

FEC60 SERIES

DC / DC Single Output: 60 Watts



Features

- 2:1 input range
- 24V and 48V input options
- Single output
- 60 watts output power
- Six-Sided continuous shield
- High efficiency up to 90%
- Industry standard package
- Fixed switching efficiency
- High isolation 1600VDC
- Output voltage trim
- Overload & Overvoltage protection
- Remote ON/OFF

Specifications

Input Voltage	24VDC (18 ~ 36) 48VDC (36 ~75)	Efficiency	907%
Input Filter	Pi type	Isolation	1600VDC
Input Surge Voltage. (100mS)	24V: 50VDC, 48V: 100VDC	Case Grounding	Connect case to –Vin with decoupling Cap.
Input Reflected Ripple Current	20mA pk-pk (@ nominal input & 100% load	Isolation Cap.	1500pF
Start Up time	Typically 20mS constant resistive load	Switching Freq.	300KHz
Start UP Voltage	24V input typ 17V, 48V input: typ 34V	Safety	EN60950-1, UL60950-1
Shutdown Voltage	24V input: 17V, 48V input: 32V.	Case Material	Nickel-coated copper
Remote ON/OFF Positive logic -Standard	DC-DC ON Open or 3.5V < Vr < 12V DC-DC OFF Short or 0V < Vr < 1.2V Input current of remote control pin: 30mA	Base Material	Non-conductive black plastic
Remote ON/OFF Negative logic - Option	DC-DC ON Short or 0V < Vr < 1.2V DC-DC OFF Open or 3V < Vr < 1.2V Input current of remote control pin: 4mA	Potting	Epoxy UL94-V0
Output power	60 watts	Dimensions	50.8 x 50.8 x 10.2mm
Voltage Accuracy	±1%	Weight	60g
Voltage Trim	±10% (24V output: +20% -10%)	MTBF	1.096 x 105 Hrs
Minim Load	Zero	Operating Temp	-40°C to +40°C (without derating) -40°C to +110°C (with derating) (see note 8)
Line Regulation	±0.2%	Case Temp	+110°C maximum case temperate
Load Regulation	±0.5% (0% to 100% load)	Thermal Shutdown	At approximately 120°C
Ripple & noise	750 ~ 100mV. 20MHZ bandwidth	Thermal Impedance	10.5°C / watt without Heat sink 8.4°C / watt without Heat sink
Temp. Coefficient	±0.02% / °C	Thermal shock	MIL-STD-810F
Transient Response	250uS (25% load step change)	Vibration	10-55Hz, 10G, 30min along X, Y,Z
Over voltage Protection (Zener Diode Clamp)	3.3V: 3.7 ~ 5.4V 5.0V: 5.6 ~ 7.0V 12V: 13.8 ~ 17.5V 15V: 16.8 ~ 20.5V 24V: 30 ~ 33V	Humidity	5-95% RH
Overload Protection	Typically 150% of load	EMC	EN55022 Class A
Short Circuit Protection	Hiccup, with auto recovery	ESD	EN61000-4-2 ±6KV contact
		Radiated Immunity	EN61000-4-3
		Fast Transients	EN61000-4-4 ±2KV
		Surge	EN61000-4-5 ±1KV
		Conducted Immunity	EN61000-4-6

