Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

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Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

PXF40xxWSxx Single Output DC/DC Converter

9 to 36 Vdc and 18 to 75 Vdc input, 3.3 to 15 Vdc Single Output, 40W

TDK·Lambda

Features

- Single output current up to 10A
- 40 watts maximum output power
- 4:1 ultra wide input voltage range of 9-36 and 18-75VDC
- Six-sided continuous shield
- Case grounding
- High efficiency up to 88%
- Low profile: 2.00 x 2.00 x 0.40 inch (50.8x50.8x10.2 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

Applications

- Wireless Network
- Telecom/Datacom
- Industry Control System
- Measurement Equipment
- Semiconductor Equipment

Options

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

General Description

The PXF40-xxWSxx single output offers 40 watts of output power from a 2.00 x 2.00 x 0.4 inch package. This series with 4:1 ultra wide input voltage of 9-36VDC and 18-75VDC, features 1600VDC of isolation, short-circuit,over-voltage and over-temperature protection, as well as six sided shielding. All models are particularly suited for telecommunications, industrial, mobile telecom and test equipment applications.

Table of Contents

Absolute Maximum Ratings				
Parameter	**Model**	**Min**	**Max**	**Unit**
Input Voltage				
Continuous	24WSxx		36	V_{DC}
	48WSxx		75	
Transient (100ms)	24WSxx		50	
	48WSxx		100	
Operating Ambient Temperature (with derating)	All	-40	105	℃
Operating Case Temperature	All		105	℃
Storage Temperature	All	-55	125	℃

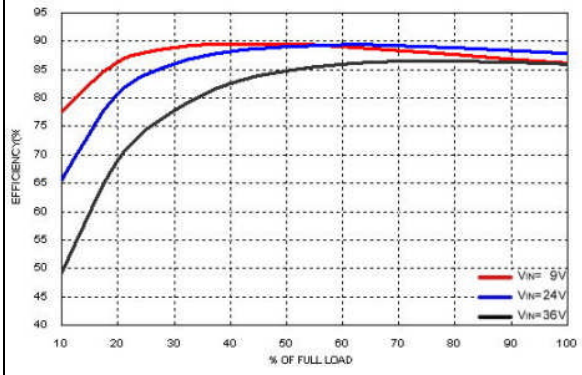
Output Specifications					
Parameter	**Model**	**Min**	**Typ**	**Max**	**Unit**
Output Voltage	xxWS3P3	3.267	3.3	3.333	V_{DC}
(Vin = Vin(nom) ; Full Load ; T_A=25°C)	xxWS05	4.95	5	5.05	
	xxWS12	11.88	12	12.12	
	xxWS15	14.85	15	15.15	
Voltage Adjustability	All	-10		+10	%
Output Regulation					
Line (Vin(min) to Vin(max) at Full Load)	All	-0.2		+0.2	%
Load (Min. to 100% of Full Load)		-0.5		+0.5	
Output Ripple & Noise	xxWS3P3			50	mVp-p
Peak-to-Peak (20MHz bandwidth)	xxWS05			50	
	xxWS12			75	
	xxWS15			75	
Temperature Coefficient	All	-0.02		+0.02	%/°C
Output Voltage Overshoot	All			3	% V_{OUT}
(Vin(min) to Vin(max) ; Full Load ; T_A=25°C)					
Dynamic Load Response					
(Vin = Vin(nom) ; T_A=25°C)					
Load step change from					
75% to 100% or 100 to 75% of Full Load					
Peak Deviation	All		250		mV
Setting Time (V_{OUT}-10% peak deviation)	All		250		μS
Output Current	xxWS3P3	0		10000	mA
	xxWS05	0		8000	
	xxWS12	50		3333	
	xxWS15	50		2666	
Output Over Voltage Protection	xxWS3P3		3.9		V_{DC}
(Zener diode clamp)	xxWS05		6.2		
	xxWS12		15		
	xxWS15		18		
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	24WSxx 48WSxx	9 18	24 48	36 75	V_{DC}
Input Current (Maximum value at Vin = Vin(nom); Full Load)	24WS3P3 24WS05 24WS12 24WS15 48WS3P3 48WS05 48WS12 48WS15			1677 2008 2008 2008 838 992 1004 1004	mA
Input Standby Current (Typical value at Vin = Vin(nom); No Load)	24WS3P3 24WS05 24WS12 24WS15 48WS3P3 48WS05 48WS12 48WS15		80 100 50 50 60 65 30 30		mA
Under Voltage Lockout Turn-on Threshold	24WSxx 48WSxx			9 18	V_{DC}
Under Voltage Lockout Turn-off Threshold	24WSxx 48WSxx		8 16		V_{DC}
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	V_{DC}
Remote Off Input Current	24WSxx 48WSxx		10 5		mA
Input Current of Remote Control Pin	All	-0.5		0.5	mA

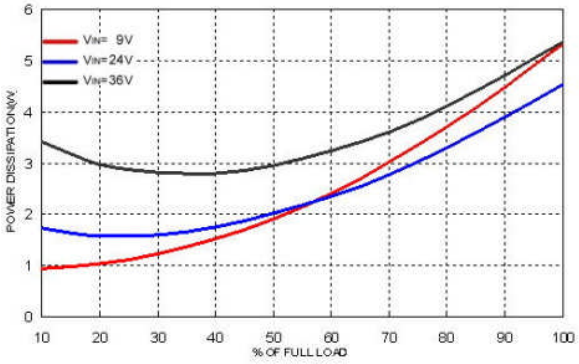
General Specifications					
Parameter	**Model**	**Min**	**Typ**	**Max**	**Unit**
Efficiency (Vin = Vin(nom) ; Full Load ; T_A=25°C)	24WS3P3 24WS05 24WS12 24WS15 48WS3P3 48WS05 48WS12 48WS15		86 87 87 87 86 88 87 87		%
Isolation Voltage Input to Output Input (Output) to Case	All	1600 1600			V_{DC}
Isolation Resistance	All	1			GΩ
Isolation Capacitance	All			2500	pF
Switching Frequency	All		300		KHz
Weight	All		60		g
MTBF(See Page 31) Bellcore TR-NWT-000332, T_C=40°C MIL-HDBK-217F	All		1.105×10^6 1.511×10^5		hours
Over Temperature Protection	All		110		°C

Characteristic Curves

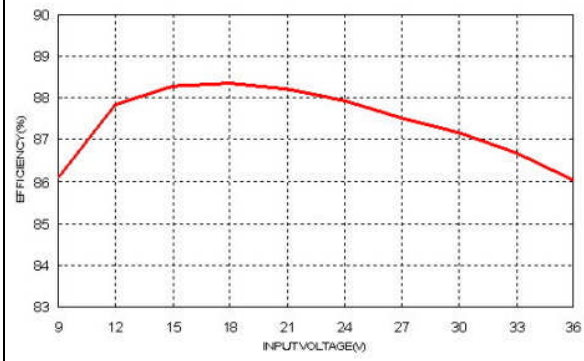
All test conditions are at 25°C.The figures are for PXF40-24WS3P3.



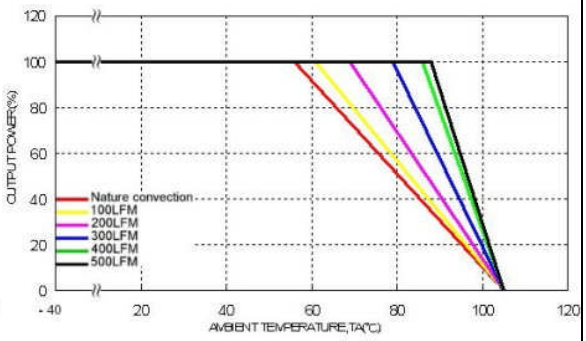
Efficiency Versus Output Current



Power Dissipation Versus Output Current

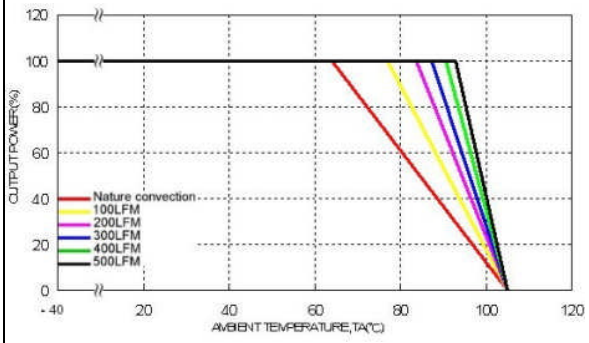


Efficiency Versus Input Voltage. Full Load



Derating Output Current Versus Ambient Temperature and Airflow

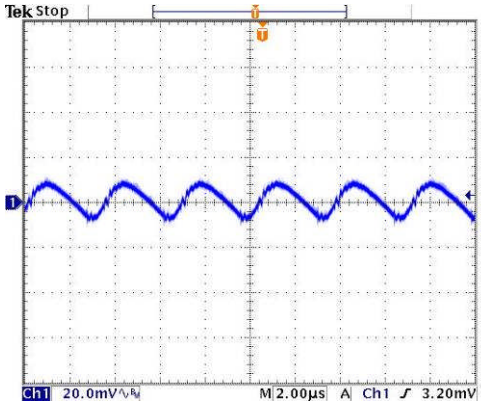
Vin = Vin(nom)



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

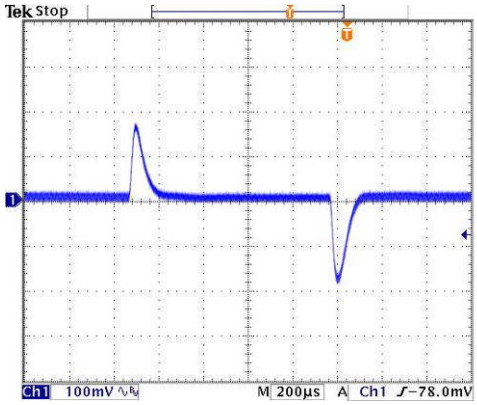
Characteristic Curves (Continued)

All test conditions are at 25°C.The figures are for PXF40-24WS3P3.

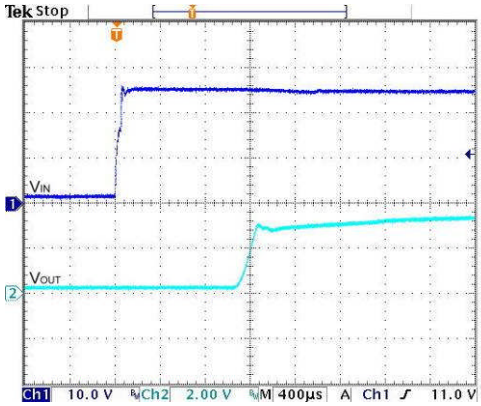


Typical Output Ripple and Noise.

