

# TSM040N03CP

## 30V N-Channel Power MOSFET



- Pin Definition:**
1. Gate
  2. Drain
  3. Source

### Key Parameter Performance

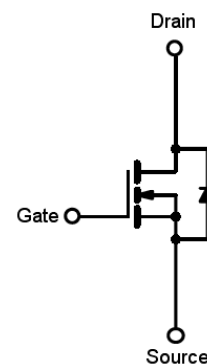
Parameter	Value	Unit
$V_{DS}$	30	V
$R_{DS(on)}$ (max)	$V_{GS} = 10V$	4
	$V_{GS} = 4.5V$	6
$Q_g$	24	nC

### Ordering Information

Ordering code	Package	Packing
TSM040N03CP ROG	TO-252	2.5kpcs / 13" Reel

**Note:** Halogen-free according to IEC 61249-2-21 definition

### Block Diagram



N-Channel MOSFET

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	30	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current	$I_D$	$T_C=25^\circ\text{C}$	90
		$T_C=100^\circ\text{C}$	57
Pulsed Drain Current <sup>(Note 1)</sup>	$I_{DM}$	360	A
Single Pulse Avalanche Energy <sup>(Note 2)</sup>	$E_{AS}$	125	mJ
Single Pulse Avalanche Current <sup>(Note 2)</sup>	$I_{AS}$	50	A
Total Power Dissipation	$P_D$	@ $T_C=25^\circ\text{C}$	88
		Derate above $T_C=25^\circ\text{C}$	0.59
Operating Junction Temperature	$T_J$	150	$^\circ\text{C}$
Storage Temperature Range	$T_{STG}$	-55 to +150	$^\circ\text{C}$

### Thermal Performance

Parameter	Symbol	Limit	Unit
Thermal Resistance - Junction to Case	$R_{\theta JC}$	1.7	$^\circ\text{C}/\text{W}$
Thermal Resistance - Junction to Ambient	$R_{\theta JA}$	62	$^\circ\text{C}/\text{W}$

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

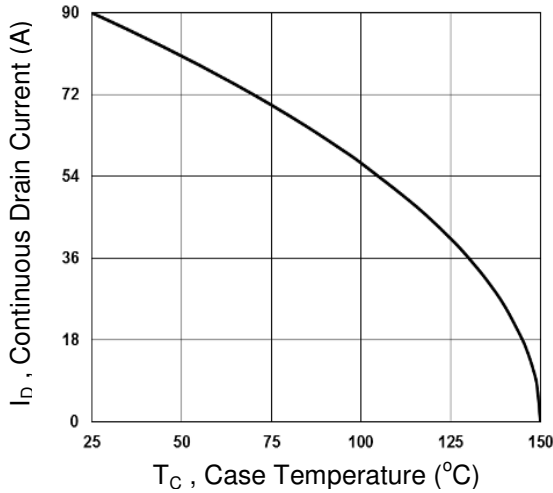
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	$BV_{DSS}$	30	--	--	V
Drain-Source On-State Resistance	$V_{GS} = 10V, I_D = 24A$	$R_{DS(ON)}$	--	3.1	4	m $\Omega$
	$V_{GS} = 4.5V, I_D = 12A$		--	4.5	6	
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	$V_{GS(TH)}$	1.2	1.6	2.5	V
Zero Gate Voltage Drain Current	$V_{DS} = 30V, V_{GS} = 0V$	$I_{DSS}$	--	--	1	$\mu A$
	$V_{DS} = 24V, T_J = 125^\circ\text{C}$		--	--	10	
Gate Body Leakage	$V_{GS} = \pm 20V, V_{DS} = 0V$	$I_{GSS}$	--	--	$\pm 100$	nA
Forward Transconductance	$V_{DS} = 10V, I_D = 10A$	$g_{fs}$	--	15.5	--	S
<b>Dynamic</b>						
Total Gate Charge (Note 3,4)	$V_{DS} = 15V, I_D = 24A,$ $V_{GS} = 4.5V$	$Q_g$	--	24	--	nC
Gate-Source Charge (Note 3,4)		$Q_{gs}$	--	4.2	--	
Gate-Drain Charge (Note 3,4)		$Q_{gd}$	--	13	--	
Input Capacitance	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1\text{MHz}$	$C_{iss}$	--	2200	--	pF
Output Capacitance		$C_{oss}$	--	280	--	
Reverse Transfer Capacitance		$C_{rss}$	--	177	--	
Gate Resistance	$f = 1\text{MHz}$	$R_g$	--	2	--	$\Omega$
<b>Switching</b>						
Turn-On Delay Time (Note 3,4)	$V_{DD}=15V, V_{GS}=10V,$ $R_G=3.3\Omega, I_D=-15A$	$t_{d(on)}$	--	12.6	--	ns
Turn-On Rise Time (Note 3,4)		$t_r$	--	19.5	--	
Turn-Off Delay Time (Note 3,4)		$t_{d(off)}$	--	42.8	--	
Turn-Off Fall Time (Note 3,4)		$t_f$	--	13.2	--	
<b>Source-Drain Diode Ratings and Characteristic</b>						
Continuous Drain-Source Diode		$I_S$	--	--	90	A
Pulse Drain-Source Diode		$I_{SM}$	--	--	360	A
Diode-Source Forward Voltage	$V_{GS} = 0V, I_S = 1A$	$V_{SD}$	--	--	1	V

