

ELECTRONIC VALVE SPECIFICATIONS

SPECIFICATION CV7430-31

ISSUE NO. 1 DATED 23.7.1963

AMENDMENT NO. 1

Pages 7 and 8, Table 2. Group B Inspection (contd.) amend to read:-

Examination or Test	Test Conditions		AQL %	Insp. Level	Sym-bol	Limits		Units
	K1007/ NATO Ref.	Specific Conditions				Min.	Max.	
<u>SUB GROUP 8</u> Operating Life (1)	6.3	T _{amb} at any single temperature between 25°C and 125°C with the corresponding P _{tot} given by the derating curve on page 12. V _{CB} = 15V Duration 72 hrs. min						
<u>Post Operating Life(1) Test End Point</u> Collector Base Cut-off Current	7.2.5.1	V _{CB} = 20V I _E = 0	0.65		I _{CBO}	-	100	nA
Static Forward Current Transfer Ratio	7.3.4.2	I _C = 10mA V _{CE} = 0.35V CV7430 CV7431	0.65		h _{FE}		17 35	70 140

Amend "Post Test End Points for Sub groups 2 to 8" to "Post Test End Points for Sub groups 2 to 7"

Page 10. Table 3. Group C Inspection. Add Sub-group 3 as follows:-

Examination or Test	Test Conditions		AQL %	Insp. Level	Sym-bol	Limits		Units
	K1007/ NATO Ref.	Specific Conditions				Min.	Max.	
<u>SUB GROUP 3</u> Operating Life (2) See Note 6	6.3 6.6 4.5.2.1.1.1	As for Operating Life(1) Duration 1000 hours min.	4.0	IA				
<u>Post Operating Life(2) Test End Point</u> Collector Base Cut-off Current	7.2.5.1.	V _{CB} = 20V I _E = 0			I _{CBO}		100	nA
Static Forward Current Transfer Ratio	7.3.4.2	I _C = 10mA V _{CE} = 0.35V CV7430 CV7431			h _{FE}		17 35	70 140

Add to Notes

6. K1007, Section B, Clause 4.5.3.3. will not apply, however the Inspectorate will inform the Qualification Approval Authority if and when the requirements of Operation Life (2) have not been met.

ELECTRONIC VALVE SPECIFICATIONS
SPECIFICATION CV7430-31
ISSUE 1. DATED 23rd JULY, 1963.
AMENDMENT No. 2.

Page 1. Mechanical Dimensions and Outlines K1007/NATO Ref.

Delete: 10.3.2.4. Insert 10.3.2.3.

Delete: 10.4.2.4. Insert 10.4.2.3.

March, 1965.

Ministry of Aviation/RRE

(269187)

MILITARY SPECIFICATION

CV 7430-31

SEMICONDUCTOR DEVICE, TRANSISTOR

Description:- This specification covers the detailed requirements for an NPN Low Level Silicon Diffused Planar Epitaxial fast switching Transistor and is in accordance with Specification K1007, Issue 3, except where otherwise stated.

Mechanical Dimensions and Outlines:- K1007, Section B. 10.3.2.4 and 10.4.2.4.

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

Absolute Maximum Ratings:-

Rating	V _{CB}	V _{CE}	V _{EB}	I _C	I _{CM}	I _B	I _{BM}	I _E	I _{EM}	P _{tot}	T _{stg}	T _j	Shock	Vib.
Unit	V	V	V	mA	mA	mA	mA	mA	mA	W	°C	°C	g	g
Min	-	-	-	-	-	-	-	-	-	-	-55	-55	-	-
Max	25	15	6	100	200	10	20	110	220	0.3	+175	+175	1500	20
Note		D		A	B	A	B	A	B	C			E	

- Note
- A. Averaged over a period of greater than 100 μsecs
 - B. For a period less than 100 μsec
 - C. At 25°C case temperature P_{tot} = 1.0W.
See derating curve Fig. 1. Page 11.
 - D. 300 μsec pulse; maximum duty cycle 2%.
 - E. Duration 0.5 mSec.
 - F. Commercial equivalent BSY26 BSY27.

