24 V and 300 V DC-DC Converter Modules

Module Construction & Component Derating

This document provides a detailed view of the construction for Maxi, Mini and Micro DC-DC converters as well as the component design derating guidelines.

VICOR

Module Size/Power Chart

	Maxi		Mini		Micro	
Output Voltage	**24 Vin max. Output Power**	**300 Vin max. Output Power**	**24 Vin max. Output Power**	**300 Vin max. Output Power**	**24 Vin max. Output Power**	**300 Vin max. Output Power**
2 V	N/A	160 W	N/A	100 W	N/A	50 W
3.3 V	264 W	264 W	150 W	150 W	75 W	75 W
5 V	400 W	400 W	200 W	200 W	100 W	100 W
12 V	400 W	500 W	200 W	250 W	100 W	150 W
15 V	400 W	500 W	200 W	250 W	100 W	150 W
24 V	400 W	500 W	200 W	250 W	100 W	150 W
28 V	400 W	500 W	200 W	250 W	100 W	150 W
36 V	400 W	500 W	200 W	250 W	100 W	150 W
48 V	400 W	500 W	200 W	250 W	100 W	150 W

Consult factory for other input / output / power modules.

Part Numbering

V	24	A	12	M	400	B	L	
	Input Voltage	**Package** A = Maxi B = Mini C = Micro	**Output Voltage**	**Product Grade** E = –10 to +100°C C = –20 to +100°C T = –40 to +100°C H = –40 to +100°C M = –55 to +100°C	**Output Power**		**Pin Style** Blank = Short solder L = Long solder *S = Short ModuMate *N = Long ModuMate	**Baseplate** Blank = Slotted 2 = Threaded 3 = Thru hole

Maxi converter example:

V24A12M400BL

24 Vin, Maxi, 12 VOUT @ 400 W,
long solder pins, slotted baseplate

Mini converter example:

V300B28H250BL2

300 Vin, Mini, 28 VOUT @ 250 W,
long solder pins, threaded baseplate

Micro converter example:

V24C5M100BL3

24 Vin, Micro, 5 VOUT @ 100 W,
long solder pins, thru-hole baseplate

**Compatible with the InMate and SurfMate socketing systems.*

Qualification Testing

Acceleration *To determine the ability of parts to withstand constant acceleration, as an indicator of the mechanical strength limits.*
Standard: MIL-STD-810F, Method 513.5, Procedure II • **Environment:** Acceleration step from 2 – 7 g, 6 direction

Altitude *To observe low air pressure effects on either operational or non-operational design parameters.*
Standard: MIL-STD-810F, Method 500.4, Procedure I & II • **Environment:** 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.*
Standard: MIL-STD-810F, Method 511.4, Procedure I, operational • **Environment:** Fuel-air explosive atmospheres

HALT *Demonstrates product design margin and robustness.*
Standard: Vicor internal reference EIAJESD22-A110-B • **Environment:** Operational limits verified / destruct limits determined

High Temperature Operational Life *An operational test used to detect thermally activated failure mechanisms.*
Standard: Vicor internal reference EIAJESD22-A110-B
Environment: Nominal line, 75% Load, temperature within 5°C max operational

Humidity *A humidity test simulates the moisture-laden air found in tropical regions.*
Standard: MIL-STD-810F, Method 507.4 • **Environment:** 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.*
Standard: MIL-STD-810F, Method 516.5, Procedure I • **Environment:** Functional shock, 40 g
Standard: MIL-S-901D, lightweight hammer shock • **Environment:** 3 impacts/axis, 1, 3, 5 ft.
Standard: MIL-STD-202F, Method 213B • **Environment:** 60 g, 9 ms half sine; 75 g, 11 ms saw tooth shock.

