

# TSA50N20M

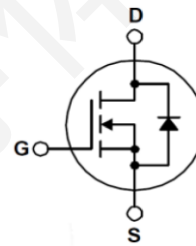
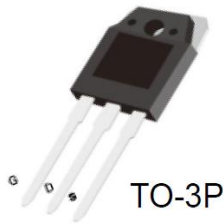
## 200V N-Channel MOSFET

### 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

- 50A,200V,Max.RDS(on)=0.051Ω @ VGS =10V
- Low gate charge: Qg=80nC (Typ.)
- Low drain-source On resistance: RDS(on)=51mΩ (Max.)
- 100% avalanche tested
- RoHS compliant device



### Absolute Maximum Ratings T<sub>c</sub>=25°C unless otherwise specified

Symbol	Parameter	Value	Units
V <sub>DSS</sub>	Drain-Source Voltage	200	V
V <sub>GS</sub>	Gate-Source Voltage	± 30	V
I <sub>D</sub>	Drain Current	T <sub>c</sub> = 25°C	50
		T <sub>c</sub> = 100°C	31.6
I <sub>DM</sub>	Pulsed Drain Current	200	A
E <sub>AS</sub>	Single Pulsed Avalanche Energy (Note 2)	1333	mJ
E <sub>AR</sub>	Repetitive Avalanche Energy (Note 1)	19.8	mJ
I <sub>AR</sub>	Repetitive Avalanche current (Note 1)	50	A
P <sub>D</sub>	Power Dissipation (T <sub>c</sub> = 25°C)	198	W
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Temperature Range	-55 to +150	°C

### Thermal Resistance Characteristics

Symbol	Parameter	Typ.	Max.	Units
R <sub>θJC</sub>	Thermal Resistance, Junction-to-Case	--	0.63	°C/W
R <sub>θJA</sub>	Thermal Resistance, Junction-to-Ambient	--	62.5	°C/W

### Electrical Characteristics T<sub>c</sub>=25 °C unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
--------	-----------	-----------------	-----	-----	-----	-------

#### On Characteristics

V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 uA	2.0	--	4.0	V
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> =25A	--	0.043	0.051	Ω
R <sub>g</sub>	Internal gate resistance	Open drain, f=1MHz	--	1	--	Ω

#### Off Characteristics

BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 uA	200	--	--	V
I <sub>DSS</sub>	Drain-source cut-off current	V <sub>DS</sub> = 200 V, V <sub>GS</sub> = 0 V	--	--	1	uA
		V <sub>DS</sub> = 160 V, T <sub>c</sub> = 125°C	--	--	100	uA
I <sub>GSSF</sub>	Gate-Body Leakage Current,Forward	V <sub>GS</sub> = 30 V, V <sub>DS</sub> = 0 V	--	--	100	nA
I <sub>GSSR</sub>	Gate-Body Leakage Current,Reverse	V <sub>GS</sub> =- 30 V, V <sub>DS</sub> = 0 V	--	--	-100	nA

#### Dynamic Characteristics

C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1.0 MHz	--	3800	--	pF
C <sub>oss</sub>	Output Capacitance		--	480	--	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		--	64	--	pF

#### Switching Characteristics

t <sub>d(on)</sub>	Turn-On Time	V <sub>DS</sub> = 100V, I <sub>D</sub> = 50 A, R <sub>G</sub> = 25 Ω (Note 4)	--	57	--	ns
t <sub>r</sub>	Turn-On Rise Time		--	28	--	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		--	169	--	ns
t <sub>f</sub>	Turn-Off Fall Time		--	44	--	ns
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =160 V, I <sub>D</sub> =50A, V <sub>GS</sub> = 10 V (Note 3,4)	--	80	--	nC
Q <sub>gs</sub>	Gate-Source Charge		--	18.5	--	nC
Q <sub>gd</sub>	Gate-Drain Charge		--	25.5	--	nC