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Primary Electrical Characteristics

Characteristic		I_{CBO}	V_{CE} (Sat)	V_{BE} (Sat)	h_{FE}	f_t	C_{ob}	t_{on}	t_{off}	t_s
Unit		nA	V	V	-	Mc/s	pF	nS	nS	nS
CV 7430	Min	-	-	0.8	20	200	-	-	-	-
	Max	50	0.6	1.1	60	450	6.0	27	70	35
CV 7431	Min	-	-	0.8	40	200	-	-	-	-
	Max	50	0.6	1.1	120	450	6.0	27	70	35
Conditions	T_{amb} °C	25	25	25	25	25	25	25	25	25
	V_{CB} V	20	-	-	-	-	6	See Page 13 Figs 3 & 4		
	V_{CE} V	-	-	-	-	0.35	9			
	I_C mA	-	50	50	50	10	10			
	I_B mA	-	5.0	6.6	3.3	-	-			
	I_E mA	-	-	-	-	-	0			
	f Mc/s	-	-	-	-	-	100			

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 and Table 3, Group C Sub Group 2 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.(e).

Joint Service Catalogue Numbers:-

CV7430 = 5960-99-037-3488

CV7431 = 5960-99-037-3489

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

Ministry of Aviation, Royal Radar Establishment, Malvern, Worcs.
England.

TABLE 1 GROUP A INSPECTION

Examination or Test	TEST CONDITIONS		AQL %	Insp. Level	Sym- bol	LIMITS		Units
	K1007/NATO Ref.	Specific Conditions				Min.	Max.	
<u>SUB GROUP 1</u> Visual and Mechanical Inspection	5.1	Excluding Physical Dimensions	0.65	I				
<u>SUB GROUP 2</u> Collector-Base Cut-off Current (1)	7.2.5.18	$V_{CB} = 20V$ $I_E = 0$	1.0	II	I_{CBO}	-	50	nA
Collector-Emitter Cut-off Current (1)	7.2.5.2	$V_{CE} = 12V$ $I_B = 0$			I_{CEO}	-	100	nA
Emitter-Base Cut-off Current (1)	7.2.6	$V_{EB} = 4V$ $I_C = 0$			I_{EBO}	-	100	nA
Base-Emitter Saturation Voltage (1)	7.3.1	$I_C = 10mA$ $I_B = CV\ 7430 = 0.5mA$ $CV\ 7431 = 0.25mA$			V_{BE} (sat)	0.68	0.78	V
Static Forward Current Transfer Ratio (1)	7.3.4.2	$I_C = 10mA$ $V_{CE} = 0.35V$			h_{FE}	20	60	
Static Forward Current Transfer Ratio (2)	7.3.4.2	$I_C = 50mA$ $V_{CE} = 2V$			h_{FE}	40	120	
						12	60	
						25	120	

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.	
<u>SUB GROUP 3</u> Output Capacitance	7.4.8	$V_{CB} = 6V$ $I_E = 0$ $f = 1 \text{ Mc/s}$	2.5	I	C_{ob}	-	6	pF
Common Emitter Forward Current Transfer Ratio at High Frequency	7.5.2	$I_C = 10\text{mA}$ $V_{CE} = 9V$ $f = 100 \text{ Mc/s.}$			h_{FE}	2	4.5	-
Transient Saturation Voltage		$I_C = 50 \text{ mA}$ (CV 7431 only) $I_B = 12.5 \text{ mA}$ Note 1			V_{CE}	-	0.65	V
<u>SUB GROUP 4</u> Switch-on Time		Note 2 $V_{CE} = 3v$; $V_{BB} = -3v$; $V_{IN} = 15v$	4.0	IA	t_{on}	-	27	nS
Switch-off Time		Note 2 $V_{CC} = 3v$; $V_{BB} = 12V$ $V_{IN} = -15v$			t_{off}	-	70	nS

TABLE 1 GROUP A (Cont'd)

Examination or Test	K1007/NATO Ref.	TEST CONDITIONS		AQL %	Insp. Level	Sym-bol	LIMITS		Units
		Specific Conditions					Min.	Max.	
SUB GROUP 4 (Cont'd) Storage-Delay Time		Note 3 $V_{CC} = 3V$; $V_{VV} = 11V$ $V_{IN} = -10V$				t_s	-	35	ns
		$T_{amb} = 150^{\circ}C$ $V_{CB} = 20V$ $I_E = 0$				I_{CBO}	-	40	μA
Collector-Base Cut-off Current (3)	7.2.5.1	$T_{amb} = -55^{\circ}C$ $I_C = 10mA$ $V_{CE} = 0.35V$				h_{FE}	10	-	-
		$T_{amb} = -55^{\circ}C$ $I_C = 10mA$ $V_{CE} = 0.35V$					20	-	-
Static Forward Current Transfer Ratio	7.3.4								

