

TSD60R580WT/TSU60R580WT

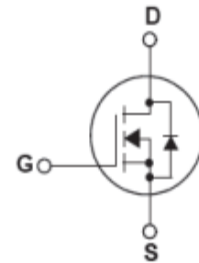
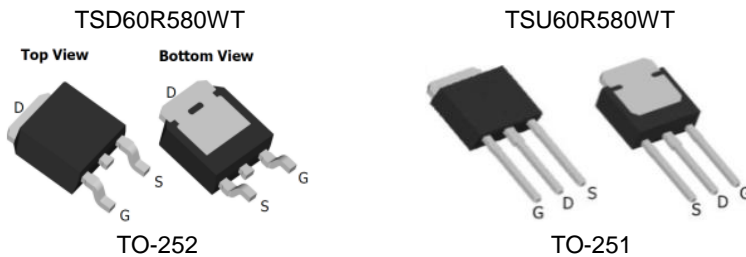
600V 7A N-Channel SJ-MOSFET

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

- 600V @ $T_J = 25^\circ\text{C}$
- Typ. $R_{DS(on)} = 0.5\Omega$
- Ultra Low gate charge (typ. $Q_g = 14.5\text{nC}$)
- 100% avalanche tested



Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V_{DSS}	Drain-Source Voltage	600	V
I_D	Drain Current -Continuous ($T_C = 25^\circ\text{C}$)	7	A
I_{DM}	Drain Current – Pulsed (Note 1)	21	A
V_{GSS}	Gate-Source voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	162	mJ
I_{AR}	Avalanche Current (Note 1)	1.4	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	0.2	mJ
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$)	63	W
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$

* Drain current limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	2.0	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62	$^\circ\text{C/W}$

Electrical Characteristics TC = 25°C unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A, T_J = 25^\circ C$	600	--	--	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 600V, V_{GS} = 0V, -T_J = 150^\circ C$	--	--	1 100	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	--	4.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10V, I_D = 3A$ (Note 3)	--	0.5	0.58	Ω
g_{FS}	Forward Trans conductance	$V_{DS} = 10V, I_D = 3A$ (Note 3)	--	0.5	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS} = 50V, V_{GS} = 0V, f = 1.0MHz$	--	585	--	pF
C_{oss}	Output Capacitance		--	32	--	pF
C_{rss}	Reverse Transfer Capacitance		--	4	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 400V, I_D = 7A, R_G = 25\Omega$	--	40	--	ns
t_r	Turn-On Rise Time		--	25	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	100	--	ns
t_f	Turn-Off Fall Time		--	17	--	ns
Q_g	Total Gate Charge	$V_{DS} = 480V, I_D = 7A, V_{GS} = 10V$	--	14.5	--	nC
Q_{gs}	Gate-Source Charge		--	3	--	nC
Q_{gd}	Gate-Drain Charge		--	5.3	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	6.3	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	19	A
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0V, I_F = 7A$	--	0.9	1.2	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0V, I_F = 7A, di_F/dt = 100A/\mu s$	--	250	--	ns
Q_{rr}	Reverse Recovery Charge		--	2.1	--	μC
I_{rrm}	Peak Reverse Recovery Current		--	16	--	A

Notes

- 1.Repetitive Rating: Pulse width limited by maximum junction temperature
2. $I_{AS} = 1.4A, V_{DD} = 50V, R_G = 25\Omega, \text{Starting } T_J = 25^\circ C$
- 3.Pulse Test: Pulse width $\leq 300\mu s, \text{Duty Cycle } \leq 1\%$

