

## **Wall Industries, Inc.**

### **JFC20 SERIES**

**2:1 Wide Input Voltage Range**  
**Single and Dual Outputs**  
**Industry Standard Package and Footprint**  
**20 Watt DC/DC Power Converters**



#### **FEATURES**

- 20 Watts Maximum Output Power
- Single and Dual Outputs
- Industry Standard Pin-Out
- Small Size and Low Profile: 1.0" x 1.0" x 0.39"
- 2:1 Wide Input Voltage Range
- High Efficiency up to 92%
- 1600VDC I/O Isolation
- Ultra Low Quiescent Current
- Remote ON/OFF Control
- Fixed Switching Frequency
- Over Voltage, Over Load, and Short Circuit Protected
- Six-Sided Continuous Shield
- EMI Meets EN55022 Class A Without External Filter
- CE Mark Meets 2006/95/EC, 93/68/EEC, and 2004/108/EC
- UL60950-1, EN60950-1, and IEC60950-1 Safety Approvals
- Compliant to RoHS EU Directive 2002/95/EC

#### **APPLICATIONS**

- Wireless Networks
- Telecom / Datacom
- Industry Control Systems
- Measurement Equipment
- Semiconductor Equipment

#### **OPTIONS**

- Negative Remote ON/OFF
- Without Trim Pin
- Without ON/OFF Pin
- Heatsink

#### **DESCRIPTION**

The JFC20 series of DC/DC power converters provides 20 watts of output power in a 1.0 x 1.0 x 0.39 inch industry standard package and footprint. This series has single and dual output models with 2:1 wide input voltage ranges of 9-18VDC, 18-36VDC, and 36-75VDC. Some features include high efficiency, ultra low quiescent current, 1600VDC I/O isolation, remote ON/OFF, and trimmable output voltage. This series is also protected against over voltage, over current, input under voltage, and short circuit conditions. All models are RoHS compliant and have UL60950-1, EN60950-1, and IEC60950-1 safety approvals.



