

Features

- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- $R_{DS(on).typ}=1.3m\Omega@V_{GS}=10V$
- High Reliability Capability

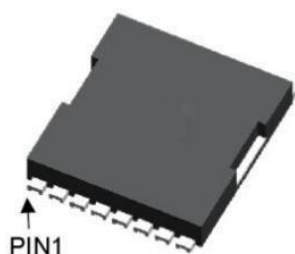
Application

- Charger
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

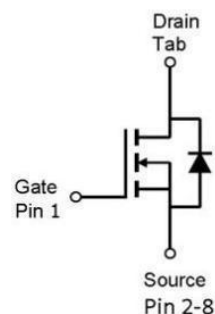
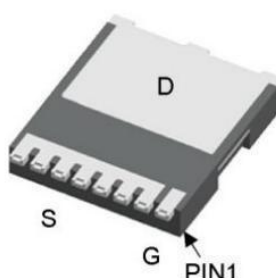
Product Summary

V_{DS}	60V
$R_{DS(on).typ}@V_{GS}=10V$	1.3mΩ
I_D	250A

TOLL Top View



TOLL Bottom View



Package Marking and Ordering Information

Type	Package	Marking	Reel Size	Qty
LR015N06SM10	TOLL	LR015N06SM10	-	2000

Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source Voltage	V_{DS}	60	V
Continuous Drain Current $T_C = 25^\circ C$ $T_C = 100^\circ C$	I_D	250 158	A
Pulsed Drain Current	$I_{D \text{ pulse}}$	1000	A
Avalanche Energy, Single Pulse	E_{AS}	1296	mJ
Gate-emitter Voltage	V_{GS}	±20	V
Power Dissipation, $T_C = 25^\circ C$	P_D	179	W
Operating Junction And Storage Temperature	T_j, T_{stg}	-55~150	°C

Thermal Resistance

Parameter	Symbol	Typ	Max	Unit
Thermal Resistance, Junction to Case	R_{thJC}	0.5	0.7	°C/W
Thermal Resistance, Junction to Ambient	R_{thJA}	45	62	°C/W

Electrical Characteristic, at Tj = 25 °C, unless otherwise specified

Parameter	Symbol	Test Condition	Value			Unit
			min.	typ.	max.	
Static Characteristic						
Drain-source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=250\mu A$	60	66	-	V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.2	3	3.8	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=60V, V_{GS}=0V$	-	-	1	μA
Gate-source leakage current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
Drain-source on-state Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=40A$	-	1.3	1.5	m Ω

Dynamic Characteristic

Input Capacitance	C_{iss}	$V_{GS}=0V,$ $V_{DS}=30V,$ $f=1MHz$	-	6944	-	pF
Output Capacitance	C_{oss}		-	1421	-	
Reverse Transfer Capacitance	C_{rss}		-	256	-	
Gate Total Charge	Q_g	$V_{GS}=10V,$ $V_{DS}=30V,$ $I_D=50A$	-	131	-	nC
Gate-Source charge	Q_{gs}		-	42	-	
Gate-Drain charge	Q_{gd}		-	28	-	
Turn-on Delay Time	$t_{d(on)}$	$V_{GS}=10V,$ $V_{DD}=30V,$ $I_D=50A,$ $R_G=3\Omega$	-	23	-	ns
Turn-on Rise Time	t_r		-	40	-	
Turn-off Delay Time	$t_{d(off)}$		-	60	-	
Turn-off Fall Time	t_f		-	27	-	

Body Diode Characteristic

Body Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_{SD}=50A$	-	-	1.2	V
Reverse Recovery Time	t_{rr}	$I_F=50A,$ $dI_F/dt=100A/\mu s$	-	60	-	ns
Reverse Recovery Charge	Q_{rr}		-	123	-	nC

