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With the principle of "Quality Parts,Customers Priority,Honest Operation,and Considerate Service",our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

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## N-Channel Power MOSFET

650V, 2.0A, 5Ω

### FEATURES

- 100% UIS & R<sub>g</sub> tested
- Pb-free plating
- Compliant to RoHS Directive 2011/65/EU and in accordance to WEE 2002/96/EC
- Halogen-free according to IEC 61249-2-21

### KEY PERFORMANCE PARAMETERS

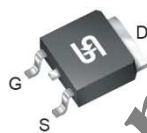
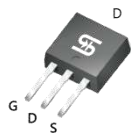
| PARAMETER                 | VALUE | UNIT |
|---------------------------|-------|------|
| V <sub>DS</sub>           | 650   | V    |
| R <sub>DS(on)</sub> (max) | 5     | Ω    |
| Q <sub>g</sub>            | 13    | nC   |

### APPLICATION

- Power Supply
- AC/DC LED Lighting



TO-251 (IPAK SL)      TO-252 (DPAK)



**Notes:** MSL 3 (Moisture Sensitivity Level) for TO-252 (D-PAK) per J-STD-020

### ABSOLUTE MAXIMUM RATINGS (T<sub>v</sub> = 25°C unless otherwise noted)

| PARAMETER  | SYMBOL                            | LIMIT                  | UNIT |
|--|-----------------------------------|------------------------|------|
| Drain-Source Voltage                             | V <sub>DS</sub>                   | 650                    | V    |
| Gate-Source Voltage                              | V <sub>GS</sub>                   | ±20                    | V    |
| Continuous Drain Current                         | I <sub>D</sub>                    | T <sub>C</sub> = 25°C  | 2.0  |
|  |                                   | T <sub>C</sub> = 100°C | 1.4  |
| Pulsed Drain Current (Note 1)                    | I <sub>DM</sub>                   | 8.0                    | A    |
| Total Power Dissipation @ T <sub>C</sub> = 25°C  | P <sub>DTOT</sub>                 | 65                     | W    |
| Single Pulsed Avalanche Energy (Note 2)          | E <sub>AS</sub>                   | 25                     | mJ   |
| Single Pulsed Avalanche Current (Note 2)         | I <sub>AS</sub>                   | 1.6                    | A    |
| Operating Junction and Storage Temperature Range | T <sub>J</sub> , T <sub>STG</sub> | - 55 to +150           | °C   |

### THERMAL PERFORMANCE

| PARAMETER                              | SYMBOL           | LIMIT | UNIT |
|--|------------------|-------|------|
| Junction to Case Thermal Resistance    | R <sub>θJC</sub> | 1.9   | °C/W |
| Junction to Ambient Thermal Resistance | R <sub>θJA</sub> | 62.5  | °C/W |

**Notes:** R<sub>θJA</sub> is the sum of the junction-to-case and case-to-ambient thermal resistances. The case thermal reference is defined at the solder mounting surface of the drain pins. R<sub>θJA</sub> is guaranteed by design while R<sub>θCA</sub> is determined by the user's board design. R<sub>θJA</sub> shown below for single device operation on FR-4 PCB in still air.

