

**FEATURES**

- Six-Sided Shielding
- High Efficiency up to 89%
- Fixed Switching Frequency
- 2:1 Wide Input Voltage Range
- 1600VDC Input to Output Isolation
- ISO9001 Certified Manufacturing Facilities
- Compliant to RoHS EU Directive 2002/95/EC
- Industry Standard Pin-Out DM Series Compatible
- Small Size and Low Profile: 1.0 x 1.0 x 0.39 Inches
- UL60950-1, EN60950-1, and IEC60950-1 Licensed
- CE Mark Meets 2006/95/EC, 93/68/EEC, and 2004/108/EC
- Options: Negative Logic Remote On/Off, Without Trim, Without On/Off pin

**APPLICATIONS**

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



**SPECIFICATIONS: JFC Series**

All specifications apply @ 25°C ambient unless otherwise noted

**INPUT SPECIFICATIONS**

Input Voltage Range.....	12V nominal input .....	9 - 18VDC
	24V nominal input .....	18 - 36VDC
	48V nominal input .....	36 - 75VDC
Input Voltage Variation .....	dv/dt .....	5V/ms max (Complies with EST300 132 part 4.4)
Input Surge Voltage (100ms max) .....	12V input.....	36VDC
	24V input.....	50VDC
	48V input.....	100VDC
Reflected Ripple Current (nominal Vin and full load).....		30mA <sub>p-p</sub>
Start Up Time (nominal Vin and constant resistive load)		
Power Up.....		30ms max.
Remote ON/OFF .....		30ms max.
Start-Up Voltage.....	12V input.....	9VDC
	24V input.....	17VDC
	48V input.....	33VDC
Shutdown Voltage.....	12V input.....	8VDC
	24V input.....	14.5VDC
	48V input.....	30.5VDC
Remote ON/OFF (See Note 7)		
Positive Logic .....	DC-DC ON.....	Open or 3V < Vr < 12V (standard)           DC-DC OFF .....
		Short or 0V < Vr < 1.2V
Negative Logic.....	DC-DC ON.....	Short or 0V < Vr < 1.2V (option "R suffix")   DC-DC OFF .....
		Open or 3V < Vr < 12V
Input Current of Remote Control Pin (nominal Vin).....		-0.5mA ~ 1.0mA
Remote Off State Input Current (nominal Vin) .....		2.5mA

**OUTPUT SPECIFICATIONS**

Output Voltage .....		see table
Voltage Accuracy (full load and nominal Vin).....		±1%
Voltage Adjustability (See Note 6).....		±10%
Output Current .....		see table
Output Power .....		15 watts max.
Line Regulation (LL to HL at FL).....	Single Output.....	±0.2%
	Dual Output.....	±0.5%
Load Regulation (no load to full load) .....	Single Output.....	±0.2%
	Dual Output .....	±1.0%
Cross Regulation (Dual) (Asymmetrical load 25% / 100% FL) .....		±5%
Ripple/Noise (20 MHz BW).....		see table (measured with a 1µF M/C and a 10µF T/C)
Minimum Load.....		0%
Transient Response Recovery Time (25% load step) .....		250µs

**PROTECTION SPECIFICATIONS**

Over Voltage Protection .....	3.3V output.....	3.7V - 5.4V
	5V output.....	5.6V - 7.0V
	12V output.....	13.5V - 19.6V
	15V output.....	16.8V - 20.5V
Over Load Protection (% of FL at nominal input) .....		150% typ.
Short Circuit Protection .....		Hiccup, automatic recovery

**GENERAL SPECIFICATIONS**

Efficiency .....		see table
Switching Frequency.....		400KHz typ.
Isolation Voltage		
Input to Output .....		1600VDC min.
Input to Case.....		1000VDC min.
Output to Case .....		1000VDC min.
Isolation Resistance .....		10GΩ min.
Isolation Capacitance.....		1000pF max.

