



SUPER-MOSFET

Super Junction Metal Oxide Semiconductor Field Effect Transistor

800V Super Junction Power MOSFET
SSB80R380S

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www.supersemi.com.cn

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800V N-Channel MOSFET

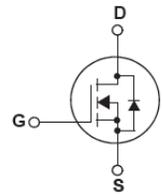
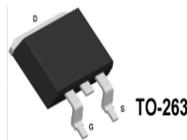
Description

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

- Multi-Epi process SJ-FET
- 850V @T_J = 150 °C
- Typ. R_{DS(on)} = 0.36Ω
- Ultra Low Gate Charge (typ. Q_g = 17.2nC)
- 100% avalanche tested

SSB80R380S



Absolute Maximum Ratings

Symbol	Parameter	SSB80R380S	Unit
V _{DSS}	Drain-Source Voltage	800	V
I _D	Drain Current -Continuous (TC = 25°C) -Continuous (TC = 100°C)	13.6* 8.6*	A
I _{DM}	Drain Current - Pulsed (Note 1)	40*	A
V _{GSS}	Gate-Source voltage	±30	V
E _{AS}	Single Pulsed Avalanche Energy (Note 2)	94	mJ
I _{AS}	Avalanche current, repetitive or not-repetitive (pulse width limited by T _J max)	2.5	A
dv/dt	Peak Diode Recovery dv/dt (Note 3)	15	V/ns
dV _{ds} /dt	Drain Source voltage slope (V _{ds} =640V)	50	V/ns
P _D	Power Dissipation (TC = 25°C)	104	W
T _J , T _{STG}	Operating and Storage Temperature Range	-55 to +150	°C
T _L	Maximum Lead Temperature for Soldering Purpose, 1/16" from Case for 10 Seconds	260	°C

* Drain current limited by maximum junction temperature. Maximum duty cycle D=0.75.

Thermal Characteristics

Symbol	Parameter	SSB80R380S	Unit
R _{θJC}	Thermal Resistance, Junction-to-Case	1.2	°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

SSB80R380S 800V N-Channel MOSFET

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Off Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0V, I _D = 250μA, T _J = 25°C	800	-	-	V
		V _{GS} = 0V, I _D = 250μA, T _J = 150°C	850	-	-	V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = 250μA, Referenced to 25°C	-	0.75	-	V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 800V, V _{GS} = 0V -T _J = 125°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 = 250μA	2.5	3.5	4.5	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} = 10V, I _D = 7A	-	0.36	0.41	Ω
g _{FS}	Forward Transconductance	V _{DS} = 40V, I _D = 14A	-	12	-	S
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} = 25V, V _{GS} = 0V, f = 1MHz	-	815	-	pF
C _{oss}	Output Capacitance		-	220	-	pF
C _{rss}	Reverse Transfer Capacitance		-	12	-	pF
Q _g	Total Gate Charge	V _{DS} = 640V, I _D = 7A, V _{GS} = 10V (Note 4)	-	17.2	-	nC
Q _{gs}	Gate-Source Charge		-	5.1	-	nC
Q _{gd}	Gate-Drain Charge		-	6.7	-	nC
V _{plateau}	Gate plateau voltage		-	5.9	-	V
Switching Characteristics						
t _{d(on)}	Turn-On Delay Time	V _{DD} = 400V, I _D = 7A, R _G = 25Ω(Note 4)	-	31	-	ns
t _r	Turn-On Rise Time		-	19	-	ns
t _{d(off)}	Turn-Off Delay Time		-	91	-	ns
t _f	Turn-Off Fall Time		-	20	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain-Source Diode Forward Current		-	-	13.6	A
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current		-	-	40	A
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0V, I _S = 14A	-	0.9	1.4	V
t _{rr}	Reverse Recovery Time	V _R = 400V, V _{GS} = 0V, I _F = 14A, diF/dt = 100A/μs	-	660	-	ns
Q _{rr}	Reverse Recovery Charge		-	9.7	-	μC
I _{rrm}	Peak reverse recovery Current		-	25	-	A

NOTES:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. I_D=I_{AS}, V_{DD}=50V, L=30mH, Starting T_J=25 °C
3. I_{SD}≤I_D, di/dt ≤ 200A/us, V_{DD} ≤ BV_{DSS}, Starting T_J = 25 °C
4. Essentially Independent of Operating Temperature Typical Characteristics

