POWER MATE TECHNOLOGY CO.,LTD.

P-DUKE

FDC20(W) SERIES

FEATURES

- 20 WATTS OUTPUT POWER
- OUTPUT CURRENT UP TO 4A
- STANDARD 2" X 1.6" X 0.4" PACKAGE
- HIGH EFFICIENCY UP TO 87%
- 2:1 AND 4:1 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

DESCRIPTION

The FDC20 and FDC20-W series offer 20 Watts of output power from a 2 x 1.6 x 0.4 inch package. The FDC20 series with 2:1 wide input voltage of 9-18, 18-36 and 36-75VDC. The FDC20-W series with 4:1 wide input voltage of 9-36 and 18-75VDC.

TECHNICAL SPECIFICATION

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

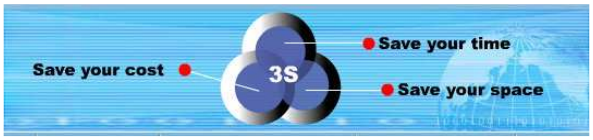
OUTPUT SPECIFICATIONS			
Output power			20 Watts, max.
Voltage accuracy	Full load and nominal Vin	Single & Dual Triple 3.3V/5V Auxiliary	± 1% ± 1% ± 5%
Minimum load (Note 6)			See Table
Voltage adjustability			± 10%
Line regulation	LL to HL at Full Load	Single (W) Dual (W) Triple 3.3V/5V Auxiliary	± 0.2% ± 0.5% ± 1% ± 5%
Load regulation	Min. Load to Full Load	Single Dual Triple 3.3V/5V Auxiliary	± 0.5% ± 3% ± 2% ± 5%
Cross regulation (Note 7)		Dual Triple 3.3V/5V Auxiliary	± 5% ± 2% ± 5%
Ripple and noise	20MHz bandwidth		See table
Temperature coefficient			±0.02% / ºC, max.
Transient response recovery time	25% load step change	Single Dual Triple	250µS 250µS 500µS
Over voltage protection Zener diode clamp	3.3V output 5V output 12V output 15V output		3.9VDC 6.2VDC 15VDC 18VDC
Over load protection	% of FL at nominal input		150%, max.
Short circuit protection			Hiccup, automatics recovery

GENERAL SPECIFICATIONS		
Efficiency		See table
Isolation voltage		1600VDC, min.
Isolation resistance		10^9 ohms, min.
Isolation capacitance		300pF, max.
Switching frequency		300KHz, 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 1.60 X 0.40 Inch (50.8 X 40.6 X 10.2 mm)
Weight		48g (1.69oz)
MTBF (Note 1)	BELLCORE TR-NWT-000332 MIL-HDBK-217F	1.928×10^6 hrs 7.650×10^5 hrs

INPUT SPECIFICATIONS			
Input voltage range	FDC20	12V nominal input 24V nominal input 48V nominal input	9 – 18VDC 18 – 36VDC 36 – 75VDC
	FDC20-W	24V nominal input 48V nominal input	9 – 36VDC 18 – 75VDC
Input filter			Pi type
Input surge voltage 100mS max	12V input 24V input 48V input		36VDC 50VDC 100VDC
Input reflected ripple current	Nominal Vin and full load		25mAp-p
Start up time	Nominal Vin and constant resistive load	Power up	20mS, typ.
Remote ON/OFF (Note 8) (Positive logic)	DC-DC ON DC-DC OFF		Open or 3.5V < Vr < 12V Short or 0V < Vr < 1.2V
Input current of remote control pin	Nominal Vin		-0.5~1.0mA
Remote off state input current	Nominal Vin		20mA

ENVIRONMENTAL SPECIFICATIONS		
Operating ambient temperature		-40ºC ~ +85ºC (with derating)
Maximum case temperature		+100ºC
Storage temperature range		-55ºC ~ +105ºC
Thermal impedance (Note 9)	Nature convection Nature convection with heat-sink	10ºC/watt 8.24ºC/watt
Thermal shock		MIL-STD-810F
Vibration		MIL-STD-810F
Relative humidity		5% to 95% RH

EMC CHARACTERISTICS				
EMI (Note 10)	EN55022			Class A
ESD	EN61000-4-2	Air Contact	± 8KV ± 6KV	Perf. Criteria B
Radiated immunity	EN61000-4-3		10 V/m	Perf. Criteria A
Fast transient (Note 11)	EN61000-4-4		± 2KV	Perf. Criteria B
Surge (Note 11)	EN61000-4-5		± 1KV	Perf. Criteria B
Conducted immunity	EN61000-4-6		10 Vr.m.s	Perf. Criteria A



POWER MATE TECHNOLOGY CO.,LTD.

