

## Features

- 650-Volt Schottky Rectifier
- Zero Reverse Recovery Current
- Zero Forward Recovery Voltage
- High-Frequency Operation
- Temperature-Independent Switching Behavior
- Extremely Fast Switching
- Positive Temperature Coefficient on  $V_F$

## Benefits

- Replace Bipolar with Unipolar Rectifiers
- Essentially No Switching Losses
- Higher Efficiency
- Reduction of Heat Sink Requirements
- Parallel Devices Without Thermal Runaway

## Applications

- Switch Mode Power Supplies
- Power Factor Correction
- Motor Drives

| Part Number | Package  | Marking   |
|-------------|----------|-----------|
| GC3D10065A  | TO-220-2 | GC3D10065 |

$$\begin{aligned} V_{RRM} &= 650 \text{ V} \\ I_F (T_c=135^\circ\text{C}) &= 14.5 \text{ A} \\ Q_c &= 24 \text{ nC} \end{aligned}$$



TO-220-2

Package



## Maximum Ratings ( $T_c = 25^\circ\text{C}$ unless otherwise specified)

| Symbol         | Parameter                                  | Value            | Unit             | Test Conditions                                                                                                                     | Note   |
|----------------|--------------------------------------------|------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------|--------|
| $V_{RRM}$      | Repetitive Peak Reverse Voltage            | 650              | V                |                                                                                                                                     |        |
| $V_{RSM}$      | Surge Peak Reverse Voltage                 | 650              | V                |                                                                                                                                     |        |
| $V_{DC}$       | DC Blocking Voltage                        | 650              | V                |                                                                                                                                     |        |
| $I_F$          | Continuous Forward Current                 | 30<br>14.5<br>10 | A                | $T_c=25^\circ\text{C}$<br>$T_c=135^\circ\text{C}$<br>$T_c=153^\circ\text{C}$                                                        | Fig. 3 |
| $I_{FRM}$      | Repetitive Peak Forward Surge Current      | 46<br>31         | A                | $T_c=25^\circ\text{C}$ , $t_p = 10 \text{ ms}$ , Half Sine Wave<br>$T_c=110^\circ\text{C}$ , $t_p = 10 \text{ ms}$ , Half Sine Wave |        |
| $I_{FSM}$      | Non-Repetitive Peak Forward Surge Current  | 90<br>71         | A                | $T_c=25^\circ\text{C}$ , $t_p = 10 \text{ ms}$ , Half Sine Wave<br>$T_c=110^\circ\text{C}$ , $t_p = 10 \text{ ms}$ , Half Sine Wave | Fig. 8 |
| $I_{FMax}$     | Non-Repetitive Peak Forward Surge Current  | 860<br>680       | A                | $T_c=25^\circ\text{C}$ , $t_p = 10 \mu\text{s}$ , Pulse<br>$T_c=110^\circ\text{C}$ , $t_p = 10 \mu\text{s}$ , Pulse                 | Fig. 8 |
| $P_{tot}$      | Power Dissipation                          | 136.5<br>59      | W                | $T_c=25^\circ\text{C}$<br>$T_c=110^\circ\text{C}$                                                                                   | Fig. 4 |
| $T_J, T_{stg}$ | Operating Junction and Storage Temperature | -55 to<br>+175   | $^\circ\text{C}$ |                                                                                                                                     |        |
|                | TO-220 Mounting Torque                     | 1<br>8.8         | Nm<br>lbf-in     | M3 Screw<br>6-32 Screw                                                                                                              |        |