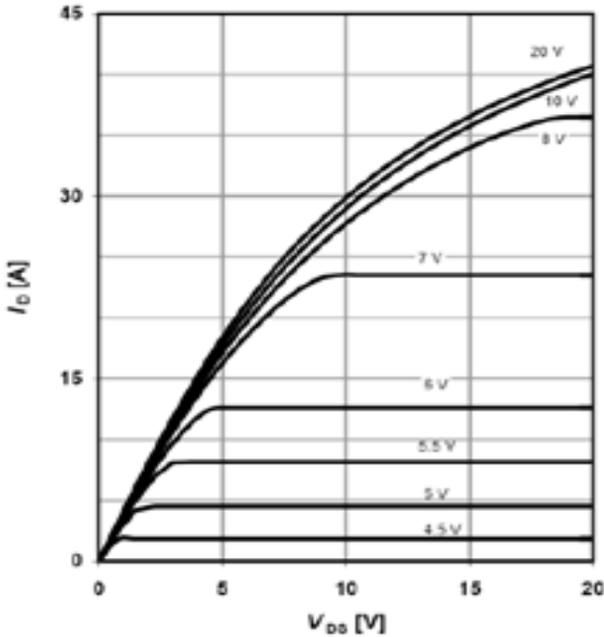


Figure 1: On-Region Characteristics @ 25°C

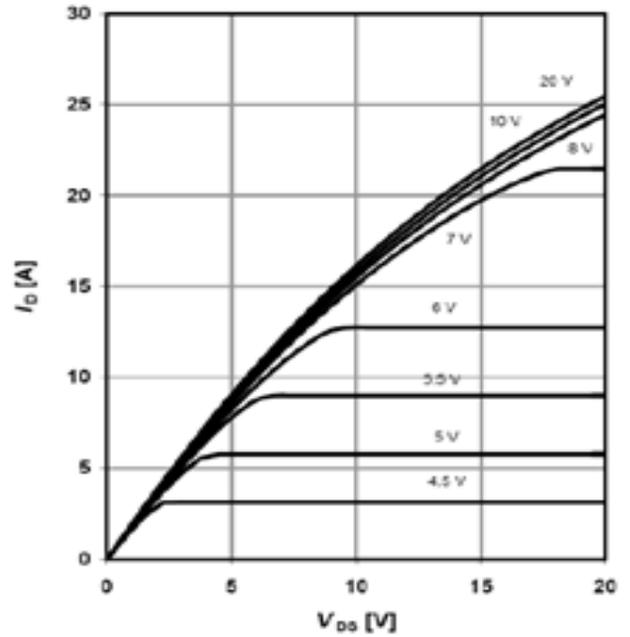


Figure 2: On-Region Characteristics @ 125°C

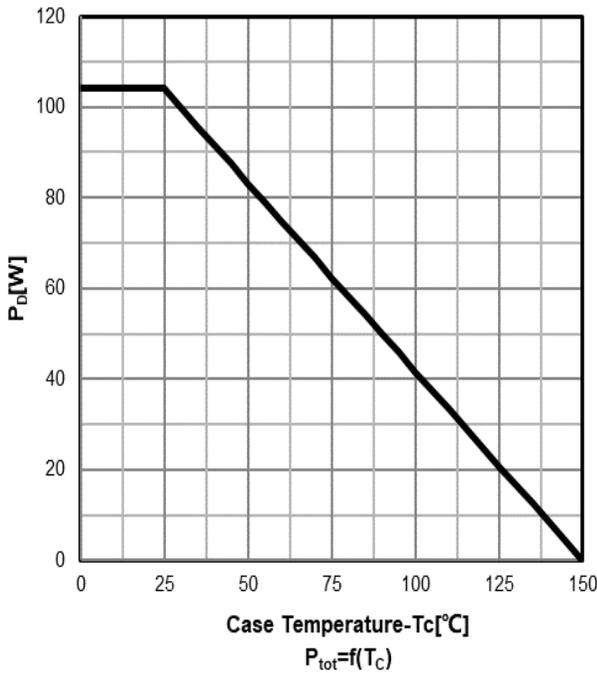


Figure 3: Power Dissipation

