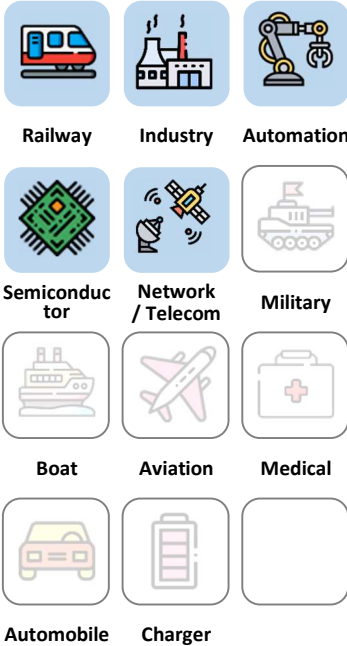




# ESCS Series

## 50W & 80W & 100W/ 2" x 1" DC/DC

### Applications



**3** Years Warranty



### Features

<b>2" x 1"</b>	<b>8:1 &amp; 4:1</b> Ultra-Wide Input range	<b>+60°C</b> without derating	<b>PI FILTER</b> Built-in	<b>2000 VDC</b> Insulation	<b>MLCC</b> No life-span constrained	<b>ON / OFF</b> REMOTE	<b>89 %</b> High efficiency
<b>MTBF</b> ≥1.6M hours @50°C GB	<b>METAL CASE</b>	<b>UVLO</b>	<b>OCP</b>	<b>OVP</b>	<b>OTP</b>		

### Model Number Structure

ESCS 024W 050 - S - P - F 100

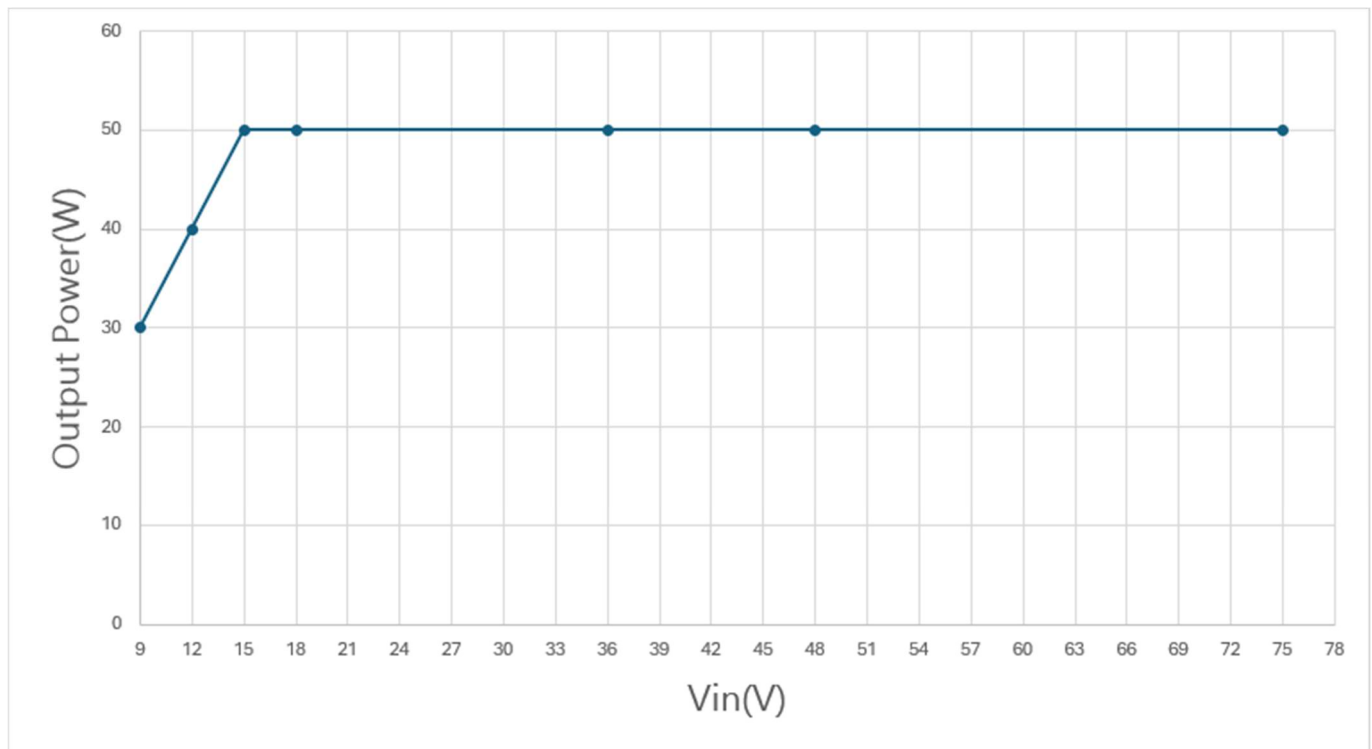
Series Name	Input Voltage (VDC)	Output Voltage (VDC)	Output Quantity	Remote Control Option	Shape	Watt
Evolving Sirius- Chivalry series – Second	024W : 9-36 036W : 9-75 048W : 18-75	050 : 5	S : Single	P : Positive logic N : Negative logic	F : Flat	80 80 100
		120 : 12				
		150 : 15				
	110 : 40-160	240 : 24	D : Dual			
		120 : ±12				
		150 : ±15				

