

**FEATURES**

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

**NEW**

**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 leakage current 2μA max. and operating ambient temp. range by -40°C to 95°C without derating. MAU01M series conform to 4<sup>th</sup> edition medical EMC standard, medical safety approval with 2xMOPP (Means Of Patient Protection) per 3<sup>rd</sup> edition of IEC/EN 60601-1 & ANSI/AAMI ES 60601-1.

The MAU01M series offer a economical solution for demanding application 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) VDC	Output Voltage VDC	Output Current		Input Current		Max. capacitive Load μF	Efficiency (typ.)
			Max.	Min.	@Max. Load	@No Load		@Max. Load
			mA	mA	mA(typ.)	mA(typ.)		%
<b>MAU01-05S05M</b>	5 (4.5 ~ 5.5)	5	200	4	253	50	220	79
<b>MAU01-05S12M</b>		12	84	1.68	252			80
<b>MAU01-05S15M</b>		15	68	1.36	252			81
<b>MAU01-12S05M</b>	12 (10.8 ~ 13.2)	5	200	4	105	35	220	79
<b>MAU01-12S12M</b>		12	84	1.68	104			81
<b>MAU01-12S15M</b>		15	68	1.36	108			79
<b>MAU01-24S05M</b>	24 (21.6 ~ 26.4)	5	200	4	55	20	220	76
<b>MAU01-24S12M</b>		12	84	1.68	53			79
<b>MAU01-24S15M</b>		15	68	1.36	54			79

**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 <sub>P-P</sub>
Temperature Coefficient		---	±0.01	±0.02	%/°C
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	---	---	VACrms
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 3 <sup>rd</sup> Edition 2xMOPP				
Safety Approvals	ANSI/AAMI ES 60601-1 2xMOPP recognition (UL certificate), IEC/EN 60601-1 3 <sup>rd</sup> Edition (CB-report)				

**General Specifications**

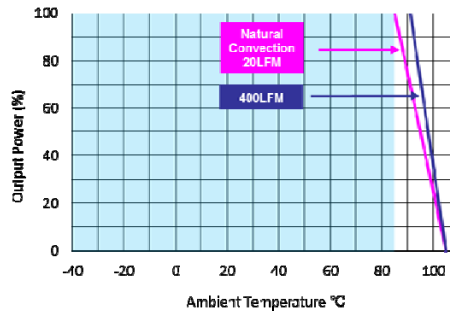
Parameter	Conditions	Min.	Typ.	Max.	Unit
Switching Frequency		---	60	---	kHz
MTBF (calculated)	MIL-HDBK-217F@25°C, Ground Benign	4,373,058	---	---	Hours

**Environmental Specifications**

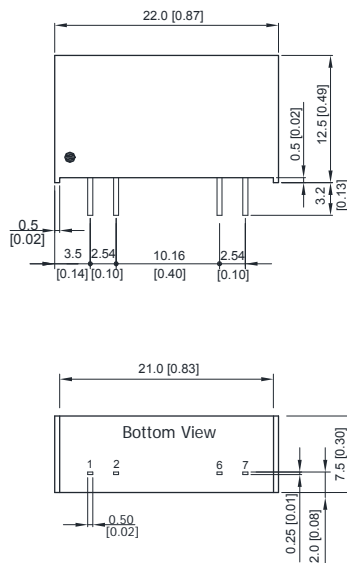
Parameter	Conditions	Min.	Max.	Unit
Operating Ambient Temperature Range (See Power Derating Curve)	Natural Convection	-40	+95	°C
Case Temperature		---	+105	°C
Storage Temperature Range		-50	+125	°C
Humidity (non condensing)		---	95	% rel. H
Cooling	Natural Convection			
Lead Temperature (1.5mm from case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

**EMC Specifications**

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

**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 factory.
- 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 That "natural convection" is about 20LFM but is not equal to still air (0 LFM).
- 8 Specifications are subject to change without notice.

**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	: Tinned Copper
Weight	: 4.1g