



FEATURES

- 40 WATTS MAXIMUM OUTPUT POWER
- OUTPUT CURRENT UP TO 8A
- STANDARD 2.0 X 2.0 X 0.4 INCH PACKAGE
- HIGH EFFICIENCY UP TO 90%
- 2:1 WIDE INPUT VOLTAGE RANGE
- SIX-SIDED CONTINUOUS SHIELD
- FIXED SWITCHING FREQUENCY
- OFFER SINGLE, DUAL, DUAL POSITIVE (TOTAL OUTPUT CURRENT 8A) AND TRIPLE OUTPUT
- 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

APPLICATIONS

Wireless Network
Telecom/Datacom
Industry Control System
Measurement Equipment
Semiconductor Equipment

DESCRIPTION

The FEC40 series offer 40 watts of output power from a 2 x 2 x 0.4 inch package. The FEC40 series with 2:1 wide input voltage of 9-18VDC, 18-36VDC and 36-75VDC and features 1600VDC of isolation, short-circuit and over-voltage protection.

TECHNICAL SPECIFICATION

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

| OUTPUT SPECIFICATIONS | | |
|---|--|---|
| Output power | | 40 Watts, max. |
| Voltage accuracy FL and nominal Vin | Single / Dual | ± 1% |
| | Triple Main | ± 1% |
| | Auxiliary | ± 5% |
| Minimum load (Note 6) | | See Table |
| Voltage adjustability (Note 7) | Single and Dual output only (not including Dual Positive and triple) | ± 10% |
| Line regulation LL to HL at Full Load | Single/Dual | ± 0.5% |
| | Triple(main) | ± 1% |
| | Triple(auxiliary) | ± 5% |
| Load regulation (Note 8) Min. Load to Full Load | Single | ± 0.5% |
| | Dual | ± 1% |
| | Triple Main | ± 2% |
| | Auxiliary | ± 5% |
| Load cross regulation (Note 9) | Triple(main) | ± 1% |
| | Dual/Triple(auxiliary) | ± 5% |
| Ripple and noise (Note 10) | 20MHz bandwidth (Measured with a 0.1µF/50V MLCC) | See table |
| Temperature coefficient | | ±0.02% / °C, max. |
| Transient response recovery time | 25% load step change | 250µs |
| Over voltage protection Zener diode clamp | 1.5V output | 3.9VDC |
| | 1.8V output | 3.9VDC |
| | 2.5V output | 3.9VDC |
| | 3.3V output | 3.9VDC |
| | 5V output | 6.2VDC |
| | 12V output | 15VDC |
| | 15V output | 18VDC |
| Over load protection | % of FL at nominal input | 150%, max. |
| Short circuit protection | | Hiccup, automatics recovery |
| GENERAL SPECIFICATIONS | | |
| Efficiency | | See table |
| Isolation voltage | Input to Output | 1600VDC, min. |
| | Input(Output) to Case | 1600VDC, min. |
| Isolation resistance | | 10 ⁹ ohms, min. |
| Isolation capacitance | | 1000pF, max. |
| Switching frequency (Note 11) | | 300KHz, typ. |
| Approvals and standard | | IEC60950-1, UL60950-1, EN60950-1 |
| Case material | | Nickel-coated copper |
| Base material | | FR4 PCB |
| Potting material | | Epoxy (UL94-V0) |
| Dimensions | | 2.00 X 2.00 X 0.40 Inch (50.8 X 50.8 X 10.2 mm) |
| Weight | | 60g (2.11oz) |
| MTBF (Note 1) | BELLCORE TR-NWT-000332 | 1.398 x 10 ⁶ hrs |
| | MIL-HDBK-217F | 3.585 x 10 ⁵ hrs |

