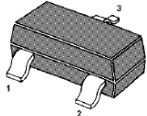


MMBT3906

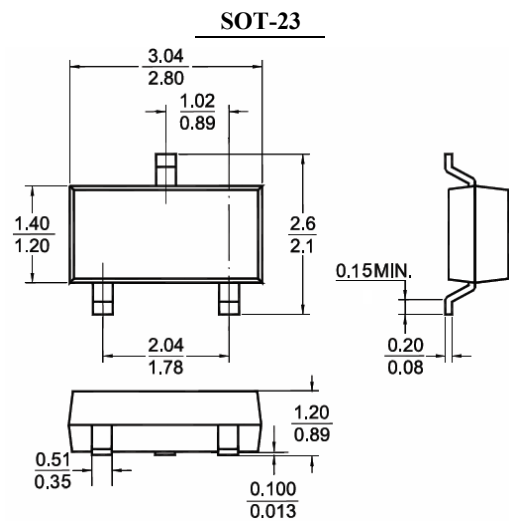
PNP TRANSISTOR

FEATURES

- As complementary types the NPN transistors MMBT3904 is recommended
- Suffix "H" indicates Halogen-free parts, ex. MMBT3906H



1, Base 2, Emitter 3, Collector



Dimensions in millimeter

Maximum Ratings ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	-40	V
Collector-Emitter Voltage	V_{CEO}	-40	V
Emitter-Base Voltage	V_{EBO}	-5.0	V
Collector Current	I_C	-200	mA
Total Device Dissipation FR-5 Board ⁽¹⁾ Derate above 25°C	P_D	225 1.8	mW mW / °C
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	556	°C / W
Total Device Dissipation Alumina Substrate ⁽²⁾ Derate above 25°C	P_D	300 2.4	mW mW / °C
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	417	°C / W
Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +150	°C

(1) Device on FR-5 = 1.0 x 0.75 x 0.062 in.

(2) Device on alumina substrate = 0.4 x 0.3 x 0.024 in. 99.5% alumina.

Electrical Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Conditions	Symbol	Min.	Max.	Unit
Collector-base breakdown voltage	$I_C = -10\mu\text{A}, I_E = 0$	$V_{(BR)CBO}$	-40	--	V
Collector-emitter breakdown voltage ⁽³⁾	$I_C = -1.0\text{mA}, I_B = 0$	$V_{(BR)CEO}$	-40	--	V
Emitter-base breakdown voltage	$I_E = -10\mu\text{A}, I_C = 0$	$V_{(BR)EBO}$	-5.0	--	V
Base cut-off current	$V_{CE} = -30\text{V}, V_{EB} = -3.0\text{V}$	I_{BL}	--	-50	nA
Collector cut-off current	$V_{CE} = -30\text{V}, V_{EB} = -3.0\text{V}$	I_{CEX}	--	-50	nA
DC current gain	$V_{CE} = -1.0\text{V}, I_C = -0.1\text{mA}$	h_{FE}	60	--	--
	$V_{CE} = -1.0\text{V}, I_C = -1.0\text{mA}$		80	--	
	$V_{CE} = -1.0\text{V}, I_C = -10\text{mA}$		100	300	
	$V_{CE} = -1.0\text{V}, I_C = -50\text{mA}$		60	--	
	$V_{CE} = -1.0\text{V}, I_C = -100\text{mA}$		30	--	
Collector-emitter saturation voltage ⁽³⁾	$I_C = -10\text{mA}, I_B = -1.0\text{mA}$	$V_{CE(sat)}$	--	-0.25	V
	$I_C = -50\text{mA}, I_B = -5.0\text{mA}$		--	-0.4	
Base-emitter saturation voltage ⁽³⁾	$I_C = -10\text{mA}, I_B = -1.0\text{mA}$	$V_{BE(sat)}$	-0.65	-0.85	V
	$I_C = -50\text{mA}, I_B = -5.0\text{mA}$		--	-0.95	

(3) Pulse Test: Pulse Width <300 μs , Duty Cycle <2.0%.