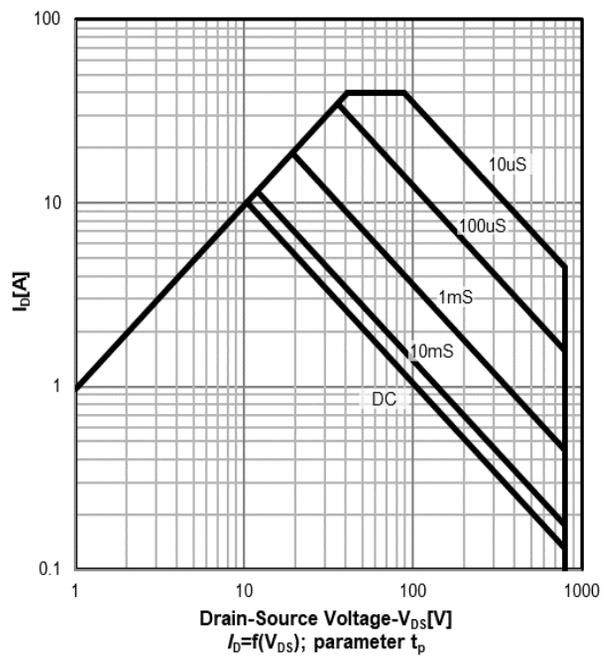


Figure 4: Maximum Forward Biased Safe Operating Area
Tc=25°C

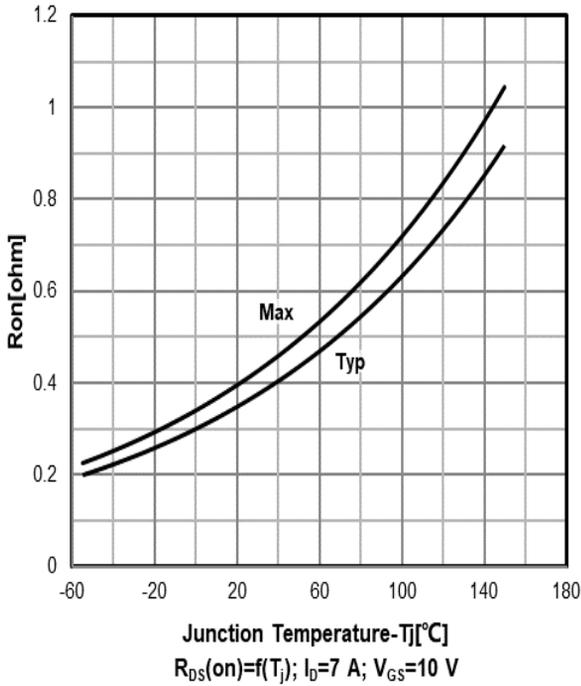


Figure 5: On-Resistance vs. Junction Temperature

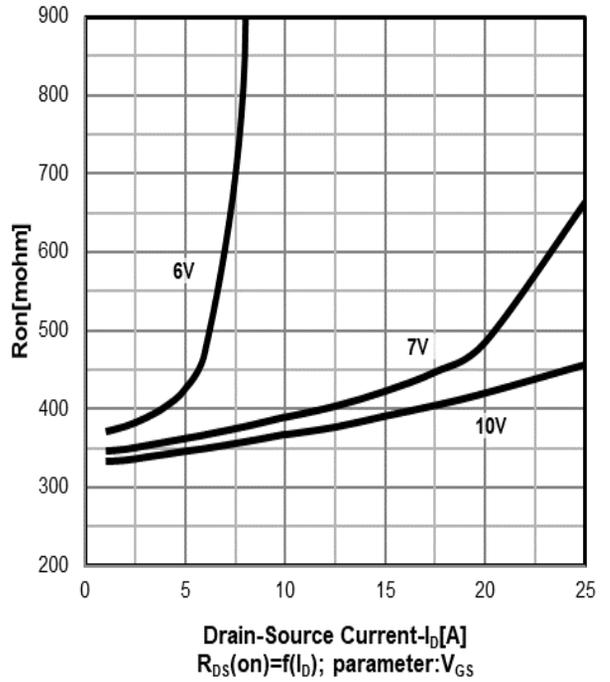


