DC – DC

Features

- 2:1/4:1 Wide Input Range
- Operating Temperature Range: -40~105°c
- Approved to CE, RoHS & REACH
- Safety Standards to IEC/UL/EN62368-1
- Efficiency up to 92%
- EMC Class A & B
- Single output 9~425V DC

Ideal Power's 28SHBvvvvvv-x-y-Bz 300W Half Brick DC/DC Converters Series are certified to CE, RoHS, REACH & EN 62368-1/IEC 62368-1/UL 62368-1/EN 50155 Standards and comply with the relevant Efficiency Regulations. These are primarily used in ITE, Audio & Video, Railway Industries and customised solutions are available upon request.

Part Number Structure

Half Brick

28SHB	-	110	120	-	S	-	P	-	B	300
Series Name		Input Voltage (VDC)	Output Voltage (VDC)		Pin Out		Remote On/Off Options		Shape	W
Supreme series **H**alf **B**rick		**018:** 9-36 **024:** 18-36 **036:** 18-75 **110:** 40-180 **300:** 180-425	**050:** 5 **120:** 12 **240:** 24 **280:** 28 **480:** 48		**S:** Dosa **V:** Victor		**N:** Negative logic. **P:** Positive logic.		**B:** Base Plate	200 300

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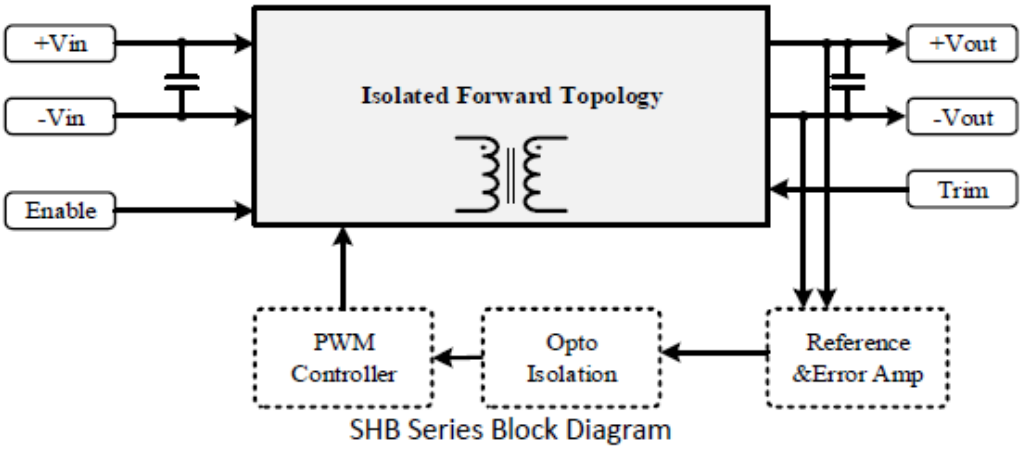
Models

