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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PXD10-xxWSxx Single Output DC/DC Converter

9 to 36 Vdc and 18 to 75 Vdc input, 3.3 to 15 Vdc Single Output, 10W

TDK·Lambda

Features

- Single output current up to 2.5A
- 10 watts maximum output power
- 4:1 ultra wide input voltage range of 9-36 and 18-75VDC
- Six-sided continuous shield
- High efficiency up to 84%
- Low profile: 2.00×1.00×0.40 inch (50.8×25.4×10.2 mm)
- Fixed switching frequency
- RoHS compliant
- No minimum load
- Input to output isolation: 1600Vdc,min
- Operating case temperature range: 100°C max
- Output over-voltage protection
- Over-current protection, auto-recovery
- Output short circuit protection

Options

- Heat sinks available for extended operation
- Remote on/off and logic configurations

Applications

- Distributed power architectures
- Computer equipment
- Communications equipment

General Description

The PXD10-xxWSxx single output series offers 10 watts of output power from a 2 X 1 X 0.4 inch package. It has 4:1 ultra wide input voltage of 9-36VDC, 18-75VDC,features 1600VDC of isolation, short circuit, over voltage protection, and six sided shielding. All models are particularly suited to telecommunications, industrial, mobile telecom and test equipment applications.

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Absolute Maximum Rating				
Parameter	**Model**	**Min**	**Max**	**Unit**
Input Voltage Continuous Transient (100ms)	 24WSxx 48WSxx 24WSxx 48WSxx		 36 75 50 100	V_{DC}
Operating Ambient Temperature (with derating)	All	-40	85	°C
Operating Case Temperature			100	°C
Storage Temperature	All	-55	105	°C

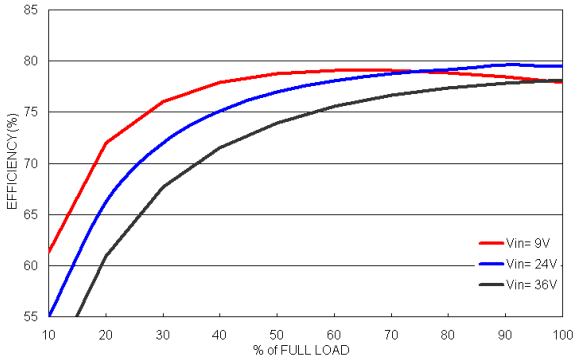
Output Specification					
Parameter	**Model**	**Min**	**Typ**	**Max**	**Unit**
Output Voltage Range (Vin = Vin(nom); Full Load ; T_A=25 °C)	xxWS3P3 xxWS05 xxWS12 xxWS15	3.267 4.95 11.88 14.85	3.3 5 12 15	3.333 5.05 12.12 15.15	V_{DC}
Output Regulation Line (Vin(min) to Vin(max) at Full Load) Load (0% to 100% of Full Load)	All			±0.2 ±0.5	%
Output Ripple & Noise Peak -to- Peak (20MHz bandwidth)	All			50	mV_{P-P}
Temperature Coefficient	All			±0.02	%/°C
Output Voltage Overshoot (Vin(min) to Vin(max); Full Load ; T_A=25°C)	All		0	5	% V_{OUT}
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 Setting Time (V_{OUT} 10% peak deviation)	 All All		 200 250	 	 mV µS
Output Current	xxWS3P3 xxWS05 xxWS12 xxWS15	0 0 0 0		2500 2000 830 670	mA
Output Over Voltage Protection (Zener diode clamp)	xxWS3P3 xxWS05 xxWS12 xxWS15		3.9 6.2 15 18		V_{DC}
Output Over Current Protection	All		130	150	% FL.
Output Short Circuit Protection	All	Hiccup, automatic recovery			

Input Specification					
Parameter	**Model**	**Min**	**Typ**	**Max**	**Unit**
Operating Input Voltage	24WSxx	9	24	36	Vdc
	48WSxx	18	48	75	
Input Current	24WS3P3			465	mA
(Maximum value at Vin = Vin(nom); Full Load)	24WS05			548	
	24WS12			519	
	24WS15			544	
	48WS3P3			239	
	48WS05			270	
	48WS12			259	
	48WS15			262	
Input Standby Current	24WS3P3		13		mA
(Typical value at Vin = Vin(nom); No Load)	24WS05		11		
	24WS12		16		
	24WS15		26		
	48WS3P3		10		
	48WS05		9		
	48WS12		9		
	48WS15		11		
Input Reflected Ripple Current (5 to 20MHz, 12μH source impedance)	All		30		mA_{P-P}
Start Up Time (Vin = Vin(nom) and constant resistive load) Power up	All		20		mS
Remote On/Off Control (Option) (The On/Off pin voltage is referenced to $-V_{IN}$) Positive logic On/Off pin High Voltage (Remote On) On/Off pin Low Voltage (Remote Off) Negative logic On/Off pin High Voltage (Remote On) On/Off pin Low Voltage (Remote Off)	 Suffix –P Suffix –P Suffix –N Suffix –N	 3.5 0 0 3.5	 	 12 1.2 1.2 12	V_{DC}
Remote Off Input Current	All		20		mA
Input Current of Remote Control Pin	All	-0.5		1	mA

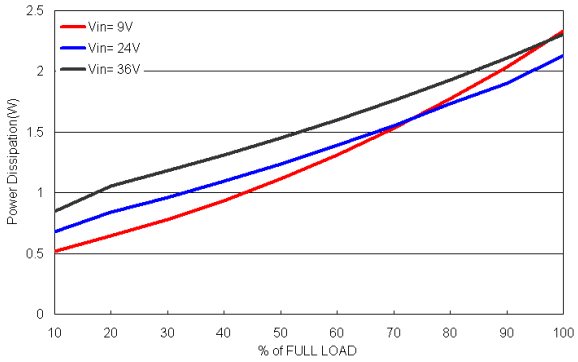
General Specification					
Parameter	**Model**	**Min**	**Typ**	**Max**	**Unit**
Efficiency (Vin = Vin(nom); Full Load ; T_A=25°C)	24WS3P3 24WS05 24WS12 24WS15 48WS3P3 48WS05 48WS12 48WS15		78 80 84 81 76 81 84 84		%
Isolation Voltage Input to Output Input to Case, Output to Case	All	1600 1600			V_{DC}
Isolation Resistance	All	1			GΩ
Isolation Capacitance	All			300	pF
Switching Frequency	All		300		kHz
Weight	All		27.0		g
MTBF Bellcore TR-NWT-000332, T_C=40°C MIL-HDBK-217F	All		 1.976×10^6 1.416×10^6		hours

Characteristic Curves

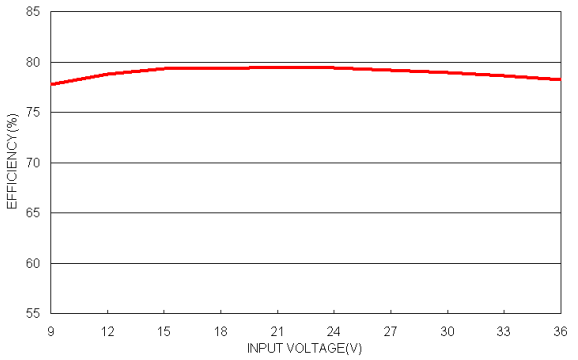
All test conditions are at 25°C.The figures are for PXD10-24WS3P3



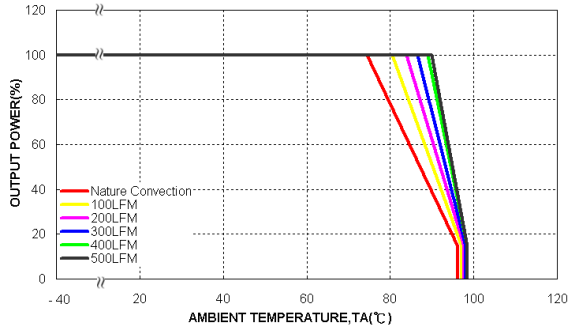
Efficiency versus Output Current



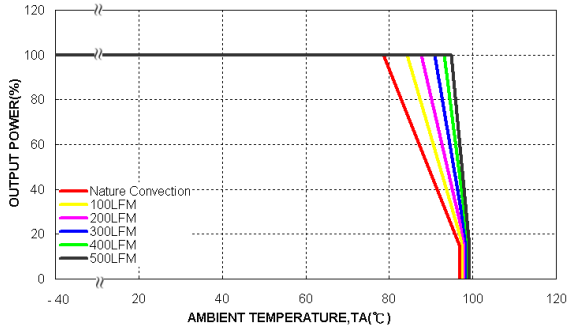
Power Dissipation versus Output Current



Efficiency versus Input Voltage. Full Load



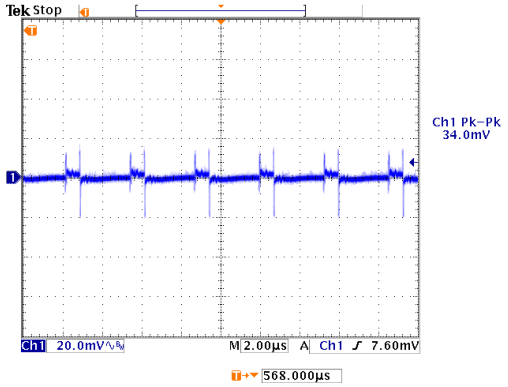
Derating Output Current versus Ambient Temperature and Airflow
Vin = Vin(nom)



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

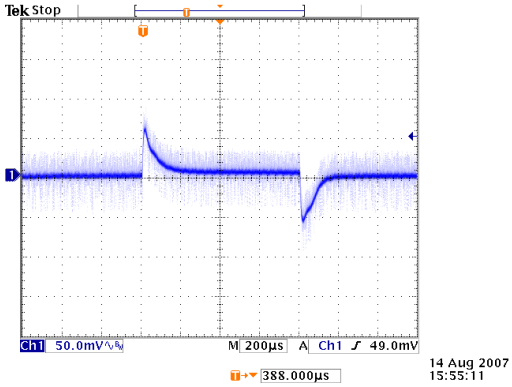
Characteristic Curves (Continued)

All test conditions are at 25°C.The figures are for PXD10-24WS3P3

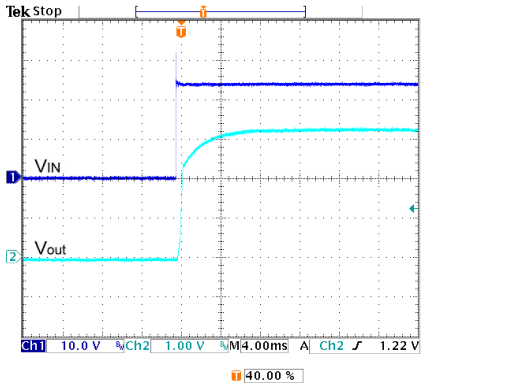


Typical Output Ripple and Noise.

