ESBS Series
30W & 40W & 50W/ 1" x 1" DC/DC

Applications

Railway | Industry | Automation

Semiconductor | Network / Telecom | Military

Boat | Aviation | Medical

Automobile | Charger

3 Years Warranty

CE RoHS COMPLIANT ISO REACH

Features

1" x 1"	**8:1 & 4:1** Ultra-Wide Input range	**+70°C** without derating	**PI FILTER** Built-in	**2000 VDC** Insulation	**MLCC** No life-span constrained	**ON / OFF** REMOTE	**88 %** High efficiency
MTBF ≥1.5M hours @50°C GB	**METAL CASE**	**UVLO**	**OCP**	**OVP**	**OTP**		

Model Number Structure

ESBS 024W 050 - S - P - F 50

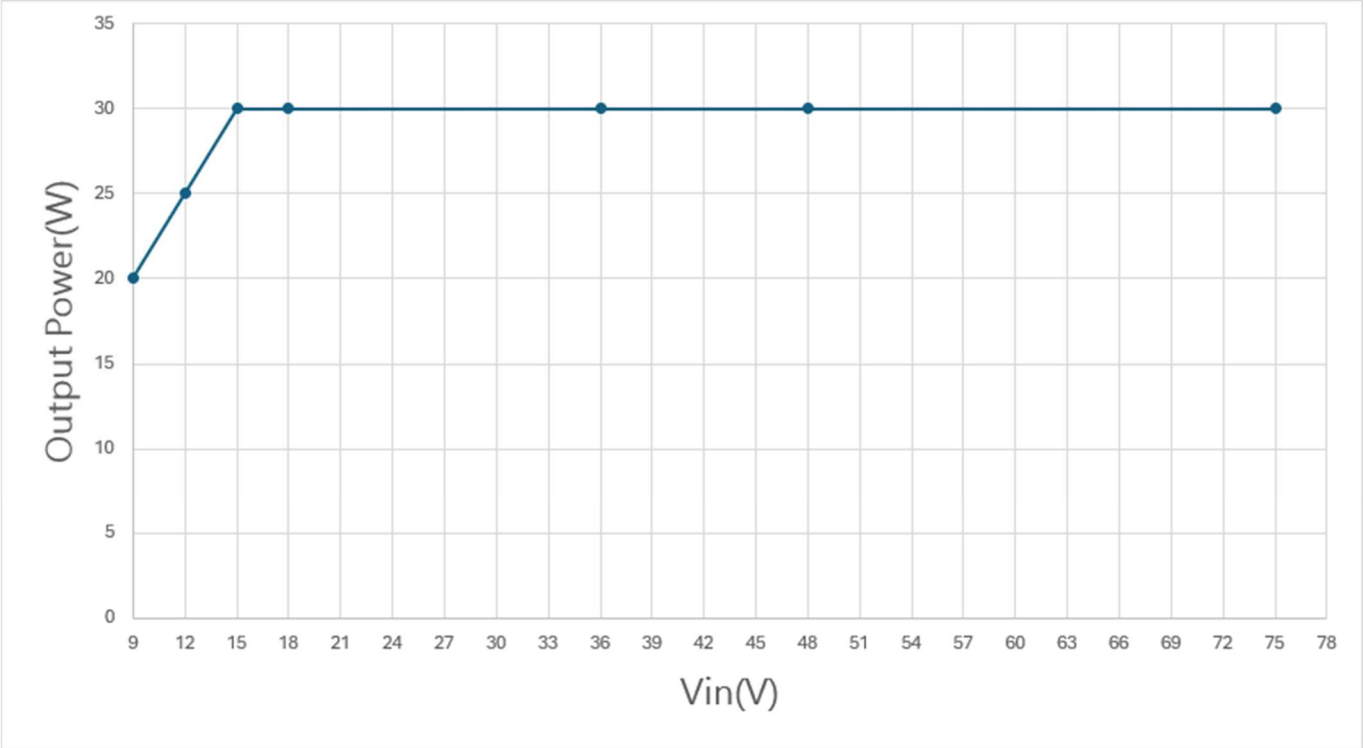
Series Name	Input Voltage (VDC)	Output Voltage (VDC)	Output Quantity	Remote Control Option	Shape	Watt
Evolving Sirius-Bishop series – Second	**024W：** 9-36 **036W：** 9-75 **048W：** 18-75	**050**：5 **120**：12 **150**：15 **240**：24	**S**：Single	**P**：Positive logic **N**：Negative logic	**F**：Flat	**30** **40** **50**
		120：±12 **150**：±15	**D**：Dual			

