

FED60 SERIES

DC-DC CONVERTER

2:1 WIDE INPUT RANGE
UP TO 60Watts



FEATURES

- NO MINIMUM LOAD REQUIRED
- LOW STANDBY POWER CONSUMPTION
- 1600VDC INPUT TO OUTPUT ISOLATION
- SIX-SIDED CONTINUOUS SHIELD
- STANDARD 2.00 X 1.00 X 0.40 INCH
- SAFETY MEETS UL60950-1, EN60950-1 AND IEC60950-1
- CE MARK MEETS 2006/95/EC, 2011/95/EC and 2004/108/EC
- COMPLIANT TO RoHS EU DIRECTIVE 2011/65/EU

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
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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
	VDC	VDC	A	mA	%	µF
FED60-12S3P3	9 ~ 18	3.3	12	10	89	32000
FED60-12S05	9 ~ 18	5	12	10	90.5	30000
FED60-12S12	9 ~ 18	12	5	10	90.5	5850
FED60-12S15	9 ~ 18	15	4	10	91.5	3900
FED60-12S24	9 ~ 18	24	2.5	10	91.5	2000
FED60-12D12	9 ~ 18	±12	±2.5	10	90	±3900
FED60-12D15	9 ~ 18	±15	±2	10	90	±2400
FED60-12D24	9 ~ 18	±24	±1.25	10	90	±1000
FED60-24S3P3	18 ~ 36	3.3	12	10	89	32000
FED60-24S05	18 ~ 36	5	12	10	92	30000
FED60-24S12	18 ~ 36	12	5	10	92	5850
FED60-24S15	18 ~ 36	15	4	10	92	3900
FED60-24S24	18 ~ 36	24	2.5	10	92	2000
FED60-24D12	18 ~ 36	±12	±2.5	10	90	±3900
FED60-24D15	18 ~ 36	±15	±2	10	90	±2400
FED60-24D24	18 ~ 36	±24	±1.25	10	90	±1000
FED60-48S3P3	36 ~ 75	3.3	12	10	89	32000
FED60-48S05	36 ~ 75	5	12	10	92	30000
FED60-48S12	36 ~ 75	12	5	10	92	5850
FED60-48S15	36 ~ 75	15	4	10	92	3900
FED60-48S24	36 ~ 75	24	2.5	10	92	2000
FED60-48D12	36 ~ 75	±12	±2.5	10	91	±3900
FED60-48D15	36 ~ 75	±15	±2	10	91	±2400
FED60-48D24	36 ~ 75	±24	±1.25	10	91	±1000

PART NUMBER STRUCTURE

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

INPUT SPECIFICATIONS

Parameter	Conditions		Min.	Typ.	Max.	Unit
Operating input voltage range	12Vin(nom)		9	12	18	VDC
	24Vin(nom)		18	24	36	
	48Vin(nom)		36	48	75	
Start-up voltage	12Vin(nom)				9	VDC
	24Vin(nom)				18	
	48Vin(nom)				36	
Shutdown voltage	12Vin(nom)			8		VDC
	24Vin(nom)			16		
	48Vin(nom)			32		
Start up time	Constant resistive load	Power up		60		ms
		Remote ON/OFF		60		
Input surge voltage	1 second, max.	12Vin(nom)			25	VDC
		24Vin(nom)			50	
		48Vin(nom)			100	
Input filter			Pi type			
Remote ON/OFF	Referenced to -INPUT 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		
		(Option)	DC-DC OFF	Open or 3 ~ 12VDC		
		Input current of CTRL pin		-0.5	0.5	
Remote off input current			3		mA	

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
Design meet safety standard			IEC60950-1, UL60950-1, EN60950-1			
Case material			Copper			
Base material			FR4 PCB			
Potting material			Silicone (UL94-V0)			
Dimensions			2.00 X 1.00 X 0.40 Inch (50.8x25.4x10.2 mm)			
Weight			33g (1.16oz)			
MTBF	MIL-HDBK-217F Tc=70°C, Full load.		8.804 x 10 ⁵ hrs			

