![Truesemi logo]

TSP70R340S1
## 700V 15A 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.
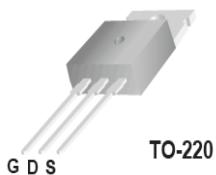
Features

• 750V @TJ = 150 ℃
• Typ. RDS(on) = 0.3Ω
• Ultra Low gate charge (typ. Qg = 43nC)
• 100% avalanche tested

TO-220

G D S
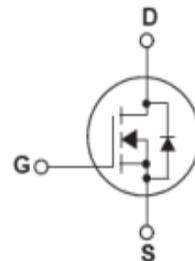
Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V_{DSS}	Drain-Source Voltage	700	V
I_D	Drain Current -Continuous (TC = 25℃) -Continuous (TC = 100℃)	15* 9.4*	A
I_{DM}	Drain Current – Pulsed (Note 1)	45	A
V_{GSS}	Gate-Source voltage	±30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	284	mJ
I_{AR}	Avalanche Current (Note 1)	2.4	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	0.43	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	15	V/ns
P_D	Power Dissipation (TC = 25℃)	104	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	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	1.2	℃/W
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink Typ.	0.5	℃/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62	℃/W

Electrical Characteristics TC = 25℃ unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0V$, $I_D = 250\mu A$, $T_J = 25℃$	700	--	--	V
		$V_{GS} = 0V$, $I_D = 250\mu A$, $T_J = 150℃$	--	750	--	V
$\Delta BV_{DSS} / \Delta_{TJ}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu A$, Referenced to 25℃	--	0.6	--	V/℃
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 700V$, $V_{GS} = 0V$ $-T_J = 150℃$	--	-- 10	1 --	μA μA
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS} = 30V$, $V_{DS} = 0V$	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = -30V$, $V_{DS} = 0V$	--	--	-100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250\mu A$	2.5	--	4.5	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10V$, $I_D = 7.5A$	--	0.3	0.34	Ω
g_{FS}	Forward Trans conductance	$V_{DS} = 40V$, $I_D = 15 A$ (Note 4)	--	12	--	S
R_g	Gate resistance	f=1MHz,open drain	--	3.5	--	Ω
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS} = 25V$, $V_{GS} = 0V$, f = 1.0MHz	--	800	--	pF
C_{oss}	Output Capacitance		--	340	--	pF
C_{rss}	Reverse Transfer Capacitance		--	10	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 400V$, $I_D = 7.5A$ $R_G = 20\Omega$(Note 4, 5)	--	13	--	ns
t_r	Turn-On Rise Time		--	11	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	100	--	ns
t_f	Turn-Off Fall Time		--	12	--	ns
Q_g	Total Gate Charge	$V_{DS} = 480V$, $I_D = 7.5A$ $V_{GS} = 10V$ (Note 4, 5)	--	43	--	nC
Q_{gs}	Gate-Source Charge		--	5	--	nC
Q_{gd}	Gate-Drain Charge		--	22	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	15	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	40	A
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0V$, $I_F = 7.5A$	--	0.9	1.5	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0V$, $I_F = 7.5A$ $di_F/dt = 100A/\mu s$ (Note 4)	--	345	--	ns
Q_{rr}	Reverse Recovery Charge		--	4.5	--	μC

NOTES:
1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. I_{AS}=2.4A, V_{DD}=50V, Starting TJ=25 ℃
3. I_{SD}≤15A, di/dt ≤ 200A/us, V_{DD} ≤ BV_{DSS}, Starting TJ = 25 ℃
4. Pulse Test: Pulse width ≤ 300us, Duty Cycle ≤ 2%
5. Essentially Independent of Operating Temperature Typical Characteristics