Random Mechanical Vibration *To evaluate the construction, materials and mounting of the device for ruggedness.*
Standard: MIL-STD-810F, Method 514.5, Procedure I, Category 14 • **Environment:** Sine and random vibration for helicopter AH-6J main rotor with overall level of 5.6 g for 4 hours per axis
Standard: MIL-STD-810F, Method 514.5C, general minimum integrity • **Environment:** 7.7 g for 1 hour per axis.

Resistance to Solvents *To verify that component markings will not become illegible and that electrical and mechanical integrity will not be disturbed when exposed to solvents.*
Standard: MIL-STD-202G, Method 215K • **Environment:** Ambient temperature, ambient humidity

Temperature Humidity Bias *An operational test that evaluates the reliability of the device package in humid environments.*
Standard: JESD22-A101-B • **Environment:** 85°C, 85% RH, high line input voltage

Thermal Shock *To determine the resistance of the part to sudden changes in temperature.*
Standard: MIL-STD-202G, Method 107G, Condition B1 and MIL-HDBK-344A • **Environment:** -65°C to 125°C, 1,000 cycles

Temperature Cycle *Conducted to determine the ability of devices to withstand mechanical stresses induced by alternating high and low temperature extremes.*
Standard: JESD22-A104-B • **Environment:** -40°C to 125°C, 1,000 cycles

Characterization Process

Electro Static Discharge *Classifies the device according to its susceptibility to damage or degradation by exposure to electrostatic discharge.*
Standard: MIL-STD-883C, Method 3015 • **Environment:** Ambient temperature, ambient humidity

Fungus *To determine if a material(s) will support the growth of specific fungi.*
Standard: MIL-STD-810F, Method 508.5 • **Environment:** Severe climate conditions

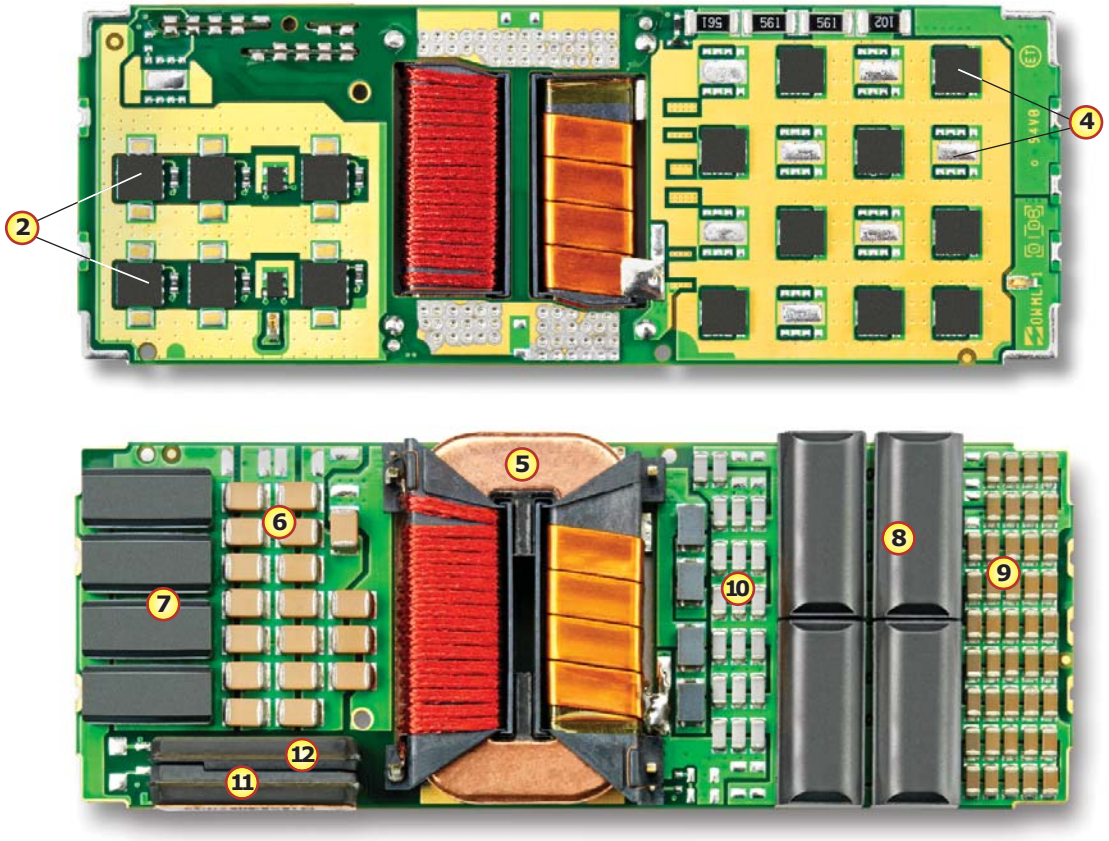
Salt Fog *To determine the resistance of the equipment to the effects of a salt atmosphere, primarily corrosion.*
Standard: MIL-STD-810F, Method 509.4 • **Environment:** Salt fog harsh environment

