

**Pin Definition:**

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

**Key Parameter Performance**

Parameter	Value	Unit
$V_{DS}$	20	V
$R_{DS(on)}$ (max)	30	m
$Q_g$	11.2	nC

**Features**

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

**Application**

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

**Ordering Information**

Part No.	Package	Packing
TSM4424CS RL	SOP-8	2.5Kpcs / 13+Reel
TSM4424CS RLG	SOP-8	2.5Kpcs / 13+Reel
TSM4424CS RVG	SOP-8	3Kpcs / 13+Reel

**Note:** %G+denotes for Halogen- and Antimony-free as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds

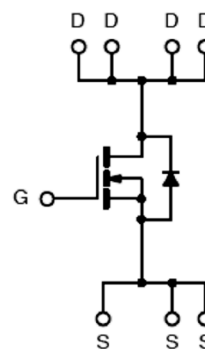
**Absolute Maximum Ratings** ( $T_C = 25^{\circ}C$ , unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	20	V
Gate-Source Voltage	$V_{GS}$	$\pm 8$	V
Continuous Drain Current	$I_D$	8	A
Pulsed Drain Current <sup>(Note 1)</sup>	$I_{DM}$	30	A
Continuous Source Current (Diode Conduction)	$I_S$	2.2	A
Maximum Power Dissipation	$P_D$	$T_a = 25^{\circ}C$	2.5
		$T_a = 75^{\circ}C$	1.3
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	$R_{JF}$	25	$^{\circ}C/W$
Thermal Resistance Junction to Ambient	$R_{JA}$	52.5	$^{\circ}C/W$

**Block Diagram**



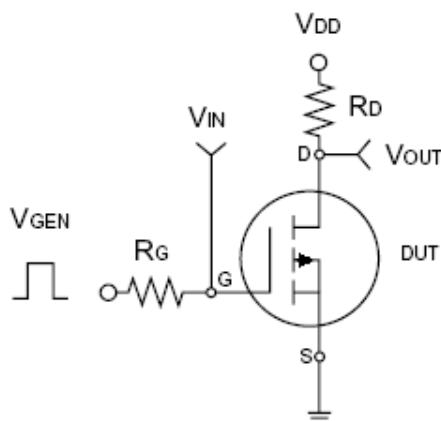
N-Channel MOSFET

### Electrical Specifications

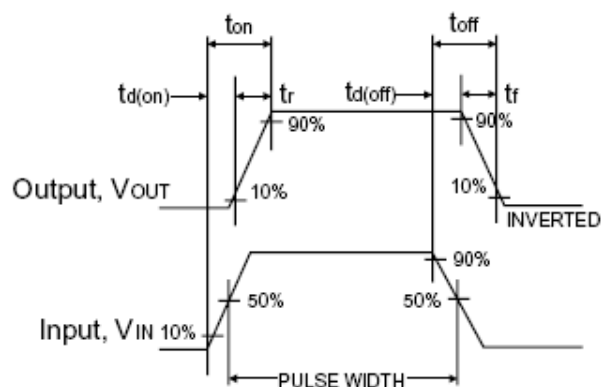
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
<b>Static</b> <sup>(Note 2)</sup>						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	$BV_{DSS}$	20	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	$V_{GS(TH)}$	--	0.65	1	V
Gate Body Leakage	$V_{GS} = \pm 8V, V_{DS} = 0V$	$I_{GSS}$	--	--	$\pm 100$	nA
Zero Gate Voltage Drain Current	$V_{DS} = 20V, V_{GS} = 0V$	$I_{DSS}$	--	--	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	$V_{GS} = 4.5V, I_D = 4.5A$	$R_{DS(ON)}$	--	23	30	m
	$V_{GS} = 2.5V, I_D = 3.5A$		--	25	35	
	$V_{GS} = 1.8V, I_D = 2.0A$		--	35	45	
Forward Transconductance	$V_{DS} = 10V, I_D = 6A$	$g_{fs}$	--	40	--	S
Diode Forward Voltage	$I_S = 1.7A, V_{GS} = 0V$	$V_{SD}$	--	0.8	1.2	V
<b>Dynamic</b> <sup>(Note 3)</sup>						
Total Gate Charge	$V_{DS} = 10V, I_D = 4.5A,$ $V_{GS} = 4.5V$	$Q_g$	--	11.2	14	nC
Gate-Source Charge		$Q_{gs}$	--	1.4	--	
Gate-Drain Charge		$Q_{gd}$	--	2.2	--	
Input Capacitance	$V_{DS} = 10V, V_{GS} = 0V,$ $f = 1.0MHz$	$C_{iss}$	--	500	--	pF
Output Capacitance		$C_{oss}$	--	300	--	
Reverse Transfer Capacitance		$C_{rss}$	--	140	--	
<b>Switching</b> <sup>(Note 4)</sup>						
Turn-On Delay Time	$V_{DD} = 10V, R_L = 10 \Omega,$ $I_D = 1A, V_{GEN} = 4.5V,$ $R_G = 6 \Omega$	$t_{d(on)}$	--	15	25	ns
Turn-On Rise Time		$t_r$	--	30	60	
Turn-Off Delay Time		$t_{d(off)}$	--	35	70	
Turn-Off Fall Time		$t_f$	--	15	45	

