



Innovating Reliable Power

TDK-Lambda

EMISSIONS EN61000-6-3:2007, EN60601-1-2:2001		
Radiated Electric Field	EN55011, EN55022	(as per CISPR.11/22) Class B, FCC47 part 15 subpart B see application note for details
Conducted Emissions	EN55011, EN55022	(as per CISPR.11/22) Class B, FCC47 part 15 subpart B
Conducted Harmonics	EN61000-3-2	Class A Class C - (at 100W and above)
Flicker	EN61000-3-3	Compliant - d _{max} only

SAFETY APPROVALS					
	Edition / Date	Amendments		Edition / Date	Amendments
EN 60950-1	Edition 2 - 2006		IEC 60950-1*	Edition 2 - 2005	
UL 60950-1	Edition 2 - 2007		CSA 22.2 No 60950-1	Edition 2 - 2007	
EN 61010-1	Edition 2 - 2001		IEC 61010-1*	Edition 2 - 2001	
EN60601-1	Edition 2 - 1990	A1, A2, A13	IEC60601-1*	Edition 2 - 1988	A1, A2
CE Mark	LV Directive 2006/95/EC (EN60950-1)		UL/CSA 60601-1	Edition 2 - 2003	With Revisions 2006
* CB certificate and Report available on request			Check with factory for status of approvals		

OUTLINE & CONNECTION DRAWINGS

EFE300M (not -V version)

J1 CONNECTION

PIN	CONNECTION
1	EARTH
2	NOT CONNECTED
3	LIVE
4	NOT CONNECTED
5	NEUTRAL

J2 CONNECTION

PIN	CONNECTION	PIN	CONNECTION
10	0V STANDBY	1	LV STANDBY
11	POWER GOOD	2	REMOTE ON/OFF
12	0V CH	3	LV CH
13	0V CH	4	LV CH
14	0V CH	5	LV CH
15	0V CH	6	LV CH
16	0V CH	7	LV CH
17	0V CH	8	LV CH
18	+12V FAN (NOTE 1)	9	N/C

MATING PARTS (MOLEX OR EQUIVALENT)

CONNECTOR	HOUSING	CRIMP PIN
J1	39-50-8001	39-52-0113
J2	39-01-2185	44478-3112

NOTE:
 A 4 OFF HOLES (3.5mm CLEARANCE FOR M3 FIXINGS)
 B 8 OFF FIXING HOLES FOR M3. MAXIMUM PENETRATION 4.5mm.
 MAXIMUM TORQUE 0.9Nm.
 ALL TOLERANCES +/-0.5mm.

EFE400M (not -V version)

J1 CONNECTION

PIN	CONNECTION
1	EARTH
2	NOT CONNECTED
3	LIVE
4	NOT CONNECTED
5	NEUTRAL

J2 CONNECTION

PIN	CONNECTION	PIN	CONNECTION
1	+V STANDBY	11	0V STANDBY
2	REMOTE ON/OFF	12	POWER GOOD
3	+V CH 1	13	0V CH 1
4	+V CH 1	14	0V CH 1
5	+V CH 1	15	0V CH 1
6	+V CH 1	16	0V CH 1
7	+V CH 1	17	0V CH 1
8	+V CH 1	18	0V CH 1
9	+V CH 1	19	0V CH 1
10	+V CH 1	20	+12V FAN

MATING PARTS (MOLEX OR EQUIVALENT)

CONNECTOR	HOUSING	CRIMP PIN
J1	39-50-8001	39-52-0113
J2	39-01-2185	44478-3112

NOTE:
 A 5 OFF HOLES (3.5mm CLEARANCE FOR M3 FIXINGS)
 B 9 OFF M3 CUSTOMER FIXINGS, MAXIMUM PENETRATION 4.5MM

Notes 1. All customer fixings M3

2. Maximum Penetration 4.5mm

3. Maximum torque 0.9Nm

4. All tolerances +/-0.5mm



Enclosed Chassis Mount AC-DC Power Supplies

A broad range with output power from 15W to 1560W encompassing basic cost effective solutions, high grade industrial products with lifetime warranty, high efficiency models with low standby input power, fanless baseplate cooled solutions and products with low operating temperature and military standard vibration and shock specifications. Some models have medical approvals. Suitable for many types of equipment including general industrial machinery, factory automation, broadcast, kiosks, vending, displays and medical equipment.

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	LS200 Series 200W Single Output	54
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	HWS HD Series 33 - 1560W Single Output	66
	HWS ME Series 30 - 1500W Single Output	69
	HWS300-600P Series 300-600W Single Output	72
	MTW Series 16 - 62W Triple Output	75
	RTW Series 41 - 312W Single Output	78
	SWS300A & 600 Series 300 & 600W Single Output	81
	SWS600L & 1000L Series 600 - 1056W Single Output	84
	RFE1000 Series 992 - 1008W Single Output	87
	CPFE500F Series 432W - 500W Single Output	89
	CPFE1000F Series 720 - 1000W Single Output	92
	LZSA Series 504 - 1512W Single Output	95



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LS25-150 Series

Single Output General Purpose Power Supplies

- High MTBF up to 900 000 hours
- Superior operating temperature performance up to 70°C
- Very High efficiency up to 87%
- Very Low Cost
- Compact
- Withstands 300VAC surges (5s)
- Three Year Warranty

Key Market Segments & Applications

Test & Measurement
Automated Service
Factory Automation
General Purpose
LED Lighting & Display

LS25-150 Features and Benefits

Features

- High MTBF
- High efficiency
- -25 to +70°C operating temperature
- Low derating above 50 °C (up to 70% load available at 70° C)
- Curve B EMC

Benefits

- Superior Reliability
- Easier system cooling
- Suitable for indoor & outdoor enclosures
- Improved system power optimisation
- Assists system compliance

Specifications

		LS25	LS35	LS50	LS75	LS100	LS150	
AC Input Voltage (300VAC for 5s)	VAC	88 - 264VAC (See note (2) for LS100)					88-132/176-264VAC(1)	
Input Frequency	Hz	47 - 63Hz						
DC Input Voltage	VDC	125 - 373VDC				248 - 273VDC		
Inrush Current (230VAC, cold start)	A	30	40	40	40	60	40	
Power Factor	-	Meets EN61000-3-2, -3						
Input Current (115/230VAC)	A	0.7 / 0.4	0.8 / 0.55	1.3 / 0.8	1.6 / 1.0	2.2 / 1.2	3.5 / 2	
Temperature Coefficient	-	<0.02%/°C (0 - 50°C)						
Overcurrent Protection	-	> 110%						
Overvoltage Protection	V	3.3V: 3.8-4.45V, 5V: 5.75-6.75V, 12V: 13.8-16.2V, 15V: 17.25-20.25V, 24V: 27.6-32.4V, 36V: 41.4-48.6V, 48V: 55.2-64.8V						
Hold Up Time (115 / 230V input)	ms	14 / 80	12 / 80	14 / 60	14 / 60	25 / 150	20 / 28	
Leakage Current (230VAC 60Hz)	mA	TBA		<1mA		<1mA		
Remote Sense	-	No						
LED Indicator	-	Green LED = On						
Operating Temperature	-	-25 to +70°C. Derate linearly to 50% load from +50 to +70°C (2)						
Storage Temperature	°C	-40 to +85°C						
Operating Humidity	-	20 - 90% RH (non condensing)						
Storage Humidity	-	10 - 95% RH (non condensing)						
Cooling	-	Convection						
Withstand Voltage	-	Input to Ground 1.5kVAC, Input to Output 3kVAC, Output to Ground 500VAC for 1 min.						
Isolation Resistance	-	>100MΩ at 25°C & 70%RH, Output to Ground 500VDC						
Vibration (non operating)	-	10 - 55Hz: 19.6m/s ² constant sweep 1 min X, Y, Z for 1 hour						
Shock	-	< 196.1 m/s ² (20G)						
Immunity	-	IEC61000-4-2, -3, -4, -5, -6, -8, -11						
Safety Agency Approvals	-	UL60950-1, EN60950-1, IEC60950-1, CE Mark						
Conducted & Radiated EMI	-	EN55011/EN55022-B, FCC-B						
MTBF (MIL-HDBK-217F)	hrs	906,997	706,464	712,890	648,786	545,375	505,393	
Weight (Typ)	g	170	270	350	410	600	700	
Size (LxWxH)	mm	79 x 51 x 28	99 x 82 x 36	99 x 97 x 36	130 x 97 x 38	160 x 97 x 38	198 x 99 x 38	
Warranty	yrs	3						



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Model Selector							
Model	Voltage	Adjust Range (V)	Max Current (A)	Load Reg (mV)	Line Reg (mV)	Ripple Noise (mV)	Efficiency (typ) %
LS25-3.3	3.3V	3.0 - 3.3	6	66	16.5	80	72
LS25-5	5V	4.75 - 5.5	5	50	25	80	77
LS25-12	12V	10.8 - 13.2	2.1	60	60	120	79
LS25-15	15V	13.5 - 16.5	1.7	75	75	120	82
LS25-24	24V	22 - 27.2	1.1	120	120	120	84
LS25-36	36V	32 - 40	0.75	150	150	150	85
LS25-48	48V	42 - 54	0.57	180	180	200	85
LS35-3.3	3.3V	3.0 - 3.3	7	66	16.5	80	73
LS35-5	5V	4.75 - 5.5	7	50	25	80	77
LS35-12	12V	10.8 - 13.2	3	60	60	120	81
LS35-15	15V	13.5 - 16.5	2.4	75	75	120	83
LS35-24	24V	22 - 27.2	1.5	120	120	120	84
LS35-36	36V	32 - 40	1	150	150	150	84
LS35-48	48V	42 - 54	0.8	180	180	200	84
LS50-3.3	3.3V	3.0 - 3.6	10	40	20	80	75
LS50-5	5V	4.75 - 5.5	10	40	20	80	80
LS50-12	12V	10.8 - 13.2	4.2	96	48	120	84
LS50-15	15V	13.5 - 16.5	3.4	120	60	120	85
LS50-24	24V	22 - 27.2	2.2	192	96	120	86
LS50-36	36V	32 - 40	1.4	288	144	150	86
LS50-48	48V	42 - 54	1.1	384	192	200	86
LS75-3.3	3.3V	3.0 - 3.6	15	40	20	80	75
LS75-5	5V	4.75 - 5.5	12	40	20	80	79
LS75-12	12V	10.8 - 13.2	6	96	48	120	84
LS75-15	15V	13.5 - 16.5	5	120	60	120	85
LS75-24	24V	22 - 27.2	3.2	192	96	120	86
LS75-36	36V	32 - 40	2.1	288	144	150	86
LS75-48	48V	42 - 54	1.6	384	192	200	87
LS100-3.3	3.3V	3.0 - 3.3	20	66	16.5	80	74
LS100-5	5V	4.75 - 5.5	16	50	25	80	77
LS100-12	12V	10.8 - 13.2	8.5	60	60	120	81
LS100-15	15V	13.5 - 16.5	7	75	75	120	82
LS100-24	24V	22 - 27.2	4.5	120	120	120	84
LS100-36	36V	32 - 40	3	150	150	150	84
LS100-48	48V	42 - 54	2.3	180	180	200	84
LS150-3.3	3.3V	3.0 - 3.3	30	66	16.5	80	74
LS150-5	5V	4.75 - 5.5	26	50	25	80	78
LS150-12	12V	10.8 - 13.2	12.5	60	60	120	83
LS150-15	15V	13.5 - 16.5	10	75	75	120	84
LS150-24	24V	22 - 27.2	6.5	120	120	120	86
LS150-36	36V	32 - 40	4.3	150	150	150	86
LS150-48	48V	42 - 54	3.3	180	180	200	87

Notes: See page 1

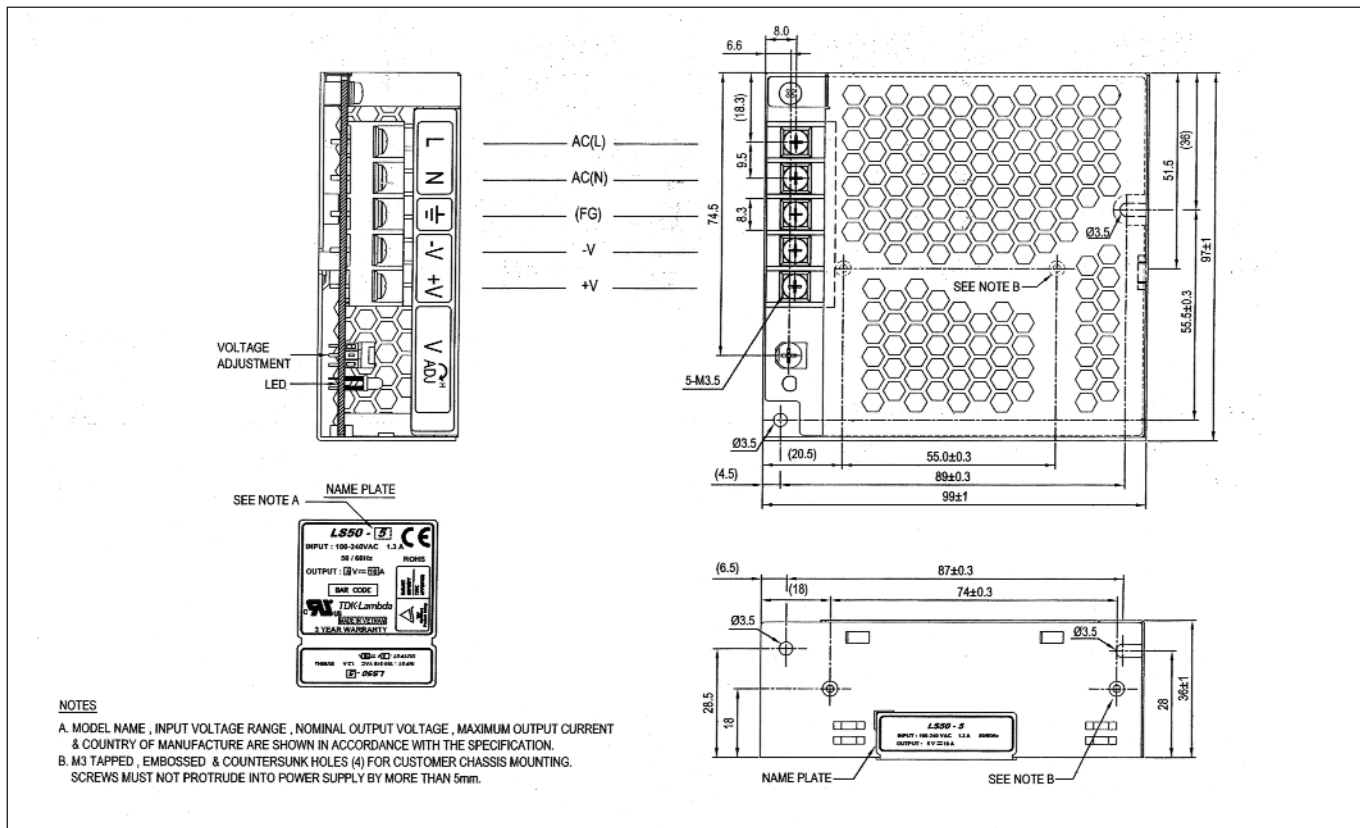
- (1) Switch selectable for 115 or 230VAC
- (2) LS50, LS75-3.3 & -5: Derate linearly to 70% load from +50 to +70°C.
 LS75-12,-15,-24,-36,-48 Derate linearly to 60% load from +50 to +70°C.
 LS100-3.3 & 5 Derate linearly to 60% load from +45 to +70°C. Derate linearly to 80% load from 115V to 88VAC input.
 LS100-12,-15,-24,-36,-48 Derate linearly to 60% load from +50 to +70°C. Derate linearly to 80% load from 115V to 88VAC input.
 LS150-3.3 & 5 Derate linearly to 50% load from +40 to +70°C.
 LS150-12,-15,-24,-36,-48 Derate linearly to 70% load from +50 to +70°C.



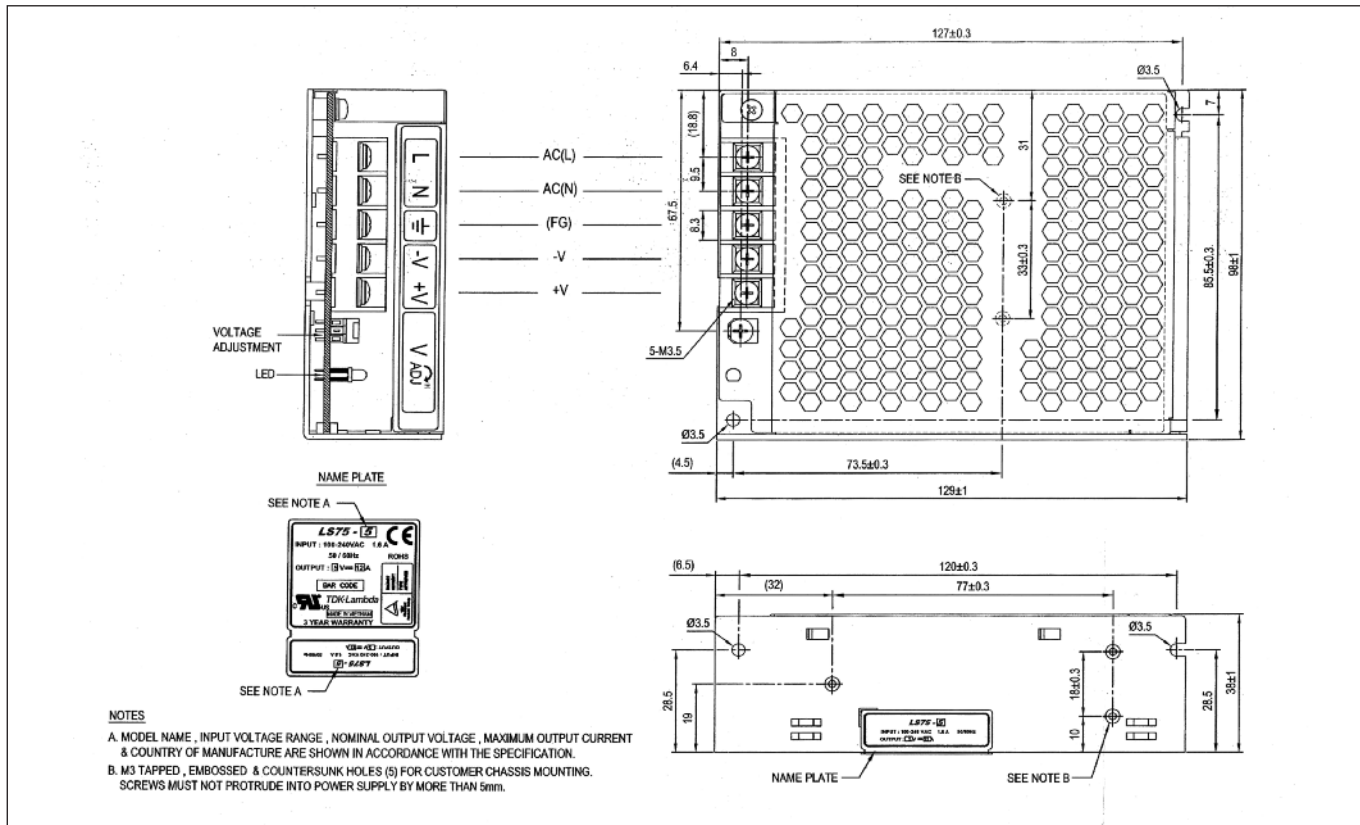
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Outline Drawing LS50



Outline Drawing LS75

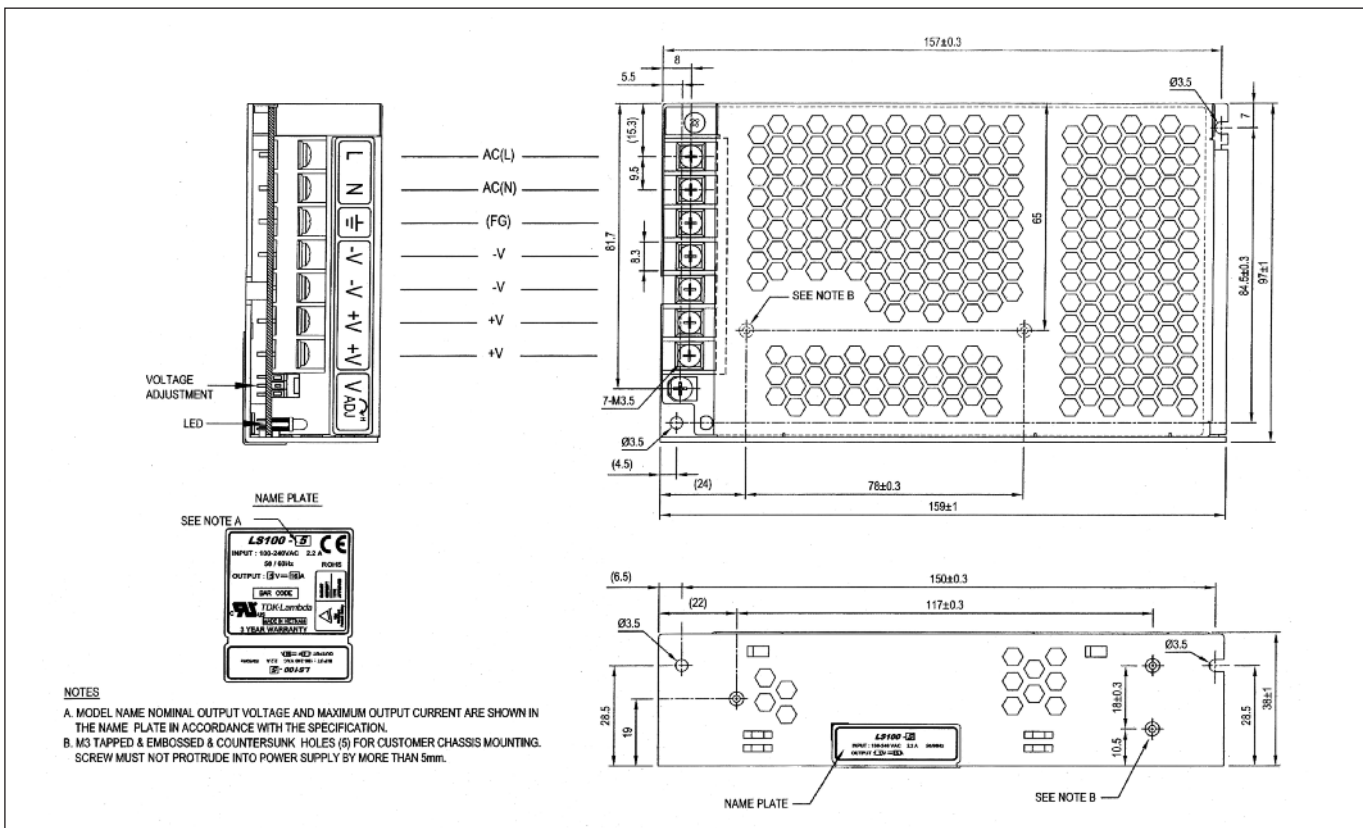




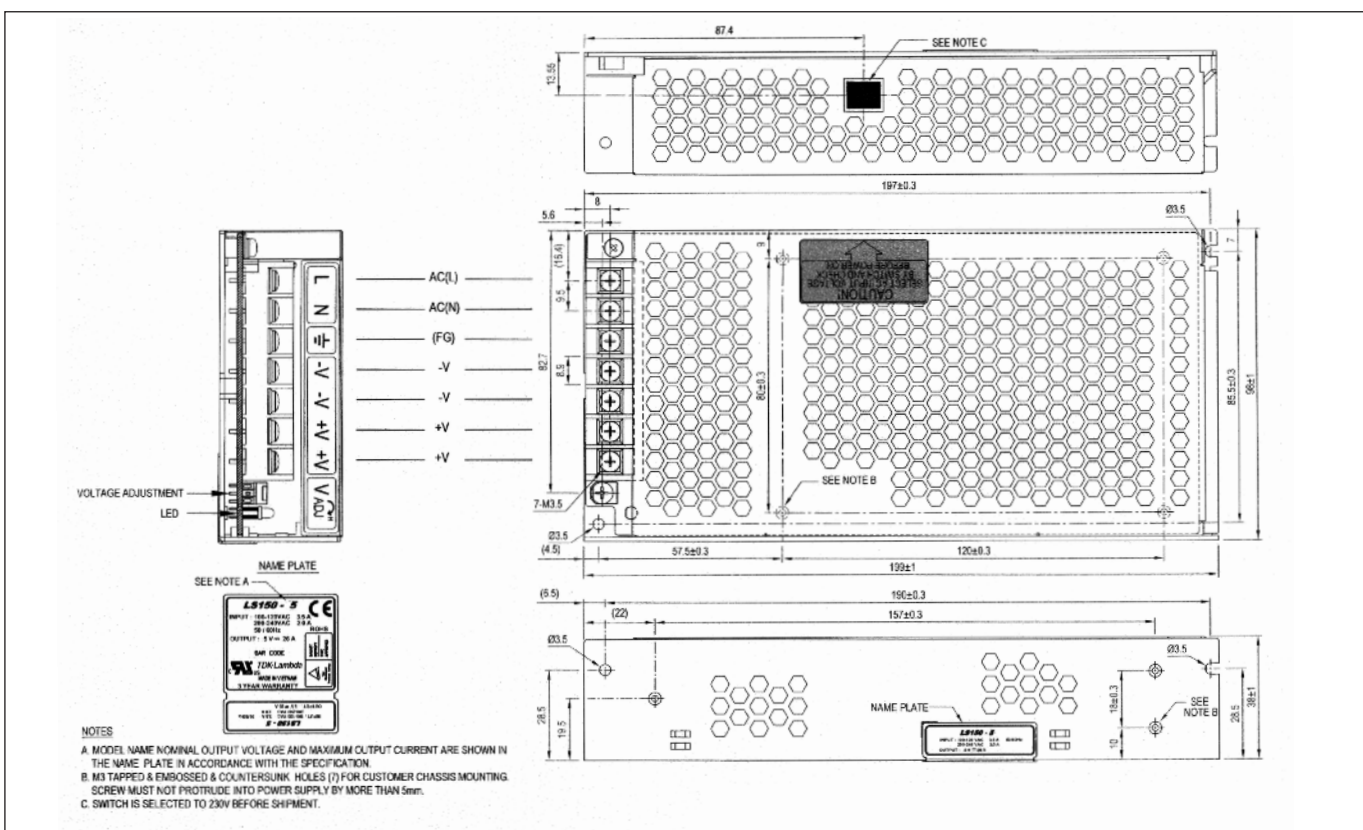
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Outline Drawing LS100



Outline Drawing LS150





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GWS Series

Single Output 250 & 500W Power Supplies

- Standby Power Draw < 0.5 Watt
- Average Active Efficiency above ErP Requirements
- 41 mm height only, allowing 1 U Racking
- 250 Watt Convection cooled
- 500 Watt with Low Fan Noise (exhale)
- 5V / 300mA Aux Supply on board
- Output Remote Programming
- Five Year Warranty

Key Market Segments & Applications

Targets all EuP/ErP compliant applications

Industrial, Traffic Controls, Automated Service, Kiosks

Test & Measurement, Entertainment Systems

Front End for Communications & Broadcasting, LED, Display & Signage

GWS Features and Benefits

Features

- Programmable Output Voltage
- Peak Power Capability
- High Efficiency

Benefits

- Broad Range of Applications
- Lower Cost, Smaller Size
- Easier System Cooling, Less Energy Used, Environmental Profit

Specifications

ITEMS		MODEL	GWS250	GWS500
AC Input Voltage (300VAC for 5s)	VAC		85 - 264VAC	
Input Frequency	Hz		47 - 63Hz	
DC Input Voltage	VDC		120 - 373VDC	
Inrush Current (cold start)	A		20A at 115VAC, 40A at 230VAC	
Power Factor (1)	-		Meets EN61000-3-2 (Typical PF 0.98/0.95)	
Input Current (115/230VAC)	A		3.0 / 1.4	5.5 / 2.7 (4.5 / 2.3 for 5V model)
Temperature Coefficient	°C		<0.02%/°C (0 - 50°C)	
Overcurrent Protection	-		>105% of nominal or >101% of peak. 5V-12V hiccup style, 24V-48V Constant current style	
Overvoltage Protection (2)	V		5V: 5.75 - 6.75V, (3) 7.5V: 8.6 - 10.1V, (3) 12V: 13.8 - 16.2V, 24V: 30.3 - 35.5V, 36V: 41.4 - 48.6V, 48V: 60 - 69.6V	
Overtemperature Protection (2)	-		Yes	
Hold Up Time (115 / 230V input)	ms		16ms	
Leakage Current (230VAC 60Hz)	mA		<0.75mA	
Remote Sense	-		No	Yes
Remote On/Off	-		Active Low	
Standby Input Power Draw	W		<0.5W	
5V Standby (always on)	-		5V 0.3A	
DC Good	-		DC Good, open collector signal, High on Fail	
LED Indicator	-		Green LED = On	
Output Remote Programming	-		See installation manual for details	
Operating Temperature	°C		-25°C to +70°C. Derate linearly to TBD % load from +50°C to +70°C	
Storage Temperature	°C		-30°C to +85°C	
Operating Humidity	-		30 - 90% RH (non condensing)	
Storage Humidity	-		10 - 95% RH (non condensing)	
Cooling	-		Convection	Internal fan
Withstand Voltage	-		Input to Ground 1.5kVAC, Input to Output 3kVAC, Output to Ground 500VAC for 1 min.	
Isolation Resistance	-		>100MΩ at 25°C & 70%RH, Output to Ground 500VDC	
Vibration (non operating)	-		10 - 55Hz: 19.6m/s ² constant sweep 1 min X, Y, Z for 1 hour	
Shock	-		< 196.1 m/s ² (20G)	
Immunity	-		IEC61000-4-2 (lv 2, 3), -3 (lv3), -4 (lv 3), -5 (lv 4), -6 (lv 3), -8 (lv 4), -11	
Safety Agency Approvals	-		UL60950-1, CSA C22.2 No 60950-1-07 (cUL), EN60950-1 2nd Edition, IEC60950-1, CE Mark	
Conducted & Radiated EMI	-		EN55022-B, FCC-B	
Weight (Typ)	g		850	1020
Size (L x W x H)	mm		199 x 105 x 41	219 x 105 x 41
Warranty	yrs		5	

Notes: (1) 115 / 230VAC input (2) Recycle AC, or use remote on/off to reset (3) 500W models

GWS Series

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Model Selector

Model	Voltage (V)	Adjust Range (V)	Max Current (A)	Peak Curr. <10s, <35% DC (A)	Load Reg. (mV)	Line Reg. (mV)	Ripple Noise (mV)	Efficiency (typ) % (230VAC)
GWS500-5	5V	4.75 - 5.5	80	-	50	25	150	85
GWS500-7.5	7.5V	6.75 - 8.25	67.2	-	70	35	150	88
GWS250-12	12V	10.8 - 13.2	21	-	96	48	150	92
GWS500-12	12V	10.8 - 13.2	42	-	96	48	150	90
GWS250-24	24V	22 - 28.8	10.5	12.5	192	96	240	92
GWS500-24	24V	22 - 28.8	21	25.0	192	96	240	91
GWS250-36	36V	32 - 40	7	8.4	288	144	360	93
GWS500-36	36V	32 - 40	14	16.7	288	144	360	91
GWS250-48	48V	42 - 57.6	5.3	-	384	192	480	93
GWS500-48	48V	42 - 57.6	10.5	-	384	192	480	91

Outline Drawing GWS250

SIGNAL CONNECTOR INFORMATION

CN1 PIN ASSIGN

1. DCOK	2. COM	3. SVSB	4. COM	5. CNT+	6. CNT-	7. PV	8. COM
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SIGNAL CONNECTOR USED

PART DESCRIPTION	PART NAME	MANUFACT
PIN HEADER	S88-PHDSS(F)(SN) (CN1)	JST

MATCHING HOUSINGS, PIN & TOOL

PART DESCRIPTION	PART NAME	MANUFACT
SOCKET HOUSING	PHDR-BVS (CN1)	JST
TERMINAL PINS	SPHD-002T-P05(AMC26-24) SPHD-001T-P05(AMC26-22)	JST
HAND CRIMPING TOOL	YRS-620(SPHD-002T-P0.5) YC-610R(SPHD-001T-P0.5)	JST

==ACCESSORIES==

* SHORT PIECE
SHORTING CNT+ → CNT-
(ATTACHED ON CN1 AT SHIPMENT)

NAME PLATE
SEE NOTE A

NOTES:

A. Model name, Input voltage range, Nominal output voltage, Maximum output current & country of manufacture are shown in accordance with the specification.

B. M4 tapped, embossed & countersunk holes (B) for customer chassis mounting. Screws must not protrude into power supply by more than 5mm



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HWS Series

15 -150W Single Output
Industrial Power Supplies

- Lifetime Warranty
- UL508 approved
- SEMI F47 Compliant (high line AC)
- Universal Input (85 - 265VAC)
- High Efficiency
- RoHS Compliant Design

Key Market Segments & Applications

Factory Automation	Process Control, NC-Machining, Automotive, Packaging Equipment, Materials Handling, Chemical Processing, Robots
Test & Measurement Automated Service	Burn-in & Test, Automated Test, Instrumentation, Measurement, Detection

HWS Features and Benefits

Features

- Lifetime Warranty
- High Efficiency
- Wide Range AC Input

Benefits

- Lower Cost of Ownership
- Easier System Cooling
- Supports Global Use

Specifications

ITEMS	MODELS	HWS15					HWS30					HWS50					HWS100					HWS150				
Input Voltage range	-	85 - 265VAC (47 - 63Hz) or 120 - 370VDC																								
Input Current (Typ) (1)	A	0.4/0.2 (3.3V: 0.3 / 0.5)			0.8/0.4 (3.3V: 0.6 / 0.3)			0.7/0.35 (3.3V: 0.5 / 0.25)			1.3/0.65 (3.3V: 0.9 / 0.45)			1.9/0.95 (3.3V: 1.3 / 0.65)												
Inrush Current 100/200VAC	A	14 / 28																								
Power Factor	-	Meets EN61000-3-2																								
Temperature Coefficient	-	<0.02%/°C																								
Overcurrent Protection	-	Yes																								
Overvoltage Protection	V	Yes (See page 2)																								
Hold Up Time (Typ)	ms	20																								
Leakage Current (max)	mA	<0.5 (Typ 0.2 at 100VAC, 0.4 at 230VAC)																								
Remote Sense	-	No										Yes														
Indicator	-	Green LED = ON																								
Operating Temp. (no cover)	°C	-10°C to 70°C, derate linearly to 20% load from 50°C to 70°C																								
Storage Temperature	°C	-30°C to 85°C																								
Humidity (non condensing)	% RH	Operating: 30 - 90, Non operating 10 - 95																								
Cooling	-	Convection																								
Withstand Voltage	-	Input to Ground 2kVAC, Input to Output 3kVAC, Output to Ground 500VAC for 1 min.																								
Isolation Resistance	-	>100MΩ at 25°C & 70%RH, Output to Ground 500VDC																								
Vibration (non operating)	-	10 - 55Hz (1 minute sweep), 19.6m/s ² constant X, Y, Z 1 hour																								
Shock	-	< 196.1m/s ²																								
Safety Agency Approvals	-	-UL60950-1, CSA60950-1, EN60950-1, EN50178, Built to meet UL508 CE Mark																								
Line Dip	-	Complies with SEMI F47 (200VAC line only)																								
Conducted & Radiated	-	EN55011 / EN55022-B, FCC-B, VCCI-B																								
Immunity	-	IEC61000-4-2(Level 2,3), -3(Level 3), -4(Level 3), -5(Level 3,4), -6(Level 3), -8(Level 4), -11																								
Weight (Typ)	g	180			220			280			450			500												
Size (WxHxD)	mm	26.5x82x80			26.5x82x95			26.5x82x120			28x82x160			37x82x160												
Warranty	-	Lifetime Warranty (See TDK-Lambda's terms & conditions)																								

Notes: (1) 100/200VAC

See website for HWS/ME medical EN/UL60601-1 approved models and HWS/HD heavy duty / harsh environment models with -40 °C startup. HWS80 is also available but no specification in this catalogue.

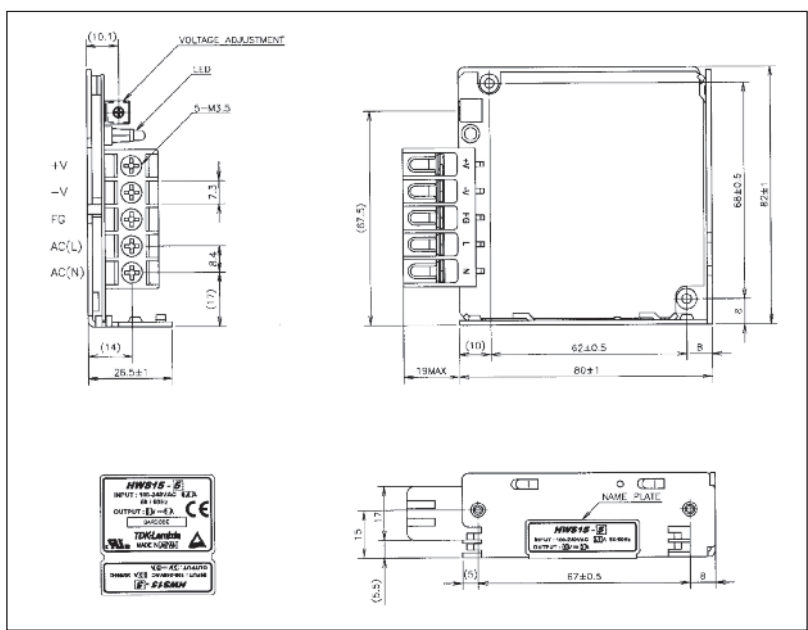


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Model Selector								
Model	Voltage	Adjust Range	Maximum Current (A)	Load Reg (mV)	Line Reg (mV)	Ripple Noise (mV)	Over Voltage (V)	Efficiency typ % 100/200 VAC
HWS15-3/A	3.3V	2.97 - 3.96	3	40	20	120	4.13-4.95	68/71
HWS30-3/A	3.3V	2.97 - 3.96	6	40	20	120	4.13-4.95	70/73
HWS50-3/A	3.3V	2.97 - 3.96	10	40	20	120	4.13-4.95	76/78
HWS100-3/A	3.3V	2.97 - 3.96	20	40	20	120	4.13-4.95	78/81
HWS150-3/A	3.3V	2.97 - 3.96	30	40	20	120	4.13-4.95	78/81
HWS15-5/A	5V	4.0 - 6.0	3	40	20	120	6.25-7.25	77/79
HWS30-5/A	5V	4.0 - 6.0	6	40	20	120	6.25-7.25	77/80
HWS50-5/A	5V	4.0 - 6.0	10	40	20	120	6.25-7.25	82/84
HWS100-5/A	5V	4.0 - 6.0	20	40	20	120	6.25-7.25	83/86
HWS150-5/A	5V	4.0 - 6.0	30	40	20	120	6.25-7.25	83/86
HWS15-12/A	12V	9.6 - 14.4	1.3	96	48	150	15-17.4	80/81
HWS30-12/A	12V	9.6 - 14.4	2.5	96	48	150	15-17.4	81/83
HWS50-12/A	12V	9.6 - 14.4	4.3	96	48	150	15-17.4	81/83
HWS100-12/A	12V	9.6 - 14.4	8.5	96	48	150	15-17.4	83/86
HWS150-12/A	12V	9.6 - 14.4	13	96	48	150	15-17.4	83/86
HWS15-15/A	15V	12.0 - 18.0	1	120	60	150	18.8-21.8	80/81
HWS30-15/A	15V	12.0 - 18.0	2	120	60	150	18.8-21.8	81/83
HWS50-15/A	15V	12.0 - 18.0	3.5	120	60	150	18.8-21.8	81/83
HWS100-15/A	15V	12.0 - 18.0	7	120	60	150	18.8-21.8	83/86
HWS150-15/A	15V	12.0 - 18.0	10	120	60	150	18.8-21.8	83/86
HWS15-24/A	24V	19.2 - 28.8	0.65	192	96	200	30-34.8	82/83
HWS30-24/A	24V	19.2 - 28.8	1.3	192	96	200	30-34.8	83/86
HWS50-24/A	24V	19.2 - 28.8	2.2	192	96	150	30-34.8	82/84
HWS100-24/A	24V	19.2 - 28.8	4.5	192	96	150	30-34.8	84/87
HWS150-24/A	24V	19.2 - 28.8	6.5	192	96	150	30-34.8	85/88
HWS15-48/A	48V	38.4 - 52.8	0.33	384	192	200	55.2-64.8	80/80
HWS30-48/A	48V	38.4 - 52.8	0.65	384	192	200	55.2-64.8	82/83
HWS50-48/A	48V	38.4 - 52.8	1.1	384	192	200	55.2-64.8	83/85
HWS100-48/A	48V	38.4 - 52.8	2.1	384	192	200	55.2-64.8	84/87
HWS150-48/A	48V	38.4 - 52.8	3.3	384	192	200	55.2-64.8	85/88

Outline Drawing HWS15 Series



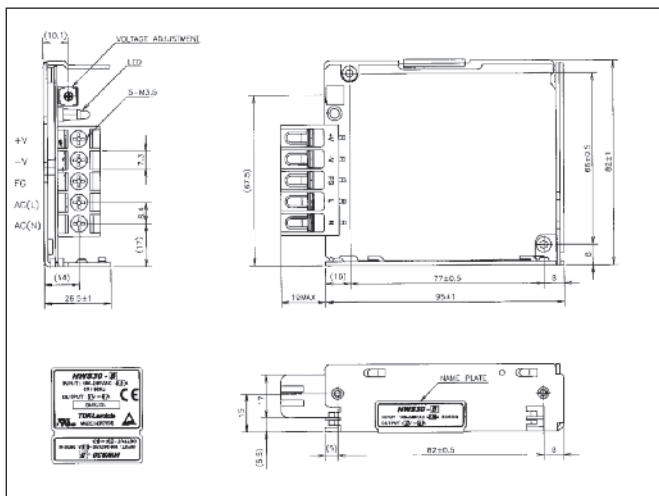
Options	
Suffix	Description
Blank	Screw terminals, no cover
/A	Screw terminals, cover
/ADIN	Cover and DinRail Mounting Bracket (24V Models only)
/R	Remote on/off (50-150W only) Example: HWS50-24/RA



