

# 2N3498 thru 2N3501 (SILICON)



**CASE 31**  
(TO-5)



NPN silicon annular transistors for high-voltage switching and low-power amplifier applications.

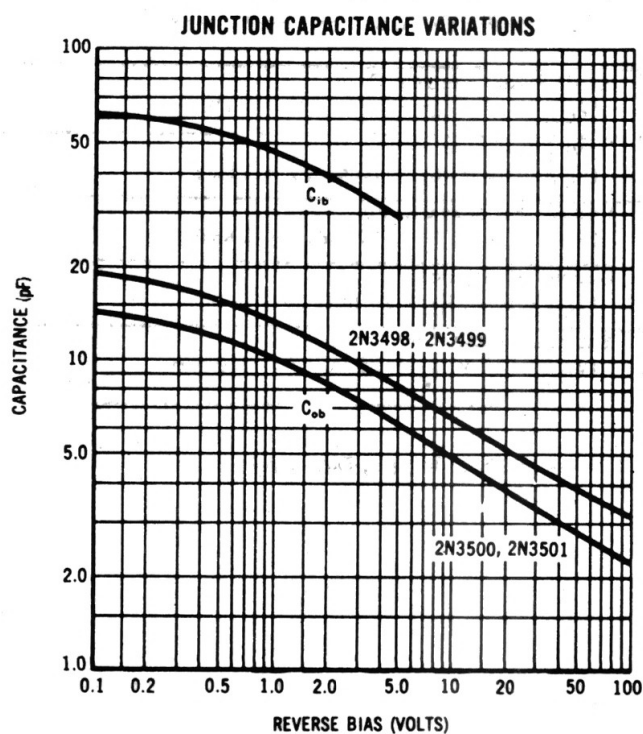
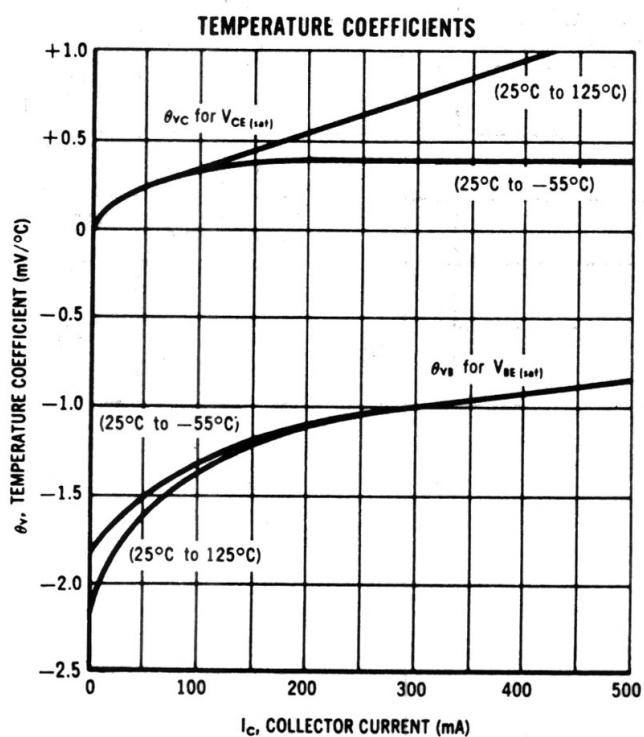
Collector connected to case

## MAXIMUM RATINGS

Rating	Symbol	2N3498 2N3499	2N3500 2N3501	Unit
Collector-Emitter Voltage	$V_{CEO}$	100	150	Vdc
Collector-Base Voltage	$V_{CB}$	100	150	Vdc
Emitter-Base Voltage	$V_{EB}$	6.0		Vdc
Collector Current	$I_C$	500	300	mAdc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	1.0		Watt
		5.71		mW/ $^\circ\text{C}$
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	5.0		Watts
		28.6		mW/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-65 to +200		$^\circ\text{C}$

