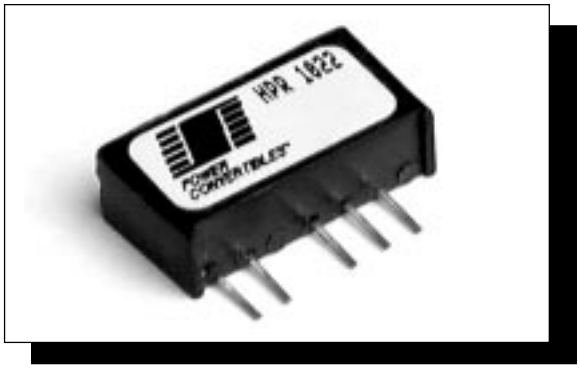
C&D TECHNOLOGIES

Product Data Sheet

# 1.0 WATT UNREGULATED SIP DC/DC CONVERTER

POWER CONVERTIBLES™

# HPR10XX




## FEATURES

- **LOW COST**
- **SINGLE-IN-LINE PACKAGE (SIP)**
- **INTERNAL INPUT AND OUTPUT FILTERING**
- **NON-CONDUCTIVE CASE**
- **HIGH OUTPUT POWER DENSITY: 13 WATTS/INCH$^3$**
- **EXTENDED TEMPERATURE RANGE: -25°C TO +65°C**
- **HIGH EFFICIENCY: TO 72% TYPICAL**

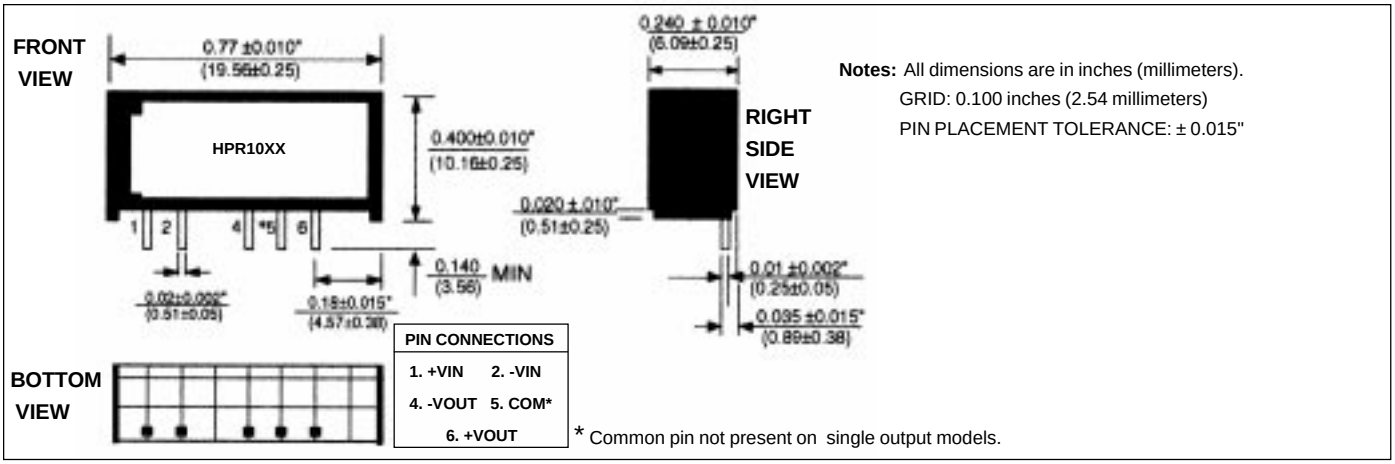
## DESCRIPTION

The HPR10XX Series uses advanced circuit design and packaging technology to deliver superior reliability and performance. A 170kHz push-pull oscillator is used in the input stage. Beat-frequency oscillation problems are reduced when using the HPR10XX Series with high frequency isolation amplifiers.

