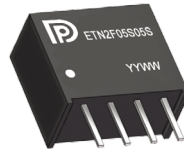


FEATURES

- Cost-effective
- Efficiency up to 83%
- Fixed input : 5, 12, 24VDC ($\pm 10\%$)
- Single isolated output: 3.3, 5, 9, 12, 15, 24VDC
- Fixed switching frequency
- Industrial standard footprint: SIP4
- Built-in short protection, OTP
- 1.5KVDC isolation
- Wide operating temperature range: -40°C to $+85^{\circ}\text{C}$
- All material compliance with UL94V-0
- Fully encapsulated, high reliability
- MTBF up to 4M hours
- RoHS Compliance



PRODUCT OVERVIEW

The ETN2F series is high performance 2W isolated DC/DC converter with industrial standard SIP 4 footprint. Adopting state-of-the-art power management IC provide high efficiency, reliability, stable and cost effectiveness of a mature power converter. Wide operating temperature range and fully encapsulated package is ideally suited for industrial applications. Intended target markets include industrial control, power electronics, instrumentations, medical systems, transportation where power modules must meet rugged environmental requirements, impact size and isolated output voltages are required.

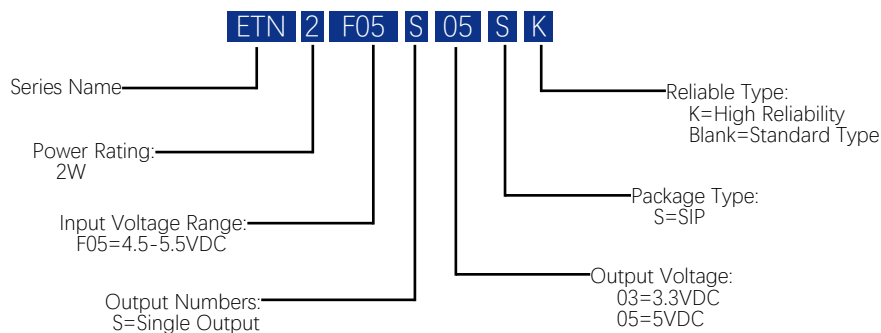
The operation temperature range is -40°C to $+85^{\circ}\text{C}$, these modules are ideal for applications that do not require any heat sink or forced air cooling.

The ETN2F series are designed to IEC/EN 62368-1 safety standards.

Models Selections

Basic Models	Input Voltage [VDC]	Input Voltage Range [VDC]	Output Voltage [VDC]	Output Current [mA]	Efficiency Typ. [%]	Capacitive Load Max. [μF]	Package [inch]
ETN2F05S05	5	4.5-5.5	5	400	80	220	0.46"×0.24"×0.4" SIP4
ETN2F05S09	5	4.5-5.5	9	223	83	220	
ETN2F05S12	5	4.5-5.5	12	167	80	220	
ETN2F05S15	5	4.5-5.5	15	133	80	220	
ETN2F05S24	5	4.5-5.5	24	84	85	220	
ETN2F12S03	12	10.8-13.2	3.3	400	75	220	
ETN2F12S12	12	10.8-13.2	12	167	83	220	
ETN2F24S05	24	21.6-26.4	5	400	80	220	
ETN2F24S15	24	21.6-26.4	15	133	83	220	

Model Numbering



Absolute Maximum Ratings

Parameters	Conditions	Min.	Typ.	Max.	Units
Input Voltage	5Vin type	-0.7		9	VDC
	12Vin type	-0.7		18	VDC
	24Vin type	-0.7		30	VDC
Operating Environment Temperature	≥ 71°C with derating	-40		85	°C
Storage Temperature Range		-50		125	°C
Soldering Temperature	Lead temperature, 1.5mm from case for 10 seconds			300	°C

General Specifications

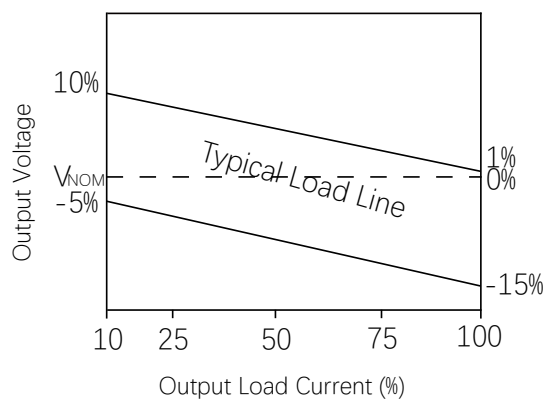
Parameters	Conditions	Min.	Typ.	Max.	Units
Isolation Voltage	Test for 1 minute	1500			VDC
Isolation Resistance	Viso=500VDC	1000			MΩ
Isolation Capacitance	Input to output		20		pF
Case Temperature Above Ambient			20		°C
Switching Frequency			220		KHz
Relative Humidity				95	%
Cooling	Free air convection				

