

**SF2002FCT THRU SF2006FCT**

**Super Fast Recovery Rectifiers**



**Voltage:** 200~600 Volts

**Current:** 20 Amperes

**Package:** TO-220F

**Features**

- NH'S Super Fast Recovery Rectifiers Chip Technology
- Low Switching Loss For High Efficiency
- Low Leakage Current For High Reliability
- Super Fast Switching Speed

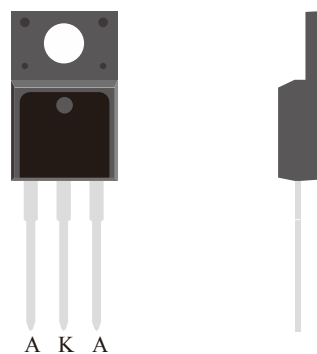
**Mechanical Data**

- **Case:** Molded With UL-94 Class V-0 Recognized, RoHS-Compliant
- **Polarity:** Look At The Diagram And Polarity On The Right
- **Terminals:** Tin Plated Leads, Solderable Per J-STD-002 And JESD22-B102

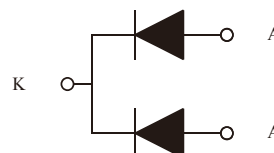
**Typical Applications**

- Switch Mode Power Supplies (SMPS)
- Fast Chargers
- LED Driver And Monitor Lighting
- Automotive Electronics And Charging Posts

**Diagram:**



**Polarity:**



Single Phase, Half Wave, 60Hz, Resistive Or Inductive Load. For Capacitive Load, Derate Current By 20%

**Maximum Ratings (Ta=25°C Unless Otherwise Specified)**

| Parameter                                 | Test Conditions                                          | Symbol      | SF<br>2002FCT | SF<br>2004FCT | SF<br>2006FCT | Unit               |
|-------------------------------------------|----------------------------------------------------------|-------------|---------------|---------------|---------------|--------------------|
| Maximum Repetitive Peak Reverse Voltage   |                                                          | $V_{RRM}$   | 200           | 400           | 600           | V                  |
| Maximum RMS Voltage                       |                                                          | $V_{RMS}$   | 140           | 280           | 420           | V                  |
| Maximum DC Blocking Voltage               |                                                          | $V_{DC}$    | 200           | 400           | 600           | V                  |
| Maximum Average Forward Rectified Current | Per Diode<br>Total device                                | $I_{F(AV)}$ | 10<br>20      |               |               | A                  |
| Peak Forward Surge Current Per Diode      | 8.3ms Single Half Sine-wave<br>Superimposed On Rate Load | $I_{FSM}$   | 200           |               |               | A                  |
| Current Squared Time Per Diode            | $t < 8.3ms$                                              | $I^2t$      | 166.0         |               |               | A <sup>2</sup> sec |
| Maximum Mounting Torque                   | M3 screw                                                 | $T_{MM}$    | 1.1           |               |               | N.m                |

**Electrical Characteristics (Ta=25°C Unless Otherwise Specified)**

| Parameter                                               | Test Conditions                                              | Symbol    | SF<br>2002FCT | SF<br>2004FCT | SF<br>2006FCT | Unit |
|---------------------------------------------------------|--------------------------------------------------------------|-----------|---------------|---------------|---------------|------|
| Instantaneous Forward Voltage Per Diode                 | $I_F = 10.0 A$                                               | $V_F$     | 0.95          | 1.30          | 1.70          | V    |
| Maximum DC Reverse Current at Rated DC Blocking Voltage | Ta=25°C, $V_R = V_{RRM}$<br>Ta=125°C, $V_R = V_{RRM} * 80\%$ | $I_{RRM}$ | 5<br>200      |               |               | uA   |
| Typical Junction Capacitance Per Diode                  | 4 V, 1MHz                                                    | $C_J$     | 100           | 70            | 40            | pF   |
| Maximum Reverse Recovery Time                           | $I_F = 0.5A$ , $I_R = 1.0A$ , $IRR = 0.25A$                  | $T_{rr}$  | 35            |               |               | nS   |

