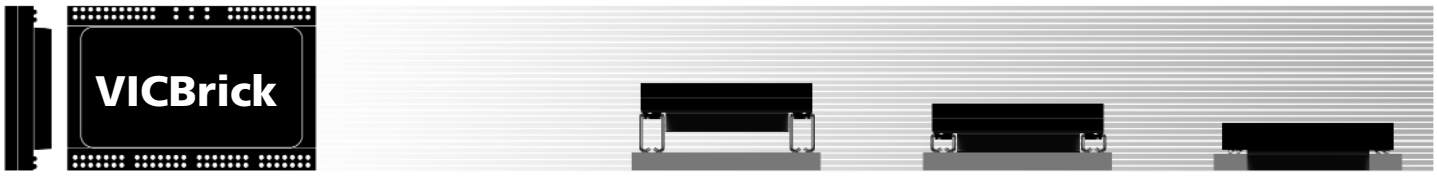


V•I Chip™
VICBrick

DC-DC Converters
Quarter Brick, 48 Vin Family

1.0 to 5.0 Vdc Output

Features
- Up to 80 A continuous, 100 A surge
- 93% efficiency @ 5 Vdc
- 100°C operating case temperature
- 180 W/in^3 power density 120 A/in^3
- 36 – 75 Vdc input range
- 100 V input surge for 100 ms
- Low noise ZCS/ZVS architecture
- Fast dynamic response
- Parallelable, with fault tolerance
- 2,250 Vdc basic insulation

Product Overview
VICBrick high-density converters (up to 120 A/in^3) are enabled by Vicor's V•I Chip technology. Each VICBrick consists of two V•I Chips: a 36 – 75 Vdc input Pre-Regulator Module (PRM) that is paired with an appropriate Voltage Transformation Module (VTM) chosen to provide the desired output voltage. While the ultra-low profile package conforms to industry-standard quarter-brick footprint (1.45" x 2.28"), it stands only 0.27" high and achieves 80 A of output current.

Standard outputs include 1.0, 1.2, 1.5 V and 1.8 V at 80 A, 2.5 V at 60 A, 3.0 and 3.3 V at 45 A, and 5 V at 30 A. Output voltages can be easily trimmed up or down over a wide range. Dual output pins are used for output currents over 50 A.

Utilizing breakthrough Sine Amplitude Converter (SAC) technology, VICBricks offer the highest efficiency, lowest noise, fastest transient response and highest power density. And because of the V•I Chips highly integrated functionality, VICBricks have only a fraction of the parts of a typical DC-DC converter.

Absolute Maximum Ratings

Parameter	Rating	Unit	Notes
+In to –In voltage			
Continuous	-1.0 to +75.0	Vdc	
Surge	100	Vdc	<100ms
On/Off to –In voltage	-0.6 to +7.0	Vdc	
Isolation voltage			Basic insulation
Input to output	2,250	Vdc	
Operating case temperature	-40 to +100	°C	Output side of VTM
Pin soldering temperature			
Wave	500 (260)	°F (°C)	<5 sec
Hand	750 (390)	°F (°C)	<7 sec

Thermal Resistance and Capacity

Parameter	Typ	Unit
VICBrick to ambient; 0 LFM	8.0	°C/W
VICBrick to ambient; 200 LFM	6.0	°C/W
Thermal capacity	22.8	Ws/°C

Specifications

■ PART NUMBERING

D	048	C	030	T	014	M	2	N
	Nominal Input Voltage	C = 1/4 Brick	Nominal Output Voltage (x10)	Product Grade T= -40 to 125°C	Output Power (x 0.1)	Enable Polarity P="+" M="–" (see page 7)	Package Style 1 = Single output pins 2 = Dual output pins (see page 3)	

■ PRODUCT MATRIX

Model Number	Input Voltage (Vdc)	Output Voltage (Vdc)	Max Continuous Output Current (Amps)	Typical Full Load Efficiency	Output Voltage Trim Range (Vdc)	Fuse Value
D048C010T010M2N	36 – 75	1.0	80*	83	0.90 – 1.10	5.0 A
D048C012T012M2N	36 – 75	1.2	80*	84	1.08 – 1.32	6.3 A
D048C015T012M2N	36 – 75	1.5	80	87	1.35 – 1.65	6.3 A
D048C018T014M2N	36 – 75	1.8	80	88	1.62 – 1.98	6.3 A
D048C025T015M2N	36 – 75	2.5	60	89	2.25 – 2.75	7.0 A
D048C030T014M1N	36 – 75	3.0	45	90	2.70 – 3.30	8.0 A
D048C033T015M1N	36 – 75	3.3	45	91	2.97 – 3.63	7.0 A
D048C050T015M1N	36 – 75	5.0	30	93	4.50 – 5.50	7.0 A

* 100 A for 100 ms

■ INPUT FUSING

VICBricks are not internally fused in order to provide flexibility in power system configuration. Input line fusing of VICBricks must always be incorporated within the power system. The input line fuse should be placed in series with +IN. Vicor recommends using the Littlefuse Nano 451/453 series for fusing VICBricks. Please refer to the chart above for appropriate fuse values.