Input Specifications					
Parameters	Conditions	Min.	Typ.	Max.	Units
Input Voltage Range	See "Models Selections".				
Input Current @ No Load	5 Vin		23	60	mA
	12 Vin		15	50	mA
	24 Vin		6	30	mA
Input Current @ Min. Line	5 Vin		500		mA
	12 Vin		200		mA
	24 Vin		100		mA
Reflected Ripple Current			15		mA p-p
Output Specifications					
Parameters	Conditions	Min.	Typ.	Max.	Units
Vout Accuracy	See voltage accuracy envelope on page 4.				
Line Regulation	3.3 Vout type	-1.5		+1.5	%/%
	Other types	-1.2		+1.2	%/%
Load Regulation	3.3 Vout type		15		%
	Other Vout types		10		%
Ripple & Noise Max. ^①			75	150	mV Pk-Pk
Minimum Load ^②		0			A
Output Short Protection	Continuous short protection.				
Note:					
① For output ripple & noise test conditions, please see output ripple & noise in technical notes on page 7 for details.					
② Operating below 10% load will not harm the converter, but specifications may not be met, such as the output voltage may be higher than rated output voltage.					

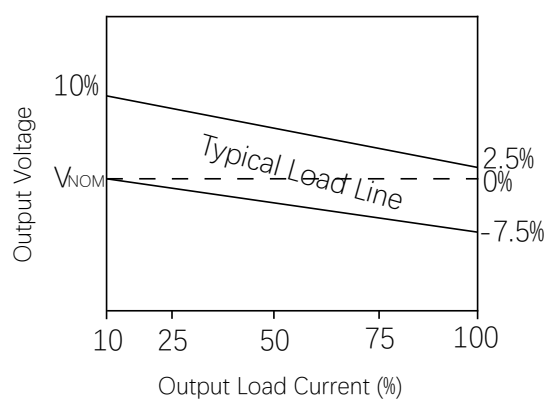
All specifications are tested at 25 °C ambient temperature, nominal input voltage, rated output current conditions unless otherwise specified.

Performance Data

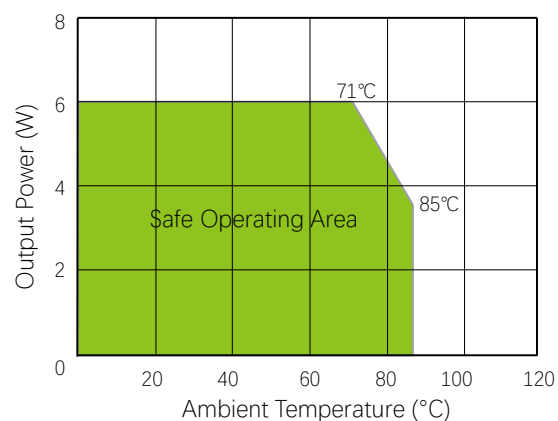
VOUT ACCURACY ENVELOPE (3.3 Vout)



VOUT ACCURACY ENVELOPE (OTHER Vout)