**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.(%)
ESCS024W050-S-□-F50	9-36	24	2.37	5	10	50	88%
ESCS024W120-S-□-F50	9-36	24	2.34	12	4.16	50	89%
ESCS024W150-S-□-F50	9-36	24	2.34	15	3.33	50	89%
ESCS024W240-S-□-F50	9-36	24	2.34	24	2.08	50	89%
ESCS024W120-D-□-F50	9-36	24	2.37	±12	±2.08	50	88%
ESCS024W150-D-□-F50	9-36	24	2.37	±15	±1.66	50	88%
ESCS048W050-S-□-F50	18-75	48	1.19	5	10	50	88%
ESCS048W120-S-□-F50	18-75	48	1.17	12	4.16	50	89%
ESCS048W150-S-□-F50	18-75	48	1.17	15	3.33	50	89%
ESCS048W240-S-□-F50	18-75	48	1.17	24	2.08	50	89%
ESCS048W120-D-□-F50	18-75	48	1.19	±12	±2.08	50	88%
ESCS048W150-D-□-F50	18-75	48	1.19	±15	±1.66	50	88%
ESCS110050-S-□-F50	40-160	110	0.52	5	10	50	88%
ESCS110120-S-□-F50	40-160	110	0.51	12	4.16	50	89%
ESCS110150-S-□-F50	40-160	110	0.51	15	3.33	50	89%
ESCS110240-S-□-F50	40-160	110	0.51	24	2.08	50	89%
ESCS110120-D-□-F50	40-160	110	0.52	±12	±2.08	50	88%
ESCS110150-D-□-F50	40-160	110	0.52	±15	±1.66	50	88%
ESCS024W050-S-□-F80	9-36	24	3.75	5	16	80	89%
ESCS024W120-S-□-F80	9-36	24	3.75	12	6.67	80	89%
ESCS024W150-S-□-F80	9-36	24	3.75	15	5.33	80	89%
ESCS024W240-S-□-F80	9-36	24	3.75	24	3.33	80	89%
ESCS024W120-D-□-F80	9-36	24	3.75	±12	±3.33	80	89%
ESCS024W150-D-□-F80	9-36	24	3.75	±15	±2.67	80	89%
ESCS048W050-S-□-F80	18-75	48	1.87	5	16	80	89%
ESCS048W120-S-□-F80	18-75	48	1.87	12	6.67	80	89%
ESCS048W150-S-□-F80	18-75	48	1.87	15	5.33	80	89%
ESCS048W240-S-□-F80	18-75	48	1.87	24	3.33	80	89%
ESCS048W120-D-□-F80	18-75	48	1.87	±12	±3.33	80	89%
ESCS048W150-D-□-F80	18-75	48	1.87	±15	±2.67	80	89%
ESCS110050-S-□-F80	40-160	110	0.82	5	16	80	89%
ESCS110120-S-□-F80	40-160	110	0.82	12	6.67	80	89%
ESCS110150-S-□-F80	40-160	110	0.82	15	5.33	80	89%
ESCS110120-D-□-F80	40-160	110	0.82	±12	±3.33	80	89%
ESCS110150-D-□-F80	40-160	110	0.82	±15	±2.67	80	89%

