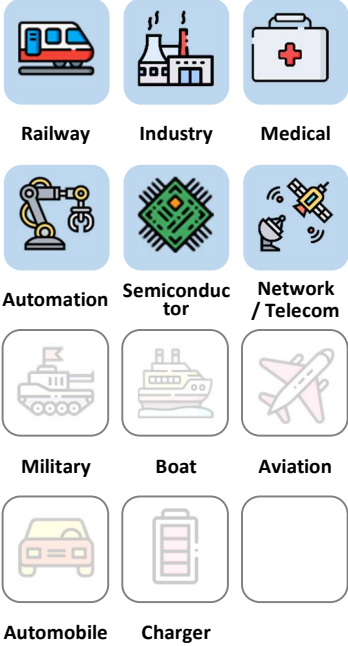


Applications



3 Years Warranty



Features

1.3" x 0.7"	2:1 / 4:1 Wide input range	+70°C without derating	PI FILTER Built-in	1600 VDC Insulation	MLCC No life-span constrained	ON / OFF REMOTE	89 % High efficiency
DIP24 Standard Pin Out	METAL CASE	LCP Plastic CASE	UVLO	OCP	OVP	OTP	

Model Number Structure

ESAN 018 033 - S - P - S 15

Series Name	Input Voltage (VDC)	Output Voltage (VDC)	Output Quantity	Remote Control Option	Shape	Watt
Evolving Sirius-Agate series – New generation	018 : 9-36	033 : 3.3	S : Single	P : Positive logic N : Negative logic	D : DIP	07 10 15
		050 : 5			MD : Metal Case	
		120 : 12			S : SMD	
	024 : 18-36	150 : 15	D : Dual	MS : Metal Case		
		050 : ±5				
	036 : 18-75	120 : ±12				
		150 : ±15				
	048 : 36-75					
	110 : 40-160					

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.(%)
ESAN018033-S-□-□07	9-36	18	0.45	3.3	2.1	7	87%
ESAN018050-S-□-□07	9-36	18	0.44	5	1.4	7	88%
ESAN018120-S-□-□07	9-36	18	0.45	12	0.6	7	87%
ESAN018150-S-□-□07	9-36	18	0.45	15	0.5	7	87%
ESAN018050-D-□-□07	9-36	18	0.46	±5.0	±0.7	7	84%
ESAN018120-D-□-□07	9-36	18	0.45	±12.0	±0.3	7	87%
ESAN018150-D-□-□07	9-36	18	0.44	±15.0	±0.2	7	88%
ESAN018033-S-□-□10	9-36	18	0.63	3.3	3	10	88%
ESAN018050-S-□-□10	9-36	18	0.62	5	2	10	89%
ESAN018120-S-□-□10	9-36	18	0.64	12	0.83	10	87%
ESAN018150-S-□-□10	9-36	18	0.63	15	0.7	10	88%
ESAN018050-D-□-□10	9-36	18	0.65	±5.0	±1.0	10	85%
ESAN018120-D-□-□10	9-36	18	0.63	±12.0	±0.4	10	88%
ESAN018150-D-□-□10	9-36	18	0.63	±15.0	±0.3	10	88%
ESAN018033-S-□-□15	9-36	18	0.95	3.3	4.5	15	88%
ESAN018050-S-□-□15	9-36	18	0.94	5	3	15	89%
ESAN018120-S-□-□15	9-36	18	0.96	12	1.3	15	87%
ESAN018150-S-□-□15	9-36	18	0.95	15	1	15	88%
ESAN018050-D-□-□15	9-36	18	0.98	±5.0	±1.5	15	85%
ESAN018120-D-□-□15	9-36	18	0.95	±12.0	±0.6	15	88%
ESAN018150-D-□-□15	9-36	18	0.95	±15.0	±0.5	15	88%
ESAN024033-S-□-□07	18-36	24	0.33	3.3	2.1	7	88%
ESAN024050-S-□-□07	18-36	24	0.33	5	1.4	7	89%
ESAN024120-S-□-□07	18-36	24	0.33	12	0.6	7	88%
ESAN024150-S-□-□07	18-36	24	0.33	15	0.5	7	88%
ESAN024050-D-□-□07	18-36	24	0.34	±5.0	±0.7	7	85%
ESAN024120-D-□-□07	18-36	24	0.33	±12.0	±0.3	7	88%
ESAN024150-D-□-□07	18-36	24	0.33	±15.0	±0.2	7	88%

