GENERAL DESCRIPTION

The XRP6272 is a low dropout voltage regulator capable of a constant output current up to 2 Amps. A wide 1.8V to 6V input voltage range allows for single supply operations from industry standard 1.8V, 2.8V, 3.3V, and 5V power rails as well as the 5.8V rail.

With better than ±2% output voltage accuracy, low output noise and high Power Supply Rejection Ratio (PSRR), the XRP6272 is perfectly suited for powering RF circuitries. Optimized for use with small low cost ESR ceramic output capacitors and featuring a low 30µA quiescent current, this device is also adequate for use in battery powered portable equipments. The XRP6272 operates by default as a 5V fixed output voltage regulator while usage of an external resistors divider allows adjustable out voltages as low as 0.7V. An Enable function, Power Good flag and output noise reduction pin complete the feature set.

Built-in current limit and thermal protections insure safe operations under abnormal operating conditions.

The XRP6272 is offered in RoHS compliant, "green"/halogen free 5-pin TO-252 and 8-pin exposed pad SOIC packages.

APPLICATIONS

- Networking Equipments
- RF Circuitry Power Supplies
- Set-top box Equipments
- Portable Equipments

FEATURES

- Guaranteed 2A Output Current
  - Low 550mV Dropout at 3.3V/2A
- 1.8V to 6V Single Input Voltage Range
  - Fixed 5V and Adjustable Output Voltage
  - ±2% Output Voltage Accuracy
- 30µA Quiescent Current
- Power Good and Enable Functions
- 70dB Power Supply Rejection Ratio
- Low Output Noise
- 0.01µA Shutdown Current
- Current Limit and Thermal Protection
- RoHS compliant “Green”/Halogen Free 5-pin TO-252 and 8-pin Exposed pad SOIC Packages

TYPICAL APPLICATION DIAGRAM

![Fig. 1: XRP6272 Application Diagram](image)
**ABSOLUTE MAXIMUM RATINGS**

These are stress ratings only and functional operation of the device at these ratings or any other above those indicated in the operation sections of the specifications below is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability.

- $V_{IN}$, EN, BP .......................... 7.0V
- Storage Temperature ....................... -65°C to 150°C
- Power Dissipation ........................ Internally Limited
- Lead Temperature (Soldering, 10 sec) ................... 260°C
- Junction Temperature ................................. 150°C
- ESD Rating (HBM - Human Body Model) .................... 2kV
- ESD Rating (MM - Machine Model) ........................... 500V

**OPERATING RATINGS**

- Input Voltage Range $V_{IN}$ .......................... 1.8V to 6V
- Operating Temperature Range ................... -40°C to 85°C

