

### SOP-8



#### Pin Definition:

1. Source
2. Source
3. Source
4. Gate
- 5, 6, 7, 8. Drain

### PRODUCT SUMMARY

V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (mΩ)	I <sub>D</sub> (A)
30	30 @ V <sub>GS</sub> = 10V	8.5
	33 @ V <sub>GS</sub> = 4.5V	8.5
	48 @ V <sub>GS</sub> = 2.5V	5

### Features

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

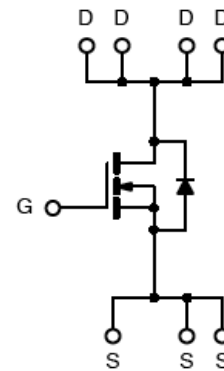
### Application

- High-Side DC/DC Conversion
- Notebook
- Sever

### Ordering Information

Part No.	Package	Packing
TSM4404CS RL	SOP-8	2.5Kpcs / 13" Reel

### Block Diagram



N-Channel MOSFET

### Absolute Maximum Rating (T<sub>a</sub> = 25°C unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V <sub>DS</sub>	30	V
Gate-Source Voltage	V <sub>GS</sub>	±12	V
Continuous Drain Current	I <sub>D</sub>	8.5	A
Pulsed Drain Current	I <sub>DM</sub>	60	A
Continuous Source Current (Diode Conduction) <sup>a,b</sup>	I <sub>S</sub>	4.3	A
Maximum Power Dissipation	P <sub>D</sub>	T <sub>a</sub> = 25°C	3.0
		T <sub>a</sub> = 75°C	2.1
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>	24	°C/W
Junction to Ambient Thermal Resistance (PCB mounted)	R <sub>θJA</sub>	62.5	°C/W

#### Notes:

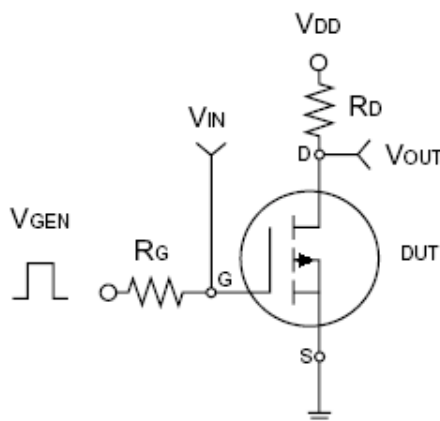
- a. Pulse width limited by the Maximum junction temperature
- b. Surface Mounted on FR4 Board, t ≤ 10 sec.

### Electrical Specifications (Ta = 25°C unless otherwise noted)

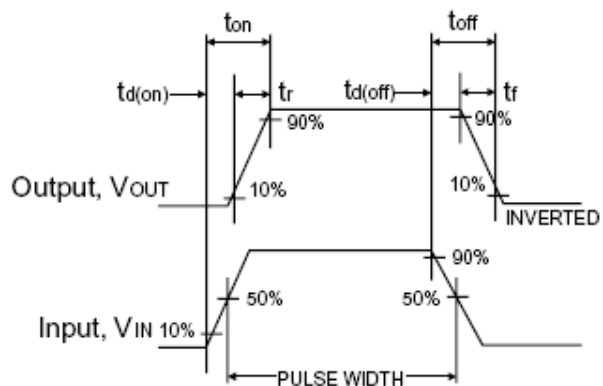
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	$BV_{DSS}$	30	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	$V_{GS(TH)}$	0.7	--	1.4	V
Gate Body Leakage	$V_{GS} = \pm 12V, V_{DS} = 0V$	$I_{GSS}$	--	--	$\pm 100$	nA
Zero Gate Voltage Drain Current	$V_{DS} = 24V, V_{GS} = 0V$	$I_{DSS}$	--	--	1.0	$\mu A$
Drain-Source On-State Resistance <sup>a</sup>	$V_{GS} = 10V, I_D = 8.5A$	$R_{DS(ON)}$	--	24	30	m $\Omega$
	$V_{GS} = 4.5V, I_D = 8.5A$		--	27	33	
	$V_{GS} = 2.5V, I_D = 5A$		--	40	48	
Forward Transconductance <sup>a</sup>	$V_{DS} = 5V, I_D = 5A$	$g_{fs}$	--	16	--	S
Diode Forward Voltage	$I_S = 1A, V_{GS} = 0V$	$V_{SD}$	--	0.76	1.0	V
<b>Dynamic<sup>b</sup></b>						
Total Gate Charge	$V_{DS} = 15V, I_D = 8.5A, V_{GS} = 4.5V$	$Q_g$	--	9.7	12	nC
Gate-Source Charge		$Q_{gs}$	--	1.63	--	
Gate-Drain Charge		$Q_{gd}$	--	3.1	--	
Input Capacitance	$V_{DS} = 15V, V_{GS} = 0V, f = 1.0MHz$	$C_{iss}$	--	857	1030	pF
Output Capacitance		$C_{oss}$	--	97	--	
Reverse Transfer Capacitance		$C_{rss}$	--	71	--	
<b>Switching<sup>c</sup></b>						
Turn-On Delay Time	$V_{DD} = 15V, R_L = 1.8\Omega, I_D = 1A, V_{GEN} = 10V, R_G = 6\Omega$	$t_{d(on)}$	--	3.3	5	nS
Turn-On Rise Time		$t_r$	--	4.7	7	
Turn-Off Delay Time		$t_{d(off)}$	--	26	39	
Turn-Off Fall Time		$t_f$	--	4.1	6.2	