TABLE 2 GROUP B INSPECTION

Examination or Test	TEST CONDITIONS		AQL %	Insp. Level	Sym- bol	LIMITS		Units
	K1007/NATO Ref.	Specific Conditions				Min.	Max.	
<u>SUB GROUP 1</u> Physical Dimensions	5.1	According to drawings 10.3.2.4 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	2 cycles	4.0	I Note 4				
<u>SUB GROUP 4</u> Lead Fragility	5.10.2		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 _{stg} +175°C Duration 1000 hrs.	4.0	I Note 4				
<u>SUB GROUP 8</u> Operating Life	6.3 6.6.1.2.2	V _{GB} = 15V. Duration 1000 hrs. T _{amb} may be at any single temperature between +25°C and +125°C with P _{tot} corresponding to that given on the derating curve Fig.1. Page 12	4.0	IA				

TABLE 2. GROUP B INSPECTION (Cont'd)

Examination or Test	K1007/NATO Ref.	TEST CONDITIONS		AQL %	Insp. Level	Sym- bol	LIMITS		Units
		Specific Conditions					Min.	Max.	
Post Test End Points for Sub-Groups 2 to 8 (inclusive)									
Collector Base Cut-off Current	7.2.5.1	$V_{CB} = 20V$ $I_E = 0$				I_{CBO}	-	100	nA
Static Forward Current Transfer Ratio	7.3.4.2	$I_C = 10mA$ $V_{CE} = 0.35V$	CV7430 CV7431			h_{FE}	17 35	70 140	-

TABLE 3 GROUP C INSPECTION

See Page 3 Quality Assurance Provisions. Group C Inspection

Examination or Test	K1007/NATO Ref.	TEST CONDITIONS		AQL %	Insp. Level	Sym- bol	LIMITS		Units
		Specific Conditions					Min.	Max.	
<u>SUB GROUP 1</u>				2.5	II				
Collector Emitter Sustaining Voltage	7.2.2.2.1	$I_C = 10mA$ $I_B = 0$	Note 5			V_{CE0} (Sust)	15	-	V
Base Emitter Saturation Voltage	7.3.1	$I_C = 50mA$ $I_B =$	CV 7430 = 6.6mA CV 7431 = 3.3mA			V_{BE} (Sat)	0.8	1.1	V
Collector Emitter Saturation Voltage	7.3.3	$I_C = 50mA$ $I_B = 5mA$				V_{CE} (Sat)	-	0.6	V
Static Forward Ratio	7.3.4.2	$I_C = 50mA$ $V_{CE} = 0.65$	CV7430 CV7431			h_{FE}	10	65	
Collector Base Breakdown Voltage	7.2.1	$I_C = 1\mu A$ $I_E = 0$				BV_{CBO}	25	-	V
Emitter Base Breakdown Voltage	7.2.3	$I_E = 10\mu A$ $I_C = 0$				BV_{EBO}	6	-	V
Collector Emitter Saturation Voltage	7.3.3	$I_C = 3mA$ $I_B = 0.5mA$	(CV7430 only)			V_{CE} (sat)	-	0.2	V

TABLE 3 GROUP C INSPECTION (Cont'd)

See Page 3 Quality Assurance Provisions, Group C Inspection

Examination or Test	TEST CONDITIONS		AQL %	Insp. Level	Sym- bol	LIMITS		Units
	K1007/NATO Ref.	Specific Conditions				Min.	Max.	
<u>SUB GROUP 2</u> Shock	5.17	Non operating, 5 blows in each of three mutually perpendicular directions	6.5	IA				
<u>Post Test End Points</u> Collector-Base Cut-Off Current (1)	7.2.5.1	$V_{CB} = 20V$ $I_E = 0$			I_{CBO}	-	100	nA
Static Forward Current Transfer Ratio (1)	7.3.4	$I_C = 10mA$ $V_{CE} = 0.35V$			h_{FE}		17 35	70 140

NOTES

1. See circuit Fig.2 Page 12
2. See circuit Fig.3 Page 13
3. See circuit Fig.4 Page 13
4. Maximum sample size 125
5. 300 μ Sec pulse. Maximum duty cycle 2%

