

DPX40-xxDxx Dual Output: DC-DC Converter Module

9.5 ~ 18 VDC, 18 ~ 36 VDC and 36 ~ 75 VDC input; ±12 to ±15 VDC Dual Output; 40 Watts Output Power



FEATURES

- 1600VDC INPUT TO OUTPUT ISOLATION
- SCREW TERMINALS FOR INPUT AND OUTPUT CONNECTIONS
- RELIABLE SNAP-ON FOR DIN RAIL TS-35/7.5 OR TS-35/15
- CASE PROTECTION MEETS IP20(IEC60529)
- INPUT FUSE PROTECTION
- INPUT REVERSE POLARITY PROTECTION
- INPUT IN-RUSH CURRENT LIMIT CIRCUIT
- OUTPUT DC-OK INDICATOR
- 2:1 WIDE INPUT VOLTAGE RANGE
- FIXED SWITCHING FREQUENCY
- INPUT UNDER-VOLTAGE PROTECTION
- OUTPUT OVER-VOLTAGE PROTECTION
- OVER-CURRENT PROTECTION
- OUTPUT SHORT CIRCUIT PROTECTION
- MEETS EN55022 CLASS B
- COMPLIANT TO RoHS II & REACH



CE MARKED SAFETY MEETS:

UL60950-1 EN60950-1 IEC60950-1

APPLICATIONS

- COMMUNICATION SYSTEMS
- INDUSTRY CONTROL SYSTEMS
- FACTORY AUTOMATION EQUIPMENT
- SEMICONDUCTOR EQUIPMENT

GENERAL DESCRIPTION

The DPX40-xxDxx series was designed for applications requiring din rail mountable DC-DC converters. Easy installation is provided with snap-on mounting to the DIN-rail. Internal circuits provide protection against reverse input voltage, input in-rush current, output short-circuit, output over-current, and output over-voltage conditions. A green LED at the front panel displays the status of the output voltage.

OPTIONS

REMOTE ON/OFF



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$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Output Specifications							
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Parameter	Model	Min	Тур	Max	Unit		
xxD15 14.775 15 15.225 Dutput Regulation Line (Vin(min) to Vin(max); Full Load) All -0.5 +0.5 % Dutput Ripple and Noise Peak to Peak (20MHz Bandwidth) xxD12 120 150 mVp-p Cross Regulation (Asymmetrical Load 25% / 100% of Full Load) All -5.0 +5.0 % of Vout Peak to Peak (20MHz Bandwidth) All -0.02 +0.02 %/ of Vout (Asymmetrical Load 25% / 100% of Full Load) All -0.02 +0.02 %/ of Vout (Asymmetrical Load 25% / 100% of Full Load) All -0.02 +0.02 %/ of Vout (Vin(nin) to Vin(max) Full Load; Ta=25°C) All 0 5 % of Vout (Vin(nom); Ta=25°C) All 250 mV ys Dutput Current xxD12 ±144 ±1800 mA xxD15 ±112 ±1400 mA mA xxD15 ±112 ±1400 mA xxD12 ±1200 µF xxD15 ±120 ±750 ±750 mA xxD12<	Output Voltage							
Dutput Regulation Mail Output Note Note Mail Note<	(Vin(nom); Full Load; Ta=25°C)	xxD12	11.82	12	12.18	VDC		
Line (Vin(min) to Vin(max); Full Load) All -0.5 +0.5 % Dutput Ripple and Noise +1.5 +1.5 +1.5 mVp-p Peak to Peak (20MHz Bandwidth) xxD12 120 150 200 Cross Regulation (Asymmetrical Load 25% / 100% of Full Load) All -5.0 +5.0 % of Vout Cross Regulation (Asymmetrical Load 25% / 100% of Full Load) All -0.02 +0.02 %/°C Output Voltage Overshoot (Vin(min) to Vin(max) Full Load; Ta=25°C) All 0 5 % of Vout Opmanic Load Response (Vin(non); Ta=25°C) All 0 5 % of Vout Opmanic Load Response (Vin(non); Ta=25°C) All 0 5 mV Use be change from 75% to 100% or 100 to 75% of Full Load Peak Deviation All 250 mV Dutput Current xxD12 ±144 ±1800 mA xxD15 ±112 ±1400 Pa Dutput Capacitance Load xxD12 ±150 ±750 Output Over Vo		xxD15	14.775	15	15.225			
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(% of lout rated; Hiccup mode)	Output Over Current Protection (see page18)	A11			150	% of El		
Dutput Short Circuit Protection (see page 18) All Continuous, automatic recovery		All			100			
	Output Short Circuit Protection (see page 18) All Continuous, automatic recovery				ry			

