



Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



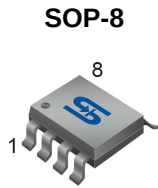
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Pin Definition:

- | | |
|-----------|----------|
| 1. Source | 8. Drain |
| 2. Source | 7. Drain |
| 3. Source | 6. Drain |
| 4. Gate | 5. Drain |

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (m Ω)	I_D (A)
-60	155 @ $V_{GS} = -10V$	-3.5
	200 @ $V_{GS} = 4.5V$	-3.1

Features

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

Application

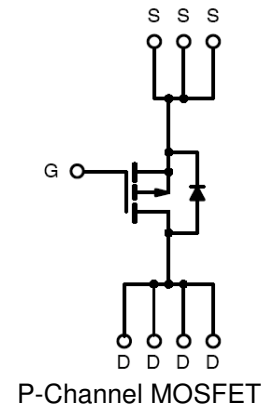
- Load Switch
- PA Switch

Ordering Information

Part No.	Package	Packing
TSM9409CS RLG	SOP-8	2.5Kpcs / 13" Reel

Note: "G" denote for Halogen Free Product

Block Diagram



Absolute Maximum Rating ($T_A = 25^\circ C$ 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	-3.5	A
Pulsed Drain Current	I_{DM}	-30	A
Continuous Source Current (Diode Conduction) ^{a,b}	I_S	-2.5	A
Maximum Power Dissipation	P_D	3.0	W
		2.1	
Operating Junction Temperature	T_J	+150	$^\circ C$
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 (PCB mounted)	$R_{\theta JA}$	50	$^\circ C/W$

Notes:

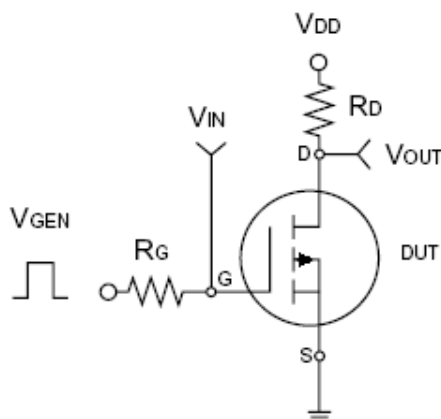
- Pulse width limited by the Maximum junction temperature
- Surface Mounted on FR4 Board, $t \leq 10$ sec.

Electrical Specifications (Ta = 25°C unless otherwise noted)

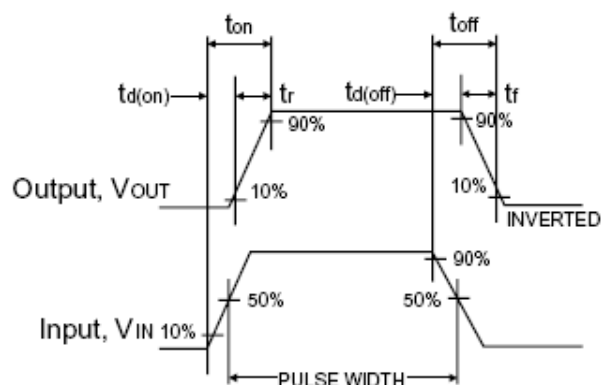
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = -250\mu A$	BV_{DSS}	-60	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\mu A$	$V_{GS(TH)}$	-1.0	--	--	V
Gate Body Leakage	$V_{GS} = \pm 20V, V_{DS} = 0V$	I_{GSS}	--	--	± 100	nA
Zero Gate Voltage Drain Current	$V_{DS} = -60V, V_{GS} = 0V$	I_{DSS}	--	--	-1.0	μA
On-State Drain Current ^a	$V_{DS} = -5V, V_{GS} = -10V$	$I_{D(ON)}$	-20	--	--	A
Drain-Source On-State Resistance ^a	$V_{GS} = -10V, I_D = -3.5A$	$R_{DS(ON)}$	--	125	155	m Ω
	$V_{GS} = -4.5V, I_D = -3.1A$		--	153	200	
Forward Transconductance ^a	$V_{DS} = -15V, I_D = -3.5A$	g_{fs}	--	8	--	S
Diode Forward Voltage	$I_S = -2.5A, V_{GS} = 0V$	V_{SD}	--	-1.25	-1.5	V
Dynamic ^b						
Total Gate Charge	$V_{DS} = -15V, I_D = -3.5A,$ $V_{GS} = -10V$	Q_g	--	6	--	nC
Gate-Source Charge		Q_{gs}	--	1.7	--	
Gate-Drain Charge		Q_{gd}	--	1.5	--	
Input Capacitance	$V_{DS} = -30V, V_{GS} = 0V,$ $f = 1.0MHz$	C_{iss}	--	540	--	pF
Output Capacitance		C_{oss}	--	60	--	
Reverse Transfer Capacitance		C_{rss}	--	30	--	
Switching ^c						
Turn-On Delay Time	$V_{DD} = -15V, R_L = 15\Omega,$ $I_D = -1A, V_{GEN} = -10V,$ $R_G = 6\Omega$	$t_{d(on)}$	--	7	--	nS
Turn-On Rise Time		t_r	--	9	--	
Turn-Off Delay Time		$t_{d(off)}$	--	19	--	
Turn-Off Fall Time		t_f	--	4	--	

