

100V, 447A, 1.1mΩ N-channel Power SGT MOSFET

JMSH1001MTHL

Features

- Excellent $R_{DS(ON)}$ and Low Gate Charge
- 100% UIS Tested
- 100% ΔV_{ds} Tested
- Halogen-free; RoHS-compliant

Applications

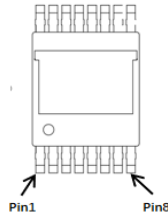
- Load Switch
- PWM Application
- Power Management

Product Summary

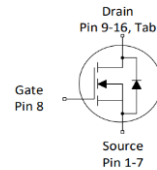
Parameters	Value	Unit
V_{DSS}	100	V
$V_{GS(th_Typ)}$	2.9	V
$I_D(@V_{GS}=10V)$	447	A
$R_{DS(ON_Typ)}(@V_{GS}=10V)$	1.1	mΩ



TOLT



Pin Assignment



Schematic Diagram

Ordering Information

Device	Marking	MSL	Form	Package	Reel(pcs)	Per Carton (pcs)
JMSH1001MTHL-13	SH1001M	1	Tape&Reel	TOLT	1800	9000

Absolute Maximum Ratings (@ $T_C = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Value	Unit
V_{DS}	Drain-to-Source Voltage	100	V
V_{GS}	Gate-to-Source Voltage	± 20	V
I_D	Continuous Drain Current	$T_C = 25^\circ\text{C}$	447
		$T_C = 100^\circ\text{C}$	283
I_{DM}	Pulsed Drain Current ⁽¹⁾	Refer to Fig.4	A
E_{AS}	Single Pulsed Avalanche Energy ⁽²⁾	1987	mJ
P_D	Power Dissipation	$T_C = 25^\circ\text{C}$	500
		$T_C = 100^\circ\text{C}$	200
T_J, T_{STG}	Junction & Storage Temperature Range	-55 to 150	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Max	Unit
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient ⁽³⁾	33	$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.25	



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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$I_D = 250\mu\text{A}$, $V_{GS} = 0\text{V}$	100	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 80\text{V}$, $V_{GS} = 0\text{V}$	-	-	1.0	μA
I_{GSS}	Gate-Body Leakage Current	$V_{DS} = 0\text{V}$, $V_{GS} = \pm 20\text{V}$	-	-	± 100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250\mu\text{A}$	2.0	2.9	3.8	V
$R_{DS(ON)}$	Static Drain-Source ON-Resistance ⁽⁴⁾	$V_{GS} = 10\text{V}$, $I_D = 20\text{A}$	-	1.1	1.4	m Ω
Dynamic Characteristics						
R_g	Gate Resistance	$f = 1\text{MHz}$	-	3.8	-	Ω
C_{iss}	Input Capacitance	$V_{GS} = 0\text{V}$, $V_{DS} = 50\text{V}$, $f = 1\text{MHz}$	-	13360	20040	pF
C_{oss}	Output Capacitance		-	5113	7669	pF
C_{rss}	Reverse Transfer Capacitance		-	122	244	pF
Q_g	Total Gate Charge	$V_{GS} = 0$ to 10V $V_{DS} = 50\text{V}$, $I_D = 20\text{A}$	-	217	-	nC
Q_{gs}	Gate Source Charge		-	65	-	nC
Q_{gd}	Gate Drain ("Miller") Charge		-	57	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{GS} = 10\text{V}$, $V_{DD} = 50\text{V}$ $I_D = 20\text{A}$, $R_{GEN} = 3\Omega$	-	41	-	ns
t_r	Turn-On Rise Time		-	69	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	157	-	ns
t_f	Turn-Off Fall Time		-	92	-	ns
Body Diode Characteristics						
I_S	Maximum Continuous Body Diode Forward Current		-	-	447	A
I_{SM}	Maximum Pulsed Body Diode Forward Current		-	-	1788	A
V_{SD}	Body Diode Forward Voltage	$V_{GS} = 0\text{V}$, $I_S = 20\text{A}$	-		1.2	V
t_{rr}	Body Diode Reverse Recovery Time	$I_F = 20\text{A}$, $di/dt = 100\text{A}/\mu\text{s}$	65	130	196	ns
Q_{rr}	Body Diode Reverse Recovery Charge		-	374	-	nC

