

FED20 SERIES

DC-DC CONVERTER

2:1 WIDE INPUT RANGE
UP TO 20Watts



FEATURES

- NO MINIMUM LOAD REQUIRED
- 1600VDC INPUT TO OUTPUT ISOLATION
- STANDARD 2.00 X 1.00 X 0.40 INCH
- SIX-SIDED CONTINUOUS SHIELD
- UL60950-1, EN60950-1, & IEC60950-1 SAFETY APPROVALS
- CE MARKED
- COMPLIANT TO RoHS II & REACH

APPLICATIONS

- WIRELESS NETWORK
- TELECOM/DATACOM
- INDUSTRY CONTROL SYSTEM
- DISTRIBUTED POWER ARCHITECTURES
- SEMICONDUCTOR EQUIPMENT

1600VDC
ISOLATION

REMOTE
CONTROL

OCP

SCP

OVP

TECHNICAL SPECIFICATION

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

| Model Number | Input Range | Output Voltage | Output Current @Full Load | Input Current @ No Load | Efficiency | Maximum Capacitor Load (1) |
|--------------|-------------|----------------|---------------------------|-------------------------|------------|----------------------------|
| | VDC | VDC | mA | mA | % | µF |
| FED20-12S1P5 | 9 ~ 18 | 1.5 | 6000 | 70 | 78 | 65000 |
| FED20-12S1P8 | 9 ~ 18 | 1.8 | 6000 | 75 | 79 | 65000 |
| FED20-12S2P5 | 9 ~ 18 | 2.5 | 6000 | 80 | 83 | 33000 |
| FED20-12S3P3 | 9 ~ 18 | 3.3 | 5000 | 115 | 85 | 13000 |
| FED20-12S05 | 9 ~ 18 | 5 | 4000 | 75 | 87 | 6800 |
| FED20-12S12 | 9 ~ 18 | 12 | 1670 | 90 | 86 | 2200 |
| FED20-12S15 | 9 ~ 18 | 15 | 1330 | 35 | 86 | 755 |
| FED20-12D12 | 9 ~ 18 | ±12 | ±833 | 45 | 86 | ±680 |
| FED20-12D15 | 9 ~ 18 | ±15 | ±667 | 50 | 86 | ±450 |
| FED20-24S1P5 | 18 ~ 36 | 1.5 | 6000 | 35 | 80 | 65000 |
| FED20-24S1P8 | 18 ~ 36 | 1.8 | 6000 | 45 | 81 | 65000 |
| FED20-24S2P5 | 18 ~ 36 | 2.5 | 6000 | 40 | 84 | 33000 |
| FED20-24S3P3 | 18 ~ 36 | 3.3 | 5000 | 30 | 86 | 13000 |
| FED20-24S05 | 18 ~ 36 | 5 | 4000 | 35 | 89 | 6800 |
| FED20-24S12 | 18 ~ 36 | 12 | 1670 | 55 | 87 | 2200 |
| FED20-24S15 | 18 ~ 36 | 15 | 1330 | 40 | 87 | 755 |
| FED20-24D12 | 18 ~ 36 | ±12 | ±833 | 30 | 87 | ±680 |
| FED20-24D15 | 18 ~ 36 | ±15 | ±667 | 30 | 88 | ±450 |
| FED20-48S1P5 | 36 ~ 75 | 1.5 | 6000 | 15 | 80 | 65000 |
| FED20-48S1P8 | 36 ~ 75 | 1.8 | 6000 | 20 | 82 | 65000 |
| FED20-48S2P5 | 36 ~ 75 | 2.5 | 6000 | 30 | 84 | 33000 |
| FED20-48S3P3 | 36 ~ 75 | 3.3 | 5000 | 15 | 87 | 13000 |
| FED20-48S05 | 36 ~ 75 | 5 | 4000 | 20 | 89 | 6800 |
| FED20-48S12 | 36 ~ 75 | 12 | 1670 | 35 | 88 | 2200 |
| FED20-48S15 | 36 ~ 75 | 15 | 1330 | 50 | 87 | 755 |
| FED20-48D12 | 36 ~ 75 | ±12 | ±833 | 20 | 88 | ±680 |
| FED20-48D15 | 36 ~ 75 | ±15 | ±667 | 20 | 88 | ±450 |

PART NUMBER STRUCTURE

FED20 - 48 S 05 - N HS

| Series Name | Input Voltage (VDC) | Output Quantity | Output Voltage (VDC) | Remote Control Option | Assembly Option |
|-------------|------------------------------------|--|---|--|--|
| | 12: 9-18 24: 18-36 48: 36-75 | S: Single D: Dual | 1P5: 1.5 1P8: 1.8 2P5: 2.5 3P3: 3.3 05: 5 12: 12 15: 15 12: ±12 15: ±15 | <input type="checkbox"/> : Positive logic N: Negative logic | <input type="checkbox"/> : None HS: Heat-sink HC: Heat-sink with Clamp |

