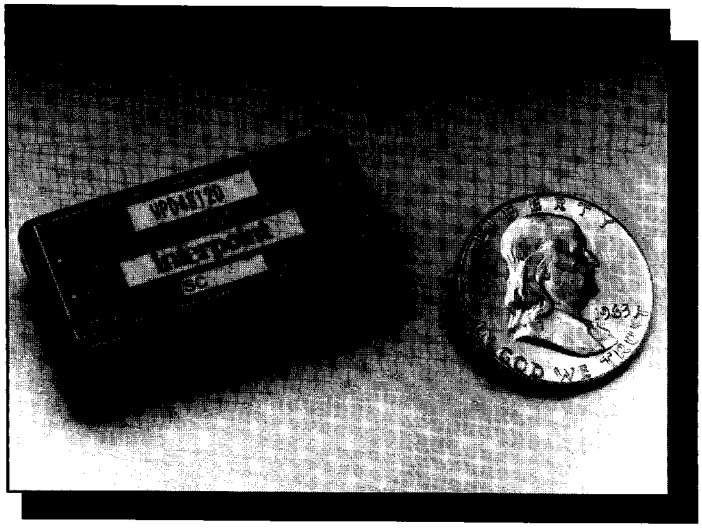
VPD Series DC/DC Converters



General Description

The VPD Series™ DC/DC converters feature a wide input voltage range of 11 to 32 VDC or 18 to 72 VDC and supply up to 10 watts of output power. Nominal input voltages are 28 or 48 VDC with dual outputs of ±5, ±12, or ±15 VDC at efficiencies up to 83%. These output voltages are accurate within 1%. The case operating temperature of -40°C to +85°C exceeds the commercial temperature range.

Converter Design

VPD DC/DC Series converters are current mode pulse-width modulated switching regulators which use a single-ended forward topology. Switching frequency is 120 kHz. Internal input and output filtering normally eliminate the need for external components (see Note 1 on page 2).

Short Circuit Protection

Internal current limiting circuitry provides short circuit protection from either output to output common.

Input to Output Capacitance

The input to output capacitance is 375 pF. This low capacitance reduces the ground loops often found in converters with higher capacitances.

10, 24 or 30 Volt Output

All models have dual outputs but may also be used as a single output to provide voltages of 10, 24 or 30 VDC. Connect the load across the positive output (pin 3) and the negative output (pin 5), leaving the output common (pin 4) floating.

Full Isolation

Isolation of 700 VDC for the 28 volt models and 1544 VDC for the 48 volt models provides protection for sensitive circuitry.

Operating at Temperature

The converters can operate at a case temperature of up to 85°C without derating. The case temperature rise is 16°C per watt dissipated.

Regulation and Stability

Tight regulation and low voltage drift further protect your system by providing stable output voltages. Line regulation is as low as 0.1% and load regulation is as low as 0.2%, depending on the model. Cross regulation is as low as1%, depending on the model. Short term stability, over a period of 24 hours, results in an output voltage drift of less than 0.02%, while long term drift is less than 0.1%.

Noise Management

Output noise is as low as 80 mV p-p for the 48 volt models and 90 mV p-p for the 28 volt models. If input common and output common are to be connected, a 1 to 10 µF, low ESR capacitor can be connected at the output of the converter to reduce switching noise.

Small Package

The 2.02 by 1.02 by 0.42 inch package weighs 34 grams. This five-sided copper package is 0.017 inches (0.43 mm) thick providing both EMI shielding and heat sinking. At 120 kHz this shielding provides greater than 20dB of absorption loss of both electric and magnetic fields. The case shield is tied to the output common terminal (pin 4). The case is water washable, providing further versatility for your production processes.

Note: The above paragraphs refer to typical specifications. See characteristics charts for detailed information.

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CHARACTERISTICS (ALL MODELS)

Operating Temperature Range (Case)
- Full Power: -40°C to +85°C
- Absolute: -50°C to +100°C

Isolation
- Input to output: 28 volt — 700 VDC
  48 volt — 1544 VDC

Storage Temperature Range (Case)
- -55°C to +105°C

Thermal Impedance: case rise over ambient
- 16°C/watt dissipated

Weight
- 34 grams, typical

Capacitance
- Input to output: 375 pF, typical

Conversion Frequency
- 120 kHz, typical

Start-up Time
- 10 milliseconds, typical

CHARACTERISTICS (28 V): Tc = 25°C, nominal input voltage, full load unless otherwise specified.

