



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.

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### 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 <sub>DS</sub> (V)	R <sub>DS(on)</sub> (mΩ)	I <sub>D</sub> (A)
60	55 @ V <sub>GS</sub> = 10V	4.5
	75 @ V <sub>GS</sub> = 4.5V	3.9

### Features

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

### Application

- High-Side DC/DC Conversion
- Notebook
- Server

### Ordering Information

Part No.	Package	Packing
TSM4946DCS RL	SOP-8	2.5Kpcs / 13" Reel
TSM4946DCS RLG	SOP-8	2.5Kpcs / 13" Reel

Note: "G" denote for Green Product

### Absolute Maximum Rating (Ta = 25°C unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V <sub>DS</sub>	60	V
Gate-Source Voltage	V <sub>GS</sub>	±20	V
Continuous Drain Current	I <sub>D</sub>	4.5	A
Pulsed Drain Current	I <sub>DM</sub>	30	A
Continuous Source Current (Diode Conduction) <sup>a,b</sup>	I <sub>S</sub>	2	A
Maximum Power Dissipation	P <sub>D</sub>	Ta = 25°C	2.4
		Ta = 75°C	1.7
Operating Junction Temperature	T <sub>J</sub>	+150	°C
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	- 55 to +150	°C

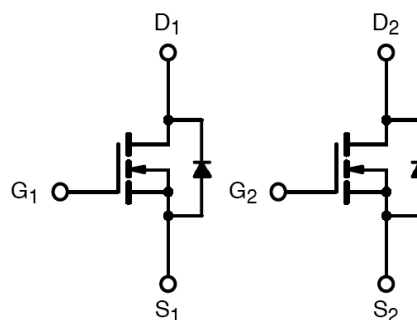
### Thermal Performance

Parameter	Symbol	Limit	Unit
Junction to Case Thermal Resistance	Rθ <sub>JF</sub>	32	°C/W
Junction to Ambient Thermal Resistance (PCB mounted)	Rθ <sub>JA</sub>	62.5	°C/W

#### Notes:

- Pulse width limited by the Maximum junction temperature
- Surface Mounted on FR4 Board, t ≤ 10 sec.

