Features

2:1/4:1 Wide Input Range

Operating Temperature Range: -45~115°C

Approved to UKCA, CE, RoHS & REACH

Safety Standards to IEC/UL/EN 62368-1 & EN 50155

Efficiency up to 90%

Single output 9~160V DC

28ESCxy-x-x-F50-IP Converter Series

DC/DC PCB Mount Power Supply

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

Part Number Structure

28ESC	-	018	033	-	S	-	P	-	F	50
Series Name		Input Voltage (VDC)	Output Voltage (VDC)		Output Quantity		Remote control option		Shape	Watt
Evolving **S**irius **C**hivalry series		**012 :** 9-18 **018 :** 9-36 **024 :** 18-36 **036 :** 18-75 **048 :** 36-75	**033 :** 3.3 **050 :** 5 **120 :** 12 **150 :** 15 **240 :** 24		**S :** single		**P:** Positive logic **N:** Negative logic		**F :** Flat **P** : Groove Cover **B** : Base Plate	20 30 40 50
			120 : ±12 **150** : ±15 **240** : ±24		**D :** Dual		**1 :** Positive logic + EMC Filter **0 :** Negative logic + EMC Filter			

Models

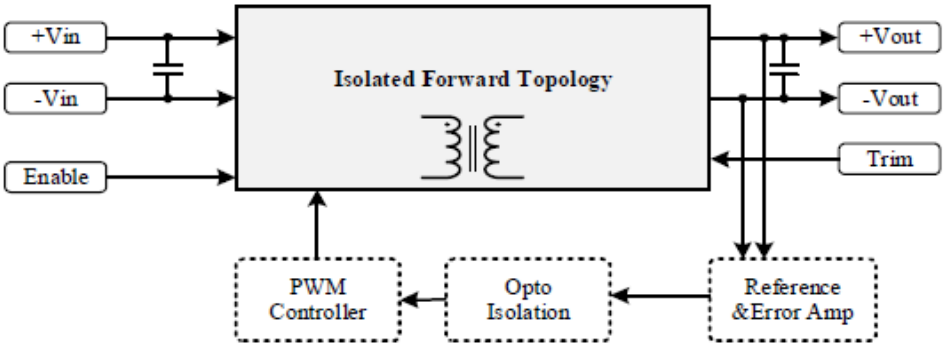
Model	Input Voltage (V) Range	Input Voltage (V) Nominal	Input Current (A) Full load	Output Voltage (V)	Output Current (A)	Output Power (W)	Efficiency Typ.(%)
28ESC012033-S-□-□30-IP	9-18	12	2.81	3.3	9.1	30	89%
28ESC012050-S-□-□30-IP	9-18	12	2.78	5	6	30	90%
28ESC012120-S-□-□30-IP	9-18	12	2.81	12	2.5	30	89%
28ESC012150-S-□-□30-IP	9-18	12	2.81	15	2	30	89%
28ESC012240-S-□-□30-IP	9-18	12	2.81	24	1.3	30	89%
28ESC012120-D-□-□30-IP	9-18	12	2.81	±12	±1.3	30	89%
28ESC012150-D-□-□30-IP	9-18	12	2.81	±15	±1.0	30	89%
28ESC012240-D-□-□30-IP	9-18	12	2.84	±24	±0.6	30	88%
28ESC012033-S-□-□40-IP	9-18	12	3.75	3.3	12.1	40	89%
28ESC012050-S-□-□40-IP	9-18	12	3.70	5	8	40	90%
28ESC012120-S-□-□40-IP	9-18	12	3.75	12	3.3	40	89%
