

# DYNAMIC CHARACTERISTICS

APT20M16B2LL\_LLL

| Symbol       | Characteristic               | Test Conditions                                                                                                   | MIN | TYP  | MAX | UNIT    |
|--------------|------------------------------|-------------------------------------------------------------------------------------------------------------------|-----|------|-----|---------|
| $C_{iss}$    | Input Capacitance            | $V_{GS} = 0V$<br>$V_{DS} = 25V$<br>$f = 1 \text{ MHz}$                                                            |     | 7220 |     | pF      |
| $C_{oss}$    | Output Capacitance           |                                                                                                                   |     | 2330 |     |         |
| $C_{rss}$    | Reverse Transfer Capacitance |                                                                                                                   |     | 145  |     |         |
| $Q_g$        | Total Gate Charge ③          | $V_{GS} = 10V$<br>$V_{DD} = 100V$<br>$I_D = 100A @ 25^\circ C$                                                    |     | 140  |     | nC      |
| $Q_{gs}$     | Gate-Source Charge           |                                                                                                                   |     | 65   |     |         |
| $Q_{gd}$     | Gate-Drain ("Miller") Charge |                                                                                                                   |     | 120  |     |         |
| $t_{d(on)}$  | Turn-on Delay Time           | <b>RESISTIVE SWITCHING</b><br>$V_{GS} = 15V$<br>$V_{DD} = 100V$<br>$I_D = 100A @ 25^\circ C$<br>$R_G = 0.6\Omega$ |     | 15   |     | ns      |
| $t_r$        | Rise Time                    |                                                                                                                   |     | 31   |     |         |
| $t_{d(off)}$ | Turn-off Delay Time          |                                                                                                                   |     | 29   |     |         |
| $t_f$        | Fall Time                    |                                                                                                                   |     | 4    |     |         |
| $E_{on}$     | Turn-on Switching Energy ⑥   | <b>INDUCTIVE SWITCHING @ 25°C</b><br>$V_{DD} = 133V, V_{GS} = 15V$<br>$I_D = 100A, R_G = 5\Omega$                 |     | 850  |     | $\mu J$ |
| $E_{off}$    | Turn-off Switching Energy    |                                                                                                                   |     | 930  |     |         |
| $E_{on}$     | Turn-on Switching Energy ⑥   | <b>INDUCTIVE SWITCHING @ 125°C</b><br>$V_{DD} = 133V, V_{GS} = 15V$<br>$I_D = 100A, R_G = 5\Omega$                |     | 935  |     |         |
| $E_{off}$    | Turn-off Switching Energy    |                                                                                                                   |     | 985  |     |         |

# SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

| Symbol   | Characteristic / Test Conditions                                    | MIN | TYP | MAX | UNIT    |
|----------|---------------------------------------------------------------------|-----|-----|-----|---------|
| $I_S$    | Continuous Source Current (Body Diode)                              |     |     | 100 | Amps    |
| $I_{SM}$ | Pulsed Source Current ① (Body Diode)                                |     |     | 400 |         |
| $V_{SD}$ | Diode Forward Voltage ② ( $V_{GS} = 0V, I_S = -I_D 100A$ )          |     |     | 1.3 | Volts   |
| $t_{rr}$ | Reverse Recovery Time ( $I_S = -I_D 100A, di_S/dt = 100A/\mu s$ )   |     | 360 |     | ns      |
| $Q_{rr}$ | Reverse Recovery Charge ( $I_S = -I_D 100A, di_S/dt = 100A/\mu s$ ) |     | 6.7 |     | $\mu C$ |
| $dv/dt$  | Peak Diode Recovery $dv/dt$ ⑤                                       |     |     | 5   | V/ns    |

# THERMAL CHARACTERISTICS

| Symbol          | Characteristic      | MIN | TYP | MAX  | UNIT         |
|-----------------|---------------------|-----|-----|------|--------------|
| $R_{\theta JC}$ | Junction to Case    |     |     | 0.18 | $^\circ C/W$ |
| $R_{\theta JA}$ | Junction to Ambient |     |     | 40   |              |

① Repetitive Rating: Pulse width limited by maximum junction temperature

② Pulse Test: Pulse width < 380  $\mu s$ , Duty Cycle < 2%

③ See MIL-STD-750 Method 3471

④ Starting  $T_J = +25^\circ C$ ,  $L = 0.60mH$ ,  $R_G = 25\Omega$ , Peak  $I_L = 100A$

⑤  $dv/dt$  numbers reflect the limitations of the test circuit rather than the device itself.  $I_S \leq -I_D 100A$   $di/dt \leq 700A/\mu s$   $V_R \leq 200V$   $T_J \leq 150^\circ C$

⑥  $E_{on}$  includes diode reverse recovery. See figures 18, 20.

