

MILITARY SPECIFICATION  
**CV 7490-91**

SEMICONDUCTOR DEVICE, TRANSISTOR

Description:- This specification covers the detailed requirements for NPN Silicon Planar Transistors which may be used in amplifying circuits at high frequencies and is in accordance with Specification K1007, Issue 3, except where otherwise stated.

Mechanical Dimensions and Outlines:- K1007, Section B 10.3.1., CV-A 10.3.2.2., 10.4.1., 10.4.2.2. (Note 1).  
 CV-B 10.3.2.4., 10.4.1., 10.4.2.4.

Connections:- Collector connected to case.  
 Lead 1. Emitter, Lead 2. Base, Lead 3. Collector.

Absolute Maximum Ratings:-

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RATING	V <sub>CB</sub>	V <sub>CE</sub>	V <sub>EB</sub>	I <sub>C</sub> mean	I <sub>C</sub> peak	I <sub>B</sub> mean	I <sub>B</sub> peak	I <sub>E</sub> mean	I <sub>E</sub> peak	P <sub>tot</sub>	T <sub>stg</sub>	T <sub>j</sub>	Shock	Vib.
Unit	V	V	V	mA	mA	mA	mA	mA	mA	W	°C	°C	g	g
Min	-	-	-	-	-	-	-	-	-	-	-55	-55	-	-
Max	40	24	3	100	200	100	200	100	200	0.6	+175	+175	1500	20
Note				A <sub>1</sub>	A <sub>2</sub>	A <sub>1</sub>	A <sub>2</sub>	A <sub>1</sub>	A <sub>2</sub>	B				

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RATING	V <sub>CB</sub>	V <sub>CE</sub>	V <sub>EB</sub>	I <sub>C</sub> mean	I <sub>C</sub> peak	I <sub>B</sub> mean	I <sub>B</sub> peak	I <sub>E</sub> mean	I <sub>E</sub> peak	P <sub>tot</sub>	T <sub>stg</sub>	T <sub>j</sub>	Shock	Vib.
Unit	V	V	V	mA	mA	mA	mA	mA	mA	W	°C	°C	g	g
Min	-	-	-	-	-	-	-	-	-	-	-55	-55	-	-
Max	40	24	3	100	200	100	200	100	200	0.3	+175	+175	1500	20
Note				A <sub>1</sub>	A <sub>2</sub>	A <sub>1</sub>	A <sub>2</sub>	A <sub>1</sub>	A <sub>2</sub>	B				

NOTE A1 Average over a period greater than 100µsecs. A2 For a period less than 100µs.  
B See derating curves.  
C Commercial equivalent CV-7490 BFY17; CV-7491 BFY18.

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## Primary Electrical Characteristics

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Characteristic	$I_{CBO}$	$V_{CE}$ (sat)	$V_{BE}$ (sat)	$h_{fe}$	$f_T$	$C_{cb}$	Noise Figure
Unit	nA	V	V		Mc/s	pF	dB
Min	-	-	-	40	200	-	-
Max	10	0.25	0.75	160	-	5.5	18
$T_{case}$ °C	25	25	25	25	25	25	25
$V_{CB}$ V	9	-	-	-	-	6	-
$V_{CE}$ V	-	-	-	9	9	-	4.5
$I_C$ mA	-	1	1	10	10	-	0.5
$I_B$ mA	-	0.1	0.1	-	-	-	-
$I_E$ mA	0	-	-	-	-	0	-
f Mc/s	-	-	-	$1 \times 10^{-3}$	100	1	$1 \times 10^{-3}$

Reliability Assurance Requirements: Under discussion

### Requirements:

Marking As K1007, Section B.1.3.4

### Quality Assurance Provisions

Destructive Tests The tests listed in Table 2, Group B Inspection, Sub-Group 2, 3 and 4 are considered destructive.

Group C Inspection This inspection shall be conducted on the initial lot, and thereafter every ninety days or every fifth lot, whichever occurs first.

