



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!



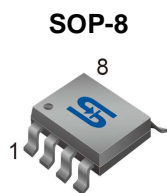
Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China





Pin Definition:

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

Key Parameter Performance

Parameter	Value	Unit
V_{DS}	-20	V
$R_{DS(on)}$ (max)	$V_{GS} = -4.5V$	60
	$V_{GS} = -2.7V$	78
	$V_{GS} = -2.5V$	85
Q_g	6	nC

Features

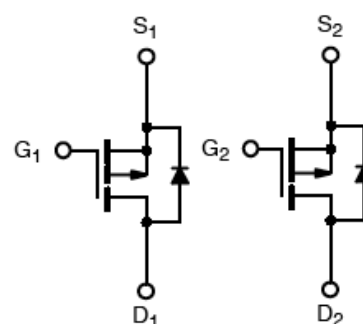
- Advance Trench Process Technology
- High Density Cell Design for Ultra Low On-resistance

Ordering Information

Part No.	Package	Packing
TSM9933DCS RLG	SOP-8	2.5kps / 13" Reel

Note: "G" denotes for Halogen- and Antimony-free as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds

Block Diagram



Dual P-Channel MOSFET

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}	± 12	V
Continuous Drain Current, V_{GS} @ 4.5V.	I_D	-4.7	A
Pulsed Drain Current, V_{GS} @ 4.5V	I_{DM}	-20	A
Continuous Source Current (Diode Conduction) ^(Note 1,2)	I_S	-2.5	A
Maximum Power Dissipation	P_D	$T_A=25^{\circ}C$	2
		$T_A=70^{\circ}C$	1.3
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)	$R_{\theta JA}$	62.5	$^{\circ}C/W$

Electrical Specifications ($T_J=25^\circ\text{C}$ unless otherwise noted)

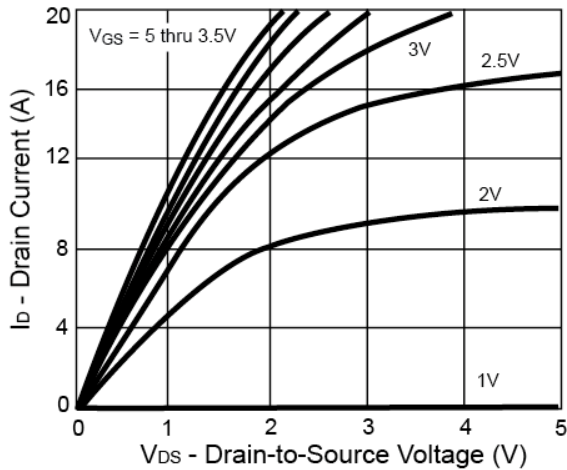
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Static (Note 3)						
Drain-Source Breakdown Voltage	$V_{GS} = 0\text{V}, I_D = -250\mu\text{A}$	BV_{DSS}	-20	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\mu\text{A}$	$V_{GS(TH)}$	-0.6	--	-1.4	V
Gate Body Leakage	$V_{GS} = \pm 12\text{V}, V_{DS} = 0\text{V}$	I_{GSS}	--	--	± 100	nA
Zero Gate Voltage Drain Current	$V_{DS} = -20\text{V}, V_{GS} = 0\text{V}$	I_{DSS}	--	--	-1.0	μA
On-State Drain Current	$V_{DS} = -5\text{V}, V_{GS} = -4.5\text{V}$	$I_{D(ON)}$	-15	--	--	A
Drain-Source On-State Resistance	$V_{GS} = -4.5\text{V}, I_D = -4.7\text{A}$	$R_{DS(ON)}$	--	48	60	m Ω
	$V_{GS} = -4.5\text{V}, I_D = -2.9\text{A}$		--	47	58	
	$V_{GS} = -2.7\text{V}, I_D = -1.5\text{A}$		--	60	78	
	$V_{GS} = -2.5\text{V}, I_D = -3.8\text{A}$		--	65	85	
Forward Transconductance	$V_{DS} = -10\text{V}, I_D = -4.7\text{A}$	g_{fs}	--	11	--	S
Diode Forward Voltage	$I_S = -1.7\text{A}, V_{GS} = 0\text{V}$	V_{SD}	--	-0.8	-1.2	V
Dynamic (Note 4,5)						
Total Gate Charge	$V_{DS} = -10\text{V}, I_D = -4.7\text{A},$ $V_{GS} = -4.5\text{V}$	Q_g	--	6	9	nC
Gate-Source Charge		Q_{gs}	--	1.4	--	
Gate-Drain Charge		Q_{gd}	--	1.9	--	
Input Capacitance	$V_{DS} = -10\text{V}, V_{GS} = 0\text{V},$ $f = 1.0\text{MHz}$	C_{iss}	--	640	--	pF
Output Capacitance		C_{oss}	--	180	--	
Reverse Transfer Capacitance		C_{rss}	--	90	--	
Switching (Note 4,5)						
Turn-On Delay Time	$V_{DD} = -10\text{V}, R_L = 10\Omega,$ $I_D = -1\text{A}, V_{GEN} = -4.5\text{V},$ $R_G = 6\Omega$	$t_{d(on)}$	--	22	35	ns
Turn-On Rise Time		t_r	--	35	55	
Turn-Off Delay Time		$t_{d(off)}$	--	45	70	
Turn-Off Fall Time		t_f	--	25	50	