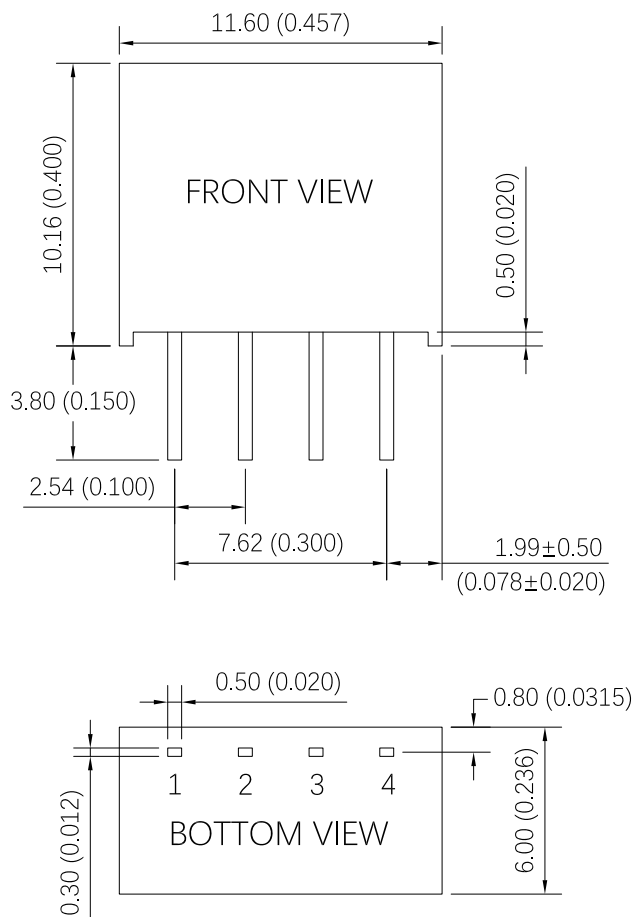


TEMPERATURE DERATING



Mechanical Specifications

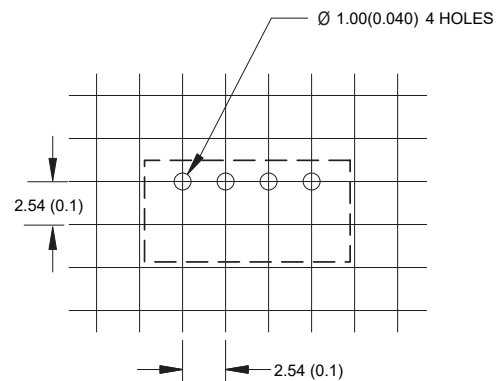
MECHANICAL DIMENSIONS



Unless otherwise specified, all dimensions are in mm ± 0.25 (inches ± 0.01).

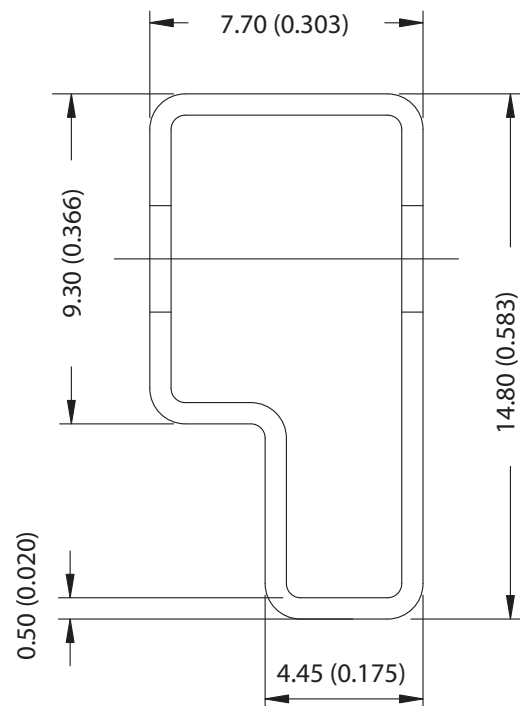
PIN Connections	
Pin	Function
1	-Vin
2	+Vin
3	-Vout
4	+Vout

RECOMMENDED FOOTPRINT DETAILS



Unless otherwise specified, all dimensions are in mm ± 0.5 (inches ± 0.02).