| <b>ELECTRICAL SPECIFICATIONS</b> ( $T_A = 25^\circ\text{C}$ unless otherwise noted) |   |              |     |      |           |          |
|---|---|--------------|-----|------|-----------|----------|
| PARAMETER   | CONDITIONS  | SYMBOL       | MIN | TYP  | MAX       | UNIT     |
| <b>Static</b> (Note 3)  |   |              |     |      |           |          |
| Drain-Source Breakdown Voltage  | $V_{GS} = 0V, I_D = 250\mu A$                           | $BV_{DSS}$   | 650 | --   | --        | V        |
| Gate Threshold Voltage  | $V_{DS} = V_{GS}, I_D = 250\mu A$                       | $V_{GS(TH)}$ | 2   | 2.5  | 4         | V        |
| Gate Body Leakage   | $V_{GS} = \pm 20V, V_{DS} = 0V$                         | $I_{GSS}$    | --  | --   | $\pm 100$ | nA       |
| Zero Gate Voltage Drain Current   | $V_{DS} = 650V, V_{GS} = 0V$                            | $I_{DSS}$    | --  | --   | 10        | $\mu A$  |
| Drain-Source On-State Resistance  | $V_{GS} = 10V, I_D = 1A$                                | $R_{DS(ON)}$ | --  | 4    | 5         | $\Omega$ |
| Forward Transfer Conductance  | $V_{DS} = 10V, I_D = 1A$                                | $g_{fs}$     | --  | 2.5  | --        | S        |
| <b>Dynamic</b> (Note 4)   |   |              |     |      |           |          |
| Total Gate Charge   | $V_{DS} = 520V, I_D = 2A, V_{GS} = 10V$                 | $Q_g$        | --  | 13   | --        | nC       |
| Gate-Source Charge  |   | $Q_{gs}$     | --  | 2.2  | --        |          |
| Gate-Drain Charge   |   | $Q_{gd}$     | --  | 5    | --        |          |
| Input Capacitance   | $V_{DS} = 25V, V_{GS} = 0V, F = 1.0\text{MHz}$          | $C_{iss}$    | --  | 390  | --        | pF       |
| Output Capacitance  |   | $C_{oss}$    | --  | 31   | --        |          |
| Reverse Transfer Capacitance  |   | $C_{rs}$     | --  | 8    | --        |          |
| Gate Resistance   | $f = 1.0\text{MHz}, \text{open drain}$                  | $R_g$        | 0.8 | 2.5  | 7.5       | $\Omega$ |
| <b>Switching</b> (Note 5)   |   |              |     |      |           |          |
| Turn-On Delay Time  | $V_{GS} = 10V, I_D = 2A, V_{DD} = 325V, R_G = 25\Omega$ | $t_{d(on)}$  | --  | 8.2  | --        | ns       |
| Turn-On Rise Time   |   | $t_r$        | --  | 23.2 | --        |          |
| Turn-Off Delay Time   |   | $t_{d(off)}$ | --  | 38   | --        |          |
| Turn-Off Fall Time  |   | $t_f$        | --  | 27   | --        |          |
| <b>Source-Drain Diode</b> (Note 3)  |   |              |     |      |           |          |
| Diode Forward Voltage   | $I_D = 2A, V_{GS} = 0V$                                 | $V_{SD}$     | --  | --   | 1.2       | V        |

**Notes:**

- Pulse width limited by the maximum junction temperature
- $L = 20\text{mH}, I_{AS} = 1.6A, V_{DD} = 50V, R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
- Pulse test:  $PW \leq 300\mu s$ , duty cycle  $\leq 2\%$
- For DESIGN AID ONLY, not subject to production testing.
- Essentially Independent of Operating Temperature.

**ORDERING INFORMATION**

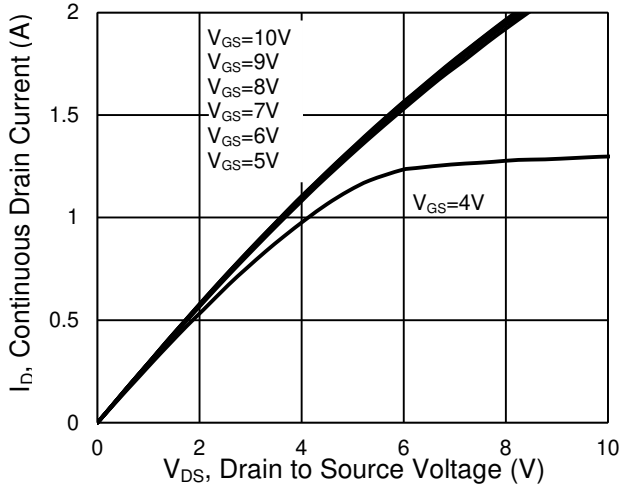
| <b>PART NO.</b> | <b>PACKAGE</b> | <b>PACKING</b>      |
|-----------------|----------------|---------------------|
| TSM2NB65CH X0G  | TO-251S        | 75pcs / Tube        |
| TSM2NB65CP ROG  | TO-252         | 2,500pcs / 13" Reel |