| INPUT SPECIFICATIONS | | |
|--|---|-------------------------|
| Input voltage range | 12V nominal input | 9 – 18VDC |
| | 24V nominal input | 18 – 36VDC |
| | 48V nominal input | 36 – 75VDC |
| Input filter | | L-C type |
| Input surge voltage 100mS max | 12V input | 36VDC |
| | 24V input | 50VDC |
| | 48V input | 100VDC |
| Input reflected ripple current | Nominal Vin and full load | 40mA _{p-p} |
| Start up time | Nominal Vin and constant resistive load | 25mS, typ. |
| | Powe up Remote ON/OFF | 25mS, typ. |
| Start-up voltage | 12V input | 9VDC |
| | 24V input | 17.8VDC |
| | 48V input | 36VDC |
| Shutdown voltage | 12V input | 8VDC |
| | 24V input | 16VDC |
| | 48V input | 34VDC |
| Remote ON/OFF (Note 12) (Positive logic) | DC-DC ON | Open or 3.5V < Vr < 12V |
| | DC-DC OFF | Short or 0V < Vr < 1.2V |
| Input current of remote control pin | Nominal Vin | -0.5mA~+0.5mA |
| Remote off input current | Nominal Vin | 2.5mA |

| ENVIRONMENTAL SPECIFICATIONS | | |
|-------------------------------|-----------------------|-------------------------------|
| Operating ambient temperature | | -40°C ~ +85°C (with derating) |
| Maximum case temperature | | +100°C |
| Storage temperature range | | -55°C ~ +105°C |
| Over temperature protection | | 115°C, typ |
| Thermal impedance (Note 13) | Nature convection | 9.2°C/Watt |
| | Heat-sink with 20LFM | 7.6°C/Watt |
| | Heat-sink with 500LFM | 2.8°C/Watt |
| Thermal shock | | MIL-STD-810F |
| Vibration | | MIL-STD-810F |
| Relative humidity | | 5% to 95% RH |

| EMC CHARACTERISTICS | | |
|--------------------------|-------------|----------------------------|
| EM I (Note 14) | EN55022 | Class A |
| ESD | EN61000-4-2 | Air ± 8KV |
| | | Contact ± 6KV |
| Radiated immunity | EN61000-4-3 | 10 V/m Perf. Criteria A |
| Fast transient (Note 15) | EN61000-4-4 | ± 2KV Perf. Criteria B |
| Surge (Note 15) | EN61000-4-5 | ± 1KV Perf. Criteria B |
| Conducted immunity | EN61000-4-6 | 10 Vr.m.s Perf. Criteria A |





