

# High Speed Fast Recovery Rectifier

## A177

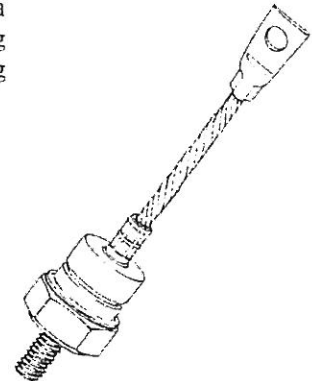
## 1500 Volts      100A Avg.

The A177 series is General Electric's highly reliable, all-diffused, Pic-Pac,<sup>4</sup> 100 ampere, fast recovery, silicon rectifier diode. These diodes are designed for use in high frequency applications or where a fast recovery diode is a necessity. These diodes provide a superior combination of speed, blocking voltage capability and soft recovery, which is required in such demanding applications as:

- Inverter Feedback Diode
- Free Wheeling Diode
- High Frequency Rectification
- Low EMI Power Supplies

**FEATURES:**

- Published Current Ratings Up To 20,000 Hz
- All-Diffused
- Thermal Fatigue Resistant Pic-Pac<sup>4</sup> Construction
- Cathode Strain Buffer
- Soft Recovery With Low Recovered Charge
- Rugged Hermetic Package
- Available in 3/8" or 1/2" Stud



### MAXIMUM ALLOWABLE RATINGS AND SPECIFICATIONS

| TYPES* | REPETITIVE PEAK <sup>1</sup><br>REVERSE VOLTAGE<br>$V_{RRM}$<br>$T_J = -40^{\circ}\text{C to } +125^{\circ}\text{C}$ | NON-REPETITIVE <sup>2</sup><br>PEAK REVERSE<br>VOLTAGE, $V_{RSM}$<br>$T_J = 25^{\circ}$ to $+125^{\circ}\text{C}$ | DC REVERSE <sup>3</sup><br>VOLTAGE, $V_R$<br>$T_J = -40^{\circ}\text{C to } +125^{\circ}\text{C}$ | REPETITIVE<br>PEAK REVERSE<br>CURRENT, $I_{RRM}$<br>$T_J = 125^{\circ}\text{C}$ |
|--------|--|---|---|---|
| A177A  | 100 Volts  | 200 Volts   | 100 Volts   | 20 mA   |
| A177B  | 200  | 300   | 200   | 20  |
| A177C  | 300  | 400   | 300   | 20  |
| A177D  | 400  | 500   | 400   | 20  |
| A177E  | 500  | 600   | 500   | 20  |
| A177M  | 600  | 720   | 600   | 20  |
| A177S  | 700  | 840   | 700   | 20  |
| A177N  | 800  | 950   | 800   | 20  |
| A177T  | 900  | 1075  | 900   | 20  |
| A177P  | 1000   | 1200  | 1000  | 20  |
| A177PA | 1100   | 1300  | 1100  | 20  |
| A177PB | 1200   | 1400  | 1200  | 20  |
| A177PC | 1300   | 1500  | 1300  | 20  |
| A177PD | 1400   | 1600  | 1400  | 20  |
| A177PE | 1500   | 1700  | 1500  | 20  |

\*Models listed are stud cathode (forward polarity) types. Specify A177R- for stud anode (reverse polarity) types. Ratings and specifications are for frequencies from 50 to 20,000 Hz, except where noted otherwise.

