# P-Channel Power MOSFET

-30V, -5.3A, 60mΩ

## FEATURES

- Advance Trench Process Technology
- High Density Cell Design for Ultra Low On-resistance
- Compliant to RoHS Directive 2011/65/EU and WEEE 2002/96/EC
- Halogen-free according to IEC 61249-2-21

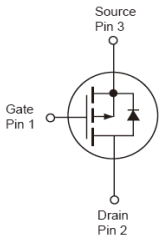
## APPLICATION

- Load Switch
- PA Switch

| KEY PERFORMANCE PARAMETERS | | | |
|---|---|---|---|
| **PARAMETER** | | **VALUE** | **UNIT** |
| $V_{DS}$ | | -30 | V |
| $R_{DS(on)}$ (max) | $V_{GS}$ = -10V | 60 | mΩ |
| | $V_{GS}$ = -4.5V | 90 | |
| $Q_g$ | | 9.52 | nC |

Pb-Free RoHS COMPLIANT HALOGEN FREE

**SOP-8**


**Notes:** MSL 3 (Moisture Sensitivity Level) per J-STD-020

| ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25°C unless otherwise noted) | | | | |
|---|---|---|---|---|
| **PARAMETER** | | **SYMBOL** | **LIMIT** | **UNIT** |
| Drain-Source Voltage | | $V_{DS}$ | -30 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | V |
| Continuous Drain Current, $V_{GS}$ @4.5V (Note 1) | $T_C$ = 25°C | $I_D$ | -5.3 | A |
| | $T_C$ = 100°C | | -3.2 | |
| Pulsed Drain Current, $V_{GS}$ @4.5V (Note 2) | | $I_{DM}$ | -20 | A |
| Total Power Dissipation @ $T_C$ = 25°C | | $P_{DTOT}$ | 2.5 | W |
| 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 3) | | | | | | |
| Drain-Source Breakdown Voltage | $V_{GS}$ = 0V, $I_D$ = -250μA | $BV_{DSS}$ | -30 | -- | -- | V |
| Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = -250μA | $V_{GS(TH)}$ | -1.0 | -1.5 | -3.0 | V |
| Gate Body Leakage | $V_{GS}$ = ±20V, $V_{DS}$ = 0V | $I_{GSS}$ | -- | -- | ±100 | nA |
| Zero Gate Voltage Drain Current | $V_{DS}$ = -24V, $V_{GS}$ = 0V | $I_{DSS}$ | -- | -- | -1 | μA |
| Drain-Source On-State Resistance | $V_{GS}$ = -10V, $I_D$ = -5.3A | $R_{DS(ON)}$ | -- | 50 | 60 | mΩ |
| | $V_{GS}$ = -4.5V, $I_D$ = -4.2A | | -- | 75 | 90 | |
| **Dynamic** (Note 4) | | | | | | |
| Total Gate Charge | $V_{DS}$ = -15V, $I_D$ = -5.3A, $V_{GS}$ = -10V | $Q_g$ | -- | 9.52 | -- | nC |
| Gate-Source Charge | | $Q_{gs}$ | -- | 3.43 | -- | |
| Gate-Drain Charge | | $Q_{gd}$ | -- | 1.71 | -- | |
| Input Capacitance | $V_{DS}$ = -15V, $V_{GS}$ = 0V, f = 1.0MHz | $C_{iss}$ | -- | 551.57 | -- | pF |
| Output Capacitance | | $C_{oss}$ | -- | 90.96 | -- | |
| Reverse Transfer Capacitance | | $C_{rss}$ | -- | 60.79 | -- | |
| **Switching** (Note 5) | | | | | | |
| Turn-On Delay Time | $V_{DD}$ = -15V, $R_{GEN}$ = 6Ω, $I_D$ = -1A, $V_{GS}$ = -10V, | $t_{d(on)}$ | -- | 10.8 | -- | ns |
| Turn-On Rise Time | | $t_r$ | -- | 2.33 | -- | |
| Turn-Off Delay Time | | $t_{d(off)}$ | -- | 22.53 | -- | |
| Turn-Off Fall Time | | $t_f$ | -- | 3.87 | -- | |
| **Source-Drain Diode** (Note 3) | | | | | | |
| Forward On Voltage | $I_S$ = -1.9A, $V_{GS}$ = 0V | $V_{SD}$ | -- | -- | -1.3 | V |

**Notes:**

1. Current limited by package
2. Pulse width limited by the maximum junction temperature
3. Pulse test: PW ≤ 300μs, duty cycle ≤ 2%
4. For DESIGN AID ONLY, not subject to production testing.
5. Switching time is essentially independent of operating temperature.

