

# P-Channel Power MOSFET

-20V, -6.4A, 40mΩ

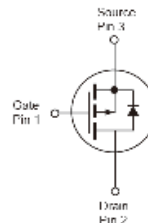
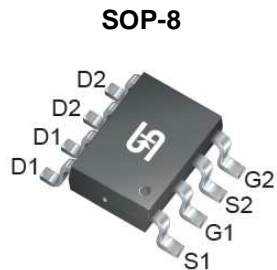
## Features

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

## Application

- Load Switch
- PA Switch

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



**Notes:** Moisture sensitivity level: level 3. 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	$V_{GS}$	$\pm 8$	V
Continuous Drain Current <sup>(Note 1)</sup>	$I_D$	$T_C = 25^\circ C$	-6.4
		$T_C = 100^\circ C$	-3.8
Pulsed Drain Current <sup>(Note 2)</sup>	$I_{DM}$	-19.2	A
Total Power Dissipation @ $T_A = 25^\circ C$	$P_{DTOT}$	2.5	W
Single Pulsed Avalanche Energy <sup>(Note 3)</sup>	$E_{AS}$	13.94	mJ
Single Pulsed Avalanche Current <sup>(Note 3)</sup>	$I_{AS}$	16.7	A
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	- 55 to +150	$^\circ C$

THERMAL PERFORMANCE			
PARAMETER	SYMBOL	LIMIT	UNIT
Junction to Case Thermal Resistance	$R_{\theta JC}$	30	$^\circ C/W$
Junction to Ambient Thermal Resistance	$R_{\theta JA}$	50	$^\circ C/W$

**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.

<b>ELECTRICAL SPECIFICATIONS</b> ( $T_A = 25^\circ\text{C}$ unless otherwise noted)						
PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
<b>Static</b> (Note 4)						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = -250\mu A$	$BV_{DSS}$	-20	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\mu A$	$V_{GS(TH)}$	-0.4	--	-1.0	V
Gate Body Leakage	$V_{GS} = \pm 8V, V_{DS} = 0V$	$I_{GSS}$	--	--	$\pm 100$	nA
Zero Gate Voltage Drain Current	$V_{DS} = -16V, V_{GS} = 0V$	$I_{DSS}$	--	--	-1	$\mu A$
On-State Drain Current	$V_{DS} \leq -5V, V_{GS} = -4.5V$	$I_{D(ON)}$	-10	--	--	A
Drain-Source On-State Resistance	$V_{GS} = -4.5V, I_D = -6.4A$	$R_{DS(ON)}$	--	31	40	m $\Omega$
	$V_{GS} = -2.5V, I_D = -5.1A$		--	45	60	
Forward Transconductance	$V_{DS} = -9V, I_D = -6.4A$	$g_{fs}$	--	14	--	S
<b>Dynamic</b> (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	$V_{DS} = -10V, V_{GS} = 0V,$ $f = 1.0\text{MHz}$	$C_{iss}$	--	1020	--	pF
Output Capacitance		$C_{oss}$	--	191	--	
Reverse Transfer Capacitance		$C_{rss}$	--	140	--	
Gate Resistance	$F = 1\text{MHz}, \text{open drain}$	$R_g$	--	3	--	$\Omega$
<b>Switching</b> (Note 6)						
Turn-On Delay Time	$V_{DD} = -10V,$ $R_{GEN} = 6\Omega,$ $I_D = -1A, V_{GS} = -4.5V,$	$t_{d(on)}$	--	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	
<b>Source-Drain Diode</b> (Note 4)						
Forward On Voltage	$I_S = -2.5A, V_{GS} = 0V$	$V_{SD}$	--	-0.9	-1.2	V
Reverse Recovery Time	$I_S = -4A$ $dI_F/dt = 100A/\mu s$	$t_{rr}$	--	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.  $L = 0.1\text{mH}, I_{AS} = 16.7A, V_{DD} = 25V, R_G = 25\Omega, \text{Starting } T_J = 25^\circ\text{C}$
4. Pulse test:  $PW \leq 300\mu s, \text{duty cycle} \leq 2\%$
5. For DESIGN AID ONLY, not subject to production testing.
6. Switching time is essentially independent of operating temperature.

