

SOT-23



Pin Definition:

1. Gate
2. Source
3. Drain

Key Parameter Performance

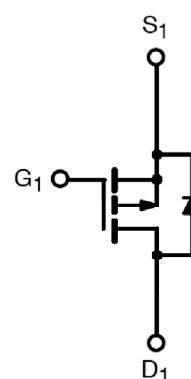
| Parameter | Value | Unit |
|--------------------|------------------|------|
| V_{DS} | -60 | V |
| $R_{DS(on)}$ (max) | $V_{GS} = -10V$ | 190 |
| | $V_{GS} = -4.5V$ | 240 |
| Q_g | 8.2 | nC |

Ordering Information

| Part No. | Package | Packing |
|---------------|---------|---------------|
| TSM2309CX RFG | SOT-23 | 3kcs / 7+Reel |

Note: %G+denotes for Halogen- and Antimony-free as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds

Block Diagram



P-Channel MOSFET

Absolute Maximum Ratings ($T_C = 25^\circ C$ unless otherwise noted)

| Parameter | Symbol | Limit | Unit |
|--|-----------|---------------------|------------|
| Drain-Source Voltage | V_{DS} | -60 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | V |
| Continuous Drain Current | I_D | $T_C = 25^\circ C$ | -3.1 |
| | | $T_C = 100^\circ C$ | -2 |
| Pulsed Drain Current ^(Note 1) | I_{DM} | -12.4 | A |
| Power Dissipation @ $T_C = 25^\circ C$ | P_D | 1.56 | W |
| Operating Junction Temperature | T_J | 50 | $^\circ C$ |
| Storage Temperature Range | T_{STG} | -50 to +150 | $^\circ C$ |

Thermal Performance

| Parameter | Symbol | Limit | Unit |
|--|----------|-------|--------------|
| Thermal Resistance - Junction to Ambient | R_{JA} | 80 | $^\circ C/W$ |



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

| Parameter | Conditions | Symbol | Min | Typ | Max | Unit |
|---|---|--------------|------|------|-----------|---------|
| Static | | | | | | |
| Drain-Source Breakdown Voltage | $V_{GS} = 0V, I_D = -250\mu A$ | BV_{DSS} | -60 | -- | -- | V |
| Drain-Source On-State Resistance | $V_{GS} = -10V, I_D = -3A$ | $R_{DS(on)}$ | -- | 160 | 190 | m |
| | $V_{GS} = -4.5V, I_D = -1.5A$ | | -- | 200 | 240 | |
| Gate Threshold Voltage | $V_{DS} = V_{GS}, I_D = -250\mu A$ | $V_{GS(TH)}$ | -1.2 | -1.9 | -2.5 | V |
| Zero Gate Voltage Drain Current | $V_{DS} = -60V, V_{GS} = 0V$ | I_{DSS} | -- | -- | -1 | μA |
| | $V_{DS} = -48V, T_J = 125^\circ C$ | | -- | -- | -10 | |
| Gate Body Leakage | $V_{GS} = \pm 20V, V_{DS} = 0V$ | I_{GSS} | -- | -- | ± 100 | nA |
| Forward Transconductance | $V_{DS} = -10V, I_D = -3A$ | g_{fs} | -- | 3.5 | -- | S |
| Dynamic | | | | | | |
| Total Gate Charge ^(Note 2,3) | $V_{DS} = -30V, I_D = -3A,$ $V_{GS} = -10V$ | Q_g | -- | 8.2 | -- | nC |
| Gate-Source Charge ^(Note 2,3) | | Q_{gs} | -- | 1.8 | -- | |
| Gate-Drain Charge ^(Note 2,3) | | Q_{gd} | -- | 1.5 | -- | |
| Input Capacitance | $V_{DS} = -30V, V_{GS} = 0V,$ $f = 1.0MHz$ | C_{iss} | -- | 425 | -- | pF |
| Output Capacitance | | C_{oss} | -- | 35 | -- | |
| Reverse Transfer Capacitance | | C_{rss} | -- | 20 | -- | |
| Switching | | | | | | |
| Turn-On Delay Time ^(Note 2,3) | $V_{DD} = -30V, I_D = -1A,$ $V_{GS} = -10V, R_{GEN} = 6$ | $t_{d(on)}$ | -- | 5.2 | -- | ns |
| Turn-On Rise Time ^(Note 2,3) | | t_r | -- | 19 | -- | |
| Turn-Off Delay Time ^(Note 2,3) | | $t_{d(off)}$ | -- | 35 | -- | |
| Turn-Off Fall Time ^(Note 2,3) | | t_f | -- | 10.6 | -- | |
| Source-Drain Diode Ratings and Characteristic | | | | | | |
| Maximum Continuous Drain-Source Diode Forward Current | Integral reverse diode in the MOSFET | I_S | -- | -- | -3.1 | A |
| Maximum Pulse Drain-Source Diode Forward Current | | I_{SM} | -- | -- | -12.4 | A |
| Diode-Source Forward Voltage | $V_{GS} = 0V, I_S = -1A$ | V_{SD} | -- | -- | -1 | V |

