



DESCRIPTION

The MBT4403L is available in SOT-23 package

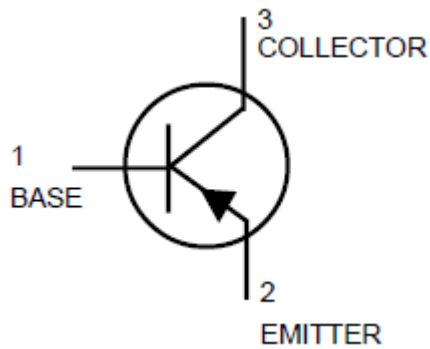
FEATURES

- Available in SOT-23 package

ORDERING INFORMATION

Package Type	Part Number
SOT-23	MBT4403L
Note	3,000PCS/Reel
AiT provides all RoHS Compliant Products	

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	– 600mA _{dc}

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

P_D , Total Device Dissipation FR –5 Board ^{NOTE1}	$T_A = 25^\circ\text{C}$	225 mW
	Derate above 25°C	1.8 mW/°C
$R_{\theta JA}$, Thermal Resistance Junction to Ambient		556 °C/W
P_D , Total Device Dissipation Alumina Substrate ^{Note2}	$T_A = 25^\circ\text{C}$	300 mW
	Derate above 25°C	2.4 mW/°C
$R_{\theta JA}$, Thermal Resistance, Junction to Ambient		417 °C/W
T_J, T_{stg} , Junction and Storage Temperature		–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 specified

Parameter	Symbol	Conditions	Min.	Max.	Unit
OFF CHARACTERISTICS					
Collector–Emitter Breakdown Voltage ^{Note3}	V _{(BR)CEO}	I _C = –1.0 mA _{dc} , I _B = 0	– 40	-	V _{dc}
Collector–Base Breakdown Voltage	V _{(BR)CB}	I _C = –0.1mA _{dc} , I _E = 0	– 40	-	V _{dc}
Emitter–Base Breakdown Voltage	V _{(BR)EBO}	I _E = –0.1mA _{dc} , I _C = 0	– 5.0	-	V _{dc}
Base Cutoff Current	I _{BEV}	V _{CE} = –35 V _{dc} , V _{EB} = –0.4 V _{dc}	-	– 0.1	μA _{dc}
Collector Cutoff Current	I _{CEX}	V _{CE} = –35 V _{dc} , V _{EB} = –0.4 V _{dc}	-	– 0.1	μA _{dc}
ON CHARACTERISTICS					
DC Current Gain	h _{FE}	I _C = –0.1mA _{dc} , V _{CE} = –1.0V _{dc}	30	-	-
		I _C = –1.0mA _{dc} , V _{CE} = –1.0V _{dc}	60		
		I _C = –10mA _{dc} , V _{CE} = –1.0 V _{dc}	100		
		I _C = –150mA _{dc} , V _{CE} = –2.0V _{dc}) ^{Note3}	100	300	
		I _C = –500mA _{dc} , V _{CE} = –2.0V _{dc}) ^{Note3}	20	--	
Collector–Emitter Saturation Voltage ^{Note3}	V _{CE(sat)}	I _C = –150mA _{dc} , I _B = –15mA _{dc}	-	– 0.4	V _{dc}
		I _C = –500mA _{dc} , I _B = –50mA _{dc}	-	– 0.75	
Base–Emitter Saturation Voltage ^{Note3}	V _{BE(sat)}	I _C = –150mA _{dc} , I _B = –15mA _{dc}	– 0.75	– 0.95	V _{dc}
		I _C = –500mA _{dc} , I _B = –50mA _{dc}	-	– 1.3	

