



# THE DATASHEET OF TSM4946DCS RLG



### 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

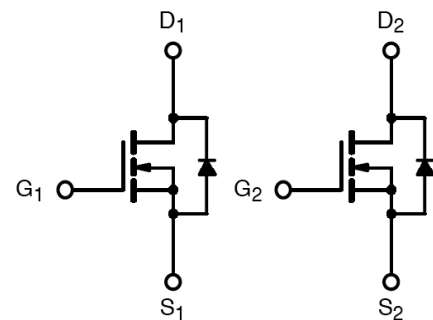
### Thermal Performance

Parameter	Symbol	Limit	Unit
Junction to Case Thermal Resistance	R <sub>θJF</sub>	32	°C/W
Junction to Ambient Thermal Resistance (PCB mounted)	R <sub>θJA</sub>	62.5	°C/W

#### Notes:

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

### Block Diagram



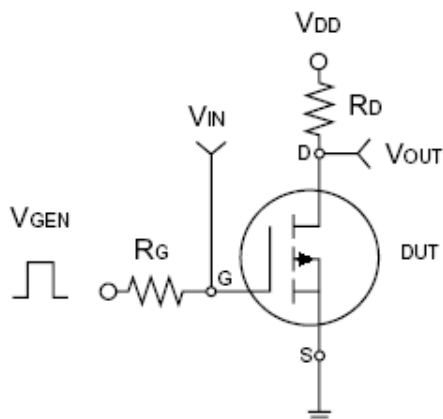
Dual N-Channel MOSFET

### Electrical Specifications

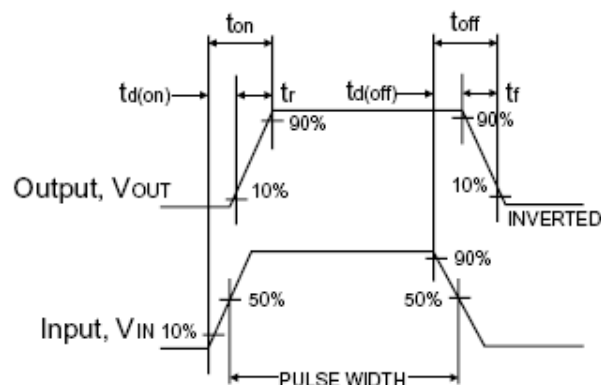
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	$BV_{DSS}$	60	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	$V_{GS(TH)}$	1	--	3	V
Gate Body Leakage	$V_{GS} = \pm 20V, V_{DS} = 0V$	$I_{GSS}$	--	--	$\pm 100$	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