		VPD2805D			VPD2812D			VPD2815D			
PARAMETERS	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	UNITS
INPUT VOLTAGE[1]	NORMAL	11	28	32	11	28	32	11	28	32	VDC
INPUT CURRENT	FULL LOAD	—	364	—	—	413	—	—	430	—	mA
OUTPUT VOLTAGE	NOMINAL INPUT V	±4.95	±5.00	±5.05	±11.90	±12.00	±12.10	±14.9	±15.00	±15.10	VDC
OUTPUT CURRENT	FULL LOAD	0	—	±850	0	—	±400	0	—	±330	mA
OUTPUT POWER	FULL LOAD	—	–	8.5	—	—	9.6	—	—	10	W
EFFICIENCY	FULL LOAD	—	83	—	—	83	—	—	83	—	%
LINE REGULATION	V_{in} = MIN TO MAX	—	0.2	0.5	—	0.2	0.5	—	0.2	0.5	%
LOAD REGULATION[2]	25% TO FULL LOAD	—	0.2	1.0	—	0.2	1.0	—	0.2	1.0	%
CROSS REGULATION[3]		—	2	—	—	2	—	—	2	—	%
OUTPUT RIPPLE[4]	0 TO 20 MHz	—	90	—	—	90	—	—	90	—	mV p-p
STABILITY	SHORT TERM[5]	—	<0.01	—	—	<0.01	—	—	<0.01	—	% / 24 HRS
	LONG TERM	—	<0.1	—	—	<0.1	—	—	<0.1	—	% / 1000 HRS

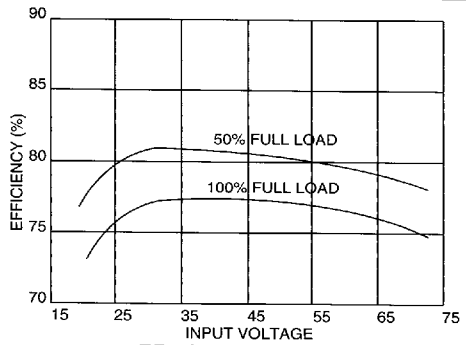
Notes:
1. If the source impedance will be greater than 0.3 ohms and /or the source will be more than about one inch from the converter, an input capacitor will be required (33 µF to 330 µF, low ESR).
2. Output voltage changes when both outputs are changed from maximum to minimum load at the same time.
3. Output voltage changes in one output at full load when the other output is changed from 25% to full load.
4. To simulate normal PCB decoupling, a 0.01 µF ceramic capacitor and a 10 µF tantalum capacitor are placed one inch from the converter when measuring output noise.
5. Following a 60 minute warm-up at full load and constant line voltage — the output voltage drift over a 24 hour period.

CHARACTERISTICS (48 V): Tc = 25°C, nominal input voltage, full load unless otherwise specified.

PARAMETERS	CONDITIONS	VPD4805D			VPD4812D			VPD4815D			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
INPUT VOLTAGE[1]	NORMAL	18	48	72	18	48	72	18	48	72	VDC
	TRANSIENT (100 ms)	—	—	85	—	—	85	—	—	85	
INPUT CURRENT	NO LOAD	—	2	—	—	4	—	—	4	—	mA
	FULL LOAD	—	210	—	—	265	—	—	260	—	
OUTPUT VOLTAGE	NOMINAL INPUT V	±4.95	±5.00	±5.05	±11.90	±12.00	±12.10	±14.9	±15.00	±15.10	VDC
OUTPUT CURRENT	FULL LOAD	0	—	±800	0	—	±415	0	—	±330	mA
OUTPUT POWER	FULL LOAD	—	–	8	—	—	10	—	—	10	W
EFFICIENCY	FULL LOAD	—	79	—	—	78	—	—	79	—	%
LINE REGULATION	V_{in} = MIN TO MAX	—	0.3	0.75	—	0.1	0.5	—	0.1	0.5	%
LOAD REGULATION[2]	25% TO FULL LOAD	—	0.3	1.0	—	0.2	1.0	—	0.2	1.0	%
CROSS REGULATION[3]		—	3	—	—	1	—	—	1	—	%
OUTPUT RIPPLE[4]	0 TO 20 MHz	—	110	—	—	80	—	—	80	—	mV p-p
	0 TO 20 MHz	—	30	—	—	20	—	—	20	—	mV rms
STABILITY	SHORT TERM[5]	—	<0.01	—	—	<0.01	—	—	<0.01	—	% / 24 HRS
	LONG TERM	—	<0.1	—	—	<0.1	—	—	<0.1	—	% / 1000 HRS

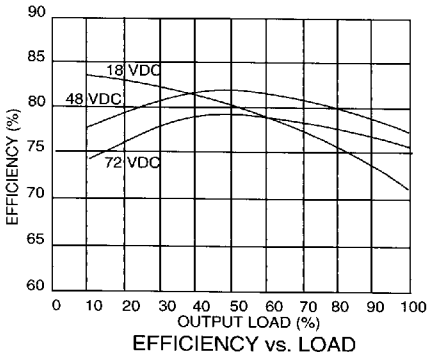
See notes on previous page.