## THERMAL CHARACTERISTICS

Characteristic	Symbol	2N3498 2N3499	2N3500 2N3501	Unit
Thermal Resistance, Junction to Case	$\theta_{JC}$	35		$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction to Ambient	$\theta_{JA}$	0.175		$^\circ\text{C}/\text{mW}$





2N3498 thru 2N3501 (continued)

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ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
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OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage* (I <sub>C</sub> = 10 mA, I <sub>B</sub> = 0)	2N3498, 2N3499 2N3500, 2N3501	BV <sub>CEO</sub> *	100 150	-	Vdc
Collector-Base Breakdown Voltage (I <sub>C</sub> = 10 μA, I <sub>E</sub> = 0)	2N3498, 2N3499 2N3500, 2N3501	BV <sub>CBO</sub>	100 150	-	Vdc
Emitter-Base Breakdown Voltage (I <sub>E</sub> = 10 μA, I <sub>C</sub> = 0)		BV <sub>EBO</sub>	6.0	-	Vdc
Collector Cutoff Current (V <sub>CB</sub> = 50 Vdc, I <sub>E</sub> = 0)	2N3498, 2N3499	I <sub>CBO</sub>	-	0.050	μA
(V <sub>CB</sub> = 50 Vdc, I <sub>E</sub> = 0, T <sub>A</sub> = 150°C)	2N3498, 2N3499		-	50	
(V <sub>CB</sub> = 75 Vdc, I <sub>E</sub> = 0)	2N3500, 2N3501		-	0.050	
(V <sub>CB</sub> = 75 Vdc, I <sub>E</sub> = 0, T <sub>A</sub> = 150°C)	2N3500, 2N3501		-	50	
Emitter Cutoff Current (V <sub>EB</sub> = 4.0 Vdc, I <sub>C</sub> = 0)		I <sub>EBO</sub>	-	25	nA

ON CHARACTERISTICS

DC Current Gain* (I <sub>C</sub> = 0.1 mA, V <sub>CE</sub> = 10 Vdc)	2N3498, 2N3500 2N3499, 2N3501	h <sub>FE</sub> *	20 35	-	-
(I <sub>C</sub> = 1.0 mA, V <sub>CE</sub> = 10 Vdc)	2N3498, 2N3500 2N3499, 2N3501		25 50	-	
(I <sub>C</sub> = 10 mA, V <sub>CE</sub> = 10 Vdc)	2N3498, 2N3500 2N3499, 2N3501		35 75	-	
(I <sub>C</sub> = 150 mA, V <sub>CE</sub> = 10 Vdc)	2N3498, 2N3500 2N3499, 2N3501		40 100	120 300	
(I <sub>C</sub> = 300 mA, V <sub>CE</sub> = 10 Vdc)	2N3500 2N3501		15 20	-	
(I <sub>C</sub> = 500 mA, V <sub>CE</sub> = 10 Vdc)	2N3498 2N3499		15 20	-	
Collector-Emitter Saturation Voltage* (I <sub>C</sub> = 10 mA, I <sub>B</sub> = 1.0 mA)		V <sub>CE(sat)</sub> *	-	0.2	Vdc
(I <sub>C</sub> = 50 mA, I <sub>B</sub> = 5.0 mA)			-	0.25	
(I <sub>C</sub> = 150 mA, I <sub>B</sub> = 15 mA)	2N3500, 2N3501		-	0.4	
(I <sub>C</sub> = 300 mA, I <sub>B</sub> = 30 mA)	2N3498, 2N3499		-	0.6	
Base-Emitter Saturation Voltage* (I <sub>C</sub> = 10 mA, I <sub>B</sub> = 1.0 mA)		V <sub>BE(sat)</sub> *	-	0.8	Vdc
(I <sub>C</sub> = 50 mA, I <sub>B</sub> = 5.0 mA)			-	0.9	
(I <sub>C</sub> = 150 mA, I <sub>B</sub> = 15 mA)	2N3500, 2N3501		-	1.2	
(I <sub>C</sub> = 300 mA, I <sub>B</sub> = 30 mA)	2N3498, 2N3499		-	1.4	

\* Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.



