



**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)	$R_{DS(on)}$ (m $\Omega$ )	$I_D$ (A)
30	15 @ $V_{GS} = 10V$	11
	24 @ $V_{GS} = 4.5V$	10

### Features

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

### Application

- Load Switch
- PWM Application

### Ordering Information

Part No.	Package	Packing
TSM4416DCS RL	SOP-8	2.5Kpcs / 13" Reel
TSM4416DCS RLG	SOP-8	2.5Kpcs / 13" Reel

**Note:** "G" denotes Halogen Free Product.

### Absolute Maximum Rating ( $T_A=25^{\circ}C$ , unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	30	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current	$I_D$	11	A
Pulsed Drain Current	$I_{DM}$	40	A
Continuous Source Current (Diode Conduction) <sup>a,b</sup>	$I_S$	2.6	A
Maximum Power Dissipation	$P_D$	$T_a = 25^{\circ}C$	2.5
		$T_a = 75^{\circ}C$	1.6
Operating Junction Temperature	$T_J$	+150	$^{\circ}C$
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	$^{\circ}C$

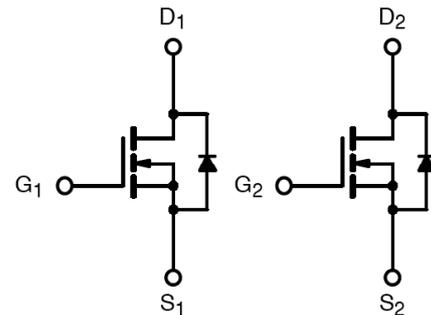
### Thermal Performance

Parameter	Symbol	Limit	Unit
Thermal Resistance Junction to Foot	$R_{\theta_{JF}}$	25	$^{\circ}C/W$
Thermal Resistance Junction to Ambient	$R_{\theta_{JA}}$	50	$^{\circ}C/W$

### Notes:

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

### Block Diagram



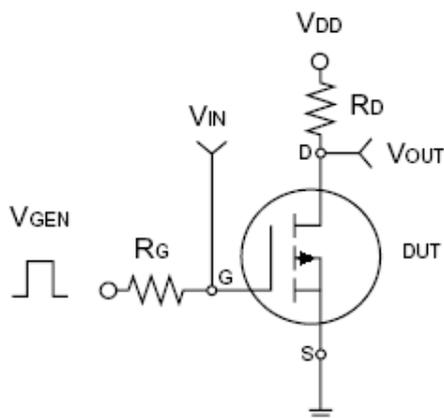
Dual N-Channel MOSFET

### Electrical Specifications

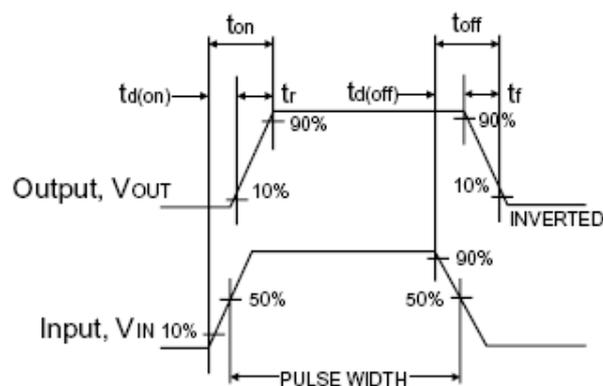
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	$BV_{DSS}$	30	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	$V_{GS(TH)}$	1	1.8	3	V
Gate Body Leakage	$V_{GS} = \pm 20V, V_{DS} = 0V$	$I_{GSS}$	--	--	$\pm 100$	nA
Zero Gate Voltage Drain Current	$V_{DS} = 24V, V_{GS} = 0V$	$I_{DSS}$	--	--	-1.0	$\mu A$
Drain-Source On-State Resistance	$V_{GS} = 10V, I_D = 10A$	$R_{DS(ON)}$	--	12	15	m $\Omega$
	$V_{GS} = 4.5V, I_D = 10A$		--	16	24	
Forward Transconductance	$I_S = 1A, V_{GS} = 0V$	$g_{fs}$	--	17	--	S
Diode Forward Voltage	$V_{GS} = 0V, I_D = 250\mu A$	$V_{SD}$	--	0.71	1.0	V
<b>Dynamic<sup>b</sup></b>						
Total Gate Charge	$V_{DS} = 15V, I_D = 10A, V_{GS} = 5V$	$Q_g$	--	7.7	10.01	nC
Gate-Source Charge		$Q_{gs}$	--	1.6	2.08	
Gate-Drain Charge		$Q_{gd}$	--	3.1	4.03	
Input Capacitance	$V_{DS} = 15V, V_{GS} = 0V, f = 1.0MHz$	$C_{iss}$	--	890	--	pF
Output Capacitance		$C_{oss}$	--	159.6	--	
Reverse Transfer Capacitance		$C_{rss}$	--	83.2	--	
<b>Switching<sup>b,c</sup></b>						
Turn-On Delay Time	$V_{DD} = 15V, I_D = 10A, V_{GEN} = 10V, R_G = 0.3\Omega$	$t_{d(on)}$	--	11.1	22.2	nS
Turn-On Rise Time		$t_r$	--	8.4	16.8	
Turn-Off Delay Time		$t_{d(off)}$	--	25.3	50.6	
Turn-Off Fall Time		$t_f$	--	2.8	5.6	

