

**SOT-23**

**Pin Definition:**

1. Gate
2. Source
3. Drain

**PRODUCT SUMMARY**

$V_{DS}$ (V)	$R_{DS(on)}$ (m $\Omega$ )	$I_D$ (A)
-20	70 @ $V_{GS} = -4.5V$	-3.3
	90 @ $V_{GS} = -2.5V$	-2.0
	130 @ $V_{GS} = -1.8V$	-1.0

**Features**

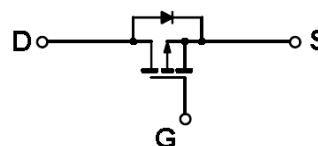
- Advance Trench Process Technology
- High Density Cell Design for Ultra Low On-resistance

**Application**

- Load Switch
- PA Switch

**Ordering Information**

Part No.	Package	Packing
TSM2313CX RF	SOT-23	T&R

**Block Diagram**


P-Channel MOSFET

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	-20V	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V
Continuous Drain Current, $V_{GS}$ @4.5V.	$I_D$	-3.3	A
Pulsed Drain Current, $V_{GS}$ @4.5V	$I_{DM}$	-20	A
Continuous Source Current (Diode Conduction) <sup>a,b</sup>	$I_S$	-1.7	A
Maximum Power Dissipation	$P_D$	$T_a = 25^\circ C$	2
		$T_a = 70^\circ C$	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
Junction to Foot (Drain) Thermal Resistance	$R_{\theta_{JF}}$	30	$^\circ C/W$
Junction to Ambient Thermal Resistance (PCB mounted)	$R_{\theta_{JA}}$	50	$^\circ C/W$

**Notes:**

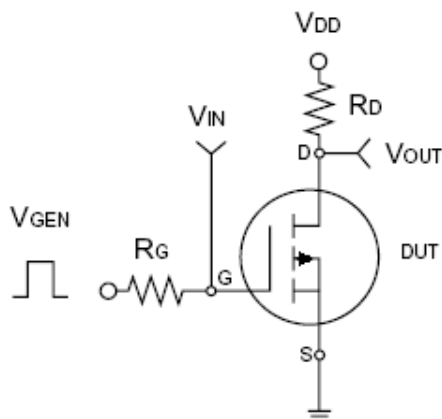
- a. Pulse width limited by the Maximum junction temperature
- b. Surface Mounted on FR4 Board,  $t \leq 5$  sec.

### Electrical Specifications

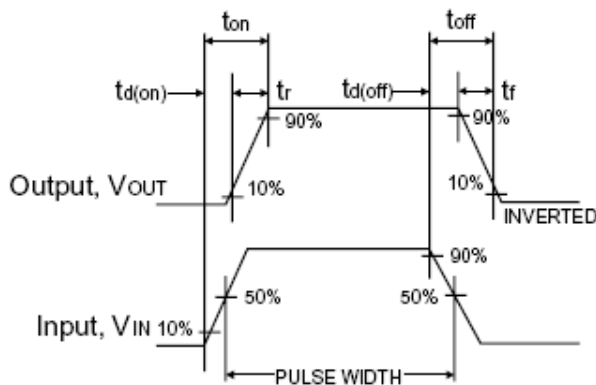
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = -250\mu A$	$BV_{DSS}$	-20	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\mu A$	$V_{GS(TH)}$	-0.6	--	-1.4	V
Gate Body Leakage	$V_{GS} = \pm 12V, V_{DS} = 0V$	$I_{GSS}$	--	--	$\pm 100$	nA
Zero Gate Voltage Drain Current	$V_{DS} = -20V, V_{GS} = 0V$	$I_{DSS}$	--	--	-1.0	$\mu A$
On-State Drain Current <sup>a</sup>	$V_{DS} = -5V, V_{GS} = -4.5V$	$I_{D(ON)}$	-15	--	--	A
Drain-Source On-State Resistance <sup>a</sup>	$V_{GS} = -4.5V, I_D = -3.3A$	$R_{DS(ON)}$	--	55	70	m $\Omega$
	$V_{GS} = -2.5V, I_D = -2.0A$		--	70	90	
	$V_{GS} = -1.8V, I_D = -1.0A$		--	120	130	
Forward Transconductance <sup>a</sup>	$V_{DS} = -10V, I_D = -4.7A$	$g_{fs}$	--	11	--	S
Diode Forward Voltage	$I_S = -1.7A, V_{GS} = 0V$	$V_{SD}$	--	-0.8	-1.2	V
<b>Dynamic<sup>b</sup></b>						
Total Gate Charge	$V_{DS} = -10V, I_D = -4.7A, V_{GS} = -4.5V$	$Q_g$	--	6	9	nC
Gate-Source Charge		$Q_{gs}$	--	1.4	--	
Gate-Drain Charge		$Q_{gd}$	--	1.9	--	
Input Capacitance	$V_{DS} = -10V, V_{GS} = 0V, f = 1.0MHz$	$C_{iss}$	--	640	--	pF
Output Capacitance		$C_{oss}$	--	180	--	
Reverse Transfer Capacitance		$C_{rss}$	--	90	--	
<b>Switching<sup>c</sup></b>						
Turn-On Delay Time	$V_{DD} = -10V, R_L = 10\Omega, I_D = -1A, V_{GEN} = -4.5V, R_G = 6\Omega$	$t_{d(on)}$	--	22	35	nS
Turn-On Rise Time		$t_r$	--	35	55	
Turn-Off Delay Time		$t_{d(off)}$	--	45	70	
Turn-Off Fall Time		$t_f$	--	25	50	

