

### SOT-23



### Pin Definition:

1. Gate
2. Source
3. Drain

### PRODUCT SUMMARY

$V_{DS}$ (V)	$R_{DS(on)}$ (m $\Omega$ )	$I_D$ (A)
-20	130 @ $V_{GS} = -4.5V$	-2.8
	190 @ $V_{GS} = -2.5V$	-2.0

### Features

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

### Application

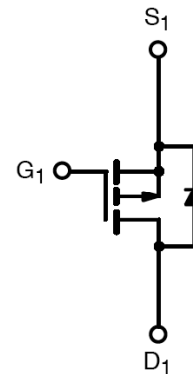
- Battery Management
- High Speed Switch

### Ordering Information

Part No.	Package	Packing
TSM2301ACX RFG	SOT-23	3Kpcs / 7" Reel

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

### Block Diagram



P-Channel MOSFET

### Absolute Maximum Rating ( $T_A=25^{\circ}C$ 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	$I_D$	-2.8	A
Pulsed Drain Current	$I_{DM}$	-10	A
Continuous Source Current (Diode Conduction) <sup>a,b</sup>	$I_S$	-1	A
Maximum Power Dissipation	$P_D$	$T_A=25^{\circ}C$	0.7
		$T_A=70^{\circ}C$	0.45
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
Junction to Ambient Thermal Resistance (PCB mounted)	$R_{\theta JA}$	175	$^{\circ}C/W$

### Notes:

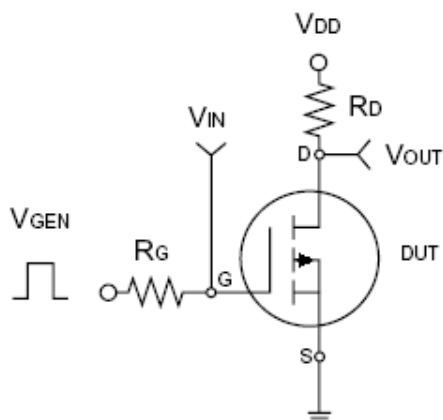
- a. Pulse width limited by the Maximum junction temperature
- b. Surface Mounted on a 1 in<sup>2</sup> pad of 2oz Cu,  $t \leq 10$  sec.

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

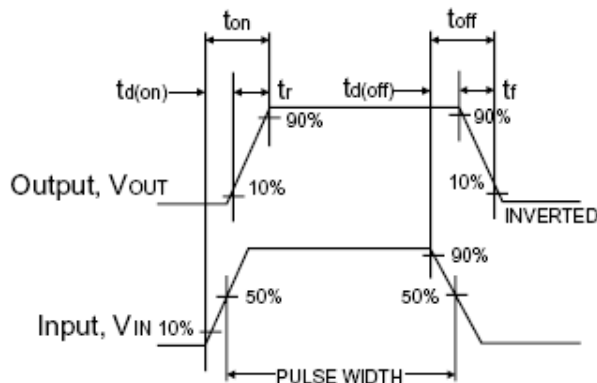
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	$BV_{DSS}$	-20	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	$V_{GS(TH)}$	-0.6	-0.7	-1	V
Gate Body Leakage	$V_{GS} = \pm 12V, V_{DS} = 0V$	$I_{GSS}$	--	--	$\pm 100$	nA
Zero Gate Voltage Drain Current	$V_{DS} = -20V, V_{GS} = 0V$	$I_{DSS}$	--	--	1.0	$\mu A$
Drain-Source On-State Resistance	$V_{GS} = -4.5V, I_D = -2.8A$	$R_{DS(ON)}$	--	90	130	m $\Omega$
	$V_{GS} = -2.5V, I_D = -2.0A$		--	120	190	
Diode Forward Voltage	$I_S = -1A, V_{GS} = 0V$	$V_{SD}$	--	-0.7	-1.3	V
<b>Dynamic<sup>b</sup></b>						
Gate Resistance	$V_{GS} = V_{DS} = 0V, f = 1MHz$	$R_g$	--	7.5	--	$\Omega$
Total Gate Charge	$V_{DS} = -6V, I_D = -2.8A, V_{GS} = -4.5V$	$Q_g$	--	7.2	--	nC
Gate-Source Charge		$Q_{gs}$	--	2.2	--	
Gate-Drain Charge		$Q_{gd}$	--	1.2	--	
Input Capacitance	$V_{DS} = -15V, V_{GS} = 0V, f = 1.0MHz$	$C_{iss}$	--	480	--	pF
Output Capacitance		$C_{oss}$	--	460	--	
Reverse Transfer Capacitance		$C_{rss}$	--	10	--	
<b>Switching<sup>b,c</sup></b>						
Turn-On Delay Time	$V_{DD} = -6V, R_L = 6\Omega, V_{GEN} = -4.5V, R_G = 6\Omega$	$t_{d(on)}$	--	38	--	nS
Turn-On Rise Time		$t_r$	--	25	--	
Turn-Off Delay Time		$t_{d(off)}$	--	43	--	
Turn-Off Fall Time		$t_f$	--	5	--	