P-DUKE

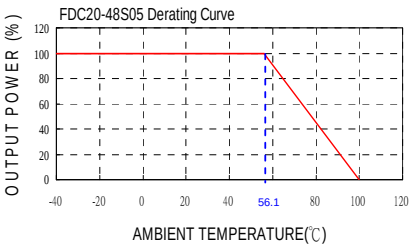
20 WATTS DC-DC CONVERTER

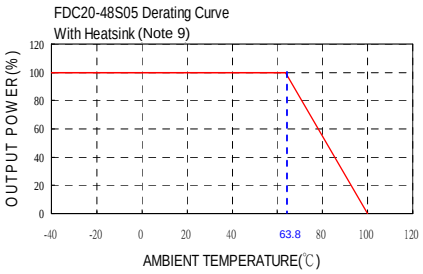
Model Number	Input Range	Output Voltage	Output Current		Output [4] Ripple & Noise	Input Current		Eff [4] (%)	Capacitor[5] Load max
			Min. load	Full load		No load [3]	Full load [2]		
FDC20-12S33	9 – 18 VDC	3.3 VDC	280mA	4000mA	75mVp-p	40mA	1507mA	77	13000μF
FDC20-12S05	9 – 18 VDC	5 VDC	280mA	4000mA	75mVp-p	15mA	2193mA	80	6800μF
FDC20-12S12	9 – 18 VDC	12 VDC	134mA	1670mA	75mVp-p	40mA	2110mA	83	2200μF
FDC20-12S15	9 – 18 VDC	15 VDC	106mA	1330mA	75mVp-p	20mA	2083mA	84	755μF
FDC20-12D05	9 – 18 VDC	± 5 VDC	± 140mA	± 2000mA	100mVp-p	15mA	2136mA	82	± 3400μF
FDC20-12D12	9 – 18 VDC	± 12 VDC	± 67mA	± 833mA	100mVp-p	35mA	2110mA	83	± 680μF
FDC20-12D15	9 – 18 VDC	± 15 VDC	± 53mA	± 666mA	100mVp-p	35mA	2110mA	83	± 450μF
FDC20-12T3312	9 – 18 VDC	3.3 / ± 12 VDC	300 / ± 30mA	3000 / ± 300mA	50/ ± 120mVp-p	20mA	1900mA	79	4700 / ± 220μF
FDC20-12T3315	9 – 18 VDC	3.3 / ± 15 VDC	300 / ± 25mA	3000 / ± 250mA	50/ ± 150mVp-p	35mA	1933mA	79	4700 / ± 220μF
FDC20-12T0512	9 – 18 VDC	5 / ± 12 VDC	200 / ± 30mA	2000 / ± 300mA	50/ ± 120mVp-p	20mA	1885mA	80	4700 / ± 220μF
FDC20-12T0515	9 – 18 VDC	5 / ± 15 VDC	200 / ± 25mA	2000 / ± 250mA	50/ ± 150mVp-p	40mA	1919mA	80	4700 / ± 220μF
FDC20-24S33 (W)	18 – 36 (9 – 36) VDC	3.3 VDC	280mA	4000mA	75mVp-p	10(20)mA	733 (764mA)	79 (76)	13000μF
FDC20-24S05 (W)	18 – 36 (9 – 36) VDC	5 VDC	280mA	4000mA	75mVp-p	10(10)mA	1082 (1111mA)	81 (79)	6800μF
FDC20-24S12 (W)	18 – 36 (9 – 36) VDC	12 VDC	134mA	1670mA	75mVp-p	10(20)mA	1018 (1082mA)	86 (81)	2200μF
FDC20-24S15 (W)	18 – 36 (9 – 36) VDC	15 VDC	106mA	1330mA	75mVp-p	15(20)mA	1018 (1082mA)	86 (81)	755μF
FDC20-24D05 (W)	18 – 36 (9 – 36) VDC	± 5 VDC	± 140mA	± 2000mA	100mVp-p	20(15)mA	1028 (1111mA)	85 (79)	± 3400μF
FDC20-24D12 (W)	18 – 36 (9 – 36) VDC	± 12 VDC	± 67mA	± 833mA	100mVp-p	25(20)mA	1016 (1068mA)	86 (82)	± 680μF
FDC20-24D15 (W)	18 – 36 (9 – 36) VDC	± 15 VDC	± 53mA	± 666mA	100mVp-p	30(25)mA	1015 (1068mA)	86 (82)	± 450μF
FDC20-24T3312	18 – 36 VDC	3.3 / ± 12 VDC	300 / ± 30mA	3000 / ± 300mA	50/ ± 120mVp-p	20mA	914mA	82	4700 / ± 220μF
FDC20-24T3315	18 – 36 VDC	3.3 / ± 15 VDC	300 / ± 25mA	3000 / ± 250mA	50/ ± 150mVp-p	20mA	967mA	79	4700 / ± 220μF
FDC20-24T0512	18 – 36 VDC	5 / ± 12 VDC	200 / ± 30mA	2000 / ± 300mA	50/ ± 120mVp-p	25mA	907mA	83	4700 / ± 220μF
FDC20-24T0515	18 – 36 VDC	5 / ± 15 VDC	200 / ± 25mA	2000 / ± 250mA	50/ ± 150mVp-p	10mA	922mA	83	4700 / ± 220μF
FDC20-48S33 (W)	36 – 75 (18 – 75) VDC	3.3 VDC	280mA	4000mA	75mVp-p	10(15)mA	367 (377mA)	79 (77)	13000μF
FDC20-48S05 (W)	36 – 75 (18 – 75) VDC	5 VDC	280mA	4000mA	75mVp-p	10(10)mA	543 (548mA)	82 (80)	6800μF
FDC20-48S12 (W)	36 – 75 (18 – 75) VDC	12 VDC	134mA	1670mA	75mVp-p	15(10)mA	509 (536mA)	86 (82)	2200μF
FDC20-48S15 (W)	36 – 75 (18 – 75) VDC	15 VDC	106mA	1330mA	75mVp-p	25(10)mA	506 (532mA)	86 (82)	755μF
FDC20-48D05 (W)	36 – 75 (18 – 75) VDC	± 5 VDC	± 140mA	± 2000mA	100mVp-p	15(10)mA	514 (541mA)	85 (81)	± 3400μF
FDC20-48D12 (W)	36 – 75 (18 – 75) VDC	± 12 VDC	± 67mA	± 833mA	100mVp-p	15(15)mA	502 (527mA)	87 (83)	± 680μF
FDC20-48D15 (W)	36 – 75 (18 – 75) VDC	± 15 VDC	± 53mA	± 666mA	100mVp-p	20(20)mA	502 (527mA)	87 (83)	± 450μF
FDC20-48T3312	36 – 75 VDC	3.3 / ± 12 VDC	300 / ± 30mA	3000 / ± 300mA	50/ ± 120mVp-p	10mA	457mA	82	4700 / ± 220μF
FDC20-48T3315	36 – 75 VDC	3.3 / ± 15 VDC	300 / ± 25mA	3000 / ± 250mA	50/ ± 150mVp-p	10mA	464mA	82	4700 / ± 220μF
FDC20-48T0512	36 – 75 VDC	5 / ± 12 VDC	200 / ± 30mA	2000 / ± 300mA	50/ ± 120mVp-p	15mA	448mA	84	4700 / ± 220μF
FDC20-48T0515	36 – 75 VDC	5 / ± 15 VDC	200 / ± 25mA	2000 / ± 250mA	50/ ± 150mVp-p	15mA	456mA	84	4700 / ± 220μF

