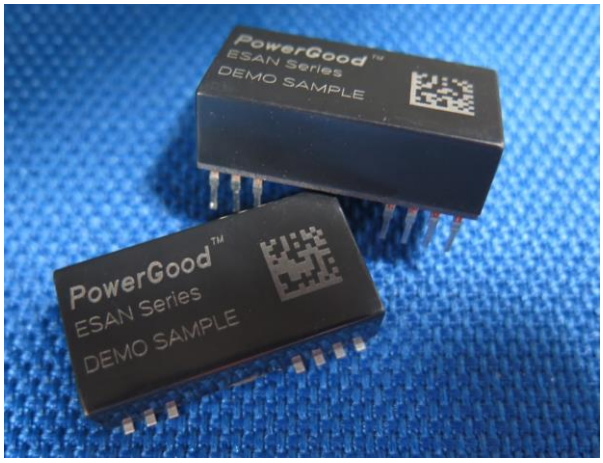


Demo photo only. Actual product outlook and marking may vary.

UVLO	OCP	OVP	OTP
LCP Plastic Case	ON/OFF Remote	PI Filter Built-in	1600V_{DC} Isolation

Features

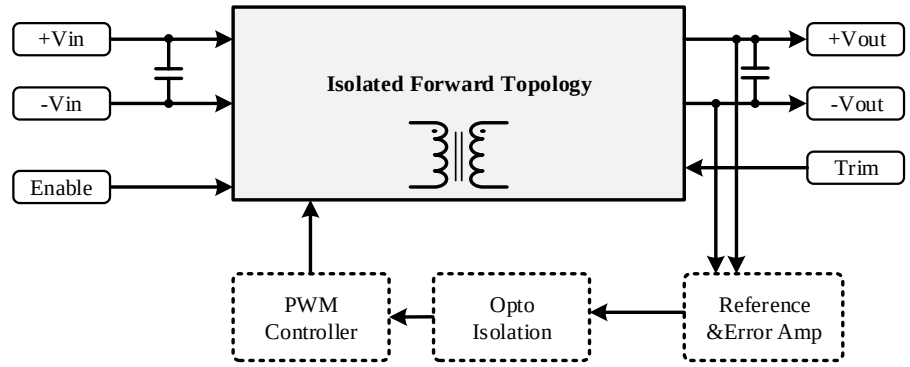
- Standard pin out; **DIP**24 packages compliant
- Compact size – **1.27" x 0.65" x 0.4"**
- **2:1 / 4:1 Ultra-Wide** input range
- Input range Min **5**Vin or Max **110**Vin Series
- -40˚C to +70˚C operation without derating
- Fixed Switching frequency provides predictable EMI
- No life-span constrained Capacitor inside
- Output voltage trim range of -10%, +10%
- 1600V_{DC} / 6KV Basic Insulation (input to output)
- Metal Case OR LCP Plastic Enclosure Package

Applications

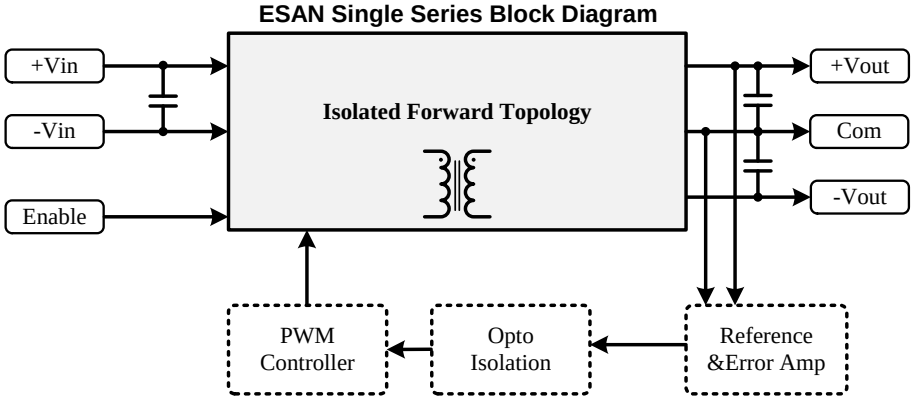
- Railway System
- Wireless Network
- Telecom / Datacom
- Industry Control System
- Distributed Power Architectures
- Semiconductor Equipment