#### Notes:

1. Pulse width limited by the maximum junction temperature
2. Pulse test: PW  $m300\mu s$ , duty cycle  $m2\%$
3. For DESIGN AID ONLY, not subject to production testing.
4. Switching time is essentially independent of operating temperature.



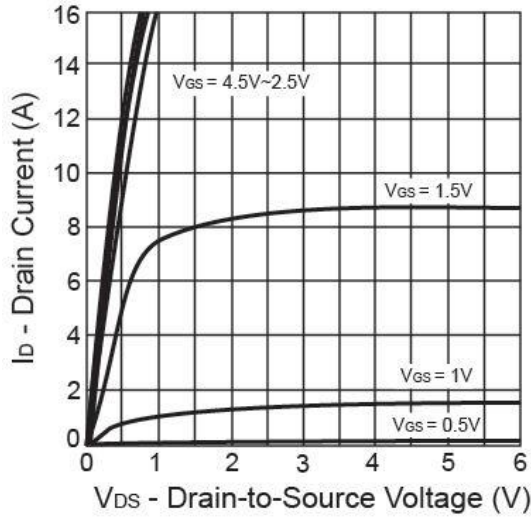
Switching Test Circuit



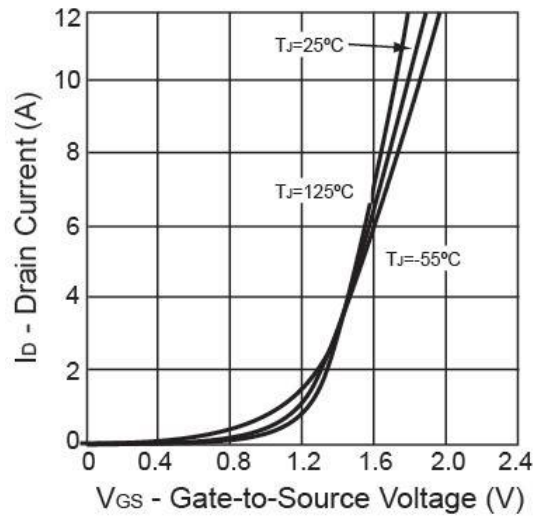
Switchin Waveforms

**Electrical Characteristics Curve**

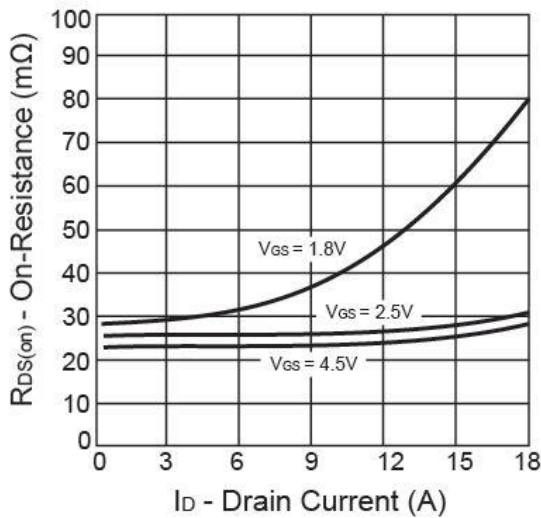
**Output Characteristics**



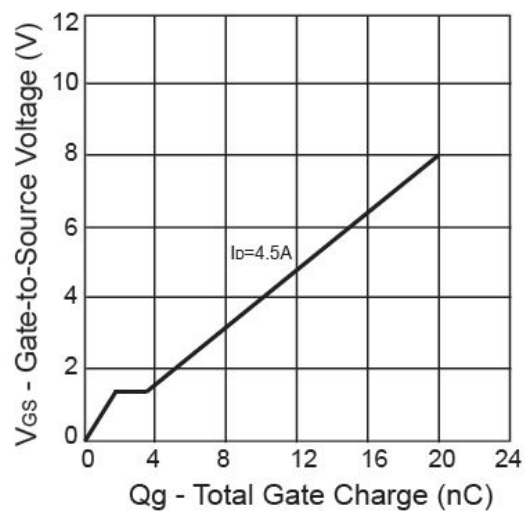
