MKW1000 Series

10W, Wide Input Range, Single & Dual Output DC/DC Converters

Key Features

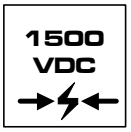
- *Efficiency up to 83%*
- *1500VDC Isolation*
- *MTBF > 700,000 Hours*
- *2:1 Wiide Input Range*
- *UL1950 Safety Approval*
- *Complies with EN55022 Class A*
- *Six−Sided Shielding*
- *Temperature Performance −40℃ to +71℃*
- *Industry Standard Pinout*
- *Internal SMD Construction*

Minmax's MKW1000 series of DC/DC converters, comprising 24 different models, is designed for a wide range of applications including 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 10W of power into a 2x1x0.4 inch package, with efficiencies as high as 83%, the MKW1000 has wide input ranges of 9−18VDC, 18−36VDC and 36−75VDC and is available in output voltages of 3.3V, 5V, 12V, 15V, 24V, ±5V, ±12V and ±15VDC.

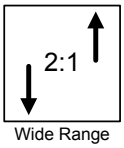
Other feathers include continuous short circuit protection, six−sided shielded case and EN55022 Class A conducted noise compliance minimize design−in time, cost and eliminate the need for external filtering.

Low Cost



I/O Isolation

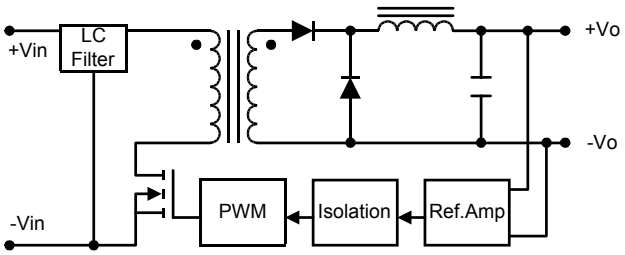
EN55022



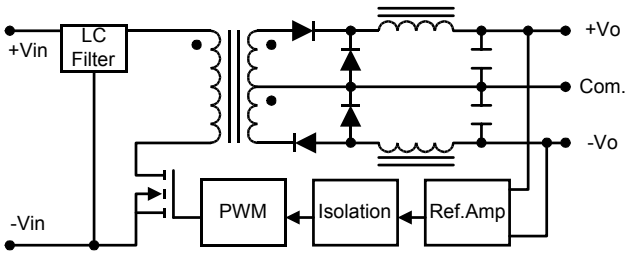
Wide Range

Block Diagram

Single Output



Dual Output



Model Selection Guide

Model Number	Input Voltage	Output Voltage	Output Current		Input Current		Reflected Ripple Current	Efficiency
			Max.	Min.	@Max. Load	@No Load		@Max. Load
	VDC	VDC	mA	mA	mA (Typ.)	mA (Typ.)	mA (Typ.)	% (Typ.)
MKW1021	12 (9 ~ 18)	3.3	2400	120	917	30	50	72
MKW1022		5	2000	100	1082			77
MKW1023		12	830	42	1038			80
MKW1024		15	670	34	1047			80
MKW1025		24	416	21	1027			81
MKW1026		±5	±1000	±50	1068			78
MKW1027		±12	±416	±21	1027			81
MKW1028		±15	±333	±17	1041			80
MKW1031	24 (18 ~ 36)	3.3	2400	120	434	20	25	76
MKW1032		5	2000	100	534			78
MKW1033		12	830	42	506			82
MKW1034		15	670	34	511			82
MKW1035		24	416	21	501			83
MKW1036		±5	±1000	±50	521			80
MKW1037		±12	±416	±21	507			82
MKW1038		±15	±333	±17	507			82
MKW1041	48 (36 ~ 75)	3.3	2400	120	217	10	12	76
MKW1042		5	2000	100	260			80
MKW1043		12	830	42	253			82
MKW1044		15	670	34	252			83
MKW1045		24	416	21	251			83
MKW1046		±5	±1000	±50	257			81
MKW1047		±12	±416	±21	251			83
MKW1048		±15	±333	±17	251			83

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		−−−	5,000	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	+71	℃
Operating Temperature	Case	−40	+90	℃
Storage Temperature		−40	+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.

