



DESCRIPTION

The MBT2222AL is available in SOT-23 Package.

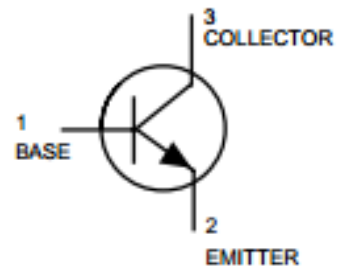
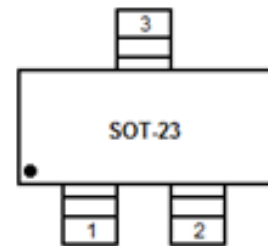
FEATURES

- ROHS compliance
- 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

TA = 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 Derate above 25°C	P _D	225 1.8	mW mW/°C
Thermal Resistance, Junction to Ambient	R _{θJA}	556	°C/W
Total Device Dissipation Alumina Substrate, T _A = 25°C ^{NOTE2} Derate above 25°C	P _D	300 2.4	mW mW/°C
Thermal Resistance, Junction to Ambient	R _{θJA}	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
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage ^{NOTE3}	V _{(BR)CEO}	I _C = 10mA, I _B = 0	40	-	Vdc
Collector-Emitter Breakdown Voltage	V _{(BR)CBO}	I _C = 10μA, I _E = 0	75	-	Vdc
Emitter-Base Breakdown Voltage	V _{(BR)EBO}	I _E = 10μA, 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 = 0.1mA, V _{CE} = 10Vdc	35	-	-
		I _C = 1.0mA, V _{CE} = 10Vdc	50	-	
		I _C = 10mA, V _{CE} = 10Vdc	75	-	
		I _C = 10mA, V _{CE} = 10Vdc, T _A = -55°C	35	-	
		I _C = 150mA, V _{CE} = 10Vdc ^{NOTE3}	100	300	
		I _C = 150mA, V _{CE} = 1.0Vdc ^{NOTE3}	50	-	
		I _C = 500mA, V _{CE} = 10Vdc ^{NOTE3}	40	-	
Collector-Emitter Saturation Voltage ^{NOTE3}	V _{CE(sat)}	I _C = 150mA, I _B = 15mA	-	0.3	Vdc
		I _C = 500mA, I _B = 50mA	-	1.0	
Base-Emitter Saturation Voltage	V _{BE(sat)}	I _C = 150mA, I _B = 15mA	0.6	1.2	Vdc
		I _C = 500mA, I _B = 50mA	-	2.0	

NOTE3: Pulse Test: Pulse Width <300 μs, Duty Cycle <2.0%.



T_A = 25°C unless otherwise noted

Parameter	Symbol	Conditions	Min	Max	Unit
SMALL-SIGNAL CHARACTERISTICS					
Current-Gain-Bandwidth Product <small>NOTE4</small>	f _T	I _C = 20mA, 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 = 1.0mA, f = 1.0kHz	2.0	8.0	kΩ
		V _{CE} = 10Vdc, I _C = 10mA, f = 1.0kHz	0.25	1.25	
Voltage Feedback Ratio	h _{re}	V _{CE} = 10Vdc, I _C = 1.0mA, f = 1.0kHz	-	8.0	x 10 ⁻⁴
		V _{CE} = 10Vdc, I _C = 10mA, f = 1.0kHz	-	4.0	
Small-Signal Current Gain	h _{fe}	V _{CE} = 10Vdc, I _C = 1.0mA, f = 1.0kHz	50	300	-
		V _{CE} = 10Vdc, I _C = 10mA, f = 1.0kHz	75	375	
Output Admittance	h _{oe}	V _{CE} = 10Vdc, I _C = 1.0mA, f = 1.0kHz	5.0	35	μmhos
		V _{CE} = 10Vdc, I _C = 10mA, f = 1.0kHz	25	200	
Current Base Time Constant	r _b , C _C	V _{CB} = 20Vdc, I _E = 20mA, f = 31.8 MHz	-	150	ps
Noise Figure	NF	V _{CE} = 10Vdc, I _C = 100μA, R _S = 1.0kΩ, f = 1.0kHz	-	4.0	dB
SWITCHING CHARACTERISTICS					
Delay Time	t _d	V _{CC} = 30Vdc, V _{EB(off)} = -0.5Vdc,	-	10	ns
Rise Time	t _r	I _C = 150mA, I _{B1} = 15mA	-	25	
Storage Time	t _s	V _{CC} = 30Vdc, I _C = 150mA,	-	225	ns
Fall Time	t _f	I _{B1} = I _{B2} = 15mA	-	60	

