

# 0.75 WATT MINIATURE SIP DC/DC CONVERTER

## HPR4XX

### FEATURES

- High Isolation Voltage: 3000 VPK Test
- Single-In-Line Package (SIP)
- Internal Input and Output Filtering
- 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%

### DESCRIPTION

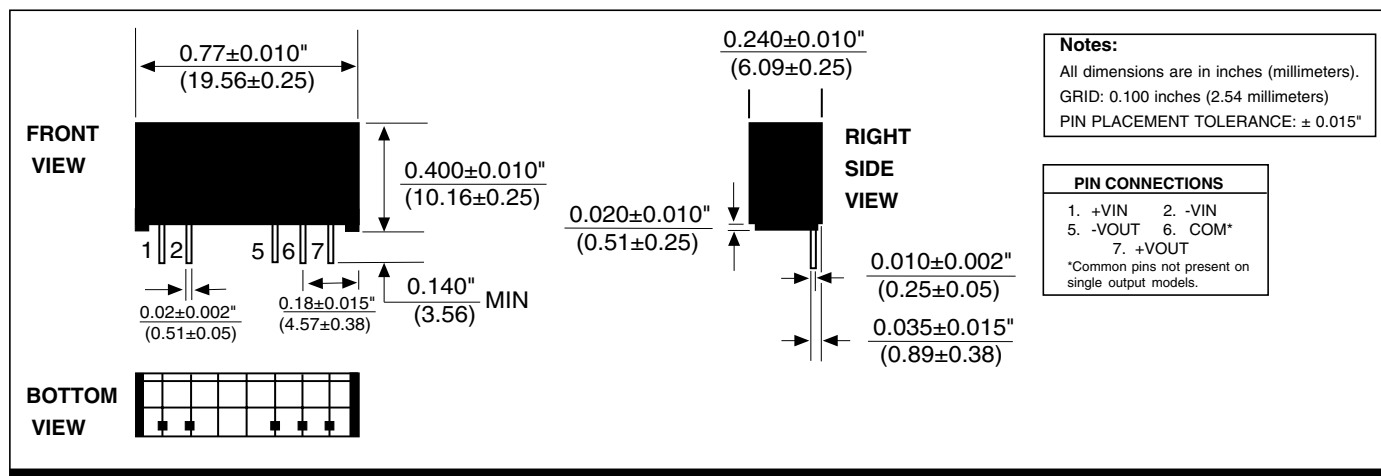
The HPR4XX Series uses advanced circuit design and packaging technology to realize superior reliability and performance. A 170kHz push-pull oscillator is used in the input stage. The HPR4XX Series reduces beat-frequency oscillation problems when used with high frequency isolation amplifiers. Reduced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

### MECHANICAL



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# ELECTRICAL SPECIFICATIONS

Specifications typical at T<sub>A</sub> = +25°C, nominal input voltage, rated output current unless otherwise specified.

| MODEL  | NOMINAL<br>INPUT<br>VOLTAGE<br><br>(Vdc) | RATED<br>OUTPUT<br>VOLTAGE<br><br>(Vdc) | RATED<br>OUTPUT<br>CURRENT<br><br>(mA) | INPUT CURRENT       |            |     | REFLECTED<br>RIPPLE<br>CURRENT<br><br>(mAp-p) | EFFICIENCY<br><br>(%) |
|--------|------------------------------------------|-----------------------------------------|----------------------------------------|---------------------|------------|-----|-----------------------------------------------|-----------------------|
|        |                                          |                                         |                                        | NO LOAD<br><br>(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                                        | ±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

## COMMON SPECIFICATIONS

Specifications typical at T<sub>A</sub> = +25°C, nominal input voltage, rated output current unless otherwise specified.

