




**UL E193009**  
**TUV R50009835**  
**CB JPTUV-003843**  
**CE MARK**  
**Patent No.144566**

# FEC40-SERIES

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

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 18-36VDC and 36-75VDC and features 1600VDC of isolation, short-circuit and over-voltage protection, as well as six sided shielding. All models are particularly suited to telecommunications, industrial, mobile telecom and test equipment applications.

## TECHNICAL SPECIFICATION

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

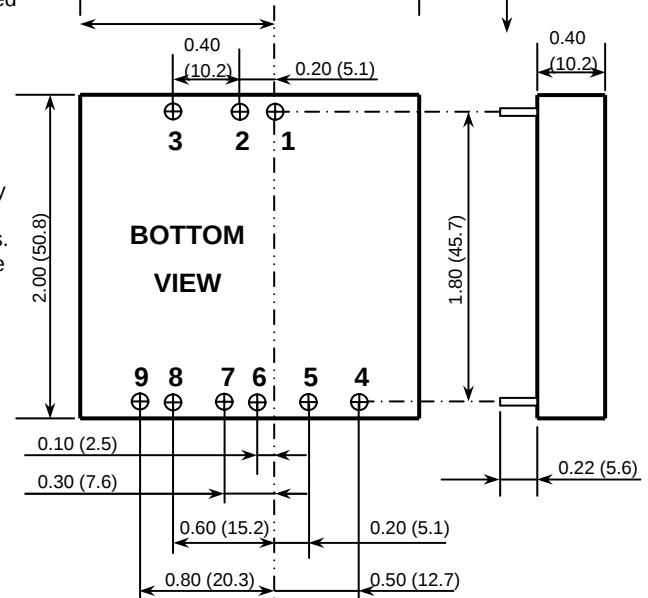
| OUTPUT SPECIFICATIONS                        |                                                  |                                               |         |
|----------------------------------------------|--------------------------------------------------|-----------------------------------------------|---------|
| Output power                                 |                                                  | 40 Watts max                                  |         |
| Voltage accuracy FL and nominal Vin          | Single / Dual                                    | ± 1%                                          |         |
|                                              | Triple Main                                      | ± 1%                                          |         |
|                                              | Auxiliary                                        | ± 3%                                          |         |
| Voltage adjustability (Note 1)               | Single output only                               | ± 10%                                         |         |
| Minimum load (Note 2)                        | Single and Dual                                  | 0%                                            |         |
|                                              | Triple                                           | 10% of FL                                     |         |
| Line regulation LL to HL at Full Load        | Single/Dual                                      | ± 0.5%                                        |         |
|                                              | Triple(main)                                     | ± 1%                                          |         |
|                                              | Triple(auxiliary)                                | ± 5%                                          |         |
| Load regulation 10% to 100% FL (Note 3)      | Single                                           | ± 0.5%                                        |         |
|                                              | Dual                                             | ± 1%                                          |         |
|                                              | Triple Main                                      | ± 2%                                          |         |
|                                              | Auxiliary                                        | ± 5%                                          |         |
| Load cross regulation (Note 4)               | Single/Dual/Triple(main)                         | ± 1%                                          |         |
|                                              | Triple(auxiliary)                                | ± 5%                                          |         |
| Ripple and noise (Note 5)                    | 20MHz bandwidth (Measured with a 104pF/50V MLCC) | See table                                     |         |
| Temperature coefficient                      |                                                  | ±0.02% / °C, max                              |         |
| Transient response recovery time             | 25% load step change                             | 400uS                                         |         |
| Over voltage protection<br>Zener diode clamp | 3.3V output                                      | 3.9V                                          |         |
|                                              | 5V output                                        | 6.2V                                          |         |
|                                              | 12V output                                       | 15V                                           |         |
|                                              | 15V output                                       | 18V                                           |         |
| Over load protection                         | % of FL at nominal input                         | 150% max                                      |         |
| Short circuit protection                     |                                                  | Hiccup, automatics recovery                   |         |
| INPUT SPECIFICATIONS                         |                                                  |                                               |         |
| Input voltage range                          | 24V nominal input                                | 18 – 36VDC                                    |         |
|                                              | 48V nominal input                                | 36 – 75VDC                                    |         |
| Under voltage lockout                        | 24V input                                        | DC-DC ON                                      | 17.8VDC |
|                                              |                                                  | DC-DC OFF                                     | 16VDC   |
|                                              | 48V input                                        | DC-DC ON                                      | 36VDC   |
|                                              |                                                  | DC-DC OFF                                     | 34VDC   |
| Input filter (Note 6)                        |                                                  | L-C type                                      |         |
| Input voltage variation dv/dt                |                                                  | 5V/ms,max (Complies with ETS300 132 part 4.4) |         |
| Input surge voltage 100mS max                | 24V input                                        | 50VDC                                         |         |
|                                              | 48V input                                        | 100VDC                                        |         |
| Input reflected ripple (Note 7)              | Nominal Vin and full load                        | 40mA-p-p                                      |         |
| Start up time                                | Nominal Vin and constant resistor load           | 25mS typ                                      |         |
| Remote ON/OFF (Note 8)                       | DC-DC ON                                         | Open or 3.5V < Vr < 12V                       |         |
|                                              | DC-DC OFF                                        | Short or 0V < Vr < 1.2V                       |         |
| Remote off input current                     | Nominal Vin                                      | 2.5mA                                         |         |