**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.



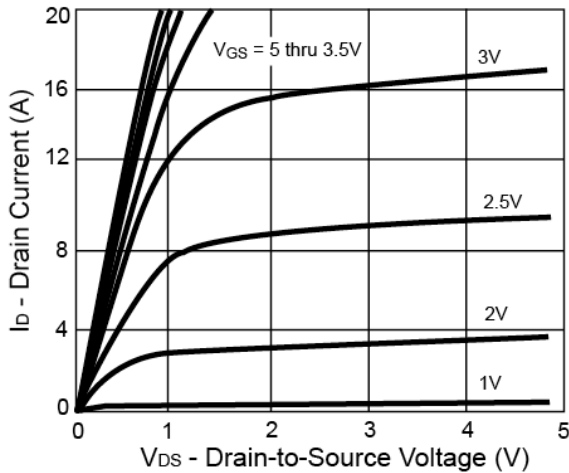
Switching Test Circuit



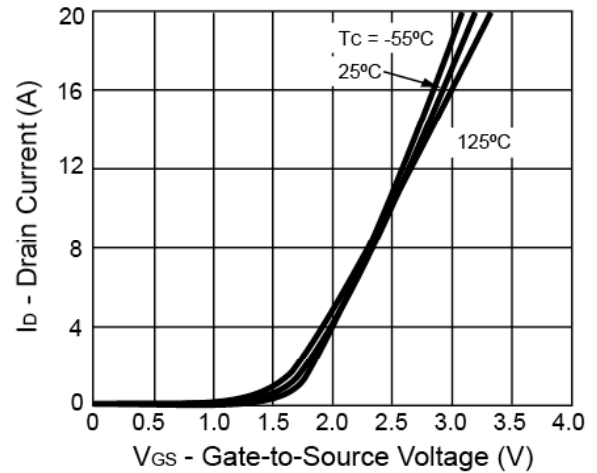
Switchin Waveforms

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

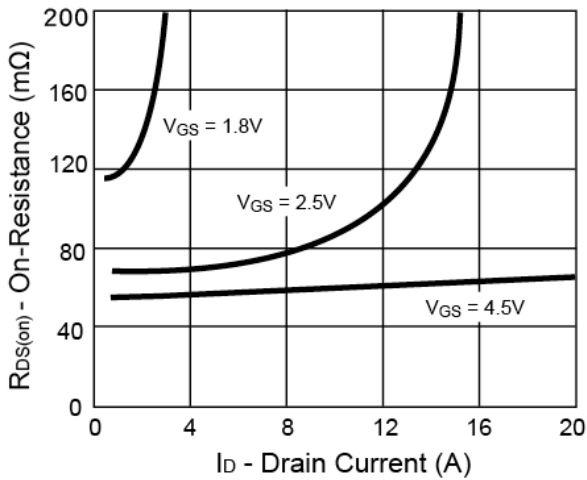
**Output Characteristics**



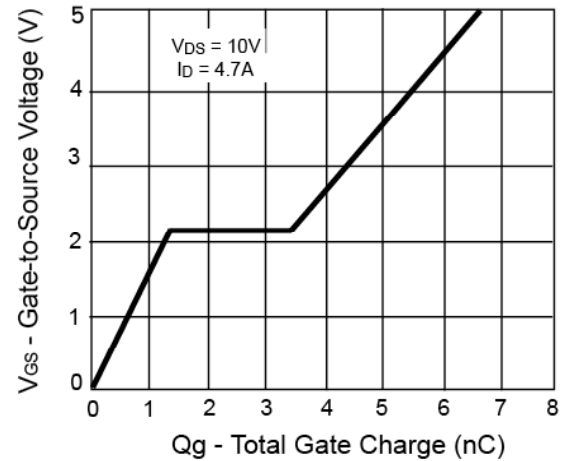
**Transfer Characteristics**



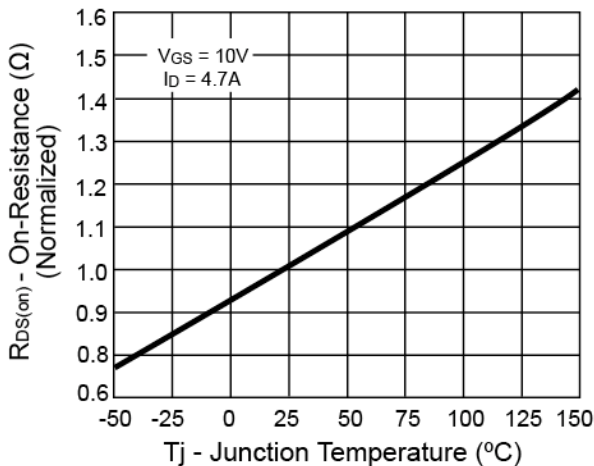
