FEATURES

- **Smallest Encapsulated 20W Converter!**
- **Package Size 1.0”x1.0”x0.4”**
- **Ultra-wide 4:1 Input Range**
- **Very high Efficiency up to 90%**
- **Operating Temp. Range -40°C to +85°C**
- **Output Voltage Trimmable**
- **I/O-isolation Voltage 1500VDC**
- **Remote On/Off Control**
- **Shielded Metal Case with Isolated Baseplate**
- **3 Years Product Warranty**

NEW

RoHS Compliant

3 year warranty

PRODUCT OVERVIEW

The MINMAX MJWI20 series is a new generation of high performance dc-dc converter modules setting a new standard concerning power density. The product offers fully 20W in a shielded metal package with dimensions of just 1.0”x1.0”x 0.4”. All models provide ultra-wide 4:1 input voltage range and tight output voltage regulation.

State-of the-art circuit topology provides a very high efficiency up to 90% which allows an operating temperature range of -40°C to +85°C. Further features include remote On/Off, trimmable output voltage as well as overload protection and over-temperature protection.

Typical applications for these converters are battery operated equipment, instrumentation, distributed power architectures in communication and industrial electronics and other space critical applications.

Model Selection Guide

Model Number	Input Voltage (Range)	Output Voltage	Output Current		Input Current		Reflected Ripple Current	Over Voltage Protection	Max. capacitive Load	Efficiency (typ.) @Max. Load
			Max.	Min.	@Max. Load	@No Load				
	VDC	VDC	mA	mA	mA(typ.)	mA(typ.)	mA (typ.)	VDC	uF	%
MJWI20-24S033	24 (9 ~ 36)	3.3	4500	0	1390	80	50	3.9	10300	87
MJWI20-24S05		5	4000	0	1852	90		6.2	6800	89
MJWI20-24S12		12	1670	0	1877	40		15	1200	89
MJWI20-24S15		15	1340	0	1882	40		18	750	89
MJWI20-24D12		±12	±835	±60	1877	40		±15	680#	89
MJWI20-24D15		±15	±670	±50	1882	40		±18	380#	89
MJWI20-48S033	48 (18 ~ 75)	3.3	4500	0	695	40	30	3.9	10300	88
MJWI20-48S05		5	4000	0	926	45		6.2	6800	89
MJWI20-48S12		12	1670	0	938	25		15	1200	89
MJWI20-48S15		15	1340	0	930	25		18	750	89
MJWI20-48D12		±12	±835	±60	938	25		±15	680#	89
MJWI20-48D15		±15	±670	±50	941	25		±18	380#	89

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	
Start-Up Voltage	24V Input Models	---	---	9	
	48V Input Models	---	---	18	
Input Filter	All Models	LC Filter			
Conducted EMI (Note 6)		Compliance to EN 55022,class A and FCC part 15,class A			

Output Specifications

Parameter	Conditions			Min.	Typ.	Max.	Unit
Output Voltage Accuracy				---	---	±1.0	%
Output Voltage Balance	Dual Output, Balanced Loads			---	---	±2.0	%
Line Regulation	Vin=Min. to Max.	Single Output		---	---	±0.2	%
		Dual Output		---	---	±0.5	%
Load Regulation	Min. Load to Full Load	Single Output	3.3V & 5V	---	---	±0.5	%
			12V & 15V	---	---	±0.2	%
		Dual Output		---	---	±1.0	%
Ripple & Noise (20MHz)	3.3V & 5V Models			---	75	---	mV P-P
Ripple & Noise (20MHz)	12V & 15V Models			---	100	---	mV P-P
Ripple & Noise (20MHz)	Dual Output Models			---	100	---	mV P-P
Transient Recovery Time	25% Load Step Change			---	300	---	uS
Temperature Coefficient				---	---	±0.02	%/℃
Over Load Protection	Current Limitation at 150% typ. of Iout max., Hiccup						
Short Circuit Protection	Hiccup Automatic Recovery						

General Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
I/O Isolation Voltage (rated)	60 Seconds	1500	---	---	VDC
I/O Isolation Resistance	500 VDC	1000	---	---	MΩ
I/O Isolation Capacitance	100KHz, 1V	---	---	1500	pF
Switching Frequency		---	330	---	KHz
MTBF(calculated)	MIL-HDBK-217F@25℃, Ground Benign	346,000	-----	-----	Hours

Input Fuse

24V Input Models	48V Input Models
5000mA Slow-Blow Type	2500mA Slow-Blow Type

Remote On/Off Control

Parameter	Conditions	Min.	Typ.	Max.	Unit
DC/DC On	3.5V ~ 12V or Open Circuit				
DC/DC Off	0V ~ 1.2V or Short Circuit				
Control Input Current (on)	Vctrl = 5.0V	---	---	0.5	mA
Control Input Current (off)	Vctrl = 0V	---	---	-0.5	mA
Control Common	Referenced to Negative Input				
Standby Input Current	Supply Off & Nominal Vin	---	10	---	mA

