

Product Data Sheet

3.0 WATT

MINIATURE SIP DC/DC CONVERTER



HPR2XX

FEATURES

- Four Channels Of Isolated Power
- High Output Power Density: > 9. 4 Watts/Inch³
- Extended Temperature Range:
 -25°C To +85°C
- High Efficiency: To 84%
- Low Cost

The HPR2XX Series is designed for multiple channel applications that require small size and could benefit from a complete one-package solution. The HPR2XX Series offers four isolated channels of output power in a footprint less than the size of many singular devices. This unregulated series of DC/DC converters provides three watts of total output power. Each isolated channel can supply up to 750mW.

The HPR2XX Series uses advanced circuit design and packaging technology to realize superior reliability and performance. With only one switching converter on the board, the HPR2XX eliminates the possibility of separate converters creating beat

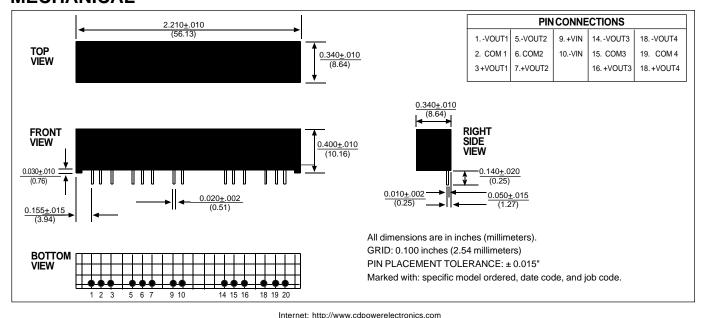
- High Isolation Voltage: 750V Continuous Input-to-Output and Channel-to-Channel
- Single In-line Package (SIP)
- Internal Input and Output Filtering
- Non-Conductive Case

frequencies, or "aliasing" in multiple channel applications.

The high efficiency of the HPR2XX Series means less internal power dissipation than comparable solutions. With reduced heat to dissipate, the HPR2XX Series can operate at higher temperatures with no degradation in reliablility. In addition, the high efficiency of the HPR2XX Series provides greater than 9 watts/inch³ output power density.

The HPR2XX Series offers the user low cost without sacrificing reliability. The use of surface mounted devices and manufacturing technologies make it possible to offer premium performance <u>and</u> low cost.

MECHANICAL



Power Electronics Division, United States 3400 E Britannia Drive, Tucson, Arizona 85706 Phone: 800.547.2537 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.

| | NOMINAL | RATED | RATED | INPUT | CURRENT | REFLECTED | |
|--------|------------------|-------------------|-------------------|---------|------------|-------------------|------------|
| | INPUT VOLTAGE | OUTPUT VOLTAGE | OUTPUT CURRENT | NO LOAD | RATED LOAD | RIPPLE CURRENT | EFFICIENCY |
| MODEL | (VDC) | (VDC) | (mA) | (mA) | (mA) | (mAp-p) | (%) |
| HPR203 | 5 | ±5.2 | ±73 | 70 | 820 | 35 | 74 |
| HPR204 | 5 | ±12 | ±30 | 75 | 750 | 35 | 80 |
| HPR205 | 5 | ±15 | ±25 | 75 | 750 | 35 | 80 |
| HPR210 | 12 | ±12 | ±30 | 30 | 305 | 15 | 82 |
| HPR211 | 12 | ±15 | ±25 | 30 | 300 | 15 | 84 |
| HPR216 | 15 | ±12 | ±30 | 20 | 240 | 15 | 83 |
| HPR217 | 15 | ±15 | ±25 | 20 | 240 | 20 | 84 |
| HPR221 | 24 | ±5.0 | ±75 | 20 | 170 | 20 | 74 |
| HPR223 | 24 | ±15 | ±25 | 20 | 155 | 20 | 81 |

Note: Other input to output voltage options may be available. Please consult factory.

