

# TSM090N03CP

## 30V N-Channel Power MOSFET



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

### Key Parameter Performance

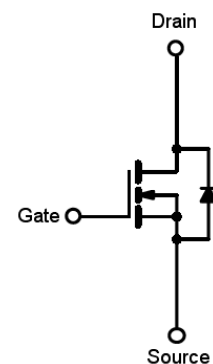
Parameter	Value	Unit
$V_{DS}$	30	V
$R_{DS(on)}$ (max)	$V_{GS} = 10V$	9
	$V_{GS} = 4.5V$	13
$Q_g$	7.5	nC

### Ordering Information

Ordering code	Package	Packing
TSM090N03CP 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	$I_D$	$T_C=25^\circ\text{C}$	55
		$T_C=100^\circ\text{C}$	35
Pulsed Drain Current <sup>(Note 1)</sup>	$I_{DM}$	220	A
Single Pulse Avalanche Energy <sup>(Note 2)</sup>	$E_{AS}$	45	mJ
Single Pulse Avalanche Current <sup>(Note 2)</sup>	$I_{AS}$	30	A
Total Power Dissipation	$P_D$	@ $T_C=25^\circ\text{C}$	40
		Derate above $T_C=25^\circ\text{C}$	0.32
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	$R_{\theta JC}$	3.1	$^\circ\text{C/W}$
Thermal Resistance - Junction to Ambient	$R_{\theta JA}$	62	$^\circ\text{C/W}$

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

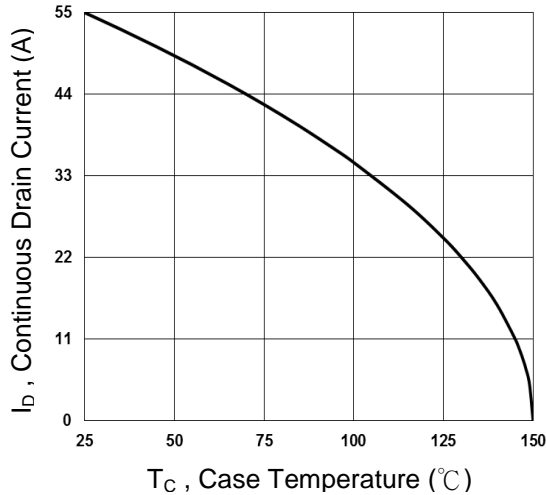
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	$BV_{DSS}$	30	--	--	V
Drain-Source On-State Resistance	$V_{GS} = 10V, I_D = 16A$	$R_{DS(ON)}$	--	7.5	9	m $\Omega$
	$V_{GS} = 4.5V, I_D = 8A$		--	10	13	
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	$V_{GS(TH)}$	1	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	$V_{DS} = 10V, I_D = 8A$	$g_{fs}$	--	14	--	S
<b>Dynamic</b>						
Total Gate Charge <sup>(Note 3,4)</sup>	$V_{DS} = 15V, I_D = 20A,$ $V_{GS} = 4.5V$	$Q_g$	--	7.5	--	nC
Gate-Source Charge <sup>(Note 3,4)</sup>		$Q_{GS}$	--	1.3	--	
Gate-Drain Charge <sup>(Note 3,4)</sup>		$Q_{gd}$	--	4.5	--	
Input Capacitance	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1\text{MHz}$	$C_{iss}$	--	750	--	pF
Output Capacitance		$C_{oss}$	--	150	--	
Reverse Transfer Capacitance		$C_{rss}$	--	110	--	
Gate Resistance	$f = 1\text{MHz}$	$R_g$	--	2.7	--	$\Omega$
<b>Switching</b>						
Turn-On Delay Time <sup>(Note 3,4)</sup>	$V_{DD}=15V, V_{GS}=10V,$ $R_G=3.3\Omega, I_D=-15A$	$t_{d(on)}$	--	4.8	--	ns
Turn-On Rise Time <sup>(Note 3,4)</sup>		$t_r$	--	12.5	--	
Turn-Off Delay Time <sup>(Note 3,4)</sup>		$t_{d(off)}$	--	27.6	--	
Turn-Off Fall Time <sup>(Note 3,4)</sup>		$t_f$	--	8.2	--	
<b>Source-Drain Diode Ratings and Characteristic</b>						
Continuous Drain-Source Diode		$I_S$	--	--	55	A
Pulse Drain-Source Diode		$I_{SM}$	--	--	220	A
Diode-Source Forward Voltage	$V_{GS} = 0V, I_S = 1A$	$V_{SD}$	--	--	1	V

