DC - DC

Features

- 8:1/4:1 Wide Input Range
- Operating Temperature Range: -40~100°C
- Approved to UKCA, CE, RoHS & REACH
- Safety Standards to IEC/EN 62368-1 & EN 50155
- Efficiency up to 88%
- Single output 9~75V DC

Certified to UKCA, CE, RoHS, REACH & EN 62368-1/IEC 62368-1/EN 50155 Standards and complies with Efficiency Regulations. These are primarily used in ITE, Audio & Video, Railway Industries and customised solutions are available upon request.

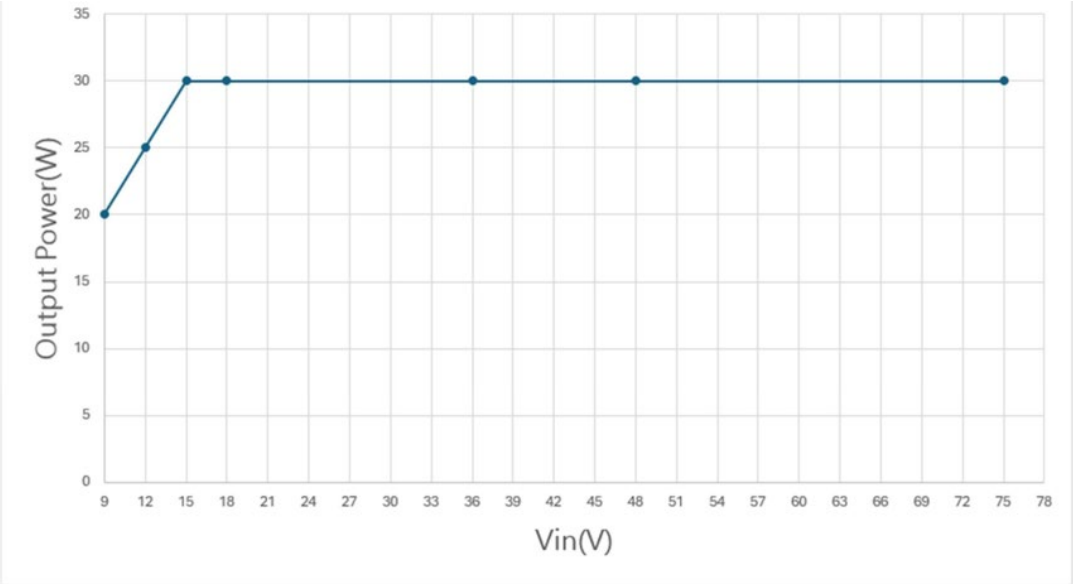
Part Number Structure

28ESBS	-	024W	050	-	S	-	P	-	F	50
Series Name		Input Voltage (VDC)	Output Voltage (VDC)		Output Quantity		Remote control option		Shape	Watt
Evolving **S**irius- **B**ishop series **S**econd		**024W :** 9-36 **036W** : 9-75 **048W :** 18-75	**050 :** 5 **120 :** 12 **150 :** 15 **240 :** 24		**S :** single		**P :** Positive logic **N :** Negative logic		**F :** Flat	15
			120 : ±12 **150 :** ±15		**D :** Dual					

