

# Lonten N-channel 40V, 356A, 0.76 mΩ Power MOSFET

Description	Product Summary	
These N-Channel enhancement mode power field effect transistors are using <b>shielded gate trench</b> DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.	$V_{DSS}$	40V
	$R_{DS(on),typ}$ @ $V_{GS}=10V$	0.76m $\Omega$
	$I_D$ , Silicon	356A
Pin Configuration		
		

## Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted

## Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.63	°C/W
Thermal Resistance, Junction-to-Ambient, minimal footprint <sup>4)</sup>	$R_{\theta JA}$	62	°C/W
Soldering temperature, wave soldering only allowed at leads. (1.6mm from case for 10s)	$T_{\text{sold}}$	260	°C

**Package Marking and Ordering Information**

Device	Device Package	Marking	Units/Reel
LSGT04R009H	TOLL	LSGT04R009H	2000

**Electrical Characteristics**
 $T_J = 25^\circ\text{C}$  unless otherwise noted

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
<b>Static characteristics</b>						
Drain-source breakdown voltage	$\text{BV}_{\text{DSS}}$	$\text{V}_{\text{GS}}=0\text{ V}, \text{I}_D=250\text{uA}$	40	---	---	V
Gate threshold voltage	$\text{V}_{\text{GS(th)}}$	$\text{V}_{\text{DS}}=\text{V}_{\text{GS}}, \text{I}_D=250\text{uA}$	2	---	4	V
Drain-source leakage current	$\text{I}_{\text{DSS}}$	$\text{V}_{\text{DS}}=40\text{V}, \text{V}_{\text{GS}}=0\text{V}, \text{T}_J = 25^\circ\text{C}$	---	---	1	$\mu\text{A}$
		$\text{V}_{\text{DS}}=40\text{V}, \text{V}_{\text{GS}}=0\text{V}, \text{T}_J = 150^\circ\text{C}$	---	---	100	$\mu\text{A}$
Gate leakage current, Forward	$\text{I}_{\text{GSSF}}$	$\text{V}_{\text{GS}}=20\text{ V}, \text{V}_{\text{DS}}=0\text{ V}$	---	---	100	nA
Gate leakage current, Reverse	$\text{I}_{\text{GSSR}}$	$\text{V}_{\text{GS}}=-20\text{V}, \text{V}_{\text{DS}}=0\text{ V}$	---	---	-100	nA
Drain-source on-state resistance	$\text{R}_{\text{DS(on)}}$	$\text{V}_{\text{GS}}=10\text{V}, \text{I}_D=50\text{ A}, \text{T}_J = 25^\circ\text{C}$	---	0.76	0.98	$\text{m}\Omega$
		$\text{T}_J = 150^\circ\text{C}$	---	1.21	---	