Solderability *To evaluate the solderability of terminations that are normally joined by a soldering operation.*
Standard: MIL-STD-202G, Method 208H • **Environment:** Continuous solder coating for a minimum of 95% surface area

Terminal Strength *Determines the resistance to external force on the terminals.*
Standard: MIL-STD-202G, Method 211A, Test Condition A • **Environment:** Ambient temperature, ambient humidity

AMCOM Testing *Developed in partnership with the U.S. Army Aviation and Missile Command to demonstrate the ability to withstand sequential harsh environments, which simulate storage, field use and a 10 year service life in a ground mobile environment.*
Standard: US Army Aviation and Missile Command • **Environment:** High temp / high humidity, temp cycle, power cycle

MAXI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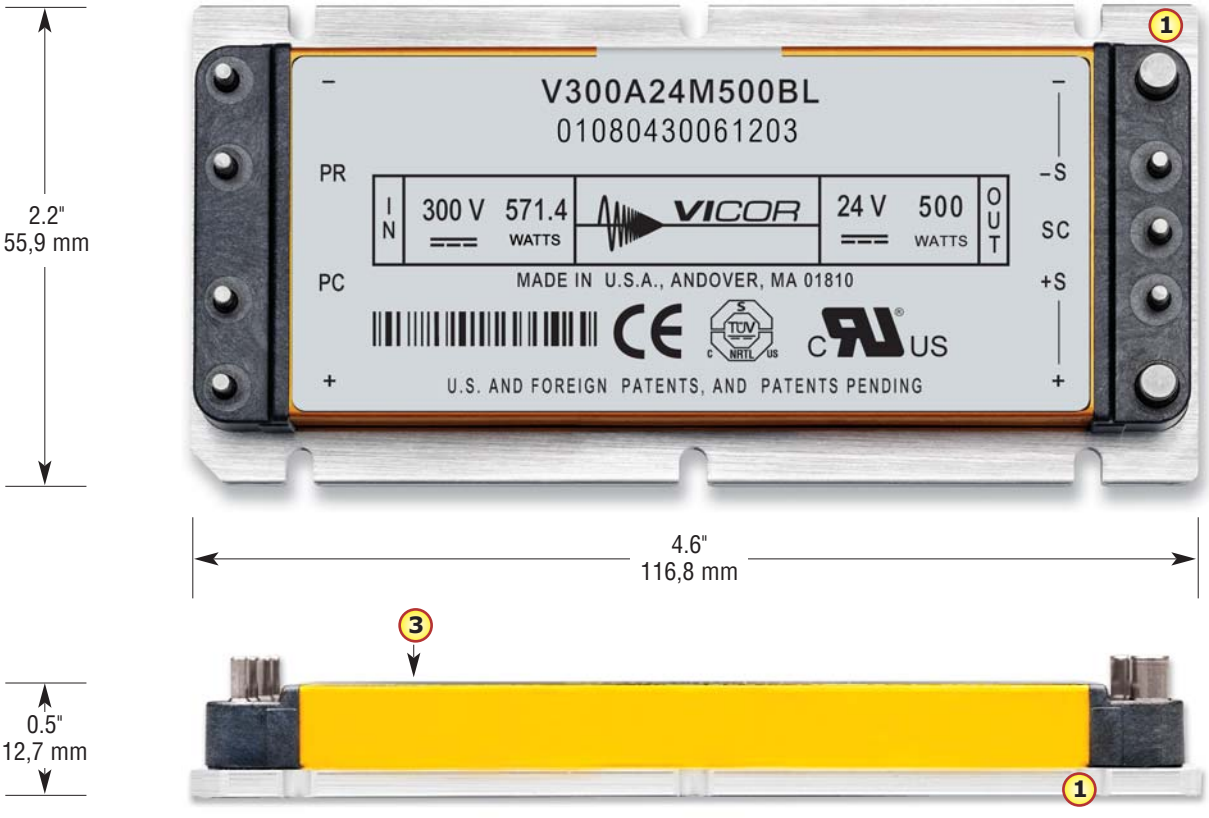
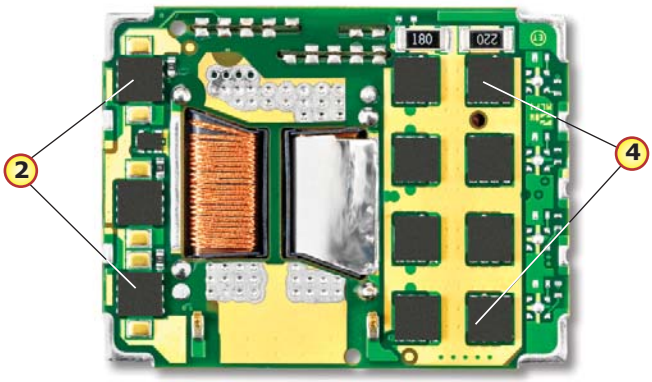
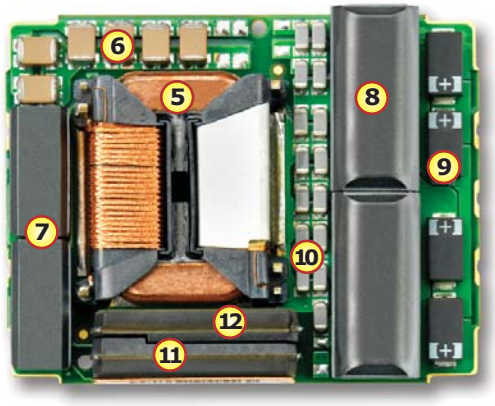

1
V300A24M500BL
01080430061203
PR
PC
IN
300 V
571.4
WATTS
VICOR
24 V
500
WATTS
OUT
MADE IN U.S.A., ANDOVER, MA 01810
U.S. AND FOREIGN PATENTS, AND PATENTS PENDING
-S
SC
+S
2.2"
55,9 mm
4.6"
116,8 mm
3
0.5"
12,7 mm

MINI


180
220
2
4


6
5
8
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7
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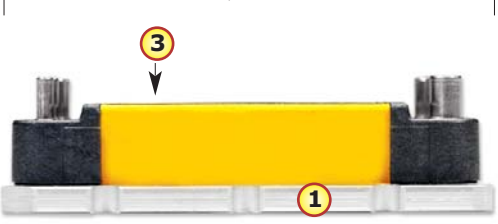
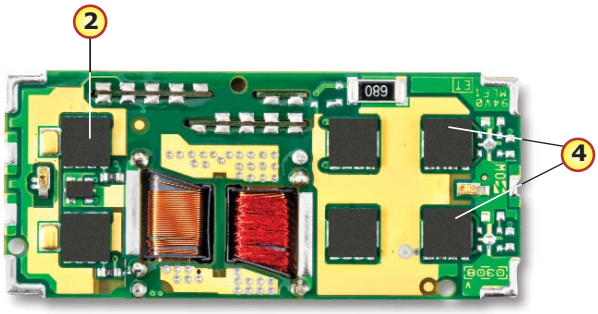
12
11