Figure 6: On-Resistance vs. Drain Current, $T_j=25^\circ\text{C}$

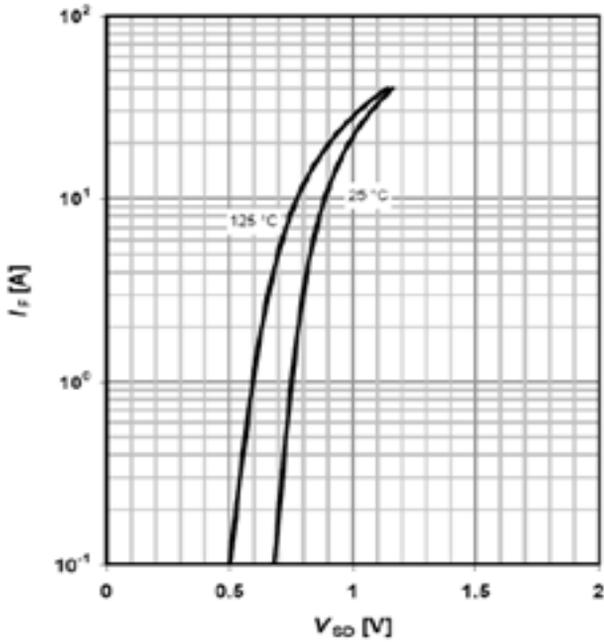


Figure 7: Body-Diode Characteristics

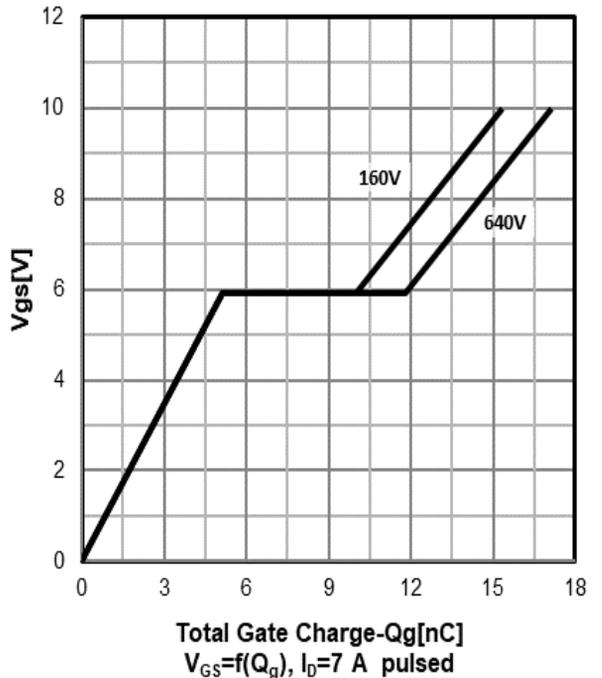


Figure 8: Gate-Charge Characteristics

