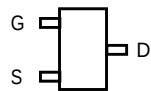
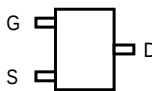
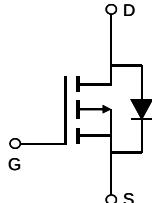


TM3401 / TM3401-3 P-CHANNEL ENHANCEMENT MOSFET

General Description The TM3401 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a load switch or in PWM applications.	Product Summary <table> <tr> <td>V_{DS}</td><td>-30V</td></tr> <tr> <td>I_D (at $V_{GS}=-10V$)</td><td>-4.0A</td></tr> <tr> <td>$R_{DS(ON)}$ (at $V_{GS}=-10V$)</td><td>< 50mΩ</td></tr> <tr> <td>$R_{DS(ON)}$ (at $V_{GS}=-4.5V$)</td><td>< 60mΩ</td></tr> <tr> <td>$R_{DS(ON)}$ (at $V_{GS}=-2.5V$)</td><td>< 85mΩ</td></tr> </table> 100% UIS Tested 100% R_g Tested 	V_{DS}	-30V	I_D (at $V_{GS}=-10V$)	-4.0A	$R_{DS(ON)}$ (at $V_{GS}=-10V$)	< 50m Ω	$R_{DS(ON)}$ (at $V_{GS}=-4.5V$)	< 60m Ω	$R_{DS(ON)}$ (at $V_{GS}=-2.5V$)	< 85m Ω
V_{DS}	-30V										
I_D (at $V_{GS}=-10V$)	-4.0A										
$R_{DS(ON)}$ (at $V_{GS}=-10V$)	< 50m Ω										
$R_{DS(ON)}$ (at $V_{GS}=-4.5V$)	< 60m Ω										
$R_{DS(ON)}$ (at $V_{GS}=-2.5V$)	< 85m Ω										

TM3401 SOT-23 Top View  MARKING:A19T	TM3401-3 SOT-23-3L Top View  MARKING:A19T	
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Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	-30	V
Gate-Source Voltage	V_{GS}	± 12	V
Continuous Drain Current	I_D	-4	A
		-3.2	
Pulsed Drain Current ^C	I_{DM}	-27	
Power Dissipation ^B	P_D	1.4	W
		0.9	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	70	90	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^{A,D}		100	125	$^\circ\text{C/W}$
Maximum Junction-to-Lead	$R_{\theta JL}$	63	80	$^\circ\text{C/W}$

Electrical Characteristics (T_J=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV _{DSS}	Drain-Source Breakdown Voltage	I _D =-250μA, V _{GS} =0V	-30			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =-30V, V _{GS} =0V T _J =55°C			-1 -5	μA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} = ±12V			±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =-250μA	-0.5	-0.9	-1.3	V
I _{D(ON)}	On state drain current	V _{GS} =-10V, V _{DS} =5V	-27			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =-10V, I _D =-4.0A T _J =125°C		41 62	50 75	mΩ
		V _{GS} =-4.5V, I _D =-3.7A		47	60	mΩ
		V _{GS} =-2.5V, I _D =-2A		60	85	mΩ
g _{FS}	Forward Transconductance	V _{DS} =-5V, I _D =-4.0A		17		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		-0.7	-1	V
I _S	Maximum Body-Diode Continuous Current				-2	A
I _{SM}	Pulsed Body-Diode Current ^B				-27	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =-15V, f=1MHz		645		pF
C _{oss}	Output Capacitance			80		pF
C _{rss}	Reverse Transfer Capacitance			55		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz	4	7.8	12	Ω
SWITCHING PARAMETERS						
Q _{g(10V)}	Total Gate Charge	V _{GS} =-10V, V _{DS} =-15V, I _D =-4.0A		14		nC
Q _{g(4.5V)}	Total Gate Charge			7		nC
Q _{gs}	Gate Source Charge			1.5		nC
Q _{gd}	Gate Drain Charge			2.5		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =-10V, V _{DS} =-15V, R _L =3.75Ω, R _{GEN} =3Ω		6.5		ns
t _r	Turn-On Rise Time			3.5		ns
t _{D(off)}	Turn-Off DelayTime			41		ns
t _f	Turn-Off Fall Time			9		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =-4.0A, dI/dt=100A/μs		11		ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =-4.0A, dI/dt=100A/μs		3.5		nC

A. The value of R_{θJA} is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25° C. The value in any given application depends on the user's specific board design.

