



## Features

- 1.2kV Schottky Rectifier
- Zero Reverse Recovery Current
- High-Frequency Operation
- Temperature-Independent Switching
- Extremely Fast Switching

## Benefits

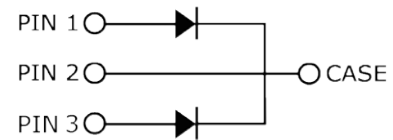
- Replace Bipolar with Unipolar Rectifiers
- Essentially No Switching Losses
- Higher Efficiency
- Reduction of Heat Sink Requirements
- Parallel Devices Without Thermal Runaway

## Applications

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



TO247-3L  
Package



| Part Number | Package  | Marking    |
|-------------|----------|------------|
| HC4D40120D  | TO247-3L | HC4D40120D |

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

| Symbol        | Parameter                                      | Value                      | Unit                 | Test Conditions                                                                                                         | Note   |
|---------------|------------------------------------------------|----------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------|--------|
| $V_{RRM}$     | Repetitive Peak Reverse Voltage                | 1200                       | V                    |                                                                                                                         |        |
| $V_{RSM}$     | Surge Peak Reverse Voltage                     | 1300                       | V                    |                                                                                                                         |        |
| $V_R$         | DC Peak Reverse Voltage                        | 1200                       | V                    |                                                                                                                         |        |
| $I_F$         | Continuous Forward Current<br>(Per Leg/Device) | 56.5/113<br>27/54<br>20/40 | 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          | 91*<br>61*                 | 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 Forward Surge Current           | 130*<br>110*               | 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            | 1150*<br>950*              | 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 (Per Leg/Device)             | 266/532<br>114/228         | 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                 | $V_R=0-960\text{V}$                                                                                                     |        |
| $\int i^2 dt$ | $i^2t$ value                                   | 84.5*<br>60.5*             | $\text{A}^2\text{s}$ | $T_C=25^{\circ}\text{C}$ , $t_p=10$ ms<br>$T_C=110^{\circ}\text{C}$ , $t_p=10$ ms                                       |        |
| $T_J$         | Operating Junction Range                       | -55 to<br>+175             | $^{\circ}\text{C}$   |                                                                                                                         |        |
| $T_{stg}$     | Storage Temperature Range                      | -55 to<br>+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             | $I_F = 20\text{ A}$ $T_J = 25^\circ\text{C}$<br>$I_F = 20\text{ A}$ $T_J = 175^\circ\text{C}$                                                                                                                      | Fig. 1 |
| $I_R$  | Reverse Current           | 35<br>65         | 200<br>400 | $\mu\text{A}$ | $V_R = 1200\text{ V}$ $T_J = 25^\circ\text{C}$<br>$V_R = 1200\text{ V}$ $T_J = 175^\circ\text{C}$                                                                                                                  | Fig. 2 |
| $Q_C$  | Total Capacitive Charge   | 99               |            | nC            | $V_R = 800\text{ V}$ , $I_F = 20\text{ A}$<br>$di/dt = 200\text{ A}/\mu\text{s}$<br>$T_J = 25^\circ\text{C}$                                                                                                       | Fig. 5 |
| C      | Total Capacitance         | 1500<br>93<br>67 |            | 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>$V_R = 800\text{ V}$ , $T_J = 25^\circ\text{C}$ , $f = 1\text{ MHz}$ | Fig. 6 |
| $E_C$  | Capacitance Stored Energy | 28               |            | $\mu\text{J}$ | $V_R = 800\text{ V}$                                                                                                                                                                                               | 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 | 0.29**<br>0.57* | $^\circ\text{C}/\text{W}$ | Fig. 9 |

