C&D TECHNOLOGIES
Power Solutions

HPR4XX

0.75 Watt Miniature SIP DC/DC Converter

- High Isolation Voltage: 3000 VPK Test
- Single-In-Line Package (SIP)
- Internal Input and Output
- Low Cost
- Non-Conductive Case
- High Output Power Density: 10 Watts/Inch^3
- Extended Temperature Range: -25°C to +85°C
- High Efficiency to 79%

The HPR4XX Series uses advanced circuit design and packaging technology to realize superior reliability and performance. A 170kHz push-pull oscillator is used in the input stage. The HPR4XX Series reduces beat-frequency oscillation problems when used with high frequency isolation amplifiers. Reduced parts count and high efficiency add to the reliability of the HPR4XX Series.

The high efficiency of the HPR4XX Series means less internal power dissipation, as low as 190mW. With less heat to dissipate the HPR4XX Series can operate at higher temperatures with no degradation of reliable operation. In addition, the high efficiency of the HPR4XX Series means the series is able to offer greater than 10 W/inch^3 of output power density. Operation down to no load will not impact the reliability of the series, although this product has a ≥1mA minimum load for specifications purposes.

The HPR4XX Series provides high isolation in a very small package. The use of surface mounted devices and manufacturing technologies makes it possible to offer premium performance and low cost.

SPECIFICATIONS All specifications are typical at T_A = +25°C nominal input voltage unless otherwise specified.

PRODUCT SELECTION CHART

MODEL	NOMINAL INPUT VOLTAGE (VDC)	RATED OUTPUT VOLTAGE (VDC)	RATED OUTPUT CURRENT (mA)	INPUT CURRENT (mA)			REFLECTED RIPPLE CURRENT (mAp-p)	EFFICIENCY (%)
				NO LOAD (mA)	RATED LOAD TYP	RATED LOAD MAX		
HPR400	5	5	150	20	216	235	10	69
HPR401	5	12	62	20	212	235	5	70
HPR402	5	15	50	20	212	235	5	71
HPR403	5	±5	±75	20	218	245	5	68
HPR404	5	±12	±30	20	212	235	5	68
HPR405	5	±15	±25	20	220	220	5	75
HPR406	12	5	150	10	90	100	5	69
HPR407	12	12	62	10	81	90	5	77
HPR408	12	15	50	10	81	90	5	77
HPR409	12	±5	±75	10	88	98	5	71
HPR410	12	±12	±30	10	81	90	5	74
HPR411	12	±15	±25	10	81	90	5	77
HPR412	15	5	150	8	72	80	5	69
HPR413	15	12	62	8	72	80	5	69
HPR414	15	15	50	8	72	80	5	69
HPR415	15	±5	±75	8	72	80	5	69
HPR416	15	±12	±30	8	63	70	5	76
HPR417	15	±15	±25	8	63	66	5	79
HPR418	24	5	150	8	48	53	15	65
HPR419	24	12	62	8	48	53	15	65
HPR420	24	15	50	8	45	50	15	69
HPR421	24	±5	±75	8	45	50	15	69
HPR422	24	±12	±30	8	45	50	15	67
HPR423	24	±15	±25	8	45	50	15	69

NOTE: Other input to output voltages may be available. Please consult factory.

SPECIFICATIONS, ALL MODELS

Specifications are at T_A = +25°C nominal input voltage unless otherwise specified.

	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
INPUT	**INPUT**					
	Voltage Range		4.5	5	5.5	VDC
			10.8	12	13.2	VDC
			13.5	15	16.5	VDC
			21.6	24	26.4	VDC
OUTPUT	**OUTPUT**					
	Rated Power			750		mW
	Voltage Setpoint Accuracy	Rated Load, Nominal V_{IN}			±5	%
	Ripple & Noise	BW = DC to 10MHz		45		mVp-p
		BW =10Hz to 2MHz		30		mVrms
	HPR403	BW = DC to 10MHz		90		mVp-p
	Voltage (Over Input Voltage Range)	1mA Load, V_{OUT} = 5V			7	VDC
		1mA Load, V_{OUT} = 12V			15	VDC
		1mA Load, V_{OUT} = 15V			18	VDC
	Temperature Coefficent			.01		%/°C
	REGULATION					
	Line Regulation	High Line to Low Line		1		%/%Vin
	Load Regulation (5V out only)	Rated Load to 1mA Load		10		%
	Load Regulation (All other modes)	Rated Load to 1mA Load		3		%
GENERAL	**GENERAL**					
	ISOLATION					
	Rated Voltage		1000			VDC
	Test Voltage	60 Hz, 60 Seconds	3000			Vpk
	Resistance			10		GΩ
	Capacitance			15		pF
	Leakage Current	V_{ISO}= 240VAC, 60Hz		2	7	µArms
	Switching Frequency			170		kHz
	Frequency Change	Over Line and Load		24		%
	Package Weight			2		g
	MTTF per MIL-HDBK-217, Rev. E*	Circuit Stress Method				
	Ground Benign	T_A = +25°C		7.9		MHr
	TEMPERATURE					
	Specification		-25	+25	+85	℃
	Operation		-40		+100	℃
	Storage		-40		+110	℃

