Military COTS

28 V DC-DC VI Chip Modules

VICOR

VICHIP
High Performance Power Modules

PRM

Pre-Regulator Module

- **Input: 16 – 50 Vdc**
- **Output: 26 – 50 Vdc**
- **Power: 120 W**
- **1.3 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) controllable over 26 – 50 Vdc to regulate the VTM output.

VTM

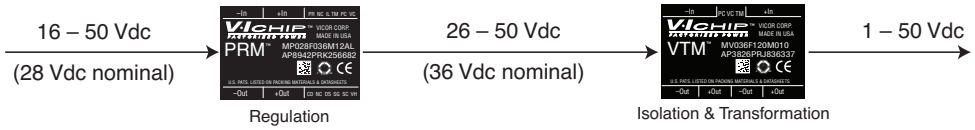
Voltage Transformation Module

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

Transformation and Isolation

The VTM puts isolated current multiplication and voltage division directly at the point of load and is available in twelve voltage division ratios to supply up to 100 A or 120 W from 1 – 50 Vdc.

DC-DC Conversion Using PRM and VTM



Together, the PRM and the VTM chip set provides the full functionality of a DC-DC converter, but with breakthrough performance and flexibility in a rugged, miniature package.

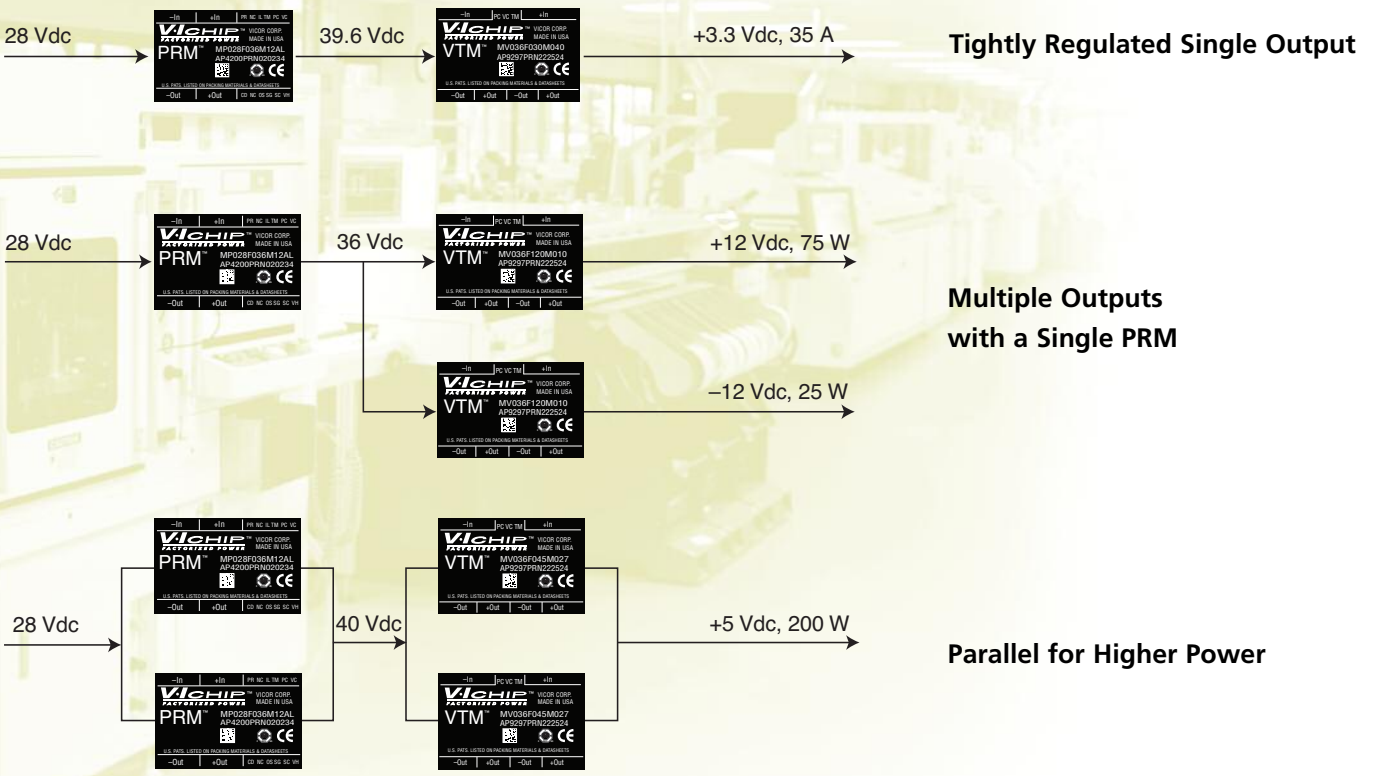
Part Numbering Chart, PRMs and VTMs

PRM	**MP**	**028**	**F**	**036**	**M**	**12**	**AL**
VTM	**MV**	**036**	**F**	**120**	**M**	**010**	
	MP = Pre-Regulator Module **MV** = Voltage Transformation Module	Input Voltage Designator	Configuration **F** = J Lead **T** = Through Hole	PRM = Nominal Factorized Bus VTM = Output Voltage Designator (= V_{OUT} x 10)	Product Grade Temperatures (°C) Storage: –65 to +125 Operating: –55 to +125 (Junction)	PRM = Output Power Designator (= P_f /10) VTM = Output Current Designator (= I_{OUT})	**AL** = Adaptive Loop (PRM)

