

## P-Channel Power MOSFET

-20V, -2.8A, 130mΩ

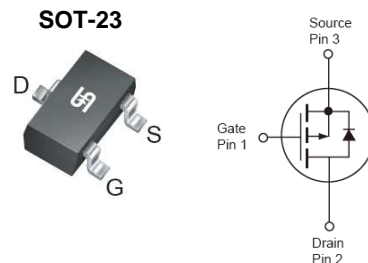
### Features

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

### Application

- Telecom power
- Consumer Electronics

KEY PERFORMANCE PARAMETERS		
PARAMETER	VALUE	UNIT
$V_{DS}$	-20	V
$R_{DS(on)}$ (max)	$V_{GS} = -4.5V$	130
	$V_{GS} = -2.5V$	190
$Q_g$	7.2	nC



**Notes:** Moisture sensitivity level: level 3. Per J-STD-020

### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ C$ 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 (Note 1)	$I_D$	$T_C = 25^\circ C$	-2.8
		$T_C = 100^\circ C$	-1.6
Pulsed Drain Current (Note 2)	$I_{DM}$	-10	A
Continuous Source Current (Diode Conduction) (Note 3)	$I_S$	-1	A
Total Power Dissipation	$P_{DTOT}$	$T_A = 25^\circ C$	0.7
		$T_A = 70^\circ C$	0.45
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:**  $R_{\theta JA}$  is the sum of the junction-to-case and case-to-ambient thermal resistances. The case thermal reference is defined at the solder mounting surface of the drain pins.  $R_{\theta JA}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.  $R_{\theta JA}$  shown below for single device operation on FR-4 PCB in still air.

<b>ELECTRICAL SPECIFICATIONS</b> ( $T_C = 25^\circ\text{C}$ unless otherwise noted)						
PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
<b>Static</b> (Note 4)						
Drain-Source Breakdown Voltage	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$	$BV_{DSS}$	-20	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	$V_{GS(th)}$	-0.6	-0.7	-1	V
Gate Body Leakage	$V_{GS} = \pm 12\text{V}, V_{DS} = 0\text{V}$	$I_{GSS}$	--	--	$\pm 100$	nA
Zero Gate Voltage Drain Current	$V_{DS} = -20\text{V}, V_{GS} = 0\text{V}$	$I_{DSS}$	--	--	1.0	$\mu\text{A}$
Drain-Source On-State Resistance	$V_{GS} = -4.5\text{V}, I_D = -2.8\text{A}$	$R_{DS(on)}$	--	90	130	m $\Omega$
	$V_{GS} = -2.5\text{V}, I_D = -2.0\text{A}$		--	120	190	
<b>Dynamic</b> (Note 5)						
Gate Resistance	$V_{GS} = V_{DS} = 0\text{V}, f = 1\text{MHz}$	$R_g$	--	7.5	--	$\Omega$
Total Gate Charge	$V_{DS} = -6\text{V}, I_D = -2.8\text{A},$ $V_{GS} = -4.5\text{V}$	$Q_g$	--	7.2	--	nC
Gate-Source Charge		$Q_{gs}$	--	2.2	--	
Gate-Drain Charge		$Q_{gd}$	--	1.2	--	
Input Capacitance	$V_{DS} = -15\text{V}, V_{GS} = 0\text{V},$ $f = 1.0\text{MHz}$	$C_{iss}$	--	480	--	pF
Output Capacitance		$C_{oss}$	--	460	--	
Reverse Transfer Capacitance		$C_{rss}$	--	10	--	
<b>Switching</b> (Note 6)						
Turn-On Delay Time	$V_{DD} = -6\text{V}, R_L = 6\Omega,$ $V_{GEN} = -4.5\text{V},$ $R_G = 6\Omega$	$t_{d(on)}$	--	38	--	ns
Turn-On Rise Time		$t_r$	--	25	--	
Turn-Off Delay Time		$t_{d(off)}$	--	43	--	
Turn-Off Fall Time		$t_f$	--	5	--	
<b>Source-Drain Diode</b> (Note 4)						
Forward On Voltage	$I_S = -1\text{A}, V_{GS} = 0\text{V}$	$V_{SD}$	--	-0.7	-1.3	V

**Notes:**

1. Current limited by package.
2. Pulse width limited by the maximum junction temperature.
3. Surface Mounted on a 1 in<sup>2</sup> pad of 2oz Cu,  $t \leq 10$  sec.
4. Pulse test:  $PW \leq 300\mu\text{s}$ , duty cycle  $\leq 2\%$ .
5. For DESIGN AID ONLY, not subject to production testing.
6. Switching time is essentially independent of operating temperature.

