

TSD80R850S1/TSU80R850S1

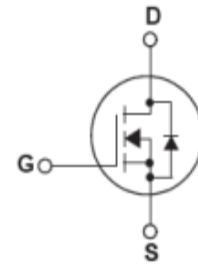
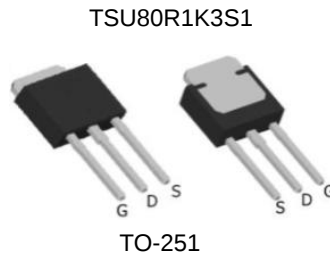
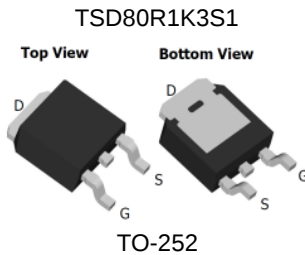
800V 6.6A N-Channel SJ-MOSFET

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

- 850V @TJ = 150 °C
- Typ. RDS(on) = 0.75Ω
- Ultra Low gate charge (typ. Qg = 25nC)
- 100% avalanche tested



Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V _{DSS}	Drain-Source Voltage	800	V
I _D	Drain Current -Continuous (TC = 25°C) -Continuous (TC = 100°C)	6.6* 4.2*	A
I _{DM}	Drain Current – Pulsed (Note 1)	20	A
V _{GSS}	Gate-Source voltage	±30	V
E _{AS}	Single Pulsed Avalanche Energy (Note 2)	86	mJ
I _{AR}	Avalanche Current (Note 1)	1.7	A
E _{AR}	Repetitive Avalanche Energy (Note 1)	0.2	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	15	V/ns
P _D	Power Dissipation (TC = 25°C) -Derate above 25°C	63	W W/°C
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	2.0	°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℃	800	--	--	V
		V _{GS} = 0V, I _D = 250μA, T _J = 150℃	--	850	--	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} = 800V, V _{GS} = 0V T _C = 25℃	--	--	1	μA
		V _{DS} = 640V, 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	3.5	4.5	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} = 10V, I _D = 3.5A	--	0.75	0.85	Ω
g _{FS}	Forward Trans conductance	V _{DS} = 40V, I _D = 3.5A (Note 4)	--	6	--	S
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} = 25V, V _{GS} = 0V, f = 1.0MHz	--	320	--	pF
C _{oss}	Output Capacitance		--	75	--	pF
C _{rss}	Reverse Transfer Capacitance		--	5	--	pF
Switching Characteristics						
t _{d(on)}	Turn-On Delay Time	V _{DD} = 400V, I _D = 3.5A R _G = 20Ω(Note 4, 5)	--	13	--	ns
t _r	Turn-On Rise Time		--	10	--	ns
t _{d(off)}	Turn-Off Delay Time		--	85	--	ns
t _f	Turn-Off Fall Time		--	14	--	ns
Q _g	Total Gate Charge	V _{DS} = 480V, I _D = 3.5A V _{GS} = 10V (Note 4, 5)	--	25	--	nC
Q _{gs}	Gate-Source Charge		--	2.0	--	nC
Q _{gd}	Gate-Drain Charge		--	2.7	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain-Source Diode Forward Current		--	--	7	A
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	20	A
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0V, I _F = 2A	--	0.9	1.5	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0V, I _F = 2A di _F /dt =100A/μs (Note 4)	--	190	--	ns
Q _{rr}	Reverse Recovery Charge		--	2.3	--	μC

NOTES:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $I_{AS}=1.7A, V_{DD}=50V$, Starting $T_J=25^\circ C$
3. $I_{SD}\leq 6.6A, di/dt \leq 200A/\mu s, V_{DD} \leq BV_{DSS}$, 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

