MKW3000 Series

20W, Wide Input Range, Single & Dual Output DC/DC Converters

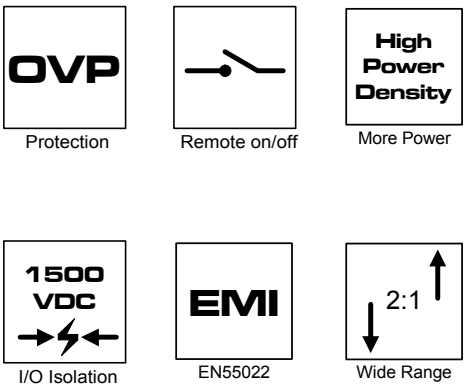
Key Features

- *Efficiency up to 89%*
- *1500VDC Isolation*
- *MTBF > 800,000 Hours*
- *2:1 Wide Input Range*
- *CSA1950 Safety Approval*
- *Complies with EN55022 Class A*
- *Six−Sided Shielding*
- *Remote On/Off Control*
- *Soft Start*
- *Over Voltage Protection*

Minmax's MKW3000 series, comprising 18 different models, has been conceived as an application specific range of DC/DC converters, specially addressing data communication equipments, mobile battery driven equipments, distributed power systems, telecommunication equipments, mixed analog/digital subsystems, process/machine control equipments, computer peripheral systems and industrial robot systems.

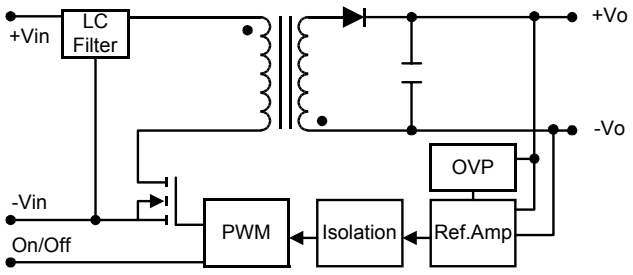
Packing up to 20W of power into a 2x1x0.4 inch package, with efficiency as high as 89%, the MKW3000 has wide input ranges of 9−18VDC, 18−36VDC and 36−75VDC and is available in output voltages of 3.3V, 5V, 12V, 15V, ±12V and ±15VDC.

Other feathers include continuous short circuit protection, overvoltage protection, remote on/off, six−sided shielded case, and EN55022 Class A conducted noise compliance minimize design−in time, cost and eliminate the need for external filtering.

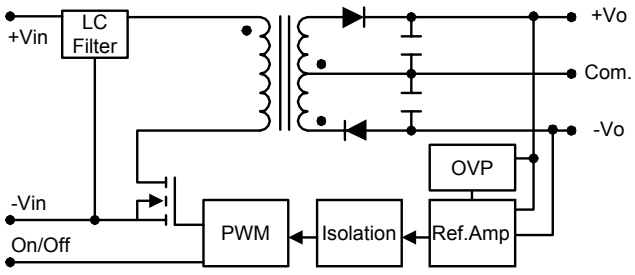


Block Diagram

Single Output



Dual Output



Model Selection Guide

Model Number	Input Voltage	Output Voltage	Output Current		Input Current		Reflected Ripple Current	Over Voltage Protection	Efficiency
			Max.	Min.	@Max. Load	@No Load			@Max. Load
	VDC	VDC	mA	mA	mA (Typ.)	mA (Typ.)	mA (Typ.)	VDC	% (Typ.)
MKW3021	12 (9 ~ 18)	3.3	4000	240	1358	30	50	3.9	81
MKW3022		5	4000	240	1984			6.8	84
MKW3023		12	1670	100	1898			15	88
MKW3024		15	1340	80	1903			18	88
MKW3026		±12	±835	±50	1898			±15	88
MKW3027		±15	±670	±40	1903			±18	88
MKW3031	24 (18 ~ 36)	3.3	4000	240	671	17	30	3.9	82
MKW3032		5	4000	240	980			6.8	85
MKW3033		12	1670	100	938			15	89
MKW3034		15	1340	80	941			18	89
MKW3036		±12	±835	±50	938			±15	89
MKW3037		±15	±670	±40	941			±18	89
MKW3041	48 (36 ~ 75)	3.3	4000	240	335	10	20	3.9	82
MKW3042		5	4000	240	490			6.8	85
MKW3043		12	1670	100	469			15	89
MKW3044		15	1340	80	471			18	89
MKW3046		±12	±835	±50	469			±15	89
MKW3047		±15	±670	±40	471			±18	89

Absolute Maximum Ratings

Parameter		Min.	Max.	Unit
Input Surge Voltage (1000 mS)	12VDC Input Models	−0.7	25	VDC
	24VDC Input Models	−0.7	50	VDC
	48VDC Input Models	−0.7	100	VDC
Lead Temperature (1.5mm from case for 10 Sec.)		−−−	260	℃
Internal Power Dissipation		−−−	4,500	mW

Exceeding the absolute maximum ratings of the unit could cause damage. These are not continuous operating ratings.