Preparation for Delivery

Packaging      The device shall be packed according to  
K1007, Issue 3, Section A., 1.2.(c). AIS Size 6

Joint Service Catalogue Numbers

CV 7490 - 5960-99-037-3701  
CV 7491 - 5960-99-037-3702

This specification has been prepared by, and the Qualification Approval  
Authority is:-

Engineer-in-Chief  
'S' Branch  
Post Office, London.

**TABLE 1. GROUP A INSPECTION**

Examination or Test	Test Conditions		Insp. Level	Symbol	Limits		Units
	K1007/ NATO REF.	Specific Conditions			Min.	Max.	
<u>SUB GROUP 1</u> Visual and Mechanical Inspection	5-1	Excluding Physical Dimensions	I				
	7.2.5.1	$V_{CB} = 9V$ $I_E = 0$	II	$I_{CB01}$		10	nA
	7.2.5.1	$V_{CB} = 40V$ $I_E = 0$		$I_{CB02}$		1	$\mu A$
Collector-Base Cut-off current (2)	7.2.5.1	$V_{CE} = 9V$ $I_B = 0$		$I_{CE0(1)}$		50	nA
Collector Emitter Cut-off current (1)	7.2.5.2	$I_C = 10 mA$ $V_C = 9V$ $f = 100 Mc/s (min)$		$f_T$	200		Mc/s
Transition Frequency	7.4.8.	$V_{CB} = 6V$ $I_E = 0$ $f = 1 Mc/s$		$C_{ob}$		5.5	pF
Output Capacitance							
<u>SUB GROUP 3</u> Collector Emitter Saturation Voltage	7.3.3	$I_C = 1 mA$ $I_B = 0.1 mA$	I	$V_{CE(sat)}$		0.25	V

TABLE 1. GROUP A INSPECTION (Cont'd)

Examination or Test	Test Conditions		AQL %	Insp. Level	Symbol	Limits		Units
	K1007/ NATO Ref.	Specific Conditions				Min.	Max.	
SUB GROUP 3 (Cont'd) Base Emitter Saturation Voltage	7.3.3	$I_C = 1 \text{ mA}$ $I_B = 0.1 \text{ mA}$			$V_{BE} \text{ (sat)}$		0.75	V
	7.4.2	$I_C = 10 \text{ mA}$ $V_{CE} = 9V$ $f = 1 \text{ kc/s}$			$h_{fe}$	40	160	
Noise Factor	7.6.3	$I_C = 0.5 \text{ mA}$ $V_{CE} = 4.5V$ $f = 1 \text{ kc/s}$			N		18	dB
Emitter Base Cut-off Current	7.2.6	$V_{EB} = 3V$ $I_C = 0$			$I_{EBO}$		1	$\mu A$
SUB GROUP 4 Breakdown Voltage Collector to Emitter Collector Emitter Cut-off Current	7.2.5.1	$I_C = 10 \text{ mA}$ (see Note 2) $I_B = 0$ $V_{CE} = 9V$ $I_B = 0$ $T_{amb} = +150^\circ C$	4.0	IA	$V_{(BR)CEO}$	24		V
					$I_{CEO} \text{ (2)}$	100		$\mu A$

TABLE 2. GROUP B INSPECTION

Examination or Test	Test Conditions		AQL %	Insp. Level	Symbol	Limits		Units
	K1007/ NATO Ref.	Specific Conditions				Min.	Max.	
<u>SUB GROUP 1</u> Physical Dimensions	5.1	Check dimensions to drawings CV-A 10.3.2.2 and 10.4.2.2 (Note 1) CV-B 10.3.4 and 10.4.2.4	6.5	IC				
<u>SUB GROUP 2</u> Solderability Temperature Cycling Moisture Resistance	5.13 5.5 5.3	-55°C to +175°C	4.0	IA				
<u>SUB GROUP 3</u> Vibration Fatigue	5.15.1		4.0	IC				
<u>SUB GROUP 4</u> Lead Fragility	5.10.2	2 cycles	6.5	IA				
<u>SUB GROUP 5</u> Omitted								
<u>SUB GROUP 6</u> Omitted								
<u>SUB GROUP 7</u> High Temperature Life (Non Operating)	6.2.1 6.6.1.2.2	T <sub>stg</sub> + 175°C Duration 1000 hrs	4.0	I Maximum 125 Devices				

