



**POWER MATE  
TECHNOLOGY CO.,LTD.**

# FEC15-SERIES

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## APPLICATIONS

Wireless Network  
Telecom/Datacom  
Industry Control System  
Measurement  
Semiconductor Equipment

## FEATURES

- 15 WATTS OUTPUT POWER
- OUTPUT CURRENT UP TO 4A
- STANDARD 2" X 1" X 0.4" PACKAGE
- HIGH EFFICIENCY UP TO 88%
- 2:1 WIDE INPUT VOLTAGE RANGE
- SIX-SIDED CONTINUOUS SHIELD
- FIXED SWITCHING FREQUENCY
- CE MARK MEETS 2006/95/EC, 93/68/EEC AND 2004/108/EC
- UL60950-1, EN60950-1 AND IEC60950-1 LICENSED
- ISO9001 CERTIFIED MANUFACTURING FACILITIES
- COMPLIANT TO RoHS EU DIRECTIVE 2002/95/EC

## OPTIONS

Positive logic & Negative logic Remote On/Off

## DESCRIPTION

The FEC15 series offer 15 watts of output power from a 2 x 1 x 0.4 inch package. The FEC15 series with 2:1 wide input voltage of 9-18, 18-36 and 36-75VDC.

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

| OUTPUT SPECIFICATIONS                          |                                                      |                |                             |
|------------------------------------------------|------------------------------------------------------|----------------|-----------------------------|
| Output power                                   |                                                      |                | 15 Watts max                |
| Voltage accuracy                               | Full load and nominal Vin                            |                | ± 1%                        |
| Minimum load (Note 6)                          |                                                      |                | See Table                   |
| Line regulation                                | LL to HL at Full Load                                |                | ± 0.5%                      |
| Load regulation                                | Min. load to Full load                               | Single<br>Dual | ± 0.5%<br>± 1%              |
| Cross regulation (Dual)                        | Asymmetrical load 25% / 100% FL                      |                | ± 5%                        |
| Ripple and noise                               | 20MHz bandwidth                                      | Single<br>Dual | 50mVp-p<br>75mVp-p          |
| Temperature coefficient                        |                                                      |                | ±0.02% / °C, max            |
| Transient response recovery time               | 25% load step change                                 |                | 250uS                       |
| Over voltage protection<br>(Zener diode clamp) | 3.3V output<br>5V output<br>12V output<br>15V output |                | 3.9V<br>6.2V<br>15V<br>18V  |
| Over load protection                           | % of FL at nominal input                             |                | 150% max                    |
| Short circuit protection                       |                                                      |                | Hiccup, automatics recovery |

| GENERAL SPECIFICATIONS |                                         |                                                            |                                                    |
|------------------------|-----------------------------------------|------------------------------------------------------------|----------------------------------------------------|
| Efficiency             |                                         |                                                            | See table                                          |
| Isolation voltage      |                                         |                                                            | 1600VDC, min                                       |
| Isolation resistance   |                                         |                                                            | 10 <sup>9</sup> ohms, min                          |
| Isolation capacitance  |                                         |                                                            | 300pF, max                                         |
| Switching frequency    | Single output<br>Dual output            |                                                            | 500KHz, typ<br>300KHz, typ                         |
| Approvals and standard |                                         |                                                            | IEC60950-1, UL60950-1, EN60950-1                   |
| Case material          |                                         |                                                            | Nickel-coated copper                               |
| Base material          |                                         |                                                            | Non-conductive black plastic                       |
| Potting material       |                                         |                                                            | Epoxy (UL94-V0)                                    |
| Dimensions             |                                         |                                                            | 2.00 X 1.00 X 0.40 Inch<br>(50.8 X 25.4 X 10.2 mm) |
| Weight                 |                                         |                                                            | 27g (0.95oz)                                       |
| MTBF (Note 1)          | BELLCORE TR-NWT-000332<br>MIL-HDBK-217F | 2.041 x 10 <sup>6</sup> hrs<br>1.044 x 10 <sup>6</sup> hrs |                                                    |