- Notes:
1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
 2. E_{AS} condition: Starting $T_J = 25^\circ\text{C}$, $V_{DD} = 50\text{V}$, $V_{GS} = 10\text{V}$, $R_G = 25\text{ohm}$, $L = 3\text{mH}$, $I_{AS} = 36.4\text{A}$, $V_{DD} = 0\text{V}$ during time in avalanche.
 3. $R_{\theta JA}$ is measured with the device mounted on a 1inch^2 pad of 2oz copper FR4 PCB.
 4. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 0.5\%$.



Typical Performance Characteristics

Figure 1: Power De-rating

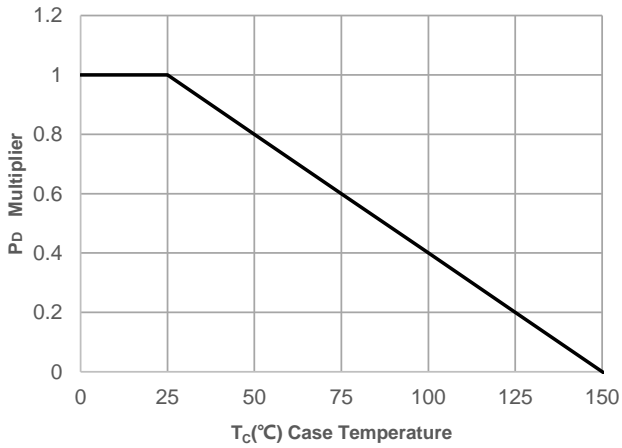


Figure 2: Current De-rating

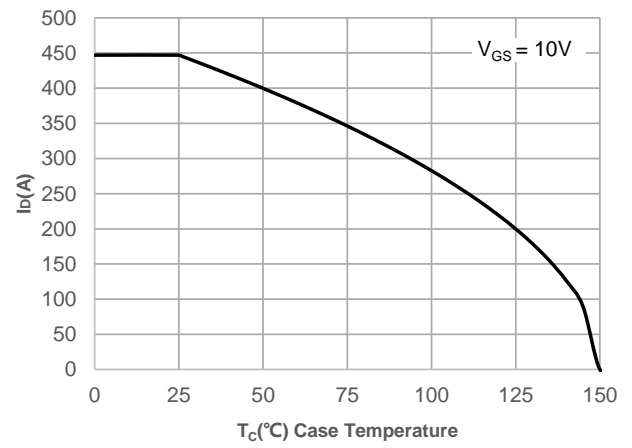


Figure 3: Normalized Maximum Transient Thermal Impedance

