DESCRIPTION

The MBT2222AL is available in SOT-23 Package.

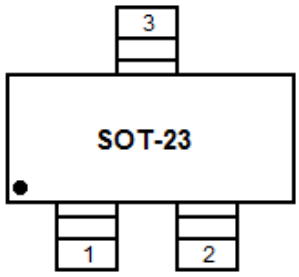
FEATURES

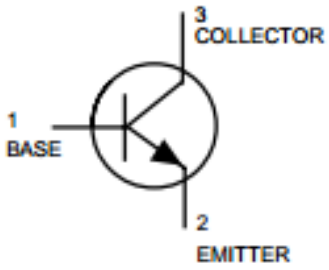
- Available in SOT-23 Package

ORDERING INFORMATION

Package Type	Part Number
SOT-23	MBT2222AL
Note	SPQ: 3,000pcs/Reel
AiT provides all RoHS Compliant Products	

PIN DESCRIPTION





ABSOLUTE MAXIMUM RATINGS

T_A = 25°C

V_{CEO}, Collector-Emitter Voltage	40Vdc
V_{CBO} , Collector-Base Voltage	75Vdc
V_{EBO}, Emitter-Base Voltage	6.0Vdc
I_C, Collector Current-Continuous	600mAdc

Stresses above may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated in the Electrical Characteristics are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

THERMAL CHARACTERISTICS

Parameter	Symbol	Max	Unit
Total Package Dissipation FR-5 Board[NOTE1]			
T_A = 25°C	P_D	225	mW
Derate above 25°C		1.8	mW/°C
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	556	°C/W
Total Device Dissipation			
Alumina Substrate, T_A = 25°C[NOTE2]	P_D	300	mW
Derate above 25°C		2.4	mW/°C
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	417	°C/W
Junction and Storage Temperature	T_J, T_{stg}	-55 to +150	°C

NOTE1: FR-5 = 1.0 x 0.75 x 0.062 in.
NOTE2: Alumina = 0.4 x 0.3 x 0.024 in. 99.5% alumina.

ELECTRICAL CHARACTERISTICS

T_A = 25°C unless otherwise noted

Parameter	Symbol	Conditions	Min	Max	Unit
OFFCHARACTERISTICS					
Collector–Emitter Breakdown Voltage[NOTE3]	$V_{(BR)CEO}$	I_C = 10mAdc, I_B = 0	40	-	Vdc
Collector-Emitter Breakdown Voltage	$V_{(BR)CBO}$	I_C = 10μAdc, I_E = 0	75	-	Vdc
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	I_E = 10μAdc, I_C = 0	6.0	-	Vdc
Collector Cutoff Current	I_{CEX}	V_{CB} = 60Vdc, $I_{EB(off)}$ = 3.0Vdc	-	10	nAdc
Collector Cutoff Current	I_{CBO}	V_{CB} = 60Vdc, I_E = 0	-	0.01	μAdc
		V_{CB} = 60Vdc, I_E = 0, T_A = 125°C	-	10	
Emitter Cutoff Current	I_{EBO}	V_{EB} = 3.0Vdc, I_C = 0	-	100	nAdc
Base Current	I_{BL}	V_{CE} = 60Vdc, $V_{EB(off)}$ = 3.0Vdc	-	20	nAdc
ON CHARACTERISTICS					
DC Current Gain	h_{FE}	I_C = 0.1mAdc, V_{CE} = 10Vdc	35	-	-
		I_C = 1.0mAdc, V_{CE} = 10Vdc	50	-	
		I_C = 10mAdc, V_{CE} = 10Vdc	75	-	
		I_C = 10mAdc, V_{CE} = 10Vdc, T_A= -55°C	35	-	
		I_C = 150mAdc, V_{CE} = 10Vdc[NOTE3]	100	300	
		I_C = 150mAdc, V_{CE} = 1.0Vdc[NOTE3]	50	-	
		I_C = 500mAdc, V_{CE} = 10Vdc[NOTE3]	40	-	
Collector-Emitter Saturation Voltage[NOTE3]	$V_{CE(sat)}$	I_C = 150mAdc, I_B = 15mAdc	-	0.3	Vdc
		I_C = 500mAdc, I_B = 50mAdc	-	1.0	
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	I_C = 150mAdc, I_B = 15mAdc	0.6	1.2	Vdc
		I_C = 500mAdc, I_B = 50mAdc	-	2.0	

