TSF20N50M

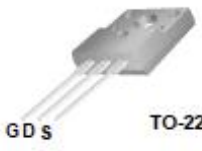
500V N-Channel MOSFET

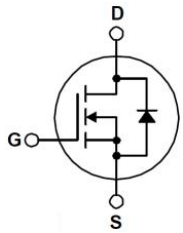
General Description

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

- 20A,500V,Max.$R_{DS(on)}$=0.28Ω @ V_{GS} =10V
- Low gate charge(typical 70nC)
- High ruggedness
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability





Absolute Maximum Ratings

T_J=25℃ unless otherwise specified

Symbol	Parameter		Value	Units
V_{DSS}	Drain-Source Voltage		500	V
V_{GS}	Gate-Source Voltage		± 30	V
I_D	Drain Current	T_C = 25℃	20	A
		T_C = 100℃	13	A
I_{DM}	Pulsed Drain Current		80	A
E_{AS}	Single Pulsed Avalanche Energy (L=0.4mH)		900	mJ
P_D	Power Dissipation (T_C = 25℃)		37	W
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +175	℃

Thermal Resistance Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Thermal Resistance,Junction-to-Case	--	3.4	℃/W
$R_{\theta JA}$	Thermal Resistance,Junction-to-Ambient	--	62.5	℃/W

Electrical Characteristics T_J=25 ℃ unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
On Characteristics						
V_{GS}	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 uA	2.0	--	4.0	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 20A	--	0.21	0.28	Ω
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 uA	500	--	--	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} =150V, V_{GS} = 0 V	--	--	1	uA
		V_{DS} = 150 V, T_J = 100℃	--	--	100	uA
I_{GSSF}	Gate-Body Leakage Current,Forward	V_{GS} = 20 V, V_{DS} = 0 V	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current,Reverse	V_{GS} =- 20 V, V_{DS} = 0 V	--	--	-100	nA
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 75V, V_{GS} = 0 V, f = 1.0 MHz	--	3900	--	pF
C_{oss}	Output Capacitance		--	400	--	pF
C_{rss}	Reverse Transfer Capacitance		--	40	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Time	V_{DS} = 75 V, I_D = 20A, R_G = 10 Ω	--	100	--	ns
t_r	Turn-On Rise Time		--	400	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	100	--	ns
t_f	Turn-Off Fall Time		--	100	--	ns
Q_g	Total Gate Charge	V_{DS} = 75 V, I_D = 20A, V_{GS} = 10 V	--	70	--	nC
Q_{gs}	Gate-Source Charge		--	18	--	nC
Q_{gd}	Gate-Drain Charge		--	35	--	nC
Source-Drain Diode Maximum Ratings and Characteristics						
I_S	Continuous Source-Drain Diode Forward Current		--	--	20	A
I_{SM}	Pulsed Source-Drain Diode Forward Current		--	--	80	
V_{SD}	Source-Drain Diode Forward Voltage	I_S = 20A, V_{GS} = 0 V	--	--	1.5	V
t_{rr}	Reverse Recovery Time	I_S =20A, V_{GS} = 0 V di_F/dt = 100 A/μs	--	500	--	ns
Q_{rr}	Reverse Recovery Charge		--	7.2	--	uC