MMBT3906

PNP TRANSISTOR

Electrical Characteristics ($T_A = 25\text{ }^\circ\text{C}$ unless otherwise specified)

Parameter	Conditions	Symbol	Min.	Max.	Unit
Current-gain — bandwidth product	$V_{CE} = -20\text{V}$, $I_C = -10\text{mA}$, $f = 100\text{MHz}$	f_T	250	--	MHz
Output capacitance	$V_{CB} = -5.0\text{V}$, $I_E = 0$, $f = 1.0\text{ MHz}$	C_{obo}	--	4.5	pF
Input capacitance	$V_{BE} = -0.5\text{V}$, $I_C = 0$, $f = 1.0\text{ MHz}$	C_{ibo}	--	10	pF
Input impedancen	$V_{CE} = -10\text{V}$, $I_C = -1.0\text{mA}$, $f = 1.0\text{ kHz}$	h_{ie}	2.0	12	k Ω
Voltage feedback Ratio	$V_{CE} = -10\text{V}$, $I_C = -1.0\text{mA}$, $f = 1.0\text{ kHz}$	h_{re}	0.1	10	$\times 10^{-4}$
Small-signal current gain	$V_{CE} = -10\text{V}$, $I_C = -1.0\text{mA}$, $f = 1.0\text{ kHz}$	h_{fe}	100	400	--
Output admittance	$V_{CE} = -10\text{V}$, $I_C = -1.0\text{mA}$, $f = 1.0\text{ kHz}$	h_{oe}	3.0	60	μmhos
Noise figure	$V_{CE} = -5.0\text{V}$, $I_C = -100\mu\text{A}$, $R_S = 1.0\text{k } \Omega$, $f = 1.0\text{ kHz}$	NF	--	4.0	dB
Delay time	$V_{CC} = -3.0\text{V}$, $V_{BE} = 0.5\text{V}$	t_d	--	35	nS
Rise time	$I_C = -10\text{mA}$, $I_{B1} = -1.0\text{mA}$	t_r	--	35	nS
Storage time	$V_{CC} = -3.0\text{V}$, $I_C = -10\text{mA}$	t_s	--	225	nS
Fall time	$I_{B1} = I_{B2} = -1.0\text{mA}$	t_f	--	75	nS