Models

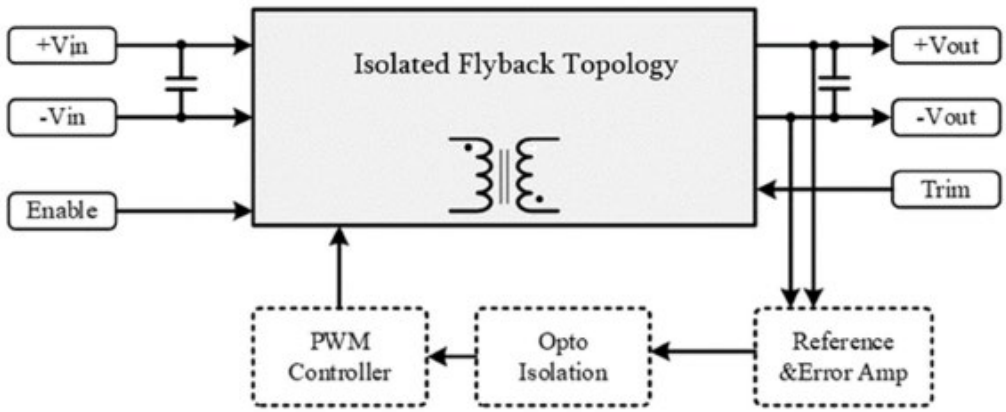
Model	Input Voltage (V) Range	Input Voltage (V) Nominal	Input Current (A) Full load	Output Voltage (V)	Output Current (A)	Output Power (W)	Efficiency Typ.(%)
28ESBS024W050-S-□-F30-IP	9-36	24	1.42	5	6	30	88%
28ESBS024W120-S-□-F30-IP	9-36	24	1.42	12	2.5	30	88%
28ESBS024W150-S-□-F30-IP	9-36	24	1.42	15	2	30	88%
28ESBS024W120-D-□-F30-IP	9-36	24	1.42	±12	±1.25	30	88%
28ESBS024W150-D-□-F30-IP	9-36	24	1.42	±15	±1	30	88%
28ESBS048W050-S-□-F30-IP	18-75	48	0.71	5	6	30	88%
28ESBS048W120-S-□-F30-IP	18-75	48	0.71	12	2.5	30	88%
28ESBS048W150-S-□-F30-IP	18-75	48	0.71	15	2	30	88%
28ESBS048W240-S-□-F30-IP	18-75	48	0.71	24	1.25	30	88%
28ESBS048W120-D-□-F30-IP	18-75	48	0.71	±12	±1.25	30	88%
28ESBS048W150-D-□-F30-IP	18-75	48	0.71	±15	±1	30	88%
28ESBS024W050-S-□-F40-IP	9-36	24	1.89	5	8	40	88%
28ESBS024W120-S-□-F40-IP	9-36	24	1.89	12	3.33	40	88%
28ESBS024W150-S-□-F40-IP	9-36	24	1.89	15	2.67	40	88%
28ESBS024W240-S-□-F40-IP	9-36	24	1.89	24	1.66	40	88%
28ESBS024W120-D-□-F40-IP	9-36	24	1.89	±12	±1.66	40	88%
28ESBS024W150-D-□-F40-IP	9-36	24	1.89	±15	±1.33	40	88%
28ESBS048W050-S-□-F40-IP	18-75	48	0.95	5	8	40	88%
28ESBS048W120-S-□-F40-IP	18-75	48	0.95	12	3.33	40	88%
28ESBS048W150-S-□-F40-IP	18-75	48	0.95	15	2.67	40	88%
28ESBS048W240-S-□-F40-IP	18-75	48	0.95	24	1.67	40	88%
28ESBS048W120-D-□-F40-IP	18-75	48	0.95	±12	±1.67	40	88%
28ESBS048W150-D-□-F40-IP	18-75	48	0.95	±15	±1.33	40	88%
28ESBS024W120-S-□-F50-IP	9-36	24	1.42	12	4.16	50	88%
28ESBS024W150-S-□-F50-IP	9-36	24	1.42	15	3.33	50	88%
28ESBS024W240-S-□-F50-IP	9-36	24	1.42	24	2.08	50	88%
28/ESBS024W120-D-□-F50-IP	9-36	24	1.42	±12	±2.08	50	88%
28ESBS024W150-D-□-F50-IP	9-36	24	1.42	±15	±1.66	50	88%
28ESBS048W120-S-□-F50-IP	18-75	48	0.71	12	4.17	50	88%
28ESBS048W150-S-□-F50-IP	18-75	48	0.71	15	3.33	50	88%
28ESBS048W240-S-□-F50-IP	18-75	48	0.71	24	2.08	50	88%
28ESBS048W120-D-□-F50-IP	18-75	48	0.71	±12	±2.08	50	88%
28ESBS048W150-D-□-F50-IP	18-75	48	0.71	±15	±1.66	50	88%
28ESBS036W050-S-□-F30-IP	9-75	36	0.96	5	6	30	87%
28ESBS036W120-S-□-F30-IP	9-75	36	0.96	12	2.5	30	87%
28ESBS036W150-S-□-F30-IP	9-75	36	0.96	15	2	30	87%
28ESBS036W240-S-□-F30-IP	9-75	36	0.96	24	1.25	30	87%
28ESBS036W120-D-□-F30-IP	9-75	36	0.96	±12	±1.25	30	87%
28ESBS036W150-D-□-F30-IP	9-75	36	0.96	±15	±1	30	87%

Output rated Power VS. Input Voltages



Description

Ideal Power Evolving Sirius - Bishop series - 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 supplied completely encased to provide protection from the harsh environments seen in many industrial and transportation applications.



