

### 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  $V_F$

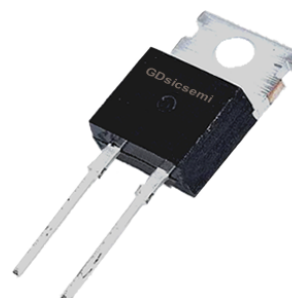
### Benefits

- 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 (SMPS)
- Boost diodes in PFC or DC/DC stages
- Free Wheeling Diodes in Inverter stages
- AC/DC converters

| Part Number | Package  | Marking  |
|-------------|----------|----------|
| C3D12065A   | TO-220-2 | C3D12065 |



TO-220-2

|                               |   |       |
|-------------------------------|---|-------|
| $V_{RRM}$                     | = | 650 V |
| $I_F (T_c=135^\circ\text{C})$ | = | 16 A  |
| $Q_c$                         | = | 34 nC |

### Package



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

| Symbol         | Parameter                                  | Value          |                      | 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                 | 35<br>16<br>12 | A                    | $T_c=25^\circ\text{C}$<br>$T_c=135^\circ\text{C}$<br>$T_c=150^\circ\text{C}$                                        | Fig. 3 |
| $I_{FRM}$      | Repetitive Peak Forward Surge Current      | 51.5<br>33.5   | A                    | $T_c=25^\circ\text{C}$ , $t_p=10$ ms, Half Sine Pulse<br>$T_c=110^\circ\text{C}$ , $t_p=10$ ms, Half Sine Pulse     |        |
| $I_{FSM}$      | Non-Repetitive Peak Forward Surge Current  | 104<br>82      | A                    | $T_c=25^\circ\text{C}$ , $t_p=10$ ms, Half Sine Pulse<br>$T_c=110^\circ\text{C}$ , $t_p=10$ ms, Half Sine Pulse     | Fig. 8 |
| $I_{FMax}$     | Non-Repetitive Peak Forward Current        | 1075<br>900    | 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                          | 143<br>62      | W                    | $T_c=25^\circ\text{C}$<br>$T_c=110^\circ\text{C}$                                                                   | Fig. 4 |
| dV/dt          | Diode dV/dt ruggedness                     | 200            | V/ns                 | $V_R=0-650\text{V}$                                                                                                 |        |
| $\int i^2 dt$  | $i^2 t$ value (Per Leg)                    | 54<br>33.5     | $\text{A}^2\text{s}$ | $T_c=25^\circ\text{C}$ , $t_p=10$ ms<br>$T_c=110^\circ\text{C}$ , $t_p=10$ ms                                       |        |
| $T_J, T_{stg}$ | Operating Junction and Storage Temperature | -55 to +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             | $I_F = 12\text{ A}$ $T_J = 25^\circ\text{C}$<br>$I_F = 12\text{ A}$ $T_J = 175^\circ\text{C}$                                                                                                                      | Fig. 1 |
| $I_R$  | Reverse Current           | 15<br>29            | 74<br>295  | $\mu\text{A}$ | $V_R = 650\text{ V}$ $T_J = 25^\circ\text{C}$<br>$V_R = 650\text{ V}$ $T_J = 175^\circ\text{C}$                                                                                                                    | Fig. 2 |
| $Q_C$  | Total Capacitive Charge   | 34                  |            | nC            | $V_R = 400\text{ V}$ , $I_F = 12\text{ A}$<br>$di/dt = 500\text{ A}/\mu\text{s}$<br>$T_J = 25^\circ\text{C}$                                                                                                       | Fig. 5 |
| C      | Total Capacitance         | 641.5<br>57<br>47.5 |            | 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 | 4.8                 |            | $\mu\text{J}$ | $V_R = 400\text{ V}$                                                                                                                                                                                               | 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 | 1.05 | $^\circ\text{C}/\text{W}$ | Fig. 9 |