Forward transconductance	$\text{g}_{\text{fs}}$	$\text{V}_{\text{DS}} =20\text{V} , \text{I}_D=50\text{A}$	---	123.2	---	S
<b>Dynamic characteristics</b>						
Input capacitance	$\text{C}_{\text{iss}}$	$\text{V}_{\text{DS}} =20\text{V}, \text{V}_{\text{GS}} = 0\text{V},$ $f = 100\text{kHz}$	---	7527	---	$\text{pF}$
Output capacitance	$\text{C}_{\text{oss}}$		---	3056.5	---	
Reverse transfer capacitance	$\text{C}_{\text{rss}}$		---	162.3	---	
Turn-on delay time	$\text{t}_{\text{d(on)}}$	$\text{V}_{\text{DD}} = 20\text{V}, \text{V}_{\text{GS}}=10\text{V},$ $\text{I}_D = 50\text{A}, \text{R}_g = 10\Omega$	---	96.1	---	$\text{ns}$
Rise time	$\text{t}_r$		---	221.4	---	
Turn-off delay time	$\text{t}_{\text{d(off)}}$		---	116.3	---	
Fall time	$\text{t}_f$		---	46.3	---	
Gate resistance	$\text{R}_g$	$\text{V}_{\text{GS}}=0\text{V}, \text{V}_{\text{DS}}=0\text{V}, f=1\text{MHz}$	---	2.9	---	$\Omega$
<b>Gate charge characteristics</b>						
Gate to source charge	$\text{Q}_{\text{gs}}$	$\text{V}_{\text{DS}}=20\text{V}, \text{I}_D=50\text{A},$ $\text{V}_{\text{GS}}= 10\text{V}$	---	30.4	---	$\text{nC}$
Gate to drain charge	$\text{Q}_{\text{gd}}$		---	14.8	---	
Gate charge total	$\text{Q}_{\text{g}}$		---	100.3	---	
Gate plateau voltage	$\text{V}_{\text{plateau}}$		---	3.2	---	V
Output Charge	$\text{Q}_{\text{oss}}$	$\text{V}_{\text{DS}}=30\text{V}, \text{V}_{\text{GS}}= 0\text{V}$	---	145	---	$\text{nC}$
<b>Drain-Source diode characteristics and Maximum Ratings</b>						
Continuous Source Current	$\text{I}_s$		---	---	220	A
Pulsed Source Current	$\text{I}_{\text{SM}}$		---	---	880	A
Diode Forward Voltage	$\text{V}_{\text{SD}}$	$\text{V}_{\text{GS}}=0\text{V}, \text{I}_s=50\text{A}, \text{T}_J=25^\circ\text{C}$	---	---	0.9	V
Peak reverse recovery current	$\text{I}_{\text{rrm}}$	$\text{I}_s=50\text{A}, \text{di/dt}=100\text{A/us}, \text{T}_J=25^\circ\text{C}$	---	1.01	---	A
Reverse Recovery Time	$\text{t}_{\text{rr}}$		---	40.6	---	ns
Reverse Recovery Charge	$\text{Q}_{\text{rr}}$		---	25	---	$\text{nC}$

