# JMTLB138K

## Features

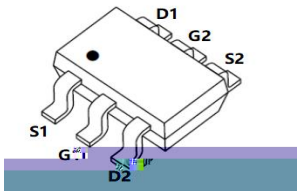
- Excellent $R_{DS(ON)}$ and Low Gate Charge
- Halogen-free; RoHS-compliant
- Pb-free plating

## Applications

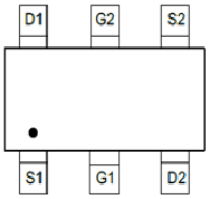
- Load Switch
- PWM Application
- Power Management

## Product Summary

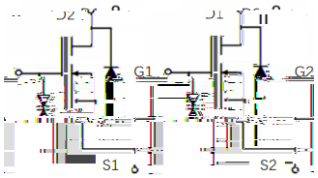
| Parameters | Value | Unit |
|---|---|---|
| $V_{DSS}$ | 60 | V |
| $V_{GS(th)_Typ}$ | 1.0 | V |
| $I_D$(@$V_{GS}$=10V) | 0.41 | A |
| $R_{DS(ON)_Typ}$(@$V_{GS}$=10V) | 805 | mΩ |
| $R_{DS(ON)_Typ}$(@$V_{GS}$=4.5V) | 871 | mΩ |




SOT-363-6L Dual top view




Pin Assignment




Schematic Diagram

## Ordering Information

| Device | Marking | MSL | Form | Package | Reel(pcs) | Per Carton (pcs) |
|---|---|---|---|---|---|---|
| JMTLB138K | B138K | 3 | Tape&Reel | SOT-363-6L | 3000 | 120000 |

## Absolute Maximum Ratings (@ $T_A$ = 25°C unless otherwise specified)

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $V_{DS}$ | Drain-to-Source Voltage | | 60 | V |
| $V_{GS}$ | Gate-to-Source Voltage | | ±20 | V |
| $I_D$ | Continuous Drain Current | $T_A$ = 25°C | 0.41 | A |
| | | $T_A$ = 100°C | 0.3 | |
| $I_{DM}$ | Pulsed Drain Current (1) | | Refer to Fig.4 | A |
| $P_D$ | Power Dissipation | $T_A$ = 25°C | 0.54 | W |
| | | $T_A$ = 100°C | 0.22 | |
| $T_J$, $T_{STG}$ | Junction & Storage Temperature Range | | -55 to 150 | °C |

## Thermal Characteristics

| Symbol | Parameter | Max | Unit |
|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient(2) | 231 | °C/W |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## Electrical Characteristics ($T_J$ = 25°C unless otherwise specified)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $V_{(BR)DSS}$ | Drain-Source Breakdown Voltage | $I_D$ = 250μA, $V_{GS}$ = 0V | 60 | - | - | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 60V, $V_{GS}$ = 0V | - | - | 1.0 | μA |
| $I_{GSS}$ | Gate-Body Leakage Current | $V_{DS}$ = 0V, $V_{GS}$ = ±20V | - | - | ±10 | μA |
| **On Characteristics** | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA | 0.6 | 1.0 | 1.6 | V |
| $R_{DS(ON)}$ | Static Drain-Source ON-Resistance(3) | $V_{GS}$ = 10, $I_D$ = 0.3A | - | 805 | 1600 | mΩ |
| | | $V_{GS}$ = 4.5V, $I_D$ = 0.2A | - | 871 | 1700 | mΩ |
| **Dynamic Characteristics** | | | | | | |
| $R_g$ | Gate Resistance | f = 1MHz | - | 6.8 | - | Ω |
| $C_{iss}$ | Input Capacitance | $V_{GS}$ = 0V, $V_{DS}$ = 30V, f = 1MHz | - | 38 | 56 | pF |
| $C_{oss}$ | Output Capacitance | | - | 5.8 | - | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | - | 2.1 | - | pF |
| $Q_g$ | Total Gate Charge | $V_{GS}$ = 0 to 10V $V_{DS}$ = 30V, $I_D$ = 1A | - | 1.7 | - | nC |
| $Q_{gs}$ | Gate Source Charge | | - | 0.3 | - | nC |
| $Q_{gd}$ | Gate Drain("Miller") Charge | | - | 0.2 | - | nC |
| | | | | | | |
| **Switching Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn-On DelayTime | $V_{GS}$ = 10V, $V_{DD}$ = 30V $I_D$= 0.3A, $R_{GEN}$ = 3Ω | - | 0.6 | - | ns |
| $t_r$ | Turn-On Rise Time | | - | 2.4 | - | ns |
| $t_{d(off)}$ | Turn-Off DelayTime | | - | 6.3 | - | ns |
| $t_f$ | Turn-Off Fall Time | | - | 9.2 | - | ns |
| **Body Diode Characteristics** | | | | | | |
| $I_S$ | Maximum Continuous Body Diode Forward Current | | - | - | 0.41 | A |
| $I_{SM}$ | Maximum Pulsed Body Diode Forward Current | | - | - | 1.6 | A |
| $V_{SD}$ | Body Diode Forward Voltage | $V_{GS}$ = 0V, $I_S$ = 0.3A | - | | 1.2 | V |
| trr | Body Diode Reverse Recovery Time | $I_F$ = 1A, di/dt = 100A/us | - | 15 | - | ns |
| Qrr | Body Diode Reverse Recovery Charge | | - | 6.1 | - | nC |