**Thermal Characteristics (Ta=25°C Unless Otherwise Specified)**

| Parameter                                                   | Test Conditions                                     | Symbol           | SF<br>2002FCT | SF<br>2004FCT | SF<br>2006FCT | Unit |
|-------------------------------------------------------------|-----------------------------------------------------|------------------|---------------|---------------|---------------|------|
| Operating Junction Temperature Range                        |                                                     | T <sub>J</sub>   | -55~150       |               |               | ℃    |
| Storage Temperature Range                                   |                                                     | T <sub>STD</sub> | -55~150       |               |               |      |
| Thermal Resistance Junction To Ambient<br>With Steady-State | Still Air Environment<br>With Ta=25℃                | R <sub>θJA</sub> | 62.5          |               |               | ℃/W  |
| Thermal Resistance Junction-Case<br>With Steady-State       | Device Mounted On<br>75mm x 45mm x 2.5mm Alu. Heat. | R <sub>θJC</sub> | 3.0           |               |               |      |

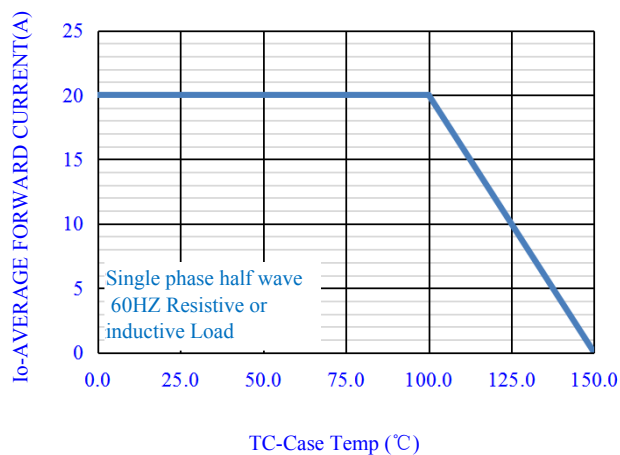
Notes: 1. Pulse Test: 300 Us Pulse Width, 1% Duty Cycle

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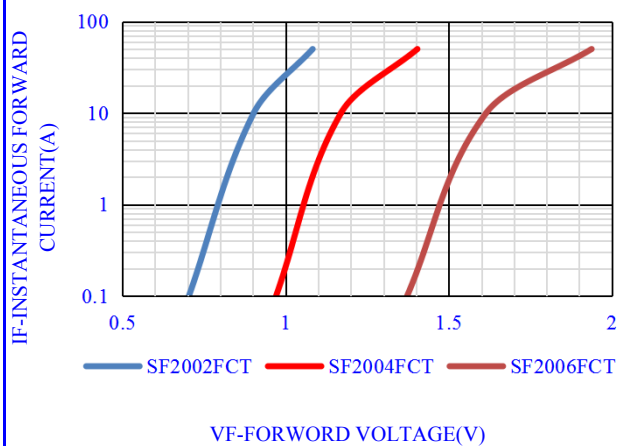
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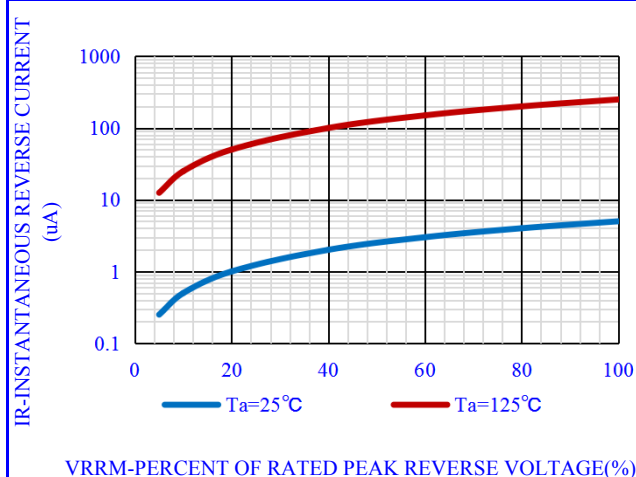
**Typical Characteristics Curves**



