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

# FDC05(W) SERIES

**5 WATTS DC-DC CONVERTER**


## FEATURES

- **5 WATTS OUTPUT POWER**
- **OUTPUT CURRENT UP TO 1000mA**
- **STANDARD 2.00 X 1.00 X 0.40 INCH PACKAGE**
- **HIGH EFFICIENCY UP TO 83%**
- **2:1 AND 4:1 WIDE INPUT VOLTAGE RANGE**
- **SIX-SIDED CONTINUOUS SHIELD**
- **FIXED SWITCHING FREQUENCY**
- **UL60950-1, EN60950-1, & IEC60950-1 SAFETY APPROVALS**
- **CE MARKED**
- **COMPLIANT TO RoHS II & REACH**

## OPTIONS

Negative & Positive logic Remote On/Off

## APPLICATIONS

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

## DESCRIPTION

The FDC05 and FDC05-W series offer 5 watts of output power from a 2 x 1 x 0.4 inch package without derating to 71ºC ambient temperature. FDC05 series have 2:1 wide input voltage of 9~18VDC, 18~36VDC and 36~75VDC. FDC05-W series have 4:1 ultra wide input voltage of 9~36VDC and 18~75VDC.

## TECHNICAL SPECIFICATION

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

### OUTPUT SPECIFICATIONS

| | | | |
|---|---|---|---|
| Output power | | | 5 Watts, max. |
| Voltage accuracy | | | ± 1% |
| Minimum load | | | 0% |
| Line regulation | LL to HL at Full Load | | ± 0.2% |
| Load regulation | No load to Full load | Single | ± 0.2% |
| | | Dual | ± 1% |
| Cross regulation (Dual) | Asymmetrical load 25% / 100% FL | | ± 5% |
| Ripple and noise | 20MHz bandwidth | | See table |
| Temperature coefficient | | | ±0.02% / ºC, max. |
| Transient response recovery time | 25% load step change FL to 1/2 FL ±1% error band | | Single 200µs Dual 200µs |
| Over load protection | % of FL at nominal input | | 170% |
| Short circuit protection | | | Continuous, automatics recovery |

### GENERAL SPECIFICATIONS

| | | |
|---|---|---|
| Efficiency | | See table |
| Isolation Voltage | Input to Output | 1600VDC, min.1minute |
| | Input (Output) to Case | 1600VDC, min.1minute |
| Isolation resistance | 500VDC | $10^9$ohms, min. |
| Isolation capacitance | | 300pF, max. |
| Switching frequency | Standard | 300kHz±10% |
| | "W" series | 200kHz±10% |
| Safety approvals | | IEC60950-1, UL60950-1, & EN60950-1 |
| Case material | | Nickel-coated copper |
| Base material | | Non-conducted black plastic |
| Potting material | | Epoxy (UL94 V-0) |
| Dimensions | | 2.00 X 1.00 X 0.40 Inch (50.8 X 25.4 X 10.2 mm) |
| Weight | | 27g (0.95oz) |
| MTBF (Note 1) | MIL-HDBK-217F | $7.066 \times 10^6$ hrs |

### INPUT SPECIFICATIONS

| | | | |
|---|---|---|---|
| Input voltage range | FDC05 | 12VDC nominal input | 9 ~ 18VDC |
| | | 24VDC nominal input | 18 ~ 36VDC |
| | | 48VDC nominal input | 36 ~ 75VDC |
| | FDC05-W | 24VDC nominal input | 9 ~ 36VDC |
| | | 48VDC nominal input | 18 ~ 75VDC |
| Input filter | | | Pi type |
| Input surge voltage | | 12VDC input | 36VDC 100ms, max. |
| | | 24VDC input | 50VDC 100ms, max. |
| | | 48VDC input | 100VDC 100ms, max. |
| Input reflected ripple current | | | 20mAp-p |
| Start up time | Nominal input and Constant resistive load | Power up | 450ms, max. |
| Remote ON/OFF (Option) (Note 6) | | | |
| (Positive logic) | | DC-DC ON | Open or 3.5V < Vr < 12V |
| | | DC-DC OFF | Short or 0V < Vr < 1.2V |
| (Negative logic) | | DC-DC ON | Short or 0V < Vr < 1.2V |
| | | DC-DC OFF | Open or 3.5V < Vr < 12V |
| Input current of remote control pin | | Nominal input | -0.5mA ~ +1mA |
| Remote off state input current | | Nominal input | 2.5mA |