Block Diagram

Input Data

Parameter	Notes and Conditions	Min.	Typ.	Max.	Unit
Transient Input Voltage Ranges	ESBS024W models (100ms max) ESBS036W models (100ms max) ESBS048W models (100ms max)	--	--	50 80 80	VDC
Operating Input Voltage Ranges	ESBS024W model ESBS036W models ESBS048W models	9 9 18	24 36 48	36 75 75	VDC

Under-Voltage Lockout Start up Voltage	ESBS024W model ESBS036W models ESBS048W models	-- -- --	8.5 8.5 17.5	9 9 18	VDC
Under-Voltage Lockout Shutdown Voltage	ESBS024W model ESBS036W models ESBS048W models	6 6 15	8 8 17	-- -- --	VDC
Input filter	All models, Built-in PI Filter				
Enable Function Input	Positive logic ON OFF		Open Short or 0 ~ 1.2		
	Negative logic ON OFF		Short or 0 ~ 1.2 Open		

Output Data

Parameter	Notes and Conditions		Min.	Typ.	Max.	Unit
Voltage Accuracy	VNOM 50% Load		--	--	±1.5	%
Line Regulation	Low Line to High Line		--	--	±0.3	%
Load Regulation	10% to 100% Load		--	--	±0.5	%
Minimum Load	Single output		0	--	--	%
	Dual output		10	--	--	%
Ripple & Noise Voltage	Bandwidth 20MHz and with 1μF MLCC Output Capacitor each output	5V	--	--	2	%Vpk-pk
		All others	--	1	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		--	--	+3	%Vo
Start-Up Time	When use Enable Function		--	20	--	mSec.
Trimming Output Protection	VNOM 10% Load		--	+10	--	%
Power Protection	VNOM 10% Load		--	120	--	%
Over Voltage Protection	VNOM (Current limit / Hiccup Mode)		--	120	--	%

General Specifications & Environmental Data

Parameter	Notes and Conditions	Min.	Typ.	Max.	Unit
Storage Temperature	All models	-60	--	125	C
Switching Frequency	V_{NOM}	220	--	330	kHz
Operating Case Temperature	All models	-45	--	115	m
Over Temperature Protection	All models, Auto. Recovery	--	105	--	C
Thermal Impedance	Natural convection (Metal Case –Flat)		11 (Vertical) 13 (horizontal)		˚C/Watt
Isolation Voltage (Input To Output)	All models, 1 Minute	2000 1500	--	--	VDC
Isolation Resistance Input To Output	All models, 500VDC, At 70%RH	100	--	--	MΩ
Isolation Capacitance Input To Output	All models	--	1500	--	pF
Humidity	All models (non condensing)	--	--	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		

DC - DC

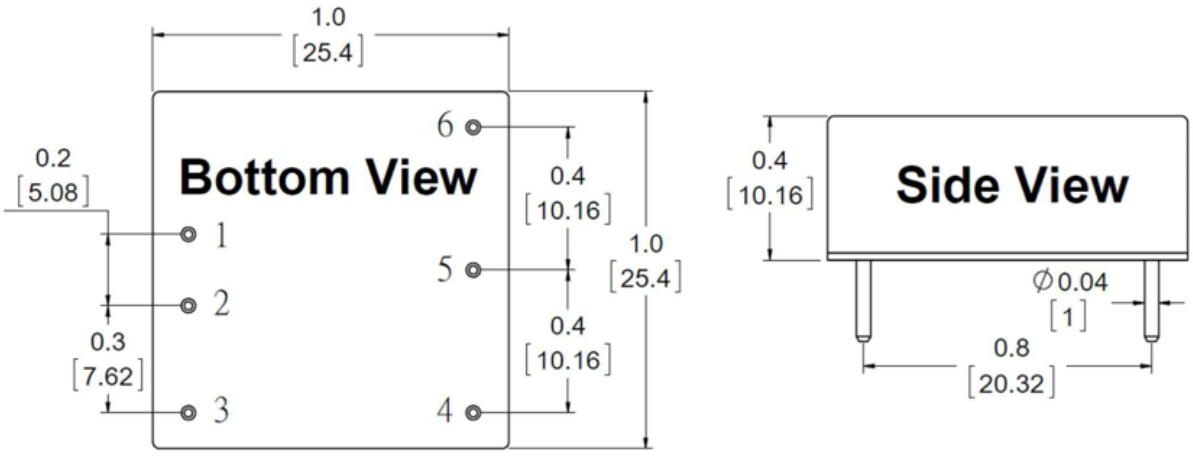
Weight	Shape-F (Flat)	15 (0.5)	g (oz.)
Dimensions	Shape-F (Flat)	1.00” x 1.00” x 0.40”(25.4 x25.4 x10.16mm)	
Case Material	Aluminium + FR4 (Non-Conductive Base)		
Potting Material	Silicone		