| GENERAL SPECIFICATIONS       |                       |                                                 |
|------------------------------|-----------------------|-------------------------------------------------|
| Efficiency                   |                       | See table                                       |
| Isolation voltage            |                       | 1600VDC, min                                    |
| Isolation resistance         |                       | 10 <sup>9</sup> ohms, min                       |
| Isolation capacitance        |                       | 1000pF, max                                     |
| Switching frequency (Note 9) |                       | 300KHz, typ                                     |
| Approvals and standard       |                       | IEC60950, UL1950, EN60950                       |
| Case material                |                       | Nickel-coated copper                            |
| Base material                |                       | Non-conductive black FR4                        |
| 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 10)               |                       | 1.398 x 10 <sup>6</sup> hrs                     |
| ENVIRONMENTAL SPECIFICATIONS |                       |                                                 |
| Operating temperature range  |                       | -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 11)  | Nature convection     | 9.2°C/Watt                                      |
|                              | Heat-sink with 20LFM  | 8.5°C/Watt                                      |
|                              | Heat-sink with 500LFM | 2.8°C/Watt                                      |
| Thermal shock                |                       | MIL-STD-810D                                    |
| Vibration                    |                       | 10-55Hz, 2G, 30minutes along X,Y and Z          |
| Relative humidity            |                       | 5% to 95% RH                                    |
| EMC CHARACTERISTICS          |                       |                                                 |
| Conducted emissions          | EN55022               | Level A                                         |
| Radiated emissions           | EN55022               | Level A                                         |
| ESD                          | EN61000-4-2           | Perf. Criteria2                                 |
| Radiated immunity            | EN61000-4-3           | Perf. Criteria2                                 |
| Fast transient               | EN61000-4-4           | Perf. Criteria2                                 |
| Surge                        | EN61000-4-5           | Perf. Criteria2                                 |
| Conducted immunity           | EN61000-4-6           | Perf. Criteria2                                 |



| Model Number  | Input Range | Output Voltage | Output Current                     | Output Ripple & Noise | Input Current <sup>(13)</sup> | Eff <sup>(14)</sup> (%) | Capacitor <sup>(15)</sup> Load max |
|---------------|-------------|----------------|------------------------------------|-----------------------|-------------------------------|-------------------------|------------------------------------|
| FEC40-24S3P3  | 18 – 36 VDC | 3.3 VDC        | 8000mA                             | 50mVp-p               | 1325mA                        | 87                      | 21000uF                            |
| FEC40-24S05   | 18 – 36 VDC | 5 VDC          | 8000mA                             | 50mVp-p               | 1961mA                        | 89                      | 13600uF                            |
| FEC40-24S12   | 18 – 36 VDC | 12 VDC         | 3333mA                             | 75mVp-p               | 2048mA                        | 88                      | 2360uF                             |
| FEC40-24S15   | 18 – 36 VDC | 15 VDC         | 2666mA                             | 75mVp-p               | 1985mA                        | 89                      | 1510uF                             |
| FEC40-24D3305 | 18 – 36 VDC | 3.3 / 5 VDC    | 4A / 4A (total 8A) <sup>(12)</sup> | 100mVp-p              | 1729mA                        | 84                      | 11000 / 6800uF                     |
| FEC40-24T3312 | 18 – 36 VDC | 3.3 / ±12 VDC  | 6000mA / ±400mA                    | 50 / 75mVp-p          | 1512mA                        | 85                      | 13000 / ±330uF                     |
| FEC40-24T3315 | 18 – 36 VDC | 3.3 / ±15 VDC  | 6000mA / ±300mA                    | 50 / 75mVp-p          | 1481mA                        | 85                      | 13000 / ±110uF                     |
| FEC40-24T0512 | 18 – 36 VDC | 5 / ±12 VDC    | 6000mA / ±400mA                    | 50 / 75mVp-p          | 1989mA                        | 87                      | 6800 / ±330uF                      |
| FEC40-24T0515 | 18 – 36 VDC | 5 / ±15 VDC    | 6000mA / ±300mA                    | 50 / 75mVp-p          | 1958mA                        | 87                      | 6800 / ±110uF                      |
| FEC40-48S3P3  | 36 – 75 VDC | 3.3 VDC        | 8000mA                             | 50mVp-p               | 655mA                         | 88                      | 21000uF                            |
| FEC40-48S05   | 36 – 75 VDC | 5 VDC          | 8000mA                             | 50mVp-p               | 969mA                         | 90                      | 13600uF                            |
| FEC40-48S12   | 36 – 75 VDC | 12 VDC         | 3333mA                             | 75mVp-p               | 1000mA                        | 89                      | 2360uF                             |
| FEC40-48S15   | 36 – 75 VDC | 15 VDC         | 2666mA                             | 75mVp-p               | 992mA                         | 89                      | 1510uF                             |
| FEC40-48D3305 | 36 – 75 VDC | 3.3 / 5 VDC    | 4A / 4A (total 8A) <sup>(12)</sup> | 100mVp-p              | 854mA                         | 85                      | 11000 / 6800uF                     |
| FEC40-48T3312 | 36 – 75 VDC | 3.3 / ±12 VDC  | 6000mA / ±400mA                    | 50 / 75mVp-p          | 747mA                         | 86                      | 13000 / ±330uF                     |
| FEC40-48T3315 | 36 – 75 VDC | 3.3 / ±15 VDC  | 6000mA / ±300mA                    | 50 / 75mVp-p          | 732mA                         | 86                      | 13000 / ±110uF                     |
| FEC40-48T0512 | 36 – 75 VDC | 5 / ±12 VDC    | 6000mA / ±400mA                    | 50 / 75mVp-p          | 982mA                         | 88                      | 6800 / ±330uF                      |
| FEC40-48T0515 | 36 – 75 VDC | 5 / ±15 VDC    | 6000mA / ±300mA                    | 50 / 75mVp-p          | 967mA                         | 88                      | 6800 / ±110uF                      |