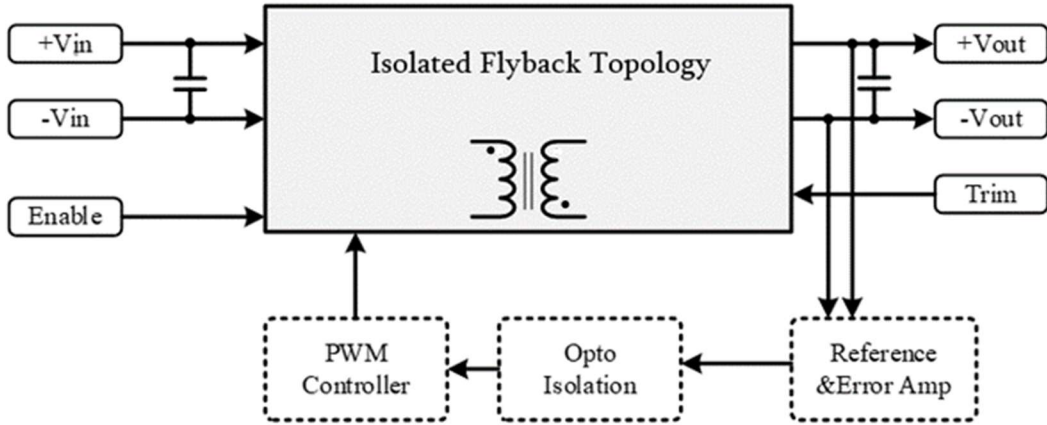
Model	Input			Output			Efficiency
	Voltage (V)		Current (A)	Voltage	Current	Power	
	Range	Nominal	Full load	(V)	(A)	(W)	Typ.(%)
ESCS024W120-S-□-F100	9-36	24	4.16	12	8.33	100	89%
ESCS024W150-S-□-F100	9-36	24	4.16	15	6.67	100	89%
ESCS024W240-S-□-F100	9-36	24	4.16	24	4.16	100	89%
ESCS024W120-D-□-F100	9-36	24	4.16	±12	±2.08	100	88%
ESCS024W150-D-□-F100	9-36	24	4.16	±15	±4.16	100	88%
ESCS048W120-S-□-F100	18-75	48	2.08	12	8.33	100	89%
ESCS048W150-S-□-F100	18-75	48	2.08	15	6.67	100	89%
ESCS048W240-S-□-F100	18-75	48	2.08	24	4.16	100	89%
ESCS048W120-D-□-F100	18-75	48	2.08	±12	±4.16	100	88%
ESCS048W150-D-□-F100	18-75	48	2.08	±15	±3.33	100	88%
ESCS036W050-S-□-F50	9-75	36	1.62	5	10	50	87%
ESCS036W120-S-□-F50	9-75	36	1.62	12	4.16	50	87%
ESCS036W150-S-□-F50	9-75	36	1.62	15	3.33	50	87%
ESCS036W240-S-□-F50	9-75	36	1.62	24	2.08	50	87%
ESCS036W120-D-□-F50	9-75	36	1.62	±12	±2.08	50	87%
ESCS036W150-D-□-F50	9-75	36	1.62	±15	±1.66	50	87%



