

TSM5NS50

500V N-Channel Power MOSFET

TO-252



Pin Definition:

1. Gate
2. Drain
3. Source

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)
500	0.8 @ $V_{GS} = 10V$	4

Features

- Low $R_{DS(on)}$
- Low Gate Charge
- Unclamped Inductive Switching (UIS) Rated

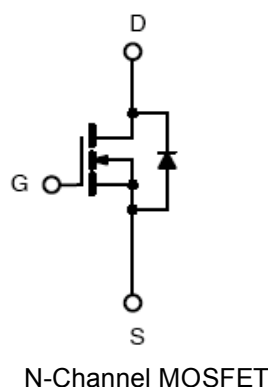
Application

- Load Switch
- Ballast
- Lighting

Ordering Information

Part No.	Package	Packing
TSM5NS50CP RO	TO-252	T&R

Block Diagram



Absolute Maximum Rating ($T_a = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	500	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current	I_D	4.4	A
Pulsed Drain Current	I_{DM}	20	A
Repetitive Avalanche Current	I_{AR}	5	A
Energy Avalanche	EAS	150	mJ
Maximum Power Dissipation	P_D	70	W
		$T_a = 25^\circ\text{C}$	
Operating Junction Temperature	T_J	+150	$^\circ\text{C}$
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to +150	$^\circ\text{C}$

Thermal Performance

Parameter	Symbol	Limit	Unit
Thermal Resistance - Junction to Case	$R_{\theta JC}$	1.78	$^\circ\text{C/W}$
Thermal Resistance - Junction to Ambient	$R_{\theta JA}$	62	$^\circ\text{C/W}$

Notes:

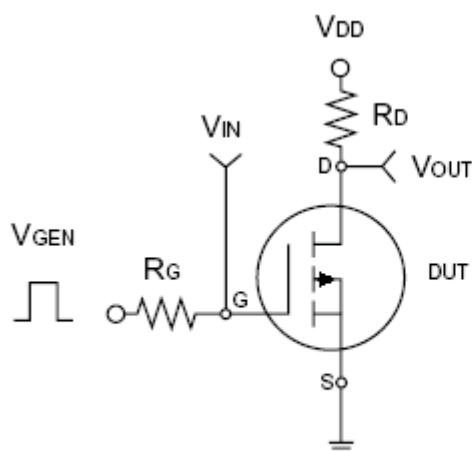
a. When mounted on 1 inch square 2oz copper clad FR-4

Electrical Specifications

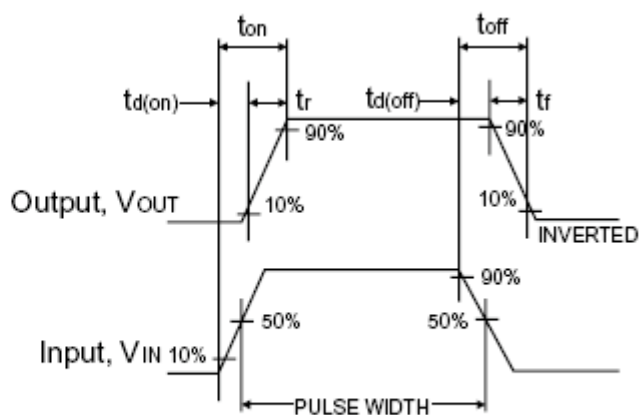
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	BV_{DSS}	500	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	$V_{GS(TH)}$	2	--	4	V
Gate Body Leakage	$V_{GS} = \pm 20V, V_{DS} = 0V$	I_{GSS}	--	--	± 100	nA
Zero Gate Voltage Drain Current	$V_{DS} = 500V, V_{GS} = 0V$	I_{DSS}	--	--	1.0	μA
Drain-Source On-State Resistance ^a	$V_{GS} = 10V, I_D = 4.0A$	$R_{DS(ON)}$	--	0.7	0.8	Ω
Diode Forward Voltage	$I_S = 4.4A, V_{GS} = 0V$	V_{SD}	--	1.0	1.5	V
Dynamic ^b						
Total Gate Charge	$V_{DS} = 520V, I_D = 4.4A,$ $V_{GS} = 10V$	Q_g	--	13	--	nC
Gate-Source Charge		Q_{gs}	--	3	--	
Gate-Drain Charge		Q_{gd}	--	6	--	
Input Capacitance	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1.0MHz$	C_{iss}	--	400	--	pF
Output Capacitance		C_{oss}	--	120	--	
Reverse Transfer Capacitance		C_{rss}	--	40	--	
Switching ^c						
Turn-On Delay Time	$V_{GS} = 10V, I_D = 4.4A,$ $V_{DS} = 350V, R_G = 25\Omega$	$t_{d(on)}$	--	6	--	nS
Turn-On Rise Time		t_r	--	3	--	
Turn-Off Delay Time		$t_{d(off)}$	--	50	--	
Turn-Off Fall Time		t_f	--	10	--	
Source-to-Drain Reverse Recovery Time	$I_S = 4.4A,$ $di/dt = 100A/\mu S$	t_r	--	250	00	nS