### ENVIRONMENTAL SPECIFICATIONS

| | | |
|---|---|---|
| Operating ambient temperature (Reference derating curve) | Standard | -25ºC ~ +85ºC (with derating) |
| | M1 (Note 7) | -40ºC ~ +85ºC (non-derating) |
| | M2 (W series) | -40ºC ~ +85ºC (with derating) |
| Maximum case temperature | | +100ºC |
| Storage temperature range | | -55ºC ~ +125ºC |
| Thermal impedance (Note 8) | Natural convection | 12ºC/watt |
| | Natural convection with Heat-sink | 10ºC/watt |
| Thermal shock | | MIL-STD-810F |
| Vibration | | MIL-STD-810F |
| Relative humidity | | 5% to 95% RH |

### EMC CHARACTERISTICS

| | | | | |
|---|---|---|---|---|
| EMI | EN55022 | | | Class A<br>Class B |
| 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 (Note 9) | EN61000-4-4 | | ± 2kV | Perf. Criteria B |
| Surge (Note 9) | EN61000-4-5 | | ± 1kV | Perf. Criteria B |
| Conducted immunity | EN61000-4-6 | | 10 Vr.m.s | Perf. Criteria A |

# FDC05(W) SERIES

5 WATTS DC-DC CONVERTER

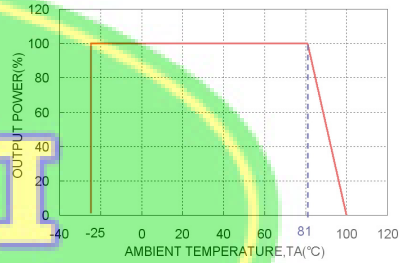
| Model Number | Input Range | Output Voltage | Output Current | | Output [2] Ripple & Noise | No load[3] Input Current | Eff [4] (%) | Capacitor Load max[5] |
|---|---|---|---|---|---|---|---|---|
| | | | Min. load | Full load | | | | |
| FDC05-12S33 | 9 ~ 18 VDC | 3.3 VDC | 0mA | 1000mA | 50mVp-p | 10mA | 76 | 3700μF |
| FDC05-12S05 | 9 ~ 18 VDC | 5 VDC | 0mA | 1000mA | 50mVp-p | 10mA | 79 | 1700μF |
| FDC05-12S12 | 9 ~ 18 VDC | 12 VDC | 0mA | 470mA | 50mVp-p | 10mA | 81 | 290μF |
| FDC05-12S15 | 9 ~ 18 VDC | 15 VDC | 0mA | 400mA | 50mVp-p | 15mA | 80 | 188μF |
| FDC05-12D05 | 9 ~ 18 VDC | ± 5 VDC | 0mA | ± 500mA | 50mVp-p | 20mA | 79 | ± 850μF |
| FDC05-12D12 | 9 ~ 18 VDC | ± 12 VDC | 0mA | ± 230mA | 50mVp-p | 15mA | 81 | ± 140μF |
| FDC05-12D15 | 9 ~ 18 VDC | ± 15 VDC | 0mA | ± 190mA | 50mVp-p | 20mA | 82 | ± 47μF |
| FDC05-24S33 (W) | 18 ~ 36 (9 ~ 36) VDC | 3.3 VDC | 0mA | 1000mA | 50mVp-p | 15(5mA) | 73 (77) | 3700μF |
| FDC05-24S05 (W) | 18 ~ 36 (9 ~ 36) VDC | 5 VDC | 0mA | 1000mA | 50mVp-p | 15(5mA) | 78 (80) | 1700μF |
| FDC05-24S12 (W) | 18 ~ 36 (9 ~ 36) VDC | 12 VDC | 0mA | 470mA | 50mVp-p | 10(5mA) | 81 (82) | 290μF |
| FDC05-24S15 (W) | 18 ~ 36 (9 ~ 36) VDC | 15 VDC | 0mA | 400mA | 50mVp-p | 20(5mA) | 81 (81) | 188μF |
| FDC05-24D05 (W) | 18 ~ 36 (9 ~ 36) VDC | ± 5 VDC | 0mA | ± 500mA | 50mVp-p | 15(5mA) | 79 (80) | ± 850μF |
| FDC05-24D12 (W) | 18 ~ 36 (9 ~ 36) VDC | ± 12 VDC | 0mA | ± 230mA | 50mVp-p | 20(5mA) | 82 (82) | ± 140μF |
| FDC05-24D15 (W) | 18 ~ 36 (9 ~ 36) VDC | ± 15 VDC | 0mA | ± 190mA | 50mVp-p | 20(10mA) | 81 (83) | ± 47μF |
| FDC05-48S33 (W) | 36 ~ 75 (18 ~ 75) VDC | 3.3 VDC | 0mA | 1000mA | 50mVp-p | 5(5mA) | 73 (73) | 3700μF |
| FDC05-48S05 (W) | 36 ~ 75 (18 ~ 75) VDC | 5 VDC | 0mA | 1000mA | 50mVp-p | 10(10mA) | 76 (76) | 1700μF |
| FDC05-48S12 (W) | 36 ~ 75 (18 ~ 75) VDC | 12 VDC | 0mA | 470mA | 50mVp-p | 10(10mA) | 82 (82) | 290μF |
| FDC05-48S15 (W) | 36 ~ 75 (18 ~ 75) VDC | 15 VDC | 0mA | 400mA | 50mVp-p | 10(10mA) | 82 (81) | 188μF |
| FDC05-48D05 (W) | 36 ~ 75 (18 ~ 75) VDC | ± 5 VDC | 0mA | ± 500mA | 50mVp-p | 10(5mA) | 78 (78) | ± 850μF |
| FDC05-48D12 (W) | 36 ~ 75 (18 ~ 75) VDC | ± 12 VDC | 0mA | ± 230mA | 50mVp-p | 10(10mA) | 81 (81) | ± 140μF |
| FDC05-48D15 (W) | 36 ~ 75 (18 ~ 75) VDC | ± 15 VDC | 0mA | ± 190mA | 50mVp-p | 10(10mA) | 81 (81) | ± 47μF |