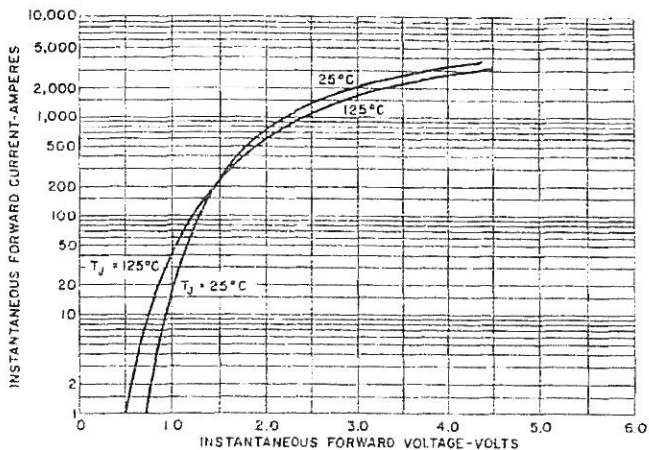
|   |   |
|---|---|
| Peak Forward Current, $I_{FM}$ ( $T_C = +65^{\circ}\text{C}$ , Half Sine Wave Pulse Base Width = 8.3 msec., D.F. = 50%) . . . . . | 280 Amperes   |
| Peak One-Cycle Surge (Non-Repetitive), Current, $I_{FSM}$ . . . . .   | 2500 Amperes  |
| Minimum $I^2t$ Rating (See Curve 11), $t \geq 1$ msec. (Non-Repetitive) . . . . .   | 13,500 (RMS Ampere) <sup>2</sup> Seconds                              |
| Thermal Resistance, $R_{\theta JC}$ (D.C.) . . . . .  | 0.4 <sup>o</sup> C/Watt   |
| Storage Temperature, $T_{stg}$ . . . . .  | -40 <sup>o</sup> C to +150 <sup>o</sup> C                             |
| Operating Junction Temperature, $T_J$ . . . . .   | -40 <sup>o</sup> C to +125 <sup>o</sup> C                             |
| Stud Torque . . . . .   | 90 Lb-in (Min.), 100 Lb-in (Max.)<br>10.2 N-m (Min.), 11.3 N-m (Max.) |

**NOTES:**

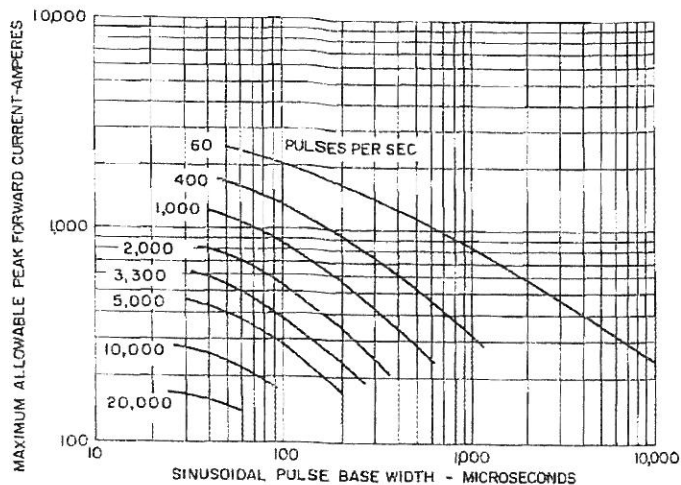
- <sup>1</sup> Assumes a heatsink thermal resistance of less than 2.0<sup>o</sup>C/watt.
- <sup>2</sup> Non-repetitive voltage and current ratings, as contrasted to repetitive ratings, apply for occasional or unpredictable overloads. For example, the forward surge current ratings are non-repetitive ratings that are used in fault coordination work.
- <sup>3</sup> Assumes a heatsink thermal resistance of less than 1.0<sup>o</sup>C/watt.
- <sup>4</sup> "Pic-Pac" is an acronym for Pressure Internal Contact Package.

DEVICE SPECIFICATIONS

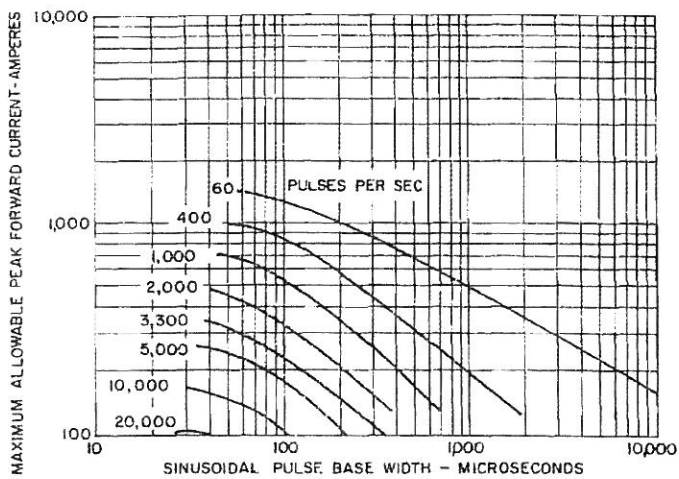
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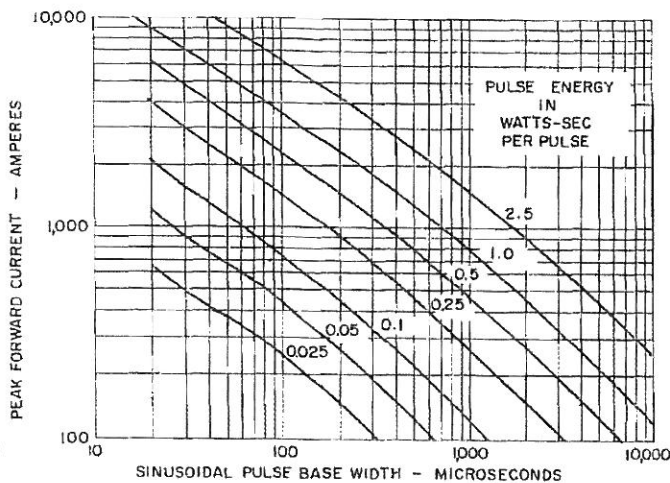
1. MAXIMUM FORWARD CHARACTERISTICS