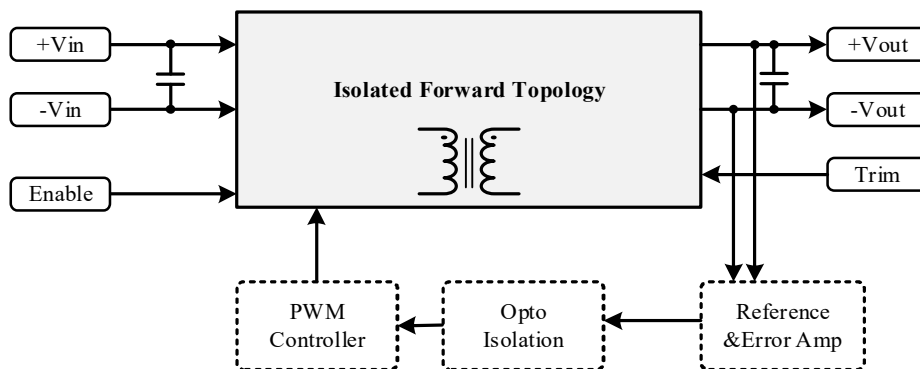
Model	Input			Output			Efficiency
	Voltage (V)		Current (A)	Voltage	Current	Power	
	Range	Nominal	Full load	(V)	(A)	(W)	Typ.(%)
ESAN024033-S-□-□10	18-36	24	0.47	3.3	3	10	88%
ESAN024050-S-□-□10	18-36	24	0.47	5	2	10	89%
ESAN024120-S-□-□10	18-36	24	0.47	12	0.8	10	88%
ESAN024150-S-□-□10	18-36	24	0.47	15	0.7	10	88%
ESAN024050-D-□-□10	18-36	24	0.48	±5.0	±1.0	10	86%
ESAN024120-D-□-□10	18-36	24	0.47	±12.0	±0.4	10	88%
ESAN024150-D-□-□10	18-36	24	0.47	±15.0	±0.3	10	88%
ESAN024033-S-□-□15	18-36	24	0.71	3.3	4.5	15	88%
ESAN024050-S-□-□15	18-36	24	0.70	5	3	15	89%
ESAN024120-S-□-□15	18-36	24	0.71	12	1.3	15	88%
ESAN024150-S-□-□15	18-36	24	0.71	15	1	15	88%
ESAN024050-D-□-□15	18-36	24	0.73	±5.0	±1.5	15	86%
ESAN024120-D-□-□15	18-36	24	0.71	±12.0	±0.6	15	88%
ESAN024150-D-□-□15	18-36	24	0.71	±15.0	±0.5	15	88%
ESAN036033-S-□-□07	18-75	36	0.22	3.3	2.1	7	87%
ESAN036050-S-□-□07	18-75	36	0.22	5	1.4	7	88%
ESAN036120-S-□-□07	18-75	36	0.22	12	0.6	7	87%
ESAN036150-S-□-□07	18-75	36	0.22	15	0.5	7	87%
ESAN036050-D-□-□07	18-75	36	0.23	±5.0	±0.7	7	84%
ESAN036120-D-□-□07	18-75	36	0.22	±12.0	±0.3	7	87%
ESAN036150-D-□-□07	18-75	36	0.22	±15.0	±0.2	7	88%
ESAN036033-S-□-□10	18-75	36	0.32	3.3	3	10	88%
ESAN036050-S-□-□10	18-75	36	0.31	5	2	10	89%
ESAN036120-S-□-□10	18-75	36	0.32	12	0.83	10	87%
ESAN036150-S-□-□10	18-75	36	0.32	15	0.7	10	88%
ESAN036050-D-□-□10	18-75	36	0.33	±5.0	±1.0	10	85%
ESAN036120-D-□-□10	18-75	36	0.32	±12.0	±0.3	10	87%
ESAN036150-D-□-□10	18-75	36	0.32	±15.0	±0.2	10	88%
ESAN036033-S-□-□15	18-75	36	0.47	3.3	4.5	15	88%
ESAN036050-S-□-□15	18-75	36	0.47	5	3	15	89%
ESAN036120-S-□-□15	18-75	36	0.48	12	1.3	15	87%
ESAN036150-S-□-□15	18-75	36	0.47	15	1	15	88%
ESAN036050-D-□-□15	18-75	36	0.49	±5.0	±1.5	15	85%
ESAN036120-D-□-□15	18-75	36	0.48	±12.0	±0.6	15	87%
ESAN036150-D-□-□15	18-75	36	0.47	±15.0	±0.5	15	88%