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



Parameter	Symbol	Conditions	Min.	Max.	Unit
SMALL-SIGNAL CHARACTERISTICS					
Current-Gain — Bandwidth Product	f_T	$I_C = -20\text{mA dc}$, $V_{CE} = -10\text{V dc}$, $f = 100\text{ MHz}$	200	-	MHz
Collector-Base Capacitance	C_{cb}	$V_{CB} = -10\text{V dc}$, $I_E = 0$, $f = 1.0\text{ MHz}$	-	8.5	pF
Emitter-Base Capacitance	C_{eb}	$V_{BE} = -0.5\text{V dc}$, $I_C = 0$, $f = 1.0\text{ MHz}$	-	30	pF
Input Impedance	h_{ie}	$V_{CE} = -10\text{V dc}$, $I_C = -1.0\text{mA dc}$, $f = 1.0\text{ kHz}$	1.5	15	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	8.0	$\times 10^{-4}$
Small-Signal Current Gain	h_{fe}	$V_{CE} = -10\text{V dc}$, $I_C = -1.0\text{mA dc}$, $f = 1.0\text{ kHz}$	60	500	-
Output Admittance	h_{oe}	$V_{CE} = -10\text{V dc}$, $I_C = -1.0\text{mA dc}$, $f = 1.0\text{ kHz}$	1.0	100	μmhos
SWITCHING CHARACTERISTICS					
Delay Time	t_d	$V_{CC} = -30\text{V dc}$, $V_{EB} = -2.0\text{V dc}$	-	15	ns
Rise Time	t_d	$I_C = -150\text{mA dc}$, $I_{B1} = -15\text{mA dc}$	-	20	
Storage Time	t_s	$V_{CC} = -30\text{V dc}$, $I_C = -150\text{mA dc}$	-	225	ns
Fall Time	t_f	$I_{B1} = I_{B2} = -15\text{mA dc}$	-	30	



TYPICAL CHARACTERISTICS

$T_A = 25^\circ\text{C}$

SWITCHING TIME EQUIVALENT TEST CIRCUITS

Scope rise time < 4.0ns *Total shunt capacitance of test jig connectors, and oscilloscope

Figure 1. Turn-On Time

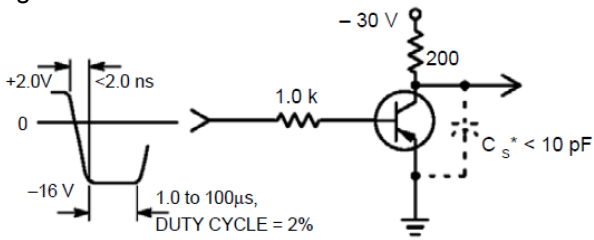
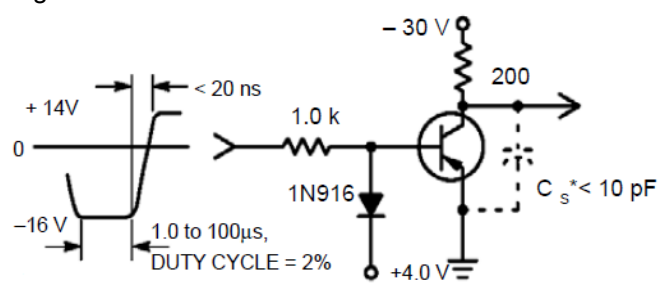


