PXF60-Single Output DC/DC Converter

18 to 36 Vdc and 36 to 75 Vdc input, 3.3 to 15 Vdc Single Output, 60W

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TDK·Lambda

Features

- Single output current up to 14A
- 60 watts maximum output power
- 2:1 wide input voltage range of 18-36 and 36-75VDC
- Six-sided continuous shield
- Case grounding
- High efficiency up to 90%
- Low profile:2.00×2.00×0.40 inches (50.8×50.8×10.2 mm)
- Fixed switching frequency
- RoHS directive compliant
- Input to output isolation: 1600Vdc,min
- Over-temperature protection
- Input under-voltage protection
- Output over-voltage protection
- Over-current protection, auto-recovery
- Output short circuit protection, auto-recovery
- Remote ON/OFF

Options

- Heat sinks available for extended operation
- Remote ON/OFF logic configuration

Applications

- Distributed power architectures
- Workstations
- Computer equipment
- Communications equipment

General Description

The PXF60-xxSxx single output series offers 60 watts of output power from a 2.00 x 2.00 x 0.4 inch package. This series has a 2:1 wide input voltage of 18-36VDC and 36-75VDC , features 1600VDC of isolation, short-circuit and over-voltage protection, and six sided shielding.

Table of Contents

Absolute Maximum Rating

Parameter	Model	Min	Max	Unit
Input Voltage				
Continuous	24Sxx		36	Vdc
	48Sxx		75	Vdc
Transient (100ms)	24Sxx		50	Vdc
	48Sxx		100	Vdc
Operating Ambient Temperature (With Derating)	All	-40	110	°C
Operating Case Temperature	All		110	°C
Storage Temperature	All	-55	125	°C

Output Specification

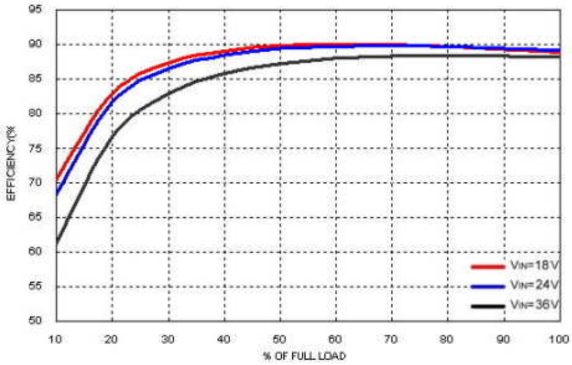
Parameter	Model	Min	Typ	Max	Unit
Output Voltage (Vin = Vin(nom) ; Full Load ; TA=25°C)	xxS3P3	3.267	3.3	3.333	V_{DC}
	xxS05	4.95	5	5.05	
	xxS12	11.88	12	12.12	
	xxS15	14.85	15	15.15	
Voltage Adjustability	All	-10		+10	%
Output Regulation					
Line (Vin(min) to Vin(max) at Full Load)	All	-0.2		+0.2	%
Load (0% to 100% of Full Load)		-0.5		+0.5	
Output Ripple & Noise Peak-to-Peak (5Hz to 20MHz Bandwidth)	xxS3P3			75	mVp-p
	xxS05			75	
	xxS12			100	
	xxS15			100	
Temperature Coefficient	All	-0.02		+0.02	%/°C
Output Voltage Overshoot (Vin = Vin(min) to Vin(max) ; Full Load ; TA=25°C)	All		0	3	% V_O
Dynamic Load Response (Vin = Vin(nom) ; TA=25°C) Load Step Change From 75% to 100% or 100 to 75% of Full Load					
Peak Deviation	All		200		mV
Setting Time (Vo<10% Peak Deviation)	All		250		µS
Output Current	xxS3P3	0		14000	mA
	xxS05	0		12000	
	xxS12	0		5000	
	xxS15	0		4000	
Output Over Voltage Protection (Voltage Clamped)	xxS3P3	3.7		5.4	Vdc
	xxS05	5.6		7.0	
	xxS12	13.8		17.5	
	xxS15	16.8		20.5	
Output Over Current Protection	All			150	% FL.
Output Short Circuit Protection	All	Hiccup, Automatic Recovery			

Input Specification					
Parameter	**Model**	**Min**	**Typ**	**Max**	**Unit**
Operating Input Voltage	24Sxx 48Sxx	18 36	24 48	36 75	Vdc
Input Current (Maximum Value at Vin = Vin(nom); Full Load)	24S3P3 24S05 24S12 24S15 48S3P3 48S05 48S12 48S15		2264 2941 2907 2907 1132 1453 1453 1453		mA
Input Standby Current (Typical Value at Vin = Vin(nom); No Load)	24S3P3 24S05 24S12 24S15 48S3P3 48S05 48S12 48S15		100 130 150 150 80 90 100 100		mA
Under Voltage Lockout Turn-on Threshold	24Sxx 48Sxx		17 34		Vdc
Under Voltage Lockout Turn-off Threshold	24Sxx 48Sxx		15 32		Vdc
Input Reflected Ripple Current (5 to 20MHz, 12µH Source Impedance)	All		20		mAp-p
Start Up Time (Vin = Vin(nom) and Constant Resistive Load) Power Up Remote ON/OFF	All			 20 20	ms
Remote ON/OFF Control (The ON/OFF pin voltage is referenced to -V_{IN}) Negative Logic DC-DC ON(Short) DC-DC OFF(Open) Positive Logic DC-DC ON(Open) DC-DC OFF(Short)	All	 0 3 3 0		 1.2 12 12 1.2	Vdc
Remote Off Input Current	ALL		4		mA
Input Current of Remote Control Pin	ALL	-0.5		1	mA

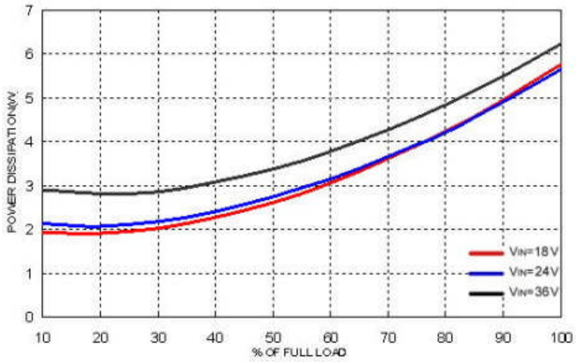
General Specification					
Parameter	**Model**	**Min**	**Typ**	**Max**	**Unit**
Efficiency (Vin = Vin(nom) ; Full Load ; TA=25°C)	24S3P3 24S05 24S12 24S15 48S3P3 48S05 48S12 48S15		89.0 90.0 90.0 90.0 89.0 90.0 90.0 90.0		%
Isolation Voltage Input to Output Input to Case, Output to Case	All	1600			Vdc
Isolation Resistance	All	1			GΩ
Isolation Capacitance	All			1500	pF
Switching Frequency	All		300		KHz
Weight	All		60.0		g
MTBF Bellcore TR-NWT-000332, TC=40°C MIL-HDBK-217F	All		1.093×10^6 1.096×10^5		hours

Characteristic Curves

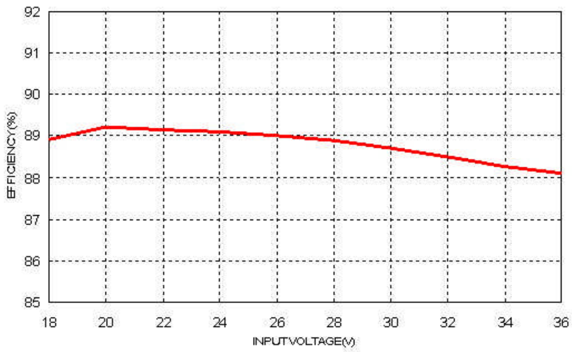
All test conditions are at 25°C.The figures are for PXF60-24S3P3



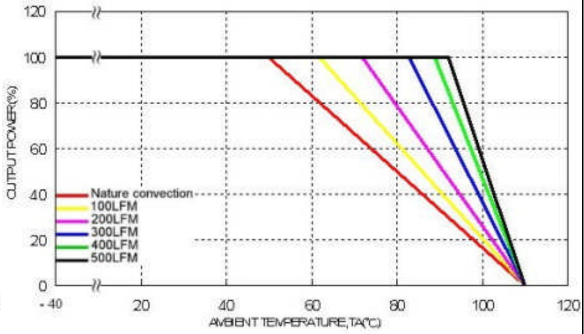
Efficiency Versus Output Current



Power Dissipation Versus Output Current

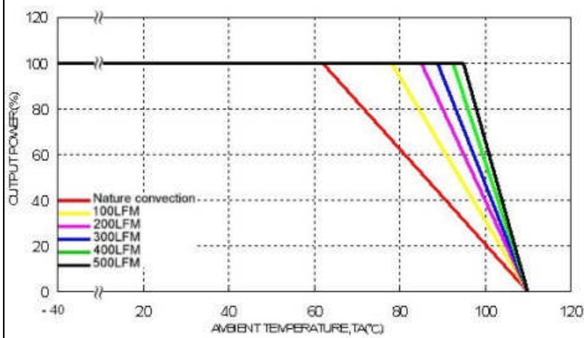


Efficiency Versus Input Voltage. Full Load



Derating Output Current Versus Ambient Temperature and Airflow

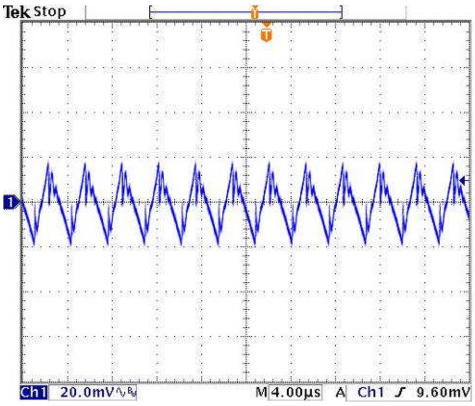
Vin = Vin(nom)



Derating Output Current Versus Ambient Temperature with Heat-Sink and Airflow Vin = Vin(nom)

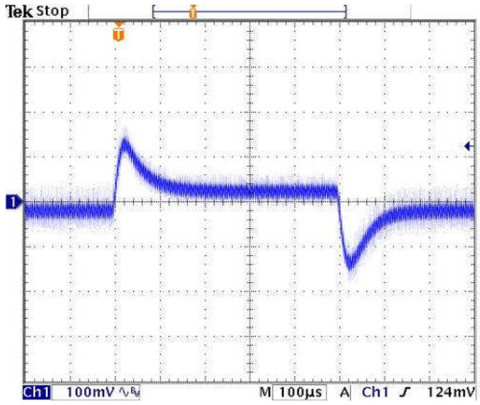
Characteristic Curves (Continued)

All test conditions are at 25°C.The figures are for PXF60-24S3P3

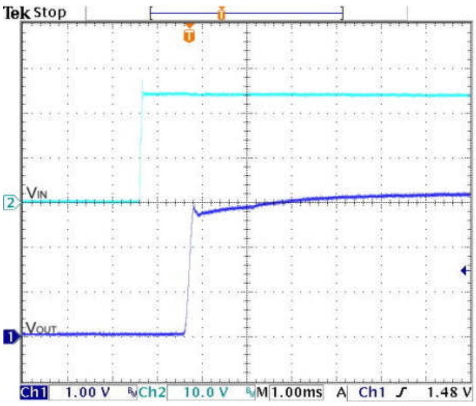


Typical Output Ripple and Noise.