### Block Diagram



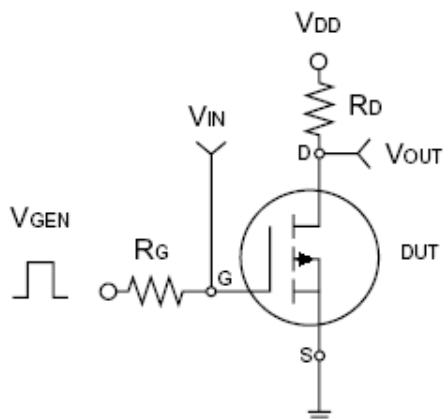
Dual N-Channel MOSFET

### Electrical Specifications

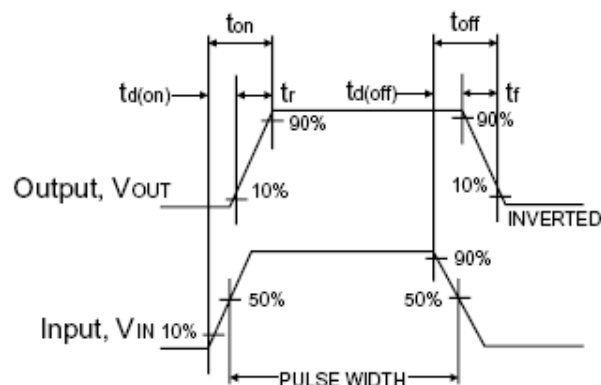
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	$BV_{DSS}$	60	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	$V_{GS(TH)}$	1	--	3	V
Gate Body Leakage	$V_{GS} = \pm 20V, V_{DS} = 0V$	$I_{GSS}$	--	--	$\pm 100$	nA
Zero Gate Voltage Drain Current	$V_{DS} = 60V, V_{GS} = 0V$	$I_{DSS}$	--	--	2	$\mu A$
On-State Drain Current <sup>a</sup>	$V_{DS} = 5V, V_{GS} = 10V$	$I_{D(ON)}$	20	--	--	A
Drain-Source On-State Resistance <sup>a</sup>	$V_{GS} = 10V, I_D = 4.5A$	$R_{DS(ON)}$	--	45	55	m $\Omega$
	$V_{GS} = 4.5V, I_D = 3.9A$		--	55	75	
Forward Transconductance <sup>a</sup>	$V_{DS} = 15V, I_D = 4.5A$	$g_{fs}$	--	13	--	S
Diode Forward Voltage	$I_S = 2A, V_{GS} = 0V$	$V_{SD}$	--	0.9	1.2	V
<b>Dynamic<sup>b</sup></b>						
Total Gate Charge	$V_{DS} = 30V, I_D = 4.5A, V_{GS} = 10V$	$Q_g$	--	19	30	nC
Gate-Source Charge		$Q_{gs}$	--	4	--	
Gate-Drain Charge		$Q_{gd}$	--	3	--	
Input Capacitance	$V_{DS} = 24V, V_{GS} = 0V, f = 1.0MHz$	$C_{iss}$	--	910	--	pF
Output Capacitance		$C_{oss}$	--	145	--	
Reverse Transfer Capacitance		$C_{rss}$	--	67	--	
<b>Switching<sup>c</sup></b>						
Turn-On Delay Time	$V_{DD} = 30V, R_L = 30\Omega, I_D = 1A, V_{GEN} = 10V, R_G = 6\Omega$	$t_{d(on)}$	--	13	20	nS
Turn-On Rise Time		$t_r$	--	11	20	
Turn-Off Delay Time		$t_{d(off)}$	--	36	60	
Turn-Off Fall Time		$t_f$	--	11	20	