28ESC012150-S-□-□40-IP	9-18	12	3.75	15	2.7	40	89%
28ESC012240-S-□-□40-IP	9-18	12	3.75	24	1.7	40	89%
28ESC012120-D-□-□40-IP	9-18	12	3.75	±12	±1.7	40	89%
28ESC012150-D-□-□40-IP	9-18	12	3.75	±15	±1.3	40	89%
28ESC012240-D-□-□40-IP	9-18	12	3.79	±24	±0.8	40	88%
28ESC012033-S-□-□50-IP	9-18	12	4.68	3.3	15.1	50	89%
28ESC012050-S-□-□50-IP	9-18	12	4.63	5	10	50	90%
28ESC012120-S-□-□50-IP	9-18	12	4.68	12	4.2	50	89%
28ESC012150-S-□-□50-IP	9-18	12	4.68	15	3.3	50	89%
28ESC012240-S-□-□50-IP	9-18	12	4.68	24	2.1	50	89%
28ESC012120-D-□-□50-IP	9-18	12	4.68	±12	±2.1	50	89%
28ESC012150-D-□-□50-IP	9-18	12	4.68	±15	±1.7	50	89%
28ESC012240-D-□-□50-IP	9-18	12	4.73	±24	±1.0	50	88%
28ESC012033-S-□-□50-IP	9-18	12	4.68	3.3	15.1	50	89%
28ESC018033-S-□-□30-IP	9-36	18	1.89	3.3	9.1	30	88%
28ESC018050-S-□-□30-IP	9-36	18	1.87	5	6	30	89%
28ESC018120-S-□-□30-IP	9-36	18	1.89	12	2.5	30	88%
28ESC018150-S-□-□30-IP	9-36	18	1.89	15	2	30	88%
28ESC018240-S-□-□30-IP	9-36	18	1.89	24	1.3	30	88%
28ESC018120-D-□-□30-IP	9-36	18	1.89	±12	±1.3	30	88%
28ESC018150-D-□-□30-IP	9-36	18	1.89	±15	±1.0	30	88%
28ESC018240-D-□-□30-IP	9-36	18	1.92	±24	±0.6	30	87%
28ESC018033-S-□-□30-IP	9-36	18	1.89	3.3	9.1	30	88%
28ESC018033-S-□-□40-IP	9-36	18	2.53	3.3	12.1	40	88%
28ESC018050-S-□-□40-IP	9-36	18	2.50	5	8	40	89%
28ESC018120-S-□-□40-IP	9-36	18	2.53	12	3.3	40	88%
28ESC018150-S-□-□40-IP	9-36	18	2.53	15	2.7	40	88%
28ESC018240-S-□-□40-IP	9-36	18	2.53	24	1.7	40	88%
28ESC018120-D-□-□40-IP	9-36	18	2.53	±12	±1.7	40	88%
28ESC018150-D-□-□40-IP	9-36	18	2.53	±15	±1.3	40	88%
28ESC018240-D-□-□40-IP	9-36	18	2.55	±24	±0.8	40	87%
28ESC024033-S-□-□30-IP	18-36	24	1.40	3.3	9.1	30	89%
28ESC024050-S-□-□30-IP	18-36	24	1.39	5	6	30	90%
28ESC012033-S-□-□30-IP	9-18	12	2.81	3.3	9.1	30	89%

