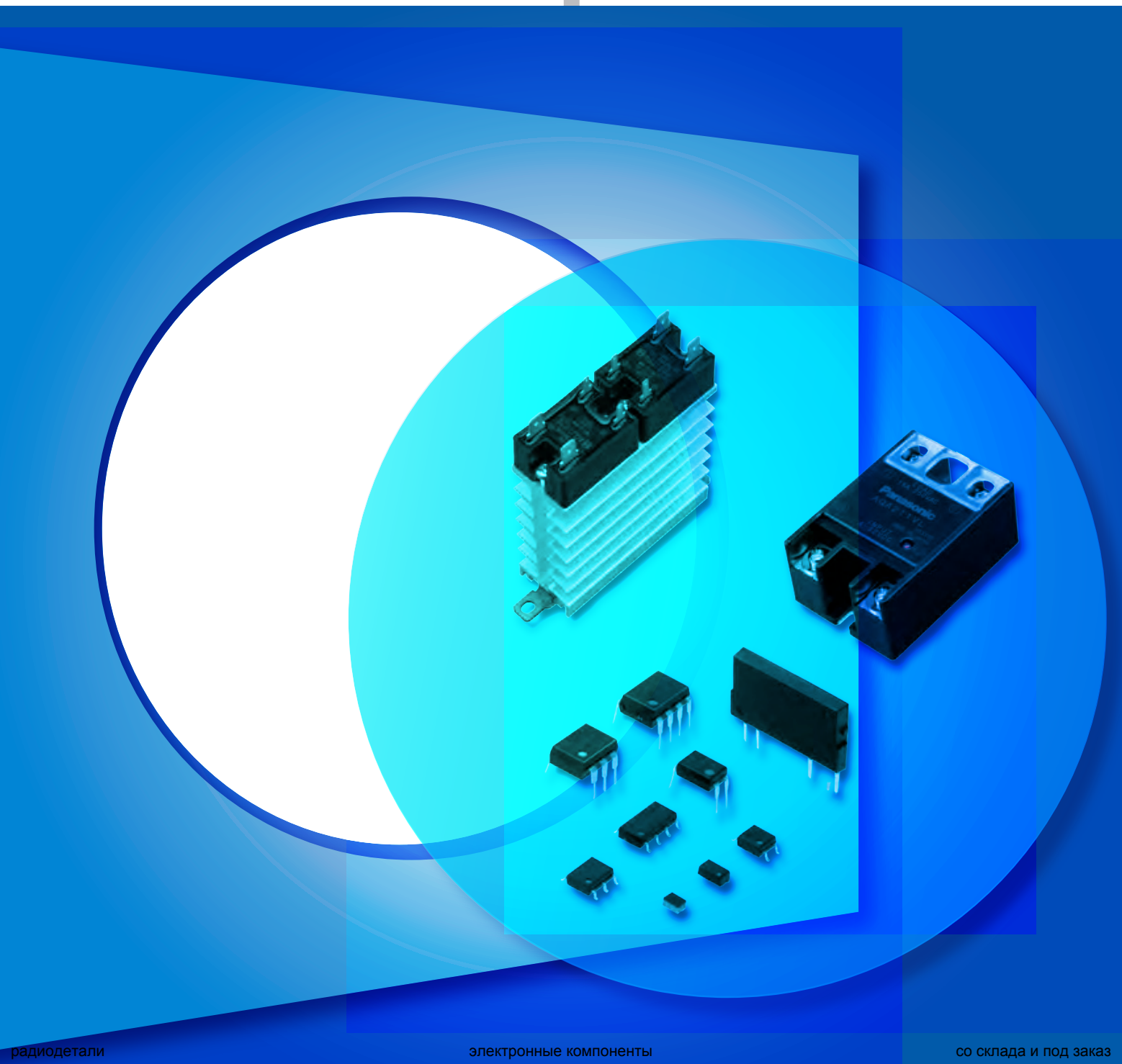
Panasonic
ideas for life

RELAY CATALOG PART 2

PHOTOMOS & SOLID STATE RELAYS

PART 1: ELECTROMECHANICAL RELAYS



Notes and Guidelines

Panasonic is part of a large worldwide group selling relays and associated switching products under different brand names in different territories. The conditions of use in some territories may differ from those customary in Europe. In particular there are often major differences in regard to national and international specifications, such as UL, CSA, VDE, SEV, EVE, SEMKO, etc. Thus, when considering contact loads as stated in this catalogue (e.g. 10 A, 30 VDC for the SP relay) it should be understood that these values are not necessarily an absolute maximum but tested ratings. Mostly the stated value has been tested for a certain life expectancy as stated by the manufacturer or the respective test house. Thus, under different conditions, the stated “maximum” may, in practice, be safely exceeded.

Therefore consideration should be given to each specific application for:

- rating and type of load
- switching frequency - cycles per second (or minute)
- environmental conditions

A general statement of compliance on data sheets, publicity, etc. concerning industrial standards, approvals or certification may imply compliance to a certain standard is available. However, because of the multiplicity of types available, in general not all types within the product family are covered to the same extent by the standard. Thus, in the event of a specific query regarding a particular product and its compliance with the standard, users are asked to refer to Panasonic for detailed information.

In case of uncertainty, contact should be made with Panasonic locally to ascertain the likelihood of the relay meeting the required life expectancy in the specific planned operational circumstances. It is also pointed out that in this book, and in deviation from EN / IEC 61810-1, operational life data is given under a normal ambient temperature of about 25°C.

The features and specifications quoted have been carefully tested using modern methods and represent the values which are to be expected with a product in new condition at room temperature. They are not guaranteed values and may change during operational life or due to ambient influences. Statistical test information covering major operating features is available on request. Panasonic reserves the right to make alterations and changes to specifications without notice from time to time as may be deemed necessary.

Application of the EC Directives to All-or-Nothing Relays

1 EMC Directive

The EMC Directive concerns primarily the finished products. In applying the Directive to components, the Guidelines[1] should be consulted to determine whether the component in question has a “direct function”. Electric motors, power supply units or temperature controls represent examples of such components with “direct function”. These types of components must be provided with a CE marking.

Components which are integrated into a device, such as relays, do not have an independent function of their own. A given relay may perform differing functions in different devices. Consequently, all-or-nothing relays must be considered components without “direct function” which are not subject to the EMC Directive.

All-or-nothing - be they electro-mechanical relays or solid state relays - shall not be labeled with a CE marking nor shall a declaration of conformity be issued within the scope of the EMC Directive.

2 Low Voltage Directive

Relays with terminals for printed boards/plug-and-socket connections do not come within the purview of the Low Voltage Directive.

The Low Voltage Directive concerns electrical equipment intended for incorporation into a device as well as equipment intended for direct use. In the case of electrical equipment which is considered a basic component intended for incorporation into other electrical equipment, the properties and safety of the final product will be largely dependent on how it is integrated: as such, these components do not fall within the Low Voltage Directive and shall not be CE marked. The Guidelines[2] specifically cite electro-mechanical basic components such as connectors, relays with terminals for printed circuit boards and micro switches. They are therefore not subject to the scope of the Low Voltage Directive.

Except for larger relays which may, for example, find application in switching cabinets, the same considerations apply to common-place relays with plug-in connections available also with printed board terminals. Here again, safety is a function of the individual application. In evaluating these relays’ performance from the perspective of the Low Voltage Directive, the same conclusion is reached as with the printed board relay. As such, CE marking is not mandatory for this type of relay.

3 Machinery Directive

The Machinery Directive differentiates between machines, machine parts and safety components. Relays are not part of any of these categories. The listing of safety components in Appendix IV is conclusive and does not include relays.

Consequently, a CE marking shall not be affixed nor shall a declaration of conformity or manufacturer’s declaration be issued under the Machinery Directive.

As of this moment, none of the aforementioned directives require CE marking for all-or-nothing relays[3].

4 RoHS Directive

The substances prohibited by the RoHS Directive (Pb, Hg, Cd, Cr^{+6}, PBB, PBDE) concern 10 categories of devices that are mostly, but not entirely, intended for private use. Components such as relays are not listed in these categories. Therefore they do not directly fall within the scope of this directive. However, if the user employs relays in devices that fall within the scope of this directive, the user must also acknowledge the substances prevented. In order to adapt to this situation in good time, all Panasonic relays are generally RoHS compliant.

---

1. Guidelines (version dated March 22, 2007) for the Application of the Council Directive 2004/108/EC.
2. Guidelines (version dated August 2007) for the Application of the Council Directive 2006/95/EC.
3. This writing deals exclusively with “non-specified-time all-or-nothing relays”. The abbreviated term “all-or-nothing relay” has been introduced merely for purposes of convenience. The term includes solid state all-or-nothing relays.

Table of Contents

Alphabetical List of Semiconductor Relays

Selector Chart

PhotoMOS 1 Form A Signal Relays

PhotoMOS Selector Chart

Type ★ = Popular Type	Photo with Dimensions (Picture scale: DIN A4)	Features	Output		Output		Input		Switching speed (I LED = 5mA)		I/O isolation voltage	Page Approvals
			Peak load V DC/AC	Continuous load current/ Peak load current (100ms)	ON resistance (typical/max.)	Output capacitance (typical)	LED operate current(max.)	LED turn-off current (min.)	Turn-on time (max.)	Turn-off time (max.)		
★**AQY212GS**	1:1 4.3 x 4.4 x 2.1mm	High capacity type	60V	• 1.0A / 3.0A 1A	0.34/0.7Ω	220pF	3.0mA	0.3mA	5.0ms	0.5ms	1,500V AC	81 UL, C-UL, TÜV, VDE
★**AQY212G2S**		High capacity type	60V	• 1.25A / 3.0A 1.25A	0.2/0.5Ω	220pF	3.0mA	0.3mA	5.0ms	0.5ms	1,500V AC	81 -
★**AQY212S**			60V	• 0.5A / 1.0A 0.5A	0.83/2.5Ω	80pF	3.0mA	0.4mA	2.0ms	0.2ms	1,500V AC	85 UL, C-UL, BSI, CSA, TÜV
AQY210LS		Current limiting	350V	• 0.12A / - 0.18A (Output limit current [typ.]) 0.12A	20/25Ω	45pF	3.0mA	0.4mA	2.0ms	1.0ms	1,500V AC	137 UL, C-UL, BSI, CSA, TÜV
★**AQY210S**		PSpice	350V	• 0.12A / 0.3A 0.12A	17/25Ω	45pF	3.0mA	0.4mA	0.5ms	0.2ms	1,500V AC	85 UL, C-UL, BSI, CSA, TÜV
★**AQY210KS**		Short circuit protected	350V	• 0.12A / - 0.2A (Cut off current [typ.]) 0.12A	23.5/35Ω	42pF	3.0mA	0.3mA	2.0ms	1.0ms	1,500V AC	128 UL, C-UL, BSI, CSA, TÜV
★**AQY214S**		PSpice	400V	• 0.1A / 0.24A 0.1A	25/35Ω	45pF	3.0mA	0.4mA	0.5ms	0.2ms	1,500V AC	85 UL, C-UL, BSI, CSA, TÜV
★**AQY232S**		Sensitive type	60V	• 0.5A / 1.5A 0.5A	0.85/2.5Ω	0.8pF	0.5mA	0.1mA	5.0ms	2.0ms	1,500V AC	274 -
★**AQY230S**		Sensitive type	350V	• 0.12A / 0.3A 0.12A	19/25Ω	0.8pF	0.5mA	0.1mA	5.0ms	2.0ms	1,500V AC	274 -
★**AQY234S**		Sensitive type	400V	• 0.1A / 0.24A 0.1A	27/35Ω	0.8pF	0.5mA	0.1mA	5.0ms	2.0ms	1,500V AC	274 -

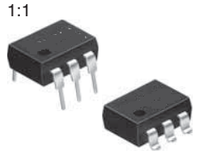
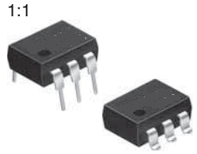
PhotoMOS 1 Form A Signal Relays

PhotoMOS Selector Chart

Type ★ = Popular Type	Photo with Dimensions (Picture scale: DIN A4)	Features	Output		Output		Input		Switching speed (I LED = 5mA)		I/O isolation voltage	Page Approvals
			Peak load V DC/AC	Continuous load current/ Peak load current (100ms)	ON resistance (typical/max.)	Output capacitance (typical)	LED operate current(max.)	LED turn-off current (min.)	Turn-on time (max.)	Turn-off time (max.)		
★**AQY211EH**	1:1  DIP : 4.78 x 6.4 x 3.2mm SMD: 4.78 x 6.4 x 2.9mm		30V	• 1.0A / 3.0A 1A	0.25/0.5Ω	240pF	3.0mA	0.4mA	5.0ms	1.0ms	5,000V AC	146 UL, C-UL, CSA, TÜV, BSI, VDE
★**AQY212EH**			60V	• 0.55A / 1.5A 0.55A	0.85/2.5Ω	80pF	3.0mA	0.4mA	4.0ms	1.0ms	5,000V AC	146 UL, C-UL, BSI, CSA, TÜV
★**AQY212GH**		High capacity type	60V	• 1.1A / 3.0A 1.1A	0.34/0.7Ω	220pF	3.0mA	0.3mA	5.0ms	0.5ms	5,000V AC	96 UL, C-UL, VDE
★**AQY214EH**			400V	• 0.12A / 0.3A 0.12A	26/35Ω	45pF	3.0mA	0.4mA	2.0ms	1.0ms	5,000V AC	146 UL, C-UL, CSA, TÜV, BSI, VDE
★**AQY210EH**			350V	• 0.13A / 0.4A 0.13A	18/25Ω	45pF	3.0mA	0.4mA	2.0ms	1.0ms	5,000V AC	146 UL, C-UL, CSA, TÜV, BSI, VDE
AQY210HL		Current limiting	350V	• 0.12A / - 0.18A (Output limit current [typ.]) 0.12A	20/25Ω	45pF	3.0mA	0.4mA	2.0ms	1.0ms	5,000V AC	140 UL, BSI, C-UL, CSA, TÜV
★**AQY216EH**			600V	• 0.05A / 0.15A 0.05A	52/120Ω	35pF	3.0mA	0.4mA	2.0ms	1.0ms	5,000V AC	146 UL, C-UL, CSA, TÜV, BSI, VDE

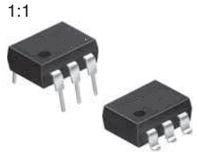
PhotoMOS 1 Form A Signal Relays

PhotoMOS Selector Chart

Type ★ = Popular Type	Photo with Dimensions (Picture scale: DIN A4)	Features	Output		Output		Input		Switching speed (I LED = 5mA)		I/O isolation voltage	Page Approvals
			Peak load V DC/AC	Continuous load current/ Peak load current (100ms)	ON resistance (typical/max.)	Output capacitance (typical)	LED operate current(max.)	LED turn-off current (min.)	Turn-on time (max.)	Turn-off time (max.)		
★**AQV212S**	1:1  6.3 x 4.4 x 2.1mm	PSpice	60V	• 0.5A / 1.0A  0.5A	0.83/2.5Ω	150pF	3.0mA	0.4mA	2.0ms	0.2ms	1,500V AC	88 UL, C-UL, CSA, TÜV
AQV215S		PSpice	100V	• 0.3A / 0.9A  0.3A	2.3/4.0Ω	110pF	3.0mA	0.4mA	2.0ms	0.2ms	1,500V AC	88 UL, C-UL, CSA, TÜV
AQV217S		PSpice	200V	• 0.16A / 0.48A  0.16A	11/15Ω	70pF	3.0mA	0.4mA	1.0ms	0.2ms	1,500V AC	88 UL, C-UL, CSA, TÜV
AQV210S		PSpice	350V	• 0.12A / 0.3A  0.12A	23/35Ω	45pF	3.0mA	0.4mA	0.5ms	0.2ms	1,500V AC	88 UL, C-UL, CSA, TÜV
AQV214S		PSpice	400V	• 0.1A / 0.3A  0.1A	30/50Ω	45pF	3.0mA	0.4mA	0.5ms	0.2ms	1,500V AC	88 UL, C-UL, CSA, TÜV
AQV216S		PSpice	600V	• 0.04A / 0.12A  0.04A	70/120Ω	45pF	3.0mA	0.4mA	0.5ms	0.2ms	1,500V AC	88 UL, C-UL, CSA, TÜV
★**AQV212**	1:1  DIP : 8.8 x 6.4 x 3.9mm SMD: 8.8 x 6.4 x 3.6mm	PSpice	60V	• 0.55A / 1.2A  0.55A	0.83/2.5Ω	150pF	3.0mA	0.4mA	2.0ms	0.2ms	1,500V AC	99 UL, C-UL, CSA, TÜV
★**AQV252G**		High capacity type	60V	• 2.5A / 6.0A  2.5A	0.08/0.12Ω	240pF	3.0mA	0.2mA	5.0ms	0.5ms	1,500V AC	251 UL, C-UL, CSA, TÜV, VDE
★**AQV251G**		High capacity type	30V	• 3.5A / 6.0A  3.5A	0.035/0.08Ω	350pF	3.0mA	0.2mA	5.0ms	0.5ms	1,500V AC	248 -
★**AQV255GS**	1:1  6.3 x 4.4 x 2.0mm	High capacity type	80V	• 1.25A / 2.5A  1.25A	0.09/0.15Ω	300pF	3.0mA	0.2mA	5.0ms	0.5ms	1,500V AC	248 -
AQV215	1:1  DIP : 8.8 x 6.4 x 3.9mm SMD: 8.8 x 6.4 x 3.6mm	PSpice	100V	• 0.32A / 0.96A  0.32A	2.3/4.0Ω	110pF	3.0mA	0.4mA	2.0ms	0.2ms	1,500V AC	99 UL, C-UL, CSA, TÜV
AQV217		PSpice	200V	• 0.18A / 0.54A  0.18A	11/15Ω	70pF	3.0mA	0.4mA	1.0ms	0.2ms	1,500V AC	99 UL, C-UL, CSA, TÜV
AQV210		PSpice	350V	• 0.13A / 0.4A  0.13A	23/35Ω	45pF	3.0mA	0.4mA	0.5ms	0.2ms	1,500V AC	99 UL, C-UL, CSA, TÜV

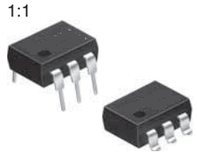
PhotoMOS 1 Form A Signal Relays

PhotoMOS Selector Chart

Type ★ = Popular Type	Photo with Dimensions (Picture scale: DIN A4)	Features	Output		Output		Input		Switching speed (I LED = 5mA)		I/O isolation voltage	Page Approvals
			Peak load V DC/AC	Continuous load current/ Peak load current (100ms)	ON resistance (typical/max.)	Output capacitance (typical)	LED operate current(max.)	LED turn-off current (min.)	Turn-on time (max.)	Turn-off time (max.)		
AQV210E	1:1  DIP : 8.8 x 6.4 x 3.9mm SMD: 8.8 x 6.4 x 3.6mm		350V	• 0.13A / 0.4A  0.13A	23/35Ω	45pF	3.0mA	1.0mA	2.0ms	1.0ms	1,500V AC	150 UL, C-UL, CSA, TÜV
★**AQV210EH**			350V	• 0.13A / 0.4A  0.13A	23/35Ω	45pF	3.0mA	0.4mA	2.0ms	1.0ms	5,000V AC	150 UL, C-UL, CSA, TÜV, BSI, VDE
AQV214		PSpice	400V	• 0.12A / 0.3A  0.12A	30/50Ω	45pF	3.0mA	0.4mA	0.5ms	0.2ms	1,500V AC	99 UL, C-UL, CSA, TÜV
AQV214E			400V	• 0.12A / 0.3A  0.12A	30/50Ω	45pF	3.0mA	0.3mA	2.0ms	1.0ms	1,500V AC	150 UL, C-UL, CSA, TÜV
★**AQV214EH**			400V	• 0.12A / 0.3A  0.12A	30/50Ω	45pF	3.0mA	0.4mA	2.0ms	1.0ms	5,000V AC	150 UL, C-UL, CSA, TÜV, BSI, VDE
AQV214H			400V	• 0.12A / 0.3A  0.12A	30/50Ω	45pF	3.0mA	0.4mA	0.8ms	0.2ms	5,000V AC	99 UL, C-UL, CSA, TÜV, BSI, VDE
AQV216		PSpice	600V	• 0.05A / 0.15A  0.05A	70/120Ω	45pF	3.0mA	0.4mA	0.5ms	0.2ms	1,500V AC	99 UL, C-UL, CSA, TÜV
AQV101			40V DC	• 0.7A / 1.8A  0.7A	0.3/0.5Ω	600pF	5.0mA	0.8mA	1.0ms	1.0ms	1,500V AC	266 UL, C-UL, TÜV
AQV201			40V	• 0.5A / 1.8A  0.5A	0.6/1Ω	350pF	5.0mA	0.8mA	1.0ms	1.0ms	1,500V AC	266 UL, C-UL, TÜV
AQV251			40V	• 0.5A / 1.8A  0.5A	0.6/1.0Ω	350pF	3.0mA	0.4mA	3.0ms	0.2ms	1,500V AC	244 UL, C-UL, CSA, TÜV
AQV102			60V DC	• 0.6A / 1.5A  0.6A	0.37/0.7Ω	600pF	5.0mA	0.8mA	1.0ms	1.0ms	1,500V AC	266 UL, C-UL, TÜV
AQV202			60V	• 0.4A / 1.5A  0.4A	0.74/1.4Ω	350pF	5.0mA	0.8mA	1.0ms	1.0ms	1,500V AC	266 UL, C-UL, TÜV

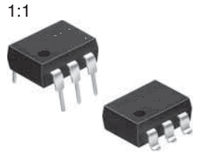
PhotoMOS 1 Form A Signal Relays

PhotoMOS Selector Chart

Type ★ = Popular Type	Photo with Dimensions (Picture scale: DIN A4)	Features	Output		Output		Input		Switching speed (I LED = 5mA)		I/O isolation voltage	Page Approvals
			Peak load V DC/AC	Continuous load current/ Peak load current (100ms)	ON resistance (typical/max.)	Output capacitance (typical)	LED operate current(max.)	LED turn-off current (min.)	Turn-on time (max.)	Turn-off time (max.)		
AQV252	1:1  DIP : 8.8 x 6.4 x 3.9mm SMD: 8.8 x 6.4 x 3.6mm		60V	• 0.4A / 1.5A 0.4A	0.74/1.4Ω	350pF	3.0mA	0.4mA	1.4ms	0.2ms	1,500V AC	244 UL, C-UL, CSA, TÜV
★**AQV112KL**		Short circuit protected	60V DC	• 0.5A / - 0.5A	0.55/2Ω	300pF	10mA	0.3mA	2.0ms	1.0ms	1,500V AC	133 UL, C-UL, CSA, TÜV, VDE
AQV255			100V	• 0.35A / 1.0A 0.35A	1.8/2.5Ω	350pF	3.0mA	0.4mA	2.0ms	0.2ms	1,500V AC	244 UL, C-UL, CSA, TÜV
AQV257			200V	• 0.25A / 0.75A 0.25A	2.6/4.0Ω	170pF	3.0mA	0.4mA	3.0ms	0.2ms	1,500V AC	244 UL, C-UL, CSA, TÜV
AQV103			250V DC	• 0.3A / 0.6A 0.3A	2.7/4Ω	300pF	5.0mA	0.8mA	1.0ms	1.0ms	1,500V AC	266 UL, C-UL, TÜV
AQV203			250V	• 0.2A / 0.6A 0.2A	5.5/8Ω	170pF	5.0mA	0.8mA	1.0ms	1.0ms	1,500V AC	266 UL, C-UL, TÜV
AQV253			250V	• 0.2A / 0.6A 0.2A	5.5/8.0Ω	170pF	3.0mA	0.4mA	2.0ms	0.2ms	1,500V AC	244 UL, C-UL, CSA, TÜV

PhotoMOS 1 Form A Signal Relays

PhotoMOS Selector Chart

Type ★ = Popular Type	Photo with Dimensions (Picture scale: DIN A4)	Features	Output		Output		Input		Switching speed (I LED = 5mA)		I/O isolation voltage	Page Approvals
			Peak load V DC/AC	Continuous load current/ Peak load current (100ms)	ON resistance (typical/max.)	Output capacitance (typical)	LED operate current(max.)	LED turn-off current (min.)	Turn-on time (max.)	Turn-off time (max.)		
AQV253H	1:1  DIP : 8.8 x 6.4 x 3.9mm SMD: 8.8 x 6.4 x 3.6mm		250V	• 0.2A / 0.6A 	5.5/8Ω	170pF	3.0mA	0.4mA	4.0ms	0.2ms	5,000V AC	244 UL, C-UL, CSA, TÜV, BSI, VDE
AQV104			400V DC	• 0.18A / 0.5A 	6.3/8Ω	300pF	5.0mA	0.8mA	1.0ms	1.0ms	1,500V AC	266 UL, C-UL, TÜV
AQV204			400V	• 0.15A / 0.5A 	12.4/16Ω	170pF	5.0mA	0.8mA	1.0ms	1.0ms	1,500V AC	266 UL, C-UL, TÜV
AQV234		Sensitive type	400V	• 0.12A / 0.3A 	30/50Ω	45pF	0.31mA	0.1mA	2.0ms	1.0ms	1,500V AC	271 UL, C-UL, CSA, TÜV
AQV254			400V	• 0.15A / 0.5A 	12.4/16Ω	170pF	3.0mA	0.4mA	2.0ms	0.2ms	1,500V AC	244 UL, C-UL, CSA, TÜV
AQV254H			400V	• 0.15A / 0.5A 	12.4/16Ω	170pF	3.0mA	0.4mA	3.0ms	0.2ms	5,000V AC	244 UL, C-UL, CSA, TÜV, BSI, VDE
★**AQV259**			1,000V	• 0.03A / 0.09A 	80/200Ω	80pF	3.0mA	0.4mA	1.0ms	0.2ms	1,500V AC	244 UL, C-UL, CSA, TÜV
★**AQV258**			1,500V	• 0.02A / 0.06A 	345/500Ω	80pF	3.0mA	0.4mA	1.0ms	0.2ms	1,500V AC	244 UL, C-UL, CSA, TÜV

PhotoMOS 1 Form A Power Relays

PhotoMOS Selector Chart

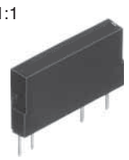
Type ★ = Popular Type	Photo with Dimensions (Picture scale: DIN A4)	Features	Output		Output		Input		Switching speed		I/O isolation voltage	Page Approvals
			Peak load V DC/AC	Continuous load current/ Peak load current (100ms)	ON resistance (typical/max.)	Output capacitance (typical)	LED operate current (max.)	LED turn-off current (min.)	Turn-on time (max.)	Turn-off time (max.)		
★**AQZ102**	1:1  21 x 3.5 x 12.5mm		60V DC	• 4.0A / 9.0A 	0.05/0.09Ω	1700pF	3.0mA	0.4mA	5.0ms	3.0ms	2,500V AC	284 UL, C-UL, CSA, TÜV
AQZ105			100V DC	• 2.6A / 6.0A 	0.081/0.17Ω	1700pF	3.0mA	0.4mA	5.0ms	3.0ms	2,500V AC	284 UL, C-UL, CSA, TÜV
AQZ107			200V DC	• 1.3A / 3.0A 	0.34/0.55Ω	900pF	3.0mA	0.4mA	5.0ms	3.0ms	2,500V AC	284 UL, C-UL, CSA, TÜV
AQZ104			400V DC	• 0.7A / 1.5A 	1.06/1.6Ω	900pF	3.0mA	0.4mA	5.0ms	3.0ms	2,500V AC	284 UL, C-UL, CSA, TÜV
AQZ262	1:1  43 x 9 x 32mm		60V	• 6.0A / 10.0A 	0.036/0.05Ω	1400pF	3.0mA	0.4mA	10.0ms	3.0ms	1,500V AC	301 UL, CSA
★**AQZ202**	1:1  21 x 3.5 x 12.5mm		60V	• 3.0A / 9.0A 	0.11/0.18Ω	1400pF	3.0mA	0.4mA	5.0ms	3.0ms	2,500V AC	284 UL, C-UL, CSA, TÜV
★**AQZ205**			100V	• 2.0A / 6.0A 	0.23/0.34Ω	1400pF	3.0mA	0.4mA	5.0ms	3.0ms	2,500V AC	284 UL, C-UL, CSA, TÜV
AQZ207			200V	• 1.0A / 3.0A 	07/11Ω	600pF	3.0mA	0.4mA	5.0ms	3.0ms	2,500V AC	284 UL, C-UL, CSA, TÜV
★**AQZ204**			400V	• 0.5A / 1.5A 	2.1/3.2Ω	600pF	3.0mA	0.4mA	5.0ms	3.0ms	2,500V AC	284 UL, C-UL, CSA, TÜV
AQY212FG2S	1:1  4.30 x 4.40 x 2.10mm	Built-in resistor	60V	• 1.25A / 3.0A 	0.2/0.5Ω	150pF	Operate voltage V_{Fon} (max.) 4.0V	Turn off voltage V_{Foff} (min.) 0.8V	5.0ms	0.5ms	500V AC	92 -

PhotoMOS 1 Form A Power Relays

PhotoMOS Selector Chart

Type ★ = Popular Type	Photo with Dimensions (Picture scale: DIN A4)	Features	Output		Output		Input		Switching speed		I/O isolation voltage	Page Approvals
			Peak load V DC/AC	Continuous load current/ Peak load current (100ms)	ON resistance (typical/max.)	Output capacitance (typical)	LED operate current (max.)	LED turn-off current (min.)	Turn-on time (max.)	Turn-off time (max.)		
AQZ264	1:1  43 x 9 x 32mm		400V	• 1.0A / 3.0A 1.0A	1.0/1.4Ω	600pF	3.0mA	0.4mA	10.0ms	3.0ms	1,500V AC	301 UL, CSA
AQY272	1:1  DIP : 9.3 x 8.8 x 3.9mm SMD: 9.3 x 8.8 x 3.7mm		60V	• 2.0A / 6.0A 2.0A	0.11/0.18Ω	1400pF	3.0mA	0.4mA	5.0ms	3.0ms	2,500V AC	280 UL, C-UL, CSA
AQY275			100V	• 1.3A / 4.0A 1.3A	0.23/0.34Ω	1400pF	3.0mA	0.4mA	5.0ms	3.0ms	2,500V AC	280 UL, C-UL, CSA
AQY277			200V	• 0.65A / 2.0A 0.65A	0.7/1.1Ω	600pF	3.0mA	0.4mA	5.0ms	3.0ms	2,500V AC	280 UL, C-UL, CSA
AQY274			400V	• 0.35A / 1.0A 0.35A	2.1/3.2Ω	600pF	3.0mA	0.4mA	5.0ms	3.0ms	2,500V AC	280 UL, C-UL, CSA

PhotoMOS 1 Form A Voltage Sensitive Power Relays

Type ★ = Popular Type	Photo with Dimensions (Picture scale: DIN A4)	Features	Output	
			Peak load V DC/AC	Continuous load current/ Peak load current (100ms)
AQZ102D	1:1  21 x 3.5 x 12.5mm	Input voltage sensitive	60V DC	• 3.6A / 9.0A 
AQZ105D		Input voltage sensitive	100V DC	• 2.3A / 6.0A 
AQZ107D		Input voltage sensitive	200V DC	• 1.1A / 3.0A 
AQZ104D		Input voltage sensitive	400V DC	• 0.6A / 1.5A 
AQZ202D		Input voltage sensitive	60V	• 2.7A / 9.0A 
AQZ205D		Input voltage sensitive	100V	• 1.8A / 6.0A 
AQZ207D		Input voltage sensitive	200V	• 0.9A / 3.0A 
AQZ204D		Input voltage sensitive	400V	• 0.45A / 1.5A 

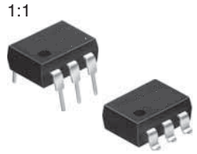
Output		Input		Switching speed		I/O isolation voltage	Page Approvals
ON resistance (typical/max.)	Output capacitance (typical)	Operate voltage (max.)	Turn-off voltage (min.)	Turn-on time (max.)	Turn-off time (max.)		
0.033/0.09Ω	1700pF	4V	0.8V	10.0ms	3.0ms	2,500V AC	295 UL, CSA, TÜV, VDE
0.090/ 0.17Ω	1700pF	4V	0.8V	10.0ms	3.0ms	2,500V AC	295 UL, CSA, TÜV, VDE
0.33/0.55Ω	900pF	4V	0.8V	10.0ms	3.0ms	2,500V AC	295 UL, CSA, TÜV, VDE
1.23/1.6Ω	900pF	4V	0.8V	10.0ms	3.0ms	2,500V AC	295 UL, CSA, TÜV, VDE
0.066/0.18Ω	1400pF	4V	0.8V	10.0ms	3.0ms	2,500V AC	295 UL, CSA, TÜV
0.18/0.34Ω	1400pF	4V	0.8V	10.0ms	3.0ms	2,500V AC	295 UL, CSA, TÜV
0.64/1.1Ω	600pF	4V	0.8V	10.0ms	3.0ms	2,500V AC	295 UL, CSA, TÜV
2.4/3.2Ω	600pF	4V	0.8V	10.0ms	3.0ms	2,500V AC	295 UL, CSA, TÜV

PhotoMOS 1 Form A Low CxR

Type ★ = Popular Type	Photo with Dimensions (Picture scale: DIN A4)	Features	Output	
			Peak load V DC/AC	Continuous load current/ Peak load current (100ms)
★AQY221R2T	1:1  1.8 x 2.1 x 2.9mm	Low CxR	40V	• 0.25A 
★AQY221N2T		Low CxR	40V	• 0.12A 
★AQY221N3T		Low CxR	25V	• 0.15A 
★AQY221N3M	1:1  2.2 x 2.95 x 1.4mm	Low CxR	25V	• 0.15A / - 
★AQY221R2M		Low CxR	40V	• 0.25A / 0.75A 
★AQY221N2M		Low CxR	40V	• 0.12A / - 
★AQY221N3V	1:1  2.65 x 4.45 x 1.8mm	Low CxR	25V	• 0.15A / 0.4A 
★AQY221R4V		Low CxR	40V	• 0.5A / 1.0A 
★AQY221N2V		Low CxR PSpice	40V	• 0.12A / 0.3A 
★AQY221R2V		Low CxR PSpice	40V	• 0.25A / 0.75A 
AQY221FR2V		Built-in resistor	40V	• 0.25A / 0.75A 
AQY221FN2V		Built-in resistor	40V	• 0.12A / 0.2A 

Output		Input		Switching speed		I/O isolation voltage	Page Approvals
ON resistance (typical/max.)	Output capacitance (typical)	LED operate current (max.)	LED turn-off current (min.)	Turn-on time (max.)	Turn-off time (max.)		
0.8/1.25Ω	14pF	3.0mA	0.1mA	0.5ms	0.2ms	200V AC	176 -
9.5/12.5Ω	1.1pF	3.0mA	0.2mA	0.2ms	0.2ms	200V AC	176 -
5.5/7.5Ω	1.1pF	3.0mA	0.2mA	0.2ms	0.2ms	200V AC	176 -
5.5/7.5Ω	1.1pF	3.0mA	0.2mA	0.2ms	0.2ms	200V AC	183 -
0.8/1.25Ω	14pF	3.0mA	0.2mA	0.5ms	0.2ms	200V AC	191 -
9.5/12.5Ω	1.1pF	3.0mA	0.2mA	0.2ms	0.2ms	200V AC	191 -
5.5/7.5Ω	1.pF	3.0mA	0.2mA	0.2ms	0.2ms	1,500V AC	187 -
0.55/1.0Ω	24pF	3.0mA	0.1mA	0.75ms	0.2ms	1,500V AC	196 -
9.5/12.5Ω	1.0pF	3.0mA	0.2mA	0.5ms	0.2ms	1,500V AC	196 -
0.75/1.25Ω	12.5pF	3.0mA	0.1mA	0.5ms	0.2ms	1,500V AC	196 -
0.75/1.25Ω	12.5pF	Operate voltage V_{Fon} (max.) 4.0V	Turn off voltage V_{Foff} (min.) 0.8V	0.5ms	0.2ms	500V AC	200 -
9.5/12.5Ω	1pF	Operate voltage V_{Fon} (max.) 4.0V	Turn off voltage V_{Foff} (min.) 0.8V	0.5ms	0.2ms	500V AC	200 -

PhotoMOS 1 Form A Low CxR

Type ★ = Popular Type	Photo with Dimensions (Picture scale: DIN A4)	Features	Output	
			Peak load V DC/AC	Continuous load current/ Peak load current (100ms)
AQY225R2V	1:1  2.65 x 4.45 x 1.8mm	Low CxR	80V	• 0.12A / 0.3A 
★**AQY221N2S**	1:1  4.3 x 4.4 x 2.1mm	Low CxR	40V	• 0.12A / 0.3A 
★**AQY221R2S**		Low CxR	40V	• 0.25A / 0.75A 
AQY222R1S		Low CxR	60V	• 0.5A / 1.0A 
AQY225R1S		Low CxR	80V	• 0.35A / 0.7A 
★**AQY225R2S**		Low CxR	80V	• 0.15A / 0.45A 
AQV227NS	1:1  6.3 x 4.4 x 2.1mm		200V	• 0.05A / 0.15A 
AQV224NS			400V	• 0.04A / 0.12A 
AQV221	1:1  DIP : 8.8 x 6.4 x 3.9mm SMD: 8.8 x 6.4 x 3.6mm		40V	• 0.08A / 0.18A 
AQV225			80V	• 0.05A / 0.15A 
AQV227N			200V	• 0.07A / 0.21A 
AQV224N			400V	• 0.05A / 0.15A 

