

Features

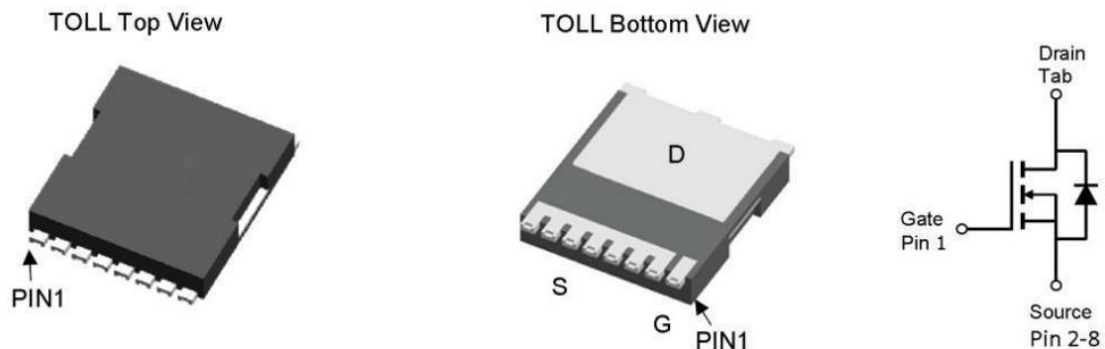
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- $R_{DS(on).typ}=4m\Omega@V_{GS}=10V$
- High Reliability Capability

Application

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

Product Summary

V_{DS}	100V
$R_{DS(on).typ}@V_{GS}=10V$	4mΩ
I_D	135A



Package Marking and Ordering Information

Type	Package	Marking	Reel Size	Qty
LR046N10SM10	TOLL	LR046N10SM10	-	2000

Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source Voltage	V_{DS}	100	V
Continuous Drain Current $T_C = 25^\circ C$ $T_C = 100^\circ C$	I_D	135 90	A
Pulsed Drain Current	$I_{D \text{ pulse}}$	580	A
Avalanche Energy, Single Pulse	E_{AS}	625	mJ
Gate-emitter Voltage	V_{GS}	±20	V
Power Dissipation, $T_C = 25^\circ C$	P_D	156	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}	-	0.8	°C/W
Thermal Resistance, Junction to Ambient	R_{thJA}	-	40	°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	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=250\mu A$	100	-	-	V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2	-	4	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=100V, V_{GS}=0V$	-	-	1	μA
Gate-source leakage current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
Drain-source on-state Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=20A$	-	4	4.6	m Ω

Dynamic Characteristic

Input Capacitance	C_{iss}	$V_{GS}=0V,$ $V_{DS}=50V,$ $f=1MHz$	-	4428	-	pF
Output Capacitance	C_{oss}		-	610	-	
Reverse Transfer Capacitance	C_{rss}		-	19	-	
Gate Total Charge	Q_g	$V_{GS}=10V,$ $V_{DS}=50V,$ $I_D=20A$	-	70	-	nC
Gate-Source charge	Q_{gs}		-	23	-	
Gate-Drain charge	Q_{gd}		-	18	-	
Turn-on Delay Time	$t_{d(on)}$	$V_{GS}=10V,$ $V_{DS}=50V,$ $I_D=50A,$ $R_G=6\Omega$	-	18	-	ns
Turn-on Rise Time	t_r		-	36	-	
Turn-off Delay Time	$t_{d(off)}$		-	60	-	
Turn-off Fall Time	t_f		-	37	-	

Body Diode Characteristic

Body Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_F=50A$	-	-	1.2	V
Reverse Recovery Time	t_{rr}	$I_F=50A,$ $dI_F/dt=100A/us$	-	72	-	ns
Reverse Recovery Charge	Q_{rr}		-	140	-	nC