Vin = Vin(nom), **Full Load**

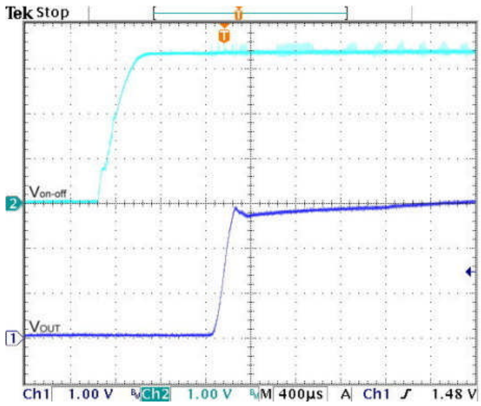


Transient Response to Dynamic Load Change from 100% to 75% to 100% of Full Load ; Vin = Vin(nom)



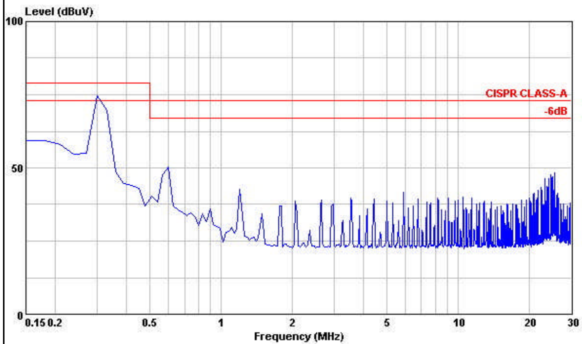
Typical Input Start-Up and Output Rise Characteristic

Vin = Vin(nom), **Full Load**



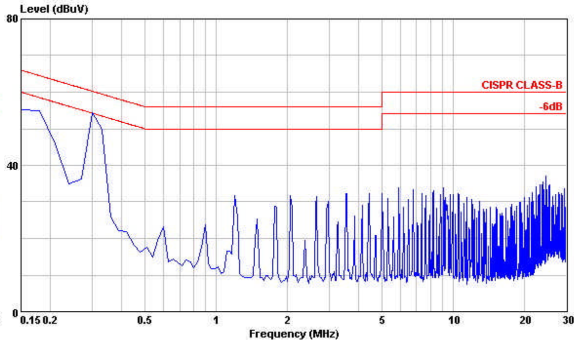
Using ON/OFF Voltage Start-Up and Vo Rise Characteristic

Vin = Vin(nom), **Full Load**



Conduction Emission of EN55022 Class A

Vin = Vin(nom), **Full Load**

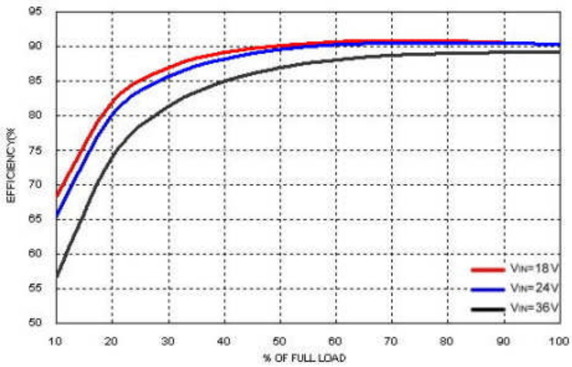


Conduction Emission of EN55022 Class B

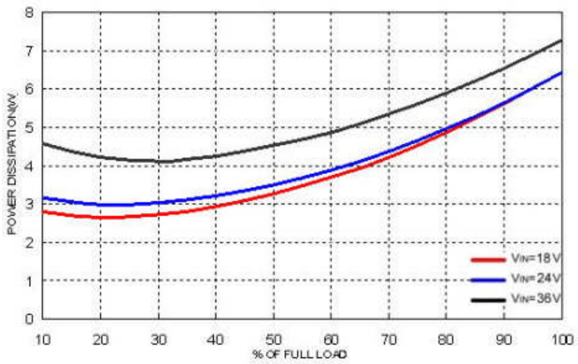
Vin = Vin(nom), **Full Load**

Characteristic Curves (Continued)

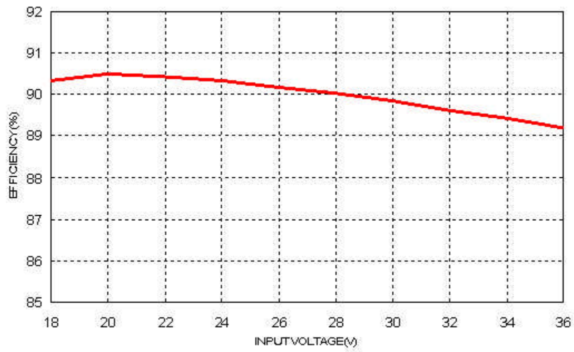
All test conditions are at 25°C.The figures are for PXF60-24S05



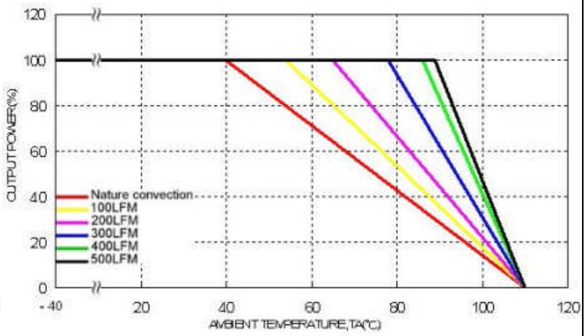
Efficiency Versus Output Current



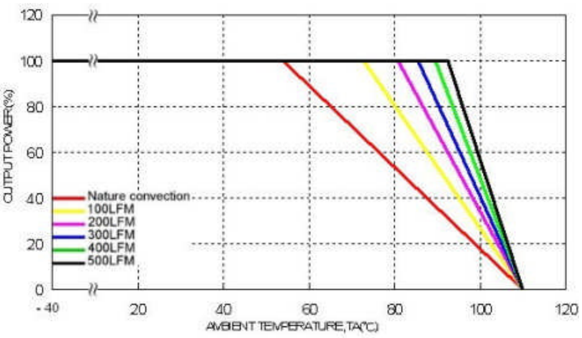
Power Dissipation Versus Output Current



Efficiency Versus Input Voltage. Full Load



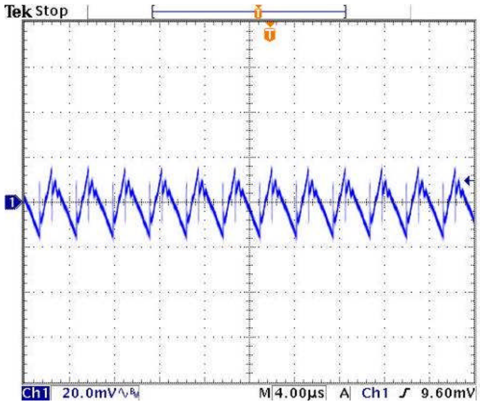
Derating Output Current Versus Ambient Temperature and Airflow Vin=Vin(nom)



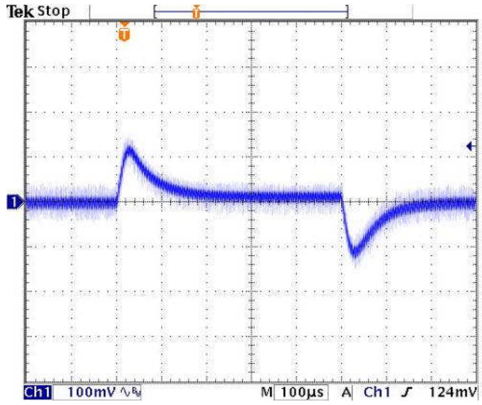
Derating Output Current Versus Ambient Temperature with Heat-Sink and Airflow Vin = Vin(nom)

Characteristic Curves (Continued)

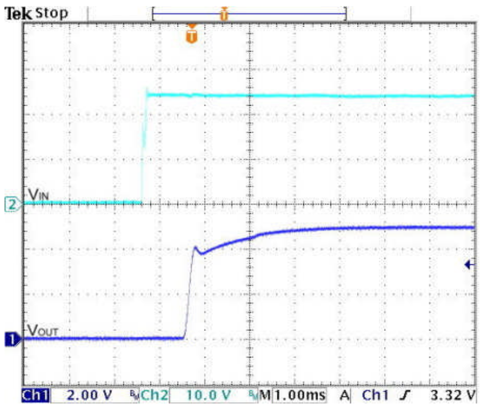
All test conditions are at 25°C.The figures are for PXF60-24S05



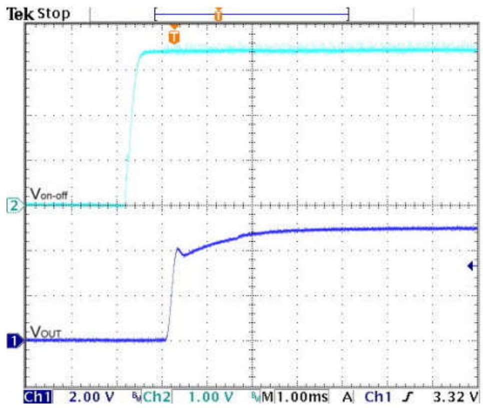
Typical Output Ripple and Noise.
Vin=Vin(nom), Full Load



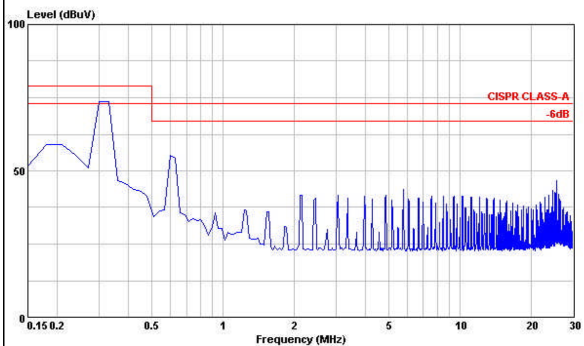
Transient Response to Dynamic Load Change from
100% to 75% to 100% of Full Load ; Vin=Vin(nom)



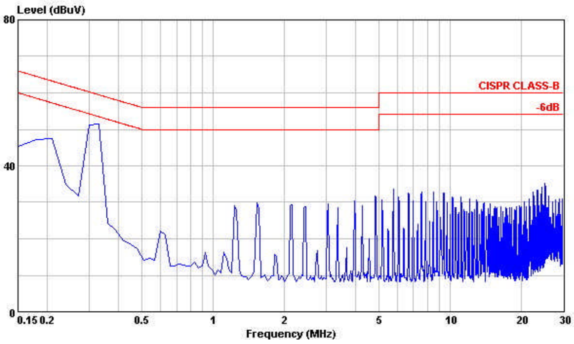
Typical Input Start-Up and Output Rise Characteristic
Vin=Vin(nom), Full Load



Using ON/OFF Voltage Start-Up and Vo Rise Characteristic
Vin=Vin(nom), Full Load



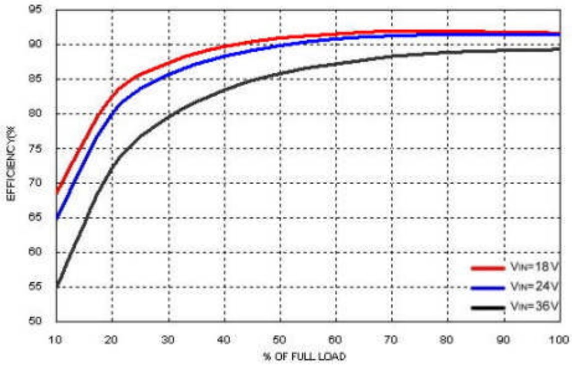
Conduction Emission of EN55022 Class A
Vin=Vin(nom), Full Load



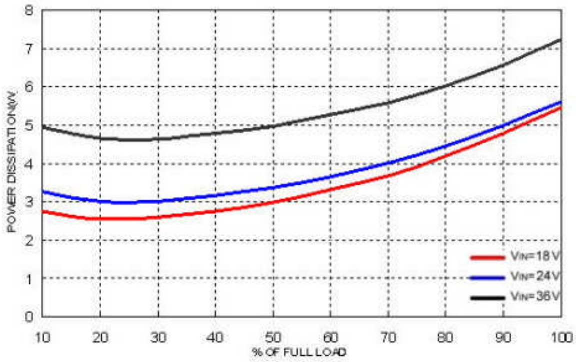
Conduction Emission of EN55022 Class B
Vin=Vin(nom), Full Load

Characteristic Curves (Continued)

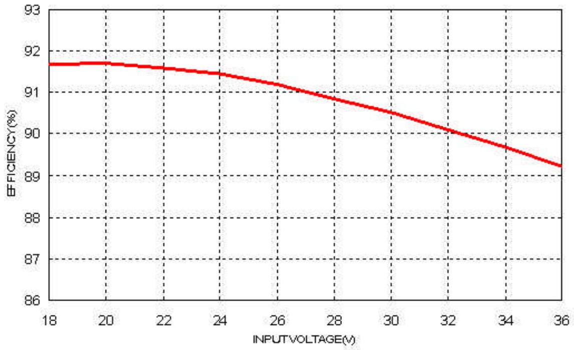
All test conditions are at 25°C.The figures are for PXF60-24S12