Model Selection Guide

Typical @ Ta=+25 ℃ 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.(%)
ESBS024W050-S-□-F30	9-36	24	1.42	5	6	30	88%
ESBS024W120-S-□-F30	9-36	24	1.42	12	2.5	30	88%
ESBS024W150-S-□-F30	9-36	24	1.42	15	2	30	88%
ESBS024W240-S-□-F30	9-36	24	1.42	24	1.25	30	88%
ESBS024W120-D-□-F30	9-36	24	1.42	±12	±1.25	30	88%
ESBS024W150-D-□-F30	9-36	24	1.42	±15	±1	30	88%
ESBS048W050-S-□-F30	18-75	48	0.71	5	6	30	88%
ESBS048W120-S-□-F30	18-75	48	0.71	12	2.5	30	88%
ESBS048W150-S-□-F30	18-75	48	0.71	15	2	30	88%
ESBS048W240-S-□-F30	18-75	48	0.71	24	1.25	30	88%
ESBS048W120-D-□-F30	18-75	48	0.71	±12	±1.25	30	88%
ESBS048W150-D-□-F30	18-75	48	0.71	±15	±1	30	88%
ESBS024W120-S-□-F40	9-36	24	1.89	12	3.33	40	88%
ESBS024W150-S-□-F40	9-36	24	1.89	15	2.67	40	88%
ESBS024W240-S-□-F40	9-36	24	1.89	24	1.66	40	88%
ESBS024W120-D-□-F40	9-36	24	1.89	±12	±1.66	40	88%
ESBS024W150-D-□-F40	9-36	24	1.89	±15	±1.33	40	88%
ESBS048W120-S-□-F40	18-75	48	0.95	12	3.33	40	88%
ESBS048W150-S-□-F40	18-75	48	0.95	15	2.67	40	88%
ESBS048W240-S-□-F40	18-75	48	0.95	24	1.67	40	88%
ESBS048W120-D-□-F40	18-75	48	0.95	±12	±1.67	40	88%
ESBS048W150-D-□-F40	18-75	48	0.95	±15	±1.33	40	88%

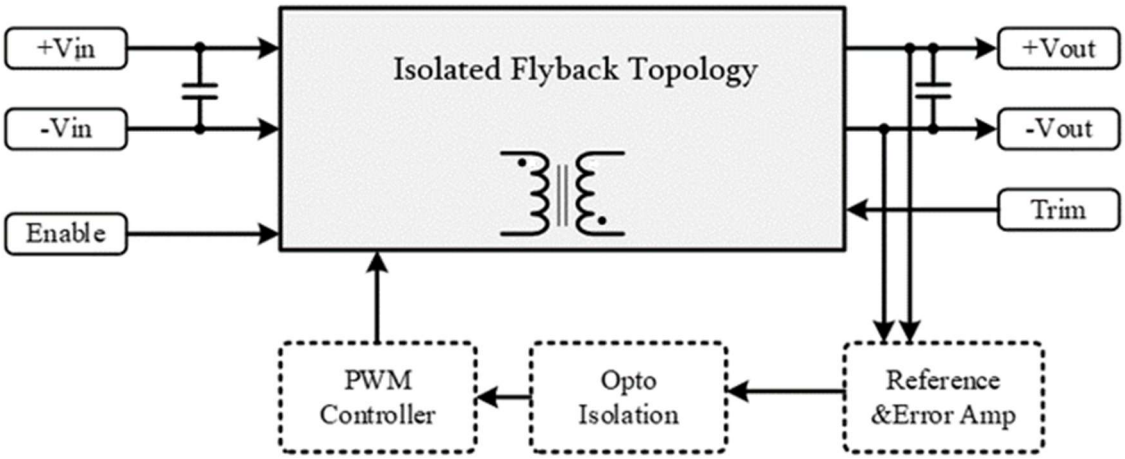
Model	Input			Output			Efficiency
	Voltage (V)		Current (A)	Voltage	Current	Power	
	Range	Nominal	Full load	(V)	(A)	(W)	Typ.(%)
ESBS024W120-S-□-F50	9-36	24	1.42	12	4.16	50	88%
ESBS024W150-S-□-F50	9-36	24	1.42	15	3.33	50	88%
ESBS024W240-S-□-F50	9-36	24	1.42	24	2.08	50	88%
ESBS024W120-D-□-F50	9-36	24	1.42	±12	±2.08	50	88%
ESBS024W150-D-□-F50	9-36	24	1.42	±15	±1.66	50	88%
ESBS048W120-S-□-F50	18-75	48	0.71	12	4.17	50	88%
ESBS048W150-S-□-F50	18-75	48	0.71	15	3.33	50	88%
ESBS048W240-S-□-F50	18-75	48	0.71	24	2.08	50	88%
ESBS048W120-D-□-F50	18-75	48	0.71	±12	±2.08	50	88%
ESBS048W150-D-□-F50	18-75	48	0.71	±15	±1.66	50	88%
ESBS036W120-S-□-F30	9-75	36	0.96	12	2.5	30	87%
ESBS036W150-S-□-F30	9-75	36	0.96	15	2	30	87%
ESBS036W240-S-□-F30	9-75	36	0.96	24	1.25	30	87%
ESBS036W120-D-□-F30	9-75	36	0.96	±12	±1.25	30	87%
ESBS036W150-D-□-F30	9-75	36	0.96	±15	±1	30	87%