Figure 2. Turn-Off Time



— $T_j = 25^\circ\text{C}$
- - - $T_j = 100^\circ\text{C}$

Figure 3. Capacitance

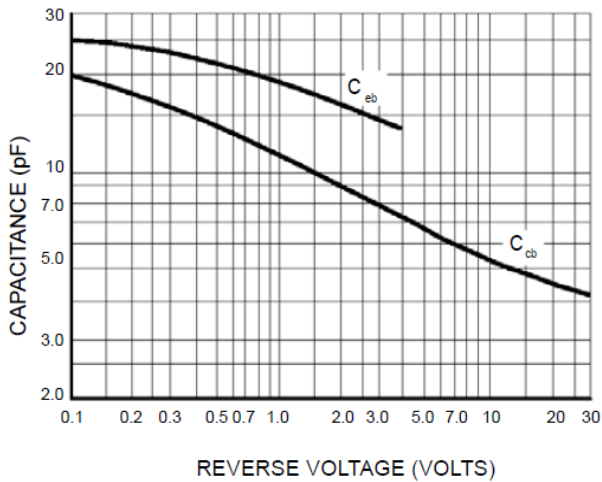


Figure 4. Charge Data

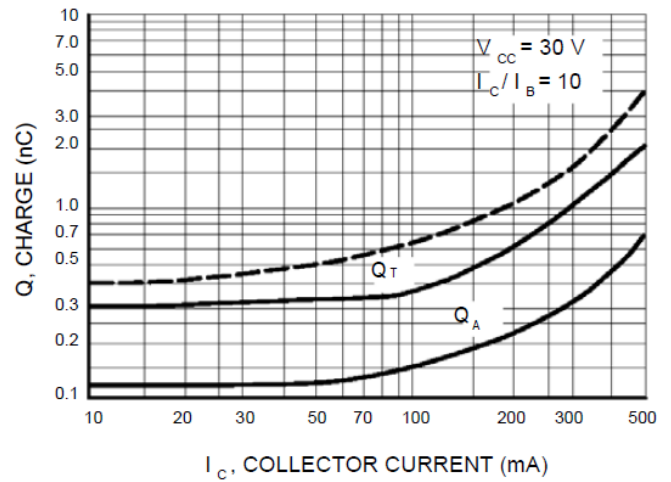




Figure 5. Turn-On Time

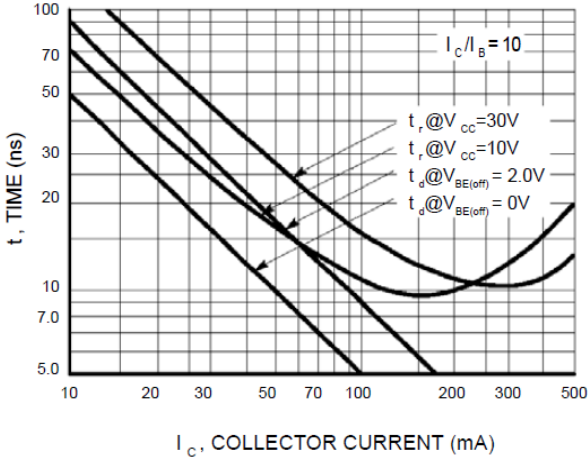


Figure 6. Rise Time

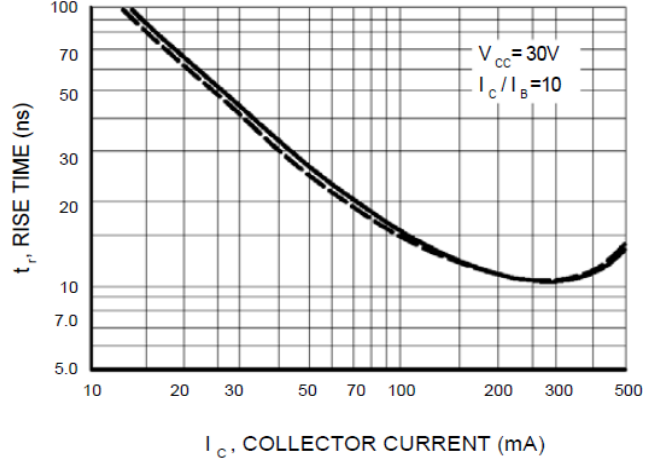
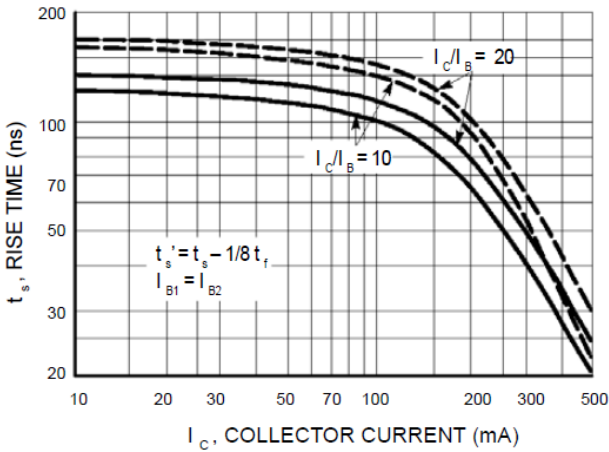


