

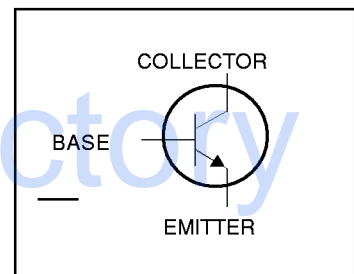
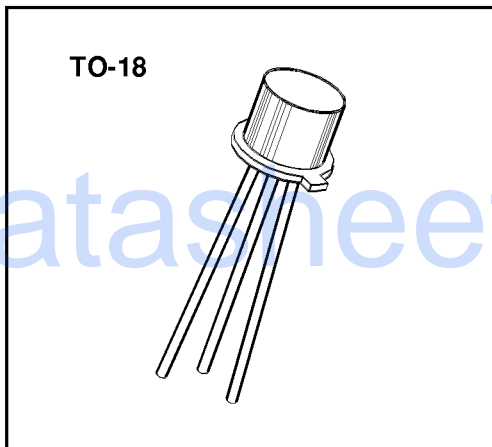
**2N2222A**

## Features

- Meets MIL 19500 /255
- Collector - Base Voltage 75 V
- Collector - Current 800 mA
- High Speed, Medium Current Bipolar Transistor

**SWITCHING  
 TRANSISTOR  
 JAN, JANTX, JANTXV**

**SMALL SIGNAL  
 BIPOLAR  
 NPN SILICON**



### Maximum Ratings

RATING	SYMBOL	VALUE	UNIT
Collector - Emitter Voltage	$V_{CEO}$	50	Vdc
Collector - Base Voltage	$V_{CBO}$	75	Vdc
Emitter - Base Voltage	$V_{EBO}$	6	Vdc
Collector Current -- Continuous	$I_C$	800	mAdc
Total Device Dissipation @ $T_A = 25\text{ C}$	$P_D$	500	mW
Derate above 25 C		2.85	mW/ C
Total Device Dissipation @ $T_C = 25\text{ C}$	$P_D$	1.8	WATTS
Derate above 25 C		10.3	mW/ C
Operating Junction&Storage Temperature Range	$T_J, T_{stg}$	- 65 to + 200	C

### Thermal Characteristics

CHARACTERISTIC	SYMBOL	MAX	UNIT
Thermal Resistance, Junction to Ambient	$R_{qJA}$	350	C/W

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

OFF CHARACTERISTIC	SYMBOL	MIN	MAX	UNIT
Collector - Emitter Breakdown Voltage (1) ( $I_C = 10\text{ mA dc}, I_B = 0$ )	$V(BR)_{CEO}$	50		Vdc
Collector - Base Breakdown Voltage (1) ( $I_C = 10\text{ mAdc}, I_E = 0$ )	$V(BR)_{CBO}$	75		Vdc
Emitter - Base Breakdown Voltage (1) ( $I_E = 10\text{ mAdc}, I_C = 0$ )	$V(BR)_{EBO}$	6		Vdc
Collector - Emitter Cutoff Current ( $V_{CE} = 50\text{ Vdc}, V_{BE(off)} = 0\text{ V}$ )	$I_{CES}$		50	nAdc
Collector - Base Cutoff Current ( $V_{CB} = 60\text{ Vdc}, I_E = 0$ )	$I_{CBO}$		10	nAdc
( $V_{CB} = 60\text{ Vdc}, I_E = 0, T_A = 150\text{ C}$ )			10	mAdc
Emitter - Base Cutoff Current ( $V_{EB} = 4\text{ Vdc}$ )	$I_{EBO}$		10	nAdc