\* Per Leg, \*\* Per Device

## Typical Performance (Per Leg)

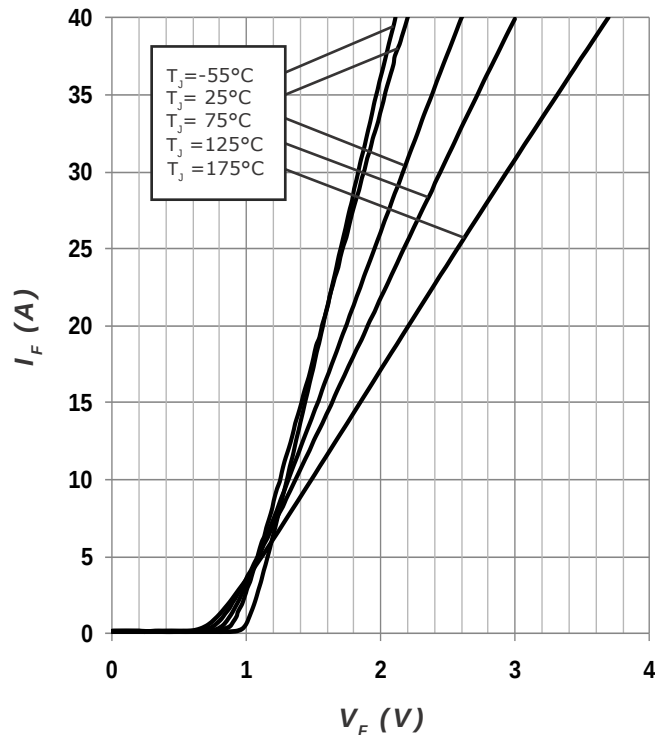


Figure 1. Forward Characteristics

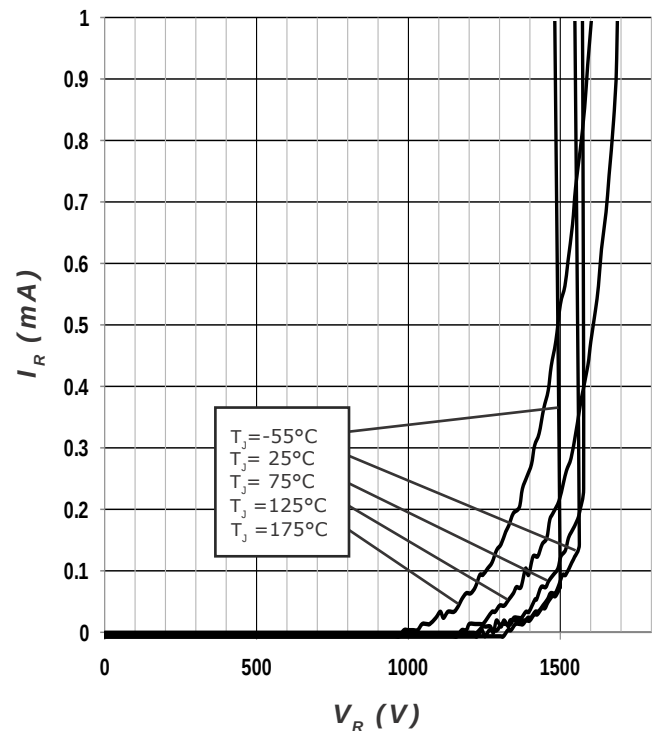


Figure 2. Reverse Characteristics



