FEATURES

- ▶ **Industrial Standard SIP-7 Package**
- ▶ **Unregulated Output Voltage**
- ▶ **I/O Isolation 3000 VDC**
- ▶ **Operating Ambient Temp. Range -40℃ to +90℃**
- ▶ **UL/cUL/IEC/EN 60950-1 Safety Approval**

CSA 60950-1 CB Scheme

PRODUCT OVERVIEW

The MINMAX MAU200 series is a range of 1W DC-DC converters in a small SIP Package featuring high I/O isolation of 3000VDC. An excellent efficiency allows an operating temperature range of –40°C to +90°C. These converters offer an economical solution for many applications where a voltage has to be isolated i.e for noise reduction, ground loop elimination, digital interfaces or for board level power distribution where a higher I/O-isolation is required.

Model Selection Guide

Model Number	Input Voltage (Range)	Output Voltage	Output Current	Input Current		Load Regulation	Max. capacitive Load	Efficiency (typ.)
			Max.	@Max. Load	@No Load			@Max. Load
	VDC	VDC	mA	mA(typ.)	mA(typ.)	% (max.)	μF	%
MAU201	5 (4.5 ~ 5.5)	3.3	260	235	30	10	220	73
MAU202		5	200	281		10		71
MAU203		9	110	260		8		76
MAU204		12	84	258		7		78
MAU205		15	67	258		7		78
MAU206		±5	±100	278		10	100#	72
MAU207		±9	±56	262		8		77
MAU208		±12	±42	258		7		78
MAU209		±15	±34	258		7		79
MAU211	12 (10.8 ~ 13.2)	3.3	260	96	12	8	220	74
MAU212		5	200	114		8		73
MAU213		9	110	106		5		78
MAU214		12	84	105		5		80
MAU215		15	67	104		5		80
MAU216		±5	±100	113		8	100#	74
MAU217		±9	±56	106		5		79
MAU218		±12	±42	104		5		81
MAU219		±15	±34	105		5		81
MAU221	24 (21.6 ~ 26.4)	3.3	260	49	7	8	220	73
MAU222		5	200	59		8		71
MAU223		9	110	54		5		76
MAU224		12	84	54		5		78
MAU225		15	67	53		5		79
MAU226		±5	±100	58		8	100#	72
MAU227		±9	±56	55		5		76
MAU228		±12	±42	53		5		79
MAU229		±15	±34	53		5		80

For each output

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.
Output Voltage Balance	Dual Output, Balanced Loads	---	±0.1	±1.0	%
Line Regulation	For Vin Change of 1%	---	±1.2	±1.5	%
Load Regulation	Io=20% to 100%	See Model Selection Guide (Operation at lower load will not damage the converter, but it may not meet all specifications)			
Ripple & Noise	0-20 MHz Bandwidth	---	65	100	mV_{P-P}
Temperature Coefficient		---	±0.01	±0.02	%/℃
Short Circuit Protection	0.5 Second Max., Automatic Recovery				

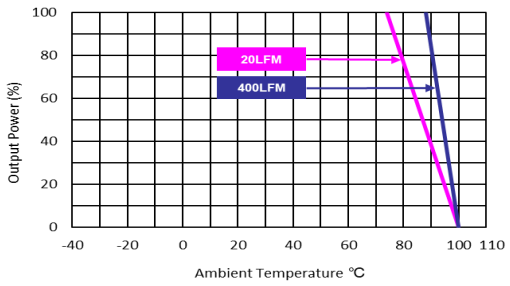
General Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
I/O Isolation Voltage	60 Seconds	3000	---	---	VDC
I/O Isolation Resistance	500 VDC	10	---	---	GΩ
I/O Isolation Capacitance	100kHz, 1V	---	60	100	pF
Switching Frequency		70	100	120	kHz
MTBF (calculated)	MIL-HDBK-217F@25℃, Ground Benign	2,000,000			Hours
Safety Approvals	UL/cUL 60950-1 recognition (CSA certificate), IEC/EN 60950-1(CB-report)				

