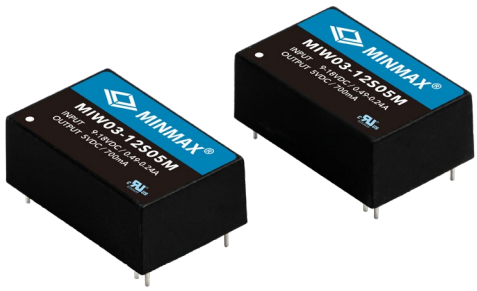
FEATURES

- **Industrial Standard DIP-24 Package**
- **Wide 2:1 Input Voltage Range**
- **Fully Regulated Output Voltage**
- **I/O Isolation 5000VAC with Reinforced Insulation, rated for 250Vrms Working Voltage**
- **Creepage & Clearance Distance meet 8mm**
- **Low I/O Leakage Current < 2μA**
- **Operating Ambient Temp. Range -40℃ to 96℃**
- **No Min. Load Requiremnt**
- **Under-Voltage, Overload/Voltage and Short Circuit Protection**
- **Conducted EMI EN 55011 Class A Approved**
- **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 MIW03M series is a new range of high performance 3.5W medical approved DC-DC converter within encapsulated DIP-24 package which specifically design for medical applications. There are 21 models available for input voltage of 5, 12, 24, 48VDC with wide 2:1 input range and fixed output voltage. The I/O isolation is specified for 5000VAC with reinforced insulation, which rated for 250Vrms working voltage. Further features include under-voltage, overload, over voltage, short circuit protection, no min. load requirement, conducted EMI EN 55011 class A approved, low I/O leakage current 2μA max. and operating ambient temp. range by -40°C to 96°C without derating by high efficiency up to 87%. MIW03M series conform to 4th edition medical EMC standard, medical safety with 2xMOPP (Means Of Patient Protection) per 3rd edition of IEC/EN 60601-1 & ANSI/AAMI ES 60601-1 approved and 8mm creepage and clearance. The MIW03M 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		Over Voltage Protection	Max. capacitive Load	Efficiency (typ.)
			Max.	@Max. Load	@No Load			@Max. Load
	VDC	VDC	mA	mA(typ.)	mA(typ.)	VDC	μF	%
MIW03-05S05M	5 (4.5 ~ 9)	5	700	843	20	6.2	750	83
MIW03-05S058M		5.8	600	839		6.2	560	83
MIW03-05S12M		12	290	829		15	130	84
MIW03-05S15M		15	235	839		18	100	84
MIW03-05D12M		±12	±145	829	35	±15	75#	84
MIW03-05D15M		±15	±115	821		±18	56#	84
MIW03-12S05M	12 (9 ~ 18)	5	700	351	8	6.2	750	83
MIW03-12S12M		12	290	333		15	130	87
MIW03-12S15M		15	235	338		18	100	87
MIW03-12D12M		±12	±145	333	13	±15	75#	87
MIW03-12D15M		±15	±115	330		±18	56#	87
MIW03-24S05M	24 (18 ~ 36)	5	700	176	6	6.2	750	83
MIW03-24S12M		12	290	169		15	130	86
MIW03-24S15M		15	235	169		18	100	87
MIW03-24D12M		±12	±145	167		±15	75#	87
MIW03-24D15M		±15	±115	167		±18	56#	86
MIW03-48S05M	48 (36 ~75)	5	700	88	4	6.2	750	83
MIW03-48S12M		12	290	84		15	130	86
MIW03-48S15M		15	235	86		18	100	85
MIW03-48D12M		±12	±145	86		±15	75#	84
MIW03-48D15M		±15	±115	86		±18	56#	84

For each output

Input Specifications

Parameter	Conditions / Model	Min.	Typ.	Max.	Unit
Input Surge Voltage (1 sec. max.)	5V Input Models	-0.7	---	15	VDC
	12V Input Models	-0.7	---	25	
	24V Input Models	-0.7	---	50	
	48V Input Models	-0.7	---	100	
Start-Up Threshold Voltage	5V Input Models	---	---	4.5	
	12V Input Models	---	---	9	
	24V Input Models	---	---	18	
	48V Input Models	---	---	36	
Under Voltage Shutdown	5V Input Models	---	4	---	
	12V Input Models	---	8	---	
	24V Input Models	---	16	---	
	48V Input Models	---	34	---	
Start Up Time (Power On)	Nominal Vin and Constant Resistive Load	---	---	30	ms
Input Filter	All Models	Internal Pi Type			