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

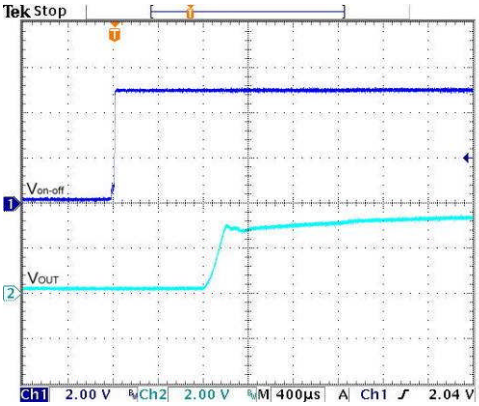


Transient Response to Dynamic Load Change from 100% to 75% to 100% of Full Load ; Vin = Vin(nom)



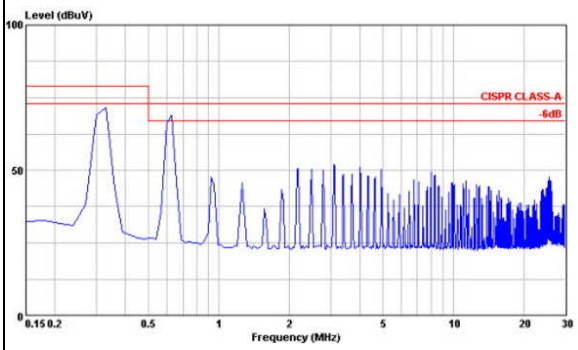
Typical Input Start-Up and Output Rise Characteristic

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



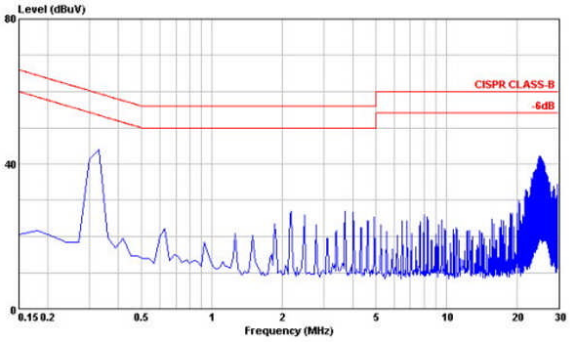
Using ON/OFF Voltage Start-Up and Vo Rise Characteristic

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



Conduction Emission of EN55022 Class A

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

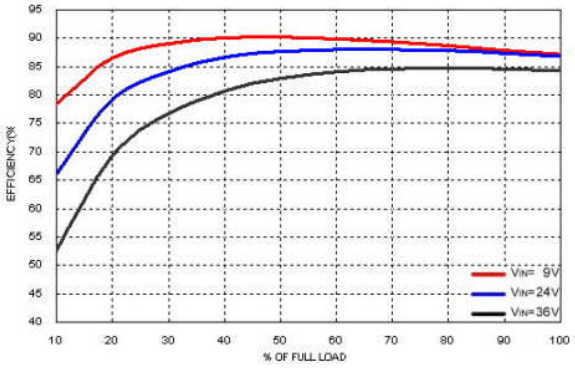


Conduction Emission of EN55022 Class B

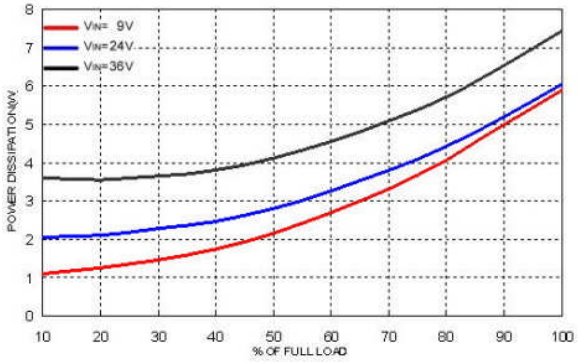
Vin = Vin(nom), **Full Load**

Characteristic Curves (Continued)

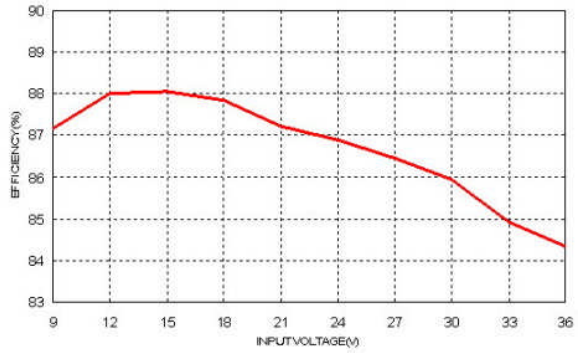
All test conditions are at 25°C.The figures are for PXF40-24WS05.



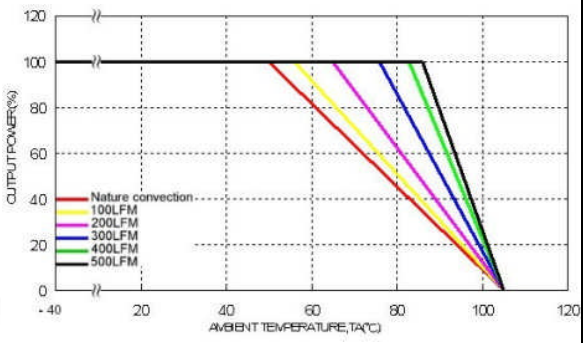
Efficiency Versus Output Current



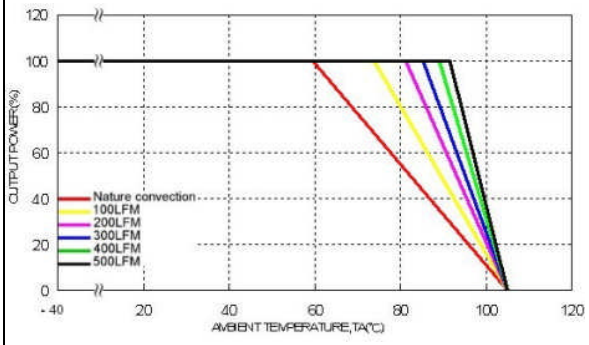
Power Dissipation Versus Output Current



Efficiency Versus Input Voltage. Full Load



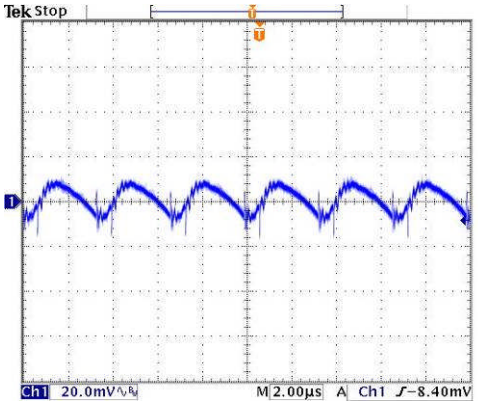
Derating Output Current Versus Ambient Temperature and Airflow Vin=Vin(nom)



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

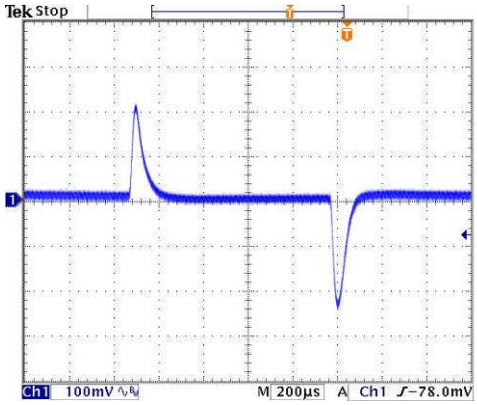
Characteristic Curves (Continued)

All test conditions are at 25°C.The figures are for PXF40-24WS05.

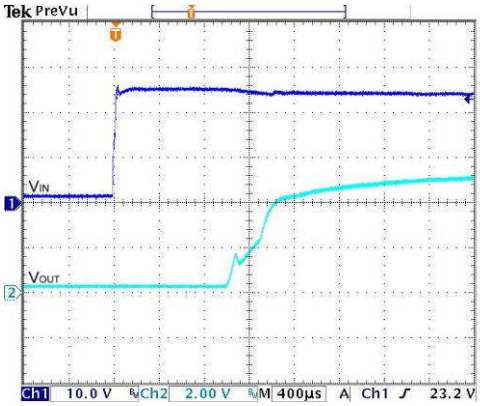


Typical Output Ripple and Noise.

Vin=Vin(nom), Full Load

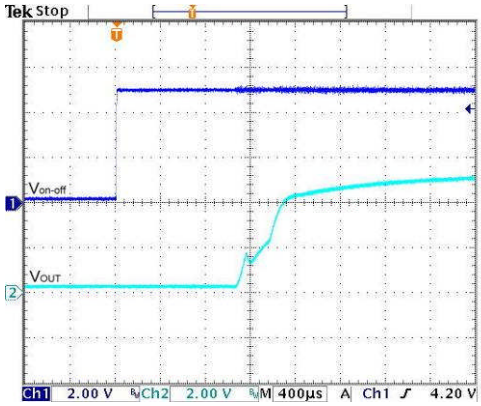


Transient Response to Dynamic Load Change from 100% to 75% to 100% of Full Load ; Vin=Vin(nom)



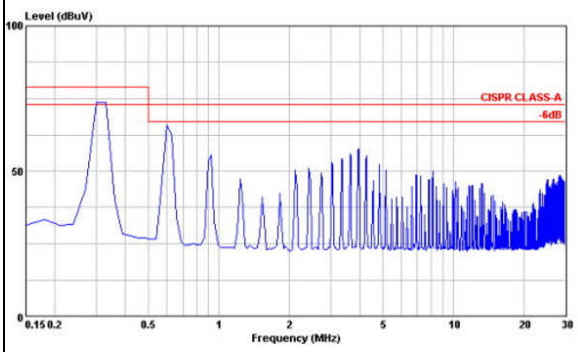
Typical Input Start-Up and Output Rise Characteristic

Vin=Vin(nom), Full Load



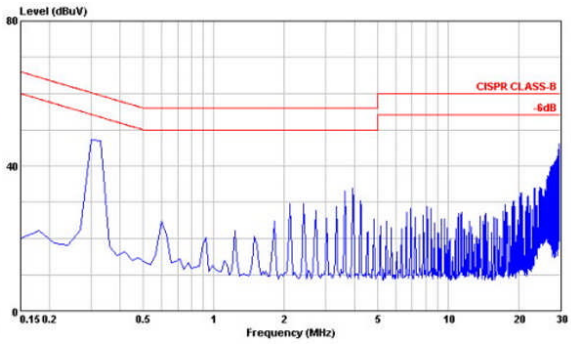
Using ON/OFF Voltage Start-Up and Vo Rise Characteristic

