

TO-252  
(DPAK)



Pin Definition:

1. Gate
2. Drain
3. Source

### Key Parameter Performance

Parameter	Value	Unit
$V_{DS}$	30	V
$R_{DS(on)}$ (max)	$V_{GS} = 10V$	50
	$V_{GS} = 4.5V$	80
$Q_g$	4	nC

### Application

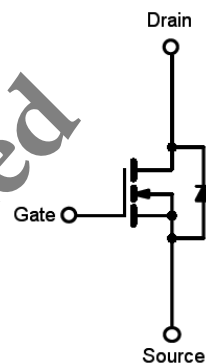
- Portable application
- DC to DC converter

### Ordering Information

Part No.	Package	Packing
TSM500N03CP ROG	TO-252	2.5kpcs / 13" Reel

**Note:** "G" denotes for Halogen- and Antimony-free as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds

### Block Diagram



N-Channel MOSFET

### Absolute Maximum Ratings ( $T_C=25^\circ C$ 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	$I_D$	$T_C=25^\circ C$	12.5
		$T_C=100^\circ C$	8
Pulsed Drain Current <sup>(Note 1)</sup>	$I_{DM}$	40	A
Power Dissipation @ $T_C=25^\circ C$	$P_D$	12.5	W
Operating Junction Temperature	$T_J$	150	$^\circ C$
Storage Temperature Range	$T_{STG}$	-55 to +150	$^\circ C$

### Thermal Performance

Parameter	Symbol	Limit	Unit
Thermal Resistance - Junction to Case	$R_{\theta JC}$	10	$^\circ C/W$
Thermal Resistance - Junction to Ambient	$R_{\theta JA}$	110	



### Electrical Specifications (T<sub>C</sub>=25°C unless otherwise noted)

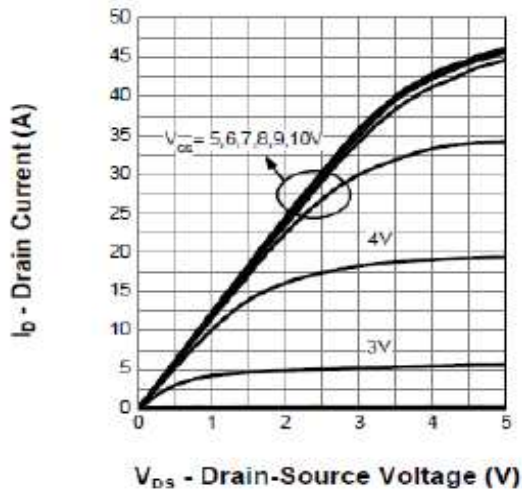
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA	BV <sub>DSS</sub>	30	--	--	V
Drain-Source On-State Resistance	V <sub>GS</sub> = 10V, I <sub>D</sub> = 8A	R <sub>DS(ON)</sub>	--	40	50	mΩ
	V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 8A		--	65	80	
Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	V <sub>GS(TH)</sub>	1	1.7	3	V
Zero Gate Voltage Drain Current	V <sub>DS</sub> = 30V, V <sub>GS</sub> = 0V	I <sub>DSS</sub>	--	--	1	μA
	V <sub>DS</sub> = 24V, T <sub>C</sub> = 150°C		--	--	25	
Gate Body Leakage	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V	I <sub>GSS</sub>	--	--	±100	nA
<b>Dynamic</b>						
Total Gate Charge <sup>(Note 2,3)</sup>	V <sub>DS</sub> = 24V, I <sub>D</sub> = 10A, V <sub>GS</sub> = 4.5V	Q <sub>g</sub>	--	4	--	nC
Gate-Source Charge <sup>(Note 2,3)</sup>		Q <sub>gs</sub>	--	1.6	--	
Gate-Drain Charge <sup>(Note 2,3)</sup>		Q <sub>gd</sub>	--	2.4	--	
Input Capacitance	V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V, f = 1.0MHz	C <sub>iss</sub>	--	270	--	pF
Output Capacitance		C <sub>oss</sub>	--	70	--	
Reverse Transfer Capacitance		C <sub>rss</sub>	--	50	--	
<b>Switching</b>						
Turn-On Delay Time <sup>(Note 2,3)</sup>	V <sub>DD</sub> = 15V, I <sub>D</sub> = 10A, V <sub>GS</sub> = 10V, R <sub>GEN</sub> = 3.3Ω	t <sub>d(on)</sub>	--	7	--	ns
Turn-On Rise Time <sup>(Note 2,3)</sup>		t <sub>r</sub>	--	30	--	
Turn-Off Delay Time <sup>(Note 2,3)</sup>		t <sub>d(off)</sub>	--	10	--	
Turn-Off Fall Time <sup>(Note 2,3)</sup>		t <sub>f</sub>	--	3	--	
<b>Source-Drain Diode Ratings and Characteristic</b>						
Diode-Source Forward Voltage	V <sub>GS</sub> = 0V, I <sub>S</sub> = 5A	V <sub>SD</sub>	--	--	1.3	V
Reverse Recovery Time <sup>(Note 2)</sup>	V <sub>GS</sub> = 0V, I <sub>S</sub> = 10A dI <sub>F</sub> /dt = 100A/μs	t <sub>rr</sub>	--	17	--	ns
Reverse Recovery Charge <sup>(Note 2)</sup>		Q <sub>rr</sub>	--	10	--	nC