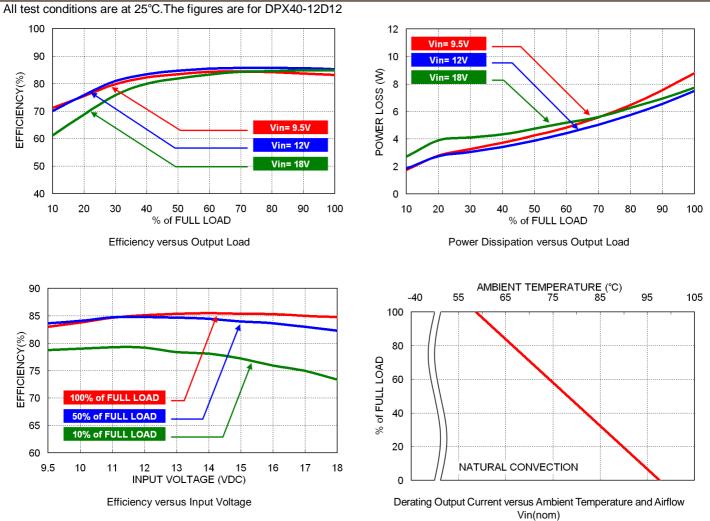
Ing	out Specifications	;				
Parameter	Model	Min	Тур	Max	Unit	
Operating Input Voltage						
Continuous	12Dxx	9.5	12	18		
	24Dxx	18	24	36		
	48Dxx	36	48	75	VDC	
Transient (100ms,max)	12Dxx			36		
	24Dxx			50		
	48Dxx			100		
Input Standby Current						
(Typical value at Vin(nom); No Load)	12D12		37			
	12D15		45			
	24D12		27		mA	
	24D15		27			
	48D12		20			
	48D15		20			
Under Voltage Lockout Turn-on Threshold	12Dxx		20	9.5		
	24Dxx			18	VDC	
	48Dxx			36	100	
Under Voltage Lockout Turn-off Threshold	12Dxx		8	50		
onder voltage Lockout full on filleshold	24Dxx		16		VDC	
	48Dxx		33		100	
Input Reflected Ripple Current (see page 18)	IODAA		00			
(Vin(nom); Full Load)	All		15		mAp-p	
Start Up Time	7.01		10			
(Vin(nom) and constant resistive load)						
Power up	All		ms			
Remote ON/OFF			100 25			
Remote ON/OFF Control (see page 19)			20			
(The Ctrl pin voltage is referenced to negative input)						
Positive Logic (Optional)						
On/Off pin High Voltage (Remote ON)			Open or 3.	5 ~ 12\/DC		
On/Off pin Low Voltage (Remote OFF)	xxDxx-P	Short or 0 ~ 1.2VDC				
Negative Logic (Optional)		-	Chort of 0	1.2000		
On/Off pin High Voltage (Remote ON)		4	Short or 0	~ 1.2\/DC		
On/Off pin Low Voltage (Remote OFF)	xxDxx-N		Open or 3.5	-		
Input Current of Remote Control Pin		-0.5	Open of 3.	0.5	mA	
Remote Off State Input Current		-0.0	2.5	0.0	mA	
Input Fuse (Slow Blow)			2.0			
	12Dxx		8			
	24Dxx		8		A	
	48Dxx		o 4			
In-rush Current	All		15		A	