Notes:

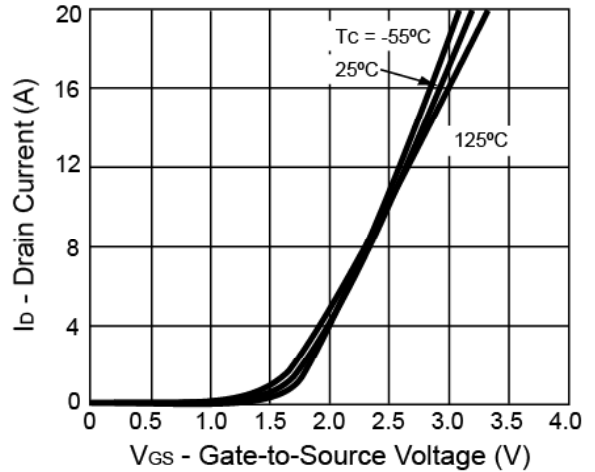
1. Pulse width limited by the Maximum junction temperature
2. Surface Mounted on FR4 Board, $t \leq 5$ sec.
3. pulse test: $PW \leq 300\mu\text{s}$, duty cycle $\leq 2\%$
4. For DESIGN AID ONLY, not subject to production testing.
5. Switching time is essentially independent of operating temperature.