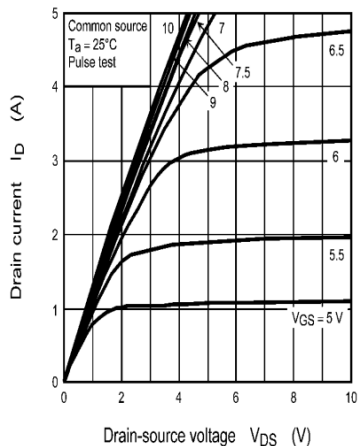


Figure 1: On-Region Characteristics@25° C

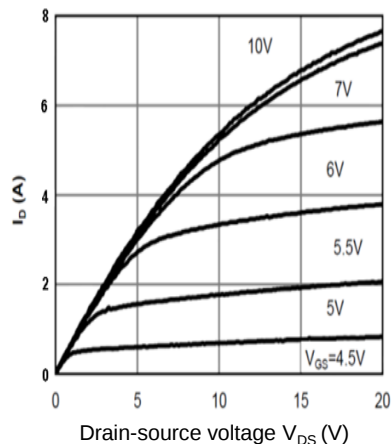


Figure 2: On-Region Characteristics@125° C

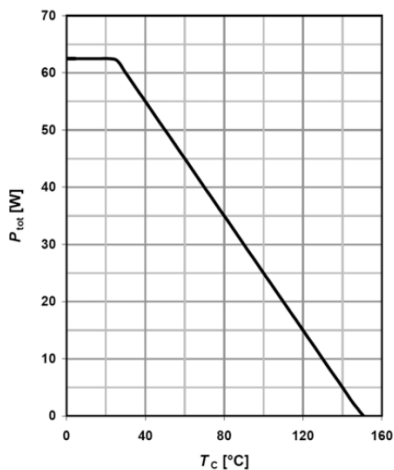


Figure 3: Power Dissipation

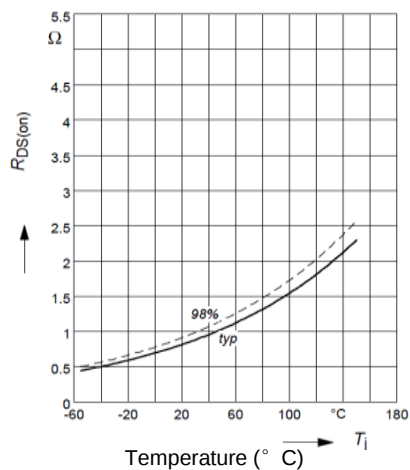


Figure 4: On-Resistance vs. Junction Temperature

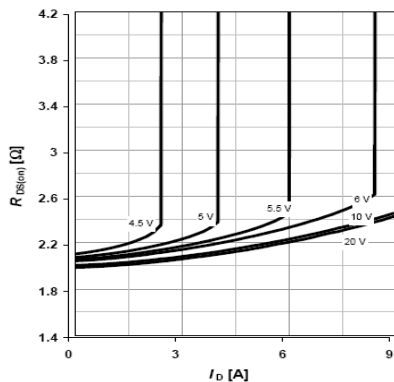


Figure 5 : On-Resistance vs. Drain Current, $T_J=150^{\circ}$ C

