VI Chip Qualification Testing

**Test**

<table>
<thead>
<tr>
<th>Environment</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceleration</td>
<td>MIL-STD-810F Method 516.4, Procedure III B</td>
</tr>
<tr>
<td>Humidity</td>
<td>MIL-STD-810F Method 502.3, Procedure II B</td>
</tr>
<tr>
<td>Mechanical Shock</td>
<td>MIL-STD-810F Method 516.6, Procedure II A</td>
</tr>
<tr>
<td>Temperature Humidity Bias</td>
<td>MIL-STD-810F Method 508.4, Section II</td>
</tr>
<tr>
<td>Solderability</td>
<td>MIL-STD-202G Method 200.8</td>
</tr>
<tr>
<td>Terminal Strength</td>
<td>MIL-STD-202G Method 200.8</td>
</tr>
</tbody>
</table>

For applications support in the U.S. call 800-927-9474
Fax: 978-749-3341 or E-Mail: apps@vicr.com

Our global technical support team is staffed with applications engineers to provide the product, application and technical assistance customers need concerning our products and power solutions. Our facilities house electronics laboratories where our applications engineers can evaluate specific customer design issues and offer a wide range of component-based power solutions that include distributed power, current sharing, fault redundancy, thermal management, and compliance with safety and performance standards.

Vicor Europe
Tel: +31 (0) 24 52 18 10
Fax: +31 (0) 24 52 28 70
E-Mail: vicor@vicr.com

Vicor Germany
Tel: +49 89 962 439 0
Fax: +49 89 962 439 19
E-Mail: vicor.de@vicr.com

Vicor Italy
Tel: +39 02 2247 2326
Fax: +39 02 2247 3166
E-Mail: vicor.it@vicr.com

Vicor Japan Co., Ltd.
Tel: +81 3 5047 5907
Fax: +81 3 5467 3985
E-Mail: apps@vicrpower.jp

Vicor Hong Kong
Tel: +852 2956 1782
Fax: +852 2956 0782
E-Mail: hkapps@vicr.com

Vicor China
Tel: +86 21 5437 6003
Fax: +86 21 5437 3106
E-Mail: china@vicr.com

Vicor P/N 33115 12/13 Rev 2.0
### DC-DC Conversion Using PRM and VTM

**Application Examples**

<table>
<thead>
<tr>
<th>Voltage Designator</th>
<th>Part Number</th>
<th>Output Current (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRM</td>
<td>MV036F030M040</td>
<td>40.0 A</td>
</tr>
<tr>
<td>VTM</td>
<td>MV036F120M010</td>
<td>100.0 A</td>
</tr>
<tr>
<td>PRM</td>
<td>MV036F045M027</td>
<td>25.0 A</td>
</tr>
<tr>
<td>VTM</td>
<td>MV036F180M007</td>
<td>65.0 A</td>
</tr>
<tr>
<td>PRM</td>
<td>MV036F240M005</td>
<td>15.0 A</td>
</tr>
<tr>
<td>VTM</td>
<td>MV036F240M005</td>
<td>15.0 A</td>
</tr>
<tr>
<td>PRM</td>
<td>MV036F120M010</td>
<td>10.0 A</td>
</tr>
<tr>
<td>VTM</td>
<td>MV036F120M010</td>
<td>10.0 A</td>
</tr>
<tr>
<td>PRM</td>
<td>MV036F090M013</td>
<td>5.0 A</td>
</tr>
<tr>
<td>VTM</td>
<td>MV036F090M013</td>
<td>5.0 A</td>
</tr>
<tr>
<td>PRM</td>
<td>MV036F060M018</td>
<td>2.0 A</td>
</tr>
<tr>
<td>VTM</td>
<td>MV036F060M018</td>
<td>2.0 A</td>
</tr>
</tbody>
</table>

**Superior Performance**

- Higher Efficiency and Power Density
- Low N oise
- Low Thermal Impedance
- Flexible Thermal Management

