

# S18CF SERIES

## 1200-1000 VOLTS RANGE

### STANDARD TURN-OFF TIME 16 $\mu$ s

### 110 AMP RMS, CENTER AMPLIFYING GATE

### INVERTER TYPE STUD MOUNTED SCRs

#### VOLTAGE RATINGS

| VOLTAGE<br>CODE<br>(1) | $V_{RRM}, V_{DRM}$ - (V)<br>Max. rep. peak reverse<br>and off-state voltage | $V_{RSM}$ - (V)<br>Max. non-rep. peak<br>reverse voltage<br>$t_p \leq 5ms$ | NOTES     |
|------------------------|-----------------------------------------------------------------------------|----------------------------------------------------------------------------|-----------|
|                        | $T_J = -40^\circ$ to $125^\circ C$                                          | $T_J = 25^\circ$ to $125^\circ C$                                          |           |
| 12                     | 1200                                                                        | 1300                                                                       | Gate open |
| 10                     | 1000                                                                        | 1100                                                                       |           |

#### MAXIMUM ALLOWABLE RATINGS

| PARAMETER                                           | VALUE                | UNITS          | NOTES                                                                                                                                                                                 |
|-----------------------------------------------------|----------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $T_J$ Junction temperature                          | -40 to 125           | $^\circ C$     |                                                                                                                                                                                       |
| $T_{stg}$ Storage temperature                       | -40 to 150           | $^\circ C$     |                                                                                                                                                                                       |
| $I_T(AV)$ Max. av. current                          | 70                   | A              | 180° half sine wave                                                                                                                                                                   |
| • Max. $T_C$                                        | 85                   | $^\circ C$     |                                                                                                                                                                                       |
| $I_T(RMS)$ Max. RMS current                         | 110                  | A              |                                                                                                                                                                                       |
| $I_{TSM}$ Max. peak non-repetitive surge current    | 1910                 | A              | 50Hz half cycle sine wave Initial $T_J = 125^\circ C$ , rated $V_{RRM}$ applied after surge.                                                                                          |
|                                                     | 2000                 |                | 60Hz half cycle sine wave                                                                                                                                                             |
|                                                     | 2270                 |                | 50Hz half cycle sine wave Initial $T_J = 125^\circ C$ , no voltage applied after surge.                                                                                               |
|                                                     | 2380                 |                | 60Hz half cycle sine wave                                                                                                                                                             |
| $I^2t$ Max. $I^2t$ capability                       | 18                   | $kA^2s$        | $t = 10ms$ Initial $T_J = 125^\circ C$ , rated $V_{RRM}$ applied after surge.                                                                                                         |
|                                                     | 17                   |                | $t = 8.3ms$                                                                                                                                                                           |
|                                                     | 26                   |                | $t = 10ms$ Initial $T_J = 125^\circ C$ , no voltage applied after surge.                                                                                                              |
|                                                     | 24                   |                | $t = 8.3ms$                                                                                                                                                                           |
| $I^2\sqrt{t}$ Max. $I^2\sqrt{t}$ capability         | 258                  | $kA^2\sqrt{s}$ | Initial $T_J = 125^\circ C$ , no voltage applied after surge. $I^2t$ for time $t_x = I^2\sqrt{t} \cdot \sqrt{t_x}$ . $0.1 \leq t_x \leq 10ms$ .                                       |
| $di/dt$ Max. non-repetitive rate-of-rise of current | 800                  | A/ $\mu s$     | $T_J = 125^\circ C$ , $V_D = V_{DRM}$ , $I_{TH} = 1600A$ . Gate pulse: 20V, 20 $\mu s$ , 0.5 $\mu s$ rise time. Max. repetitive $di/dt$ is approximately 40% of non-repetitive value. |
| $P_{GH}$ Max. peak gate power                       | 10                   | W              | $t_p \leq 5ms$                                                                                                                                                                        |
| $P_{G(AV)}$ Max. av. gate power                     | 2                    | W              |                                                                                                                                                                                       |
| $+I_{GH}$ Max. peak gate current                    | 3                    | A              | $t_p \leq 5ms$                                                                                                                                                                        |
| $-V_{GH}$ Max. peak negative gate voltage           | 15                   | V              |                                                                                                                                                                                       |
| T Mounting torque                                   | $15.5(137) \pm 10\%$ | N•m            | Non-lubricated threads                                                                                                                                                                |
|                                                     | $14(120) \pm 10\%$   | [lbf-in]       | Lubricated threads                                                                                                                                                                    |

[1] To complete the part number, refer to the Ordering Information table.