Electrical Characteristics Curves

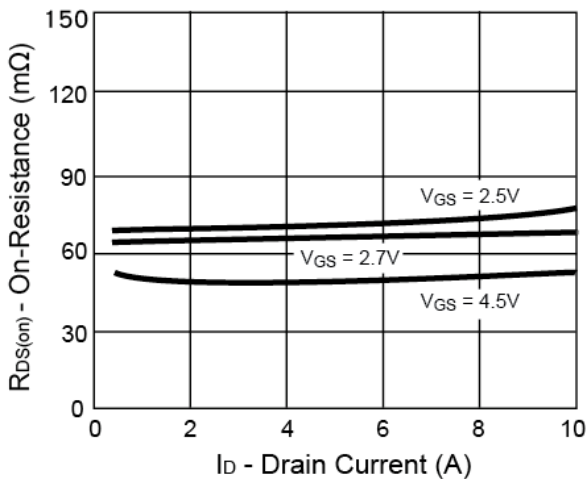
Output Characteristics



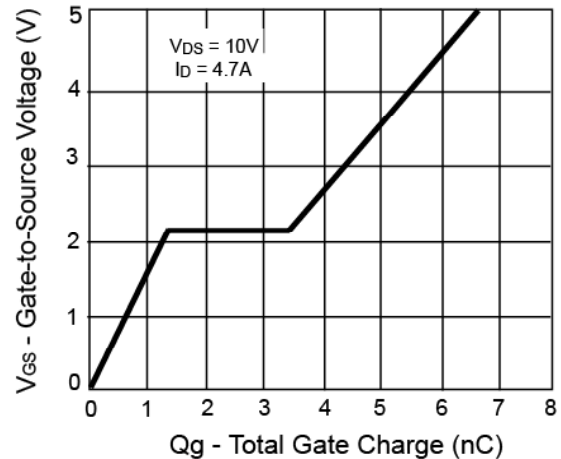
Transfer Characteristics



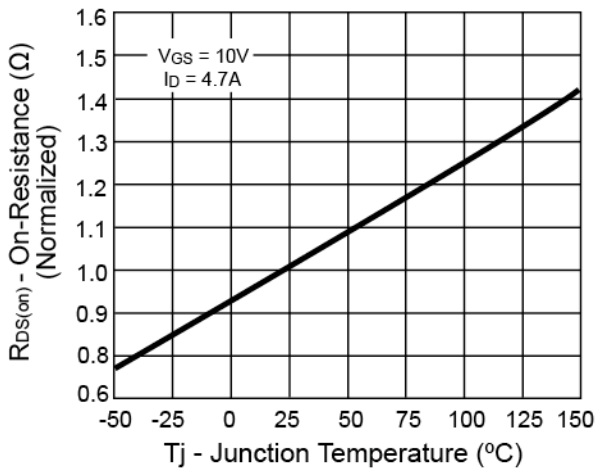
On-Resistance vs. Drain Current



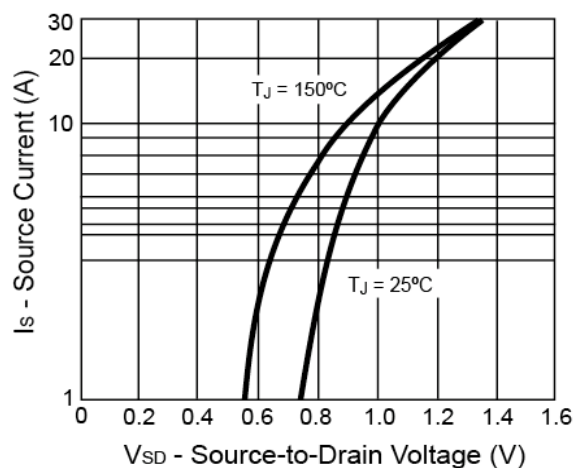
Gate Charge



On-Resistance vs. Junction Temperature

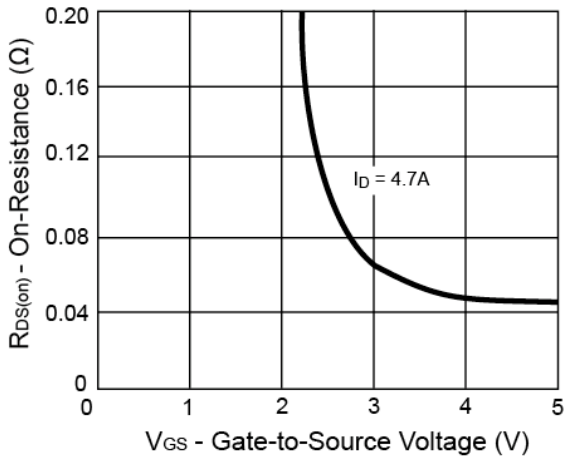


Source-Drain Diode Forward Voltage

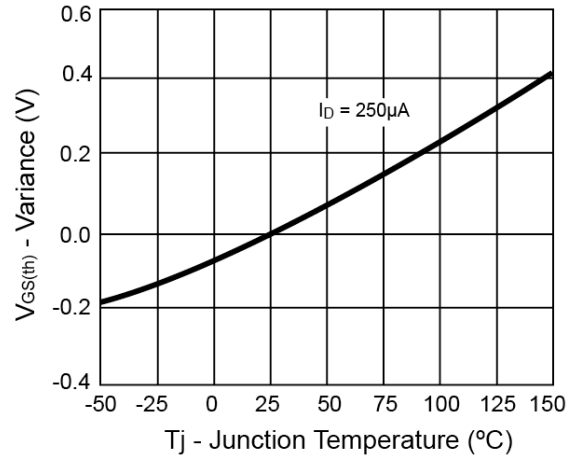