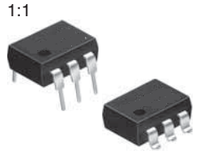
Output		Input		Switching speed		I/O isolation voltage	Page Approvals
ON resistance (typical/max.)	Output capacitance (typical)	LED operate current (max.)	LED turn-off current (min.)	Turn-on time (max.)	Turn-off time (max.)		
10.5/15Ω	4.5pF	3.0mA	0.1mA	0.5ms	0.2ms	1,500V AC	217 -
9.5/12.5Ω	1.0pF	3.0mA	0.2mA	0.5ms	0.2ms	1,500V AC	209 UL, CSA, TÜV
0.8/1.25Ω	13pF	3.0mA	0.1mA	0.5ms	0.2ms	500V AC	204 UL, CSA, TÜV
0.8/1.2Ω	24.5pF	3.0mA	0.1mA	0.5ms	0.2ms	1,500V AC	220 -
0.8/1.2Ω	37.5pF	3.0mA	0.1mA	0.75ms	0.2ms	1,500V AC	220 -
10.5/15Ω	4.5pF	3.0mA	0.1mA	0.5ms	0.2ms	1,500V AC	220 -
30/50Ω	10pF	3.0mA	0.4mA	0.5ms	0.2ms	1,500V AC	227 UL, CSA, TÜV
70/100Ω	10pF	3.0mA	0.4mA	0.5ms	0.2ms	1,500V AC	227 UL, CSA, TÜV
22/35Ω	5.6pF	3.0mA	0.4mA	0.3ms	0.1ms	1,500V AC	172 UL, CSA, TÜV
36/50Ω	4.8pF	3.0mA	0.4mA	0.3ms	0.1ms	1,500V AC	172 UL, CSA, TÜV
30/50Ω	10pF	3.0mA	0.4mA	0.5ms	0.2ms	1,500V AC	231 UL, CSA, TÜV
70/100Ω	10pF	3.0mA	0.4mA	0.5ms	0.2ms	1,500V AC	231 UL, CSA, TÜV

PhotoMOS 1 Form B

PhotoMOS Selector Chart

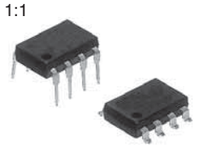
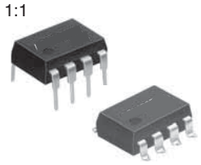
Type ★ = Popular Type	Photo with Dimensions (Picture scale: DIN A4)	Features	Output		Output		Input		Switching speed		I/O isolation voltage	Page Approvals
			Peak load V DC/AC	Continuous load current/ Peak load current (100ms)	ON resistance (typical/max.)	Output capacitance (typical)	LED operate current (max.)	LED turn-off current (min.)	Turn-on time (max.)	Turn-off time (max.)		
1 Form B Signal Relays												
★**AQY412S**	1:1 4.3 x 4.4 x 2.1mm		60V	• 0.5A / 1.5A 0.5A	1/2.5Ω	450pF	3.0mA	0.4mA	3.0ms	1.0ms	1,500V AC	109 UL, CSA, VDE
★**AQY410S**			350V	• 0.12A / 0.3A 0.12A	18/25Ω	110pF	3.0mA	0.4mA	1.0ms	1.0ms	1,500V AC	109 UL, CSA, TÜV, BSI
★**AQY414S**			400V	• 0.1A / 0.24A 0.1A	26/35Ω	100pF	3.0mA	0.4mA	1.0ms	1.0ms	1,500V AC	109 UL, CSA, TÜV, BSI
AQY412EH	1:1 DIP : 4.78 x 6.4 x 3.2mm SMD: 4.78 x 6.4 x 2.9mm		60V	• 0.55A / 1.5A 0.55A	1/2.5Ω	480pF	3.0mA	0.4mA	10.0ms	1.0ms	5,000V AC	158 UL, CSA, VDE
★**AQY410EH**			350V	• 0.13A / 0.4A 0.13A	18/25Ω	110pF	3.0mA	0.4mA	3.0ms	1.0ms	5,000V AC	158 UL, CSA, BSI
AQY414EH			400V	• 0.12A / 0.3A 0.12A	26/35Ω	100pF	3.0mA	0.4mA	3.0ms	1.0ms	5,000V AC	158 UL, CSA, BSI
AQV414S	1:1 6.3 x 4.4 x 2.1mm		400V	• 0.1A / 0.3A 0.1A	26/50Ω	100pF	3.0mA	0.4mA	1.0ms	1.0ms	1,500V AC	112 UL, CSA, TÜV

PhotoMOS 1 Form B

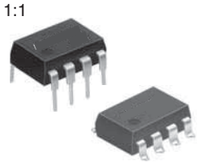
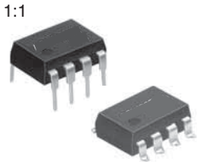
Type ★ = Popular Type	Photo with Dimensions (Picture scale: DIN A4)	Features	Output		Output		Input		Switching speed		I/O isolation voltage	Page Approvals
			Peak load V DC/AC	Continuous load current/ Peak load current (100ms)	ON resistance (typical/max.)	Output capacitance (typical)	LED operate current (max.)	LED turn-off current (min.)	Turn-on time (max.)	Turn-off time (max.)		
AQV410EH	1:1  DIP : 8.8 x 6.4 x 3.9mm SMD: 8.8 x 6.4 x 3.6mm		350V	• 0.13A / 0.4A 0.13A	18/35Ω	110pF	3.0mA	0.4mA	3.0ms	1.5ms	5,000V AC	161 UL, CSA, TÜV, BSI, VDE
AQV412EH			60V	• 0.55A / 1.5A 0.55A	1/2.5Ω	480pF	3.0mA	0.4mA	10.0ms	1.5ms	5,000V AC	161 UL, CSA, TÜV, VDE
AQV414E			400V	• 0.12A / 0.3A 0.12A	26/50Ω	100pF	3.0mA	0.3mA	2.0ms	1.0ms	1,500V AC	161 UL, CSA, TÜV
AQV414EH			400V	• 0.12A / 0.3A 0.12A	26/50Ω	100pF	3.0mA	0.4mA	3.0ms	1.5ms	5,000V AC	161 UL, CSA, TÜV, BSI, VDE
AQV453			250V	• 0.2A / 0.6A 0.2A	5.5/8.0Ω	350pF	3.0mA	0.4mA	3.0ms	1.0ms	1,500V AC	257 UL, CSA
AQV414			400V	• 0.12A / 0.3A 0.12A	26/50Ω	100pF	3.0mA	0.4mA	1.0ms	1.0ms	1,500V AC	116 UL, CSA, TÜV
AQV454			400V	• 0.15A / 0.5A 0.15A	10.5/16Ω	170pF	3.0mA	0.4mA	2.0ms	1.0ms	1,500V AC	257 UL, CSA, TÜV
AQV454H			400V	• 0.15A / 0.5A 0.15A	10.5/16Ω	170pF	3.0mA	0.4mA	3.0ms	1.0ms	5,000V AC	257 UL, CSA, TÜV
1 Form B Power Relays												
AQZ404	1:1  21 x 3.5 x 12.5mm		400V	• 0.5A / 1.5A 0.5A	2.8/4.0Ω	2000pF	3.0mA	0.4mA	7.5ms	3.0ms	2,500V AC	291 UL, CSA

PhotoMOS 2 Form A Signal Relays

PhotoMOS Selector Chart

Type ★ = Popular Type	Photo with Dimensions (Picture scale: DIN A4)	Features	Output		Output		Input		Switching speed		I/O isolation voltage	Page Approvals
			Peak load V DC/AC	Continuous load current/ Peak load current (100ms)	ON resistance (typical/max.)	Output capacitance (typical)	LED operate current (max.)	LED turn-off current (min.)	Turn-on time (max.)	Turn-off time (max.)		
★AQW210S	1:1  9.37 x 4.4 x 2.1mm		350V	• 0.1A / 0.3A 0.1A	16/35Ω	45pF	3.0mA	0.4mA	0.5ms	0.2ms	1,500V AC	103 UL, CSA, TÜV
AQW212S			60V	• 0.4A / 1.5A 0.4A	0.83/2.5Ω	-	3.0mA	0.4mA	2.0ms	0.2ms	1,500V AC	103 UL, CSA, TÜV
★AQW214S			400V	• 0.08A / 0.24A 0.8A	30/50Ω	45pF	3.0mA	0.4mA	0.5ms	0.2ms	1,500V AC	103 UL, CSA, TÜV
★AQW212EH	1:1  DIP : 9.86 x 6.4 x 3.2mm SMD: 9.86 x 6.4 x 2.9mm		60V	• 0.5A / 1.5A 0.5A	0.83/2.5Ω	80pF	3.0mA	0.4mA	4.0ms	1.0ms	5,000V AC	154 UL, CSA, TÜV
★AQW210EH			350V	• 0.12A / 0.36A 0.12A	18/25Ω	45pF	3.0mA	0.4mA	2.0ms	1.0ms	5,000V AC	154 UL, CSA, TÜV
AQW210HL		Current limiting	350V	• 0.1A / - 0.18A (Output limit current [typ.]) 0.1A	20/25Ω	45pF	3.0mA	0.4mA	2.0ms	1.0ms	5,000V AC	143 UL, CSA, TÜV
AQW214EH			400V	• 0.1A / 0.3A 0.1A	26/35Ω	45pF	3.0mA	0.4mA	2.0ms	1.0ms	5,000V AC	154 UL, CSA, TÜV
★AQW216EH			600V	• 0.04A / 0.12A 0.04A	52/120Ω	45pF	3.0mA	0.4mA	2.0ms	1.0ms	5,000V AC	154 UL, CSA, TÜV
AQW212	1:1  DIP : 9.78 x 6.4 x 3.9mm SMD: 9.78 x 6.4 x 3.6mm		60V	• 0.6A / 1.0A 0.6A	0.83/2.5Ω	150pF	3.0mA	0.4mA	2.0ms	0.2ms	1,500V AC	106 UL, CSA, TÜV
AQW215			100V	• 0.3A / 0.9A 0.3A	2.3/4.0Ω	110pF	3.0mA	0.4mA	2.0ms	0.2ms	1,500V AC	106 UL, CSA, TÜV
AQW217			200V	• 0.16A / 0.48A 0.16A	11/15Ω	70pF	3.0mA	0.4mA	2.0ms	0.2ms	1,500V AC	106 UL, CSA, TÜV
AQW210			350V	• 0.12A / 0.36A 0.12A	23/35Ω	45pF	3.0mA	0.4mA	0.5ms	0.05ms	1,500V AC	106 UL, CSA, TÜV
AQW214			400V	• 0.1A / 0.3A 0.1A	30/50Ω	45pF	3.0mA	0.4mA	0.5ms	0.05ms	1,500V AC	106 UL, CSA, TÜV
AQW254			400V	• 0.12A / 0.36A 0.12A	12.4/16Ω	170pF	3.0mA	0.4mA	2.0ms	0.2ms	1,500V AC	254 UL, CSA, TÜV
AQW216			600V	• 0.04A / 0.12A 0.04A	70/120Ω	45pF	3.0mA	0.4mA	0.5ms	0.2ms	1,500V AC	106 UL, CSA, TÜV

PhotoMOS Other Types

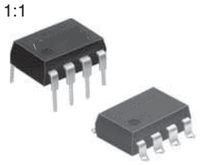
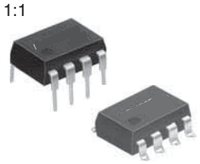
Type ★ = Popular Type	Photo with Dimensions (Picture scale: DIN A4)	Features	Output	
			Peak load V DC/AC	Continuous load current/ Peak load current (100ms)
2 Form A Low CxR				
AQW227NS	1:1  9.37 x 4.4 x 2.1mm		200V	• 0.04A / 0.15A 
AQW223R2S		Low CxR	250V	• 0.14A / 0.42A 
AQW227N	1:1  DIP : 9.78 x 6.4 x 3.9mm SMD: 9.78 x 6.4 x 3.6mm		200V	• 0.05A / 0.15A 
AQW224N			400V	• 0.04A / 0.12A 
2 Form B				
★**AQW414EH**	1:1  DIP : 9.86 x 6.4 x 3.2mm SMD: 9.86 x 6.4 x 2.9mm		400V	• 0.1A / 0.3A 
AQW414	1:1  DIP : 9.78 x 6.4 x 3.9mm SMD: 9.78 x 6.4 x 3.6mm		400V	• 0.1A / 0.3A 
AQW454			400V	• 0.12A / 0.36A 
1 Form A / 1 Form B				
AQW612S	1:1  9.4 x 4.4 x 2.1mm		60V	• 0.45A / 1.5A 
★**AQW610S**	1:1  9.37 x 4.4 x 2.1mm		350V	• 0.1A / 0.3A 

PhotoMOS Selector Chart

Output		Input		Switching speed		I/O isolation voltage	Page Approvals
ON resistance (typical/max.)	Output capacitance (typical)	LED operate current (max.)	LED turn-off current (min.)	Turn-on time (max.)	Turn-off time (max.)		
30/50Ω	10pF	3.0mA	0.4mA	0.5ms	0.2ms	1,500V AC	235 UL, C-UL, TÜV
10/15Ω	33pF	3.0mA	0.1mA	0.5ms	0.2ms	1,500V AC	224 C-UL
30/50Ω	10pF	3.0mA	0.4mA	0.5ms	0.2ms	1,500V AC	238 UL, CSA, TÜV
70/100Ω	10pF	3.0mA	0.4mA	0.5ms	0.2ms	1,500V AC	238 UL, CSA, TÜV
26/35Ω	100pF	3.0mA	0.4mA	3.0ms	1.0ms	5,000V AC	165 UL, CSA, TÜV, BSI
26/50Ω	100pF	3.0mA	0.4mA	1.0ms	1.0ms	1,500V AC	119 UL, CSA, TÜV
11/16Ω	170pF	3.0mA	0.4mA	2.0ms	1.0ms	1,500V AC	260 UL, CSA, TÜV
1/2.5Ω	80pF (N.O.) 450pF (N.C.)	3.0mA	0.4mA	3.0ms	1.0m	1,500V AC	122 UL, CSA, TÜV, VDE
18/25Ω	45pF (N.O) 100pF (N.C.)	3.0mA	0.4mA	1.0ms	1.0ms	1,500V AC	122 UL, CSA, TÜV, BSI

PhotoMOS Other Types

PhotoMOS Selector Chart

Type ★ = Popular Type	Photo with Dimensions (Picture scale: DIN A4)	Features	Output		Output		Input		Switching speed		I/O isolation voltage	Page Approvals
			Peak load V DC/AC	Continuous load current/ Peak load current (100ms)	ON resistance (typical/max.)	Output capacitance (typical)	LED operate current (max.)	LED turn-off current (min.)	Turn-on time (max.)	Turn-off time (max.)		
AQW612EH	1:1  DIP : 9.78 x 6.4 x 3.9mm SMD: 9.78 x 6.4 x 3.6mm		60V	• 0.5A / 1.5A 0.5A	1/2.5Ω	80pF (N.O.) 480pF (N.C.)	3.0mA	0.4mA	4.0ms (N.O.) 10.0ms (N.C.)	1.0ms	5,000V AC	168 UL, CSA, TÜV, VDE
★**AQW610EH**	1:1  DIP : 9.86 x 6.4 x 3.2mm SMD: 9.86 x 6.4 x 2.9mm		350V	• 0.12A / 0.36A 0.12A	18/25Ω	45pF (N.O.) 100pF (N.C.)	3.0mA	0.4mA	3.0ms	1.0ms	5,000V AC	168 UL, CSA, TÜV, BSI
★**AQW614EH**			400V	• 0.1A / 0.3A 0.1A	26/35Ω	45pF (N.O.) 100pF (N.C.)	3.0mA	0.4mA	3.0ms	1.0ms	5,000V AC	168 UL, CSA, TÜV, BSI
AQW614	1:1  DIP : 9.78 x 6.4 x 3.9mm SMD: 9.78 x 6.4 x 3.6mm		400V	• 0.1A / 0.3A 0.1A	27/50Ω	45pF (N.O.) 100pF (N.C.)	3.0mA	0.4mA	1.0ms	1.0ms	1,500V AC	125 UL, CSA, TÜV
AQW654			400V	• 0.12A / 0.36A 0.12A	• N.O.: 10/16Ω • N.C.: 11/16Ω	170pF	3.0mA	0.4mA	3.0ms	1.0ms	1,500V AC	263 UL, CSA, TÜV
Multichannel												
AQS221N2S	1:1  10.37 x 4.4 x 2.1mm	Low CxR	40V	• 0.06A / 0.12A 0.06A	9.5/12.5Ω	1pF	3.0mA	0.1mA	0.2ms	0.2ms	500V AC	209 -
★**AQS225R2S**		Low CxR	80V	• 0.07A / 0.2A 0.07A	10.5/15.0Ω	4.5pF	3.0mA	0.3mA	0.3ms	0.2ms	1,500V AC	241 UL, CSA, TÜV
AQS221FR2S		Built-in resistor	40V	• 0.16A / 0.2A 0.16A	0.5/1.5Ω	12.5pF	Operate voltage V_{Fon} (max.) 4.0V	Turn off voltage V_{Foff} (min.) 0.8V	0.5ms	0.2ms	500V AC	213 -
AQS221FN2S		Built-in resistor	40V	• 0.06A / 0.12A 0.06A	9.5/12.5Ω	1pF	Operate voltage V_{Fon} (max.) 4.0V	Turn off voltage V_{Foff} (min.) 0.8V	0.5ms	0.2ms	500V AC	213 -

Photovoltaic MOSFET drivers

PhotoMOS Selector Chart

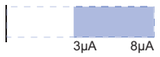
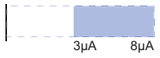
Type ★ = Popular Type	Photo with Dimensions (Picture scale: DIN A4)	Features	Output		Input		Switching speed		I/O isolation voltage	Page Approvals
			Drop-out voltage (typical/min.)	Short circuit current (typical/min.)	LED operate current (max.)	LED turn-off current (min.)	Turn-on time (typical)	Turn-off time (typical)		
★**APV2111V**	1:1  2.65 x 4.45 x 1.8mm	• Ultra small SSOP housing	8.2/5.0V	• 8 / 3μA 	3.0mA	0.2mA	0.8ms	0.1ms	1,500V AC	306 C-UL
★**APV1121S**	1:1  4.3 x 4.4 x 2mm	• Ultra small SMD (SOP) housing	8.7/6.0V	• 14 / 5μA 	3.0mA	0.2mA	0.4ms	0.1ms	2,500V AC	306 C-UL
APV2121S		• Ultra small SMD (SOP) housing	8.2/5.0V	• 8 / 3μA 	3.0mA	0.2mA	0.8ms	0.1ms	2,500V AC	306 C-UL
APV1122	1:1  DIP : 8.8 x 6.4 x 3.6mm SMD: 8.8 x 6.4 x 3.9mm	• 5000V breakdown voltage	8.7/6.0V	• 14 / 5μA 	3.0mA	0.2mA	0.4ms	0.1ms	5,000V AC	306 C-UL

Photo-Triac Couplers

Solid State Relays Selector Chart

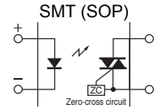
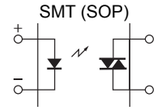
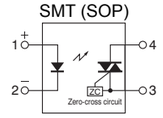
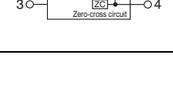
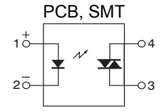
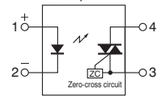
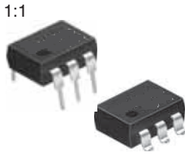
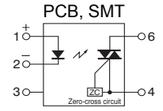
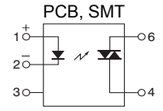
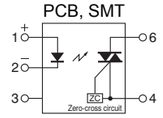
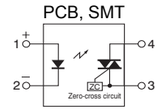
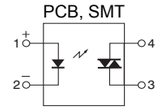
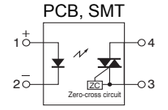
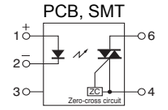
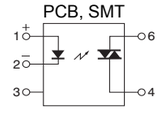
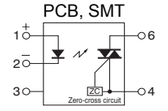
Type	Photo with Dimensions (Picture scale: DIN A4)	Features	Output				Input			Zero-cross voltage (max.)	I/O isolation voltage	Connection type Switching diagram	Page Approvals
			Repetitive peak OFF-state voltage	Max. load current/ Non-repetitive surge current (1 cycle, 60Hz)	PeakON-state voltage (max.)	Peak OFF-state current (max.)	LED trigger current (max.)	LED drop-out voltage (max.)	Turn-on time (max.)				
APT1211S	1:1  4.3 x 4.4 x 2.1mm	• Zero-cross • SOP 4 pin	• 600V	• 0.05A / 0.6A 	2.5V	1μA	10mA	1.3V	0.1ms	50V	3,750V AC	SMT (SOP) 	327 UL, C-UL, VDE
APT1221S		• Random • SOP 4 pin								-		SMT (SOP) 	
APT1231S		• Low zero-cross • SOP 4 pin			2.0V					15V		SMT (SOP) 	
APT1211	1:1  DIP : 4.78 x 6.4 x 3.2mm SMD: 4.78 x 6.4 x 2.9mm	• Zero-cross • DIP 4 pin	• 600V	• 0.1A / 1.2A	2.5V	1μA	10mA	1.3V	0.1ms	50V	5,000V AC	PCB, SMT 	327 UL, C-UL, VDE
APT1221		• Random • DIP 4 pin								-		PCB, SMT 	
APT1231		• Low zero-cross • DIP 4 pin			2.0V					15V		PCB, SMT 	
APT1212	1:1  DIP : 8.8 x 6.4 x 3.9mm SMD: 8.8 x 6.4 x 3.6mm	• Zero-cross • DIP 6 pin	• 600V	• 0.1A / 1.2A 	2.5V	1μA	10mA	1.3V	0.1ms	50V	5,000V AC	PCB, SMT 	327 UL, C-UL, VDE
APT1222		• Random • DIP 6 pin								-		PCB, SMT 	
APT1232		• Low zero-cross • DIP 6 pin			2.0V					15V		PCB, SMT 	

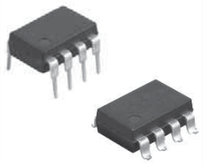
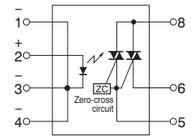
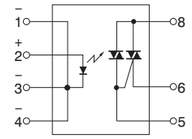
Photo-Triac Couplers Wide Terminal

Solid State Relays Selector Chart

Type	Photo with Dimensions (Picture scale: DIN A4)	Features	Output				Input			Zero-cross voltage (max.)	I/O isolation voltage	Connection type Switching diagram	Page Approvals
			Repetitive peak OFF-state voltage	Max. load current/ Non-repetitive surge current (1 cycle, 60Hz)	PeakON-state voltage (max.)	Peak OFF-state current (max.)	LED trigger current (max.)	LED drop-out voltage (max.)	Turn-on time (max.)				
APT1211W	1:1  DIP : 4.78 x 6.4 x 3.0mm SMD: 4.78 x 6.4 x 2.7mm	• Zero-cross • DIP 4 pin wide terminal	• 600V	• 0.1A / 1.2A 	2.5V	1μA	10mA	1.3V	0.1ms	50V	5,000V AC	PCB, SMT 	327 UL, C-UL, VDE
APT1221W		• Random • DIP 4 pin wide terminal								-		PCB, SMT 	
APT1231W		• Low zero-cross • DIP 4 pin wide terminal			2.0V					15V		PCB, SMT 	
APT1212W	1:1  DIP : 8.8 x 6.4 x 3.9mm SMD: 8.8 x 6.4 x 3.6mm	• Zero-cross • DIP 6 pin wide terminal	• 600V	• 0.1A / 1.2A 	2.5V	1μA	10mA	1.3V	0.1ms	50V	5,000V AC	PCB, SMT 	327 UL, C-UL, VDE
APT1222W		• Random • DIP 6 pin wide terminal								-		PCB, SMT 	
APT1232W		• Low zero-cross • DIP 6 pin wide terminal			2.0V					15V		PCB, SMT 	

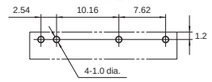
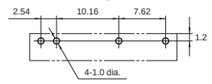
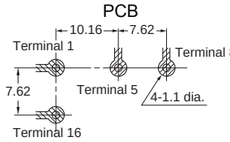
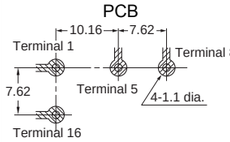
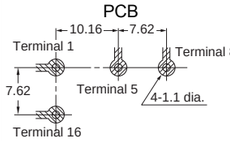
AQH Relays

Solid State Relays Selector Chart

Type	Photo with Dimensions (Picture scale: DIN A4)	Features	Output				Input			Zero-cross voltage (max.)	I/O isolation voltage	Connection type Switching diagram	Page Approvals
			Repetitive peak OFF-state voltage	Max. load current/ Non-repetitive surge current (1 cycle, 60Hz)	PeakON-state voltage (max.)	Peak OFF-state current (max.)	LED trigger current (max.)	LED drop-out voltage (max.)	Turn-on time (max.)				
AQH0213	1:1  DIP : 9.78 x 6.4 x 3.9mm SMD: 9.78 x 6.4 x 3.6mm	• Photo-Triac • Zero-cross	• 600V	• 0.3A / 3A 	2.5V	100μA	10mA	1.3V	0.1ms	50V	5,000V	PCB, SMT With zero-cross switch: 	335 UL, C-UL, VDE
AQH0223		• Photo-Triac • Random								-			
AQH1213		• Photo-Triac • Zero-cross	• 600V	• 0.6A / 6A 	2.5V	100μA	10mA	1.3V	0.1ms	50V	5,000V		
AQH1223		• Photo-Triac • Random								-			
AQH2213		• Photo-Triac • Zero-cross	• 600V	• 0.9A / 9A 	2.5V	100μA	10mA	1.3V	0.1ms	50V	5,000V	Without zero-cross switch: 	
AQH2223		• Photo-Triac • Random								-			
AQH3213		• Photo-Triac • Zero-cross	• 600V	• 1.2A / 12A 	2.5V	100μA	10mA	1.3V	0.1ms	50V	5,000V		
AQH3223		• Photo-Triac • Random								-			

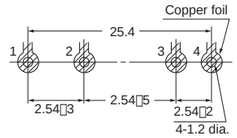
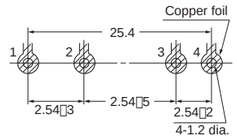
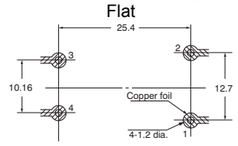
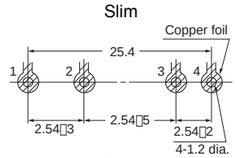
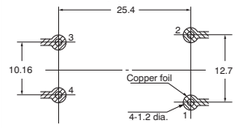
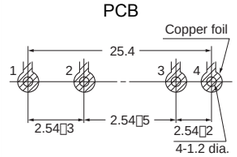
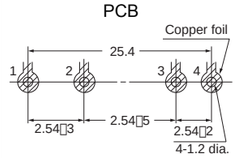
Solid State SIL and DIL Types

Solid State Relays Selector Chart

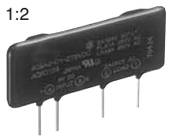
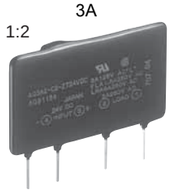
Type	Features	Output			Input					Breakdown voltage	Connection type Terminal layout	Page Approvals
		Load voltage	Max. load current/ Non-repetitive surge current (1 cycle, 60Hz)	OFF-state leakage current (max.)	Input voltage	Input impedance	Drop-out voltage (min.)	Operate time	Release time			
AQG 1A 1:1  24.5 x 4.5 x 13.5mm	• Photo-Triac • Zero-cross • Integrated snubber circuit	• 75 - 264V AC	• 1A / 8A 	1.5mA	4 - 6V DC 9.6 - 14.4V DC 19.2 - 28.8V DC	0.3kΩ 0.8kΩ 1.6kΩ	1V	½ cycle of voltage sine wave + 1ms	½ cycle of voltage sine wave + 1ms	3,000V AC	PCB 	338 UL, C-UL, VDE
	• Photo-Triac • Random • Integrated snubber circuit	• 75 - 264V AC	• 1A / 8A 	1.5mA	4 - 6V DC 9.6 - 14.4V DC 19.2 - 28.8V DC	0.3kΩ 0.8kΩ 1.6kΩ	1V	1ms	½ cycle of voltage sine wave + 1ms	3,000V AC		
AQG 2A 1:1  24.5 x 4.5 x 20.5mm	• Photo-Triac • Zero-cross • Integrated snubber circuit	• 75 - 264V AC	• 2A / 30A 	1.5mA	4 - 6V DC 9.6 - 14.4V DC 19.2 - 28.8V DC	0.3kΩ 0.8kΩ 1.6kΩ	1V	½ cycle of voltage sine wave + 1ms	½ cycle of voltage sine wave + 1ms	3,000V AC	PCB 	
	• Photo-Triac • Random • Integrated snubber circuit	• 75 - 264V AC	• 2A / 30A 	1.5mA	4 - 6V DC 9.6 - 14.4V DC 19.2 - 28.8V DC	0.3kΩ 0.8kΩ 1.6kΩ	1V	1ms	½ cycle of voltage sine wave + 1ms	3,000V AC		
AQ-C AC input, DC input 1:2  20 x 10 x 12.8mm	• Photo-Transistor • AC input type	• 4 - 32V DC	• 25mA / -	5μA	80 - 250V AC	-	10V AC	20ms	20ms	2,500V AC	PCB 	371 UL, CSA, TÜV
	• Photo-Transistor • DC input type	• 4 - 32V DC	• 25mA / -	5μA	3 - 32V DC	-	1V DC	5ms	5ms	2,500V AC		
AQ-C 1A (AC output) 1:2  20 x 10 x 12.8mm	• Photo-Triac • Zero-cross	• 75 -125V AC • 75 - 250V AC	• 1A / 20A 	1.1mA	4 - 6V DC 9.6 - 14.4V DC 21.6 - 26.4V DC	0.3kΩ 0.8kΩ 1.8kΩ	0.5V 1.2V 2.4V	½ cycle of voltage sine wave + 1ms	½ cycle of voltage sine wave + 1ms	2,500V AC	PCB 	371 UL, CSA, TÜV
	• Photo-Triac • Random	• 75 -125V AC • 75 - 250V AC	• 1A / 20A 	1.1mA	4.- 6V DC 9.6 - 14.4V DC 21.6 - 26.4V DC	0.3kΩ 0.8kΩ 1.8kΩ	0.5V 1.2V 2.4V	1ms	½ cycle of voltage sine wave + 1ms	2,500V AC		
AQ-C 1A (DC output) 1:2  20 x 10 x 12.8mm	• Photo-Transistor	• 3 - 60V DC	• 1A / 1.5A (1s) 	0.1mA	4 - 6V DC 9.6 - 14.4V DC 21.6 - 26.4V DC	430Ω 1.2kΩ 2.8kΩ	4V 9.6V 21.6V	0.5ms	1ms	2,500V AC	PCB 	371 UL, CSA, TÜV

Solid State SIL and DIL Types

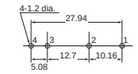
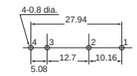
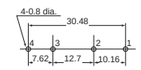
Solid State Relays Selector Chart

Type	Features	Output			Input					Breakdown voltage	Connection type Terminal layout	Page Approvals
		Load voltage	Max. load current/ Non-repetitive surge current (1 cycle, 60Hz)	OFF-state leakage current (max.)	Input voltage	Input impedance	Drop-out voltage (min.)	Operate time	Release time			
AQ1 1A (DC output) 1:2  33 x 10 x 25.1mm	• Photo-Transistor	• 10 - 200V DC	• 1A / 5A (1s) 	1mA	3 - 28V DC	1.6kΩ	0.8V	0.5ms	2ms	3,000V AC	PCB Slim 	341 UL, CSA, TÜV
AQ1 2A (DC output) 1:2  33 x 10 x 25.1mm	• Photo-Transistor	• 3 - 60V DC	• 2A / 5A (1s) 	1mA	3 - 28V DC	1.6kΩ	0.8V	0.5ms	2ms	3,000V AC		
AQ1 2A (AC output) 1:2  33 x 10 x 25.1mm  33 x 25 x 12mm	• Photo-Transistor • Zero-cross	• 75 - 250V AC	• 2A / 80A 	5mA	3 - 28V DC	1.6kΩ	0.8V	½ cycle of voltage sine wave + 1ms	½ cycle of voltage sine wave + 1ms	3,000V AC	PCB Slim  Flat 	341 UL, CSA, TÜV
AQ1 3A (AC output) 1:2  33 x 10 x 25.1mm  33 x 25 x 12mm	• Photo-Triac • Zero-cross and random type available	• 75 - 250V AC	• 3A / 100A 	5mA	4 - 32V DC	- (Input current, max. 20mA)	1.0V	½ cycle of voltage sine wave + 1ms	½ cycle of voltage sine wave + 1ms	• 4,000V AC (between input and output) • 2,500V AC (between input, output and case)	PCB Slim  Flat 	341 VDE
AQ1 5A (AC output) 1:2  54 x 26mm	• Photo-Transistor • Zero-cross	• 75 - 250V AC	• 5A (3A without heat sink) / 100A 	5mA	3 - 28V DC	1.6kΩ	0.8V	½ cycle of voltage sine wave + 1ms	½ cycle of voltage sine wave + 1ms	• 3,000V AC (between input and output) • 1,500V AC (between input, output and case)	PCB 	341 UL, CSA, TÜV
AQ1 10A (AC output) 1:2  54 x 26mm	• Photo-Triac • Zero-cross and random type available	• 75 - 250V AC	• 10A (5A without heat sink) / 100A 	5mA	4 - 32V DC	- (Input current, max. 20mA)	1.0V	½ cycle of voltage sine wave + 1ms	½ cycle of voltage sine wave + 1ms	• 4,000V AC (between input and output) • 2,500V AC (between input, output and case)	PCB 	341 VDE

Solid State SIL and DIL Types

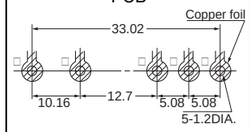
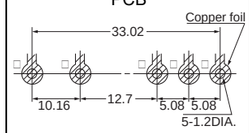
Type	Features	Output		
		Load voltage	Max. load current/ Non-repetitive surge current (1 cycle, 60Hz)	OFF-state leakage current (max.)
AQ8 2A 1:2  45 x 9 x 24mm	• Photo-Triac • Zero-cross	• 75 - 125V AC • 75 - 250V AC	• 2A / 30A 	5mA
	• Photo-Triac • Random	• 75 - 125V AC • 75 - 250V AC	• 2A / 30A 	5mA
AQ8 3A 1:2  43 x 9 x 32mm	• Photo-Triac • Zero-cross	• 75 - 125V AC • 75 - 250V AC	• 3A / 80A 	5mA
	• Photo-Triac • Random	• 75 - 125V AC • 75 - 250V AC	• 3A / 80A 	5mA

Solid State Relays Selector Chart

Input					Breakdown voltage	Connection type Terminal layout	Page Approvals
Input voltage	Input impedance	Drop-out voltage (min.)	Operate time	Release time			
4 - 6V DC	0.18kΩ	0.5V	½ cycle of voltage sine wave + 1ms	½ cycle of voltage sine wave + 1ms	3,000V AC	PCB Between input terminal 5.08mm 	347 UL, CSA, TÜV, VDE
9.6 - 14.4V DC	0.55kΩ	1.2V					
21.6 - 26.4V DC	1.4kΩ	2.4V					
4 - 6V DC	0.3kΩ	0.5V	1ms	½ cycle of voltage sine wave + 1ms	3,000V AC	Between input terminal 7.65mm 	
9.6 - 14.4V DC	0.8kΩ	1.2V					
21.6 - 26.4V DC	1.8kΩ	2.4V					
4 - 6V DC	0.18kΩ	0.5V	½ cycle of voltage sine wave + 1ms	½ cycle of voltage sine wave + 1ms	3,000V AC	PCB Between input terminal 5.08mm 	347 UL, CSA, TÜV, VDE
9.6 - 14.4V DC	0.55kΩ	1.2V					
21.6 - 26.4V DC	1.4kΩ	2.4V					
4 - 6V DC	0.3kΩ	0.5V	1ms	½ cycle of voltage sine wave + 1ms	3,000V AC	Between input terminal 7.65mm 	
9.6 - 14.4V DC	0.8kΩ	1.2V					
21.6 - 26.4V DC	1.8kΩ	2.4V					

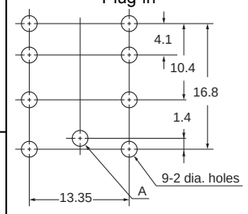
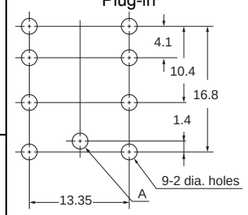
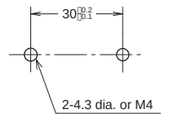
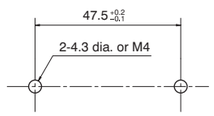
Solid State SIL and DIL Types

Solid State Relays Selector Chart

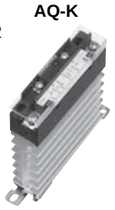
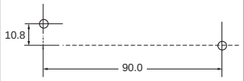
Type	Features	Output			Input					Breakdown voltage	Connection type Terminal layout	Page Approvals
		Load voltage	Max. load current/ Non-repetitive surge current (1 cycle, 60Hz)	OFF-state leakage current (max.)	Input voltage	Input impedance	Drop-out voltage (min.)	Operate time	Release time			
I/O RELAY AC input modules 1:2  43 x 10 x 20.5mm	• Photo-Transistor	• 4 - 15V DC • 10 - 32V DC	• 15mA / - 	100μA	80 - 140V AC	-	10V AC	20ms	20ms	4,000V AC		376 UL, CSA
					160 - 280V AC	-	20V AC					
I/O RELAY DC input modules 1:2  43 x 10 x 20.5mm	• Photo-Transistor	• 4 - 15V DC • 10 - 32V DC	• 15mA / - 	100μA	3 - 32V DC	-	0.8V	5ms	5ms	4,000V AC		
I/O RELAY AC output modules 1:2  43 x 10 x 20.5mm	• Photo-Transistor • Zero-cross	• 75 - 125V AC • 75 - 250V AC	• 2A / 30A 	5mA	3 - 15V DC	1.6kΩ	0.8V	½ cycle of voltage sine wave + 1ms	½ cycle of voltage sine wave + 1ms	4,000V AC		376 UL, CSA
					4 - 15V DC	1.7kΩ						
					10 - 32V DC	5.6kΩ						
I/O RELAY DC output modules 1:2  43 x 10 x 20.5mm	• Photo-Transistor • Zero-cross	• 3 - 60V DC • 10 - 200V DC	• 2A / 5A (1s)  • 1A 	1mA	3 - 15V DC	1.6kΩ	0.8V	0.5ms	2ms	4,000V AC		
					4 - 15V DC	1.7kΩ						
					10 - 32V DC	5.6kΩ						

