

**TO-252**

**Pin Definition:**

1. Gate
2. Drain
3. Source

**PRODUCT SUMMARY**

<b>V<sub>DS</sub> (V)</b>	<b>R<sub>DS(on)</sub>(mΩ)</b>	<b>I<sub>D</sub> (A)</b>
20	30 @ V <sub>GS</sub> = 10V	8
	40 @ V <sub>GS</sub> = 4.5V	6

**Features**

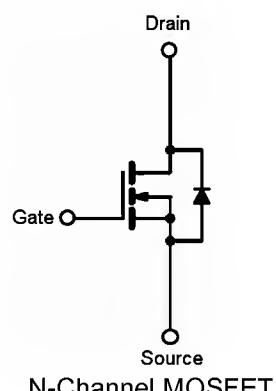
- Advance Trench Process Technology
- High Density Cell Design for Ultra Low On-resistance

**Application**

- Load Switch
- PA Switch

**Ordering Information**

<b>Part No.</b>	<b>Package</b>	<b>Packing</b>
TSM12N02CP RO	TO-252	T&R

**Block Diagram**

**N-Channel MOSFET**
**Absolute Maximum Rating (Ta = 25 °C unless otherwise noted)**

<b>Parameter</b>		<b>Symbol</b>	<b>Limit</b>	<b>Unit</b>
Drain-Source Voltage		V <sub>DS</sub>	20	V
Gate-Source Voltage		V <sub>GS</sub>	±12	V
Continuous Drain Current, V <sub>GS</sub> @4.5V.		I <sub>D</sub>	12	A
Pulsed Drain Current, V <sub>GS</sub> @4.5V		I <sub>DM</sub>	30	A
Continuous Source Current (Diode Conduction) <sup>a,b</sup>		I <sub>S</sub>	1.7	A
Maximum Power Dissipation	Ta = 25 °C	P <sub>D</sub>	60	W
	Ta = 70 °C		23	
Operating Junction Temperature		T <sub>J</sub>	+150	°C
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

**Thermal Performance**

<b>Parameter</b>		<b>Symbol</b>	<b>Limit</b>	<b>Unit</b>
Lead Temperature (1/8" from case)		T <sub>L</sub>	10	S
Junction to Case Thermal Resistance		R <sub>θ<sub>JC</sub></sub>	2.2	°C/W
Junction to Ambient Thermal Resistance (PCB mounted)		R <sub>θ<sub>JA</sub></sub>	50	°C/W

**Notes:**

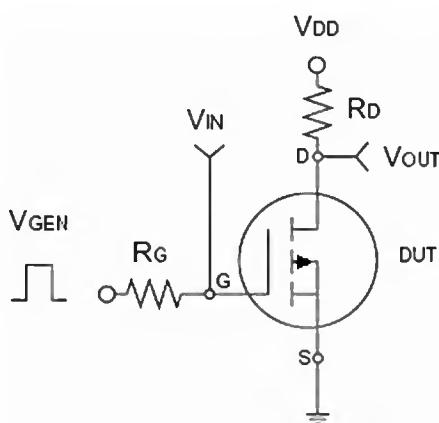
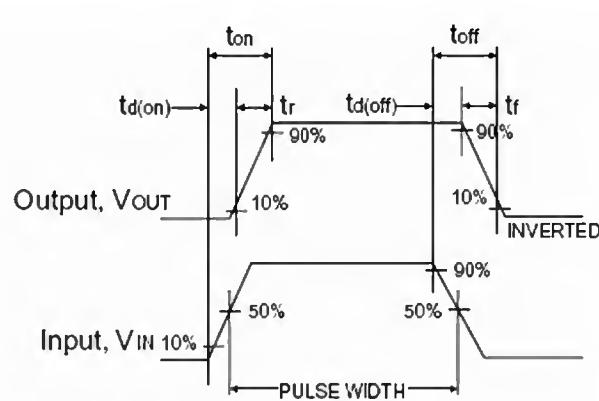
- a. Maximum DC current limited by the package
- b. Surface Mounted on 1" x 1" FR4 Board, t ≤ 10 sec.