**On-Resistance vs. Drain Current**



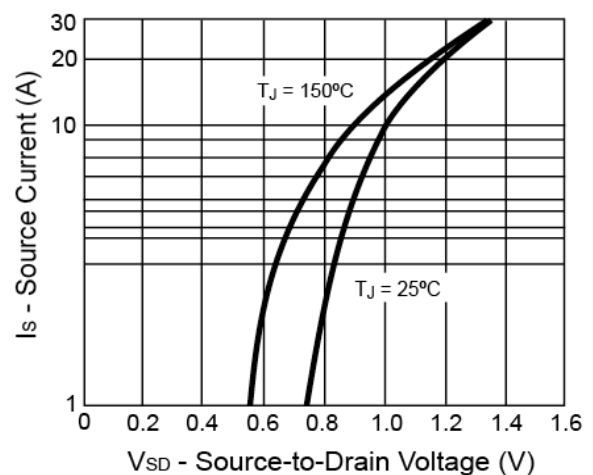
**Gate Charge**



**On-Resistance vs. Junction Temperature**

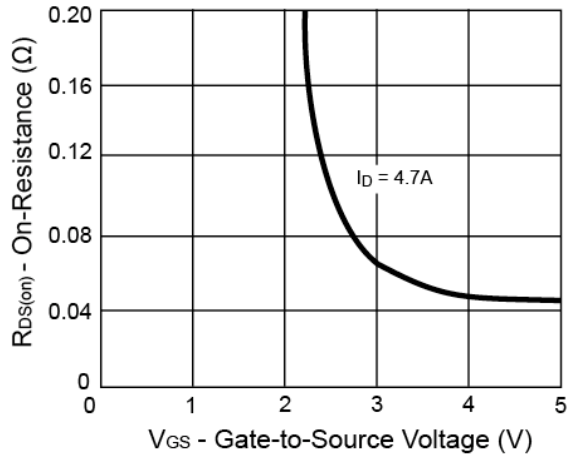


**Source-Drain Diode Forward Voltage**

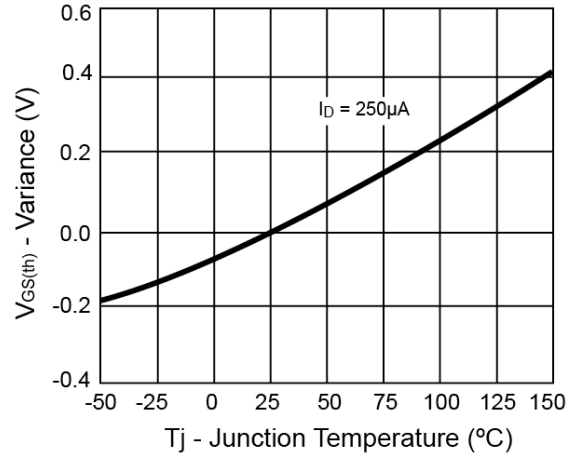


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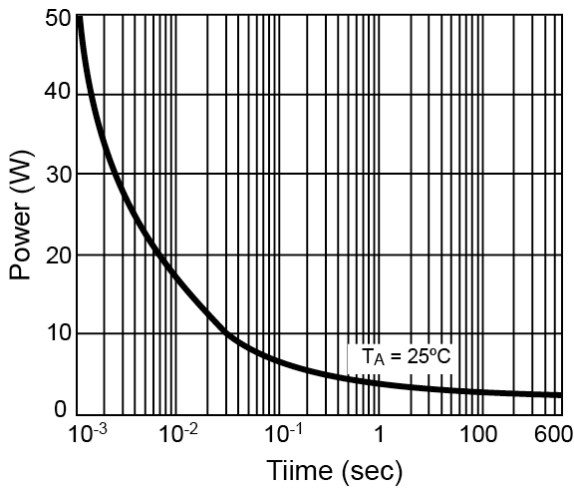
**On-Resistance vs. Gate-Source Voltage**