Vin=Vin(nom), Full Load



Conduction Emission of EN55022 Class A

Vin=Vin(nom), Full Load

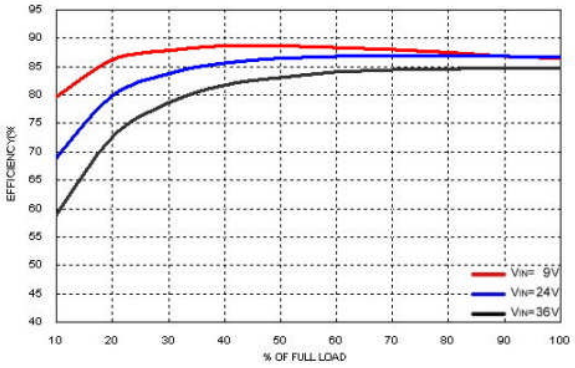


Conduction Emission of EN55022 Class B

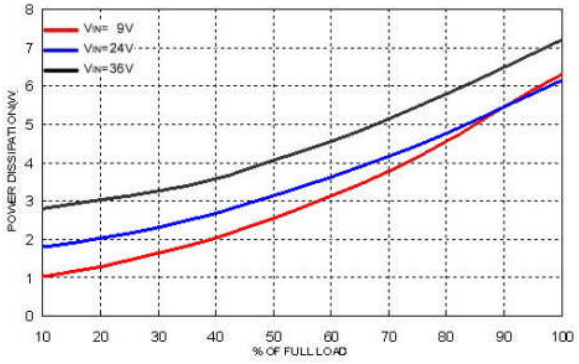
Vin=Vin(nom), Full Load

Characteristic Curves (Continued)

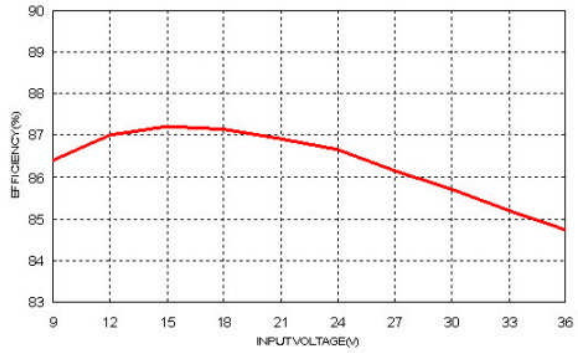
All test conditions are at 25°C.The figures are for PXF40-24WS12.



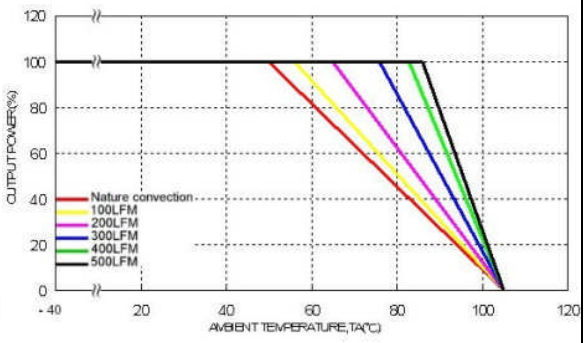
Efficiency Versus Output Current



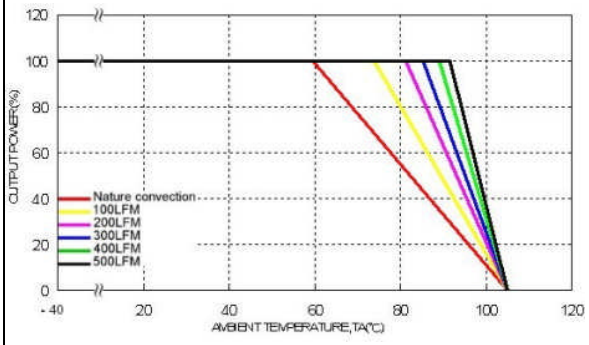
Power Dissipation Versus Output Current



Efficiency Versus Input Voltage. Full Load



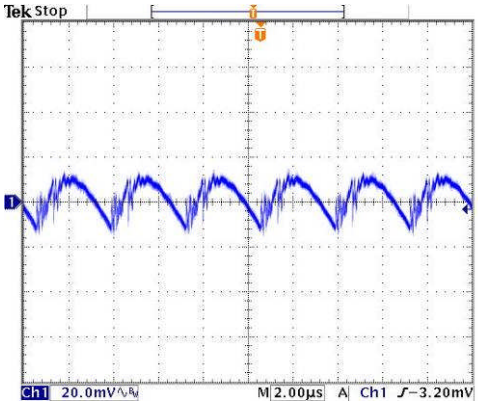
Derating Output Current Versus Ambient Temperature and Airflow Vin=Vin(nom)



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

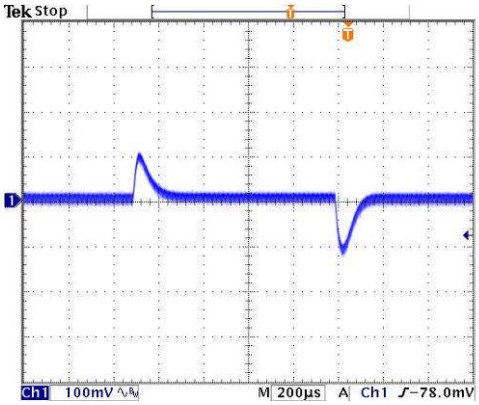
Characteristic Curves (Continued)

All test conditions are at 25°C.The figures are for PXF40-24WS12.

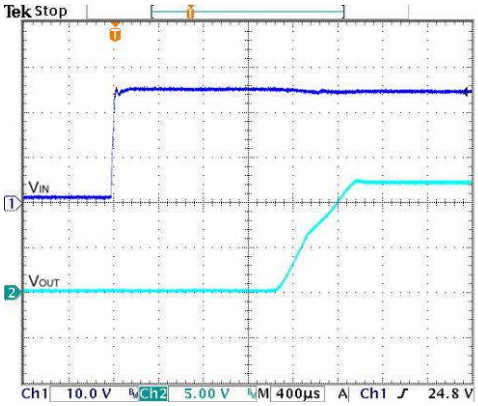


Typical Output Ripple and Noise.

Vin=Vin(nom), Full Load

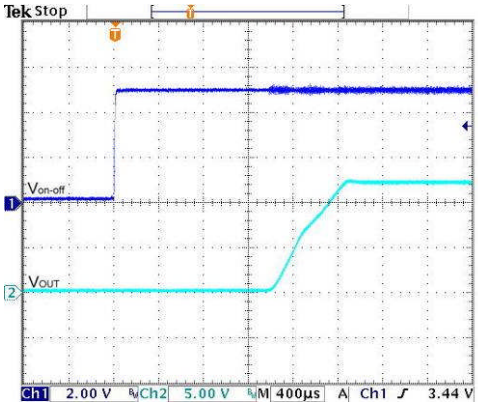


Transient Response to Dynamic Load Change from 100% to 75% to 100% of Full Load ; Vin=Vin(nom)



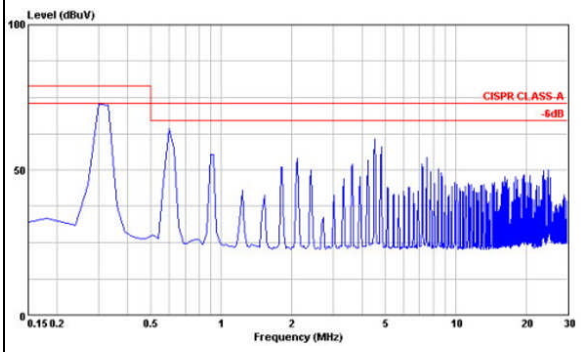
Typical Input Start-Up and Output Rise Characteristic

Vin=Vin(nom), Full Load



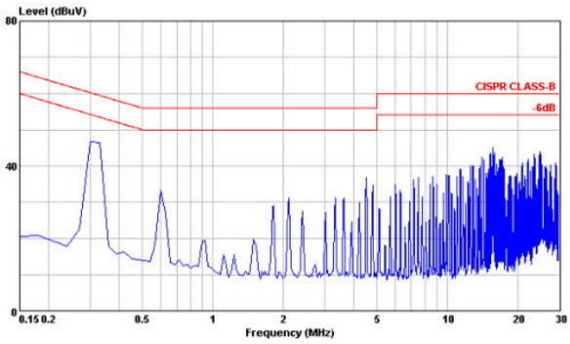
Using ON/OFF Voltage Start-Up and Vo Rise Characteristic

Vin=Vin(nom), Full Load



Conduction Emission of EN55022 Class A

Vin=Vin(nom), Full Load

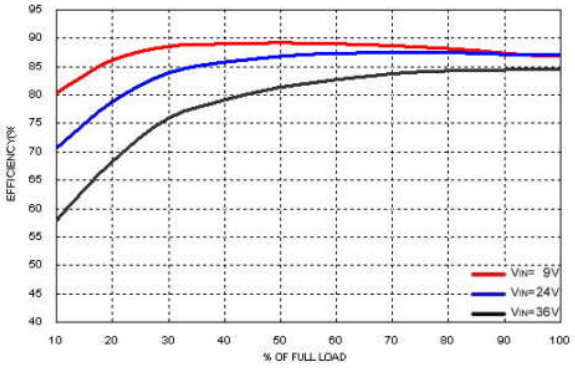


Conduction Emission of EN55022 Class B

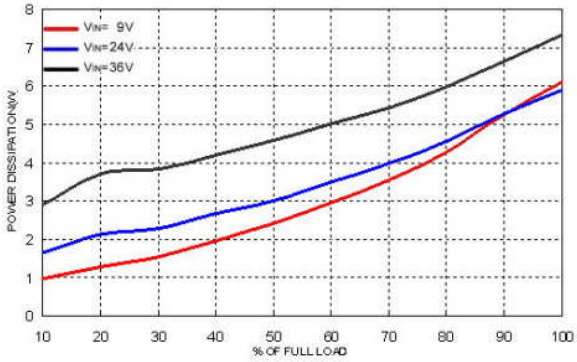
Vin=Vin(nom), Full Load

Characteristic Curves (Continued)

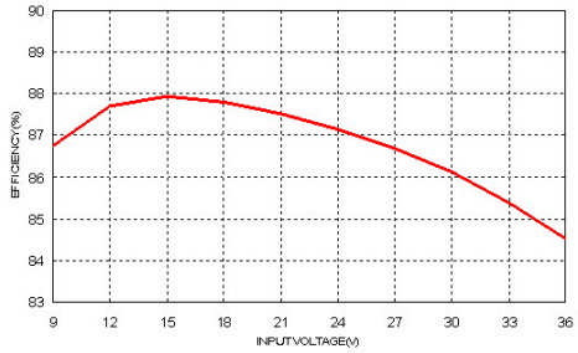
All test conditions are at 25°C..The figures are for PXF40-24WS15.