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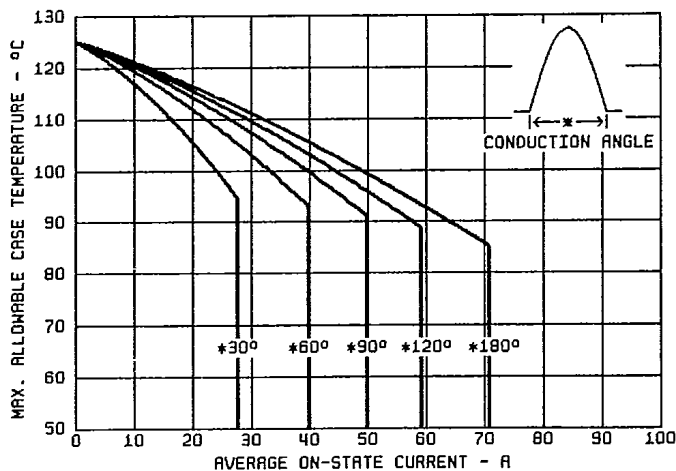
## 1200-1000 VOLTS RANGE

### CHARACTERISTICS

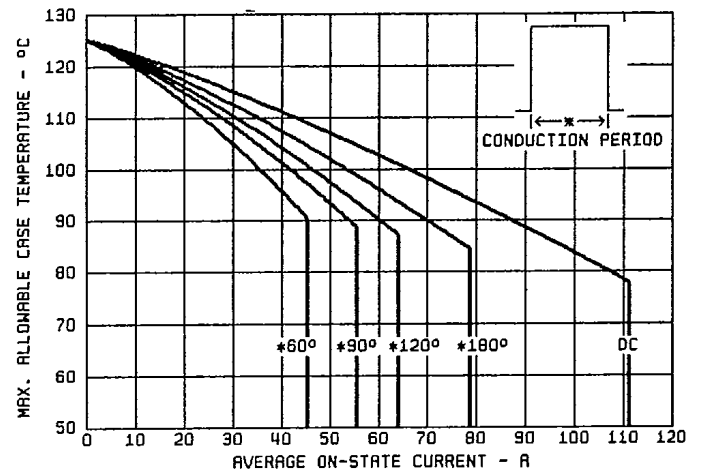
| PARAMETER             |                                            | MIN.             | TYP.     | MAX.  | UNITS                       | TEST CONDITIONS                                                                                                                                                                                              |
|-----------------------|--------------------------------------------|------------------|----------|-------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $V_{TH}$              | Peak on-state voltage                      | —                | 1.85     | 2.06  | V                           | Initial $T_J = 25^{\circ}\text{C}$ , 50-60Hz half sine, $I_{peak} = 220\text{A}$ .                                                                                                                           |
| $V_{T(TO)1}$          | Low-level threshold                        | —                | —        | 1.28  | V                           | $T_J = 125^{\circ}\text{C}$<br>$\text{Av. power} = V_{T(TO)} \cdot I_{T(AV)} + r_T \cdot [I_{T(RMS)}]^2$<br><br>Use low level values for<br>$I_{TH} \leq \pi$ rated $I_{T(AV)}$                              |
| $V_{T(TO)2}$          | High-level threshold                       | —                | —        | 1.61  |                             |                                                                                                                                                                                                              |
| $r_{T1}$              | Low-level resistance                       | —                | —        | 3.54  | m $\Omega$                  |                                                                                                                                                                                                              |
| $r_{T2}$              | High-level resistance                      | —                | —        | 2.27  |                             |                                                                                                                                                                                                              |
| $I_L$                 | Latching current                           | —                | 270      | —     | mA                          | $T_C = 25^{\circ}\text{C}$ , 12V anode. Gate pulses: 10V, 20 $\Omega$ , 100 $\mu\text{s}$ .                                                                                                                  |
| $I_H$                 | Holding current                            | —                | 90       | 500   | mA                          | $T_C = 25^{\circ}\text{C}$ , 12V anode. Initial $I_T = 3\text{A}$ .                                                                                                                                          |
| $t_d$                 | Delay time                                 | —                | 0.5      | 1.5   | $\mu\text{s}$               | $T_C = 25^{\circ}\text{C}$ , $V_D = \text{rated } V_{DRM}$ , 50A resistive load.<br>Gate pulse: 10V, 20 $\Omega$ , 10 $\mu\text{s}$ , 1 $\mu\text{s}$ rise time.                                             |
| $t_q$                 | Turn-off time                              |                  |          |       | $\mu\text{s}$               | $T_J = 125^{\circ}\text{C}$ . $I_{TH} = 200\text{A}$ , $di_P/dt = 10\text{A}/\mu\text{s}$ , $V_R = 50\text{V}$ ,<br>$dv/dt = 200\text{V}/\mu\text{s}$ lin. to 80% rated $V_{DRM}$ . Gate: 0V, 100 $\Omega$ . |
|                       | "A" suffix                                 | —                | —        | 16    |                             |                                                                                                                                                                                                              |
|                       | "B" suffix                                 | —                | —        | 20    |                             |                                                                                                                                                                                                              |
| $t_{q(\text{diode})}$ | Turn-off time with feedback diode          |                  |          |       | $\mu\text{s}$               | $T_J = 125^{\circ}\text{C}$ . $I_{TH} = 200\text{A}$ , $di_P/dt = 10\text{A}/\mu\text{s}$ , $V_R = 1\text{V}$ ,<br>$dv/dt = 600\text{V}/\mu\text{s}$ lin. to 40% rated $V_{DRM}$ . Gate: 0V, 100 $\Omega$ .  |
|                       | "A" suffix                                 | —                | —        | 20    |                             |                                                                                                                                                                                                              |
|                       | "B" suffix                                 | —                | —        | 25    |                             |                                                                                                                                                                                                              |
