

### SOP-8



#### Pin Definition:

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

### PRODUCT SUMMARY

$V_{DS}$ (V)	$R_{DS(on)}$ (m $\Omega$ )	$I_D$ (A)
20	25 @ $V_{GS} = 4.5V$	4.5
	30 @ $V_{GS} = 2.5V$	3.5
	65 @ $V_{GS} = 1.8V$	2.0

### Features

- Advance Trench Process Technology
- High Density Cell Design for Ultra Low On-resistance
- ESD Protect 2KV

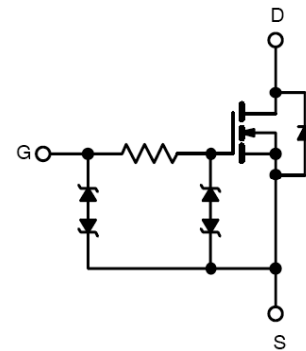
### Application

- Specially Designed for Li-on Battery Packs
- Battery Switch Application

### Ordering Information

Part No.	Package	Packing
TSM7401CS RL	SOP-8	2.5Kpcs / 13" Reel

### Block Diagram



N-Channel MOSFET

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	20	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V
Continuous Drain Current	$I_D$	8	A
Pulsed Drain Current	$I_{DM}$	30	A
Continuous Source Current (Diode Conduction) <sup>a,b</sup>	$I_S$	1.4	A
Maximum Power Dissipation	$P_D$	Ta = 25°C	2.5
		Ta = 75°C	1.3
Operating Junction Temperature	$T_J$	+150	°C
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	°C

### Thermal Performance

Parameter	Symbol	Limit	Unit
Junction to Case Thermal Resistance	$R_{\theta JF}$	30	°C/W
Junction to Ambient Thermal Resistance (PCB mounted)	$R_{\theta JA}$	50	°C/W

#### Notes:

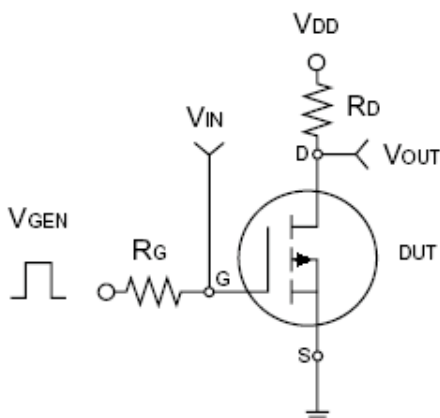
- a. Pulse width limited by the Maximum junction temperature
- b. Surface Mounted on FR4 Board,  $t \leq 5$  sec.

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

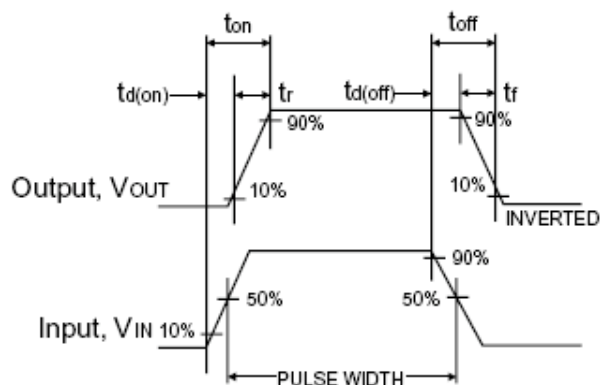
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	$BV_{DSS}$	20	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	$V_{GS(TH)}$	0.6	0.8	1.0	V
Gate Body Leakage	$V_{GS} = \pm 12V, V_{DS} = 0V$	$I_{GSS}$	--	--	$\pm 10$	$\mu A$
Zero Gate Voltage Drain Current	$V_{DS} = 16V, V_{GS} = 0V$	$I_{DSS}$	--	--	1.0	$\mu A$
On-State Drain Current	$V_{DS} = 5V, V_{GS} = 4.5V$	$I_{D(ON)}$	30	--	--	A
Drain-Source On-State Resistance	$V_{GS} = 4.5V, I_D = 4.5A$	$R_{DS(ON)}$	--	17	25	m $\Omega$
	$V_{GS} = 2.5V, I_D = 3.5A$		--	21	30	
	$V_{GS} = 1.8V, I_D = 2.0A$		--	34	65	
Forward Transconductance	$V_{DS} = 10V, I_D = 4.5A$	$g_{fs}$	--	30	--	S
Diode Forward Voltage	$I_S = 2A, V_{GS} = 0V$	$V_{SD}$	--	0.6	1.2	V
<b>Dynamic<sup>b</sup></b>						
Total Gate Charge	$V_{DS} = 10V, I_D = 4.5A,$ $V_{GS} = 4.5V$	$Q_g$	--	15	20	nC
Gate-Source Charge		$Q_{gs}$	--	3.4	--	
Gate-Drain Charge		$Q_{gd}$	--	1.2	--	
Input Capacitance	$V_{DS} = 10V, V_{GS} = 0V,$ $f = 1.0MHz$	$C_{iss}$	--	950	--	pF
Output Capacitance		$C_{oss}$	--	450	--	
Reverse Transfer Capacitance		$C_{rss}$	--	135	--	
<b>Switching<sup>c</sup></b>						
Turn-On Delay Time	$V_{DD} = 10V, R_L = 10\Omega,$ $I_D = 1A, V_{GEN} = 4.5V,$ $R_G = 6\Omega$	$t_{d(on)}$	--	140	200	nS
Turn-On Rise Time		$t_r$	--	210	250	
Turn-Off Delay Time		$t_{d(off)}$	--	3700	4800	
Turn-Off Fall Time		$t_f$	--	2000	2600	