**High Efficiency, Low Noise, Low Thermal Impedance**

- Eliminates bulk capacitance at point of load
- Flexibility to fit module and load link

**Fast Transient Response**

- Meets challenging load slew rate requirements

**EMI Filtering and Transient Suppression**

- MIL-STD-461E compliance
- MIL-COTS Evaluation Boards

### Breakthrough Performance and Flexibility in a Rugged, Miniature Package

The PRM accepts a wide input of 16 – 50 Vdc and provides a nominal 36 Vdc factorized bus voltage (Vf)

- **Efficiency**: 95%
- **Operation**: –55°C to +125°C
- **Weight**: 0.5 oz (15 g)
- **1 µs transient response**
- **Nominal 36 Vdc factorized bus voltage (Vf)**

**Voltage Transformation Module**

- **Isolated output**: 1 – 50 Vdc
- **Power**: Up to 100 A or 120 W
- **1 µs transient response**
- **Efficiency**: Up to 96.5%
- **Operation**: –55°C to +125°C
- **Weight**: 0.5 oz (15 g)

**Transistor and Isolation**

The VTM uses isolated current multiplication, and voltage division exactly at the point of load and is expandable to higher current and voltage. The VTM can be input up to 100 A or 120 W from 1 – 50 Vdc.

- **Voltage (Vdc) Part Number Output Current (A)**
  - MP 028 F 036 M 12 AL
  - MV 036 F 120 M 010

### Part Numbering Chart, PRM and VTM

<table>
<thead>
<tr>
<th>Part Code</th>
<th>Name</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP</td>
<td>Nominal PRM</td>
<td>028 F</td>
</tr>
<tr>
<td>MV</td>
<td>Nominal VTM</td>
<td>036 F</td>
</tr>
</tbody>
</table>

**Voltage Designator**

- **PRM**: Nominal PRM
- **VTM**: Output VTM

**Input Voltage**

- **–12 Vdc, 25 W**
- **28 V to 12 V, 10 A**
- **28 Vdc +5 Vdc, 200 W**
- **28 Vdc +3.3 Vdc, 35 A**

**Efficiency vs. Output Current**

- **High efficiency, low thermal impedance**

**EMI Filtering and Transient Suppression**

- **Conducted Noise MIL-STD-461E**

**Flexible Thermal Management**

- **Low thermal impedance package**
- **RHM boxes can be separated away from the point of load**
- **VTM Chip package simplifies secret link design**

**MIL-COTS Evaluation Boards**

Vicor has created a simple, convenient way to evaluate the entire family of MIL-COTS 28 V DC-DC V•I-Chip Modules. Each PRM and VTM & surface mounted to a unique V•I pin that can be walked together using the integral connectors. Just add CB to the suffix of any PRM and VTM to specify the requested evaluation board.
**Part Numbering Chart, PRMs and VTM s**

- **Input:** 16 – 50 Vdc
- **Output:** 26 – 50 Vdc
- **Power:** 120 W
- **3.3 MHz switching frequency**
- **Efficiency:** 95%
- **Operation:** –55°C to +125°C
- **Weight:** 0.5 oz (15 g)

**Regulation**

The PRM accepts a wide input of 16 – 50 Vdc and provides a nominal 36 Vdc factorized bus voltage (Vf).

**Voltage Transformation Module**

- **Isolated output:** 1 – 50 Vdc
- **Power:** Up to 100 A or 120 W
- **1 μs transient response**
- **96.5% efficiency**
- **Operation:** –55°C to +125°C
- **Weight:** 8.5 oz (235 g)

**Voltage Transformer Module (VTM)**

- Provides a nominal 36 Vdc factorized bus voltage (Vf)
- Available in twelve voltage division ratios to supply voltage division directly at the point of load and is controllable over 26 – 50 Vdc to regulate the VTM output.

