



DESCRIPTION

The MMBT3906 is available in SOT-23 package.

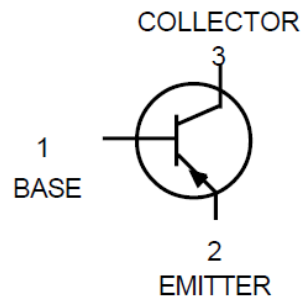
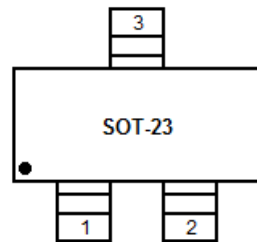
ORDERING INFORMATION

Package Type	Part Number
SOT-23	MMBT3906
Note	SPQ: 3,000pcs/Reel
AiT provides all RoHS Compliant Products	

FEATURES

- Available in SOT-23 package

PIN DESCRIPTION





ABSOLUTE MAXIMUM RATINGS

V_{CEO} , Collector-Emitter Voltage	-40Vdc
V_{CBO} , Collector-Base Voltage	-40Vdc
V_{EBO} , Emitter-Base Voltage	-5.0Vdc
I_C , Collector Current-Continuous	-200mAdc

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



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 = -1.0mA, I _B = 0	-40	-	Vdc
Collector-Base Breakdown Voltage	V _{(BR)CBO}	I _C = -10μA, I _E = 0	-40	-	Vdc
Emitter-Base Breakdown Voltage	V _{(BR)EBO}	I _E = -10μA, I _C = 0	-5.0	-	Vdc
Base Cutoff Current	I _{BL}	V _{CE} = -30Vdc, V _{EB} = -3.0Vdc	-	-50	nAdc
Collector Cutoff Current	I _{CEX}	V _{CE} = -30Vdc, V _{EB} = -3.0Vdc	-	-50	nAdc
ON CHARACTERISTICS^{NOTE3}					
DC Current Gain ^{NOTE1}	h _{FE}	I _C = -0.1mA, V _{CE} = -1.0Vdc	60	-	-
		I _C = -1.0mA, V _{CE} = -1.0Vdc	80	-	
		I _C = -10mA, V _{CE} = -1.0Vdc	100	300	
		I _C = -50mA, V _{CE} = -1.0Vdc	60	-	
		I _C = -100mA, V _{CE} = -1.0Vdc	30	-	
Collector-Emitter Saturation Voltage	V _{CE(sat)}	I _C = -10mA, I _B = -1.0mA	-	-0.25	Vdc
		I _C = -50mA, I _B = -5.0mA	-	-0.4	
Base-Emitter Saturation Voltage ^{NOTE3}	V _{BE(sat)}	I _C = -10mA, I _B = -1.0mA	-0.65	-0.85	Vdc
		I _C = -50mA, I _B = -5.0mA	-	-0.95	



Parameter	Symbol	Conditions	Min	Max	Unit
SMALL-SIGNAL CHARACTERISTICS					
Current-Gain-Bandwidth Product	f_T	$I_C = -10\text{mA dc}$, $V_{CE} = -20\text{V dc}$, $f = 100\text{MHz}$	250	-	MHz
Output Capacitance	C_{obo}	$V_{CB} = -5.0\text{V dc}$, $I_E = 0$, $f = 1.0\text{MHz}$	-	4.5	pF
Input Capacitance	C_{ibo}	$V_{EB} = -0.5\text{V dc}$, $I_C = 0$, $f = 1.0\text{MHz}$	-	10	pF
Input Impedance	h_{ie}	$V_{CE} = -10\text{V dc}$, $I_C = -1.0\text{mA dc}$, $f = 1.0\text{kHz}$	2.0	12	k Ω
Voltage Feedback Ratio	h_{re}	$V_{CE} = -10\text{V dc}$, $I_C = -1.0\text{mA dc}$, $f = 1.0\text{kHz}$	0.1	10	$\times 10^{-4}$
Small-Signal Current Gain	h_{fe}	$V_{CE} = -10\text{V dc}$, $I_C = -1.0\text{mA dc}$, $f = 1.0\text{kHz}$	100	400	-
Output Admittance	h_{oe}	$V_{CE} = -10\text{V dc}$, $I_C = -1.0\text{mA dc}$, $f = 1.0\text{kHz}$	3.0	60	μmhos
Noise Figure	NF	$V_{CE} = -5.0\text{V dc}$, $I_C = -100\mu\text{A dc}$, $R_s = 1.0\text{k}\Omega$, $f = 1.0\text{kHz}$	-	4.0	dB
SWITCHING CHARACTERISTICS					
Delay Time	t_d	$V_{CC} = -3.0\text{V dc}$, $V_{BE} = 0.5\text{V dc}$	-	35	ns
Rise Time	t_r	$I_C = -10\text{mA dc}$, $I_{B1} = -1.0\text{mA dc}$	-	35	
Storage Time	t_s	$V_{CC} = -3.0\text{V dc}$, $I_C = -10\text{mA dc}$	-	225	ns
Fall Time	t_f	$I_{B1} = I_{B2} = -1.0\text{mA dc}$	-	75	

