

TO-220



ITO-220



Pin Definition:

1. Gate
2. Drain
3. Source

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)
500	0.85 @ $V_{GS}=10V$	4.8

General Description

The TSM9N50 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.

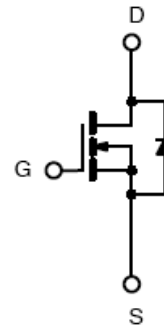
Features

- Low $R_{DS(on)}$ 0.85 Ω @ $V_{GS} = 10V$
- Low gate charge typical @ 63nC (Typ.)
- Low C_{rss} typical @ 120pF (Typ.)
- Fast Switching

Ordering Information

Part No.	Package	Packing
TSM9N50CZ C0	TO-220	50pcs / Tube
TSM9N50CI C0	ITO-220	50pcs / Tube

Block Diagram



N-Channel MOSFET

Absolute Maximum Rating ($T_a = 25^\circ C$ 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	$T_a = 25^\circ C$	9	A
		$T_a = 100^\circ C$	5.1	A
Pulsed Drain Current*	I_{DM}	36	A	
Single Pulse Avalanche Energy (Note 2)	E_{AS}	510	mJ	
Avalanche Current (Repetitive) (Note 1)	I_{AR}	8	A	
Repetitive Avalanche Energy (Note 1)	E_{AR}	13	mJ	
Total Power Dissipation @ $T_c = 25^\circ C$	P_{DTOT}	125	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	$R_{\theta JC}$	3.1	$^\circ C/W$
Thermal Resistance - Junction to Ambient	$R_{\theta JA}$	62.5	$^\circ C/W$

Notes: Surface mounted on FR4 board $t \leq 10sec$

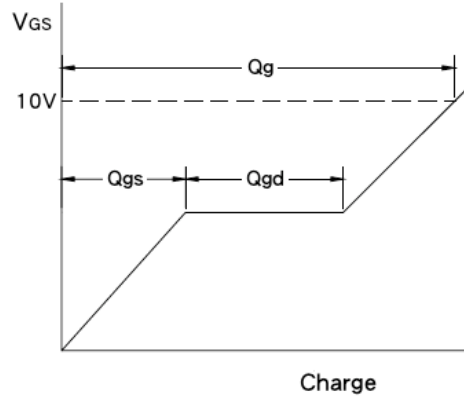
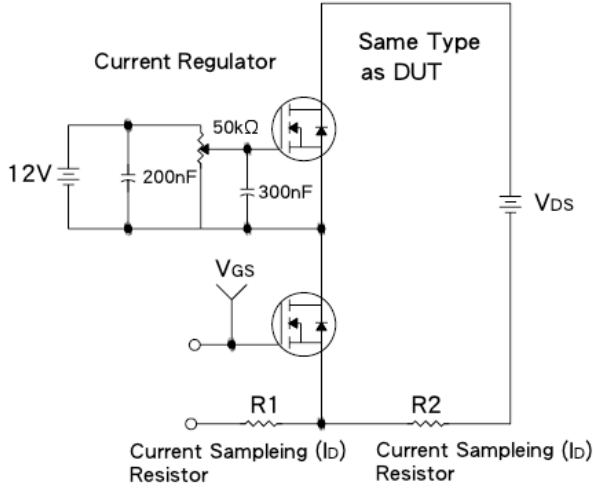
Electrical Specifications ($T_a = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	BV_{DSS}	500	--	--	V
Drain-Source On-State Resistance	$V_{GS} = 10V, I_D = 4.8A$	$R_{DS(ON)}$	--	0.75	0.85	Ω
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	$V_{GS(TH)}$	2.0	--	4.0	V
Zero Gate Voltage Drain Current	$V_{DS} = 500V, V_{GS} = 0V$	I_{DSS}	--	--	25	μA
Gate Body Leakage	$V_{GS} = \pm 30V, V_{DS} = 0V$	I_{GSS}	--	--	± 100	nA
Forward Transfer Conductance	$V_{DS} = 50V, I_D = 4.8A$	g_{fs}	5.9	--	--	S
Dynamic^b						
Total Gate Charge	$V_{DS} = 400V, I_D = 9A,$ $V_{GS} = 10V$	Q_g	--	63	--	nC
Gate-Source Charge		Q_{gs}	--	9.3	--	
Gate-Drain Charge		Q_{gd}	--	32	--	
Input Capacitance	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1.0\text{MHz}$	C_{iss}	--	1300	--	pF
Output Capacitance		C_{oss}	--	310	--	
Reverse Transfer Capacitance		C_{rss}	--	120	--	
Switching^c						
Turn-On Delay Time	$V_{DD} = 250V, I_D = 9A,$ $R_G = 9.1\Omega$	$t_{d(on)}$	--	14	--	nS
Turn-On Rise Time		t_r	--	23	--	
Turn-Off Delay Time		$t_{d(off)}$	--	49	--	
Turn-Off Fall Time		t_f	--	20	--	
Source Drain Diode						
Source-drain Current		I_{SD}	--	--	9	A
Diode Forward Voltage	$I_S = 9A, V_{GS} = 0V$	V_{SD}	--	--	2.0	V
Reverse Recovery Time	$V_{GS} = 0V, I_S = 9A,$ $di_f/dt = 100A/\mu s$	t_{fr}	--	460	970	nS
Reverse Recovery Charge		Q_{fr}	--	4.2	8.9	μC