**ORDERING INFORMATION**

<b>PART NO.</b>	<b>PACKAGE</b>	<b>PACKING</b>
TSM9434CS RLG	SOP-8	2,500pcs / 13" Reel

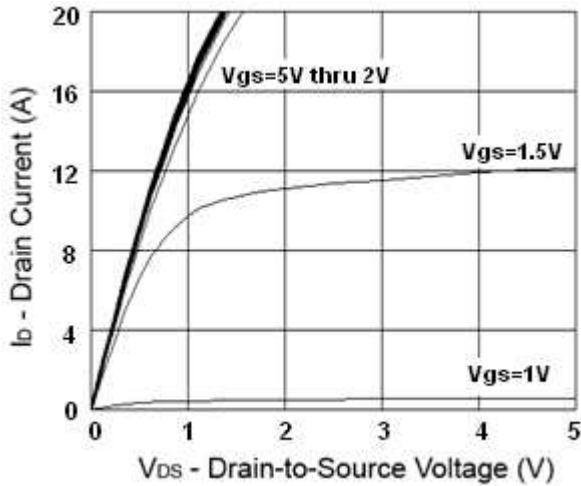
**Note:**

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

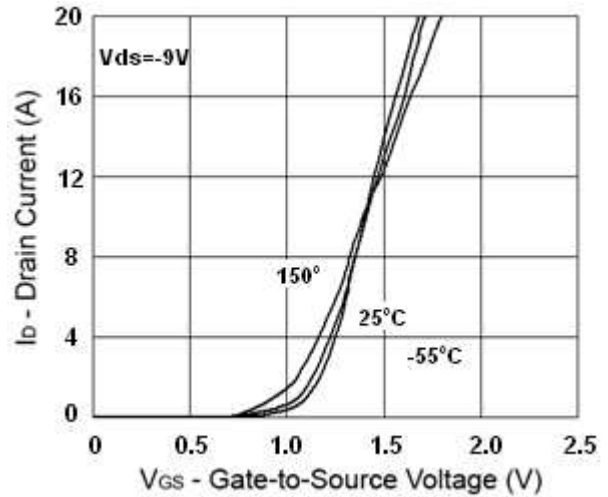
**CHARACTERISTICS CURVES**

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

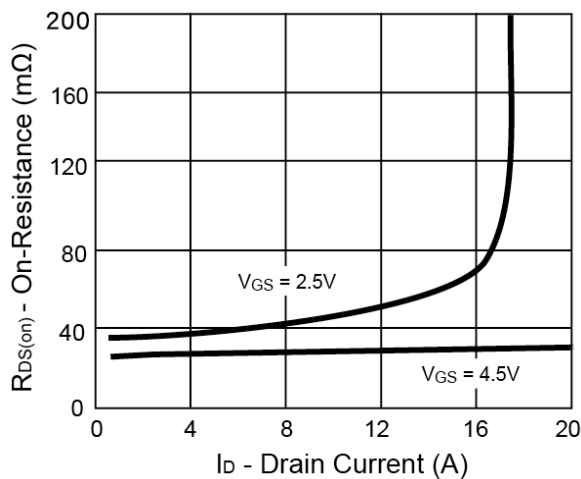
**Output Characteristics**



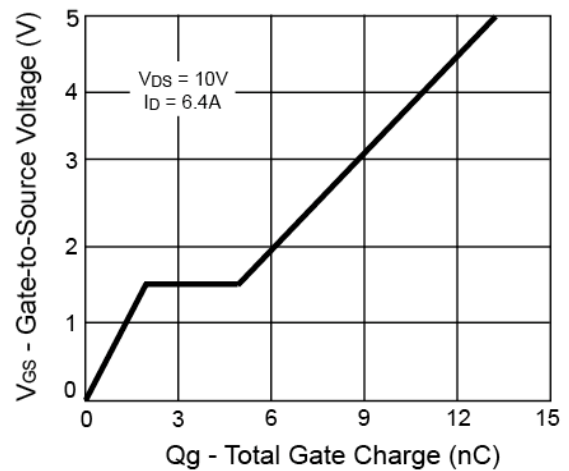
