

TSP51N25MSD

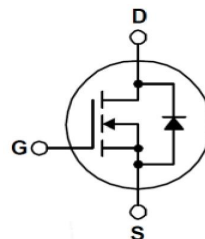
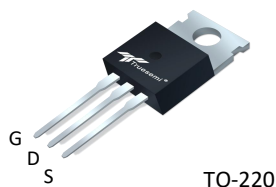
250V N-Channel Fast Recovery POWER MOSFET

General Description

This Power MOSFET is produced using Truesemi's advanced 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.

Features

- 51A, 250V, Max. $R_{DS(on)}$ = 83m Ω @ V_{GS} = 10V
- Low gate charge: Q_g = 84nC (Typ.)
- Low reverse transfer capacitance: C_{rss} = 49pF (Typ.)
- Ultrafast body diode
- RoHS compliant device
- 100% avalanche tested



Absolute Maximum Ratings

$T_c = 25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter		Value	Units
V_{DSS}	Drain-Source Voltage		250	V
V_{GS}	Gate-Source Voltage		± 30	V
I_D	Drain Current	$T_c = 25^\circ\text{C}$	51	A
		$T_c = 100^\circ\text{C}$	32.2	A
I_{DM}	Pulsed Drain Current	(Note 1)	204	A
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	3025	mJ
E_{AR}	Repetitive Avalanche Energy	(Note 1)	15	mJ
I_{AR}	Repetitive Avalanche current	(Note 1)	22	A
P_D	Power Dissipation ($T_c = 25^\circ\text{C}$)		150	W
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150	$^\circ\text{C}$

Thermal Resistance Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	--	0.83	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	62.5	$^\circ\text{C}/\text{W}$

Electrical Characteristics $T_c=25\text{ }^{\circ}\text{C}$ unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	3	--	5	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}$, $I_D = 25.5\text{ A}$	--	74	83	$\text{m}\Omega$
g_{fs}	Forward transfer conductance	$V_{DS} = 10\text{ V}$, $I_D = 25.5\text{ A}$ (Note3)	--	2.5	--	S

Off Characteristics

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$	250	--	--	V
I_{DSS}	Drain-source cut-off current	$V_{DS} = 250\text{ V}$, $V_{GS} = 0\text{ V}$	--	--	1	μA
		$V_{DS} = 250\text{ V}$, $T_c = 125^{\circ}\text{C}$	--	--	100	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS} = 30\text{ V}$, $V_{DS} = 0\text{ V}$	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = -30\text{ V}$, $V_{DS} = 0\text{ V}$	--	--	-100	nA

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 25\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1.0\text{ MHz}$	--	4171	--	pF
C_{oss}	Output Capacitance		--	482	--	pF
C_{rss}	Reverse Transfer Capacitance		--	49	--	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Time	$V_{DS} = 125\text{ V}$, $I_D = 51\text{ A}$, $R_G = 25\text{ }\Omega$ (Note 3,4)	--	76	--	ns
t_r	Turn-On Rise Time		--	33	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	134	--	ns
t_f	Turn-Off Fall Time		--	34	--	ns
Q_g	Total Gate Charge	$V_{DS} = 200\text{ V}$, $I_D = 51\text{ A}$, $V_{GS} = 10\text{ V}$ (Note 3,4)	--	84	--	nC
Q_{gs}	Gate-Source Charge		--	30	--	nC
Q_{gd}	Gate-Drain Charge		--	35	--	nC

Source-Drain Diode Maximum Ratings and Characteristics

I _S	Continuous Source-Drain Diode Forward Current		--	--	51	A
I _{SM}	Pulsed Source-Drain Diode Forward Current		--	--	204	
V _{SD}	Source-Drain Diode Forward Voltage	I _{SD} = 51A, V _{GS} = 0 V	--	1.27	--	V
t _{rr}	Reverse Recovery Time	I _{SD} = 51A, V _{GS} = 0 V di _F /dt = 100 A/μs (Note 3,4)	--	79	--	ns
Q _{rr}	Reverse Recovery Charge		--	4.7	--	uC

