

**SOT-23**

**Pin Definition:**

1. Gate
2. Source
3. Drain

**PRODUCT SUMMARY**

$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (mA)
60	7.5 @ $V_{GS} = 10V$	300
	7.5 @ $V_{GS} = 4.5V$	200

**Features**

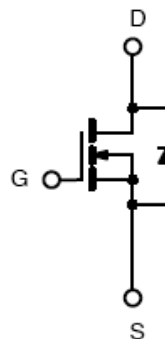
- Fast Switching Speed
- Low Input and Output Leakage

**Application**

- Direct Logic-Level Interface: TTL/CMOS
- Solid-State Relays

**Ordering Information**

Part No.	Package	Packing
TSM2N7002CX RF	SOT-23	3Kpcs / 7" Reel

**Block Diagram**


N-Channel MOSFET

**Absolute Maximum Rating** ( $T_a = 25^\circ C$  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	$I_D$	300	mA
Pulsed Drain Current	$I_{DM}$	800	mA
Continuous Source Current (Diode Conduction) <sup>a,b</sup>	$I_S$	300	mA
Maximum Power Dissipation	$P_D$	$T_a = 25^\circ C$	350
		$T_a = 75^\circ C$	220
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
Lead Temperature (1/8" from case)	$T_L$	5	S
Junction to Ambient Thermal Resistance (PCB mounted)	$R_{\theta JA}$	357	$^\circ C/W$

**Notes:**

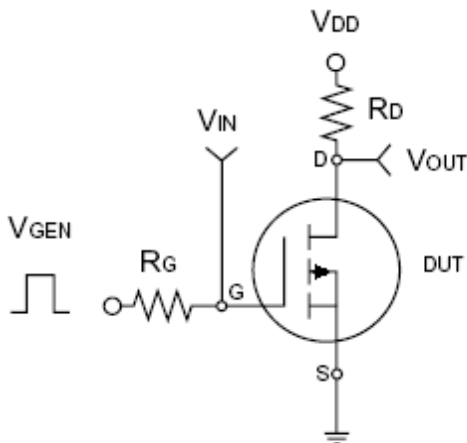
- a. Pulse width limited by the Maximum junction temperature
- b. Surface Mounted on FR4 Board,  $t \leq 5$  sec.

### Electrical Specifications (Ta = 25°C, unless otherwise noted)

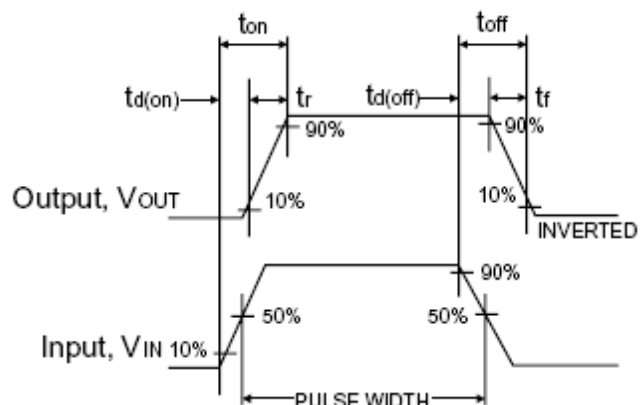
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 10\mu A$	$BV_{DSS}$	60	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	$V_{GS(TH)}$	1.0	--	2.5	V
Gate Body Leakage	$V_{GS} = \pm 20V, V_{DS} = 0V$	$I_{GSS}$	--	--	$\pm 100$	nA
Zero Gate Voltage Drain Current	$V_{DS} = 60V, V_{GS} = 0V$	$I_{DSS}$	--	--	1.0	$\mu A$
Drain-Source On-State Resistance	$V_{GS} = 10V, I_D = 300mA$	$R_{DS(ON)}$	--	--	7.5	$\Omega$
	$V_{GS} = 4.5V, I_D = 200mA$		--	--	7.5	
Forward Transconductance	$V_{DS} = 15V, I_D = 300mA$	$g_{fs}$	--	320	--	mS
Diode Forward Voltage	$I_S = 300mA, V_{GS} = 0V$	$V_{SD}$	--	0.9	1.2	V
<b>Dynamic<sup>b</sup></b>						
Total Gate Charge	$V_{DS} = 10V, I_D = 250mA,$ $V_{GS} = 4.5V$	$Q_g$	--	0.4	0.6	nC
Gate-Source Charge		$Q_{gs}$	--	0.06	--	
Gate-Drain Charge		$Q_{gd}$	--	0.06	--	
Input Capacitance	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1.0MHz$	$C_{iss}$	--	50	--	pF
Output Capacitance		$C_{oss}$	--	25	--	
Reverse Transfer Capacitance		$C_{rss}$	--	5	--	
<b>Switching<sup>c</sup></b>						
Turn-On Delay Time	$V_{DD} = 30V,$ $I_D = 100mA, V_{GEN} = 10V,$ $R_G = 10\Omega$	$t_{d(on)}$	--	7.5	20	nS
Turn-On Rise Time		$t_r$	--	6	--	
Turn-Off Delay Time		$t_{d(off)}$	--	7.5	20	
Turn-Off Fall Time		$t_f$	--	3	--	

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.