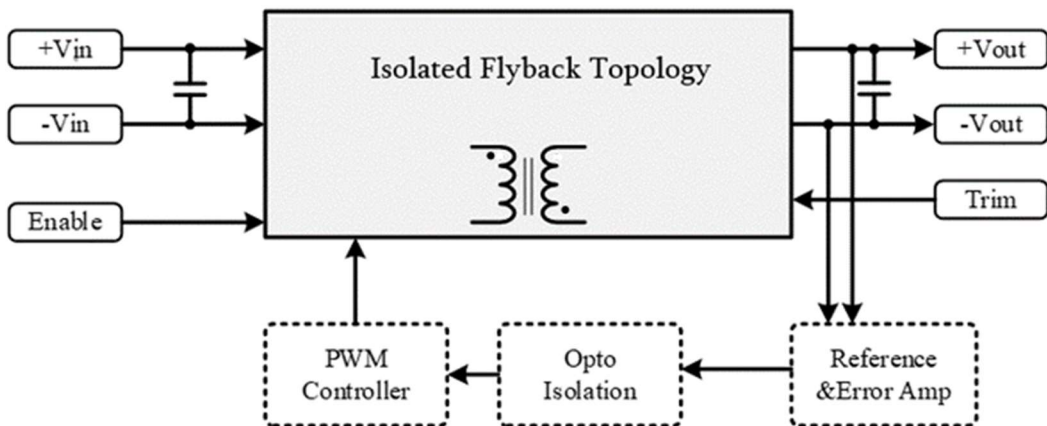
Output rated Power VS. Input Voltages

Description

**Evolving Sirius - Chivalry 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.



ESCS Single Series Block Diagram



ESCS Dual Series Block Diagram

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

Parameter	Notes and Conditions	Min.	Typ.	Max.	Unit
Transient Input Voltage Ranges	ESCS024W models (100ms max)			50	VDC
	ESCS036W models (100ms max)			80	
	ESCS048W models (100ms max)			80	
	ESCS110 models (100ms max)			250	
Operating Input Voltage Ranges	ESCS024W models	9	24	36	VDC
	ESCS036W models	9	36	75	
	ESCS048W models	18	48	75	
	ESCS110 models	40	110	160	
Under-Voltage Lockout Start up Voltage	ESCS024W models		8.5	9	VDC
	ESCS036W models		8.5	9	
	ESCS048W models		17.5	18	
	ESCS110 models		38	40	
Under-Voltage Lockout Shutdown Voltage	ESCS024W models	7	8		VDC
	ESCS036W models	7	8		
	ESCS048W models	16	17		
	ESCS110 models	35	37		
Enable Function Input	Positive logic	ON OFF	Open Short or 0 ~ 1.2		VDC
	Negative logic	ON OFF	Short or 0 ~ 1.2 Open		VDC
Input Filter	All models	Built-in PI Filter			

**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	%
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 <sub>pk-pk</sub>
		All others		1	1.5
Temperature Drift				±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> (Current limit / Hiccup Mode)		120		%

**General Specifications & Environmental Specifications**

Parameter	Notes and Conditions	Min.	Typ.	Max.	Unit
Switching Frequency	V <sub>NOM</sub>	180		300	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				VDC
Input to Output		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)	31 (1.09)			g (oz.)
Dimensions	Shape-F (Flat)	2.00" x 1.00" x 0.40" (50.8 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
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

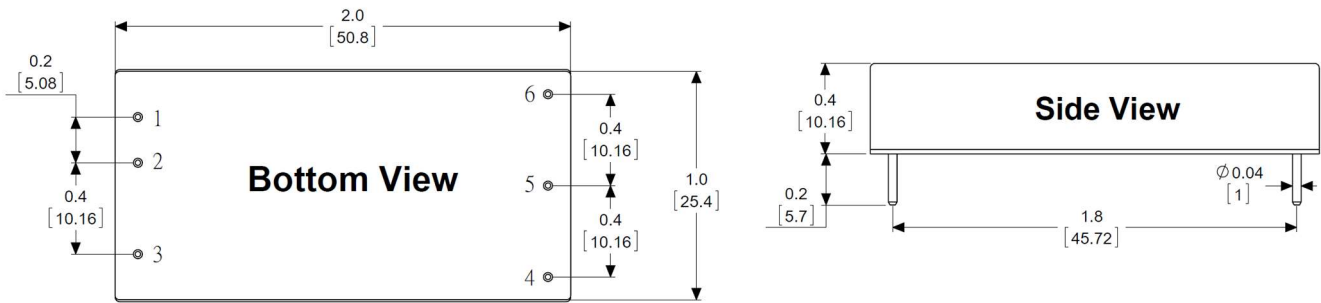
It is recommended to protect the input by fuses or other protection devices.

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

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

Shape – F



Pin Assignments:

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

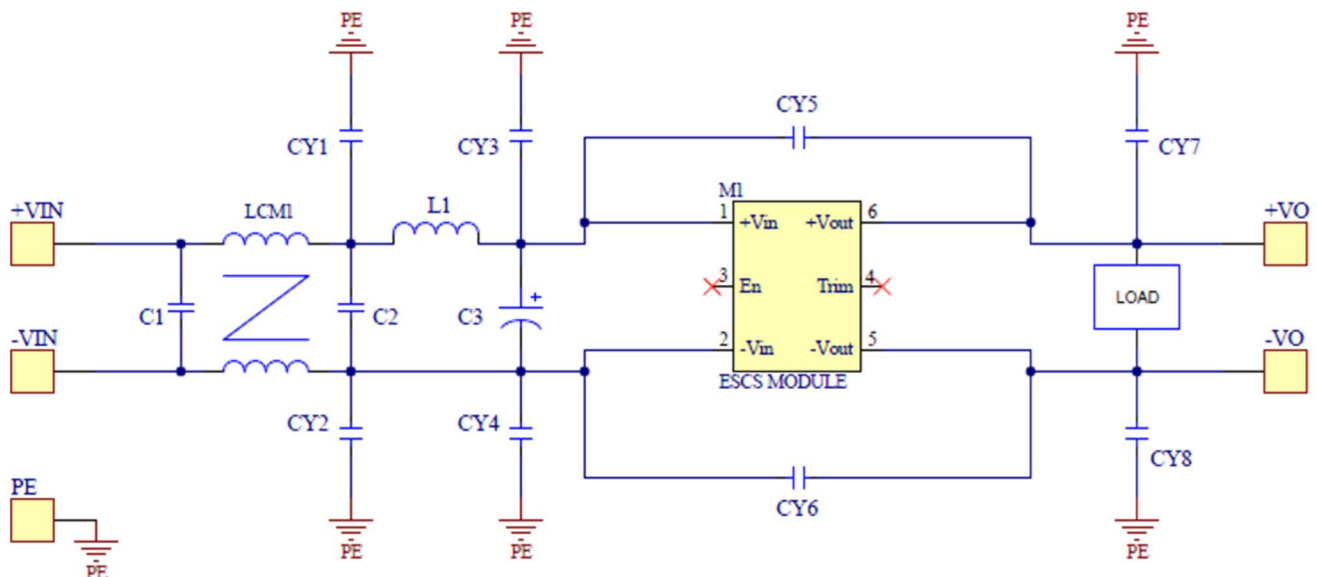
Note:

- Pin Pitch tolerance:  $\pm 0.01$  [0.25]
- Pin Dimensions:  $.XX \pm 0.02$  [  $.X \pm 0.5\text{mm}$  ]
- Pin Material: Copper Alloy
- Pin Plating: Gold
- Dimensions in inches [mm]
- Tolerances:  $.XX \pm 0.02$  [  $.X \pm 0.5\text{mm}$  ]
- $.XXX \pm 0.001$  [  $.X \pm 0.025\text{mm}$  ]