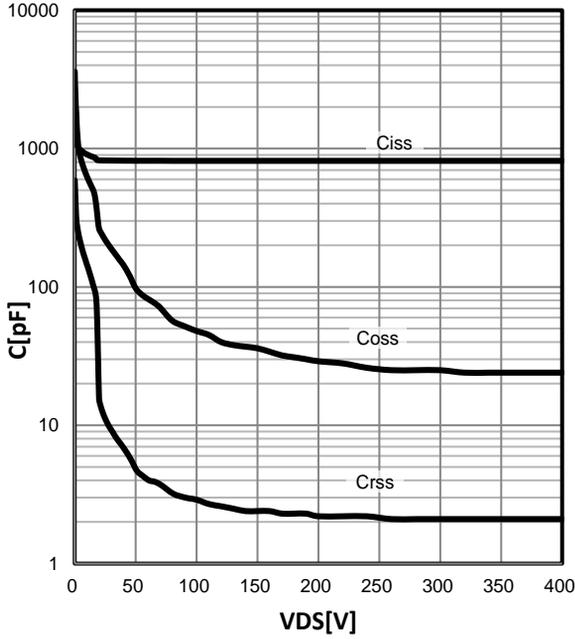


Figure 9: Capacitance Characteristics

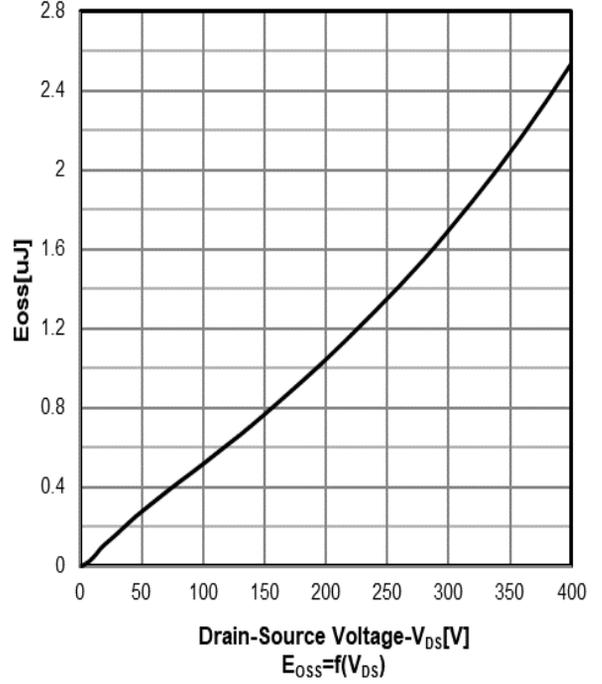


Figure 10: C_{oss} stored Energy

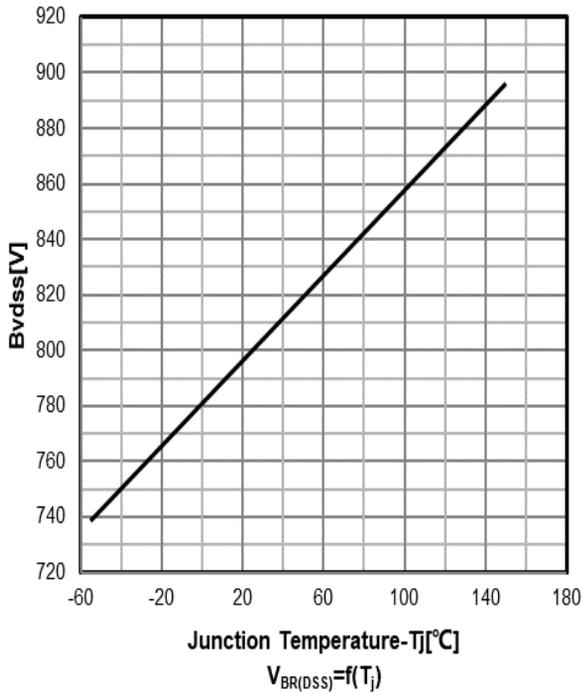


Figure 11: Break Down vs. Junction Temperature