Solid State Other Types

Solid State Relays Selector Chart

Type	Features	Output			Input					Breakdown voltage	Connection type Terminal layout	Page Approvals
		Load voltage	Max. load current/ Non-repetitive surge current (1 cycle, 60Hz)	OFF-state leakage current (max.)	Input voltage	Input impedance	Drop-out voltage (min.)	Operate time	Release time			
Solid State Plug-in Terminals												
AQ-F 2A/3A (AC output) 1:2  27 x 21 x 35.2mm	• Photo-Triac • Zero-cross	• 75 - 250V AC	• 2A / 80A 	5mA	3 - 28V DC	1.6kΩ	0.8V	½ cycle of voltage sine wave + 1ms	½ cycle of voltage sine wave + 1ms	2,000V AC	Plug-in 	353 UL, CSA
	• Photo-Triac • Zero-cross	• 75 - 250V AC	• 3A / 80A 	5mA	3 - 28V DC	1.6kΩ	0.8V	½ cycle of voltage sine wave + 1ms	½ cycle of voltage sine wave + 1ms	2,000V AC		
AQ-F 2A/3A (DC output) 1:2  27 x 21 x 35.2mm	• Photo-Transistor	• 3 - 60V DC	• 2A / 5A 	1mA	3 - 28V DC	1.6kΩ	0.8V	0.5ms	2ms	2,000V AC	Plug-in 	
	• Photo-Transistor	• 3 - 60V DC	• 3A / 6A 	1mA	3 - 28V DC	1.6kΩ	0.8V	0.5ms	2ms	2,000V AC		
Solid State Hockey Puck Types												
AQ-J 1:2  38 x 28 x 17mm	• Photo-Triac • Zero-cross • Ultra-compact size • Built-in varistor	• 75 - 264V AC	• 10A / 100A 	5mA	4 - 6V DC	260Ω	1V	½ cycle of voltage sine wave + 1ms	½ cycle of voltage sine wave + 1ms	• 3,000V AC (between input and output) • 2,500V AC (between input, output and case)	- 	357 C-UL, TÜV
			• 15A / 150A 		10 - 18V DC	800Ω						
			• 25A / 250A 		18 - 28V DC	1.6kΩ						
					4 - 6V DC	260Ω						
					10 - 18V DC	800Ω						
					18 - 28V DC	1.6kΩ						
AQ-A 1:2  58 x 40 x 25.5mm	• Photo-Triac • Zero-cross and random type available • Built-in varistor and LED indication	• 75 - 250V AC	• 15A / 150A 	10mA	4 - 32V DC	- (Input current, max. 20mA)	1V	½ cycle of voltage sine wave + 1ms	½ cycle of voltage sine wave + 1ms	• 4,000V AC (between input and output) • 2,500V AC (between input, output and case)	- 	364
			• 25A / 250A 									
			• 40A / 400A 									

Solid State Other Types

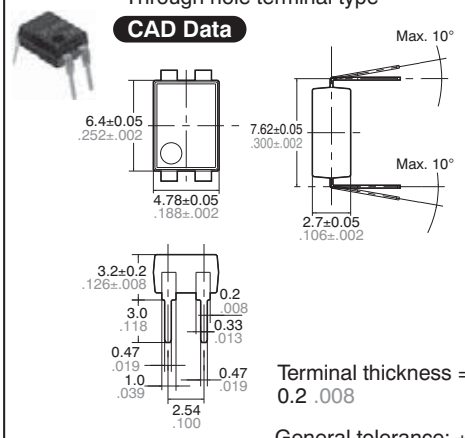
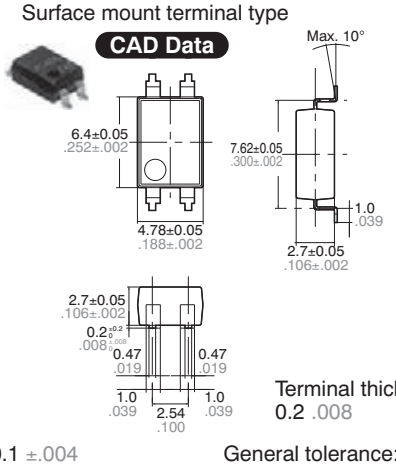
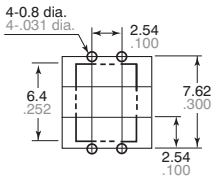
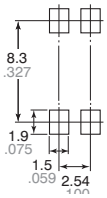
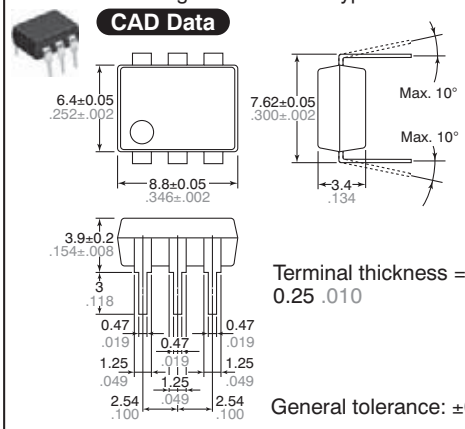
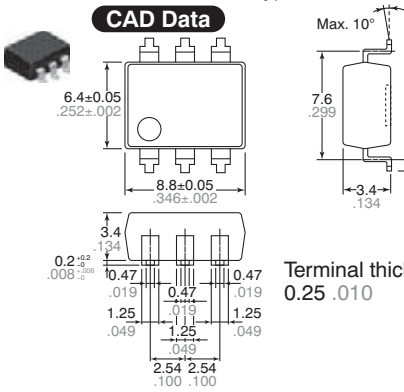
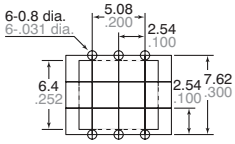
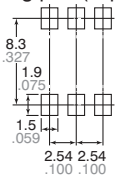
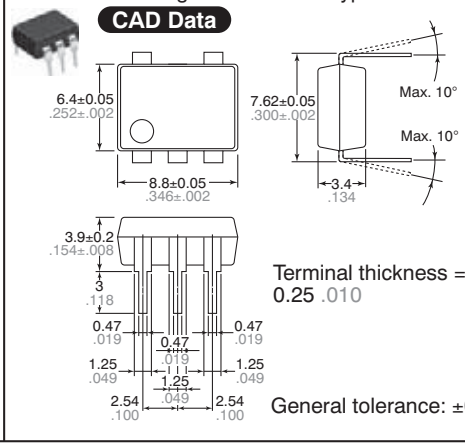
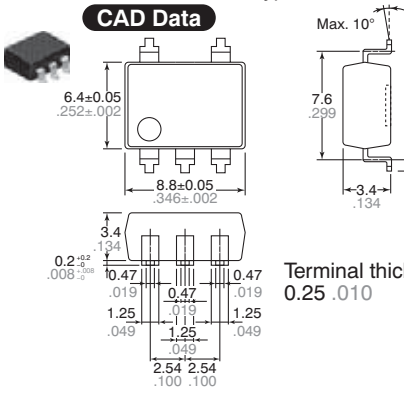
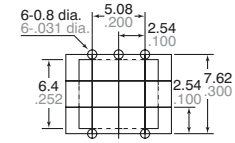
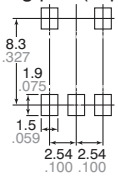
Type	Features	Output			Input					Breakdown voltage	Connection type Terminal layout	Page Approvals
		Load voltage	Max. load current/ Non-repetitive surge current (1 cycle, 60Hz)	OFF-state leakage current (max.)	Input voltage	Input impedance	Drop-out voltage (min.)	Operate time	Release time			
Solid State DIN Rail Types												
AQ-K 1:2  102 x 22.5 x 100mm	• Photo-Triac • Zero-cross	• 75 - 250V AC	• 15A / 150A 	9mA	4.5 - 30V DC	- (Input current, max. 10mA)	1V	½ cycle of voltage sine wave + 1ms	½ cycle of voltage sine wave + 1ms	2,500V AC/ 4,000V AC	- 35mm DIN rail mounting hole or 2-4.6mm dia. hole or M4 hole 	369 UL, C-UL, TÜV
	• Photo-Triac • Zero-cross	• 75 - 250V AC	• 25A / 250A 	9mA	4.5 - 30V DC	- (Input current, max. 10mA)	1V	½ cycle of voltage sine wave + 1ms	½ cycle of voltage sine wave + 1ms	2,500V AC/ 4,000V AC		

Solid State Relays Selector Chart

PhotoMOS Relays

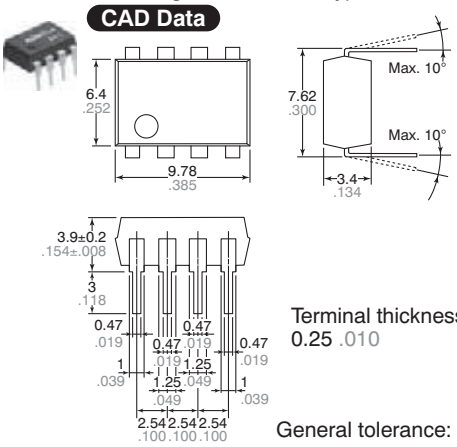
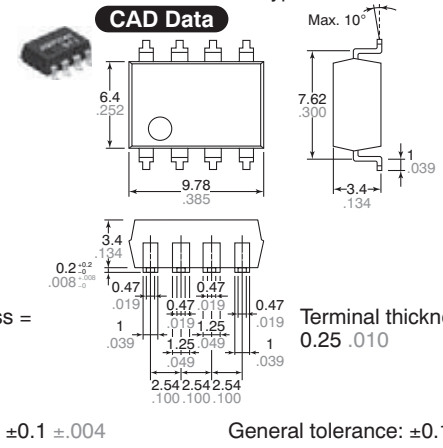
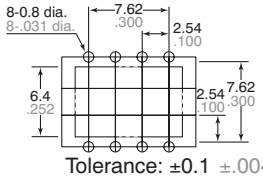
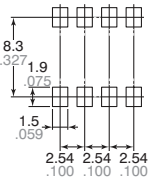
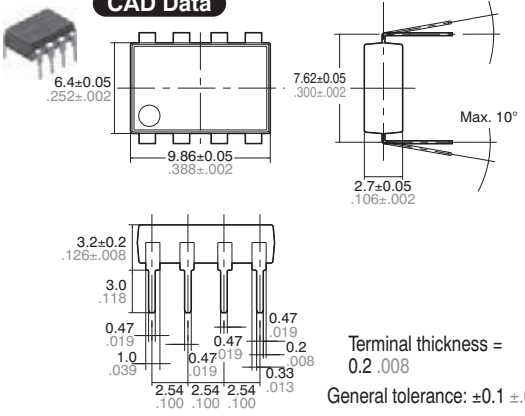
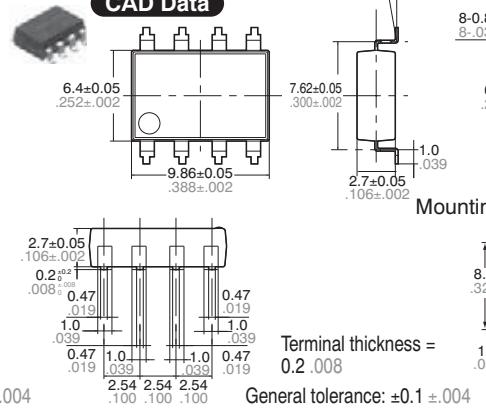
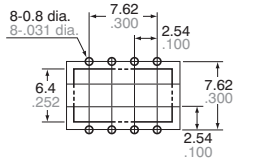
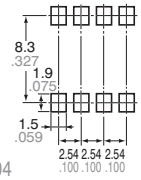
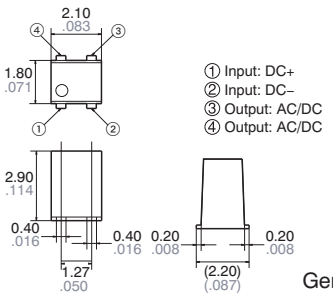
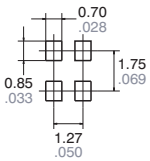
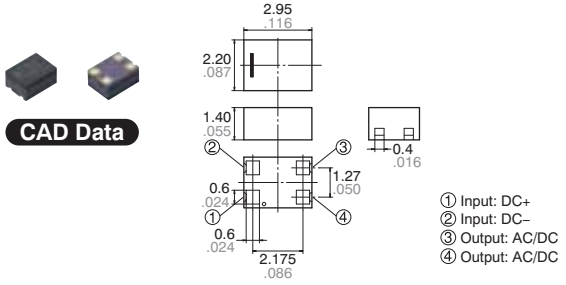
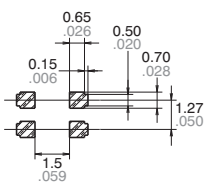
PhotoMOS Relay Dimensions

mm inch

Type	Dimensions
AQY21(DIP) AQY41(DIP) Series	Through hole terminal type  Terminal thickness = 0.2 .008 General tolerance: ±0.1 ±.004 Surface mount terminal type  Terminal thickness = 0.2 .008 General tolerance: ±0.1 ±.004 PC board pattern (Bottom view)  Tolerance: ±0.1 ±.004 Mounting pad (Top view)  Tolerance: ±0.1 ±.004
AQV10(DIP) AQV11(DIP) AQV20(DIP) AQV21(DIP) AQV22(DIP) AQV23(DIP) AQV25(DIP) AQV41(DIP) AQV45(DIP) Series	Through hole terminal type  Terminal thickness = 0.25 .010 General tolerance: ±0.1 ±.004 Surface mount terminal type  Terminal thickness = 0.25 .010 General tolerance: ±0.1 ±.004 PC board pattern (Bottom view)  Tolerance: ±0.1 ±.004 Recommended mounting pad (Top view) 
APV1122(DIP) Series	Through hole terminal type  Terminal thickness = 0.25 .010 General tolerance: ±0.1 ±.004 Surface mount terminal type  Terminal thickness = 0.25 .010 General tolerance: ±0.1 ±.004 PC board pattern (Bottom view)  Tolerance: ±0.1 ±.004 Recommended mounting pad (Top view) 

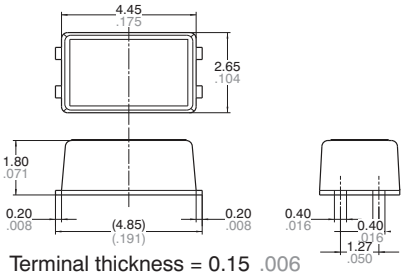
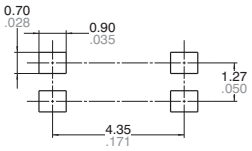
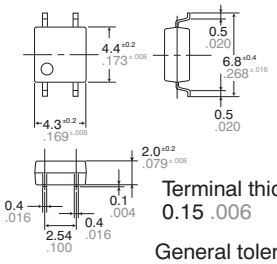
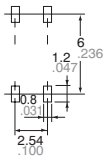
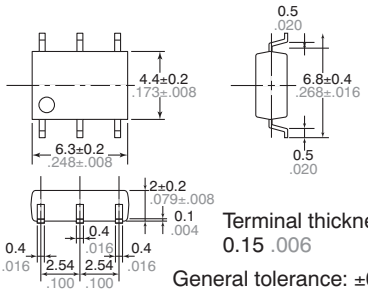
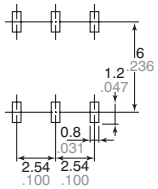
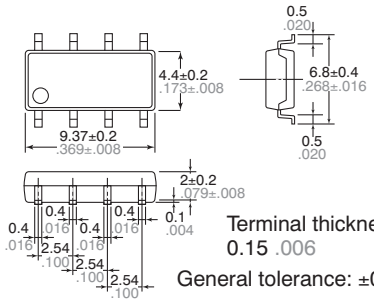
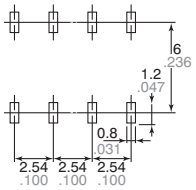
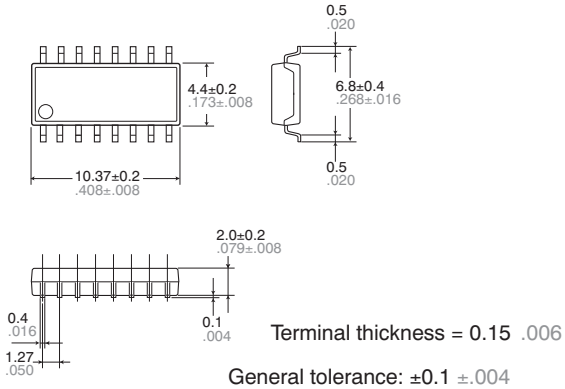
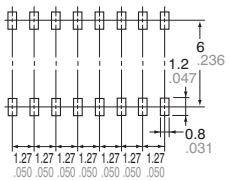
Download CAD Data from our Web site.

mm inch

Type	Dimensions
AQW21(DIP) AQW22(DIP) AQW25(DIP) AQW41(DIP) AQW45(DIP) AQW61(DIP) AQW65(DIP) Series	Through hole terminal type CAD Data  Terminal thickness = 0.25 .010 General tolerance: ±0.1 ±.004 Surface mount terminal type CAD Data  Terminal thickness = 0.25 .010 General tolerance: ±0.1 ±.004 PC board pattern (Bottom view)  Tolerance: ±0.1 ±.004 Recommended mounting pad (Top view) 
AQW21❍EH (DIP) AQW21❍HL (DIP) AQW41❍EH (DIP) AQW61❍EH (DIP) Series	Through hole terminal type CAD Data  Terminal thickness = 0.2 .008 General tolerance: ±0.1 ±.004 Surface mount terminal type CAD Data  Terminal thickness = 0.2 .008 General tolerance: ±0.1 ±.004 PC board pattern (Bottom view)  Tolerance: ±0.1 ±.004 Mounting pad (Top view)  Tolerance: ±0.1 ±.004
AQY221 (VSSOP) Series	CAD Data  ① Input: DC+ ② Input: DC– ③ Output: AC/DC ④ Output: AC/DC General tolerance: ±0.2 Recommended mounting pad (Top view)  Tolerance : ±0.1
AQY22(SON) Series	CAD Data  ① Input: DC+ ② Input: DC– ③ Output: AC/DC ④ Output: AC/DC General tolerance: ±0.2 ±.008 Recommended mounting pad (Top view)  Tolerance: ±0.1 ±.004

Download CAD Data from our Web site.

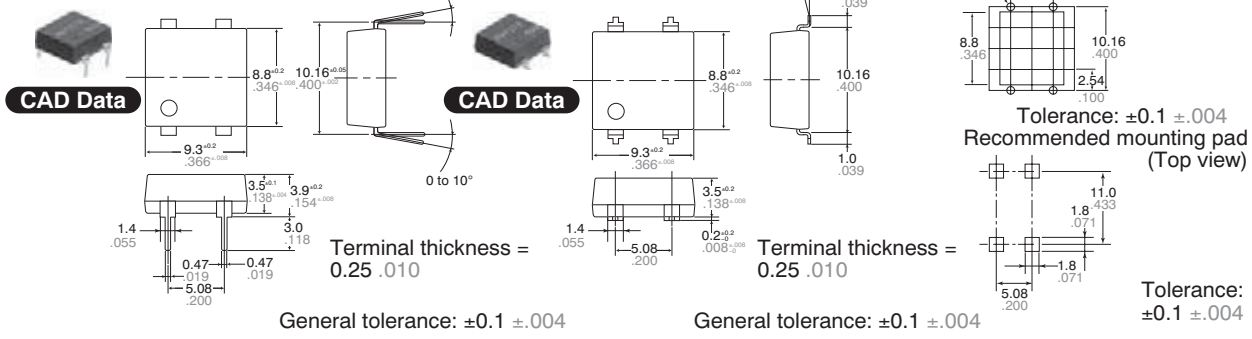
mm inch

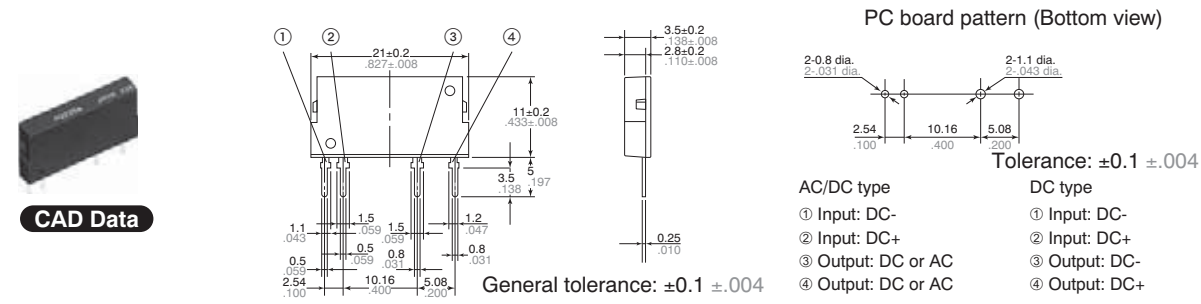
Type	Dimensions
APV21(SSOP) AQY22(SSOP) Series	 CAD Data  Terminal thickness = 0.15 .006 General tolerance: ±0.5 ±.020 Recommended mounting pad (Top view)  Tolerance: ±0.1 ±.004
APV11(SOP) APV21(SOP) AQY2 (SOP) AQY21(SOP) AQY22(SOP) AQY41(SOP) Series	 CAD Data  Terminal thickness = 0.15 .006 General tolerance: ±0.1 ±.004 Recommended mounting pad (Top view)  Tolerance: ±0.1 ±.004
AQV21(SOP) AQV22(SOP) AQV25(SOP) AQV41(SOP) Series	 CAD Data  Terminal thickness = 0.15 .006 General tolerance: ±0.1 ±.004 Recommended mounting pad (Top view)  Tolerance: ±0.1 ±.004
AQW21(SOP) AQW22(SOP) AQW61(SOP) Series	 CAD Data  Terminal thickness = 0.15 .006 General tolerance: ±0.1 ±.004 Recommended mounting pad (Top view)  Tolerance: ±0.1 ±.004
AQS22(SOP) Series	 CAD Data  Terminal thickness = 0.15 .006 General tolerance: ±0.1 ±.004 Recommended mounting pad (Top view)  Tolerance: ±0.1 ±.004

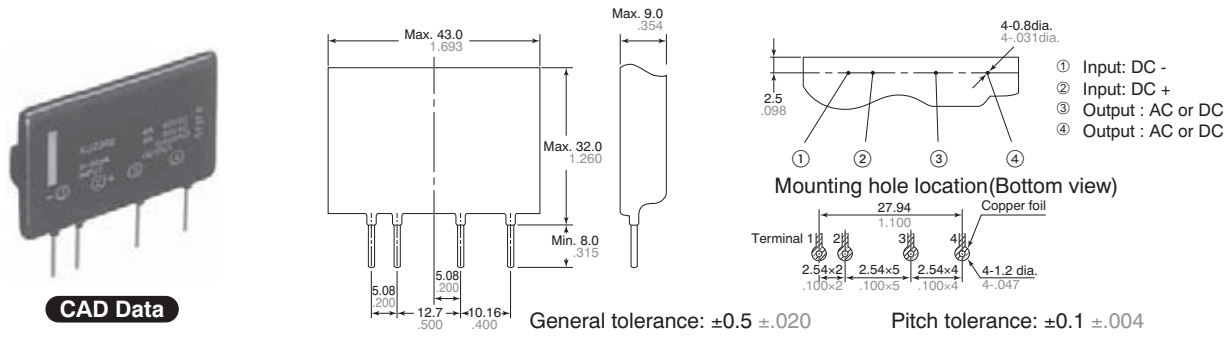
Download CAD Data from our Web site.

mm inch

Type	Dimensions
AQY27 Power (DIP) Series	Through hole terminal type / Surface mount terminal type / PC board pattern (Bottom view)
AQZ10(SIL) AQZ20(SIL) AQZ40(SIL) Series	PC board pattern (Bottom view)
AQZ26(SIL) Series	Mounting hole location(Bottom view)

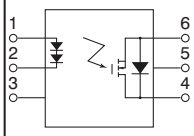
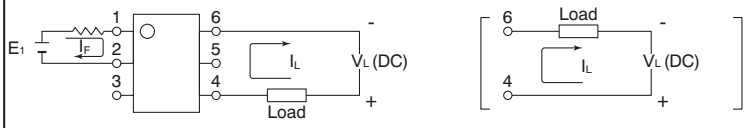
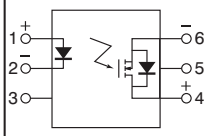
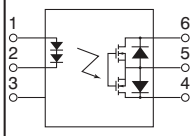
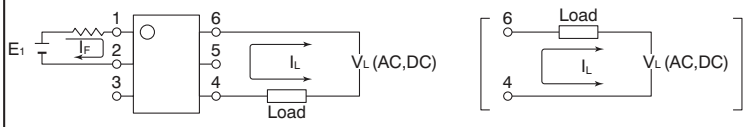
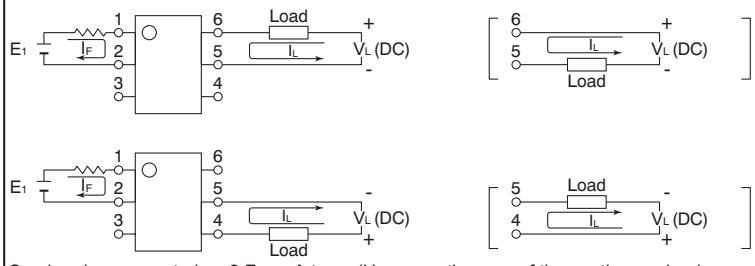
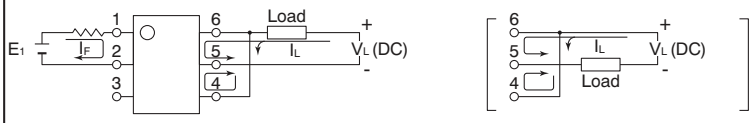
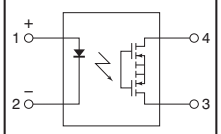
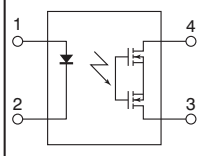
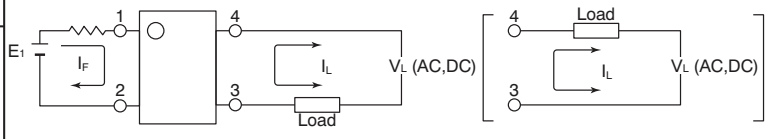




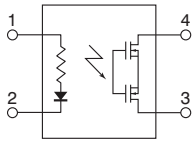
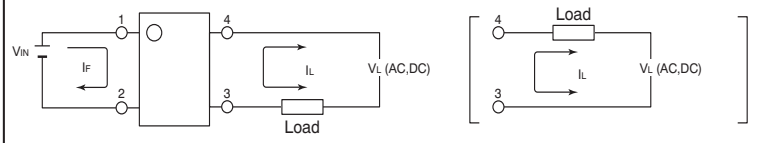
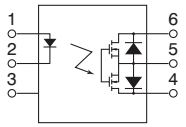
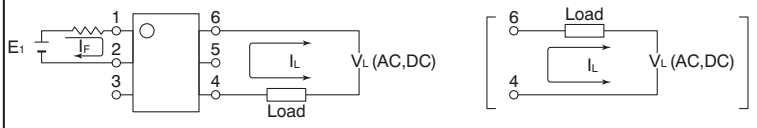
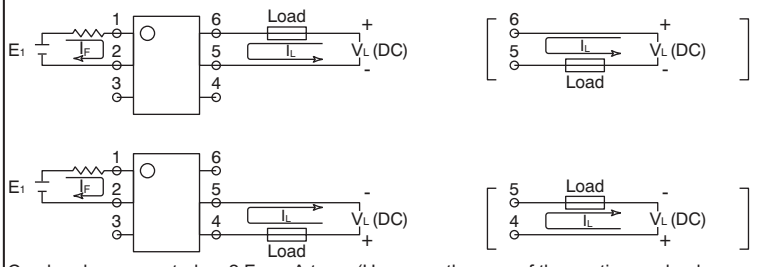
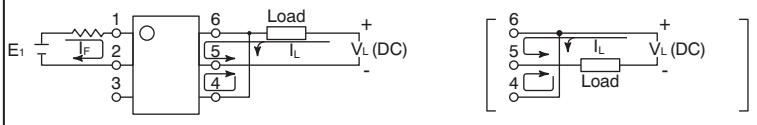
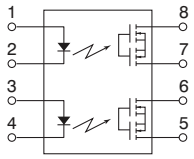
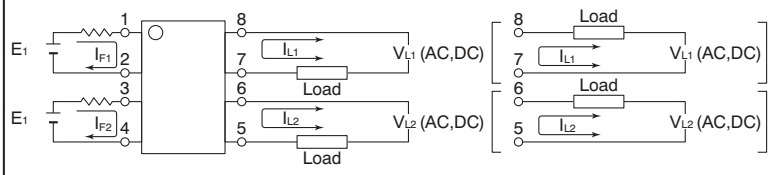
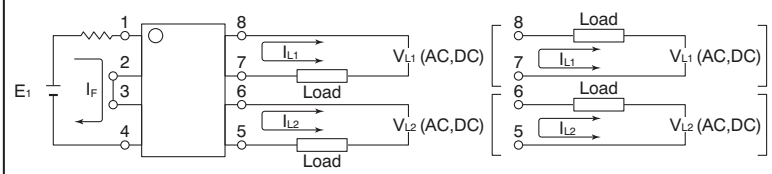
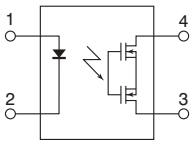
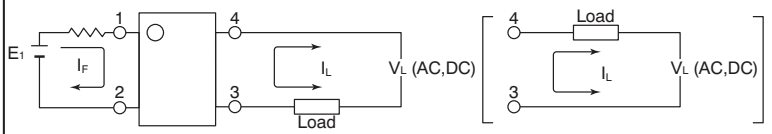


Download CAD Data from our Web site.

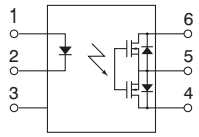
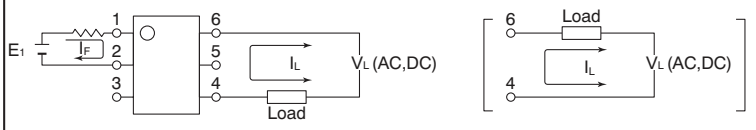
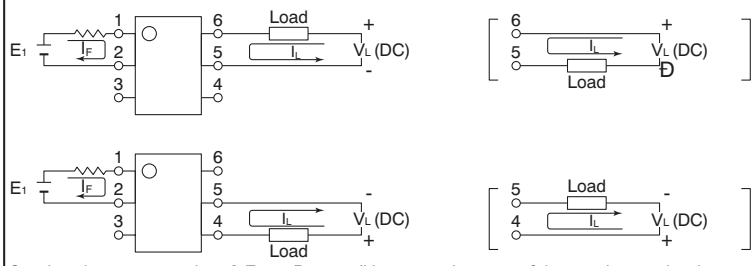
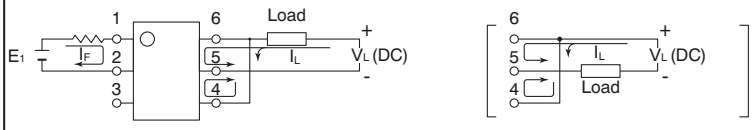
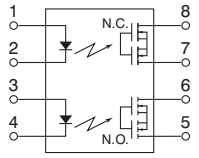
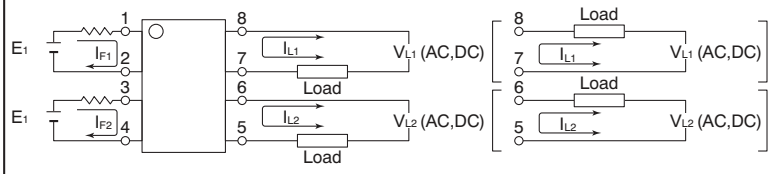
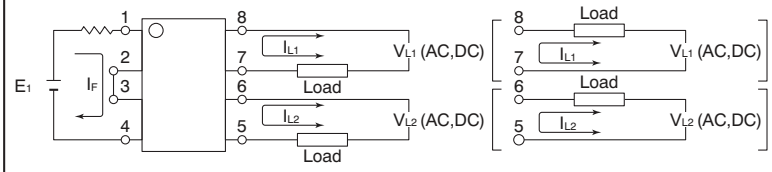
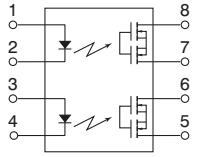
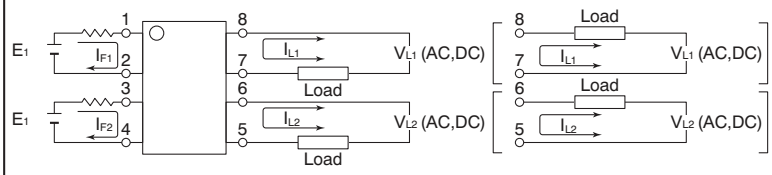
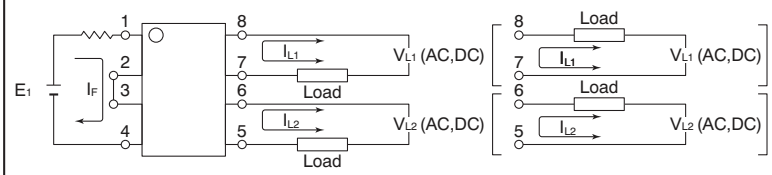
PhotoMOS Relay Schematic and Wiring Diagrams

	Schematic	Output configu-ration	Load type	Con-nection	Wiring diagram
AQV10(DIP) Series		1a	DC	A	
AQV11(DIP) Series					
AQV20(DIP) Series		1a	AC/DC	A	
			DC	B	 Can be also connected as 2 Form A type. (However, the sum of the continuous load current should not exceed the absolute maximum rating.)
			DC	C	
AQY22 (VSSOP)		1a	AC/DC	—	
AQY2 (SOP) AQY21 (DIP, SOP) AQY22(SOP, SSOP, SON) AQY27 (Power-DIP) Series		1a	AC/DC	—	

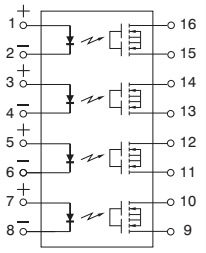
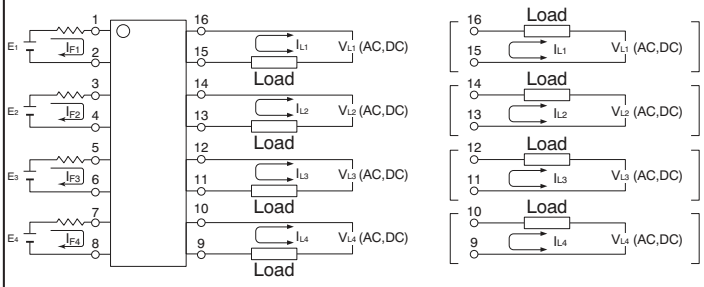
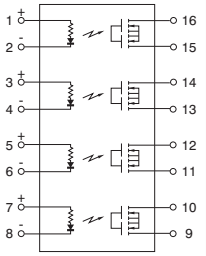
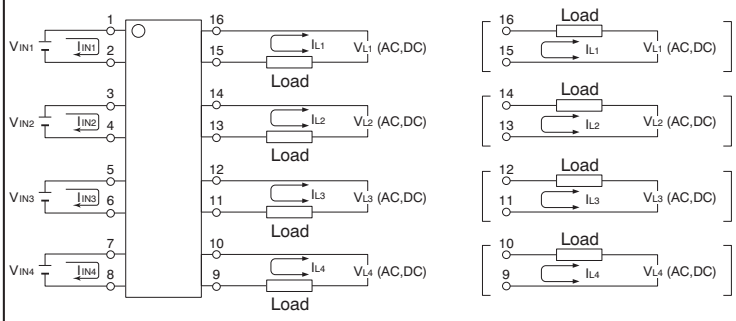
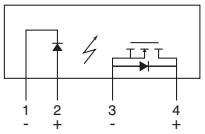
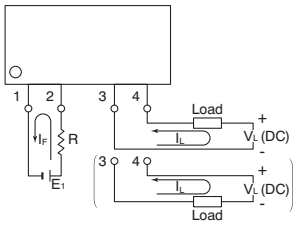
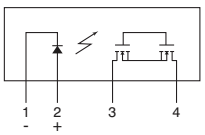
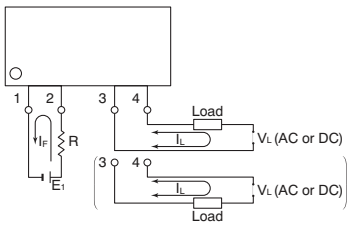
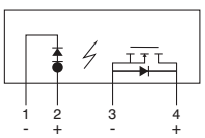
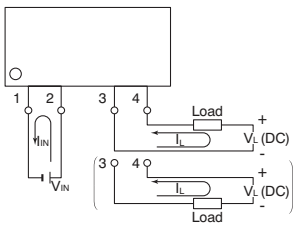
Notes: 1. E_1: Power source at input side; V_{IN}: Input voltage; I_F: LED forward current; I_{IN}: Input current; V_L: Load voltage; I_L: Load current; R: Current limit resistor.
2. Method of connecting the load at the output is divided into 3 types.
*Terminal 3 cannot be used, since it is in the internal circuit of the relay.