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

MODEL NUMBER STRUCTURE

ESAN	018	033	-	S	-	P	-	S	15V0
Series Name	Input Voltage (VDC)	Output Voltage (VDC)		Output Quantity		Remote Control Option		Shape	Watt
Evolving Sirius- Agate series – New generation	**018**： 9-36 **024**：18-36 **036**：18-75 **048**：36-75 **110:** 40-160	**033**：3.3 **050**： 5 **120**：12 **150**：15		**S**: Single		**P**: Positive logic **N**: Negative logic		**D**：DIP **MD**：Metal case **S**：SMD **MS**：Metal case	**07** **10** **15**
		050：±5 **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.(%)
ESAN018033-S-P-D07V0	9-36	18	0.45	3.3	2.1	7	87%
ESAN018050-S-P-D07V0	9-36	18	0.44	5	1.4	7	88%
ESAN018120-S-P-D07V0	9-36	18	0.45	12	0.6	7	87%
ESAN018150-S-P-D07V0	9-36	18	0.45	15	0.5	7	87%
ESAN018050-D-P-D07V0	9-36	18	0.46	±5.0	±0.7	7	84%
ESAN018120-D-P-D07V0	9-36	18	0.45	±12.0	±0.3	7	87%
ESAN018150-D-P-D07V0	9-36	18	0.44	±15.0	±0.2	7	88%
ESAN018033-S-P-D10V0	9-36	18	0.63	3.3	3	10	88%
ESAN018050-S-P-D10V0	9-36	18	0.62	5	2	10	89%
ESAN018120-S-P-D10V0	9-36	18	0.64	12	0.83	10	87%
ESAN018150-S-P-D10V0	9-36	18	0.63	15	0.7	10	88%
ESAN018050-D-P-D10V0	9-36	18	0.65	±5.0	±1.0	10	85%
ESAN018120-D-P-D10V0	9-36	18	0.63	±12.0	±0.4	10	88%
ESAN018150-D-P-D10V0	9-36	18	0.63	±15.0	±0.3	10	88%
ESAN018033-S-P-D15V0	9-36	18	0.95	3.3	4.5	15	88%
ESAN018050-S-P-D15V0	9-36	18	0.94	5	3	15	89%
ESAN018120-S-P-D15V0	9-36	18	0.96	12	1.3	15	87%
ESAN018150-S-P-D15V0	9-36	18	0.95	15	1	15	88%
ESAN018050-D-P-D15V0	9-36	18	0.98	±5.0	±1.5	15	85%
ESAN018120-D-P-D15V0	9-36	18	0.95	±12.0	±0.6	15	88%
ESAN018150-D-P-D15V0	9-36	18	0.95	±15.0	±0.5	15	88%
ESAN036033-S-P-D07V0	18-75	36	0.22	3.3	2.1	7	87%
ESAN036050-S-P-D07V0	18-75	36	0.22	5	1.4	7	88%
ESAN036120-S-P-D07V0	18-75	36	0.22	12	0.6	7	87%
ESAN036150-S-P-D07V0	18-75	36	0.22	15	0.5	7	87%
ESAN036050-D-P-D07V0	18-75	36	0.23	±5.0	±0.7	7	84%
ESAN036120-D-P-D07V0	18-75	36	0.22	±12.0	±0.3	7	87%
ESAN036150-D-P-D07V0	18-75	36	0.22	±15.0	±0.2	7	88%

※ Modification or customized design is available. Please contact us for detail.