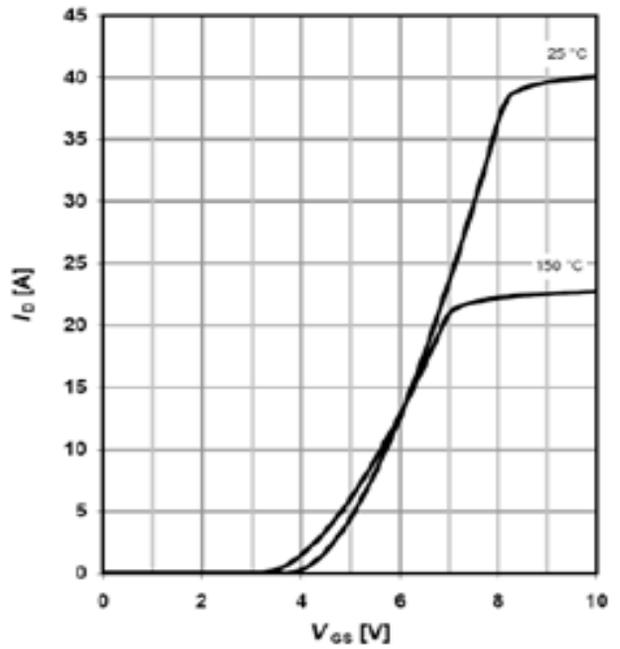


Figure 12: Typical transfer characteristics

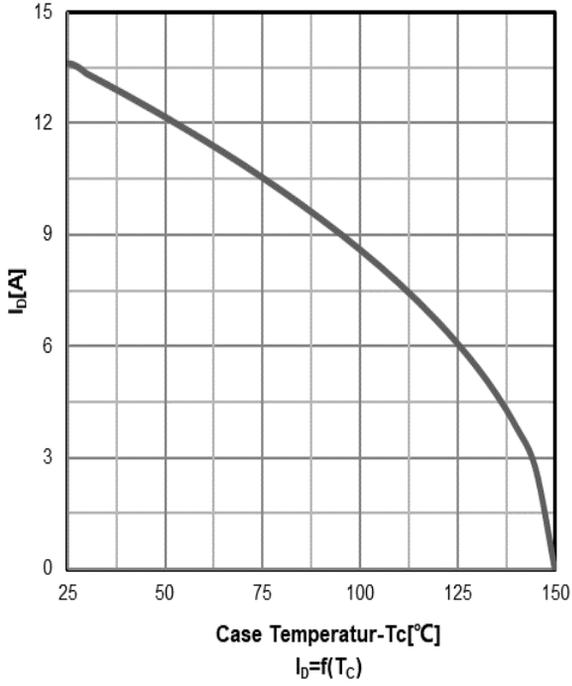


Figure 13: Drain current vs temperature

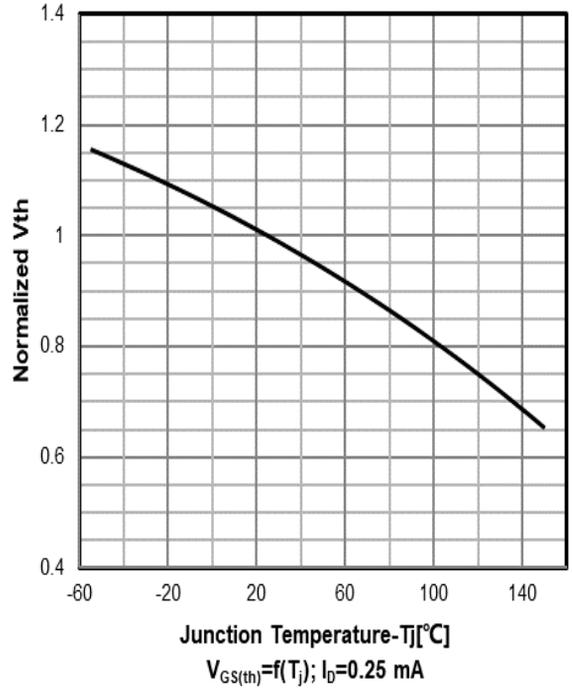