NOTES:

1. Repeated rating: Pulse width limited by safe operating area
2. $L=10\text{ mH}$, $I_{AS}=22\text{ A}$, $V_{DD}=50\text{ V}$, $R_G=25\text{ }\Omega$, Starting $T_J=25^{\circ}\text{C}$
3. Pulse test: Pulse width $\leq 300\text{ }\mu\text{s}$, Duty cycle $\leq 2\%$
4. Essentially independent of operating temperature typical characteristics

Typical Electrical Characteristics Curves

Fig. 1 Typical Output Characteristics

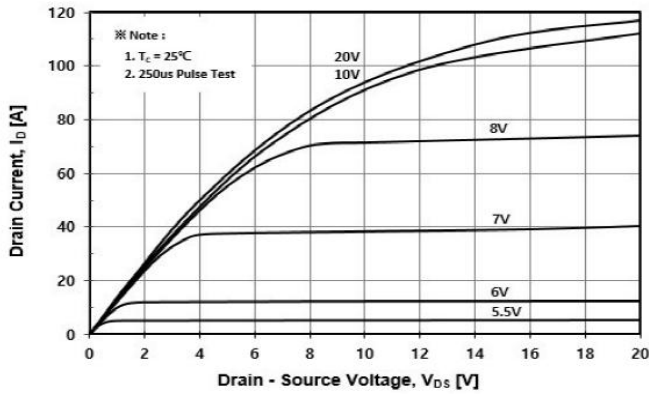


Fig. 2 Typical Transfer Characteristics

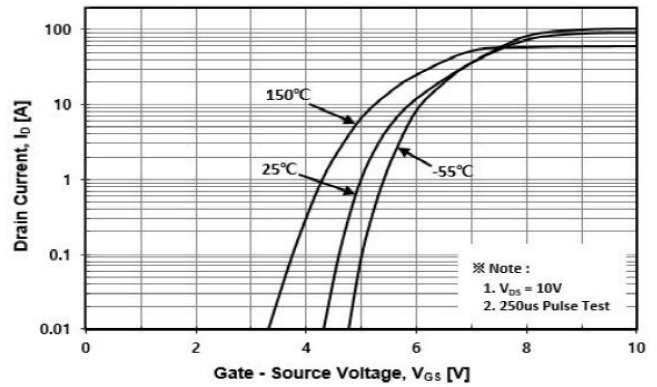


Fig.3 On-Resistance Variation with Drain Current and Gate Voltage

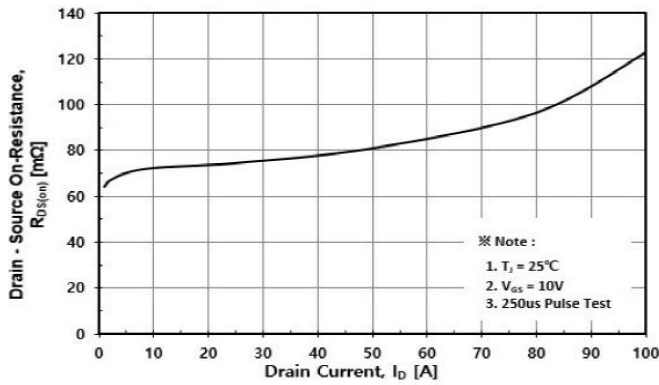


Fig. 4 Body Diode Forward Voltage Variation with Source Current

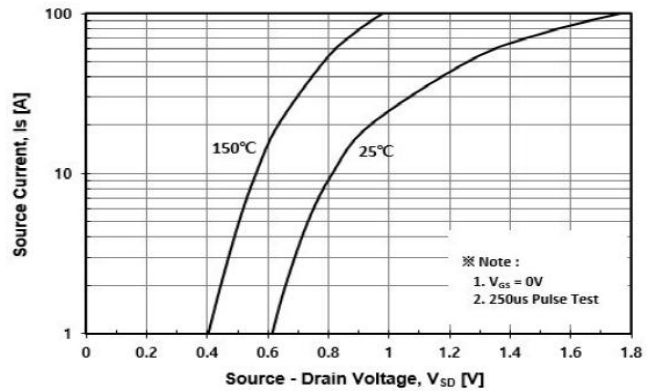


Fig. 5 Typical Capacitance Characteristics

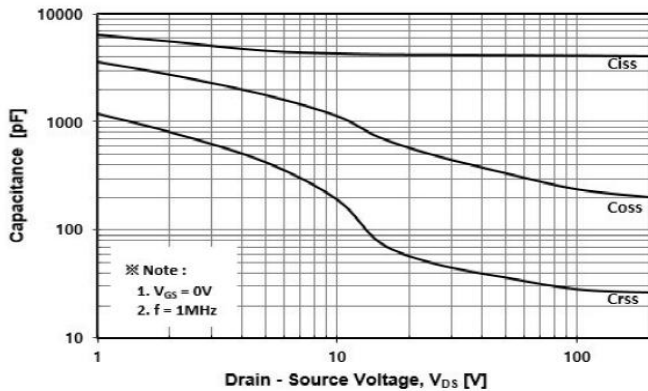
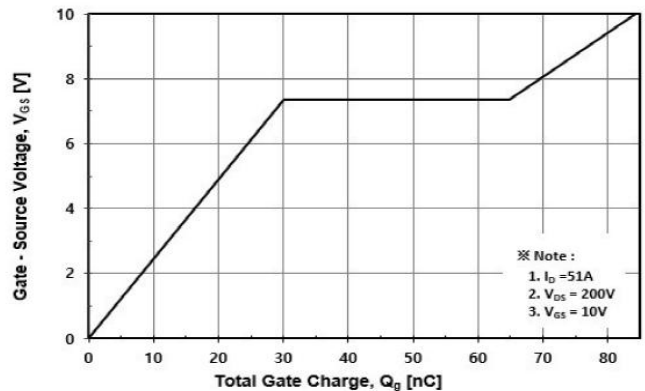