Reduced parts count and high efficiency add to the reliability of the HPR10XX Series. The high efficiency of the HPR10XX Series means less internal power dissipation, as low as 190mW. With reduced heat dissipation the HPR10XX Series can operate at higher temperatures with no degradation. In addition, the high efficiency of the HPR10XX Series means the series is able to offer greater than 13 W/inch$^3$ of output power density. Operation down to no load will not impact the reliability of the series, although a 1mA minimum load is needed to realize published specifications.

The HPR10XX Series provides the user low cost without sacrificing reliability. The use of surface mounted devices and advanced manufacturing technologies make it possible to offer premium performance and low cost.

## MECHANICAL




Internet: http://www.cdpowerelectronics.com

**Power Electronics Division, United States**
3400 E Britannia Drive, Tucson, Arizona 85706
Phone: 520.295.4100 Fax: 520.770.9369

**Power Electronics Division, Europe**
C&D Technologies (Power Electronics) Ltd.
132 Shannon Industrial Estate, Shannon, Co. Clare, Ireland
Tel: +353.61.474.133 Fax:+353.61.474.141

# ELECTRICAL SPECIFICATIONS

Specifications typical at $T_A$ = +25°C, nominal input voltage, rated output current unless otherwise specified.

| MODEL | NOMINAL INPUT VOLTAGE ($V_{DC}$) | RATED OUTPUT VOLTAGE ($V_{DC}$) | RATED OUTPUT CURRENT (mA) | INPUT CURRENT NO LOAD (mA) | INPUT CURRENT RATED LOAD (mA) | REFLECTED RIPPLE CURRENT (mAp-p) | EFFICIENCY (%) |
|---|---|---|---|---|---|---|---|
| HPR1000 | 5 | 5 | 200 | 33 | 290 | 8 | 68 |
| HPR1001 | 5 | 12 | 83 | 33 | 290 | 8 | 69 |
| HPR1002 | 5 | 15 | 67 | 33 | 285 | 8 | 70 |
| HPR1003 | 5 | ±5 | ±100 | 33 | 285 | 8 | 70 |
| HPR1004 | 5 | ±12 | ±42 | 33 | 285 | 8 | 70 |
| HPR1005 | 5 | ±15 | ±34 | 33 | 285 | 8 | 70 |
| HPR1006 | 12 | 5 | 200 | 18 | 110 | 10 | 70 |
| HPR1007 | 12 | 12 | 83 | 18 | 107 | 10 | 71 |
| HPR1008 | 12 | 15 | 67 | 18 | 107 | 10 | 71 |
| HPR1009 | 12 | ±5 | ±100 | 18 | 107 | 10 | 71 |
| HPR1010 | 12 | ±12 | ±42 | 18 | 107 | 10 | 71 |
| HPR1011 | 12 | ±15 | ±34 | 18 | 107 | 10 | 71 |
| HPR1012 | 15 | 5 | 200 | 15 | 96 | 10 | 70 |
| HPR1013 | 15 | 12 | 83 | 15 | 94 | 10 | 70 |
| HPR1014 | 15 | 15 | 67 | 15 | 94 | 10 | 71 |
| HPR1015 | | | | | | | |
| HPR1016 | 15 | ±12 | ±42 | 15 | 94 | 10 | 71 |
| HPR1017 | 15 | ±15 | ±34 | 15 | 94 | 10 | 71 |
| HPR1018 | 24 | 5 | 200 | 12 | 60 | 15 | 71 |
| HPR1019 | 24 | 12 | 83 | 12 | 60 | 15 | 71 |
| HPR1020 | 24 | 15 | 67 | 12 | 58 | 15 | 72 |
| HPR1021 | 24 | ±5 | ±100 | 12 | 58 | 15 | 72 |
| HPR1022 | 24 | ±12 | ±42 | 12 | 58 | 15 | 72 |
| HPR1023 | 24 | ±15 | ±34 | 12 | 58 | 15 | 72 |

Note: Other input to output voltages may be available. Please contact factory.

# COMMON SPECIFICATIONS

Specifications typical at $T_A$ = +25°C, nominal input voltage, rated output current unless otherwise specified.