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.(%)
ESAN036033-S-P-D10V0	18-75	36	0.32	3.3	3	10	88%
ESAN036050-S-P-D10V0	18-75	36	0.31	5	2	10	89%
ESAN036120-S-P-D10V0	18-75	36	0.32	12	0.83	10	87%
ESAN036150-S-P-D10V0	18-75	36	0.32	15	0.7	10	88%
ESAN036050-D-P-D10V0	18-75	36	0.33	±5.0	±1.0	10	85%
ESAN036120-D-P-D10V0	18-75	36	0.32	±12.0	±0.3	10	87%
ESAN036150-D-P-D10V0	18-75	36	0.32	±15.0	±0.2	10	88%
ESAN036033-S-P-D15V0	18-75	36	0.47	3.3	4.5	15	88%
ESAN036050-S-P-D15V0	18-75	36	0.47	5	3	15	89%
ESAN036120-S-P-D15V0	18-75	36	0.48	12	1.3	15	87%
ESAN036150-S-P-D15V0	18-75	36	0.47	15	1	15	88%
ESAN036050-D-P-D15V0	18-75	36	0.49	±5.0	±1.5	15	85%
ESAN036120-D-P-D15V0	18-75	36	0.48	±12.0	±0.6	15	87%
ESAN036150-D-P-D15V0	18-75	36	0.47	±15.0	±0.5	15	88%
ESAN110033-S-P-D07V0	40-160	110	0.07	3.3	2.1	7	87%
ESAN110050-S-P-D07V0	40-160	110	0.07	5	1.4	7	88%
ESAN110120-S-P-D07V0	40-160	110	0.07	12	0.6	7	87%
ESAN110150-S-P-D07V0	40-160	110	0.07	15	0.5	7	87%
ESAN110050-D-P-D07V0	40-160	110	0.08	±5.0	±0.7	7	84%
ESAN110120-D-P-D07V0	40-160	110	0.07	±12.0	±0.3	7	87%
ESAN110150-D-P-D07V0	40-160	110	0.07	±15.0	±0.2	7	87%
ESAN110033-S-P-D10V0	40-160	110	0.10	3.3	3	10	88%
ESAN110050-S-P-D10V0	40-160	110	0.10	5	2	10	89%
ESAN110120-S-P-D10V0	40-160	110	0.10	12	0.83	10	87%
ESAN110150-S-P-D10V0	40-160	110	0.10	15	0.7	10	88%
ESAN110050-D-P-D10V0	40-160	110	0.11	±5.0	±1.0	10	85%
ESAN110120-D-P-D10V0	40-160	110	0.10	±12.0	±0.4	10	87%
ESAN110150-D-P-D10V0	40-160	110	0.10	±15.0	±0.3	10	88%
ESAN110033-S-P-D15V0	40-160	110	0.15	3.3	4.5	15	88%
ESAN110050-S-P-D15V0	40-160	110	0.15	5	3	15	89%
ESAN110120-S-P-D15V0	40-160	110	0.15	12	1.3	15	88%
ESAN110150-S-P-D15V0	40-160	110	0.15	15	1	15	88%
ESAN110050-D-P-D15V0	40-160	110	0.16	±5.0	±1.5	15	85%
ESAN110120-D-P-D15V0	40-160	110	0.15	±12.0	±0.6	15	88%
ESAN110150-D-P-D15V0	40-160	110	0.15	±15.0	±0.5	15	88%

※ Modification or customized design is available. Please contact us for detail.

