DC-DC CONVERTER 40W, Highest Power Density

FEATURES

- ▶Smallest Encapsulated 40W Converter
- ▶Ultra-compact 1"×1" Package
- ▶Ultra-high Power Density 93W/in³
- ▶Excellent Efficiency up to 93%
- ▶Ultra-wide 4:1 Input Voltage Range
- ▶Fully Regulated Output Voltage
- ▶I/O Isolation 1500 VDC
- ▶Operating Ambient Temp. Range -40℃ to +85℃
- ▶No Min. Load Requirement
- ▶Very Low No Load Power Consumption
- ▶Under-voltage, Overload/Temperature and Short Circuit Protection
- ▶Remote On/Off Control, Output Voltage Trim
- ▶Shielded Metal Case with Insulated Baseplate
- ▶UL/cUL/IEC/EN 62368-1 Safety Approval & CE Marking (Pending)

PRODUCT OVERVIEW

The MJWI40 series represents the smallest encapsulated 40W DC-DC isolated converters available, designed for compact, high-performance applications. With an ultra-compact 1"×1" package and an ultra-high power density of 93W/in³, these converters are optimized for efficiency and space-saving designs. They feature an ultra-wide 4:1 input voltage range, fully regulated output voltage, and deliver up to 93% efficiency. The series also offers I/O isolation rated at 1500 VDC and operates in extreme temperatures from -40℃ to +85℃ without a minimum load requirement.
Additional features include low no-load power consumption, comprehensive protections (under-voltage, overload, temperature, and short circuit), and convenient remote On/Off control with output voltage trim. For enhanced thermal management, the MJWI40 series also provides an optional heatsink, ensuring optimal heat dissipation and stable performance in more demanding environments. Housed in a shielded metal case with an insulated baseplate, the MJWI40 series meets UL/cUL/IEC/EN 62368-1 safety standards and bears CE marking.
These converters are ideal for applications such as server power supplies, communication equipment, and electric vehicle chargers, where high power requirements and limited space are critical considerations. The MJWI40 series provides a reliable, efficient, and space-optimized power solution for such demanding environments.

Model Selection Guide

Model Number	Input Voltage (Range)	Output Voltage	Output Current	Input Current		Max. capacitive Load	Efficiency (typ.)
			Max.	@Max. Load	@No Load		@Max. Load
	VDC	VDC	mA	mA(typ.)	mA(typ.)	µF	%
MJWI40-24S05	24 (9 ~ 36)	5	8000	1832	8	14300	91
MJWI40-24S12		12	3400	1848		2500	92
MJWI40-24S15		15	2700	1834		1600	92
MJWI40-24S24		24	1700	1868		620	91
MJWI40-24S48		48	835	1856		160	90
MJWI40-24S54		54	740	1830		120	91
MJWI40-24D12		±12	±1700	1868		1250#	91
MJWI40-24D15		±15	±1350	1854		800#	91
MJWI40-48S05	48 (18 ~ 75)	5	8000	906	5	14300	92
MJWI40-48S12		12	3400	914		2500	93
MJWI40-48S15		15	2700	907		1600	93
MJWI40-48S24		24	1700	924		620	92
MJWI40-48S48		48	835	928		160	90
MJWI40-48S54		54	740	915		120	91
MJWI40-48D12		±12	±1700	934		1250#	91
MJWI40-48D15		±15	±1350	938		800#	90

For each output

Input Specifications

Parameter		Conditions / Model	Min.	Typ.	Max.	Unit
Input Surge Voltage (100ms. max)		24V Input Models	-0.7	---	50	VDC
		48V Input Models	-0.7	---	100	VDC
Start-Up Threshold Voltage		24V Input Models	---	---	9	VDC
		48V Input Models	---	---	18	VDC
Under Voltage Lockout		24V Input Models	---	7.8	---	VDC
		48V Input Models	---	16.5	---	VDC
Start Up Time	Power Up	Nominal Vin and Constant Resistive Load	---	30	50	ms
	Remote On	Nominal Vin and Constant Resistive Load	---	30	50	ms