ON CHARACTERISTIC	SYMBOL	MIN	MAX	UNIT
DC Current Gain ( $I_C = 100\text{ mA dc}, V_{CE} = 10\text{ Vdc}$ )	$h_{FE}$	50		
( $I_C = 1\text{ mA dc}, V_{CE} = 10\text{ Vdc}$ )		75	325	
( $I_C = 10\text{ mA dc}, V_{CE} = 10\text{ Vdc}$ )		100		
( $I_C = 150\text{ mA dc}, V_{CE} = 10\text{ Vdc}$ ) (1)		100	300	
( $I_C = 500\text{ mA dc}, V_{CE} = 10\text{ Vdc}$ ) (1)		30		
( $I_C = 10\text{ mA dc}, V_{CE} = 10\text{ Vdc}, T_J = -55\text{ C}$ )		35		
Collector - Emitter Saturation Voltage ( $I_C = 150\text{ mAdc}, I_B = 15\text{ mAdc}$ ) (1)	$V_{CE(sat)}$		0.3	Vdc
( $I_C = 500\text{ mAdc}, I_B = 50\text{ mAdc}$ ) (1)			1.0	Vdc
Base - Emitter Saturation Voltage ( $I_C = 150\text{ mAdc}, I_B = 15\text{ mAdc}$ ) (1)	$V_{BE(sat)}$	0.6	1.2	Vdc
( $I_C = 500\text{ mAdc}, I_B = 50\text{ mAdc}$ ) (1)			2.0	Vdc

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

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

SMALL - SIGNAL CHARACTERISTICS	SYMBOL	MIN	MAX	UNIT
<b>Output Capacitance</b> ( $V_{CB} = 10\text{ Vdc}$ , $I_E = 0$ , 100kHz $\leq f \leq 1\text{ MHz}$ )	$C_{obo}$		8	pF
<b>Input Capacitance</b> ( $V_{EB} = 0.5\text{ Vdc}$ , $I_C = 0$ , 100kHz $\leq f \leq 1\text{ MHz}$ )	$C_{ibo}$		25	pF

SWITCHING CHARACTERISTICS	SYMBOL	MIN	MAX	UNIT
<b>Turn - On Time</b> ( $V_{CC} = 30\text{ Vdc}$ , $I_C = 150\text{ mAdc}$ , $I_{B1} = 15\text{ mAdc}$ ) ( See FIGURE 1 )	$t_{on}$		35	ns
<b>Turn - Off Time</b> ( $V_{CC} = 30\text{ Vdc}$ , $I_C = 150\text{ mAdc}$ , $I_{B1} = -I_{B2} = 15\text{ mAdc}$ ) ( See FIGURE 2 )	$t_{off}$		300	ns

Small-Signal AC Characteristics ( $T_A = 25^\circ\text{C}$ )