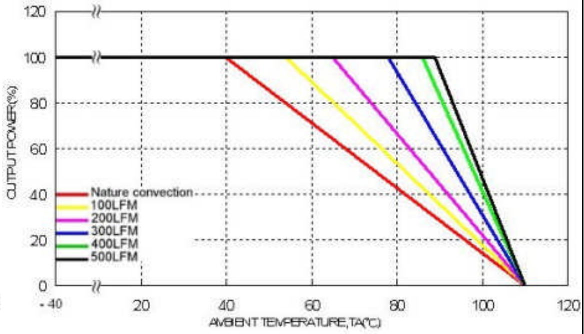
Efficiency Versus Output Current



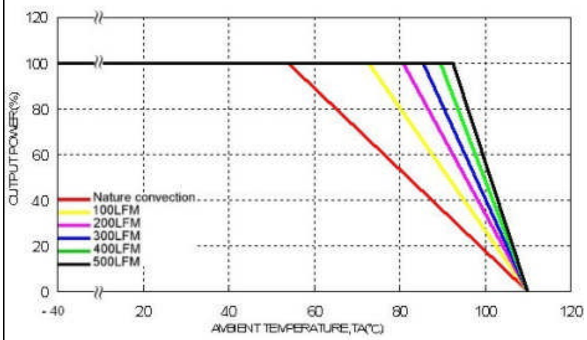
Power Dissipation Versus Output Current



Efficiency Versus Input Voltage. Full Load



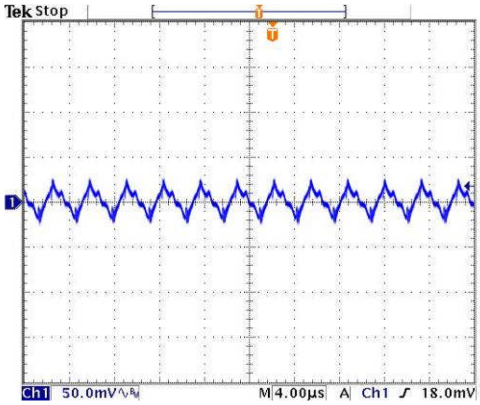
Derating Output Current Versus Ambient Temperature and Airflow Vin=Vin(nom)



Derating Output Current Versus Ambient Temperature with Heat-Sink and Airflow Vin = Vin(nom)

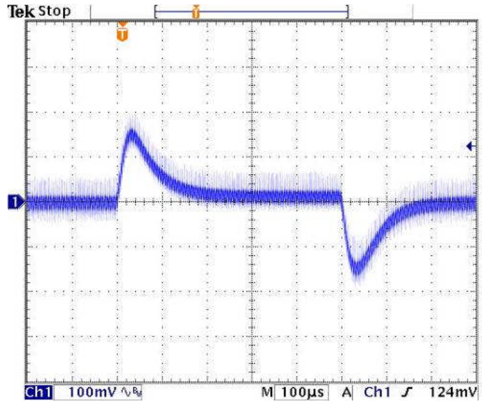
Characteristic Curves (Continued)

All test conditions are at 25°C.The figures are for PXF60-24S12



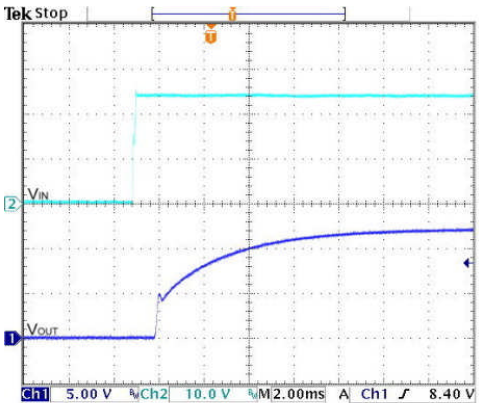
Typical Output Ripple and Noise.

Vin=Vin(nom), Full Load



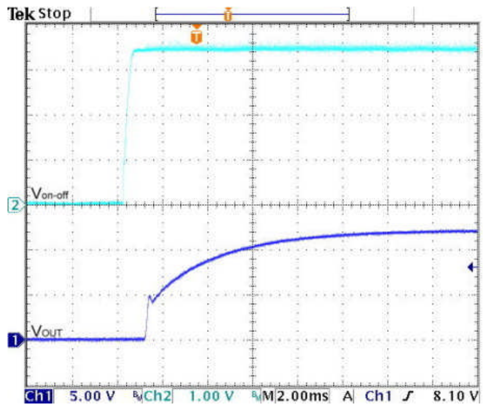
Transient Response to Dynamic Load Change from

100% to 75% to 100% of Full Load ; Vin=Vin(nom)



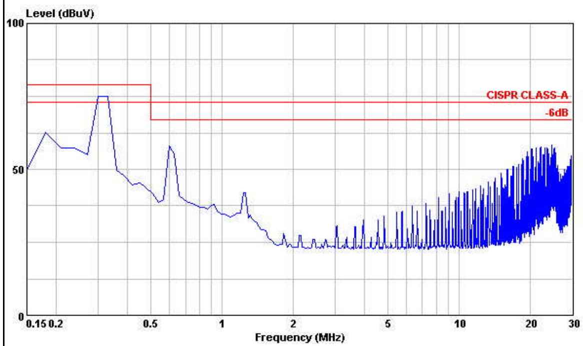
Typical Input Start-Up and Output Rise Characteristic

Vin=Vin(nom), Full Load



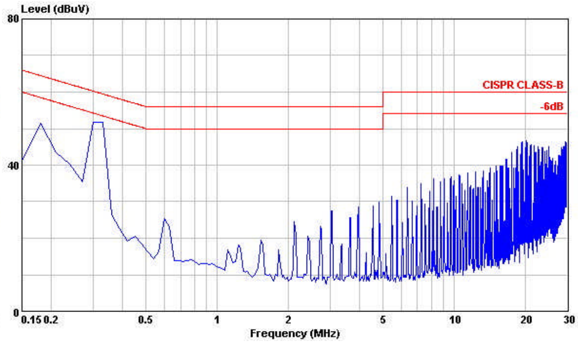
Using ON/OFF Voltage Start-Up and Vo Rise Characteristic

Vin=Vin(nom), Full Load



Conduction Emission of EN55022 Class A

Vin=Vin(nom), Full Load

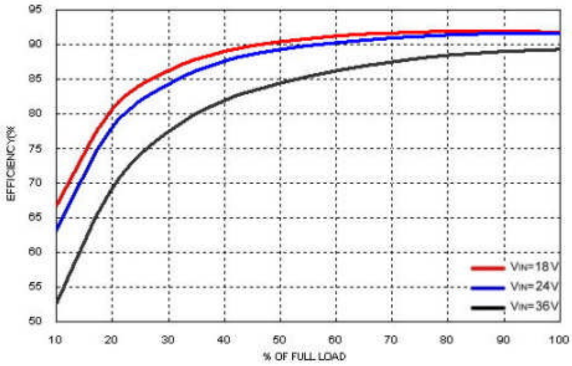


Conduction Emission of EN55022 Class B

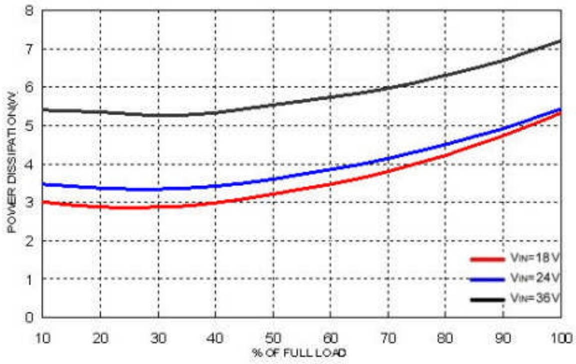
Vin=Vin(nom), Full Load

Characteristic Curves (Continued)

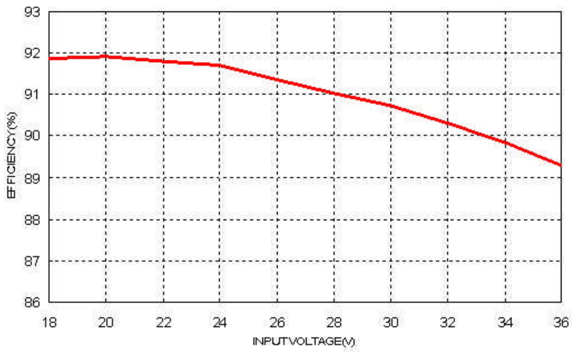
All test conditions are at 25°C.The figures are for PXF60-24S15



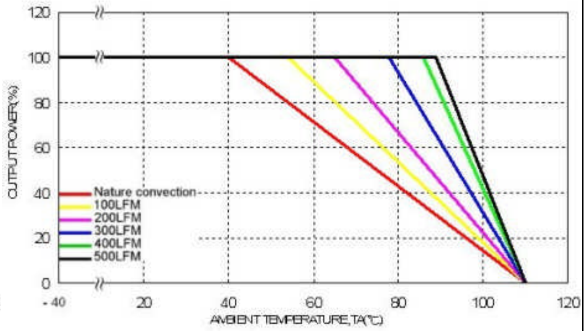
Efficiency Versus Output Current



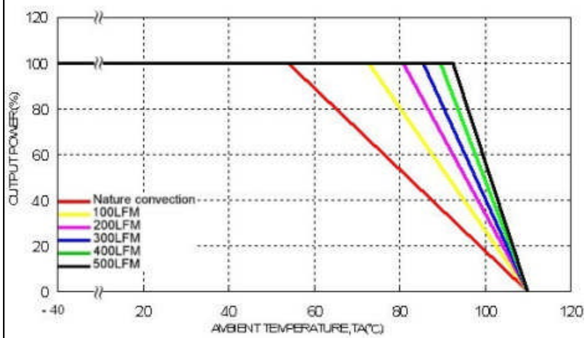
Power Dissipation Versus Output Current



Efficiency Versus Input Voltage. Full Load



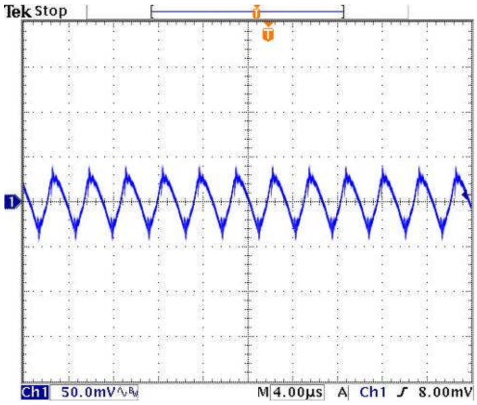
Derating Output Current Versus Ambient Temperature and Airflow
Vin=Vin(nom)



Derating Output Current Versus Ambient Temperature with Heat-Sink and Airflow Vin = Vin(nom)

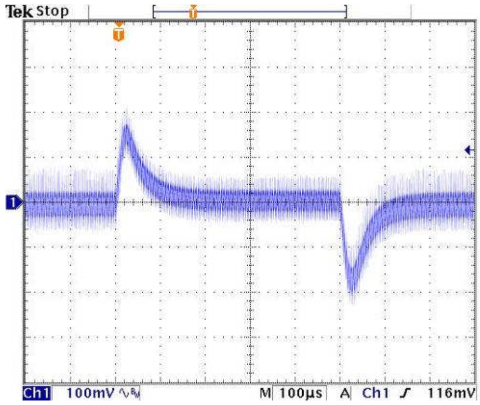
Characteristic Curves (Continued)

All test conditions are at 25°C.The figures are for PXF60-24S15



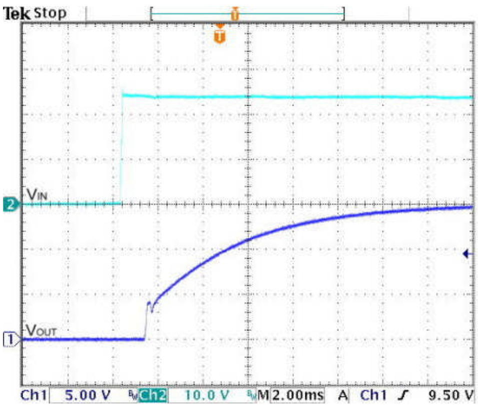
Typical Output Ripple and Noise.