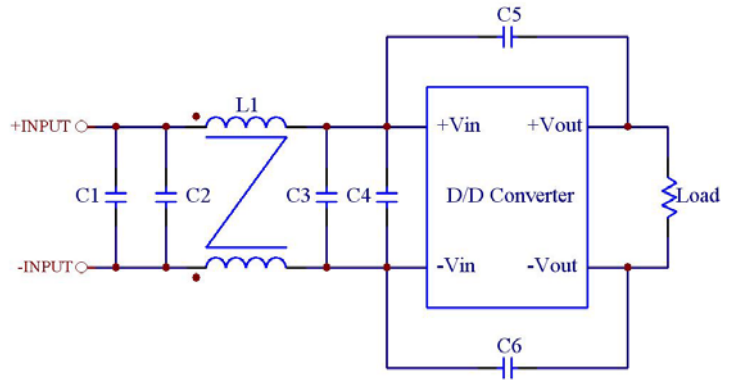
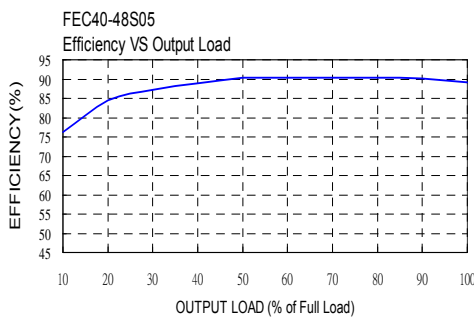
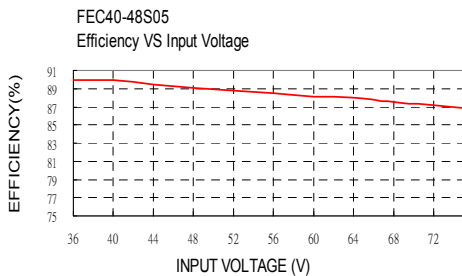
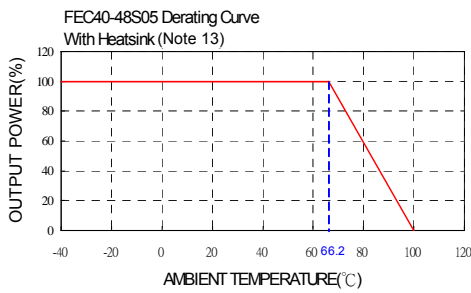
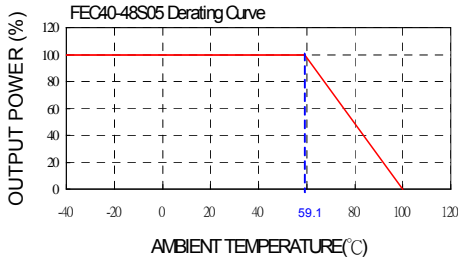
| Model Number | Input Range | Output Voltage | Output Current | | Output (4) Ripple & Noise | Input Current | | Eff (4) (%) | Capacitor(5) Load max |
|---------------|-------------|----------------|----------------|-------------------------|------------------------------|---------------|---------------|----------------|--------------------------|
| | | | Min. load | Full load | | No load (3) | Full load (2) | | |
| FEC40-12S1P5 | 9 – 18 VDC | 1.5 VDC | 0mA | 8000mA | 50mVp-p | 110mA | 1250mA | 84 | 45000µF |
| FEC40-12S1P8 | 9 – 18 VDC | 1.8 VDC | 0mA | 8000mA | 50mVp-p | 110mA | 1538mA | 82 | 37700µF |
| FEC40-12S2P5 | 9 – 18 VDC | 2.5 VDC | 0mA | 8000mA | 50mVp-p | 110mA | 2083mA | 84 | 27000µF |
| FEC40-12S3P3 | 9 – 18 VDC | 3.3 VDC | 0mA | 8000mA | 50mVp-p | 175mA | 2683mA | 86 | 21000µF |
| FEC40-12S05 | 9 – 18 VDC | 5 VDC | 0mA | 8000mA | 50mVp-p | 225mA | 4065mA | 86 | 13600µF |
| FEC40-12S12 | 9 – 18 VDC | 12 VDC | 0mA | 3333mA | 75mVp-p | 255mA | 4065mA | 86 | 2360µF |
| FEC40-12S15 | 9 – 18 VDC | 15 VDC | 0mA | 2666mA | 75mVp-p | 310mA | 4015mA | 87 | 1510µF |
| FEC40-12D12 | 9 – 18 VDC | ± 12 VDC | ± 144mA | ± 1800mA | 120mVp-p | 30mA | 4444mA | 85 | ± 1200µF |
| FEC40-12D15 | 9 – 18 VDC | ± 15 VDC | ± 112mA | ± 1400mA | 150mVp-p | 35mA | 4321mA | 85 | ± 750µF |
| FEC40-12D3305 | 9 – 18 VDC | 3.3 / 5 VDC | 0mA | 4A / 4A (total 8A) (16) | 100mVp-p | 325mA | 3416mA | 85 | 11000 / 6800µF |
| FEC40-12T3312 | 9 – 18 VDC | 3.3 / ±12 VDC | 600mA / ±40mA | 6000mA / ±400mA | 50 / 75mVp-p | 215mA | 3063mA | 84 | 13000 / ±330µF |
| FEC40-12T3315 | 9 – 18 VDC | 3.3 / ±15 VDC | 600mA / ±30mA | 6000mA / ±300mA | 50 / 75mVp-p | 230mA | 3000mA | 84 | 13000 / ±110µF |
| FEC40-12T0512 | 9 – 18 VDC | 5 / ±12 VDC | 600mA / ±40mA | 6000mA / ±400mA | 50 / 75mVp-p | 280mA | 4024mA | 86 | 6800 / ±330µF |
| FEC40-12T0515 | 9 – 18 VDC | 5 / ±15 VDC | 600mA / ±30mA | 6000mA / ±300mA | 50 / 75mVp-p | 255mA | 3963mA | 86 | 6800 / ±110µF |
| FEC40-24S1P5 | 18 – 36 VDC | 1.5 VDC | 0mA | 8000mA | 50mVp-p | 40mA | 649mA | 81 | 45000µF |
| FEC40-24S1P8 | 18 – 36 VDC | 1.8 VDC | 0mA | 8000mA | 50mVp-p | 40mA | 759mA | 83 | 37700µF |
| FEC40-24S2P5 | 18 – 36 VDC | 2.5 VDC | 0mA | 8000mA | 50mVp-p | 40mA | 1016mA | 86 | 27000µF |
| FEC40-24S3P3 | 18 – 36 VDC | 3.3 VDC | 0mA | 8000mA | 50mVp-p | 60mA | 1325mA | 87 | 21000µF |
| FEC40-24S05 | 18 – 36 VDC | 5 VDC | 0mA | 8000mA | 50mVp-p | 80mA | 1961mA | 89 | 13600µF |