Standards Compliance

Parameter	Standard	Test conditions	Performance criteria
Environmental Compliance	Reach; RoHS	--	Pass
EMI	EN55032	--	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 EN55032 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.

Mechanical Dimensions & Pin Assignments

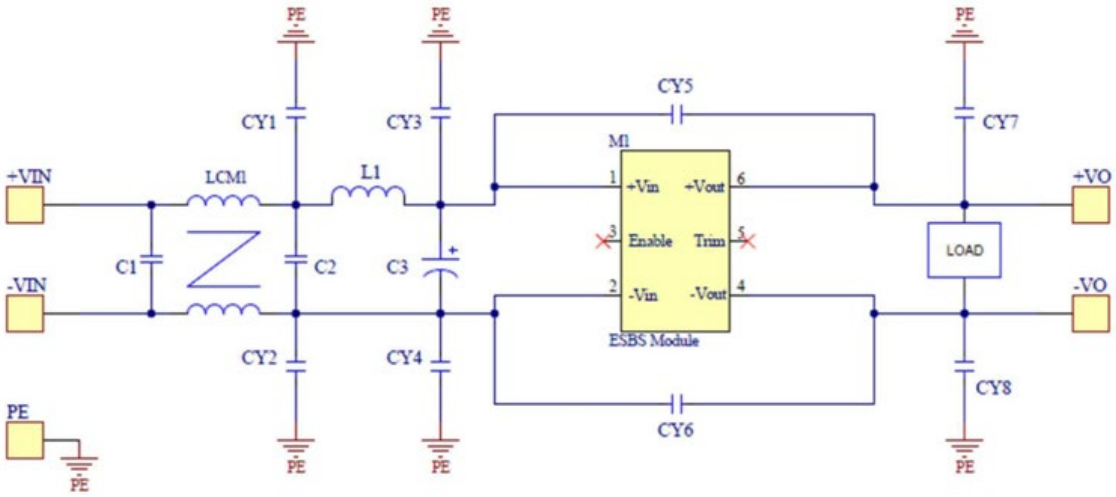


Pin#	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	Enable	Enable
4	-Vout	-Vout
5	Trim	Com
6	+Vout	+Vout

Note:
Pin Pitch tolerance: ±0.01 [0.25]
Pin Dimensions: .XX±0.03 [.X±0.76mm]
Pin Material: Copper Alloy
Pin Plating: Gold
Dimensions in inches [mm]
Tolerances: .XX±0.02 [.X±0.5mm]
.XXX±0.001 [.X±0.025mm]