Conducted EMI Class A & Class B

Input terminal value (typ.) ESCS110240-S-P-F80@Vin = 110VDC, Iout = 3.33A

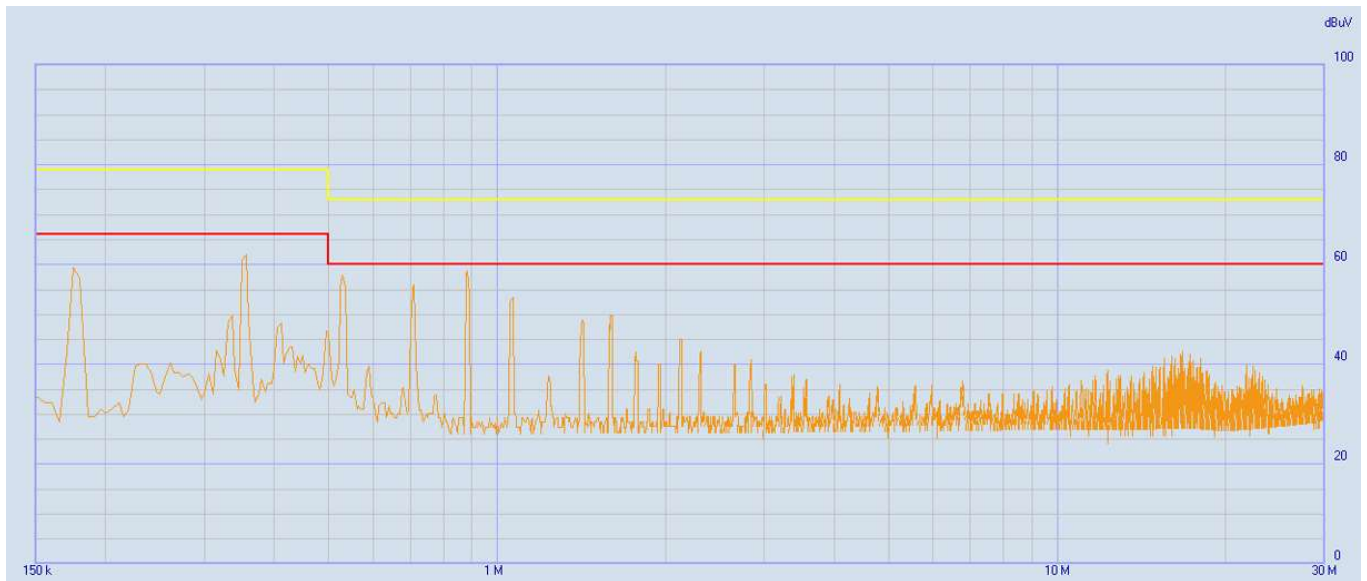
Recommended Circuit Diagram



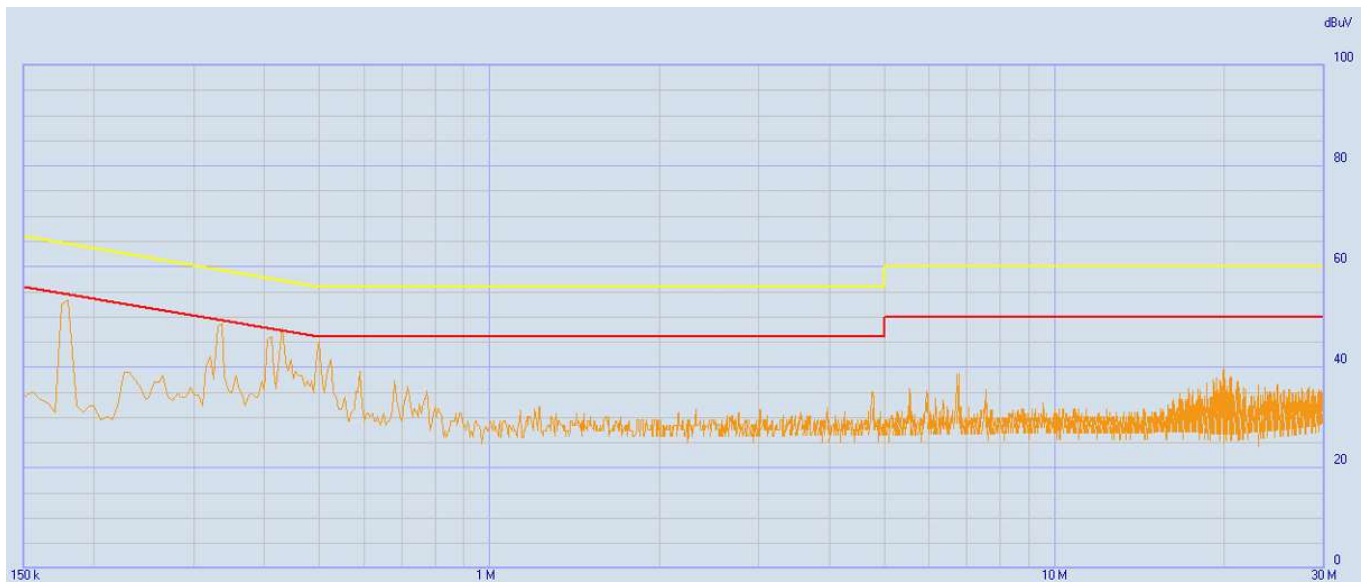
**Bill of Materials**

Class A												
C1	LCM1	C2	L1	C3	CY1	CY2	CY3	CY4	CY5	CY6	CY7	CY8
0.22uF	55uH	0.47uF	200uH	470uF	X	X	X	X	1500pF	1500pF	X	X
MLCC		MLCC		EC					Y Cap	Y Cap		
Class B												
0.22uF	450uH	0.47uF	530uH	470uF	4700pF	4700pF	X	X	4700pF	4700pF	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 ESCS024W120-S-P-F50

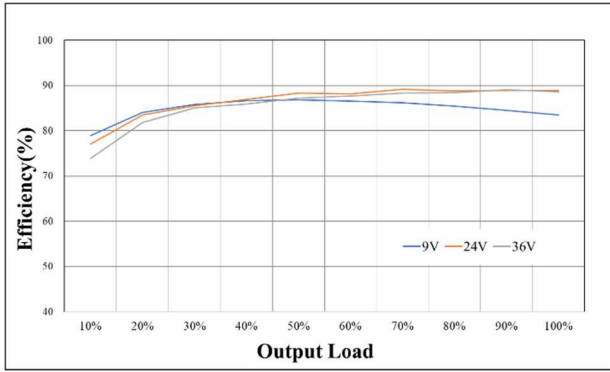


Figure 1 : Efficiency at Minimum, Nominal and Maximum Input Voltages VS. Output Load.