⑦ The maximum current is limited by lead temperature

APT Reserves the right to change, without notice, the specifications and information contained herein.

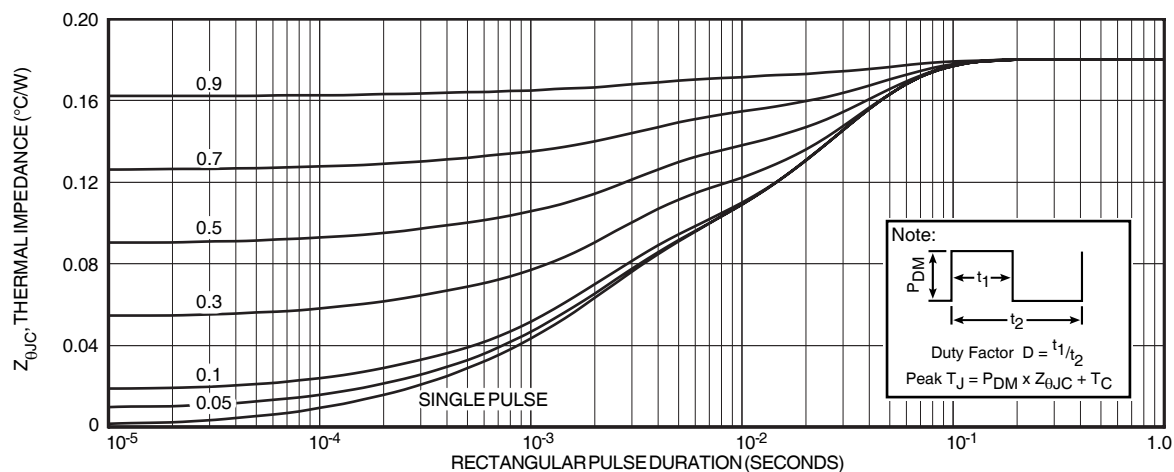


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

## Typical Performance Curves

APT20M16B2LL\_LLL

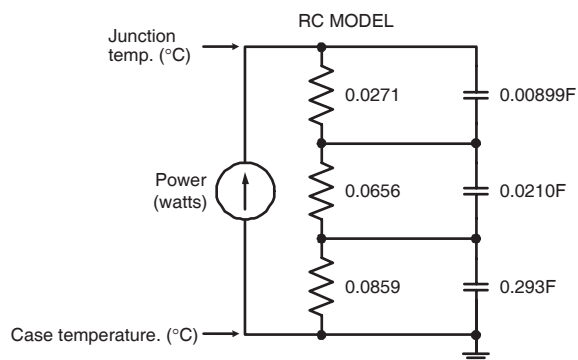


FIGURE 2, TRANSIENT THERMAL IMPEDANCE MODEL

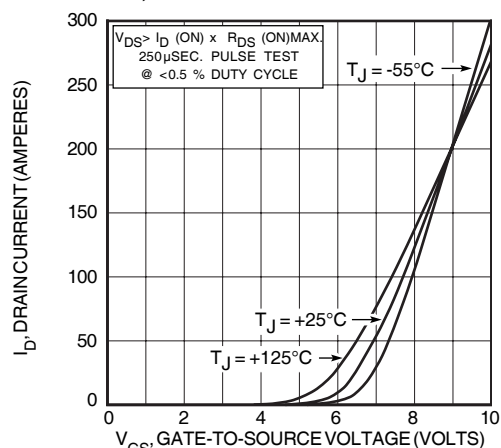


FIGURE 4, TRANSFER CHARACTERISTICS

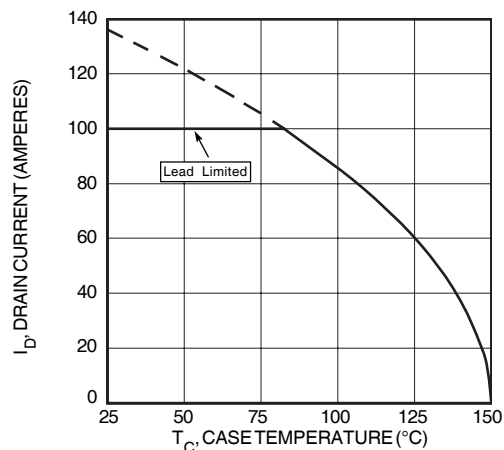


