

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

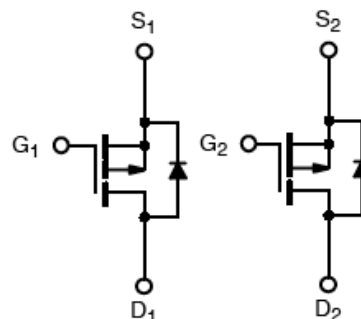
- Advance Trench Process Technology
- High Density Cell Design for Ultra Low On-resistance

Ordering Information

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

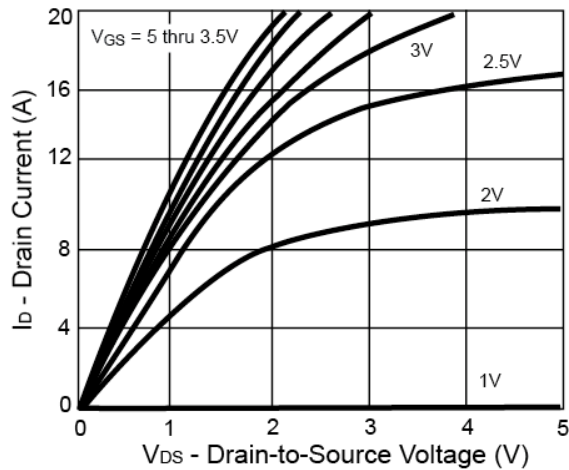
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Static ^(Note 3)						
Drain-Source Breakdown Voltage	V _{GS} = 0V, I _D = -250μA	BV _{DSS}	-20	--	--	V
Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = -250μA	V _{GS(TH)}	-0.6	--	-1.4	V
Gate Body Leakage	V _{GS} = ±12V, V _{DS} = 0V	I _{GSS}	--	--	±100	nA
Zero Gate Voltage Drain Current	V _{DS} = -20V, V _{GS} = 0V	I _{DSS}	--	--	-1.0	μA
On-State Drain Current	V _{DS} = -5V, V _{GS} = -4.5V	I _{D(ON)}	-15	--	--	A
Drain-Source On-State Resistance	V _{GS} = -4.5V, I _D = -4.7A	R _{DS(ON)}	--	48	60	mΩ
	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	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 ^(Note 4,5)						
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 ^(Note 4,5)						
Turn-On Delay Time	V _{DD} = -10V, R _L = 10Ω, I _D = -1A, V _{GEN} = -4.5V, R _G = 6Ω	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:

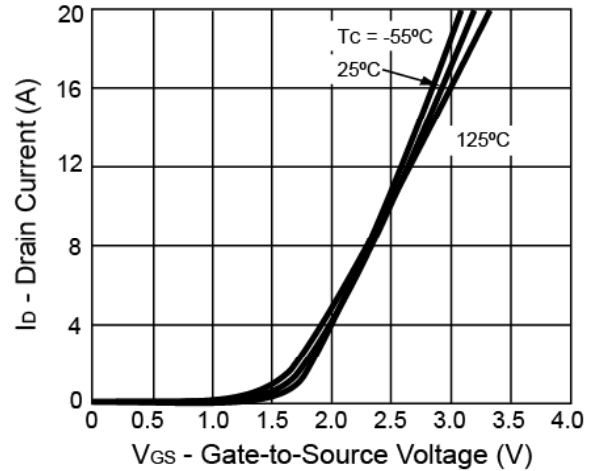
1. Pulse width limited by the Maximum junction temperature
2. Surface Mounted on FR4 Board, $t \leq 5$ sec.
3. pulse test: $PW \leq 300\mu\text{s}$, duty cycle $\leq 2\%$
4. For DESIGN AID ONLY, not subject to production testing.
5. Switching time is essentially independent of operating temperature.