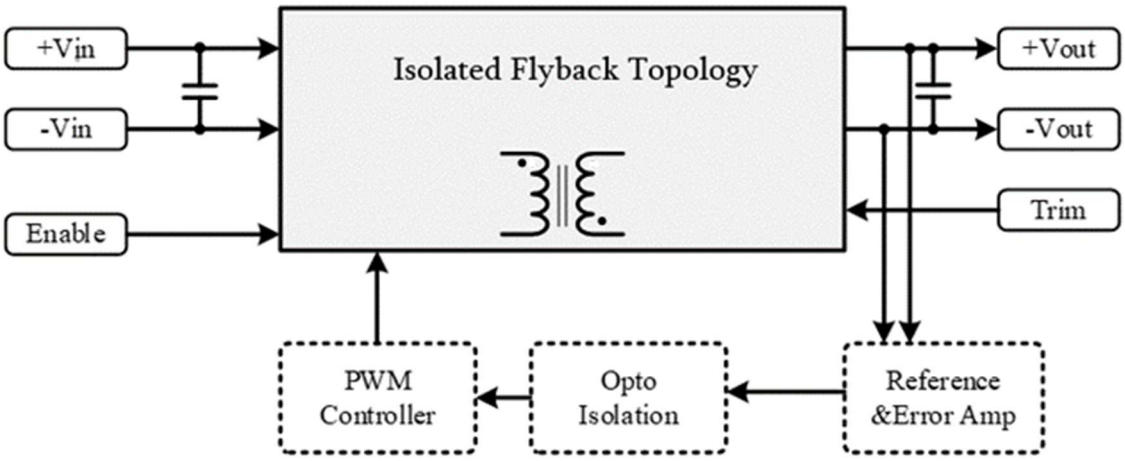
Output rated Power VS. Input Voltages

Description

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.



ESBS Single Series Block Diagram



ESBS Dual 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	ESBS024W models (100ms max)			50	VDC
	ESBS036W models (100ms max)			80	
	ESBS048W models (100ms max)			80	
Operating Input Voltage Ranges	ESBS024W models	9	24	36	VDC
	ESBS036W models	9	36	75	
	ESBS048W models	18	48	75	
Under-Voltage Lockout Start up Voltage	ESBS024W models		8.5	9	VDC
	ESBS036W models		8.5	9	
	ESBS048W models		17.5	18	
Under-Voltage Lockout Shutdown Voltage	ESBS024W models	6	8		VDC
	ESBS036W models	6	8		
	ESBS048W models	15	17		
Enable Function Input	Positive logic ON	Open			VDC
	Positive logic OFF	Short or 0 ~ 1.2			
	Negative logic ON	Short or 0 ~ 1.2			VDC
	Negative logic OFF	Open			
Input Filter	All models	Built-in PI Filter			

