# P-Channel Power MOSFET

-20V, -6.4A, 40mΩ

## Features

- Advance Trench Process Technology
- High Density Cell Design for Ultra Low On-resistance

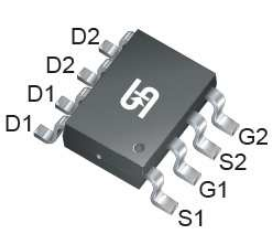
| KEY PERFORMANCE PARAMETERS | | | |
|---|---|---|---|
| **PARAMETER** | | **VALUE** | **UNIT** |
| $V_{DS}$ | | -20 | V |
| $R_{DS(on)}$ (max) | $V_{GS}$ = -10V | 40 | mΩ |
| | $V_{GS}$ = -4.5V | 60 | |
| $Q_g$ | | 19 | nC |

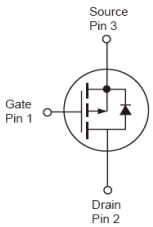
## Application

- Load Switch
- PA Switch

Pb-Free RoHS COMPLIANT HALOGEN FREE

**SOP-8**




**Notes:** Moisture sensitivity level: level 3. Per J-STD-020

| ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25°C unless otherwise noted) | | | | |
|---|---|---|---|---|
| **PARAMETER** | | **SYMBOL** | **LIMIT** | **UNIT** |
| Drain-Source Voltage | | $V_{DS}$ | -20 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±8 | V |
| Continuous Drain Current (Note 1) | $T_C$ = 25°C | $I_D$ | -6.4 | A |
| | $T_C$ = 100°C | | -3.8 | |
| Pulsed Drain Current (Note 2) | | $I_{DM}$ | -19.2 | A |
| Total Power Dissipation @ $T_A$ = 25°C | | $P_{DTOT}$ | 2.5 | W |
| Single Pulsed Avalanche Energy (Note 3) | | $E_{AS}$ | 13.94 | mJ |
| Single Pulsed Avalanche Current (Note 3) | | $I_{AS}$ | 16.7 | A |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{STG}$ | - 55 to +150 | °C |

| THERMAL PERFORMANCE | | | |
|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **LIMIT** | **UNIT** |
| Junction to Case Thermal Resistance | $R_{\Theta JC}$ | 30 | °C/W |
| Junction to Ambient Thermal Resistance | $R_{\Theta JA}$ | 50 | °C/W |

**Notes:** $R_{\Theta JA}$ 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. $R_{\Theta JA}$ is guaranteed by design while $R_{\Theta CA}$ is determined by the user's board design. $R_{\Theta JA}$ shown below for single device operation on FR-4 PCB in still air.