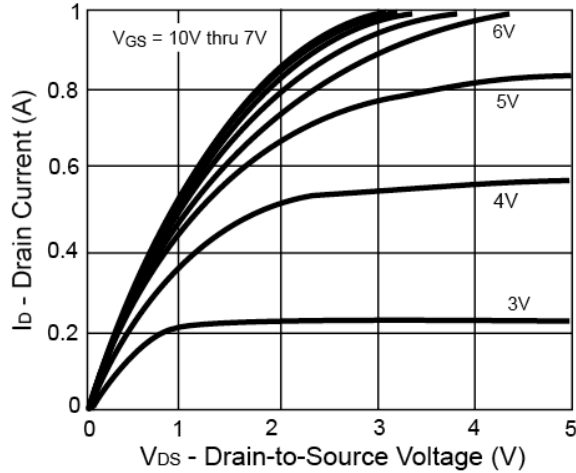
Switching Test Circuit



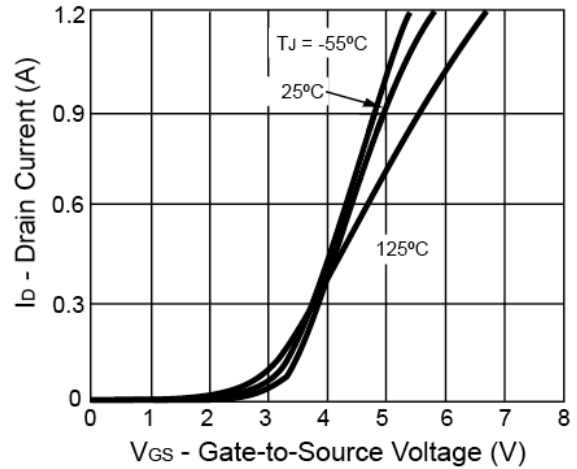
Switchin Waveforms

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

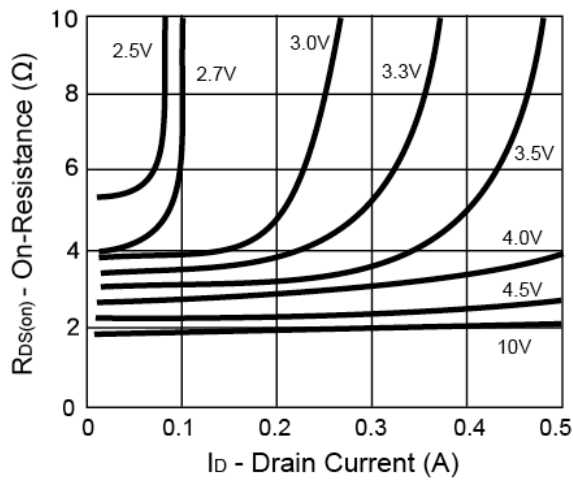
**Output Characteristics**



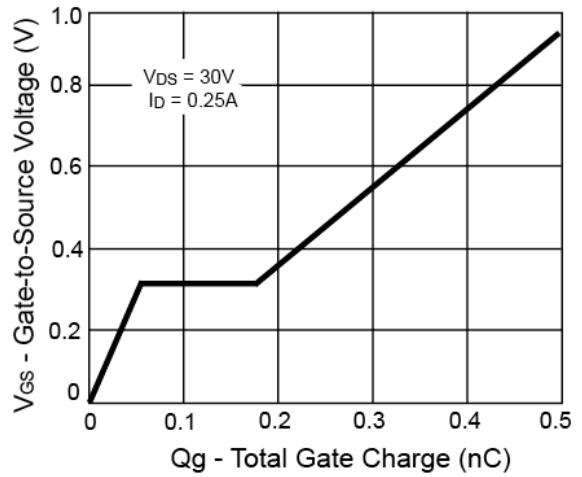
**Transfer Characteristics**



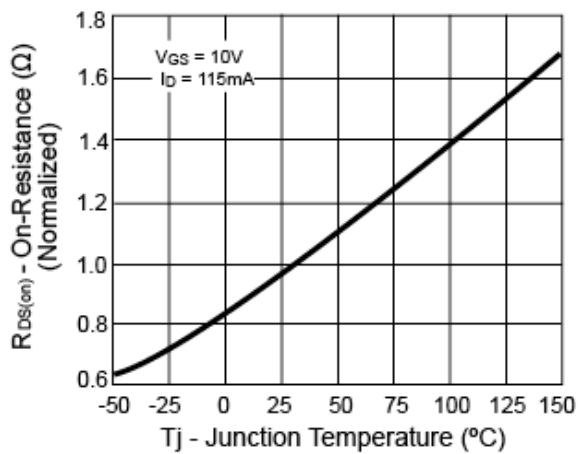
