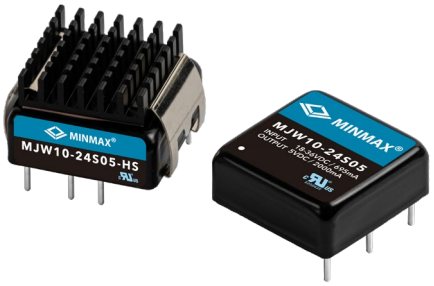
FEATURES

- ▶ **Industrial Standard 1" x 1" Package**
- ▶ **Wide 2:1 Input Voltage Range**
- ▶ **Fully Regulated Output Voltage**
- ▶ **I/O Isolation 1500VDC**
- ▶ **Operating Ambient Temp. Range -40℃ to +80℃**
- ▶ **Low No Load Power Consumption**
- ▶ **No Min. Load Requirement**
- ▶ **Under-voltage, Overload and Short Circuit Protection**
- ▶ **Remote On/Off Control (option)**
- ▶ **Shielded Metal Case with Insulated Baseplate**
- ▶ **Conducted EMI EN 55032 Class A Approved**
- ▶ **UL/cUL/IEC/EN 62368-1(60950-1) Safety Approval & CE Marking**



UL 62368-1 CSA 60950-1 CB Scheme

PRODUCT OVERVIEW

The MINMAX MJW10 series is a range of cost-optimized 10W isolated DC-DC converter within an encapsulated 1"x1" industrial standard package. There are 24 models available for 12, 24, 48VDC with wide 2:1 input voltage range and tight output voltage regulation. The MJW10 series come in a shielded metal package and conducted EMI EN 55032 Class A approved without external components. By state-of-the-art circuit topology and 89% high efficiency could be achieved allowing an operating temperature of -40°C to +80°C as well as low standby power consumption. Further features include remote ON/OFF, under-voltage protection, overload protection, short circuit protection and no min. load requirement as well. These DC-DC converters offer a better solution for critical space applications to reduce PCB layout demand area like battery-powered equipment, instrumentation, distributed power architectures in communication, industrial electronics, energy facilities and others.

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	%
MJW10-12S033	12 (9 ~ 18)	3.3	2500	838	15	4700	82
MJW10-12S05		5	2000	980		2200	85
MJW10-12S051		5.1	2000	1000		2200	85
MJW10-12S12		12	830	954		330	87
MJW10-12S15		15	670	952		220	88
MJW10-12D05		±5	±1000	992		1000#	84
MJW10-12D12		±12	±416	956		150#	87
MJW10-12D15		±15	±333	957		100#	87
MJW10-24S033	24 (18 ~ 36)	3.3	2500	414	12	4700	83
MJW10-24S05		5	2000	490		2200	85
MJW10-24S051		5.1	2000	500		2200	85
MJW10-24S12		12	830	472		330	88
MJW10-24S15		15	670	471		220	89
MJW10-24D05		±5	±1000	490		1000#	85
MJW10-24D12		±12	±416	473		150#	88
MJW10-24D15		±15	±333	468		100#	89
MJW10-48S033	48 (36 ~ 75)	3.3	2500	207	10	4700	83
MJW10-48S05		5	2000	242		2200	86
MJW10-48S051		5.1	2000	250		2200	85
MJW10-48S12		12	830	233		330	89
MJW10-48S15		15	670	235		220	89
MJW10-48D05		±5	±1000	242		1000#	86
MJW10-48D12		±12	±416	239		150#	87
MJW10-48D15		±15	±333	237		100#	88

For each output

Input Specifications

Parameter	Conditions / Model	Min.	Typ.	Max.	Unit
Input Surge Voltage (1 sec. max.)	12V Input Models	-0.7	---	25	VDC
	24V Input Models	-0.7	---	50	
	48V Input Models	-0.7	---	100	
Start-Up Threshold Voltage	12V Input Models	---	---	9	
	24V Input Models	---	---	18	
	48V Input Models	---	---	36	
Under Voltage Shutdown	12V Input Models	---	---	8.5	
	24V Input Models	---	---	17	
	48V Input Models	---	---	34	
Input Filter	All Models	Internal Pi Type			