Typical Performance Characteristics

Fig.1 Typ. transfer characteristics

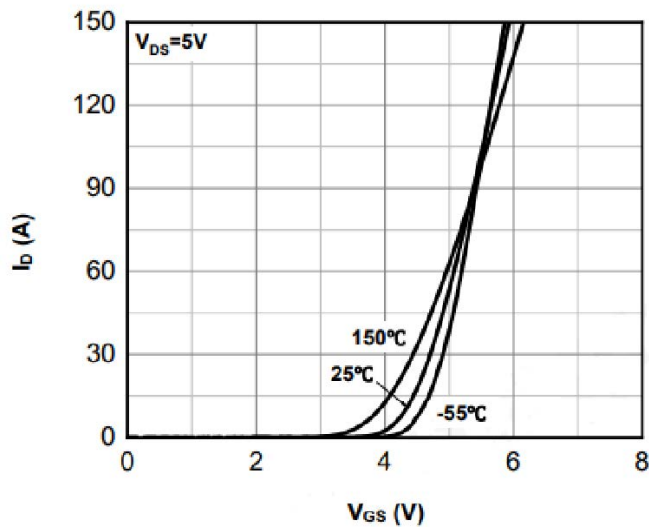


Fig.2 Typ. output characteristics

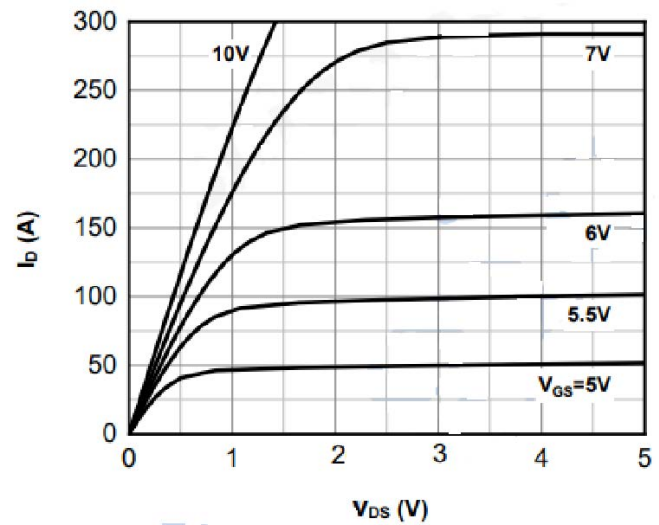


Fig.3 Normalized on-resistance vs drain current

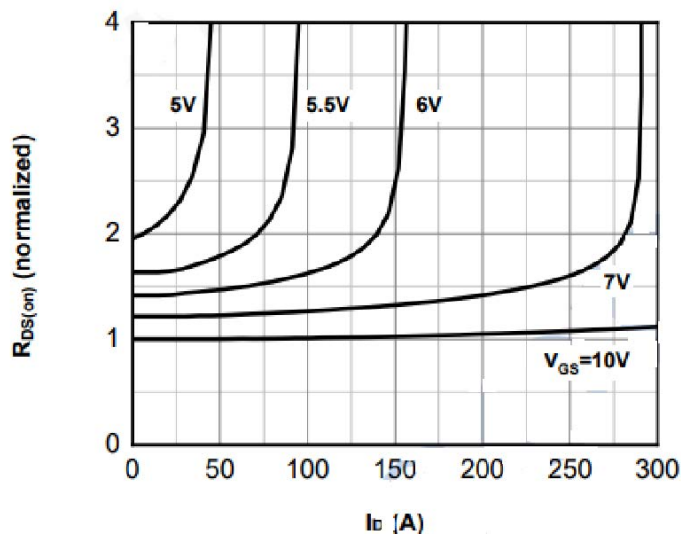