Figure 7. Storage Time



SMALL-SIGNAL CHARACTERISTICS

NOISE FIGURE $V_{CE} = -10 Vdc$, $T_A = 25^\circ C$ Bandwidth = 1.0 Hz

Figure 8. Frequency Effects

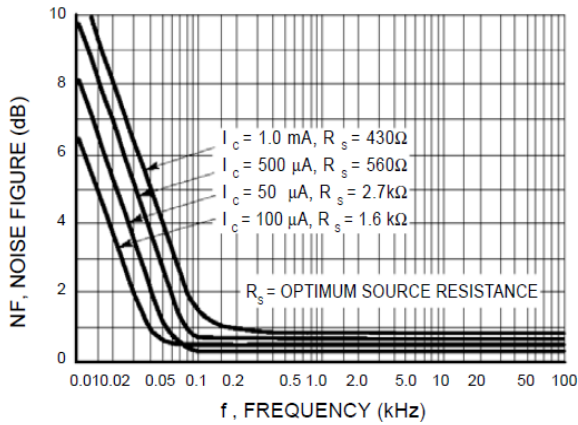
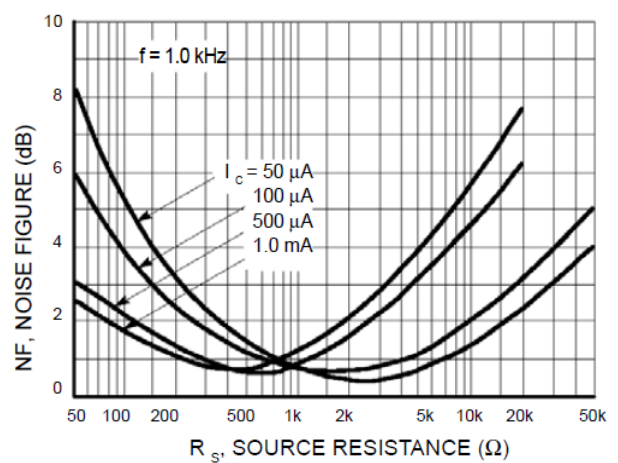


Figure 9. Source Resistance Effects





h PARAMETERS

$V_{CE} = -10V_{dc}$, $f = 1.0kHz$, $T_A = 25^{\circ}C$

This group of graphs illustrates the relationship between h_{fe} and other “h” parameters for this series of Transistors. To obtain these curves, a high-gain and a low-gain unit were selected from the MBT4403L lines, and the same units were used to develop the correspondingly numbered curves on each graph.

