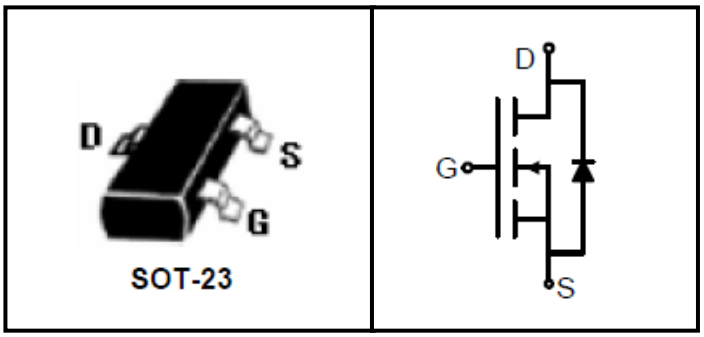
20V N-Channel Trench MOSFET

FEATURES

- Trench Power MOSFET Technology
- Low $R_{DS(ON)}$
- Low Gate Charge
- Optimized For Fast-switching Applications



APPLICATIONS

- Synchronous Rectification in DC/DC and AC/DC Converters
- Isolated DC/DC Converters in Telecom and Industrial

RoHS

Device Marking and Package Information		
Device	**Package**	**Marking**
TTX2302	SOT-23	2302

Absolute Maximum Ratings T_C = 25ºC, unless otherwise noted			
Parameter	**Symbol**	**Value**	**Unit**
		SOT-23	
Drain-Source Voltage (V_{GS} = 0V)	V_{DSS}	20	V
Continuous Drain Current	I_D	4	A
Pulsed Drain Current (note1)	I_{DM}	16	A
Gate-Source Voltage	V_{GSS}	±10	V
Single Pulse Avalanche Energy (note2)	E_{AS}	7.4	mJ
Avalanche Current	I_{AS}	7	A
Power Dissipation (T_C = 25ºC)	P_D	1	W
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55~+150	ºC

Thermal Resistance			
Parameter	**Symbol**	**Value**	**Unit**
		SOT-23	
Thermal Resistance, Junction-to-Case	R_{thJC}	14.4	ºC/W
Thermal Resistance, Junction-to-Ambient	R_{thJA}	125	

Specifications T_J = 25ºC, unless otherwise noted						
Parameter	**Symbol**	**Test Conditions**	**Value**			**Unit**
			Min.	**Typ.**	**Max.**	
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = 250μA	20	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 20V, V_{GS} = 0V, T_J = 25ºC	--	--	1	μA
		V_{DS} = 20V, V_{GS} = 0V, T_J = 150ºC	--	--	100	
Gate-Source Leakage	I_{GSS}	V_{GS} = ±10V	--	--	±100	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250μA	0.5	0.7	1.2	V
Drain-Source On-Resistance (Note3)	$R_{DS(on)}$	V_{GS} = 10V, I_D = 2A	--	18.5	23.5	mΩ
		V_{GS} = 4.5V, I_D = 2A	--	21.5	27.5	mΩ
		V_{GS} = 2.5V, I_D = 2A	--	28	36.5	mΩ
Forward Transconductance (Note3)	g_{fs}	V_{DS} = 5V, I_D =2A	--	8	--	S
Dynamic						
Input Capacitance	C_{iss}	V_{GS} = 0V, V_{DS} = 10V, f = 1.0MHz	--	621	--	pF
Output Capacitance	C_{oss}		--	135	--	
Reverse Transfer Capacitance	C_{rss}		--	58	--	
Total Gate Charge	Q_g (10V)	V_{DD} = 10V, I_D = 4A, V_{GS} = 10V	--	12	--	nC
	Q_g (4.5V)		--	5.8	--	
Gate-Source Charge	Q_{gs}		--	0.7	--	
Gate-Drain Charge	Q_{gd}		--	1.8	--	
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 10V, I_D = 4A, R_G = 2.5Ω	--	15	--	ns
Turn-on Rise Time	t_r		--	17	--	
Turn-off Delay Time	$t_{d(off)}$		--	42	--	
Turn-off Fall Time	t_f		--	40	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I_S	T_C = 25ºC	--	--	4	A
Pulsed Diode Forward Current	I_{SM}		--	--	16	
Body Diode Voltage	V_{SD}	T_J = 25ºC, I_{SD} = 4A, V_{GS} = 0V	--	--	1.2	V