Remote On/Off Control

Parameter		Conditions	Min.	Typ.	Max.	Unit
Positive logic (Standard)	Converter On	3.5V ~ 12V or Open Circuit				
	Converter Off	0V ~ 1.2V or Short Circuit				
Negative logic (Option)	Converter On	0V ~ 1.2V or Short Circuit				
	Converter Off	3.5V ~ 12V or Open Circuit				
Positive logic Control Input Current (on)		Vctrl = 5.0V	---	0.5	---	mA
Positive logic Control Input Current (off)		Vctrl = 0V	---	-0.5	---	mA
Negative logic Control Input Current (on)		Vctrl = 0V	---	-0.5	---	mA
Negative logic Control Input Current (off)		Vctrl = 5.0V	---	0.5	---	mA
Control Common		Referenced to Negative Input				
Standby Input Current			---	---	3	mA

Output Specifications

Parameter	Conditions / Model			Min.	Typ.	Max.	Unit
Output Voltage Setting Accuracy				---	---	±1.0	%Vnom.
Output Voltage Balance	Dual Output, Balanced Loads			---	---	±2.0	%
Line Regulation	Vin=Min. to Max. @ Full Load			---	---	±0.2	%
Load Regulation	Io=0% to 100%			---	---	±0.3	%
Cross Regulation (Dual)	Asymmetrical Load 25% / 100% FL			---	---	±5.0	%
Minimum Load	No minimum Load Requirement						
Ripple & Noise	0-20 MHz Bandwidth	5Vo	Measured with a 10µF MLCC and 33µF/35V Polymer	---	75	100	mV P-P
		12Vo,15Vo ±12Vo, ±15Vo	Measured with a 10µF MLCC and 33µF/35V Polymer	---	100	125	mV P-P
		24Vo	Measured with a 10µF MLCC and 33µF/35V Polymer	---	150	200	mV P-P
		48Vo, 54Vo	Measured with a 2.2µF MLCC	---	280	330	mV P-P
Transient Recovery Time	25% Load Step Change(2)			---	---	500	µsec
Temperature Coefficient				---	---	±0.02	%/℃
Trim Up / Down Range (See Page 6)	% of Nominal Output Voltage			---	---	±10	%
Over Load Protection	Hiccup			110	---	180	%
Overshoot				---	---	5	%
Short Circuit Protection	Continuous, Automatic Recovery (Hiccup Mode 1Hz typ.)						

General Specifications

Parameter	Conditions / Model	Min.	Typ.	Max.	Unit
I/O Isolation Voltage	60 Seconds	1500	---	---	VDC
	1 Second	1800	---	---	VDC
Isolation Voltage Input/Output to case	60 Seconds	1000	---	---	VDC
I/O Isolation Resistance	500 VDC	1000	---	---	MΩ
I/O Isolation Capacitance	100kHz, 1V	---	1500	---	pF
Switching Frequency	5Vo	---	185	---	kHz
	Other Output	---	210	---	kHz
MTBF(calculated)	MIL-HDBK-217F@25℃ Full Load, Ground Benign	1,051,007	---	---	Hours
Safety Approval (Pending)	UL/cUL 62368-1 recognition(UL certificate), IEC/EN 62368-1(CB-report)				

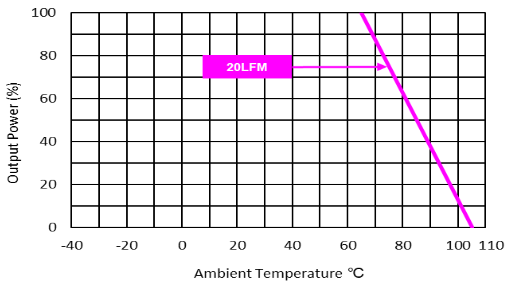
EMC Specifications

Parameter	Standards & Level			Performance
EMI(6)	Conduction	EN 55032	With external components	Class A
	Radiation			
EMS(6)	EN 55035			
	ESD	Direct discharge	Indirect discharge HCP & VCP	A
		EN 61000-4-2 Air ± 8kV, Contact ± 6kV	Contact ± 6kV	
	Radiated immunity	EN 61000-4-3 10V/m		A
	Fast transient	EN 61000-4-4 ±2kV		A
	Surge	EN 61000-4-5 ±2kV		A
	Conducted immunity	EN 61000-4-6 10Vrms		A
	PFMF	EN61000-4-8 100A/M for Continuous ； 1000A/M for 1 Sec.		A