## Electrical Characteristics

| Symbol | Parameter                 | Typ.              | Max.       | Unit          | Test Conditions                                                                                                                                                                                                    | Note   |
|--------|---------------------------|-------------------|------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| $V_F$  | Forward Voltage           | 1.5<br>2.0        | 1.8<br>2.4 | V             | $I_F = 10\text{ A}$ $T_J = 25^\circ\text{C}$<br>$I_F = 10\text{ A}$ $T_J = 175^\circ\text{C}$                                                                                                                      | Fig. 1 |
| $I_R$  | Reverse Current           | 12<br>24          | 60<br>220  | $\mu\text{A}$ | $V_R = 650\text{ V}$ $T_J = 25^\circ\text{C}$<br>$V_R = 650\text{ V}$ $T_J = 175^\circ\text{C}$                                                                                                                    | Fig. 2 |
| $Q_C$  | Total Capacitive Charge   | 24                |            | nC            | $V_R = 400\text{ V}$ , $I_F = 10\text{ A}$<br>$di/dt = 500\text{ A}/\mu\text{s}$<br>$T_J = 25^\circ\text{C}$                                                                                                       | Fig. 5 |
| C      | Total Capacitance         | 460.5<br>44<br>40 |            | pF            | $V_R = 0\text{ V}$ , $T_J = 25^\circ\text{C}$ , $f = 1\text{ MHz}$<br>$V_R = 200\text{ V}$ , $T_J = 25^\circ\text{C}$ , $f = 1\text{ MHz}$<br>$V_R = 400\text{ V}$ , $T_J = 25^\circ\text{C}$ , $f = 1\text{ MHz}$ | Fig. 6 |
| $E_C$  | Capacitance Stored Energy | 3.6               |            | $\mu\text{J}$ | $V_R = 400\text{ V}$                                                                                                                                                                                               | Fig. 7 |

Note: This is a majority carrier diode, so there is no reverse recovery charge.

## Thermal Characteristics

| Symbol          | Parameter                                | Typ. | Unit                      | Note   |
|-----------------|------------------------------------------|------|---------------------------|--------|
| $R_{\theta JC}$ | Thermal Resistance from Junction to Case | 1.1  | $^\circ\text{C}/\text{W}$ | Fig. 9 |