**On-Resistance vs. Drain Current**



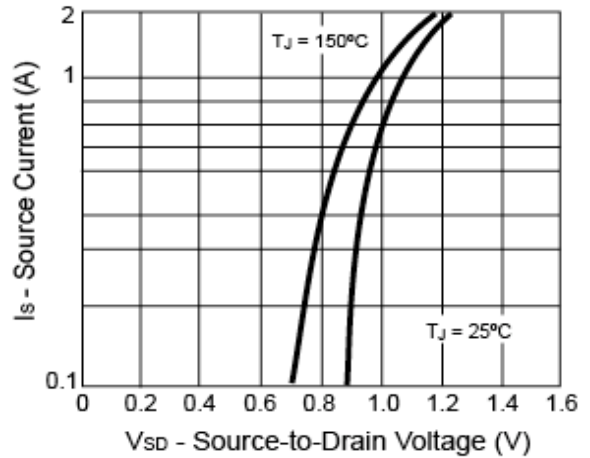
**Gate Charge**



**On-Resistance vs. Junction Temperature**

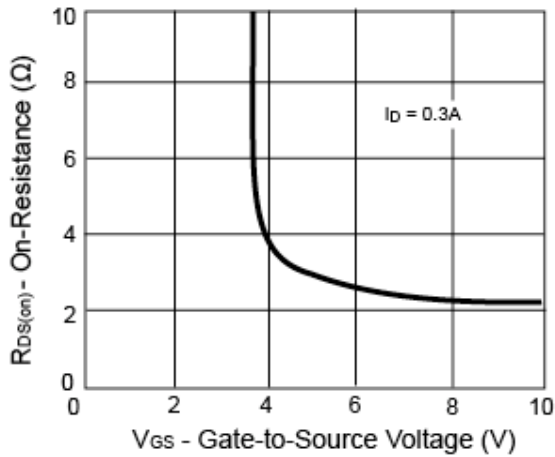


**Source-Drain Diode Forward Voltage**

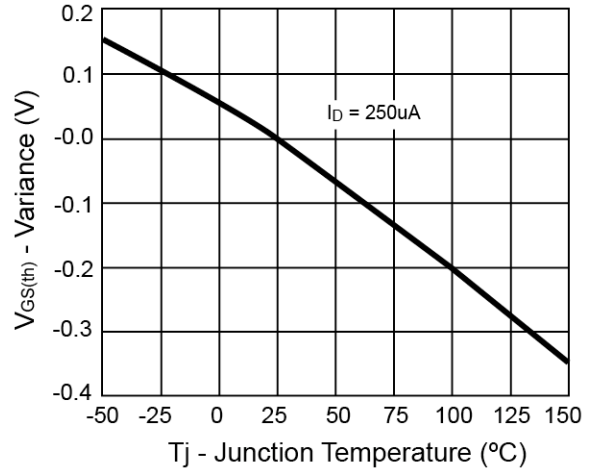


**Electrical Characteristics Curve** (Ta = 25°C, unless otherwise noted)

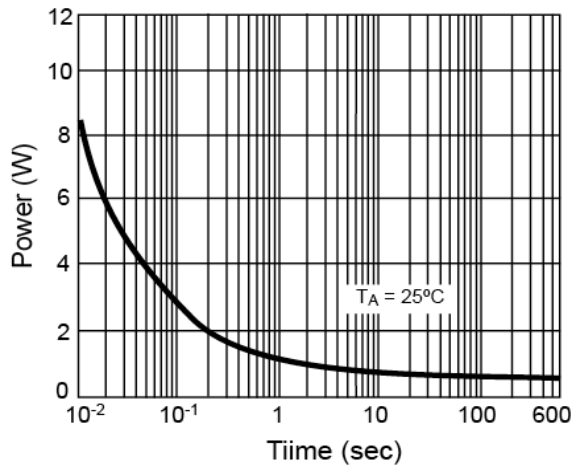
**On-Resistance vs. Gate-Source Voltage**