28ESC024120-S-□-□30-IP	18-36	24	1.40	12	2.5	30	89%
28ESC024150-S-□-□30-IP	18-36	24	1.40	15	2	30	89%
28ESC024240-S-□-□30-IP	18-36	24	1.40	24	1.3	30	89%
28ESC024120-D-□-□30-IP	18-36	24	1.40	±12	±1.3	30	89%
28ESC024150-D-□-□30-IP	18-36	24	1.40	±15	±1.0	30	89%
28ESC024240-D-□-□30-IP	18-36	24	1.40	±24	±0.6	30	89%
28ESC024033-S-□-□40-IP	18-36	24	1.87	3.3	12.1	40	89%
28ESC024050-S-□-□40-IP	18-36	24	1.85	5	8	40	90%
28ESC024120-S-□-□40-IP	18-36	24	1.87	12	3.3	40	89%
28ESC024150-S-□-□40-IP	18-36	24	1.87	15	2.7	40	89%
28ESC024240-S-□-□40-IP	18-36	24	1.87	24	1.7	40	89%
28ESC024120-D-□-□40-IP	18-36	24	1.87	±12	±1.7	40	89%
28ESC024150-D-□-□40-IP	18-36	24	1.87	±15	±1.3	40	89%
28ESC024240-D-□-□40-IP	18-36	24	1.87	±24	±0.8	40	89%
28ESC024033-S-□-□50-IP	18-36	24	2.34	3.3	15.1	50	89%
28ESC024050-S-□-□50-IP	18-36	24	2.31	5	10	50	90%
28ESC024120-S-□-□50-IP	18-36	24	2.34	12	4.2	50	89%
28ESC024150-S-□-□50-IP	18-36	24	2.34	15	3.3	50	89%
28ESC024240-S-□-□50-IP	18-36	24	2.34	24	2.1	50	89%
28ESC024120-D-□-□50-IP	18-36	24	2.34	±12	±2.1	50	89%
28ESC024150-D-□-□50-IP	18-36	24	2.34	±15	±1.7	50	89%
28ESC024240-D-□-□50-IP	18-36	24	2.37	±24	±1.0	50	88%
28ESC036033-S-□-□30-IP	18-75	36	0.95	3.3	9.1	30	88%
28ESC036050-S-□-□30-IP	18-75	36	0.94	5	6	30	89%
28ESC036120-S-□-□30-IP	18-75	36	0.95	12	2.5	30	88%
28ESC036150-S-□-□30-IP	18-75	36	0.95	15	2	30	88%
28ESC036240-S-□-□30-IP	18-75	36	0.95	24	1.3	30	88%
28ESC036120-D-□-□30-IP	18-75	36	0.95	±12	±1.3	30	88%
28ESC036150-D-□-□30-IP	18-75	36	0.95	±15	±1.0	30	88%
28ESC036240-D-□-□30-IP	18-75	36	0.96	±24	±0.6	30	87%
28ESC036033-S-□-□40-IP	18-75	36	1.26	3.3	12.1	40	88%
28ESC036050-S-□-□40-IP	18-75	36	1.25	5	8	40	89%
28ESC036120-S-□-□40-IP	18-75	36	1.26	12	3.3	40	88%
28ESC036150-S-□-□40-IP	18-75	36	1.26	15	2.7	40	88%
28ESC036240-S-□-□40-IP	18-75	36	1.26	24	1.7	40	88%
28ESC036120-D-□-□40-IP	18-75	36	1.26	±12	±1.7	40	88%
28ESC036150-D-□-□40-IP	18-75	36	1.26	±15	±1.3	40	88%
28ESC036240-D-□-□40-IP	18-75	36	1.28	±24	±0.8	40	87%
28ESC048033-S-□-□30-IP	36-75	48	0.70	3.3	9.1	30	89%
28ESC048050-S-□-□30-IP	36-75	48	0.69	5	6	30	90%
28ESC048120-S-□-□30-IP	36-75	48	0.70	12	2.5	30	89%
28ESC048150-S-□-□30-IP	36-75	48	0.70	15	2	30	89%
28ESC048240-S-□-□30-IP	36-75	48	0.70	24	1.3	30	89%
28ESC048120-D-□-□30-IP	36-75	48	0.70	±12	±1.3	30	89%
28ESC048150-D-□-□30-IP	36-75	48	0.70	±15	±1.0	30	89%
28ESC048240-D-□-□30-IP	36-75	48	0.70	±24	±0.6	30	89%
28ESC048033-S-□-□50-IP	36-75	48	1.17	3.3	15.1	50	89%
28ESC048050-S-□-□50-IP	36-75	48	1.16	5	10	50	90%
28ESC048120-S-□-□50-IP	36-75	48	1.17	12	4.2	50	89%
28ESC048150-S-□-□50-IP	36-75	48	1.17	15	3.3	50	89%