| FEC40-24S12 | 18 – 36 VDC | 12 VDC | 0mA | 3333mA | 75mVp-p | 70mA | 2048mA | 88 | 2360µF |
| FEC40-24S15 | 18 – 36 VDC | 15 VDC | 0mA | 2666mA | 75mVp-p | 85mA | 1985mA | 89 | 1510µF |
| FEC40-24D12 | 18 – 36 VDC | ± 12 VDC | ± 144mA | ± 1800mA | 120mVp-p | 20mA | 2169mA | 87 | ± 1200µF |
| FEC40-24D15 | 18 – 36 VDC | ± 15 VDC | ± 112mA | ± 1400mA | 150mVp-p | 20mA | 2108mA | 87 | ± 750µF |
| FEC40-24D3305 | 18 – 36 VDC | 3.3 / 5 VDC | 0mA | 4A / 4A (total 8A) (16) | 100mVp-p | 80mA | 1689mA | 86 | 11000 / 6800µF |
| FEC40-24T3312 | 18 – 36 VDC | 3.3 / ±12 VDC | 600mA / ±40mA | 6000mA / ±400mA | 50 / 75mVp-p | 65mA | 1512mA | 85 | 13000 / ±330µF |
| FEC40-24T3315 | 18 – 36 VDC | 3.3 / ±15 VDC | 600mA / ±30mA | 6000mA / ±300mA | 50 / 75mVp-p | 65mA | 1481mA | 85 | 13000 / ±110µF |
| FEC40-24T0512 | 18 – 36 VDC | 5 / ±12 VDC | 600mA / ±40mA | 6000mA / ±400mA | 50 / 75mVp-p | 60mA | 1989mA | 87 | 6800 / ±330µF |
| FEC40-24T0515 | 18 – 36 VDC | 5 / ±15 VDC | 600mA / ±30mA | 6000mA / ±300mA | 50 / 75mVp-p | 75mA | 1958mA | 87 | 6800 / ±110µF |
| FEC40-48S1P5 | 36 – 75 VDC | 1.5 VDC | 0mA | 8000mA | 50mVp-p | 25mA | 321mA | 82 | 45000µF |
| FEC40-48S1P8 | 36 – 75 VDC | 1.8 VDC | 0mA | 8000mA | 50mVp-p | 25mA | 375mA | 84 | 37700µF |
| FEC40-48S2P5 | 36 – 75 VDC | 2.5 VDC | 0mA | 8000mA | 50mVp-p | 25mA | 508mA | 86 | 27000µF |
| FEC40-48S3P3 | 36 – 75 VDC | 3.3 VDC | 0mA | 8000mA | 50mVp-p | 35mA | 655mA | 88 | 21000µF |
| FEC40-48S05 | 36 – 75 VDC | 5 VDC | 0mA | 8000mA | 50mVp-p | 40mA | 969mA | 90 | 13600µF |
| FEC40-48S12 | 36 – 75 VDC | 12 VDC | 0mA | 3333mA | 75mVp-p | 50mA | 1000mA | 89 | 2360µF |
| FEC40-48S15 | 36 – 75 VDC | 15 VDC | 0mA | 2666mA | 75mVp-p | 50mA | 992mA | 89 | 1510µF |
| FEC40-48D12 | 36 – 75 VDC | ± 12 VDC | ± 144mA | ± 1800mA | 120mVp-p | 15mA | 1084mA | 87 | ± 1200µF |
| FEC40-48D15 | 36 – 75 VDC | ± 15 VDC | ± 112mA | ± 1400mA | 150mVp-p | 15mA | 1054mA | 87 | ± 750µF |
| FEC40-48D3305 | 36 – 75 VDC | 3.3 / 5 VDC | 0mA | 4A / 4A (total 8A) (16) | 100mVp-p | 45mA | 823mA | 88 | 11000 / 6800µF |
| FEC40-48T3312 | 36 – 75 VDC | 3.3 / ±12 VDC | 600mA / ±40mA | 6000mA / ±400mA | 50 / 75mVp-p | 35mA | 747mA | 86 | 13000 / ±330µF |
| FEC40-48T3315 | 36 – 75 VDC | 3.3 / ±15 VDC | 600mA / ±30mA | 6000mA / ±300mA | 50 / 75mVp-p | 35mA | 732mA | 86 | 13000 / ±110µF |
| FEC40-48T0512 | 36 – 75 VDC | 5 / ±12 VDC | 600mA / ±40mA | 6000mA / ±400mA | 50 / 75mVp-p | 30mA | 982mA | 88 | 6800 / ±330µF |
| FEC40-48T0515 | 36 – 75 VDC | 5 / ±15 VDC | 600mA / ±30mA | 6000mA / ±300mA | 50 / 75mVp-p | 40mA | 967mA | 88 | 6800 / ±110µF |