**ELECTRICAL SPECIFICATIONS**

Specifications with standard type are for an Operating Junction Temperature of $T_J = 25°C$ only. Minimum and Maximum limits are guaranteed through test, design, or statistical correlation. Typical values represent the most likely parametric norm at $T_J = 25°C$, and are provided for reference purposes only. Unless otherwise indicated, $V_{IN} = V_{OUT} + 1V$, $C_{IN} = 4.7\mu F$, $C_{OUT} = 4.7\mu F$ or 10µF (Note 1), $C_{BYP} = 22nF$, $T_J = 25°C$.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltage</td>
<td>1.8</td>
<td>6.0</td>
<td></td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Output Voltage Tolerance</td>
<td>-2</td>
<td>+2</td>
<td>%</td>
<td>I_{OUT} = 1mA</td>
<td></td>
</tr>
<tr>
<td>Continuous Output Current</td>
<td>2</td>
<td></td>
<td>A</td>
<td>$V_{IN} \geq 2.3V$</td>
<td></td>
</tr>
<tr>
<td>Ground Current</td>
<td>30</td>
<td>50</td>
<td>µA</td>
<td>$V_{EN} \geq 1.6V$, No Load</td>
<td></td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>50</td>
<td>µA</td>
<td>$V_{EN} \geq 1.6V$, $I_{OUT} = 300mA$</td>
<td></td>
</tr>
<tr>
<td>Standby Current</td>
<td>0.01</td>
<td>0.5</td>
<td>µA</td>
<td>$V_{EN} = 0$</td>
<td></td>
</tr>
<tr>
<td>Line Regulation</td>
<td>3</td>
<td>15</td>
<td>mV</td>
<td>$V_{IN} = V_{OUT} + 1V$ to 6V, $I_{OUT} = 1mA$</td>
<td></td>
</tr>
<tr>
<td>Load Regulation</td>
<td>5</td>
<td>15</td>
<td>mV</td>
<td>$I_{OUT} = 1mA$ to 2A</td>
<td></td>
</tr>
<tr>
<td>Output Current Limit</td>
<td>2.2</td>
<td>3.0</td>
<td>3.9</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Current Fold Back</td>
<td>1.0</td>
<td></td>
<td>A</td>
<td>$V_{EN} = 0$</td>
<td></td>
</tr>
<tr>
<td>Dropout Voltage (Note 2)</td>
<td>960</td>
<td></td>
<td>mV</td>
<td>$I_{OUT} = 2A$, $V_{OUT} = 1.2V$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>700</td>
<td>900</td>
<td></td>
<td>$I_{OUT} = 2A$, $V_{OUT} = 1.8V$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>550</td>
<td>700</td>
<td></td>
<td>$I_{OUT} = 2A$, $V_{OUT} = 3.3V$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>480</td>
<td>600</td>
<td></td>
<td>$I_{OUT} = 2A$, $V_{OUT} = 5.0V$</td>
<td></td>
</tr>
<tr>
<td>Reference Voltage Tolerance</td>
<td>0.686</td>
<td>0.714</td>
<td>V</td>
<td>$V_{ADJ} = V_{REF}$</td>
<td></td>
</tr>
<tr>
<td>ADJ Pin Current</td>
<td>10</td>
<td>100</td>
<td>nA</td>
<td>$V_{ADJ} = V_{REF}$</td>
<td></td>
</tr>
<tr>
<td>ADJ Pin Threshold</td>
<td>0.05</td>
<td>0.1</td>
<td>0.2</td>
<td>V</td>
<td>Output ON</td>
</tr>
<tr>
<td>Enable Turn-On Threshold</td>
<td>1.6</td>
<td></td>
<td>V</td>
<td>Output OFF</td>
<td></td>
</tr>
<tr>
<td>Enable Turn-Off Threshold</td>
<td>0.4</td>
<td></td>
<td>V</td>
<td>Output OFF</td>
<td></td>
</tr>
<tr>
<td>Shutdown Pin Current</td>
<td>0</td>
<td>0.5</td>
<td>µA</td>
<td>$V_{EN} = 0$</td>
<td></td>
</tr>
<tr>
<td>Shutdown Exit Delay Time</td>
<td>100</td>
<td></td>
<td>µs</td>
<td>$I_{PGOOD} = 10mA$</td>
<td></td>
</tr>
<tr>
<td>Max Output Discharge Resistance to GND during Shutdown</td>
<td>20</td>
<td>100</td>
<td>Ω</td>
<td>$R_{GOOD} = 90 - 93%$</td>
<td></td>
</tr>
<tr>
<td>PGOOD Rise Threshold</td>
<td>90</td>
<td></td>
<td>%</td>
<td>$I_{PGOOD} = 10mA$</td>
<td></td>
</tr>
<tr>
<td>PGOOD Hysteresis</td>
<td>3</td>
<td>10</td>
<td>%</td>
<td>$R_{GOOD} = 5 - 5ms$</td>
<td></td>
</tr>
<tr>
<td>PGOOD Delay</td>
<td>0.5</td>
<td></td>
<td>ms</td>
<td>$I_{PGOOD} = 10mA$</td>
<td></td>
</tr>
<tr>
<td>Ripple Rejection</td>
<td>70</td>
<td></td>
<td>dB</td>
<td>$f=1KHz$, Ripple=0.5V-p</td>
<td></td>
</tr>
<tr>
<td>Output Noise Voltage</td>
<td>24</td>
<td></td>
<td>µVRms</td>
<td>$C_{BYP} = 22nF$, $f=10Hz$ ~100KHz</td>
<td></td>
</tr>
<tr>
<td>Temperature Coefficient</td>
<td>50</td>
<td></td>
<td>ppm/°C</td>
<td>$T_{GOOD} = 50°C$</td>
<td></td>
</tr>
<tr>
<td>Thermal Shutdown Temperature</td>
<td>150</td>
<td></td>
<td>°C</td>
<td>$V_{IN} = V_{OUT} + 1V$</td>
<td></td>
</tr>
</tbody>
</table>
### Parameter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal Shutdown Hysteresis</td>
<td>20</td>
<td></td>
<td></td>
<td>°C</td>
<td></td>
</tr>
</tbody>
</table>

Note 1: In the case of $V_{OUT} \leq 1.8V$, $C_{OUT} = 10\mu F$ is recommended.