Fig.4 Typ. on-resistance vs gate-source voltage

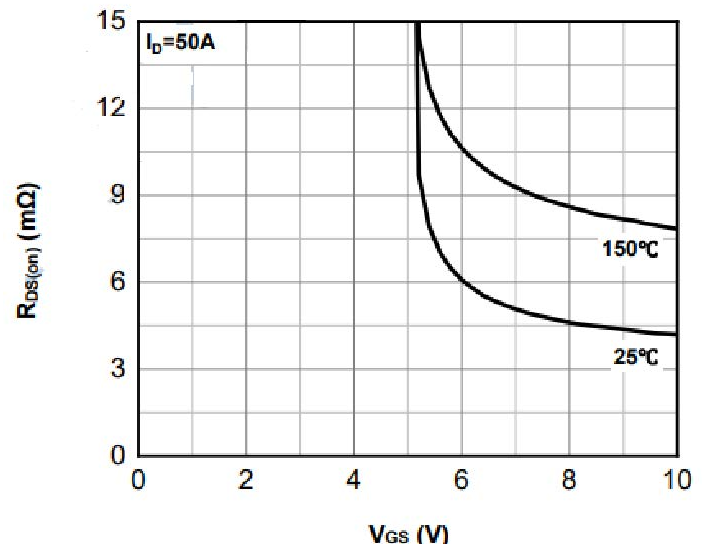


Fig.5 Normalized on-resistance vs junction temperature

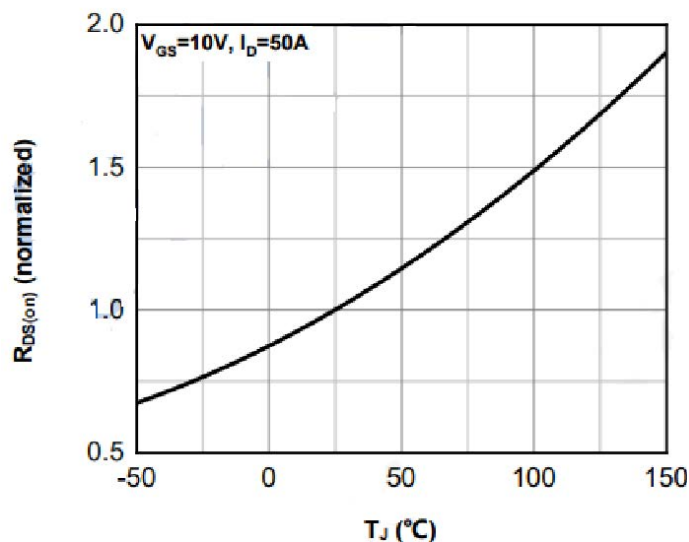


Fig.6 Typ. gate charge

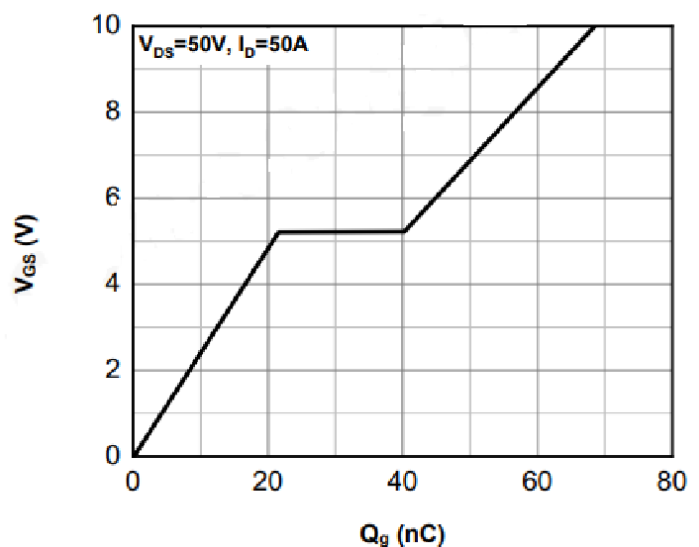