**Notes:**

1. Limited by maximum junction temperature and duty cycle.
2. Repetitive Rating: Pulse width limited by maximum junction temperature.
3.  $\text{V}_{\text{DD}}=30\text{V}, \text{V}_{\text{GS}}=10\text{V}, \text{L}=0.5\text{mH}, \text{I}_{\text{AS}}=62\text{A}$ , Starting  $\text{T}_J=25^\circ\text{C}$ .
4. The value of  $\text{R}_{\text{thJA}}$  is measured by placing the device in a still air box which is one cubic foot.

### Electrical Characteristics Diagrams

Figure 1. Typ. Output Characteristics

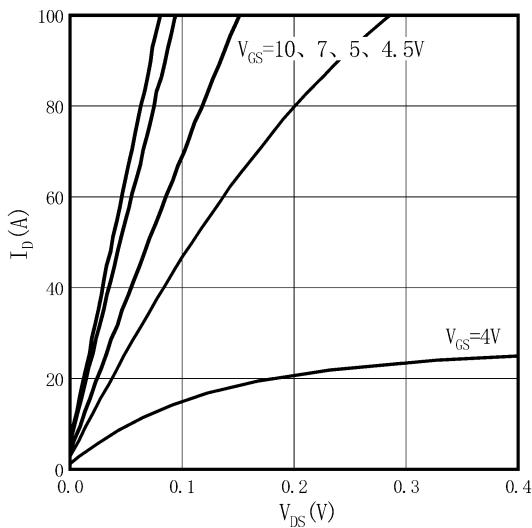


Figure 3. On-Resistance vs. Drain Current

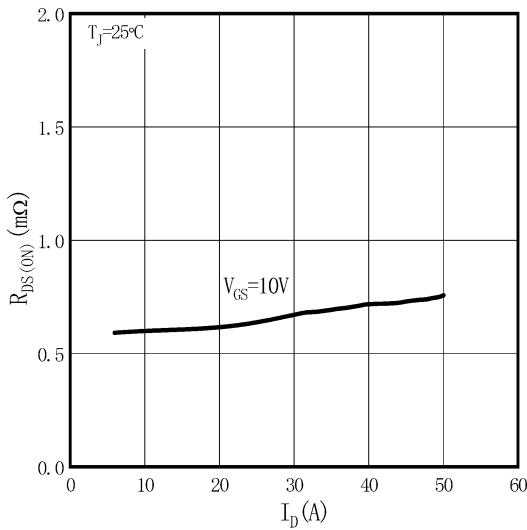


Figure 5. Breakdown Voltage vs. Temperature

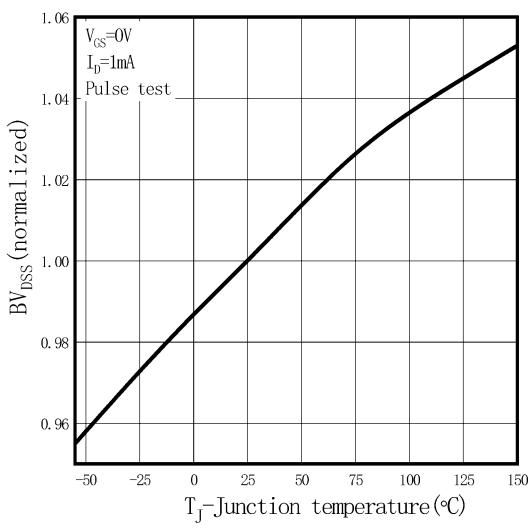


Figure 2. Transfer Characteristics

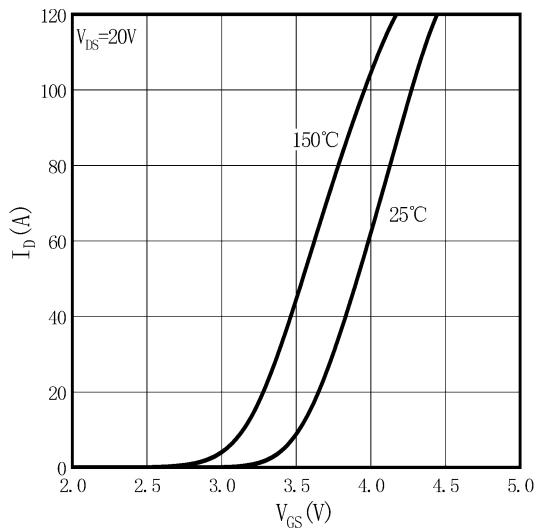


