

## P-Channel Power MOSFET

-20V, -2.8A, 100mΩ

### Features

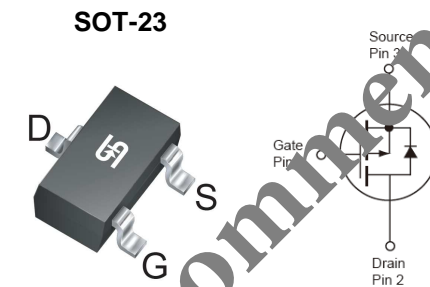
- Advance Trench Process Technology
- High Density Cell Design for Ultra Low On-resistance

### KEY PERFORMANCE PARAMETERS

PARAMETER	VALUE	UNIT
$V_{DS}$	-20	V
$R_{DS(on)}$ (max)	$V_{GS} = -4.5V$	100
	$V_{GS} = -2.5V$	150
	$V_{GS} = -1.8V$	190
$Q_g$	5.8	nC

### Application

- Load Switch
- PA Switch



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

### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25°C unless otherwise noted)

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	$V_{DS}$	-20	V
Gate-Source Voltage	$V_{GS}$	±8	V
Continuous Drain Current <sup>(Note 1)</sup>	$V_{GS} = 4.5V$ , $I_D$	-2.8	A
Pulsed Drain Current <sup>(Note 2)</sup>	$V_{GS} = 4.5V$ , $I_{DM}$	-8	A
Continuous Source Current (Diode Conduction)	$I_S$	-0.72	A
Total Power Dissipation	$P_{TOT}$	$T_A = 25^\circ C$	0.9
		$T_A = 75^\circ C$	0.57
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	- 55 to +150	°C

### THERMAL PERFORMANCE

PARAMETER	SYMBOL	LIMIT	UNIT
Junction to Ambient Thermal Resistance(PCB mounted)	$R_{\theta JA}$	120	°C/W
Lead Temperature (1/8" from case)	$T_L$	5	S

**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> ( $T_A = 25^\circ\text{C}$ unless otherwise noted)						
PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
<b>Static</b> (Note 3)						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = -250\mu A$	$BV_{DSS}$	-20	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\mu A$	$V_{GS(TH)}$	-0.45	--	-0.95	V
Gate Body Leakage	$V_{GS} = \pm 8V, V_{DS} = 0V$	$I_{GSS}$	--	--	$\pm 100$	nA
Zero Gate Voltage Drain Current	$V_{DS} = -9.6V, V_{GS} = 0V$	$I_{DSS}$	--	--	-1.0	$\mu A$
On-State Drain Current	$V_{DS} \geq -10V, V_{GS} = -5V$	$I_{D(ON)}$	-6	--	--	A
Drain-Source On-State Resistance	$V_{GS} = -4.5V, I_D = -2.8A$	$R_{DS(ON)}$	--	80	100	m $\Omega$
	$V_{GS} = -2.5V, I_D = -2.0A$		--	110	150	
	$V_{GS} = -1.8V, I_D = -2.0A$		--	150	190	
Forward Transconductance	$V_{DS} = -5V, I_D = -4A$	$g_{fs}$	--	6.5	--	S
<b>Dynamic</b> (Note 4)						
Total Gate Charge	$V_{DS} = -6V, I_D = -2.8A,$ $V_{GS} = -4.5V$	$Q_g$	--	5.8	--	nC
Gate-Source Charge		$Q_{gs}$	--	0.85	--	
Gate-Drain Charge		$Q_{gd}$	--	1.7	--	
Input Capacitance	$V_{DS} = -6V, V_{GS} = 0V,$ $f = 1.0\text{MHz}$	$C_{iss}$	--	415	--	pF
Output Capacitance		$C_{oss}$	--	223	--	
Reverse Transfer Capacitance		$C_{rss}$	--	87	--	
<b>Switching</b> (Note 5)						
Turn-On Delay Time	$V_{DS} = -6V, R_L = 6\Omega,$ $I_D = -1.7A, V_{GEN} = -4.5V,$ $R_G = 6\Omega$	$t_{d(on)}$	--	13	--	ns
Turn-On Rise Time		$t_r$	--	36	--	
Turn-Off Delay Time		$t_{d(off)}$	--	42	--	
Turn-Off Fall Time		$t_f$	--	34	--	
<b>Source-Drain Diode</b> (Note 3)						
Forward On Voltage	$I_S = -0.75A, V_{GS} = 0V$	$V_{SD}$	--	-0.8	-1.2	V

**Notes:**

1. Pulse width limited by the maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 5$  sec.
3. Pulse test:  $PW \leq 300\mu s$ , duty cycle  $\leq 2\%$ .
4. For DESIGN AID ONLY, not subject to production testing.
5. Switching time is essentially independent of operating temperature.