TUBE OUTLINE DIMENSIONS



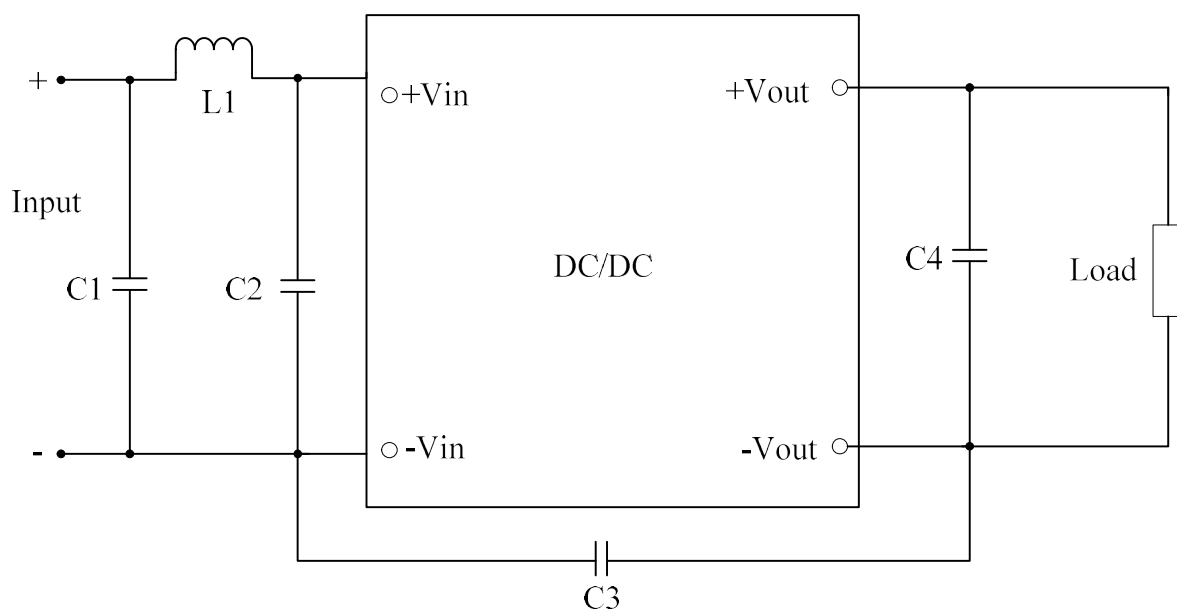
Unless otherwise specified, all dimensions are in mm ± 0.5 (inches ± 0.02).

Tube length : 530mm ± 2mm (20.87)

Tube quantity : 40pcs

Emissions Performance

Density Power measures its products for emissions against the CISPR32/EN55032 standards. The maximum output power of the module is 2W and the conduction limits can meet class B.



Conducted Emissions Test Circuit

Conducted Emissions Parts List

REFERENCE	DESCRIPTION	REFERENCE	DESCRIPTION
C1	4.7 μ F	C3	2.2nF
C2	4.7 μ F	C4	According to capacitive loading in "Models Selections" on page 1-2.
L1	6.8 μ H		

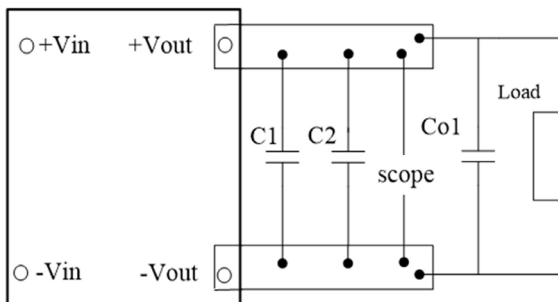
Technical Notes

INPUT FUSING

Certain applications may require fuse at the inputs of power conversion components. Fuses should also be used when there is possibility of sustained input voltage reversal which is not current limited. The ETN2F modules are not internally fused. We strongly recommend a slow blow fuse to be used in the ungrounded input supply line.

For safety agency approvals, the installer must install the converter in compliance with the end user safety standard.

OUTPUT RIPPLE & NOISE



These ETN2F series' output ripple and noise is measured at the rated input voltage and output current, along with 10uF and 0.1uF MLCC are used in parallel with appropriate voltage ratings. The oscilloscope bandwidth is set to 20MHz.

External output capacitors are required to reduce the ripple & noise. The output capacitors should be low ESR and appropriate frequency response with appropriate voltage ratings, and must be located as close to the converters as possible, also particular load and layout must be taken into consideration.

ISOLATION VOLTAGE

The ETN2F series are 100% production tested at their specified isolation voltage. Parts can be expected to withstand the specified test voltage several times. But it is well known that repeated high-voltage isolation testing will degrade isolation capability which is depending on materials, construction and environment. Thus, the number of tests should be strictly limited and we strongly advise against repeated high voltage isolation testing.

CAPACITIVE LOADING

The ETN2F series are optimized for robust output capacitance load capability. It can start up with the maximum capacitance which is listed in the "Models Selections" on page 1-2 @ 100% rated output current within 20mS.



This product is subject to the following operating requirements and the Life and Safety Critical Application Sales Policy:

Refer to: <http://www.densitypower.com>

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Specifications are subject to change without prior notice.