Output Specifications

Parameter	Notes and Conditions		Min.	Typ.	Max.	Unit
Output Voltage Accuracy	V_{NOM} 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			%
Output Ripple & Noise Voltage	Bandwidth 20MHz and with 1μF MLCC Output Capacitor each output	5V			2	$\%V_{pk-pk}$
		All others		1	1.5	$\%V_{pk-pk}$
Temperature Drift					±0.04	% /°C
Transient Recovery Time	25% load step change			800		μSec.
Transient Peak Deviation	ΔIo/Δt=2.5A/μs				±3	%Vo
Start-Up Time	When use Enable Function			20		mSec.
Trimming Output Voltage	V_{NOM} 10% Load			±10		%
Over Voltage Protection	V_{NOM} 10% Load			120		%
Output Power Protection	V_{NOM} (Current limit / Hiccup Mode)			120		%

General Specifications & Environmental Specifications

Parameter	Notes and Conditions	Min.	Typ.	Max.	Unit
Switching Frequency	V_{NOM}	180		330	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		
Thermal impedance	Natural convection (Metal Case –Flat)	11(Vertical)			˚C/Watt
		13(horizontal)			
Isolation Voltage					VDC
Input to Output	All models, 1 Minute	2000			
Input & Output to Case		1500			
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-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	Shape-F (Flat)	Aluminum + FR4 (Non-Conductive Base)			
Potting Material		Silicone			

Standards Compliance

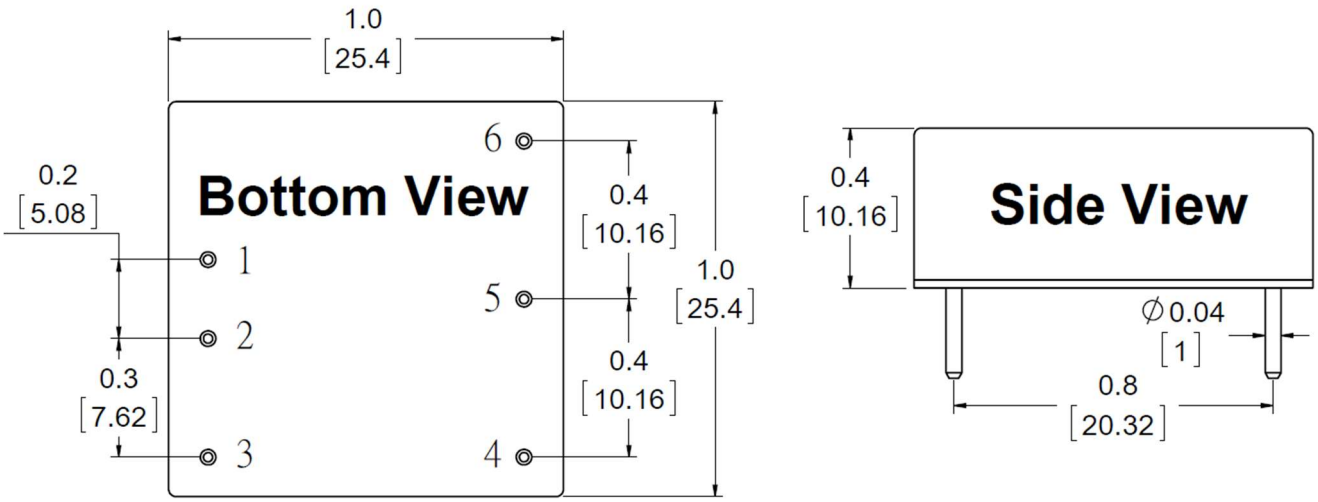
Parameter	Standard	Test Conditions	Performance Criteria
Environmental Compliance	Reach; RoHS		PASS
EMI	EN55032		Class A / Class B
ESD	EN61000-4-2	±4 kV Air Discharge ±4 kV Contact Discharge	Crit. A
Radiated Immunity	EN61000-4-3	Level 2, 3 V/m	Crit. A
Fast Transient	EN61000-4-4	±2 kV Applied	Crit. A
Surge	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.

The standard modules meet EN55032 Class A and Class B standard with external components.