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.(%)
ESAN024033-S-P-D07V0	18-36	24	0.33	3.3	2.1	7	88%
ESAN024050-S-P-D07V0	18-36	24	0.33	5	1.4	7	89%
ESAN024120-S-P-D07V0	18-36	24	0.33	12	0.6	7	88%
ESAN024150-S-P-D07V0	18-36	24	0.33	15	0.5	7	88%
ESAN024050-D-P-D07V0	18-36	24	0.34	±5.0	±0.7	7	85%
ESAN024120-D-P-D07V0	18-36	24	0.33	±12.0	±0.3	7	88%
ESAN024150-D-P-D07V0	18-36	24	0.33	±15.0	±0.2	7	88%
ESAN024033-S-P-D10V0	18-36	24	0.47	3.3	3	10	88%
ESAN024050-S-P-D10V0	18-36	24	0.47	5	2	10	89%
ESAN024120-S-P-D10V0	18-36	24	0.47	12	0.8	10	88%
ESAN024150-S-P-D10V0	18-36	24	0.47	15	0.7	10	88%
ESAN024050-D-P-D10V0	18-36	24	0.48	±5.0	±1.0	10	86%
ESAN024120-D-P-D10V0	18-36	24	0.47	±12.0	±0.4	10	88%
ESAN024150-D-P-D10V0	18-36	24	0.47	±15.0	±0.3	10	88%
ESAN024033-S-P-D15V0	18-36	24	0.71	3.3	4.5	15	88%
ESAN024050-S-P-D15V0	18-36	24	0.70	5	3	15	89%
ESAN024120-S-P-D15V0	18-36	24	0.71	12	1.3	15	88%
ESAN024150-S-P-D15V0	18-36	24	0.71	15	1	15	88%
ESAN024050-D-P-D15V0	18-36	24	0.73	±5.0	±1.5	15	86%
ESAN024120-D-P-D15V0	18-36	24	0.71	±12.0	±0.6	15	88%
ESAN024150-D-P-D15V0	18-36	24	0.71	±15.0	±0.5	15	88%
ESAN048033-S-P-D07V0	36-75	48	0.17	3.3	2.1	7	88%
ESAN048050-S-P-D07V0	36-75	48	0.16	5	1.4	7	89%
ESAN048120-S-P-D07V0	36-75	48	0.17	12	0.6	7	88%
ESAN048150-S-P-D07V0	36-75	48	0.17	15	0.5	7	88%
ESAN048050-D-P-D07V0	36-75	48	0.17	±5.0	±0.7	7	85%
ESAN048120-D-P-D07V0	18-36	48	0.17	±12.0	±0.3	7	88%
ESAN048150-D-P-D07V0	18-36	48	0.17	±15.0	±0.2	7	88%
ESAN048033-S-P-D10V0	36-75	48	0.24	3.3	3	10	88%
ESAN048050-S-P-D10V0	36-75	48	0.23	5	2	10	89%
ESAN048120-S-P-D10V0	36-75	48	0.24	12	0.8	10	88%
ESAN048150-S-P-D10V0	36-75	48	0.24	15	0.7	10	88%
ESAN048050-D-P-D10V0	36-75	48	0.24	±5.0	±1.0	10	86%
ESAN048120-D-P-D10V0	18-36	48	0.24	±12.0	±0.4	10	88%
ESAN048150-D-P-D10V0	18-36	48	0.24	±15.0	±0.3	10	88%
ESAN048033-S-P-D15V0	36-75	48	0.36	3.3	4.5	15	88%
ESAN048050-S-P-D15V0	36-75	48	0.35	5	3	15	89%
ESAN048120-S-P-D15V0	36-75	48	0.36	12	1.3	15	88%
ESAN048150-S-P-D15V0	36-75	48	0.36	15	1	15	88%
ESAN048050-D-P-D15V0	36-75	48	0.36	±5.0	±1.5	15	86%
ESAN048120-D-P-D15V0	36-75	48	0.36	±12.0	±0.6	15	88%
ESAN048150-D-P-D15V0	36-75	48	0.36	±15.0	±0.5	15	88%

※ Modification or customized design is available. Please contact us for detail.

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	ESAN012&18&24 models (100ms max)			50	VDC
	ESAN036&48 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
	Positive logic OFF	Short or 0 ~ 1.2			
	Negative logic ON	Short or 0 ~ 1.2			VDC
	Negative logic 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 1uFMLCC.Output Capacitor each output	3.3V&5V			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	△Io/△t=2.5A/us				±2	%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)			120		%

General 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
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	Shape-NA (DIP)	13(0.46)			g (oz.)
	Shape-S (SMD)				
Dimensions	1.27" x 0.65" x 0.4" (32.3 x 16.5 x 10.2mm)				
Case Material	LCP Plastic (UL 94V-0)				
	Metal + LCP Plastic (Non-Conductive Base)				
Potting Material	Silicone				