Model Number	Input			Output			Efficiency
	Voltage (V)		Current (A)	Voltage	Current	Power	
	Range	Nominal	Full load	(V)	(A)	(W)	Typ.(%)
28SHB018050-□-□-B200	9-36	18	12.63	5	40	200	88
28SHB018120-□-□-B200	9-36	18	12.63	12	16.67	200	88
28SHB018240-□-□-B200	9-36	18	12.63	24	8.33	200	88
28SHB018280-□-□-B200	9-36	18	12.63	28	7.14	200	88
28SHB018480-□-□-B200	9-36	18	12.48	48	4.17	200	89
28SHB018120-□-□-B300	9-36	18	19.16	12	25	300	87
28SHB018240-□-□-B300	9-36	18	19.16	24	12.5	300	87
28SHB018280-□-□-B300	9-36	18	19.16	28	10.71	300	87
28SHB018480-□-□-B300	9-36	18	18.73	48	6.25	300	89
28SHB024050-□-□-B200	18-36	24	9.26	5	40	200	90
28SHB024120-□-□-B200	18-36	24	9.16	12	16.67	200	91
28SHB024240-□-□-B200	18-36	24	9.06	24	8.33	200	92
28SHB024280-□-□-B200	18-36	24	9.06	28	7.14	200	92
28SHB024480-□-□-B200	18-36	24	9.06	48	4.17	200	92
28SHB024120-□-□-B300	18-36	24	13.74	12	25	300	91
28SHB024240-□-□-B300	18-36	24	13.74	24	12.5	300	91
28SHB024280-□-□-B300	18-36	24	13.74	28	10.71	300	91
28SHB024480-□-□-B300	18-36	24	13.74	48	6.25	300	91
28SHB036050-□-□-B200	18-75	36	6.31	5	40	200	88
28SHB036120-□-□-B200	18-75	36	6.17	12	16.67	200	90
28SHB036240-□-□-B200	18-75	36	6.17	24	8.33	200	90
28SHB036280-□-□-B200	18-75	36	6.17	28	7.14	200	90
28SHB036480-□-□-B200	18-75	36	6.17	48	4.17	200	90
28SHB036120-□-□-B300	18-75	36	9.36	12	25	300	89
28SHB036240-□-□-B300	18-75	36	9.36	24	12.5	300	89
28SHB036280-□-□-B300	18-75	36	9.36	28	10.71	300	89
28SHB036480-□-□-B300	18-75	36	9.36	48	6.25	300	89
28SHB110050-□-□-B200	40-180	110	2.07	5	40	200	88
28SHB110120-□-□-B200	40-180	110	2.04	12	16.67	200	89
28SHB110240-□-□-B200	40-180	110	2.04	24	8.33	200	89
28SHB110280-□-□-B200	40-180	110	2.04	28	7.14	200	89
28SHB110480-□-□-B200	40-180	110	2.04	48	4.17	200	89
28SHB110120-□-□-B300	40-180	110	3.06	12	25	300	89
28SHB110240-□-□-B300	40-180	110	3.06	24	12.5	300	89
28SHB110280-□-□-B300	40-180	110	3.06	28	10.71	300	89
28SHB110480-□-□-B300	40-180	110	3.06	48	6.25	300	89
28SHB300050-□-□-B200	180-425	300	0.74	5	40	200	90
28SHB300120-□-□-B200	180-425	300	0.74	12	16.67	200	90
28SHB300240-□-□-B200	180-425	300	0.74	24	8.33	200	90
28SHB300280-□-□-B200	180-425	300	0.74	28	7.14	200	90
28SHB300480-□-□-B200	180-425	300	0.74	48	4.17	200	90
28SHB300120-□-□-B300	180-425	300	1.11	12	25	300	90
28SHB300240-□-□-B300	180-425	300	1.10	24	12.5	300	91
28SHB300280-□-□-B300	180-425	300	1.11	28	10.71	300	90
28SHB300480-□-□-B300	180-425	300	1.11	48	6.25	300	90

Description

Supreme series - Half Brick 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.



SHB Series Block Diagram

Input Specifications

Parameter	Conditions	Min	Typ	Max	Unit
Transient Input Voltage Ranges	28SHB018 models(100ms Max)	--	--	50	VDC
	28SHB024 models(100ms Max)	--	--	50	
	28SHB036 models(100ms Max)	--	--	100	
	28SHB110 models(100ms Max)	--	--	250	
	28SHB300 models(100ms Max)	--	--	500	
Operating Input Voltage Ranges	28SHB018 models	9	18	36	VDC
	28SHB024 models	18	24	36	
	28SHB036 models	18	36	75	
	28SHB110 models	40	110	180	
	28SHB300 models	180	300	425	
Over-Voltage Turn-off Voltage	28SHB018 models	--	--	48	VDC
	28SHB024 models	--	--	48	
	28SHB300 models	--	--	85	
	28SHB018 models	--	--	195	
	28SHB024 models	--	--	470	
Over-Voltage Turn-on Voltage	28SHB300 models	36	--	--	VDC
	28SHB018 models	36	--	--	
	28SHB024 models	75	--	--	
	28SHB300 models	180	--	--	
	28SHB018 models	425	--	--	