| $I_{RM(REC)}$         | Recovery current                           | —                | 57       | —     | A                           | $T_J = 125^{\circ}\text{C}$ , $I_{TH} = 400\text{A}$ , $di_P/dt = 50\text{A}/\mu\text{s}$ .                                                                                                                  |
| $Q_{RR}$              | Recovered charge                           | —                | 58       | —     | $\mu\text{C}$               |                                                                                                                                                                                                              |
| $dv/dt$               | Critical rate-of-rise of off-state voltage | 500              | 700      | —     | V/ $\mu\text{s}$            | $T_J = 125^{\circ}\text{C}$ . Exp. to 100% or lin. Higher $dv/dt$ values to 80% $V_{DRM}$ , gate open. available.                                                                                            |
|                       |                                            | 1000             | —        | —     |                             | $T_J = 125^{\circ}\text{C}$ . Exp. to 67% $V_{DRM}$ , gate open.                                                                                                                                             |
| $I_{RM}$ , $I_{DM}$   | Peak reverse and off-state current         | —                | 10       | 20    | mA                          | $T_J = 125^{\circ}\text{C}$ . Rated $V_{RRM}$ and $V_{DRM}$ , gate open.                                                                                                                                     |
| $I_{GT}$              | DC gate current to trigger                 | —                | —        | 300   | mA                          | $T_C = -40^{\circ}\text{C}$ +12V anode-to-cathode. For recommended gate drive see "Gate Characteristics" figure.                                                                                             |
|                       |                                            | 25               | 50       | 150   |                             | $T_C = 25^{\circ}\text{C}$                                                                                                                                                                                   |
| $V_{GT}$              | DC gate voltage to trigger                 | —                | —        | 3.3   | V                           | $T_C = -40^{\circ}\text{C}$                                                                                                                                                                                  |
|                       |                                            | —                | 1.2      | 2.5   |                             | $T_C = 25^{\circ}\text{C}$                                                                                                                                                                                   |
| $V_{GD}$              | DC gate voltage not to trigger             | —                | —        | 0.3   | V                           | $T_C = 125^{\circ}\text{C}$ . Max. value which will not trigger with rated $V_{DRM}$ anode-to-cathode.                                                                                                       |
| $R_{thJC}$            | Thermal resistance, junction-to-case       | —                | —        | 0.250 | $^{\circ}\text{C}/\text{W}$ | DC operation                                                                                                                                                                                                 |
|                       |                                            | —                | —        | 0.291 | $^{\circ}\text{C}/\text{W}$ | 180 $^{\circ}$ sine wave                                                                                                                                                                                     |
|                       |                                            | —                | —        | 0.302 | $^{\circ}\text{C}/\text{W}$ | 120 $^{\circ}$ rectangular wave                                                                                                                                                                              |
| $R_{thCS}$            | Thermal resistance, case-to-sink           | —                | —        | 0.100 | $^{\circ}\text{C}/\text{W}$ | Mtg. surface smooth, flat and greased.                                                                                                                                                                       |
| $wt$                  | Weight                                     | —                | 100(3.5) | —     | g(oz.)                      |                                                                                                                                                                                                              |
| Case Style            |                                            | TO-209AC (TO-94) |          |       | JEDEC                       |                                                                                                                                                                                                              |