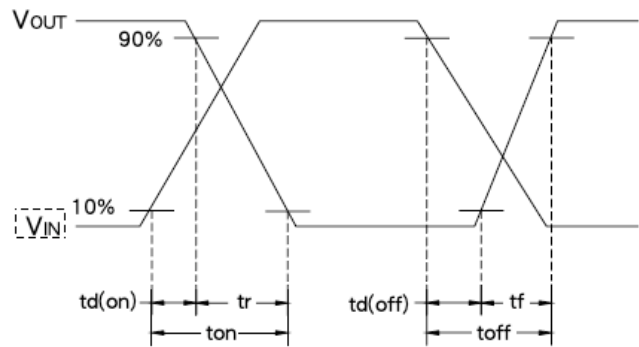
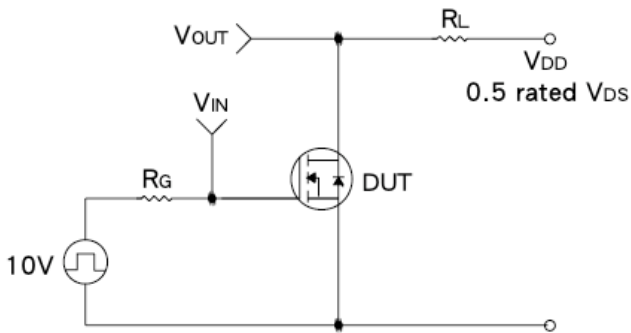
Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
2. $V_{DD} = 50V, I_{AS} = 9A, L = 5.7\text{mH}, R_G = 9.1\Omega, \text{Starting } T_J = 25^\circ\text{C}$
3. Pulse test: pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
4. Essentially Independent of Operating Temperature

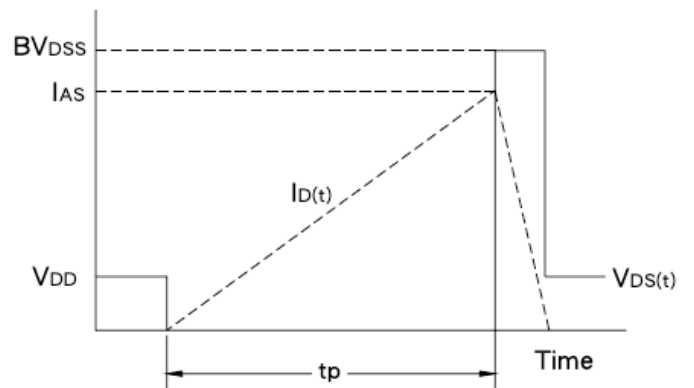
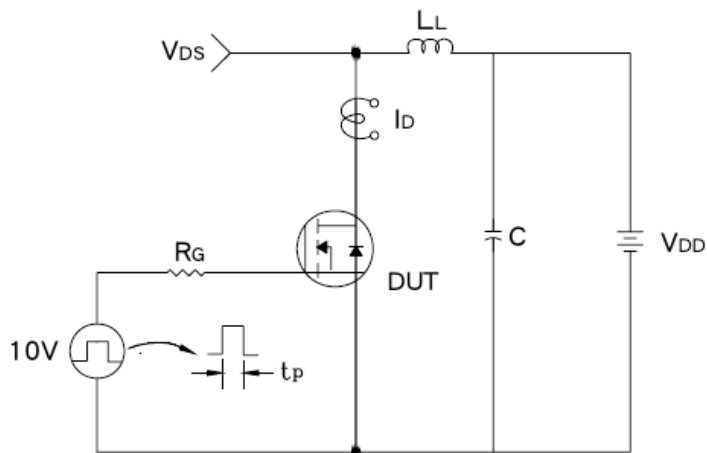
Gate Charge Test Circuit & Waveform



