

## P-Channel Power MOSFET

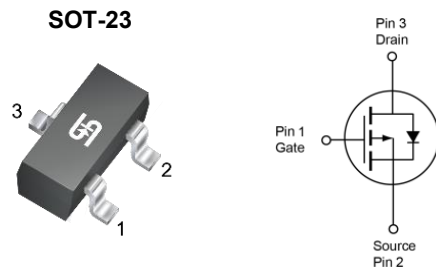
### FEATURES

- Advance trench process technology
- RoHS compliant
- Halogen-free

### APPLICATIONS

- Power management
- Load switch

| KEY PERFORMANCE PARAMETERS |                  |      |
|----------------------------|------------------|------|
| PARAMETER                  | VALUE            | UNIT |
| $V_{DS}$                   | -30              | V    |
| $R_{DS(on)}$ (max)         | $V_{GS} = -10V$  | 95   |
|                            | $V_{GS} = -4.5V$ | 140  |
| $Q_g$                      | 6.5              | nC   |



Note: MSL 1 (Moisture Sensitivity Level) per J-STD-020

| ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted) |                |                          |                  |
|-----------------------------------------------------------------------------|----------------|--------------------------|------------------|
| PARAMETER                                                                   | SYMBOL         | LIMIT                    | UNIT             |
| Drain-Source Voltage                                                        | $V_{DS}$       | -30                      | V                |
| Gate-Source Voltage                                                         | $V_{GS}$       | $\pm 20$                 | V                |
| Continuous Drain Current                                                    | $I_D$          | -2.6                     | A                |
| Pulsed Drain Current (Note 1)                                               | $I_{DM}$       | -10.4                    | A                |
| Total Power Dissipation                                                     | $P_D$          | $T_A = 25^\circ\text{C}$ | 1.04             |
|                                                                             |                | $T_A = 70^\circ\text{C}$ | 0.67             |
| Operating Junction and Storage Temperature Range                            | $T_J, T_{STG}$ | - 55 to +150             | $^\circ\text{C}$ |

| THERMAL PERFORMANCE                             |                 |       |                    |
|-------------------------------------------------|-----------------|-------|--------------------|
| PARAMETER                                       | SYMBOL          | LIMIT | UNIT               |
| Junction to Ambient Thermal Resistance (Note 2) | $R_{\theta JA}$ | 120   | $^\circ\text{C/W}$ |

**Notes:**

1. Pulse Width  $\leq 100\mu\text{s}$ .
2. Device on a PCB FR4 with 1 in<sup>2</sup> (single layer, 2 oz thickness) copper area for drain connection.

| <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                                                      | $V_{GS} = 0V, I_D = -250\mu A$                                  | $BV_{DSS}$   | -30 | --   | --        | V          |
| Gate Threshold Voltage                                                              | $V_{DS} = V_{GS}, I_D = -250\mu A$                              | $V_{GS(TH)}$ | -1  | -1.5 | -3        | V          |
| Gate Body Leakage                                                                   | $V_{GS} = \pm 20V, V_{DS} = 0V$                                 | $I_{GSS}$    | --  | --   | $\pm 100$ | nA         |
| Zero Gate Voltage Drain Current                                                     | $V_{DS} = -30V, V_{GS} = 0V$                                    | $I_{DSS}$    | --  | --   | -1        | $\mu A$    |
| Drain-Source On-State Resistance                                                    | $V_{GS} = -10V, I_D = -2.6A$                                    | $R_{DS(on)}$ | --  | 54   | 95        | m $\Omega$ |
|                                                                                     | $V_{GS} = -4.5V, I_D = -2.2A$                                   |              | --  | 78   | 140       |            |
| Forward Transconductance                                                            | $V_{DS} = -10V, I_D = -0.7A$                                    | $g_{fs}$     | --  | 3.6  | --        | S          |
| <b>Dynamic</b> (Note 4)                                                             |                                                                 |              |     |      |           |            |
| Total Gate Charge                                                                   | $V_{DS} = -15V, I_D = -2.6A,$<br>$V_{GS} = -10V$                | $Q_g$        | --  | 6.5  | --        | nC         |
| Gate-Source Charge                                                                  |                                                                 | $Q_{gs}$     | --  | 0.8  | --        |            |
| Gate-Drain Charge                                                                   |                                                                 | $Q_{gd}$     | --  | 1.7  | --        |            |
| Input Capacitance                                                                   | $V_{DS} = -15V, V_{GS} = 0V,$<br>$f = 1.0\text{MHz}$            | $C_{iss}$    | --  | 272  | --        | pF         |
| Output Capacitance                                                                  |                                                                 | $C_{oss}$    | --  | 50   | --        |            |
| Reverse Transfer Capacitance                                                        |                                                                 | $C_{rss}$    | --  | 42   | --        |            |
| <b>Switching</b> (Note 5)                                                           |                                                                 |              |     |      |           |            |
| Turn-On Delay Time                                                                  | $V_{DD} = -15V, R_G = 6\Omega,$<br>$I_D = -2.6A, V_{GS} = -10V$ | $t_{d(on)}$  | --  | 4.2  | --        | ns         |
| Turn-On Rise Time                                                                   |                                                                 | $t_r$        | --  | 2.2  | --        |            |
| Turn-Off Delay Time                                                                 |                                                                 | $t_{d(off)}$ | --  | 22   | --        |            |
| Turn-Off Fall Time                                                                  |                                                                 | $t_f$        | --  | 14   | --        |            |
| <b>Source-Drain Diode</b>                                                           |                                                                 |              |     |      |           |            |
| Forward Voltage (Note 3)                                                            | $I_S = -2.6A, V_{GS} = 0V$                                      | $V_{SD}$     | --  | -0.8 | -1.2      | V          |

