



Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



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## P-Channel Power MOSFET

-20V, -2.8A, 130mΩ

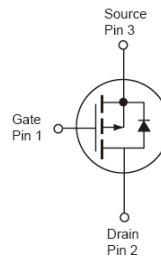
### Features

- 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	mΩ
	$V_{GS} = -2.5V$	190	
$Q_g$		7.2	nC


**SOT-23**

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

### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ 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)	$T_C = 25^\circ\text{C}$	$I_D$	-2.8	A
	$T_C = 100^\circ\text{C}$		-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	$T_A = 25^\circ\text{C}$	$P_{DTOT}$	0.7	W
	$T_A = 70^\circ\text{C}$		0.45	
Operating Junction and Storage Temperature Range		$T_J, T_{STG}$	- 55 to +150	$^\circ\text{C}$

### THERMAL PERFORMANCE

PARAMETER	SYMBOL	LIMIT	UNIT
Junction to Ambient Thermal Resistance (PCB mounted)	$R_{\theta JA}$	175	$^\circ\text{C/W}$

**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.

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

PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
Static <sup>(Note 4)</sup>						
Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA	BV <sub>DSS</sub>	-20	--	--	V
Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	V <sub>GS(th)</sub>	-0.6	-0.7	-1	V
Gate Body Leakage	V <sub>GS</sub> = ±12V, V <sub>DS</sub> = 0V	I <sub>GSS</sub>	--	--	±100	nA
Zero Gate Voltage Drain Current	V <sub>DS</sub> = -20V, V <sub>GS</sub> = 0V	I <sub>DSS</sub>	--	--	1.0	μA
Drain-Source On-State Resistance	V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -2.8A	R <sub>DS(on)</sub>	--	90	130	mΩ
	V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -2.0A		--	120	190	
Dynamic <sup>(Note 5)</sup>						
Gate Resistance	V <sub>GS</sub> = V <sub>DS</sub> =0V, f=1MHz	R <sub>g</sub>	--	7.5	--	Ω
Total Gate Charge	V <sub>DS</sub> = -6V, I <sub>D</sub> = -2.8A, V <sub>GS</sub> = -4.5V	Q <sub>g</sub>	--	7.2	--	nC
Gate-Source Charge		Q <sub>gs</sub>	--	2.2	--	
Gate-Drain Charge		Q <sub>gd</sub>	--	1.2	--	
Input Capacitance	V <sub>DS</sub> = -15V, V <sub>GS</sub> = 0V, f = 1.0MHz	C <sub>iss</sub>	--	480	--	pF
Output Capacitance		C <sub>oss</sub>	--	460	--	
Reverse Transfer Capacitance		C <sub>rss</sub>	--	10	--	
Switching <sup>(Note 6)</sup>						
Turn-On Delay Time	V <sub>DD</sub> = -6V, R <sub>L</sub> = 6Ω, V <sub>GEN</sub> = -4.5V, R <sub>G</sub> = 6Ω	t <sub>d(on)</sub>	--	38	--	ns
Turn-On Rise Time		t <sub>r</sub>	--	25	--	
Turn-Off Delay Time		t <sub>d(off)</sub>	--	43	--	
Turn-Off Fall Time		t <sub>f</sub>	--	5	--	
Source-Drain Diode <sup>(Note 4)</sup>						
Forward On Voltage	I <sub>S</sub> = -1A, V <sub>GS</sub> = 0V	V <sub>SD</sub>	--	-0.7	-1.3	V

**Notes:**

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

**ORDERING INFORMATION**

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

**Note:**

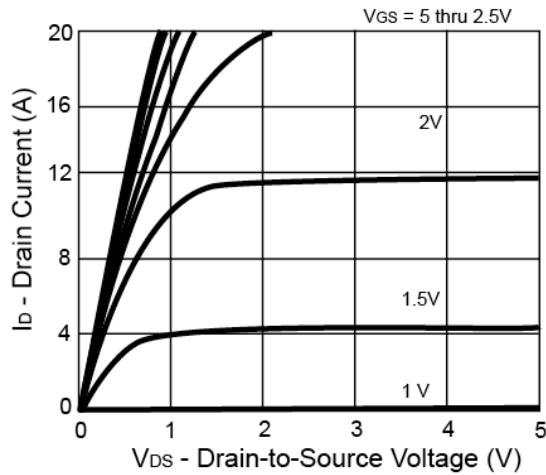
1. Compliant to RoHS Directive 2011/65/EU and in accordance to WEEE 2002/96/EC
2. Halogen-free according to IEC 61249-2-21 definition