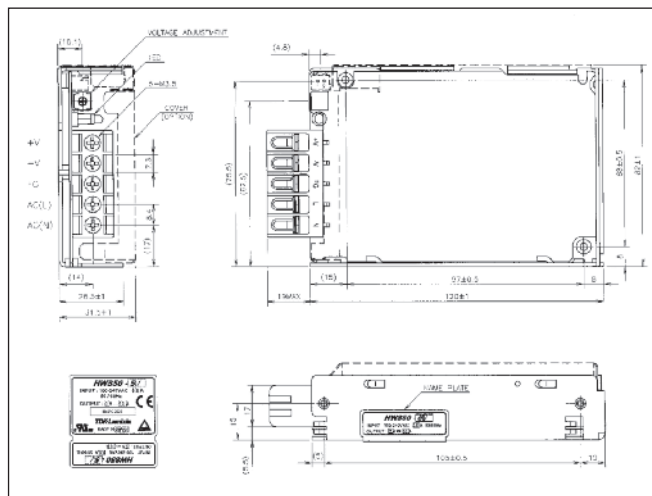
Innovating Reliable Power

TDK-Lambda

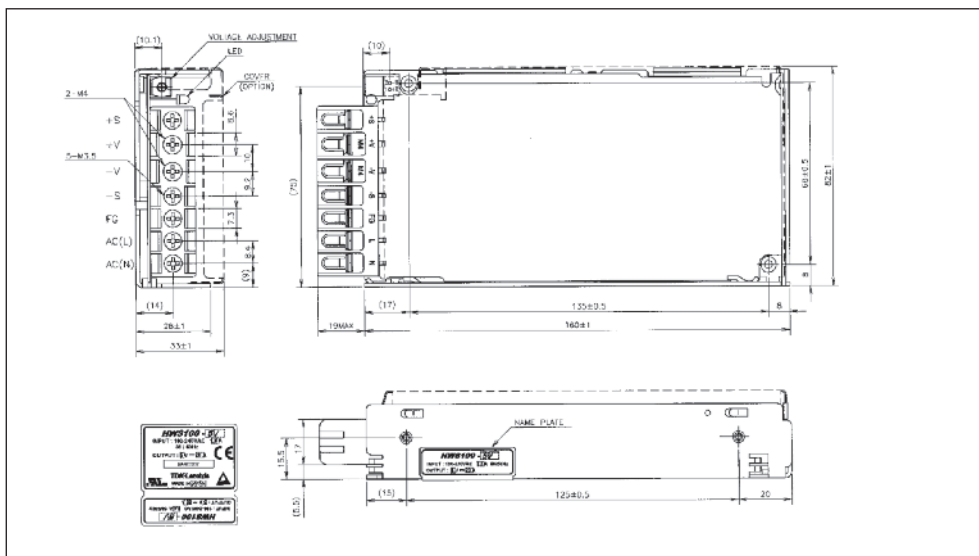
Outline Drawing HWS30 Series



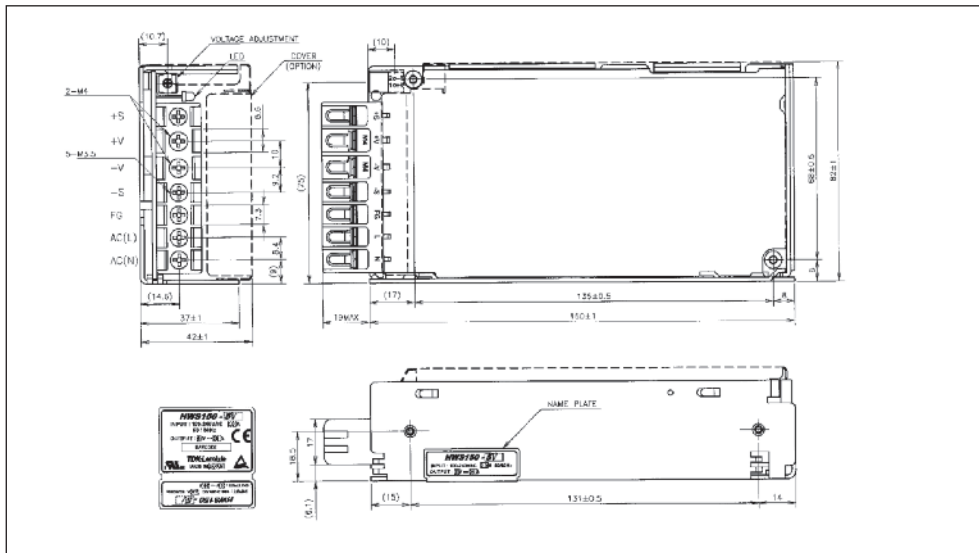
Outline Drawing HWS50 Series



Outline Drawing HWS100 Series



Outline Drawing HWS150 Series

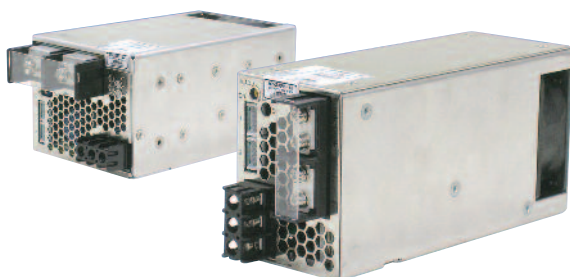


Note: All fixing holes M3 tapped max. depth 6mm



Innovating Reliable Power

TDK-Lambda



- Lifetime Warranty
- UL508 Approved
- SEMI F47 Compliant (high line AC)
- Universal Input (85 - 265VAC)
- High Efficiency
- RoHS Compliant Design

Key Market Segments & Applications

Factory Automation
Test & Measurement
Automated Service

HWS300-1500 Series

Single Output Industrial
Power Supplies

HWS300-1500 Features and Benefits

Features

- Lifetime Warranty
- High Efficiency
- Wide Range AC Input

Benefits

- Lower Cost of Ownership
- Easier System Cooling
- Supports Global Use

Specifications

MODEL		HWS300	HWS600	HWS1000	HWS1500
ITEMS					
Input Voltage range (47-63Hz)	-	85 - 265VAC or 120 - 330VDC			
Input Current (Typ)	(1) A	5V: 3.8/1.9; 12-48V: 4.2/2.1	5V: 7.5/3.6; 12-48V: 8.1/3.9	3.3V: 9.6/5.0; 5-60V: 13.5/7.0	3.3V: 15/8 5-60V: 19/10
Inrush Current	(1) A	20 / 40			
Power Factor	-	Meets EN61000-3-2			
Temperature Coefficient	-	<0.02%/°C			
Overcurrent Protection	-	>105% (>101% of peak current for peak current capable models)			
Overvoltage Protection	V	See table on page 2 (Recycle AC or remote on/off to reset)			
Hold Up Time (Typ)	ms	20 (HWS1500-7 - 16ms)			
Leakage Curr. (at 240VAC, 60Hz)	mA	<0.75mA		<1.2mA	<1.5mA
Remote Sense	-	Yes			
Indicator	-	Green LED = ON			
Remote on/off	-	Yes (Isolated from output)			
Parallel operation	-	Single wire connection (up to 5 units)			
DC Good	-	Yes			
Remote Adjust (PV)	-	External voltage adjusts output, see options table			
Operating Temperature	°C	-10 to +70°C, derate linearly to 50% load from 50 to 70 (2, 3)			
Storage Temperature	°C	-30 to +85°C			
Humidity (non condensing)	-	Operating: 10 - 90%RH, Non operating 10 - 95%RH			
Cooling	-	Internal fan			
Withstand Voltage	(4) -	Input to Ground 2.5kVAC, Input to Output 3kVAC, Output to Ground 500VAC for 1 min.			
Isolation Resistance	-	>100MΩ at 25°C & 70%RH, Output to Ground 500VDC			
Vibration (non operating)	-	10 - 55Hz (1 minute sweep), 19.6m/s ² constant X, Y, Z 1 hour			
Shock	-	< 196.1 m/s ²			
Safety Agency Approvals	(5) -	UL60950-1, CSA60950-1, EN60950-1, EN50178, UL508, CE Mark			
Line Dip	-	Complies with SEMI F47 (200VAC line only)			
Conducted & Radiated EMI	-	EN55011 / EN55022, FCC VCCI (HWS300, 600 & 1000: Class B, HWS1500: Class A)			
Recommended EMI Filter	-	MC1206	MC1210	MC1220	MC1230
Immunity	-	IEC61000-4-2, -3, -4, -6 (Level 3), -5, -8 (Level 4), -11			
Weight (Typ)	g	1,000	1,600	3,200	3,800
Size	mm	61 x 82 x 165	100 x 82 x 165	240 x 126.5 x 82	280 x 126.5 x 82
Warranty		Lifetime Warranty (See TDK-Lambda's terms & conditions)			



Innovating Reliable Power

TDK-Lambda

Model Selector

Model	Voltage V	Adjust Range V(3)	Max Curr. A	Peak Curr. A(2)	Max. Pwr. W	Peak Power W	Load Reg mV	Line Reg mV	Ripple Noise mV	Over- voltage V	Eff. typ % (1)
HWS300-3	3.3V	2.64 - 3.96	60	-	198		30	20	120	4.13 - 4.95	74/77
HWS600-3	3.3V	2.64 - 3.96	120	-	396		30	20	120	4.13 - 4.95	75/78
HWS1000-3	3.3V	2.64 - 3.96	200		660		40	20	120	4.13 - 4.62	71/73
HWS1500-3	3.3V	2.64 - 3.96	300		990		60	36	150	4.12 - 4.62	72/75
HWS300-5	5V	4 - 6	60	-	300		30	20	120	6.25 - 7.25	79/82
HWS600-5	5V	4 - 6	120	-	600		30	20	120	6.25 - 7.25	80/83
HWS1000-5	5V	4 - 6	200		1000		40	20	120	6.25 - 7	76/78
HWS1500-5	5V	4 - 6	300		1500		60	36	150	4.0 - 6.0	77/81
HWS1000-6	6V	4.8 - 7.2	167		1002		60	36	150	7.5 - 8.4	79/81
HWS1500-6	6V	4.8 - 7.2	250	300	1500	1800	60	40	150	4.8 - 7.2	79/82
HWS1000-7	7.5V	6 - 9V	134	160	1005	1200	60	36	150	9.38 - 10.5	80/82
HWS1500-7	7.5V	6 - 9V	200	240	1500	1800	60	40	150	6.0 - 9.0	81/83
HWS300-12	12V	9.6 - 14.4	27	-	324		72	48	150	15 - 17.4	80/83
HWS600-12	12V	9.6 - 14.4	53	-	636		72	48	150	15 - 17.4	80/83
HWS1000-12	12V	9.6 - 14.4	88	100	1056	1200	100	48	150	15 - 17.4	82/85
HWS1500-12	12V	9.6 - 14.4	125	-	1500		72	48	150	15 - 17.4	82/85
HWS300-15	15V	12 - 18	22	-	330		90	60	150	18.8 - 21.8	80/83
HWS600-15	15V	12 - 18	43	-	645		90	60	150	18.8 - 21.8	81/84
HWS1000-15	15V	12 - 18	70	80	1050	1200	120	60	150	18.8 - 21.8	83/85
HWS1500-15	15V	12 - 18	100	-	1500		90	60	150	18.7 - 21.8	83/87
HWS300-24	24V	19.2 - 28.8	14	16.5	336	396	144	96	150	30 - 34.8	82/85
HWS600-24	24V	19.2 - 28.8	27	31	648	744	144	96	150	30 - 34.8	82/85
HWS1000-24	24V	19.2 - 28.8	46	58.5	1104	1404	150	96	150	30 - 34.8	85/87
HWS1500-24	24V	19.2 - 28.8	65/70 (1)	105	1560	2520	144	96	200	30 - 34.8	84/88
HWS1000-36	36V	28.8 - 43.2	30.7	39	1104	1404	150	144	200	45 - 49.7	85/88
HWS1500-36	36V	28.8 - 43.2	42/46.5 (1)	70	1512	2520	150	144	200	45 - 49.7	84/88
HWS300-48	48V	38.4 - 52.8	7	-	336		288	192	350	55.2 - 64.8	82/85
HWS600-48	48V	38.4 - 52.8	13	-	624		288	192	350	55.2 - 64.8	83/86
HWS1000-48	48V	38.4 - 52.8	23	29	1104	1404	300	192	200	55.2 - 64.8	86/88
HWS1500-48	48V	38.4 - 52.8	32	-	1536		288	192	200	55.2 - 64.8	86/90
HWS1000-60	60V	48 - 66	18.4	23.4	1104	1404	360	240	400	69 - 75	85/88
HWS1500-60	60V	48 - 66	28	42	1536	2520	360	240	400	69 - 75	86/90

Notes

(1) 100/200VAC

(2) 200-265VAC Input, 10s maximum on time with 35% duty cycle

(3) Use program input (PV) to adjust from 20-120% of nominal (20-110% for 48V models)

Options

Suffix	Description
Blank	HWS300-1500 the cover is fitted as standard
/A	Not Applicable HWS300-1500 the cover is fitted as standard
/PV	HWS300, 600 (Standard on HWS1000 & 1500 all output voltages): 1-6V program voltage input to adjust output 20-120% of nominal (20-110% for 48V) (12V-48V models only for 300 & 600W):
/HD	See HWS30-1500/HD Datasheet for details. -40 to +71(74)°C operation, conformally coated PCBs
/ME	See HWS30-1500/ME Datasheet for details. UL60601-1, EN60601-1 medical approvals

Specification Notes (See Page 1):

- (1) 100/200VAC
- (2) HWS start up -20°C. (-40°C see options table)
- (3) HWS1000/1500 with 85VAC input:
See installation manual
HWS1000: -10 to +71°C.
HWS1000-5 derate linearly above 40°C
- (4) 2kVAC HWS1000/1500 Input to ground
- (5) UL60601-1, EN60601-1, see options.
UL508; HWS300/600 5V, 12V, 24V & 48V models



Innovating Reliable Power

TDK-Lambda

Outline Drawing HWS300 -1500 Series

SIGNAL CONNECTOR INFORMATION

CON1, CON2 PIN ASSIGN

S12B-PHDS5 (LF)

ACCESSORIES ==

- COVER FOR BARRIER TERMINAL STRIP (ATTACHED ON TERMINAL AT SHIPMENT)
- SHORT FENCE (ATTACHED ON DAY AT SHIPMENT)
- NAME PLATE (ATTACHED ON DAY AT SHIPMENT)

SIGNAL CONNECTOR USED ==

PART DESCRIPTION	PART NAME	MANUFACT
MATCHING HOUSING	PHDR-12VS	JST
MATCHING CONTACT	SPHD-002T-P0.5(AWG28-24)	JST
HAND CRIMPING TOOL	YC-610R(SPHD-001T-P0.5)	JST

OPTIONAL MODELS ==

MODEL	COUNTRY
HWS300-*	○
HWS1500-*	○

AIR FLOW →

FAN

NAME PLATE DETAILS

HWS300

Notes

A: Model name, nominal output voltage and maximum output current are shown in the name plate in accordance with the specifications.

B: M4 tapped holes (8) for customer chassis mounting. (Screw penetration depth 6mm maximum.)

ACCESSORIES ==

- COVER FOR BARRIER TERMINAL STRIP (ATTACHED ON TERMINAL AT SHIPMENT)
- SHORT FENCE (ATTACHED ON DAY AT SHIPMENT)
- NAME PLATE (ATTACHED ON DAY AT SHIPMENT)

SIGNAL CONNECTOR USED ==

PART DESCRIPTION	PART NAME	MANUFACT
MATCHING HOUSING	PHDR-12VS	JST
MATCHING CONTACT	SPHD-002T-P0.5(AWG28-24)	JST
HAND CRIMPING TOOL	YC-610R(SPHD-001T-P0.5)	JST

OPTIONAL MODELS ==

MODEL	COUNTRY
HWS600-*	○
HWS1500-*	○

AIR FLOW →

FAN

NAME PLATE DETAILS

HWS600

Notes

A: Model name, nominal output voltage and maximum output current are shown in the name plate in accordance with the specifications.

B: M4 tapped holes (8) for customer chassis mounting. (Screw penetration depth 6mm maximum.)

SIGNAL CONNECTOR INFORMATION

CON1, CON2 PIN ASSIGN

S12B-PHDS5 (LF)

ACCESSORIES ==

- COVER FOR BARRIER TERMINAL STRIP (ATTACHED ON TERMINAL AT SHIPMENT)
- SHORT FENCE (ATTACHED ON DAY AT SHIPMENT)
- NAME PLATE (ATTACHED ON DAY AT SHIPMENT)

SIGNAL CONNECTOR USED ==

PART DESCRIPTION	PART NAME	MANUFACT
MATCHING HOUSING	PHDR-12VS	JST
MATCHING CONTACT	SPHD-002T-P0.5(AWG28-24)	JST
HAND CRIMPING TOOL	YC-610R(SPHD-001T-P0.5)	JST

OPTIONAL MODELS ==

MODEL	COUNTRY
HWS1000-*	○
HWS1500-*	○

AIR FLOW →

FAN

NAME PLATE DETAILS

HWS1000

Notes

A: Model name, nominal output voltage and maximum output current are shown in the name plate in accordance with the specifications.

B: Country of manufacture is shown here.

C: M4 tapped holes (16) for customer chassis mounting. (Screws must not protrude into power supply by more than 6mm.)

D: I/O Signal Connector.

Connector: S12B-PHDS5(LF)(SN) (JST)

Matching Housing: PHDR-12VS (JST)

Matching Contact: SPHD-002T-P0.5(AWG28-24) (JST) or SPHD-001T-P0.5(AWG26-22) (JST) or BPHD-001T-P0.5(AWG26-22) (JST)

Hand Crimping Tool: YRS-620(SPHD-002T-P0.5) (JST) or YC-610R(SPHD-001T-P0.5) (JST)

E: Recommended torque for the terminal piece

Input terminal (M4 screw): 1.27N·m

Output terminal (M8 bolt & nut): 10.8N·m

Output terminal (M4 screw): 1.27N·m

SIGNAL CONNECTOR INFORMATION

CON1, CON2 PIN ASSIGN

S12B-PHDS5 (LF)

ACCESSORIES ==

- COVER FOR BARRIER TERMINAL STRIP (ATTACHED ON TERMINAL AT SHIPMENT)
- SHORT FENCE (ATTACHED ON DAY AT SHIPMENT)
- NAME PLATE (ATTACHED ON DAY AT SHIPMENT)

SIGNAL CONNECTOR USED ==

PART DESCRIPTION	PART NAME	MANUFACT
MATCHING HOUSING	PHDR-12VS	JST
MATCHING CONTACT	SPHD-002T-P0.5(AWG28-24)	JST
HAND CRIMPING TOOL	YC-610R(SPHD-001T-P0.5)	JST

OPTIONAL MODELS ==

MODEL	COUNTRY
HWS1500-*	○
HWS1500-*	○

AIR FLOW →

FAN

NAME PLATE DETAILS

HWS1500

Notes

A: Model name, option, input voltage range, nominal output voltage, maximum output current are shown in the name plate in accordance with the specifications.

B: Country of manufacture is shown here.

C: M4 tapped holes (16) for customer chassis mounting. (Screws must not protrude into power supply by more than 6mm.) Recommended M4 screws torque: 1.27N·m

D: I/O Signal Connector.

Connector: S12B-PHDS5(LF)(SN) (JST)

Matching Housing: PHDR-12VS (JST)

Matching Contact: SPHD-002T-P0.5(AWG28-24) (JST) or SPHD-001T-P0.5(AWG26-22) (JST) or BPHD-001T-P0.5(AWG26-22) (JST)

Hand Crimping Tool: YRS-620(SPHD-002T-P0.5) (JST) or YC-610R(SPHD-001T-P0.5) (JST)

E: Recommended torque for the terminal piece

Input terminal (M4 screw): 1.27N·m

Output terminal (M8 bolt & nut): 10.8N·m

Output terminal (M4 screw): 1.27N·m

HWS300-1500 Series



Innovating Reliable Power

TDK-Lambda



HWS30-1500/HD Series

Single Output Industrial
Power Supplies

- Lifetime Warranty
- -10°C to +71°C Operation (-40°C start up)
- Universal Input (85 - 265VAC)
- Conformally coated PCB's
- RoHS Compliant Design

Key Market Segments & Applications

Factory Automation
Test & Measurement
LED Displays

HWS30-1500/HD Features and Benefits

Features

- Lifetime Warranty
- Conformally coated PCB's
- Wide Range AC Input

Benefits

- Lower Cost of Ownership
- Operates in Harsh Environments
- Supports Global Use

Specifications

MODELS		HWS30 HWS50	HWS100 HWS150	HWS300	HWS600	HWS1000	HWS1500	
ITEMS								
Input Voltage range (47-63Hz)		85 - 265VAC or 120 - 370VDC			85 - 265VAC or 120 - 330VDC			
Input Current (Typ)	(1)	A	0.8 / 0.4 0.7 / 0.35	1.3 / 0.65 1.9 / 0.95	4.1 / 2.1	8.1 / 3.9	13.5 / 7.0 19 / 10	
Inrush Current	(1)	A	14 / 28		20 / 40			
Power Factor	-	Meets EN61000-3-2						
Temperature Coefficient	-	<0.02%/°C						
Overcurrent Protection	-	>104%						
Overvoltage Protection	V	Yes (See table on page 2)						
Hold Up Time (Typ)	ms	20						
Leakage Current (60Hz)	mA	<0.5mA		<0.75mA		<1.2mA	≤1.5mA	
Remote Sense	-	No		Yes				
Indicator	-	Green LED = ON						
Remote On/Off	-	No		Yes (Isolated from output)				
Parallel operation	-	No		Single wire connection (5 units max)				
DC Good	-	No		Yes				
Operating Temperature & Derating (operation to +74°C - contact factory)		HWS30-150: -10°C to +71°C, (-10 to +50°C: 100%, +60°C: 60%, +71°C: 20%) HWS300-1500: -10°C to +71°C, (-10 to +50°C: 100%, derate linearly to 50% load from +50 to +71°C) Guaranteed start up at -40°C (see specification sheets on website for details and derating)						
Storage Temperature		-40°C to +85°C						
Humidity (non condensing)	-	Operating: 30-90%RH (10 - 90% on HWS300-1500), Non operating 10-95%RH						
Cooling	-	Convection			Internal fan			
Withstand Voltage (2)	-	Input to Ground 2kVAC, Input to Output 3kVAC, Output to Ground 500VAC for 1 min.						
Isolation Resistance	-	>100MΩ at 25°C & 70%RH, Output to Ground 500VDC, >10MΩ Output to remote on/off 100VDC						
Vibration (non operating)	-	MIL-STD-810F 514.5 Category 4, 10						
Shock (in packaging)	-	MIL-STD-810F 516.5 Procedure I, VI (<196.1m/s ²)						
Safety Agency Approvals	-	UL60950-1, CSA60950-1, EN60950-1, EN50178, CE Mark						
Line Dip	-	Complies with SEMI F47 (200VAC line only)						
Conducted & Radiated EMI	-	EN55011 / EN55022-B, FCC-B, VCCI-B (Curve A for HWS1500)						
Immunity	-	IEC61000-4-2 (Level 2,3), -3, -4, -6, (Level 3), -5, -8 (Level 4), -11						
Weight (Typ)	g	220 280	450 500	1000	1600	3200	3800	
Size (WxHxD)	mm	26.5 x 82 x 95 26 x 82 x 120	28 x 82 x 160 37 x 82 x 160	61 X 82 X 165	100 X 82 X 165	126.5 X 82 X 240	126.5 X 82 X 280	
Warranty		Lifetime Warranty (See TDK-Lambda's terms & conditions)						

Notes: (1) 100/200VAC input. (2) HWS300-600 2.5kVAC Input to ground



Innovating Reliable Power

TDK-Lambda

Model Selector

Model	Voltage (V)	Adjust Range (V)	Max Curr. (A)	Peak ⁽³⁾ Curr. (A)	Max. Power (W)	Peak ⁽³⁾ Power (W)	Load Reg (mV)	Line Reg (mV)	Ripple Noise (mV)	Over voltage (V)	Efficiency ⁽¹⁾ typ %
HWS50-3/HD	3.3	2.97 - 3.96	6		20		40	20	120	4.13 - 4.95	70/73
HWS50-3/HD	3.3	2.97 - 3.96	10		33		40	20	120	4.13 - 4.95	76/78
HWS100-3/HD	3.3	2.97 - 3.96	20		66		40	20	120	4.13 - 4.95	78/81
HWS150-3/HD	3.3	2.97 - 3.96	30		99		40	20	120	4.13 - 4.95	78/81
HWS300-3/HD	3.3	2.64 - 3.96	60		198		30	20	120	4.13 - 4.95	74/77
HWS600-3/HD	3.3	2.64 - 3.96	120		396		30	20	120	4.13 - 4.95	75/78
HWS1000-3/HD	3.3	2.64 - 3.96	200		660		40	20	120	4.12 - 4.62	71/73
HWS1500-3/HD	3.3	2.64 - 3.96	300		990		60	36	200	4.12 - 4.62	72/75
HWS30-5/HD	5	4.0 - 6.0	6		30		40	20	120	6.25 - 7.25	77/80
HWS50-5/HD	5	4.0 - 6.0	10		50		40	20	120	6.25 - 7.25	82/84
HWS100-5/HD	5	4.0 - 6.0	20		100		40	20	120	6.25 - 7.25	83/86
HWS150-5/HD	5	4.0 - 6.0	30		150		40	20	120	6.25 - 7.25	83/86
HWS300-5/HD	5	4.0 - 6.0	60		300		30	20	120	6.25 - 7.25	79/82
HWS600-5/HD	5	4.0 - 6.0	120		600		30	20	120	6.25 - 7.25	80/83
HWS1000-5/HD	5	4.0 - 6.0	200		1000		30	20	120	6.25 - 7.0	76/78
HWS1500-5/HD	5	4.0 - 6.0	300		1500		60	36	200	6.25 - 7.0	77/81
HWS1000-6/HD	6	4.8 - 7.2	167		1002		30	20	150	7.5 - 8.4	79/81
HWS1500-6/HD	6	4.8 - 7.2	250	300	1500	1800	60	36	200	6.25 - 7.0	79/82
HWS1000-7/HD	7.5	6.0 - 9.0	134	160	1005	1200	30	20	150	9.37 - 10.5	80/82
HWS1500-7/HD	7.5	6.0 - 9.0	200	240	1500	1800	60	40	200	9.37 - 10.5	81/83
HWS30-12/HD	12	9.6 - 14.4	2.5		30		96	48	150	15.0 - 17.4	81/83
HWS50-12/HD	12	9.6 - 14.4	4.3		51.6		96	48	150	15 - 17.4	81/83
HWS100-12/HD	12	9.6 - 14.4	8.5		102		96	48	150	15 - 17.4	83/86
HWS150-12/HD	12	9.6 - 14.4	13		156		96	48	150	15 - 17.4	83/86
HWS300-12/HD	12	9.6 - 14.4	27		324		72	48	150	15 - 17.4	80/83
HWS600-12/HD	12	9.6 - 14.4	53		636		72	48	150	15 - 17.4	80/83
HWS1000-12/HD	12	9.6 - 14.4	88	100	1056	1200	72	48	150	15 - 17.4	82/85
HWS1500-12/HD	12	9.6 - 14.4	125		1500		72	48	150	15 - 17.4	82/85
HWS30-15/HD	15	12.0 - 18.0	2		30		120	60	150	18.8 - 21.8	81/84
HWS50-15/HD	15	12.0 - 18.0	3.5		52.5		120	60	150	18.8 - 21.8	81/83
HWS100-15/HD	15	12.0 - 18.0	7		105		120	60	150	18.8 - 21.8	83/86
HWS150-15/HD	15	12.0 - 18.0	10		150		120	60	150	18.8 - 21.8	83/86
HWS300-15/HD	15	12.0 - 18.0	22		330		90	60	150	18.8 - 21.8	80/83
HWS600-15/HD	15	12.0 - 18.0	43		645		90	60	150	18.8 - 21.8	81/84
HWS1000-15/HD	15	12.0 - 18.0	70	80	1050	1200	90	60	150	18.7 - 21.8	83/85
HWS1500-15/HD	15	12.0 - 18.0	100		1500		90	60	150	18.7-21.8	83/87
HWS30-24/HD	24	19.2 - 28.8	1.3		31.2		192	96	200	30 - 34.8	83/86
HWS50-24/HD	24	19.2 - 28.8	2.2		52.8		192	96	150	30 - 34.8	82/84
HWS100-24/HD	24	19.2 - 28.8	4.5		108		192	96	150	30 - 34.8	84/87
HWS150-24/HD	24	19.2 - 28.8	6.5		156		192	96	150	30 - 34.8	85/88
HWS300-24/HD	24	19.2 - 28.8	14	16.5	336	396	144	96	150	30 - 34.8	82/85
HWS600-24/HD	24	19.2 - 28.8	27	31	648	744	144	96	150	30 - 34.8	82/85
HWS1000-24/HD	24	19.2 - 28.8	46	58.5	1104	1404	144	96	150	30 - 34.8	85/87
HWS1500-24/HD	24	19.2 - 28.8	65/70	105	1560/1680	2520 ⁽¹⁾	144	96	200	30 - 34.8	84/88
HWS1000-36/HD	36	28.8 - 43.2	30.7	39	1104	1404	150	144	200	45 - 49.7	85/88
HWS1500-36/HD	36	28.8 - 43.2	42/46.5	70	1512/1674	2520 ⁽¹⁾	150	144	200	45 - 49.7	84/88
HWS30-48/HD	48	38.4 - 52.8	0.65		31.2		384	192	200	55.2 - 64.8	82/83
HWS50-48/HD	48	38.4 - 52.8	1.1		52.8		384	192	200	55.2 - 64.8	83/85
HWS100-48/HD	48	38.4 - 52.8	2.1		100.8		384	192	200	55.2 - 64.8	84/87
HWS150-48/HD	48	38.4 - 52.8	3.3		158.4		384	192	200	55.2 - 64.8	85/88
HWS300-48/HD	48	38.4 - 52.8	7		336		288	192	350	55.2 - 64.8	82/85
HWS600-48/HD	48	38.4 - 52.8	13		624		288	192	350	55.2 - 64.8	83/86
HWS1000-48/HD	48	38.4 - 52.8	23	29.2	1104	1404	288	192	200	55.2 - 60.0	86/88
HWS1500-48/HD	48	38.4 - 52.8	32		1536		288	192	200	55.2 - 64.8	86/90
HWS1000-60/HD	60	48.0 - 66	18.4	23.4	1104	1404	360	240	400	69.0 - 75.0	85/88
HWS1500-60/HD	60	48.0 - 66	28	42	1536	2520	360	240	400	69.0 - 75.0	86/90

Options

Suffix	Description
Blank	No cover (except HWS300-1500 cover fitted as standard)
/A	Cover fitted (eg HWS100-24/HDA) Deratings apply

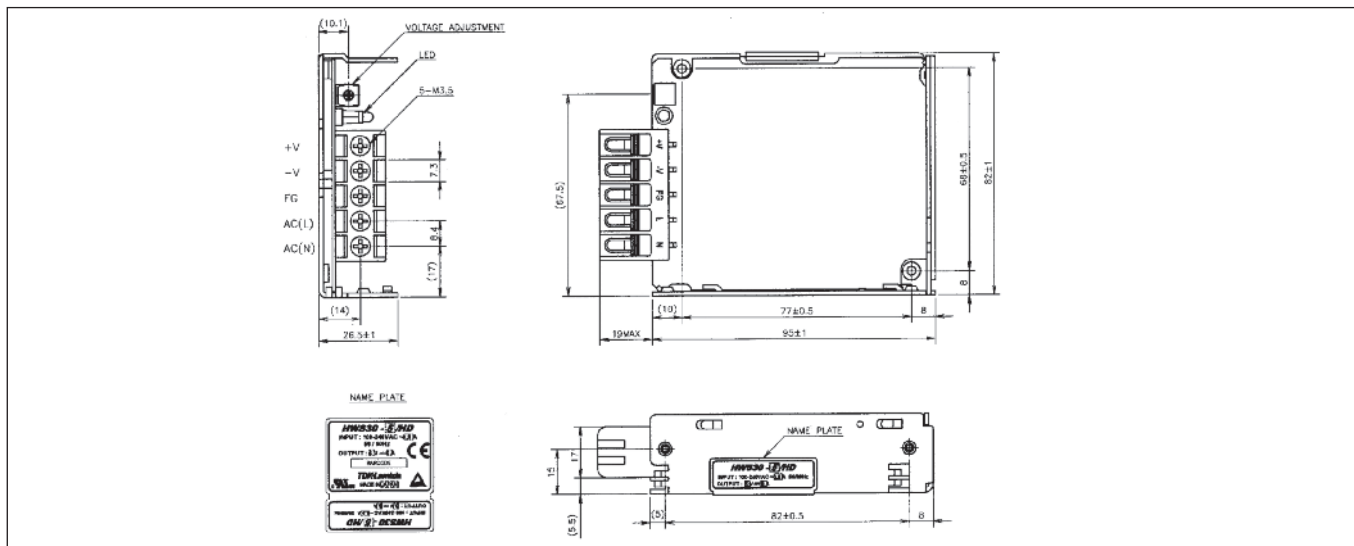
Notes: (3) Peak load for 10s maximum on time, 35% duty cycle at >200V input



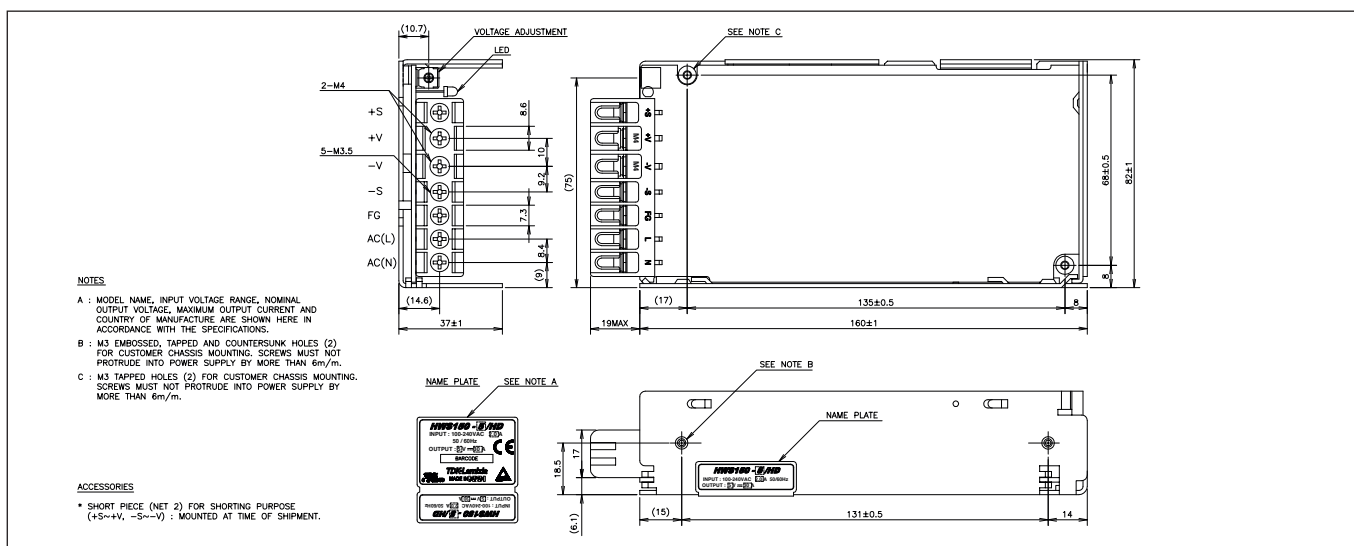
Innovating Reliable Power

TDK-Lambda

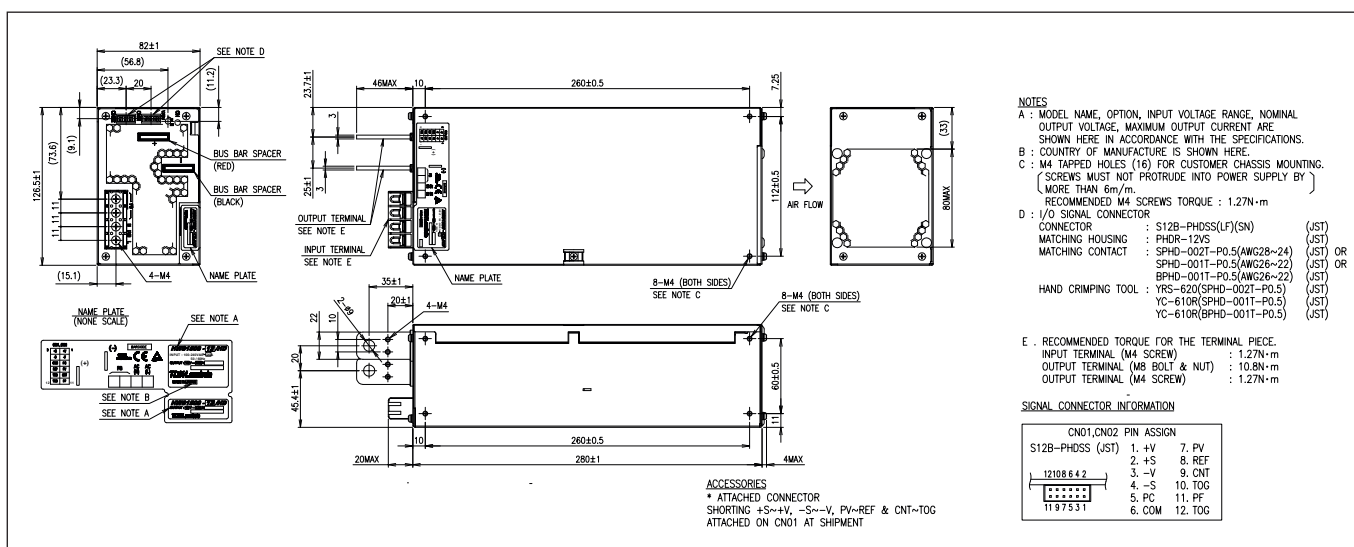
Outline Drawing HWS30 Series



Outline Drawing HWS150 Series



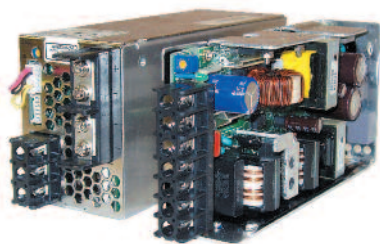
Outline Drawing HWS1500 Series





Innovating Reliable Power

TDK-Lambda



- Lifetime Warranty
- Medical Approvals
- Universal Input (85 - 265VAC)
- High Efficiency
- Broad 30W to 1500W product range
- RoHS Compliant Design

HWS30-1500/ME Series

Single Output
Medical Power Supplies

Key Market Segments & Applications

Non-Surgical Medical Equipment
Analysers

HWS30-1500/ME Features and Benefits

Features

- Lifetime Warranty
- Medical Approvals
- Wide Range AC Input

Benefits

- Lower Cost of Ownership
- Reduces System Approval Times
- Supports Global Use

Specifications

MODELS		HWS30 HWS50	HWS100 HWS150	HWS300	HWS600	HWS1000	HWS1500
Input Voltage range		85-265VAC (47-63Hz) or 120-370VDC		85-265VAC (47-330VDC)		85-265VAC (47-63Hz)	
Input Current (Typ)	(1) A	0.8 / 0.4	1.3 / 0.65	4.1 / 2.1	8.1 / 3.9	13.5/7.0	19/10
Inrush Current	(1) A	14 / 28		20 / 40			
Power Factor / Flicker		Meets EN61000-3-2, EN61000-3-3					
Temperature Coefficient	-	<0.02%/°C					
Overcurrent Protection	-	>104%					
Overvoltage Protection	V	Yes (See table on page 2)					
Hold Up Time (Typ)	ms	20					
Leakage Current (60Hz)	(2) mA	<0.5mA					
Remote Sense		No		Yes			
Indicator	-	Green LED = ON					
Remote On/Off	-	No		Yes (Isolated from output)			
Parallel operation	-	No		Single wire conn. (5 units max)			
DC Good	-	No		Yes			
Voltage Programming		No				Yes	
Operating Temperature and Derating	-	HWS30-150: -10°C to +70°C, (-10 to +50°C: 100%, +60°C: 60%, +70°C: 20%) HWS300-1500: -10°C to +70°C, (-10 to +50°C: 100%, derate linearly to 50% load from +50°C to +70°C)					
Storage Temperature	°C	-30°C to +85°C					
Humidity (non condensing)	-	Operating: 30 - 90%RH (10 -90% on HWS300-1500), Non operating 10 - 95%RH					
Cooling	-	Convection		Internal fan			
Withstand Voltage	(3) -	Input to Ground 2kVAC, Input to Output 3kVAC, Output to Ground 500VAC for 1 min.					
Isolation Resistance	-	>100MΩ at 25°C & 70%RH, Output to Ground 500VDC, >10MΩ Output to remote on/off 100VDC					
Vibration (non operating)	-	10 - 55Hz (1 min sweep), 19.6m/s ² constant, X, Y, Z axis, one hour each					
Shock (in packaging)	-	< 196.1m/s ²					
Safety Agency Approvals	(2) -	UL60601-1, EN60601-1, CSA-C22.2 No6011-M90 (C-UL) (basic insulation), CE Mark					
Line Dip	-	Complies with SEMI F47 (200VAC line only)					
Conducted & Radiated EMI	-	EN55011 / EN55022-B, FCC-B, VCCI-B (HWS600 & 1500 Class A)					
Immunity	-	IEC61000-4-2 (Level 2,3), -3, -4, -6, (Level 3), -5 (Level 3,4), -11					
Weight (Typ)	g	220 280	450 500	1000	1600	3200	3800
Size (WxHxD)	mm	26 x 82 x 95 26 x 82 x 120	28 x 82 x 160 37 x 82 x 160	61 x 82 x 165	100 x 82 x 165	126.5 x 82 x 240	280 x 82 x 126.5
Warranty		Lifetime Warranty (See TDK-Lambda's terms & conditions)					

Notes: (1) 100/200VAC input (2) See clause 19.5DV.2 of UL60601 for equipment in proximity of patient (3) HWS300-600 2.5kVAC Input to ground