Environmental Specifications

Parameter	Conditions	Min.	Max.	Unit
Operating Temperature	Ambient	−40	+50	℃
Operating Temperature	Case	−40	+105	℃
Storage Temperature		−50	+125	℃
Humidity		−−−	95	%
Cooling	Free−Air Convection			
RFI	Six−Sided Shielded, Metal Case			
Conducted EMI	EN55022 Class A			

Notes :

1. Specifications typical at Ta=+25℃, resistive load, nominal input voltage, 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 0−20 MHz.
4. These power converters require a minimum output loading to maintain specified regulation.
5. Operation under no−load conditions will not damage these modules; however, they may not meet all specifications listed.
6. All DC/DC converters should be externally fused at the front end for protection.
7. Other input and output voltage may be available, please contact factory.
8. Specifications subject to change without notice.
9. To order the converter without Remote On/Off function, please add a suffix −N (e.g.MKW3021−N).

Input Specifications

Parameter	Model	Min.	Typ.	Max.	Unit
Start Voltage	12V Input Models	8.6	8.8	9	VDC
	24V Input Models	17	17.5	18	
	48V Input Models	34	35	36	
Under Voltage Shutdown	12V Input Models	8.1	8.3	8.5	
	24V Input Models	16	16.5	17	
	48V Input Models	32	33	34	
Reverse Polarity Input Current	All Models	---	---	2	A
Short Circuit Input Power		---	---	3500	mW
Input Filter		Pi Filter			

Output Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy		---	±0.5	±1.0	%
Output Voltage Balance	Dual Output, Balanced Loads	---	±0.5	±2.0	%
Line Regulation	Vin=Min. to Max.	---	±0.1	±0.3	%
Load Regulation	Io=10% to 100%	---	±0.1	±0.5	%
Ripple & Noise (20MHz)		---	55	80	mV P-P
Ripple & Noise (20MHz)	Over Line, Load & Temp.	---	---	100	mV P-P
Ripple & Noise (20MHz)		---	---	10	mV rms
Over Power Protection		110	---	160	%
Transient Recovery Time	25% Load Step Change	---	150	300	uS
Transient Response Deviation		---	±2	±4	%
Temperature Coefficient		---	±0.01	±0.02	%/°C
Output Short Circuit	Continuous				

General Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Isolation Voltage Rated	60 Seconds	1500	---	---	VDC
Isolation Voltage Test	Flash Tested for 1 Second	1650	---	---	VDC
Isolation Resistance	500VDC	1000	---	---	MΩ
Isolation Capacitance	100KHz,1V	---	1200	1500	pF
Switching Frequency		290	330	360	KHz
MTBF	MIL-HDBK-217F @ 25°C, Ground Benign	800	---	---	K Hours

Remote On/Off Control

Parameter	Conditions	Min.	Typ.	Max.	Unit
Supply On	2.5 to 100VDC or Open Circuit				
Supply Off		0	---	1	VDC
Standby Input Current		---	2	5	mA
Control Input Current (on)	Vin-RC = 5.0V	---	---	5	uA
Control Input Current (off)	Vin-RC = 0V	---	---	-100	uA
Control Common	Referenced to Negative Input				

