FEATURES

- **High Power Density, 3W in SIP-7 Package**
- **Small Footprint: 19.5x 7.6mm (0.77”x 0.30”)**
- **Semi-regulated Output Voltage**
- **High Efficiency to 89%**
- **I/O-isolation 1000VDC**
- **Operating Temp. Range –40°C to +85°C**
- **CSA/UL/IEC/EN 60950-1 (Approval pending)**
- **3 Years Product Warranty**

NEW

RoHS Compliant

3 year warranty

PRODUCT OVERVIEW

The MINMAX MA03 series is a new range of isolated 3W DC/DC-converter modules in a small SIP-package. There are 12 models available with 5V, 12V or 24VDC input. These products have a typical load regulation of 5.0% to 7.0% depending on model.

The MA03 DC/DC converters are a compromise between a more expensive fully regulated converter and a non-regulated converter. They offer the designer a new solution for many cost critical applications where the output voltage variation has to be kept in a certain limit under all load conditions.

Model Selection Guide

Model Number	Input Voltage (Range)	Output Voltage	Output Current		Input Current		Load Regulation	Max. capacitive Load	Efficiency (typ.)
			Max.	Min.	@Max. Load	@No Load			@Max. Load
	VDC	VDC	mA	mA	mA(typ.)	mA(typ.)	% (max.)	µF	%
MA03-05S05	5 (4.5 ~ 5.5)	5	600	12	723	50	8	220	83
MA03-05S09		9	333	6	689		7		87
MA03-05S12		12	250	4.5	701		7		85.5
MA03-05S15		15	200	3	686		6		87.5
MA03-12S05	12 (10.8 ~ 13.2)	5	600	12	298	40	6	220	84
MA03-12S09		9	333	6	285		5		87.5
MA03-12S12		12	250	4.5	284		4.5		88
MA03-12S15		15	200	3	281		4		89
MA03-24S05	24 (21.6 ~ 26.4)	5	600	12	152	30	5.8	220	82
MA03-24S09		9	333	6	147		4.8		85
MA03-24S12		12	250	4.5	146		4.3		85.5
MA03-24S15		15	200	3	147		3.5		85

Input Specifications

Parameter	Model	Min.	Typ.	Max.	Unit
Input Surge Voltage (1 sec. max.)	5V Input Models	-0.7	---	9	VDC
	12V Input Models	-0.7	---	18	
	24V Input Models	-0.7	---	30	
Input Voltage Range	5V Input Models	4.5	5	5.5	
	12V Input Models	10.8	12	13.2	
	24V Input Models	21.6	24	26.4	
Reverse Polarity Input Current	All Models	---	---	0.5	A
Internal Filter Type		Internal Capacitor			
Internal Power Dissipation		---	---	700	mW

Output Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Line Regulation	For Vin Change of 1%	---	±1.01	±1.2	%
Load Regulation	Io=20% to 100%	See Model Selection Guide			
Ripple & Noise (20MHz)		---	60	100	mV_{P-P}
Temperature Coefficient		---	±0.01	±0.02	%/°C
Short Circuit Protection	0.5 Second Max.				

General Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
I/O Isolation Voltage (rated)	60 Seconds	1000	---	---	VDC
I/O Isolation Resistance	500 VDC	1000	---	---	MΩ
I/O Isolation Capacitance	100KHz, 1V	---	60	120	pF
Switching Frequency		---	60	---	KHz
MTBF (calculated)	MIL-HDBK-217F@25℃, Ground Benign	2,000,000	---	---	Hours
Safety Approvals(pending)	CSA 60950-1 recognition,IEC/EN 60950-1(CB-scheme)				

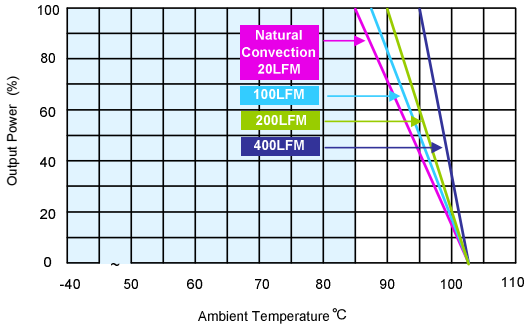
Input Fuse

5V Input Models	12V Input Models	24V Input Models
2000mA Slow-Blow Type	1000mA Slow-Blow Type	500mA Slow-Blow Type