| ELECTRICAL SPECIFICATIONS ($T_A$ = 25°C unless otherwise noted) | | | | | | |
|---|---|---|---|---|---|---|
| **PARAMETER** | **CONDITIONS** | **SYMBOL** | **MIN** | **TYP** | **MAX** | **UNIT** |
| **Static** (Note 4) | | | | | | |
| Drain-Source Breakdown Voltage | $V_{GS}$ = 0V, $I_D$ = -250μA | $BV_{DSS}$ | -20 | -- | -- | V |
| Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = -250μA | $V_{GS(TH)}$ | -0.4 | -- | -1.0 | V |
| Gate Body Leakage | $V_{GS}$ = ±8V, $V_{DS}$ = 0V | $I_{GSS}$ | -- | -- | ±100 | nA |
| Zero Gate Voltage Drain Current | $V_{DS}$ = -16V, $V_{GS}$ = 0V | $I_{DSS}$ | -- | -- | -1 | μA |
| On-State Drain Current | $V_{DS}$ ≤ -5V , $V_{GS}$ = -4.5V | $I_{D(ON)}$ | -10 | -- | -- | A |
| Drain-Source On-State Resistance | $V_{GS}$ = -4.5V, $I_D$ = -6.4A | $R_{DS(ON)}$ | -- | 31 | 40 | mΩ |
| | $V_{GS}$ = -2.5V, $I_D$ = -5.1A | | -- | 45 | 60 | |
| Forward Transconductance | $V_{DS}$ = -9V, $I_D$ = -6.4A | $g_{fs}$ | -- | 14 | -- | S |
| **Dynamic** (Note 5) | | | | | | |
| Total Gate Charge | $V_{DS}$ = -10V, $I_D$ = -6.4A, $V_{GS}$ = -4.5V | $Q_g$ | -- | 12 | 19 | nC |
| Gate-Source Charge | | $Q_{gs}$ | -- | 1.7 | -- | |
| Gate-Drain Charge | | $Q_{gd}$ | -- | 3.3 | -- | |
| Input Capacitance | $V_{DS}$ = -10V, $V_{GS}$ = 0V, f = 1.0MHz | $C_{iss}$ | -- | 1020 | -- | pF |
| Output Capacitance | | $C_{oss}$ | -- | 191 | -- | |
| Reverse Transfer Capacitance | | $C_{rss}$ | -- | 140 | -- | |
| Gate Resistance | F = 1MHz, open drain | $R_g$ | -- | 3 | -- | Ω |
| **Switching** (Note 6) | | | | | | |
| Turn-On Delay Time | $V_{DD}$ = -10V, $R_{GEN}$ = 6Ω, $I_D$ = -1A, $V_{GS}$ = -4.5V, | $t_{d(on)}$ | -- | 25 | 40 | ns |
| Turn-On Rise Time | | $t_r$ | -- | 43 | 65 | |
| Turn-Off Delay Time | | $t_{d(off)}$ | -- | 71 | 110 | |
| Turn-Off Fall Time | | $t_f$ | -- | 48 | 75 | |
| **Source-Drain Diode** (Note 4) | | | | | | |
| Forward On Voltage | $I_S$ = -2.5A, $V_{GS}$ = 0V | $V_{SD}$ | -- | -0.9 | -1.2 | V |
| Reverse Recovery Time | $I_S$ = -4A, $dI_F/dt$ = 100A/μs | $t_{rr}$ | -- | 12.6 | -- | ns |
| Reverse Recovery Charge | | $Q_{rr}$ | -- | 2.84 | -- | nC |

**Notes:**

1. Current limited by package
2. Pulse width limited by the maximum junction temperature
3. L = 0.1mH, $I_{AS}$ = 16.7A, $V_{DD}$ = 25V, $R_G$ = 25Ω, Starting $T_J$ = 25°C
4. Pulse test: PW ≤ 300μs, duty cycle ≤ 2%
5. For DESIGN AID ONLY, not subject to production testing.
6. Switching time is essentially independent of operating temperature.

## ORDERING INFORMATION

| PART NO. | PACKAGE | PACKING |
|---|---|---|
| TSM9434CS RLG | SOP-8 | 2,500pcs / 13” Reel |

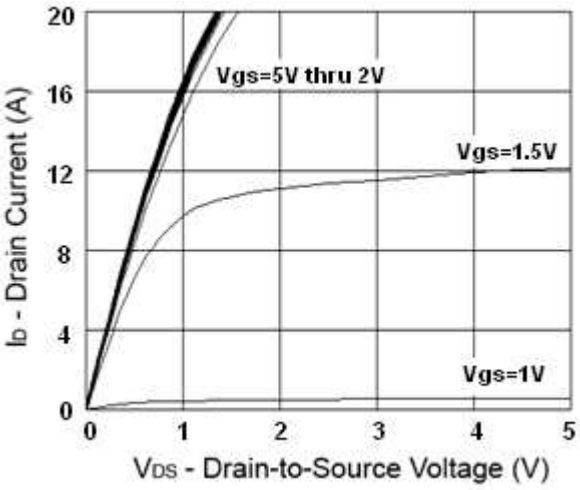
**Note:**

1. Compliant to RoHS Directive 2011/65/EU and in accordance to WEEE 2002/96/EC
2. Halogen-free according to IEC 61249-2-21 definition