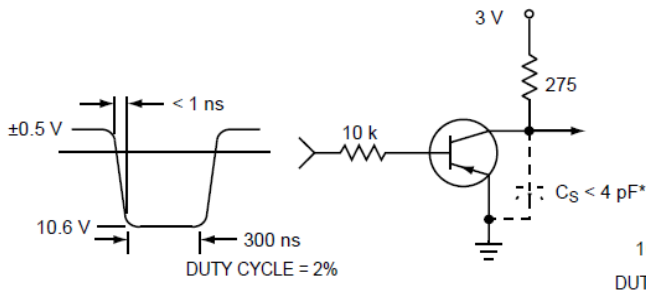


Figure 1. Delay and Rise Time
Equivalent Test Circuit

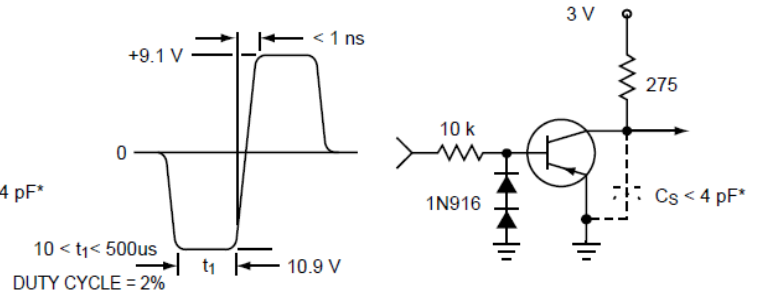


Figure 2. Storage and Fall Time
Equivalent Test Circuit

* Total shunt capacitance of test jig and connectors

RATINGS AND CHARACTERISTIC CURVES

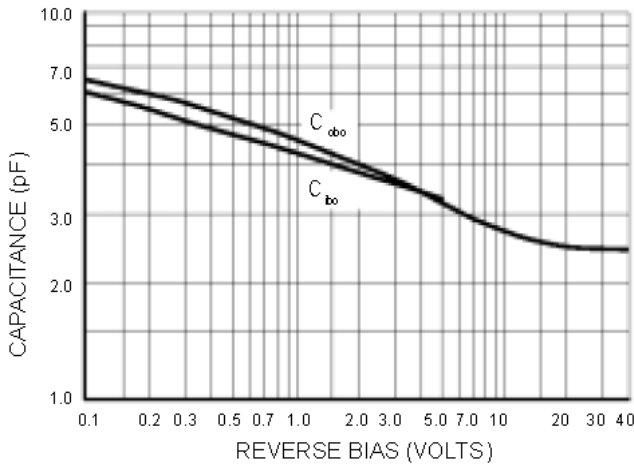


Figure 3. Capacitance

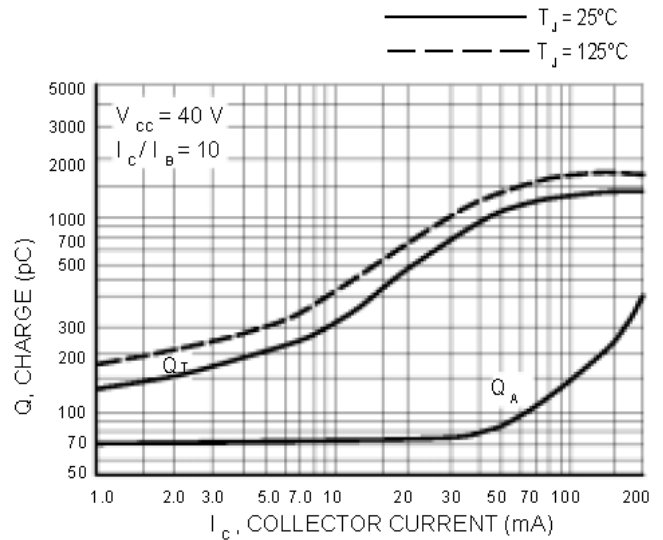


Figure 4. Charge Data

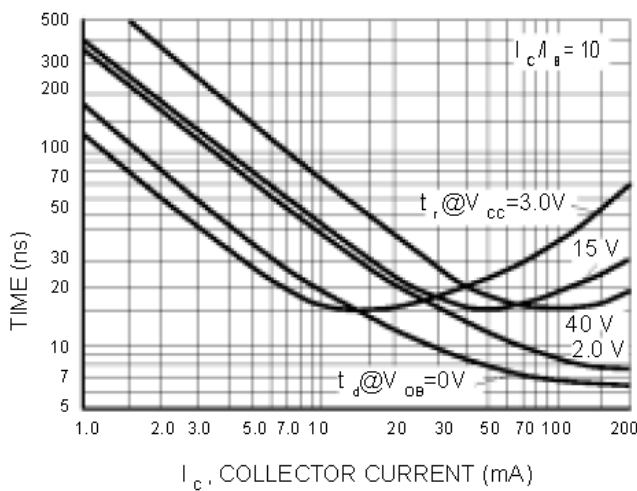