| INPUT SPECIFICATIONS                |                                                             |          |                                                    |
|-------------------------------------|-------------------------------------------------------------|----------|----------------------------------------------------|
| Input voltage range                 | 12V nominal input<br>24V nominal input<br>48V nominal input |          | 9 – 18VDC<br>18 – 36VDC<br>36 – 75VDC              |
| Input filter                        |                                                             |          | Pi type                                            |
| Input surge voltage<br>100mS max    | 12V input<br>24V input<br>48V input                         |          | 36VDC<br>50VDC<br>100VDC                           |
| Input reflected ripple current      | Nominal Vin and full load                                   |          | 20mA p-p                                           |
| Start up time                       | Nominal Vin and<br>constant resistive load                  | Power up | 20mS typ                                           |
| Remote ON/OFF (Option) (Note 7)     |                                                             |          |                                                    |
| (Positive logic)                    | DC-DC ON<br>DC-DC OFF                                       |          | Open or 3.5V < Vr < 12V<br>Short or 0V < Vr < 1.2V |
| (Negative logic)                    | DC-DC ON<br>DC-DC OFF                                       |          | Short or 0V < Vr < 1.2V<br>Open or 3.5V < Vr < 12V |
| Input current of remote control pin | Nominal Vin                                                 |          | -0.5mA ~ +1mA                                      |
| Remote off state input current      | Nominal Vin                                                 |          | 20mA                                               |

| ENVIRONMENTAL SPECIFICATIONS |                                                       |  |                                         |
|------------------------------|-------------------------------------------------------|--|-----------------------------------------|
| Operating temperature range  |                                                       |  | -40°C ~ +85°C (with derating)           |
| Maximum case temperature     |                                                       |  | 100°C                                   |
| Storage temperature range    |                                                       |  | -55°C ~ +105°C                          |
| Thermal impedance (Note 8)   | Nature convection<br>Nature convection with heat-sink |  | 12°C/Watt<br>10°C/Watt                  |
| Thermal shock                |                                                       |  | MIL-STD-810F                            |
| Vibration                    |                                                       |  | 10~55Hz, 10G, 30minutes along X,Y and Z |
| Relative humidity            |                                                       |  | 5% to 95% RH                            |

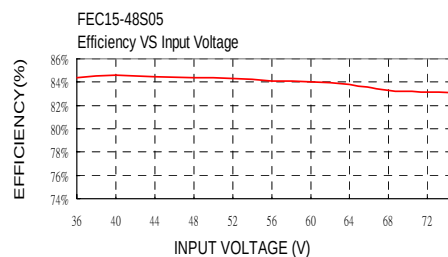
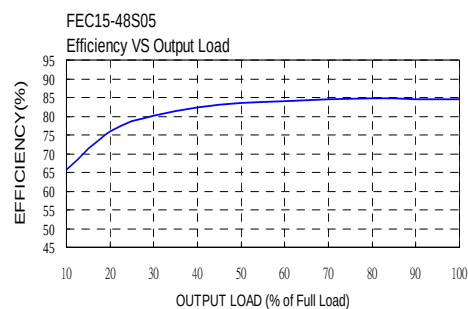
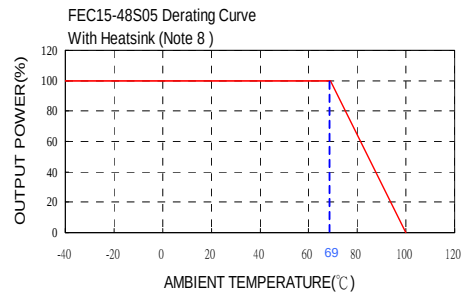
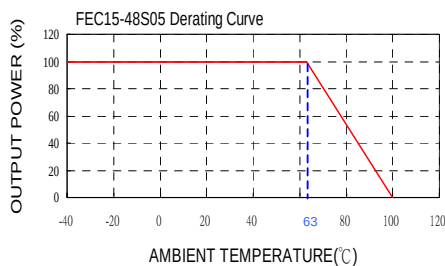
| EMC CHARACTERISTICS |             |                |                                 |
|---------------------|-------------|----------------|---------------------------------|
| EMI (Note 9)        | EN55022     |                | Class A                         |
| ESD                 | EN61000-4-2 | Air<br>Contact | ± 8KV<br>± 6KV Perf. Criteria B |
| Radiated immunity   | EN61000-4-3 |                | 10 V/m Perf. Criteria A         |
| Fast transient      | EN61000-4-4 |                | ± 2KV Perf. Criteria B          |
| Surge (Note 10)     | EN61000-4-5 |                | ± 1KV Perf. Criteria B          |
| Conducted immunity  | EN61000-4-6 |                | 10 Vr.m.s Perf. Criteria A      |