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.

NOTE3: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2.0\%$



TYPICAL CHARACTERISTICS

Figure 1. Delay and Rise Time Equivalent Test Circuit

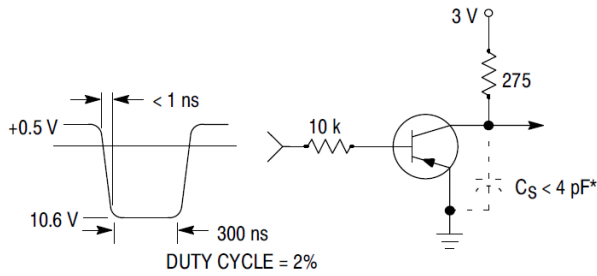
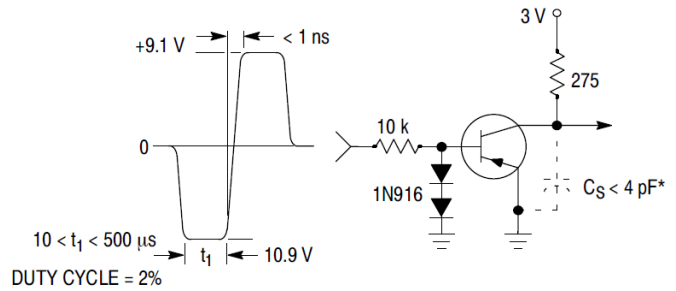