#### Note:

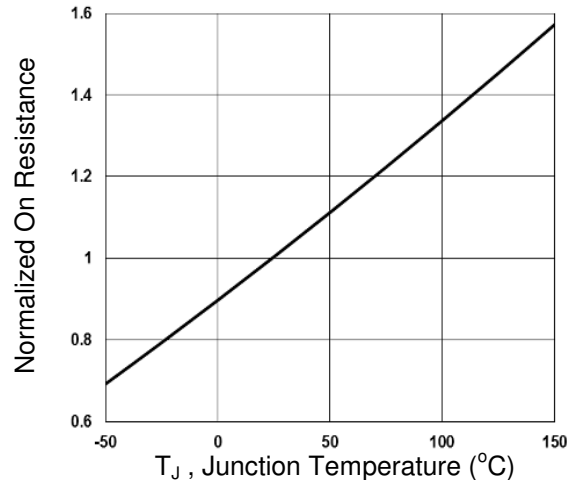
1. Repetitive Rating: Pulsed width limited by maximum junction temperature.
2.  $V_{DD}=25V, V_{GS}=10V, L=0.1\text{mH}, I_{AS}=50A, R_G=25\Omega,$  Starting  $T_J=25^\circ\text{C}$
3. The data tested by pulsed, pulse width  $\leq 300\mu\text{s}$ , duty cycle  $\leq 2\%$
4. Essentially independent of operating temperature.

### Electrical Characteristics Curves

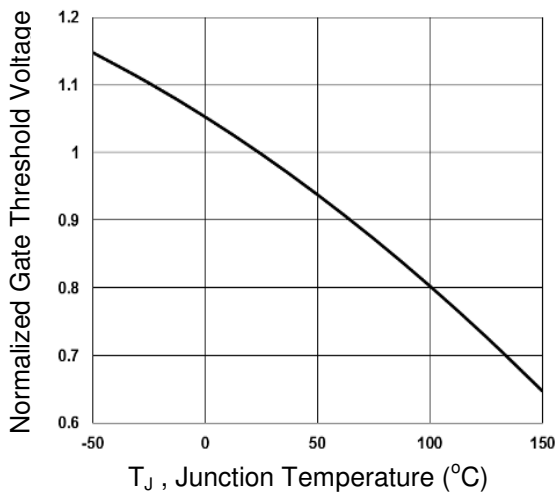
**Continuous Drain Current vs. T<sub>c</sub>**



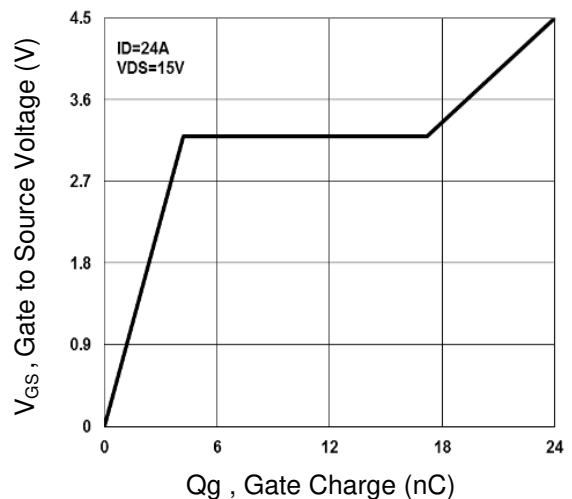
**Normalized R<sub>DS(on)</sub> vs. T<sub>J</sub>**



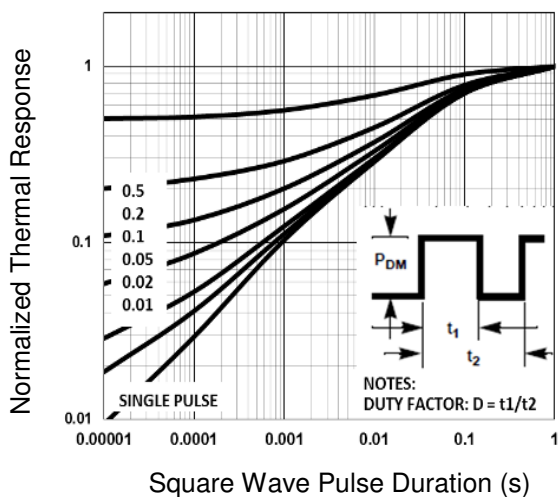
**Normalized V<sub>th</sub> vs. T<sub>J</sub>**