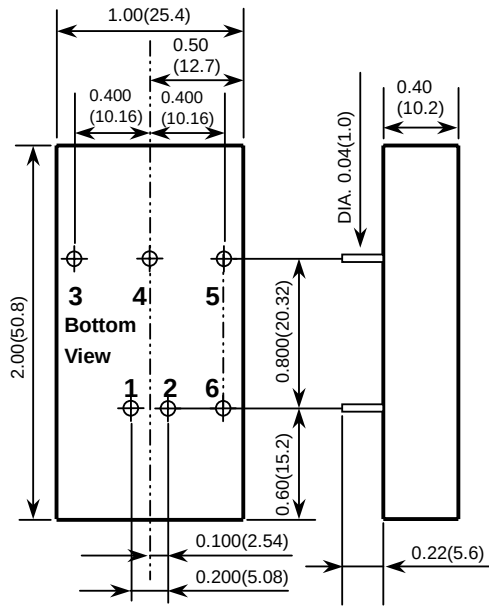


| Model Number | Input Range | Output Voltage | Output Current |           | Output <sup>(4)</sup><br>Ripple & Noise | Input Current          |                          | Eff <sup>(4)</sup><br>(%) | Capacitor <sup>(5)</sup><br>Load max |
|--------------|-------------|----------------|----------------|-----------|-----------------------------------------|------------------------|--------------------------|---------------------------|--------------------------------------|
|              |             |                | Min. load      | Full load |                                         | No load <sup>(3)</sup> | Full load <sup>(2)</sup> |                           |                                      |
| FEC15-12S33  | 9 – 18 VDC  | 3.3 VDC        | 0mA            | 4000mA    | 50mVp-p                                 | 30mA                   | 1467mA                   | 79                        | 10200uF                              |
| FEC15-12S05  | 9 – 18 VDC  | 5 VDC          | 15mA           | 3000mA    | 50mVp-p                                 | 25mA                   | 1603mA                   | 82                        | 7050uF                               |
| FEC15-12S12  | 9 – 18 VDC  | 12 VDC         | 0mA            | 1250mA    | 50mVp-p                                 | 25mA                   | 1524mA                   | 86                        | 1035uF                               |
| FEC15-12S15  | 9 – 18 VDC  | 15 VDC         | 0mA            | 1000mA    | 50mVp-p                                 | 20mA                   | 1524mA                   | 86                        | 705uF                                |
| FEC15-12D05  | 9 – 18 VDC  | ± 5 VDC        | 0mA            | ± 1500mA  | 75mVp-p                                 | 20mA                   | 1582mA                   | 83                        | ± 1020uF                             |
| FEC15-12D12  | 9 – 18 VDC  | ± 12 VDC       | 0mA            | ± 625mA   | 75mVp-p                                 | 30mA                   | 1524mA                   | 86                        | ± 495uF                              |
| FEC15-12D15  | 9 – 18 VDC  | ± 15 VDC       | ±10mA          | ± 500mA   | 75mVp-p                                 | 35mA                   | 1563mA                   | 84                        | ± 165uF                              |
| FEC15-24S33  | 18 – 36 VDC | 3.3 VDC        | 0mA            | 4000mA    | 50mVp-p                                 | 15mA                   | 724mA                    | 80                        | 10200uF                              |
| FEC15-24S05  | 18 – 36 VDC | 5 VDC          | 15mA           | 3000mA    | 50mVp-p                                 | 10mA                   | 781mA                    | 84                        | 7050uF                               |
| FEC15-24S12  | 18 – 36 VDC | 12 VDC         | 0mA            | 1250mA    | 50mVp-p                                 | 20mA                   | 772mA                    | 85                        | 1035uF                               |
| FEC15-24S15  | 18 – 36 VDC | 15 VDC         | 10mA           | 1000mA    | 50mVp-p                                 | 15mA                   | 772mA                    | 85                        | 705uF                                |