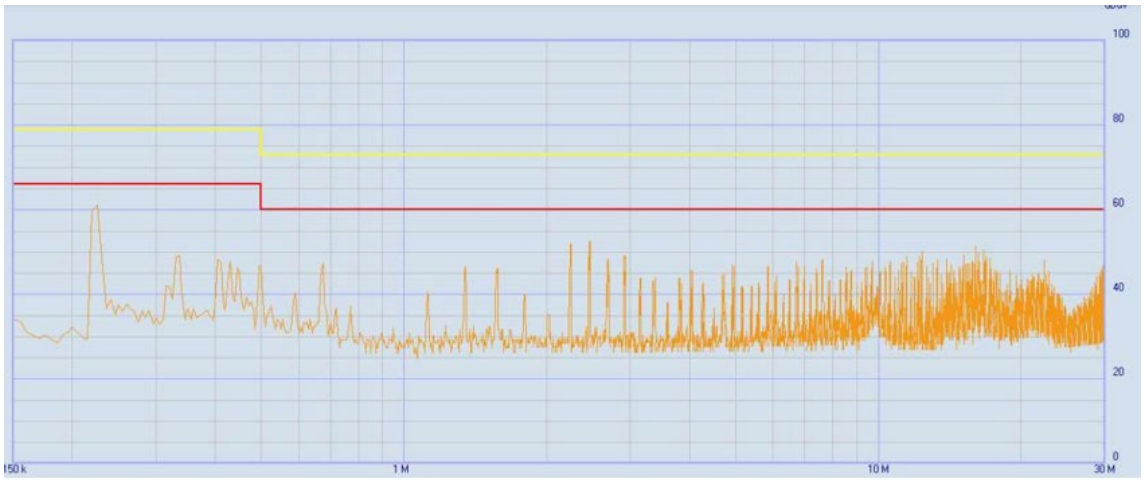
Conducted EMI

Input terminal value (typ.) 28ESBS048W150-S-P-F40-IP @Vin = 48VDC, Iout = 2.66A



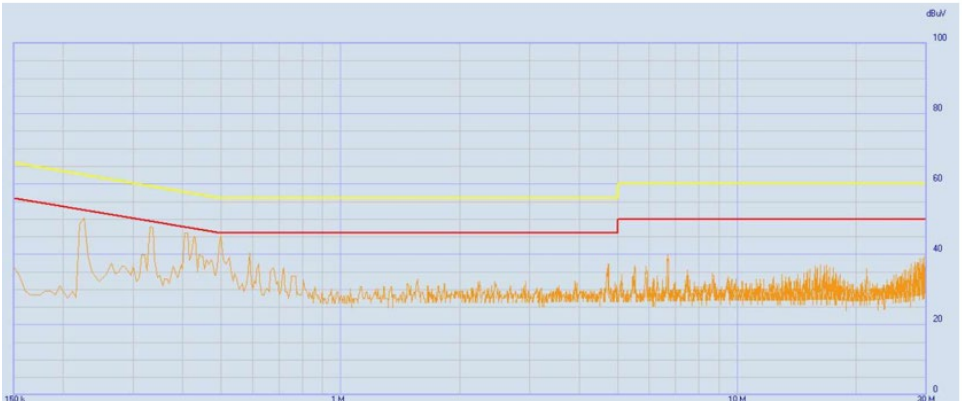
Bill of Materials

Class A



C1	LCM1	C2	L1	C3	CY1	CY2	CY3	CY4	CY5	CY6	CY7	CY8
2.5uF	x	x	5uH	100uF	x	x	x	x	2000p	2000p	x	x
MLCC				EC					Y Cap	Y Cap		

Class B



C1	LCM1	C2	L1	C3	CY1	CY2	CY3	CY4	CY5	CY6	CY7	CY8
2.5uF	55uH	4.7uF	90uH	220uF	4700p*2	4700p*2	x	x	470p	470p	x	x
MLCC		MLCC		EC	Y Cap	Y Cap			Y Cap	Y Cap		

Recommended data is for reference only. Different environment and application condition may cause some differences.

Characteristic curves

Testing conditions are at typical input, Ta=+25˚C, full load (horizontal mount) Unless otherwise indicated.
The figures of 28ESBS024W120-S-P-F30

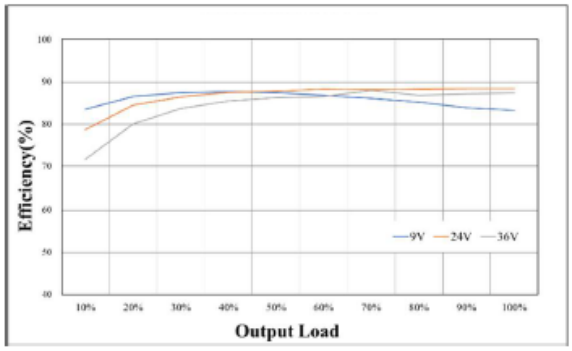


Figure 1 : Efficiency at Minimum, Nominal and Maximum Input voltages VS. Output load.