Figure 5. Turn-On Time

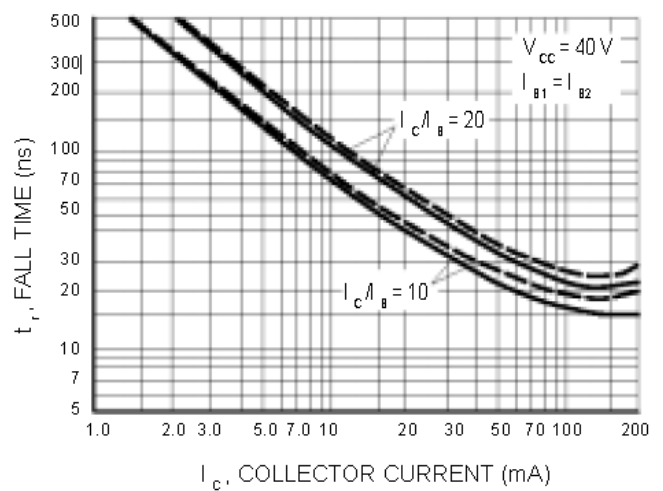


Figure 6. Fall Time

RATINGS AND CHARACTERISTIC CURVES

TYPICAL AUDIO SMALL-SIGNAL CHARACTERISTICS

NOISE FIGURE VARIATIONS

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

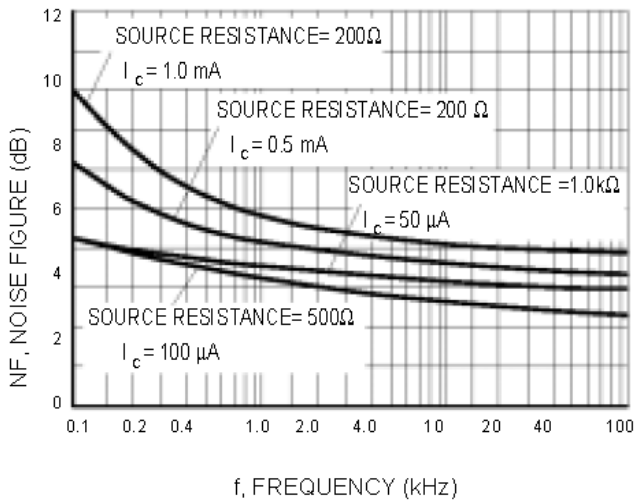


Figure 7. Noise Figure

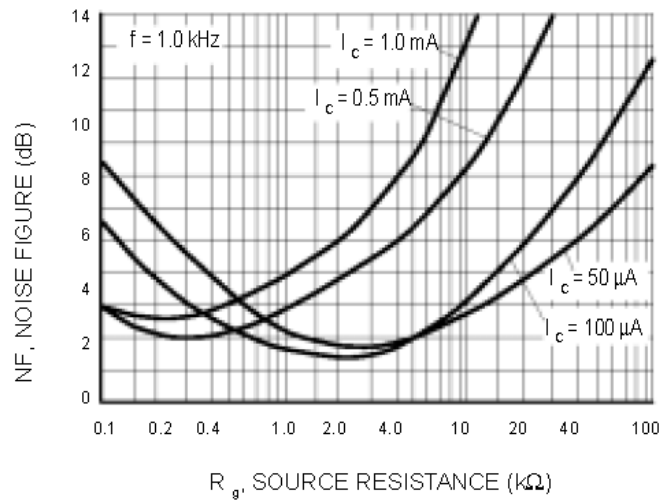


Figure 8. Noise Figure

h PARAMETERS

($V_{CE} = 10\text{ V}$, $f = 1.0\text{ kHz}$, $T_A = 25^\circ\text{C}$)