| FEC15-24D05  | 18 – 36 VDC | ± 5 VDC        | 0mA            | ± 1500mA  | 75mVp-p                                 | 15mA                   | 781mA                    | 84                        | ± 1020uF                             |
| FEC15-24D12  | 18 – 36 VDC | ± 12 VDC       | 0mA            | ± 625mA   | 75mVp-p                                 | 25mA                   | 762mA                    | 86                        | ± 495uF                              |
| FEC15-24D15  | 18 – 36 VDC | ± 15 VDC       | 0mA            | ± 500mA   | 75mVp-p                                 | 25mA                   | 762mA                    | 86                        | ± 165uF                              |
| FEC15-48S33  | 36 – 75 VDC | 3.3 VDC        | 0mA            | 4000mA    | 50mVp-p                                 | 10mA                   | 357mA                    | 81                        | 10200uF                              |
| FEC15-48S05  | 36 – 75 VDC | 5 VDC          | 0mA            | 3000mA    | 50mVp-p                                 | 20mA                   | 396mA                    | 83                        | 7050uF                               |
| FEC15-48S12  | 36 – 75 VDC | 12 VDC         | 10mA           | 1250mA    | 50mVp-p                                 | 15mA                   | 377mA                    | 87                        | 1035uF                               |
| FEC15-48S15  | 36 – 75 VDC | 15 VDC         | 0mA            | 1000mA    | 50mVp-p                                 | 15mA                   | 381mA                    | 86                        | 705uF                                |
| FEC15-48D05  | 36 – 75 VDC | ± 5 VDC        | 0mA            | ± 1500mA  | 75mVp-p                                 | 10mA                   | 386mA                    | 85                        | ± 1020uF                             |
| FEC15-48D12  | 36 – 75 VDC | ± 12 VDC       | 0mA            | ± 625mA   | 75mVp-p                                 | 15mA                   | 372mA                    | 88                        | ± 495uF                              |
| FEC15-48D15  | 36 – 75 VDC | ± 15 VDC       | 0mA            | ± 500mA   | 75mVp-p                                 | 15mA                   | 377mA                    | 87                        | ± 165uF                              |

#### 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 voltage and full load
- Typical value at nominal input voltage and no load.
- Typical value at nominal input voltage and full load.
- Test by minimum Vin and constant resistor load. minimum Vin and constant resistive load.
- The output requires a minimum loading on the output to maintain specified regulation. Operation under no-load condition will not damage these devices, however they may not meet all listed specification.
- The ON/OFF control pin voltage is referenced to -Vin.  
To order positive logic ON-OFF control add the suffix-P (Ex: FEC15-24S05-P)  
To order negative logic ON-OFF control add the suffix-N (Ex: FEC15-24S05-N)
- Heat sink is optional and P/N: 7G-0020A
- The FEC15 series can meet EN55022 Class A with parallel an external capacitor to the input pins.  
Recommend: 12Vin : 6.8μF/50V 1812 MLCC . 24Vin : 2.2μF/50V 1812 MLCC . 48Vin : 1.5μF/100V 1812 MLCC.
- An external filter capacitor is required if the module has to meet EN61000-4-5.  
The filter capacitor Power Mate suggest: Nippon chemi-con KY series, 220 μ F/100V, ESR 48mΩ.