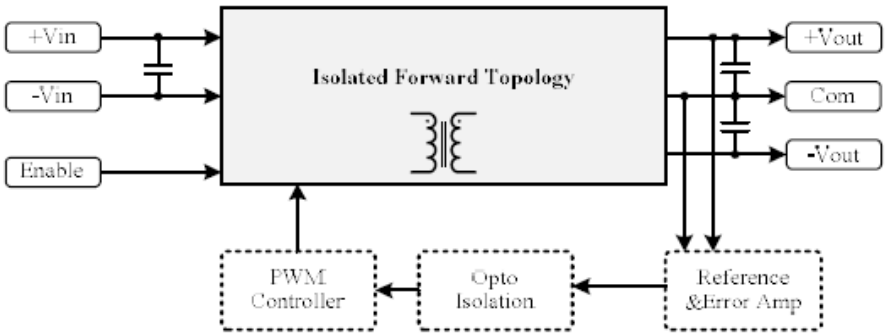
28ESC048240-S-□-□50-IP	36-75	48	1.17	24	2.1	50	89%
28ESC048120-D-□-□50-IP	36-75	48	1.17	±12	±2.1	50	89%
28ESC048150-D-□-□50-IP	36-75	48	1.17	±15	±1.7	50	89%
28ESC048240-D-□-□50-IP	36-75	48	1.17	±24	±1.0	50	89%
28ESC110033-S-□-□20-IP	40-160	110	0.21	3.3	6.1	20	88%
28ESC110050-S-□-□20-IP	40-160	110	0.20	5	4	20	89%
28ESC110120-S-□-□20-IP	40-160	110	0.21	12	1.7	20	88%
28ESC110150-S-□-□20-IP	40-160	110	0.21	15	1.3	20	88%
28ESC110240-S-□-□20-IP	40-160	110	0.21	24	0.8	20	88%
28ESC110120-D-□-□20-IP	40-160	110	0.21	±12	±0.8	20	88%
28ESC110150-D-□-□20-IP	40-160	110	0.21	±15	±0.7	20	88%
28ESC110240-D-□-□20-IP	40-160	110	0.21	±24	±0.4	20	87%
28ESC110033-S-□-□30-IP	40-160	110	0.31	3.3	9.1	30	88%
28ESC110050-S-□-□30-IP	40-160	110	0.31	5	6	30	89%
28ESC110120-S-□-□30-IP	40-160	110	0.31	12	2.5	30	88%
28ESC110150-S-□-□30-IP	40-160	110	0.31	15	2	30	88%
28ESC110240-S-□-□30-IP	40-160	110	0.31	24	1.3	30	87%
28ESC110120-D-□-□30-IP	40-160	110	0.31	±12	±1.3	30	88%
28ESC110150-D-□-□30-IP	40-160	110	0.31	±15	±1.0	30	88%
28ESC110240-D-□-□30-IP	40-160	110	0.31	±24	±0.6	30	87%
28ESC110033-S-□-□40-IP	40-160	110	0.41	3.3	12.1	40	88%
28ESC110050-S-□-□40-IP	40-160	110	0.41	5	8	40	89%
28ESC110120-S-□-□40-IP	40-160	110	0.41	12	3.3	40	88%
28ESC110150-S-□-□40-IP	40-160	110	0.41	15	2.7	40	88%
28ESC110240-S-□-□40-IP	40-160	110	0.42	24	1.7	40	87%
28ESC110120-D-□-□40-IP	40-160	110	0.41	±12	±1.7	40	88%
28ESC110150-D-□-□40-IP	40-160	110	0.41	±15	±1.3	40	88%
28ESC110240-D-□-□40-IP	40-160	110	0.42	±24	±0.8	40	87%
28ESC110033-S-□-□50-IP	40-160	110	0.52	3.3	15.1	50	88%
28ESC110050-S-□-□50-IP	40-160	110	0.51	5	10	50	89%
28ESC110120-S-□-□50-IP	40-160	110	0.52	12	4.2	50	88%
28ESC110150-S-□-□50-IP	40-160	110	0.52	15	3.3	50	88%
28ESC110240-S-□-□50-IP	40-160	110	0.52	24	2.1	50	87%
28ESC110120-D-□-□50-IP	40-160	110	0.52	±12	±2.1	50	88%
28ESC110150-D-□-□50-IP	40-160	110	0.52	±15	±1.7	50	88%
28ESC110240-D-□-□50-IP	40-160	110	0.52	±24	±1.0	50	87%