Note

- BELLCORE TR-NWT-000332. Case I: 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 resistive load.
- The output requires minimum loading on the output to maintain specified regulation. Operation in no-load condition will not damage these devices, however they may not meet all listed specification.
- For the single output: 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.
- Load regulation for triple output:
Main output(V1):10 to 100% with 10% to 100% balanced on auxiliaries.
Auxiliary outputs(V2 and V3):10% to 100% balanced on all outputs.
- Cross regulation for dual output: asymmetrical load 25% / 100% FL.
Cross regulation for triple output:
Main output 100% load, auxiliary 100%,other auxiliary25% to 100%.
Auxiliary outputs(V2 and V3):main output 100% load, auxiliary 100%, other auxiliary 25% to 100% or main output 25%,auxiliary 25%,other auxiliary 25% to 100%.
- The models of FEC40-XXD3305 are specified with a 1uF ceramic output capacitors.
- Switching frequency for dual output: master (5Vo) 300KHz slave (3.3Vo) 500KHz
- The ON/OFF control pin voltage is referenced to -Vin.
- Heat sink is optional and P/N : 7G-0026C-F.
- The FEC40 series can meet EN55022 Class A with parallel an external capacitor to the input pins.
Recommend: 12Vin : 6.8µF/50V 1812 MLCC ; 24Vin : 6.8µF/50V 1812 MLCC . 48Vin : 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 µF/100V, ESR 48mΩ.
- Any condition of dual output (3.3V/5V) rated lout current, not to exceed 8A of total output currents. The product safety approval Date: 2008/06/12