Typical Performance Characteristics

Figure 1. Output Characteristics

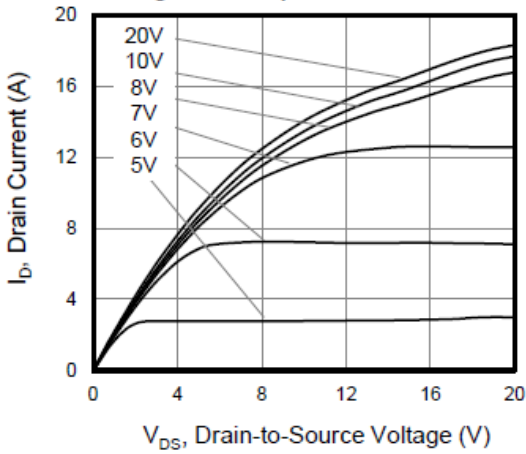


Figure 2. Transfer Characteristics

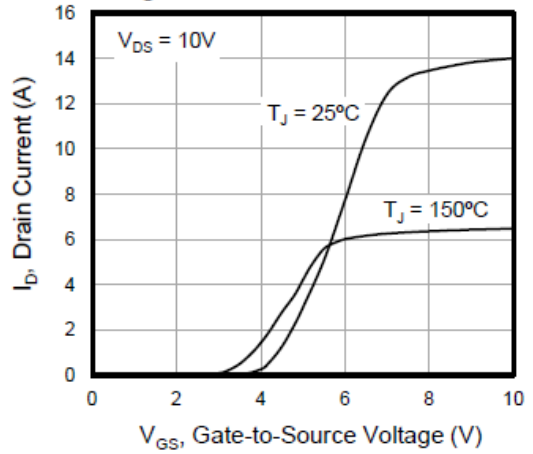


Figure 3. On-Resistance vs. Drain Current

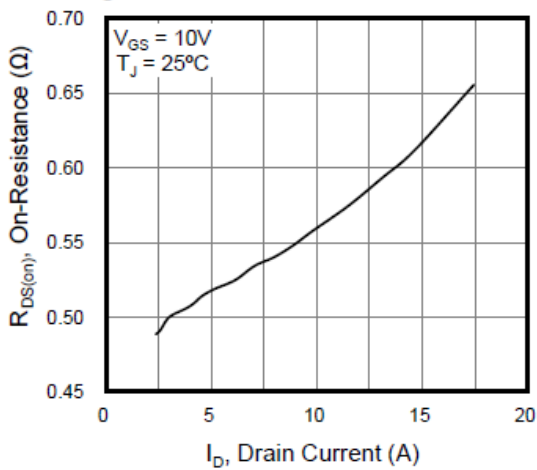


Figure 4. Capacitance

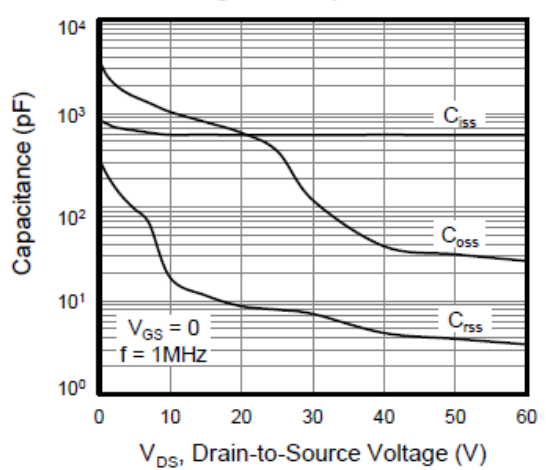


Figure 5. Gate Charge

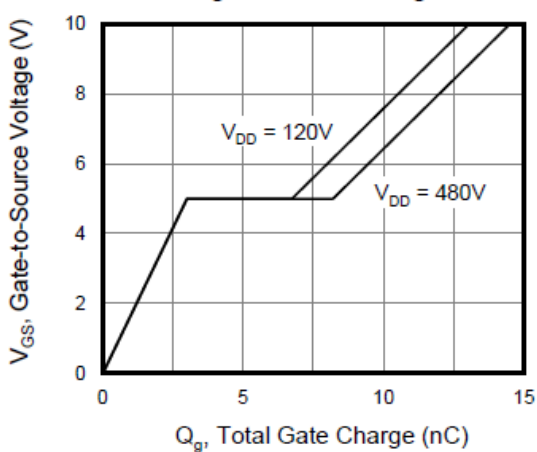
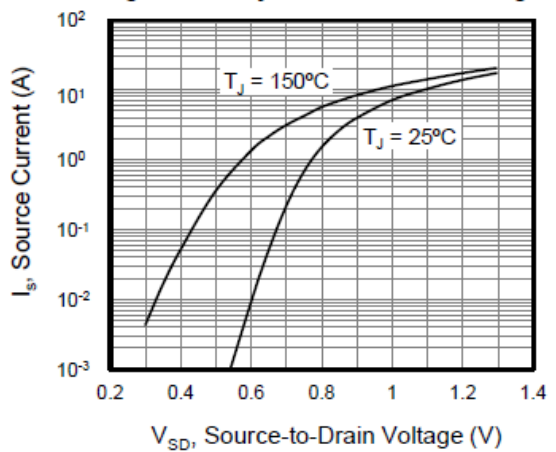