Capacitive Load

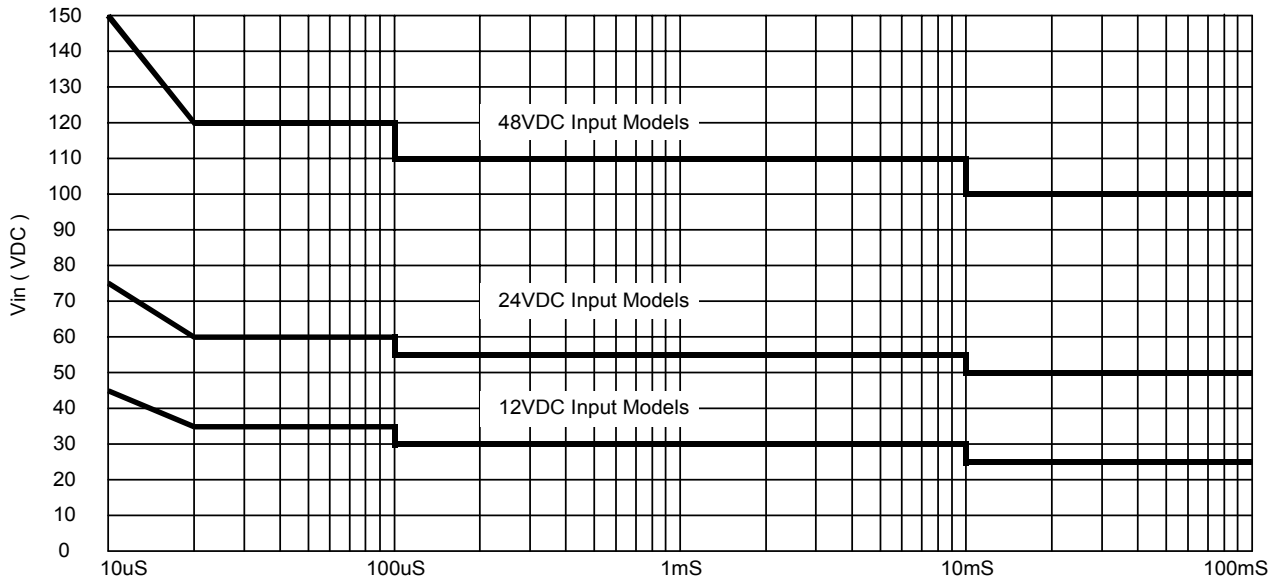
Models by Vout	3.3V	5V	12V	15V	±12V #	±15V #	Unit
Maximum Capacitive Load	6800	6800	680	680	270	270	uF

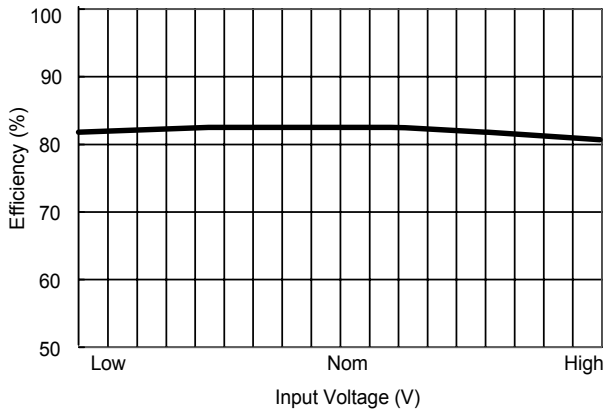
 # For each output

Input Fuse Selection Guide

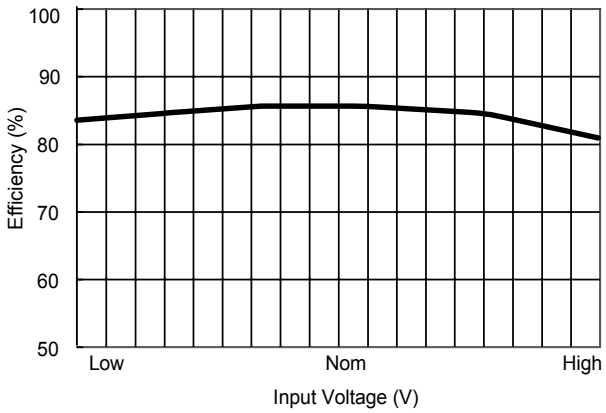
12V Input Models	24V Input Models	48V Input Models
4000mA Slow – Blow Type	2000mA Slow – Blow Type	1000mA Slow – Blow Type