### Typical Performance (Per Leg)

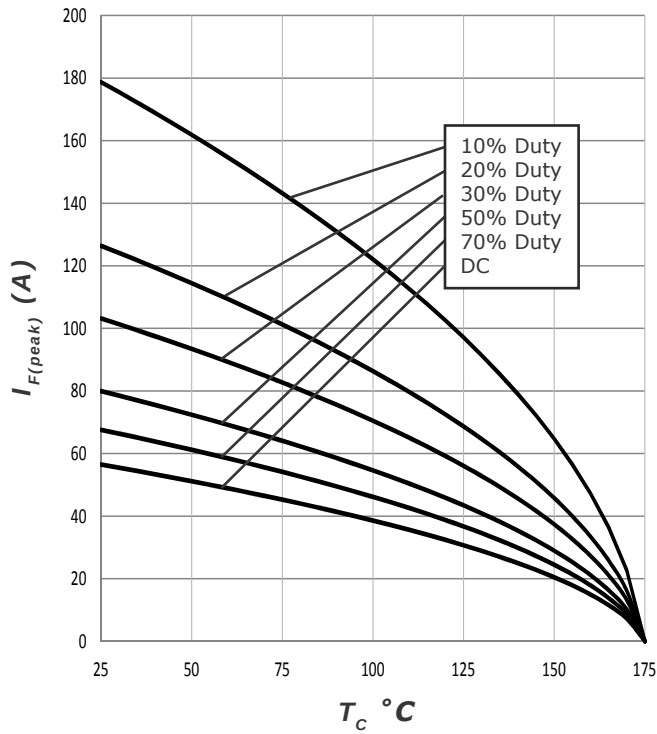


Figure 3. Current Derating

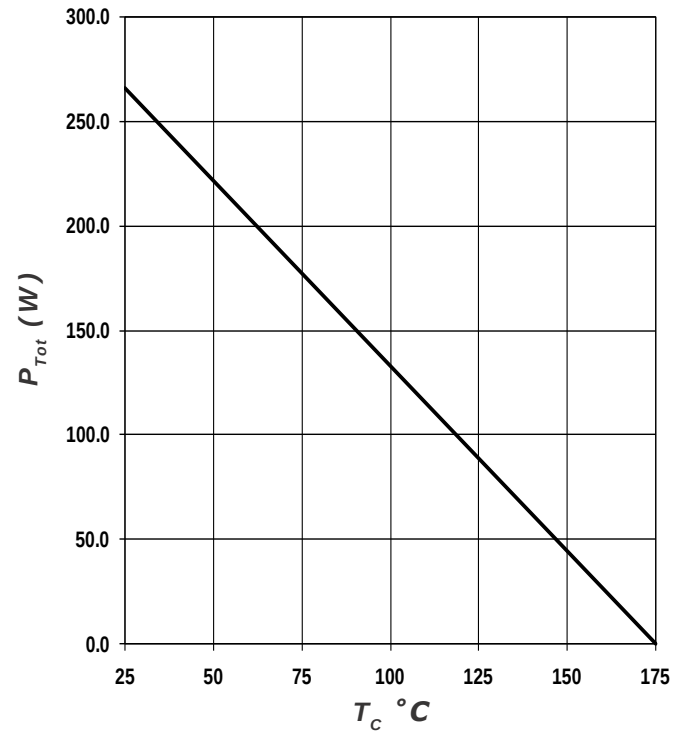


Figure 4. Power Derating

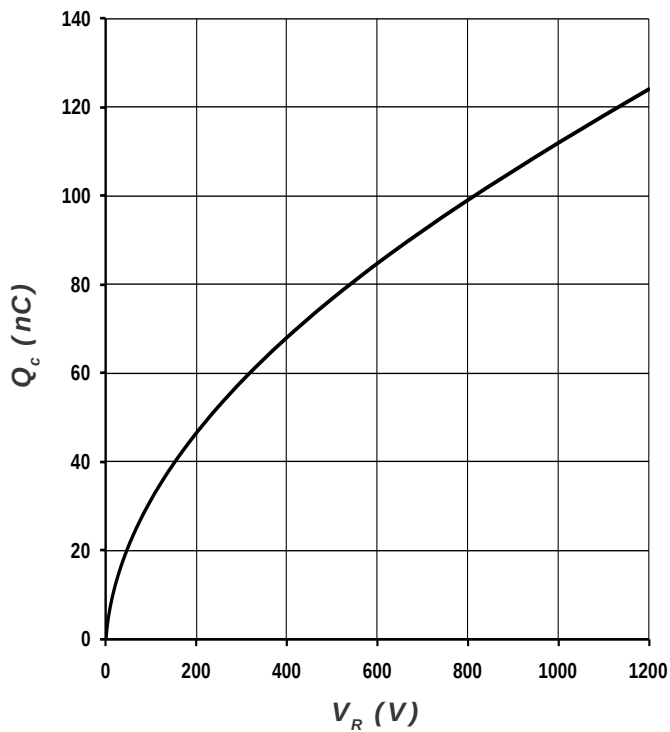


Figure 5. Recovery Charge vs. Reverse Voltage