**Superior Performance**

- **Higher Efficiency and Power Density**
  - Higher efficiency, no load/heat dissipation
  - Eliminates bulk capacitance at point of load

- **Low Noise**
  - ZVS and ZCS enable low noise power conversion
  - High switching frequency (1.1 MHz) means small filter components

- **Fast Transient Response**
  - Meets challenging load slew rate requirements

- **Flexible Thermal Management**
  - Low thermal impedance package
  - PRM losses can be separated away from the point of load

- **Conduction Noise**
  - MIL-STD-461F compliance

- **Conducted Immunity**
  - MIL-STD-1275A/B/D compliance

**Application Examples**

**Multiple Outputs with a Single PRM**

**Tightly Regulated Single Output**

**Parallel for Higher Power**

**Part Numbering Chart, M-FIAM7**

- **M-FIAM 7**
- **MP 028 F 036 M 12 AL**
- **MV 036 F 120 M 010**

**DC-DC Conversion Using PRM and VTM**

Together, the PRM and the VTM chip set provide the full functionality of an DC-DC converter, but with breakthrough performance and flexibility in a single, instant package.

**EMI Filtering and Transient Suppression**

- **M-PRM7**
  - **Input:** 14 – 50 Vdc
  - **Current rating:** 10 A
  - **MIL-STD-461F/B/D compliance**
  - **MIL-STD-1275B compliance**

**MIL-COTS Evaluation Boards**

Vicor has created a simple, convenient way to evaluate the entire family of MIL-COTS 28 V DC-DC VIP-Chip Modules. Each PRM and VTM is a surface mounted to a unique VIP package and is mounted together using the integral connectors. Just add 3B to the suffix of any PRM and VTM to qualify the requested evaluation board.
Together, the PRM and the VTM chip set provides the full functionality of a DC-DC converter, but with no external capacitance.

- Output: 26 – 50 Vdc
- Weight: 0.5 oz (15 g)
- Efficiency: 95%
- Operation: –55°C to +125°C
- 1.3 MHz switching frequency

Transformation and Isolation
The VTM accepts a wide input of 16 – 50 Vdc and provides a nominal 36 Vdc factorized bus voltage (Vf).

### Application Examples

#### Tightly Regulated Single Output

- Multiple Outputs with a Single PRM

#### Parallel for Higher Power

### Part Numbering Chart, PRMs and VTMks

<table>
<thead>
<tr>
<th>Desired Load (V)</th>
<th>PRM</th>
<th>VTM</th>
<th>Max VTM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 V</td>
<td>028</td>
<td>F</td>
<td>036 M</td>
</tr>
<tr>
<td>2 V</td>
<td>028</td>
<td>F</td>
<td>036 M</td>
</tr>
<tr>
<td>3 V</td>
<td>028</td>
<td>F</td>
<td>036 M</td>
</tr>
<tr>
<td>4 V</td>
<td>028</td>
<td>F</td>
<td>036 M</td>
</tr>
<tr>
<td>5 V</td>
<td>028</td>
<td>F</td>
<td>036 M</td>
</tr>
<tr>
<td>6 V</td>
<td>028</td>
<td>F</td>
<td>036 M</td>
</tr>
<tr>
<td>7 V</td>
<td>028</td>
<td>F</td>
<td>036 M</td>
</tr>
<tr>
<td>8 V</td>
<td>028</td>
<td>F</td>
<td>036 M</td>
</tr>
<tr>
<td>9 V</td>
<td>028</td>
<td>F</td>
<td>036 M</td>
</tr>
<tr>
<td>10 V</td>
<td>028</td>
<td>F</td>
<td>036 M</td>
</tr>
</tbody>
</table>

### DC-DC Conversion Using PRM and VTM

- Input: 16 – 20 Vdc
- Output: 26 – 50 Vdc
- Power: Up to 100 A or 120 W
- Isolated output: 1 – 50 Vdc
- Efficiency: Up to 95%
- Operation: –55°C to +125°C
- 1.3 MHz switching frequency