HWS30-1500/ME Series

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Innovating Reliable Power

TDK-Lambda

Model Selector									
Model	Voltage	Adjust Range	Max Curr(A) ⁴	Max Power(W)	Load Reg(mV)	Line Reg(mV)	Ripple Noise(mV)	Oversvoltage (V)	Efficiency (typ)% ¹
HWS30-5/ME	5V	4.0 - 6.0	6	30	40	20	120	6.25-7.25	77/80
HWS50-5/ME	5V	4.0 - 6.0	10	50	40	20	120	6.25-7.25	82/84
HWS100-5/ME	5V	4.0 - 6.0	20	100	40	20	120	6.25-7.25	83/86
HWS150-5/ME	5V	4.0 - 6.0	30	150	40	20	120	6.25-7.25	83/86
HWS600-5/ME	5V	4.0 - 6.0	120	600	30	20	120	6.25-7.25	80/83
HWS30-12/ME	12V	9.6 - 14.4	2.5	30	96	48	150	15-17.4	81/83
HWS50-12/ME	12V	9.6 - 14.4	4.3	51.6	96	48	150	15-17.4	81/83
HWS100-12/ME	12V	9.6 - 14.4	8.5	102	96	48	150	15-17.4	83/86
HWS150-12/ME	12V	9.6 - 14.4	13	156	96	48	150	15-17.4	83/86
HWS300-12/ME	12V	9.6 - 14.4	27	324	72	48	150	15-17.4	80/83
HWS600-12/ME	12V	9.6 - 14.4	53	636	72	48	150	15-17.4	80/83
HWS30-15/ME	15V	12.0 - 18.0	2	30	120	60	150	18.8-21.8	81/83
HWS50-15/ME	15V	12.0 - 18.0	3.5	52.5	120	60	150	18.8-21.8	81/83
HWS100-15/ME	15V	12.0 - 18.0	7	105	120	60	150	18.8-21.8	83/86
HWS150-15/ME	15V	12.0 - 18.0	10	150	120	60	150	18.8-21.8	83/86
HWS300-15/ME ⁽⁵⁾	15V	12.0 - 18.0	22	330	90	60	150	18.8-21.8	82/85
HWS600-15/ME	15V	12.0 - 18.0	43	645	90	60	150	18.8-21.8	81/84
HWS30-24/ME	24V	19.2 - 28.8	1.3	31.2	192	96	200	30-34.8	83/86
HWS50-24/ME	24V	19.2 - 28.8	2.2	52.8	192	96	150	30-34.8	82/84
HWS100-24/ME	24V	19.2 - 28.8	4.5	108	192	96	150	30-34.8	84/87
HWS150-24/ME	24V	19.2 - 28.8	6.5	156	192	96	150	30-34.8	85/88
HWS300-24/ME	24V	19.2 - 28.8	14 (16.5 pk)	336	144	96	150	30-34.8	82/85
HWS600-24/ME	24V	19.2 - 28.8	27 (31 pk)	648	144	96	150	30-34.8	82/85
HWS1000-24/ME	24V	19.2 - 28.8	46 (58.5 pk)	1104	150	96	150	30-34.8	85/87
HWS1500-24/ME	24V	4.8 - 28.8 ⁽⁷⁾	65/70 ⁽¹⁾ (105pk ⁽⁶⁾)	1560/1680 ⁽¹⁾ (2520 pk ⁽⁶⁾)	144	96	200	30-34.8	84/88
HWS1000-36/ME	36V	28.8 - 43.2	30.7 (39 pk)	1104	150	144	200	45-49.7	85/88
HWS1500-36/ME	36V	7.2 - 43.2 ⁽⁷⁾	42/46.5 ⁽¹⁾ (70 pk) ⁽⁶⁾	1512/1674 ⁽¹⁾ (2520 pk ⁽⁶⁾)	150	144	200	34-49.7	84/88
HWS30-48/ME	48V	38.4 - 52.8	0.65	31.2	384	192	200	55.2-64.8	82/83
HWS50-48/ME	48V	38.4 - 52.8	1.1	52.8	384	192	200	55.2-64.8	83/85
HWS100-48/ME	48V	38.4 - 52.8	2.1	100.8	384	192	200	55.2-64.8	84/87
HWS150-48/ME	48V	38.4 - 52.8	3.3	158.4	384	192	200	55.2-64.8	85/88
HWS300-48/ME	48V	38.4 - 52.8	7	336	288	192	350	55.2-64.8	82/85
HWS600-48/ME	48V	38.4 - 52.8	13	624	288	192	350	55.2-64.8	83/86
HWS1000-48/ME	48V	38.4 - 52.8	23	1104	300	192	200	55.2-60	86/88
HWS1500-48/ME	48V	9.6 - 52.8 ⁽⁷⁾	32	1536	288	192	200	55.2-64.8	86/90

(4) Peak load for 10s maximum on time, 35% duty cycle
 (6) 200-265AC Input

(5) Safety Agency in progress - contact factory for status
 (7) Using voltage programming input - see installation manual for details

Options

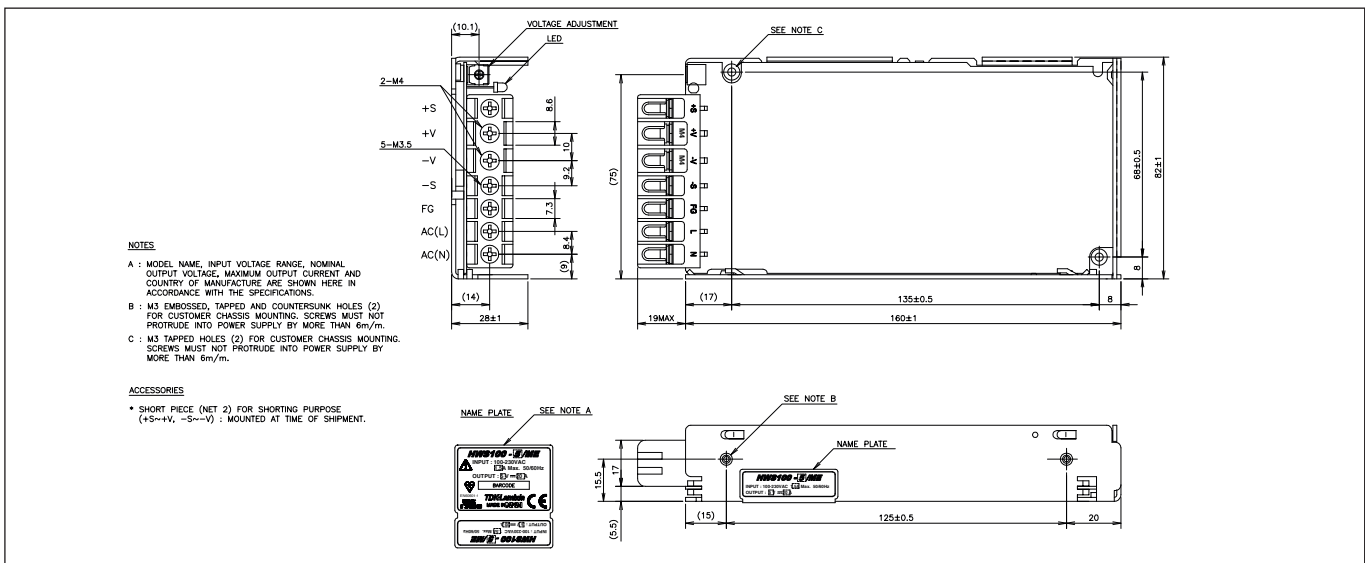
Suffix	Description
Blank	No cover (except HWS300-1500 cover fitted) as standard
/A	Cover fitted (egHWS100-24/MEA) option available for HWS100 & HWS150 only



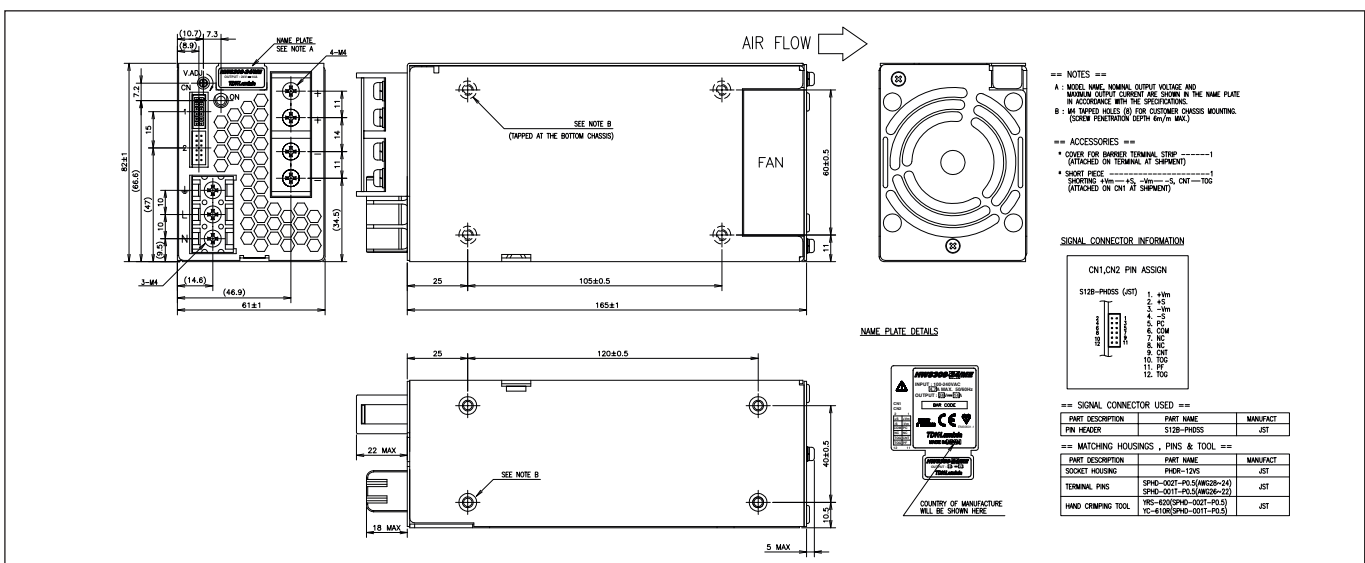
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TDK-Lambda

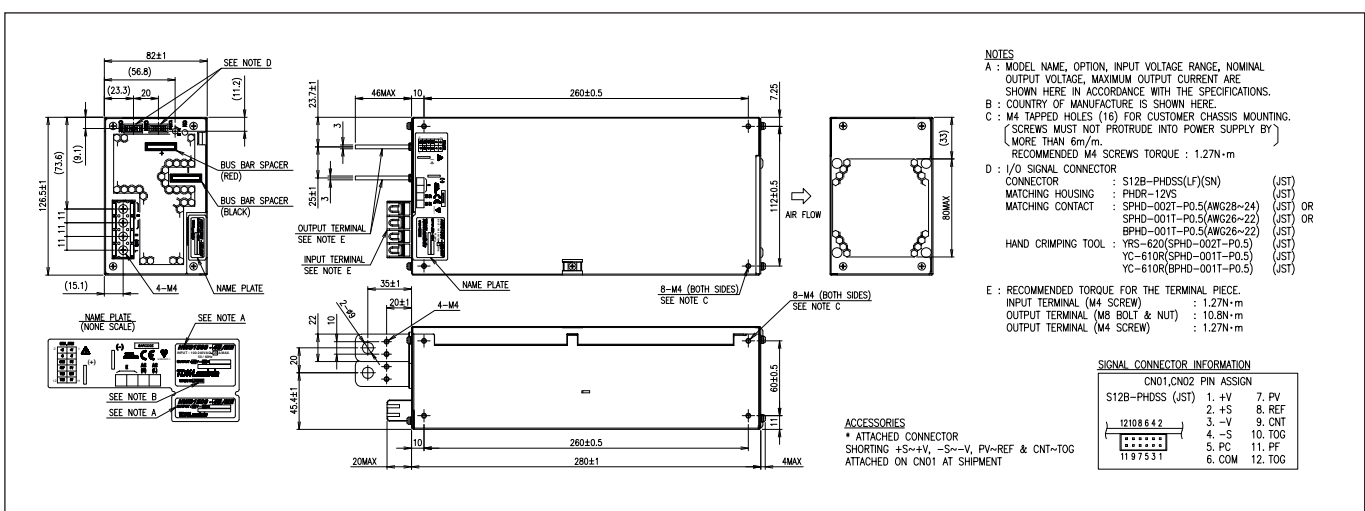
Outline Drawing HWS100 Series



Outline Drawing HWS300 Series



Outline Drawing HWS1500 Series



HWS30-1500/ME Series



Innovating Reliable Power

TDK-Lambda



- Lifetime Warranty
- 300% Peak Power Capability
- Small Package Size
- Universal Input (85 - 265VAC)
- High Efficiency

Key Market Segments & Applications

Factory Automation
Process Control
Semiconductor Fabrication
Motor and Pump Drives

HWS300P & 600P Series

Peak Power Industrial
Power Supplies

HWS300P & 600P Features and Benefits

Features

- Limited Lifetime Warranty
- Peak Power Capability
- High Efficiency

Benefits

- Lower Cost of Ownership
- Lower cost, smaller size
- Easier system cooling, less power used

Specifications

ITEMS	MODEL		HWS300P	HWS600P
Input Voltage range	-		85 - 265VAC (47 - 63Hz) or 120 - 330VDC	
Input Current (Typ)	(1)	A	3.6/1.9	7.2/3.7
Inrush Current	(1)	A	20 / 40	
Power Factor	-		Meets EN61000-3-2	
Temperature Coefficient	-		<0.02%/°C	
Overcurrent Protection	-		See table on page 2 (Recycle AC or remote on/off to reset)	
Overvoltage Protection	-	V	See table on page 2 (Recycle AC or remote on/off to reset)	
Hold Up Time (Typ)		ms	20	
Efficiency	(1)	%	84 / 87	
Leakage Curr. (@240VAC, 60Hz)		mA	<0.75mA (Typically 0.2mA at 100VAC)	
Remote Sense	-		No	
Indicator	-		Green LED = ON	
Remote on/off	-		Yes	
Line Regulation		mV	24V: 96mV, 36V: 144mV, 48V: 192mV	
Load Regulation		mV	24V: 144mV, 36V: 216mV, 48V: 288mV	
Ripple & Noise		mV	24V: 150mV, 36V: 200mV, 48V: 350mV	
Parallel operation	-		No	Yes, up to 2 units
DC Good	-		Yes	
Operating Temperature	-		-10°C to +70°C, derate linearly to 50% load from 50°C to 70°C	
Storage Temperature	-		-30°C to +85°C	
Humidity (non condensing)	-		Operating: 10 - 90%RH, Non operating 10 - 95%RH	
Cooling	-		Internal fan	
Withstand Voltage	-		Input to Ground 2.5kVAC, Input to Output 3kVAC, Output to Ground 500VAC for 1 min.	
Isolation Resistance	-		>100MΩ at 25°C & 70%RH, Output to Ground 500VDC	
Vibration (non operating)	-		10 - 55Hz (1 minute sweep), 19.6m/s ² constant X, Y, Z 1 hour	
Shock	-		< 196.1 m/s ²	
Safety Agency Certification	-		UL60950-1, CSA60950-1, EN60950-1, EN50178, CE Mark	
Line Dip	-		Complies with SEMI F47 (200VAC line only)	
Conducted & Radiated EMI	-		EN55011 / EN55022, FCC VCCI Class B	
Immunity	-		IEC61000-4-2, -3, -4, -6 (Level 3), -5, -8 (Level 4), -11	
Weight (Typ)		g	1,000	1,600
Size (WxHxD)		mm	61 x 82 x 165	100 x 82 x 165
Warranty	-		Lifetime Warranty (See TDK-Lambda's terms & conditions)	

Notes: (1) 100/200VAC



Innovating Reliable Power

TDK-Lambda

Model Selector

Model	Voltage V	Adjust Range V	Max Avg. Current A	Max Avg. Power W	Peak Current A (1,2)	Max Peak Power W (1)	Overcurrent Minimum A	Overvoltage V
HWS300P-24	24V	19.2 - 26.4	12.5	300	21 / 42	504 / 1008	21.4 / 42.8	27.6 - 32.4
HWS600P-24	24V	19.2 - 26.4	25	600	40.5 / 83	972 / 1992	41.3 / 84.6	27.6 - 32.4
HWS300P-36	36V	28.8 - 39.6	8.4	302.4	14 / 28	504 / 1008	14.3 / 28.6	41.4 - 48.6
HWS600P-36	36V	28.8 - 39.6	16.7	601.2	27 / 55.5	972 / 1998	27.5 / 56.6	41.4 - 48.6
HWS300P-48	48V	38.4 - 52.8	6.3	302.4	10.5 / 21	504 / 1008	10.7 / 21.4	55.2 - 64.8
HWS600P-48	48V	38.4 - 52.8	12.5	600	20 / 41.5	960 / 1992	20.4 / 42.3	55.2 - 64.8

Notes

- (1) 100/200VAC
- (2) 200-265VAC Input, 5s maximum on time up to 35% duty cycle (see instruction manual)

Outline Drawing HWS300P

SIGNAL CONNECTOR INFORMATION

CNT PIN ASSIGN
S8B-PH05(5/1)

ACCESSORIES

- COVER FOR BARRIER TERMINAL STRIP (ATTACHED ON TERMINAL AT SHIPMENT)
- SHORT PIECE (ATTACHED ON CNT AT SHIPMENT)

SIGNAL CONNECTOR USED ==

PART DESCRIPTION	PART NAME	MANUFACT
PIN HEADER	S8B-PH05	JST

MATCHING HOUSINGS, PINS & TOOL ==

PART DESCRIPTION	PART NAME	MANUFACT
SOCKET HOUSING	PH08-08VS	JST
TERMINAL PINS	SPHD-002T-PO.5(AWG28-24) SPHD-001T-PO.5(AWG26-22)	JST
HAND CRIMPING TOOL	YRS-620(SPHD-002T-PO.5) YC-610R(SPHD-001T-PO.5)	JST

NAME PLATE DETAILS

COUNTRY OF MANUFACTURE WILL BE SHOWN HERE

Outline Drawing HWS600P

SIGNAL CONNECTOR INFORMATION

CNT PIN ASSIGN
S8B-PH05(5/1)

ACCESSORIES

- COVER FOR BARRIER TERMINAL STRIP (ATTACHED ON TERMINAL AT SHIPMENT)
- SHORT PIECE (ATTACHED ON CNT AT SHIPMENT)

SIGNAL CONNECTOR USED ==

PART DESCRIPTION	PART NAME	MANUFACT
PIN HEADER	S8B-PH05	JST

MATCHING HOUSINGS, PINS & TOOL ==

PART DESCRIPTION	PART NAME	MANUFACT
SOCKET HOUSING	PH08-08VS	JST
TERMINAL PINS	SPHD-002T-PO.5(AWG28-24) SPHD-001T-PO.5(AWG26-22)	JST
HAND CRIMPING TOOL	YRS-620(SPHD-002T-PO.5) YC-610R(SPHD-001T-PO.5)	JST

NAME PLATE DETAILS

COUNTRY OF MANUFACTURE WILL BE SHOWN HERE

NOTES

A: MODEL NAME, NOMINAL OUTPUT VOLTAGE AND MAXIMUM OUTPUT CURRENT ARE SHOWN IN THE NAME PLATE IN ACCORDANCE WITH THE SPECIFICATIONS.

B: M4 TAPPED HOLES (8) FOR CUSTOMER CHASSIS MOUNTING. (SCREW PENETRATION DEPTH 6mm MAX.)

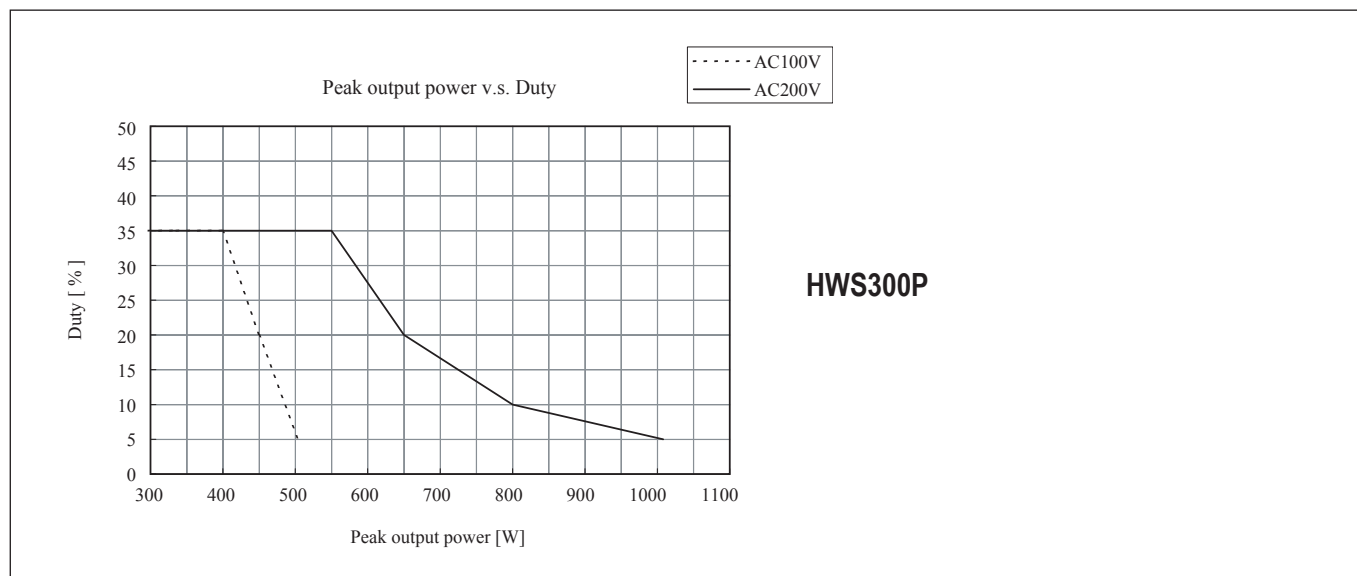
HWS300P & 600P Series



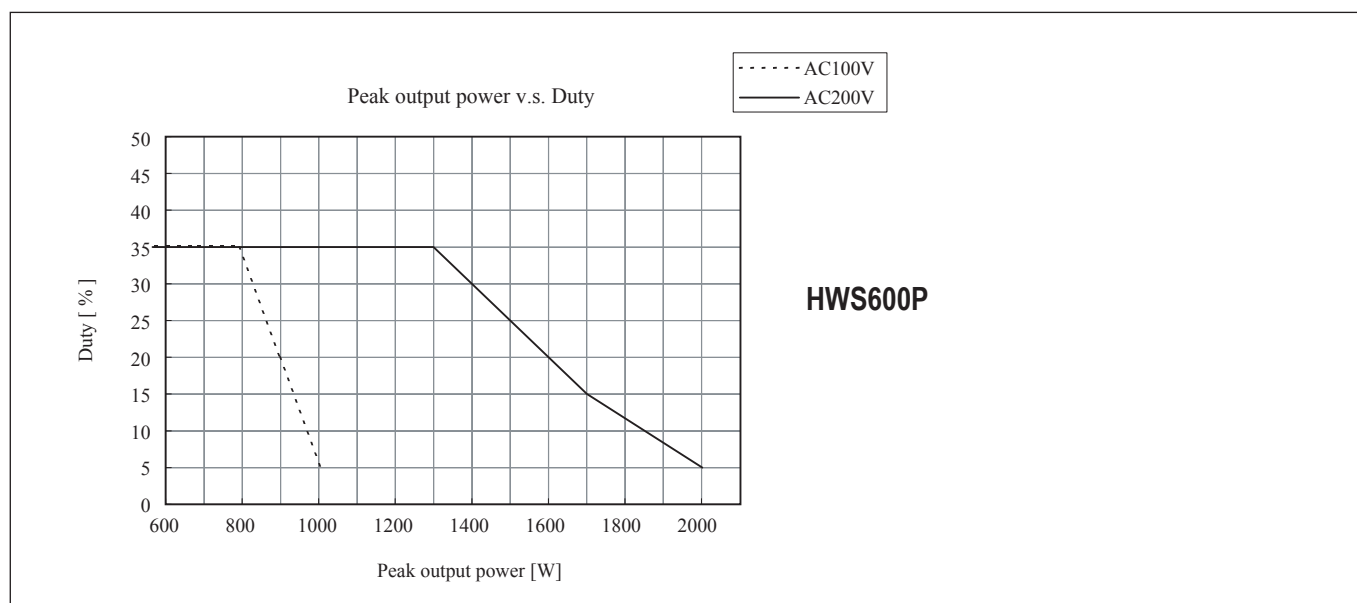
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TDK-Lambda

HWS300P Peak Output Power vs. Duty Cycle



HWS600P Peak Output Power vs. Duty Cycle



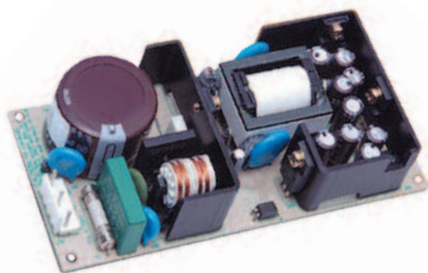
Options

Suffix	Description
Blank	HWS300-1500 cover is fitted as standard
/A	Not applicable



Innovating Reliable Power

TDK-Lambda



- 26mm height
- 3 year Warranty
- Peak Load capable
- Light weight
- Output 1 isolated from outputs 2 & 3

MTW Series

15W to 60W Low Profile Triple
Output Power Supplies

Key Market Segments & Applications

Factory Automation
Test & Measurement
Automated Service
Portable Equipment

MTW Features and Benefits

Features

- Low Profile
- Three Year Warranty
- Output 1 is isolated from outputs 2 & 3

Benefits

- Assists System Integration
- Low Cost of Ownership
- Outputs V2 & V3 can be connected in series

Specifications

ITEMS	MODELS		MTW15-51212	MTW30-51212	MTW60-51212
			MTW15-51515	MTW30-51515	MTW60-51515
Input Voltage Range		V	85 - 265VAC (47 - 440Hz)		
Input Current Typ	(1)	A	0.42 / 0.25	0.8 / 0.4	1.4 / 0.8
Inrush Current	(1)	A	25 / 50	20 / 40	20 / 40
Leakage Current (240VAC, 60Hz)		mA	0.75mA Max		
Max Output Power		W	16	30	60
			17.5	33	62.5
Efficiency (Typ)		%	71	76	76
Hold Up Time	(1)	ms	20 / 150	20 / 140	10 / 20
Output Voltage Adjustment		-	Fixed		
Overcurrent Protection		-	Yes, automatic recovery. Hiccup style on MTW30 & 60		
Overvoltage Protection		V	V1: Zener Clamp	V1: Zener Clamp	V1 & V2: Zener Clamp
Operating Temperature		-	-20°C start up. -10°C to +60°C, derating linearly to 70% load above 50°C		
Storage Temperature		-	-30°C to +75°C		
Humidity (Non condensing)		-	10 - 90%RH (Operating & storage) at 35°C		
Cooling		-	Convection		
Withstand Voltage		-	Input to ground 2kVAC, Input to output 3kVAC, Output to ground 500VAC		
Vibration (non operating)		-	5 - 10Hz: 10mm amplitude, 10 - 200Hz: 2G (19.6m/s ²)10m sweep time, 3 axis, 1 hour each		
Shock		-	Acceleration: 60G (588m/s ²) Half sine wave, 6 - 16ms pulse duration, 3x each direction		
Safety Agency Approvals		-	UL60950-1, CSA C22.2 No 60950-1 (C-UL), EN60950-1		
Immunity		-	EN61000-4-2 (Lv 4), -3, -4 (Lv 3), -5 (Lv 4), -6 (Lv 3), -8 (Lv 4), -11		
Conducted EMI		-	FCC-Class B, EN55011-B, EN55022-B		
Weight (Typ)		g	150	210	330
Size (WxHxL)		mm	50 x 26 x 127	65 x 26 x 140	83 x 26 x 185
Warranty		yrs	3		

Notes:

(1) 100/240VAC



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TDK-Lambda

Model Selector

Model	Output	Voltage (V)	Regulation	Minimum Current (A)	Maximum Current (A)	Peak Current (A)	Ripple & Noise (mV)
MTW15-51212	V1	5V	4.75 - 5.25V	0	2.0	3.0	120
	V2	12V	11.4 - 12.6V	0	0.3	0.6	150
	V3	-12V	11.4 - 12.6V	0	0.2	0.3	150
MTW15-51515	V1	5V	4.75 - 5.25V	0	2.0	3.0	120
	V2	15V	14.4 - 15.6V	0	0.3	0.6	150
	V3	-15V	14.4 - 15.6V	0	0.2	0.3	150
MTW30-51212	V1	5V	4.9 - 5.3V	0	3	4.5	120
	V2	12V	11.4 - 12.6V	0	1.2	2.0	150
	V3	-12V	11.4 - 12.6V	0	0.3	0.45	150
MTW30-51515	V1	5V	4.9 - 5.3V	0	3	4.5	120
	V2	15V	14.25 - 15.75V	0	0.8	2.0	150
	V3	-15V	14.25 - 15.75V	0	0.3	0.45	150
MTW60-51212	V1	5V	4.9 - 5.3V	0	5.0	7.0	120
	V2	12V	11.4 - 12.6V	0	2.5	3.5	150
	V3	-12V	11.4 - 12.6V	0	0.5	0.7	150
MTW60-1515	V1	5V	4.9 - 5.3V	0	5.0	7.0	120
	V2	15V	14.25 - 15.75V	0	2.0	3.5	150
	V3	-15V	14.25 - 15.75V	0	0.5	0.7	150

Mating Connectors

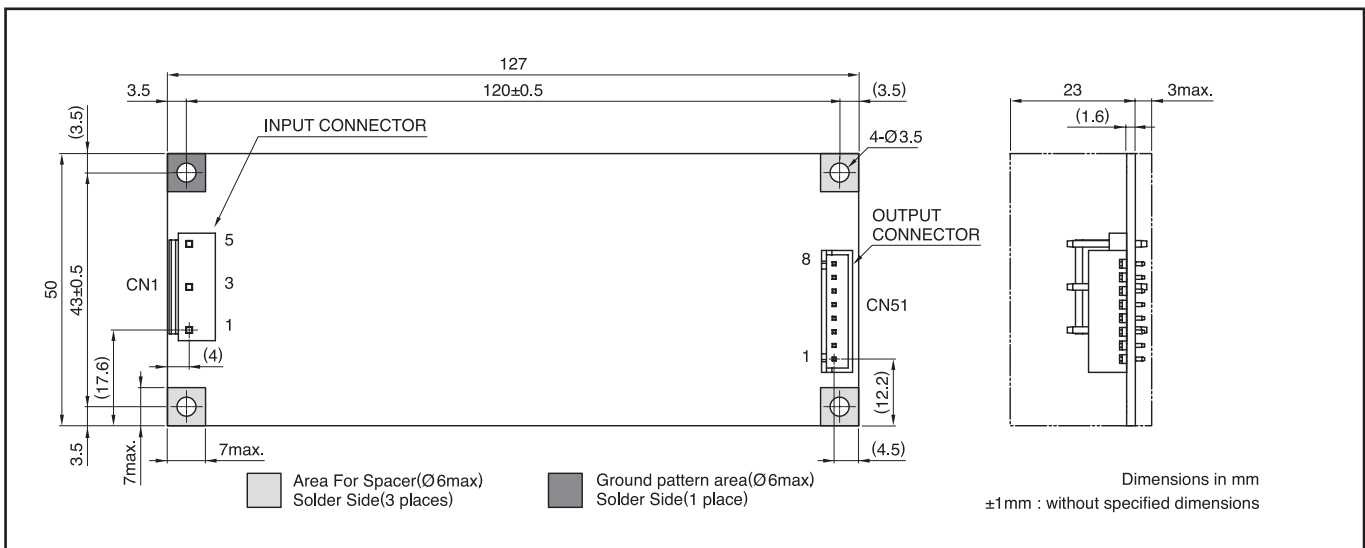
	Model	Input	Output
Connectors	MTW15	B3P5-VH-B	B8B-XH-2
JST	MTW30	B3P5-VH-B	B6P-VH-B
	MTW60	B3P5-VH-B	B8P-VH-B



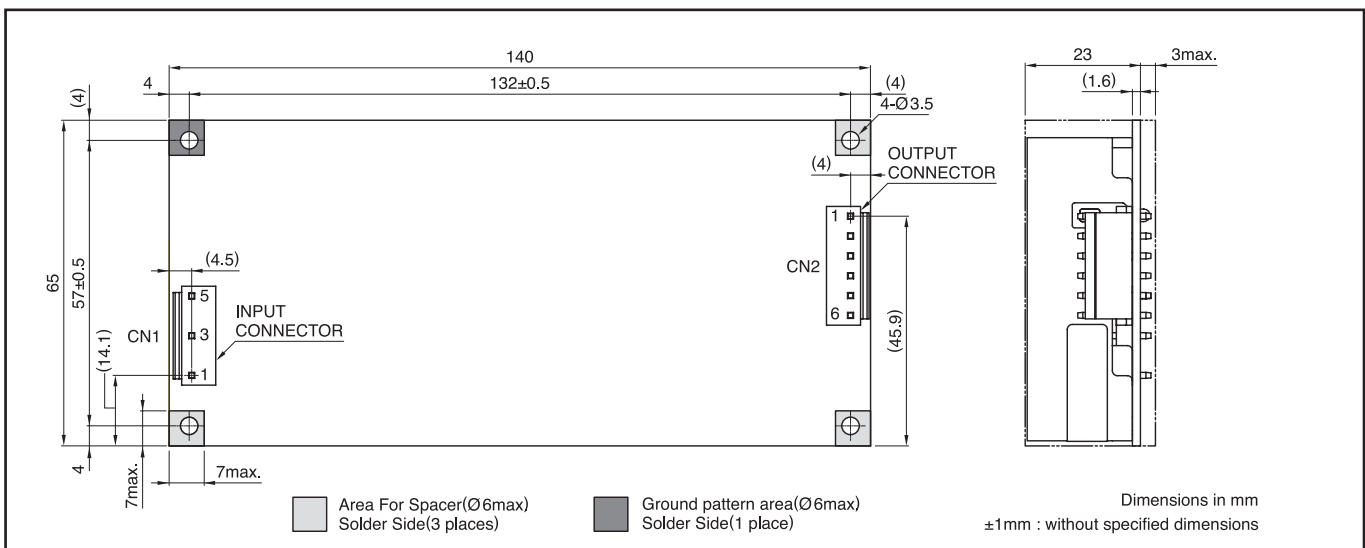
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TDK-Lambda

Outline Drawing MTW15 Series



Outline Drawing MTW30 Series





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TDK-Lambda



- 5 Year Warranty
- Ultra Thin Package
- SEMI F47 Compliant (high line AC)
- Universal Input (85 - 265VAC)
- High Efficiency

Key Market Segments & Applications

Semiconductor Fabrication
 Test & Measurement:
 LED Signs

RTW Series

Single Output Industrial
 Power Supplies

RTW Features and Benefits

Features

- 5 Year Warranty
- Ultra Thin Package
- Wide range AC Input

Benefits

- Lower Cost of Ownership
- Allows use in small spaces
- Supports global use

Specifications

MODELS		50W	100W	150W	300W
ITEMS					
Input Voltage range	(1)	85 - 265VAC (47 - 440Hz), 120-370VDC			
Input Current (100/200VAC) (Typ)	A	0.7 / 0.4	1.5 / 0.75	1.9 / 1.0	2.0 / 4.0
Inrush Current (100/200VAC)	A	14 / 28			15 / 30
Power Factor	-	Meets EN61000-3-2			
Overcurrent Protection	-	Yes, typically 105 - 125% (100 & 150W hiccup style)			
Overvoltage Protection	V	Yes, typically 120-140%. Cycle input to reset			
Hold Up Time (100/200VAC)	ms	>20			
Leakage Current (max at 240VAC)	mA	0.6	0.45	0.65	0.75
Load Regulation	%	0.4% (0-100% load change)			
Line Regulation	%	0.2% (85-132 or 170-265VAC line change)			
Remote Sense	-	Yes			
Current Share	-	No			Yes
Remote On/Off	-	Yes, see instruction manual on website			
DC Fail Signal	-	No			Yes
Indicator	-	Green LED = ON			
Operating Temperature	-	-10°C to +71°C, -20°C start up. See derating curves on sheet 2			
Storage Temperature	°C	-30°C to +75°C			
Humidity (non condensing)	-	10 - 95%RH			
Cooling	-	Convection			
Withstand Voltage	-	Input to Ground 2kVAC, Input to Output 3kVAC, Output to Ground 500VAC for 1 min.			
Isolation Resistance	-	>100MΩ at 25°C & 70%RH, Output to Ground 500VDC			
Vibration (non operating)	-	5 - 200Hz (10 min sweep), 19.6m/s ² , 1 hour (Amplitude 10mm)			
Shock (Vertical mounting)	-	392m/s ²	196m/s ²	588m/s ²	
Safety Agency Approvals	-	UL60950-1, CSA60950-1 (cUL), EN60950-1, CE Mark			
Line Dip	-	Complies with SEMI F47 (200VAC line only)			
Conducted & Radiated EMI	-	EN55011 / EN55022-B, FCC-B			
Immunity	-	IEC61000-4-2 (Level 4), -3, -4 (Level 3), -5 (Level 4)			
Weight (Typ)	g	290	450	600	1300
Size (WxHxD)	mm	22 x 82 x 124	25 x 82 x 160	30 x 92 x 180	40 x 120 x 250
Warranty	yrs	5			

Notes: (1) Safety approvals do not cover DC input



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TDK-Lambda

Model Selector

Model	Voltage (V)	Adjustment Range	Max Current (A)	Max Power (W)	Ripple/Noise (mV)	Efficiency (typ)% ²	Pack Size
RTW03-12R	3.3V	2.6 - 4.0	12.5	41.2	120	75 / 77	50W
RTW03-25R	3.3V	2.6 - 4.0	25	82.5	120	79 / 81	100W
RTW03-35R	3.3V	2.6 - 4.0	35	115.5	120	80 / 83	150W
RTW03-70RH	3.3V	1.8 - 3.6	70	231	120	83 / 86	300W
RTW05-10R	5V	4.0 - 5.8	10	50	120	80 / 82	50W
RTW05-20R	5V	4.0 - 5.8	20	100	120	83 / 85	100W
RTW05-30R	5V	4.0 - 5.8	30	150	120	83 / 86	150W
RTW05-60RH	5V	3.5 - 5.6	60	300	120	84 / 87	300W
RTW12-4R3	12V	9.6 - 13.2	4.3	51.6	150	81 / 83	50W
RTW12-8R4	12V	9.6 - 13.2	8.4	100.8	150	84 / 86	100W
RTW12-12R	12V	9.6 - 13.2	12.5	150	150	84 / 87	150W
RTW12-25RH	12V	7.2 - 14.4	25	300	150	83 / 86	300W
RTW15-3R5	15V	12.0 - 16.5	3.5	52.5	150	82 / 85	50W
RTW15-6R7	15V	12.0 - 16.5	6.7	100.5	150	85 / 87	100W
RTW15-10R	15V	12.0 - 16.5	10	150	150	84 / 87	150W
RTW15-20RH	15V	10.5 - 18.0	20	300	150	83 / 86	300W
RTW24-2R2	24V	19.2 - 26.4	2.2	52.8	200	82 / 85	50W
RTW24-4R2	24V	19.2 - 26.4	4.2	100.8	200	85 / 87	100W
RTW24-6R3	24V	19.2 - 26.4	6.3	151.2	150	86 / 88	150W
RTW24-13RH	24V	16.8 - 26.4	13	312	200	85 / 88	300W
RTW28-1R8	28V	22.4 - 30.8	1.8	50.4	200	82 / 85	50W
RTW28-3R6	28V	22.4 - 30.8	3.6	100.8	200	85 / 87	100W
RTW28-5R4	28V	22.4 - 30.8	5.4	151.2	200	86 / 88	150W
RTW28-11RH	28V	19.6 - 33.6	11	308	200	85 / 88	300W
RTW48-1R1	48V	38.4 - 52.8	1.1	52.8	300	82 / 85	50W
RTW48-2R1	48V	38.4 - 52.8	2.1	100.8	300	85 / 88	100W
RTW48-3R2	48V	38.4 - 52.8	3.2	153.6	200	86 / 89	150W
RTW48-6R5H	48V	33.6 - 55.0	6.5	312	300	86 / 89	300W

Notes: (2) 100/200VAC See website technical downloads for detailed information

Options

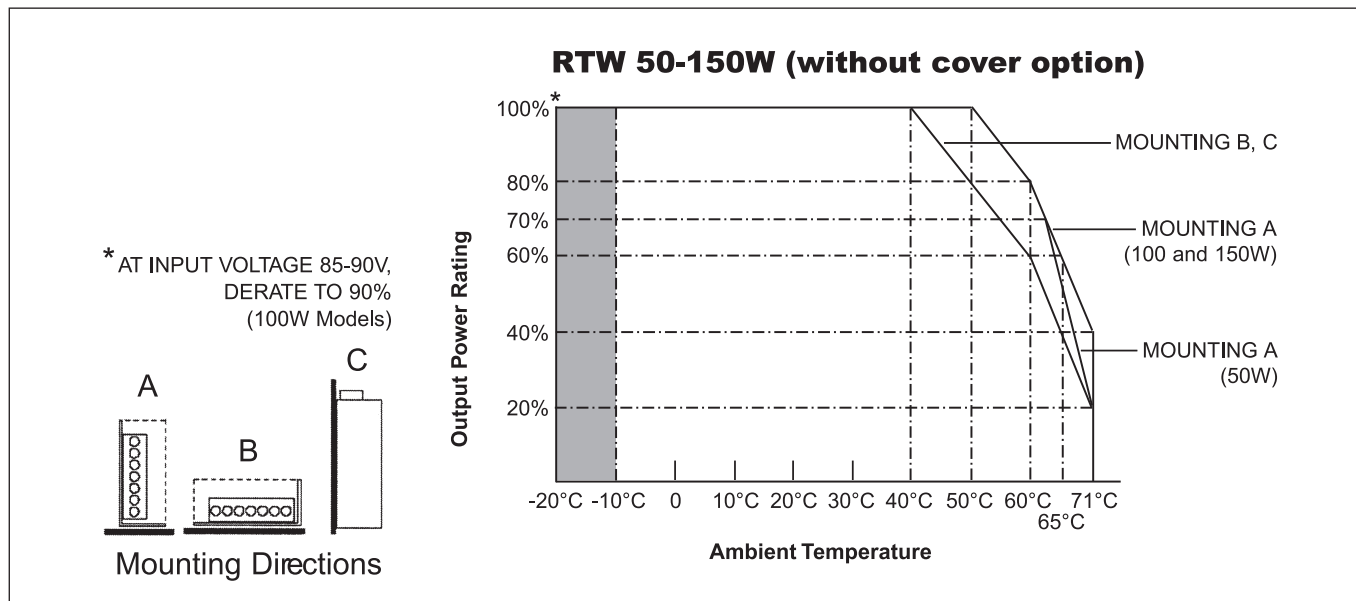
Suffix	Description
L	Vertical Terminal Block (option for 50W & 100W models only)
C	Cover (50W, 100W & 150W models)
H	Cover (300W models)