[12]FDC20-24D3305 and FDC20-48D3305, Output 3.3V(3A)/5V(2A), Detail Spec. Contact Factory.

Note

1. BELLCORE TR-NWT-000332. Case 1: 50% Stress, Temperature at 40ºC.
   MIL-HDBK-217F Notice2 @Ta=25 ºC, Full load(Ground, Benign, controlled environment).
2. Maximum value at nominal input voltage and full load.
3. Typical value at nominal input voltage and no load.
4. Typical value at nominal input voltage and full load.
5. Test by minimum Vin and constant resistive load.
6. The output requires a minimum 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.
7. Cross regulation : Dual output—Asymmetrical load 25% to 100% full load
   Triple output – 3.3V / 5V 100% load and one of auxiliary 100% load, other auxiliary load change from 25% to 100% load
8. The ON/OFF control pin voltage is referenced to -Vin
9. Heat sink is optional and P/N: 7G-0011C-F and the operation temperature range please see curve.
10. The FDC20 series can meet EN55022 Class A with parallel an external capacitor to the input pins.
    Recommend: 12Vin : 6.8μF/50V 1812 MLCC . 24Vin : N/A. 48Vin : 2.2μF/100V 1812 MLCC .
11. 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, ESR 48mΩ.
12. The FDC20-24D3305 and FDC20-48D3305 are safety approval pending.