**ORDERING INFORMATION**

<b>PART NO.</b>	<b>PACKAGE</b>	<b>PACKING</b>
TSM2301ACX RFG	SOT-23	3,000 pcs / 7" Reel

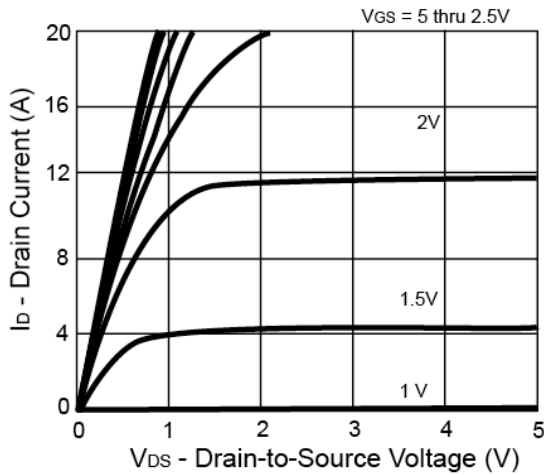
**Note:**

1. Compliant to RoHS Directive 2011/65/EU and in accordance to WEEE 2002/96/EC
2. Halogen-free according to IEC 61249-2-21 definition

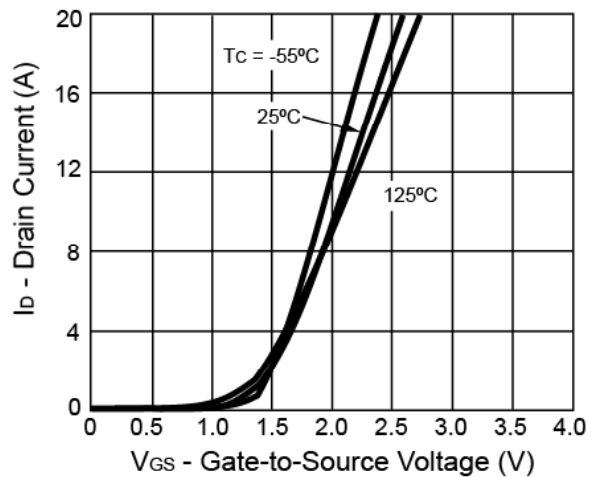
**CHARACTERISTICS CURVES**

( $T_C = 25^\circ\text{C}$  unless otherwise noted)