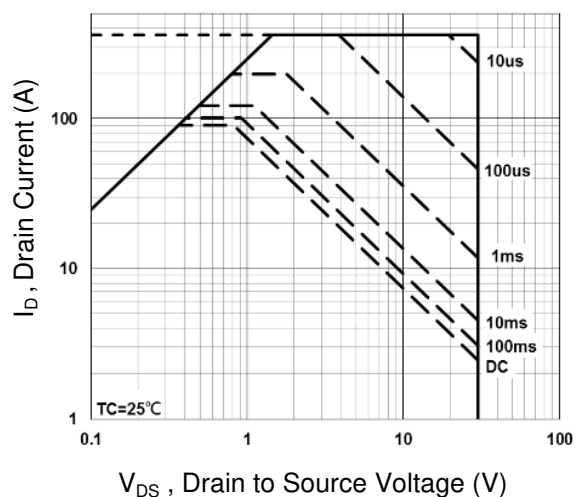
**Gate Charge Waveform**



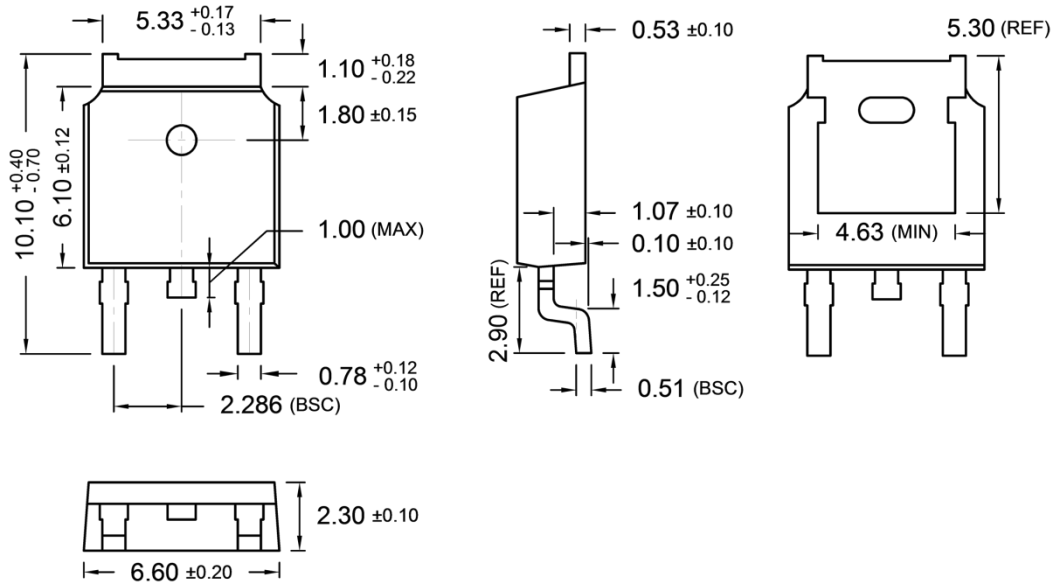
**Normalized Transient Impedance**



**Maximum Safe Operation Area**

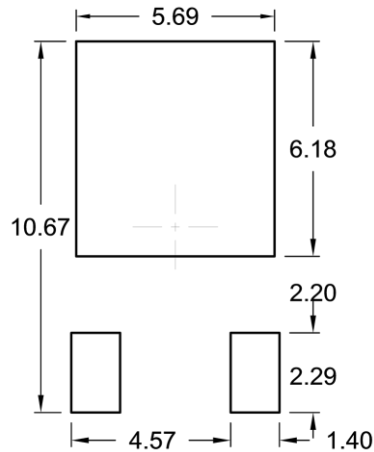


### TO-252 Mechanical Drawing



Unit: Millimeters

### SUGGESTED PAD LAYOUT (Unit: Millimeters)



### Marking Diagram



- Y** = Year Code
- M** = Month Code
- 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 (1~9, A~Z)

### Notice

Specifications of the products displayed herein are subject to change without notice. TSC or anyone on its behalf, assumes no responsibility or liability for any errors or inaccuracies.

Information contained herein is intended to provide a product description only. No license, express or implied, to any intellectual property rights is granted by this document. Except as provided in TSC's terms and conditions of sale for such products, TSC assumes no liability whatsoever, and disclaims any express or implied warranty, relating to sale and/or use of TSC products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright, or other intellectual property right.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify TSC for any damages resulting from such improper use or sale.