Prisemi®

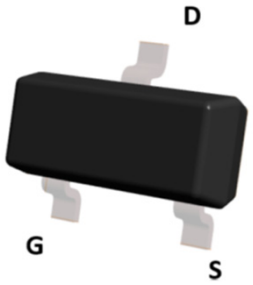
# PNM3T02R12L

## N-Channel MOSFET

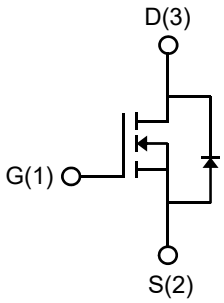
## Description

The PNM3T02R12L uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. This device is suitable for use as a load switch or in PWM applications.

| MOSFET Product Summary | | |
|---|---|---|
| $V_{DS}$(V) | $R_{DS(on)}$(mΩ)(Typ) | $I_D$(A) |
| 20 | 10@ $V_{GS}$ = 4.5V | 9.5 |
| | 12.2@ $V_{GS}$ = 2.5V | |




SOT23-3L



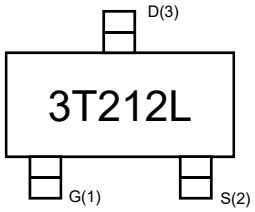

## Feature

- High Power and current handing capability
- Lead free product is acquired
- Surface Mount Package

## Applications

- PWM applications
- Load switch
- Power management
- DC-DC Converters
- Wireless Chargers

**Circuit Diagram**




**Marking (Top View)**

## Absolute maximum rating@25℃

| Rating | | Symbol | Value | Units |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 20 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±10 | V |
| Drain Current-Continuous[1] | $T_C$=25℃ | $I_D$ | 9.5 | A |
| | $T_C$=100℃ | | 6 | |
| Pulsed Drain Current[2] | | $I_{DM}$ | 38 | A |
| Total Power Dissipation[3] | | $P_D$ | 1.64 | W |
| Avalanche Current[4] | | $I_{AS}$ | 27.8 | A |
| Avalanche Energy[4] | | $E_{AS}$ | 38.6 | mJ |
| Thermal Resistance Junction-to-Case[5] | | $R_{\theta JC}$ | 17.1 | ℃/W |
| Thermal Resistance Junction-to-Ambient[6] | | $R_{\theta JA}$ | 76.4 | ℃/W |
| Junction and Storage Temperature Range | | $T_J$,$T_{STG}$ | -55 to 150 | ℃ |

## Electrical characteristics per line@25℃ (unless otherwise specified)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$= 0V, $I_D$= 250μA | 20 | - | - | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=20V,$V_{GS}$= 0V | - | - | 1.0 | μA |
| Gate-Body Leakage Current | $I_{GSS}$ | $V_{GS}$= ±10V, $V_{DS}$= 0V | - | - | ±100 | nA |
| **On Characteristics** | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$= $V_{GS}$, $I_D$= 250μA | 0.5 | 0.65 | 1.1 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}$=4.5V, $I_D$=6A | - | 10 | 13 | mΩ |
| | | $V_{GS}$=2.5V, $I_D$=5A | - | 12.2 | 16 | |
| **Dynamic Characteristics**[5)] | | | | | | |
| Input Capacitance | $C_{lss}$ | $V_{DS}$= 10V,$V_{GS}$= 0V f= 1MHz | - | 1068 | - | pF |
| Output Capacitance | $C_{oss}$ | | - | 192 | - | |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 179 | - | |
| **Switching Characteristics**[5)] | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DS}$ = 10V, $V_{GS}$ = 4.5V, $R_G$ = 6Ω,$I_D$ = 6A | - | 6.5 | - | ns |
| Turn-on Rise Time | $t_r$ | | - | 14.5 | - | |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 40.7 | - | |
| Turn-Off Fall Time | $t_f$ | | - | 25.8 | - | |
| Total Gate Charge | $Q_g$ | $V_{DS}$ = 16V, $V_{GS}$ = 4.5V, $I_D$ = 6A | - | 15 | - | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 2.3 | - | |
| Gate-Drain Charge | $Q_{gd}$ | | - | 4.9 | - | |
| Gate Resistance | $R_g$ | f=1MHz, Open Drain | - | 2.0 | - | Ω |
| **Drain-Source Diode Characteristics** | | | | | | |
| Diode Forward Voltage | $V_{SD}$ | $V_{GS}$= 0V,$I_S$= 5A | - | 0.75 | 1.2 | V |
| Reverse Recovery Time | $T_{rr}$ | $I_F$=1A,$d_i/d_t$=100A/μs | - | 12.6 | - | ns |
| Reverse Recovery Charge | $Q_{rr}$ | | - | 3.5 | - | nC |