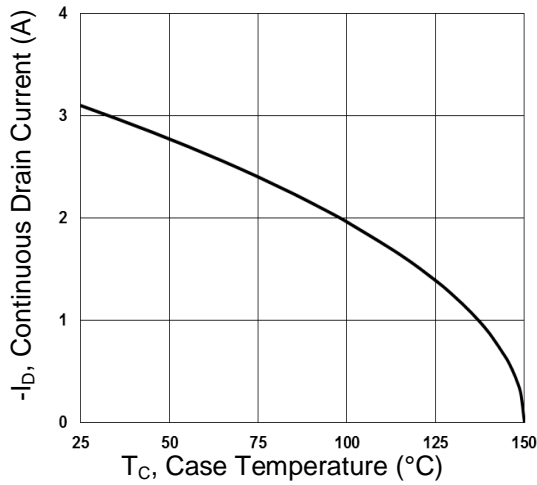
Note:

1. Pulse width limited by safe operating area
2. Pulse test: pulse width $m300\mu s$, duty cycle $m2\%$
3. Switching time is essentially independent of operating temperature.

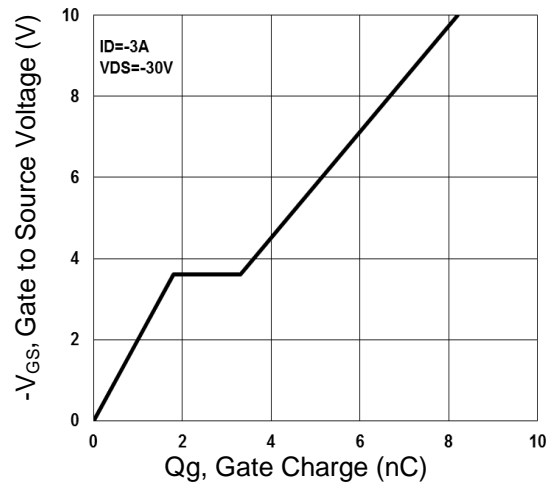


Electrical Characteristics Curve

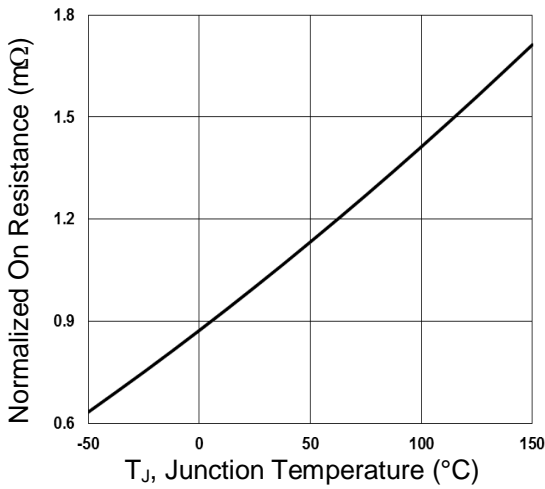
Continuous Drain Current vs. T_c



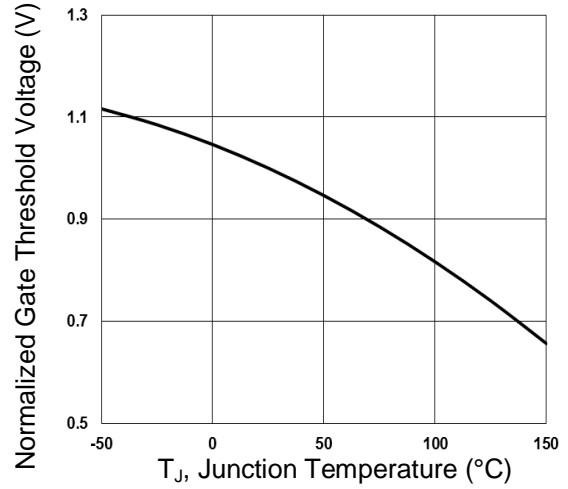
Gate Charge



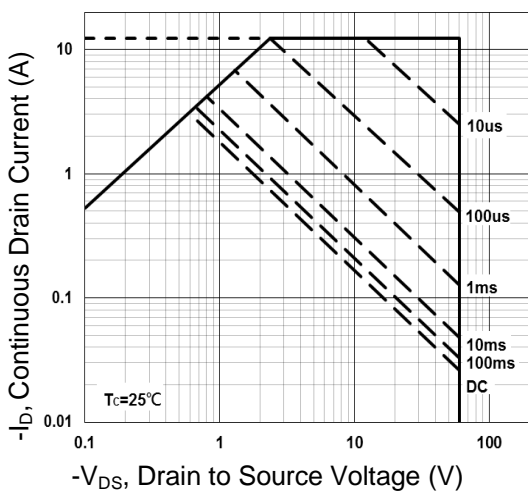