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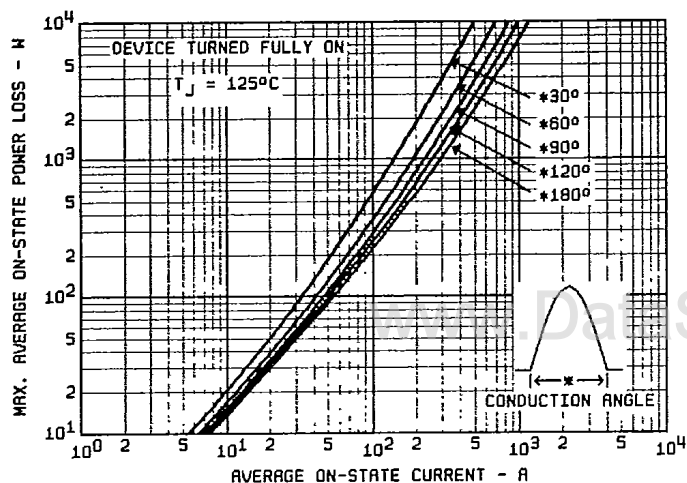
## 1200-1000 VOLTS RANGE



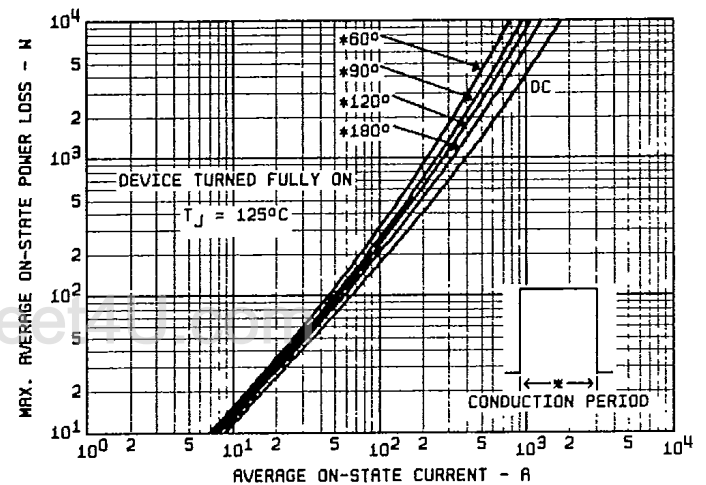
**Fig. 1 — Case Temperature Ratings**  
— Sinusoidal Waveforms, 50 to 400 Hz



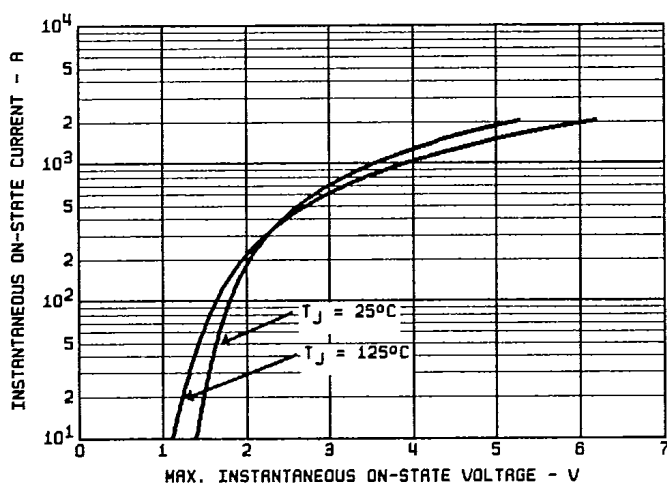
**Fig. 2 — Case Temperature Ratings**  
— Rectangular Waveforms, 50 to 400 Hz