**Transfer Characteristics**



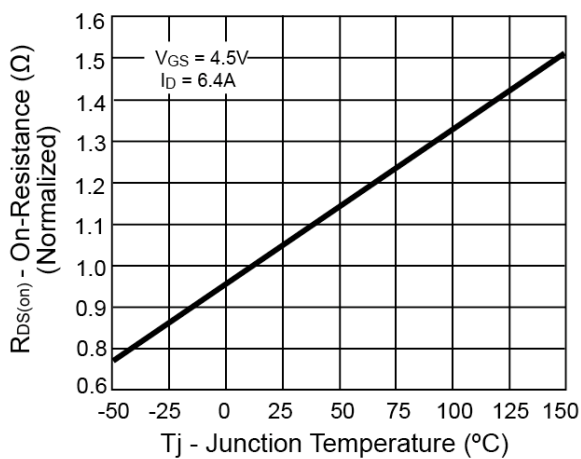
**On-Resistance vs. Drain Current**



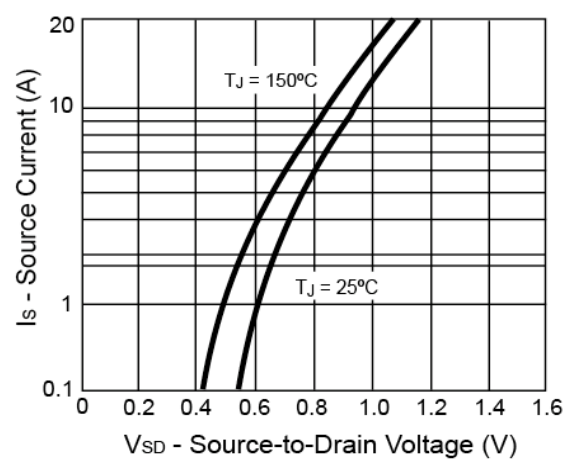
**Gate Charge**



**On-Resistance vs. Junction Temperature**



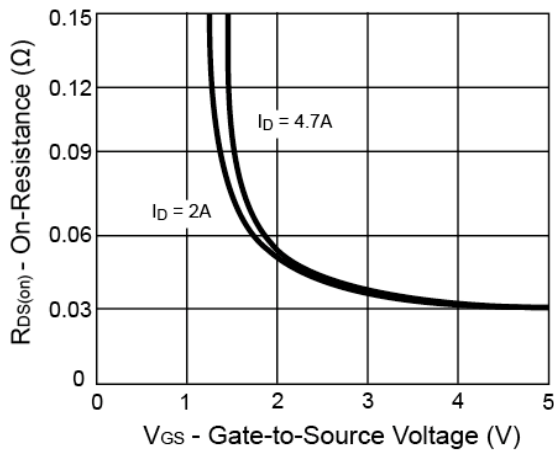
**Source-Drain Diode Forward Voltage**



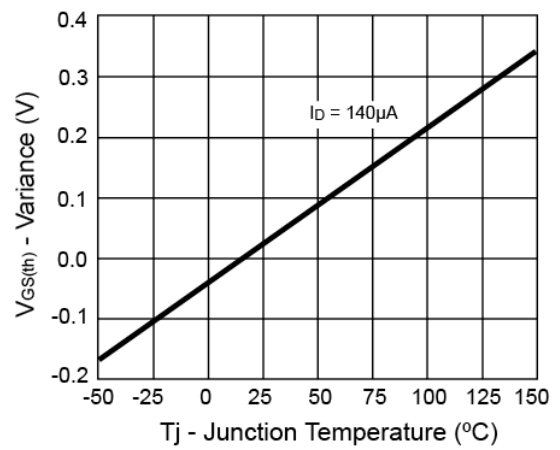
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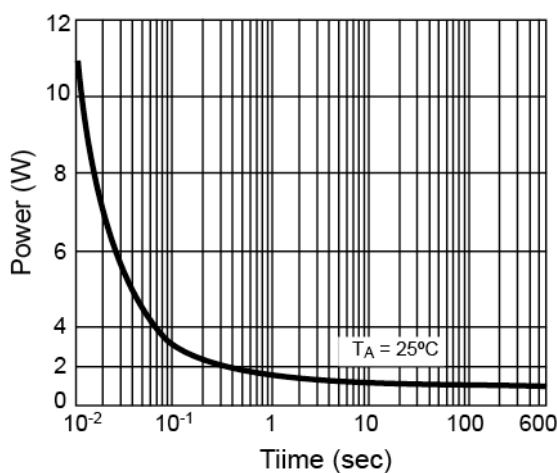
**On-Resistance vs. Gate-Source Voltage**