| SPECIFICATIONS: JFC20 Series                                                                                                                                                                   |                                         |                      |                                                |      |       |                  |      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|----------------------|------------------------------------------------|------|-------|------------------|------|
| All specifications are based on 25°C, Nominal Input Voltage, and Maximum Output Current unless otherwise noted. We reserve the right to change specifications based on technological advances. |                                         |                      |                                                |      |       |                  |      |
| SPECIFICATION                                                                                                                                                                                  |                                         | TEST CONDITIONS      |                                                | Min  | Nom   | Max              | Unit |
| INPUT SPECIFICATIONS                                                                                                                                                                           |                                         |                      |                                                |      |       |                  |      |
| Input Voltage Range                                                                                                                                                                            | 12VDC nominal input models              |                      | 9                                              | 12   | 18    | VDC              |      |
|                                                                                                                                                                                                | 24VDC nominal input models              |                      | 18                                             | 24   | 36    |                  |      |
|                                                                                                                                                                                                | 48VDC nominal input models              |                      | 36                                             | 48   | 75    |                  |      |
| Input Surge Voltage (1 sec max)                                                                                                                                                                | 12VDC nominal input models              |                      |                                                |      | 25    | VDC              |      |
|                                                                                                                                                                                                | 24VDC nominal input models              |                      |                                                |      | 50    |                  |      |
|                                                                                                                                                                                                | 48VDC nominal input models              |                      |                                                |      | 100   |                  |      |
| Start-Up Voltage                                                                                                                                                                               | 12VDC nominal input models              |                      |                                                |      | 9     | VDC              |      |
|                                                                                                                                                                                                | 24VDC nominal input models              |                      |                                                |      | 18    |                  |      |
|                                                                                                                                                                                                | 48VDC nominal input models              |                      |                                                |      | 36    |                  |      |
| Shutdown Voltage                                                                                                                                                                               | 12VDC nominal input models              |                      |                                                | 8    |       | VDC              |      |
|                                                                                                                                                                                                | 24VDC nominal input models              |                      |                                                | 16   |       |                  |      |
|                                                                                                                                                                                                | 48VDC nominal input models              |                      |                                                | 33   |       |                  |      |
| Input Reflected Ripple Current                                                                                                                                                                 | Nominal Vin and full load               |                      |                                                | 30   |       | mAp-p            |      |
| Input Filter                                                                                                                                                                                   |                                         |                      | Pi type                                        |      |       |                  |      |
| OUTPUT SPECIFICATIONS                                                                                                                                                                          |                                         |                      |                                                |      |       |                  |      |
| Output Voltage                                                                                                                                                                                 |                                         |                      | See Table                                      |      |       |                  |      |
| Line Regulation                                                                                                                                                                                | Low line to high line at full load      | Single Output Models | -0.2                                           |      | +0.2  | %                |      |
|                                                                                                                                                                                                |                                         | Dual Output Models   | -0.5                                           |      | +0.5  |                  |      |
| Load Regulation                                                                                                                                                                                | No load to full load                    | Single Output Models | -0.2                                           |      | +0.2  | %                |      |
|                                                                                                                                                                                                |                                         | Dual Output Models   | -1.0                                           |      | +1.0  |                  |      |
|                                                                                                                                                                                                | 10% Load to 90% Load                    | Single Output Models | -0.1                                           |      | +0.1  |                  |      |
|                                                                                                                                                                                                |                                         | Dual Output Models   | -0.8                                           |      | +0.8  |                  |      |
| Cross Regulation (Dual Output Models)                                                                                                                                                          | Asymmetrical load 25% to 100% full load |                      | -5                                             |      | +5    | %                |      |
| Voltage Adjustability (See Note 6)                                                                                                                                                             | Single Output Models                    | 24Vout               | -10                                            |      | +20   | %                |      |
|                                                                                                                                                                                                |                                         | Others               | -10                                            |      | +10   |                  |      |