#### 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.



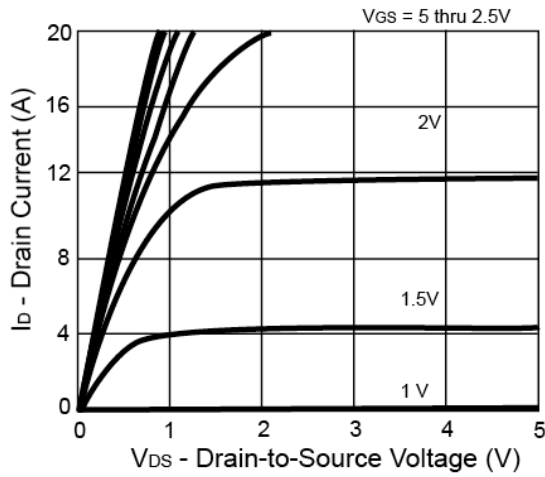
Switching Test Circuit



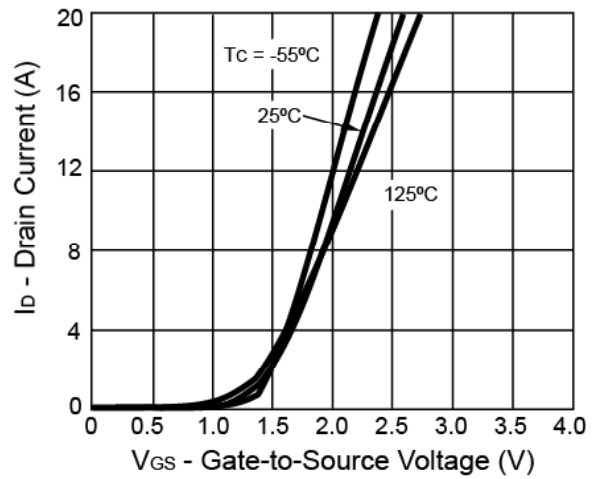
Switchin Waveforms

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

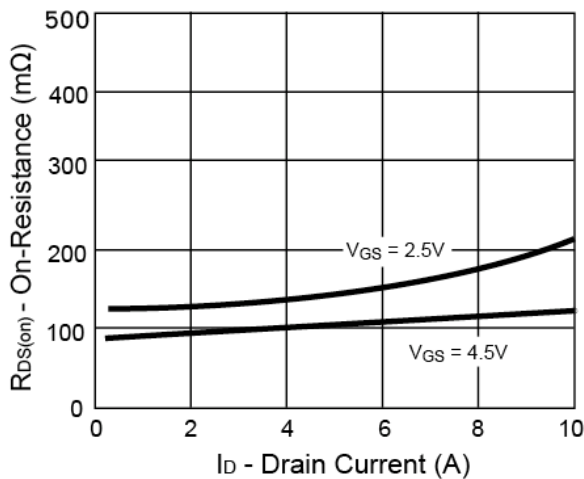
**Output Characteristics**



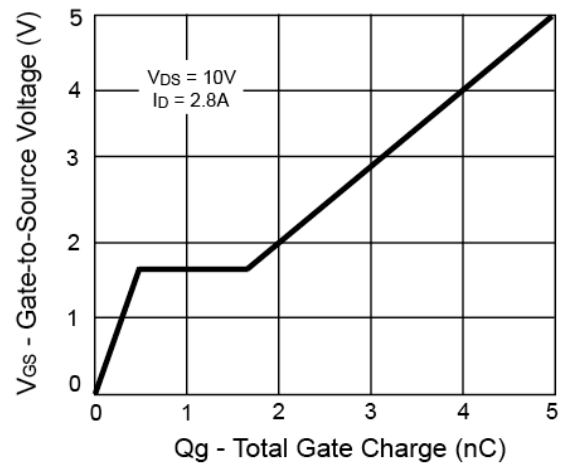
**Transfer Characteristics**



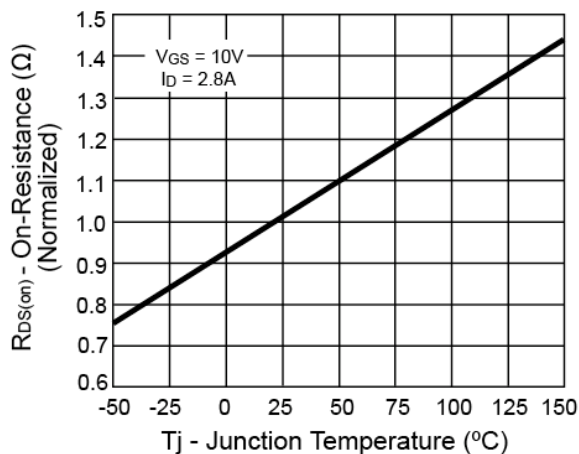
