The **Series** of non-isolated dc-dc converters deliver exceptional electrical and thermal performance in industry-standard pin-out for Point-of-Load converters. Operating from a 6.0Vdc-14Vdc input, these are the converters of choice for Intermediate Bus Architecture and Distributed Power Architecture applications that require high efficiency, tight regulation, and high reliability in elevated temperature environments with low airflow.

The **FPMR12TR7508*A** converter of the **Series** delivers 8A of output current at a tightly regulated programmable output voltage of 0.7525Vdc to 5.5Vdc. The thermal performance of the **FPMR12TR7508*A** is best-in-class: No derating is needed up to 85°C, under natural convection.

This leading edge thermal performance results from electrical, thermal and packaging design that is optimized for high density circuit card conditions. Extremely high quality and reliability are achieved through advanced circuit and thermal design techniques and FDK’s state of the art in-house manufacturing processes and systems.

**Applications**
- Intermediate Bus Architecture
- Telecommunications
- Data/Voice processing
- Distributed Power Architecture
- Computing (Servers, Workstations)

**Features**
- Delivers up to 8A (44.0W)
- High efficiency, no heatsink required
- No derating up to 85°C
- Negative and Positive ON/OFF logic
- Industry-standard SIP pin-out
- RoHS compliance
- Small size and low profile: 0.90” x 0.40” x 0.195” nominal
- Programmable output voltage via external resistor
- No minimum load required
- Start up into pre-biased output
- Remote ON/OFF
- Auto-reset over-current protection
- Auto-reset over-temperature protection
- High reliability, MTBF = 1 Million Hours
- UL60950 recognition in U.S. & Canada, and CB Scheme certification per IEC/EN60950 (Pending)
- All materials meet UL94, V-0 flammability rating

http://www.fdk.co.jp
Electrical Specifications
All specifications apply over specified input voltage, output load, and temperature range, unless otherwise noted.

Conditions: Ta=25°C, Airflow=200LFM(1.0m/s), Vin=12Vdc, Vout=0.7525-5.5Vdc, unless otherwise specified.

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>NOTES</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNITS</th>
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<tbody>
<tr>
<td><strong>ABSOLUTE MAXIMUM RATINGS</strong>☆</td>
<td></td>
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<td></td>
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<tr>
<td>Input Voltage</td>
<td>Continuous</td>
<td>-0.3</td>
<td>15</td>
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<td>Vdc</td>
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<tr>
<td>Operating Temperature</td>
<td>Ambient temperature</td>
<td>-40</td>
<td>85</td>
<td></td>
<td>°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td></td>
<td>-55</td>
<td>125</td>
<td></td>
<td>°C</td>
</tr>
<tr>
<td>Output Voltage</td>
<td></td>
<td>0.7525</td>
<td>5.5</td>
<td>Vdc</td>
<td></td>
</tr>
<tr>
<td><strong>FEATURE CHARACTERISTICS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switching Frequency</td>
<td></td>
<td></td>
<td>320</td>
<td></td>
<td>kHz</td>
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<tr>
<td>Output Voltage Programming Range</td>
<td>By external resistor, See trim Table-1</td>
<td>0.7525</td>
<td>5.5</td>
<td>Vdc</td>
<td></td>
</tr>
<tr>
<td>Turn-On Delay Time</td>
<td>Full resistive load</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- with Vin (module enabled, then Vin applied)</td>
<td>From Vin=Vin(min) to 0.1*Vout(nom)</td>
<td>5.0</td>
<td></td>
<td>ms</td>
<td></td>
</tr>
<tr>
<td>- with Enable (Vin applied, then enabled)</td>
<td>From enable to 0.1*Vout(nom)</td>
<td>5.0</td>
<td></td>
<td>ms</td>
<td></td>
</tr>
<tr>
<td>Rise Time (Full resistive load)</td>
<td>From 0.1<em>Vout(nom) to 0.9</em>Vout(nom)</td>
<td>5.0</td>
<td></td>
<td>ms</td>
<td></td>
</tr>
<tr>
<td>ON/OFF Control (Negative)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Module Off</td>
<td></td>
<td>2.4</td>
<td></td>
<td></td>
<td>Vdc</td>
</tr>
<tr>
<td>Module On</td>
<td></td>
<td>-5</td>
<td>0.8</td>
<td></td>
<td>Vdc</td>
</tr>
<tr>
<td>ON/OFF Control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Module Off</td>
<td></td>
<td>-5</td>
<td></td>
<td></td>
<td>Vin-2.7</td>
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<tr>
<td>Module On</td>
<td></td>
<td>Vin-1.0</td>
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<td>Vdc</td>
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</table>

☆Absolute Maximum Ratings
Stresses in excess of the absolute maximum ratings may lead to degradation in performance and reliability of the converter and may result in permanent damage.