**ENVIRONMENTAL SPECIFICATIONS**

Operating Temperature .....		-40°C ~ +85°C (with derating)
Storage Temperature .....		-55°C ~ +125°C
Maximum Case Temperature .....		105°C
Relative Humidity .....		5% to 95% RH
Thermal Impedance (See Note 8)		
Natural Convection.....		18.2°C / Watt
Natural Convection with heat-sink .....		15.8°C / Watt
Thermal Shock.....		MIL-STD-810F
Vibration.....		MIL-STD-810F
Temperature Coefficient.....		±0.02% / °C max.
MTBF (See Note 1)		
BELLCORE TR-NWT-000332 .....		1.330 x 10 <sup>6</sup> hours
MIL-HDBK-217F.....		5.630 x 10 <sup>5</sup> hours

**PHYSICAL SPECIFICATIONS**

Weight .....		15g
Dimensions .....		1.0 x 1.0 x 0.39 inches (25.4 x 25.4 x 9.9 mm)
Case Material.....		Nickel-coated copper
Base Material.....		FR4 PCB
Potting Material .....		Epoxy (UL94-V0)
Shielding.....		six – sided

**SAFETY & EMC**

Approvals and Standards .....		IEC60950-1, UL60950-1, EN60950-1
EMI (See Note 9).....		EN55022..... Class A
ESD .....	EN61000-4-2.....	Air     ± 8KV
		Contact ± 6KV..... Perf. Criteria B
Radiated Immunity .....	EN61000-4-3 .....	10V/m Perf. Criteria A
Fast Transient (See Note 10).....	EN61000-4-4 .....	±2KV Perf. Criteria A
Surge (See Note 10).....	EN61000-4-5 .....	±0.5KV Perf. Criteria A
Conducted Immunity .....	EN61000-4-6 .....	3Vrms Perf. Criteria A

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

**OUTPUT VOLTAGE / CURRENT RATING CHARTS**

SINGLE OUTPUT MODELS								
Model Number	Input Range	Output Voltage	Output Current	Ripple & Noise <sup>(4)</sup>	Input Current		Efficiency <sup>(4)</sup>	Max Capacitive Load <sup>(5)</sup>
					No Load <sup>(3)</sup>	Full Load <sup>(2)</sup>		
JFC12S3.3-4000	12VDC (9 - 18VDC)	3.3 VDC	4000mA	75mVp-p	120mA	1375mA	84%	1000µF
JFC12S5-3000		5 VDC	3000mA	75mVp-p	90mA	1524mA	86%	1000µF
JFC12S12-1300		12 VDC	1300mA	100mVp-p	40mA	1605mA	85%	330µF
JFC12S15-1000		15 VDC	1000mA	100mVp-p	40mA	1506mA	87%	220µF
JFC24S3.3-4000	24VDC (18 - 36 VDC)	3.3 VDC	4000mA	75mVp-p	50mA	671mA	86%	1000µF
JFC24S5-3000		5 VDC	3000mA	75mVp-p	65mA	763mA	86%	1000µF
JFC24S12-1300		12 VDC	1300mA	100mVp-p	20mA	792mA	87%	330µF
JFC24S15-1000		15 VDC	1000mA	100mVp-p	20mA	744mA	88%	220µF
JFC48S3.3-4000	48VDC (36 - 75 VDC)	3.3 VDC	4000mA	75mVp-p	40mA	336mA	86%	1000µF
JFC48S5-3000		5 VDC	3000mA	75mVp-p	40mA	372mA	88%	1000µF
JFC48S12-1300		12 VDC	1300mA	100mVp-p	15mA	387mA	88%	330µF
JFC48S15-1000		15 VDC	1000mA	100mVp-p	15mA	372mA	88%	220µF