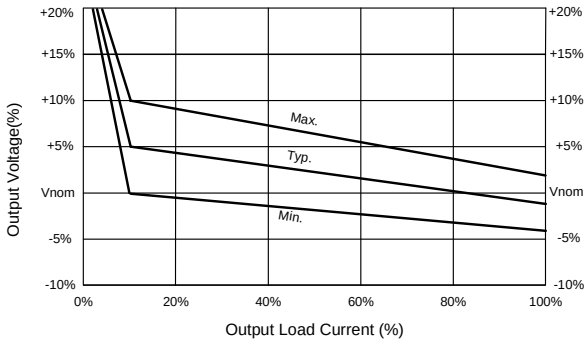
Environmental Specifications

Parameter	Conditions	Min.	Max.	Unit
Operating Ambient Temperature Range (See Power Derating Curve)	Natural Convection	-40	+85	℃
Case Temperature		---	+100	℃
Storage Temperature Range		-50	+125	℃
Humidity (non condensing)		---	95	% rel. H
Cooling	Free-Air convection			
Lead Temperature (1.5mm from case for 10Sec.)		---	260	℃

Power Derating Curve



Output Voltage Tolerance

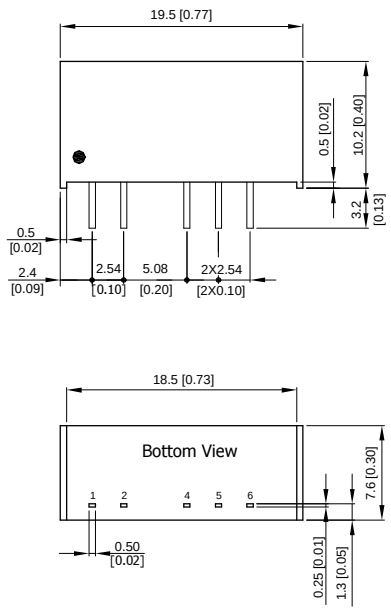


Notes

1 Specifications typical at Ta=+25°C, resistive load, nominal input voltage and rated output current unless otherwise noted.
2 Ripple & Noise measurement bandwidth is 0-20MHz.
3 These power converters require a minimum output loading to maintain specified regulation, operation under no-load conditions will not damage these modules; however they may not meet all specifications listed.
4 All DC/DC converters should be externally fused at the front end for protection.
5 Other input and output voltage may be available, please contact factory.
6 That "natural convection" is about 20LFM but is not equal to still air (0 LFM).
7 Specifications are subject to change without notice.

Package Specifications

Mechanical Dimensions



Pin Connections

Pin	Function
1	+Vin
2	-Vin
4	-Vout
5	No Pin
6	+Vout

- All dimensions in mm (inches)
- Tolerance: X.X±0.25 (X.XX±0.01)
  X.XX±0.13 (X.XXX±0.005)
- Pins ±0.05(±0.002)

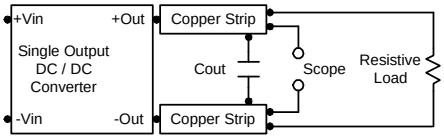
Physical Characteristics

Case Size	:	19.5x7.6x10.2mm (0.77x0.30x0.40 inches)
Case Material	:	Non-Conductive Black Plastic (flammability to UL 94V-0 rated)
Pin Material	:	Alloy 42
Weight	:	2.2g

Test Setup

Peak-to-Peak Output Noise Measurement Test

Use a Cout 0.33μF ceramic capacitor. 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.



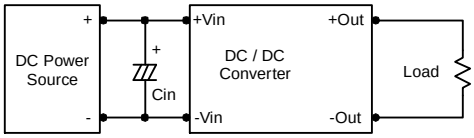
Technical Notes

Maximum Capacitive Load

The MA03 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. For optimum performance we recommend 220μF maximum capacitive load for devices. The maximum capacitance can be found in the data sheet.

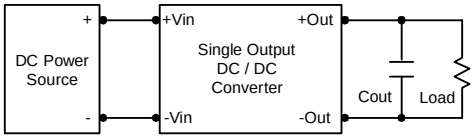
Input Source Impedance

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 commended to use a good quality low Equivalent Series Resistance (ESR < 1.0Ω at 100 KHz) capacitor of a 2.2μF for the 5V input devices, a 1.0μF for the 12V input devices and a 0.47μF for the 24V 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 1.0μF capacitors at the output.



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 100°C. The derating curves are determined from measurements obtained in a test setup.