Electrical Characteristics Curves

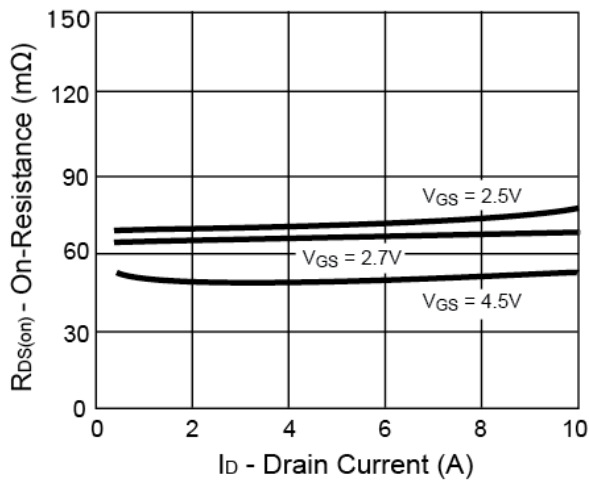
Output Characteristics



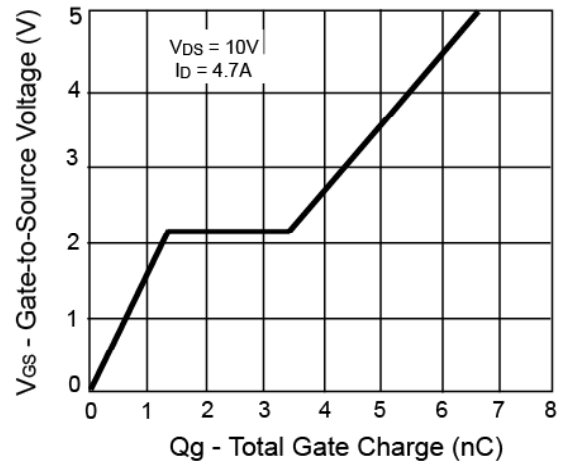
Transfer Characteristics



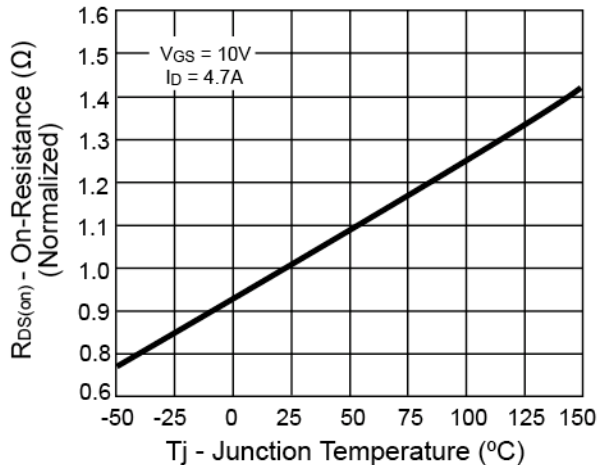
On-Resistance vs. Drain Current



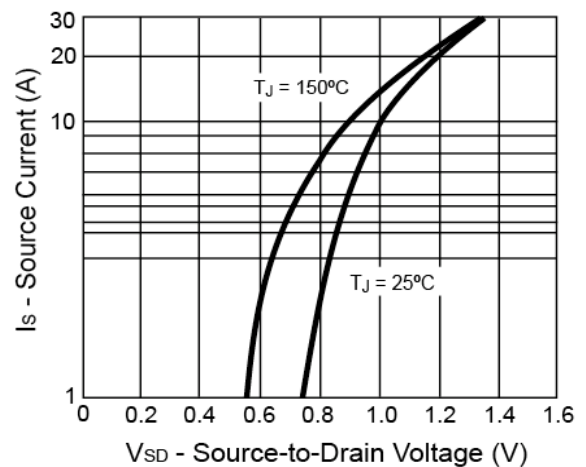
Gate Charge



On-Resistance vs. Junction Temperature

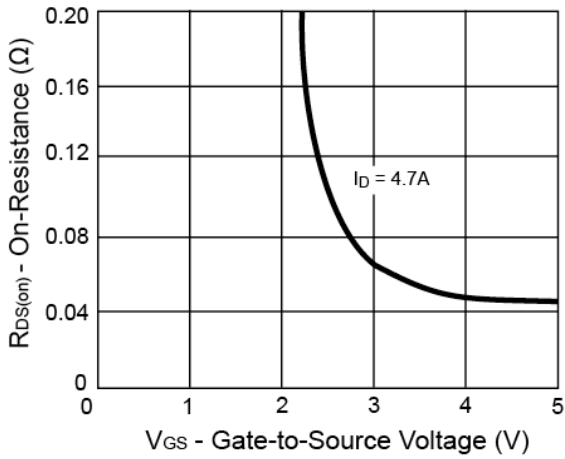


Source-Drain Diode Forward Voltage

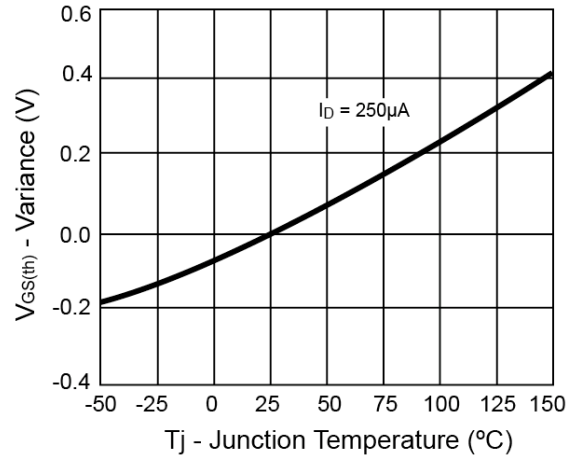


Electrical Characteristics Curves