| Voltage Accuracy                                                                                                                                                                               |                                         |                      | -1                                             |      | +1    | %                |      |
| Output Power                                                                                                                                                                                   |                                         |                      |                                                |      | 20    | W                |      |
| Output Current                                                                                                                                                                                 |                                         |                      | See Table                                      |      |       |                  |      |
| Ripple & Noise (20MHz Bandwidth)                                                                                                                                                               |                                         |                      | See Table                                      |      |       |                  |      |
| Transient Response Recovery Time                                                                                                                                                               | 25% load step change                    |                      |                                                | 250  |       | µs               |      |
| Start-Up Time                                                                                                                                                                                  | Nominal Vin and constant resistive load | Power Up             |                                                |      | 30    | ms               |      |
|                                                                                                                                                                                                |                                         | Remote ON/OFF        |                                                |      | 30    |                  |      |
| Minimum Load                                                                                                                                                                                   |                                         |                      | 0                                              |      |       | %                |      |
| Temperature Coefficient                                                                                                                                                                        |                                         |                      | -0.02                                          |      | +0.02 | %/°C             |      |
| PROTECTION                                                                                                                                                                                     |                                         |                      |                                                |      |       |                  |      |
| Over Voltage Protection                                                                                                                                                                        | 3.3V output models                      |                      | 3.7                                            |      | 5.4   | VDC              |      |
|                                                                                                                                                                                                | 5V output models                        |                      | 5.6                                            |      | 7.0   |                  |      |
|                                                                                                                                                                                                | 12V output models                       |                      | 13.5                                           |      | 19.6  |                  |      |
|                                                                                                                                                                                                | 15V output models                       |                      | 16.8                                           |      | 20.5  |                  |      |
|                                                                                                                                                                                                | 24V output models                       |                      | 29.1                                           |      | 32.5  |                  |      |
| Over Load Protection                                                                                                                                                                           | % of full load at nominal input         |                      |                                                | 150  |       | %                |      |
| Short Circuit Protection                                                                                                                                                                       |                                         |                      | Continuous, automatic recovery                 |      |       |                  |      |
| GENERAL SPECIFICATIONS                                                                                                                                                                         |                                         |                      |                                                |      |       |                  |      |
| Efficiency                                                                                                                                                                                     | Nominal Vin and full load               |                      | See Table                                      |      |       |                  |      |
| Switching Frequency                                                                                                                                                                            | 3.3Vout, 5Vout                          |                      | 248                                            | 275  | 303   | KHz              |      |
|                                                                                                                                                                                                | Others                                  |                      | 297                                            | 330  | 363   |                  |      |
| Isolation Voltage (1 minute)                                                                                                                                                                   | Input to Output                         |                      | 1600                                           |      |       | VDC              |      |
|                                                                                                                                                                                                | Input (Output) to Case                  |                      | 1000                                           |      |       |                  |      |
| Isolation Resistance                                                                                                                                                                           | 500VDC                                  |                      | 1                                              |      |       | GΩ               |      |
| Isolation Capacitance                                                                                                                                                                          |                                         |                      |                                                |      | 1500  | pF               |      |
| REMOTE ON/OFF (See Note 7)                                                                                                                                                                     |                                         |                      |                                                |      |       |                  |      |
| Positive Logic (standard)                                                                                                                                                                      | DC/DC ON                                |                      | Open or 3V~ 15V                                |      |       |                  |      |
|                                                                                                                                                                                                | DC/DC OFF                               |                      | Short or 0V ~ 1.2V                             |      |       |                  |      |
| Negative Logic (option)                                                                                                                                                                        | DC/DC ON                                |                      | Short or 0V ~ 1.2V                             |      |       |                  |      |