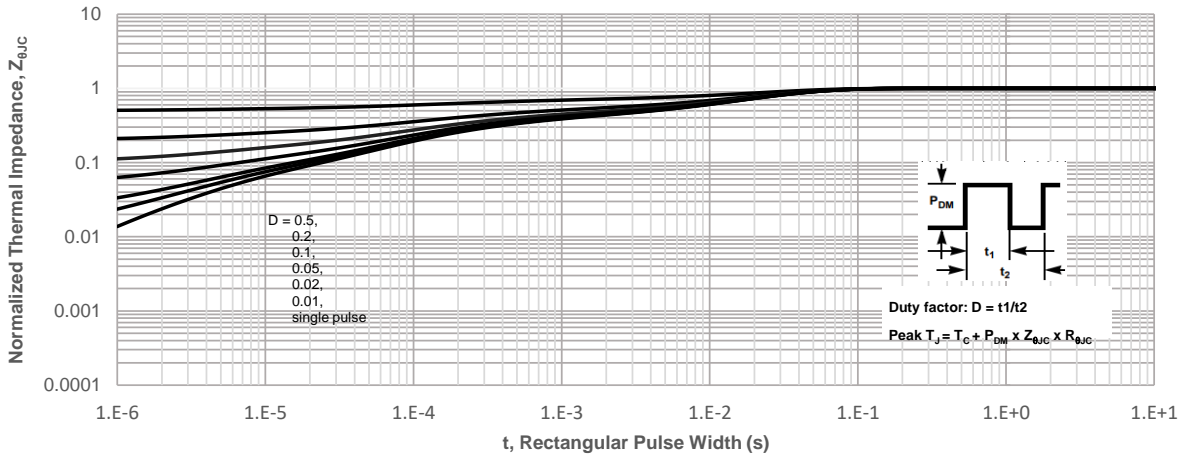
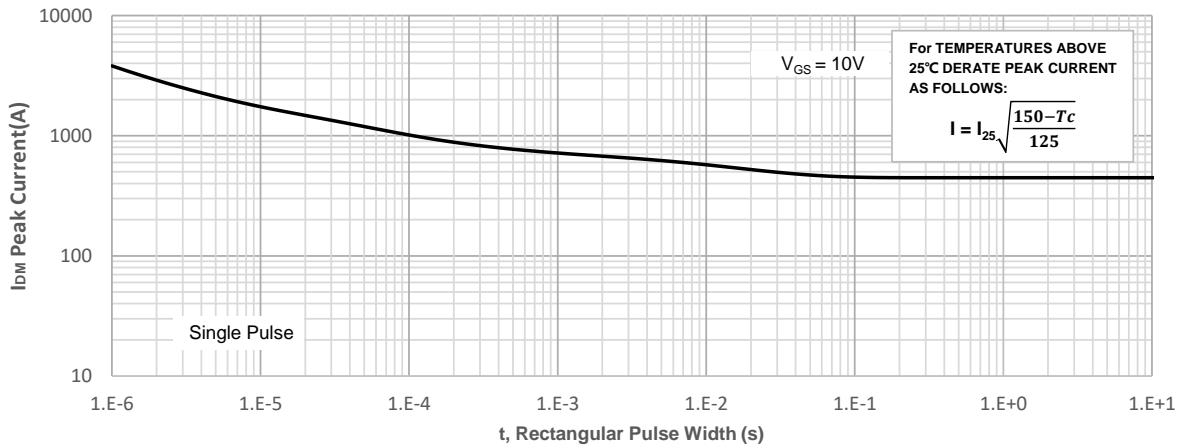
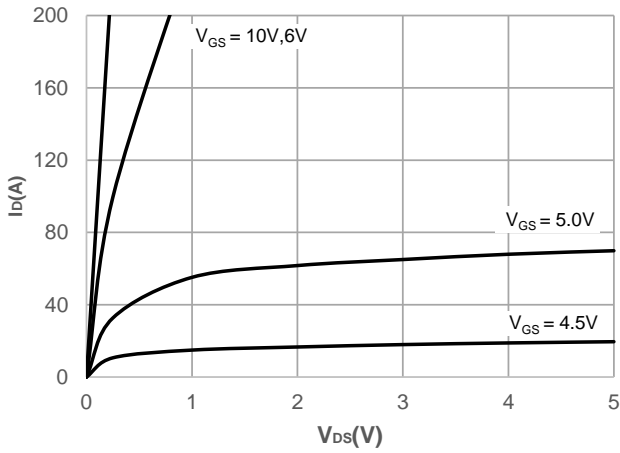
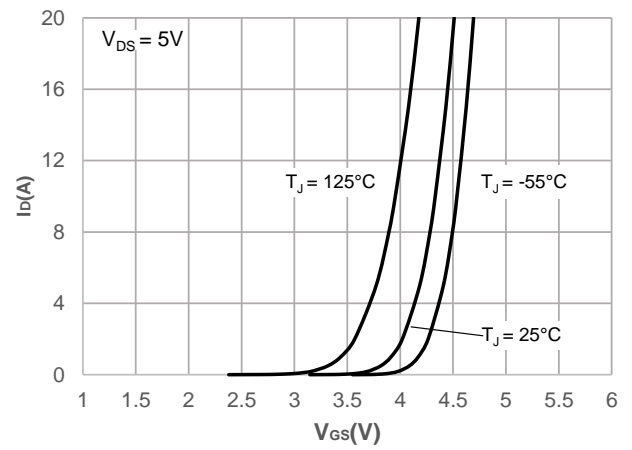
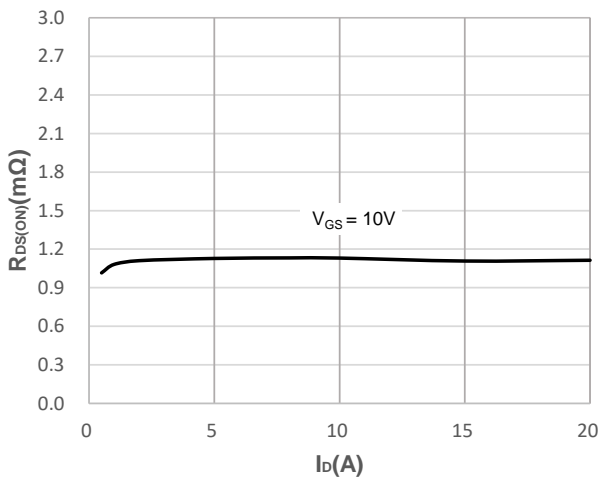
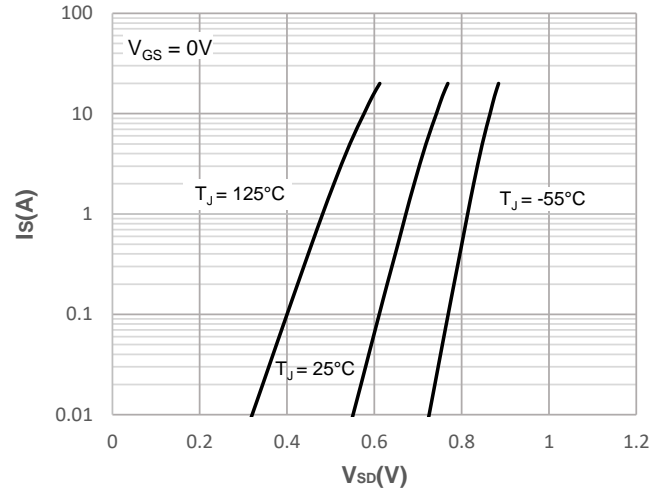
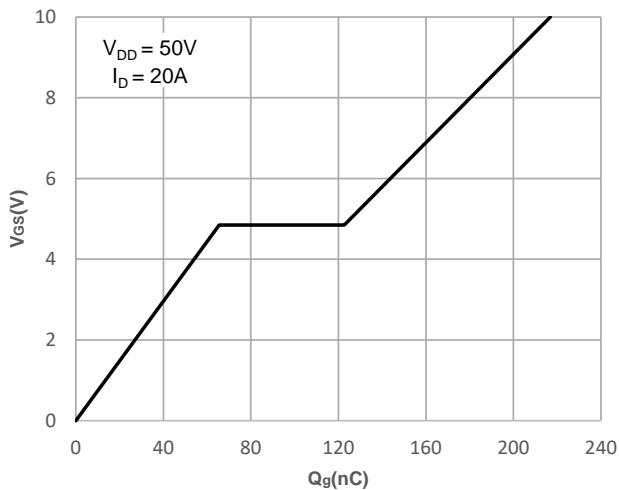
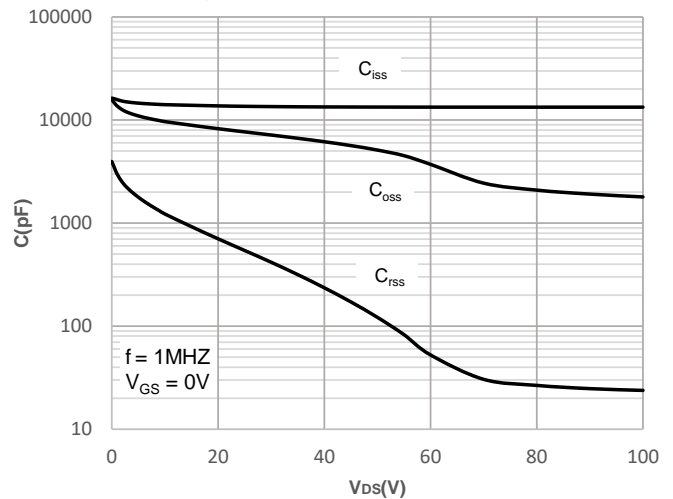


