

# C4D20120D

## Silicon Carbide Schottky Diode

### Z-REC™ RECTIFIER

|                                |   |        |
|--------------------------------|---|--------|
| $V_{RRM}$                      | = | 1200 V |
| $I_F, T_c < 135^\circ\text{C}$ | = | 32 A   |
| $Q_c$                          | = | 132 nC |

#### Features

- 1.2-KVolt Schottky Rectifier
- Zero Reverse Recovery Current
- High-Frequency Operation
- Temperature-Independent Switching Behavior
- Positive Temperature Coefficient on  $V_F$

#### Benefits

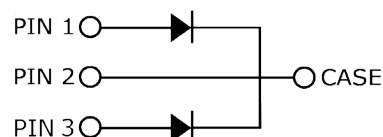
- Replace Bipolar with Unipolar Rectifiers
- Essentially No Switching Losses
- Higher Efficiency
- Reduction of Heat Sink Requirements
- Parallel Devices Without Thermal Runaway

#### Applications

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



| Part Number | Package  | Marking  |
|-------------|----------|----------|
| C4D20120D   | TO-247-3 | C4D20120 |



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

| Symbol    | Parameter                                  | Value             |                  | Test Conditions                                                                                                         | Note |
|-----------|--------------------------------------------|-------------------|------------------|-------------------------------------------------------------------------------------------------------------------------|------|
| $V_{RRM}$ | Repetitive Peak Reverse Voltage            | 1200              | V                |                                                                                                                         |      |
| $V_{RSM}$ | Surge Peak Reverse Voltage                 | 1300              | V                |                                                                                                                         |      |
| $V_{DC}$  | DC Blocking Voltage                        | 1200              | V                |                                                                                                                         |      |
| $I_F$     | Continuous Forward Current(Per Leg/Device) | 16/32             | A                | $T_c < 135^\circ\text{C}$ , No AC component                                                                             |      |
| $I_{FRM}$ | Repetitive Peak Forward Surge Current      | 47*<br>31.5*      | 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  | 71*<br>59.5*      | 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 |      |
| $P_{tot}$ | Power Dissipation(Per Leg/Device)          | 176/352<br>76/152 | W                | $T_c = 25^\circ\text{C}$<br>$T_c = 110^\circ\text{C}$                                                                   |      |
| $T_c$     | Maximum Case Temperature                   | 135               | $^\circ\text{C}$ |                                                                                                                         |      |
| $T_j$     | Operating Junction Range                   | -55 to +175       | $^\circ\text{C}$ |                                                                                                                         |      |
| $T_{stg}$ | Storage Temperature Range                  | -55 to +135       | $^\circ\text{C}$ |                                                                                                                         |      |
|           | TO-247 Mounting Torque                     | 1<br>8.8          | Nm<br>lbf-in     | M3 Screw<br>6-32 Screw                                                                                                  |      |

\* Per Leg, \*\* Per Device

## Electrical Characteristics (Per Leg)

| Symbol | Parameter               | Typ.            | Max.       | Unit          | Test Conditions                                                                                                                                                                                                    | Note |
|--------|-------------------------|-----------------|------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| $V_F$  | Forward Voltage         | 1.5<br>2.2      | 1.8<br>3   | V             | $I_F = 10\text{ A}$ $T_J = 25^\circ\text{C}$<br>$I_F = 10\text{ A}$ $T_J = 175^\circ\text{C}$                                                                                                                      |      |
| $I_R$  | Reverse Current         | 35<br>65        | 200<br>400 | $\mu\text{A}$ | $V_R = 1200\text{ V}$ $T_J = 25^\circ\text{C}$<br>$V_R = 1200\text{ V}$ $T_J = 175^\circ\text{C}$                                                                                                                  |      |
| $Q_C$  | Total Capacitive Charge | 66              |            | nC            | $V_R = 1200\text{ V}$ , $I_F = 10\text{ A}$<br>$di/dt = 200\text{ A}/\mu\text{s}$<br>$T_J = 25^\circ\text{C}$                                                                                                      |      |
| C      | Total Capacitance       | 754<br>45<br>38 |            | pF            | $V_R = 0\text{ V}$ , $T_J = 25^\circ\text{C}$ , $f = 1\text{ MHz}$<br>$V_R = 400\text{ V}$ , $T_J = 25^\circ\text{C}$ , $f = 1\text{ MHz}$<br>$V_R = 800\text{ V}$ , $T_J = 25^\circ\text{C}$ , $f = 1\text{ MHz}$ |      |