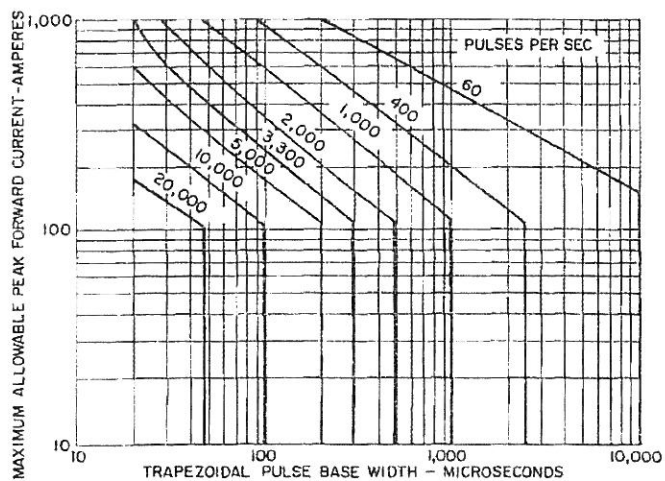
2. MAXIMUM ALLOWABLE PEAK FORWARD CURRENT SINUSOIDAL WAVEFORM ( $T_C = 65^\circ C$ )



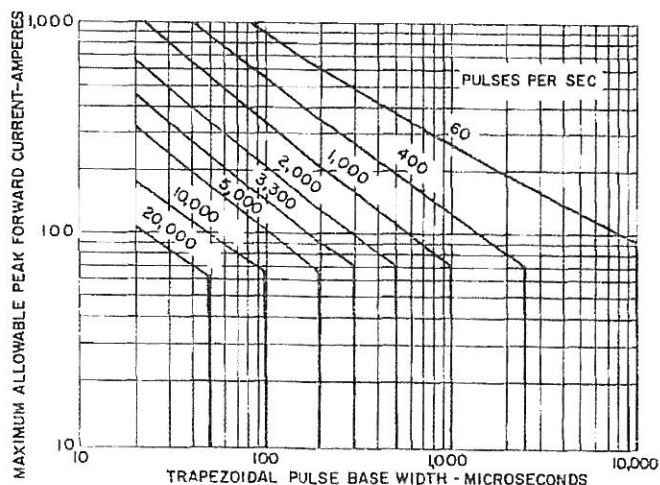
3. MAXIMUM ALLOWABLE PEAK FORWARD CURRENT SINUSOIDAL WAVEFORM ( $T_C = 90^\circ C$ )



4. SINUSOIDAL PULSE ENERGY ( $T_C = 125^\circ C$ )



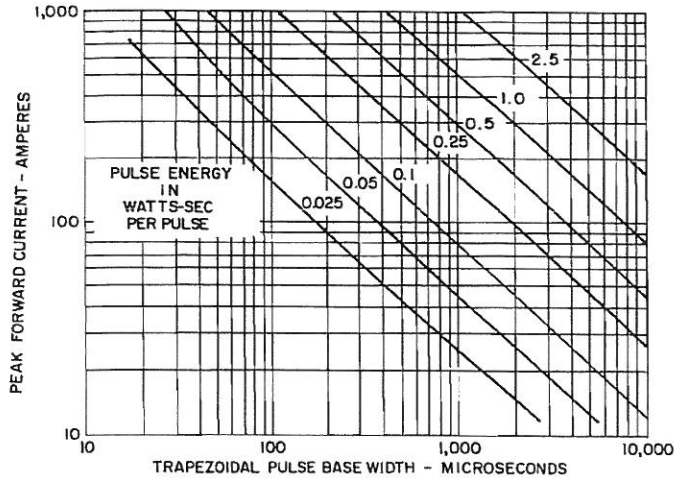
5. MAXIMUM ALLOWABLE PEAK FORWARD CURRENT, TRAPEZOIDAL WAVEFORM ( $T_C = 65^\circ C$ ), DI/DT (RISING & FALLING) = 100 A/ $\mu$ S