**ORDERING INFORMATION**

<b>PART NO.</b>	<b>PACKAGE</b>	<b>PACKING</b>
TSM2301BCX RFG	SOT-23	3,000pcs / 7"Reel

**Note:**

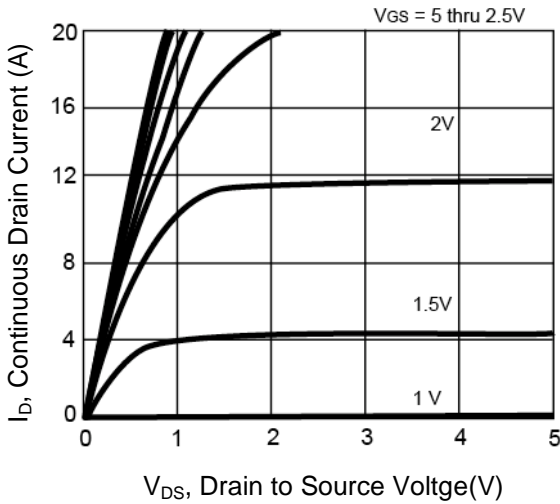
1. Compliant to RoHS Directive 2011/65/EU and in accordance to WEEE 2002/96/EC
2. Halogen-free according to IEC 61249-2-21 definition