## Typical Performance

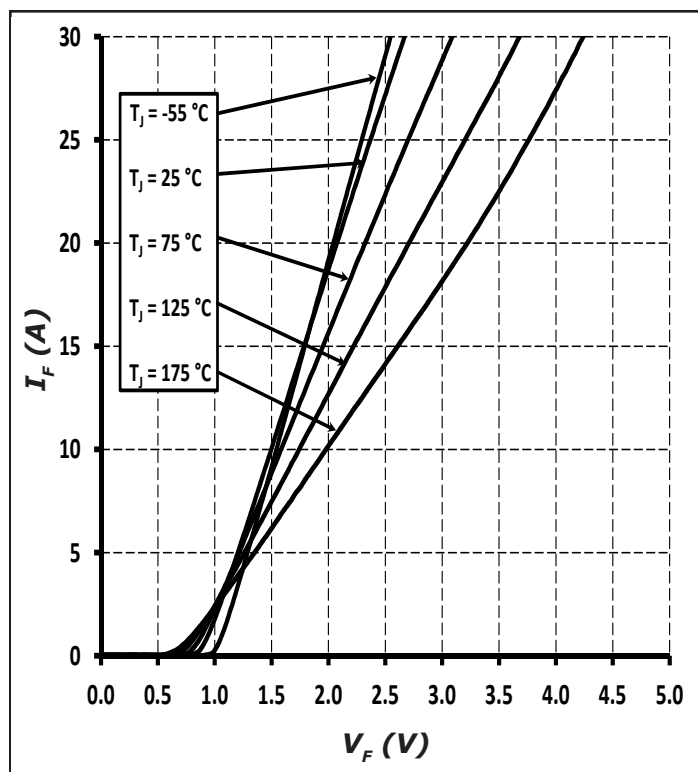


Figure 1. Forward Characteristics

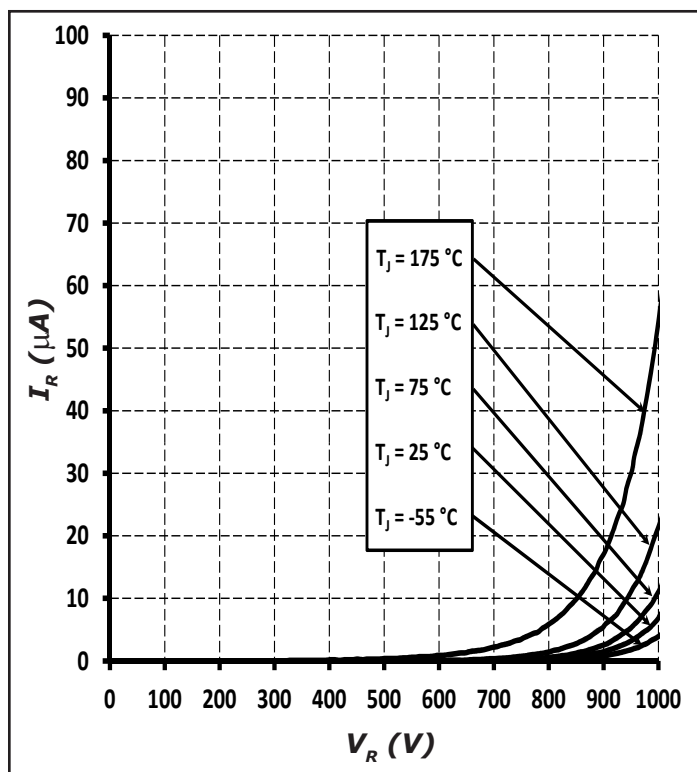


Figure 2. Reverse Characteristics

## Typical Performance

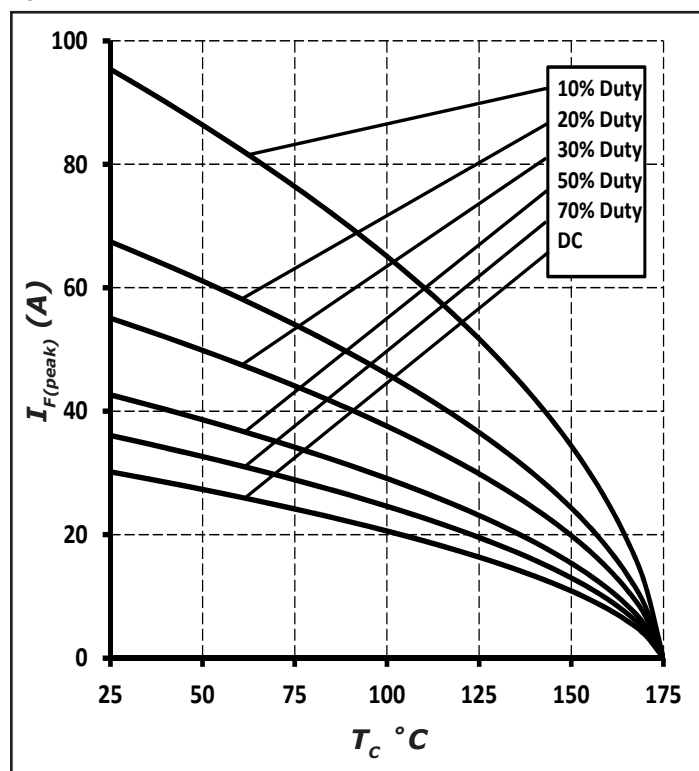