Remote On/Off Control

Parameter	Conditions	Min.	Typ.	Max.	Unit
Converter On	3.5V ~ 12V or Open Circuit				
Converter Off	0~1.2V or Short Circuit (Pin 2 and Pin 6)				
Control Input Current (on)	Vctrl = 5V	---	---	0.5	mA
Control Input Current (off)	Vctrl = 0V	---	---	-0.5	mA
Control Common	Referenced to Negative Input				
Standby Input Current	Nominal Vin	---	5	---	mA

Output Specifications

Parameter	Conditions / Model		Min.	Typ.	Max.	Unit
Output Voltage Setting Accuracy			---	---	±2.0	%Vnom.
Output Voltage Balance	Dual Output, Balanced Loads		---	---	±2.0	%
Line Regulation	Vin=Min. to Max. @Full Load		---	---	±1.0	%
Load Regulation	Io=0% to 100%	Single Output	---	---	±0.5	%
		Dual Output	---	---	±1.0	%
Cross Regulation (Dual)	Asymmetrical load 25% / 100% FL		---	---	±5.0	%
Minimum Load	No minimum Load Requirement					
Ripple & Noise	0-20 MHz Bandwidth	3.3 & 5V Output	---	80	---	mV_{p-p}
		Other Output	---	100	---	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	Hiccup		110	150	---	%
Short Circuit Protection	Continuous, Automatic Recovery (Hiccup Mode 0.7Hz typ.)					

General Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
I/O Isolation Voltage	60 Seconds	1500	---	---	VDC
	1 Second	1800	---	---	VDC
I/O Isolation Resistance	500 VDC	1000	---	---	MΩ
I/O Isolation Capacitance	100kHz, 1V	---	---	2000	pF
Switching Frequency		---	330	---	kHz
MTBF(calculated)	MIL-HDBK-217F@25°C, Ground Benign	2,596,000	---	---	Hours
Safety Approvals	UL/cUL 60950-1 recognition(CSA certificate), IEC/EN 60950-1(CB-report)				
	UL/cUL 62368-1 recognition(UL certificate), IEC/EN 62368-1(CB-report)				

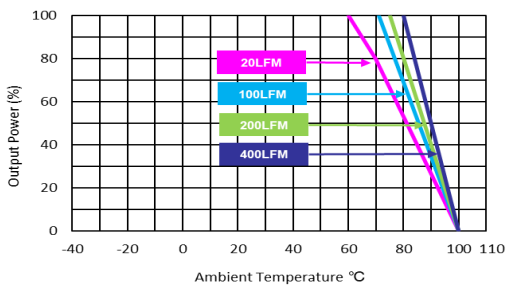
EMC Specifications

Parameter	Standards & Level			Performance
EMI(5)	Conduction	EN 55032	Without external components	Class A
	Radiation		With external components	
EMS(5)	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 ±1kV		A
	Conducted immunity	EN 61000-4-6 10Vrms		A
	PFMF	EN 61000-4-8 3A/m		A

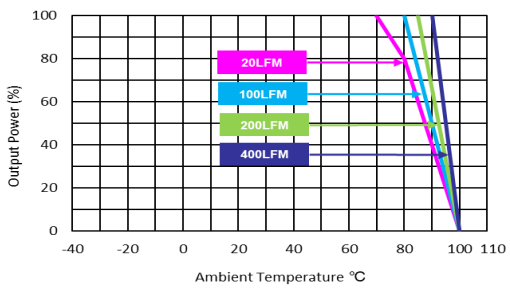
Environmental Specifications

Parameter	Min.	Max.	Unit
Operating Ambient Temperature Range (See Power Derating Curve)	-40	+80	℃
Case Temperature	---	+100	℃
Storage Temperature Range	-50	+125	℃
Humidity (non condensing)	---	95	% rel. H
RFI	Six-Sided Shielded, Metal Case		
Lead Temperature (1.5mm from case for 10Sec.)	---	260	℃