#### Source-Drain Diode Maximum Ratings and Characteristics

I <sub>S</sub>	Continuous Source-Drain Diode Forward Current	--	--	50	A	
I <sub>SM</sub>	Pulsed Source-Drain Diode Forward Current	--	--	200		
V <sub>SD</sub>	Source-Drain Diode Forward Voltage	I <sub>S</sub> =50A, V <sub>GS</sub> = 0 V	--	--	1.5	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>S</sub> =50, V <sub>GS</sub> = 0 V di <sub>r</sub> /dt = -100 A/μs	--	282	--	ns
Q <sub>rr</sub>	Reverse Recovery Charge	(Note 3. 4)	--	2.3	--	uC

#### NOTES:

1. Repeated rating: Pulse width limited by safe operating area
2. L=0.8mH, I<sub>AS</sub>=50A, V<sub>DD</sub>=50V, R<sub>G</sub>=25Ω, Starting T<sub>J</sub>=25 °C
3. Pulse test: Pulse width≤300us, Duty cycle≤2%
4. Essentially Independent of Operating Temperature Typical Characteristics

Typical Characteristics

Fig. 1  $I_D - V_{DS}$

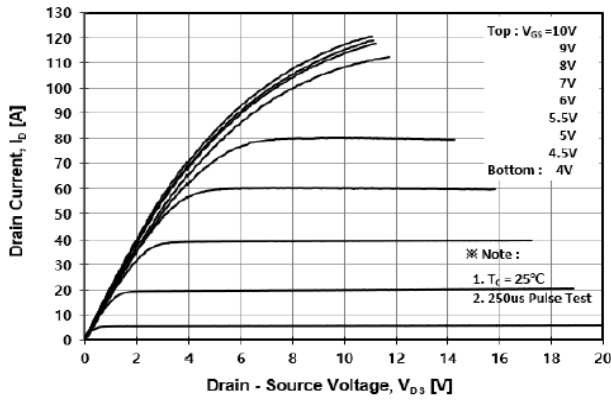


Fig. 2  $I_D - V_{GS}$

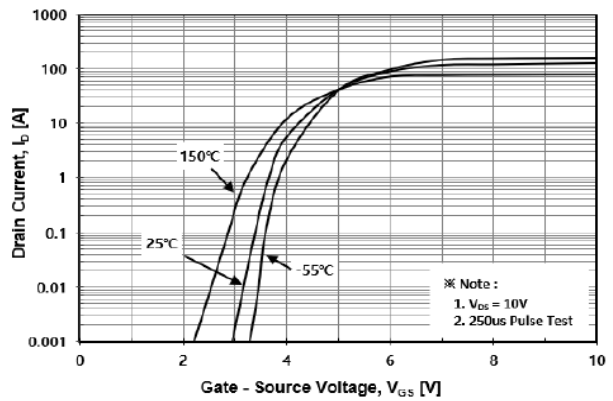


Fig. 3  $R_{DS(ON)} - I_D$

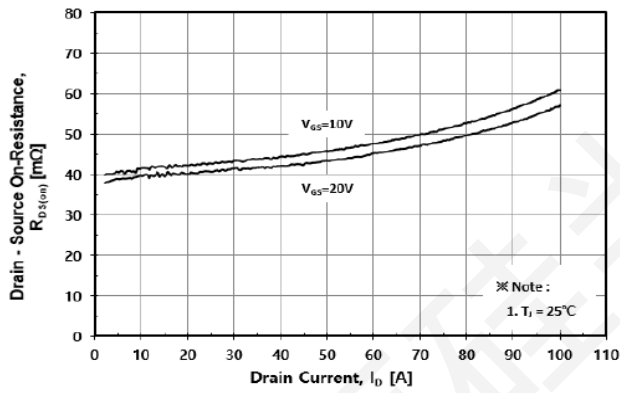


Fig. 4  $I_S - V_{SD}$

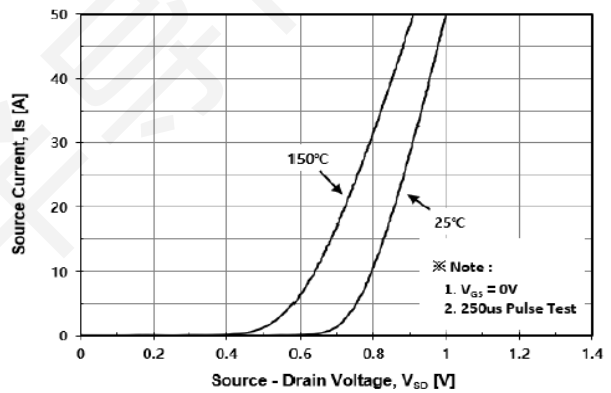


Fig. 5 Capacitance -  $V_{DS}$

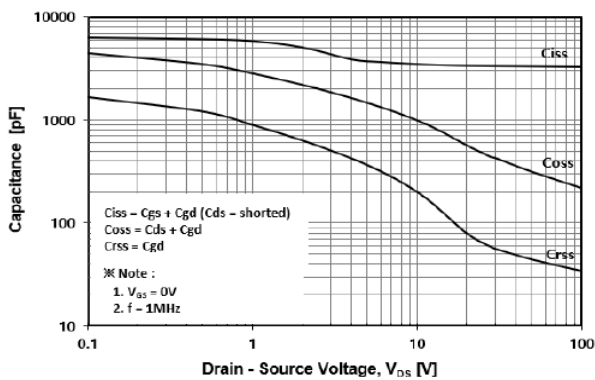
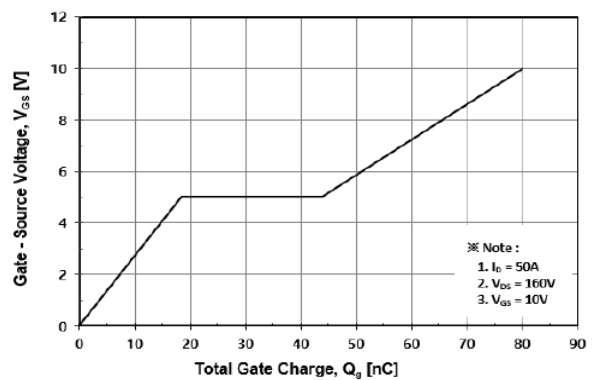


Fig. 6  $V_{GS} - Q_G$



Typical Characteristics Curve (Continue)

