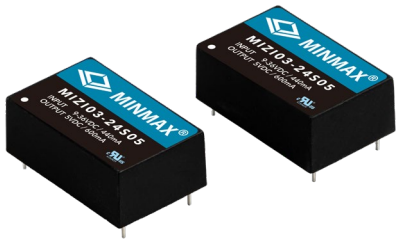
FEATURES



- **Industrial Standard DIP-24 Package**
- **Ultra-wide Input Ranges 9-36VDC, 18-75VDC, 40-160VDC**
- **I/O Isolation 3000VAC with Reinforced Insulation**
- **Wide Operating Ambient Temp. Range**
- **No Min. Load Requirement**
- **Under-Voltage, Overload and Short Circuit Protection**
- **EMI Emission EN 55032/11 Class A Approved**
- **Vibration and Shock/Bump Test EN 61373 Approved**
- **Cooling, Dry & Damp Heat Test IEC/EN 60068-2-1, 2, 30 Approved**
- **Railway EMC Standard EN 50121-3-2 Approved**
- **Railway Certified EN 50155 (IEC60571) Approved**
- **Fire Protection Test EN 45545-2 Approved**
- **UL/cUL/IEC/EN 62368-1, UL/cUL 60950-1 Safety Approval & CE Marking**

UL 62368-1
UL 60950-1

PRODUCT OVERVIEW

The MINMAX MIZI03 series is a new range of railway approved 3W isolated DC-DC converter within encapsulated DIP-24 package which specifically design for railway applications. There are 15 models available for the railway system of multi-input voltage range by 24(9~36)VDC, 48(18~75)VDC, 72/110(40~160)VDC and fixed output voltage regulation.

Further features include high I/O isolation rated for 3000VAC with reinforced insulation, overload, under-voltage, short circuit protection and EMI emission EN55032 Class A approved as well. MIZI03 series conform to vibration and shock/bump test EN 61373, cooling, dry and damp heat test IEC/EN 60068-2-1,2,30 and railway EMC standard EN 50121-3-2 and complies also with Railway Certification EN 50155 (IEC 60571) and EN 45545-2 for fire protection test.

MIZI03 series offer an highly reliable solution for critical applications in railway systems, battery-powered equipment, measure instrumentation and many critical applications.

Model Selection Guide

Model Number	Input Voltage (Range)	Output Voltage	Output Current	Input Current		Max. capacitive Load	Efficiency (typ.)
			Max.	@Max. Load	@No Load		@Max. Load
	VDC	VDC	mA	mA(typ.)	mA(typ.)	μF	%
MIZI03-24S05	24 (9 ~ 36)	5	600	156	9	680	80
MIZI03-24S12		12	250	149		330	84
MIZI03-24S15		15	200	147		220	85
MIZI03-24D12		±12	±125	151		220#	83
MIZI03-24D15		±15	±100	149		220#	84
MIZI03-48S05	48 (18 ~ 75)	5	600	78	5	680	80
MIZI03-48S12		12	250	75		330	83
MIZI03-48S15		15	200	74		220	84
MIZI03-48D12		±12	±125	75		220#	83
MIZI03-48D15		±15	±100	75		220#	83
MIZI03-110S05	110 (40 ~ 160)	5	600	34	3	680	80
MIZI03-110S12		12	250	32		330	84
MIZI03-110S15		15	200	32		220	84
MIZI03-110D12		±12	±125	33		220#	83
MIZI03-110D15		±15	±100	32		220#	85

For each output

Input Specifications

Parameter	Model	Min.	Typ.	Max.	Unit
Input Surge Voltage (1 sec. max.)	24V Input Models	-0.7	---	50	VDC
	48V Input Models	-0.7	---	100	
	110V Input Models	-0.7	---	170	
Start-Up Threshold Voltage	24V Input Models	---	---	9	
	48V Input Models	---	---	18	
	110V Input Models	---	---	40	
Under Voltage Shutdown	24V Input Models	---	7.5	---	
	48V Input Models	---	16	---	
	110V Input Models	---	37	---	
Start Up Time (Power On)	Nominal Vin and Constant Resistive Load	---	---	60	ms
Input Filter	All Models	Internal Pi Type			

Output Specifications

Parameter	Conditions / Model			Min.	Typ.	Max.	Unit
Output Voltage Setting Accuracy				---	---	±1.0	%
Output Voltage Balance	Dual Output, Balanced Loads			---	±1	±2.0	%
Line Regulation	Vin=Min. to Max. @Full Load			---	---	±0.5	%
Load Regulation	Io=0% to 100%			---	---	±1.0	%
Minimum Load	No minimum Load Requirement						
Load Cross Regulation (Dual Output Models)	Asymmetrical Load 25/100% Full Load			---	---	±5.0	%
Ripple & Noise	0-20 MHz Bandwidth	5Vo	Measured with a 10μF/25V MLCC	---	50	---	mV P-P
		12Vo, 15Vo ±12Vo, ±15Vo		---	75	---	mV P-P
Transient Recovery Time	25% Load Step Change(2)			---	---	500	μs
Transient Response Deviation				---	±3	±5	%
Temperature Coefficient				---	---	±0.02	%/℃
Over Load Protection	Hiccup			---	150	---	%
Short Circuit Protection	Continuous, Automatic Recovery (Hiccup Mode 0.7Hz typ.)						

General Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
I/O Isolation Voltage	Reinforced Insulation, Rated For 60 Seconds	3000	---	---	VAC
I/O Isolation Resistance	500 VDC	1000	---	---	MΩ
I/O Isolation Capacitance	100kHz, 1V	---	1500	---	pF
Switching Frequency	110Vin Models	---	170	---	kHz
	Other Models	---	285	---	kHz
MTBF(calculated)	MIL-HDBK-217F@25℃, Ground Benign	3,360,038	---	---	Hours
Safety Approval	UL/cUL 60950-1 recognition(UL certificate), EN 50155, IEC 60571				
	UL/cUL 62368-1 recognition(UL certificate), IEC/EN 62368-1(CB-report)				

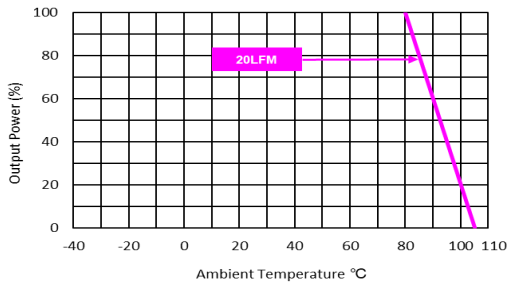
EMC Specifications

Parameter	Standards & Level			Performance
General	Compliance with EN 50121-3-2 Railway Applications			
EMI	Conduction	EN 55032/11	Without external components	Class A
	Radiation			
EMS(4)	EN 55035			
	ESD	EN 61000-4-2 Air ± 8kV, Contact ± 6kV		A
	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, 1000A/m For 1 Second		A

Environmental Specifications

Parameter	Conditions	Min.	Max.	Unit
Operating Ambient Temperature Range (For Power Derating see relative Derating Curve)		-40	+92	℃
Case Temperature		---	+105	℃
Storage Temperature Range		-50	+125	℃
Cooling Test	Compliance to IEC/EN 60068-2-1			
Dry Heat	Compliance to IEC/EN 60068-2-2			
Damp Heat	Compliance to IEC/EN 60068-2-30			
Shock & Vibration Test	Compliance to IEC/EN 61373			
Humidity (non condensing)		---	95	% rel. H
Lead Temperature (1.5mm from case for 10Sec.)		---	260	℃

Power Derating Curve

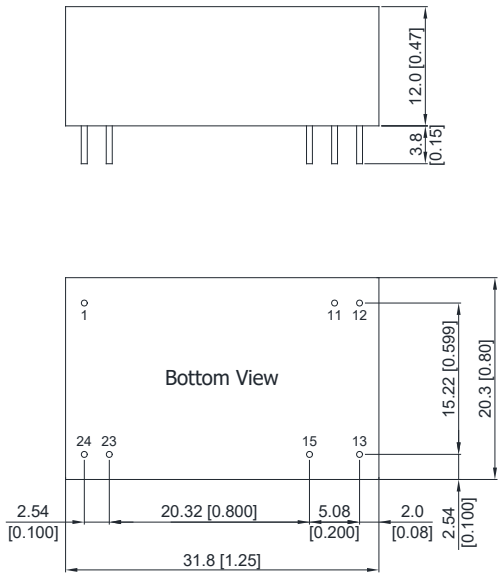


Notes

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 The external components might be required to meet EMS standard for some of test items. Please contact MINMAX for the solution in detail.
5 Other input and output voltage may be available, please contact MINMAX.
6 Specifications are subject to change without notice.
7 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	Diameter mm (inches)
1	+Vin	+Vin	Ø 0.6 [0.024]
11	No Pin	Common	Ø 0.6 [0.024]
12	-Vout	No Pin	Ø 0.6 [0.024]
13	+Vout	-Vout	Ø 0.6 [0.024]
15	No Pin	+Vout	Ø 0.6 [0.024]
23	-Vin	-Vin	Ø 0.6 [0.024]
24	-Vin	-Vin	Ø 0.6 [0.024]

- All dimensions in mm (inches)
- Tolerance: X.X±0.5 (X.XX±0.02)
  X.XX±0.25 (X.XXX±±0.010)
- Pin diameter tolerance: X.X±0.05 (X.XX±0.002)

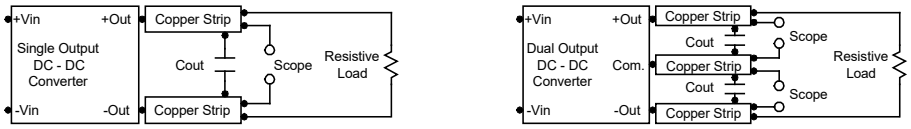
Physical Characteristics

Case Size	:	31.8x20.3x12.0mm (1.25x0.8x0.47 inches)
Case Material	:	Plastic resin (flammability to UL 94V-0 rated)
Pin Material	:	Copper Alloy
Potting Material	:	Silicone (UL94-V0)
Weight	:	15.4g

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.



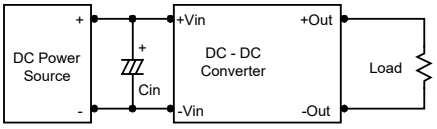
Technical Notes

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.

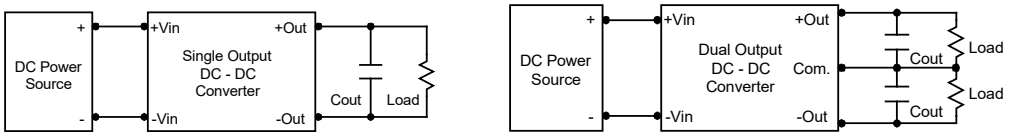
Input Source Impedance

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 4.7μF for the 24V input devices, a 2.2μF for the 48V devices and a 1μF for the 110V devices.



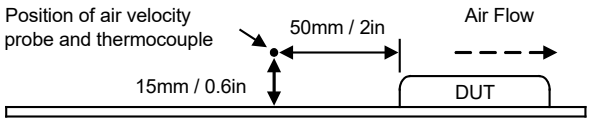
Output Ripple Reduction

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 4.7μF capacitors at the output.



Maximum Capacitive Load

The MIZI03 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. 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.