Specifications, continued

■ MECHANICAL DRAWINGS

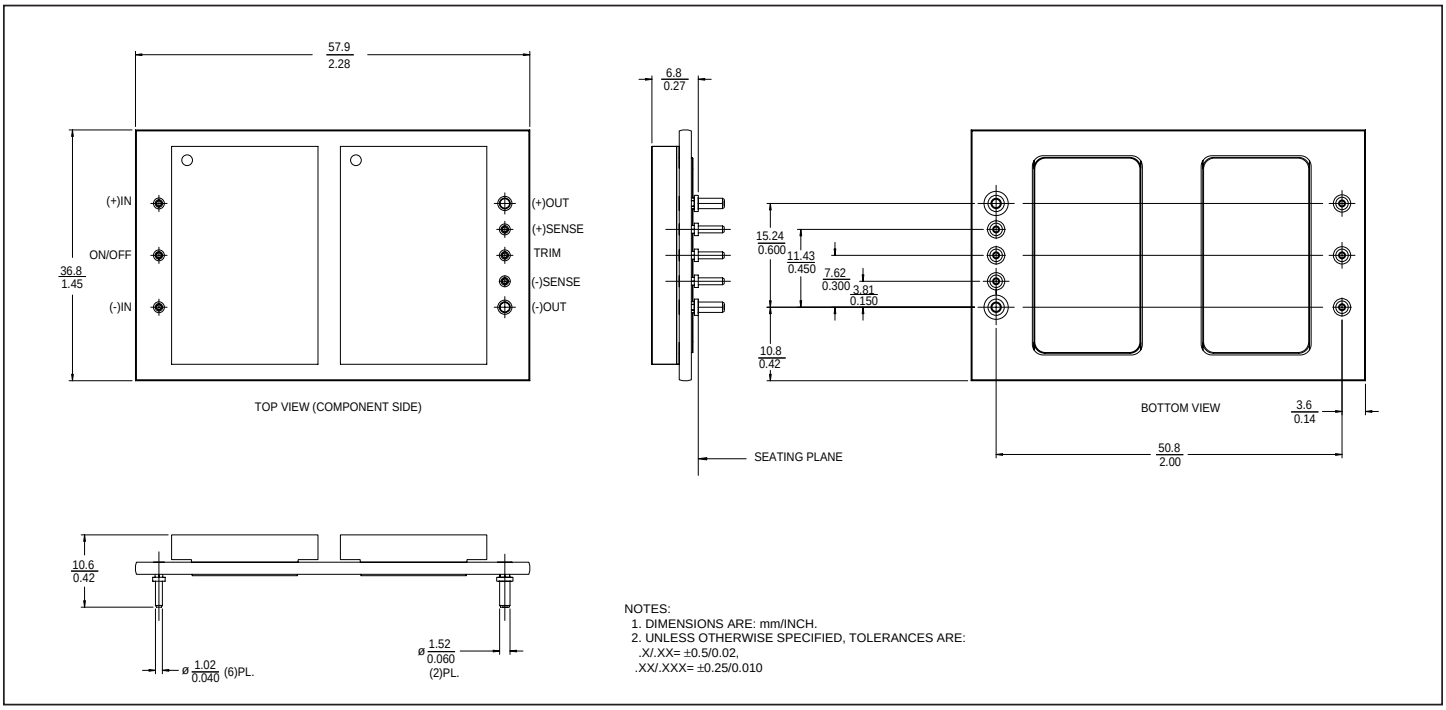


Figure 1*— Mechanical outline and PCB footprint information; single output pin version (package style 1)*

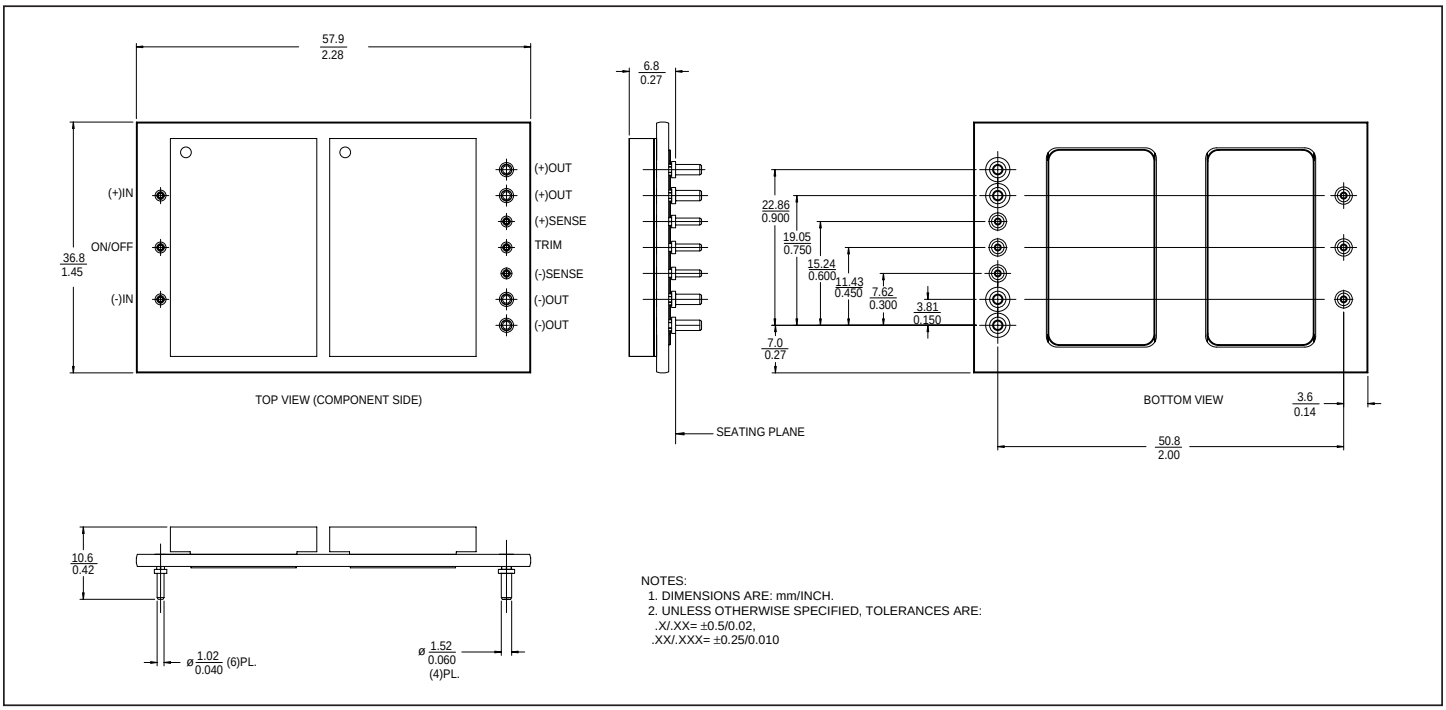


Figure 2*— Mechanical outline and PCB footprint information; dual output pin version (package style 2)*

Specifications, continued

Electrical characteristics apply over the full operating range of input voltage, output load (resistive) and case temperature, unless otherwise specified.

