TSF65R380WT

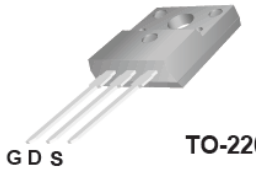
650V 11A N-Channel SJ-MOSFET

General Description

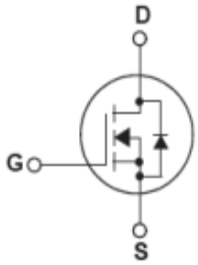
Truesemi SJ-FET is new generation of high voltage MOSFET family that is utilizing an advanced charge balance mechanism for outstanding low on-resistance and lower gate charge performance.
This advanced technology has been tailored to minimize conduction loss, provide superior switching performance, and withstand extreme dv/dt rate and higher avalanche energy.
SJ-FET is suitable for various AC/DC power conversion in switching mode operation for higher efficiency.

Features

- 700V @TJ = 150 ℃
- Max. RDS(on) = 0.38Ω
- Ultra Low gate charge (typ. Qg = 17.5nC)
- 100% avalanche tested



TO-220F



Absolute Maximum Ratings

T_C=25℃ unless otherwise specified

Symbol	Parameter	Value	Unit
V_{DSS}	Drain-Source Voltage	650	V
I_D	Drain Current -Continuous (T_C = 25℃) -Continuous (T_C = 100℃)	11* 7*	A
I_{DM}	Drain Current – Pulsed (Note 1)	33*	A
V_{GSS}	Gate-Source voltage	±30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	270	mJ
P_D	Power Dissipation (T_C = 25℃)	31	W
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	℃
T_L	Maximum Lead Temperature for Soldering Purpose,1/8” from Case for 5 Seconds	300	℃

* Drain current limited by maximum junction temperature.

Thermal Characteristics

Symbol	**Parameter**	Typ.	Max.	**Unit**
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	--	4.0	℃/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	62.5	℃/W

Electrical Characteristics T_J = 25℃ unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 250μA,	650	--	--	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 650V, V_{GS} = 0V T_J = 25℃ V_{DS} = 520V, V_{GS} = 0V T_J = 125℃	--	--	10 100	μA μA
I_{GSS}	Gate-Body Leakage Current,	V_{GS} = ±30V, V_{DS} = 0V	--	--	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250μA	2.0	--	4.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10V, I_D = 3.2A	--	0.33	0.38	Ω
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 50V, V_{GS} = 0V, f = 1.0MHz	--	900	1170	pF
C_{oss}	Output Capacitance		--	54	70	pF
C_{rss}	Reverse Transfer Capacitance		--	7.0	9.5	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DS} = 325V, I_D = 11A R_G = 25Ω	--	30	70	ns
t_r	Turn-On Rise Time		--	17	44	ns
$t_{d(off)}$	Turn-Off Delay Time		--	70	150	ns
t_f	Turn-Off Fall Time		--	17	44	ns
Q_g	Total Gate Charge	V_{DS} = 520V, I_D = 11A V_{GS} = 10V	--	17.5	23	nC
Q_{gs}	Gate-Source Charge		--	5.0	--	nC
Q_{gd}	Gate-Drain Charge		--	5.5	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	11	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	33	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0V, I_F = 11A	--	--	1.4	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0V, I_F = 11A di_F/dt =100A/μs	--	220	--	ns
Q_{rr}	Reverse Recovery Charge		--	2.0	--	μC

NOTES:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. I_{AS}=3.5A, V_{DD}=50V, R_G=25Ω , Starting TJ=25 ℃
3. Pulse Test: Pulse width ≤ 300us, Duty Cycle ≤ 2%