INPUT SPECIFICATIONS

| Parameter | Conditions | | Min. | Typ. | Max. | Unit |
|--------------------------------|-----------------------------|---------------------------|-------------------|---------------------|------|-------|
| Operating input voltage range | 12Vin(nom) | | 9 | 12 | 18 | VDC |
| | 24Vin(nom) | | 18 | 24 | 36 | |
| | 48Vin(nom) | | 36 | 48 | 75 | |
| Input reflected ripple current | Nominal input and Full load | | | 20 | | mAp-p |
| Start up time | Constant resistive load | Power up | | 10 | | ms |
| | | Remote ON/OFF | | 10 | | |
| Input surge voltage | 100 ms, max. | 12Vin(nom) | | | 36 | VDC |
| | | 24Vin(nom) | | | 50 | |
| | | 48Vin(nom) | | | 100 | |
| Input filter | | | L-C type | | | |
| Remote ON/OFF | Referred to -Vin pin | Positive logic (Standard) | DC-DC ON | Open or 3 ~ 12VDC | | mA |
| | | | DC-DC OFF | Short or 0 ~ 1.2VDC | | |
| | | Negative logic (Option) | DC-DC ON | Short or 0 ~ 1.2VDC | | |
| | | DC-DC OFF | Open or 3 ~ 12VDC | | | |
| | | Input current of Ctrl pin | -0.5 | | +0.5 | |
| | | Remote off input current | | 2.5 | | |

OUTPUT SPECIFICATIONS

| Parameter | Conditions | | Min. | Typ. | Max. | Unit |
|----------------------------------|--|---------|--------------------------------|------|-------|-------|
| Voltage accuracy | | | -1.0 | | +1.0 | % |
| Line regulation | Low Line to High Line at Full Load | | -0.2 | | +0.2 | % |
| Load regulation | No Load to Full Load | | -0.5 | | +0.5 | % |
| Cross regulation | Asymmetrical load 25%/100% FL | Dual | -5.0 | | +5.0 | % |
| Voltage adjustability | Single output | | -10 | | +10 | % |
| Ripple and noise | Measured by 20MHz bandwidth With a 0.1µF/50V MLCC | Single | | 60 | | mVp-p |
| | | Others | 5Vout, 12Vout, 15Vout | 75 | | |
| | | Dual | All | 100 | | |
| Temperature coefficient | | | -0.02 | | +0.02 | %/°C |
| Transient response recovery time | 25% load step change | | | 250 | | µs |
| Over voltage protection | Zener diode clamp | 1.5Vout | | 3.9 | | VDC |
| | | 1.8Vout | | 3.9 | | |
| | | 2.5Vout | | 3.9 | | |
| | | 3.3Vout | | 3.9 | | |
| | | 5Vout | | 6.2 | | |
| | | 12Vout | | 15 | | |
| | | 15Vout | | 18 | | |
| Over load protection | % of Iout rated | | | | 150 | % |
| Short circuit protection | | | Continuous, automatic recovery | | | |

GENERAL SPECIFICATIONS

| Parameter | Conditions | | Min. | Typ. | Max. | Unit |
|-----------------------|--------------------------|-----------------------|--------------------------------------|------|------|------|
| Isolation voltage | 1 minute | Input to Output | 1600 | | | VDC |
| | | Input(Output) to Case | 1600 | | | |
| Isolation resistance | 500VDC | | 1 | | | GΩ |
| Isolation capacitance | | | | | 1000 | pF |
| Switching frequency | | | 450 | 500 | 550 | kHz |
| Safety approvals | | | UL60950-1 EN60950-1 IEC60950-1 | | | |
| Case material | | | Nickel-coated copper | | | |
| Base material | | | Non-conductive black plastic | | | |
| Potting material | | | Epoxy (UL94 V-0) | | | |
| Weight | | | 27g (0.95oz) | | | |
| MTBF | MIL-HDBK-217F, Full load | | 1.583 x 10 ⁶ hrs | | | |

ENVIRONMENTAL SPECIFICATIONS

| Parameter | Conditions | | Min. | Typ. | Max. | Unit |
|-------------------------------|--|-------------------|--------------|------|------|------|
| Operating ambient temperature | With derating | | -40 | | +100 | °C |
| Maximum case temperature | | | | | +100 | °C |
| Storage temperature range | | | -55 | | +125 | °C |
| Thermal impedance | Vertical direction by natural convection (20LFM) | Without heat-sink | | 12 | | °C/W |
| | | With heat-sink | | 10 | | |
| Thermal shock | | | MIL-STD-810F | | | |
| Vibration | | | MIL-STD-810F | | | |
| Relative humidity | | | 5% to 95% RH | | | |

