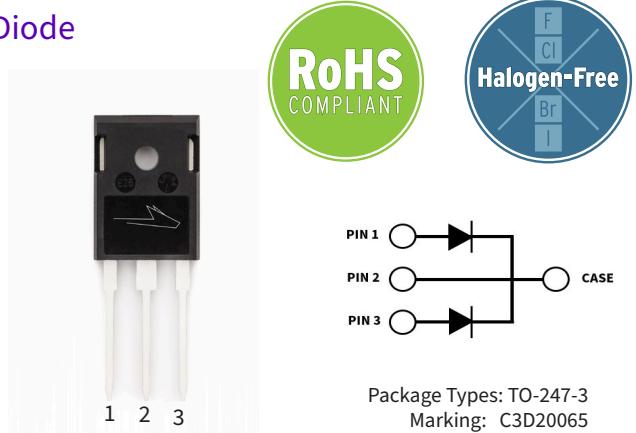


C3D20065D

3rd Generation 650 V, 20 A Silicon Carbide Schottky Diode

Description

With the performance advantages of a Silicon Carbide (SiC) Schottky Barrier diode, power electronics systems can expect to meet higher efficiency standards than Si-based solutions, while also reaching higher frequencies and power densities. SiC diodes can be easily paralleled to meet various application demands, without concern of thermal runaway. In combination with the reduced cooling requirements and improved thermal performance of SiC products, SiC diodes are able to provide lower overall system costs in a variety of diverse applications.



Package Types: TO-247-3
Marking: C3D20065

Features

- High-Frequency Operation
- Zero Reverse Recovery Current / Forward Recovery Voltage
- Temperature-Independent Switching Behavior
- Parallel Devices Without Thermal Runaway

Typical Applications

- Boost Diodes in PFC or DC/DC Stages
- Free Wheeling Diodes in Inverter Stages
- Switch Mode Power Supplies
- Solar Inverters
- AC/DC Converters

Maximum Ratings ($T_c = 25^\circ\text{C}$ Unless Otherwise Specified)

* Per Leg, ** Per Device

| Parameter | Symbol | Value | Unit | Test Conditions | Notes |
|--|-------------|-----------|------|---|--------|
| Repetitive Peak Reverse Voltage | V_{RRM} | 650 | V | | |
| Surge Peak Reverse Voltage | V_{RSM} | 650 | | | |
| DC Blocking Voltage | V_{DC} | 650 | | | |
| Continuous Forward Current (Per Leg/Per Device) | I_F | 27.5/55 | A | $T_c = 25^\circ\text{C}$ | Fig. 3 |
| | | 13/26 | | $T_c = 135^\circ\text{C}$ | |
| | | 10/20 | | $T_c = 149^\circ\text{C}$ | |
| Repetitive Peak Forward Surge Current | I_{FRM} | 46* | | $T_c = 25^\circ\text{C}, t_p = 10\text{ ms, Half Sine Wave}$ | Fig. 8 |
| | | 31* | | $T_c = 110^\circ\text{C}, t_p = 10\text{ ms, Half Sine Wave}$ | |
| Non-Repetitive Forward Surge Current | I_{FSM} | 90* | | $T_c = 25^\circ\text{C}, t_p = 10\text{ ms, Half Sine Wave}$ | |
| | | 71* | | $T_c = 110^\circ\text{C}, t_p = 10\text{ ms, Half Sine Wave}$ | |
| Non-Repetitive Peak Forward Surge Current | $I_{F,Max}$ | 860* | | $T_c = 25^\circ\text{C}, t_p = 10\text{ }\mu\text{s, Pulse}$ | |
| | | 680* | | $T_c = 110^\circ\text{C}, t_p = 10\text{ }\mu\text{s, Pulse}$ | |
| Power Dissipation (Per Leg/Per Device) | P_{tot} | 115.5/231 | W | $T_c = 25^\circ\text{C}$ | Fig. 4 |
| | | 50/100 | | $T_c = 110^\circ\text{C}$ | |
| Diode dV/dt Ruggedness | dV/dt | 200 | V/ns | $V_R = 0\text{--}650\text{V}$ | |

Electrical Characteristics

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

Notes:

SiC Schottky Diodes are majority carrier devices, so there is no reverse recovery charge.