#### Notes:

- a. pulse test:  $PW \leq 300\mu S$ , duty cycle  $\leq 2\%$
- b. For DESIGN AID ONLY, not subject to production testing.
- c. Switching time is essentially independent of operating temperature.



Switching Test Circuit

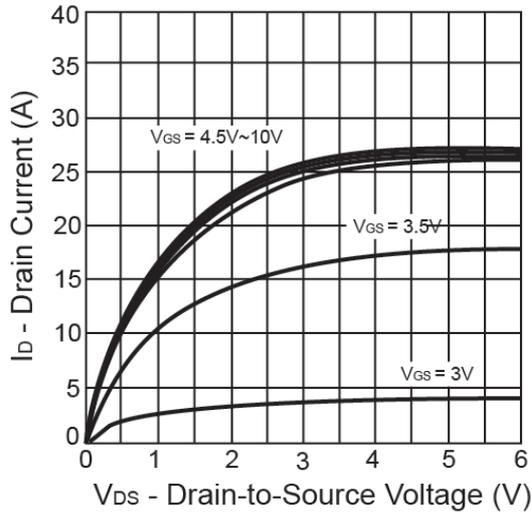


Switchin Waveforms

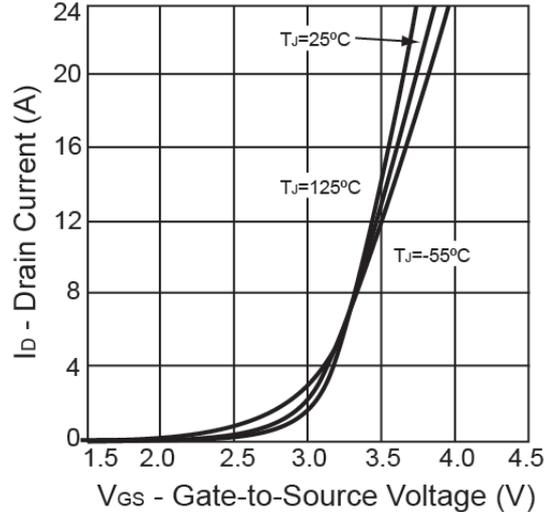


**Electrical Characteristics Curve** ( $T_A=25^{\circ}\text{C}$ , unless otherwise noted)

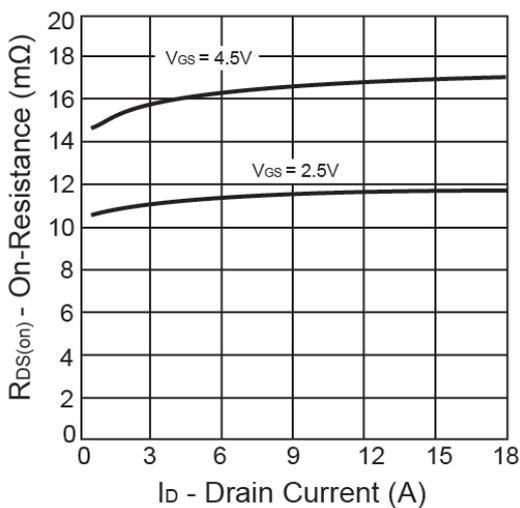