 $\begin{tabular}{ll} \textbf{COMMON SPECIFICATIONS} \\ \textbf{Specifications typical at T_A} = +25^{\circ}\text{C}, nominal input voltage, rated output current unless otherwise specified.} \end{tabular}$

| A | PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS |
|--|------------------------------|-------------------------------------|------------|-------------|-------------|---------|
| A | INPUT | | | | | |
| 10.8 12 13.2 VDC 13.5 15 16.5 VDC 12.6 24 26.4 VDC 1 VIJUSC | | | 4.5 | 5 | 5.5 | VDC |
| 13.5 | | | | _ | | _ |
| Voltage Rise Time In Rush Current At Startup At Startup At Startup Input to Output, Channel to Channel 60 Hz, 10 seconds 60 Hz, 10 seconds 750 Resistance Capacitance Leakage Current V ₁₅₀ =240VAC, 60Hz Voltage Rated Load, Nominal V _N Rated Power Each Channel Voltage Setpoint Accuracy Rated Power Each Channel Voltage Setpoint Accuracy Rated Load, Nominal V _N BW = DC to 10MHz BW = 10Hz to 2MHz BW = 10Hz to 2MHz BW = 10Hz to 2MHz BW = 15V L=1mA, V _{corr} = 12V L=1mA, V _{corr} = 15V L=1mA, V _{corr} = 15V Load Regulation (All other Models) Rated Load to 1mA Load Rated Load to 1mA Load High Line to Low Line Circuit Stress Method Ground Benign Ty = 25 Ty = 25 Ty = 27 T | | | | | _ | |
| Voltage Rated Load, Norminal V Rated Lo | | | | | | |
| In Rush Current At Startup Amps | Voltago Pico Timo | | 21.0 | 24 | _ | _ |
| SOLATION Rated Voltage Input to Output, Channel to Channel 750 | | At Startun | | | ' | |
| Input to Output, Channel to Channel 750 7 | III Rusii Cuiteiti | At Startup | | | | Amps |
| Test Voltage Resistance | ISOLATION | | | | | |
| Resistance Capacitance | Rated Voltage | Input to Output, Channel to Channel | 750 | | | VDC |
| Capacitance Leakage Current V _{ISO} = 240VAC, 60Hz 30 pF UoTPUT Total Rated Power 3 W Rated Power Each Channel 750 mW Voltage Setpoint Accuracy Rated Load, Nominal V _{IN} 40 mVp-p Ripple & Noise BW = DC to 10MHz 7 mVrms Voltage L=1mA, V _{corr} = 5V 8 VDC L=1mA, V _{corr} = 15V 20 VDC Temperature Coefficent .05 3 %0/Peg C REGULATION High Line to Low Line 1 %0/Peg C 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 300 kHz Package Weight 7 g % Frequency Change Rated Load to 1mA Load 5 % High Line to Low Line 20 % % Frequency Change Rated Load to 1mA Load 5 % High Lin | Test Voltage | 60 Hz, 10 seconds | 750 | | | Vpk |
| Leakage Current V _{ISO} = 240VAC, 60Hz 4 μÅrms OUTPUT Total Rated Power Rach Channel 3 W Voltage Setpoint Accuracy Rated Load, Nominal V _{IN} ±5 % Ripple & Noise BW = DC to 10MHz 40 mV-pown MV | Resistance | | | 10 | | GΩ |
| OUTPUT 3 W Total Rated Power Rated Power Rated Power Each Channel 3 750 mW Voltage Septoint Accuracy Rated Load, Nominal V _N ±5 % Ripple & Noise BW = DC to 10MHz 40 mVp-p BW = 10Hz to 2MHz 7 mVrms Voltage L=1mA, V _{our} = 5V 8 VDC L=1mA, V _{our} = 12V 17 VDC L=1mA, V _{our} = 15V .05 %/Deg C REGULATION Line Regulation High Line to Low Line 1 %/SVN_N Load Regulation (SV out only) Rated Load to 1mA Load 10 % Load Regulation (All other Models) Rated Load to 1mA Load 3 % Switching Frequency 300 kHz y Package Weight 7 g g Frequency Change Rated Load to 1mA Load 5 % MITF per MIL-HDBK-217, Rev. E Circuit Stress Method 5 % T _x = +25°C 1.8 MHr Naval Sheltered | Capacitance | | | 30 | | pF |