Note 2: Dropout Voltage is defined as input voltage minus output voltage when the output voltage drops by 1% of its nominal value at $V_{IN} = V_{OUT} + 1V$.

Note 3: $V_{IN (min)}$ is the higher value of $(V_{OUT} + $Dropout Voltage$)$ or 1.8V.

### BLOCK DIAGRAM

Fig. 2: XRP6272 Block Diagram

### PIN ASSIGNMENT

Fig. 3: XRP6272 Pin Assignment
**PIN DESCRIPTION**

<table>
<thead>
<tr>
<th>Name</th>
<th>SOIC-8</th>
<th>TO-252</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN</td>
<td>1</td>
<td>1</td>
<td>Enable Pin. Minimum 1.6V to enable the device. Maximum 0.4V to shutdown the device.</td>
</tr>
<tr>
<td>VIN</td>
<td>2</td>
<td>2</td>
<td>Power Input Pin. Must be closely decoupled to GND pin with a 4.7μF or greater ceramic capacitor.</td>
</tr>
<tr>
<td>VOUT</td>
<td>3</td>
<td>4</td>
<td>Regulator Output pin.</td>
</tr>
<tr>
<td>ADJ</td>
<td>4</td>
<td>5</td>
<td>Adjustable Pin. Output Voltage can be set by external feedback resistors when using a resistive divider. Or, connect ADJ to GND for VOUT = 5V, set by internal feedback resistors.</td>
</tr>
<tr>
<td>GND</td>
<td>5, 8</td>
<td>3</td>
<td>Ground Signal</td>
</tr>
<tr>
<td>BP</td>
<td>6</td>
<td>-</td>
<td>Bypass pin. Connect a 22nF capacitor to GND to reduce output noise. Bypass pin can be left floating if not necessary.</td>
</tr>
<tr>
<td>PGOOD</td>
<td>7</td>
<td>-</td>
<td>Power Good open Drain Output.</td>
</tr>
<tr>
<td>GND</td>
<td>Exposed Pad</td>
<td>Tab</td>
<td>Connect to GND.</td>
</tr>
</tbody>
</table>

**ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Operating Temperature Range</th>
<th>Package</th>
<th>Packing Method</th>
<th>Lead-Free(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>XRP6272ITCSTR-F</td>
<td>-40°C ≤ $T_a$ ≤ +85°C</td>
<td>5-pin TO-252</td>
<td>Tape &amp; Reel</td>
<td>Yes</td>
</tr>
<tr>
<td>XRP6272IDBTR-F</td>
<td>-40°C ≤ $T_a$ ≤ +85°C</td>
<td>8-pin HSOIC</td>
<td>Tape &amp; Reel</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**NOTES:**

1. Refer to [www.maxlinear.com/XRP6272](http://www.maxlinear.com/XRP6272) for most up-to-date Ordering Information
2. Visit [www.maxlinear.com](http://www.maxlinear.com) for additional information on Environmental Rating.
TYPICAL PERFORMANCE CHARACTERISTICS

All data taken at $V_{IN} = V_{OUT} + 1\,V$, $T_j = T_a = 25^\circ C$, $C_{IN} = 4.7\mu F$, $C_{OUT} = 4.7\mu F$ or $10\mu F$ (Note 1) unless otherwise specified.