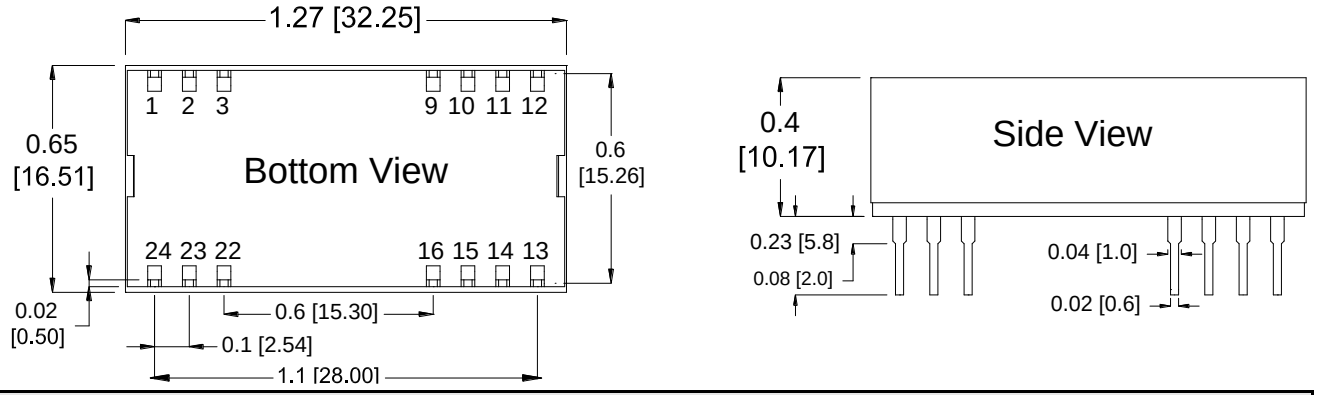
Standards Compliance

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

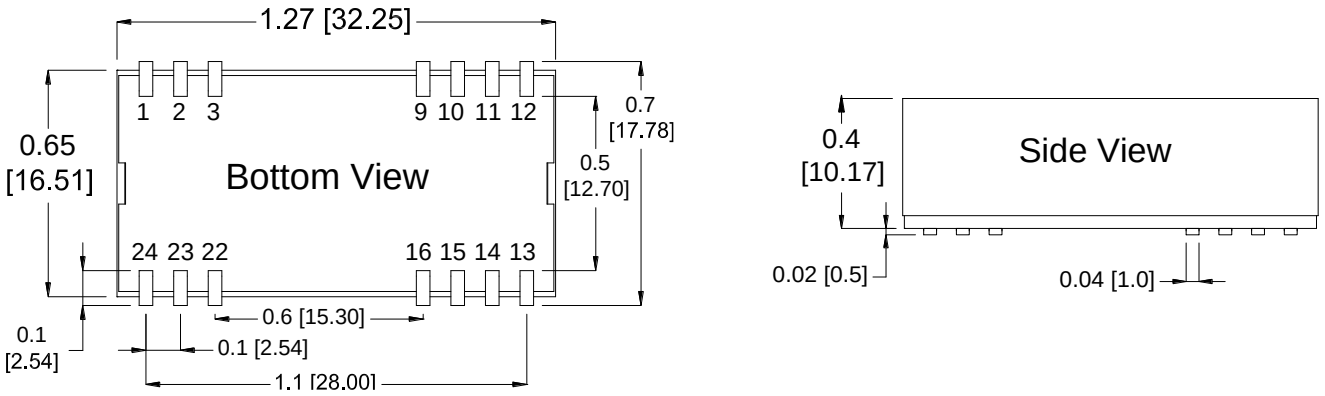
It is recommended to protect the input by fuses or other protection devices.

Mechanical Dimensions

Shape –D(DIP)
–MD(Metal Case DIP)



Shape –S (SMD)
–MS (Metal case SMD)



Pin Assignments:

Pin#	Single	Dual
1	EN	EN
2	-Vin	-Vin
3	-Vin	-Vin
4	No Pin	No Pin
5	No Pin	No Pin
6	No Pin	No Pin
7	No Pin	No Pin
8	No Pin	No Pin

