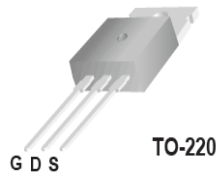


TSP60R2K3S1

600V 2.3A N-Channel SJ-MOSFET

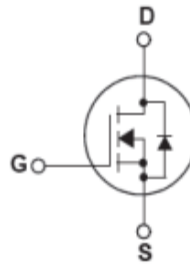
General Description

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

- 650V @T_J = 150 °C
- Typ. R_{DS(on)} = 1.9Ω
- Ultra Low gate charge (typ. Q_g = 7nC)
- 100% avalanche tested



Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V _{DSS}	Drain-Source Voltage	600	V
I _D	Drain Current -Continuous (TC = 25°C) -Continuous (TC = 100°C)	2.3* 1.4*	A
I _{DM}	Drain Current – Pulsed (Note 1)	6*	A
V _{GSS}	Gate-Source voltage	±30	V
E _{AS}	Single Pulsed Avalanche Energy (Note 2)	11	mJ
I _{AR}	Avalanche Current (Note 1)	0.4	A
E _{AR}	Repetitive Avalanche Energy (Note 1)	0.06	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	15	V/ns
dvds/dt	Drain Source voltage slope (V _{ds} =480V)	50	V/ns
P _D	Power Dissipation (TC = 25°C)	22.5	W
T _J , T _{STG}	Operating and Storage Temperature Range	-55 to +150	°C
T _L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	°C

* Drain current limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	Value	Unit
R _{θJC}	Thermal Resistance, Junction-to-Case	5.6	°C/W
R _{θCS}	Thermal Resistance, Case-to-Sink Typ.	0.5	°C/W
R _{θJA}	Thermal Resistance, Junction-to-Ambient	62	°C/W

Electrical Characteristics TC = 25°C unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Off Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0V, I _D = 250μA, T _J = 25℃	600	--	--	V
		V _{GS} = 0V, I _D = 250μA, T _J = 150℃	--	650	--	V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = 250μA, Referenced to 25℃	--	0.6	--	V/℃
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 600V, V _{GS} = 0V T _C = 25℃	--	--	1	μA
		V _{DS} = 600V, V _{GS} = 0V T _C = 150℃		10	--	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 = 250μA	2.5	--	4.5	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} = 10V, I _D = 1A	--	1.9	2.3	Ω
g _{FS}	Forward Trans conductance	V _{DS} = 40V, I _D = 2A (Note 4)	--	2	--	S
R _g	Gate resistance	f=1 MHz, open drain	-	3	-	Ω
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} = 25V, V _{GS} = 0V, f = 1.0MHz	--	130	--	pF
C _{oss}	Output Capacitance		--	40	--	pF
C _{rss}	Reverse Transfer Capacitance		--	4	--	pF
Switching Characteristics						
t _{d(on)}	Turn-On Delay Time	V _{DD} = 400V, I _D = 1A R _G = 20Ω(Note 4, 5)	--	7	--	ns
t _r	Turn-On Rise Time		--	7	--	ns
t _{d(off)}	Turn-Off Delay Time		--	30	--	ns
t _f	Turn-Off Fall Time		--	50	--	ns
Q _g	Total Gate Charge	V _{DS} = 480V, I _D = 1A	--	7	--	nC
Q _{gs}	Gate-Source Charge	V _{GS} = 10V (Note 4, 5)	--	0.8	--	nC
Q _{gd}	Gate-Drain Charge		--	3.6	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain-Source Diode Forward Current		--	--	2	A
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	6	A
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0V, I _F = 1A	--	0.9	1.5	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0V, I _F = 1A	--	150	--	ns
Q _{rr}	Reverse Recovery Charge	di _F /dt =100A/μs (Note 4)	--	1.2	--	μC