**Fig. 4:** GND Current vs. VIN at VOUT=1.8V, No Load

**Fig. 5:** GND Current vs. VIN at VOUT=3.3V, No Load

**Fig. 6:** GND Current vs. VIN at VOUT=1.8V, 300mA

**Fig. 7:** GND Current vs. VIN at VOUT=3.3V, 300mA

**Fig. 8:** GND Current vs. Temp. at VOUT=1.8V, No Load

**Fig. 9:** GND Current vs. Temp. at VOUT=3.3V, No Load
Fig. 10: Dropout Voltage at VOUT = 1.8V

Fig. 11: Dropout Voltage at VOUT = 3.3V

Fig. 12: Dropout Voltage at VOUT = 5.0V

Fig. 13: Load Transient Response at VOUT=1.8V, VIN=2.8V

Fig. 14: Load Transient Response at VOUT=3.3V, VIN=4.3V

Fig. 15: Load Transient Response at VOUT=5V, VIN=6V
Fig. 16: Enable Startup at VOUT = 1.8V

Fig. 17: Shutdown at VOUT = 1.8V

Fig. 18: Enable Startup at VOUT = 5V

Fig. 19: Shutdown at VOUT = 5V

Fig. 20: Current Foldback at VOUT = 1.8V

Fig. 21: Current Foldback at VOUT = 3.3V
APPLICATION INFORMATION

The XRP6272 is a low-dropout voltage regulator with low quiescent current, low noise and high PSRR. It can support load current up to 2A. It incorporates current-limit and thermal protection features.

TYPICAL APPLICATION SCHEMATIC

PROGRAMMING THE OUTPUT VOLTAGE

XRP6272’s internal feedback resistors set the output voltage $V_{OUT}$ to 5V when the ADJ pin is connected to GND. Alternatively; the output voltage is adjustable via the external feedback resistor network $R_1$ and $R_2$ by calculating the following formula:

$$V_{OUT} = V_{REF} \times \left(1 + \frac{R_1}{R_2}\right)$$

where, $V_{REF}$ is the reference voltage set internally at 0.7V nominal.

INPUT & OUTPUT CAPACITORS

XRP6272 is optimized for use with ceramic capacitors. To ensure stability of the device, an output ceramic capacitor of at least 4.7μF or 10μF (for $V_{OUT} \leq 1.8V$) is recommended. An input capacitor of 4.7μF is recommended.

X5R or X7R ceramic capacitors are recommended as they have the best temperature and voltage characteristics.

NOISE BYPASS CAPACITOR

A 22nF bypass capacitor at BP pin can reduce output voltage noise. This pin can be left floating if it is unnecessary.

THEORY OF OPERATION

SHUTDOWN

By connecting EN pin to GND, the XRP6272 can be shutdown to reduce the supply current to 0.01μA (typ.). In this mode, the output voltage of XRP6272 is equal to 0V.

CURRENT LIMIT

The XRP6272 includes current limit protection feature, which monitors and controls the maximum output current. If the output is overloaded or shorted to ground, this can protect the device from being damaged.

THERMAL PROTECTION

The XRP6272 includes a thermal protection feature that protects the IC by turning off the pass transistor when the maximum junction temperature $T_J$ exceeds 150°C.
POWER DISSIPATION

The power dissipation across the device can be calculated as:

\[ P_D = I_{OUT} \times (V_{IN} - V_{OUT}) \]

The total junction temperature is calculated as:

\[ T_J = T_A + P_D \times \theta_{JA} \]

where, \( T_J \) is the junction temperature, \( T_A \) is the ambient temperature and \( \theta_{JA} \) is the thermal resistance between junction to ambient.

There is a temperature rise associated with this power dissipated while operating in a given ambient temperature. If the calculated junction temperature exceeds maximum junction temperature specification, then the built-in thermal protection feature is triggered as described previously.

To insure reliable performance, the maximum allowable power dissipation for a given ambient temperature must be considered and it can be calculated as follows:

\[ P_{D(MAX)} = \frac{(T_{J(MAX)} - T_A)}{\theta_{JA}} \]

where, \( T_{J(MAX)} \) is the maximum junction temperature, \( T_A \) is the ambient temperature and \( \theta_{JA} \) is the thermal resistance between junction to ambient. In order to insure the best thermal flow, proper mounting of the IC is required.

LAYOUT CONSIDERATION

1. Connect the bottom-side pad to a large ground plane for good thermal conductivity and to reduce the thermal resistance of the device.

2. The input capacitor \( C_{IN} \) and output capacitor \( C_{OUT} \) must be placed as close as possible to the pins \( V_{IN} \) and \( V_{OUT} \) respectively.