TABLE 2. GROUP B INSPECTION (Cont'd)

Examination or Test	Test Conditions		Insp. Level	Symbol	Limits		Units
	K1007/ NATO Ref.	Specific Conditions			Min.	Max.	
<u>SUB GROUP 8</u> Operating Life	6.3 6.6.1.2.2	$V_{CB} = 20V$ MIN Duration 1000 hrs. $T_{amb}$ may be at any single temperature between $+25^{\circ}C$ and $+125^{\circ}C$ with $P_{tot}$ corresponding to that given on the derating curve Page 12.	IA				
<u>Post Test End</u> <u>Points for</u> <u>SUB GROUPS 2 to 8</u> (inclusive)							
Collector Base Cut-off Current	7.2.5.1	$V_{CB} = 9V$ $I_E = 0$		$I_{CBO}$	20		mA
Small Signal Short Circuit Forward Current Transfer Ratio	7.4.2	$I_C = 10$ mA $V_{CE} = 9V$ $f = 1$ kc/s		$h_{fe}$	35	180	

**TABLE 3. GROUP C INSPECTION**

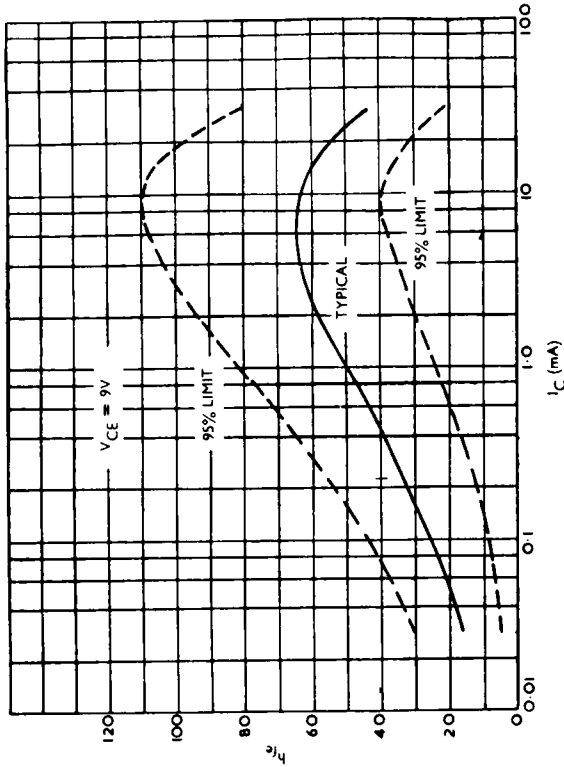
Examination or Test	Test Condition		INSPI. LEVEL	Symbol	Limits		Units
	K1007/ NATO Ref.	Specific Condition			Min.	Max.	
<u>SUB GROUP 1</u> Omitted							
<u>SUB GROUP 2</u> Shock	5.17.1	Non operating	IA				
<u>Post Test End</u> <u>Points for</u> <u>SUB GROUP 2</u> Collector Base Cut-off Current	7.2.5.1	$V_{CB} = 9V$ $I_E = 0$ $I_C = 10 \text{ mA}$ $V_{CE} = 9V$ $f = 1 \text{ kc/s}$		$I_{CB0}$	20		nA
Small Signal Short Circuit Forward Current Transfer Ratio				$h_{fe}$	35	180	