**Transfer Characteristics**



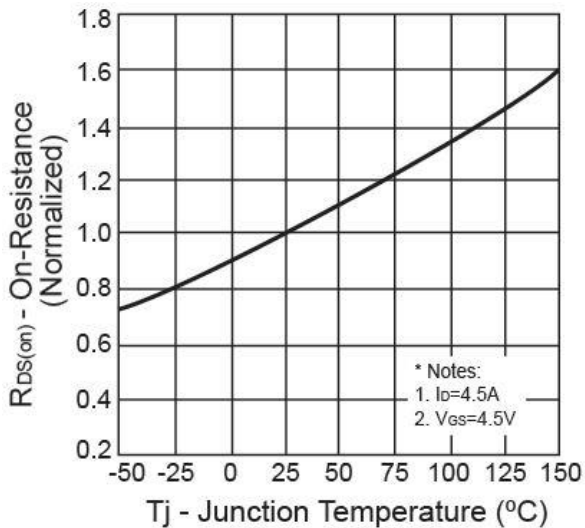
**On-Resistance vs. Drain Current**



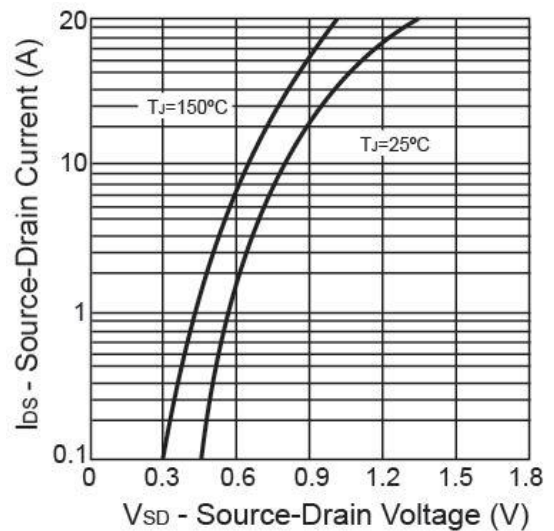
**Gate Charge**



**On-Resistance vs. Junction Temperature**

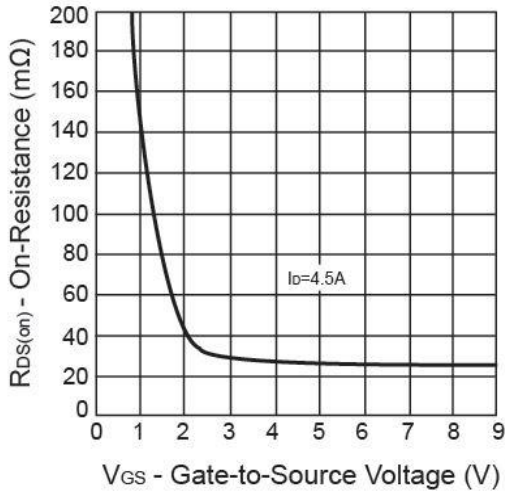


**Source-Drain Diode Forward Voltage**

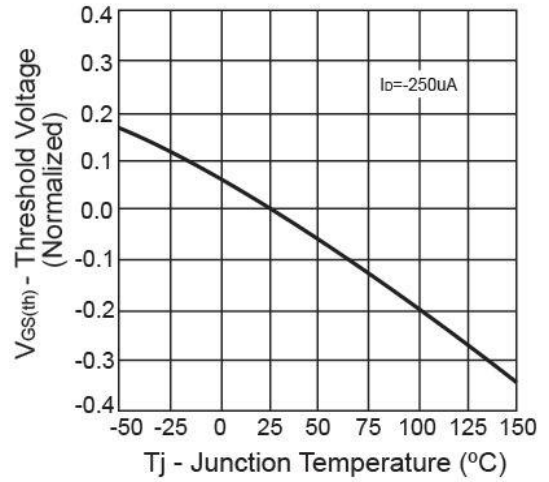


**Electrical Characteristics Curve**

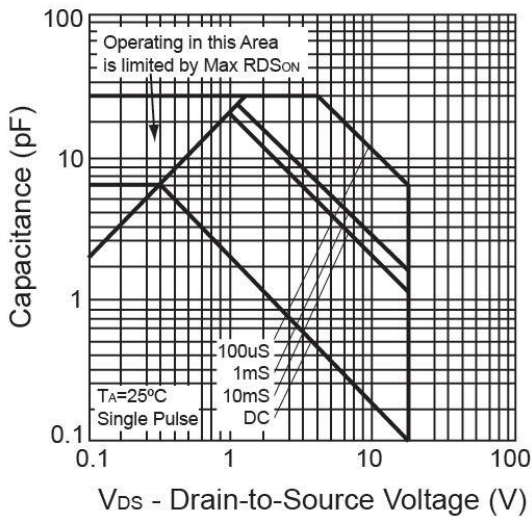
**On-Resistance vs. Gate-Source Voltage**