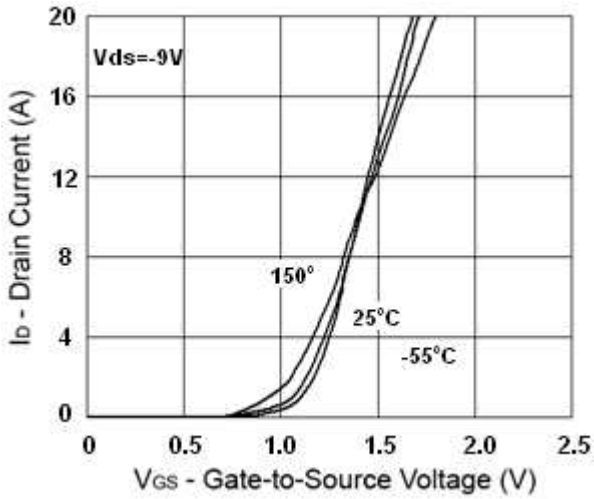
## CHARACTERISTICS CURVES

($T_C$ = 25°C unless otherwise noted)

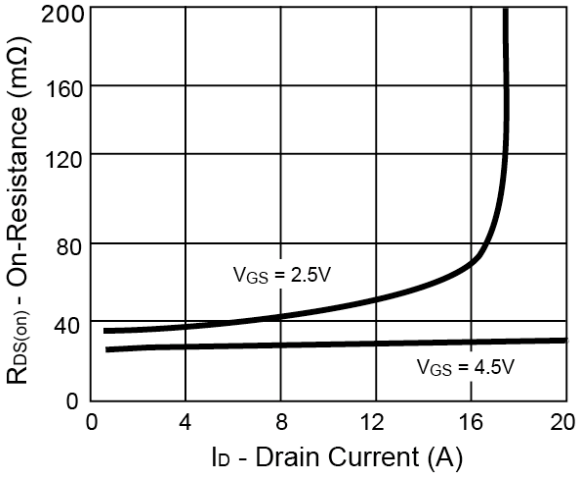
**Output Characteristics**



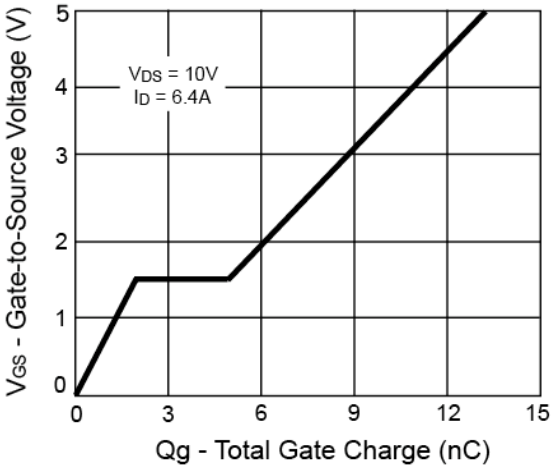

**Transfer Characteristics**



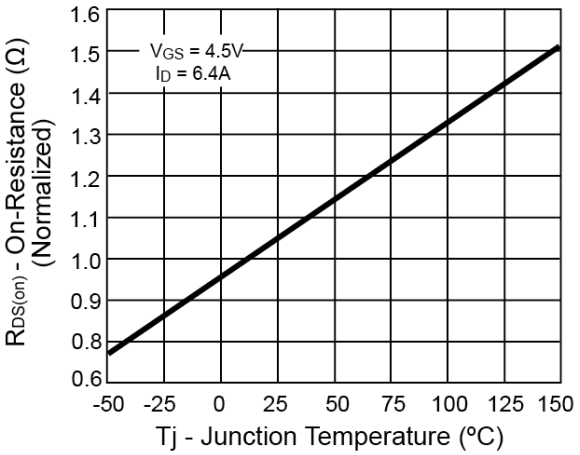

**On-Resistance vs. Drain Current**



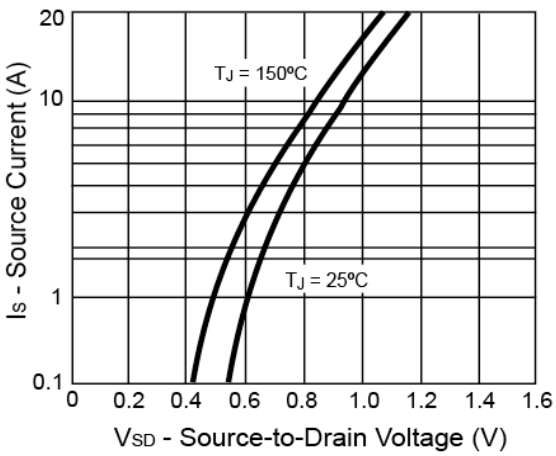