**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.



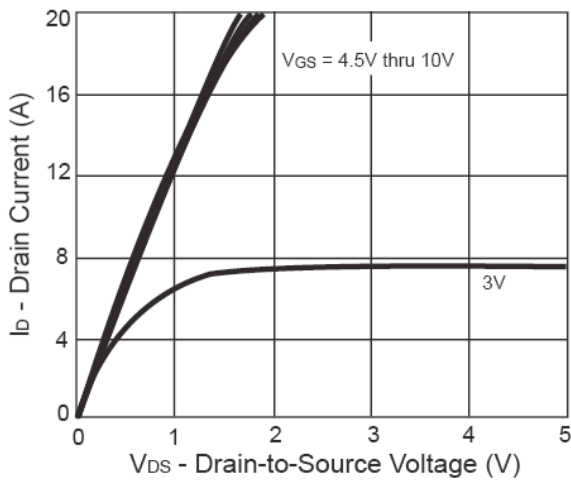
**Switching Test Circuit**



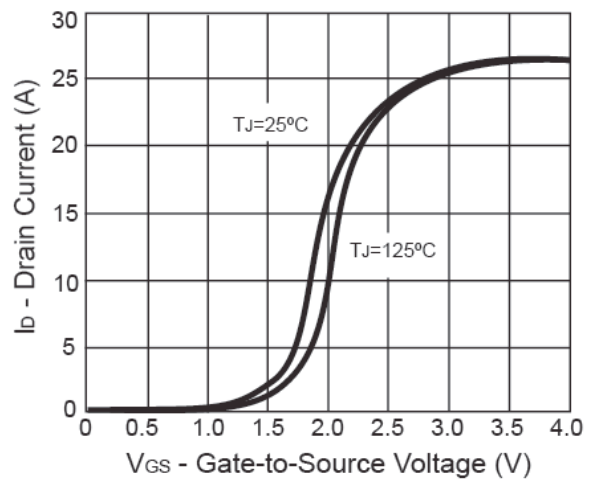
**Switchin Waveforms**

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

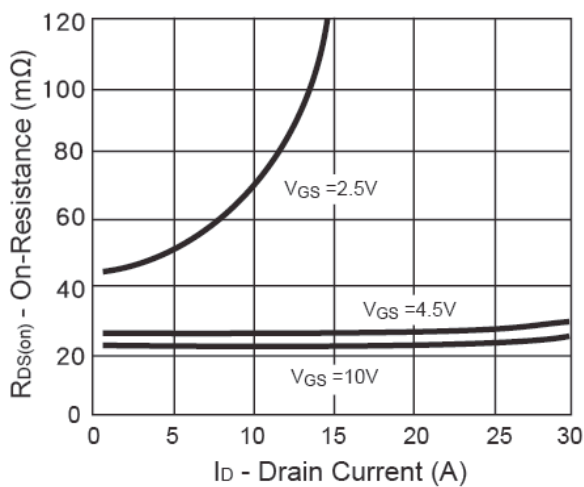
**Output Characteristics**



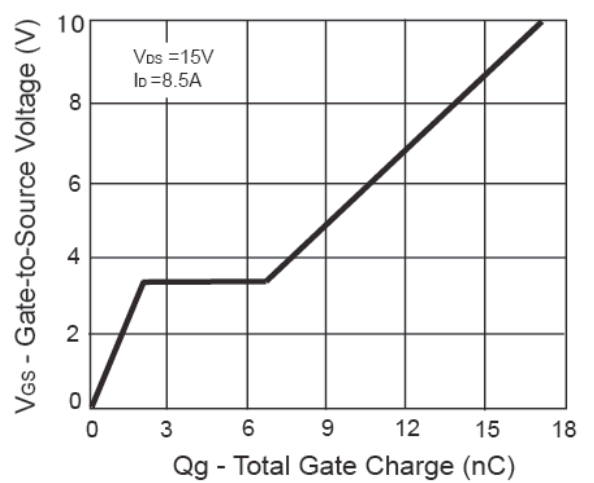
**Transfer Characteristics**



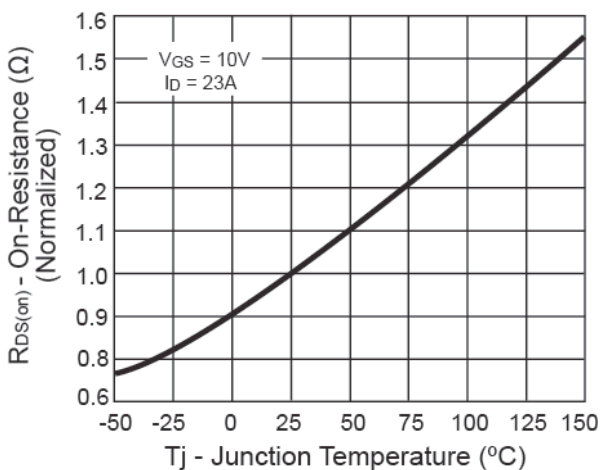
