



TSP40N20M

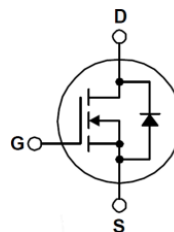
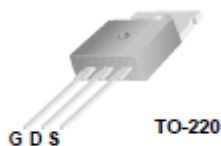
200V N-Channel MOSFET

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. These devices are well suited for high efficiency switched mode power supplies, active power factor correction based on half bridge topology.

Features

- 40A,200V,Max.RDS(on)=65mΩ @ VGS=10V
- Low gate charge:Qg=62nC (Typ.)
- Low reverse transfer capacitance: Crss=50pF (Typ.)
- Lower EMI noise
- 100% avalanche tested
- RoHS compliant device



Absolute Maximum Ratings

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

Symbol	Parameter		TSP40N20M	Units
V_{DSS}	Drain-Source Voltage		200	V
V_{GS}	Gate-Source Voltage		± 30	V
I_D	Drain Current	$T_C = 25^{\circ}\text{C}$	40	A
		$T_C = 100^{\circ}\text{C}$	25.3	A
I_{DM}	Pulsed Drain Current (Note 1)		160	A
E_{AS}	Single Pulsed Avalanche Energy (Note 2)		1066	mJ
I_{AR}	Repetitive avalanche current (Note 1)		40	A
E_{AR}	Repetitive Avalanche Energy (Note 1)		5.8	mJ
P_D	Power Dissipation		160	W
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150	$^{\circ}\text{C}$

* Drain current limited by maximum junction temperature.

Thermal Resistance Characteristics

Symbol	Parameter	Rating	Units
$R_{\theta JC}$	Thermal Resistance,Junction-to-Case	Max.0.78	$^{\circ}\text{C/W}$
$R_{\theta JA}$	Thermal Resistance,Junction-to-Ambient	Max.62.5	$^{\circ}\text{C/W}$

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2.0	--	4.0	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}$	--	50	65	m Ω

Off Characteristics

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	200	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, Referenced to 25°C	--	1	--	V/ $^{\circ}\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 200\text{ V}, V_{GS} = 0\text{ V}$	--	--	10	μA
		$V_{DS} = 200\text{ V}, T_J = 125^{\circ}\text{C}$	--	--	100	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = -20\text{ V}, V_{DS} = 0\text{ V}$	--	--	-100	nA

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	2684	--	pF
C_{oss}	Output Capacitance		--	382	--	pF
C_{rss}	Reverse Transfer Capacitance		--	50	--	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Time	$V_{DS} = 100\text{ V}, I_D = 20\text{ A},$ $R_G = 25\text{ }\Omega$ (Note 3,4)	--	40	--	ns
t_r	Turn-On Rise Time		--	25	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	157	--	ns
t_f	Turn-Off Fall Time		--	35	--	ns
Q_g	Total Gate Charge	$V_{DS} = 100\text{ V}, I_D = 20\text{ A},$ $V_{GS} = 10\text{ V}$ (Note 3,4)	--	62	--	nC
Q_{gs}	Gate-Source Charge		--	16	--	nC
Q_{gd}	Gate-Drain Charge		--	18	--	nC

Source-Drain Diode Maximum Ratings and Characteristics

I_S	Continuous Source-Drain Diode Forward Current		--	--	40	A
I_{SM}	Pulsed Source-Drain Diode Forward Current		--	--	160	
V_{SD}	Source-Drain Diode Forward Voltage	$I_S = 40\text{ A}, V_{GS} = 0\text{ V}$	--	--	1.4	V
t_{rr}	Reverse Recovery Time	$I_S = 20\text{ A}, V_{GS} = 0\text{ V}$	--	185	--	ns
Q_{rr}	Reverse Recovery Charge	$di_F/dt = 100\text{ A}/\mu\text{s}$ (Note 3,4)	--	1.2	--	μC

NOTES:

1. Repetitive Rating: Pulse width limited by safe operating area
2. $L=1\text{ mH}, I_{AS}=40\text{ A}, V_{DD}=50\text{ V}, R_G=25\text{ }\Omega$, Starting $T_J=25^{\circ}\text{C}$
3. Pulse test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$
4. Essentially independent of operating temperature typical characteristics

