

# 60 Watt

# 2x2 Inch Package H3 2:1 Input Range - Metal Case



- o Pi Input Filter
- o Efficiency up to 91%
- o Remote On/Off Control
- o Continuous Short Circuit Protection
- o Over Current Protection
- o Over Voltage Protection
- o Soft Start
- o Built-in EMC filter meets EN55022 Class A without external components

MODEL NUMBER	INPUT VOLTAGE	OUTPUT VOLTAGE	OUTPUT CURRENT		INPUT CURRENT		% EFF.	CAPACITOR LOAD (µF)
			MIN. LOAD	FULL LOAD	NO LOAD	FULL LOAD		
60H3RS24W3.3M	18-36 VDC	3.3 VDC	0 mA	14000 mA	80 mA	2151 mA	91	36000
60H3RS24W5M		5 VDC		12000 mA	100 mA	2762 mA		20400
60H3RS24W12M		12 VDC		5000 mA	40 mA	2793 mA	90	3550
60H3RS24W15M		15 VDC		4000 mA				2300
60H3RS48W3.3M	36-75 VDC	3.3 VDC		14000 mA	50 mA	1075 mA	91	36000
60H3RS48W5M		5 VDC		12000 mA	60 mA	1389 mA		20400
60H3RS48W12M		12 VDC		5000 mA	40 mA	1397 mA		3550
60H3RS48W15M		15 VDC		4000 mA				2300

**SPECIFICATIONS**

All Specifications Typical At Nominal Line, Full Load, and 25°C Unless Otherwise Noted

**INPUT SPECIFICATIONS**

Input Voltage Range		2:1
Under Voltage lockout	24 Vin Module ON	17.8 V
	24 Vin Module OFF	16 V
	48 Vin Module ON	33.5 V
	48 Vin Module OFF	30.5 V
Start up Time (Nominal Vin and constant resistive Load)		20 mS
Input Filter		Pi Type
Input Current (No-Load)		see table max.
Input Current (Full-Load)		see table
Input Reflected Ripple Current <sup>1)</sup>		20 mA p-p
Remote ON/OFF (CTRL) <sup>2)</sup>	ON	3.0 to 12 VDC or Open Circuit
	OFF	1.2 VDC or Short Circuit Pin2 an Pin3
	OFF idle Current	5.0 mA

**OUTPUT SPECIFICATIONS**

Voltage Accuracy		±1.0% max.
Voltage Adjustability (Trim) <sup>3)</sup>		±10% max.
Maximum Output Current		see table
Temperature Coefficient		±0.02%/°C
Capacitive Load <sup>4)</sup>		see table
Ripple & Noise 20MHz BW <sup>5)</sup>	3.3 V, 5 V Output	75 mV p-p max.
	12 V, 15 V Output	100 mV p-p max.
Short Circuit Protection		Indefinite (Hiccup) (Automatic Recovery)
Line Regulation		±0.5% max.
Load Regulation		±0.5% max.
Over Voltage Protection (Zener Diode Clamp)	3.3 V	3.9 V
	5 V	6.2 V
	12 V	15 V
	15 V	18 V
Over Load Protection		135% of FL
Transient Recovery Time <sup>6)</sup>		250 µs
Transient Response Deviation <sup>6)</sup>		±3% max.

**NOTE:**

1. Measured Input reflected ripple current with a simulated source inductance of 12 µH.
2. The Remote ON/OFF control pin is referenced to -Vin(pin2).
3. Maximum output deviation is 10% inclusive of remote sense and trim. If remote sense is not being used, the +sense should be connected to its corresponding +OUTPUT and likewise the -sense should be connected to its corresponding -OUTPUT.
4. Tested by minimal Vin and constant resistive load.
5. Measured with 20 MHz bandwidth and 1.0 µF ceramic capacitor.
6. Tested by normal Vin and 25% load step change (75%-50%-25% of Io).