Output Specifications

Parameter	Conditions		Min.	Typ.	Max.	Unit
Output Voltage Setting Accuracy			---	---	±1.0	%Vnom.
Output Voltage Balance	Dual Output, Balanced Loads		---	±0.5	±2.0	%
Line Regulation	Vin=Min. to Max. @Full Load		---	---	±0.5	%
Load Regulation	Io=0% to 100%		---	---	±0.5	%
Load Cross Regulation (Dual Output)	Asymmetrical Load 25%/100% Full Load		---	---	±5.0	%
Minimum Load	No minimum Load Requirement					
Ripple & Noise	0-20 MHz Bandwidth	Measured with a 1μF MLCC	---	---	70	mV_{P-P}
Transient Recovery Time	25% Load Step Change		---	300	---	μsec
Transient Response Deviation			---	±3	±5	%
Temperature Coefficient			---	±0.01	±0.02	%/°C
Over Load Protection			---	150	---	%
Short Circuit Protection	Continuous, Automatic Recovery (Hiccup Mode 0.5Hz typ.)					

Isolation, Safety Standards

Parameter	Conditions	Min.	Typ.	Max.	Unit
I/O Isolation Voltage	60 Seconds Reinforced insulation, rated for 250Vrms working voltage	5000	---	---	VAC
Leakage Current	240VAC, 60Hz	---	---	2	μA
I/O Isolation Resistance	500 VDC	10	---	---	GΩ
I/O Isolation Capacitance	100kHz, 1V	---	---	40	pF
Safety Standards	ANSI/AAMI ES60601-1, CAN/CSA-C22.2 No. 60601-1				
	IEC/EN 60601-1 3rd Edition 2xMOPP				
Safety Approvals	ANSI/AAMI ES60601-1 2xMOPP recognition(UL certificate), IEC/EN 60601-1 3rd Edition(CB-report)				

General Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Switching Frequency		---	330	---	kHz
MTBF(calculated)	MIL-HDBK-217F@25°C, Ground Benign	5,815,448	---	---	Hours

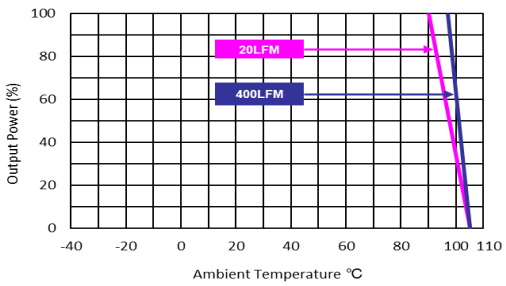
EMC Specifications

Parameter	Standards & Level			Performance
EMI(5)	Conduction	EN 55011	Without external components	Class A
	Radiation		With external components	
EMS(5)	EN 60601-1-2 4th			
	ESD	Direct discharge	Indirect discharge HCP & VCP	A
		EN 61000-4-2 Air ± 15kV	Contact ± 8kV	
	Radiated immunity	EN 61000-4-3 10V/m		A
	Fast transient	EN 61000-4-4 ±2kV		A
	Surge	EN 61000-4-5 ±2kV		A
	Conducted immunity	EN 61000-4-6 10Vrms		A
	PFMF	EN 61000-4-8 100A/m		A

Environmental Specifications

Parameter	Min.	Max.	Unit
Operating Ambient Temperature Range (See Power Derating Curve)	-40	+96	℃
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