Notes:
1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
2. $R_{\theta JA}$ is measured with the device mounted on a $1inch^2$ pad of 2oz copper FR4 PCB.
3. Pulse Test: Pulse Width 300μs, Duty Cycle 0.5%.


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## Typical Performance Characteristics

Figure 1: Power De-rating

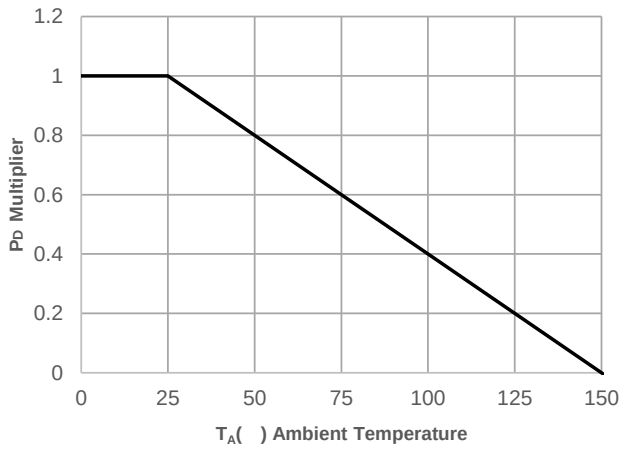



Figure 2: Current De-rating

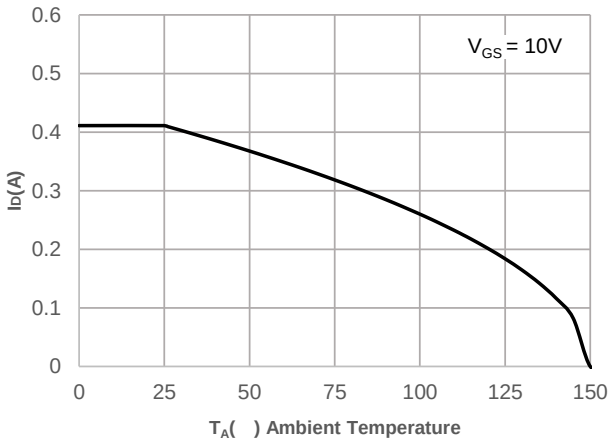



Figure 3: Normalized Maximum Transient Thermal Impedance

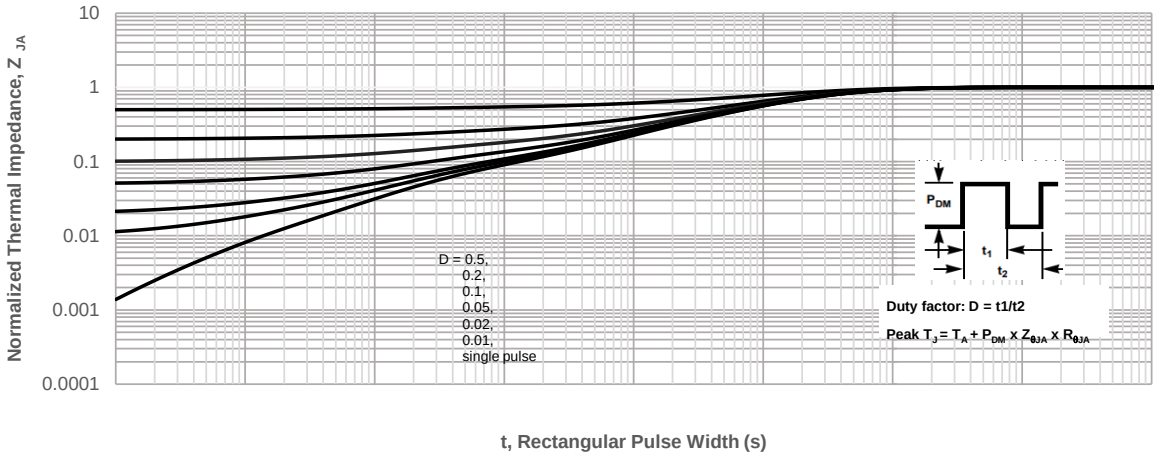
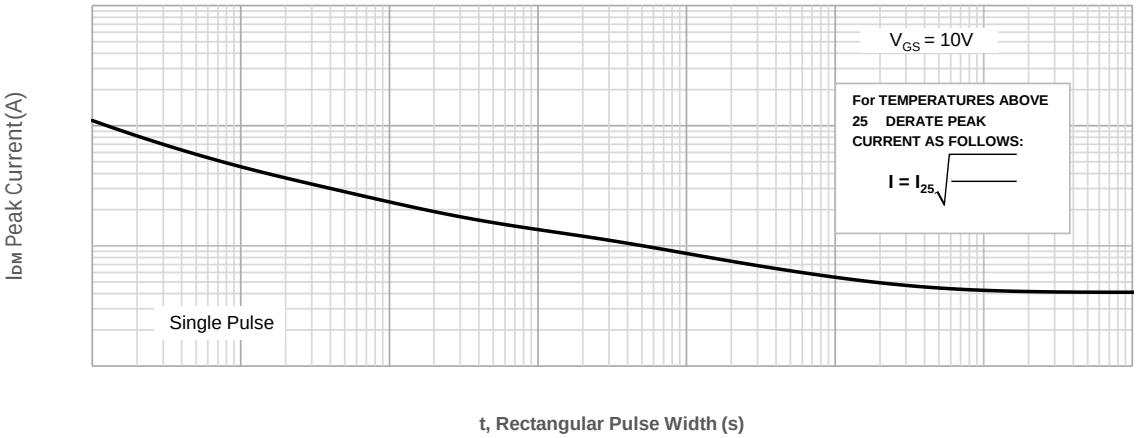



Figure 4: Peak Current Capacity





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## Typical Performance Characteristics