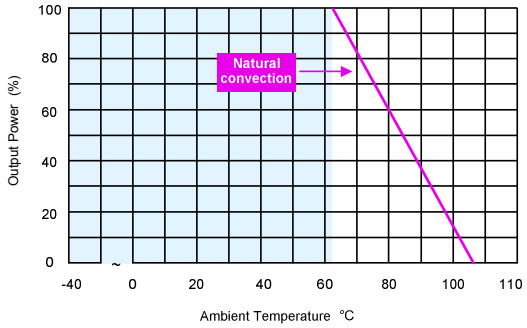
Output Voltage Trim

Parameter	Conditions	Min.	Typ.	Max.	Unit
Trim Up / Down Range	% of nominal output voltage	±10	---	---	%

Environmental Specifications

Parameter	Conditions	Min.	Max.	Unit
Operating Temperature Range (with Derating)	Ambient	-40	+85	℃
Case Temperature		---	+105	℃
Storage Temperature Range		-50	+125	℃
Humidity (non condensing)		---	95	% rel. H
Cooling	Free-Air convection			
RFI	Six-Sided Shielded, Metal Case			
Lead Temperature (1.5mm from case for 10Sec.)		---	260	℃

Power Derating Curve



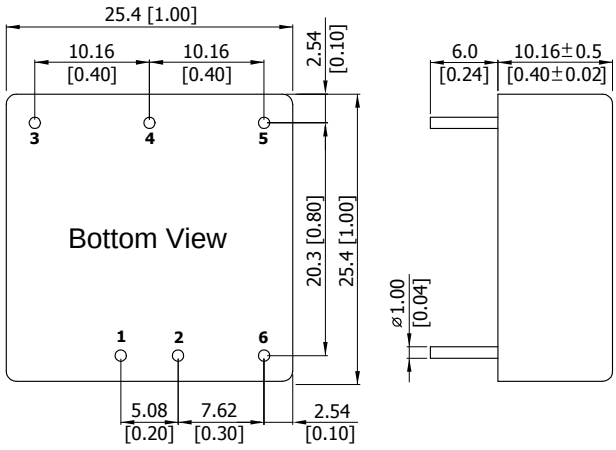
(MJWI20-48S05)

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 Ripple & Noise measurement bandwidth is 20 MHz, measured with a 1uF MLCC and a 10uF Tantalum Capatitor.
4 All DC/DC converters should be externally fused at the front end for protection.
5 Other input and output voltage may be available, please contact factory.
6 The MJWI20 series can meet EN55022 Class A with parallel an external LC Filter to the input pins. Please refer to Test Configurations on the last page.
7 Specifications subject to change without notice.

Package Specifications

Mechanical Dimensions



Pin Connections

Pin	Single Output	Dual Output
1	+Vin	+Vin
2	-Vin	-Vin
3	+Vout	+Vout
4	Trim	Common
5	-Vout	-Vout
6	Remote On/Off	Remote On/Off

- All dimensions in mm (inches)
- Tolerance: X.X±0.25 (X.XX±0.01)
  X.XX±0.13 (X.XXX±0.005)
- Pin pitch tolerance: ±0.25 (0.01)
- Pin tolerance: ±0.05 (0.002)

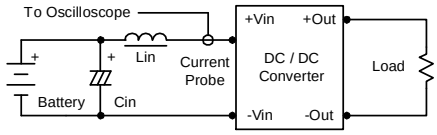
Physical Characteristics

Case Size	:	25.4x25.4x10.16mm (1.0x1.0x0.4 Inches)
Case Material	:	Aluminium Alloy, Black Anodized Coating
Base Material	:	FR4 PCB (flammability to UL 94V-0 rated)
Weight	:	15g

Test Configurations

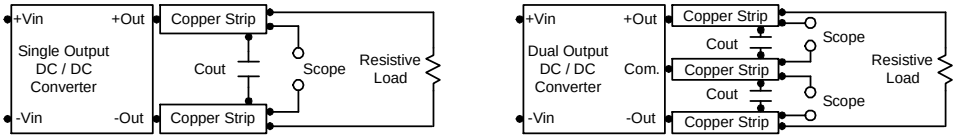
Input Reflected-Ripple Current Test Setup

Input reflected-ripple current is measured with a inductor Lin (4.7uH) and Cin (220uF, ESR < 1.0Ω at 100 KHz) to simulate source impedance. Capacitor Cin, offsets possible battery impedance. Current ripple is measured at the input terminals of the module, measurement bandwidth is 0-500 KHz.



Peak-to-Peak Output Noise Measurement Test

Use a 1uF ceramic capacitor and a 10uF tantalum 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.



Design & Feature Considerations

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. The maximum allowable leakage current of a switch connected to the on/off terminal (Pin 6) at logic high (3.5V to 12V) is 10mA.

Overcurrent Protection

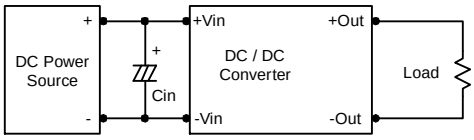
To provide hiccup mode protection in a fault (output overload) condition, the unit is equipped with internal current limiting circuitry and can endure overload for an unlimited duration.