Desired Load Voltage (Vdc)	VTM Part Number	Max VTM Output Current (A)
1.0	MV036F011M100	100
1.2	MV036F011M100	100
1.5	MV036F015M080	80
1.8	MV036F015M080	80
2.0	MV036F022M055	55
3.3	MV036F030M040	40
5.0	MV036F045M027	27

Desired Load Voltage (Vdc)	VTM Part Number	Max VTM Output Current (A)
10	MV036F090M013	13.3
12	MV036F120M010	10.0
15	MV036F180M007	6.7
24	MV036F240M005	5.0
28	MV036F240M005	5.0
36	MV036F360M003	3.3
48	MV036F360M003	3.3

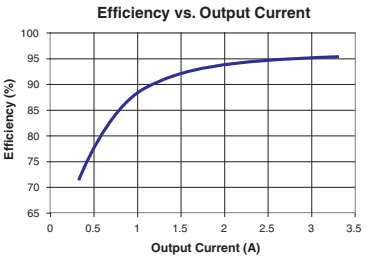
Application Examples



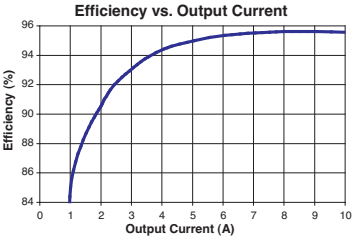
Superior Performance

Higher Efficiency and Power Density

- Higher efficiency = less total heat dissipation



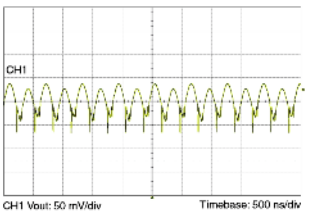
PRM Efficiency vs. Output Current



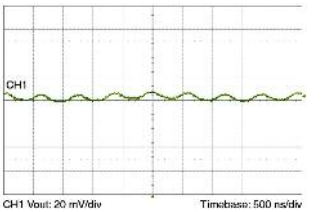
VTM Efficiency vs. Output Current

Low Noise

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



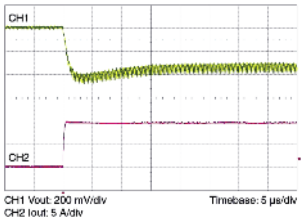
28 V to 12 V, 10 A VTM
with no external capacitance

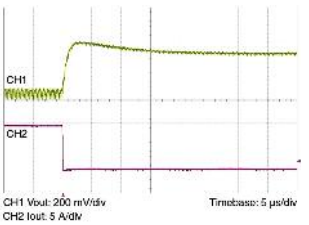


28 V to 12 V, 10 A VTM
with 4.7 µF external capacitance

Fast Transient Response

- Meets challenging load slew rate requirements
- Eliminates bulk capacitance at point of load

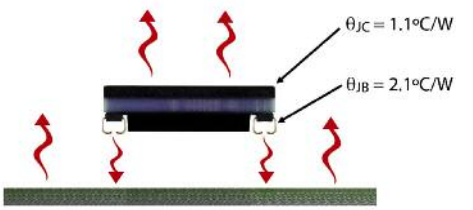




Load step with 100 uF input capacitance
and no output capacitance (MV036F120M010)

Flexible Thermal Management

- Low thermal impedance package
- PRM losses can be separated away from the point of load
- V•I Chip package simplifies heat sink design



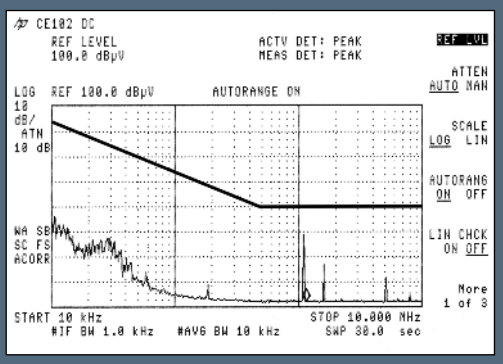
Low thermal impedance to the PC board and heat sink