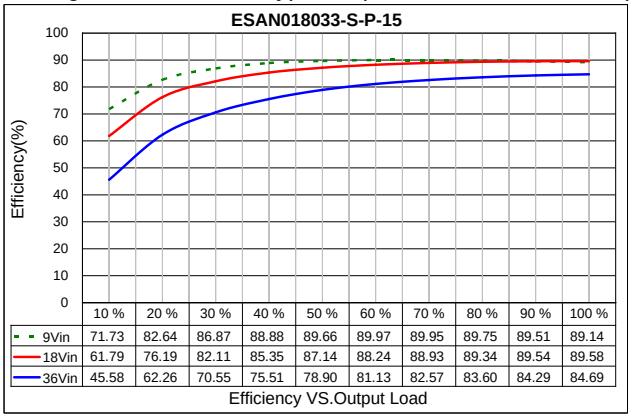
Pin#	Single	Dual
9	NC	Comm
10	NC	NC
11	NC	-Vout
12	Trim	NC
13	NC	NC
14	+Vout	+Vout
15	NC	NC
16	-Vout	Comm

Pin#	Single	Dual
17	No Pin	No Pin
18	No Pin	No Pin
19	No Pin	No Pin
20	No Pin	No Pin
21	No Pin	No Pin
22	+Vin	+Vin
23	+Vin	+Vin
24	NC	NC

Note:
Pin Pitch tolerance: ±0.01 [0.25]
Pin Dimensions: .XX±0.02 [.X±0.5mm]
Pin Material: Copper Alloy
Pin Plating: Tinned Copper
Dimensions in inches [mm]
Tolerances: .XX±0.02 [.X±0.5mm]
.XXX±0.001 [.X±0.025mm]

Characteristic Curves

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



	10 %	20 %	30 %	40 %	50 %	60 %	70 %	80 %	90 %	100 %
9Vin	71.73	82.64	86.87	88.88	89.66	89.97	89.95	89.75	89.51	89.14
18Vin	61.79	76.19	82.11	85.35	87.14	88.24	88.93	89.34	89.54	89.58
36Vin	45.58	62.26	70.55	75.51	78.90	81.13	82.57	83.60	84.29	84.69

