

## N-Channel Power MOSFET

60V, 300mA, 2Ω

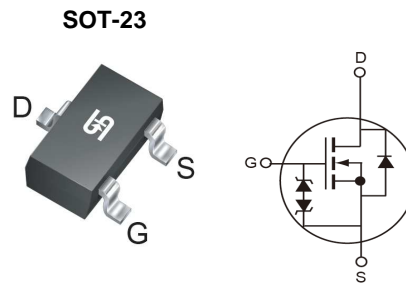
### FEATURES

- Low On-Resistance
- ESD Protected 2KV
- High Speed Switching
- Low Voltage Drive

### APPLICATION

- Logic Level translators
- DC-DC Converter

KEY PERFORMANCE PARAMETERS		
PARAMETER	VALUE	UNIT
$V_{DS}$	60	V
$R_{DS(on)}$ (max)	$V_{GS} = 10V$	2
	$V_{GS} = 4.5V$	4
$Q_g$	0.4	nC



**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	$V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current <sup>(Note 1)</sup>	$I_D$	$T_A = 25^\circ\text{C}$	300
		$T_A = 100^\circ\text{C}$	180
Pulsed Drain Current <sup>(Note 2)</sup>	$I_{DM}$	800	mA
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	$P_{DTOT}$	300	mW
Single Pulsed Avalanche Energy <sup>(Note 3)</sup>	$E_{AS}$	0.2	mJ
Single Pulsed Avalanche Current <sup>(Note 3)</sup>	$I_{AS}$	2	A
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	$R_{\theta JA}$	350	$^\circ\text{C/W}$

**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

<b>ELECTRICAL SPECIFICATIONS</b> ( $T_A = 25^\circ\text{C}$ unless otherwise noted)						
PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
<b>Static</b> (Note 4)						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 10\mu A$	$BV_{DSS}$	60	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	$V_{GS(TH)}$	1.0	1.5	2.5	V
Gate Body Leakage	$V_{GS} = \pm 20V, V_{DS} = 0V$	$I_{GSS}$	--	--	$\pm 10$	$\mu A$
Zero Gate Voltage Drain Current	$V_{DS} = 60V, V_{GS} = 0V$	$I_{DSS}$	--	--	1.0	$\mu A$
Drain-Source On-State Resistance	$V_{GS} = 10V, I_D = 300mA$	$R_{DS(ON)}$	--	1.2	2	m $\Omega$
	$V_{GS} = 4.5V, I_D = 200mA$		--	2	4	
Forward Transconductance	$V_{DS} = 10V, I_D = 200mA$	$g_{fs}$	100	--	--	mS
Diode Forward Voltage	$I_S = 300mA, V_{GS} = 0V$	$V_{SD}$	--	0.8	1.4	V
<b>Dynamic</b> (Note 5)						
Total Gate Charge	$V_{DS} = 10V, I_D = 250mA,$ $V_{GS} = 4.5V$	$Q_g$	--	0.4	0.6	nC
Input Capacitance	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1.0MHz$	$C_{iss}$	--	30	--	pF
Output Capacitance		$C_{oss}$	--	6	--	
Reverse Transfer Capacitance		$C_{rss}$	--	2.5	--	
Gate Resistance	$F = 1MHz, \text{open drain}$	$R_g$	--	70	--	$\Omega$
<b>Switching</b> (Note 6)						
Turn-On Delay Time	$V_{DD} = 30V, R_G = 10\Omega$ $I_D = 200mA, V_{GEN} = 10V,$	$t_{d(on)}$	--	25	--	ns
Turn-Off Delay Time		$t_{d(off)}$	--	35	--	
<b>Source-Drain Diode</b> (Note 4)						
Diode Forward Voltage	$I_S = 300mA, V_{GS} = 0V$	$V_{SD}$	--	0.8	1.4	
Reverse Recovery Time	$I_S = 0.5A$	$t_{rr}$	--	40	--	ns
Reverse Recovery Charge	$di_f/dt = 100A/\mu s$	$Q_{rr}$	--	39	--	nC

**Notes:**

1. Current limited by package
2. Pulse width limited by the maximum junction temperature
3.  $L = 0.1mH, I_{AS} = 2A, V_{DD} = 25V, R_G = 25\Omega, \text{Starting } T_J = 25^\circ\text{C}$
4. Pulse test:  $PW \leq 300\mu s, \text{duty cycle} \leq 2\%$
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>
TSM2N7002KCX RFG	SOT-23	3,000pcs / 7" Reel