Typical Electrical Characteristics Curves

Fig. 1 Typical Output Characteristics

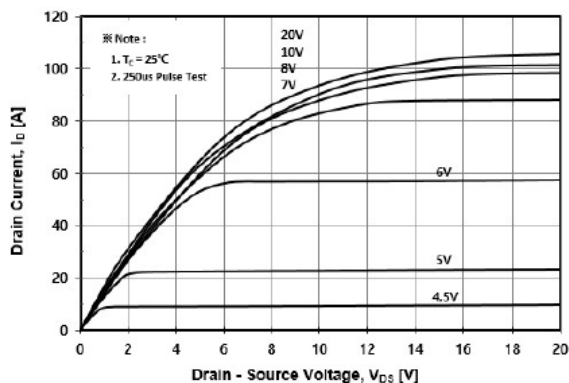


Fig. 2 Typical Transfer Characteristics

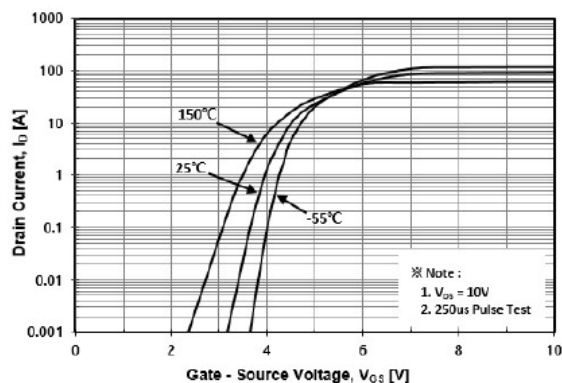


Fig.3 On-Resistance Variation with Drain Current and Gate Voltage

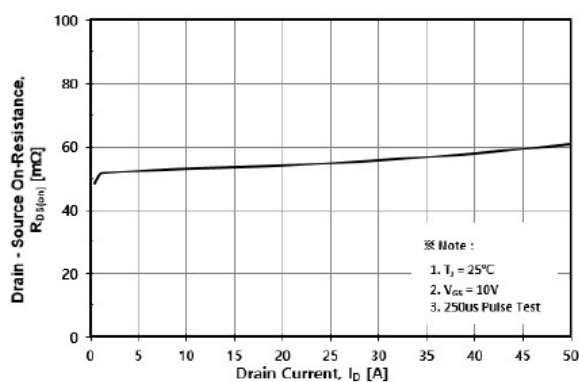


Fig. 4 Body Diode Forward Voltage Variation with Source Current

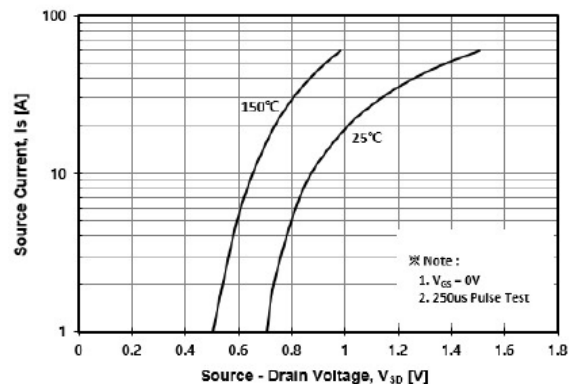


Fig. 5 Typical Capacitance Characteristics

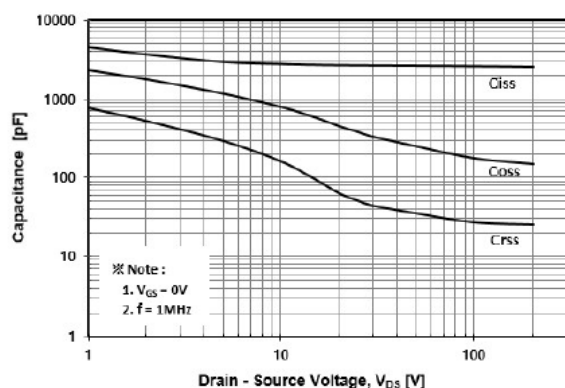
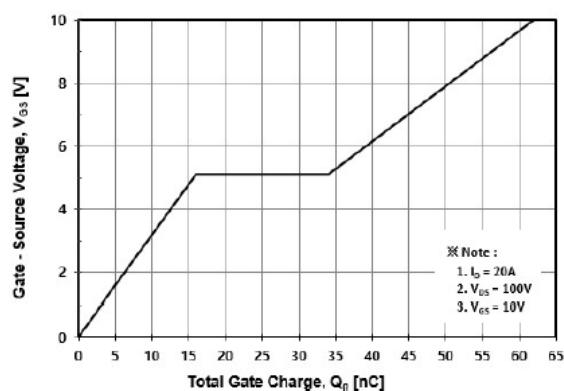