Mechanical Dimensions & Pin Assignments

Shape – F



Pin Assignments:

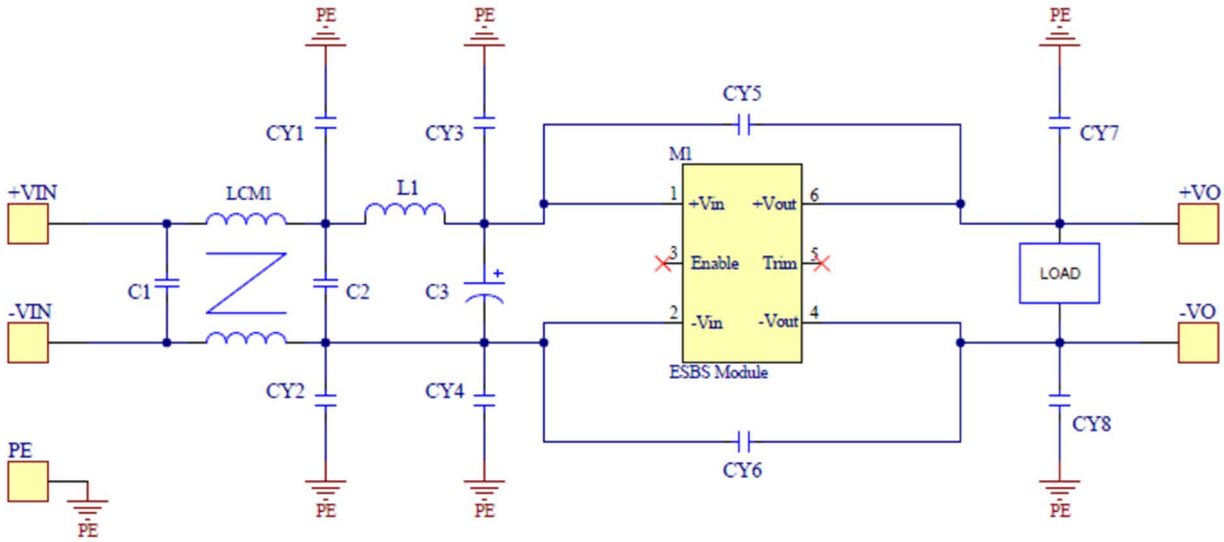
Pin#	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	Enable	Enable
4	-Vout	-Vout
5	Trim	Com
6	+Vout	+Vout

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]

Conducted EMI

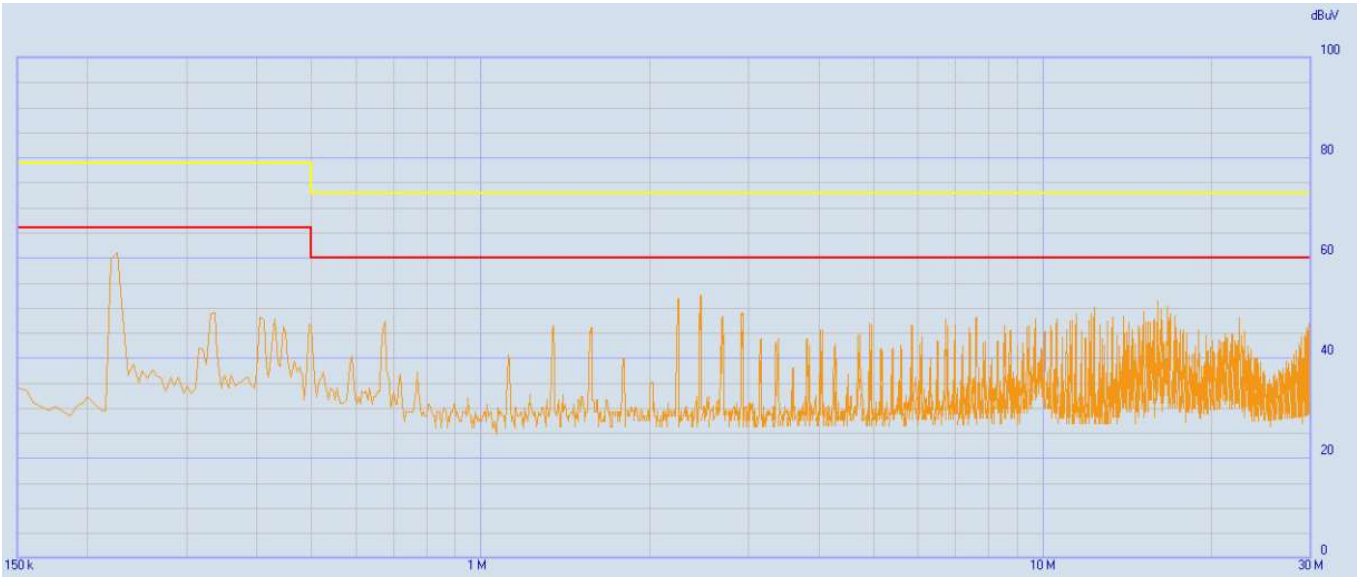
Input terminal value (typ.) ESBS048W150-S-P-F40 @Vin = 48VDC, Iout = 2.66A