#### 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

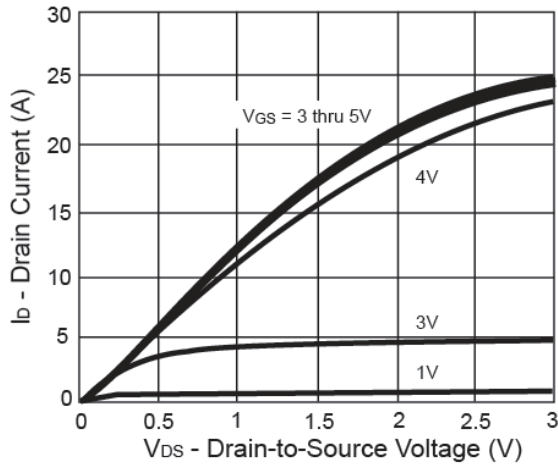


Switchin Waveforms

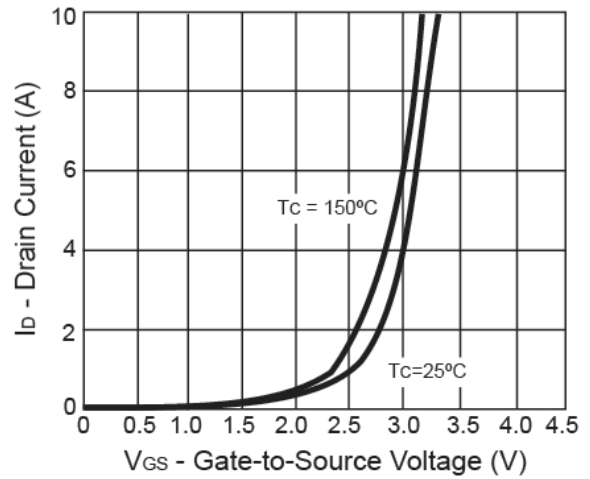


**Electrical Characteristics Curve** ( $T_a = 25^\circ\text{C}$ , unless otherwise noted)

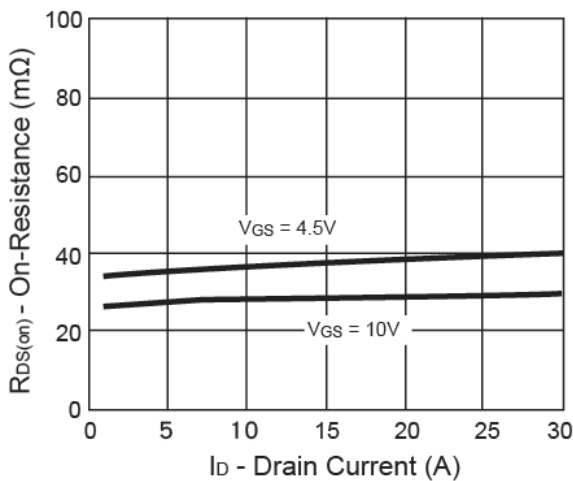
**Output Characteristics**



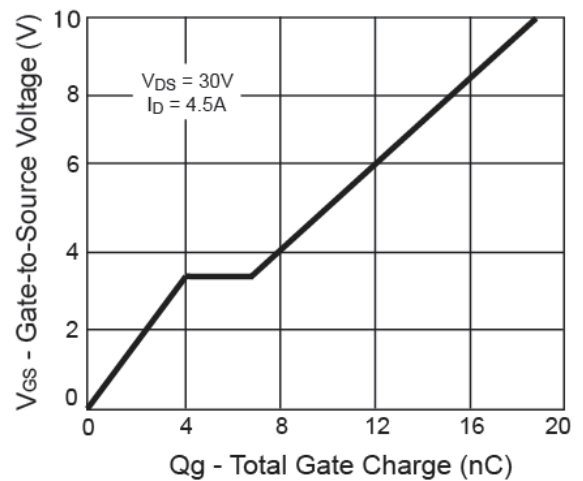
**Transfer Characteristics**



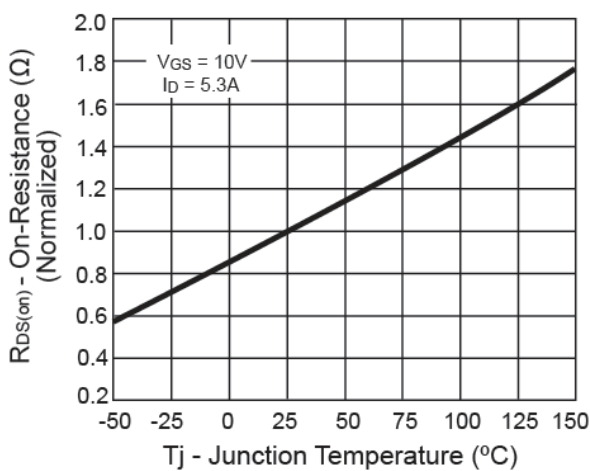
