NST3904DXV6T1, NST3904DXV6T5

Dual General Purpose Transistor

The NST3904DXV6T1 device is a spin−off of our popular SOT−23/SOT−323 three−leaded device. It is designed for general purpose amplifier applications and is housed in the SOT−563 six−leaded surface mount package. By putting two discrete devices in one package, this device is ideal for low−power surface mount applications where board space is at a premium.

Features

- h_{FE}, 100−300
- Low $V_{CE(sat)}$, ≤ 0.4 V
- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- These are Pb−Free Devices

MAXIMUM RATINGS

Rating		Symbol	Value	Unit
Collector − Emitter Voltage		V_{CEO}	40	Vdc
Collector − Base Voltage		V_{CBO}	60	Vdc
Emitter − Base Voltage		V_{EBO}	6.0	Vdc
Collector Current − Continuous		I_C	200	mAdc
Electrostatic Discharge	HBM MM	ESD	>16000 >2000	V

THERMAL CHARACTERISTICS

Characteristic (One Junction Heated)	Symbol	Max	Unit
Total Device Dissipation T_A = 25°C Derate above 25°C (Note 1)	P_D	357 2.9	mW mW/°C
Thermal Resistance Junction-to-Ambient (Note 1)	$R_{\theta JA}$	350	°C/W
Characteristic (Both Junctions Heated)	**Symbol**	**Max**	**Unit**
Total Device Dissipation T_A = 25°C Derate above 25°C (Note 1)	P_D	500 4.0	mW mW/°C
Thermal Resistance, Junction-to-Ambient (Note 1)	$R_{\theta JA}$	250	°C/W
Junction and Storage Temperature Range	T_J, T_{stg}	−55 to +150	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. FR−4 @ Minimum Pad

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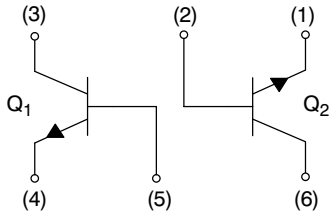
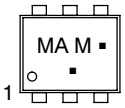


NST3904DXV6T1

SOT−563
CASE 463A
PLASTIC

MARKING DIAGRAM



MA = Device Code
M = Date Code
▪ = Pb−Free Package
(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping†
NST3904DXV6T1	SOT−563*	4000/Tape & Reel
NST3904DXV6T1G	SOT−563*	4000/Tape & Reel
NST3904DXV6T5	SOT−563*	8000/Tape & Reel
NST3904DXV6T5G	SOT−563*	8000/Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*This package is inherently Pb−Free.