NOTES:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $I_{AS}=0.4A, V_{DD}=50V$, Starting $T_J=25^\circ C$
3. $I_{SD}\leq 2.3A, di/dt \leq 200A/\mu s, V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ C$
4. Pulse Test: Pulse width $\leq 300\mu s$, Duty Cycle $\leq 2\%$
5. Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

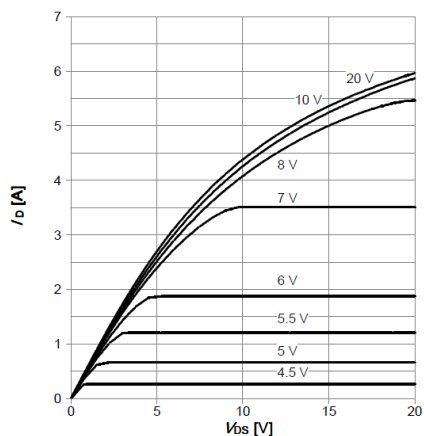


Figure 1: On-Region Characteristics@25°C

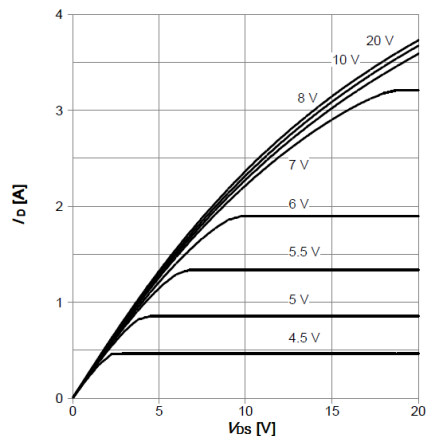


Figure 2: On-Region Characteristics@125°C

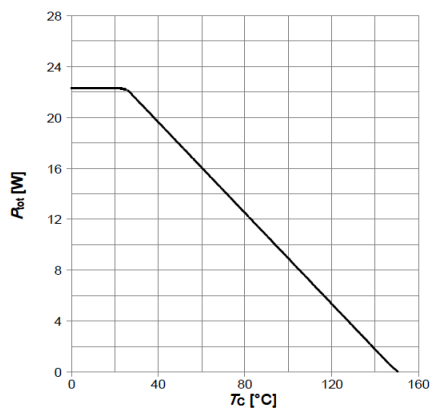


Figure 3: Power Dissipation

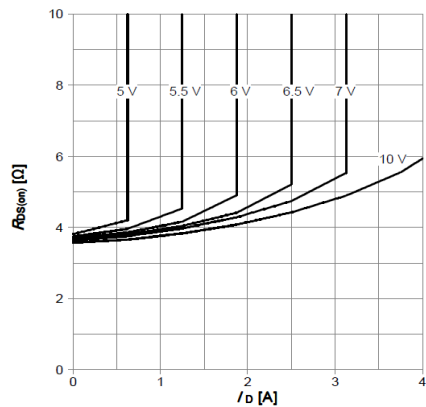


Figure 4: On-Resistance vs. Drain Current and Gate Voltage@125°C