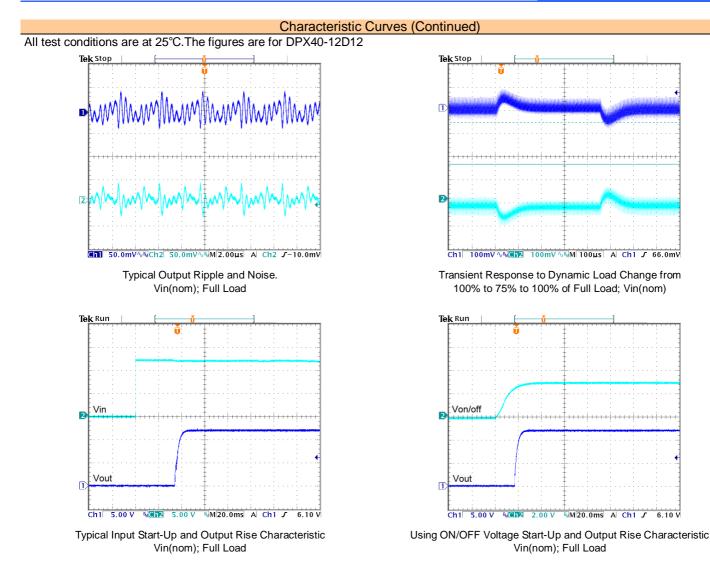
General Specifications								
Parameter	Model	Min	Тур	Max	Unit			
Efficiency								
(Vin(nom); Full Load; Ta=25°C)	12D12		83					
	12D15							
	24D12		%					
	24D15		85					
	48D12		85					
	48D15		85					
Isolation Voltage (1 minute)								
Input to Output	All	1600			VDC			
Input to Chassis, Output to Chassis		1600						
Isolation Resistance (500VDC)	All	1			GΩ			
Isolation Capacitance	All			4000	pF			
Switching Frequency	All	270	300	330	kHz			
Safety Meets	All	IEC60950-1,UL60950-1, EN60950-1						
Weight	All	182			g			
MTBF (see page 21)					hours			
MIL-HDBK-217F Ta=25°C, Full load		8.080 x 10 ⁵			nours			
Chassis Material All				inum				

Environmental Specifications									
Parameter		Model	Min	Тур	Max	Unit			
Operating Ambient Temperature Without derating		All	-40		+58	°C			
	With derating	All	+58		+97	C			
Storage Temperature		All	-40		105	°C			
Relative Humidity		All	5		95	% RH			
Thermal Shock		All	MIL-STD-810F						
Vibration		All	IEC60068-2-6						

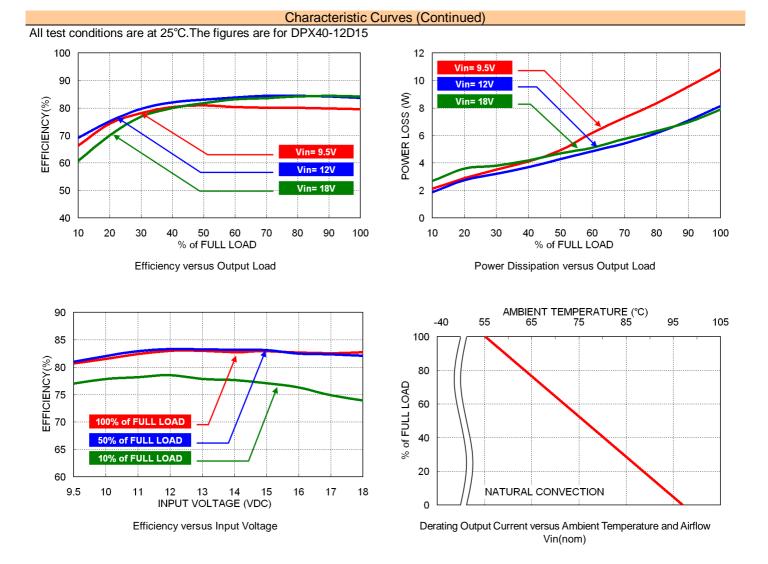
EMC Characteristics								
Characteristic	Standard	Level						
EMI	EN55022	Module stand-alone	Class B					
ESD	EN61000-4-2	Air ±8kV	Perf. Criteria A					
ESD	EIN01000-4-2	Contact ±6kV	Fen. Cillena A					
Radiated Immunity	EN61000-4-3	10V/m	Perf. Criteria A					
Fast Transient (see page 19)	EN61000-4-4	±2kV	Perf. Criteria A					
Surge (see page 19)	EN61000-4-5	±1kV	Perf. Criteria A					
Conducted Immunity	EN61000-4-6	10V r.m.s	Perf. Criteria A					
Power Frequency Magnetic Field	EN61000-4-8	100A/m continuous; 1000A/m 1 second	Perf. Criteria A					