Power Derating Curve



Derating Curve without Heatsink



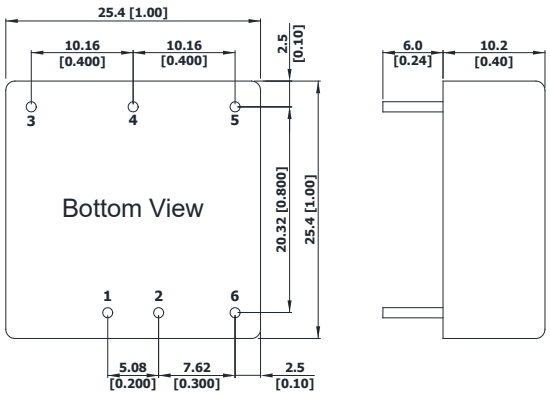
Derating Curve with Heatsink

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 fast 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.
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 1.0 [0.04]
2	-Vin	-Vin	Ø 1.0 [0.04]
3	+Vout	+Vout	Ø 1.0 [0.04]
4	No Pin	Common	Ø 1.0 [0.04]
5	-Vout	-Vout	Ø 1.0 [0.04]
6	Remote On/Off (Optional)		Ø 1.0 [0.04]

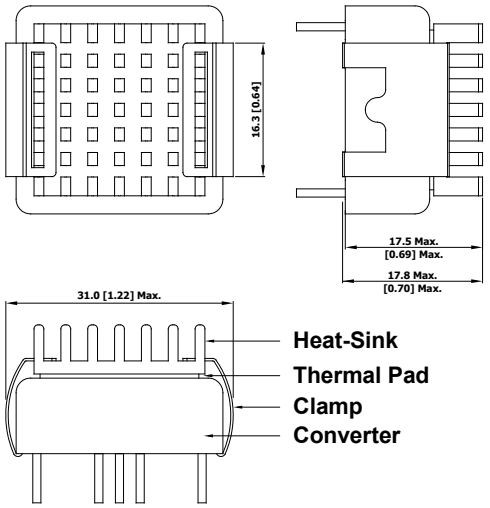
▶ All dimensions in mm (inches)
▶ Tolerance: X.X±0.5 (X.XX±0.02)
X.XX±0.25 (X.XXX±0.01)
▶ Pin diameter tolerance: X.X±0.05 (X.XX±0.002)

Physical Characteristics

Case Size	:	25.4x25.4x10.2mm (1.0x1.0x0.4 inches)
Case Material	:	Metal With Non-Conductive Baseplate
Base Material	:	FR4 PCB (flammability to UL 94V-0 rated)
Pin Material	:	Copper Alloy
Weight	:	15g

Heatsink (Option –HS)

Mechanical Dimensions

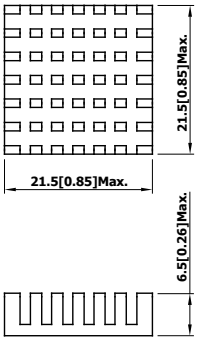


Heatsink Material: Aluminum
Finish: Anodic treatment (black)
Weight: 2g

▶ The advantages of adding a heatsink are:
1.To improve heat dissipation and increase the stability and reliability of the DC-DC converters at high operating temperatures.
2.To increase Operating temperature of the DC-DC converter, please refer to Derating Curve.