Figure 4: Peak Current Capacity



Typical Performance Characteristics

Figure 5: Output Characteristics

Figure 6: Typical Transfer Characteristics

Figure 7: On-resistance vs. Drain Current

Figure 8: Body Diode Characteristics

Figure 9: Gate Charge Characteristics

Figure 10: Capacitance Characteristics


Typical Performance Characteristics

Figure 11: Normalized Breakdown voltage vs. Junction Temperature

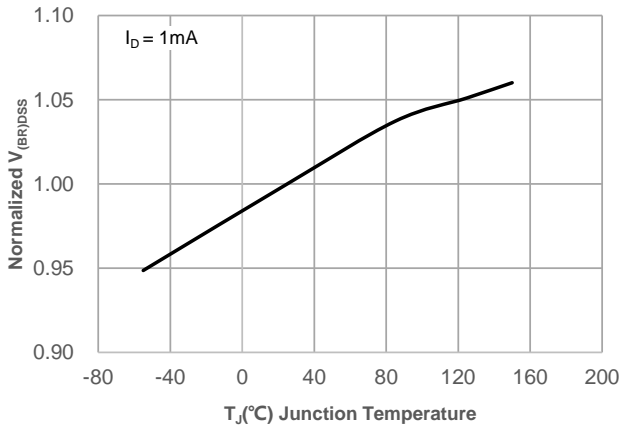


Figure 12: Normalized on Resistance vs. Junction Temperature

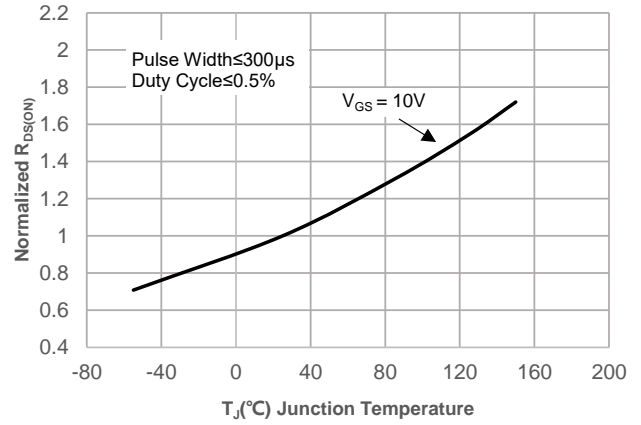


Figure 13: Normalized Threshold Voltage vs. Junction Temperature

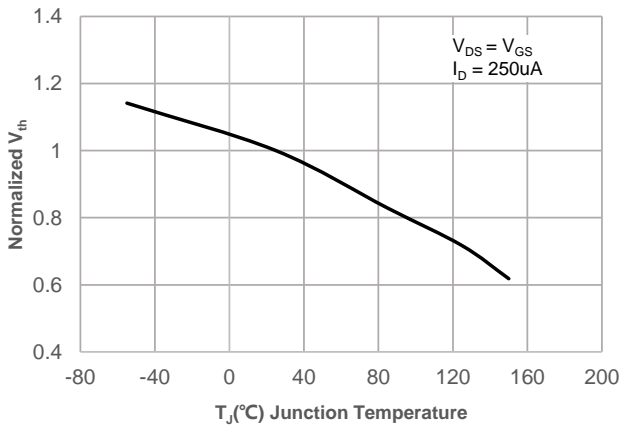


Figure 14: $R_{DS(ON)}$ vs. V_{GS}

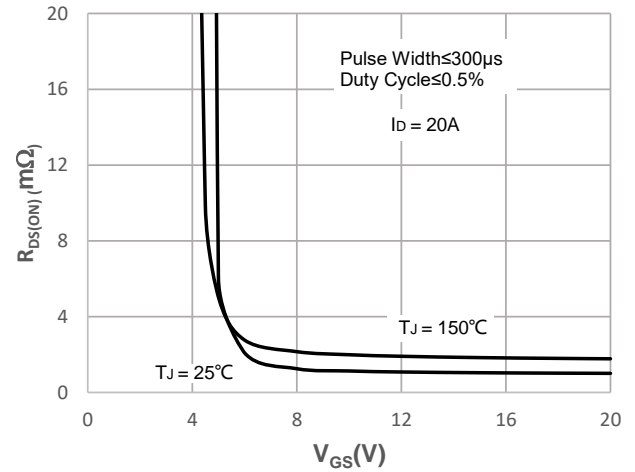
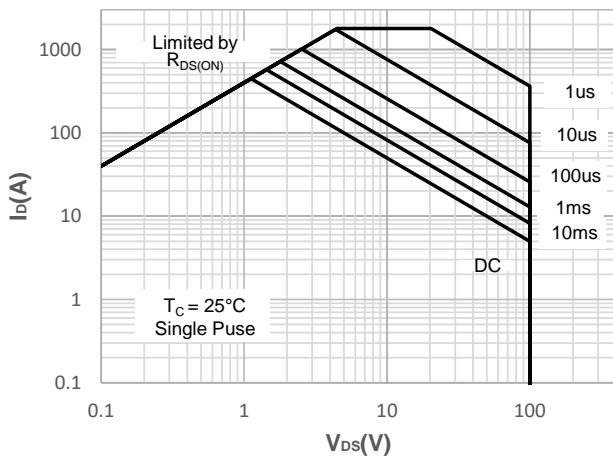