Notes

1. Repetitive Rating: Pulse Width limited by maximum junction temperature
2. V_{DD} = 20V, R_G = 25Ω, Starting T_J = 25°C
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 1%

Typical Characteristics T_J = 25ºC, unless otherwise noted

Figure 1. Output Characteristics

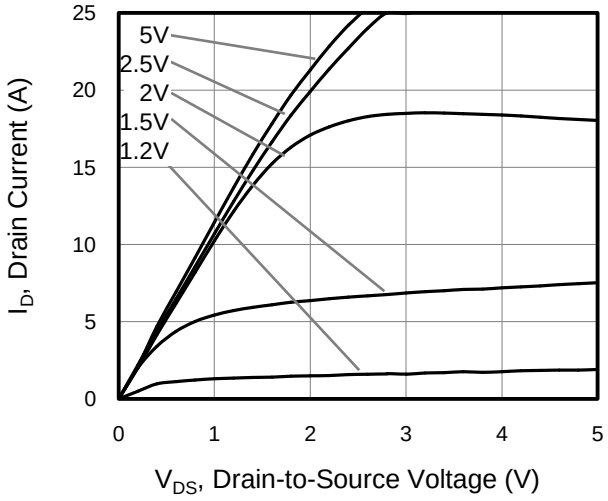