Note:

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

## Thermal Characteristics

| Symbol          | Parameter                                | Typ.            | Max. | Unit                      | Test Conditions | Note |
|-----------------|------------------------------------------|-----------------|------|---------------------------|-----------------|------|
| $R_{\theta JC}$ | Thermal Resistance from Junction to Case | 0.85*<br>0.43** |      | $^\circ\text{C}/\text{W}$ |                 |      |

\* Per Leg, \*\* Per Device

## Typical Performance (Per Leg)

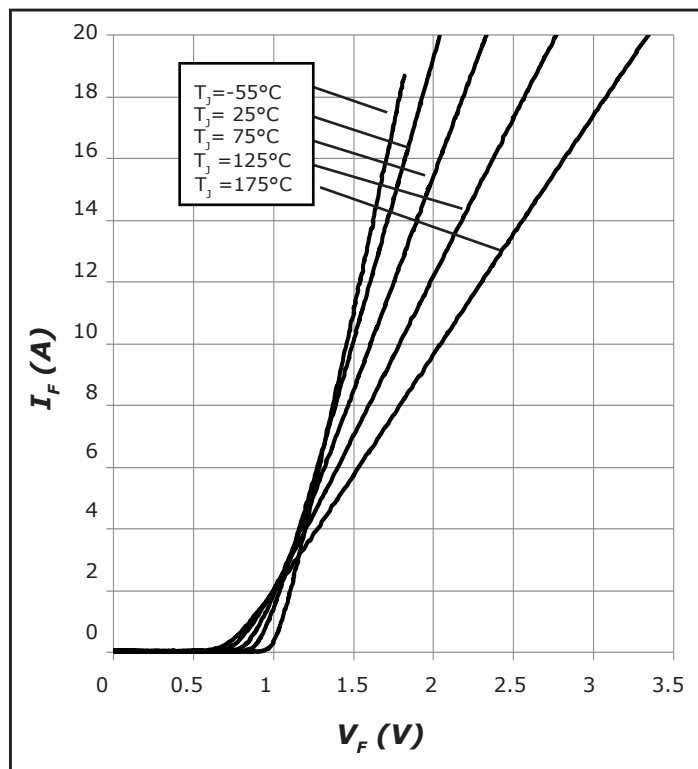