Description

Ideal Power **Evolving Sirius - Chivalry series 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.



28ESB Single Series Block Diagram



28ESC Dual Series Block Diagram

Input Data

Parameter	Notes and Conditions	Min.	Typ.	Max.	Unit
Transient Input Voltage Ranges	28ESC012 models (100ms max) 28ESC018 models (100ms max) 28ESC024 models (100ms max) 28ESC036 models (100ms max) 28ESC048 models (100ms max) 28ESC110 models (100ms max)	--	--	50 50 50 80 80 180	VDC
Operating Input Voltage Ranges	28ESC012 models 28ESC018 models 28ESC024 models 28ESC036 models 28ESC048 models 28ESC110 models	9 9 18 18 36 40	12 18 24 36 48 110	18 36 36 75 75 160	VDC
Under-Voltage Lockout Start-up Voltage	28ESC012 models 28ESC018 models 28ESC024 models 28ESC036 models 28ESC048 models 28ESC110 models	--	8.5 8.5 17.5 17.5 35 38	9 9 18 18 36 40	VDC
Under-Voltage Lockout Shutdown Voltage	28ESC012 models 28ESC018 models 28ESC024 models 28ESC036 models 28ESC048 models 28ESC110 models	7 7 16 16 32 35	8 8 17 17 34 37	--	VDC
Input filter	All models, Built-in PI Filter				
Enable Function Input	Positive logic ON OFF ESC110 models	Open or 8 ~20 Short or 0 ~1.2			VDC
	Negative logic ON OFF ESC110 models	Short or 0 ~ 1.2 Open or 8 ~ 20			VDC
Enable Function Input	Positive logic ON OFF Others	Open or 4.5 ~ 5.5 Short or 0 ~ 1.2			VDC
	Negative logic ON OFF Others	Short or 0 ~ 1.2 Open or 4.5 ~ 5.5			VDC

General Specifications & Environmental Data

Parameter	Notes and Conditions		Min.	Typ.	Max.	Unit
Storage temperature range	All models		-55	--	125	C
Switching frequency	VNOM	2:1 wide	270	300	330	kHz
		4:1 wide	220	260	300	kHz
Operating case temperature	All models		-45	--	115	m
Over temperature protection	All models, Auto. Recovery		--	120	--	C
Thermal impedance	Natural convection (Flat)		5.4 (Vertical) / 7.2 (horizontal)			˚C/Watt
	Natural convection (Groove		4.6 (Vertical) / 6.5 (horizontal)			
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		--	1.54	--	M HR
Thermal shock	Environmental Engineering Experimental Tests			MIL-STD-810F		
Vibration				MIL-STD-810F		
Drop				MIL-STD-810F		
Weight	Shape-F (Flat)		33 (1.2)			g (oz.)
Dimensions	Shape-F (Flat)		2.00” x 1.20” x 0.40” (50.8 x 30.5 x 10.2mm)			
Case Material	Six-Sided Continuous Shield		aluminium			
Potting material	Silicone					

Output Data

Parameter	Notes and 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	%
Minimum Load	Single output		0	--	--	%
	Dual output		10	--	--	%
Output Ripple & Noise Voltage	Bandwidth 20MHz and with 1µF MLCC Output Capacitor each output	3.3V & 5V	--	--	75/100	m Vp-p
		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		--	--	+2	%Vo
Start-Up Time	When use Enable Function		--	20	--	mSec.
Trimming Output Protection	VNOM 10% Load		--	+10	--	%
Output power protection	VNOM 10% Load		--	120	--	%
Over Voltage Protection	VNOM		--	120	--	%

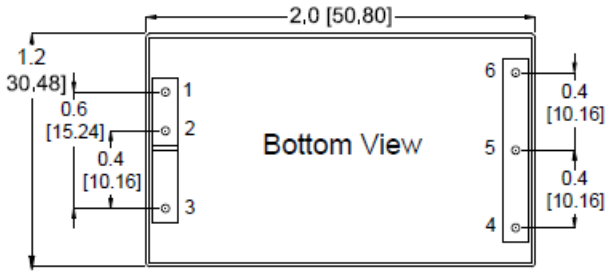
Standards Compliance

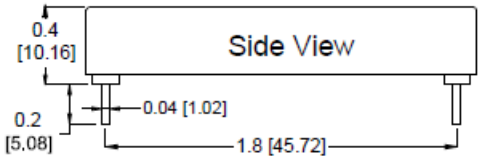
Parameter	Standard	Test conditions	Performance criteria
Environmental Compliance	Reach; RoHS	--	Pass
EMI	EN55022	--	Class B
ESD	EN61000-4-2	±4 kV Air Discharge ±4 kV Contact Discharge	Crit. A
Radiated Immunity	EN61000-4-3	Level 2, 3 V/m	Crit. A
Fast Transient	EN61000-4-4	±2 kV Applied	Crit. A
Surge	EN61000-4-5	±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.