Notes:

- a. pulse test: $PW \leq 300\mu S$, duty cycle $\leq 2\%$
b. For DESIGN AID ONLY, not subject to production testing.
b. Switching time is essentially independent of operating temperature.



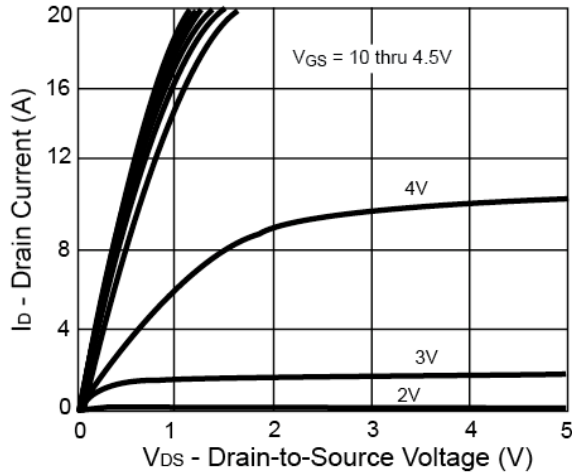
Switching Test Circuit



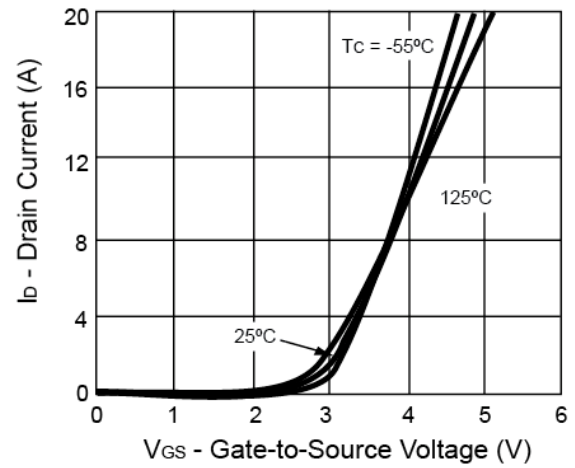
Switchin Waveforms

Electrical Characteristics Curve ($T_a = 25^\circ\text{C}$, unless otherwise noted)