Typical Performance Characteristics

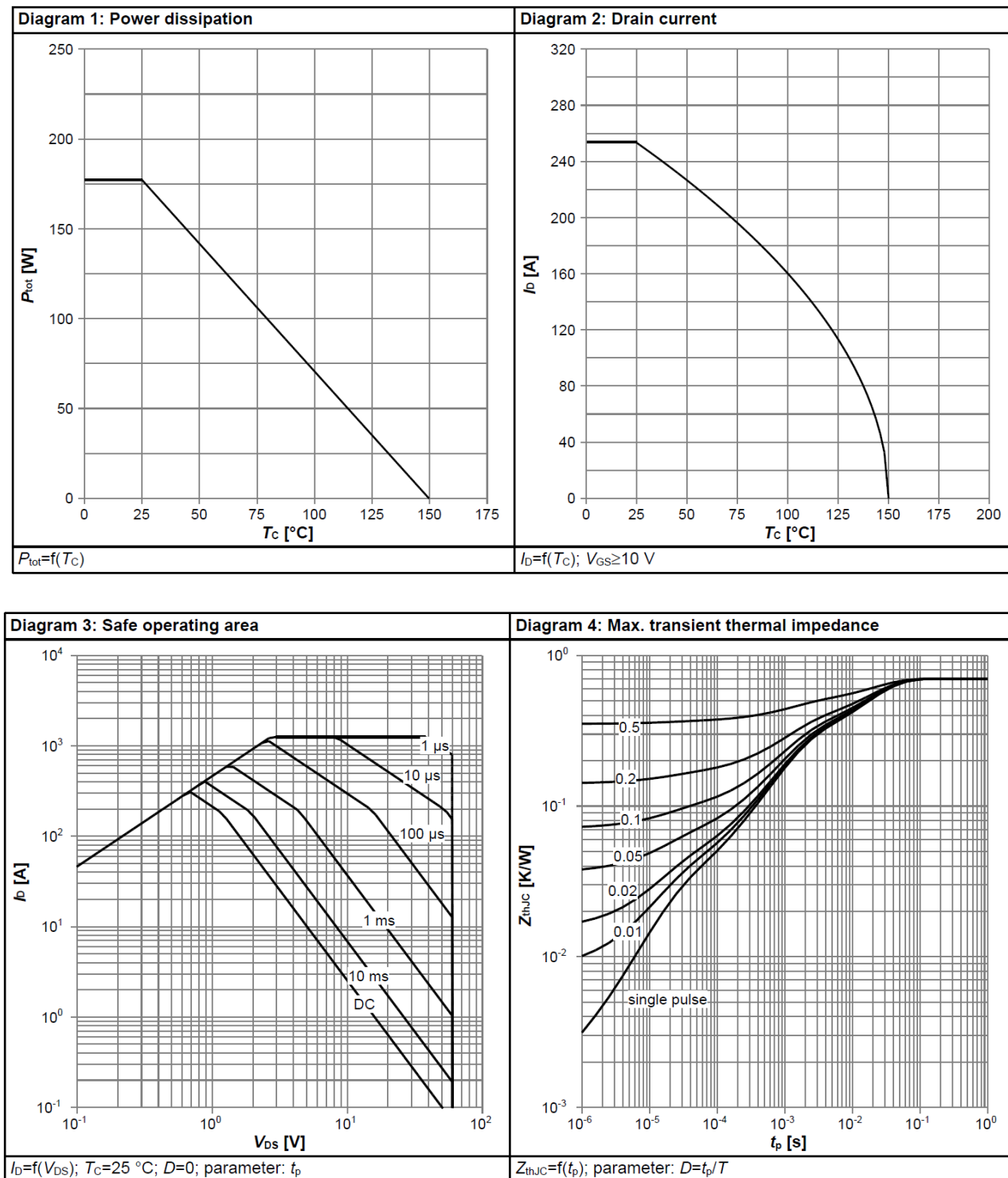
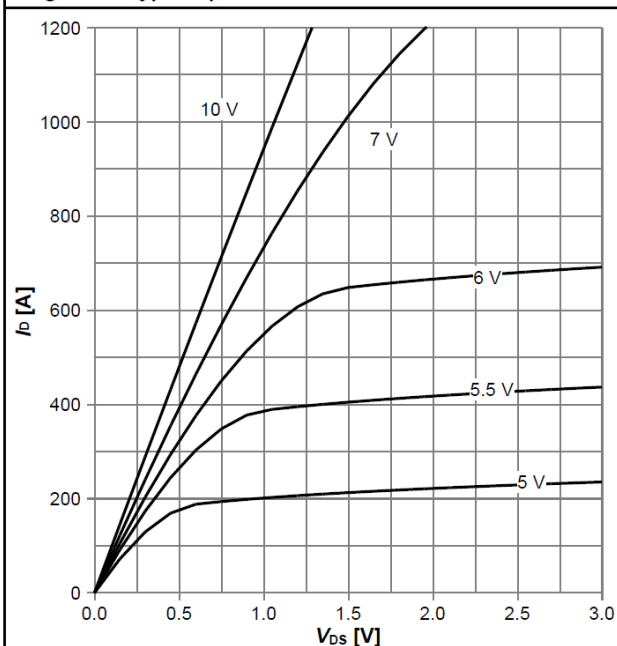
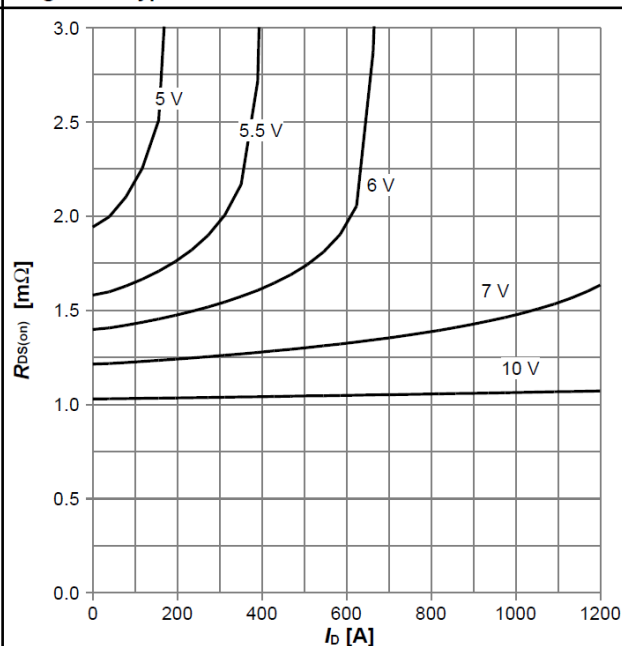


