

MKW2600 Series

15W, Wide Input Range, Single & Dual Output DC/DC Converters



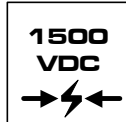
Key Features



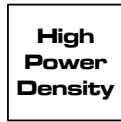
- Efficiency up to 86%
- 1500VDC Isolation
- MTBF > 700,000 Hours
- 4:1 Wide Input Range
- UL60950-1 Safety Approval
- Complies with EN55022 Class A
- Six-Sided Shielding
- Remote On/Off Control
- UL 94V-0 Package Material
- Internal SMD Construction



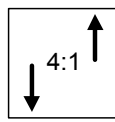
EN55022



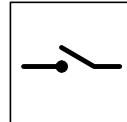
I/O Isolation



More Power



Wide Range



Remote on/off

Minmax's MKW2600 series, comprising 16 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 15W of power into a 2x1x0.4 inch package, with efficiency as high as 86%, the MKW2600 has ultra-wide input ranges of 9-36VDC and 18-75VDC which is available in output voltages of 3.3V, 5V, 5.1V, 12V, 15V, $\pm 5V$, $\pm 12V$ and $\pm 15VDC$.

Other features include continuous short circuit 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.

Absolute Maximum Ratings

Parameter	Min.	Max.	Unit	
Input Surge Voltage (1000 mS)	24VDC Input Models	-0.7	50	VDC
	48VDC Input Models	-0.7	100	VDC
Lead Temperature (1.5mm from case for 10 Sec.)	---	260	°C	
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	+60	°C
Operating Temperature	Case	-40	+100	°C
Storage Temperature		-50	125	°C
Humidity		---	95	%
Cooling	Free-Air Convection			
RFI	Six-Sided Shielded, Metal Case			
Conducted EMI	EN55022 Class A			

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.)
MKW2621	24 (9 ~ 36)	3.3	3000	300	528	25	40	78
MKW2622		5	3000	300	762			82
MKW2623		12	1250	125	735			85
MKW2624		15	1000	100	726			86
MKW2625		±5	±1500	±150	771			81
MKW2626		±12	±625	±62.5	735			85
MKW2627		±15	±500	±50	726			86
MKW2629		5.1	3000	300	787			81
MKW2631		48 (18 ~ 75)	3.3	3000	300			264
MKW2632	5		3000	300	381	82		
MKW2633	12		1250	125	368	85		
MKW2634	15		1000	100	363	86		
MKW2635	±5		±1500	±150	386	81		
MKW2636	±12		±625	±62.5	368	85		
MKW2637	±15		±500	±50	363	86		
MKW2639	5.1		3000	300	393	81		

Capacitive Load

Models by Vout	3.3V	5V	5.1V	12V	15V	±5V #	±12V #	±15V #	Unit
Maximum Capacitive Load	470	470	470	470	470	220	220	220	uF

For each output

Input Fuse Selection Guide

24V Input Models	48V Input Models
2500mA Slow – Blow Type	1250mA Slow – Blow Type

Input Specifications

Parameter	Model	Min.	Typ.	Max.	Unit
Start Voltage	24V Input Models	8	8.5	9	VDC
	48V Input Models	15	17	18	
Under Voltage Shutdown	24V Input Models	7	8	8.5	
	48V Input Models	13	15	17	
Reverse Polarity Input Current	All Models	---	---	1	A
Short Circuit Input Power		---	---	3500	mW
Input Filter		Pi Filter			

MKW2600 Series

Output Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy		---	± 1.0	± 2.0	%
Output Voltage Balance	Dual Output, Balanced Loads	---	± 0.5	± 2.0	%
Line Regulation	$V_{in} = \text{Min. to Max.}$	---	± 0.1	± 0.5	%
Load Regulation	$I_o = 10\% \text{ to } 100\%$	---	± 0.5	± 1.0	%
Ripple & Noise (20MHz)		---	55	80	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	---	300	500	μS
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	---	---	M Ω
Isolation Capacitance	100KHz, 1V	---	1200	1500	pF
Switching Frequency		290	330	400	KHz
MTBF	MIL-HDBK-217F @ 25°C, Ground Benign	700	---	---	K Hours