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

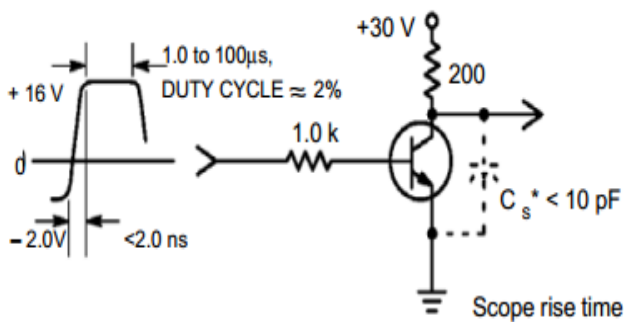
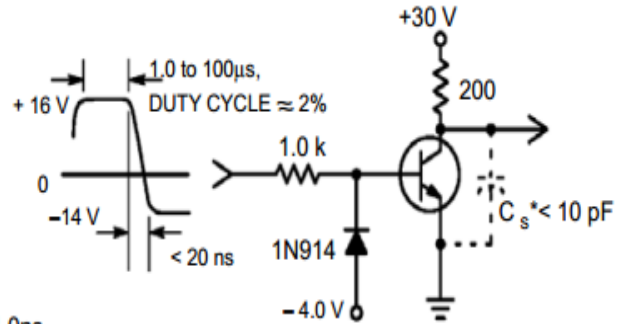