■ INPUT SPECIFICATIONS

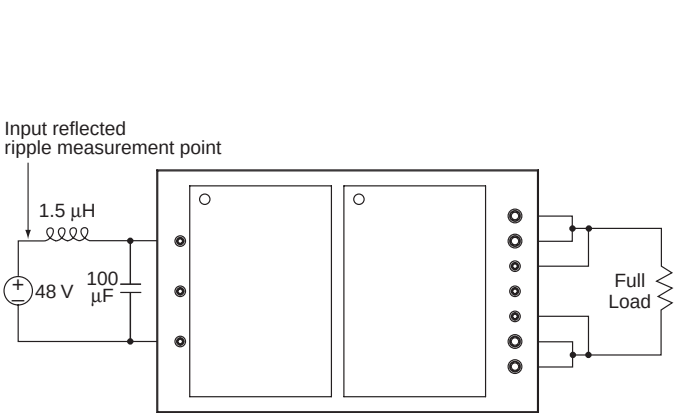
Parameter	Min	Typ	Max	Unit	Notes
Operating input voltage	36	48	75	Vdc	
Input surge withstand			100	Vdc	<100 ms
Undervoltage					
Turn-on		35	36	Vdc	
Turn-off	32.6	33.8		Vdc	
Overvoltage					
Turn-off	76.0			Vdc	
Turn-on			75.0	Vdc	
Input reflected ripple current		3		% Iin	mA p-p (see Fig.3 for test circuit)
Input dV/dt			10	V/µs	
Turn-on time					
Power up		150		ms	
ON/OFF enable		6		ms	
No load power dissipation		6.0		W	
Recommended external input capacitance	10	50		µF	200 nH maximum source inductance

■ OUTPUT SPECIFICATIONS

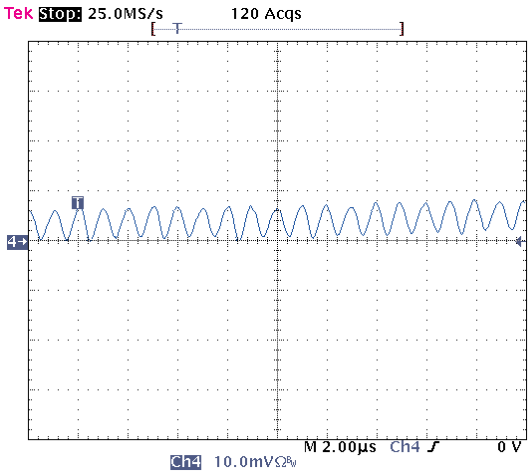
Parameter	Min	Typ	Max	Unit	Notes
Output voltage accuracy		±1		%	48 V input; no load; 25°C
Current limit		125		%	
Average short circuit current		200		mA	
Efficiency	Module dependent, see charts for individual models				
Output OVP setpoint		120		%	
Line regulation		0.1		%	
Load regulation		0.1		%	
Temperature regulation		±0.05		% / °C	
Ripple and noise, p-p	Module dependent, see charts for individual models				
Transient response					No load - full load step change, see note 1 below
Voltage deviation		2		%	
Recovery time		75		µs	

Note 1: For important information relative to applications where the unit is subjected to continuous dynamic loading, contact Vicor Applications Engineering at 800-927-9474.

Specifications, continued



Example filter for low input reflected ripple



Input reflected current at full load and 48 Vin
Peak-to-peak 36 mA

Figure 3*—Typical input reflected ripple, and example input filter design*

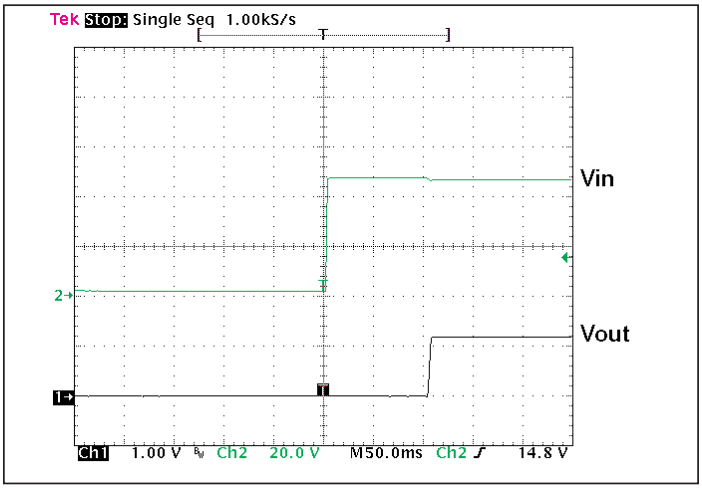


Figure 4*—Output turn-on waveform with input turn-on at full load and 48 Vin*

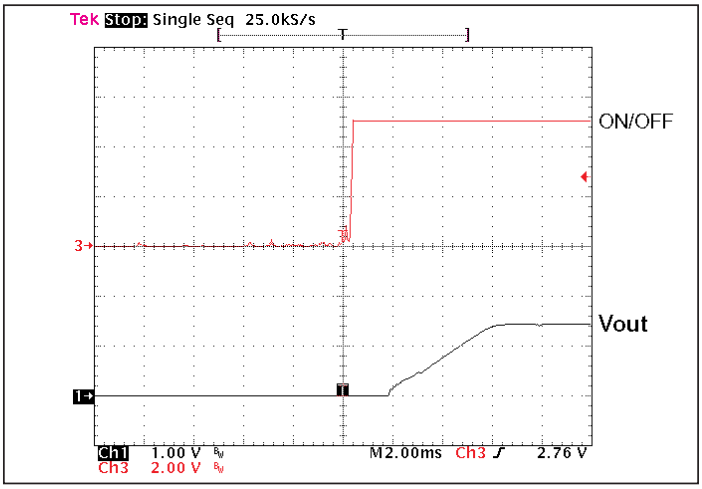


Figure 5*— Output voltage turn-on waveform with ON/OFF enable at full load and 48 Vin.*