Fig. 7  $BV_{DSS} - T_J$

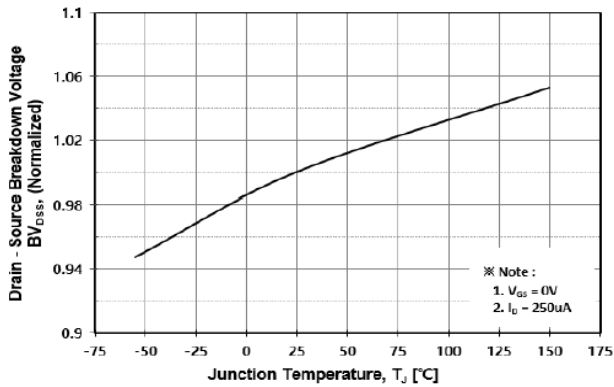


Fig. 8  $R_{DS(ON)} - T_J$

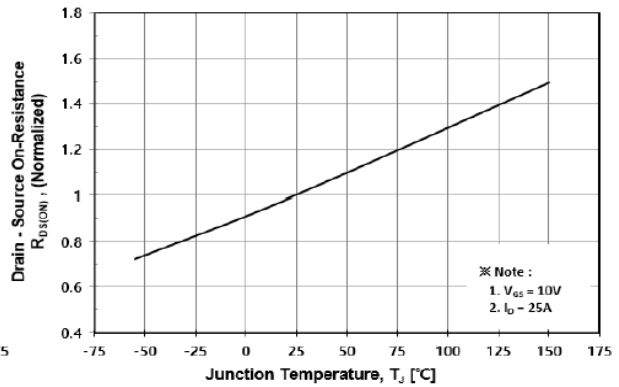


Fig. 9  $I_D - T_C$

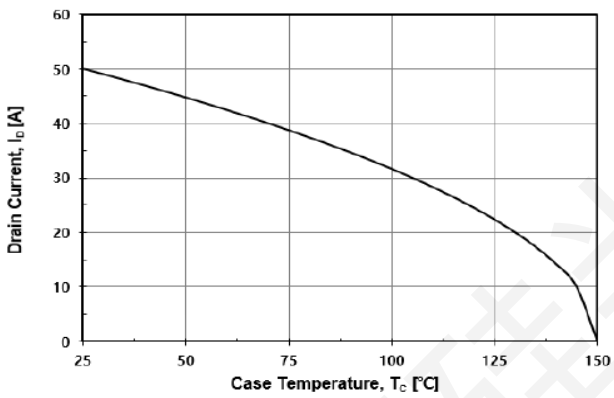


Fig. 10 Safe Operating Area

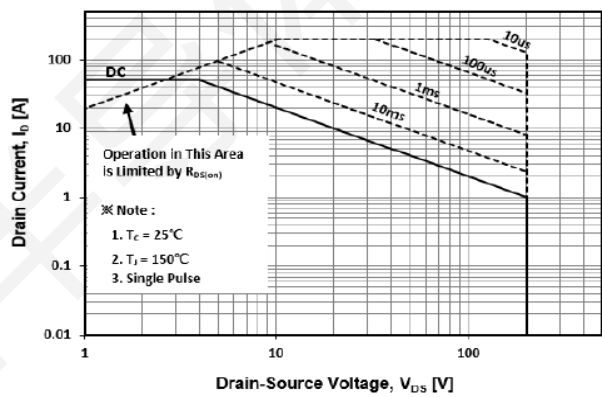


Fig. 11 Transient Thermal Impedance

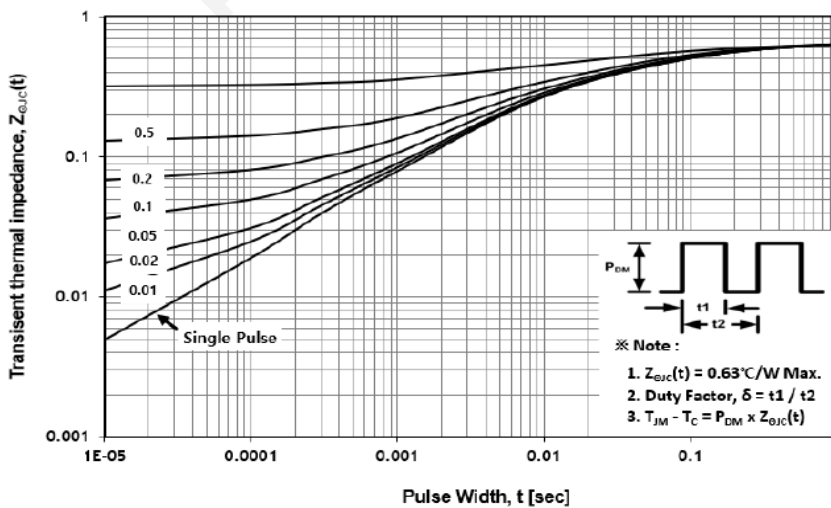