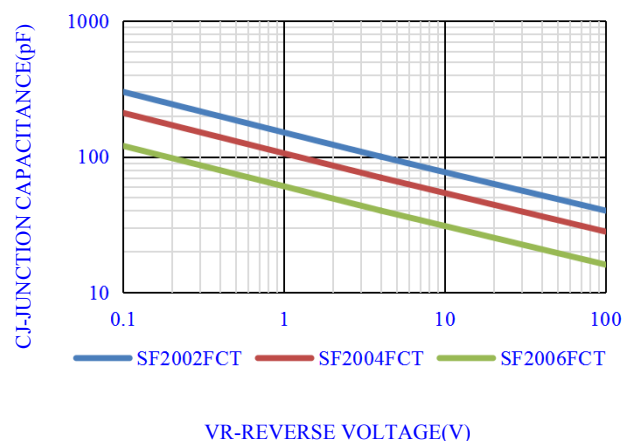
**Fig.1-FORWARD CURRENT DERATING CURVE**



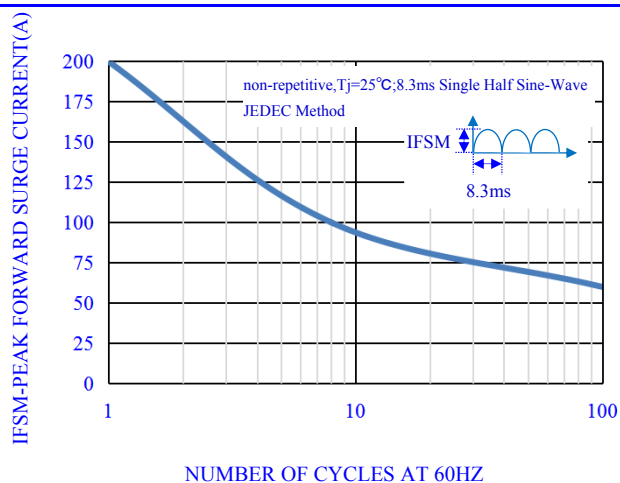
**Fig.2- TYPICAL INSTANTANEOUS FORWARD**



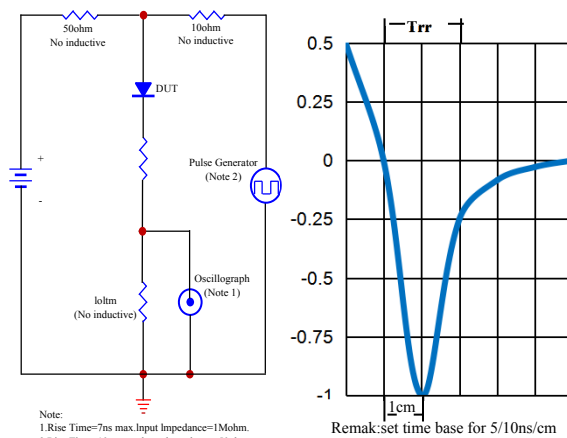
**Fig.3- TYPICAL REVERSE CHARACTERISTICS**