Figure 6. Body Diode Forward Voltage



Typical Performance Characteristics

Figure 7. On-Resistance vs. Junction Temperature

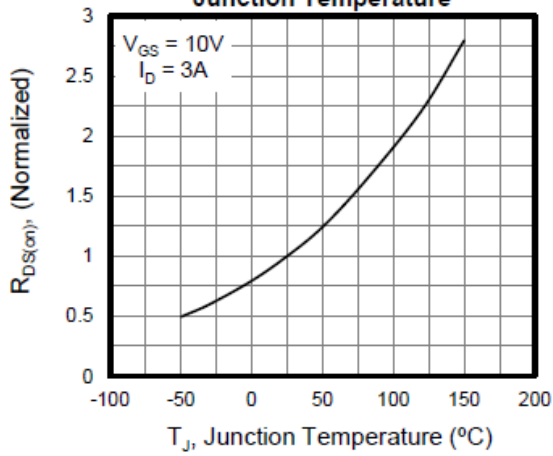


Figure 8. Threshold Voltage vs. Junction Temperature

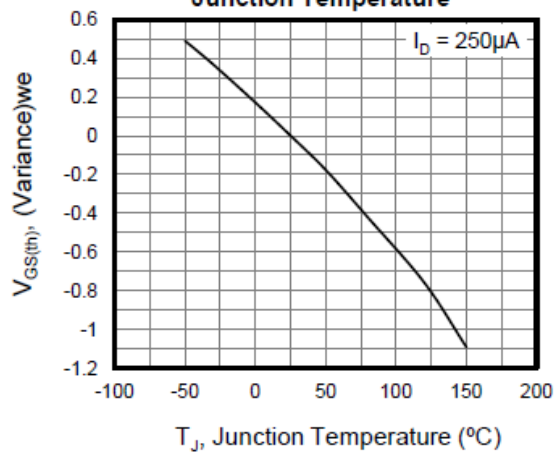
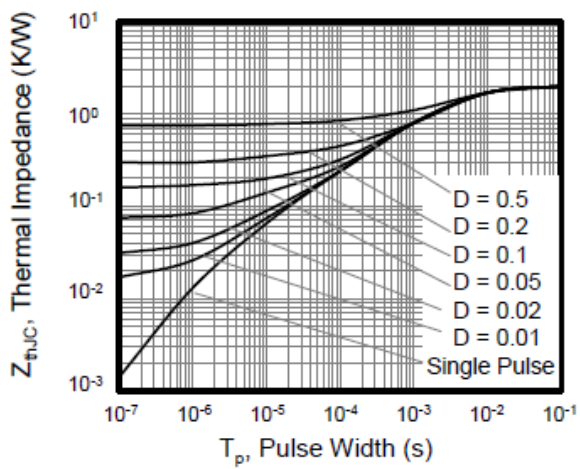
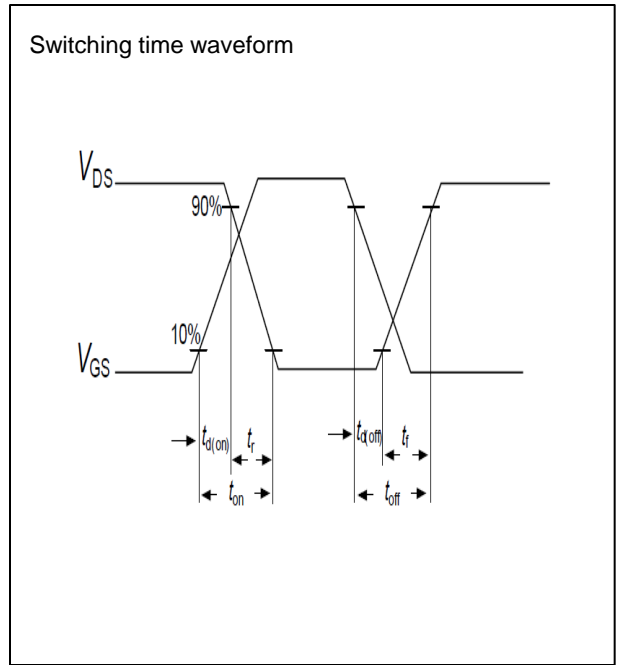
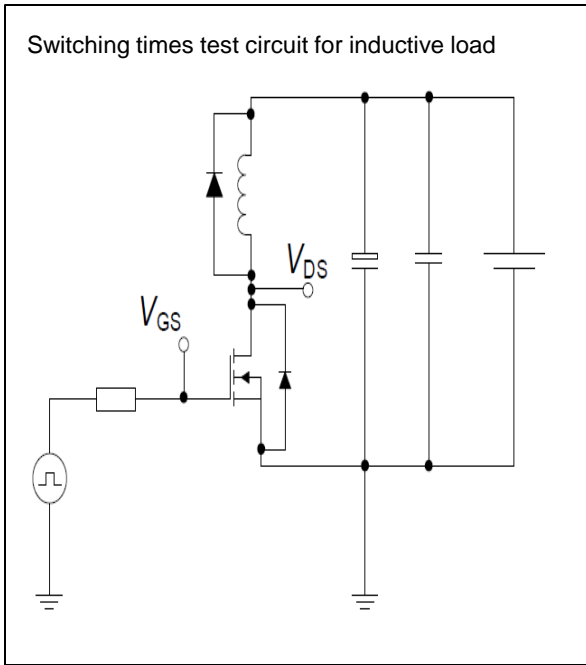


