



SOP-8



Pin Definition:

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

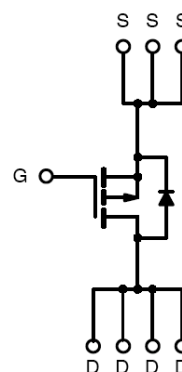
Application

- Load Switch
- PA Switch

Ordering Information

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

Block Diagram



P-Channel MOSFET

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	$T_a = 25^\circ C$	3.0
		$T_a = 70^\circ C$	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:

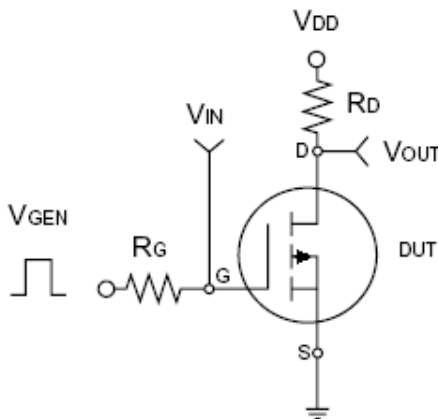
- a. Pulse width limited by the Maximum junction temperature
- b. Surface Mounted on FR4 Board, $t \leq 10$ sec.

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

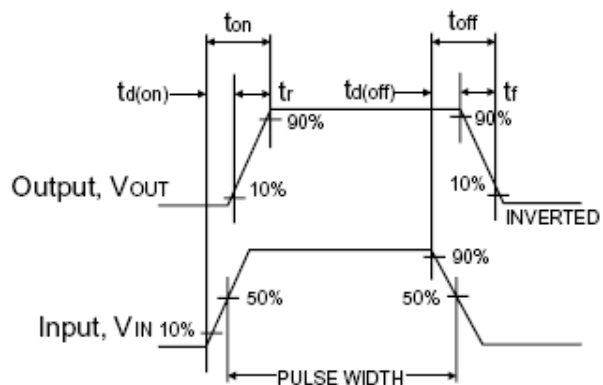
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = -250\mu A$	BV_{DSS}	-60	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\mu A$	$V_{GS(TH)}$	-1.0	--	--	V
Gate Body Leakage	$V_{GS} = \pm 20V, V_{DS} = 0V$	I_{GSS}	--	--	± 100	nA
Zero 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.



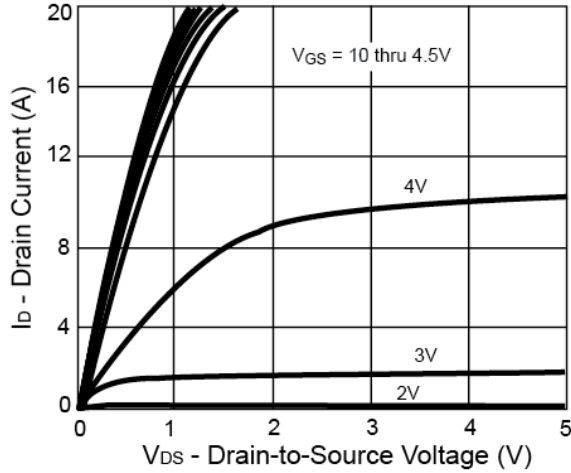
Switching Test Circuit



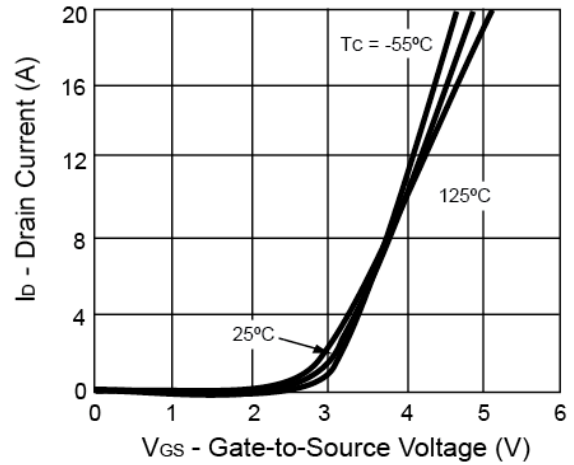
Switchin Waveforms

Electrical Characteristics Curve (Ta = 25°C, unless otherwise noted)