**Gate Charge**




**On-Resistance vs. Junction Temperature**



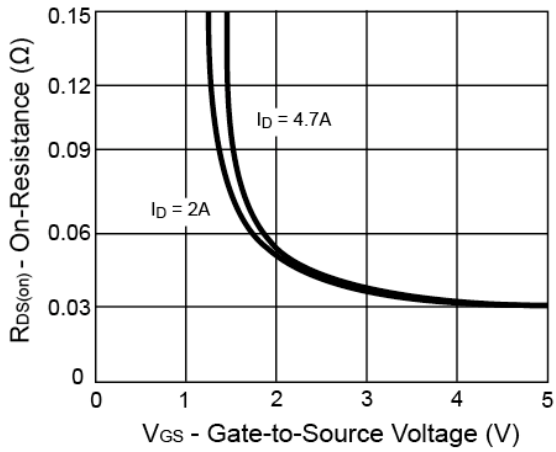

**Source-Drain Diode Forward Voltage**



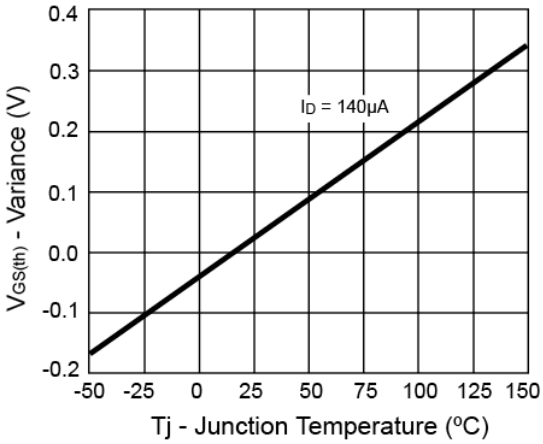
## CHARACTERISTICS CURVES

($T_C$ = 25°C unless otherwise noted)

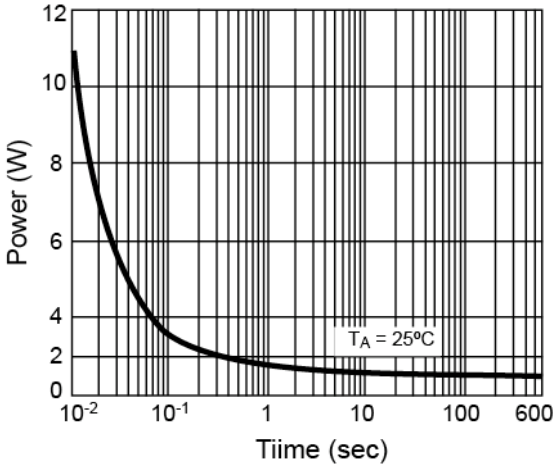
**On-Resistance vs. Gate-Source Voltage**



