

# FED60W SERIES

DC-DC CONVERTER

4:1 ULTRA WIDE INPUT RANGE  
UP TO 60Watts



## FEATURES

- NO MINIMUM LOAD REQUIRED
- 1600VDC INPUT TO OUTPUT ISOLATION
- STANDARD 2.00 X 1.00 X 0.40 INCH
- SIX-SIDED CONTINUOUS SHIELD
- SAFETY MEETS UL60950-1, EN60950-1, IEC60950-1, & EN50155
- CE MARKED
- COMPLIANT TO RoHS II & REACH

## APPLICATIONS

- WIRELESS NETWORK
- TELECOM/DATACOM
- INDUSTRY CONTROL SYSTEM
- DISTRIBUTED POWER ARCHITECTURES
- SEMICONDUCTOR EQUIPMENT

1600VDC ISOLATION	REMOTE CONTROL	UVP	OCP	SCP	OVP	OTP	LOW STANDBY POWER
-------------------	----------------	-----	-----	-----	-----	-----	-------------------

## TECHNICAL SPECIFICATION

All specifications are typical at nominal input, full load and 25°C otherwise noted

Model Number	Input Range	Output Voltage	Output Current @Full Load	Input Current @ No Load	Efficiency	Maximum Capacitor Load (1)
	VDC	VDC	A	mA	%	µF
FED60-24S3P3W	9 ~ 36	3.3	12	10	90	32000
FED60-24S05W	9 ~ 36	5	12	10	92	30000
FED60-24S12W	9 ~ 36	12	5	10	92	5850
FED60-24S15W	9 ~ 36	15	4	10	92	3900
FED60-24S24W	9 ~ 36	24	2.5	10	92	2000
FED60-24D12W	9 ~ 36	±12	±2.5	10	91	±3900
FED60-24D15W	9 ~ 36	±15	±2	10	91	±2400
FED60-24D24W	9 ~ 36	±24	±1.25	10	91	±1000
FED60-48S3P3W	18 ~ 75	3.3	12	10	90	32000
FED60-48S05W	18 ~ 75	5	12	10	92	30000
FED60-48S12W	18 ~ 75	12	5	10	92	5850
FED60-48S15W	18 ~ 75	15	4	10	92	3900
FED60-48S24W	18 ~ 75	24	2.5	10	91	2000
FED60-48D12W	18 ~ 75	±12	±2.5	10	91	±3900
FED60-48D15W	18 ~ 75	±15	±2	10	91	±2400
FED60-48D24W	18 ~ 75	±24	±1.25	10	91	±1000

## PART NUMBER STRUCTURE

<b>FED60</b>	-	<b>48</b>	<b>S</b>	<b>05</b>	<b>W</b>	-	<b>N</b>	<b>HS</b>
Series Name		Input Voltage (VDC)	Output Quantity	Output Voltage (VDC)	Input Range		Remote Control options	Heat-sink
		24: 9~36 48: 18~75	S: Single	3P3: 3.3 05: 5 12: 12 15: 15 24: 24	4:1		□: Positive logic N: Negative logic	□: No Heat-sink HS Heat-sink HC Heat-sink with Clamp
			D: Dual	12: ±12 15: ±15 24: ±24				

## INPUT SPECIFICATIONS

Parameter	Conditions		Min.	Typ.	Max.	Unit
Operating input voltage range	24Vin(nom)		9	24	36	VDC
	48Vin(nom)		18	48	75	
Start-up voltage	24Vin(nom)				9	VDC
	48Vin(nom)				18	
Shutdown voltage	24Vin(nom)			8		VDC
	48Vin(nom)			16		
Start up time	Constant resistive load	Power up		60		ms
		Remote ON/OFF		60		
Input surge voltage	1 second, max.	24Vin(nom)			50	VDC
		48Vin(nom)			100	
Input filter				Pi type		
Remote ON/OFF	Referred to -Vin pin	Positive logic	DC-DC ON	Open or 3 ~ 12VDC		mA
		(Standard)	DC-DC OFF	Short or 0 ~ 1.2VDC		
		Negative logic	DC-DC ON	Short or 0 ~ 1.2VDC		mA
		(Option)	DC-DC OFF	Open or 3 ~ 12VDC		
		Input current of Ctrl pin		-0.5	0.5	
		Remote off input current			3	

