

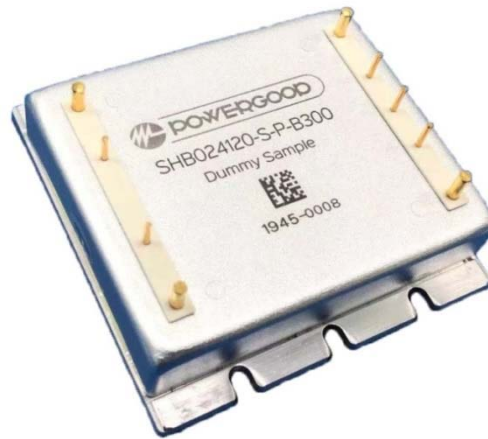
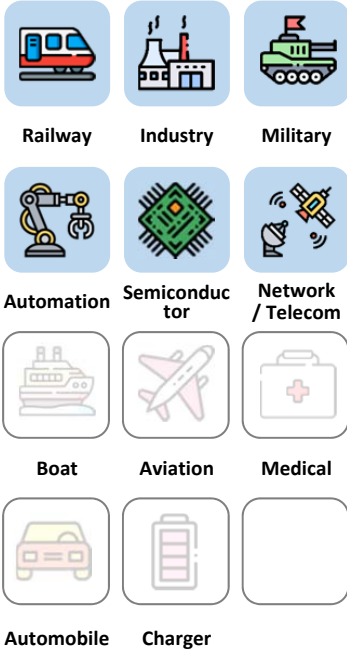


# SHBS Series

## 100W / Half Brick

### DC/DC

#### Applications



**3** Years Warranty



#### Features

<b>1/2 Brick</b>	<b>2:1 / 4:1</b> Wide input range	<b>Vicor</b> Pin out	<b>PI FILTER</b> Built-in	<b>2250 VDC</b> Insulation	<b>MLCC</b> No life-span constrained	<b>89%</b> High efficiency	<b>ON / OFF</b> REMOTE
<b>METAL CASE</b>	<b>UVLO</b>	<b>OCP</b>	<b>OVP</b>	<b>OTP</b>			

#### Model Number Structure

Series Name	Input Voltage (VDC)	Output Voltage (VDC)	Pin out	Remote Control Option	Shape	Watt
SHBS	110	120	- V	- P	- B	100
Supreme series	024W : 9-36 024 : 18-36	050 : 5 120 : 12	V : Vicor	P : Positive logic N : Negative logic	B : Base Plate	50 100
Half Brick	048W : 18-75	240 : 24				
Second	110 : 40-180	280 : 28				
	300 : 180-425	480 : 48				

**Model Selection Guide**

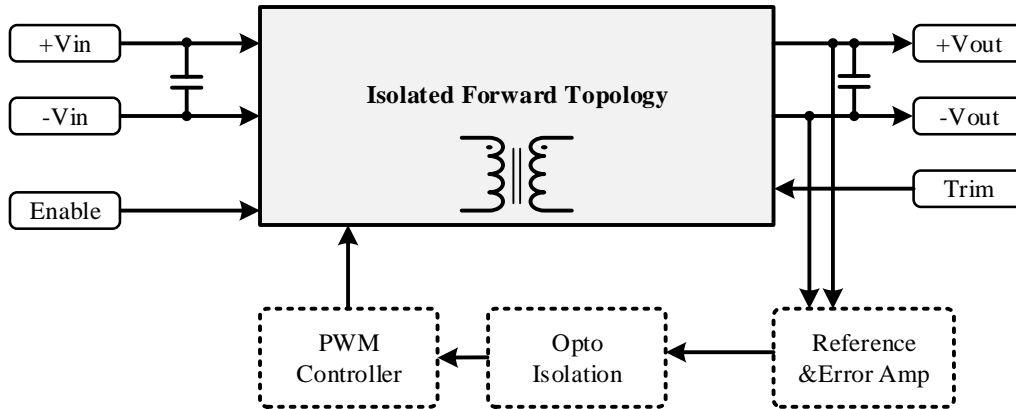
Typical @ Ta=+25 °C under nominal line voltage conditions unless noted