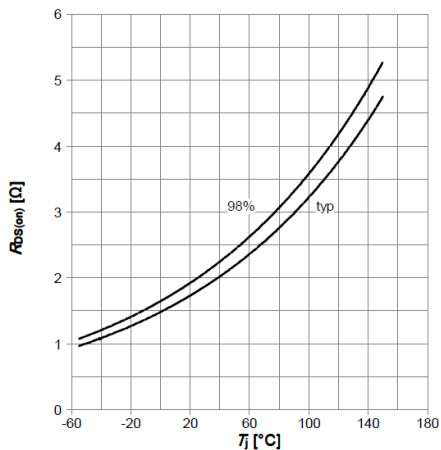


Figure 5: On-Resistance vs. Junction Temperature

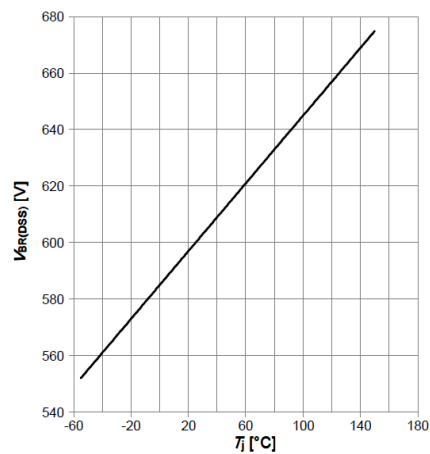


Figure 6: Break Down vs. Junction Temperature

Typical Performance Characteristics

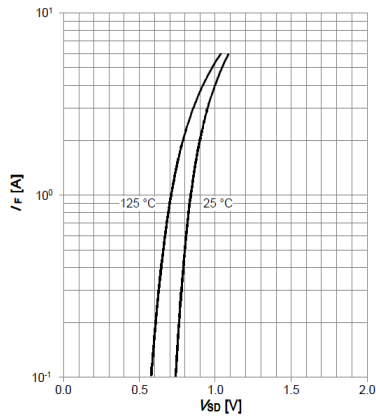


Figure 7: Body-Diode Characteristics

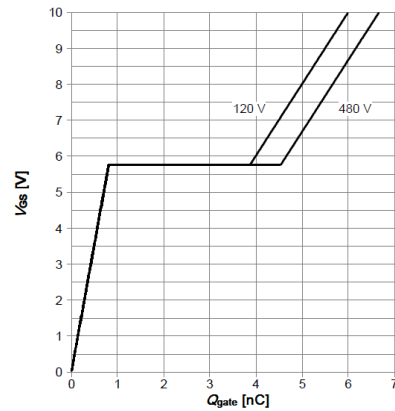


Figure 8: Gate-Charge Characteristics

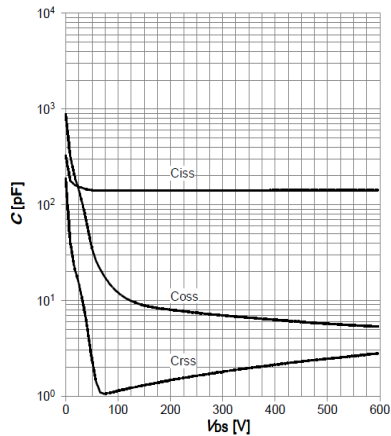


Figure 9: Capacitance Characteristics

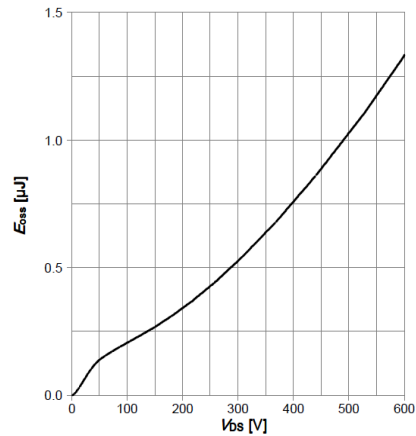


Figure 10: C_{oss} stored Energy

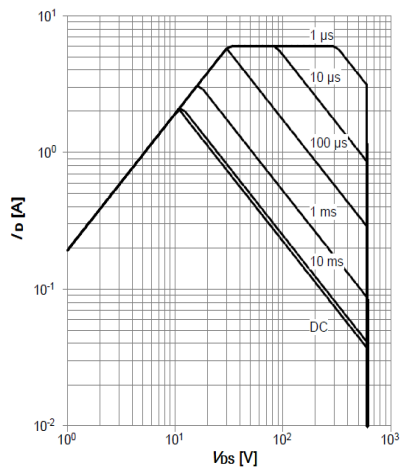


Figure 11: Maximum Forward Biased Safe Operating Area (@25°C)