Input Voltage Transient Rating

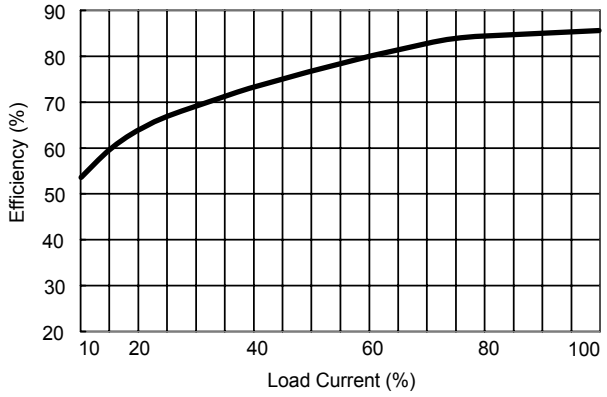




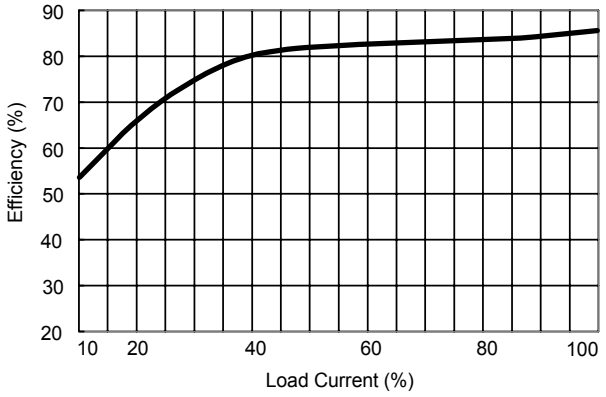
Efficiency vs Input Voltage (Single Output)



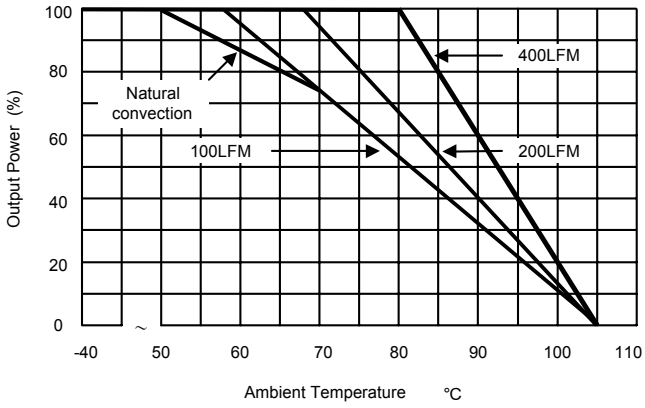
Efficiency vs Input Voltage (Dual Output)



Efficiency vs Output Load (Single Output)



Efficiency vs Output Load (Dual Output)



Derating Curve

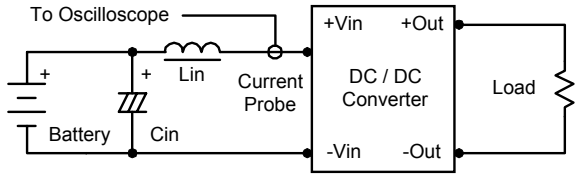
Test Configurations

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 .

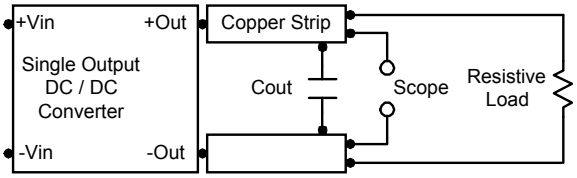
Current ripple is measured at the input terminals of the module, measurement bandwidth is 0−500 KHz.

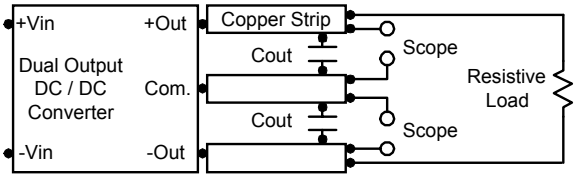


Peak-to-Peak Output Noise Measurement Test

Use a Cout 1.0uF 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.





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 1.0V.

A logic high is 2.5V to 100V.

The maximum sink current at on/off terminal during a logic low is −100 uA.

The maximum allowable leakage current of the switch at on/off terminal (2.5 to 100V) is 5uA.

Overcurrent 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.

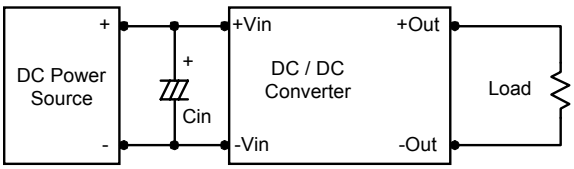
The OVP level can be found in the output data.

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.

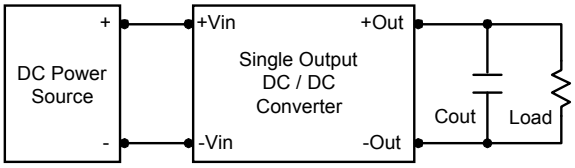
Capacitor mounted close to the power module helps ensure stability of the unit, it is recommended to use a good quality low Equivalent Series Resistance (ESR < 1.0Ω at 100 KHz) capacitor of a 22uF for the 12V input devices and a 6.8uF for the 24V and 48V devices.

