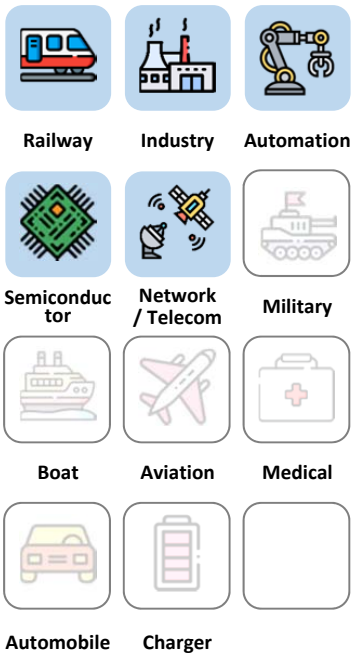
ESBS Series
30W / 1" x 1" DC/DC

Applications



3 Years Warranty

Features

1" x 1"	**4 : 1** 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	30
Series Name	Input Voltage (VDC)	Output Voltage (VDC)		Output Quantity		Remote Control Option		Shape	Watt
Evolving Sirius-Bishop series – Second	024W : 9-36 048W : 18-75 110 : 40-160	050 : 5 120 : 12 150 : 15		S : Single		P : Positive logic N : Negative logic		F : Flat	30
		120 : ±12 150 : ±15		D : Dual					

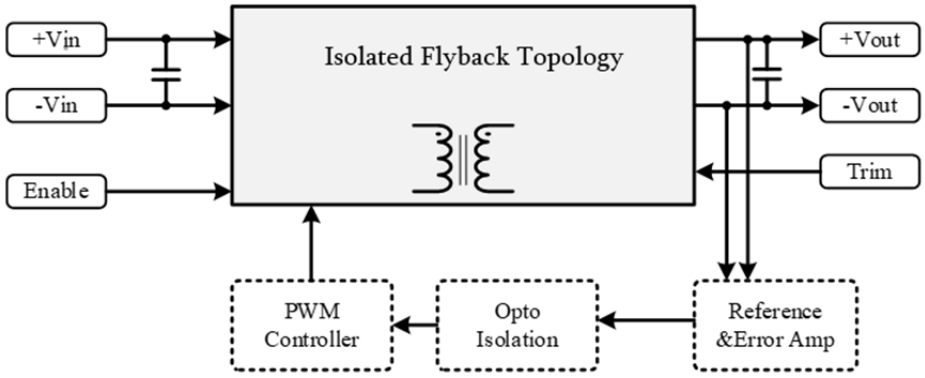
Model Selection Guide

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

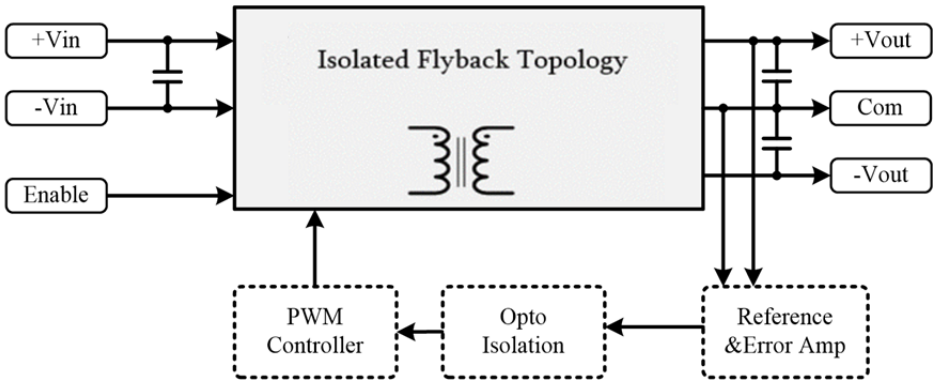
Model	Input			Output			Efficiency
	Voltage (V)		Current (A)	Voltage	Current	Power	
	Range	Nominal	Full load	(V)	(A)	(W)	Typ.(%)
ESBS024W050-S-□-F30	9-36	24	1.42	5	6	30	88%
ESBS024W120-S-□-F30	9-36	24	1.42	12	2.5	30	88%
ESBS024W150-S-□-F30	9-36	24	1.42	15	2	30	88%
ESBS024W120-D-□-F30	9-36	24	1.42	±12	±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%
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%
ESBS110050-S-□-F30	40-160	110	0.31	5	6	30	88%
ESBS110120-S-□-F30	40-160	110	0.31	12	2.5	30	88%
ESBS110150-S-□-F30	40-160	110	0.31	15	2	30	88%
ESBS110120-D-□-F30	40-160	110	0.31	±12	±1.25	30	88%
ESBS110150-D-□-F30	40-160	110	0.31	±15	±1	30	88%