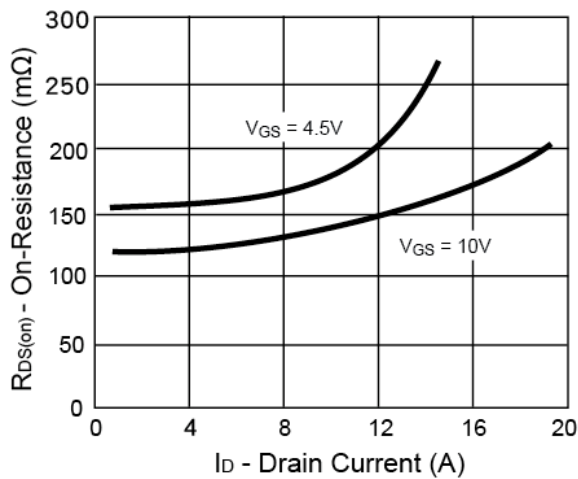
Output Characteristics



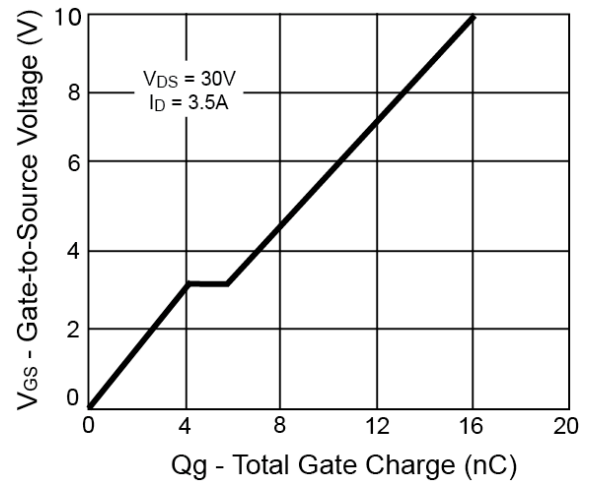
Transfer Characteristics



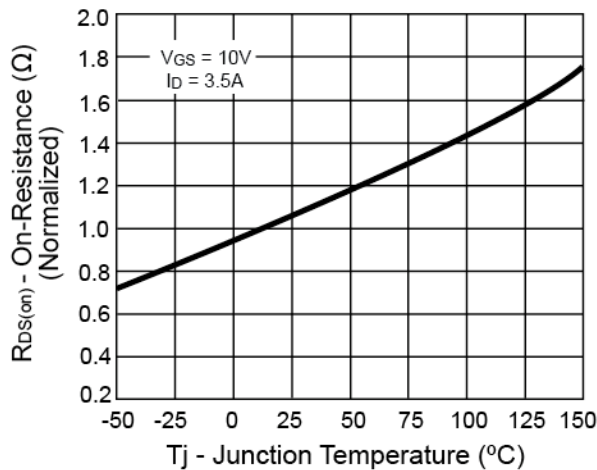
On-Resistance vs. Drain Current



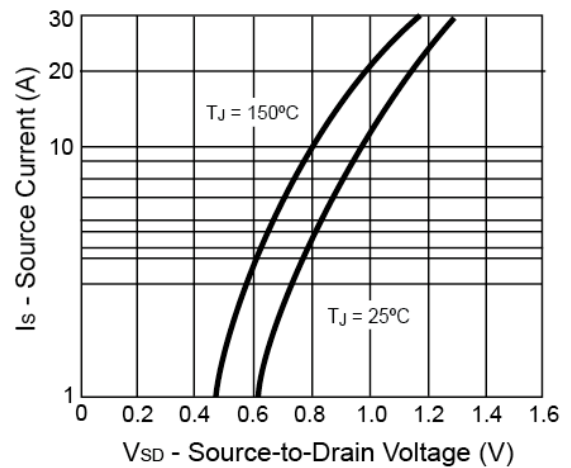
Gate Charge



On-Resistance vs. Junction Temperature

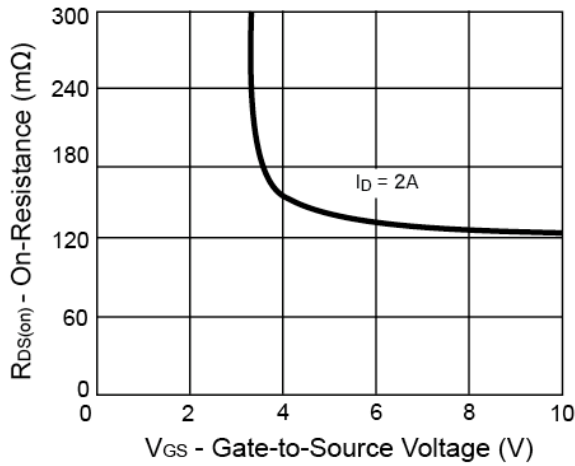


Source-Drain Diode Forward Voltage

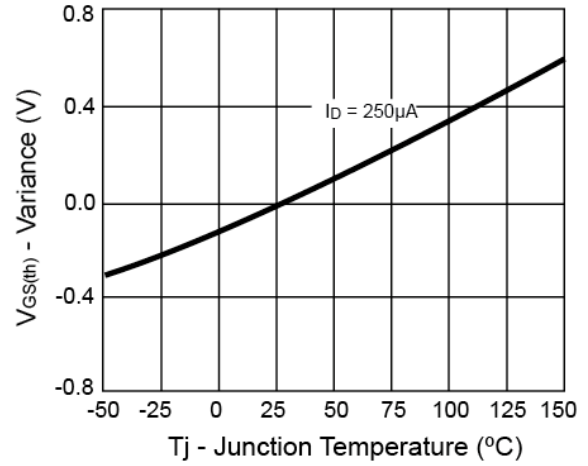


Electrical Characteristics Curve ($T_A = 25^\circ\text{C}$, unless otherwise noted)