Figure 14: Normalized $V_{GS(th)}$ characteristics

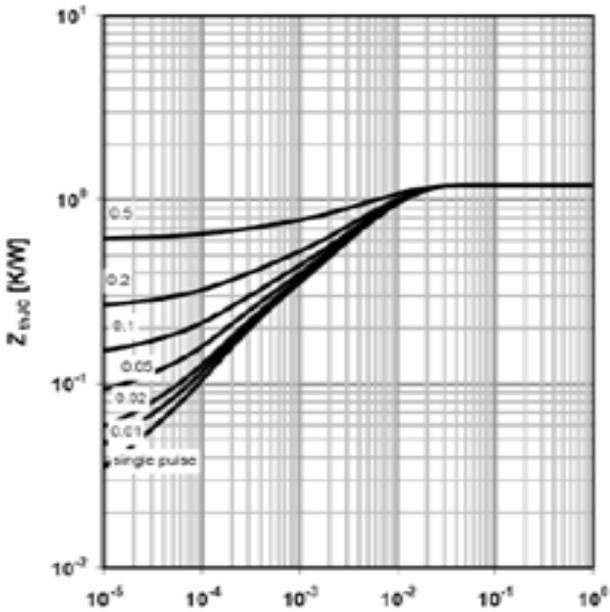
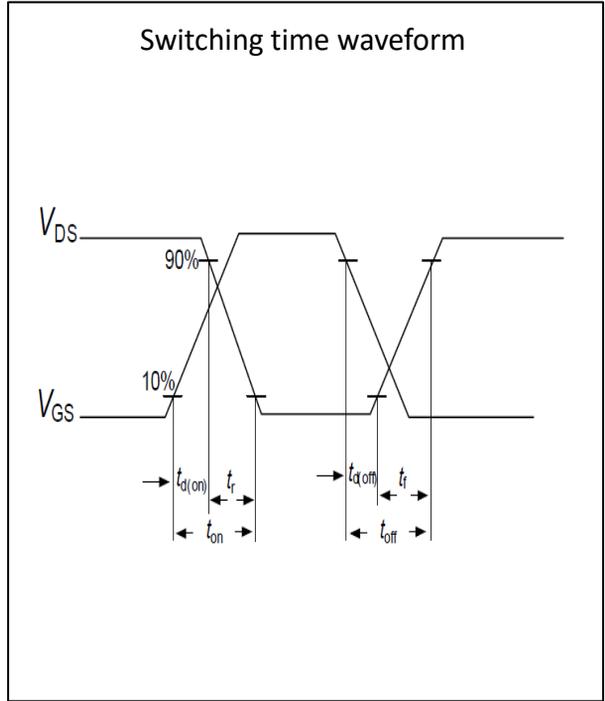
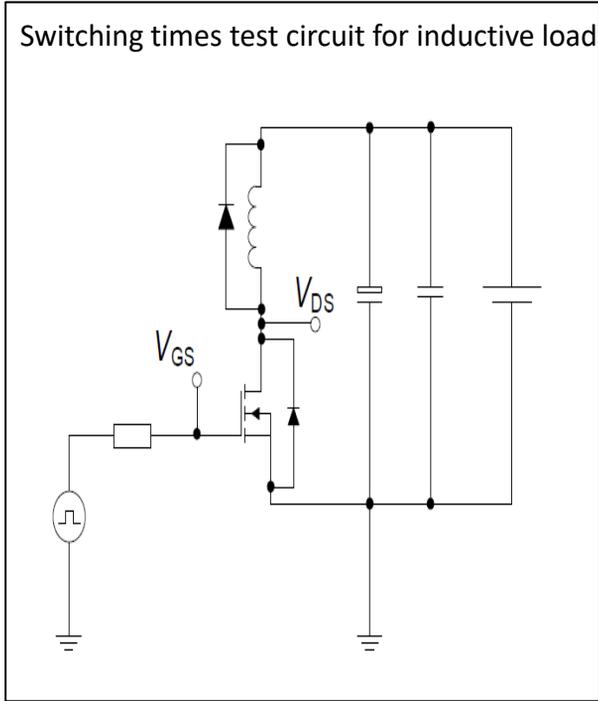
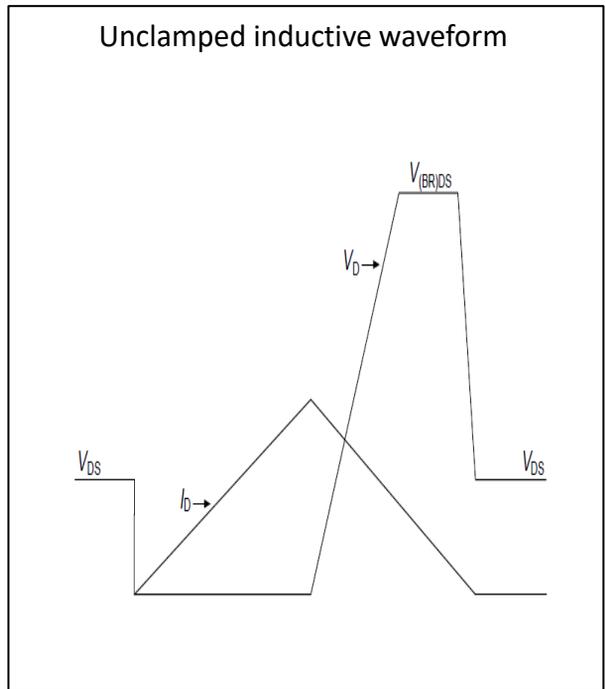
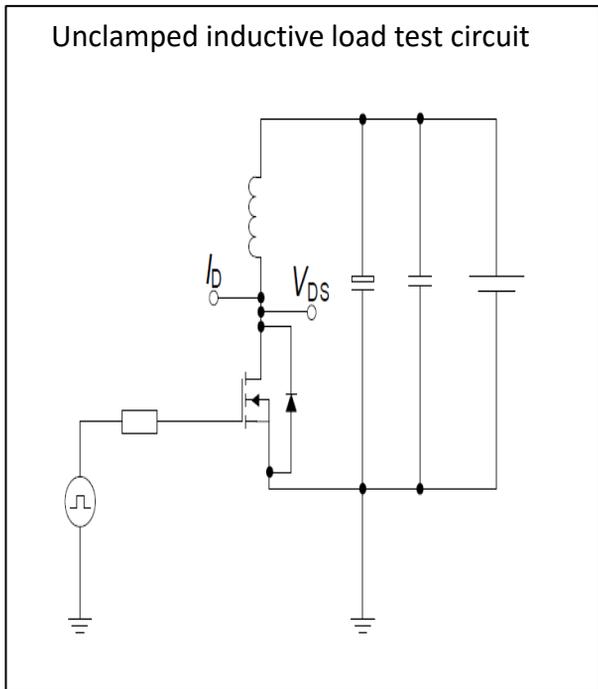


