

SOP-8

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 |

TSM9933D

20V P-Channel MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (m Ω)	I_D (A)
-20	60 @ $V_{GS} = -4.5V$	-4.7
	58 @ $V_{GS} = -4.5V$	-2.9
	78 @ $V_{GS} = -2.7V$	-1.5
	85 @ $V_{GS} = -2.5V$	-3.8

Features

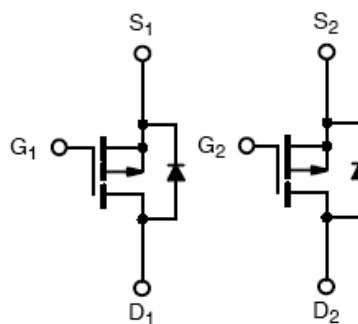
- Advance Trench Process Technology
- High Density Cell Design for Ultra Low On-resistance

Application

- Load Switch
- PA Switch

Ordering Information

Part No.	Package	Packing
TSM9933DCS RL	SOP-8	2.5Kpcs / 13" Reel

Block Diagram


Dual P-Channel MOSFET

Absolute Maximum Rating ($T_a = 25^\circ\text{C}$ 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) ^{a,b}	I_S	-2.5	A
Maximum Power Dissipation	P_D	2	W
		1.3	
Operating Junction Temperature	T_J	+150	$^\circ\text{C}$
Operating Junction and Storage Temperature Range	T_J, T_{STG}	- 55 to +150	$^\circ\text{C}$

Thermal Performance

Parameter	Symbol	Limit	Unit
Junction to Case Thermal Resistance	$R\theta_{JC}$	30	$^\circ\text{C/W}$
Junction to Ambient Thermal Resistance (PCB mounted)	$R\theta_{JA}$	62.5	$^\circ\text{C/W}$

Notes:

- a. Pulse width limited by the Maximum junction temperature
b. Surface Mounted on FR4 Board, $t \leq 5$ sec.

Electrical Specifications

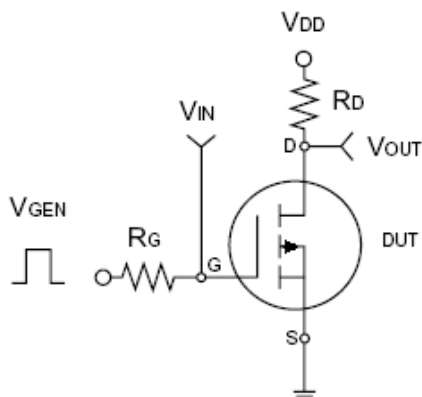
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = -250\mu A$	BV_{DSS}	-20	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\mu A$	$V_{GS(TH)}$	-0.6	--	-1.4	V
Gate Body Leakage	$V_{GS} = \pm 12V, V_{DS} = 0V$	I_{GSS}	--	--	± 100	nA
Zero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

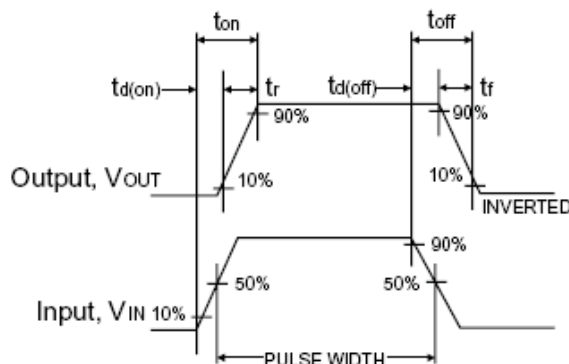
a. pulse test: PW $\leq 300\mu s$, duty cycle $\leq 2\%$

b. For DESIGN AID ONLY, not subject to production testing.

b. Switching time is essentially independent of operating temperature.