Figure 10. Current Gain

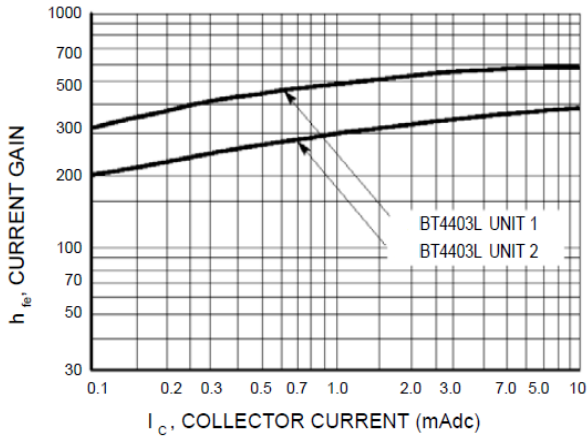


Figure 11. Input Impedance

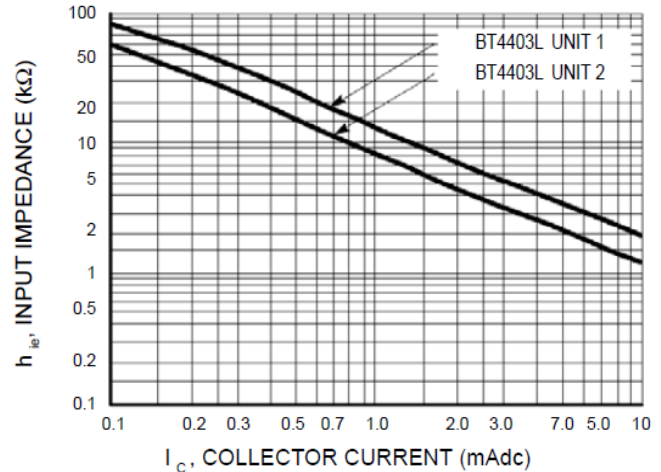


Figure 12. Voltage Feedback Ratio

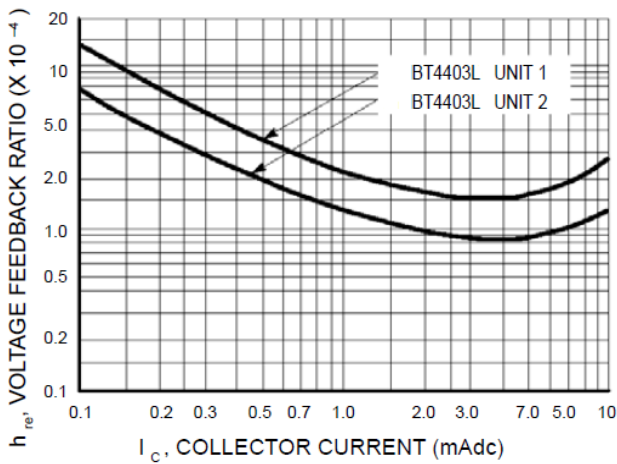
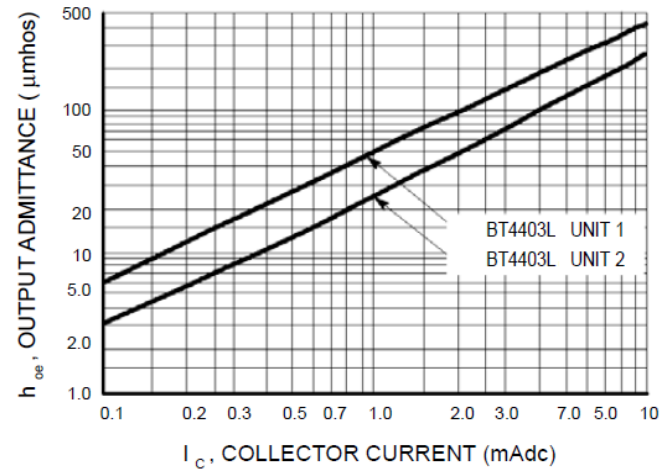