☆絶対最大定格
絶対最大定格を超えたストレスは、性能の低下、長期信頼性の低下、及びモジュールの破損を引き起こすことがあります。
### Electrical Specifications (Continued)

*Conditions: Ta=25°C, Airflow=200LFM(1.0m/s), Vin=12Vdc, Vout=0.7525-5.5Vdc, unless otherwise specified.*

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>NOTES</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INPUT CHARACTERISTICS</strong></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Operating Input Voltage Range</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vout≤3.8Vdc (3.3Vdc+15%)</td>
<td>6</td>
<td>12</td>
<td>14</td>
<td>Vdc</td>
<td></td>
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<tr>
<td>Vout&gt;3.8Vdc (3.3Vdc+15%)</td>
<td>8</td>
<td>12</td>
<td>14</td>
<td>Vdc</td>
<td></td>
</tr>
<tr>
<td>Input Under Voltage Lockout</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Turn-on Threshold</td>
<td>5.5</td>
<td></td>
<td></td>
<td>Vdc</td>
<td></td>
</tr>
<tr>
<td>Turn-off Threshold</td>
<td>4.4</td>
<td></td>
<td></td>
<td>Vdc</td>
<td></td>
</tr>
<tr>
<td>Maximum Input Current</td>
<td>8 Adc out at 6.0Vdc in</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vout=5.0Vdc (8 Adc at 8.0Vdc in)</td>
<td>5.4</td>
<td></td>
<td></td>
<td>Adc</td>
<td></td>
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<tr>
<td>Vout=3.3Vdc</td>
<td>4.9</td>
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<td></td>
<td>Adc</td>
<td></td>
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<tr>
<td>Vout=2.5Vdc</td>
<td>3.8</td>
<td></td>
<td></td>
<td>Adc</td>
<td></td>
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<tr>
<td>Vout=2.0Vdc</td>
<td>3.1</td>
<td></td>
<td></td>
<td>Adc</td>
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<tr>
<td>Vout=1.8Vdc</td>
<td>2.8</td>
<td></td>
<td></td>
<td>Adc</td>
<td></td>
</tr>
<tr>
<td>Vout=1.5Vdc</td>
<td>2.4</td>
<td></td>
<td></td>
<td>Adc</td>
<td></td>
</tr>
<tr>
<td>Vout=1.2Vdc</td>
<td>2.0</td>
<td></td>
<td></td>
<td>Adc</td>
<td></td>
</tr>
<tr>
<td>Vout=1.0Vdc</td>
<td>1.7</td>
<td></td>
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<td>Adc</td>
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<tr>
<td>Input Stand-by Current (module disabled)</td>
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<td>2.5</td>
<td></td>
<td>mA</td>
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<tr>
<td>Input No Load Current (module disabled)</td>
<td>Vout=5.0Vdc</td>
<td>65</td>
<td></td>
<td>mA</td>
<td></td>
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<td></td>
<td>Vout=3.3Vdc</td>
<td>46</td>
<td></td>
<td>mA</td>
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<td></td>
<td>Vout=2.5Vdc</td>
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<td></td>
<td>Vout=2.0Vdc</td>
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<td>Vout=1.8Vdc</td>
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<td>Vout=1.5Vdc</td>
<td>24</td>
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<td>Vout=1.2Vdc</td>
<td>22</td>
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<td>mA</td>
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<td></td>
<td>Vout=1.0Vdc</td>
<td>20</td>
<td></td>
<td>mA</td>
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<tr>
<td>Input Reflected-Ripple Current</td>
<td>See Fig.E for setup (BW=20MHz)</td>
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<tr>
<td>Vout=5.0Vdc</td>
<td>120</td>
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<td></td>
<td>mAp-p</td>
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<td>Vout=3.3Vdc</td>
<td>105</td>
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<td></td>
<td>mAp-p</td>
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<td>Vout=2.5Vdc</td>
<td>95</td>
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<td>Vout=2.0Vdc</td>
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<td>mAp-p</td>
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<td>Vout=1.8Vdc</td>
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<td>mAp-p</td>
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<tr>
<td>Vout=1.5Vdc</td>
<td>65</td>
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<td></td>
<td>mAp-p</td>
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<td>Vout=1.2Vdc</td>
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<td>mAp-p</td>
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<td>Vout=1.0Vdc</td>
<td>55</td>
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<td></td>
<td>mAp-p</td>
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*Note: All specifications are based on standard operating conditions.*
### Electrical Specifications (Continued)

*Conditions: Ta=25degC, Airflow=200LFM(1.0m/s), Vin=12Vdc, Vout=0.7525-5.5Vdc, unless otherwise specified.*