| PARAMETER                                                                                                                           | CONDITIONS                                                                                                                                                                                                     | MIN                         | TYP                                      | MAX                             | UNITS                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|------------------------------------------|---------------------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>INPUT</b><br>Voltage Range                                                                                                       |                                                                                                                                                                                                                | 4.5<br>10.8<br>13.5<br>21.6 | 5<br>12<br>15<br>24                      | 5.5<br>13.2<br>16.5<br>26.4     | V <sub>DC</sub><br>V <sub>DC</sub><br>V <sub>DC</sub><br>V <sub>DC</sub>                                           |
| <b>ISOLATION</b><br>Rated Voltage<br>Test Voltage<br>Resistance<br>Capacitance<br>Leakage Current                                   | 60Hz, 60 Sec<br><br><br><br>V <sub>ISO</sub> = 240V <sub>AC</sub> , 60Hz                                                                                                                                       | 1000<br>3000                | 10<br>15<br>2                            | 7                               | V <sub>DC</sub><br>V <sub>pk</sub><br>GW<br>pF<br>μArms                                                            |
| <b>OUTPUT</b><br>Rated Power<br>Voltage Setpoint Accuracy<br>Ripple & Noise<br><br>HPR403<br>Voltage<br><br>Temperature Coefficient | Rated Load, Nominal V <sub>IN</sub><br>BW = DC to 10MHz<br>BW = 10Hz to 2MHz<br>BW = DC to 10MHz<br>1 mA Load, V <sub>OUT</sub> = 5V<br>1 mA Load, V <sub>OUT</sub> = 12V<br>1 mA Load, V <sub>OUT</sub> = 15V |                             | 750<br><br>45<br>30<br>90<br><br><br>.01 | ±5<br><br><br><br>7<br>15<br>18 | mW<br>%<br>mVp-p<br>mV <sub>rms</sub><br>mVp-p<br>V <sub>DC</sub><br>V <sub>DC</sub><br>V <sub>DC</sub><br>%/Deg C |
| <b>REGULATION</b><br>Line Regulation<br>Load Regulation (5V out only)<br>Load Regulation (All other Models)                         | High Line to Low Line<br>Rated Load to 1mA Load<br>Rated Load to 1mA Load                                                                                                                                      |                             | 1<br>10<br>3                             |                                 | %/V <sub>IN</sub><br>%<br>%                                                                                        |
| <b>GENERAL</b><br>Switching Frequency<br>Frequency Change<br>Package Weight<br>MTTF per MIL-HDBK-217, Rev. E<br>Ground Benign       | Over Line and Load<br><br><br>Circuit Stress Method<br>T <sub>A</sub> = +25°C                                                                                                                                  |                             | 170<br>24<br>2<br>7.9                    |                                 | kHz<br>%<br>g<br>Mhr                                                                                               |
| <b>TEMPERATURE</b><br>Specification<br>Operation<br>Storage                                                                         |                                                                                                                                                                                                                | -25<br>-40<br>-40           | +25                                      | +85<br>+100<br>+110             | °C<br>°C<br>°C                                                                                                     |

## ABSOLUTE MAXIMUM RATINGS

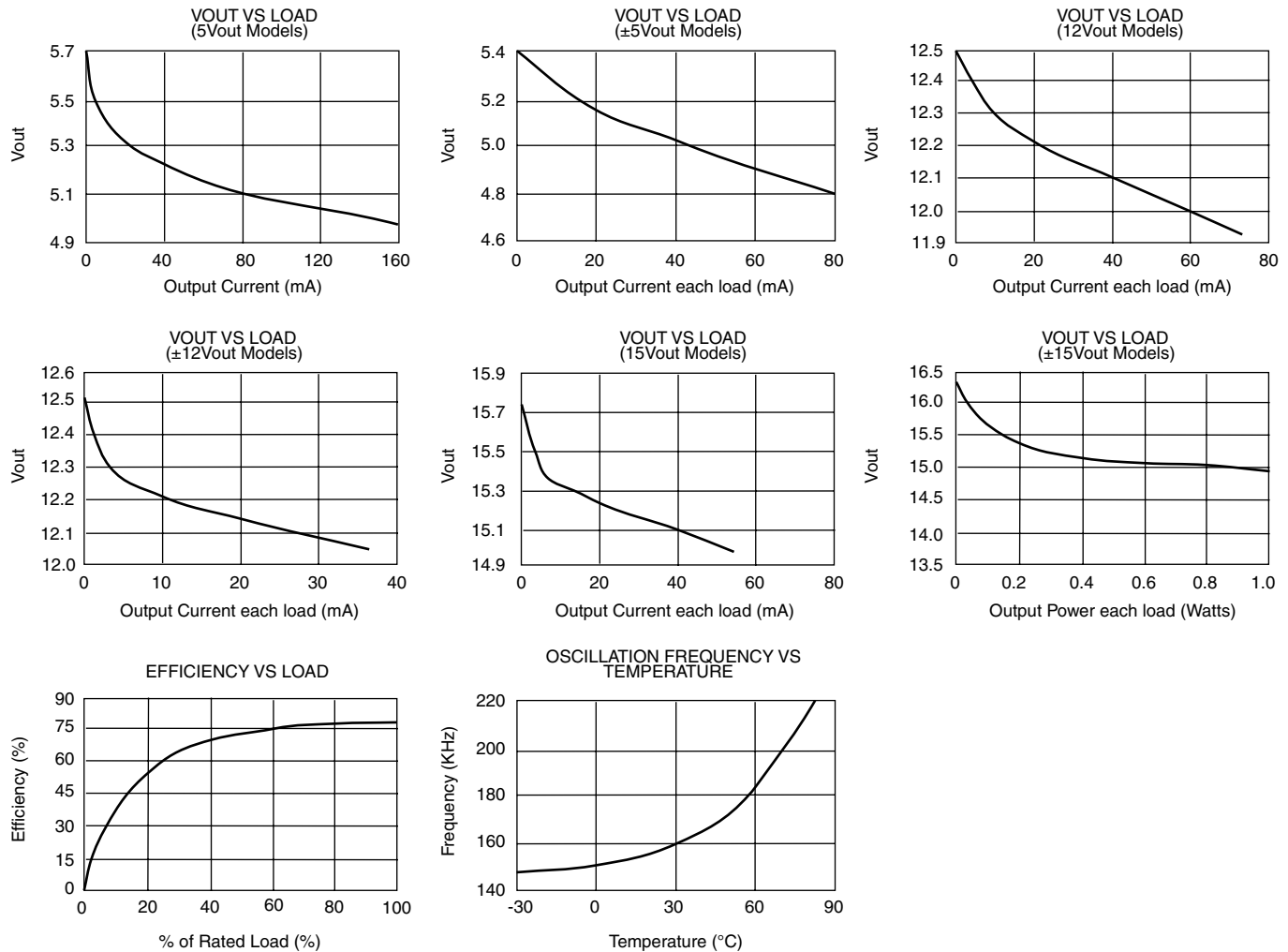
|                                                   |           |
|---------------------------------------------------|-----------|
| Internal Power Dissipation.....                   | 450mW     |
| Short Circuit Duration.....                       | Momentary |
| Lead Temperature (soldering, 10 seconds max)..... | +300°C    |