Figure 5: Output Characteristics

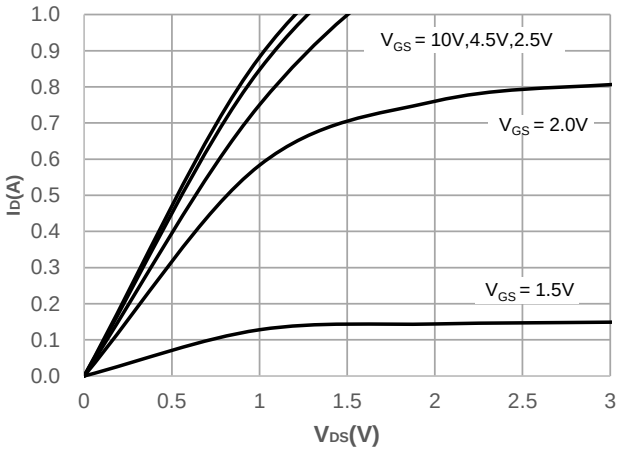



Figure 6: Typical Transfer Characteristics

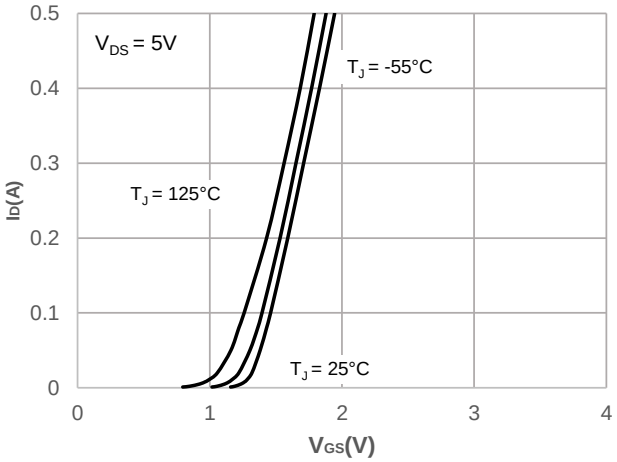
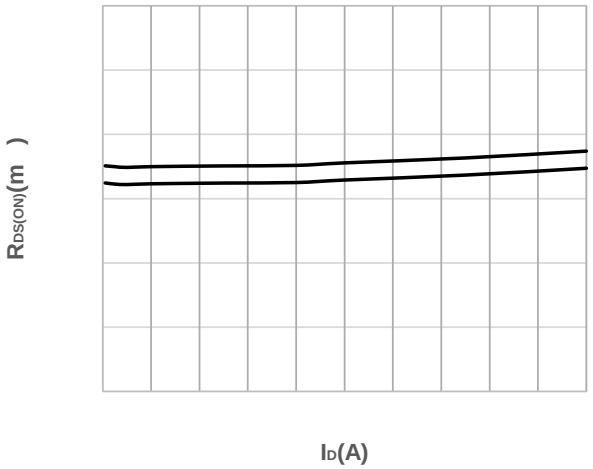