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# Typical Performance Characteristics
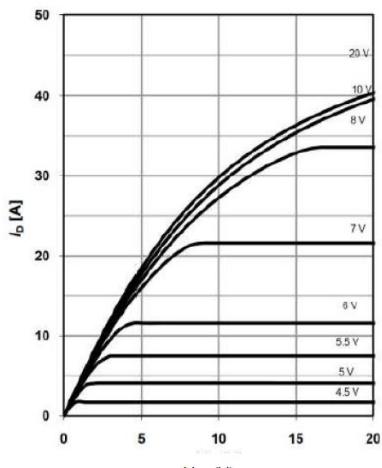
Figure 1: On-Region Characteristics@25°C
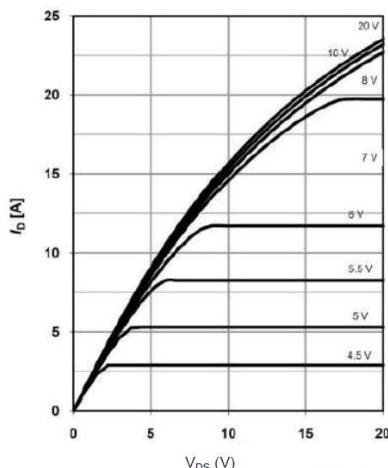
Figure 2: On-Region Characteristics@125°C
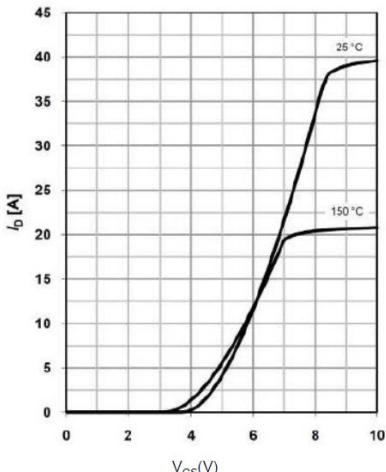

Figure 3: Transfer Characteristics
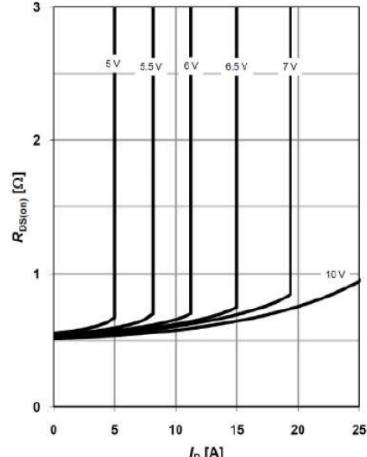
Figure 4: On-Resistance vs. Drain Current and Gate Voltage, T_j=125°C
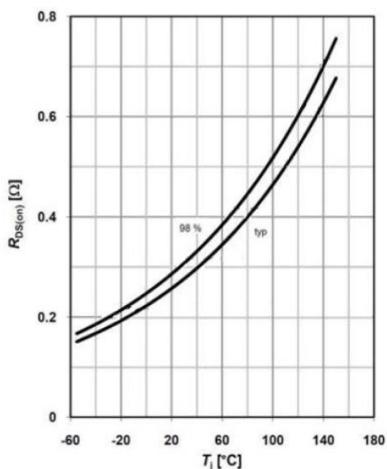
Figure 5: On-Resistance vs. Junction Temperature
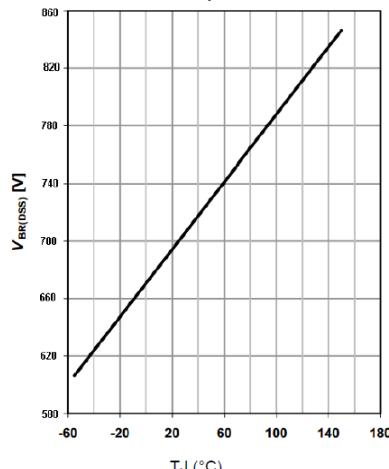
Figure 6: Break Down vs. Junction Temperature