|                                                                                                                                                                                                | DC/DC OFF                               |                      | Open or 3V ~ 15V                               |      |       |                  |      |
| Input Current of Remote Control Pin                                                                                                                                                            | Nominal Vin                             |                      | -0.5                                           |      | +1.0  | mA               |      |
| Remote Off State Input Current                                                                                                                                                                 | Nominal Vin                             |                      |                                                | 2.0  |       | mA               |      |
| ENVIRONMENTAL SPECIFICATIONS                                                                                                                                                                   |                                         |                      |                                                |      |       |                  |      |
| Operating Ambient Temperature                                                                                                                                                                  | Without derating                        |                      | -40                                            |      | +60   | °C               |      |
|                                                                                                                                                                                                | With derating                           |                      | +60                                            |      | +101  |                  |      |
| Maximum Case Temperature                                                                                                                                                                       |                                         |                      |                                                |      | +105  | °C               |      |
| Storage Temperature                                                                                                                                                                            |                                         |                      | -55                                            |      | +125  | °C               |      |
| Thermal Impedance (See Note 8)                                                                                                                                                                 | Natural convection                      |                      |                                                | 17.6 |       | °C/Watt          |      |
|                                                                                                                                                                                                | Natural convection with heatsink        |                      |                                                | 14.8 |       |                  |      |
| Relative Humidity (non-condensing)                                                                                                                                                             |                                         |                      | 5                                              |      | 95    | % RH             |      |
| Thermal Shock                                                                                                                                                                                  | MIL-STD-810F                            |                      |                                                |      |       |                  |      |
| Vibration                                                                                                                                                                                      | MIL-STD-810F                            |                      |                                                |      |       |                  |      |
| MTBF (See Note 1)                                                                                                                                                                              | MIL-HDBK-217F, Full Load                |                      | 1, 477, 000 Hours                              |      |       |                  |      |
| PHYSICAL SPECIFICATIONS                                                                                                                                                                        |                                         |                      |                                                |      |       |                  |      |
| Weight                                                                                                                                                                                         |                                         |                      | 0.53oz (15g)                                   |      |       |                  |      |
| Case Material                                                                                                                                                                                  |                                         |                      | Nickel-coated copper                           |      |       |                  |      |
| Base Material                                                                                                                                                                                  |                                         |                      | FR4 PCB                                        |      |       |                  |      |
| Potting Material                                                                                                                                                                               |                                         |                      | Silicon (UL94-V0)                              |      |       |                  |      |
| Dimensions (L x W x H)                                                                                                                                                                         |                                         |                      | 1.0 x 1.0 x 0.39 inches (25.4 x 25.4 x 9.9 mm) |      |       |                  |      |
| SAFETY & EMC CHARACTERISTICS                                                                                                                                                                   |                                         |                      |                                                |      |       |                  |      |
| Safety Approvals                                                                                                                                                                               | IEC60950-1, UL60950-1, EN60950-1        |                      |                                                |      |       |                  |      |
| EMI (See Note 9)                                                                                                                                                                               | EN55022                                 |                      | Class A, Class B                               |      |       |                  |      |
| ESD                                                                                                                                                                                            | EN61000-4-2                             | Air Contact          | ±8KV<br>±6KV                                   |      |       | Perf. Criteria A |      |
| Radiated Immunity                                                                                                                                                                              | EN61000-4-3                             |                      | 10 V/m                                         |      |       | Perf. Criteria A |      |
| Fast Transient (See Note 10)                                                                                                                                                                   | EN61000-4-4                             |                      | ±2KV                                           |      |       | Perf. Criteria A |      |
| Surge (See Note 10)                                                                                                                                                                            | EN61000-4-5                             |                      | ±2KV                                           |      |       | Perf. Criteria A |      |
| Conducted Immunity                                                                                                                                                                             | EN61000-4-6                             |                      | 10 Vrms                                        |      |       | Perf. Criteria A |      |
| Power Frequency Magnetic Field                                                                                                                                                                 | EN61000-4-8                             |                      | 100A/m continuous; 100A/m 1 second             |      |       | Perf. Criteria A |      |