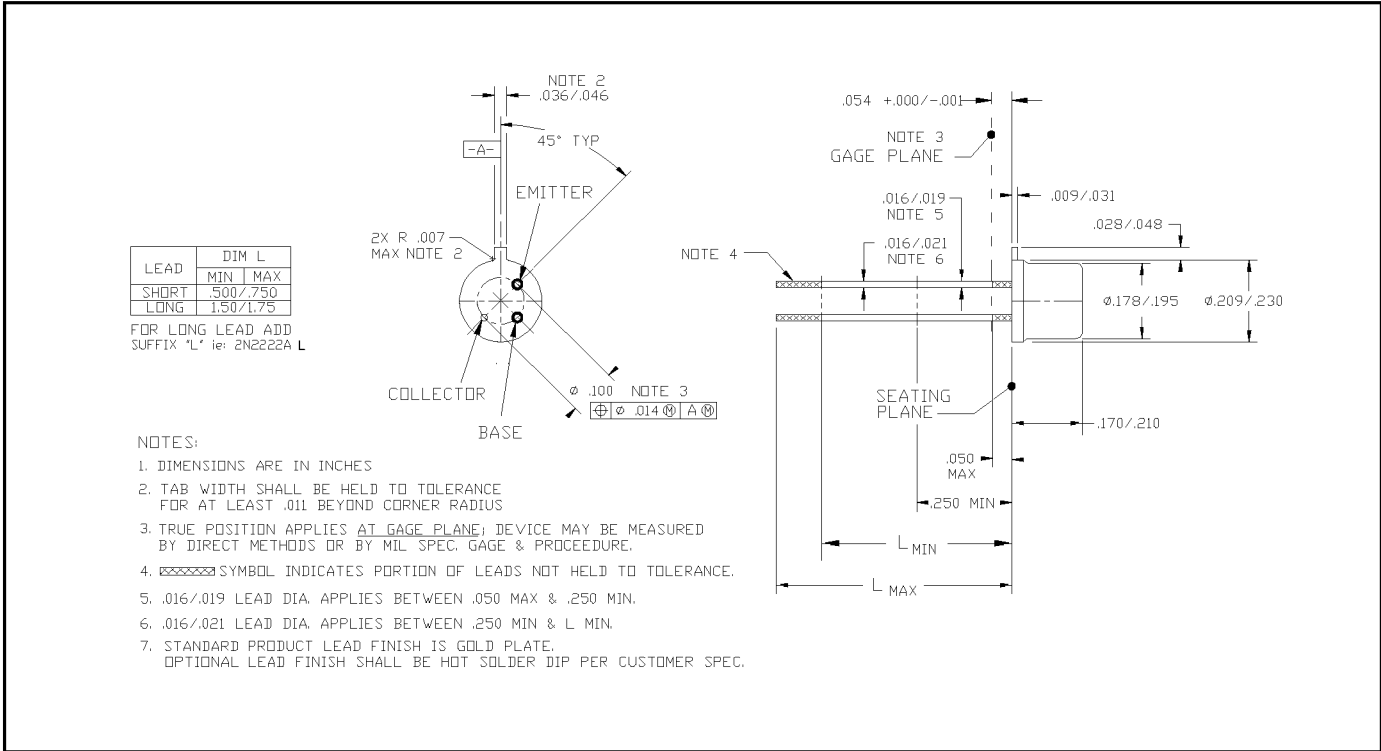
LOW FREQUENCY	SYMBOL	MIN	MAX	UNIT
<b>Common - Emitter Forward Current Transfer Ratio</b> ( $I_C = 1\text{ mA}$ , $V_{CE} = 10\text{ V}$ , $f = 1\text{ kHz}$ )	$h_{fe}$	50		
<b>HIGH FREQUENCY</b>				
<b>Common - Emitter Forward Current Transfer Ratio</b> ( $I_C = 20\text{ mA}$ , $V_{CE} = 20\text{ V}$ , $f = 100\text{ MHz}$ )	$ h_{fe} $	2.5		