**On-Resistance vs. Drain Current**



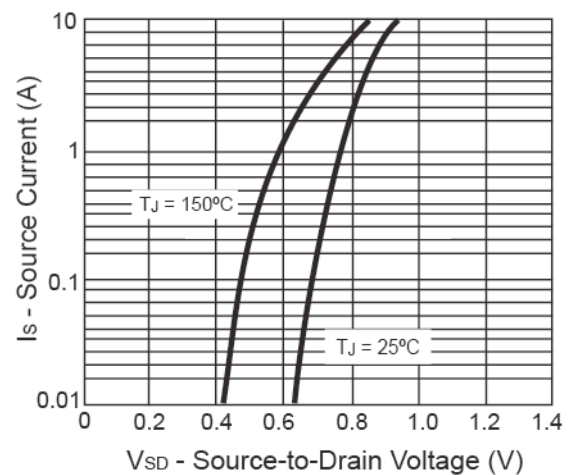
**Gate Charge**



**On-Resistance vs. Junction Temperature**

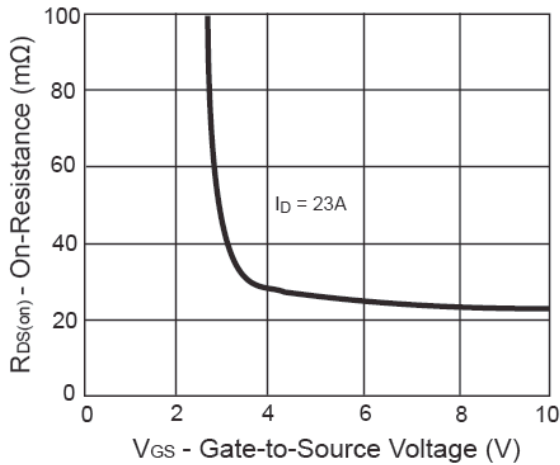


**Source-Drain Diode Forward Voltage**

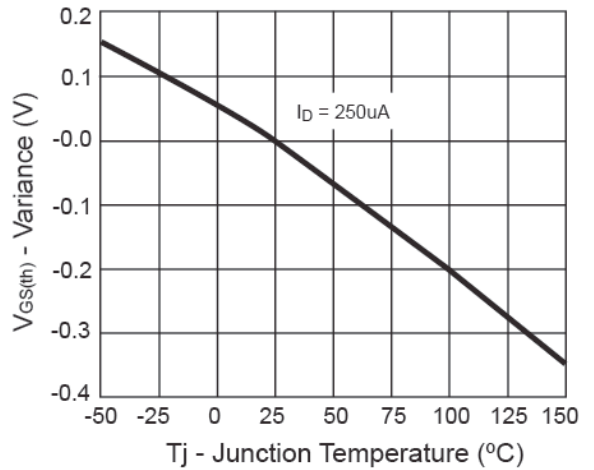


**Electrical Characteristics Curve** (Ta = 25°C, unless otherwise noted)

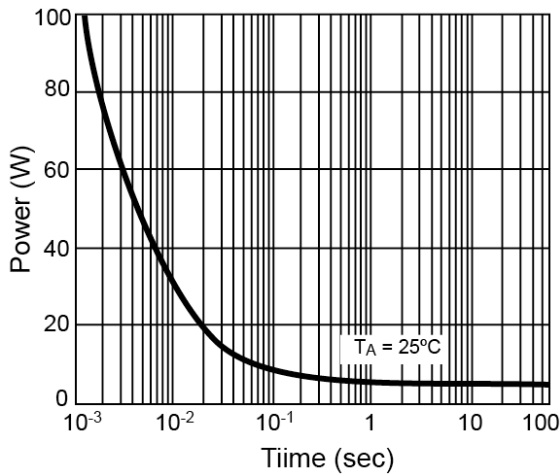
**On-Resistance vs. Gate-Source Voltage**



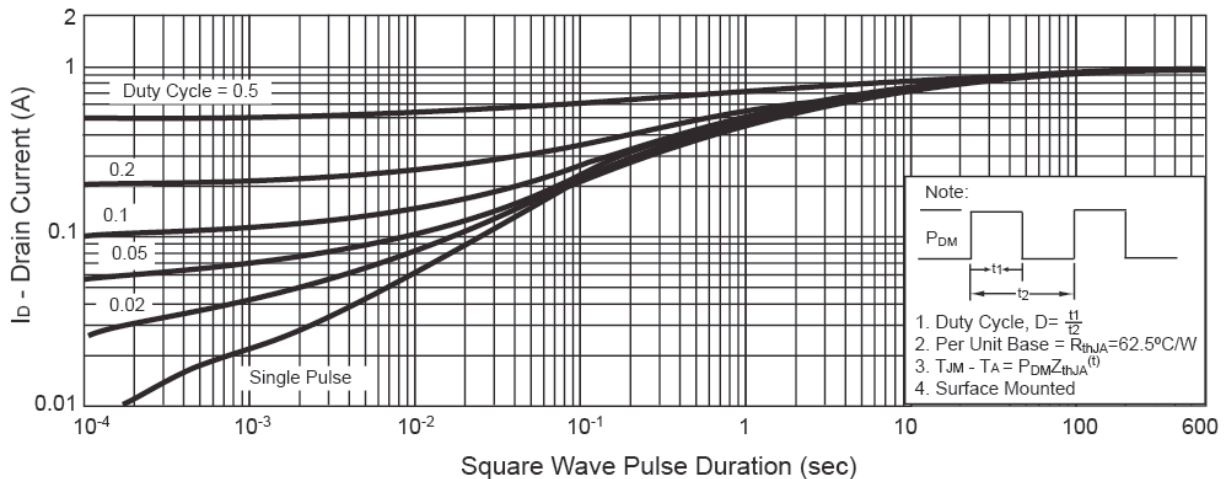