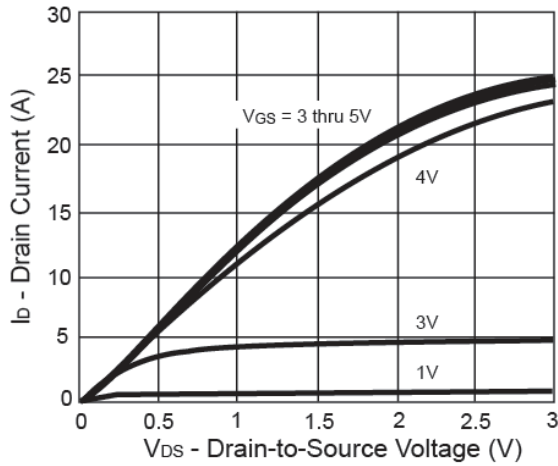


Switchin Waveforms

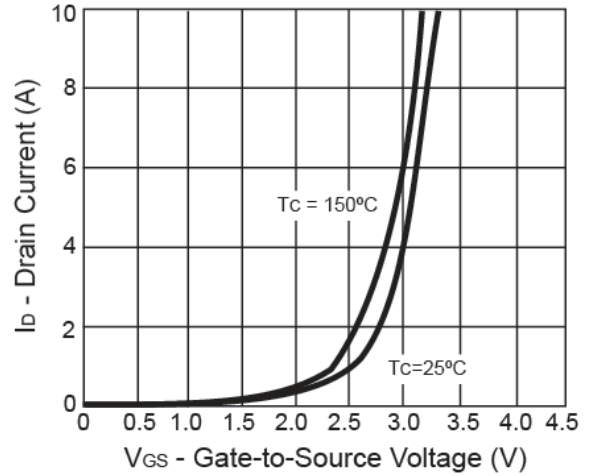


**Electrical Characteristics Curve** ( $T_a = 25^\circ\text{C}$ , unless otherwise noted)

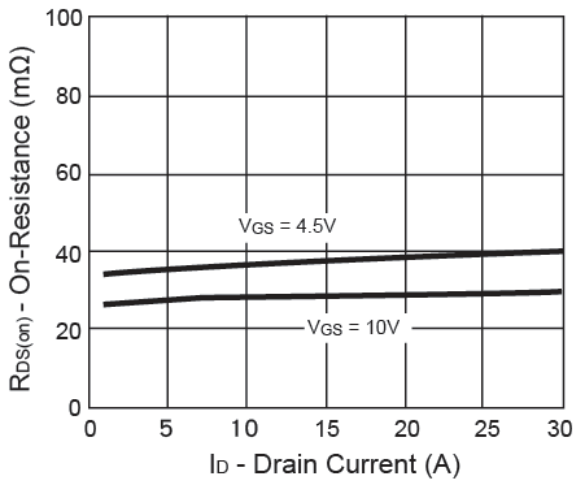
**Output Characteristics**



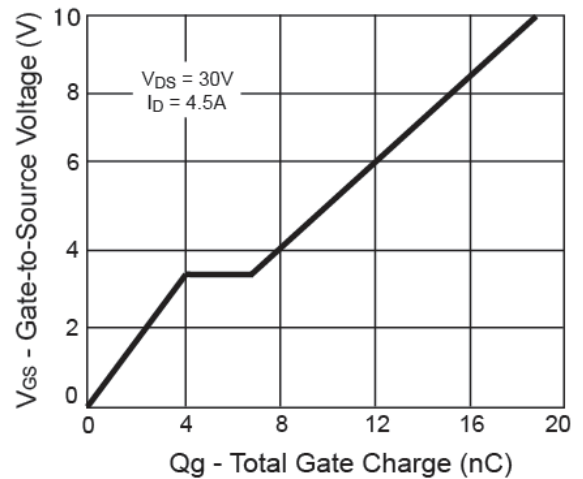
**Transfer Characteristics**



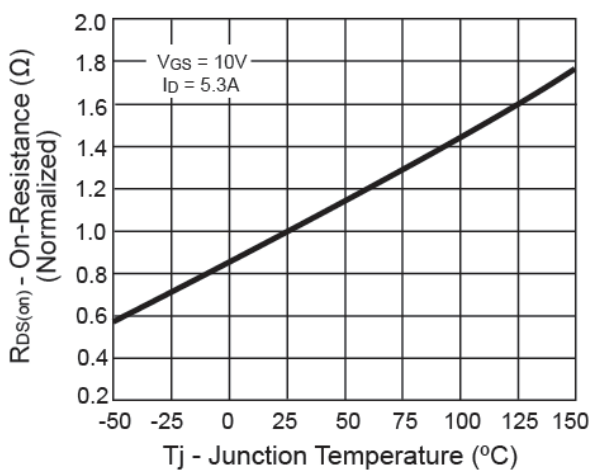
