



## FEATURES

- 20 WATTS MAXIMUM OUTPUT POWER
- OUTPUT CURRENT UP TO 6A
- STANDARD 2.0 X 1.0 X 0.4 INCH PACKAGE
- HIGH EFFICIENCY UP TO 89%
- 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

## APPLICATIONS

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

## OPTIONS

Negative logic Remote On/Off

## DESCRIPTION

The FED20 series offer 20 watts of output power from a 2 x 1 x 0.4 inch package. The FED20 series with 2:1 wide input voltage of 9-18, 18-36 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                                 | 20 Watts, max.                                      |                                                            |
| Voltage accuracy                             | Full load and nominal Vin                           | ± 1%                                                       |
| Minimum load                                 | 0%                                                  |                                                            |
| Voltage adjustability                        | Single output                                       | ± 10%                                                      |
| Line regulation                              | LL to HL at Full Load                               | ± 0.2%                                                     |
| Load regulation                              | No Load to Full Load                                | ± 0.5%                                                     |
| Cross regulation (Dual)                      | Asymmetrical load 25% / 100% FL                     | ± 5%                                                       |
| Ripple and noise                             | 20MHz bandwidth<br>(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<br>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<br>Input(Output) to case            | 1600VDC, min.<br>1600VDC, min.                             |
| Isolation resistance                         | 10 <sup>9</sup> ohms, min.                          |                                                            |
| Isolation capacitance                        | 1000pF, max.                                        |                                                            |
| Switching frequency                          | 500KHz, 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             | 1.791 x 10 <sup>6</sup> hrs<br>6 842 x 10 <sup>5</sup> 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<br>100mS max    | 12V input                                  | 36VDC                     |                          |                  |
|                                     | 24V input                                  | 50VDC                     |                          |                  |
|                                     | 48V input                                  | 100VDC                    |                          |                  |
| Input reflected ripple current      | Nominal Vin and full load                  | 20mA <sub>p-p</sub>       |                          |                  |
| Start up time                       | Nominal Vin and<br>constant resistive load | Power up<br>Remote ON/OFF | 10mS, typ.<br>10mS, typ. |                  |
| Remote ON/OFF (Note 6)              |                                            |                           |                          |                  |
| (Positive logic)(Standard)          | DC-DC ON                                   | Open or 3V < Vr < 12V     |                          |                  |
|                                     | DC-DC OFF                                  | Short or 0V < Vr < 1.2V   |                          |                  |
|                                     | (Negative logic)(Option)                   | DC-DC ON                  | Short or 0V < Vr < 1.2V  |                  |
|                                     | DC-DC OFF                                  | Open or 3V < Vr < 12V     |                          |                  |
| Input current of remote control pin | Nominal Vin                                | -0.5mA ~ +0.5mA           |                          |                  |
| Remote off state 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                             |                           |                          |                  |
| Thermal impedance (Note 7)          | Nature convection                          | 12°C/Watt                 |                          |                  |
|                                     | Nature convection with heat-sink           | 10°C/Watt                 |                          |                  |
| Thermal shock                       | MIL-STD-810F                               |                           |                          |                  |
| Vibration                           | MIL-STD-810F                               |                           |                          |                  |
| Relative humidity                   | 5% to 95% RH                               |                           |                          |                  |
| EMC CHARACTERISTICS                 |                                            |                           |                          |                  |
| EMI (Note 8)                        | EN55022                                    | Class A                   |                          |                  |
| ESD                                 | EN61000-4-2                                | Air                       | ± 8KV                    | Perf. Criteria B |
|                                     |                                            | Contact                   | ± 6KV                    |                  |
| Radiated immunity                   | EN61000-4-3                                | 10 V/m                    | Perf. Criteria A         |                  |
| Fast transient (Note 9)             | EN61000-4-4                                | ± 2KV                     | Perf. Criteria A         |                  |
| Surge (Note 9)                      | EN61000-4-5                                | ± 1KV                     | Perf. Criteria B         |                  |
| Conducted immunity                  | EN61000-4-6                                | 10 Vr.m.s                 | Perf. Criteria A         |                  |