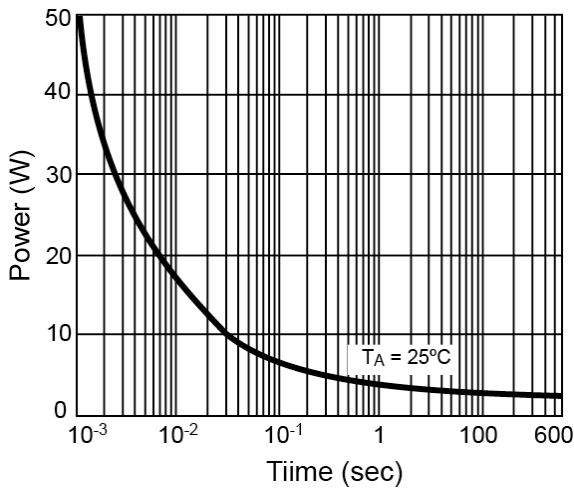
On-Resistance vs. Gate-Source Voltage



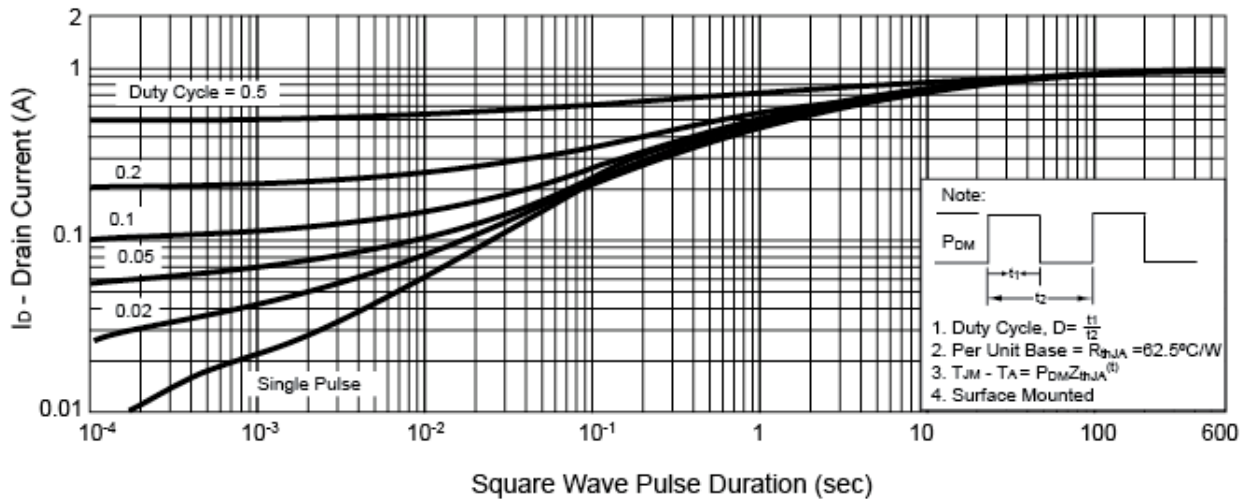
Threshold Voltage



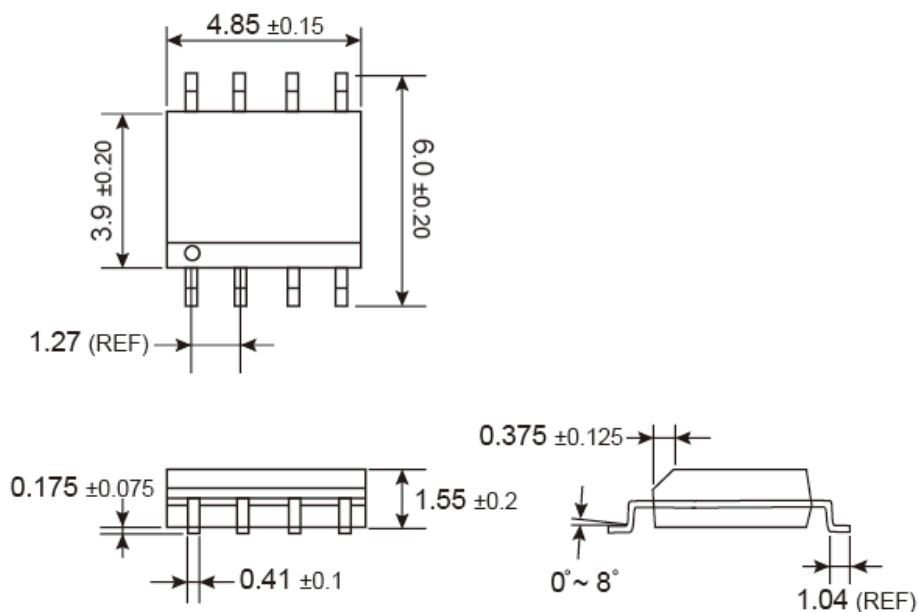
Single Pulse Power



Normalized Thermal Transient Impedance, Junction-to-Ambient

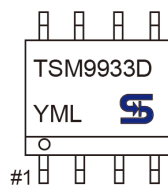


SOP-8 Mechanical Drawing



Unit: Millimeters

Marking Diagram



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

TSM9933DCS

-20V P-Channel Power MOSFET

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