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector – Emitter Breakdown Voltage (Note 2) (I_C = 1.0 mAdc, I_B = 0)	$V_{(BR)CEO}$	40	–	Vdc
Collector – Base Breakdown Voltage (I_C = 10 μAdc, I_E = 0)	$V_{(BR)CBO}$	60	–	Vdc
Emitter – Base Breakdown Voltage (I_E = 10 μAdc, I_C = 0)	$V_{(BR)EBO}$	6.0	–	Vdc
Base Cutoff Current (V_{CE} = 30 Vdc, V_{EB} = 3.0 Vdc)	I_{BL}	–	50	nAdc
Collector Cutoff Current (V_{CE} = 30 Vdc, V_{EB} = 3.0 Vdc)	I_{CEX}	–	50	nAdc
ON CHARACTERISTICS (Note 2)				
DC Current Gain (I_C = 0.1 mAdc, V_{CE} = 1.0 Vdc) (I_C = 1.0 mAdc, V_{CE} = 1.0 Vdc) (I_C = 10 mAdc, V_{CE} = 1.0 Vdc) (I_C = 50 mAdc, V_{CE} = 1.0 Vdc) (I_C = 100 mAdc, V_{CE} = 1.0 Vdc)	h_{FE}	 40 70 100 60 30	 – – 300 – –	–
Collector – Emitter Saturation Voltage (I_C = 10 mAdc, I_B = 1.0 mAdc) (I_C = 50 mAdc, I_B = 5.0 mAdc)	$V_{CE(sat)}$	 – –	 0.2 0.3	Vdc
Base – Emitter Saturation Voltage (I_C = 10 mAdc, I_B = 1.0 mAdc) (I_C = 50 mAdc, I_B = 5.0 mAdc)	$V_{BE(sat)}$	 0.65 –	 0.85 0.95	Vdc
SMALL–SIGNAL CHARACTERISTICS				
Current – Gain – Bandwidth Product (I_C = 10 mAdc, V_{CE} = 20 Vdc, f = 100 MHz)	f_T	300	–	MHz
Output Capacitance (V_{CB} = 5.0 Vdc, I_E = 0, f = 1.0 MHz)	C_{obo}	–	4.0	pF
Input Capacitance (V_{EB} = 0.5 Vdc, I_C = 0, f = 1.0 MHz)	C_{ibo}	–	8.0	pF
Input Impedance (V_{CE} = 10 Vdc, I_C = 1.0 mAdc, f = 1.0 kHz)	h_{ie}	1.0 2.0	10 12	k Ω
Voltage Feedback Ratio (V_{CE} = 10 Vdc, I_C = 1.0 mAdc, f = 1.0 kHz)	h_{re}	0.5 0.1	8.0 10	X 10^{-4}
Small – Signal Current Gain (V_{CE} = 10 Vdc, I_C = 1.0 mAdc, f = 1.0 kHz)	h_{fe}	100 100	400 400	–
Output Admittance (V_{CE} = 10 Vdc, I_C = 1.0 mAdc, f = 1.0 kHz)	h_{oe}	1.0 3.0	40 60	μmhos
Noise Figure (V_{CE} = 5.0 Vdc, I_C = 100 μAdc, R_S = 1.0 k Ω, f = 1.0 kHz)	NF	– –	5.0 4.0	dB
SWITCHING CHARACTERISTICS				
Delay Time	(V_{CC} = 3.0 Vdc, V_{BE} = –0.5 Vdc)	t_d	–	35	ns
Rise Time	(I_C = 10 mAdc, I_{B1} = 1.0 mAdc)	t_r	–	35	
Storage Time	(V_{CC} = 3.0 Vdc, I_C = 10 mAdc)	t_s	–	200	ns
Fall Time	(I_{B1} = I_{B2} = 1.0 mAdc)	t_f	–	50	

2. Pulse Test: Pulse Width ≤ 300 μs; Duty Cycle ≤ 2.0%.

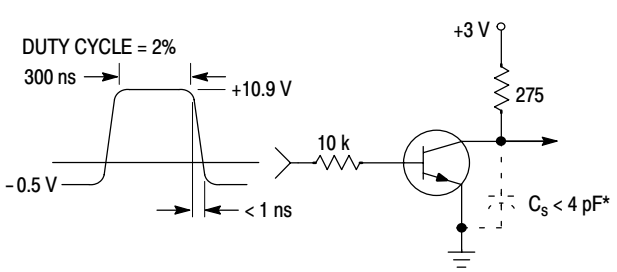
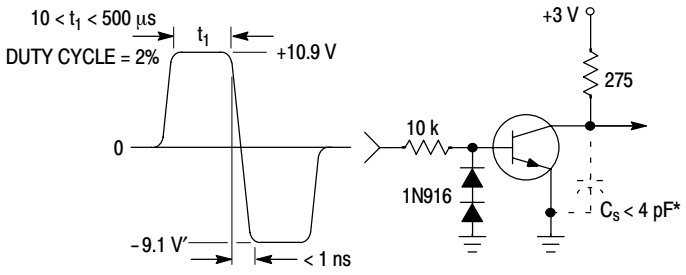