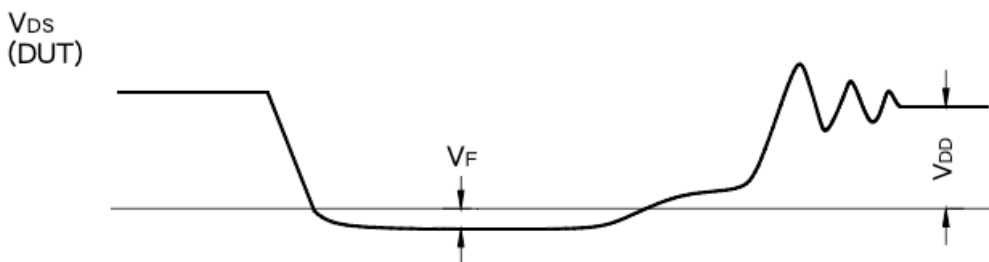
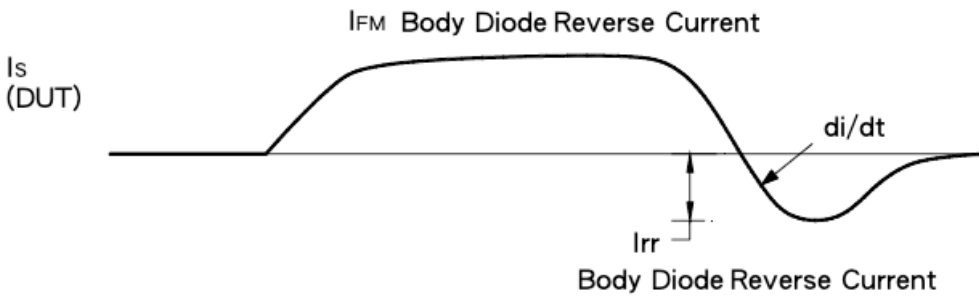
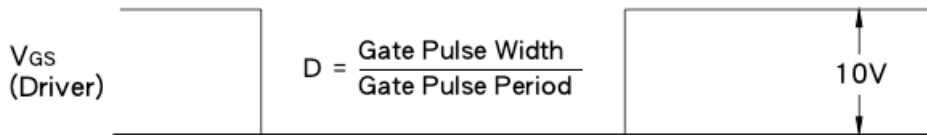
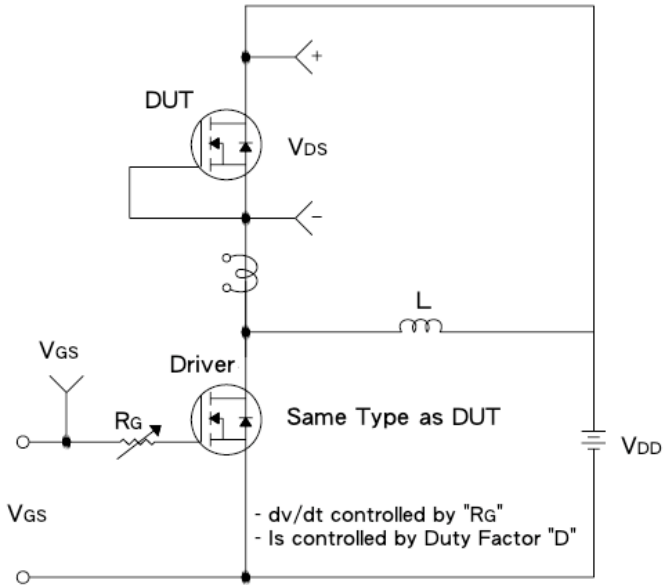
Resistive Switching Test Circuit & Waveform