Vin=Vin(nom), Full Load



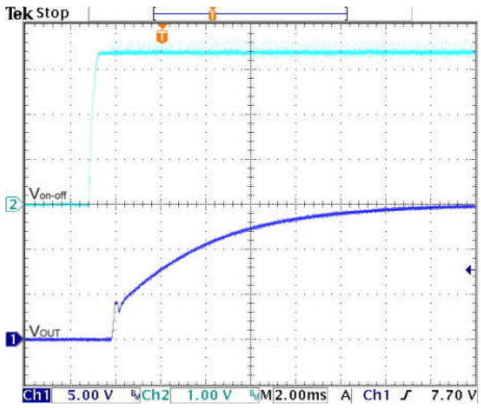
Transient Response to Dynamic Load Change from

100% to 75% to 100% of Full Load ; Vin=Vin(nom)



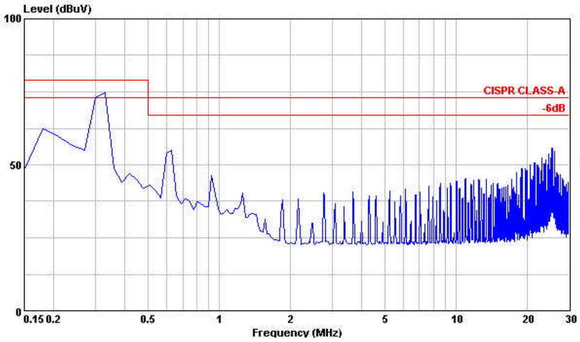
Typical Input Start-Up and Output Rise Characteristic

Vin=Vin(nom), Full Load



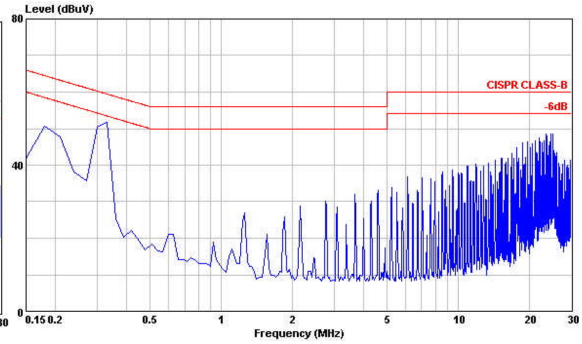
Using ON/OFF Voltage Start-Up and Vo Rise Characteristic

Vin=Vin(nom), Full Load



Conduction Emission of EN55022 Class A

Vin=Vin(nom), Full Load

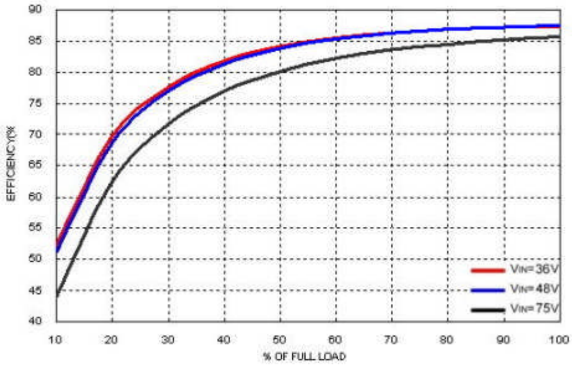


Conduction Emission of EN55022 Class B

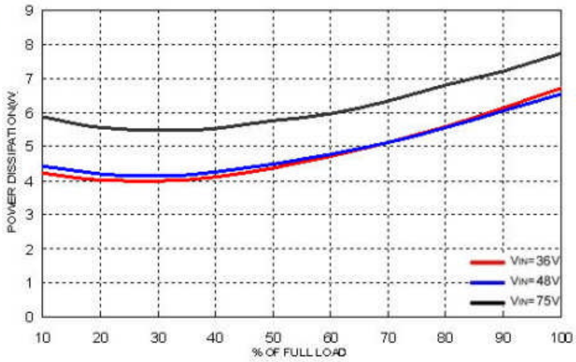
Vin=Vin(nom), Full Load

Characteristic Curves (Continued)

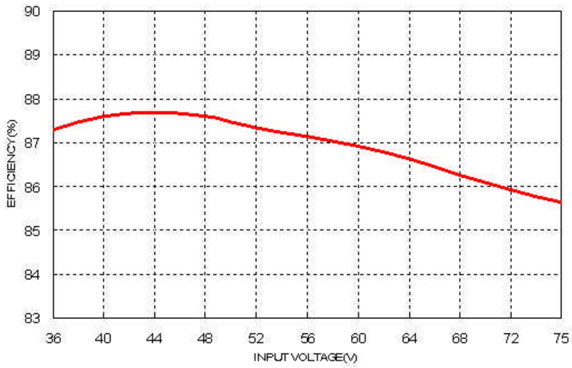
All test conditions are at 25°C.The figures are for PXF60-48S3P3



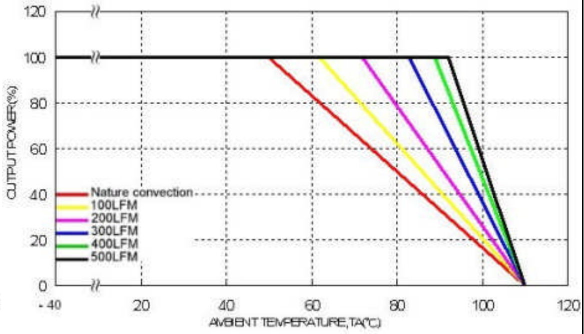
Efficiency Versus Output Current



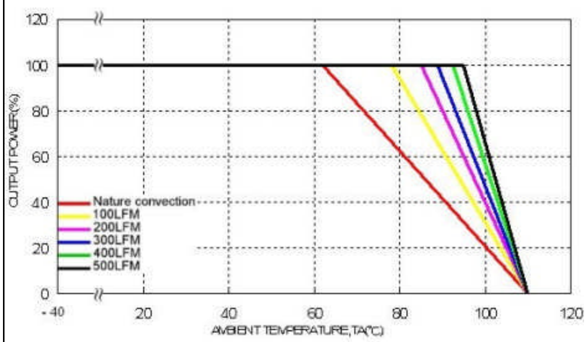
Power Dissipation Versus Output Current



Efficiency Versus Input Voltage. Full Load



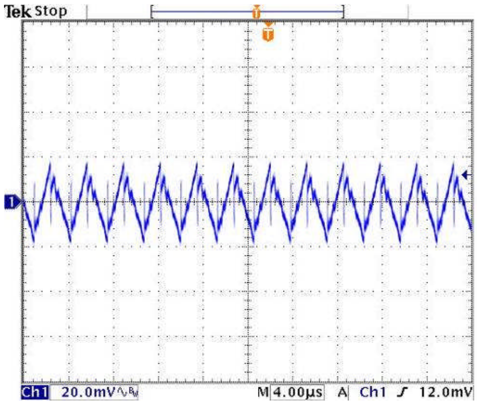
Derating Output Current Versus Ambient Temperature and Airflow Vin=Vin(nom)



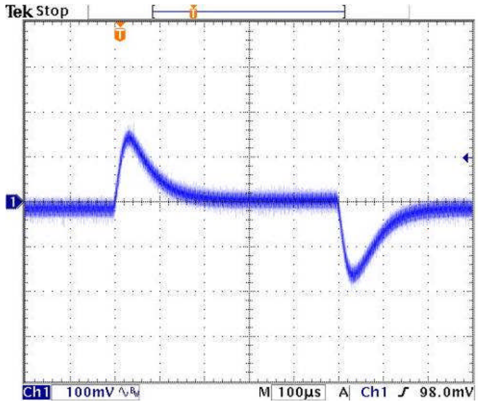
Derating Output Current Versus Ambient Temperature with Heat-Sink and Airflow Vin = Vin(nom)

Characteristic Curves (Continued)

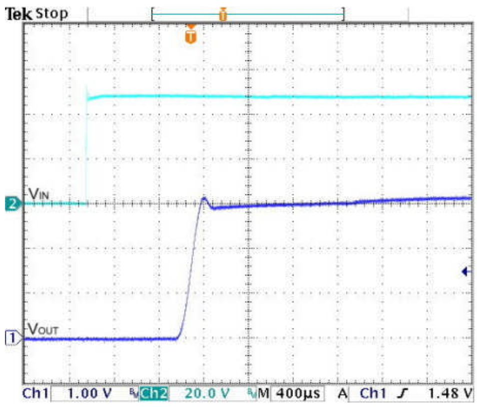
All test conditions are at 25°C.The figures are for PXF60-48S3P3



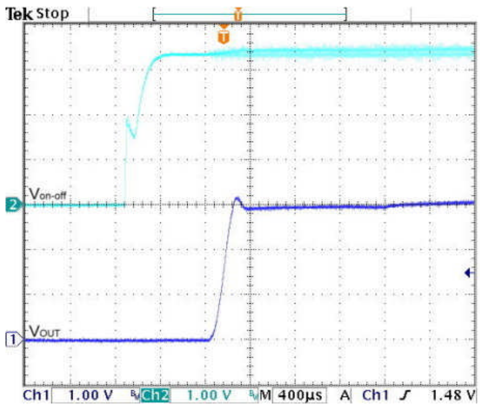
Typical Output Ripple and Noise.
Vin=Vin(nom), Full Load



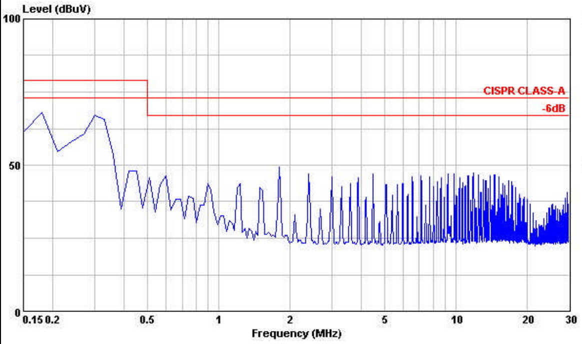
Transient Response to Dynamic Load Change from
100% to 75% to 100% of Full Load ; Vin=Vin(nom)



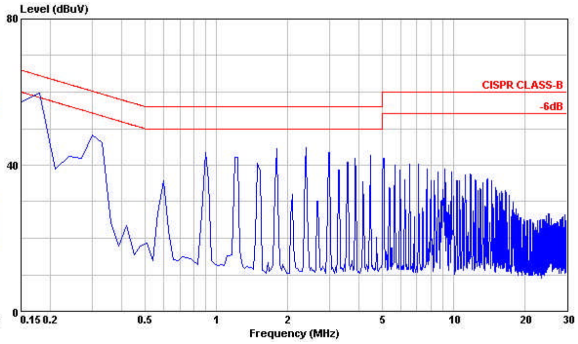
Typical Input Start-Up and Output Rise Characteristic
Vin=Vin(nom), Full Load



Using ON/OFF Voltage Start-Up and Vo Rise Characteristic
Vin=Vin(nom), Full Load



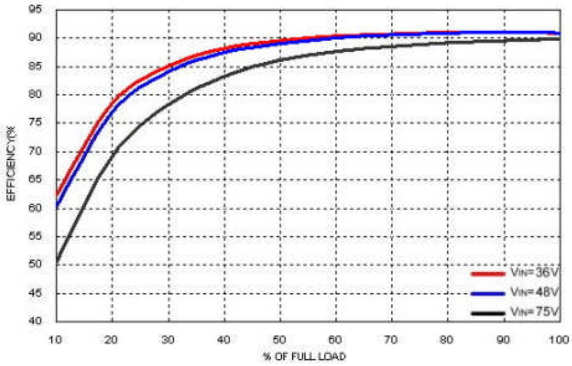
Conduction Emission of EN55022 Class A
Vin=Vin(nom), Full Load



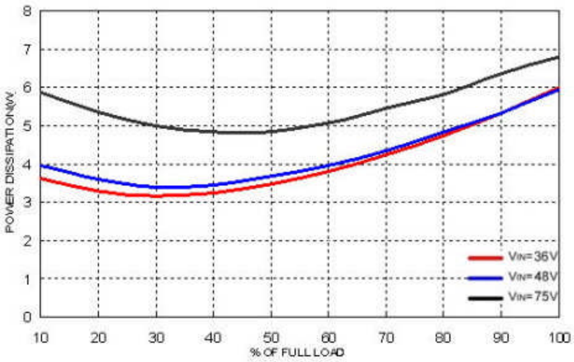
Conduction Emission of EN55022 Class B
Vin=Vin(nom), Full Load

Characteristic Curves (Continued)

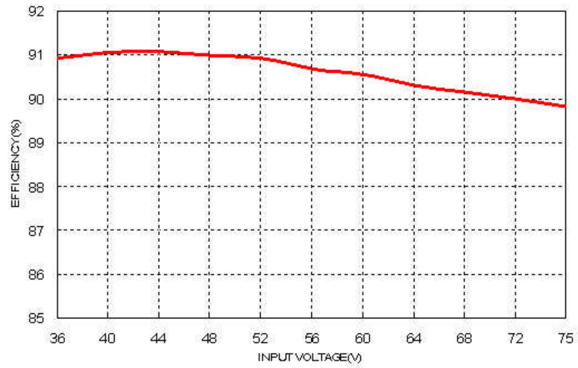
All test conditions are at 25°C.The figures are for PXF60-48S05



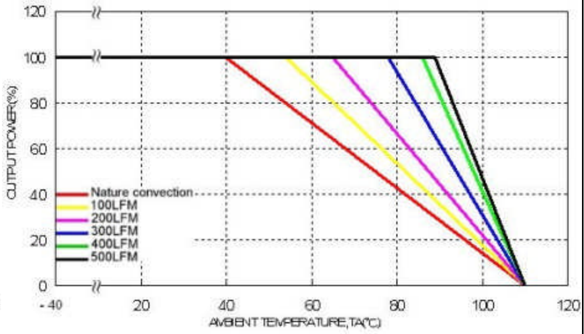
Efficiency Versus Output Current



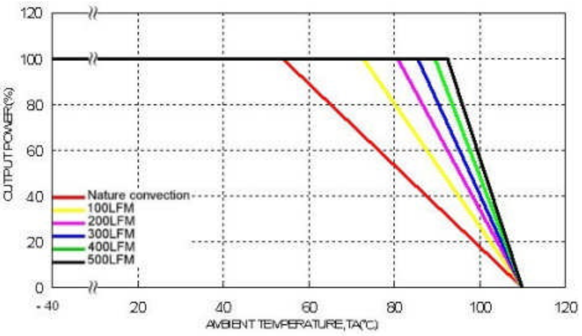
Power Dissipation Versus Output Current



Efficiency Versus Input Voltage. Full Load



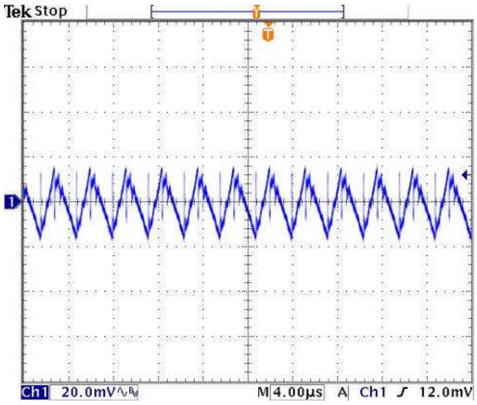
Derating Output Current Versus Ambient Temperature and Airflow Vin=Vin(nom)