Vin = Vin(nom) ; Full Load

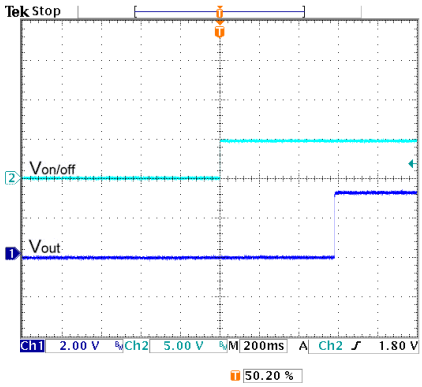


Transient Response to Dynamic Load Change from 100% to 75% to 100% of Full Load ; Vin = Vin(nom)



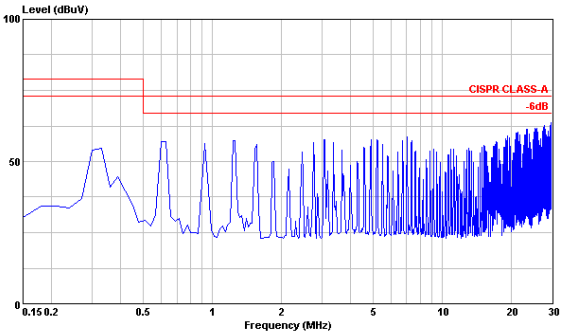
Typical Input Start-Up and Output Rise Characteristic

Vin = Vin(nom) ; Full Load



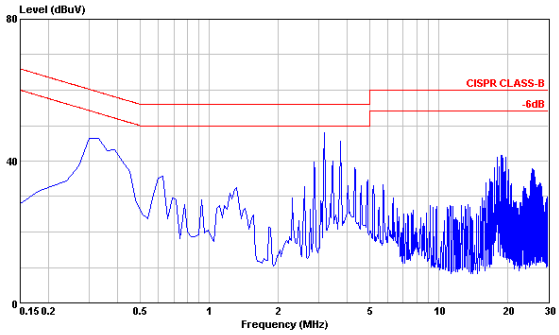
Using ON/OFF Voltage Start-Up and Vo Rise Characteristic

Vin = Vin(nom) ; Full Load



Conduction Emission of EN55022 Class A

Vin = Vin(nom) ; Full Load

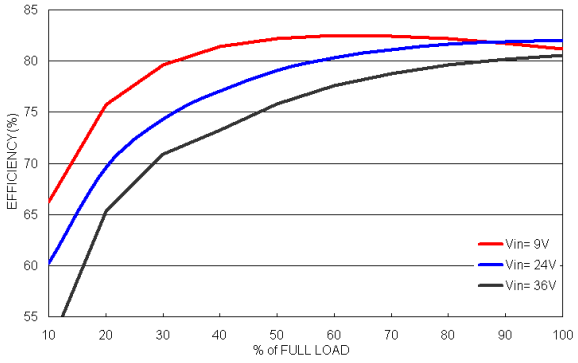


Conduction Emission of EN55022 Class B

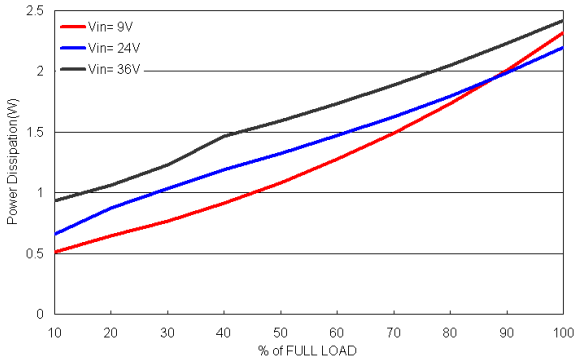
Vin = Vin(nom) ; Full Load

Characteristic Curves

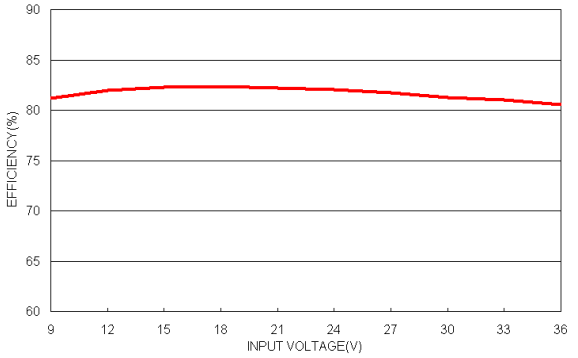
All test conditions are at 25°C.The figures are for PXD10-24WS05



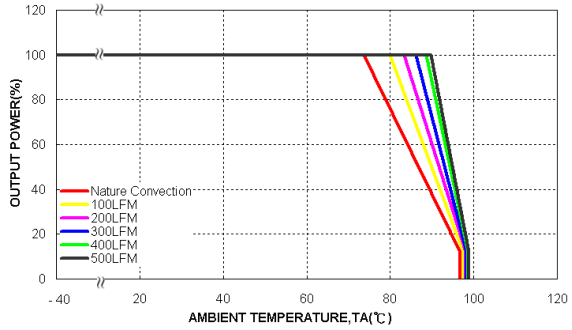
Efficiency versus Output Current



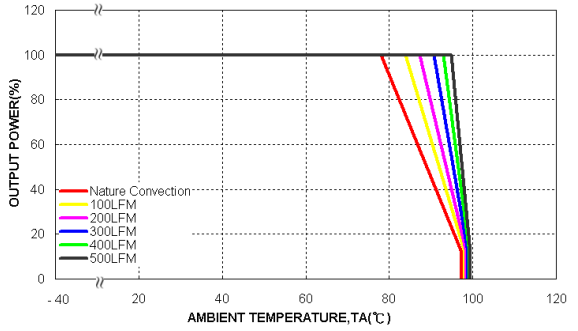
Power Dissipation versus Output Current



Efficiency versus Input Voltage. Full Load



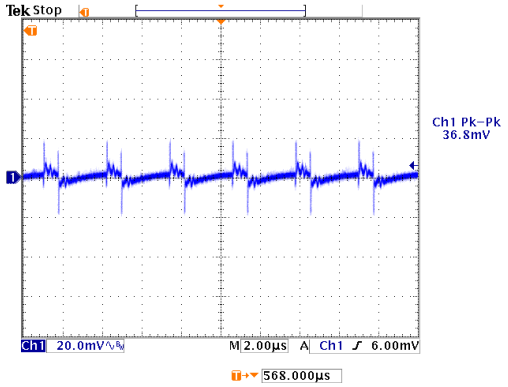
Derating Output Current versus Ambient Temperature and Airflow Vin = Vin(nom)



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

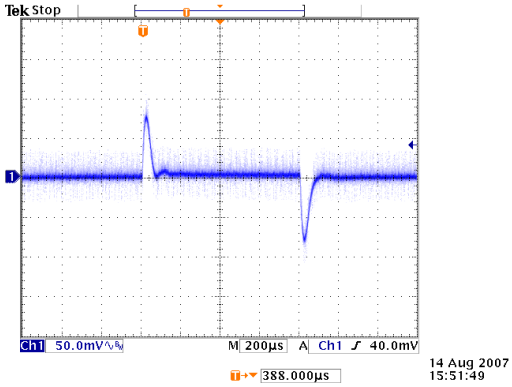
Characteristic Curves (Continued)

All test conditions are at 25°C.The figures are for PXD10-24WS05

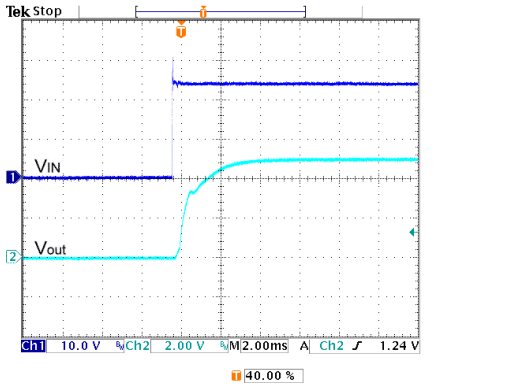


Typical Output Ripple and Noise.