**Electrical Specifications**

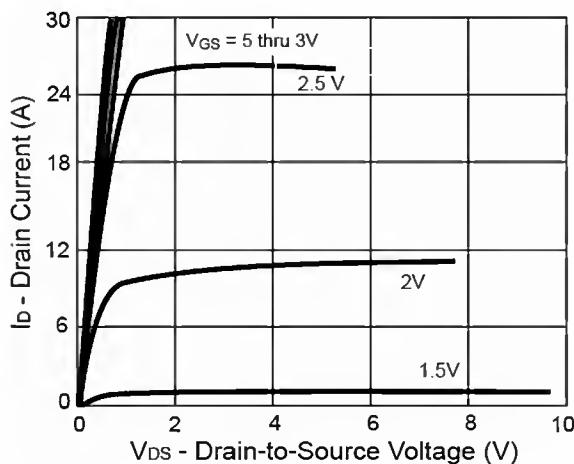
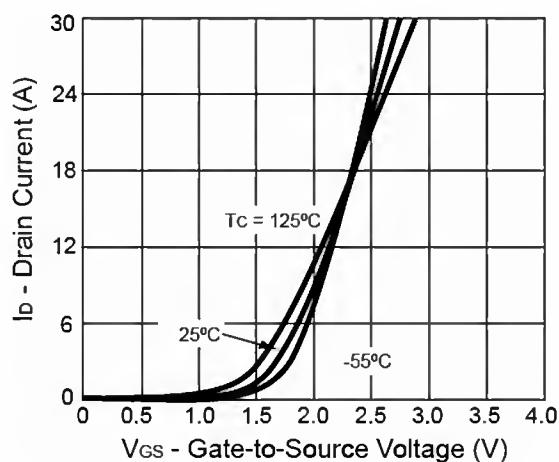
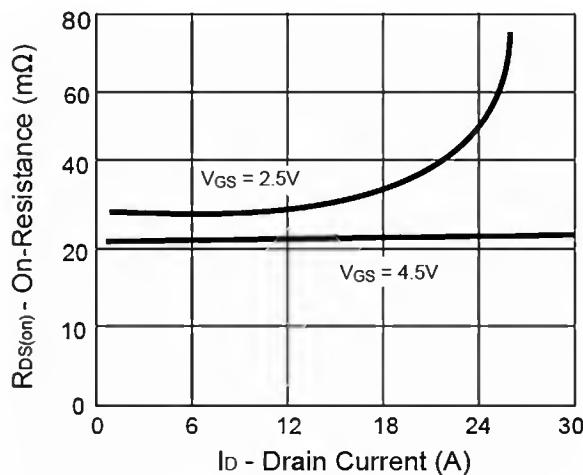
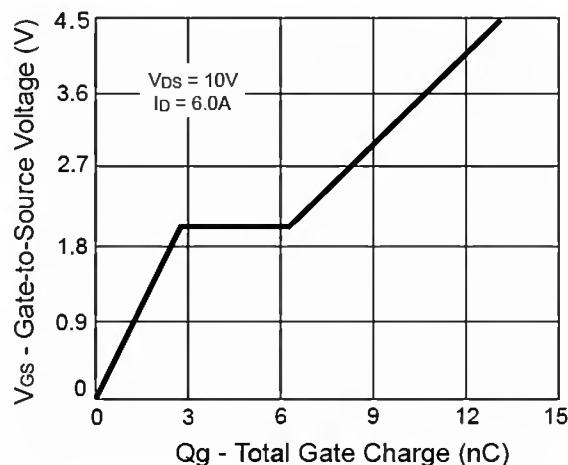
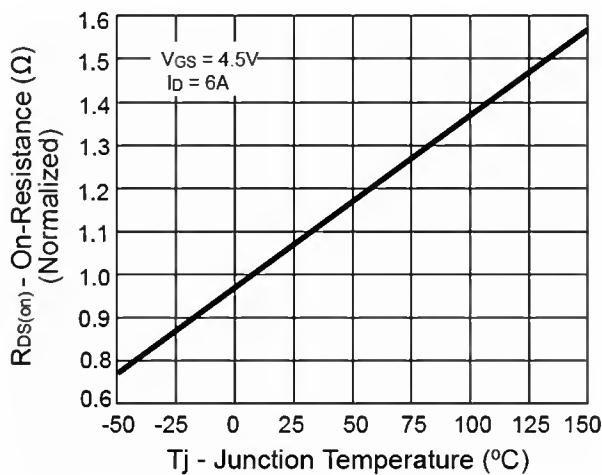
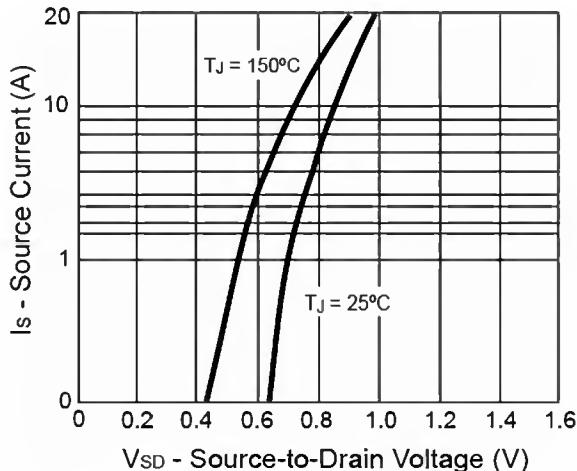
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	$BV_{DSS}$	20	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	$V_{GS(TH)}$	0.6	--	--	V
Gate Body Leakage	$V_{GS} = \pm 12V, V_{DS} = 0V$	$I_{GSS}$	--	--	$\pm 100$	nA
Zero Gate Voltage Drain Current	$V_{DS} = 20V, V_{GS} = 0V$	$I_{DSS}$	--	--	1.0	$\mu A$
On-State Drain Current	$V_{DS} \geq 5V, V_{GS} = 10V$	$I_{D(ON)}$	12	--	--	A
Drain-Source On-State Resistance	$V_{GS} = 4.5V, I_D = 6A$	$R_{DS(ON)}$	--	30	40	$m\Omega$
