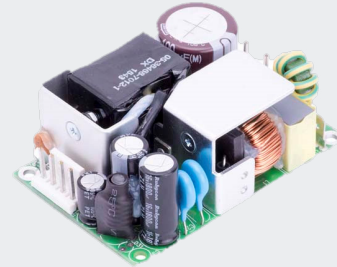


# SL POWER MB60 SERIES

60 Watts Single Output  
Medical Grade



Advanced Energy's SL Power MB60 medically-approved AC-DC power supplies are available with a nominal main output of 12 V, 15 V, 18V, 24 V, 36 V or 48 V. MB60 power supplies provide up to 60 Watts of output power with convection cooling. All models have output overvoltage, short circuit and overload protection and a 2 x 3 x 1.063 inch form factor.

## AT A GLANCE

### Total Power

60 Watts

### Input Voltage

90 to 264 VAC

### # of Outputs

Single



## SPECIAL FEATURES

- 60 Watts Convection
- 2"W x 3"L x 1"H Size
- Universal Input 90 to 264 VAC
- Less than 0.5W no-load Power Consumption
- -10°C to 80°C Operating Temperature Range
- Meets IEC60601-1 3th Edition
- Level V Efficiency Compliant Models
- Optional LED Indicator for power on
- Class I and Class II Input Versions Available
- RoHS Compliant
- 3 Years Warranty

## SAFETY

- |         |             |
|---------|-------------|
| ■ UL    | ES60601     |
| ■ CSA   | CSAS60601-1 |
| ■ Demko | EN60601-1   |
| ■ CB    | IEC60601-1  |

## ELECTRICAL SPECIFICATIONS

Input	
Input range	90 to 264 VAC
Input frequency	47 - 63 Hz
Input current	1.4 A max at 120VAC, 0.75 A max at 240 VAC
Inrush current	40 A max., cold start @ 264 VAC input
Input fuses	2.5 A, 250 VAC fuse provided in both line & neutral
Earth leakage current	<275 uA @ 264 VAC, 60 Hz, NC
Efficiency	83% to 88%
No load input power	<0.5 W
Turn-on Input Voltage	70V
Turn-off Input Voltage	65V
Isolation voltage	Input/Ground: 2000 VAC (1 MOPP), Class I input models Input/Output: 4750 VAC (2 MOPP), Class I input models Output/Ground: Functional, Class I input models
Output	
Maximum power	See "Ordering information" section
Ripple and noise	1% of Vout on all models
Total regulation	2%
Minimum load	Not required
Turn On Delay	<2 Seconds at 120 VAC
Overshoot	5% overshoot at turn-on, 5% overshoot at turnoff, under all conditions
Hold Up Time	16mS minimum from loss of ac input at 120 VAC, full load
Transient response	500 us response time for return to within 0.5% of final value for any 50% load step over the range of 25% to 100% of rated load, $\Delta i/\Delta t < 0.2 \text{ A}/\mu\text{s}$ . Max. voltage deviation is $\pm 3.5\%$ of final value.
Reliability	
MTBF	700,000 hours, 25°C ambient, full load
Warranty	3 years
Protection	
Overvoltage protection	OVP firing reduces output voltage to <50% of nominal in <50ms. See models chart for trip ranges
Short circuit protection	Short across the output terminals will not cause damage to the unit. Hiccup Mode
Overtemperature protection	Will shutdown at $T_c = 155^\circ\text{C}$ . Auto-recovery mode.
Overload protection	120% to 180% of rated output current value. Hiccup mode.

## ORDERING INFORMATION

Model Number <sup>3</sup>	Output Voltage	Output Current (Convection)	Output Power (Convection)	Ripple & Noise <sup>1</sup>	Total Regulation	OVP Threshold
MB60S12K	12 V	4.58 A	55 W	120mV	±2%	14.4-18 Vdc
MB60S15K	15 V	4.00 A	60 W	120mV	±2%	18-22.5 Vdc
MB60S18K	18 V	3.33 A	60 W	120mV	±2%	21-25.5 Vdc
MB60S24K	24 V	2.50 A	60 W	120mV	±2%	28.8-36 Vdc
MB60S36K <sup>2</sup>	36 V	1.67 A	60 W	120mV	±2%	42-47 Vdc
MB60S48K	48 V	1.25 A	60 W	120mV	±2%	57.6-72 Vdc

Notes:

1. At -20°C, the noise and ripple is 2% of the output..

2. For product availability, please contact the factory.

3. Replace "K" in model number with "C" for class II input versions.

## ENVIRONMENTAL SPECIFICATIONS

Vibration	Random Vibration: Operating: 0.003 g/Hz, 1.5 grams overall, 3 axes, 10 min/axis, 5 to 500 Hz. Non-operating: Random waveform, 3 mins/axis, 3 axes and sine waveform, Vib. frequency / acceleration:10 Hz to 500 Hz / 1 g, sweep rate of 1 octave/minutes, vibration time of 10 sweeps/axes, 3 axes. Transportation vibration: Random vib. per MIL-STD-810E, Method 514.4, Cat. 1, Figure 514.4-1, 1hr in each of three axes.
Shock	Non-operating: Half-sine, 40 gpk, 10 ms, 3 axes, 6 shocks total.
Cooling	Convection
Operating temperature	-10°C to +80°C
Temperature derating	For 24 V output and up, derate output power to 50 W@60°C, 40 W@70°C, 20 W@80°C. See derating curve for details.
Storage temperature	-40°C to +85°C
Altitude	Operating: -500 to 3,000 m. Non-operating: -500 to 12,192 m
Relative humidity	5% to 95%, non-condensing

## SAFETY

UL	ANSI/AAMI ES60101:2005 3rd Edition
CSA	CAN/CSA-C22.2 No. 60601-1 (2008)
Demko	EN 60601-1:2006
CB Report	IEC60601-1-1 3rd Edition

## EMI/EMC COMPLIANCE

Conducted emissions	EN55011/15/32: Class B, FCC Part 15.107, Class B
Radiated emissions	EN55011/15/32: Class A, FCC Part 15.107, Class B
Harmonic current emissions	EN61000-3-2, Class A
Voltage fluctuations & flicker	IEC61000-3-3
Electro static discharge immunity	EN55024/IEC61000-4-2, $\pm 6$ kV contact, $\pm 8$ kV air, Criteria A
Radiated RF EM fields susceptibility	EN55022/EN61000-4-3, 3 V/m, Criteria A
Electrical fast transients / bursts	EN55024/IEC61000-4-4, PS: $\pm 2$ kV, 40 A, other lines 1kV, 20 A, Criteria B
Surges line to line (DM) and line to ground (CM)	EN55024/IEC61000-4-5, Installation Class 3 (1kV diff. mode, 2kV common mode), Criteria A
Conducted disturbances induced by RF fields	EN55022/IEC61000-4-6, 3 V/m, Criteria A
Rated power frequency magnetic fields test	EN55024/IEC1000-4-8, 3 A/m, Criteria A
Voltage dips	EN61000-4-11 95% dip/0.5 cycle, Criteria A 60%/5cycles, Criteria B, 30%/25 cycles, Criteria A