Parameter	Symbol	Conditions	Min	Max	Unit
SMALL-SIGNAL CHARACTERISTICS					
Current-Gain-Bandwidth Product NOTE4	f_T	I_C = 20mAdc, V_{CE} = 20Vdc, f = 100MHz	300	-	MHz
Output Capacitance	C_{obo}	V_{CB} = 10Vdc, I_E = 0, f = 1.0MHz	-	8.0	pF
Input Capacitance	C_{ibo}	V_{EB} = 0.5Vdc, I_C = 0, f = 1.0MHz	-	25	pF
Input Impedance	h_{ie}	V_{CE} = 10Vdc, I_C = 1.0mAdc,f = 1.0kHz	2.0	8.0	kΩ
		V_{CE} = 10Vdc, I_C = 10mAdc, f = 1.0kHz	0.25	1.25	
Voltage Feedback Ratio	h_{re}	V_{CE} = 10Vdc, I_C = 1.0mAdc, f =1.0kHz	-	8.0	x 10^{-4}
		V_{CE} = 10Vdc, I_C = 10mAdc, f = 1.0kHz	-	4.0	
Small-Signal Current Gain	h_{fe}	V_{CE} = 10Vdc, I_C = 1.0mAdc, f = 1.0kHz	50	300	-
		V_{CE} = 10Vdc, I_C = 10mAdc, f = 1.0kHz	75	375	
Output Admittance	h_{oe}	V_{CE} = 10Vdc, I_C = 1.0mAdc,f = 1.0kHz	5.0	35	μmhos
		V_{CE} = 10Vdc, I_C = 10mAdc, f = 1.0kHz	25	200	
Current Base Time Comstant	rb, C_C	V_{CB} = 20Vdc, I_E=20mAdc, f=31.8 MHz	-	150	ps
Noise Figure	NF	V_{CE} = 10Vdc, I_C = 100μAdc, R_S =1.0kΩ, f =1.0kHz	-	4.0	dB
SWITCHING CHARACTERISTICS					
Delay Time	t_d	V_{CC} = 30Vdc, $V_{EB(off)}$ = – 0.5Vdc, I_C = 150mAdc, I_{B1} = 15mAdc	-	10	ns
Rise Time	t_r		-	25	
Storage Time	t_s	V_{CC} = 30Vdc, I_C = 150mAdc, I_{B1} = I_{B2} = 15mAdc	-	225	ns
Fall Time	t_f		-	60	

NOTE3: Pulse Test: Pulse Width <300 μs, Duty Cycle <2.0%.
NOTE4: f_T is defined as the frequency at which | h_{FE} | extrapolates to unity.

TYPICAL CHARACTERISTICS

SWITCHING TIME EQUIVALENT TEST CIRCUITS

Figure 1. Turn–On Time

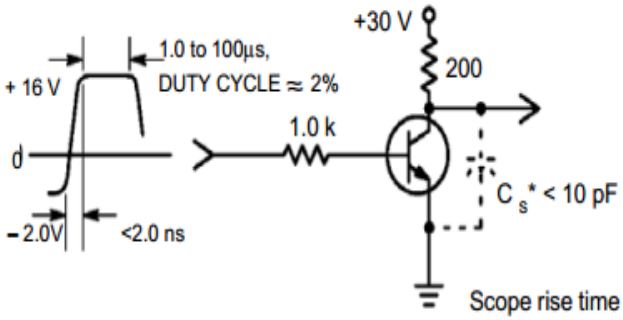
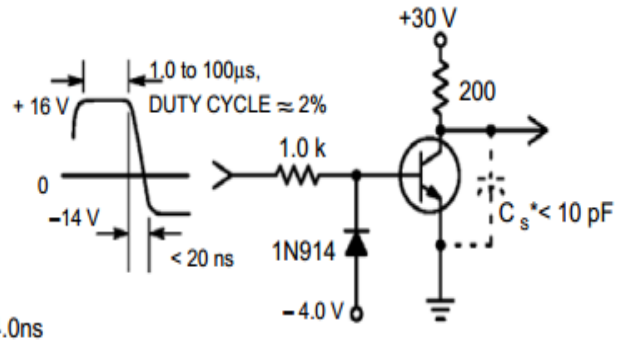


Figure 2. Turn–Off Time



Scope rise time < 4.0ns

*Total shunt capacitance of test jig, connectors, and oscilloscope.