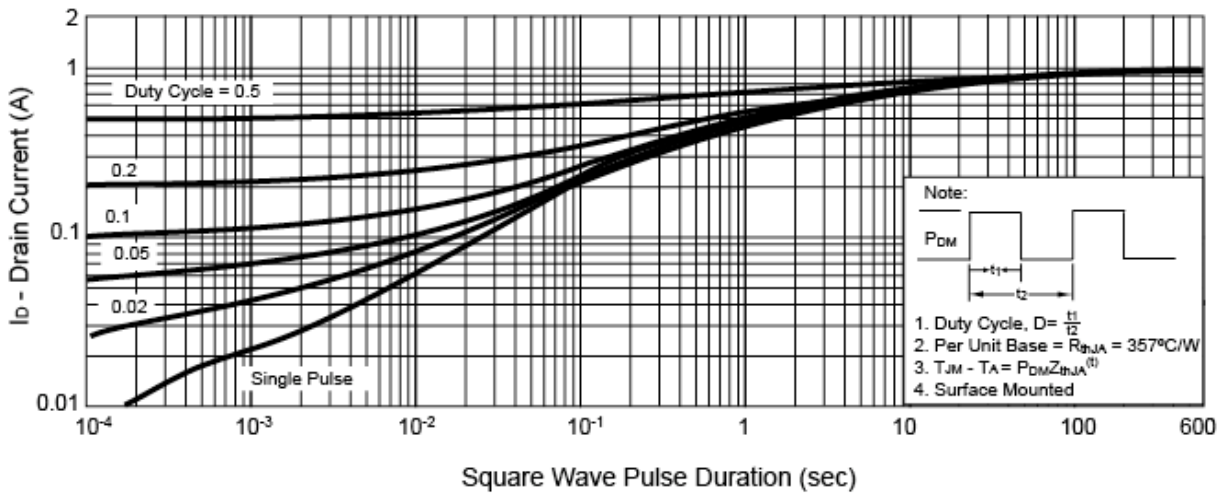
**Threshold Voltage**



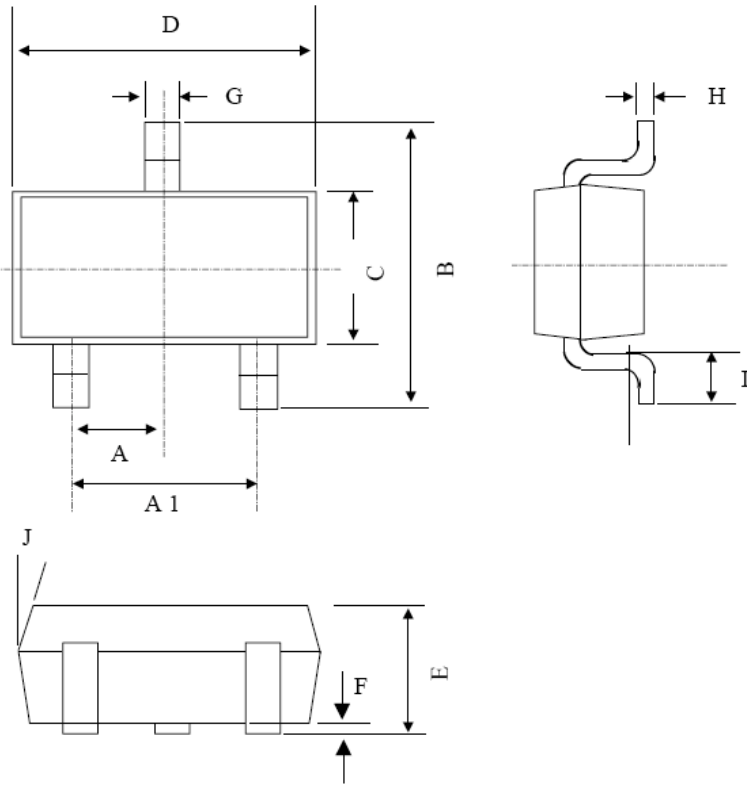
**Single Pulse Power**



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

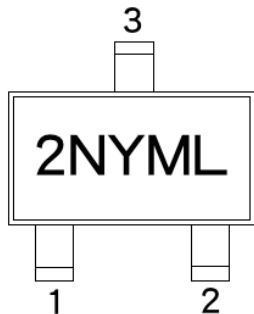


**SOT-23 Mechanical Drawing**



SOT-23 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX.
A	0.95 BSC		0.037 BSC	
A1	1.9 BSC		0.074 BSC	
B	2.60	3.00	0.102	0.118
C	1.40	1.70	0.055	0.067
D	2.80	3.10	0.110	0.122
E	1.00	1.30	0.039	0.051
F	0.00	0.10	0.000	0.004
G	0.35	0.50	0.014	0.020
H	0.10	0.20	0.004	0.008
I	0.30	0.60	0.012	0.024
J	5°	10°	5°	10°

**Marking Diagram**



- 2N** = Device Code
- Y** = Year Code
- M** = Month Code  
(A=Jan, B=Feb, C=Mar, D=Apl, E=May, F=Jun, G=Jul, H=Aug, I=Sep, J=Oct, K=Nov, L=Dec)
- L** = Lot Code

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