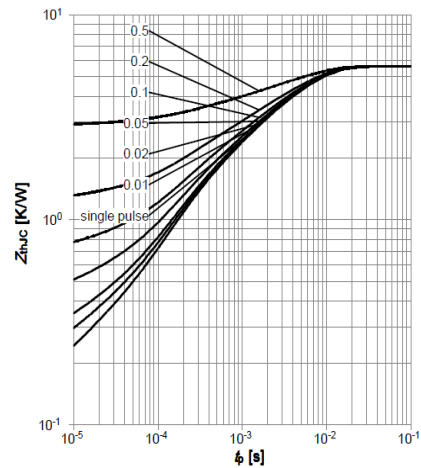


Figure 12: Single Pulse Power Rating Junction-to-Case

Typical Performance Characteristics

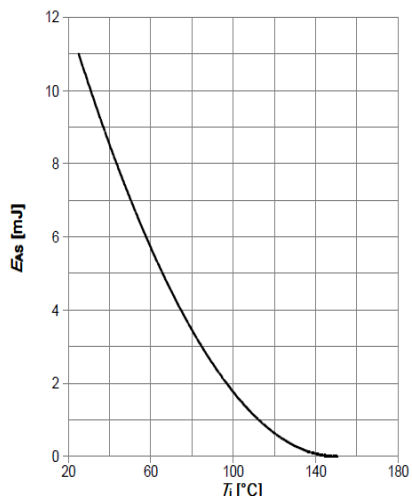


Figure 13: Avalanche energy

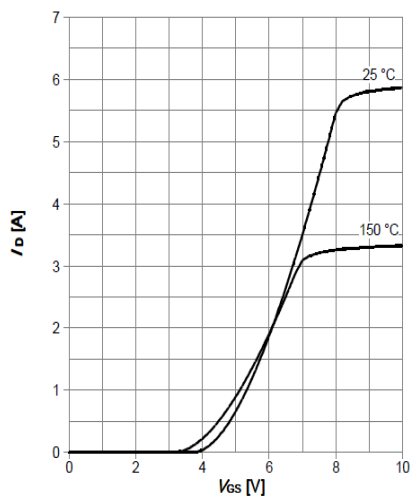
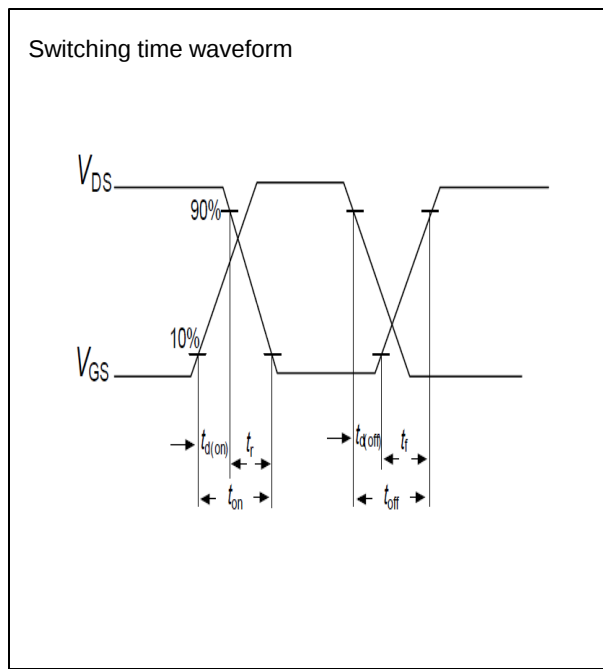
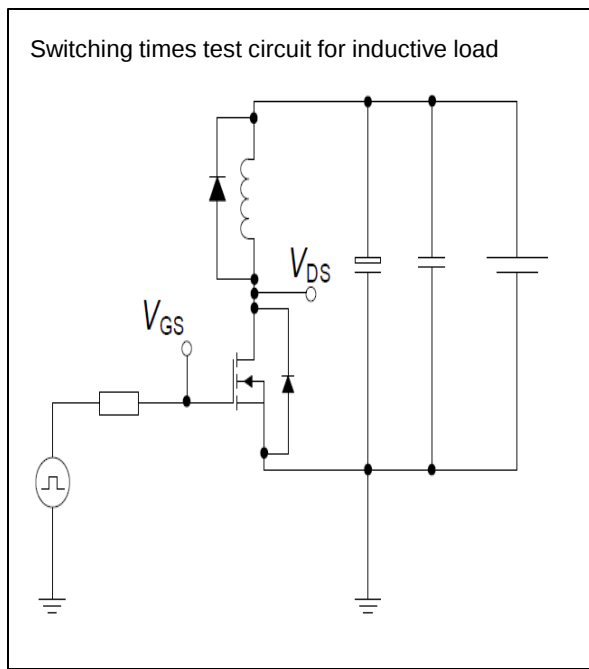