**NOTES**

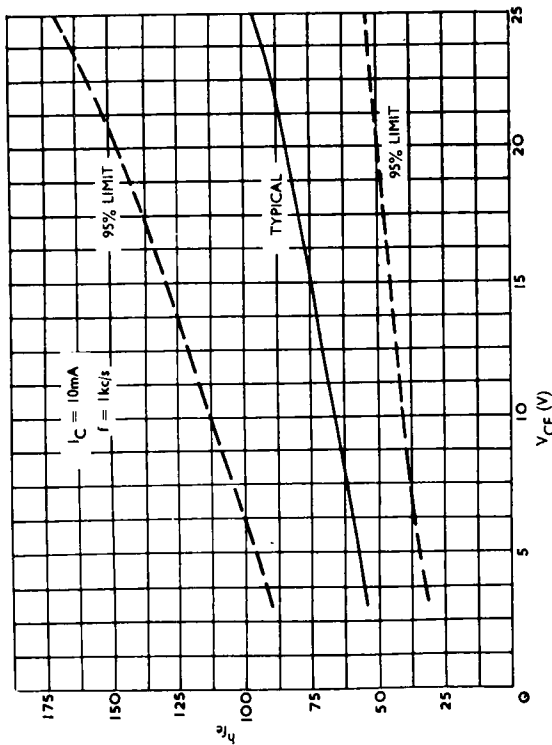
1. Lead length 0.3 in. min.
2. 300  $\mu$ Sec. pulse; maximum duty cycle  $\neq$



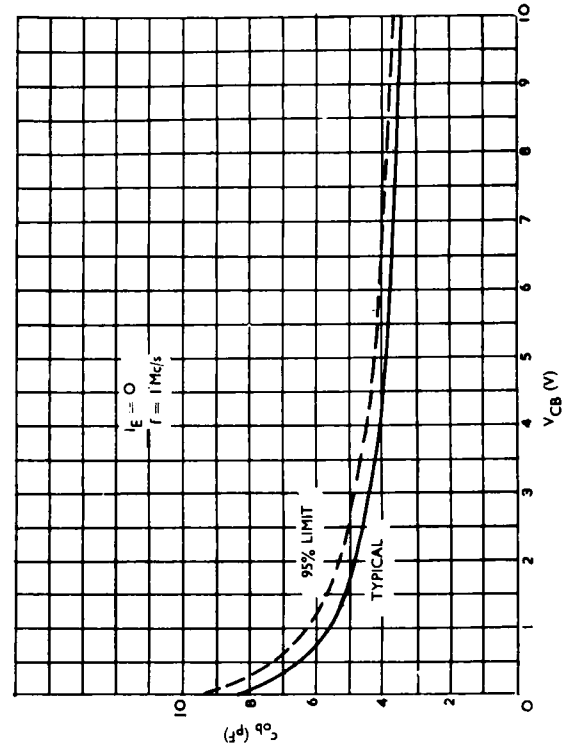
Small Signal Common Emitter Forward Current Transfer Ratio  
v. Collector Current



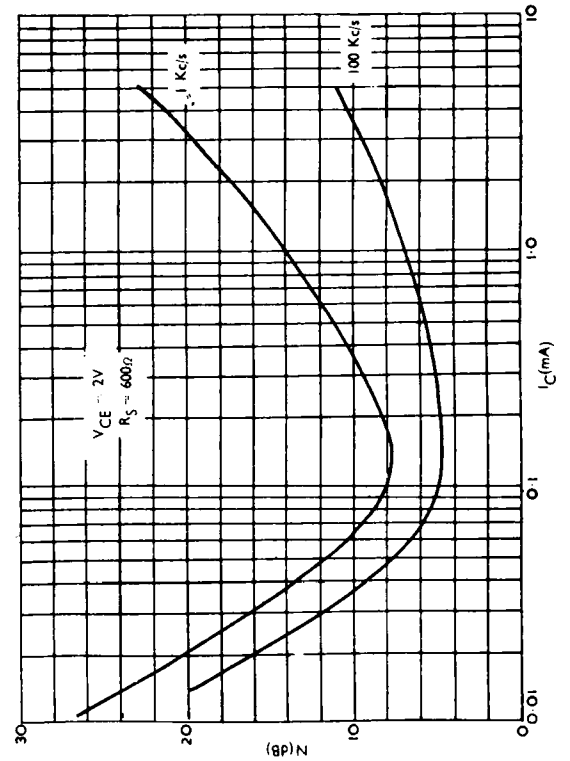
Small Signal Common Emitter Forward Current Transfer Ratio  
v. Collector Voltage