Figure 2. Turn-Off Time



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

Figure 3. DC Current Gain

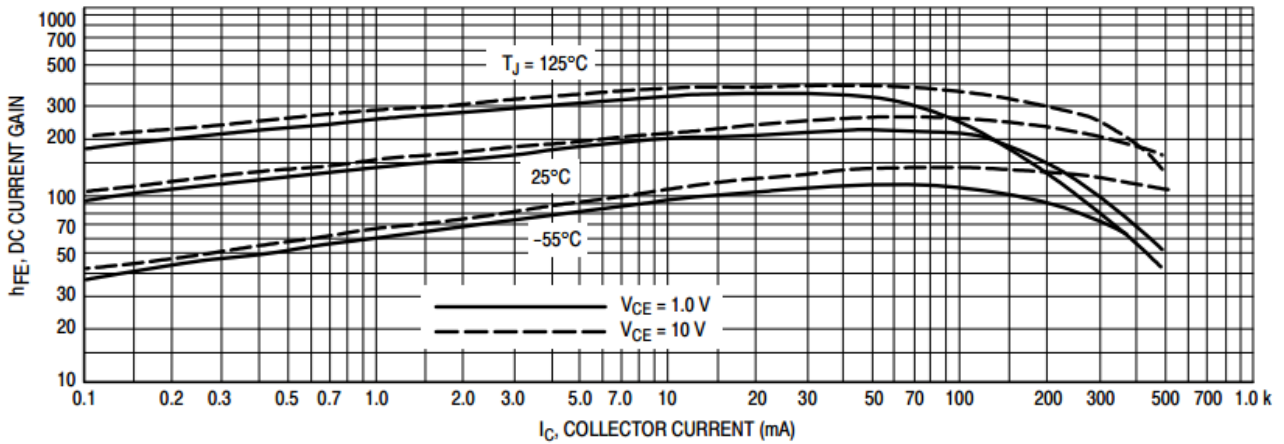


Figure 4. Collector Saturation Region

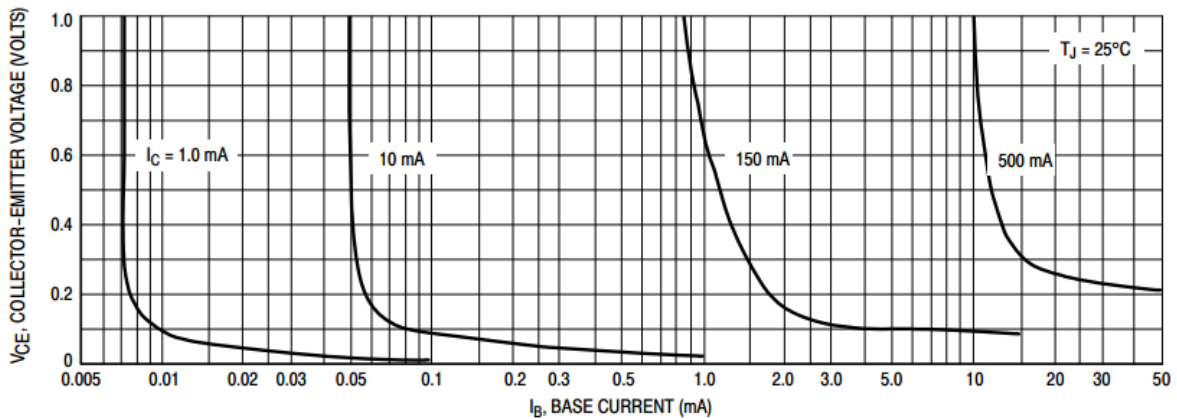




Figure 5. Turn-On Time

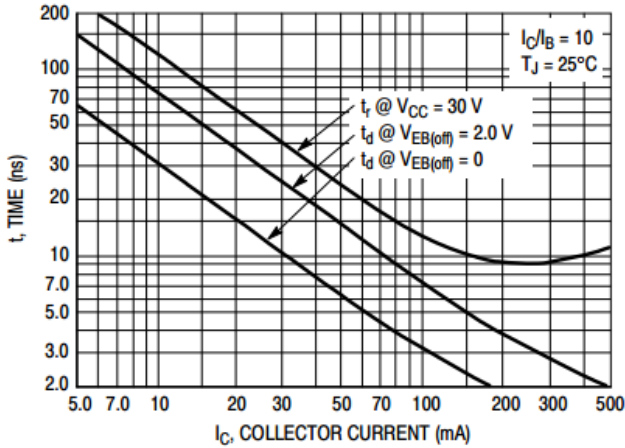


Figure 6. Turn - Off Time

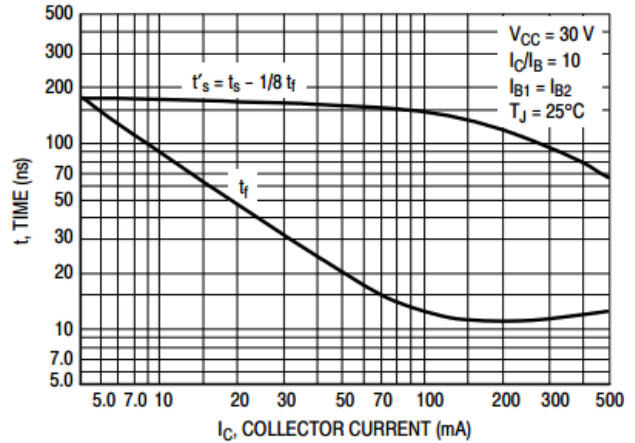


Figure 7. Frequency Effects

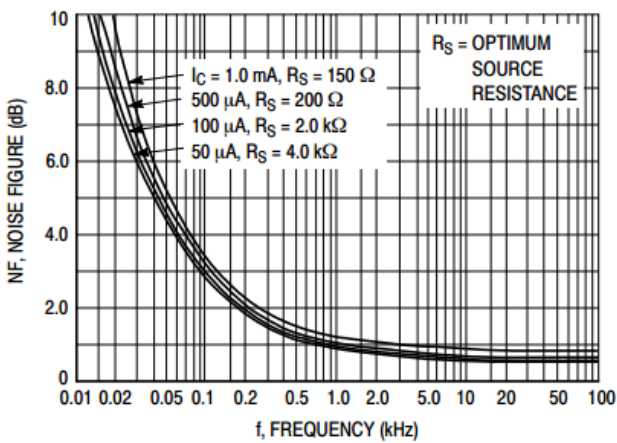