Figure 3. DC Current Gain

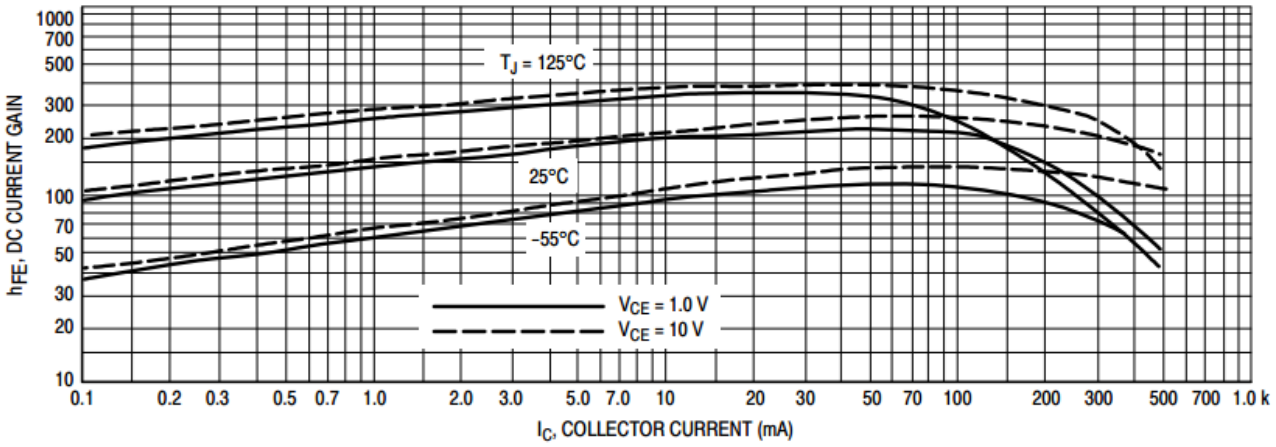


Figure 4. Collector Saturation Region

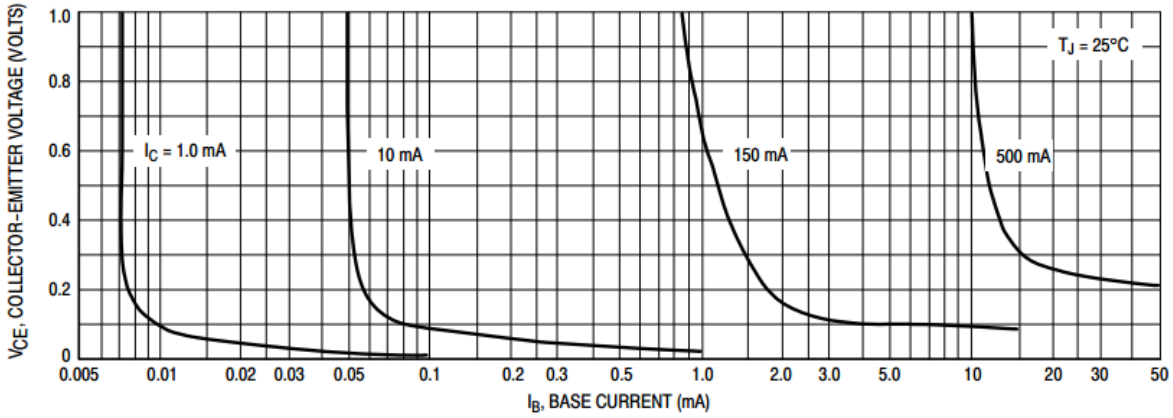


Figure 5. Turn–On Time

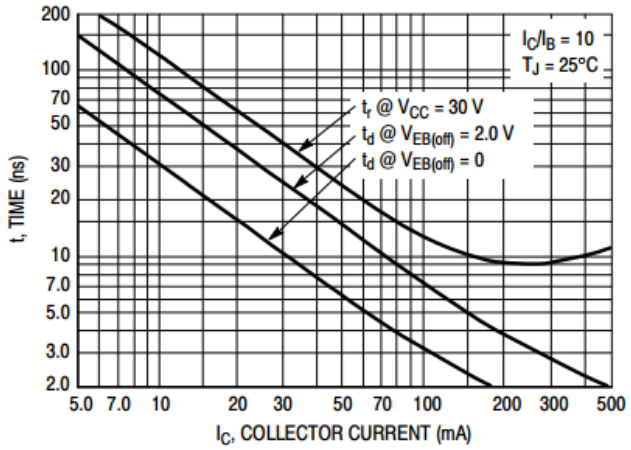


Figure 6. Turn - Off Time

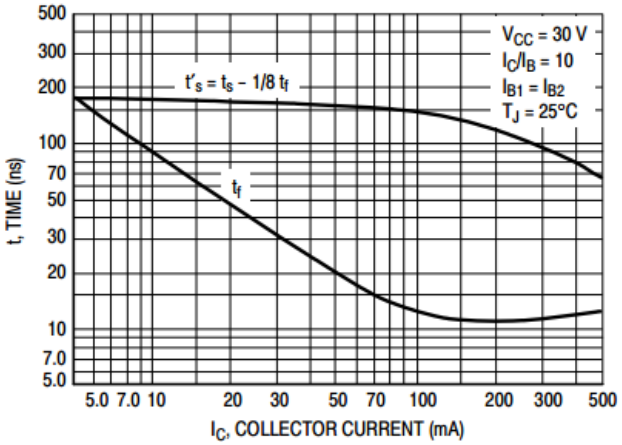


Figure 7. Frequency Effects

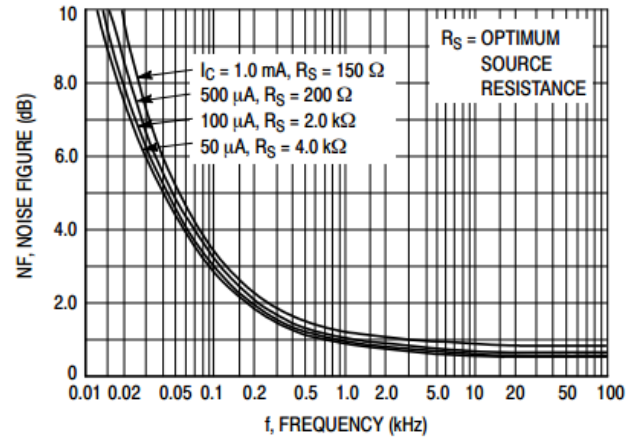


Figure 8. Source Resistance Effects