Figure 15: Maximum Safe Operating Area



Test Circuit

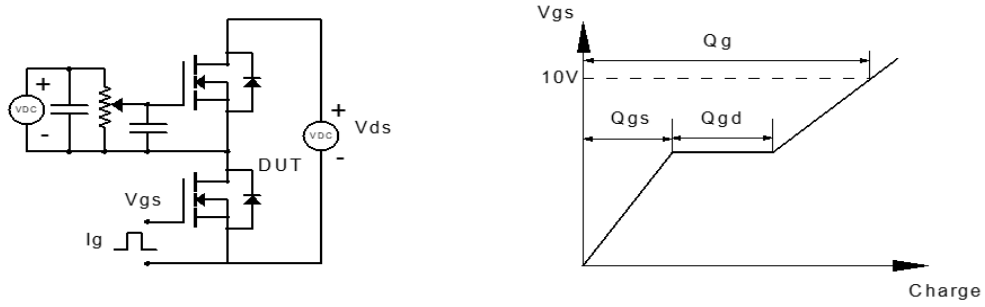


Figure 1: Gate Charge Test Circuit & Waveform

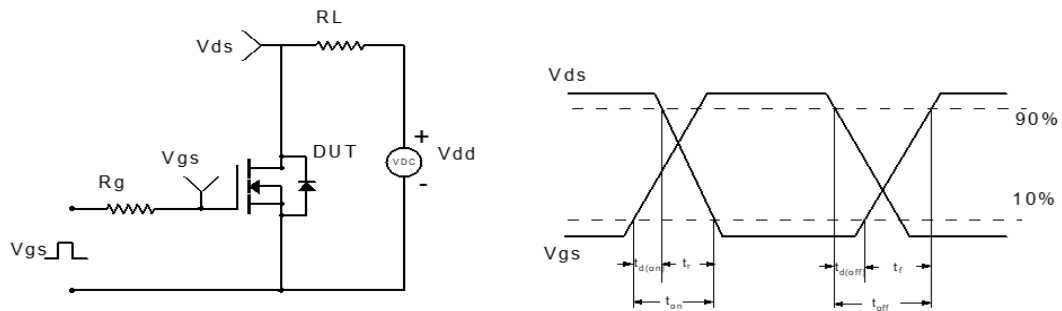


Figure 2: Resistive Switching Test Circuit & Waveform



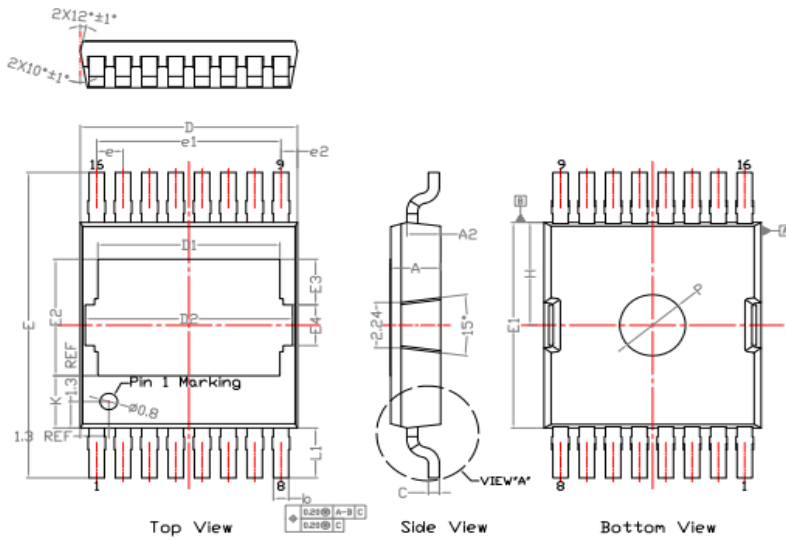
Figure 3: Unclamped Inductive Switching Test Circuit & Waveform



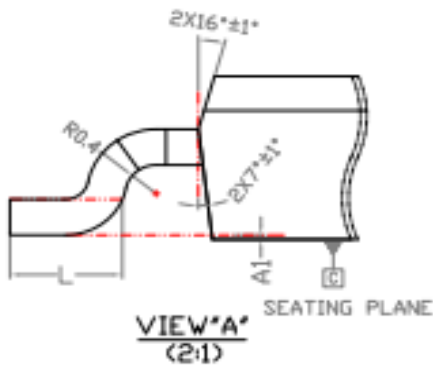
Figure 4: Diode Recovery Test Circuit & Waveform



Package Mechanical Data(TOLT)



SYMBOLS	DIMENSION IN MM			DIMENSION IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
*A	2.200	2.300	2.400	0.087	0.091	0.094
A1	0.010	---	0.050	0.0004	---	0.002
A2	1.500	1.540	1.580	0.059	0.061	0.062
*b	0.600	0.700	0.800	0.024	0.028	0.031
C	0.400	0.500	0.600	0.016	0.020	0.024
*D	9.700	9.900	10.100	0.382	0.390	0.398
D1	8.300 REF			0.327 REF		
D2	9.460 REF			0.372 REF		
E	14.800	15.000	15.200	0.583	0.591	0.598
*E1	10.000	10.100	10.300	0.394	0.398	0.406
E2	5.570	---	5.770	0.219	---	0.227
E3	2.240 REF			0.088 REF		
E4	2.000 REF			0.079 REF		
*e	1.200 BSC			0.047 BSC		
e1	8.400 BSC			0.331 BSC		
e2	0.750 BSC			0.030 BSC		
H	4.850	5.050	5.250	0.191	0.199	0.207
K	2.570 REF			0.101 REF		
*L	1.363	1.463	1.563	0.054	0.058	0.062
L1	2.250	2.450	2.650	0.089	0.096	0.104
P	2.900	3.000	3.100	0.114	0.118	0.122
φ	0"	4"	8"	---	---	---



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