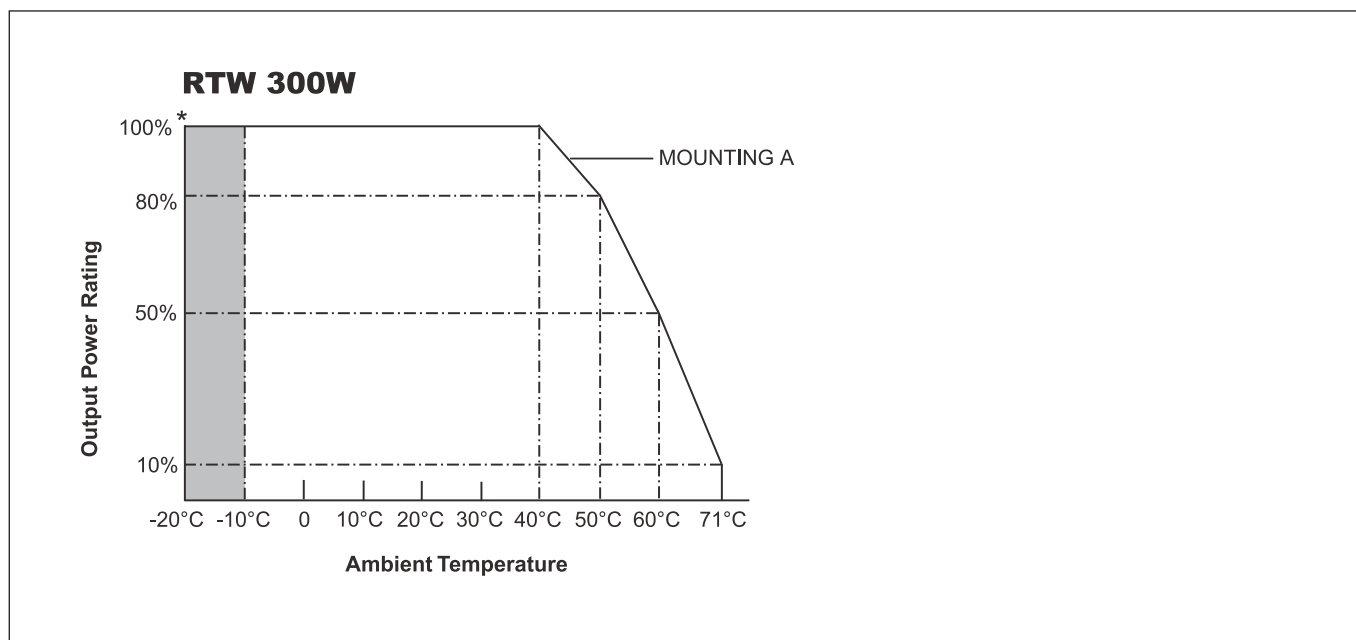
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Derating Curves RTW50-150W Series



Derating Curve RTW 300W Series





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SWS300A&600 Series

Single Output

General Purpose Power Supplies

- Low Cost
- Active Power Factor Correction
- Input Transient Protected IEC61000-4
- Enclosed

Key Market Segments & Applications

Factory Automation	Process Control, NC-Machining, Automotive, Packaging Equipment, Materials Handling, Chemical Processing, Robots
Test & Measurement	Burn-in & Test, Automated, Detection Test, Instrumentation, Measurement
Automated Service	Vending Machines, Elevators, Video Gaming, Point of Sale Equipment

SWS300A&600 Features and Benefits

Features

- Meets IEC61000-4
- Global Safety Approvals
- Power Factor Corrected
- Level B EMI

Benefits

- Greater Reliability
- Supports Global Use
- Assists System Compliance

Specifications

MODEL		SWS300A	SWS600
ITEMS			
Input Voltage range (1)	-	85 - 265VAC (47 - 63Hz) or 120 - 370VDC	
Inrush Current (115 / 230VAC)	A	20 / 40	
Power Factor	-	Meets EN61000-3-2	
Input Current (100/200VAC)	A	3.6 / 1.8 (3.3V: 2.5/1.3, 4V:2.8/1.4, 5V: 3.2/1.6)	7.2 / 3.6 (3.3V: 4.3/2.2, 5V: 6.6/3.3)
Temperature Coefficient	-	<0.02%/°C	
Overcurrent Protection	-	>105%, Constant current style	
Overvoltage Protection	V	3.3V: 4.1-5.3V, 4V: 5.0-6.0V, 5V: 6.25-7.5V, 7.5V: 9.4-11.2V, 12V: 13.8-16.8V 15V: 19.3-24.2V, 24V: 30-34.8V, 28V: 35-40.6V, 36V: 41.4-50.4V, 48V: 60-69.6V	
Overtemperature Protection	-	Yes, cycle AC to reset	
Hold Up Time (Typ)	ms	20ms at 115/230VAC	
Leakage Current (max)	mA	0.75	1.5
Remote Sense	-	None	Yes
Parallel Connection	-	None	Yes
Remote On/Off	-	None	Yes
DC Good Signal	-	None	Yes, open collector output
LED Indicator	-	Green LED = On	
Operating Temperature	°C	-10°C to +65°C (See table for derating - model specific)	
Storage Temperature	°C	-30°C to +85°C	
Operating Humidity	%RH	30 - 90 (non condensing)	
Storage Humidity	%RH	10 - 95 (non condensing)	
Cooling	-	Internal fan	
Withstand Voltage	-	I/P to Gnd 2kVAC, I/P to O/P 3kVAC, O/P to Gnd 500VAC, (O/P to CNT 100VAC for 1 min SWS600)	
Isolation Resistance	-	>100MΩ at 25°C & 70%RH, Output to Ground 500VDC	
Vibration (non operating)	-	10 - 55Hz (sweep for 1 min)19.6m/s ² constant X, Y, Z 1 hour each plane)	
Immunity	-	EN61000-4-2, -3, -4, -5, -6, -8, -11	
Safety Agency Approvals	-	UL60950-1, CSA60950-1, EN60950-1, EN50178, CE Mark	
Conducted & Radiated EMI	-	EN55011 / EN55022-B, FCC Class B	
Weight (Typ)	g	950	2000
Size (WxHxD)	mm	52 x 102 x 198	92 x 120 x 190
Warranty	yrs	2	

Notes: (1) Derate linearly to 85% load from 115VAC to 85VAC input (derate to 90% load for SWS600-5)



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Model Selector							
Model	Voltage	Adjust Range (V)	Max Current (A)	Load Reg mV	Line Reg mV	Ripple Noise mV	Eff. (3) (typ)%
SWS300A-3	3.3	2.97-3.96	55	40	20	120	69/72
SWS300A-4	4	3.6-4.8	55	40	20	120	72/75
SWS300A-5	5	4.6-6.0	55	40	20	120	75/78
SWS300A-7R5	7.5	6.0-9.0	40	60	30	120	77/80
SWS300A-12	12	9.6-13.2	26	96	48	120	79/83
SWS300A-15	15	13.2-18.6	21	120	48	120	80/84
SWS300A-24	24	20-28.8	13	120	48	150	82/85
SWS300A-28	28	22.4-33.6	11	140	56	150	83/86
SWS300A-36	36	28.8-40	8.8	180	72	200	83/87
SWS300A-48	48	40-57.6	6.7	240	96	240	83/86
SWS600-3	3.3	2.97-3.96	100 (2)	40	20	100	69/71
SWS600-5	5	4.5-6	100 (2)	40	20	100	74/77
SWS600-12	12	9.6-13.2	50	96	48	120	78/81
SWS600-15	15	13.2-18.6	40	120	48	120	80/83
SWS600-24	24	20-28.8	25	120	48	150	81/84
SWS600-36	36	28.8-40	16.7	180	72	200	81/85
SWS600-48	48	40-57.6	12.5	240	96	240	82/85

Notes: (2) Peak rating of 120A for 10s (3) 115/230VAC

Derating				
Model	50°C	55°C	60°C	65°C
SWS300A	100%	91.6%	83.3%	50%
SWS600	100%	85%	70%	55%

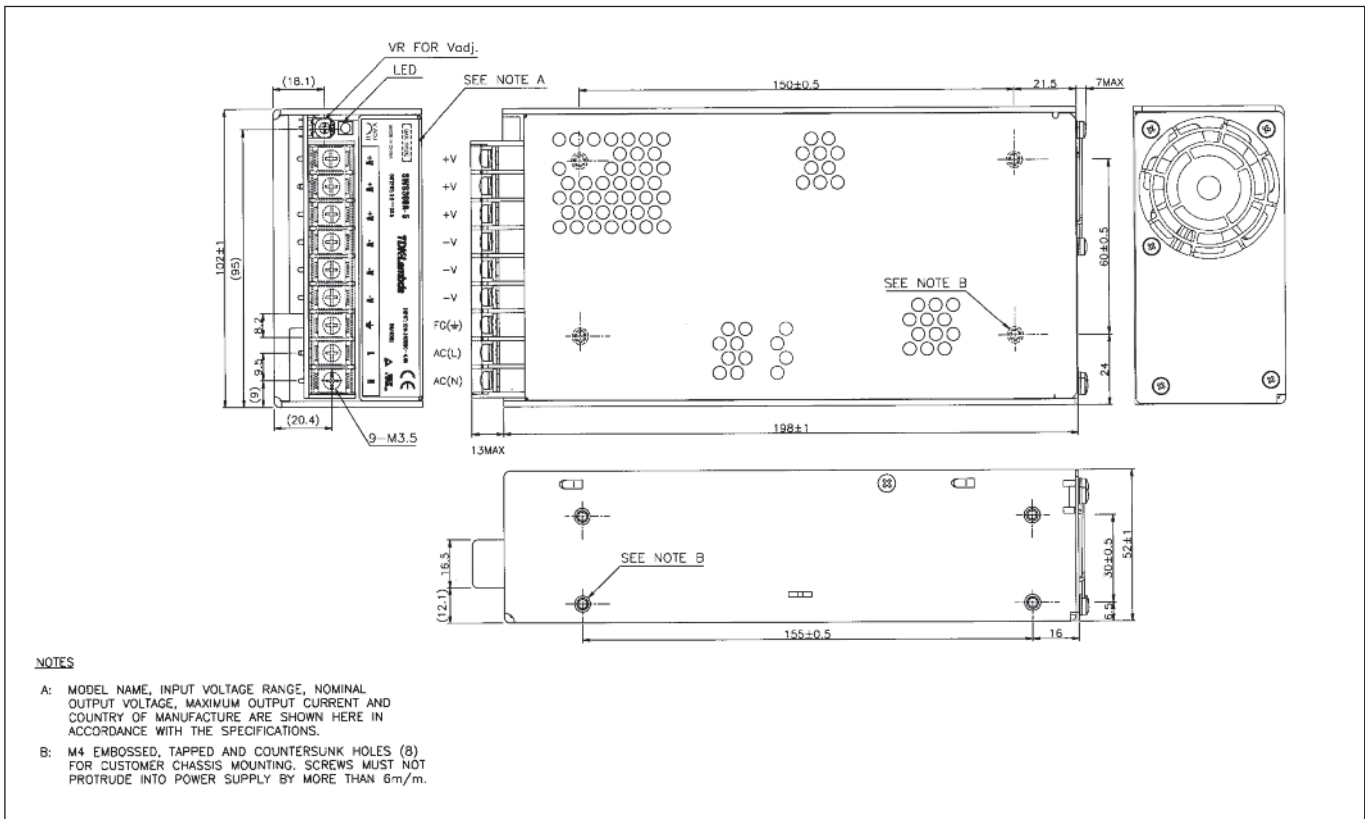
Additional derating required when operating SWS600 with side ventilation holes blocked
See installation manual.



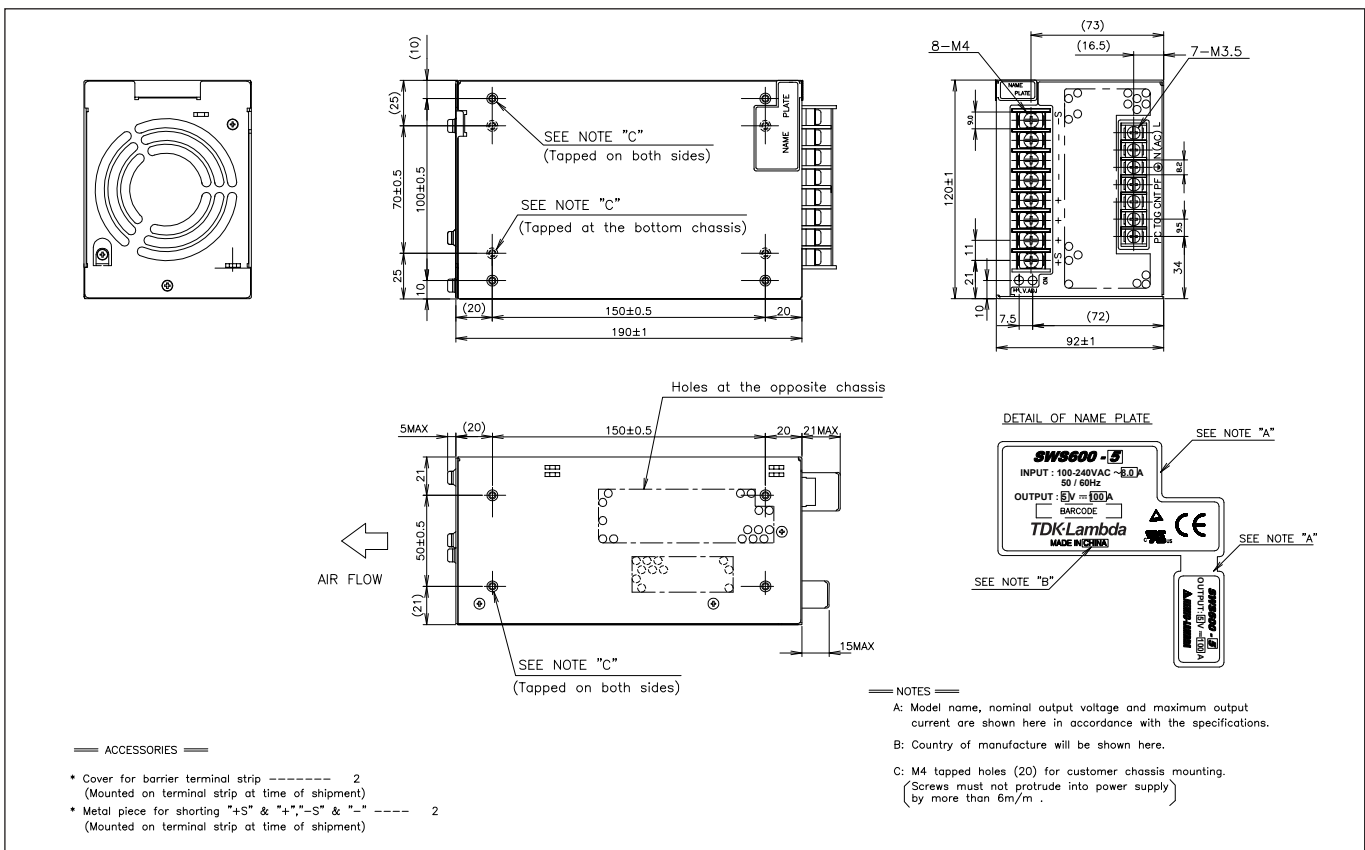
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Outline Drawing SWS300A Series



Outline Drawing SWS600 Series





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TDK-Lambda



- Quiet Temperature Controlled Fan
- Low Cost
- Low Profile
- Wide Operating Temperature Range
- Active Power Factor Correction
- Medical Approvals (SWS1000L)

SWS600/1000L Series

600W and 1000W Low Profile Single Output Power Supplies

SWS600/1000L Features and Benefits

Features

- Temperature Controlled Fan
- Global safety Approvals
- Wide Temperature Range
- Level B EMI

Benefits

- Low Acoustic Noise
- Supports Global Use
- Suitable for Outdoor Temperature Extremes
- Assists System Compliance

Specifications

MODEL		SWS600L	SWS1000L
ITEMS			
Input Voltage range	-	85 - 265VAC (47 - 63Hz) or 120 - 350VDC	
Inrush Current (115 / 230VAC)	A	20 / 40	
Power Factor	-	Meets EN61000-3-2 Class A	
Input Current (100/200VAC)	A	7.1 / 3.6 (3.3V : 5/2.5)	12/6 (3.3V : 8/4)
Temperature Coefficient	-	<0.02%/°C	
Overcurrent Protection	-	>105%, Constant current style	
Overvoltage Protection	V	125% -145%	
Over temperature Protection	-	Yes, cycle AC or Remote On/Off to reset	
Hold Up Time (Typ)	ms	20ms at 115/230VAC	
Leakage Current (max)	mA	<0.75mA	<0.3mA
Remote Sense	-	Yes	
Parallel Connection	-	Yes	
Remote On/Off (CNT)	-	Yes	
Voltage Programming	-	Yes, 1-6V adjusts output from 20 - 120% of nominal	
DC Good & Fan Fail Signal	-	Yes, open collector output	
Auxiliary Output	-	12V 0.1A	
LED Indicator	-	Green LED = On	
Operating Temperature	-	-40°C start up. -20°C to 74°C, derating linearly to 50% load above 50°C	
Storage Temperature	-	-40°C to +85°C	
Humidity (non condensing)	-	20 - 90% RH operating, 10 - 95%RH non operating	
Cooling	-	Internal fan	
Withstand Voltage(One minute)	-	Input to Ground 2kVAC, Input to Output 3kVAC, Output to Ground 500VAC, Output to CNT 100VAC	Input to Ground 2kVAC, Input to Output 4kVAC, Output to Ground 500VAC, Output to CNT 120VAC
Isolation Resistance	-	>50MΩ at 25°C & 70%RH, Output to Ground 500VDC	
Vibration (non operating)	-	MIL-STD-810F 514.5 CAT. 4, 10	
Shock (in packaging)	-	MIL-STD-810F 516.5 Procedure 1, V1	
Immunity	-	EN61000-4-2, -3, -4, -5, -6, -8, -11	
Safety Agency Approvals	-	UL, CSA, EN60950-1, EN/UL60601-1 (1000W only), IEC61010-1 (600W only), EN50178, CE Mark	
Conducted & Radiated EMI	-	EN55011 / EN55022-B, FCC Class B	
Weight (Typ)	g	1600	2300
Size (WxHxD)	mm	61 x 120 x 190	61 x 150 x 240
Warranty	yrs	3	



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TDK-Lambda

Note: (Numbers in brackets indicate peak current and power available at 170 - 265VAC Input, 10s max, 35% duty cycle)

Model Selector								
Model	Voltage (V)	Adjust Range (via Trim Pot)	Max Curr. (A)	Max Pwr (W)	Load Reg (mV)	Line Reg (mV)	Ripple Noise (mV)	Eff. ⁽¹⁾ (typ)%
SWS600L-3	3.3V	2.64 - 3.96V	120	396	30	20	120	70 / 72
SWS1000L-3	3.3V	2.64 - 3.96V	200	660	30	20	120	74 / 76
SWS600L-5	5V	4 - 6V	120	600	30	20	120	75 / 77
SWS1000L-5	5V	4 - 6V	200	1000	30	20	120	79 / 81
SWS600L-12	12V	9.6 - 14.4V	53	636	72	48	150	79 / 82
SWS1000L-12	12V	9.6 - 14.4V	88	1056	72	48	150	82 / 84
SWS600L-15	15V	12 - 19.5V	43	645	90	60	150	79 / 82
SWS1000L-15	15V	12 - 19.5V	70	1050	90	60	150	82 / 84
SWS600L-24	24V	19.2 - 28.8V	27 (31)	648 (744)	144	96	150	81 / 84
SWS1000L-24	24V	19.2 - 28.8V	44 (51)	1056 (1224)	144	96	150	84 / 86
SWS600L-36	36V	28.8 - 43.2V	18	648	216	144	200	82 / 84
SWS1000L-36	36V	28.8 - 43.2V	29	1044	216	144	200	84 / 86
SWS600L-48	48V	38.4 - 56V	13 (15)	624 (720)	288	192	200	82 / 84
SWS1000L-48	48V	38.4 - 56V	22 (25)	1056 (1200)	288	192	200	84 / 86
SWS600L-60	60V	48 - 66V	10	600	360	240	200	82 / 84
SWS1000L-60	60V	48 - 66V	17	1020	360	240	200	84 / 86



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TDK-Lambda

Outline Drawing SWS600L Series

SIGNAL CONNECTOR INFORMATION
PIN CONFIGURATION AND FUNCTIONS OF CN1,CN2

PIN No.	FUNCTION
1	+V _{in} : +OUTPUT VOLTAGE MONITOR
2	+S : +SENSING
3	-V _{in} : -OUTPUT VOLTAGE MONITOR
4	-S : -SENSING
5	N.C. : NO CONNECTION
6	PC : CURRENT BALANCE
7	PV : ADJUSTMENT OF OUTPUT VOLTAGE
8	COM : GROUND FOR PC AND PV SIGNAL
9	CNT1 : REMOTE ON/OFF
10	TOG : REMOTE ON/OFF GROUND

PIN CONFIGURATION AND FUNCTIONS OF CN3

PIN No.	FUNCTION
1	COM : GROUND FOR PC AND PV SIGNAL
2	COM : GROUND FOR PC AND PV SIGNAL
3	AUX : AUXILIARY OUTPUT (12V 0.1A)
4	CNT1 : REMOTE ON/OFF
5	G2 : GROUND FOR AUX AND CNT1
6	G2 : GROUND FOR AUX AND CNT1
7	ALM : ALARM
8	G1 : ALARM GROUND

PIN CONFIGURATION AND FUNCTIONS OF CN1

PIN No.	FUNCTION		
1	3	5	7
2	4	6	8
3	5	7	9
4	6	8	10

SIGNAL CONNECTOR USED

PART DESCRIPTION	PART NAME	MANUFACT
PIN HEADER	S10B-PH0SS (CN1,CN2) S8B-PH0SS (CN3)	JST

MATCHING HOUSINGS, PIN & TOOL

PART DESCRIPTION	PART NAME	MANUFACT
SOCKET HOUSING	PHDR-10VS (CN1,CN2) PHDR-8VS (CN3)	JST
TERMINAL PINS	SPHD-002T-P05(AWG28~24) SPHD-001T-P05(AWG26~24)	JST
HAND CRIMPING TOOL	YRS-620(SPHD-002T-P0.5) YC-610R(SPHD-001T-P0.5)	JST

NOTE:

- MODEL NAME, INPUT VOLTAGE RANGE, NOMINAL OUTPUT VOLTAGE, NOMINAL OUTPUT CURRENT AND PEAK OUTPUT CURRENT ARE SHOWN ON THE NAME PLATE IN ACCORDANCE WITH THE SPECIFICATIONS
- COUNTRY OF MANUFACTURE IS SHOWN ON THE NAME PLATE IN ACCORDANCE WITH THE SPECIFICATIONS
- M4 TAPPED HOLES (12) FOR CUSTOMER CHASSIS MOUNTING (SCREW PENETRATION DEPTH 6m/m MAX.)
- RECOMMENDED SCREW TORQUE OUTPUT TERMINAL(M5 SCREW) = 2.5N·m
INPUT TERMINAL(M4 SCREW) = 1.27N·m

Outline Drawing SWS1000L Series

SIGNAL CONNECTOR INFORMATION

CN1,CN2 PIN ASSIGNMENT
S10B-PH0SS (LIST)

CN3 PIN ASSIGNMENT
S8B-PH0SS (LIST)

== ACCESSORIES ==

- SHORT PIECE -----1
- SHORTING +V_{in} - +S, -V_{in} - -S (ATTACHED ON CN1 AT SHIPMENT)

== SIGNAL CONNECTOR USED ==

PART DESCRIPTION	PART NAME	MANUFACT
PIN HEADER (CN1 & CN2)	S10B-PH0SS	JST
PIN HEADER (CN3)	S8B-PH0SS	JST

== MATCHING HOUSINGS, PINS & TOOL ==

PART DESCRIPTION	PART NAME	MANUFACT
SOCKET HOUSING (CN1 & CN2)	PHDR-10VS	JST
SOCKET HOUSING (CN3)	PHDR-8VS	JST
TERMINAL PINS	SPHD-002T-P0.5(AWG28~24) SPHD-001T-P0.5(AWG26~24)	JST
HAND CRIMPING TOOL	YRS-620(SPHD-002T-P0.5) YC-610R(SPHD-001T-P0.5)	JST

== NAME PLATE ==

SEE NOTE A

SEE NOTE B

== NOTES ==

- MODEL NAME, INPUT VOLTAGE RANGE, NOMINAL OUTPUT VOLTAGE, NOMINAL OUTPUT CURRENT AND PEAK OUTPUT CURRENT ARE ON NAME PLATE IN ACCORDANCE WITH THE SPECIFICATIONS.
- COUNTRY OF MANUFACTURE IS SHOWN HERE.
- M4 TAPPED HOLES (12) FOR CUSTOMER CHASSIS MOUNTING. (SCREW PENETRATION DEPTH 6m/m MAX.)



Innovating Reliable Power

TDK-Lambda



- 1U high
- Optional Internal ORing Diodes
- Current Share

RFE Series

1000W 1U Front End Power Supplies

RFE Features and Benefits

Features

1U high
Internal ORing diode option
Current Share
Full array of signals

Benefits

Utilizes less system space
Suitable for N+1 redundancy
Can be paralleled for higher power
Easier system monitoring

Specifications

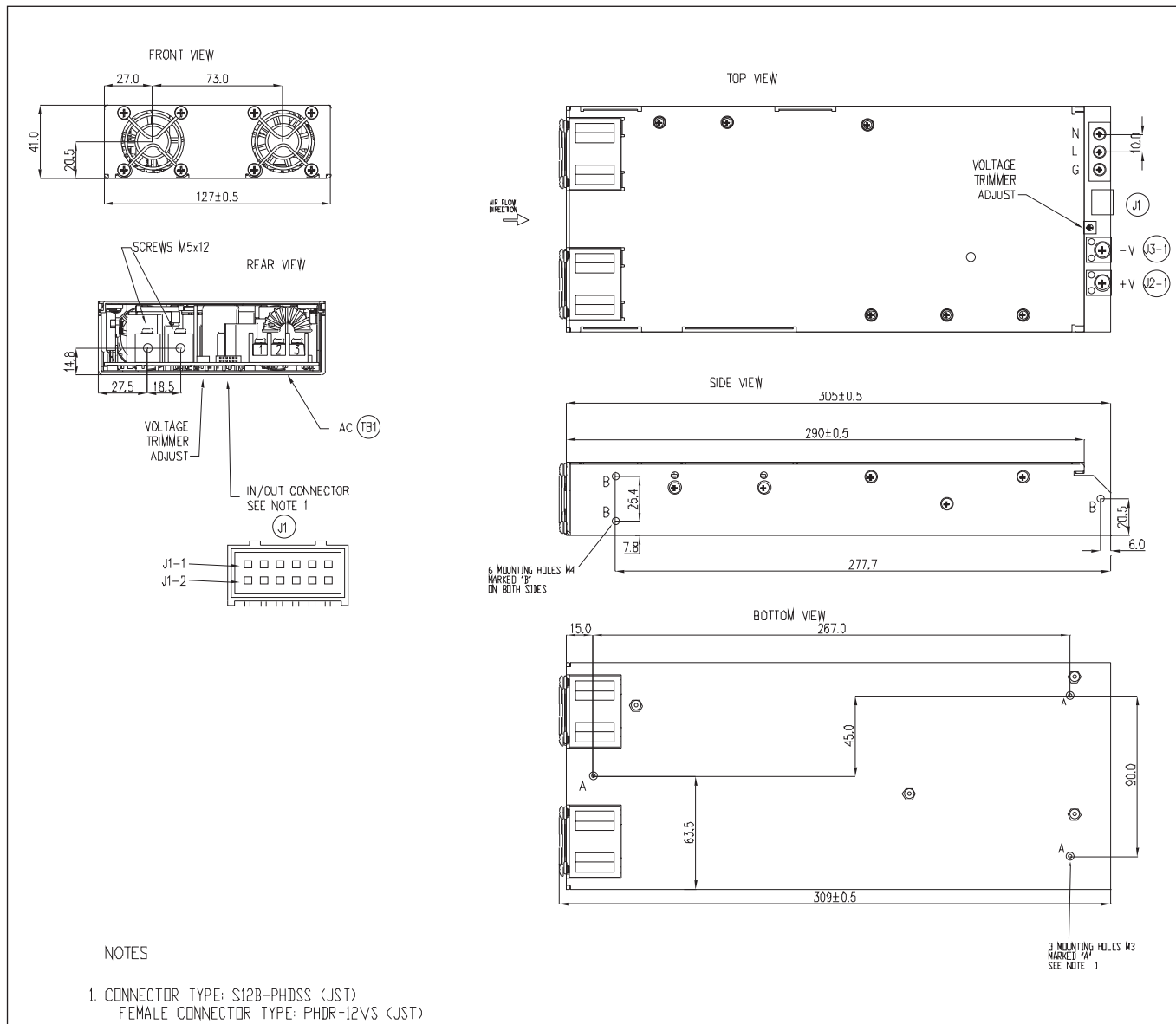
MODEL		RFE1000-24	RFE1000-32	RFE1000-48
ITEMS				
Nominal Output Voltage	V	24V	32V	48V
Output Voltage Range (front panel)	V	21.5 - 29V	28.8 - 38.4V	43 - 58V
Output Current	A	40A	31A	21A
Output Power	W	960W	992W	1008W
Line Regulation	mV	96mV	128mV	192mV
Load Regulation	mV	192mV	256mV	384mV
Output Noise	mV	200mV	250mV	300mV
Overvoltage Protection (Latching)	V	31 to 34V	41.5 to 45.5V	62 to 66V
Overcurrent Protection	%	105 - 125%, Non foldback type		
Overtemperature	-	Yes, automatic reset		
Series Operation	-	Up to 3 units may be connected in series		
Current share	-	Single wire current sharing, up to 8 units		
Remote Sense	-	Compensates for up to 1V on each load wire		
Signals (opto isolated)	-	DC OK, AC Fail, and Overtemperature warning, high on fail		
Remote On/Off	-	On: 0 - 0.6V or short, Off: 2- 15V or open		
Auxiliary Output	-	12V 0.25A bias voltage, (11.2 to 12.5V). Built in ORing diode		
AC Input Range	-	85 - 265VAC, 47 - 63Hz		
AC Input Current (100/200VAC)	A	12 / 6A		
Leakage Current	mA	<1.1mA at 230VAC input		
Inrush Current	A	<40A		
Hold up time (100VAC input)	ms	20ms typical		
Efficiency (typical) 100/200VAC	%	86 / 88%	86 / 88%	87 / 89%
Power factor Correction	-	EN61000-3-2 class A (20-100% load), >0.98 at full load		
Immunity	-	EN61000-4-2, -3, -4, -5, -6, -11		
EMC (conducted and radiated)	-	EN55022, level B, FCC part 15J-B		
Operating Temperature	-	0°C to +70°C, derate 2%/°C from 50°C to 60°C, 2.5%/°C from 60°C to 70°C		
Storage Temperature	°C	-30°C to +85°C		
Withstand Voltage	-	Input to Output 3kVAC, Input to Output 2kVAC, Output to Ground 500VAC for 1 min.		
Isolation Resistance	-	>100MΩ at 25°C & 70%RH, Output to Ground 500VDC		
Cooling	-	Two variable speed internal fans, airflow exits across input/output		
Humidity	-	Operating: 10 - 90% RH, Storage: 10 - 95% RH (non condensing)		
Shock & Vibration	-	Meets ETS 300 019		
Safety Agency	-	UL60950-1, EN60950-1, CE Mark		
Input / Output Connector	-	Input: Screw terminals, Output: M5x12 screws, Signals: Mating connector JST PHDR-12VS		
Output indicator	-	Green LED DC OK		
Size (L x W x H)	mm	305 x 127 x 41		
Weight	g	2000		
Warranty	yrs	2		



Innovating Reliable Power

TDK-Lambda

Outline Drawing RFE Series



NOTES

- CONNECTOR TYPE: S12B-PHDSS (JST)
FEMALE CONNECTOR TYPE: PHDR-12VS (JST)
- LED INDICATORS REFER TO INSTRUCTION MANUAL.
- MOUNTING SCREWS MUST NOT PENETRATE MORE THAN 3mm INTO THE UNIT.
- MODEL NAME, INPUT AND OUTPUT RATING AND SAFETY APPROVALS SYMBOLS ARE DESCRIBED ON TOP SURFACE LABEL.
- ALLOW MINIMUM 50 mm OF UNRESTRICTED AIR SPACE AT THE REAR OF UNIT. DO NOT OBSTRUCT AIR FLOW TO THE UNIT FRONT PANEL.
- IN OUT CONNECTOR BACK VIEW AND PINS ASSIGNMENT:

Options	
Suffix	Description
-Y	O Ring output diode

PIN.No.	FUNCTION
J1-3	+V
J1-10	-V
J1-6	ON/OFF
J1-1	+SENSE
J1-7	CURRENT SHARE
J1-9	CURRENT SHARE

PIN.No.	FUNCTION
J1-5	DC_OK
J1-11	SIGNAL_RTN
J1-12	AC_FAIL
J1-8	TEMP_ALARM
J1-2	-SENSE
J1-4	+12V AUX

PIN.No.	FUNCTION
TB1-1	AC GROUND
TB1-2	AC LINE
TB1-3	AC NEUTRAL



Innovating Reliable Power

TDK-Lambda



CPFE500F

500 Watts, single output, AC-DC,
Conduction/Baseplate cooled power supply

- Universal Input
- Baseplate cooled
- No fan required
- High Efficiency
- Protective coating
- No minimum load
- 2 Year Warranty

Key Market Segments & Applications

- Outdoor Electronics
- LED Signage
- COTS
- Rugged environments
- Quiet/Silent Applications

Features and Benefits

Features

- Fanless
- Baseplate cooled
- Wide range ac input
- Diode ORing + share option

Benefits

- Longer field life and no fan noise
- Conducts heat outside of the system
- Supports global use
- Increases system reliability

INPUT			
Input Voltage	90 - 265Vac	Input Frequency	47 - 63Hz (440Hz with reduced PFC - consult factory)
Input Harmonics	EN61000-3-2 compliant	Power Factor	0.95 typical
Input Fuse	Fast acting (not user accessible)	Inrush Current	<40A at 25°C and 230Vac, (cold start) (meets EN61000-3-3)
Earth Leakage Current	1.5mA at 230Vac (50Hz)		

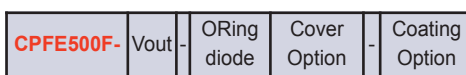
QUICK SELECTOR (Standard models). Additional variants available - contact sales office

Output Voltage	Max Output current	ORing diode?	Units with cover	
			Description	Order Code
12V	42A	Yes	CPFE500F-12-DL-C	T800097
		No	CPFE500F-12-NL-C	T800100
24V	18A	Yes	CPFE500F-24-DL-C	T800111
		No	CPFE500F-24-NL-C	T800122
28V	18A	Yes	CPFE500F-28-DL-C	T800133
		No	CPFE500F-28-NL-C	T800144
48V	10.5A	Yes	CPFE500F-48-DL-C	T800155
		No	CPFE500F-48-NL-C	T800166

HOW TO CREATE A PRODUCT CODE

Output	Adjustment Range	Maximum Current
12	9.6 - 14.4V	42A
24	22.4 - 33.6V	18A
28	22.4 - 33.6V	18A
48	38.4 - 57.6V	10.5A

ORing diode Option	
N	No ORing diode
D	ORing diode included Note:- Reduces maximum output Voltage by 1V



Coating Option	
C	Protective coating applied

Cover Option	
L	supplied with cover fitted

Confirm availability of created product code with the factory



Innovating Reliable Power

TDK-Lambda

ISOLATION			
Input to Output	Reinforced	4.24kV (dc)	
Input to Earth	Basic	2.12 kV (dc)	Output to Earth 500 Vdc

OUTPUT SPECIFICATION		
Output Power	504W	Continuous. Do not exceed maximum output current in 'How to Create a Product Code'.
Total Regulation	better than 4%	Including Line (for 90-264Vac input change), Load (for 0-100% load change) and temperature (0-50°C). The ORing diode option adds 1V to the load regulation specification.
Ripple & Noise	1%	pk-pk, using EIAJ test method & 20MHz bandwidth (1.5% below -10°C)
Voltage Setting Accuracy	±2%	at 50% load
Turn on time	1.5s	at 90Vac and 100% of rated output power.
Efficiency	85%	typical (at 75% load, without ORing diode).
Hold up	10ms	typical at 230 Vac, 100% load
Min Load	None	
Transient Response	<10%	of set voltage for 50% load change (in 50µs within the range 25 - 100% load)
Recovery	<0.5ms	for recovery to 2% of set voltage
Short circuit protection	Yes	Auto recovery after removal of short circuit
Over Temperature protection	Yes	Latching, need to cycle ac to restart unit.
Over Voltage Protection	Yes	Latching, need to cycle ac to restart unit.
Series Operation	Yes	
Parallel Operation	Yes	Single wire, up to 6 units
Remote Sense	Yes	Compensates for up to 500mV cable drop.

GLOBAL SIGNALS	
Remote on/off	Opto isolated, 2.5mA (10-14V) to enable power supply, less than 0.15mA (0.5V) to disable.
Standby Supply	12V+/-2V / 20mA isolated supply, not affected by remote on/off.
Output good (ENA)	Open collector (10mA sink current). Low (on) when output is in regulation
ORing diode	(option) - Allows redundant connection of power supplies with no additional diodes required.

ENVIRONMENT	
Baseplate Temperature	-40°C to 85°C operational (12V version 80°C max), -40°C to 85°C storage (max 12 months).
Low Temp Startup	-40°C
Humidity	20 - 90% RH non condensing
Shock	±3 x 30g shocks in each plane, total 18 shocks 30g shock = 11ms (+/-0.5msec), half sine Conforms to EN60068-2-27, EN60068-2-47, IEC68-2-27, IEC68-2-47, JIS C0041-1987. Conforms to MIL-STD-810E/F, Method 516.5, Pro I, IV, VI
Vibration	Single axis 10 - 500 Hz at 2g (sweep and endurance at resonance) in all 3 planes Conforms to EN60068-2-6, IEC68-2-6 Conforms to MIL-STD-810E, Method 514.4, Pro I, Cat 1,9
Altitude	-200 to 2000 metres operational (-200 to 5000m storage/transportation)
Weights	With lid = 1.4kg, no lid = 1.2kg
Pollution	Degree 2, Material group IIIb

IMMUNITY EN61000-6-2:2005				Criteria
Electrostatic Discharge	EN61000-4-2	Level 2	Air discharge level 3 Contact discharge level 2 Not applicable to units without lid	A
Electromagnetic Field	EN61000-4-3	Level 3	12V/m	A
Fast / Burst Transient	EN61000-4-4	Level 3		A
Surge Immunity	EN61000-4-5	Level 4	Common mode - 4.4kVac Differential - 2.2kVac	A
Conducted RF Immunity	EN61000-4-6	Level 3	12V	A
Power Frequency Magnetic Field	EN61000-4-8	Level 4	30A/m	A
Voltage Dips, Variations, Interruptions	EN61000-4-11	Class 3	as required by EN61000-6-2:2005	A/B
Ring Wave	EN61000-4-12	Level 3	Common mode - 2.2kV Differential - 1.1kV	A
Voltage Fluctuations	EN61000-4-14	Class 3		A



Innovating Reliable Power

TDK-Lambda

EMISSIONS EN61000-6-3:2007

Radiated Electric Field	EN55011, EN55022	(as per CISPR.11/22) Class B, FCC47 part 15 subpart B see application note for details
Conducted Emissions	EN55011, EN55022	(as per CISPR.11/22) Class B, FCC47 part 15 subpart B
	MIL STD 461E/462D CE102	115V and 220V
Conducted Harmonics	EN61000-3-2	Class A, Class C at full load.
Flicker	EN61000-3-3	Compliant - $d_{max} < 4\%$ only

SAFETY APPROVALS

	Edition / Date	Amendments		Edition / Date	Amendments
EN 60950-1	Edition 2 - 2006		IEC 60950-1*	Edition 2 - 2005	
UL 60950-1	Edition 2 - 2007		CSA 22.2 No 60950-1	Edition 2 - 2007	
CE Mark	LV Directive 2006/95/EC (EN60950-1)				
* CB certificate and Report available on request			Check with factory for status of approvals		

OUTLINE & CONNECTION DRAWINGS

CPFE500F

Signals Connections
Housing - Molex 22-01-1102
Crimp - Molex 50802 series
(or equivalents)

Pin	Function
10	Do not connect
9	Output good - ENA
8	Trim
7	Current share
6	Aux
5	+remote on/off
4	-remote on/off
3	Aux common
2	- Sense
1	+ Sense

dc output
M6 x 18 stud for +ve output
M6 x 18 stud for -ve output
M6 nut, spring washer and flat washer supplied for each terminal

ac input connector
Housing Tyco 350766-4
Crimp 926895-1 (3 off)
or equivalent

Notes 1. All customer fixings 10 x M4 clearance holes 2. All tolerances +/-0.5mm



Innovating Reliable Power

TDK-Lambda



- Universal Input
- Baseplate cooled
- No fan required
- High Efficiency
- Protective coating option
- No minimum load
- I²C interface
- 2 Year Warranty

CPFE1000F

1000 Watts, single output, AC-DC,
Conduction/Baseplate cooled power supply

Key Market Segments & Applications

Outdoor Electronics
LED Signage
COTS
Rugged environments
Quiet/Silent Applications

Features and Benefits

Features

- Fanless
- Baseplate cooled
- Wide range ac input
- I²C interface

Benefits

- Longer field life and no fan noise
- Conducts heat outside of the system
- Supports global use
- Allows remote monitoring

INPUT

Input Voltage	90 - 265Vac	Input Frequency	47 - 63Hz (reduced PFC 63 - 440Hz - consult sales office)
Input Harmonics	EN61000-3-2 compliant	Power Factor	0.95 typical (meets EN61000-3-2)
Input Fuse	Fast acting (not user accessible)	Inrush Current	<40A at 25°C and 230Vac, (cold start) (meets EN61000-3-3)
Earth Leakage Current	1.3mA at 230Vac (50Hz)		

QUICK SELECTOR (Standard models)

Output Voltage	Adjustment Range	Output current	Description	Order Code
12V	9.6 - 14.4V	60A	CPFE1000F-12	XXXXXXX
28V	22.4 - 33.6V	36A	CPFE1000F-28	XXXXXXX
48V	38.4 - 57.6V	21A	CPFE1000F-48	XXXXXXX

GLOBAL SIGNALS

Remote on/off	Opto isolated, 2.5mA to enable power supply, less than 0.15mA to disable
Standby Supply	12V+/-2V / 20mA isolated supply, not affected by remote on/off.
Output good (ENA)	Open collector (10mA sink current). Low (on) when output is in regulation
I ² C	Provides manufacturing location, date, serial number, part number, unit revision, output voltage & current read back, base plate temperature, remote on/off, IOG, DC good and over temperature warning



Innovating Reliable Power

TDK-Lambda

ISOLATION			
Input to Output	Reinforced	4.24kV (dc)	
Input to Earth	Basic	2.12 kV (dc)	Output to Earth 500 Vdc

OUTPUT SPECIFICATION		
Output Power	1008W	Continuous. (12V versions = 720W)
Total Regulation	better than 4%	Including Line (for 90-264Vac input change), Load (for 0-100% load change) and temperature (0-50°C). The ORing diode option adds 1V to the load regulation specification.
Ripple & Noise	1%	pk-pk, using EIAJ test method & 20MHz bandwidth (2% below 0°C)
Voltage Setting Accuracy	±2%	at 50% load
Turn on time	1.5s	at 90Vac and 100% of rated output power.
Efficiency	85%	typical (at 75% load, without ORing diode).
Hold up	25ms	typical at 230 Vac, 100% load
Min Load	None	
Transient Response	<10%	of set voltage for 50% load change (in 50µs within the range 25 - 100% load)
Recovery	<0.5ms	for recovery to 2% of set voltage
Short circuit protection	Yes	Auto recovery after removal of short circuit
Over Temperature protection	Yes	Auto recovery
Over Voltage Protection	Yes	Auto recovery
Remote Sense	Yes	Compensates for up to 500mV cable drop