### Superior Performance

#### Higher Efficiency and Power Density

- Higher efficiency, less bulk heat dissipation
- ZVS and ZCS enable low noise power conversion
- Higher switching frequency (> 1 MHz) means small filter components

#### Low Noise

- ZVS and ZCS enable low noise power conversion
- High switching frequency (>1 MHz) means small filter components

### Fast Transient Response

- Meets challenging load transient requirements
- Eliminates bulk capacitance at point of load

### Flexible Thermal Management

- Low thermal impedance package
- PRM boxes can be separated away from the point of load
- VTM chip package simplifies heat sink design

#### Part Numbering Chart, M-FIAM7

<table>
<thead>
<tr>
<th>M-FIAM</th>
<th>7</th>
<th>M</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
28 V DC-DC VI Chip Modules

Military COTS

VI Chip Qualification Testing

**Test**
- Acceleration: To determine the ability of parts to withstand conductive accelerations, as an indicator of the ability of parts to withstand mechanical shocks. 3%... 6%... 40G/87G and 70G/83 G, operational.
- Electrical Shock: To determine the ability of parts to withstand electrical shocks that are suddenly applied forces or an abrupt change in motion produced by handling, transportation or field operation.
- Temperature Humidity Bias: An operational test that evaluates the reliability of the device package in humid environments. Test Condition A, 1/2 to 5 lbs. ambient humidity.
- HAST: Demonstrates product design in large scale evaluations.

**Environment**
- Standard: Ambient temperature, ambient humidity.
- Condition: Severe climate conditions, 15°C... 20°C... 25°C...
- Test Condition A, 1/2 to 5 lbs. ambient humidity.
- Condition: Severe climate conditions, 15°C... 20°C... 25°C...
- Test Condition A, 1/2 to 5 lbs. ambient humidity.
- Condition: Severe climate conditions, 15°C... 20°C... 25°C...
- Test Condition A, 1/2 to 5 lbs. ambient humidity.
- Condition: Severe climate conditions, 15°C... 20°C... 25°C...
- Test Condition A, 1/2 to 5 lbs. ambient humidity.
- Condition: Severe climate conditions, 15°C... 20°C... 25°C...
- Test Condition A, 1/2 to 5 lbs. ambient humidity.
- Condition: Severe climate conditions, 15°C... 20°C... 25°C...
- Test Condition A, 1/2 to 5 lbs. ambient humidity.
- Condition: Severe climate conditions, 15°C... 20°C... 25°C...
- Test Condition A, 1/2 to 5 lbs. ambient humidity.
- Condition: Severe climate conditions, 15°C... 20°C... 25°C...
- Test Condition A, 1/2 to 5 lbs. ambient humidity.
- Condition: Severe climate conditions, 15°C... 20°C... 25°C...
- Test Condition A, 1/2 to 5 lbs. ambient humidity.
- Condition: Severe climate conditions, 15°C... 20°C... 25°C...
- Test Condition A, 1/2 to 5 lbs. ambient humidity.
- Condition: Severe climate conditions, 15°C... 20°C... 25°C...
- Test Condition A, 1/2 to 5 lbs. ambient humidity.
- Condition: Severe climate conditions, 15°C... 20°C... 25°C...
- Test Condition A, 1/2 to 5 lbs. ambient humidity.
- Condition: Severe climate conditions, 15°C... 20°C... 25°C...
- Test Condition A, 1/2 to 5 lbs. ambient humidity.
- Condition: Severe climate conditions, 15°C... 20°C... 25°C...
- Test Condition A, 1/2 to 5 lbs. ambient humidity.
- Condition: Severe climate conditions, 15°C... 20°C... 25°C...
- Test Condition A, 1/2 to 5 lbs. ambient humidity.
- Condition: Severe climate conditions, 15°C... 20°C... 25°C...
- Test Condition A, 1/2 to 5 lbs. ambient humidity.
- Condition: Severe climate conditions, 15°C... 20°C... 25°C...
- Test Condition A, 1/2 to 5 lbs. ambient humidity.
- Condition: Severe climate conditions, 15°C... 20°C... 25°C...
- Test Condition A, 1/2 to 5 lbs. ambient humidity.
- Condition: Severe climate conditions, 15°C... 20°C... 25°C...
- Test Condition A, 1/2 to 5 lbs. ambient humidity.
- Condition: Severe climate conditions, 15°C... 20°C... 25°C...
- Test Condition A, 1/2 to 5 lbs. ambient humidity.
- Condition: Severe climate conditions, 15°C... 20°C... 25°C...
- Test Condition A, 1/2 to 5 lbs. ambient humidity.
VI Chip Qualification Testing