**Notes:**

3. Pulse test: Pulse Width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .
4. Defined by design. Not subject to production test.
5. Switching time is essentially independent of operating temperature.

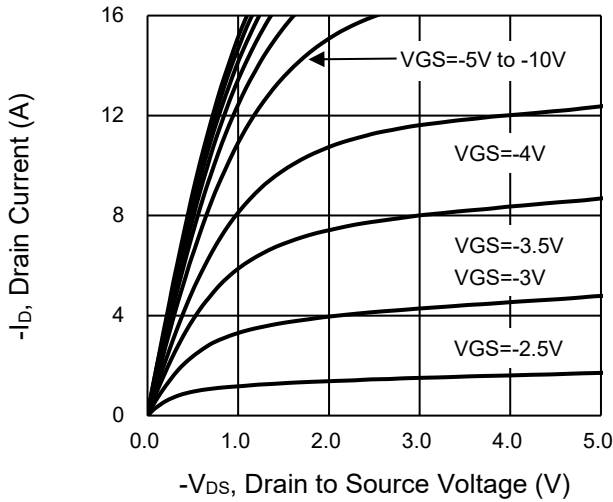
**ORDERING INFORMATION**

| ORDERING CODE | PACKAGE | PACKING         |
|---------------|---------|-----------------|
| TSM2307CX RFG | SOT-23  | 3kpcs / 7" Reel |