On-Resistance vs. Junction Temperature



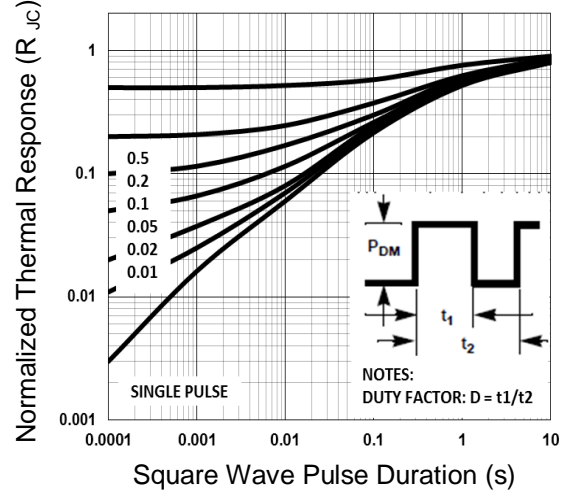
Threshold Voltage vs. Junction Temperature



Maximum Safe Operating Area

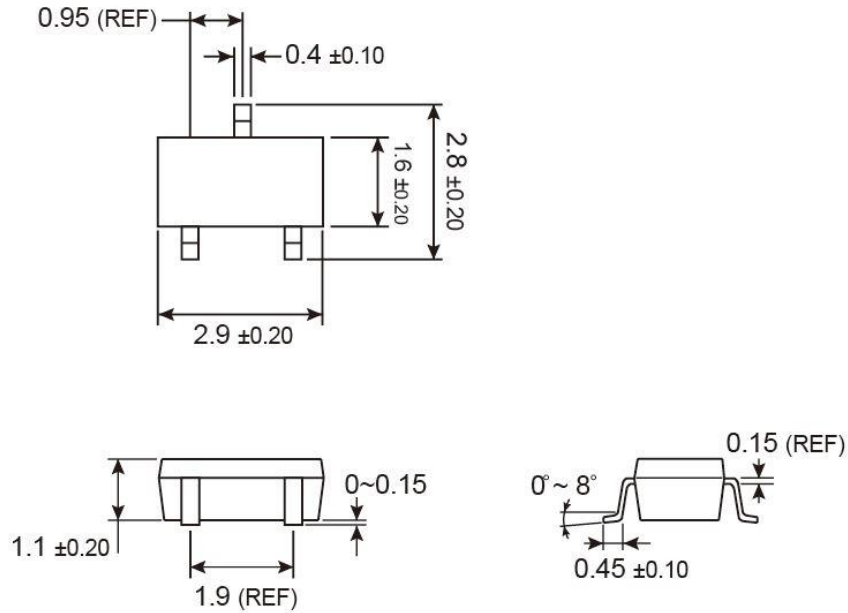


Normalized Thermal Transient Impedance Curve



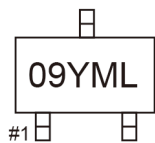


SOT-23 Mechanical Drawing



Unit: Millimeters

Marking Diagram



- 09** = Device Code
- 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



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