Typical Performance Characteristics

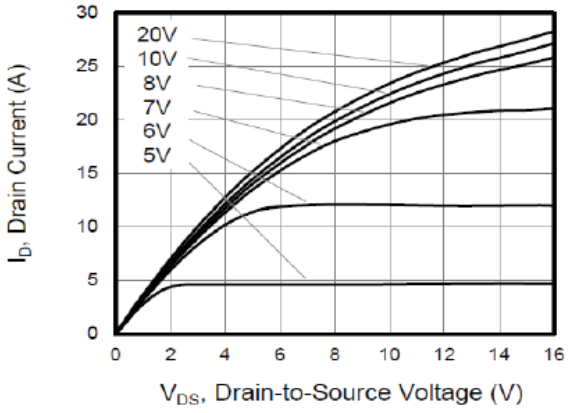


Figure 1. On Region Characteristics

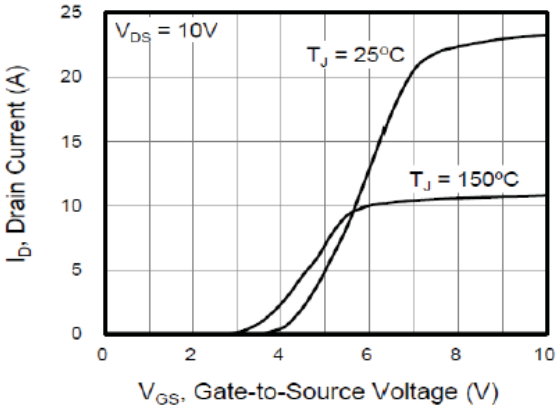


Figure 2. Transfer Characteristics

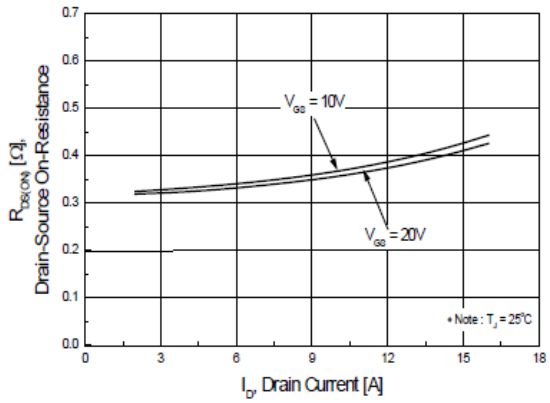


Figure 3. On Resistance Variation vs Drain Current and Gate Voltage

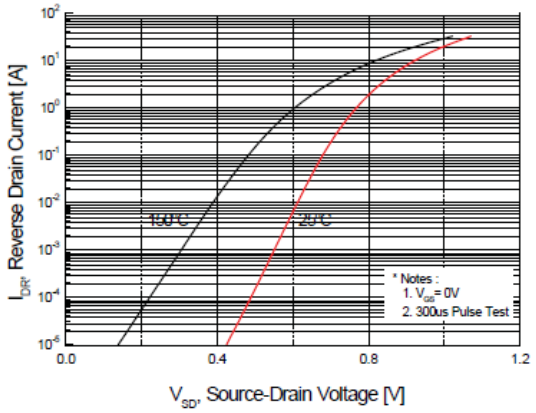


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

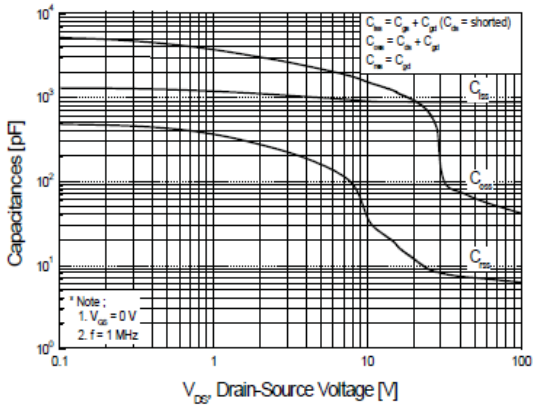


Figure 5. Capacitance Characteristics

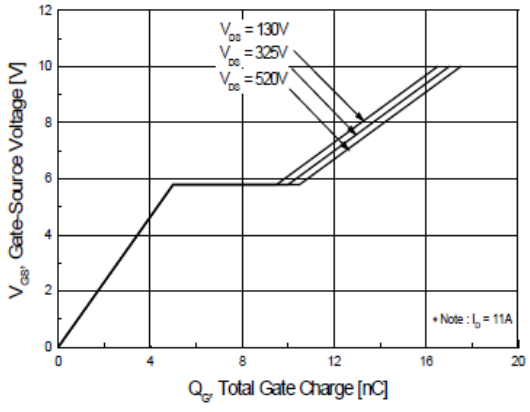