## OUTPUT SPECIFICATIONS

Parameter	Conditions		Min.	Typ.	Max.	Unit
Voltage accuracy			-1.0		+1.0	%
Line regulation	Low Line to High Line at Full Load		-0.2		+0.2	%
Load regulation	No Load to Full Load	Single	-0.5		+0.5	%
		Dual	-1.0		+1.0	
Cross regulation	Asymmetrical load 25%/100% FL	Dual	-5.0		+5.0	%
Voltage adjustability	Single output	3.3Vout, 5Vout, 12Vout	-10		+10	%
		15Vout, 24Vout	-10		+20	
Ripple and noise	Measured by 20MHz bandwidth					mVp-p
	With a 10µF/25V X7R MLCC	3.3Vout, 5Vout		75	100	
	With a 10µF/25V X7R MLCC	12Vout, 15Vout		100	125	
	With a 4.7µF/50V X7R MLCC	24Vout		150	200	
Temperature coefficient			-0.02		+0.02	%/°C
Transient response recovery time	25% load step change			250		µs
Over voltage protection	Zener diode clamp	3.3Vout		3.9		VDC
		5Vout		6.2		
		12Vout		15		
		15Vout		20		
		24Vout		30		
Over load protection	% of Iout rated; Hiccup mode			150		%
Short circuit protection			Continuous, automatic recovery			

## GENERAL SPECIFICATIONS

Parameter	Conditions		Min.	Typ.	Max.	Unit
Isolation voltage	1 minute	Input to Output	1600			VDC
		Input (Output) to Case	1600			
Isolation resistance	500VDC		1			GΩ
Isolation capacitance					2200	pF
Switching frequency			225	250	275	kHz
Safety meets			UL60950-1, EN60950-1, IEC60950-1			
Case material			Copper			
Base material			FR4 PCB			
Potting material			Silicone (UL94 V-0)			
Weight			33g (1.16oz)			
MTBF	MIL-HDBK-217F, Full load.		8.582 x 10 <sup>5</sup> hrs			

## ENVIRONMENTAL SPECIFICATIONS

Parameter	Conditions		Min.	Typ.	Max.	Unit
Operating ambient temperature	With Derating		-40		+105	°C
Maximum case temperature					+105	°C
Over temperature protection				+115		°C
Storage temperature range			-55		+125	°C
Thermal impedance	Vertical direction by natural convection (20LFM)	Without Heat-sink		10.8		°C/W
		With Heat-sink		10.3		
Thermal shock			MIL-STD-810F			
Vibration			MIL-STD-810F			
Relative humidity			5% to 95% RH			

## EMC SPECIFICATIONS

Parameter	Conditions	Level
EMI <sup>(2)</sup>	EN55022	Class A
ESD	EN61000-4-2	Air ± 8kV and Contact ± 6kV Perf. Criteria A

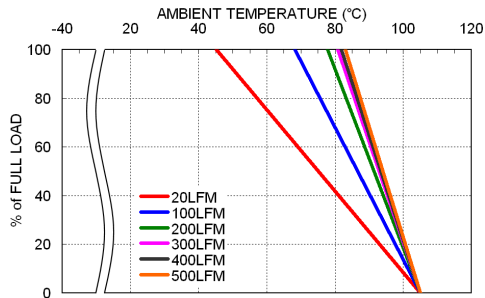
Radiated immunity	EN61000-4-3	20 V/m	Perf. Criteria A
Fast transient <sup>(3)</sup>	EN61000-4-4	± 2kV	Perf. Criteria A
Surge <sup>(3)</sup>	EN61000-4-5	± 2kV	Perf. Criteria A
Conducted immunity	EN61000-4-6	10 Vr.m.s	Perf. Criteria A