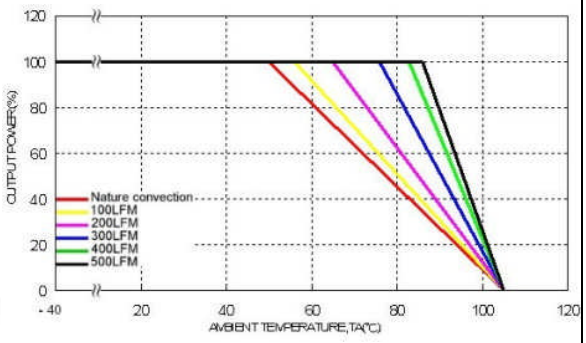
Efficiency Versus Output Current



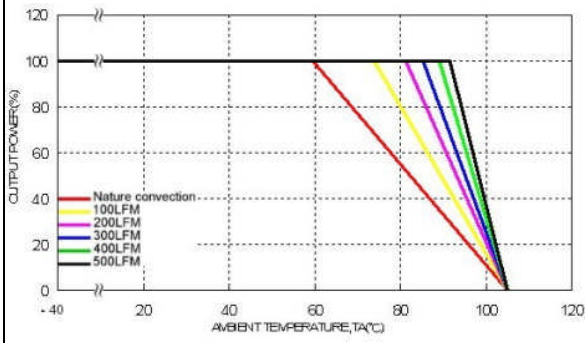
Power Dissipation Versus Output Current



Efficiency Versus Input Voltage. Full Load



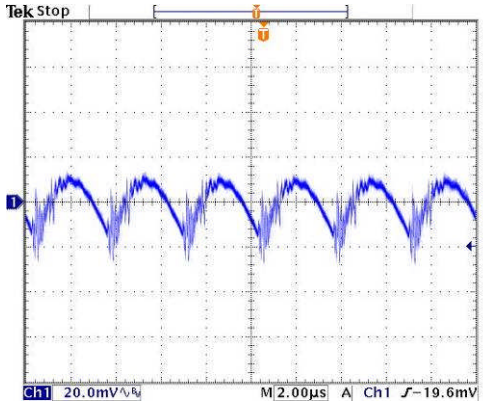
Derating Output Current Versus Ambient Temperature and Airflow Vin=Vin(nom)



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

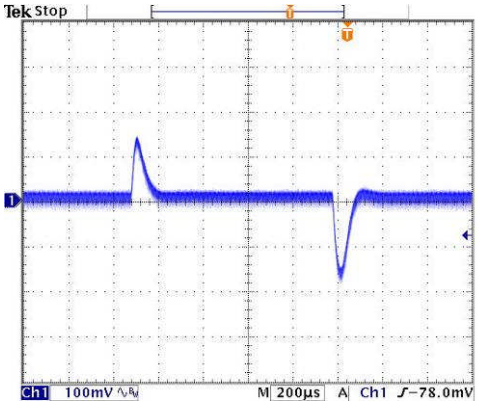
Characteristic Curves (Continued)

All test conditions are at 25°C.The figures are for PXF40-24WS15.

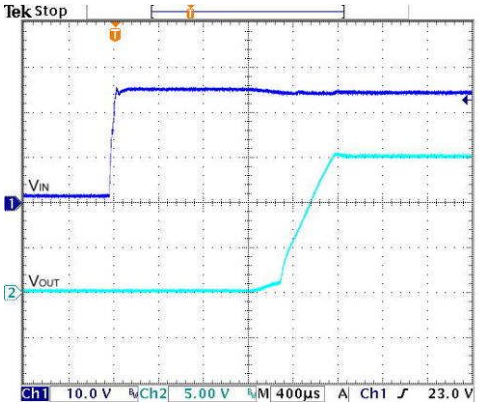


Typical Output Ripple and Noise.

Vin=Vin(nom), Full Load

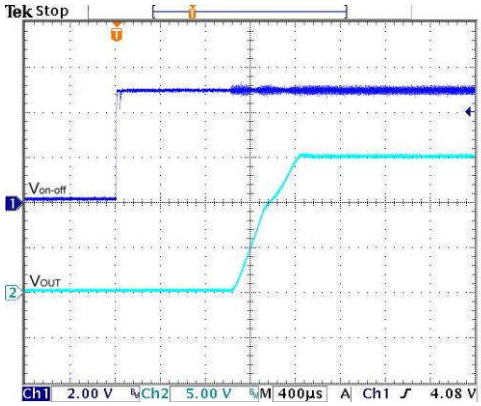


Transient Response to Dynamic Load Change from 100% to 75% to 100% of Full Load ; Vin=Vin(nom)



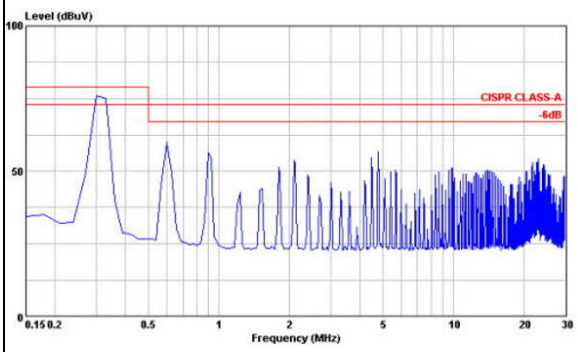
Typical Input Start-Up and Output Rise Characteristic

Vin=Vin(nom), Full Load



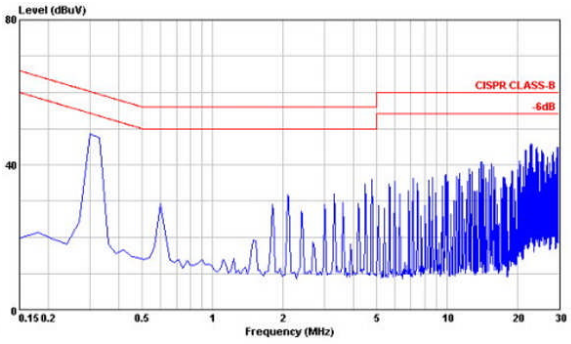
Using ON/OFF Voltage Start-Up and Vo Rise Characteristic

Vin=Vin(nom), Full Load



Conduction Emission of EN55022 Class A

Vin=Vin(nom), Full Load

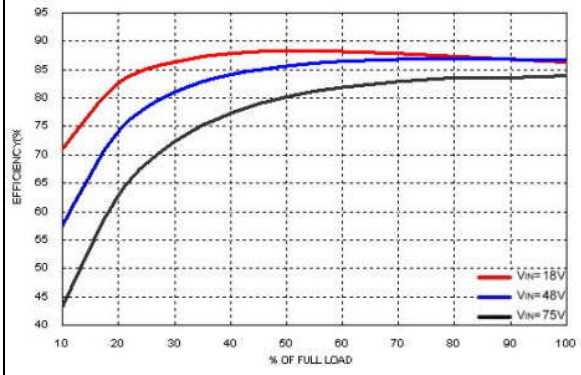


Conduction Emission of EN55022 Class B

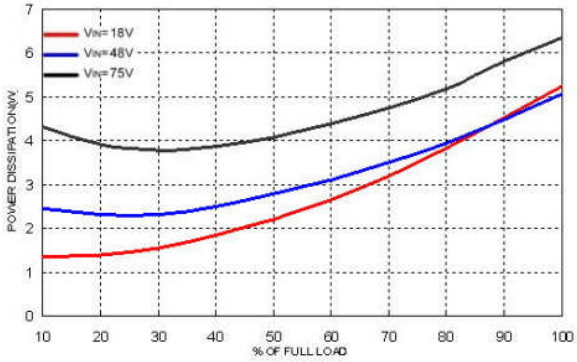
Vin=Vin(nom), Full Load

Characteristic Curves (Continued)

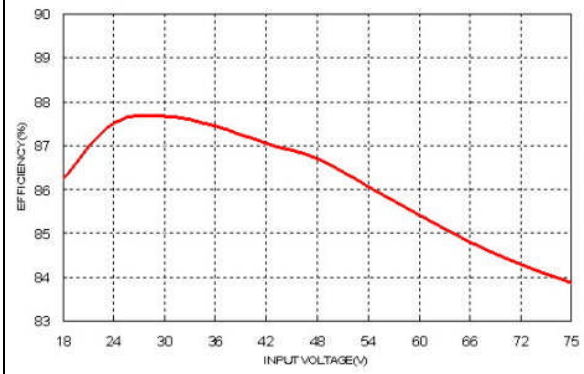
All test conditions are at 25C. The figures are for PXF40-48WS3P3



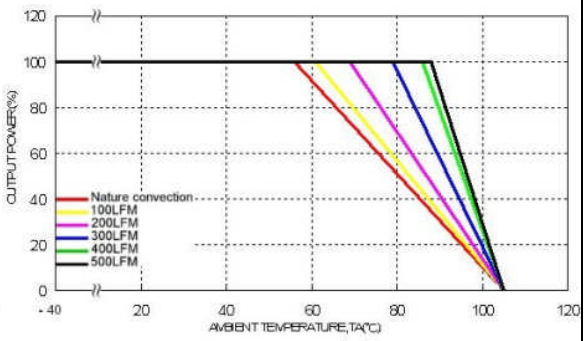
Efficiency Versus Output Current



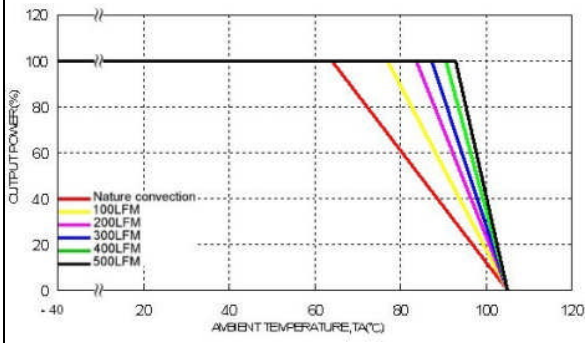
Power Dissipation Versus Output Current



Efficiency Versus Input Voltage. Full Load



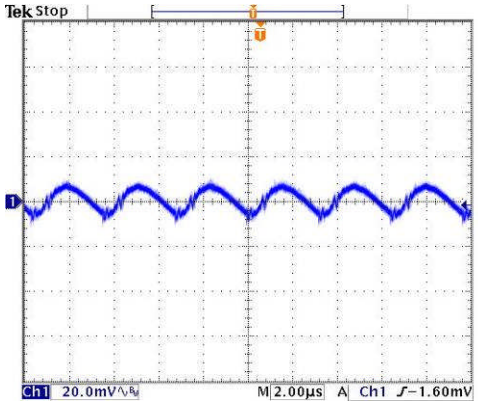
Derating Output Current Versus Ambient Temperature and Airflow Vin=Vin(nom)



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

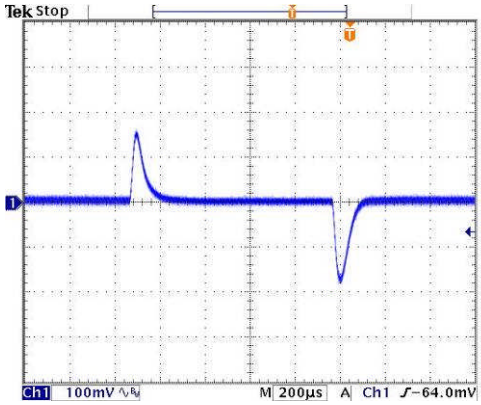
Characteristic Curves (Continued)

All test conditions are at 25°C.The figures are for PXF40-48WS3P3.