Figure 3. Current Derating

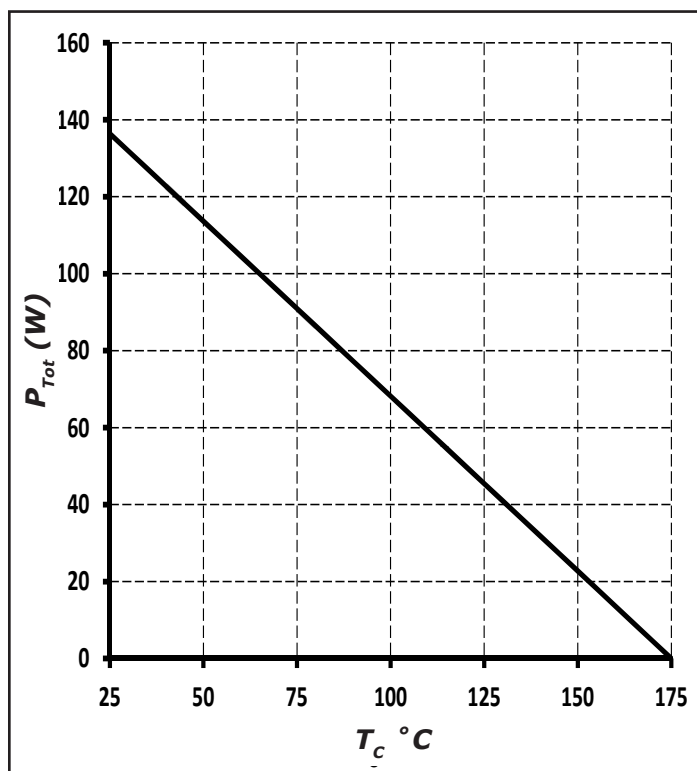


Figure 4. Power Derating

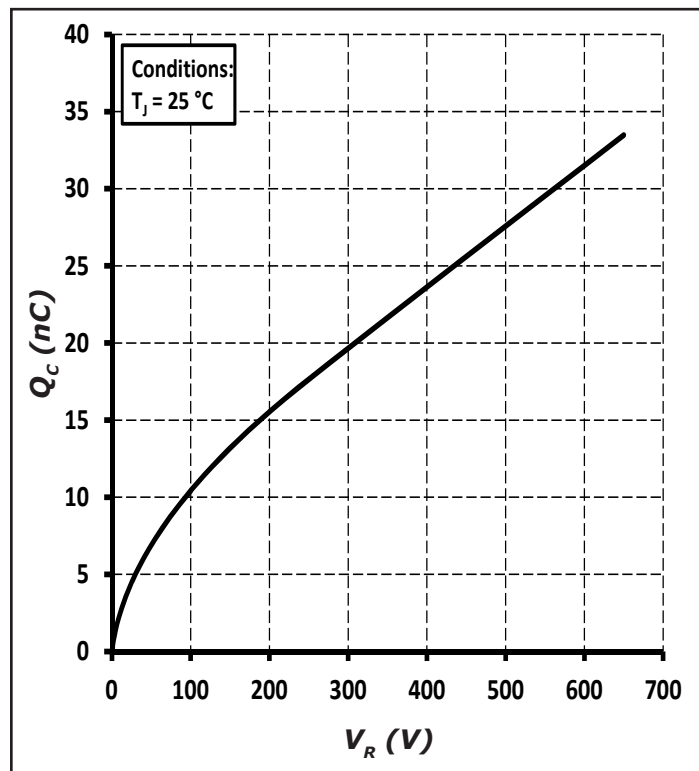


Figure 5. Total Capacitance Charge vs. Reverse Voltage

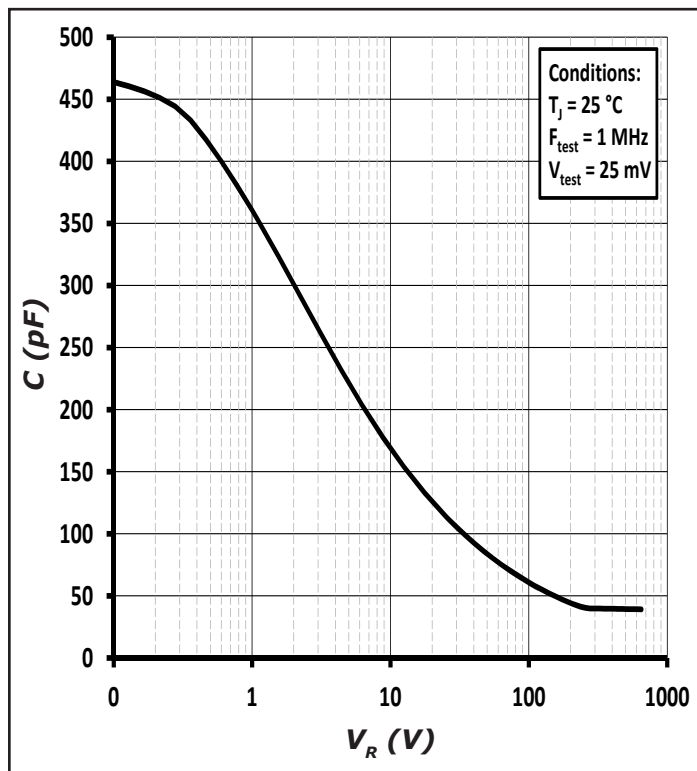


Figure 6. Capacitance vs. Reverse Voltage