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

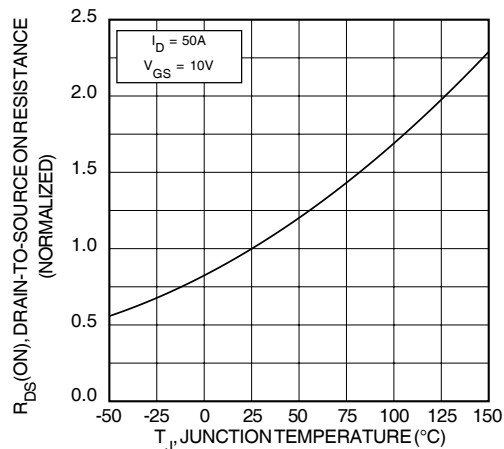


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

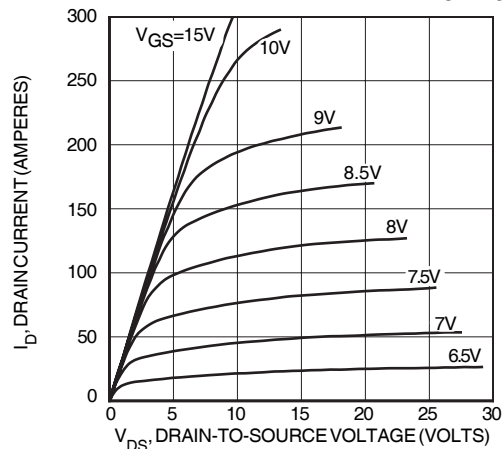


FIGURE 3, LOW VOLTAGE OUTPUT CHARACTERISTICS

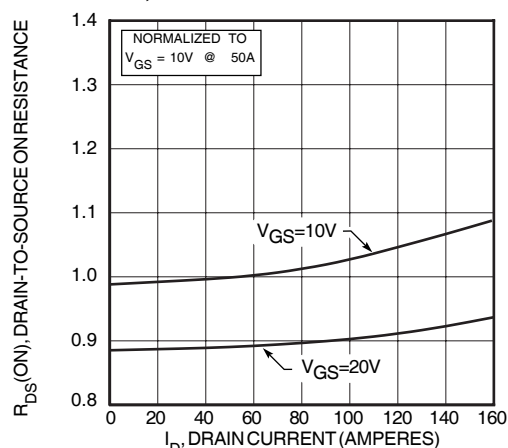


FIGURE 5,  $R_{DS(ON)}$  vs DRAIN CURRENT

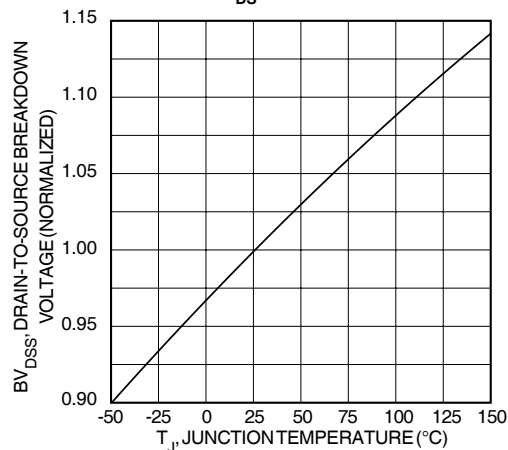


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

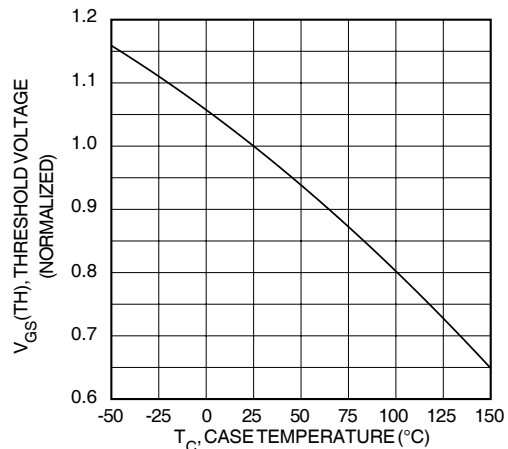


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