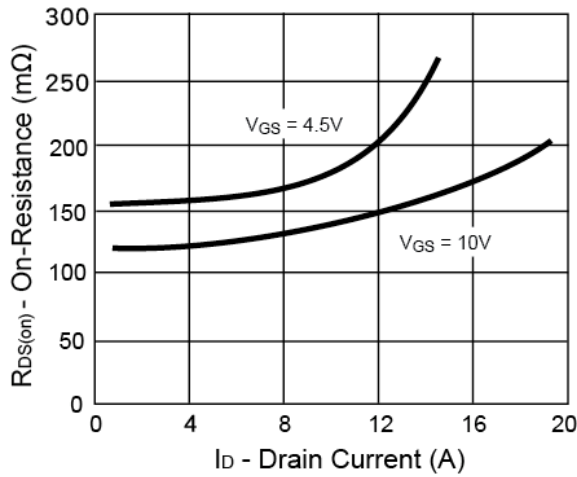
Output Characteristics



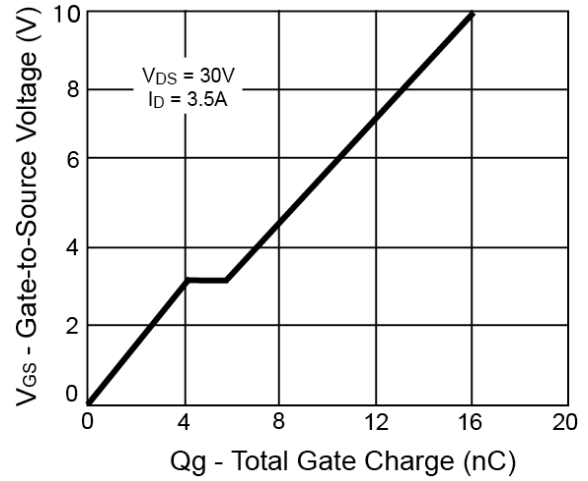
Transfer Characteristics



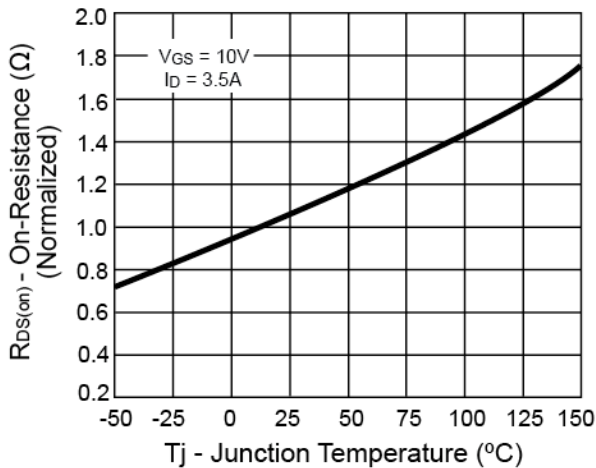
On-Resistance vs. Drain Current



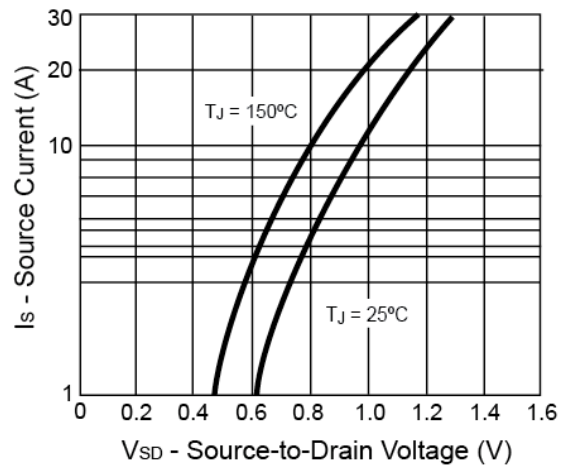
Gate Charge



On-Resistance vs. Junction Temperature

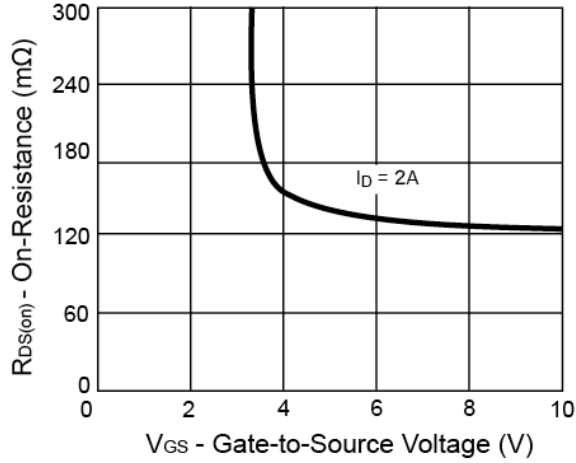


Source-Drain Diode Forward Voltage

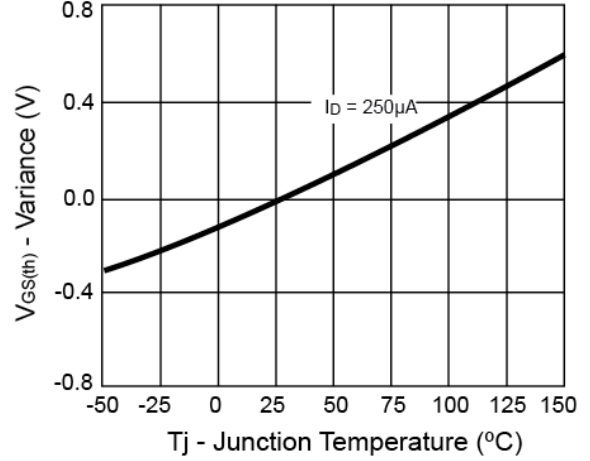


Electrical Characteristics Curve ($T_A = 25^\circ\text{C}$, unless otherwise noted)