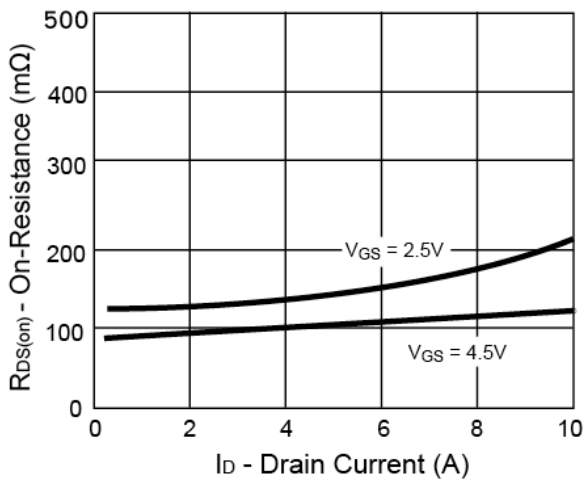
**Output Characteristics**



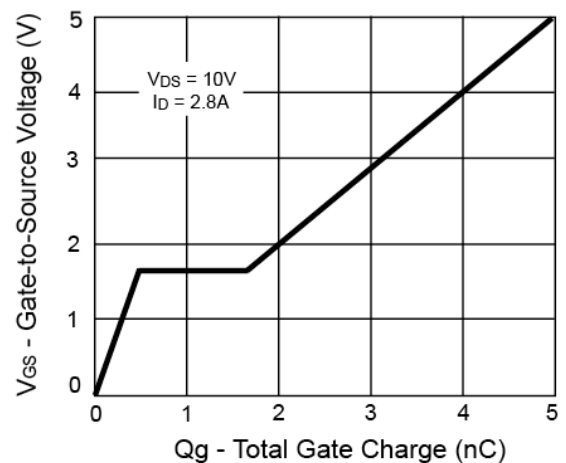
**Transfer Characteristics**



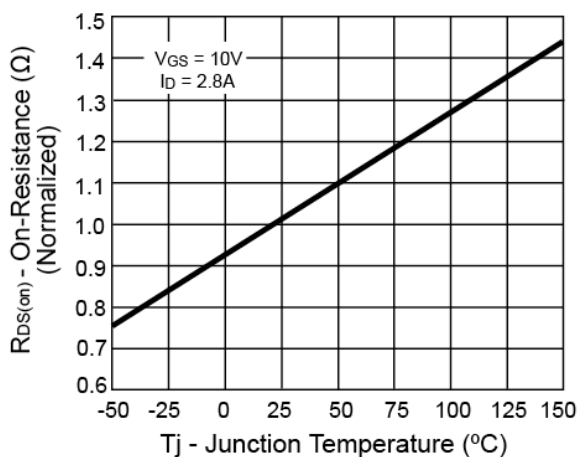
**On-Resistance vs. Drain Current**



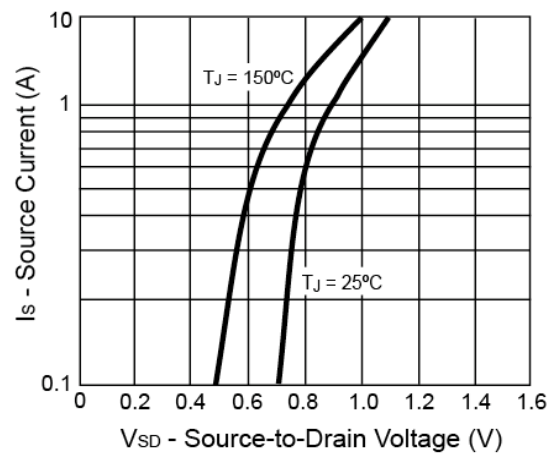
**Gate Charge**



**On-Resistance vs. Junction Temperature**

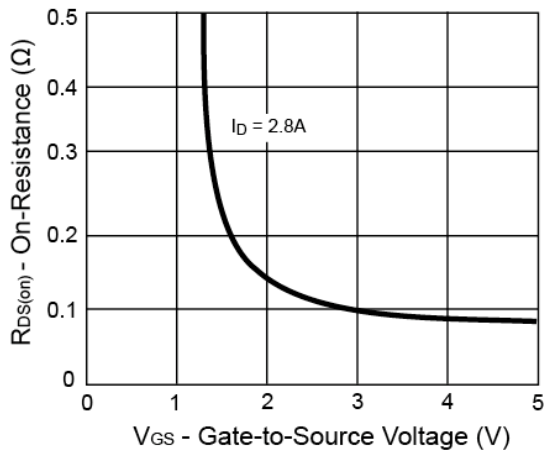


**Source-Drain Diode Forward Voltage**

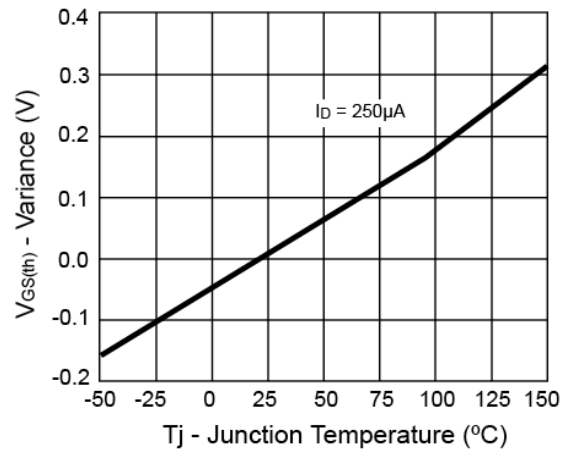


**Electrical Characteristics Curve**  
(Tc= 25°C, unless otherwise noted)

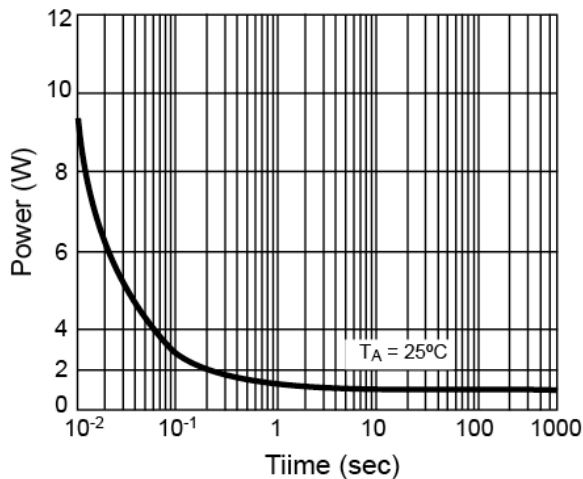
**On-Resistance vs. Gate-Source Voltage**



