

# 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<sup>3</sup>
- 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<sup>3</sup> of output power density. Operation down to no load

will not impact the reliability of the series, although this product has a  $\geq 1\text{mA}$  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  $T_A = +25^\circ\text{C}$  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 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	$\pm 5$	$\pm 75$	20	218	245	5	68
HPR404	5	$\pm 12$	$\pm 30$	20	212	235	5	68
HPR405	5	$\pm 15$	$\pm 25$	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	$\pm 5$	$\pm 75$	10	88	98	5	71
HPR410	12	$\pm 12$	$\pm 30$	10	81	90	5	74
HPR411	12	$\pm 15$	$\pm 25$	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	$\pm 5$	$\pm 75$	8	72	80	5	69
HPR416	15	$\pm 12$	$\pm 30$	8	63	70	5	76
HPR417	15	$\pm 15$	$\pm 25$	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	$\pm 5$	$\pm 75$	8	45	50	15	69
HPR422	24	$\pm 12$	$\pm 30$	8	45	50	15	67
HPR423	24	$\pm 15$	$\pm 25$	8	45	50	15	69

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

# SPECIFICATIONS, ALL MODELS

Specifications are at  $T_A = +25^\circ\text{C}$  nominal input voltage unless otherwise specified.

	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS	
<b>INPUT</b>	<b>INPUT</b> 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	
<b>OUTPUT</b>	<b>OUTPUT</b> Rated Power			750		mW	
	Voltage Setpoint Accuracy	Rated Load, Nominal $V_{IN}$			$\pm 5$	%	
	Ripple & Noise  HPR403	BW = DC to 10MHz			45		mVp-p
		BW = 10Hz to 2MHz			30		mVrms
		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 Coefficient			.01		%/°C	
	<b>REGULATION</b>	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		%	
<b>GENERAL</b> ISOLATION							
<b>GENERAL</b>	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	$T_A = +25^\circ\text{C}$		7.9		MHr	
<b>TEMPERATURE</b>	Specification		-25	+25	+85	°C	
	Operation		-40		+100	°C	
	Storage		-40		+110	°C	

\* 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 \*

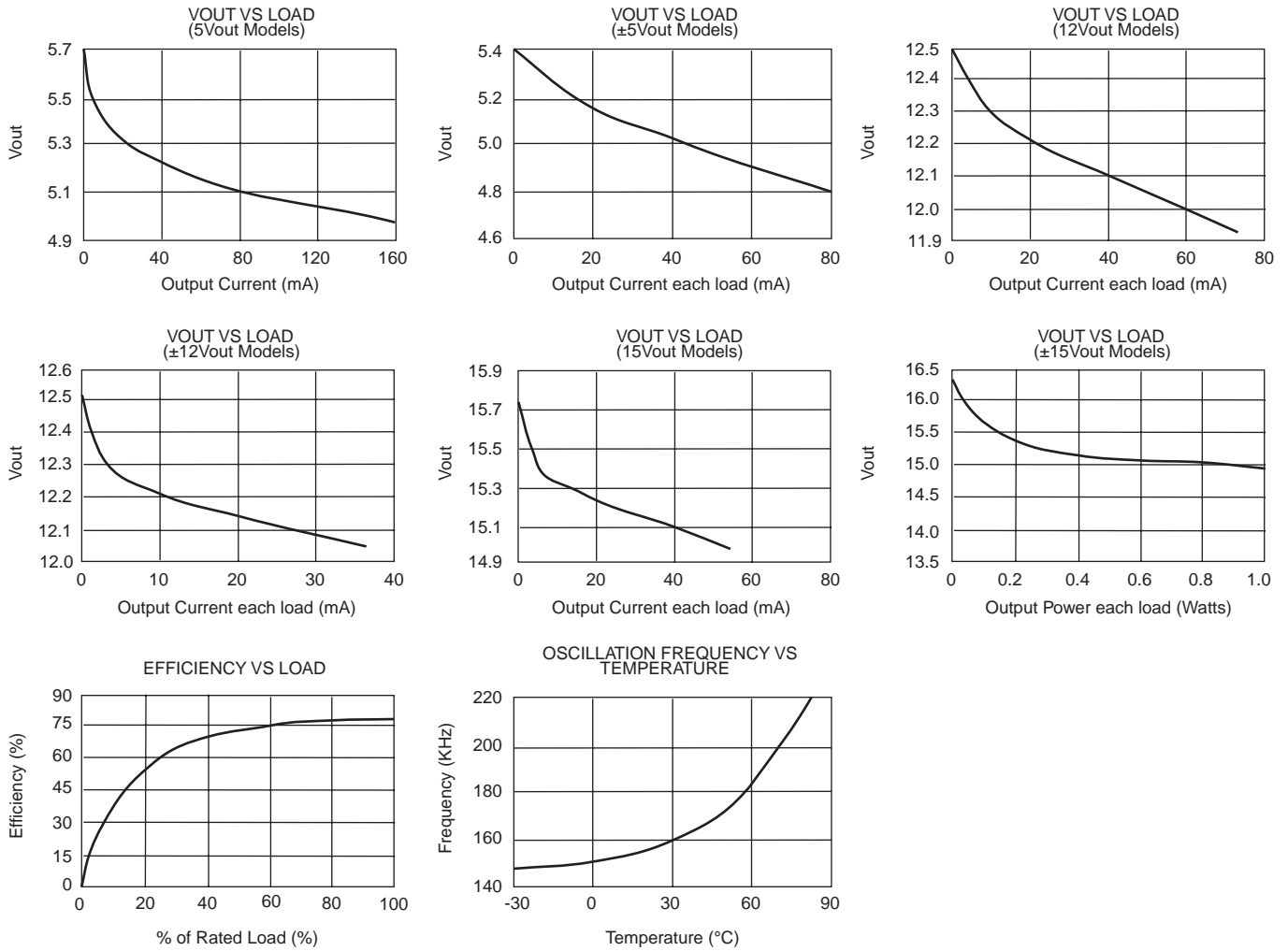
\* NOTE: Refer to Reflow Profile for SMD Models.