Diagram 5: Typ. output characteristics



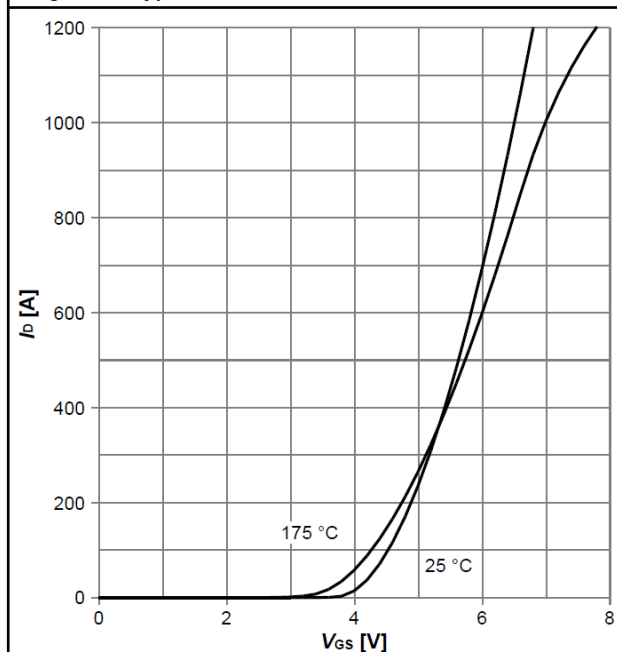
$I_D = f(V_{DS}); T_J = 25^\circ\text{C}; \text{parameter: } V_{GS}$