Fig.7 Typ. forward characteristics of body diode

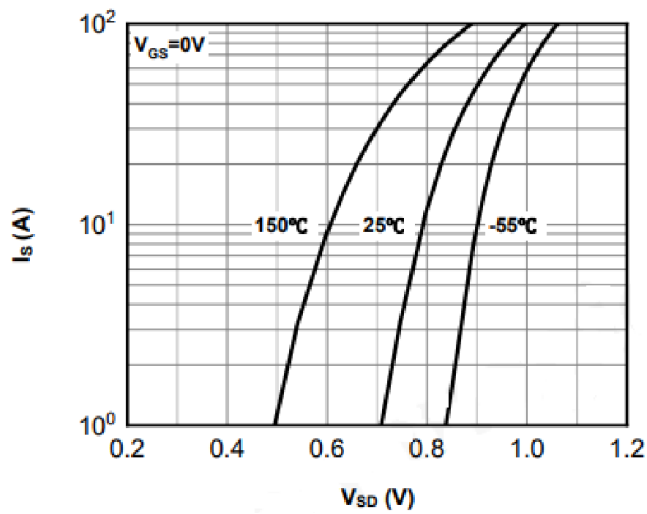


Fig.8 Safe operating area

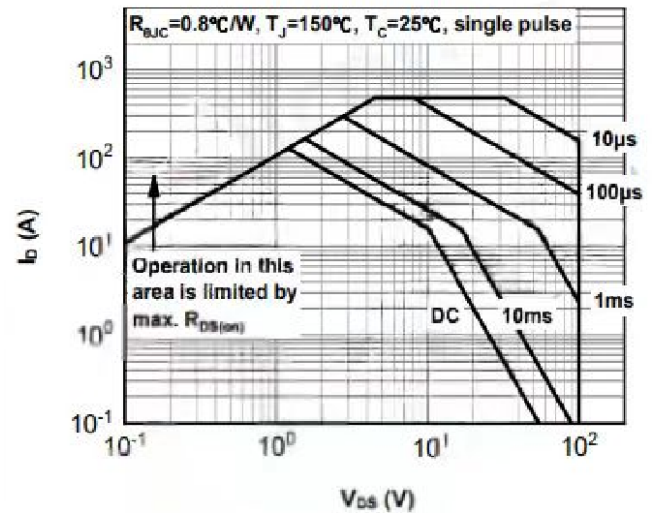


Fig.9 Typ. Capacitance

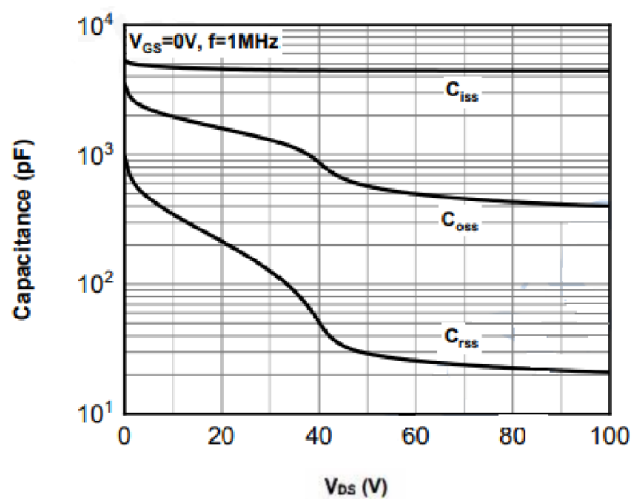


Fig.10 Single pulse maximum power dissipation