Common Base Output Capacitance v. Collector Voltage

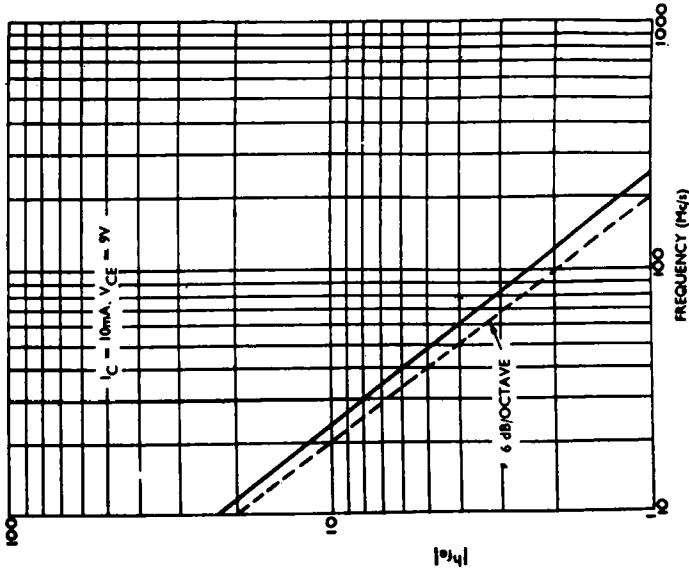


Typical Noise Factor v. Collector Current

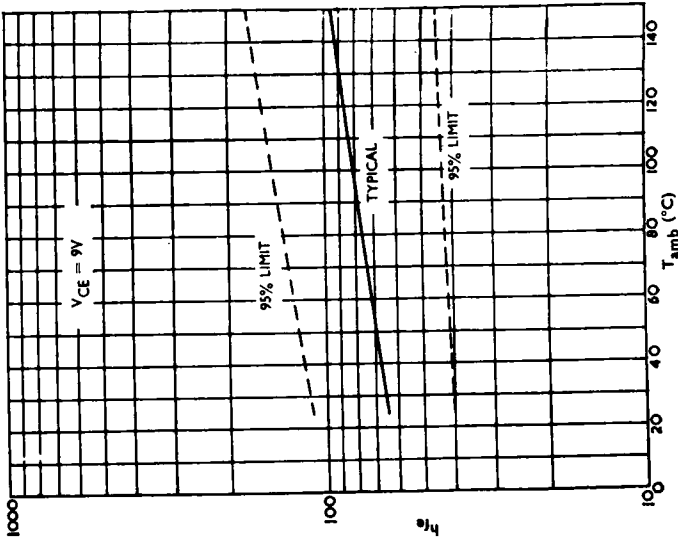


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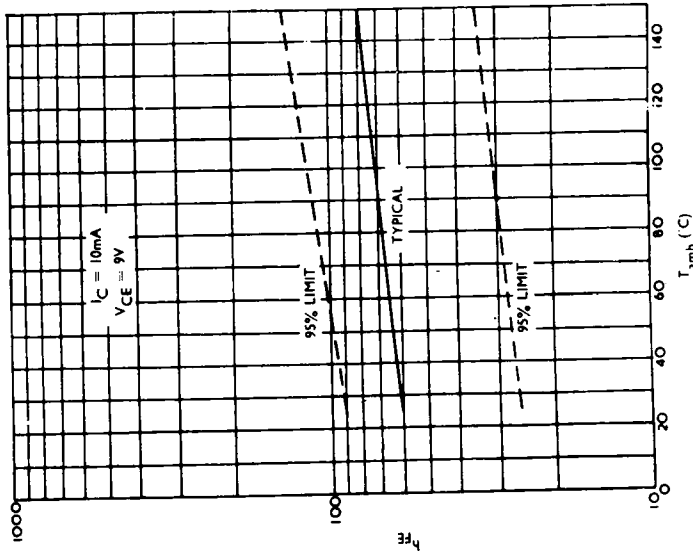
Typical Modulus of Small Signal Common Emitter Forward Current Transfer Ratio v. Frequency