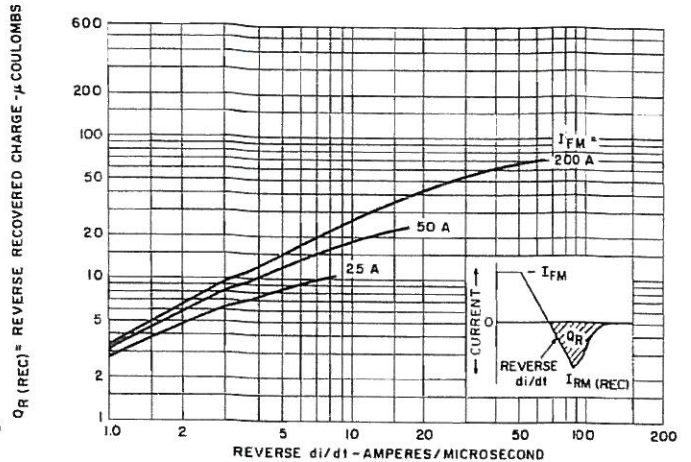
6. MAXIMUM ALLOWABLE PEAK FORWARD CURRENT, TRAPEZOIDAL WAVEFORM ( $T_C = 90^\circ C$ ), DI/DT (RISING & FALLING) = 100 A/ $\mu$ S

# DEVICE SPECIFICATIONS

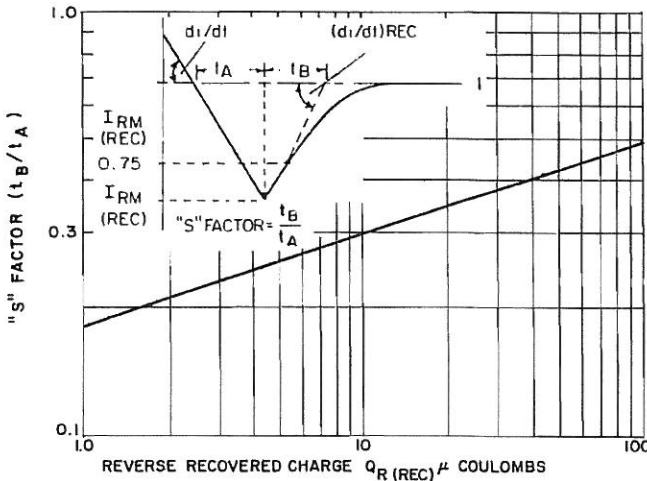
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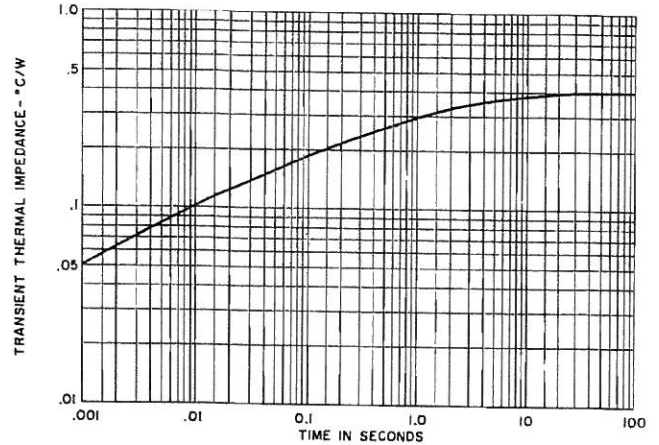
7. TRAPEZOIDAL PULSE ENERGY  
DI/DT (RISING & FALLING) = 100 A/ $\mu$ S



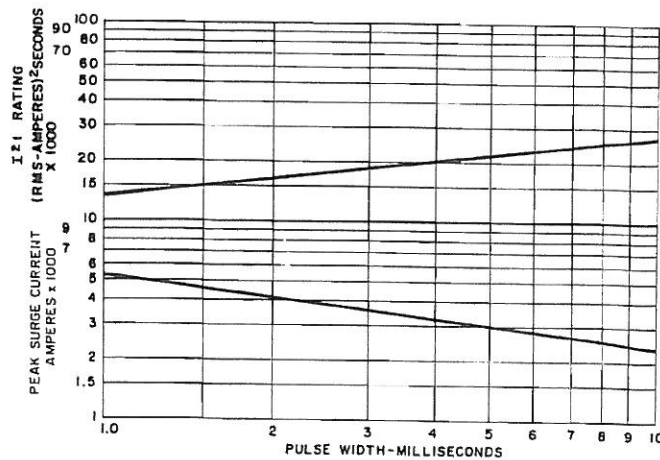
8. RECOVERED CHARGE ( $T_J = 125^\circ\text{C}$ )  
(Maximum Recovered Charge Group 12)  
If maximum recovered charge group 12 is required,  
request A177 X9, e.g. A177BX9, A177RBX9, etc.