Figure 6. Gate Charge Characteristics

Typical Performance Characteristics

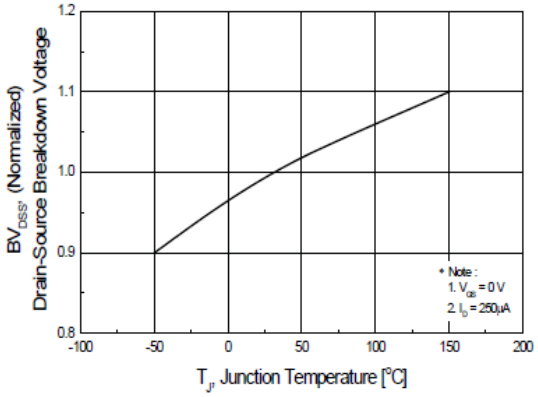


Figure 7. Breakdown Voltage Variation vs Temperature

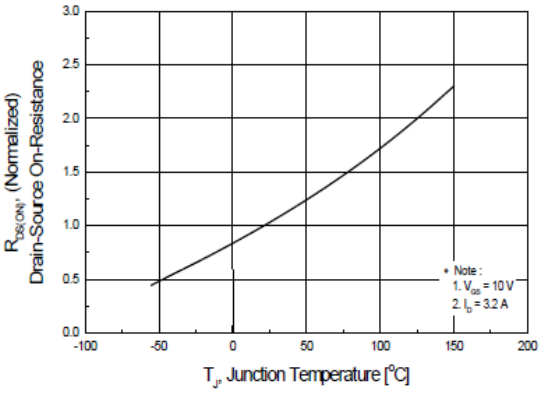


Figure 8. On-Resistance Variation vs Temperature

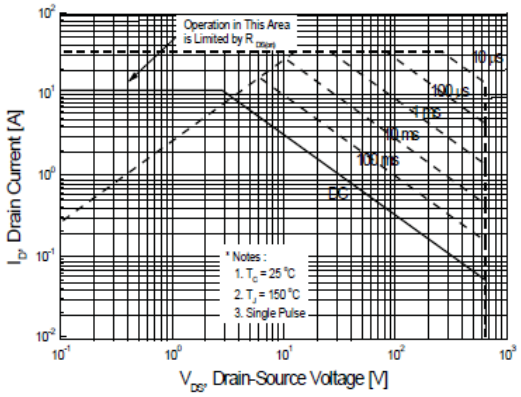


Figure 9. Maximum Safe Operating Area

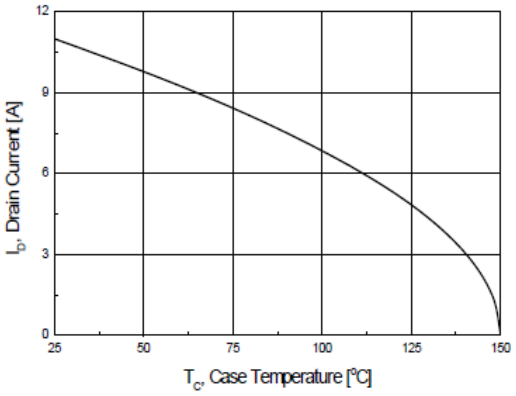


Figure 10. Maximum Drain Current vs Case Temperature

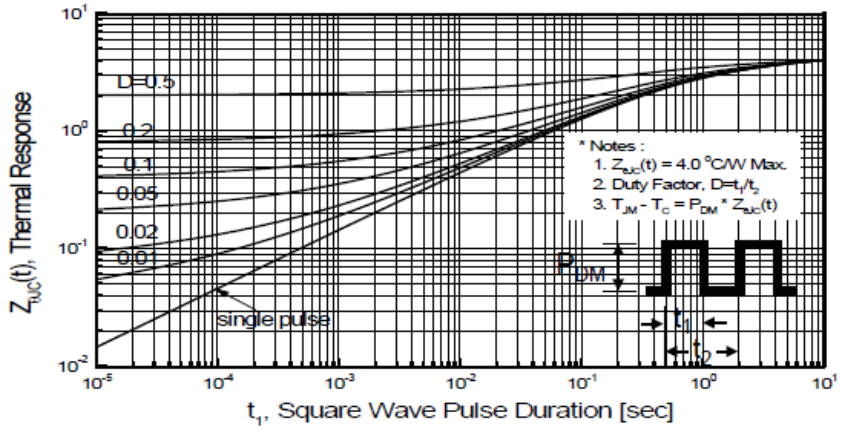
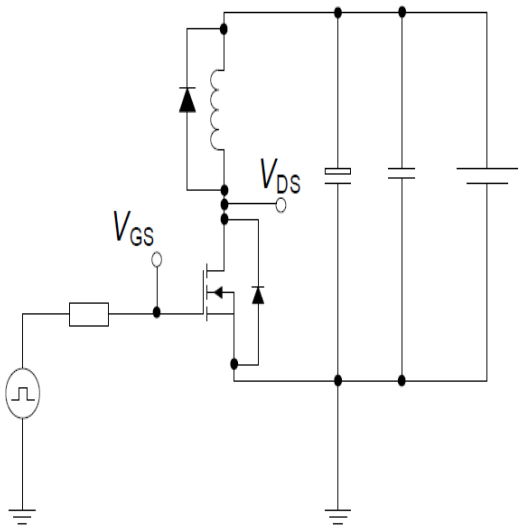