Fig. 6 Typical Total Gate Charge Characteristics



Typical Electrical Characteristics Curves

Fig. 7 Breakdown Voltage Variation vs. Temperature

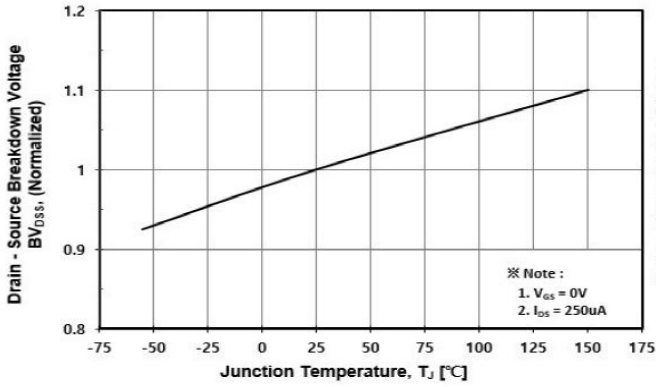


Fig. 8 On-Resistance Variation vs. Temperature

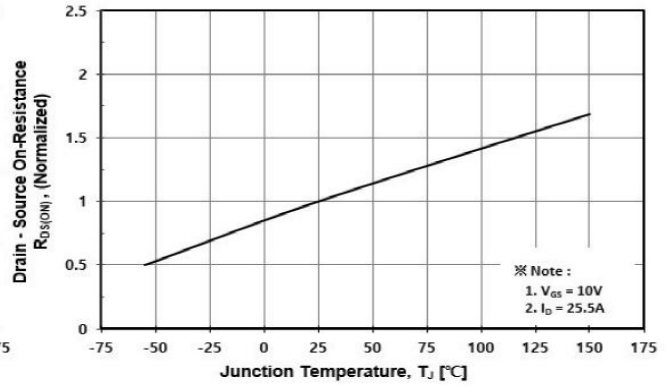


Fig. 9 Maximum Drain Current vs. Case Temperature

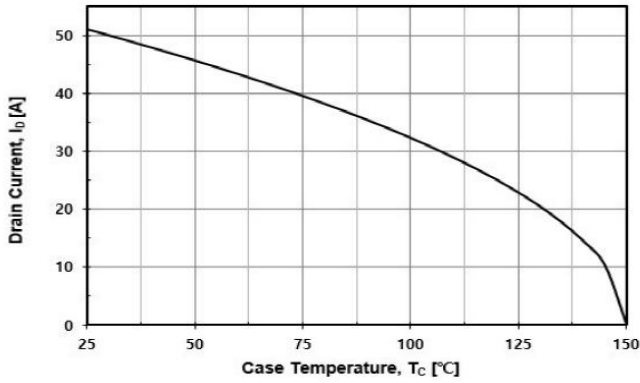


Fig. 10 Maximum Safe Operating Area

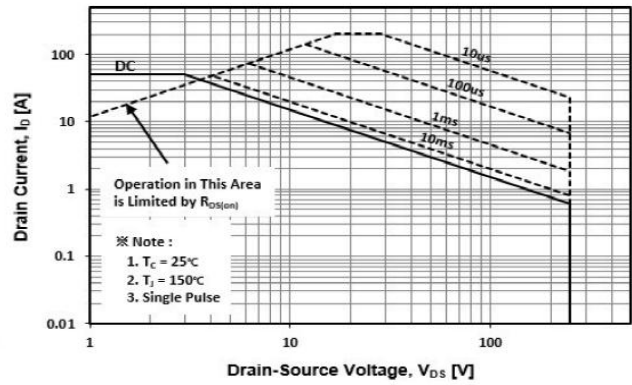


Fig. 11 Transient Thermal Impedance