| OUTPUT 3 W Total Rated Power Rated Power Rated Power Each Channel 3 750 mW Voltage Septoint Accuracy Rated Load, Nominal V _N ±5 % Ripple & Noise BW = DC to 10MHz 40 mVp-p BW = 10Hz to 2MHz 7 mVrms Voltage L=1mA, V _{our} = 5V 8 VDC L=1mA, V _{our} = 12V 17 VDC L=1mA, V _{our} = 15V .05 %/Deg C REGULATION Line Regulation High Line to Low Line 1 %/SVN_N Load Regulation (SV out only) Rated Load to 1mA Load 10 % Load Regulation (All other Models) Rated Load to 1mA Load 3 % Switching Frequency 300 kHz y Package Weight 7 g g Frequency Change Rated Load to 1mA Load 5 % MITF per MIL-HDBK-217, Rev. E Circuit Stress Method 5 % T _x = +25°C 1.8 MHr Naval Sheltered | Leakage Current | V ₁₀₀ = 240VAC, 60Hz | | 4 | | uArms |
| Total Rated Power Rated Power Rated Power Each Channel Voltage Setpoint Accuracy Ripple & Noise BW = DC to 10MHz BW = 10Hz to 2MHz To 20 | | iso, | | | | , , |
| Rated Power Each Channel Rated Load, Nominal V _{IN} ±5 % Woltage Setpoint Accuracy BW = DC to 10MHz 40 mVp-p Ripple & Noise BW = DC to 10MHz 7 mVrp-p Voltage I,=1mA, V _{our} = 5V 8 VDC I,=1mA, V _{our} = 12V 17 VDC I,=1mA, V _{our} = 15V 20 VDC Temperature Coefficent High Line to Low Line 1 %/76V REGULATION High Line to Low Line 1 %/76V Load Regulation (SI) out only) Rated Load to 1mA Load 10 % Load Regulation (All other Models) Rated Load to 1mA Load 3 % GENERAL Switching Frequency 300 kHz Package Weight 7 g % Frequency Change Rated Load to 1mA Load 5 % MITTF per MIL-HDBK-217, Rev. E Circuit Stress Method 1 18 MHr Fixed Ground T _A = +35°C 450 kHr Naval Sheltered T _A = +35°C 450 <td< td=""><td></td><td></td><td></td><td>2</td><td></td><td>10/</td></td<> | | | | 2 | | 10/ |
| Voltage Setpoint Accuracy Rated Load, Nominal V BW = DC to 10MHz BW = DC to 10MHz BW = DC to 10MHz To 2MHz To 2 | | | | 1 | | |
| Ripple & Noise BW = DC to 10MHz BW = 10Hz to 2MHz 7 | | | | 750 | _ | |
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$ | | | | | ±5 | |
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$ | Ripple & Noise | | | | | |
| I_=1mA, V_{out} = 12V | | | | 7 | | |
| Temperature Coefficent | Voltage | $I_L=1mA, V_{OUT}=5V$ | | | | |
| REGULATION High Line to Low Line 1 %/Veg C Load Regulation High Line to Low Line 1 %/Viv Load Regulation (SV out only) Rated Load to 1mA Load 10 % Load Regulation (All other Models) Rated Load to 1mA Load 3 % GENERAL Switching Frequency 300 kHz Package Weight 7 g g Frequency Change Rated Load to 1mA Load 5 % High Line to Low Line 20 % MTTF per MIL-HDBK-217, Rev. E Circuit Stress Method 1.8 MHr Ground Benign T _A = +35°C 450 kHr Naval Sheltered T _A = +35°C 270 kHr Airborne Uninhabited Fighter T _A = +35°C 45 kHr TEMPERATURE Specification -25 +25 +85 °C Operation -40 +100 °C | | $I_L=1mA, V_{OUT}=12V$ | | | 17 | |
| REGULATION Line Regulation High Line to Low Line 1 $\%/\%V_{\text{IN}}$ 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 300 kHz Package Weight 7 g Frequency Change Rated Load to 1mA Load 5 $\%$ MTTF per MIL-HDBK-217, Rev. E Circuit Stress Method 20 $\%$ Ground Benign $T_A = +25^{\circ}C$ 1.8 MHr Fixed Ground $T_A = +35^{\circ}C$ 450 kHr Naval Sheltered $T_A = +35^{\circ}C$ 270 kHr Airborne Uninhabited Fighter $T_A = +35^{\circ}C$ 45 kHr TEMPERATURE Specification -25 +25 +85 $^{\circ}C$ Operation -40 +100 $^{\circ}C$ | | $I_L=1mA, V_{OUT}=15V$ | | | 20 | VDC |
| Line Regulation Load Regulation (5V out only) Rated Load to 1mA Load 3 % % | Temperature Coefficent | | | .05 | | %/Deg C |
| Load Regulation (5V out only) Rated Load to 1mA Load 10 % GENERAL 300 kHz Switching Frequency 300 kHz Package Weight 7 g Frequency Change Rated Load to 1mA Load 5 % MTTF per MIL-HDBK-217, Rev. E Circuit Stress Method 20 % MTTF per MIL-HDBK-217, Rev. E Circuit Stress Method Tale +25°C 1.8 MHr Fixed Ground Tale +35°C 450 kHr Naval Sheltered Tale +35°C 270 kHr Airborne Uninhabited Fighter Tale +35°C 45 kHr TEMPERATURE Specification -25 +25 +85 °C Operation -40 +100 °C | REGULATION | | | | | |