**On-Resistance vs. Drain Current**



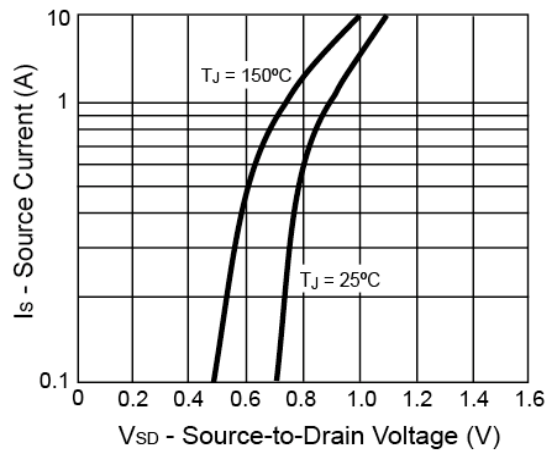
**Gate Charge**



**On-Resistance vs. Junction Temperature**

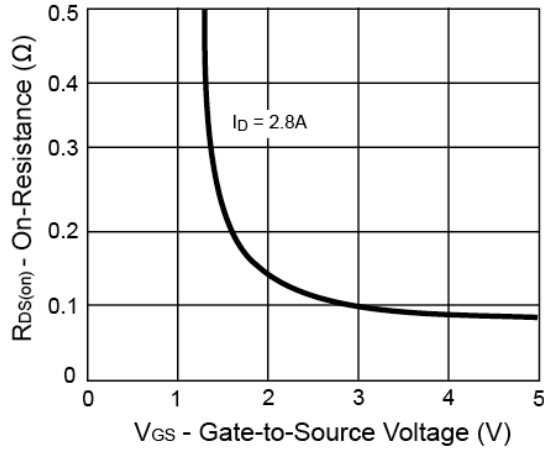


**Source-Drain Diode Forward Voltage**

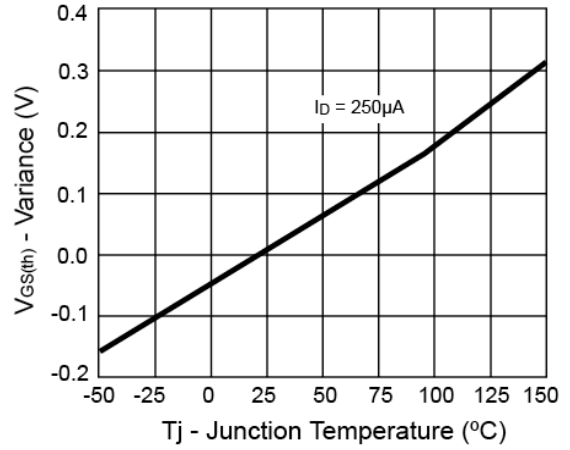


**Electrical Characteristics Curve** ( $T_a = 25^\circ\text{C}$ , unless otherwise noted)

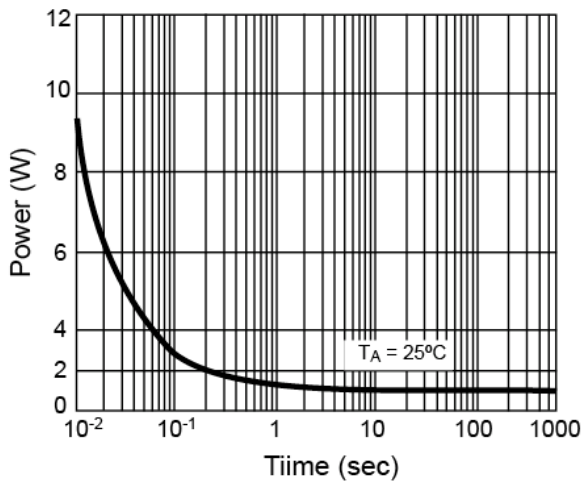
**On-Resistance vs. Gate-Source Voltage**