<table>
<thead>
<tr>
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<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNITS</th>
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<tr>
<td><strong>OUTPUT CHARACTERISTICS</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Output Voltage Set Point (no load)</td>
<td></td>
<td>-1.5</td>
<td>Vout</td>
<td>+1.5</td>
<td>%Vout</td>
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<tr>
<td>Output Regulation</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Over Line</td>
<td>Full resistive load</td>
<td>+/-0.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over Load</td>
<td>From no load to full load</td>
<td>+/-0.4</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Output Voltage Range</td>
<td>(Over all operating input voltage, resistive load and temperature conditions until end of life)</td>
<td>-2.5</td>
<td></td>
<td>+2.5</td>
<td>%Vout</td>
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<tr>
<td>Output Ripple and Noise BW=20MHz</td>
<td>Over line, load and temperature (Fig.D)</td>
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<tr>
<td>Peak to Peak</td>
<td>Vout=1.0Vdc</td>
<td>45</td>
<td>80</td>
<td></td>
<td>mVp-p</td>
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<tr>
<td>Peak to Peak</td>
<td>Vout=5.0Vdc</td>
<td>50</td>
<td>80</td>
<td></td>
<td>mVp-p</td>
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<td>External Load Capacitance</td>
<td>Plus full load (resistive)</td>
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<tr>
<td>Min ESR &gt; 1mΩ</td>
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<td>1.000</td>
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<td>µF</td>
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<tr>
<td>Min ESR &gt; 10mΩ</td>
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<td>2.000</td>
<td></td>
<td></td>
<td>µF</td>
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<td>Output Current Range</td>
<td></td>
<td>0</td>
<td>8.0</td>
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<td>A</td>
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<tr>
<td>Output Current Limit Inception (Iout)</td>
<td>Vout=3.3Vdc</td>
<td>17</td>
<td></td>
<td></td>
<td>A</td>
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<tr>
<td>Output Short-Circuit Current</td>
<td>Short=10mΩ, Vout=3.3Vdc Set</td>
<td>2.9</td>
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<td></td>
<td>Arms</td>
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<tr>
<td><strong>DYNAMIC RESPONSE</strong></td>
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<tr>
<td>Iout step from 4.0A to 8.0A with di/dt=5A/µs</td>
<td>Co=47µF x 2 ceramic + 1µF ceramic</td>
<td>120</td>
<td></td>
<td></td>
<td>mV</td>
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<tr>
<td>Setting time (Vout &lt; 10% peak deviation)</td>
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<td>60</td>
<td></td>
<td></td>
<td>µs</td>
</tr>
<tr>
<td>Setting time (Vout &lt; 10% peak deviation)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>µs</td>
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<tr>
<td><strong>EFFICIENCY</strong></td>
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<td></td>
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<tr>
<td>Full load (8A)</td>
<td>Vout=5.0Vdc</td>
<td>93.0</td>
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<td>%</td>
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<td>Vout=3.3Vdc</td>
<td>90.5</td>
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<td>Vout=2.5Vdc</td>
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<td>Vout=2.0Vdc</td>
<td>87.0</td>
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<td>%</td>
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<td>Vout=1.8Vdc</td>
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<td>Vout=1.5Vdc</td>
<td>84.0</td>
<td></td>
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<td></td>
<td>Vout=1.2Vdc</td>
<td>80.5</td>
<td></td>
<td></td>
<td>%</td>
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<td></td>
<td>Vout=1.0Vdc</td>
<td>78.0</td>
<td></td>
<td></td>
<td>%</td>
</tr>
</tbody>
</table>
**FPMR12TR7508*A**

6-14Vdc Input, 8A, 0.7525-5.5Vdc Output

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### Operation

**Input and Output Impedance**

The **FPMR12SR7508*A** converter should be connected to a DC power source using a low impedance input line. In order to counteract the possible effect of input line inductance on the stability of the converter, the use of decoupling capacitors placed in close proximity to the converter input pins is recommended. This will ensure stability of the converter and reduce input ripple voltage. Although low ESR Tantalum or other capacitors should typically be adequate, very low ESR capacitors (ceramic, over 100μF) are recommended to minimize input ripple voltage. The converter itself has on-board internal input capacitance of 3μF with very low ESR (ceramic).

**FPMR12SR7508*A**と入力電源間は低インピーダンスで接続してください。コンバータの安定性に影響のある入力インダクタンスを抑えるため、コンバータの入力ピンの近傍にデカップリングコンデンサを付加することをお勧めします。これによりコンバータの安定動作を確実にし、入力リップル電圧を抑制します。低ESRタンタル、又は他のコンデンサも一般的には問題ありませんが、入力リップルを最小にするためには、非常に低ESRを含むセラミックで100μF以上のものを推奨します。コンバータ自身は入力回路に極低ESRの3μFセラミック入力コンデンサを搭載しています。

The **FPMR12SR7508*A** is capable of stable operation with no external capacitance on the output. To minimize output ripple voltage, the use of very low ESR ceramic capacitors is recommended. These capacitors should be placed in close proximity to the load to improve transient performance and to decrease output voltage ripple.

**FPMR12SR7508*A**は出力に外付けコンデンサが無い状態でも安定して動作します。出力リップルを最小にするため、極低ESRセラミックコンデンサの接続を推奨します。過渡時の特性向上と出力リップル低減のために負荷の近傍に極低ESRセラミックコンデンサを実装することをお勧めします。

Note that the converter does not have a SENSE pin to counteract voltage drops between the output pins and the load. The impedance of the line from the converter output to the load should thus be kept as low as possible to maintain good load regulation.

このコンバータは出力端子と負荷間の電圧トロコを補正するセンサ端子を設けていません。精度の高い負荷特性を保持するために、コンバータの出力から負荷までのラインインピーダンスは可能な限り低くしてください。

---

### ON/OFF (Pin 5)

The ON/OFF pin (pin 5) can be used to turn the converter on or off remotely using a signal that is referenced to GND (pin 3), as shown in Fig. A. Two remote control options are available, corresponding to negative and positive logic. In the negative logic option, to turn the converter on Pin 5 should be at logic low or left open, and to turn the converter off Pin 5 should be at logic high or connected to Vin. In the positive logic option, to turn the converter on Pin 5 should be at logic high, connected to Vin or left open, and to turn the converter off Pin 5 should be at logic low.