Figure 7: On-resistance vs. Drain Current



## Typical Performance Characteristics

Figure 11: Normalized Breakdown voltage vs. Junction Temperature

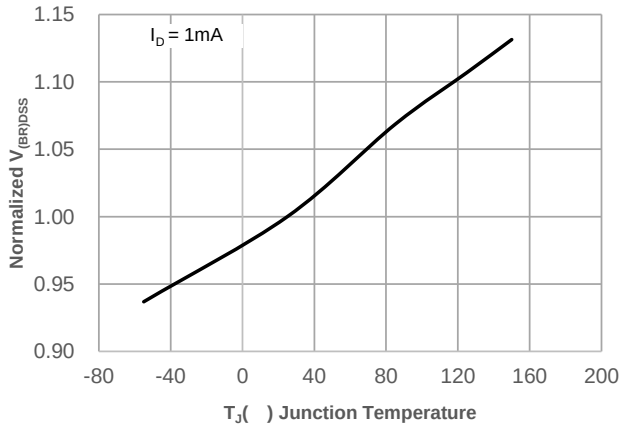



Figure 12: Normalized on Resistance vs. Junction Temperature

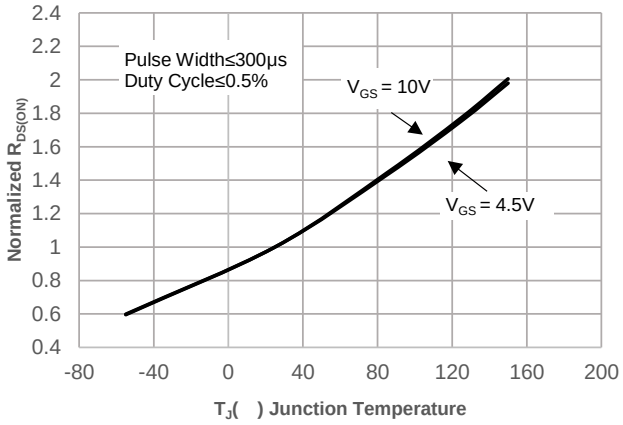



Figure 13: Normalized Threshold Voltage vs. Junction Temperature

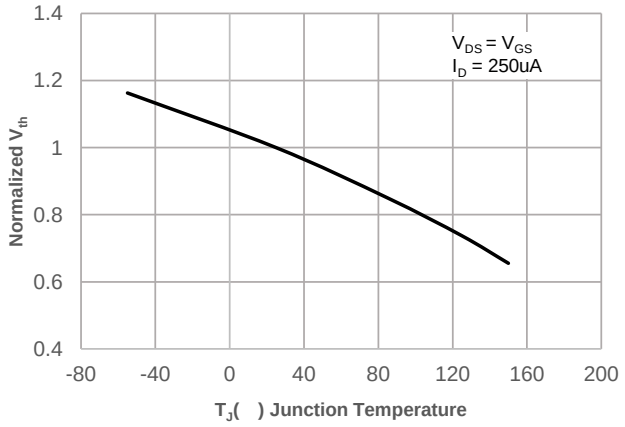



Figure 14: $R_{DS(ON)}$ vs. $V_{GS}$

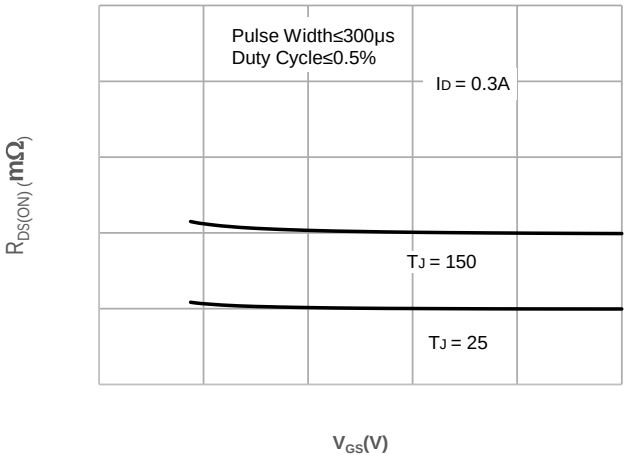
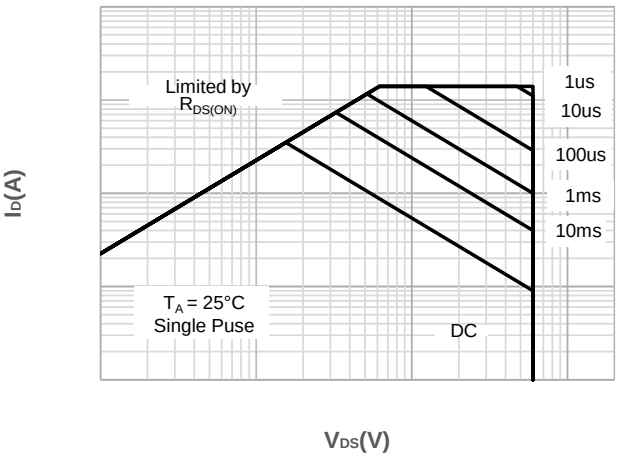