## ORDERING INFORMATION

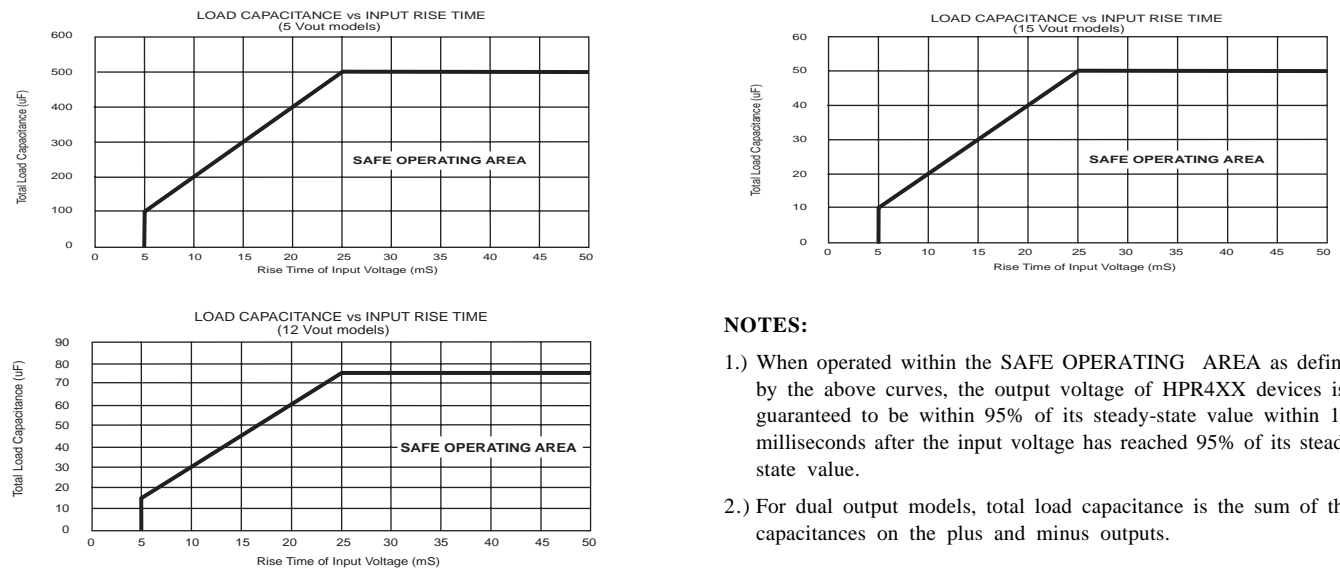
Device Family \_\_\_\_\_ **HPR 4XX**  
 HPR Indicates DC/DC Converter  
 Model Number \_\_\_\_\_  
 Selected from Table of Electrical Characteristics

## TYPICAL PERFORMANCE CURVES

Specifications are at  $T_A = +25^\circ\text{C}$  nominal input voltage, nominal load, recommended external components applied, unless otherwise specified. (Refer to Application Note DCAN-9 at [www.cdpowerelectronics.com](http://www.cdpowerelectronics.com))



## SAFE OPERATING AREA

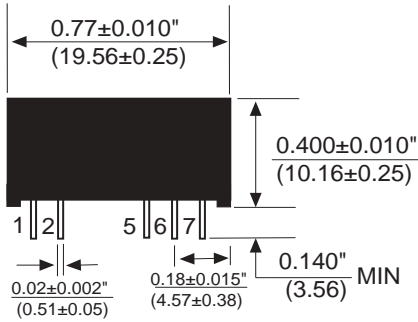


**NOTES:**

- 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

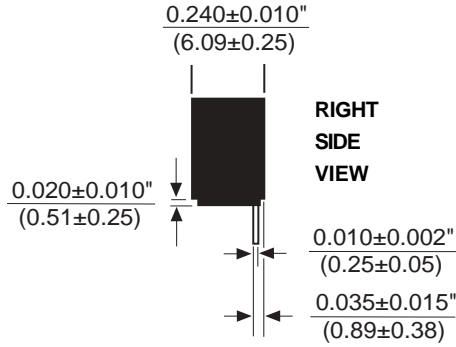
FRONT  
VIEW



BOTTOM  
VIEW



RIGHT  
SIDE  
VIEW



## 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:  $\pm 0.015''$

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