Figure 4. On-Resistance vs. Temperature

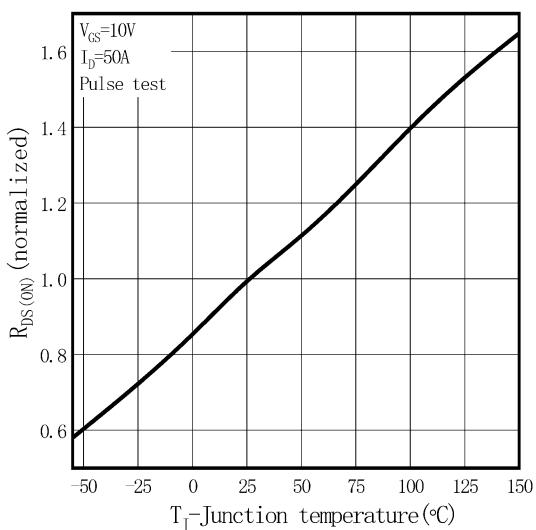


Figure 6. Threshold Voltage vs. Temperature

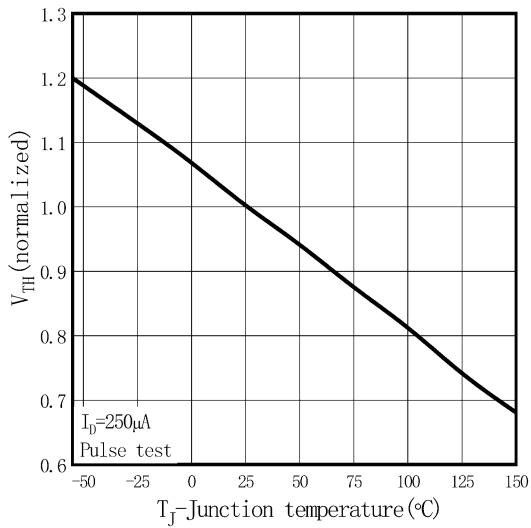


Figure 7.Rds(on) vs. Gate Voltage

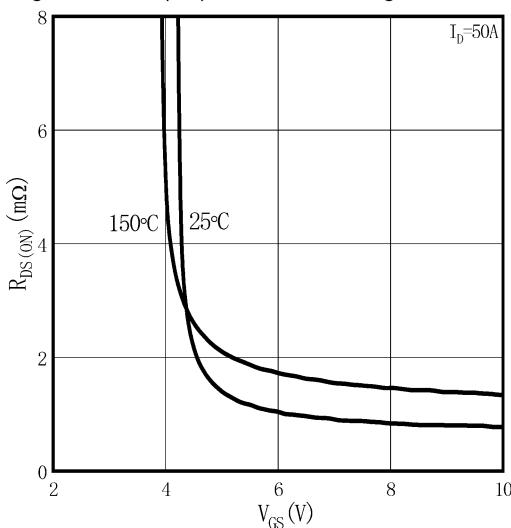


Figure 9.Capacitance Characteristics

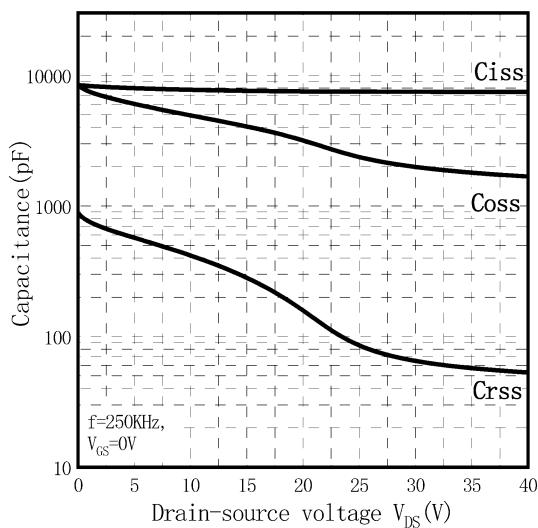


Figure 11.Drain Current Derating

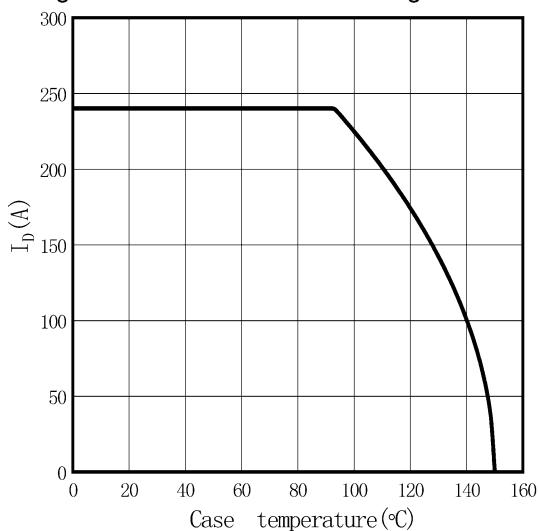


