

## N-Channel Power MOSFET

### FEATURES

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

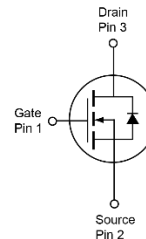
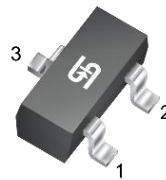
### APPLICATIONS

- Load switch
- PA switch

| KEY PERFORMANCE PARAMETERS |                 |      |
|----------------------------|-----------------|------|
| PARAMETER                  | VALUE           | UNIT |
| $V_{DS}$                   | 20              | V    |
| $R_{DS(on)}$ (max)         | $V_{GS} = 4.5V$ | 33   |
|                            | $V_{GS} = 2.5V$ | 40   |
|                            | $V_{GS} = 1.8V$ | 100  |
| $Q_g$                      | 10              | nC   |



SOT-23



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

| ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ C$ unless otherwise noted) |                |                    |            |
|---|----------------|--------------------|------------|
| PARAMETER   | SYMBOL         | LIMIT              | UNIT       |
| Drain-Source Voltage  | $V_{DS}$       | 20                 | V          |
| Gate-Source Voltage   | $V_{GS}$       | $\pm 12$           | V          |
| Continuous Drain Current  | $I_D$          | 4.6                | A          |
| Pulsed Drain Current (Note 1)   | $I_{DM}$       | 18.4               | A          |
| Total Power Dissipation   | $P_D$          | $T_A = 25^\circ C$ | 1.04       |
|   |                | $T_A = 70^\circ C$ | 0.67       |
| Operating Junction and Storage Temperature Range                      | $T_J, T_{STG}$ | - 55 to +150       | $^\circ C$ |

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

**Notes:**

1. Pulse Width  $\leq 100\mu s$ .
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  | $V_{GS} = 0V, I_D = 250\mu A$                                 | $BV_{DSS}$   | 20   | --  | --        | V          |
| Gate Threshold Voltage  | $V_{DS} = V_{GS}, I_D = 250\mu A$                             | $V_{GS(TH)}$ | 0.45 | 0.7 | 1         | V          |
| Gate Body Leakage   | $V_{GS} = \pm 12V, V_{DS} = 0V$                               | $I_{GSS}$    | --   | --  | $\pm 100$ | nA         |
| Zero Gate Voltage Drain Current   | $V_{DS} = 20V, V_{GS} = 0V$                                   | $I_{DSS}$    | --   | --  | 1         | $\mu A$    |
| Drain-Source On-State Resistance  | $V_{GS} = 4.5V, I_D = 4.6A$                                   | $R_{DS(on)}$ | --   | 15  | 33        | m $\Omega$ |
|   | $V_{GS} = 2.5V, I_D = 4.1A$                                   |              | --   | 18  | 40        |            |
|   | $V_{GS} = 1.8V, I_D = 2.3A$                                   |              | --   | 24  | 100       |            |
| Forward Transconductance  | $V_{DS} = 10V, I_D = 1.1A$                                    | $g_{fs}$     | --   | 14  | --        | S          |
| <b>Dynamic</b> (Note 4)   |   |              |      |     |           |            |
| Total Gate Charge   | $V_{DS} = 10V, I_D = 4.6A,$<br>$V_{GS} = 4.5V$                | $Q_g$        | --   | 10  | --        | nC         |
| Gate-Source Charge  |   | $Q_{gs}$     | --   | 0.9 | --        |            |
| Gate-Drain Charge   |   | $Q_{gd}$     | --   | 3.1 | --        |            |
| Input Capacitance   | $V_{DS} = 10V, V_{GS} = 0V,$<br>$f = 1.0\text{MHz}$           | $C_{iss}$    | --   | 687 | --        | pF         |
| Output Capacitance  |   | $C_{oss}$    | --   | 120 | --        |            |
| Reverse Transfer Capacitance  |   | $C_{rss}$    | --   | 99  | --        |            |
| <b>Switching</b> (Note 5)   |   |              |      |     |           |            |
| Turn-On Delay Time  | $V_{DD} = 10V, R_G = 6\Omega,$<br>$I_D = 4.6A, V_{GS} = 4.5V$ | $t_{d(on)}$  | --   | 6.8 | --        | ns         |
| Turn-On Rise Time   |   | $t_r$        | --   | 13  | --        |            |
| Turn-Off Delay Time   |   | $t_{d(off)}$ | --   | 36  | --        |            |
| Turn-Off Fall Time  |   | $t_f$        | --   | 21  | --        |            |
| <b>Source-Drain Diode</b>   |   |              |      |     |           |            |
| Forward Voltage (Note 3)  | $I_S = 4.6A, V_{GS} = 0V$                                     | $V_{SD}$     | --   | 0.7 | 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.