Diagram 6: Typ. drain-source on resistance



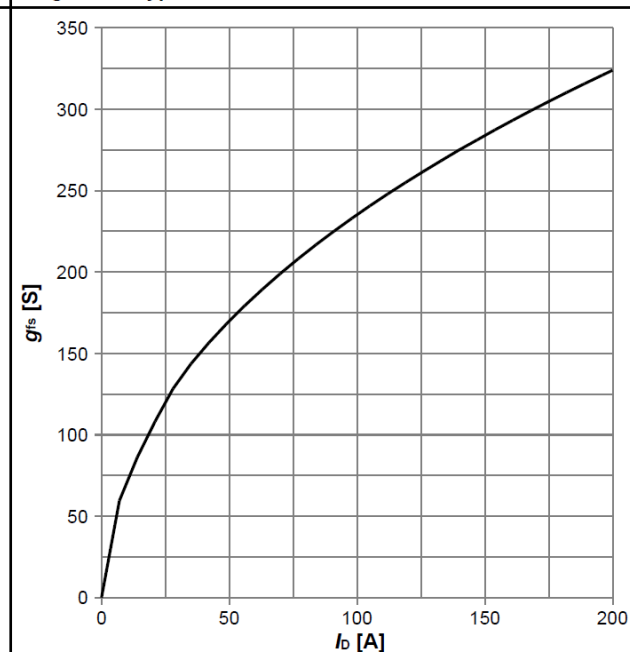
$R_{DS(on)} = f(I_D); T_J = 25^\circ\text{C}; \text{parameter: } V_{GS}$

Diagram 7: Typ. transfer characteristics



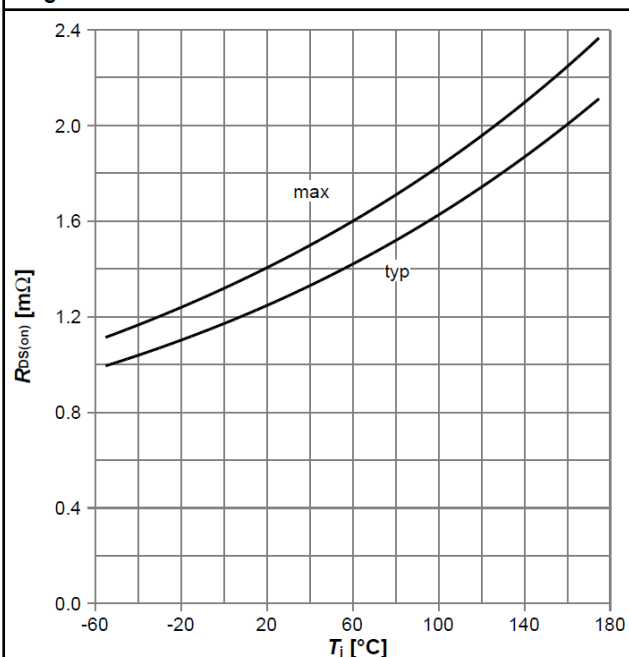
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}; \text{parameter: } T_J$

Diagram 8: Typ. forward transconductance



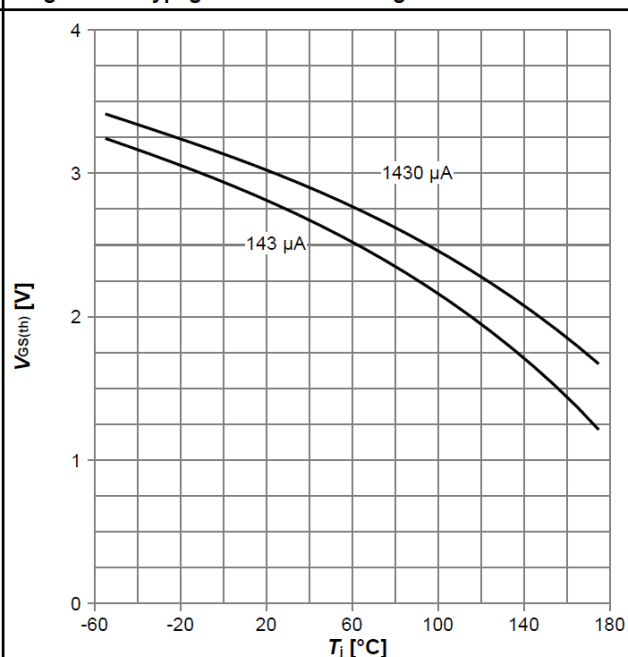
$g_{fs} = f(I_D); T_J = 25^\circ\text{C}$