Spice Model (based upon typical device characteristics) \*1

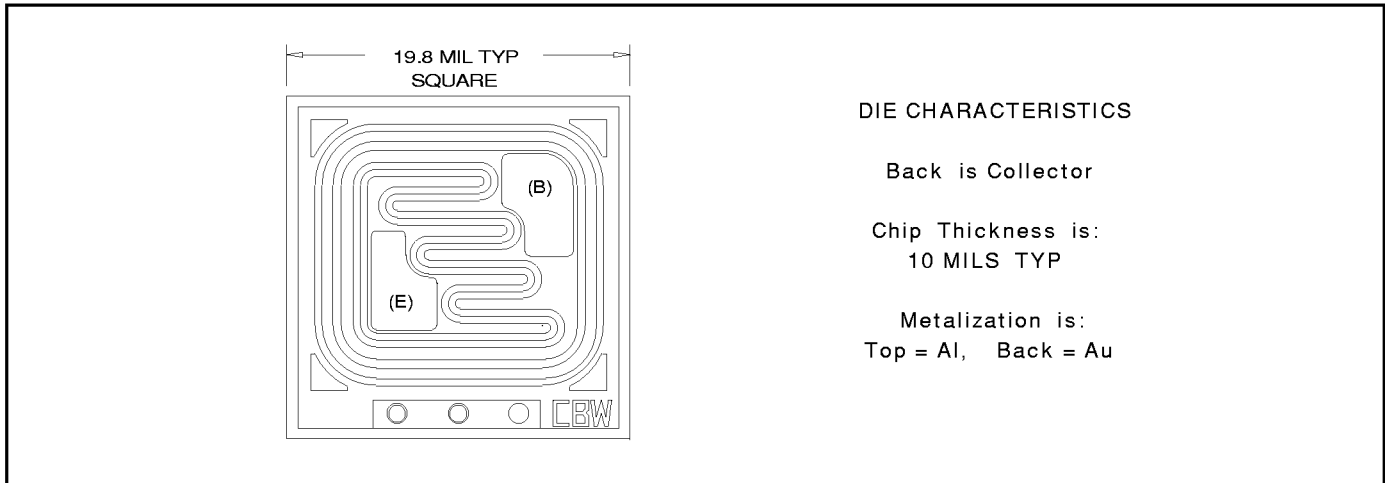
Q2N2222A NPN ( IS = 19.34n XT = 3.0 EG = 1.11 VAF=250.3 BF = 163.8 ISE =174.3f  
 + NE = 1.647 IKF = 3.0 NK = 0.3052 XTB = 1.5 BR = 11.49 ISC = 19.9f  
 + NC = 1.88 IKR = 10.75 RC = 0.3567 CJC = 11.02p VJC = 0.3869 MJC = 0.3292  
 + FC = 0.5 CJE = 29.31p VJE = 0.9036 MJE = 0.4101 TR = 38.32n TF =361.8p  
 + ITF = 5.282 XTF = 249.9 VTF=10 )

\*1. Microsemi Corp. claims no responsibility for misapplication of Spice Model information. Spice modeling should be used as a precursor guide to in-circuit performance. Actual performance is the responsibility of the user/designer.