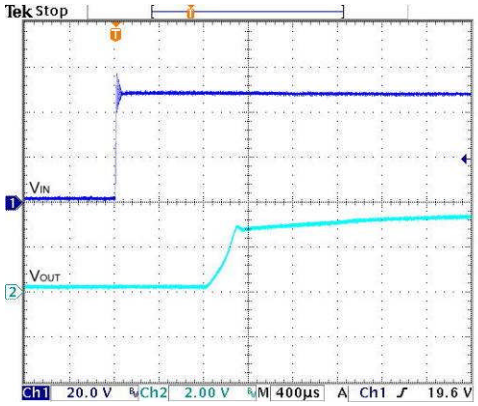


Typical Output Ripple and Noise.

Vin=Vin(nom), Full Load

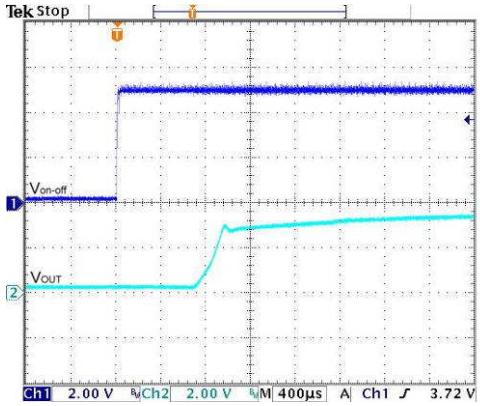


Transient Response to Dynamic Load Change from 100% to 75% to 100% of Full Load ; Vin=Vin(nom)



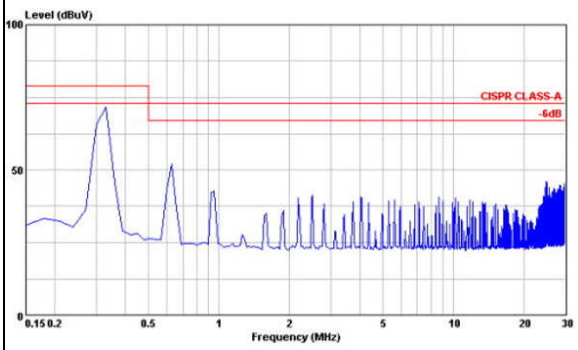
Typical Input Start-Up and Output Rise Characteristic

Vin=Vin(nom), Full Load



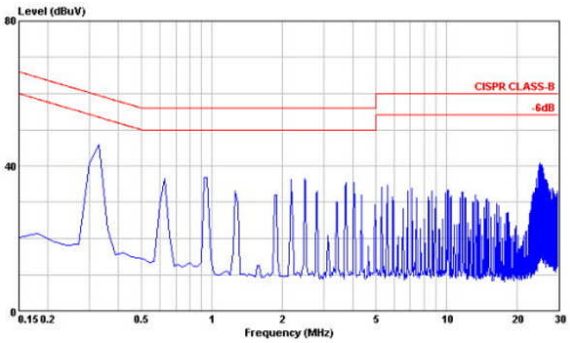
Using ON/OFF Voltage Start-Up and Vo Rise Characteristic

Vin=Vin(nom), Full Load



Conduction Emission of EN55022 Class A

Vin=Vin(nom), Full Load

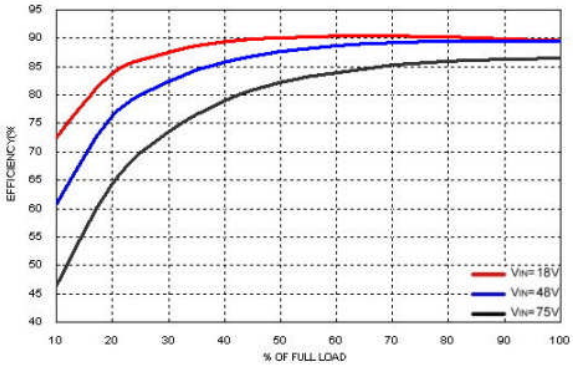


Conduction Emission of EN55022 Class B

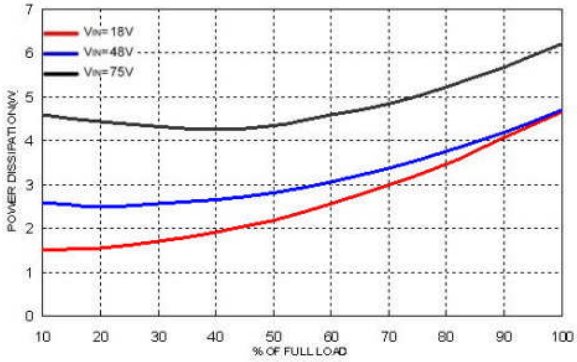
Vin=Vin(nom), Full Load

Characteristic Curves (Continued)

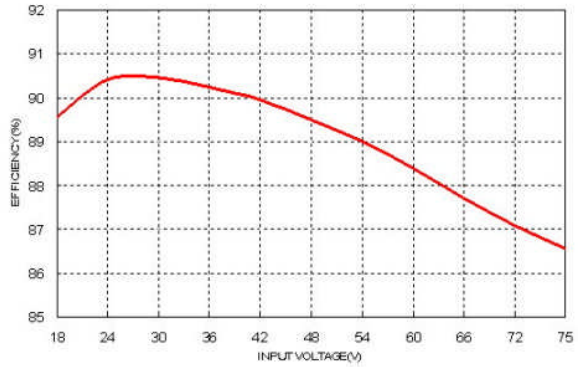
All test conditions are at 25°C..The figures are for PXF40-48WS05.



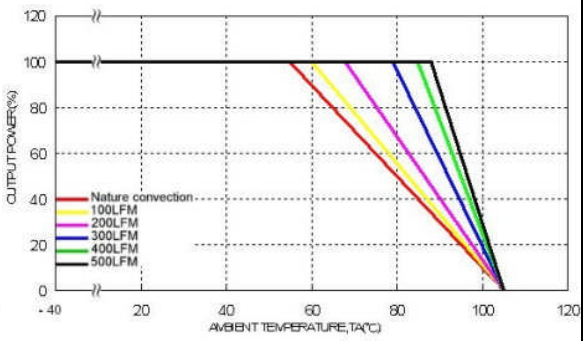
Efficiency Versus Output Current



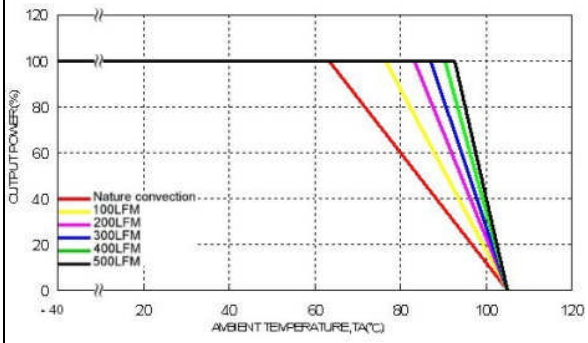
Power Dissipation Versus Output Current



Efficiency Versus Input Voltage. Full Load



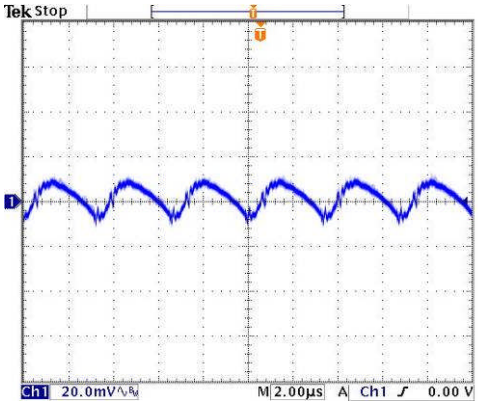
Derating Output Current Versus Ambient Temperature and Airflow Vin=Vin(nom)



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

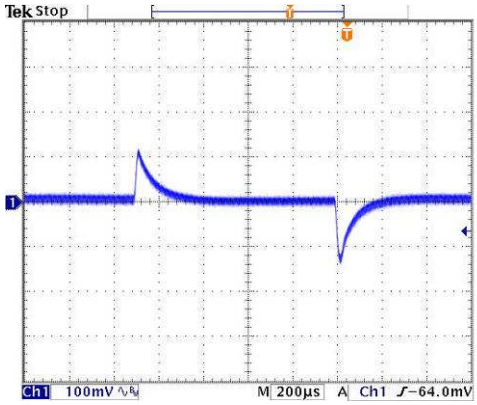
Characteristic Curves (Continued)

All test conditions are at 25°C.The figures are for PXF40-48WS05.

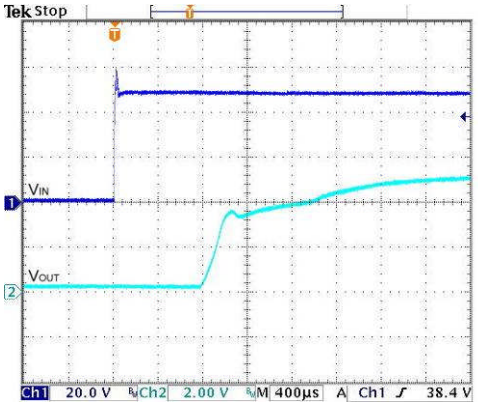


Typical Output Ripple and Noise.