Diagram 9: Drain-source on-state resistance



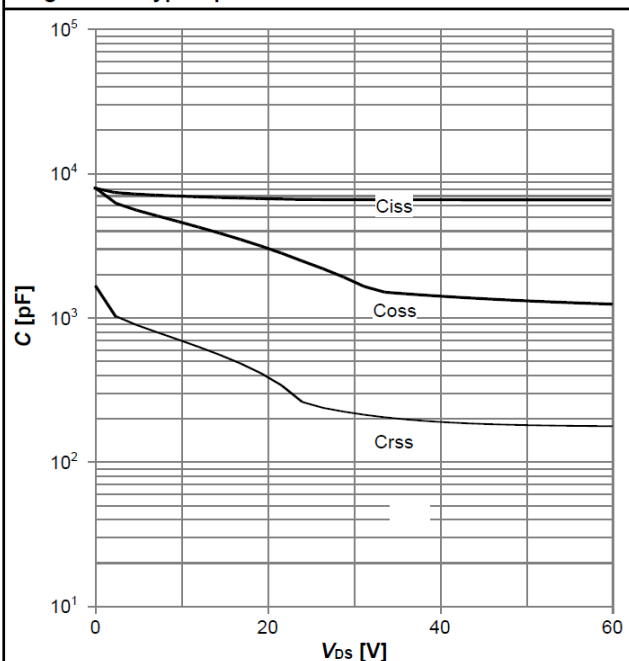
$$R_{DS(on)} = f(T_j); I_D = 40 \text{ A}; V_{GS} = 10 \text{ V}$$

Diagram 10: Typ. gate threshold voltage



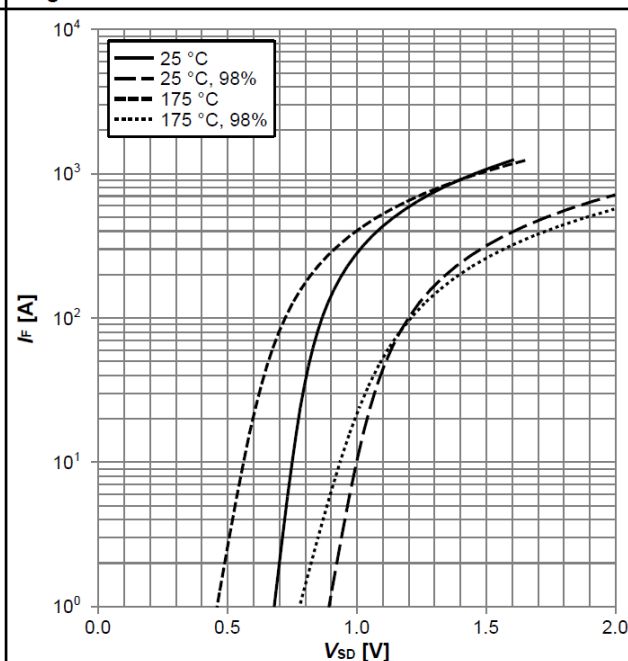
$$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$$