Input Specifications (continued)

Under-Voltage Lockout Turn-on Voltage	28SHB018 models	--	--	9	VDC
	28SHB024 models	--	--	18	
	28SHB300 models	--	--	180	
	28SHB018 models	--	--	9	
	28SHB024 models	--	--	18	
Under-Voltage Lockout Turn-off Voltage	28SHB300 models	--	8	--	VDC
	28SHB018 models	--	17	--	
	28SHB024 models	--	175	--	
	28SHB300 models	--	8	--	
	28SHB018 models	--	17	--	
Input Current	See model selection guide, Standby mode (OFF,UVLO) 5mA				
Enable Function Input	Positive logic ON	Open			VDC
	Positive logic OFF	Short or 0 ~ 1.2			
	Negative logic ON	Short or 0 ~ 1.2			
	Negative logic OFF	Open			

Output Specifications

Parameter	Conditions	Min	Typ	Max	Unit
Output Voltage Accuracy	VNOM 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	--	1.5	--	%Vpk-pk
Temperature Coefficient		--	--	±0.04	% /˚C
Transient Recovery Time	25% load step change	--	800	--	µSec.
Transient Peak Deviation	ΔIo/Δt=2.5A/us	--	±2	--	%Vo
Start-Up Time	When use Enable Function	--	20	--	mSec.
Trimming Output Voltage	VNOM 10% Load	--	±10	--	%
Over Voltage Protection	VNOM 10% Load	--	120	--	
Output Power Protection	VNOM	--	120	--	

General Specifications

Parameter	Conditions	Min	Typ	Max	Unit
Switching Frequency	VNOM	--	250	--	KHz
Storage Temperature Range	All models	-60	--	125	˚C
Operating Case Temperature	All models	-45	--	105	
Over temperature Protection	All models, auto. Recovery	--	110	--	
Isolation Voltage Input to Output	All models, 1 Minute	2250	--	--	VDC
Isolation Resistance Input to Output	All models, 500VDC,At 70%RH	100	--	--	MΩ
Isolation Capacitance Input to Output	All models	--	1500	--	pF
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				2.42” x 2.40” x 0.59” (61.4 x 61.0 x
Case Material	Aluminum				
Potting Material	Silicone				

EMC Specifications

Parameter	Conditions		Level
Environmental Compliance	Reach, RoHS		PASS
EMI	EN55022		Class A / Class
ESD	EN61000-4-2	±4 kV Air Discharge ±4 kV Contact Discharge	Perf. Criteria A
Radiated immunity	EN61000-4-3	Level 2, 3 V/m	Perf. Criteria A
Fast transient	EN61000-4-4	±2 kV Applied	Perf. Criteria A
Surge	EN61000-4-5	±2 kV Applied	Perf. Criteria A
Conducted immunity	EN61000-4-6	Level 2, 3 V rms	Perf. Criteria A

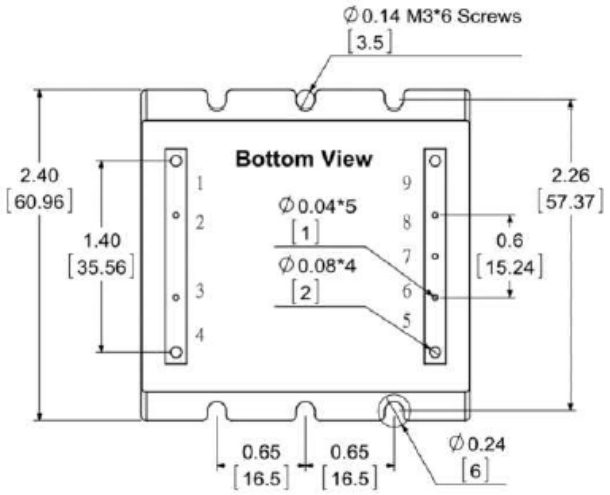
It is recommended to protect the input by fuses or other protection devices.