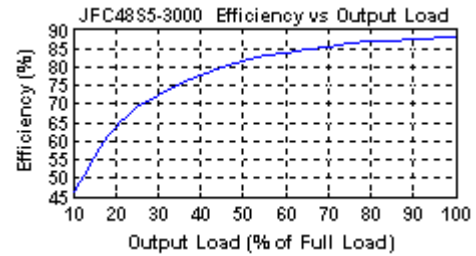
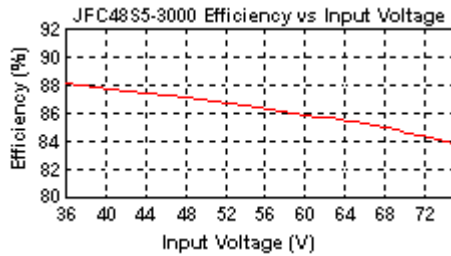
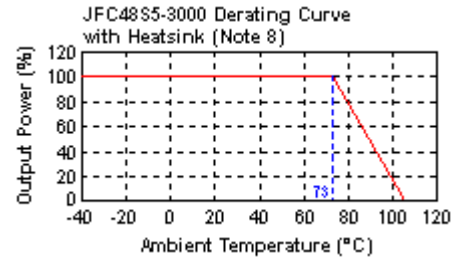
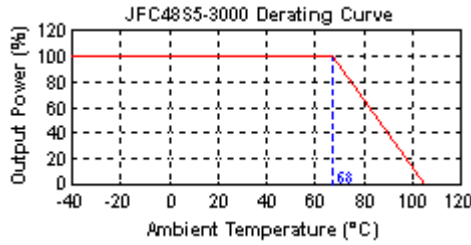
DUAL OUTPUT MODELS								
Model Number	Input Range	Output Voltage	Output Current	Ripple & Noise <sup>(4)</sup>	Input Current		Efficiency <sup>(4)</sup>	Max Capacitive Load <sup>(5)</sup>
					No Load <sup>(3)</sup>	Full Load <sup>(2)</sup>		
JFC12D5-1500	12VDC (9 - 18VDC)	±5 VDC	±1500mA	100mVp-p	30mA	1543mA	85%	±500µF
JFC12D12-625		±12 VDC	±625mA	100mVp-p	30mA	1506mA	87%	±150µF
JFC12D15-500		±15 VDC	±500mA	100mVp-p	30mA	1488mA	88%	±100µF
JFC24D5-1500	24VDC (18 - 36 VDC)	±5 VDC	±1500mA	100mVp-p	20mA	772mA	85%	±500µF
JFC24D12-625		±12 VDC	±625mA	100mVp-p	15mA	744mA	88%	±150µF
JFC24D15-500		±15 VDC	±500mA	100mVp-p	25mA	744mA	88%	±100µF
JFC48D5-1500	48VDC (36 - 75 VDC)	±5 VDC	±1500mA	100mVp-p	15mA	386mA	85%	±500µF
JFC48D12-625		±12 VDC	±625mA	100mVp-p	15mA	368mA	89%	±150µF
JFC48D15-500		±15 VDC	±500mA	100mVp-p	20mA	372mA	88%	±100µF

\*\*\*\*\*See Product Standard Table for suffix options\*\*\*\*\*

**NOTES**

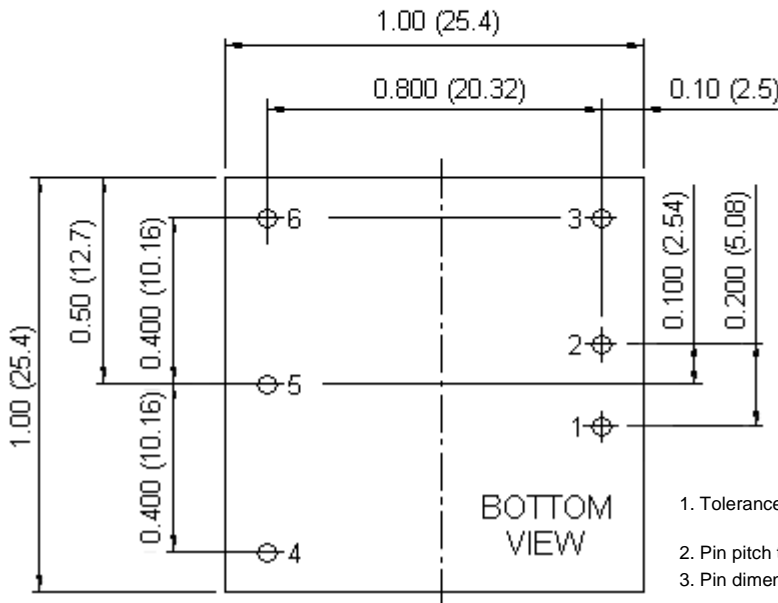
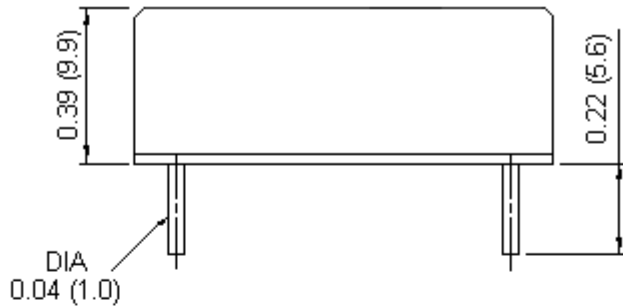
- BELLCORE TR-NWT-000332. Case 1: 50% Stress, Temperature at 40°C.  
MIL-HDBK-217F Notice2 @Ta=25 °C, Full load (Ground fixed and controlled environment).
- Maximum value at nominal input voltage and full load.
- Typical value at nominal input voltage and no load.
- Typical value at nominal input voltage and full load.
- Test by minimum Vin and constant resistive load.
- 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 voltage is referenced to -Vin. (See the "Product Standard Table" below for suffix options).
- For Heat Sink option add the suffix "HS" to the part number (Ex: JFC48S5-3000HS)(P/N: 7G-0047C-F). See attached drawings for more details.
- The JFC Series can meet EN55022 Class A with external capacitors connected in parallel to the input pins.  
Recommended: 12Vin: 10µF/25V 1812 MLCC  
24Vin: 6.8µF/50V \* 2 pcs 1812 MLCC  
48Vin: 2.2µF/100 \* 2 pcs 1812MLCC
- An external filter capacitor is required if the module has to meet EN61000-4-4 and EN61000-4-5. The filter capacitor suggested is Nippon chemi-con KY Series, 220µF/100V, ESR 48mΩ.