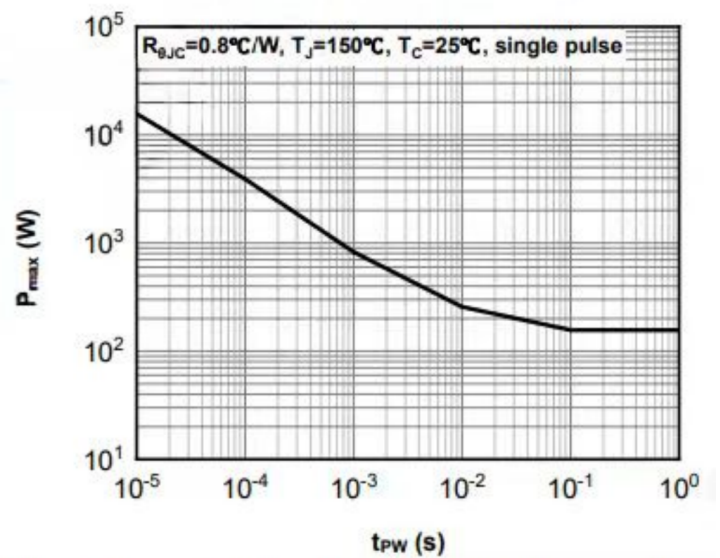


Fig.11 Max. power dissipation vs case temperature

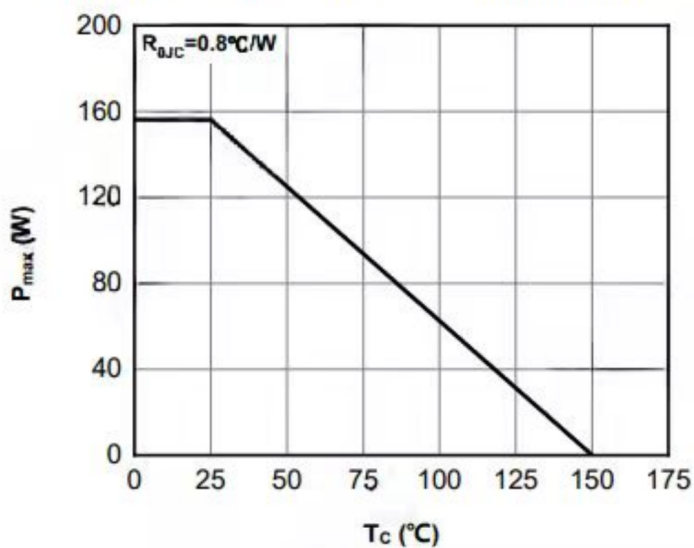


Fig.12 Max. continuous drain current vs case temperature

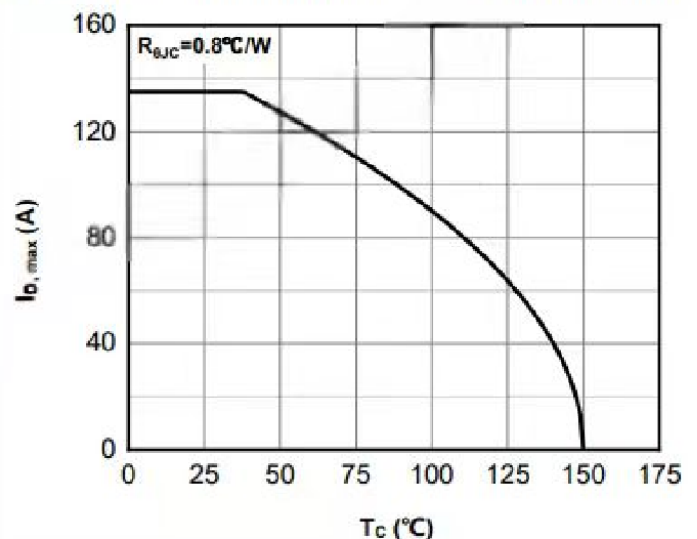


Fig.13 Normalized $V_{(BR)DSS}$ vs junction temperature