## Typical Performance

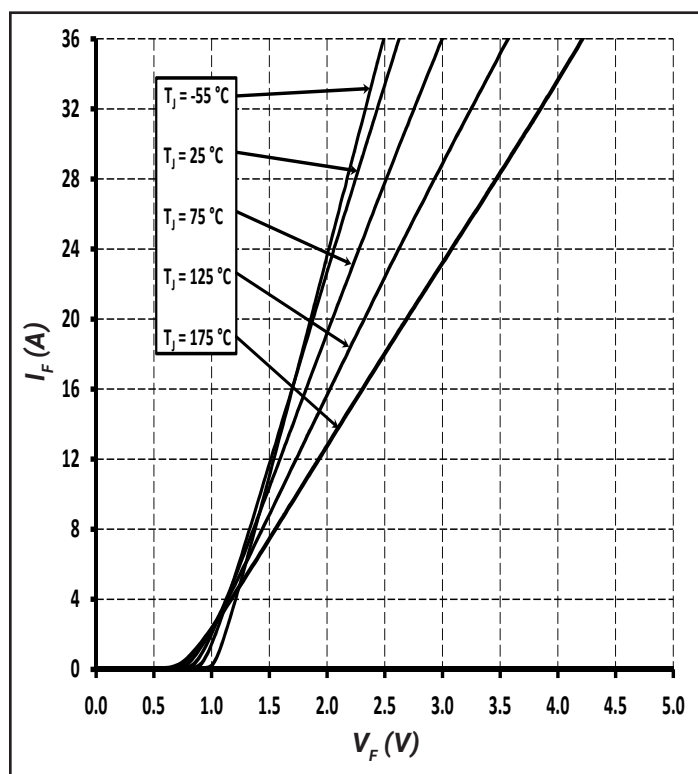


Figure 1. Forward Characteristics

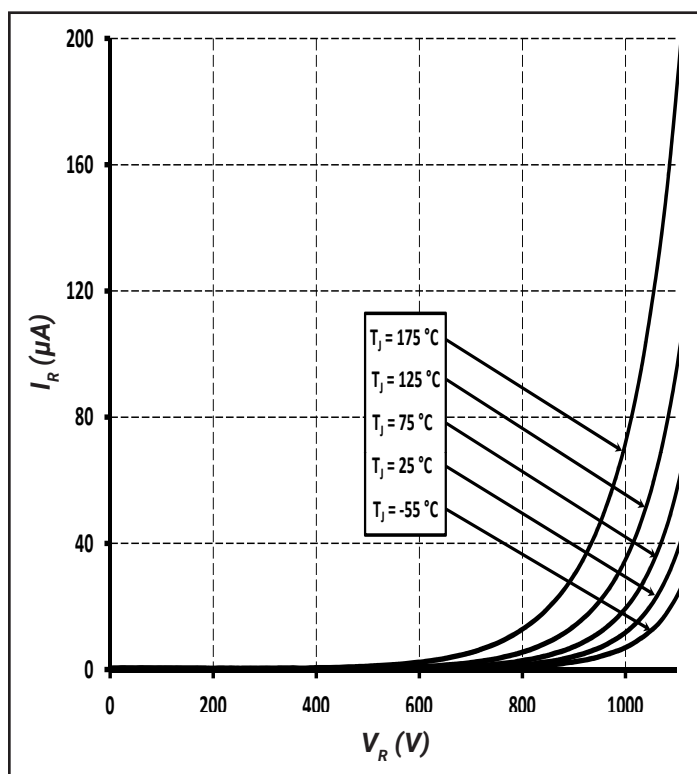


Figure 2. Reverse Characteristics

Typical Performance