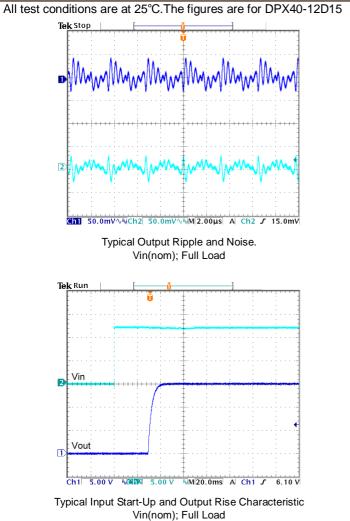
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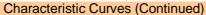


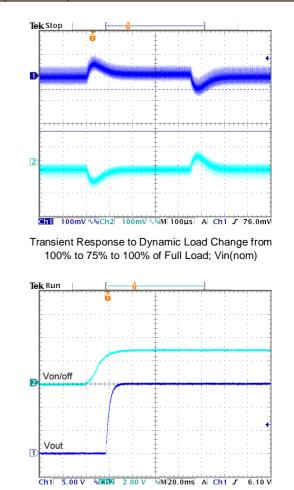


DPX40-xxDxx



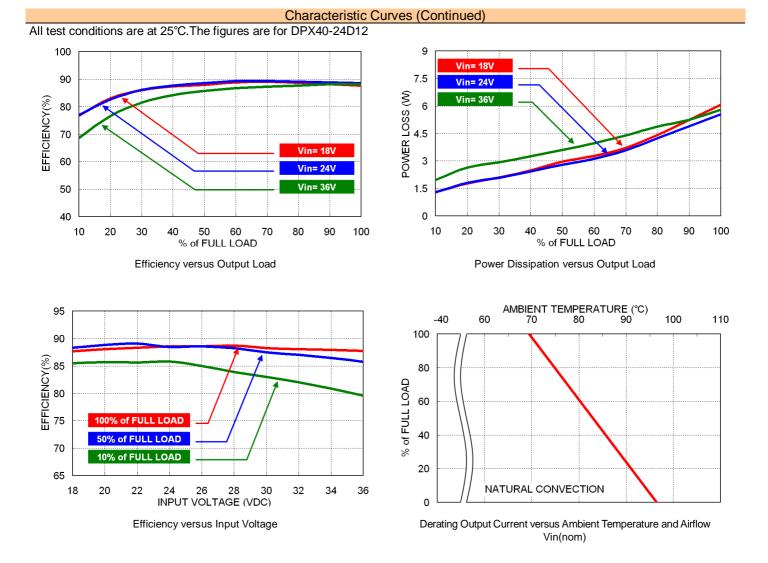




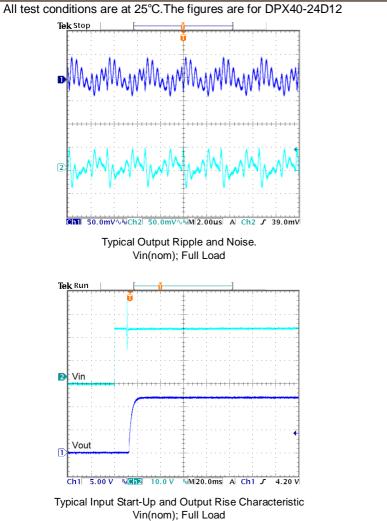


Using ON/OFF Voltage Start-Up and Output Rise Characteristic Vin(nom); Full Load

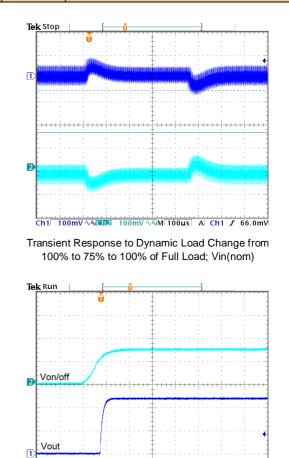
DPX40-xxDxx



DPX40-xxDxx



Characteristic Curves (Continued)