Fig. 6 Typical Total Gate Charge Characteristics



Typical Electrical Characteristics Curves

Fig. 7 Breakdown Voltage Variation vs. Temperature

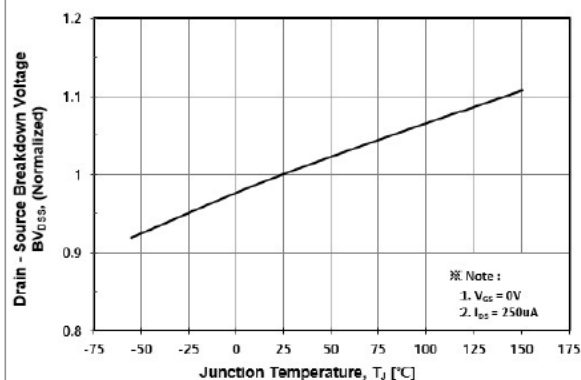


Fig. 8 On-Resistance Variation vs. Temperature

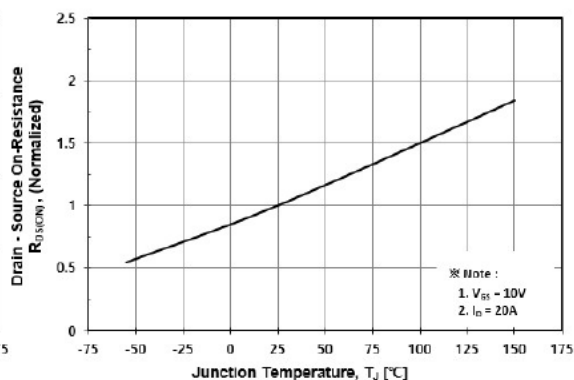


Fig. 9 Maximum Drain Current vs. Case Temperature

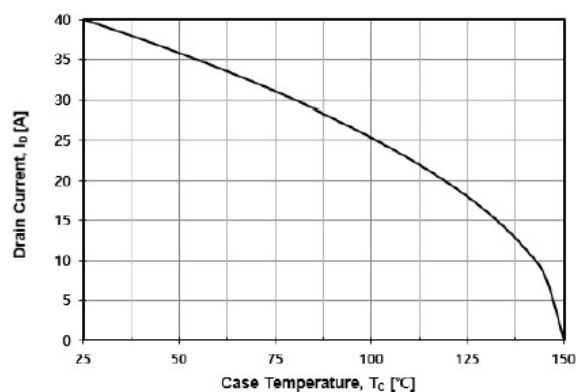


Fig. 10 Maximum Safe Operating Area

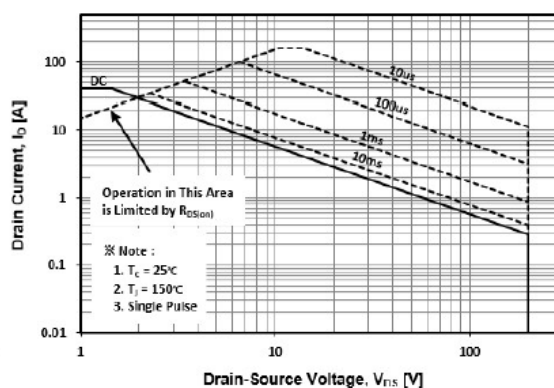


Fig. 11 Transient Thermal Impedance