Remote On/Off Control

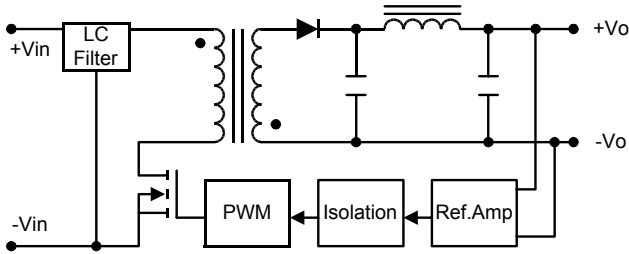
Parameter	Conditions	Min.	Typ.	Max.	Unit
Supply On	2.5 to 5.5VDC or Open Circuit				
Supply Off		-0.7	---	0.8	VDC
Standby Input Current		---	---	10	mA
Control Input Current (on)	$V_{in} - RC = 5.0V$	---	---	50	μA
Control Input Current (off)	$V_{in} - RC = 0V$	---	---	-1	mA
Control Common	Referenced to Negative Input				

Notes :

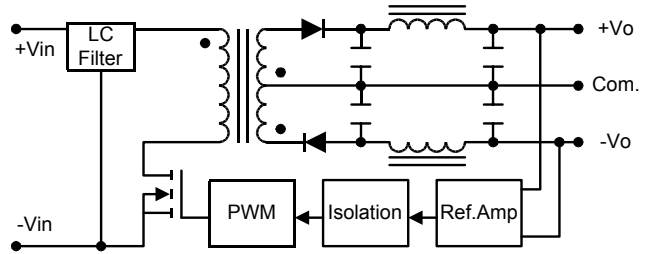
- Specifications typical at $T_a = +25^\circ\text{C}$, resistive load, nominal input voltage, rated output current unless otherwise noted.
- Transient recovery time is measured to within 1% error band for a step change in output load of 75% to 100%.
- Ripple & Noise measurement bandwidth is 0–20 MHz.
- These power converters require a minimum output loading to maintain specified regulation.
- Operation under no-load conditions will not damage these modules; however, they may not meet all specifications listed.
- All DC/DC converters should be externally fused at the front end for protection.
- Other input and output voltage may be available, please contact factory.
- To order the converter with Remote On/Off function, please add a suffix -RC (e.g. MKW2621-RC).
- To order the converter with EN55022 Class A function, please add a suffix A (e.g. MKW2621A).
- To order the converter with heatsink, please add a suffix H (e.g. MKW2621H).
- Specifications subject to change without notice.