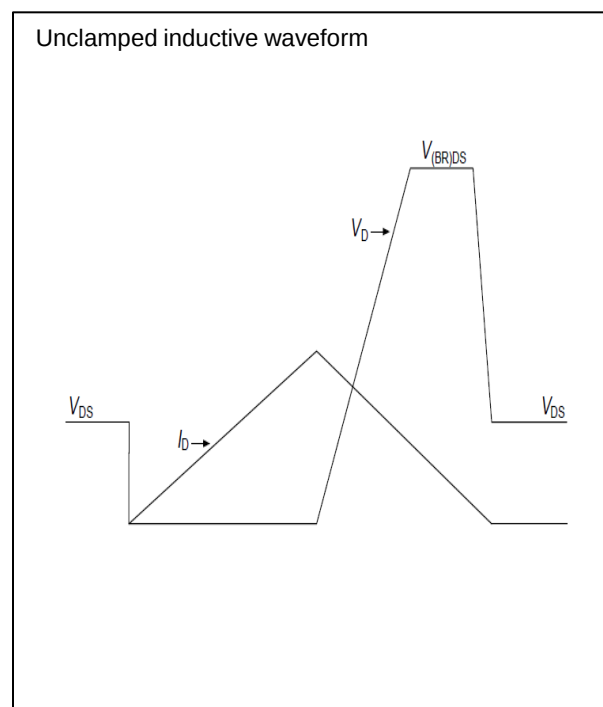
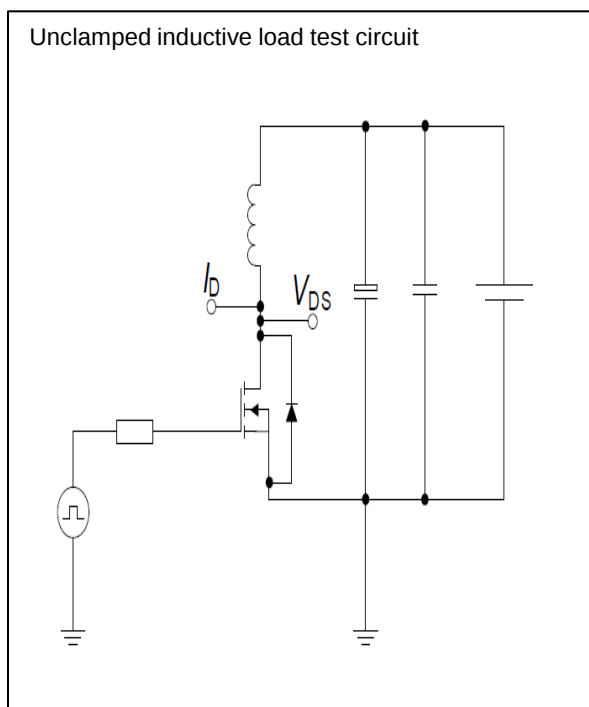
Figure 14: Transfer Characteristics @ $V_{DS}=20V$