* For demonstrated MTTF results reference: Power Convertibles Reliability Report HPR105.

ABSOLUTE MAXIMUM RATINGS

Internal Power Dissipation 450mW
ShortCircuitDuration ..... Momentary
Lead Temperature (soldering, 10 seconds max .+300°C *

* NOTE: Refer to Reflow Profile for SMD Models.

ORDERING INFORMATION

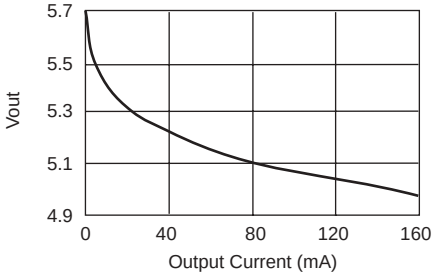
HPR 4XX

Device Family
HPR Indicates DC/DC Converter
Model Number
Selected from Table of Electrical Characteristics

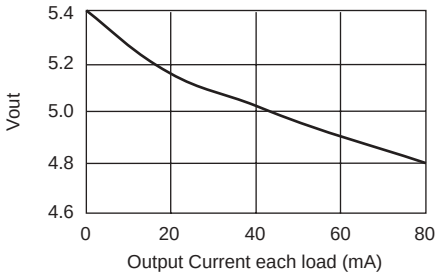
TYPICAL PERFORMANCE CURVES

Specifications are at T_A = +25°C nominal input voltage, nominal load, recommended external components applied, unless otherwise specified. (Refer to Application Note DCAN-9 at www.cdpowerelectronics.com)

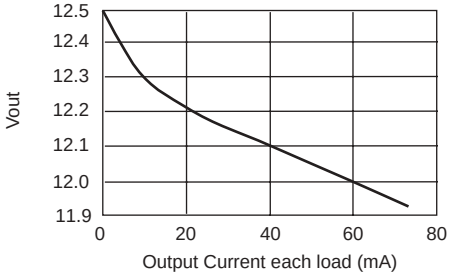
VOUT VS LOAD (5Vout Models)



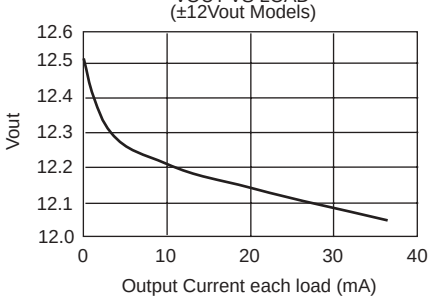
VOUT VS LOAD (±5Vout Models)



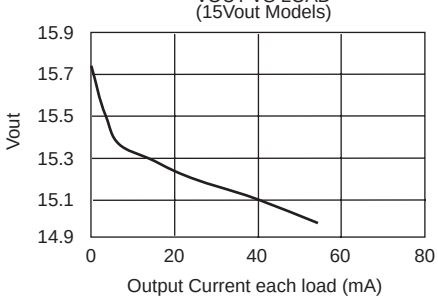
VOUT VS LOAD (12Vout Models)



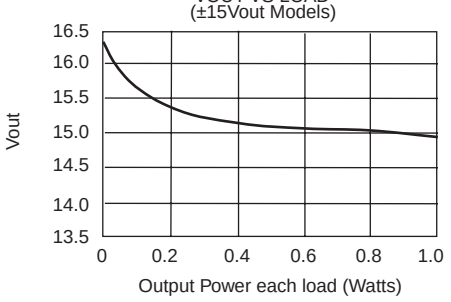
VOUT VS LOAD (±12Vout Models)



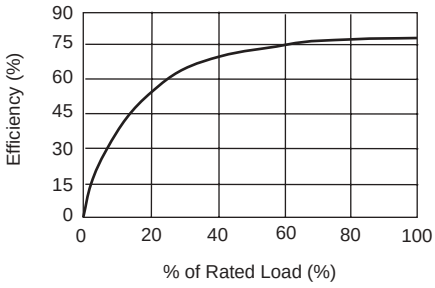
VOUT VS LOAD (15Vout Models)