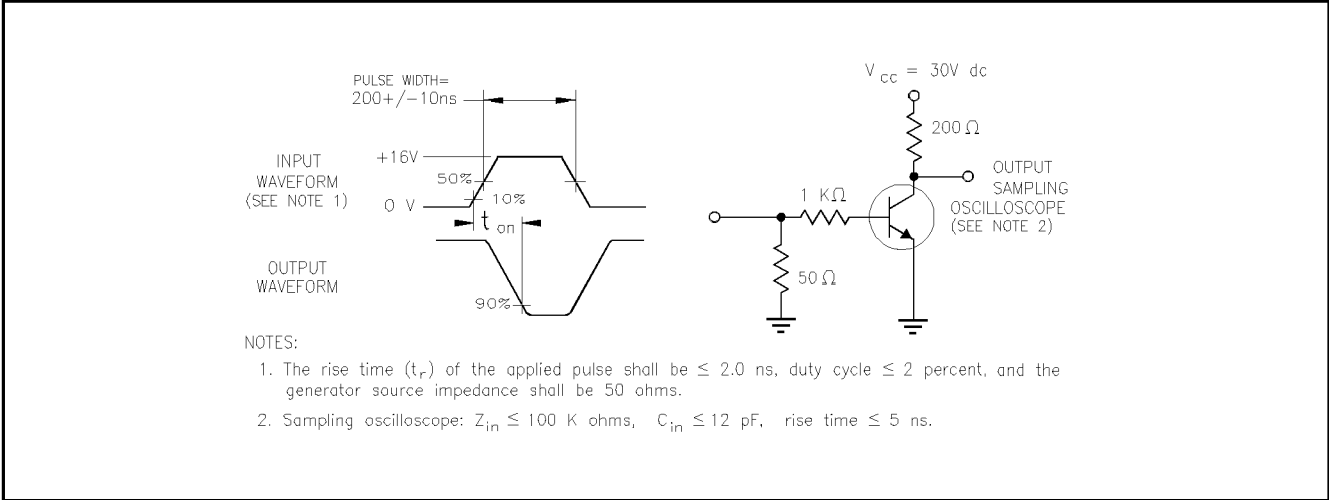
**2N2222A**



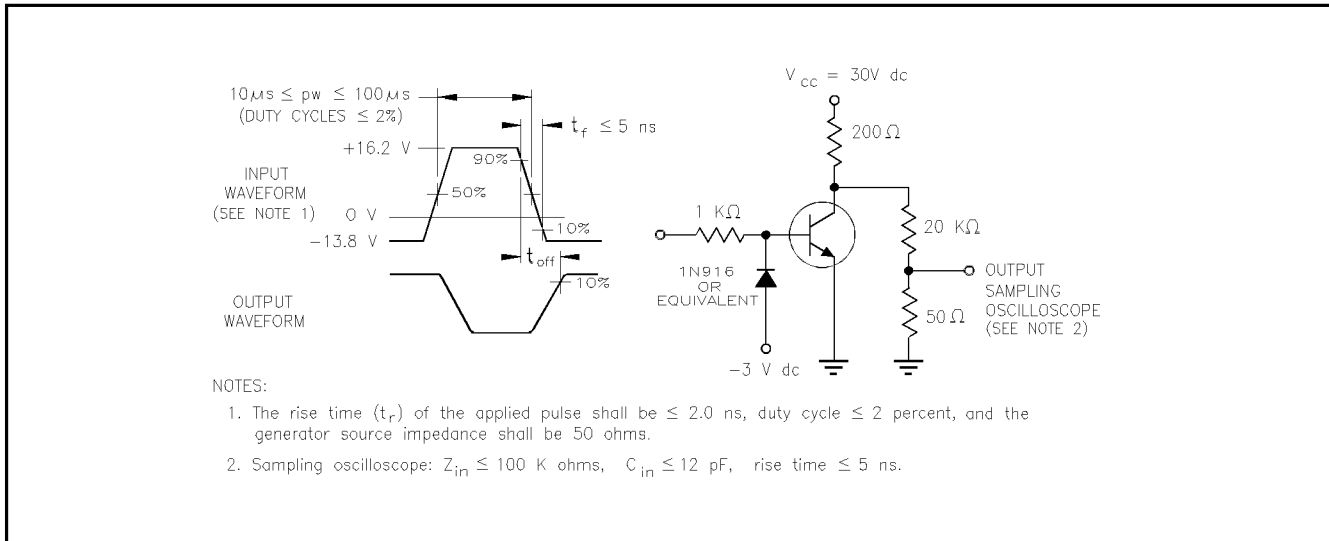
**TO 18 CASE OUTLINE**



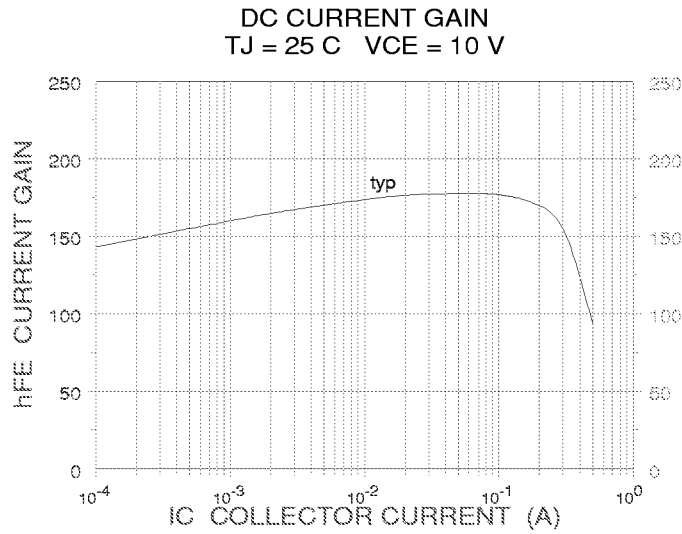