Conducted EMI

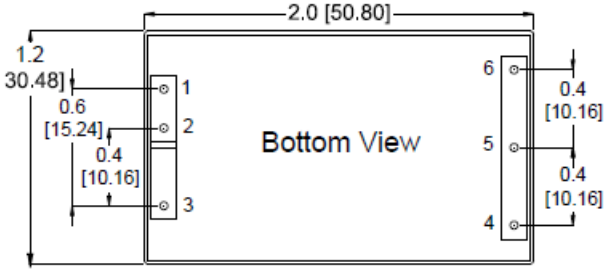
Shape F

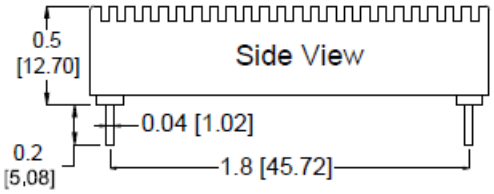




(Metal Case –Flat)

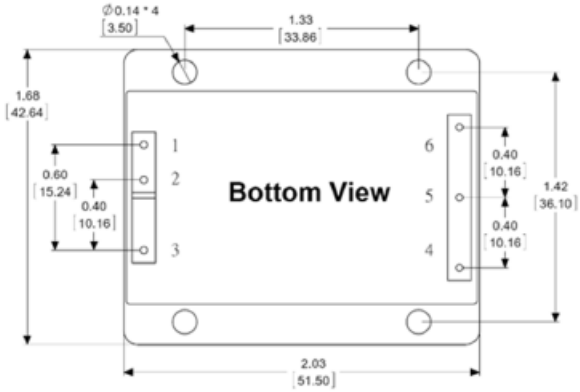
Shape P – (Groove Cover/Heat Sink)

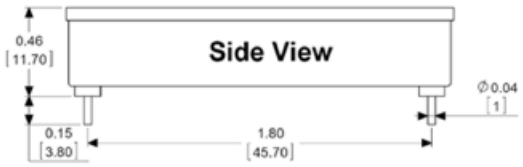




(Metal case shell with Heat-Sink)

Shape – B (Base Plate)





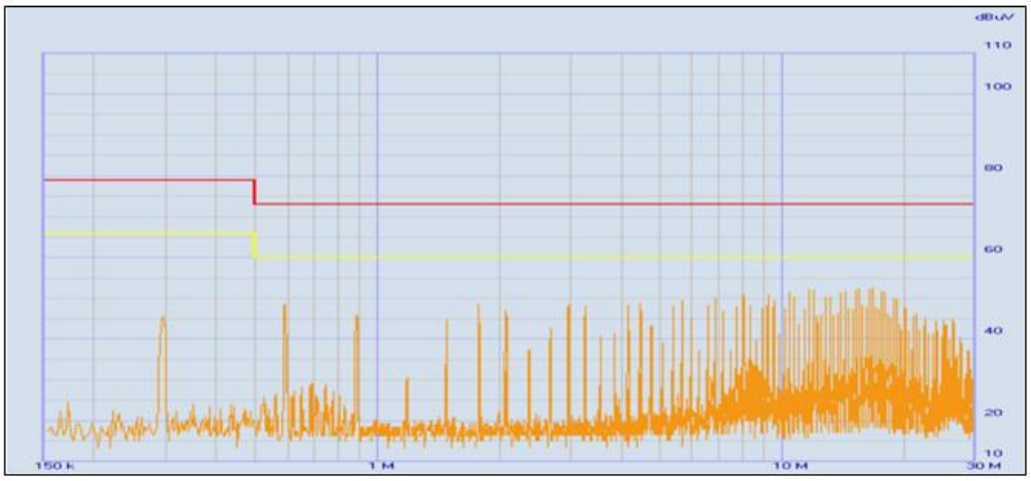
(Metal case shell with Heat-Sink)

Pin#	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	Enable	Enable
4	Trim	-Vout
5	-Vout	Comm
6	+Vout	+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.) 28ESC110050-S-1-P50-IP @Vin = 110VDC, Iout = 10A



The fundamental switching frequency of the module is 260 kHz.