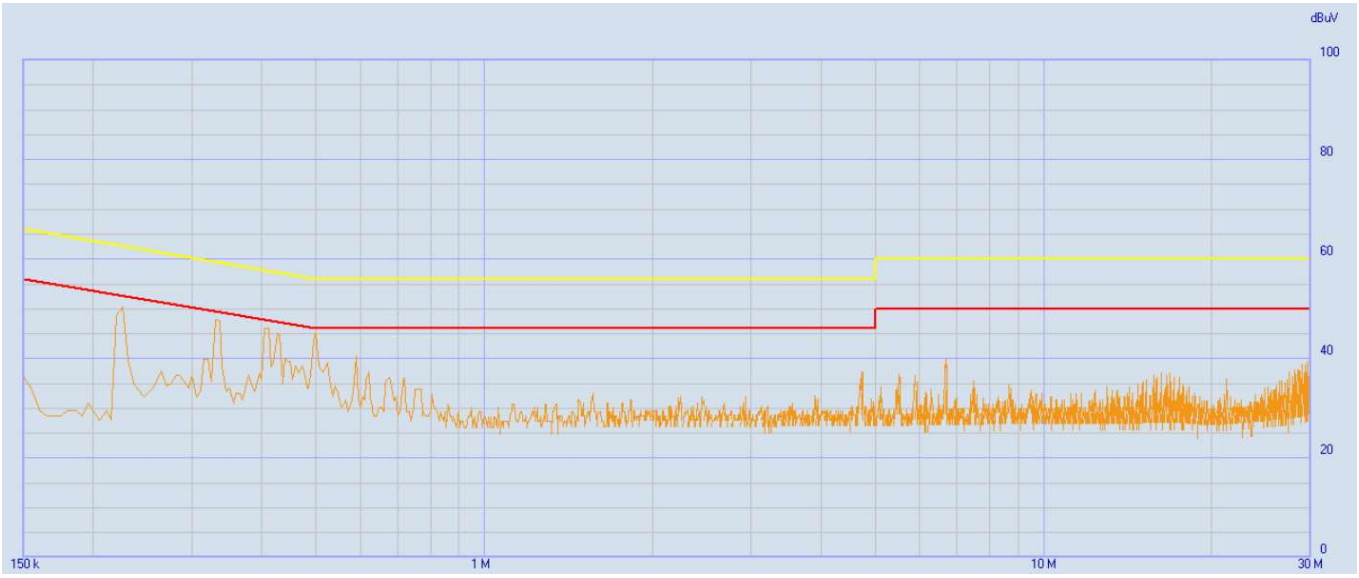
Bill of Materials

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		

Class A



Class B



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 ESBS024W120-S-P-F30

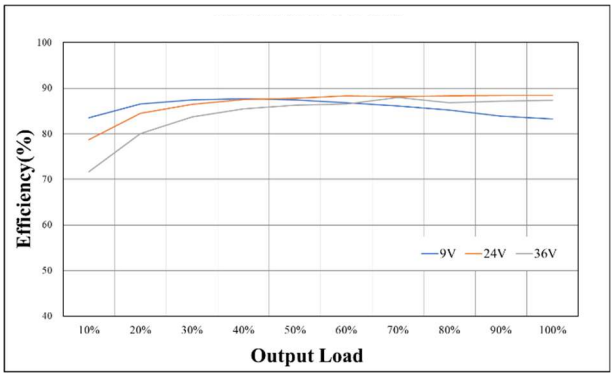


Figure 1 : Efficiency at Minimum, Nominal and Maximum Input voltages VS. Output load.