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.



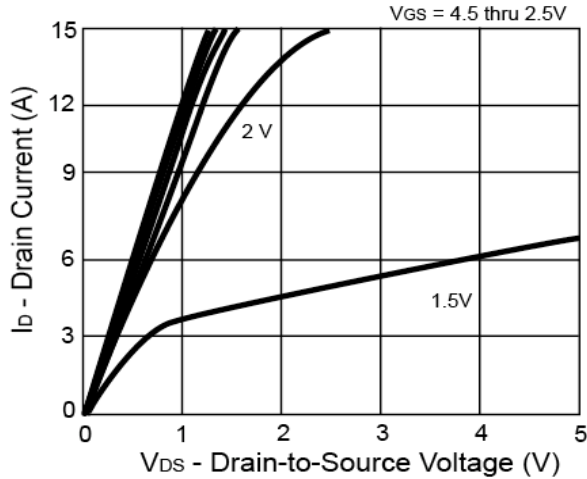
Switching Test Circuit



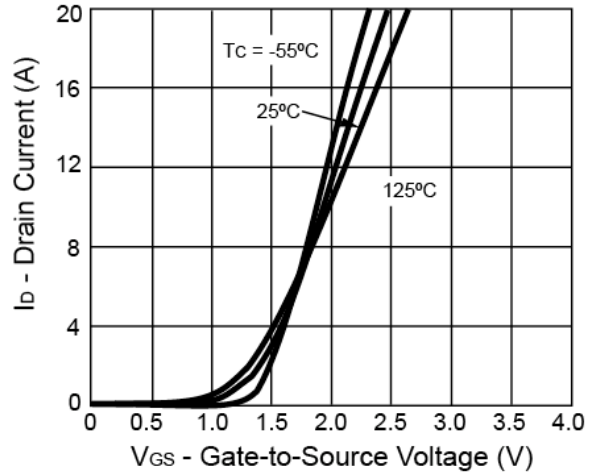
Switchin Waveforms

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

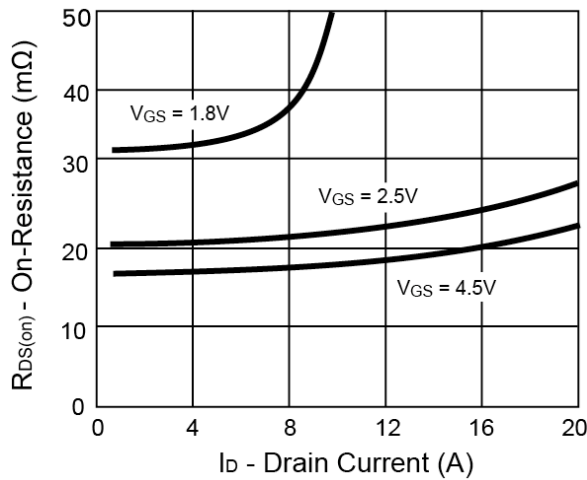
**Output Characteristics**



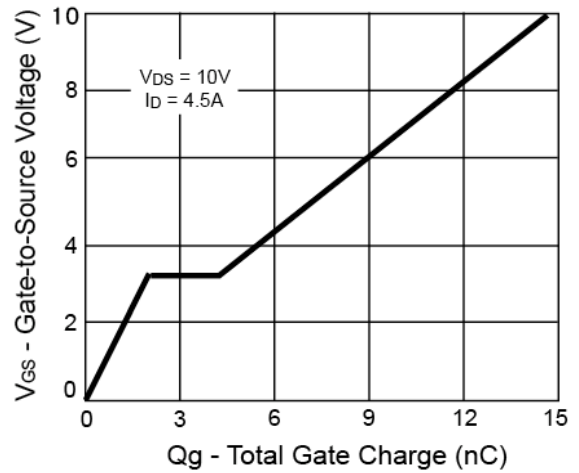
**Transfer Characteristics**



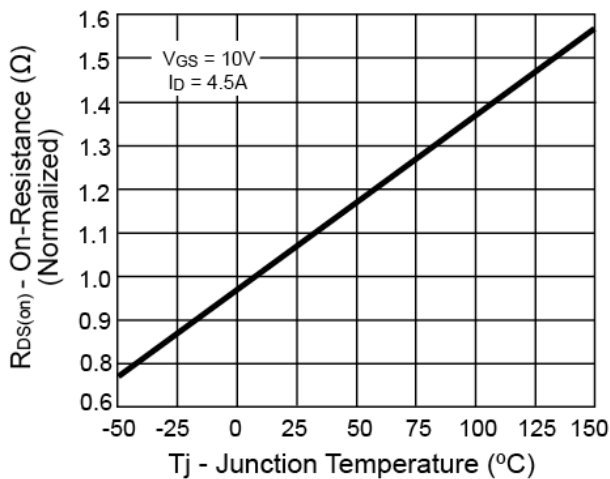