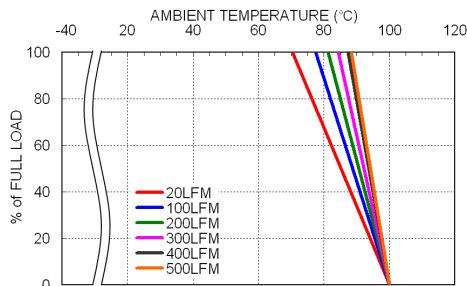
EMC SPECIFICATIONS

| Parameter | Conditions | | Level |
|--------------------------------|-------------|-------------------------------------|------------------|
| EMI ⁽²⁾ | EN55022 | | Class A, Class B |
| ESD | EN61000-4-2 | Air $\pm 8kV$ and Contact $\pm 6kV$ | Perf. Criteria B |
| Radiated immunity | EN61000-4-3 | 10 V/m | Perf. Criteria A |
| Fast transient ⁽³⁾ | EN61000-4-4 | $\pm 2kV$ | Perf. Criteria A |
| Surge ⁽³⁾ | EN61000-4-5 | $\pm 1kV$ | Perf. Criteria B |
| Conducted immunity | EN61000-4-6 | 10 Vr.m.s | Perf. Criteria A |
| Power frequency magnetic field | EN61000-4-8 | 100A/m continuous; 1000A/m 1 second | Perf. Criteria A |

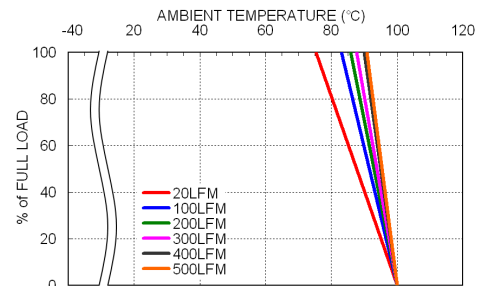
Note:

1. Test by minimum input and constant resistive load.
2. The standard module meet EN55022 Class A and Class B with external components. For further information, please contact with P-DUKE.
3. 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.

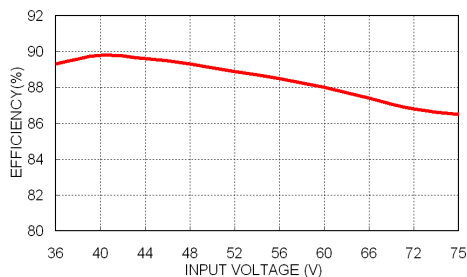
CAUTION: This power module is not internally fused. An input line fuse must always be used.

CHARACTERISTIC CURVE


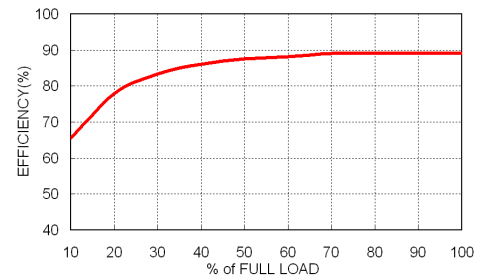
FED20-48S05 Derating Curve



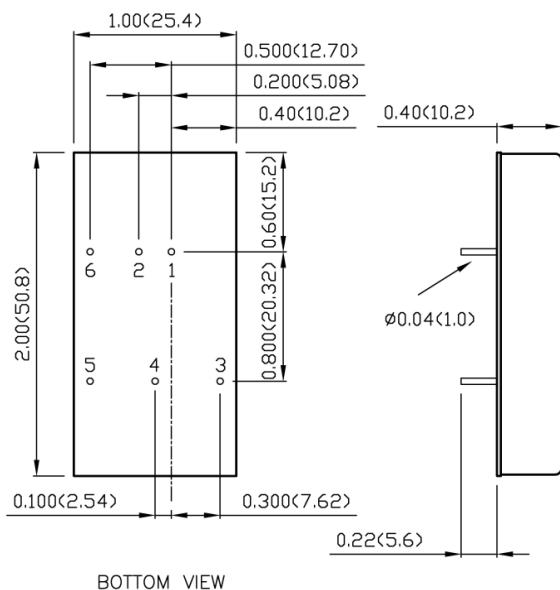
FED20-48S05 Derating Curve With Heat-sink



FED20-48S05 Efficiency vs. Input Voltage



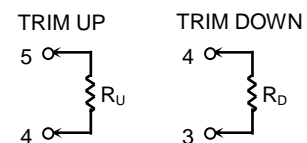
FED20-48S05 Efficiency vs. Output Load

MECHANICAL DRAWING

PIN CONNECTION

| PIN | SINGLE | DUAL |
|-----|--------|--------|
| 1 | +Vin | +Vin |
| 2 | -Vin | -Vin |
| 3 | +Vout | +Vout |
| 4 | Trim | Common |
| 5 | -Vout | -Vout |
| 6 | Ctrl | Ctrl |

EXTERNAL OUTPUT TRIMMING

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



1. All dimensions in inch (mm)
2. Tolerance : $x.xx \pm 0.02$ ($x.x \pm 0.5$)
 $x.xxx \pm 0.01$ ($x.xx \pm 0.25$)
3. Pin pitch tolerance ± 0.01 (0.25)
4. Pin dimension tolerance ± 0.004 (0.1)