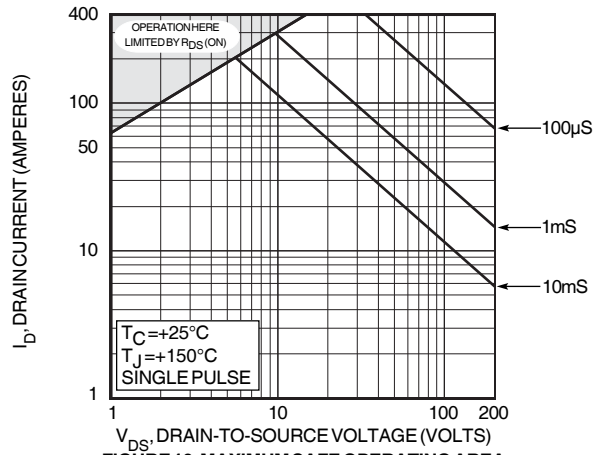


FIGURE 10, MAXIMUM SAFE OPERATING AREA

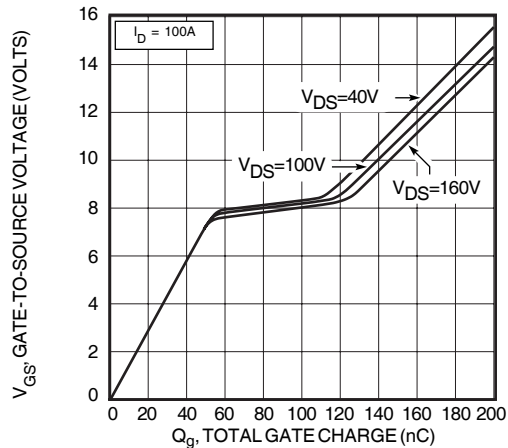


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

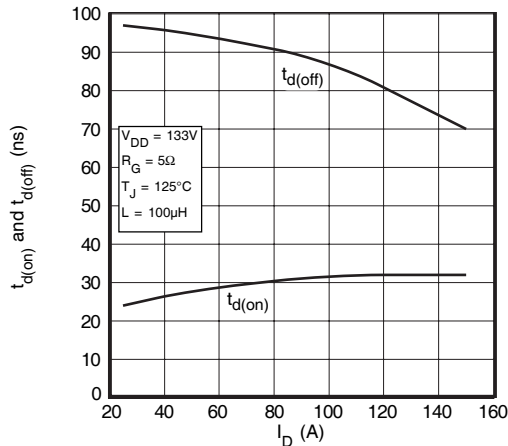


FIGURE 14, DELAY TIMES vs CURRENT

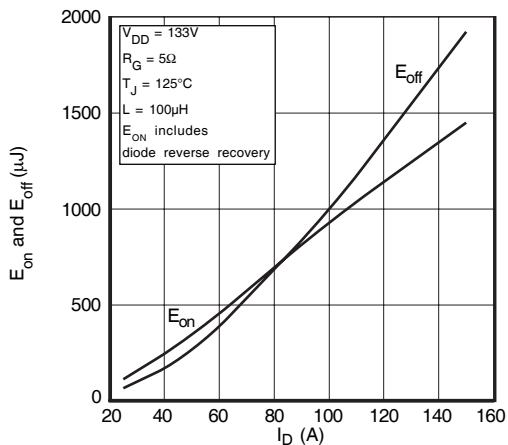


FIGURE 16, SWITCHING ENERGY vs CURRENT

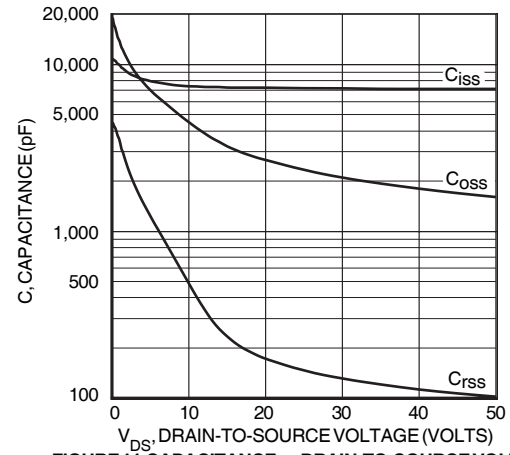


FIGURE 11, CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

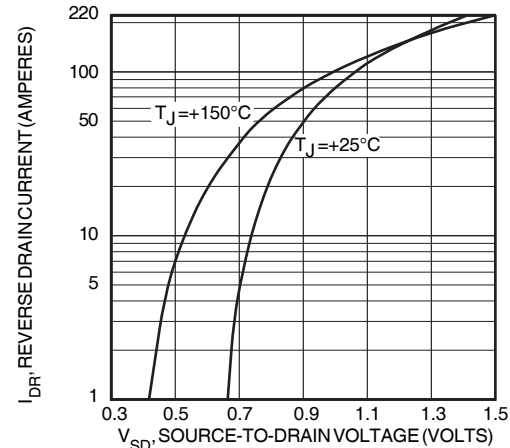


FIGURE 13, SOURCE-DRAIN DIODE FORWARD VOLTAGE