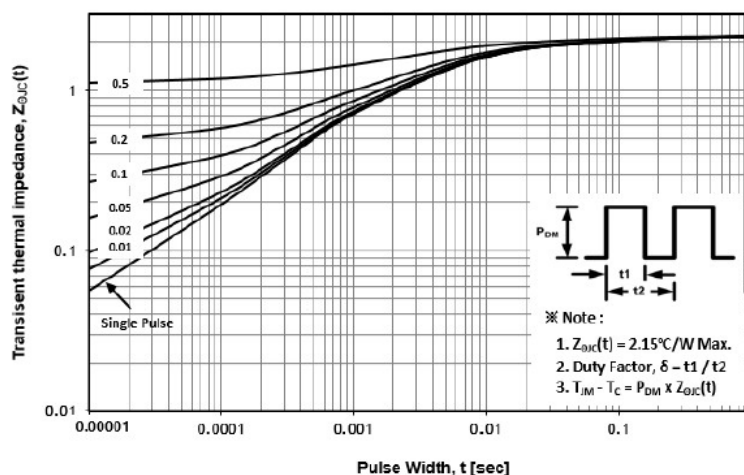


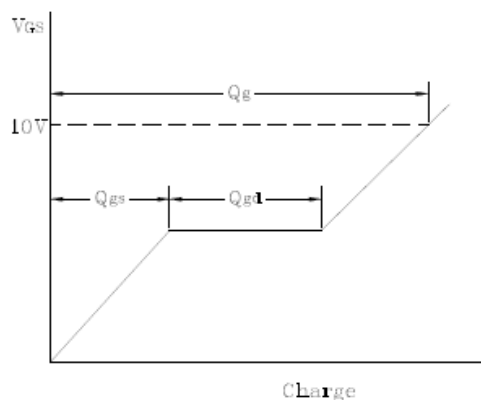
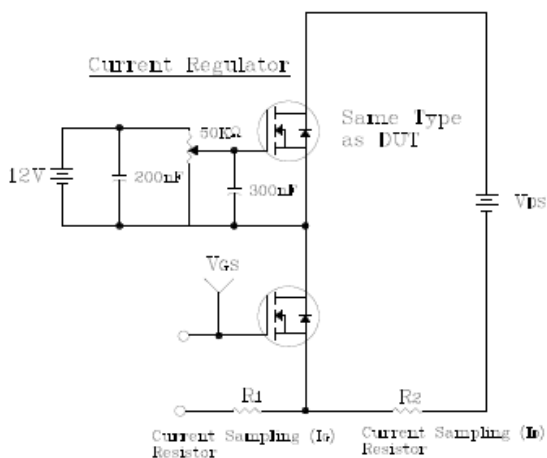
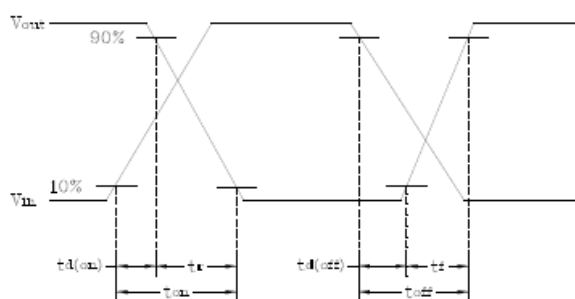
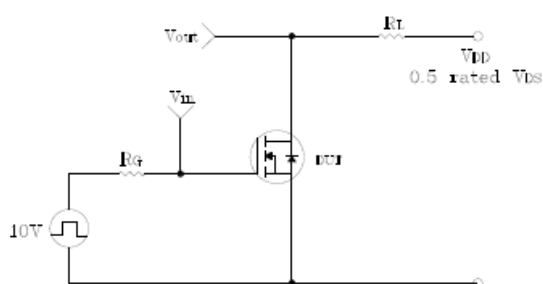
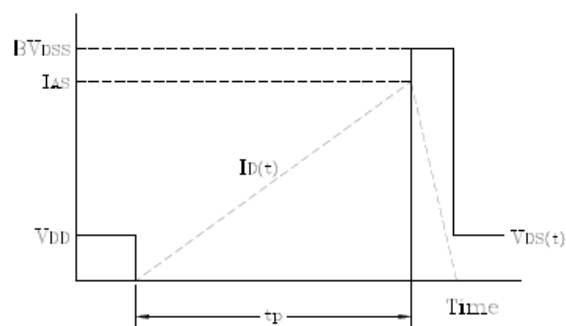
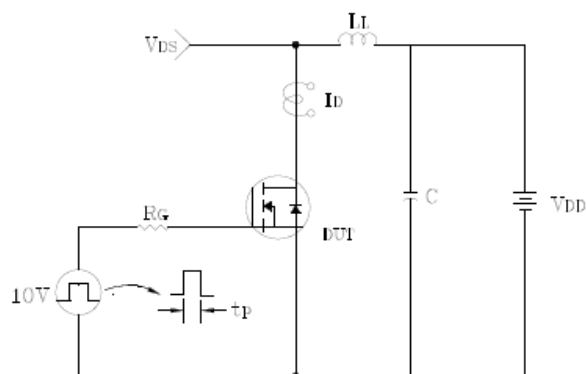
Fig. 12 Gate Charge Test Circuit & Waveform**Fig. 13 Resistive Switching Test Circuit & Waveform****Fig. 14 EAS Test Circuit & Waveform**

Fig. 15 Diode Reverse Recovery Time Test Circuit & Waveform