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

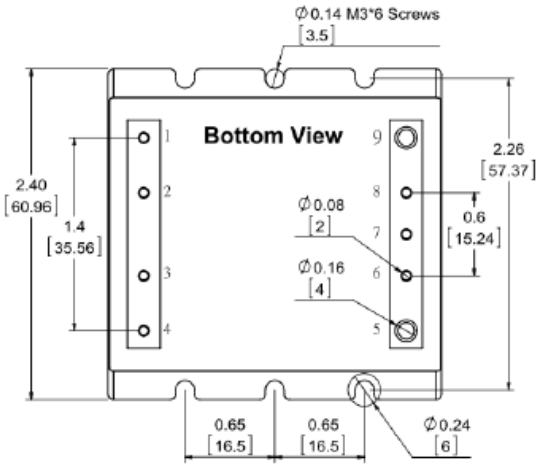
DC – DC

Mechanical Drawing

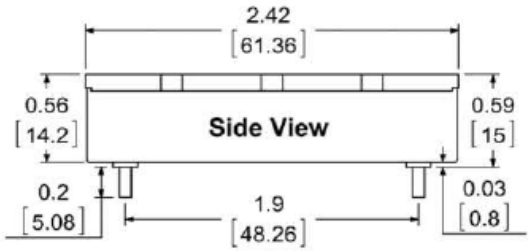
Shape – B (Base Plate with DOSA pinout)



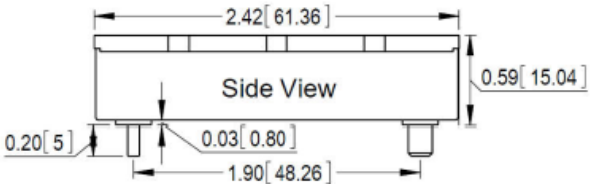
Shape – B (Base Plate with Vicor pinout)



Shape – B (Base Plate with DOSA pinout)



Shape – B (Base Plate with Vicor pinout)



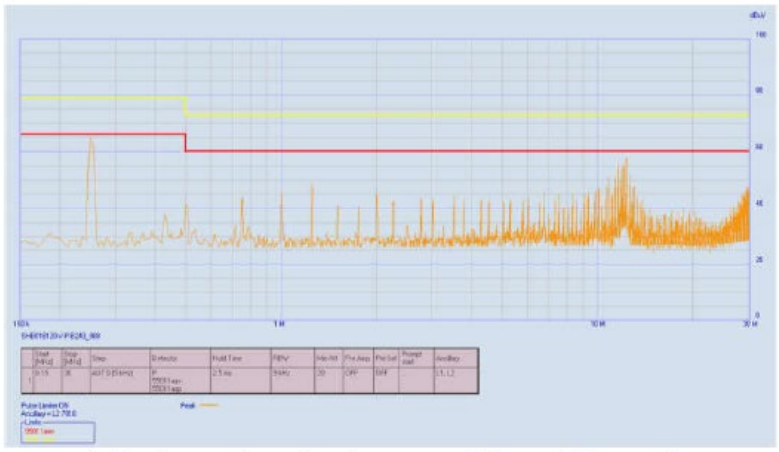
Pin Assignments:

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]

Conducted EMI

Input terminal value (typ.) SHB018120-V-P-B300 @Vin = 18VDC, Iout = 25A



The fundamental switching frequency of the module is 220 kHz.