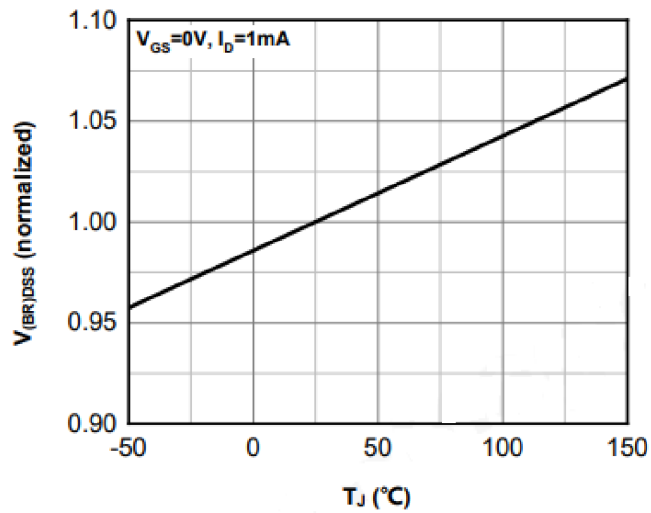


Fig.14 Normalized $V_{GS(th)}$ vs junction temperature

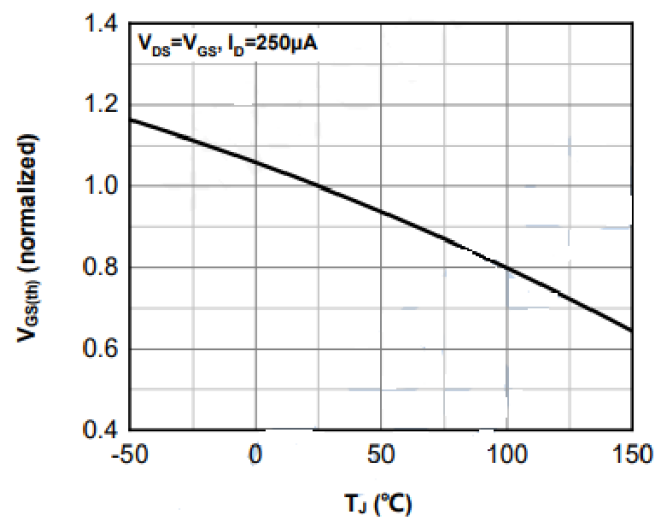
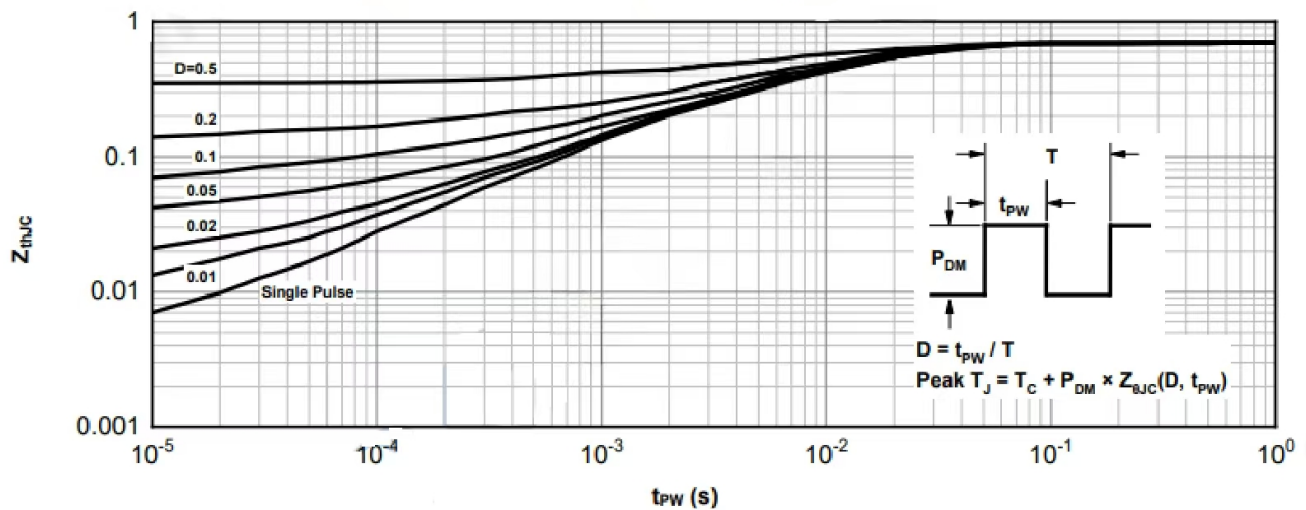
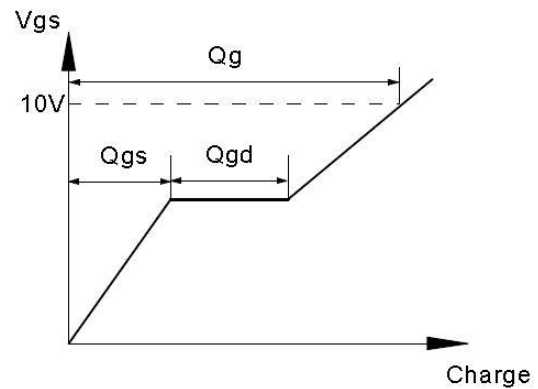
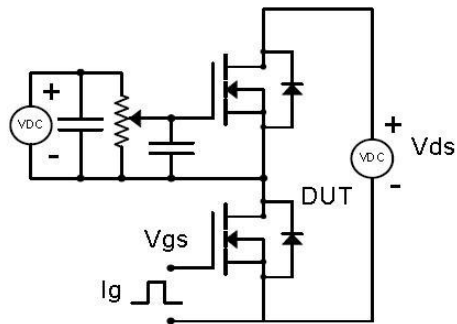