Typical Characteristics

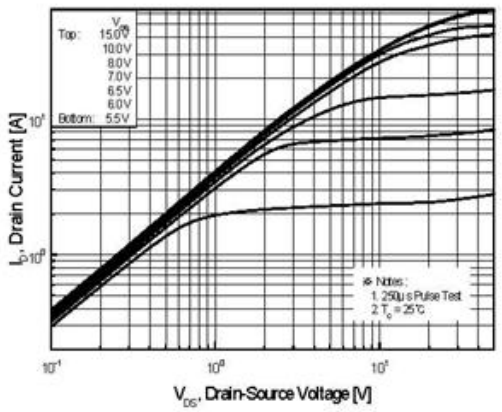


Figure 1. On-Region Characteristics

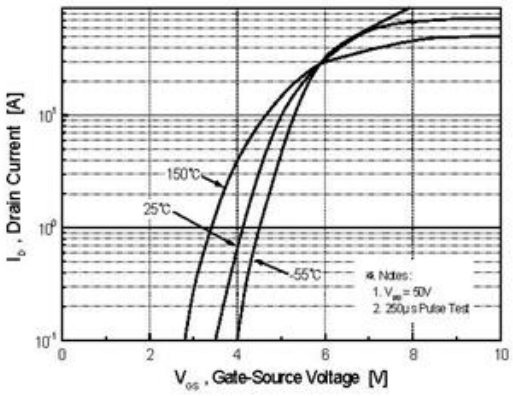


Figure 2. Transfer Characteristics

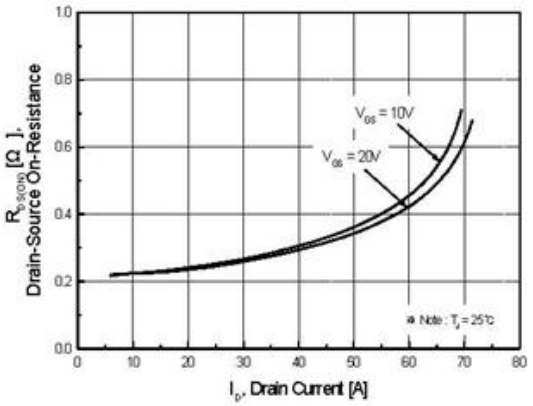


Figure 3. On-Resistance Variation vs

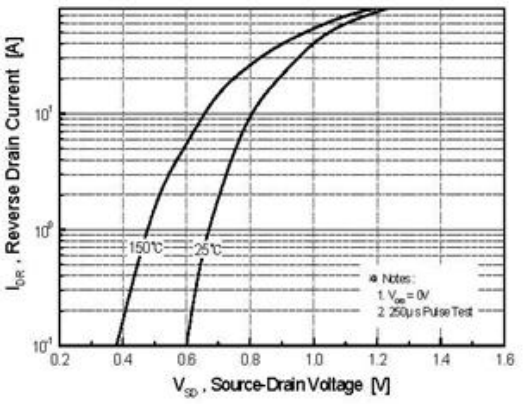


Figure 4. Body Diode Forward Voltage

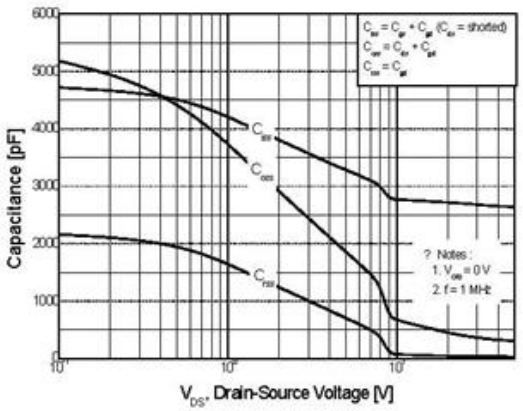


Figure 5. Capacitance Characteristics

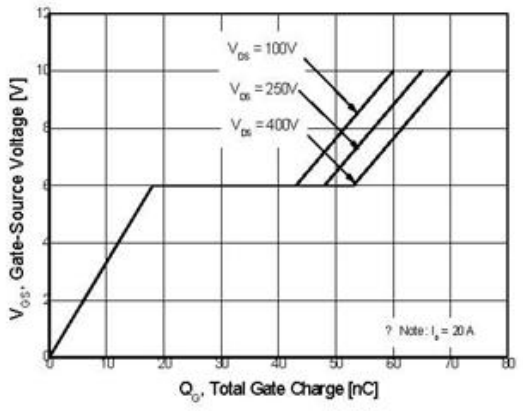


Figure 6. Gate Charge Characteristics

Typical Characteristics

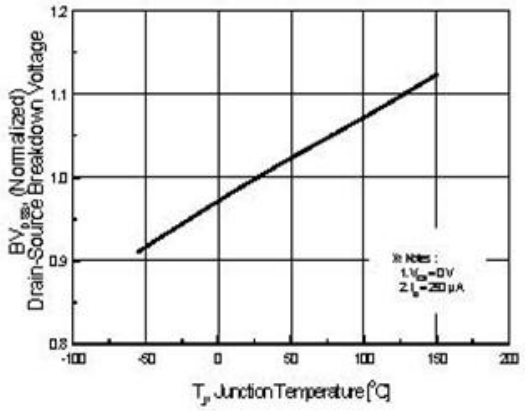