## MODEL SELECTION TABLES

| SINGLE OUTPUT MODELS |                         |                |                |           |                        |                          |                                         |              |                           |                                           |
|----------------------|-------------------------|----------------|----------------|-----------|------------------------|--------------------------|-----------------------------------------|--------------|---------------------------|-------------------------------------------|
| Model Number         | Input Voltage Range     | Output Voltage | Output Current |           | Input Current          |                          | Output <sup>(4)</sup><br>Ripple & Noise | Output Power | Efficiency <sup>(4)</sup> | Maximum <sup>(5)</sup><br>Capacitive Load |
|                      |                         |                | Min. Load      | Full Load | No Load <sup>(3)</sup> | Full Load <sup>(2)</sup> |                                         |              |                           |                                           |
| JFC12S3.3-20         | 12 VDC<br>(9 – 18 VDC)  | 3.3 VDC        | 0mA            | 4500mA    | 10mA                   | 1510mA                   | 75mVp-p                                 | 14.85W       | 89%                       | 7000µF                                    |
| JFC12S5-20           |                         | 5 VDC          | 0mA            | 4000mA    | 10mA                   | 1960mA                   | 75mVp-p                                 | 20W          | 89%                       | 5000µF                                    |
| JFC12S12-20          |                         | 12 VDC         | 0mA            | 1670mA    | 10mA                   | 1960mA                   | 100mVp-p                                | 20W          | 89%                       | 850µF                                     |
| JFC12S15-20          |                         | 15 VDC         | 0mA            | 1330mA    | 10mA                   | 1960mA                   | 100mVp-p                                | 20W          | 89%                       | 700µF                                     |
| JFC12S24-20          |                         | 24 VDC         | 0mA            | 833mA     | 12mA                   | -                        | 75mVp-p                                 | 20W          | 90%                       | 220µF                                     |
| JFC24S3.3-20         | 24 VDC<br>(18 – 36 VDC) | 3.3 VDC        | 0mA            | 4500mA    | 10mA                   | 746mA                    | 75mVp-p                                 | 14.85W       | 90%                       | 7000µF                                    |
| JFC24S5-20           |                         | 5 VDC          | 0mA            | 4000mA    | 10mA                   | 969mA                    | 75mVp-p                                 | 20W          | 91%                       | 5000µF                                    |
| JFC24S12-20          |                         | 12 VDC         | 0mA            | 1670mA    | 6mA                    | 969mA                    | 100mVp-p                                | 20W          | 90%                       | 850µF                                     |
| JFC24S15-20          |                         | 15 VDC         | 0mA            | 1330mA    | 6mA                    | 958mA                    | 100mVp-p                                | 20W          | 91%                       | 700µF                                     |
| JFC24S24-20          |                         | 24 VDC         | 0mA            | 833mA     | 10mA                   | -                        | 75mVp-p                                 | 20W          | 92%                       | 220µF                                     |
| JFC48S3.3-20         | 48 VDC<br>(36 – 75 VDC) | 3.3 VDC        | 0mA            | 4500mA    | 10mA                   | 373mA                    | 75mVp-p                                 | 14.85W       | 90%                       | 7000µF                                    |
| JFC48S5-20           |                         | 5 VDC          | 0mA            | 4000mA    | 10mA                   | 490mA                    | 75mVp-p                                 | 20W          | 90%                       | 5000µF                                    |
| JFC48S12-20          |                         | 12 VDC         | 0mA            | 1670mA    | 4mA                    | 484mA                    | 100mVp-p                                | 20W          | 90%                       | 850µF                                     |
| JFC48S15-20          |                         | 15 VDC         | 0mA            | 1330mA    | 4mA                    | 484mA                    | 100mVp-p                                | 20W          | 90%                       | 700µF                                     |
| JFC48S24-20          |                         | 24 VDC         | 0mA            | 833mA     | 8mA                    | -                        | 75mVp-p                                 | 20W          | 91%                       | 220µF                                     |

| DUAL OUTPUT MODELS |                         |                |                |           |                        |                          |                                         |              |                           |                                           |
|--------------------|-------------------------|----------------|----------------|-----------|------------------------|--------------------------|-----------------------------------------|--------------|---------------------------|-------------------------------------------|
| Model Number       | Input Voltage Range     | Output Voltage | Output Current |           | Input Current          |                          | Output <sup>(4)</sup><br>Ripple & Noise | Output Power | Efficiency <sup>(4)</sup> | Maximum <sup>(5)</sup><br>Capacitive Load |
|                    |                         |                | Min. Load      | Full Load | No Load <sup>(3)</sup> | Full Load <sup>(2)</sup> |                                         |              |                           |                                           |
| JFC12D12-20        | 12 VDC<br>(9 – 18 VDC)  | ±12 VDC        | 0mA            | ±833mA    | 10mA                   | 1960mA                   | 100mVp-p                                | 20W          | 89%                       | ±500µF                                    |
| JFC12D15-20        |                         | ±15 VDC        | 0mA            | ±667mA    | 10mA                   | 1938mA                   | 100mVp-p                                | 20W          | 90%                       | ±350µF                                    |
| JFC12D24-20        |                         | ±24 VDC        | 0mA            | ±417mA    | 14mA                   | -                        | 100mVp-p                                | 20W          | 90%                       | ±100µF                                    |
| JFC24D12-20        | 24 VDC<br>(18 – 36 VDC) | ±12 VDC        | 0mA            | ±833mA    | 6mA                    | 969mA                    | 100mVp-p                                | 20W          | 90%                       | ±500µF                                    |
| JFC24D15-20        |                         | ±15 VDC        | 0mA            | ±667mA    | 6mA                    | 969mA                    | 100mVp-p                                | 20W          | 90%                       | ±350µF                                    |
| JFC24D24-20        |                         | ±24 VDC        | 0mA            | ±417mA    | 12mA                   | -                        | 100mVp-p                                | 20W          | 91%                       | ±100µF                                    |
| JFC48D12-20        | 48 VDC<br>(36 – 75 VDC) | ±12 VDC        | 0mA            | ±833mA    | 4mA                    | 490mA                    | 100mVp-p                                | 20W          | 89%                       | ±500µF                                    |
| JFC48D15-20        |                         | ±15 VDC        | 0mA            | ±667mA    | 4mA                    | 484mA                    | 100mVp-p                                | 20W          | 90%                       | ±350µF                                    |
| JFC48D24-20        |                         | ±24 VDC        | 0mA            | ±417mA    | 10mA                   | -                        | 100mVp-p                                | 20W          | 91%                       | ±100µF                                    |