B. The power dissipation P_D is based on T_{J(MAX)}=150° C, using ≤ 10s junction-to-ambient thermal resistance.

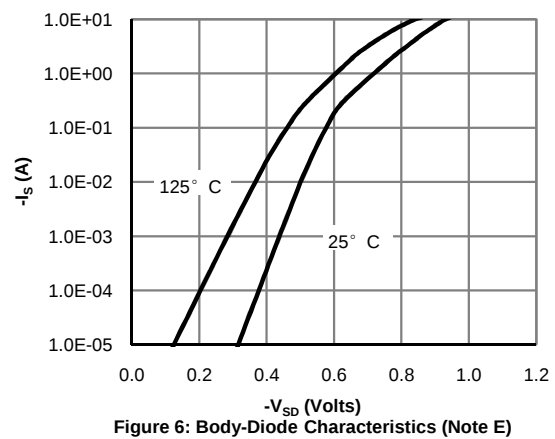
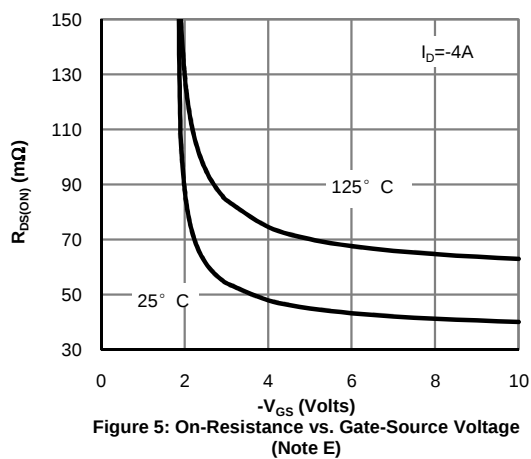
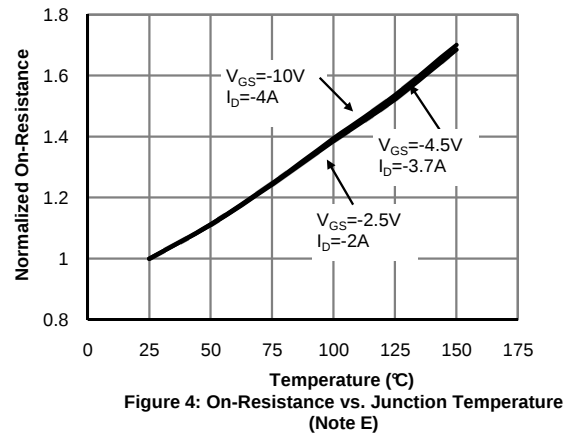
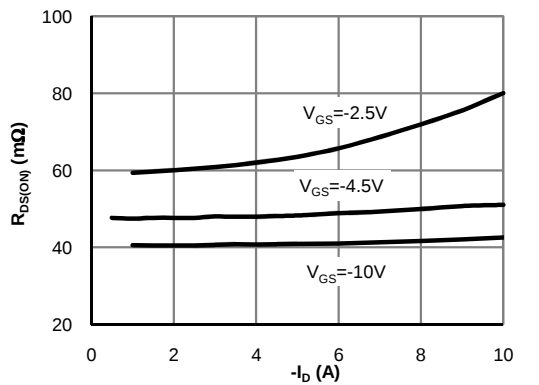
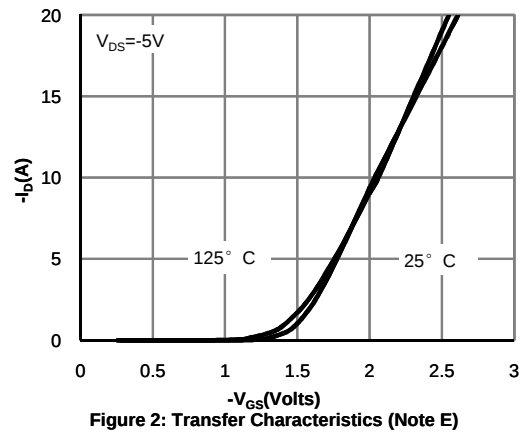
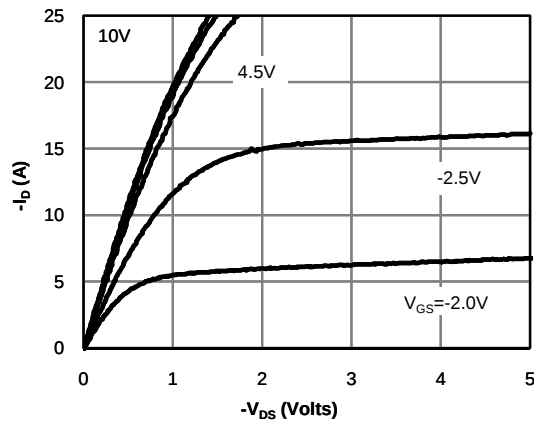
C. Repetitive rating, pulse width limited by junction temperature T_{J(MAX)}=150° C. Ratings are based on low frequency and duty cycles to keep initial T_J=25° C.