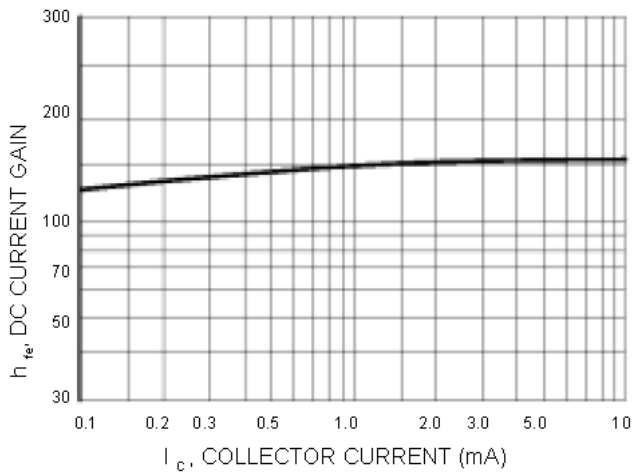


Figure 9. Current Gain

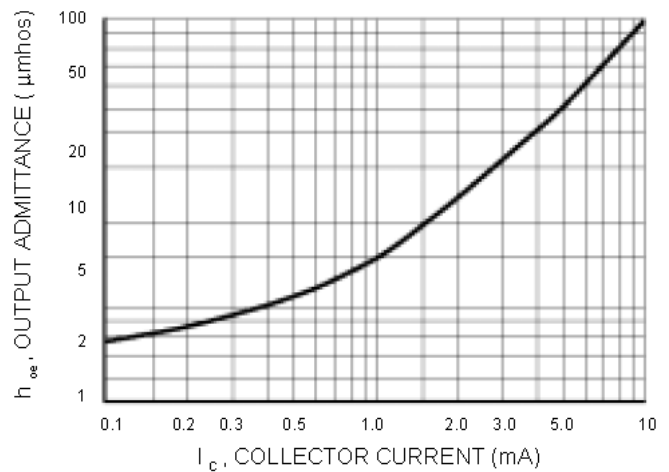


Figure 10. Output Admittance

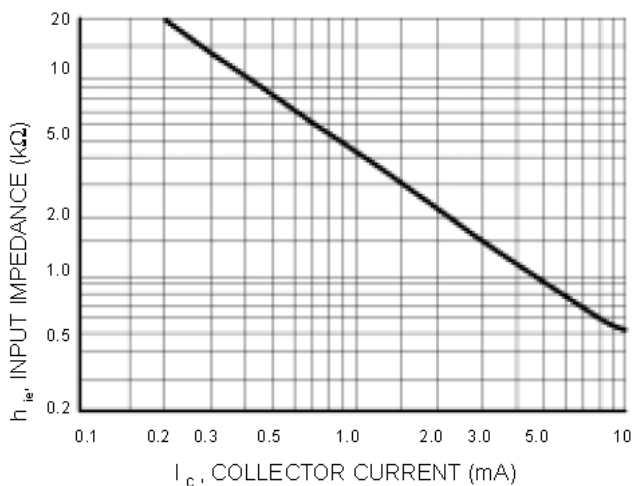


Figure 11. Input Impedance

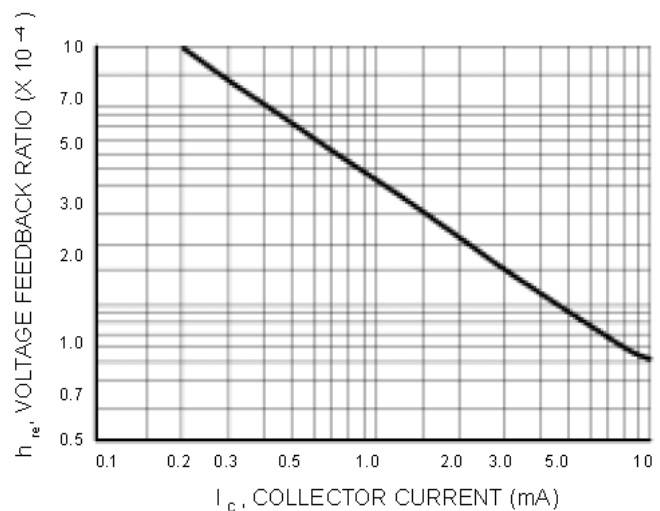


Figure 12. Voltage Feedback Ratio

RATINGS AND CHARACTERISTIC CURVES