Model	Input			Output			Efficiency
	Voltage (V)		Current (A)	Voltage	Current	Power	
	Range	Nominal	Full load	(V)	(A)	(W)	Typ.(%)
SHBS024W050-V-□-B50	9-36	24	2.37	5	10	50	88
SHBS024W120-V-□-B50	9-36	24	2.34	12	4.17	50	89
SHBS024W240-V-□-B50	9-36	24	2.34	24	2.08	50	89
SHBS024W280-V-□-B50	9-36	24	2.34	28	1.79	50	89
SHBS024W480-V-□-B50	9-36	24	2.34	48	1.04	50	89
SHBS024W050-V-□-B100	9-36	24	4.73	5	20	100	88
SHBS024W120-V-□-B100	9-36	24	4.68	12	8.33	100	89
SHBS024W240-V-□-B100	9-36	24	4.68	24	4.17	100	89
SHBS024W280-V-□-B100	9-36	24	4.68	28	3.57	100	89
SHBS024W480-V-□-B100	9-36	24	4.68	48	2.08	100	89
SHBS024050-V-□-B50	18-36	24	2.37	5	10	50	88
SHBS024120-V-□-B50	18-36	24	2.34	12	4.17	50	89
SHBS024240-V-□-B50	18-36	24	2.34	24	2.08	50	89
SHBS024280-V-□-B50	18-36	24	2.34	28	1.79	50	89
SHBS024480-V-□-B50	18-36	24	2.34	48	1.04	50	89
SHBS024050-V-□-B100	18-36	24	4.73	5	20	100	88
SHBS024120-V-□-B100	18-36	24	4.68	12	8.33	100	89
SHBS024240-V-□-B100	18-36	24	4.68	24	4.17	100	89
SHBS024280-V-□-B100	18-36	24	4.68	28	3.57	100	89
SHBS024480-V-□-B100	18-36	24	4.68	48	2.08	100	89
SHBS048W050-V-□-B50	18-75	48	1.18	5	10	50	88
SHBS048W120-V-□-B50	18-75	48	1.17	12	4.17	50	89
SHBS048W240-V-□-B50	18-75	48	1.17	24	2.08	50	89
SHBS048W280-V-□-B50	18-75	48	1.17	28	1.79	50	89
SHBS048W480-V-□-B50	18-75	48	1.17	48	1.04	50	89

Model	Input			Output			Efficiency
	Voltage (V)		Current (A)	Voltage	Current	Power	
	Range	Nominal	Full load	(V)	(A)	(W)	Typ.(%)
SHBS048W050-V-□-B100	18-75	48	2.37	5	20	100	88
SHBS048W120-V-□-B100	18-75	48	2.34	12	8.33	100	89
SHBS048W240-V-□-B100	18-75	48	2.34	24	4.17	100	89
SHBS048W280-V-□-B100	18-75	48	2.34	28	3.57	100	89
SHBS048W480-V-□-B100	18-75	48	2.34	48	2.08	100	89
SHBS110050-V-□-B50	40-180	110	0.52	5	10	50	88
SHBS110120-V-□-B50	40-180	110	0.51	12	4.17	50	89
SHBS110240-V-□-B50	40-180	110	0.51	24	2.08	50	89
SHBS110280-V-□-B50	40-180	110	0.51	28	1.79	50	89
SHBS110480-V-□-B50	40-180	110	0.51	48	1.04	50	89
SHBS110050-V-□-B100	40-180	110	1.03	5	20	100	88
SHBS110120-V-□-B100	40-180	110	1.02	12	8.33	100	89
SHBS110240-V-□-B100	40-180	110	1.02	24	4.17	100	89
SHBS110280-V-□-B100	40-180	110	1.02	28	3.57	100	89
SHBS110480-V-□-B100	40-180	110	1.02	48	2.08	100	89
SHBS300050-V-□-B50	180-425	300	0.19	5	10	50	88
SHBS300120-V-□-B50	180-425	300	0.19	12	4.17	50	89
SHBS300240-V-□-B50	180-425	300	0.19	24	2.08	50	89
SHBS300280-V-□-B50	180-425	300	0.19	28	1.79	50	89
SHBS300480-V-□-B50	180-425	300	0.19	48	1.04	50	89
SHBS300050-V-□-B100	180-425	300	0.38	5	20	100	88
SHBS300120-V-□-B100	180-425	300	0.37	12	8.33	100	89
SHBS300240-V-□-B100	180-425	300	0.37	24	4.17	100	89
SHBS300280-V-□-B100	180-425	300	0.37	28	3.57	100	89
SHBS300480-V-□-B100	180-425	300	0.37	48	2.08	100	89

## Description

**Supreme series - Half Brick - Second generation converter** is composed of Isolated, board-mountable, fixed switching frequency DC-DC converters that use synchronous rectification to achieve extremely high-power conversion efficiency. These DC-DC converter modules use advanced power processing, control and packaging technologies to enhance the performance, flexibility, reliability and cost effectiveness of mature power components. Each module is six-sided metal case enclosed to provide protection from the harsh environments seen in many industrial and transportation applications.