Block Diagram

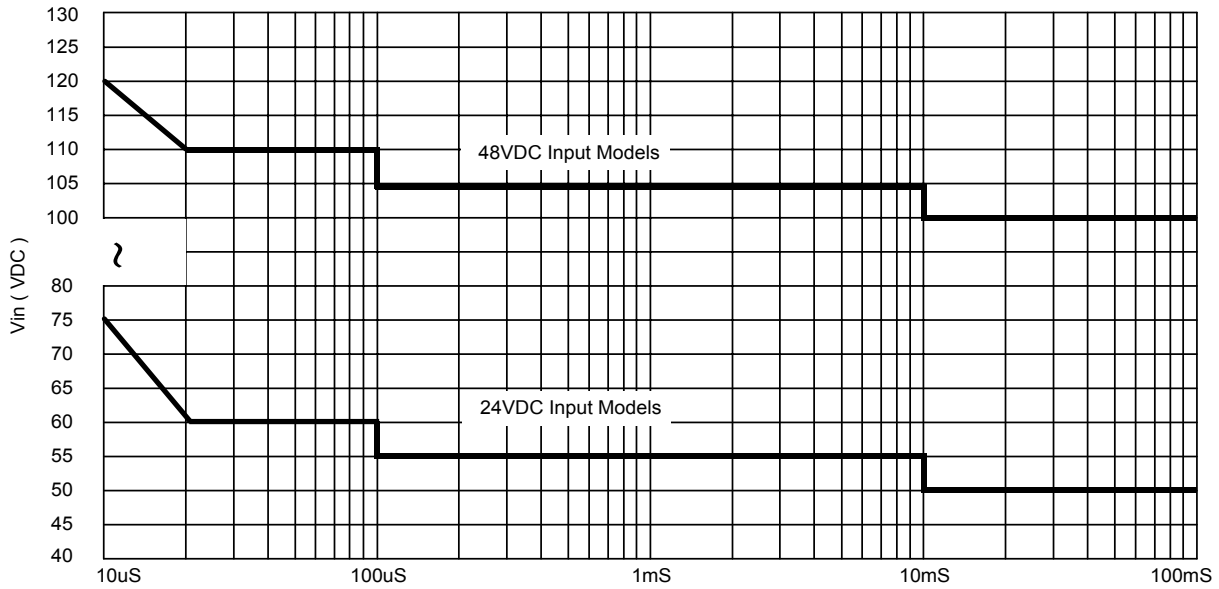
Single Output

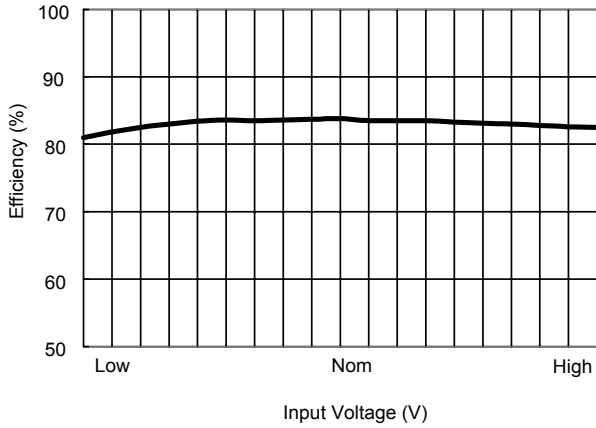


Dual Output

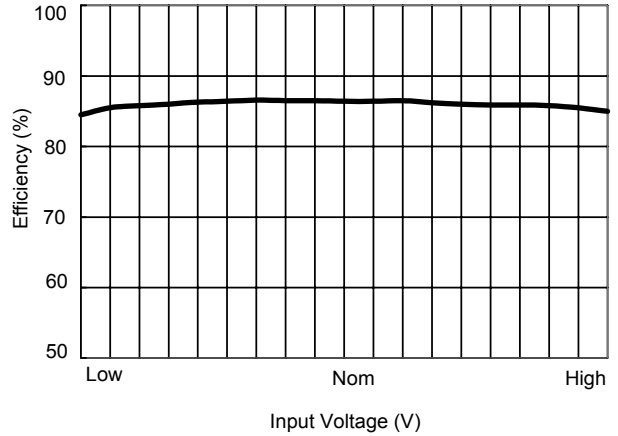


Input Voltage Transient Rating

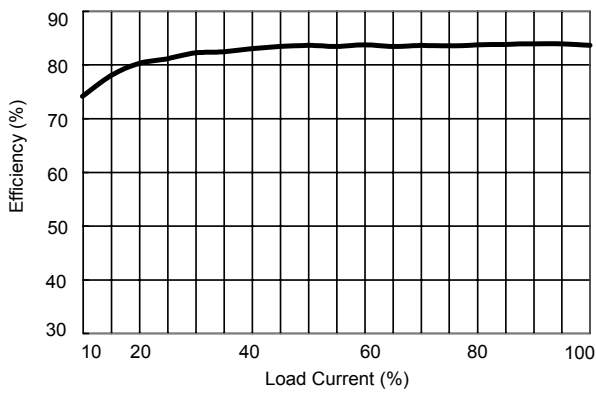




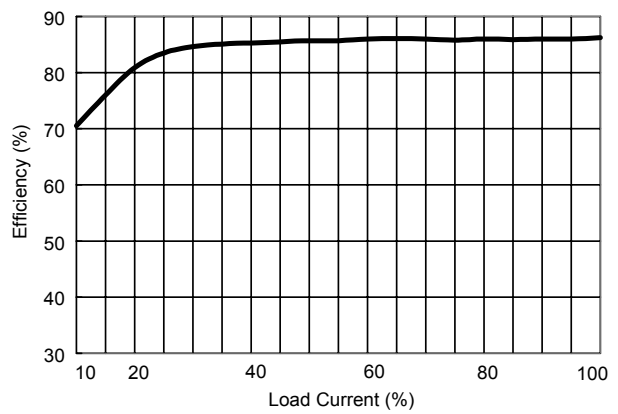
Efficiency vs Input Voltage (Single Output)