*Not Recommended*

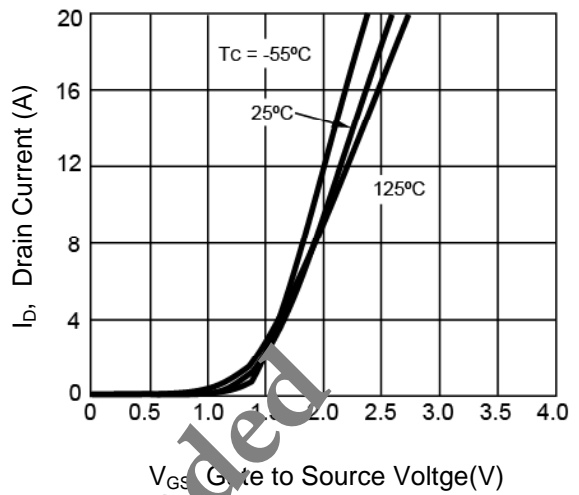
**CHARACTERISTICS CURVES**

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

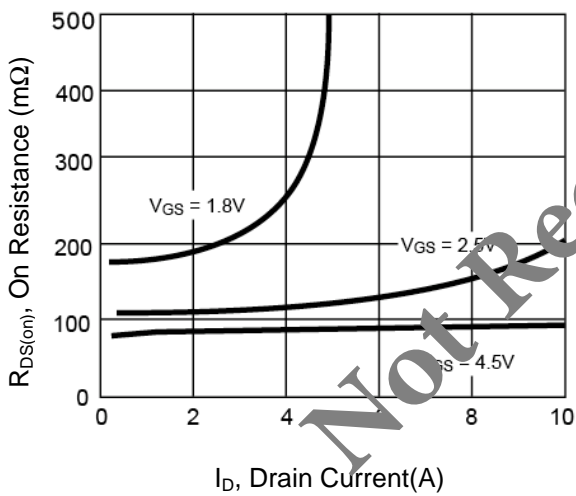
**Output Characteristics**



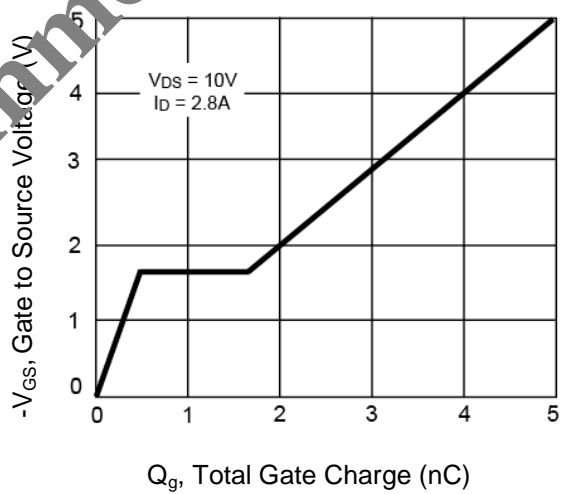
**Transfer Characteristics**



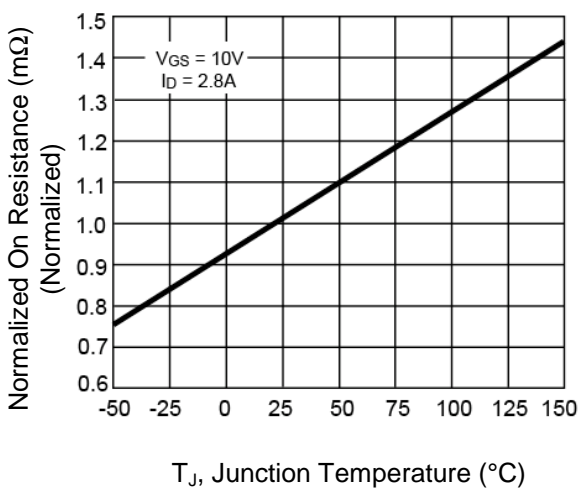
**On-Resistance vs. Drain Current**



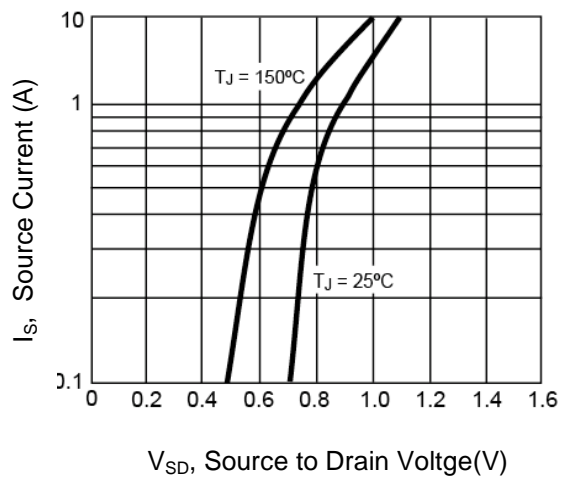
**Gate Charge**



**On-Resistance vs. Junction Temperature**



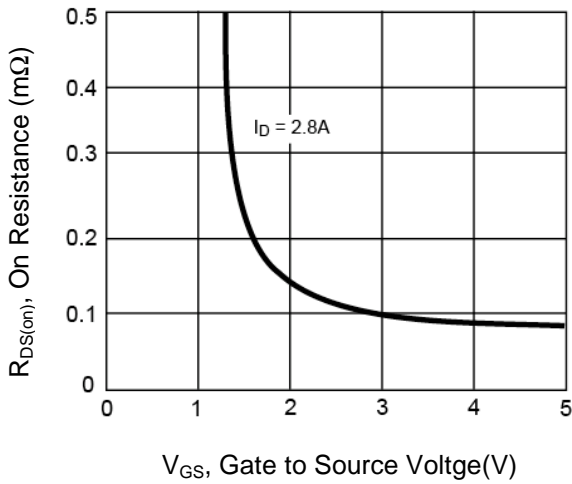
**Source-Drain Diode Forward Voltage**



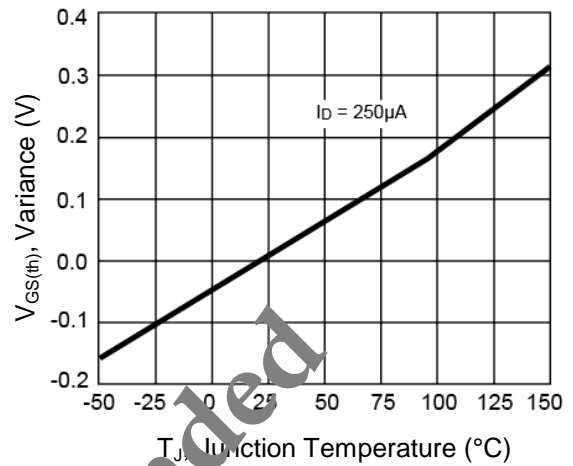
**CHARACTERISTICS CURVES**

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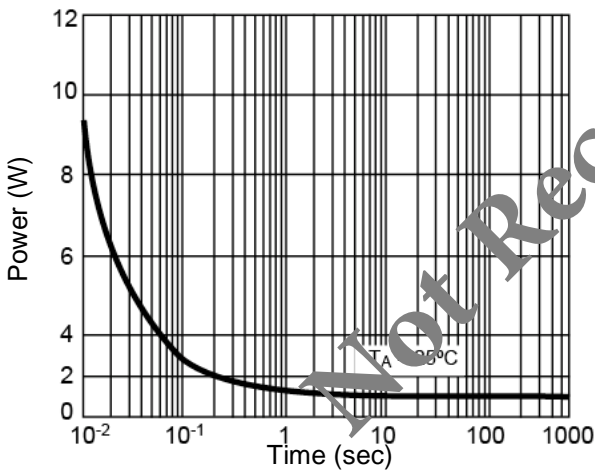
**On-Resistance vs. Gate-Source Voltage**