Input Specifications

Parameter	Model	Min.	Typ.	Max.	Unit
Start Voltage	12V Input Models	8	8.5	9	VDC
	24V Input Models	15	17	18	
	48V Input Models	30	33	36	
Under Voltage Shutdown	12V Input Models	7	8	8.5	
	24V Input Models	13	15	17	
	48V Input Models	25	29	34	
Reverse Polarity Input Current	All Models	---	---	2	A
Short Circuit Input Power		---	3500	4500	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)		---	50	75	mV P-P
Ripple & Noise (20MHz)	Over Line, Load & Temp.	---	---	100	mV P-P
Ripple & Noise (20MHz)		---	---	15	mV rms
Over Power Protection		120	---	---	%
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	---	150	470	pF
Switching Frequency		260	300	340	KHz
MTBF	MIL-HDBK-217F @ 25°C, Ground Benign	700	---	---	K Hours

Capacitive Load

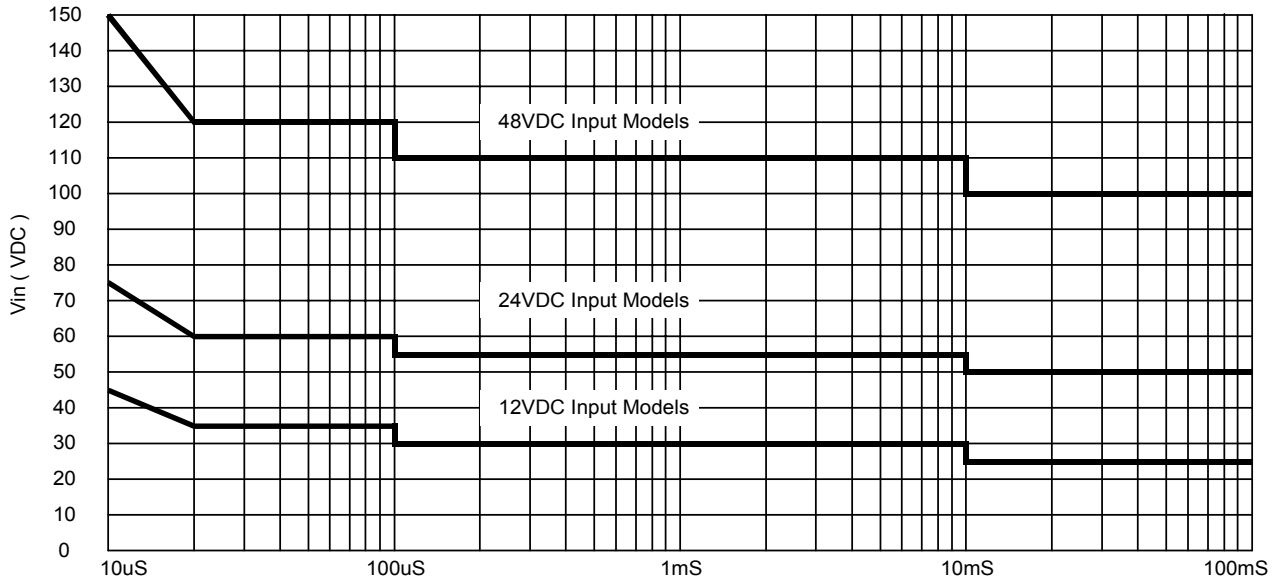
Models by Vout	3.3V	5V	12V	15V	24V	±5V #	±12V #	±15V #	Unit
Maximum Capacitive Load	2200	2200	2200	2200	2200	470	470	470	uF

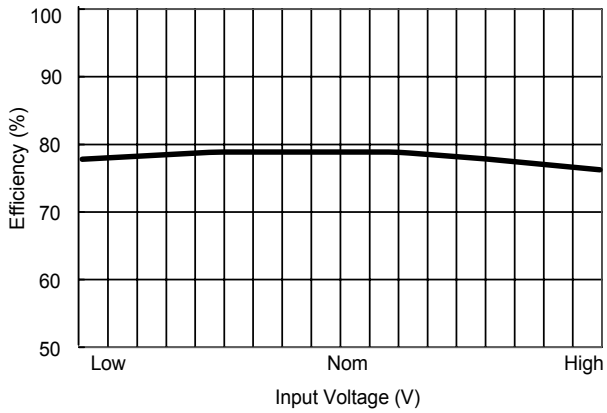
 # For each output

Input Fuse Selection Guide

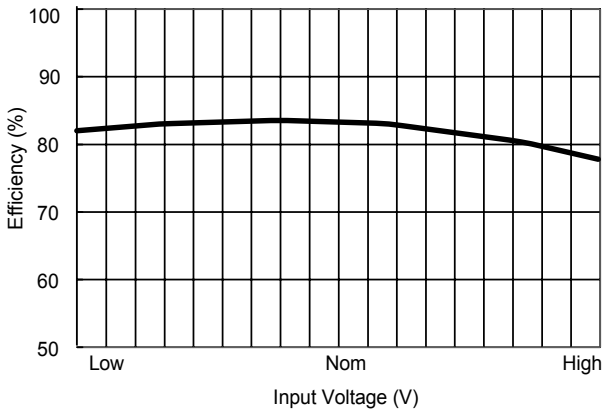
12V Input Models	24V Input Models	48V Input Models
3000mA Slow – Blow Type	1500mA Slow – Blow Type	750mA Slow – Blow Type

