TAIWAN SEMICONDUCTOR

RoHS COMPLIANCE

TSM5N50

500V N-Channel Power MOSFET

TO-220

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

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$(Ω)	I_D (A)
500	1.8 @ V_{GS} =10V	2.2

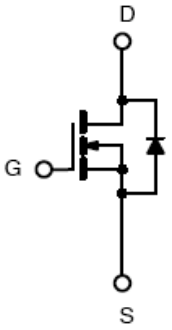
General Description

The TSM5N50 N-Channel enhancement mode Power MOSFET is produced by planar stripe DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency switch mode power supply, power factor correction, electronic lamp ballast based on half bridge.

Features

- Low gate charge typical @ 13nC
- Low Crss typical @ 8.5pF
- Fast Switching
- 100% avalanche tested
- Improved dv/dt capability

Block Diagram



N-Channel MOSFET

Ordering Information

Part No.	Package	Packing
TSM5N50CZ C0	TO-220	50pcs / Tube

Absolute Maximum Rating (Ta = 25°C unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	500	V
Gate-Source Voltage	V_{GS}	±30	V
Continuous Drain Current	I_D	4.5	A
Pulsed Drain Current	I_{DM}	18	A
Continuous Source Current (Diode Conduction)	I_S	4.5	A
Peak Diode Recovery (Note 2)	dv/dt	4.5	V/ns
Single Pulse Drain to Source Avalanche Energy (Note 3)	EAS	300	mJ
Maximum Power Dissipation @Ta = 25°C	P_D	85	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to +150	°C

Thermal Performance

Parameter	Symbol	Limit	Unit
Thermal Resistance - Junction to Case	$R\Theta_{JC}$	1.47	°C/W
Thermal Resistance - Junction to Ambient	$R\Theta_{JA}$	62.5	°C/W

Notes: Surface mounted on FR4 board t ≤ 10sec

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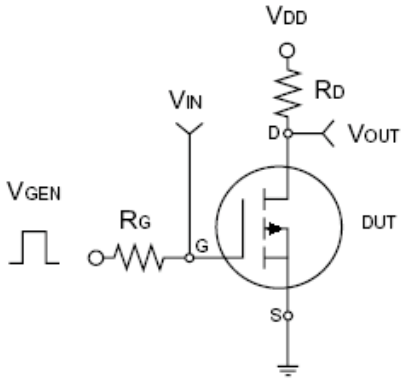
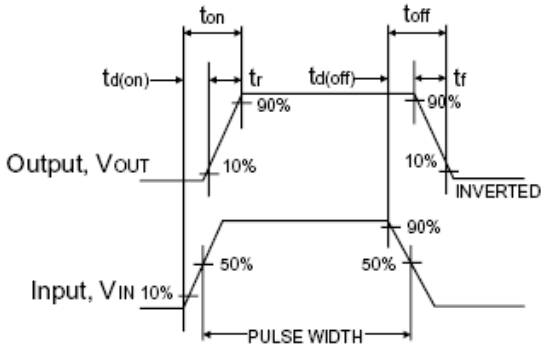
Electrical Specifications (Ta = 25°C unless otherwise noted)