ON/OFF端子(5番ピン)は図Aのように、グラウンド(3番ピン)を基準としたリモート信号によりコンバータをON/OFFするのに使われます。ネガティブとポジティブロジックに対応するため、2種類のリモートコントロールが選択可能です。ネガティブロジックの場合、コンバータをONするには5番ピンをLowレベル、又は未接続とし、コンバータをOFFするには5番ピンをHighレベル、又はVinと接続とします。ポジティブロジックの場合、コンバータをONするには5番ピンをHighレベル、Vinに接続、又は未接続とし、コンバータをOFFするには5番ピンをLowレベルにします。

Pin 5 is internally pulled-down. A TTL or CMOS logic gate, or an open collector/drain transistor can be used to drive Pin 5. When using an open collector/drain transistor, a pull-up resistor, R*=75kΩ, should be connected to Vin (See Fig.A).

The device driving Pin 5 must be capable of:

(a) Sinking up to 0.2mA at low logic level (≦0.8V)
(b) Sourcing up to 0.25mA at high logic level (2.3–5V)
(c) Sourcing up to 0.75mA when connected to Vin

ON/OFFピンはモジュール内部でプルダウンされています。TTL、CMOSロジック、又はオープンコレクタのトランジスタもON/OFFピンの操作に使用可能です。オープンコレクタのトランジスタを使用する時は図Aに示す75kΩ程度のプルアップ抵抗をVinに接続してください。（図A参照）

ON/OFFピンを操作するデバイスには下記能力が必要です。

(a) 0.8V以下のLowレベルで0.2mAまでのシンク能力
(b) 2.3–5VのHighレベルで0.25mAまでの供給能力
(c) Vin接続時には0.75mAまでの供給能力

---

**Fig. A: Circuit configuration for remote ON/OFF**
Output Voltage Programming (Pin 2)

The output voltage of the FPMR12TR7508*A converter can be programmed from 0.7525V to 5.5V by using an external resistor or a voltage source.

The external voltage source is applied to the TRIM pin. Use of a series resistor, R_{EXT}, between the TRIM pin and the programming voltage source is recommended to make trimming less sensitive.

\[
R_{TRIM} = \frac{10.5}{V_{O-REQ} - 0.7525} \times 1 \text{ [kΩ]}
\]

Note that the tolerance of a trim resistor will affect the tolerance of the output voltage. Standard 1% or 0.5% resistors may suffice for most applications; however, a tighter tolerance can be obtained by using two resistors in series instead of one standard value resistor.

Table 1 lists calculated values of R_{TRIM} for common output voltages. For each value of R_{TRIM}, Table 1 also shows the closest available standard resistor value.

<table>
<thead>
<tr>
<th>V_{O-REQ} [V]</th>
<th>R_{TRIM} [kΩ]</th>
<th>The Closest Standard Value [kΩ]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.7525</td>
<td>Open</td>
<td>0.700</td>
</tr>
<tr>
<td>1.0</td>
<td>41.42</td>
<td>41.2</td>
</tr>
<tr>
<td>1.2</td>
<td>22.46</td>
<td>22.6</td>
</tr>
<tr>
<td>1.5</td>
<td>13.05</td>
<td>13.0</td>
</tr>
<tr>
<td>1.8</td>
<td>9.02</td>
<td>9.09</td>
</tr>
<tr>
<td>2.0</td>
<td>7.42</td>
<td>7.50</td>
</tr>
<tr>
<td>2.5</td>
<td>5.01</td>
<td>4.99</td>
</tr>
<tr>
<td>3.3</td>
<td>3.12</td>
<td>3.09</td>
</tr>
<tr>
<td>5.0</td>
<td>1.47</td>
<td>1.47</td>
</tr>
<tr>
<td>5.5</td>
<td>1.21</td>
<td>1.21</td>
</tr>
</tbody>
</table>

External Voltage Source

To program the output voltage using an external voltage source, a voltage, V_{CTRL}, should be applied to the TRIM pin. Use of a series resistor, R_{EXT}, between the TRIM pin and the programming voltage source is recommended to make trimming less sensitive.

Table 2 lists the values of V_{CTRL} for common output voltages. For each value of R_{EXT}, Table 2 also shows the closest available standard resistor value.

<table>
<thead>
<tr>
<th>V_{O-REQ} [V]</th>
<th>V_{CTRL} (R_{EXT}=0)</th>
<th>V_{CTRL} (R_{EXT}=15k)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.7525</td>
<td>0.700</td>
<td>0.700</td>
</tr>
<tr>
<td>1.0</td>
<td>0.684</td>
<td>0.436</td>
</tr>
<tr>
<td>1.2</td>
<td>0.670</td>
<td>0.223</td>
</tr>
<tr>
<td>1.5</td>
<td>0.650</td>
<td>-0.097</td>
</tr>
<tr>
<td>1.8</td>
<td>0.630</td>
<td>-0.417</td>
</tr>
<tr>
<td>2.0</td>
<td>0.617</td>
<td>-0.631</td>
</tr>
<tr>
<td>2.5</td>
<td>0.584</td>
<td>-1.164</td>
</tr>
<tr>
<td>3.3</td>
<td>0.530</td>
<td>-2.017</td>
</tr>
<tr>
<td>5.0</td>
<td>0.417</td>
<td>-3.831</td>
</tr>
<tr>
<td>5.5</td>
<td>0.384</td>
<td>-4.364</td>
</tr>
</tbody>
</table>
Protection Features

Input Under-Voltage Lockout

From a turned-on state, the converter will turn off automatically when the input voltage drops below typically 4.4V. It will then turn on automatically when the input voltage reaches typically 5.5V.