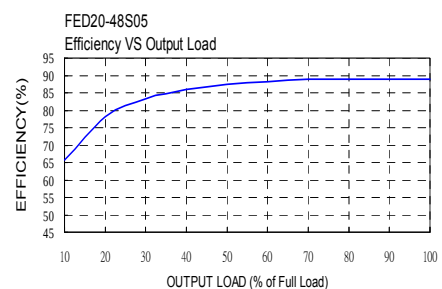
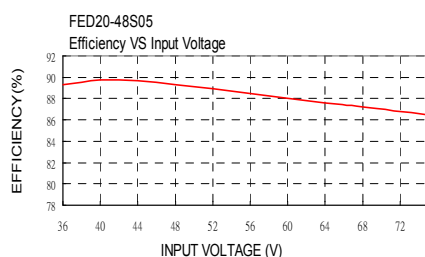
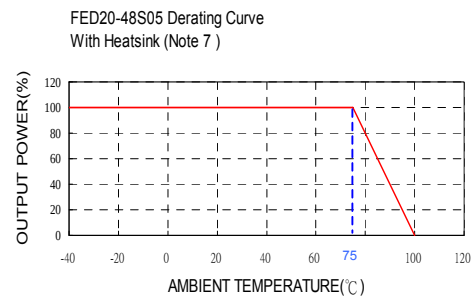
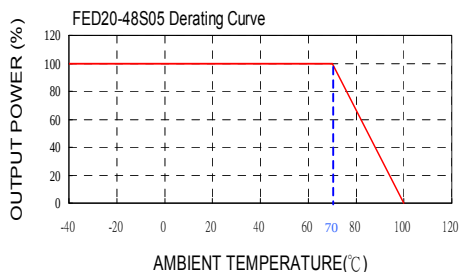