Figure 8. Source Resistance Effects

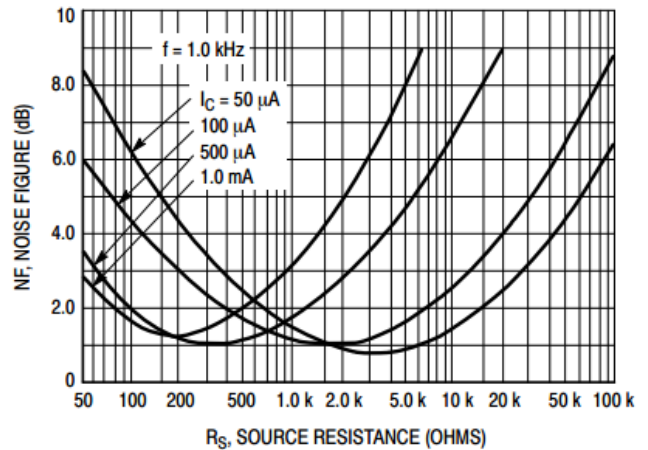


Figure 9. Capacitance

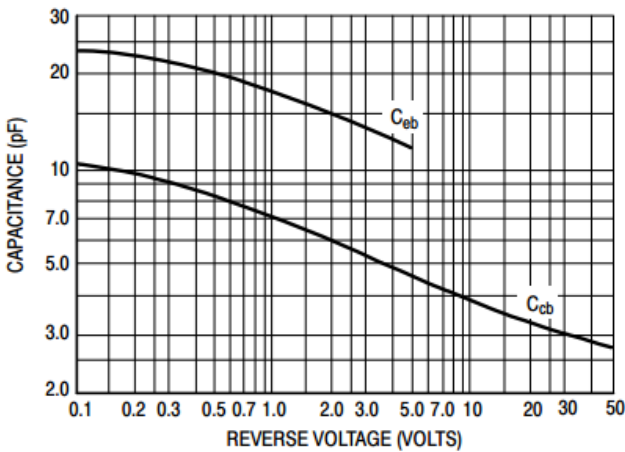


Figure 10. Current- Gain Bandwidth Product

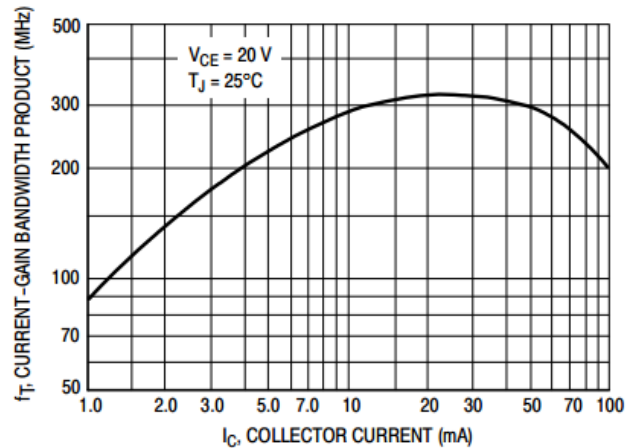




Figure 11. Collector Emitter Saturation Voltage vs. Collector Current

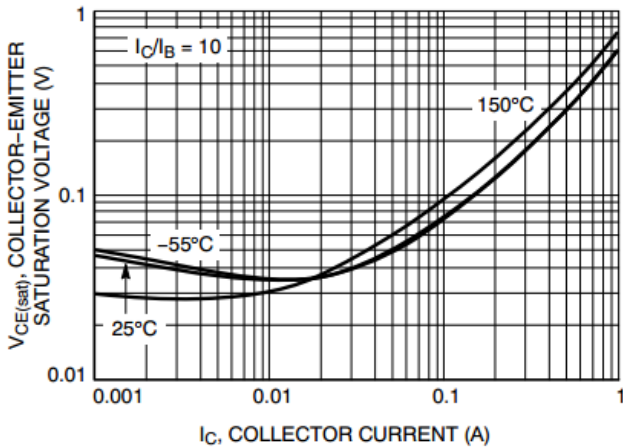


Figure 12. Base Emitter Saturation Voltage vs. Collector Current