## Typical Performance

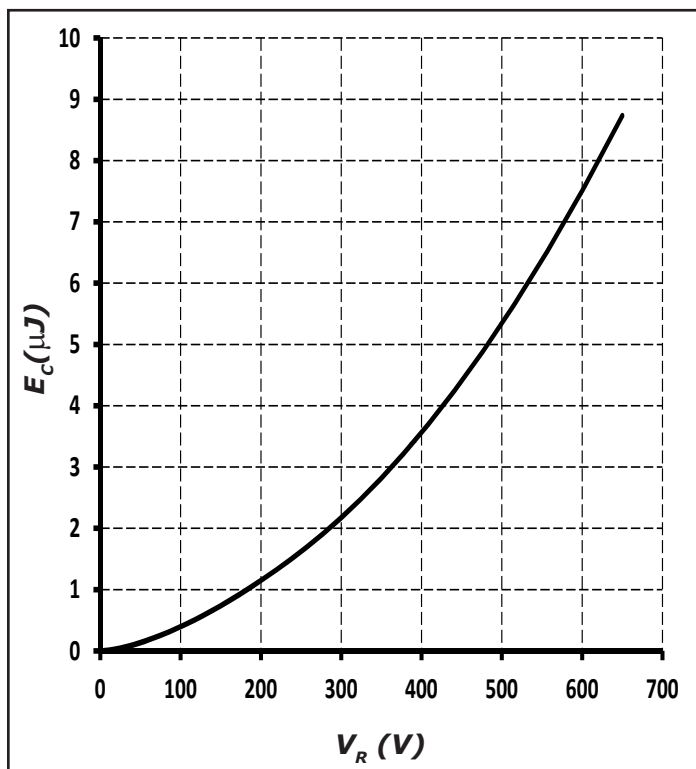


Figure 7. Capacitance Stored Energy

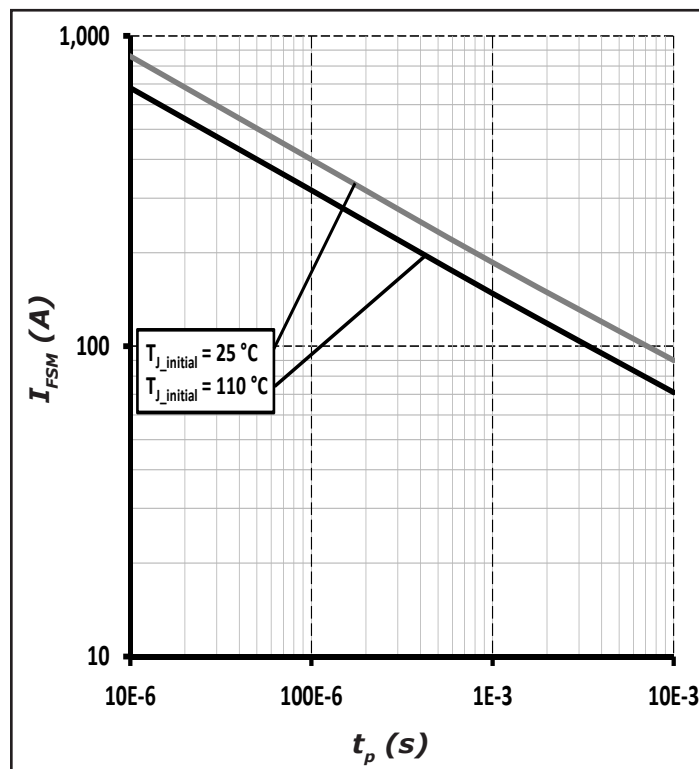


Figure 8. Non-repetitive peak forward surge current versus pulse duration (sinusoidal waveform)