Figure 7. Breakdown Voltage Variation

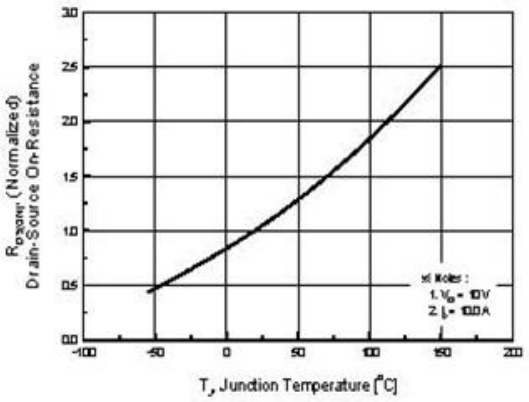


Figure 8. On-Resistance Variation

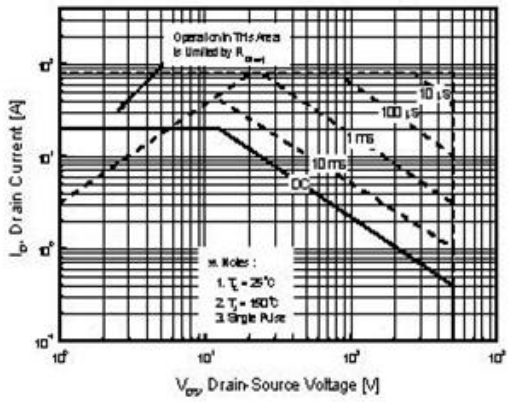


Figure 9. Maximum Safe Operating Area

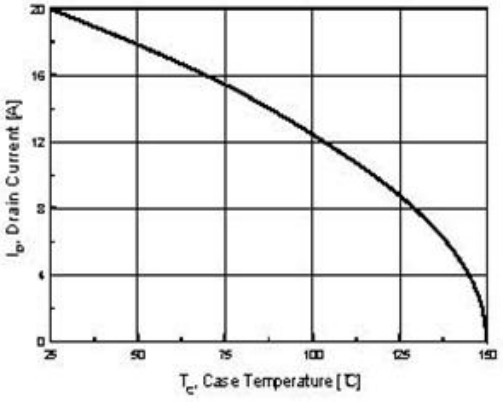


Figure 10. Maximum Drain Current vs Case Temperature

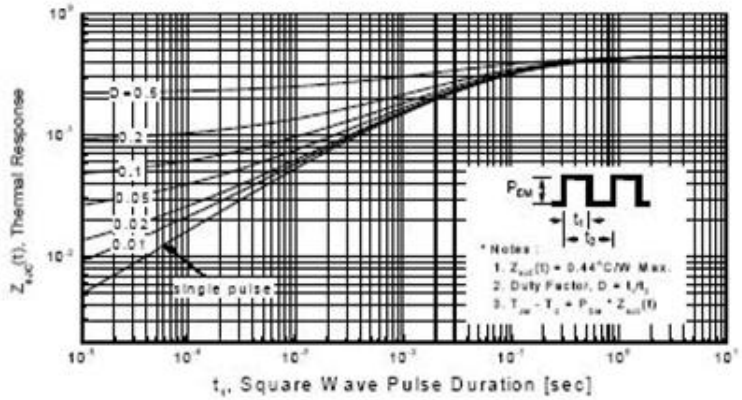
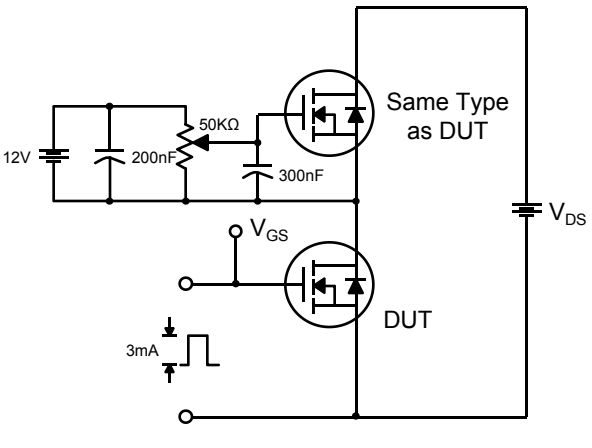


Figure 11. Transient Thermal Response Curve

Fig 12. Gate Charge Test Circuit & Waveform



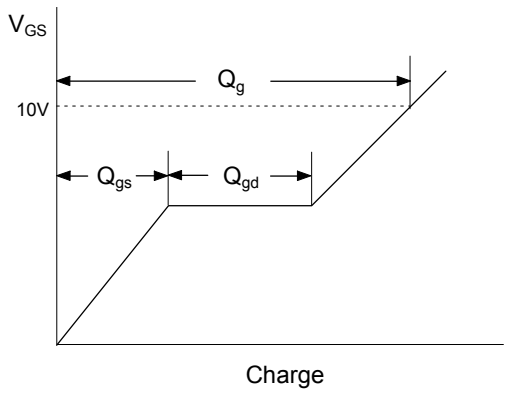
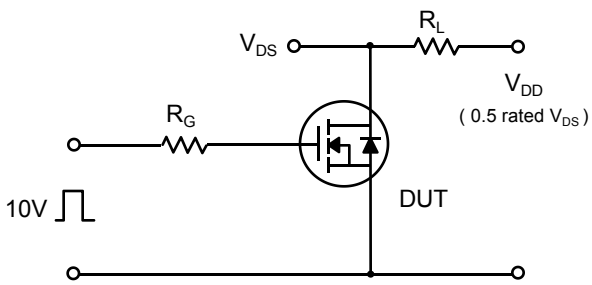