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 250uA	BV_{DSS}	500	--	--	V
Drain-Source On-State Resistance	V_{GS} = 10V, I_D = 2.2A	$R_{DS(ON)}$	--	1.36	1.8	Ω
Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250uA	$V_{GS(TH)}$	3.0	--	5.0	V
Zero Gate Voltage Drain Current	V_{DS} = 500V, V_{GS} = 0V	I_{DSS}	--	--	1	uA
Gate Body Leakage	V_{GS} = ±30V, V_{DS} = 0V	I_{GSS}	--	--	±100	nA
Forward Transconductance	V_{DS} = 50V, I_D = 2.2A	g_{fs}	--	4	--	S
Diode Forward Voltage	I_S = 4.5A, V_{GS} = 0V	V_{SD}	--	--	1.4	V
Dynamic [b]						
Total Gate Charge	V_{DS} = 250V, I_D = 4.5A, V_{GS} = 10V	Q_g	--	13	17	nC
Gate-Source Charge		Q_{gs}	--	3.4	--	
Gate-Drain Charge		Q_{gd}	--	6.4	--	
Input Capacitance	V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz	C_{iss}	--	470	610	pF
Output Capacitance		C_{oss}	--	75	95	
Reverse Transfer Capacitance		C_{rss}	--	8.5	11	
Switching [c]						
Turn-On Delay Time	V_{GS} = 10V, I_D = 4.5A, V_{DD} = 250V, R_G = 25Ω	$t_{d(on)}$	--	13	35	nS
Turn-On Rise Time		t_r	--	55	120	
Turn-Off Delay Time		$t_{d(off)}$	--	25	60	
Turn-Off Fall Time		t_f	--	35	80	
Reverse Recovery Time	V_{GS} = 0V, I_S = 4.5A, dI_F/dt = 100A/us	t_{fr}	--	215	--	uC
Reverse Recovery Charge		Q_{fr}	--	1.26	--	

Notes:
1. Pulse test: pulse width ≤300uS, duty cycle ≤2%
2. I_{SD}<4.5A, di/dt<200A/us, VDD<BV_{DSS}
3. V_{DD} = 50V, V_{GS}=10V, I_{AS}=4.5A, L=27mH, R_G=25Ω
4. For design reference only, not subject to production testing.
5. Switching time is essentially independent of operating temperature.