Figure 1. Delay and Rise Time Equivalent Test Circuit



* Total shunt capacitance of test jig and connectors

Figure 2. Storage and Fall Time Equivalent Test Circuit

TYPICAL TRANSIENT CHARACTERISTICS

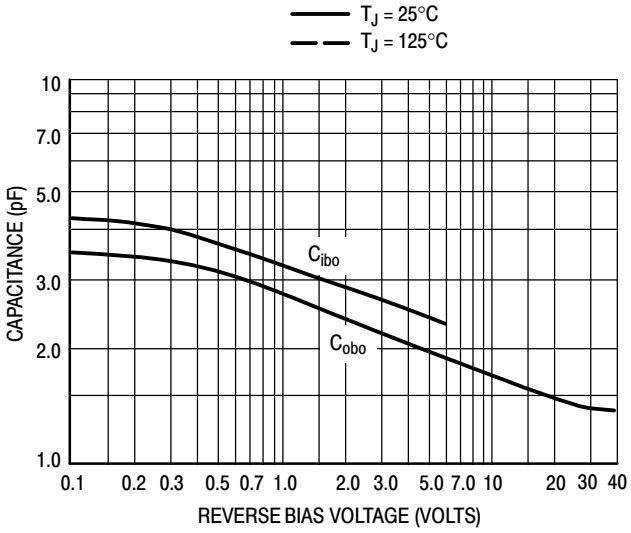


Figure 3. Capacitance

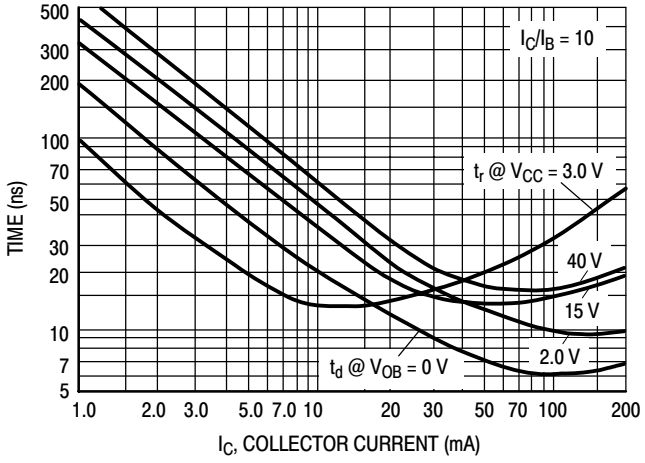


Figure 4. Turn−On Time

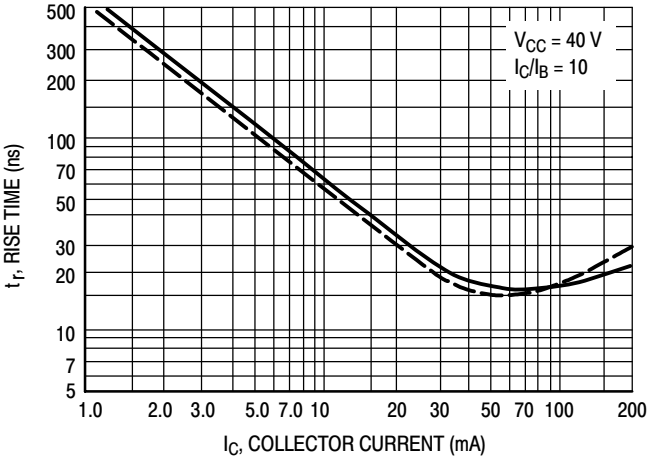


Figure 5. Rise Time