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) ESBS048W models (100ms max) ESBS110 models (100ms max)			50 80 180	VDC
Operating Input Voltage Ranges	ESBS024W models ESBS048W models ESBS110 models	9 18 40	24 48 110	36 75 160	VDC
Under-Voltage Lockout Start up Voltage	ESBS024W models ESBS048W models ESBS110 models		8.5 17.5 38	9 18 40	VDC
Under-Voltage Lockout Shutdown Voltage	ESBS024W models ESBS048W models ESBS110 models	7 16 35	8 17 37		VDC
Enable Function Input	Positive logic ON Positive logic OFF	Open or 8 ~ 20 Short or 0 ~ 1.2			VDC
	Negative logic ON Negative logic OFF	Short or 0 ~ 1.2 Open or 8 ~ 20			VDC
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 1uF 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/us				±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}	220		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	All models, 1 Minute	1600			VDC
Input to Output		2000			
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)	1.0” x 1.0” x 0.4” (25.4 x 25.4 x 10.16mm)			
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.

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

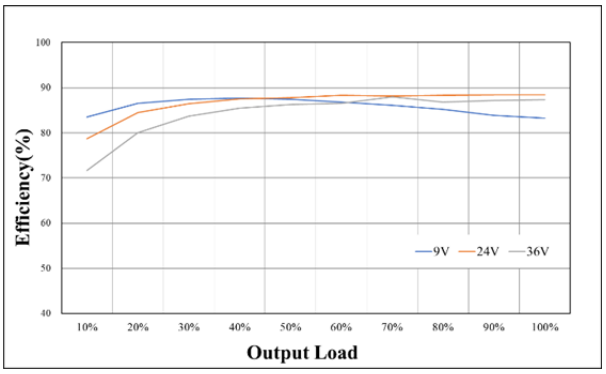


Figure 1 : Efficiency at Minimum, Nominal and Maximum Input voltages VS. Output load.