Figure 8.Body-Diode Characteristics

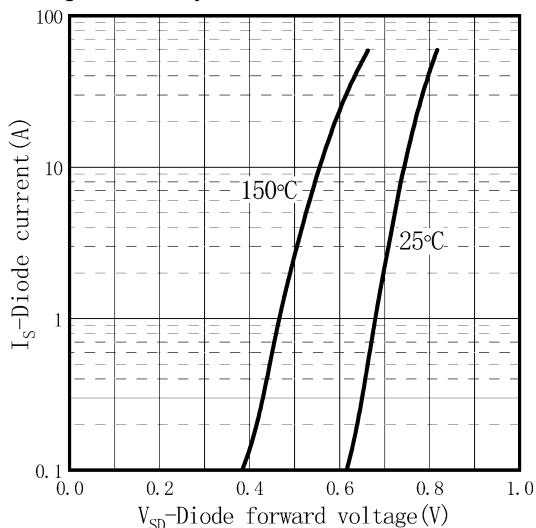


Figure 10.Gate Charge Characteristics

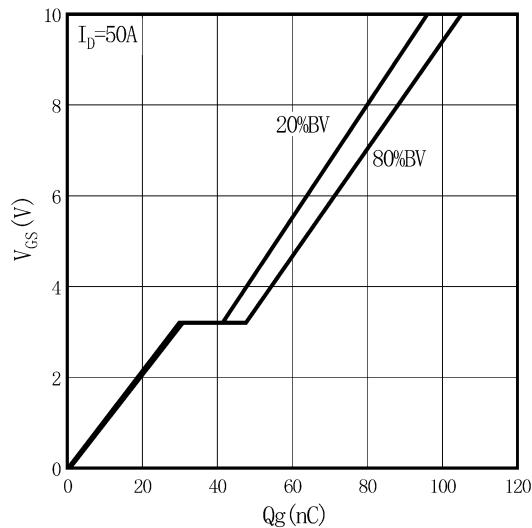


Figure 12.Power Dissipation vs.Temperature

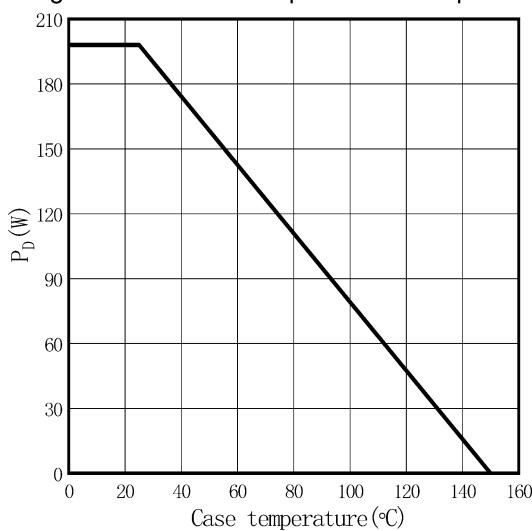


Figure 13. Safe Operating Area

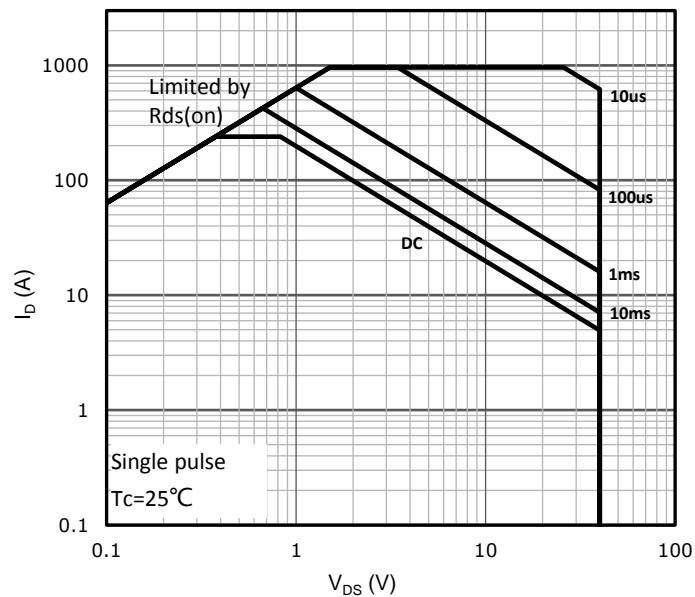
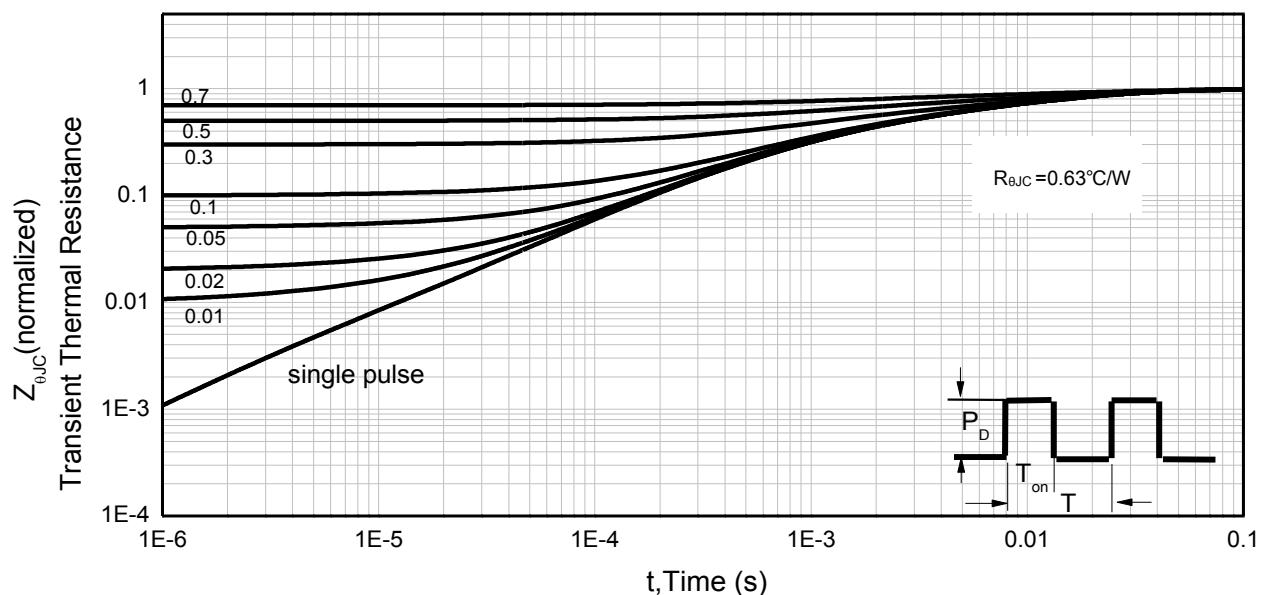
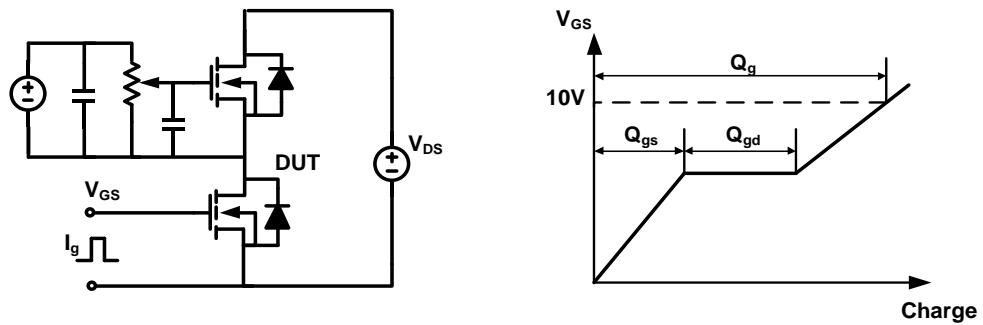