D. The R_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} and lead to ambient.

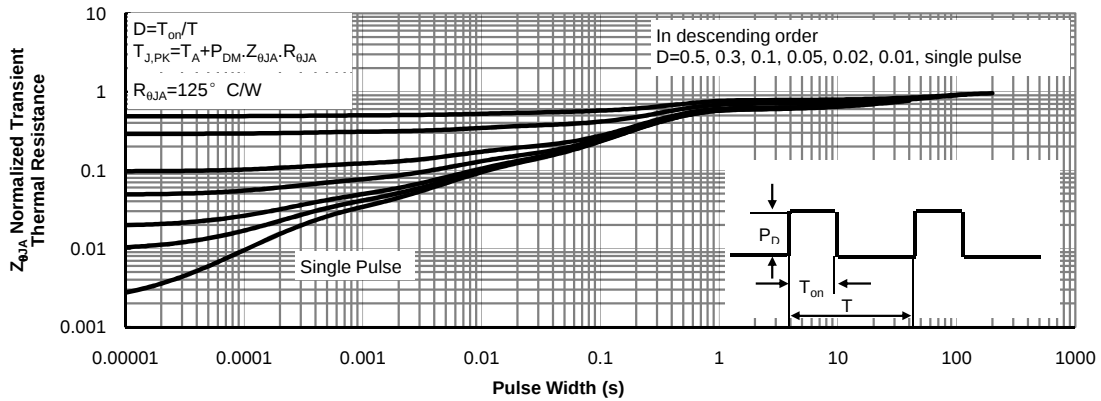
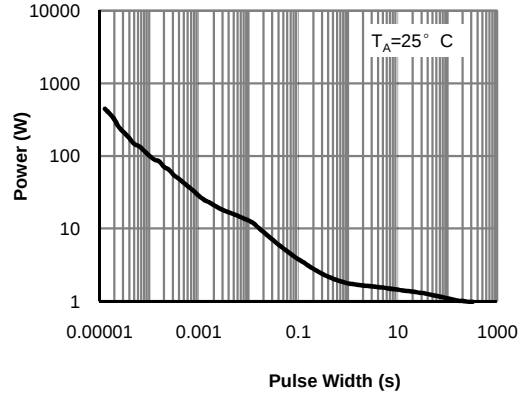
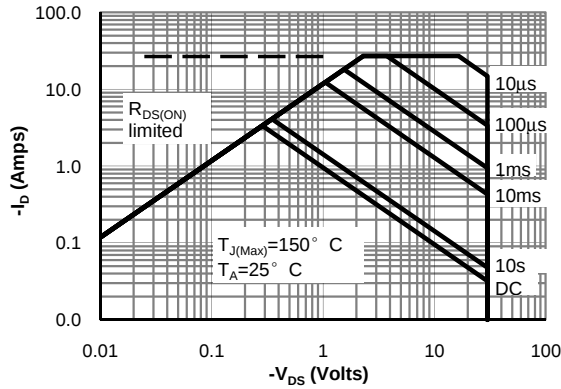
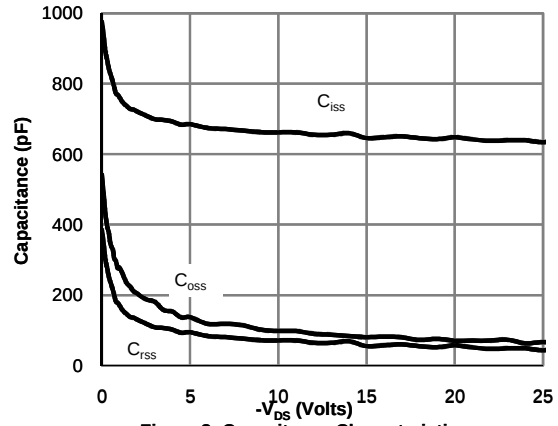
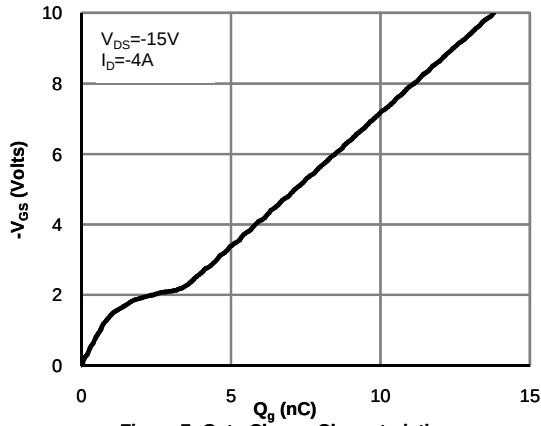
E. The static characteristics in Figures 1 to 6 are obtained using <300μs pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-ambient thermal impedance which is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, assuming a maximum junction temperature of T_{J(MAX)}=150° C. The SOA curve provides a single pulse rating.

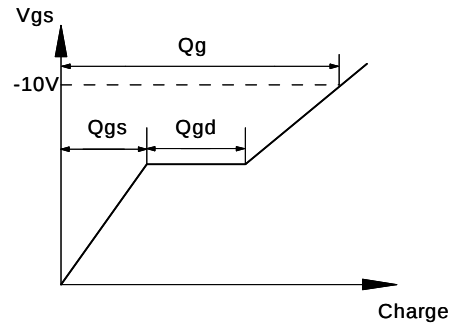
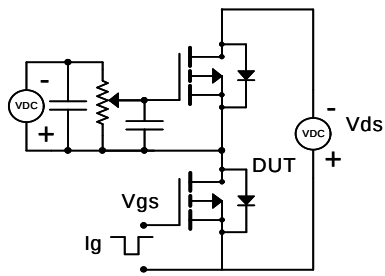
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