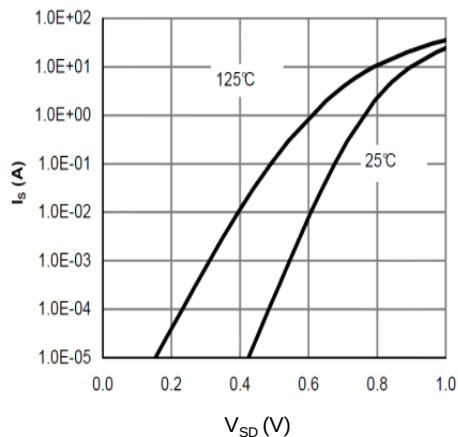


Figure 6: Body-Diode Characteristics

Typical Performance Characteristics

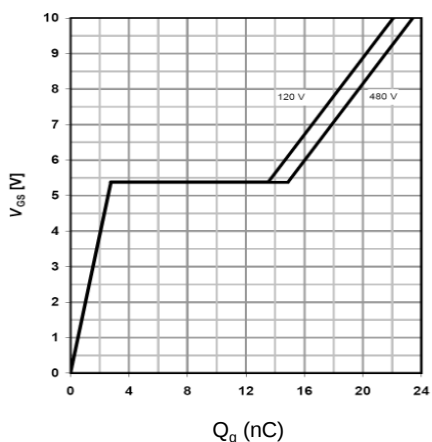


Figure 7: Gate-Charge Characteristics

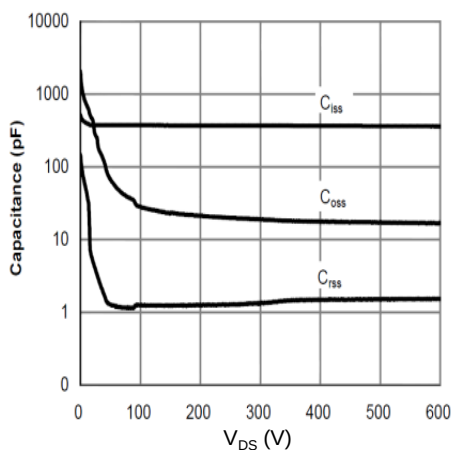


Figure 8: Capacitance Characteristics

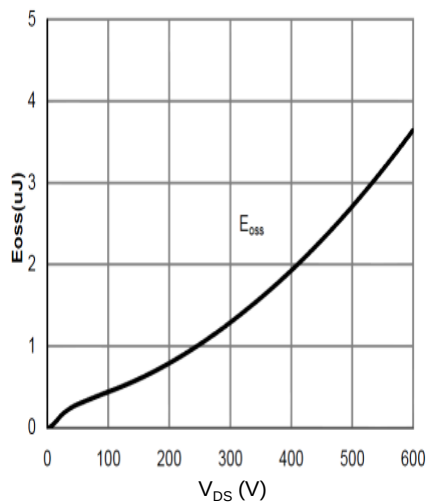


Figure 9: C_{oss} stored Energy

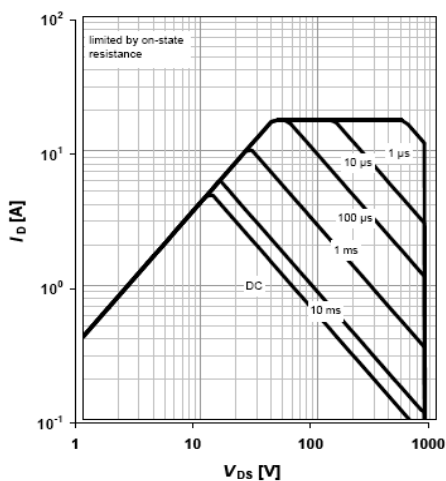


Figure 10: Maximum Forward Biased Safe Operating Area