Fig.15 Transient thermal impedance from junction to case

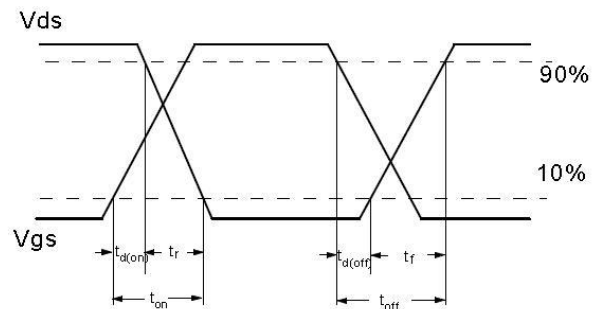
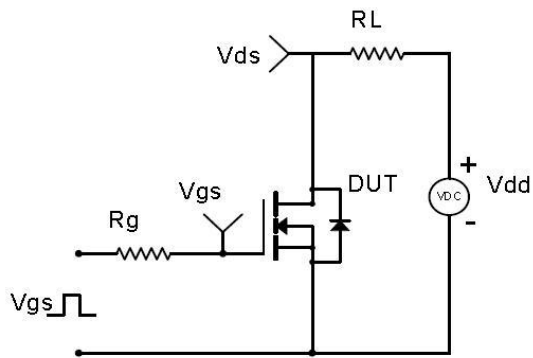


Test Circuit & Waveform

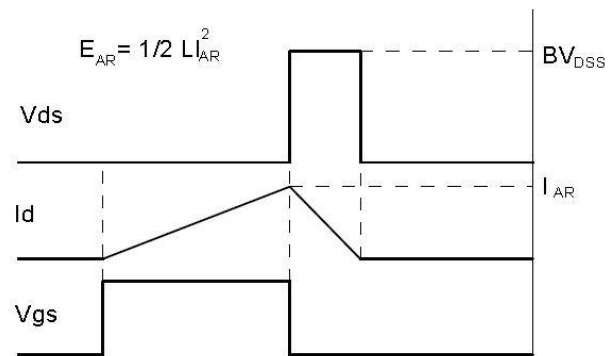
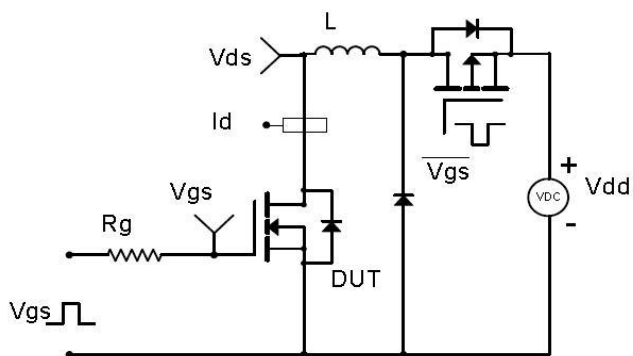
Gate Charge Test Circuit & Waveform