**On-Resistance vs. Drain Current**



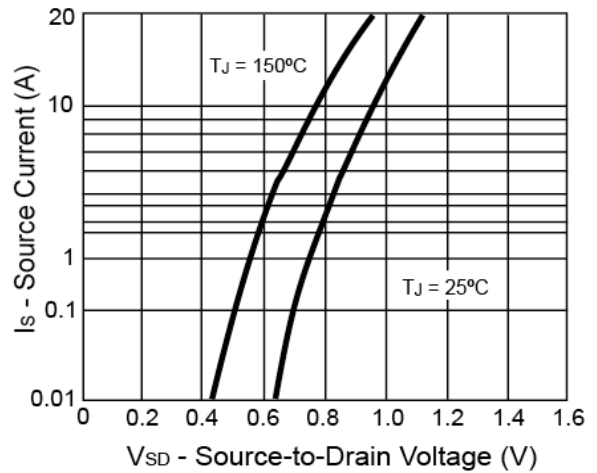
**Gate Charge**



**On-Resistance vs. Junction Temperature**

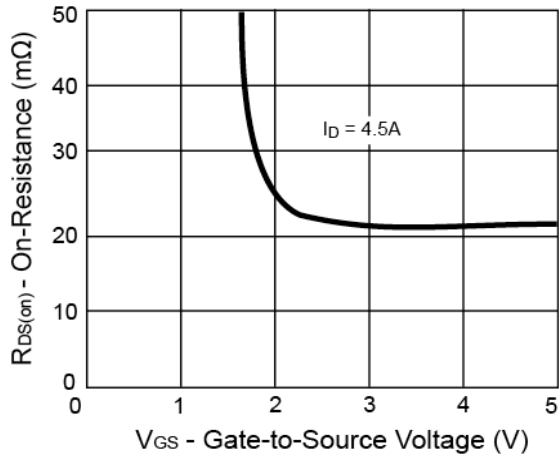


**Source-Drain Diode Forward Voltage**

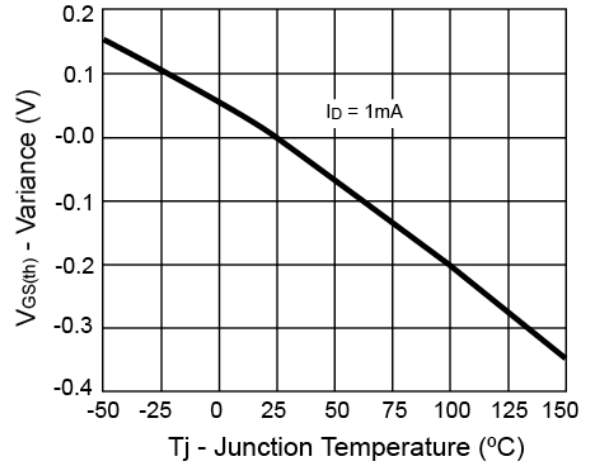


**Electrical Characteristics Curve** (Ta = 25°C, unless otherwise noted)

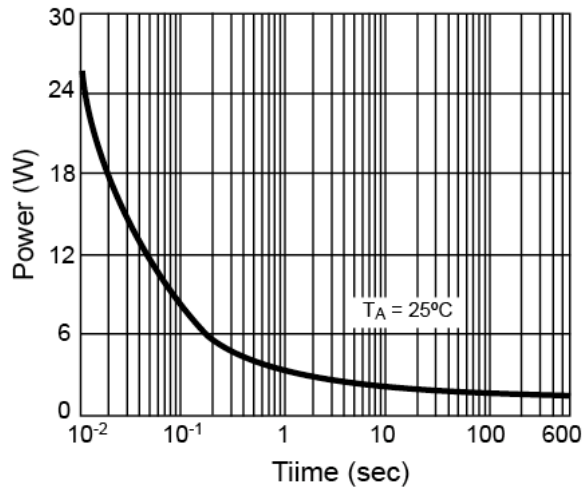
**On-Resistance vs. Gate-Source Voltage**