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# Typical Performance Characteristics
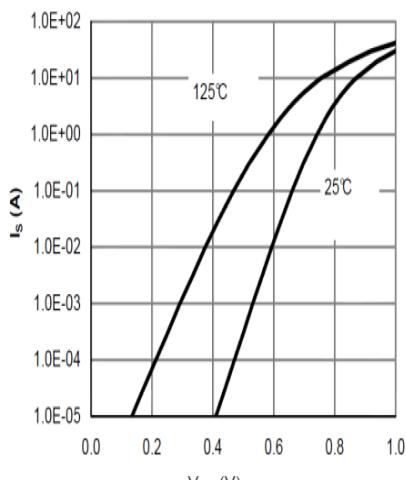
Figure 7: Body-Diode Characteristics
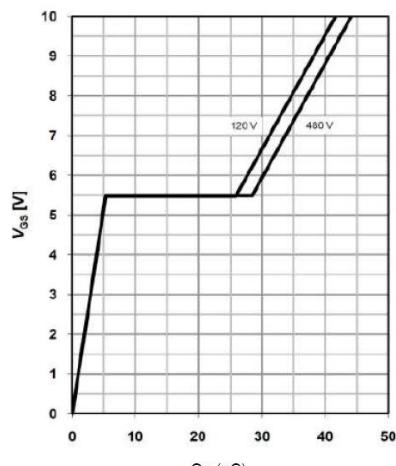
Figure 8: Gate-Charge Characteristics
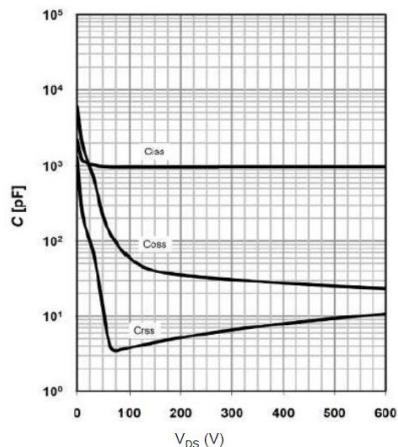
Figure 9: Capacitance Characteristics
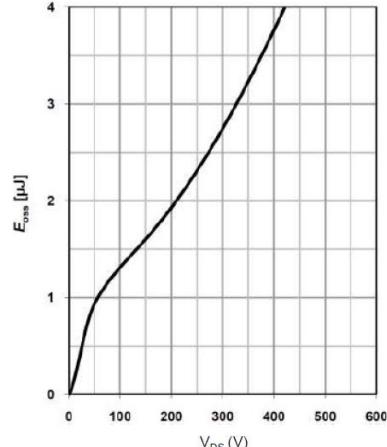
Figure 10: C_{oss} stored Energy
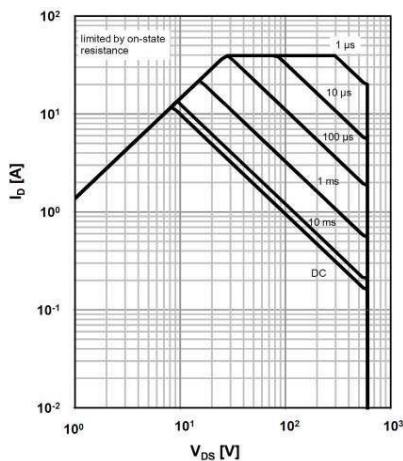
Figure 11:Maximum Forward Biased Safe Operating Area,T_C =25℃
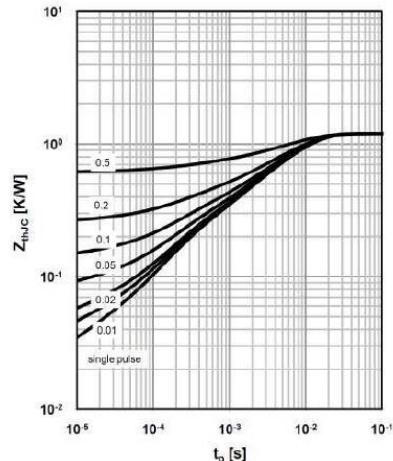
Figure 12: Max. Transient thermal impedance

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Typical Performance Characteristics
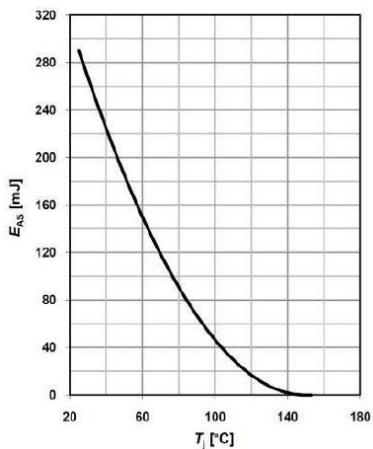
Figure 13:Avalanche energy