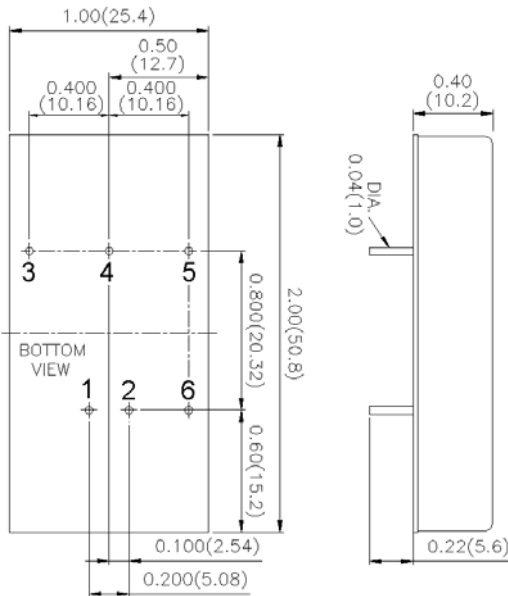


| Model Number | Input Range | Output Voltage | Output Current |           | Output (4)<br>Ripple & Noise | Input Current |               | Eff (4)<br>(%) | Capacitor (5)<br>Load max |
|--------------|-------------|----------------|----------------|-----------|------------------------------|---------------|---------------|----------------|---------------------------|
|              |             |                | Min. load      | Full load |                              | No load (3)   | Full load (2) |                |                           |
| FED20-12S1P5 | 9 – 18 VDC  | 1.5 VDC        | 0mA            | 6000mA    | 60mVp-p                      | 70mA          | 1014mA        | 78             | 65000μF                   |
| FED20-12S1P8 | 9 – 18 VDC  | 1.8 VDC        | 0mA            | 6000mA    | 60mVp-p                      | 75mA          | 1200mA        | 79             | 65000μF                   |
| FED20-12S2P5 | 9 – 18 VDC  | 2.5 VDC        | 0mA            | 6000mA    | 60mVp-p                      | 80mA          | 1582mA        | 83             | 33000μF                   |
| FED20-12S3P3 | 9 – 18 VDC  | 3.3 VDC        | 0mA            | 5000mA    | 60mVp-p                      | 115mA         | 1698mA        | 85             | 13000μF                   |
| FED20-12S05  | 9 – 18 VDC  | 5 VDC          | 0mA            | 4000mA    | 75mVp-p                      | 75mA          | 2008mA        | 87             | 6800μF                    |
| FED20-12S12  | 9 – 18 VDC  | 12 VDC         | 0mA            | 1670mA    | 75mVp-p                      | 90mA          | 2037mA        | 86             | 2200μF                    |
| FED20-12S15  | 9 – 18 VDC  | 15 VDC         | 0mA            | 1330mA    | 75mVp-p                      | 35mA          | 2027mA        | 86             | 755μF                     |
| FED20-12D12  | 9 – 18 VDC  | ±12VDC         | 0mA            | ±833mA    | 100mVp-p                     | 45mA          | 2032mA        | 86             | ±680μF                    |
| FED20-12D15  | 9 – 18 VDC  | ±15VDC         | 0mA            | ±667mA    | 100mVp-p                     | 50mA          | 2034mA        | 86             | ±450μF                    |
| FED20-24S1P5 | 18 – 36 VDC | 1.5 VDC        | 0mA            | 6000mA    | 60mVp-p                      | 35mA          | 493mA         | 80             | 65000μF                   |
| FED20-24S1P8 | 18 – 36 VDC | 1.8 VDC        | 0mA            | 6000mA    | 60mVp-p                      | 45mA          | 584mA         | 81             | 65000μF                   |
| FED20-24S2P5 | 18 – 36 VDC | 2.5 VDC        | 0mA            | 6000mA    | 60mVp-p                      | 40mA          | 781mA         | 84             | 33000μF                   |
| FED20-24S3P3 | 18 – 36 VDC | 3.3 VDC        | 0mA            | 5000mA    | 60mVp-p                      | 30mA          | 838mA         | 86             | 13000μF                   |
| FED20-24S05  | 18 – 36 VDC | 5 VDC          | 0mA            | 4000mA    | 75mVp-p                      | 35mA          | 980mA         | 89             | 6800μF                    |
| FED20-24S12  | 18 – 36 VDC | 12 VDC         | 0mA            | 1670mA    | 75mVp-p                      | 55mA          | 1006mA        | 87             | 2200μF                    |
| FED20-24S15  | 18 – 36 VDC | 15 VDC         | 0mA            | 1330mA    | 75mVp-p                      | 40mA          | 1002mA        | 87             | 755μF                     |
| FED20-24D12  | 18 – 36 VDC | ±12VDC         | 0mA            | ±833mA    | 100mVp-p                     | 30mA          | 1004mA        | 87             | ±680μF                    |
| FED20-24D15  | 18 – 36 VDC | ±15VDC         | 0mA            | ±667mA    | 100mVp-p                     | 30mA          | 993mA         | 88             | ±450μF                    |
| FED20-48S1P5 | 36 – 75 VDC | 1.5 VDC        | 0mA            | 6000mA    | 60mVp-p                      | 15mA          | 247mA         | 80             | 65000μF                   |
| FED20-48S1P8 | 36 – 75 VDC | 1.8 VDC        | 0mA            | 6000mA    | 60mVp-p                      | 20mA          | 288mA         | 82             | 65000μF                   |
| FED20-48S2P5 | 36 – 75 VDC | 2.5 VDC        | 0mA            | 6000mA    | 60mVp-p                      | 30mA          | 391mA         | 84             | 33000μF                   |
| FED20-48S3P3 | 36 – 75 VDC | 3.3 VDC        | 0mA            | 5000mA    | 60mVp-p                      | 15mA          | 414mA         | 87             | 13000μF                   |
| FED20-48S05  | 36 – 75 VDC | 5 VDC          | 0mA            | 4000mA    | 75mVp-p                      | 20mA          | 490mA         | 89             | 6800μF                    |
| FED20-48S12  | 36 – 75 VDC | 12 VDC         | 0mA            | 1670mA    | 75mVp-p                      | 35mA          | 497mA         | 88             | 2200μF                    |
| FED20-48S15  | 36 – 75 VDC | 15 VDC         | 0mA            | 1330mA    | 75mVp-p                      | 50mA          | 501mA         | 87             | 755μF                     |
| FED20-48D12  | 36 – 75 VDC | ±12VDC         | 0mA            | ±833mA    | 100mVp-p                     | 20mA          | 496mA         | 88             | ±680μF                    |
| FED20-48D15  | 36 – 75 VDC | ±15VDC         | 0mA            | ±667mA    | 100mVp-p                     | 20mA          | 496mA         | 88             | ±450μF                    |