**Note:**

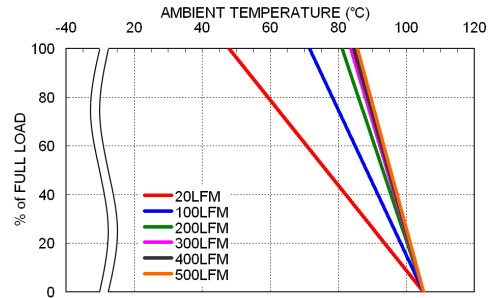
1. Test by minimum input and constant resistive load.
2. The standard module meets EMI Class A or Class B with external components. For further information, please contact with P-DUKE.
3. The external input components are required if the module has to meet EN61000-4-4, EN61000-4-5.  
 The FED60-24□□□W recommended an aluminum electrolytic capacitor (Nippon chemi-con KY series, 220μF/100V) and a TVS (SMDJ58A, 58V, 3000Watt peak pulse power) to connect in parallel.  
 The FED60-48□□□W recommended an aluminum electrolytic capacitor (Nippon chemi-con KY series, 220μF/100V) and a TVS (SMDJ120A, 120V, 3000Watt peak pulse power) to connect in parallel.

**CAUTION:** This power module is not internally fused. An input line fuse must always be used.

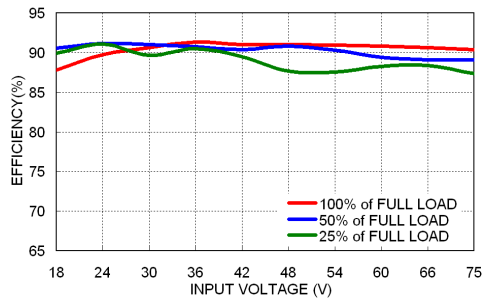
**CHARACTERISTIC CURVE**



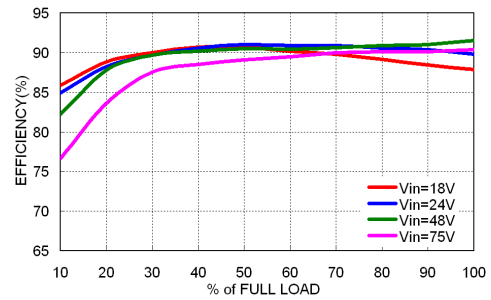
FED60-48S12W Derating Curve



FED60-48S12W Derating Curve with Heat-sink

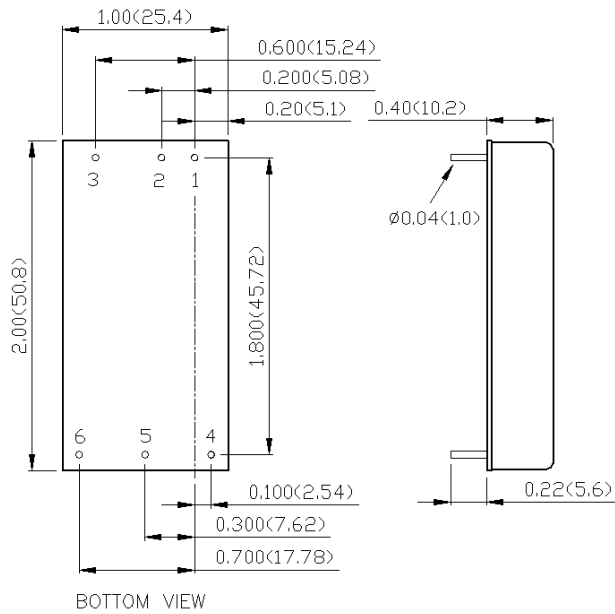


FED60-48S12W Efficiency VS Input Voltage



FED60-48S12W Efficiency VS Output Load

**MECHANICAL DRAWING**

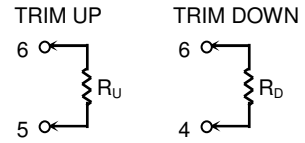


### PIN CONNECTION

PIN	SINGLE	DUAL
1	+Vin	+Vin
2	-Vin	-Vin
3	Ctrl	Ctrl
4	+Vout	+Vout
5	-Vout	Common
6	Trim	-Vout

### EXTERNAL OUTPUT TRIMMING

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



1. All dimensions in inch (mm)
2. Tolerance :x.xx±0.02 (x.x±0.5)  
x.xxx±0.01 (x.xx±0.25)
3. Pin pitch tolerance ±0.01 (0.25)
4. Pin dimension tolerance ±0.004(0.1)