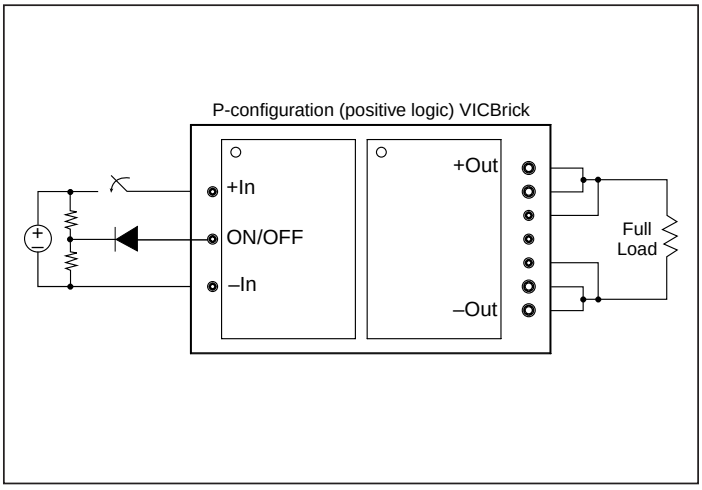


Figure 6*—Test circuit for measuring turn-on times*

Specifications, continued

■ SAFETY SPECIFICATIONS

Parameter	Min	Typ	Max	Unit	Notes
Isolation voltage					Complies with basic insulation requirements
Input to output	2,250			Vdc	
Isolation resistance	10			MΩ	Input to output
Agency approvals (pending)		cTÜVus			UL/CSA 60950, EN 60950
		CE Mark			Low voltage directive

■ THERMAL SPECIFICATIONS

Parameter	Min	Typ	Max	Unit	Notes
Operating case temperature	-40		100	°C	Measured at output side of VTM
Storage temperature	-40		+150	°C	
Temperature limiting	125	130	135	°C	Junction temperature, PRM or VTM
Thermal capacity		22.8		Ws/°C	
Pin soldering temperature					
Wave			500 (260)	°F (°C)	<5 sec
Hand			750 (390)	°F (°C)	<7 sec

■ GENERAL SPECIFICATIONS

Parameter	Min	Typ	Max	Unit	Notes
MTBF					
MIL-HDBK-217F		1,500		khrs	25°C, GB
Weight		3.7 (104)		oz (g)	
Dimensions		2.28 x 1.45 x 0.27		in	L x W x H
		57,9 x 36,8 x 6,8		mm	L x W x H

■ CONTROL SPECIFICATIONS – ON/OFF PIN

Parameter	Min	Typ	Max	Unit	Notes
Disable voltage (P version)	– 0.6		1.7	Vdc	Referenced to –in
Enable voltage (P version)	2.8		6.2	Vdc	Referenced to –in
Enable voltage (M version)	– 0.6		0.7	Vdc	Referenced to –in
Disable voltage (M version)	1.8		6.2	Vdc	Referenced to –in

Pin/Control Functions

+IN / –IN — DC Voltage Input Pins
The VICBrick DC-DC Converter input voltage range should not be exceeded. The VICBrick's internal under/over voltage lockout-function prevents operation outside of the normal input range. The VICBrick turns ON within an input voltage window bounded by the "Input under-voltage turn-on" and "Input over-voltage turn-off" levels, as specified. The module may be protected against accidental application of a reverse input voltage by the addition of a rectifier in series with the positive input, or a reverse rectifier in shunt with the positive input located on the load side of the input fuse.

Input impedance
Vicor recommends a minimum of 10 µF bypass capacitance be used on-board across the +IN and –IN pins. The type of capacitor used should have a low Q with some inherent ESR such as an electrolytic capacitor. If ceramic capacitance is required for space or MTBF purposes, it should be damped with approximately 0.3 Ω series resistance.

The DC resistance of the source should be kept as low as possible.

ON/OFF PIN

The ON/OFF pin provides the following Enable/Disable functionality:

Standard "M" configuration — If the ON/OFF pin is left floating, the module output is disabled. Once this port is pulled lower than 0.7 Vdc with respect to –IN, the output is enabled. This action can be realized by employing a relay, opto-coupler or open collector transistor. This pin should not be toggled at a rate higher than 1 Hz.

Optional "P" configuration — This is the reverse function from above: when the ON/OFF pin is left floating, the module output is enabled. Once this port is pulled lower than 1.7 Vdc with respect to –IN, the output is disabled.

If not using the ON/OFF pin function, perform one of the following to turn the converter on:
For M configuration, short ON/OFF pin to –IN.
For P configuration, leave ON/OFF pin open.

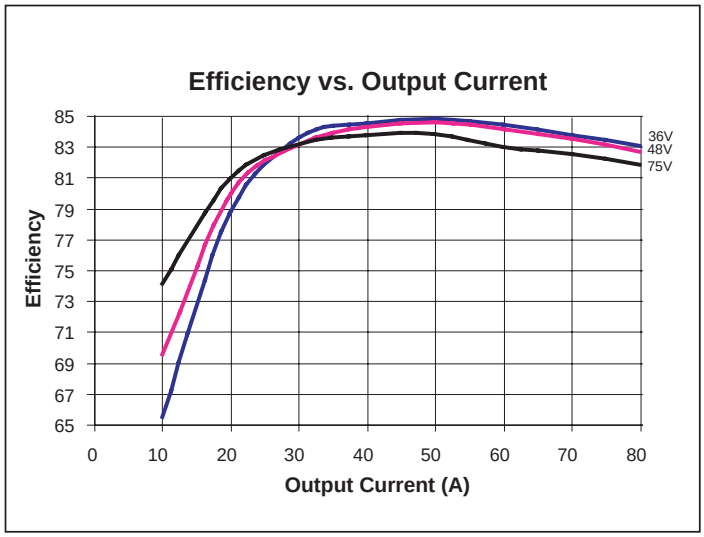
+OUT / – OUT — DC Voltage Output Pins
The 0.060" diameter + and – output pins are rated for a maximum current of 50 A. Two sets of pins are provided for all units with a current rating over 50 A. These pins must be connected in parallel with minimal interconnect resistance.