Electrical Characteristics Curves

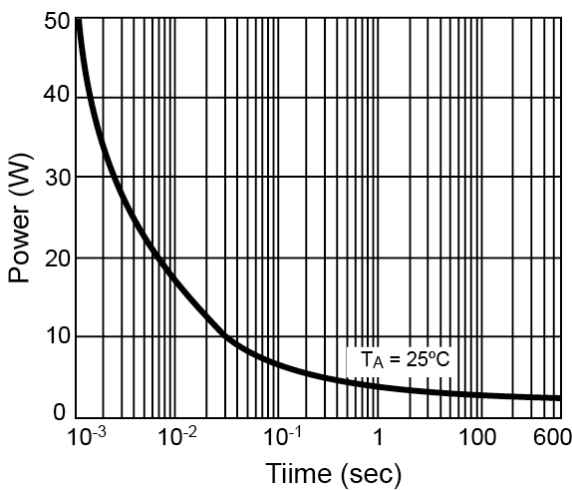
On-Resistance vs. Gate-Source Voltage



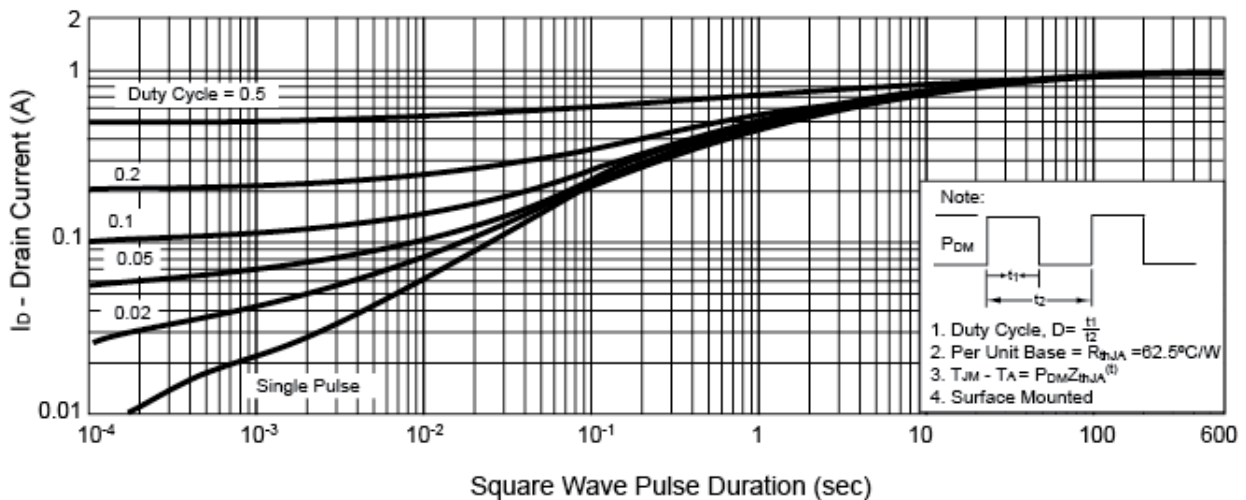
Threshold Voltage



Single Pulse Power

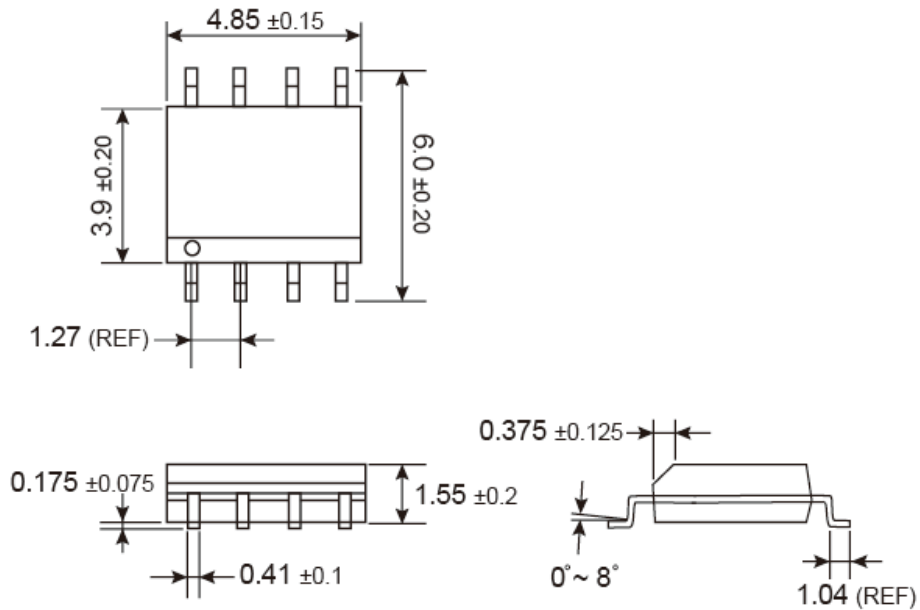


Normalized Thermal Transient Impedance, Junction-to-Ambient



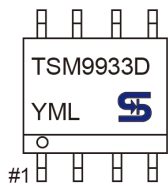


SOP-8 Mechanical Drawing



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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