Environmental Specifications

Parameter	Model	Min.	Max.		Unit
			without Heatsink	with Heatsink	
Operating Ambient Temperature Range Nominal Vin, Load 100% Inom. (for Power Derating see relative Derating Curves)	MJWI40-24S12, MJWI40-24S15, MJWI40-24S24 MJWI40-24D12, MJWI40-24D15, MJWI40-48S12 MJWI40-48S15, MJWI40-48S24, MJWI40-48D12 MJWI40-48D15	-40	+65	+75	℃
	MJWI40-24S05, MJWI40-24S48, MJWI40-24S54 MJWI40-48S05, MJWI40-48S48, MJWI40-48S54		+60	+70	
Case Temperature		---	+105		℃
Over Temperature Protection (Case)		+115 typ.			℃
Storage Temperature Range		-50	+125		℃
Humidity (non condensing)		---	95		% rel. H
RFI	Six-Sided Shielded, Metal Case				
Lead Temperature (1.5mm from case for 10Sec.)		---	260		℃

Power Derating Curve



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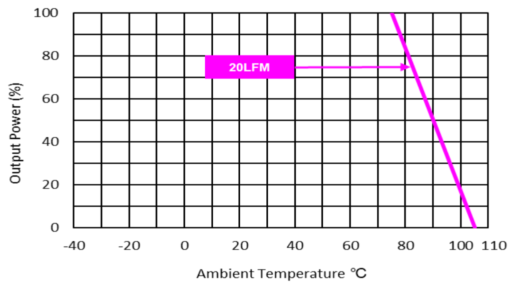
MJWI40-24D15, MJWI40-48S12, MJWI40-48S15, MJWI40-48S24
MJWI40-48D12, MJWI40-48D15
Derating Curve without Heatsink



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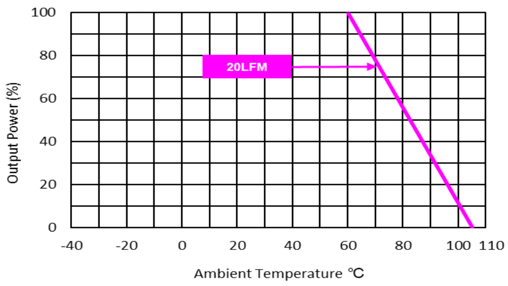
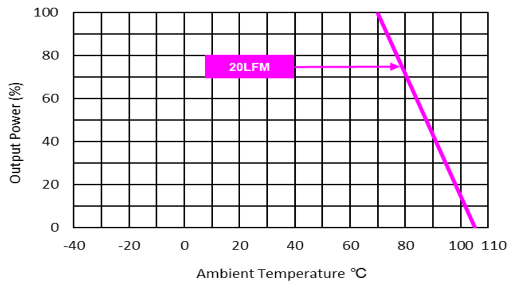
MJWI40-24D15, MJWI40-48S12, MJWI40-48S15, MJWI40-48S24
MJWI40-48D12, MJWI40-48D15
Derating Curve with Heatsink



MJWI40-24S05, MJWI40-24S48, MJWI40-24S54
MJWI40-48S05, MJWI40-48S48, MJWI40-48S54
Derating Curve without Heatsink



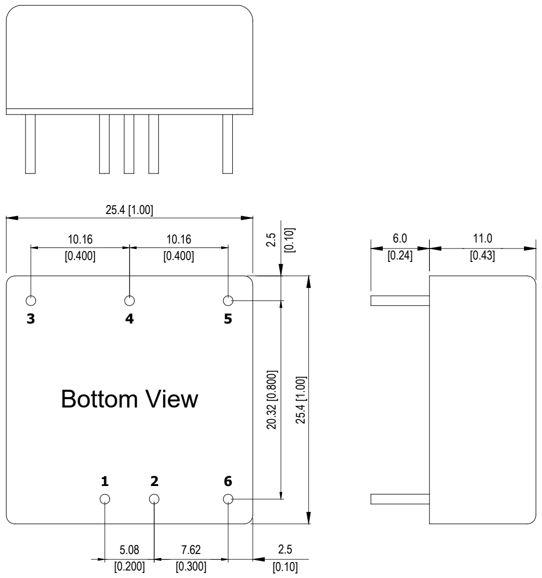
MJWI40-24S05, MJWI40-24S48, MJWI40-24S54
MJWI40-48S05, MJWI40-48S48, MJWI40-48S54
Derating Curve with Heatsink