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

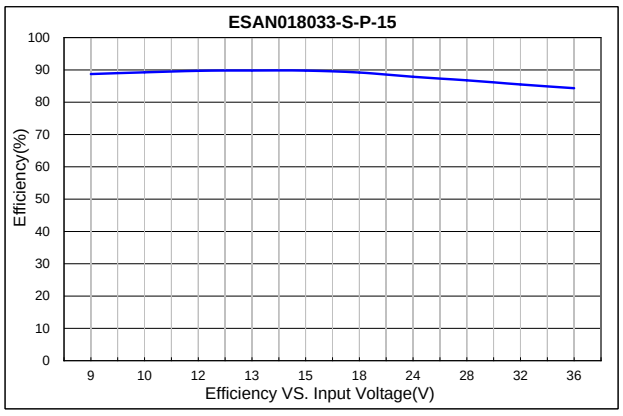


Figure 2: Efficiency VS. Input Voltagesat at 100% rated power

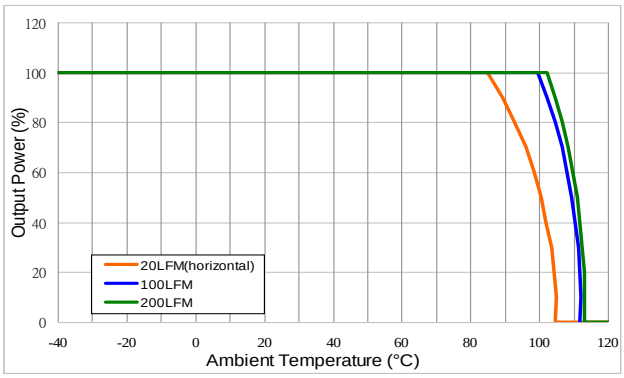


Figure 3: Ambient Temperature VS. Output Power Derating Curves

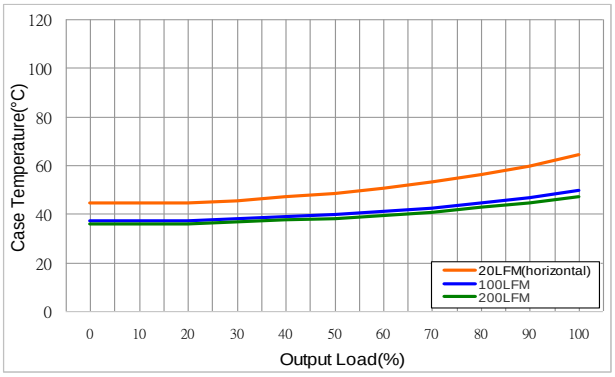


Figure 4: Case Temperature VS. Output rated Power

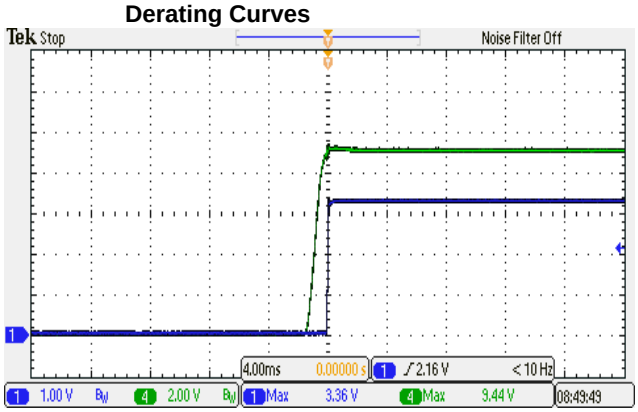


Figure 5: CH1 = Vout, CH4 = Nominal Input Typical Start-up waveform at Full load.

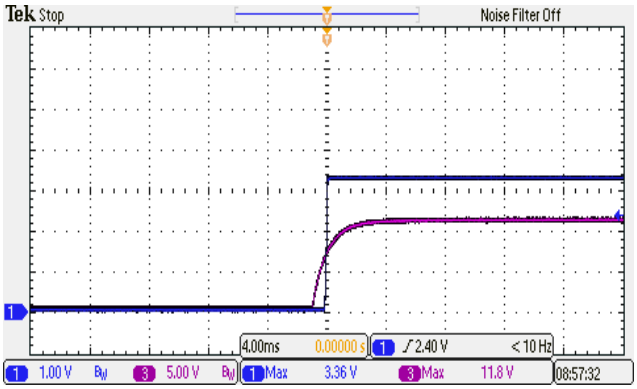


Figure 6: CH1 = Vout, CH3 = Enable Pin Typical Start-up waveform. Input voltage pre-applied

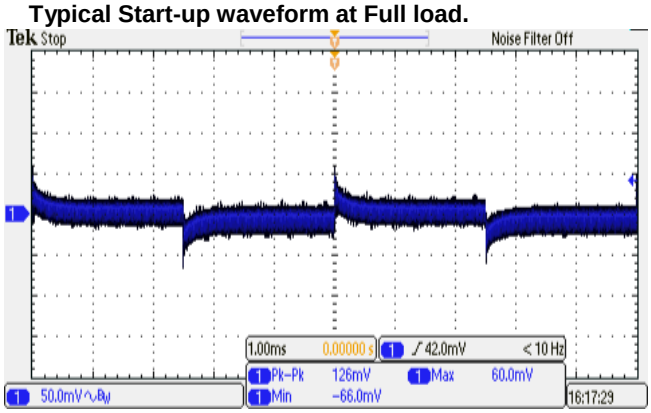


Figure 7: Transient Response at Output step load
(Vin: Typical ,50~75% of output current; ΔIo/Δt =0.01A/μS)

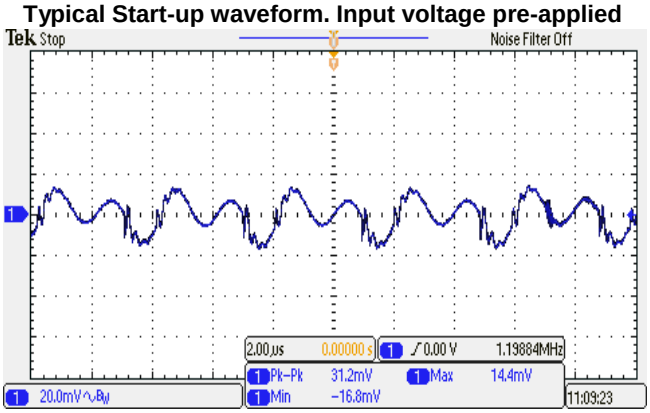


Figure 8: Output Voltage Ripple & Noise at full load.
(Vin: Typical, With Output Capacitor to add 1uF MLCC)