SHBS Series Block Diagram

## Electrical Specifications

(Typical @ Ta=+25°C under nominal line voltage conditions unless noted.)

### Input Specifications

Parameter	Notes and Conditions	Min.	Typ.	Max.	Unit
Transient Input Voltage Ranges	SHBS024W models(100ms Max)			50	VDC
	SHBS024 models(100ms Max)			50	
	SHBS048W models(100ms Max)			80	
	SHBS110 models(100ms Max)			250	
	SHBS300 models(100ms Max)			500	
Operating Input Voltage Ranges	SHBS024W models	9	24	36	VDC
	SHBS024 models	18	24	36	
	SHBS048W models	18	48	75	
	SHBS110 models	40	110	180	
	SHBS300 models	180	300	425	
Under-Voltage Lockout Start up Voltage	SHBS024W models			9	VDC
	SHBS024 models			18	
	SHBS048W models			18	
	SHBS110 models			40	
	SHBS300 models			180	
Under-Voltage Lockout Shutdown Voltage	SHBS024W models		8		VDC
	SHBS024 models		17		
	SHBS048W models		17		
	SHBS110 models		38		
	SHBS300 models		145		
Over-Voltage Lockout Turn OFF Threshold	SHBS024W models			50	VDC
	SHBS024 models			50	
	SHBS048W models			80	
	SHBS110 models			190	
	SHBS300 models			450	
Over-Voltage Lockout Turn ON Threshold	SHBS024W models	36			VDC
	SHBS024 models	36			
	SHBS048W models	75			
	SHBS110 models	180			
	SHBS300 models	425			
Input Current	See model selection guide, Standby mode (OFF,UVLO) 5mA				
Enable Function Input	Positive logic	ON	Open		VDC
		OFF	Short or 0 ~ 1.2		
	Negative logic	ON	Short or 0 ~ 1.2		VDC
		OFF	Open		

**Output Specifications**

Parameter	Notes and Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy	V <sub>NOM</sub> 50% Load			±1.5	%
Line Regulation	Low Line to High Line			±0.3	%
Load Regulation	10% to 100% Load			±0.5	%
Output Ripple & Noise Voltage	Bandwidth 20MHz and with 1uF MLCC Output Capacitor		1.5		%V <sub>pk-pk</sub>
Temperature Coefficient				±0.04	% / °C
Transient Recovery Time	25% load step change		800		µSec.
Transient Peak Deviation	ΔI <sub>o</sub> /Δt=2.5A/µs		±2		%V <sub>o</sub>
Start-Up Time	When use Enable Function		20		mSec.
Trimming Output Voltage	V <sub>NOM</sub> 10% Load		±10		%
Over Voltage Protection	V <sub>NOM</sub> 10% Load		120		%
Output Power Protection	V <sub>NOM</sub>		120		%

**General Specifications & Environmental Specifications**

Parameter	Notes and Conditions	Min.	Typ.	Max.	Unit
Switching Frequency	V <sub>NOM</sub>		220		KHz
Storage Temperature Range	All models	-60		125	°C
Operating Case Temperature	All models	-40		100	°C
Over temperature Protection	All models, Auto. Recovery		105		
Isolation Voltage	All models, 1 Minute	2250			VDC
Input to Output					
Isolation Resistance	All models, 500VDC, At 70%RH	100			MΩ
Input to Output					
Isolation Capacitance	All models		1500		pF
Input to Output					
Humidity (non condensing)	All models			95	%
Calculated MTBF	BellCore-TR-332@ 50°C G.B		1.5		M HR
Thermal shock	Environmental Engineering Experimental Tests	MIL-STD-810F			
Vibration		MIL-STD-810F			
Drop		MIL-STD-810F			
Weight	Shape-B		117		g (oz.)
Dimensions	Shape-B	2.4" x 2.42" x 0.59" (61.0 x 61.4 x 15.0mm)			
Case Material	Aluminum				
Potting Material	Silicone				