9. TYPICAL "S" FACTOR VERSUS REVERSE RECOVERED CHARGE ( $T_J = 125^\circ\text{C}$ )



10. TRANSIENT THERMAL IMPEDANCE - JUNCTION-TO-CASE



11. SUB-CYCLE SURGE FORWARD CURRENT AND  $I^2t$  RATING VERSUS PULSE TIME FOLLOWING RATED LOAD CONDITIONS

OUTLINE DRAWING

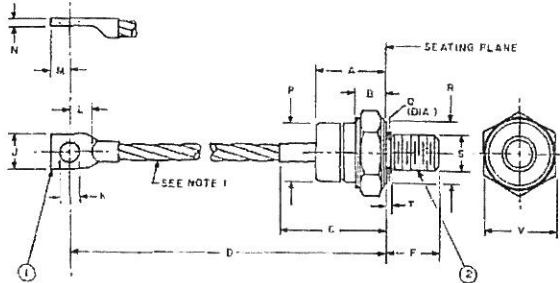


TABLE OF DIMENSIONS  
Conversion Table

| SYM. | DECIMAL INCHES |       | METRIC MM. |        | NOTES |
|------|----------------|-------|------------|--------|-------|
|      | MIN.           | MAX.  | MIN.       | MAX.   |       |
| A    | 1.020          | 1.140 | 25.90      | 28.96  |       |
| B    | .390           | .500  | 9.90       | 12.70  |       |
| C    | 1.570          | 1.750 | 39.67      | 44.45  |       |
| D    | 4.345          | 4.745 | 110.36     | 120.52 |       |
| J    | .500           | .625  | 12.70      | 15.20  |       |
| K    | .259           | .281  | 6.57       | 7.14   |       |
| L    | .320           | —     | 8.12       | —      |       |
| M    | .280           | .320  | 7.11       | 8.13   |       |
| N    | .060           | .090  | 1.52       | 2.29   |       |
| P    | .840           | .910  | 21.33      | 23.11  |       |
| R    | .920           | —     | 23.36      | —      | 3     |
| T    | —              | .060  | —          | 1.52   | 4     |
| V    | 1.052          | 1.063 | 26.72      | 27.00  |       |

NOTES:

1. Flexible Copper Lead, 3/16 Inch Nominal Diameter.
2. One Nut and One Lockwasher Supplied With Each Unit. Material of Hardware is Steel Cad Plated.
3. "R" Dimension is Diameter of Effective Seating Area.
4. "T" Dimension is Area of Unthreaded Portion. Complete Threads are Within 2.5 Threads of Seating Plane.
5. Angular Orientation of Terminals is Undefined.
6. Approximate Weight: 105 Grams.

| MODEL                        | TERMINAL 1 | TERMINAL 2 | S<br>THREAD<br>SIZE | F<br>THREAD<br>LENGTH | Q<br>RELIEF<br>DIAMETER |
|------------------------------|------------|------------|---------------------|-----------------------|-------------------------|
| A177<br>FORWARD<br>POLARITY  | ANODE      | CATHODE    | 3/8 - 24            | .640<br>.610 IN.      | .373<br>.344 IN.        |
| A177B<br>REVERSE<br>POLARITY | CATHODE    | ANODE      | UNF - 2A            | 16.26<br>15.48 MM     | 9.47<br>8.74 MM         |

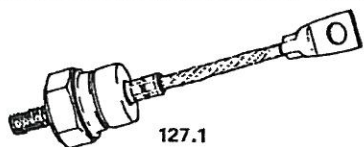
MOUNTING INSTRUCTIONS

Following these installation instructions will result in a rectifier diode-to-heatsink contact thermal resistance of 0.10°C/watt or less.