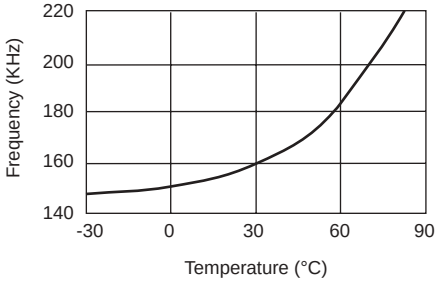
VOUT VS LOAD (±15Vout Models)



EFFICIENCY VS LOAD

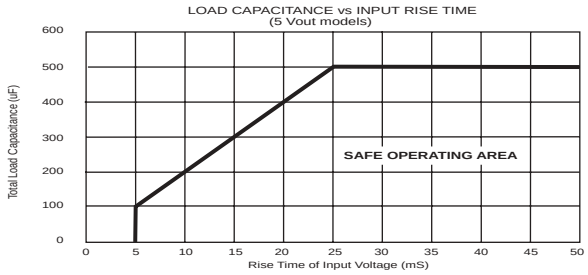


OSCILLATION FREQUENCY VS TEMPERATURE

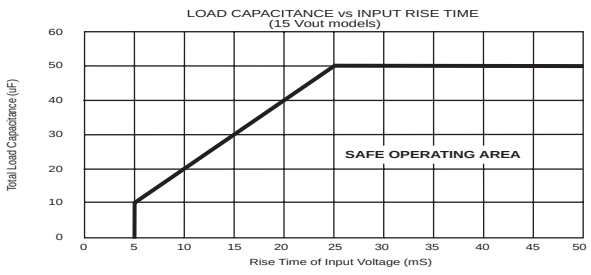


SAFE OPERATING AREA

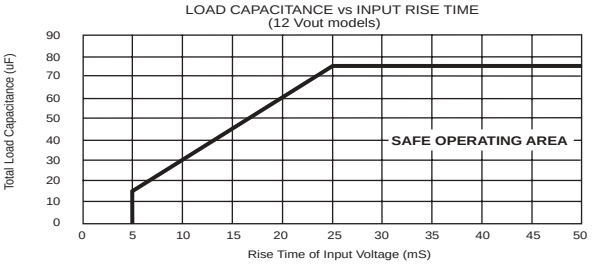
LOAD CAPACITANCE vs INPUT RISE TIME (5 Vout models)



LOAD CAPACITANCE vs INPUT RISE TIME (15 Vout models)



LOAD CAPACITANCE vs INPUT RISE TIME (12 Vout models)

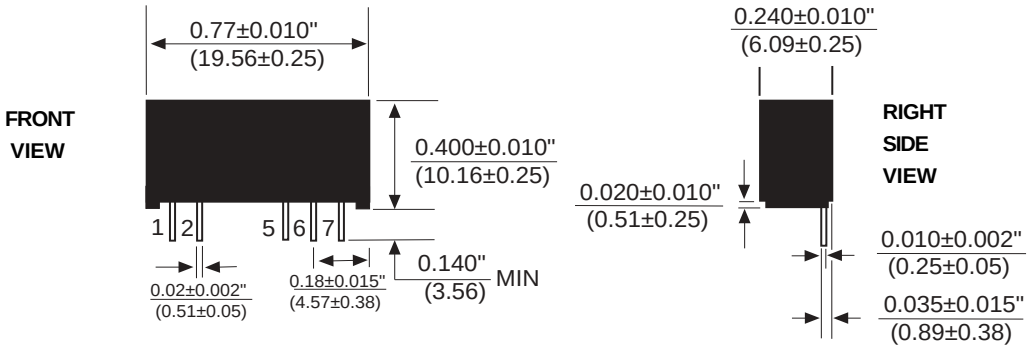


NOTES:

1.) When operated within the SAFE OPERATING AREA as defined by the above curves, the output voltage of HPR4XX devices is guaranteed to be within 95% of its steady-state value within 100 milliseconds after the input voltage has reached 95% of its steady-state value.

2.) For dual output models, total load capacitance is the sum of the capacitances on the plus and minus outputs.

MECHANICAL



PIN CONNECTIONS	
1.	+VIN
2.	-VIN
5.	-VOUT
6.	COM*
7.	+VOUT

*Common pin not present on single output models.

Notes:
All dimensions are in inches (millimeters).
GRID: 0.100 inches (2.54 millimeters)
PIN PLACEMENT TOLERANCE: ± 0.015"

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