Vin = Vin(nom) ; Full Load

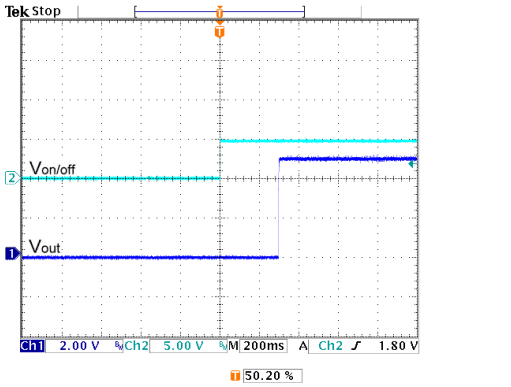


Transient Response to Dynamic Load Change from 100% to 75% to 100% of Full Load ; Vin = Vin(nom)



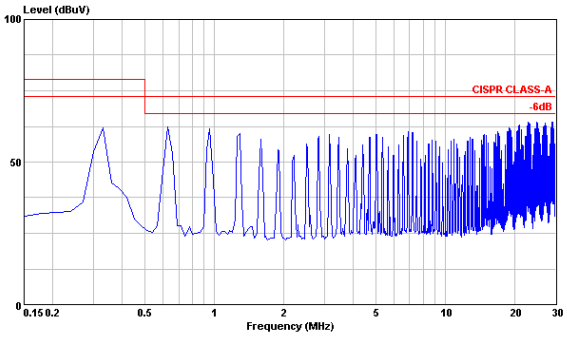
Typical Input Start-Up and Output Rise Characteristic

Vin = Vin(nom) ; Full Load



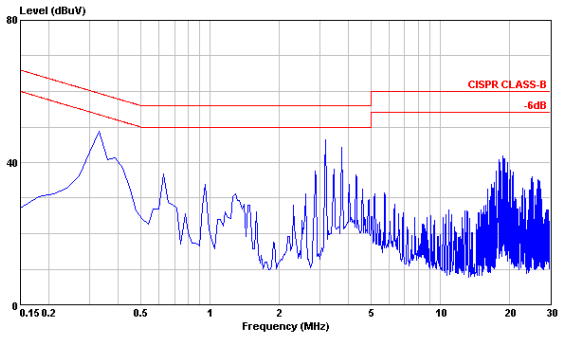
Using ON/OFF Voltage Start-Up and Vo Rise Characteristic

Vin = Vin(nom) ; Full Load



Conduction Emission of EN55022 Class A

Vin = Vin(nom) ; Full Load

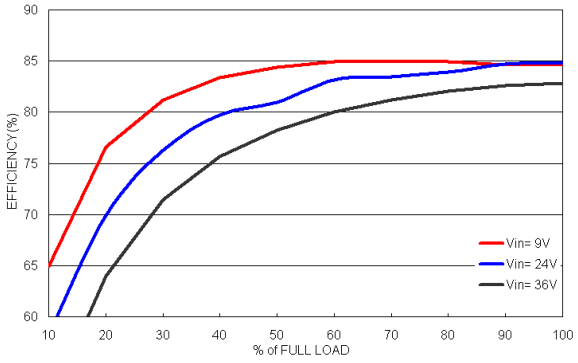


Conduction Emission of EN55022 Class B

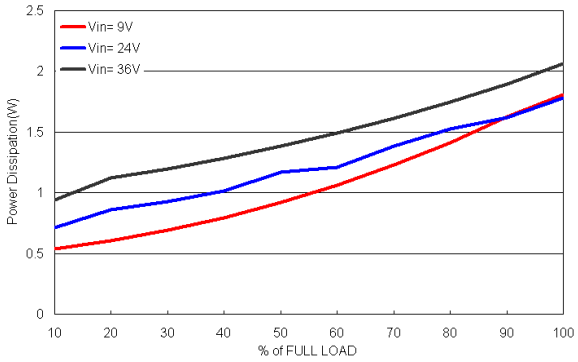
Vin = Vin(nom) ; Full Load

Characteristic Curves (Continued)

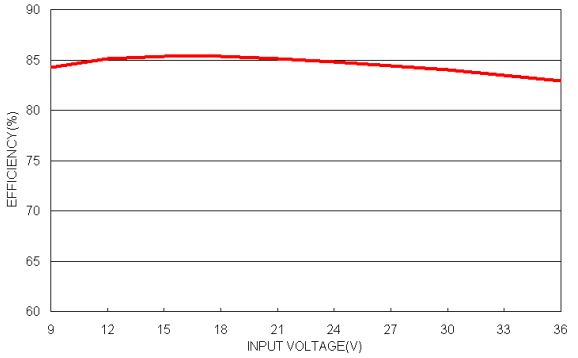
All test conditions are at 25°C.The figures are for PXD10-24WS12



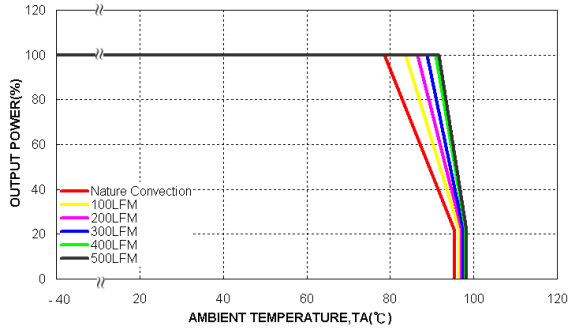
Efficiency versus Output Current



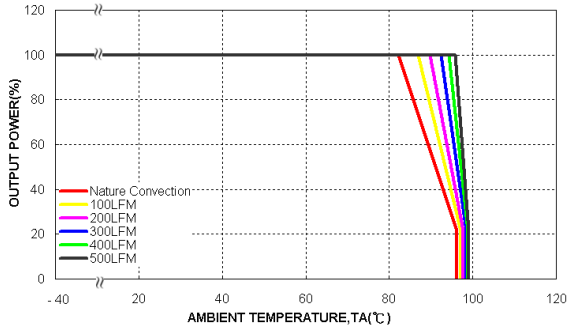
Power Dissipation versus Output Current



Efficiency versus Input Voltage. Full Load



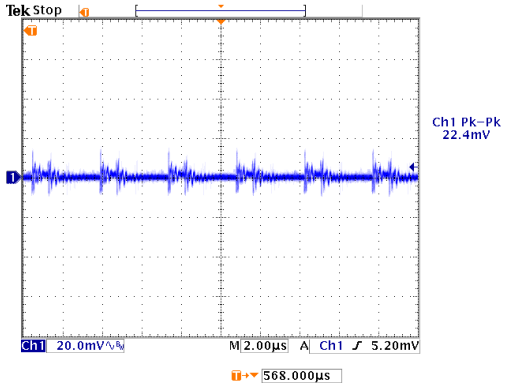
Derating Output Current versus Ambient Temperature and Airflow Vin = Vin(nom)



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

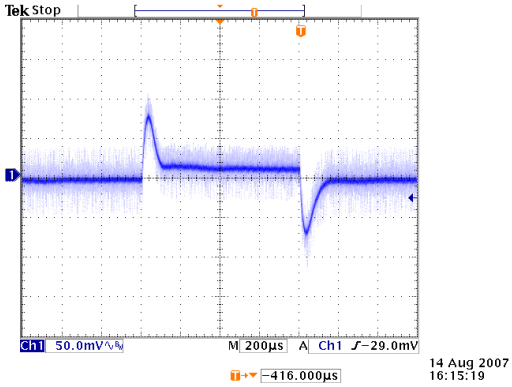
Characteristic Curves (Continued)

All test conditions are at 25°C.The figures are for PXD10-24WS12

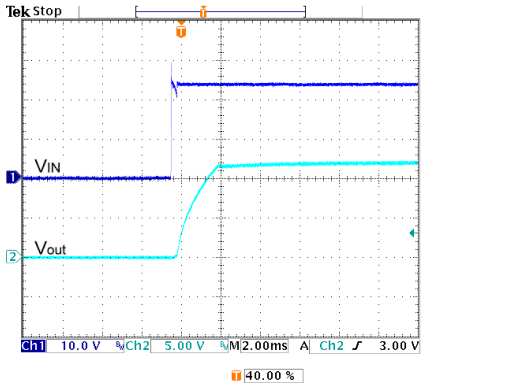


Typical Output Ripple and Noise.

Vin = Vin(nom) ; Full Load

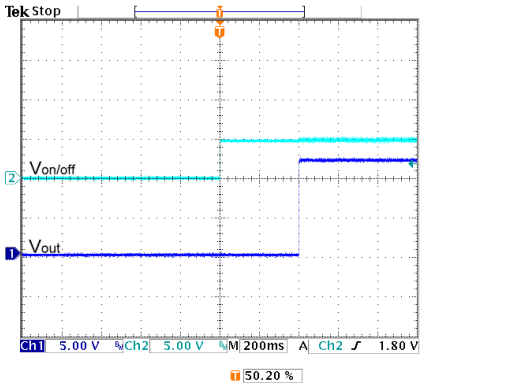


Transient Response to Dynamic Load Change from 100% to 75% to 100% of Full Load ; Vin = Vin(nom)



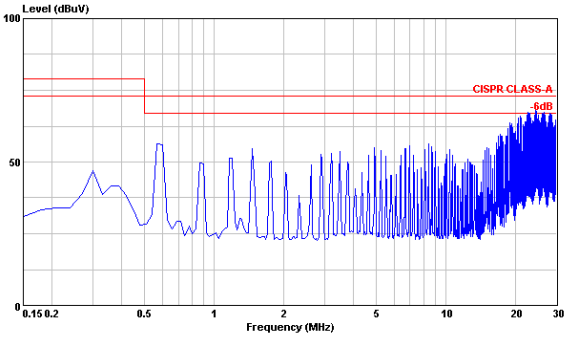
Typical Input Start-Up and Output Rise Characteristic

Vin = Vin(nom) ; Full Load



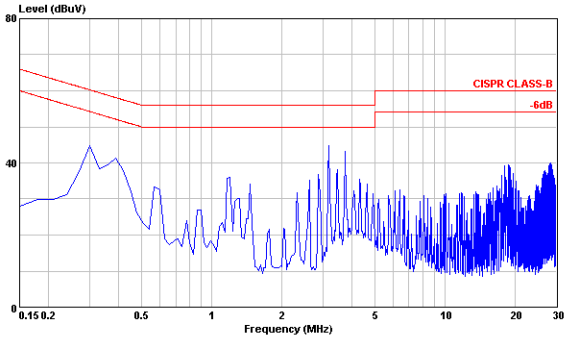
Using ON/OFF Voltage Start-Up and Vo Rise Characteristic