*Not Recommended*

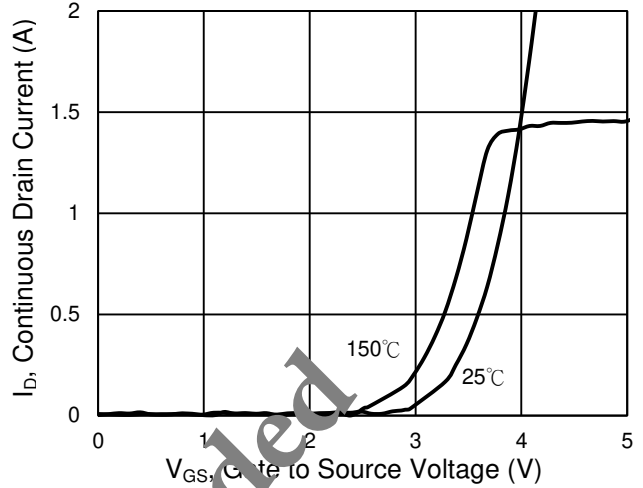
**CHARACTERISTICS CURVES**

( $T_C = 25^\circ\text{C}$  unless otherwise noted)

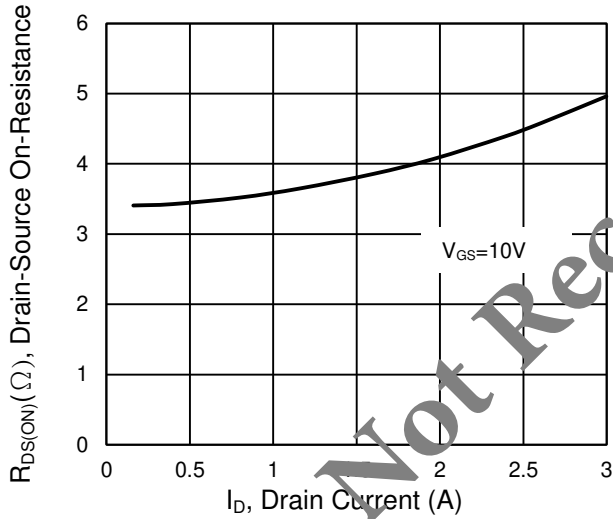
**Output Characteristics**