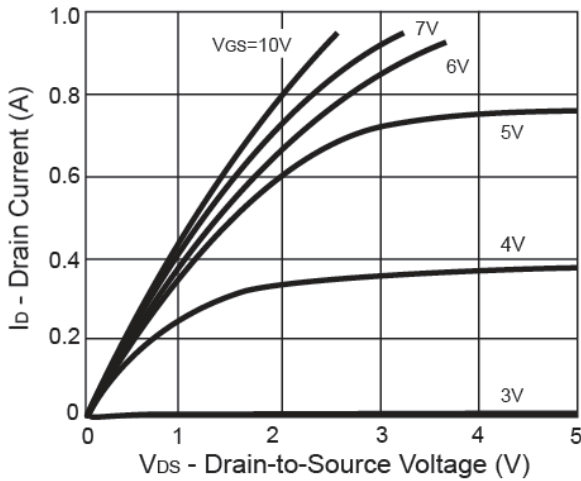
**Note:**

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

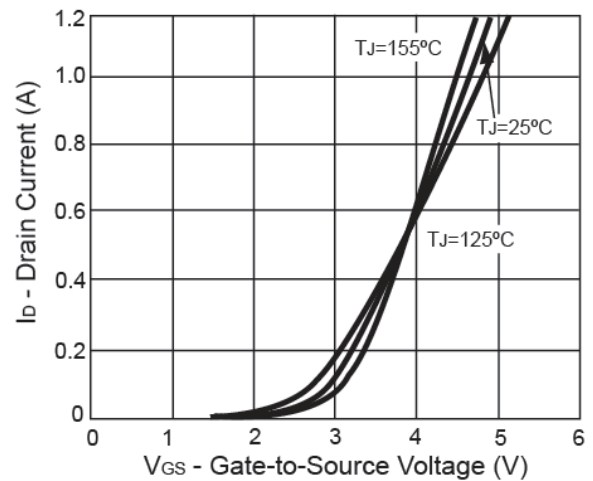
**CHARACTERISTICS CURVES**

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

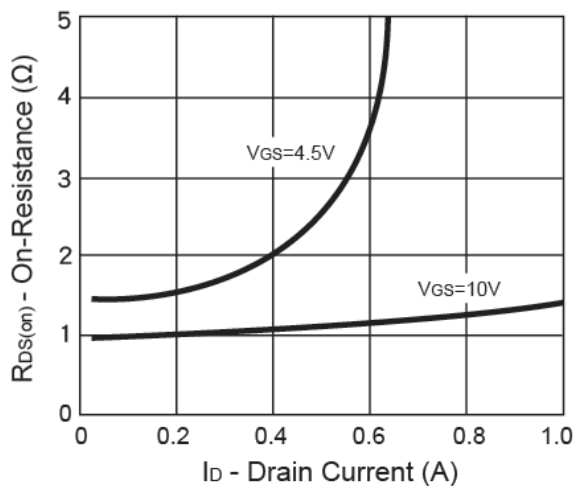
**Output Characteristics**



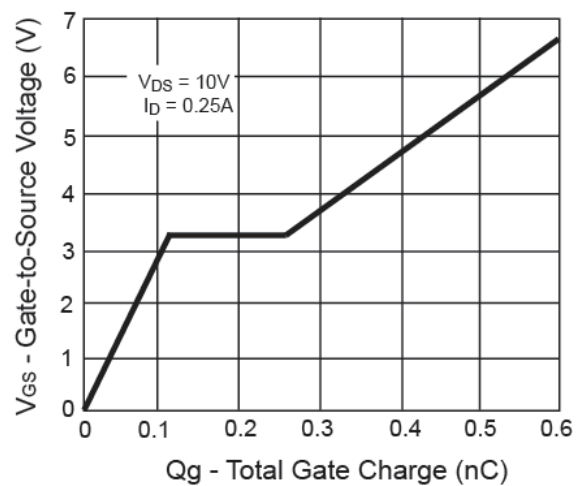
**Transfer Characteristics**



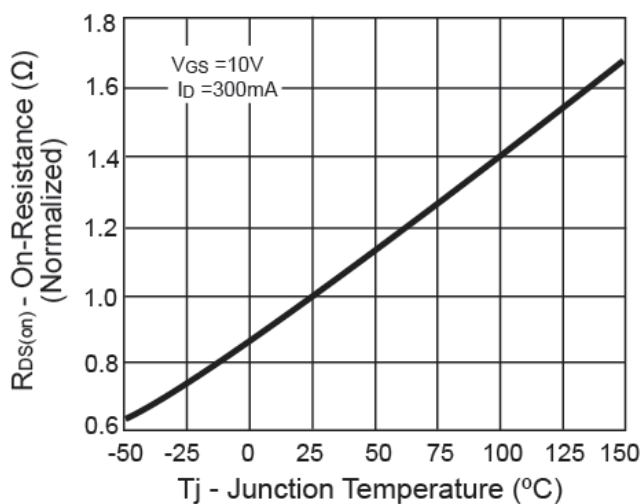