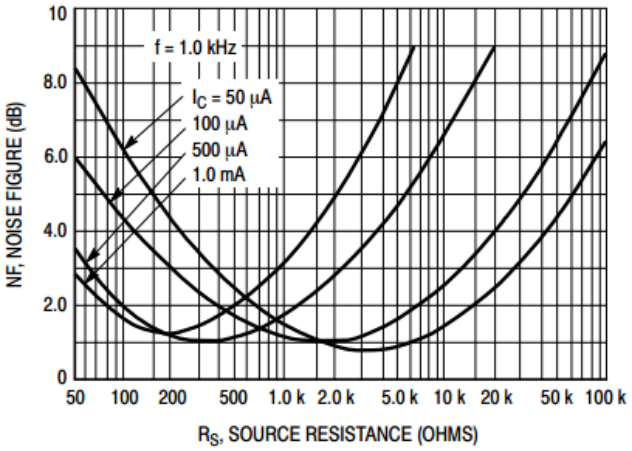


Figure 9. Capacitance

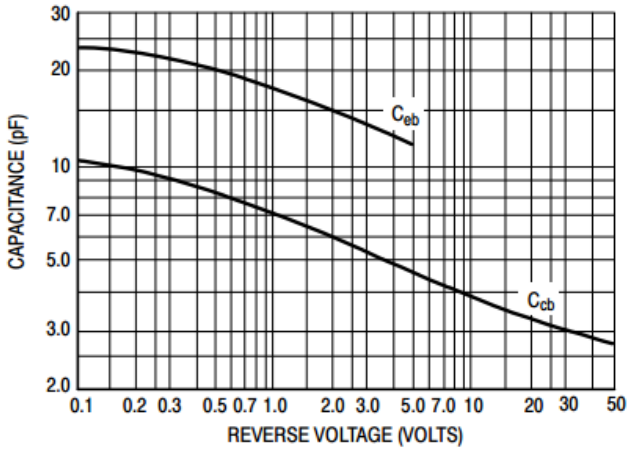


Figure 10. Current– Gain Bandwidth Product

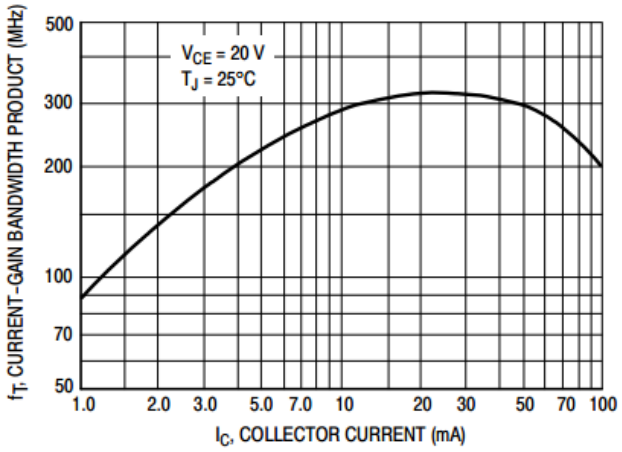


Figure 11. Collector Emitter Saturation Voltage vs. Collector Current

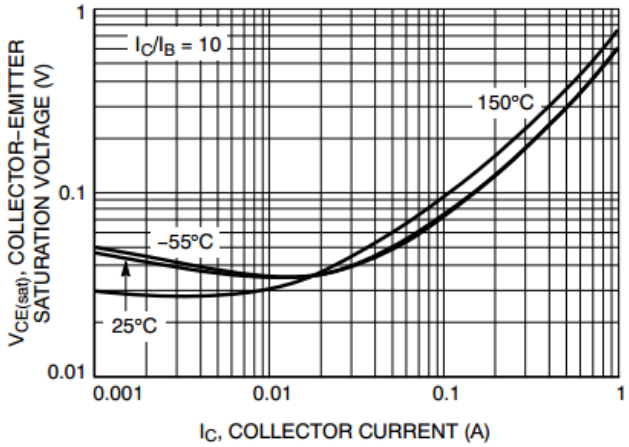


Figure 12. Base Emitter Saturation Voltage vs. Collector Current