Model	Input			Output			Efficiency
	Voltage (V)		Current (A)	Voltage	Current	Power	
	Range	Nominal	Full load	(V)	(A)	(W)	Typ.(%)
ESAN048033-S-□-□07	36-75	48	0.17	3.3	2.1	7	88%
ESAN048050-S-□-□07	36-75	48	0.16	5	1.4	7	89%
ESAN048120-S-□-□07	36-75	48	0.17	12	0.6	7	88%
ESAN048150-S-□-□07	36-75	48	0.17	15	0.5	7	88%
ESAN048050-D-□-□07	36-75	48	0.17	±5.0	±0.7	7	85%
ESAN048120-D-□-□07	18-36	48	0.17	±12.0	±0.3	7	88%
ESAN048150-D-□-□07	18-36	48	0.17	±15.0	±0.2	7	88%
ESAN048033-S-□-□10	36-75	48	0.24	3.3	3	10	88%
ESAN048050-S-□-□10	36-75	48	0.23	5	2	10	89%
ESAN048120-S-□-□10	36-75	48	0.24	12	0.8	10	88%
ESAN048150-S-□-□10	36-75	48	0.24	15	0.7	10	88%
ESAN048050-D-□-□10	36-75	48	0.24	±5.0	±1.0	10	86%
ESAN048120-D-□-□10	18-36	48	0.24	±12.0	±0.4	10	88%
ESAN048150-D-□-□10	18-36	48	0.24	±15.0	±0.3	10	88%
ESAN048033-S-□-□15	36-75	48	0.36	3.3	4.5	15	88%
ESAN048050-S-□-□15	36-75	48	0.35	5	3	15	89%
ESAN048120-S-□-□15	36-75	48	0.36	12	1.3	15	88%
ESAN048150-S-□-□15	36-75	48	0.36	15	1	15	88%
ESAN048050-D-□-□15	36-75	48	0.36	±5.0	±1.5	15	86%
ESAN048120-D-□-□15	36-75	48	0.36	±12.0	±0.6	15	88%
ESAN048150-D-□-□15	36-75	48	0.36	±15.0	±0.5	15	88%
ESAN110033-S-□-□07	40-160	110	0.07	3.3	2.1	7	87%
ESAN110050-S-□-□07	40-160	110	0.07	5	1.4	7	88%
ESAN110120-S-□-□07	40-160	110	0.07	12	0.6	7	87%
ESAN110150-S-□-□07	40-160	110	0.07	15	0.5	7	87%
ESAN110050-D-□-□07	40-160	110	0.08	±5.0	±0.7	7	84%
ESAN110120-D-□-□07	40-160	110	0.07	±12.0	±0.3	7	87%
ESAN110150-D-□-□07	40-160	110	0.07	±15.0	±0.2	7	87%
ESAN110033-S-□-□10	40-160	110	0.10	3.3	3	10	88%
ESAN110050-S-□-□10	40-160	110	0.10	5	2	10	89%
ESAN110120-S-□-□10	40-160	110	0.10	12	0.83	10	87%
ESAN110150-S-□-□10	40-160	110	0.10	15	0.7	10	88%
ESAN110050-D-□-□10	40-160	110	0.11	±5.0	±1.0	10	85%
ESAN110120-D-□-□10	40-160	110	0.10	±12.0	±0.4	10	87%
ESAN110150-D-□-□10	40-160	110	0.10	±15.0	±0.3	10	88%

