![Taiwan Semiconductor logo]

RoHS COMPLIANCE

TSM9933D
20V P-Channel MOSFET

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

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$(mΩ)	I_D (A)
-20	65 @ V_{GS} = -4.5V	-4.7
	100 @ V_{GS} = -2.5V	-3.8

Features

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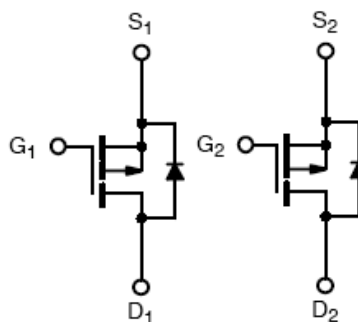- High Density Cell Design for Ultra Low On-resistance

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 (Ta = 25°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	-1.7	A
Maximum Power Dissipation	Ta = 25°C	P_D	2	W
	Ta = 70°C		1.3	
Operating Junction Temperature		T_J	+150	^{o}C
Operating Junction and Storage Temperature Range		T_J, T_{STG}	- 55 to +150	^{o}C

Thermal Performance

Parameter	Symbol	Limit	Unit
Junction to Case Thermal Resistance	$R\Theta_{JC}$	30	^{o}C/W
Junction to Ambient Thermal Resistance (PCB mounted)	$R\Theta_{JA}$	80	^{o}C/W

Notes:

a. Pulse width limited by the Maximum junction temperature

b. Surface Mounted on FR4 Board, t ≤ 5 sec.

Version: A07

Electrical Specifications

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	$V_{GS} = 0V$, $I_D = -250uA$	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	mΩ
	$V_{GS} = -2.5V$, $I_D = -3.8A$		--	80	100	
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:
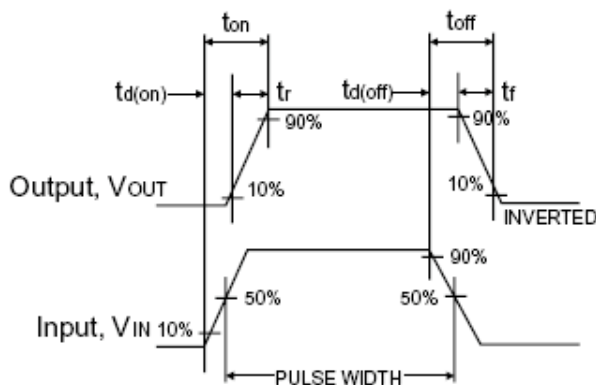a. pulse test: PW ≤300μS, duty cycle ≤2%
b. For DESIGN AID ONLY, not subject to production testing.
b. Switching time is essentially independent of operating temperature.
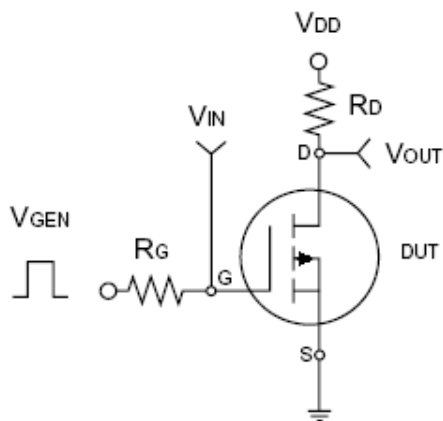
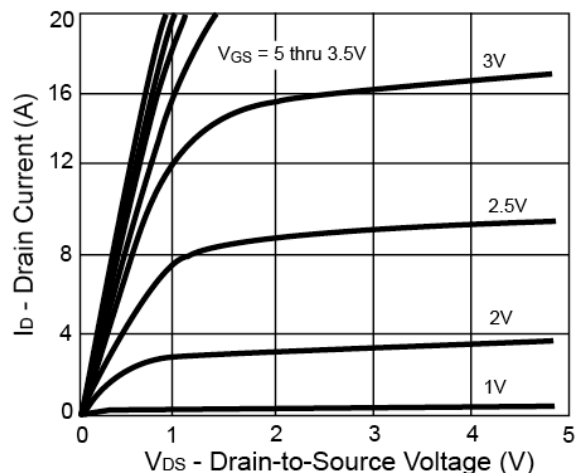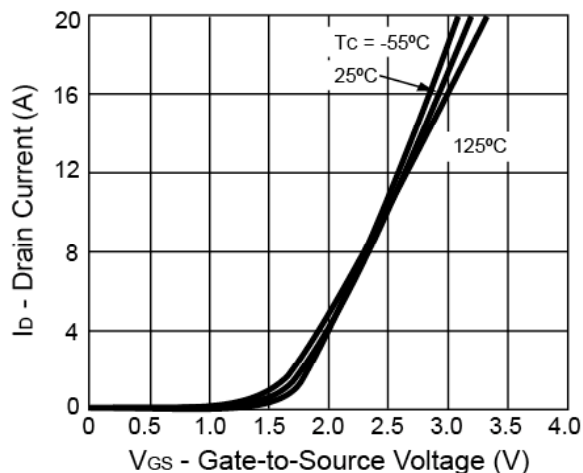**Switching Test Circuit**