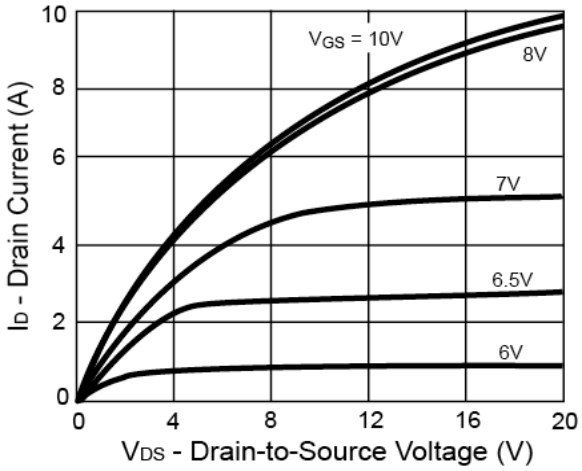
Switching Test Circuit



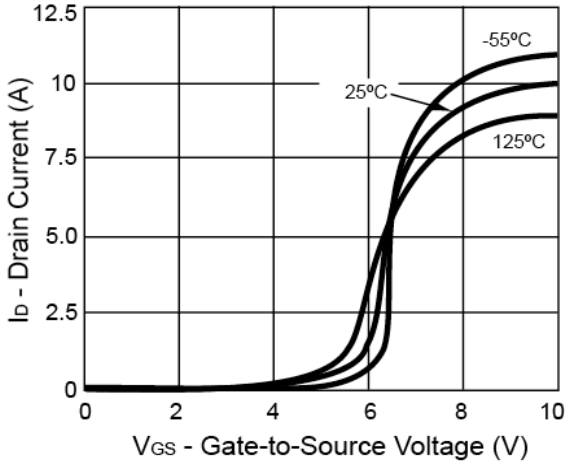
Switchin Waveforms

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

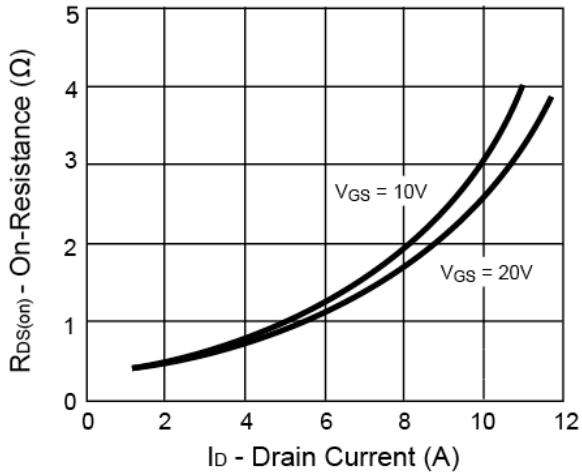
Output Characteristics



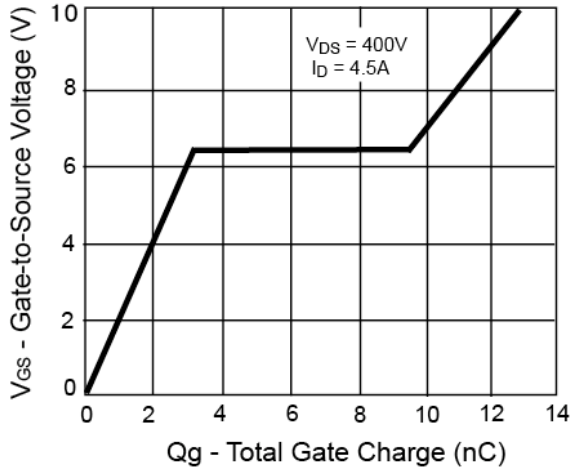
Transfer Characteristics



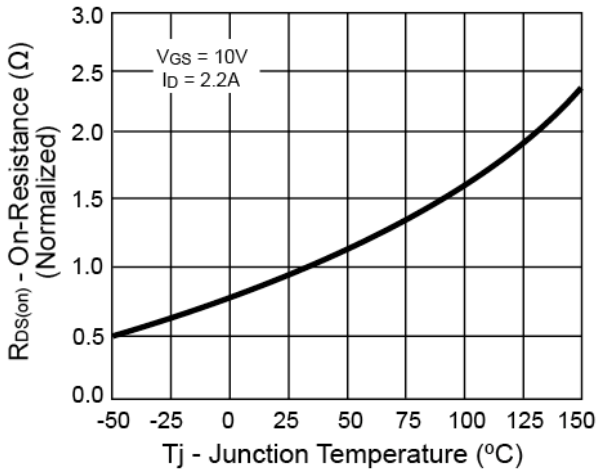