Input Voltage Transient Rating

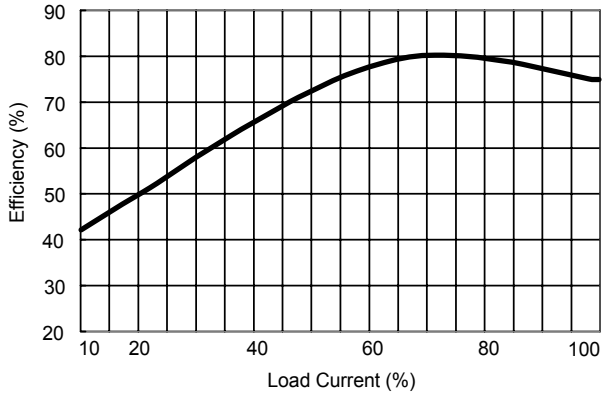




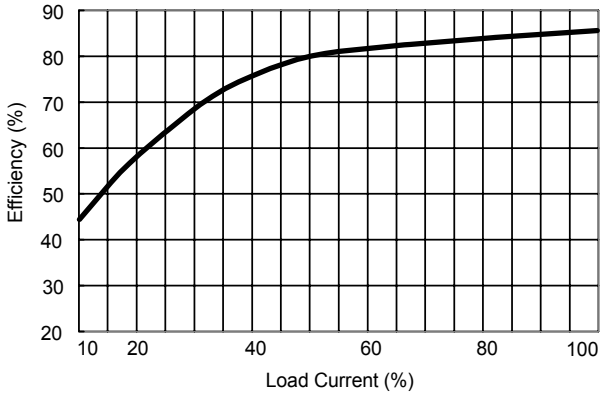
Efficiency vs Input Voltage (Single Output)



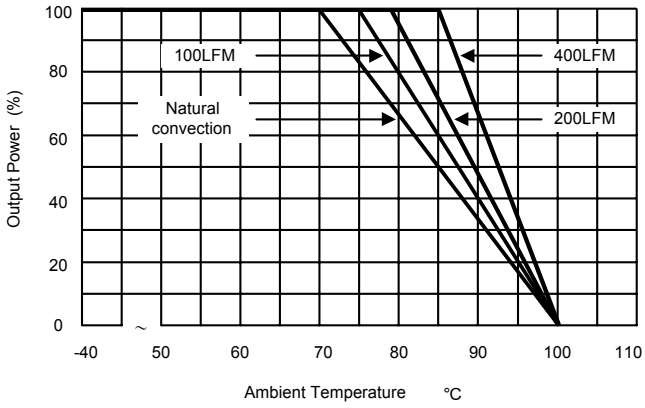
Efficiency vs Input Voltage (Dual Output)



Efficiency vs Output Load (Single Output)



Efficiency vs Output Load (Dual Output)



Derating Curve

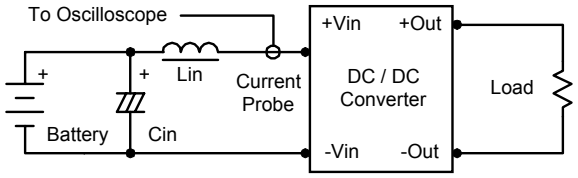
Test Configurations

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.

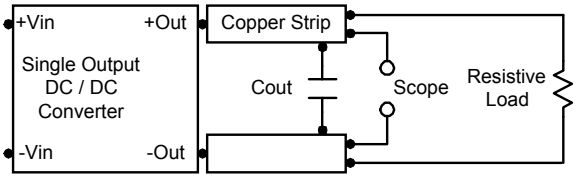
Current ripple is measured at the input terminals of the module, measurement bandwidth is 0−500 KHz.

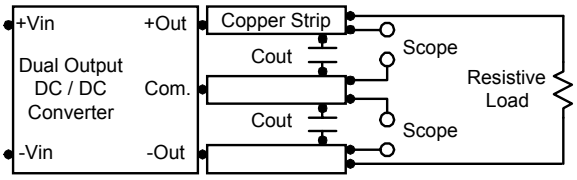


Peak-to-Peak Output Noise Measurement Test

Use a Cout 0.47uF 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

Maximum Capacitive Load

The MKW1000 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 470uF maximum capacitive load for dual outputs and 2200uF capacitive load for single outputs.

The maximum capacitance can be found in the data sheet.