## Standards Compliance

Parameter	Standard	Test Conditions	Performance Criteria
Environmental Compliance	Reach; RoHS		PASS
EMI	EN55022		Class A / Class B
ESD	EN61000-4-2	±4 kV Air Discharge ±4 kV Contact Discharge	Crit. A
Radiated Immunity	EN61000-4-3	Level 2, 3 V/m	Crit. A
Fast Transient	EN61000-4-4	±2 kV Applied	Crit. A
Surge	EN61000-4-5	±2 kV Applied	Crit. A
Conducted Immunity	EN61000-4-6	Level 2, 3 V rms	Crit. A

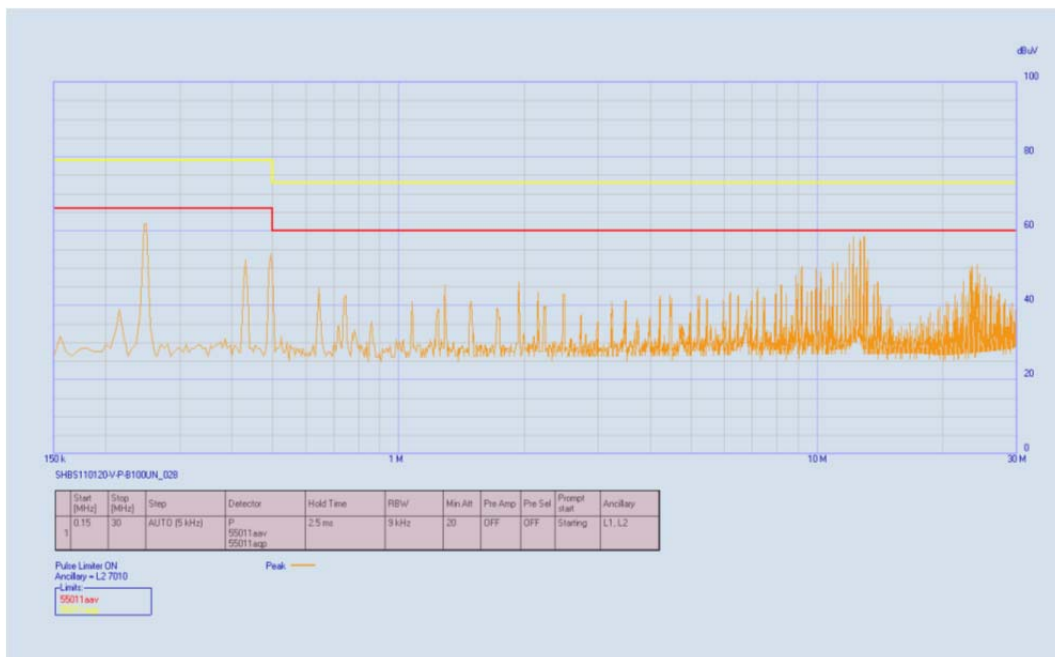
It is recommended to protect the input by fuses or other protection devices.

**Modules could meet EN55022 Class A and Class B standard with external components.**

The information and specifications contained in this data sheet are believed to be correct at time of publication. All specifications are subject to change without notice. No rights under any patent accompany the sale of any such products or information contained herein.

## Conducted EMI

Input terminal value (typ.) SHBS110120-V-P-B100 @Vin = 110VDC, Iout = 8.3A



The fundamental switching frequency of the module is 260 kHz.

## Characteristic Curves

Testing conditions are at typical input,  $T_a=+25^{\circ}\text{C}$ , full load (horizontal mount) Unless otherwise indicated

The figures of SHBS024W240-V-P-B100

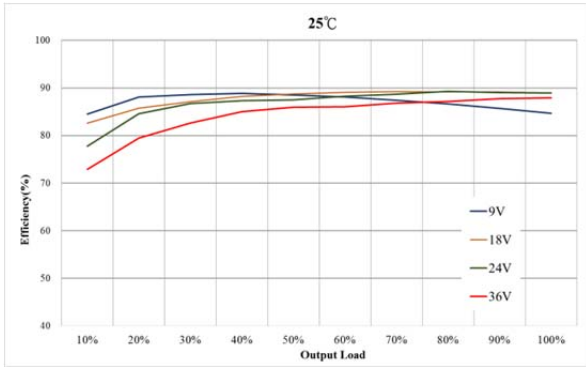


Figure 1 : Efficiency at Minimum, Nominal and Maximum Input Voltages VS. Output Load.