Diagram 11: Typ. capacitances



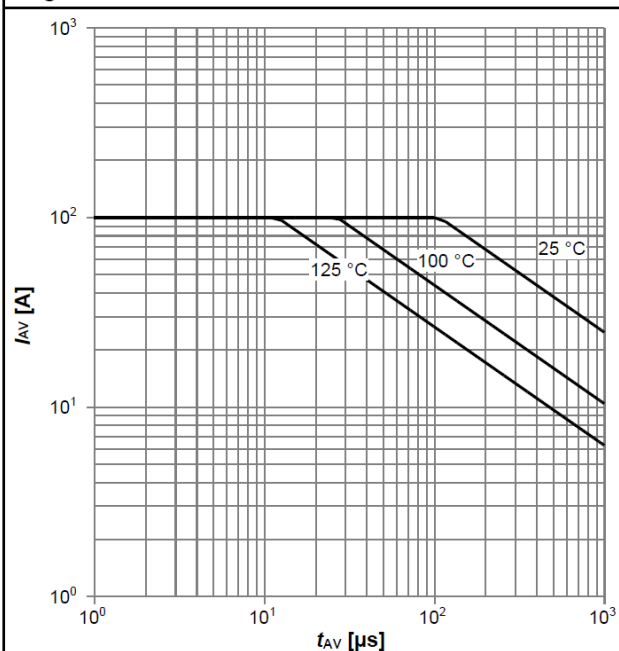
$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$$

Diagram 12: Forward characteristics of reverse diode



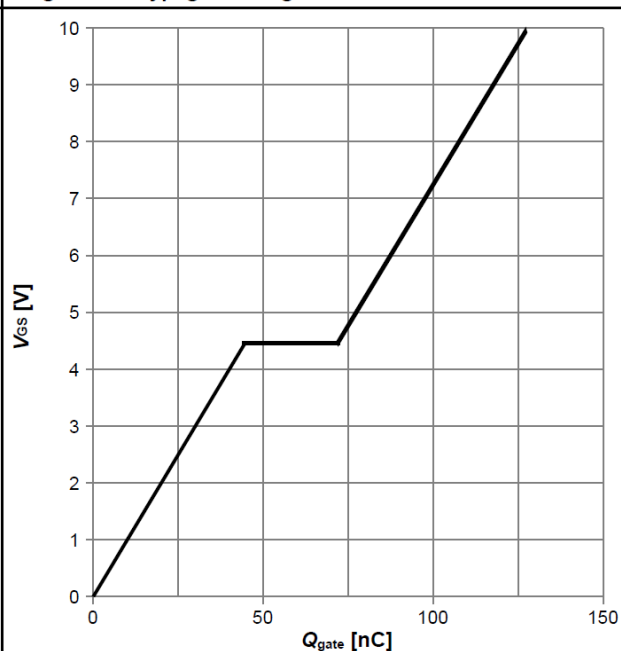
$$I_F = f(V_{SD}); \text{parameter: } T_j$$

Diagram 13: Avalanche characteristics



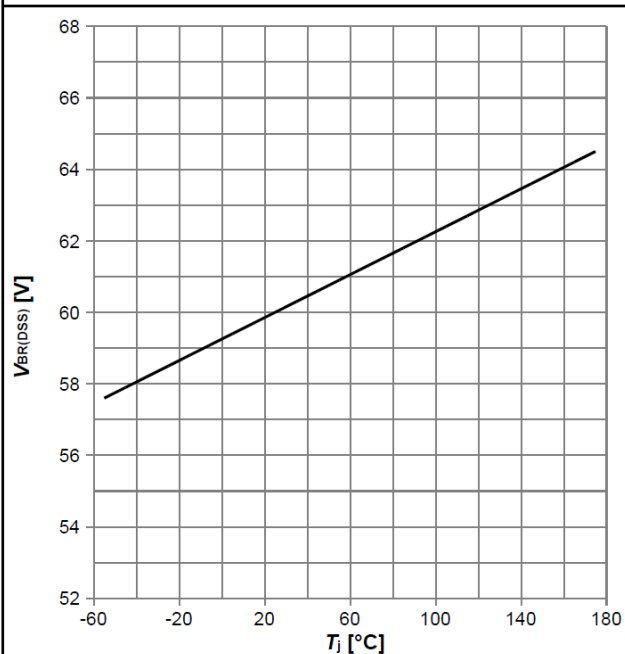
$I_{AS}=f(t_{AV})$; parameter: $T_{J(start)}$