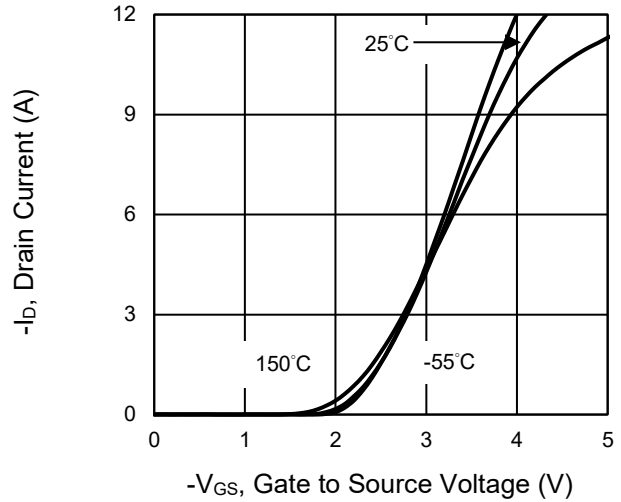
**CHARACTERISTICS CURVES**

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

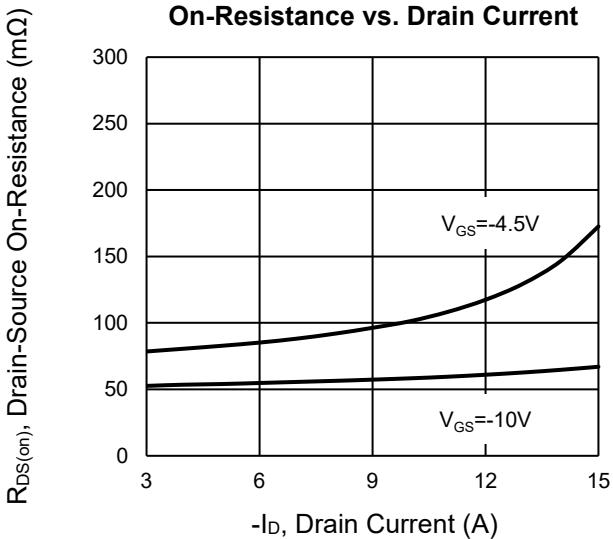
**Output Characteristics**



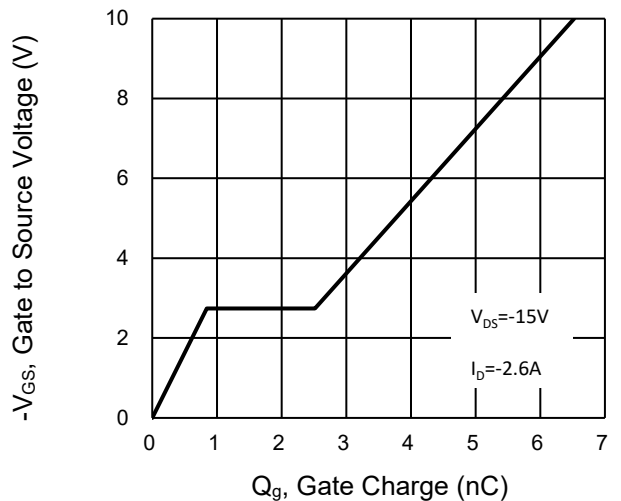
**Transfer Characteristics**



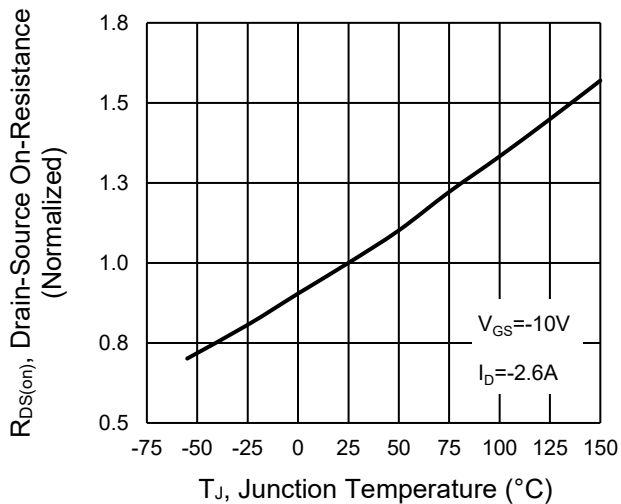
**On-Resistance vs. Drain Current**



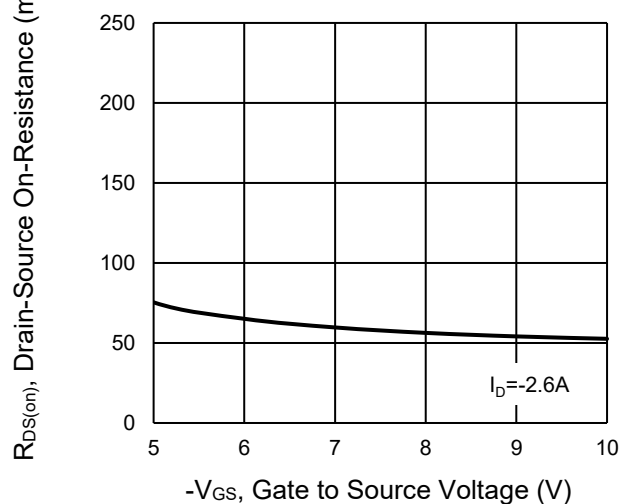
**Gate-Source Voltage vs. Gate Charge**



**On-Resistance vs. Junction Temperature**



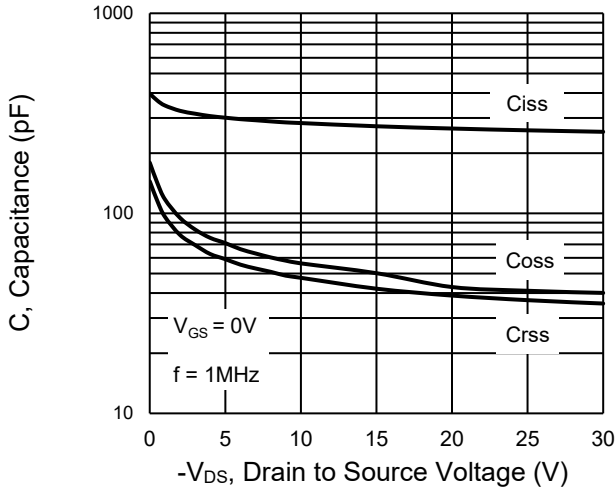
**On-Resistance vs. Gate-Source Voltage**