ENVIRONMENT								
Baseplate Temperature	-40°C to 85°C operational, -40°C to 100°C storage (max 12 months). (PFE1000F-28 and PFE1000F-48, -40°C to 70°C below 170Vac input)	Ambient Temperature Operating Limits						
Ambient Temperature	See adjacent table of operating limits	Model No	Input Voltage	Output Power				Derating Factor
Low Temp Startup	-40°C			at 50°C	at 60°C	at 70°C	at 85°C	
Humidity	20 - 90% RH non condensing, (non operating 10-95% RH) (PCB assembly protective coated)	CPFE1000F-12	85-170Vac	720W	720W	576W	360W	14.4W/°C
Shock	Conforms to MIL-STD-810E, Method 516.4, Pro I, II, IV, VI	CPFE1000F-28	170-265Vac	720W	720W	670W	595W	5W/°C
			85-170Vac	1008W	864W	720W		14.4W/°C
Vibration (non operating)	Conforms to MIL-STD-810E, Method 514.4, Pro I, Cat 1,9	CPFE1000F-48	170-265Vac	1008W	1008W	958W	883W	5W/°C
			85-170Vac	1008W	864W	720W		14.4W/°C
Altitude	-200 to 2000 metres operational (-200 to 5000m storage/transportation)							
Pollution	Degree 2, Material group IIIb							

IMMUNITY EN61000-6-2:2005				Criteria
Electrostatic Discharge	EN61000-4-2	Level 2	Air discharge level 3 Contact discharge level 2 Not applicable to units without lid	A
Electromagnetic Field	EN61000-4-3	Level 3	12V/m	A
Fast / Burst Transient	EN61000-4-4	Level 3		A
Surge Immunity	EN61000-4-5	Level X (Better than level 4)	Common mode - 6kV Differential - 6kV	A
Conducted RF Immunity	EN61000-4-6	Level 3	12V	A
Power Frequency Magnetic Field	EN61000-4-8	Level 4	30A/m	A
Voltage Dips, Variations, Interruptions	EN61000-4-11	Class 3	as required by EN61000-6-2:2005	A/B
Ring Wave	EN61000-4-12	Level 3	Common mode - 2.2kV Differential - 1.1kV	A
Voltage Fluctuations	EN61000-4-14	Class 3		A



Innovating Reliable Power

TDK-Lambda

EMISSIONS EN61000-6-3:2007

Radiated Electric Field	EN55011, EN55022	Class B (see application note for details)
Conducted Emissions	EN55011, EN55022 MIL STD 461E/462D CE102	Class B
Conducted Harmonics	EN61000-3-2	TBC
Flicker	EN61000-3-3	Compliant - $d_{max} < 4\%$ only

SAFETY APPROVALS

	Edition / Date	Amendments	Edition / Date	Amendments
EN 60950-1	Edition 2 - 2006		UL 60950-1	Edition 2 - 2007
CE Mark	LV Directive 2006/95/EC (EN60950-1)			
<i>Check with factory for status of approvals</i>				

OUTLINE & CONNECTION DRAWINGS

ac input connector
Housing Tyco 350766-1
Crimp 3 off
926895-1 (24-18 awg)
926893-1 (*20-14 awg)
or equivalent

Earth Neutral
Live

dc output
M6 x 18 stud for +ve output
M6 x 18 stud for -ve output
M6 nut, spring washer and flat washer supplied for each terminal
Maximum tightening torque 10Nm

I2C
Molex 22-01-2037
Pins: Molex 2759 series

Notes
1. All customer fixings 10 x M4 clearance holes
2. All tolerances +/-0.5mm



Innovating Reliable Power

TDK-Lambda



LZSA Series

Single Output Industrial
Power Supplies

- 5 Year Warranty
- -40°C to +71°C Operation
- MIL-STD-810E Vibration / Shock
- Input transient protected
- UL508, SEMIF47, Factory Mutual (Class 1, Division 2)

Key Market Segments & Applications

Factory Automation
Process & Controls
Harsh Environments

LZSA Features and Benefits

Features

- Rugged mechanical design
- Superior thermal design
- Wide range adjustment of output
- Input voltage transient protected

Benefits

- High reliability in harsh conditions
- Longer life even at 71°C operation
- Reduces need for custom outputs
- Reduced system filtering

Specifications

MODELS		LZSA500	LZSA1000	LZSA1500
ITEMS				
Input Voltage (47-440Hz)*	-	85 - 265V (1500W: See output rating below 100VAC) 100-400VDC		
Inrush Current (110 / 220VAC)	A	20 / 40A	40 / 80A	
Power Factor	-	EN61000-3-2 Class A		
Efficiency (typical)	%	84%		
Ripple & Noise (Max) Pk-Pk	-	75mV	75mV	24V: 75mV 48V: 150mV
Line Regulation	%	0.1%		
Load Regulation	%	0.1%		
Transient Response	-	±1% deviation, recovering to ±0.2% in <1.25ms (25% load change)		
Overcurrent Protection	-	110 - 130%		
Overvoltage Protection	V	User adjustable from front panel		
Thermal Protection	-	Internal thermostat. Recycle AC to reset		
Hold Up Time at 110VAC	ms	20ms Hold Up, 20ms Ride Through		
Remote Sense	-	Compensates for a total of 1V cable drop		
Remote Adjust	-	Using front panel potentiometer, Resistance (1k/V), or Voltage (1V/V)		
Remote On / Off	-	TTL compatible, active high		
Signals	-	Optocoupled transistor for AC Fail, DC Good, Inverter OK, 200kHz sync signal (ref-sense)		
Indicators	-	Green LED indicates output good, red LED indicates overvoltage or over temperature		
Parallel Connection	-	Single wire current share		
Operating Temperature	°C	-40°C to +71°C, derate linearly to 60% load from 60°C to 71°C (20 min warm up period needed for <-30°C)		
Storage Temperature	°C	-40°C to +85°C		
Temperature Coefficient	-	0.01%/°C		
Humidity (non condensing)	%RH	10 - 90		
Cooling	-	Internal fan		
Withstand Voltage	-	Input - Ground 2,121VDC, Input - Output 4,242VDC, Output - Ground 500VDC		
Vibration	-	MIL-STD-810E, Method 516.4 Proc. I, II, IV, VI		
Shock	-	MIL-STD-810E, Method 514.4, Category 1, 9		
Safety Agency Approvals	-	UL60950-1, UL508, EN60950-1, FM 3600, 3611, 3810, & CE Mark. SEMIF47(>100VAC)		
Leakage current	uA	<500uA at 265VAC, 60Hz		
Emissions	-	EN55022/EN55011 Class B, EN61000-3-3, MIL STD461/462D CE102		
Immunity	-	EN61000-4-2, -3, -4, -5, -6, -8, -11. IEEE C62.41 (6kV/30 Ohm, Criteria A)		
Altitude	m	3,000m operating, 12,000m non operating		
Weight	kg	2.95	3.7	
Size (WxHxD) (w/o bus bars)	mm	108 x 121 x 260	143 x 121 x 267	
Warranty	yrs	5		

Notes: (Consult Installation Manual for detailed specifications, test methods and application notes)

*Reduced power factor above 63Hz

LZSA Series

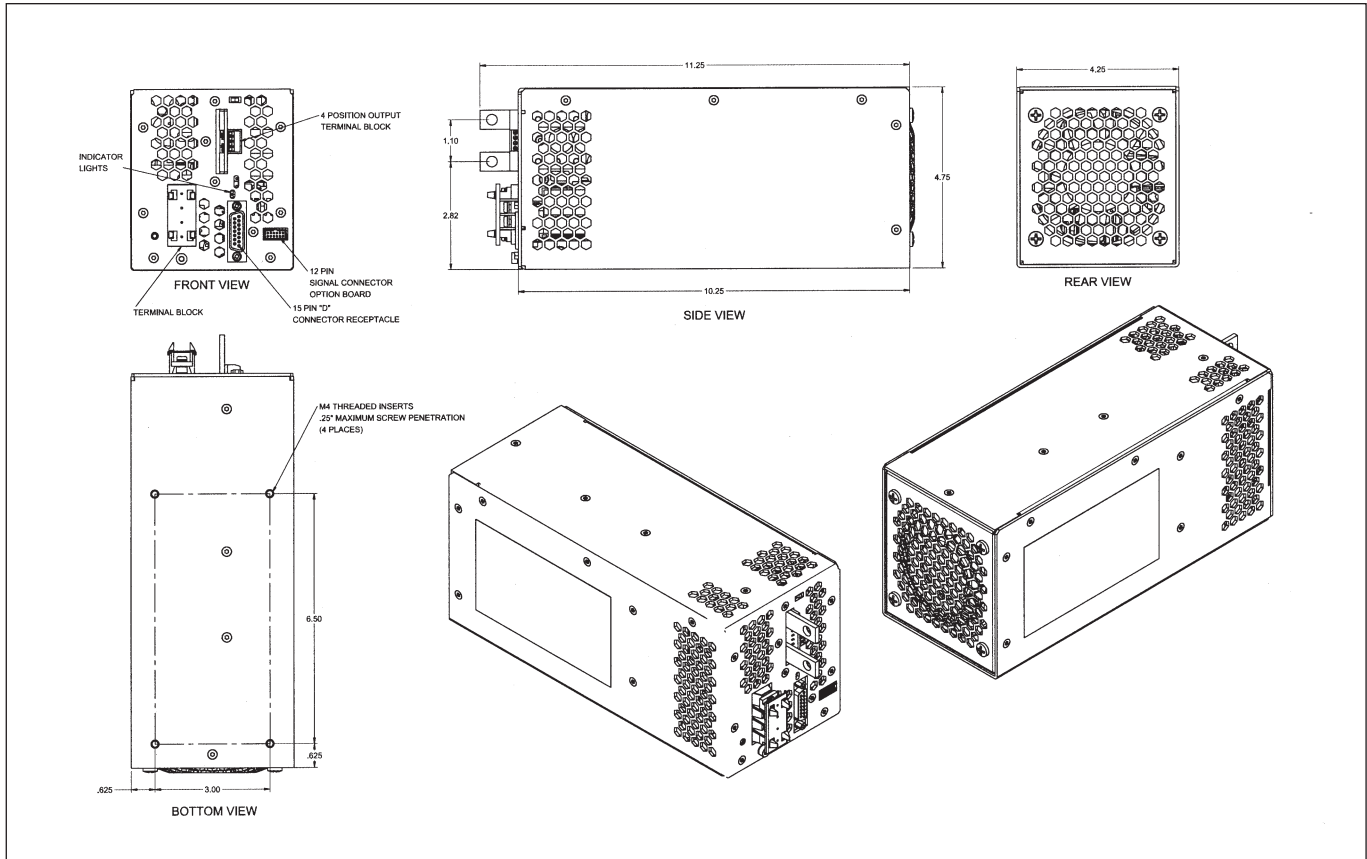
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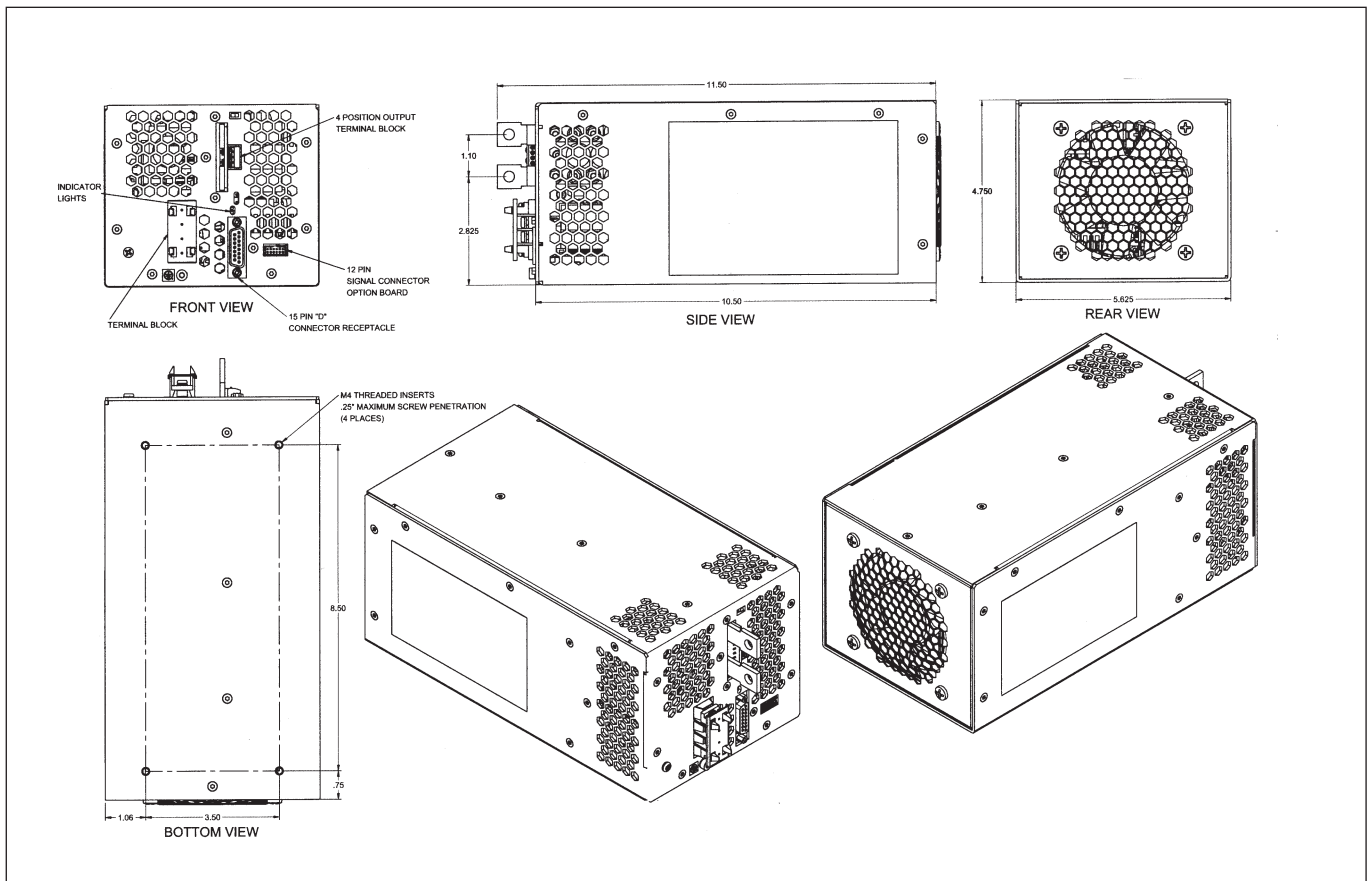
Innovating Reliable Power

TDK-Lambda

Outline Drawing LZSA500

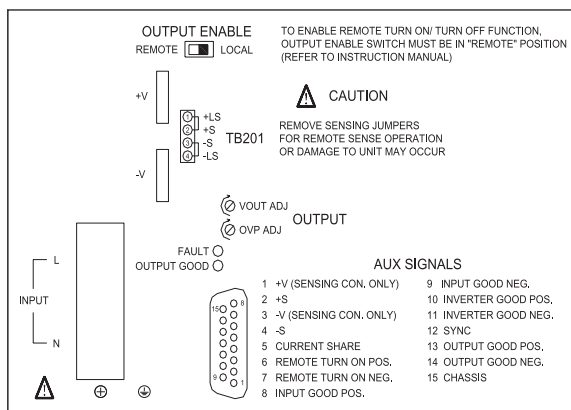


Outline Drawing LZSA1000/1500





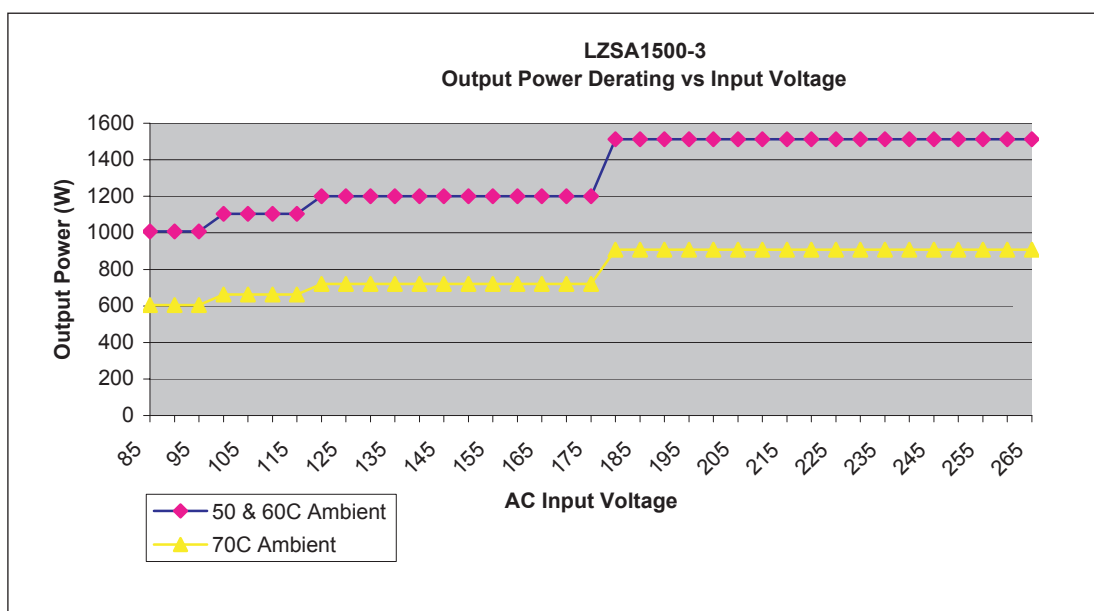
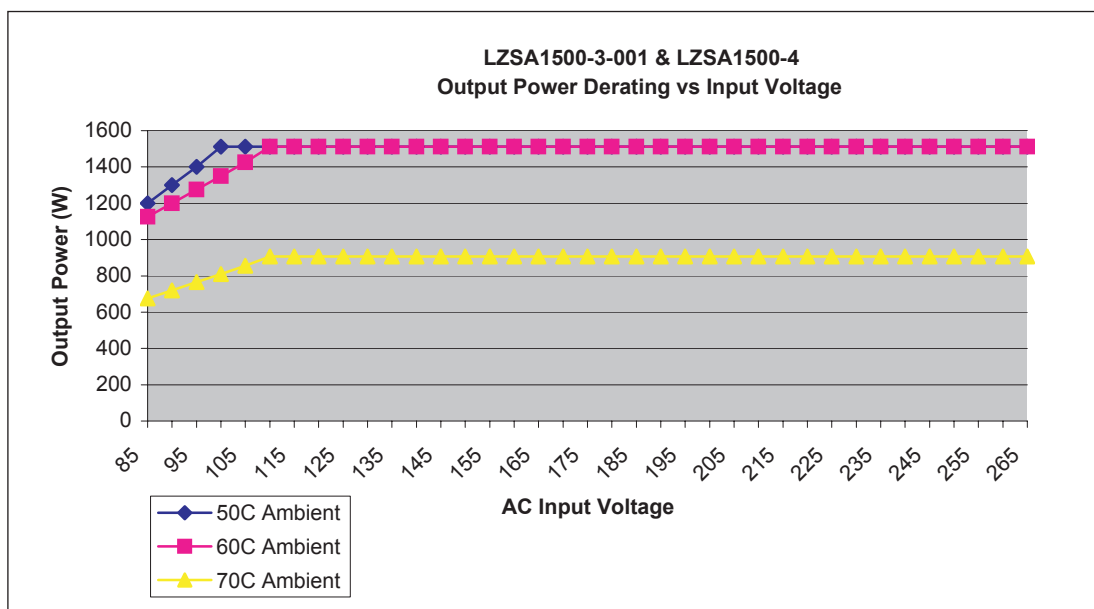
Connection Diagram LZSA500 Series



Model Selector				
Model	Nominal Voltage (V)	Adjustment Range (V)	Maximum Current (A)	Maximum Power (W)
LZSA500-3	24	18 - 29.4	21	504
LZSA1000-2	12	10 - 15.75	84	1008
LZSA1000-3	24	18 - 29.4	42	1008
LZSA1500-3-001	24	18 - 29.4	63	1512 ⁽¹⁾
LZSA1500-4	48	36 - 56	31.5	1512 ⁽¹⁾

Note (1) 1512W @ 180-265VAC, 1200W @ 120VAC, 1104W @ 100 VAC, 1008W @ 85VAC

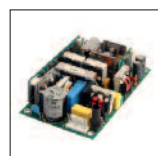
Figure 1 - PIN Assignments for TB201 and chassis mounted "D" connector





Configurable and Modular AC-DC Power Supplies

These products offer flexibility in the extreme because they are configured or assembled to order and offer a rapid and cost effective way to provide the exact set of outputs required for your equipment. Non-standard output voltages are easily catered for. Output power levels range from 100W to 1500W and up to 16 outputs are possible. Many signal options are available. Most models have medical approval. Suitable for many types of equipment including general industrial machinery, factory automation, broadcast, displays and medical equipment.


NV100 Series 100W Quad Output

Page No.

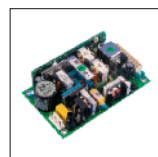
99


NV175/180/200 Series 175/180/200W Up to 5 Outputs

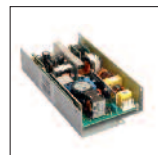
102


NV175M Series 180/200W Up to 5 Outputs

107


NVM175 Series 180W Single Output

110


NV300 Series 300W Up to 5 Outputs

112


NV350/700 Series 350 - 1150W Up to 8 Outputs

117


Vega Series 450 - 900W Up to 10 Outputs

122


Vega Lite Series 450 - 900W Up to 10 Outputs

127


Alpha 1000/1500 Series 1000 - 1500W Up to 16 Outputs

132



Innovating Reliable Power

TDK-Lambda



NV-100

100 Watts

AC-DC flexible power solution

- High Efficiency
- 4 Outputs
- Fits 1U Applications
- 3 Year Warranty
- Open frame or cased

Key Market Segments & Applications

Instrumentation	Broadcast
Automation	ATE
Security	Industrial Computing
Network Servers and Routers	Lifesciences/Laboratory

Features and Benefits

Features

- Low Profile
- Multiple output
- Single connector output

Benefits

- Fits 1U applications, less space in system
- Reduces number of power supplies in system
- Simple and error free connection

INPUT

Input Voltage	90 - 264Vac / 120 - 350Vdc	Input Frequency	45 - 63Hz (440Hz with reduced PFC - consult factory)
Input Harmonics	EN61000-3-2 compliant	Inrush Current	<40A at 25°C and 264Vac, (cold start)
Input Fuse	Time delay (not user accessible)	Power Factor	0.97 typical
Earth Leakage Current	123µA typical at 120Vac (60Hz), 257µA typical at 240Vac (60Hz)		

ISOLATION

Input to Output	Reinforced	4.3kV (dc)		
Input to Earth	Basic	2.3 kV (dc)	Output to Earth	200 V (dc)

QUICK SELECTOR - preferred configurations

Model	CH1	CH2	CH3	CH4
NVA1-453TT	5V / 10A	3.3V / 8A	12V / 3A	-12V / 1A
NVA1-453FF	5V / 10A	3.3V / 8A	15V / 3A	-15V / 1A
NVA1-4G5TT	24V / 4A	5V / 5A	12V / 3A	-12V / 1A
NVA1-4G5FF	24V / 4A	5V / 5A	15V / 3A	-15V / 1A

Additional variants available (depending on volume) - 'Build to Order' - see below

AVAILABLE OUTPUTS

Channel 1	Adjustment Range	Channel 2	Adjustment Range	Channel 3	Adjustment Range	Channel 4 ₂	Adjustment Range
5 5V / 10A ₁	4.75 - 5.25V	3 3.3V / 8A	3.14 - 3.46V	T 12V / 3A F 15V / 3A G 24.5V / 1.5A	Fixed Fixed Fixed	T -12V / 1A ₃ F -15V / 1A ₃	Fixed Fixed
G 24V / 4A	23 - 25V	5 5V / 5A	3.3 - 5.5V	T 12V / 3A F 15V / 3A	Fixed Fixed	T -12V / 1A F -15V / 1A	Fixed Fixed

1. 5V ch 1/3.3V ch 2 combined power must not exceed 60W 2. Follow characters in red by 'P' for positive channel 4 3. If channel 3 = 24V (G), channel 4 must be 'P'

Other output options are available, please contact factory with your requirements.

NV-Power Series (NV-100)

99



Innovating Reliable Power

TDK-Lambda

OUTPUT SPECIFICATION		
Remote Sense	Yes	Channels 1 & 2 - Max 0.5V total line drop.
Total Regulation	1%	Including Line (for 90-264Vac input change), Load (for 0-100% load change) and Cross (for 0-100% load change on any other output) regulation. (5% for channels 3 & 4)
Ripple & Noise	1%	(or 50mV if higher) pk-pk, using EIAJ test method & 20MHz bandwidth 1.5% on channel 4 for 5V channel 1 configs.
Voltage Accuracy	±1%	±5% for Channels 3 & 4 (with Channel 1 set to nominal voltage)
Turn on Time	1.5s max	at 90 Vac & 100% rated output power
Efficiency	up to 90%	configuration dependent
Hold up	16ms min	at 90 Vac
Min Load	None	on any output. (For models with 12V or 15V Ch3, a load ≥ 1A is required on Ch3 to keep it in full regulation when Ch1+Ch2 output power ≥ 50W.)
Transient Response	<4%	of set voltage for 50% load change (in 50µs within the range 25 - 100% load)
Recovery	<500µs	for recovery to 1% of set voltage
Short circuit protection	Yes	
Over Temperature protection	Yes	
Over Voltage Protection	Yes	See Application Notes for details
Ch1 Good Signal	Optional	Contact factory for details

HOW TO CREATE A PRODUCT CODE

1. For Positive Output Channel 4, follow chosen letter by 'P'.
For example, FP channel 4 = +15V / 1A

Confirm availability of created product code with the factory

ENVIRONMENT	
Temperature	0°C to 50°C operational, -40°C to 85°C storage (max 12 months). Full load, with 2m/s air blown from input to output (approximately 10CFM)
Convection Rating	50W at 50°C. Max 50% output current on any output. See Application note for details
Derating	50°C to 70°C derate each output by 2.5% per °C
Low Temp Startup	-20°C
Humidity	5 - 95% RH non condensing
Shock	±3 x 30g shocks in each plane, total 18 shocks 30g shock = 11ms (+/-0.5msec), half sine Conforms to EN60068-2-27, EN60068-2-47, IEC68-2-27, IEC68-2-47, JIS C0041-1987. Conforms to MIL-STD-810E/F, Method 516.5, Pro I, IV, VI
Vibration	Single axis 10 - 500 Hz at 2g (sweep and endurance at resonance) in all 3 planes Conforms to EN60068-2-6, IEC68-2-6 Conforms to MIL-STD-810E, Method 514.4, Pro I, Cat 1,9
Altitude	-200 to 3,000 metres operational (-200 to 5000m storage/transportation)
Pollution	Degree 2, Material group IIIb

IMMUNITY EN61000-6-2:2001				Criteria
Electrostatic Discharge	EN61000-4-2	Level 4	Air discharge 15kV Contact discharge 8kV Not applicable to open frame units	A
Electromagnetic Field	EN61000-4-3	Level 3	(12V/m)	A
Fast / Burst Transient	EN61000-4-4	Level 3	ac input tested to 2.2kV dc output tested to 1.1kV	A
Surge Immunity	EN61000-4-5	Level 3	Common mode - 2.2kV Differential - 1.1kV	A
Conducted RF Immunity	EN61000-4-6	Level 3	(12V)	A
Power Frequency Magnetic Field	EN61000-4-8	Level 4	(30A/m)	A
Voltage Dips, Variations, Interruptions	EN61000-4-11	Class 3	Criteria B for 5 sec interruption	A



Innovating Reliable Power

TDK-Lambda

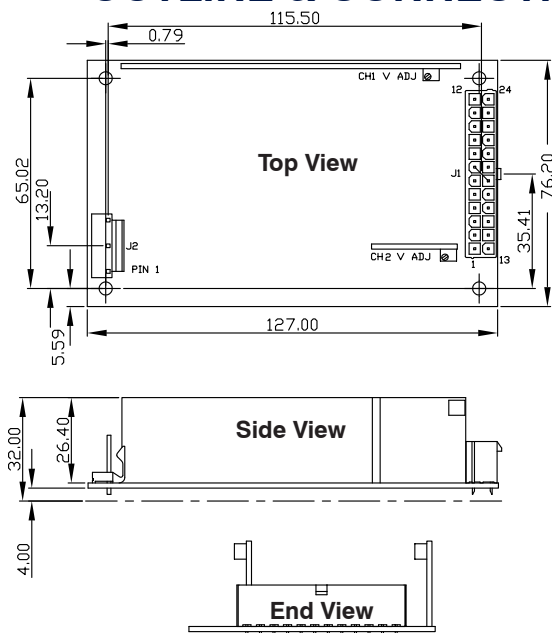
EMISSIONS EN61000-6-3:2001, EN60601-1-2:2001

Radiated Electric Field	EN55011, EN55022	(as per CISPR.11/22) Class B, FCC47 part 15 subpart B see application note for details
Conducted Emissions	EN55011, EN55022	(as per CISPR.11/22) Class B, FCC47 part 15 subpart B
Conducted Harmonics	EN61000-3-2	Class A
Flicker	EN61000-3-3	Compliant - d _{max} only

SAFETY APPROVALS

	Date	Amendments	Date	Amendments
EN 60950-1	2006		CSA 22.2 No 60950-1	2003
UL 60950-1	2007		IEC 60950-1*	2005
CE Mark	LV Directive 2006/95/EC (EN60950-1)			
* CB certificate and Report available on request			Check with factory for status of approvals	

OUTLINE & CONNECTION DRAWINGS



J2

PIN	FUNCTION
1	EARTH
2	NOT CONNECTED
3	LIVE
4	NOT CONNECTED
5	NEUTRAL

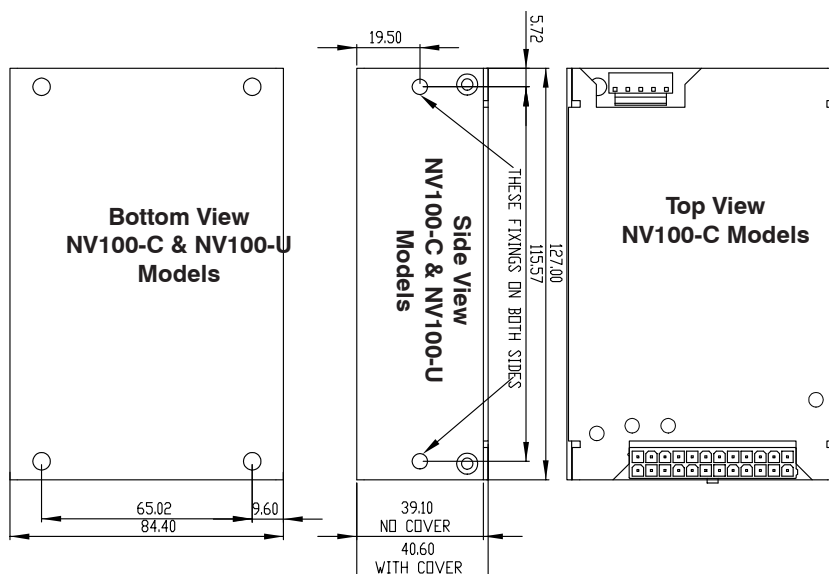
Weights (+/-80g)
 open frame = 250g
 '-U' = 350g
 '-C' = 400g

J1

PIN	FUNCTION	PIN	FUNCTION
12	NOT CONNECTED	24	NOT CONNECTED
11	NOT CONNECTED	23	NOT CONNECTED
10	CH1 OUTPUT	22	CH1 POWER GOOD
9	CH1 OUTPUT	21	CH1 OUTPUT
8	CH1 OUTPUT	20	CH1 OUTPUT
7	+SENSE CH1	19	-SENSE CH1
6	0V COMMON	18	0V COMMON
5	0V COMMON	17	0V COMMON
4	CH2 OUTPUT	16	0V COMMON
3	CH2 OUTPUT	15	CH2 OUTPUT
2	+SENSE CH2	14	-SENSE CH2
1	CH3 OUTPUT	13	CH4 OUTPUT

MATING PARTS (MOLLEX OR EQUIVALENT)

CONN	HOUSING	PINS
J1	39-01-2245	44476-3112
J2	09-50-8051	08-52-0113



Notes 1. All customer fixings M3 2. Maximum Penetration 4.5mm 3. Maximum torque 0.9Nm 4. All tolerances +/-0.5mm

NV-Power Series (NV-100)



Innovating Reliable Power

TDK-Lambda



- High Efficiency
- High Power Density (9.3W/in³)
- Up to 5 outputs
- No minimum load
- Fits 1U applications
- Medical Approval
- 3 Year Warranty
- Temperature controlled Fan Option

Key Market Segments & Applications

- | | |
|-----------------------------|-------------------------|
| Instrumentation | Broadcast |
| Medical | ATE |
| Automation | Industrial Computing |
| Security | Lifesciences/Laboratory |
| Network Servers and Routers | |

NV-175

175/180/200 Watts

AC/DC Flexible Power Solution

Features and Benefits

Features

- High Efficiency
- Low profile
- High Power Density

Benefits

- Minimises heat in system
- Fits 1U applications
- Less Space

INPUT

Input Voltage	90 - 264Vac / 120 - 350Vdc	Input Frequency	45 - 63Hz (440Hz with reduced PFC - consult factory)
Input Harmonics	EN61000-3-2 compliant	Inrush Current	<40A at 25°C and 264Vac, (cold start)
Input Fuse	Fast acting (not user accessible)	Power Factor	0.97 typical
Earth Leakage Current	123µA max at 120Vac (60Hz), 257µA max at 240Vac (60Hz) Worst case leakage current is less than 300µA at 264Vac, 63Hz (normal condition, 500µA Single Fault Condition)		

AVAILABLE OUTPUTS

Channel 1	Adjustment Range	Channel 2 ₁	Adjustment Range	Channel 3 ₃	Adjustment Range	Channel 4 ₄	Adjustment Range
S 5V / 25A ₂	5 - 5.5V	1 1.8V / 15A	0.9 - 2.5V	T 12V / 5A F 15V / 5A G 24V / 2.5A O Omit	12 - 15V 12 - 15V 18 - 24V	T -12V / 1A	Fixed
		2 2.7V / 15A	2.5 - 3.3V			F -15V / 1A	Fixed
		3 3.3V / 15A	2.5 - 3.3V			3H -3.3V / 2A ₉	Fixed
T 12V / 15A F 15V / 12A	12 - 15V ₅ 12 - 15V ₆	5 5V / 10A ₁₀ O Omit	3.3 - 5.5V	O Omit	18 - 24V	5H -5V / 2A ₉	Fixed
G 24V / 7.5A	24 - 28V ₇	5 5V / 8A ₈ O Omit	3.3 - 5.5V			TH -12V / 2A ₉	Fixed
		O Omit				FH -15V / 2A ₉	Fixed
						OH Fan supply only O Omit	

- | | | |
|---|--|--|
| 1. 1.8V, 2.7V, 3.3V channel 2 only available with 5V Channel 1
5V/10A channel 2 only available with 12V or 15V Channel 1
5V/8A channel 2 only available with 24V Channel 1. | 3. Follow letters in red by 'Y' for negative output channel 3.
4. Follow letters in red by 'P' for positive output channel 4. | 7. 24 - 24.5V if 5V channel 2 fitted
24 - 26V if 24V channel 3 fitted. |
| 2. Maximum combined output current from Ch1 & Ch2 = 25A
Models with 5V channel 1 are limited to 175W output power | 5. 12 - 12.5V if 24V channel 3 fitted.
6. 14.5 - 15V if 24V channel 3 fitted. | 8. 7A max with '-F' or '-I' option.
9. 1.5A max with '-F' or '-I' option.
10. 9A max with '-F' or '-I' option. |

Other output options are available, please contact factory with your requirements.

ISOLATION

Input to Output	Reinforced	4.3kV (dc)	Note: Basic for IEC/EN/UL/CSA60601-1. Medical Reinforced version available, contact factory for details	
Input to Earth	Basic	2.3 kV (dc)	Output to Earth	200 V (dc)



Innovating Reliable Power

TDK-Lambda

OUTPUT SPECIFICATION		
Remote Sense	Yes	Channels 1 & 2 - Max 0.5V total line drop.
Total Regulation	1%	Including Line (for 90-264Vac input change), Load (for 0-100% load change) and Cross (for 0-100% load change on any other output) regulation
Ripple & Noise	1%	(or 50mV if higher) pk-pk, using EIAJ test method & 20MHz bandwidth
Voltage Accuracy	±1%	±4% for Channel 4 with 'T' or 'F' type outputs, +4%/-3% for all other Ch 4
Turn on Time	1.5s max	at 90 Vac & 100% rated output power
Efficiency	up to 90%	configuration dependent
Hold up	16ms min	at 90 Vac
Min Load	None	on any output
Transient Response	<4%	of set voltage for 50% load change (in 50µs within the range 25 - 100% load)
Recovery	<500µs	for recovery to 1% of set voltage
Short circuit protection	Yes	
Over Temperature protection	Yes	
Over Voltage Protection	Yes	See Application Notes for details
Ch1 Good Signal	Yes	Provides a Logic 'Low' signal after Channel 1 output is within 90% (±5%) of nominal.
Peak Output Power	200W	Single output units with 12V, 15V or 24V (T, F or G). Average output power must not exceed 180W over any 5 minute period.

HOW TO CREATE A PRODUCT CODE

NV1-	#o/p	Ch1	Ch2	Ch3 ₂	Ch4 ₃	Global Option	Case Option	Connector Option
	Number of outputs (excluding standby supply)	Ch1 - Ch4 Letter/number from table on pg 102 to represent output voltage.						(Blank = standard, vertical connector) -R = Right angled connector (see handbook for -R connection and mechanical details)
							(Blank = no case) -C = U Chassis + Cover -U = U Chassis -F = End fan + case ₁ -I = End fan + case + IEC inlet ₁	
							(Blank = no option) -N = 5V/2A -N1 = 12V/1A -N2 = 13.5/1A -N3 = 5V/2A ATX compatible -N4 = 12V/1A ATX compatible	

1. Needs 0H, 3H, 5H, TH or FH type channel 4.
The fan speed is temperature dependent, ensuring optimum cooling and lowest audible noise.
 2. For Negative Output Channel 3, follow chosen letter by 'Y'. For example, TY channel 3 = -12V / 5A
 3. For Positive Output Channel 4, follow chosen letter by 'P'. For example, TP channel 4 = +12V / 1A
 Confirm availability of created product code with the factory

QUICK SELECTOR - preferred configurations

Model	CH1	CH2	CH3	CH4	CH5	Global Option ₁
NV1-1T000	12V / 15A	-	-	-	-	No
NV1-1G000	24V / 7.5A	-	-	-	-	No
NV1-453TT	5V / 25A	3.3V / 15A	12V / 5A	-12V / 1A	-	No
NV1-453TT-N3	5V / 25A	3.3V / 15A	12V / 5A	-12V / 1A	5V / 2A	ATX (-N3)
NV1-453FF	5V / 25A	3.3V / 15A	15V / 5A	-15V / 1A	-	No
NV1-453FF-N3	5V / 25A	3.3V / 15A	15V / 5A	-15V / 1A	5V / 2A	ATX (-N3)
NV1-4G5TT	24V / 7.5A	5V / 8A	12V / 5A	-12V / 1A	-	No
NV1-4G5TT-N3	24V / 7.5A	5V / 8A	12V / 5A	-12V / 1A	5V / 2A	ATX (-N3)
NV1-4G5FF	24V / 7.5A	5V / 8A	15V / 5A	-15V / 1A	-	No
NV1-4G5FF-N3	24V / 7.5A	5V / 8A	15V / 5A	-15V / 1A	5V / 2A	ATX (-N3)

Above Units available on rapid delivery.

Additional variants available 'Build to Order' - see above

1. see page 104 for details of global option

NV-Power Series (NV-175)



Innovating Reliable Power

TDK-Lambda

GLOBAL SIGNALS (-N, -N1 and -N2 Option Models)	
Remote on/off	TTL logic level high inhibits all outputs (except Standby)
Power Good	Open collector output (referenced to PSU 0V). Turns on to indicate ac supply is good and output 1 is within regulation.
Standby Supply	Isolated supply, not affected by remote on/off -N option = 5V / 2A (2.5A peak) -N1 Option = 12V / 1A -N2 Option = 13.5V / 1A

GLOBAL SIGNALS (-N3 and -N4 Option Models)	
ATX Remote on/off	TTL logic level high or open circuit will inhibit all outputs (except Standby)
ATX Power Good	Logic high indicates ac supply is good and output 1 is within regulation.
Standby Supply	Common 0V with power supply. Not affected by ATX remote on/off -N3 Option = 5V / 2A -N4 Option = 12V / 1A.