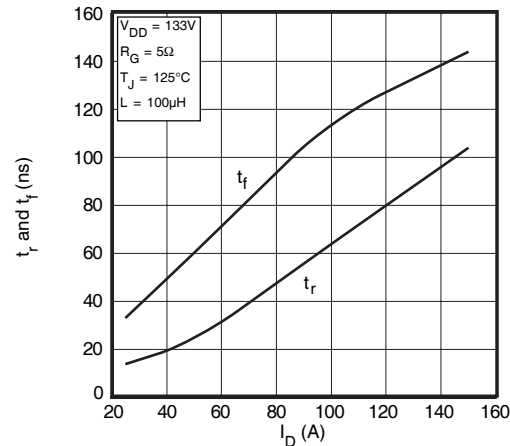


FIGURE 15, RISE AND FALL TIMES vs CURRENT

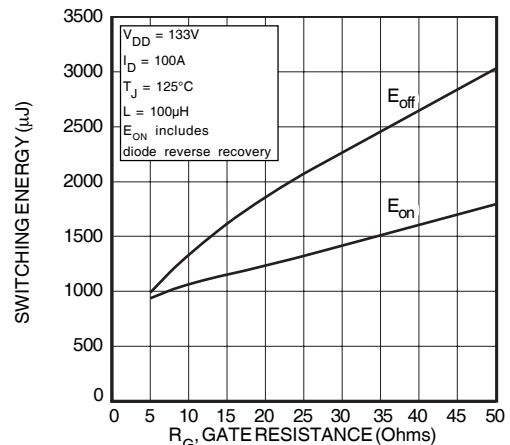


FIGURE 17, SWITCHING ENERGY vs. GATE RESISTANCE

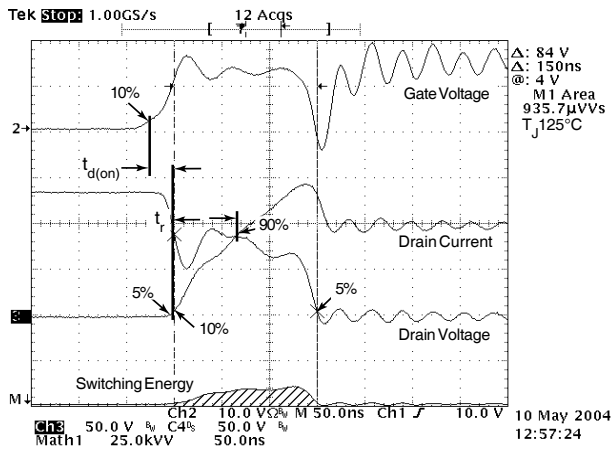


Figure 18, Turn-on Switching Waveforms and Definitions

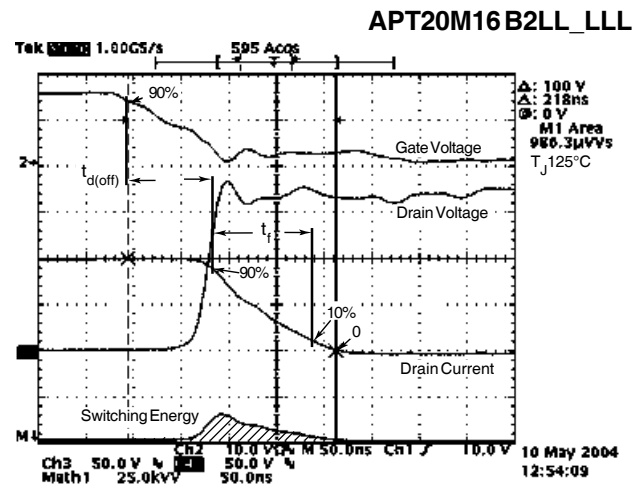


Figure 19, Turn-off Switching Waveforms and Definitions

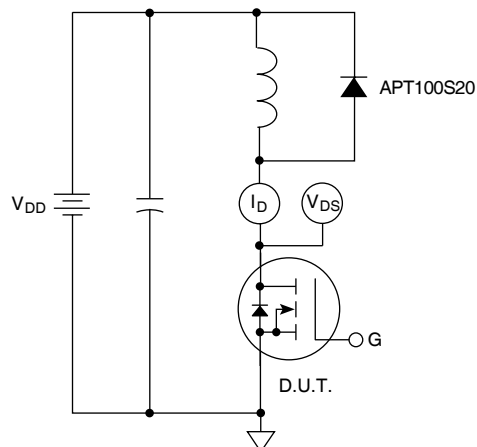
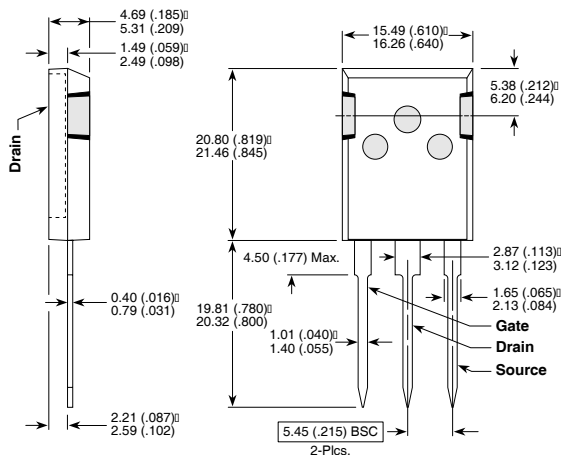


Figure 20, Inductive Switching Test Circuit