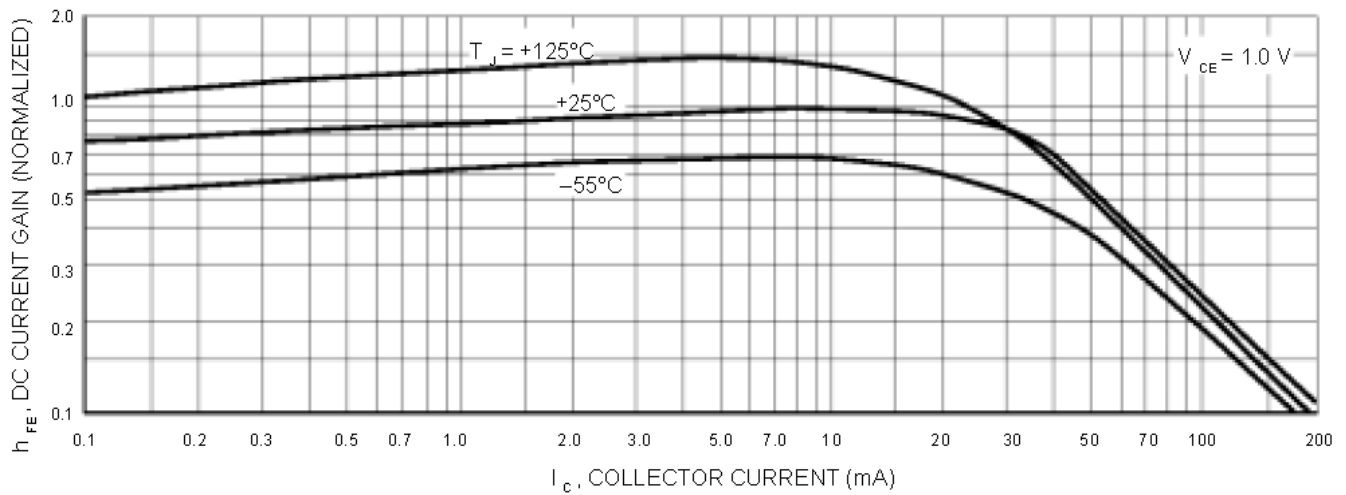


Figure 13. DC Current Gain

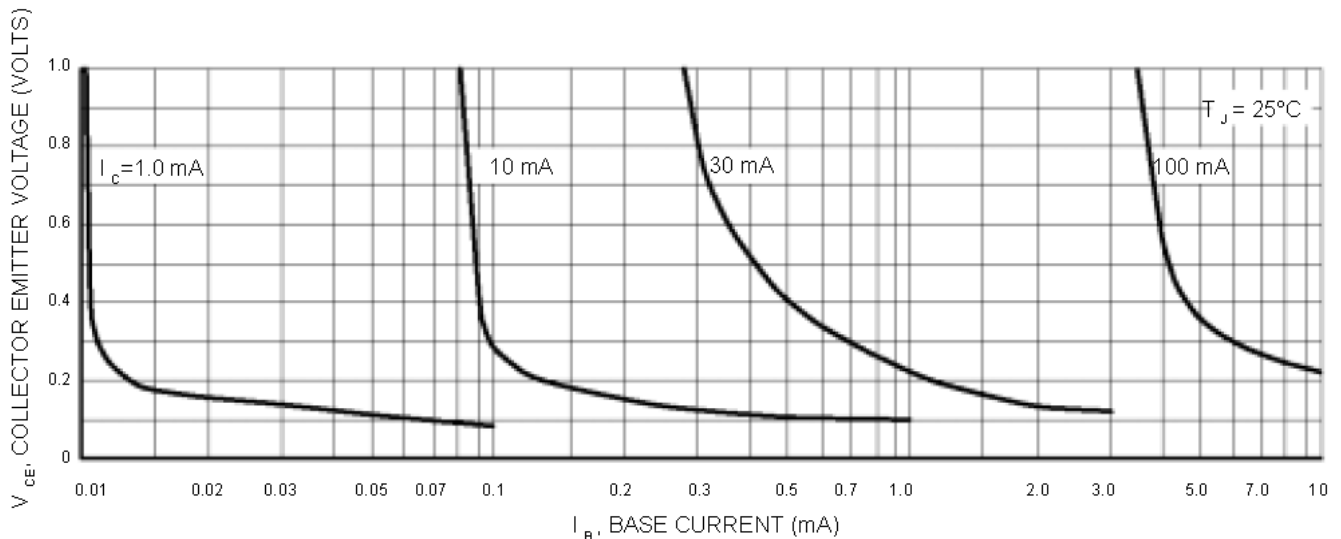


Figure 14. Collector Saturation Region

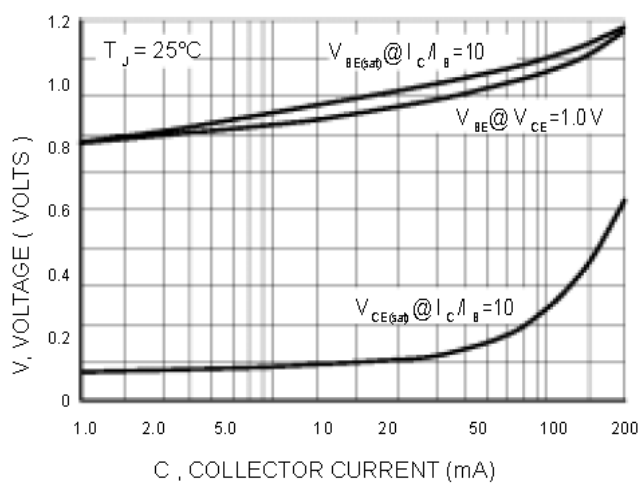


Figure 15. "ON" Voltages

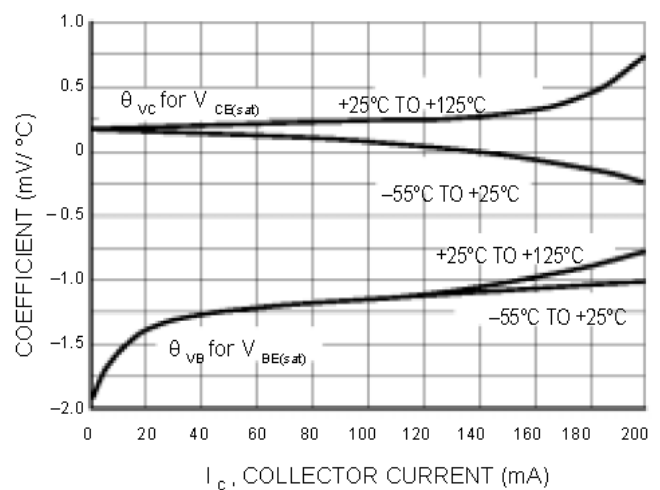


Figure 16. Temperature Coefficients