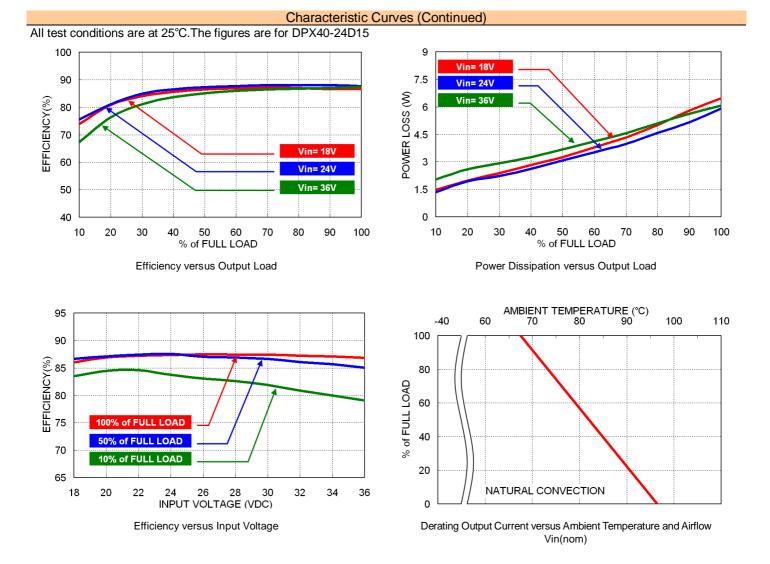
Using ON/OFF Voltage Start-Up and Output Rise Characteristic Vin(nom); Full Load