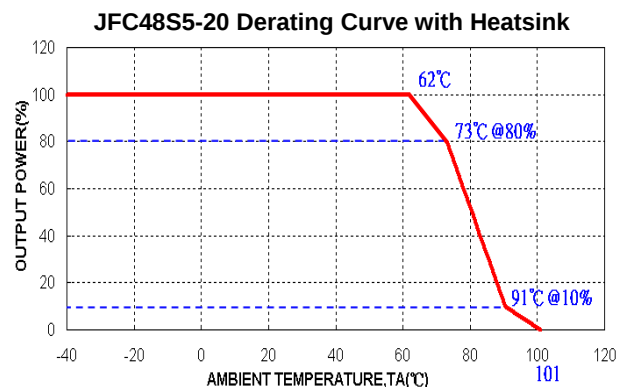
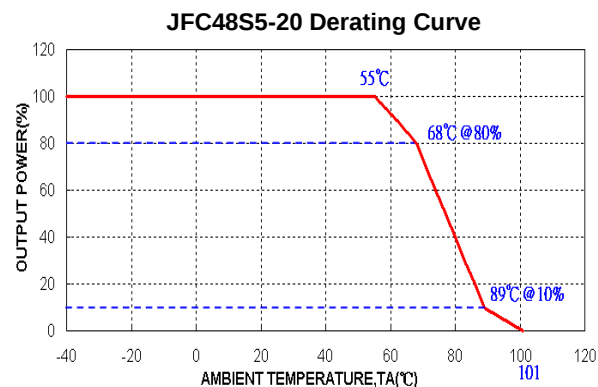
## NOTES

- 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.
- Single Outputs: 3.3-15V measured with 1µF M/C X7R and a 10µF T/C, 24V measured with 2 pcs of 6.8µF/50V X7R MLCC  
Dual Outputs: 12, 15V measured with 1µF M/C X7R and a 10µF T/C for each output, 24V measured with a 4.7µF/50V X7R MLCC for each output
- Test by minimum Vin and constant resistive load.
- Trimming allows the user to increase or decrease the output voltage set point of the module. This is accomplished by connecting an external resistor between the TRIM pin and either the +Vout pin or the -Vout pin.
- The ON/OFF control pin is referenced to -Vin. To order Negative Logic Remote ON/OFF add the suffix "R" to the model number.
- Heatsink is optional and P/N: 7G-0047C-F. See "Product Standard Table" on page 5 for ordering information.
- EN55022  
1) To meet Class A the module needs no external components  
2) To meet Class B please refer to the filter suggestion on page 4.
- An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5. The filter capacitor suggested is Nippon chemi-con KY series, 220µF /100V, ESR 48mΩ.
- There are several different options available for this series. Please see the "Product Standard Table" on page 5 for all options and ordering information.