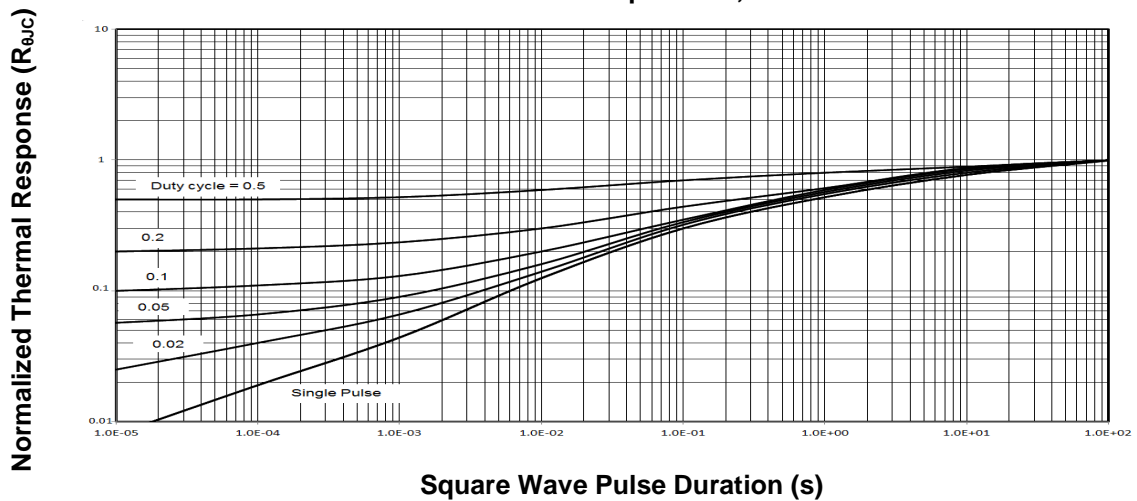
**Threshold Voltage**



**Single Pulse Power**

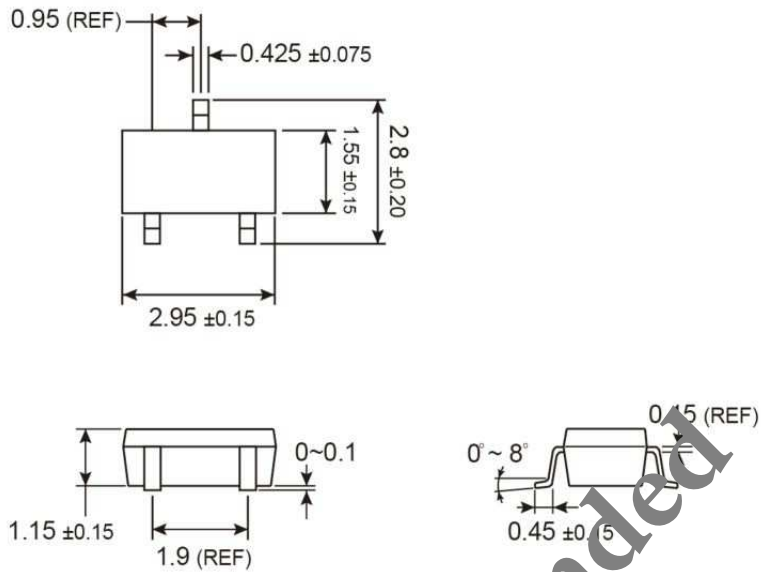


**Normalized Thermal Transient Impedance, Junction-to-Ambient**

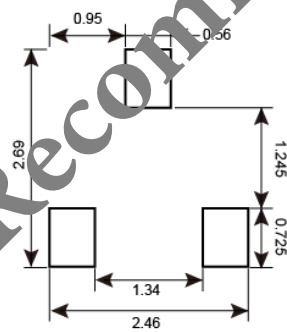


**PACKAGE OUTLINE DIMENSIONS** (Unit: Millimeters)

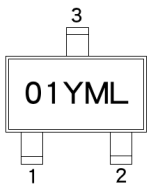
**SOT-23**



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



**MARKING DIAGRAM**



- 01** = Device Code
- 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

**Not Recommended**

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