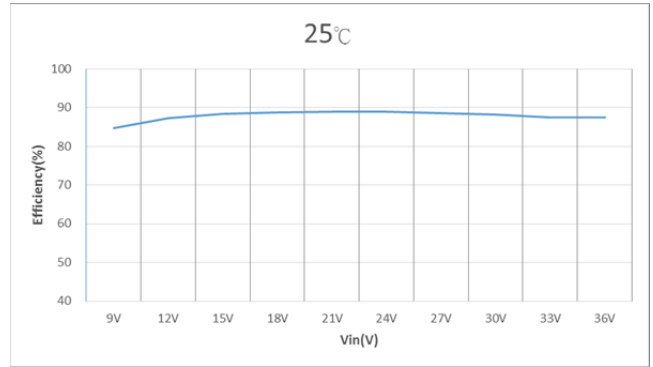


Figure 2 : Efficiency VS. Input Voltages at 100% rated power

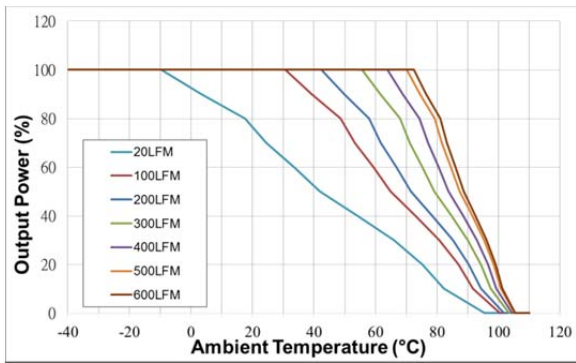


Figure 3 : Ambient Temperature VS. Output Power Derating Curves

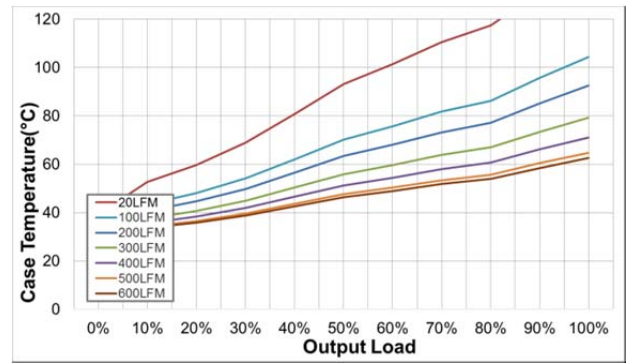


Figure 4 : Case Temperature VS. Output rated Power

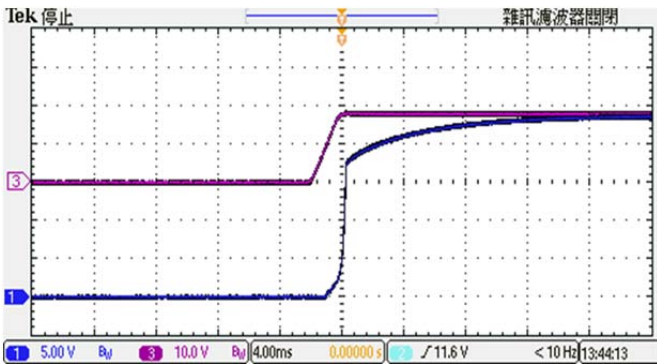


Figure 5 : CH1 = Vout, CH3 = Nominal Input  
Typical Start-up waveform at Full load.

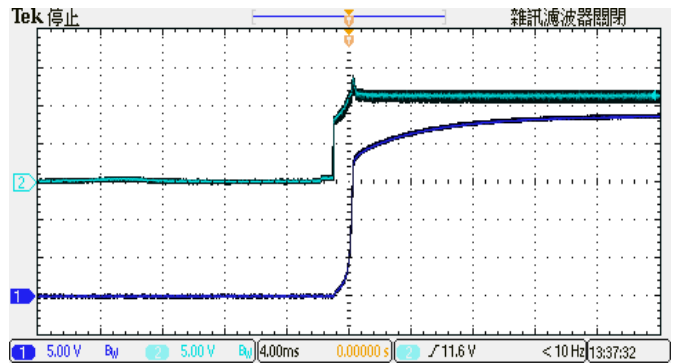


Figure 6 : CH1 = Vout, CH3 = Enable Pin  
Typical Start-up waveform. Input voltage pre-applied