**DIE OUTLINE**



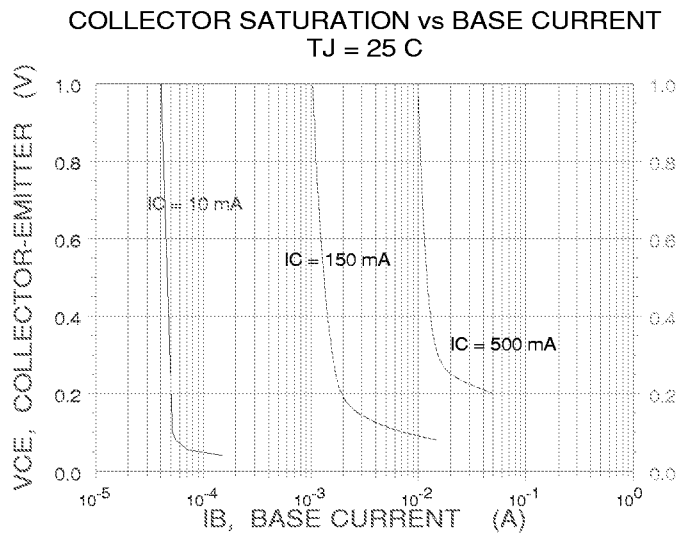
**FIGURE 1 Saturated Turn-on Time Test Circuit**



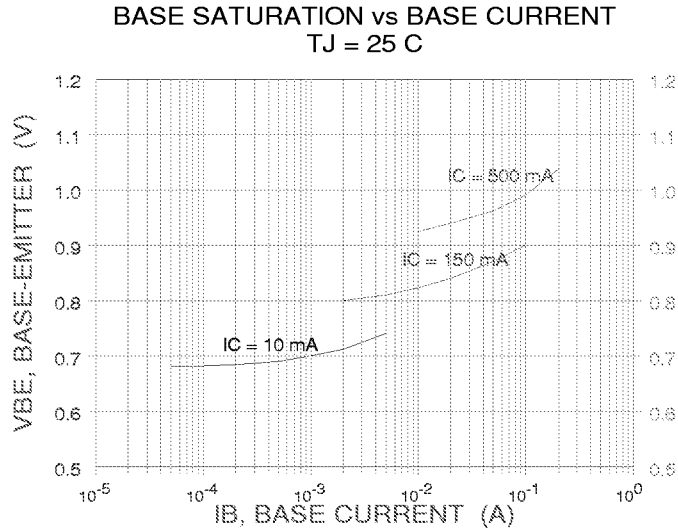
**FIGURE 2 Saturated Turn-off Time Test Circuit**