ENVIRONMENTAL SPECIFICATIONS

Parameter	Conditions		Min.	Typ.	Max.	Unit
Operating ambient temperature			-40		+85	°C
Maximum case temperature					+105	°C

Over temperature protection			+115	°C
Storage temperature range			-55	+125
Thermal impedance (1)	Natural convection (20LFM)	Without Heat-sink	10.8	°C/W
		With Heat-sink	10.3	°C/W
Thermal shock				MIL-STD-810F
Vibration				MIL-STD-810F
Relative humidity				5% to 95% RH

EMC SPECIFICATIONS

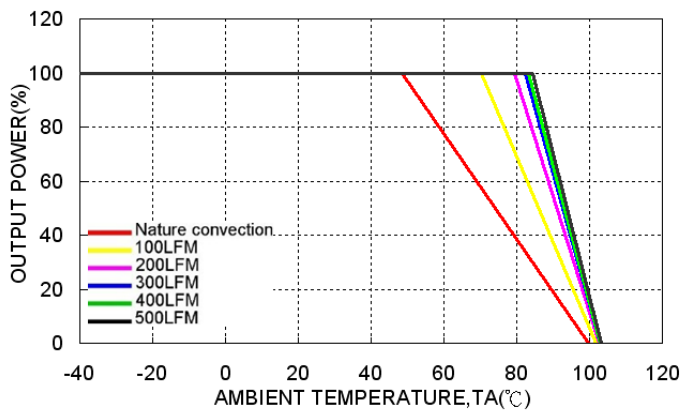
Parameter	Conditions		Level
EMI (2)	EN55022		Class A
ESD	EN61000-4-2	Air ± 8kV Contact ± 6kV	Perf. Criteria A
Radiated immunity	EN61000-4-3	20 V/m	Perf. Criteria A
Fast transient (3)	EN61000-4-4	± 2kV	Perf. Criteria A
Surge (3)	EN61000-4-5	± 2kV	Perf. Criteria A
Conducted immunity	EN61000-4-6	10 Vr.m.s	Perf. Criteria A

Note:

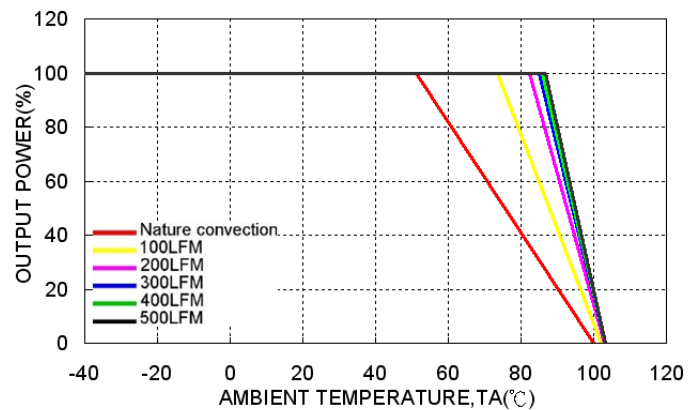
- The heat-sink is optional and P/N: 7G-0020C-F.
- The FED60 series standard module meets EMI Class A or Class B with external components. For more detail information, please contact with P-DUKE.
- An external filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5.
The FED60-12□□□ and The FED60-24□□□ 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□□□ 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.