Overcurrent Protection

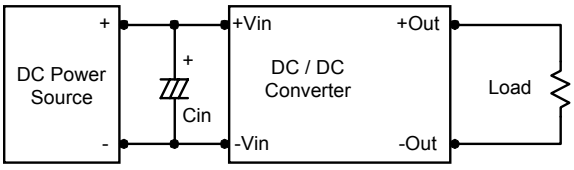
To provide protection in a fault (output overload) condition, the unit is equipped with internal current limiting circuitry and can endure current limiting for an unlimited duration. At the point of current−limit inception, the unit shifts from voltage control to current control. The unit operates normally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

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.

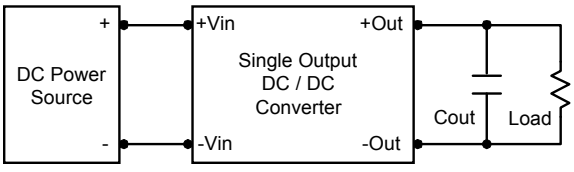
Capacitor mounted close to the power module helps ensure stability of the unit, it is recommended to use a good quality low Equivalent Series Resistance (ESR < 1.0Ω at 100 KHz) capacitor of a 15uF for the 12V input devices and a 4.7uF for the 24V and 48V devices.

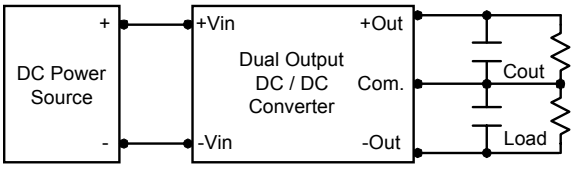


Output Ripple Reduction

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 3.9uF capacitors at the output.

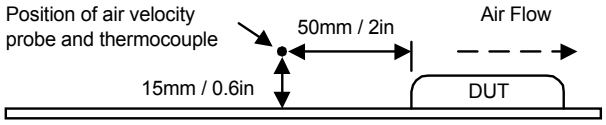




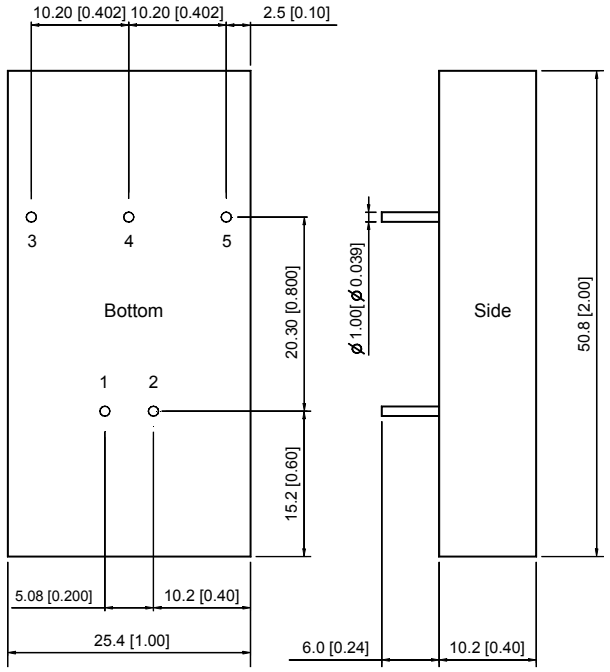
Thermal Considerations

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 90°C.

The derating curves are determined from measurements obtained in an experimental apparatus.



Mechanical Dimensions

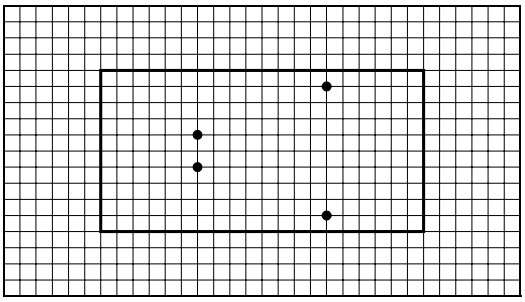


Tolerance	*Millimeters*	*Inches*
	X.X±0.25	*X.XX±0.01*
	X.XX±0.13	*X.XXX±0.005*
Pin	*±0.05*	*±0.002*

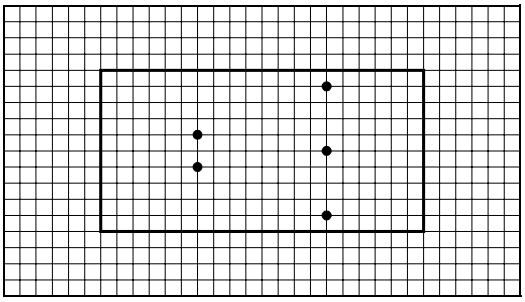
Connecting Pin Patterns

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

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	:	32g
Flammability	:	UL94V−0

The MKW1000 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.