**On-Resistance vs. Drain Current**



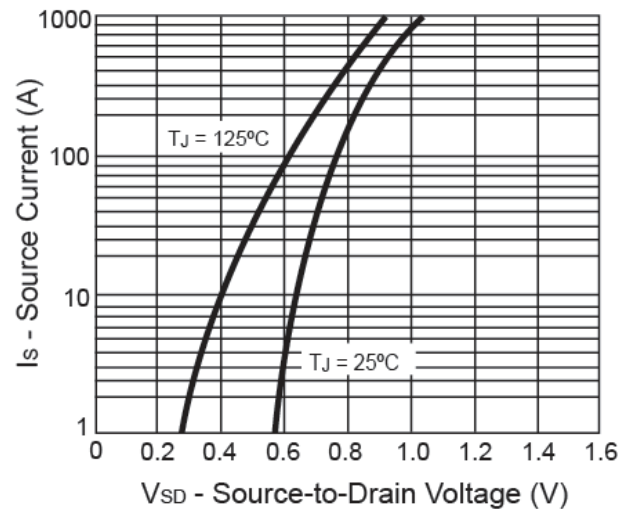
**Gate Charge**



**On-Resistance vs. Junction Temperature**



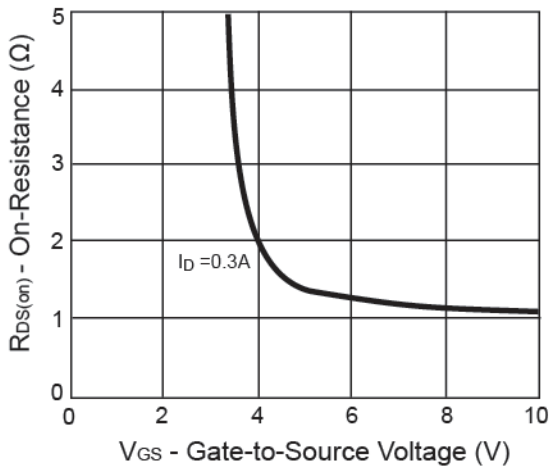
**Source-Drain Diode Forward Voltage**



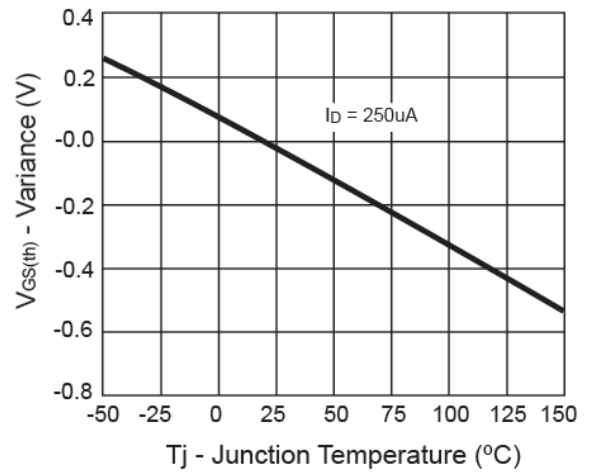
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( $T_C = 25^\circ\text{C}$  unless otherwise noted)

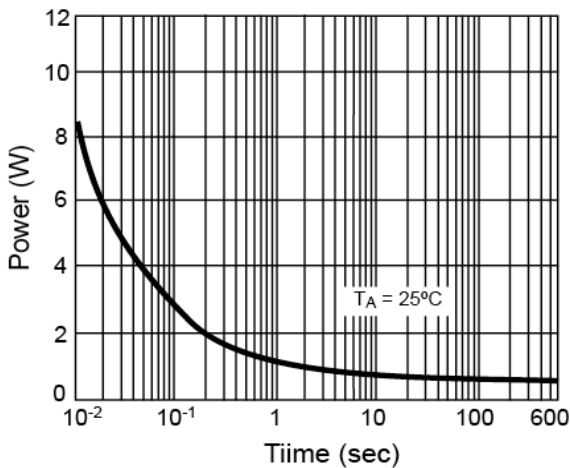
**On-Resistance vs. Gate-Source Voltage**