	$V_{GS} = 10V, I_D = 8A$		--	21	30	
Forward Transconductance	$V_{DS} = 10V, I_D = 6A$	$g_{fs}$	7	13	--	S
Diode Forward Voltage	$I_S = 1.7A, V_{GS} = 0V$	$V_{SD}$	--	--	1.2	V
<b>Dynamic<sup>b</sup></b>						
Total Gate Charge	$V_{DS} = 10V, I_D = 6A, V_{GS} = 4.5V$	$Q_g$	--	4.86	--	nC
Gate-Source Charge		$Q_{gs}$	--	0.92	--	
Gate-Drain Charge		$Q_{gd}$	--	1.4	--	
Input Capacitance	$V_{DS} = 8V, V_{GS} = 0V, f = 1.0MHz$	$C_{iss}$	--	562	--	pF
Output Capacitance		$C_{oss}$	--	106	--	
Reverse Transfer Capacitance		$C_{rss}$	--	75	--	
<b>Switching<sup>c</sup></b>						
Turn-On Delay Time	$V_{DD} = 10V, I_D = 1A, V_{GEN} = 10V, R_G = 16\Omega$	$t_{d(on)}$	--	8.1	--	nS
Turn-On Rise Time		$t_r$	--	9.95	--	
Turn-Off Delay Time		$t_{d(off)}$	--	21.85	--	
Turn-Off Fall Time		$t_f$	--	5.35	--	