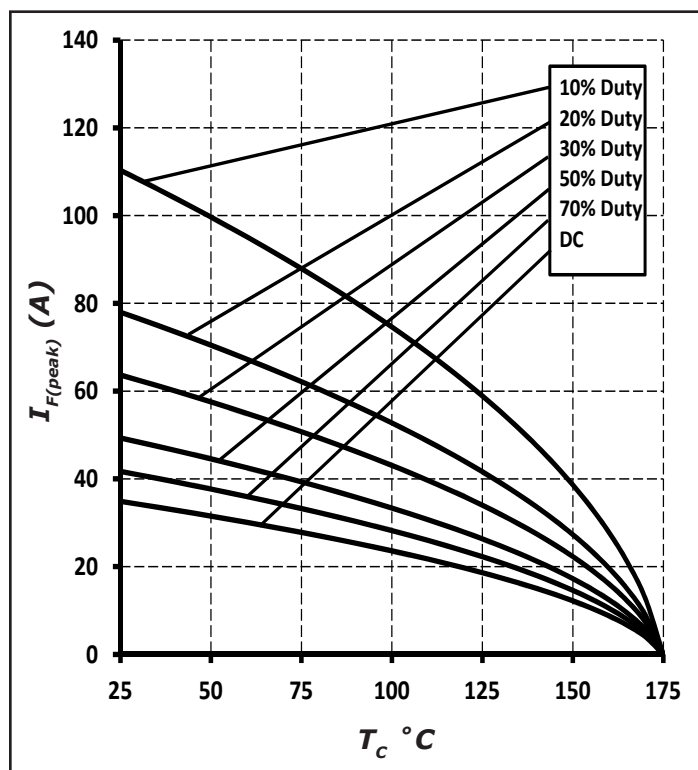


Figure 3. Current Derating

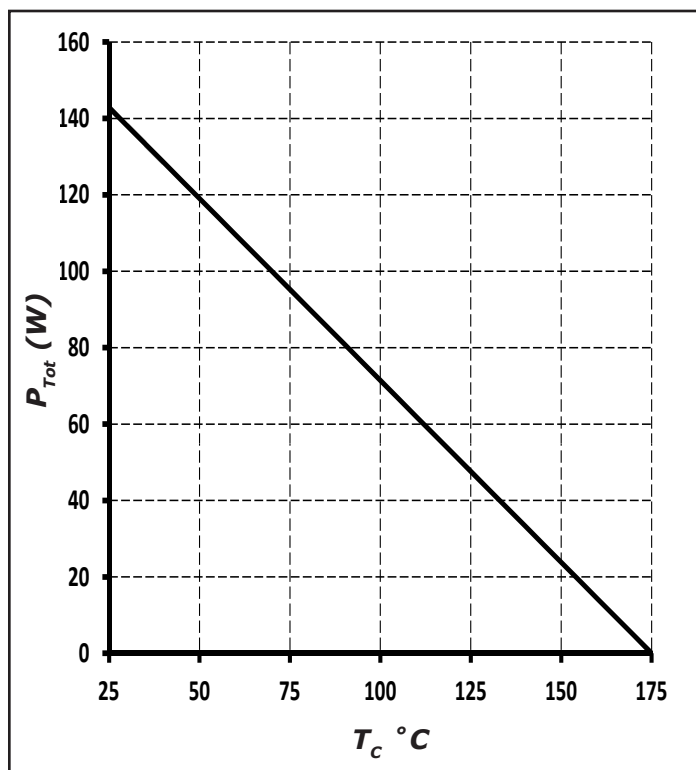


Figure 4. Power Derating

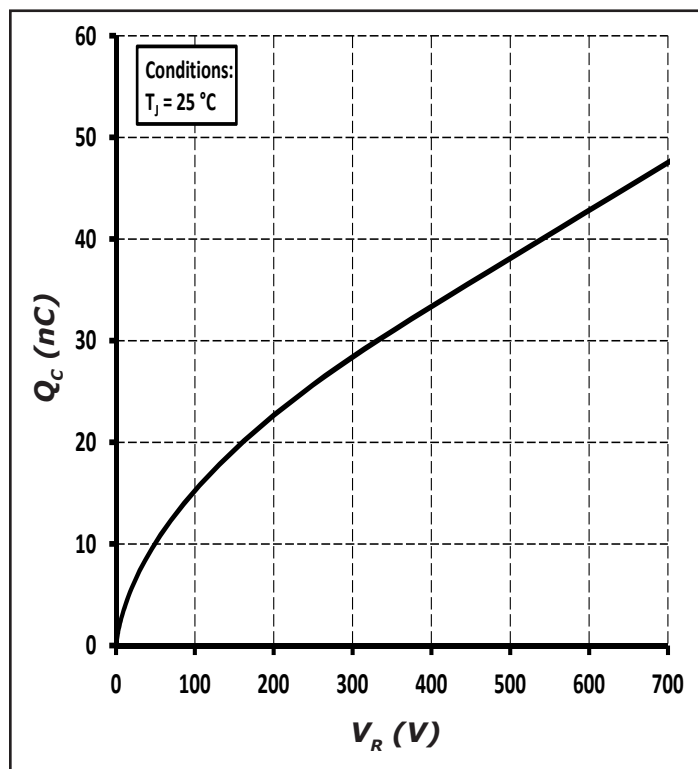


Figure 5. Total Capacitance Charge vs. Reverse Voltage