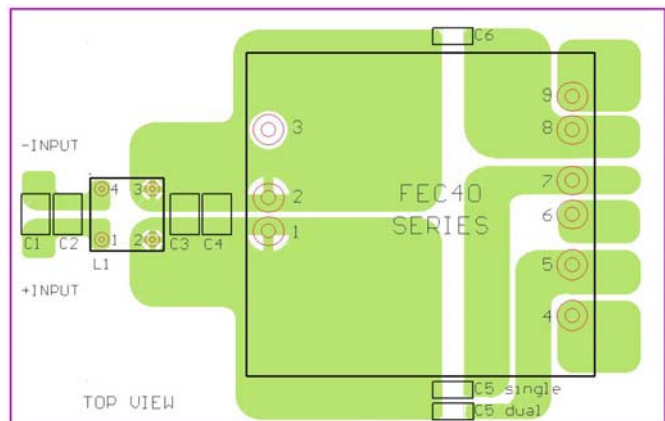
40 WATTS DC-DC CONVERTER



Recommended Filter for EN55022 Class B Compliance

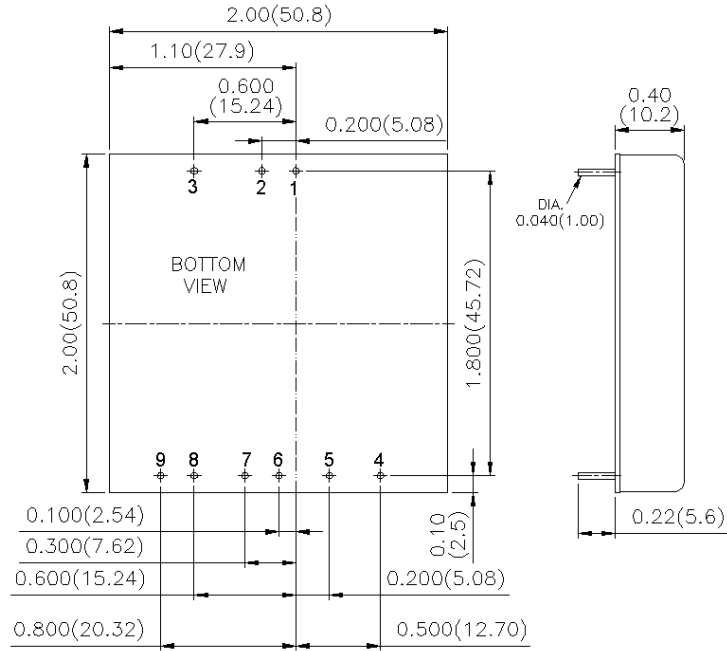
The components used in the above figure, together with the manufacturers' part numbers for these components, are as follows:

| | C1 | C2 | C3 | C4 | C5 & C6 | L1 |
|-------------|-------------------------|-------------------------|-------------------------|-------------------------|--------------------|-------------------------------------|
| FEC40-12xxx | 4.7μF/50V 1812 MLCC | N/A | 4.7μF/50V 1812 MLCC | N/A | 1000pF/2KV MLCC | 450μH Common Choke PMT-048 |
| FEC40-24xxx | 6.8μF/50V 1812 MLCC | N/A | 6.8μF/50V 1812 MLCC | N/A | 1000pF/2KV MLCC | 450μH Common Choke PMT-048 |
| FEC40-48xxx | 2.2μF/100V 1812 MLCC | 2.2μF/100V 1812 MLCC | 2.2μF/100V 1812 MLCC | 2.2μF/100V 1812 MLCC | 1000pF/2KV MLCC | 830μH Common Choke PMT-053 |



Recommended EN55022 Class B Filter Circuit Layout





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 | DUAL POSITIVE | TRIPLE |
|-----|-----------------|---------|---------------|---------|
| 1 | +INPUT | +INPUT | +INPUT | +INPUT |
| 2 | -INPUT | -INPUT | -INPUT | -INPUT |
| 3 | CTRL | CTRL | CTRL | CTRL |
| 4 | NC | NO PIN | 3.3V | +AUX |
| 5 | -SENSE (Note 7) | +OUTPUT | COMMON | COMMON |
| 6 | +SENSE (Note 7) | COMMON | NC | -AUX |
| 7 | +OUTPUT | COMMON | NC | +OUTPUT |
| 8 | -OUTPUT | -OUTPUT | 5V | COMMON |
| 9 | TRIM | TRIM | COMMON | NC |

EXTERNAL OUTPUT TRIMMING

Output can be externally trimmed by using the method shown below.
() for dual output trim