M20.0ms A Ch1 J

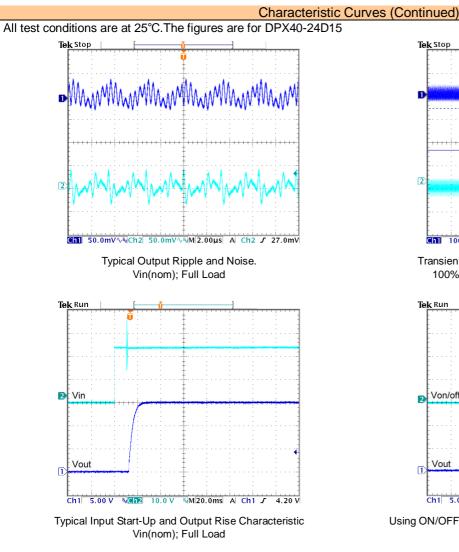
4.20 V

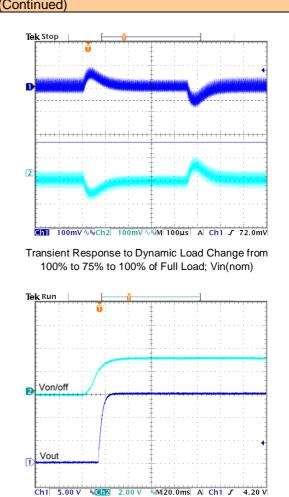
Ch1 5.00 V NCh2 2.00 V

DPX40-xxDxx



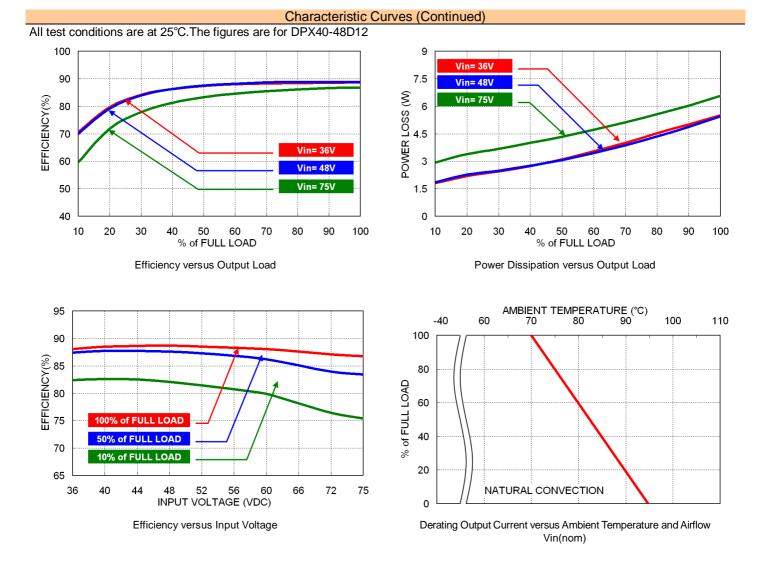
DPX40-xxDxx



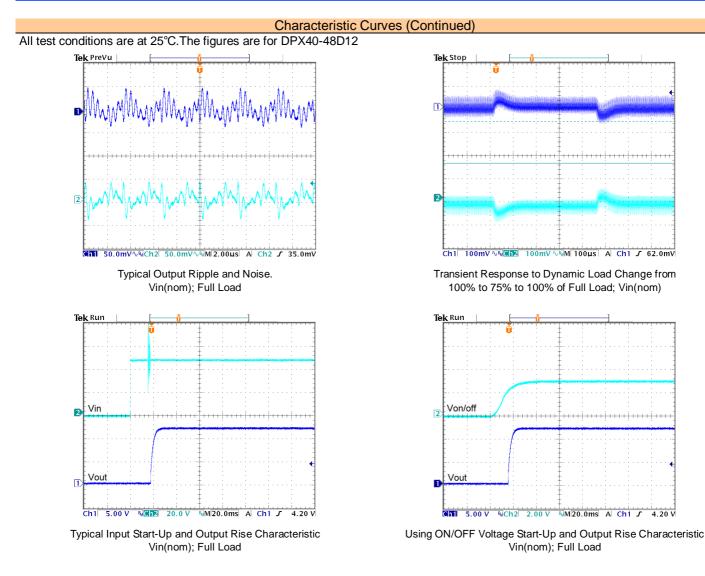


Using ON/OFF Voltage Start-Up and Output Rise Characteristic Vin(nom); Full Load

DPX40-xxDxx



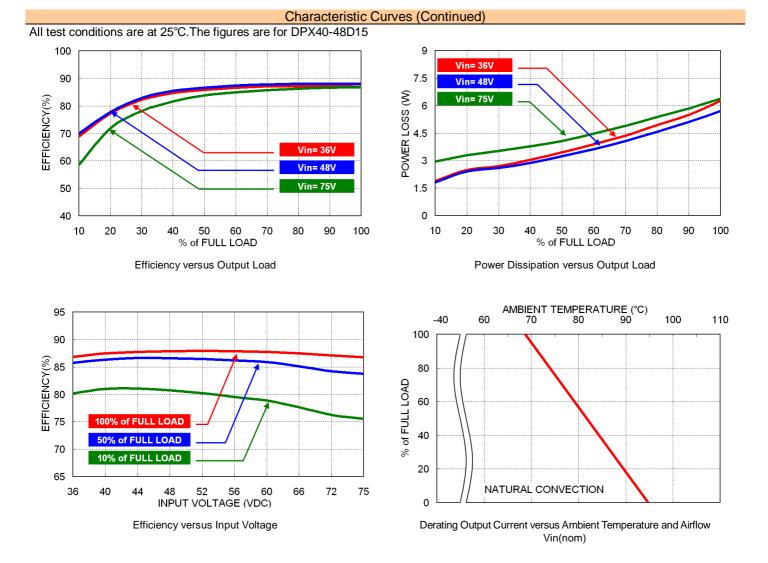
DPX40-xxDxx



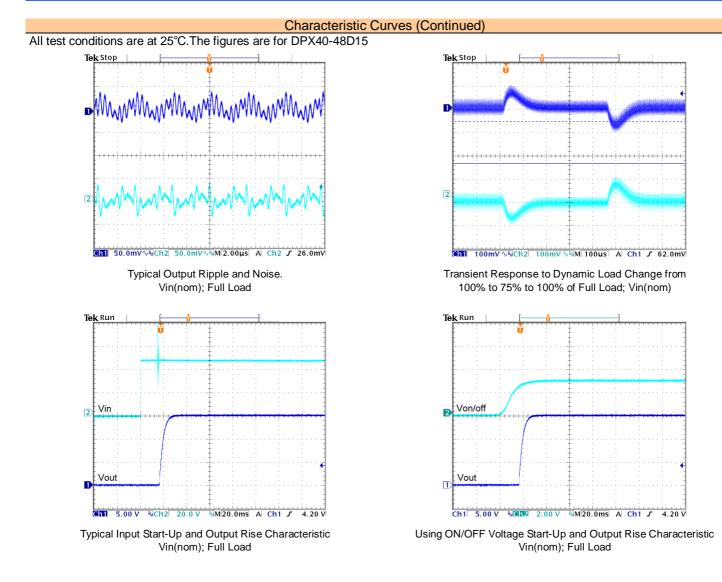
15

4.20 V

DPX40-xxDxx



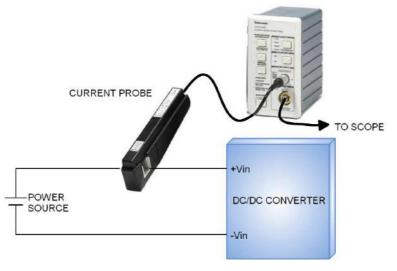
DPX40-xxDxx



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 power module. The test configuration for the input reflected-ripple current measurement is shown below:

Input reflected-ripple current measurement setup



Output Over Current Protection

When excessive output currents occur in the system, circuit protection is required on all power supplies. Normally, overload current is maintained at approximately 150 percent of rated current for DPX40-xxDxx series.

Hiccup-mode is a method of operation in a power supply whose purpose is to protect the power supply from being damaged during an over-current fault condition. It also enables the power supply to restart when the fault is removed. There are other ways of protecting the power supply when it is over-loaded, such as the maximum current limiting or current fold-back 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 those devices may exceed their specified limits. A protection mechanism has to be used to prevent those 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 power supply for a given time and then tries to start up the power supply again. If the over-load condition has been removed, the power supply will start up and operate normally; otherwise, the controller will see another over-current event and shut off the power supply 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.