Vin = Vin(nom) ; Full Load



Conduction Emission of EN55022 Class A

Vin = Vin(nom) ; Full Load

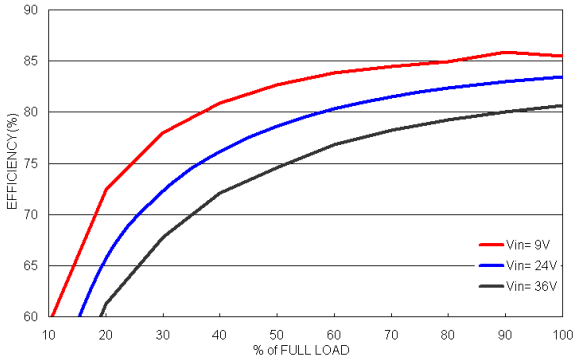


Conduction Emission of EN55022 Class B

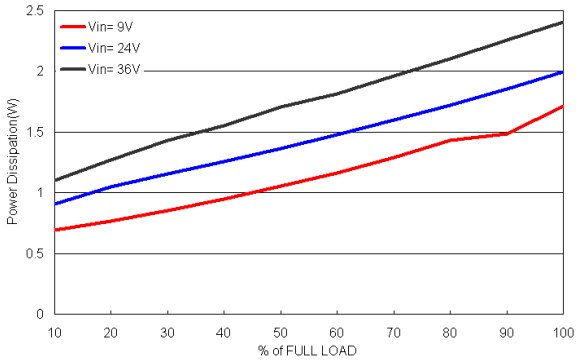
Vin = Vin(nom) ; Full Load

Characteristic Curves (Continued)

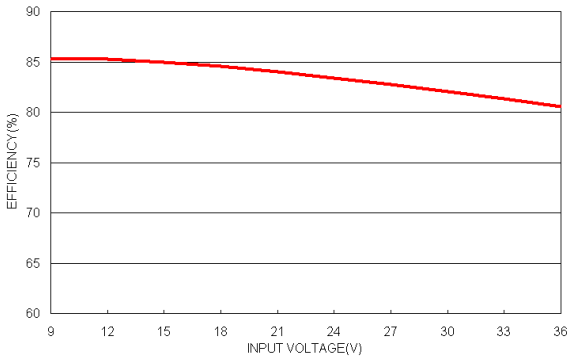
All test conditions are at 25°C.The figures are for PXD10-24WS15



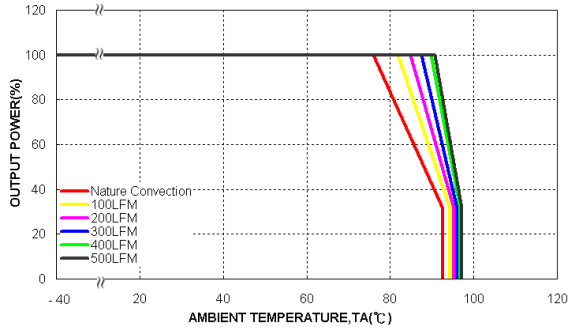
Efficiency versus Output Current



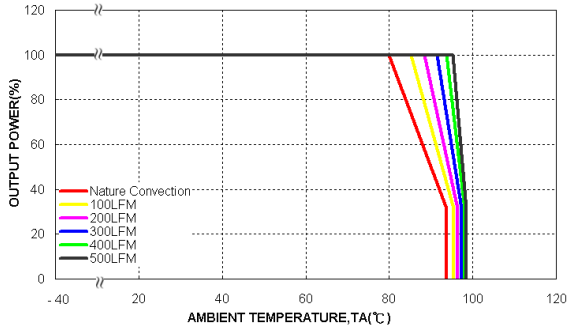
Power Dissipation versus Output Current



Efficiency versus Input Voltage. Full Load



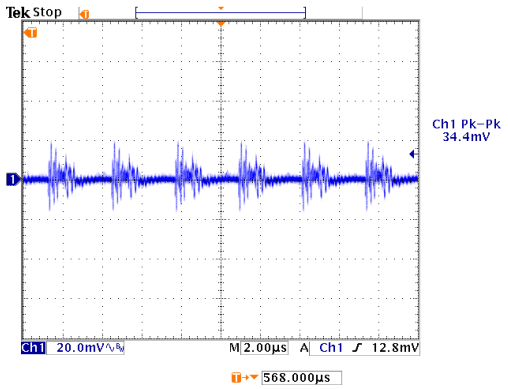
Derating Output Current versus Ambient Temperature and Airflow
Vin = Vin(nom)



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

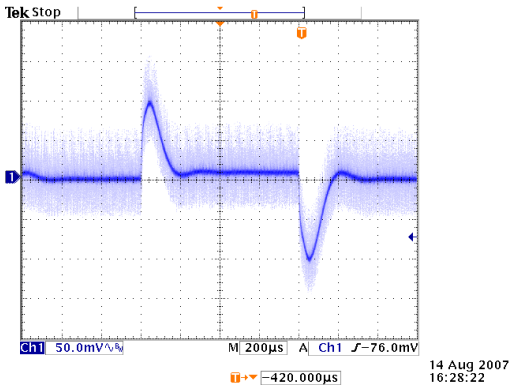
Characteristic Curves (Continued)

All test conditions are at 25°C.The figures are for PXD10-24WS15

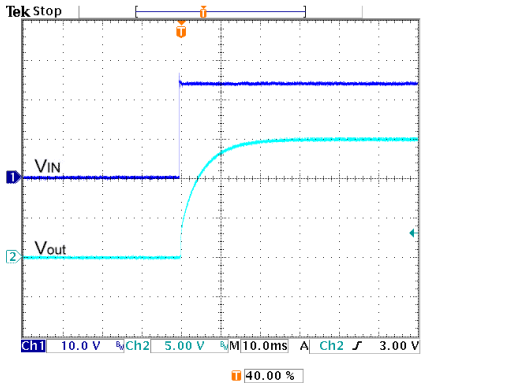


Typical Output Ripple and Noise.

Vin = Vin(nom) ; Full Load

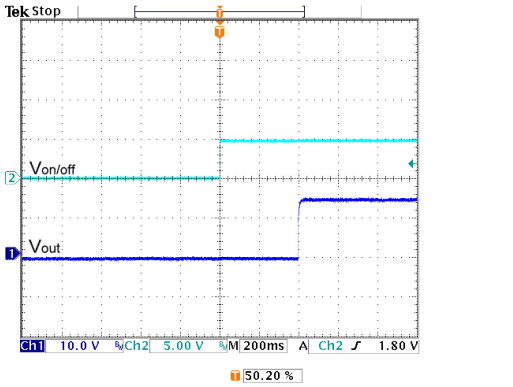


Transient Response to Dynamic Load Change from 100% to 75% to 100% of Full Load ; Vin = Vin(nom)



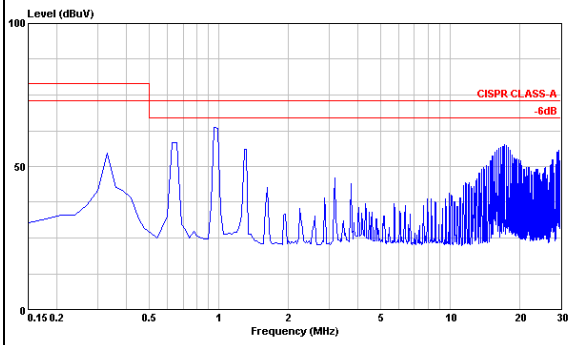
Typical Input Start-Up and Output Rise Characteristic

Vin = Vin(nom) ; Full Load



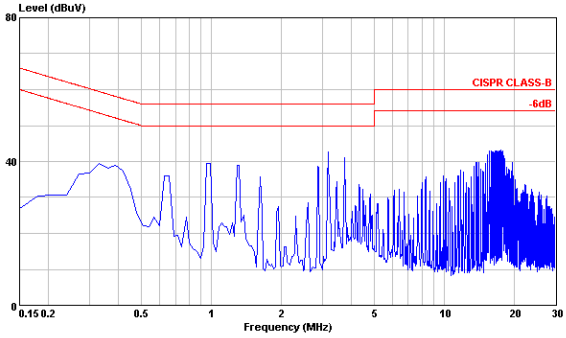
Using ON/OFF Voltage Start-Up and Vo Rise Characteristic

Vin = Vin(nom) ; Full Load



Conduction Emission of EN55022 Class A

Vin = Vin(nom) ; Full Load

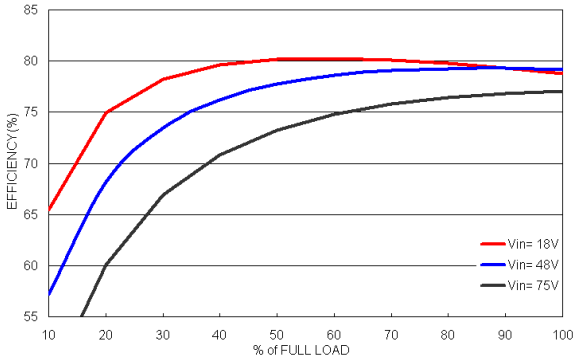


Conduction Emission of EN55022 Class B

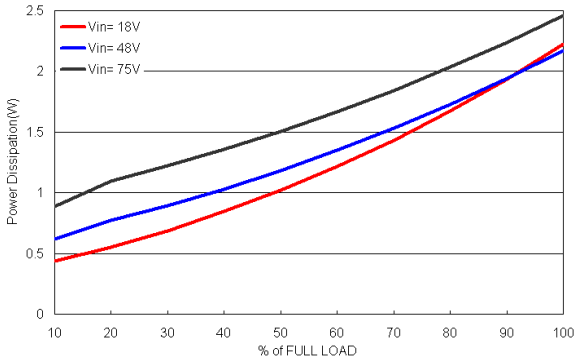
Vin = Vin(nom) ; Full Load

Characteristic Curves (Continued)

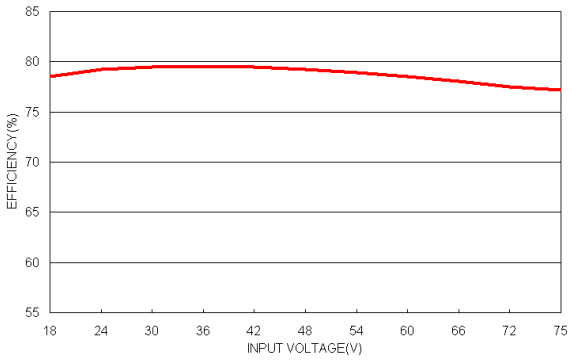
All test conditions are at 25°C.The figures are for PXD10-48WS3P3