| Load Regulation (5V out only) Rated Load to 1mA Load 10 % GENERAL 300 kHz Switching Frequency 300 kHz Package Weight 7 g Frequency Change Rated Load to 1mA Load 5 % MTTF per MIL-HDBK-217, Rev. E Circuit Stress Method 20 % MTTF per MIL-HDBK-217, Rev. E Circuit Stress Method Tale +25°C 1.8 MHr Fixed Ground Tale +35°C 450 kHr Naval Sheltered Tale +35°C 270 kHr Airborne Uninhabited Fighter Tale +35°C 45 kHr TEMPERATURE Specification -25 +25 +85 °C Operation -40 +100 °C | Line Regulation | High Line to Low Line | | 1 | | %/%V |
| Companies | | | | 10 | | |
| GENERAL 300 kHz Switching Frequency 7 g Package Weight 7 g Frequency Change Rated Load to 1mA Load 5 % High Line to Low Line 20 % MTTF per MIL-HDBK-217, Rev. E Circuit Stress Method Circuit Stress Method Ground Benign T _A = +25°C 1.8 MHr Fixed Ground T _A = +35°C 450 kHr Naval Sheltered T _A = +35°C 270 kHr Airborne Uninhabited Fighter T _A = +35°C 45 kHr TEMPERATURE Specification -25 +25 +85 °C Operation -40 +100 °C | | | | | | |
| Switching Frequency 300 kHz Package Weight 7 g Frequency Change Rated Load to 1mA Load 5 % MTTF per MIL-HDBK-217, Rev. E Circuit Stress Method 20 % MTTF per MIL-HDBK-217, Rev. E Circuit Stress Method Tall Stress Method MHr Ground Benign Tall + 25°C 1.8 MHr Fixed Ground Tall + 35°C 450 kHr Naval Sheltered Tall + 35°C 270 kHr Airborne Uninhabited Fighter Tall + 35°C 45 kHr TEMPERATURE Specification -25 +25 +85 °C Operation -40 +100 °C | | Nation Load to Tilly Cloud | | | | ,,, |
| Package Weight 7 g Frequency Change Rated Load to 1mA Load 5 % MTTF per MIL-HDBK-217, Rev. E Circuit Stress Method 20 % Ground Benign T _A = +25°C 1.8 MHr Fixed Ground T _A = +35°C 450 kHr Naval Sheltered T _A = +35°C 270 kHr Airborne Uninhabited Fighter T _A = +35°C 45 kHr TEMPERATURE Specification -25 +25 +85 °C Operation -40 +100 °C | | | | | | |
| Frequency Change Rated Load to 1mA Load High Line to Low Line Circuit Stress Method Ground Benign $T_A = +25^{\circ}\text{C}$ 1.8 MHr Fixed Ground $T_A = +35^{\circ}\text{C}$ 450 kHr Naval Sheltered $T_A = +35^{\circ}\text{C}$ 450 kHr Airborne Uninhabited Fighter $T_A = +35^{\circ}\text{C}$ 45 kHr Specification $T_A = +35^{\circ}\text{C}$ 45 $T_A = +35^{\circ}\text{C}$ 47 $T_A = +35^{\circ}\text{C}$ 48 $T_A = +35^{\circ}\text{C}$ 49 $T_A = +35^{\circ}$ | | | | | | |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | 5 5 | | | | | _ |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | Frequency Change | | | | | |
| | | ı | | 20 | | % |
| Fixed Ground $T_A^2 + 35^{\circ}C$ 450 kHr Naval Sheltered $T_A = +35^{\circ}C$ 270 kHr Airborne Uninhabited Fighter $T_A = +35^{\circ}C$ 45 kHr TEMPERATURE Specification -25 +25 +85 $^{\circ}C$ Operation -40 +100 $^{\circ}C$ | | | | | | |
| Naval Sheltered $T_A^- = +35^{\circ}C$ 270 kHr Airborne Uninhabited Fighter $T_A^- = +35^{\circ}C$ 45 kHr TEMPERATURE Specification -25 +25 +85 $^{\circ}C$ Operation -40 +100 $^{\circ}C$ | Ground Benign | | | 1.8 | | MHr |
| Airborne Uninhabited Fighter TA = +35°C 45 kHr TEMPERATURE Specification -25 +25 +85 °C Operation -40 +100 °C | Fixed Ground | | | 450 | | kHr |
| Airborne Uninhabited Fighter T_A = +35°C 45 kHr TEMPERATURE Specification -25 +25 +85 °C Operation -40 +100 °C | Naval Sheltered | T _A = +35°C | | 270 | | kHr |
| Specification -25 +25 +85 °C Operation -40 +100 °C | Airborne Uninhabited Fighter | | | 45 | | kHr |
| Specification -25 +25 +85 °C Operation -40 +100 °C | TEMPERATURE | | | | | |
| Operation -40 +100 °C | | | -25 | ± 25 | ± 85 | °C |
| | | | | 120 | | |
| | Storage | | -40 -40 | | +110 | .c |