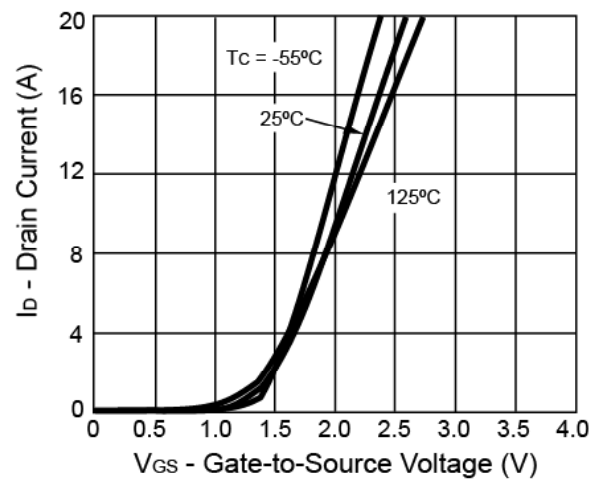
## CHARACTERISTICS CURVES

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

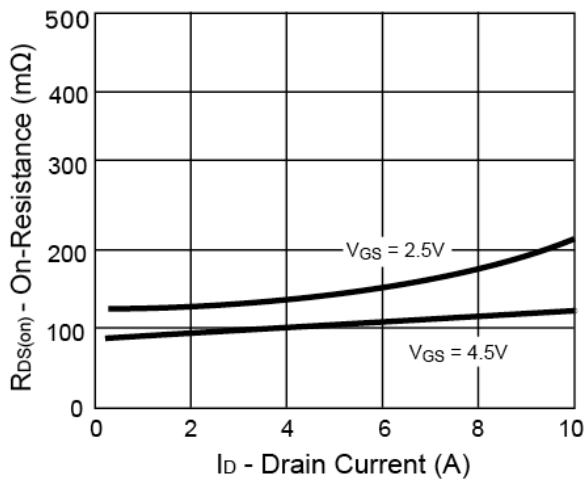
**Output Characteristics**



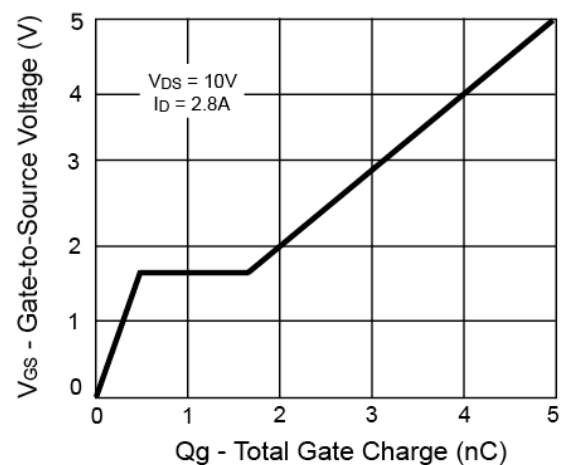
**Transfer Characteristics**



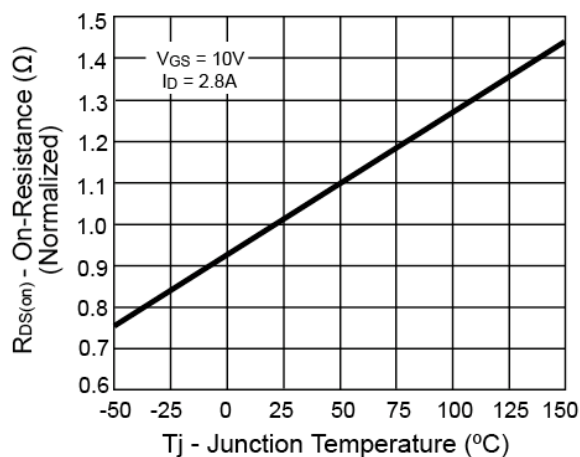
**On-Resistance vs. Drain Current**



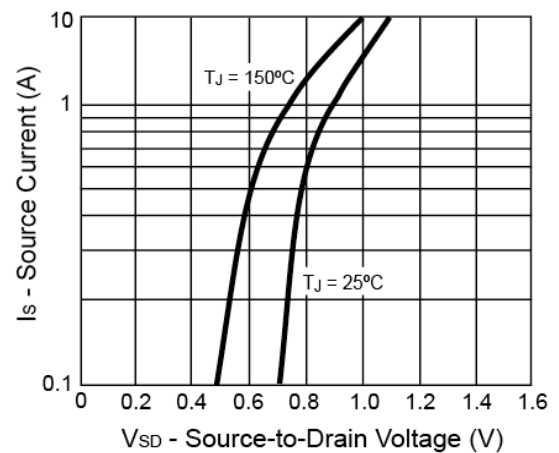