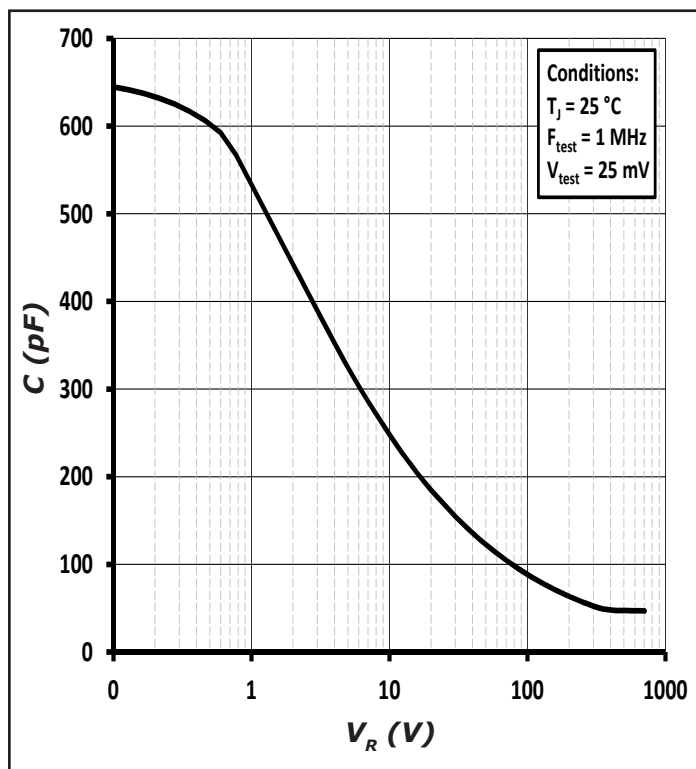


Figure 6. Capacitance vs. Reverse Voltage

Typical Performance

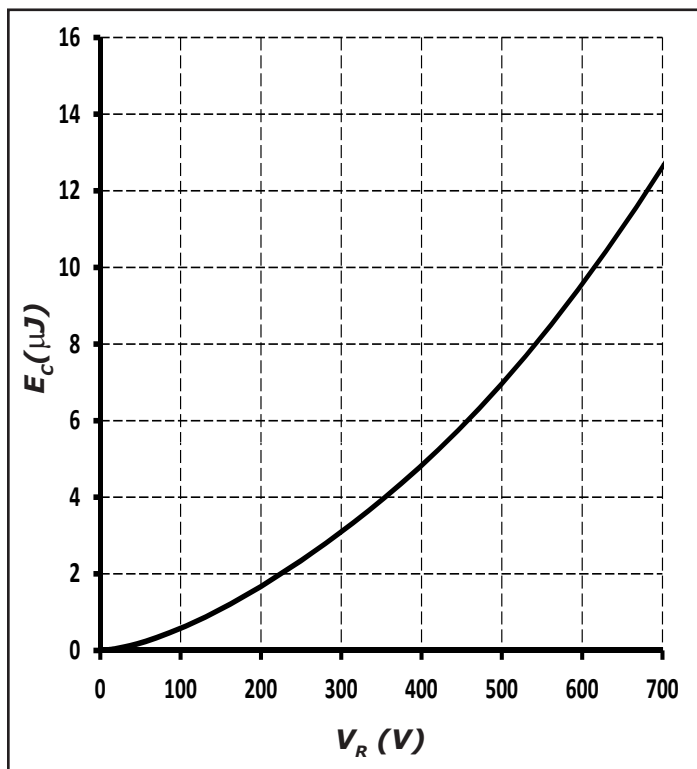


Figure 7. Capacitance Stored Energy