ABSOLUTE MAXIMUM RATINGS

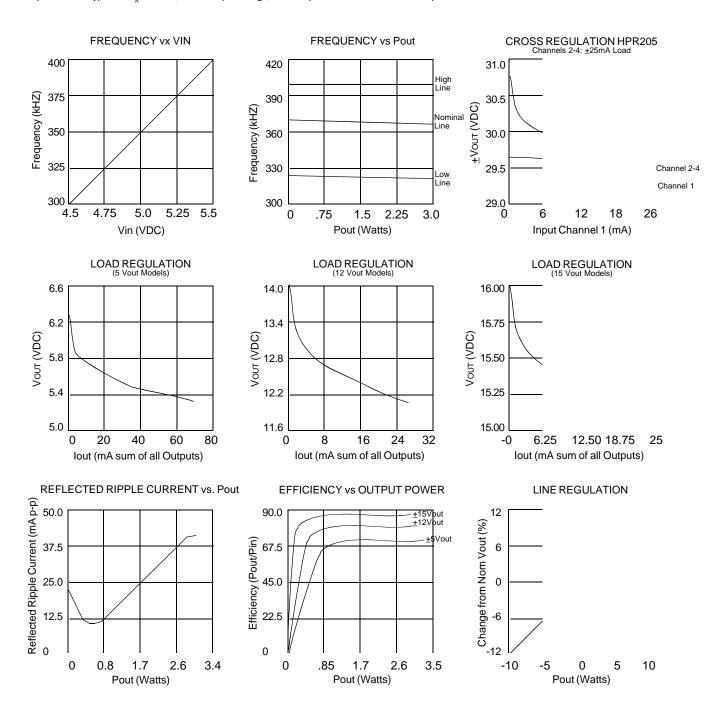
| Internal Power Dissipation | 1.2W |
|--|--------|
| Short Circuit Protection | |
| Lead Temperature (soldering, 10 seconds max) | +300°C |

ORDERING INFORMATION

| Device Family HPR Indicates DC/DC Converter Model Number | HPR 2XX /H |
|--|------------|
| Selected From Table Above | |
| Screening Option ———————————————————————————————————— | |

TYPICAL PERFORMANCE CURVES

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



The information provided herein is believed to be reliable; however, C&D TECHNOLOGIES assumes no responsibility for inaccuracies or omissions. C&D TECHNOLOGIES assumes no responsibility for the use of this information, and all use of such information shall be entirely at the user's own risk. Prices and specifications are subject to change without notice. No patent rights or licenses to any of the circuits described herein are implied or granted to any third party. C&D TECHNOLOGIES does not authorize or warrant any C&D TECHNOLOGIES product for use in life support devices/systems or in aircraft control applications.

HPR2XX REV D 4/99 Page 3