**DERATING CURVES & EFFICIENCY GRAPHS**



**MECHANICAL DRAWING**

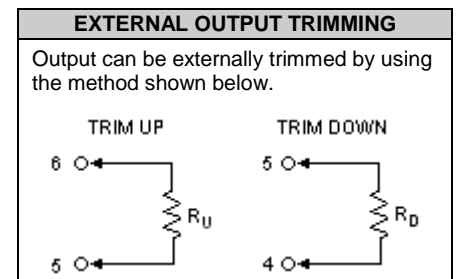
Unit: inches (mm)



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)
3. Pin dimension tolerance: ±0.004 (0.1)

PIN CONNECTION		
PIN	SINGLE OUTPUT	DUAL OUTPUT
1	+INPUT	+INPUT
2	-INPUT	-INPUT
3	ON/OFF	ON/OFF
4	+VOUT	+VOUT
5	TRIM	COMMON
6	-VOUT	-VOUT

PRODUCT STANDARD TABLE	
Option	Suffix
Negative Remote ON/OFF	R
Positive Remote ON/OFF	Blank
Without ON/OFF pin	D
Without ON/OFF & TRIM pin	G
Negative Remote ON/OFF without TRIM pin	RF
Positive Remote ON/OFF without TRIM pin	F

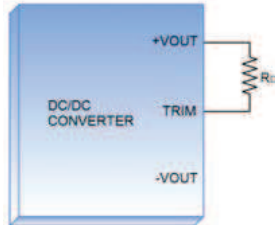


**OUTPUT VOLTAGE ADJUSTMENT**

Output voltage set point adjustment allows the user to increase or decrease the output voltage set point of a module. This is accomplished by connecting an external resistor between the TRIM pin and either the +OUTPUT or -OUTPUT pins. With an external resistor between the TRIM and -OUTPUT pin, the output voltage set point increases. With an external resistor between the TRIM and +OUTPUT pins, the output voltage set point decreases. The external TRIM resistor needs to be at least 1/16W resistors.

Trim Up

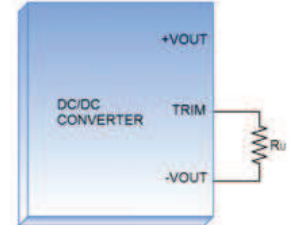
$$R_U = \left[ \frac{G \times L}{(V_{O,up} - L - K)} - H \right] \Omega$$



TRIM CONSTANTS				
Module	G	H	K	L
JFCXXS3.3-4000	5110	2050	0.8	2.5
JFCXXS5-4000	5110	2050	2.5	2.5
JFCXXS12-4000	10000	5110	9.5	2.5
JFCXXS15-4000	10000	5110	12.5	2.5

Trim Down

$$R_D = \left[ \frac{(V_{O,down} - L) \times G}{(V_O - V_{O,down})} - H \right] \Omega$$