**Output Characteristics**



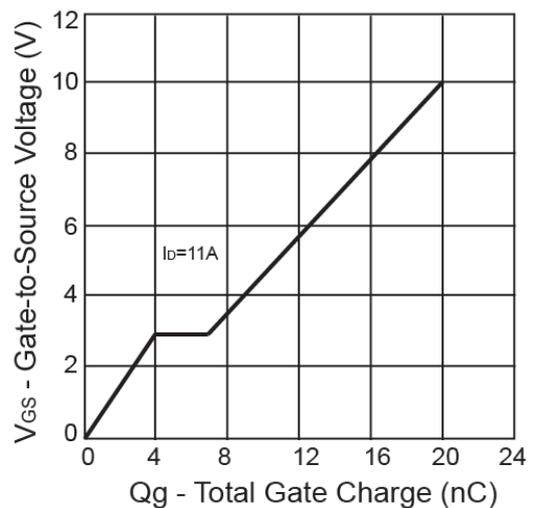
**Transfer Characteristics**



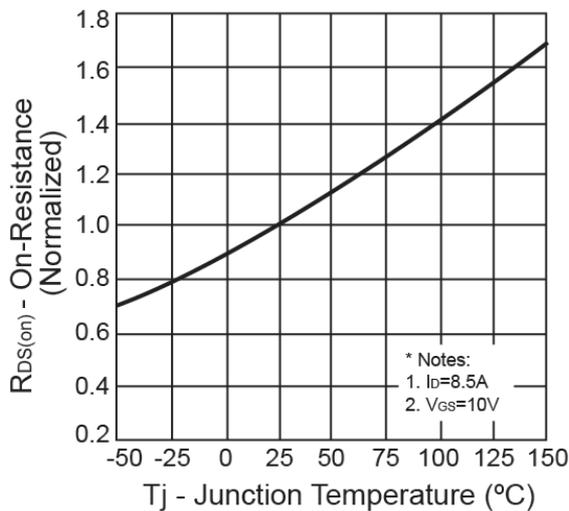
**On-Resistance vs. Drain Current**



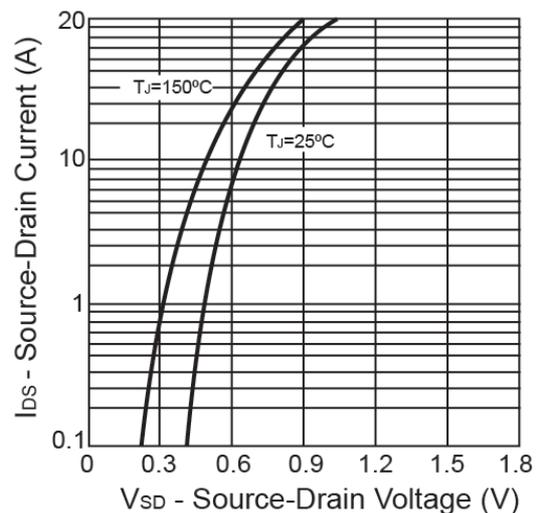
**Gate Charge**



**On-Resistance vs. Junction Temperature**

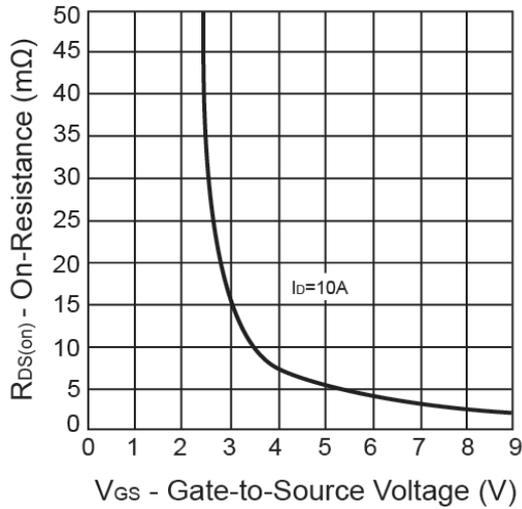


**Source-Drain Diode Forward Voltage**

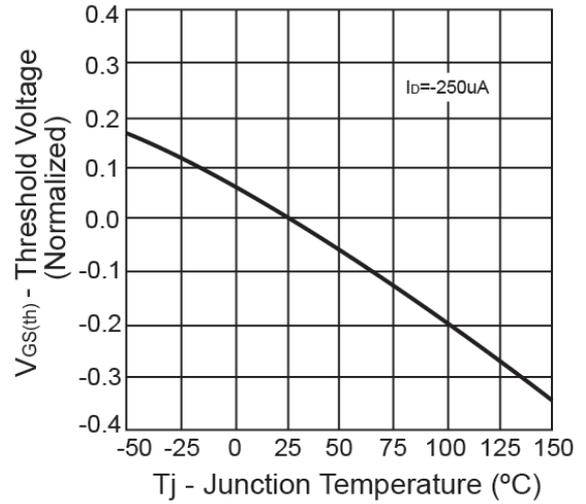