Notes:

- Pulse test: pulse width $\leq 300\mu S$, duty cycle $\leq 2\%$
- For design reference only, not subject to production testing.
- Switching time is essentially independent of operating temperature.



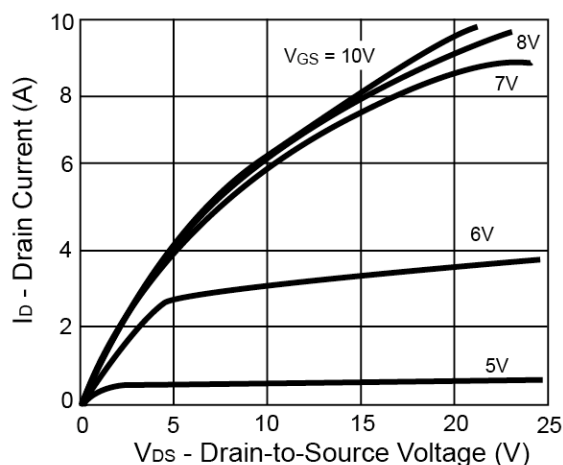
Switching Test Circuit



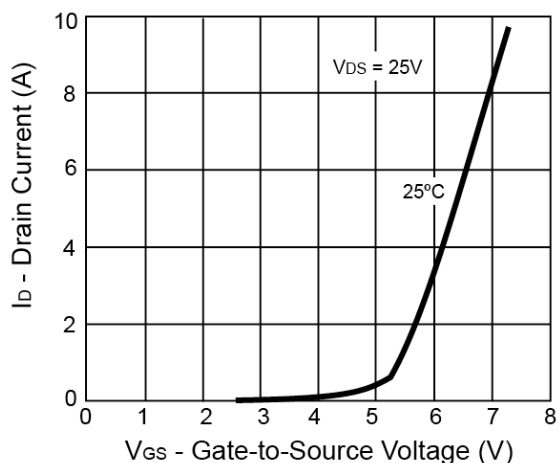
Switchin Waveforms

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

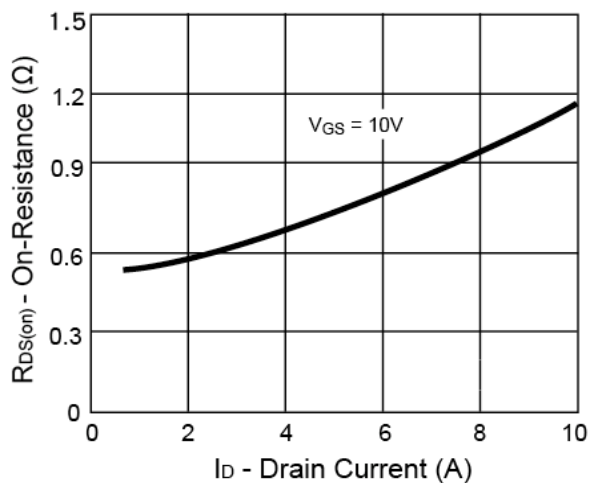