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Test circuits

Switching times test circuit and waveform for inductive load

Switching times test circuit for inductive load
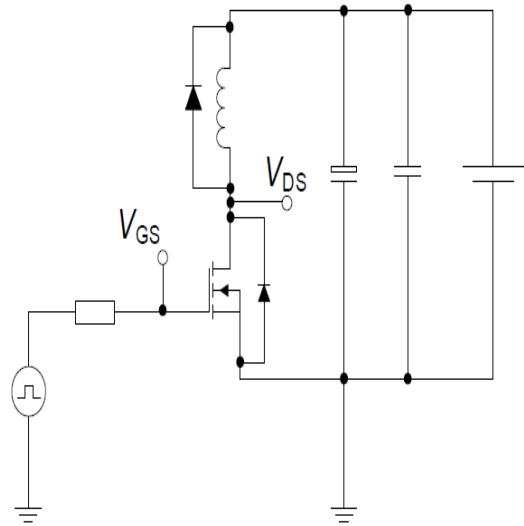
Switching time waveform
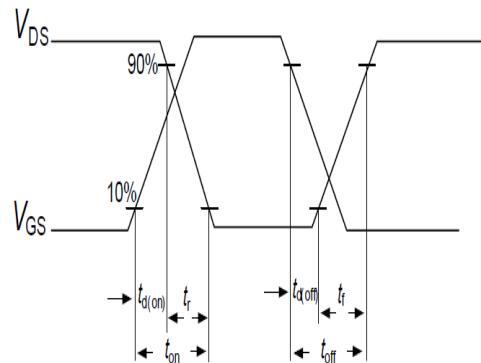
Unclamped inductive load test circuit and waveform

Unclamped inductive load test circuit
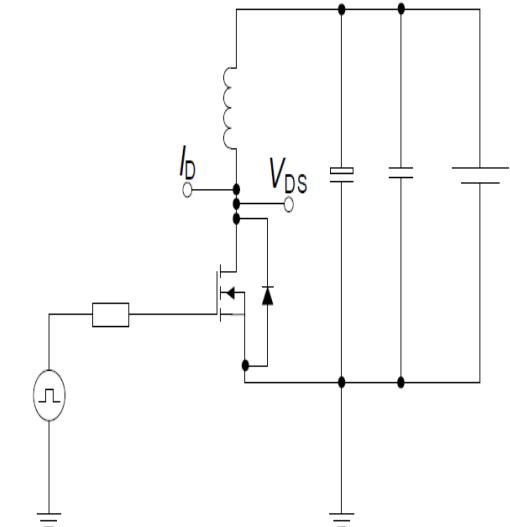
Unclamped inductive waveform

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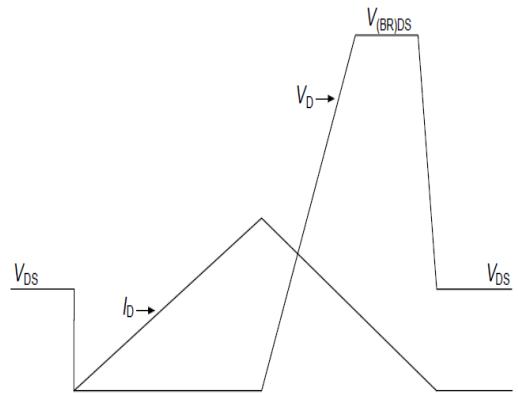
Test circuits

Test circuit and waveform for diode characteristics

Test circuit for diode characteristics

R_{G1}

R_{G2}

I_D

V_{DS}

$R_{G1} = R_{G2}$
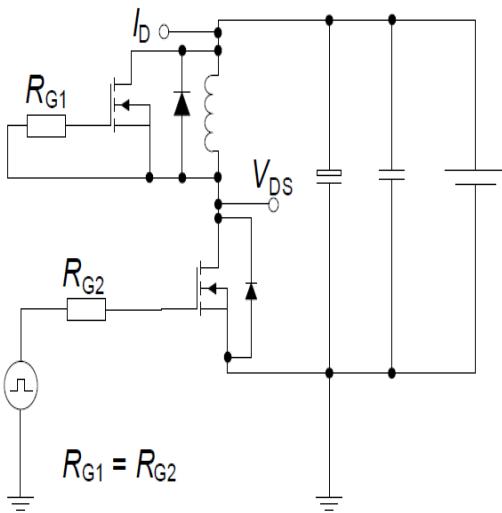
Diode recovery waveform