TRIM CONSTANTS				
Module	G	H	K	L
JFCXXS3.3-4000	5110	2050	0.8	2.5
JFCXXS5-4000	5110	2050	2.5	2.5
JFCXXS12-4000	10000	5110	9.5	2.5
JFCXXS15-4000	10000	5110	12.5	2.5

JFCXXS3.3-4000		
Trim	V <sub>out,up</sub>	R <sub>up</sub>
1%	3.333V	385.071kΩ
2%	3.366V	191.511kΩ
3%	3.399V	126.990kΩ
4%	3.432V	94.730kΩ
5%	3.465V	75.374kΩ
6%	3.498V	62.470kΩ
7%	3.531V	53.253kΩ
8%	3.564V	46.340kΩ
9%	3.597V	40.963kΩ
10%	3.630V	36.662kΩ

JFCXXS5-3000		
Trim	V <sub>out,up</sub>	R <sub>up</sub>
1%	5.050V	253.450kΩ
2%	5.100V	125.700kΩ
3%	5.150V	83.117kΩ
4%	5.200V	61.825kΩ
5%	5.250V	49.050kΩ
6%	5.300V	40.533kΩ
7%	5.350V	34.450kΩ
8%	5.400V	29.888kΩ
9%	5.450V	26.339kΩ
10%	5.500V	23.500kΩ

JFCXXS3.3-4000		
Trim	V <sub>out,down</sub>	R <sub>down</sub>
1%	3.267V	116.719kΩ
2%	3.234V	54.779kΩ
3%	3.201V	34.133kΩ
4%	3.168V	23.810kΩ
5%	3.135V	17.616kΩ
6%	3.102V	13.486kΩ
7%	3.069V	10.537kΩ
8%	3.036V	8.325kΩ
9%	3.003V	6.604kΩ
10%	2.970V	5.228kΩ

JFCXXS5-3000		
Trim	V <sub>out,down</sub>	R <sub>down</sub>
1%	4.950V	248.340kΩ
2%	4.900V	120.590kΩ
3%	4.850V	78.007kΩ
4%	4.800V	56.715kΩ
5%	4.750V	43.940kΩ
6%	4.700V	35.423kΩ
7%	4.650V	29.340kΩ
8%	4.600V	24.778kΩ
9%	4.550V	21.229kΩ
10%	4.500V	18.390kΩ

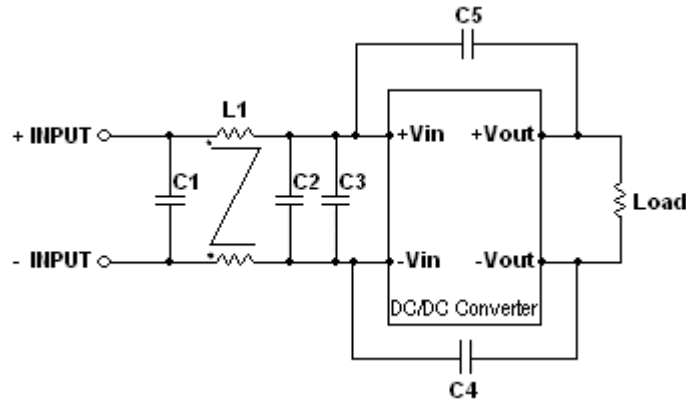
JFCXXS12-1300		
Trim	V <sub>out,up</sub>	R <sub>up</sub>
1%	12.120V	203.223kΩ
2%	12.240V	99.057kΩ
3%	12.360V	64.334kΩ
4%	12.480V	46.973kΩ
5%	12.600V	36.557kΩ
6%	12.720V	29.612kΩ
7%	12.840V	24.652kΩ
8%	12.960V	20.932kΩ
9%	13.080V	18.038kΩ
10%	13.200V	15.723kΩ

JFCXXS15-1000		
Trim	V <sub>out,up</sub>	R <sub>up</sub>
1%	15.150V	161.557kΩ
2%	15.300V	78.223kΩ
3%	15.450V	50.446kΩ
4%	15.600V	36.557kΩ
5%	15.750V	28.223kΩ
6%	15.900V	22.668kΩ
7%	16.050V	18.700kΩ
8%	16.200V	15.723kΩ
9%	16.350V	13.409kΩ
10%	16.500V	11.557kΩ