Figure 2. Storage and Fall Time Equivalent Test Circuit



* Total shunt capacitance of test jig and connectors

TYPICAL TRANSIENT CHARACTERISTICS

Figure 3. Capacitance

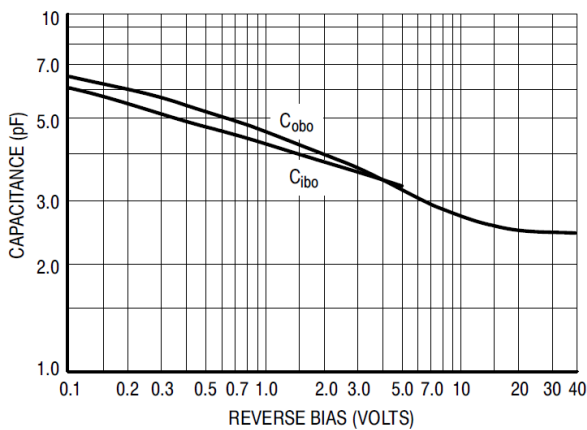


Figure 4. Charge Data

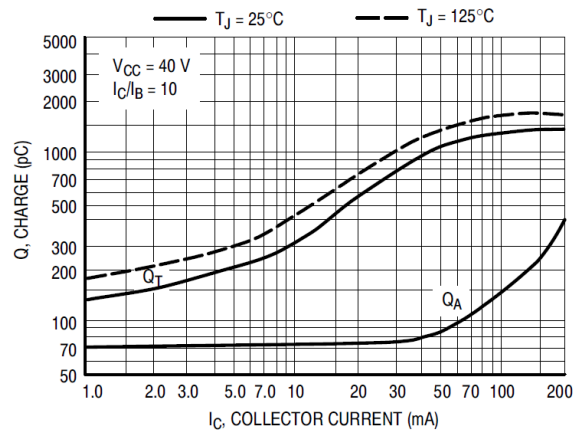


Figure 5. Turn-On Time

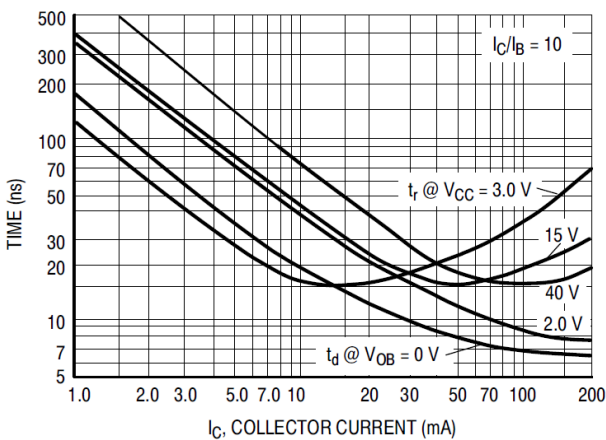
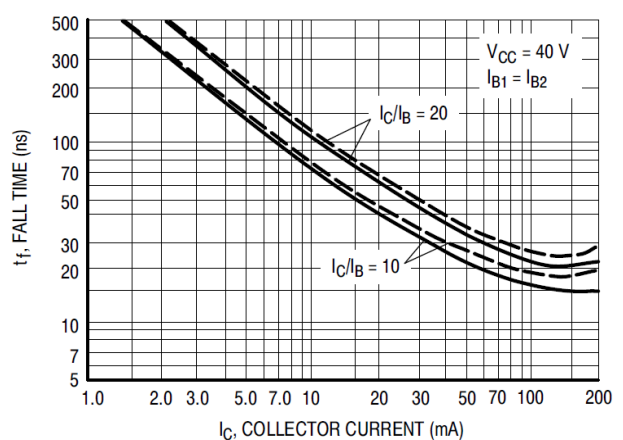


Figure 6. Fall Time





TYPICAL AUDIO SMALL-SIGNAL CHARACTERISTICS NOISE FIGURE VARIATIONS

($V_{CE} = -5.0V_{dc}$, $T_A = 25^\circ C$, Bandwidth=1.0Hz)

Figure 7. Noise Figure

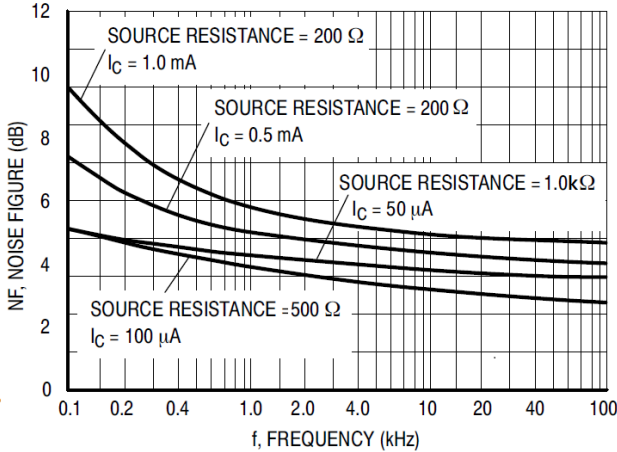
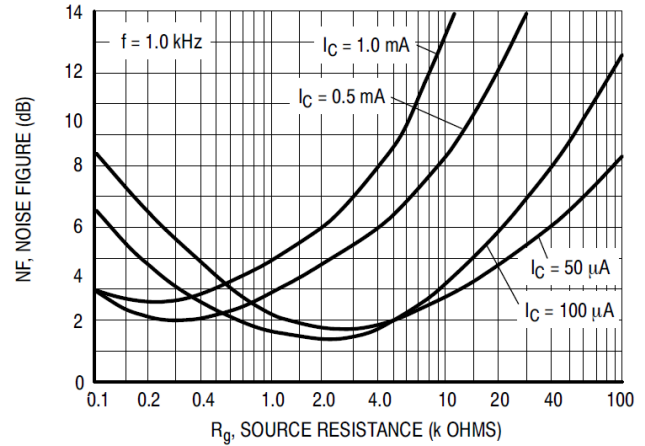


Figure 8. Noise Figure



h PARAMETERS ($V_{CE} = 10V_{dc}$, $f=1.0kHz$, $T_A = 25^\circ C$)