 $T_c=25^{\circ}\text{C}$

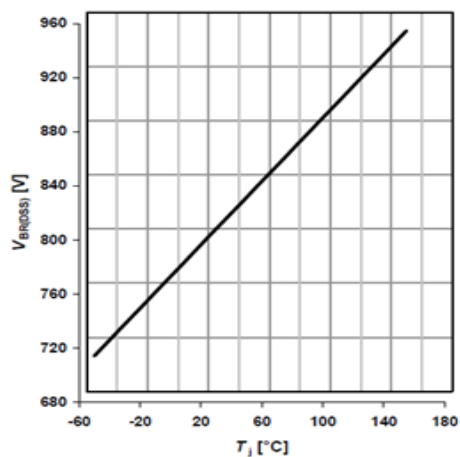


Figure 11: Break Down vs. Junction Temperature

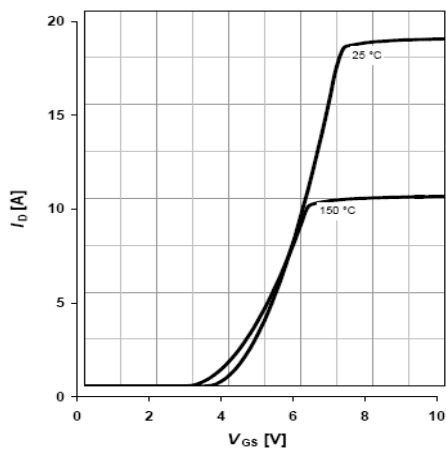


Figure 12: Typical transfer characteristics

Typical Performance Characteristics

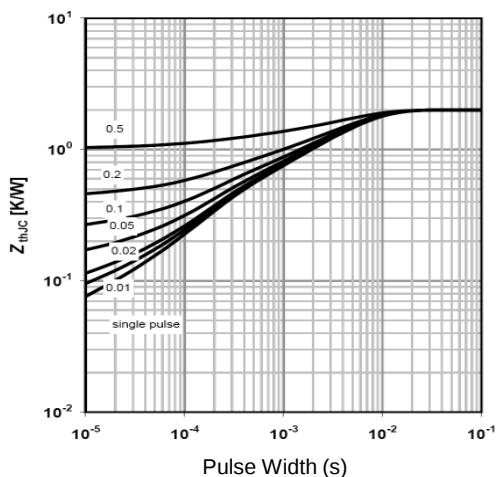


Figure 13: Maximum Transient Thermal Impedance

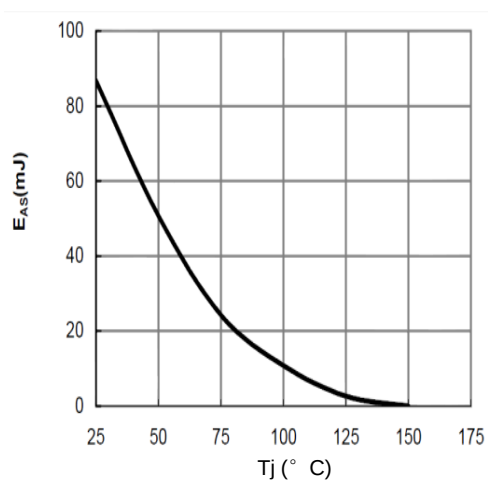
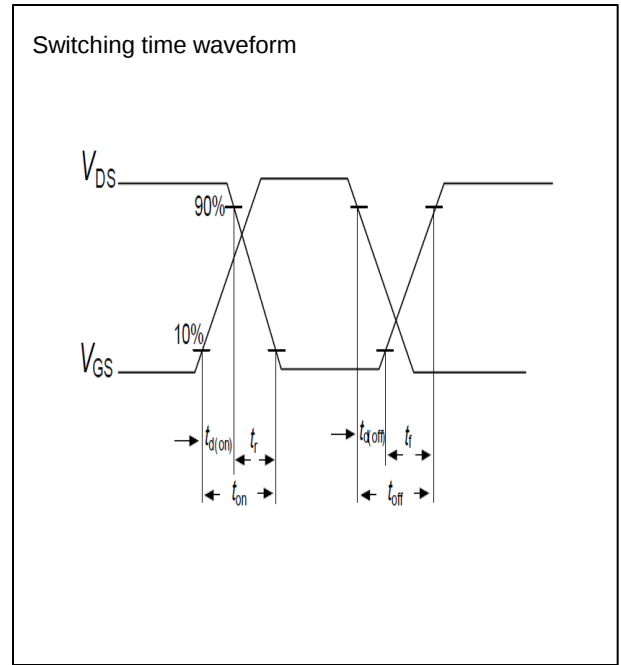
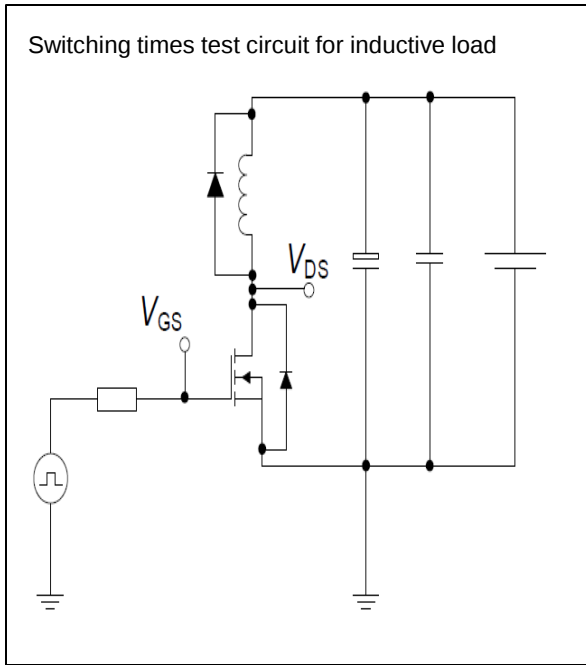