Diagram 14: Typ. gate charge



$V_{GS}=f(Q_{gate})$; $I_D=50$ A pulsed; parameter: V_{DD}

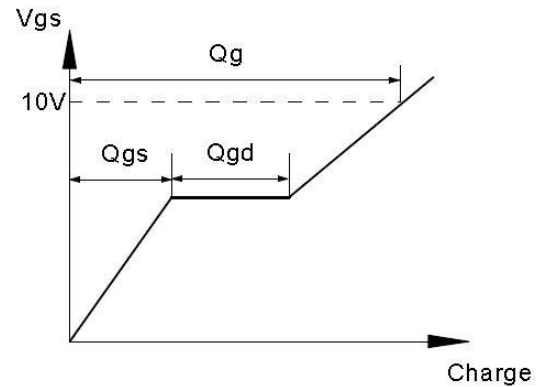
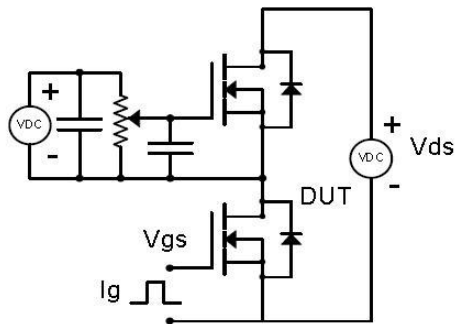
Diagram 15: Drain-source breakdown voltage



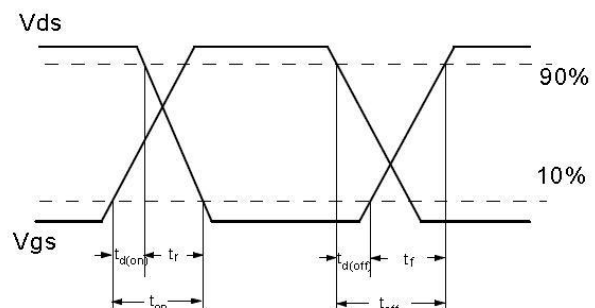
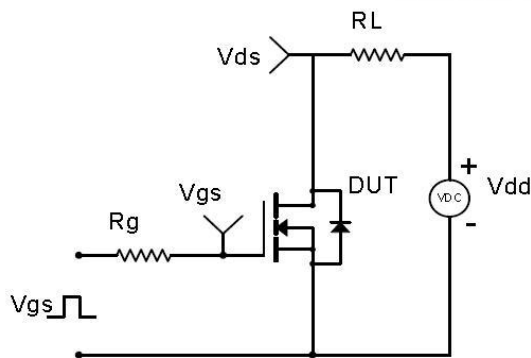
$V_{BR(DSS)}=f(T_J)$; $I_D=1$ mA

Test Circuit & Waveform

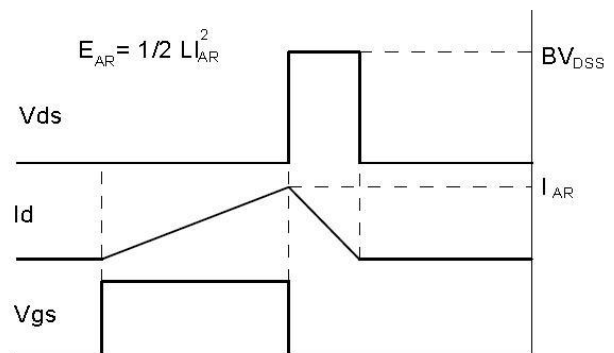
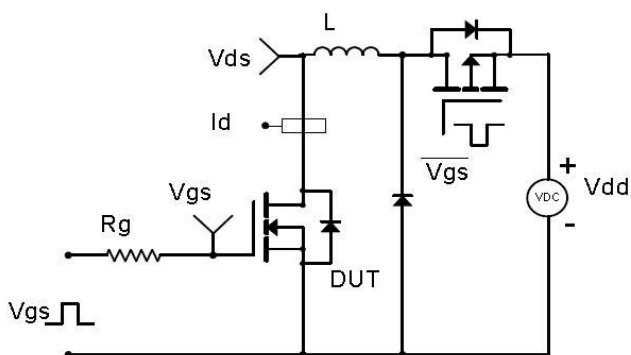
Gate Charge Test Circuit & Waveform