Fig 1

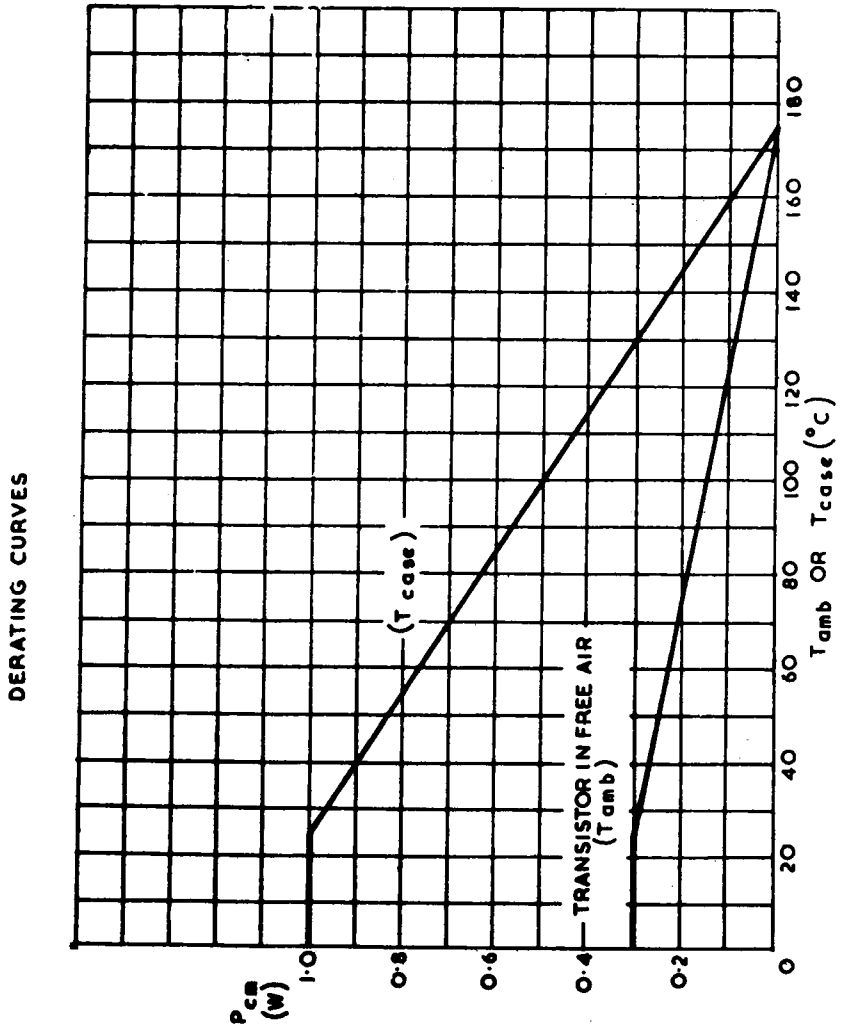
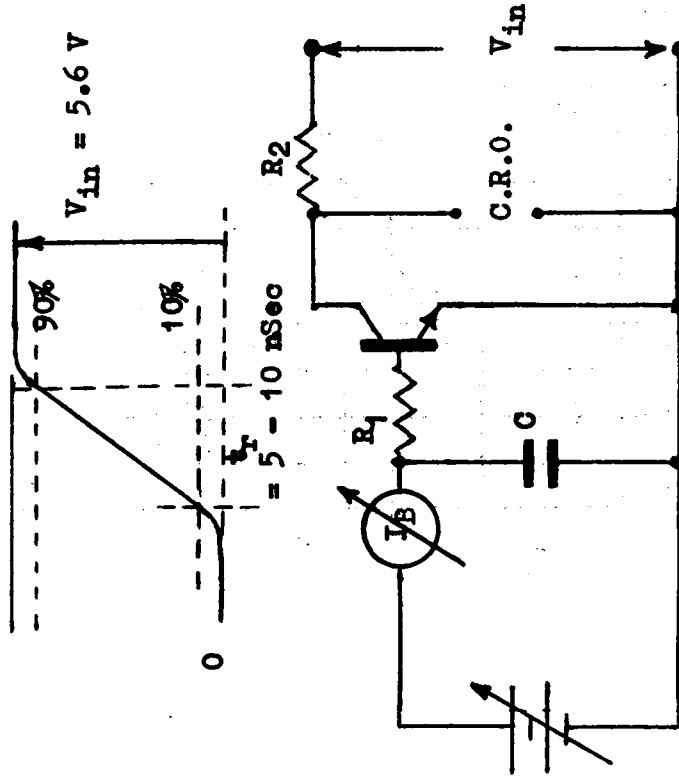