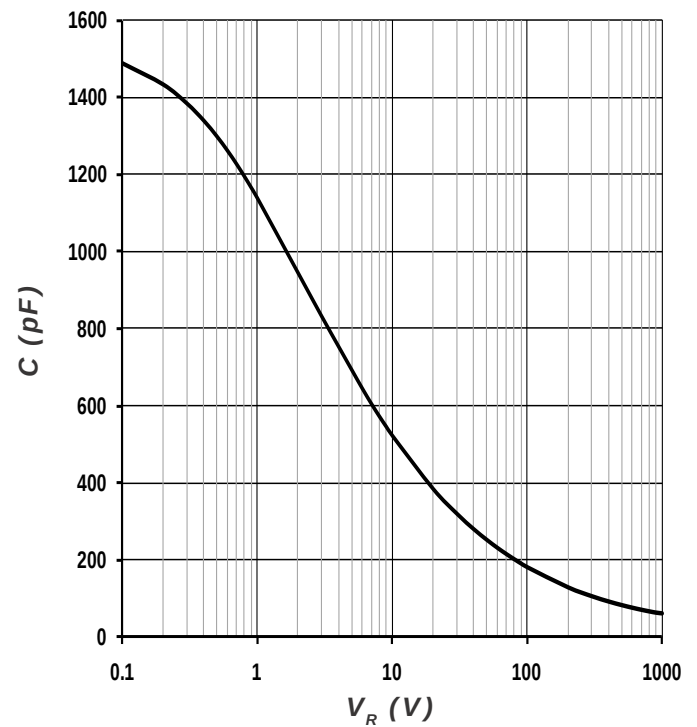


Figure 6. Capacitance vs. Reverse Voltage



## Typical Performance

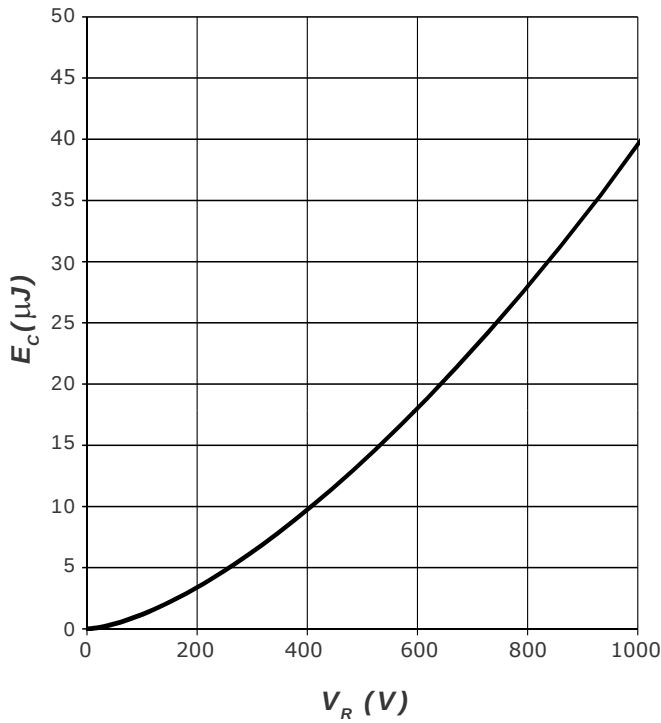


Figure 7. Typical Capacitance Stored Energy, per leg