動作している状態で入力電圧がTYPで4.4V未満になると、このコンバータは自動的に停止します。また、入力電圧がTYPで5.5V以上になると、このコンバータは自動的に動作を開始します。

Output Over-Current Protection (OCP)

The converter is self-protected against over-current and short circuit conditions. On the occurrence of an over-current condition, the converter will enter a pulse-by-pulse hiccup mode. On the removal of the over-current or short circuit condition, Vout will return to the original value (auto-reset).

このコンバータは過電流と短絡に対し自己保護します。過電流状態になると、このコンバータはパルス-バイ-パルス HICUPモードになり、過電流状態が解除されるとVoutは通常の値に戻ります。(自動リセット)

Over-Temperature Protection (OTP)

The converter is self-protected against over-temperature conditions. In case of overheating due to abnormal operation conditions, the converter will turn off automatically. It will turn back on automatically once it has cooled down to a safe temperature (auto-reset).

このコンバータは加熱保護機能を有しています。異常な動作条件によって加熱状態になると、このコンバータは自動的に停止します。安全な温度まで下がると自動的に復帰します。 (自動リセット)

Safety Requirements

The converter meets North American and International safety regulatory requirements per UL60950 and EN60950. The converter meets SELV (safety extra-low voltage) requirements under normal operating conditions in that the output voltages are ELV (extra-low voltage) when all the input voltages are ELV. Note that the converter is not internally fused: to meet safety requirements, a fast acting in-line fuse with a maximum rating of 10.0A must be used in the positive input line.

このコンバータはUL60950とEN60950による北米、及び国際的な安全基準を満たしています。このコンバータは通常の動作条件下においてSELVの条件を満たしており、入力電圧がELVであれば出力電圧もELVとなります。但し、このコンバータは内部にヒューズを持っていませんので、安全規格に適合させるためには、入力ラインのプラス側に断別で最大定格10.0Aのヒューズを接続してください。

Characterization

Overview

The converter has been characterized for several operational features, including thermal derating (maximum available load current as a function of ambient temperature and airflow), efficiency, power dissipation, start-up and shutdown characteristics, ripple and noise, and transient response to load step-changes.

このコンバータは温度ディレーティング、効率、電力損失、スタートアップ時、及びシャットダウン時の動作、リップル・ノイズ、動的負荷変動などを含む、さまざまな動作状態で特徴付けられます。

Figures showing data plots and waveforms for different output voltages are presented in the following pages. The figures are numbered as Fig.*V-#, where *V indicates the output voltage, and # indicates a particular plot type for that voltage. For example, Fig *V-2 is a plot of efficiency vs. load current for any output voltage *V.

各出力电压時のデータ、及び波形の図は以後のページに掲載されています。図はFig *V-#のように番号付けされており、*Vは出力電圧を表し、#は特定のプロットを表します。例えばFig *V-2とあれば、*V出力での効率特性を表します。

Test Conditions

To ensure measurement accuracy and reproducibility, all thermal and efficiency data were taken with the converter soldered to a standardized thermal test board. The thermal test board was mounted inside FDK’s custom wind tunnel to enable precise control of ambient temperature and airflow conditions.

測定精度、及び再現性を確実にするために、全ての温度、及び効率データは標準化された温度評価ボードにコンバータを半田付けして取得しています。温度評価ボードはFDK特性の風洞実験設備内に設置することで、環境温度、及び風量を精密に管理しています。
The thermal test board comprised a four layer printed circuit board (PCB) with a total thickness of 0.060". Copper metallization on the two outer layers was limited to pads and traces needed for soldering the converter and peripheral components to the board. The two inner layers comprised power and ground planes of 2 oz. copper. This thermal test board, with the paucity of copper on the outer surfaces, limits heat transfer from the converter to the PCB, thereby providing a worst-case but consistent set of conditions for thermal measurements.

The thermal test board comprised a four layer printed circuit board (PCB) with a total thickness of 0.060". Copper metallization on the two outer layers was limited to pads and traces needed for soldering the converter and peripheral components to the board. The two inner layers comprised power and ground planes of 2 oz. copper. This thermal test board, with the paucity of copper on the outer surfaces, limits heat transfer from the converter to the PCB, thereby providing a worst-case but consistent set of conditions for thermal measurements.

It is advisable to check the converter temperature in the actual application, particularly if the application calls for loads close to the maximums specified by the derating curves. IR thermography or thermocouples may be used for this purpose. In the latter case, AWG#40 gauge thermocouples are recommended to minimize interference and measurement error. An optimum location for placement of a thermocouple is indicated in Fig. C.

FDK's custom wind tunnel was used to provide precise horizontal laminar airflow in the range of 50 LFM (equivalent to natural convection, NC) to 400 LFM, at ambient temperatures between 30°C and 85°C. Ambient temperature was varied between 30°C and 85°C, with airflow rates from NC(50 LFM) to 400 LFM (0.25m/s to 2.0m/s). The converter was mounted horizontally, and the airflow was parallel to the long axis of the converter, going from pin 1 to pin 5.