Fig 2
Transient V_{CE} Test



C = 2000pF

R₁ = 1k Ω m

R₂ = 100 Ω m

Input pulse 5.6V

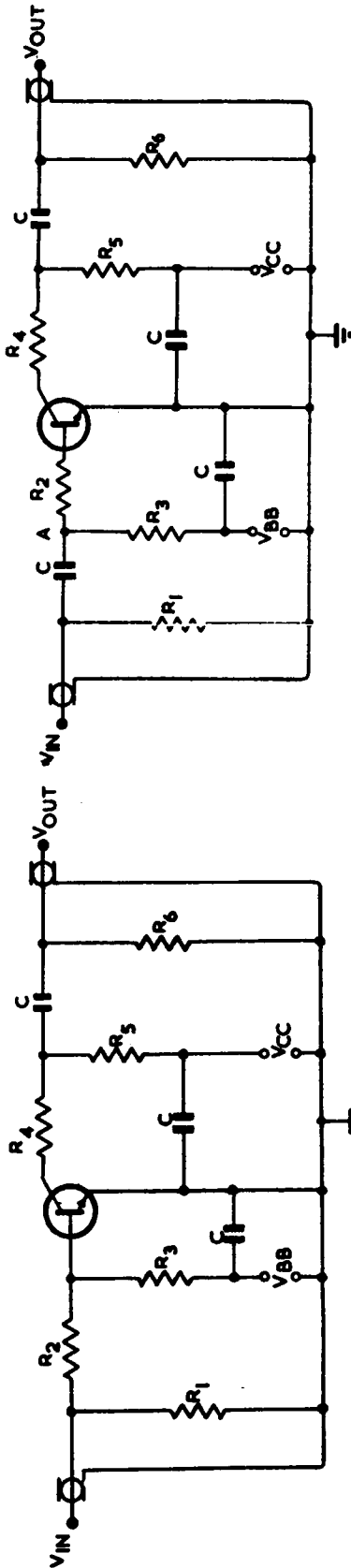
t_r 10% to 90% = 5 to 10nSec.

(1) CRO must have a rise time of not greater than 1.5 nSec.

(2) V_{CE} shall not exceed the specified limit V_{CE} transient during any part of the "on" period.

(3) Duration of the "on" period shall not be less than 100 nSec the pulse period shall not be less than 10 μ Sec.

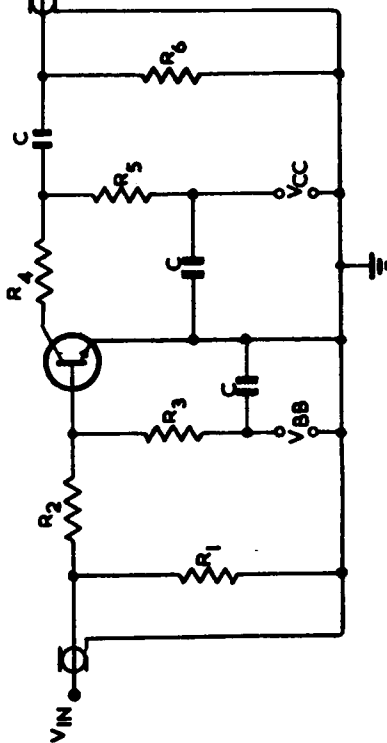
FIG 4



Resistor Values ($\pm 2\%$, non-inductive)

- R1 56 Ohms
- R2 500 Ohms
- R3 500 Ohms
- R4 890 Ohms
- R5 91 Ohms
- R6 50 Ohms

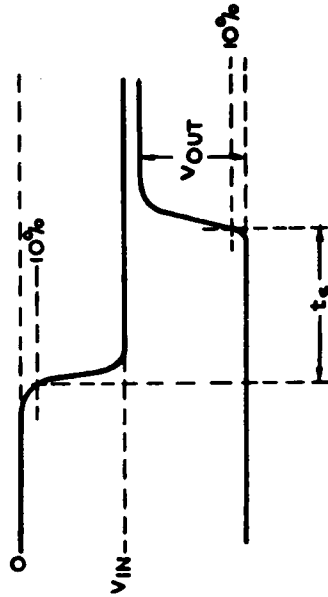
FIG 3



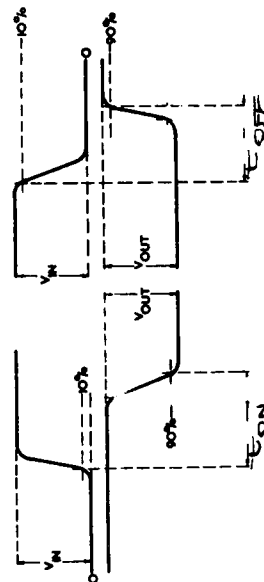
Resistor Values ($\pm 2\%$, Non-inductive)