	Schematic	Output configuration	Load type	Connection	Wiring diagram
AQY22○F AQY21○F Series		1a	AC/DC	—	
AQV21 (DIP, SOP) AQV22 (DIP, SOP) AQV23(DIP)* AQV25 (DIP, SOP) Series	 Terminal 3 cannot be used, since it is in the internal circuit of the relay.	1a	AC/DC	A	
			DC	B	 Can be also connected as 2 Form A type. (However, the sum of the continuous load current should not exceed the absolute maximum rating.)
			DC	C	
AQW21 (DIP, SOP) AQW22 (DIP, SOP) AQW25 Series		2a	AC/DC	—	(1) Two independent 1 Form A use  (2) 2 Form A use 
AQY41 (DIP, SOP) Series		1b	AC/DC	—	

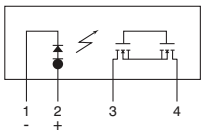
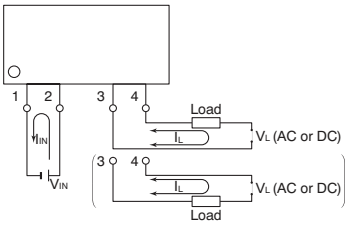
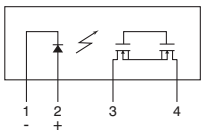
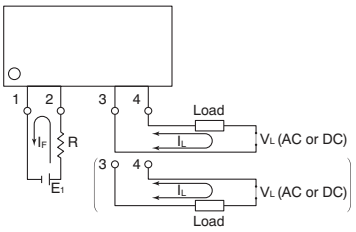
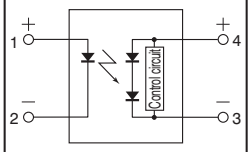
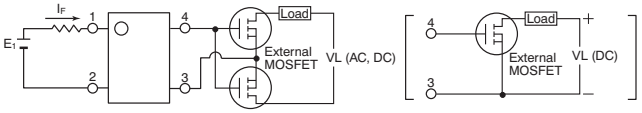
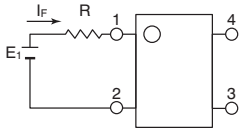
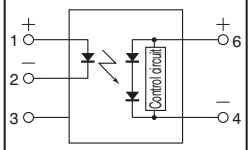
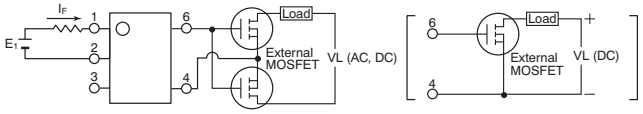
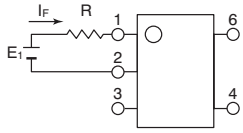
Notes: 1. E_1: Power source at input side; V_{IN}: Input voltage; I_F: LED forward current; I_{IN}: Input current; V_L: Load voltage; I_L: Load current; R: Current limit resistor.
2. Method of connecting the load at the output is divided into 3 types.
* AQV23 series in SOP is also possible. Please inquire.

	Schematic	Output configuration	Load type	Connection	Wiring diagram
AQV41 (DIP, SOP) AQV45 (DIP) Series	 Terminal 3 cannot be used, since it is in the internal circuit of the relay.	1b	AC/DC	A	
			DC	B	 Can be also connected as 2 Form B type. (However, the sum of the continuous load current should not exceed the absolute maximum rating.)
			DC	C	
AQW61 (DIP, SOP) AQW65 (DIP) Series		1a1b	AC/DC	—	(1) Two independent 1 Form A & 1 Form B use  (2) 1 Form A 1 Form B use 
AQW41 (DIP) AQW45 (DIP) Series		2b	AC/DC	—	(1) Two independent 1 Form B use  (2) 2 Form B use 

Notes: 1. E_1: Power source at input side; V_{IN}: Input voltage; I_F: LED forward current; I_{IN}: Input current; V_L: Load voltage; I_L: Load current; R: Current limit resistor.
2. Method of connecting the load at the output is divided into 3 types.

	Schematic	Output configu-ration	Load type	Con-nection	Wiring diagram
AQS22(SOP) Series		4a	AC/DC	—	
AQS22❍F (SOP) Series		4a	AC/DC	—	
AQZ10(SIL) Series		1a	DC	—	
AQZ20(SIL) AQZ26(SIL) Series		1a	AC/DC	—	
AQZ10❍D (SIL) Series		1a	DC	—	

Notes: 1. E_1: Power source at input side; V_{IN}: Input voltage; I_F: LED forward current; I_{IN}: Input current; V_L: Load voltage; I_L: Load current; R: Current limit resistor.
2. Method of connecting the load at the output is divided into 3 types.

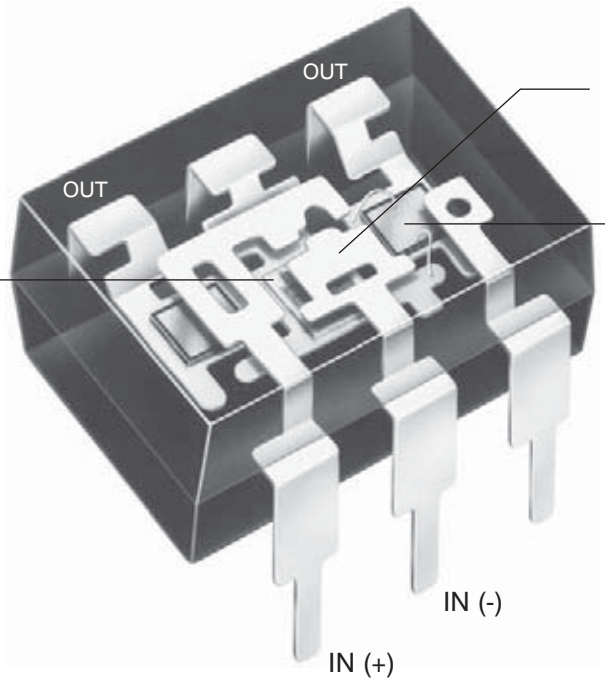
	Schematic	Output configu-ration	Load type	Con-nection	Wiring diagram
AQZ20❍D (SIL) Series		1a	AC/DC	—	
AQZ40(SIL) Series		1b	AC/DC	—	
APV1121S (SOP) APV2121S (SOP) APV2111V (SSOP)		1a	—	—	Power MOSFET drive wiring diagram  Example of each input power supply and current limit resistors (I_F = 10mA) 
APV1122(DIP)		1a	—	—	Power MOSFET drive wiring diagram  Example of each input power supply and current limit resistors (I_F = 10mA) 

E_1	R
5V	Approx. 380Ω
15V	Approx. 1.4kΩ
24V	Approx. 2.3kΩ

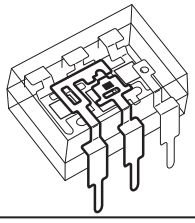
Notes: 1. E_1: Power source at input side; V_{IN}: Input voltage; I_F: LED forward current; I_{IN}: Input current; V_L: Load voltage; I_L: Load current; R: Current limit resistor.
2. Method of connecting the load at the output is divided into 3 types.

PhotoMOS Relay Technical Information

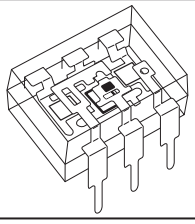
How PhotoMOS Relays Operate



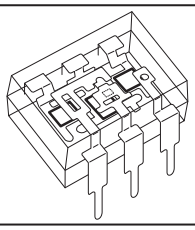
When operated



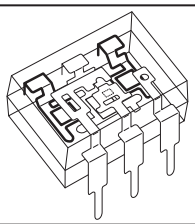
When a signal current flows to the input terminals the LED on the input side emits light.



The emitted light passes through transparent silicon and reaches the photoelectric element (solar cell) which is mounted opposite the LED.

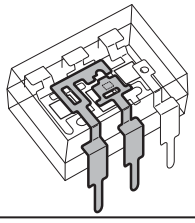


The photoelectric element converts the received light to a voltage corresponding to the quantity of light. This voltage passes through a control circuit and charges the MOSFET gate on the output side.

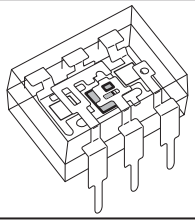


When the MOSFET gate voltage supplied from the photoelectric element reaches a preset voltage value, the MOSFET begins to conduct and turns on the load.

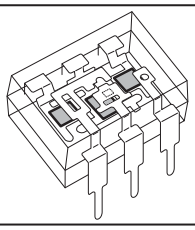
When turned off



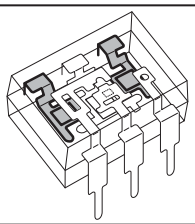
When the signal current at the input terminal is cut off, the LED stops emitting light.



When the emitted light from the LED stops, the voltage of the photoelectric element decreases.



When the voltage supplied from photoelectric element decrease, the control circuit rapidly discharges the gate charge of MOSFET.



This control circuit makes MOSFET stop conducting and immediately turns off the load.

Note: The explanation above applies to the current driving method. Products using the voltage driving method employ a different internal structure and operating principle.

Terminology

Term		Symbol	Description
Input	LED forward current	I_F	Current that flows between the input terminals when the input diode is forward biased.
	LED reverse voltage	V_R	Reverse breakdown voltage between the input terminals.
	Peak forward current	I_{FP}	Maximum instantaneous value of the forward current.
	LED operate current	I_{FON}	Current when the output switches on (by increasing the LED current) with a designated supply voltage and load connected between the output terminals.
	LED turn off current	I_{Foff}	Current when the output switches off (by decreasing the LED current) after operating the relay with a designated supply voltage and load connected between the output terminals.
	LED dropout voltage	V_F	Dropout voltage between the input terminals due to forward current.
	Power dissipation	P_{in}	Allowable power dissipation between the input terminals.
Output	Load voltage	V_L	Supply voltage range at the output used to normally operate the PhotoMOS relay. Represents the peak value for AC voltages.
	Continuous load current	I_L	Maximum current value that flows continuously between the output terminals of the PhotoMOS relay under designated ambient temperature conditions. Represents the peak value for AC current.
	On resistance	R_{on}	Obtained using the equation below from dropout voltage VDS (on) between the output terminals (when a designated LED current is made to flow through the input terminals and the designated load current through the output terminals.) $R_{on} = V_{DS}$ (on)/I_L
	Off state leakage current	I_{leak}	Current flowing to the output when a designated supply voltage is applied between the output terminals with no LED current flow.
	Power dissipation	P_{out}	Allowable power dissipation between the output terminals.
Electrical characteristics	Turn on time	T_{on}	Delay time until the output switches on after a designated LED current is made to flow through the input terminals.
	Turn off time	T_{off}	Delay time until the output switches off after the designated LED current flowing through the input terminals is cut off.
	I/O capacitance	C_{iso}	Capacitance between the input and output terminals.
	Output capacitance	C_{out}	Capacitance between output terminals when LED current does not flow.
	I/O isolation resistance	R_{iso}	Resistance between terminals (input and output) when a specified voltage is applied between the input and output terminals.
	Total power dissipation	P_T	Allowable power dissipation in the entire circuit between the input and output terminals.
	I/O isolation voltage	V_{iso}	Critical value before dielectric breakdown occurs, when a high voltage is applied for 1 minute between the same terminals where the I/O isolation resistance is measured.
	Operating temperature	T_{opr}	Ambient temperature range in which the PhotoMOS relay can operate normally with a designated load current conditions.
	Storage temperature	T_{stg}	Ambient temperature range in which the PhotoMOS relay can be stored without applying voltage.

Reliability tests

Classification	Item	Condition	Purpose
Life tests	High temperature storage test	T_{stg} (Max.)	Determines resistance to long term storage at high temperature.
	Low temperature storage test	T_{stg} (Min.)	Determines resistance to long term storage at low temperature.
	High temperature and high humidity storage test	85°C 185°F, R.H. 85%	Determines resistance to long term storage at high temperature and high humidity.
	Continuous operation life test	V_L = Max., I_L = Max., I_F = LED operate current (Max.)	Determines resistance to electrical stress (voltage and current).
Thermal environment tests	Temperature cycling test	Low storage temperature (T_{stg} Min.) High storage temperature (T_{stg} Max.)	Determines resistance to exposure to both low temperatures and high temperatures.
	Thermal shock test	Low temperature (0°C) (32°F), High temperature (100°C) (212°F)	Determines resistance to exposure to sudden changes in temperature.
	Solder burning resistance	260±5°C 500±41°F, 10 s	Determines resistance to thermal stress occurring while soldering.
Mechanical environment tests	Vibration test	196 m/s² {20 G}, 20 to 2,000 Hz*1	Determines the resistance to vibration sustained during shipment or operation.
	Shock test	9,800 m/s² {1,000 G} 0.5 ms*2; 4,900 m/s² {500 G} 1 ms	Determines the mechanical and structural resistance to shock.
	Drop test	Dropped at a height of 80 cm on oak board	Determines the mechanical resistance to drops sustained during shipment or operation.
	Terminal strength test	Determined from terminal shape and cross section	Determines the resistance to external force on the terminals of the PhotoMOS relay mounted on the PC board while wiring or operating.
	Solderability	230°C 446°F 5 s (with soldering flux)	Evaluates the solderability of the terminals.

*1 10 to 55 Hz at double amplitude of 3 mm for Power PhotoMOS relays.
*2 4,900 m/s², 1 ms for Power PhotoMOS relays.

PhotoMOS Relays Cautions for Use

SAFETY WARNINGS

• Do not use the product under conditions that exceed the range of its specifications. It may cause overheating, smoke, or fire.

• Do not touch the recharging unit while the power is on. There is a danger of electrical shock. Be sure to turn off the power when performing mounting, maintenance, or repair operations on the relay (including connecting parts such as the terminal board and socket).

• Check the connection diagrams in the catalog and be sure to connect the terminals correctly. Erroneous connections could lead to unexpected operating errors, overheating, or fire.

1. Applying stress that exceeds the absolute maximum rating

If the voltage or current value for any of the terminals exceeds the absolute maximum rating, internal elements will deteriorate because of the overvoltage or overcurrent. In extreme cases, wiring may melt, or silicon P/N junctions may be destroyed.

Therefore, the circuit should be designed in such a way that the load never exceed the absolute maximum ratings, even momentarily.

2. Derating design

Derating is essential in any reliable design and a significant factor in consideration of product life. Sufficient derating is needed against maximum rating when designing a system.

And also, relays should be examined using a measurement equipment.

Derated voltages must be considered according to operating and environmental conditions the relay will be subjected to.

3. Unused terminals

The No. 3 terminal is used with the circuit inside the relay. Therefore, do not connect it to the external circuitry with either connection method A, B or C.

(1 Form A 6-pin type)

4. Short across terminals

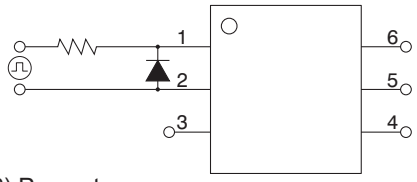
Do not short circuit between terminals when relay is energized, since there is possibility of breaking of the internal IC.

5. Surge voltages at the input

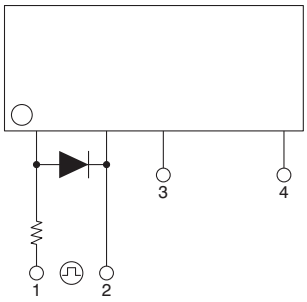
If reverse surge voltages are present at the input terminals, connect a diode in reverse parallel across the input terminals and keep the reverse voltages below the reverse breakdown voltage.

Typical circuits are below shown.

1) 6-pin



2) Power type



6. Recommended LED forward current (I_F) or recommended input voltage (V_{IN})

It is recommended that the LED forward current (I_F) or the input voltage (V_{IN}) of each PhotoMOS Relay should be set according to the following table.

	Product name	Recommended LED forward current (I_F)
DIP SOP SSOP SON VSSOP	AQV10, 11, 20 Series APV11, 21 Series (MOSFET drivers)	10 mA
	AQY21, 41 Series AQY22 Series AQV21, 41 Series AQV22 Series AQV25, 45 Series AQW21 Series AQW41, 61 Series AQW22 Series AQW25, 45, 65 Series AQS22 Series	5mA
	AQY212GS, AQY212G2S AQY21✳H, 41✳H Series AQY210KS AQY210HL AQY27 Series AQV21✳H Series AQV25✳H, 45✳H Series AQV252G AQV255GS AQW21✳H, 41✳H, 61✳H Series AQW210HL	5 to 10mA
	AQV234	2 mA
SIL	AQZ10, 20, 40 Series AQZ26 Series	5 to 10 mA

	Product name	Recommended input voltage (V_{IN})
SOP • SSOP	AQY2○○F Series, AQS221F Series	5 V
SIL	AQZ10○D, AQZ20○D	

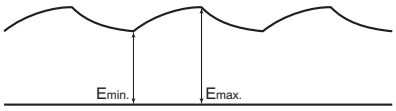
Notes: "✳" indicates two or more characters of number or alphabet.
"○" indicates a single-digit figure.

7. Ripple in the input power supply

If ripple is present in the input power supply, observe the following:

1) For LED operate current at E_{min}, please maintain the value mentioned in the table of "6. Recommended LED forward current (I_F)."

2) Please make sure for $E_{max.}$ is no higher the LED operate current at than 50 mA.



3) Please maintain the input voltage at least 4V for $E_{min.}$ (GU, RF and Power voltage-sensitive type).

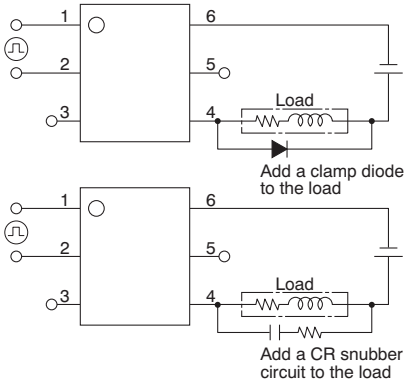
4) Please make sure the input voltage for $E_{max.}$ is no higher than 6V (GU and RF voltage-sensitive type).

5) Please make sure the input voltage for $E_{max.}$ is no higher than 30V (Power voltage-sensitive type).

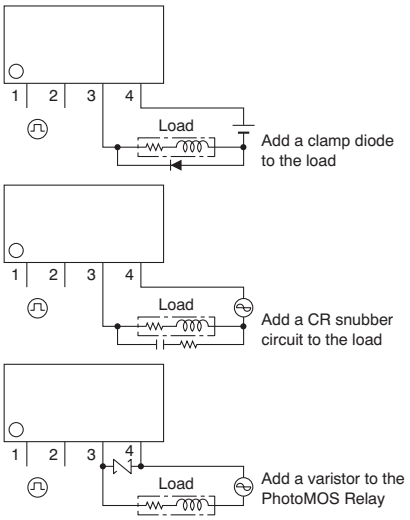
8. Output spike voltages

1) If an inductive load generates spike voltages which exceed the absolute maximum rating, the spike voltage must be limited. Typical circuits of AC/DC dual use type are shown below. It is the same with DC only type.

1) 6-pin



2) Power type



2) Even if spike voltages generated at the load are limited with a clamp diode if the circuit wires are long, spike voltages will occur by inductance. Keep wires as short as possible to minimize inductance.

9. Cleaning solvents compatibility

The PhotoMOS relay forms an optical path by coupling a light-emitting diode (LED) and photodiode via transparent silicon resin. For this reason, unlike other directory element molded resin products (e.g., MOS transistors and bipolar transistors), avoid ultrasonic cleansing if at all possible. We recommend cleaning with an organic solvent. If you cannot avoid using ultrasonic cleansing, please ensure that the following conditions are met, and check beforehand for defects.

- Frequency: 27 to 29 kHz
- Ultrasonic output:
  No greater than 0.25W/cm^2
- Cleaning time:
  No longer than 30 s
- Cleanser used: Asahiklin AK-225
- Other:
  Submerge in solvent in order to prevent the PCB and elements from being contacted directly by the ultrasonic vibrations.

Note: Applies to unit area ultrasonic output for ultrasonic baths.

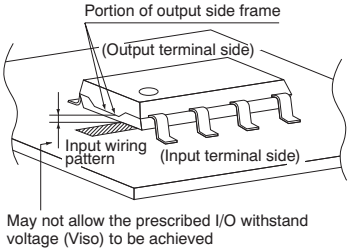
10. Notes for mounting

1) If many different packages are combined on a single substrate, then lead temperature rise is highly dependent on package size. For this reason, please make sure that the temperature of the terminal solder area of the PhotoMOS relay falls within the temperature conditions of item 9 before mounting.

2) If the mounting conditions exceed the recommended solder conditions in item 12, resin strength will fall and the nonconformity of the heat expansion coefficient of each constituent material will increase markedly, possibly causing cracks in the package, severed bonding wires, and the like. For this reason, please inquire with us about whether this use is possible.

11. Input wiring pattern

With AQY* or AQW*, AQS series avoid installing the input (LED side) wiring pattern to the bottom side of the package if you require the specified I/O isolation voltage (V_{iso}) after mounting the PC board. Since part of the frame on the output side is exposed, it may cause fluctuations in the I/O isolation voltage.



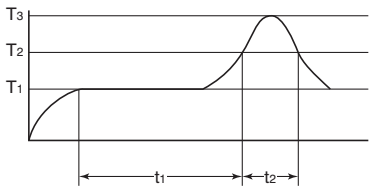
*except for GU-E (Reinforced 5,000V) type

12. Soldering

1) When soldering PC board terminals, keep soldering time to within 10 s at 260°C 500°F.

2) When soldering surface-mount terminals, SOP, SSOP, SON and VSSOP package, the following conditions are recommended.

(1) IR (Infrared reflow) soldering method



T_1 = 150 to 180°C 302 to 356°F
T_2 = 230°C 446°F
T_3 = 250°C 482°F or less*
t_1 = 60 to 120 s or less
t_2 = 30 s or less

*245°C 473°F or less for SON, VSSOP package

(2) Soldering iron method

Tip temperature: 350 to 400°C 662 to 752°F
Wattage: 30 to 60 W
Soldering time: within 3 s

• When using lead-free solder, we recommend a type with an alloy composition of Sn 3.0 Ag 0.5 Cu. Please inquire about soldering conditions and other details.

(3) Others

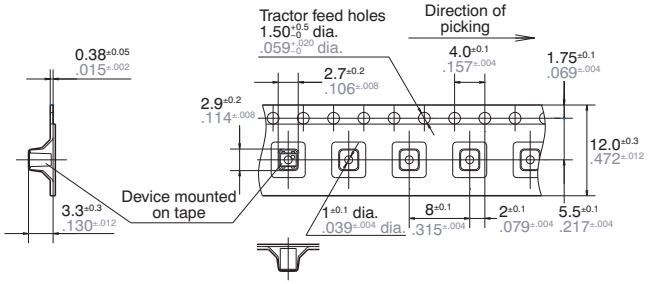
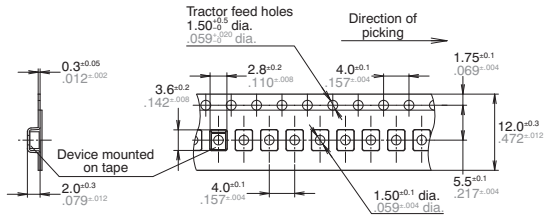
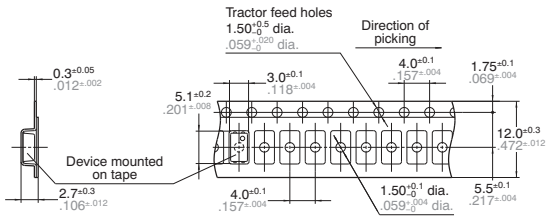
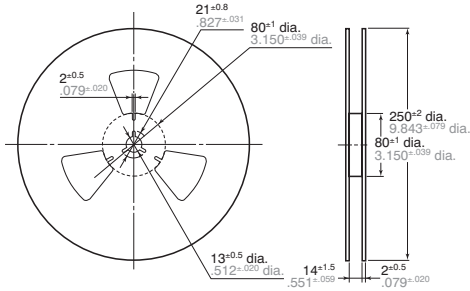
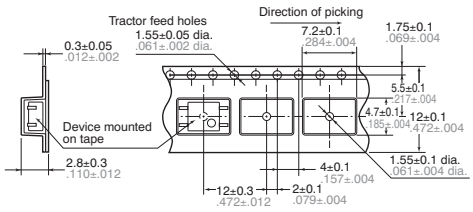
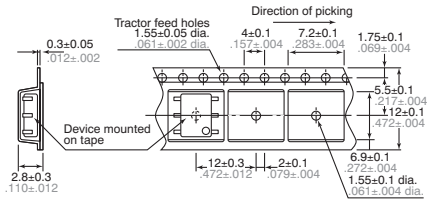
Check mounting conditions before using other soldering methods (DWS, VPS, hot-air, hot plate, laser, pulse heater, etc.)

• The temperature profile indicates the temperature of the soldered terminal on the surface of the PC board. The ambient temperature may increase excessively. Check the temperature under mounting conditions.

13. The following shows the packing format

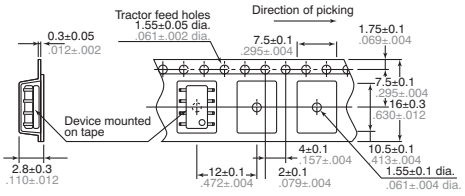
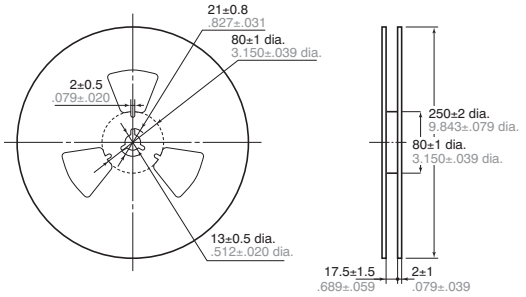
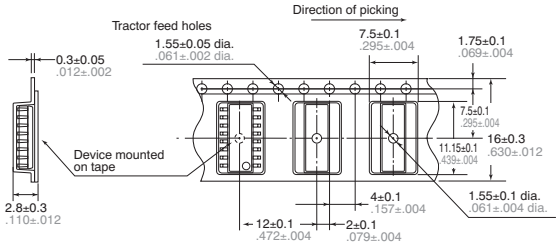
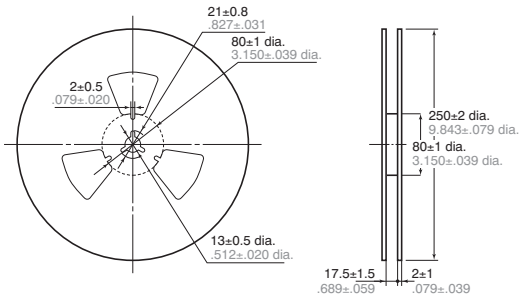
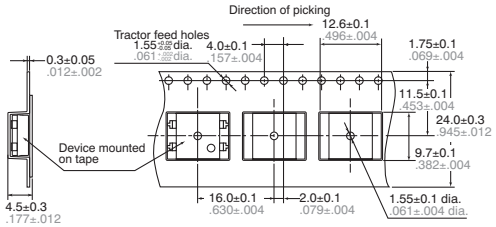
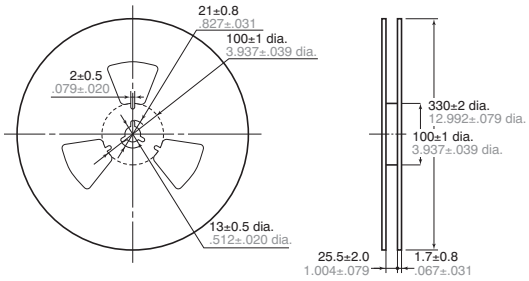
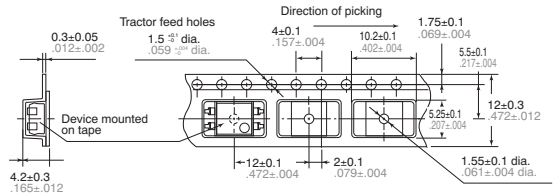
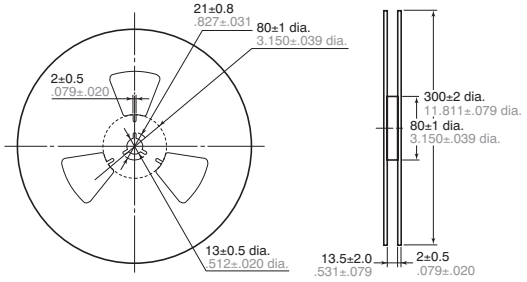
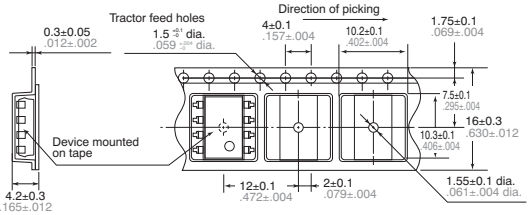
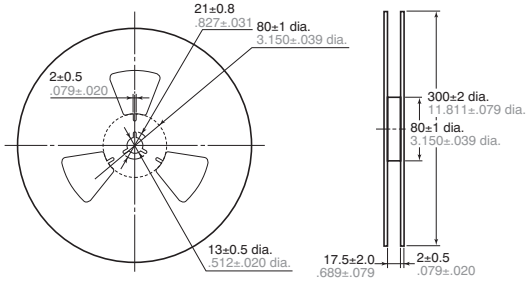
1) Tape and reel

mm inch

	Tape dimensions	Dimensions of paper tape reel
VSSOP 4-pin	 (1) When picked from 1 and 4-pin side: Part No. AQY❍❍❍TY (Shown above) (2) When picked from 2 and 3-pin side: Part No. AQY❍❍❍TW	
SON 4-pin	 (1) When picked from 1 and 4-pin side: Part No. AQY✳MY (Shown above) (2) When picked from 2 and 3-pin side: Part No. AQY✳MW	
SSOP 4-pin	 (1) When picked from 1 and 4-pin side: Part No. AQY✳VY, APV2111VY (Shown above) (2) When picked from 2 and 3-pin side: Part No. AQY✳VW, APV2111VW	
SOP 4-pin	 (1) When picked from 1/2-pin side: Part No. AQY✳SX, APV❍❍21SX (Shown above) (2) When picked from 3/4-pin side: Part No. AQY✳SZ, APV❍❍21SZ	
SOP 6-pin	 (1) When picked from 1/2/3-pin side: Part No. AQV✳SX (Shown above) (2) When picked from 4/5/6-pin side: Part No. AQV✳SZ	

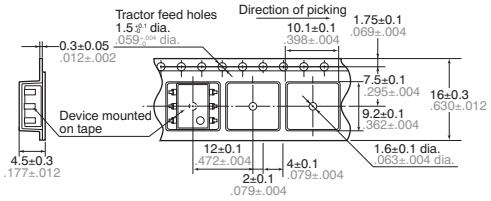
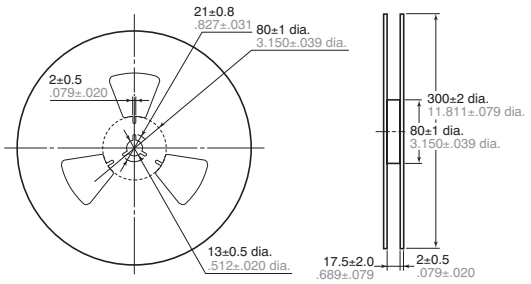
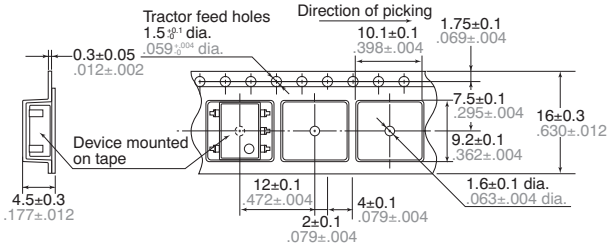
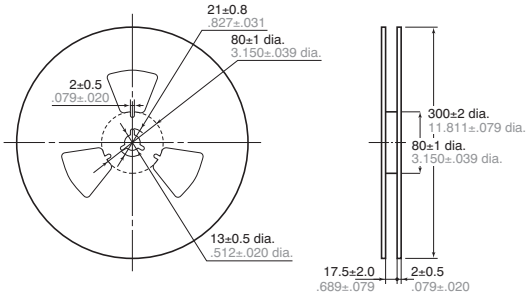
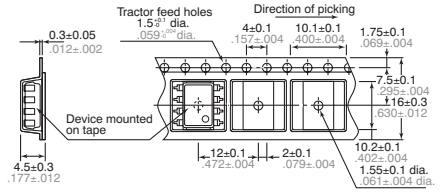
Notes: "✳" indicates two or more characters of number or alphabet.
"❍" indicates a single-digit figure.

mm inch

	Tape dimensions	Dimensions of paper tape reel
SOP 8-pin	 (1) When picked from 1/2/3/4-pin side: Part No. AQW✳SX (Shown above) (2) When picked from 5/6/7/8-pin side: Part No. AQW✳SZ	
SOP 16-pin	 (1) When picked from 1/2/3/4/5/6/7/8-pin side: Part No. AQS✳SX (Shown above) (2) When picked from 9/10/11/12/13/14/15/16-pin side: Part No. AQS✳SZ	
Power-DIP 4-pin SMD	 (1) When picked from 1/2-pin side: Part No. AQY❍7❍AX (Shown above) (2) When picked from 3/4-pin side: Part No. AQY❍7❍AZ	
DIP 4-pin Surface mount terminal	 (1) When picked from 1/2-pin side: Part No. AQY✳HAX, AQY210HLAX (Shown above) (2) When picked from 3/4-pin side: Part No. AQY✳HAZ, AQY210HLAZ	
DIP 8-pin Surface mount terminal (Reinforced insulation type)	 (1) When picked from 1/2/3/4-pin side: Part No. AQW❍❍❍EHAX, AQW210HLAX (Shown above) (2) When picked from 5/6/7/8-pin side: Part No. AQW❍❍❍EHAZ, AQW210HLAZ	

Notes: "✳" indicates two or more characters of number or alphabet.
"❍" indicates a single-digit figure.

mm inch

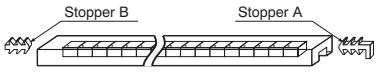
	Tape dimensions	Dimensions of paper tape reel
DIP 6-pin Surface mount terminal	 (1) When picked from 1/2/3-pin side: Part No. AQV✳AX (Shown above) (2) When picked from 4/5/6-pin side: Part No. AQV✳AZ	
DIP 6-pin Surface mount terminal (Photovoltaic MOSFET driver)	 (1) When picked from 1/2/3-pin side: Part No. APV1122AX (Shown above) (2) When picked from 4/6-pin side: Part No. APV1122AZ	
DIP 8-pin Surface mount terminal (Basic insulation type)	 (1) When picked from 1/2/3/4-pin side: Part No. AQW✳AX (Shown above) (2) When picked from 5/6/7/8-pin side: Part No. AQW✳AZ	

Note: "✳" indicates two or more characters of number or alphabet.

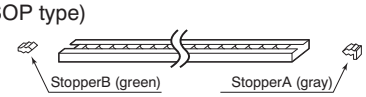
2) Tube
Devices are packaged in a tube so that pin No. 1 is on the stopper B side. Observe correct orientation when mounting them on PC boards.

GU Current Limit Function type [AQY○HL, AQW○HL])

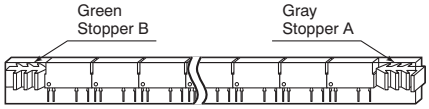
(DIP type)



(SOP type)



(Power type)



The power photoMOS relays are stick packed so that the number 1 terminal is in the direction of stopper B.
One stick contains 25 power photoMOS relays.

14. Transportation and storage

1) Extreme vibration during transport will warp the lead or damage the relay. Handle the outer and inner boxes with care.

2) Storage under extreme conditions will cause soldering degradation, external appearance defects, and deterioration of the characteristics. The following storage conditions are recommended:

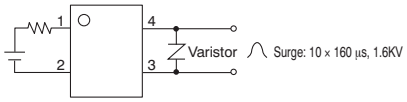
• Temperature: 0 to 45°C 32 to 113°F
• Humidity: Less than 70% R.H.
• Atmosphere: No harmful gasses such as sulfurous acid gas, minimal dust.

3) PhotoMOS relays implemented in VSSOP, SON, SSOP, SOP are sensitive to moisture and come in sealed moisture-proof packages. Observe the following cautions on storage.

• After the moisture-proof package is unsealed, take the devices out of storage as soon as possible (within 1 month ≦ 45°C/70% R.H.).
• If the devices are to be left in storage for a considerable period after the moisture-proof package has been unsealed, it is recommended to keep them in another moisture-proof bag containing silica gel (within 3 months at the most).

15. Current limit function (output current control)

1) Current limit function aims to increase resistance to surges when the switch is turned on. Before using this function, connect the varistor to the output as shown in the figure below.



* Set the varistor voltage to 150 V or less.

2) The current limit function capability can be lost if used longer than the specified time. Be sure to set the output loss to the max. rate.

16. Deterioration and destruction caused by discharge of static electricity (RF C×R5, 10)

This phenomenon is generally called static electricity destruction, and occurs when static electricity generated by various factors is discharged while the relay terminals are in contact, producing internal destruction of the element.

To prevent problems from static electricity, the following precautions and measures should be taken when using your device.

1) Employees handling relays should wear anti-static clothing and should be grounded through protective resistance of 500 kΩ to 1 MΩ.
2) A conductive metal sheet should be placed over the work table. Measuring instruments and jigs should be grounded.
3) When using soldering irons, either use irons with low leakage current, or ground the tip of the soldering iron. (Use of low-voltage soldering irons is also recommended.)
4) Devices and equipment used in assembly should also be grounded.
5) When packing printed circuit boards and equipment, avoid using high-polymer materials such as foam styrene, plastic, and other materials which carry an electrostatic charge.
6) When storing or transporting relays, the environment should not be conducive to generating static electricity (for instance, the humidity should be between 45 and 60%), and relays should be protected using conductive packing materials.

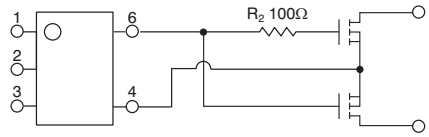
17. Short circuit protection circuit

The short circuit protection circuit is designed to protect circuits from excess current. Therefore, surge current may be detected as current overload in which case the output current will be cut and the off state maintained. For this reason, please include the inrush current in the load current and keep it below the maximum load current. Also, in order to maintain stability of internal IC operation, maintain an input current of at least 5 mA (Latch type), 10 mA (Non Latch type).

18. Photovoltaic MOSFET driver cautions for use

When two external MOSFETs are connected with a common source terminal, oscillation may occur when operation is restored. Therefore, please insert a 100 to 1,000 ohms resistor between the gate terminal of the first MOSFET and the gate terminal of the second MOSFET.

A typical example of this is given in the circuit below.



19. Power PhotoMOS Relays cautions for use

(1) Input LED current (Standard type)

For rising and dropping ratio of input LED current (di/dt), maintain min. 100 μA/s.

(2) Input voltage (Voltage sensitive type)

For rising and dropping ratio of input voltage (dv/dt), maintain min. 100 mV/s.

(3) Adjacent mounting

1) When relays are mounted close together with the heat-generated devices, ambient temperature may rise abnormally. Mounting layout and ventilation should be considered.

2) When many relays are mounted close together, load current should be reduced. (Refer to the date of “Load current vs. ambient temperature characteristics in adjacent mounting.”)

(4) Recommended load voltage

As a guide in selecting PhotoMOS Relays, please refer to the following table.