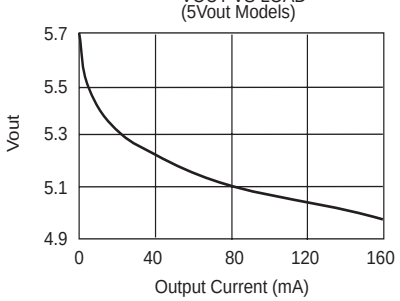
| PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|
| **INPUT** | | | | | |
| Voltage Range | | 4.5 | 5 | 5.5 | $V_{DC}$ |
| | | 10.8 | 12 | 13.2 | $V_{DC}$ |
| | | 13.5 | 15 | 16.5 | $V_{DC}$ |
| | | 21.6 | 24 | 26.4 | $V_{DC}$ |
| Voltage Rise Time | See Typical Performance Curves & Application Notes: "Capacitive Loading Effects on Start-Up of DC/DC Converters" | | | | |
| **ISOLATION** | | | | | |
| Rated Voltage | | 1000 | | | $V_{DC}$ |
| Test Voltage | 60 Hz, 10 Seconds | 1000 | | | Vpk |
| Resistance | | | 10 | | GΩ |
| Capacitance | | | 25 | 100 | pF |
| Leakage Current | $V_{ISO}$= 240VAC, 60Hz | | 2 | 8.5 | µArms |
| **OUTPUT** | | | | | |
| Rated Power | | | 1.0 | | W |
| Voltage Setpoint Accuracy | Rated Load, Nominal $V_{IN}$ | | | ±5 | % |
| Ripple & Noise | BW = DC to 10MHz | | | 100 | mVp-p |
| | BW =10Hz to 2MHz | | 30 | | mVrms |
| Voltage | 1mA Load, $V_{OUT}$ = 5V | | | 7 | $V_{DC}$ |
| | 1mA Load, $V_{OUT}$ = 12V | | | 15 | $V_{DC}$ |
| | 1mA Load, $V_{OUT}$ = 15V | | | 18 | $V_{DC}$ |
| Temperature Coefficent | | | .01 | | %/Deg 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 Models) | Rated Load to 1mA Load | | 3 | | % |
| **GENERAL** | | | | | |
| 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 | | 3.8 | | MHr |
| Fixed Ground | $T_A$ = +35°C | | 1.4 | | MHr |
| Naval Sheltered | $T_A$ = +35°C | | 685 | | kHr |
| Airborne Uninhabited Fighter | $T_A$ = +35°C | | 211 | | kHr |
| **TEMPERATURE** | | | | | |
| Specification | | -25 | +25 | +65 | °C |
| Storage | | -50 | | +110 | °C |

* For demonstrated MTTF results reference Reliability Report HPR105

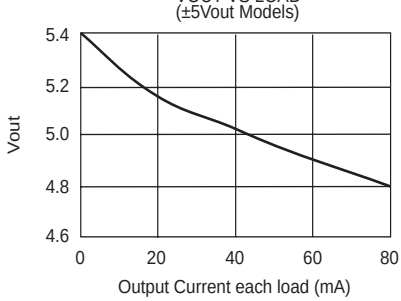
# TYPICAL PERFORMANCE CURVES

Specifications typical at $T_A$ = +25°C, nominal input voltage, rated output current unless otherwise specified.

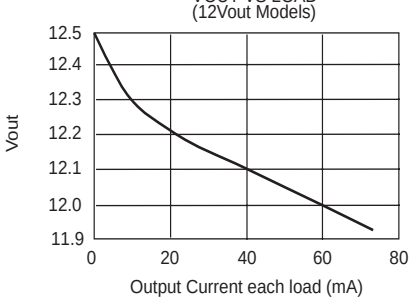
VOUT VS LOAD
(5Vout Models)



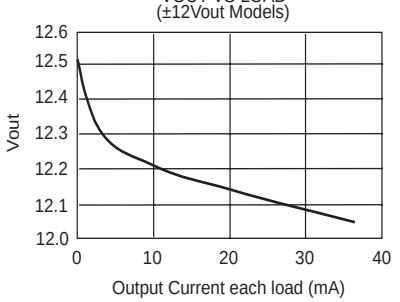

VOUT VS LOAD
(±5Vout Models)