Conducted EMI **Input terminal value (typ) ESAN018033-S-P-15 @Vin = 18VDC, Iout = 4.5A**

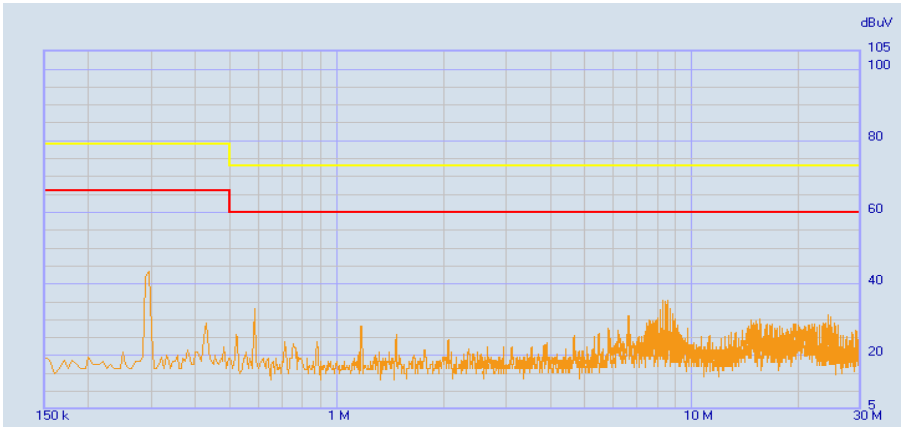


Figure 1. The fundamental switching frequency of the module is 260 kHz.

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 2 and 3. 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.

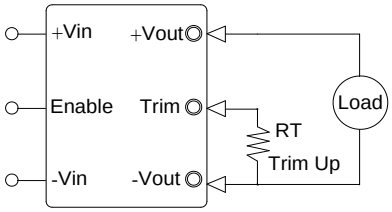


Figure 2. Trim Connections To increase Output Voltages Using Fixed Resistors

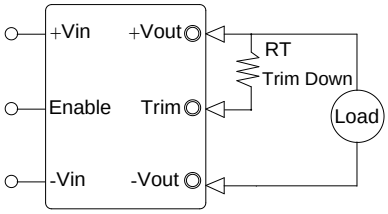


Figure 3. Trim Connections To Decrease Output Voltages Using Fixed Resistors

	Trim Up register value(KΩ) RT									
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
24	542	247	149	100	70.7	51.1	37.1	26.6	18.4	11.9

	Trim Down register value(KΩ) RT									
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
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 4.

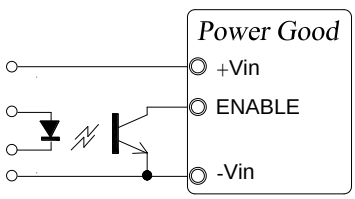


Figure 4. Driving the Enable Control pin

Output Ripple Noise

In Figure 5, the two copper strips simulate real-world PCB impedances between the converter and its load. Scope measuremer 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 l located as close to the converter as possible. Temperature variations t all relevant parameters should be taken into consideration.

The most effective combination of external I/O capacitors will be function of line voltage and source impedance, as well as particular load and layout conditions.

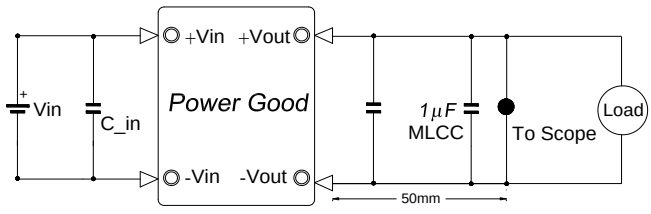


Figure 5. Measuring Output Ripple/Noise(20MHz bandwidth)