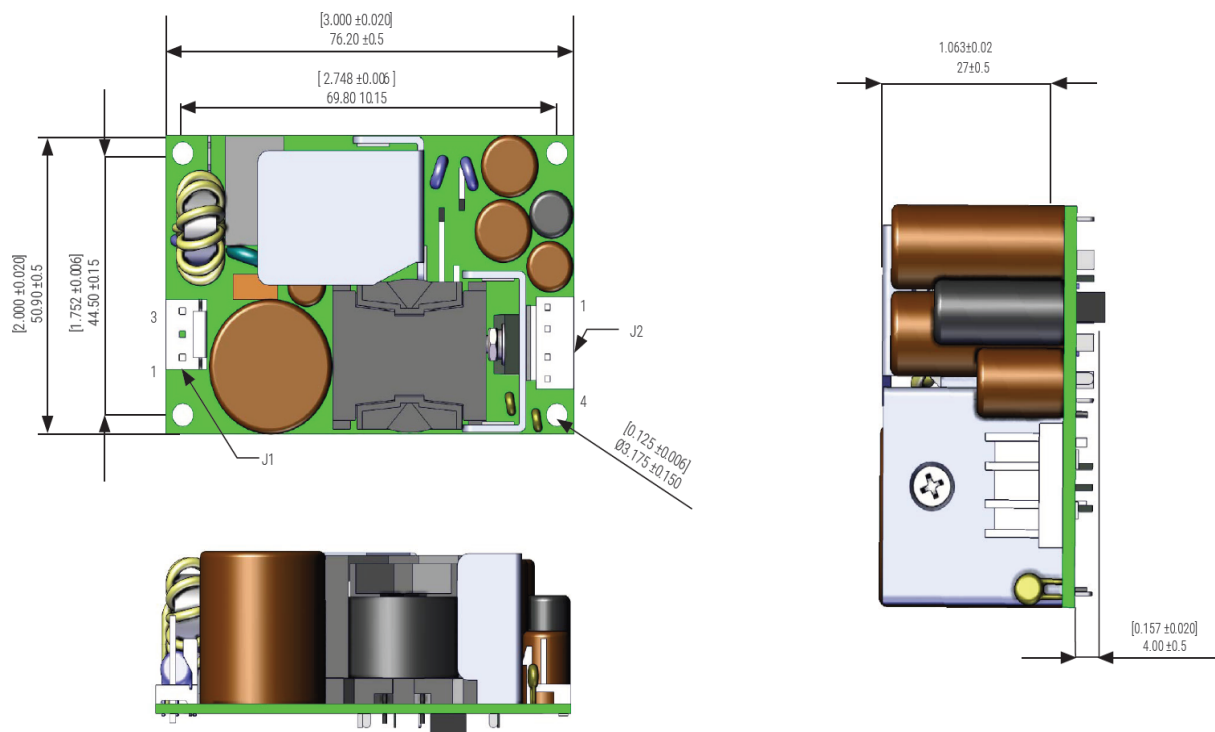
## PIN ASSIGNMENTS

Connector	Pin Assignment		Mating Connector
J1 (Input connector)	PIN 1	AC Line	Tyco/AMP 640250-3, Pins: 770461-1
	PIN 2	Empty	
	PIN 3	AC Neutral	
J200 (DC output connector)	PIN 1	+Vout	AMP 640250-4, Pins: 770461-1
	PIN 2	-Vout	
	PIN 3	+Vout	
	PIN 4	-Vout	
FG (Ground)	19-30258-0187 (Keystone 1285) (Zierick 895) (.187*0.020)		Molex 19002-0005

## Notes:

1. Mounting holes should be connected together for EMI purpose.
2. FG is safety ground connection (class I version).
3. This power supply requires mounting on metal standoffs 0.20" (5mm) in height.

## MECHANICAL DRAWING



## Notes:

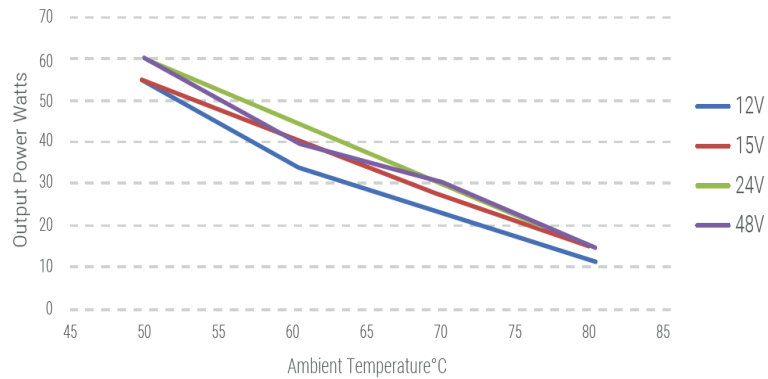
1. For class I model, the unit shall be mounted to a metal plate with metal stand offs and screws to ensure proper emissions attenuation.
2. For class II model, the unit should be mounted using plastic or other non-conductive hardware.

## DERATING CURVES

## Output vs. Temperature

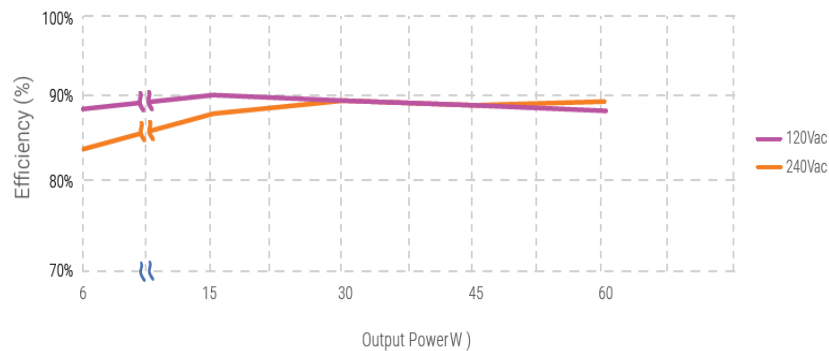
1. -40°C start up: At -20°C, the supply meet its full spec except ripple & noise might be increased from 1% to 2% of the output voltage.
2. See chart below for output power available at higher ambient.