#### 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 resistive load.
- The ON/OFF control pin voltage is referenced to -Vin.  
To order negative logic ON-OFF control add the suffix-N (Ex: FED20-24S05-N).
- Heat sink is optional and P/N: 7G-0020C-F.
- The FED20 series can meet EN55022 Class A with parallel an external capacitor to the input pins.  
Recommend: 12Vin : 4.7μF/50V 1812 MLCC .  
24Vin : 2.2μF/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.



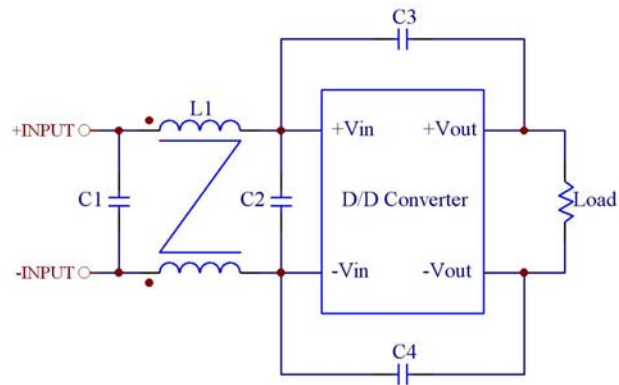
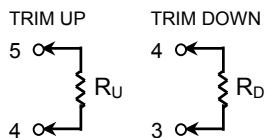


1. All dimensions in Inches (mm)  
Tolerance: X.XX±0.02 (X.X±0.5)  
X.XXX±0.01 (X.XX±0.25)
2. Pin pitch tolerance ±0.01(0.25)
3. Pin dimension tolerance ±0.004 (0.1)

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

#### EXTERNAL OUTPUT TRIMMING

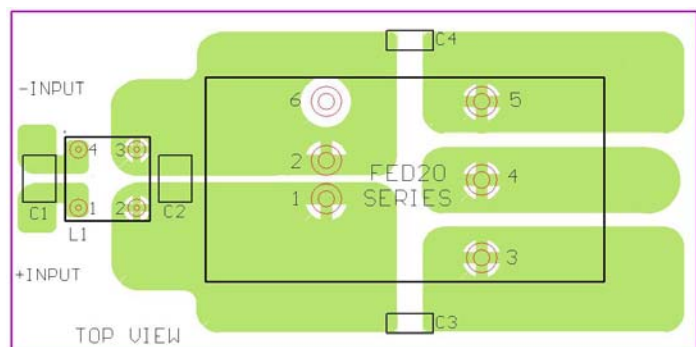
Output can be externally trimmed by using the method shown below.



#### 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                                  |
|-------------|-------------------------|-------------------------|--------------------|--------------------|-------------------------------------|
| FED20-12xxx | 3.3μF/50V<br>1812 MLCC  | 3.3μF/50V<br>1812 MLCC  | 1000pF/2KV<br>MLCC | 1000pF/2KV<br>MLCC | 450μH<br>Common<br>Choke<br>PMT-048 |
| FED20-24xxx | 4.7μF/50V<br>1812 MLCC  | N/A                     | 1000pF/2KV<br>MLCC | 1000pF/2KV<br>MLCC | 450μH<br>Common<br>Choke<br>PMT-048 |
| FED20-48xxx | 2.2μF/100V<br>1812 MLCC | 2.2μF/100V<br>1812 MLCC | 1000pF/2KV<br>MLCC | 1000pF/2KV<br>MLCC | 325μH<br>Common<br>Choke<br>PMT-050 |



#### Recommended EN55022 Class B Filter Circuit Layout

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

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- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

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## JONHON

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ВЧ соединители, коаксиальные кабели,  
кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



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