Figure 9. Current Gain

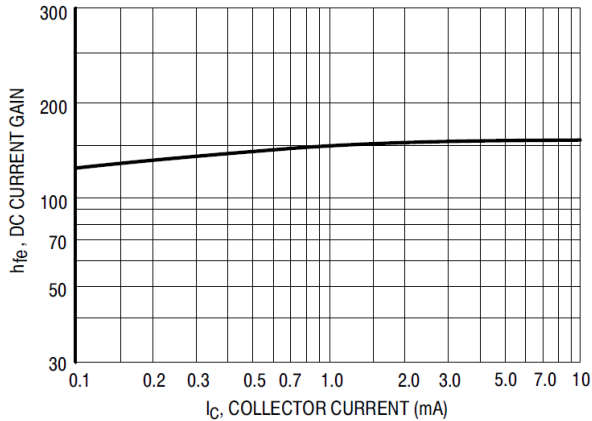


Figure 10. Output Admittance

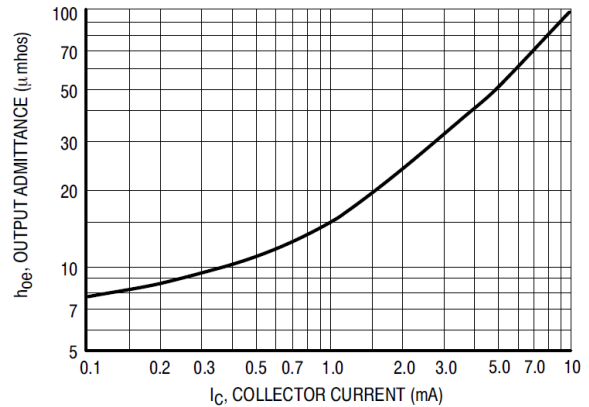


Figure 11. Input Impedance

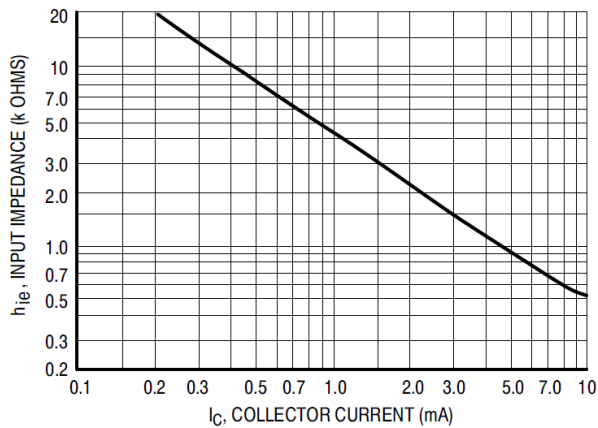
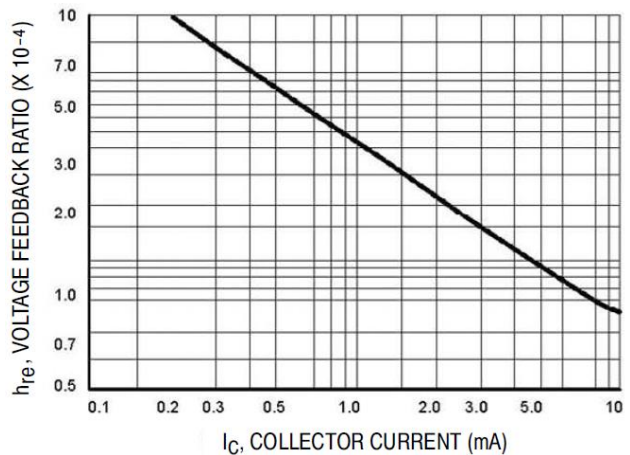