**Electrical Characteristics Curve** ( $T_A=25^\circ\text{C}$ , unless otherwise noted)

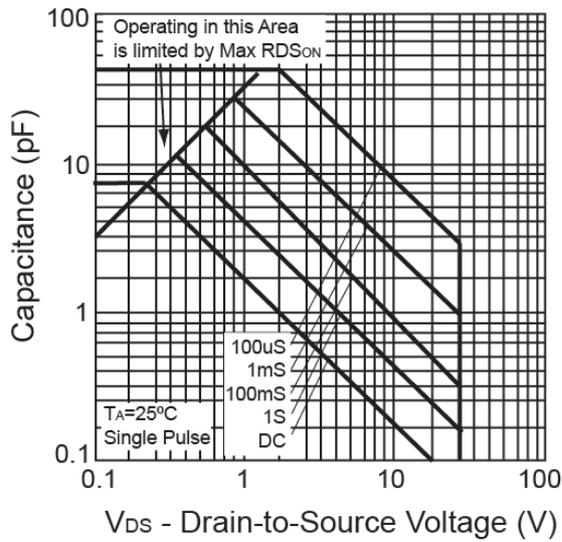
**On-Resistance vs. Gate-Source Voltage**



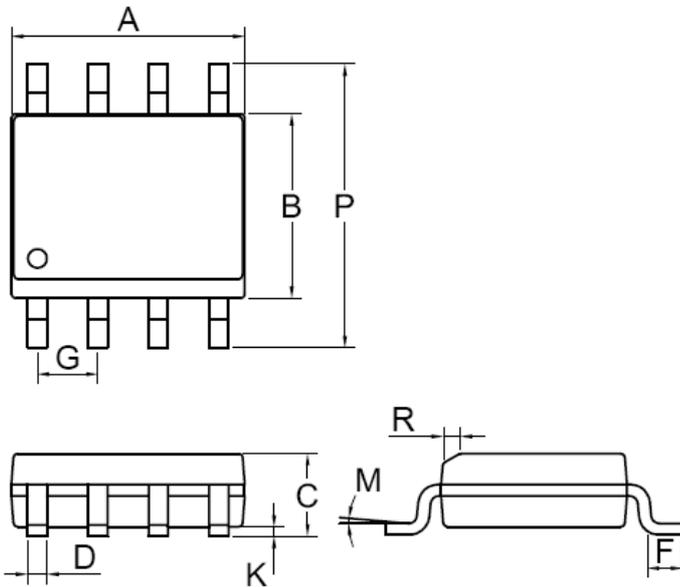
**Threshold Voltage**



**Safety Operation Area**

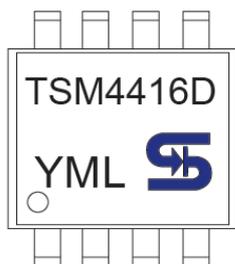


### SOP-8 Mechanical Drawing



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)
- = 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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