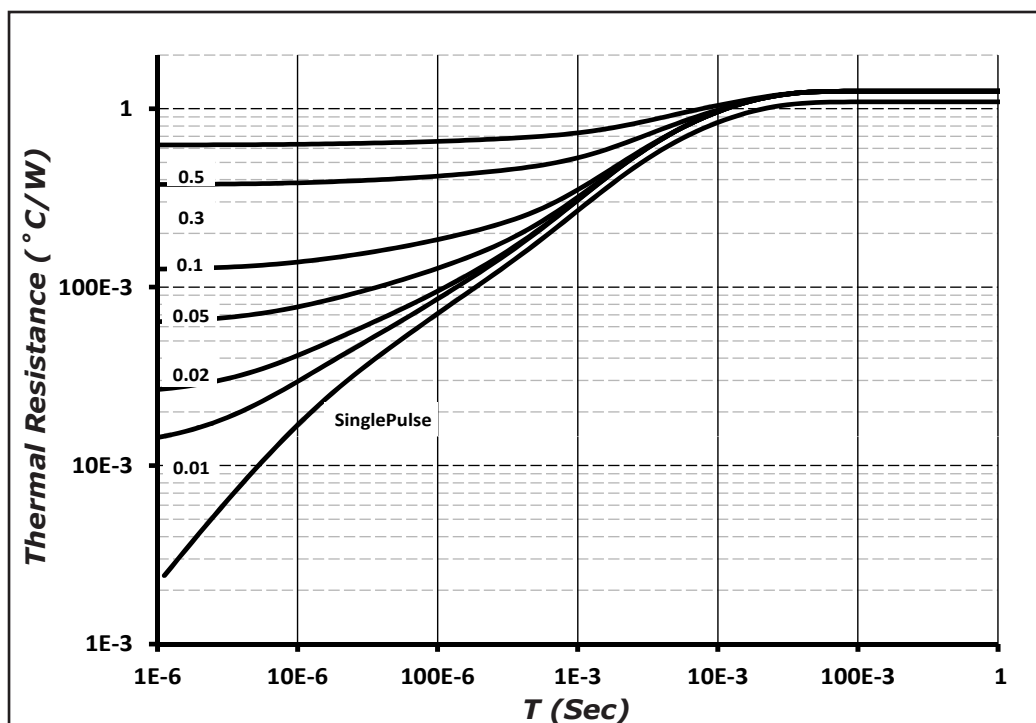
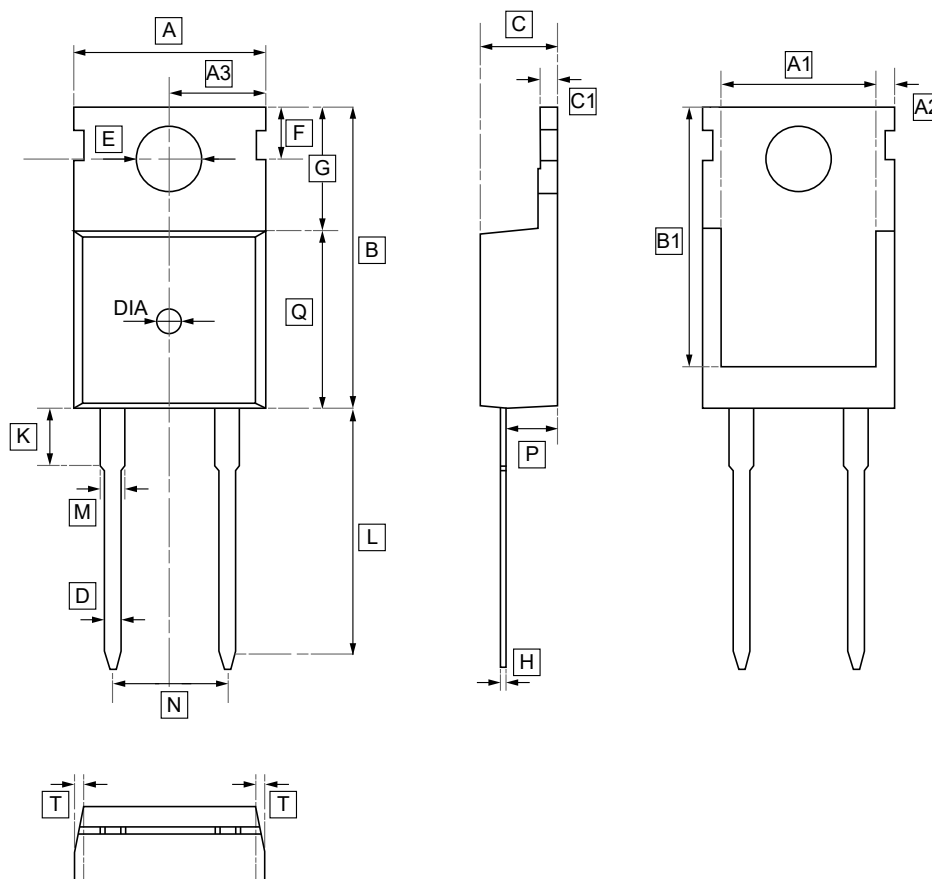