Figure 14. Normalized Maximum Transient Thermal Impedance ( $R_{thJC}$ )

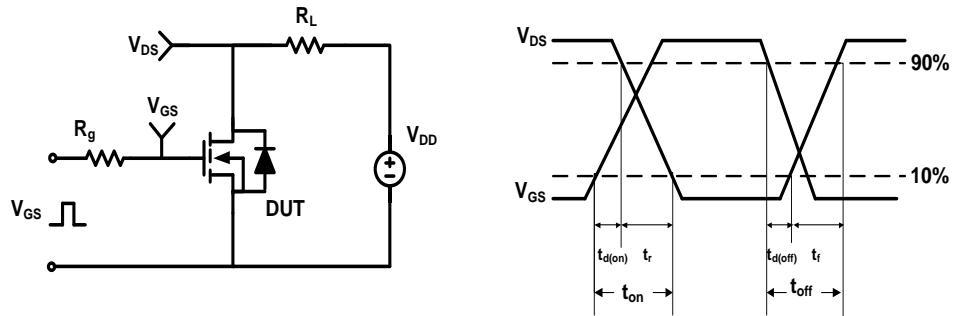


**Test Circuit & Waveforms**

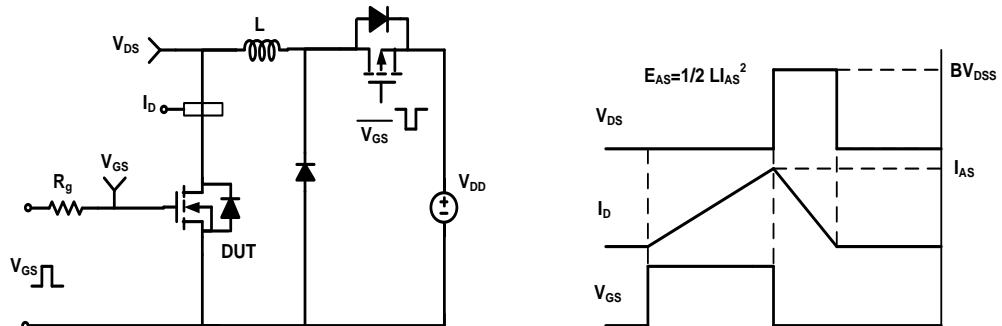
**Gate Charge Test Circuit & Waveform**



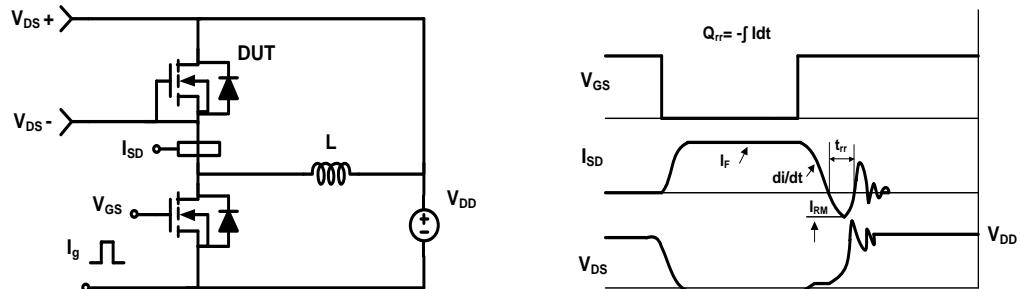
**Resistive Switching Test Circuit & Waveform**