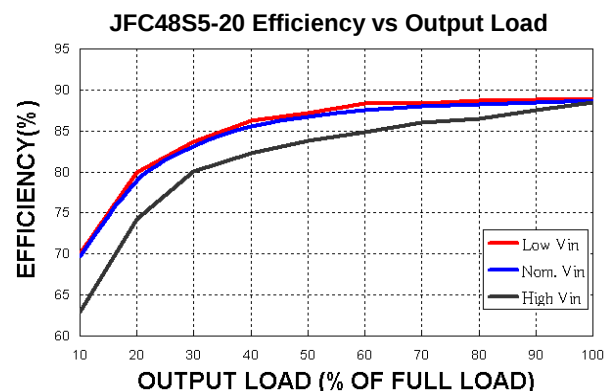
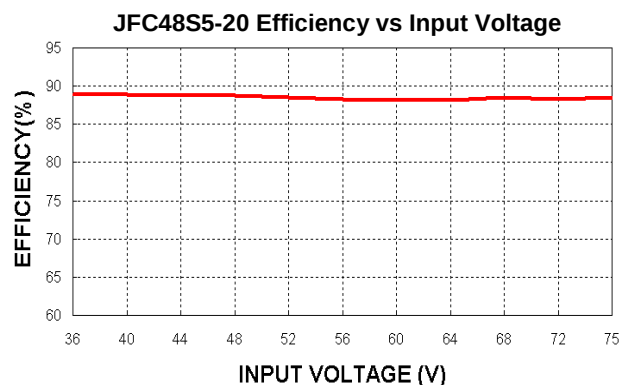
CAUTION: This power module is not internally fused. An input line fuse must always be used.

*Due to advances in technology, specifications subject to change without notice.*