**On-Resistance vs. Drain Current**



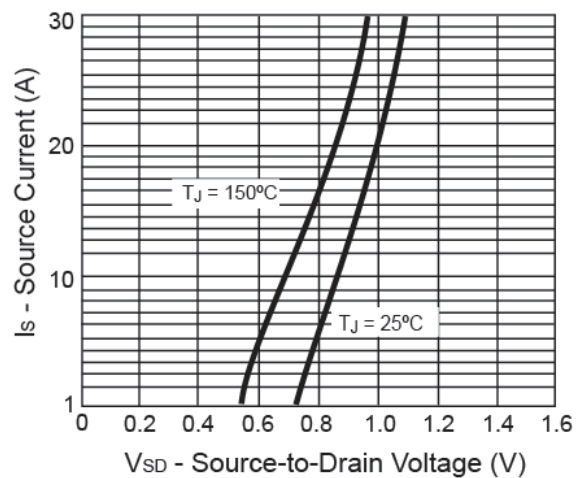
**Gate Charge**



**On-Resistance vs. Junction Temperature**



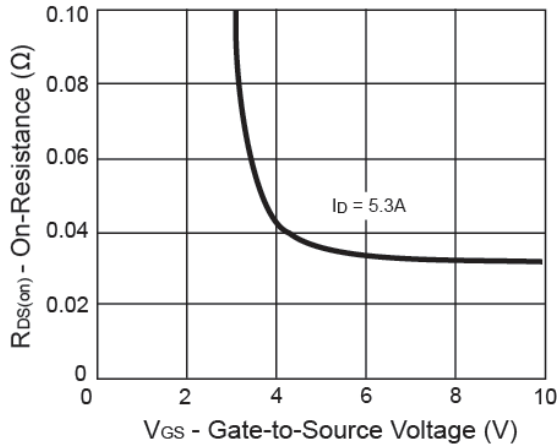
**Source-Drain Diode Forward Voltage**



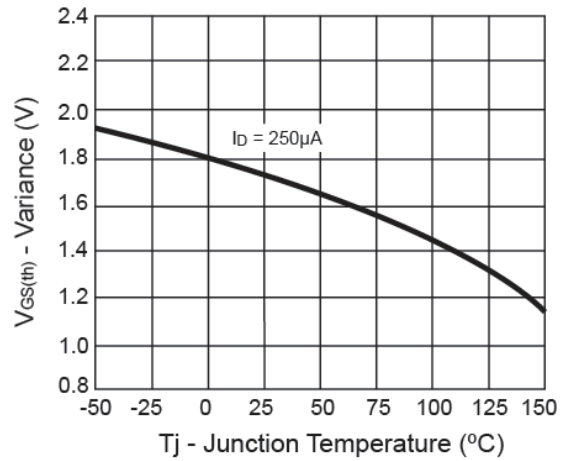


**Electrical Characteristics Curve** ( $T_a = 25^\circ\text{C}$ , unless otherwise noted)

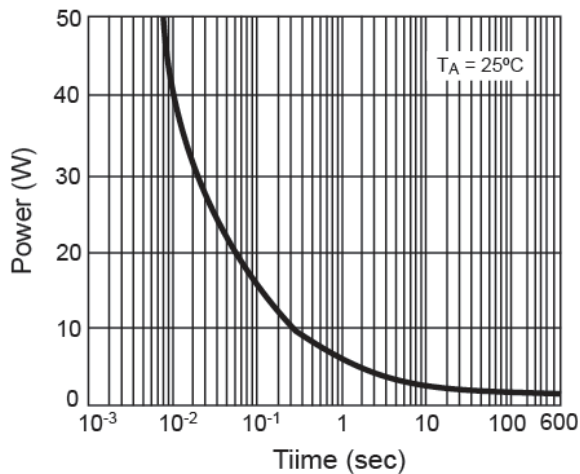
**On-Resistance vs. Gate-Source Voltage**



