SERIES: PQMC3-S  |  DESCRIPTION: DC-DC CONVERTER

FEATURES
- 3 W isolated output
- smaller package
- single/dual regulated output
- 1,500 Vdc isolation
- continuous short circuit
- temperature range (-40~105°C)
- high efficiency at light load
- efficiency up to 84%

### MODEL

<table>
<thead>
<tr>
<th>MODEL</th>
<th>Voltage Input Typ (Vdc)</th>
<th>Voltage Input Range (Vdc)</th>
<th>Voltage Output Typ (Vdc)</th>
<th>Voltage Output Range (Vdc)</th>
<th>Current Min (mA)</th>
<th>Current Max (mA)</th>
<th>Power Max (W)</th>
<th>Ripple and Noise Max (mVpp)</th>
<th>Efficiency Typ (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PQMC3-D5-S5-S</td>
<td>5</td>
<td>4.5~9</td>
<td>5</td>
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## MODEL (CONTINUED)

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<th>MODEL</th>
<th>input voltage</th>
<th>output voltage</th>
<th>output current</th>
<th>output power</th>
<th>ripple and noise(^1)</th>
<th>efficiency</th>
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</thead>
<tbody>
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<td>PQMC3-D48-S12-S</td>
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<td>36~75</td>
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<td>13</td>
<td>250</td>
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<td>PQMC3-D48-S15-S</td>
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<td>36~75</td>
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<td>200</td>
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<td>PQMC3-D48-S24-S</td>
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<td>36~75</td>
<td>24</td>
<td>6</td>
<td>125</td>
<td>3</td>
</tr>
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<td>PQMC3-D48-D5-S</td>
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<td>36~75</td>
<td>±5</td>
<td>±15</td>
<td>±300</td>
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<td>PQMC3-D48-D12-S</td>
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<td>±125</td>
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<td>36~75</td>
<td>±15</td>
<td>±5</td>
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</table>

Notes: 1. ripple and noise are measured at 20 MHz BW by "parallel cable" method with 1 μF ceramic and 10 μF electrolytic capacitors on the output.

## PART NUMBER KEY

- **PQMC3-DXX-XXX-S**
  - Base Number
  - Input Voltage
  - Output S = single
  - Output D = dual
  - Output Voltage
  - Packaging Style
  - SIP

## INPUT

### parameter

<table>
<thead>
<tr>
<th>conditions/description</th>
<th>min</th>
<th>typ</th>
<th>max</th>
<th>units</th>
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<tbody>
<tr>
<td>5 Vdc input models</td>
<td>4.5</td>
<td>5</td>
<td>9</td>
<td>Vdc</td>
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<td>12 Vdc input models</td>
<td>9</td>
<td>12</td>
<td>18</td>
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<td>3.5</td>
<td>4</td>
<td>4.5</td>
<td>Vdc</td>
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<td>9</td>
<td>Vdc</td>
</tr>
<tr>
<td>24 Vdc input models</td>
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<td>16</td>
<td>18</td>
<td>Vdc</td>
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<td>48 Vdc input models</td>
<td>24</td>
<td>33</td>
<td>36</td>
<td>Vdc</td>
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<tr>
<td>5 Vdc input models</td>
<td>-0.7</td>
<td>12</td>
<td>Vdc</td>
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<td>Vdc</td>
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<td>capacitance filter</td>
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### CTRL\(^2\)

- models ON (CTRL open or insulated)
- models OFF (connect voltage, current into CTRL is 5~10mA)

## OUTPUT

### parameter

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<tr>
<th>conditions/description</th>
<th>min</th>
<th>typ</th>
<th>max</th>
<th>units</th>
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<td>full load, input voltage from low to high</td>
<td>±0.2</td>
<td>±0.5</td>
<td>%</td>
<td></td>
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<tr>
<td>5% to 100% load</td>
<td>±0.6</td>
<td>±1</td>
<td>%</td>
<td></td>
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<tr>
<td>5% to 100% load</td>
<td>±1</td>
<td>±3</td>
<td>%</td>
<td></td>
</tr>
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<td>±1.5</td>
<td>±8</td>
<td>%</td>
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<tr>
<td>PQMC3-D48-S3-S &amp; all other models</td>
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<td>±8</td>
<td>%</td>
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<tr>
<td>±0.5</td>
<td>±1</td>
<td>%</td>
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<td>100% load, nominal input voltage, PFM mode</td>
<td>250</td>
<td>kHz</td>
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<td>25% load step change</td>
<td>0.5</td>
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<td>ms</td>
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<td>25% load step change</td>
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<td>±5</td>
<td>%</td>
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<td>100% load</td>
<td>±0.02</td>
<td>±0.03</td>
<td>%/°C</td>
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Notes: 2. See application notes on page 6.
### PROTECTIONS

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<td>continuous, automatic recovery</td>
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### SAFETY AND COMPLIANCE

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<th>units</th>
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<tr>
<td>isolation voltage</td>
<td>input to output for 1 minute at 1 mA max.</td>
<td>1,500</td>
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<td></td>
<td>Vdc</td>
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<tr>
<td>isolation resistance</td>
<td>input to output at 500 Vdc</td>
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<td>CISPR22/EN55022, class B (external circuit required, see Figure 1-b)</td>
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<td>CISPR22/EN55022, class B (external circuit required, see Figure 1-b)</td>
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<td>ESD</td>
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<td>radiated immunity</td>
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<td>EFT/burst</td>
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<td>surge</td>
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<td>voltage dips &amp; interruptions</td>
<td>IEC/EN61000-4-29, class B, 0%-70%</td>
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<td>MTBF</td>
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<td>1,000,000</td>
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<td>hours</td>
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<tr>
<td>operating temperature</td>
<td>see derating curve</td>
<td>-40</td>
<td>105</td>
<td></td>
<td>°C</td>
</tr>
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<td>°C</td>
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<tr>
<td>storage humidity</td>
<td>non-condensing</td>
<td>95</td>
<td></td>
<td></td>
<td>%</td>
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<td>temperature rise</td>
<td>at full load, Ta=25°C</td>
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### SOLDERABILITY