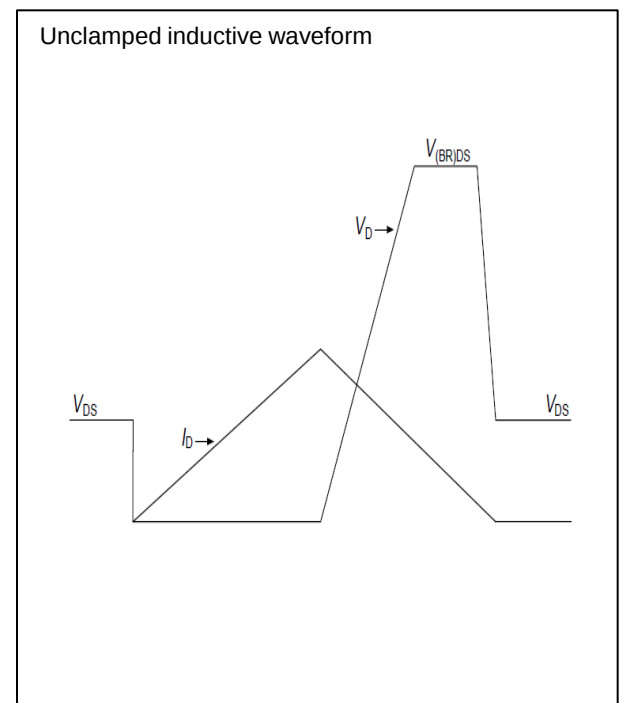
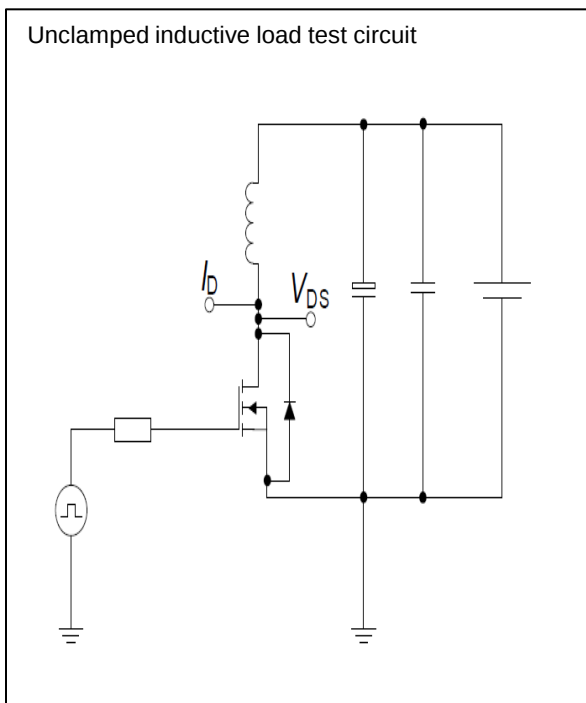
Figure 14: Avalanche energy

Test circuits

Switching times test circuit and waveform for inductive load



Unclamped inductive load test circuit and waveform



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Test circuit for diode characteristics