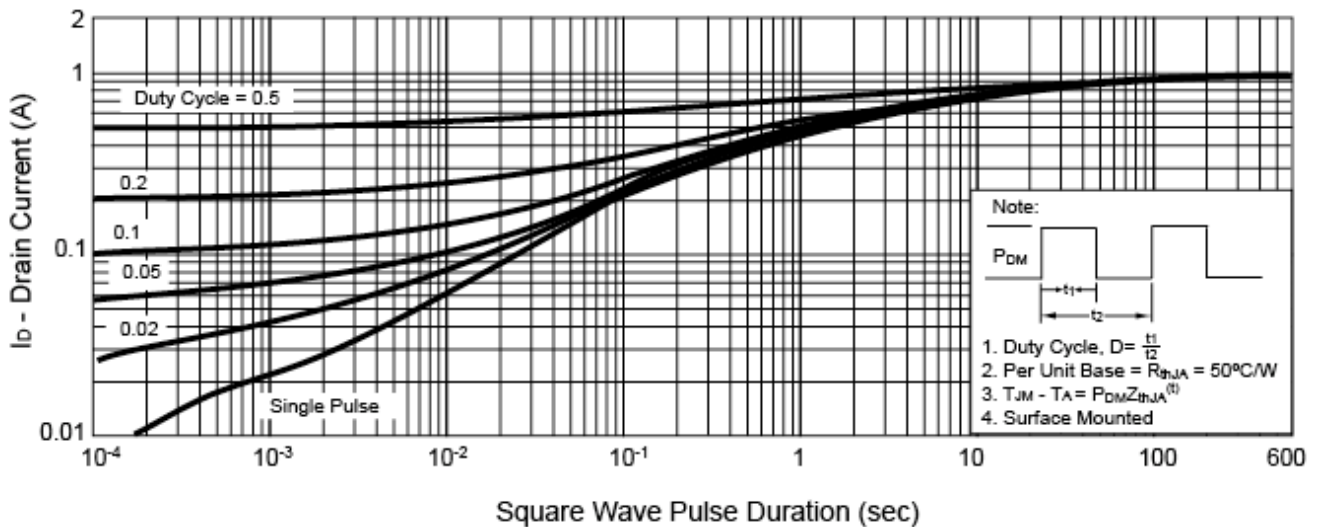
**Threshold Voltage**



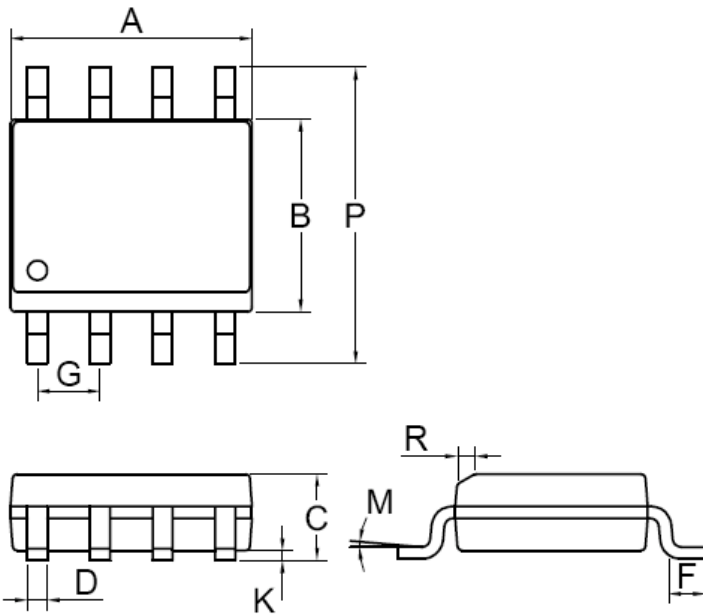
**Single Pulse Power**



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

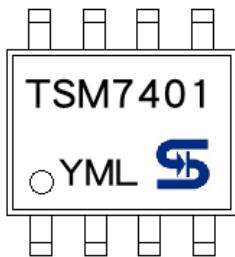


**SOP-8 Mechanical Drawing**



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

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