Output impedance
The very low output impedance of the VICBrick reduces or eliminates the need for limited life aluminum electrolytic or tantalum capacitors at the input of the non-isolated point-of-load converters.

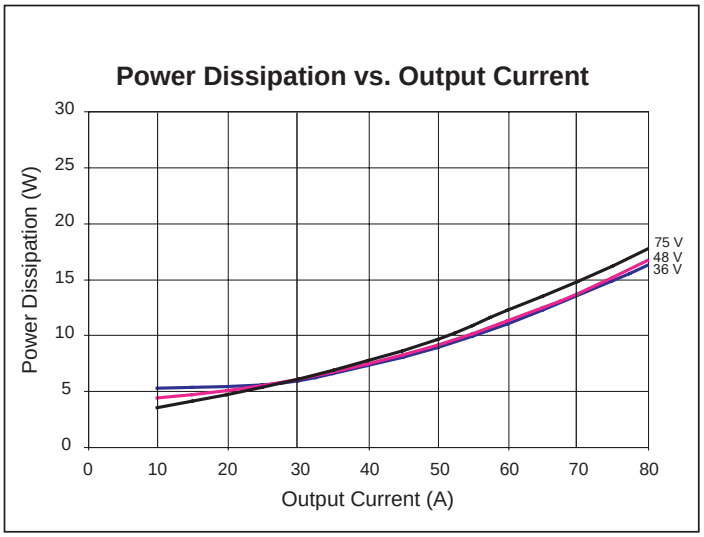
+SENSE / –SENSE — Remote Sense Pins
Remote sense minimizes the effects of distributiion losses by regulating the voltage at the remote sense connections.

■ D048C010T010M2N Specifications

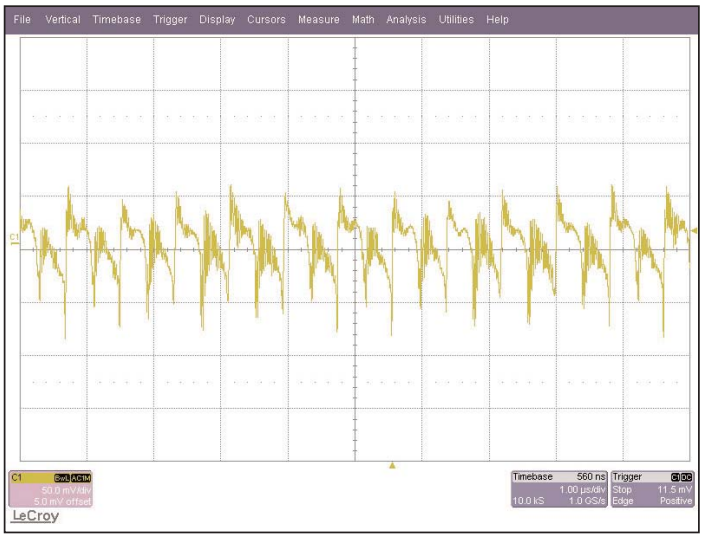
Parameter	Min	Typ	Max	Unit	Note
Setpoint voltage	0.990	1.000	1.010	V	
Output current – continuous	0		80	A	
– surge			100	A	100 ms
Input current			4.0	A	
No load dissipation			7.0	W	
Current limit	110	120	130	A	



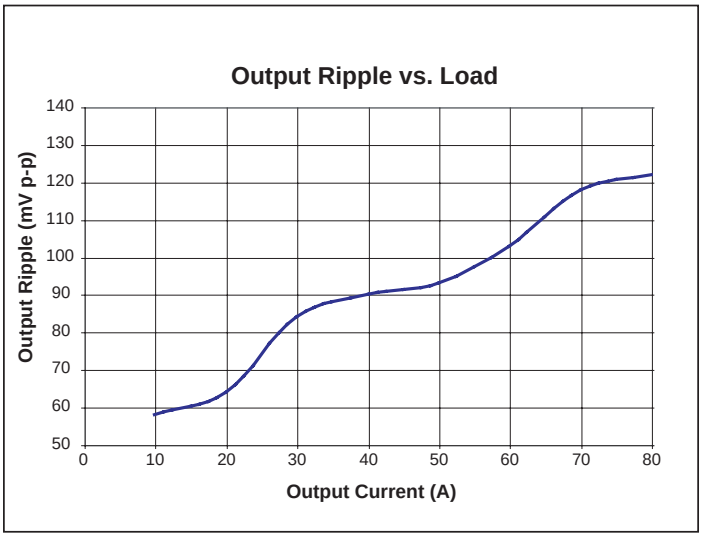
Efficiency vs. load



Power dissipation vs. load

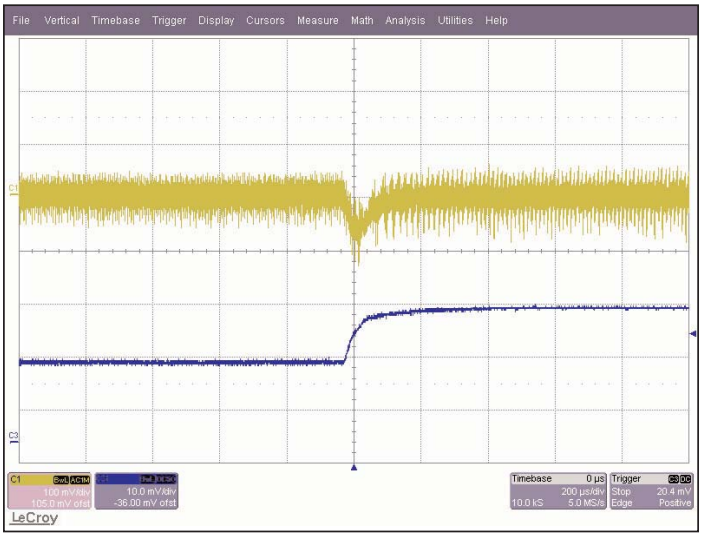


Output voltage ripple at full load and nominal Vin with no external bypass capacitor. Peak-to-peak 82 mV