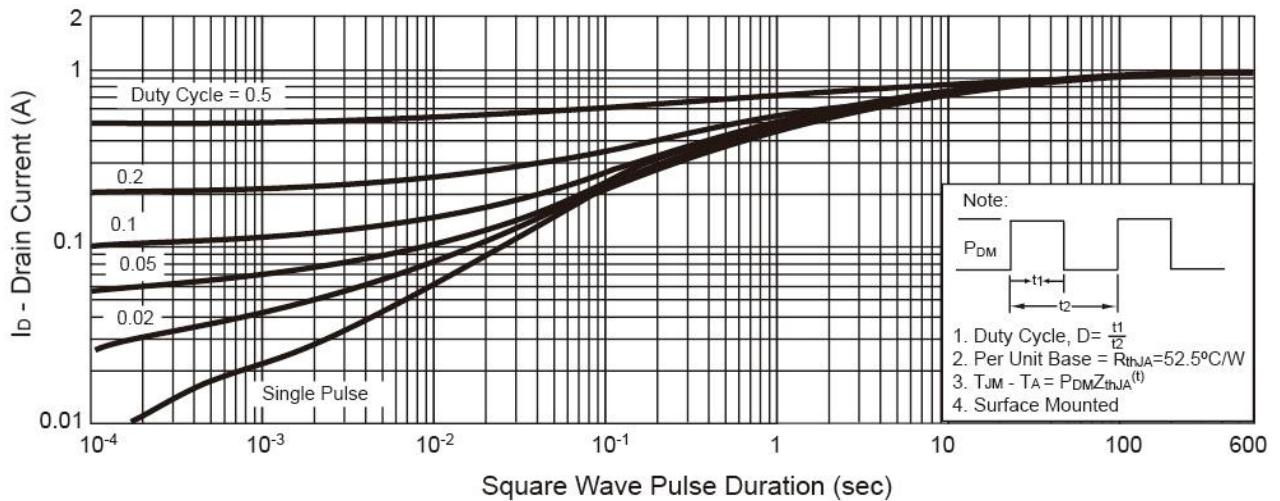
**Threshold Voltage**



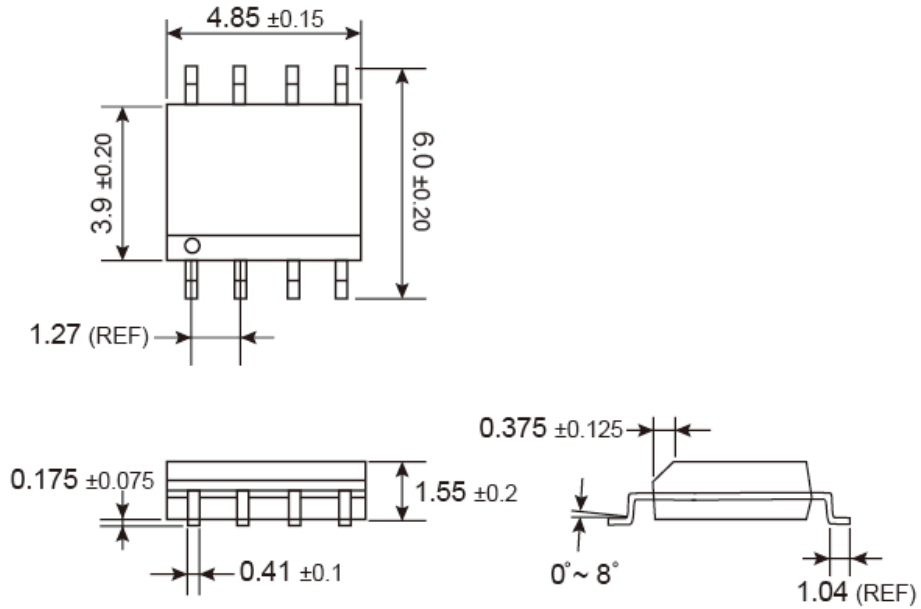
**Safety Operation Area**



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

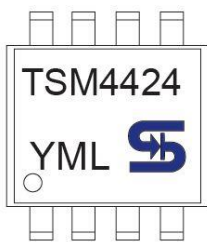


**SOP-8 Mechanical Drawing**



Unit: Millimeters

**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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