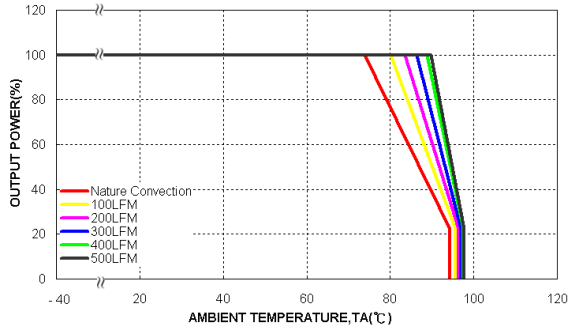
Efficiency versus Output Current



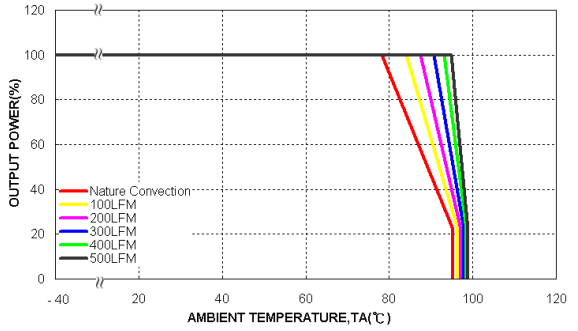
Power Dissipation versus Output Current



Efficiency versus Input Voltage. Full Load



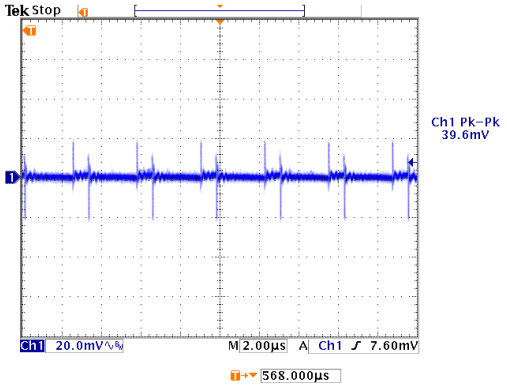
Derating Output Current versus Ambient Temperature and Airflow Vin = Vin(nom)



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

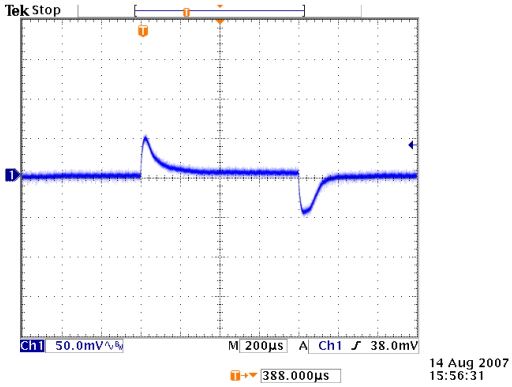
Characteristic Curves (Continued)

All test conditions are at 25°C.The figures are for PXD10-48WS3P3

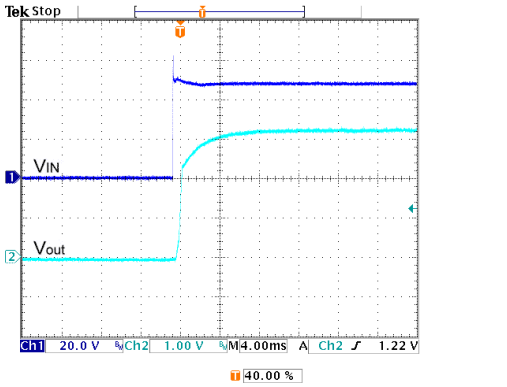


Typical Output Ripple and Noise.

Vin = Vin(nom) ; Full Load

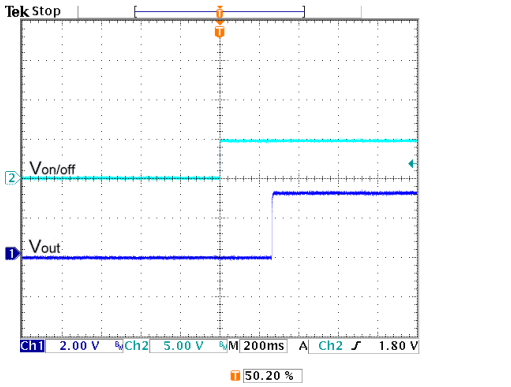


Transient Response to Dynamic Load Change from 100% to 75% to 100% of Full Load ; Vin = Vin(nom)



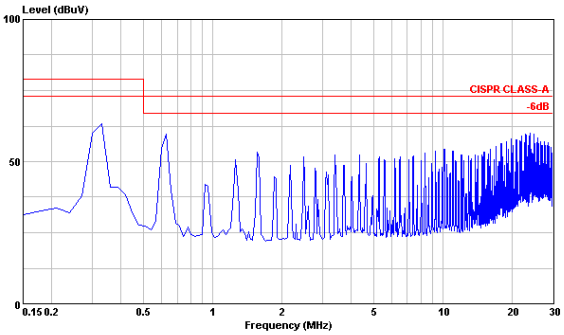
Typical Input Start-Up and Output Rise Characteristic

Vin = Vin(nom) ; Full Load



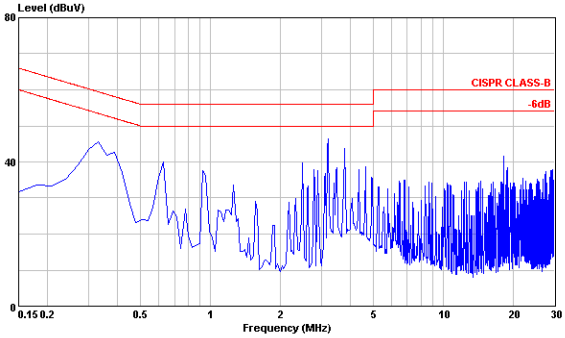
Using ON/OFF Voltage Start-Up and Vo Rise Characteristic

Vin = Vin(nom) ; Full Load



Conduction Emission of EN55022 Class A

Vin = Vin(nom) ; Full Load

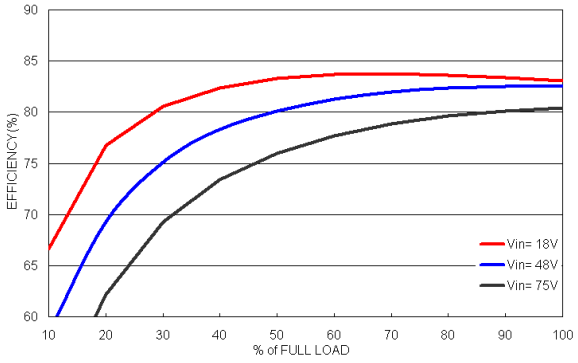


Conduction Emission of EN55022 Class B

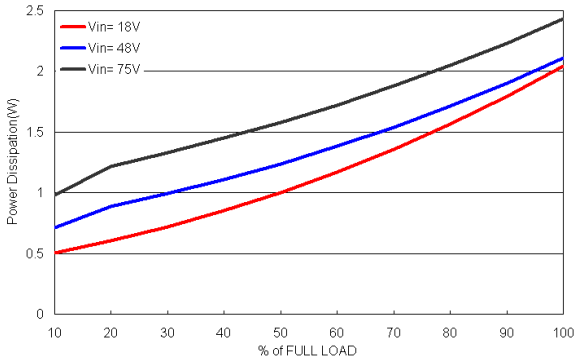
Vin = Vin(nom) ; Full Load

Characteristic Curves (Continued)

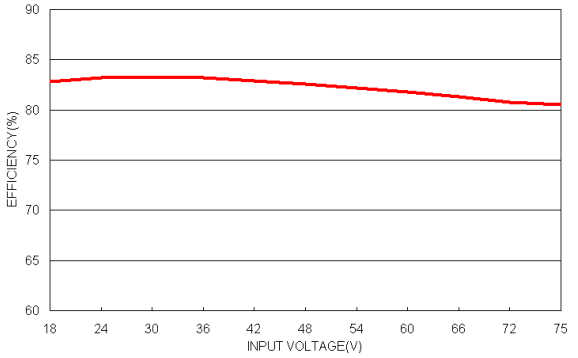
All test conditions are at 25°C.The figures are for PXD10-48WS05



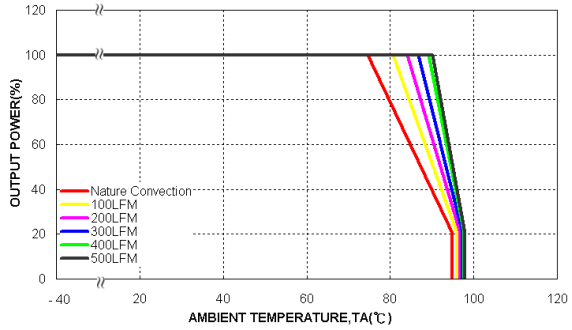
Efficiency versus Output Current



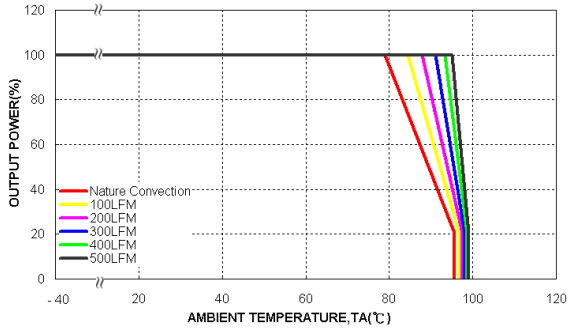
Power Dissipation versus Output Current



Efficiency versus Input Voltage. Full Load



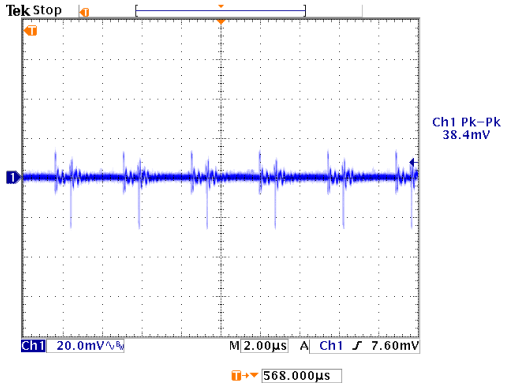
Derating Output Current versus Ambient Temperature and Airflow Vin = Vin(nom)