Switchin Waveforms

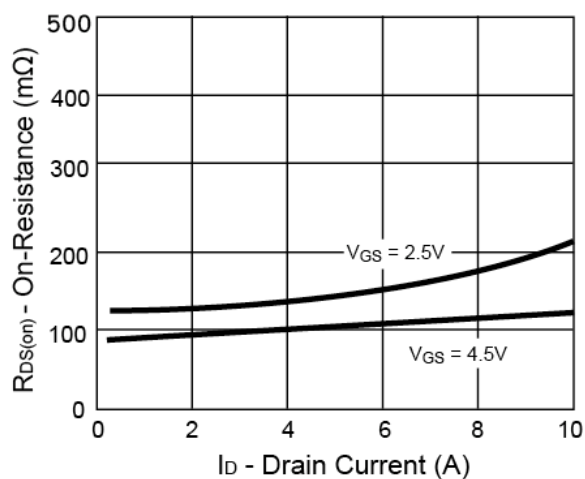## Electrical Characteristics Curve (Ta = 25°C, unless otherwise noted)
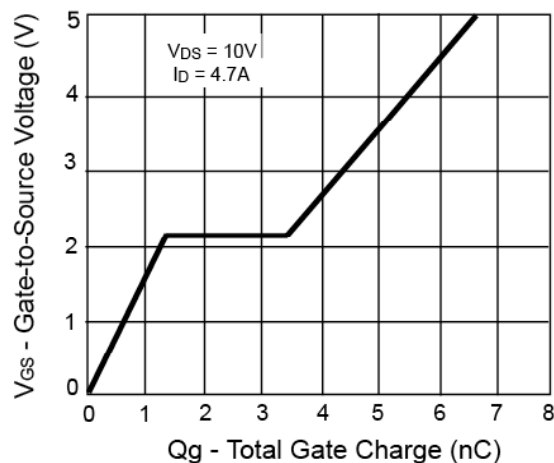
Output Characteristics
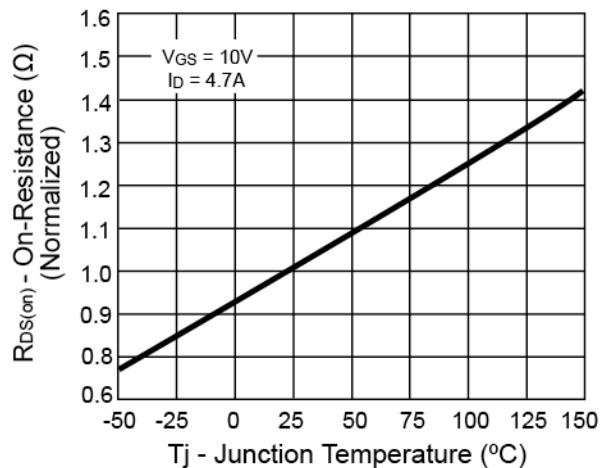