Order Code Table			
Standard	With Remote On/Off	With heatsink	With Remote On/Off & heatsink
MJW10-12S033	MJW10-12S033-RC	MJW10-12S033-HS	MJW10-12S033-RC-HS
MJW10-12S05	MJW10-12S05-RC	MJW10-12S05-HS	MJW10-12S05-RC-HS
MJW10-12S051	MJW10-12S051-RC	MJW10-12S051-HS	MJW10-12S051-RC-HS
MJW10-12S12	MJW10-12S12-RC	MJW10-12S12-HS	MJW10-12S12-RC-HS
MJW10-12S15	MJW10-12S15-RC	MJW10-12S15-HS	MJW10-12S15-RC-HS
MJW10-12D05	MJW10-12D05-RC	MJW10-12D05-HS	MJW10-12D05-RC-HS
MJW10-12D12	MJW10-12D12-RC	MJW10-12D12-HS	MJW10-12D12-RC-HS
MJW10-12D15	MJW10-12D15-RC	MJW10-12D15-HS	MJW10-12D15-RC-HS
MJW10-24S033	MJW10-24S033-RC	MJW10-24S033-HS	MJW10-24S033-RC-HS
MJW10-24S05	MJW10-24S05-RC	MJW10-24S05-HS	MJW10-24S05-RC-HS
MJW10-24S051	MJW10-24S051-RC	MJW10-24S051-HS	MJW10-24S051-RC-HS
MJW10-24S12	MJW10-24S12-RC	MJW10-24S12-HS	MJW10-24S12-RC-HS
MJW10-24S15	MJW10-24S15-RC	MJW10-24S15-HS	MJW10-24S15-RC-HS
MJW10-24D05	MJW10-24D05-RC	MJW10-24D05-HS	MJW10-24D05-RC-HS
MJW10-24D12	MJW10-24D12-RC	MJW10-24D12-HS	MJW10-24D12-RC-HS
MJW10-24D15	MJW10-24D15-RC	MJW10-24D15-HS	MJW10-24D15-RC-HS
MJW10-48S033	MJW10-48S033-RC	MJW10-48S033-HS	MJW10-48S033-RC-HS
MJW10-48S05	MJW10-48S05-RC	MJW10-48S05-HS	MJW10-48S05-RC-HS
MJW10-48S051	MJW10-48S051-RC	MJW10-48S051-HS	MJW10-48S051-RC-HS
MJW10-48S12	MJW10-48S12-RC	MJW10-48S12-HS	MJW10-48S12-RC-HS
MJW10-48S15	MJW10-48S15-RC	MJW10-48S15-HS	MJW10-48S15-RC-HS
MJW10-48D05	MJW10-48D05-RC	MJW10-48D05-HS	MJW10-48D05-RC-HS
MJW10-48D12	MJW10-48D12-RC	MJW10-48D12-HS	MJW10-48D12-RC-HS
MJW10-48D15	MJW10-48D15-RC	MJW10-48D15-HS	MJW10-48D15-RC-HS

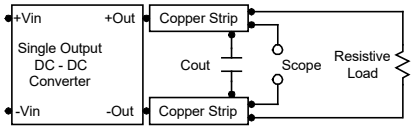
Order Code For Heatsink kit (including: Heatsink x1, Clamp x 2, Thermal Pad x1)
HS-J001

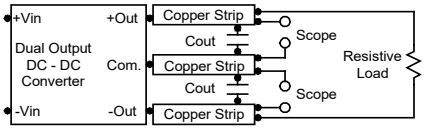


Test Setup

Peak-to-Peak Output Noise Measurement Test

Use a Cout 0.47μF 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

Remote On/Off

Positive logic remote on/off turns the module on during a logic high voltage on the remote on/off pin, and off during a logic low. To turn the power module on and off, the user must supply a switch to control the voltage between the on/off terminal and the -Vin terminal. The switch can be an open collector or equivalent. A logic low is 0V to 1.2V. A logic high is 3.5V to 12V. The maximum sink current at the on/off terminal (Pin 6) during a logic low is -500uA.

Overload Protection

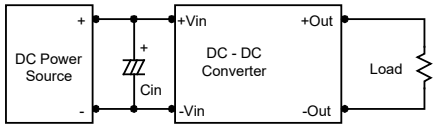
To provide protection in a fault (output overload) condition, the unit is equipped with internal current limiting circuitry and can endure current limiting for an unlimited duration. At the point of current-limit inception, the unit shifts from voltage control to current control. The unit operates normally once the output current is brought back into its specified range.

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.

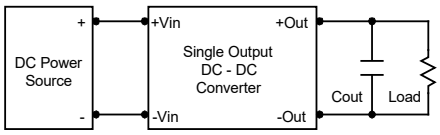
Input Source Impedance

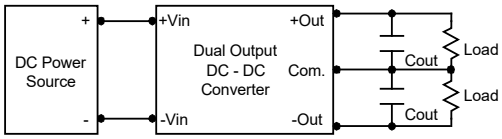
The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module. In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure startup. By using a good quality low Equivalent Series Resistance (ESR < 1.0Ω at 100 kHz) capacitor of a 12μF for the 12V, 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 3.3μF capacitors at the output.





Maximum Capacitive Load

The MJW10 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. 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 100°C.
The derating curves are determined from measurements obtained in a test setup.