1. Be sure mounting surface is clean and flat within .001 inch/inch.
2. Mounting hole diameter should not exceed the outside diameter of the rectifier diode stud by more than 1/16 inch, and should be deburred.
3. Use Dow Corning's DC3, 4, 340 or 640 or GE G322L or equivalent, on mounting surfaces that come in contact with the heatsink.
4. Use only hardware furnished with each rectifier diode.
5. Tighten with a torque wrench, from nut side, to 100 lb-in max.

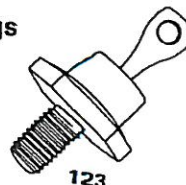


## 5.2 Condensed Electrical and Thermal Characteristics and Ratings



127.1

### RECTIFIERS 20 TO 100 AMPERES



123



128

|            |     |      |           |             |      |
|------------|-----|------|-----------|-------------|------|
| JEDEC TYPE | —   | —    | 1N3289-96 | 1N3289A-96A | —    |
| GE TYPE    | A44 | A139 | —         | A170        | A177 |

#### SPECIFICATIONS

|   |   |  |                |            |            |            |       |
|---|---|--|----------------|------------|------------|------------|-------|
| $I_{FM(AV)}$                                    | Max. average forward (1 phase operation)                                    | 20   | 25             | 100        | 100        | 100        |       |
|   | $T_C = (^{\circ}C)$   | 110  | 75             | 130        | 130        | 65         |       |
| $V_{RM}$ (Rep)                                  | Max. repetitive peak reverse voltage (V)                                    | 50-600   | 50-1000        | 200-1200   | 100-1500   | 100-1500   |       |
| $I_{FM}$ (Surge)                                | Max. peak one cycle, non-recurrent surge current (1 phase operation) 50 Hz. | 270  | 360            | 1440       | 2250       | 2250       |       |
|   | @ max. rated load conditions (A) 60 Hz.                                     | 300  | 400            | 1600       | 2500       | 2500       |       |
| $I^2t$  | Max. non-repetitive for 1.5 msec ( $A^2sec$ )                               | 100  | 500            | 4000       | 5500       | 15000      |       |
| $T_J$   | Operation junction temperature range ( $^{\circ}C$ )                        | -65 to 175   | -40 to 125     | -40 to 200 | -40 to 200 | -40 to 125 |       |
| $R_{\theta JC}$                                 | Max. thermal resistance, junction-to-case ( $^{\circ}C/W$ )                 | 1.5<br>TYPICAL   | 1.0            | .4         | .4         | .4         |       |
|   | $V_{FM}$  | Max. peak forward voltage drop @ rated $I_{F(AV)}$ (1 phase operation) @ $T_C = (^{\circ}C)$ | 1.0<br>TYPICAL | 1.0        | 1.4        | 1.3        | 1.3   |
| $Q_{R(REC)}$                                    | Reverse recovered charge @ rated $T_J$ ( $\mu c$ )                          | —  | —              | —          | —          | 50         |       |
| $t_{rr}$  | Reverse recovery time @ rated $T_J$ ( $\mu s$ )                             | —  | 0.5            | —          | —          | 2.3        |       |
| $V_F$   | Max. forward <sup>(1)</sup> voltage drop for the current range:             | $I_{MIN}(A)$   | .2             | .8         | 2          | 1          | 3     |
|   |   | $I_{MAX}(A)$   | 200            | 800        | 2000       | 1000       | 3000  |
|   |   | A  | .38            | .6702      | .4283      | .4290      | .4405 |
|   |   | B  | .0352          | -.0094     | -.0099     | .1008      | .1163 |
|   |   | C  | .0082          | -.0008     | .0002      | .0011      | .0007 |
| $R_{\theta JC}$                                 | Transient thermal <sup>(2)</sup> resistance for time:                       | $T_{MIN}(S)$   | —              | —          | .001       | .001       | .001  |
|   |   | $T_{MAX}(S)$   | —              | —          | .01        | .01        | .01   |
|   |   | F  | —              | —          | .4         | .4         | .4    |
|   |   | G  | —              | —          | .3         | .3         | .3    |
|   |   | Package Outline No.  |                | 126        | 123        | 127.1      | 127.1 |
| Maximum Stud Torque (In-Lbs/N-M)                |   | —  | 30/3.39        | 100/11.3   | 100/11.3   | 100/11.3   |       |
| Expanded Electrical Characterization, see page: |   | N.A.   | N.A.           | N.A.       | N.A.       | N.A.       |       |

<sup>(1)</sup>Voltage Drop Model:  $V_F = A + B \cdot L_N(I) + CI + D\sqrt{I}$

<sup>(2)</sup>Transient Thermal Resistance Model:  $R_{\theta JC} = F \cdot t^G$