1
V300B5M200BL
01080429083226
VICOR
PR
–S
300 V 241 5 V 200
IN
OUT
SC
WATTS
WATTS
MADE IN USA, ANDOVER, MA 01810
PC
+S
U.S. & FOREIGN PATENTS & PATENTS PENDING


2.28"
57,9 mm
3
1

MICRO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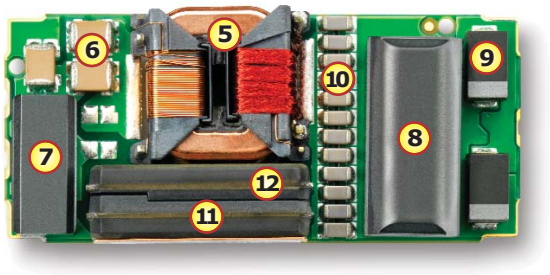
6
5
9
10
7
8
12
11


1
VICOR
V300C15M150BL
01080429124113
PR
300 V 170 WATTS
15 V 150 WATTS
IN
OUT
SC
PC
US & FOREIGN PATS. & PATS. PENDING MADE IN THE USA
CE
US


1.45"
36,8 mm


2.28"
57,9 mm
3
1

Component

24 V Inpu

The photos to the left illustrate typical Maxi, Mini and Micro DC-DC converters and the captions below provide information as to materials and operating parameters. Temperatures and voltages shown are for nominal input voltages under full load conditions at 100°C baseplate; maximum device ratings are shown in parenthesis.

		24 VOUT Maxi V24A24M400BL	5 VOUT Mini V24B5H200BL
1 **Baseplate**	Provides mounting, mechanical rigidity and heat spreading.	Aluminum 6063T-5	Aluminum 6063T-5
2 **Mosfet MLP**	Main switch and common drain for low conducted and radiated noise	Quantity: 6 121°C (150°C) 37 V (60 V) θj =10°C/W	Quantity: 3 126°C (150°C) 35 V (60 V) θj =10°C/W
3 **Insert Molded Terminal Block and Shield**	Functions as an EMI shield to reduce conducted and radiated noise, supplies electrical isolation for the pins and provides mechanical protection for the module.	DuPont Zenite/ Clad Aluminum	DuPont Zenite/ Clad Aluminum
4 **Rectifier MLP**	A dual diode rectifier	Quantity: 4 (forward) + 8 (shunt) Forward: 117°C (150°C) 87 V (200 V) Shunt: 105°C (150°C) 87 V (200 V) θj =10°C/W	Quantity: 4 (forward) + 4 (shunt) Forward: 121°C (150°C) 21 V (45 V) Shunt:115°C (150°C) 21 V (45 V) θj =10°C/W
5 **Main Transformer**	Provides voltage transformation and primary to secondary isolation.	110°C (180°C) core	116°C (180°C) core
6 **Input Capacitor**	Reduces reflected ripple and conducted noise in conjunction with the input inductor.	Quantity: 42 24 V (50 V)	Quantity: 14 24 V (50 V)
7 **Input Inductor**	Reduces reflected ripple and conducted noise in conjunction with the input capacitors.	Quantity: 4 101°C (180°C) core	Quantity: 1 104°C (180°C) core
8 **Output Inductor**	Reduces output ripple in conjunction with the output capacitors.	Quantity: 4 102°C (180°C) core	Quantity: 2 117°C (180°C) core
9 **Output Capacitor**	Reduces output ripple in conjunction with the output inductor.	Quantity: 43 24 V (50 V)	Quantity: 4 5 V (10 V)
10 **Resonant Capacitor**	Quasi-resonant tank for zero-current- switching converter	Quantity: 20 87 V (250 V)	Quantity: 10 21 V (50 V)
11 **Brain (primary)**	Contains primary control device (ASIC).	102°C (135°C)	108°C (135°C)
12 **Brain (secondary)**	Contains secondary control device (ASIC).	102°C (135°C)	108°C (135°C)
Encapsulant	Two component silicone elastomer		Thermal conductivity: 3.2 W/m-k Temperature rating guide: 200°C
MTBF	MIL-HDBK-217F: G.B. @ 25°C Baseplate MTBF in 1000 hours	2210	4205
PRISM	PRISM ties together several tools into a comprehensive system reliability prediction methodology that accounts for the myriad of factors that can influence reliability.	0.091808	0.056142