#### Note:

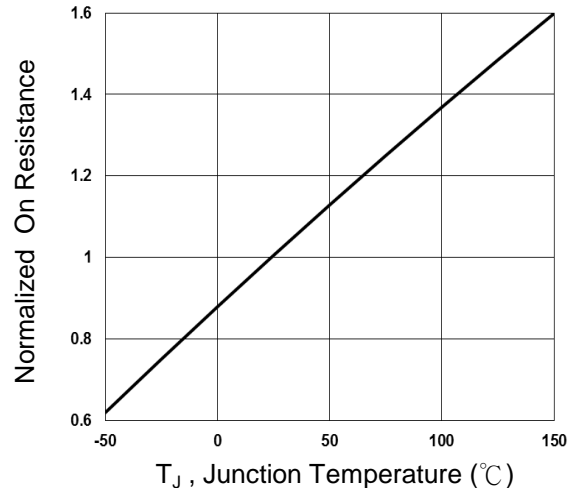
1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2.  $V_{DD}=25V, V_{GS}=10V, L=0.1\text{mH}, I_{AS}=30A., R_G=25\Omega, \text{Starting } T_J=25^\circ\text{C}$
3. The data tested by pulsed , pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$
4. Essentially independent of operating temperature.

### Electrical Characteristics Curve

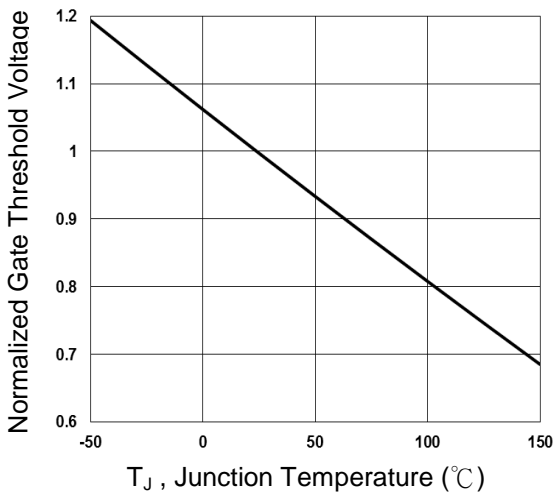
**Continuous Drain Current vs. T<sub>c</sub>**



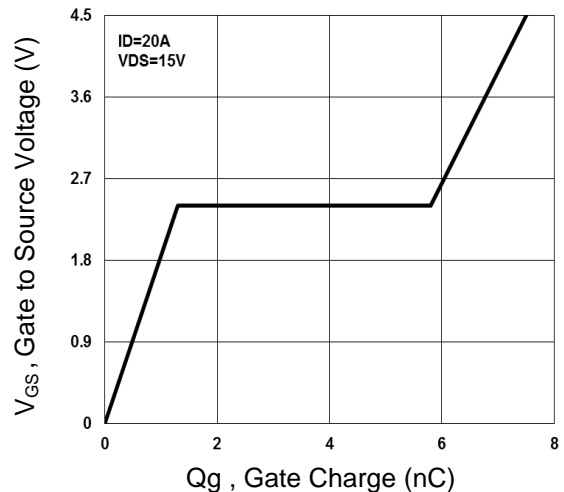
**Normalized R<sub>DS(on)</sub> vs. T<sub>J</sub>**



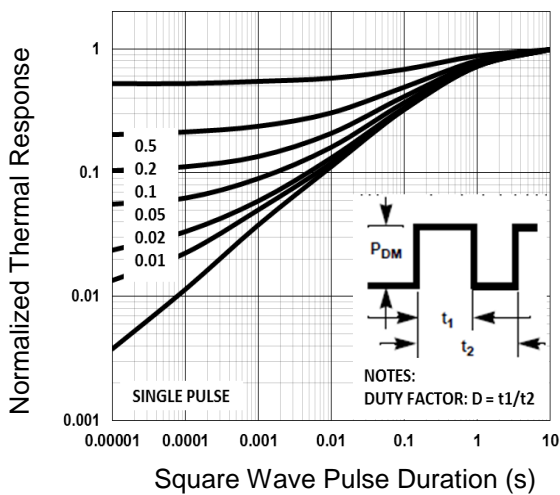
**Normalized V<sub>th</sub> vs. T<sub>J</sub>**