Output Characteristics



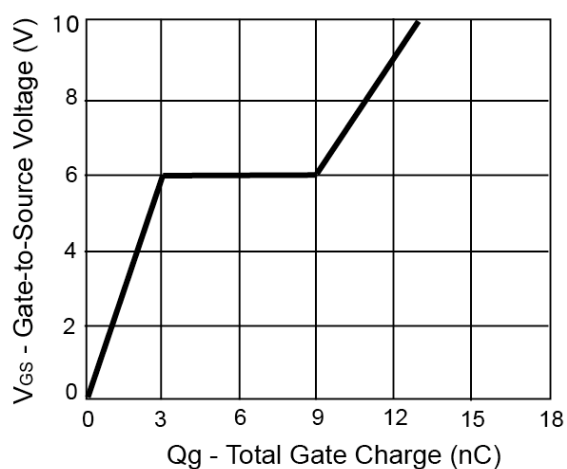
Transfer Characteristics



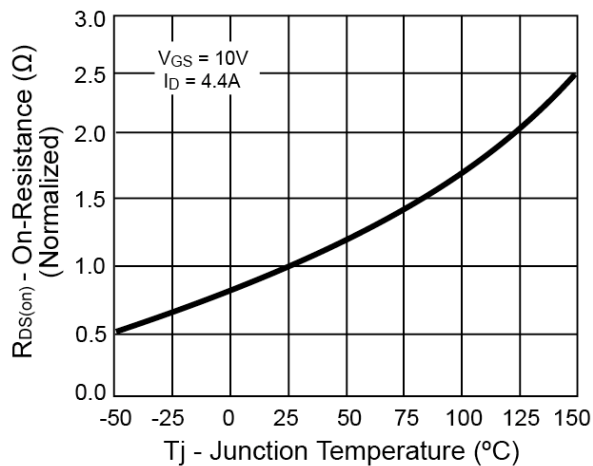
On-Resistance vs. Drain Current



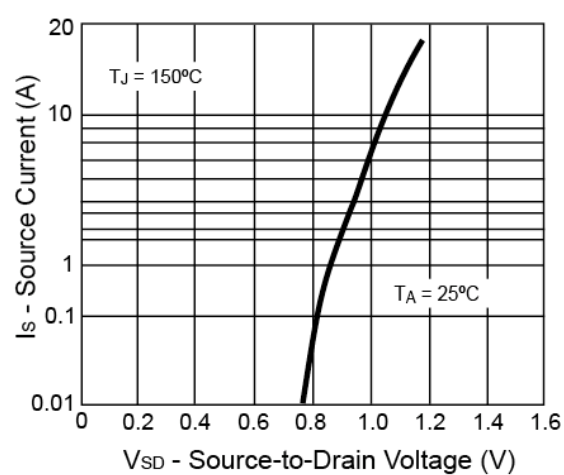
Gate Charge



On-Resistance vs. Junction Temperature

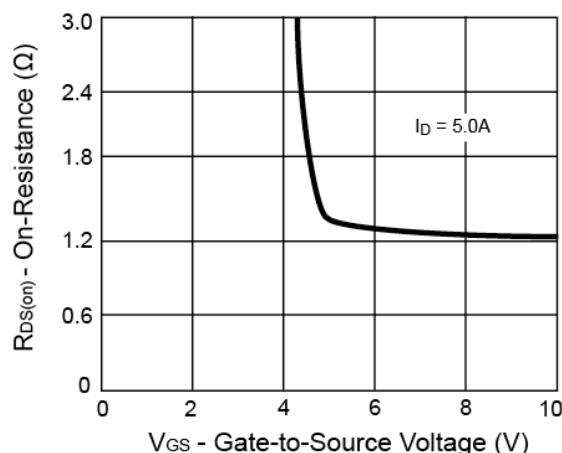


Source-Drain Diode Forward Voltage

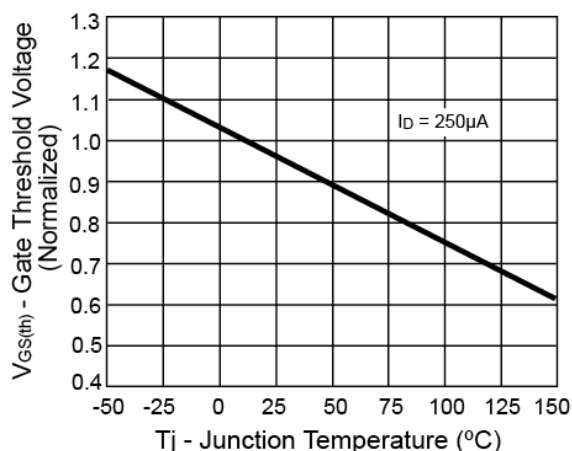


Electrical Characteristics Curve (Ta = 25 °C, unless otherwise noted)