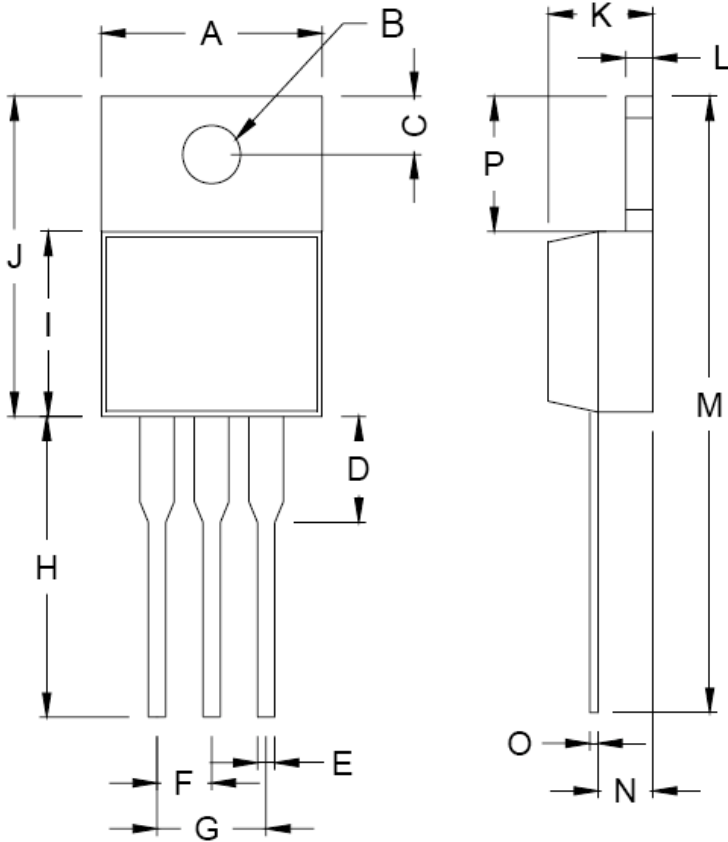
E_{AS} Test Circuit & Waveform



Diode Reverse Recovery Time Test Circuit & Waveform

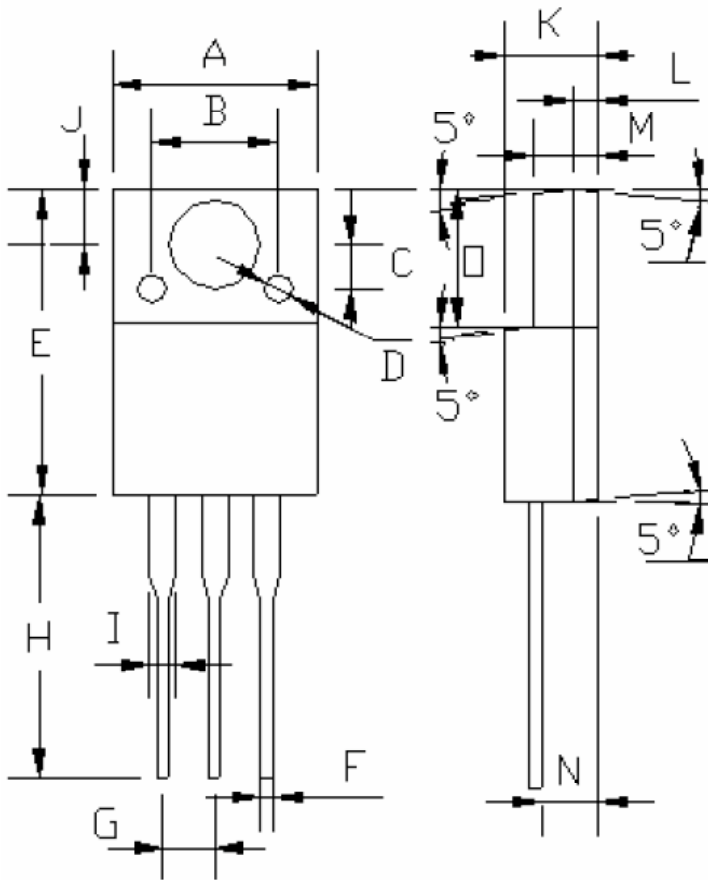


TO-220 Mechanical Drawing



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

ITO-220 Mechanical Drawing



ITO-220 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	10.04	10.07	0.395	0.396
B	6.20 (typ.)		0.244 (typ.)	
C	2.20 (typ.)		0.087 (typ.)	
D	∅ 1.40 (typ.)		∅ 0.055 (typ.)	
E	15.0	15.20	0.591	0.598
F	0.52	0.54	0.020	0.021
G	2.35	2.73	0.093	0.107
H	13.50	13.55	0.531	0.533
I	1.11	1.49	0.044	0.058
J	2.60	2.80	0.102	0.110
K	4.49	4.50	0.176	0.177
L	1.15 (typ.)		0.045 (typ.)	
M	3.03	3.05	0.119	0.120
N	2.60	2.80	0.102	0.110
O	6.55	6.65	0.258	0.262

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