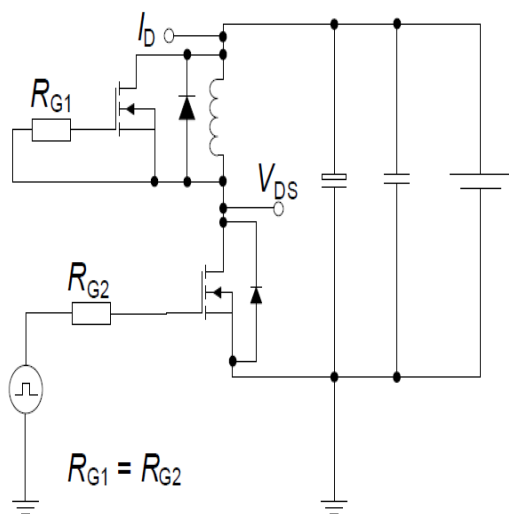
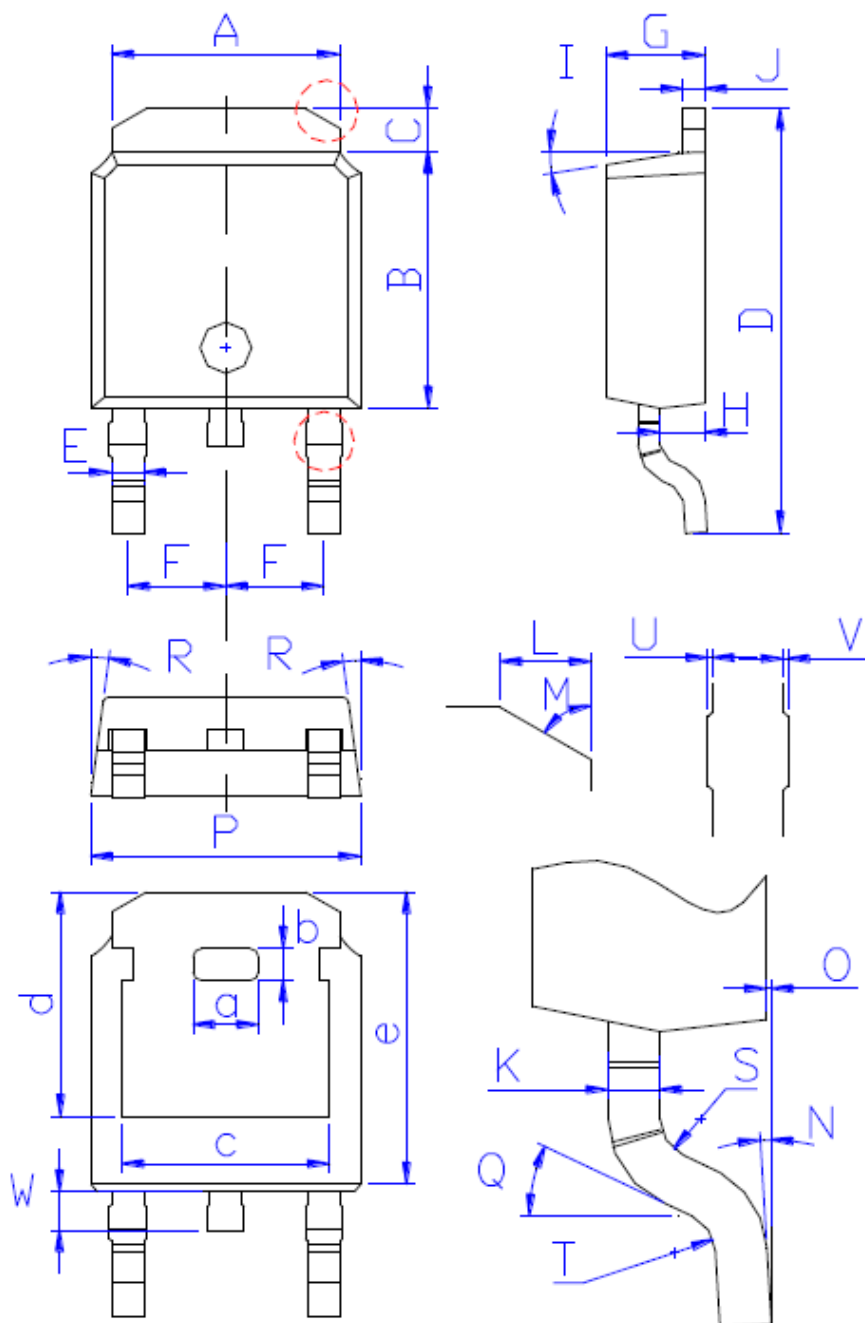
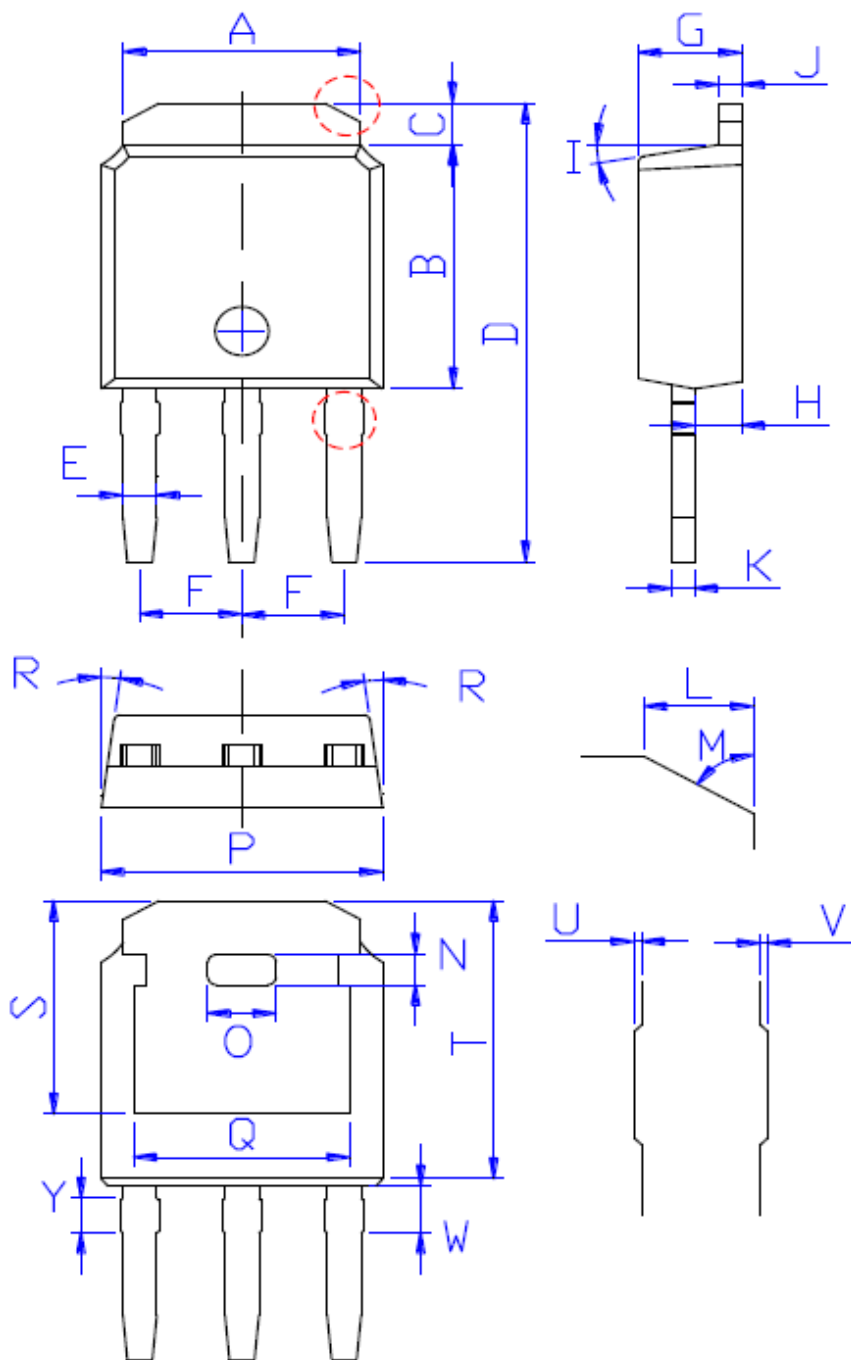


Figure 1 illustrates the waveforms of current and voltage during the turn-on of a thyristor. The top graph shows the current i_T and its derivative di_T/dt . The bottom graph shows the voltage V . Key parameters include forward current I_F , reverse recovery current I_{RRM} , reverse recovery time t_{rr} , storage time t_s , and fall time t_f . The area under the reverse current is divided into Q_s (shaded) and Q_f (hatched). The equations $t_{rr} = t_s + t_f$ and $Q_{rr} = Q_s + Q_f$ are also shown.

Package Outline TO-252



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



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