On-Resistance vs. Drain Current



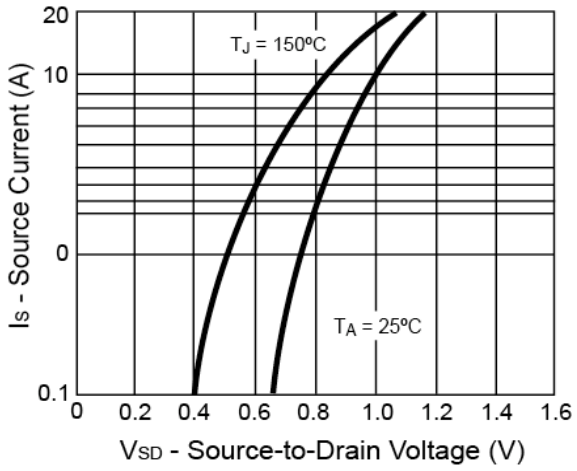
Gate Charge



On-Resistance vs. Junction Temperature

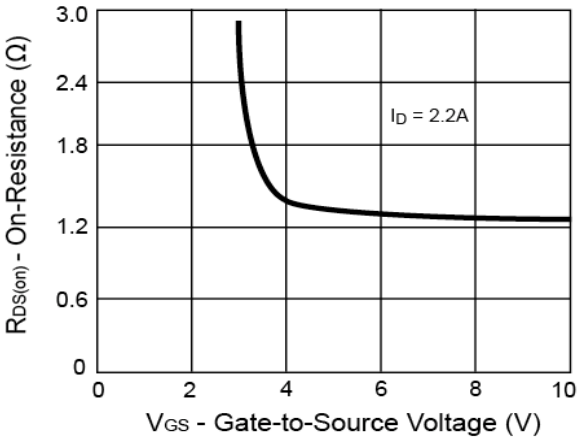


Source-Drain Diode Forward Voltage

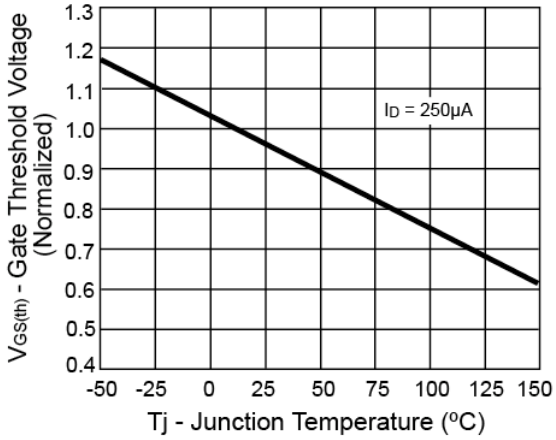


Electrical Characteristics Curve (Ta = 25°C, unless otherwise noted)