**Test**

- **Acceleration:** To determine the ability of parts to withstand shock or vibration, using a spectrum in the frequency range of 5-2000 Hz. (Standard: MIL-STD-810F)
- **Humidity:** Tests to determine the ability of parts to withstand moisture, using a range of conditions from 10% to 95% relative humidity. (Standard: MIL-STD-810F)
- **Mechanical Shock:** Tests to determine the ability of parts to withstand mechanical shock, using a range of conditions from 10-1000g. (Standard: MIL-STD-810F)
- **Random Mechanical Vibration:** Tests to determine the ability of parts to withstand random mechanical vibration, using a range of conditions from 10-1000 Hz. (Standard: MIL-STD-810F)
- **Resistance to Solvents:** Tests to determine the ability of parts to withstand exposure to various solvents. (Standard: MIL-STD-883G)
- **Temperature Humidity Bias:** Tests to determine the ability of parts to withstand temperature and humidity conditions. (Standard: MIL-STD-810F)
- **Temperature Cycle:** Tests to determine the ability of parts to withstand temperature cycles. (Standard: MIL-STD-810F)
- **Test Standard Environment:**
  - Electro Static Discharge (ESD): Tests to determine the ability of parts to withstand electrostatic discharge. (Standard: MIL-STD-883C)
  - Fungus: Tests to determine the ability of parts to withstand exposure to fungi. (Standard: MIL-STD-810F)
  - Salt Fog: Tests to determine the ability of parts to withstand exposure to salt fog. (Standard: MIL-STD-810F)
  - Solderability: Tests to determine the ability of parts to withstand soldering. (Standard: MIL-STD-202G)
  - Terminal Strength: Tests to determine the ability of parts to withstand mechanical forces. (Standard: MIL-STD-202G)
  - HALT: Tests to determine the ability of parts to withstand harsh environmental conditions. (Standard: MIL-STD-810F)

**Military COTS 28 V DC-DC VI Chip Modules**

For applications support in the U.S. call 800-927-9474
Fax: 978-749-3341 or E-mail: apps@vicr.com

Vicor France
Tel: +33 1 34 52 10 30
Fax: +33 1 34 52 29 70
E-mail: vicor@fr

Vicor Germany
Tel: +49 89 962 439 0
Fax: +49 89 962 439 10
E-mail: vicor@ger

Vicor Italy
Tel: +39 02 2247 2326
Fax: +39 02 2247 3166
E-mail: vicor@it

Vicor Japan Co., Ltd.
Tel: +81 3 5487 5087
Fax: +81 3 5487 3885
E-mail: vicor@jp

Vicor Hong Kong
Tel: +852-2956-1780
Fax: +852-2956-0782
E-mail: apps@hk

Our global technical support team is staffed with applications engineers to provide the product, application and technical assistance customers need concerning our products and power solutions. Our facilities house electronics laboratories where our applications engineers can evaluate specific customer design issues and offer a wide range of component-based power solutions that include distributed power, current sharing, fault redundancy, thermal management, and compliance with safety and performance standards.