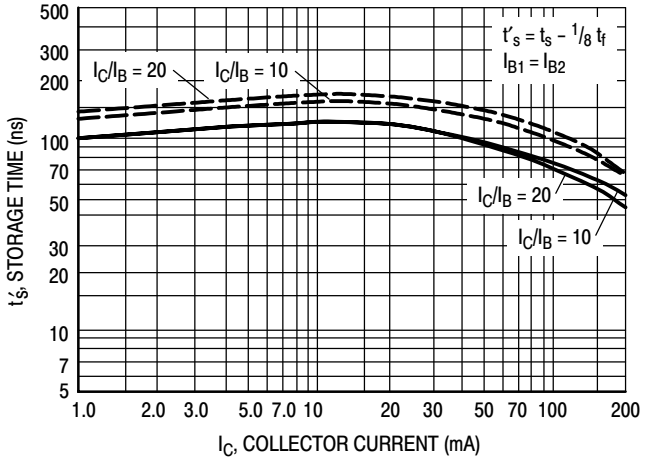


Figure 6. Storage Time

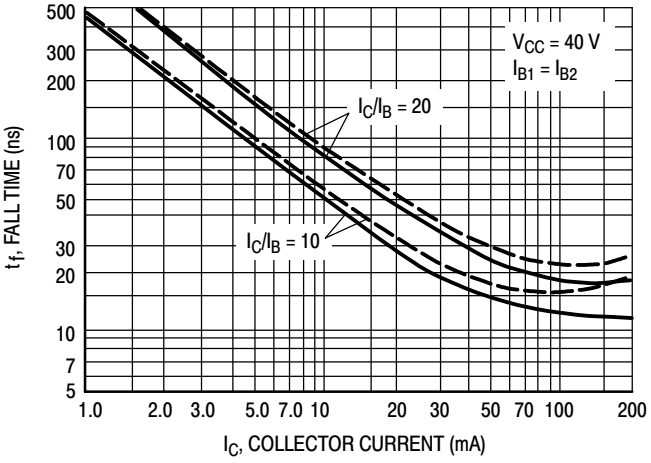


Figure 7. Fall Time

TYPICAL AUDIO SMALL−SIGNAL CHARACTERISTICS
NOISE FIGURE VARIATIONS

(V_{CE} = 5.0 Vdc, T_A = 25°C, Bandwidth = 1.0 Hz)

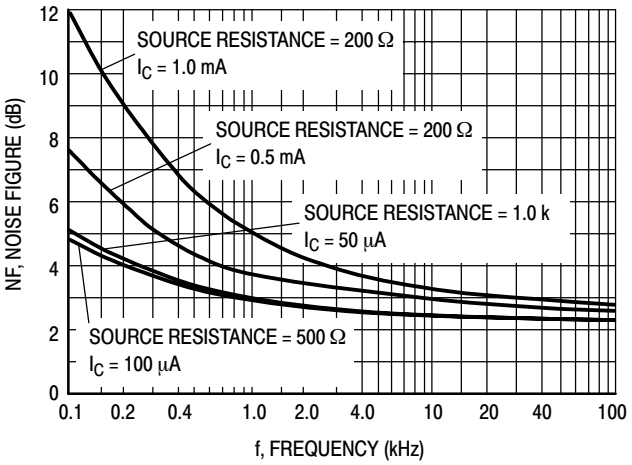


Figure 8. Noise Figure

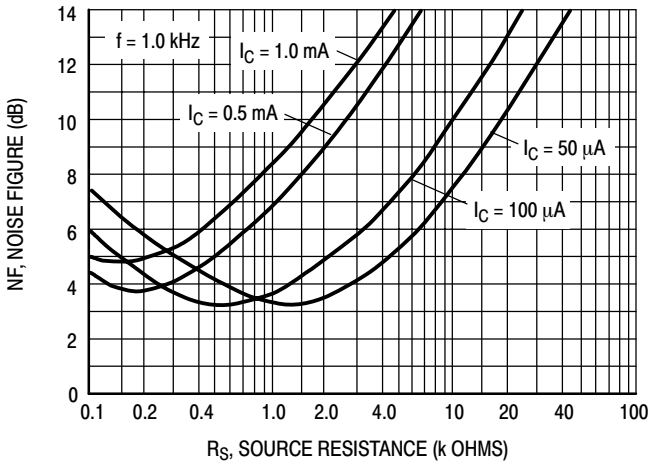


Figure 9. Noise Figure

h PARAMETERS

(V_{CE} = 10 Vdc, f = 1.0 kHz, T_A = 25°C)