Notes

1. Specifications typical at Ta=+25℃, resistive load, nominal input voltage and rated output current unless otherwise noted.
2. Transient recovery time is measured to within 1% error band for a step change in output load of 75% to 100%.
3. We recommend to protect the converter by a slow blow fuse in the input supply line.
4. Other input and output voltage may be available, please contact MINMAX.
5. It is necessary to parallel a capacitor across the input pins under hot-swap operation. Minimum Capacitance: 68μF/ 100V KZE.
6. The external components might be required to meet EMI/EMS standard for some of test items. Please contact MINMAX for the solution in detail.
7. Do not exceed maximum power specification when adjusting output voltage.
8. Specifications are subject to change without notice.
9. The repeated high voltage isolation testing of the converter can degrade isolation capability, to a lesser or greater degree depending on materials, construction, environment and reflow solder process. Any material is susceptible to eventual chemical degradation when subject to very high applied voltages thus implying that the number of tests should be strictly limited. We therefore strongly advise against repeated high voltage isolation testing, but if it is absolutely required, that the voltage be reduced by 20% from specified test voltage. Furthermore, the high voltage isolation capability after reflow solder process should be evaluated as it is applied on system.

Package Specifications

Mechanical Dimensions



Pin Connections

Pin	Single Output	Dual Output	Diameter mm (inches)
1	+Vin	+Vin	Ø 1.0 [0.04]
2	-Vin	-Vin	Ø 1.0 [0.04]
3	+Vout	+Vout	Ø 1.0 [0.04]
4	Trim	Common	Ø 1.0 [0.04]
5	-Vout	-Vout	Ø 1.0 [0.04]
6	Remote On/Off	Remote On/Off	Ø 1.0 [0.04]

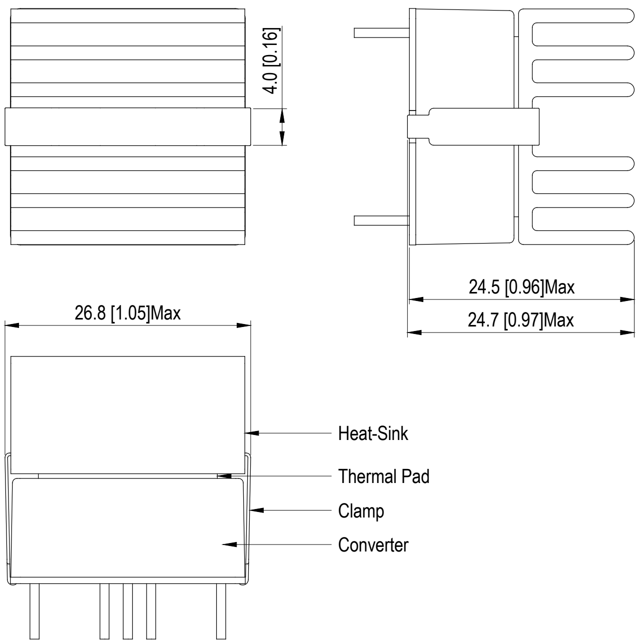
- All dimensions in mm (inches)
- Tolerance: X.X±0.5 (X.XX±0.02)
  X.XX±0.25 (X.XXX±0.01)
- Pin diameter tolerance: X.X±0.05 (X.XX±0.002)

Physical Characteristics

Case Size	:	25.4x25.4x11.0 mm (1.0x1.0x0.43 inches)
Case Material	:	Metal With Non-Conductive Baseplate
Base Material	:	FR4 PCB (flammability to UL 94V-0 rated)
Pin Material	:	Copper Alloy
Weight	:	26g

Heatsink (Option –HS)

Mechanical Dimensions



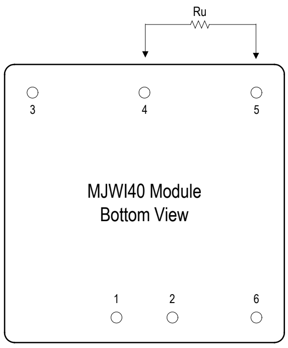
Heatsink Material: Aluminum
Finish: Anodic treatment (black)
Weight: 6g

- The advantages of adding a heatsink are:

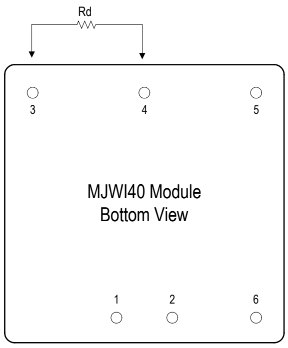
1. To improve heat dissipation and increase the stability and reliability of the DC-DC converters at high operating temperatures.
2. To increase Operating temperature of the DC-DC converter, please refer to Derating Curve.