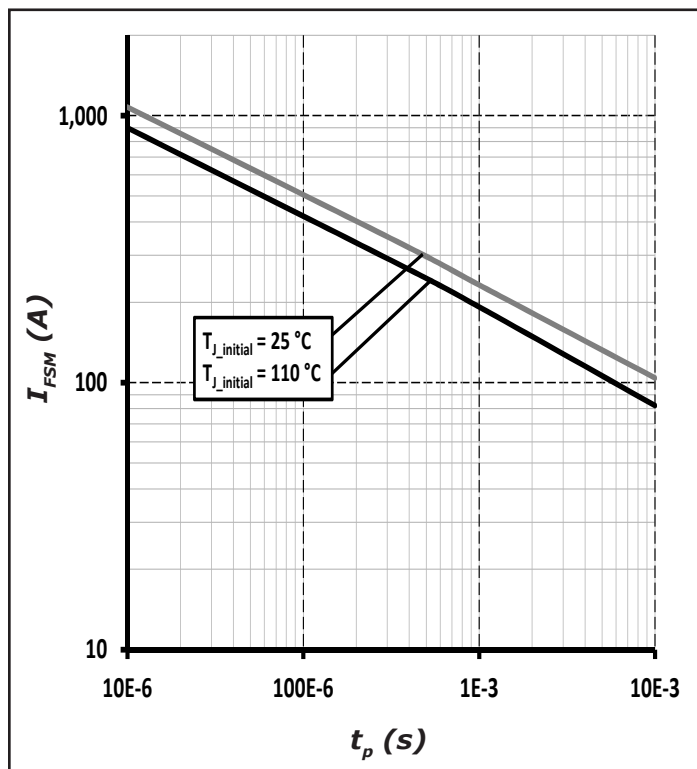


Figure 8. Non-repetitive peak forward surge current versus pulse duration (sinusoidal waveform)

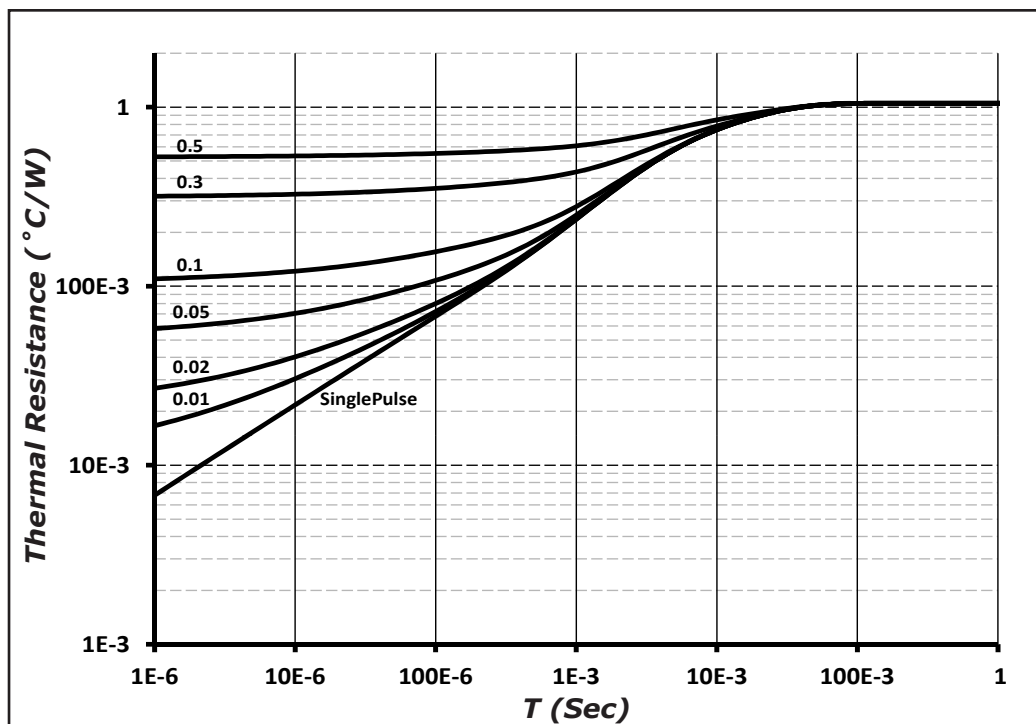
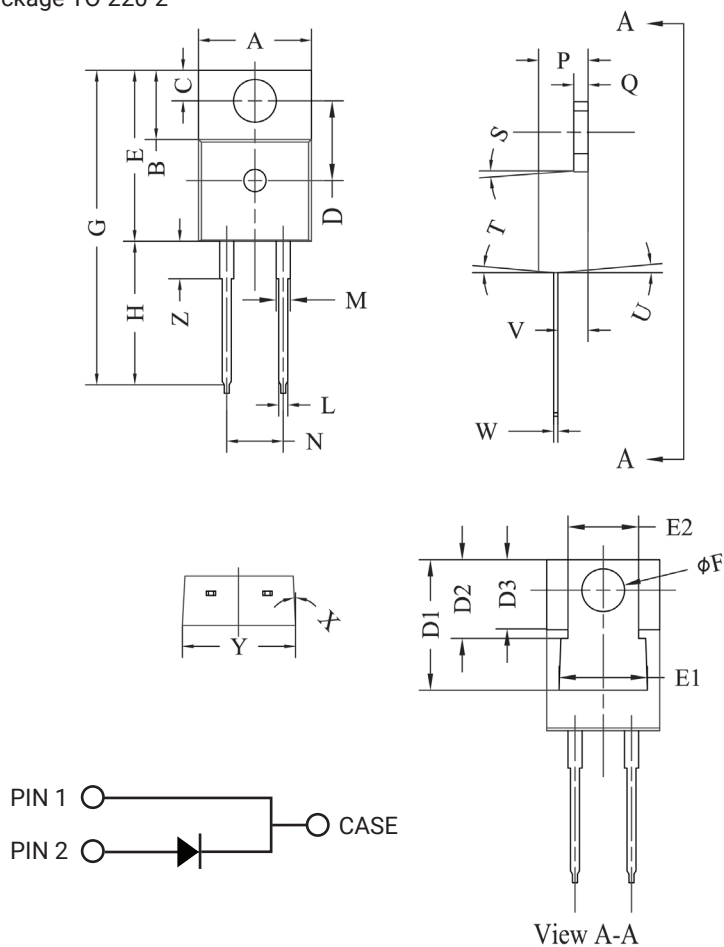