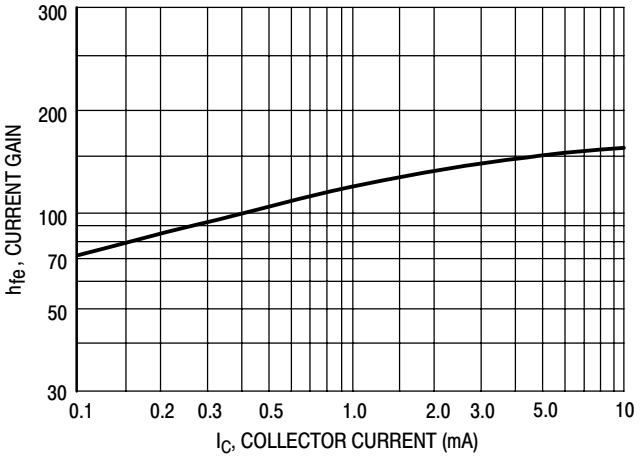


Figure 10. Current Gain

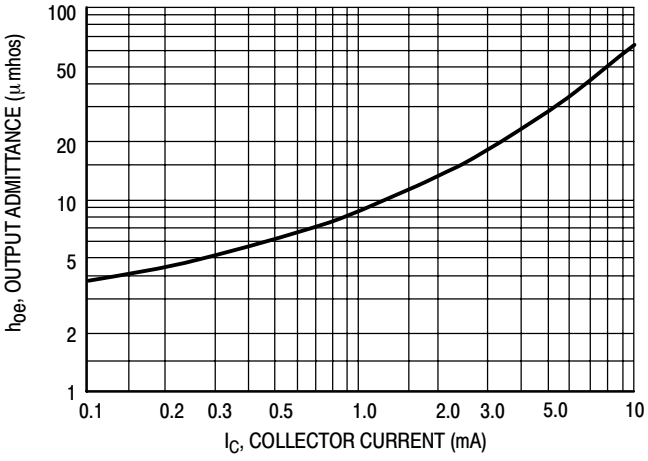


Figure 11. Output Admittance

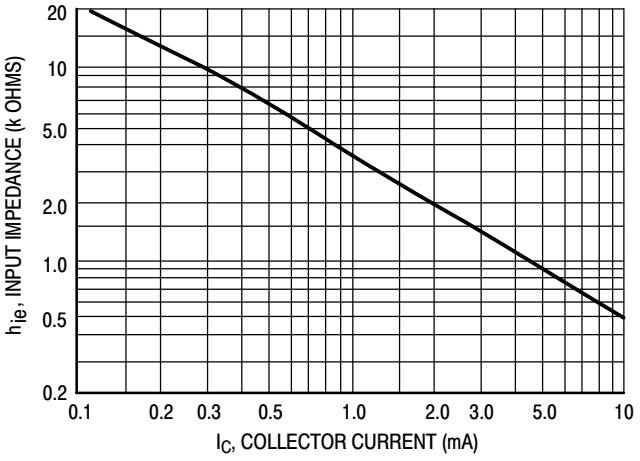


Figure 12. Input Impedance

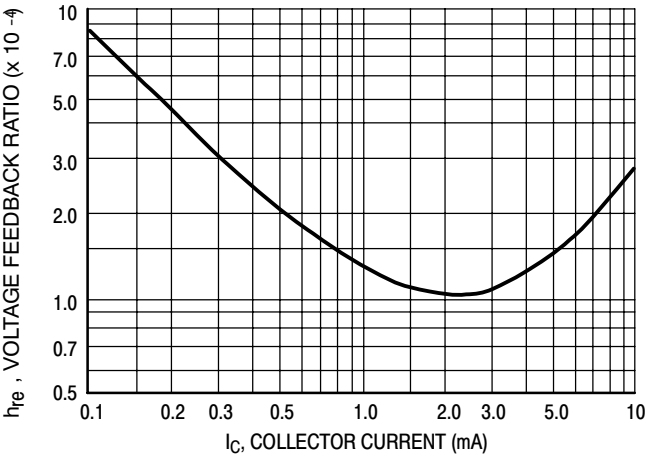


Figure 13. Voltage Feedback Ratio

TYPICAL STATIC CHARACTERISTICS

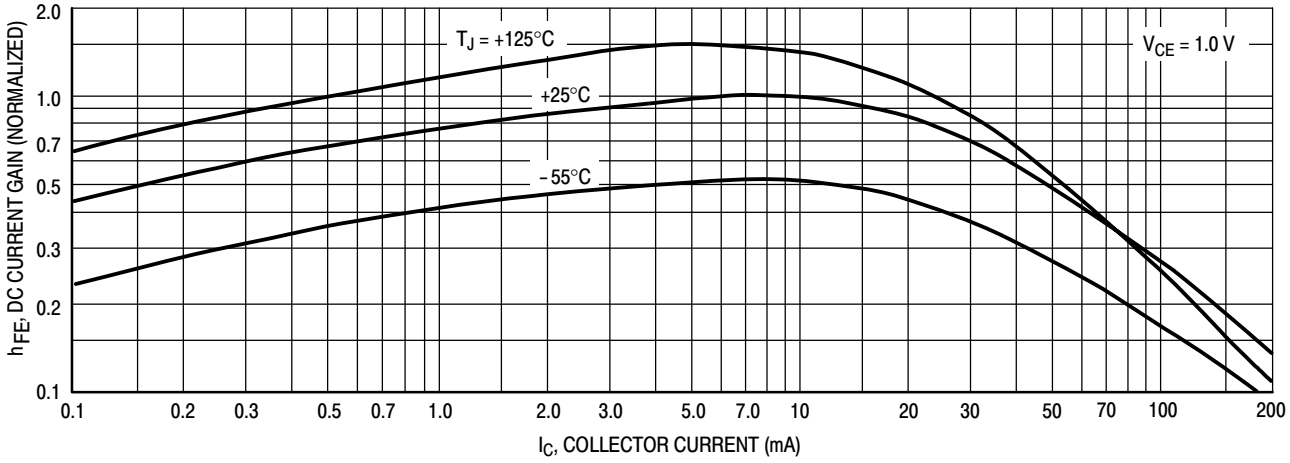


Figure 14. DC Current Gain

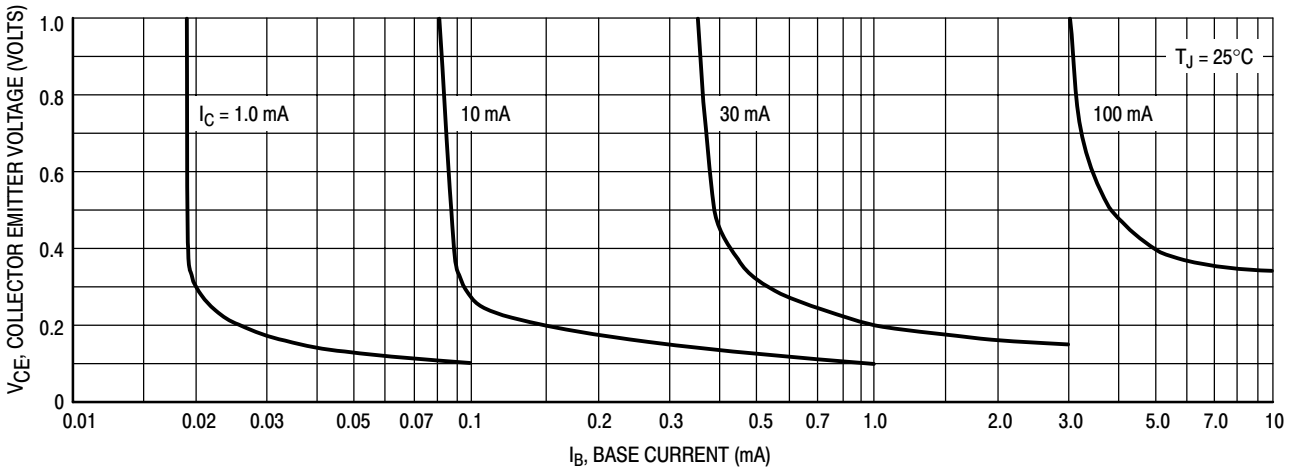