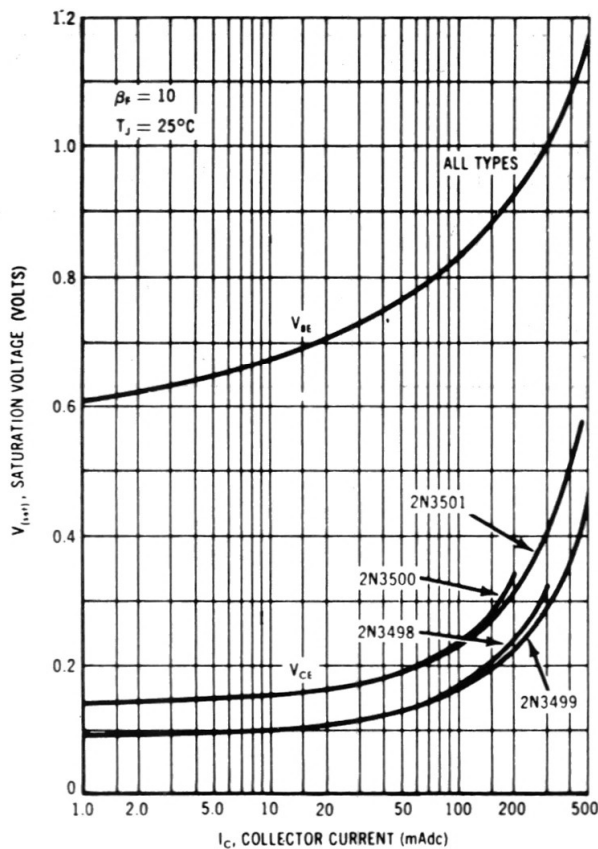
2N3498 thru 2N3501 (continued)

ELECTRICAL CHARACTERISTICS (continued)

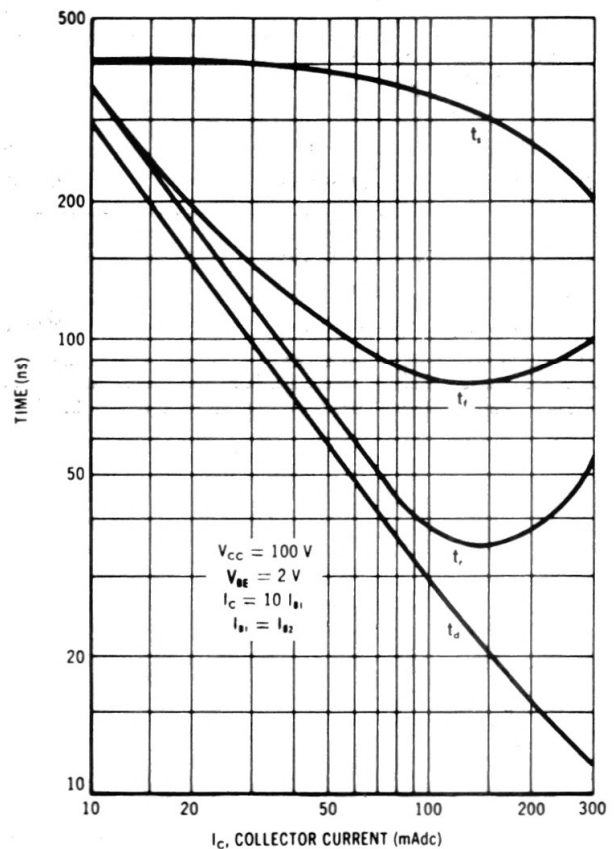
Characteristic	Symbol	Min	Max	Unit
<b>SMALL-SIGNAL CHARACTERISTICS</b>				
Current-Gain-Bandwidth Product ( $I_C = 20 \text{ mA dc}$ , $V_{CE} = 20 \text{ V dc}$ , $f = 100 \text{ MHz}$ )	$f_T$	150	-	MHz
Output Capacitance ( $V_{CB} = 10 \text{ V dc}$ , $I_E = 0$ , $f = 100 \text{ kHz}$ )	$C_{ob}$	-	10 8.0	pF
Input Capacitance ( $V_{BE} = 0.5 \text{ V dc}$ , $I_C = 0$ , $f = 100 \text{ kHz}$ )	$C_{ib}$	-	80	pF
Input Impedance ( $I_C = 10 \text{ mA dc}$ , $V_{CE} = 10 \text{ V dc}$ , $f = 1.0 \text{ kHz}$ )	$h_{ie}$	0.2 0.25	1.0 1.25	k ohms