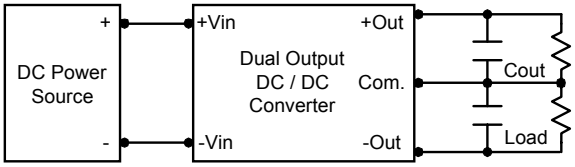


Output Ripple Reduction

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 MKW3000 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.

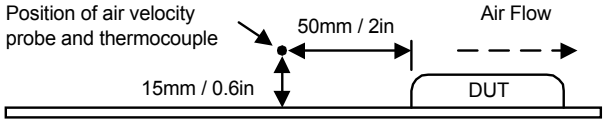
For optimum performance we recommend 270uF maximum capacitive load for dual outputs, 680uF capacitive load for 12V & 15V outputs and 6800uF capacitive load for 3.3V & 5V outputs.

The maximum capacitance can be found in the data sheet.

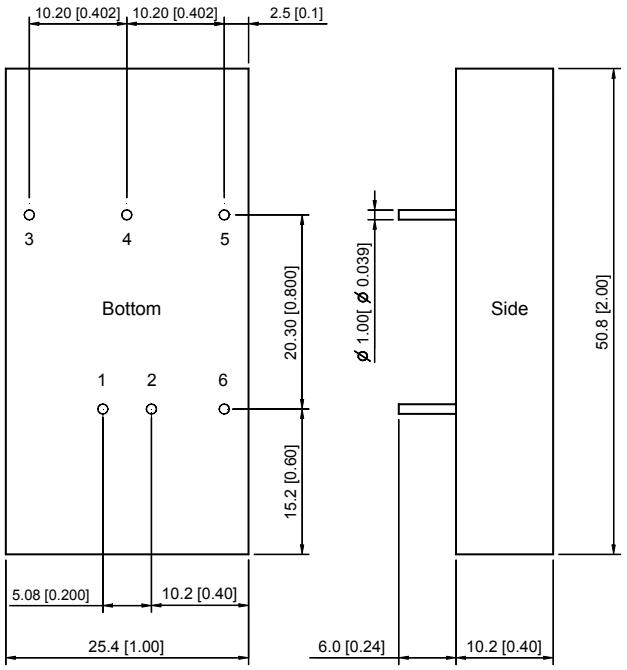
Thermal Considerations

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 an experimental apparatus.



Mechanical Dimensions

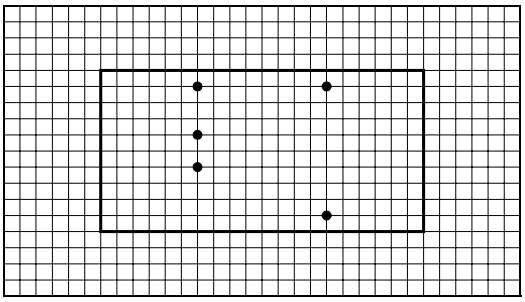


Tolerance	Millimeters	Inches
	X.X±0.25	X.XX±0.01
	X.XX±0.13	X.XXX±0.005
Pin	±0.05	±0.002

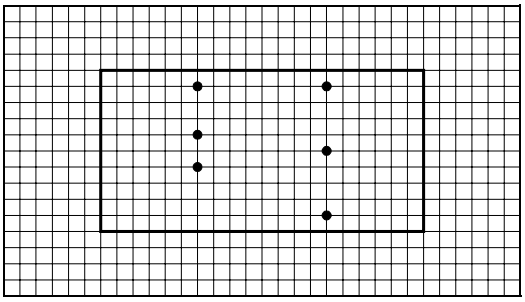
Connecting Pin Patterns

Top View (2.54 mm / 0.1 inch grids)

Single Output



Dual Output



Pin Connections

Pin	Single Output	Dual Output
1	+Vin	+Vin
2	−Vin	−Vin
3	+Vout	+Vout
4	No Pin	Common
5	−Vout	−Vout
6	Remote On/Off	Remote On/Off

Physical Characteristics

Case Size : 50.8×25.4×10.2 mm
2.0×1.0×0.4 inches

Case Material : Metal With Non−Conductive Baseplate

Weight : 30g

Flammability : UL94V−0

The MKW3000 converter is encapsulated in a low thermal resistance molding compound that has excellent resistance/electrical characteristics over a wide temperature range or in high humidity environments.
The encapsulant and unit case are both rated to UL 94V−0 flammability specifications.
Leads are tin plated for improved solderability.