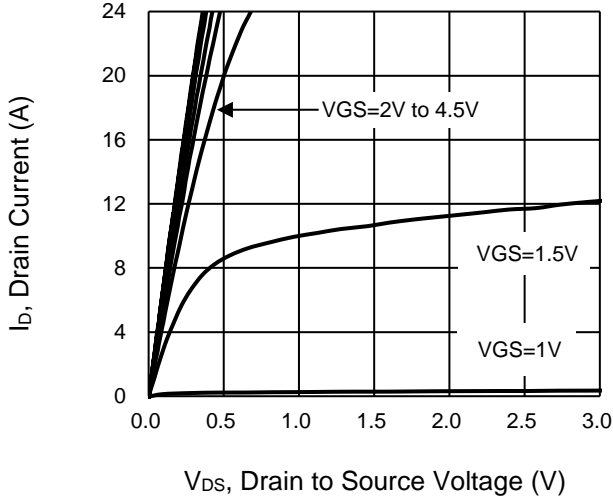
**ORDERING INFORMATION**

| ORDERING CODE | PACKAGE | PACKING         |
|---------------|---------|-----------------|
| TSM2314CX RFG | SOT-23  | 3kpcs / 7" Reel |

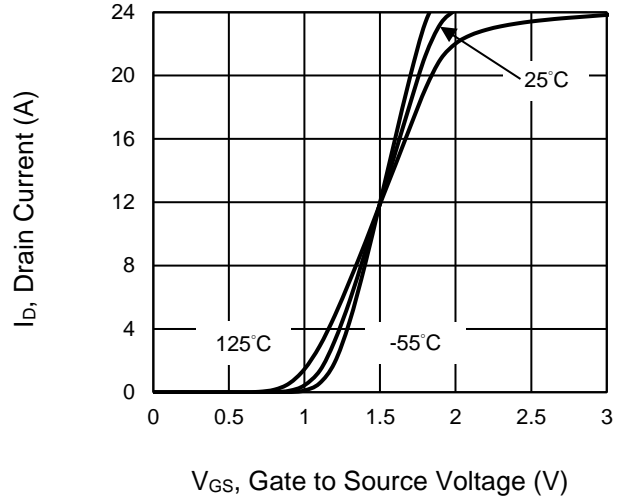
**CHARACTERISTICS CURVES**

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

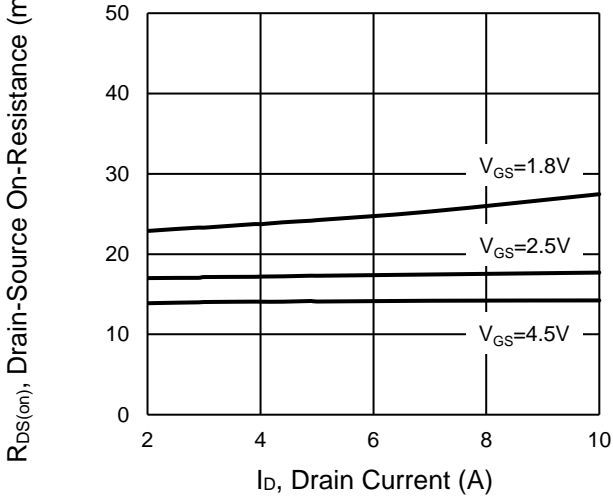