$\frac{di_F}{dt}$

$t_{rr} = t_S + t_F$

$Q_{rr} = Q_S + Q_F$

t_{rr}

t_S

t_F

I_F

I_{RRM}

Q_S

Q_F

$\frac{di_{rr}}{dt}$

10% I_{RRM}

90% I_{RRM}

V_{RRM}

V

SJI 00088

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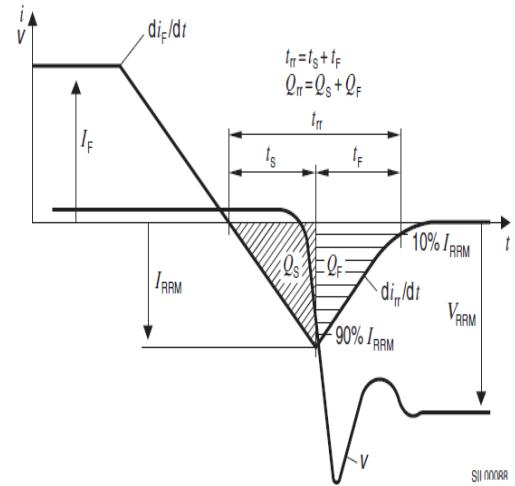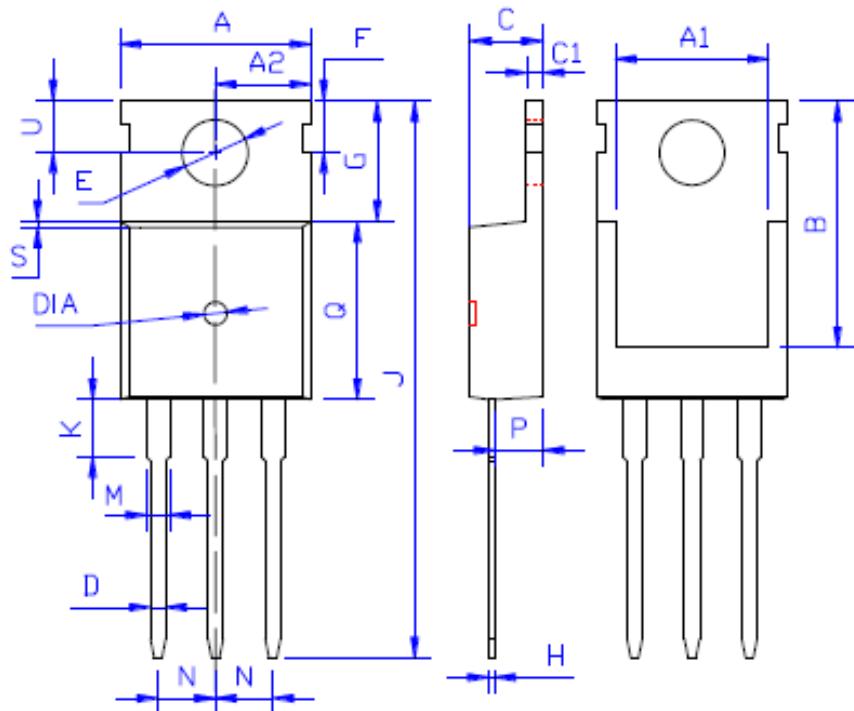
DIM	MILLIMETERS
A	10.00±0.30
A1	8.00±0.30
A2	5.00±0.30
B	13.20±0.40
C	4.50±0.20
C1	1.30±0.20
D	0.80±0.20
E	3.60±0.20
F	3.00±0.30
G	6.60±0.40
H	0.50±0.20
J	28.88±0.50
K	3.00±0.30
M	1.30±0.30
N	Typical 2.54
P	2.40±0.40
Q	9.20±0.40
S	0.25±0.15
T	0.25±0.15
U	2.80±0.30
DIA	宽 1.50±0.10 深 0.50 **MAX**

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