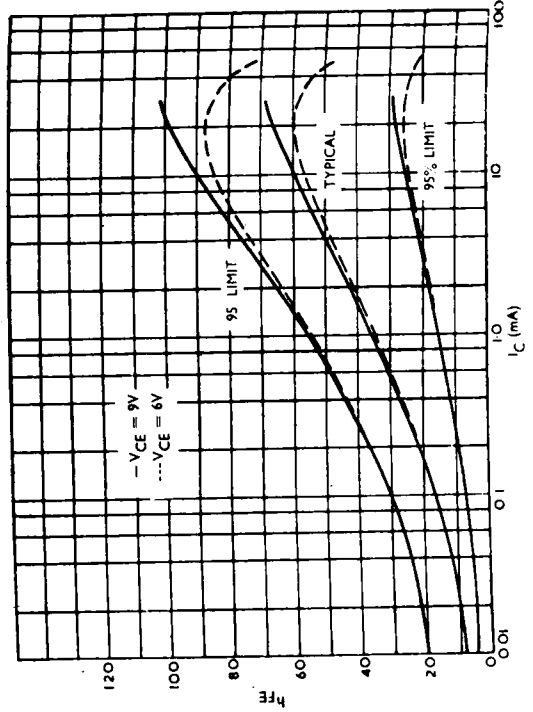
Small Signal Common Emitter Forward Current Transfer Ratio v. Temperature



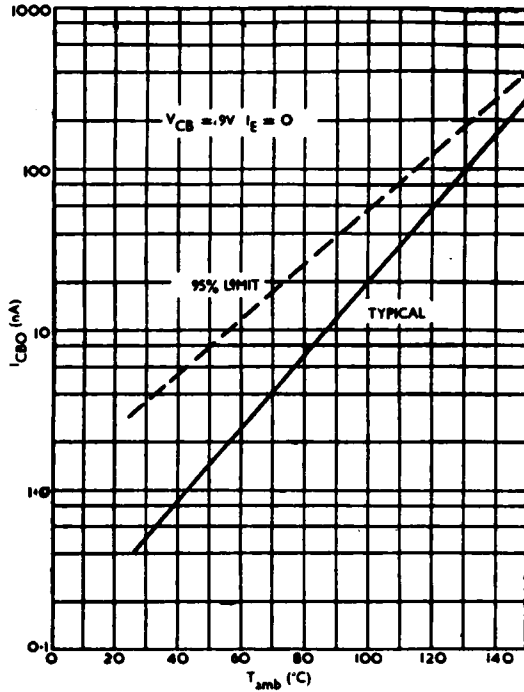
Large Signal Common Emitter Forward Current Transfer Ratio v. Temperature