Voltage Feedback Ratio ( $I_C = 10 \text{ mA dc}$ , $V_{CE} = 10 \text{ V dc}$ , $f = 1.0 \text{ kHz}$ )	$h_{re}$	-	2.5 4.0	$\times 10^{-4}$
Small-Signal Current Gain ( $I_C = 10 \text{ mA dc}$ , $V_{CE} = 10 \text{ V dc}$ , $f = 1.0 \text{ kHz}$ )	$h_{fe}$	50 75	300 375	-
Output Admittance ( $I_C = 10 \text{ mA dc}$ , $V_{CE} = 10 \text{ V dc}$ , $f = 1.0 \text{ kHz}$ )	$h_{oe}$	10 20	100 200	$\mu\text{mhos}$
<b>SWITCHING CHARACTERISTICS</b>				
Typ				
Delay Time	( $V_{CC} = 100 \text{ V dc}$ , $V_{BE(off)} = 2.0 \text{ V dc}$ , $I_C = 150 \text{ mA dc}$ , $I_{B1} = 15 \text{ mA dc}$ )	$t_d$	20	ns
Rise Time		$t_r$	35	ns
Storage Time	( $V_{CC} = 100 \text{ V dc}$ , $I_C = 150 \text{ mA dc}$ , $I_{B1} = I_{B2} = 15 \text{ mA dc}$ )	$t_s$	300	ns
Fall Time		$t_f$	80	ns