**Output Characteristics**



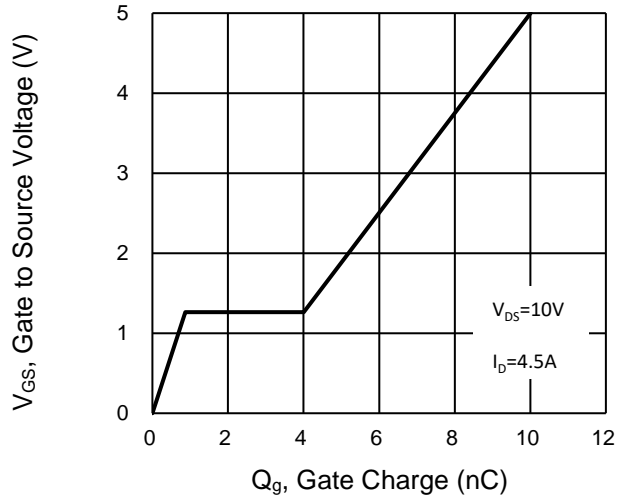
**Transfer Characteristics**



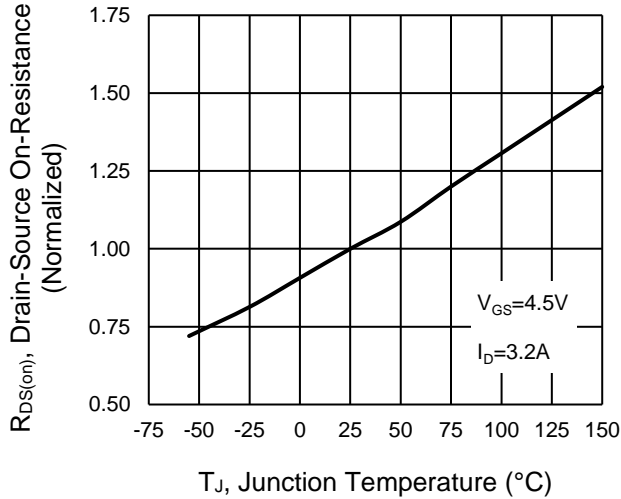
**On-Resistance vs. Drain Current**



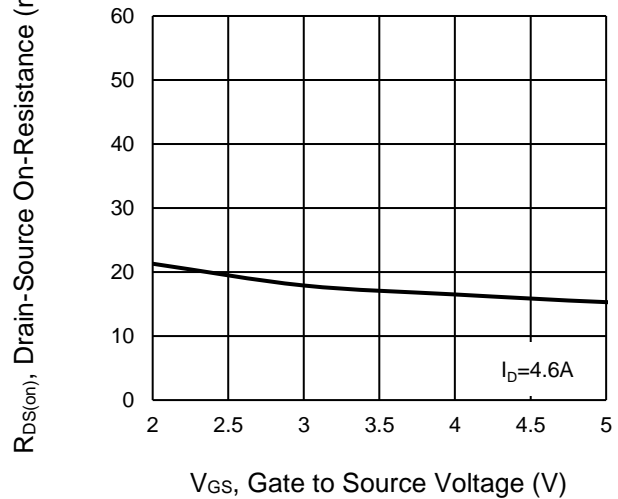
**Gate-Source Voltage vs. Gate Charge**



**On-Resistance vs. Junction Temperature**



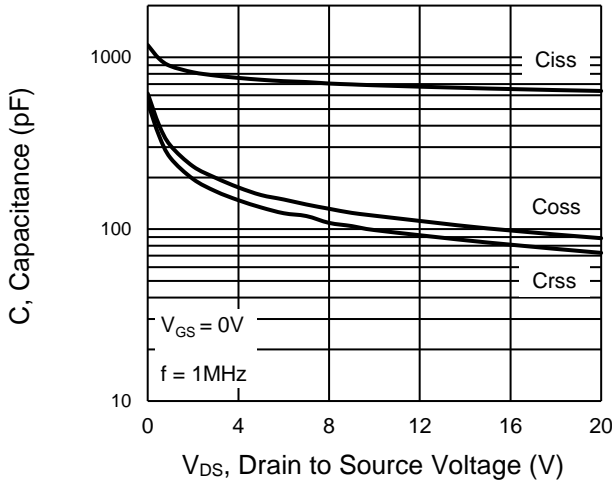
**On-Resistance vs. Gate-Source Voltage**