1) Power photoMOS relays (1 Form A)

		Absolute maximum rating		Recommended load voltage
		Load voltage	Load current	
DC type	AQZ102	60 V DC	4.0 A DC	5,12,24 V DC
	AQZ105	100 V DC	2.6 A DC	48 V DC
	AQZ107	200 V DC	1.3 A DC	100 V DC
	AQZ104	400 V DC	0.7 A DC	200 V DC
AC/DC type	AQZ202	Peak AC 60 V	Peak AC 3.0 A	12 V AC; 5,12,24 V DC
	AQZ205	Peak AC 100 V	Peak AC 2.0 A	24 V AC 48 V DC
	AQZ207	Peak AC 200 V	Peak AC 1.0 A	48 V AC 100 V DC
	AQZ204	Peak AC 400 V	Peak AC 0.5 A	100 V AC 200 V DC

2) Power PhotoMOS relays (1 Form B)

		Absolute maximum rating		Recommended load voltage
		Load voltage	Load current	
AC/DC type	AQZ404	Peak AC 400 V	Peak AC 0.5 A	100 V AC 200 V DC

3) Power PhotoMOS relays Voltage-sensitive type (1 Form A)

		Absolute maximum rating		Recommended load voltage
		Load voltage	Load current	
DC type	AQZ102D	60 V DC	3.6 A DC	5.12,24 V DC
	AQZ105D	100 V DC	2.3 A DC	48 V DC
	AQZ107D	200 V DC	1.1 A DC	100 V DC
	AQZ104D	400 V DC	0.6 A DC	200 V DC
AC/DC type	AQZ202D	Peak AC 60 V	Peak AC 2.7 A	12 V AC; 5,12,24 V DC
	AQZ205D	Peak AC 100 V	Peak AC 1.8 A	24 V AC 48 V DC
	AQZ207D	Peak AC 200 V	Peak AC 0.9 A	48 V AC 100 V DC
	AQZ204D	Peak AC 400 V	Peak AC 0.45 A	100 V AC 200 V DC

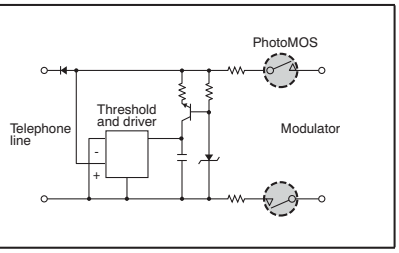
4) Power PhotoMOS relay High Capacity type (1 Form A)

		Absolute maximum rating		Recommended load voltage
		Load voltage	Load current	
AC/DC type	AQZ262	Peak AC, DC 60V	Peak AC, DC 6A	12V AC 5,12,24V DC
	AQZ264	Peak AC, DC 400V	Peak AC, DC 1A	100V AC 200V DC

PhotoMOS Relays for Various Applications

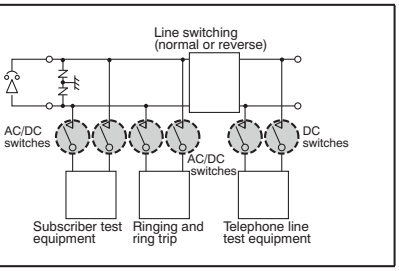
Automatic meter reading

The needs of centralized remote meter reading systems for water, gas and electricity in medium and high rise apartments and new subdivisions are now increasing. PhotoMOS relays are capable of controlling from low level signals up to power signals and feature low leakage current and noise from the optoelectronic device and power MOSFET combination.



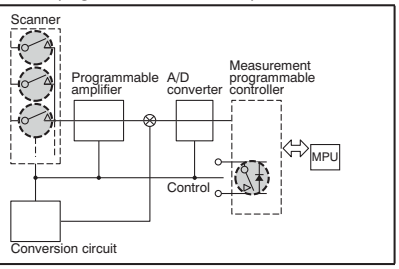
Telecommunications

A variety of signals, with levels from millivolts (at microamperes) to tens of volts (at several hundred milliamperes), AC or DC, and even high bit-rate signals, can be superimposed on telephone lines, the heart of telecommunication networks. The switches in telecommunication circuits, which normally carry DC signals, also carry AC signals on top of the DC level when an intermittent signal (e.g. ringer signal) is being sent. PhotoMOS relays are capable of controlling small level (millivolts at microamperes) AC or DC signals.



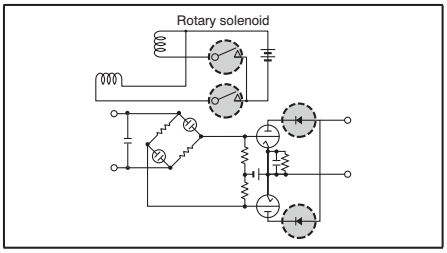
Instrumentation

With the spread of microcomputer chips, the latest instruments are required to measure a variety of signals at high speeds under various conditions. PhotoMOS relays are recommended for measurement scanning functions, automatic zero-point compensation to eliminate zero-point error, and measurement sequence interfaces (e.g. alarm interface.)



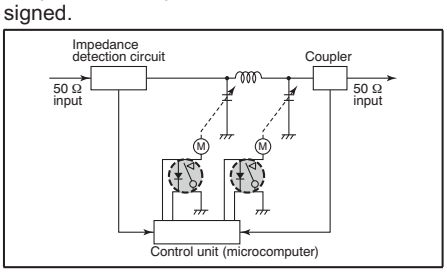
Medical equipment

Medical equipment which processes low level signals includes electrocardiographs, electroencephalographs, and X-ray CT scanners. PhotoMOS relays accurately transfer low level signals (less than several hundred millivolts). Furthermore, they are also convenient in driving rotary solenoids such as those used to automatically switch voltage ranges.



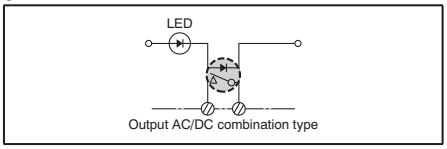
Communications equipment

The future of communications is in satellite communications. Satellite-communications feature many advantages such as indifference to terrestrial disasters, wide service areas, simple circuit modification and simultaneous conversations. An important control operation in communications equipment is fast automatic tuning.
PhotoMOS relays can easily be connected in parallel, difficult with conventional transistor type. As a result, a variety of circuit connection are possible and power circuits can also be designed.



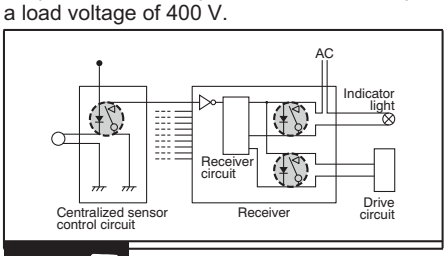
Programmable controller

The output circuit of a programmable controller requires various interfaces to match the load type. Recently, as the computing speed and data processing speed increase, problems may arise from noise at the input interface as well as at the output interface.
PhotoMOS relays are resistant to inrush current (due to phase shift) and eliminate the need for snubber circuits as long as they are operated within the ratings. Furthermore, use of PhotoMOS relays decreases the mounting area requirements, resulting in more compact programmable controllers.



Security Equipment

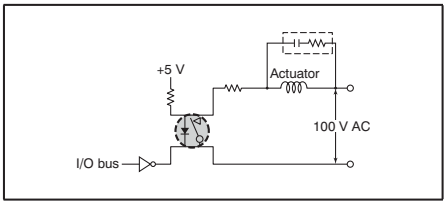
There are many types of security systems from home and office security to building security. PhotoMOS relays are ideal for use as input interfaces for system sensors and output interfaces for alarms.
Input interface: Low leakage current makes use possible for low level voltage and current input.
Output interface: Outputs either AC or DC up to a load voltage of 400 V.



OA equipment

OA equipment usually contains a sensor control unit (for temperature, speed, torque, etc.), drive unit, power supply unit, and a processing unit which controls the overall system. It is organized similarly to compact factory automation machinery. PhotoMOS relays have wide application in the interfaces for signals which connect the functions of these units.

- Operates on a 24 mW input to enable direct control of C-MOS devices.
- Signal transfer through optical coupling achieves high resistance to noise and transients, eliminating the need for adding a snubber circuit to the output to control the load voltage.
- Advantages in the total cost and reliability in the control system result from the absence of AC leakage current related to the snubber circuit.

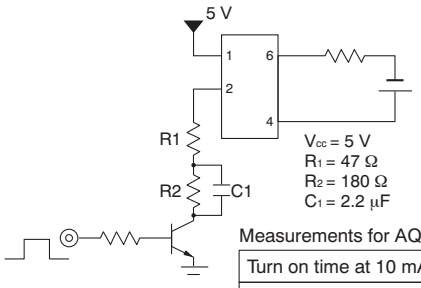


If you are a user experiencing difficulty with solid-state relays and triacs:

If you would like to control small analog signals with a photocoupler and solid-state relays.	PhotoMOS relays feature low offset voltages and on resistances of 0.25 Ω or less. (AQV251 Connection)
If you require a device with a small leakage current (as opposed to bipolar devices having large internal leakage currents).	PhotoMOS relays have leakage currents in the order of microamperes and can control up to 1500 V (peak). (AQV258)
If you would like to directly control analog signals and you would like a device integrating a photocoupler, driver and analog IC to simplify the circuit as much as possible.	PhotoMOS relays contain all of these functions in a single package. Furthermore, circuit design is simplified as a power supply is unnecessary since the internal optoelectronic device directly drives the power MOSFET.
If you require a snubber circuit with a triac or solid-state relay, but are concerned about the snubber circuit's AC leakage current.	PhotoMOS relays are resistant to transients and as long as they are operated within the maximum ratings, eliminate the need for adding a snubber circuit to the output to control the rise in load voltage. Leakage current ceases to be a problem, with cost and reliability being other advantages.
If you require a device for AC control that is resistant to ambient temperature changes and input signal noise.	PhotoMOS relays do not employ the self-trigger mechanism used in SCRs and triacs. Therefore, they do not switch on accidentally. Furthermore, the noise suppression characteristics of optoelectronic devices make them highly resistant to ambient noise for operation at temperatures up to 80°C 176°F.

PhotoMOS Relay Application Examples

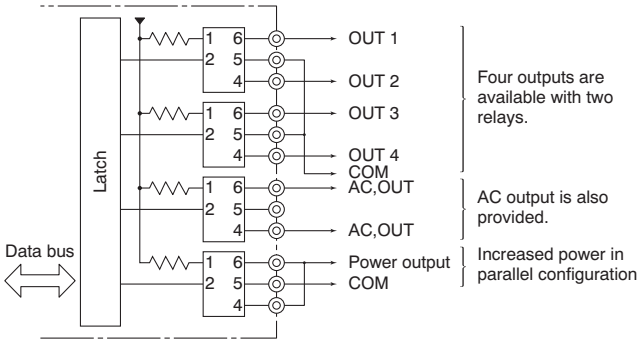
High Response Speed



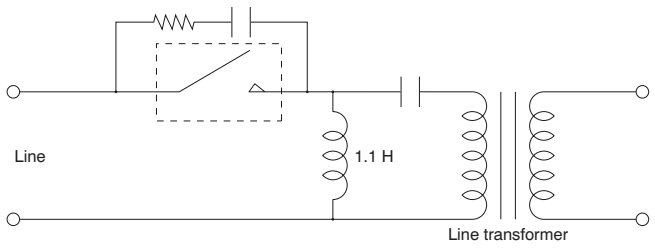
Measurements for AQV204(400V) AC/DC type

Turn on time at 10 mA LED current	0.18 ms
Turn on time with speed-increase capacitor (LED current 45 mA)	0.03 ms

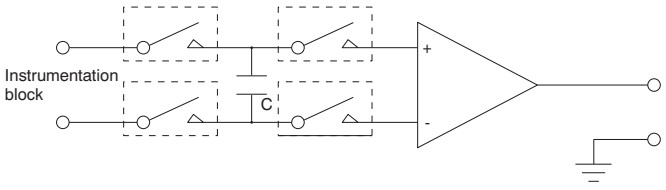
Microprocessor system I/O board



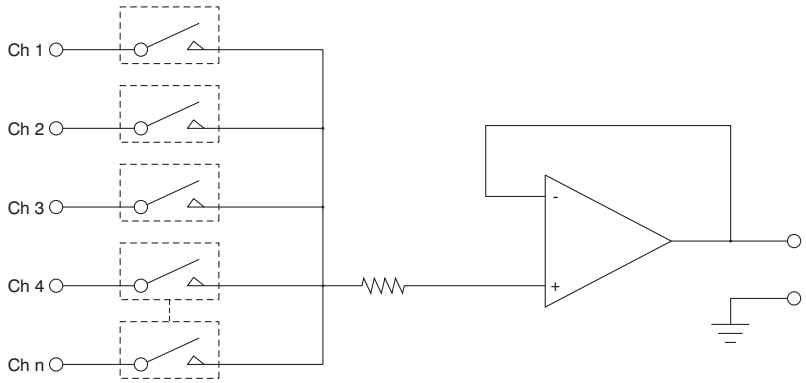
Dial Pulse Generator



Capacitor Switch Circuit



Scanner



PhotoMOS Relays for Automotive Applications

Before Selecting PhotoMOS Relays for Automotive Applications

Some changes in specification parameters are needed when PhotoMOS relays are used in certain automotive applications. Automotive grade PhotoMOS relays are generally used in automotive environment since stricter enhanced quality controls are needed. The user is cautioned and asked to inquire with a local Panasonic sales representative before designing the products in such environments.

About Specification Reviews

Automotive applications require specification reviews. This is important and necessary in order to prevent performance, quality and reliability problems. The following parameters should be reviewed with a local Panasonic sales representative:

- Targeted application
- Targeted levels of quality and reliability
- Circuits description of load level, driving methods, etc.
- Service conditions
- Influence at failure and failsafe concepts, etc.

About Derating Design

Derating is essential in any reliable design and a significant factor in consideration of product life. Sufficient derating is needed against maximum rating when designing a system. Please contact your local Panasonic sales representative to determine derated percentages of the maximum load voltage and maximum load current ratings.
Relays should be examined using measurement equipment.
Derated voltages must be considered according to the operating and environmental conditions the relay will be subjected to.
In case of automotive applications, more allowance should be given to maximum ratings and installation of safety measures (i.e. use of double circuits). Misuse of the products listed in this document shall be made at the users' own risk.

Typical Products for Automotive Applications

Types and absolute maximum ratings (Ambient temperature: 25°C 77°F)

Part number	Type	Package	Contact configuration	Load voltage (V_L)*1	Continuous load current (I_L)*1	Temperature limits	
						Operating (T_{opr})	Storage (T_{stg})
AQW216HAX○○○	GU	DIP8pin (SMD)	2 Form A	600V	40mA (50mA)*2	–40°C to +85°C –40°F to +185°F	–40°C to +100°C –40°F to +212°F
AQW212HAX○○○	GU	DIP8pin (SMD)	2 Form A	60V	500mA (600mA)*2		
AQV258HAX○○○	HE	DIP6pin (SMD)	1 Form A	1500V	20mA		

*1 Indicate the peak AC and DC values.
*2 In case of using only 1 channel

Electric characteristics (Ambient temperature: 25°C 77°F)

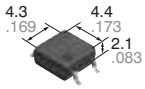
Item			Symbol	Part number			Test conditions
				AQW216HAX○○○	AQW212HAX○○○	AQV258HAX○○○	
Input	LED operate current	Typ.	I_{Fon}	1mA	1mA	0.8mA	I_L = Max.
		Max.		3mA	3mA	3mA	
	LED turn off current	Typ.	I_{Foff}	0.2mA	0.2mA	0.2mA	
		Max.		0.8mA	0.8mA	0.7mA	
	LED dropout voltage	Typ.	V_F	1.25V	1.25V	1.25V	I_F = 50mA
		Max.		1.5V	1.5V	1.5V	
Output	On resistance	Typ.	R_{on}	70Ω	0.83Ω	305Ω	I_F = 10mA (AQW216HAX○○○, AQW212HAX○○○) I_F = 7.5mA (AQV258HAX○○○) I_L = Max.
		Max.		150Ω	2.5Ω	500Ω	
	Off state leakage current	Max.	I_{Leak}	1μA	1μA	10μA	I_F = 0mA, VL = Max.
Transfer characteristics	Turn on time	Typ.	T_{on}	0.2ms	0.5ms	0.28ms	I_F = 10mA (AQW216HAX○○○, AQW212HAX○○○) I_F = 7.5mA (AQV258HAX○○○) I_L = Max.
		Max.		0.5ms	2ms	1ms	
	Turn off time	Typ.	T_{off}	0.04ms	0.08ms	0.1ms	
		Max.		0.5ms	0.5ms	0.5ms	

For further particulars on automotive grade PhotoMOS relays, please inquire with a Panasonic sales representive.

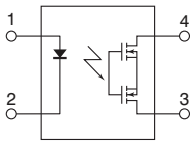
Panasonic
ideas for life

Miniature SOP4-pin type with high capacity up to 1.25A

PhotoMOS® GU SOP 1 Form A High Capacity (AQY212GS, AQY212G2S)



CAD Data
mm inch



FEATURES

1. Greatly increased load current in miniature SOP4-pin package (1.25A high capacity type added).
2. Greatly improved specifications allow you to use this in place of mercury and mechanical relays.

TYPICAL APPLICATIONS

- Measuring instruments
- Security and disaster-preventing system: use in I/O for alarm and security devices, etc.

PhotoMOS

TYPES

	Output rating*		Package	Part No.			Packing quantity	
	Load voltage	Load current		Tube packing style	Tape and reel packing style		Tube	Tape and reel
					Picked from the 1/2-pin side	Picked from the 3/4-pin side		
AC/DC dual use	60V	1.0A	SOP4-pin	AQY212GS	AQY212GSX	AQY212GSZ	1 tube contains: 100 pcs. 1 batch contains: 2,000 pcs.	1,000 pcs.
		1.25A		AQY212G2S	AQY212G2SX	AQY212G2SZ		

* Indicate the peak AC and DC values.

Note: 1. For space reasons, the three initial letters of the part number “AQY”, the surface mount terminal shape indicator “S” and the packing style indicator “X” or “Z” are not marked on the relay. (Ex. the label for product number AQY212G2SX is 212G2.)
2. For types with a built-in resistor, see page 92.

RATING

1. Absolute maximum ratings (Ambient temperature: 25°C 77°F)

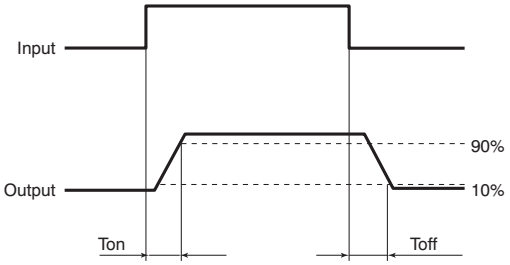
Item		Symbol	AQY212GS	AQY212G2S	Remarks
Input	LED forward current	I_F	50 mA		
	LED reverse voltage	V_R	5 V		
	Peak forward current	I_{FP}	1 A		f = 100 Hz, Duty factor = 0.1%
	Power dissipation	P_{in}	75 mW		
Output	Load voltage (peak AC)	V_L	60 V		
	Continuous load current	I_L	1.0 A	1.25 A	Peak AC, DC
	Peak load current	I_{peak}	3 A		100ms (1 shot), V_L = DC
	Power dissipation	P_{out}	300 mW		
Total power dissipation		P_T	350 mW		
I/O isolation voltage		V_{iso}	1,500 V AC		
Temperature limits	Operating	T_{opr}	–40°C to +85°C –40°F to +185°F		Non-condensing at low temperatures
	Storage	T_{stg}	–40°C to +100°C –40°F to +212°F		

GU SOP 1 Form A High Capacity (AQY212GS, AQY212G2S)

2. Electrical characteristics (Ambient temperature: 25°C 77°F)

Item			Symbol	AQY212GS	AQY212G2S	Condition
Input	LED operate current	Typical	I_{Fon}	1.1 mA		I_L = 100mA
		Maximum		3 mA		
	LED turn off current	Minimum	I_{Foff}	0.3 mA		I_L = 100mA
		Typical		1.0 mA		
	LED dropout voltage	Typical	V_F	1.32 V (1.14 V at I_F = 5 mA)		I_F = 50 mA
		Maximum		1.5 V		
Output	On resistance	Typical	R_{on}	0.34 Ω	0.2 Ω	I_F = 5 mA I_L = Max. Within 1 s on time
		Maximum		0.7 Ω	0.5 Ω	
	Off state leakage current	Maximum	I_{Leak}	1 μA		I_F = 0 mA V_L = Max.
Transfer characteristics	Turn on time*	Typical	T_{on}	1.3 ms		I_F = 5 mA I_L = 100 mA V_L = 10 V
		Maximum		5.0 ms		
	Turn off time*	Typical	T_{off}	0.1 ms		I_F = 5 mA I_L = 100 mA V_L = 10 V
		Maximum		0.5 ms		
	I/O capacitance	Typical	C_{iso}	0.8 pF		f = 1 MHz V_B = 0 V
		Maximum		1.5 pF		
	Initial I/O isolation resistance	Minimum	R_{iso}	1,000 MΩ		500 V DC
	Max. switching frequency	Maximum	—	—	5 times/s	I_F = 5 mA duty = 50% $V_L \times I_L$ = 75 V·A

*Turn on/Turn off time



RECOMMENDED OPERATING CONDITIONS

Please obey the following conditions to ensure proper relay operation and resetting.

Item	Symbol	Recommended value	Unit
Input LED current	I_F	5 to 10	mA

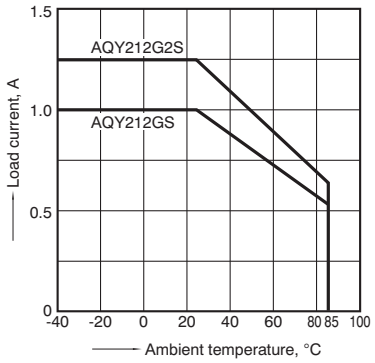
■ **For Dimensions, see page 62.**
■ **For Schematic and Wiring Diagrams, see page 64.**
■ **For Cautions for Use, see page 71.**

■ **These products are not designed for automotive use.**
If you are considering to use these products for automotive applications, please contact your local Panasonic technical representative.
For more information, see page 80.

REFERENCE DATA

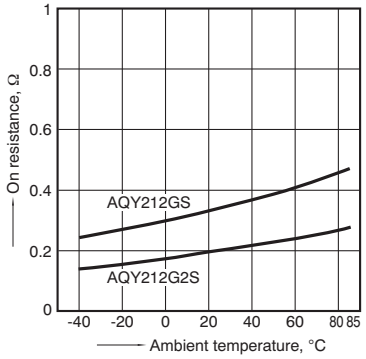
1. Load current vs. ambient temperature characteristics

Allowable ambient temperature: –40°C to +85°C
–40°F to +185°F



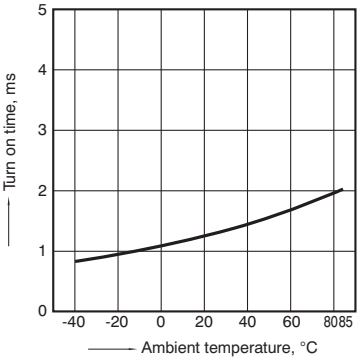
2. On resistance vs. ambient temperature characteristics

Measured portion: between terminals 3 and 4;
LED current: 5 mA; Load voltage: Max. (DC)
Continuous load current: Max.(DC)



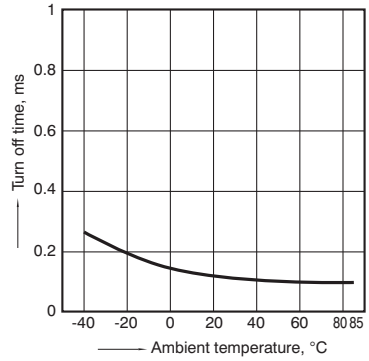
3. Turn on time vs. ambient temperature characteristics

LED current: 5 mA; Load voltage: 10 V (DC);
Continuous load current: 100 mA (DC)



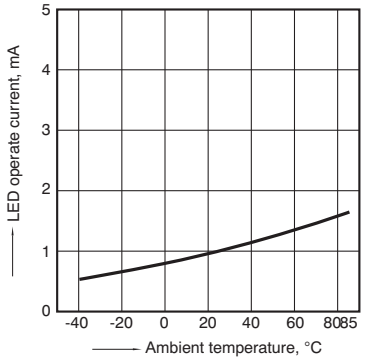
4. Turn off time vs. ambient temperature characteristics

LED current: 5 mA; Load voltage: 10 V (DC);
Continuous load current: 100 mA (DC)



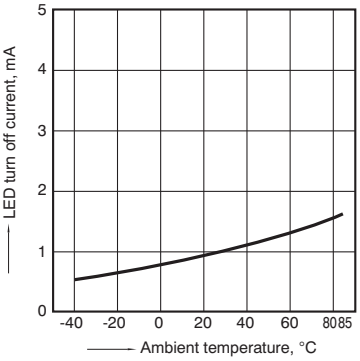
5. LED operate current vs. ambient temperature characteristics

Load voltage: 10 V (DC);
Continuous load current: 100mA (DC)



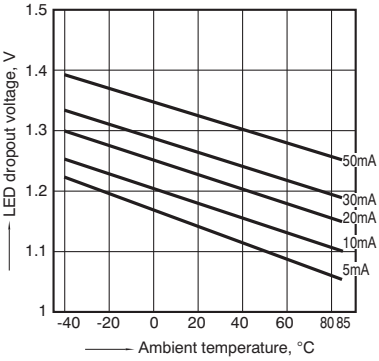
6. LED turn off current vs. ambient temperature characteristics

Load voltage: 10 V (DC);
Continuous load current: 100mA (DC)



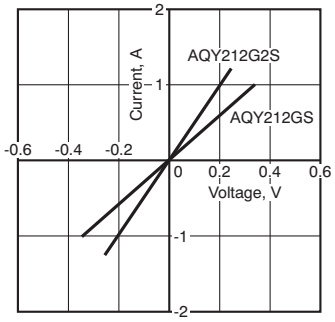
7. LED dropout voltage vs. ambient temperature characteristics

LED current: 5 to 50 mA



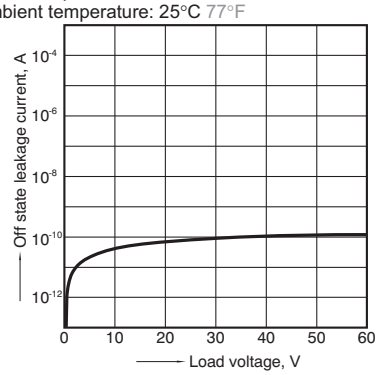
8. Current vs. voltage characteristics of output at MOS portion

Measured portion: between terminals 3 and 4;
Ambient temperature: 25°C 77°F



9. Off state leakage current vs. load voltage characteristics

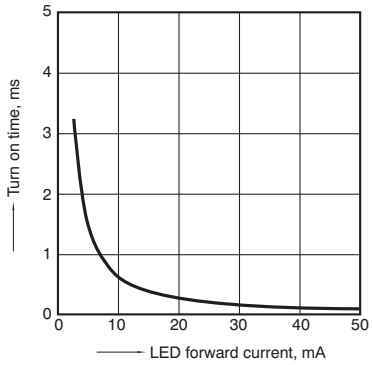
Measured portion: between terminals 3 and 4;
Ambient temperature: 25°C 77°F



GU SOP 1 Form A High Capacity (AQY212GS, AQY212G2S)

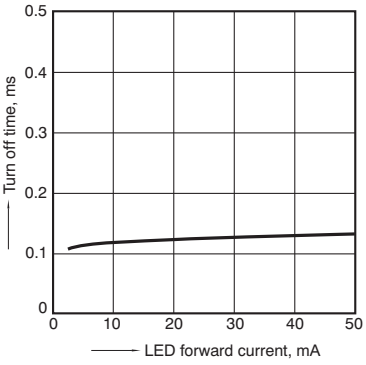
10.Turn on time vs. LED forward current characteristics

Measured portion: between terminals 3 and 4;
Load voltage: 10 V (DC);
Continuous load current: 100 mA (DC);
Ambient temperature: 25°C 77°F



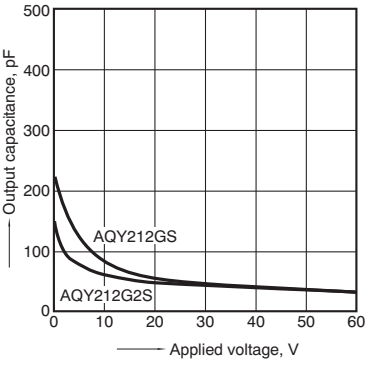
11.Turn off time vs. LED forward current characteristics

Measured portion: between terminals 3 and 4;
Load voltage: 10 V (DC);
Continuous load current: 100 mA (DC);
Ambient temperature: 25°C 77°F



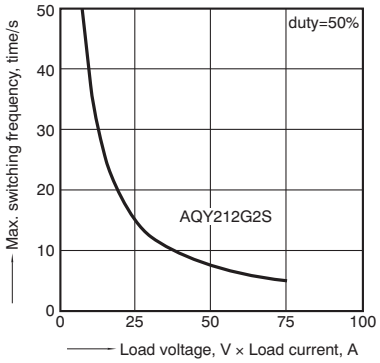
12.Output capacitance vs. applied voltage characteristics

Measured portion: between terminals 3 and 4;
Frequency: 1 MHz;
Ambient temperature: 25°C 77°F



13.Max. switching frequency vs. load voltage and load current

LED current: 5 mA
Ambient temperature: 25°C 77°F



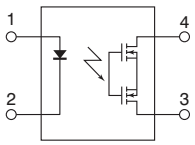
Panasonic
ideas for life

Miniature SOP4-pin type of 60V/350V/400V load voltage

PhotoMOS® GU SOP 1 Form A (AQY21○S)

CAD Data

mm inch



FEATURES

1. Controls low-level analog signals
PhotoMOS relays feature extremely low closed-circuit offset voltage to enable control of low-level analog signals without distortion.

2. Small SOP4-Pin package
The device comes in a miniature SOP4-pin type measuring (W)4.3 × (L)4.4 × (H)2.1 mm (W).169 × (L).173 × (H).083 inch

3. Low-level off state leakage current of max. 1 μA

4. Load voltage 60V, 350V and 400V types available

TYPICAL APPLICATIONS

- Telecommunication (PC, electronic notepad)
- Measuring and testing equipment
- Factory automation equipment
- Security equipment
- High speed inspection machines

TYPES

	Output rating*		Package	Part No.			Packing quantity	
	Load voltage	Load current		Tube packing style	Tape and reel packing style		Tube	Tape and reel
					Picked from the 1/2-pin side	Picked from the 3/4-pin side		
AC/DC dual use	60V	500mA	SOP4-pin	AQY212S	AQY212SX	AQY212SZ	1 tube contains: 100 pcs. 1 batch contains: 2,000 pcs.	1,000 pcs.
	350V	120mA		AQY210S	AQY210SX	AQY210SZ		
	400V	100mA		AQY214S	AQY214SX	AQY214SZ		

* Indicate the peak AC and DC values.
Note: For space reasons, the three initial letters of the part number “AQY”, the surface mount terminal indicator “S” and the packing style indicator “X” or “Z” are not marked on the relay. (Ex. the label for product number AQY210SX is 210.)

RATING

1. Absolute maximum ratings (Ambient temperature: 25°C 77°F)

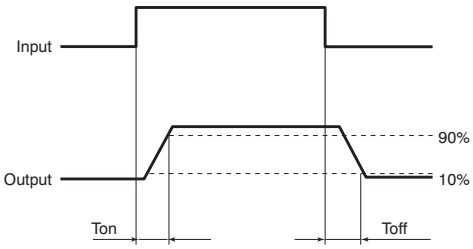
Item		Symbol	AQY212S	AQY210S	AQY214S	Remarks
Input	LED forward current	I_F	50 mA			
	LED reverse voltage	V_R	5 V			
	Peak forward current	I_{FP}	1 A			f = 100 Hz, Duty factor = 0.1%
	Power dissipation	P_{in}	75 mW			
Output	Load voltage (peak AC)	V_L	60 V	350 V	400 V	
	Continuous load current	I_L	0.5 A	0.12 A	0.1 A	Peak AC, DC
	Peak load current	I_{peak}	1.5 A	0.3 A	0.24 A	100ms (1 shot), V_L = DC
	Power dissipation	P_{out}	300 mW			
Total power dissipation		P_T	350 mW			
I/O isolation voltage		V_{iso}	1,500 V AC			
Temperature limits	Operating	T_{opr}	–40°C to +85°C –40°F to +185°F			Non-condensing at low temperatures
	Storage	T_{stg}	–40°C to +100°C –40°F to +212°F			

GU SOP 1 Form A (AQY21❍S)

2. Electrical characteristics (Ambient temperature: 25°C 77°F)

Item			Symbol	AQY212S	AQY210S	AQY214S	Remarks
Input	LED operate current	Typical	I_{Fon}	0.9 mA			I_L = Max.
		Maximum		3 mA			
	LED turn off current	Minimum	I_{Foff}	0.4 mA			I_L = Max.
		Typical		0.85 mA			
	LED dropout voltage	Typical	V_F	1.25 V (1.14 V at I_F = 5 mA)			I_F = 50 mA
		Maximum		1.5 V			
Output	On resistance	Typical	R_{on}	0.83 Ω	17 Ω	25 Ω	I_F = 5 mA I_L = Max. Within 1 s on time
		Maximum		2.5 Ω	25 Ω	35 Ω	
	Off state leakage current	Maximum	I_{Leak}	1 μA			I_F = 0 mA V_L = Max.
Transfer characteristics	Turn on time*	Typical	T_{on}	0.65 ms	0.23 ms	0.21 ms	I_F = 5 mA I_L = Max.
		Maximum		2 ms	0.5 ms	0.5 ms	
	Turn off time*	Typical	T_{off}	0.08 ms	0.04 ms		I_F = 5 mA I_L = Max.
		Maximum		0.2 ms			
	I/O capacitance	Maximum	C_{iso}	1.5 pF			f = 1 MHz V_B = 0 V
	Initial I/O isolation resistance	Minimum	R_{iso}	1,000 MΩ			500 V DC

*Turn on/Turn off time



RECOMMENDED OPERATING CONDITIONS

Please obey the following conditions to ensure proper relay operation and resetting.

Item	Symbol	Recommended value	Unit
Input LED current	I_F	5	mA

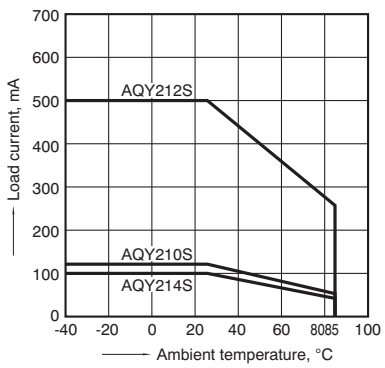
■ **For Dimensions, see page 60.**
■ **For Schematic and Wiring Diagrams, see page 64.**
■ **For Cautions for Use, see page 71.**

■ **These products are not designed for automotive use.**
If you are considering to use these products for automotive applications, please contact your local Panasonic technical representative.
For more information, see page 80.