The maximum available load current, for any given set of conditions, is defined as the lower of:

(i) The output current at which the temperature of any component reaches 120°C, or
(ii) The current rating of the converter (8A)

A maximum component temperature of 120°C should not be exceeded in order to operate within the derating curves. Thus, the temperature at the thermocouple location shown in Fig. C should not exceed 120°C in normal operation.
Ripple and Noise

The test circuit setup shown in Fig D was used to obtain the output voltage ripple. And Fig. E was used to obtain the input reflected ripple current waveforms. The output voltage ripple waveform was measured across a 1µF ceramic capacitor, at full load current.

Fig. D: Test setup for measuring output voltage ripple

Fig. E: Test setup for measuring input reflected ripple current
Fig 5.0V-1: Available load current vs. ambient temperature and airflow rates for Vout=5.0V with Vin=12V. Maximum component temperature $\leq 120^\circ$C.

Fig 5.0V-2: Efficiency vs. load current and input voltage for Vout=5.0V. Airflow rate=200LFM (1m/s) and Ta=25°C.

Fig 5.0V-3: Power Loss vs. load current and input voltage for Vout=5.0V. Airflow rate = 200LFM (1m/s) and Ta=25°C.
**Fig 5.0V-4:** Turn-on transient for $V_{out}=5.0V$ with application of $V_{in}$ at full rated load current (resistive) and $47\mu F \times 2$ external capacitance at $V_{in}=12V$.
Top trace: $V_{in}$ (10V/div.)
Bottom trace: output voltage (1V/div.)
Time scale: 2ms/div.

**Fig 5.0V-5:** Output voltage ripple (20mV/div.) for $V_{out}=5.0V$ at full rated load current into a resistive load with external capacitance $47\mu F \times 2$ ceramic + $1\mu F$ ceramic at $V_{in}=12V$.
Time scale: 2µs/div.

**Fig 5.0V-6:** Output voltage response for $V_{out}=5.0V$ to positive load current step change from 4A to 8A with slew rate of 5A/µs at $V_{in}=12V$. $C_{o}=47\mu F \times 2$ ceramic.
Top trace: output voltage (100mV/div.)
Bottom trace: load current (2A/div.)
Time scale: 20µs/div.

**Fig 5.0V-7:** Output voltage response for $V_{out}=5.0V$ to negative load current step change from 8A to 4A with slew rate of –5A/µs at $V_{in}=12V$. $C_{o}=47\mu F \times 2$ ceramic.
Top trace: output voltage (100mV/div.)
Bottom trace: load current (2A/div.)
Time scale: 20µs/div.
**FPMR12TR7508*A**

6-14Vdc Input, 8A, 0.7525-5.5Vdc Output

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**Fig 3.3V-1:** Available load current vs. ambient temperature and airflow rates for Vout=3.3V with Vin=12V. Maximum component temperature $\leq 120^\circ$C.

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**Fig 3.3V-2:** Efficiency vs. load current and input voltage for Vout=3.3V.
Airflow rate=200LFM (1m/s) and Ta=25°C.

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**Fig 3.3V-3:** Power Loss vs. load current and input voltage for Vout=3.3V.
Airflow rate = 200LFM (1m/s) and Ta=25°C.
Fig 3.3V-4: Turn-on transient for Vout=3.3V with application of Vin at full rated load current (resistive) and 47µFx2 external capacitance at Vin=12V.
Top trace: Vin (10V/div.)
Bottom trace: output voltage (1V/div.)
Time scale: 2ms/div.

Fig 3.3V-5: Output voltage ripple (20mV/div.) for Vout=3.3V at full rated load current into a resistive load with external capacitance 47µFx2 ceramic + 1µF ceramic at Vin=12V.
Top trace: output voltage (100mV/div.)
Bottom trace: load current (2A/div.)
Time scale: 2µs/div.

Fig 3.3V-6: Output voltage response for Vout=3.3V to positive load current step change from 4A to 8A with slew rate of 5A/µs at Vin=12V. Co=47µFx2 ceramic.
Top trace: output voltage (100mV/div.)
Bottom trace: load current (2A/div.)
Time scale: 20µs/div.

Fig 3.3V-7: Output voltage response for Vout=3.3V to negative load current step change from 8A to 4A with slew rate of −5A/µs at Vin=12V. Co=47µFx2 ceramic.
Top trace: output voltage (100mV/div.)
Bottom trace: load current (2A/div.)
Time scale: 20µs/div.
FPMR12TR7508*A
6-14Vdc Input, 8A, 0.7525-5.5Vdc Output

**Fig 2.5V-1:** Available load current vs. ambient temperature and airflow rates for Vout=2.5V with Vin=12V. Maximum component temperature ≤120°C.

**Fig 2.5V-2:** Efficiency vs. load current and input voltage for Vout=2.5V. Airflow rate=200LFM (1m/s) and Ta=25°C.

**Fig 2.5V-3:** Power Loss vs. load current and input voltage for Vout=2.5V. Airflow rate = 200LFM (1m/s) and Ta=25°C.
Fig 2.5V-4: Turn-on transient for $V_{out}=2.5V$ with application of $V_{in}$ at full rated load current (resistive) and $47\mu F\times 2$ external capacitance at $V_{in}=12V$.  
Top trace: $V_{in}$ (10V/div.) 
Bottom trace: output voltage (1V/div.)  
Time scale: 2ms/div.

Fig 2.5V-5: Output voltage ripple (20mV/div.) for $V_{out}=2.5V$ at full rated load current into a resistive load with external capacitance $47\mu F\times 2$ ceramic + 1µF ceramic at $V_{in}=12V$.  
Time scale: 2µs/div.