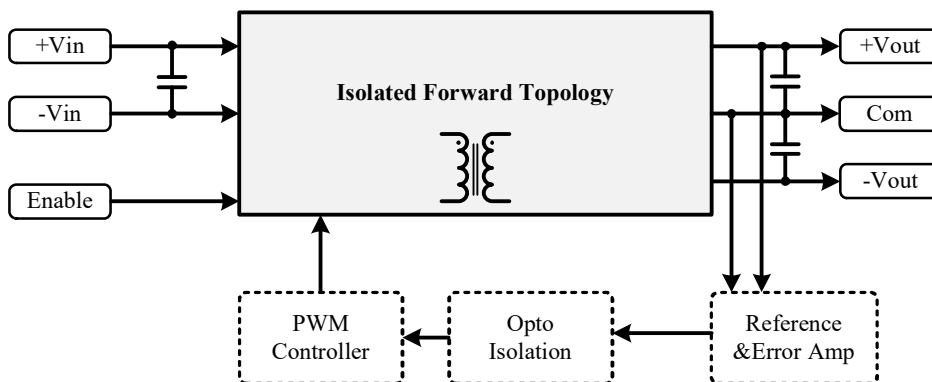
Model	Input			Output			Efficiency
	Voltage (V)		Current (A)	Voltage	Current	Power	
	Range	Nominal	Full load	(V)	(A)	(W)	Typ.(%)
ESAN110033-S-□-□15	40-160	110	0.15	3.3	4.5	15	88%
ESAN110050-S-□-□15	40-160	110	0.15	5	3	15	89%
ESAN110120-S-□-□15	40-160	110	0.15	12	1.3	15	88%
ESAN110150-S-□-□15	40-160	110	0.15	15	1	15	88%
ESAN110050-D-□-□15	40-160	110	0.16	±5.0	±1.5	15	85%
ESAN110120-D-□-□15	40-160	110	0.15	±12.0	±0.6	15	88%
ESAN110150-D-□-□15	40-160	110	0.15	±15.0	±0.5	15	88%

Description

Evolving Sirius - Agate series - New 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.



ESAN Single Series Block Diagram



ESAN 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	ESAN018 models (100ms max)			50	VDC
	ESAN024 models (100ms max)			50	
	ESAN036 models (100ms max)			80	
	ESAN048 models (100ms max)			80	
	ESAN110 models (100ms max)			180	
Operating Input Voltage Ranges	ESAN018 models	9	18	36	VDC
	ESAN024 models	18	24	36	
	ESAN036 models	18	36	75	
	ESAN048 models	36	48	75	
	ESAN110 models	40	110	160	
Under-Voltage Lockout Start up Voltage	ESAN018 models		8.5	9	VDC
	ESAN024 models		17.5	18	
	ESAN036 models		17.5	18	
	ESAN048 models		35	36	
	ESAN110 models		38	40	
Under-Voltage Lockout Shutdown Voltage	ESAN018 models	7	8		VDC
	ESAN024 models	16	17		
	ESAN036 models	16	17		
	ESAN048 models	32	34		
	ESAN110 models	35	37		
Enable Function Input	Positive logic	ON	Open or 8 ~ 20		VDC
		OFF	Short or 0 ~ 1.2		
	Negative logic	ON	Short or 0 ~ 1.2		VDC
		OFF	Open or 8 ~ 20		
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	3.3V & 5V		75 / 100	mVp-p
		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	ΔI _o /Δt=2.5A/µs			±2	%V _o
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	-50		125	°C
Operating Case Temperature	All models	-45		85	°C
Over temperature Protection	All models, Auto. Recovery		90		
Thermal impedance	Natural convection	12(Vertical)			°C/Watt
		16(horizontal)			
Isolation Voltage Input to Output	All models, 1 Minute	1600			VDC
		2000			
Isolation Resistance Input to Output	All models, 500VDC, At 70%RH	100			MΩ
Isolation Capacitance Input to Output	All models		1000		pF
Humidity (non condensing)	All models			95	%
Calculated MTBF	BellCore-TR-332@ 50°C G.B		TBD		M HR
Thermal shock	Environmental Engineering Experimental Tests	MIL-STD-810F			
Vibration		MIL-STD-810F			
Drop		MIL-STD-810F			
Weight	Plastic Shape-D (DIP) Shape-S (SMD)	13 (0.46)			g (oz.)
	Metal Shape-MD (DIP) Shape-MS (SMD)	15 (0.5)			
Dimensions		1.27" x 0.65" x 0.40" (32.3 x 16.5 x 10.2mm)			
Case Material		LCP Plastic (UL 94V-0)			
		Metal + LCP Plastic (Non-Conductive Base)			
Potting Material		Silicone			