Notes:
1. Computed continuous current assumes the condition of $T_{J\_Max}$ while the actual continuous current depends on the thermal & electro-mechanical application board design.
2. Repetitive Rating: Pulse width limited by maximum junction temperature($T_{J\_Max}$=150℃).
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. This single-pulse measurement was taken under the following condition [L=0.1mH,$V_{GS}$=4.5V,$V_{DS}$=10V]while it's value is limited by $T_{J\_Max}$=150℃.
5. Device mounted on infinite heatsink.
6. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper pad layout.
7. Guaranteed by design, not subject to production.

## Typical Characteristics

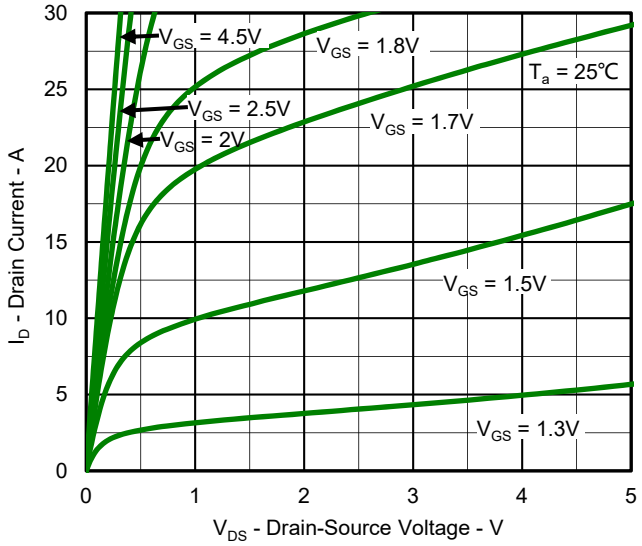



**Fig.1 Output Characteristics**

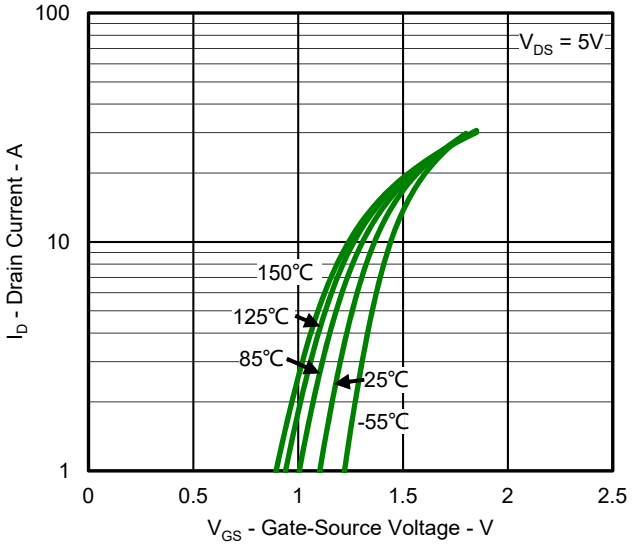