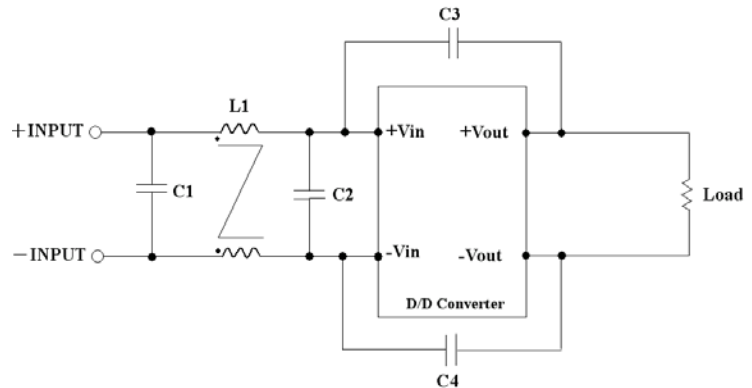




1. All dimensions in Inches (mm)  
Tolerance: X.XX±0.02 (X.X±0.5)  
X.XXX±0.01 (X.XX±0.25)
2. Pin pitch tolerance ±0.01(0.25)
3. Pin dimension tolerance ±0.004 (0.1)

## PIN CONNECTION

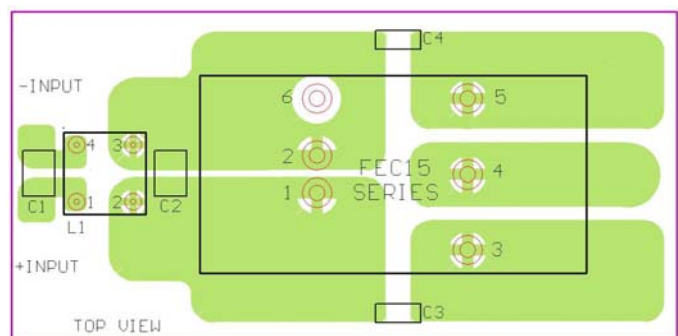
| PIN | SINGLE        | DUAL          |
|-----|---------------|---------------|
| 1   | + INPUT       | + INPUT       |
| 2   | - INPUT       | - INPUT       |
| 3   | + OUTPUT      | + OUTPUT      |
| 4   | NO PIN        | COMMON        |
| 5   | - OUTPUT      | - OUTPUT      |
| 6   | CTRL (Option) | CTRL (Option) |



## 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                 | L1                                  |
|-------------|-------------------------|-------------------------|--------------------|--------------------|-------------------------------------|
| FEC15-12xxx | 4.7uF/50V<br>1812 MLCC  | N/A                     | 1000pF/2KV<br>MLCC | 1000pF/2KV<br>MLCC | 325uH<br>Common<br>Choke<br>PMT-050 |
| FEC15-24xxx | 3.3uF/50V<br>1812 MLCC  | N/A                     | 1000pF/2KV<br>MLCC | 1000pF/2KV<br>MLCC | 325uH<br>Common<br>Choke<br>PMT-050 |
| FEC15-48xxx | 2.2uF/100V<br>1812 MLCC | 2.2uF/100V<br>1812 MLCC | 1000pF/2KV<br>MLCC | 1000pF/2KV<br>MLCC | 325uH<br>Common<br>Choke<br>PMT-050 |



## Recommended EN55022 Class B Filter Circuit Layout