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

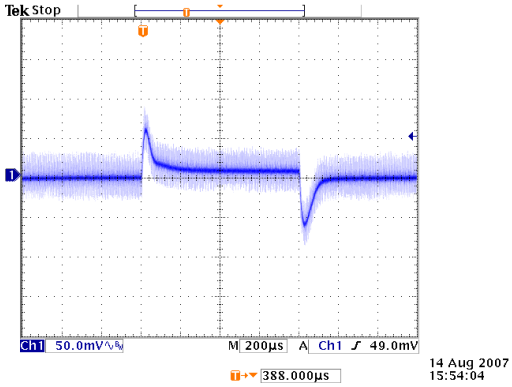
Characteristic Curves (Continued)

All test conditions are at 25°C.The figures are for PXD10-48WS05

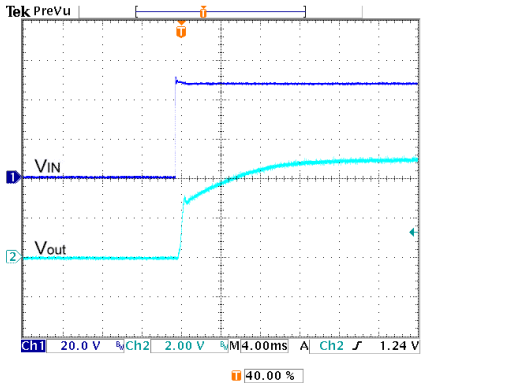


Typical Output Ripple and Noise.

Vin = Vin(nom) ; Full Load

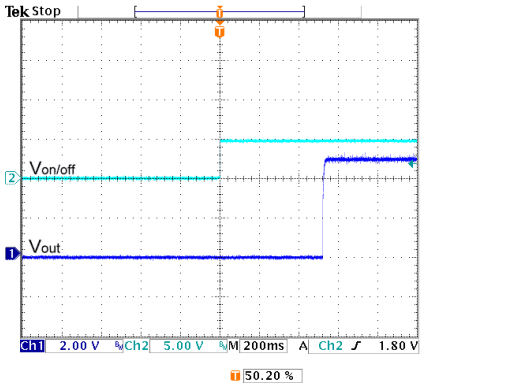


Transient Response to Dynamic Load Change from 100% to 75% to 100% of Full Load ; Vin = Vin(nom)



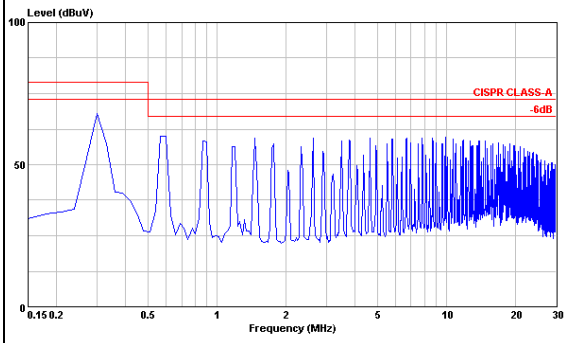
Typical Input Start-Up and Output Rise Characteristic

Vin = Vin(nom) ; Full Load



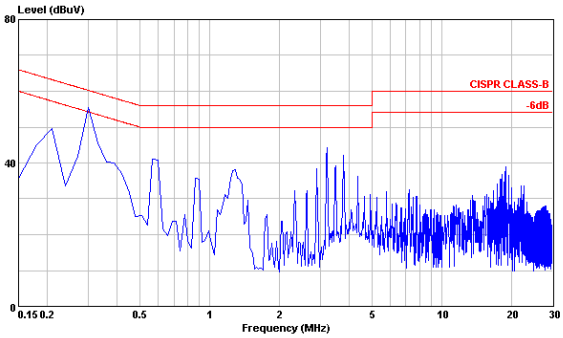
Using ON/OFF Voltage Start-Up and Vo Rise Characteristic

Vin = Vin(nom) ; Full Load



Conduction Emission of EN55022 Class A

Vin = Vin(nom) ; Full Load

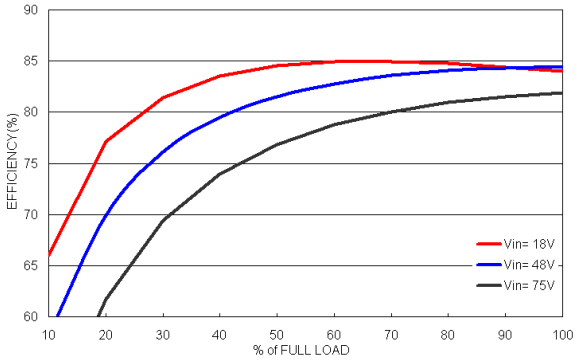


Conduction Emission of EN55022 Class B

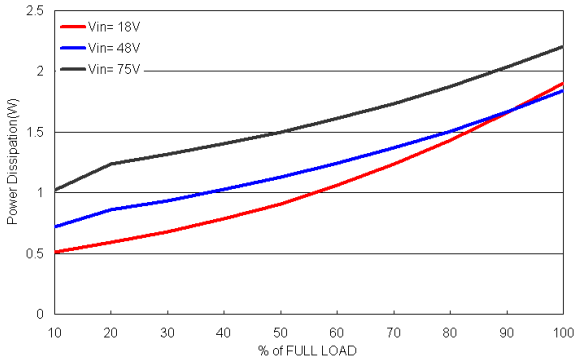
Vin = Vin(nom) ; Full Load

Characteristic Curves (Continued)

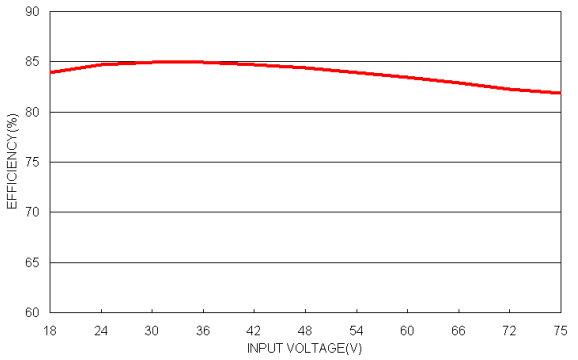
All test conditions are at 25°C.The figures are for PXD10-48WS12



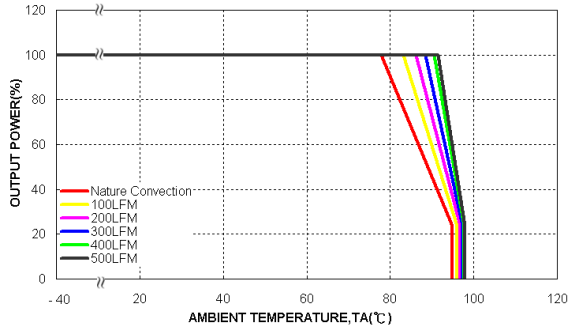
Efficiency versus Output Current



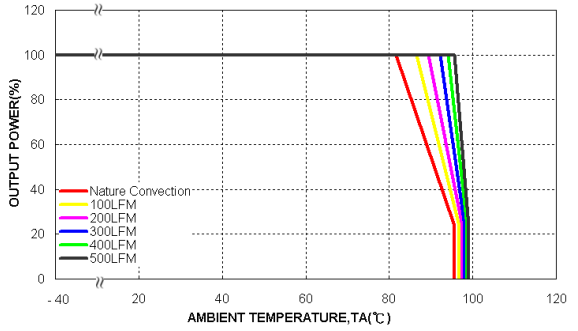
Power Dissipation versus Output Current



Efficiency versus Input Voltage. Full Load



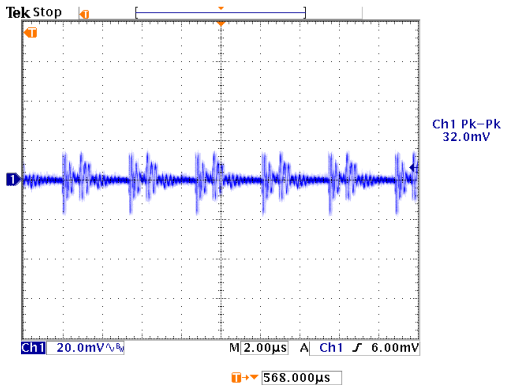
Derating Output Current versus Ambient Temperature and Airflow Vin = Vin(nom)



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

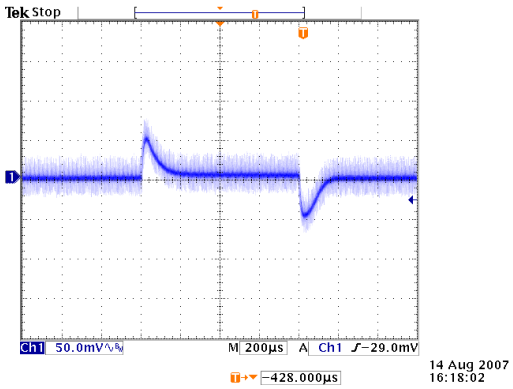
Characteristic Curves (Continued)

All test conditions are at 25°C.The figures are for PXD10-48WS12

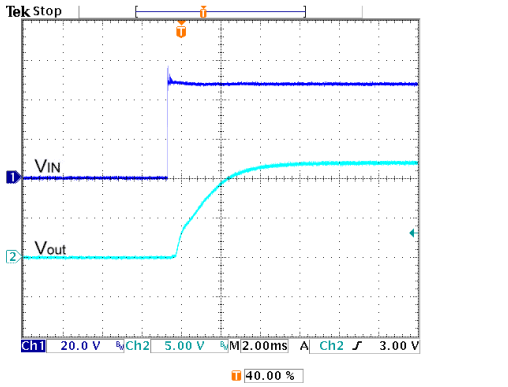


Typical Output Ripple and Noise.