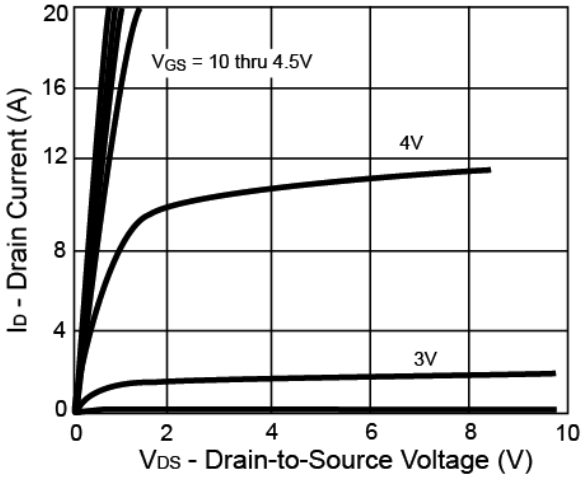
## ORDERING INFORMATION

| PART NO. | PACKAGE | PACKING |
|---|---|---|
| TSM9435CS RLG | SOP-8 | 2,500pcs / 13” Reel |

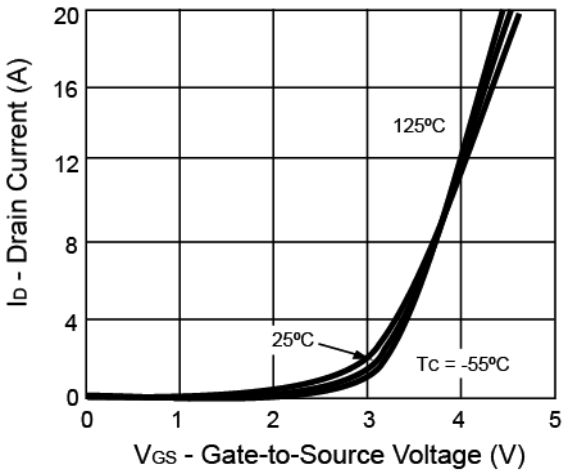
## CHARACTERISTICS CURVES

($T_A$ = 25°C unless otherwise noted)