Derating Output Current Versus Ambient Temperature with Heat-Sink and Airflow Vin = Vin(nom)

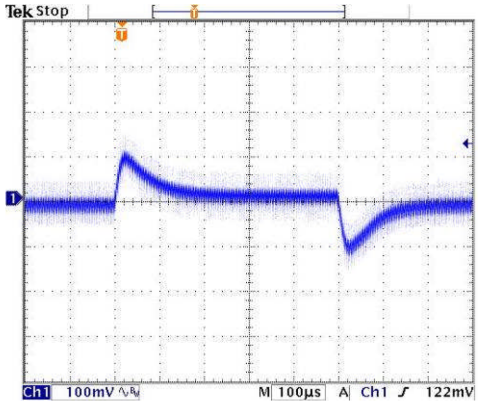
Characteristic Curves (Continued)

All test conditions are at 25°C.The figures are for PXF60-48S05



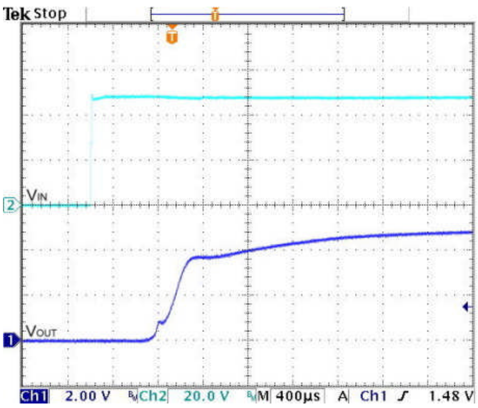
Typical Output Ripple and Noise.

Vin=Vin(nom), Full Load



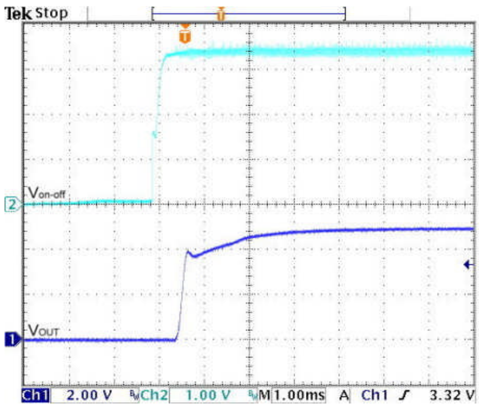
Transient Response to Dynamic Load Change from

100% to 75% to 100% of Full Load ; Vin=Vin(nom)



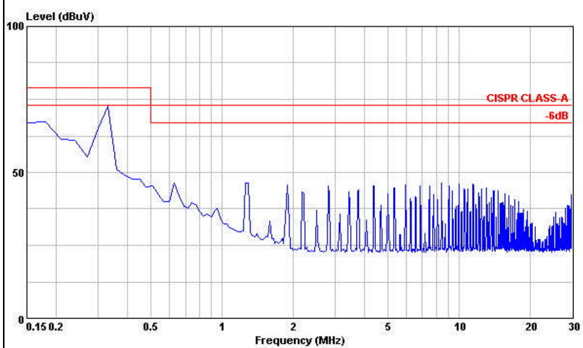
Typical Input Start-Up and Output Rise Characteristic

Vin=Vin(nom), Full Load



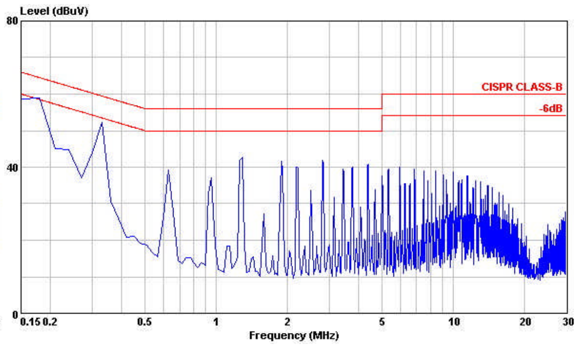
Using ON/OFF Voltage Start-Up and Vo Rise Characteristic

Vin=Vin(nom), Full Load



Conduction Emission of EN55022 Class A

Vin=Vin(nom), Full Load

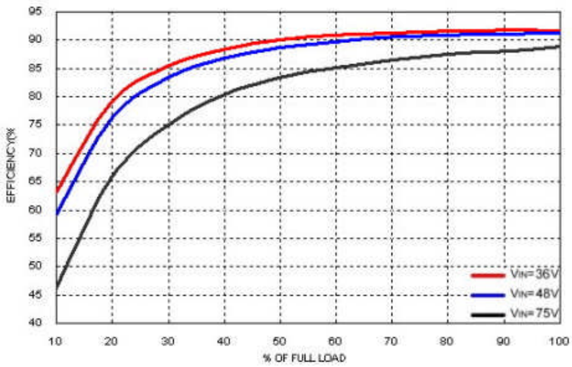


Conduction Emission of EN55022 Class B

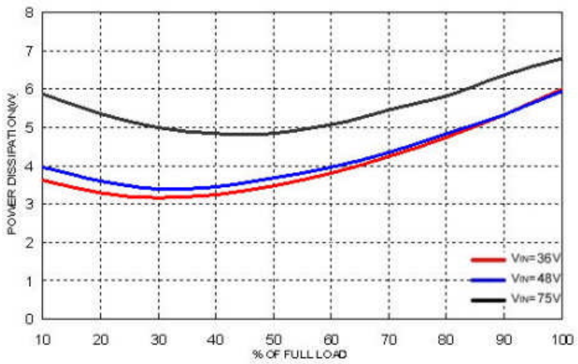
Vin=Vin(nom), Full Load

Characteristic Curves (Continued)

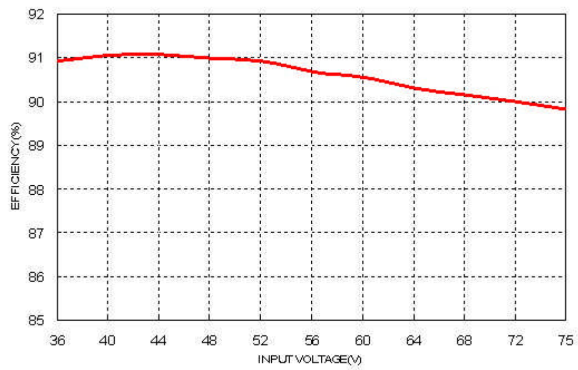
All test conditions are at 25°C.The figures are for PXF60-48S12



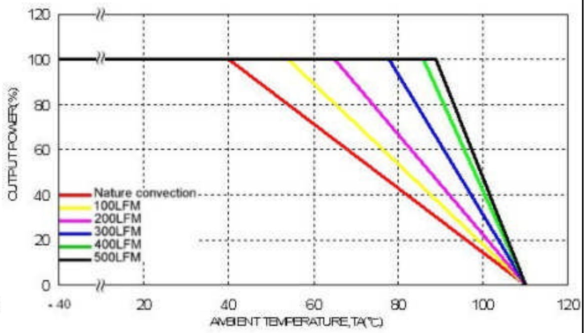
Efficiency Versus Output Current



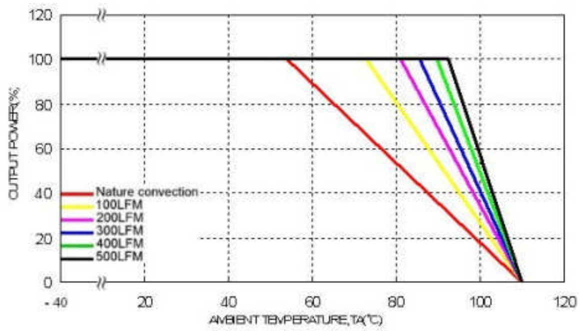
Power Dissipation Versus Output Current



Efficiency Versus Input Voltage. Full Load



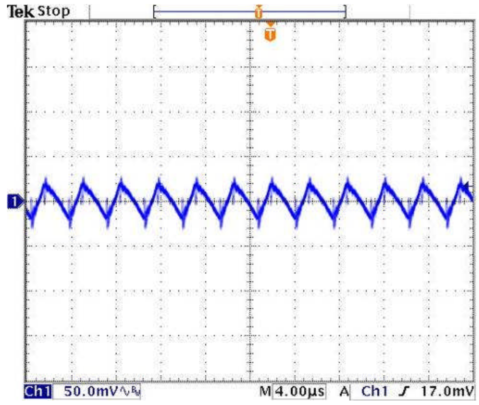
Derating Output Current Versus Ambient Temperature and Airflow Vin=Vin(nom)



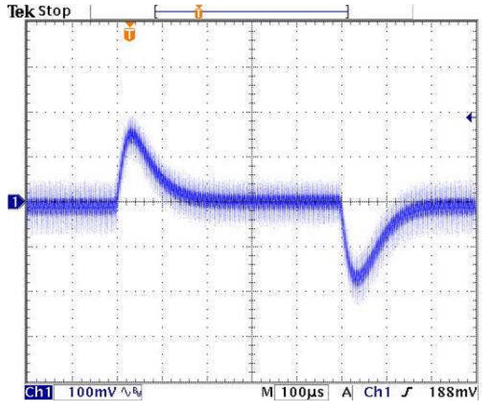
Derating Output Current Versus Ambient Temperature with Heat-Sink and Airflow Vin = Vin(nom)

Characteristic Curves (Continued)

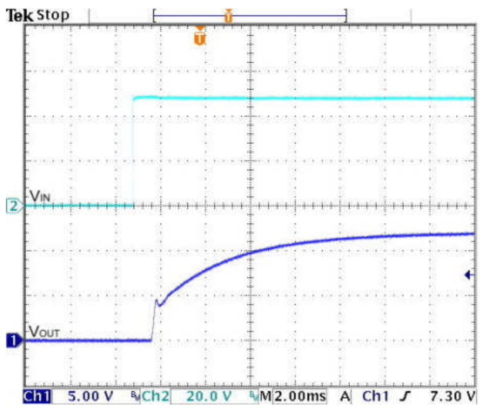
All test conditions are at 25°C.The figures are for PXF60-48S12



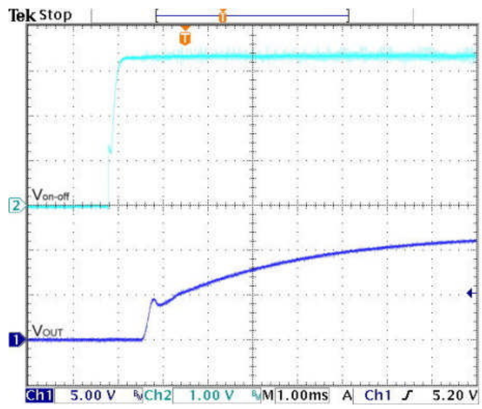
Typical Output Ripple and Noise.
Vin=Vin(nom), Full Load



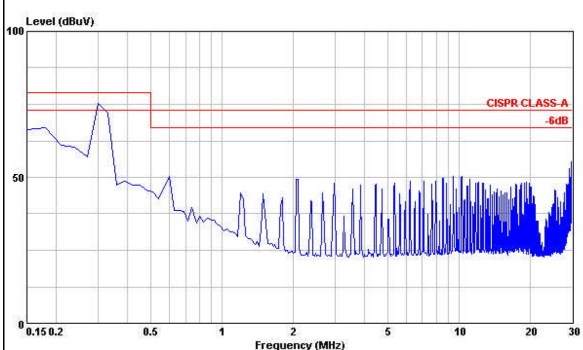
Transient Response to Dynamic Load Change from
100% to 75% to 100% of Full Load ; Vin=Vin(nom)