External Output Trimming

Output can be externally trimmed by using the method shown below



Trim Up



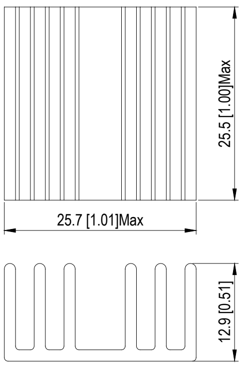
Trim Down

	MJWI40-XXS05		MJWI40-XXS12		MJWI40-XXS15		MJWI40-XXS24		MJWI40-XXS48		MJWI40-XXS54	
Trim Range (%)	Trim down (kΩ)	Trim up (kΩ)	Trim down (kΩ)	Trim up (kΩ)	Trim down (kΩ)	Trim up (kΩ)	Trim down (kΩ)	Trim up (kΩ)	Trim down (kΩ)	Trim up (kΩ)	Trim down (kΩ)	Trim up (kΩ)
1	138.88	106.87	413.55	351.00	530.73	422.77	598.97	486.83	2043.74	1685.06	2774.19	2196.91
2	62.41	47.76	184.55	157.50	238.61	189.89	267.93	217.87	913.77	755.03	1243.64	982.46
3	36.92	28.06	108.22	93.00	141.24	112.26	157.59	128.21	537.11	445.02	733.46	577.64
4	24.18	18.21	70.05	60.75	92.56	73.44	102.42	83.38	348.78	290.02	478.37	375.23
5	16.53	12.30	47.15	41.40	63.35	50.15	69.31	56.49	235.79	197.01	325.32	253.78
6	11.44	8.36	31.88	28.50	43.87	34.63	47.24	38.56	160.46	135.01	223.28	172.82
7	7.79	5.55	20.98	19.29	29.96	23.54	31.48	25.75	106.65	90.72	150.40	114.99
8	5.06	3.44	12.80	12.37	19.53	15.22	19.66	16.14	66.29	57.51	95.74	71.61
9	2.94	1.79	6.44	7.00	11.41	8.75	10.46	8.67	34.90	31.67	53.22	37.88
10	1.24	0.48	1.35	2.70	4.92	3.58	3.11	2.69	9.79	11.01	19.21	10.89

Order Code Table			
Standard (Positive logic)	With heatsink (Positive logic)	Negative logic	With heatsink (Negative logic)
MJWI40-24S05	MJWI40-24S05-HS	MJWI40-24S05N	MJWI40-24S05N-HS
MJWI40-24S12	MJWI40-24S12-HS	MJWI40-24S12N	MJWI40-24S12N-HS
MJWI40-24S15	MJWI40-24S15-HS	MJWI40-24S15N	MJWI40-24S15N-HS
MJWI40-24S24	MJWI40-24S24-HS	MJWI40-24S24N	MJWI40-24S24N-HS
MJWI40-24S48	MJWI40-24S48-HS	MJWI40-24S48N	MJWI40-24S48N-HS
MJWI40-24S54	MJWI40-24S54-HS	MJWI40-24S54N	MJWI40-24S54N-HS
MJWI40-24D12	MJWI40-24D12-HS	MJWI40-24D12N	MJWI40-24D12N-HS
MJWI40-24D15	MJWI40-24D15-HS	MJWI40-24D15N	MJWI40-24D15N-HS
MJWI40-48S05	MJWI40-48S05-HS	MJWI40-48S05N	MJWI40-48S05N-HS
MJWI40-48S12	MJWI40-48S12-HS	MJWI40-48S12N	MJWI40-48S12N-HS
MJWI40-48S15	MJWI40-48S15-HS	MJWI40-48S15N	MJWI40-48S15N-HS
MJWI40-48S24	MJWI40-48S24-HS	MJWI40-48S24N	MJWI40-48S24N-HS
MJWI40-48S48	MJWI40-48S48-HS	MJWI40-48S48N	MJWI40-48S48N-HS
MJWI40-48S54	MJWI40-48S54-HS	MJWI40-48S54N	MJWI40-48S54N-HS
MJWI40-48D12	MJWI40-48D12-HS	MJWI40-48D12N	MJWI40-48D12N-HS
MJWI40-48D15	MJWI40-48D15-HS	MJWI40-48D15N	MJWI40-48D15N-HS