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 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 < 1.0 Ω at 100 KHz) capacitor of a 10uF for the 24V and 48V devices.



Output Ripple Reduction

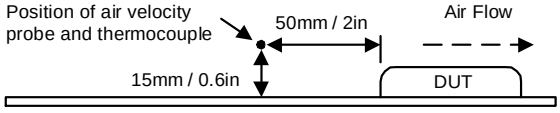
A good quality low ESR capacitor placed as close as practicable across the load will give the best ripple and noise performance. To reduce output ripple, it is recommended to use 4.7uF capacitors at the output.

Maximum Capacitive Load

The MJWI20 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.

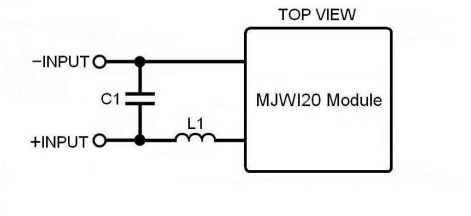
Thermal Considerations

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℃. The derating curves are determined from measurements obtained in a test setup.



Electromagnetic Emission EN 55022 Class A

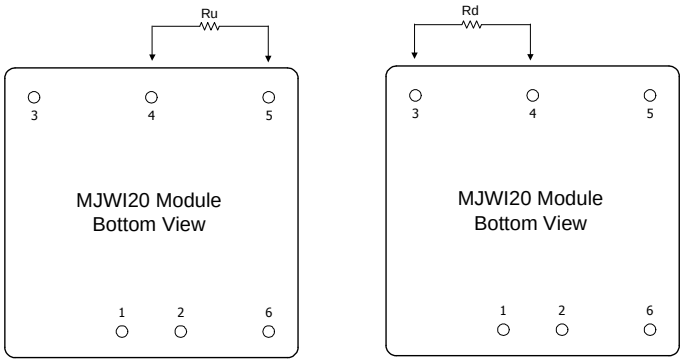
Conducted and radiated emissions EN55022 Class A



Model	Component	Value
MJWI20-24XXX	C1	3.3uF/50V 1210 X7R MLCC
	L1	SMTDR54-6R5M-JT8
MJWI20-48XXX	C1	2.2uF/100V 1210 X7R MLCC
	L1	SMTDR54-120M-JT8

External Output Trimming

Output can be externally trimmed by using the method shown below



Trim Up

Trim Down

MJWI20-XXS033 Trim Table

Trim down	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox0.99	Vox0.98	Vox0.97	Vox0.96	Vox0.95	Vox0.94	Vox0.93	Vox0.92	Vox0.91	Vox0.90	Volts
Rd=	63.59	30.28	18.19	11.95	8.13	5.56	3.70	2.31	1.21	0.34	KOhms
Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox1.01	Vox1.02	Vox1.03	Vox1.04	Vox1.05	Vox1.06	Vox1.07	Vox1.08	Vox1.09	Vox1.10	Volts
Rd=	70.50	29.28	16.87	10.90	7.38	5.06	3.42	2.20	1.25	0.49	KOhms

MJWI20-XXS05 Trim Table

Trim down	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox0.99	Vox0.98	Vox0.97	Vox0.96	Vox0.95	Vox0.94	Vox0.93	Vox0.92	Vox0.91	Vox0.90	Volts
Rd=	45.53	20.61	12.31	8.15	5.66	4.00	2.81	1.92	1.23	0.68	KOhms
Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox1.01	Vox1.02	Vox1.03	Vox1.04	Vox1.05	Vox1.06	Vox1.07	Vox1.08	Vox1.09	Vox1.10	Volts
Rd=	36.57	16.58	9.92	6.59	4.59	3.25	2.30	1.59	1.03	0.59	KOhms

MJWI20-XXS12 Trim Table

Trim down	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox0.99	Vox0.98	Vox0.97	Vox0.96	Vox0.95	Vox0.94	Vox0.93	Vox0.92	Vox0.91	Vox0.90	Volts
Rd=	394.50	179.74	106.08	68.86	46.39	31.36	20.60	12.51	6.21	1.17	KOhms
Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox1.01	Vox1.02	Vox1.03	Vox1.04	Vox1.05	Vox1.06	Vox1.07	Vox1.08	Vox1.09	Vox1.10	Volts
Rd=	368.92	161.92	94.97	61.86	42.12	29.00	19.66	12.66	7.23	2.89	KOhms

MJWI20-XXS15 Trim Table

Trim down	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox0.99	Vox0.98	Vox0.97	Vox0.96	Vox0.95	Vox0.94	Vox0.93	Vox0.92	Vox0.91	Vox0.90	Volts
Rd=	572.67	248.63	145.60	94.97	64.87	44.92	30.72	20.10	11.86	5.28	KOhms
Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox1.01	Vox1.02	Vox1.03	Vox1.04	Vox1.05	Vox1.06	Vox1.07	Vox1.08	Vox1.09	Vox1.10	Volts
Rd=	392.98	182.12	108.73	71.43	48.85	33.71	22.86	14.69	8.33	3.23	KOhms