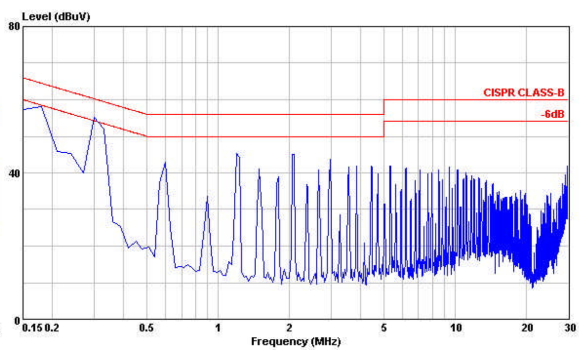
Typical Input Start-Up and Output Rise Characteristic
Vin=Vin(nom), Full Load



Using ON/OFF Voltage Start-Up and Vo Rise Characteristic
Vin=Vin(nom), Full Load



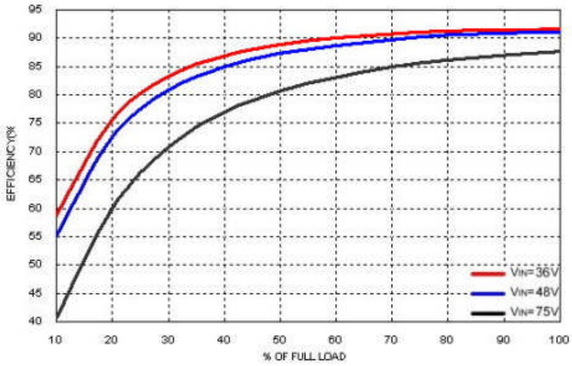
Conduction Emission of EN55022 Class A
Vin=Vin(nom), Full Load



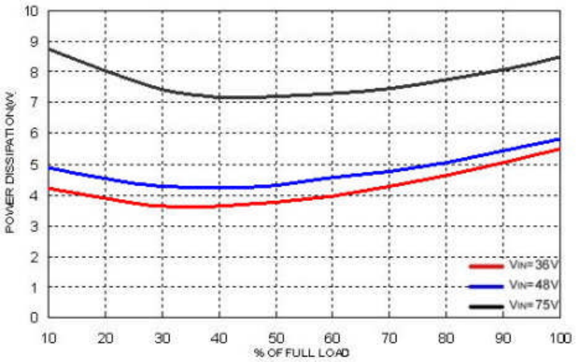
Conduction Emission of EN55022 Class B
Vin=Vin(nom), Full Load

Characteristic Curves (Continued)

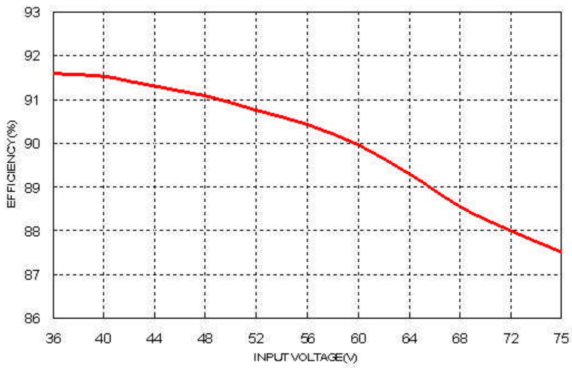
All test conditions are at 25°C.The figures are for PXF60-48S15



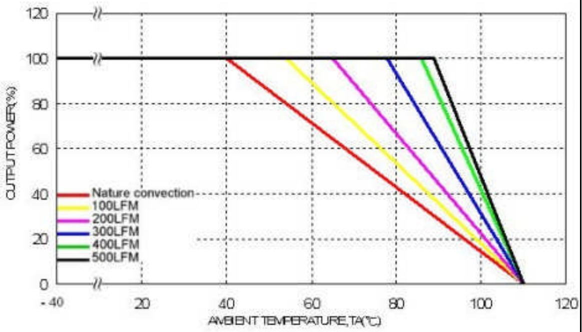
Efficiency Versus Output Current



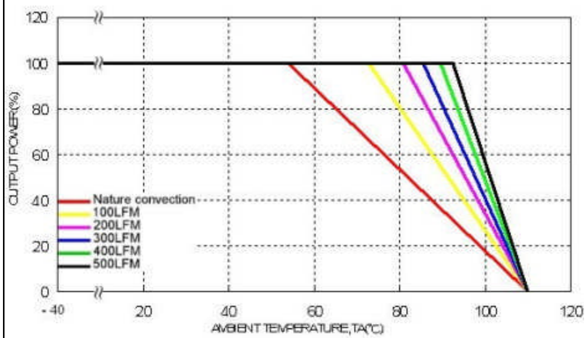
Power Dissipation Versus Output Current



Efficiency Versus Input Voltage. Full Load



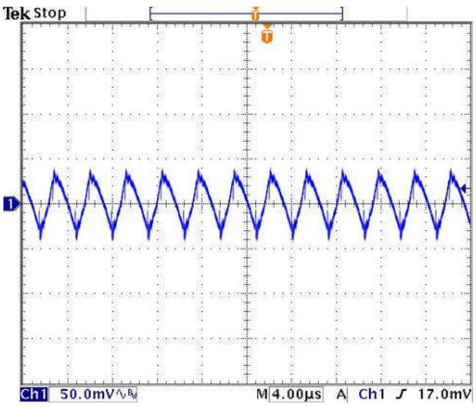
Derating Output Current Versus Ambient Temperature and Airflow Vin=Vin(nom)



Derating Output Current Versus Ambient Temperature with Heat-Sink and Airflow Vin = Vin(nom)

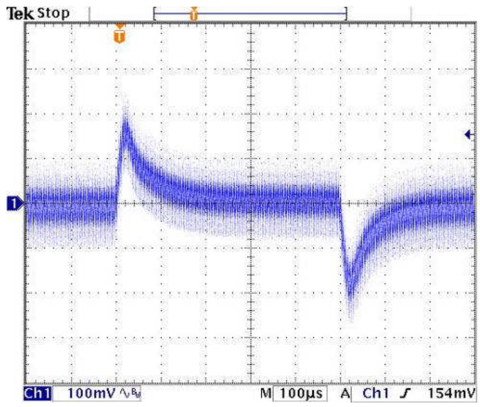
Characteristic Curves (Continued)

All test conditions are at 25°C.The figures are for PXF60-48S15



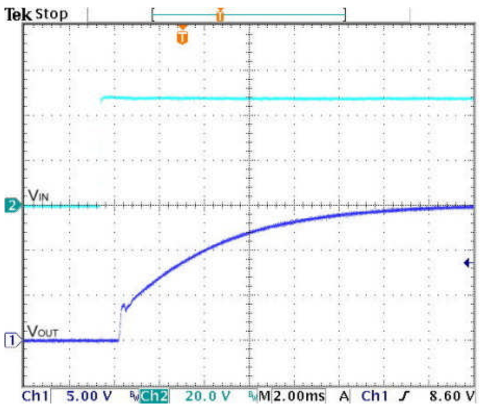
Typical Output Ripple and Noise.

Vin=Vin(nom), Full Load



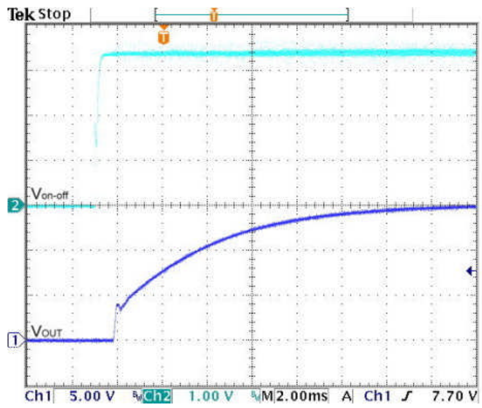
Transient Response to Dynamic Load Change from

100% to 75% to 100% of Full Load ; Vin=Vin(nom)



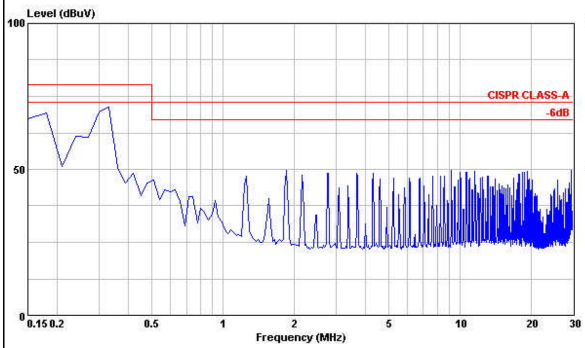
Typical Input Start-Up and Output Rise Characteristic

Vin=Vin(nom), Full Load



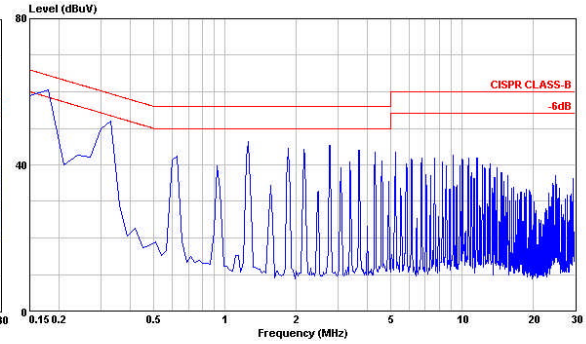
Using ON/OFF Voltage Start-Up and Vo Rise Characteristic

Vin=Vin(nom), Full Load



Conduction Emission of EN55022 Class A

Vin=Vin(nom), Full Load

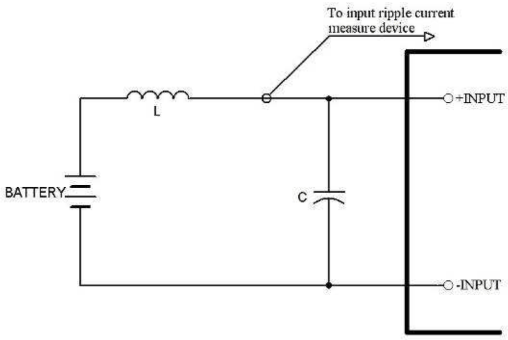


Conduction Emission of EN55022 Class B

Vin=Vin(nom), Full Load

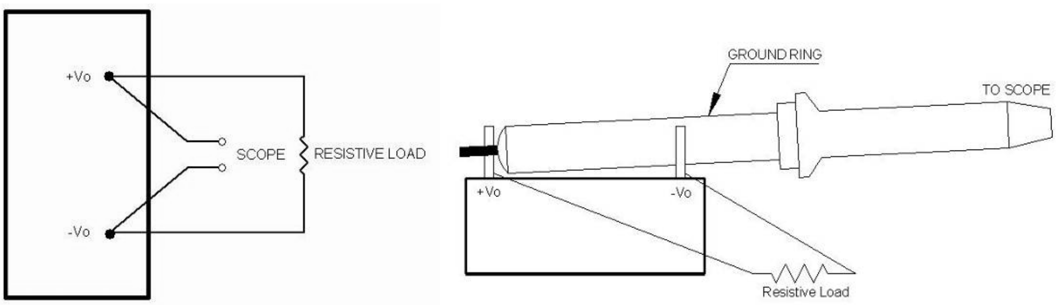
Testing Configurations

Input reflected-ripple current measurement test

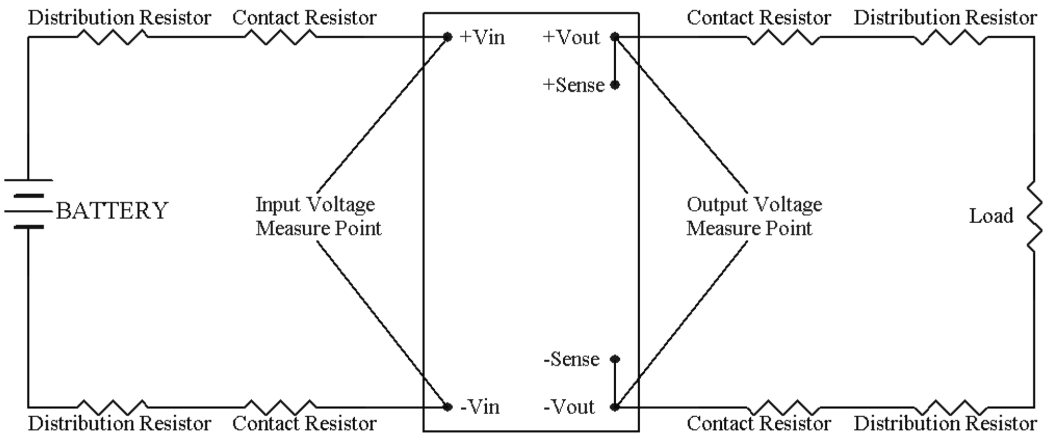


Component	Value	Voltage	Reference
L	12μH	----	----
C	47μF	100V	Aluminum Electrolytic Capacitor