Figure 2. Transfer Characteristics

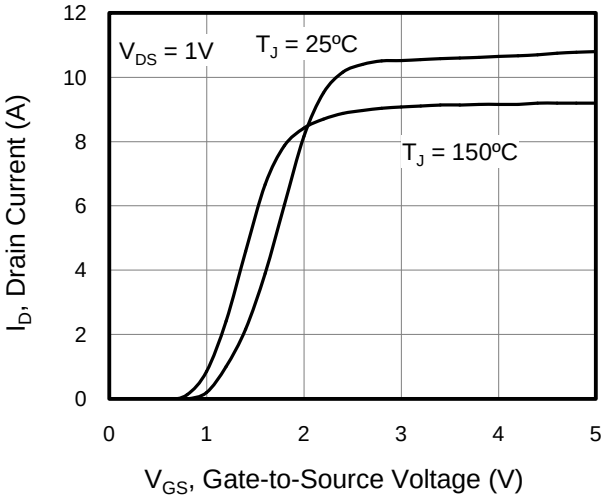


Figure 3. On-Resistance vs. Drain Current

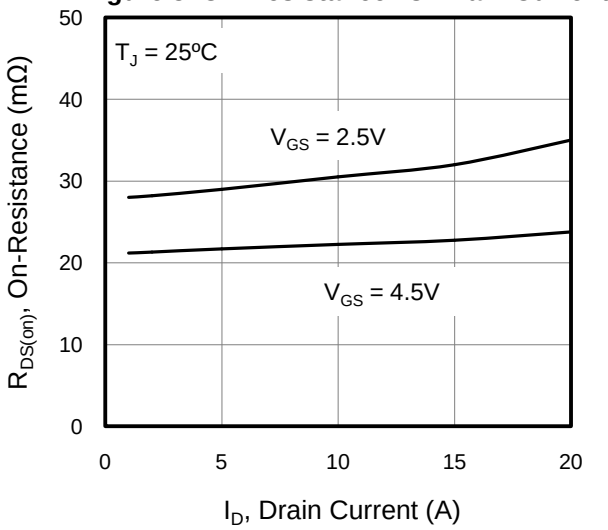


Figure 4. Capacitance

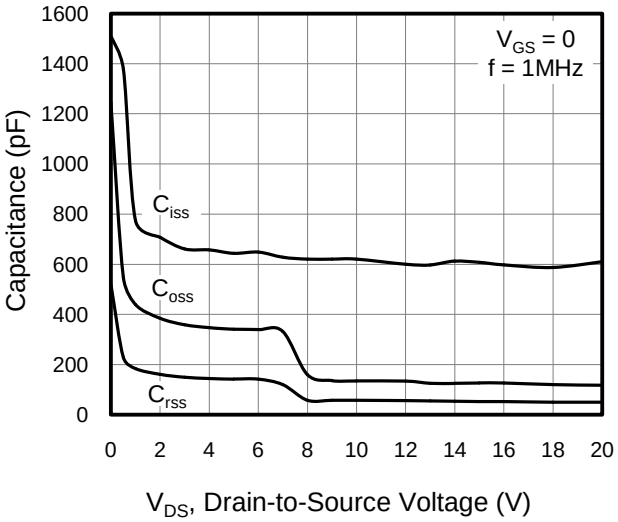


Figure 5. Gate Charge

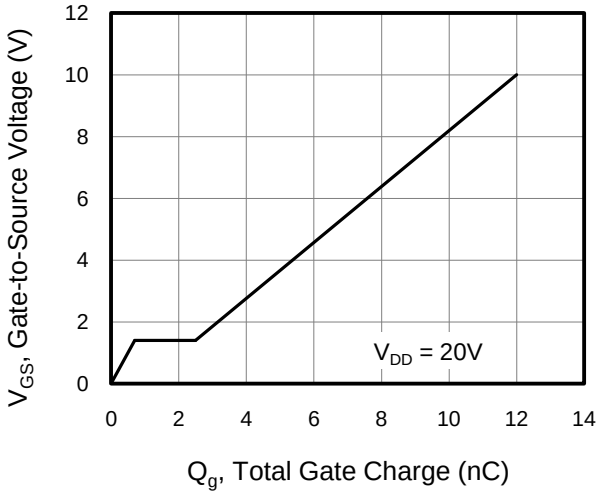
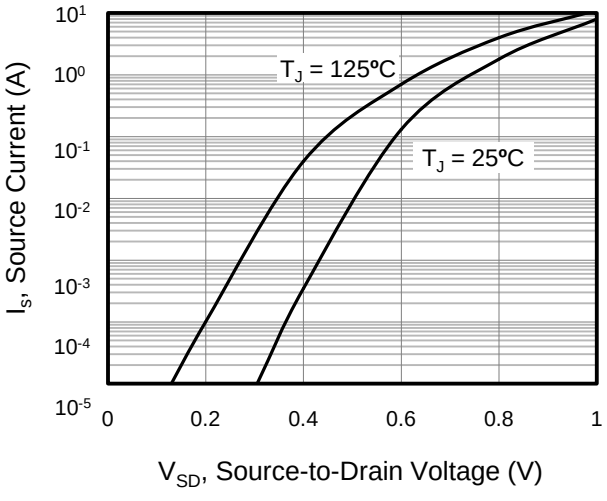