Thermal & Mechanical Characteristics

| Parameter | Symbol | Value | Unit | Notes |
|--|-------------------------------|----------------|-----------------------------|------------|
| Thermal Resistance, Junction to Case (Typical) | $R_{\theta, JC (\text{TYP})}$ | 1.3** 0.65* | $^\circ\text{C} / \text{W}$ | |
| Junction Temperature | T_j | -55 to +175 | $^\circ\text{C}$ | |
| Case & Storage Temperature | T_c | -55 to +175 | | |
| TO-247 Mounting Torque | - | 1 | Nm | M3 Screw |
| | | 8.8 | lbf-in | 6-32 Screw |

* Per Leg, ** Per Device

Typical Performance

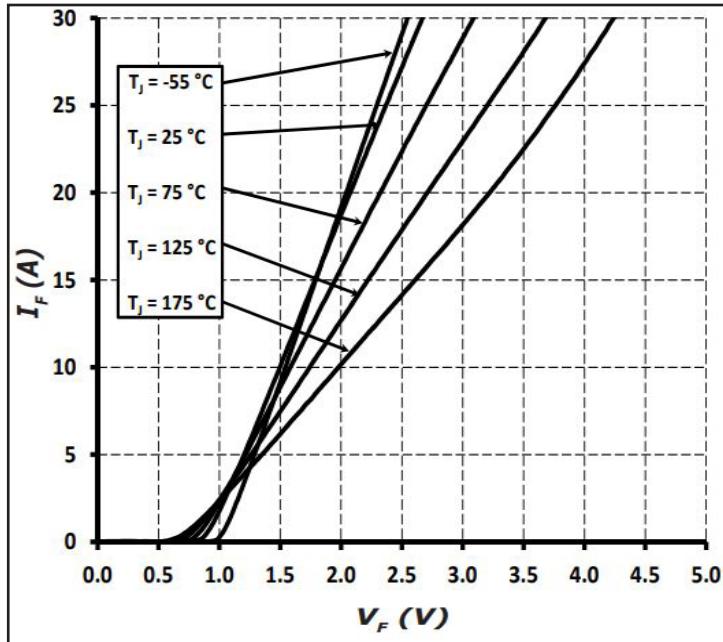


Figure 1
Forward Characteristics

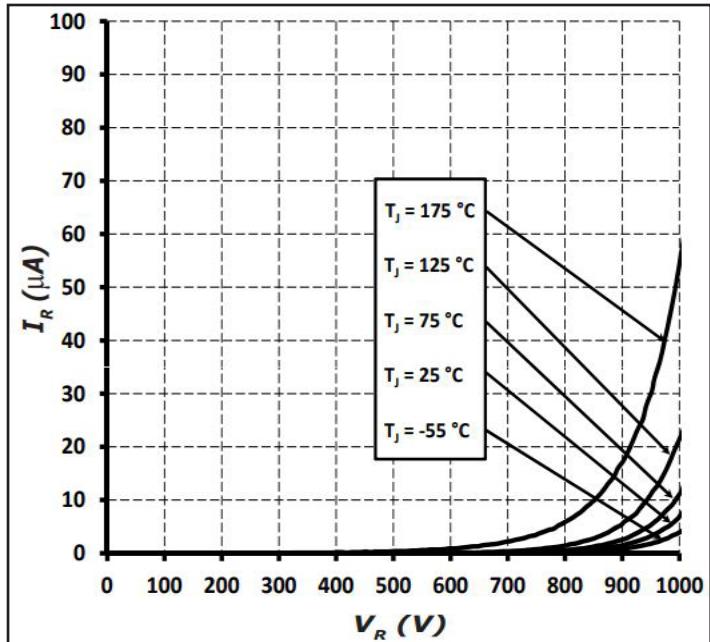


Figure 2
Reverse Characteristics

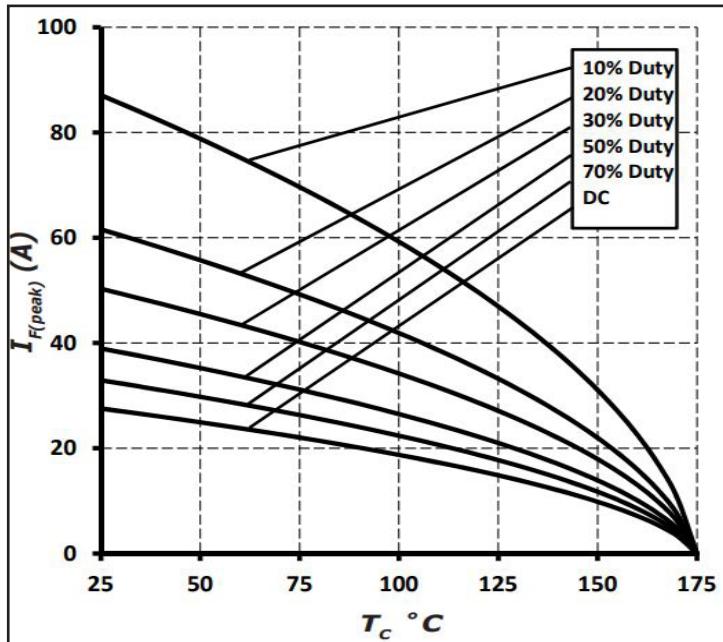


Figure 3
Current Derating

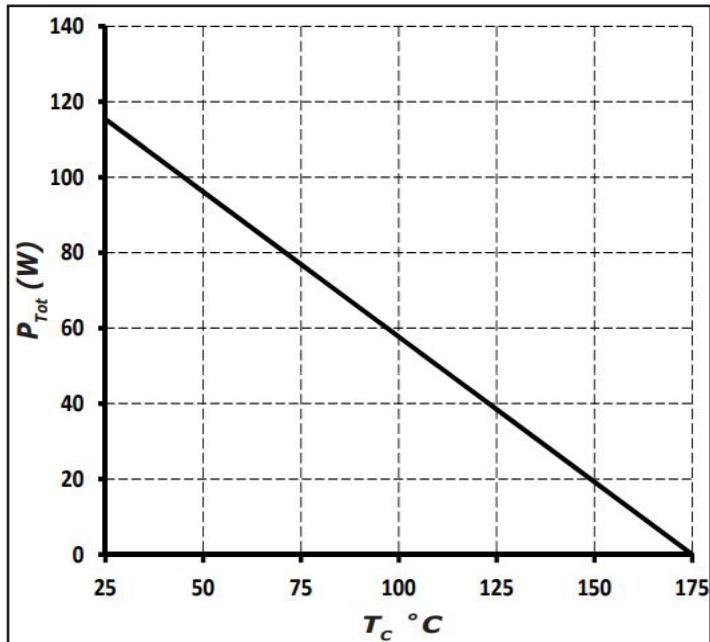
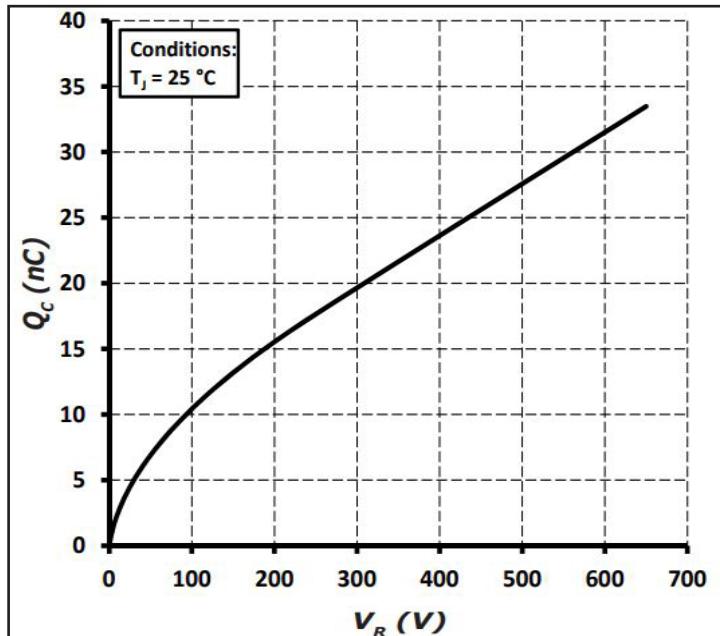
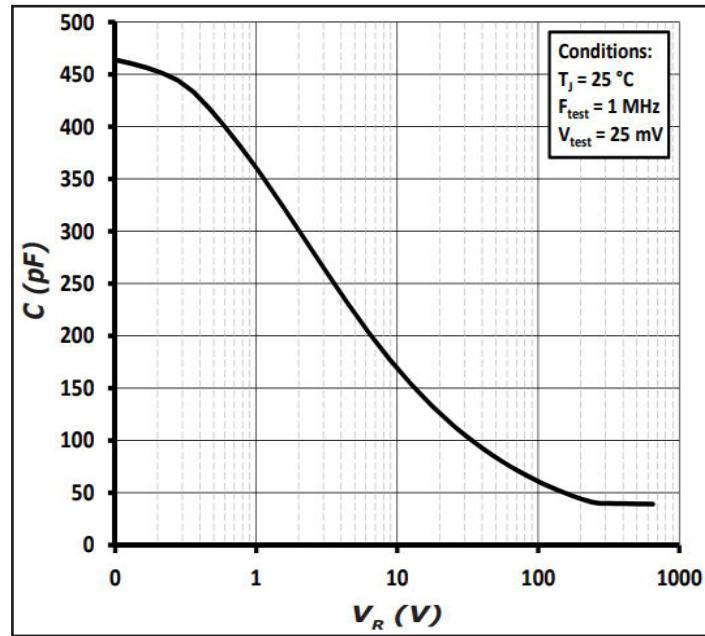