Characteristic Curves

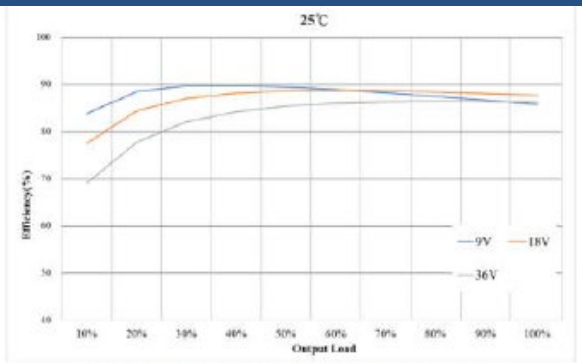


Figure 1 : Efficiency at Minimum, Nominal and Maximum Input Voltages VS. Output Load.

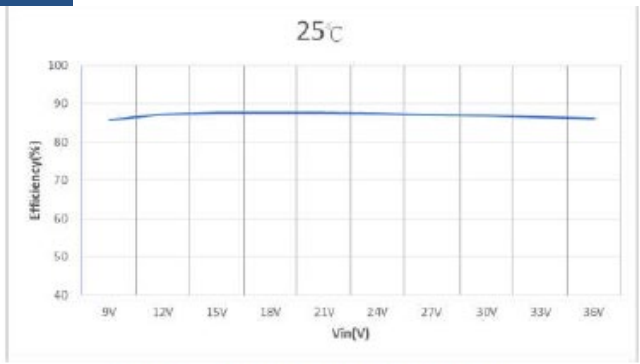


Figure 2 : Efficiency VS. Input Voltages at 100% rated power

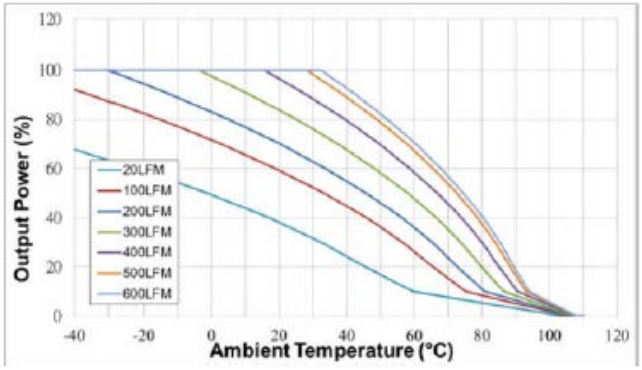


Figure 3 : Ambient Temperature VS. Output Power Derating Curves

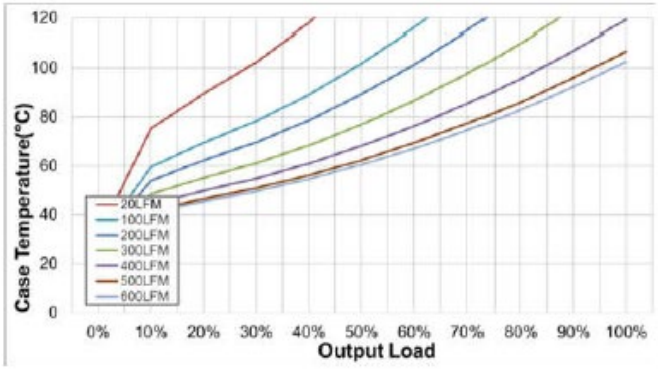


Figure 4 : Case Temperature VS. Output rated Power

Characteristic Curves (continued)

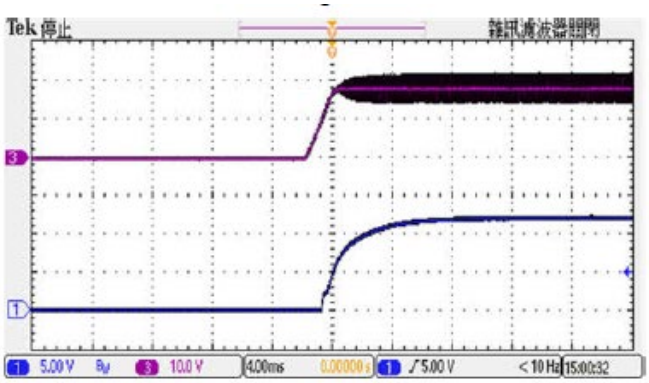


Figure 5 : CH1 = Vout, CH3 = Nominal Input
Typical Start-up waveform at Full load.