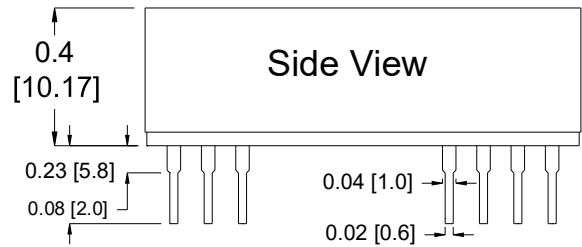
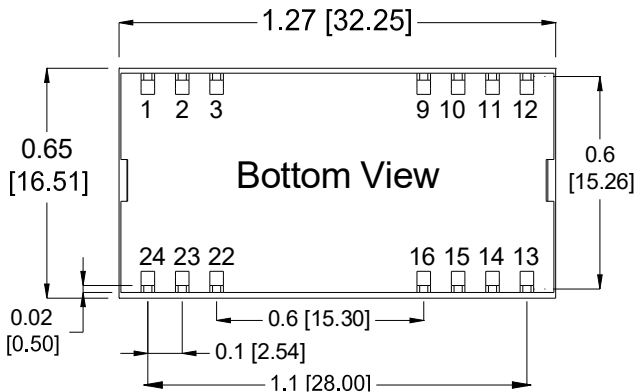
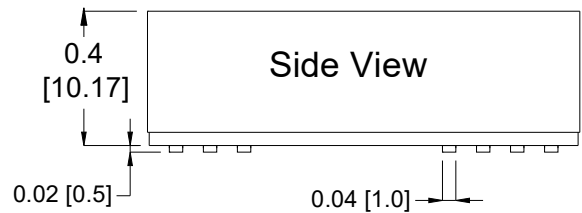
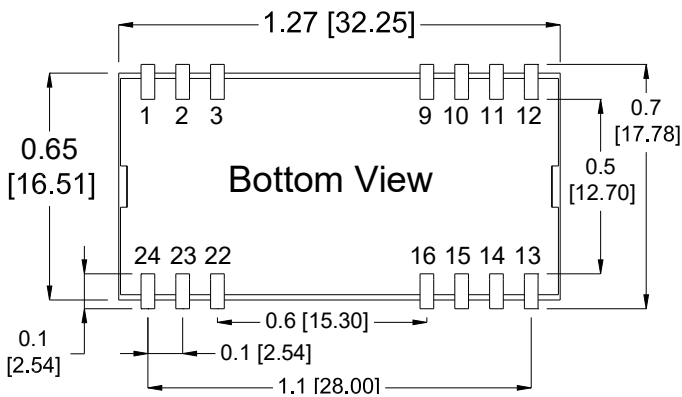
Standards Compliance

Parameter	Standard	Test Conditions	Performance Criteria
Environmental Compliance	Reach; RoHS		PASS
EMI	EN55022		Class A
ESD	EN61000-4-2	±8 kV Air Discharge ±6 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 – D (DIP)
Shape – MD (Metal Case DIP)**

**Shape – S (SMD)
Shape – MS (Metal Case SMD)**

Pin Assignments:

