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240 Watt LPE Series

DC/DC Converter

Typical Unit

Product Overview

The “On-Board” DC/DC Converter is a ruggedized DC-DC power module intended to be permanently installed “on board” a mobile battery system application. The converter module is designed to operate from a 48Vdc (nominal) motive power battery source and provide a 12Vdc (nominal) output (at 20Adc) for power system control electronics. Optimized for harsh environments that require battery operated systems.

Features

- 35Vdc to 60Vdc input range
- 12Vdc (nom) at 20A output
- Thermal management: conduction & convection
- “Flying Lead” cables
- Ruggedized IP67 enclosure
- Enable function
- Overall size L x W x H:

  119.3mm x 78.7mm x 39.9mm

  4.7” x 3.07” x 1.57”
- Designed to comply with RoHS Directive & REACh Regulations
- RoHS compliant
- UL/CUL/CB 62368-1 Approved

Model Number	Input voltage (Vdc)	Output voltage (Vdc)	Iout (Adc)
48S12.20LPE	48	12	20

Table of Contents

General Conditions (unless otherwise specified)

- Ambient Temperature +25°C Vin typical; Vout nominal load
- Vin typical; Vout nominal load
- With 0.1µF, 10µF, and 22µF capacitors across output pins

INPUT CHARACTERISTICS					
Parameter	Conditions	Min	Nom	Max	Units
Input Voltage DC Operating Range	Provided by motive power battery	35	48	60	Vdc
Turn-on input voltage[1]	Input rising	34.5	35.5	37	
Turn-off input voltage[1]	Input falling	32.5	33.8	34.5	
Input overvoltage protection	Input rising	61	62.5	64	Vdc
Input Current	35Vdc Input Voltage		7.3	7.6	Adc
Shutdown mode input power	48Vdc Input Voltage		0.4	1	W
Input Capacitance				2.0	mF

[1]Based upon initial 48Vdc motive power battery limits

OUTPUT CHARACTERISTICS						
Parameter		Conditions	Min	Nom	Max	Units
Voltage setpoint accuracy		48 Vin, 50% load	11.76	12.0	12.24	Vdc
Line regulation		35 Vin to 60 Vin, FL	-0.15		0.15	%
Load regulation		48 Vin, NL load to FL	-1.25		1.25	%
Temperature Coefficient				0.02		%/°C
Output Current Capability		Stable Operation	0		20.0	Adc
Output Protection	OCP	Auto reset “hiccup” mode	25		36	
	S/C	Auto reset “hiccup” mode	36			
	OTP	Self-recovery (with hysteresis)[2]		115		°C
	OVP	Latching (recycle input to reset)	13	14	15	Vdc
Output Ripple		Zero to Full Load[3]			200	mVpp
Transient Response		50% load step, 1A/µsec slew rate load		1,000	1,300	mV
Turn On (active) delay (Output Delayed Start)		After each application of 48 Vdc Input power		110	150	mSec
Output Voltage Rise-Time		10-90% of Vo			20	mSec
Efficiency		Overall Vin and Io operating conditions.		94		%

[2]External case temperature.
[3]Measurement point at cable/connector termination w/ 0.1µF, 10µF, & 22µF ceramic capacitors in parallel across measurement point; coax to scope without ground loop. BW = 20MHz.
[4]See Figures 1a & 1b for efficiency and power dissipation characteristics over full operating range.

FEATURES					
Parameter	Conditions	Min	Typ	Max	Units
ON/OFF Control – Positive Logic					
ON state	Pin open = ON or	2		6.5	V
Control Current	Leakage current			0.16	mA
OFF state		0		0.8	V
Control current	Sinking	0.3		0.36	mA
Delayed Start	Upon every instance the 48Vdc input is applied to the power module there shall be a 110 mSec delay before the DC/DC converter switches ON to provide output current.				