Vin=Vin(nom), Full Load

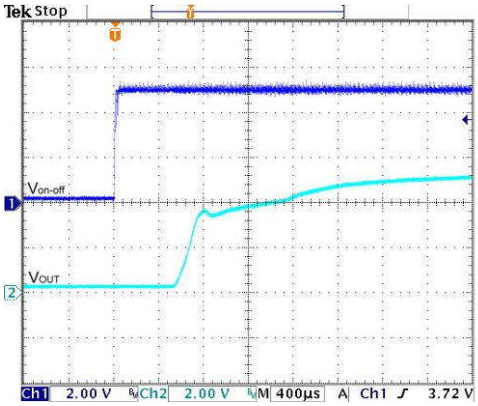


Transient Response to Dynamic Load Change from 100% to 75% to 100% of Full Load ; Vin=Vin(nom)



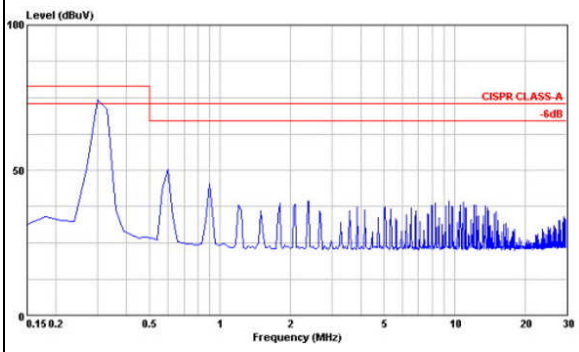
Typical Input Start-Up and Output Rise Characteristic

Vin=Vin(nom), Full Load



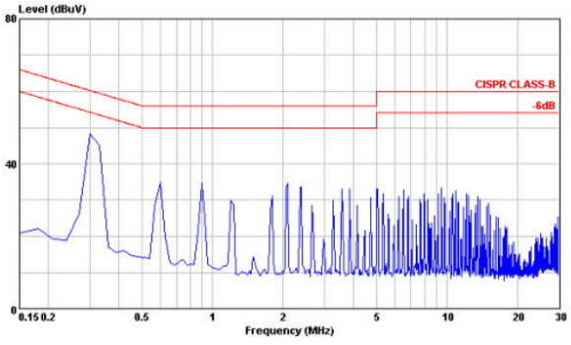
Using ON/OFF Voltage Start-Up and Vo Rise Characteristic

Vin=Vin(nom), Full Load



Conduction Emission of EN55022 Class A

Vin=Vin(nom), Full Load

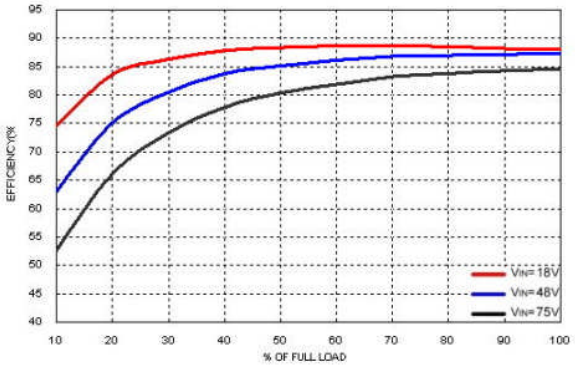


Conduction Emission of EN55022 Class B

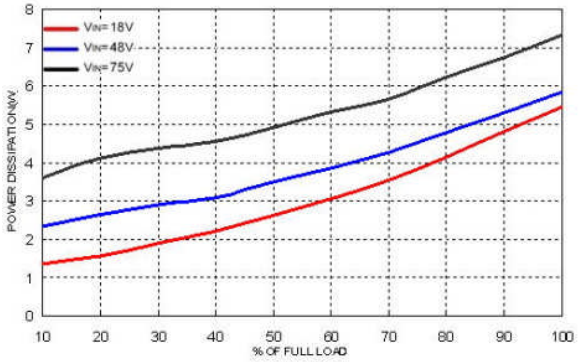
Vin=Vin(nom), Full Load

Characteristic Curves (Continued)

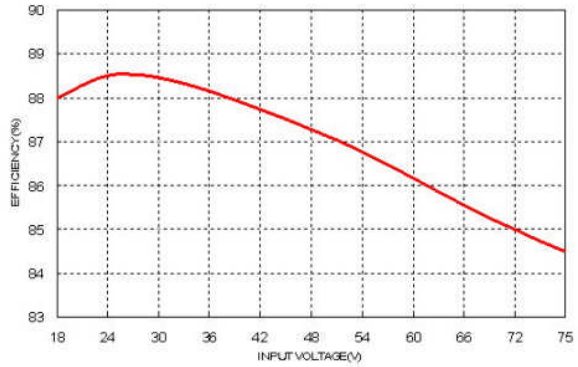
All test conditions are at 25°C.The figures are for PXF40-48WS12.



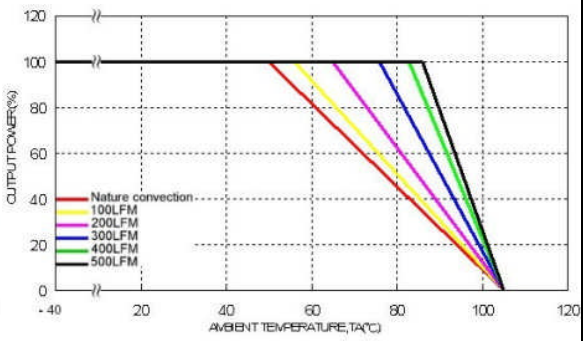
Efficiency Versus Output Current



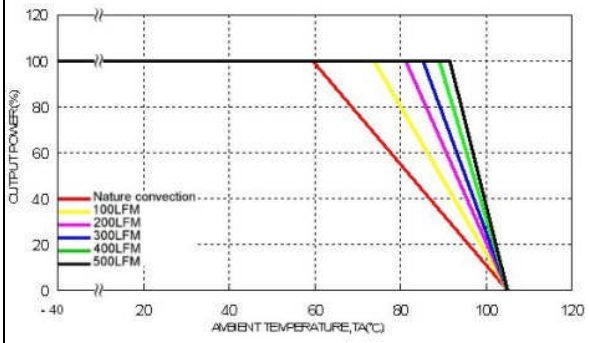
Power Dissipation Versus Output Current



Efficiency Versus Input Voltage. Full Load



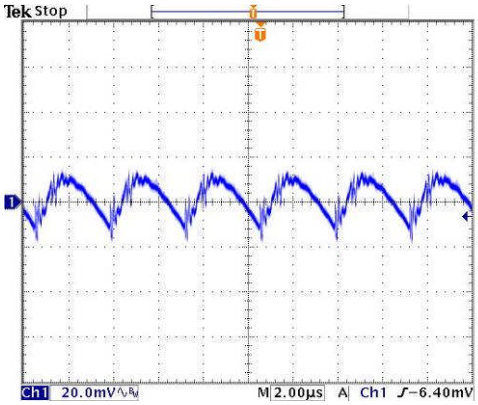
Derating Output Current Versus Ambient Temperature and Airflow Vin=Vin(nom)



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

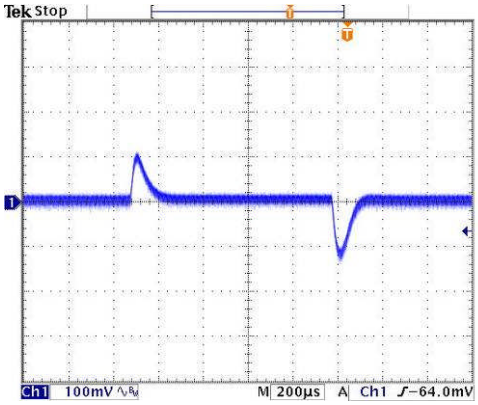
Characteristic Curves (Continued)

All test conditions are at 25°C.The figures are for PXF40-48WS12.

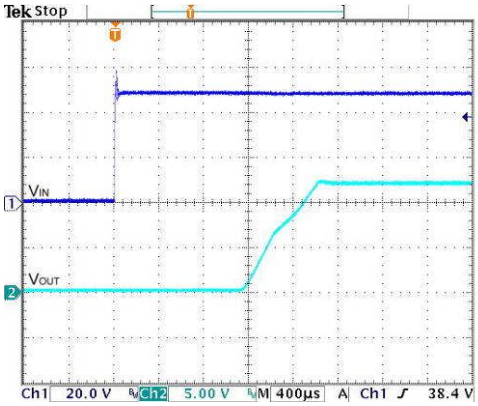


Typical Output Ripple and Noise.

Vin=Vin(nom), Full Load

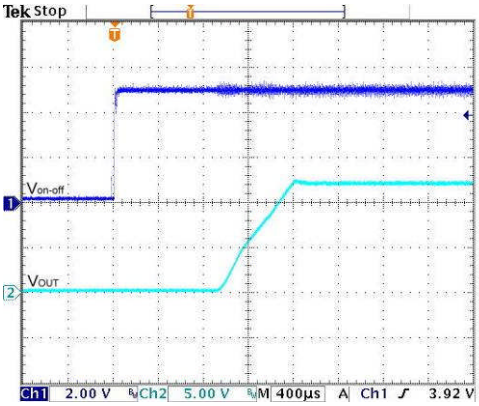


Transient Response to Dynamic Load Change from 100% to 75% to 100% of Full Load ; Vin=Vin(nom)



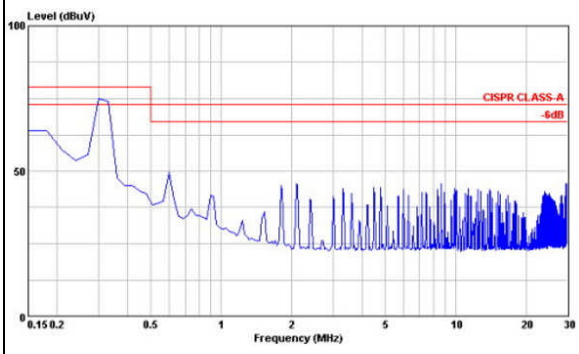
Typical Input Start-Up and Output Rise Characteristic

Vin=Vin(nom), Full Load



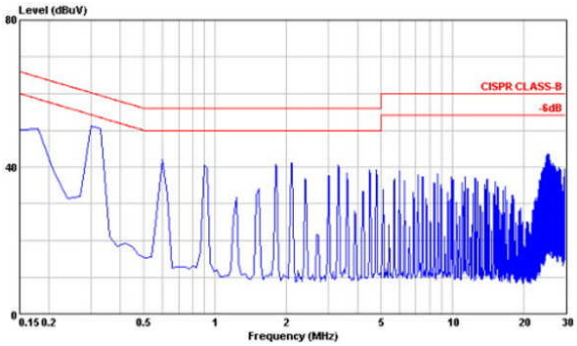
Using ON/OFF Voltage Start-Up and Vo Rise Characteristic