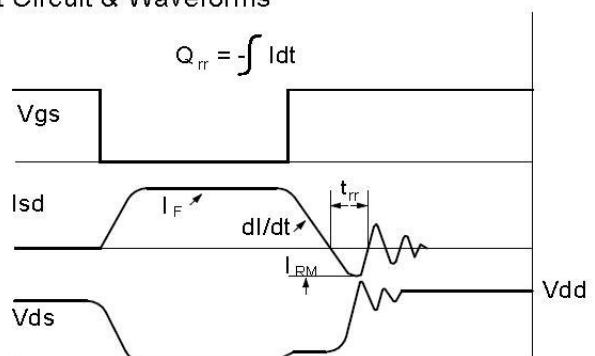
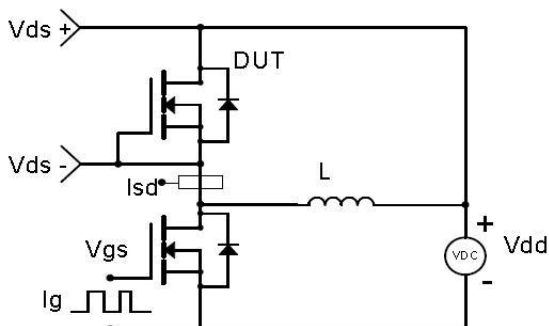
Resistive Switching Test Circuit & Waveforms



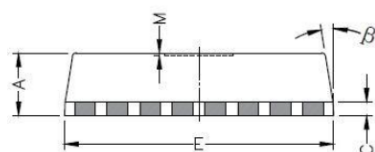
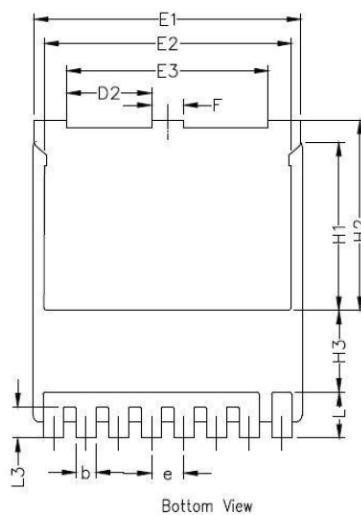
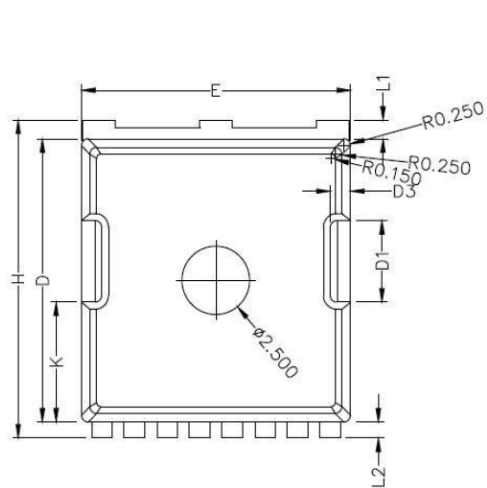
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Package Outline: TOLL



Symbols	Millimeters		
	MIN.	NOM	MAX.
A	2.20	2.30	2.40
b	0.65	0.75	0.85
C	0.508 REF		
D	10.25	10.40	10.55
D1	2.85	3.00	3.15
D2	2.95	3.10	3.25
D3	0.75 REF		
E	9.75	9.90	10.05
E1	9.65	9.80	9.95
E2	8.95	9.10	9.25
E3	7.25	7.40	7.55
e	1.20 BSC		
F	1.05	1.20	1.35
H	11.55	11.70	11.85
H1	6.03	6.18	6.33
H2	6.85	7.00	7.15
H3	3.00 BSC		
L	1.55	1.70	1.85
L1	0.55	0.70	0.85
L2	0.45	0.60	0.75
L3	1.00	1.15	1.30
M	0.08 REF		
β	8°	10°	12°
K	4.25	4.40	4.55