Figure 6. Body Diode Forward Voltage



Typical Characteristics T_J = 25ºC, unless otherwise noted

Figure 7. On-Resistance vs. Junction Temperature

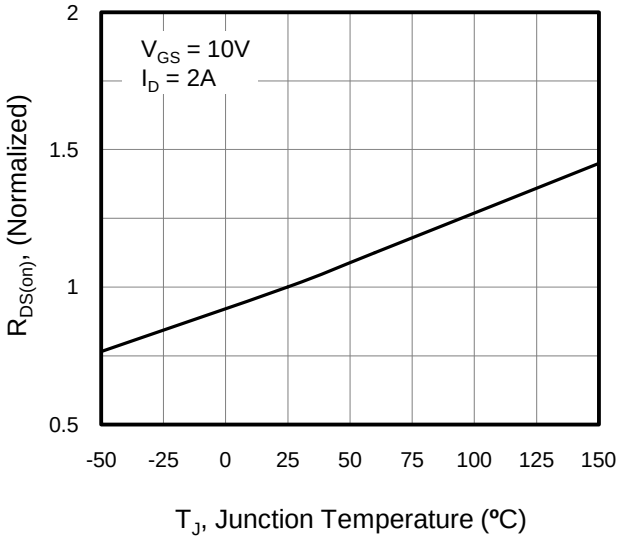


Figure 8. Threshold Voltage vs. Junction Temperature

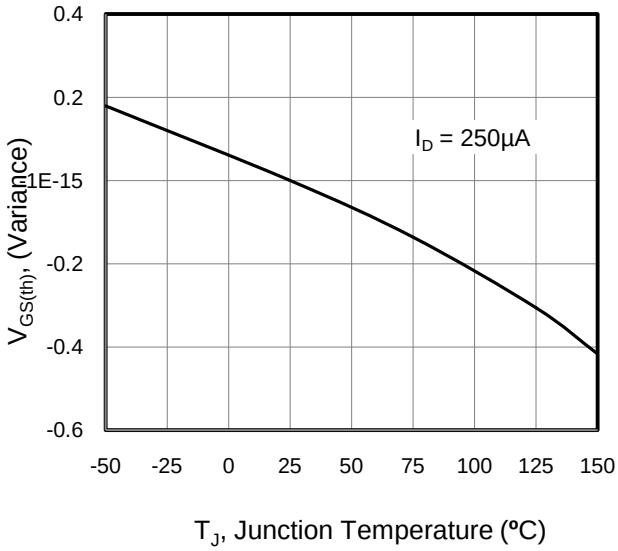


Figure 9. Transient Thermal Impedance