Figure 15: Maximum Transient Thermal Impedance

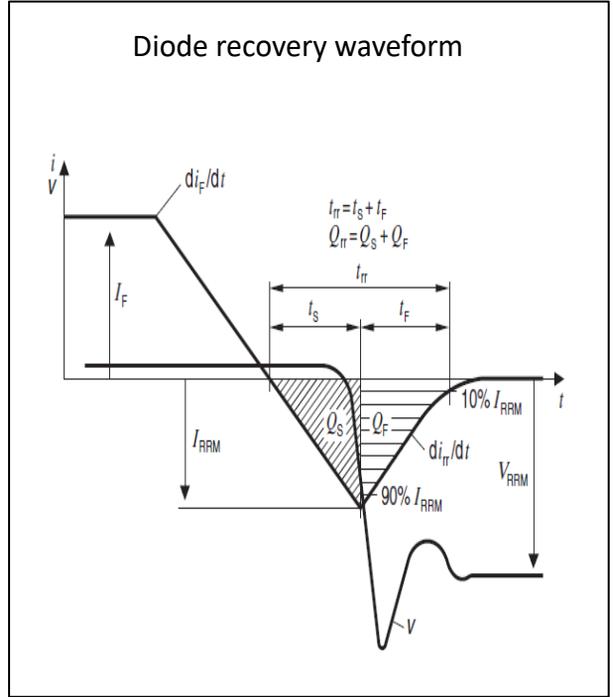
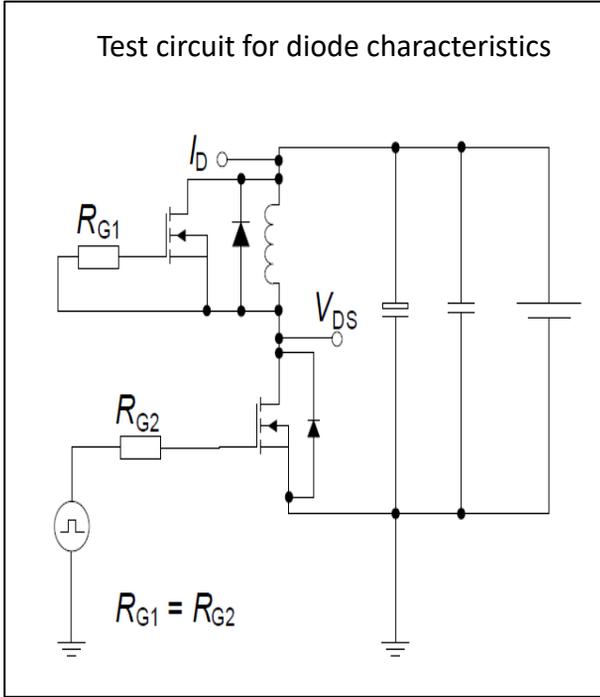
Switching times test circuit and waveform for inductive load

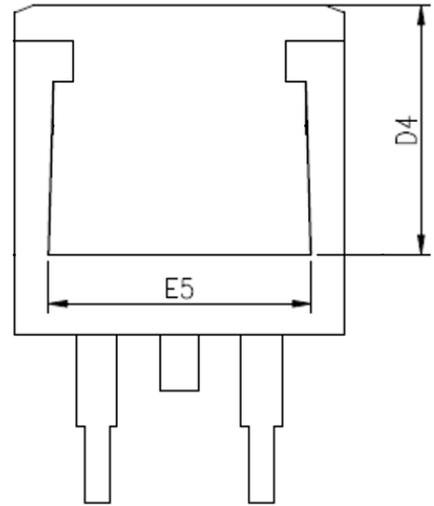
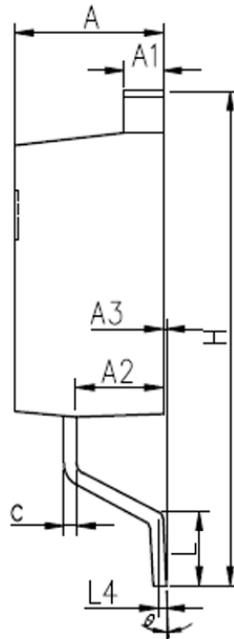
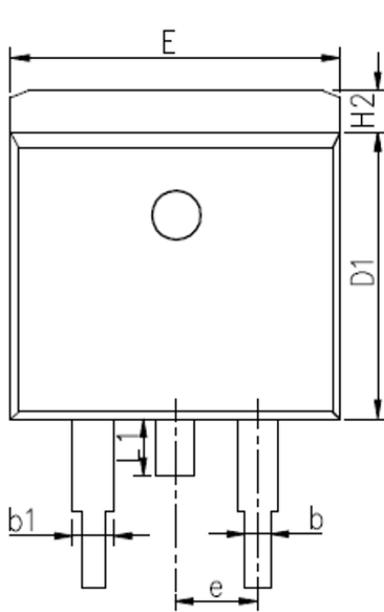


Unclamped inductive load test circuit and waveform



Test circuit and waveform for diode characteristics





COMMON DIMENSIONS

SYMBOL	MM		
	MIN	NOM	MAX
A	4.37	4.57	4.77
A1	1.22	1.27	1.42
A2	2.49	2.69	2.89
A3	0.00	0.13	0.25
b	0.70	0.81	0.96
b1	1.17	1.27	1.47
c	0.30	0.38	0.53
D1	8.50	8.70	8.90
D4	6.60	-	-
E	9.86	10.16	10.36
E5	7.06	-	-
e	2.54 BSC		
H	14.70	15.10	15.50
H2	1.07	1.27	1.47
L	2.00	2.30	2.60
L1	1.40	1.55	1.70
L4	0.25 BSC		
θ	0°	5°	9°



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