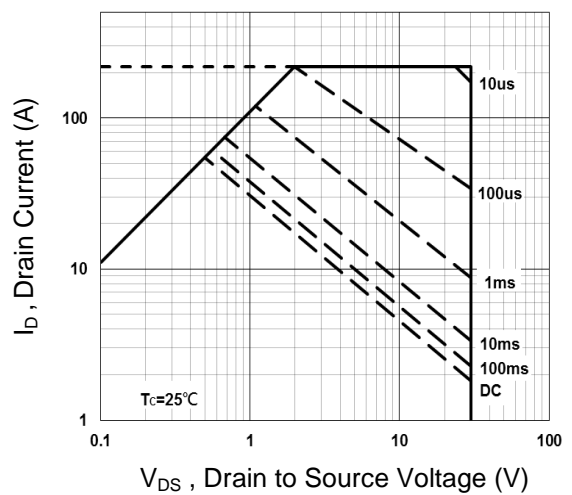
**Gate Charge Waveform**



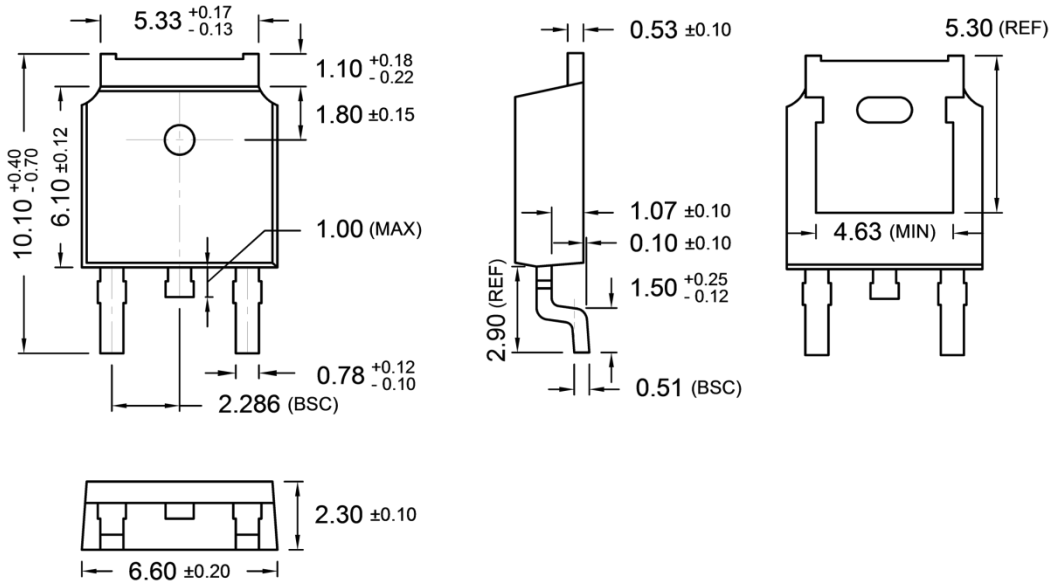
**Normalized Transient Impedance**



**Maximum Safe Operation Area**

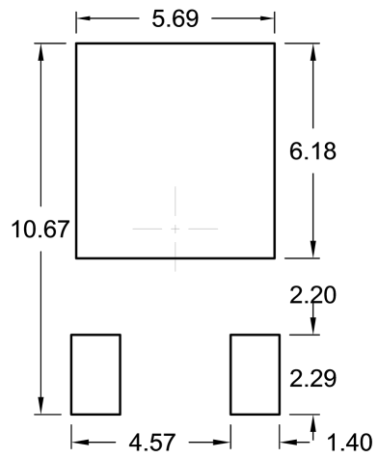


### TO-252 Mechanical Drawing



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)

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