Figure 9. Transient Thermal Impedance

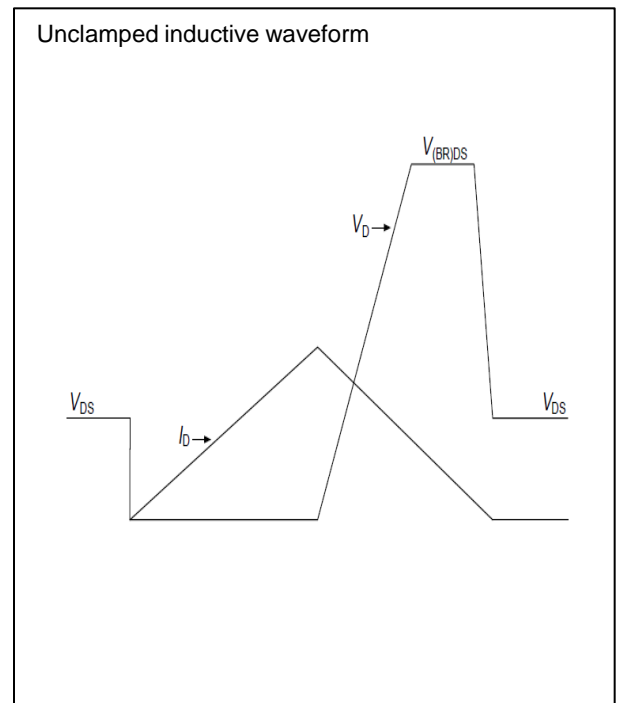
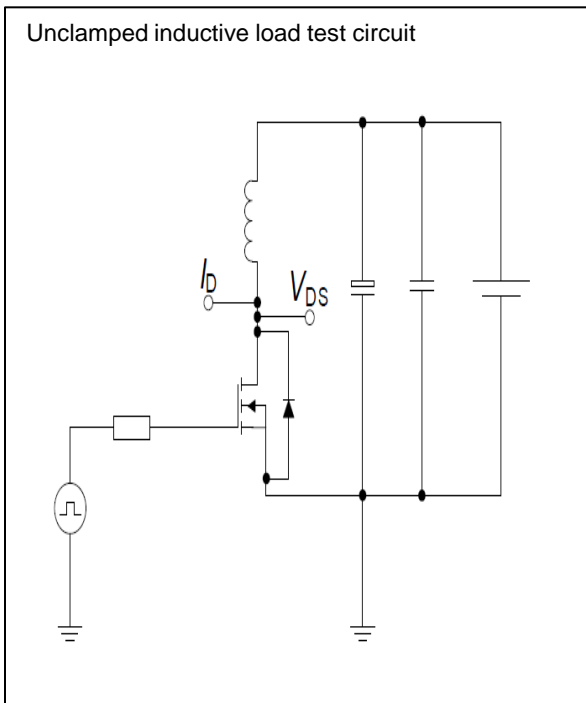