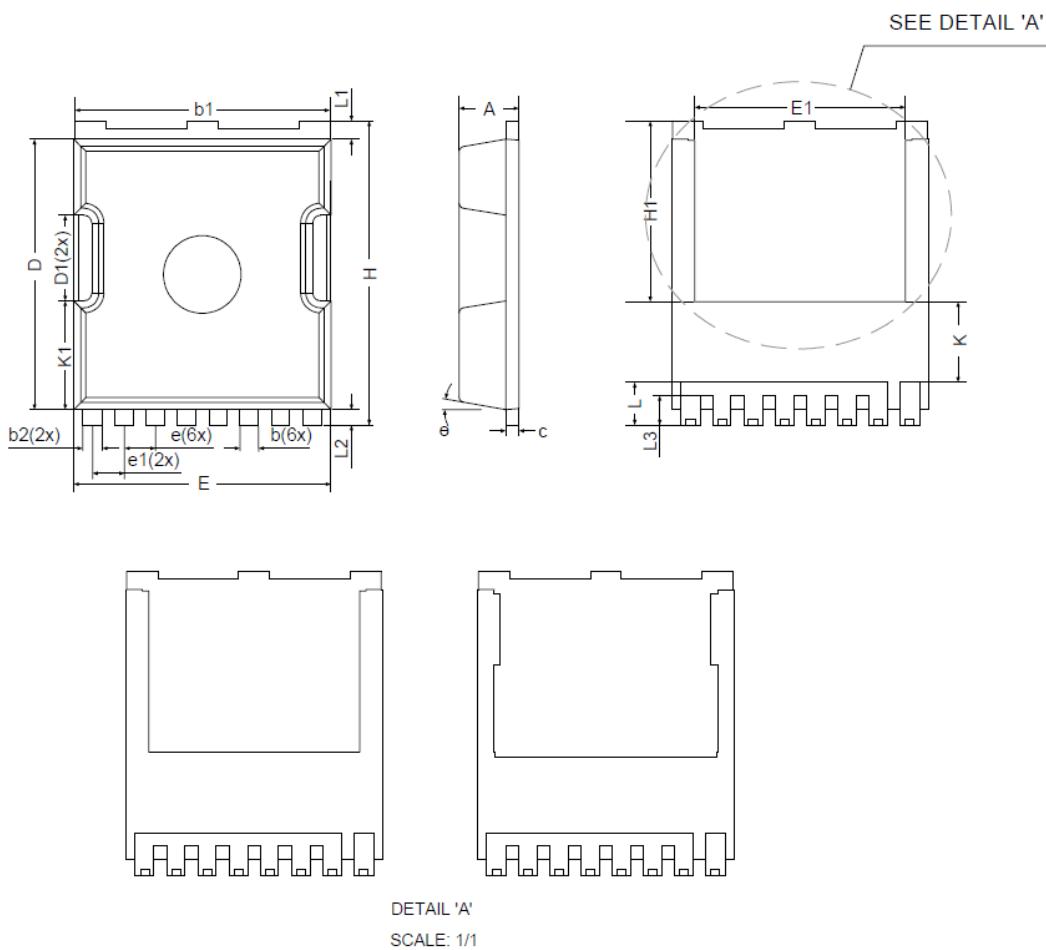
**Unclamped Inductive Switching (UIS) Test Circuit & Waveform**



**Diode Recovery Test Circuit & Waveform**



Mechanical Dimensions for TOLL



SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.15	2.45	0.085	0.096
b	0.60	0.90	0.024	0.035
b1	9.65	9.95	0.380	0.392
b2	0.65	0.90	0.026	0.035
c	0.40	0.60	0.016	0.024
D	10.18	10.58	0.401	0.417
D1	3.15	3.45	0.124	0.136
E	9.70	10.10	0.382	0.398
E1	7.90	8.40	0.311	0.331
e	1.10	1.30	0.043	0.051
e1	1.10	1.30	0.043	0.051
H	11.48	11.88	0.452	0.468
H1	6.75	7.30	0.266	0.287
K	2.45	3.33	0.096	0.131
K1	4.03	4.33	0.159	0.170
L	1.50	2.10	0.059	0.083
L1	0.50	0.90	0.020	0.035
L2	0.45	0.75	0.018	0.030
L3	1.00	1.30	0.039	0.051
θ	10° REF		10° REF	

## Revision History

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LSGT04R009H

**Revision 1.0**

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