**On-Resistance vs. Drain Current**



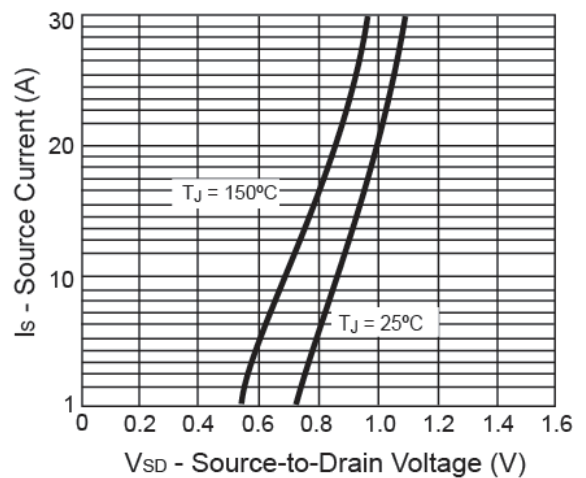
**Gate Charge**



**On-Resistance vs. Junction Temperature**



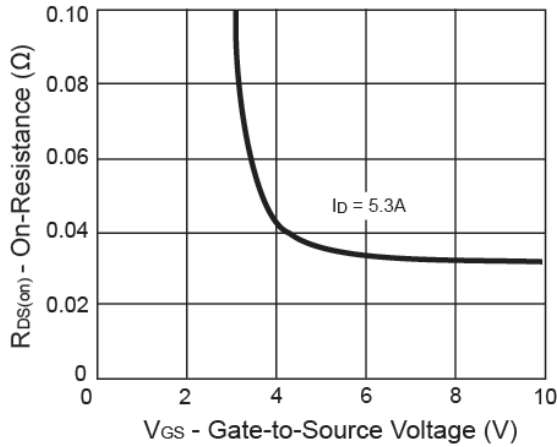
**Source-Drain Diode Forward Voltage**



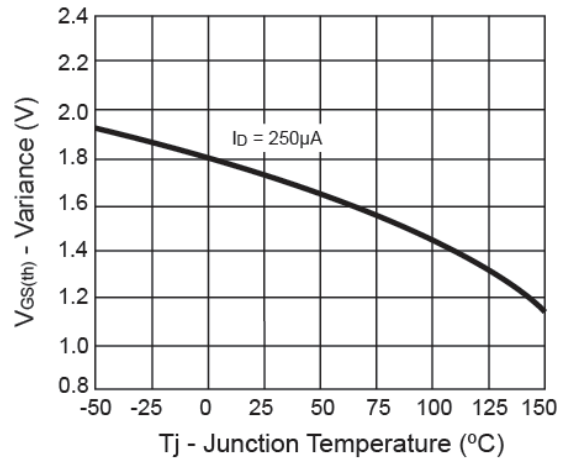


**Electrical Characteristics Curve** ( $T_a = 25^\circ\text{C}$ , unless otherwise noted)

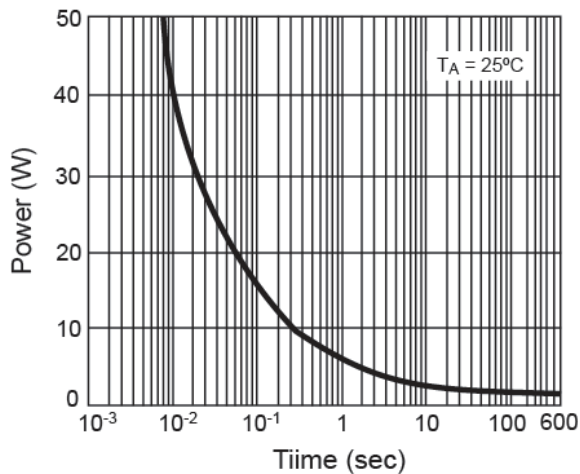
**On-Resistance vs. Gate-Source Voltage**