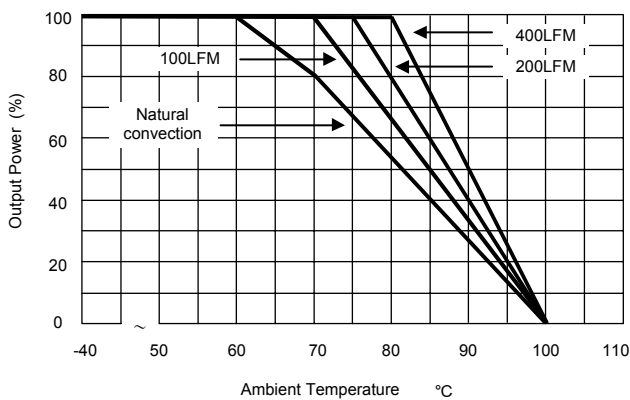
Efficiency vs Input Voltage (Dual Output)



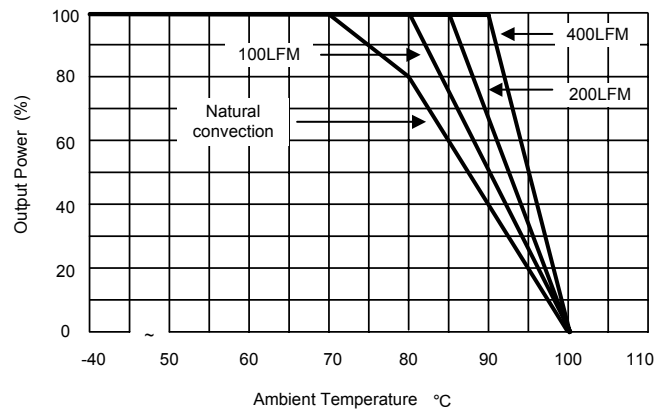
Efficiency vs Output Load (Single Output)



Efficiency vs Output Load (Dual Output)



Derating Curve without Heatsink



Derating Curve with Heatsink

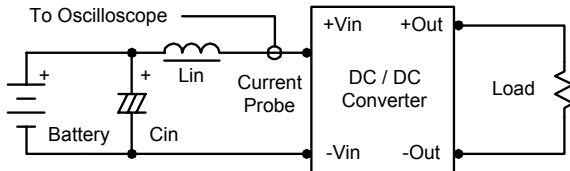
Test Configurations

Input Reflected-Ripple Current Test Setup

Input reflected-ripple current is measured with an inductor L_{in} (4.7uH) and C_{in} (220uF, ESR < 1.0Ω at 100 KHz) to simulate source impedance.

Capacitor C_{in} , offsets possible battery impedance.

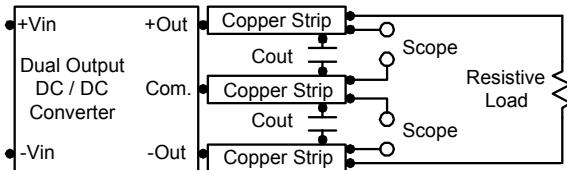
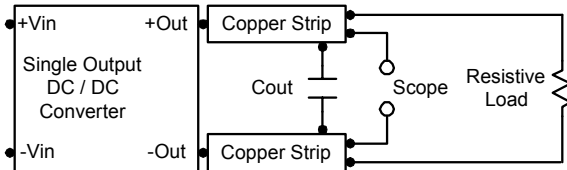
Current ripple is measured at the input terminals of the module, measurement bandwidth is 0–500 KHz.