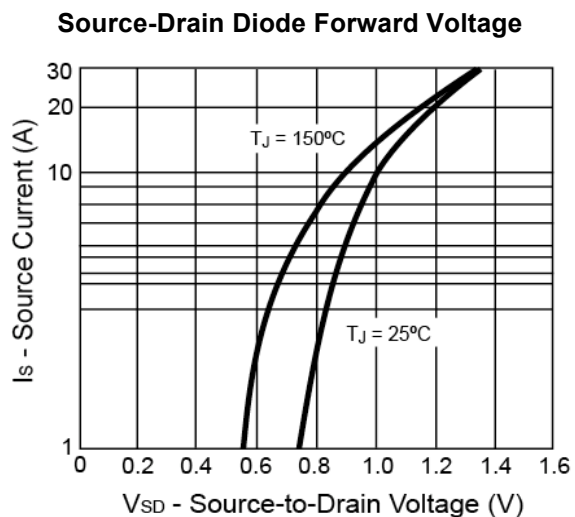
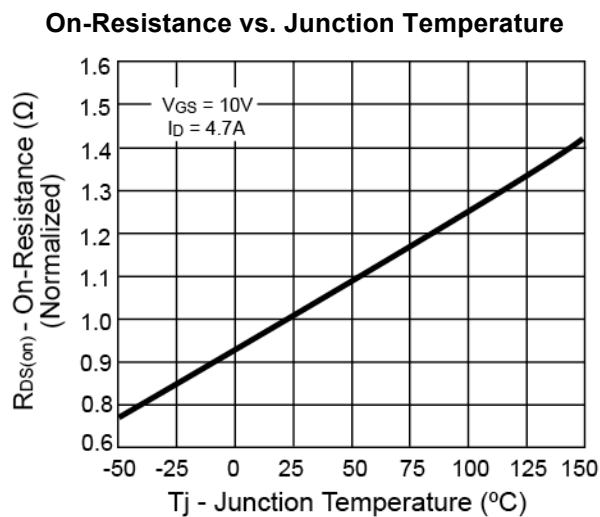
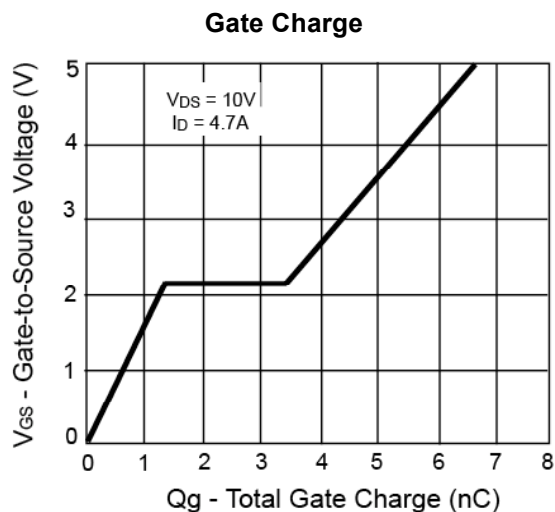
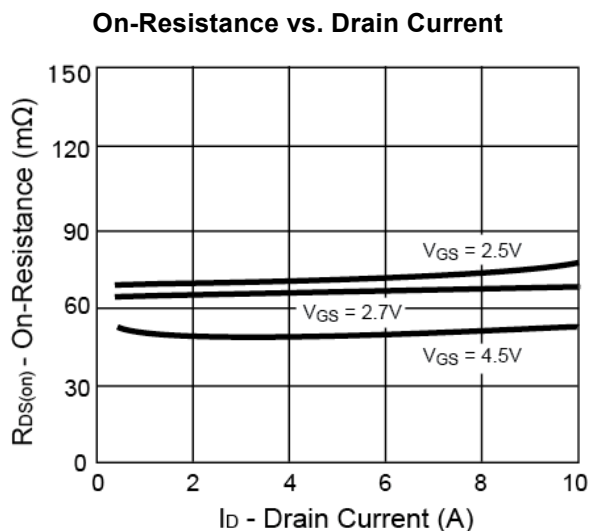
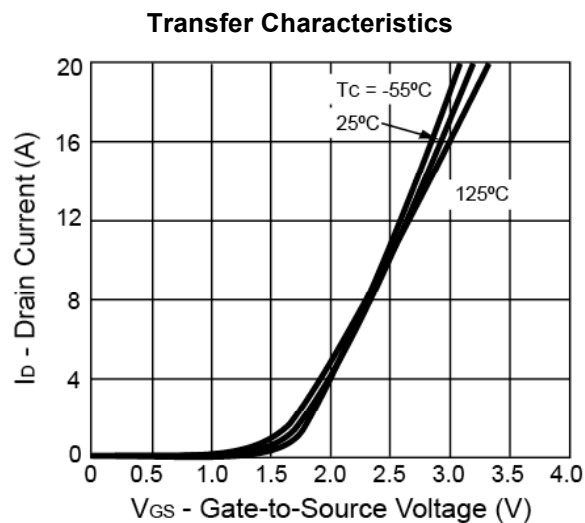
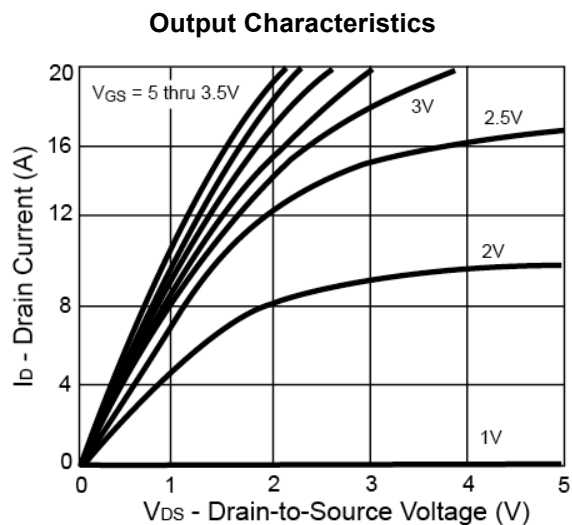