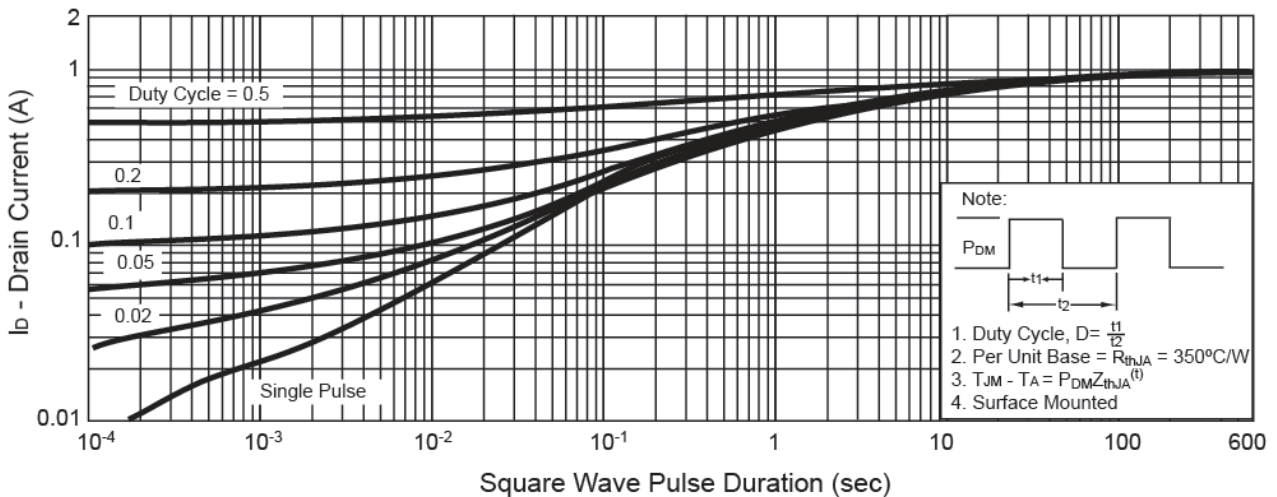
**Threshold Voltage**



**Single Pulse Power**

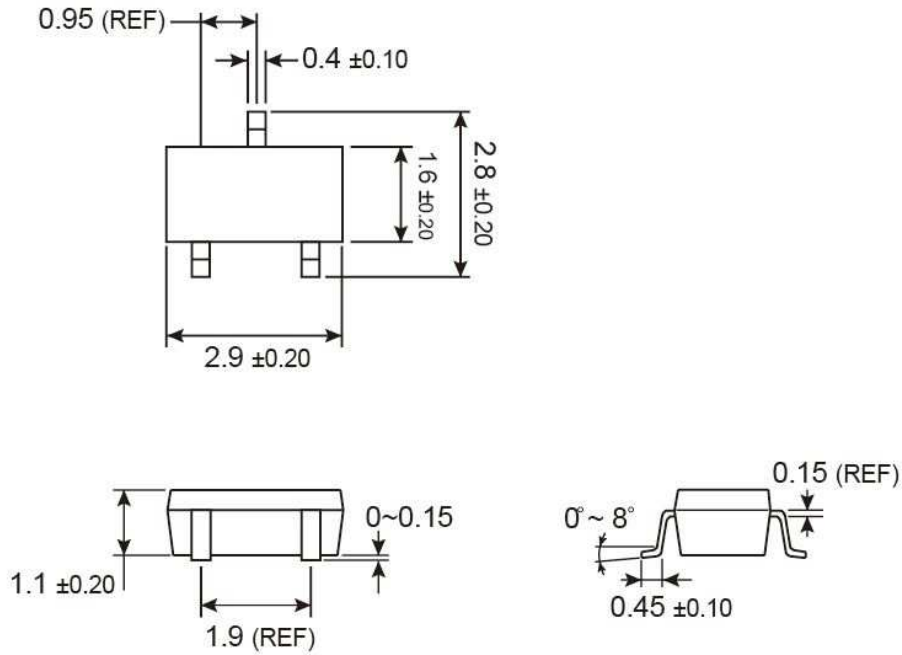


**Normalized Thermal Transient Impedance, Junction-to-Ambient**

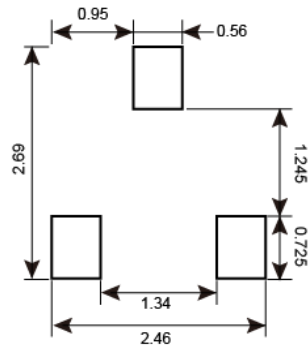


**PACKAGE OUTLINE DIMENSIONS** (Unit: Millimeters)

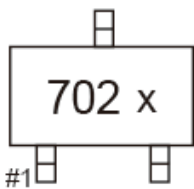
**SOT-23**



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



**MARKING DIAGRAM**



702 = TSM2N7002KCX Device Code  
X = Internal Code

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