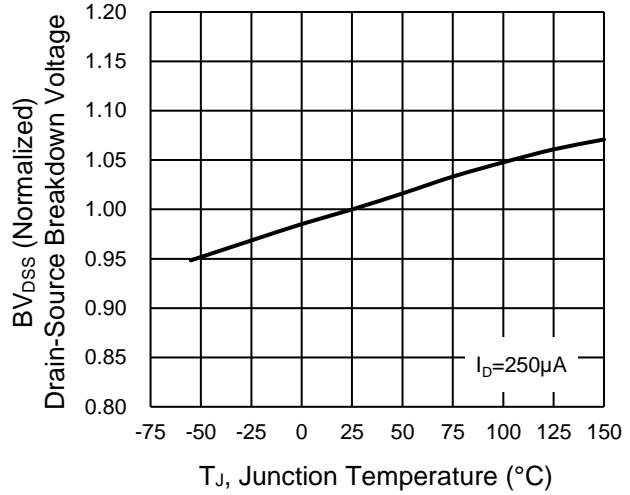
**CHARACTERISTICS CURVES**

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

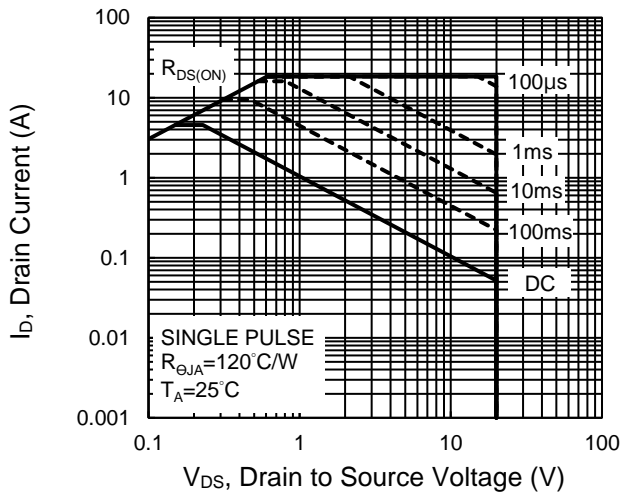
**Capacitance vs. Drain-Source Voltage**



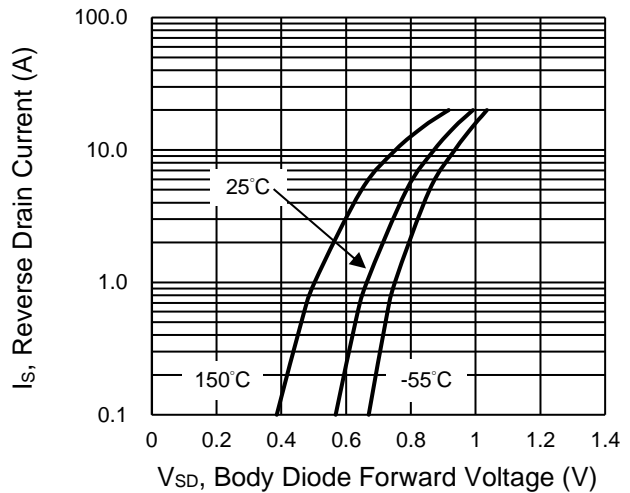
**$BV_{DSS}$  vs. Junction Temperature**