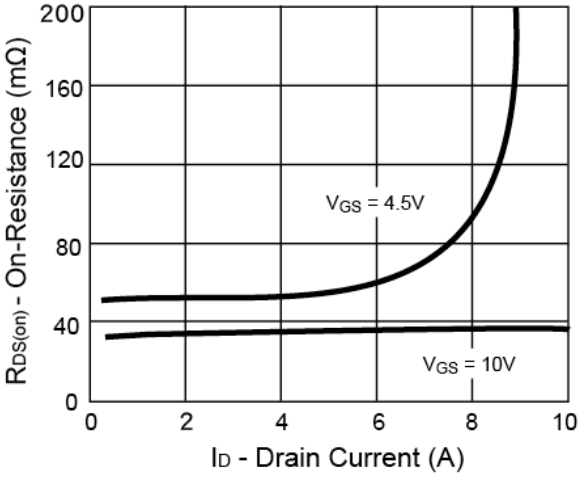
### Output Characteristics



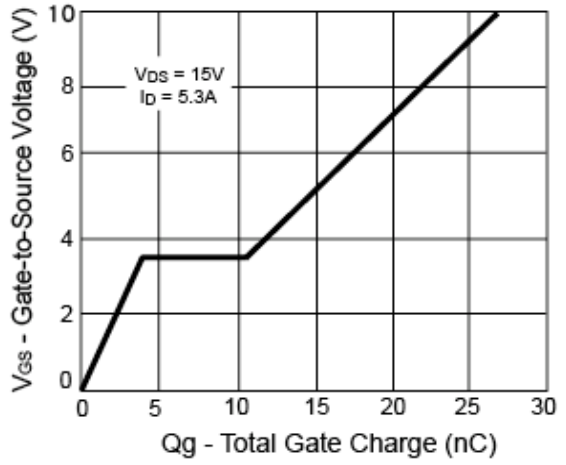

### Transfer Characteristics



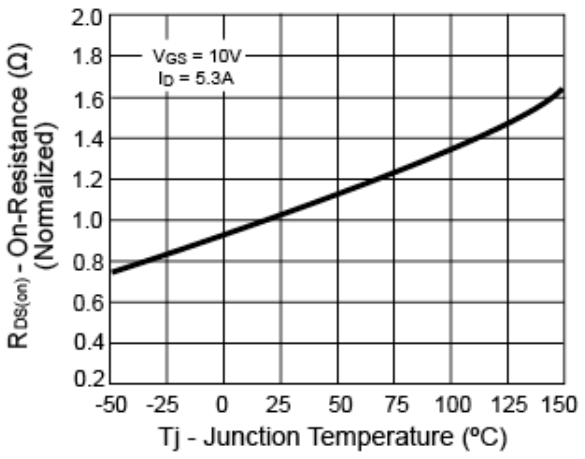

### On-Resistance vs. Drain Current



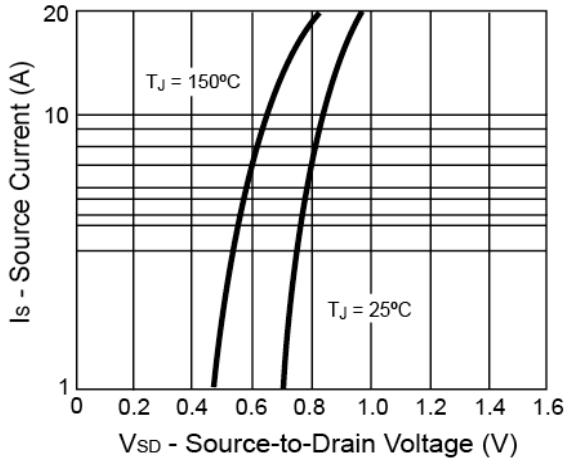

### Gate Charge




### On-Resistance vs. Junction Temperature



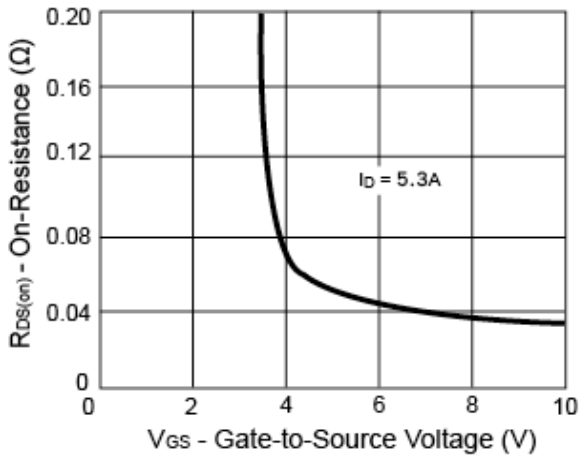

### Source-Drain Diode Forward Voltage



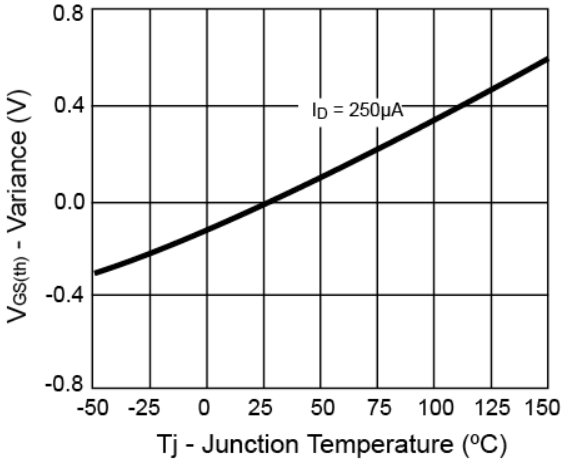
## CHARACTERISTICS CURVES

($T_A$ = 25°C unless otherwise noted)

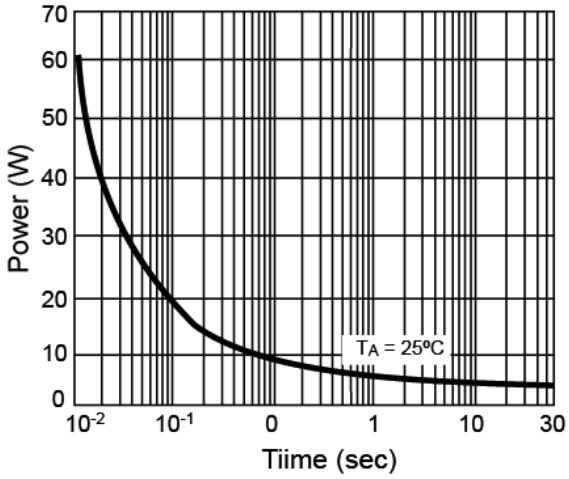
**On-Resistance vs. Gate-Source Voltage**