Pin#	Single	Dual
1	EN	EN
2	-Vin	-Vin
3	-Vin	-Vin
9	NC	Comm
10	NC	NC
11	NC	-Vout
12	Trim	NC
13	NC	NC
14	+Vout	+Vout
15	NC	NC
16	-Vout	Comm
22	+Vin	+Vin
23	+Vin	+Vin
24	NC	NC

Note:

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

Characteristic Curves

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

The figures of ESAN018033-S-P-S15

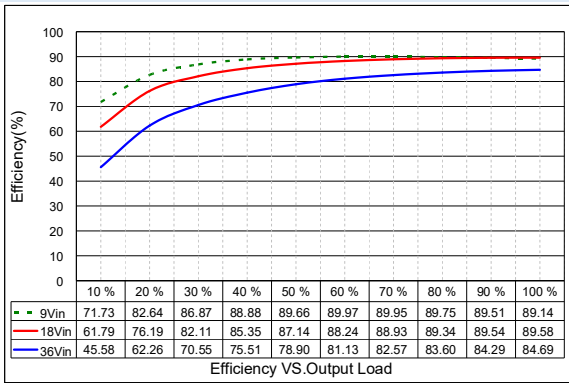


Figure 1 : Efficiency at Minimum, Nominal and Maximum Input voltages VS. Output load.

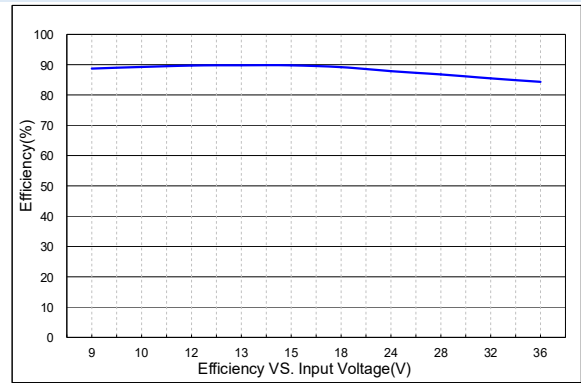


Figure 2 : Efficiency VS. Input Voltages at 100% rated power

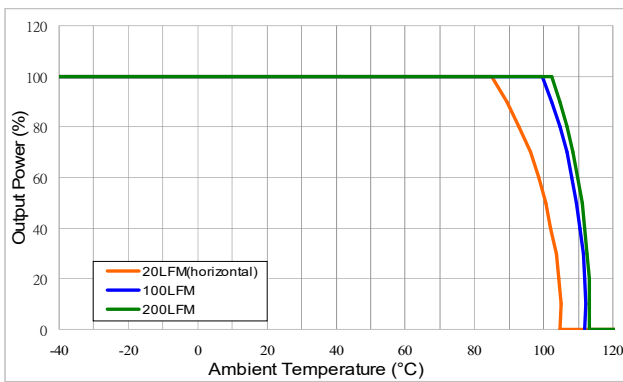


Figure 3 : Ambient Temperature VS. Output Power Derating Curves(Note: 20LFM = Free Air)

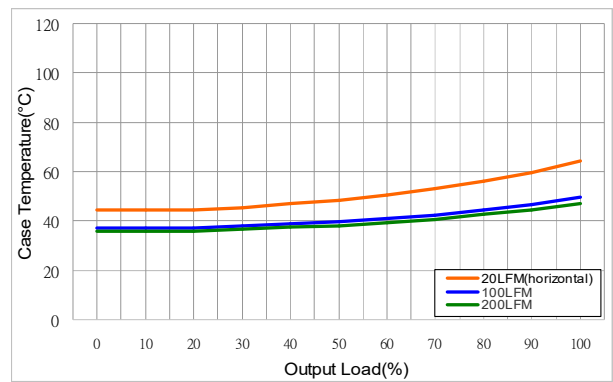


Figure 4 : Case Temperature VS. Output rated Power (Note: 20LFM = Free Air)