Fig 13. Resistive Switching Test Circuit & Waveforms



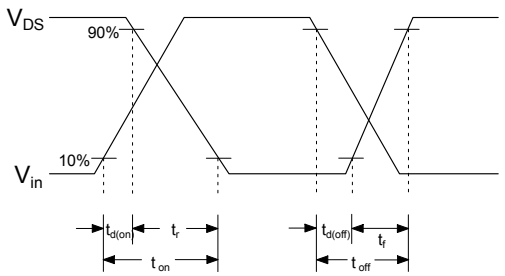
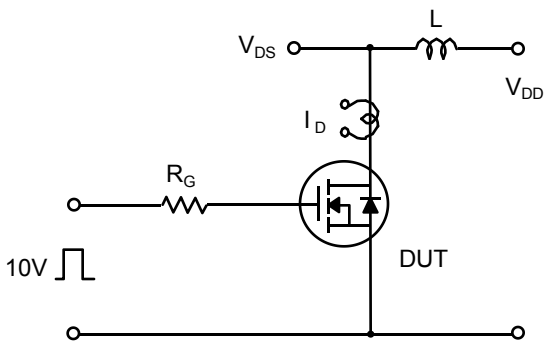


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms



$$E_{AS} = \frac{1}{2} L_L I_{AS}^2$$

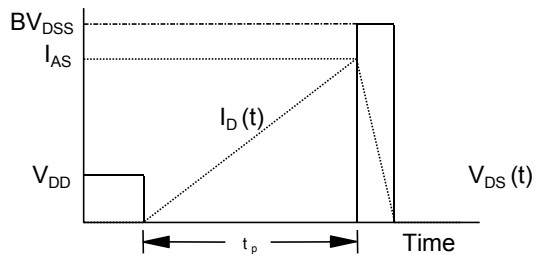
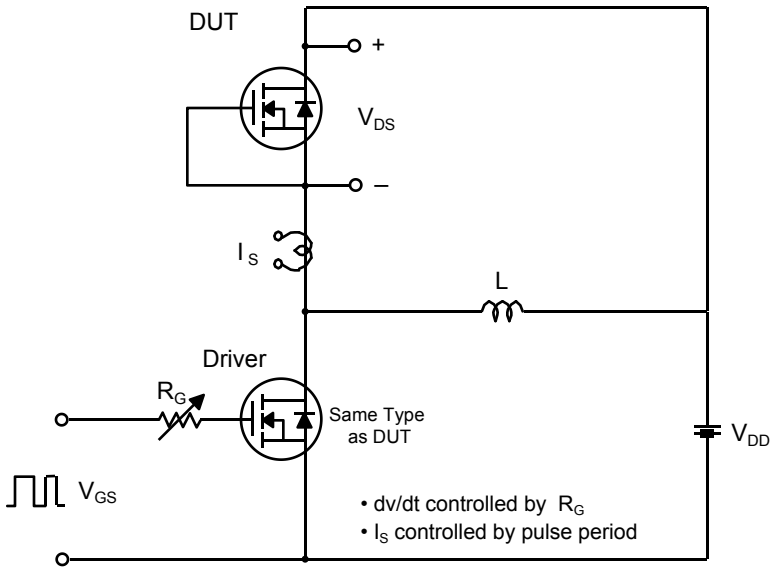
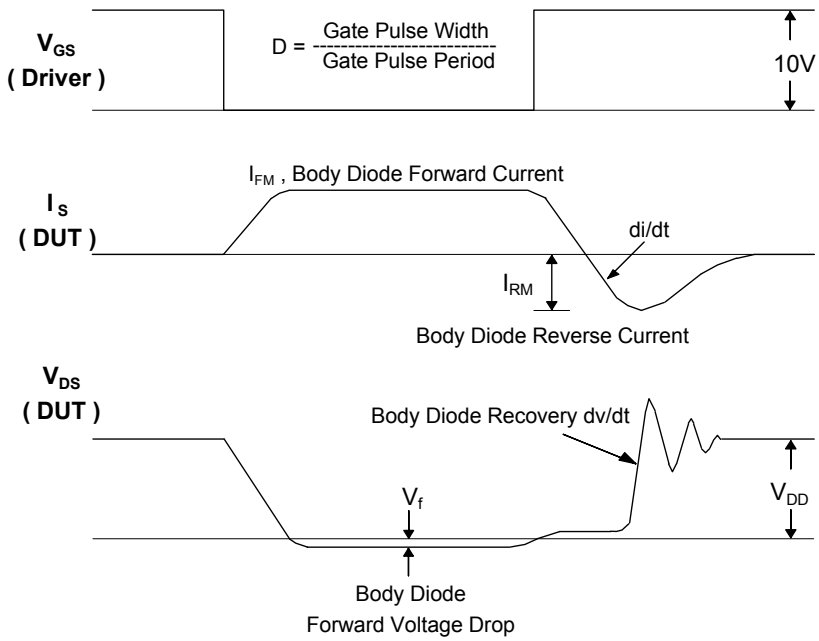