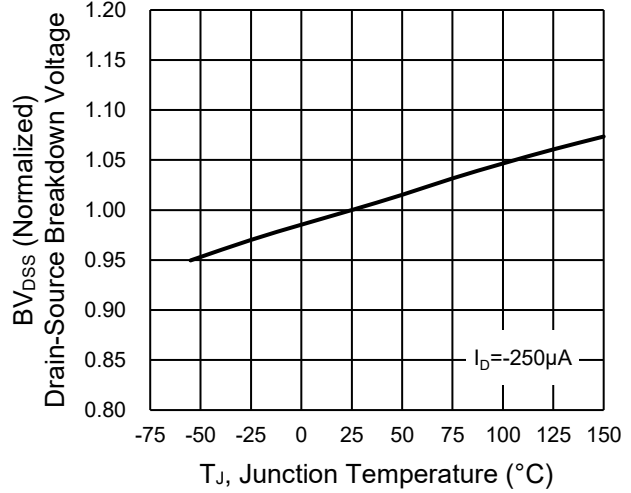
**CHARACTERISTICS CURVES**

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

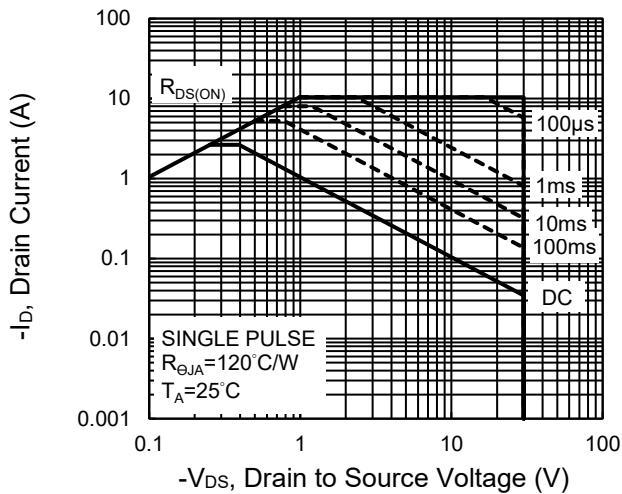
**Capacitance vs. Drain-Source Voltage**



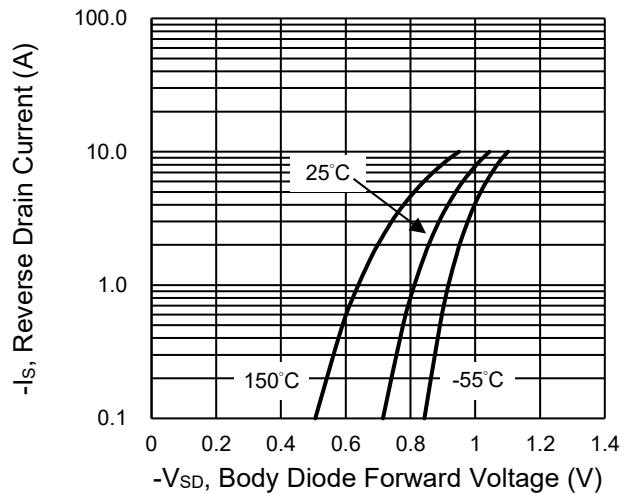
**$BV_{DSS}$  vs. Junction Temperature**