Note

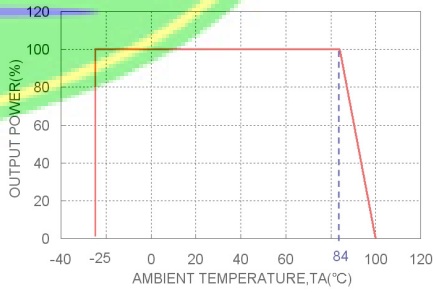
1. MIL-HDBK-217F @Ta=25 ºC, Full load.
2. Typical value at nominal input and full load. (20MHz BW.)
3. Typical value at nominal input and no load.
4. Typical value at nominal input and full load.
5. Test by minimum input and constant resistive load.
6. The CTRL pin voltage is referenced to -INPUT
   To order positive logic ON/OFF control add the suffix-P (Ex: FDC05-48S05-P)
   To order negative logic ON/OFF control add the suffix-N (Ex: FDC05-48S05-N)
7. M1 version is more efficient, therefore, it can be operated in a more extensive temperature range than standard and M2 version.
8. Heat-sink is optional and P/N: 7G-0020C-F.
9. 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, 220μF/100V.

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

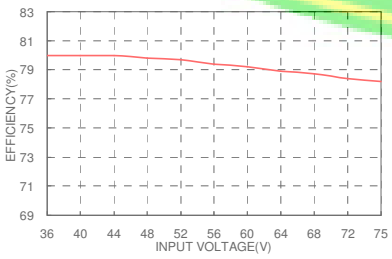
FDC05-48S05 Derating Curve



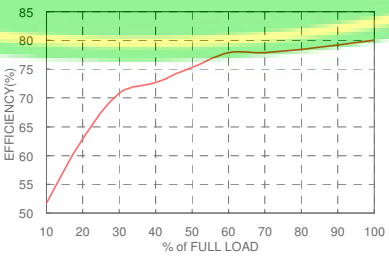

FDC05-48S05 Derating Curve With Heat-sink (Note 8)

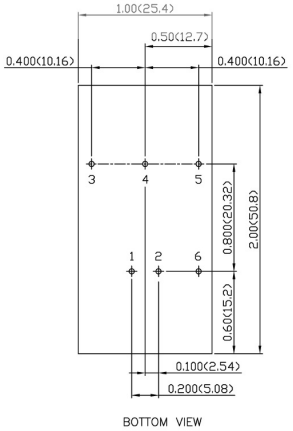


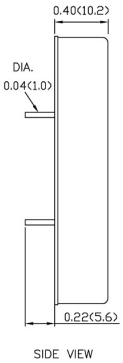

FDC05-48S05 Efficiency VS Input Voltage




FDC05-48S05 Efficiency VS Output Load




| 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) |

1. All dimensions in Inch (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)