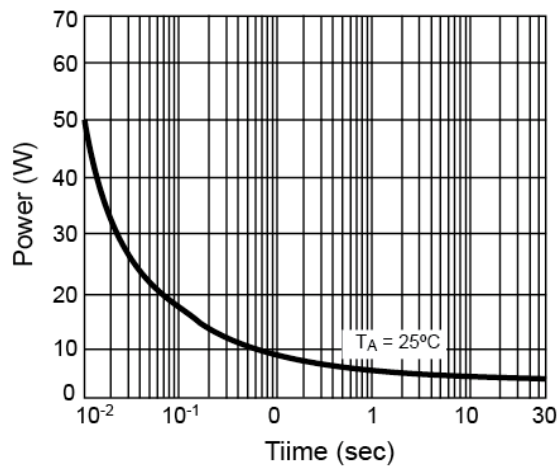
On-Resistance vs. Gate-Source Voltage



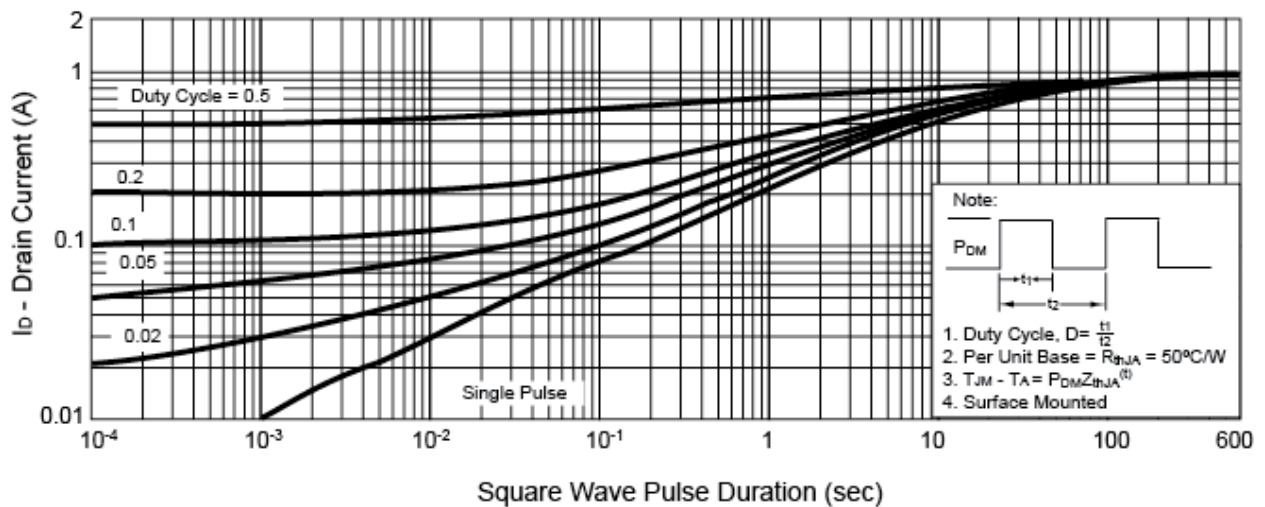
Threshold Voltage



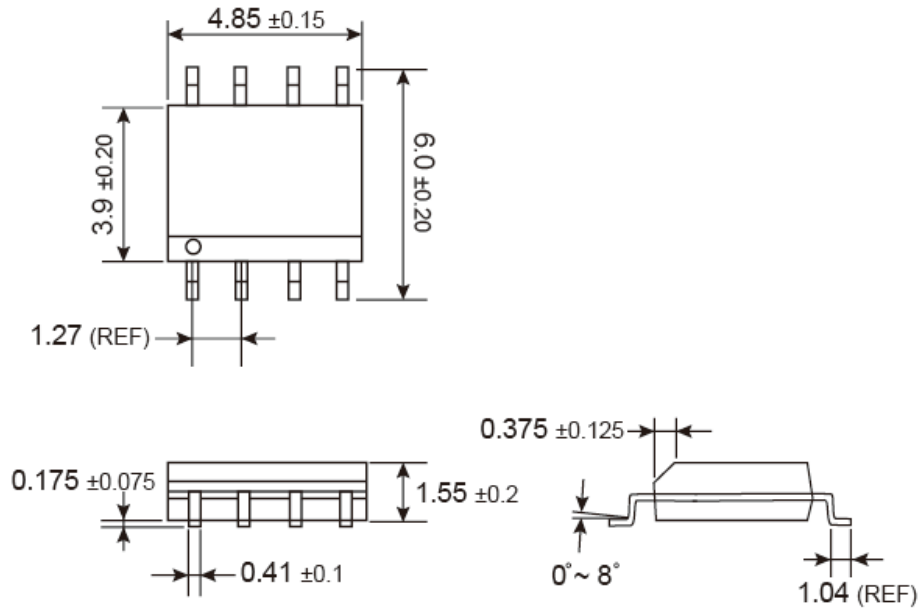
Single Pulse Power



Normalized Thermal Transient Impedance, Junction-to-Ambient

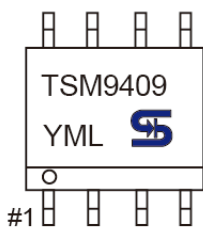


SOP-8 Mechanical Drawing



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

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TSM9409

60V P-Channel MOSFET