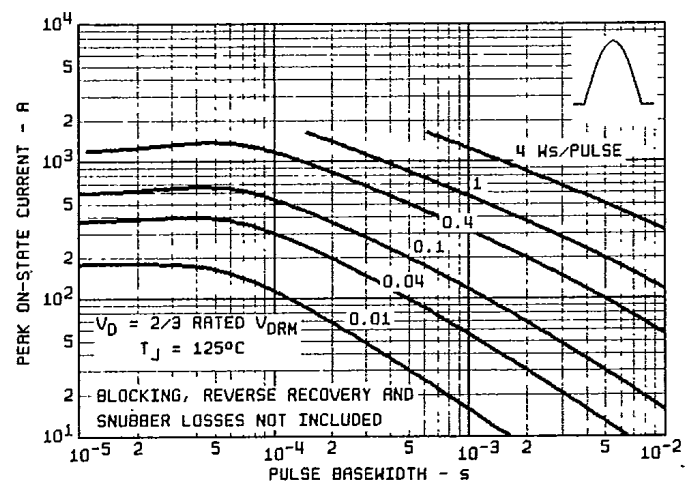
**Fig. 3 — Power Loss Characteristics**  
— Sinusoidal Waveforms



**Fig. 4 — Power Loss Characteristics**  
— Rectangular Waveforms



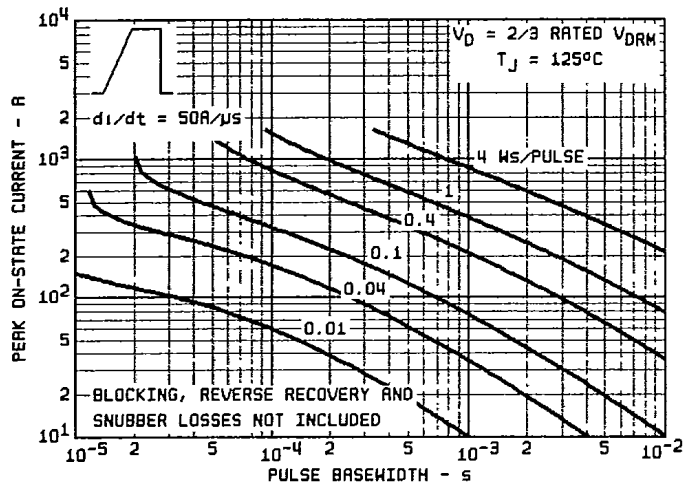
**Fig. 5 — On-State Characteristics**



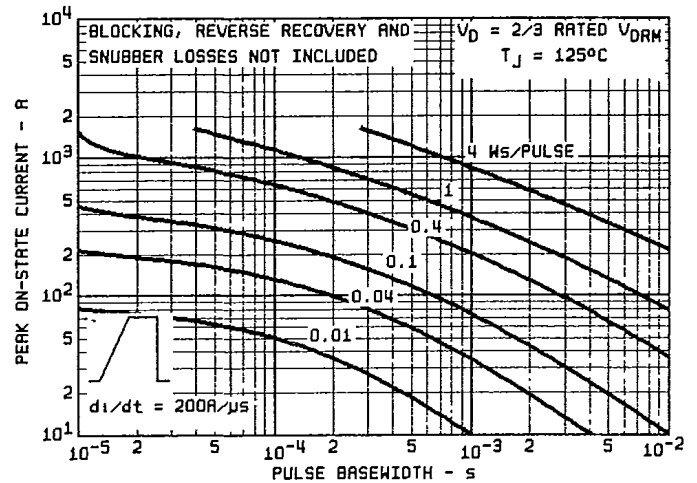
**Fig. 6 — Max. Energy Loss per Pulse**  
— Sinusoidal Waveforms

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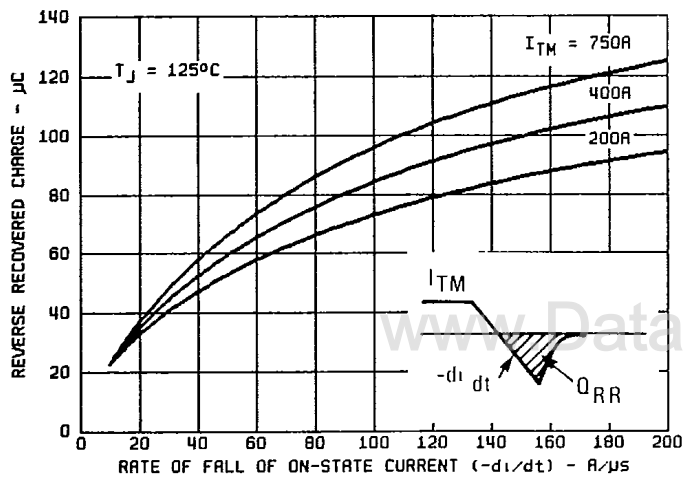
## 1200-1000 VOLTS RANGE