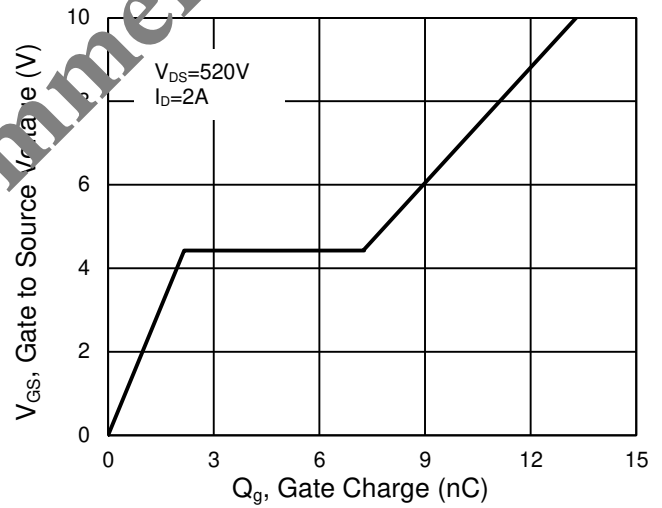
**Transfer Characteristics**



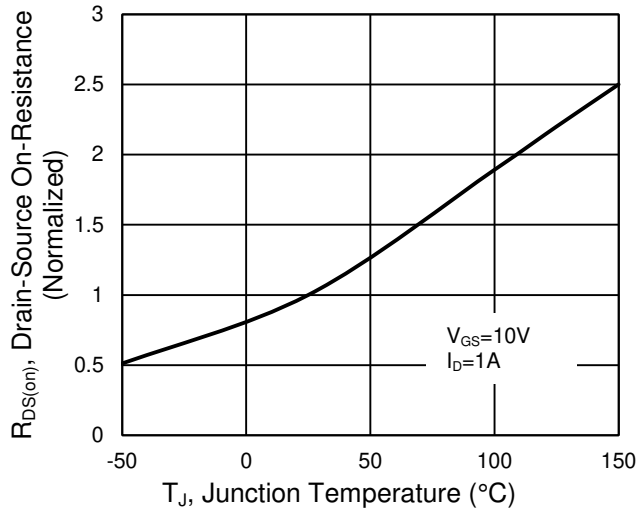
**On-Resistance vs. Drain Current**



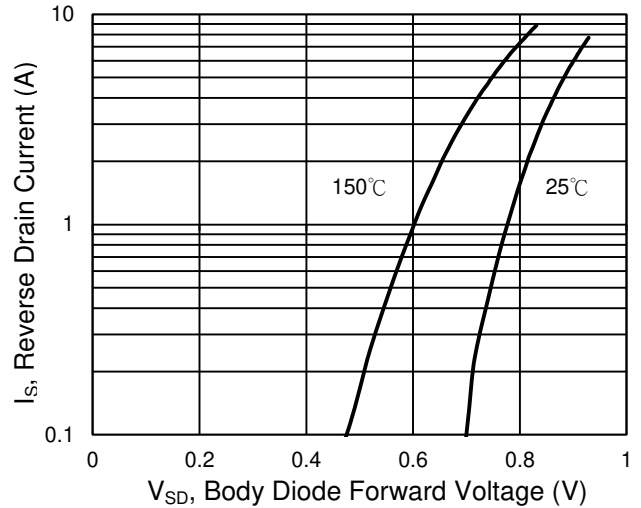
**Gate-Source Voltage vs. Gate