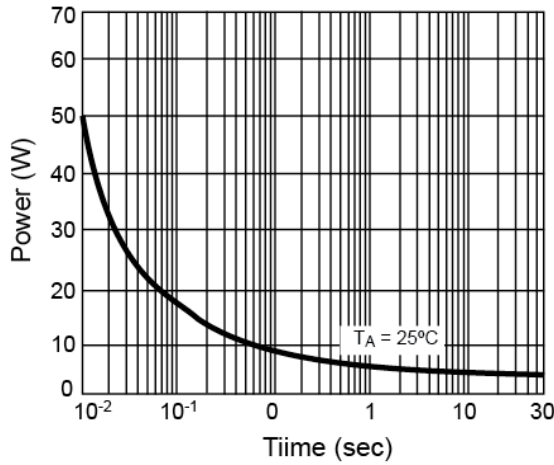
On-Resistance vs. Gate-Source Voltage



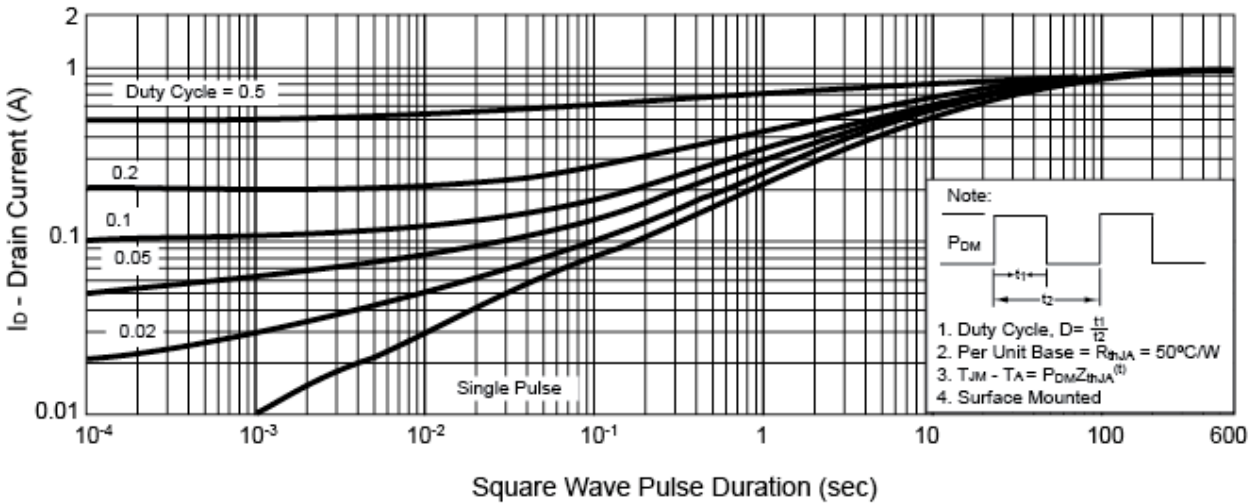
Threshold Voltage



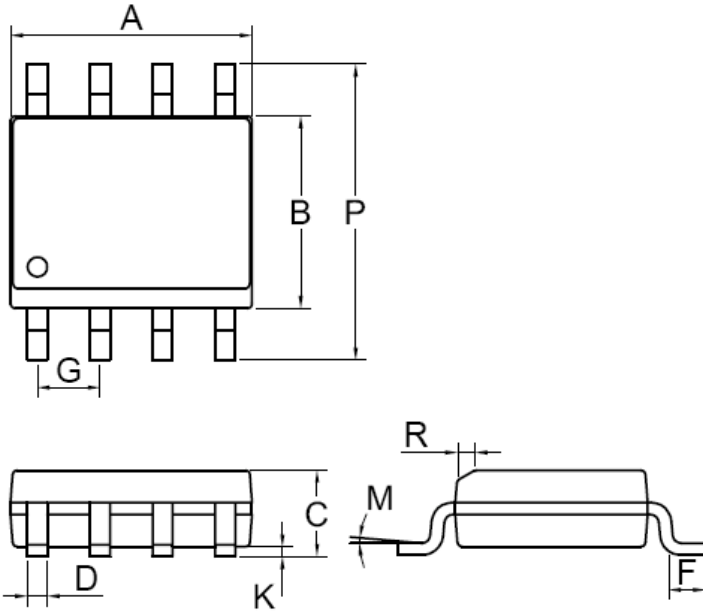
Single Pulse Power



Normalized Thermal Transient Impedance, Junction-to-Ambient

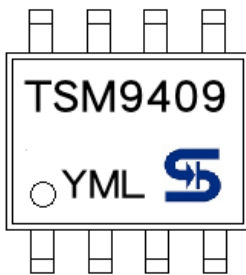


SOP-8 Mechanical Drawing



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX.
A	4.80	5.00	0.189	0.196
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27BSC		0.05BSC	
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

Marking Diagram



- Y** = Year Code
- M** = Month Code
(A=Jan, B=Feb, C=Mar, D=Apr, E=May, F=Jun, G=Jul, H=Aug, I=Sep, J=Oct, K=Nov, L=Dec)
- L** = Lot Code

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