**SPECIFICATIONS**

All Specifications Typical At Nominal Line, Full Load, and 25°C Unless Otherwise Noted

<b>GENERAL SPECIFICATION</b>		
Efficiency		see table
I/O Isolation Voltage (3 sec)	Input/Output Case/ Input & Output	1600 VDC 1600 VDC
Isolation Resistance		1000 Mohms min.
Isolation Capacitance		2000 pF
Switching Frequency		270 kHz
Operating Temperature Range		-40°C to +85°C (see Derating Curve) -40°C to +40°C (for 100% Load)
Case Temperature		+110°C max.
Storage Temperature Range		-55°C to +125°C
Over Temperature Protection (Case)		120°C
Cooling		Natural Convection
Humidity		95% RH
Reliability Calculated MTBF (MIL-HDBK-217F)		>110 khrs
Safety Standard (design to meet)		IEC/EN 60950-1
Radiated Emissions		EN55022 Class A
Conducted Emissions		EN55022 Class A
ESD		IEC61000-4-2 Perf. Criteria A
RS		IEC61000-4-3 Perf. Criteria A
EFT <sup>7)</sup>		IEC61000-4-4 Perf. Criteria A
Surge <sup>7)</sup>		IEC61000-4-5 Perf. Criteria A
CS		IEC61000-4-6 Perf. Criteria A
PFMF		IEC61000-4-8 Perf. Criteria A
Case Material		Nickel-coated Copper
Base Material		Non-conductive Black Plastic (UL94V-0 rated)
Pin Material		Ø1.0 mm Brass Solder-coated
Potting Material		Epoxy (UL94V-0 rated)
Dimensions		2.0 x 2.0 x 0.4 Inches (50.8 x 50.8 x 10.2 mm)
Weight		70 g

## NOTE

7. An external filter capacitor is required if the module has to meet IEC61000-4-4 and IEC61000-4-5.  
The filter capacitor M+R suggest: Nippon chemi-con KY series, 220 µF/100 V.

**SPECIFICATIONS**

All Specifications Typical At Nominal Line, Full Load, and 25°C Unless Otherwise Noted

**ABSOLUTE SPECIFICATIONS**

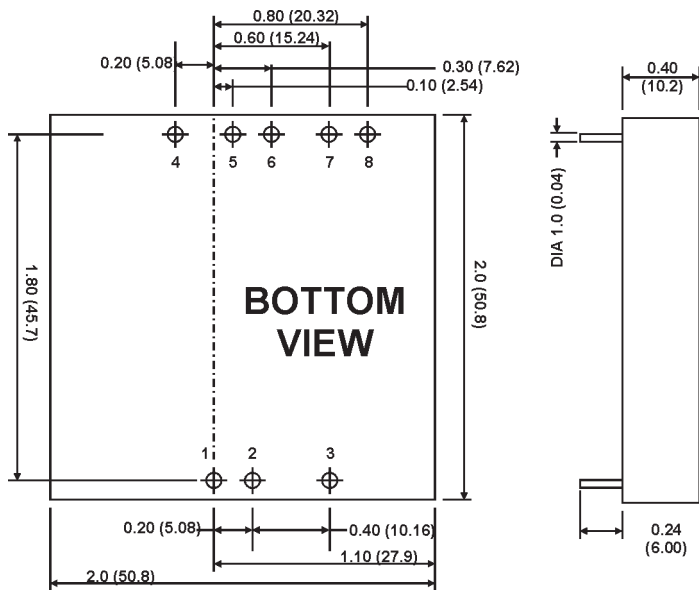
These are stress ratings. Exposure of devices to any of these conditions may adversely affect long-term reliability.

Input Surge Voltage (100 mS)	24 V 48 V	50 VDC max. 100 VDC max.
Soldering Temperature (1.5 mm from case 10 sec. max.)		+260°C max.

NOTE:  
Exceeding the absolute ratings of the unit could cause damage. It is not allowed for continuous operating.