Figure 15. Collector Saturation Region

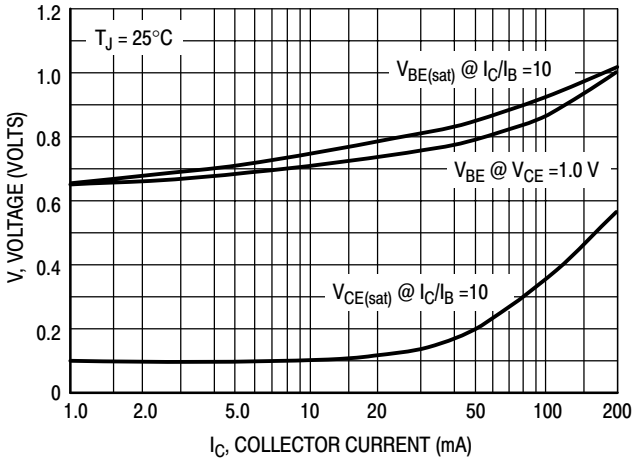


Figure 16. “ON” Voltages

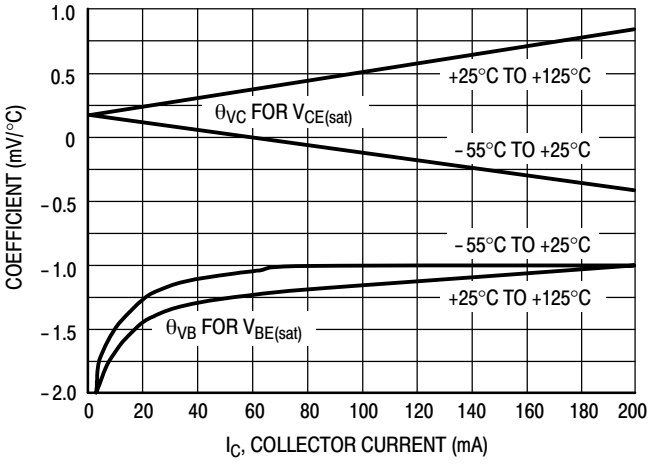
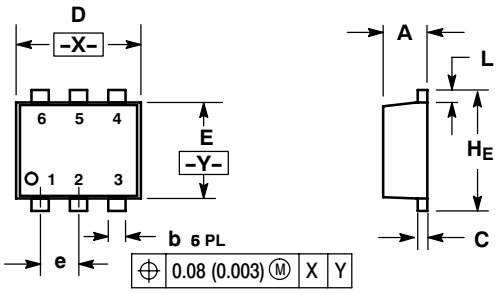


Figure 17. Temperature Coefficients

PACKAGE DIMENSIONS

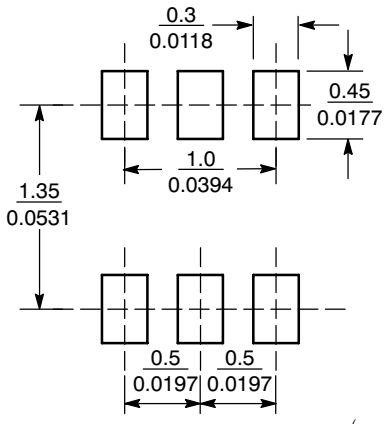
SOT−563, 6 LEAD
CASE 463A−01
ISSUE F



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	0.50	0.55	0.60	0.020	0.021	0.023
b	0.17	0.22	0.27	0.007	0.009	0.011
C	0.08	0.12	0.18	0.003	0.005	0.007
D	1.50	1.60	1.70	0.059	0.062	0.066
E	1.10	1.20	1.30	0.043	0.047	0.051
e	0.5 BSC			0.02 BSC		
L	0.10	0.20	0.30	0.004	0.008	0.012
H_E	1.50	1.60	1.70	0.059	0.062	0.066

SOLDERING FOOTPRINT*



*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PUBLICATION ORDERING INFORMATION

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