Fig 2.5V-6: Output voltage response for $V_{out}=2.5V$ to positive load current step change from 4A to 8A with slew rate of 5A/µs at $V_{in}=12V$.  
$C_{o}=47\mu F\times 2$ ceramic.  
Top trace: output voltage (100mV/div.)  
Bottom trace: load current (2A/div.)  
Time scale: 20µs/div.

Fig 2.5V-7: Output voltage response for $V_{out}=2.5V$ to negative load current step change from 8A to 4A with slew rate of −5A/µs at $V_{in}=12V$.  
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Top trace: output voltage (100mV/div.)  
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Time scale: 20µs/div.
FPMR12TR7508*A
6-14Vdc Input, 8A, 0.7525-5.5Vdc Output

Fig 2.0V-1: Available load current vs. ambient temperature and airflow rates for Vout=2.0V with Vin=12V. Maximum component temperature ≤ 120°C.

Fig 2.0V-2: Efficiency vs. load current and input voltage for Vout=2.0V. Airflow rate=200LFM (1m/s) and Ta=25°C.

Fig 2.0V-3: Power Loss vs. load current and input voltage for Vout=2.0V. Airflow rate = 200LFM (1m/s) and Ta=25°C.
**FPMR12TR7508*A**

6-14Vdc Input, 8A, 0.7525-5.5Vdc Output

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**Fig 2.0V-4:** Turn-on transient for Vout=2.0V with application of Vin at full rated load current (resistive) and 47µF×2 external capacitance at Vin=12V. Top trace: Vin (10V/div.) Bottom trace: output voltage (1V/div.) Time scale: 2ms/div.

**Fig 2.0V-5:** Output voltage ripple (20mV/div.) for Vout=2.0V at full rated load current into a resistive load with external capacitance 47µF×2 ceramic + 1µF ceramic at Vin=12V. Time scale: 2µs/div.

**Fig 2.0V-6:** Output voltage response for Vout=2.0V to positive load current step change from 4A to 8A with slew rate of 5A/µs at Vin=12V. Co=47µF×2 ceramic. Top trace: output voltage (100mV/div.) Bottom trace: load current (2A/div.) Time scale: 20µs/div.

**Fig 2.0V-7:** Output voltage response for Vout=2.0V to negative load current step change from 8A to 4A with slew rate of −5A/µs at Vin=12V. Co=47µF×2 ceramic. Top trace: output voltage (100mV/div.) Bottom trace: load current (2A/div.) Time scale: 20µs/div.

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6-14Vdc Input, 8A, 0.7525-5.5Vdc Output

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**Fig 1.8V-1:** Available load current vs. ambient temperature and airflow rates for Vout=1.8V with Vin=12V. Maximum component temperature \(\leq 120^\circ\text{C}\).

**Fig 1.8V-2:** Efficiency vs. load current and input voltage for Vout=1.8V.
Airflow rate=200LFM (1m/s) and Ta=25°C.

**Fig 1.8V-3:** Power Loss vs. load current and input voltage for Vout=1.8V.
Airflow rate = 200LFM (1m/s) and Ta=25°C.
Fig 1.8V-4: Turn-on transient for Vout=1.8V with application of Vin at full rated load current (resistive) and 47µF x 2 external capacitance at Vin=12V.
Top trace: Vin (10V/div.)
Bottom trace: output voltage (1V/div.)
Time scale: 2ms/div.

Fig 1.8V-5: Output voltage ripple (20mV/div.) for Vout=1.8V at full rated load current into a resistive load with external capacitance 47µF x 2 ceramic + 1µF ceramic at Vin=12V.
Time scale: 2µs/div.

Fig 1.8V-6: Output voltage response for Vout=1.8V to positive load current step change from 4A to 8A with slew rate of 5A/µs at Vin=12V. Co=47µF x 2 ceramic.
Top trace: output voltage (100mV/div.)
Bottom trace: load current (2A/div.)
Time scale: 20µs/div.

Fig 1.8V-7: Output voltage response for Vout=1.8V to negative load current step change from 8A to 4A with slew rate of −5A/µs at Vin=12V. Co=47µF x 2 ceramic.
Top trace: output voltage (100mV/div.)
Bottom trace: load current (2A/div.)
Time scale: 20µs/div.
FPMR12TR7508*A
6-14Vdc Input, 8A, 0.7525-5.5Vdc Output

**Fig 1.5V-1:** Available load current vs. ambient temperature and airflow rates for Vout=1.5V with Vin=12V. Maximum component temperature \( \leq 120^\circ\text{C} \).

**Fig 1.5V-2:** Efficiency vs. load current and input voltage for Vout=1.5V. Airflow rate=200LFM (1m/s) and Ta=25°C.

**Fig 1.5V-3:** Power Loss vs. load current and input voltage for Vout=1.5V. Airflow rate = 200LFM (1m/s) and Ta=25°C.
**FPMR12TR7508*A**

6-14Vdc Input, 8A, 0.7525-5.5Vdc Output

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**Fig 1.5V-4:** Turn-on transient for Vout=1.5V with application of Vin at full rated load current (resistive) and 47µF×2 external capacitance at Vin=12V.  
Top trace: Vin (10V/div.)  
Bottom trace: output voltage (1V/div.)  
Time scale: 2ms/div.