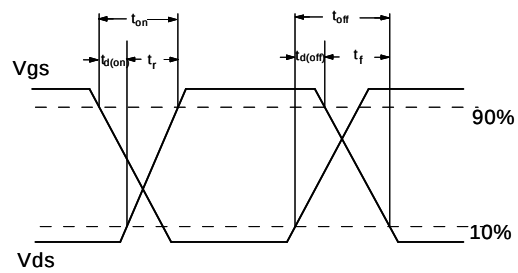
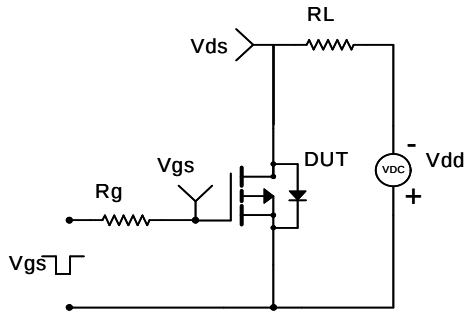
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



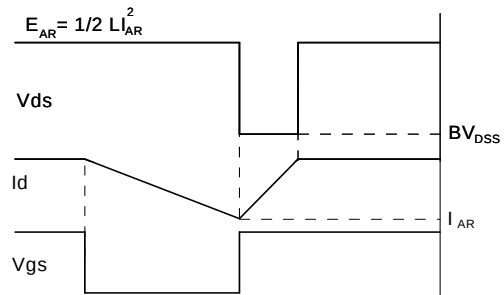
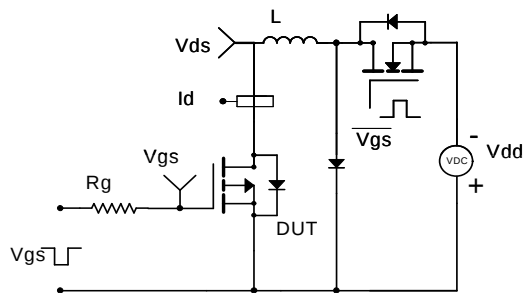
Gate Charge Test Circuit & Waveform



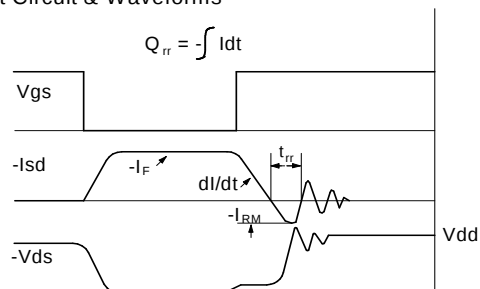
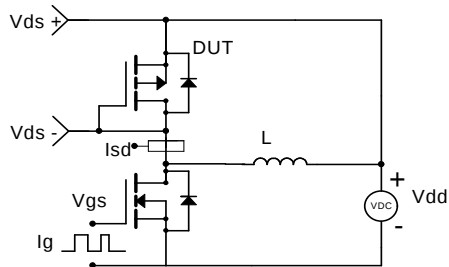
Resistive Switching Test Circuit & Waveforms



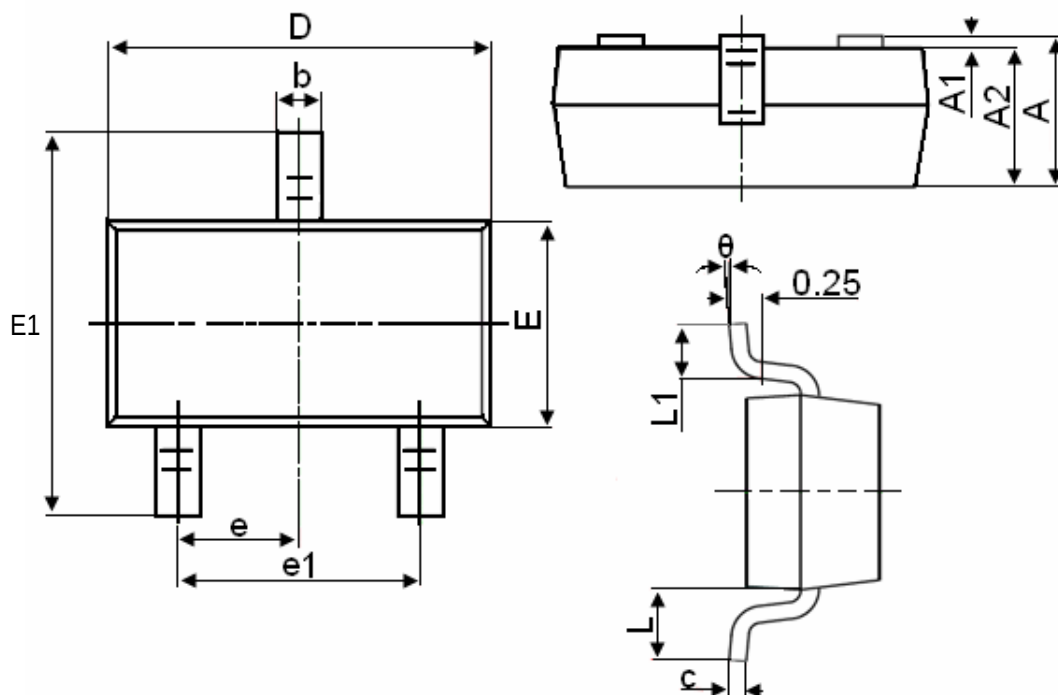
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