TYPICAL PERFORMANCE CURVES (48 V)



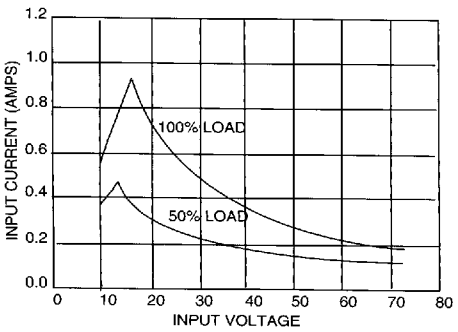
EFFICIENCY vs. LINE

Figure 1



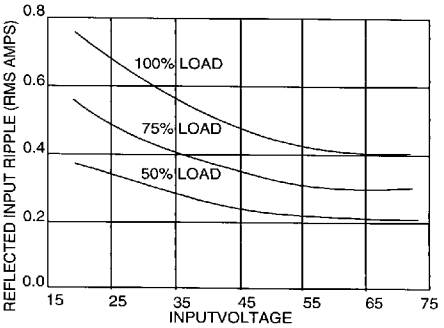
EFFICIENCY vs. LOAD

Figure 2



INPUT CURRENT vs. INPUT VOLTAGE

Figure 3



RMS INPUT RIPPLE vs. INPUT VOLTAGE

Figure 4

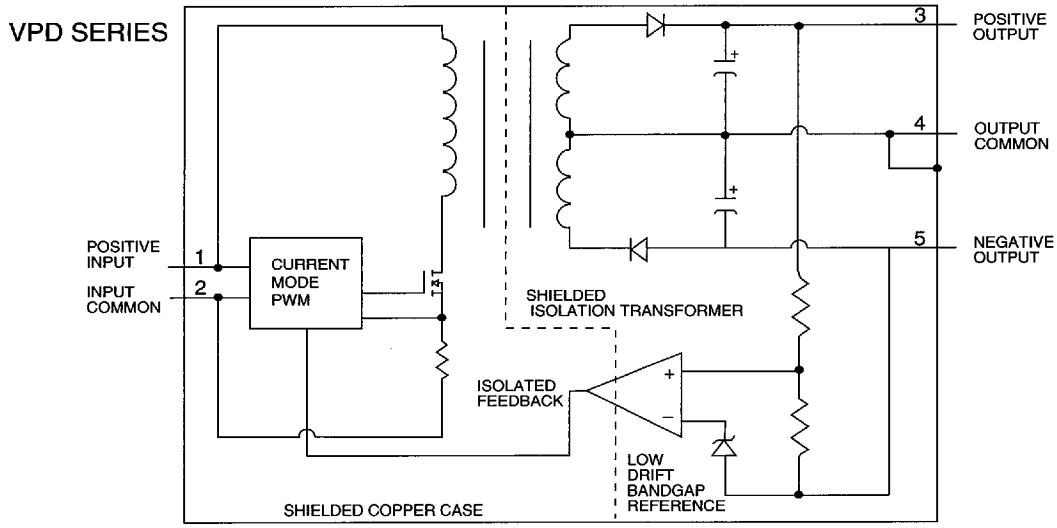
OPTIONAL ENVIRONMENTAL SCREENING

Environmental screening consists of the following procedures (Methods and Conditions refer to MIL-STD-202):

- 96 hours of burn-in at 85°C, per method 108.
- Mechanical shock per method 213, condition D.
- Temperature shock per method 107, condition A (modified).
- Final electrical test per Interpoint acceptance test procedure

To order optional screening, add suffix -/ST to model number. Example: VPD4815D/ST. On unscreened parts, the screening code block is blank. On screened parts, the block is marked "ST."

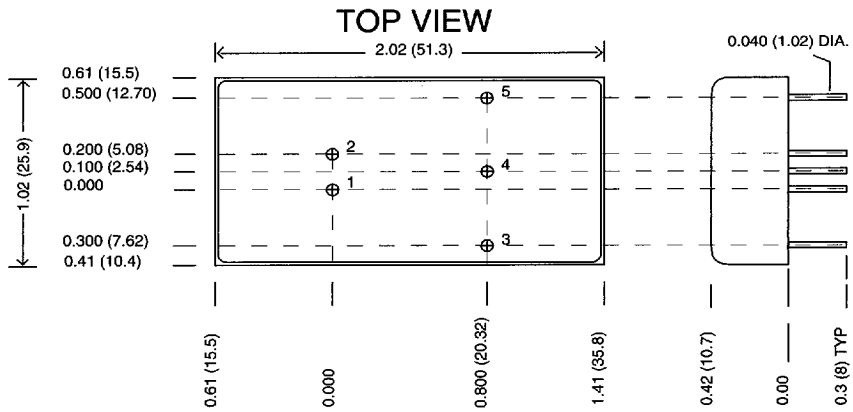
BLOCK DIAGRAM



METAL AND EPOXY CASE

Designation	Pin #
Positive input	1
Input common	2
Positive output	3
Output common	4
Negative output	5

Note: Case is connected to output common (pin 4).



VPD SERIES CASE DRAWING
NOMINAL CASE DIMENSIONS IN INCHES (MM)
TOLERANCE X.XX ±0.020 (0.51), X.XXX —0.005 (0.13)