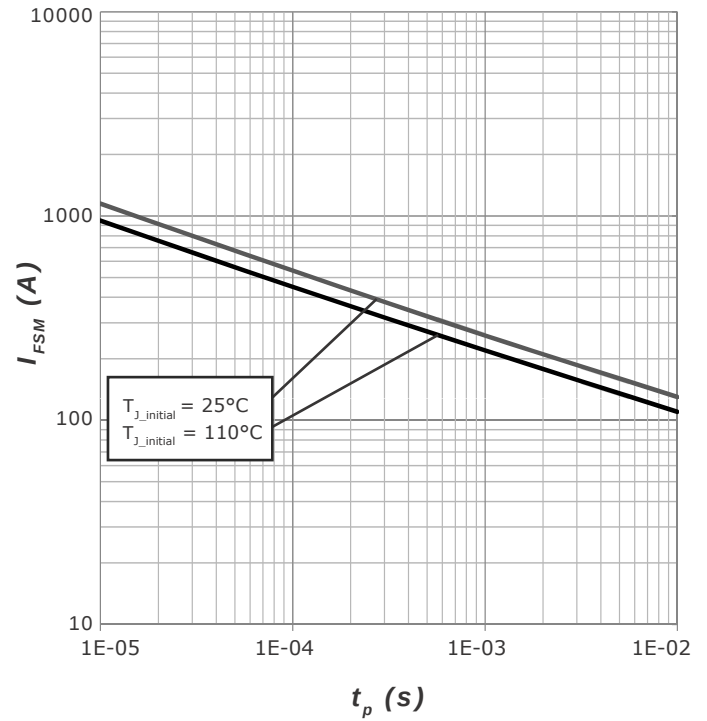


Figure 8. Non-Repetitive Peak Forward Surge Current versus Pulse Duration (sinusoidal waveform), per leg

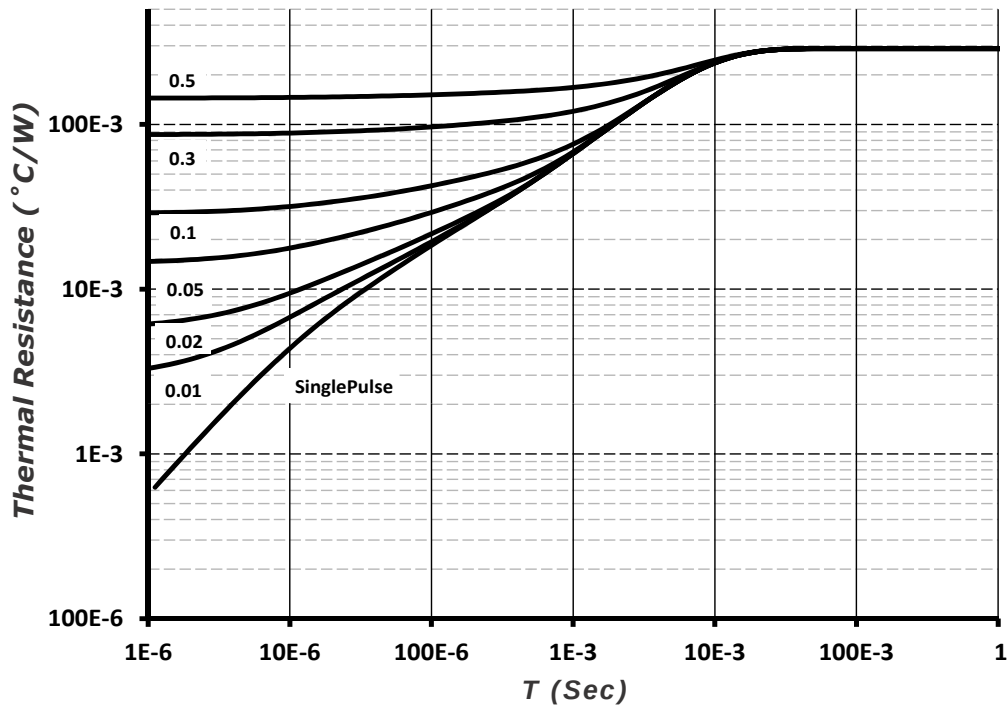
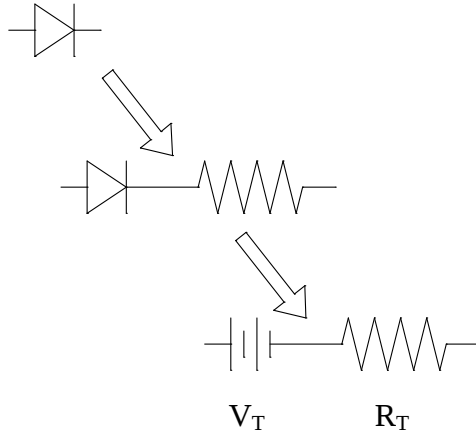