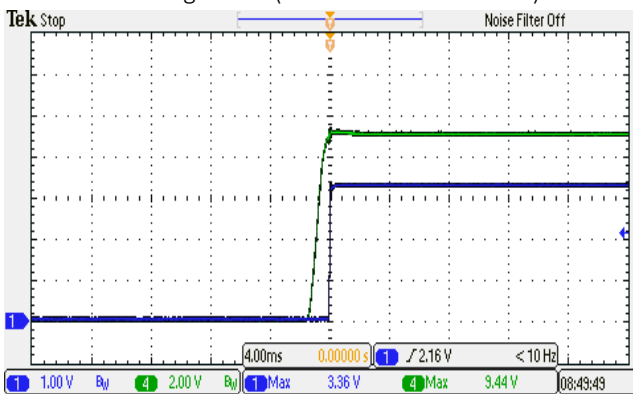


Figure 5 : CH1 = Vout, CH3 = Nominal Input Typical Start-up waveform at Full load.

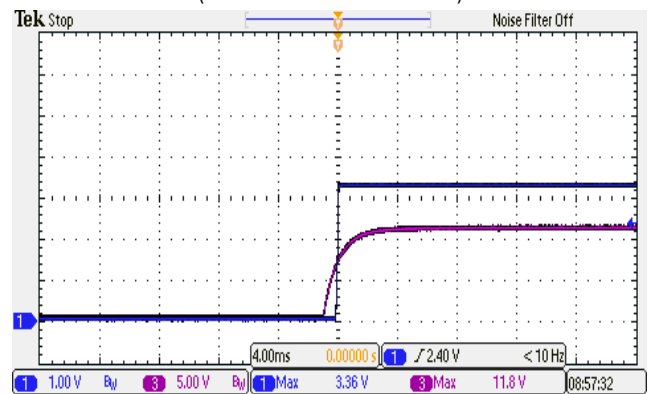


Figure 6 : CH1 = Vout, CH3 = Enable Pin Typical Start-up waveform. Input voltage pre-applied

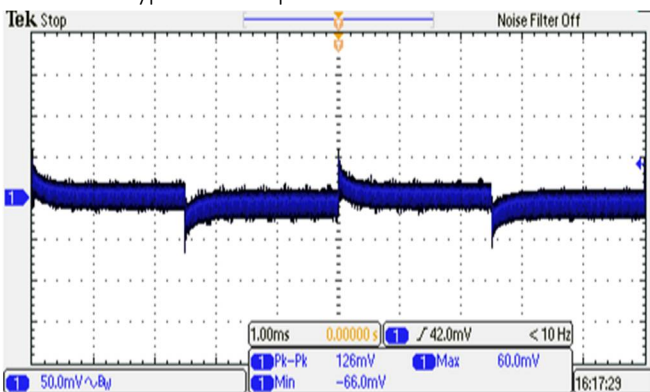


Figure 7 : Transient Response at Output step load (Vin: Typical, 50~75% of output current; $\Delta I_o/\Delta t = 1A/\mu s$)

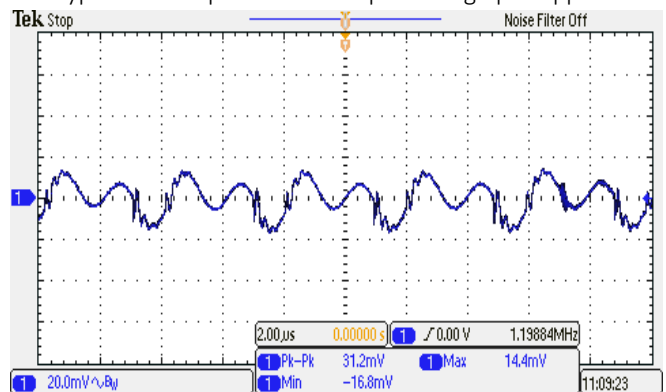


Figure 8 : Output Voltage Ripple & Noise at full load. (Vin: Typical, With Output Capacitor to add 1uF MLCC)

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.