Figure 4
Power Derating

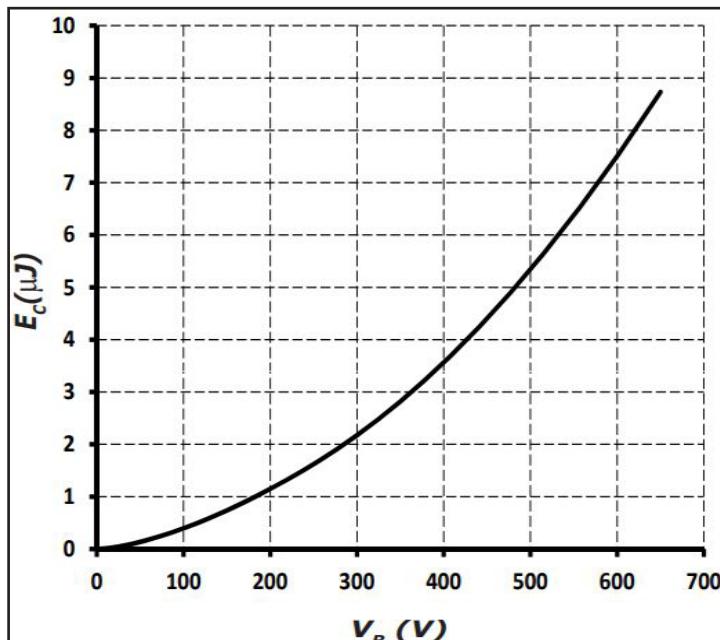
Typical Performance

**Figure 5**

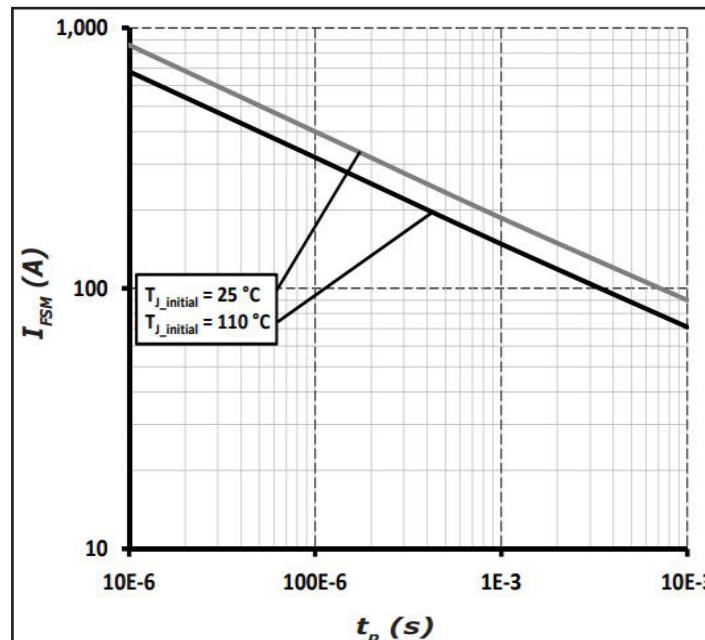
Total Capacitance Charge vs. Reverse Voltage