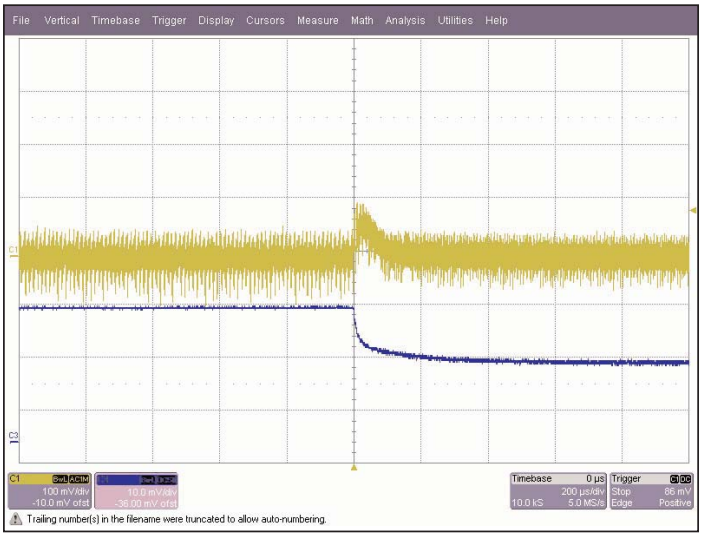


Output ripple vs. load with no external bypass capacitance

■ D048C010T010M2N Specifications (continued)



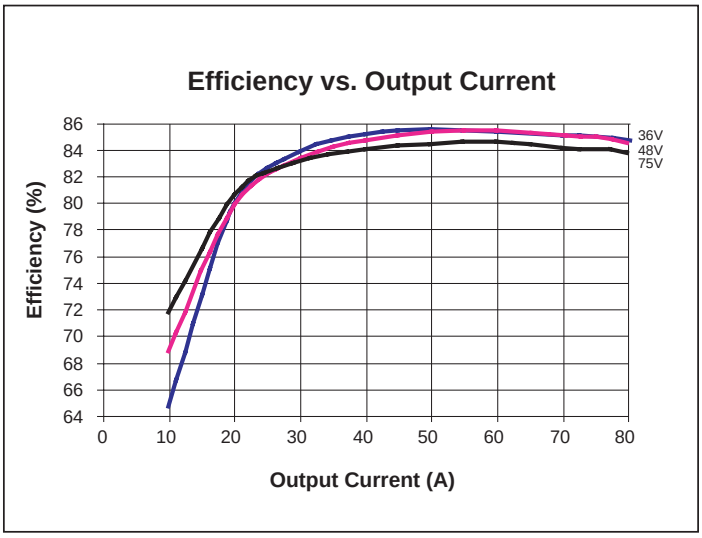
Transient response 50 – 100%



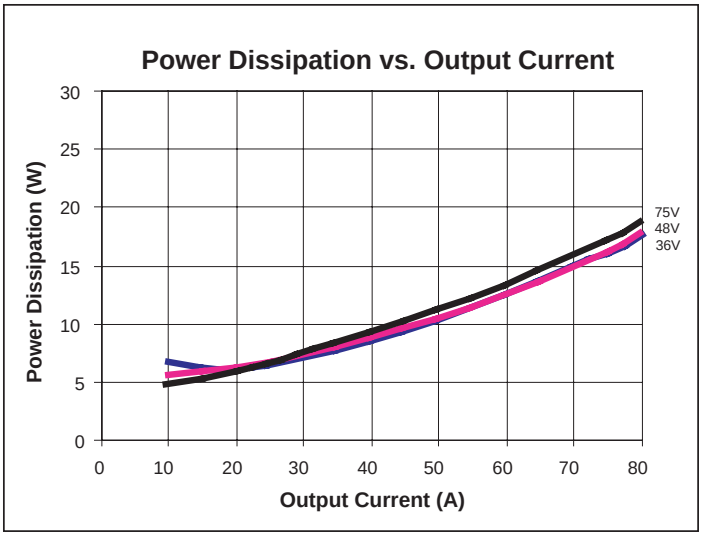
Transient response 100 – 50%

■ D048C012T012M2N Specifications

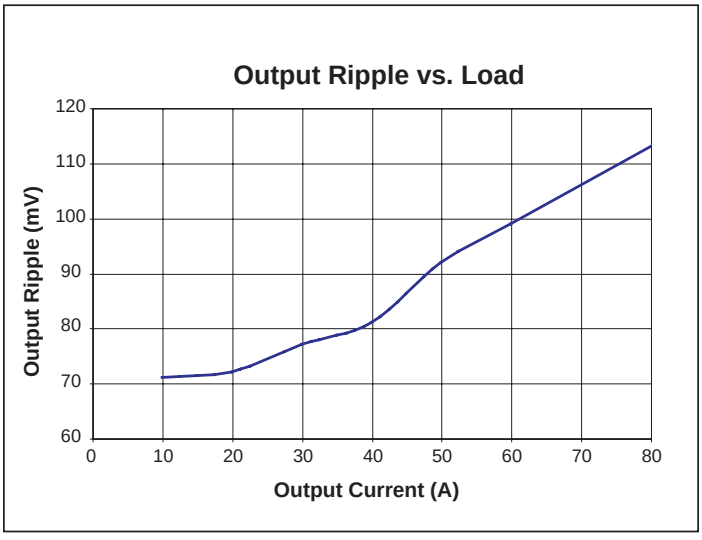
Parameter	Min	Typ	Max	Unit	Note
Setpoint voltage	1.188	1.200	1.212	V	
Output current – continuous	0		80	A	
– surge	0		100	A	100 ms
Input current			4.7	A	
No load dissipation			7.0	W	
Current limit	110	120	130	A	