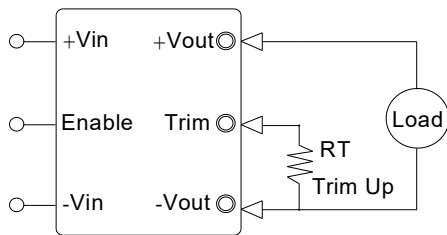


Figure 1. Trim Connections To increase Output Voltages Using Fixed Resistors

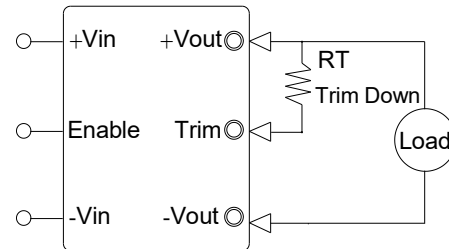


Figure 2. Trim Connections To decrease Output Voltages Using Fixed Resistors

	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	113	51	31.0	20.7	14.6	10.5	7.6	5.4	3.7	2.3
12	274	128	79.5	55.1	40.5	30.7	23.8	18.6	14.5	11.2
15	341	157	95.6	64.9	46.6	34.3	25.5	19.0	13.9	9.8

	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	117	52	30.5	19.7	13.3	9.0	5.9	3.6	1.8	0.4
12	230	103	61.0	39.9	27.2	18.8	12.8	8.2	4.7	1.9
15	329	147	86.8	56.5	38.4	26.2	17.6	11.1	6.1	2.0

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.

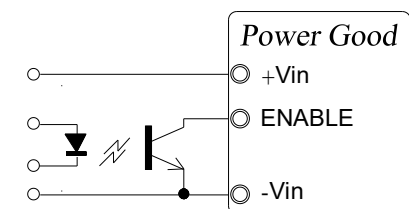


Figure 3. Driving the Enable Control pin

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.

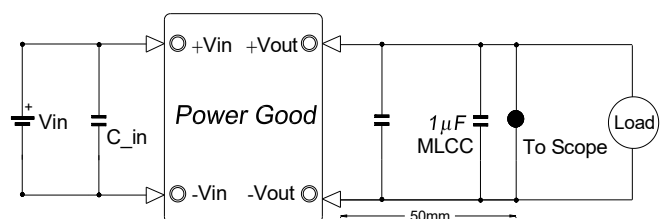
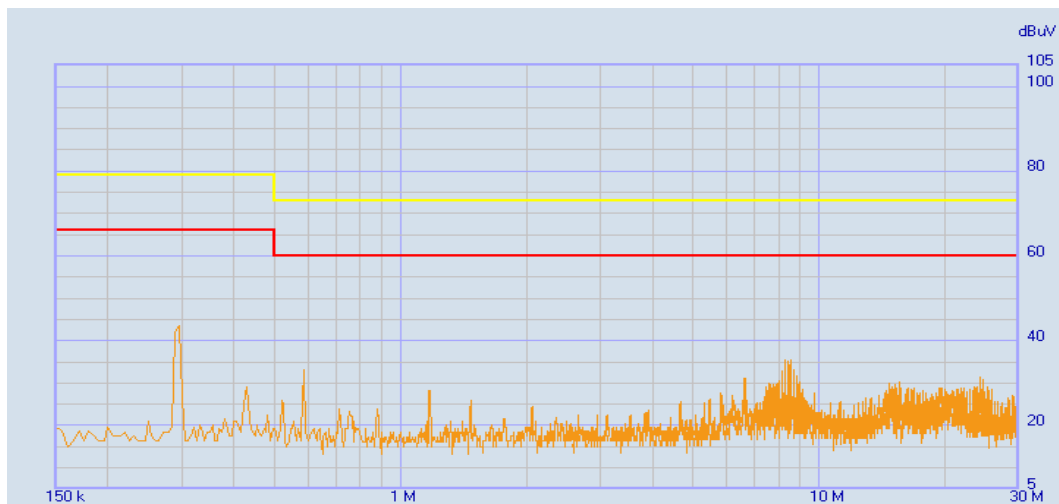


Figure 4. Measuring Output Ripple/Noise(20MHz bandwidth)

Conducted EMI

Input terminal value (typ.) ESAN018033-S-P-S15 @Vin = 18VDC, Iout = 4.5A



The fundamental switching frequency of the module is 260 kHz.