MB60 Series Output Power Derating



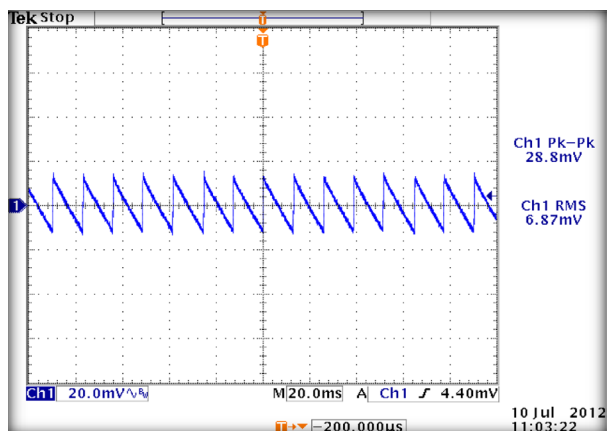
## Efficiency vs. Loading

Efficiency vs. Output Power

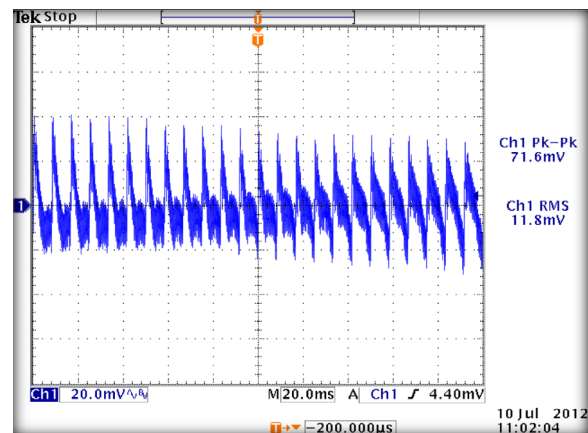


## RIPPLE AND NOISE

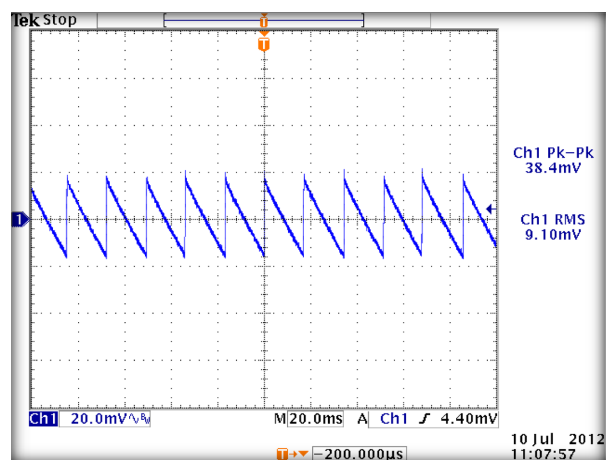
Ripple and noise



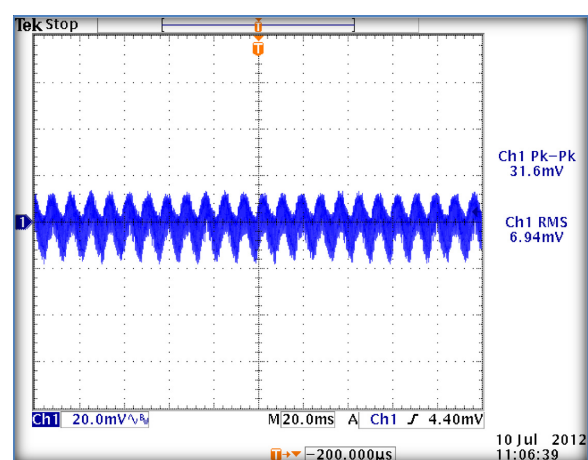
24V Out, No load, 90VAC, 60Hz



24V Out, Full load, 90VAC, 60Hz



24V Out, No load, 264VAC, 50Hz



24V Out, Full load, 264VAC, 50Hz



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## ABOUT ADVANCED ENERGY

Advanced Energy (AE) has devoted more than three decades to perfecting power for its global customers. AE designs and manufactures highly engineered, precision power conversion, measurement and control solutions for mission-critical applications and processes.

Our products enable customer innovation in complex applications for a wide range of industries including semiconductor equipment, industrial, manufacturing, telecommunications, data center computing, and medical. With deep applications know-how and responsive service and support across the globe, we build collaborative partnerships to meet rapid technological developments, propel growth for our customers, and innovate the future of power.

**PRECISION | POWER | PERFORMANCE | TRUST**

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