REFERENCE DATA

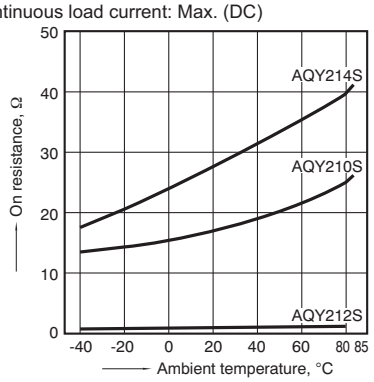
1. Load current vs. ambient temperature characteristics

Allowable ambient temperature: –40°C to +85°C
–40°F to +185°F



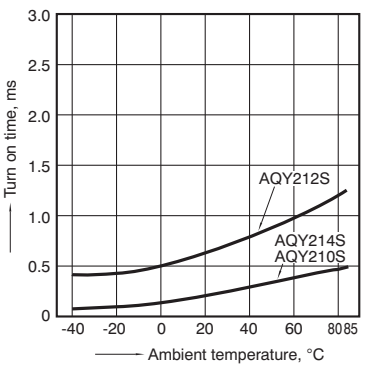
2. On resistance vs. ambient temperature characteristics

Measured portion: between terminals 3 and 4;
LED current: 5 mA; Load voltage: Max. (DC);
Continuous load current: Max. (DC)



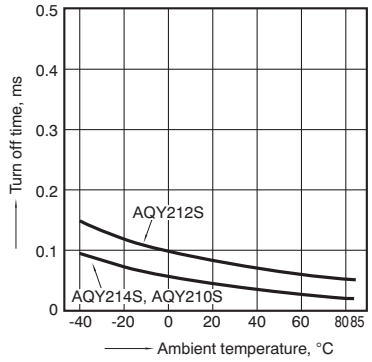
3. Turn on time vs. ambient temperature characteristics

LED current: 5 mA; Load voltage: Max. (DC);
Continuous load current: Max. (DC)



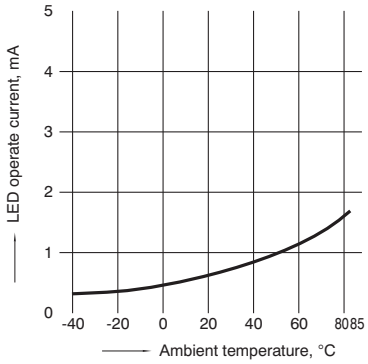
4. Turn off time vs. ambient temperature characteristics

LED current: 5 mA; Load voltage: Max. (DC);
Continuous load current: Max. (DC)



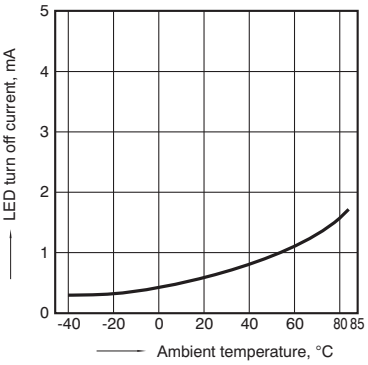
5. LED operate current vs. ambient temperature characteristics

Sample: All types; Load voltage: Max. (DC);
Continuous load current: Max. (DC)



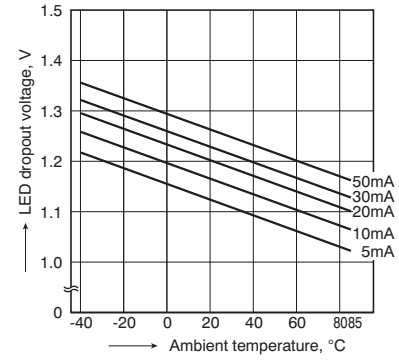
6. LED turn off current vs. ambient temperature characteristics

Sample: All types; Load voltage: Max. (DC);
Continuous load current: Max. (DC)



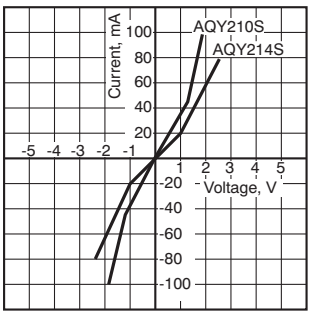
7. LED dropout voltage vs. ambient temperature characteristics

Sample: All types; LED current: 5 to 50 mA



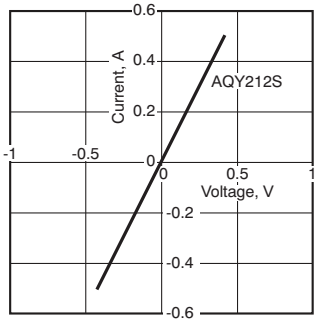
8-(1). Current vs. voltage characteristics of output at MOS portion

Measured portion: between terminals 3 and 4;
Ambient temperature: 25°C 77°F



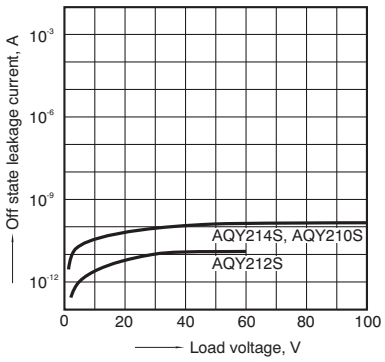
8-(2). Current vs. voltage characteristics of output at MOS portion

Measured portion: between terminals 3 and 4;
Ambient temperature: 25°C 77°F



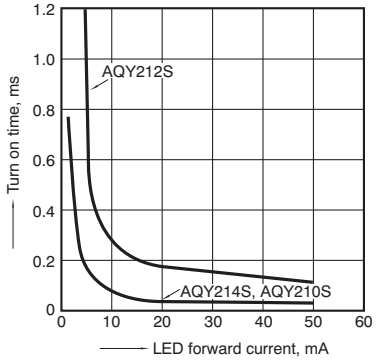
9. Off state leakage current vs. load voltage characteristics

Measured portion: between terminals 3 and 4;
Ambient temperature: 25°C 77°F



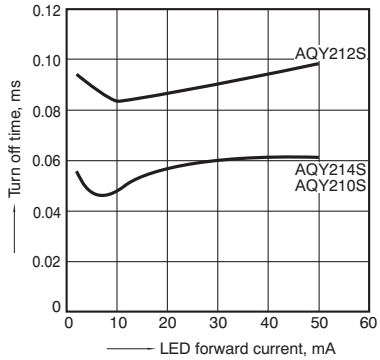
10. Turn on time vs. LED forward current characteristics

Measured portion: between terminals 3 and 4;
Load voltage: Max. (DC); Continuous load current:
Max. (DC); Ambient temperature: 25°C 77°F



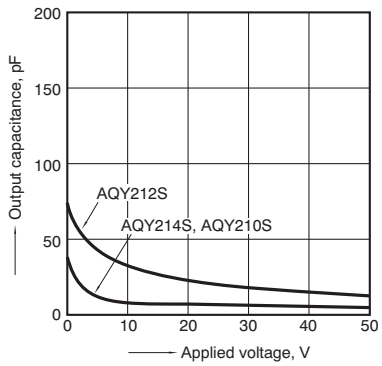
11. Turn off time vs. LED forward current characteristics

Measured portion: between terminals 3 and 4;
Load voltage: Max. (DC); Continuous load current:
Max. (DC); Ambient temperature: 25°C 77°F



12. Output capacitance vs. applied voltage characteristics

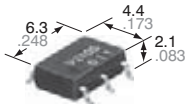
Measured portion: between terminals 3 and 4;
Frequency: 1 MHz; Ambient temperature: 25°C 77°F



Panasonic
ideas for life

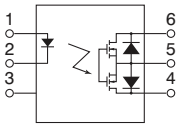
Miniature SOP6-pin type of 60 to 400V load voltage

PhotoMOS® GU SOP 1 Form A (AQV21○S)



CAD Data

mm inch



FEATURES

1. Controls low-level analog signals
PhotoMOS relays feature extremely low closed-circuit offset voltage to enable control of low-level analog signals without distortion.

2. Small SOP6-Pin package
The device comes in a miniature SOP measuring (W) 4.4 × (L) 6.3 ×(H) 2.1 mm (W) .173× (L) .248×(H) .083 inch approx. 25% of the volume and 50% of the footprint size of DIP type

3. Low-level off state leakage current of max. 1 μA

4. Wide variation of load voltage 60V to 600V

TYPICAL APPLICATIONS

- Telephones
- Measuring instruments
- Computers
- Industrial robots
- High-speed inspection machines

TYPES

	Output rating*		Package	Part No.			Packing quantity	
	Load voltage	Load current		Tube packing style	Tape and reel packing style: Picked from the 1/2/3-pin side	Tape and reel packing style: Picked from the 4/5/6-pin side	Tube	Tape and reel
AC/DC dual use	60V	500mA	SOP6-pin	AQV212S	AQV212SX	AQV212SZ	1 tube contains: 75 pcs. 1 batch contains: 1,500 pcs.	1,000 pcs.
	100V	300mA		AQV215S	AQV215SX	AQV215SZ		
	200V	160mA		AQV217S	AQV217SX	AQV217SZ		
	350V	120mA		AQV210S	AQV210SX	AQV210SZ		
	400V	100mA		AQV214S	AQV214SX	AQV214SZ		
	600V	40mA		AQV216S	AQV216SX	AQV216SZ		

* Indicate the peak AC and DC values.
Note: For space reasons, the two initial letters of the part number "AQ" and the packing style indicator "X" or "Z" are not marked on the relay.
(Ex. the label for product number AQV212SX is V212S.)

RATING

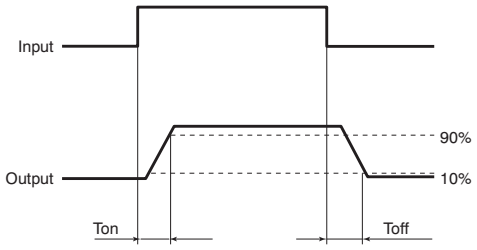
1. Absolute maximum ratings (Ambient temperature: 25°C 77°F)

Item		Symbol	Type of connection	AQV212S	AQV215S	AQV217S	AQV210S	AQV214S	AQV216S	Remarks
Input	LED forward current	I_F		50 mA						
	LED reverse voltage	V_R		5 V						
	Peak forward current	I_{FP}		1 A						f = 100 Hz, Duty factor = 0.1%
	Power dissipation	P_{in}		75 mW						
Output	Load voltage (peak AC)	V_L		60 V	100 V	200 V	350 V	400 V	600 V	
	Continuous load current	I_L	A	0.50 A	0.30 A	0.16 A	0.12 A	0.10 A	0.04 A	A connection: Peak AC, DC B, C connection: DC
			B	0.65 A	0.40 A	0.20 A	0.13 A	0.11 A	0.05 A	
			C	0.80 A	0.56 A	0.28 A	0.15 A	0.12 A	0.06 A	
	Peak load current	I_{peak}		1.0A	0.90A	0.48A	0.3 A	0.3 A	0.12 A	A connection: 100 ms (1 shot) V_L= DC
	Power dissipation	P_{out}		450 mW						
Total power dissipation		P_T		500 mW						
I/O isolation voltage		V_{iso}		1,500 V AC						
Temperature limits	Operating	T_{opr}		–40°C to +85°C –40°F to +185°F						Non-condensing at low temperatures
	Storage	T_{stg}		–40°C to +100°C –40°F to +212°F						

2. Electrical characteristics (Ambient temperature: 25°C 77°F)

Item			Symbol	Type of connection	AQV212S	AQV215S	AQV217S	AQV210S	AQV214S	AQV216S	Remarks
Input	LED operate current	Typical	I_{Fon}	—	0.7 mA						I_L = Max.
		Maximum			3 mA						
	LED turn off current	Minimum	I_{Foff}	—	0.4 mA						I_L = Max.
		Typical			0.65 mA						
	LED dropout voltage	Typical	V_F	—	1.25 V (1.14 V at I_F = 5 mA)						I_F = 50 mA
		Maximum			1.5 V						
Output	On resistance	Typical	R_{on}	A	0.83 Ω	2.3 Ω	11 Ω	23 Ω	30 Ω	70 Ω	I_F = 5 mA I_L = Max. Within 1 s on time
		Maximum			2.5 Ω	4.0 Ω	15 Ω	35 Ω	50 Ω	120 Ω	
		Typical	R_{on}	B	0.44 Ω	1.15 Ω	5.5 Ω	11.5 Ω	22.5 Ω	55 Ω	I_F = 5 mA I_L = Max. Within 1 s on time
		Maximum			1.25 Ω	2.0 Ω	7.5 Ω	17.5 Ω	25 Ω	100 Ω	
		Typical	R_{on}	C	0.25 Ω	0.6 Ω	2.8 Ω	6.0 Ω	11.3 Ω	28 Ω	I_F = 5 mA I_L = Max. Within 1 s on time
		Maximum			0.63 Ω	1.0 Ω	3.8 Ω	8.8 Ω	12.5 Ω	50 Ω	
	Off state leakage current	Maximum	I_{Leak}	—	1 μA						I_F = 0 mA V_L = Max.
Transfer characteristics	Turn on time*	Typical	T_{on}	—	0.65 ms	0.60 ms	0.25 ms	0.25 ms	0.25 ms	0.25 ms	I_F = 5 mA V_L = Max.
		Maximum			2.0 ms	2.0 ms	1.0 ms	0.5 ms	0.5 ms	0.5 ms	
	Turn off time	Typical	T_{off}	—	0.08 ms	0.06 ms	0.05 ms	0.05 ms	0.05 ms	0.05 ms	I_F = 5 mA V_L = Max.
		Maximum			0.2 ms						
	I/O capacitance	Typical	C_{iso}	—	0.8 pF						f = 1 MHz V_B = 0 V
		Maximum			1.5 pF						
	Initial I/C isolation resistance	Minimum	R_{iso}	—	1,000 MΩ						500 V DC

*Turn on/Turn off time



RECOMMENDED OPERATING CONDITIONS

Please obey the following conditions to ensure proper relay operation and resetting.

Item	Symbol	Recommended value	Unit
Input LED current	I_F	5	mA

■ **For Dimensions, see Page 62.**
■ **For Schematic and Wiring Diagrams, see Page 65.**
■ **For Cautions for Use, see Page 71.**

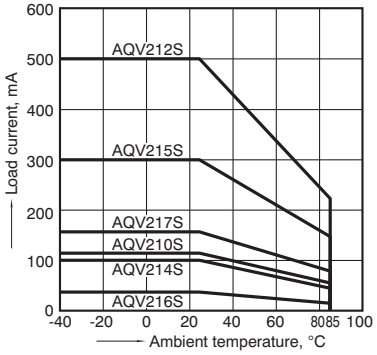
■ **These products are not designed for automotive use.**
If you are considering to use these products for automotive applications, please contact your local Panasonic technical representative.
For more information, see page 80.

REFERENCE DATA

1. Load current vs. ambient temperature characteristics

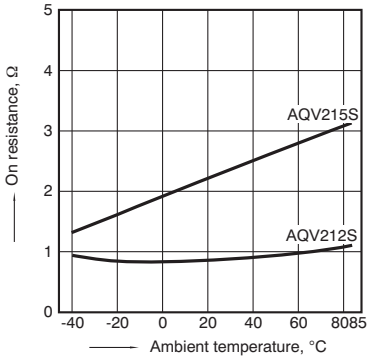
Allowable ambient temperature: –40°C to +85°C
–40°F to +185°F

Type of connection: A



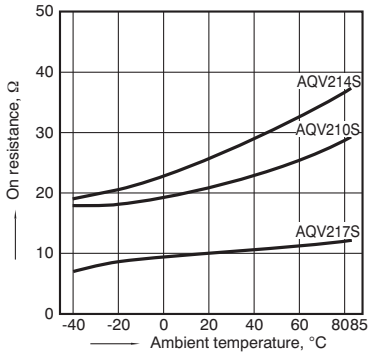
2. -(1) On resistance vs. ambient temperature characteristics

Measured portion: between terminals 4 and 6;
LED current: 5 mA; Load voltage: Max. (DC);
Continuous load current: Max. (DC)



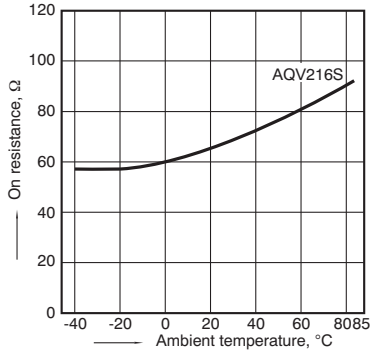
2.-(2) On resistance vs. ambient temperature characteristics

Measured portion: between terminals 4 and 6;
LED current: 5 mA; Load voltage: Max. (DC);
Continuous load current: Max. (DC)



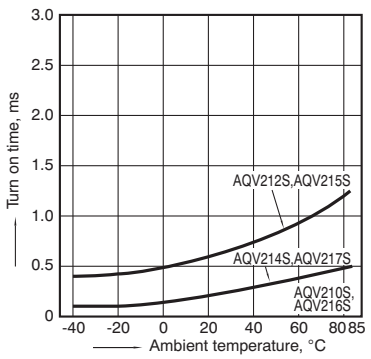
2.-(3) On resistance vs. ambient temperature characteristics

Measured portion: between terminals 4 and 6;
LED current: 5 mA; Load voltage: Max. (DC);
Continuous load current: Max. (DC)



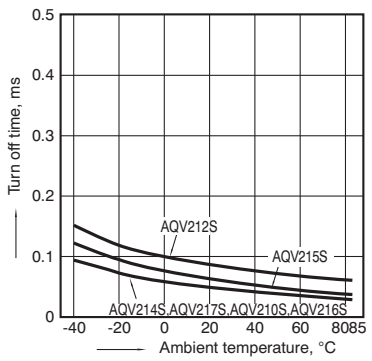
3. Turn on time vs. ambient temperature characteristics

LED current: 5 mA; Load voltage: Max. (DC);
Continuous load current: Max. (DC)



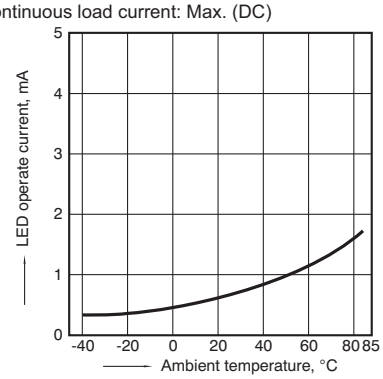
4. Turn off time vs. ambient temperature characteristics

LED current: 5 mA; Load voltage: Max. (DC);
Continuous load current: Max. (DC)



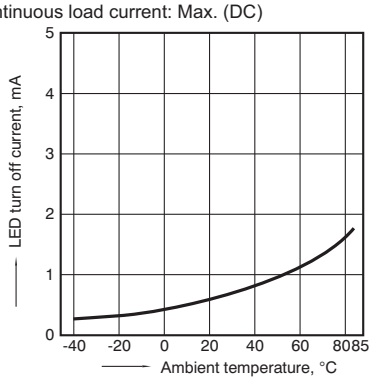
5. LED operate current vs. ambient temperature characteristics

Sample: All types;
Load voltage: Max. (DC);
Continuous load current: Max. (DC)



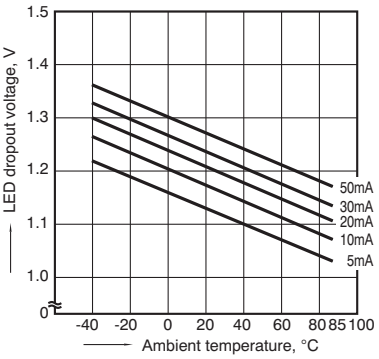
6. LED turn off current vs. ambient temperature characteristics

Sample: All types;
Load voltage: Max. (DC);
Continuous load current: Max. (DC)



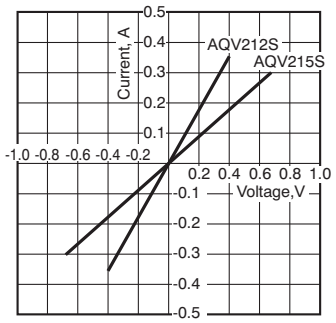
7. LED dropout voltage vs. ambient temperature characteristics

Sample: All types;
LED current: 5 to 50 mA



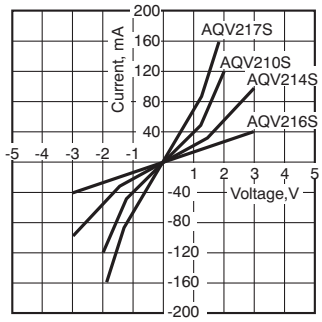
8. -(1). Current vs. voltage characteristics of output at MOS portion

Measured portion: between terminals 4 and 6;
Ambient temperature: 25°C 77°F



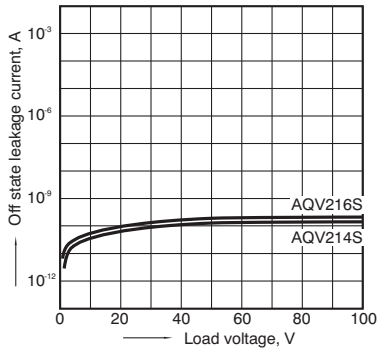
8.-(2). Current vs. voltage characteristics of output at MOS portion

Measured portion: between terminals 4 and 6;
Ambient temperature: 25°C 77°F



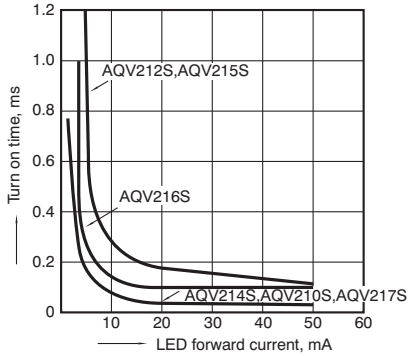
9. Off state leakage current vs. load voltage characteristics

Measured portion: between terminals 4 and 6;
Ambient temperature: 25°C 77°F



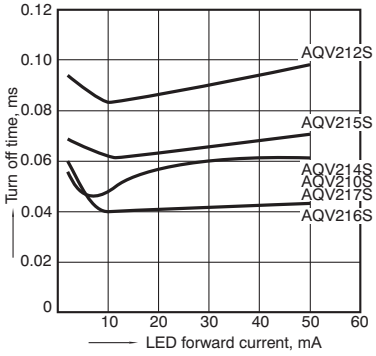
10. Turn on time vs. LED forward current characteristics

Measured portion: between terminals 4 and 6;
Load voltage: Max. (DC); Continuous load current: Max. (DC); Ambient temperature: 25°C 77°F



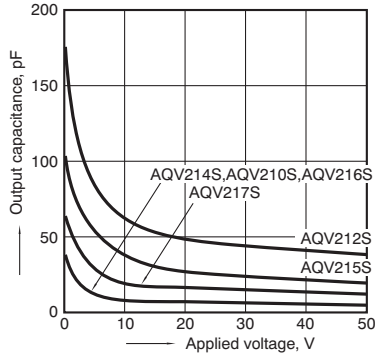
11. Turn off time vs. LED forward current characteristics

Measured portion: between terminals 4 and 6;
Load voltage: Max. (DC); Continuous load current: Max. (DC); Ambient temperature: 25°C 77°F



12. Output capacitance vs. applied voltage characteristics

Measured portion: between terminals 4 and 6;
Frequency: 1 MHz;
Ambient temperature: 25°C 77°F

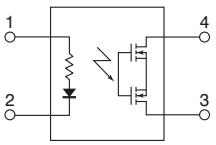


Panasonic
ideas for life

Space-saving SOP4-pin high capacity type with built-in input registor

PhotoMOS® GU SOP 1 Form A High Capacity Voltage-sensitive (AQY212FG2S)

L 4.30mm .169inch
W 4.40mm .173inch
H 2.10mm .083inch

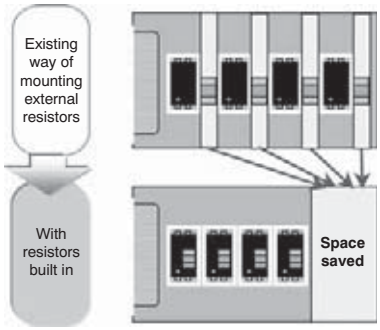


CAD Data

FEATURES

1. Built-in input resistor means less man-hours when mounting
The voltage-sensitive type, which eliminates the need to mount an external input resistor, is now available in a small package (recommended input voltage is 5 V). Man-hours spent mounting external input resistors are cut and board designing is simplified.

2. Saves space on PC board
Since the small package size remains the same while including a built-in input resistor, space on the PC board is saved. This makes it easier to incorporate space savings when designing miniature devices.



<Artistic impression of PC board space savings due to built-in resistor>
*Above is in case of SSOP.

3. Continuous load current of 1.25A
This miniature SOP type controls 1.25A/ 60V load.

TYPICAL APPLICATIONS

1. Measuring and testing equipment
Semiconductor testing equipment, Probe cards, Datalogger, Board tester and other testing equipment.

2. Telecommunication, Broadcasting, and Medical equipment

TYPES

	Output rating*1		Package	Part No.*2			Packing quantity	
	Load voltage	Load current		Tube packing style	Tape and reel packing style		Tube	Tape and reel
					Picked from the 1/2-pin side	Picked from the 3/4-pin side		
AC/DC dual use	60V	1.25A	SOP4-pin	AQY212FG2S	AQY212FG2SX	AQY212FG2SZ	1 tube contains: 100 pcs. 1 batch contains: 2,000 pcs.	1,000 pcs.

Notes:
*1 Indicate the peak AC and DC values.
*2 For space reasons, only “212FG2” is marked on the product. The three initial letters of the part number “AQY”, the package (SOP) indicator “S”, and the packing style indicator “X” or “Z” have been omitted.

RATING

1. Absolute maximum ratings (Condition: ambient temperature 25°C 77°F)

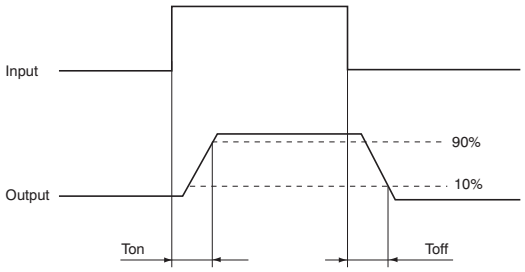
Item		Symbol	AQY212FG2S	Remarks
Input	Input voltage	V_{IN}	6V	
	Input reverse voltage	V_{RIN}	5V	
	Power dissipation	P_{in}	65mW	*65mW for 1a
Output	Load voltage (peak AC)	V_L	60V	
	Load current	I_L	1.25A	Peak AC, DC
	Peak load current	I_{peak}	3A	100ms (1shot), V_L=DC
	Power dissipation	P_{out}	300mW	
Total power dissipation		P_T	350mW	
I/O isolation voltage		V_{iso}	500V AC	
Operating temperature		T_{opr}	–40°C to +85°C –40°F to +185°F	Non-condensing at low temperatures
Storage temperature		T_{stg}	–40°C to +100°C –40°F to +212°F	

GU SOP 1 Form A High Capacity Voltage-sensitive (AQY212FG2S)

2. Electrical characteristics (Condition: ambient temperature 25°C 77°F)

Item			Symbol	AQY212FG2S	Condition
Input	Operate voltage	Typ.	V_{Fon}	1.4V	I_L = 100mA
		Max.		4V	
	Turn off voltage	Min.	V_{Foff}	0.8V	
		Typ.		1.4V	
	Input current	Typ.	I_{IN}	8.5mA	V_{IN} = 5V
Output	On resistance	Typ.	R_{on}	0.2Ω	V_{IN} = 5V, I_L = Max. Within 1 s on time
		Max.		0.5Ω	
	Output capacitance	Typ.	C_{out}	–	V_{IN} = 0V, V_B = 0V, f = 1MHz
		Max.		–	
	Off state leakage current	Typ.	I_{Leak}	–	V_{IN} = 0V, V_L = Max.
		Max.		1μA	
Transfer characteristics	Turn on time*	Typ.	T_{on}	0.7ms	V_{IN} = 5V, I_L = 100mA, V_L = 10V
		Max.		5ms	
	Turn off time*	Typ.	T_{off}	0.1ms	
		Max.		0.5ms	
	I/O capacitance	Typ.	C_{iso}	0.8pF	f = 1MHz, V_B = 0V
		Max.		1.5pF	f = 1MHz, V_B = 0V
	Initial I/O isolation resistance	Min.	R_{iso}	1,000MΩ	500V DC
	Maximum operating frequency	Max.	–	5 cps	V_{IN} = 5V, duty = 50% $V_I \times I_I$ = 75V·A

*Turn on/Turn off time



RECOMMENDED OPERATING CONDITIONS

Please obey the following conditions to ensure proper relay operation and resetting.

Item	Symbol	Minimum	Typical	Maximum	Unit
Input voltage	V_{IN}	4.5	5	5.5	V

■ **For Dimensions, see page 62.**
■ **For Schematic and Wiring Diagrams, see page 65.**
■ **For Cautions for Use, see page 71.**

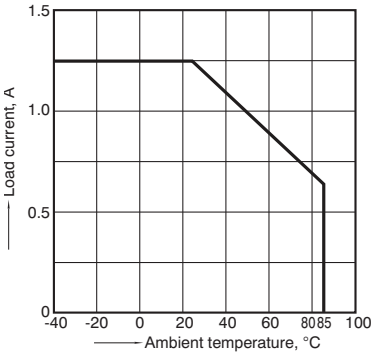
■ **These products are not designed for automotive use.**
If you are considering to use these products for automotive applications, please contact your local Panasonic technical representative.
For more information, see page 80.

GU SOP 1 Form A High Capacity Voltage-sensitive (AQY212FG2S)

REFERENCE DATA

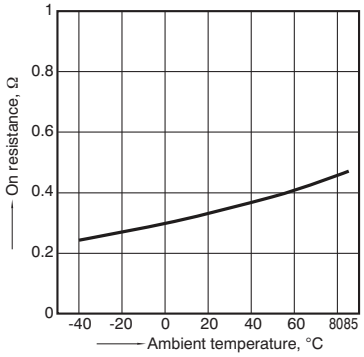
13.Load current vs. ambient temperature characteristics

Allowable ambient temperature: –40°C to +85°C
–40°F to +185°F



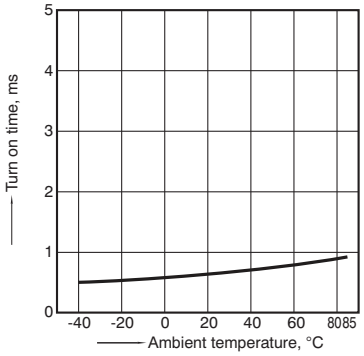
14.On resistance vs. ambient temperature characteristics

Measured portion: between terminals 3 and 4
Input voltage: 5V; Load voltage: Max. (DC);
Continuous load current: Max. (DC)



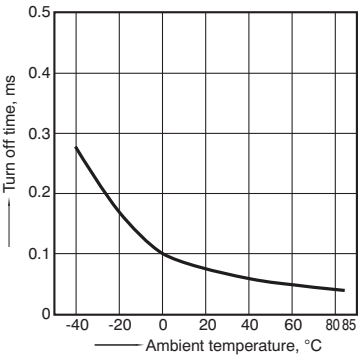
15.Turn on time vs. ambient temperature characteristics

Input voltage: 5V; Load voltage: 10V (DC);
Continuous load current: 100mA (DC)



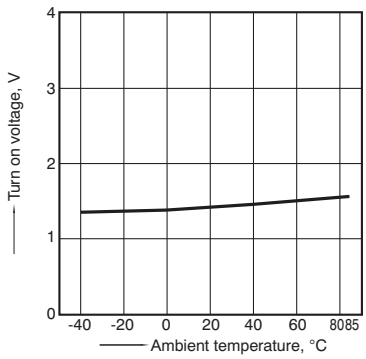
16.Turn off time vs. ambient temperature characteristics

Input voltage: 5V; Load voltage: 10V (DC);
Continuous load current: 100mA (DC)



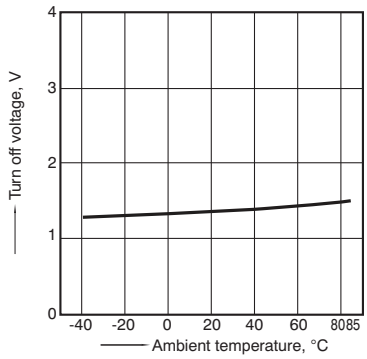
17.Turn on voltage vs. ambient temperature characteristics

Load voltage: 10V (DC);
Continuous load current: 100mA (DC)



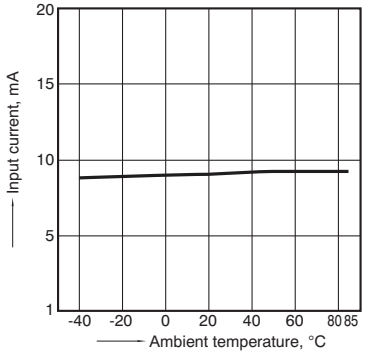
18.Turn off voltage vs. ambient temperature characteristics

Load voltage: 10V (DC);
Continuous load current: 100mA (DC)



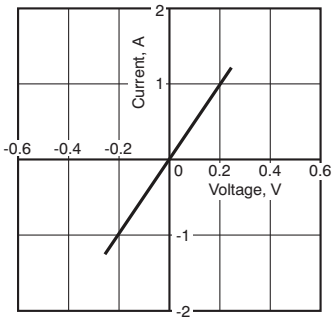
19.Input current vs. ambient temperature characteristics

Input voltage: 5V



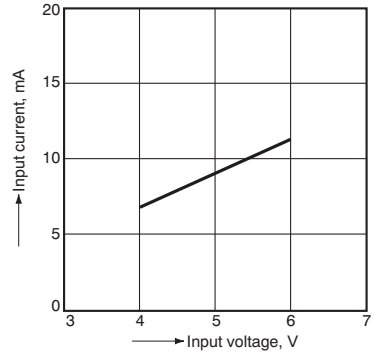
20.Current vs. voltage characteristics of output at MOS portion

Measured portion: between terminals 3 and 4
Ambient temperature: 25°C 77°F



21.Input current vs. input voltage characteristics

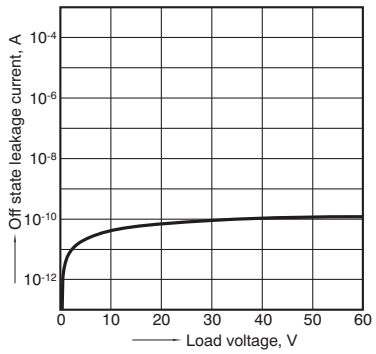
Ambient temperature: 25°C 77°F
(Recommended input voltage: 5±0.5V)



GU SOP 1 Form A High Capacity Voltage-sensitive (AQY212FG2S)

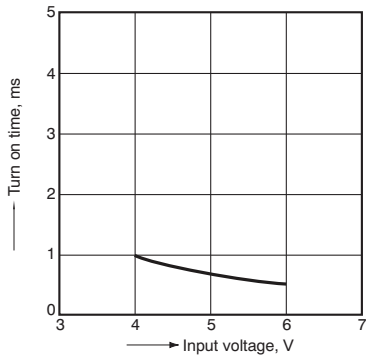
22.Off state leakage current vs. load voltage characteristics

Measured portion: between terminals 3 and 4
Ambient temperature: 25°C 77°F



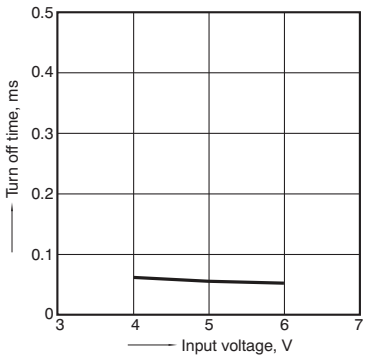
23.Turn on time vs. input voltage characteristics

Measured portion: between terminals 3 and 4
Load voltage: 10V (DC); Continuous load current: 100mA (DC); Ambient temperature: 25°C 77°F



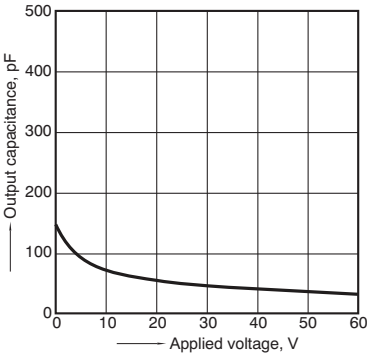
24.Turn off time vs. input voltage characteristics

Measured portion: between terminals 3 and 4
Load voltage: 10V (DC); Continuous load current: 100mA (DC); Ambient temperature: 25°C 77°F



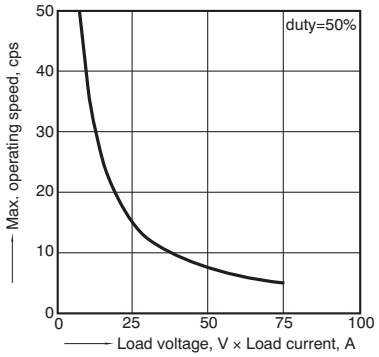
25.Output capacitance vs. applied voltage characteristics

Measured portion: between terminals 3 and 4
Frequency: 1 MHz, 30m Vrms;
Ambient temperature: 25°C 77°F



26.Max. operating speed vs. load voltage-load current characteristics

Input voltage: 5V
Ambient temperature: 25°C 77°F

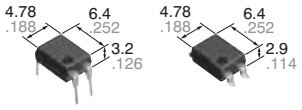


PhotoMOS

Panasonic
ideas for life

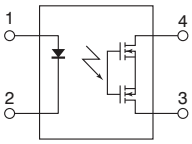
4-pin high capacity of 1.1A, I/O isolation voltage of 5,000V

PhotoMOS® GU 1 Form A High Capacity (AQY212GH)



(Height includes standoff) mm inch

CAD Data



FEATURES

1. Greatly increased capacity
Continuous load current: 1.1A
2. Reinforced insulation
I/O isolation voltage: 5,000 V AC
3. Compact 4-pin DIP type
4. The improved performance relative to mercury or mechanical relays

TYPICAL APPLICATIONS

• Measuring instruments
• Security and disaster-preventing system: use in I/O for alarm and security devices, etc.

TYPES

	Output rating*		Part No.				Packing quantity	
			Through hole terminal	Surface-mount terminal				
	Load voltage	Load current	Tube packing style		Tape and reel packing style		Tube	Tape and reel
					Picked from the 1/2-pin side	Picked from the 3/4-pin side		
AC/DC dual use	60 V	1.1 A	AQY212GH	AQY212GHA	AQY212GHAX	AQY212GHAZ	1 tube contains 100 pcs. 1 batch contains 1,000 pcs.	1,000 pcs.

*Indicate the peak AC and DC values.
Note: For space reasons, the three initial letters of the part number “AQY”, the surface mount terminal shape indicator “A” and the packing style indicator “X” or “Z” are not marked on the relay.

RATING

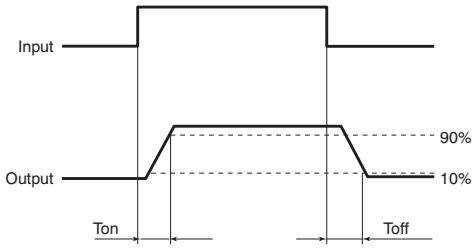
1. Absolute maximum ratings (Ambient temperature: 25°C 77°F)

Item		Symbol	AQY212GH(A)	Remarks
Input	LED forward current	I_F	50 mA	
	LED reverse voltage	V_R	5 V	
	Peak forward current	I_{FP}	1 A	f = 100 Hz, Duty factor = 0.1%
	Power dissipation	P_{in}	75 mW	
Output	Load voltage (peak AC)	V_L	60 V	
	Continuous load current	I_L	1.1 A	Peak AC, DC
	Peak load current	I_{peak}	3.0 A	100ms (1 shot), V_L = DC
	Power dissipation	P_{out}	500 mW	
Total power dissipation		P_T	550 mW	
I/O isolation voltage		V_{iso}	5,000 V AC	
Temperature limits	Operating	T_{opr}	–40°C to +85°C –40°F to +185°F	Non-condensing at low temperatures
	Storage	T_{stg}	–40°C to +100°C –40°F to +212°F	

2. Electrical characteristics (Ambient temperature: 25°C 77°F)

Item			Symbol	AQY212GH(A)	Condition
Input	LED operate current	Typical	I_{Fon}	1.1 mA	I_L = 100mA
		Maximum		3 mA	
	LED turn off current	Minimum	I_{Foff}	0.3 mA	I_L = 100mA
		Typical		1.0 mA	
	LED dropout voltage	Typical	V_F	1.32 V (1.14 V at I_F = 5 mA)	I_F = 50 mA
		Maximum		1.5 V	
Output	On resistance	Typical	R_{on}	0.34 Ω	I_F = 5 mA I_L = Max. Within 1 s on time
		Maximum		0.7 Ω	
	Off state leakage current	Maximum	I_{Leak}	1 μA	I_F = 0 mA V_L = Max.
Transfer characteristics	Turn on time*	Typical	T_{on}	1.3 ms	I_F = 5 mA I_L = 100 mA V_L = 10 V
		Maximum		5.0 ms	
	Turn off time*	Typical	T_{off}	0.1 ms	I_F = 5 mA I_L = 100 mA V_L = 10 V
		Maximum		0.5 ms	
	I/O capacitance	Typical	C_{iso}	0.8 pF	f = 1 MHz V_B = 0 V
		Maximum		1.5 pF	
	Initial I/O isolation resistance	Minimum	R_{iso}	1,000 MΩ	500 V DC

*Turn on/Turn off time



RECOMMENDED OPERATING CONDITIONS

Please obey the following conditions to ensure proper relay operation and resetting.

Item	Symbol	Recommended value	Unit
Input LED current	I_F	5 to 10	mA

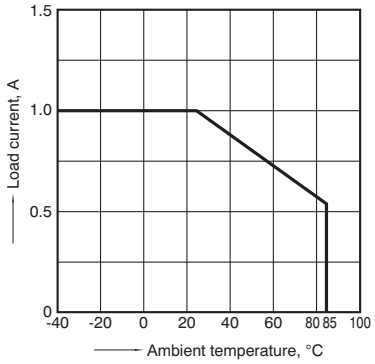
■ **For Dimensions, see page 60.**
■ **For Schematic and Wiring Diagrams, see page 64.**
■ **For Cautions for Use, see page 71.**

■ **These products are not designed for automotive use.**
If you are considering to use these products for automotive applications, please contact your local Panasonic technical representative.
For more information, see page 80.