Switching Test Circuit



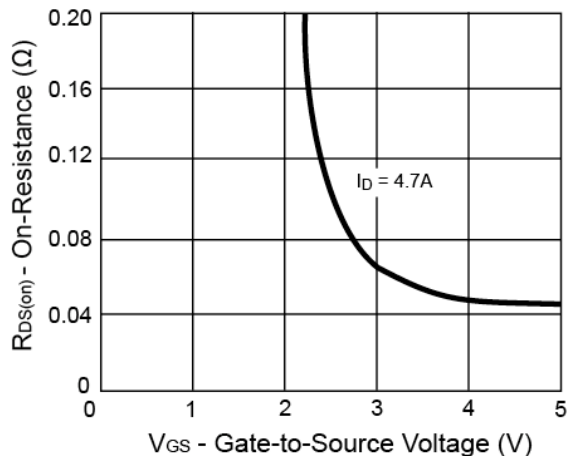
Switchin Waveforms

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

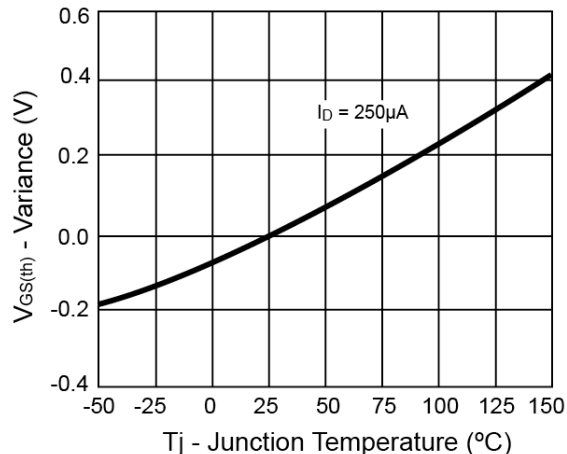


Electrical Characteristics Curve (Ta = 25°C, unless otherwise noted)