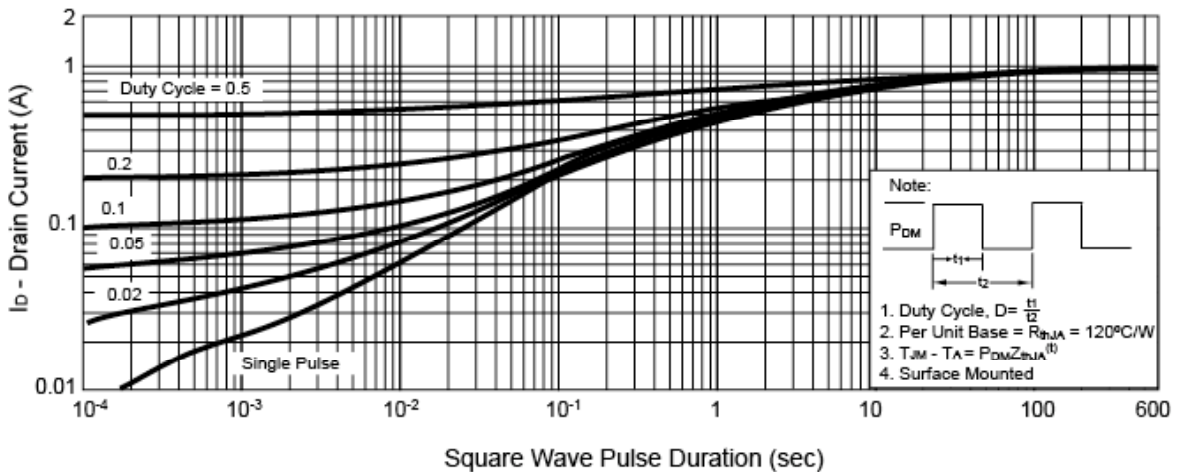
**Threshold Voltage**



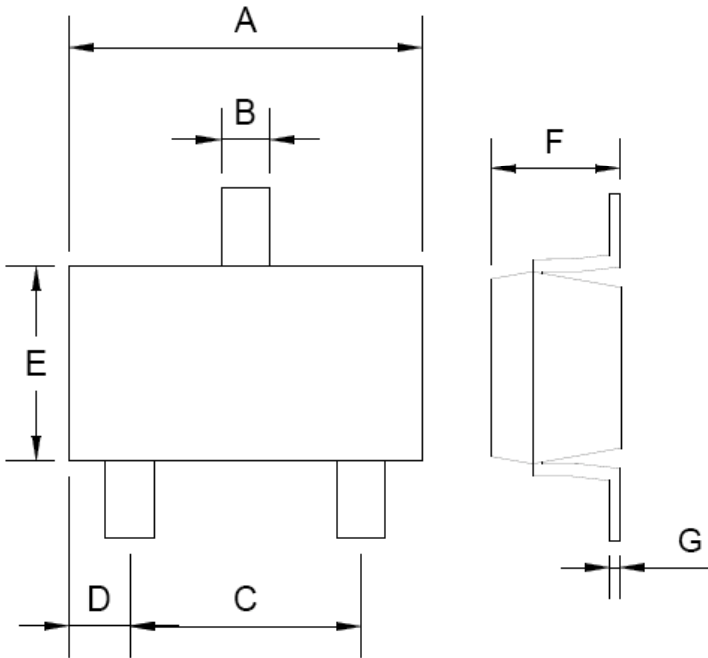
**Single Pulse Power**



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



**SOT-23 Mechanical Drawing**



DIM	SOT-23 DIMENSION			
	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX.
A	2.88	2.91	0.113	0.115
B	0.39	0.42	0.015	0.017
C	1.78	2.03	0.070	0.080
D	0.51	0.61	0.020	0.024
E	1.59	1.66	0.063	0.065
F	1.04	1.08	0.041	0.043
G	0.07	0.09	0.003	0.004

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