Order Code For Heatsink kit (including: Heatsink x1, Clamp x 1, Thermal Pad x1)

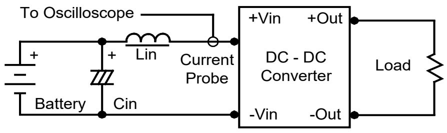
HS-J002



Test Setup

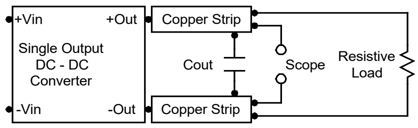
Input Reflected-Ripple Current Test Setup

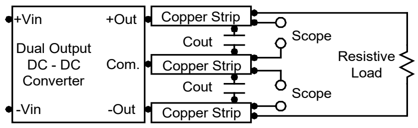
Input reflected-ripple current is measured with a inductor Lin (4.7μH) and Cin (220μF, ESR < 1.0Ω at 100 kHz) to simulate source impedance. Capacitor Cin, offsets possible battery impedance. Current ripple is measured at the input terminals of the module, measurement bandwidth is 0-500 kHz.



Peak-to-Peak Output Noise Measurement Test

Use external ceramic capacitor, please refer to the descriptions in the "Ripple & Noise" section on page 2. Scope measurement should be made by using a BNC socket, measurement bandwidth is 0-20 MHz. Position the load between 50 mm and 75 mm from the DC-DC Converter.





Technical Notes

Remote On/Off

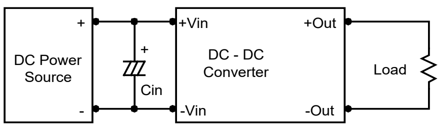
Positive logic remote on/off turns the module on during a logic high voltage on the remote on/off pin, and off during a logic low. To turn the power module on and off, the user must supply a switch to control the voltage between the on/off terminal and the -Vin terminal.
The switch can be an open collector or equivalent. A logic low is 0V to 1V. A logic high is 2.5V to 50V. The maximum sink current at on/off terminal during a logic low is -500μA. The maximum allowable leakage current of the switch at on/off terminal (2.5 to 50V) is 500μA.

Overload Protection

To provide protection in a fault (output overload) condition, the unit is equipped with internal current limiting circuitry and can endure current limiting for an unlimited duration. At the point of current-limit inception, the unit shifts from voltage control to current control. The unit operates normally once the output current is brought back into its specified range.

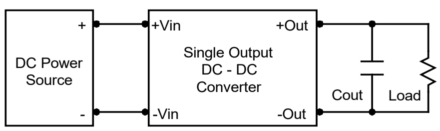
Input Source Impedance

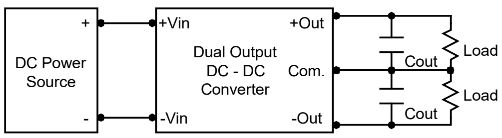
The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module.
In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure startup.
Capacitor mounted close to the power module helps ensure stability of the unit, it is recommended to use a good quality low Equivalent Series Resistance (ESR < 1.0Ω at 100 kHz) capacitor of a 68μF for the 24V and 48V devices.



Output Ripple Reduction

A good quality low ESR capacitor placed as close as practicable across the load will give the best ripple and noise performance. To reduce output ripple, it is recommended to use 68μF capacitors at the output.





Maximum Capacitive Load

The MJWI40 series has limitation of maximum connected capacitance at the output. The power module may be operated in current limiting mode during start-up, affecting the ramp-up and the startup time. The maximum capacitance can be found in the data sheet.

Thermal Considerations

Many conditions affect the thermal performance of the power module, such as orientation, airflow over the module and board spacing. To avoid exceeding the maximum temperature rating of the components inside the power module, the case temperature must be kept below 105°C. The derating curves are determined from measurements obtained in a test setup.