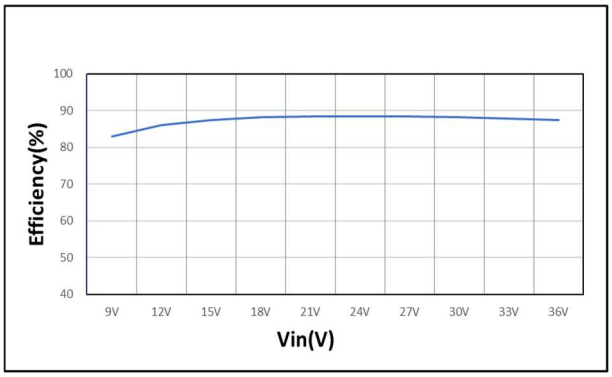


Figure 2 : Efficiency VS. Input Voltages at 100% rated power

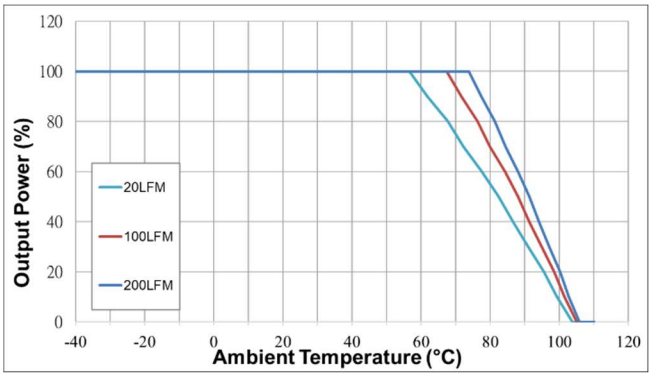


Figure 3 : Ambient Temperature VS. Output Power Derating Curves(Note: 20LFM = Free Air)

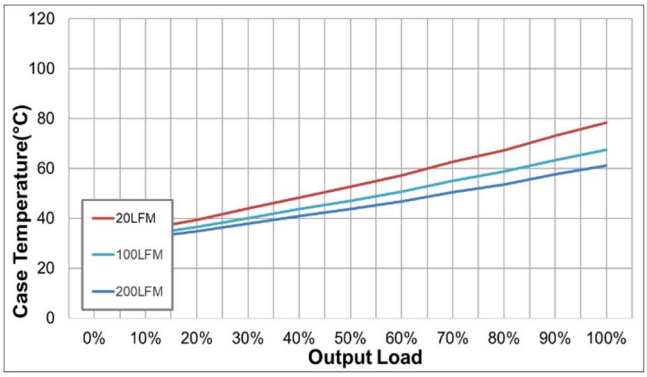


Figure 4 : Case Temperature VS. Output rated Power (Note: 20LFM = Free Air)

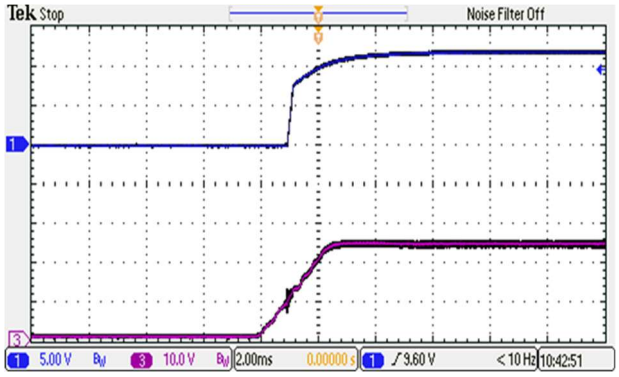


Figure 5 : CH1 = Vout, CH3 = Nominal Input Typical Start-up waveform at Full load.

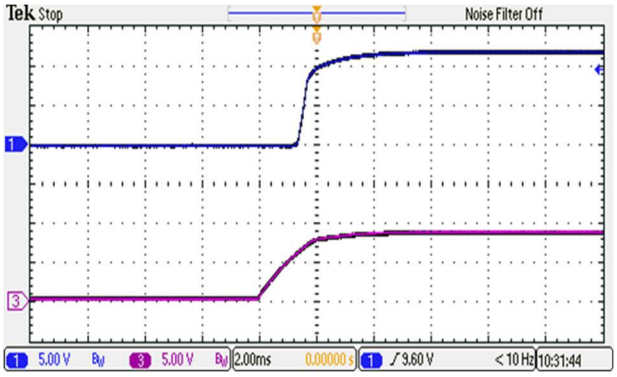


Figure 6 : CH1 = Vout, CH3 = Enable Pin Typical Start-up waveform. Input voltage pre-applied