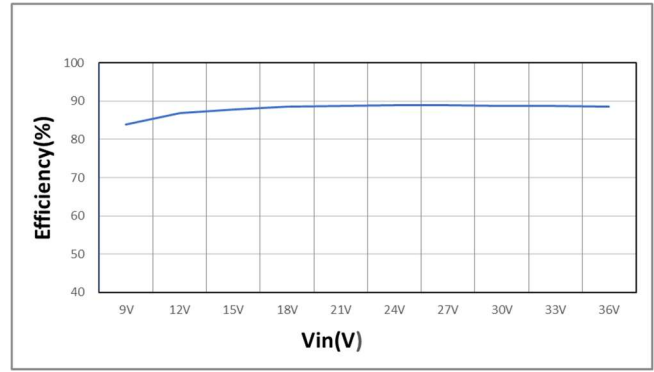


Figure 2 : Efficiency VS. Input Voltages at 100% rated power

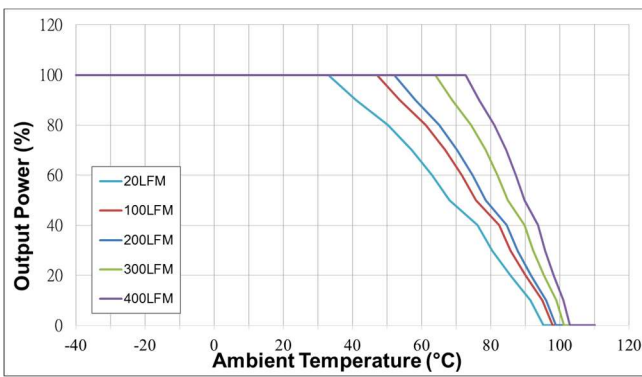


Figure 3 : Ambient Temperature VS. Output Power Derating Curves(Note: 20LFM = Free Air)

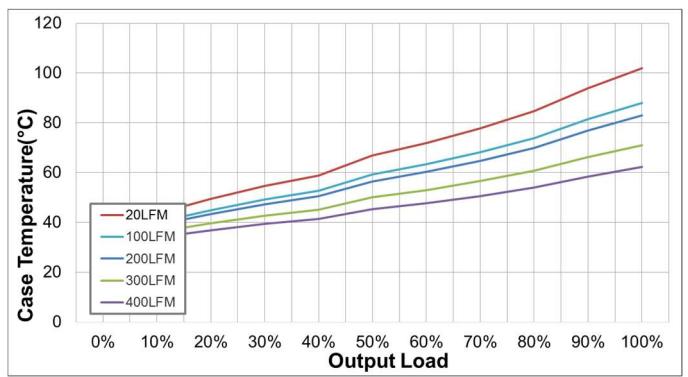


Figure 4 : Case Temperature VS. Output rated Power (Note: 20LFM = Free Air)

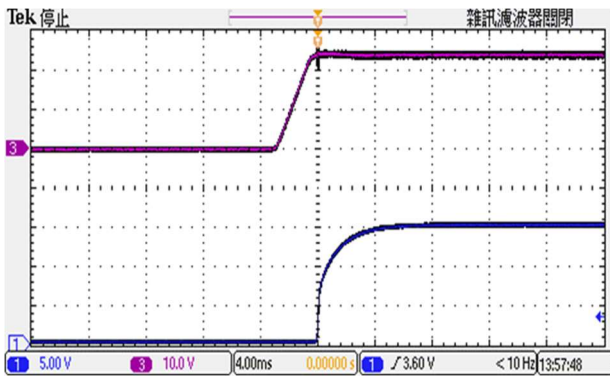


Figure 5 : CH1 = Vout, CH3 = Nominal Input Typical Start-up waveform at Full load.

