

MA01H Series

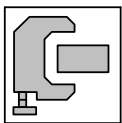
1W, Miniature SIP, Single Output DC/DC Converters



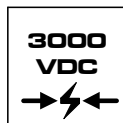
Key Features



- Efficiency up to 88%
- Improved Regulation Performance
- Low Ripple & Noise
- 3000VDC Isolation
- MTBF > 2,000,000 Hours
- Input 5, 12 and 24VDC
- Output 5,9,12 and 15VDC
- Temperature Performance -40°C to +85°C
- UL 94V-0 Package Material
- Internal SMD Construction
- Industry Standard Pinout



Low Profile



I/O Isolation

Minmax's new launched MA01H series comprises 12 different models with improved regulation performance, low ripple & noise at 30mVp-p and high efficiency up to 88%. This series operates input voltages of 5V, 12V and 24V and is available in output voltages of 5V, 9V, 12V and 15VDC.

Standard footprint targets data communication equipments, mobile battery driven equipments, distributed power systems, telecommunication equipments, mixed analog/digital subsystems, process/machine control equipments, computer peripheral systems and industrial robot systems.

Absolute Maximum Ratings

Parameter	Min.	Max.	Unit	
Input Surge Voltage (1000 mS)	5VDC Input Models	-0.7	9	VDC
	12VDC Input Models	-0.7	18	VDC
	24VDC Input Models	-0.7	30	VDC
Lead Temperature (1.5mm from case for 10 Sec.)	---	260	°C	
Internal Power Dissipation	---	450	mW	

Exceeding the absolute maximum ratings of the unit could cause damage. These are not continuous operating ratings.

Environmental Specifications

Parameter	Conditions	Min.	Max.	Unit
Operating Temperature	Ambient	-40	+85	°C
Operating Temperature	Case	-40	+90	°C
Storage Temperature		-50	+125	°C
Humidity		---	95	%
Cooling	Free-Air Convection			

Model Selection Guide

Model Number	Input Voltage	Output Voltage	Output Current		Input Current		Load Regulation	Reflected Ripple Current	Efficiency
			Max.	Min.	@Max. Load	@No Load			@Max. Load
	VDC	VDC	mA	mA	mA (Typ.)	mA (Typ.)	% (Max.)	mA (Typ.)	% (Typ.)
MA01-05S05H	5 (4.5 ~ 5.5)	5	200	4	238	30	6.2	11	84
MA01-05S09H		9	110	2	229		5.5		86.5
MA01-05S12H		12	84	1.5	231		5.5		87
MA01-05S15H		15	67	1	230		5		87.5
MA01-12S05H	12 (10.8 ~ 13.2)	5	200	4	99	12	5	5	84
MA01-12S09H		9	110	2	96		3.3		86
MA01-12S12H		12	84	1.5	95		3.6		88
MA01-12S15H		15	67	1	95		2.9		88
MA01-24S05H	24 (21.6 ~ 26.4)	5	200	4	50	11	5	4.7	84
MA01-24S09H		9	110	2	48		3.5		86.5
MA01-24S12H		12	84	1.5	48		3.5		87.5
MA01-24S15H		15	67	1	48		3		87.5

Capacitive Load

Models by Vout	5V	9V	12V	15V	Unit
Maximum Capacitive Load	220	220	220	220	uF

Input Fuse Selection Guide

5V Input Models	12V Input Models	24V Input Models
500mA Slow – Blow Type	200mA Slow – Blow Type	100mA Slow – Blow Type

Input Specifications

Parameter	Model	Min.	Typ.	Max.	Unit
Input Voltage Range	5V Input Models	4.5	5	5.5	VDC
	12V Input Models	10.8	12	13.2	
	24V Input Models	21.6	24	26.4	
Reverse Polarity Input Current	All Models	---	---	0.3	A
Input Filter		Internal Capacitor			

Output Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Line Regulation	For Vin Change of 1%	---	±1.05	±1.2	%
Load Regulation	Io=20% to 100%	See Model Selection Guide			%
Ripple & Noise (20MHz)		---	30	60	mV P-P
Temperature Coefficient		---	±0.01	±0.02	%/°C
Output Short Circuit	0.5 Second Max.				