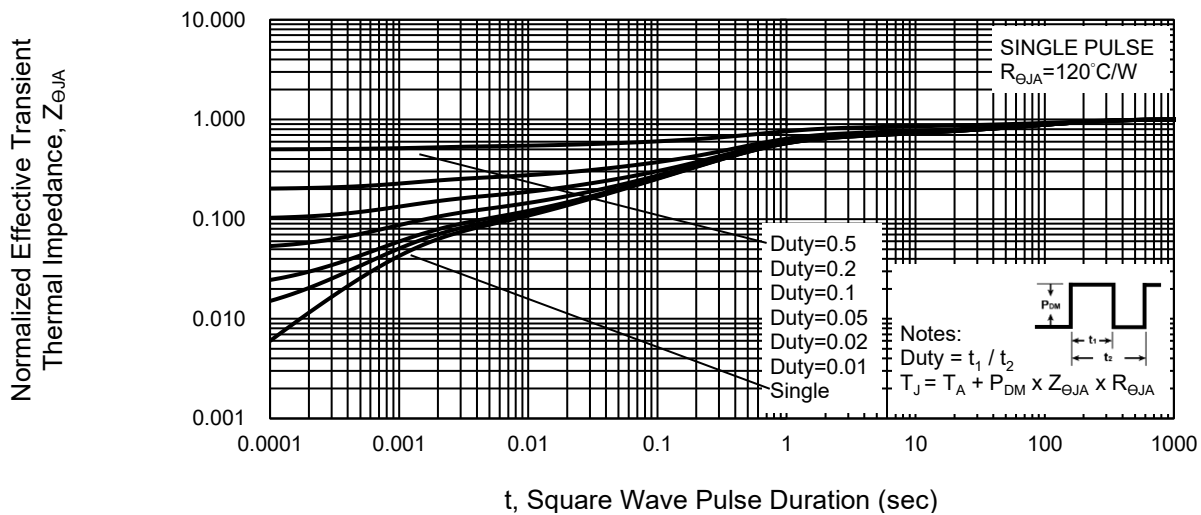
**Maximum Safe Operating Area, Junction-to-Ambient**



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



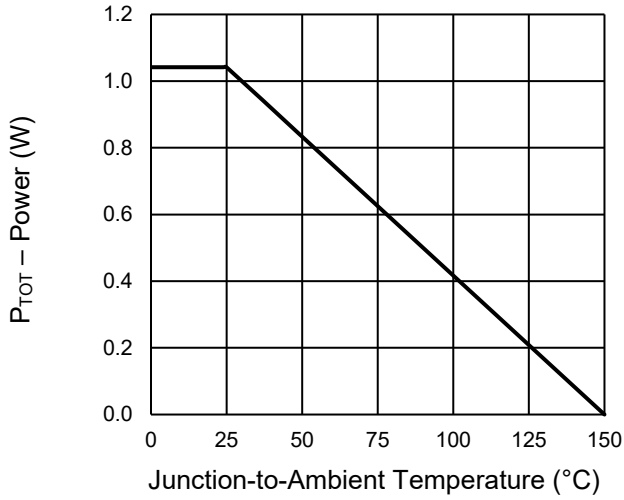
**Normalized Thermal Transient Impedance, Junction-to-Ambient**