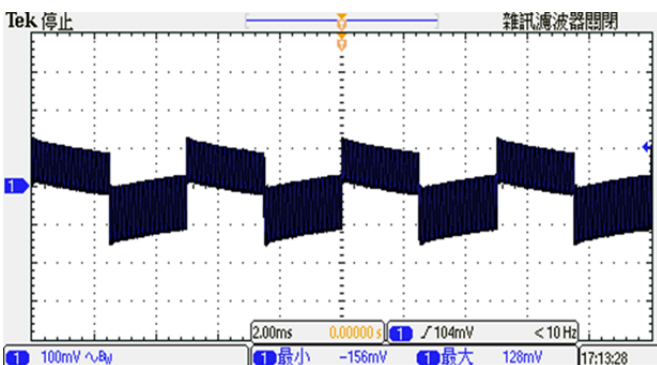


Figure 7 : Transient Response at Output step load  
(  $V_{in}$ : Typical ,50~75% of output current;  $\Delta I_o/\Delta t = 1\text{A}/\mu\text{S}$  )

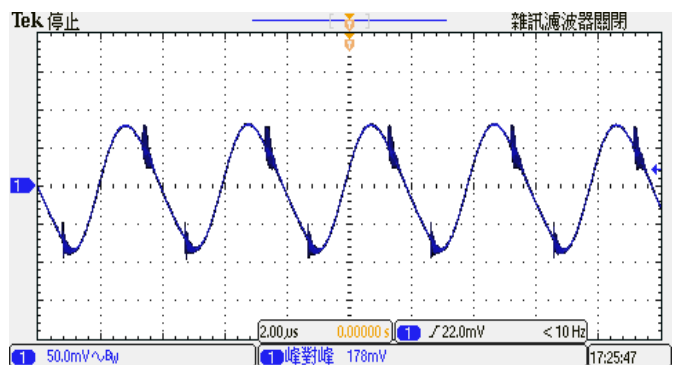
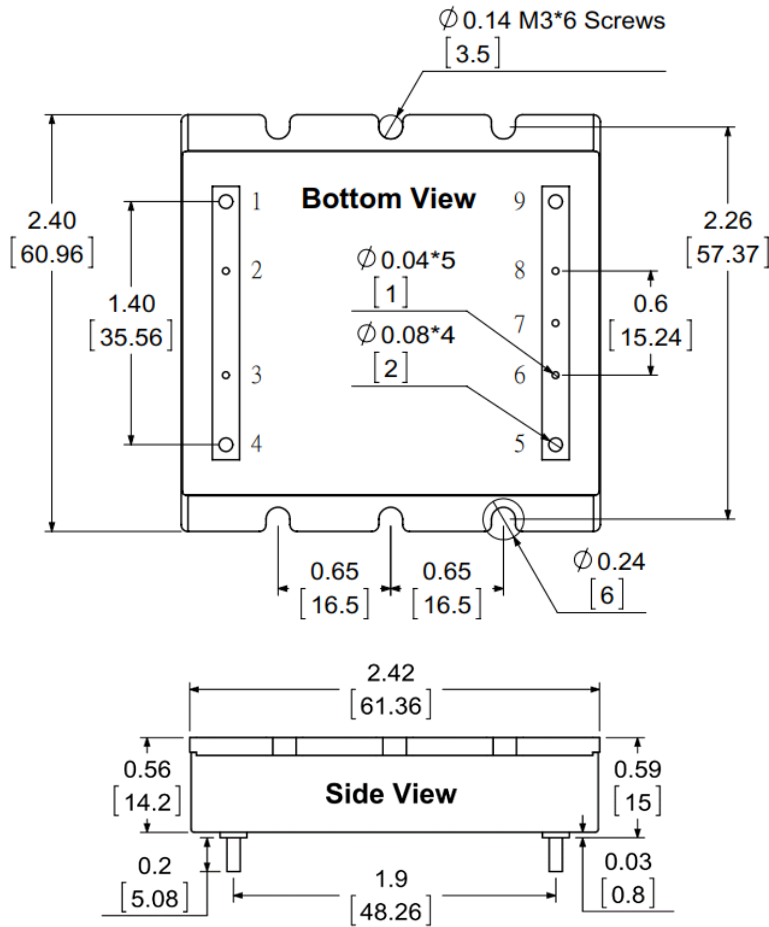


Figure 8 : Output Voltage Ripple & Noise at full load.  
(  $V_{in}$ : Typical, With Output Capacitor to add 1uF MLCC )