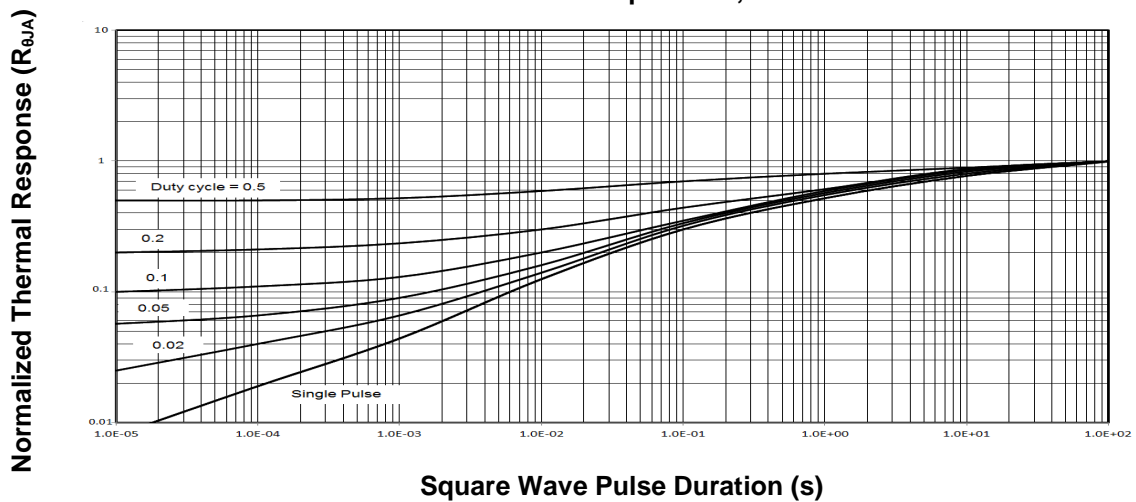
**Threshold Voltage**



**Single Pulse Power**

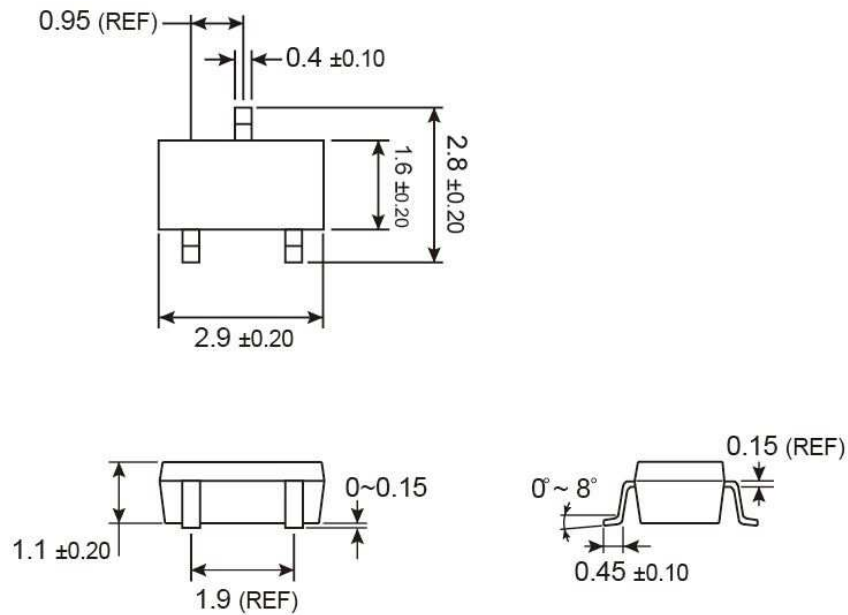


**Normalized Thermal Transient Impedance, Junction-to-Ambient**

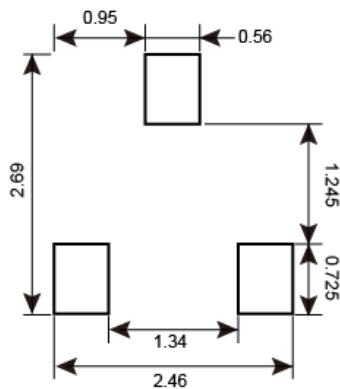


**PACKAGE OUTLINE DIMENSIONS** (Unit: Millimeters)

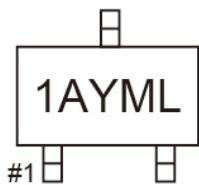
**SOT-23**



**SUGGESTED PAD LAYOUT** (Unit: Millimeters)



**Marking Diagram**



- Y = Year Code
- M = 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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