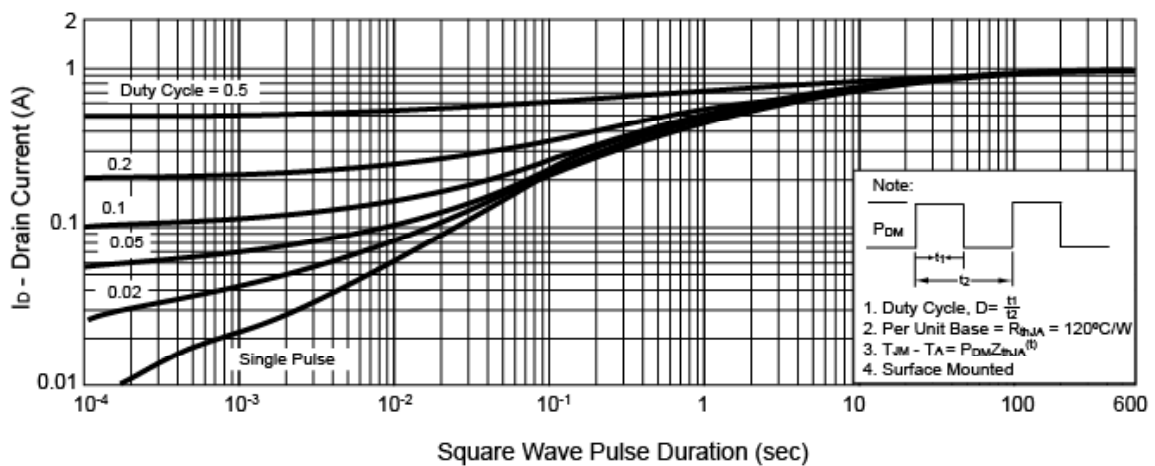
**Threshold Voltage**



**Single Pulse Power**

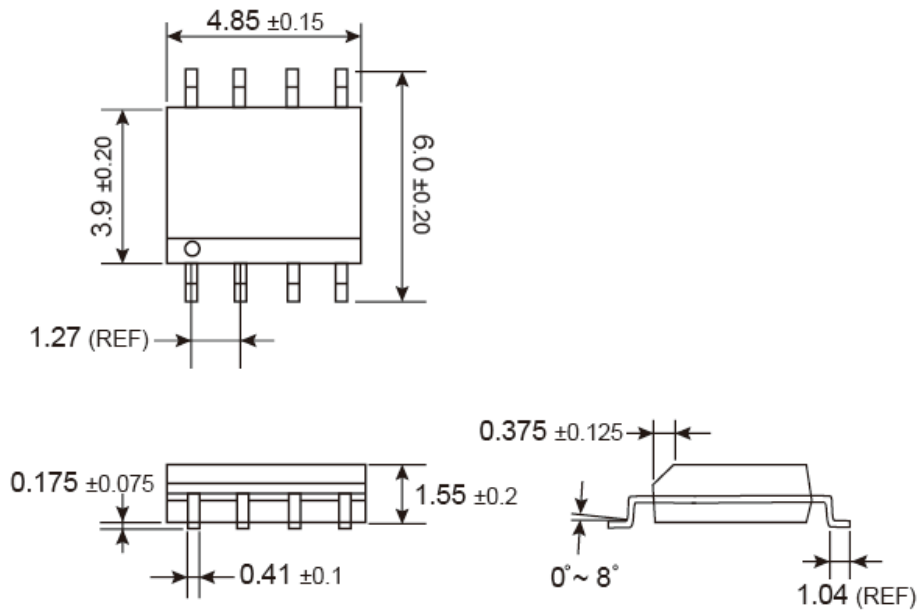


**Normalized Thermal Transient Impedance, Junction-to-Ambient**

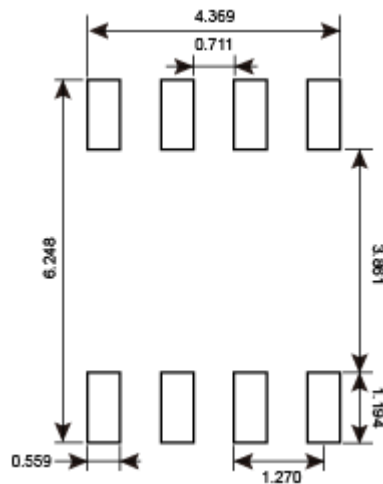


**PACKAGE OUTLINE DIMENSIONS** (Unit: Millimeters)

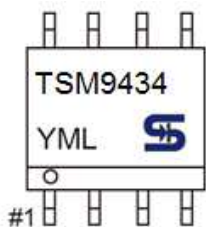
**SOP-8**



**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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