Efficiency vs. load



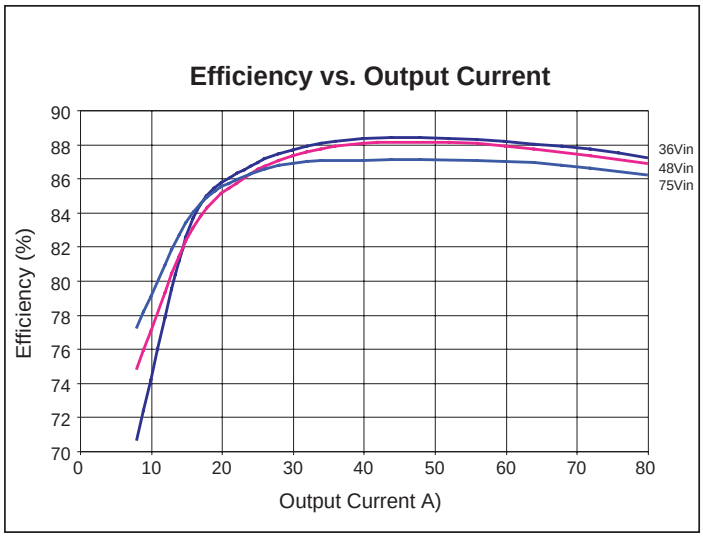
Power dissipation vs. load



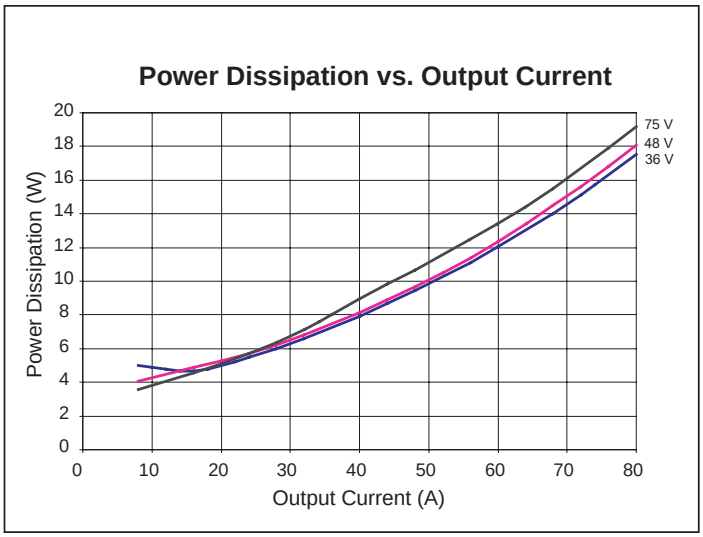
Output ripple vs. load with no external bypass capacitance

■ D048C015T012M2N Specifications

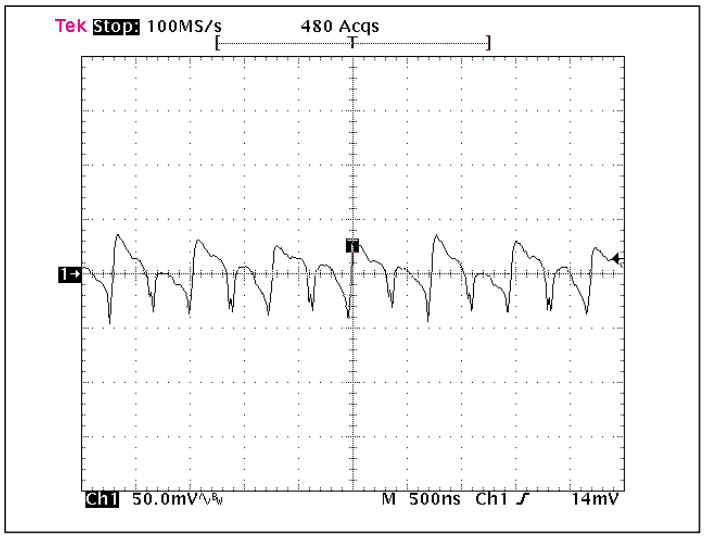
Parameter	Min	Typ	Max	Unit	Note
Setpoint voltage	1.485	1.500	1.515	V	
Output current	0		80	A	Continuous
Input current			4.7	A	
No load dissipation			7.0	W	
Current limit	88	96	104	A	



Efficiency vs. load

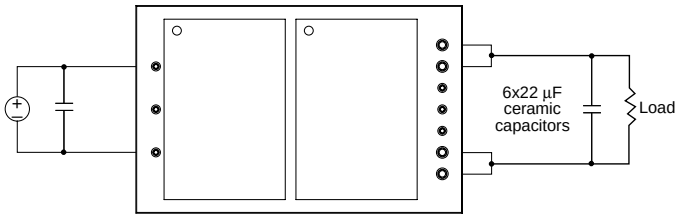


Power dissipation vs. load

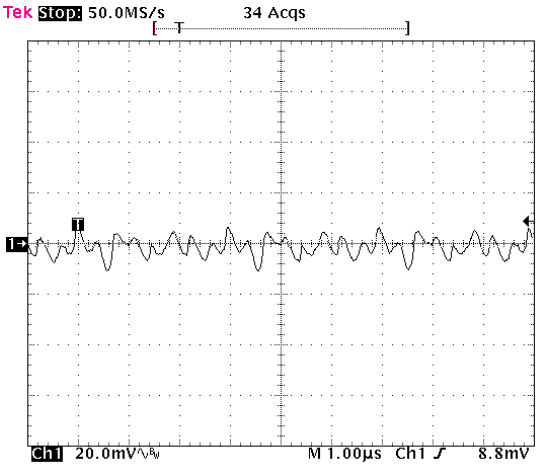


Output voltage ripple at full load and nominal Vin with no external bypass capacitor. Peak-to-peak 82 mV