REFERENCE DATA

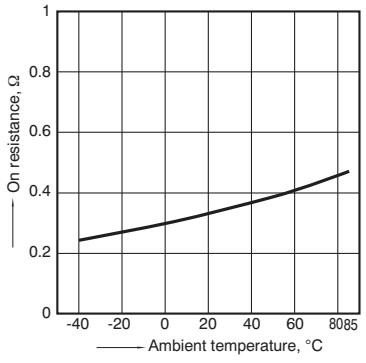
1. Load current vs. ambient temperature characteristics

Allowable ambient temperature: –40°C to +85°C
–40°F to +185°F



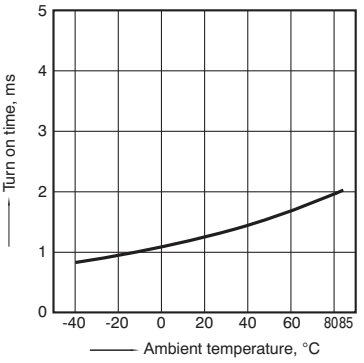
2. On resistance vs. ambient temperature characteristics

Measured portion: between terminals 3 and 4;
LED current: 5 mA; Load voltage: Max. (DC)
Continuous load current: Max.(DC)



3. Turn on time vs. ambient temperature characteristics

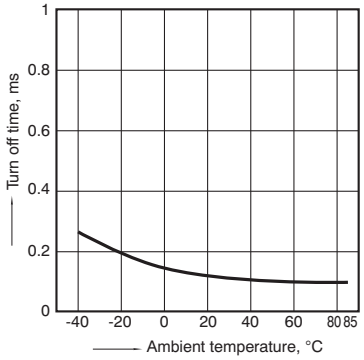
LED current: 5 mA; Load voltage: 10 V (DC);
Continuous load current: 100 mA (DC)



GU 1 Form A High Capacity (AQY212GH)

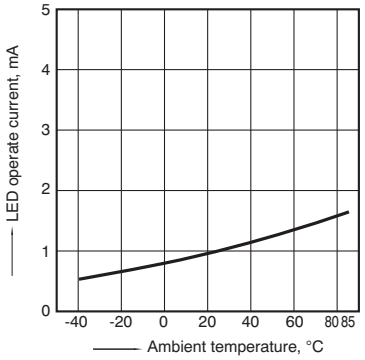
4. Turn off time vs. ambient temperature characteristics

LED current: 5 mA; Load voltage: 10 V (DC);
Continuous load current: 100 mA (DC)



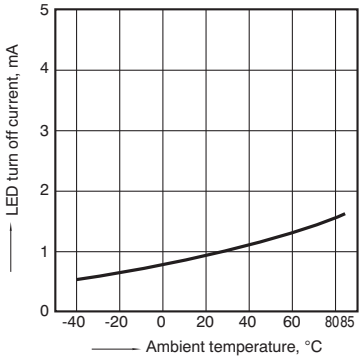
5. LED operate current vs. ambient temperature characteristics

Load voltage: 10 V (DC);
Continuous load current: 100mA (DC)



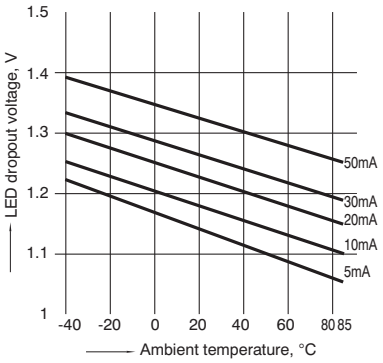
6. LED turn off current vs. ambient temperature characteristics

Load voltage: 10 V (DC);
Continuous load current: 100mA (DC)



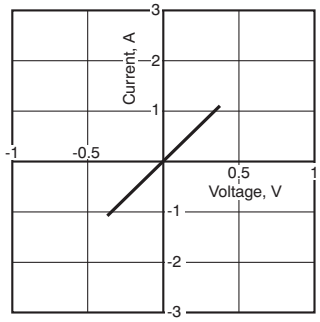
7. LED dropout voltage vs. ambient temperature characteristics

LED current: 5 to 50 mA



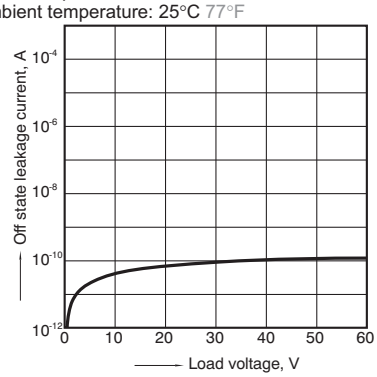
8. Current vs. voltage characteristics of output at MOS portion

Measured portion: between terminals 3 and 4;
Ambient temperature: 25°C 77°F



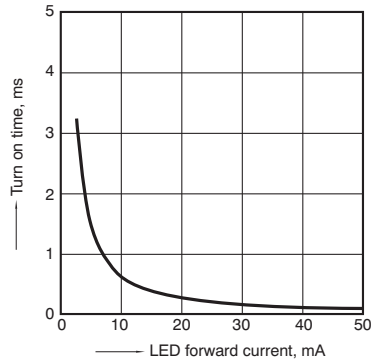
9. Off state leakage current vs. load voltage characteristics

Measured portion: between terminals 3 and 4;
Ambient temperature: 25°C 77°F



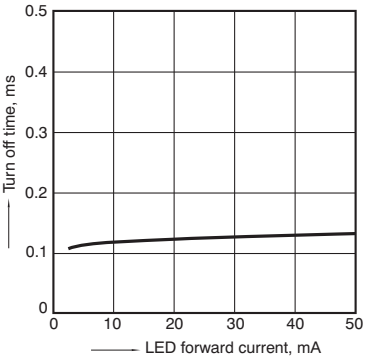
10. Turn on time vs. LED forward current characteristics

Measured portion: between terminals 3 and 4;
Load voltage: 10 V (DC);
Continuous load current: 100 mA (DC);
Ambient temperature: 25°C 77°F



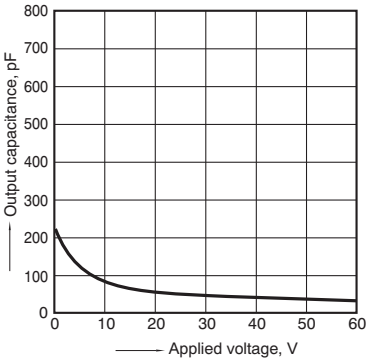
11. Turn off time vs. LED forward current characteristics

Measured portion: between terminals 3 and 4;
Load voltage: 10 V (DC);
Continuous load current: 100 mA (DC);
Ambient temperature: 25°C 77°F



12. Output capacitance vs. applied voltage characteristics

Measured portion: between terminals 3 and 4;
Frequency: 1 MHz;
Ambient temperature: 25°C 77°F

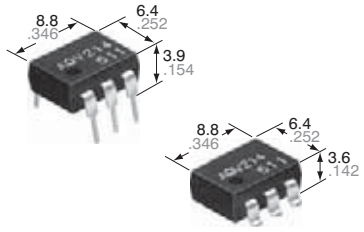


(Standard type) (Reinforced type)

Panasonic
ideas for life

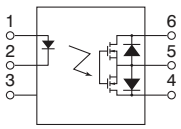
6-pin type for switching low-level analog signal

PhotoMOS® GU 1 Form A (AQV21❍, AQV214H)



CAD Data

mm inch



FEATURES

1. Controls low-level analog signals
PhotoMOS relays feature extremely low closed-circuit offset voltage to enable control of low-level analog signals without distortion.

2. Controls various types of loads such as relays, motors, lamps and solenoids

3. Optical coupling for extremely high isolation
Unlike mechanical relays, the PhotoMOS relay combines LED and optoelectronic device to transfer signals using light for extremely high isolation.

4. Eliminates the need for a counter electromotive force protection diode in the drive circuits on the input side

5. Stable on-resistance

6. Low-level off state leakage current of max. 1 μA

7. Reinforced insulation type of I/O voltage 5,000V also available

TYPICAL APPLICATIONS

- High-speed inspection machines
- Telephone equipment
- Data communication equipment
- Computers

TYPES

	I/O isolation	Output rating*		Package	Part No.				Packing quantity	
					Through hole terminal	Surface-mount terminal				
					Tube packing style		Tape and reel packing style		Tube	Tape and reel
		Load voltage	Load current				Picked from the 1/2/3-pin side	Picked from the 4/5/6-pin side		
AC/DC dual use	Standard 1,500 V AC	60V	550 mA	DIP6-pin	AQV212	AQV212A	AQV212AX	AQV212AZ	1 tube contains 50 pcs. 1 batch contains 500 pcs.	1,000 pcs.
		100 V	320 mA		AQV215	AQV215A	AQV215AX	AQV215AZ		
		200 V	180 mA		AQV217	AQV217A	AQV217AX	AQV217AZ		
		350 V	130 mA		AQV210	AQV210A	AQV210AX	AQV210AZ		
		400 V	120 mA		AQV214	AQV214A	AQV214AX	AQV214AZ		
		600 V	50 mA		AQV216	AQV216A	AQV216AX	AQV216AZ		
	Reinforced 5,000 V	400 V	120 mA		AQV214H	AQV214HA	AQV214HAX	AQV214HAZ		

*Indicate the peak AC and DC values.
Note: The surface mount terminal shape indicator “A” and the packing style indicator “X” or “Z” are not marked on the relay.

RATING

1. Absolute maximum ratings (Ambient temperature: 25°C 77°F)

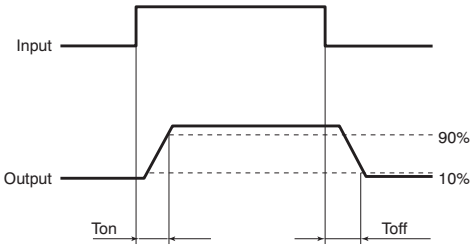
	Item		Sym-bol	Type of connec-tion	AQV212(A)	AQV215(A)	AQV217(A)	AQV210(A)	AQV214(A)	AQV216(A)	AQV214H(A)	Remarks
Input	LED forward current		I_F		50 mA							
	LED reverse voltage		V_R		5 V							
	Peak forward current		I_{FP}		1 A							f = 100 Hz, Duty factor = 0.1%
	Power dissipation		P_{in}		75 mW							
Output	Load voltage (peak AC)		V_L		60 V	100 V	200 V	350 V	400 V	600 V	400 V	
	Continuous load current		I_L	A	0.55 A	0.32 A	0.18 A	0.13 A	0.12 A	0.05 A	0.12 A	A connection: Peak AC, DC B, C connection: DC
				B	0.65 A	0.42 A	0.22 A	0.15 A	0.13 A	0.06 A	0.13 A	
				C	0.80 A	0.60 A	0.30 A	0.17 A	0.15 A	0.08 A	0.15 A	
	Peak load current		I_{peak}		1.2 A	0.96 A	0.54 A	0.4 A	0.3 A	0.15 A	0.3 A	A connection: 100 ms (1 shot), V_L=DC
	Power dissipation		P_{out}		500 mW							
Total power dissipation			P_T		550 mW							
I/O isolation voltage			V_{iso}		1,500 V AC						5,000 V AC	
Temperature limits		Operating	T_{opr}		–40°C to +85°C –40°F to +185°F							Non-condensing at low temp.
		Storage	T_{stg}		–40°C to +100°C –40°F to +212°F							

GU 1 Form A (AQV21❍, AQV214H)

2. Electrical characteristics (Ambient temperature: 25°C 77°F)

	Item		Sym-bol	Type of connec-tion**	AQV212(A)	AQV215(A)	AQV217(A)	AQV210(A)	AQV214(A)	AQV216(A)	AQV214H(A)	Condition
Input	LED operate current	Typical	I_{Fon}	—	1 mA	1 mA	1 mA	1 mA	1 mA	1 mA	1.3 mA	I_L = Max.
		Maximum			3 mA	3 mA	3 mA	3 mA	3 mA	3 mA	3 mA	
	LED turn off current	Minimum	I_{Foff}	—	0.4 mA	0.4 mA	0.4 mA	0.4 mA	0.4 mA	0.4 mA	1.2 mA	I_L = Max.
		Typical			0.79 mA	0.79 mA	0.79 mA	0.79 mA	0.79 mA	0.79 mA	0.79 mA	
	LED dropout voltage	Typical	V_F	—	1.25 V (1.14 V at I_F = 5 mA)							I_F = 50 mA
		Maximum			1.5 V							
Output	On resistance	Typical	R_{on}	A	0.83 Ω	2.3 Ω	11.0 Ω	23 Ω	30 Ω	70 Ω	30 Ω	I_F = 5 mA I_L = Max. Within 1 s on time
		Maximum			2.5 Ω	4.0 Ω	15.0 Ω	35 Ω	50 Ω	120 Ω	50 Ω	
		Typical	R_{on}	B	0.44 Ω	1.15 Ω	5.5 Ω	11.5 Ω	22.5 Ω	55 Ω	22.5 Ω	I_F = 5 mA I_L = Max. Within 1 s on time
		Maximum			1.25 Ω	2.0 Ω	7.5 Ω	17.5 Ω	25 Ω	100 Ω	25 Ω	
		Typical	R_{on}	C	0.25 Ω	0.6 Ω	2.8 Ω	6.0 Ω	11.3 Ω	28 Ω	11.3 Ω	I_F = 5 mA I_L = Max. Within 1 s on time
		Maximum			0.63 Ω	1.0 Ω	3.8 Ω	8.8 Ω	12.5 Ω	50 Ω	12.5 Ω	
	Output capacitance	Typical	C_{out}	A	150 pF	110 pF	70 pF	45 pF	45 pF	45 pF	45 pF	I_F = 0 mA V_B = 0 V f = 1 MHz
	Off state leakage current	Maximum	I_{Leak}	—	1 μA							I_F = 0 mA V_L = Max.
Transfer characteristics	Turn on time*	Typical	T_{on}	—	0.65 ms	0.6 ms	0.25 ms	0.25 ms	0.21 ms	0.28 ms	0.6 ms	I_F= 5 mA** I_L=Max.
		Maximum			2 ms	2 ms	1.0 ms	0.5 ms	0.5 ms	0.5 ms	0.8 ms	
	Turn off time*	Typical	T_{off}	—	0.08 ms	0.06 ms	0.05 ms	0.05 ms	0.05 ms	0.04 ms	0.05 ms	I_F = 5 mA I_L = Max.
		Maximum			0.2 ms	0.2 ms	0.2 ms	0.2 ms	0.2 ms	0.2 ms	0.2 ms	
	I/O capacitance	Typical	C_{iso}	—	0.8 pF							f = 1 MHz V_B = 0 V
		Maximum			1.5 pF							
	Initial I/O isolation resistance	Minimum	R_{iso}	—	1,000 MΩ							500 V DC

*Turn on/Turn off time



RECOMMENDED OPERATING CONDITIONS

Please obey the following conditions to ensure proper relay operation and resetting.

Item	Symbol	Recommended value	Unit
Input LED current	I_F	Standard type: 5 Reinforced type: 5 to 10	mA

■ **For Dimensions, see page 60.**
■ **For Schematic and Wiring Diagrams, see page 65.**
■ **For Cautions for Use, see page 71.**

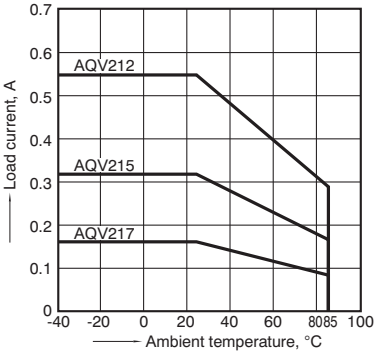
■ **These products are not designed for automotive use.**
If you are considering to use these products for automotive applications, please contact your local Panasonic technical representative.
For more information, see page 80.

REFERENCE DATA

1-(1). Load current vs. ambient temperature characteristics

Allowable ambient temperature: –40°C to +85°C
–40°F to +185°F

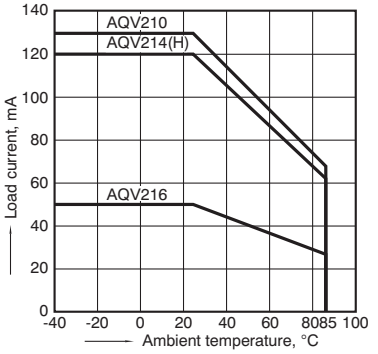
Type of connection: A



1-(2). Load current vs. ambient temperature characteristics

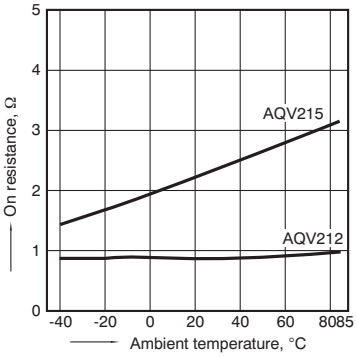
Allowable ambient temperature: –40°C to +85°C
–40°F to +185°F

Type of connection: A



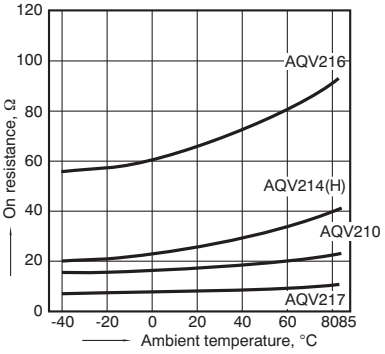
2-(1). On resistance vs. ambient temperature characteristics

Measured portion: between terminals 4 and 6;
LED current: 5 mA; Load voltage: Max. (DC)
Continuous load current: Max. (DC)



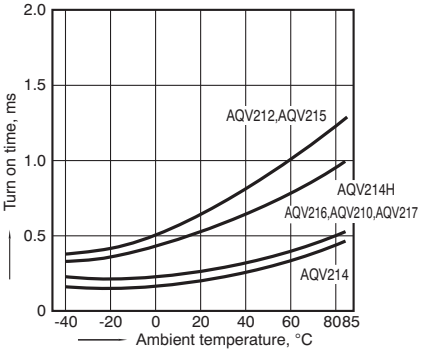
2-(2). On resistance vs. ambient temperature characteristics

Measured portion: between terminals 4 and 6;
LED current: 5 mA; Load voltage: Max. (DC)
Continuous load current: Max. (DC)



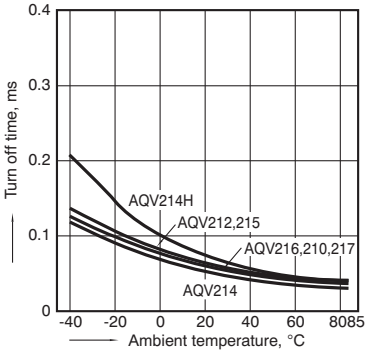
3. Turn on time vs. ambient temperature characteristics

LED current: 5 mA;
Load voltage: Max. (DC);
Continuous load current: Max. (DC)



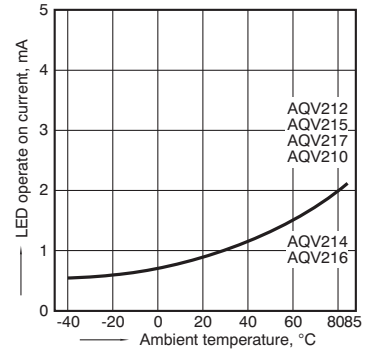
4. Turn off time vs. ambient temperature characteristics

LED current: 5 mA;
Load voltage: Max. (DC);
Continuous load current: Max. (DC)



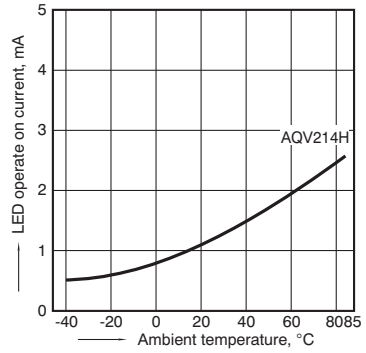
5-(1). LED operate current vs.ambient temperature characteristics

Load voltage: Max. (DC);
Continuous load current: Max. (DC)



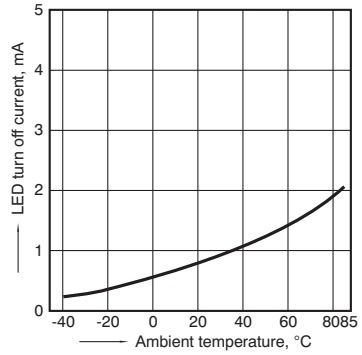
5-(2). LED operate current vs.ambient temperature characteristics

Load voltage: Max. (DC);
Continuous load current: Max. (DC)



6-(1). LED turn off current vs. ambient temperature characteristics

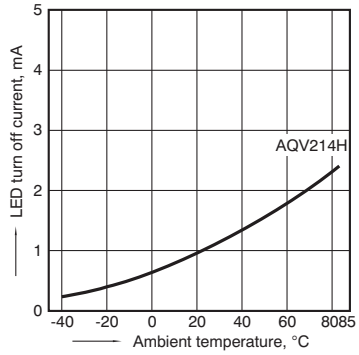
Load voltage: Max. (DC);
Continuous load current: Max. (DC)



GU 1 Form A (AQV21❍, AQV214H)

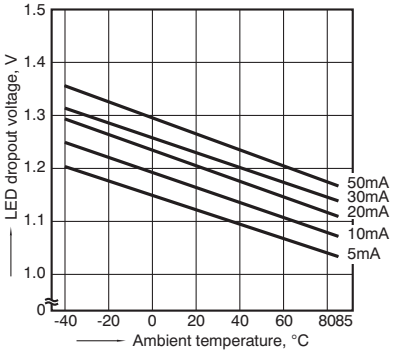
6-(2). LED turn off current vs. ambient temperature characteristics

Load voltage: Max. (DC);
Continuous load current: Max. (DC)



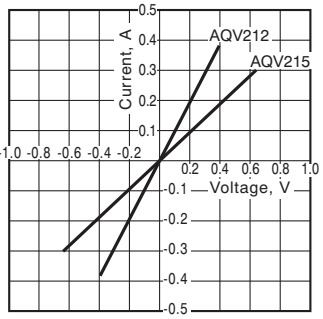
7. LED dropout voltage vs. ambient temperature characteristics

Sample: All types
LED current: 5 to 50 mA



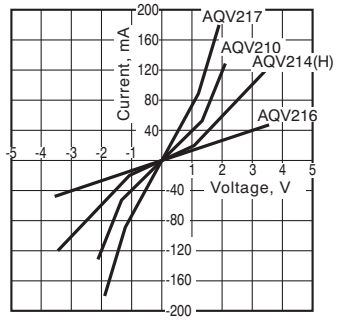
8-(1). Current vs. voltage characteristics of output at MOS portion

Measured portion: between terminals 4 and 6;
Ambient temperature: 25°C 77°F



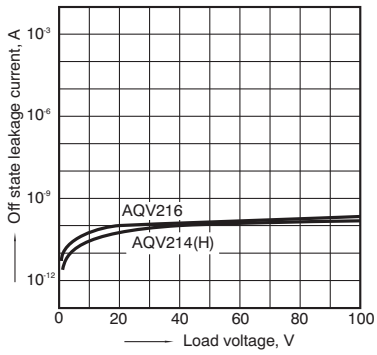
8-(2). Current vs. voltage characteristics of output at MOS portion

Measured portion: between terminals 4 and 6;
Ambient temperature: 25°C 77°F



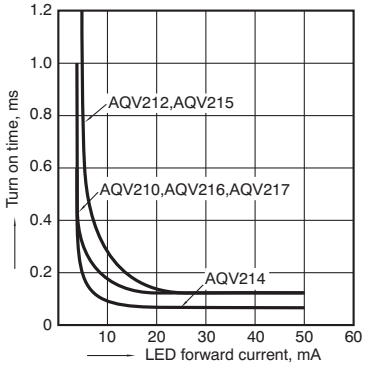
9. Off state leakage current vs. load voltage characteristics

Measured portion: between terminals 4 and 6;
Ambient temperature: 25°C 77°F



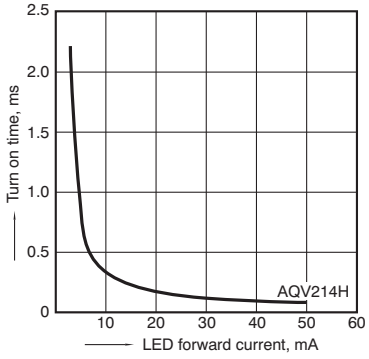
10-(1). Turn on time vs. LED forward current characteristics

Measured portion: between terminals 4 and 6;
Load voltage: Max. (DC); Continuous load current: Max. (DC); Ambient temperature: 25°C 77°F



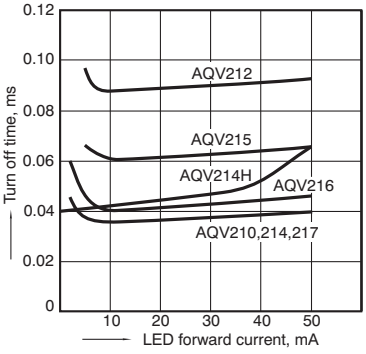
10-(2). Turn on time vs. LED forward current characteristics

Measured portion: between terminals 4 and 6;
Load voltage: 400 V (DC); Continuous load current: 120 mA (DC); Ambient temperature: 25°C 77°F



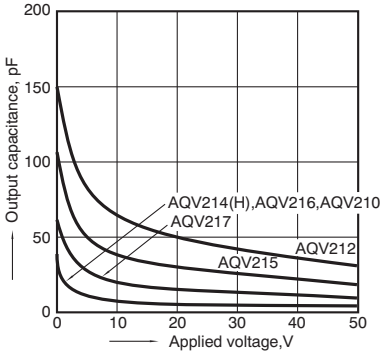
11.Turn off time vs. LED forward current characteristics

Measured portion: between terminals 4 and 6;
Load voltage: Max. (DC); Continuous load current: Max. (DC); Ambient temperature: 25°C 77°F



12.Output capacitance vs. applied voltage characteristics

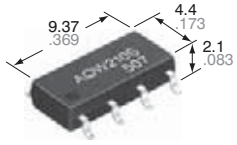
Measured portion: between terminals 4 and 6;
Frequency: 1 MHz; Ambient temperature: 25°C 77°F



Panasonic
ideas for life

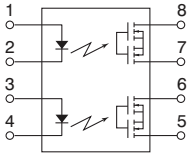
Miniature SOP8-pin type of 60V/350V/400V load voltage

PhotoMOS® GU SOP 2 Form A (AQW21○S)



CAD Data

mm inch



FEATURES

1. 2 channels in miniature SOP8-pin design
The device comes in a super-miniature SO package measuring (W) 4.4 × (L) 9.37 × (H) 2.1 mm (W) .173× (L) .369× (H) .083 inch —approx. 38% of the volume and 66% of the footprint size of DIP8-pin type.

2. Controls low-level analog signals
PhotoMOS relays feature extremely low closed-circuit offset voltage to enable control of low-level analog signals without distortion.

3. Low-level off state leakage current of max. 1 μA

TYPICAL APPLICATIONS

- Measuring instruments
- Data communications
- Computers
- Industrial robots
- High-speed inspection machines.

PhotoMOS

TYPES

	Output rating*		Package	Part No.			Packing quantity	
	Load voltage	Load current		Tube packing style	Tape and reel packing style		Tube	Tape and reel
					Picked from the 1/2/3/4-pin side	Picked from the 5/6/7/8-pin side		
AC/DC dual use	60V	400mA	SOP8-pin	AQW212S	AQW212SX	AQW212SZ	1 tube contains: 50 pcs. 1 batch contains: 1,000 pcs.	1,000 pcs.
	350V	100mA		AQW210S	AQW210SX	AQW210SZ		
	400V	80mA		AQW214S	AQW214SX	AQW214SZ		

* Indicate the peak AC and DC values.
Note: The packing style indicator “X” or “Z” are not marked on the relay.

RATING

1. Absolute maximum ratings (Ambient temperature: 25°C 77°F)

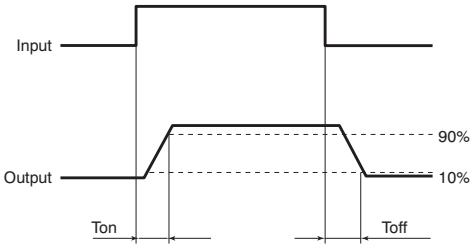
Item		Symbol	AQW212S	AQW210S	AQW214S	Remarks
Input	LED forward current	I_F	50 mA			
	LED reverse voltage	V_R	5 V			
	Peak forward current	I_{FP}	1 A			f = 100 Hz, Duty factor = 0.1%
	Power dissipation	P_{in}	75 mW			
Output	Load voltage (peak AC)	V_L	60 V	350 V	400 V	
	Continuous load current	I_L	0.4 A (0.5 A)	0.1 A (0.13 A)	0.08 A (0.1 A)	Peak AC, DC ( ): in case of using only 1 channel
	Peak load current	I_{peak}	1.5 A	0.3 A	0.24 A	A connection: 100 ms (1 shot), V_L = DC
	Power dissipation	P_{out}	600 mW			
Total power dissipation		P_T	650 mW			
I/O isolation voltage		V_{iso}	1,500 V AC			
Temperature limits	Operating	T_{opr}	–40°C to +85°C –40°F to +185°F			Non-condensing at low temperatures
	Storage	T_{stg}	–40°C to +100°C –40°F to +212°F			

GU SOP 2 Form A (AQW21❍S)

2. Electrical characteristics (Ambient temperature: 25°C 77°F)

Item			Symbol	AQW212S	AQW210S	AQW214S	Remarks
Input	LED operate current	Typical	I_{Fon}	0.9 mA			I_L = Max.
		Maximum		3 mA			
	LED turn off current	Minimum	I_{Foff}	0.4 mA			I_L = Max.
		Typical		0.8 mA			
	LED dropout voltage	Typical	V_F	1.25 V (1.14 V at I_F = 5 mA)			I_F = 50 mA
		Maximum		1.5 V			
Output	On resistance	Typical	R_{on}	0.83 Ω	16 Ω	30 Ω	I_F = 5 mA I_L = Max. Within 1 s on time
		Maximum		2.5 Ω	35 Ω	50 Ω	
	Off state leakage current	Maximum	I_{Leak}	1 μA			I_F = 0 mA V_L = Max.
Transfer characteristics	Turn on time*	Typical	T_{on}	0.65 ms	0.23 ms	0.21 ms	I_F = 5 mA I_L = Max.
		Maximum		2 ms	0.5 ms		
	Turn off time*	Typical	T_{off}	0.08 ms	0.04 ms		I_F = 5 mA I_L = Max.
		Maximum		0.2 ms			
	I/O capacitance	Typical	C_{iso}	0.8 pF			f = 1 MHz V_B = 0 V
		Maximum		1.5 pF			
	Initial I/O isolation resistance	Minimum	R_{iso}	1,000 MΩ			500 V DC

*Turn on/ Turn off time



RECOMMENDED OPERATING CONDITIONS

Please obey the following conditions to ensure proper relay operation and resetting.

Item	Symbol	Recommended value	Unit
Input LED current	I_F	5	mA

■ **For Dimensions, see page 61.**
■ **For Schematic and Wiring Diagrams, see page 65.**
■ **For Cautions for Use, see page 71.**

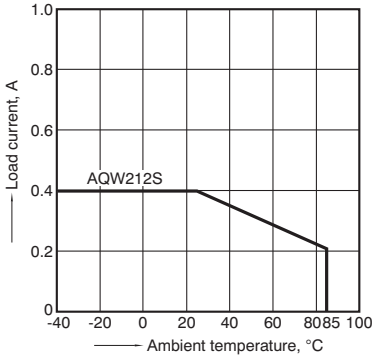
■ **These products are not designed for automotive use.**
If you are considering to use these products for automotive applications, please contact your local Panasonic technical representative.
For more information, see page 80.

REFERENCE DATA

1-(1) Load current vs. ambient temperature characteristics

Allowable ambient temperature: –40°C to +85°C
–40°F to +185°F

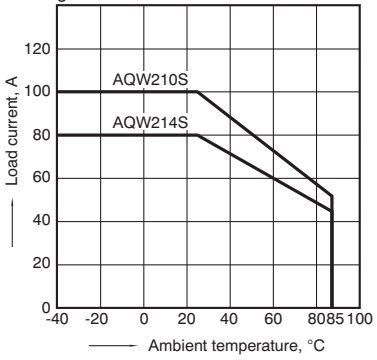
When using 2 channels



1.-(2) Load current vs. ambient temperature characteristics

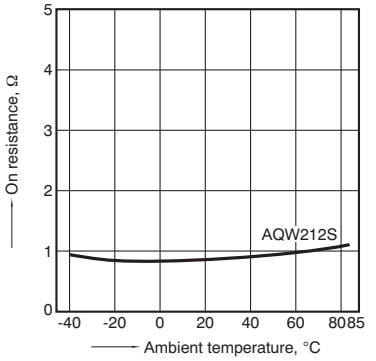
Allowable ambient temperature: –40°C to +85°C
–40°F to +185°F

When using 2 channels



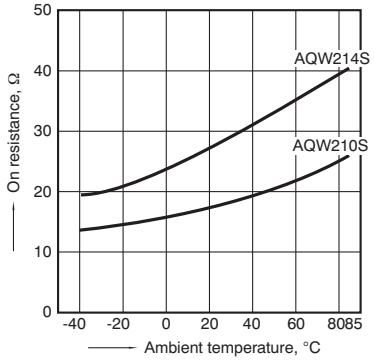
2-(1) On resistance vs. ambient temperature characteristics

Measured portion: between terminals 5 and 6, 7 and 8;
LED current: 5 mA; Load voltage: Max. (DC);
Continuous load current: Max. (DC)



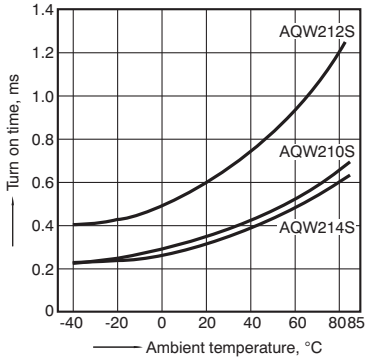
2.-(2) On resistance vs. ambient temperature characteristics

Measured portion: between terminals 5 and 6, 7 and 8;
LED current: 5 mA; Load voltage: Max. (DC);
Continuous load current: Max. (DC)



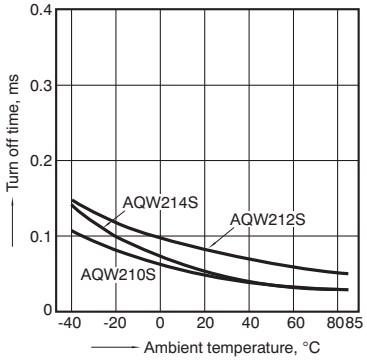
3. Turn on time vs. ambient temperature characteristics

LED current: 5 mA;
Load voltage: Max. (DC);
Continuous load current: Max. (DC)



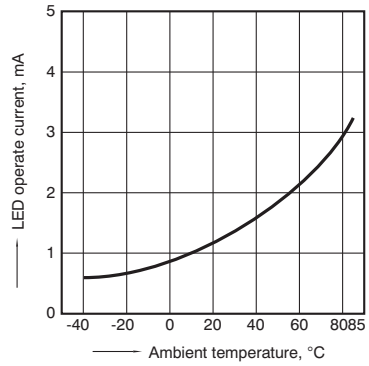
4. Turn off time vs. ambient temperature characteristics

LED current: 5 mA;
Load voltage: Max. (DC);
Continuous load current: Max. (DC)



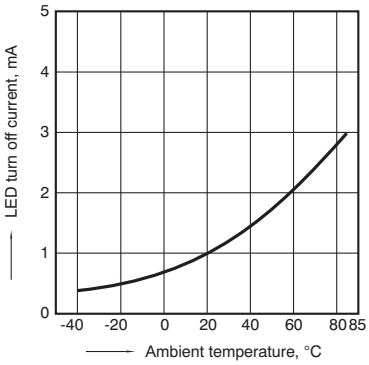
5. LED operate current vs. ambient temperature characteristics

Sample: All types; Load voltage: Max. (DC);
Continuous load current: Max. (DC)



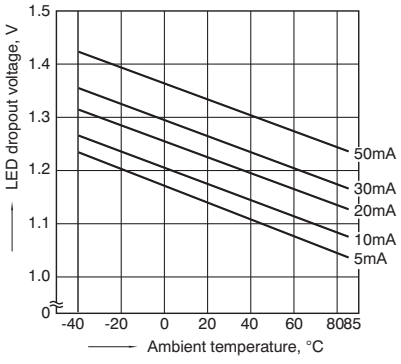
6. LED turn off current vs. ambient temperature characteristics

Sample: All types; Load voltage: Max. (DC);
Continuous load current: Max. (DC)



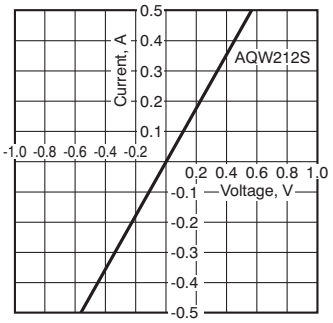
7. LED dropout voltage vs. ambient temperature characteristics

Sample: All types;
LED current: 5 to 50 mA



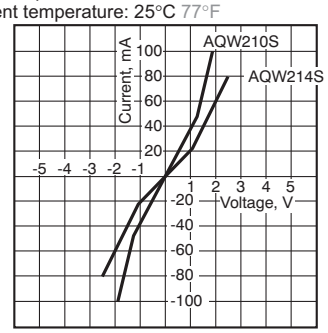
8-(1) Current vs. voltage characteristics of output at MOS portion

Measured portion: between terminals 5 and 6, 7 and 8;
Ambient temperature: 25°C 77°F



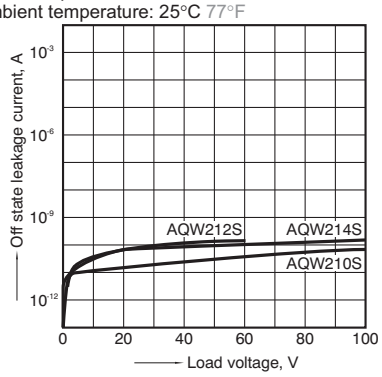
8.-(2) Current vs. voltage characteristics of output at MOS portion

Measured portion: between terminals 5 and 6, 7 and 8;
Ambient temperature: 25°C 77°F



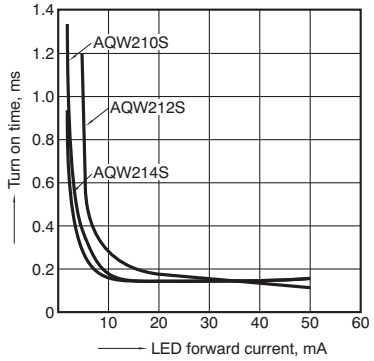
9. Off state leakage current vs. load voltage characteristics

Measured portion: between terminals 5 and 6, 7 and 8;
Ambient temperature: 25°C 77°F



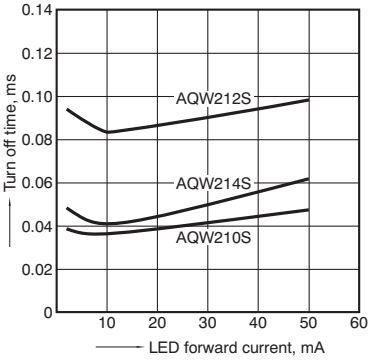
10.Turn on time vs. LED forward current characteristics

Measured portion: between terminals 5 and 6, 7 and 8;
Load voltage: Max. (DC); Continuous load current:
Max. (DC); Ambient temperature: 25°C 77°F



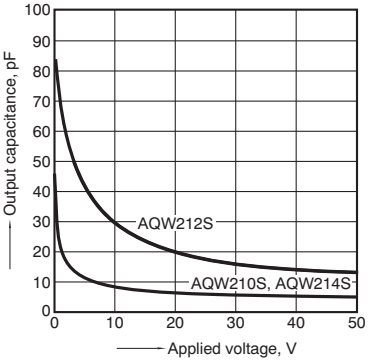
11.Turn off time vs. LED forward current characteristics

Measured portion: between terminals 5 and 6, 7 and 8;
Load voltage: Max. (DC); Continuous load current:
Max. (DC); Ambient temperature: 25°C 77°F



12.Output capacitance vs. applied voltage characteristics

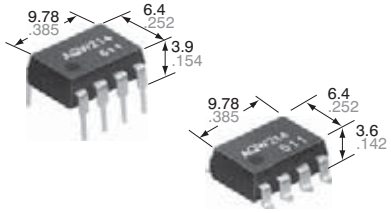
Measured portion: between terminals 5 and 6, 7 and 8;
Frequency: 1 MHz;
Ambient temperature: 25°C 77°F



Panasonic
ideas for life

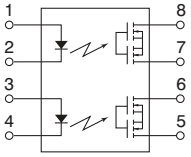
Compact DIP8-pin type of 60V to 600V load voltage

PhotoMOS® GU 2 Form A (AQW21❍)



CAD Data

mm inch



FEATURES

1. Compact 8-pin DIP size
The device comes in a compact (W) 6.4 × (L) 9.78 ×(H) 3.9 mm (W) .252×(L) .385×(H) .154 inch, 8-pin DIP size (through hole terminal type).