ENVIRONMENTAL CHARACTERISTICS					
Parameter	Conditions	Min	Typ	Max	Units
Temperature - Storage	Including transport	-40		125	°C
Temperature - Operating Case		-20		105	
Humidity - Operating	Non-condensing	10		85	%RH
Altitude - Operating	Maximum power capability at altitude: to 94% of max power rating @ 1km to 87% of max power rating @ 2km to 80% of max power rating @ 3km	0		3,000	meters
Temperature - Case	Operational, Monitor ref. location, see Fig. 3			115	°C
Temperature - Rise	ΔT – From $T_{REFERENCE}$ (Case) to $T_{Ambient}$ Reference location see Fig. 3 – Mechanical)		25		°C
Service Life	Operational	2,670			Hrs.
Ingress Protection	Rating of IP67				
Flammability	Case material is rated for level of UL94 V0				
Safety Approval	UL/CUL/CB 62368-1 approved				
Outside Dimensions	78.7mm x 119.3mm x 39.9mm, nominal				
Case Material	Cast aluminum - Matte Black Anodize				
Weight (typ.)	0.68 / 1.5				kg/lbs

ISOLATION CHARACTERISTICS	
Parameter	Description
Input to output	Non-isolated design
Input return and all output return lines are electrically connected to chassis	

EMISSIONS AND IMMUNITY		
Parameter	Method/Standard	Compliance
Radiated - Emissions (Broadband)	ECE R010r5e, Annex 7	ECE R010r5e Para 6.5 (w/ 3dB margin)
Radiated - Emissions (Narrowband)	ECE R010r5e, Annex 8	ECE R010r5e Para 6.6 (w/ 3dB margin)
Conducted Transients - Emissions	ISO 7637-2 per ECE R010r5e, Annex 10.	per ECE R010r5e Para 6.7 (w/ 3dB margin) Table 1 for 12V systems.
EM Radiation - Immunity	ECE R010r5e, Annex 9	ECE R010r5e Para 6.8
Conducted Transients – Immunity	ISO 7637-2 per ECE R010r5e, Annex 10.	per ECE R010r5e Para 6.9 Table 2 for 12V systems. (Test pulses 1, 2a, 2b, 3a, 3b and 4)
ESD - Immunity	IEC/EN 61000-4-2	8kV Direct Contact Discharge 25kV Indirect (Air) Discharge