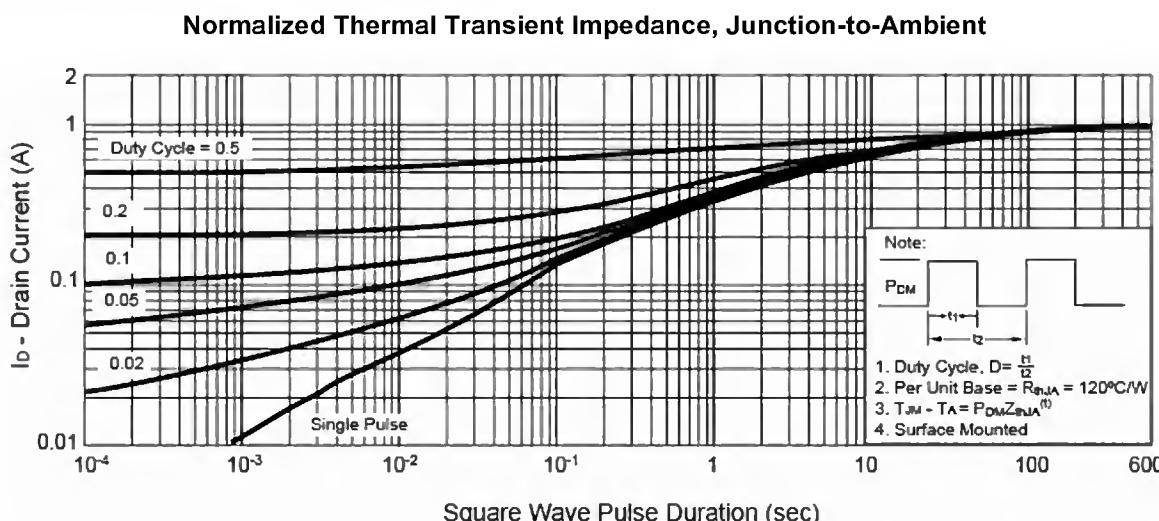
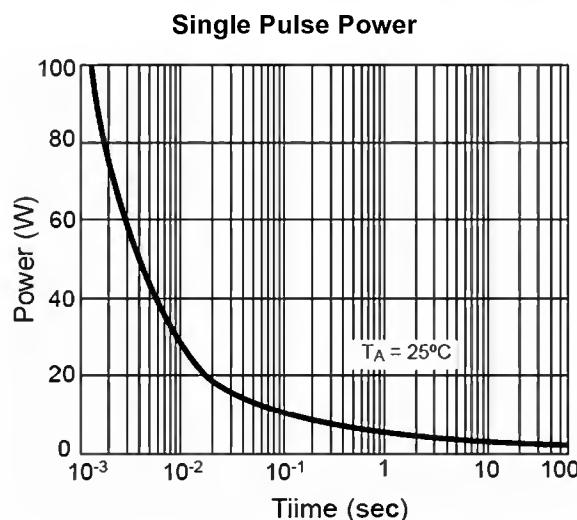
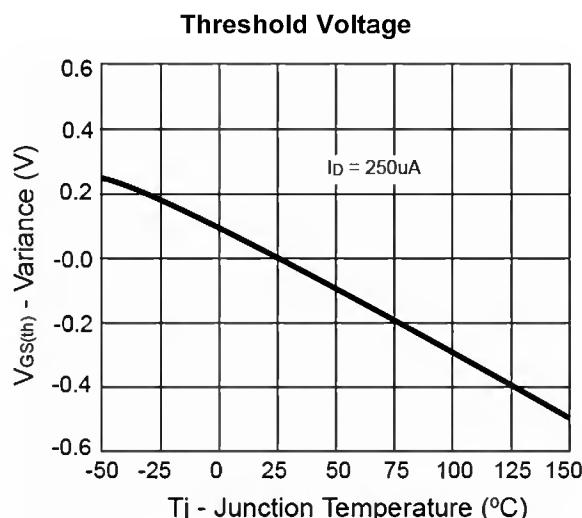
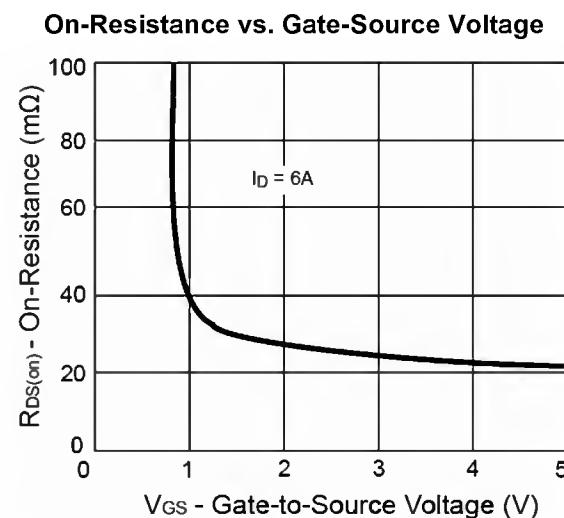
**Notes:**