Figure 1. Forward Characteristics

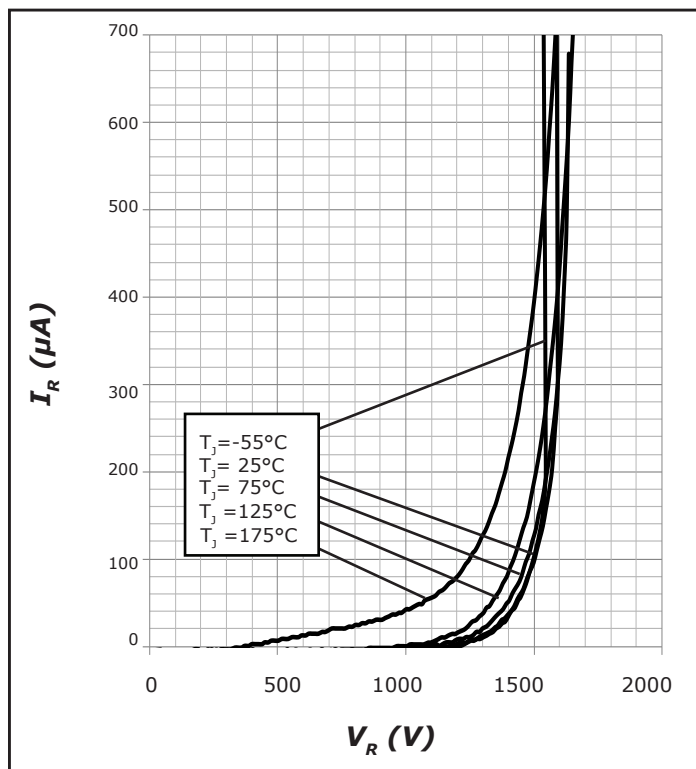


Figure 2. Reverse Characteristics

## Typical Performance (Per Leg)

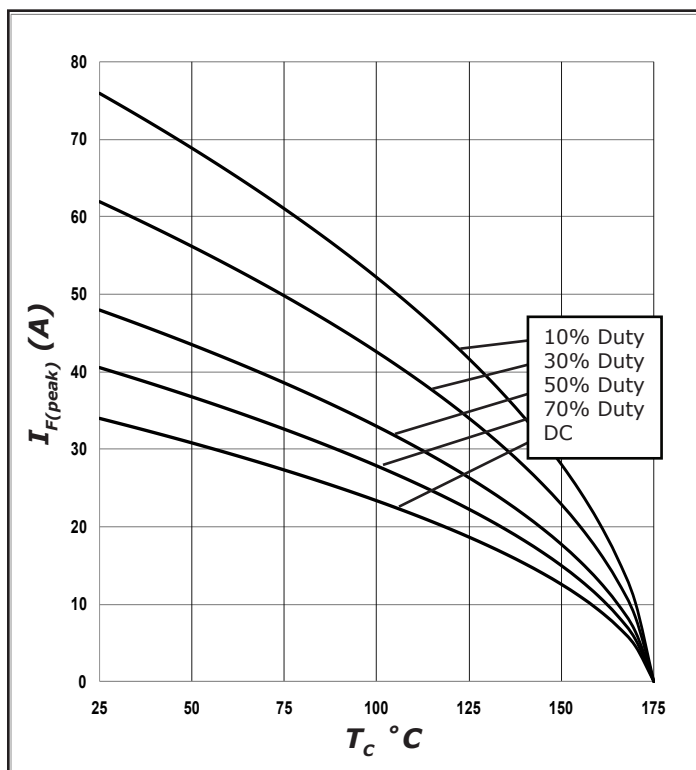


Figure 3. Current Derating

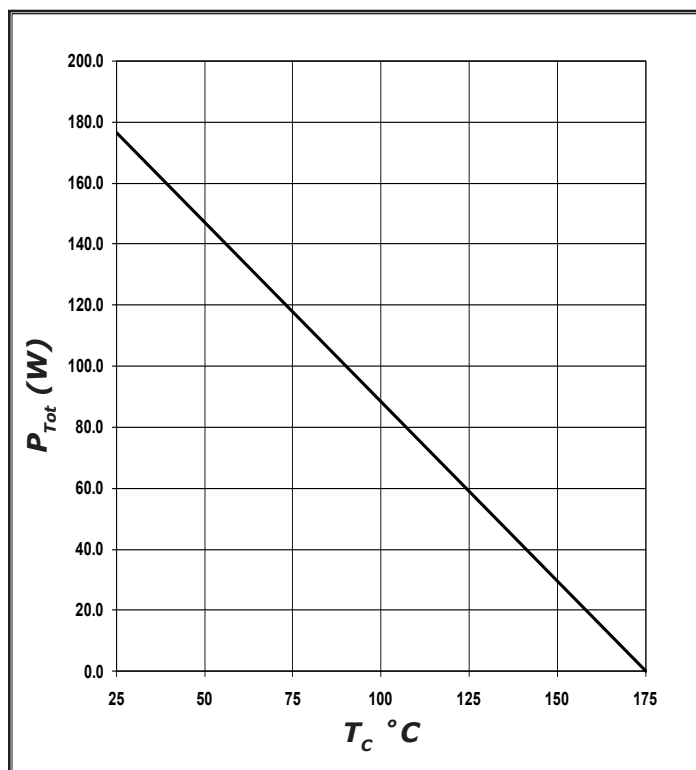


Figure 4. Power Derating