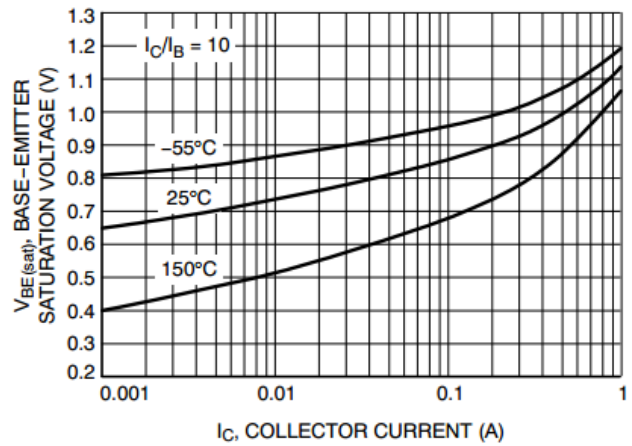


Figure 13. Base Emitter Voltage vs. Collector Current

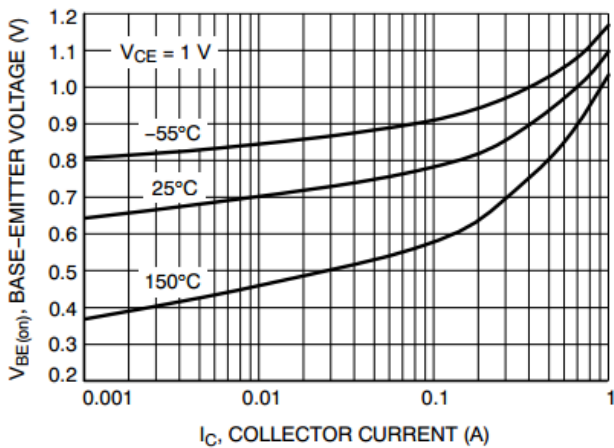


Figure 14. Temperature Coefficients

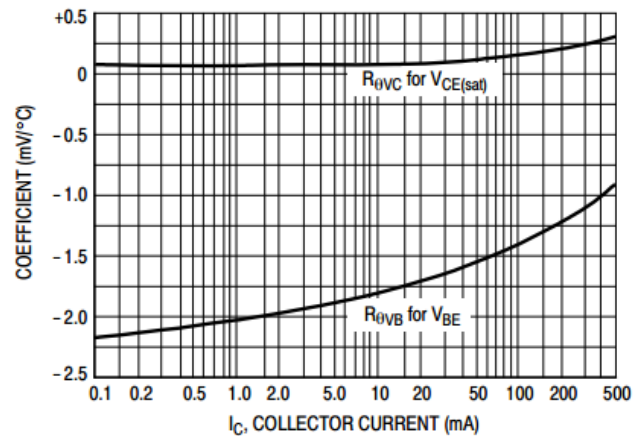
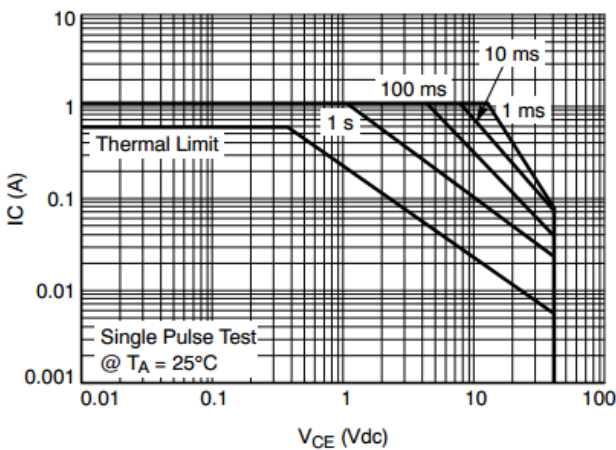


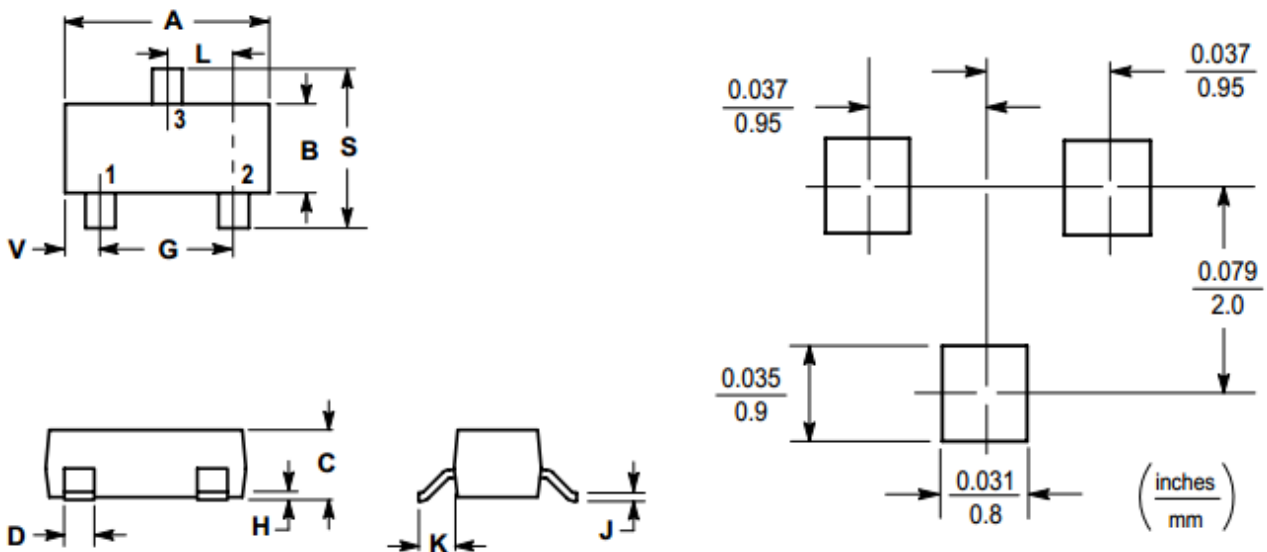
Figure 15. Safe Operating Area





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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