EMI Filtering and Transient Suppression

M-FIAM7

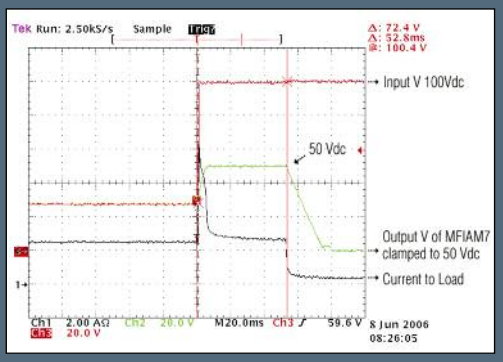
- **Input:** 14 – 50 Vdc
- **Current rating:** 10 A
- **MIL-STD-1275A/B/D compliance**
  100 Vdc, 50 ms
  250 Vdc, 50 µs
- **MIL-STD-461E compliance**
  Conducted emissions: CE101, CE102
  Conducted susceptibility:
  CS101, CS114, CS115, CS116

Conducted Noise
MIL-STD-461E



M-FIAM7 and MP028F036M12AL + MV036F120M010 DC-DC V•I Chip modules operating at 28 Vdc, 120 W.

Transient Immunity
MIL-STD-1275B



M-FIAM7 output response to an input transient.

Part Numbering Chart, M-FIAM7

M-FIAM7	M-FIAM	7	M	2	1
	Filter Input Attenuator Module	Input Voltage **7** = 14 – 50 V_{IN}	Product Grade Operating Temp.(°C) **H** = –40 to +100 **M** = –55 to +100	Pin Style **1** = Short Solder **2** = Long Solder **S** = Short ModuMate **N** = Long ModuMate	Baseplate **1** = Slotted **2** = Threaded **3** = Through Hole

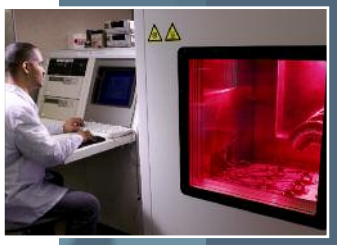
Log onto **vicorpower.com** or call **800-735-6200** to order your evaluation boards

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 are surface mounted to a unique PWB and can be mated together using the integral connectors. Just add –CB to the suffix of any PRM and VTM to specify the requested evaluation board.

VI Chip Qualification Testing

Test	Standard	Environment
Acceleration To determine the ability of parts to withstand constant acceleration, as an indicator of the mechanical strength limits.	MIL-STD-810F, Method 513.5, Procedure II, Operational	Acceleration step 2 g, 6 direction
Altitude To observe low air pressure effects on either operational or non-operational design parameters.	MIL-STD-810D, Method 500.4, Procedure I & II	40,000 ft. and 70,000 ft. operational
Explosive Atmosphere To determine the ability of equipment to operate in the presence of an explosive atmosphere.	MIL-STD-810F, Method 511.4, Procedure I, Operational	Fuel-air explosive atmospheres
High Temperature Operational Life An operational test used to detect thermally activated failure mechanisms.	Vicor internal reference EIAJESD22-A108C	Nominal line, 75% load, temperature within 5°C max. operational
Humidity A humidity test simulates the moisture-laden air found in tropical regions.	MIL-STD-810F, Method 507.4	240 hours, 95% RH
Mechanical Shock To determine the ability to withstand mechanical shocks from suddenly applied forces or an abrupt change in motion produced by handling, transportation or field operation.	JESD22-B104C, Service Condition C	100 g, 2 ms shock, 10 shock / axis, 3 axis, 30 total
Random Mechanical Vibration To evaluate the construction, materials and mounting of the device for ruggedness.	JESD22-B103B, Service Condition B	Vibration from 2 – 500 Hz, 30 minutes / axis, 3 axis, 90 minutes total
Resistance to Solvents Determines the resistance to externally applied solvents.	MIL-STD-883G, Method 2015.13	Ambient temperature, ambient humidity
Temperature Humidity Bias An operational test that evaluates the reliability of the device package in humid environments.	JESD47	85°C, 85% RH, high-line input voltage
Temperature Cycle Conducted to determine the ability of devices to withstand mechanical stresses induced by alternating high and low temperature extremes.	JESD22-A104-B	–55°C to +125°C, 500 cycles



VI Chip Characterization Process

Test	Standard	Environment
Electro Static Discharge Classifies the device according to it's susceptibility to damage or degradation by exposure to electrostatic discharge.	MIL-STD-883C, Method 3015	Ambient temperature, ambient humidity
Fungus To determine if a material(s) will support the growth of specific fungi.	MIL-STD-810F, Method 508.4 Section II	Severe climate conditions
Salt Fog To determine the resistance of the equipment to the effects of a salt atmosphere, primarily corrosion.	MIL-STD-810F, Method 509.4	Salt-fog harsh environment
Solderability To evaluate the solderability of terminations that are normally joined by a soldering operation.	MIL-STD-202G, Method 208H	Continuous solder coating for a minimum of 95% surface area
Terminal Strength Determines the resistance to external force on the terminals.	MIL-STD-202G, Method 211A Test Condition A, 1/2 to 5 lbs.	Ambient temperature, ambient humidity
HALT Demonstrates product design margin and robustness.	Vicor internal reference Destruct limits determined	Operational limits verified

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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, N+1 redundancy, thermal management, and compliance with safety and performance standards.

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