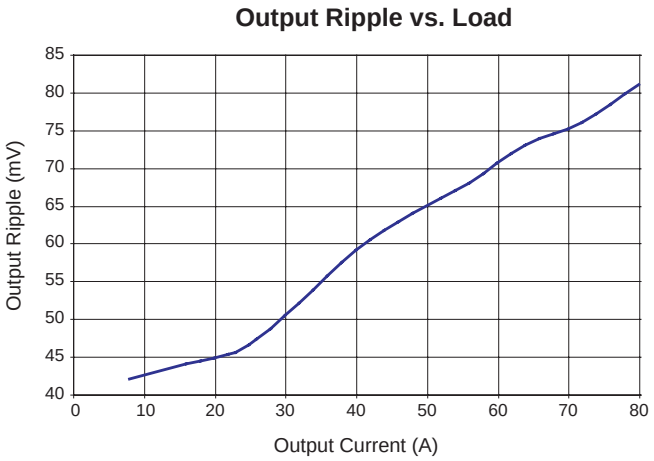
■ D048C015T012M2N Specifications (continued)



Example output filter



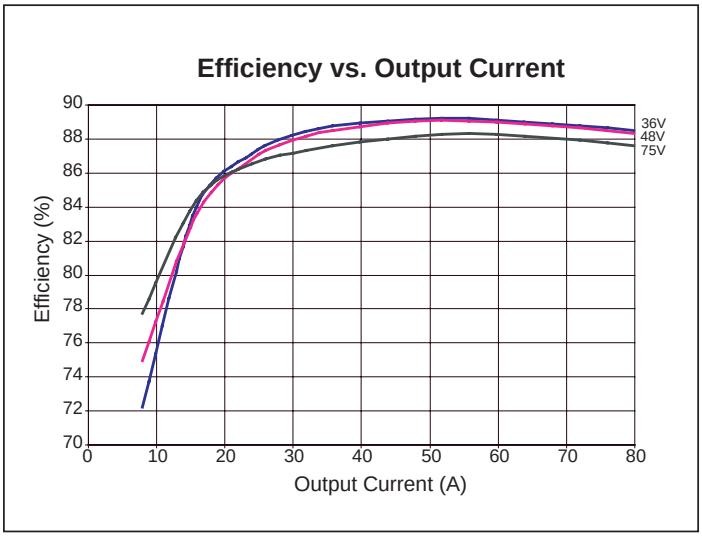
Output voltage ripple at full load and nominal Vin with 5 (22 µf) External bypass capacitor. Peak-to-peak 18.4 mV



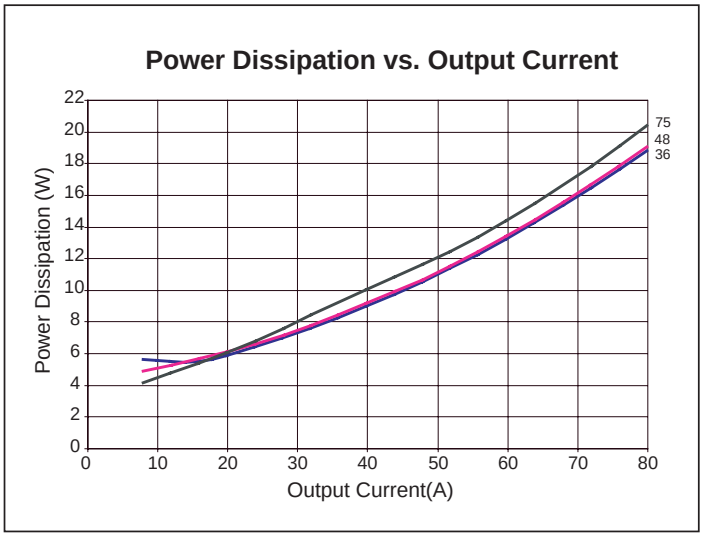
Output ripple vs. load with no external bypass capacitance

■ D048C018T014M2N Specifications

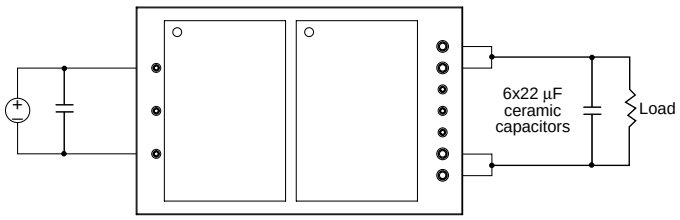
Parameter	Min	Typ	Max	Unit	Note
Setpoint voltage	1.782	1.800	1.818	V	
Output current	0		80	A	Continuous
Input current			5.6	A	
No load dissipation			7.0	W	
Current limit	88	96	104	A	



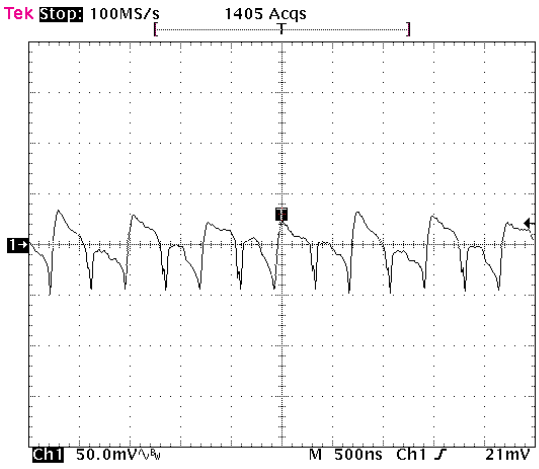
Efficiency vs. load



Power dissipation vs. load



Example output filter



Output voltage ripple at full load and nominal Vin with 7x (22 µF) ceramic external bypass capacitor. Peak-to-peak 36 mV

Warranty

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Vicor's comprehensive line of power solutions includes high density AC-DC and DC-DC modules and accessory components, fully configurable AC-DC and DC-DC power supplies, and complete custom power systems.

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Specifications are subject to change without notice.

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Vicor and its subsidiaries own Intellectual Property (issued U.S. and Foreign Patents and pending patent applications) relating to the product described in this data sheet including;

- The electrical and thermal utility of the V•I Chip package
- The design of the V•I Chip package
- The Power Conversion Topology utilized in the V•I Chip package
- The Control Architecture utilized in the V•I Chip package
- The Factorized Power Architecture.

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