**Gate Charge**



**On-Resistance vs. Junction Temperature**



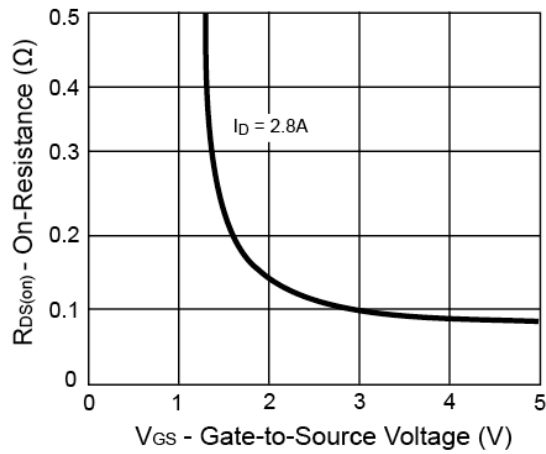
**Source-Drain Diode Forward Voltage**



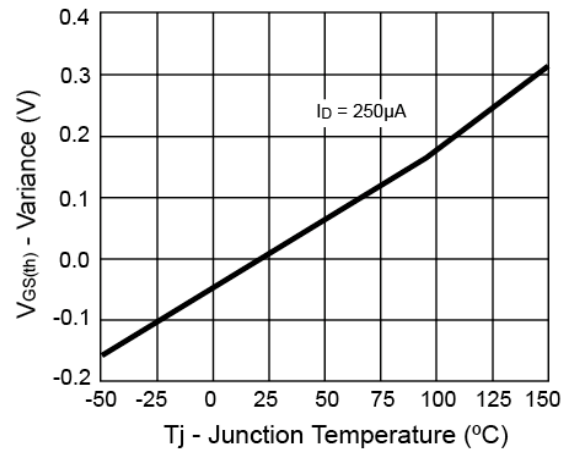
## Electrical Characteristics Curve

(T<sub>c</sub> = 25°C, unless otherwise noted)

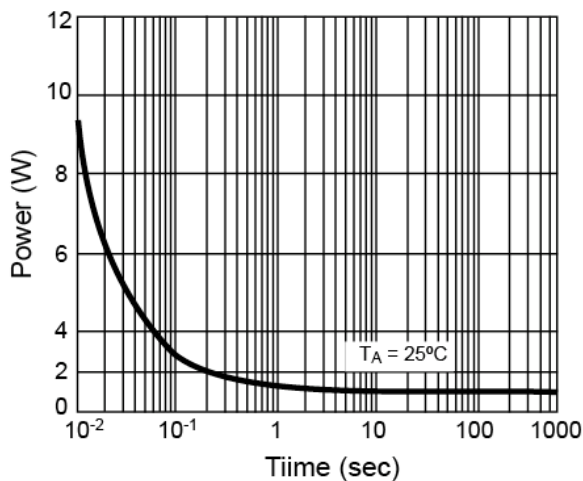
**On-Resistance vs. Gate-Source Voltage**