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300 V Input

15 VOUT Micro V24C15M100BL	24 VOUT Maxi V300A24H500BL	5 VOUT Mini V300B5M200BL	15 VOUT Micro V300C15H150BL
Aluminum 6063T-5	Aluminum 6063T-5	Aluminum 6063T-5	Aluminum 6063T-5
Quantity: 2 111°C (150°C) 33 V (60 V) θj =10°C/W	Quantity: 6 119°C (150°C) 484 V (550 V) θj =10°C/W	Quantity: 3 120°C (150°C) 404 V (650 V) θj =10°C/W	Quantity: 2 129°C (150°C) 406 V (650 V) θj =10°C/W
DuPont Zenite/ Clad Aluminum	DuPont Zenite/ Clad Aluminum	DuPont Zenite/ Clad Aluminum	DuPont Zenite/ Clad Aluminum
Quantity: 2 (forward) + 2 (shunt) Forward: 104°C (150°C) 57 V (100 V) Shunt: 104°C (150°C) 57 V (100 V) θj =10°C/W	Quantity: 8 (forward) + 8 (shunt) Forward: 106°C (150°C) 135 V (200 V) Shunt: 110°C (150°C) 135 V (200 V) θj =10°C/W	Quantity: 4 (forward) + 4 (shunt) Forward: 116°C (150°C) 24 V (30 V) Shunt: 115°C (150°C) 24 V (30 V) θj =10°C/W	Quantity: 2 (forward) + 2 (shunt) Forward: 112°C (150°C) 71 V (100 V) Shunt: 112°C (150°C) 71 V (100 V) θj =10°C/W
107°C (180°C) core	119°C (180°C) core	119°C (180°C) core	127°C (180°C) core
Quantity: 8 24 V (50 V)	Quantity: 18 300 V (600 V)	Quantity: 6 300 V (600 V)	Quantity: 3 300 V (600 V)
Quantity: 1 101°C (180°C) core	Quantity: 4 103°C (180°C) core	Quantity: 2 107°C (180°C) core	Quantity: 1 113°C (180°C) core
Quantity: 1 103°C (180°C) core	Quantity: 4 110°C (180°C) core	Quantity: 2 125°C (180°C) core	Quantity: 1 112°C (180°C) core
Quantity: 2 15 V (25 V)	Quantity: 43 24 V (50 V)	Quantity: 4 5 V (10 V)	Quantity: 2 15 V (25 V)
Quantity: 7 57 V (100 V)	Quantity: 20 135 V (250 V)	Quantity: 15 24 V (50 V)	Quantity: 12 71 V (100 V)
102°C (135°C)	109°C (135°C)	118°C (135°C)	114°C (135°C)
102°C (135°C)	109°C (135°C)	118°C (135°C)	114°C (135°C)
		Thermal conductivity: 3.2 W/m-k Temperature rating guide: 200°C	
4646	2690	5324	6104
0.043105	0.094210	0.047520	0.067441

Maximum device ratings in parenthesis.

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