Figure 12. Voltage Feedback Ratio





TYPICAL STATIC CHARACTERISTICS

Figure 13. DC Current Gain

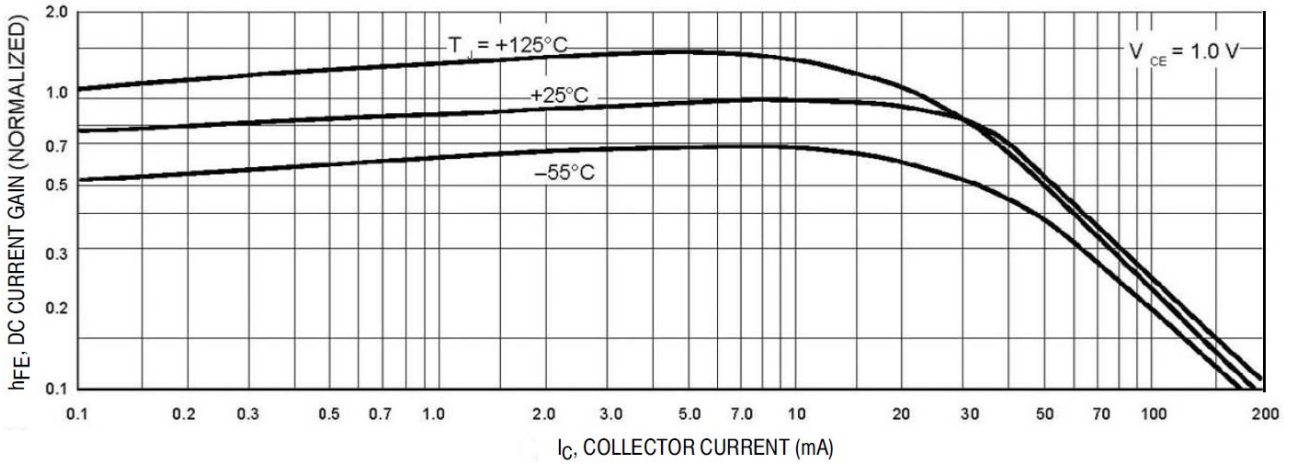


Figure 14. Collector Saturation Region

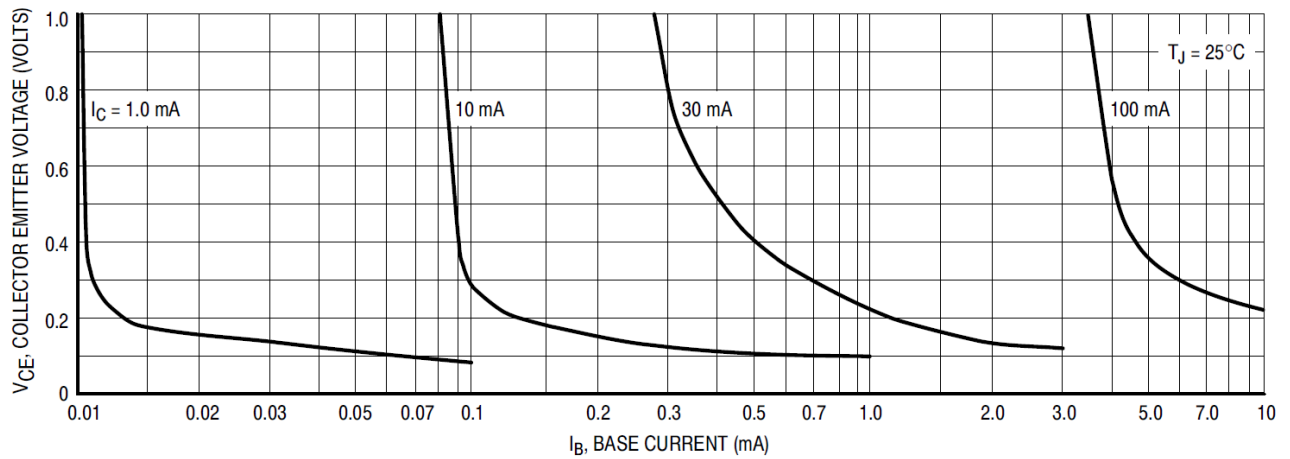


Figure 15. "ON" Voltages

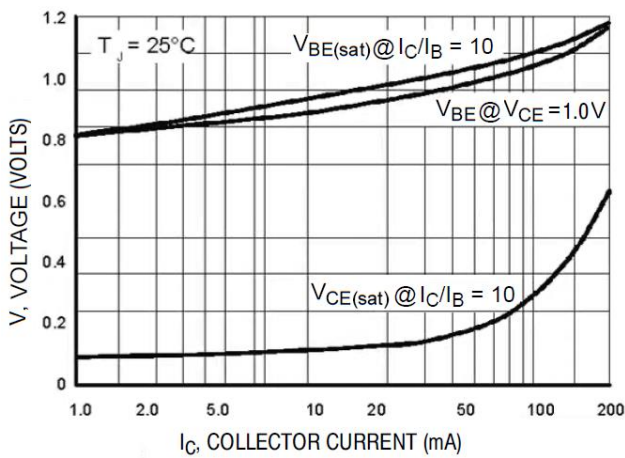
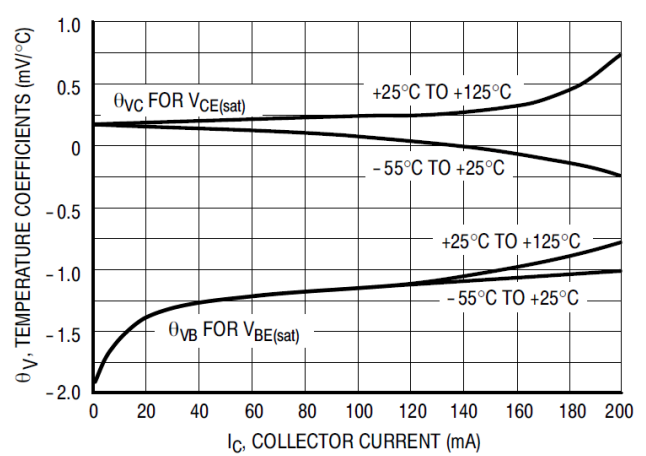