2. Applicable for 2 Form A use as well as two independent 1 Form A use

3. Controls low-level analog signals
PhotoMOS relays feature extremely low closed-circuit offset voltage to enable control of low-level analog signals without distortion.

4. High sensitivity and high speed response
Can control max. 0.6 A load current with 5 mA input current. Fast operation speed of typ. 0.65 ms (AQW212).

5. Low-level off state leakage current of max. 1 μA

6. Wide variation of load voltage 60V to 600V

TYPICAL APPLICATIONS

- High-speed inspection machines
- Telephones equipment
- Computer

TYPES

	Output rating*		Package	Part No.				Packing quantity	
				Through hole terminal	Surface-mount terminal				
	Load voltage	Load current		Tube packing style		Tape and reel packing style		Tube	Tape and reel
						Picked from the 1/2/3/4-pin side	Picked from the 5/6/7/8-pin side		
AC/DC dual use	60V	500 mA	DIP8-pin	AQW212	AQW212A	AQW212AX	AQW212AZ	1 tube contains: 50 pcs. 1 batch contains: 500 pcs.	1,000 pcs.
	100 V	300 mA		AQW215	AQW215A	AQW215AX	AQW215AZ		
	200 V	160 mA		AQW217	AQW217A	AQW217AX	AQW217AZ		
	350 V	120 mA		AQW210	AQW210A	AQW210AX	AQW210AZ		
	400 V	100 mA		AQW214	AQW214A	AQW214AX	AQW214AZ		
	600 V	40 mA		AQW216	AQW216A	AQW216AX	AQW216AZ		

*Indicate the peak AC and DC values.
Note: The surface mount terminal shape indicator “A” and the packing style indicator “X” or “Z” are not marked on the relay.

RATING

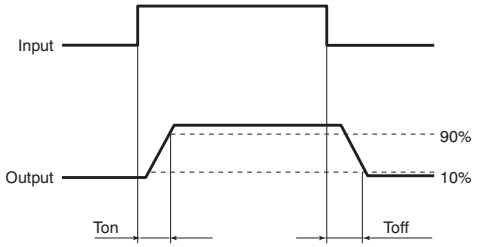
1. Absolute maximum ratings (Ambient temperature: 25°C 77°F)

Item		Symbol	AQW212(A)	AQW215(A)	AQW217(A)	AQW210(A)	AQW214(A)	AQW216(A)	Remarks
Input	LED forward current	I_F	50 mA						
	LED reverse voltage	V_R	5 V						
	Peak forward current	I_{FP}	1 A						f = 100 Hz, Duty factor = 0.1%
	Power dissipation	P_{in}	75 mW						
Output	Load voltage (peak AC)	V_L	60 V	100 V	200 V	350 V	400 V	600 V	
	Continuous load current	I_L	0.50 A (0.60A)	0.30 A (0.35 A)	0.16 A (0.2 A)	0.12 A (0.14 A)	0.10 A (0.13 A)	0.04 A (0.05 A)	Peak AC, DC ( ): in case of using only 1 channel
	Peak load current	I_{peak}	1.0 A	0.9 A	0.48 A	0.36 A	0.3 A	0.12 A	A connection: 100 ms (1 shot), V_L = DC
	Power dissipation	P_{out}	800 mW						
Total power dissipation		P_T	850 mW						
I/O isolation voltage		V_{iso}	1,500 V AC						Between input and output/between contact sets
Temperature limits	Operating	T_{opr}	–40°C to +85°C –40°F to +185°F						Non-condensing at low temperatures
	Storage	T_{stg}	–40°C to +100°C –40°F to +212°F						

2. Electrical characteristics (Ambient temperature: 25°C 77°F)

Item			Symbol	AQW212(A)	AQW215(A)	AQW217(A)	AQW210(A)	AQW214(A)	AQW216(A)	Condition
Input	LED operate current	Typical	I_{Fon}	0.9 mA						I_L = Max.
		Maximum		3 mA						
	LED turn off current	Minimum	I_{Foff}	0.4 mA						I_L = Max.
		Typical		0.8 mA						
	LED dropout voltage	Typical	V_F	1.25 V (1.14 V at I_F = 5 mA)						I_F = 50 mA
		Maximum		1.5 V						
Output	On resistance	Typical	R_{on}	0.83 Ω	2.3 Ω	11 Ω	23 Ω	30 Ω	70 Ω	I_F = 5 mA I_L = Max. Within 1 son time
		Maximum		2.5 Ω	4.0 Ω	15 Ω	35 Ω	50 Ω	120 Ω	
	Off state leakage current	Maximum	I_{Leak}	1 μA						I_F = 0 mA V_L = Max.
Transfer characteristics	Turn on time*	Typical	T_{on}	0.65 ms	0.60 ms	0.25 ms	0.25 ms	0.31 ms	0.28 ms	I_F = 5 mA I_L = Max.
		Maximum		2 ms	2 ms	1.0 ms	0.5 ms	0.5 ms	0.5 ms	
	Turn off time*	Typical	T_{off}	0.08 ms	0.06 ms	0.05 ms	0.05 ms	0.05 ms	0.04 ms	I_F = 5 mA I_L = Max.
		Maximum		0.2 ms						
	I/O capacitance	Typical	C_{iso}	0.8 pF						f = 1 MHz V_B = 0 V
		Maximum		1.5 pF						
	Initial I/C isolation resistance	Minimum	R_{iso}	1,000 MΩ						500 V DC

*Turn on/Turn off time



RECOMMENDED OPERATING CONDITIONS

Please obey the following conditions to ensure proper relay operation and resetting.

Item	Symbol	Recommended value	Unit
Input LED current	I_F	5	mA

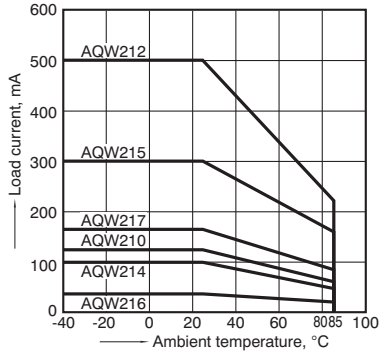
■ **For Dimensions, see Page 61.**
■ **For Schematic and Wiring Diagrams, see Page 65.**
■ **For Cautions for Use, see Page 71.**

■ **These products are not designed for automotive use.**
If you are considering to use these products for automotive applications, please contact your local Panasonic technical representative.
For more information, see page 80.

REFERENCE DATA

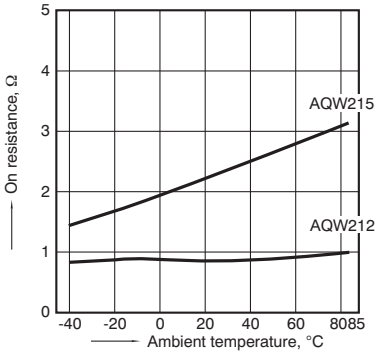
1. Load current vs. ambient temperature characteristics

Allowable ambient temperature: –40°C to +85°C
–40°F to +185°F



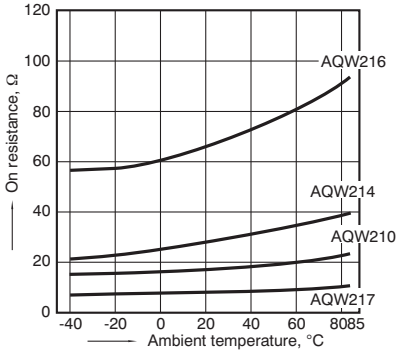
2-(1) On resistance vs. ambient temperature characteristics

Measured portion: between terminals 5 and 6, 7 and 8;
LED current: 5 mA; Load voltage: Max. (DC);
Continuous load current: Max. (DC)



2.-(2) On resistance vs. ambient temperature characteristics

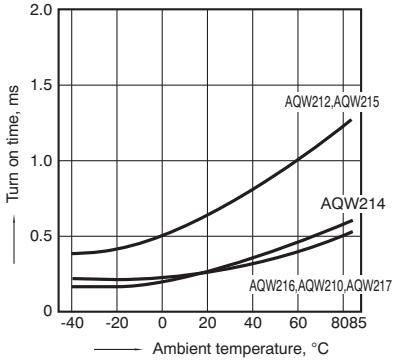
Measured portion: between terminals 5 and 6, 7 and 8;
LED current: 5 mA; Load voltage: Max. (DC);
Continuous load current: Max. (DC)



GU 2 Form A (AQW21❍)

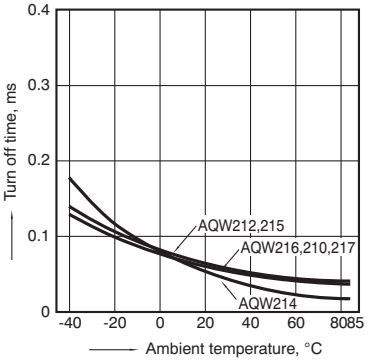
3. Turn on time vs. ambient temperature characteristics

LED current: 5 mA; Load voltage: Max. (DC);
Continuous load current: Max. (DC)



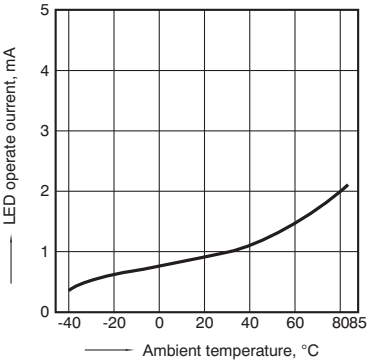
4. Turn off time vs. ambient temperature characteristics

LED current: 5 mA; Load voltage: Max. (DC);
Continuous load current: Max. (DC)



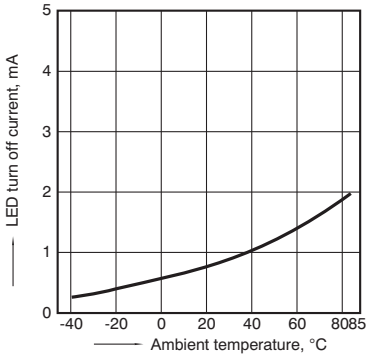
5. LED operate current vs. ambient temperature characteristics

Sample: All types; Load voltage: Max. (DC);
Continuous load current: Max. (DC)



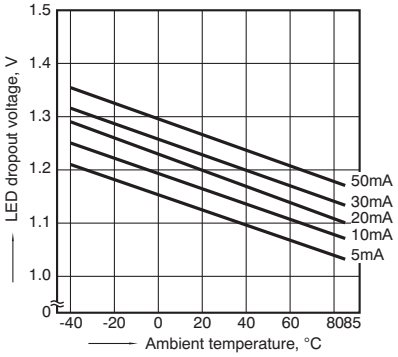
6. LED turn off current vs. ambient temperature characteristics

Sample: All types; Load voltage: Max. (DC);
Continuous load current: Max. (DC)



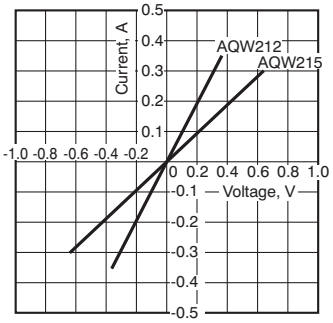
7. LED dropout voltage vs. ambient temperature characteristics

Sample: All types;
LED current: 5 to 50 mA



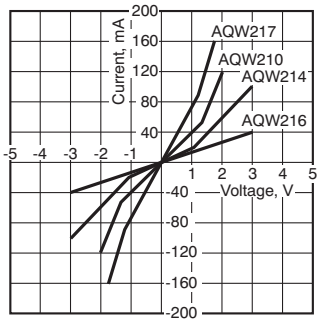
8-(1) Current vs. voltage characteristics of output at MOS portion

Measured portion: between terminals 5 and 6, 7 and 8;
Ambient temperature: 25°C 77°F



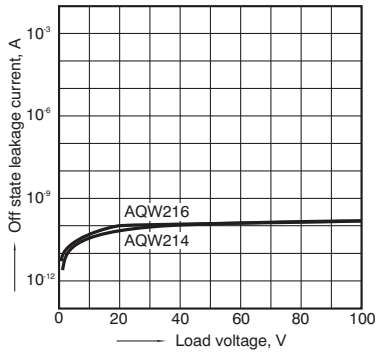
8.-(2) Current vs. voltage characteristics of output at MOS portion

Measured portion: between terminals 5 and 6, 7 and 8;
Ambient temperature: 25°C 77°F



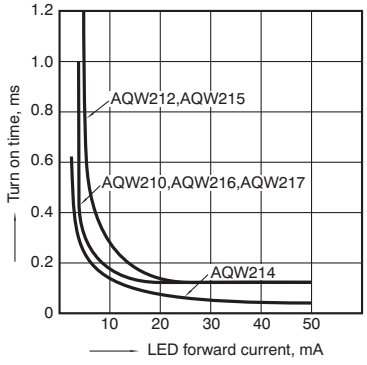
9. Off state leakage current vs. load voltage characteristics

Measured portion: between terminals 5 and 6, 7 and 8;
Ambient temperature: 25°C 77°F



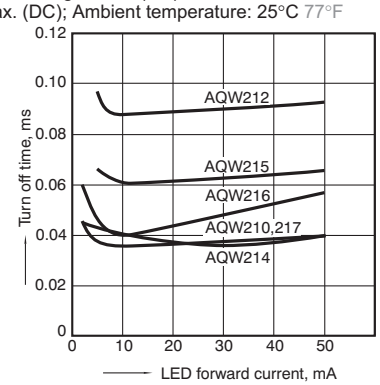
10.Turn on time vs. LED forward current characteristics

Measured portion: between terminals 5 and 6, 7 and 8;
Load voltage: Max. (DC); Continuous load current:
Max. (DC); Ambient temperature: 25°C 77°F



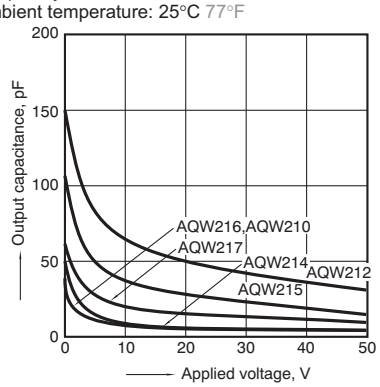
11.Turn off time vs. LED forward current characteristics

Measured portion: between terminals 5 and 6, 7 and 8;
Load voltage: Max. (DC); Continuous load current:
Max. (DC); Ambient temperature: 25°C 77°F



12.Output capacitance vs. applied voltage characteristics

Measured portion: between terminals 5 and 6, 7 and 8;
Frequency: 1 MHz;
Ambient temperature: 25°C 77°F



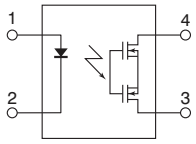
Panasonic
ideas for life

Normally closed SOP4-pin type of 60V/350V/400V load voltage

PhotoMOS® GU SOP 1 Form B (AQY41○S)

CAD Data

mm inch

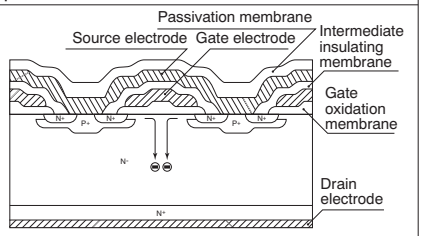


FEATURES

1. Small SOP4-pin package
The device comes in a super-miniature SO package 4-pin type measuring (W) 4.3×(L) 4.4×(H) 2.1 mm (W) .169×(L) .173×(H) .083 inch

2. Low on-resistance
The AQ○4 series (normally closed type) has a low on-resistance.
This has been achieved thanks to the built-in MOSFET processed by our proprietary method, DSD (Double-diffused and Selective Doping) method.

Cross section of the normally-closed type of power MOS



3. Controls low-level analog signals
PhotoMOS relays feature extremely low closed-circuit offset voltage to enable control of low-level analog signals without distortion.

4. Low-level off-state leakage current of max. 1 μA

PhotoMOS

TYPICAL APPLICATIONS

- Power supply
- Measuring instruments
- Security equipment
- Telephone equipment
- Sensing equipment

TYPES

	Output rating*		Package	Part No.			Packing quantity	
	Load voltage	Load current		Tube packing style	Tape and reel packing style		Tube	Tape and reel
					Picked from the 1/2-pin side	Picked from the 3/4-pin side		
AC/DC dual use	60V	500mA	SOP4-pin	AQY412S	AQY412SX	AQY412SZ	1 tube contains: 100 pcs. 1 batch contains: 2,000 pcs.	1,000 pcs.
	350V	120mA		AQY410S	AQY410SX	AQY410SZ		
	400V	100mA		AQY414S	AQY414SX	AQY414SZ		

* Indicate the peak AC and DC values.
Note: For space reasons, the three initial letters of the part number "AQY", the surface mount terminal shape indicator "S" and the packing style indicator "X" or "Z" are not marked on the relay. (Ex. the label for product number AQY412SX is 412)

RATING

1. Absolute maximum ratings (Ambient temperature: 25°C 77°F)

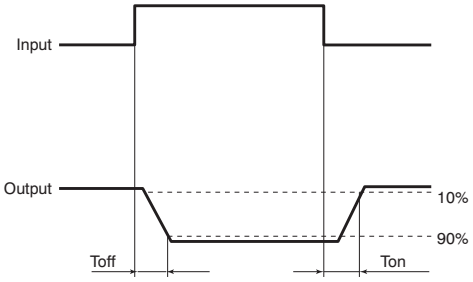
Item		Symbol	AQY412S	AQY410S	AQY414S	Remarks
Input	LED forward current	I_F	50 mA			
	LED reverse voltage	V_R	5 V			
	Peak forward current	I_{FP}	1 A			f = 100 Hz, Duty factor = 0.1%
	Power dissipation	P_{in}	75 mW			
Output	Load voltage (peak AC)	V_L	60 V	350 V	400 V	
	Continuous load current	I_L	0.5 A	0.12 A	0.1 A	Peak AC, DC
	Peak load current	I_{peak}	1.5 A	0.3 A	0.24 A	100ms (1 shot), V_L = DC
	Power dissipation	P_{out}	300 mW			
Total power dissipation		P_T	350 mW			
I/O isolation voltage		V_{iso}	1,500 V AC			
Temperture limits	Operating	T_{opr}	–40°C to +85°C –40°F to +185°F			Non-condensing at low temperatures
	Storage	T_{stg}	–40°C to +100°C –40°F to +212°F			

GU SOP 1 Form B (AQY41❍S)

2. Electrical characteristics (Ambient temperature: 25°C 77°F)

Item			Symbol	AQY412S	AQY410S	AQY414S	Remarks
Input	LED operate (OFF) current	Typical	I_{Foff}	0.9 mA			I_L = Max.
		Maximum		3 mA			
	LED reverse (ON) current	Minimum	I_{Fon}	0.4 mA			I_L = Max.
		Typical		0.85 mA			
	LED dropout voltage	Typical	V_F	1.25 V (1.14 V at I_F = 5 mA)			I_F = 50 mA
		Maximum		1.5 V			
Output	On resistance	Typical	R_{on}	1 Ω	18 Ω	26 Ω	I_F = 0 mA I_L = Max. Within 1 s on time
		Maximum		2.5 Ω	25 Ω	35 Ω	
	Off state leakage current	Maximum	I_{Leak}	1 μA			I_F = 5 mA V_L = Max.
Transfer characteristics	Operate (OFF) time*	Typical	T_{off}	0.9 ms	0.52 ms	0.47 ms	I_F = 0 mA → 5 mA I_L = Max.
		Maximum		3 ms	1 ms		
	Reverse (ON) time*	Typical	T_{on}	0.21 ms	0.23 ms	0.28 ms	I_F = 5 mA → 0 mA I_L = Max.
		Maximum		1 ms	1 ms		
	I/O capacitance	Typical	C_{iso}	0.8 pF			f = 1 MHz V_B = 0 V
		Maximum		1.5 pF			
	Initial I/O isolation resistance	Minimum	R_{iso}	1,000 MΩ			500 V DC

*Operate/Reverse time



RECOMMENDED OPERATING CONDITIONS

Please obey the following conditions to ensure proper relay operation and resetting.

Item	Symbol	Recommended value	Unit
Input LED current	I_F	5	mA

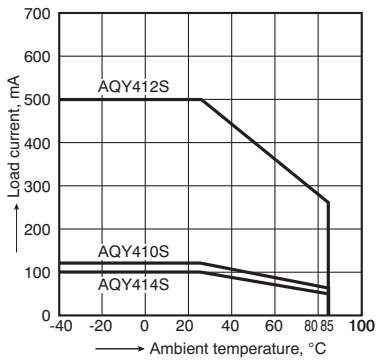
■ **For Dimensions, see page 62.**
■ **For Schematic and Wiring Diagrams, see page 66.**
■ **For Cautions for Use, see page 71.**

■ **These products are not designed for automotive use.**
If you are considering to use these products for automotive applications, please contact your local Panasonic technical representative.
For more information, see page 80.

REFERENCE DATA

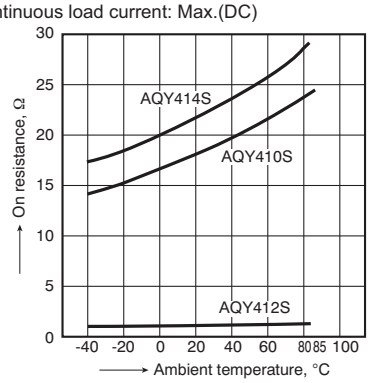
1. Load current vs. ambient temperature characteristics

Allowable ambient temperature:
–40°C to +85°C
–40°F to +185°F



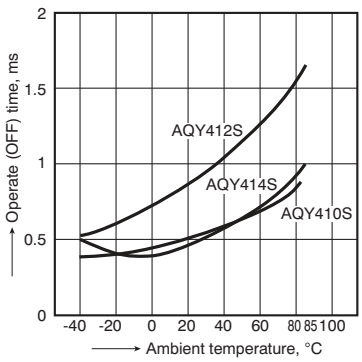
2. On resistance vs. ambient temperature characteristics

Measured portion: between terminals 3 and 4;
LED current: 0 mA;
Continuous load current: Max.(DC)



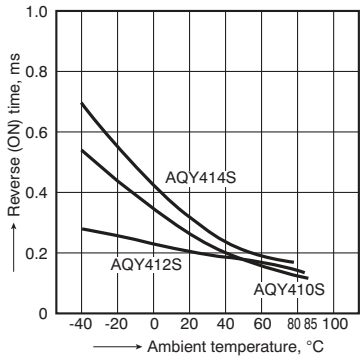
3. Operate (OFF) time vs. ambient temperature characteristics

LED current: 5 mA; Load voltage: Max.(DC);
Continuous load current: Max.(DC)



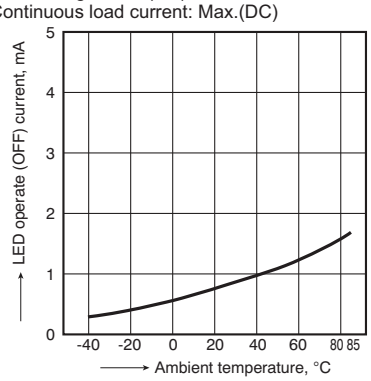
4. Reverse (ON) time vs. ambient temperature characteristics

LED current: 5 mA; Load voltage: Max.(DC);
Continuous load current: Max.(DC)



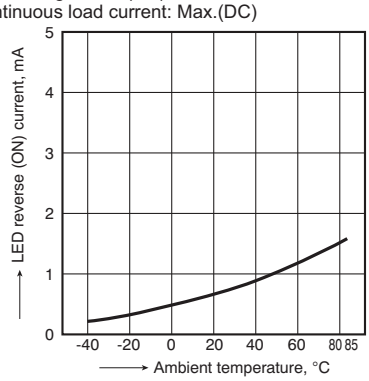
5. LED operate (OFF) current vs. ambient temperature characteristics

Sample: All types;
Load voltage: Max.(DC);
Continuous load current: Max.(DC)



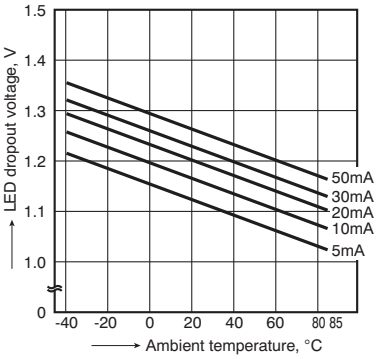
6. LED reverse (ON) current vs. ambient temperature characteristics

Sample: All types;
Load voltage: Max.(DC);
Continuous load current: Max.(DC)



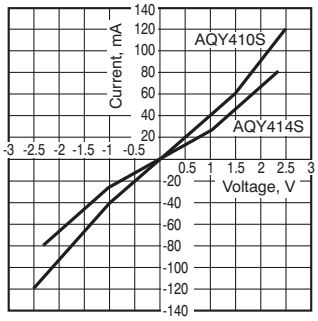
7. LED dropout voltage vs. ambient temperature characteristics

Sample: All types;
LED current: 5 to 50 mA



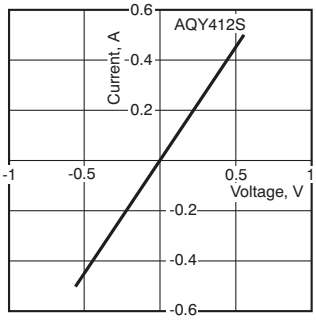
8-(1). Current vs. voltage characteristics of output at MOS portion

Measured portion: between terminals 3 and 4;
Ambient temperature: 25°C 77°F



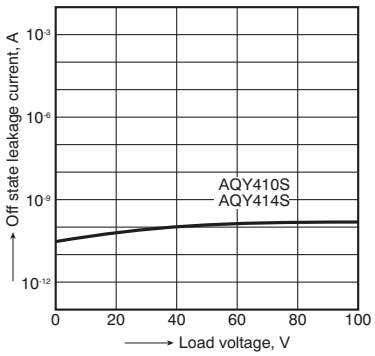
8-(2). Current vs. voltage characteristics of output at MOS portion

Measured portion: between terminals 3 and 4;
Ambient temperature: 25°C 77°F



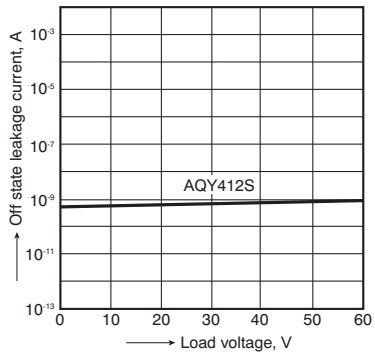
9-(1). Off state leakage current vs. load voltage characteristics

Measured portion: between terminals 3 and 4;
LED current: 5 mA; Ambient temperature: 25°C 77°F



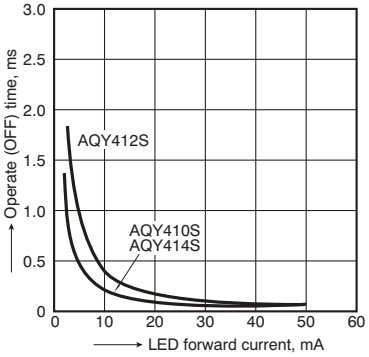
9-(2). Off state leakage current vs. load voltage characteristics

Measured portion: between terminals 3 and 4;
LED current: 5 mA; Ambient temperature: 25°C 77°F



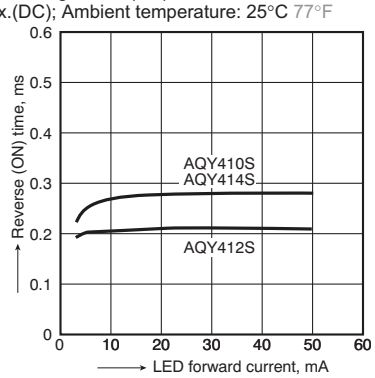
10. Operate (OFF) time vs. LED forward current characteristics

Measured portion: between terminals 3 and 4;
Load voltage: Max.(DC); Continuous load current: Max.(DC); Ambient temperature: 25°C 77°F



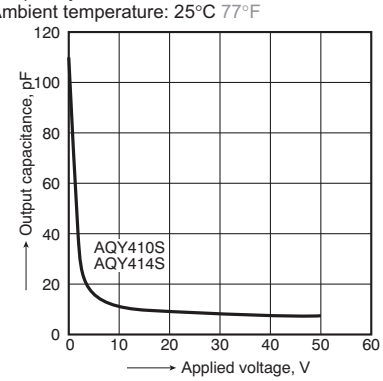
11. Reverse (ON) time vs. LED forward current characteristics

Measured portion: between terminals 3 and 4;
Load voltage: Max.(DC); Continuous load current: Max.(DC); Ambient temperature: 25°C 77°F



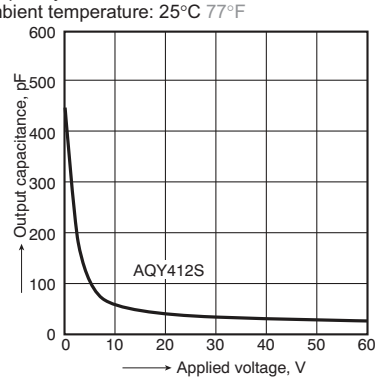
12-(1). Output capacitance vs. applied voltage characteristics

Measured portion: between terminals 3 and 4;
Frequency: 1 MHz;
Ambient temperature: 25°C 77°F



12-(2). Output capacitance vs. applied voltage characteristics

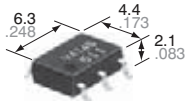
Measured portion: between terminals 3 and 4;
Frequency: 1 MHz;
Ambient temperature: 25°C 77°F



Panasonic
ideas for life

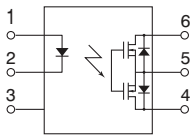
Normally closed SOP6-pin type of 400V load voltage

PhotoMOS®
GU SOP 1 Form B
(AQV414S)



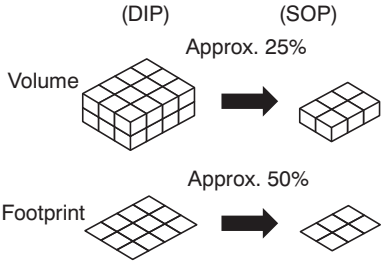
CAD Data

mm inch



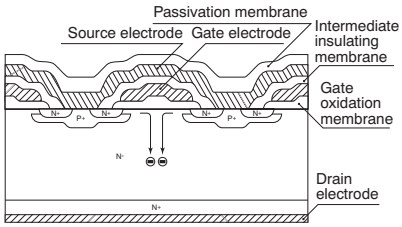
FEATURES

1. Miniature SOP6-pin package
The device comes in a small SOP measuring (W) 4.4 × (L) 6.3 ×(H) 2.1 mm (W) .173× (L) .248×(H) .083 inch approx. 25% of the volume and 50% of the footprint size of DIP type.



2. Low on-resistance (typ. 26 Ω) for normally-closed type
This has been achieved thanks to the built-in MOSFET processed by our proprietary method, DSD (Double-Diffused and Selective Doping) method.

Cross section of the normally-closed type of power MOS



3. Controls low-level analog signals
PhotoMOS relays feature extremely low closed-circuit offset voltage to enable control of low-level analog signals without distortion.

4. Low-level off state leakage current of max. 1 μA

TYPICAL APPLICATIONS

- Telephones
- Measuring instruments
- Computers
- Industrial robots
- High-speed inspection machines

TYPES

	Output rating*		Package	Part No.			Packing quantity	
					Tape and reel packing style			
	Load voltage	Load current		Tube packing style	Picked from the 1/2/3-pin side	Picked from the 4/5/6-pin side	Tube	Tape and reel
AC/DC dual use	400V	100mA	SOP6-pin	AQV414S	AQV414SX	AQV414SZ	1 tube contains: 75 pcs. 1 batch contains: 1,500 pcs.	1,000 pcs.

* Indicate the peak AC and DC values.
Note: For space reasons, only “V41S” is marked on the product. The two initial letters of the part number “AQ” and the packing style indicator “X” or “Z” have been omitted.

RATING

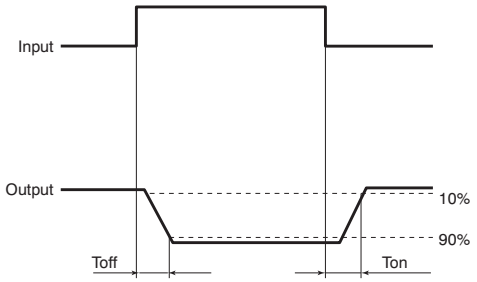
1. Absolute maximum ratings (Ambient temperature: 25°C 77°F)

Item		Symbol	Type of connection	AQV414S	Remarks
Input	LED forward current	I_F		50 mA	
	LED reverse voltage	V_R		5 V	
	Peak forward current	I_{FP}		1 A	f = 100 Hz, Duty factor = 0.1%
	Power dissipation	P_{in}		75 mW	
Output	Load voltage (peak AC)	V_L		400 V	
	Continuous load current	I_L	A	0.10 A	A connection: Peak AC, DC B, C connection: DC
			B	0.11 A	
			C	0.12 A	
	Peak load current	I_{peak}		0.3 A	A connection: 100 ms (1 shot) V_L= DC
	Power dissipation	P_{out}		450 mW	
Total power dissipation		P_T		500 mW	
I/O isolation voltage		V_{iso}		1,500 V AC	
Temperature limits	Operating	T_{opr}		–40°C to +85°C –40°F to +185°F	Non-condensing at low temperatures
	Storage	T_{stg}		–40°C to +100°C –40°F to +212°F	

2. Electrical characteristics (Ambient temperature: 25°C 77°F)

Item			Symbol	Type of connection	AQV414S	Remarks
Input	LED operate (OFF) current	Typical	I_{Foff}	—	0.6 mA	I_L= Max.
		Maximum			3 mA	
	LED reverse (ON) current	Minimum	I_{Fon}	—	0.4 mA	I_L= Max.
		Typical			0.55 mA	
	LED dropout voltage	Typical	V_F	—	1.25 V (1.14 V at I_F = 5 mA)	I_F= 50 mA
		Maximum			1.5 V	
Output	On resistance	Typical	R_{on}	A	26 Ω	I_F= 0 mA I_L= Max. Within 1 s on time
		Maximum			50 Ω	
		Typical	R_{on}	B	20 Ω	I_F = 0 mA I_L = Max. Within 1 s on time
		Maximum			25 Ω	
		Typical	R_{on}	C	10 Ω	I_F = 0 mA I_L = Max. Within 1 s on time
		Maximum			12.5 Ω	
	Off state leakage current	Maximum	I_{Leak}	—	1 μA	I_F = 5 mA, V_L = Max.
Transfer characteristics	Operate (OFF) time*	Typical	T_{off}	—	0.47 ms	I_F= 0 mA → 5 mA V_L = Max.
		Maximum			1.0 ms	
	Reverse (ON) time*	Typical	T_{on}	—	0.28 ms	I_F= 5 mA → 0 mA V_L = Max.
		Maximum			1.0 ms	
	I/O capacitance	Typical	C_{iso}	—	0.8 pF	f = 1 MHz V_B = 0 V
		Maximum			1.5 pF	
	Initial I/C isolation resistance	Minimum	R_{iso}	—	1,000 MΩ	500 V DC

*Operate/Reverse time



RECOMMENDED OPERATING CONDITIONS

Please obey the following conditions to ensure proper relay operation and resetting.

Item	Symbol	Recommended value	Unit
Input LED current	I_F	5	mA

■ **For Dimensions, see page 62.**
■ **For Schematic and Wiring Diagrams, see page 66.**
■ **For Cautions for Use, see page 71.**

■ **These products are not designed for automotive use.**
If you are considering to use these products for automotive applications, please contact your local Panasonic technical representative.
For more information, see page 80.