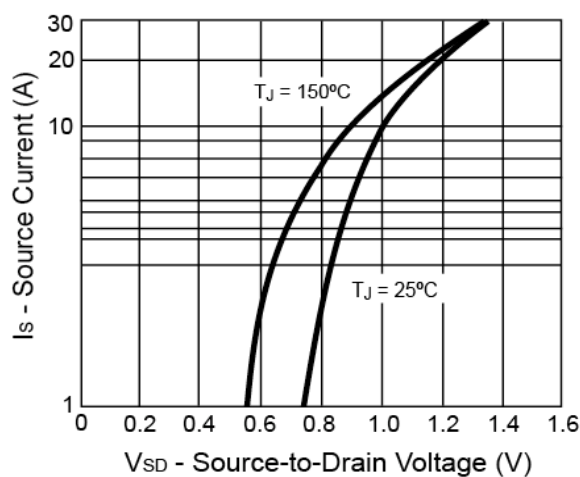### Transfer Characteristics

On-Resistance vs. Drain Current

Gate Charge

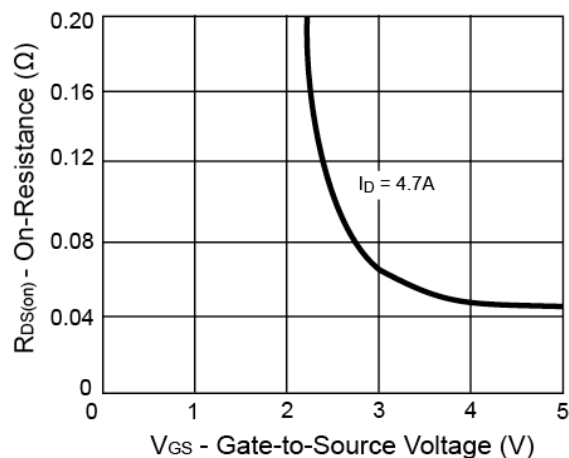### On-Resistance vs. Junction Temperature
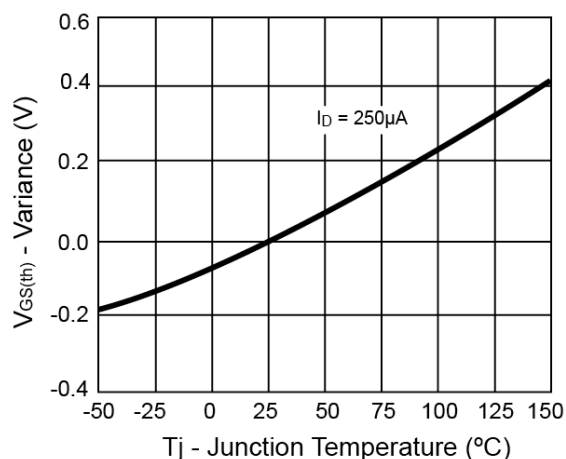