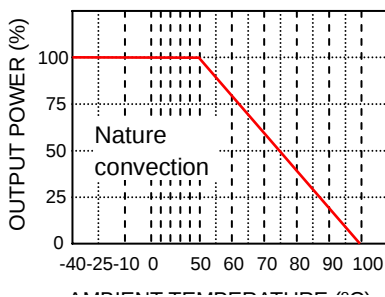
1. If remote sense is not being used, the +Vsense should be connected to its corresponding +OUTPUT and likewise the sense should be connected to its corresponding -OUTPUT.
2. The triple output required a minimum 10% loading on the output to maintain specified regulation. Operation under no-load condition will not damage these devices, however they may not meet all listed specification
3. 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.
4. Cross regulation for triple output:  
Main output 100% load, auxiliary 100%, other auxiliary 25% 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%.
5. The models of FEC40-XXD3305 are specified with a 1uF ceramic output capacitors.
6. An external filter capacitor is required for normal operation. The capacitor should be capable of handling 1A ripple current for 48V/24V models. Power mate suggest: Nippon chemi-con KMF series, 220uF/100V, ESR 90mΩ.
7. Simulated source impedance of 12uH. 12uH inductor in series with +Vin.
8. The ON/OFF control pin voltage is referenced to negative input.
9. Switching frequency for dual output:  
master (5Vo) 300KHz slave (3.3Vo) 500KHz
10. BELLCORE TR-NWT-000332. Case I: 50% Stress, Temperature at 40°C. (Ground fixed and controlled environment).
11. Heat sink is optional and P/N : 7G-0026A.
12. Any condition of dual output (3.3V/5V) rated lout current, not to exceed 8A of total output currents. The product safety approval pending..
13. Maximum value at nominal input voltage and full load.
14. Typical value at nominal input voltage and full load.
15. Test by minimum Vin and constant resistor load.



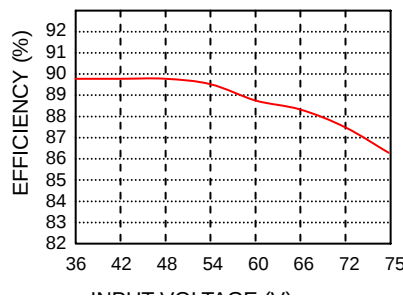
1. All dimensions in Inches (mm)  
2. Pin pitch tolerance ±0.014(0.35)

| PIN CONNECTION |                 |                |                |
|----------------|-----------------|----------------|----------------|
| PIN            | SINGLE          | DUAL           | TRIPLE         |
| 1              | + INPUT         | + INPUT        | + INPUT        |
| 2              | - INPUT         | - INPUT        | - INPUT        |
| 3              | CTRL            | CTRL           | CTRL           |
| 4              | NC              | 3.3V           | + AUX          |
| 5              | - SENSE (Note1) | 3.3V RTN (COM) | COMMON         |
| 6              | + SENSE (Note1) | NC             | - AUX          |
| 7              | + OUTPUT        | NC             | + OUTPUT       |
| 8              | - OUTPUT        | 5V             | - OUTPUT (COM) |
| 9              | TRIM            | 5V RTN (COM)   | NC             |

FEC40-48S05  
Derating Curve



FEC40-48S05  
Efficiency VS Input voltage



FEC40-48S05  
Efficiency VS Output load