Figure 11. Transient Thermal Response Curve

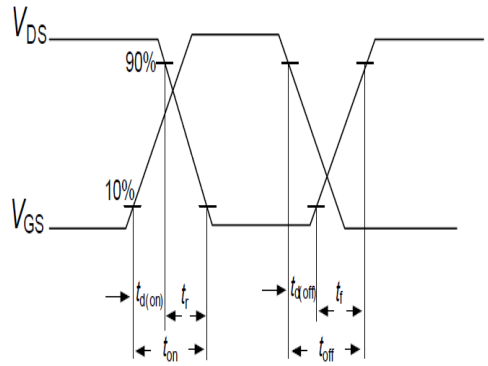
Test circuits

Switching times test circuit and waveform for inductive load

Switching times test circuit for inductive load

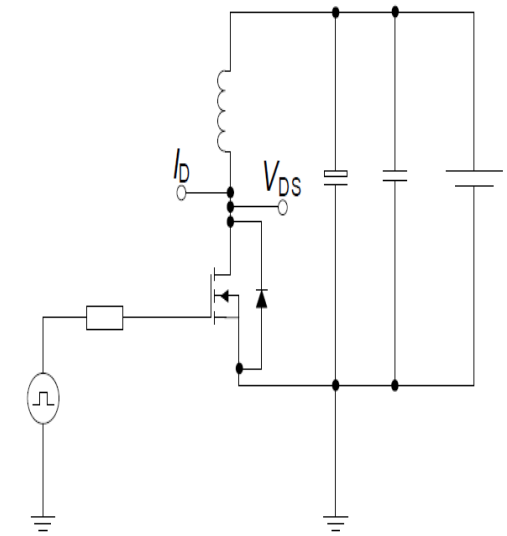


Switching time waveform

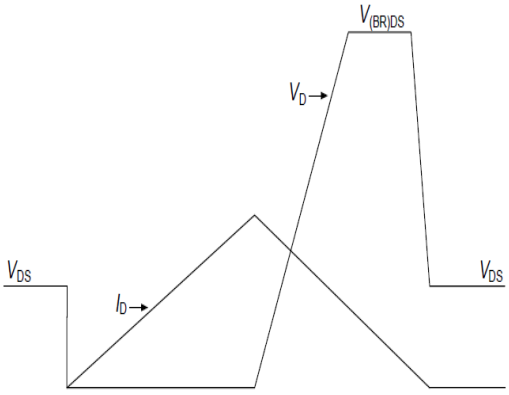


Unclamped inductive load test circuit and waveform