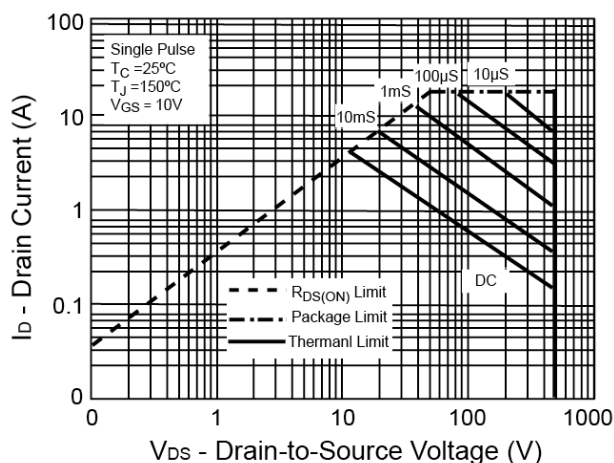
On-Resistance vs. Gate-Source Voltage



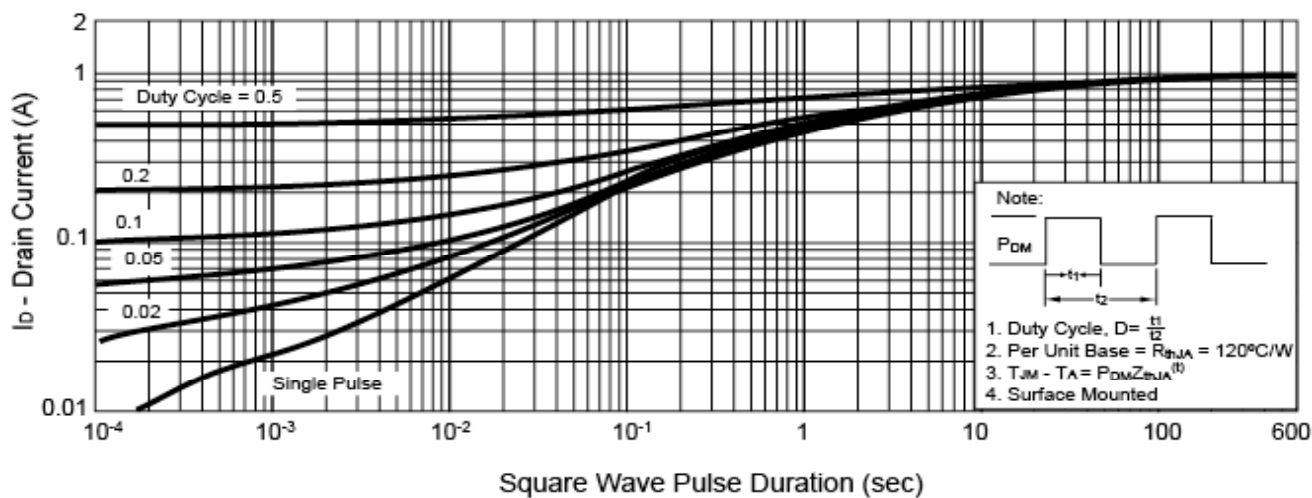
Threshold Voltage



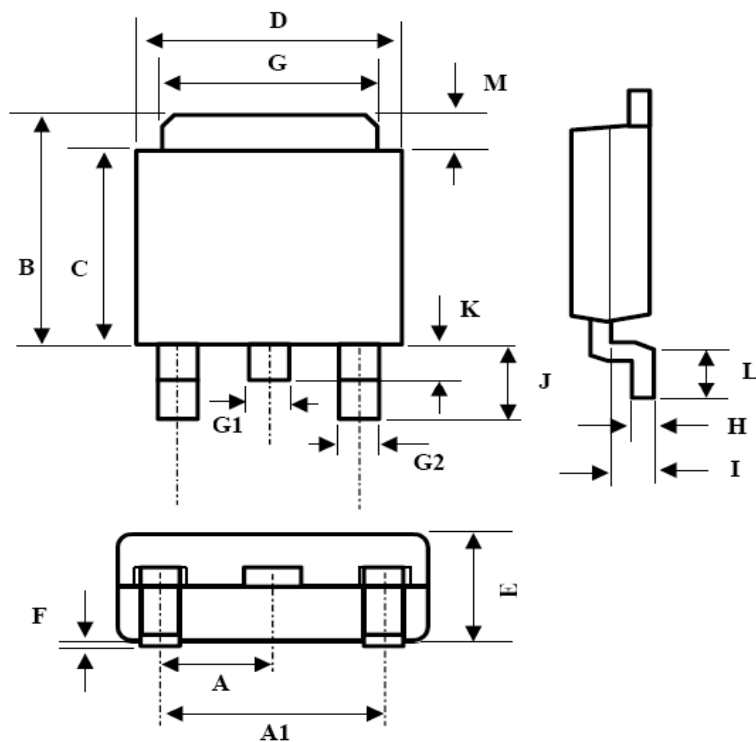
Maximum Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient



SOT-252 Mechanical Drawing



TO-252 DIMENSION				
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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