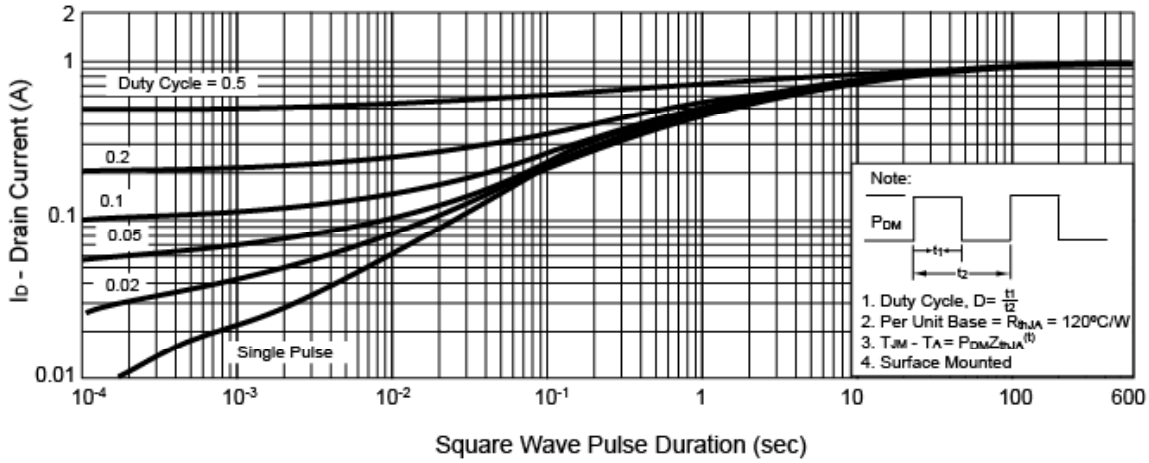

**Threshold Voltage**




**Single Pulse Power**

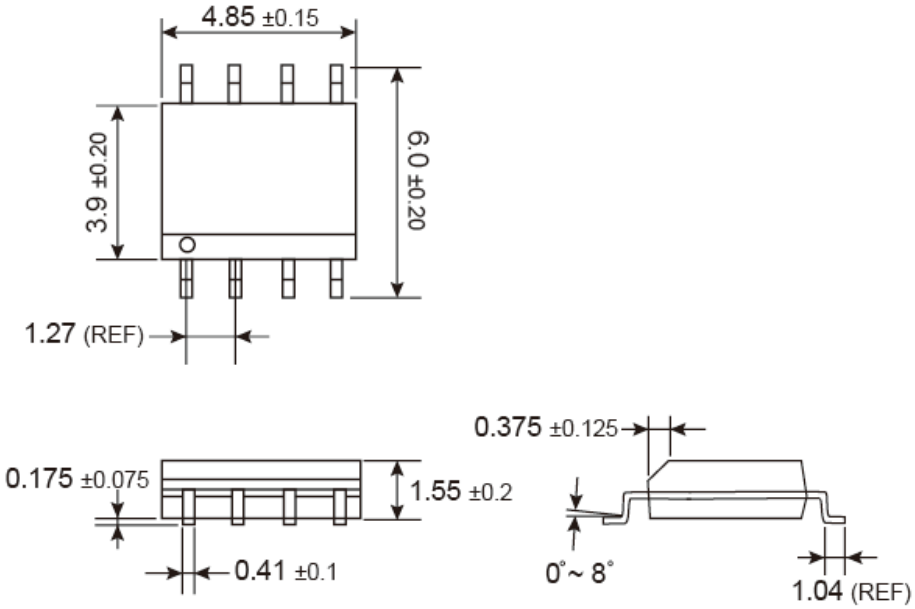



**Normalized Thermal Transient Impedance, Junction-to-Ambient**

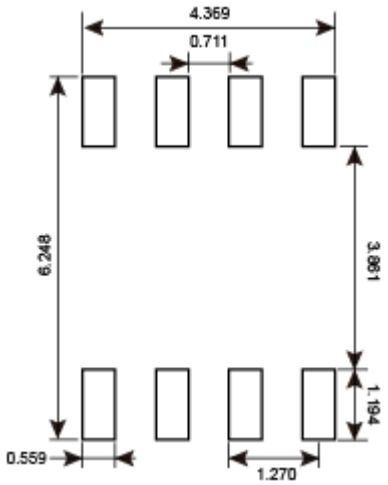


## PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

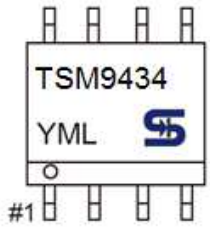
**SOP-8**




## SUGGESTED PAD LAYOUT (Unit: Millimeters)




## 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)

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