## ORDERING INFORMATION

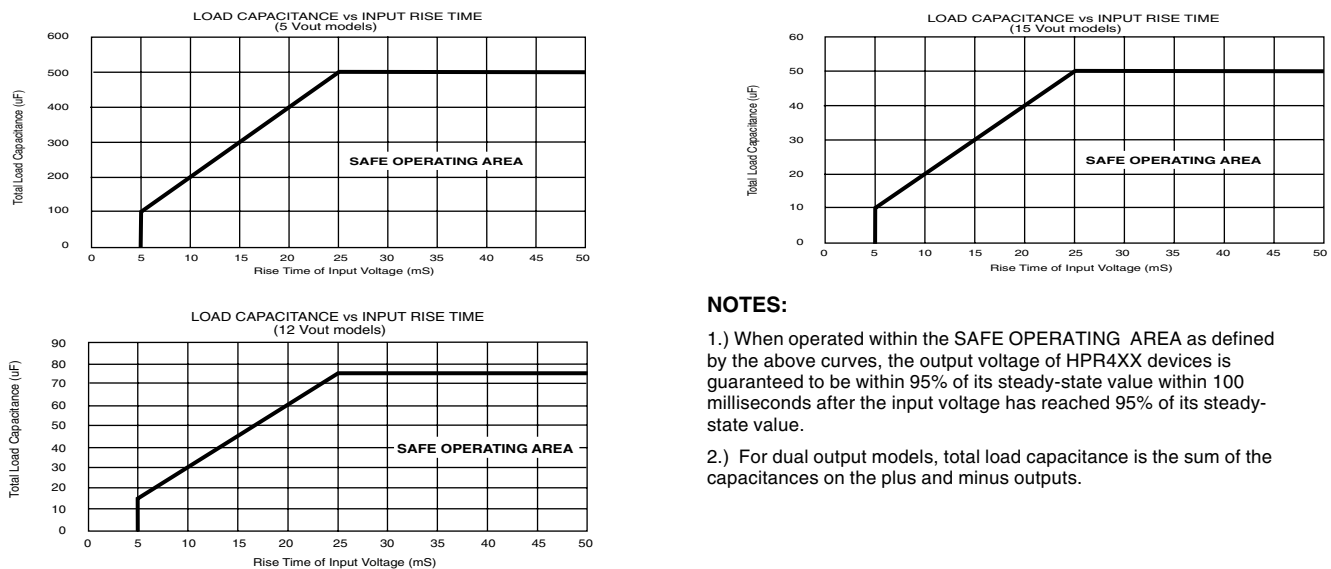
|                                                   |             |
|---------------------------------------------------|-------------|
| Device Family                                     | HPR 4 XX /H |
| HPR Indicates DC/DC converter                     |             |
| Model Number                                      |             |
| Selected from Table of Electrical Characteristics |             |
| Screening Option                                  |             |

# TYPICAL PERFORMANCE CURVES

Specifications typical at  $T_A = +25^\circ\text{C}$ , nominal input voltage, rated output current unless otherwise specified.



## 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.