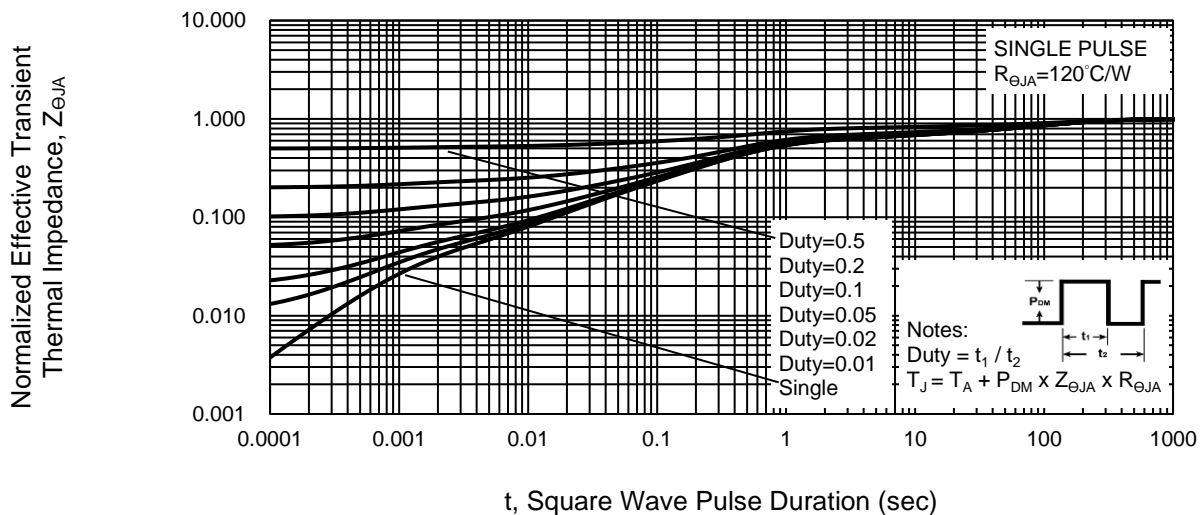
**Maximum Safe Operating Area, Junction-to-Ambient**



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



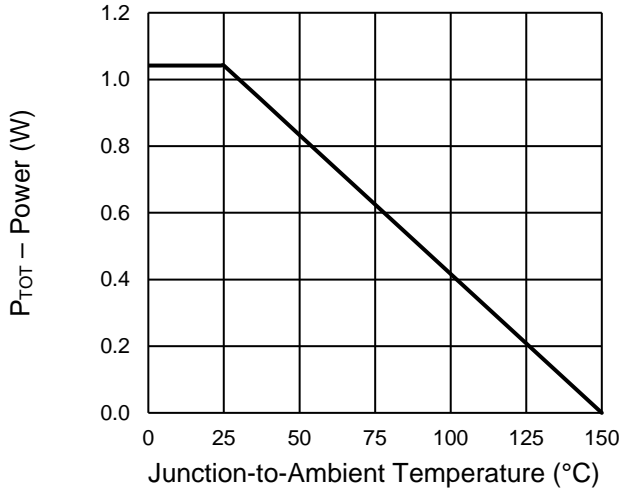
**Normalized Thermal Transient Impedance, Junction-to-Ambient**