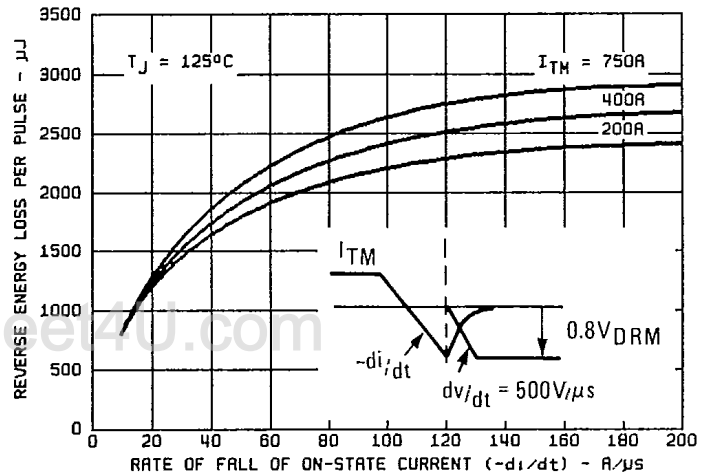
**Fig. 7 — Max. Energy Loss per Pulse**  
— Trapezoidal Waveforms,  $di/dt = 50 \text{ A}/\mu\text{s}$



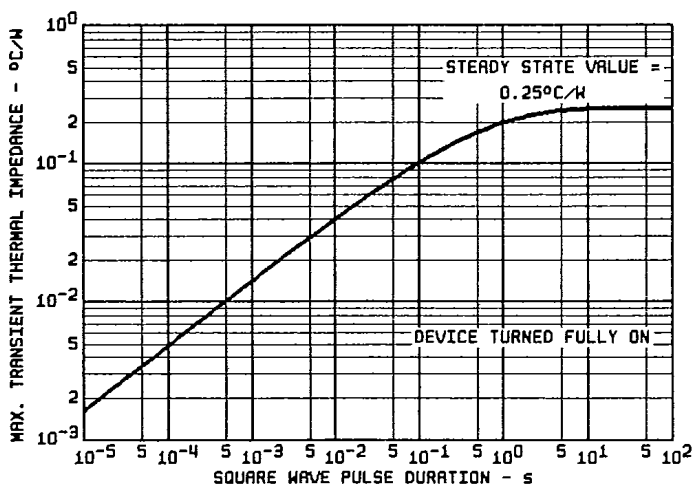
**Fig. 8 — Max. Energy Loss per Pulse**  
— Trapezoidal Waveforms,  $di/dt = 200 \text{ A}/\mu\text{s}$