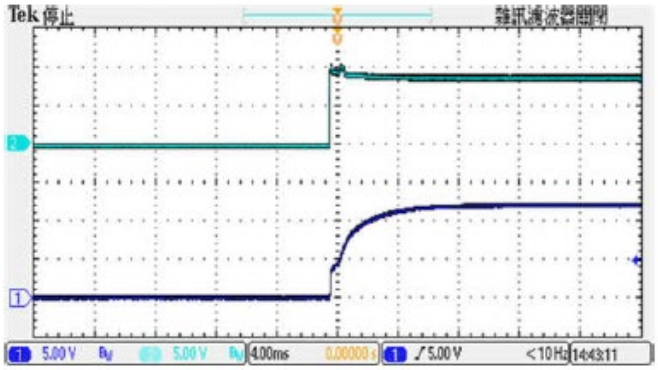


Figure 6 : CH1 = Vout, CH3 = Enable Pin
Typical Start-up waveform. Input voltage pre-applied

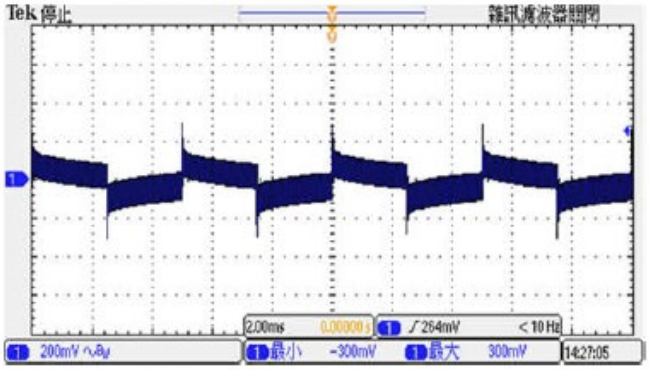


Figure 7 : Transient Response at Output step load
(Vin: Typical ,50~75% of output current; ΔIo/Δt =1A/μS)

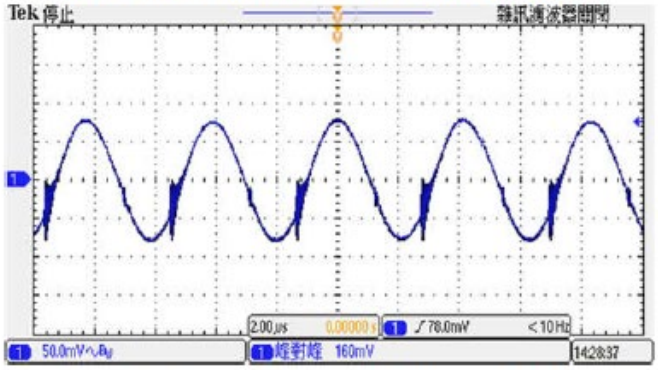


Figure 8 : Output Voltage Ripple & Noise at full load.
(Vin: Typical, With Output Capacitor to add 1uF MLCC)

DC – DC

Output Voltage Adjustment

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.

Trim Up

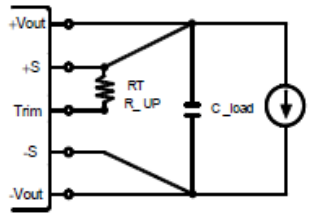


Figure 1. Trim Connections To increase Output Voltages Using Fixed Resistors

Trim up resistor value (KΩ)										
Vout	**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

Trim Down

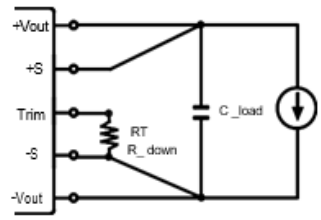


Figure 2. Trim Connections to Decrease Output Voltages Using Fixed Resistors

Trim up resistor value (KΩ)										
Vout	**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.