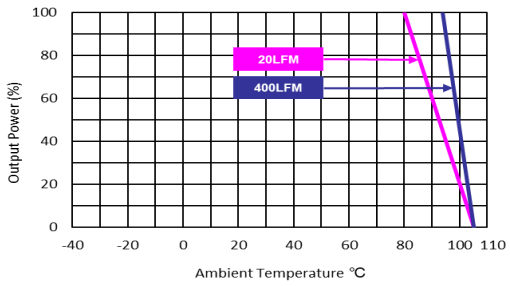
Environmental Specifications

Parameter	Min.	Max.	Unit
Operating Ambient Temperature Range Nominal Vin, Load 100% Inom. (for Power Derating see relative Derating Curves)	-40	+90	℃
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



3.3Vo, 5Vo, ±5Vo Output Models



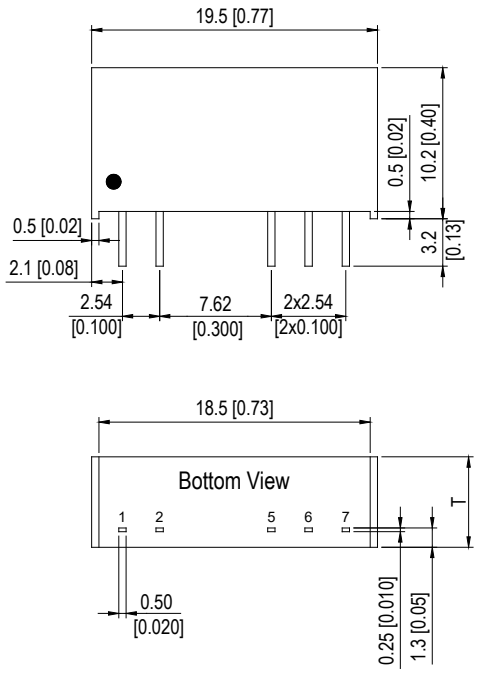
9Vo, 12Vo, 15Vo, ±9Vo, ±12Vo, ±15Vo Output Models

Notes

1 Specifications typical at Ta=+25℃, 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 Specifications are subject to change without notice.
6 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
1	+Vin	+Vin
2	-Vin	-Vin
5	-Vout	-Vout
6	No Pin	Common
7	+Vout	+Vout

T: 6.1mm(0.24 inch) for 5V&12V Input Models
T: 7.1mm(0.28 inch) for 24V Input Models

- 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)

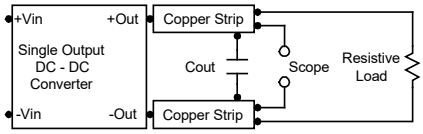
Physical Characteristics

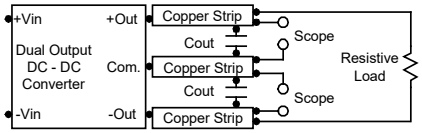
Case Size (5V&12V Input)	:	19.5x6.1x10.2mm (0.77x0.24x0.40 inches)
Case Size (24V Input)	:	19.5x7.1x10.2mm (0.77x0.28x0.40 inches)
Case Material	:	Plastic resin (flammability to UL 94V-0 rated)
Pin Material	:	Alloy 42
Weight (5V&12V Input)	:	2.2g
Weight (24V Input)	:	2.6g

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.





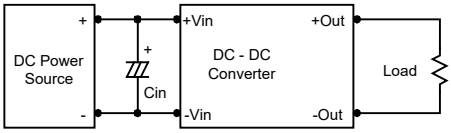
Technical Notes

Maximum Capacitive Load

The MAU200 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 100μF maximum capacitive load for dual outputs and 220μF capacitive load for single outputs. The maximum capacitance can be found in the data sheet.

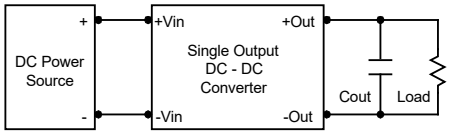
Input Source Impedance

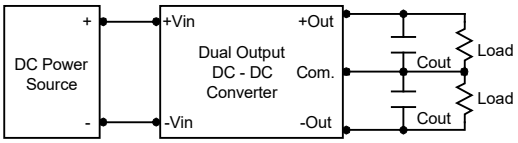
The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module. In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure startup.
Capacitor mounted close to the power module helps ensure stability of the unit, it is recommended 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 105°C. The derating curves are determined from measurements obtained in a test setup.