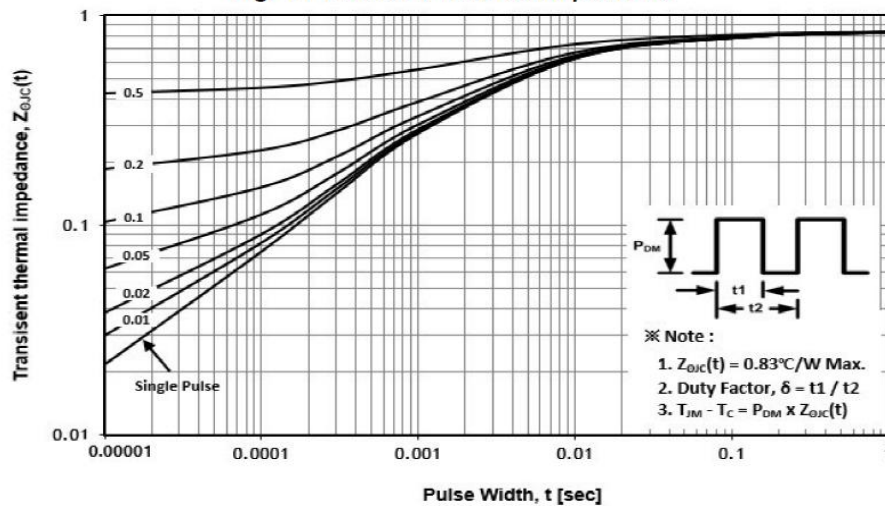


Fig. 12 Gate Charge Test Circuit & Waveform

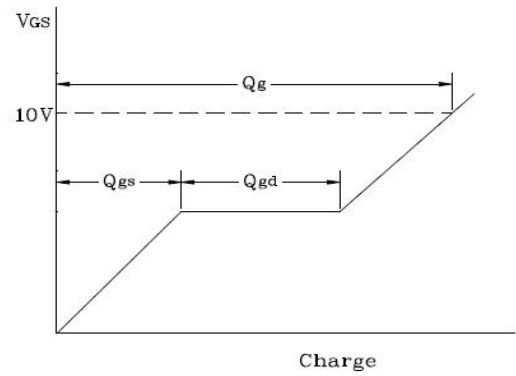
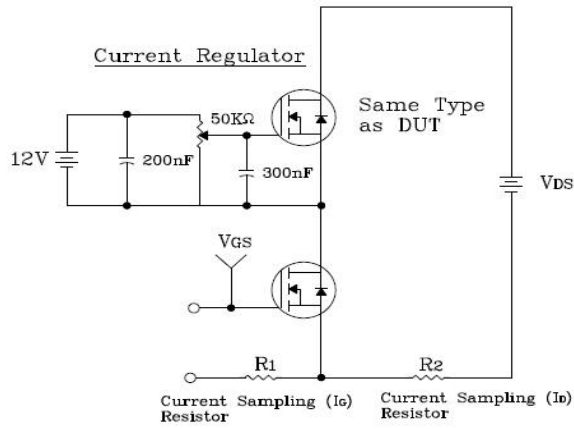


Fig. 13 Resistive Switching Test Circuit & Waveform

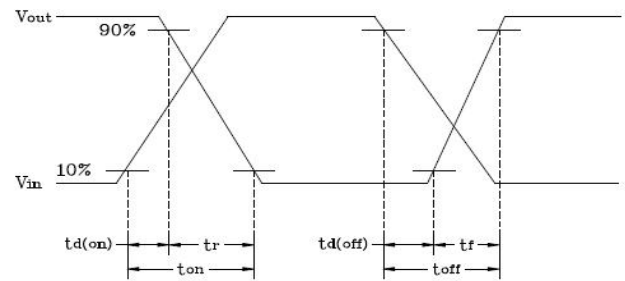
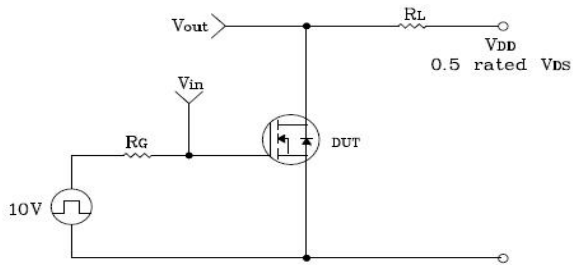


Fig. 14 E_{AS} Test Circuit & Waveform

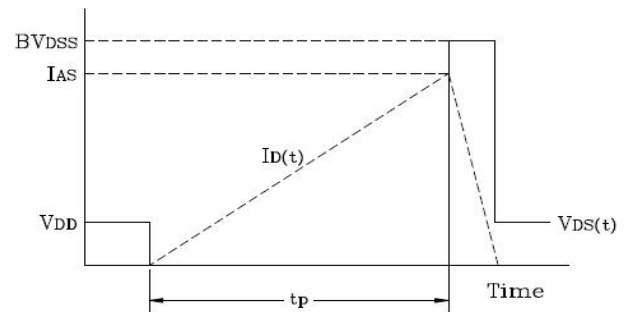
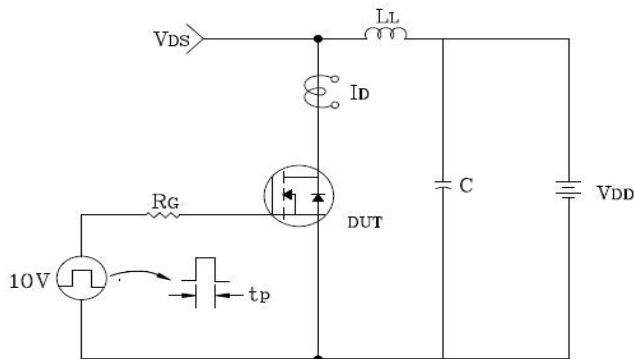


Fig. 15 Diode Reverse Recovery Time Test Circuit & Waveform