Peak-to-peak output ripple & noise measurement test



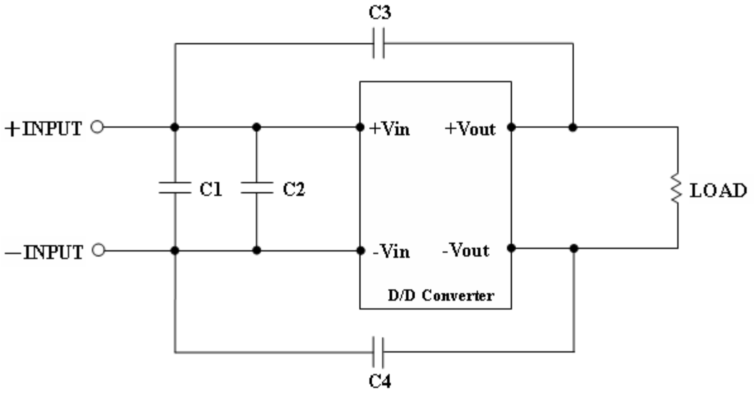
Output voltage and efficiency measurement test



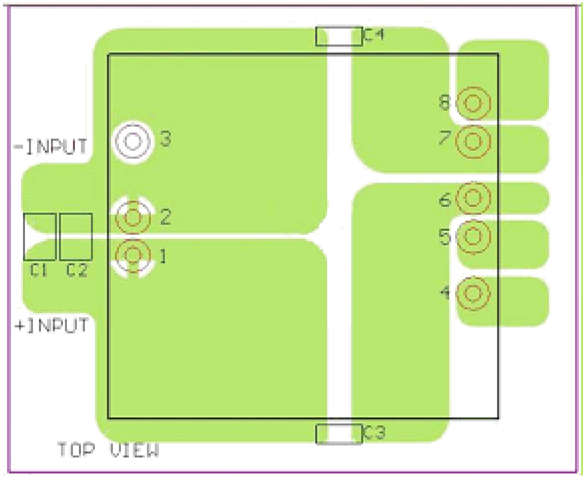
Note: All measurements are taken at the module terminals.

$$Efficiency = \left(\frac{V_o \times I_o}{V_{in} \times I_{in}} \right) \times 100\%$$

EMC considerations



Suggested Schematic for EN55022 Conducted Emission Class A Limits



Recommended Layout with Input Filter

To meet conducted emissions EN55022 CLASS A needed the following components:

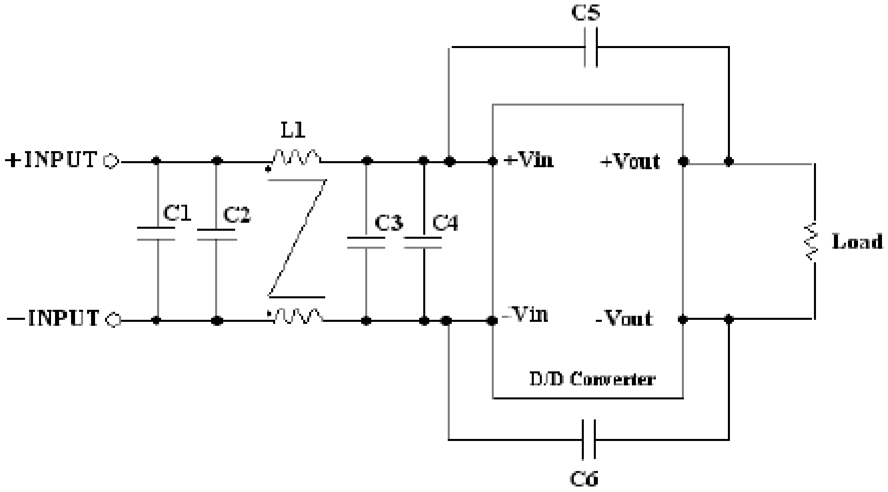
PXF60-24Sxx

Component	Value	Voltage	Reference
C2	6.8uF	50V	1812 MLCC
C3,C4	1000pF	2KV	1808MLCC

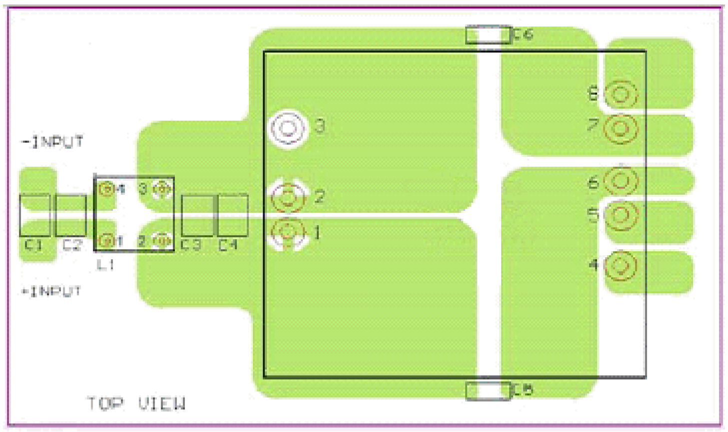
PXF60-48Sxx

Component	Value	Voltage	Reference
C1,C2	2.2uF	100V	1812 MLCC
C3,C4	1000pF	2KV	1808 MLCC

EMC considerations (Continued)



Suggested Schematic for EN55022 Conducted Emission Class B Limits



Recommended Layout with Input Filter

EMC considerations (Continued)

To meet conducted emissions EN55022 CLASS B needed the following components：

PXF60-24Sxx

Component	Value	Voltage	Reference
C1,C3	4.7uF	50V	1812 MLCC
C5,C6	1000pF	2KV	1808 MLCC
L1	450uH	----	

PXF60-48Sxx

Component	Value	Voltage	Reference
C1,C2,C3	2.2uF	100V	1812 MLCC
C5,C6	1000pF	2KV	1808MLCC
L1	830uH	----	

This Common Choke L1 has been defined as follow:

■

L: 450μH±35% / DCR: 25mΩ, max

A height: 9.8 mm, Max

■

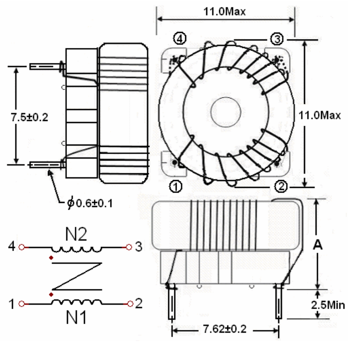
L: 830μH±35% / DCR: 31mΩ, max

A height: 8.8 mm, Max

■ Test condition: 100KHz / 100mV

■ Recommended through hole: Φ0.8mm

■ All dimensions in millimeters



Input Source Impedance

The converter should be connected to a low impedance input source. A highly inductive source impedance can affect the stability of the converter. An input external L-C filter is recommended to minimize input reflected ripple current. The inductor has a simulated source impedance of 12μH and the capacitor is Nippon chemi-con KZE series 47μF/100V. The capacitor must be located as close as possible to the input terminals of the converter for the lowest impedance.

Output Over Current Protection

When excessive output currents occur in the system, circuit protection is required on all converters. Normally, overload current is maintained at approximately 150 percent of rated current for PXF60 single output series.

Hiccup-mode is a method of operation to protect the converter from being damaged during an over-current fault condition. It also enables the converter to restart when the fault is removed.

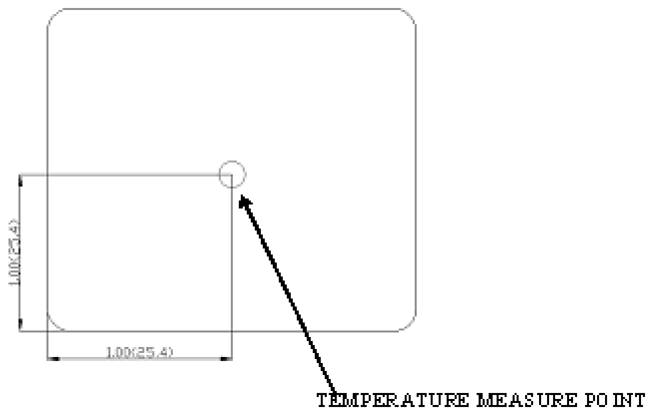
One of the problems resulting from over current is that excessive heat may be generated in power devices; especially MOSFET and Schottky diodes and the temperature of these devices may exceed their specified limits. A protection mechanism has to be employed to prevent those power devices from being damaged.

Output Over Voltage Protection

The output over-voltage protection consists of a Zener diode that monitors the output voltage on the feedback loop. If the voltage on the output terminals exceeds the over-voltage protection threshold, then the Zener diode will send a signal to the control IC to limit the output voltage.

Thermal Consideration

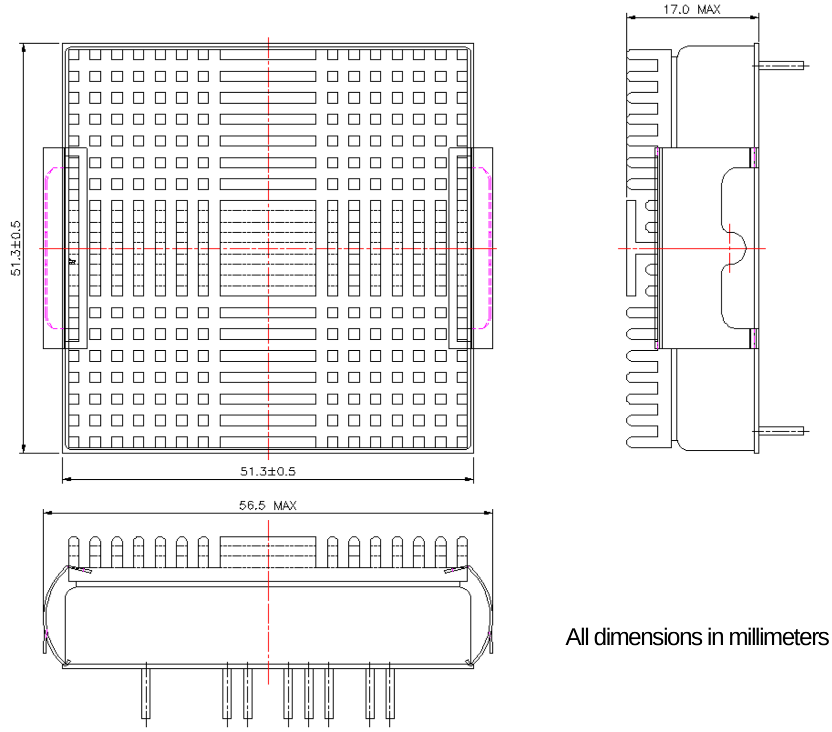
The converter operates in a variety of thermal environments. Sufficient cooling should be provided to help ensure reliable operation of the unit. Heat is removed by conduction, convection, and radiation to the surrounding environment. Proper cooling can be verified by measuring the point as the figure below. The temperature at this location should not exceed 110°C. When operating, adequate cooling must be provided to maintain the test point temperature at or below 110°C. Although the maximum point temperature of the power modules is 110°C, limiting this temperature to a lower value will increase the reliability.



Measurement shown in inches and (millimeters) TOP VIEW

Heat Sink Consideration

Use heat-sink (7G-0026A) for lowering temperature and higher reliability of the module.

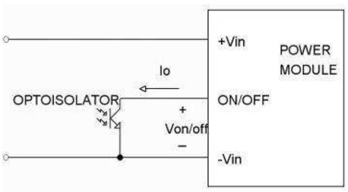


All dimensions in millimeters

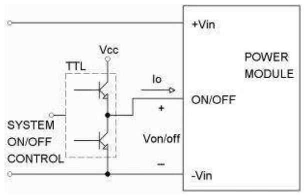
Remote ON/OFF Control

The Remote ON/OFF Pin is used to turn on and off the DC/DC converter. The user must use a switch to control the logic voltage (high or low level) of the ON / OFF pin referenced to Vi (-). The switch can be an open collector transistor, FET or Photo-Coupler that is capable of sinking up to 1 mA at low-level logic voltage. At High-level logic(ON/OFF signal maximum voltage): the allowable leakage current of the switch at 12V is 0.5 mA.