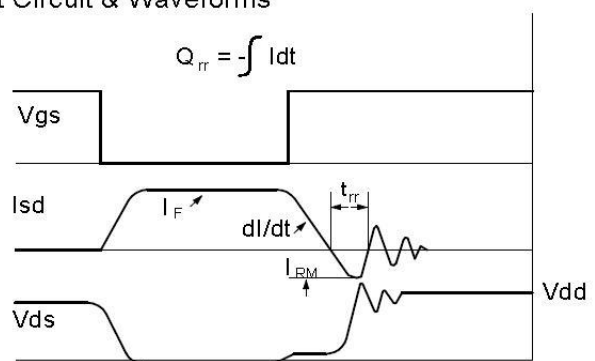
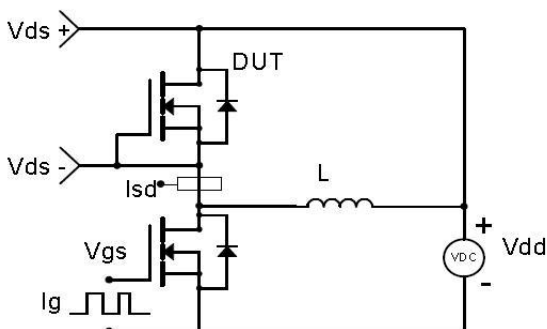
Resistive Switching Test Circuit & Waveforms



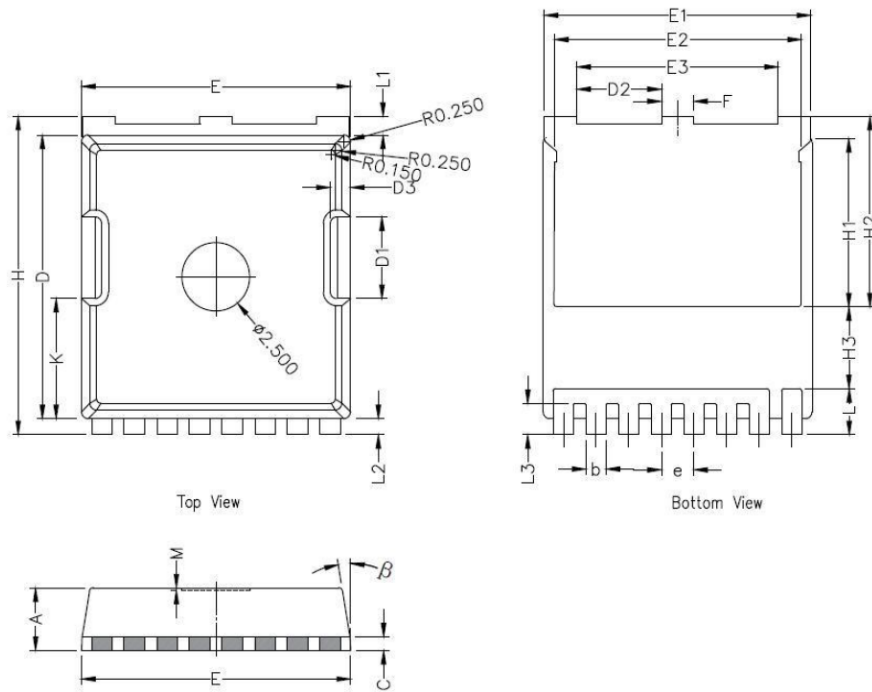
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



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