Performance Curves

Figure 1a: Efficiency

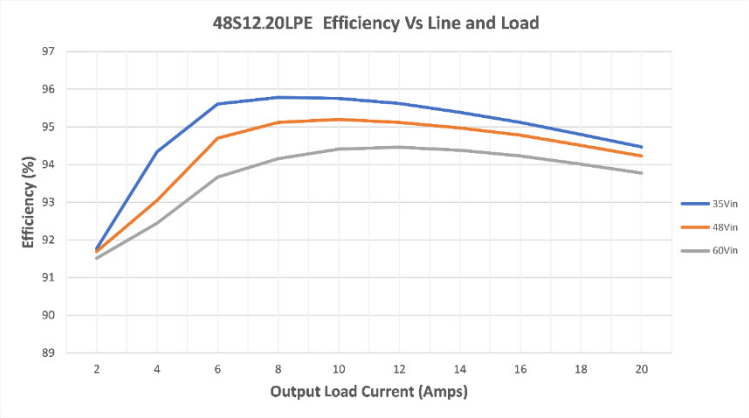


Figure 1b: Power Dissipation

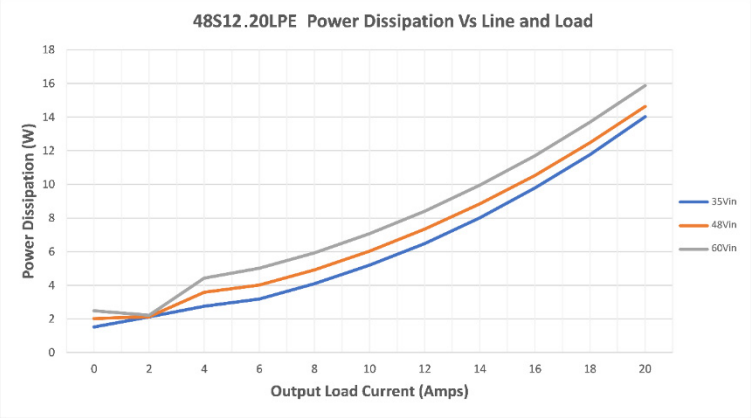
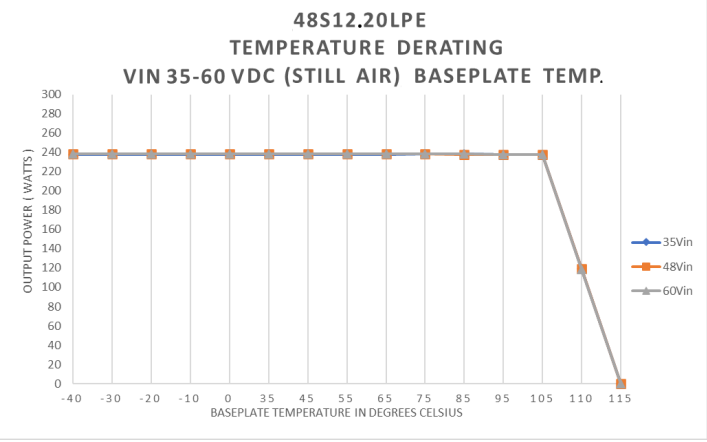


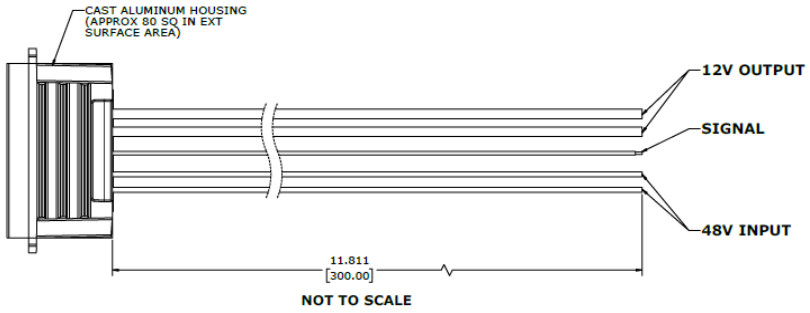
Figure 2a: Thermal Power Derating Curves



NOTE: Above, are the output power derating curves with an output load at 20Adc.

(x axis = Baseplate Temperature. Natural Conduction/Baseplate Controlled.)

Mechanical Specifications



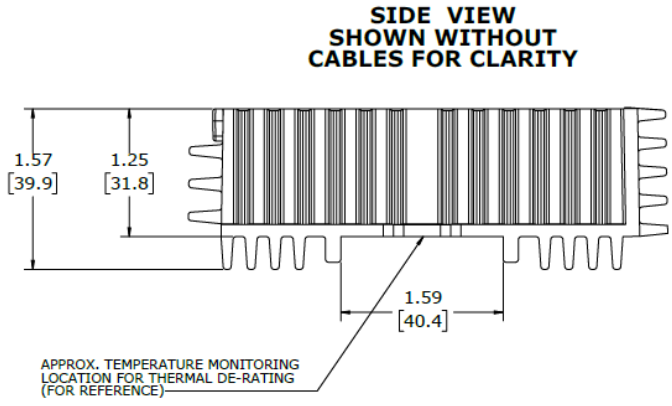


Figure 3: Side View

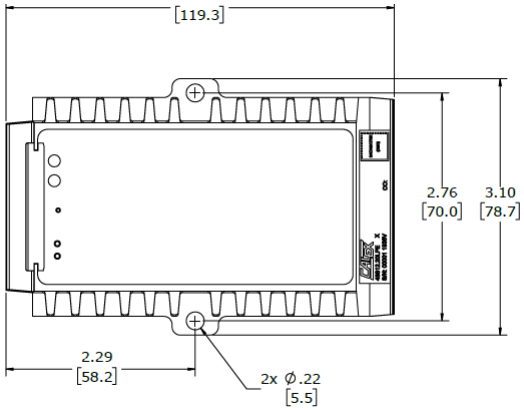
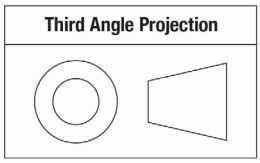