IMMUNITY EN61000-6-2:2001				Criteria
Electrostatic Discharge	EN61000-4-2	Level 4	Air discharge 15kV Contact discharge 8kV Not applicable to open frame units	A
Electromagnetic Field	EN61000-4-3	Level 3	(12V/m)	A
Fast / Burst Transient	EN61000-4-4	Level 4	ac input tested to 4.4kV dc output tested to 2.2kV	A
Surge Immunity	EN61000-4-5	Level 3	Common mode - 2.2kV Differential - 1.1kV	A
Conducted RF Immunity	EN61000-4-6	Level 3	(12V)	A
Power Frequency Magnetic Field	EN61000-4-8	Level 4	(30A/m)	A
Voltage Dips, Variations, Interruptions	EN61000-4-11	Class 3	Criteria B for 5 sec interruption	A

EMISSIONS EN61000-6-3:2001, EN60601-1-2:2001		
Radiated Electric Field	EN55011, EN55022	(as per CISPR.11/22) Class B, FCC47 part 15 subpart B see application note for details. Additional filtering required for IEC inlet version.
Conducted Emissions	EN55011, EN55022	(as per CISPR.11/22) Class B, FCC47 part 15 subpart B
Conducted Harmonics	EN61000-3-2	Class A
Flicker	EN61000-3-3	Compliant - d_{max} only

ENVIRONMENT	
Temperature	0°C to 50°C operational, -40°C to 85°C storage (max 12 months). Full load, with either 'F' option fitted or 2m/s air blown from input to output (approximately 10CFM)
Convection Rating	See Application note for details
Derating	50°C to 70°C derate each output by 2.5% per °C
Low Temp Startup	-20°C
Humidity	5 - 95% RH non condensing
Shock	±3 x 30g shocks in each plane, total 18 shocks 30g shock = 11ms (+/-0.5msec), half sine Conforms to EN60068-2-27, EN60068-2-47, IEC68-2-27, IEC68-2-47, JIS C0041-1987. Conforms to MIL-STD-810E/F, Method 516.5, Pro I, IV, VI
Vibration	Single axis 10 - 500 Hz at 2g (sweep and endurance at resonance) in all 3 planes Conforms to EN60068-2-6, IEC68-2-6 Conforms to MIL-STD-810E, Method 514.4, Pro I, Cat 1,9
Altitude	3,000 metres operational
Pollution	Degree 2, Material group IIIb

SAFETY APPROVALS					
	Date	Amendments		Date	Amendments
EN 60950-1	2006		EN 61010-1	2001	
UL 60950-1	2007		IEC 61010-1*	2001	
CSA 22.2 No 60950-1	2003		IEC 60601-1*	1988	
IEC 60950-1*	2005		EN 60601-1	1990	A1, A2
CE Mark	LV Directive 2006/95/EC (EN60950-1)		UL 60601-1	2003	with revisions 2006
* CB certificate and Report available on request			Check with factory for status of approvals		

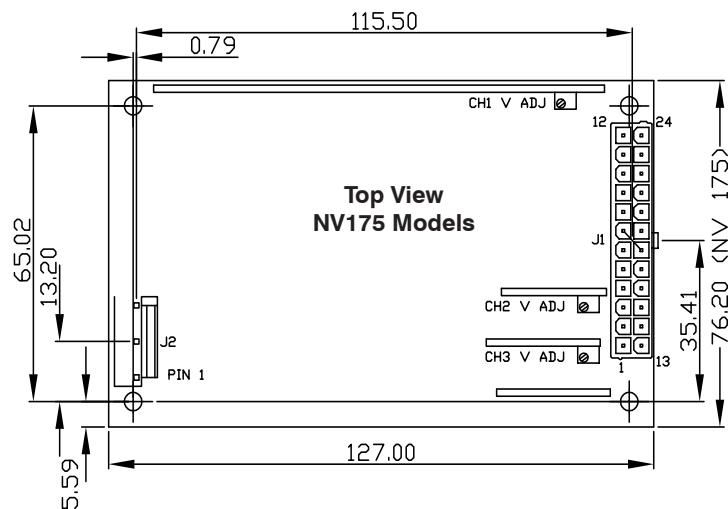


Innovating Reliable Power

TDK-Lambda

OUTLINE & CONNECTION DRAWINGS

All drawings relate to both 175W and 180W versions

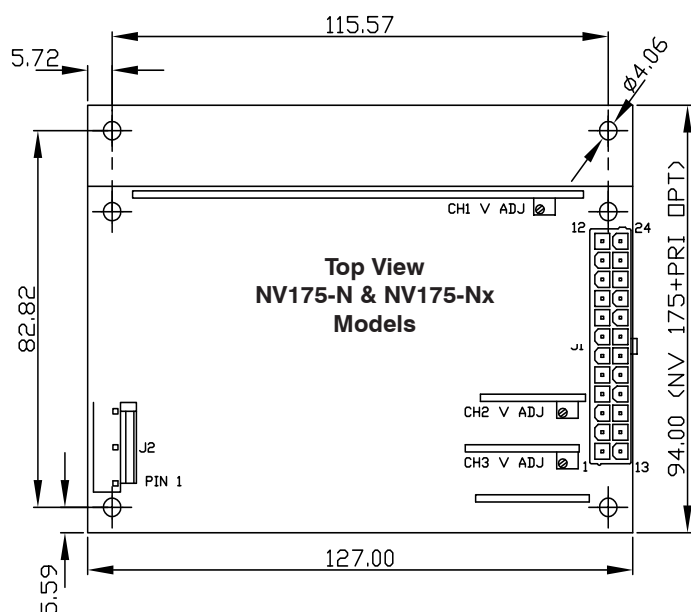


J2

PIN	FUNCTION
1	EARTH
2	NOT CONNECTED
3	LIVE
4	NOT CONNECTED
5	NEUTRAL

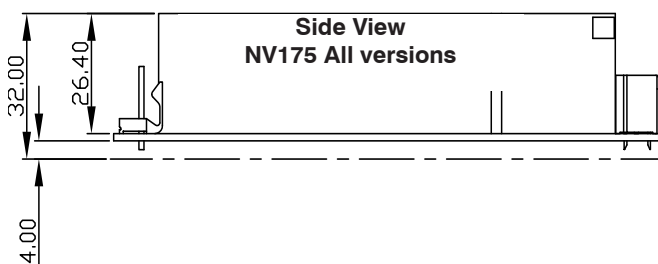
J1

PIN	FUNCTION	PIN	FUNCTION
12	STANDBY +Ve	24	STANDBY RETURN
11	POWER GOOD	23	REMOTE ON/OFF
10	CH1 OUTPUT	22	CH1 POWER GOOD
9	CH1 OUTPUT	21	CH1 OUTPUT
8	CH1 OUTPUT	20	CH1 OUTPUT
7	+SENSE CH1	19	-SENSE CH1
6	0V COMMON	18	0V COMMON
5	0V COMMON	17	0V COMMON
4	CH2 OUTPUT	16	0V COMMON
3	CH2 OUTPUT	15	CH2 OUTPUT
2	+SENSE CH2	14	-SENSE CH2
1	CH3 OUTPUT	13	CH4 OUTPUT

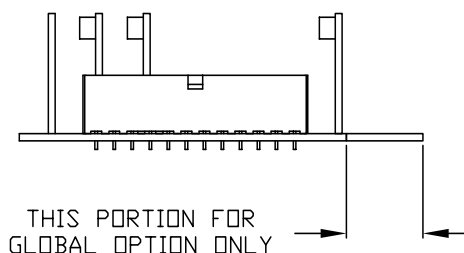


MATING PARTS (MOLEX OR EQUIVALENT)

CONN	HOUSING	PINS
J1	39-01-2245	44476-3112
J2	09-50-8051	08-52-0113



End View



Notes 1. All customer fixings M3

2. Maximum Penetration 4.5mm

3. Maximum torque 0.9Nm

4. All tolerances +/-0.5mm

NV-Power Series (NV-175)

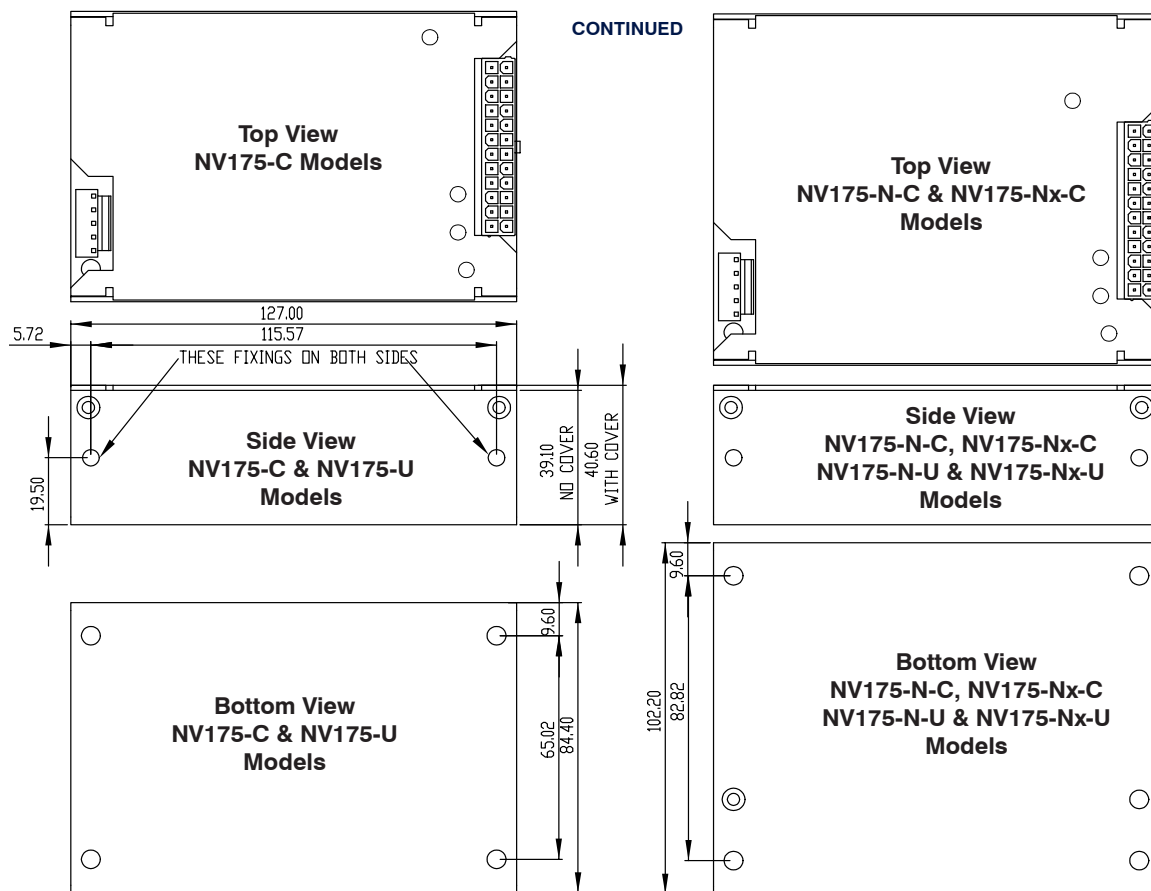


Innovating Reliable Power

TDK-Lambda

OUTLINE & CONNECTION DRAWINGS

CONTINUED

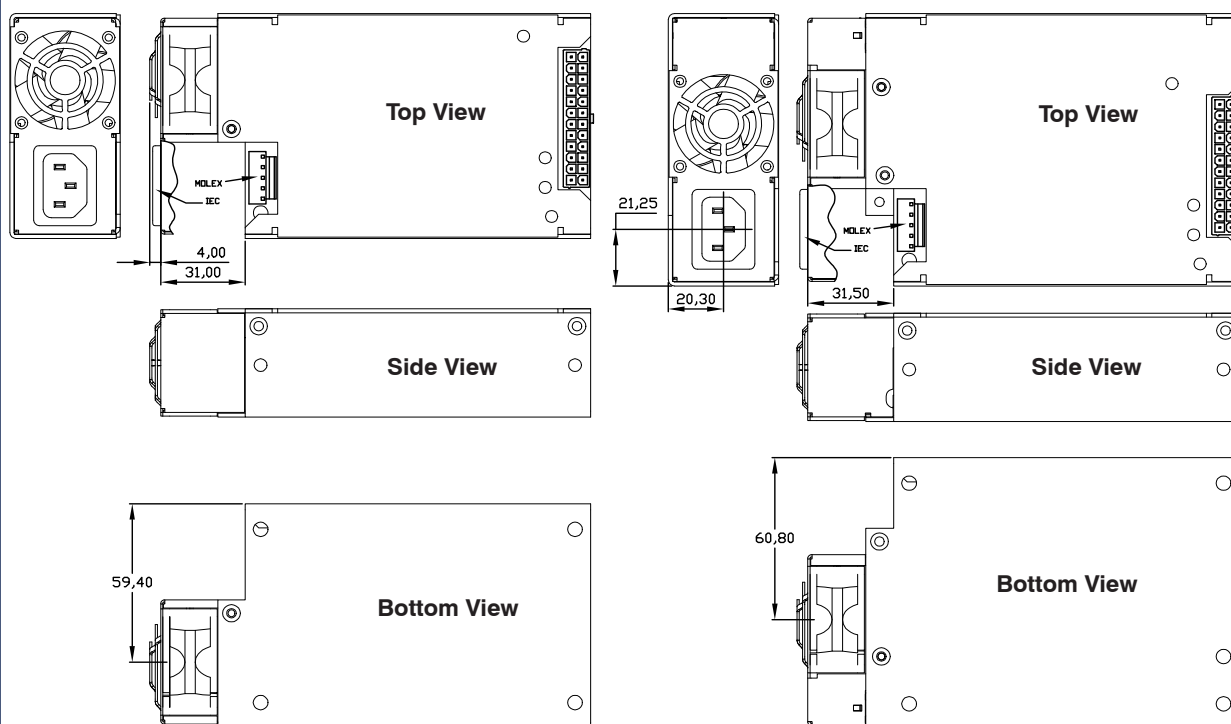


NV-175 units with fan (-F / -I)

All drawings relate to both 175W and 180W versions

WITHOUT GLOBAL OPTION

WITH GLOBAL OPTION



Other dimensions same as cases without fans (above)

- Notes 1. All customer fixings M3 2. Maximum Penetration 4.5mm 3. Maximum torque 0.9Nm 4. All tolerances +/-0.5mm



Innovating Reliable Power

TDK-Lambda



NV-Power Medical

180/200 Watts, flexible power solution

- Reinforced Input to Output Isolation for IEC60601
- Low Earth Leakage and Class B EMC
- Medical Approval
- High Efficiency
- High Power Density (9.3W/in³)
- Up to 3 outputs
- No minimum load
- Fits 1U applications
- 3 Year Warranty

Key Market Segments & Applications

Medical	Broadcast
Instrumentation	ATE
Automation	Industrial Computing
Security	Lifesciences/Laboratory
Network Servers and Routers	

Features and Benefits

Features

- High Efficiency
- Low Profile
- High Power Density

Benefits

- Minimises heat in system
- Fits 1U applications
- Less Space

INPUT			
Input Voltage	90 - 264Vac (100 - 240Vac nominal)	Input Frequency	45 - 63Hz
Input Harmonics	EN61000-3-2 compliant	Inrush Current	<40A at 25°C and 264Vac, (cold start)
Input Fuse	Fast acting (not user accessible)	Power Factor	0.97 typical
Earth Leakage Current	123µA max at 120Vac (60Hz), 257µA max at 240Vac (60Hz). Worst case leakage current is less than 300µA at 264Vac, 63Hz (normal condition, 500µA Single Fault Condition) Lower leakage versions available. Contact sales office for details		

ISOLATION			
Input to Output	Reinforced	4kV (ac)	type tested to 4kVac (equivalent to 5.7kVdc), production tested to 4.3kV (dc)
Input to Earth	Basic	2.3 kV (dc)	Output to Earth
			200 V (dc)

QUICK SELECTOR - preferred configurations				
Model	CH1	CH3	CH4	
NV1-1T000-M	12V / 15A	-	-	
NV1-1G000-M	24V / 7.5A	-	-	
NV1-3G0TT-M	24V / 7.5A	12V / 5A	-12V / 1A	
NV1-3G0FF-M	24V / 7.5A	15V / 5A	-15V / 1A	

Above Units available on rapid delivery.

Additional variants available 'Build to Order' - see below

AVAILABLE OUTPUTS						
Channel 1	Adjustment Range	Channel 2	Channel 3 ₁	Adjustment Range	Channel 4 ₂	Adjustment Range
T 12V / 15A	12 - 15V ₃	Not available	T 12V / 5A	12 - 15V	T -12V / 1A	Fixed
F 15V / 12A	12 - 15V ₄		F 15V / 5A	12 - 15V	F -15V / 1A	Fixed
G 24V / 7.5A	24 - 28V ₅		G 24V / 2.5A	18 - 24V	3HP +3.3V / 2A ₆	Fixed
			O Omit		5HP +5V / 2A ₆	Fixed
					TH -12V / 2A ₆	Fixed
					FH -15V / 2A ₆	Fixed
					OH Fan supply only	
					O Omit	

1. Follow letters in red by 'Y' for negative output channel 3.

2. Follow letters in red by 'P' for positive output channel 4.

3. 12 - 12.5V if 24V channel 3 fitted.

4. 14.5 - 15V if 24V channel 3 fitted.

5. 24 - 26V if 24V channel 3 fitted.

6. 1.5A max if fitted with '-F' option.

Other output options are available, please contact factory with your requirements.

NV-Power Series (NV-175M)

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Innovating Reliable Power

TDK-Lambda

OUTPUT SPECIFICATION		
Remote Sense	Yes	Channel 1 - Max 0.5V total line drop.
Total Regulation	1%	Including Line (for 90-264Vac input change), Load (for 0-100% load change) and Cross (for 0-100% load change on any other output) regulation
Ripple & Noise	1%	(or 50mV if higher) pk-pk, using EIAJ test method & 20MHz bandwidth
Voltage Accuracy	±1%	±4% for Channel 4 with 'T' or 'F' type outputs, +4%/-3% for all other Ch 3
Turn on Time	1.5s max	at 90 Vac & 100% rated output power
Efficiency	up to 90%	configuration dependent
Hold up	16ms min	at 90 Vac
Min Load	None	on any output
Transient Response	<4%	of set voltage for 50% load change (in 50µs within the range 25 - 100% load)
Recovery	<500µs	for recovery to 1% of set voltage
Short circuit protection	Yes	
Over Temperature protection	Yes	
Over Voltage Protection	Yes	See Application Notes for details
Ch1 Good Signal	Yes	Provides a Logic 'Low' signal after Channel 1 output is within 90% (±5%) of nominal.
Peak Output Power	200W	Single output units. Average output power must not exceed 180W over any 5 minute period.

HOW TO CREATE A PRODUCT CODE

Number of outputs

NV1-	#o/p	Ch1	0	Ch3 ₂	Ch4 ₃	Case Option	-M	Connector Option
------	------	-----	---	------------------	------------------	-------------	----	------------------

Medical with reinforced input to output isolation.

Ch1, Ch3, Ch4 Letter/number from table on pg 107 to represent output voltage.

(Blank = standard, vertical connector)
R = Right angled connector (see handbook for 'R' connection and mechanical details)

(Blank = no case)
-C = U Chassis + Cover
-U = U Chassis
-F = End fan + case₁
-I = End fan + case + IEC inlet₁

1. Needs 0H, 3H, 5H, TH or FH type channel 4. **The fan speed is temperature dependent, ensuring optimum cooling and lowest audible noise.**
2. For Negative Output Channel 3, follow chosen letter by 'Y'. For example, TY channel 3 = -12V / 5A
3. For Positive Output Channel 4, follow chosen letter by 'P'. For example, TP channel 4 = +12V / 1A

Confirm availability of created product code with the factory

ENVIRONMENT	
Temperature	0°C to 50°C operational, -40°C to 85°C storage (max 12 months). Full load, with either '-F' option fitted or 2m/s air blown from input to output (approximately 10CFM)
Convection Rating	See Application note for details
Derating	50°C to 65°C derate each output by 2.5% per °C
Low Temp Startup	-20°C
Humidity	5 - 95% RH non condensing
Shock	±3 x 30g shocks in each plane, total 18 shocks 30g shock = 11ms (+/-0.5msec), half sine Conforms to EN60068-2-27, EN60068-2-47, IEC68-2-27, IEC68-2-47, JIS C0041-1987. Conforms to MIL-STD-810E/F, Method 516.5, Pro I, IV, VI
Vibration	Single axis 10 - 500 Hz at 2g (sweep and endurance at resonance) in all 3 planes Conforms to EN60068-2-6, IEC68-2-6
Altitude	3,000 metres operational
Pollution	Degree 2, Material group IIIb

IMMUNITY EN61000-6-2:2001				Criteria
Electrostatic Discharge	EN61000-4-2	Level 4	Air discharge 15kV Contact discharge 8kV Not applicable to open frame units	A
Electromagnetic Field	EN61000-4-3	Level 3	(12V/m)	A
Fast / Burst Transient	EN61000-4-4	Level 4	(tested to 4.4kV)	A
Surge Immunity	EN61000-4-5	Level 3	Common mode - 2.2kV Differential - 1.1kV	A
Conducted RF Immunity	EN61000-4-6	Level 3	(12V)	A
Power Frequency Magnetic Field	EN61000-4-8	Level 4	(30A/m)	A
Voltage Dips, Variations, Interruptions	EN61000-4-11	Class 3	Criteria B for 5 sec interruption	A



Innovating Reliable Power

TDK-Lambda

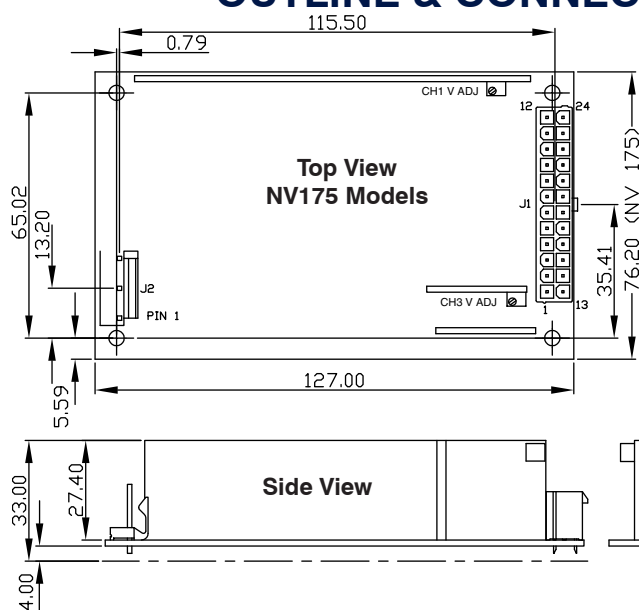
EMISSIONS EN61000-6-3:2001, EN60601-1-2:2001

Radiated Electric Field	EN55011, EN55022	(as per CISPR.11/22) Class B, FCC47 part 15 subpart B (2005) see application note for details
Conducted Emissions	EN55011, EN55022	(as per CISPR.11/22) Class B, FCC47 part 15 subpart B (2005)
Conducted Harmonics	EN61000-3-2	Class A
Flicker	EN61000-3-3	Compliant - d _{max} only

SAFETY APPROVALS

	Date	Amendments		Date	Amendments
EN 60950-1	2006		EN 61010-1	2001	
UL 60950-1	2007		IEC 61010-1*	2001	
CSA 22.2 No 60950-1	2003		IEC 60601-1*	1988	A1, A2
IEC 60950-1*	2005		EN 60601-1	1990	A1, A2, A13
CE Mark	LV Directive 2006/95/EC (EN60950-1)		UL 60601-1	2003	with revisions 2006
* CB certificate and Report available on request			Check with factory for status of approvals		

OUTLINE & CONNECTION DRAWINGS

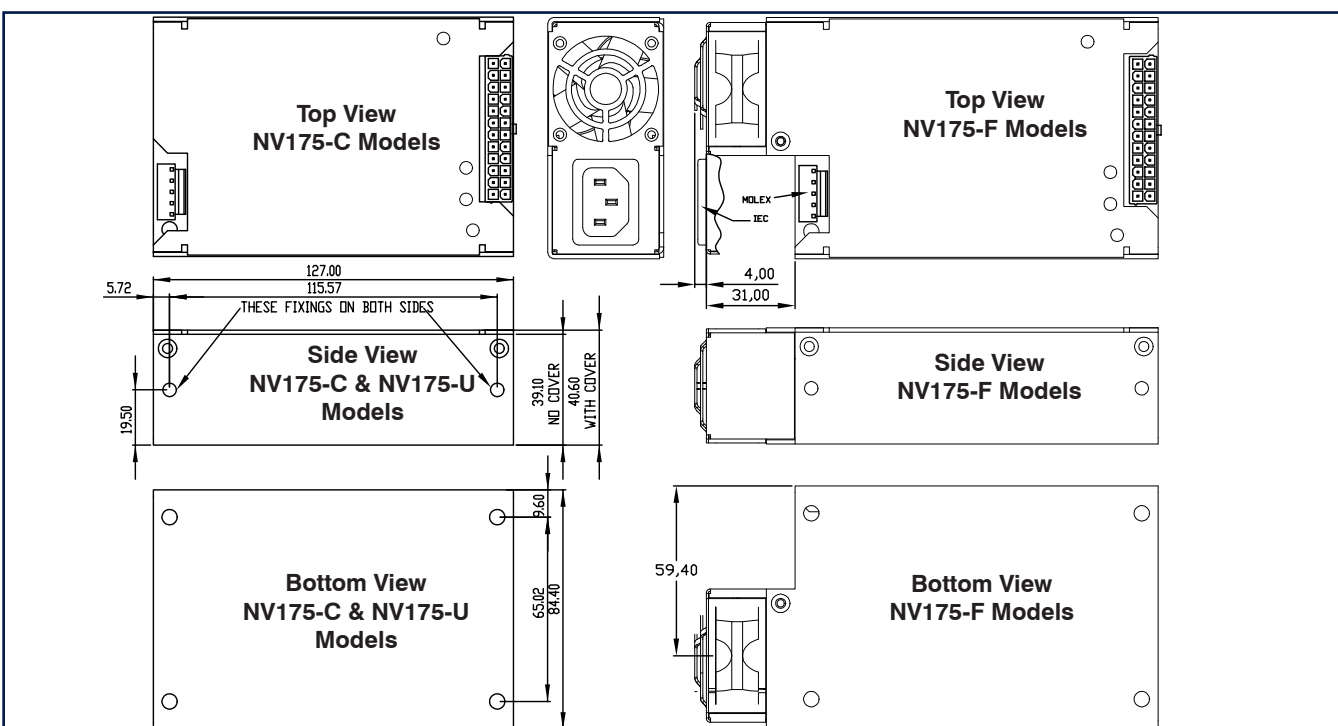


MATING PARTS (MOLEX OR EQUIVALENT)

CONN	HOUSING	PINS
J1	39-01-2245	44476-3112
J2	09-50-8051	08-52-0113

J1			
PIN	FUNCTION	PIN	FUNCTION
12	STANDBY +Ve	24	Do not connect
11	Do not connect	23	Do not connect
10	CH1 OUTPUT	22	CH1 POWER GOOD
9	CH1 OUTPUT	21	CH1 OUTPUT
8	CH1 OUTPUT	20	CH1 OUTPUT
7	+SENSE CH1	19	-SENSE CH1
6	0V COMMON	18	0V COMMON
5	0V COMMON	17	0V COMMON
4	Do not connect	16	0V COMMON
3	Do not connect	15	Do not connect
2	Do not connect	14	Do not connect
1	CH3 OUTPUT	13	CH4 OUTPUT

J2	
PIN	FUNCTION
1	EARTH
2	NOT CONNECTED
3	LIVE
4	NOT CONNECTED
5	NEUTRAL



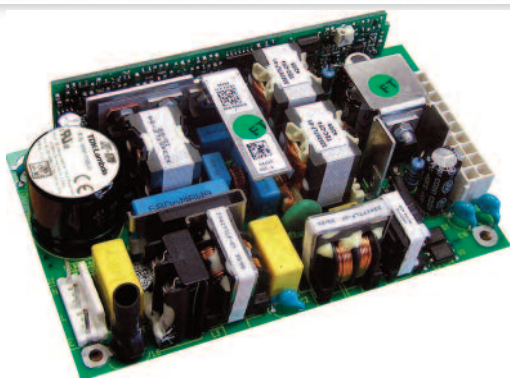
- Notes 1. All customer fixings M3 2. Maximum Penetration 4.5mm 3. Maximum torque 0.9Nm 4. All tolerances +/-0.5mm

NV-Power Series (NV-175M)



Innovating Reliable Power

TDK-Lambda



NV-Power Medical

180 Watts medical power supply for BF applications

- Reinforced Input to Output Isolation for IEC60601
- Very low Earth Leakage and Class B EMC
- Below 1W standby power
- Medical Approval (Designed for BF applications)
- 5" x 3" footprint
- Standby supply and remote on/off
- High Efficiency & High Power Density (9.3W/in³)
- No minimum load
- Fits 1U applications
- 3 Year Warranty

Key Market Segments & Applications

Medical	Security
Lifesciences/Laboratory	Network Servers and Routers
Instrumentation	Broadcast
Automation	ATE

Features and Benefits

Features

- Very low Earth Leakage and Class B EMC
- Dual Fusing
- Designed for BF medical applications

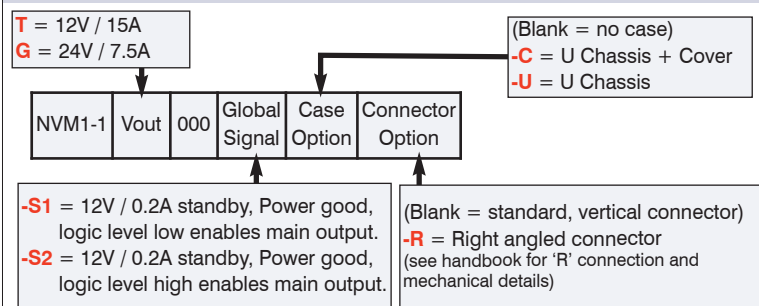
Benefits

- Meets medical leakage specs and achieves curve B EMC
- Simplifies system design, reduces cost
- Simplifies system design

INPUT

Input Voltage	90 - 264Vac (100 - 240Vac nominal)	Input Frequency	45 - 63Hz
Input Harmonics	EN61000-3-2 compliant	Inrush Current	<40A at 25°C and 264Vac, (cold start)
Input Fuse	Dual Fused, Fast acting (not user accessible)	Power Factor	0.97 typical
Earth Leakage Current	80µA max at 120Vac (60Hz), 170µA max at 240Vac (60Hz). Worst case leakage current is less than 200µA at 264Vac, 63Hz (normal condition, =330µA Single Fault Condition)		

HOW TO CREATE A PRODUCT CODE



Confirm availability of created product code with the factory

SAFETY APPROVALS

	Date	Amendments
EN 60950-1	2006	
UL 60950-1	2007	
CSA 22.2 No 60950-1	2003	
IEC 60950-1*	2005	
CE Mark	LV Directive 2006/95/EC (EN60950-1)	
IEC 60601-1*	1988	A1, A2
EN 60601-1	1990	A1, A2, A13
UL 60601-1	2003	with revisions 2006

* CB certificate and Report available on request
Check with factory for status of approvals

ISOLATION

Input to Output	Reinforced	4.5kV (ac) type tested to 4.5kVac (equivalent to 6.3kVdc), production tested to 4.3kV (dc)
Input to Earth	Basic	1.5 kV (ac), 2.3 kV (dc)
Output to Earth		1.5 kV (ac)

QUICK SELECTOR

Model	CH1	Standby	Remote On/Off
NVM1-1T000-S1	12V/15A	12V/0.2A TTL high / OC to inhibit	
NVM1-1G000-S1	24V/7.5A		

IMMUNITY EN61000-6-2:2001

Criteria	EN61000-6-2:2001	Criteria
Electrostatic Discharge	EN61000-4-2 Level 4	Air discharge 15kV Contact discharge 8kV Not applicable to open frame units
Electromagnetic Field	EN61000-4-3 Level 3	(12V/m)
Fast / Burst Transient	EN61000-4-4 Level 4	(tested to 4.4kV)
Surge Immunity	EN61000-4-5 Level 3	Common mode - 2.2kV Differential - 1.1kV
Conducted RF Immunity	EN61000-4-6 Level 3	(12V)
Power Frequency Magnetic Field	EN61000-4-8 Level 4	(30A/m)
Voltage Dips, Variations, Interruptions	EN61000-4-11 Class 3	Criteria B for 5 sec interruption

EMISSIONS EN61000-6-3:2001, EN60601-1-2:2001

Radiated Electric Field	EN55011, EN55022	(as per CISPR.11/22) Class B, FCC47 part 15 subpart B (2005) see application note for details
Conducted Emissions	EN55011, EN55022	(as per CISPR.11/22) Class B, FCC47 part 15 subpart B (2005)
Conducted Harmonics	EN61000-3-2	Class A
Flicker	EN61000-3-3	Compliant - d _{max} only

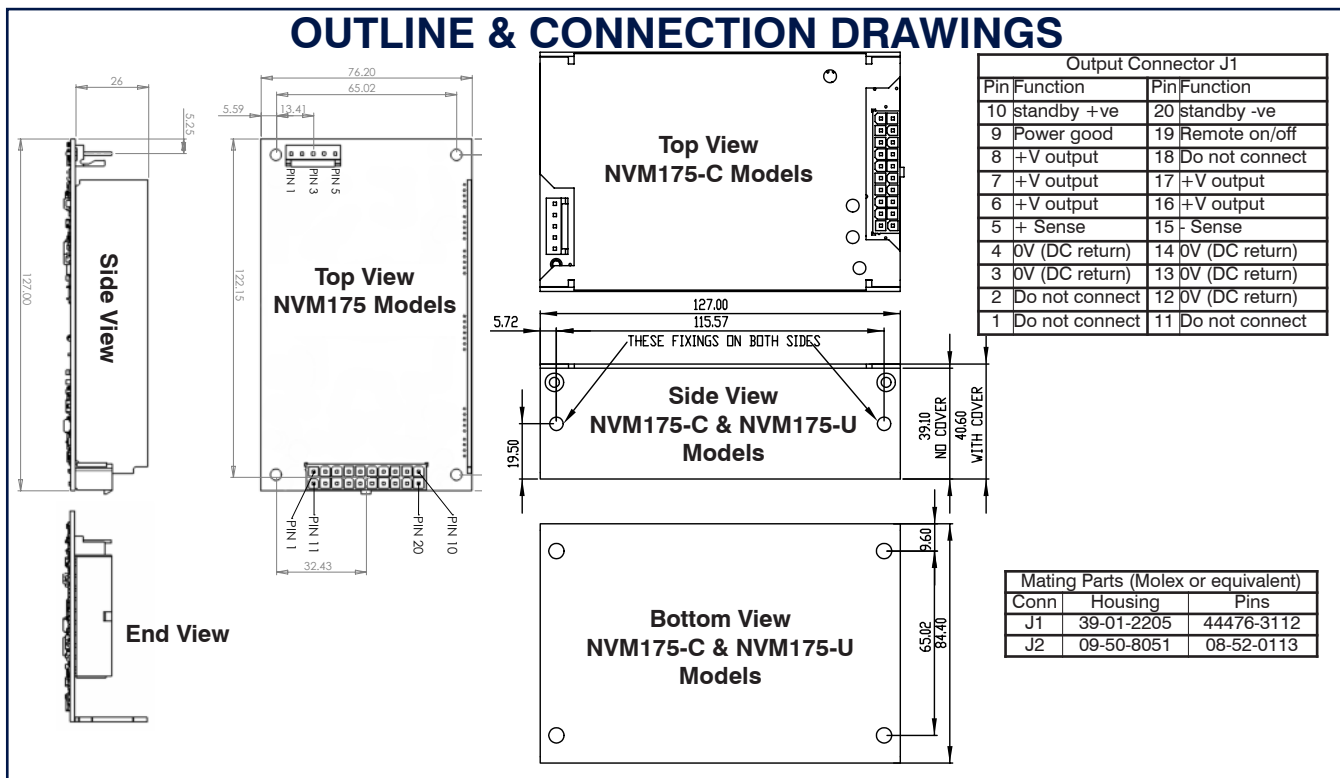


Innovating Reliable Power

TDK-Lambda

OUTPUT SPECIFICATION			ENVIRONMENT	
Remote Sense	Yes	Channel 1 - Max 0.5V total line drop.	Temperature	0° to 50°C operational, -40°C to 85°C storage (max 12 months).
Total Regulation	1%	Including Line (for 90-264Vac input change) and Load (for 0-100% load change)		Full load, with 1.5m/s air blown from input to output (approximately 10CFM)
Ripple & Noise	1%	(or 50mV if higher) pk-pk, using EIAJ test method & 20MHz bandwidth	Convection Rating	See Application note for details
Voltage Accuracy	±1%		Derating	50° to 70°C derate each output by 2.5% per °C with 2.0m/s air blown from input to output.
Turn on Time	1.5s max	at 90 Vac & 100% rated output power	Low Temp Startup	-20°C
Efficiency	up to 90%		Humidity	5 - 95% RH non condensing
Hold up	16ms min	at 90 Vac	Shock	±3 x 30g shocks in each plane, total 18 shocks 30g shock = 11ms (+/-0.5msec), half sine Conforms to EN60068-2-27, EN60068-2-47, IEC68-2-27, IEC68-2-47, JIS C0041-1987. Conforms to MIL-STD-810E/F, Method 516.5, Pro I, IV, VI
Min Load	None	on any output		
Transient Response	< 4%	of set voltage for 50% load change (in 50µs within the range 25 - 100% load)		
Recovery	<500µs	for recovery to 1% of set voltage	Vibration	Single axis 10 - 500 Hz at 2g (sweep and endurance at resonance) in all 3 planes Conforms to EN60068-2-6, IEC68-2-6 Conforms to MIL-STD-810E, Method 514.4, Pro I, Cat 1,9
Short circuit protection	Yes			
Over Temperature protection	Yes		Altitude	5,000metres operational (3,000 metres for IEC/EN/UL60601-1)
Over Voltage Protection	Yes	120-135% of Vout. Remove ac for 10 seconds then reapply to restart unit.	Pollution	Degree 2, Material group IIIb
Power good signal (J1, pin 12)	Yes	'S1' and 'S2' type global signals. Logic 'High' signal indicates ac supply is good and output 1 is within regulation. Provides minimum 4ms ac fail warning.		

OUTLINE & CONNECTION DRAWINGS



Notes 1. All customer fixings M3 2. Maximum Penetration 4.5mm 3. Maximum torque 0.9Nm 4. All tolerances +/-0.5mm



Innovating Reliable Power

TDK-Lambda



- High Efficiency
- High Power Density (8.3W/in³)
- Up to 5 outputs
- No minimum load
- Fits 1U applications
- Medical Approval
- 3 Year Warranty
- Temperature controlled Fan Option

NV-300

300 Watts

Flexible Power Solution

Key Market Segments & Applications

- | | |
|-----------------------------|-------------------------|
| Instrumentation | Broadcast |
| Medical | ATE |
| Automation | Industrial Computing |
| Security | Lifesciences/Laboratory |
| Network Servers and Routers | |

Features and Benefits

Features

- High Efficiency
- Low Profile
- High Power Density

Benefits

- Minimises heat in system
- Fits 1U applications
- Less Space

INPUT			
Input Voltage	90 - 264Vac / 120 - 350Vdc (Below 100Vac input, derate by 3W per Volt)	Input Frequency	45 - 63Hz (440Hz with reduced PFC - consult factory)
Input Harmonics	EN61000-3-2 compliant	Inrush Current	15A (typical) at 20°C and 264Vac, (cold start)
Input Fuse	6.3A, Fast acting (not user accessible)	Power Factor	0.97 typical
Earth Leakage Current	123µA max at 120Vac (60Hz), 257µA max at 240Vac (60Hz) Worst case leakage current is less than 300µA at 264Vac, 63Hz (normal condition, 500µA Single Fault Condition)		

AVAILABLE OUTPUTS											
Channel 1	Adjustment Range ₅	Channel 2 ₁	Adjustment Range ₅	Channel 3	Adjustment Range	Channel 4 ₃	Adjustment Range				
5 5V / 40A ₂	5 - 5.5V	1 1.8V / 15A	0.9 - 2.5V								
		2 2.7V / 15A	2.5 - 3.8V								
T 12V / 25A	12 - 13V	3 3.3V / 15A	2.5 - 3.8V	T 12V / 5A ₄	12 - 15V	3H -3.3V / 2A ₈	Fixed				
		2H 2.7V / 24A	2.5 - 3.8V					TH 12V / 8A ₆	12 - 15V	5H -5V / 2A ₈	Fixed
		3H 3.3V / 24A	2.5 - 3.8V					F 15V / 4A ₄	12 - 15V	TH -12V / 2A ₈	Fixed
G 24V / 12.5A	24 - 28V ₇	0 Omit	2.5 - 3.8V	FH 15V / 6.4A ₆	12 - 15V	FH -15V / 2A ₈	Fixed				
		5 5V / 10A	3.3 - 5.5V	G 24V / 2.5A	18 - 24V	0H Fan supply only					
		5H 5V / 16A	3.3 - 5.5V	0 Omit		0 Omit					
		0 Omit									
		5 5V / 8A	5 - 5.5V								
		5H 5V / 12.5A	5 - 5.5V								
		T 12V / 10A	12 - 15.5V								
		F 15V / 10A	12 - 15.5V								
		0 Omit									

- 1, 2, 3, 2H & 3H channel 2 only available with 5V channel 1.
5V / 10A channel 2 only available with 12 or 15V channel 1
5V / 8A channel 2 only available with 24V channel 1
- Maximum combined output current from Ch1 & Ch2 = 40A
- Follow letters in red by 'P' for positive output channel 4.
- 60W max output power
- Max voltage at the output (includes remote sense)
- 96W max output power
- 24 - 24.5V if 5V channel 2 fitted
24 - 26V if 24V channel 3 fitted
- 1.5A max if fitted with '-F' option.

Other output options are available, please contact factory with your requirements.



Innovating Reliable Power

TDK-Lambda

ISOLATION			
Input to Output	Reinforced	4.3kV (dc)	Note: Basic for IEC/EN/UL/CSA60601-1
Input to Earth	Basic	2.25 kV (dc)	Output to Earth 200 V (dc)

OUTPUT SPECIFICATION		
Remote Sense	Yes	Channels 1 & 2 - Max 0.5V total line drop.
Total Regulation	1.5%	For channels 1, 2 and 3 (2.5% for channel 4) Including Line (for 90-264Vac input change), Load (for 0-100% load change) and Cross (for 0-100% load change on any other output) regulation.
Ripple & Noise	1%	(or 50mV if higher) pk-pk, using EIAJ test method & 20MHz bandwidth 1.5% for units with 5V Channel 1
Voltage Accuracy	±1%	±5% for Channel 4
Turn on Time	1.5s max	at 90 Vac & 100% rated output power
Efficiency	up to 90%	configuration dependent
Hold up	16ms min	at 90 Vac
Min Load	None	on any output
Transient Response	<5%	of set voltage for 40% load change (in 50µs within the range 25 - 100% load)
Recovery	<500µs	for recovery to 1% of set voltage
Short circuit protection	Yes	
Over Temperature protection	Yes	
Over Voltage Protection	Yes	See Application Notes for details
Ch1 Good Signal	Yes	Provides a Logic 'Low' signal after Channel 1 output is within 90% (±5%) of nominal.
Output Power	300W	Total output power from all outputs (for Vin below 180Vac including standby supply) for Vin above 180Vac, max output power = 300W + standby supply

HOW TO CREATE A PRODUCT CODE

NVA3-	#o/p	Ch1	Ch2	Ch3	Ch4	Global Option	Case Option
-------	------	-----	-----	-----	-----	---------------	-------------

Number of outputs (excluding standby supply) → #o/p

Ch1 - Ch4 Letter/number from table on pg 112 to represent output voltage.