**Fig 1.5V-5:** Output voltage ripple (20mV/div.) for Vout=1.5V at full rated load current into a resistive load with external capacitance 47µF×2 ceramic + 1µF ceramic at Vin=12V.  
Time scale: 2μs/div.

---

**Fig 1.5V-6:** Output voltage response for Vout=1.5V to positive load current step change from 4A to 8A with slew rate of 5A/μs at Vin=12V. Co=47µF×2 ceramic.  
Top trace: output voltage (100mV/div.)  
Bottom trace: load current (2A/div.)  
Time scale: 20μs/div.

**Fig 1.5V-7:** Output voltage response for Vout=1.5V to negative load current step change from 8A to 4A with slew rate of −5A/μs at Vin=12V. Co=47µF×2 ceramic.  
Top trace: output voltage (100mV/div.)  
Bottom trace: load current (2A/div.)  
Time scale: 20μs/div.

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http://www.fdk.co.jp  
Page 21 of 26  
Ver 2.2 Aug. 21, 2007
FPMR12TR7508*A
6-14Vdc Input, 8A, 0.7525-5.5Vdc Output

**Fig 1.2V-1:** Available load current vs. ambient temperature and airflow rates for Vout=1.2V with Vin=12V. Maximum component temperature $\leq$ 120°C.

**Fig 1.2V-2:** Efficiency vs. load current and input voltage for Vout=1.2V.
Airflow rate=200LFM (1m/s) and Ta=25°C.

**Fig 1.2V-3:** Power Loss vs. load current and input voltage for Vout=1.2V.
Airflow rate = 200LFM (1m/s) and Ta=25°C.
**FPMR12TR7508*A**

6-14Vdc Input, 8A, 0.7525-5.5Vdc Output

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Top trace: Vin (10V/div.)
Bottom trace: output voltage (1V/div.)
Time scale: 2ms/div.

**Fig 1.2V-5:** Output voltage ripple (20mV/div.) for Vout=1.2V at full rated load current into a resistive load with external capacitance 47µFx2 ceramic + 1µF ceramic at Vin=12V.
Time scale: 2µs/div.

**Fig 1.2V-6:** Output voltage response for Vout=1.2V to positive load current step change from 4A to 8A with slew rate of 5A/µs at Vin=12V. Co=47µFx2 ceramic.
Top trace: output voltage (100mV/div.)
Bottom trace: load current (2A/div.)
Time scale: 20µs/div.

**Fig 1.2V-7:** Output voltage response for Vout=1.2V to negative load current step change from 8A to 4A with slew rate of −5A/µs at Vin=12V. Co=47µFx2 ceramic.
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Time scale: 20µs/div.
FPMR12TR7508*A
6-14Vdc Input, 8A, 0.7525-5.5Vdc Output

**Fig 1.0V-1:** Available load current vs. ambient temperature and airflow rates for Vout=1.0V with Vin=12V. Maximum component temperature $\leq 120^\circ$C.

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Top trace: Vin (10V/div.)
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Time scale: 2ms/div.

Fig 1.0V-5: Output voltage ripple (20mV/div.) for Vout=1.0V at full rated load current into a resistive load with external capacitance 47µF x2 ceramic + 1µF ceramic at Vin=12V.
Time scale: 2µs/div.

Fig 1.0V-6: Output voltage response for Vout=1.0V to positive load current step change from 4A to 8A with slew rate of 5A/µs at Vin=12V. Co=47µF x2 ceramic.
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Time scale: 20µs/div.
FPMR12TR7508*A
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Mechanical Drawing

<table>
<thead>
<tr>
<th>Pad #</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vout</td>
</tr>
<tr>
<td>2</td>
<td>TRIM</td>
</tr>
<tr>
<td>3</td>
<td>GND</td>
</tr>
<tr>
<td>4</td>
<td>Vin</td>
</tr>
<tr>
<td>5</td>
<td>ON/OFF</td>
</tr>
</tbody>
</table>

Notes
- All dimensions are in millimeters (inches)
- Unless otherwise specified, tolerances are +/- 0.25mm
- Connector Material: Copper
- Connector Finish: Tin over Nickel
- Module Weight: 0.081 oz (2.3g)
- Module Height: 5.7mm Max
- Recommended Through Hole: Φ1.2mm

Part Number System

<table>
<thead>
<tr>
<th>Product Series</th>
<th>Shape</th>
<th>Regulated /Non</th>
<th>Input Voltage</th>
<th>Mounting Scheme</th>
<th>Output Voltage</th>
<th>Rated Current</th>
<th>ON/OFF Logic</th>
<th>Pin Shape</th>
</tr>
</thead>
<tbody>
<tr>
<td>FP M R 12 T R75 08 A</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Series Name</td>
<td>Middle</td>
<td>Regulated</td>
<td>Typ=12V</td>
<td>Through Hole</td>
<td>0.75V (programmable: See Page 6)</td>
<td>8A</td>
<td>N: Negative P: Positive</td>
<td>Standard</td>
</tr>
</tbody>
</table>

Cautions

NUCLEAR AND MEDICAL APPLICATIONS: FDK Corporation products are not authorized for use as critical components in life support systems, equipment used in hazardous environments, or nuclear control systems without the written consent of FDK Corporation.

SPECIFICATION CHANGES AND REVISIONS: Specifications are version-controlled, but are subject to change without notice.