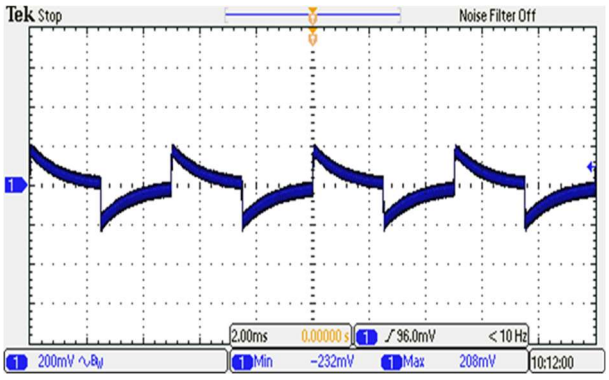


Figure 7 : Transient Response at Output step load (Vin: Typical ,50~75% of output current; ΔIo/Δt =1A/μS)

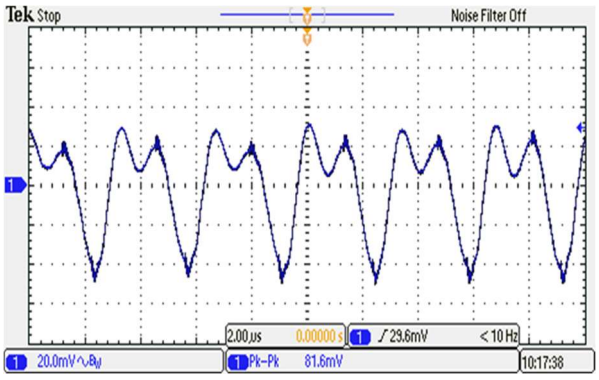


Figure 8 : Output Voltage Ripple & Noise at full load. (Vin: Typical, With Output Capacitor to add 10μF MLCC)

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.

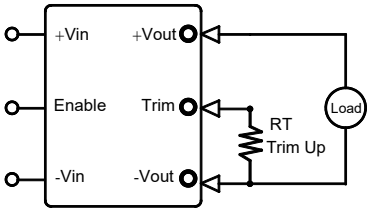


Figure 1. Trim Connections To increase Output Voltages Using Fixed Resistors

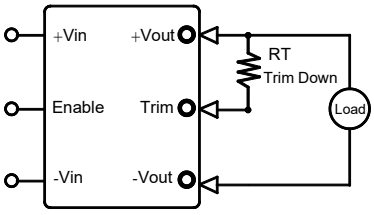


Figure 2. Trim Connections To Decrease Output Voltages Using Fixed Resistors

	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)									
Vout	-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

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.

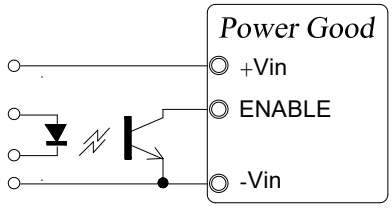


Figure 3. Driving the Enable Control pin

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.

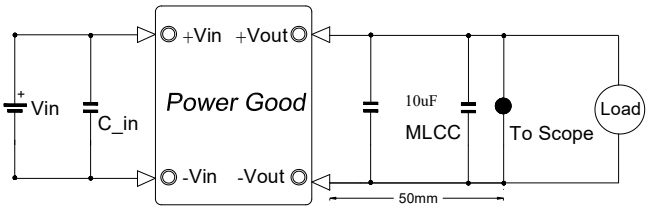
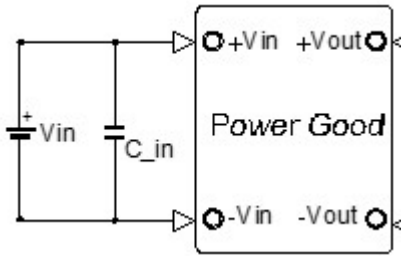


Figure 4. Measuring Output Ripple/Noise(20MHz bandwidth)

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



PowerGood Tech. Research Co., Ltd.
Address：5F, No. 40, Keya Rd., Daya Dist., Taichung City 42881, Taiwan
Website：www.powergood.com
Email：sales1@powergood.com
TEL：+886 4 2568 0448
FAX：+886 4 2568 0438

MORE INFO