**MECHANICAL SPECIFICATIONS**

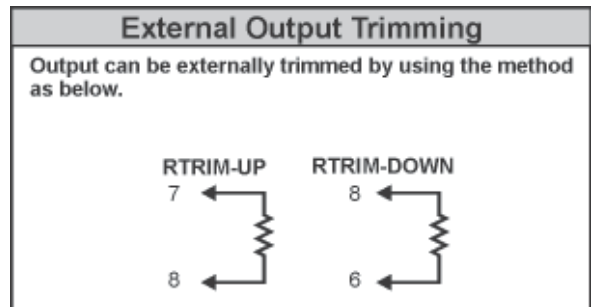
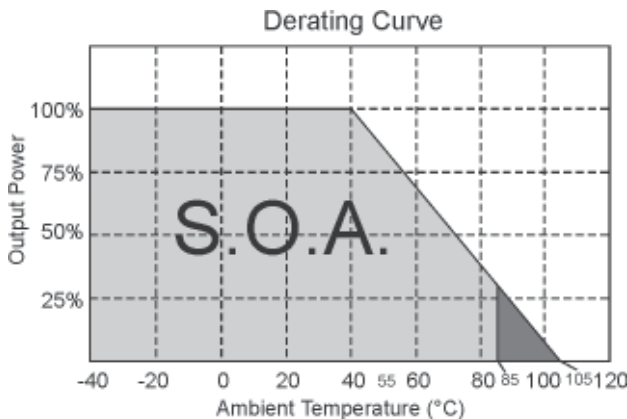
Case "H3"



PIN CONNECTIONS	
1	+INPUT
2	-INPUT
3	REMOTE CONTROL
4	-SENSE
5	+SENSE
6	+OUTPUT
7	-OUTPUT
8	TRIM

- All Dimensions in Inches (mm).  
 1. Pin diameter 0.04 ±0.002 (1.0 ±0.05)  
 2. Pin pitch and length Tolerance: ±0.014 (±0.35)  
 3. Case Tolerance: ±0.02 (±0.5)

**APPLICATION NOTES & DIAGRAMS**



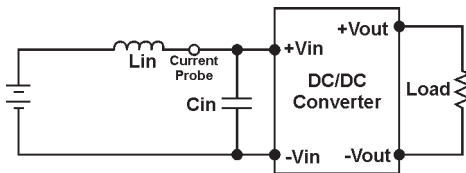
## SPECIFICATIONS

All Specifications Typical At Nominal Line, Full Load, and 25°C Unless Otherwise Noted

## TEST CONFIGURATIONS

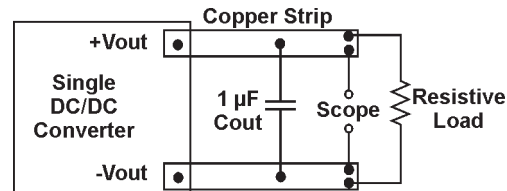
### Input Reflected Ripple Current Test Step

Input reflected ripple current is measured through a source inductor  $L_{in}$  (12  $\mu\text{H}$ ) and a source capacitor  $C_{in}$  (47  $\mu\text{F}$ ,  $\text{ESR} < 1.0 \text{ Ohm}$  at 100 kHz) at nominal input and full load.



### Output Ripple & Noise Measurement Test

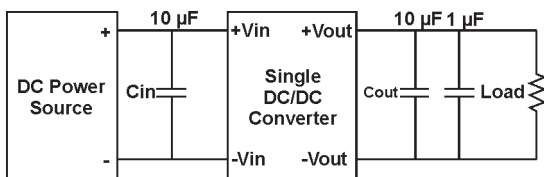
Use a capacitor  $C_{out}$  (1.0  $\mu\text{F}$ ) measurement. The Scope measurement bandwidth is 0-20 MHz.



## DESIGN & FEATURE CONFIGURATIONS

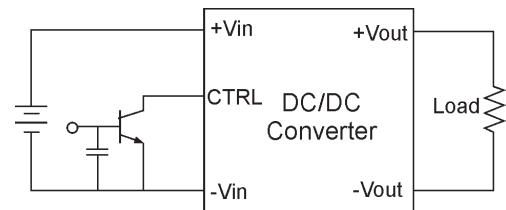
### Output Ripple & Noise Reduction

To reduce ripple and noise, it is recommended to use a 1  $\mu\text{F}$  ceramic disk capacitor and a 10  $\mu\text{F}$  electrolytic capacitor at the output.