Figure 9. Device Transient Thermal Impedance



## Diode Model



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

$$V_T = 0.97 + (T_j * -1.40 * 10^{-3})$$

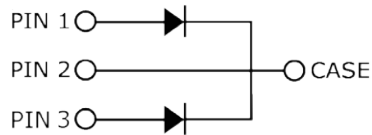
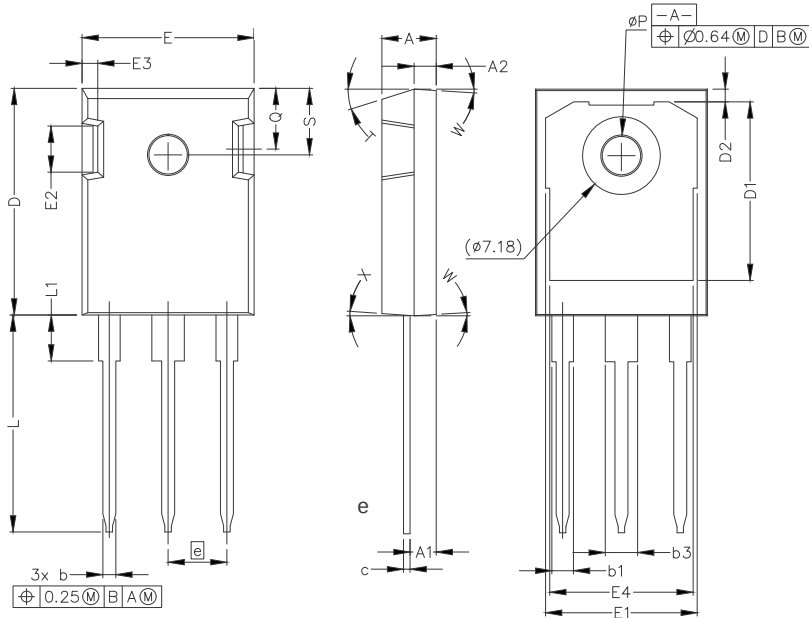
$$R_T = 0.023 + (T_j * 2.71 * 10^{-4})$$

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



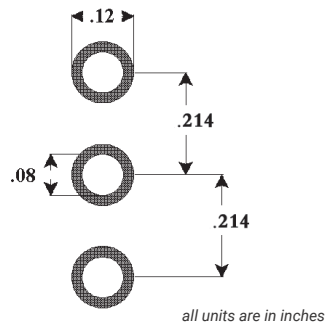
## Package Dimensions

Package TO247-3L



| POS | Inches    |      | Millimeters |       |
|-----|-----------|------|-------------|-------|
|     | Min       | Max  | Min         | Max   |
| A   | .190      | .205 | 4.83        | 5.21  |
| A1  | .090      | .100 | 2.29        | 2.54  |
| A2  | .075      | .085 | 1.91        | 2.16  |
| b   | .042      | .052 | 1.07        | 1.33  |
| b1  | .075      | .095 | 1.91        | 2.41  |
| b3  | .113      | .133 | 2.87        | 3.38  |
| c   | .022      | .027 | 0.55        | 0.68  |
| D   | .819      | .831 | 20.80       | 21.10 |
| D1  | .640      | .695 | 16.25       | 17.65 |
| D2  | .037      | .049 | 0.95        | 1.25  |
| E   | .620      | .635 | 15.75       | 16.13 |
| E1  | .516      | .557 | 13.10       | 14.15 |
| E2  | .145      | .201 | 3.68        | 5.10  |
| E3  | .039      | .075 | 1.00        | 1.90  |
| E4  | .487      | .529 | 12.38       | 13.43 |
| e   | .214 BSC  |      | 5.44 BSC    |       |
| L   | .780      | .800 | 19.81       | 20.32 |
| L1  | .161      | .173 | 4.10        | 4.40  |
| N   | 3         |      |             |       |
| ØP  | .138      | .144 | 3.51        | 3.65  |
| Q   | .216      | .236 | 5.49        | 6.00  |
| S   | .238      | .248 | 6.04        | 6.30  |
| T   | 17.5° REF |      |             |       |
| W   | 3.5° REF  |      |             |       |
| X   | 4° REF    |      |             |       |

## Recommended Solder Pad Layout





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