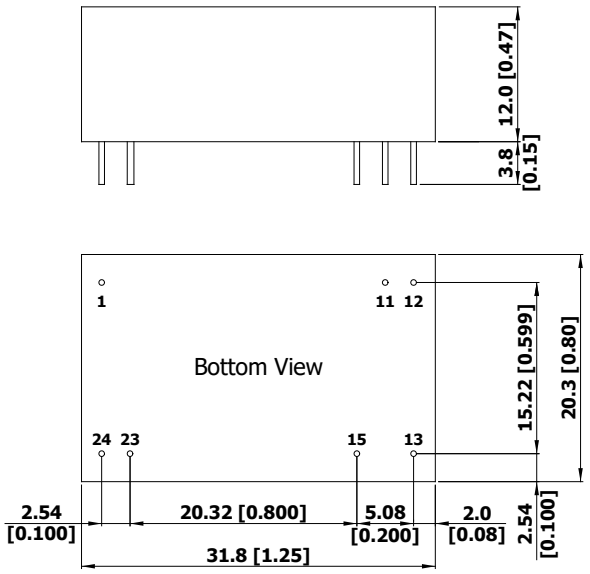


Notes

1. Specifications typical at Ta=+25℃, resistive load, nominal input voltage and rated output current unless otherwise noted.
2. Transient recovery time is measured to within 1% error band for a step change in output load of 75% to 100%.
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. The external components might be required to meet EMI/EMS standard for some of test items. Please contact MINMAX for the solution in detail.
6. Specifications are subject to change without notice.

Package Specifications

Mechanical Dimensions



Pin Connections

Pin	Single Output	Dual Output	Diameter mm (inches)
1	+Vin	+Vin	Ø 0.6 [0.02]
11	No Pin	Common	Ø 0.6 [0.02]
12	-Vout	No Pin	Ø 0.6 [0.02]
13	+Vout	-Vout	Ø 0.6 [0.02]
15	No Pin	+Vout	Ø 0.6 [0.02]
23	-Vin	-Vin	Ø 0.6 [0.02]
24	-Vin	-Vin	Ø 0.6 [0.02]

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

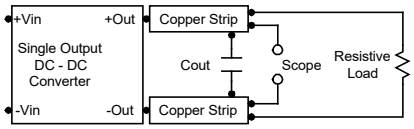
Physical Characteristics

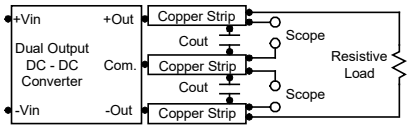
Case Size	:	31.8x20.3x12.0mm (1.25x0.80x0.47 inches)
Case Material	:	Plastic resin (flammability to UL 94V-0 rated)
Pin Material	:	Copper Alloy
Weight	:	15.5g

Test Setup

Peak-to-Peak Output Noise Measurement Test

Refer to the output specifications or add 4.7μF capacitor if the output specifications undefine Cout. 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

Overload Protection

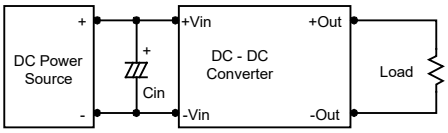
To provide hiccup mode protection in a fault (output overload) condition, the unit is equipped with internal current limiting circuitry and can endure overload for an unlimited duration.

Overvoltage Protection

The output overvoltage clamp consists of control circuitry, which is independent of the primary regulation loop, that monitors the voltage on the output terminals. The control loop of the clamp has a higher voltage set point than the primary loop. This provides a redundant voltage control that reduces the risk of output overvoltage. The OVP level can be found in the output data.

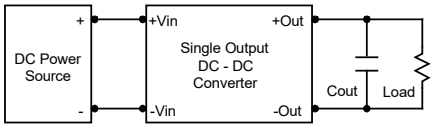
Input Source Impedance

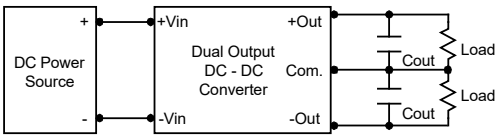
The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module. In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor on the input to insure startup. By using a good quality low Equivalent Series Resistance (ESR < 1.0Ω at 100 kHz) capacitor of a 22μF for the 5V input devices and a 10μF for the 12V input devices and a 4.7μF for the 24V input devices and a 2.2μF for the 48V devices, capacitor mounted close to the power module helps ensure stability of the unit.



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 1μF capacitors at the output.





Maximum Capacitive Load

The MIW03M series has limitation of maximum connected capacitance on the output. The power module may operate in current limiting mode during start-up, affecting the ramp-up and the startup time. Connect capacitors at the point of load for best performance. The maximum capacitance can be found in the data sheet.

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.