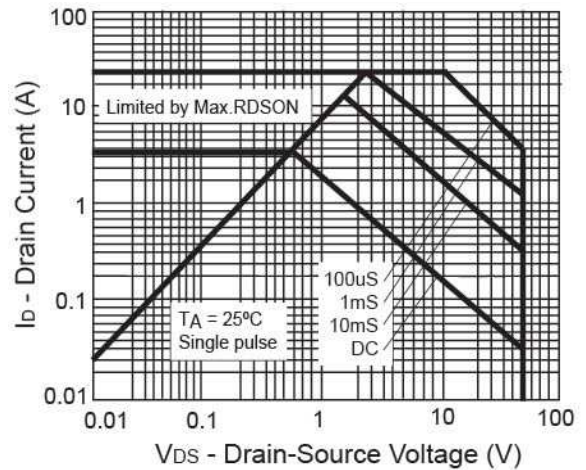
**Threshold Voltage**



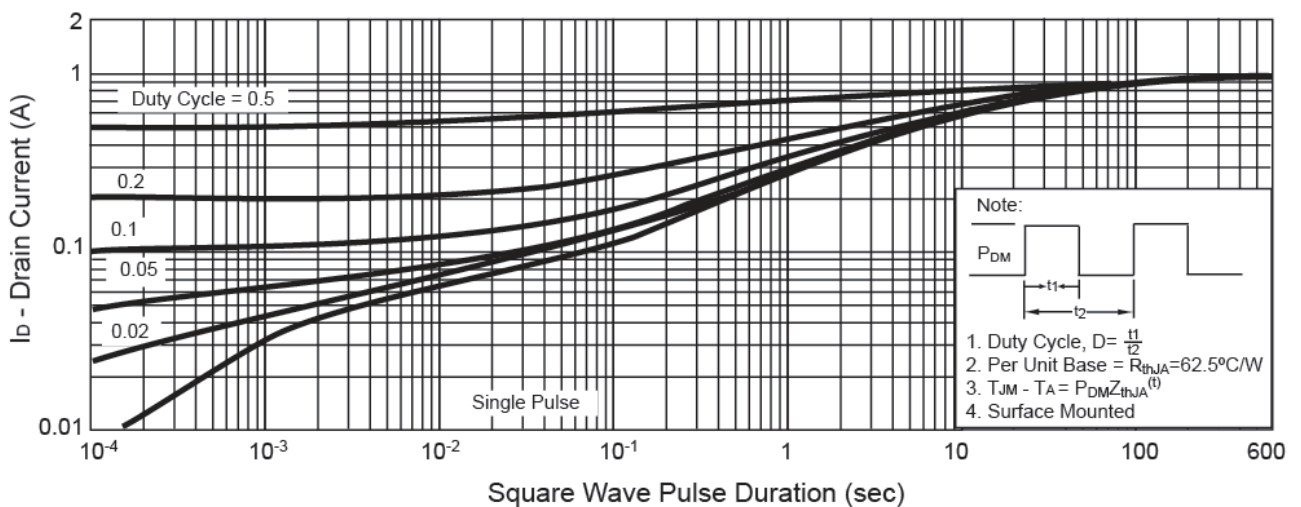
**Single Pulse Power**



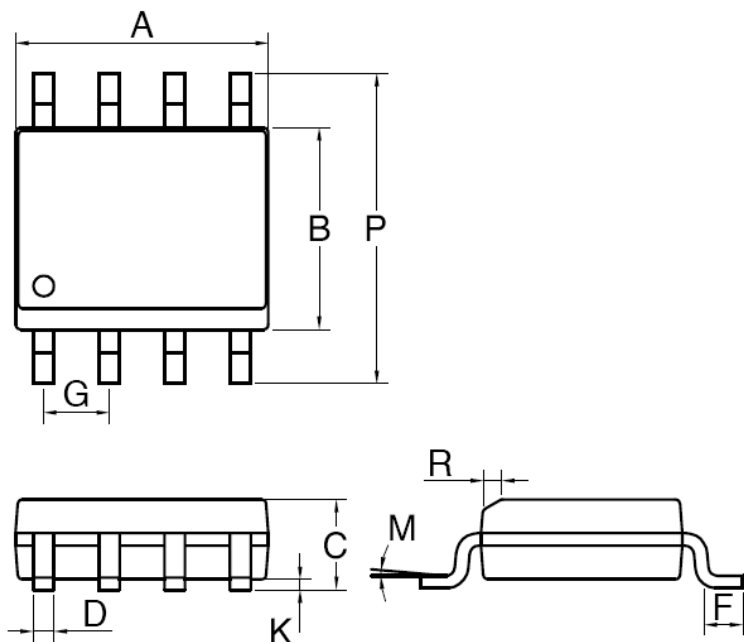
**Safety Operating Area**



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

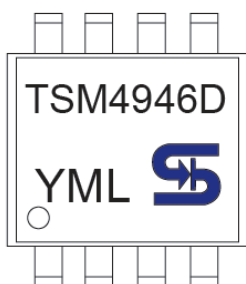


**SOP-8 Mechanical Drawing**



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**=Apr, **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**=Apr, **S**=May, **T**=Jun, **U**=Jul, **V**=Aug, **W**=Sep, **X**=Oct, **Y**=Nov, **Z**=Dec)
- L** = Lot Code

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