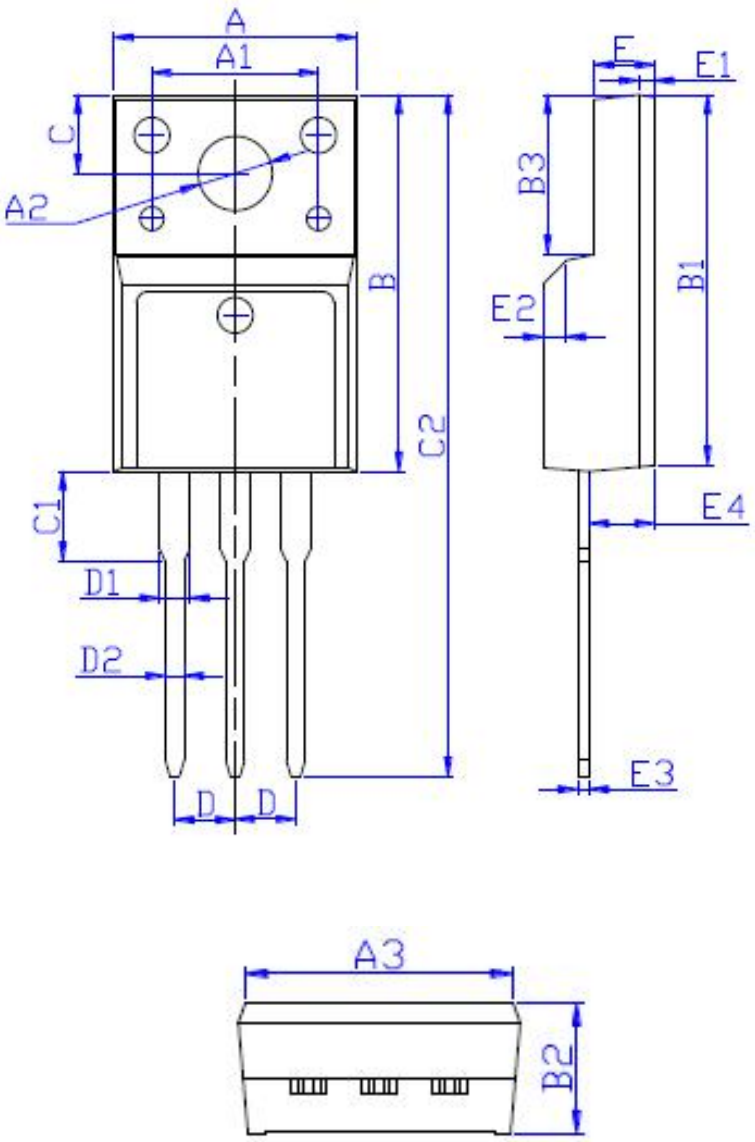
Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms





Package Dimension

TO-220F



DIM	MILLIMETERS
A	10.16±0.30
A1	7.00±0.20
A2	3.12±0.20
A3	9.70±0.30
B	15.90±0.50
B1	15.60±0.50
B2	4.70±0.30
B3	6.70±0.30
C	3.30±0.25
C1	3.25±0.30
C2	28.70±0.50
D	Typical 2.54
D1	1.47 (MAX)
D2	0.80±0.20
E	2.55±0.25
E1	0.70±0.25
E2	1.0×45°
E3	0.50±0.20
E4	2.75±0.30