**Fig.2 Typical Transfer Characteristic**

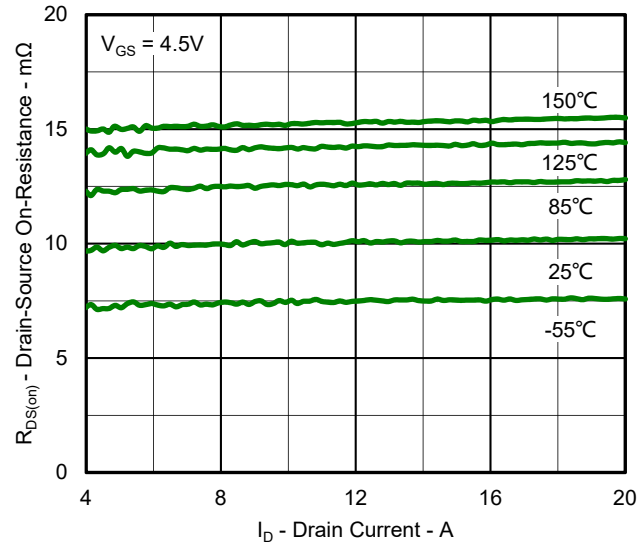



**Fig.3 Typical On-Resistance vs Drain Current and Temperature**

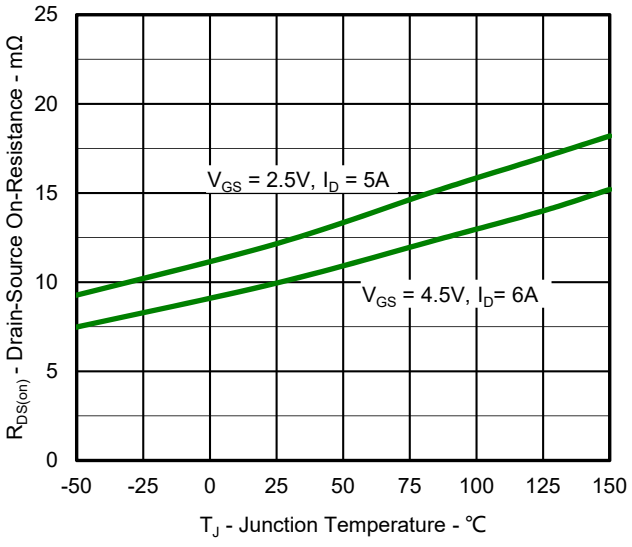



**Fig.4 On-Resistance Variation with Temperature**

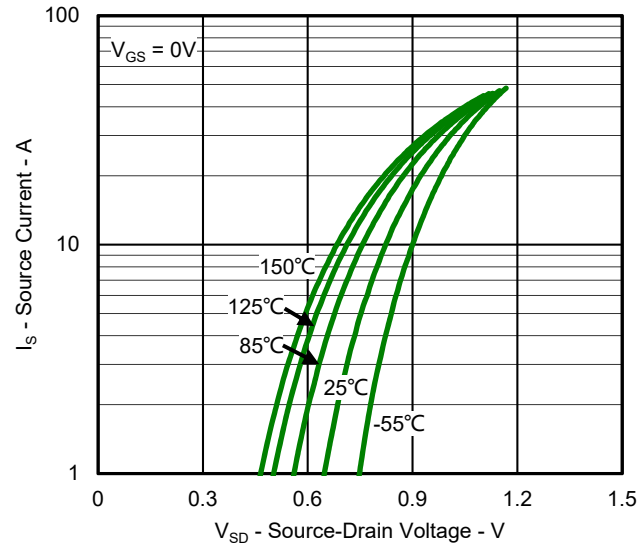



**Fig.5 Diode Forward Voltage vs. Current**

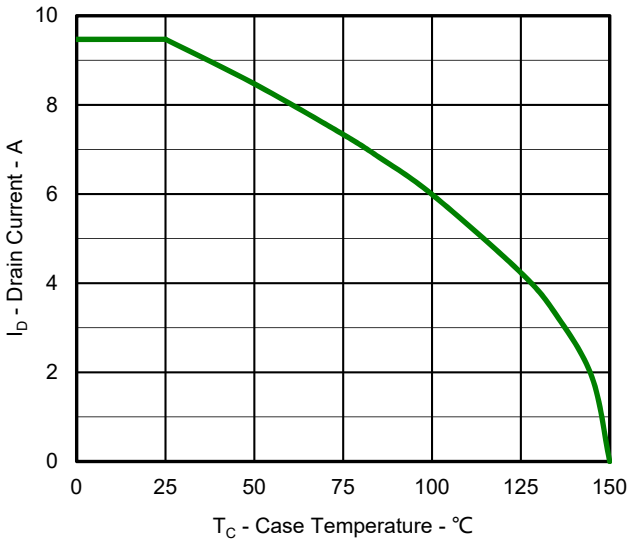