Test circuits

Switching times test circuit and waveform for inductive load

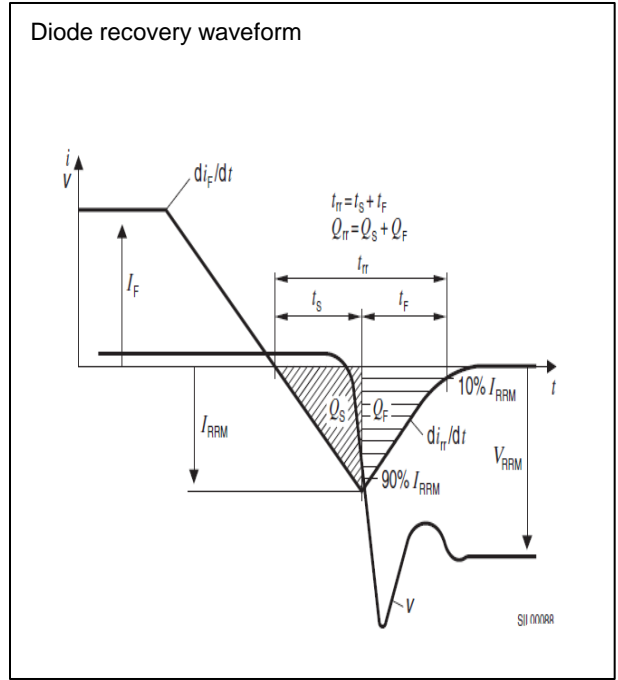
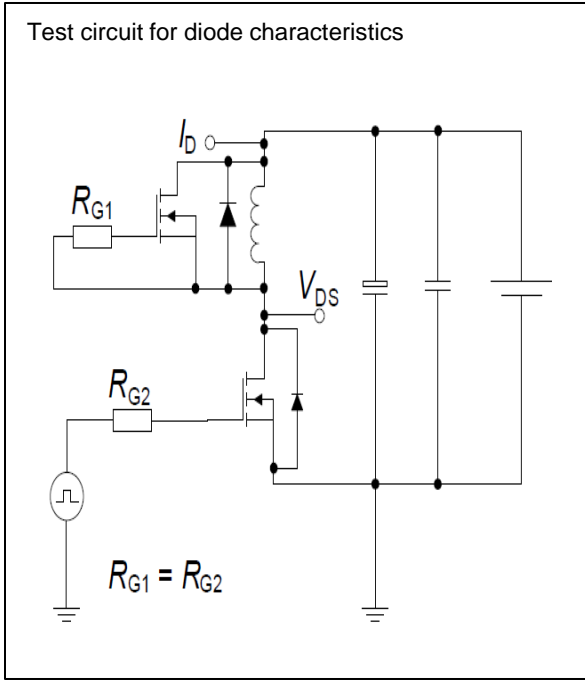