Vin=Vin(nom), Full Load



Conduction Emission of EN55022 Class A

Vin=Vin(nom), Full Load

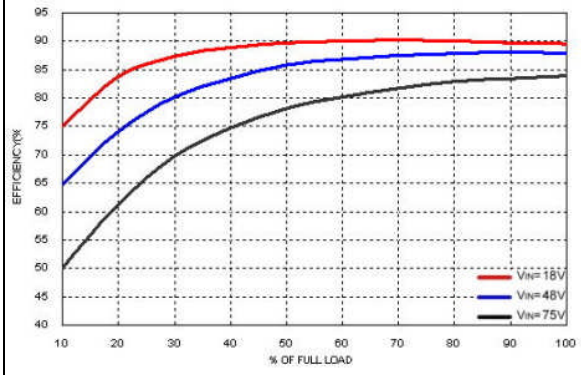


Conduction Emission of EN55022 Class B

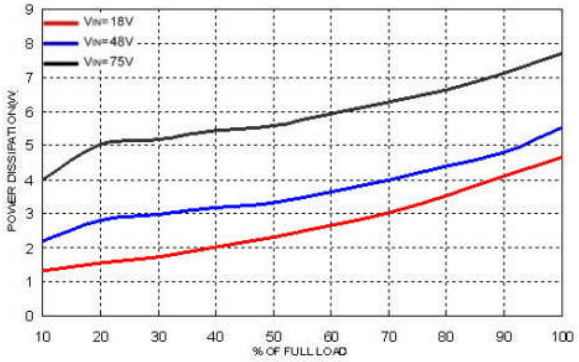
Vin=Vin(nom), Full Load

Characteristic Curves (Continued)

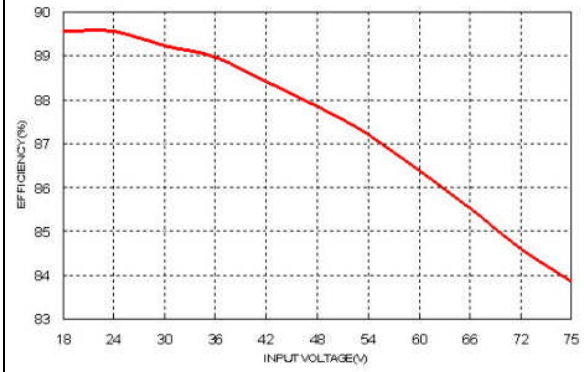
All test conditions are at 25°C.The figures are identical for PXF40-48WS15.



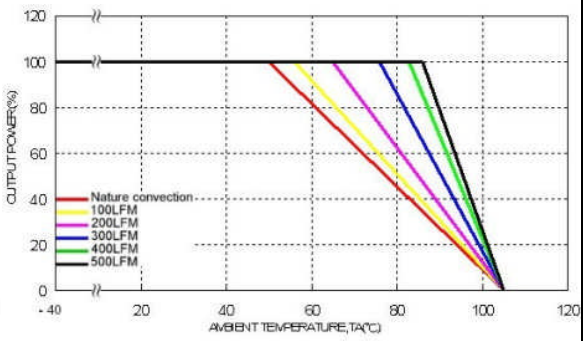
Efficiency Versus Output Current



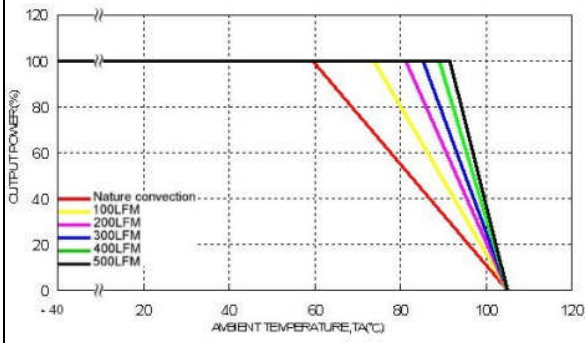
Power Dissipation Versus Output Current



Efficiency Versus Input Voltage. Full Load



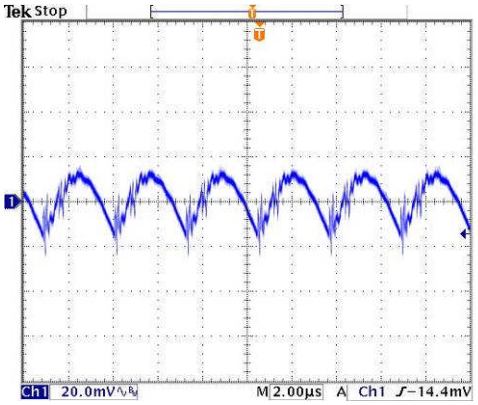
Derating Output Current Versus Ambient Temperature and Airflow Vin=Vin(nom)



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

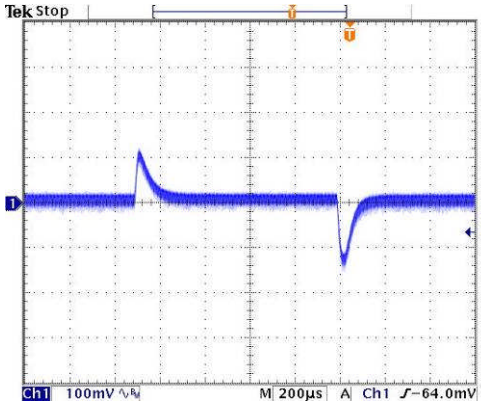
Characteristic Curves (Continued)

All test conditions are at 25°C.The figures are for PXF40-48WS15.

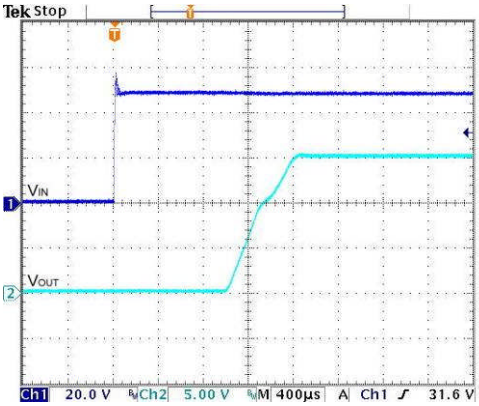


Typical Output Ripple and Noise.

Vin=Vin(nom), Full Load

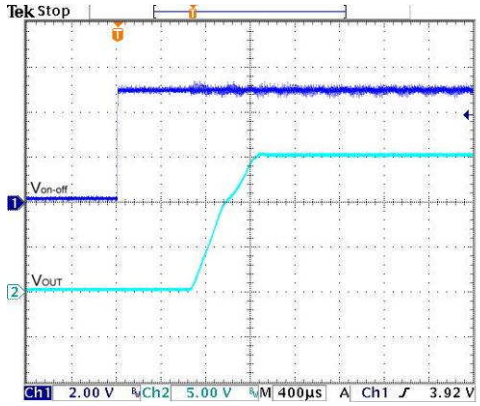


Transient Response to Dynamic Load Change from 100% to 75% to 100% of Full Load ; Vin=Vin(nom)



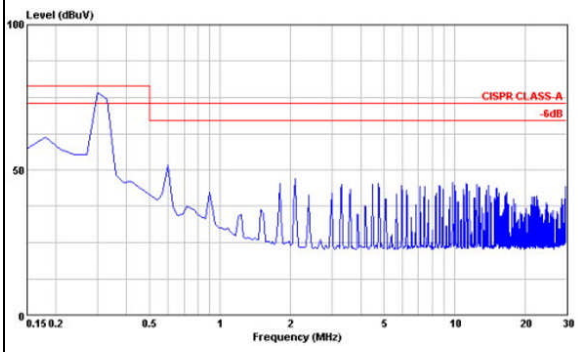
Typical Input Start-Up and Output Rise Characteristic

Vin=Vin(nom), Full Load



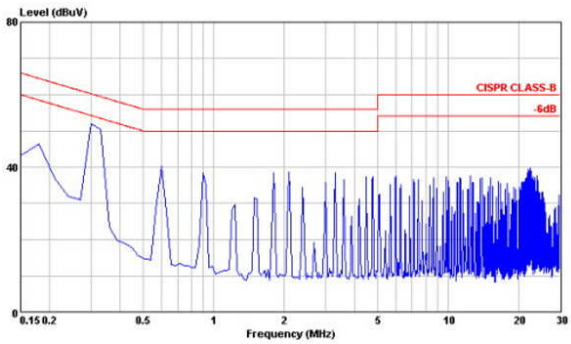
Using ON/OFF Voltage Start-Up and Vo Rise Characteristic

Vin=Vin(nom), Full Load



Conduction Emission of EN55022 Class A

Vin=Vin(nom), Full Load

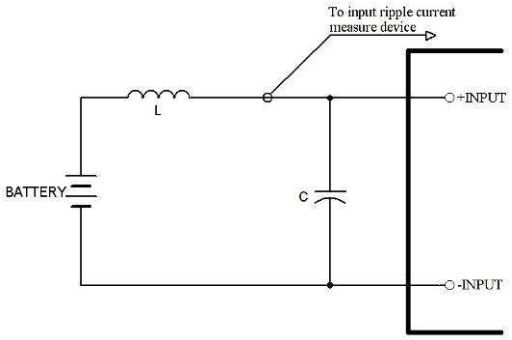


Conduction Emission of EN55022 Class B

Vin=Vin(nom), Full Load

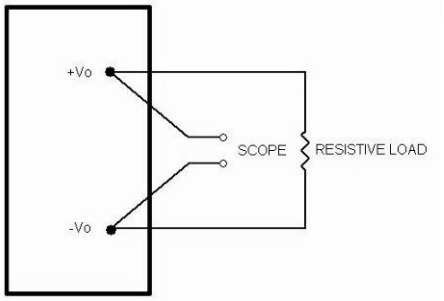
Test Configurations

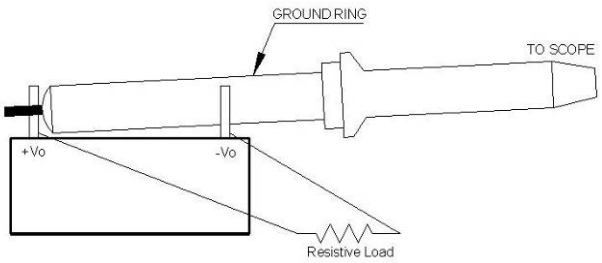
Input reflected-ripple current measurement test:



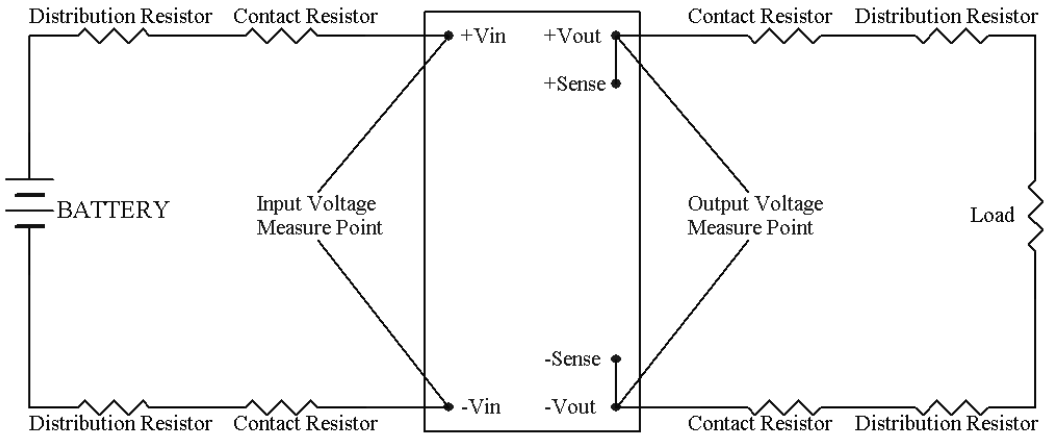
Component	Value	Voltage	Reference
L	12μH	----	----
C	47μF	100V	Aluminum Electrolytic Capacitor

Peak-to-peak output ripple & noise measurement test:





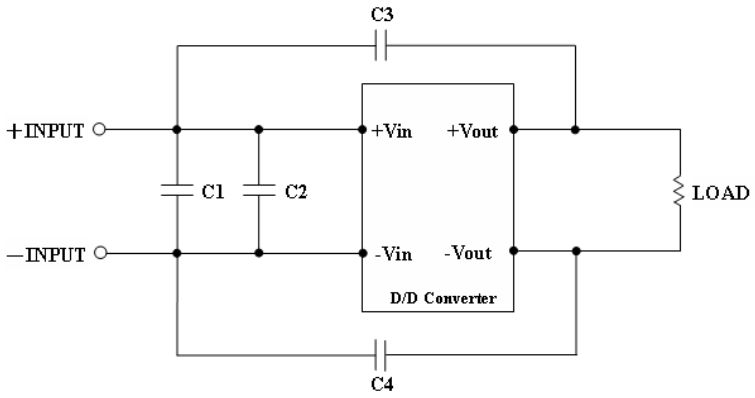
Output voltage and efficiency measurement test:



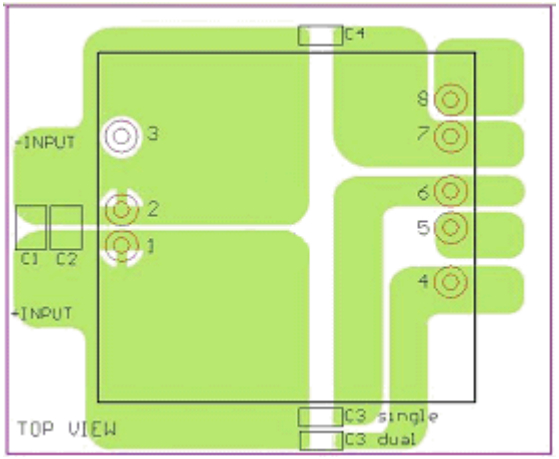
Note: All measurements are taken at the module terminals.

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

EMC Considerations



Suggested Schematic for EN55022 Conducted Emission Class A Limits



Recommended Layout with Input Filter

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

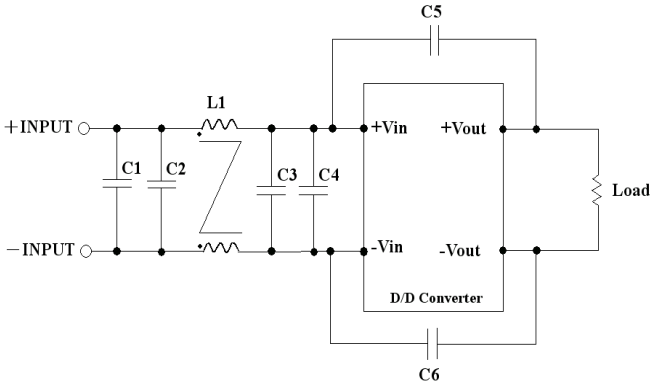
PXF40-24WSxx

Component	Value	Voltage	Reference
C1,C2	----	----	----
C3,C4	1000pF	2KV	1206 MLCC

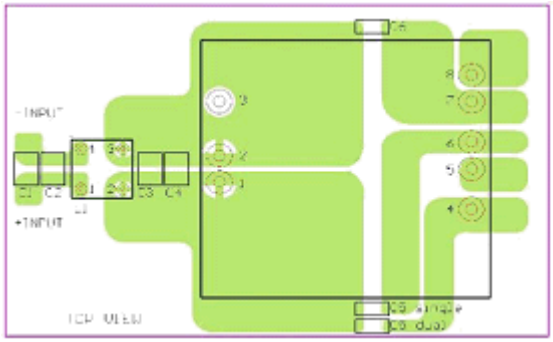
PXF40-48WSxx

Component	Value	Voltage	Reference
C1,C2	2.2uF	100V	1812 MLCC
C3,C4	1000pF	2KV	1206 MLCC

EMC Considerations (Continued)



Suggested Schematic for EN55022 Conducted Emission Class B Limits



Recommended Layout with Input Filter

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

PXF40-24WSxx

Component	Value	Voltage	Reference
C1,C3	4.7uF	50V	1812 MLCC
C5,C6	1000pF	2KV	1206 MLCC
L1	450uH	----	Common Choke

PXF40-48WSxx

Component	Value	Voltage	Reference
C1,C2	2.2uF	100V	1812 MLCC
C3,C4	2.2uF	100V	1812 MLCC
C5,C6	1000pF	2KV	1206 MLCC
L1	830uH	----	Common Choke

This Common Choke L1 is defined as follows:

■

L: 450μH±35% / DCR:25mΩ, max

A height:9.8 mm, Max

■

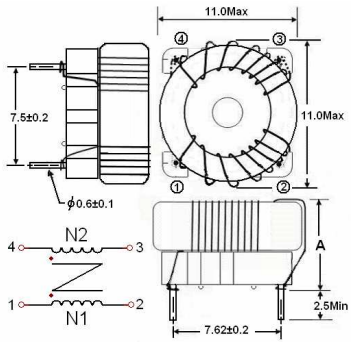
L: 830μH±35% / DCR:31mΩ, max

A height:8.8 mm, Max

■ Test condition:100KHz / 100mV

■ Recommended through hole:Φ0.8mm

■ All dimensions in millimeters



Input Source Impedance

The power module should be connected to a low impedance input source. Highly inductive source impedance can affect the stability of the DC-DC converter. 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 lower 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 PXF40-xxWsxx series.

Hiccup-mode is a method of operation in the converter whose purpose is 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.

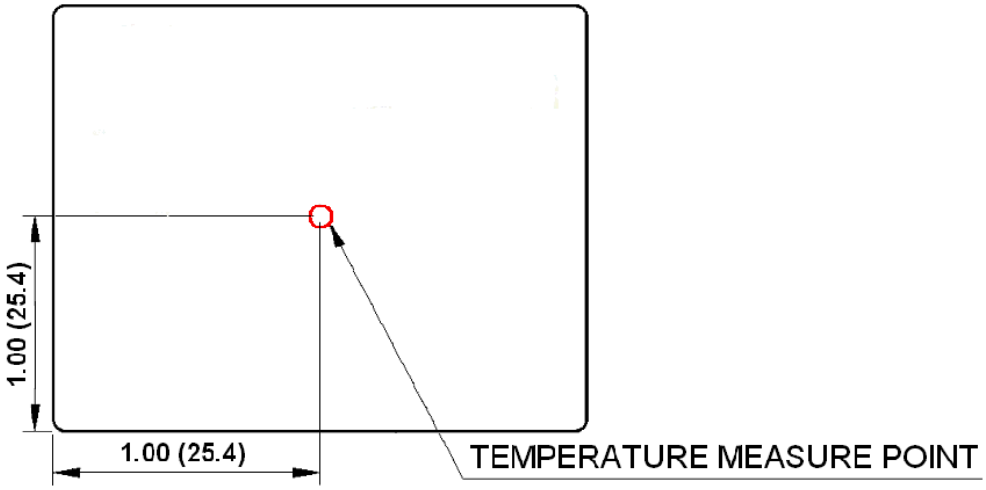
One of the problems resulting from over current is that excessive heat may be generated in power devices; especially MOSFET and Schottky diodes and the temperature of those devices may exceed their specified limits. A protection mechanism has to be used to prevent those power devices from being damaged.

Output Over Voltage Protection

The output over-voltage protection consists of an output Zener diode that monitors the voltage on the output terminals. If the voltage on the output terminals exceeds the over-voltage protection threshold, then the Zener diode clamps the output voltage.

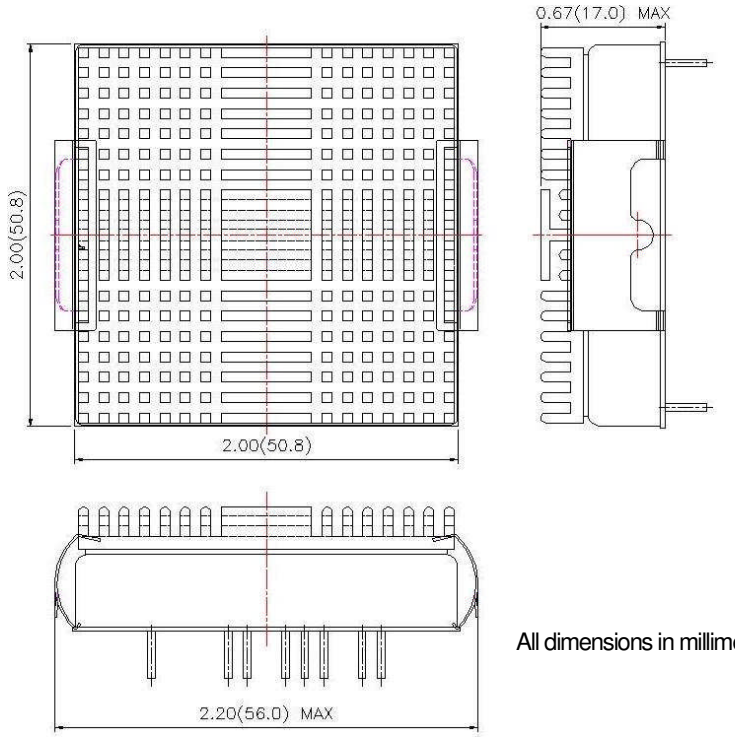
Thermal Consideration

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 shown in the figure below. The temperature at this location should not exceed 105°C. When operating, adequate cooling must be provided to maintain the test point temperature at or below 105°C. Although the maximum point temperature of the converter is 105°C, limiting this temperature to a lower value will increase the reliability of the unit.



Heat Sink Consideration

Use heat-sink (7G-0026A) for lowering temperature; thus increasing the reliability of the converter.



All dimensions in millimeters