MA01H Series

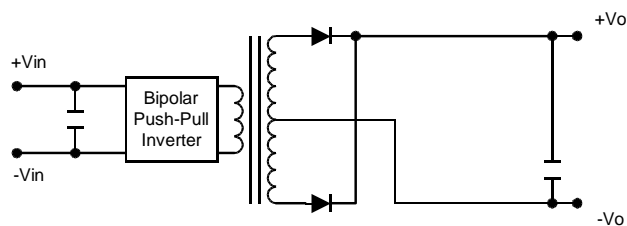
General Specifications

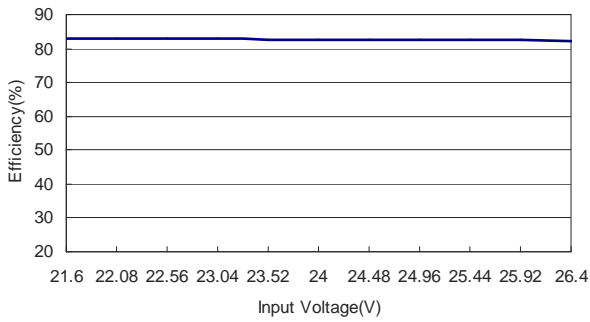
Parameter	Conditions	Min.	Typ.	Max.	Unit
Isolation Voltage Rated	60 Seconds	3000	---	---	VDC
Isolation Voltage Test	Flash Tested for 1 Second	3300	---	---	VDC
Isolation Resistance	1000VDC	10	---	---	GΩ
Isolation Capacitance	100KHz, 1V	30	60	120	pF
Switching Frequency		50	100	120	KHz
MTBF	MIL-HDBK-217F @ 25°C, Ground Benign	2000	---	---	K Hours

Notes:

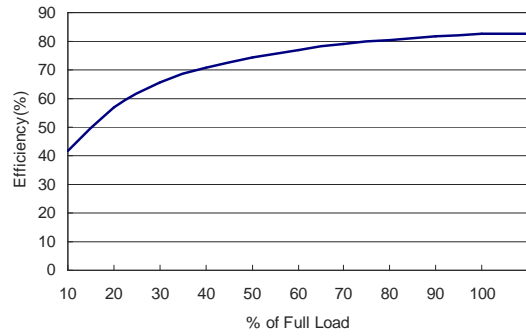
1. Specifications typical at $T_a=+25^{\circ}\text{C}$, resistive load, nominal input voltage, rated output current unless otherwise noted.
2. Ripple & Noise measurement bandwidth is 0–20 MHz.
3. These power converters require a minimum output loading to maintain specified regulation.
4. Operation under no-load conditions will not damage these modules; however, they may not meet all specifications listed.
5. All DC/DC converters should be externally fused at the front end for protection.
6. Other input and output voltage may be available, please contact factory.
7. Specifications subject to change without notice.

Block Diagram

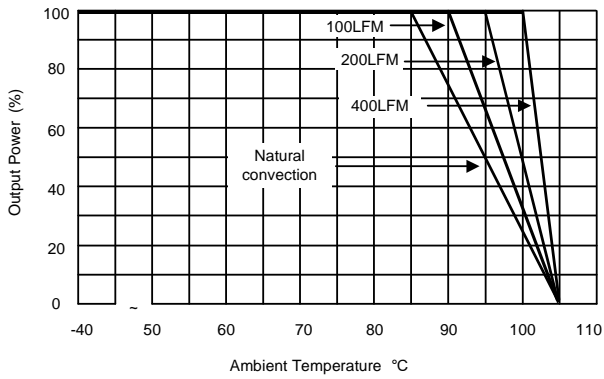




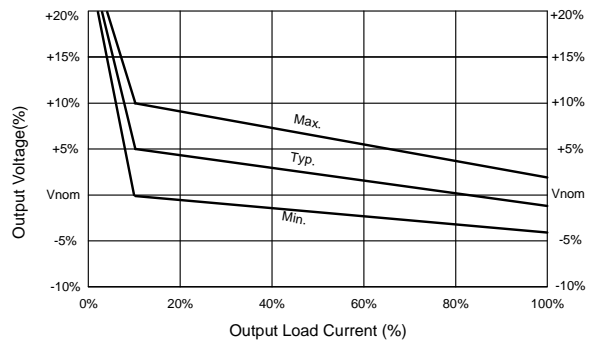
Efficiency vs Input Voltage (MA01-24S05H)



Efficiency vs Output Load (MA01-24S05H)



Derating Curve



Tolerance Envelopes Graph

MA01H Series

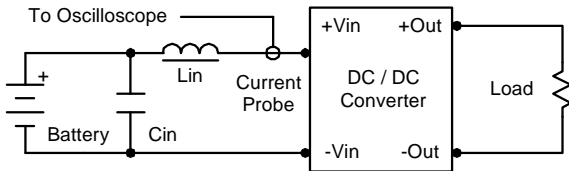
Test Configurations

Input Reflected-Ripple Current Test Setup

Input reflected-ripple current is measured with an inductor L_{in} (10 μ H) and C_{in} (1 μ F, ESR < 1.0 Ω at 100 KHz) to simulate source impedance.