Figure 9. Transient Thermal Impedance

## Package Dimensions

Package TO-220-2

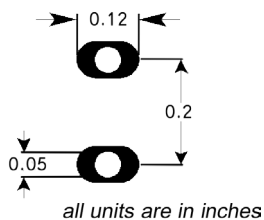


## DIMENSIONS (mm are the original dimensions)

| Symbol | A    | A1   | A2   | A3  | B    | B1   | C    | C1  | D   | E   | F    | G   |
|--------|------|------|------|-----|------|------|------|-----|-----|-----|------|-----|
| Min    | 9.7  | 8.44 | 1.05 | 4.8 | 15.4 | 12.9 | 4.28 | 1.1 | 0.6 | 3.4 | 2.65 | 5.2 |
| Max    | 10.3 | 8.84 | 1.25 | 5.2 | 16.2 | 13.5 | 4.68 | 1.5 | 1.0 | 3.8 | 3.25 | 5.8 |

| Symbol | H   | K   | L    | L1  | M    | N    | P   | Q   | T      | DIA        |
|--------|-----|-----|------|-----|------|------|-----|-----|--------|------------|
| Min    | 0.4 | 2.9 | 12.8 | 2.7 | 1.15 | 4.98 | 2.1 | 8.7 | W:0.35 | 1.5        |
| Max    | 0.6 | 3.3 | 13.6 | 3.3 | 1.35 | 5.18 | 2.7 | 9.3 |        | (deep 0.2) |

## Diode Model

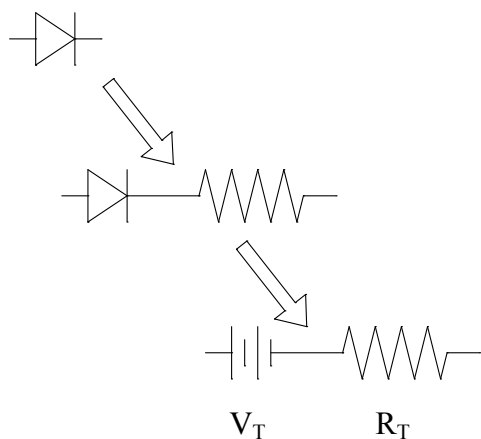


TO-220-2

| Part Number | Package  |
|-------------|----------|
| GC3D10065A  | TO-220-2 |



## Diode Model



$$V_{f_T} = V_T + I_f * R_T$$

$$V_T = 0.94 + (T_J * -1.3 * 10^{-3})$$

$$R_T = 0.044 + (T_J * 4.4 * 10^{-4})$$

Note:  $T_J$  = Diode Junction Temperature In Degrees Celsius,  
valid from 25°C to 175°C