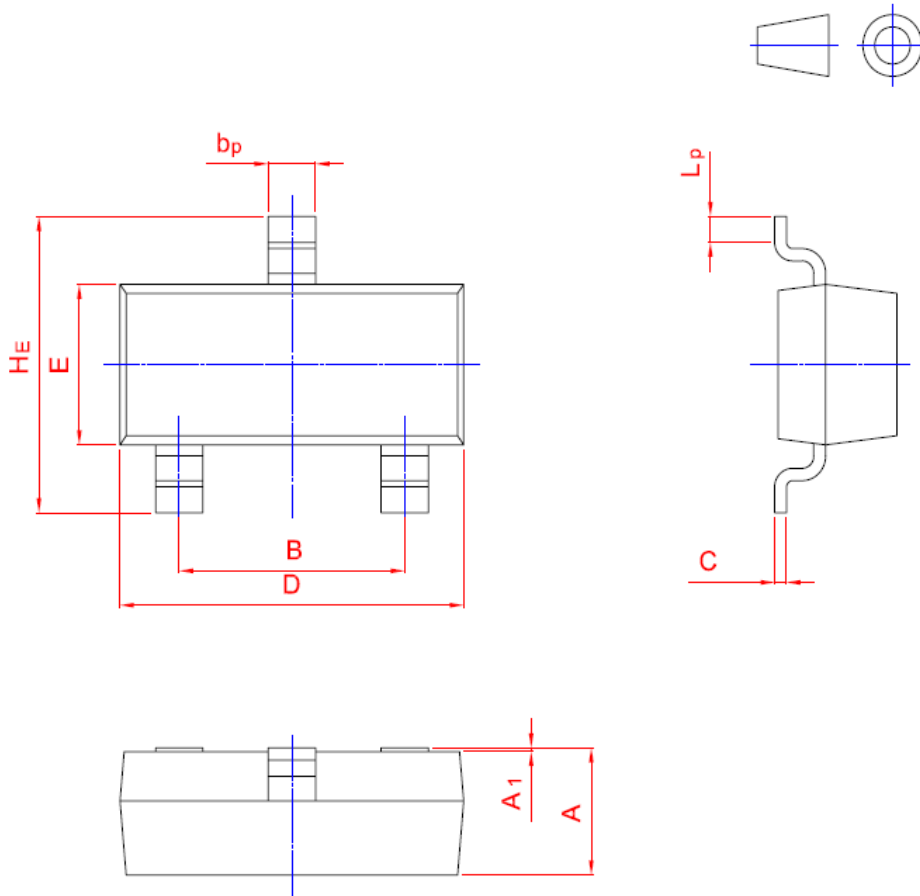
Figure 16. Temperature Coefficients





PACKAGE INFORMATION

Dimension in SOT-23 Package (Unit: mm)



Unit	A	B	bp	C	D	E	HE	A1	Lp
mm	1.40	2.04	0.50	0.19	3.10	1.65	3.00	0.100	0.50
	0.95	1.78	0.35	0.08	2.70	1.20	2.20	0.013	0.20



IMPORTANT NOTICE

AiT Semiconductor Inc. (AiT) reserves the right to make changes to any its product, specifications, to discontinue any integrated circuit product or service without notice, and advises its customers to obtain the latest version of relevant information to verify, before placing orders, that the information being relied on is current.

AiT Semiconductor Inc.'s integrated circuit products are not designed, intended, authorized, or warranted to be suitable for use in life support applications, devices or systems or other critical applications. Use of AiT products in such applications is understood to be fully at the risk of the customer. As used herein may involve potential risks of death, personal injury, or severe property, or environmental damage. In order to minimize risks associated with the customer's applications, the customer should provide adequate design and operating safeguards.

AiT Semiconductor Inc. assumes to no liability to customer product design or application support. AiT warrants the performance of its products of the specifications applicable at the time of sale.