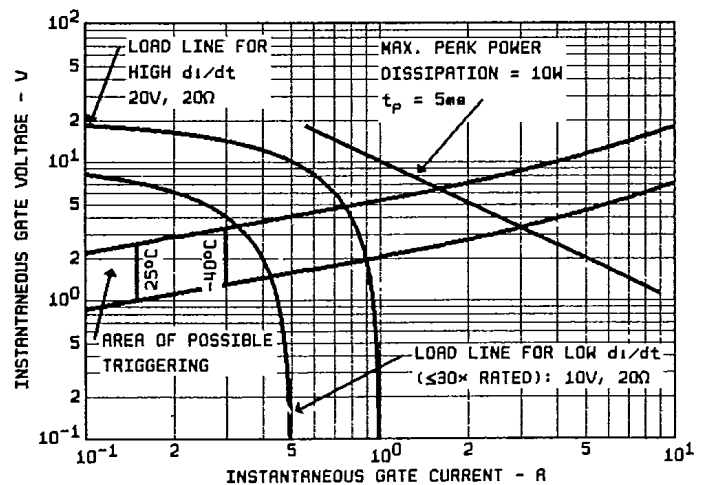
**Fig. 9 — Typical Recovered Charge**



**Fig. 10 — Typical Reverse Energy Losses**



**Fig. 11 — Transient Thermal Impedance, Junction-to-Case**



**Fig. 12 — Gate Characteristics**

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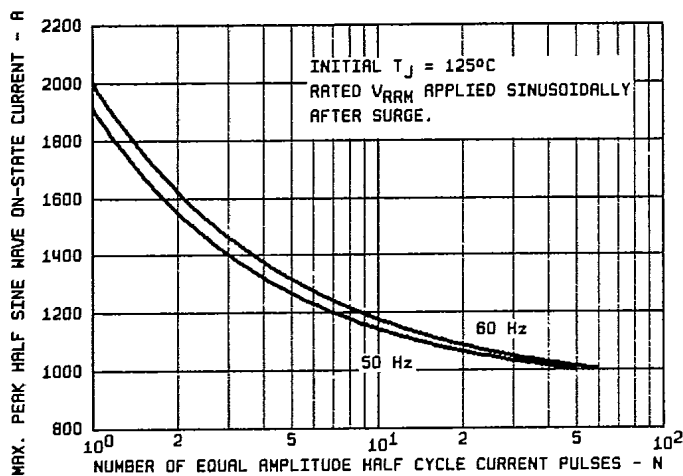


Fig. 13 — Non-Repetitive Surge Current Ratings

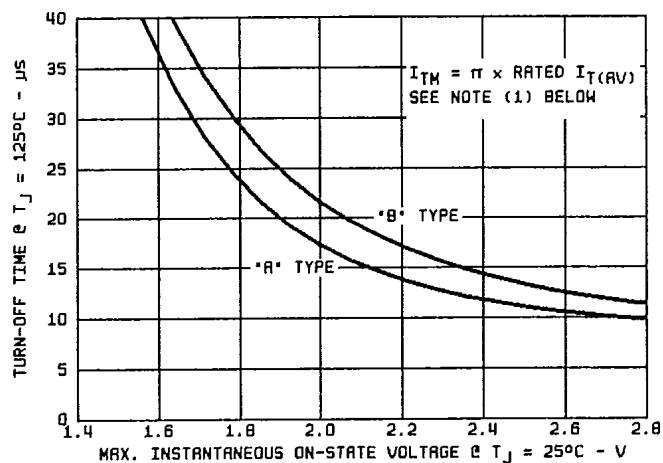


Fig. 14 — Trend for Turn-Off Time vs. On-State Voltage

(1) These curves are intended as a guideline. To specify non-standard  $t_q/V_{TM}$  contact factory.

## ORDERING INFORMATION

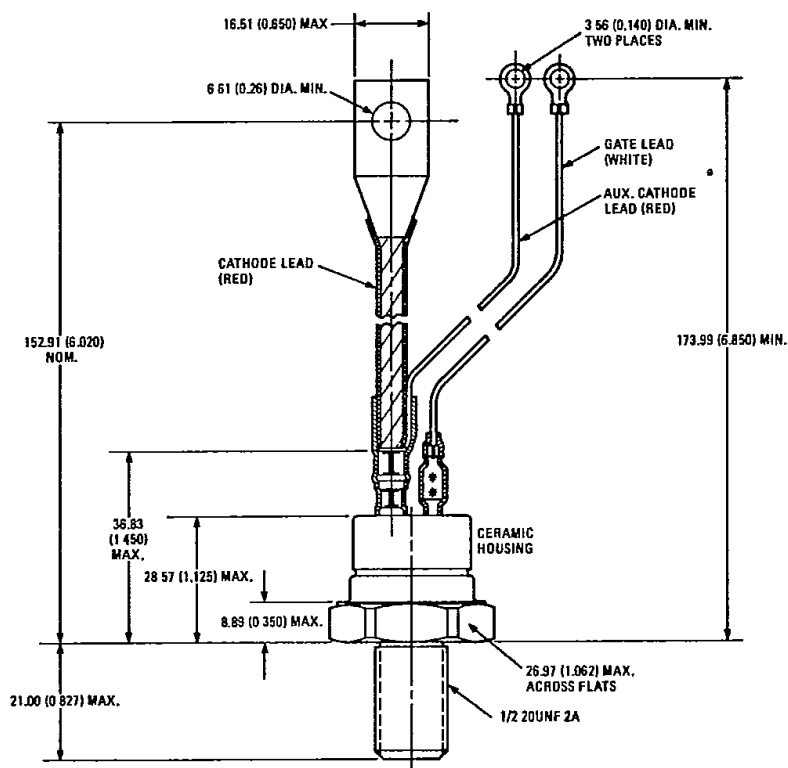
| TYPE | PACKAGE (1) |                             | FAST | TEMPERATURE |            | VOLTAGE |           | TURN-OFF |                  | LEADS & TERMINALS |                                                                 |
|------|-------------|-----------------------------|------|-------------|------------|---------|-----------|----------|------------------|-------------------|-----------------------------------------------------------------|
|      | CODE        | DESCRIPTION                 |      | CODE        | MAX. $T_J$ | CODE    | $V_{DRM}$ | CODE     | MAX. $t_q$       | CODE              | DESCRIPTION                                                     |
| S18  | C           | 1/2" stud, ceramic housing. | F    | —           | 125°C      | 12      | 1200V     | A        | 16 $\mu\text{s}$ | 0                 | Flexible leads, eyelet terminals. Standard in USA. (Fig. 1)     |
|      |             |                             |      |             |            | 10      | 1000V     | B        | 20 $\mu\text{s}$ | 1                 | Flexible leads, fast-on terminals. Standard in Europe. (Fig. 2) |