Test circuits

Switching times test circuit and waveform for inductive load

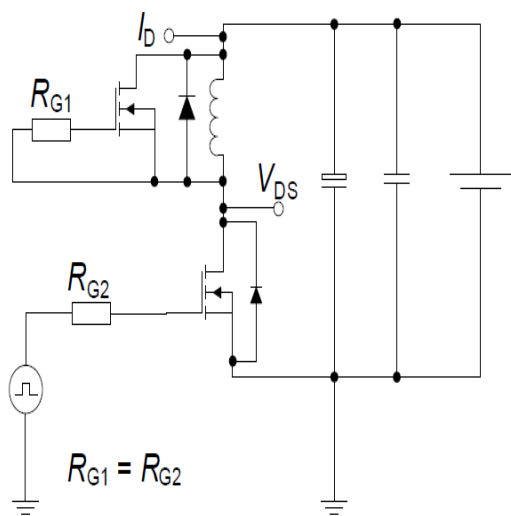


Unclamped inductive load test circuit and waveform



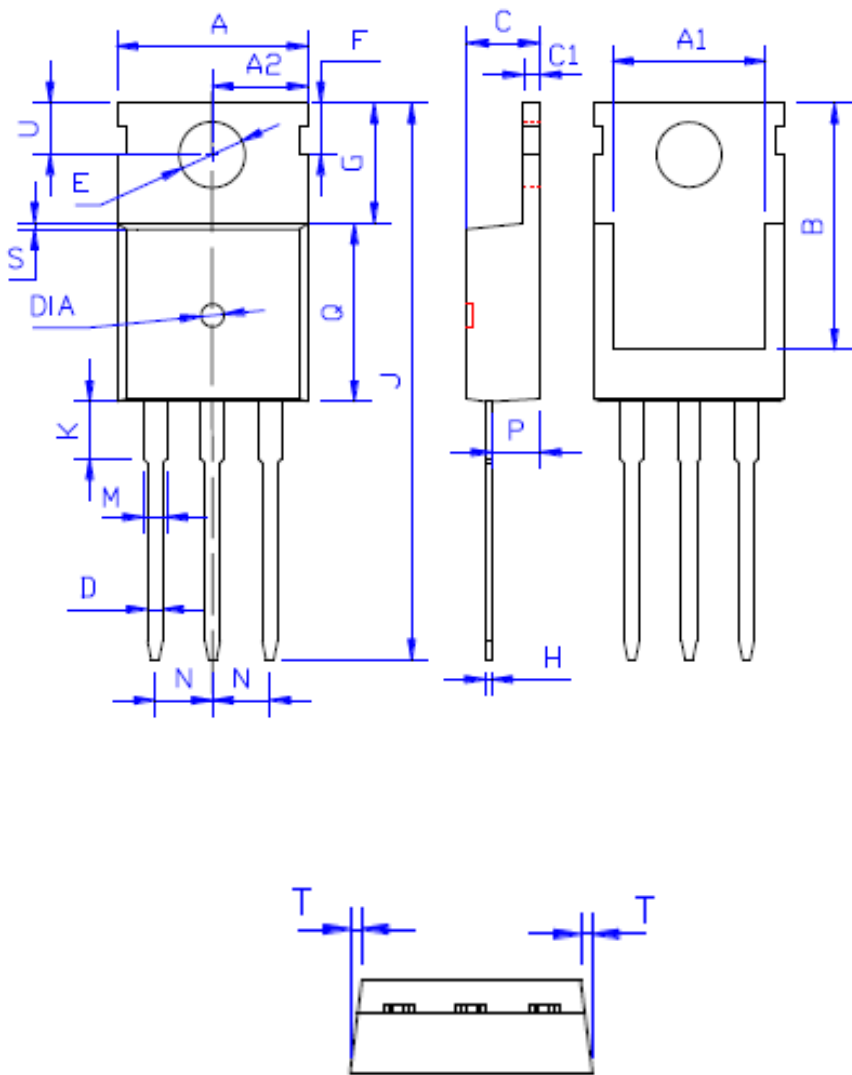
TSP60R2K3S1 600V 2.3A N-Channel S-J-MOSFET

Test circuit for diode characteristics



Package Outline TO-220

TSP60R2K3S1 600V 2.3A N-Channel SJ-MOSFET



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