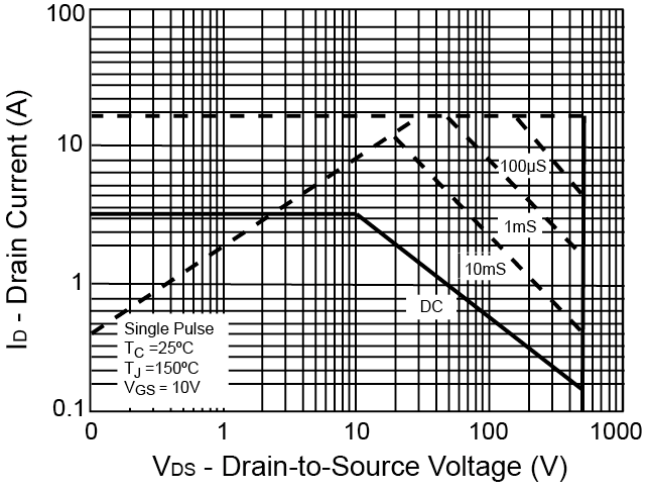
On-Resistance vs. Gate-Source Voltage



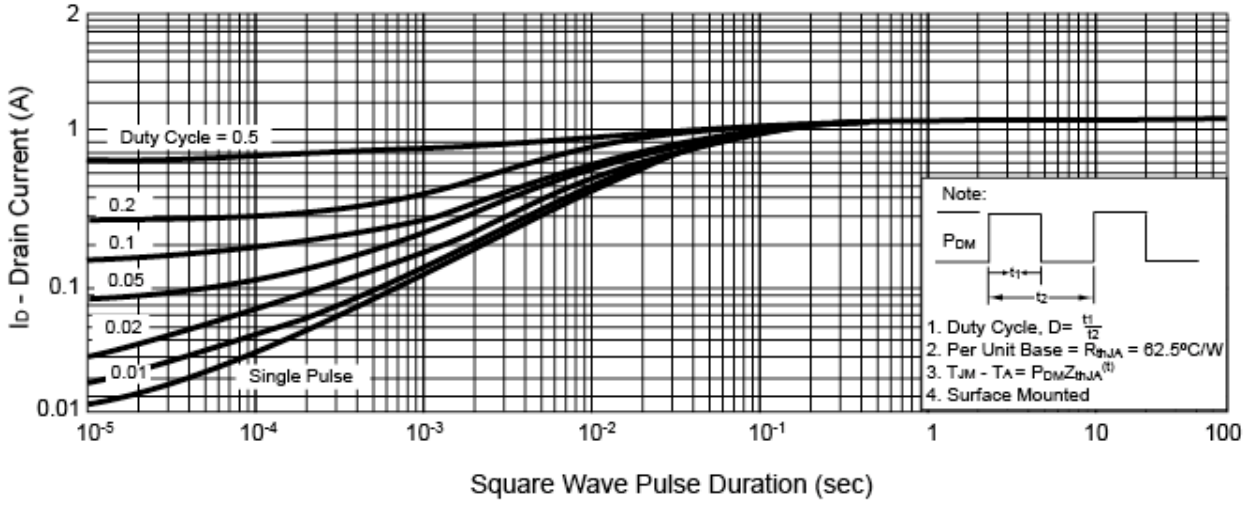
Threshold Voltage



Maximum Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient



TSM5N50

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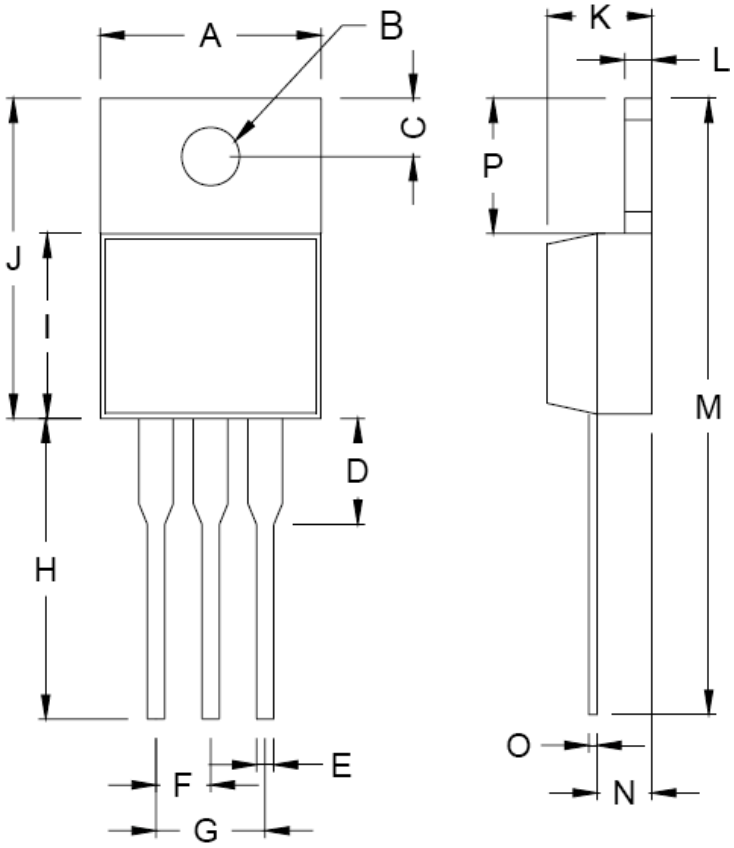
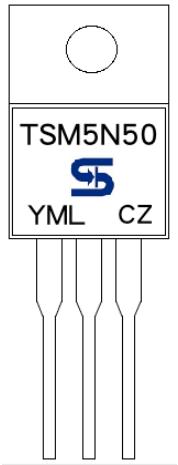
TO-220 Mechanical Drawing



TO-220 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	10.000	10.500	0.394	0.413
B	3.740	3.910	0.147	0.154
C	2.440	2.940	0.096	0.116
D	-	6.350	-	0.250
E	0.381	1.106	0.015	0.040
F	2.345	2.715	0.092	0.058
G	4.690	5.430	0.092	0.107
H	12.700	14.732	0.500	0.581
J	14.224	16.510	0.560	0.650
K	3.556	4.826	0.140	0.190
L	0.508	1.397	0.020	0.055
M	27.700	29.620	1.060	1.230
N	2.032	2.921	0.080	0.115
O	0.255	0.610	0.010	0.024
P	5.842	6.858	0.230	0.270

Marking Diagram



Y = Year Code
M = Month Code
(**A**=Jan, **B**=Feb, **C**=Mar, **D**=Apl, **E**=May, **F**=Jun, **G**=Jul, **H**=Aug, **I**=Sep, **J**=Oct, **K**=Nov, **L**=Dec)
L = Lot Code

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