### T-MAX™ (B2) Package Outline (B2LL)



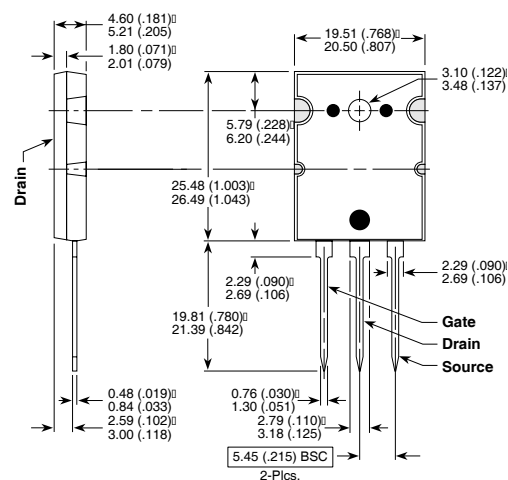
These dimensions are equal to the TO-247 without the mounting hole.

Dimensions in Millimeters and (Inches)

APT's products are covered by one or more of U.S. patents 4,895,810 5,045,903 5,089,434 5,182,234 5,019,522

5,262,336 6,503,786 5,256,583 4,748,103 5,283,202 5,231,474 5,434,095 5,528,058 and foreign patents. US and Foreign patents pending. All Rights Reserved.

### TO-264 (L) Package Outline (LLL)



Dimensions in Millimeters and (Inches)