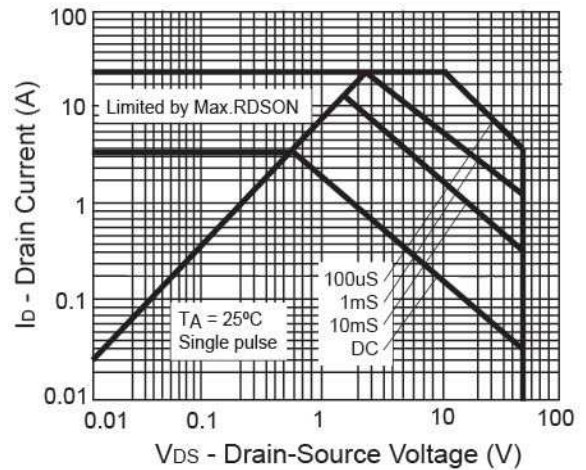
**Threshold Voltage**



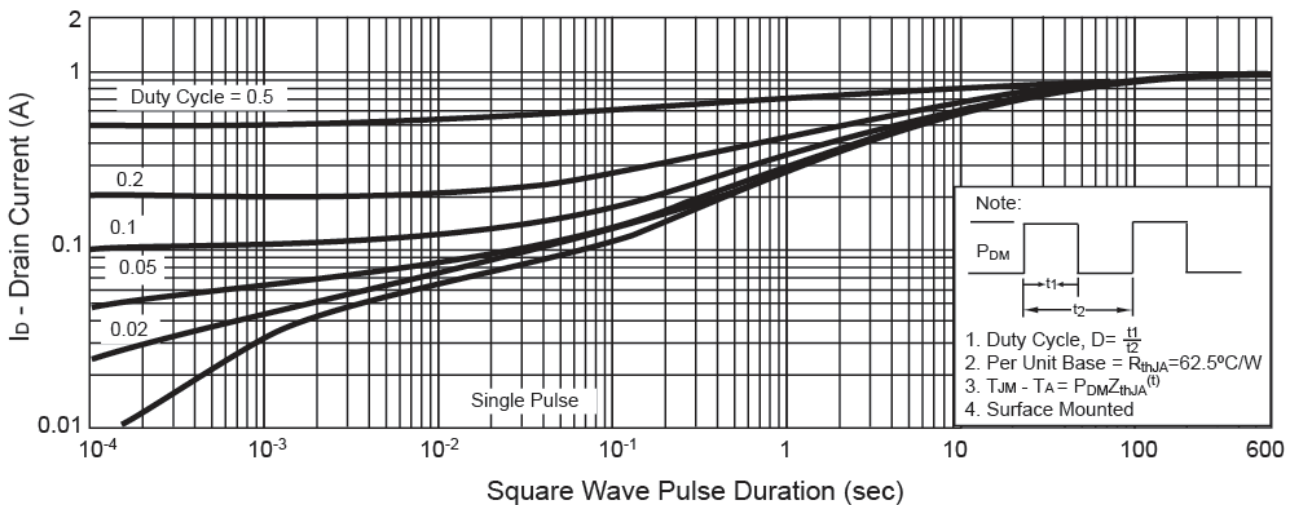
**Single Pulse Power**



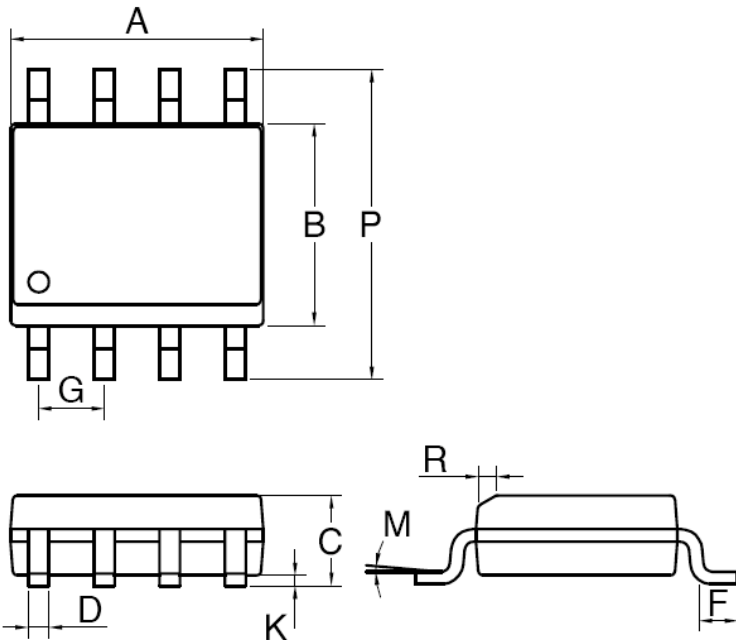
**Safety Operating Area**



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

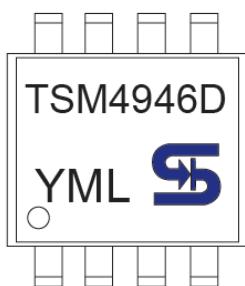


**SOP-8 Mechanical Drawing**



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=Apl, E=May, F=Jun, G=Jul, H=Aug, I=Sep, J=Oct, K=Nov, L=Dec)  
 = Month Code for Halogen Free Product  
 (O=Jan, P=Feb, Q=Mar, R=Apl, S=May, T=Jun, U=Jul, V=Aug, W=Sep, X=Oct, Y=Nov, Z=Dec)
- L** = Lot Code

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