**Fig.4- TYPICAL JUNCTION CAPACITANCE**



**Fig.5-MAX. NON-REPETITIVE SURGE CURRENT**

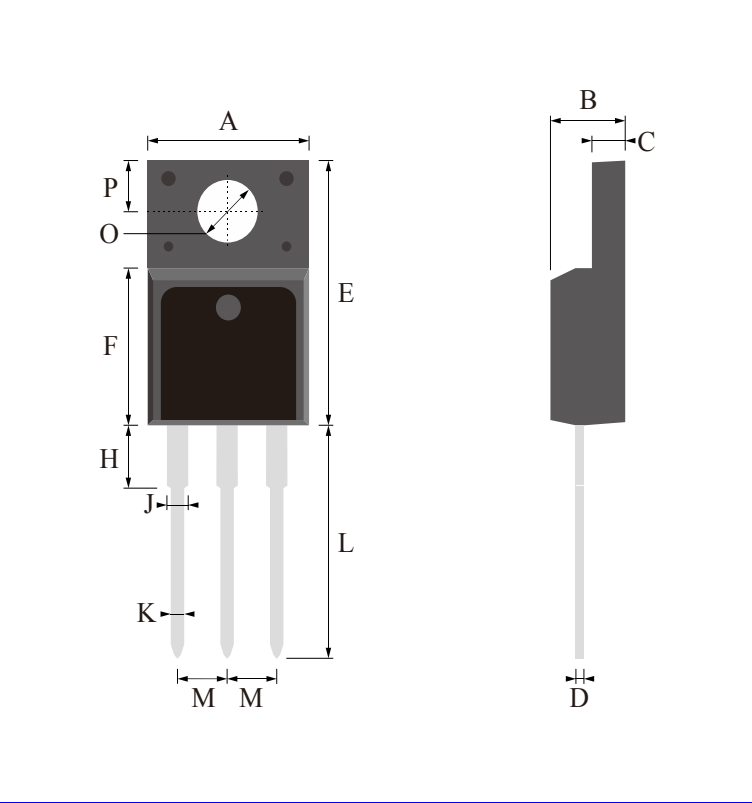


**Fig.6-REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT**

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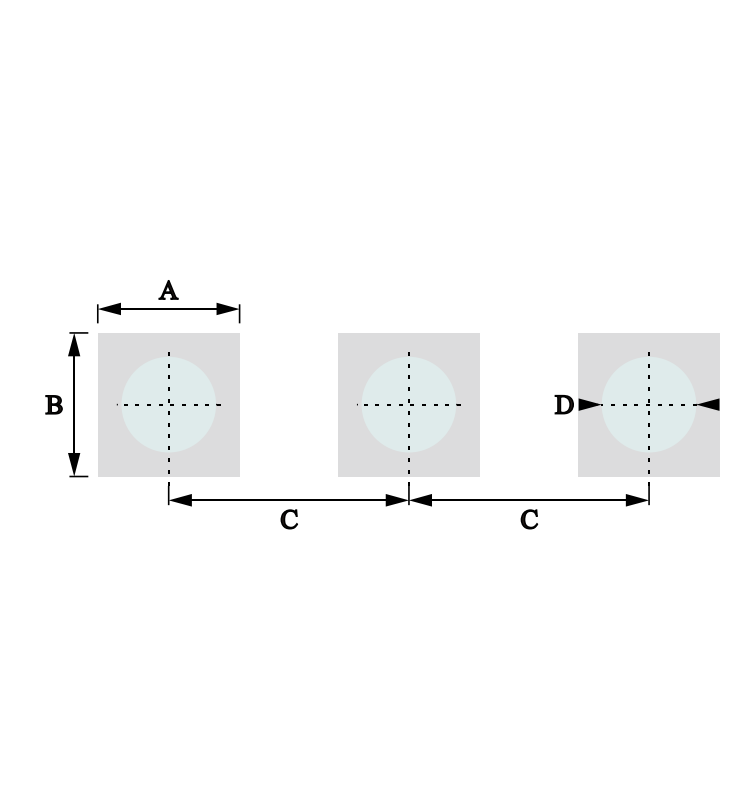
OUTLINE DRAWINGS



TO-220F

| OUTLINE DIMENSIONS |            |      |       |        |      |        |
|--------------------|------------|------|-------|--------|------|--------|
| Dim.               | Milimeters |      |       | Inches |      |        |
|                    | Min.       | Typ. | Max.  | Min.   | Typ. | Max.   |
| A                  | 9.25       | -    | 10.75 | 0.3642 | -    | 0.4232 |
| B                  | 4.20       | -    | 5.20  | 0.1654 | -    | 0.2047 |
| C                  | 2.30       | -    | 2.90  | 0.0906 | -    | 0.1142 |
| D                  | 0.35       | -    | 0.75  | 0.0138 | -    | 0.0295 |
| E                  | 14.80      | -    | 16.80 | 0.5827 | -    | 0.6614 |
| F                  | 8.25       | -    | 9.75  | 0.3248 | -    | 0.3839 |
| L                  | 12.15      | -    | 14.15 | 0.4783 | -    | 0.5571 |
| H                  | 2.40       | -    | 3.00  | 0.0945 | -    | 0.1181 |
| J                  | 1.10       | -    | 1.50  | 0.0433 | -    | 0.0591 |
| K                  | 0.60       | -    | 1.00  | 0.0236 | -    | 0.0394 |
| M                  | 2.20       | -    | 3.00  | 0.0866 | -    | 0.1181 |
| O                  | 2.70       | -    | 3.50  | 0.1063 | -    | 0.1378 |
| P                  | 2.25       | -    | 2.85  | 0.0886 | -    | 0.1122 |

RECOMMEDND LAYOUT DRAWINGS



TO-220F

| OUTLINE DIMENSIONS |            |      |      |        |        |      |
|--------------------|------------|------|------|--------|--------|------|
| Dim.               | Milimeters |      |      | Inches |        |      |
|                    | Min.       | Typ. | Max. | Min.   | Typ.   | Max. |
| A                  | -          | 1.60 | -    | -      | 0.0630 | -    |
| B                  | -          | 1.60 | -    | -      | 0.0630 | -    |
| C                  | -          | 2.54 | -    | -      | 0.1000 | -    |
| D                  | -          | 1.00 | -    | -      | 0.0394 | -    |