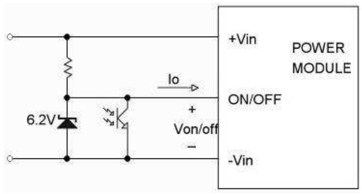
Remote ON/OFF Implementation Circuits



Isolated-Control Remote ON/OFF



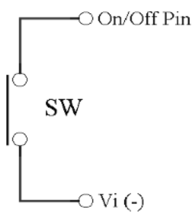
Level Control Using TTL Output



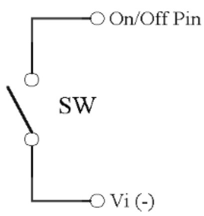
Level Control Using Line Voltage

There are two remote control options available, positive logic and negative logic.

a. Positive Logic:

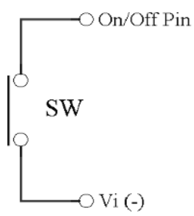


PXF60 module is turned off at
Low-level logic

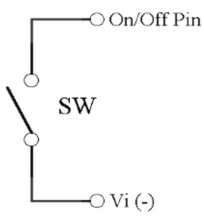


PXF60 module is turned on at
High-level logic

b. Negative Logic :

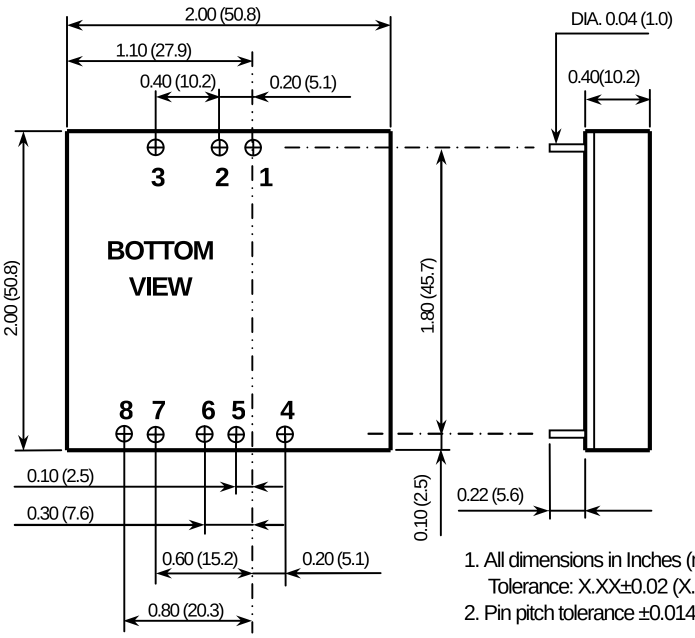


PXF60 module is turned on at
Low-level logic



PXF60 module is turned off at
High-level logic

Mechanical Data



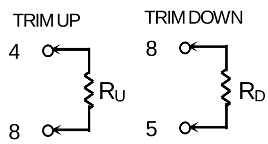
1. All dimensions in Inches (mm)
   Tolerance: X.XX±0.02 (X.X±0.5)
2. Pin pitch tolerance ±0.014(0.35)

PIN CONNECTION

PIN	FUNCTION
1	+INPUT
2	-INPUT
3	CTRL
4	-SENSE
5	+SENSE
6	+OUTPUT
7	-OUTPUT
8	TRIM

EXTERNAL OUTPUT TRIMMING

Output can be externally trimmed by using the method shown below.

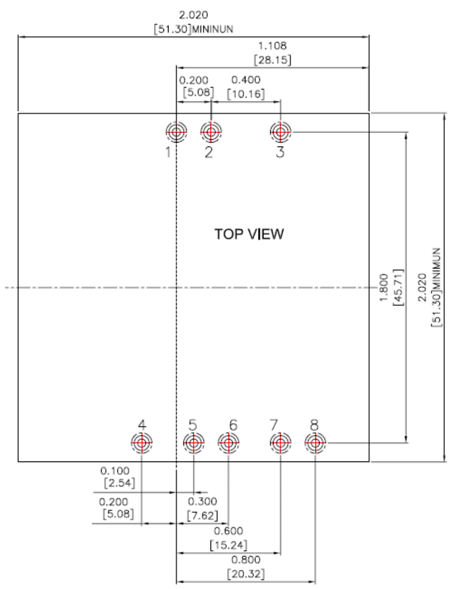


Recommended Pad Layout

Recommeded Pad Layout

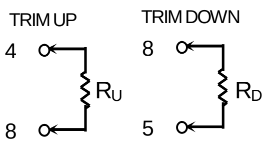
ALL Dimensions in inches (millimeters)
Tolerances:xx.xxx in ±0.010 in (xx.xx mm±0.25mm)

PAD SIZE (LEAD FREE RECOMMENDED)
PIN THROUGH HOLE: ∅ 0.047in(1.2mm)
TOP VIEW PAD: ∅ 0.079in(2.0mm)
BOTTOM VIEW PAD: ∅ 0.118in(3.0mm)



Output Voltage Adjustment

Output voltage set point adjustment allows the user to increase or decrease the output voltage set point of a module. This is accomplished by connecting an external resistor between the TRIM pin and either the SENSE(+) or SENSE(-) pins. With an external resistor between the TRIM and SENSE(-) pin, the output voltage set point increases. With an external resistor between the TRIM and SENSE(+) pin, the output voltage set point decreases.



TRIM TABLE

PXF60-xxS3P3

Trim up (%)	1	2	3	4	5	6	7	8	9	10
V_{OUT} (Volts)=	3.333	3.366	3.399	3.432	3.465	3.498	3.531	3.564	3.597	3.630
R_U (K Ohms)=	57.930	26.165	15.577	10.283	7.106	4.988	3.476	2.341	1.459	0.753
Trim down (%)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
V_{OUT} (Volts)=	3.267	3.234	3.201	3.168	3.135	3.102	3.069	3.036	3.003	2.970
R_D (K Ohms)=	69.470	31.235	18.490	12.117	8.294	5.745	3.924	2.559	1.497	0.647

PXF60-xxS05

Trim up (%)	1	2	3	4	5	6	7	8	9	10
V_{OUT} (Volts)=	5.050	5.100	5.150	5.200	5.250	5.300	5.350	5.400	5.450	5.500
R_U (K Ohms)=	36.570	16.580	9.917	6.585	4.586	3.253	2.302	1.588	1.032	0.588
Trim down (%)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
V_{OUT} (Volts)=	4.950	4.900	4.850	4.800	4.750	4.700	4.650	4.600	4.550	4.500
R_D (K Ohms)=	45.533	20.612	12.306	8.152	5.660	3.999	2.812	1.922	1.230	0.676

PXF60-xxS12

Trim up (%)	1	2	3	4	5	6	7	8	9	10
V_{OUT} (Volts)=	12.120	12.240	12.360	12.480	12.600	12.720	12.840	12.960	13.080	13.200
R_U (K Ohms)=	367.910	165.950	98.636	64.977	44.782	31.318	21.701	14.488	8.879	4.391
Trim down (%)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
V_{OUT} (Volts)=	11.880	11.760	11.640	11.520	11.400	11.280	11.160	11.040	10.920	10.800
R_D (K Ohms)=	460.990	207.950	123.600	81.423	56.118	39.249	27.199	18.162	11.132	5.509

PXF60-xxS15

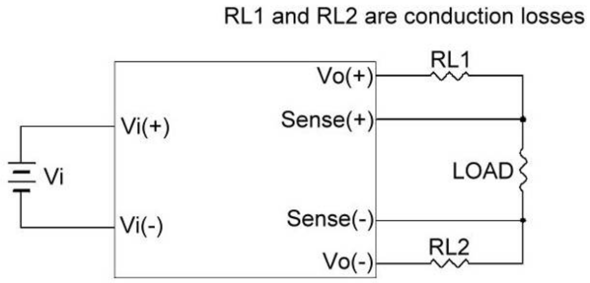
Trim up (%)	1	2	3	4	5	6	7	8	9	10
V_{OUT} (Volts)=	15.150	15.300	15.450	15.600	15.750	15.900	16.050	16.200	16.350	16.500
R_U (K Ohms)=	404.180	180.590	106.060	68.796	46.437	31.531	20.883	12.898	6.687	1.718
Trim down (%)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
V_{OUT} (Volts)=	14.850	14.700	14.550	14.400	14.250	14.100	13.950	13.800	13.650	13.500
R_D (K Ohms)=	499.820	223.410	131.270	85.204	57.563	39.136	25.974	16.102	8.424	2.282

Remote Sense Application Circuit

The Remote Sense function can be used to regulate the voltage at the load. The Remote Sense voltage range can't be greater than 10% Vo, i.e.:

[Vo (+) to Vo (-)] – [Sense (+) to Sense (-)] ≦ 10% Vo

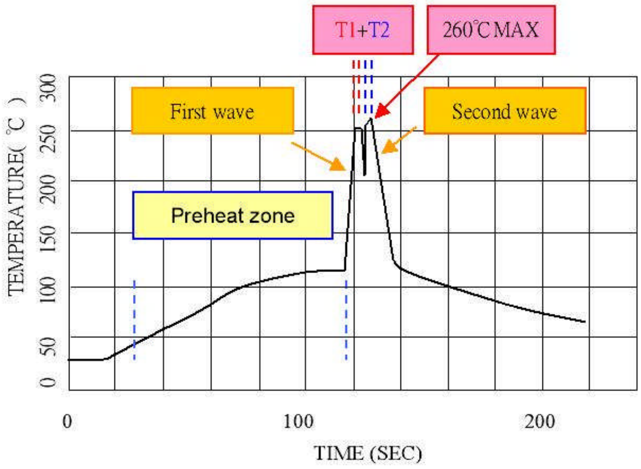
If the Remote Sense function is not used,, connect the SENSE (+) to OUTPUT (+) and connect the SENSE (-) to OUTPUT(-) of the PXF60 converter.



Operation Output Voltage with Sense Function Used

Soldering Considerations

Lead free wave solder profile for PXF60



Zone	Reference Parameter
Preheat zone	Rise temp. speed : 3°C / sec max. Preheat temp. : 100~130°C
Actual heating	Peak temp. : 250~260°C Peak time (T1+T2 time) : 4~6 sec

Reference Solder : Sn-Ag-Cu ; Sn-Cu

Hand Welding :

Soldering iron : Power 90W

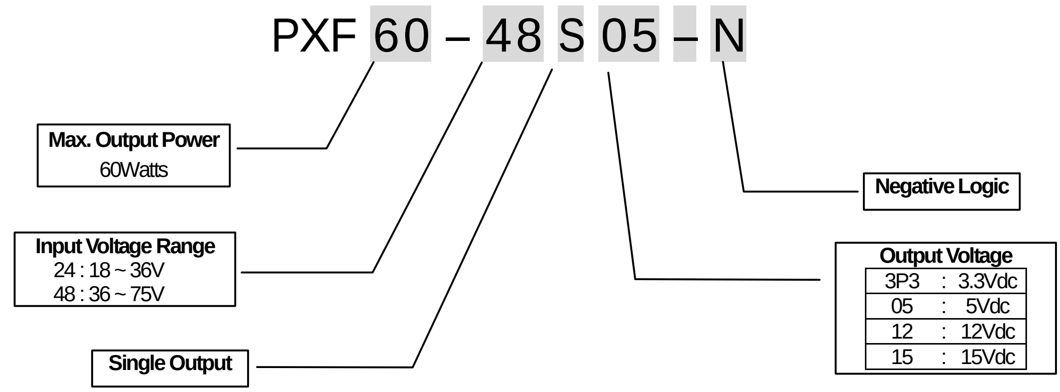
Welding Time : 2~4 sec

Temp. : 380~400°C

Packaging Information

10 PCS per TUBE

Part Number Structure



Model Number	Input Range	Output Voltage	Output Current Max. Load	Input Current Full Load(1)	Eff (2) (%)
PXF60-24S3P3	18 – 36 VDC	3.3 VDC	14000mA	2264mA	89
PXF60-24S05	18 – 36 VDC	5 VDC	12000mA	2941mA	90
PXF60-24S12	18 – 36 VDC	12 VDC	5000mA	2907mA	90
PXF60-24S15	18 – 36 VDC	15 VDC	4000mA	2907mA	90
PXF60-48S3P3	36 – 75 VDC	3.3 VDC	14000mA	1132mA	89
PXF60-48S05	36 – 75 VDC	5 VDC	12000mA	1453mA	90
PXF60-48S12	36 – 75 VDC	12 VDC	5000mA	1453mA	90
PXF60-48S15	36 – 75 VDC	15 VDC	4000mA	1453mA	90

Note 1. Maximum value at nominal input voltage and full load of standard type.
Note 2. Typical value at nominal input voltage and full load.

Safety and Installation Instruction

Fusing Consideration

Caution: This converter is not internally fused. An input line fuse must always be used.

This converter can be used in a wide variety of applications, ranging from simple stand-alone operation to an integrated part of a sophisticated power architecture. For maximum flexibility, internal fusing is not included; however, to achieve maximum safety and system protection, always use an input line fuse. The safety agencies require a slow-blow fuse with maximum rating of 5A for PXF60-24Sxx modules and 3A for PXF60-48Sxx modules. Based on the information provided in this data sheet on Inrush energy and maximum DC input current; the same type of fuse with lower rating can be used. Refer to the fuse manufacturer's data for further information.

MTBF and Reliability

The MTBF of PXF60-SERIES of DC/DC converters has been calculated using

Bellcore TR-NWT-000332 Case I: 50% stress, Operating temperature at 40 °C (Ground fixed and controlled environment). The resulting figure for MTBF is 1.093×10^6 hours.

MIL-HDBK-217F NOTICE2 FULL LOAD, Operating temperature at 25°C . The resulting figure for MTBF is 1.096×10^5 hours.