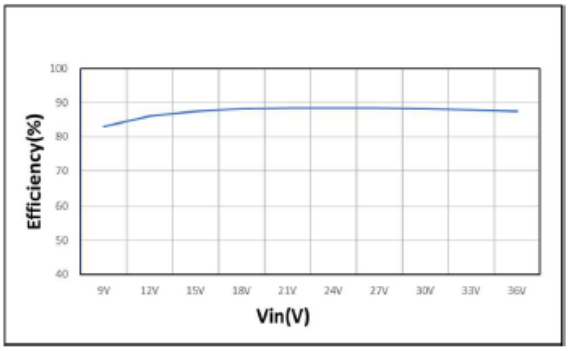


Figure 2 : Efficiency VS. Input Voltages at 100% rated power

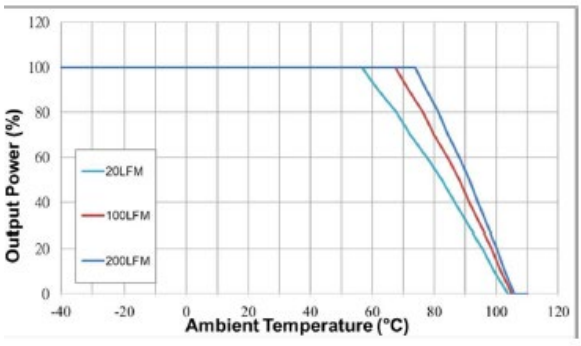


Figure 3 : Ambient Temperature VS. Output Power Derating Curves(Note: 20LFM = Free Air)

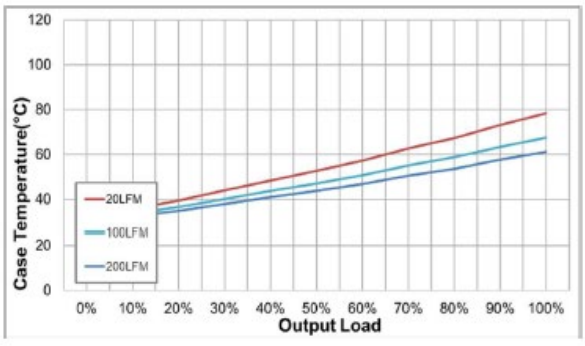


Figure 4 : Case Temperature VS. Output rated Power (Note: 20LFM = Free Air)

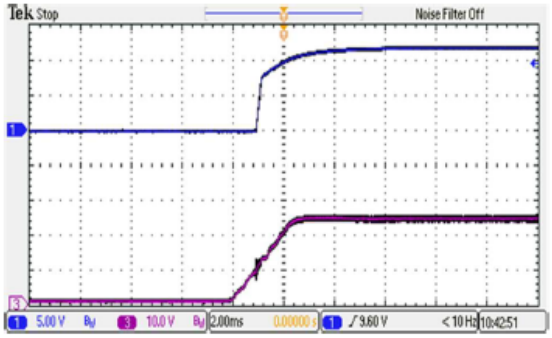


Figure 5 : CH1 = Vout, CH3 = Nominal Input
Typical Start-up waveform at Full load.

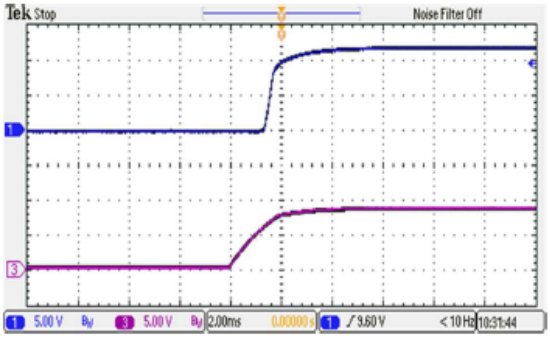


Figure 6 : CH1 = Vout, CH3 = Enable Pin
Typical Start-up waveform. Input voltage pre-applied