Unclamped inductive load test circuit and waveform



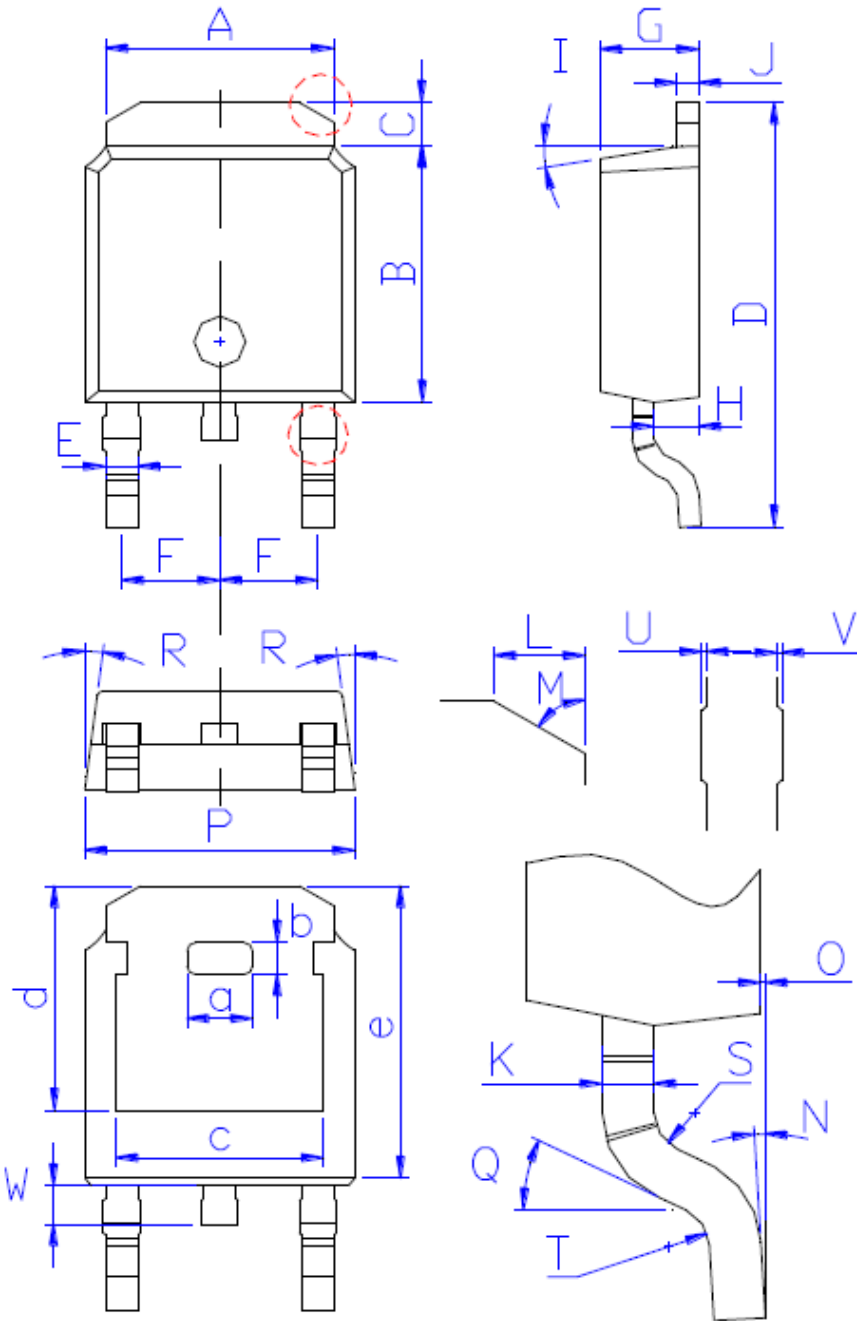
Test circuits

Test circuit and waveform for diode characteristics



Package Outline TO-252

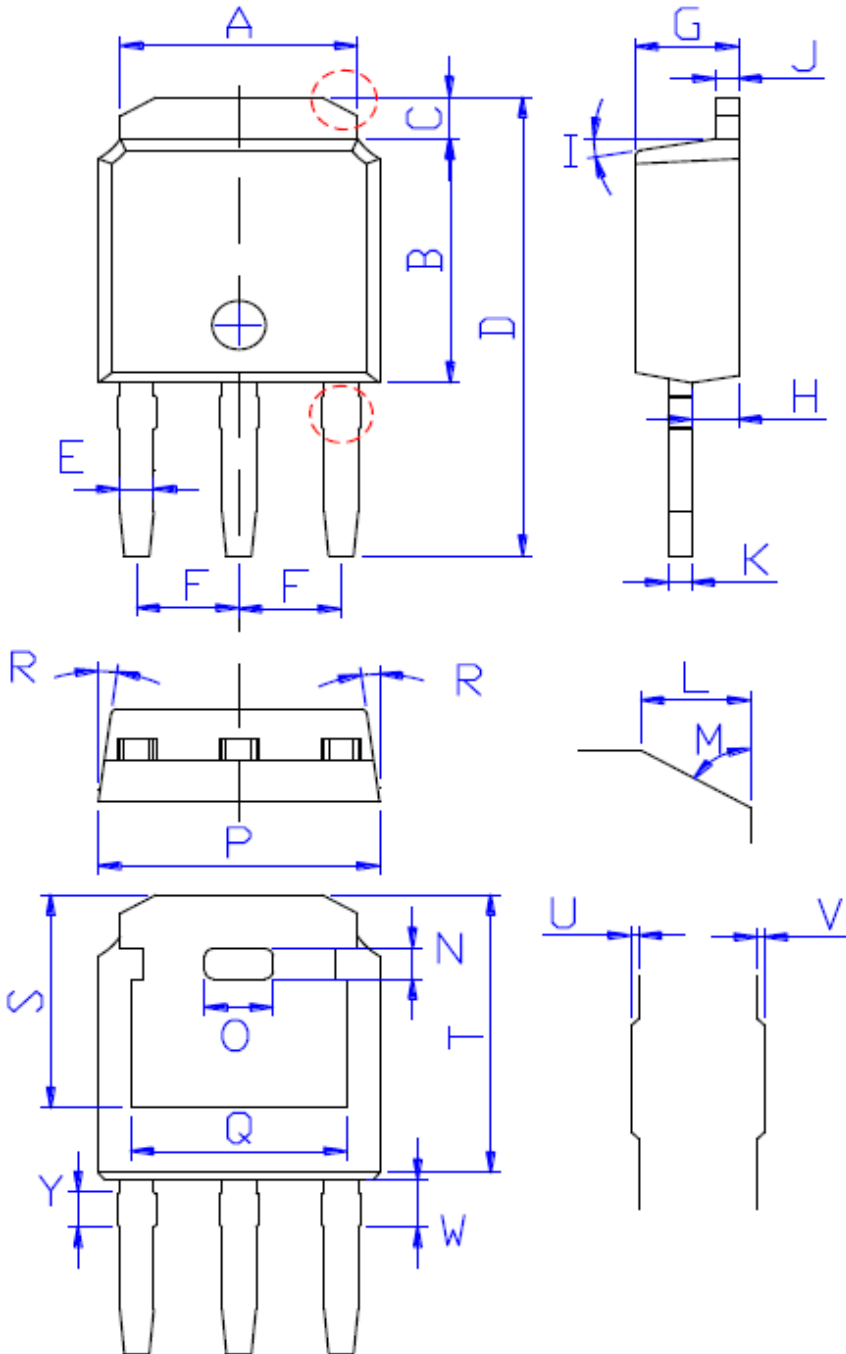
TSD60R580WT/TSU60R580WT 600V 7A N-Channel SJ-MOSFET



DIM	MILLIMETERS
A	5.34 ± 0.30
B	6.00 ± 0.30
C	1.05 ± 0.30
D	9.95 ± 0.30
E	0.76 ± 0.15
F	2.28 ± 0.15
G	2.30 ± 0.30
H	1.06 ± 0.30
I	$(4-10)^\circ$
J	0.51 ± 0.15
K	0.52 ± 0.15
L	0.80 ± 0.30
M	60°
N	$(0-10)^\circ$
O	0.05 ± 0.05
P	6.60 ± 0.30
Q	25°
R	$(4-8.5)^\circ$
S	R0.40
T	R0.40
U	0.05 ± 0.05
V	0.05 ± 0.05
W	0.90 ± 0.30
a	1.80 ± 0.30
b	0.75 ± 0.30
c	4.85 ± 0.30
d	5.30 ± 0.30
e	6.90 ± 0.30

Package Outline TO-251

TSD60R580WT/TSU60R580WT 600V 7A N-Channel SJ-MOSFET



DIM	MILLIMETERS
A	5.34±0.30
B	6.00±0.30
C	1.05±0.30
D	11.31±0.30
E	0.76±0.15
F	2.28±0.15
G	2.30±0.30
H	1.06±0.30
I	(4-10)°
J	0.51±0.15
K	0.52±0.15
L	0.80±0.30
M	60°
N	0.75±0.30
O	1.80±0.30
P	6.60±0.30
Q	4.85±0.30
R	(4-8.5)°
S	5.30±0.30
T	6.90±0.30
U	0.05±0.05
V	0.05±0.05
W	1.15±0.25
Y	0.85±0.25