**Figure 6**

Capacitance vs. Reverse Voltage

**Figure 7**

Capacitance Stored Energy

**Figure 8**

Non-Repetitive Peak Forward Surge Current vs. Pulse Duration

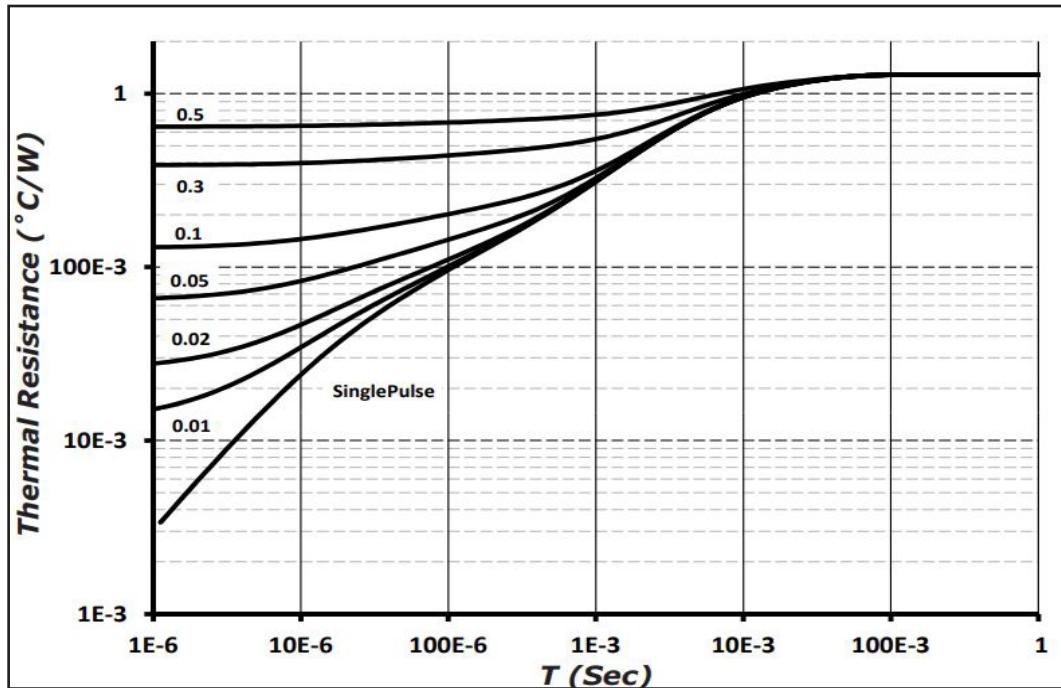
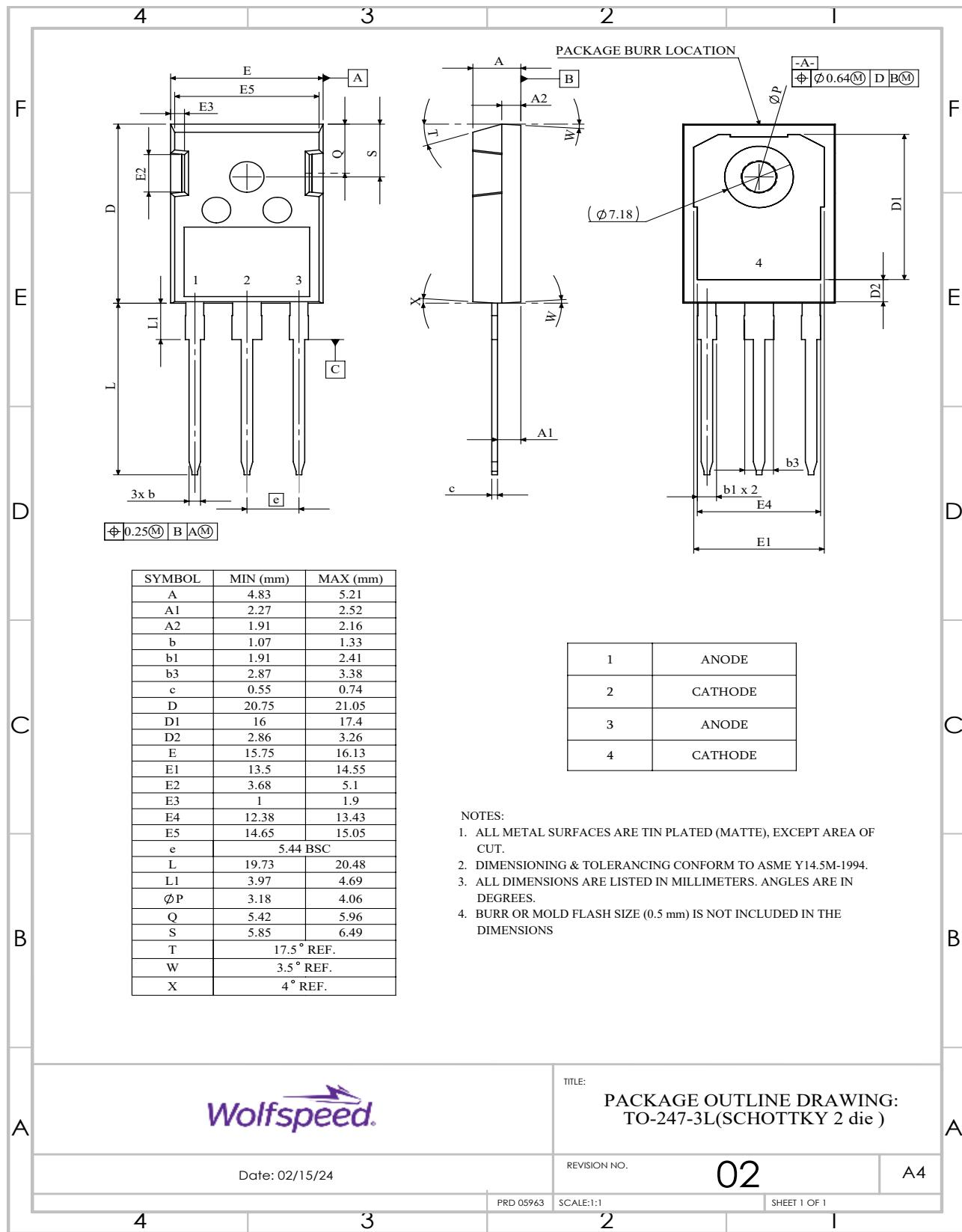