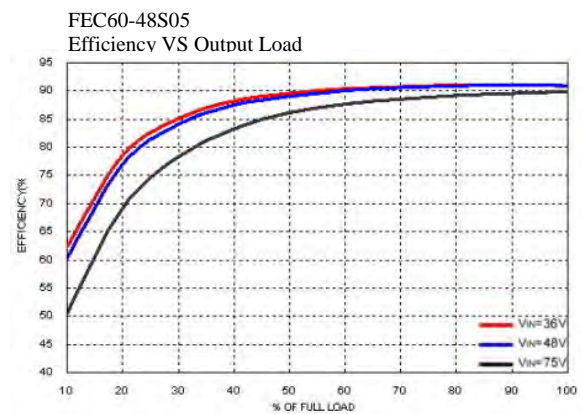
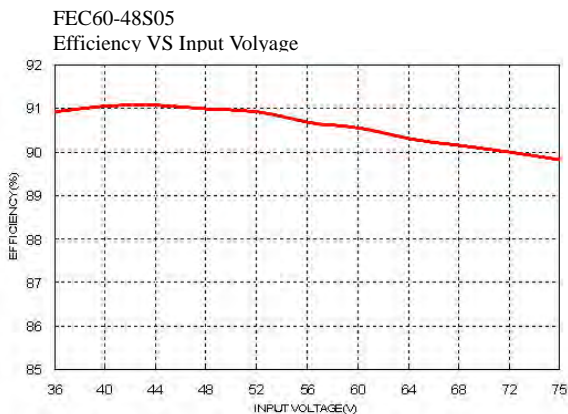
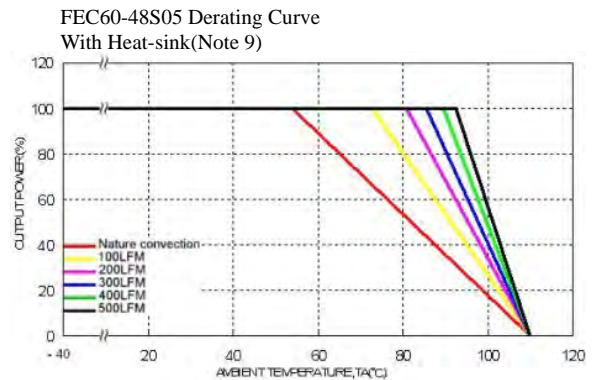
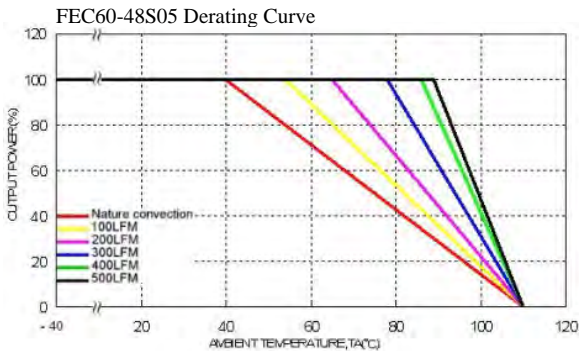
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Model Number	Input Range	Output Voltage	Output Current		Output ⁽⁴⁾ Ripple & Noise	Input Current		Eff ⁽⁴⁾ (%)	Capacitor ⁽⁵⁾ Load max
			Min. load	Full load		No load ⁽³⁾	Full load ⁽²⁾		
FEC60-24S3P3	18 ~ 36 V	3.3 V	0mA	14000mA	75mVp-p	100mA	2264mA	89	36000μF
FEC60-24S05	18 ~ 36 V	5 V	0mA	12000mA	75mVp-p	130mA	2941mA	90	20400μF
FEC60-24S12	18 ~ 36 V	12 V	0mA	5000mA	100mVp-p	50mA	2907mA	90	3550μF
FEC60-24S15	18 ~ 36 V	15 V	0mA	4000mA	100mVp-p	50mA	2907mA	90	2300μF
FEC60-24S24	18 ~ 36 V	24V	0mA	2500mA	200mVp-p	50mA	2942mA	89	885μF
FEC60-48S3P3	36 ~ 75 V	3.3 V	0mA	14000mA	75mVp-p	80mA	1132mA	89	36000μF
FEC60-48S05	36 ~ 75 V	5 V	0mA	12000mA	75mVp-p	90mA	1453mA	90	20400μF
FEC60-48S12	36 ~ 75 V	12 V	0mA	5000mA	100mVp-p	30mA	1453mA	90	3550μF
FEC60-48S15	36 ~ 75 V	15 V	0mA	4000mA	100mVp-p	30mA	1453mA	90	2300μF
FEC60-48S24	36 ~ 75 V	24V	0mA	2500mA	200mVp-p	30mA	1470mA	89	885μF