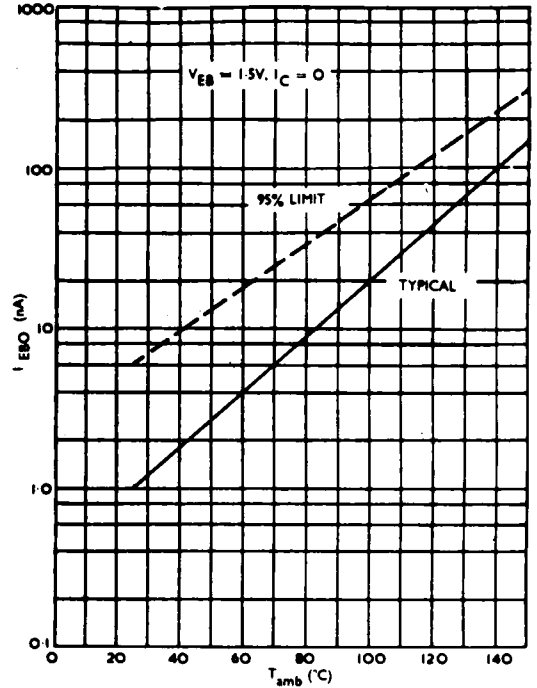
Large Signal Common Emitter Forward Current Transfer Ratio v. Collector Current



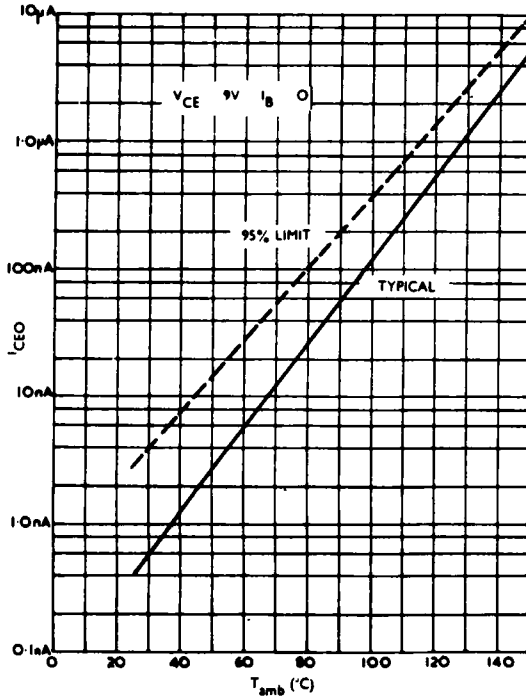
**Collector-Base Cut-off Current v. Temperature**



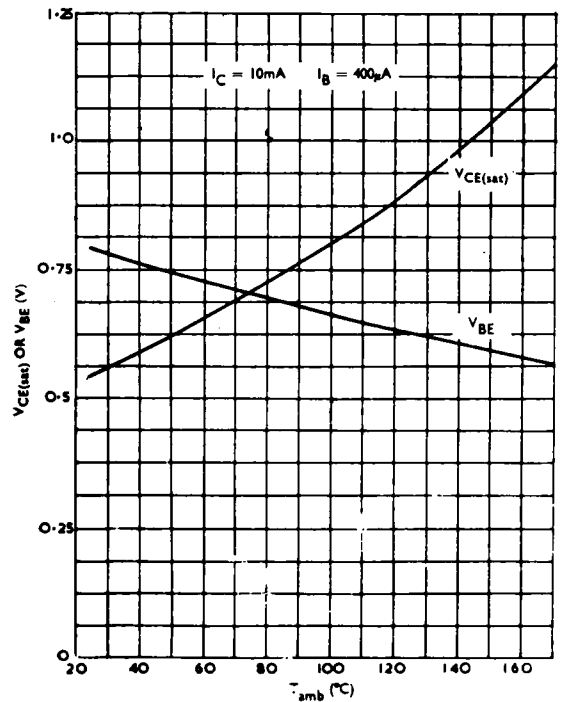
**Emitter-Base Cut-Off Current v. Temperature**