Figure 4: Top View

CABLE SPECIFICATIONS				
Run #	**Function**	**Wire Size**	**Cable Length, "L"**	**Color**
48V INPUT				
1	48V IN	0.75 mm2	11.8" [300 mm]	Red
2	GND (48V)	0.75 mm2	11.8" [300 mm]	Black
12V OUTPUT				
3	+12V OUT	4.0 mm2	11.8" [300 mm]	Red
4	GND (12V)	4.0 mm2	11.8" [300 mm]	Black
SIGNAL				
5	ENABLE	0.35mm2	11.8" [300 mm]	White

Dimensions are in inches (mm) shown for ref. only.



Tolerances (unless otherwise specified):
.XX ± 0.02 (0.5)
.XXX ± 0.010 (0.25)
Angles ± 2˚

Shipping Trays and Box

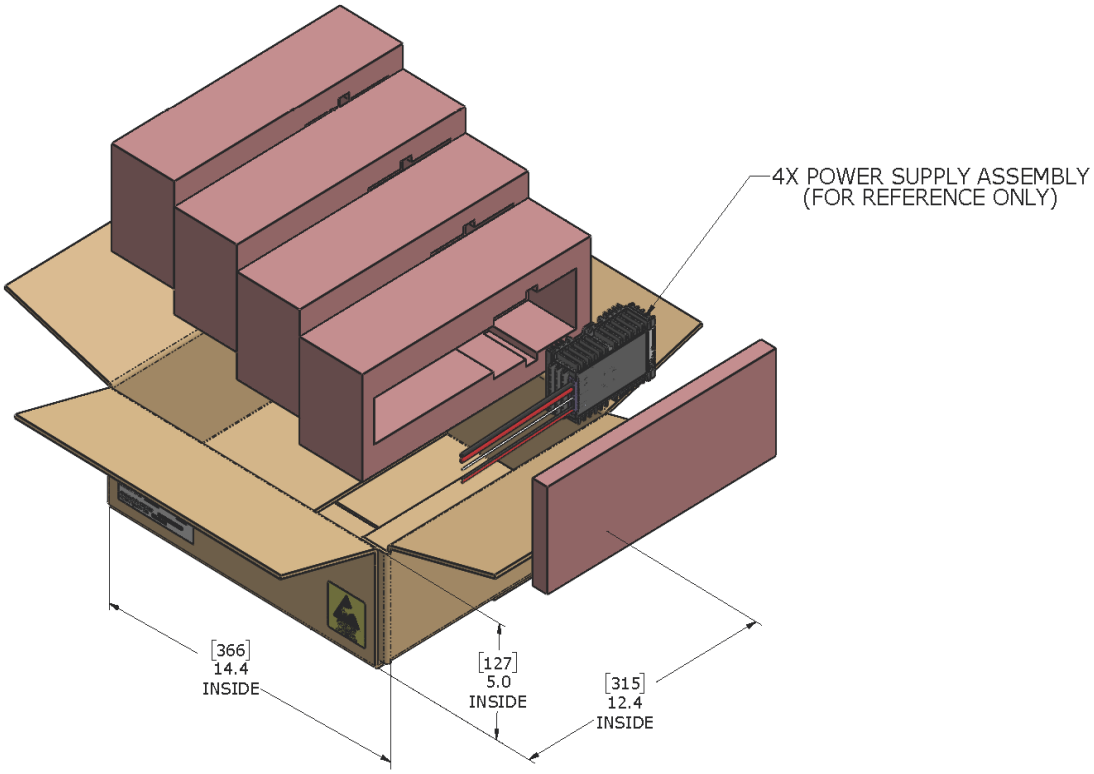


Figure 5: Shipping Carton

Inside Dimensions = 14.4” x 12.4” x 5.0”

MPQ = 4