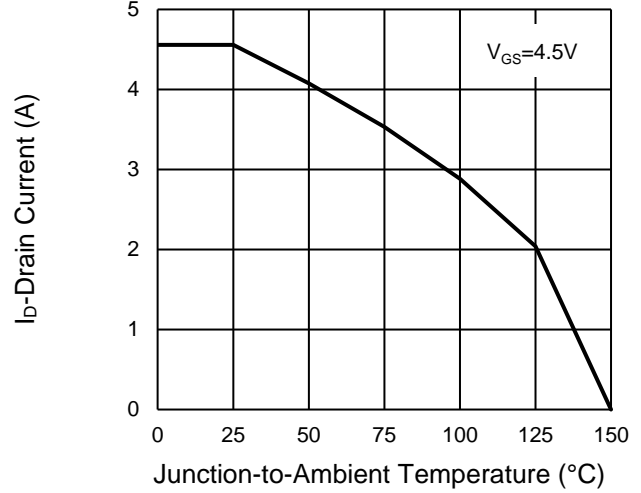
**CHARACTERISTICS CURVES**

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

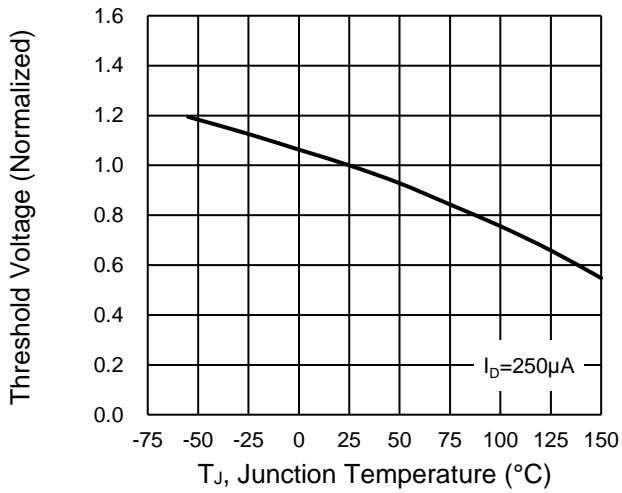
**Power Dissipation**



**Drain Current**

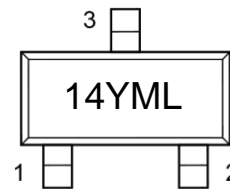
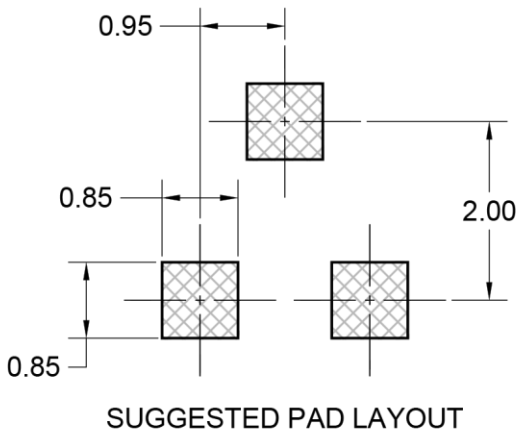
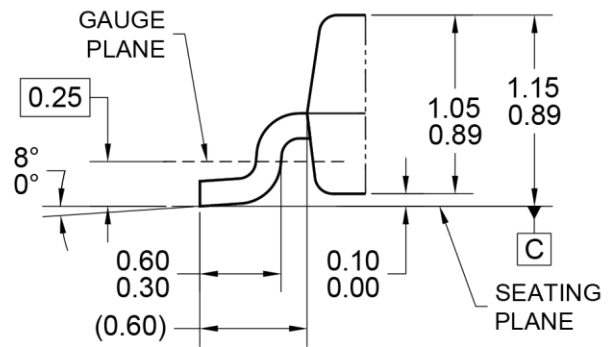
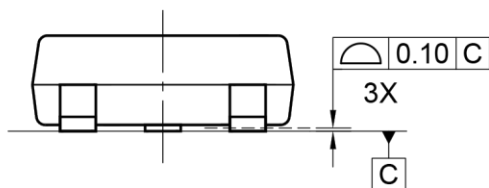
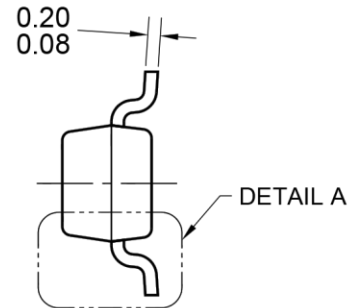
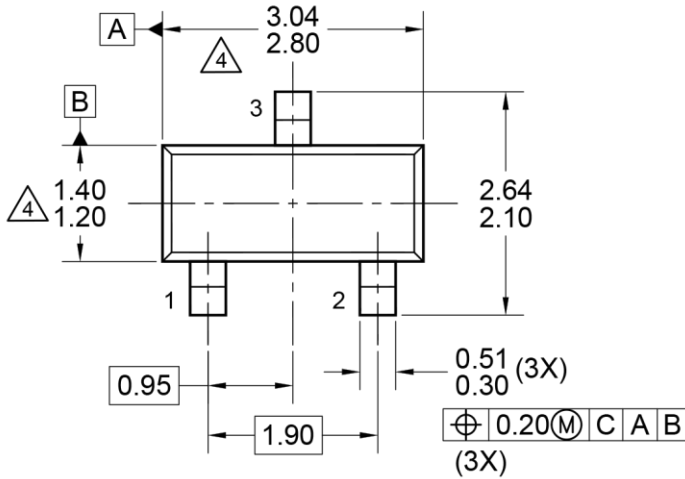


**Normalized gate threshold voltage vs Temperature**



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

**SOT-23**



**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.

**MARKING DIAGRAM**

- 14 = 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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