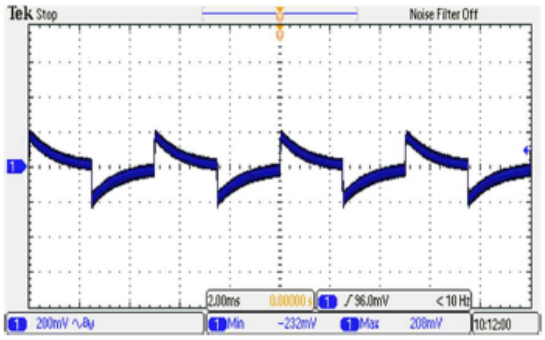


Figure 7 : Transient Response at Output step load
(Vin: Typical ,50~75% of output current; ΔIo/Δt =1A/μS)

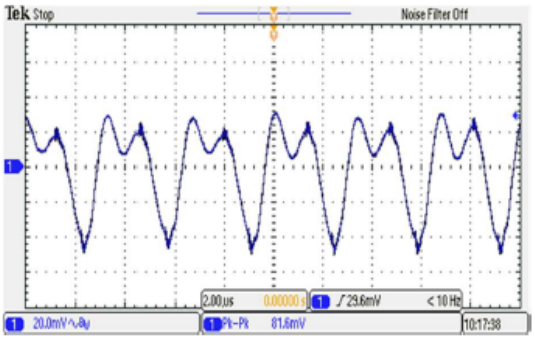


Figure 8 : Output Voltage Ripple & Noise at full load.
(Vin: Typical, With Output Capacitor to add 10μF MLCC)

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.

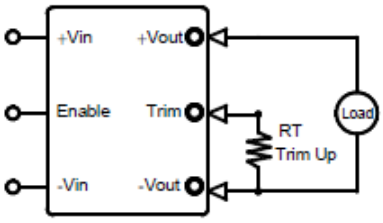


Figure 1. Trim Connections To increase Output Voltages Using Fixed Resistors

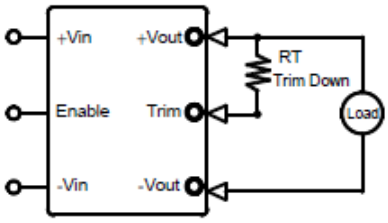


Figure 2. Trim Connections To Decrease Output Voltages Using Fixed Resistors

Trim up resistor value(KΩ)										
Vout	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
5	112.2	51.1	30.7	20.5	14.4	10.4	7.5	5.3	3.6	2.2
12	267.8	121.9	73.3	49.0	34.4	24.6	17.7	12.5	8.4	5.2
15	332.9	151.5	91	60.7	42.6	30.5	21.8	15.4	10.3	6.3

Trim down resistor value(KΩ)										
Vo	-1%	-2%	-3%	-4%	-5%	-6%	-7%	-8%	-9%	-10%
5	139.8	63.5	38.1	25.4	17.8	12.7	9.0	6.3	4.2	2.5
12	342.5	155.9	93.7	62.6	44.0	31.5	22.7	16.0	10.8	6.7
15	454.5	205	125.8	84.7	60.1	43.6	31.9	23.1	16.2	10.7

DC - DC

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.

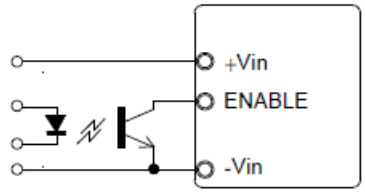


Figure 3. Driving the Enable Control pin

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

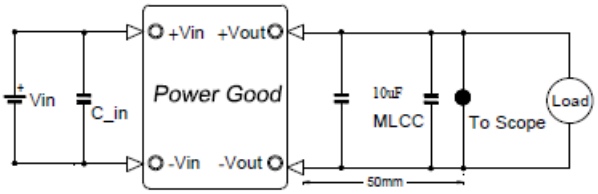
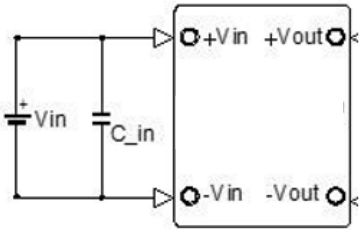


Figure 4. Measuring Output Ripple/Noise(20MHz bandwidth)

Operating Recommendation for UVLO

To ensure module’s functionality, we suggest adding an additional capacitor on the input side. This method can be used to avoid possible voltage drop or voltage fluctuation on the input side caused by using a longer or thinner cable.
Recommended Capacitance: 47uF – 100uF



DC - DC