Characteristic curves

Testing conditions are at typical input, Ta=+25˚C, full load (horizontal mount) Unless otherwise indicated

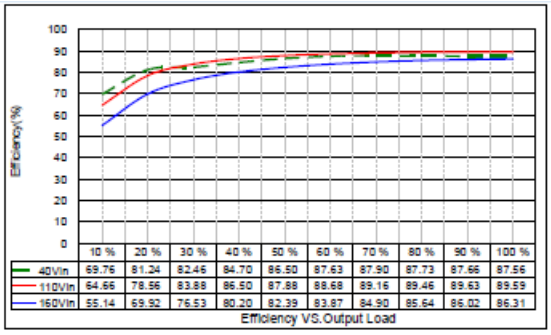


Figure 1 : Efficiency at Minimum, Nominal and Maximum Input voltages VS. Output load.

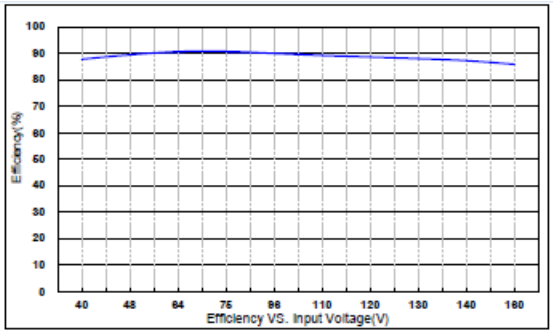


Figure 2 : Efficiency VS. Input Voltages at 100% rated power

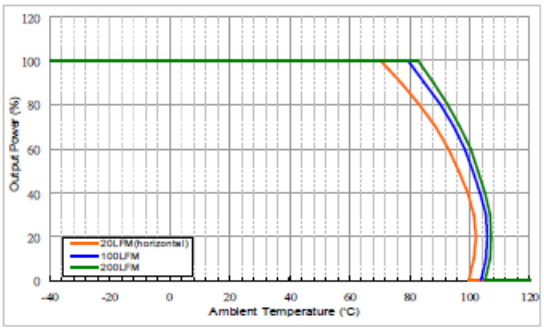


Figure 3 : Ambient Temperature VS. Output Power Derating Curves(Note: 20LFM = Free Air)

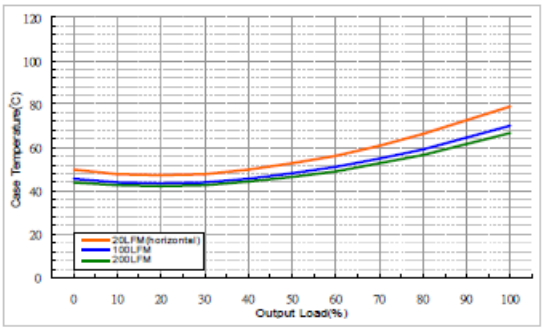


Figure 4 : Case Temperature VS. Output rated Power (Note: 20LFM = Free Air)

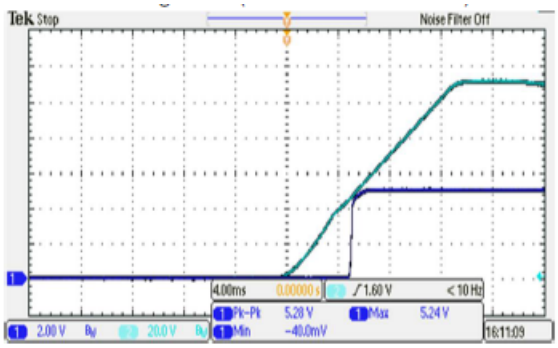


Figure 5 : CH1 = Vout, CH3 = Nominal Input Typical Start-up waveform at Full load.