### CTRL Module ON/OFF

Positive logic turns On the module during high logic and Off during low logic. Ctrl module on/off can be controlled by an external switch between the ctrl terminal and -Vin terminal. The switch can be an open collector or open drain for positive logic if the ctrl feature is not used, please leave the ctrl pin floating.



### Over Voltage Protection

The module includes an internal output over voltage protection circuit, which monitors the voltage on the output terminals. If this voltage exceeds the over voltage set point, the module will activate the control loop of internal circuit to clamp the output voltage.

### Over Current Protection

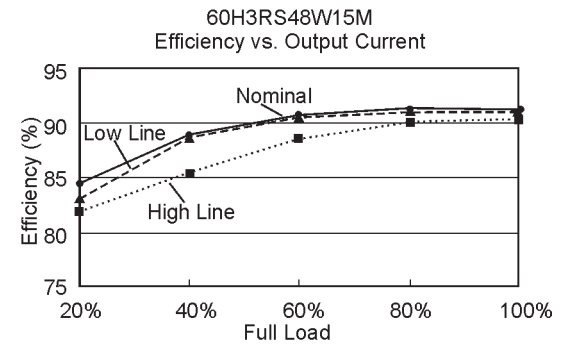
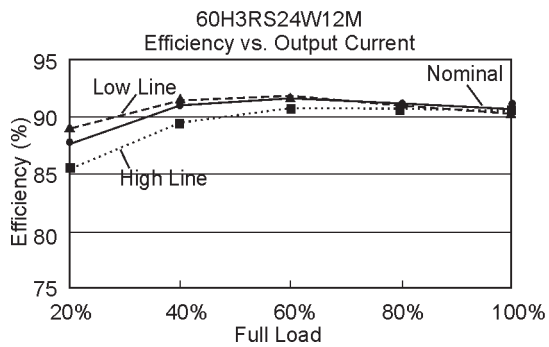
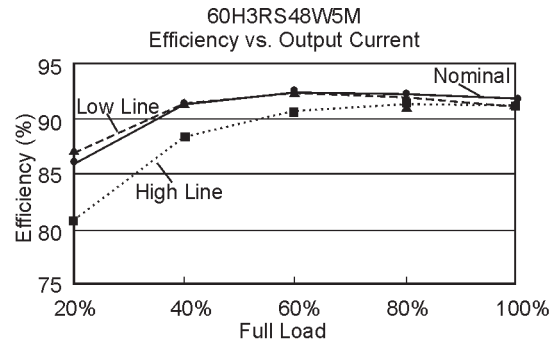
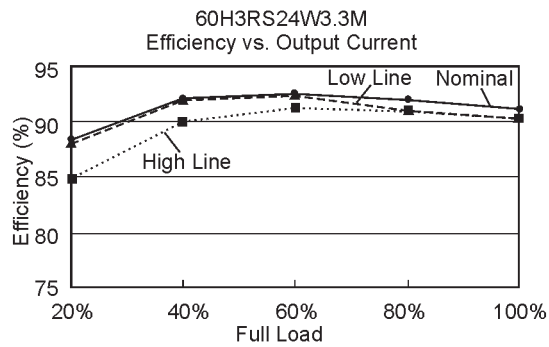
The module includes an internal over current protection circuit, which will endure current limiting for an unlimited duration during output over load condition. If the output current exceeds the OCP set point, the module will shut down automatically (hiccup).

The module will try to restart after shut down. If the over load condition still exists, the module will shut down again.

**SPECIFICATIONS**

All Specifications Typical At Nominal Line, Full Load, and 25°C Unless Otherwise Noted

**ELECTRICAL CHARACTERISTIC CURVES**



**NOTICE:**  
The information in this document has been carefully checked. However, no responsibility is assumed for inaccuracies! Specifications can be changed without notice. The latest and most complete information can be found on our website.