The hiccup operation can be done in various ways. For example, one can start hiccup operation any time an over-current event is detected; or prohibit hiccup during a designated start-up is usually larger than during normal operation and it is easier for an over-current event is detected; or prohibit hiccup during a designated start-up interval (usually a few milliseconds). The reason for the latter operation is that during start-up, the power supply needs to provide extra current to charge up the output capacitor. Thus the current demand during start-up is usually larger than during normal operation and it is easier for an over-current event to occur. If the power supply starts to hiccup once there is an over-current, it might never start up successfully. Hiccup mode protection will give the best protection for a power supply against over current situations, since it will limit the average current to the load at a low level, so reducing power dissipation and case temperature in the power devices.

Output Short Circuit Protection

Continuous and auto-recovery mode. During an output short circuit, converter shuts down. The average current during this condition will be very low.

Output Over Voltage Protection

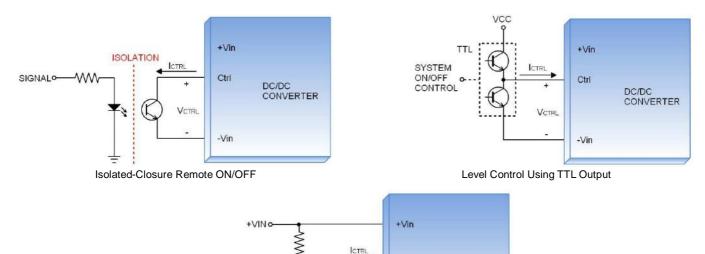
The output over-voltage protection consists of output Zener diode that monitors the voltage on the output terminals. If the voltage on the output terminals exceeds the over-voltage protection threshold, then the Zener diode clamps the output voltage.

DPX40-xxDxx

Remote On/off Control

The Ctrl Pin is used to turn the DC/DC power module on and off. The user must use a switch to control the logic voltage (high or low) level of the pin referenced to -Vin. The switch can be an open collector transistor, FET, or Photo-Coupler. The switch must be capable of sinking up to 1 mA at low-level logic voltage. A High-level logic of the Ctrl pin signal should be limited to a maximum voltage of 12V and a maximum current of 0.5 mA.

Remote ON/OFF Implementation





VCTRL

Ctrl

-Vin

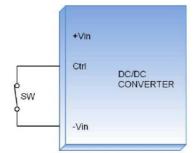
DC/DC CONVERTER

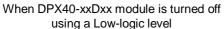
Level Control Using Line Voltage

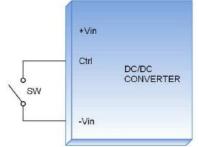
There are two remote control options available, positive logic and negative logic.