Charge**



**On-Resistance vs. Junction Temperature**

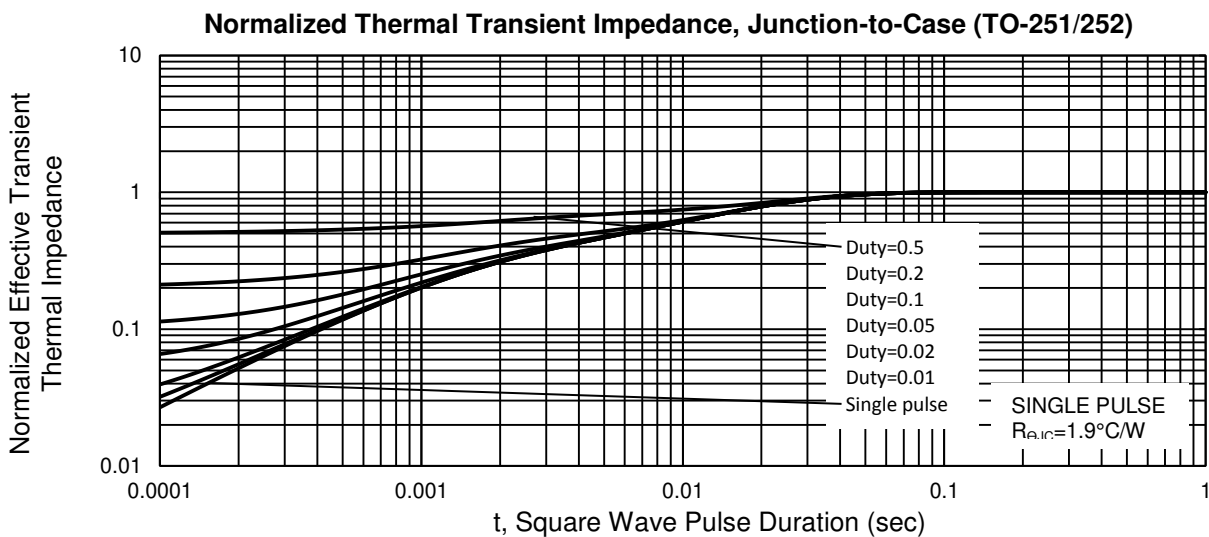
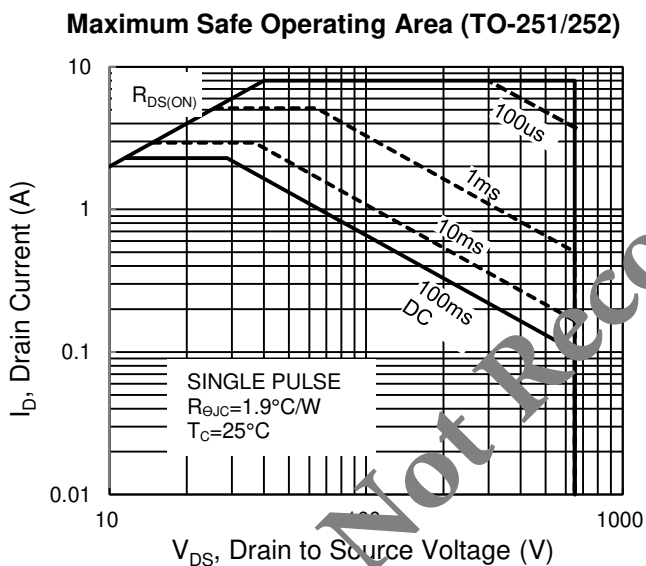
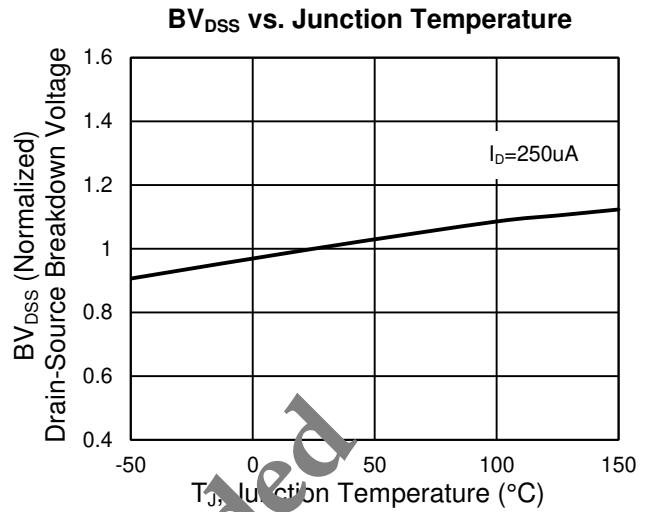
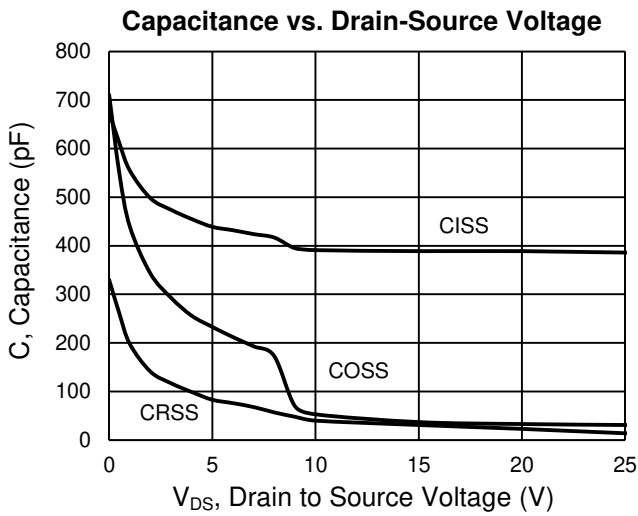