Figure 13. Output Admittance





STATIC CHARACTERISTICS

Figure 14. DC Current Gain

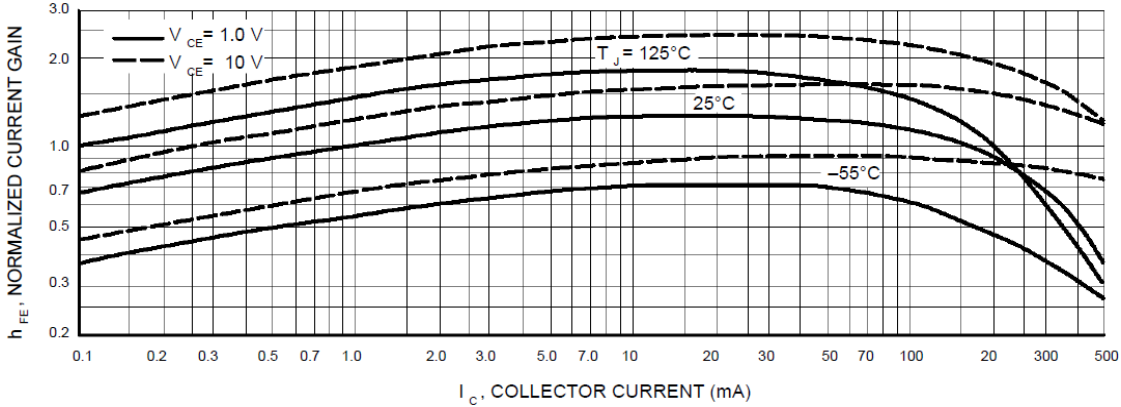


Figure 15. Collector Saturation Region

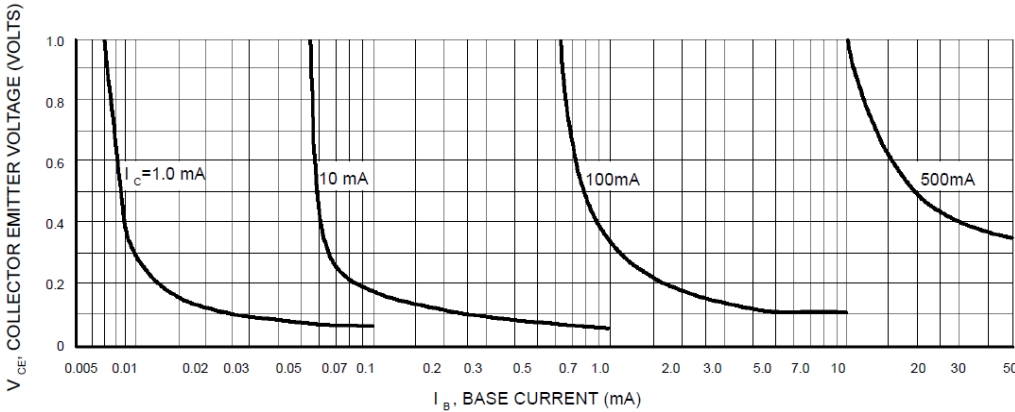


Figure 16. "On" Voltages

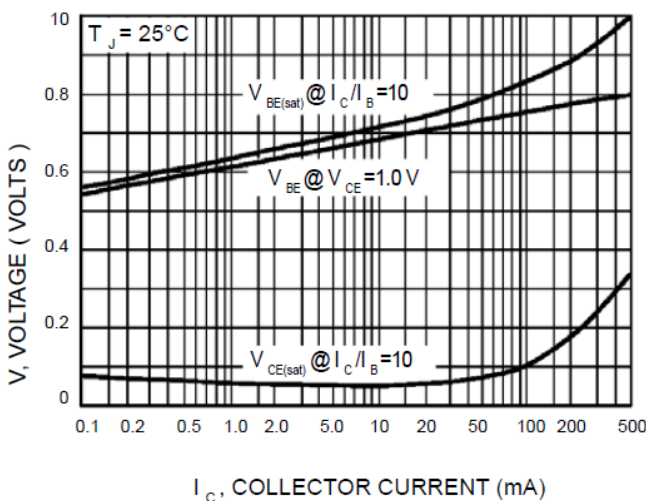
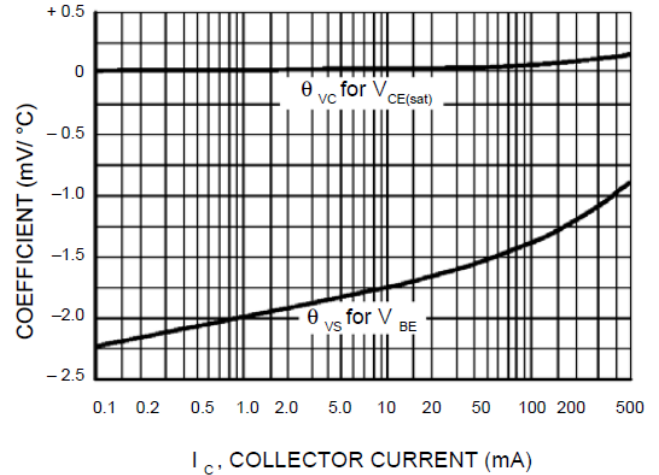


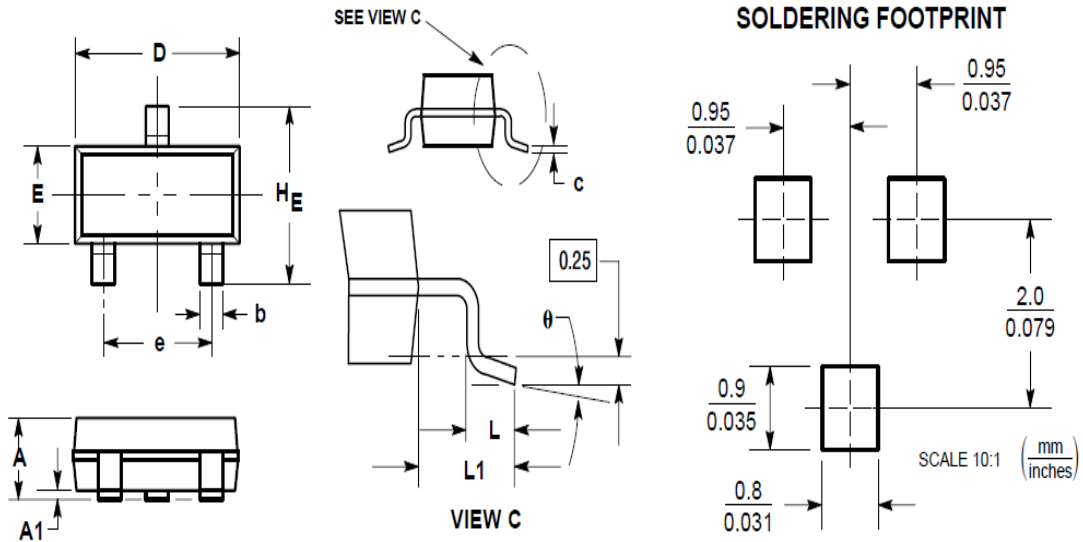
Figure 17. Temperature Coefficients





PACKAGE INFORMATION

Dimension in SOT-23 Package (Unit: mm)



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.035	0.044	0.89	1.11
A1	0.001	0.004	0.01	0.10
b	0.015	0.020	0.37	0.50
c	0.003	0.007	0.09	0.18
D	0.110	0.120	2.80	3.04
E	0.047	0.055	1.20	1.40
e	0.070	0.081	1.78	2.04
L	0.004	0.012	0.10	0.30
L1	0.014	0.029	0.35	0.69
HE	0.083	0.104	2.10	2.64



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