- 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.

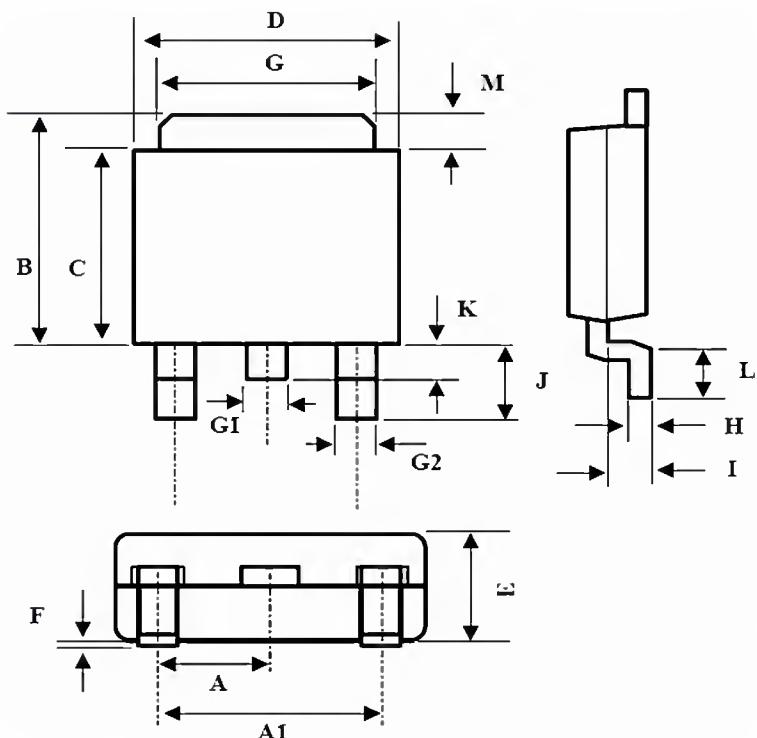

**Switching Test Circuit**

**Switching Waveforms**

**Electrical Characteristics Curve** ( $T_a = 25^\circ\text{C}$ , unless otherwise noted)

**Output Characteristics**

**Transfer Characteristics**

**On-Resistance vs. Drain Current**

**Gate Charge**

**On-Resistance vs. Junction Temperature**

**Source-Drain Diode Forward Voltage**


**Electrical Characteristics Curve** ( $T_a = 25^\circ\text{C}$ , unless otherwise noted)


**SOT-252 Mechanical Drawing**



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.3BSC		0.09BSC	
A1	4.6BSC		0.18BSC	
B	6.80	7.20	0.268	0.283
C	5.40	5.60	0.213	0.220
D	6.40	6.65	0.252	0.262
E	2.20	2.40	0.087	0.094
F	0.00	0.20	0.000	0.008
G	5.20	5.40	0.205	0.213
G1	0.75	0.85	0.030	0.033
G2	0.55	0.65	0.022	0.026
H	0.35	0.65	0.014	0.026
I	0.90	1.50	0.035	0.059
J	2.20	2.80	0.087	0.110
K	0.50	1.10	0.020	0.043
L	0.90	1.50	0.035	0.059
M	1.30	1.70	0.051	0.67

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