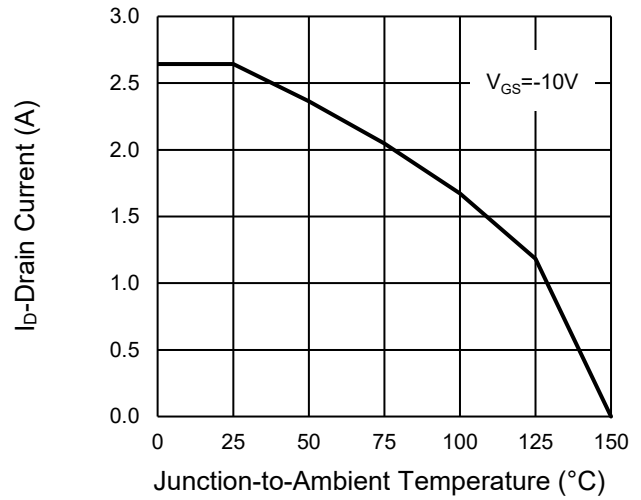
**CHARACTERISTICS CURVES**

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

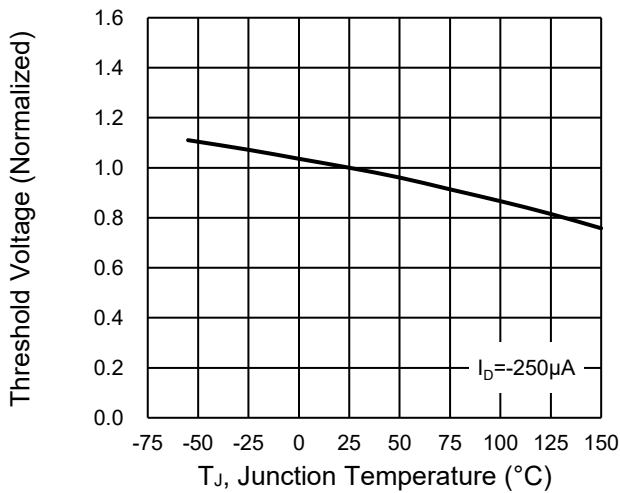
**Power Dissipation**



**Drain Current**

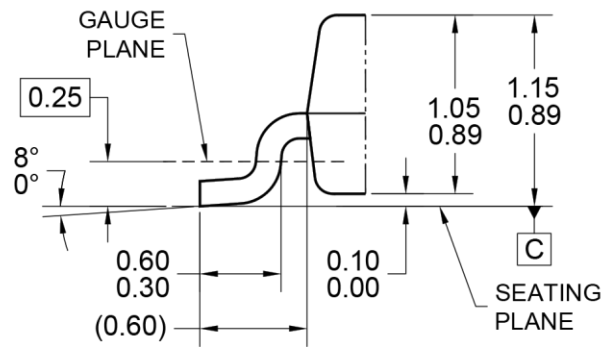
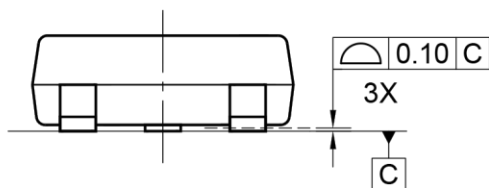
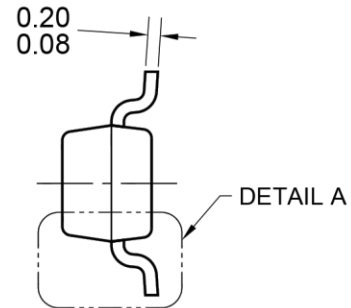
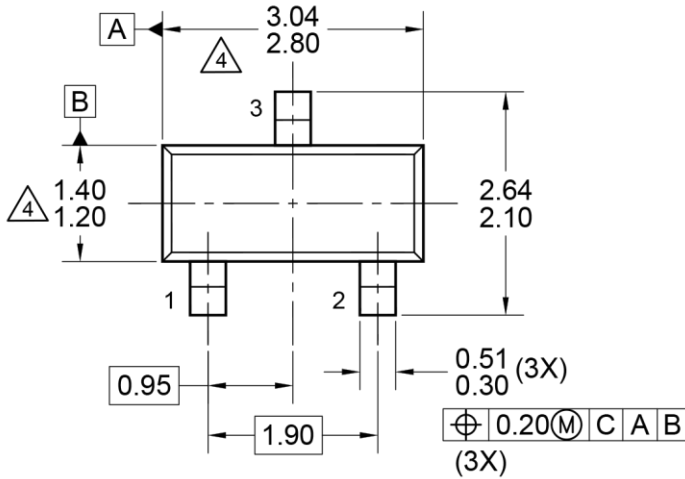


**Normalized gate threshold voltage vs Temperature**

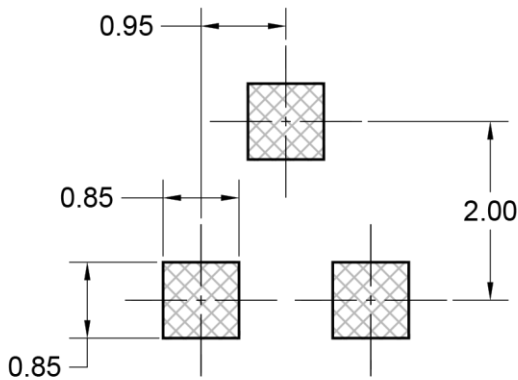


**PACKAGE OUTLINE DIMENSIONS** (Unit: Millimeters)

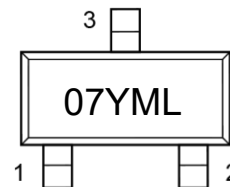
**SOT-23**



DETAIL A, ROTATED -90°  
(SCALE 2:1)



SUGGESTED PAD LAYOUT



MARKING DIAGRAM

NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
3. PACKAGE OUTLINE REFERENCE: JEDEC TO-236, ISSUE H, VARIATION AA.
4. MOLDED PLASTIC BODY DIMENSIONS DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
5. DWG NO. REF: HQ2SD07-SOT23JEDEC-104 REV A.

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

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