3. Use short wires to connect the power supply to pins \( V_{IN} \) and GND on the board.
TYPICAL APPLICATIONS

APPLICATION 1

Fig. 23: 5V to 3.3V / 2A

APPLICATION 2

Fig. 24: 5.8V to 5V RF Stage Low Noise Power Supply

APPLICATION 3

Fig. 25: 2.7V Min to 1.8V / 2A Power Supply
Note: 1. Refer to JEDEC TO-252AD and AB.
   2. Dimension "E" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 6 mil per side.
   3. Dimension "D" does not include inter-lead flash or protrusions.
   4. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.
**EXPOSED PAD 8-PIN SOIC**

![Diagram of the SOIC package with dimensions](diagram.png)

### Table: SOP-8 Exposed Pad (Heat Sink) Dimensions

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>MIN.</th>
<th>MAX.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1.35</td>
<td>1.75</td>
</tr>
<tr>
<td>A1</td>
<td>0.00</td>
<td>0.15</td>
</tr>
<tr>
<td>B</td>
<td>0.31</td>
<td>0.51</td>
</tr>
<tr>
<td>C</td>
<td>0.17</td>
<td>0.25</td>
</tr>
<tr>
<td>D</td>
<td>4.80</td>
<td>5.00</td>
</tr>
<tr>
<td>E</td>
<td>3.80</td>
<td>4.00</td>
</tr>
<tr>
<td>e</td>
<td>1.27 BSC</td>
<td></td>
</tr>
</tbody>
</table>

**H**  | 5.80 | 6.20 |

**h**  | 0.25 | 0.50 |

**L**  | 0.40 | 1.27 |

**q**  | 0° | 8° |

**D1**  | 1.5 | 3.5 |

**E1**  | 1.0 | 2.55 |

---

**Note:**
1. Refer to JEDEC MS-012E.
2. Dimension "D" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 6 mil per side.
3. Dimension "E" does not include inter-lead flash or protrusions.
4. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.
## REVISION HISTORY

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1.0</td>
<td>10/14/2011</td>
<td>Initial release of Data Sheet</td>
</tr>
<tr>
<td>1.2.0</td>
<td>11/30/2011</td>
<td>Corrected pin assignment package drawing</td>
</tr>
<tr>
<td>1.2.1</td>
<td>11/01/2019</td>
<td>Updated to MaxLinear logo. Updated Ordering Information.</td>
</tr>
</tbody>
</table>

---

**CORPORATE HEADQUARTERS:**

5966 La Place Court  
Suite 100  
Carlsbad, CA 92008  
Tel.: +1 (760) 692-0711  
Fax: +1 (760) 444-8598  
www.maxlinear.com

The content of this document is furnished for informational use only, is subject to change without notice, and should not be construed as a commitment by Maxlinear, Inc. Maxlinear, Inc. Assumes no responsibility or liability for any errors or inaccuracies that may appear in the informational content contained in this guide. Complying with all applicable copyright laws is the responsibility of the user. Without limiting the rights under copyright, no part of this document may be reproduced into, stored in, or introduced into a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording, or otherwise), or for any purpose, without the express written permission of Maxlinear, Inc.

Maxlinear, Inc. Does not recommend the use of any of its products in life support applications where the failure or malfunction of the product can reasonably be expected to cause failure of the life support system or to significantly affect its safety or effectiveness. Products are not authorized for use in such applications unless Maxlinear, Inc. Receives, in writing, assurances to its satisfaction that: (a) the risk of injury or damage has been minimized; (b) the user assumes all such risks; (c) potential liability of Maxlinear, Inc. Is adequately protected under the circumstances.

Maxlinear, Inc. May have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Maxlinear, Inc., the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.

Maxlinear, the Maxlinear logo, and any Maxlinear trademarks, MxL, Full-Spectrum Capture, FSC, G.now, AirPHY and the Maxlinear logo are all on the products sold, are all trademarks of Maxlinear, Inc. or one of Maxlinear's subsidiaries in the U.S.A. and other countries. All rights reserved. Other company trademarks and product names appearing herein are the property of their respective owners.

© 2011 - 2019 Maxlinear, Inc. All rights reserved.