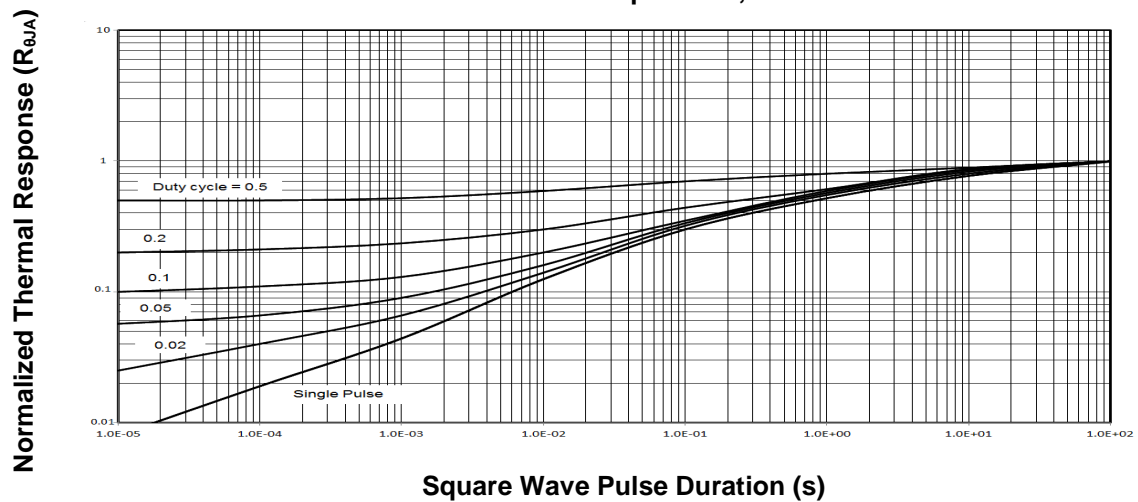
**Threshold Voltage**



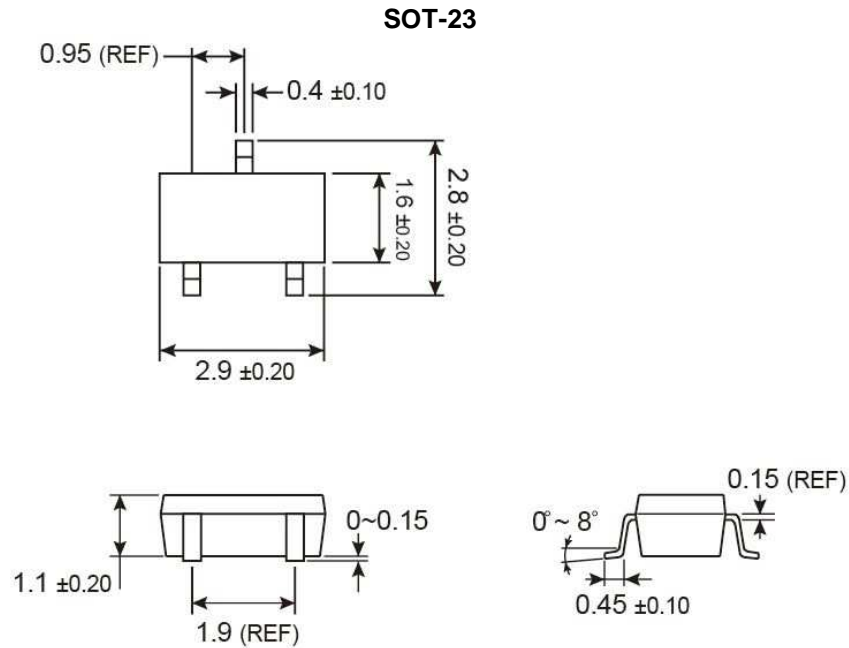
**Single Pulse Power**



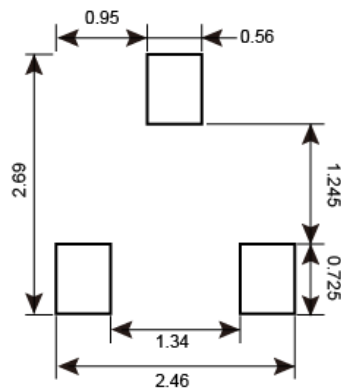
**Normalized Thermal Transient Impedance, Junction-to-Ambient**



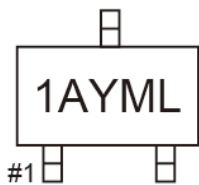
**PACKAGE OUTLINE DIMENSIONS** (Unit: Millimeters)



**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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