-VIN C

a. The positive logic structure turns on the DC/DC module when the Ctrl pin is at a high-logic level and turns the module off using a low-logic level.

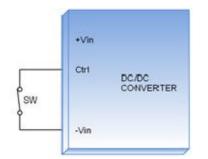




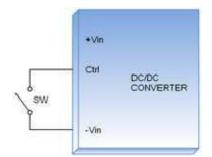


When DPX40-xxDxx module is turned on using a High-logic level

b. The negative logic structure turns on the DC/DC module when the Ctrl pin is at a low-logic level and turns the module off when using a high-logic level



When DPX40-xxDxx module is turned on using a Low-logic level.

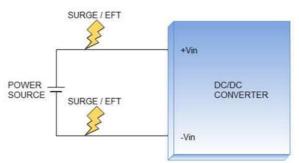


When DPX40-xxDxx module is turned off using a High Logic level.

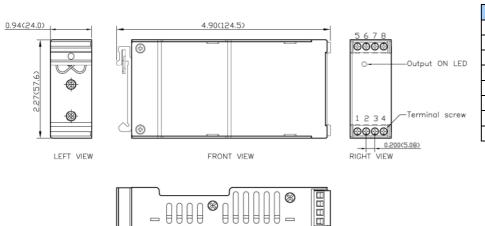
DPX40-xxDxx

EMS Considerations

The DPX40-xxDxx series can meet Fast Transient EN61000-4-4 and Surge EN61000-4-5 performance criteria A. Please see the following schematic:



Mechanical Data



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BOTTOM VIEW

PINOL	л
PIN	FUNCTION
1	Ctrl
2	-Vin
3	-Vin
4	+Vin
5	NC
6	-Vout
7	Common
8	+Vout

* NC : No Connection

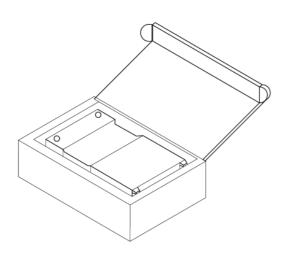
* Screw terminals-wire range from 14 to 18 AWG

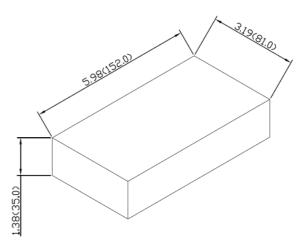
All dimensions in inch (mm) 1.

2 X.XX±0.02 (X.X±0.5) Tolerance : X.XXX±0.01 (X.XX±0.25)

Terminal screw locked torque : 3. MAX 2.5kgf-cm (0.25N-m)

Packaging Information





1PCS / BOX All dimensions in mm

Part Number Structure

DPX40 - 48 Series Name

Voltage (VDC) 12: 9.5~18 24: 18~36 48: 36~75



005 Output Voltage (VDC) 12: ±12 15: ±15

Remote Control Option P: Positive logic N: Negative logic

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Model	Input Range	Output Voltage	Output Current @Full Load		Input Current @ No Load	Efficiency	Maximum Capacitor Load
Number	VDC	VDC	Min. Load ⁽¹⁾ mA	Full Load mA	mA	%	μF
DPX40-12D12	9.5 ~ 18	±12	±144	±1800	37	83	±1200
DPX40-12D15	9.5 ~ 18	±15	±112	±1400	45	83	±750
DPX40-24D12	18 ~ 36	±12	±144	±1800	27	85	±1200
DPX40-24D15	18 ~ 36	±15	±112	±1400	27	85	±750
DPX40-48D12	36 ~ 75	±12	±144	±1800	20	85	±1200
DPX40-48D15	36 ~ 75	±15	±112	±1400	20	85	±750

Note:

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1. The output requires a minimum load on the output to maintain specified regulation. Operation under no-load condition will not damage these devices; however, they may not meet all the listed specifications.

MTBF and Reliability

The MTBF for DPX40-xxDxx series of DC/DC converters has been calculated using MIL-HDBK-217F @ full load, operating temperature at 25°C. The resulting figure for MTBF is 8.080 × 10⁵ hours.