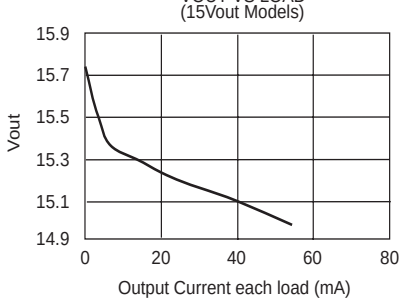

VOUT VS LOAD
(12Vout Models)



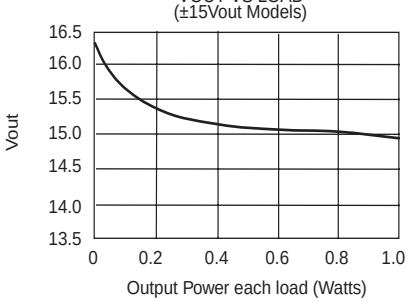

VOUT VS LOAD
(±12Vout Models)



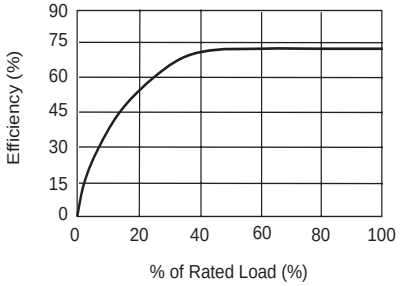

VOUT VS LOAD
(15Vout Models)



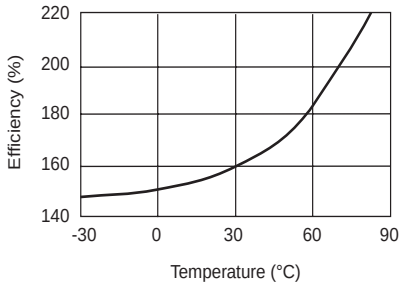

VOUT VS LOAD
(±15Vout Models)




EFFICIENCY VS LOAD

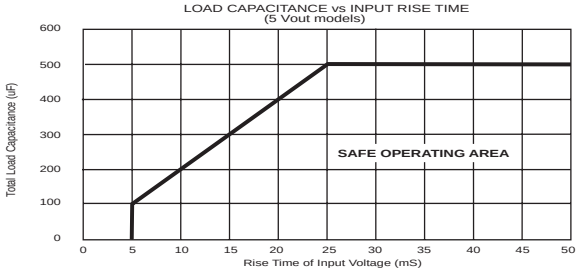



OSCILLATION FREQUENCY VS
TEMPERATURE

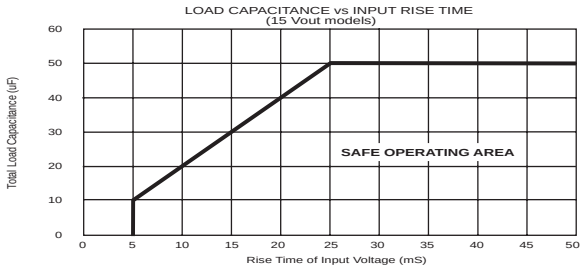



# SAFE OPERATING AREA

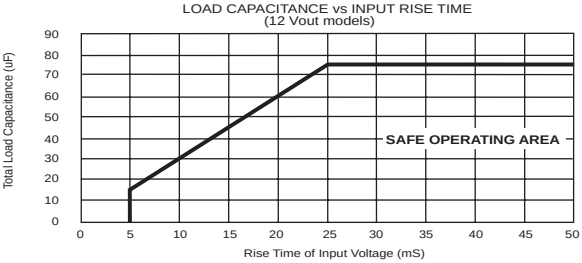
LOAD CAPACITANCE vs INPUT RISE TIME
(5 Vout models)




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 HPR10XX 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.

## ORDERING INFORMATION

**HPR 10XX /H**

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

## ABSOLUTE MAXIMUM RATINGS

Internal Power Dissipation.....490mW
Short Circuit Duration.....Momentary
Lead Temperature (soldering, 10 seconds max).....+300°C

# ENGINEERING NOTES