SOT-23 Package Information

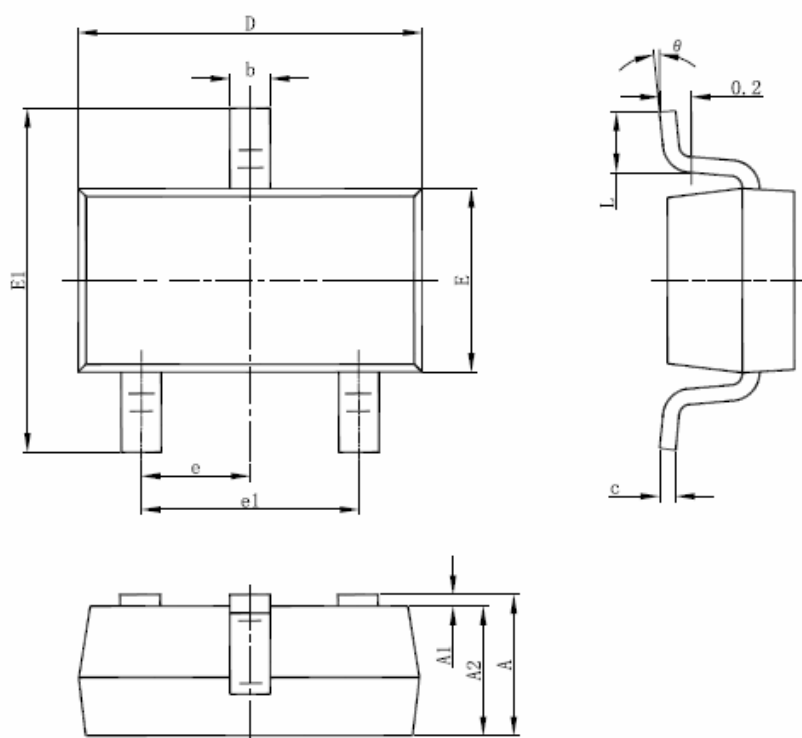


Symbol	Dimensions in Millimeters	
	MIN.	MAX.
A	0.900	1.150
A1	0.000	0.100
A2	0.900	1.050
b	0.300	0.500
c	0.080	0.150
D	2.800	3.000
E	1.200	1.400
E1	2.250	2.550
e	0.950TYP	
e1	1.800	2.000
L	0.550REF	
L1	0.300	0.500
θ	0°	8°

Notes

1. All dimensions are in millimeters.
2. Tolerance $\pm 0.10\text{mm}$ (4 mil) unless otherwise specified
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

SOT-23-3L Package Information



Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

Notes

1. All dimensions are in millimeters.
2. Tolerance $\pm 0.10\text{mm}$ (4 mil) unless otherwise specified
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.