Unclamped inductive load test circuit



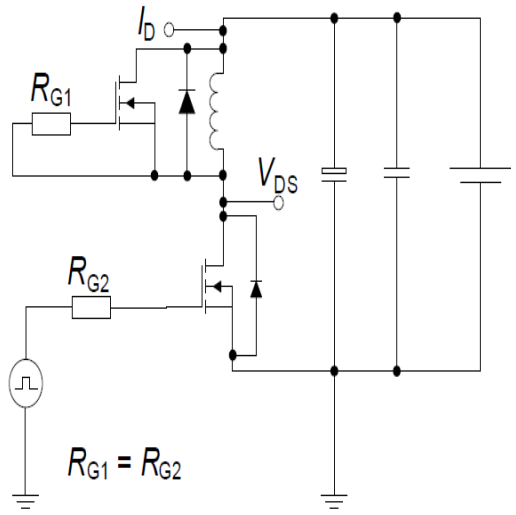
Unclamped inductive waveform



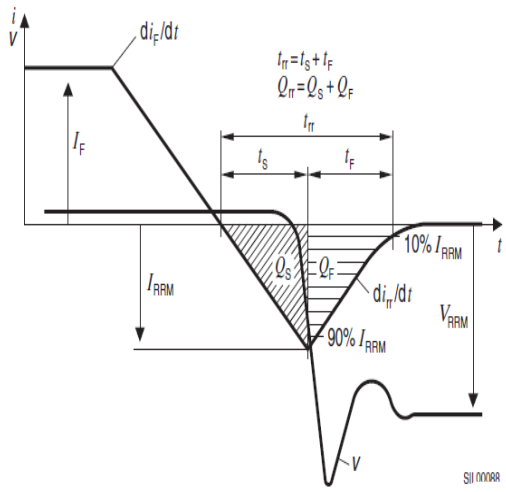
Test circuits

Test circuit and waveform for diode characteristics

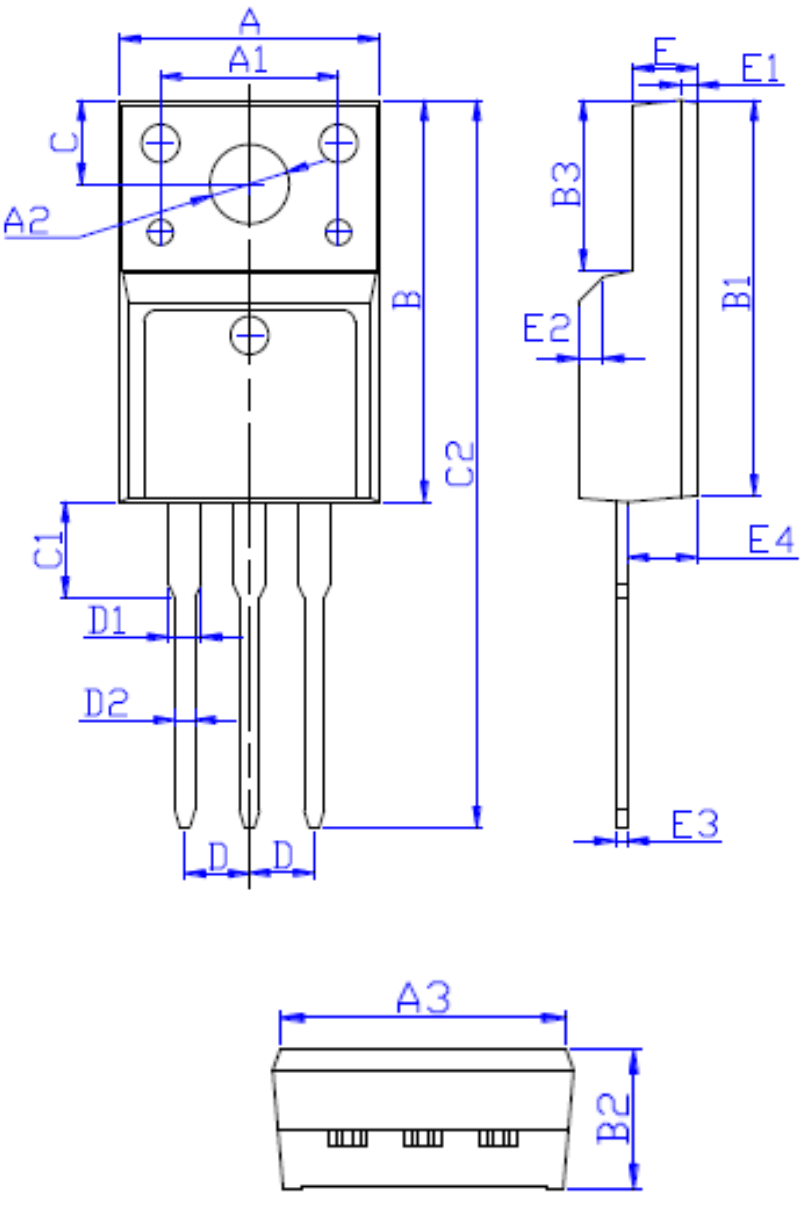
Test circuit for diode characteristics



Diode recovery waveform



Package Outline 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