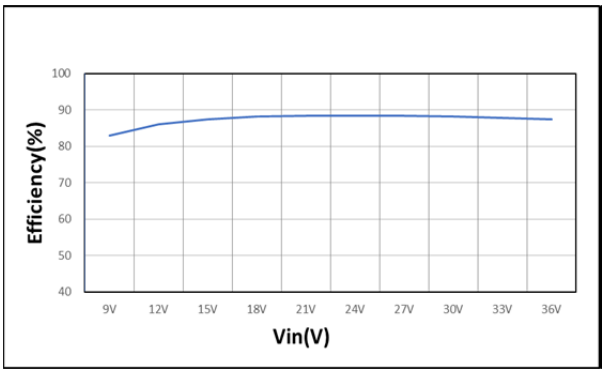


Figure 2 : Efficiency VS. Input Voltagesat at 100% rated power

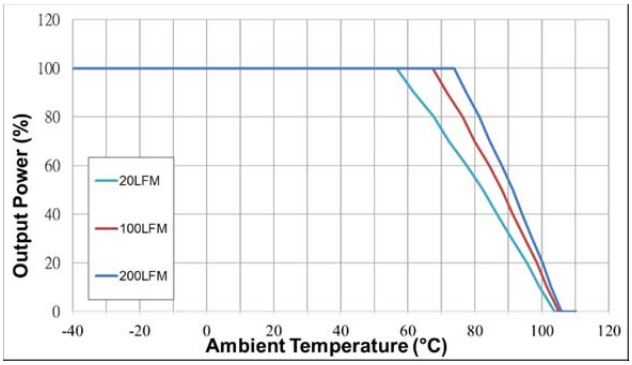


Figure 3 : Ambient Temperature VS. Output Power Derating Curves

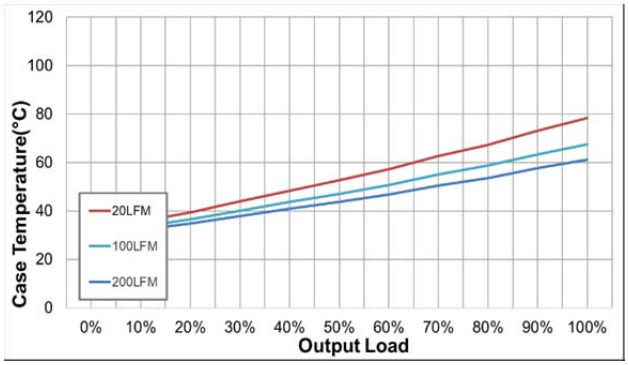


Figure 4 : Case Temperature VS. Output rated Power

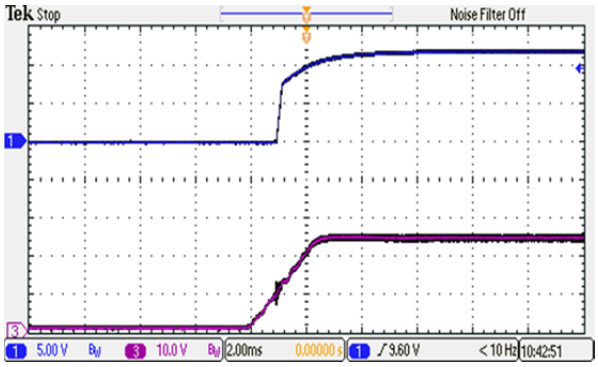


Figure 5 : CH1 = Vout, CH3 = Nominal Input Typical Start-up waveform at Full load.

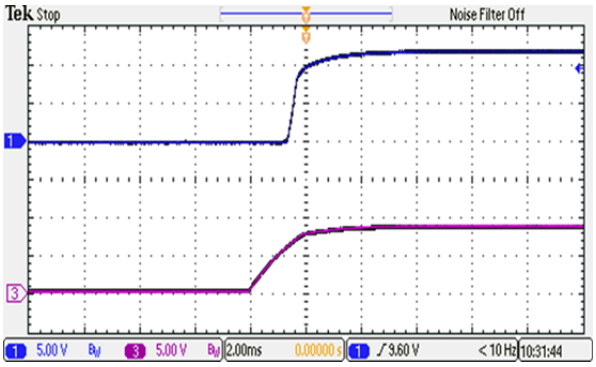


Figure 6 : CH1 = Vout, CH3 = Enable Pin Typical Start-up waveform. Input voltage pre-applied

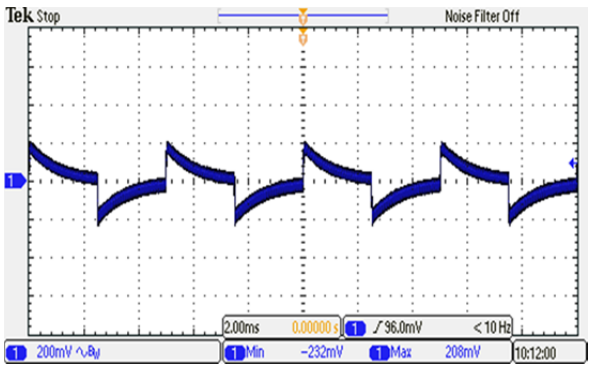


Figure 7 : Transient Response at Output step load (Vin: Typical ,50~75% of output current; ΔIo/Δt =1A/μS)

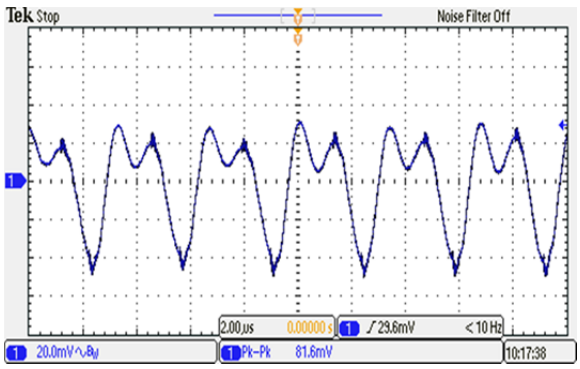
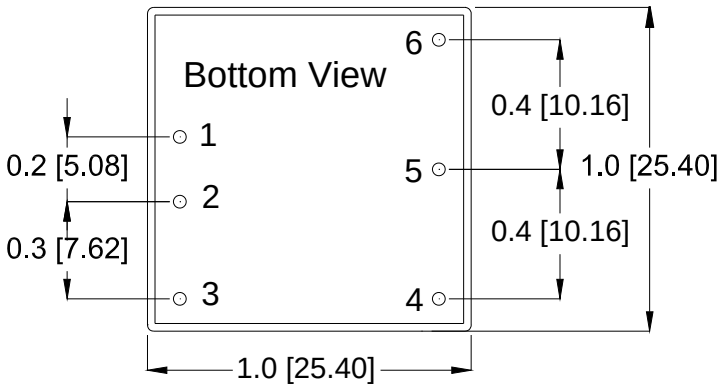
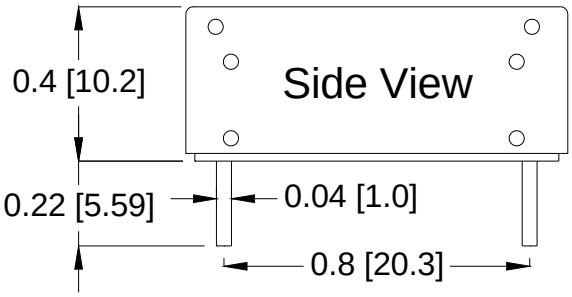