Figure 9
Transient Thermal Impedance

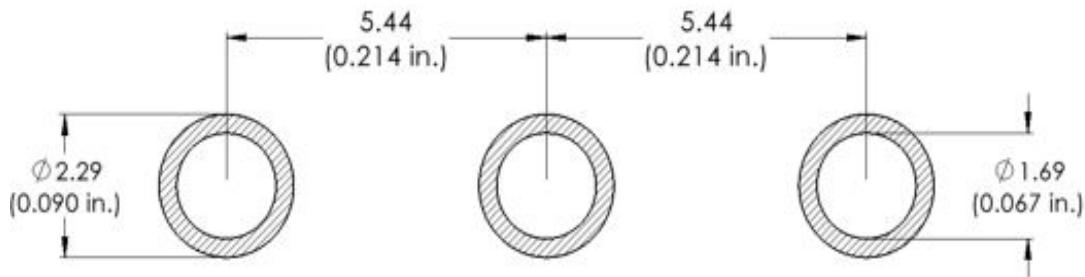
Package Dimensions & Pin-Out

Package: TO-247-3

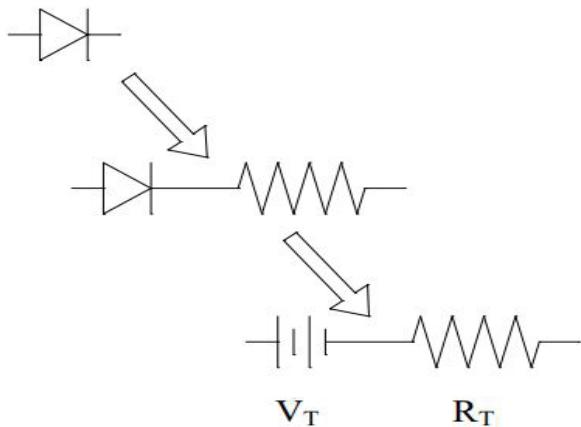


Recommended Solder Pad Layout

Primary dimensions shown in mm.



Diode Model



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

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

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

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

Product Ordering Information

| Order Number | Packing Type |
|--------------|--------------|
| C3D20065D | Tube |

REACH, RoHS, and Halogen-Free compliance documentation available for this product.

Revision History

| Document Version | Date of Release | Description of Changes |
|------------------|-----------------|--|
| 3 | May- 2021 | Initial Release |
| 4 | November-2023 | Update Branding, POD, Package Image, Solder pad layout |
| 5 | September- 2024 | Legal Disclaimer and POD Updated |

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