**Fig.6 Maximum Drain Current vs. Case Temperature**

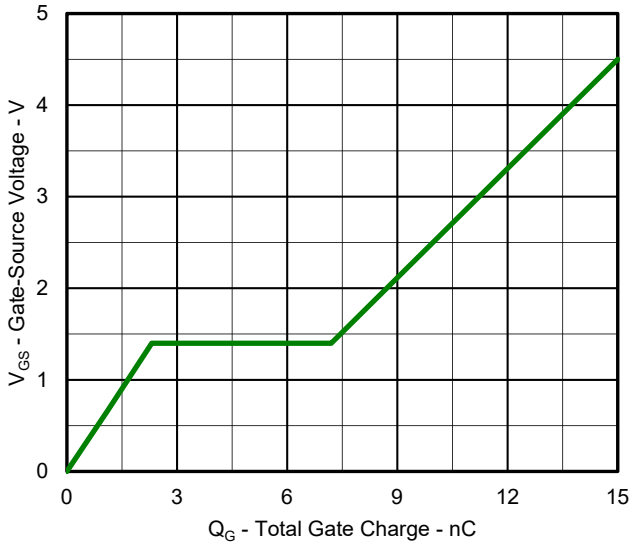



**Fig.7 Gate Charge Characteristics**

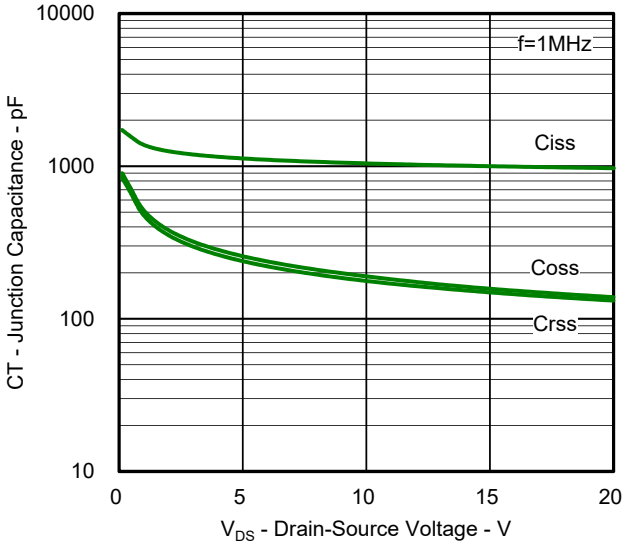



**Fig.8 Typical Junction Capacitance**

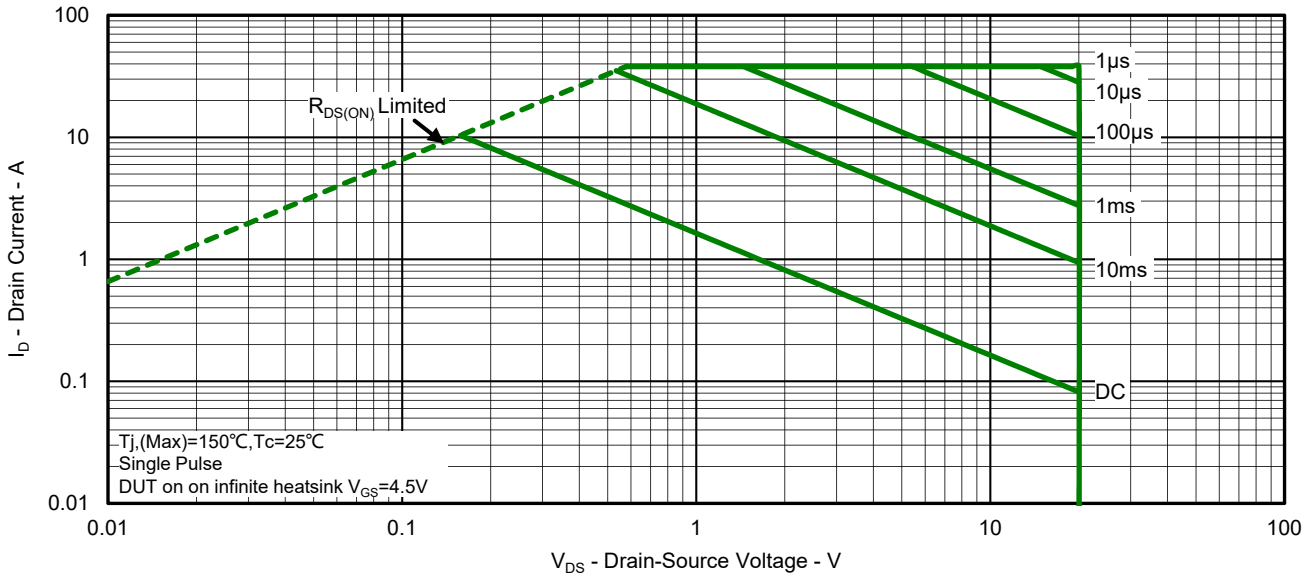



**Fig.9 Safe Operation Area**

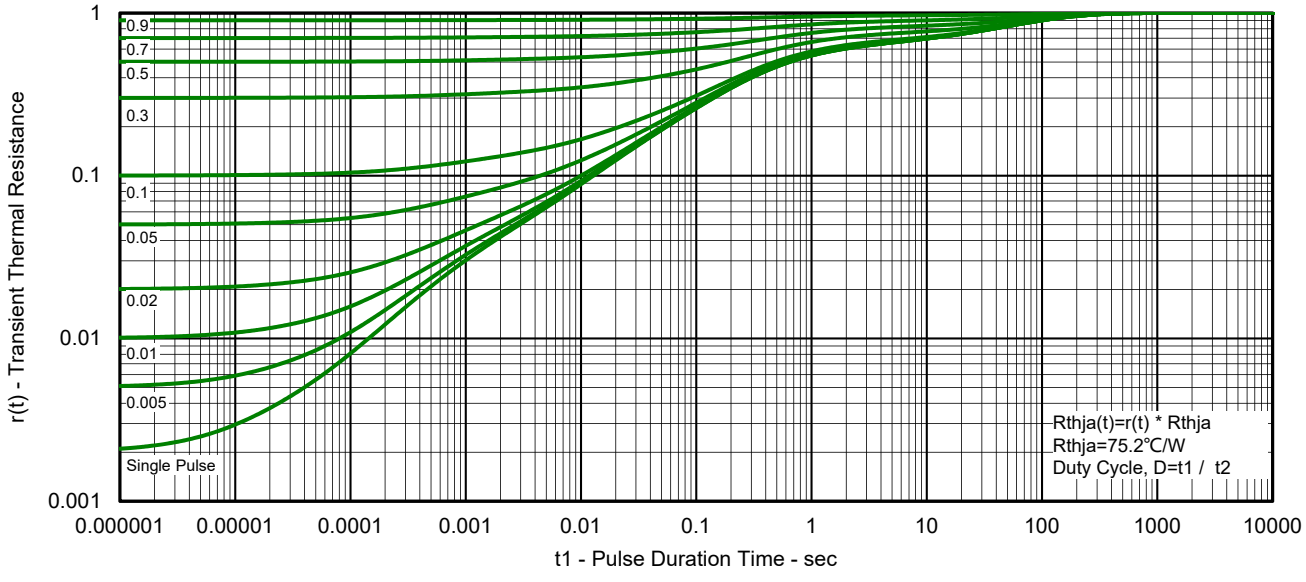
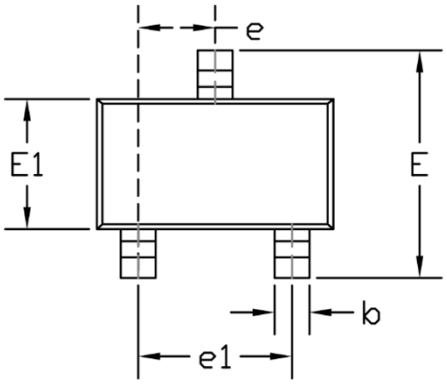
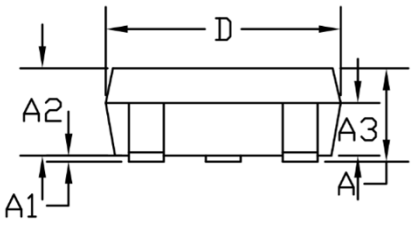