#### Note:

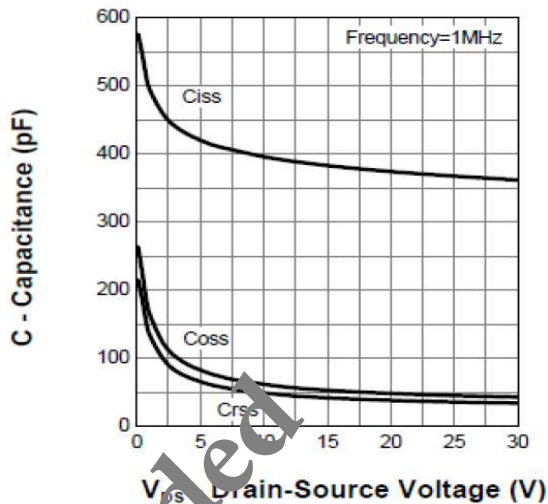
1. Pulse width limited by safe operating area
2. Pulse test: pulse width ≤ 300μs, duty cycle ≤ 2%
3. Switching time is essentially independent of operating temperature.

### Electrical Characteristics Curves

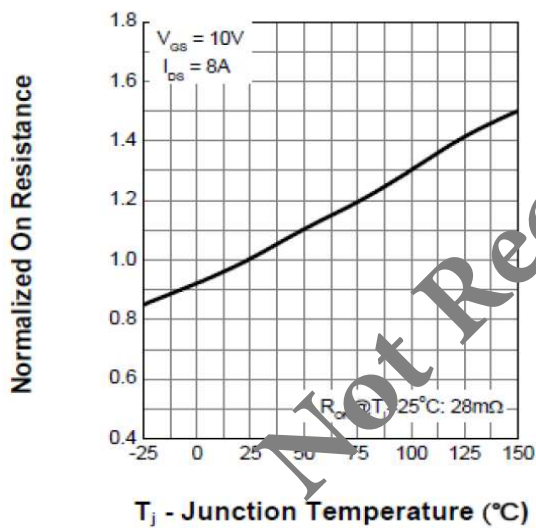
**Output Characteristics**



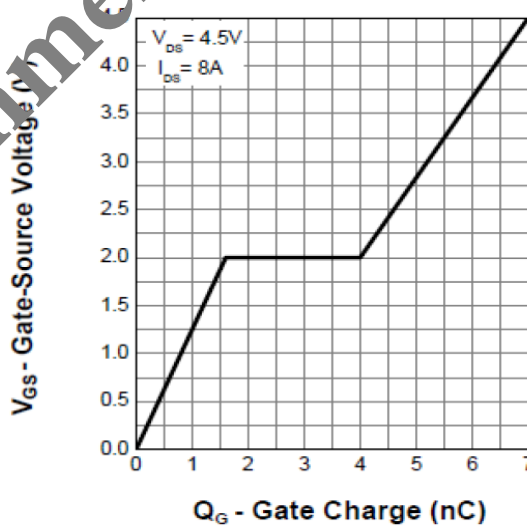
**Capacitance**



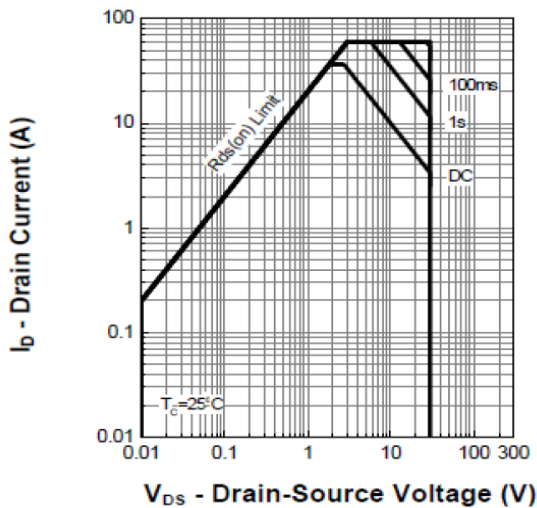
**Drain-Source On-Resistance**



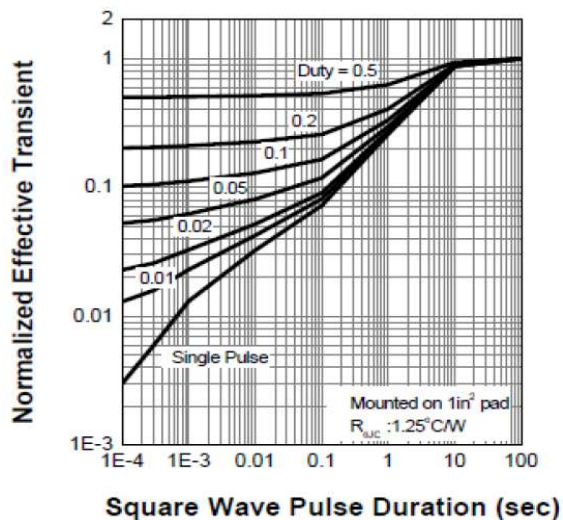