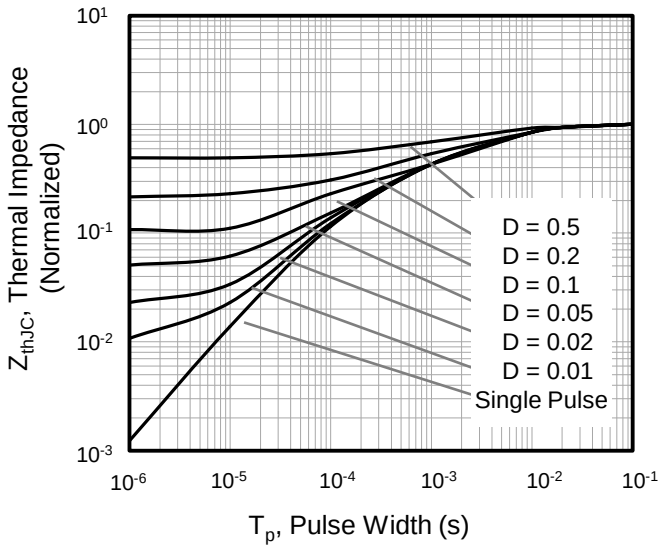


Figure 10. Safe operation area for

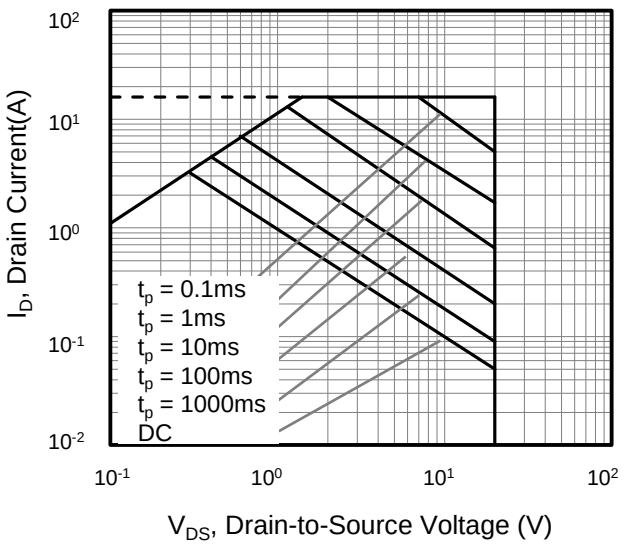


Figure A：Gate Charge Test Circuit and Waveform

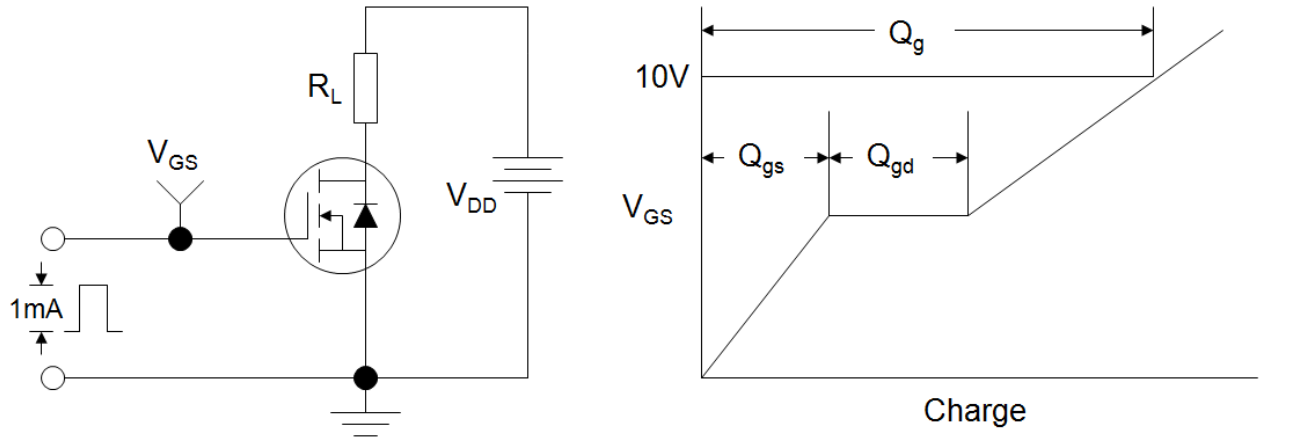


Figure B：Resistive Switching Test Circuit and Waveform

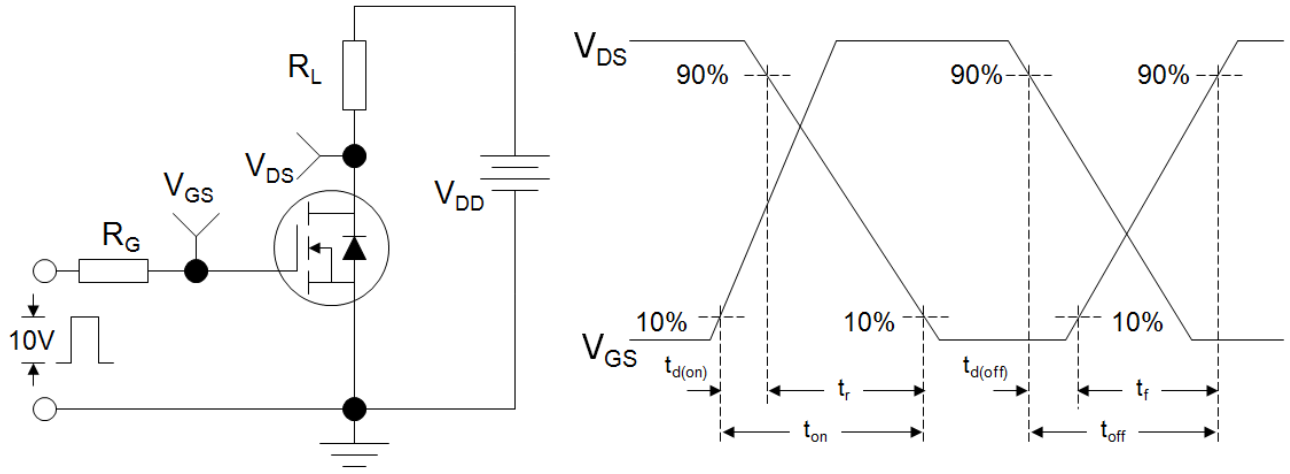
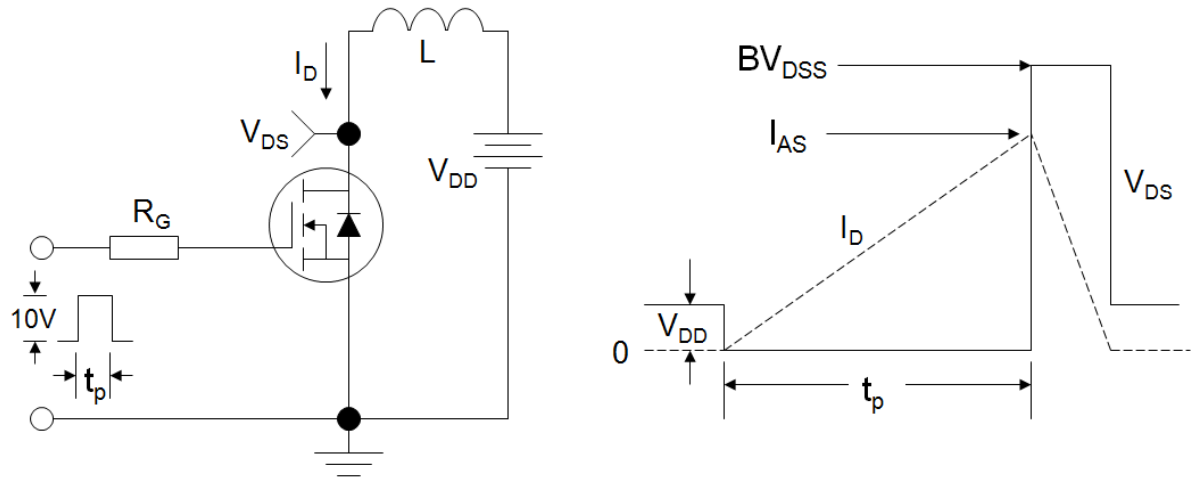