## Mechanical Dimensions & Pin Assignments

### Shape – B



#### Pin Assignments:

Pin#	Function
1	-Vin
2	NC
3	Enable
4	+Vin
5	+Vout
6	+Sense
7	Trim
8	-Sense
9	-Vout

#### Note:

Pin Material: Copper Alloy

Pin Plating: Gold

Dimensions in inches [mm]

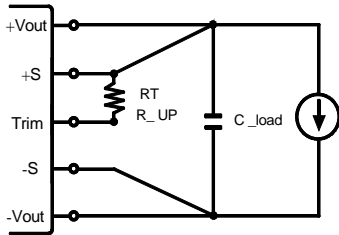
Tolerances: .XX±0.02 [ .X±0.5mm]

## Trimming Output Voltage – for Single output models

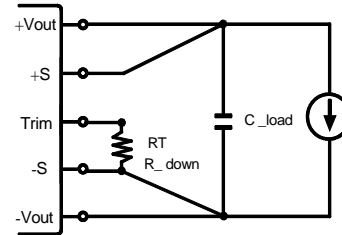
Only the single output converters have a trim function. That allows users to adjust the output voltage from +10% to -10%, please refer to the trim table that follow for details. Adjustments to the output voltage can be used with a simple fixed resistor as shown in Figures 1 and 2. A single fixed resistor can increase or decrease the output voltage depending on its connection.

**Note:**

- ※ Trim adjustments higher than the specified range can have an adverse effect on the converter’s performance and are not recommended.
- ※ If the trim function is not used, leave the trim pin open.



**Figure 1.** Trim Connections To increase Output Voltages Using Fixed Resistors



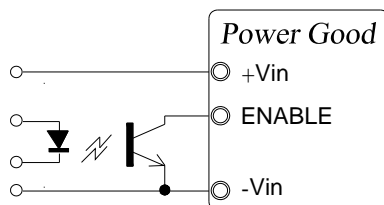
**Figure 2.** Trim Connections To decrease Output Voltages Using Fixed Resistors

Vout	Trim up resistor value(KΩ)									
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
5	109	50	30	20	14	10	7	5	3.3	2
12	258	115	67	44	29	20	13	7.8	3.8	0.6
24	514	232	137	90	62	43	30	20	12	5.5
28	602	271	161	105	72	50	34	22	13	5.9
48	1039	464	273	177	120	81	54	34	18	5

Vout	Trim down resistor value(KΩ)									
	-1%	-2%	-3%	-4%	-5%	-6%	-7%	-8%	-9%	-10%
5	137	62	37	25	17	12	9	6	4	2.2
12	358	162	96	63	44	31	21	14	8.9	4.5
24	769	352	213	143	102	74	54	39	28	18
28	860	392	236	158	111	80	57	41	28	17
48	1413	638	380	251	173	121	85	57	35	18

### Enable Control Function

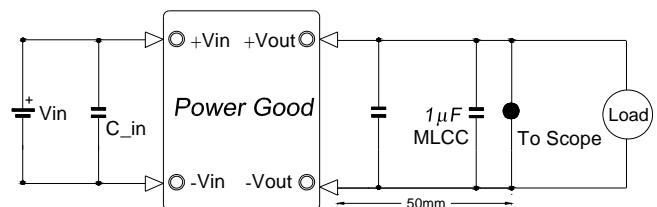
The primary-side, Enable Control function can be specified to operate with either positive or negative polarity. Positive-polarity devices are enabled when the enable pin is left open or is pulled high. See “Enable Function Input.” Positive-polarity devices are disabled when the enable pin is pulled low (under +1.0V with respect to -input). Negative-polarity devices are off when the enable pin is high/open and on when the enable pin is pulled low. See Figure 3.



**Figure 3.** Driving the Enable Control pin

### Output Ripple Noise

The two copper strips simulate real-world PCB impedances between the converter and its load. Scope measurements should be made using BNC connectors or The probe ground should be less than 1/2 inch and soldered directly to the fixture. All external capacitors should have appropriate voltage ratings and be located as close to the converter as possible. Temperature variations for all relevant parameters should be taken into consideration. The most effective combination of external I/O capacitors will be a function of line voltage and source impedance, as well as particular load and layout conditions. See Figure 4.



**Figure 4.** Measuring Output Ripple/Noise(20MHz bandwidth)