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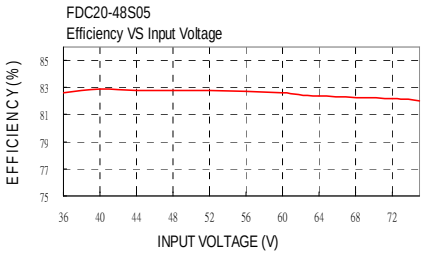
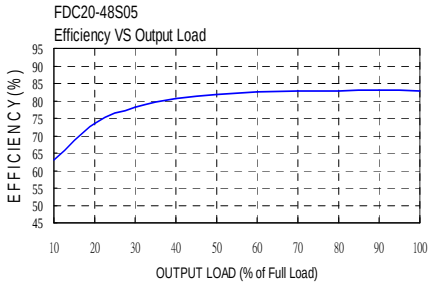
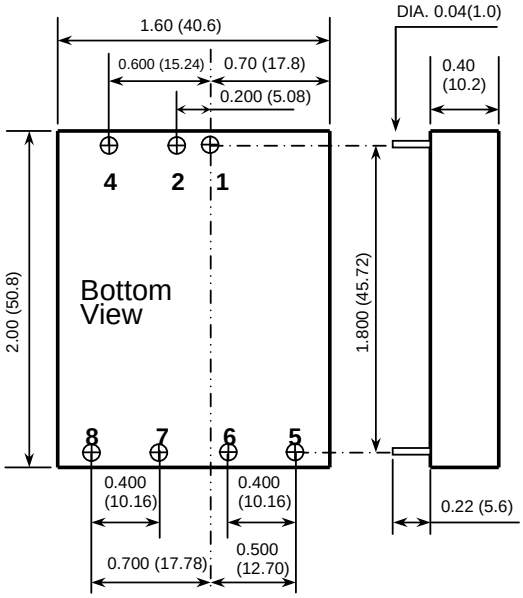
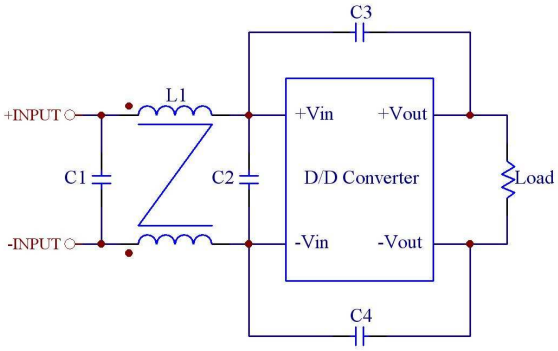
20 WATTS DC-DC CONVERTER







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)



Recommended Filter for EN55022 Class B Compliance

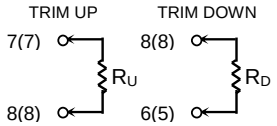
The components used in the above figure, together with the manufacturers' part numbers for these components, are as follows:

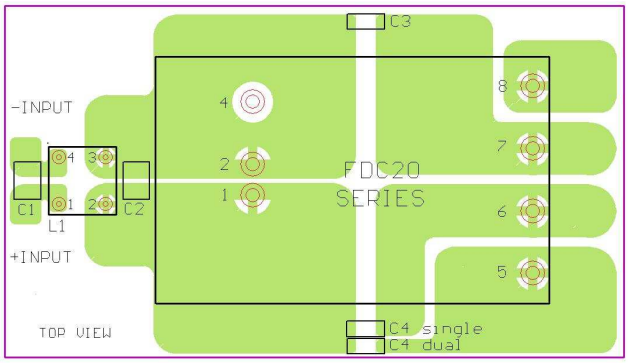
	C1	C2	C3	C4	L1
FDC20-12xxx	4.7μF/50V 1812 MLCC	N/A	1000pF/2KV MLCC	1000pF/2KV MLCC	450μH Common Choke PMT-048
FDC20-24xxx	4.7μF/50V 1812 MLCC	N/A	1000pF/2KV MLCC	1000pF/2KV MLCC	450μH Common Choke PMT-048
FDC20-48xxx	2.2μF/100V 1812 MLCC	2.2μF/100V 1812 MLCC	1000pF/2KV MLCC	1000pF/2KV MLCC	450μH Common Choke PMT-048

PIN CONNECTION			
PIN	SINGLE	DUAL	TRIPLE
1	+ INPUT	+ INPUT	+ INPUT
2	- INPUT	- INPUT	- INPUT
4	CTRL	CTRL	CTRL
5	NO PIN	+ OUTPUT	+ AUXILIARY
6	+ OUTPUT	COMMON	+3.3V / +5V
7	- OUTPUT	- OUTPUT	COMMON
8	TRIM	TRIM	- AUXILIARY

EXTERNAL OUTPUT TRIMMING

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





Recommended EN55022 Class B Filter Circuit Layout

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