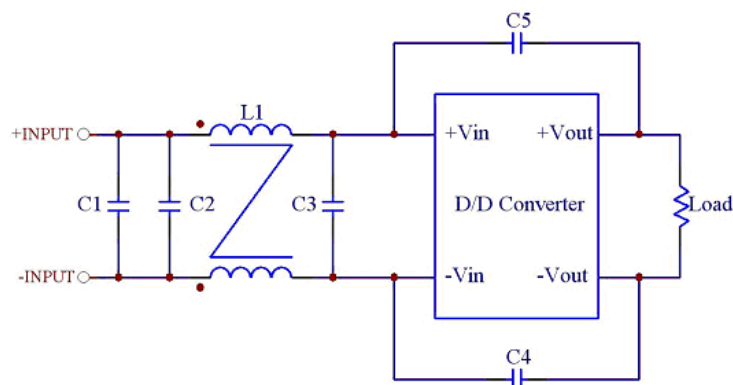
## DERATING CURVES



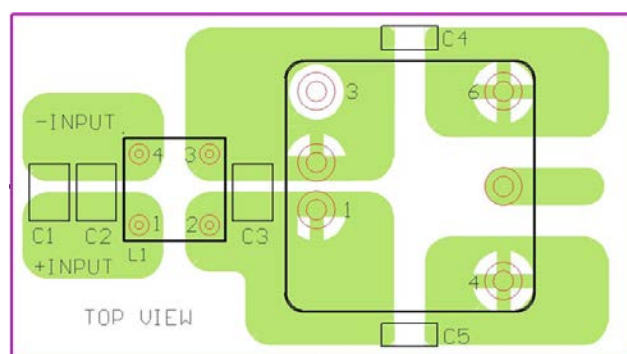
## CHARACTERISTICS



### Recommended Filter for EN55022 Class B Compliance



### Recommended EN55022 Class B Filter Circuit Layout

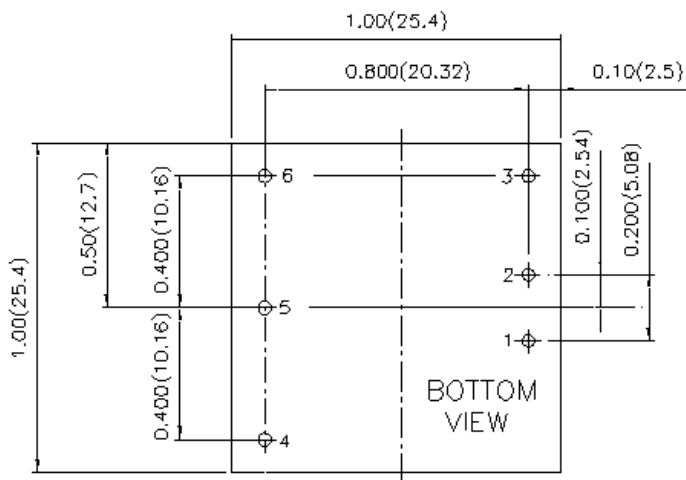
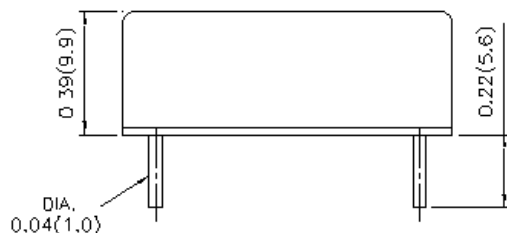


The components used in the figure above are as follows:

|              | C1, C2                  | C2                      | C3                      | C4 & C5                 | L1                               |
|--------------|-------------------------|-------------------------|-------------------------|-------------------------|----------------------------------|
| JFC20-12xxxx | 4.7µF/25V<br>1812 MLCC  | N/A                     | N/A                     | 470pF/2KV<br>1808 MLCC  | 325µH<br>Common Choke<br>PMT-050 |
| JFC20-24xxxx | 4.7µF/50V<br>1812 MLCC  | N/A                     | N/A                     | 470pF/2KV<br>1808 MLCC  | 325µH<br>Common Choke<br>PMT-050 |
| JFC20-48xxxx | 2.2µF/100V<br>1812 MLCC | 2.2µF/100V<br>1812 MLCC | 2.2µF/100V<br>1812 MLCC | 1000pF/2KV<br>1808 MLCC | 325µH<br>Common Choke<br>PMT-050 |

## MECHANICAL DRAWING

Unit: inches (mm)



1. 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)

| PIN CONNECTIONS |        |        |
|-----------------|--------|--------|
| Pin             | Single | Dual   |
| 1               | +Input | +Input |
| 2               | -Input | -Input |
| 3               | ON/OFF | ON/OFF |
| 4               | +Vout  | +Vout  |
| 5               | Trim   | Common |
| 6               | -Vout  | -Vout  |

| EXTERNAL OUTPUT TRIMMING                                          |                  |
|-------------------------------------------------------------------|------------------|
| Output can be externally trimmed by using the method shown below. |                  |
| <p>TRIM UP</p>                                                    | <p>TRIM DOWN</p> |

| PRODUCT STANDARD TABLE                  |           |
|-----------------------------------------|-----------|
| Option                                  | Suffix    |
| Positive Remote ON/OFF (standard)       | No Suffix |
| Negative Remote ON/OFF                  | R         |
| Without ON/OFF Pin                      | D         |
| Without ON/OFF & Trim Pin               | G         |
| Positive Remote ON/OFF without Trim Pin | F         |
| Negative Remote ON/OFF without Trim Pin | RF        |

## COMPANY INFORMATION

Wall Industries, Inc. has created custom and modified units for over 50 years. Our in-house research and development engineers will provide a solution that exceeds your performance requirements on-time and on budget. Our ISO9001-2008 certification is just one example of our commitment to producing a high quality, well-documented product for our customers.

Our past projects demonstrate our commitment to you, our customer. Wall Industries, Inc. has a reputation for working closely with its customers to ensure each solution meets or exceeds form, fit and function requirements. We will continue to provide ongoing support for your project above and beyond the design and production phases. Give us a call today to discuss your future projects.

Contact **Wall Industries** for further information:

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