Fig. 12 Gate Charge Test Circuit & Waveform

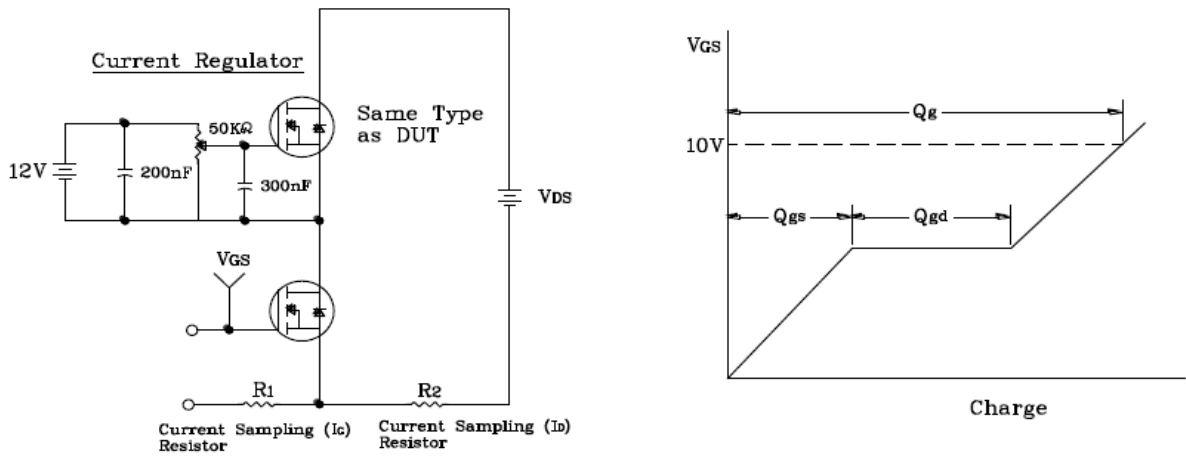


Fig. 13 Resistive Switching Test Circuit & Waveform

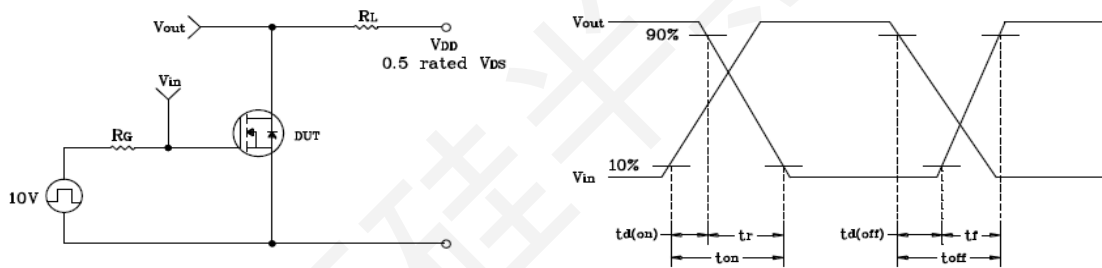


Fig. 14  $E_{AS}$  Test Circuit & Waveform

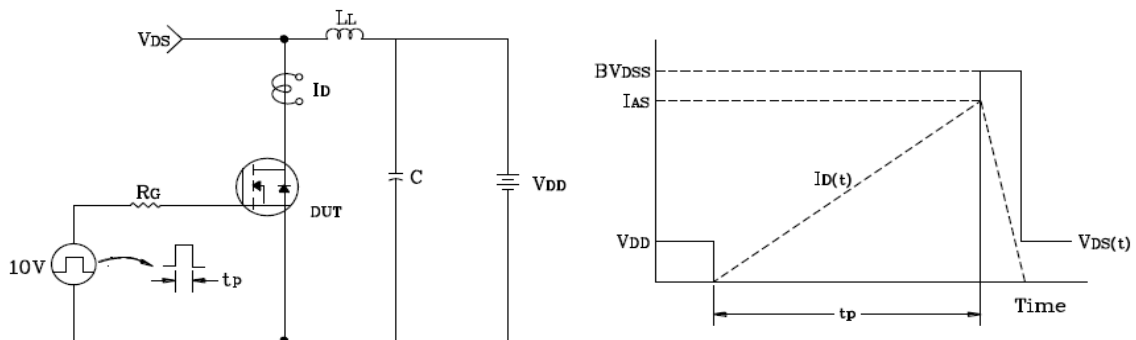


Fig. 15 Diode Reverse Recovery Time Test Circuit & Waveform