(Blank = no case)
 -C = U Chassis + Cover
 -U = U Chassis
 -F = End fan + case,
 -I = IEC input, End fan + case,

(Blank = no option)
 -N3 = 5V/2A ATX compatible
 -N4 = 12V/1A ATX compatible

1. Needs 0H, 3H, 5H, TH or FH type channel 4. **The fan speed is temperature dependent, ensuring optimum cooling and lowest audible noise.**

Confirm availability of created product code with the factory

QUICK SELECTOR - preferred configurations						
Model	CH1	CH2	CH3	CH4	CH5	Global Option ₁
NVA3-453TTH	5V / 40A	3.3V / 15A	12V / 5A	-12V / 2A	-	No
NVA3-453TTH-N3	5V / 40A	3.3V / 15A	12V / 5A	-12V / 2A	5V / 2A	ATX (-N3)
NVA3-350TTH	5V / 40A	-	12V / 5A	-12V / 2A	-	No
NVA3-350TTH-N3	5V / 40A	-	12V / 5A	-12V / 2A	5V / 2A	ATX (-N3)
NVA3-453FFH	5V / 40A	3.3V / 15A	15V / 5A	-15V / 2A	-	No
NVA3-453FFH-N3	5V / 40A	3.3V / 15A	15V / 5A	-15V / 2A	5V / 2A	ATX (-N3)
NVA3-350FFH	5V / 40A	-	15V / 5A	-15V / 2A	-	No
NVA3-350FFH-N3	5V / 40A	-	15V / 5A	-15V / 2A	5V / 2A	ATX (-N3)

Above Units available on rapid delivery. See over for additional variants available 'Build to Order'

1. see page 114 for details of global option

NV-Power Series (NV-300)



Innovating Reliable Power

TDK-Lambda

GLOBAL SIGNALS (-N3 and -N4 Option Models)

ATX Remote on/off	TTL logic level high or open circuit will inhibit all outputs (except Standby)
ATX Power Good	Logic high indicates ac supply is good and output 1 is within regulation.
Standby Supply	Common 0V with power supply. Not affected by ATX remote on/off -N3 Option = 5V / 2A -N4 Option = 12V / 1A.

IMMUNITY EN61000-6-2:2005, EN60601-1-2:2001

				Criteria
Electrostatic Discharge	EN61000-4-2	Level 4	Air discharge 15kV Contact discharge 8kV Not applicable to open frame units	A
Electromagnetic Field	EN61000-4-3	Level 3	(12V/m)	A
Fast / Burst Transient (ac input)	EN61000-4-4	Level 4	(tested to 4.4kV)	A
Fast / Burst Transient (dc output)	EN61000-4-4	Level 4	(tested to 2.2kV)	A
Surge Immunity	EN61000-4-5	Level 3	Common mode - 2.2kV Differential - 1.1kV	A
Conducted RF Immunity	EN61000-4-6	Level 3	(12V)	A
Power Frequency Magnetic Field	EN61000-4-8	Level 4	(30A/m)	A
Voltage Dips, Variations, Interruptions	EN61000-4-11	Class 3	Criteria B for 5 sec interruption	A
Voltage Fluctuations	EN61000-4-14	Class 3	For 100 - 240V Nominal	A

EMISSIONS EN61000-6-3:2001, EN60601-1-2:2001

Radiated Electric Field	EN55011, EN55022	(as per CISPR.11/22) Class B, FCC47 part 15 subpart B see app note for details
Conducted Emissions	EN55011, EN55022	(as per CISPR.11/22) Class B, FCC47 part 15 subpart B
Conducted Harmonics	EN61000-3-2	Class A
Flicker	EN61000-3-3	Compliant - d _{max} only

ENVIRONMENT

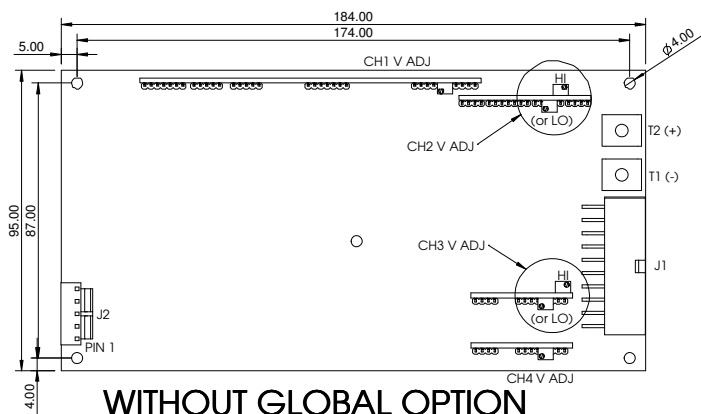
Temperature	0°C to 50°C operational, -40°C to 85°C storage (max 12 months). Full load, with either '-F' option fitted or 1.5m/s air blown from input to output (approximately 10CFM)
Derating	50°C to 65°C derate each output by 2.5% per °C
Low Temp Startup	-20°C
Humidity	5 - 95% RH non condensing
Shock	±3 x 30g shocks in each plane, total 18 shocks 30g shock = 11ms (+/-0.5msec), half sine Conforms to EN60068-2-27, EN60068-2-47, IEC68-2-27, IEC68-2-47, JIS C0041-1987. Conforms to MIL-STD-810E/F, Method 516.5, Pro I, IV, VI
Vibration	Single axis 10 - 500 Hz at 2g (sweep and endurance at resonance) in all 3 planes Conforms to EN60068-2-6, IEC68-2-6 Conforms to MIL-STD-810E, Method 514.4, Pro I, Cat 1,9
Altitude	3,000 metres operational
Pollution	Degree 2, Material group 3

SAFETY APPROVALS

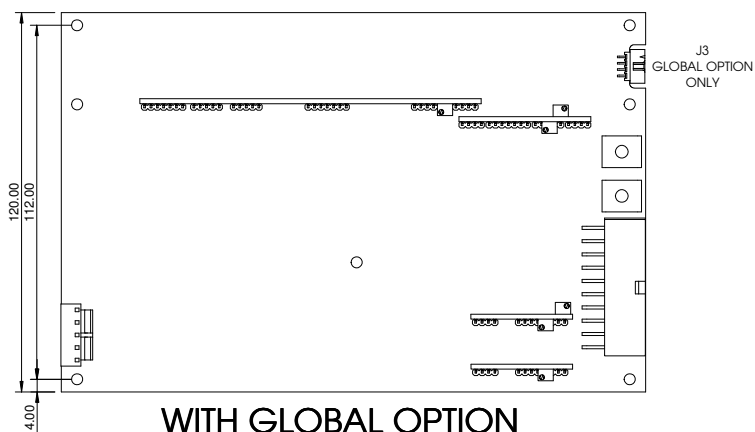
	Date	Amendments	Date	Amendments	
EN 60950-1	2006		EN 61010-1	2001	
UL 60950-1	2007		IEC 61010-1*	2001	
CSA 22.2 No 60950-1	2003		IEC 60601-1*	1988	A1, A2
IEC 60950-1*	2005		EN 60601-1	1990	A1, A2, A13
CE Mark	LV Directive 2006/95/EC (EN60950-1)		UL 60601-1	2003	with revisions 2006
* CB certificate and Report available on request			Check with factory for status of approvals		



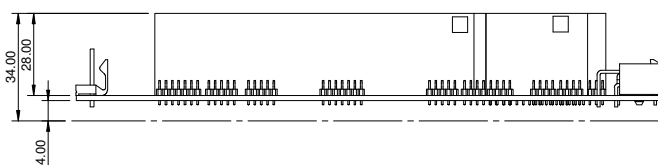
OUTLINE & CONNECTION DRAWINGS



WITHOUT GLOBAL OPTION



WITH GLOBAL OPTION



J2

PIN	CONNECTION
1	EARTH
2	NOT CONNECTED
3	LIVE
4	NOT CONNECTED
5	NEUTRAL

J1

PIN	CONNECTION	PIN	CONNECTION
11	0V COMMON	1	0V COMMON
12	0V COMMON	2	0V COMMON
13	CH2 +Ve	3	CH2 +Ve
14	CH2 +Ve	4	CH2 +Ve
15	+SENSE CH1	5	-SENSE CH1
16	+SENSE CH2	6	-SENSE CH2
17	CH1 GOOD	7	N/C
18	CH3 +Ve	8	CH3 +Ve
19	0V COMMON	9	0V COMMON
20	CH4 O/P	10	CH4 O/P

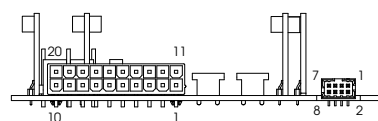
T1 & T2 (SEE TOP LEFT)

J3 (GLOBAL OPTION ONLY)

PIN	CONNECTION	PIN	CONNECTION
1	STANDBY -Ve	5	N/C
2	STANDBY +Ve	6	N/C
3	STANDBY -Ve	7	POWER GOOD
4	STANDBY +Ve	8	REM ON/OFF

MATING PARTS (MOLEX OR EQUIVALENT)

CONNECTOR	HOUSING	CRIMP PIN
J1	39-01-2205	44476-3112
J2	09-50-8051	08-52-0113
J3	51110-0860	50394
T1 & T2	N/A	TAG 19073-0165



Notes 1. All customer fixings M3

2. Maximum Penetration 4.5mm

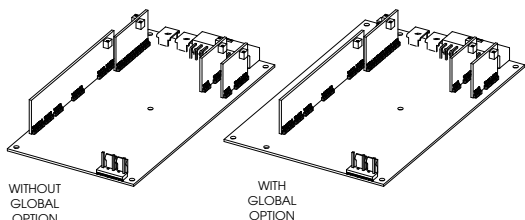
3. Maximum torque 0.9Nm

4. All tolerances +/-0.5mm

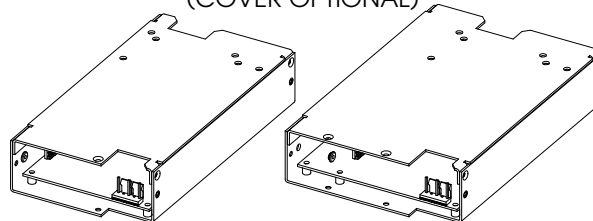


OUTLINE & CONNECTION DRAWINGS

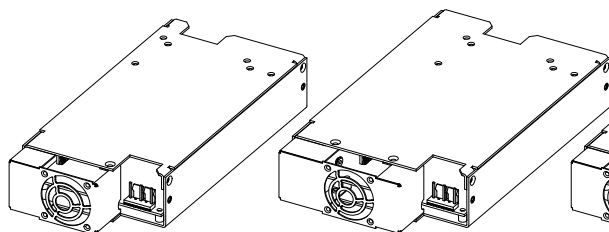
OPEN FRAME



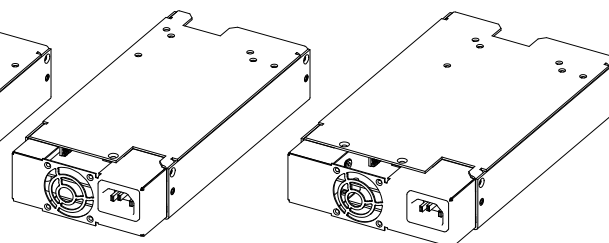
'U' CHANNEL (COVER OPTIONAL)



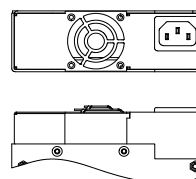
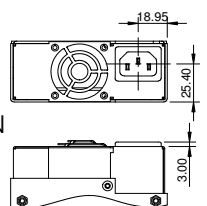
FAN OPTION



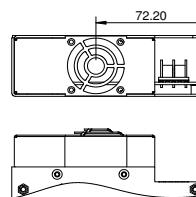
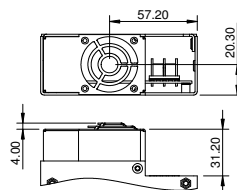
FAN+IEC OPTION



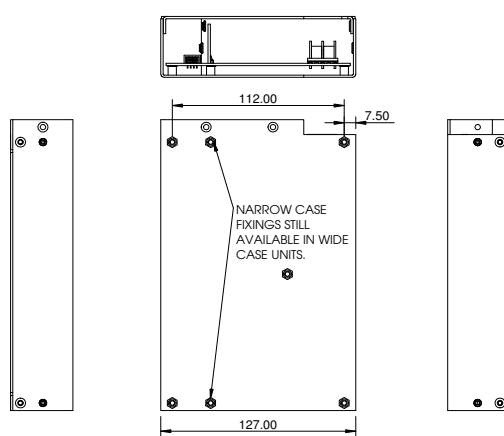
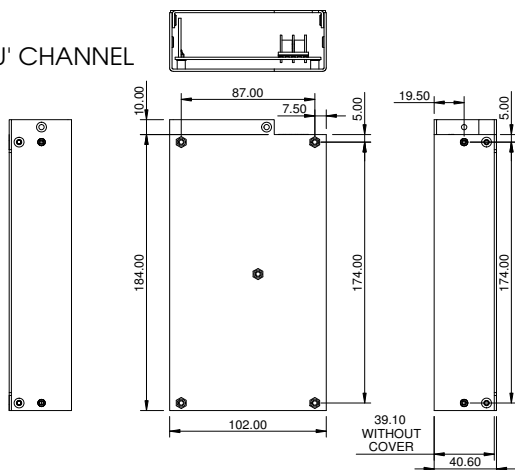
FAN+IEC OPTION



FAN OPTION



'U' CHANNEL



Notes 1. All customer fixings M3

2. Maximum Penetration 4.5mm

3. Maximum torque 0.9Nm

4. All tolerances +/-0.5mm



Innovating Reliable Power

TDK-Lambda



NV-350 / NV-700

350 - 1150Watts Modular power solution

With up to 1450W peak rating for 10 seconds

- High Efficiency
- High Power Density (up to 19W/in3)
- High Peak Power Rating
- Up to 8 outputs (6 for NV350)
- No minimum load
- Fits 1U applications
- Medical Approval
- 3 Year Warranty

Key Market Segments & Applications

Instrumentation	Broadcast
Medical	ATE
Automation	Industrial Computing
Security	Lifesciences/Laboratory
Network Servers and Routers	

Features and Benefits

Features

- High Efficiency
- Low Profile
- High Power Density

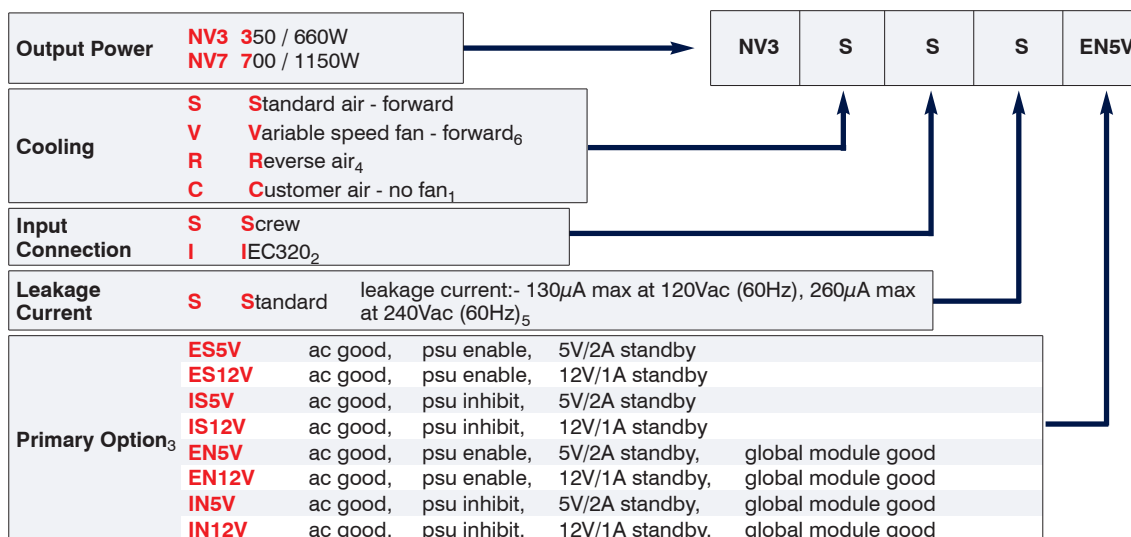
Benefits

- Minimises Heat in System
- Fits 1U Applications
- Less Space

NV350 / NV700 CONFIGURING

The extensive range of output modules and options make it possible to achieve almost any combination of Volts and Amps. You can create your own NV350 or NV700 configuration online at www.nv-power.com. This method checks your configuration and offers the optimum solution. Alternatively, you can do this manually by using the guide below.

1. Calculate total output power to ensure power requirements are within 350W or 1150W, then select required Cooling, Connection and Controls/Signals from the following table:



1 - Thermocoupled sample recommended to ensure adequate cooling - consult sales

2 - Not with customer air Cooling

3 - The Primary Option uses 1 slot

4 - Not with NV7

5 - Worst case leakage current is less than 300µA at 264Vac, 63Hz Normal Condition (<500µA Single Fault Condition)

6 - Recommended for new designs for NV-350. Not with NV7 (variable speed fan standard on NV7).



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2. Select Output Modules from the Module Tables below ensuring that no more than 6 slots (NV-350) or 8 slots (NV-700) in total are used.

Example - if you require 13V 20A :-

a) Select B as closest match for voltage & current and prefix with voltage eg **13BH**

b) Repeat for other outputs.

This will create a complete product description eg **NV3SSSES5V 13BH 12/15DB** which represents a three output NV350 with Forward air cooling, Screw input terminals, standard leakage filter, ac good, PSU enable & 5V/2A aux supply

Output 1 = 13V / 20A. Output 2 = 12V / 13A with screw terminals. Output 3 = 15V / 4A with screw terminals

Max 350W continuous output power

3. Contact TDK-Lambda to validate configuration and issue a part number.

DUAL OUTPUT MODULES							
Module		Output 1		Output 2		Max Power	
Code	Slots	Voltage Range	Current	Voltage Range	Current		
DA	1 ₈	12 (fixed)		-12 (fixed)		3A	48W
DB	2	3.2 - 3.6	25A	3.3 - 5.5	10A	55W	
				7 - 15	5A	60W	
DB	2	4.75 - 5.5	25A	24 - 32	2A	50W	
				3.3 - 5.5	10A	55W	
DB	2	5.5 - 6.5	25A	7 - 15	5A	60W	
				24 - 32	2A	50W	
DB	2	12 - 15	13A ₁	3.3 - 5.5	10A	55W	
				7 - 15	5A	60W	
DB	2	24 - 28	7A ₂	24 - 32	2A	50W	
				3.3 - 5.5	10A	55W	
DB	2	24 - 28	7A ₂	7 - 15	5A	60W	
				24 - 32	2A	50W	

SINGLE OUTPUT MODULES						
Module		Voltage Range		Current		
Code	Slots			Continuous	Peak	
B	2	3.2 - 3.6		40A	40A	
		4.75 - 5.5		40A ₃	40A ₃	
		7 - 9		22.5A ₄	22.5A ₄	
BH	2	12 - 15.5		20A ₅	20A ₅	
		24 - 28		10A ₆	10A ₆	
C	3	12 - 13.2		37.5A ₇	50A ₇	
		15 - 16.5		30A ₇	37.5A ₇	
		24 - 26.4		18.75A ₇	25A ₇	
		27 - 32		16.6A ₇	19.7A ₇	
CM	3	24 - 26.4		18.75A ₇	25A ₇	
		24 - 26.4		37.5A ₉	50A ₉	
CC	6	30 - 33		30A ₉	37.5A ₉	
		48 - 52.8		18.75A ₉	25A ₉	
		54 - 63		16.6A ₉	19.7A ₉	
CCM	6	48 - 52.8		18.75A ₉	25A ₉	

1. derate linearly from 13A at 12.5V to 10A at 15.5V

2. derate linearly from 7A at 25V to 6A at 28V

3. for NV3 - derate linearly from 40A at 5.2V to 36A at 5.5V

for NV7 - derate linearly from 40A at 5V to 36A at 5.5V

4. derate linearly from 22.5A at 8V to 20A at 9V

5. for NV3 - derate linearly from 20A at 13.2V to 16.5A at 15.5V

for NV7 - derate linearly from 20A at 12.5V to 15.5A at 15.5V

6. for NV3 - derate linearly from 10A at 25.7V to 8.5A at 28V

for NV7 - derate linearly from 10A at 24V to 8.5A at 28V

7. for NV3, 400W max

for NV7, 600W peak for up to 10sec, 450W average

8. Only one per power supply.

9. for NV7 only, 1200W peak for up to 10sec, 900W average

INPUT					
Input Voltage	90-264Vac		Input Frequency	47 - 63 Hz (up to 440Hz with reduced PFC)	
Input Harmonics	EN61000-3-2 compliant		Power Factor	0.97 typical	
Inrush Current	NV-350 <15A	at 25°C and 264Vac	Input Fuse	NV-350 6.3A	250Vac HBC Fast Acting
	NV-700 <40A	(cold start)		NV-700 16A	(not user accessible)
Leakage Current	130µA max at 120Vac (60Hz), 260µA max at 240Vac (60Hz)				
	Worst case leakage current is less than 300µA at 264Vac, 63Hz (Normal Condition, <500µA Single Fault Condition)				

OUTPUT POWER						
		90-115Vac	115-150Vac	150-180Vac	180-264Vac	Comments
NV-350	Continuous ₆	350W	450W	450W	660W	1. 350W average 2. 450W average 3. 600W average 4. 700W average 5. 1150W average 6. 250W for reverse air 7. Not for reverse air
	Peak (10s) ₇	400W ₁	500W ₂	500W ₂	740W ₃	
NV-700	Continuous	700W	700W	1150W	1150W	
	Peak (10s)		850W ₄	1150W	1450W ₅	

OUTPUT		
Voltage / Current	See module tables	
Turn on Time	1.5s max	at 90Vac and 100% rated output power
Rise time	<50ms	to 90% of voltage, monotonic rise above 10%
Efficiency	up to 90%	configuration dependent
Hold up	16ms min	at 90Vac and 100% rated power (12ms for NV-700 above 700W output power)
Ripple and Noise	<1%	pk-pk, using EIAJ test method & 20MHz bandwidth
Voltage Accuracy	<1%	of set voltage (DA module: +5/-1% for channel 1, +2/-3.5% for channel 2)
Remote Sense	Yes	standard on single o/p + ch1 of dual modules, max 0.5V total line drop (DA module: None)
Minimum Load	No	on any output (DA module: 150mA on channel 1)
Temperature Coefficient	<0.02%	of rated voltage per °C
Load Regulation	<1%	for 0-100% load change (<2% for channel 2) (DA module: <3%)
Line Regulation	<0.1%	for 90-264Vac input change
Cross Regulation	<0.1%	for 100% load change on any output (DA module: 0.2% for channel 1, 3% for channel 2)



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OUTPUT - continued		
Transient Response	<4%	of set voltage for 50% load change
Recovery	500 μ s	for recovery to 1% of set voltage (DA module: 1000 μ s)
Over Voltage Protection	Yes	
Over Current Protection (singles)	110 - 150%	of module current. Hiccup mode. Module primary side protected
Power Limit (duals)	110 - 150%	of max Power ch1 + ch2. Hiccup mode. Module primary side protected (DA module: 110-220% for channel 1, 110 - 170% for channel 2)
Short Circuit Protection	Yes	
Over Temperature Protection	Yes	cycle ac off/on to reset Shutdown temperature varies according to ambient, output power & input Voltage.

ISOLATION			
Input to Output	Reinforced	4kV (ac), 5.7kV (dc) type tested to 4kVac (equivalent to 5.7kVdc), production tested to 4.3kVdc	Outputs from C, CC, CM or CCM modules only
	Reinforced	4.3kV (dc) Note: Basic for IEC/EN/UL/CSA60601-1	Units with any other module or primary option
Input to Earth	Basic	2.3kV (dc)	
Output to Earth		200V (dc).	CM and CCM modules are 500Vac

SIGNALS - Standard	
Ch1/Ch2 Module Good	Open collector output. 'On' indicates output is within 90% (\pm 5%) of nominal
Module Inhibit	TTL logic high inhibits the output (both outputs for duals) of the module
Ch2 On/Off (duals only)	TTL logic low inhibits output 2 of the module
All signals referenced to 0V of channel	

GLOBAL INTERFACE SIGNALS - with Primary Option	
AC good collector AC good emitter	Uncommitted optocoupler. Turns on typically 5ms after ac is good and off typically 5ms before any channel falls below 95% of nominal
Global module good collector Global module good emitter	Uncommitted optocoupler. Turns on typically 200ms after all outputs are within 90% (\pm 5%) of nominal and off typically 5ms before any channel falls below 90% (\pm 5%) of nominal. Do not connect for ES and IS type primary option.
EN/ES & IN/IS Logic 0	TTL low enables (EN or ES) or inhibits (IN or IS) the entire psu including fan (except standby)
EN/ES & IN/IS Logic 1	TTL high enables (EN or ES) or inhibits (IN or IS) the entire psu including fan (except standby)
Standby Supply	5V / 2A (2.5A peak) or 12V / 1A (1.2A peak)

ENVIRONMENT	
Temperature	0° to 50° operational, -40° to 85°C storage (max 12 months)
Derating	50°C _a to 70°C derate total output power and each output current by 2.5% per °C
Low Temperature Start-up	-20°C
Humidity	5-95% RH non condensing
Shock	\pm 3 x 30g shocks in each plane, total 18 shocks 30g shock = 11ms (\pm 0.5ms), half sine conforms to EN60068-2-27, EN60068-2-47, IEC68-2-27, IEC68-2-47, JIS C0041-1987.
Vibration	Single axis 10 - 500Hz at 2g (sweep and endurance at resonance) in all 3 planes
Altitude	3,000 metres operational (5,000 metres non operational)
Pollution	Degree 2, Material group IIIb
a - 45°C for NV7 with input voltage below 100Vac	

IMMUNITY EN61000-6-2:2005, EN60601-1-2:2001				Criteria
Electrostatic Discharge	EN61000-4-2	Level 4	Air discharge 15kV Contact discharge 8kV	A
Electromagnetic Field	EN61000-4-3	Level 3	12V/m	A
Fast / Burst Transient (ac input)	EN61000-4-4	Level 4	tested to 4.4kV	A
Fast / Burst Transient (dc output)	EN61000-4-4	Level 4	tested to 2.2kV	A
Surge Immunity	EN61000-4-5	Level 3	Common mode - 2.2kV Differential - 1.1kV	A
Conducted RF Immunity	EN61000-4-6	Level 3	12V	A
Power Frequency Magnetic Field	EN61000-4-8	Level 4	30A/m	A
Voltage Dips, Variations, Interruptions	EN61000-4-11	Class 3	Criteria B for 5 sec interruption	A
Voltage Fluctuations	EN61000-4-14	Class 3	For 100 - 240V Nominal	A

NV-Power Series (NV-350 / NV-700)

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TDK-Lambda

EMISSIONS EN61000-6-3:2001, EN60601-1-2:2001

Radiated Electric Field	EN55011, EN55022	(as per CISPR.11/22) Class B, FCC47 part 15 subpart B see app note for details
Conducted Emissions	EN55011, EN55022	(as per CISPR.11/22) Class B, FCC47 part 15 subpart B
Conducted Harmonics	EN61000-3-2	Class A
Flicker	EN61000-3-3	Compliant - d _{max} only

SAFETY APPROVALS

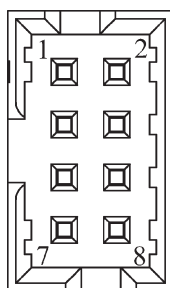
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EN 60950-1	2006		EN 61010-1	2001
UL 60950-1	2003		IEC 61010-1*	2001
CSA22.2 No 60950-1	2003		IEC 60601-1*	1988 A1, A2
IEC 60950-1*	2005		EN 60601-1	1990 A1, A2, A13
CE Mark	LV Directive 2006/95/EC (EN60950-1)		UL 60601-1	2003 with revisions 2006

* CB Certificate and report available on request Please check with Technical Sales for status of approvals

PRIMARY OPTION / DA MODULE

DA Module

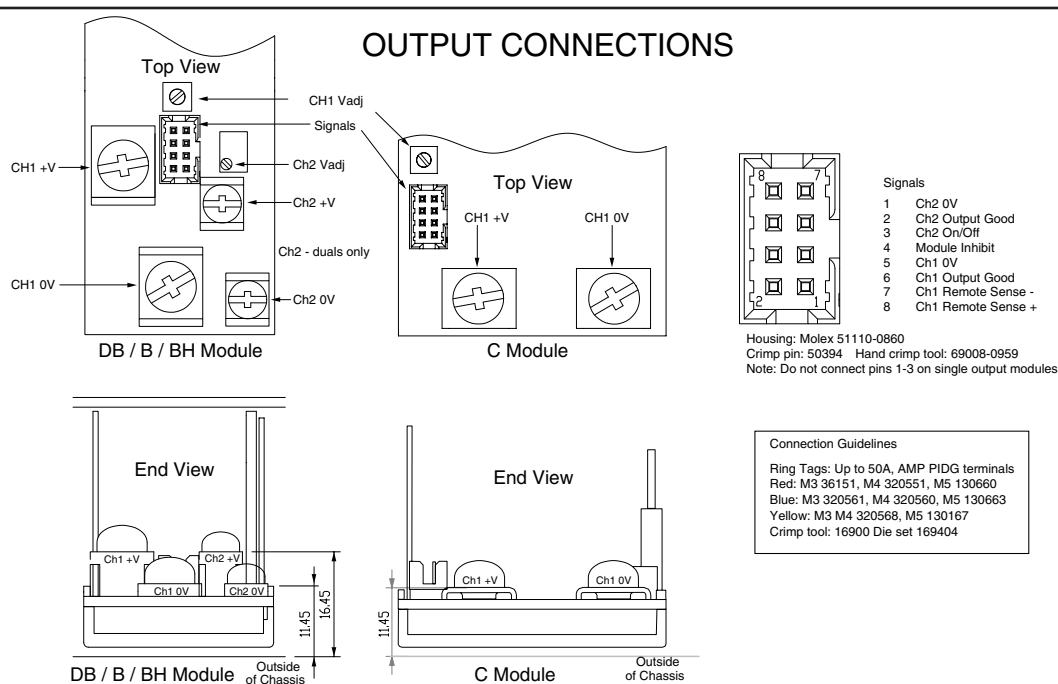
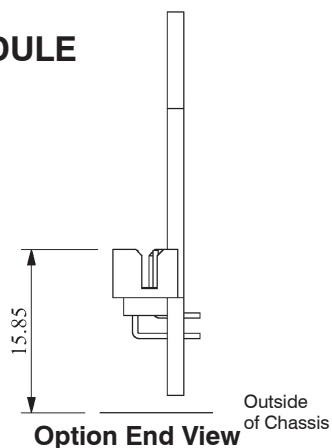
- 1 +12V (channel 1)
- 2 +12V (channel 1)
- 3 +12V (channel 1)
- 4 0V (common ch1 / ch2)
- 5 0V (common ch1 / ch2)
- 6 0V (common ch1 / ch2)
- 7 -12V (channel 2)
- 8 -12V (channel 2)



Primary Option

- 1 +V Standby
- 2 0V Standby
- 3 EN/ES & IN/IS Logic 1
- 4 EN/ES & IN/IS Logic 0
- 5 Global Module Good Collector
- 6 Global Module Good Emitter
- 7 AC good Collector
- 8 AC good Emitter

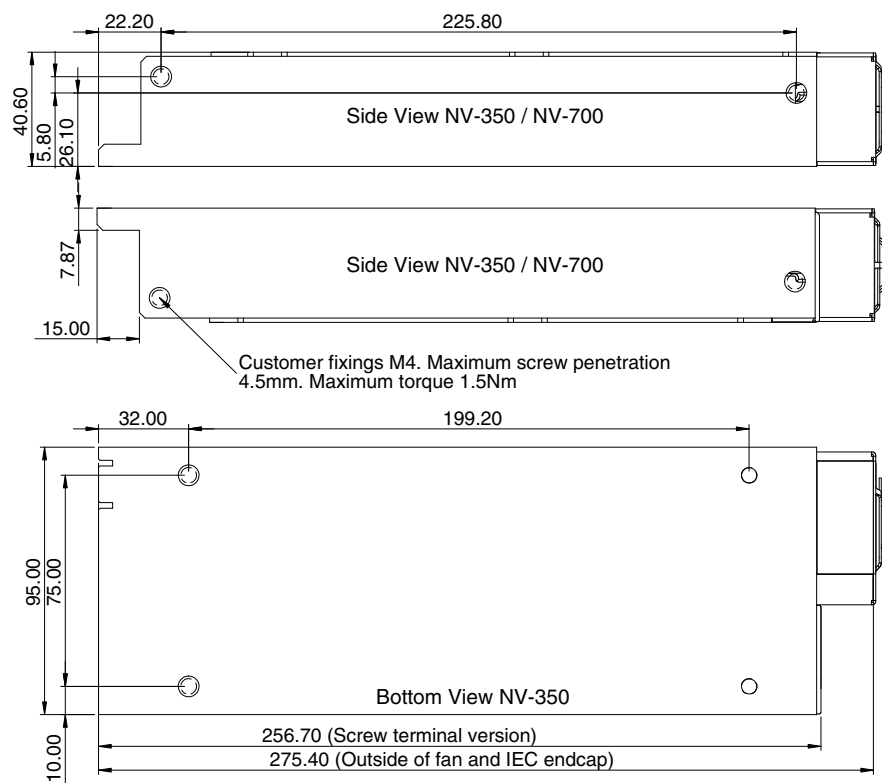
Housing: Molex 51110-0860
Crimp pin: 50394
Hand crimp tool: 69008-0959



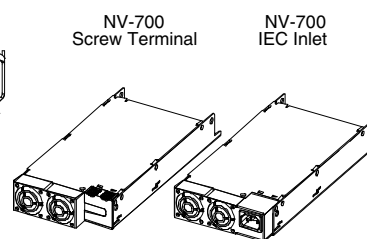
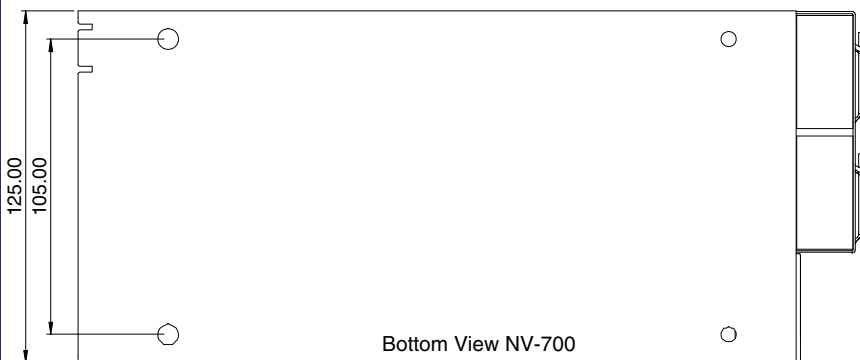
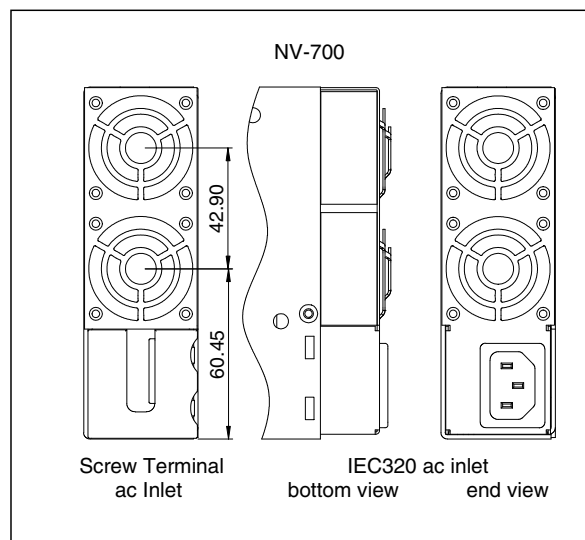
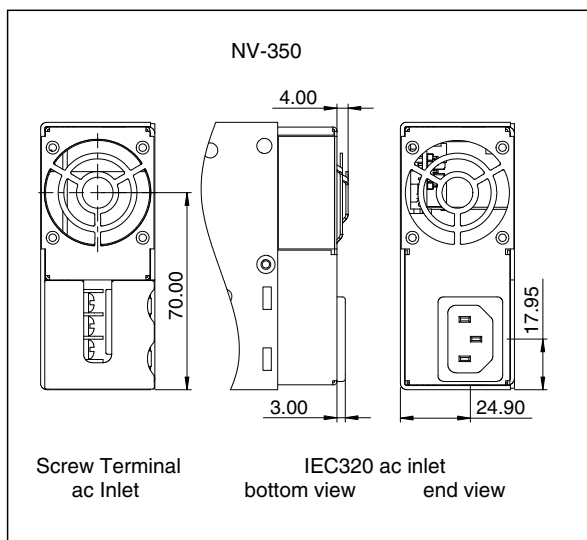
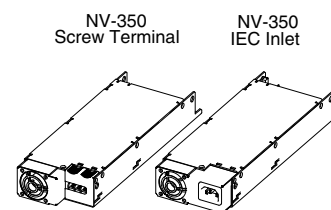


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NOTES
1) Dimensions in mm
2) Tolerances:
Edge to edge/Edge to centre, +/-0.5
Centre to centre +/-0.2





Innovating Reliable Power

TDK-Lambda



Vega Series

450, 650 & 900 Watts
Modular Power Solution

- Industry Leading Flexibility
- Up to 11 outputs
- Voltages up to 62V, Current up to 114 Amps
- Screw, Fast-on or IEC connection
- Worldwide approvals & CB report
- Medical Approval Option
- 3 Year Warranty

Key Market Segments & Applications

Instrumentation	Broadcast
Medical	ATE
Automation	Industrial Computing
Security	Lifesciences/Laboratory
Network Servers and Routers	

Features and Benefits

Features

- Modular construction
- Selection of termination options
- Worldwide Safety Approvals

Benefits

- Maximum flexibility
- Improves connection / looming options
- Supports global use

INPUT		
	Vega 450, 650, and 900	Vega dc (450W)
Input Voltage	90 - 264Vac 900W version is 150-264Vac only, 650W below 150Vac	34 - 75Vdc Derate linearly below 44V to 340W at 34V
Input Frequency	47 - 63Hz (440Hz with reduced PFC - consult factory)	dc only
Inrush Current	<40A at 25°C and 264Vac (cold start)	<40A at 25°C, ETSI EN300 132-2
Input Fuse	16A / 250Vac HBC Fast Acting (not user accessible)	20A Fast Acting (not user accessible)
Leakage Current	1.5mA max at 264Vac & 63Hz	n/a
Lower Leakage Option	see configuring guide	n/a
Power Factor	0.99 typical	n/a

OUTPUT		
Voltage / Current	See module output table	
Turn on Delay	1.5s max	at 90Vac (150Vac for 900W, 48Vdc for Vega dc) & 100% rated output power
Rise Time	<50ms	to 90% of voltage, monotonic rise above 10%
Turn on Overshoot	<5% or 250mV	Load type dependant, no overshoot with resistive load
Efficiency	75%	typical at 230Vac (48Vdc for Vega dc) & 100% rated power, config dependent
Hold up	16ms min	at 90Vac (150Vac for 900W) & 100% rated output power. 10ms min for Vega dc
Ripple & Noise	<1% or 50mV	Pk- Pk, using EIAJ test method & 20MHz bandwidth
Voltage Accuracy	<1%	of set Voltage
Remote Sense	Yes	Standard on single output modules, max 0.75V total line drop Option for twin output modules
Minimum Load	No	on any output
Temperature Coefficient	<0.02%	of rated voltage per °C
Load Regulation	<0.5% or 25mV	for 0-100% load change
Line Regulation	<0.1%	for 90 - 264Vac input change (34-75Vdc for Vega dc)
Cross Regulation	<0.2%	for 100% load change on any other output
Transient Response Recovery	<6% or 300mV	of set voltage for 50% load change (above 25% load)
	500µs	for recovery to 1% or 100mV of set voltage
Over Voltage Protection	120 - 130%	of set voltage for outputs > 4.1V (Tracking OVP)
	140 - 150%	of set voltage for outputs < 4.1V (Tracking OVP)
	120 - 150%	of max rated output (Fixed OVP)
Over Current Protection	105 - 125%	of rated current, constant current characteristic
Short Circuit Protection	<150%	of rated current, when output voltage <1%
Over Temperature Protection	Yes	Shuts down all outputs and fan. Cycle ac off / on to reset

Note 1 shutdown temp varies according to ambient, output power and input V
2 ac fail signal (if fitted) provides 5ms warning of thermal shutdown



Innovating Reliable Power

TDK-Lambda

SAFETY APPROVALS

	Date	Amendments		Date	Amendments
EN 60950-1	2006		EN 61010-1	2001	
UL 60950-1	2003		IEC 61010-1*	2001	
CSA22.2 No 60950-1	2003		IEC 60601-1* _a	1988	A1, A2
IEC60950-1*	2005		EN 60601-1 _a	1990	A1, A2, A13
CE Mark	LV Directive 2006/95/EC (EN60950-1)		UL 60601-1 _a	2003	with revisions 2006
* CB Certificate and report available on request			a - Only for L, R and T leakage variants. Not applicable to Vega dc		

EMISSIONS BS EN61000-6-3:2001 (Residential, Commercial & Light Industrial Supply), also complies with BS EN61000-6-4:2001

Radiated Electric Field	EN55022	Class B (as per CISPR.22) Class A for Vega dc	See application note for details. Only for 'S' type leakage versions
Conducted Emissions	EN55022	Class B (as per CISPR.22) Class A for Vega dc	Only for 'S' type leakage versions. 'M' & 'L' types meet Class A
Conducted Harmonics	EN61000-3-2	Compliant to Class A	Not applicable to Vega dc
Flicker	EN61000-3-3	Compliant	Not applicable to Vega dc

IMMUNITY BS EN61000-6-2:2001 (Industrial Environment), also complies with BS EN61000-6-1:2001

				Criteria
Electrostatic Discharge	EN61000-4-2	Level 4	Air discharge 15kV Contact discharge 8kV	A
Electromagnetic Field	EN61000-4-3	Level 3	10V/m (tested to 12V/m)	A
Fast / Burst Transient	EN61000-4-4	Level 4 Level 3 for Vega dc	Input 4kV, (2kV for Vega dc) Outputs 2kV, (1kV for Vega dc) Tested at 5kHz and 100kHz	A
Surge Immunity	EN61000-4-5	Level 3 Level 2 for Vega dc	Line to Line 1kV tested to 1.1kV (0.5kV, tested to 0.55kV for Vega dc) Line to Earth 2kV tested to 2.2kV (1kV, tested to 1.1kV for Vega dc)	A
Conducted RF Immunity	EN61000-4-6	Level 3	10V (tested to 12V)	A
Power Frequency Magnetic Field	EN61000-4-8	Level 4	30A Continuous	A
Voltage Dips, Variation, Interruptions	EN61000-4-11	Class 3 na - Vega dc		A B for 5s interruptions

ENVIRONMENT

Temperature	0° to 65° operational, -40° to 85°C storage (max 12 months)
Derating	50°C to 65°C derate each output by 2.5% per °C (1.5% per °C for Vega dc)
Low Temperature Start-up	-20°C
Humidity	5-95% RH non condensing
Shock	±3 x 20g shocks in each plane, total 18 shocks 20g shock = 11ms (±0.5ms), half sine conforms to EN60068-2-27, EN60068-2-47, IEC68-2-27, IEC68-2-47, JIS C0041-1987 conforms to MIL-STD-810E/F, Method 516.5, Pro I, IV, VI
Vibration	Single axis 10 - 500Hz at 2g (sweep and endurance at resonance) in all 3 planes Conforms to EN60068-2-6, IEC68-2-6 Conforms to MIL-STD-810E, Method 514.4, Pro I, Cat 1, 9
Altitude	5000 metres operational / non operational (IEC inlet 3000m operational, 5000m non-operational)
Pollution	Degree 2, Material group 3
IP Rating	IP 10