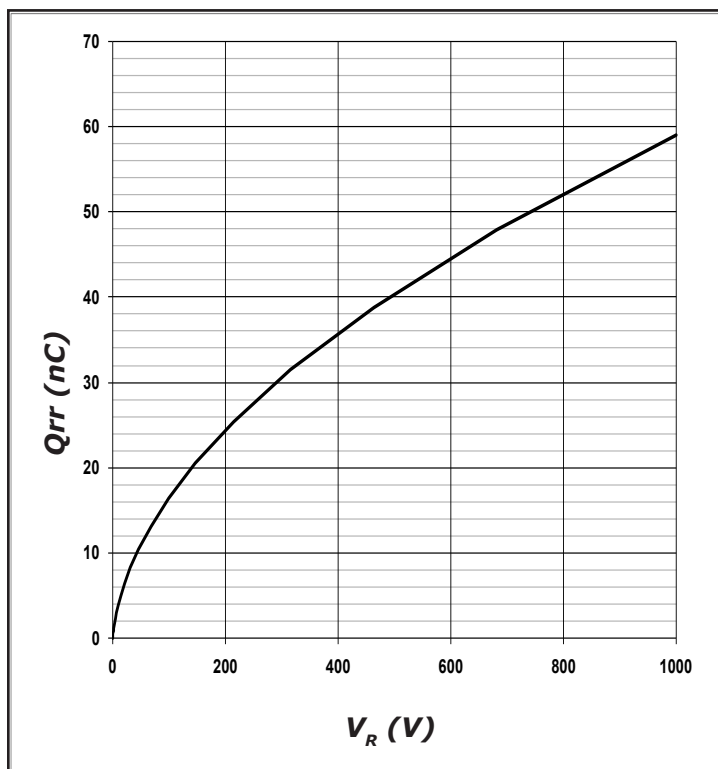


Figure 5. Recovery Charge vs. Reverse Voltage

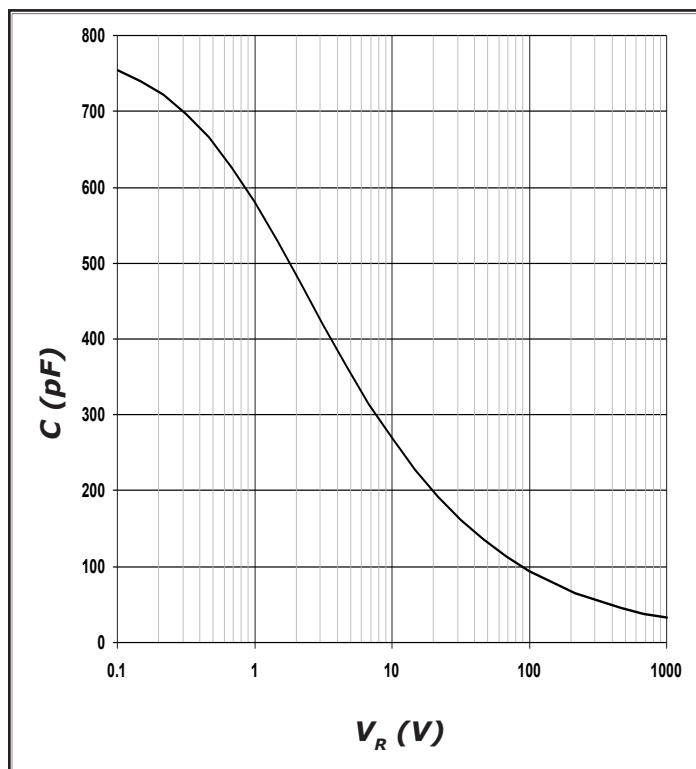


Figure 6. Capacitance vs. Reverse Voltage

## Typical Performance (Per Leg)

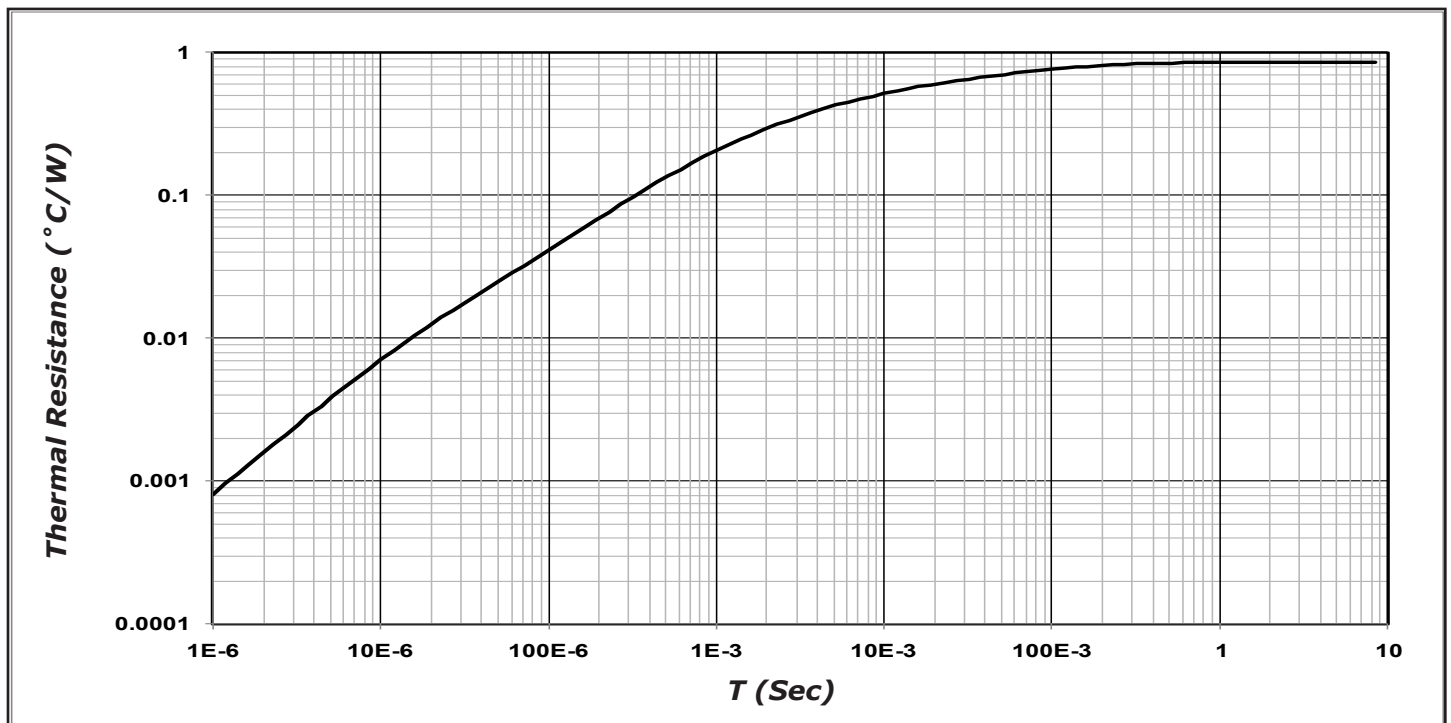
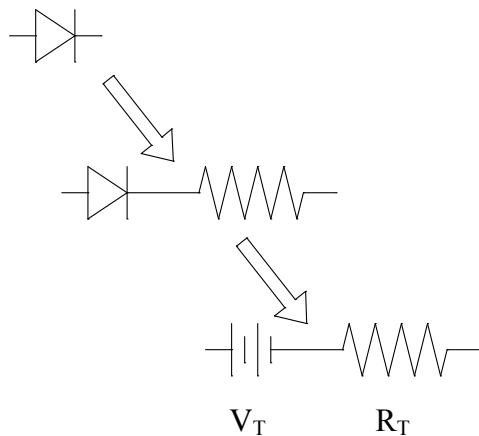