**Gate-Source Voltage vs. Gate Charge**



**Safe Operation Area**

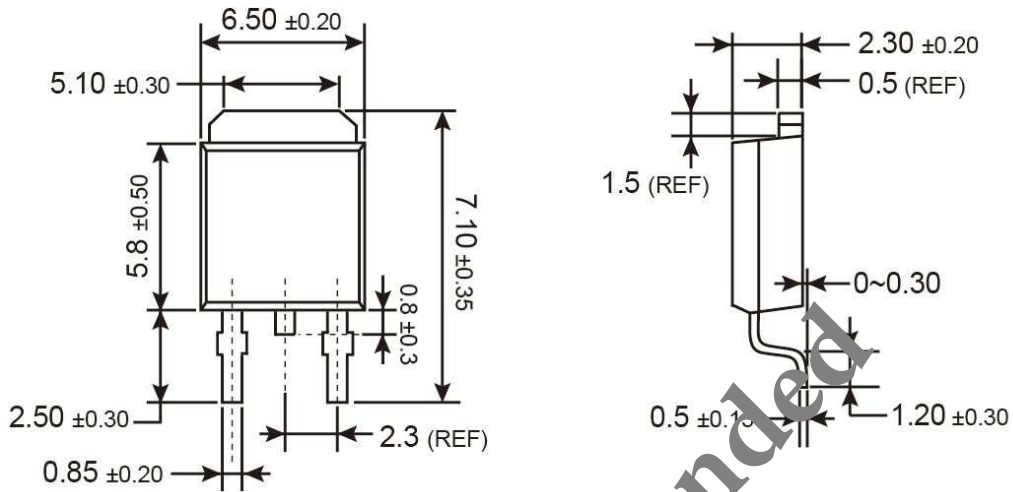


**Thermal Transient Impedance**



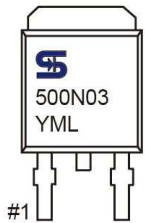


**TO-252 Mechanical Drawing**



Unit: Millimeters

**Marking Diagram**



- Y** = Year Code
- M** = Month Code for Halogen Free Product  
(**Q**=Jan, **V**=Feb, **Q**=Mar, **R**=Apr, **S**=May, **T**=Jun, **U**=Jul, **V**=Aug, **W**=Sep, **X**=Oct, **Y**=Nov, **Z**=Dec)
- L** = Lot Code

Not Recommended

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