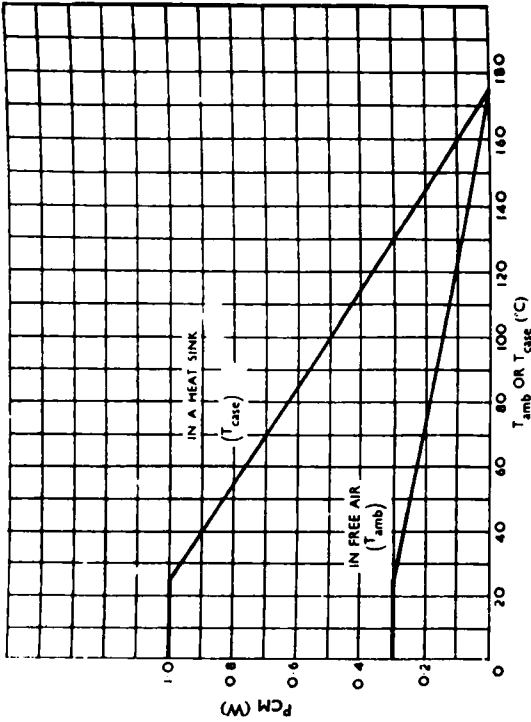
**Collector-Emitter Cut-off Current v. Temperature**



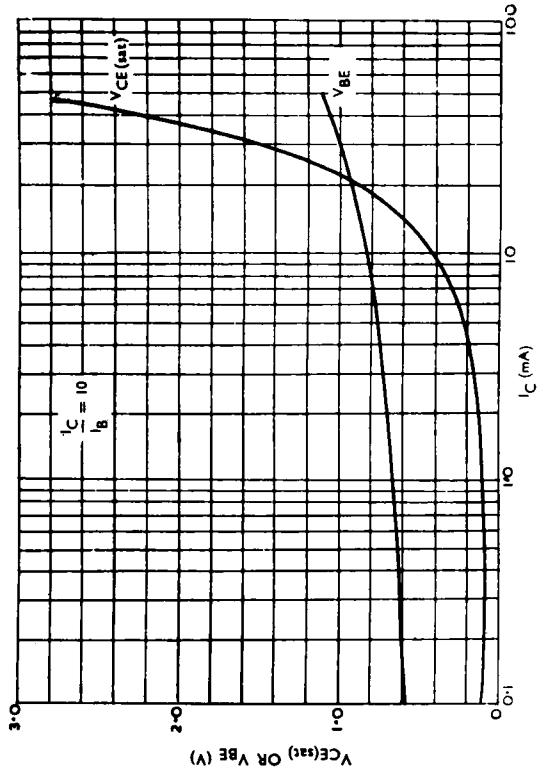
**Typical Collector-Emitter Voltage and Base-Emitter Voltage v. Temperature**



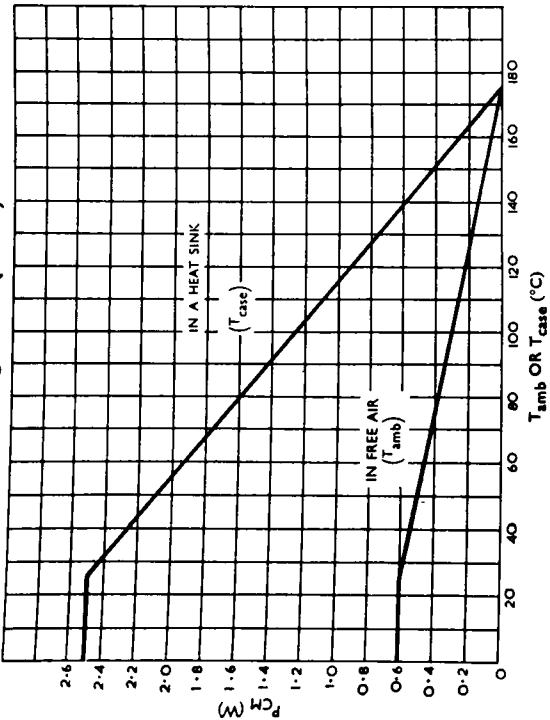
**Derating Curves (BFY18)**



**Typical  $V_{CE(sat)}$  and  $V_{BE}$  v. Collector Current**



**Derating Curves (BFY17)**



**Typical Contours of Constant Gain-Bandwidth Product, fr**