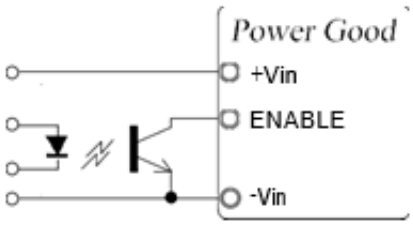


Figure 3. Driving the Enable Control pin

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 load and layout conditions. See Figure 4.

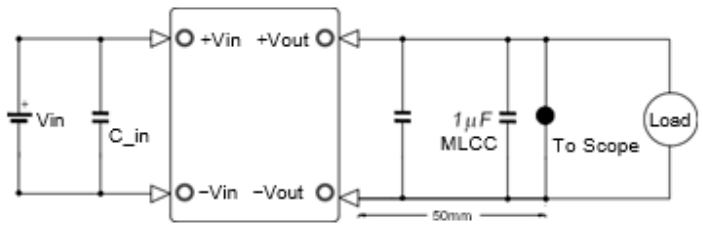
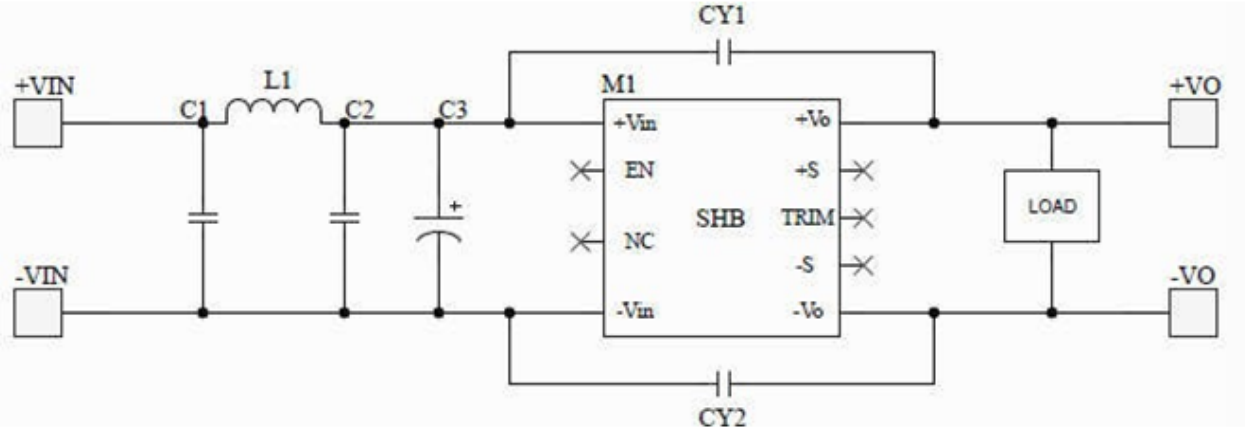


Figure 4. Measuring Output Ripple/Noise (20MHz bandwidth)

Recommended Circuit Diagram for Conducted EMI



Bill of Materials

Model No.	C1	C2	C3	L1	CY1	CY2
SHB018XXX	10uF/50V/MLCC	10uF/50V/MLCC	470uF/50V	2.2uH	NC	3300pF/Y Cap
SHB110XXX	1uF/250V/MLCC	1uF/250V/MLCC	100uF/250V	7uH	1500pF/Y Cap	NC
SHB300XXX	0.22uF/500V/MLCC	0.22uF/500V/MLCC	100uF/450V	220uH	1500pF/Y Cap	NC