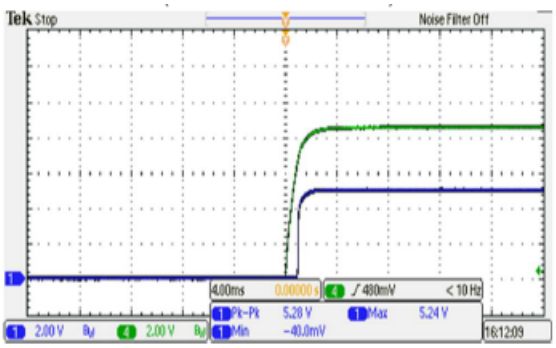


Figure 6 : CH1 = Vout, CH3 = Enable Pin Typical Start-up waveform. Input voltage pre-applied

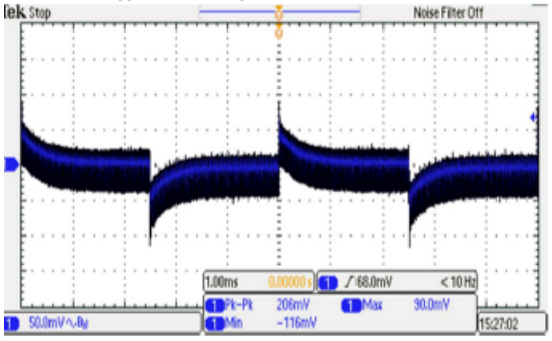


Figure 7 : Transient Response at Output step load (Vin: Typical ,50~75% of output current; Δlo/Δt =1A/μS)

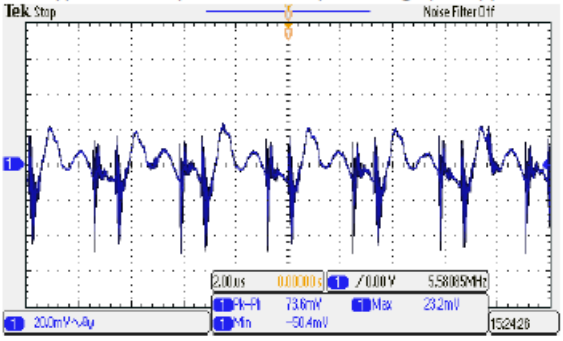


Figure 8 : Output Voltage Ripple & Noise at full load. (Vin: Typical, With Output Capacitor to add 1uF MLCC)

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.

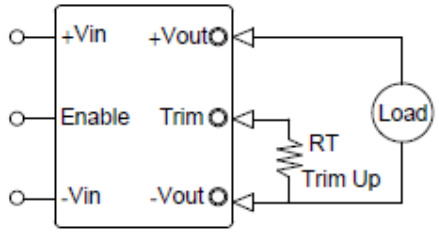


Figure 1. Trim Connections To increase Output Voltages Using Fixed Resistors

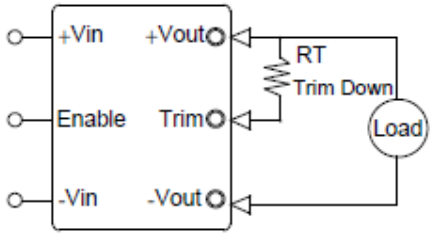


Figure 2. Trim Connections To Decrease Output Voltages Using Fixed Resistors

Trim up resistor value(KΩ)										
Vout	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
3.3	75	34	20.6	13.7	9.6	6.9	4.9	3.5	2.3	1.4
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	34.3	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
24	542	247	149	100	70.7	51.1	37.1	26.6	18.4	11.9

Trim down resistor value(KΩ)										
Vout	-1%	-2%	-3%	-4%	-5%	-6%	-7%	-8%	-9%	-10%
3.3	83	37	21.9	14.3	9.7	6.7	4.5	2.9	1.6	0.6
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	362.6	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	323.1	16.2	10.7
24	592	266	158	104	70.9	49.2	33.7	22.1	13.0	5.8

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.

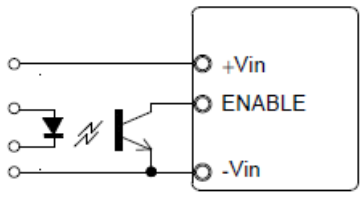


Figure 3. Driving the Enable Control pin

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

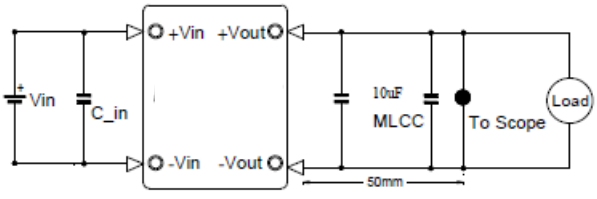


Figure 4. Measuring Output Ripple/Noise(20MHz bandwidth)