Figure 9. Transient Thermal Impedance

## Package Dimensions

Package TO-220-2

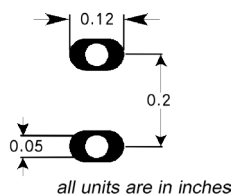


| POS | Inches        |       | Millimeters     |        |
|-----|---------------|-------|-----------------|--------|
|     | Min           | Max   | Min             | Max    |
| A   | .381          | .410  | 9.677           | 10.414 |
| B   | .235          | .255  | 5.969           | 6.477  |
| C   | .100          | .120  | 2.540           | 3.048  |
| D   | .223          | .337  | 5.664           | 8.560  |
| D1  | .457-.490     |       | 11.60-12.45 typ |        |
| D2  | .277-.303 typ |       | 7.04-7.70 typ   |        |
| D3  | .244-.252 typ |       | 6.22-6.4 typ    |        |
| E   | .590          | .615  | 14.986          | 15.621 |
| E1  | .302          | .326  | 7.68            | 8.28   |
| E2  | .227          | .251  | 5.77            | 6.37   |
| F   | .143          | .153  | 3.632           | 3.886  |
| G   | 1.105         | 1.147 | 28.067          | 29.134 |
| H   | .500          | .550  | 12.700          | 13.970 |
| L   | .025          | .036  | .635            | .914   |
| M   | .045          | .055  | 1.143           | 1.550  |
| N   | .195          | .205  | 4.953           | 5.207  |
| P   | .165          | .185  | 4.191           | 4.699  |
| Q   | .048          | .054  | 1.219           | 1.372  |
| S   | 3°            | 6°    | 3°              | 6°     |
| T   | 3°            | 6°    | 3°              | 6°     |
| U   | 3°            | 6°    | 3°              | 6°     |
| V   | .094          | .110  | 2.388           | 2.794  |
| W   | .014          | .025  | .356            | .635   |
| X   | 3°            | 5.5°  | 3°              | 5.5°   |
| Y   | .385          | .410  | 9.779           | 10.414 |
| Z   | .130          | .150  | 3.302           | 3.810  |

NOTE:

1. Dimension L, M, W apply for Solder Dip Finish

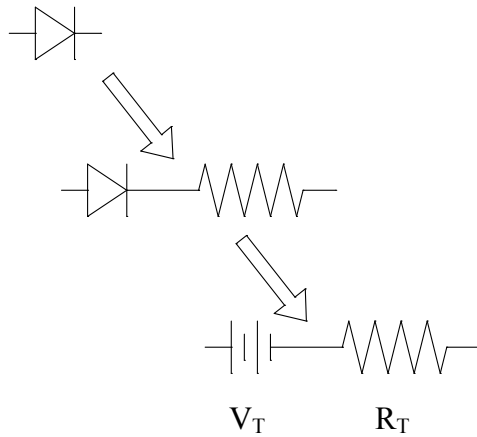
## Recommended Solder Pad Layout



TO-220-2

| Part Number | Package  | Marking  |
|-------------|----------|----------|
| C3D12065A   | TO-220-2 | C3D12065 |

Diode Model



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

$$V_T = 0.98 + (T_J * -1.1 * 10^{-3})$$

$$R_T = 0.0365 + (T_J * 3.2 * 10^{-4})$$

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