Vin = Vin(nom) ; Full Load

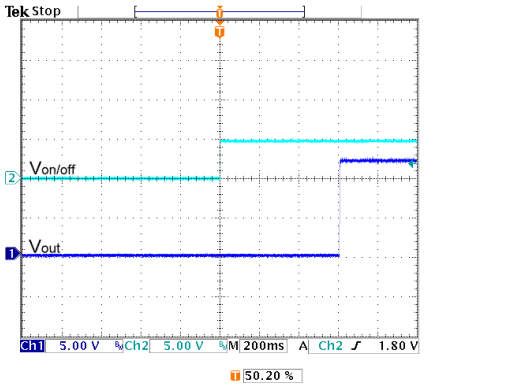


Transient Response to Dynamic Load Change from 100% to 75% to 100% of Full Load ; Vin = Vin(nom)



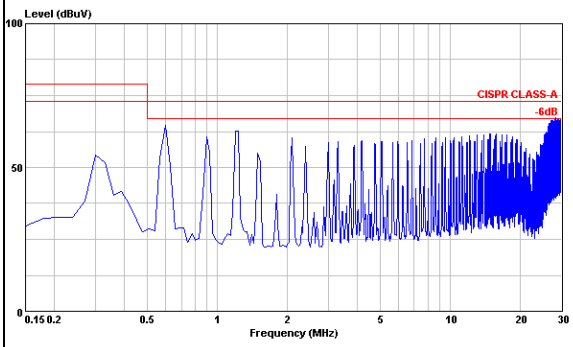
Typical Input Start-Up and Output Rise Characteristic

Vin = Vin(nom) ; Full Load



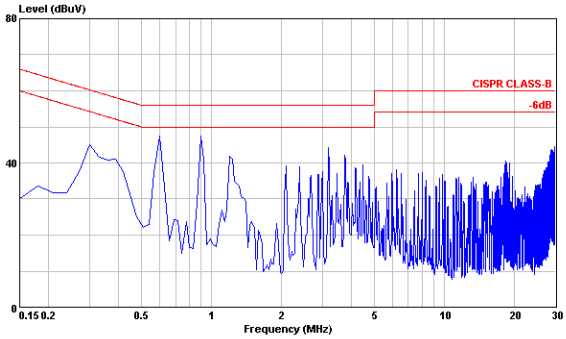
Using ON/OFF Voltage Start-Up and Vo Rise Characteristic

Vin = Vin(nom) ; Full Load



Conduction Emission of EN55022 Class A

Vin = Vin(nom) ; Full Load

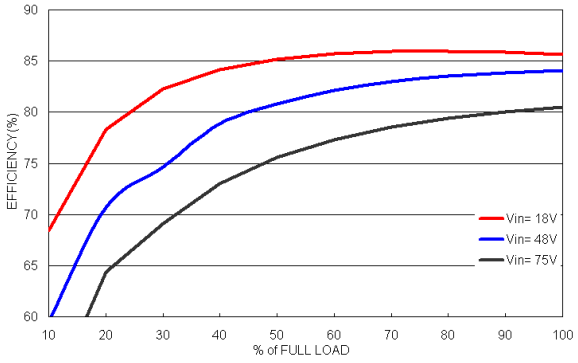


Conduction Emission of EN55022 Class B

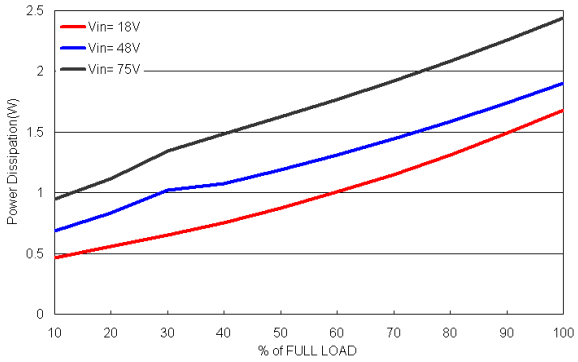
Vin = Vin(nom) ; Full Load

Characteristic Curves (Continued)

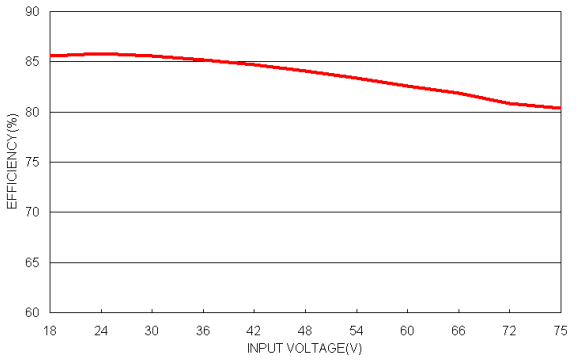
All test conditions are at 25°C.The figures are for PXD10-48WS15



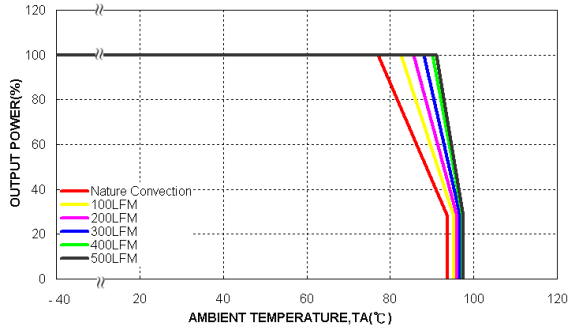
Efficiency versus Output Current



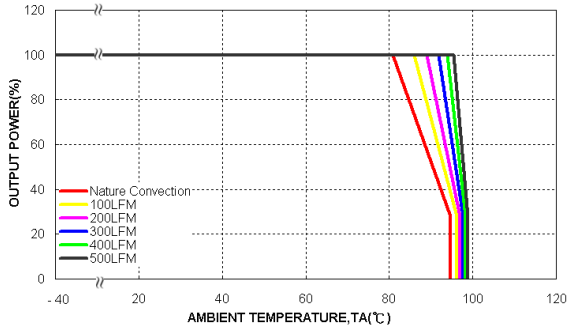
Power Dissipation versus Output Current



Efficiency versus Input Voltage. Full Load



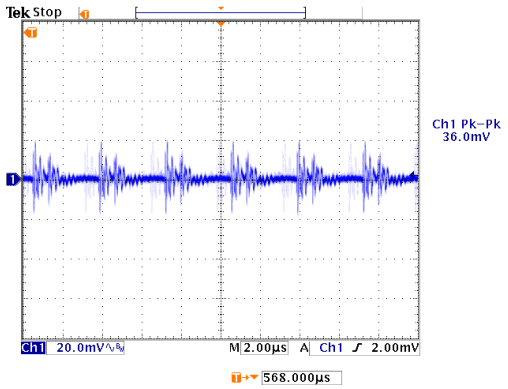
Derating Output Current versus Ambient Temperature and Airflow Vin = Vin(nom)



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

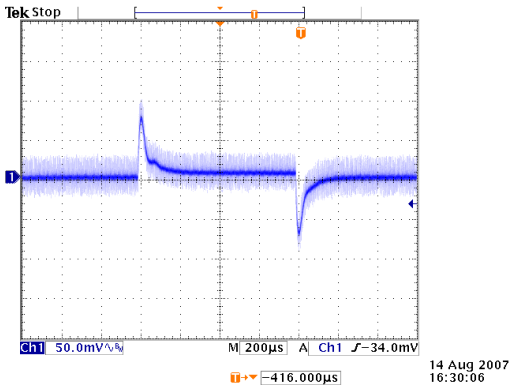
Characteristic Curves (Continued)

All test conditions are at 25°C.The figures are for PXD10-48WS15

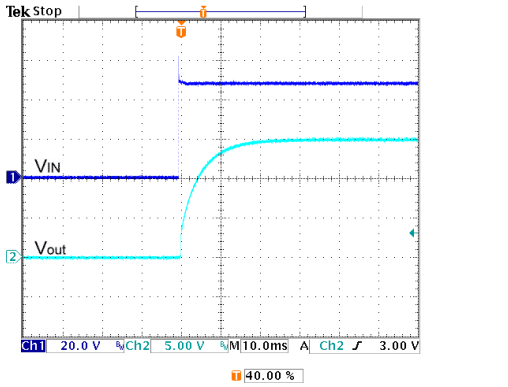


Typical Output Ripple and Noise.

Vin = Vin(nom) ; Full Load

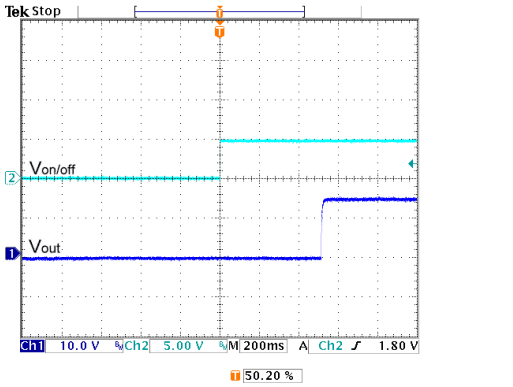


Transient Response to Dynamic Load Change from 100% to 75% to 100% of Full Load ; Vin = Vin(nom)



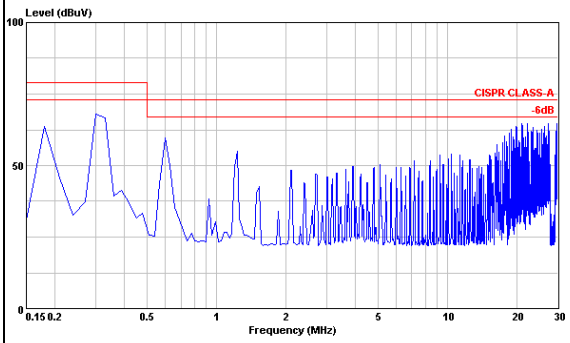
Typical Input Start-Up and Output Rise Characteristic

Vin = Vin(nom) ; Full Load



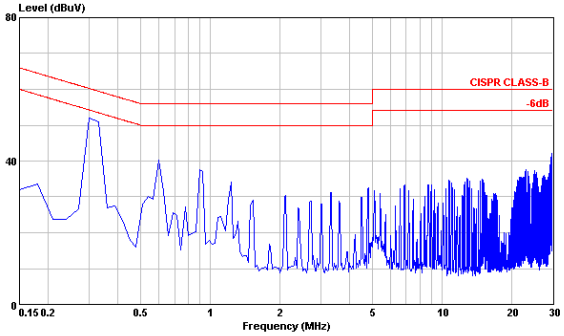
Using ON/OFF Voltage Start-Up and Vo Rise Characteristic