Peak-to-Peak Output Noise Measurement Test

Use a C_{out} 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

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 $-0.7V$ to $0.8V$.

A logic high is $2.5V$ to $5.5V$.

The maximum sink current at on/off terminal during a logic low is -1 mA.

The maximum allowable leakage current of the switch at on/off terminal (2.5 to $5.5V$) is $50\mu A$.

Overcurrent Protection

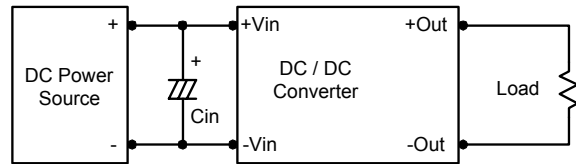
To provide protection in a fault (output overload) condition, the unit is equipped with internal current limiting circuitry and can endure current limiting for an unlimited duration. At the point of current-limit inception, the unit shifts from voltage control to current control. The unit operates normally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

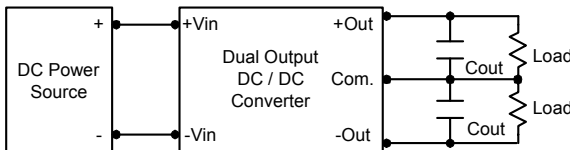
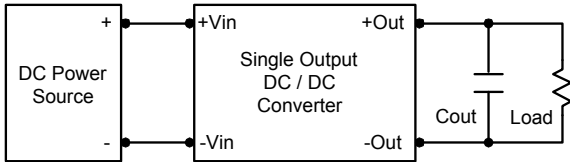
Capacitor mounted close to the power module helps ensure stability of the unit, it is recommended to use a good quality low Equivalent Series Resistance (ESR < 1.0Ω at 100 KHz) capacitor of a 22uF for the 12V input devices and a 6.8uF for the 24V and 48V devices.



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 MKW2600 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.

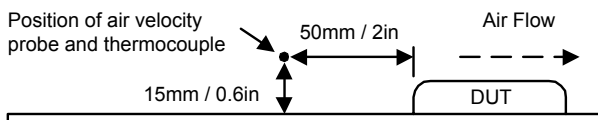
For optimum performance we recommend 220uF maximum capacitive load for dual outputs and 470uF capacitive load for single outputs.

The maximum capacitance can be found in the data sheet.

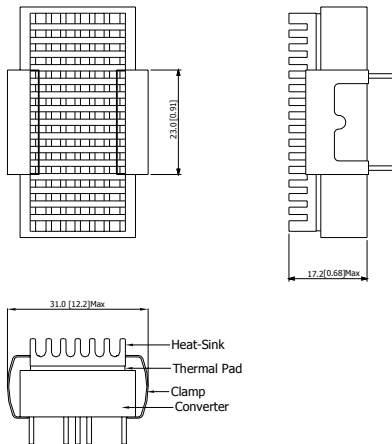
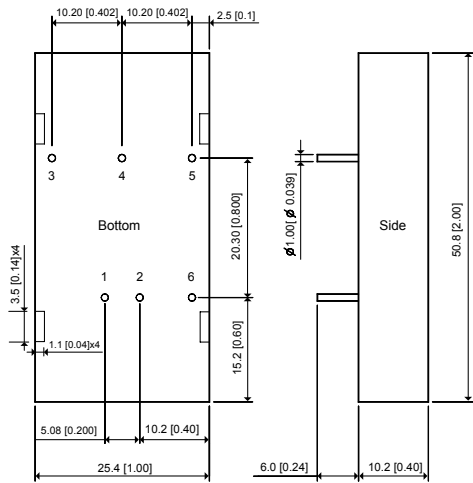
Thermal Considerations

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 100°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

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

Heatsink Material : Aluminum

Finish : Anodic treatment (black)

Weight : 2g

*The advantages of adding a heatsink are:

1. To help heat dissipation and increase the stability and reliability of DC/DC converters at high operating temperature atmosphere.
2. To upgrade the operating temperature of DC/DC converters, please refer to Derating Curve.

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 (Optional)	

The MKW2600 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.