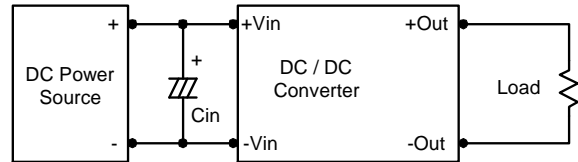
Capacitor C_{in} offsets possible battery impedance.

Current ripple is measured at the input terminals of the module, measurement bandwidth is 0–500 KHz.



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.

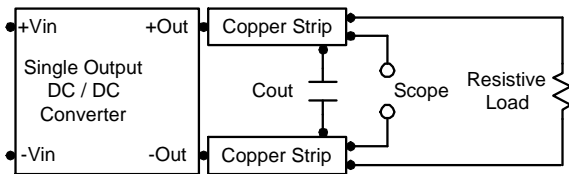
Capacitor mounted close to the power module helps ensure stability of the unit, it is recommended to use a good quality low Equivalent Series Resistance (ESR < 1.0 Ω at 100 KHz) capacitor of a 2.2 μ F for the 5V input devices, a 1.0 μ F for the 12V input devices and a 0.47 μ F for the 24V devices.



Peak-to-Peak Output Noise Measurement Test

Use a C_{out} 0.33 μ F ceramic capacitor.

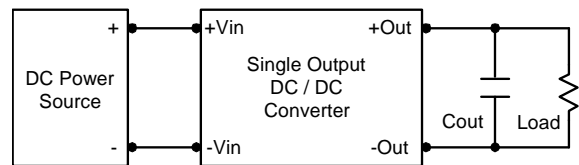
Scope measurement should be made by using a BNC socket, measurement bandwidth is 0–20 MHz. Position the load between 50 mm and 75 mm from the DC/DC Converter.



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 1.0 μ F capacitors at the output.



Design & Feature Considerations

Maximum Capacitive Load

The MA01H 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 220 μ F maximum capacitive load for devices.

The maximum capacitance can be found in the data sheet.

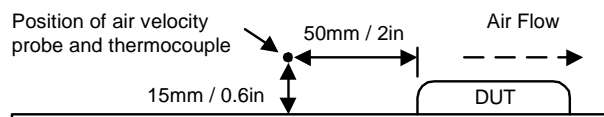
Input Source Impedance

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.

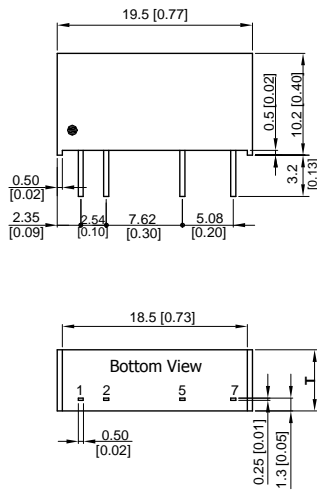
Thermal Considerations

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 90°C.

The derating curves are determined from measurements obtained in an experimental apparatus.



Mechanical Dimensions



T=6.1 [0.24] for 5V & 12V Input Models

T=7.1 [0.28] for 24V Input Models

Tolerance	Millimeters	Inches
	X.X±0.25	X.XX±0.01
	X.XX±0.13	X.XXX±0.005
Pin	±0.05	±0.002

Physical Characteristics

Case Size (5V & 12V Input) : 19.5×6.1×10.2 mm
0.77×0.24×0.40 inches

Case Size (24V Input) : 19.5×7.1×10.2 mm
0.77×0.28×0.40 inches

Case Material : Non-Conductive Black Plastic

Weight : 2.2g (5 & 12V Input)
2.6g (24V Input)

Pin Connections

Pin	Function
1	+Vin
2	-Vin
5	-Vout
7	+Vout