FEATURES

NEW

- ▶ **Industrial Standard SIP-7 Package**
- ▶ **Unregulated Output Voltage**
- ▶ **I/O Isolation 4000VAC with Reinforced Insulation, rated for 300Vrms Working Voltage**
- ▶ **Low I/O Leakage Current < 2μA**
- ▶ **Operating Ambient Temp. Range -40℃ to 95℃**
- ▶ **Short Circuit Protection**
- ▶ **Medical EMC Standard with 4th Edition of EMI EN 55011 and EMS EN 60601-1-2 Approved**
- ▶ **Medical Safety with 2xMOPP per 3rd Edition of IEC/EN 60601-1 & ANSI/AAMI ES60601-1 Approved with CE Marking**

PRODUCT OVERVIEW

The MINMAX MAU01M series is a new range of medical approved 1W isolated DC-DC converter within encapsulated SIP-7 package which specifically design for medical applications. There are 9 models available for input voltage of 5, 12, 24VDC and 5, 12, 15VDC output. The I/O isolation is specified for 4000VAC with reinforced insulation, which rated for 300Vrms working voltage. Further features include short circuit protection, low I/O leakage current 2μA max and operating ambient temp. range by -40°C to 95°C without derating. MAU01M series conform to 4th edition medical EMC standard, medical safety approval with 2xMOPP (Means Of Patient Protection) per 3rd edition of IEC/EN 60601-1 & ANSI/AAMI ES 60601-1. The MAU01M series offer the best solution for demanding applications in medical instrument requesting a certified supplementary and reinforced insulation system to comply with latest medical safety approval for 2xMOPP requirement.

Model Selection Guide

Model Number	Input Voltage (Range)	Output Voltage	Output Current		Input Current		Max. capacitive Load	Efficiency (typ.)
			Max.	Min.	@Max. Load	@No Load		@Max. Load
	VDC	VDC	mA	mA	mA(typ.)	mA(typ.)	μF	%
MAU01-05S05M	5 (4.5 ~ 5.5)	5	200	4	253	50	220	79
MAU01-05S12M		12	84	1.68	252			80
MAU01-05S15M		15	68	1.36	252			81
MAU01-12S05M	12 (10.8 ~ 13.2)	5	200	4	105	35	220	79
MAU01-12S12M		12	84	1.68	104			81
MAU01-12S15M		15	68	1.36	108			79
MAU01-24S05M	24 (21.6 ~ 26.4)	5	200	4	55	20	220	76
MAU01-24S12M		12	84	1.68	53			79
MAU01-24S15M		15	68	1.36	54			79

* Min. Output Current for Lower Load Regulation

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	
Input Surge Voltage (1 sec. max.)	5V Input Models	-0.7	---	9	
	12V Input Models	-0.7	---	18	
	24V Input Models	-0.7	---	30	
Input Filter	All Models	Internal Capacitor			

Output Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Output Voltage Setting Accuracy		---	±1.0	±3.0	%Vnom.
Line Regulation	For Vin Change of 1%	---	±1.2	±1.5	%
Load Regulation	Io=10% to 100%	---	---	±10	%
Ripple & Noise	0-20 MHz Bandwidth	---	---	75	mV P-P
Temperature Coefficient		---	±0.01	±0.02	%/℃
Short Circuit Protection	Continuous, Automatic Recovery				

Isolation, Safety Standards

Parameter	Conditions	Min.	Typ.	Max.	Unit
I/O Isolation Voltage	60 Seconds Reinforced insulation, rated for 300Vrms working voltage	4000	---	---	VAC
Leakage Current	240VAC, 60Hz	---	---	2	μA
I/O Isolation Resistance	500 VDC	10	---	---	GΩ
I/O Isolation Capacitance	100kHz, 1V	---	20	---	pF
Safety Standards	ANSI/AAMI ES 60601-1, CAN/CSA-C22.2 No. 60601-1				
	IEC/EN 60601-1 3rd Edition 2xMOPP				
Safety Approvals	ANSI/AAMI ES 60601-1 2xMOPP recognition (UL certificate), IEC/EN 60601-1 3rd Edition (CB-report)				

General Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Switching Frequency		---	60	---	kHz
MTBF (calculated)	MIL-HDBK-217F@25℃, Ground Benign	4,373,058	---	---	Hours

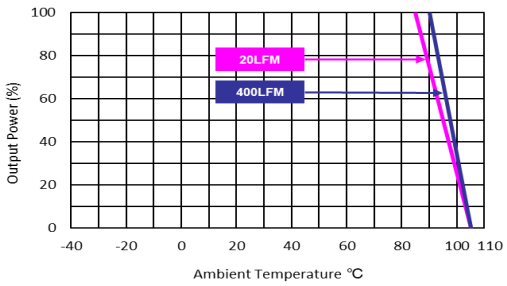
EMC Specifications

Parameter	Standards & Level			Performance
EMI	Conduction	EN 55011	With external components	Class A(5)
	Radiation			
EMS	EN 60601-1-2 4th			
	ESD	EN 61000-4-2 Air ± 15kV , Contact ± 8kV		A
	Radiated immunity	EN 61000-4-3 10V/m		A
	Fast transient (6)	EN 61000-4-4 ±2kV		A
	Surge (6)	EN 61000-4-5 ±1kV		A
	Conducted immunity	EN 61000-4-6 10Vrms		A
	PFMF	EN 61000-4-8 30A/m		A

Environmental Specifications

Parameter	Min.	Max.	Unit
Operating Ambient Temperature Range (See Power Derating Curve)	-40	+95	℃
Case Temperature	---	+105	℃
Storage Temperature Range	-50	+125	℃
Humidity (non condensing)	---	95	% rel. H
Lead Temperature (1.5mm from case for 10Sec.)	---	260	℃

Power Derating Curve

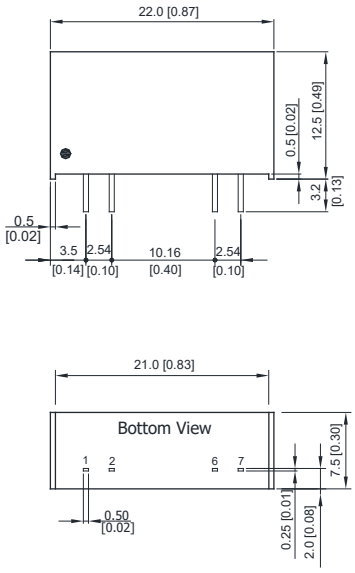


Notes

1 Specifications typical at Ta=+25°C, resistive load, nominal input voltage and rated output current unless otherwise noted.
2 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.
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 To meet EN 55011 Class A an external filter, please contact MINMAX.
6 To meet EN 61000-4-4 & EN 61000-4-5 an external capacitor across the input pins is required, please contact MINMAX.
7 Specifications are subject to change without notice.
8 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 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 Connection

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

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

Physical Characteristics

Case Size	:	22.0x7.5x12.5mm (0.87x0.30x0.49 inches)
Case Material	:	Non-Conductive Black Plastic (flammability to UL 94V-0 rated)
Pin Material	:	Alloy 42
Weight	:	4.1g