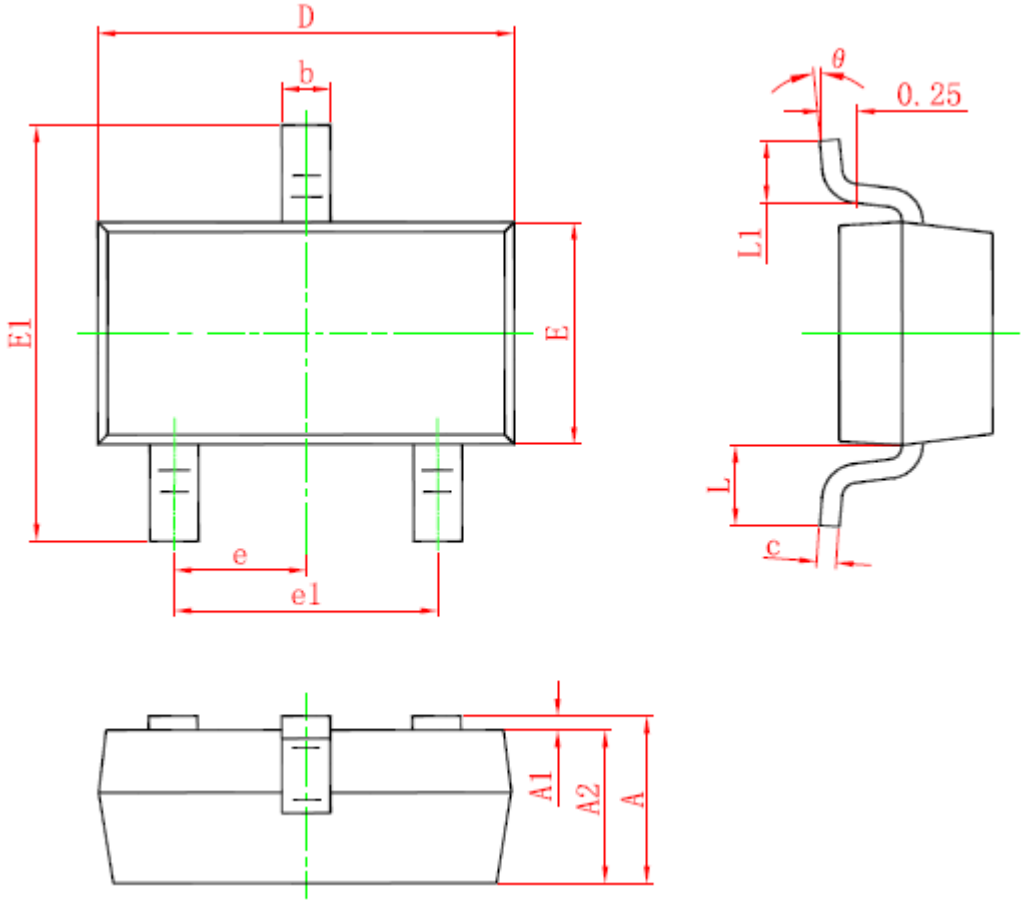


Figure C：Unclamped Inductive Switching Test Circuit and Waveform



SOT-23



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP.		0.037 TYP.	
e1	1.800	2.000	0.071	0.079
L	0.550 REF.		0.022 REF.	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°

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