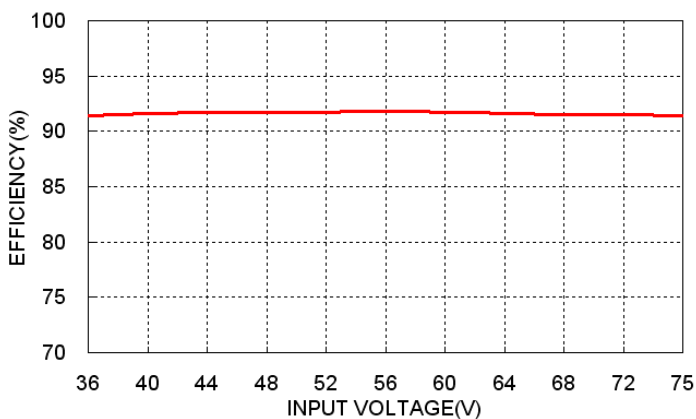
CHARACTERISTIC CURVE



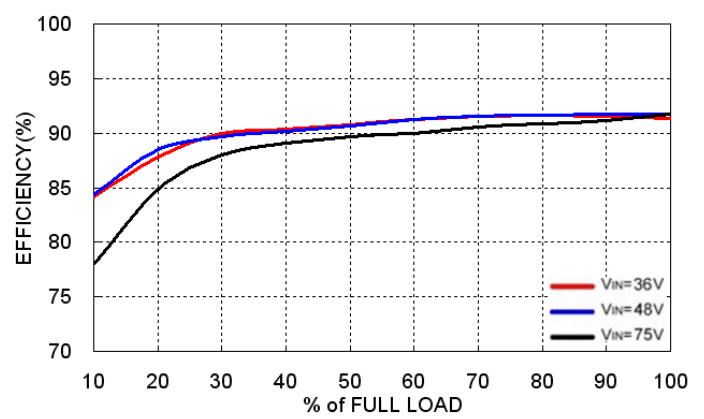
FED60-48S12 Derating Curve



FED60-48S12 Derating Curve with Heat-sink

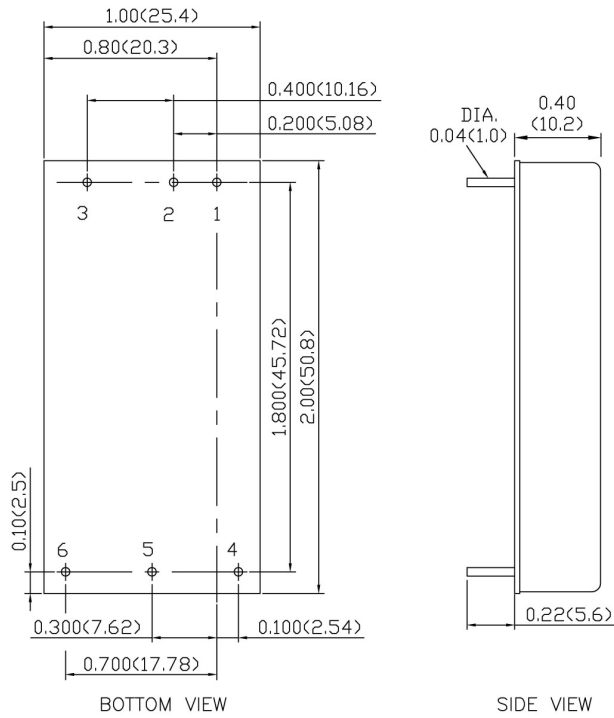


FED60-48S12 Efficiency VS Input Voltage

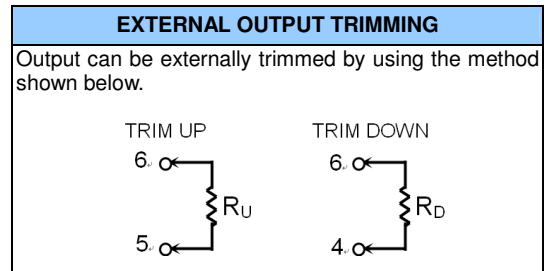


FED60-48S12 Efficiency VS Output Load

MECHANICAL DRAWING



PIN CONNECTION		
PIN	SINGLE	DUAL
1	+ INPUT	+ INPUT
2	- INPUT	- INPUT
3	CTRL	CTRL
4	+ OUTPUT	+ OUTPUT
5	- OUTPUT	COMMON
6	TRIM	- OUTPUT



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)