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SATURATION VOLTAGES

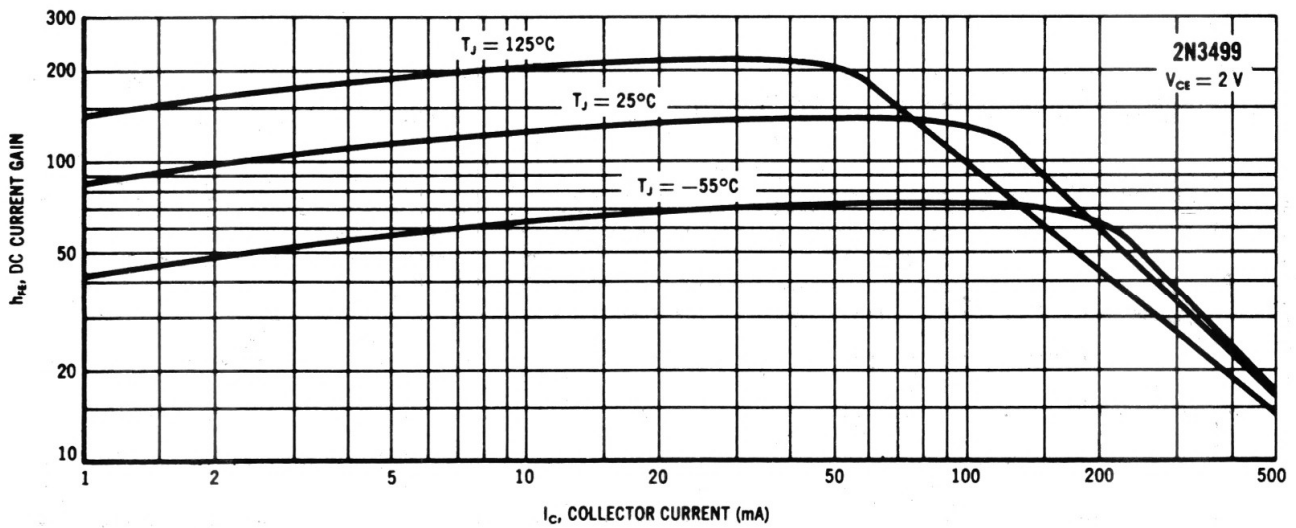
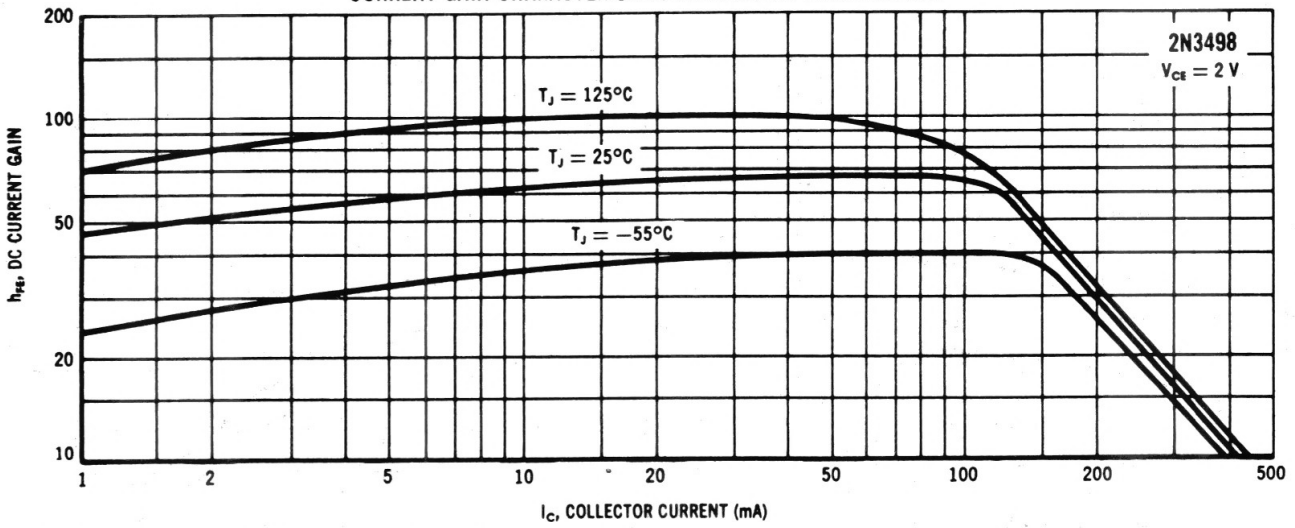