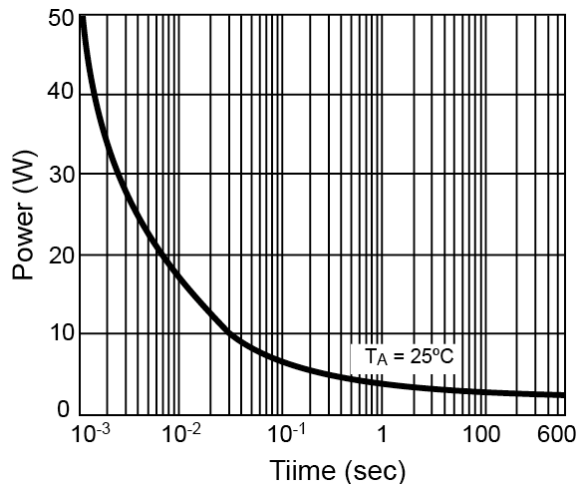
On-Resistance vs. Gate-Source Voltage



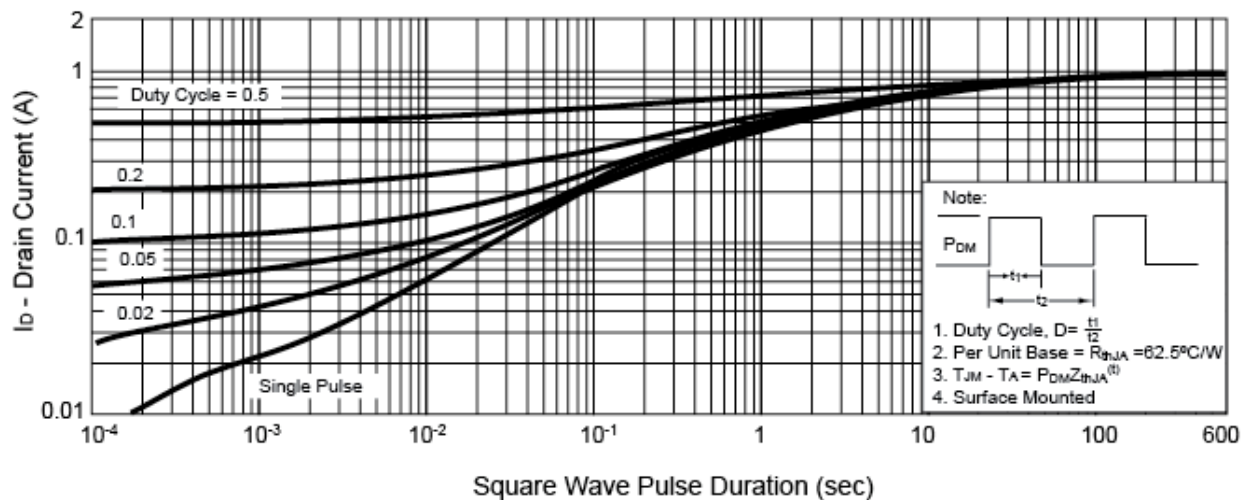
Threshold Voltage



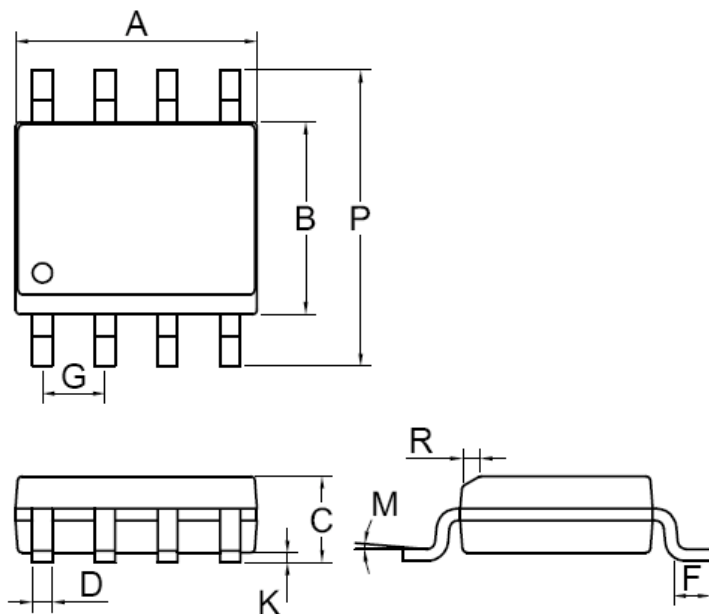
Single Pulse Power



Normalized Thermal Transient Impedance, Junction-to-Ambient

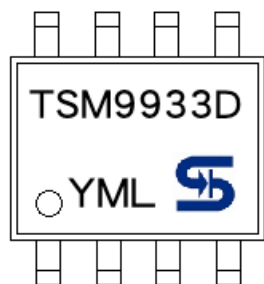


SOP-8 Mechanical Drawing



SOP-8 DIMENSION				
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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