Figure 15: Maximum Safe Operating Area





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## Test Circuit

**Figure 1: Gate Charge Test Circuit & Waveform**

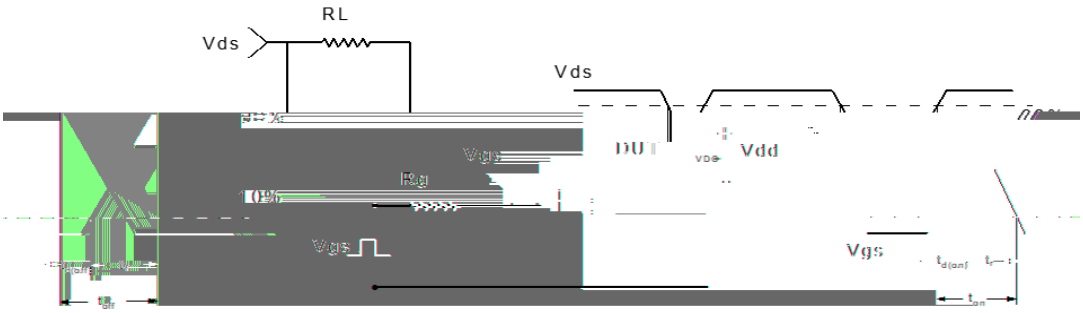


**Figure 2: Resistive Switching Test Circuit & Waveform**

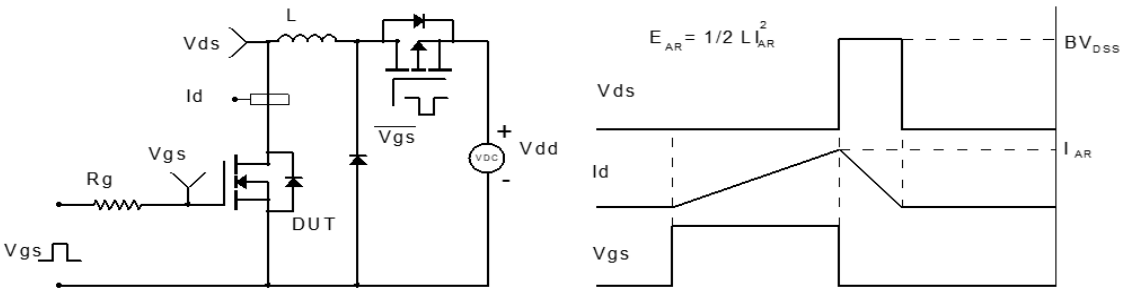


**Figure 3: Unclamped Inductive Switching Test Circuit& Waveform**

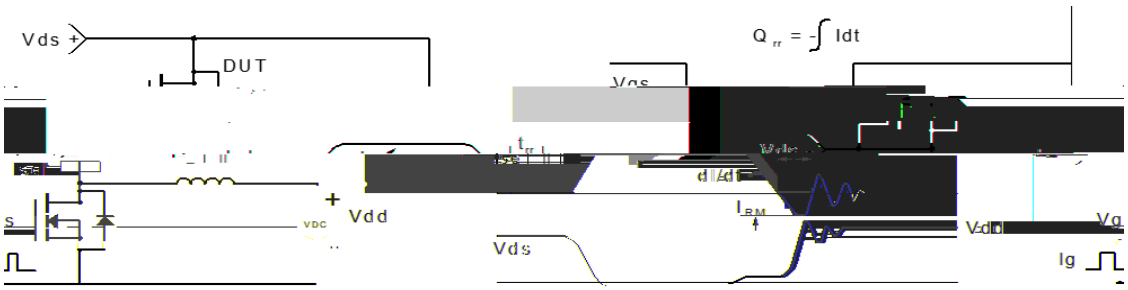


**Figure 4: Diode Recovery Test Circuit & Waveform**


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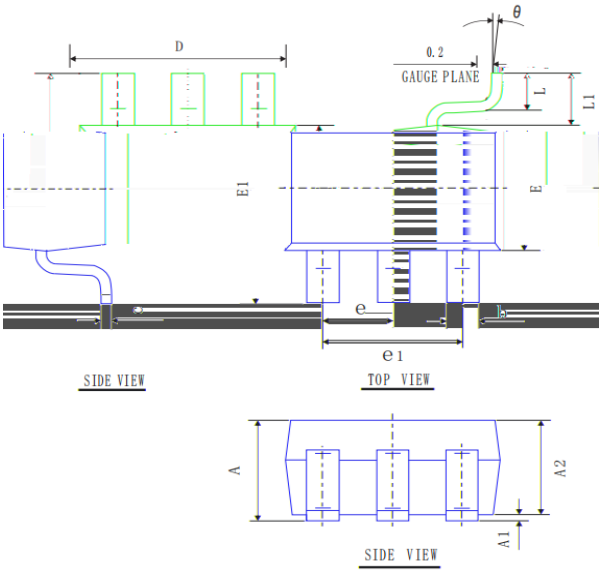
## Package Mechanical Data(SOT-363-6L)

**Package Outline**




COMMON DIMENSIONS
(UNITS OF MEASURE=mm)

| SYMBOL | MIN | NOM | MAX |
|---|---|---|---|
| [illegible] | [illegible] | [illegible] | A |
| [illegible] | [illegible] | [illegible] | A1 |
| [illegible] | [illegible] | [illegible] | A2 |
| 0.20 | 0.25 | 0.30 | b |
| 0.08 | 0.10 | 0.15 | c |
| 1.20 | 1.30 | 1.40 | e1 |
| 2.00 | 2.10 | 2.20 | D |
| 1.15 | 1.25 | 1.35 | E |
| 2.15 | 2.30 | 2.45 | E1 |
| 0.26 | 0.36 | 0.46 | L |
| 0° | 4° | 8° | θ |
| | 0.525 REF | | L1 |
| | 0.65 TYP | | e |

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