Note

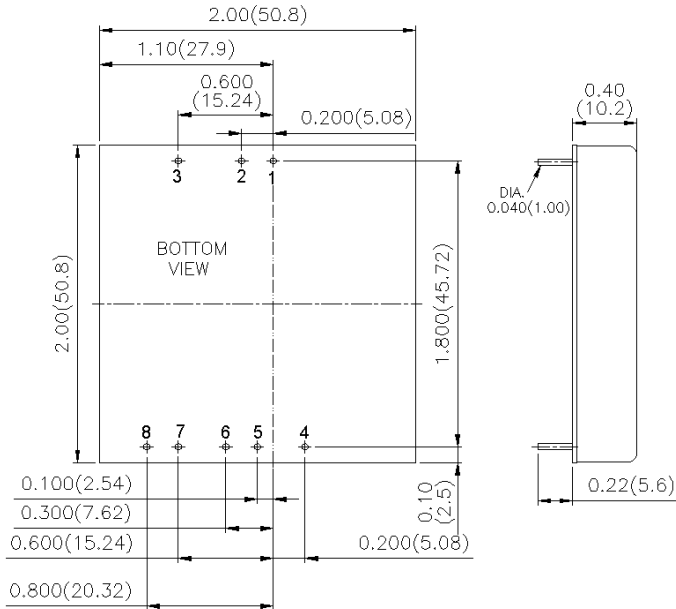
- BELLCORE TR-NWT-000332. Case 1: 50% Stress, Temperature at 40°C.
MIL-HDBK-217F Notice2 @Ta=25 °C, Full load(Ground, Benign, controlled environment)
 - Maximum value at nominal input and full load.
 - Typical value at nominal input and no load.
 - Typical value at nominal input and full load.
 - Test by minimum input and constant resistive load.
 - 24VDC output maximum output deviation is +20%,-10% inclusive of remote sense and trim. Others maximum output deviation is 10% inclusive of remote sense and trim. If remote sense is not being used, the +SENSE should be connected to its corresponding +OUTPUT and likewise the -SENSE should be connected to its corresponding -OUTPUT.
 - The CTRL pin voltage is referenced to -INPUT.
To order negative logic ON/OFF control add the suffix-N (Ex: FEC60-48S05-N).
 - Test condition with vertical direction by natural convection.
 - Heat-sink is optional and P/N : 7G-0026C-F.
 - The FEC60 series can meet EN55022 Class A with parallel an external capacitor to the input pins.
Recommend: 24VDC input : 6.8μF/50V 1812 MLCC
48VDC input : 2pcs of 2.2μF/100V 1812 MLCC.
 - An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5.
The filter capacitor Power Mate suggest: Nippon chemi-con KY series, 220 μ F/100V, ESR 48mΩ.
 - FEC60-24S24 and FEC60-48S24 safety approvals are pending.
- CAUTION:** This power module is not internally fused. An input line fuse must always be used.



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Mechanical Drawing:

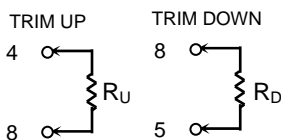


1. All dimensions in Inch (mm)
Tolerance: X.XX±0.02 (X.X±0.5)
X.XXX±0.01 (X.XX±0.25)
2. Pin pitch tolerance ±0.01(0.25)
3. Pin dimension tolerance ±0.004 (0.1)

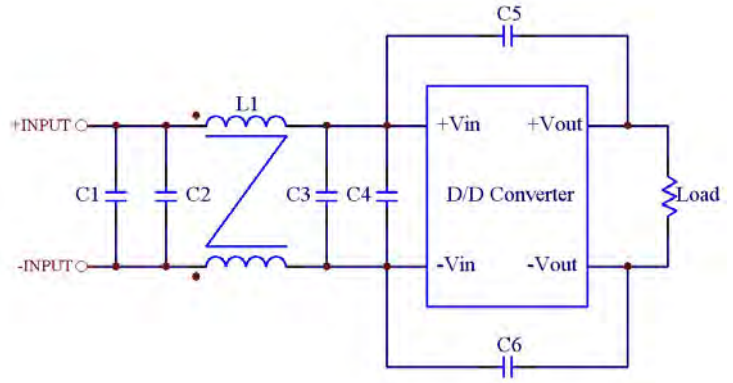
PIN CONNECTION	
PIN	SINGLE
1	+INPUT
2	-INPUT
3	CTRL
4	-SENSE
5	+SENSE
6	+OUTPUT
7	-OUTPUT
8	TRIM

EXTERNAL OUTPUT TRIMMING

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



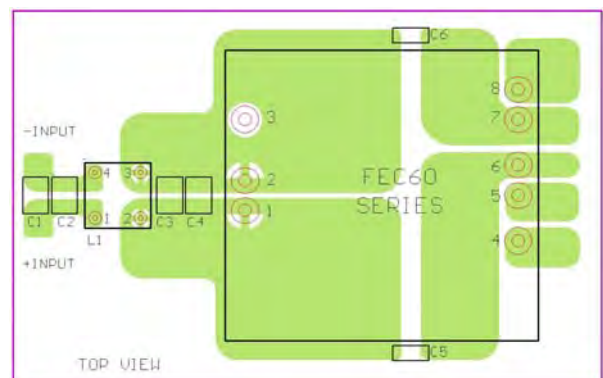
Recommended EMI Filter:



Recommended Filter for EN55022 Class B Compliance

The components used in the above figure, together with the manufacturers' part numbers for these components, are as follows:

	C1	C2	C3	C4	C5 & C6	L1
FEC60-24xxx	4.7µF/50V 1812MLCC	N/A	4.7µF/50V 1812MLCC	N/A	1000pF/2KV MLCC	450µH Common Choke PMT-048
FEC60-48xxx	2.2µF/100V 1812MLCC	2.2µF/100V 1812MLCC	2.2µF/100V 1812MLCC	N/A	1000pF/2KV MLCC	830µH Common Choke PMT-053



Recommended EN55022 Class B Filter Circuit Layout