Figure 8 : Output Voltage Ripple & Noise at full load. (Vin: Typical, With Output Capacitor to add 1uF MLCC)

Mechanical Dimensions & Pin Assignments

Shape – F





(Metal Case –Flat) "Non-Conductive Base"

Pin Assignments:

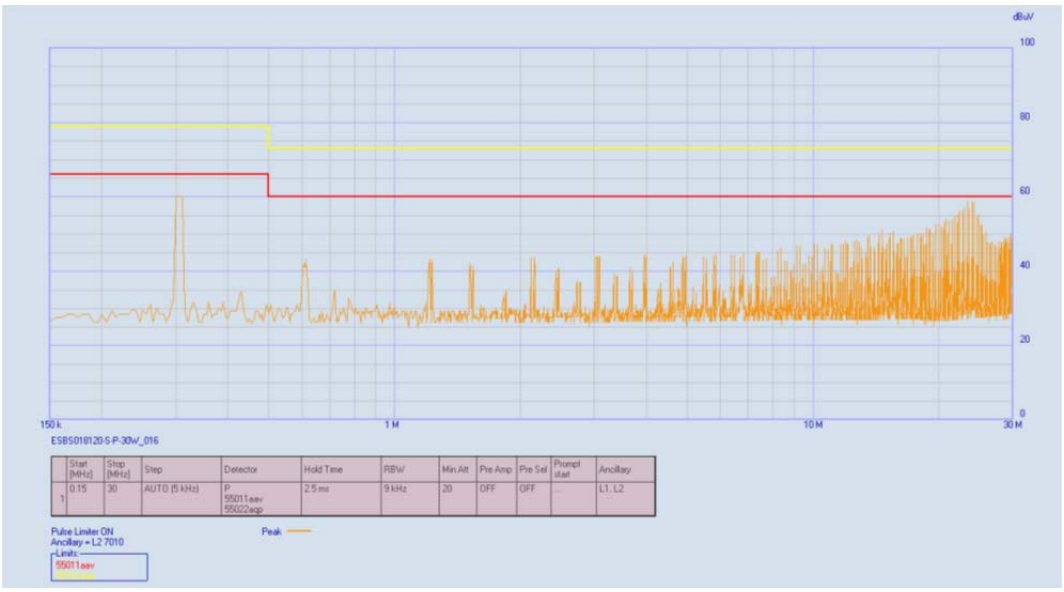
Pin#	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	Enable	Enable
4	-Vout	-Vout
5	Trim	Com
6	+Vout	+Vout

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) ESBS024W120-S-P-F30 @Vin = 24VDC, Iout = 2.5A



The fundamental switching frequency of the module is 300 kHz.

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.

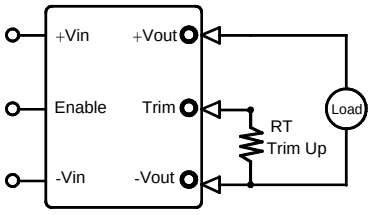


Figure 1. Trim Connections To increase Output Voltages Using Fixed Resistors

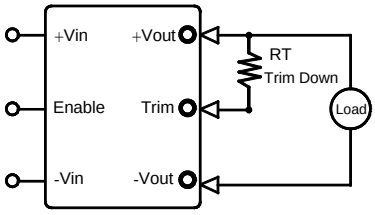


Figure 2. Trim Connections To Decrease Output Voltages Using Fixed Resistors

	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.

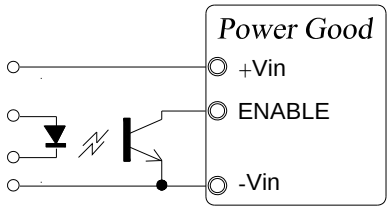


Figure 3. Driving the Enable Control pin

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.

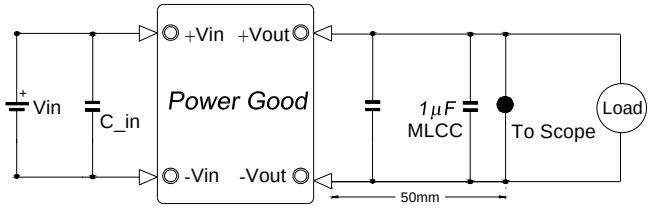


Figure 4. Measuring Output Ripple/Noise(20MHz bandwidth)

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