Vin = Vin(nom) ; Full Load



Conduction Emission of EN55022 Class A

Vin = Vin(nom) ; Full Load

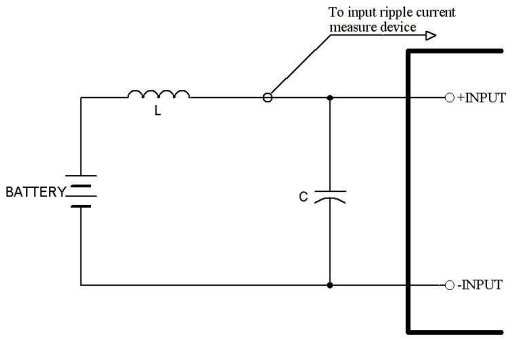


Conduction Emission of EN55022 Class B

Vin = Vin(nom) ; Full Load

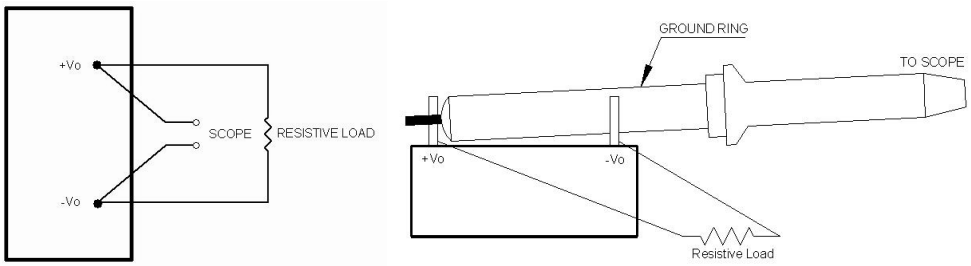
Testing Configurations

Input reflected-ripple current measurement test:

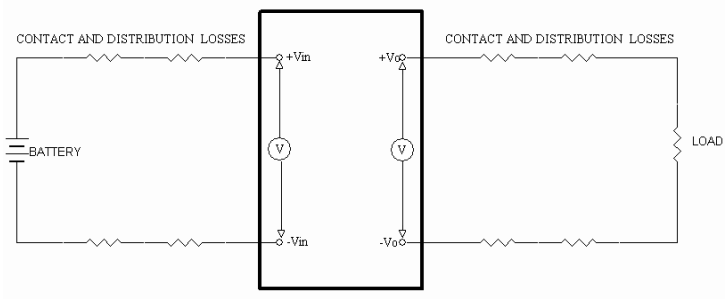


Component	Value	Voltage	Reference
L	12μH	----	----
C	100μF	100V	Aluminum Electrolytic Capacitor

Peak-to-peak output ripple & noise measurement test



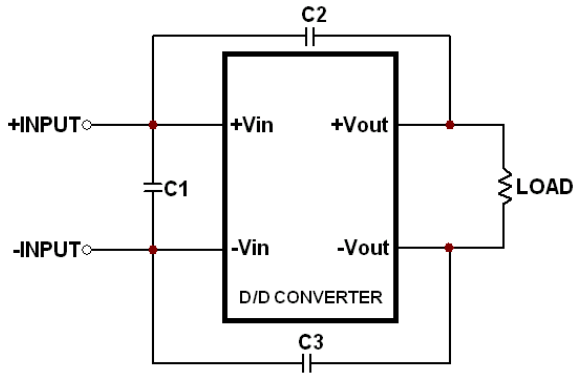
Output voltage and efficiency measurement test



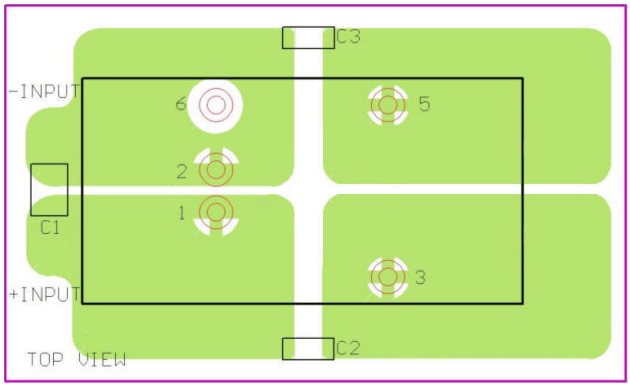
Note: All measurements are taken at the module terminals.

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

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:

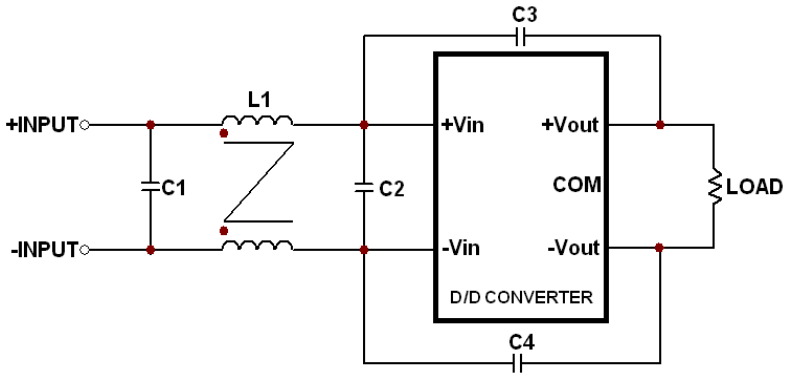
PXD10-24WSxx

Component	Value	Voltage	Reference
C1	1μF	50V	1210 MLCC
C2, C3	1000pF	2KV	1808 MLCC

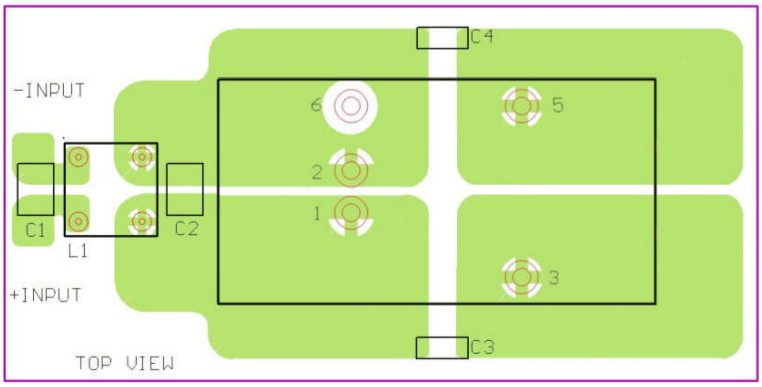
PXD10-48WSxx

Component	Value	Voltage	Reference
C1	1.5μF	100V	1812 MLCC
C2, C3	1000pF	2KV	1808 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:

PXD10-24WSxx

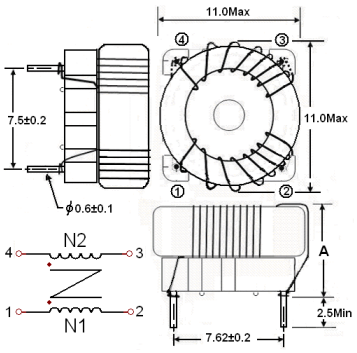
Component	Value	Voltage	Reference
C1	2.2μF	50V	1812 MLCC
C3, C4	1000pF	2KV	1808 MLCC
L1	325μH	----	Common Choke

PXD10-48WSxx

Component	Value	Voltage	Reference
C1, C2	2.2μF	100V	1812 MLCC
C3, C4	1000pF	2KV	1808 MLCC
L1	325μH	----	Common Choke

Common Choke L1 is defined as follows:

- L-325μH±35% / DCR-35mΩ, 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. Highly inductive source impedance can affect the stability of the converter Input external L-C filter is recommended to minimize input reflected ripple current. The inductor is a simulated source impedance of 12μH and the capacitor is Nippon chemi-con KY series 100μF/100V. The capacitor must be located as close as possible to the input terminals of the converter for 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 PXF40-xxSxx series.

Hiccup-mode is a method of operation in a converter whose purpose is to protect the power supply from being damaged during an over-current fault condition. It also enables the converter to restart when the fault is removed. There are other ways of protecting the converter when it is over-loaded, such as the maximum current limiting or current foldback methods.

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 used to prevent these power devices from being damaged.

The operation of hiccup is as follows. When the current sense circuit sees an over-current event, the controller shuts off the converter for a given time and then tries to start up the converter again. If the over-load condition has been removed, the converter will start up and operate normally; otherwise, the controller will see another over-current event and will shut off the converter again, repeating the previous cycle. Hiccup operation has none of the drawbacks of the other two protection methods, although its circuit is more complicated because it requires a timing circuit. The excess heat due to overload lasts for only a short duration in the hiccup cycle, hence the junction temperature of the power devices is much lower.

Output Over Voltage Protection

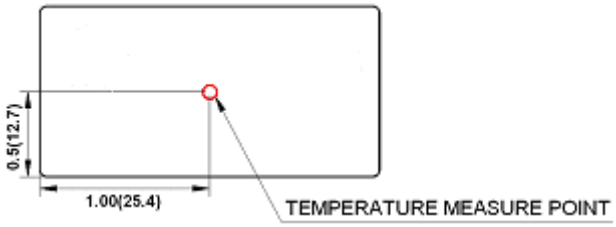
The output over-voltage protection consists of an output Zener diode that monitors the voltage on the output terminals. If the voltage on the output terminals exceeds the over-voltage protection threshold, then the Zener diode clamps the output voltage.

Short Circuit Protection

Continuous, hiccup and auto-recovery mode.

Thermal Consideration

The converter operates in a variety of thermal environments; however, 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 100°C. When Operating, adequate cooling must be provided to maintain the test point temperature at or below 100°C. Although the maximum point temperature of the power modules is 100°C, lowering this temperature yields higher reliability.



Measurement shown in inches(mm) TOP VIEW