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MARKING



MARKING INSTRUCTION

NH=Niuhan Trademark  
FF=Product Line Code,According To Actual Changes  
YWW=Date Code,According To Actual Changes  
LLWWF=Inernal Code,According To Actual Changes  
SF20xxFCT=Make,x=xx=02,04,06

PACKING INFORMATION

| Package Type | Package Code | Product Weight<br>Approx(g/Pcs) | Package Method | Quantity<br>(Pcs/Min. Pack.) | Quantity<br>(Pcs/Inner Box) | Quantity<br>(Pcs/Carton) |
|--------------|--------------|---------------------------------|----------------|------------------------------|-----------------------------|--------------------------|
| TO-220F      | P1           | 2.048                           | Tube           | 50                           | 1000                        | 5000                     |

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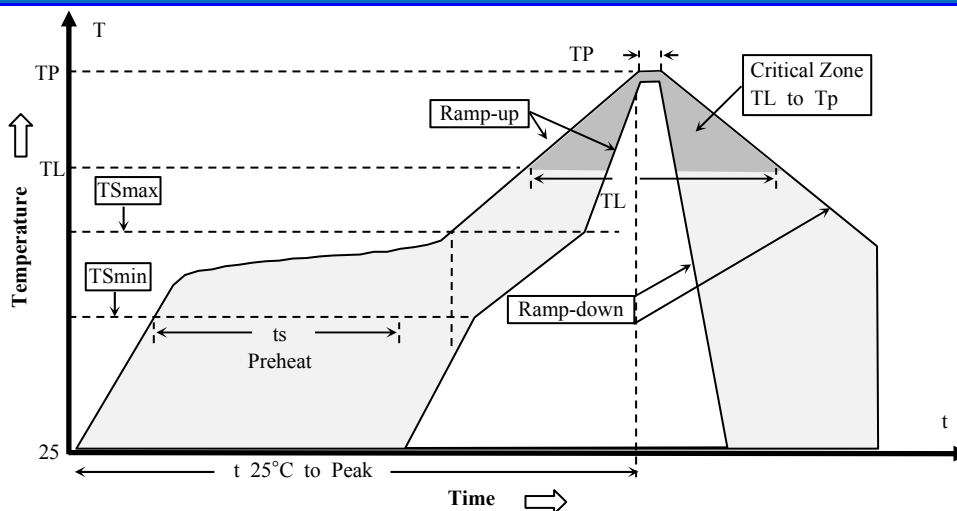
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**Recommended wave soldering condition**

| Product         | Peak Temperature | Soldering Time  |
|-----------------|------------------|-----------------|
| Pb-free devices | 260 +0/-5 °C     | 5 +1/-1 seconds |

**Recommended temperature profile for IR reflow**



| Profile feature                                                                            | Sn-Pb eutectic Assembly          | Pb-free Assembly                 |
|--------------------------------------------------------------------------------------------|----------------------------------|----------------------------------|
| Average ramp-up rate<br>(T <sub>smax</sub> to T <sub>p</sub> )                             | 3°C/second max.                  | 3°C/second max.                  |
| Preheat<br>-Temperature Min(TS min)<br>-Temperature Max(TS max)<br>-Time(ts min to ts max) | 100°C<br>150°C<br>60-120 seconds | 150°C<br>200°C<br>60-180 seconds |
| Time maintained above:<br>-Temperature (TL)<br>- Time (tL)                                 | 183°C<br>60-150 seconds          | 217°C<br>60-150 seconds          |
| Peak Temperature(TP)                                                                       | 240 +0/-5 °C                     | 260 +0/-5 °C                     |
| Time within 5°C of actual peak<br>temperature(tp)                                          | 10-30 seconds                    | 20-40 seconds                    |
| Ramp down rate                                                                             | 6°C/second max.                  | 6°C/second max.                  |
| Time 25 °C to peak temperature                                                             | 6 minutes max.                   | 8 minutes max.                   |

Note : All temperatures refer to topside of the package, measured on the package body surface.

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