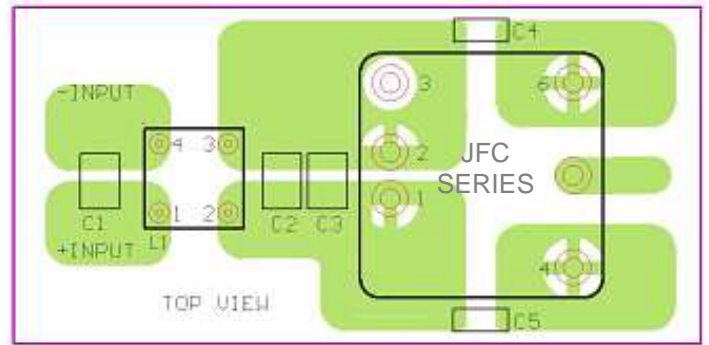
JFCXXS12-1300		
Trim	V <sub>out,down</sub>	R <sub>down</sub>
1%	11.880V	776.557kΩ
2%	11.760V	380.723kΩ
3%	11.640V	248.779kΩ
4%	11.520V	182.807kΩ
5%	11.400V	143.223kΩ
6%	11.280V	116.834kΩ
7%	11.160V	97.985kΩ
8%	11.040V	83.848kΩ
9%	10.920V	72.853kΩ
10%	10.800V	64.057kΩ

JFCXXS15-1000		
Trim	V <sub>out,down</sub>	R <sub>down</sub>
1%	14.850V	818.223kΩ
2%	14.700V	401.557kΩ
3%	14.550V	262.668kΩ
4%	14.400V	193.223kΩ
5%	14.250V	151.557kΩ
6%	14.100V	123.779kΩ
7%	13.950V	103.938kΩ
8%	13.800V	89.057kΩ
9%	13.650V	77.483kΩ
10%	13.500V	68.223kΩ

Recommended Filter for EN5022 Class B Compliance



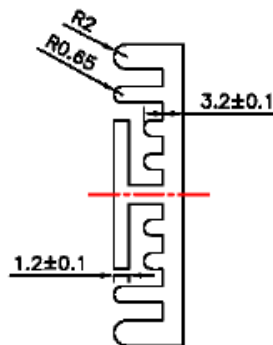
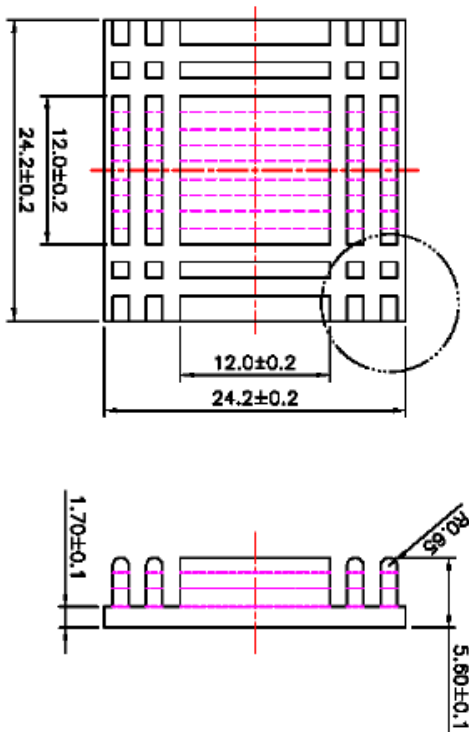
Recommended EN5022 Class B Filter Circuit Layout



The components used in the figure above are as follows:

	C1	C2	C3	C4 & C5	L1
JFC12xxx-xxxx	10 $\mu$ F/25V	N/A	10 $\mu$ F/25V	470pF/2KV	145 $\mu$ H Common Choke
JFC24xxx-xxxx	6.8 $\mu$ F/50V	N/A	6.8 $\mu$ F/50V	470pF/2KV	325 $\mu$ H Common Choke
JFC48xxx-xxxx	2.2 $\mu$ F/100V	2.2 $\mu$ F/100V	2.2 $\mu$ F/100V	1000pF/2KV	325 $\mu$ H Common Choke

**HEAT SINK OPTION**



SCALE:4:1