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<td>hand soldering</td>
<td>1.5 mm from case for 10 seconds</td>
<td>300</td>
<td></td>
<td></td>
<td>°C</td>
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<td>wave soldering</td>
<td>see wave soldering profile</td>
<td>260</td>
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<td></td>
<td>°C</td>
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### MECHANICAL

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<th>max</th>
<th>units</th>
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<tbody>
<tr>
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<td></td>
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<td>mm</td>
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<td>case material</td>
<td>plastic (UL94-V0)</td>
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<td>weight</td>
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<td>4.9</td>
<td></td>
<td></td>
<td>g</td>
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### DERATING CURVES

#### Wave Soldering Profile

- Peak Temp. 260°C Max.
- Wave Soldering Time 4 Sec. Max.
- 10 Sec. Max.

#### Temperature Derating Curve

- Safe operating area
- Ambient Temperature (°C)
- Load (%)
MECHANICAL DRAWING

units: mm[inch]
tolerance: ±0.25[±0.010]
pin section tolerance: ±0.10[±0.004]

<table>
<thead>
<tr>
<th>PIN CONNECTIONS</th>
<th>PIN</th>
<th>Single Output</th>
<th>Dual Output</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>GND</td>
<td>GND</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Vin</td>
<td>Vin</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Ctrl</td>
<td>Ctrl</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>NC</td>
<td>NC</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>+Vo</td>
<td>+Vo</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>0V</td>
<td>0V</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>CS</td>
<td>-Vo</td>
<td></td>
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NC: No Connection

EMC RECOMMENDED CIRCUIT

Figure 1

Recommended external circuit components

<table>
<thead>
<tr>
<th>Vin (Vdc)</th>
<th>5</th>
<th>12</th>
<th>24</th>
<th>48</th>
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<tbody>
<tr>
<td>FUSE</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MOV</td>
<td></td>
<td></td>
<td>S14K35</td>
<td>S14K60</td>
</tr>
<tr>
<td>LDM1</td>
<td></td>
<td></td>
<td></td>
<td>56μH</td>
</tr>
<tr>
<td>TVS</td>
<td>SMCJ13A</td>
<td>SMCJ28A</td>
<td>SMCJ48A</td>
<td>SMCJ90A</td>
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<tr>
<td>C0</td>
<td>680μF/16V</td>
<td>680μF/25V</td>
<td>330μF/50V</td>
<td>330μF/100V</td>
</tr>
<tr>
<td>C1</td>
<td>4.7μF/50V</td>
<td>4.7μF/50V</td>
<td>4.7μF/50V</td>
<td>4.7μF/100V</td>
</tr>
<tr>
<td>LDM2</td>
<td>12μH</td>
<td>12μH</td>
<td>12μH</td>
<td>12μH</td>
</tr>
<tr>
<td>C2</td>
<td>4.7μF/50V</td>
<td>4.7μF/50V</td>
<td>4.7μF/50V</td>
<td>4.7μF/100V</td>
</tr>
<tr>
<td>CY</td>
<td>1nF/2kV</td>
<td>1nF/2kV</td>
<td>1nF/2kV</td>
<td>1nF/2kV</td>
</tr>
<tr>
<td>D1</td>
<td>RB160M-60/1A</td>
<td>RB160M-60/1A</td>
<td>RB160M-60/1A</td>
<td>RB160M-60/1A</td>
</tr>
<tr>
<td>R</td>
<td>Follows: $R = \frac{V_c - V_o - 10}{I_c} \approx 300$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cd</td>
<td>47nF/100V</td>
<td>47nF/100V</td>
<td>47nF/100V</td>
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Note: Figure 1-c is on/off control circuit. See page 6 for details.

TEST CONFIGURATION

Note: Input reflected-ripple current is measured with an inductor Lin and Capacitor Cin to simulate source impedance.
1. **Output load requirement**
   To ensure this module can operate efficiently and reliably, the minimum output load may not be less than 5% of the full load during operation. If the actual output power is low, connect a resistor at the output end in parallel to increase the load.

2. **Recommended circuit**
   This series has been tested according to the following recommended testing circuit before leaving the factory. This series should be tested under load (see Figure 3 and Table 3). If you want to further decrease the input/output ripple, you can increase the capacitance accordingly or choose capacitors with low ESR. However, the capacitance of the output filter capacitor must be appropriate. If the capacitance is too high, a startup problem might arise. For every channel of the output, to ensure safe and reliable operation, the maximum capacitance must be less than the maximum capacitive load (see Table 4).

3. **CTRL Terminal**
   When open or applied high impedance, the converter will turn on. When it’s pulled high, the converter will shutdown. The input current should be between 5~10mA. Exceeding the maximum 20mA will cause permanent damage to the converter. The value for R can be derived as follows:

   \[ R = \frac{V_c - V_D}{I_c} \times \frac{1}{300} \]

   \( V_c \): Control pin input voltage
   \( V_D \): Forward voltage drop of diode D1
   \( I_c \): Input current to control pin
   \( R \): Resistor of control circuit

4. **Input Current**
   When it is used in an unregulated condition, make sure that the input fluctuations and ripple voltage do not exceed the module standard. Refer to Figure 5 and Table 5 for the startup current of this dc-dc module.
REVISION HISTORY

<table>
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<tr>
<td>1.01</td>
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The revision history provided is for informational purposes only and is believed to be accurate.