Figure 7. Transient Thermal Impedance

## Diode Model



$$V_{fT} = V_T + I_f \cdot R_T$$

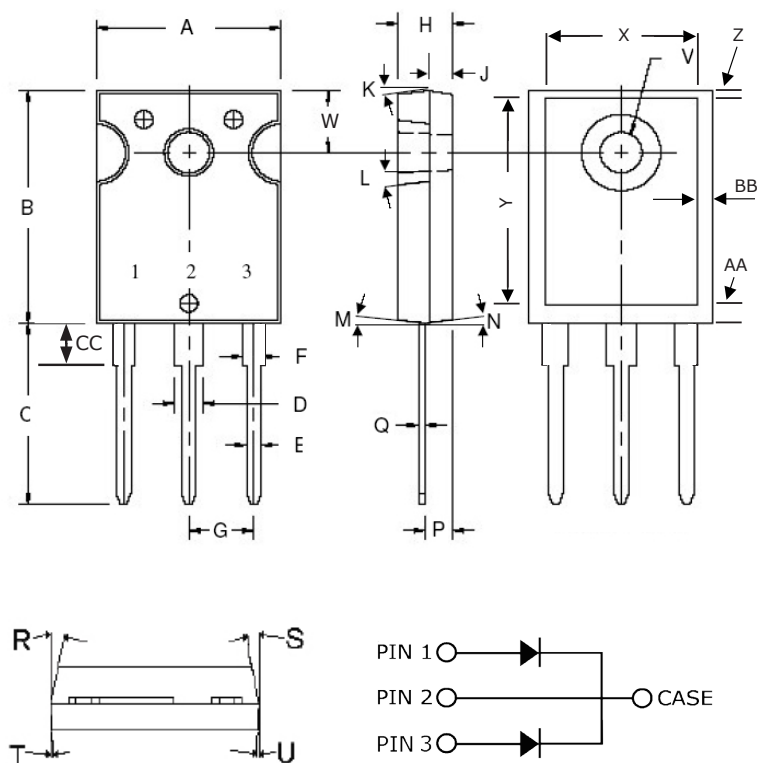
$$V_T = 0.98 + (T_J \cdot -1.71 \cdot 10^{-3})$$

$$R_T = 0.040 + (T_J \cdot 5.32 \cdot 10^{-4})$$

Note:  $T_J$  = Diode Junction Temperature In Degrees Celsius

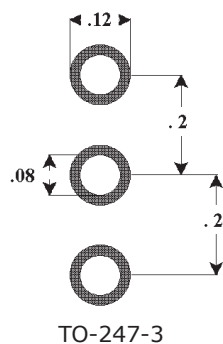
## Package Dimensions

Package TO-247-3



| POS | Inches   |      | Millimeters |        |
|-----|----------|------|-------------|--------|
|     | Min      | Max  | Min         | Max    |
| A   | .605     | .635 | 15.367      | 16.130 |
| B   | .800     | .831 | 20.320      | 21.10  |
| C   | .780     | .800 | 19.810      | 20.320 |
| D   | .095     | .133 | 2.413       | 3.380  |
| E   | .046     | .052 | 1.168       | 1.321  |
| F   | .060     | .095 | 1.524       | 2.410  |
| G   | .215 TYP |      | 5.460 TYP   |        |
| H   | .175     | .205 | 4.450       | 5.210  |
| J   | .075     | .085 | 1.910       | 2.160  |
| K   | 6°       | 21°  | 6°          | 21°    |
| L   | 4°       | 6°   | 4°          | 6°     |
| M   | 2°       | 4°   | 2°          | 4°     |
| N   | 2°       | 4°   | 2°          | 4°     |
| P   | .090     | .100 | 2.286       | 2.540  |
| Q   | .020     | .030 | .508        | .762   |
| R   | 9°       | 11°  | 9°          | 11°    |
| S   | 9°       | 11°  | 9°          | 11°    |
| T   | 2°       | 8°   | 2°          | 8°     |
| U   | 2°       | 8°   | 2°          | 8°     |
| V   | .137     | .144 | 3.487       | 3.658  |
| W   | .210     | .248 | 5.334       | 6.300  |
| X   | .502     | .557 | 12.751      | 14.150 |
| Y   | .637     | .695 | 16.180      | 17.653 |
| Z   | .038     | .052 | 0.964       | 1.321  |
| AA  | .110     | .140 | 2.794       | 3.556  |
| BB  | .030     | .046 | 0.766       | 1.168  |
| CC  | .161     | .176 | 4.100       | 4.472  |

## Recommended Solder Pad Layout



| Part Number | Package  | Marking  |
|-------------|----------|----------|
| C4D20120D   | TO-247-3 | C4D20120 |

This product has not been designed or tested for use in, and is not intended for use in, applications implanted into the human body nor in applications in which failure of the product could lead to death, personal injury or property damage, including but not limited to equipment used in the operation of nuclear facilities, life-support machines, cardiac defibrillators or similar emergency medical equipment, aircraft navigation or communication or control systems, air traffic control systems, or weapons systems.

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