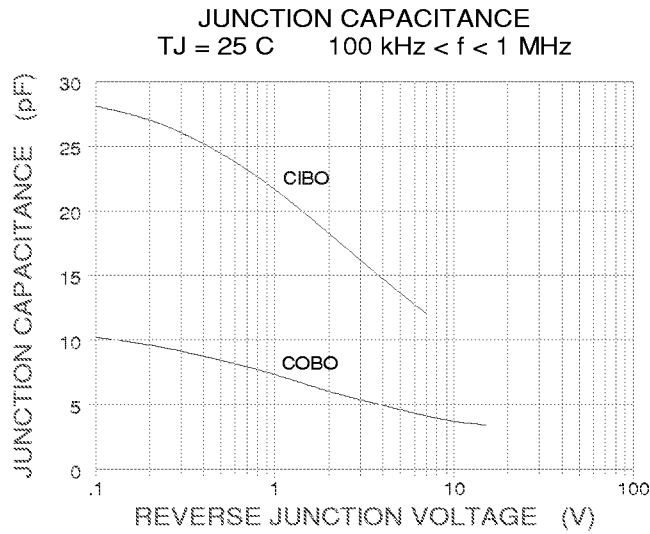
**FIGURE 3**



**FIGURE 4**



**FIGURE 5**



**FIGURE 6**

SMALL SIGNAL CURENT GAIN vs COLLECTOR CURRENT  
 T<sub>J</sub> = 25 C VCE = 10 V f = 1kHz

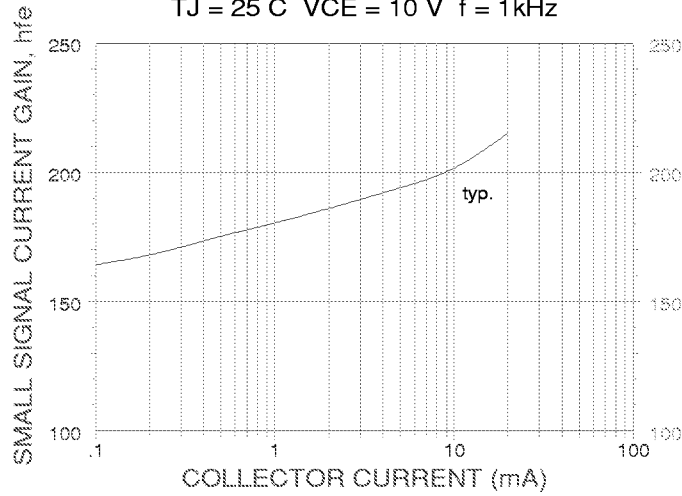


FIGURE 7

HIGH FREQUENCY GAIN  
 T<sub>J</sub> = 25 C VCE = 20 V f = 100 MHz

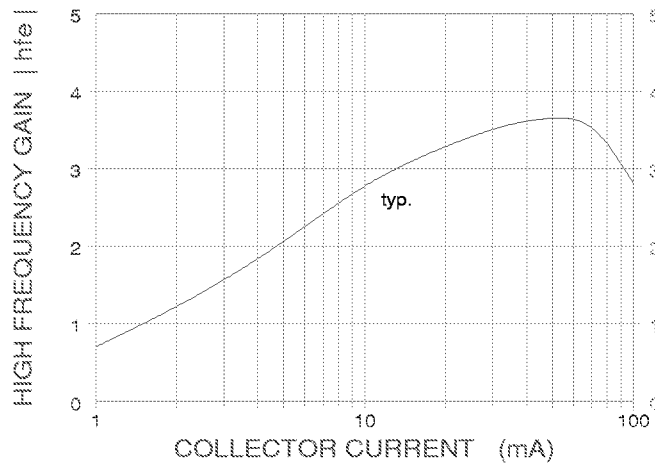


FIGURE 8



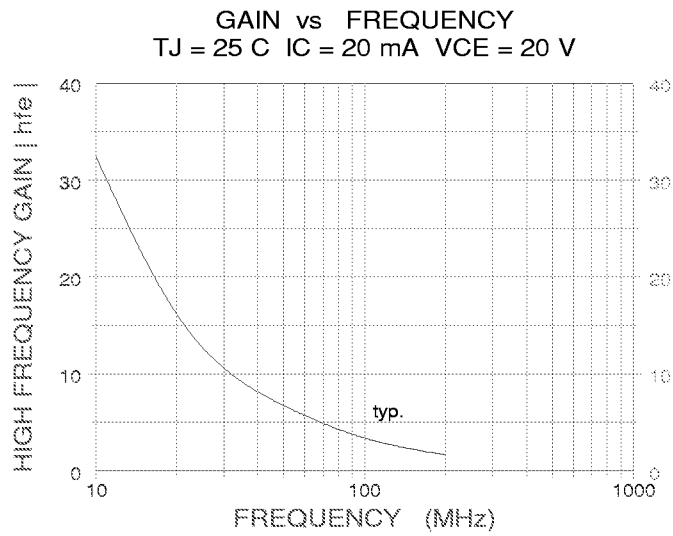


FIGURE 9