ISOLATION

Input to Output	Reinforced	4kV (ac), 5.7kV (dc) type tested, production tested to 4.3kVdc. Vega dc = 4.3kVdc
Input to Earth	Basic	2.3 kV (dc) Output to Output / Output to Earth Operational 200 V (dc)



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TDK-Lambda

OUTPUT VOLTAGES (single output modules)					(twin output modules)						
Module	Adjustment Range (Volts)		Amps	Slots	Module	V1 Adjustment Range (Volts)		Amps	V2 Adjustment Range (Volts)	Amps	Slots
B1L	1.8	- 3.8 _e	20	1	H1L/1L				1.8 - 3.8 _n	8	1
C1	1.8	- 4.1 _e	35	1	H1L/1H				3.9 - 5.5 _d	8	1
C1Y	1.8	- 4.1 _e	40	1	H1L/2	1.8	- 3.8 _n	12	5.6 - 9 _f	6	1
D1L	1.8	- 3.8	50	1.5	H1L/3				9.1 - 16.2 _u	6	1
E1	1.8	- 3.8 _e	60	2	H1L/4				16.3 - 25 _p	4.5	1
F1 _a	1.8	- 3.8	80	2	H1H/1L				1.8 - 3.8 _n	8	1
Z2	1.8	- 3.8 _e	95	3	H1H/1H				3.9 - 5.5 _d	8	1
Z3	1.8	- 3.8 _e	114	4	H1H/2	3.9	- 5.5 _d	12	5.6 - 9 _f	6	1
B1H	3.9	- 5.5 _d	20	1	H1H/3				9.1 - 16.2 _u	6	1
L1	4.2	- 5.5 _d	35	1	H1H/4				16.3 - 25 _p	4.5	1
D2	3.8	- 9 _k	45	1.5	H2/1L				1.8 - 3.8 _n	8	1
D1H	3.9	- 5.5 _d	50	1.5	H2/1H				3.9 - 5.5 _d	8	1
E2	3.8	- 8 _k	60	2	H2/2	5.6	- 9 _f	10	5.6 - 9 _f	6	1
Z18	4.2	- 5.5	66	2	H2/3				9.1 - 16.2 _u	6	1
F2 _a	3.8	- 8	75	2	H2/4				16.3 - 25 _p	4.5	1
Z4	3.9	- 5.5 _d	95	3	H3/1L				1.8 - 3.8 _n	8	1
Z6	3.9	- 5.5 _d	104	3.5	H3/1H				3.9 - 5.5 _d	8	1
B2	5	- 9 _f	25	1	H3/2	9.1	- 16.2 _u	10	5.6 - 9 _f	6	1
B3	9.1	- 16.2 _g	12	1	H3/3				9.1 - 16.2 _u	6	1
C3	9.1	- 16.2 _g	18	1	H3/4				16.3 - 25 _p	4.5	1
D3	8	- 16.5 _g	24	1.5	H5/1L				1.8 - 3.8 _n	8	1
E3L	8	- 13.9 _l	40	2	H5/1H				3.9 - 5.5 _d	8	1
Z7	8	- 16.5 _g	45	3	H5/2	16.2	- 28	5	5.6 - 9 _f	6	1
EE2	7.6	- 16 _g	45	4	H5/3				9.1 - 16.2 _u	6	1
D4	14	- 21.5 _i	18	1.5	H5/4				16.3 - 25 _p	4.5	1
E4	14	- 19.9 _m	30	2	Wide Range Programmable Modules						
E3H	14	- 15	36	2	Module	Voltage Range	Amps	Slots			
C4	16.3	- 21.5 _i	14	1	W2 _a	1 - 7.5	30	1	Select features from table		
CC3	18.2	- 32.4 _j	18	2	W5	0.5 - 32	8.5	1	below		
E5L _v	20	- 24	27	2	Follow by F or T Fixed or T Tracking Overvoltage protection F or S Fast-on or S Screw terminal R or V Resistance (0-32kOhm) Voltage (0-5V) programming 1 Inhibit, Fixed Current Limit 1, 2, 3 2 Inhibit, Programmable current limit (0-5V) or 4 3 Enable, Fixed Current Limit 4 Enable, Programmable current limit (0-5V)						
B5	21.6	- 31 _h	6	1							
C5	21.6	- 31 _j	10	1							
D5	21	- 28	15	1.5							
E5H _v	24	- 28	25	2							
Z19 _{co}	24	- 28	36	3.5							
HH5/3	25.3	- 44.2 _b	5	1							
DD4	28	- 43 _s	18	3							
EE4 _c	28	- 38	22.5	4							
HH5/4	32.5	- 53 _t	4.5	1							
BB4	32.6	- 43 _q	10	2	Follow non wide range modules by F (Fast-on) or S (Screw) terminal						
EE5L _{co}	40	- 48	18	4	Options - Single output Modules*			Options - Twin Output Modules*			
C5B4	43	- 48	10	2	N	Output Inhibit, Module Good Current Sharing			Output Inhibit, Module Good, Remote Sense		
EE5H _o	48	- 56	18	4					Remote sense only		
CC5	48.1	- 62 _r	10	2	* see configuring guide						
DD5	42	- 56	15	3							

- a) F1, F2 and W2 modules not for Vega 900
 b) 38V max for 900W
 c) Only available for Vega 900
 d) 5.1V max for 900W
 e) 3.4V max for 900W
 f) 8V max for 900W
 g) 15V max for 900W
 h) 28V max for 900W

- i) 18V max for 900W
 j) 30V max for 900W
 k) 7.5V max for 900W
 l) 12.5V max for 900W
 m) 19V max for 900W
 n) 3.4V max for 900W
 o) 'N' option not available
 p) 24V max for 900W

- q) 40V max for 900W
 r) 60V max for 900W
 s) 36V max for 900W
 t) 52V max for 900W
 u) 15.5V max for 900W
 v) 'N' option not available if more than 1 module fitted



Vega Configuring Guide

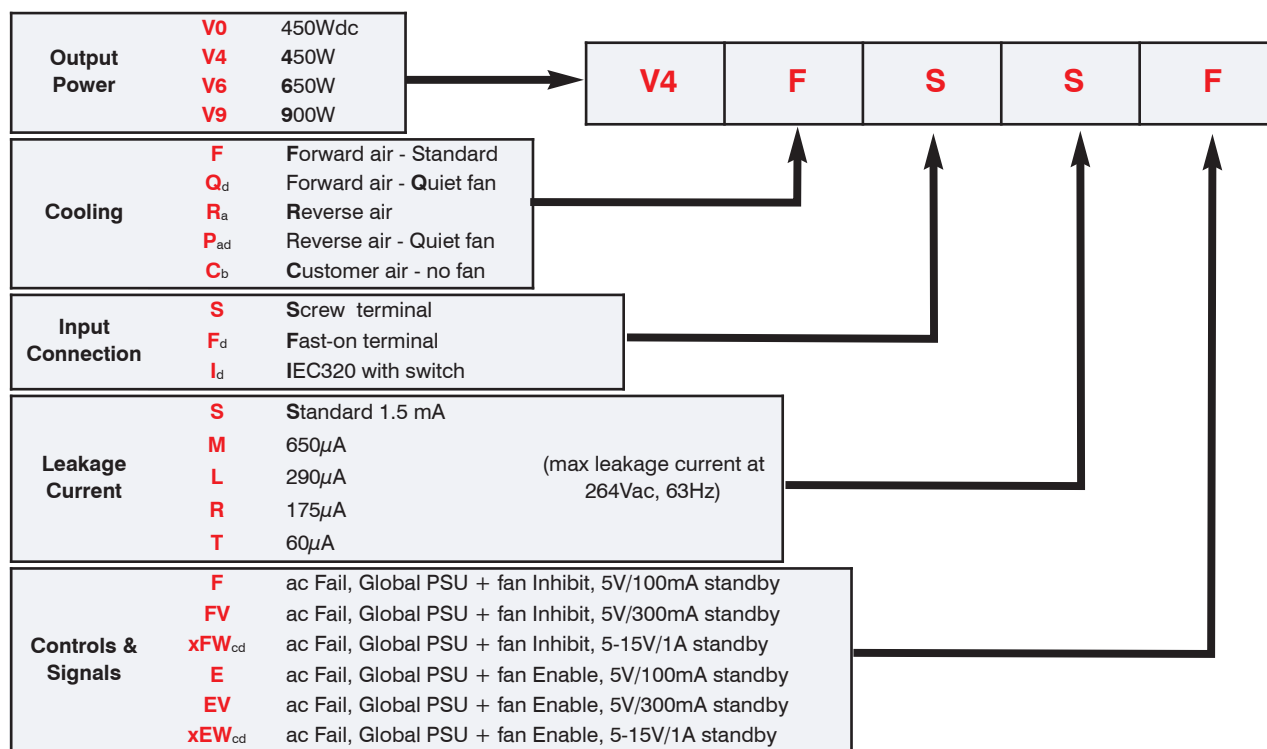
The extensive range of output modules and options make it possible to achieve almost any combination of Volts and Amps. The 'online' configurator is the best way to achieve the optimum configuration, however you can also create your own Vega configuration from this datasheet by using the guide below.

Web Configurator

- 1 Visit <http://www.emea.tdk-lambda.com>, select 'Vega Configurator' and follow the online instructions.
- 2 Enter your required Volts / Amps, type of output connection and any additional functions (if required)
- 3 Enter preferred type of cooling, input connection, lower leakage current (if required) and controls & signal functions, (if required)
- 4 Configurator will select the most suitable modules and options and give a unique part number.

Configuring from Datasheet

- 1 Calculate total output power to determine Vega 450W, 650W or 900W and select converter, then select required Cooling, Connection, Leakage Current and Controls/Signals from the following table:-



Notes:

- Not available for Vega 900
 - Thermocoupled sample recommended to ensure adequate cooling - consult sales
 - xFW and xEW options increase leakage current by 90μA
Replace 'x' with required output voltage (5FW = 5V aux supply)
 - Not available for Vega dc.
- 2 Select Output Modules and Options from the Output Voltages tables.
Example - if you require 5.2V / 18A with output inhibit : -
 - a) select B1H as closest match for voltage and current and prefix with voltage (eg **5.2B1H**)
 - b) add suffix S or F for Screw or Fast-on connection (eg **5.2B1HS**)
 - c) add suffix N for output inhibit eg **5.2B1HSN**
 - d) repeat for other outputs

Ensure you do not select more than a total of 5 slots width of module. This will create a complete product description eg:-

V6FSSF 5L1SN 12/12H3/3S 24C5S which represents a four output 650W Vega with Forward air, Screw input terminals, 1.5mA Earth Leakage, ac Fail, Global Inhibit & 5V / 100mA aux supply with the following outputs:-

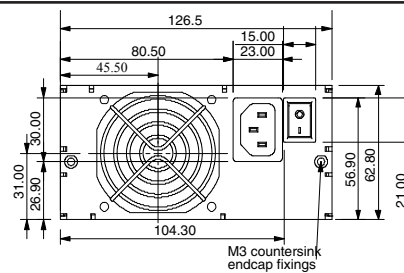
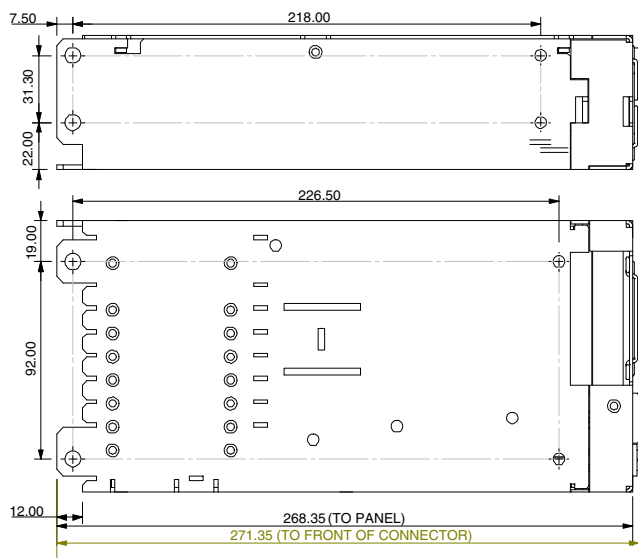
- Output 1 = 5V / 35A with output inhibit, Module Good and Current Share option
- Output 2 = 12V / 10A
- Output 3 = 12V / 6A
- Output 4 = 24V / 10A

- 3 Contact TDK-Lambda to validate configuration and issue a part number.



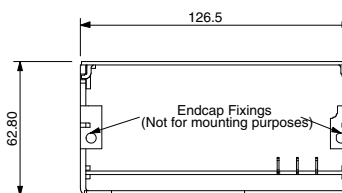
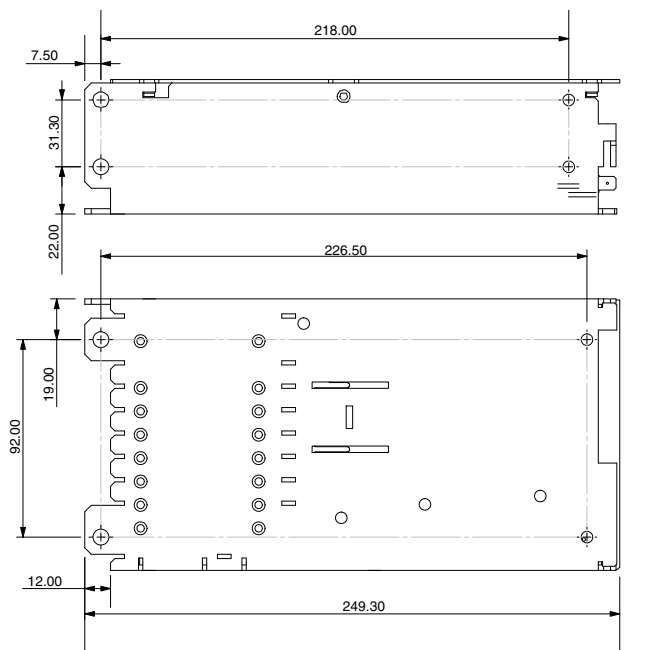
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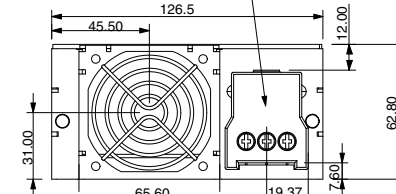
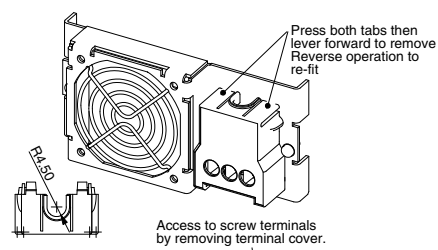
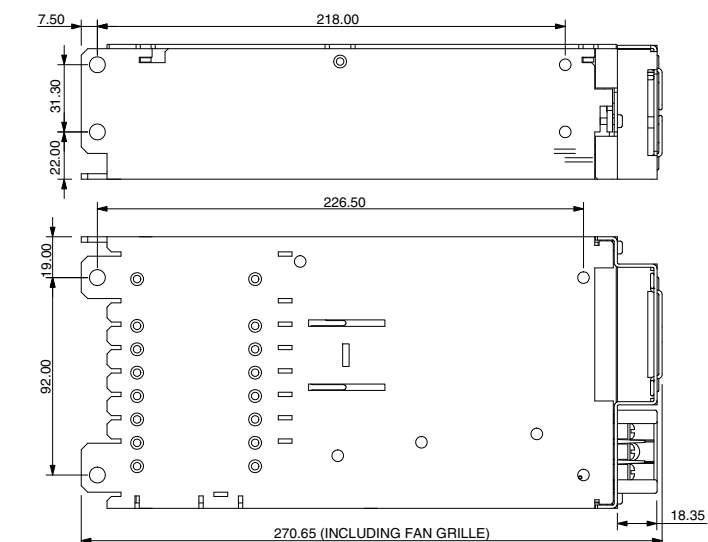


IEC-320 Connector Case

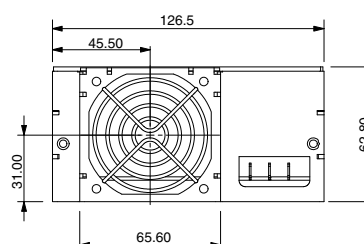
All versions have:-
 8 x M4 Customer fixings
 Max thread penetration:- 4.5mm



Customer Air Case (no fan)



Screw & Fast-on Terminal Case





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TDK-Lambda



Vega-Lite Series

550 - 900 Watts

Modular power solution

- Industry Leading Flexibility
- 1 to 11 outputs
- Voltages from 1.8 to 56V
- Current up to 60 Amps
- Worldwide approvals & CB report
- Medical approval option
- 3 Year Warranty

Key Market Segments & Applications

Instrumentation	Broadcast
Medical	ATE
Automation	Industrial Computing
Security	Lifesciences/Laboratory
Network Servers and Routers	

Features and Benefits

Features

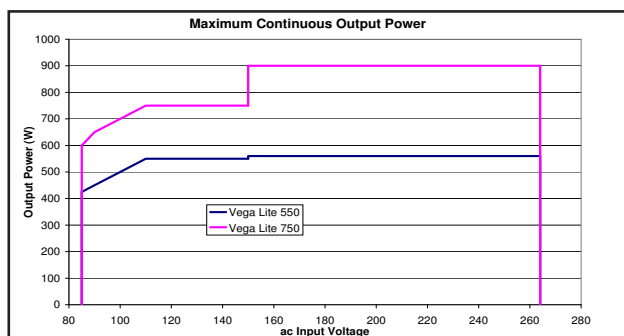
- Modular Construction
- Worldwide Safety Approvals

Benefits

- Maximum flexibility
- Supports Global use

INPUT

Voltage Range	85 - 264Vac
Frequency	47 - 63Hz (440Hz with reduced PFC - consult factory)
Inrush Current	<40A at 25°C and 264Vac (cold start)
Fuse	16A / 250Vac High Breaking Capacity, Fast Acting (not user accessible)
Leakage Current	1.5mA max at 264Vac & 63Hz (medical version also available)
Power Factor	0.99 typical



OUTPUT

Voltage / Current	See module tables	
Turn on Delay	1.5s max	at 90Vac & 100% rated output power
Rise Time	<50ms	to 90% of voltage, monotonic rise above 10%
Turn on Overshoot	<5% or 250mV	Load type dependant, no overshoot with resistive load
Efficiency	75%	typical at 230Vac & 100% rated power, configuration dependent
Hold up	16ms min	at 100Vac & 100% rated output power
Ripple & Noise	<1%	(or 50mV if higher) Pk- Pk, using EIAJ test method & 20MHz bandwidth
Voltage Accuracy	<1%	of set Voltage
Remote Sense	Yes	Standard on single output modules, max 0.75V total line drop Option for twin output modules
Minimum Load	No	on any output
Temperature Coefficient	<0.02%	of rated voltage per °C
Load Regulation	<0.5% or 25mV	for 0-100% load change
Line Regulation	<0.1%	for 100 - 264Vac input change
Cross Regulation	<0.2%	for 100% load change on any other output
Transient Response Recovery	<6% or 300mV	of set voltage for 50% load change (above 25% load)
	500µs	for recovery to 1% or 100mV of set voltage
Over Voltage Protection	120 - 130%	of set voltage for outputs > 4.1V (Tracking OVP)
	140 - 150%	of set voltage for outputs < 4.1V (Tracking OVP)
	120 - 150%	of max rated output (Fixed OVP)
Over Current Protection	105 - 125%	of rated current, constant current characteristic
Short Circuit Protection	<150%	of rated current, when output voltage <1%
Over Temperature Protection	Yes	Shuts down all outputs and fan. Cycle ac off / on to reset

Note 1 shutdown temp varies according to ambient, output power and input V
2 ac fail signal (if fitted) provides 5ms warning of thermal shutdown



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TDK-Lambda

OUTPUT VOLTAGES (single modules)

Output Voltage	Module Width (Slots)							
	1 slot		1.5 slots		2 slots		3 slots	
	Module	Current	Module	Current	Module	Current	Module	Current
1.8V	1.8C1S	35A	1.8D1LS	50A	1.8E1S	60A		
2V	2C1S	35A	2D1LS	50A	2E1S	60A		
3.3V	3.3C1S	35A	3.3D1LS	50A	3.3E1S	60A		
5V	5L1S	35A	5D1HS	50A	5E2S	60A		
6.5V	6.5B2S	25A	6.5D2S	45A	6.5E2S	60A		
12V	12C3S	18A	12D3S	24A	12E3LS	40A		
15V	15C3S	18A	15D3S	24A	15E4S	30A		
18V	18C4S	14A	18D4S	18A	18E4S	30A		
24V	24C5S	10A	24D5S	15A	24E5HS	25A		
28V	28C5S	10A	28D5S	15A	28E5HS	25A		
36V	36HH5/4S	4.5A			36BB4S	10A		
48V	48HH5/4S	4.5A			48C5B4S	10A	48DD5S	15A

OUTPUT VOLTAGES (twin modules) - all 1 slot width

Output Voltage	Channel 1						
	5V / 12A	12V / 10A	15V / 10A	18V / 5A	24V / 5A	28V / 5A	
Channel 2	1.8V / 8A	5/1.8H1H/1LS					
	2V / 8A	5/2H1H/1LS					
	3.3V / 8A	5/3.3H1H/1LS					
	5V / 8A		12/5H3/1HS	15/5H3/1HS	18/5H5/1HS	24/5H5/1HS	28/5H5/1HS
	12V / 6A	5/12H1H/3S	12/12H3/3S	15/12H3/3S	18/12H5/3S	25/12H5/3S	28/12H5/3S
	15V / 6A	5/15H1H/3S	12/15H3/3S	15/15H3/3S	18/15H5/3S	25/15H5/3S	28/15H5/3S
	18V / 4.5A				18/18H5/4S	24/18H5/4S	28/18H5/4S
	24V / 4.5A				18/24H5/4S	24/24H5/4S	28/24H5/4S

OUTPUT VOLTAGES (single modules)

OUTPUT VOLTAGES (single modules)						TWIN OUTPUT MODULES						
Module	Adjustment Range (Volts)		Amps	Slots	Module	V1 Adjustment Range (Volts)		Amps	V2 Adjustment Range (Volts)		Amps	Slots
C1S	1.8	- 3.4	35	1	H1H/1LS	3.9	- 5.1	12	1.8	- 3.4	8	1
D1LS	1.8	- 3.8	50	1.5	H1H/3S	3.9	- 5.1	12	9.1	- 15.5	6	1
E1S	1.8	- 3.4	60	2	H3/1HS	9.1	- 15.5	10	3.9	- 5.1	8	1
L1S	4.2	- 5.1	35	1	H3/3S	9.1	- 15.5	10	9.1	- 15.5	6	1
D2S	3.8	- 7.5	45	1.5	H5/1HS	16.2	- 28	5	3.9	- 5.1	8	1
D1HS	3.9	- 5.1	50	1.5	H5/3S	16.2	- 28	5	9.1	- 15.5	6	1
E2S	3.8	- 7.5	60	2	H5/4S	16.2	- 28	5	16.3	- 24	4.5	1
B2S	5	- 8	25	1								
C3S	9.1	- 15	18	1								
D3S	8	- 15	24	1.5								
E3LS	8	- 12.5	40	2								
D4S	14	- 18	18	1.5								
E4S	14	- 19	30	2								
C4S	16.3	- 21.5	14	1								
C5S	21.6	- 30	10	1								
D5S	21	- 28	15	1.5								
E5HS	24	- 28	25	2	Options - Single output Modules*				Options - Twin Output Modules*			
HH5/4S	32.5	- 48	4.5	1	N	Output Inhibit, Module Good Current Sharing			N Output Inhibit, Module Good, Remote Sense			
BB4S	32.6	- 40	10	2					R Remote Sense Only			
C5B4S	43	- 48	10	2								
DD5S	42	- 56	15	3	* see configuring guide							



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TDK-Lambda

SAFETY APPROVALS					
	Date	Amendments		Date	Amendments
EN 60950-1	2006		EN 61010-1	2001	
UL 60950-1	2003		IEC 61010-1*	2001	
CSA22.2 No 60950-1	2003		IEC 60601-1*	1988	A1, A2
IEC 60950-1*	2005		EN 60601-1 _a	1990	A1, A2, A13
CE Mark	LV Directive 2006/95/EC (EN60950-1)		UL 60601-1 _a	2003	with revisions 2006
* CB Certificate and report available on request			a - Only for 'L' type leakage variants Check with technical Sales for status of approvals		

ISOLATION					
Input to Output	Reinforced	4kV (ac), 5.7kV (dc) type tested, production tested to 4.3kVdc.			
Input to Earth	Basic	2.3 kV (dc)	Output to Output / Output to Earth	Operational	200 V (dc)

EMISSIONS BS EN61000-6-3:2001 (Residential, Commercial & Light Industrial Supply), also complies with BS EN61000-6-4:2001			
Radiated Electric Field	EN55022	Class B (as per CISPR.22)	See application note for details. Only for 'S' type leakage versions
Conducted Emissions	EN55022	Class B (as per CISPR.22)	Only for 'S' type leakage versions. 'L' types meet Class A
Conducted Harmonics	EN61000-3-2	Compliant to Class A	
Flicker	EN61000-3-3	Compliant	

IMMUNITY BS EN61000-6-2:2001 (Industrial Environment), also complies with BS EN61000-6-1:2001					Criteria
Electrostatic Discharge	EN61000-4-2	Level 4	Air discharge 15kV Contact discharge 8kV		A
Electromagnetic Field	EN61000-4-3	Level 3	10V/m (tested to 12V/m)		A
Fast / Burst Transient	EN61000-4-4	Level 4	Input 4kV Outputs 2kV Tested at 5kHz and 100kHz		A
Surge Immunity	EN61000-4-5	Level 3	Line to Line 1kV (tested to 1.1kV) Line to Earth 2kV (tested to 2.2kV)		A
Conducted RF Immunity	EN61000-4-6	Level 3	10V (tested to 12V)		A
Power Frequency Magnetic Field	EN61000-4-8	Level 4	30A Continuous		A
Voltage Dips, Variation, Interruptions	EN61000-4-11	Class 3			A B for 5s interruptions

ENVIRONMENT	
Temperature	0° to 65° operational, -40° to 85°C storage (max 12 months)
Derating	50°C to 65°C derate each output by 2.5% per °C
Low Temperature Start-up	-20°C
Humidity	5-95% RH non condensing
Shock	±3 x 20g shocks in each plane, total 18 shocks 20g shock = 11ms (±0.5ms), half sine conforms to EN60068-2-27, EN60068-2-47, IEC68-2-27, IEC68-2-47, JIS C0041-1987 conforms to MIL-STD-810E/F, Method 516.5, Pro I, IV, VI
Vibration	Single axis 10 - 500Hz at 2g (sweep and endurance at resonance) in all 3 planes Conforms to EN60068-2-6, IEC68-2-6 Conforms to MIL-STD-810E, Method 514.4, Pro I, Cat 1, 9
Altitude	5,000 metres operational / non operational
Pollution	Degree 2, Material group 3
IP Rating	IP 10



Vega-Lite Configuring Guide

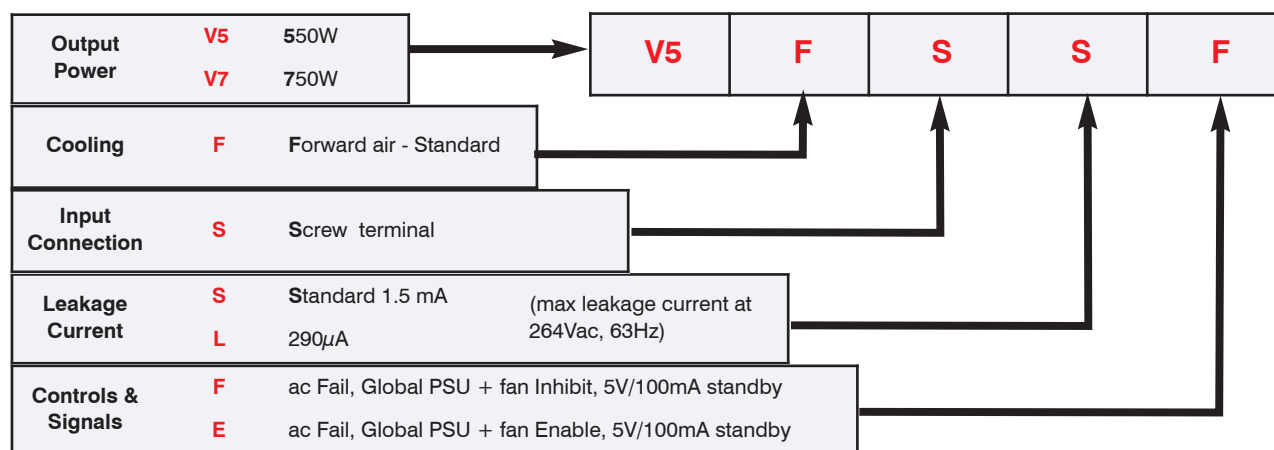
The extensive range of output modules and options make it possible to achieve all popular combinations of Volts and Amps. The 'online' configurator is the best way to achieve the optimum configuration, however you can also create your own Vega configuration from this datasheet by using the guide below.

Web Configurator

- 1 Visit <http://www.emea.tdk-lambda.com>, select 'Vega Configurator' and follow the online instructions.
- 2 Enter your required Volts / Amps, and any additional functions (if required)
- 3 Enter preferred type of cooling, input connection, lower leakage current (if required) and controls & signal functions, (if required)
- 4 Configurator will select the most suitable modules and options and give a unique part number.

Configuring from Datasheet

- 1 Calculate total output power to determine Vega 550W (560W at 150 Vac and above) or 750W (900W at 150Vac and above) and select converter, then select required Cooling, Connection, Leakage Current and Controls/Signals from the following table:-
- 2 Select Output Modules and Options from the Available Output Voltages tables.



- Example - if you require 5V / 18A with output inhibit :-
- a) select 5L1S as closest match for voltage and current
 - b) add suffix N for output inhibit eg **5L1SN**
 - c) repeat for other outputs

Ensure you do not select more than a total of 5 slots width of module. This will create a complete product description eg:- **V5FSSF 5L1SN 12/12H3/3S 24C5S** which represents a four output 550W Vega with Forward air, Screw input terminals, 1.5mA Earth Leakage, ac Fail, Global Inhibit & 5V / 100mA aux supply.

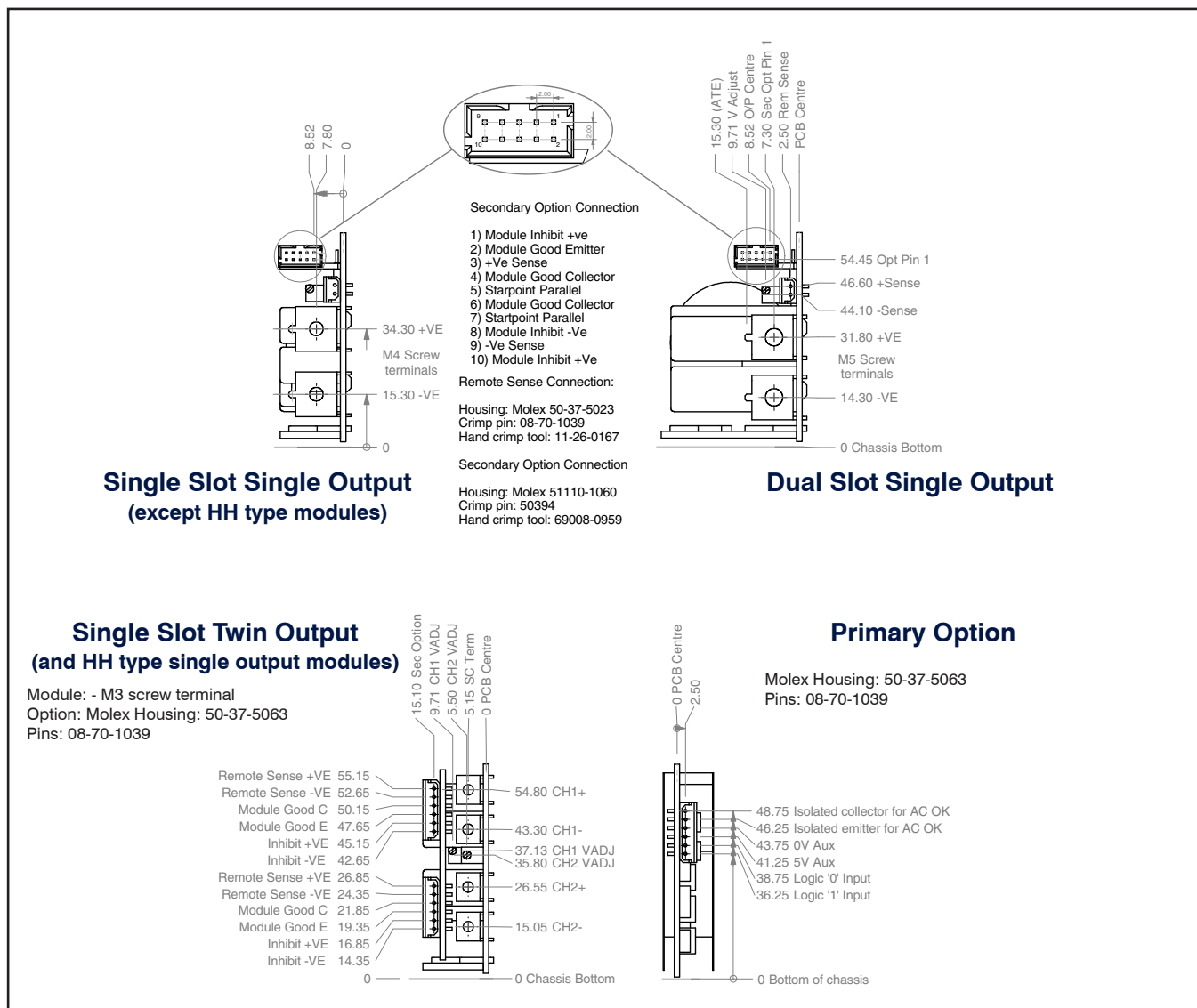
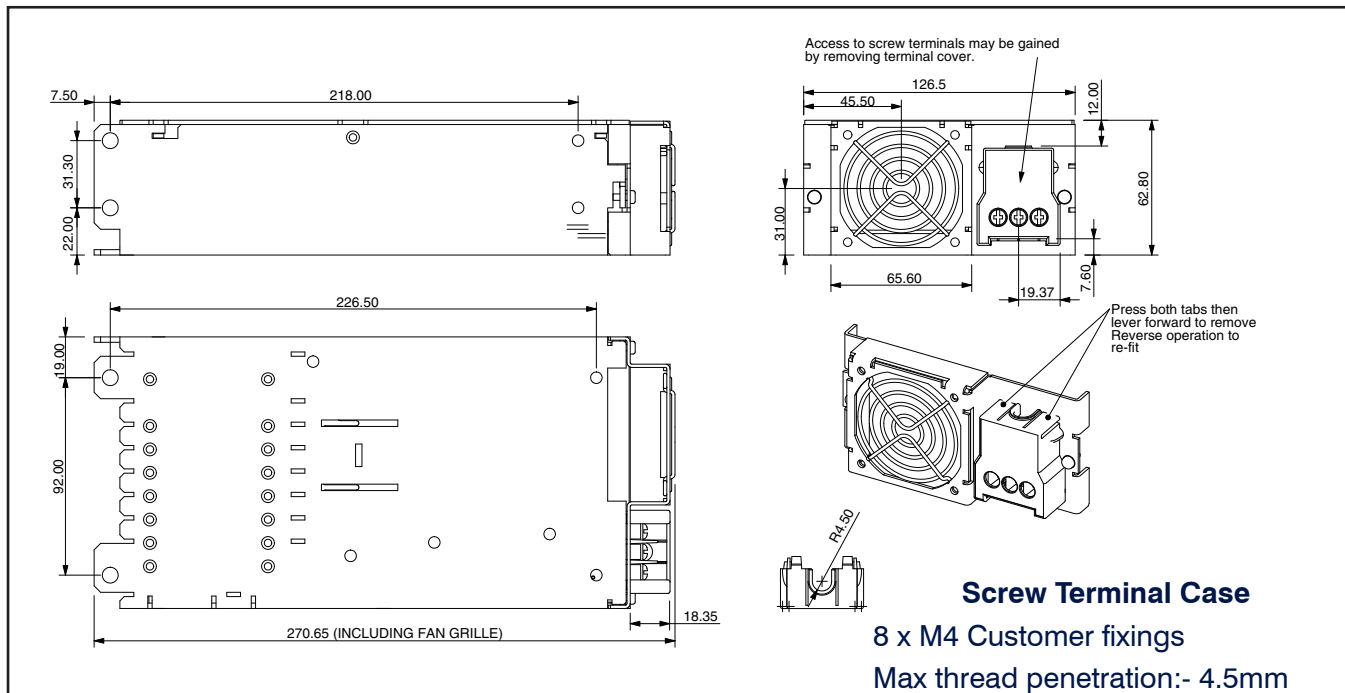
- Output 1 = 5V / 35A with output inhibit, Module Good and Current Share option
 Output 2 = 12V / 10A
 Output 3 = 12V / 6A
 Output 4 = 24V / 10A

- 3 **Contact TDK-Lambda to validate configuration and issue a part number.**



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Alpha Series

1000 and 1500W
AC/DC Modular

- Up to 16 outputs
- Voltages up to 48V, Current up to 300A
- Fast-on output connection
- Worldwide approvals & CB report
- Medical Approval Option
- 3 Year Warranty

Key Market Segments & Applications

Instrumentation	Broadcast
Medical	ATE
Automation	Industrial Computing
Security	Lifesciences/Laboratory
Network Servers and Routers	

Features and Benefits

Features

- Low Profile
- Fast-on output terminal
- Medical Approval available

Benefits

- Simpler to install in system
- Reduces installation time/errors
- Suitable in medical applications

INPUT

Input Voltage	Alpha 1000	85 - 264Vac, 120 - 360Vdc
	Alpha 1500	85 - 264Vac (1000W below 150Vac input)
Input Frequency	47 - 63Hz (440Hz with reduced PFC - consult factory)	
Inrush Current	<50A at 25°C and 264Vac (cold start)	
Input Fuse	20A / 250Vac HBC Fast Acting (not user accessible)	
Leakage Current	1.1mA max at 264Vac & 63Hz	
Lower Leakage Option	see configuring guide	
Power Factor	0.99 typical	

OUTPUT

Voltage / Current	See module output table	
Turn on Delay	1.5s max	at 90Vac (150Vac for Alpha 1500W) & 100% rated output power
Rise Time	<50ms	to 90% of voltage, monotonic rise above 10%
Turn on Overshoot	<5% or 250mV	Load type dependant, no overshoot with resistive load
Efficiency	75%	typical at 230Vac & 100% rated power, config dependent
Hold up	13ms min	at 90Vac & 100% rated output power 13ms for 1000W, 8ms for 1500W and at 207Vac for 1500W
Ripple & Noise	<2%	(or 100mV if greater) Pk- Pk, using EIAJ test method & 20MHz bandwidth
Voltage Accuracy	<1%	of set Voltage
Remote Sense	Yes	Standard on single output modules
Minimum Load	No	on any output
Temperature Coefficient	<0.02%	of rated voltage per °C
Load Regulation	<0.5% or 25mV	for 0-100% load change (with sense connected, <2% without)
Line Regulation	<0.5%	for 90 - 264Vac input change (210-264Vac for 1500W)
Cross Regulation	<0.2%	for 100% load change on any other output
Transient Response Recovery	<10%	of set voltage for 50% load change (above 25% load)
	500µs	for recovery to 1% or 100mV of set voltage (1000µs for S module)
Over Voltage Protection	Standard	for all outputs
Over Current Protection	Standard	for all outputs
Short Circuit Protection	<150%	of rated current, when output voltage <1%
Over Temperature Protection	Yes	Shuts down all outputs. Cycle ac off / on to reset

Note shutdown temp varies according to ambient, output power and input V



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TDK-Lambda

SAFETY APPROVALS					
	Date	Amendments		Date	Amendments
EN 60950-1	2001		IEC 60601-1 _a	1988	A1, A2
UL 60950-1	2003		UL 60601-1 _a	2003	
CSA22.2 No 60950-1	2003		CSA 60601-1 _a	2003	
IEC60950-1*	2001		CE Mark	LV Directive 2006/95/EC (EN60950-1)	
* CB Certificate and report available on request			a - Only for LL, RL and TL leakage variants. CA400 + CA1000 only		

PRODUCT, GENERIC & COLLATERAL STANDARDS				
Low Voltage Power Supply, EMC	EN61204-3: 2001	Compliant to High Severity Immunity	Class A emissions for CA1000 / CA1500	
Medical Electrical Equipment, EMC	EN61601-1-2: 2001	Compliant	Class A emissions for CA1000 / CA1500	
Immunity for residential, commercial and light industrial environments	EN61000-6-1: 2001	Compliant		
Immunity for industrial environments	EN61000-6-2: 2001	Compliant		
Emissions for industrial environments	EN61000-6-4: 2001	Compliant		

EMISSIONS				
Radiated Electric Field	EN55022	Class A (as per CISPR.22)	See application note for details. Only for 'S' type leakage versions	
Conducted Emissions	EN55022	Class A (as per CISPR.22)	Only for 'S' type leakage versions.	
Conducted Harmonics	EN61000-3-2: 2001	Compliant to Class A		
Flicker	EN61000-3-3: 1995 + A1:2001	Compliant - d _{max} only.		

IMMUNITY					Criteria
Electrostatic Discharge	EN61000-4-2	Level 4	Air discharge 15kV Contact discharge 8kV		A
Electromagnetic Field	EN61000-4-3	Level 3	10V/m (tested to 12V/m)		A
Fast / Burst Transient	EN61000-4-4	Level 4	Input 4kV Outputs 2kV, Tested at 5kHz and 100kHz		A
Surge Immunity	EN61000-4-5	Level 3	Line to Line (Differential) 1.1kV Line to Earth (Common Mode) 2.2kV		A
Conducted RF Immunity	EN61000-4-6	Level 3	10V (tested to 12V)		A
Power Frequency Magnetic Field	EN61000-4-8	Level 4	30A Continuous		A
Voltage Dips, Variation, Interruptions	EN61000-4-11	Class 3			A B for 5s interruptions
Voltage Fluctuations	EN61000-4-14	Class 3	For 100 to 240V nominal		A

ENVIRONMENT	
Temperature	0°C to 70°C operational, -40° to 85°C storage (max 12 months)
Derating	50°C to 70°C derate each output by 2.5% per °C
Low Temperature Start-up	-20°C
Humidity	5-95% RH non condensing
Shock	3000 shocks, each of 10g (16ms) half sine
Vibration	10 - 200Hz @ 1.5g
Altitude	3,000 metres operational (15,000 metres non operational)
Pollution	Degree 2, Material group 3
IP Rating	IP 10

ISOLATION					
Input to Output	Reinforced	4.3 kV (dc)	Output to Earth	Operational	500 V (dc)
Input to Earth	Basic	2.3 kV (dc)	Output to Output	Operational	500 V (dc)