Source-Drain Diode Forward Voltage

Electrical Characteristics Curve (Ta = 25°C, unless otherwise noted)
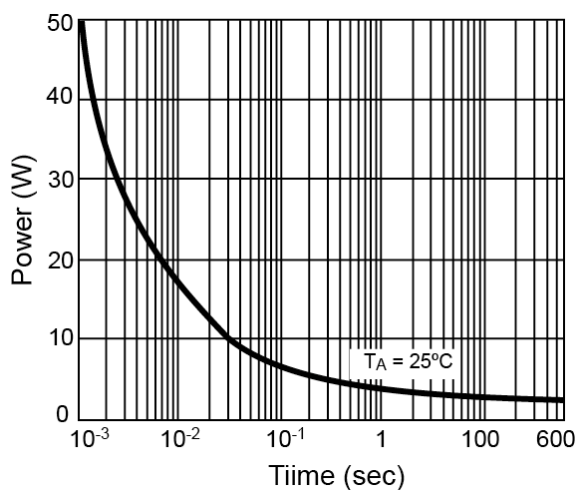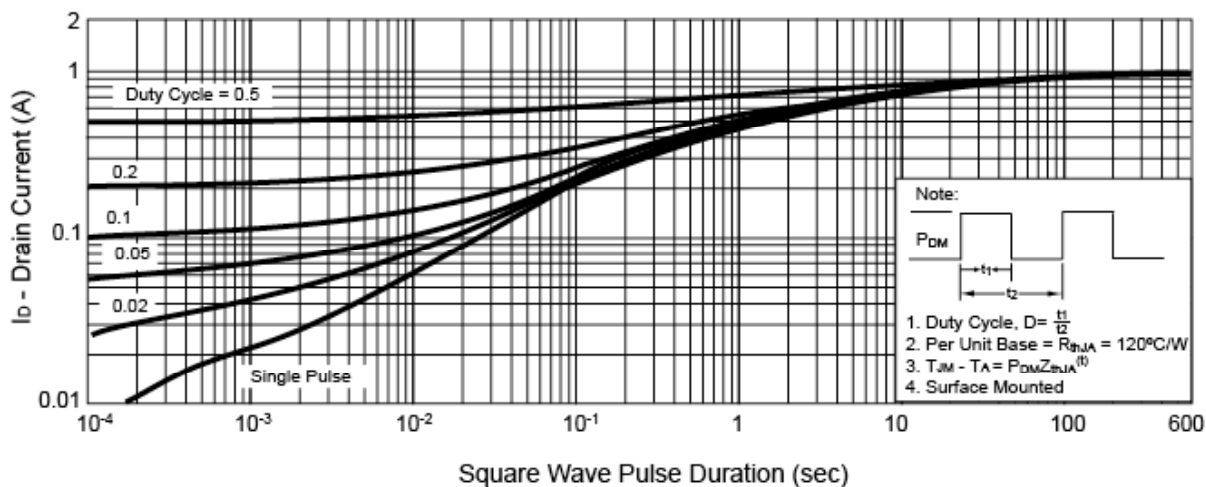
On-Resistance vs. Gate-Source Voltage

Threshold Voltage
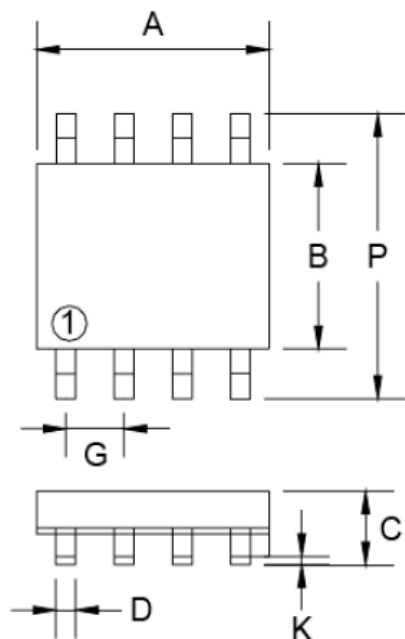

Single Pulse Power

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

Note:

1. Duty Cycle, D= $\frac{t1}{t2}$
2. Per Unit Base = R_{thJA} = 120°C/W
3. $T_{JM} - T_A = P_{DM}Z_{thJA}^{(t)}$
4. Surface Mounted

SOP-8 Mechanical Drawing

DIM	SOP-8 DIMENSION			
	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	0º	7º	0º	7º
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019
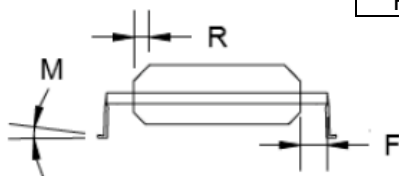
Marking Diagram
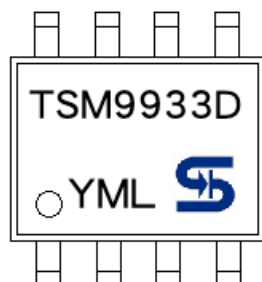
Y = Year Code

M = Month Code

(**A**=Jan, **B**=Feb, **C**=Mar, **D**=Apl, **E**=May, **F**=Jun, **G**=Jul, **H**=Aug,
I=Sep, **J**=Oct, **K**=Nov, **L**=Dec)

L = Lot Code

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