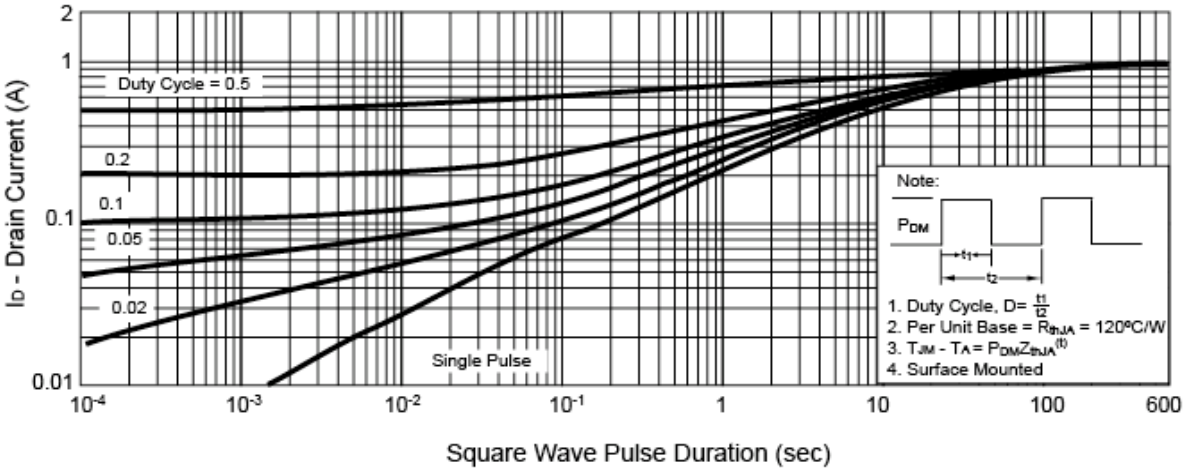

**Threshold Voltage**




**Single Pulse Power**

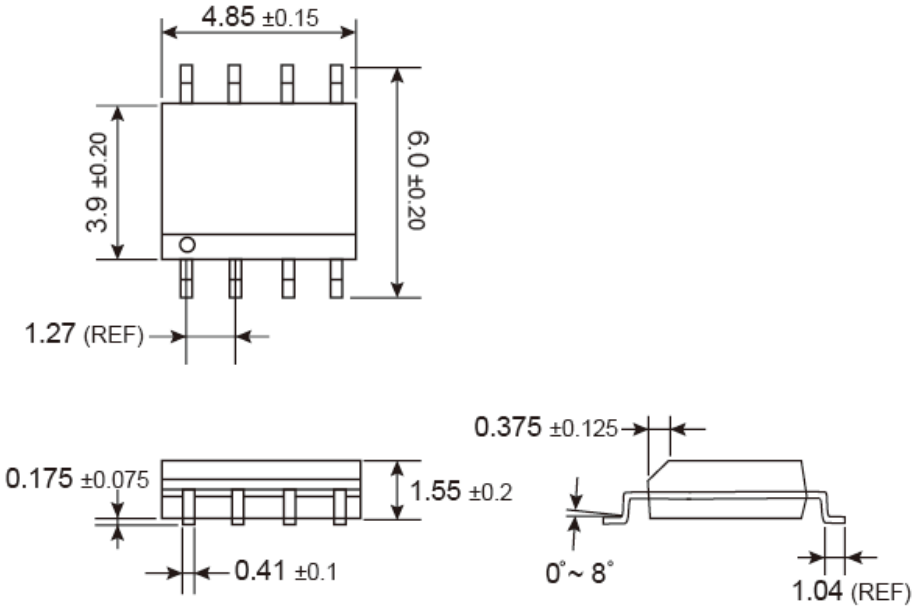



**Normalized Thermal Transient Impedance, Junction-to-Ambient**

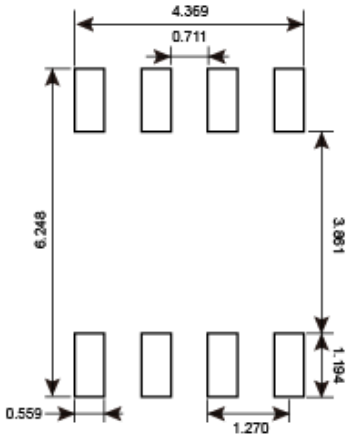


## PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

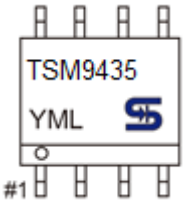
**SOP-8**




## 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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