**Fig.10 Transient Thermal Resistance**

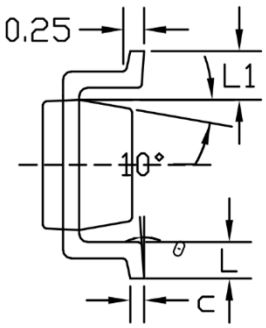
## Product Dimension (SOT23-3L)



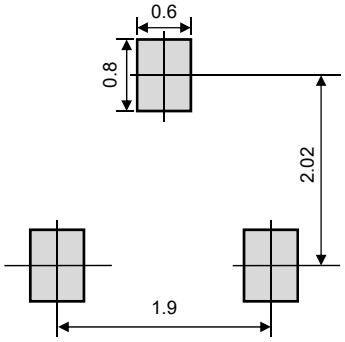

TOP VIEW




FORNT VIEW




SIDE VIEW




Suggested PCB Layout

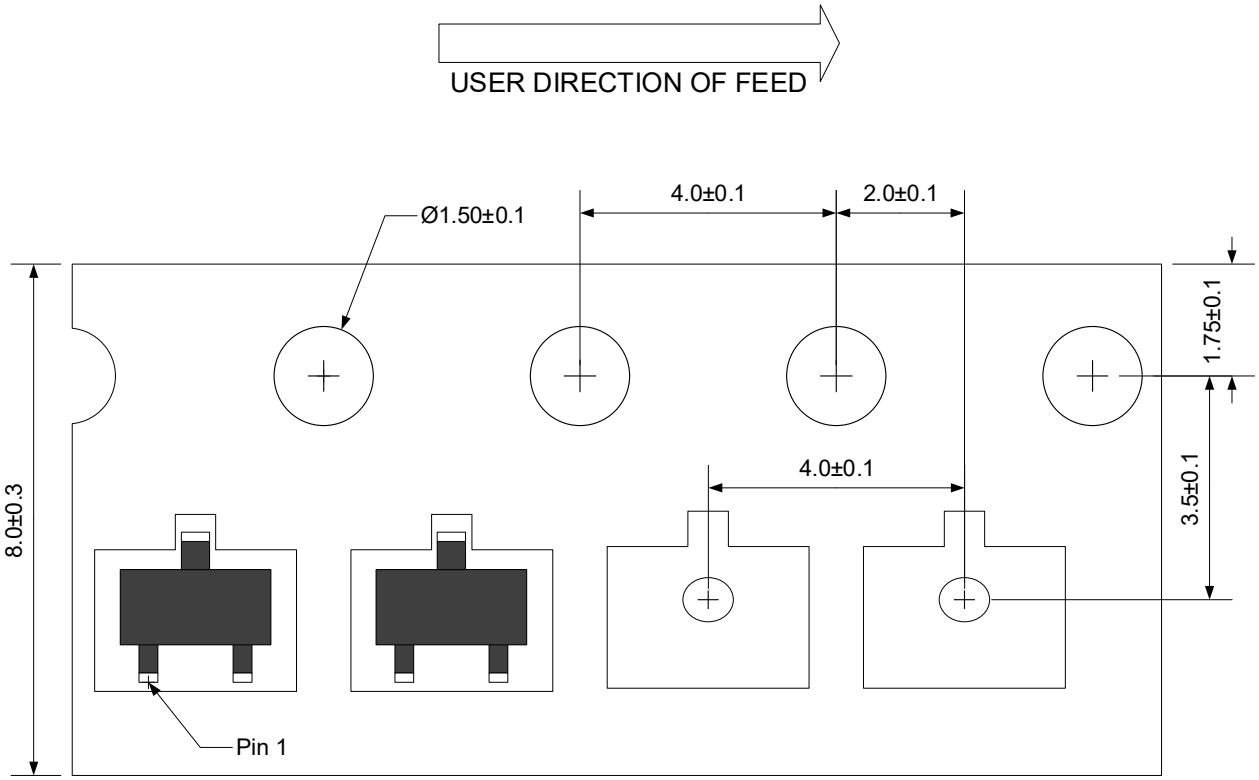
Unit: mm

| Dim | Millimeters | | Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 1.05 | 1.35 | 0.041 | 0.053 |
| A1 | 0.01 | 0.15 | 0.000 | 0.006 |
| A2 | 1.00 | 1.20 | 0.039 | 0.047 |
| A3 | 0.60 | 0.70 | 0.024 | 0.028 |
| b | 0.30 | 0.40 | 0.012 | 0.016 |
| c | 0.14 | 0.20 | 0.006 | 0.008 |
| D | 2.82 | 3.02 | 0.111 | 0.119 |
| E | 2.80 | 3.00 | 0.110 | 0.118 |
| E1 | 1.50 | 1.70 | 0.059 | 0.067 |
| L | 0.32 | 0.52 | 0.013 | 0.020 |
| e | 0.90 | 1.00 | 0.035 | 0.039 |
| e1 | 1.85 | 1.95 | 0.073 | 0.077 |
| θ | 0° | 8° | 0° | 8° |
| L1 | 0.645 REF | | 0.025 REF | |

## Ordering Information

| Package | Reel | Shipping |
|---|---|---|
| SOT-23 | 7" | 3000 / Tape & Reel |

## Load With Information




Unit:mm

**IMPORTANT NOTICE**

Prisemi® and Prisemi® are registered trademarks of **Prisemi Electronics Co., Ltd** (Prisemi**),** Prisemi reserves the right to make changes without further notice to any products herein. Prisemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Prisemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. “Typical” parameters which may be provided in Prisemi data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including “Typicals” must be validated for each customer application by customer’s technical experts. Prisemi does not convey any license under its patent rights nor the rights of others. The products listed in this document are designed to be used with ordinary electronic equipment or devices, Should you intend to use these products with equipment or devices which require an extremely high level of reliability and the malfunction of with would directly endanger human life (such as medical instruments, aerospace machinery, nuclear-reactor controllers, fuel controllers and other safety devices), please be sure to consult with our sales representative in advance.

Website: http://www.prisemi.com
For additional information, please contact your local Sales Representative.