SWITCHING TIMES



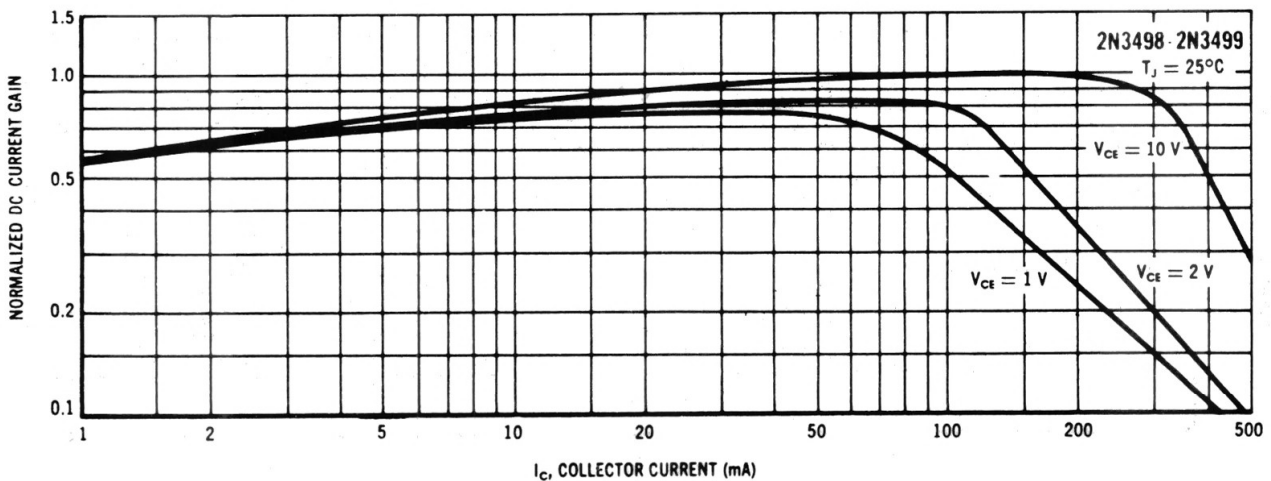


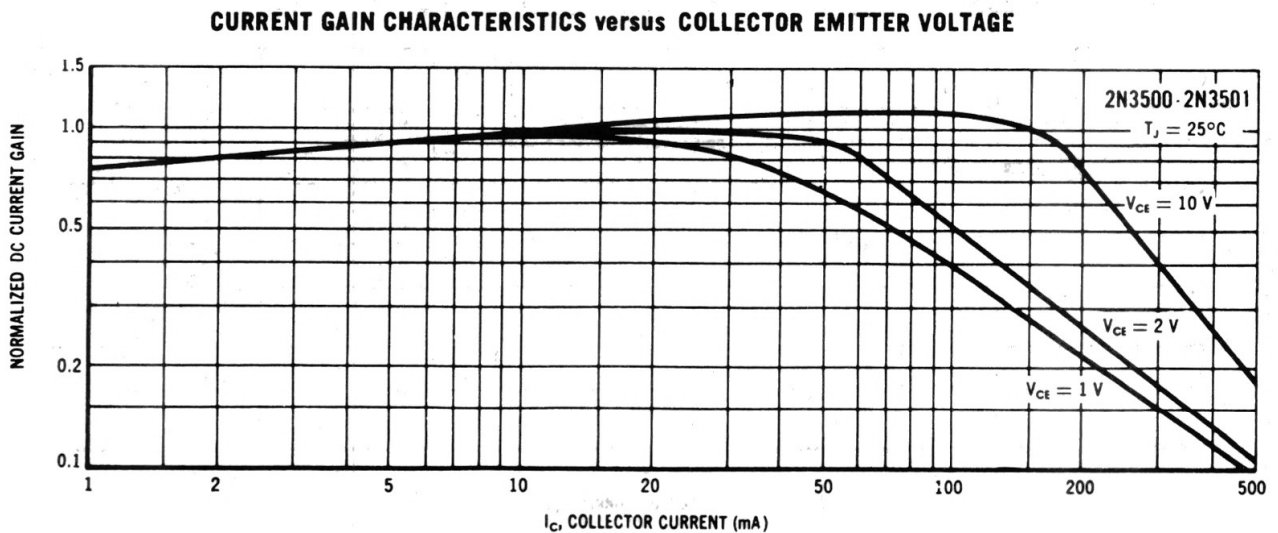
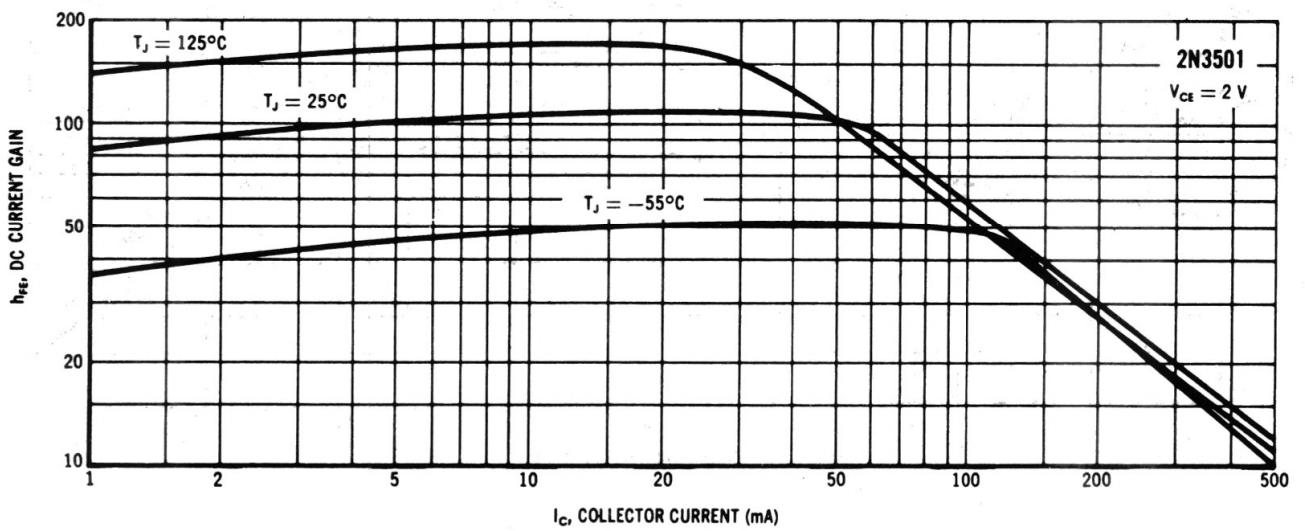
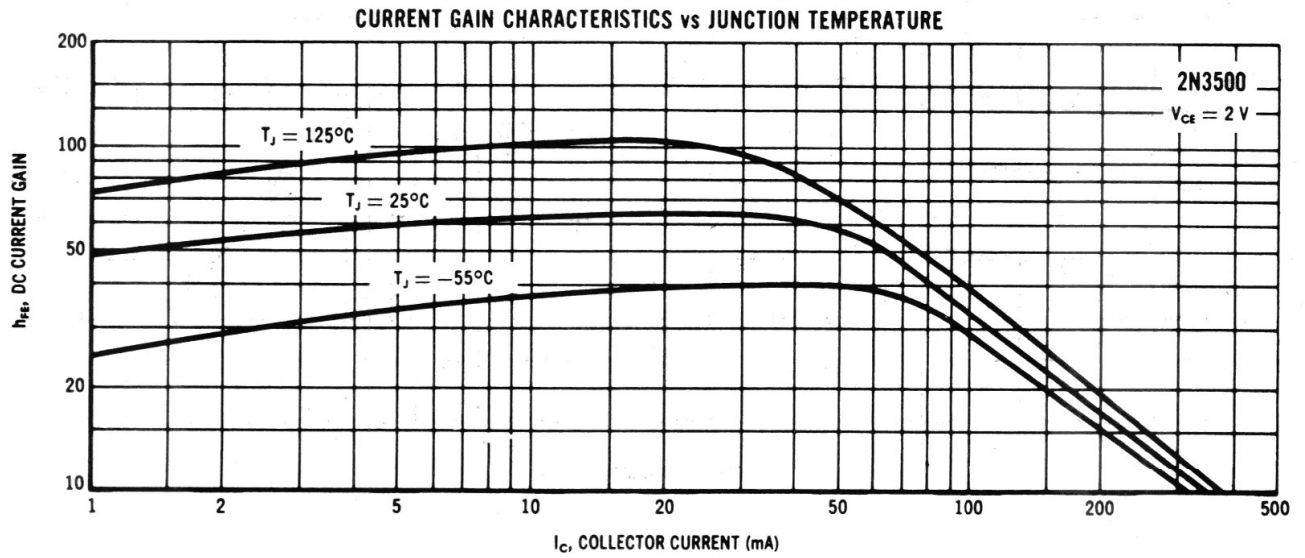
CURRENT GAIN CHARACTERISTICS vs JUNCTION TEMPERATURE



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CURRENT GAIN CHARACTERISTICS versus COLLECTOR EMITTER VOLTAGE





**2N3498 thru 2N3501 (continued)**
**SMALL SIGNAL h PARAMETER CHARACTERISTICS**
 $V_{CE} = 10 \text{ Vdc}$ ,  $f = 1.0 \text{ kHz}$ ,  $T_A = 25^\circ\text{C}$ 