**Source-Drain Diode Forward Current vs. Voltage**



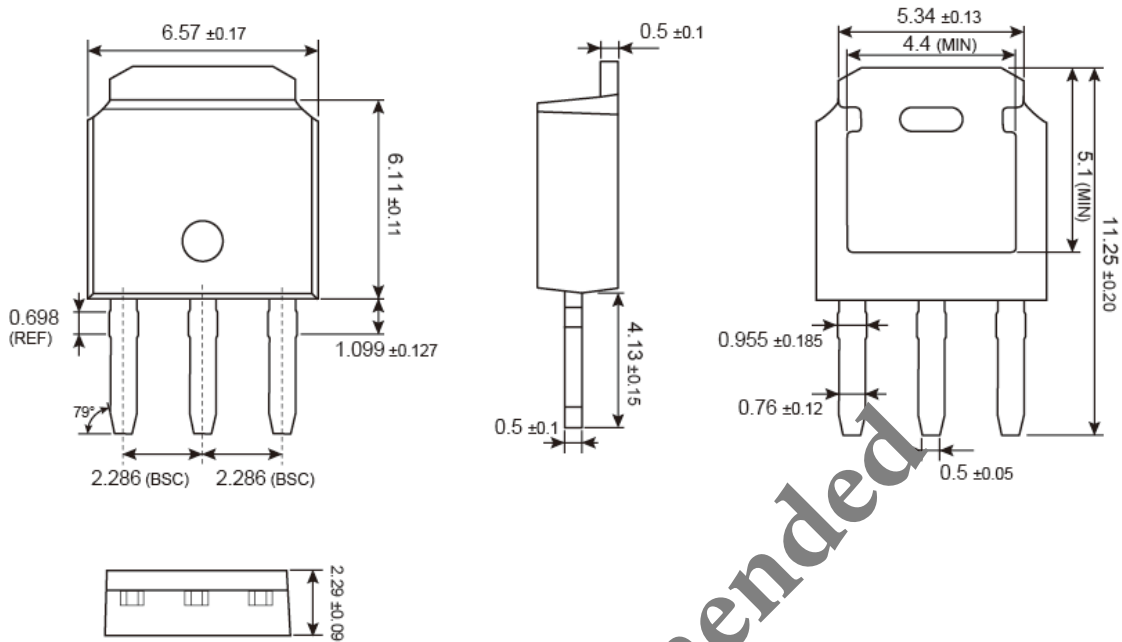
**CHARACTERISTICS CURVES**

( $T_C = 25^\circ\text{C}$  unless otherwise noted)



**PACKAGE OUTLINE DIMENSIONS** (Unit: Millimeters)

**TO-251S**



**MARKING DIAGRAM**

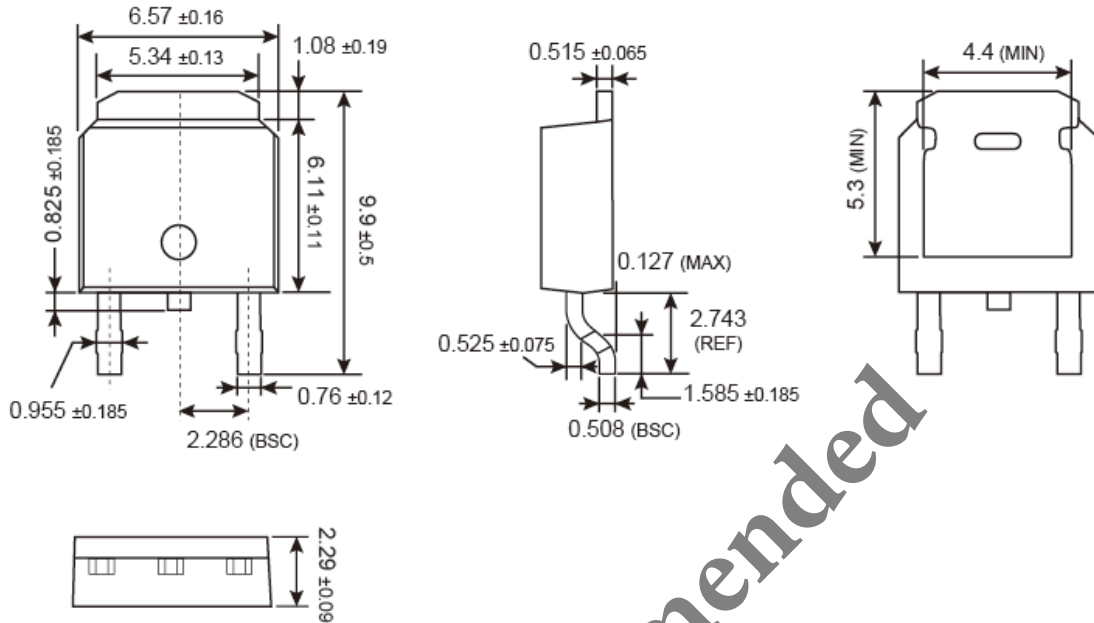


- Y** = Year Code
- M** = Month Code for Halogen Free Product
  - O** =Jan
  - P** =Feb
  - Q** =Mar
  - R** =Apr
  - S** =May
  - T** =Jun
  - U** =Jul
  - V** =Aug
  - W** =Sep
  - X** =Oct
  - Y** =Nov
  - Z** =Dec
- L** = Lot Code (1-9, A-Z)

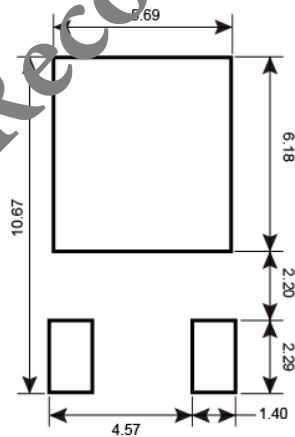
Not Recommended

**PACKAGE OUTLINE DIMENSIONS** (Unit: Millimeters)

**TO-252**



**SUGGESTED PAD LAYOUT** (Unit: Millimeters)



**MARKING DIAGRAM**



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**Not Recommended**

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