**Threshold Voltage**



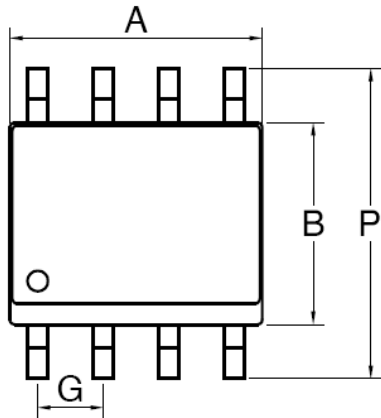
**Single Pulse Power**



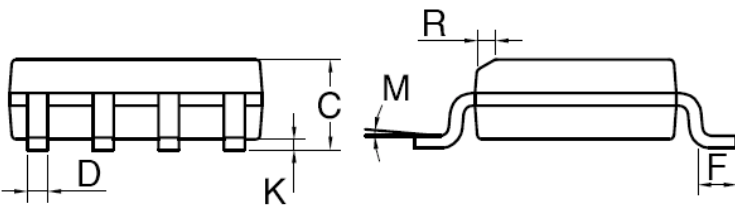
**Normalized Thermal Transient Impedance, Junction-to-Ambient**



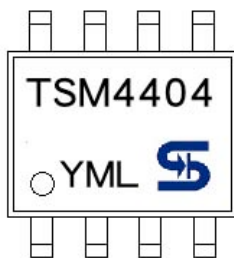
### SOP-8 Mechanical Drawing



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=Apl, E=May, F=Jun, G=Jul, H=Aug, I=Sep, J=Oct, K=Nov, L=Dec)
- L** = Lot Code



# TSM4404

## 30V N-Channel MOSFET

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