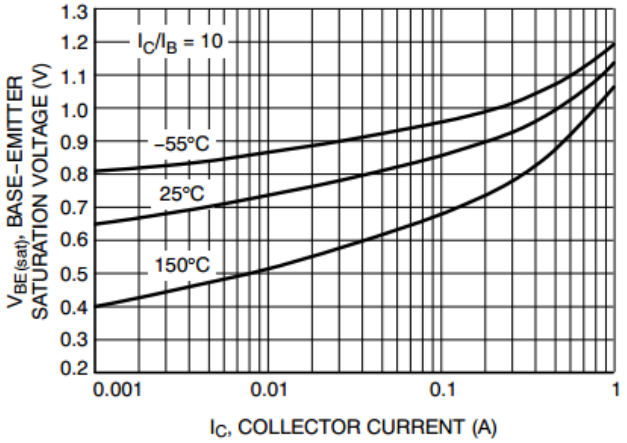


Figure 13. Base Emitter Voltage vs. Collector Current

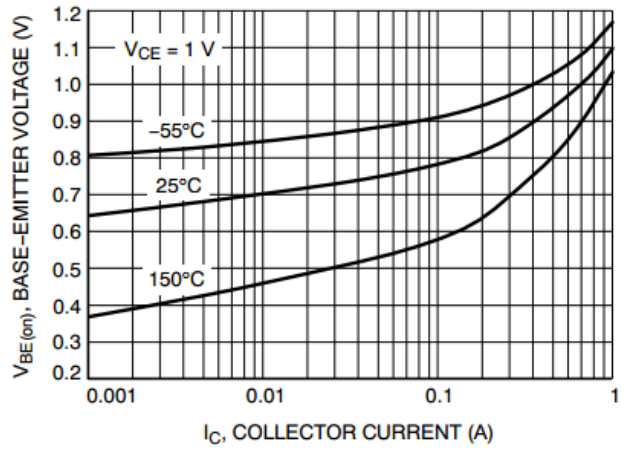


Figure 14.Temperature Coefficients

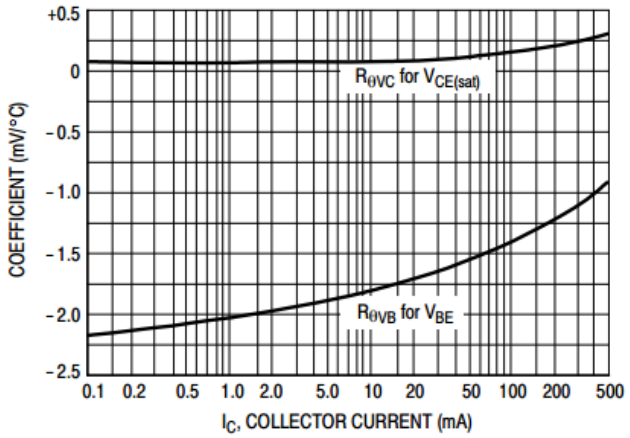
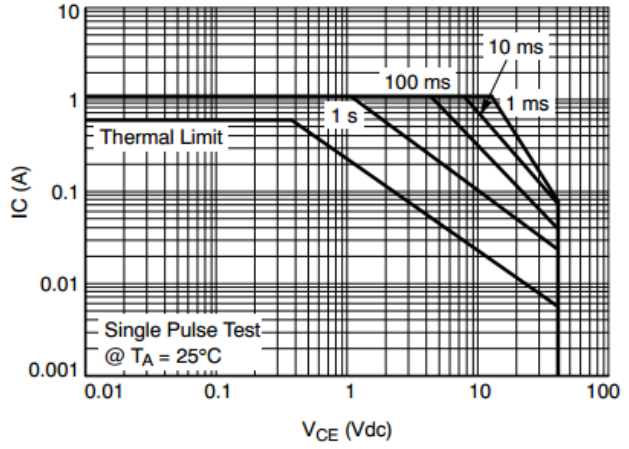
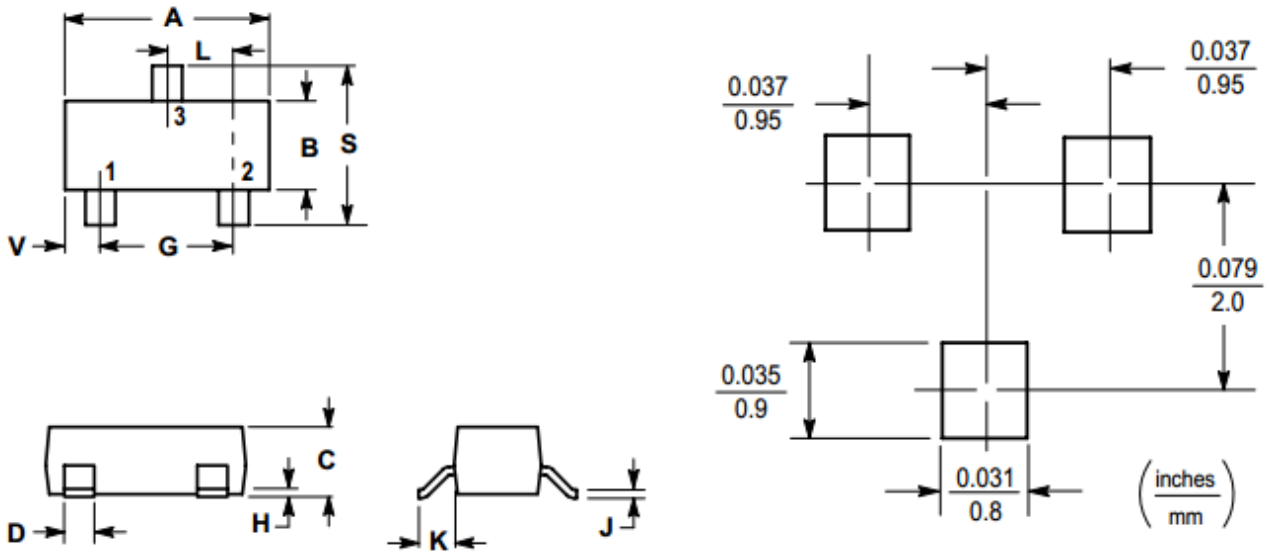


Figure 15.Safe Operating Area



PACKAGE INFORMATION

Dimension in SOT-23 Package (Unit: mm)



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.1102	0.1197	2.80	3.04
B	0.0472	0.0551	1.20	1.40
C	0.0350	0.0440	0.89	1.11
D	0.0150	0.0200	0.37	0.50
G	0.0701	0.0807	1.78	2.04
H	0.0005	0.0040	0.013	0.100
J	0.0034	0.0070	0.085	0.177
K	0.0140	0.0285	0.35	0.69
L	0.0350	0.0401	0.89	1.02
S	0.0830	0.1039	2.10	2.64
V	0.0177	0.0236	0.45	0.60

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