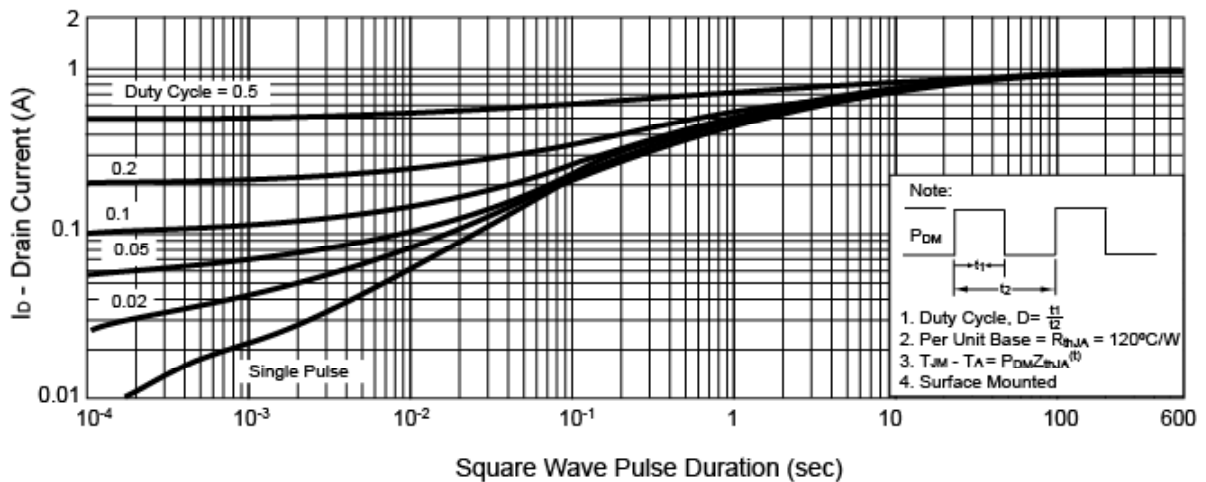
**Threshold Voltage**



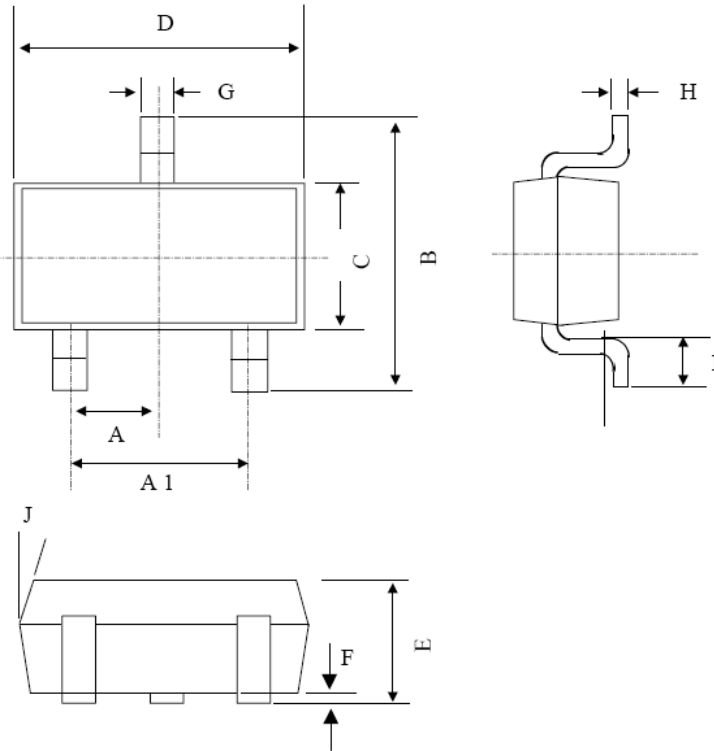
**Single Pulse Power**



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



**SOT-23 Mechanical Drawing**



SOT-23 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX.
A	0.95 BSC		0.037 BSC	
A1	1.9 BSC		0.074 BSC	
B	2.60	3.00	0.102	0.118
C	1.40	1.70	0.055	0.067
D	2.80	3.10	0.110	0.122
E	1.00	1.30	0.039	0.051
F	0.00	0.10	0.000	0.004
G	0.35	0.50	0.014	0.020
H	0.10	0.20	0.004	0.008
I	0.30	0.60	0.012	0.024
J	5°	10°	5°	10°

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