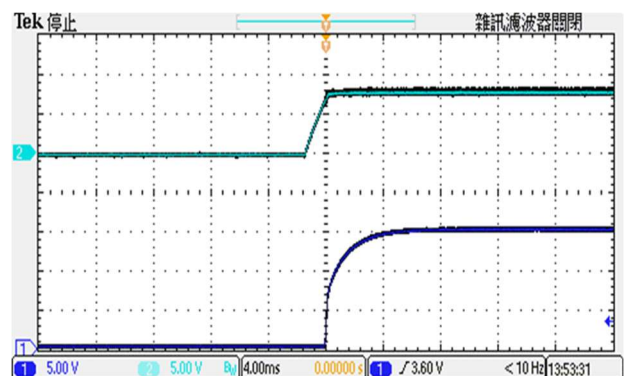


Figure 6 : CH1 = Vout, CH3 = Enable Pin Typical Start-up waveform. Input voltage pre-applied

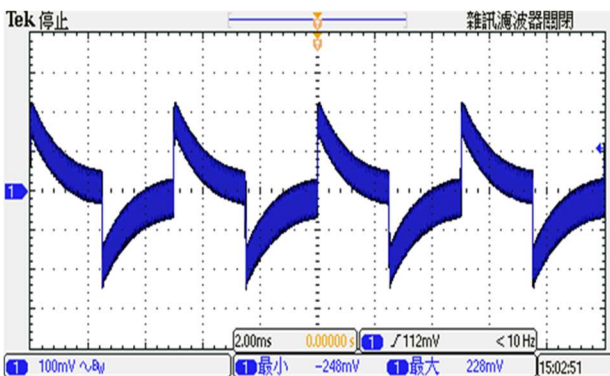


Figure 7 : Transient Response at Output step load ( Vin: Typical, 50~75% of output current;  $\Delta I_o/\Delta t = 1A/\mu S$  )

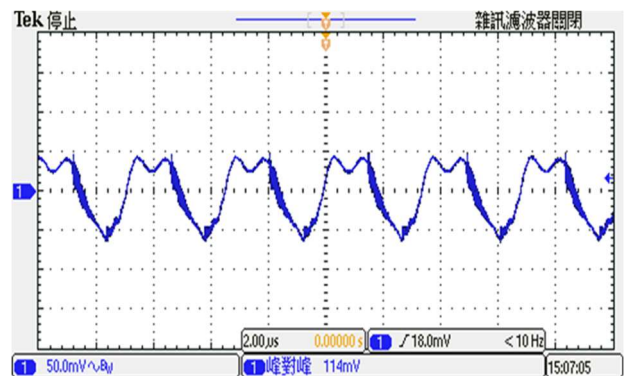


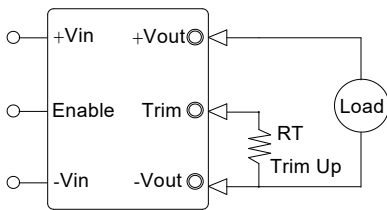
Figure 8 : Output Voltage Ripple & Noise at full load. ( Vin: Typical, With Output Capacitor to add 10μF MLCC )

**Trimming Output Voltage – for Single output models**

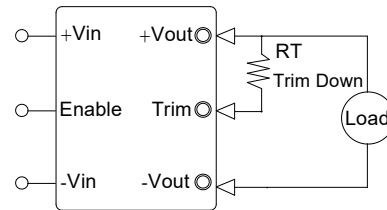
Only the single output converters have a trim function. That allows users to adjust the output voltage from +10% to -10%, please refer to the trim table that follow for details. Adjustments to the output voltage can be used with a simple fixed resistor as shown in Figures 1 and 2. A single fixed resistor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



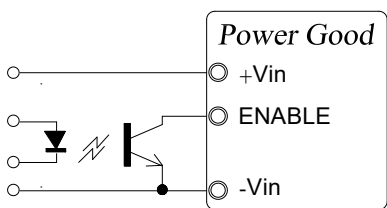
**Figure 2.** Trim Connections To Decrease Output Voltages Using Fixed Resistors

Vout	Trim up resistor value(KΩ)									
	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

Vout	Trim down resistor value(KΩ)									
	-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**

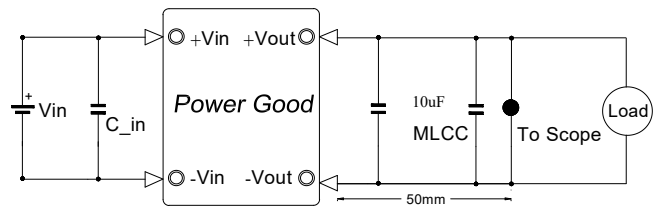
The primary-side, Enable Control function can be specified to operate with either positive or negative polarity. Positive-polarity devices are enabled when the enable pin is left open or is pulled high. See “Enable Function Input.” Positive-polarity devices are disabled when the enable pin is pulled 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