(1) Other packages are also available:  
 - Supplied with flag terminals.  
 For further details contact factory.

For a device with standard USA case, max  $T_J = 125^\circ\text{C}$ ,  $V_{DRM} = 1200\text{V}$ , max.  $t_q = 16\mu\text{s}$ , order as: S18CF12A0.

# S18CF SERIES

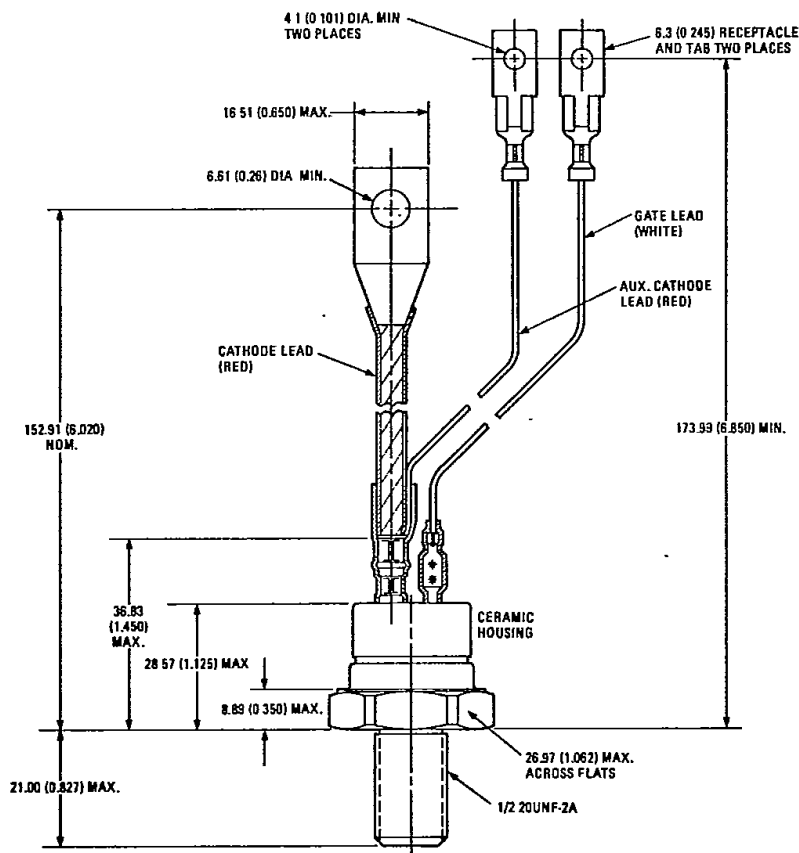
## 1200-1000 VOLTS RANGE



**Fig. 1 — Conforms to JEDEC Outline TO-209AC (TO-94)**

Dimensions in Millimeters and (Inches)

www.DataSheet4U.com



**Fig. 2 — Similar to JEDEC Outline TO-209AC (TO-94) (A-25)**

Dimensions in Millimeters and (Inches)

www.DataSheet4U.com