- R1 56 Ohms
- R2 3.3k Ohms
- R3 3.3k Ohms
- R4 220 Ohms
- R5 56 Ohms
- R6 56 Ohms

DEFINITION OF t_s



DEFINITION OF t_{ON} AND t_{OFF}



NOTES - See Page 14.

NOTES ON CIRCUITS FIG 3 AND FIG 4

1. A high impedance oscilloscope should be used for waveform measurements
Driving pulse rise time $< 1\text{ns}$
" " width $\geq 300\text{ns}$
Duty cycle $< 10\%$
2. Capacitors C should be large enough to prevent more than 20mV appearing across them during any part of the Switching cycle.
3. Decoupling capacitors should be placed across the terminals supplying V_{CC} and V_{BB} .

Fig 5

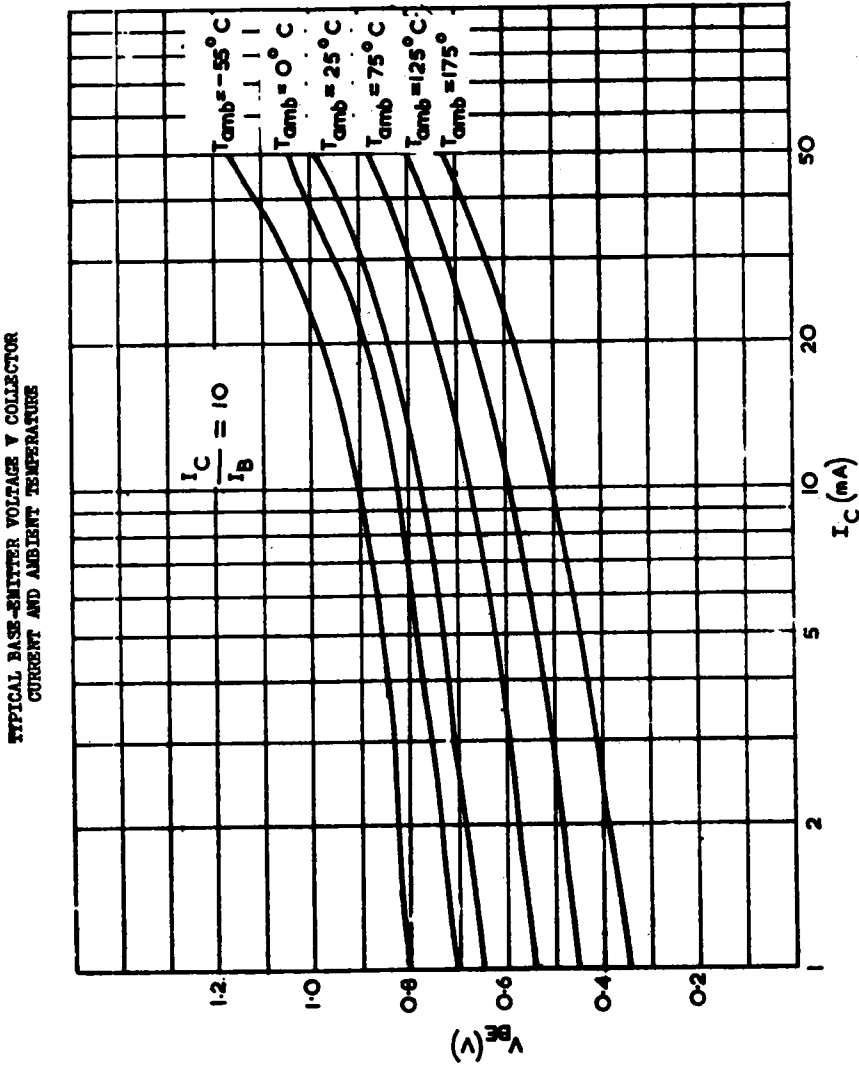


Fig 6

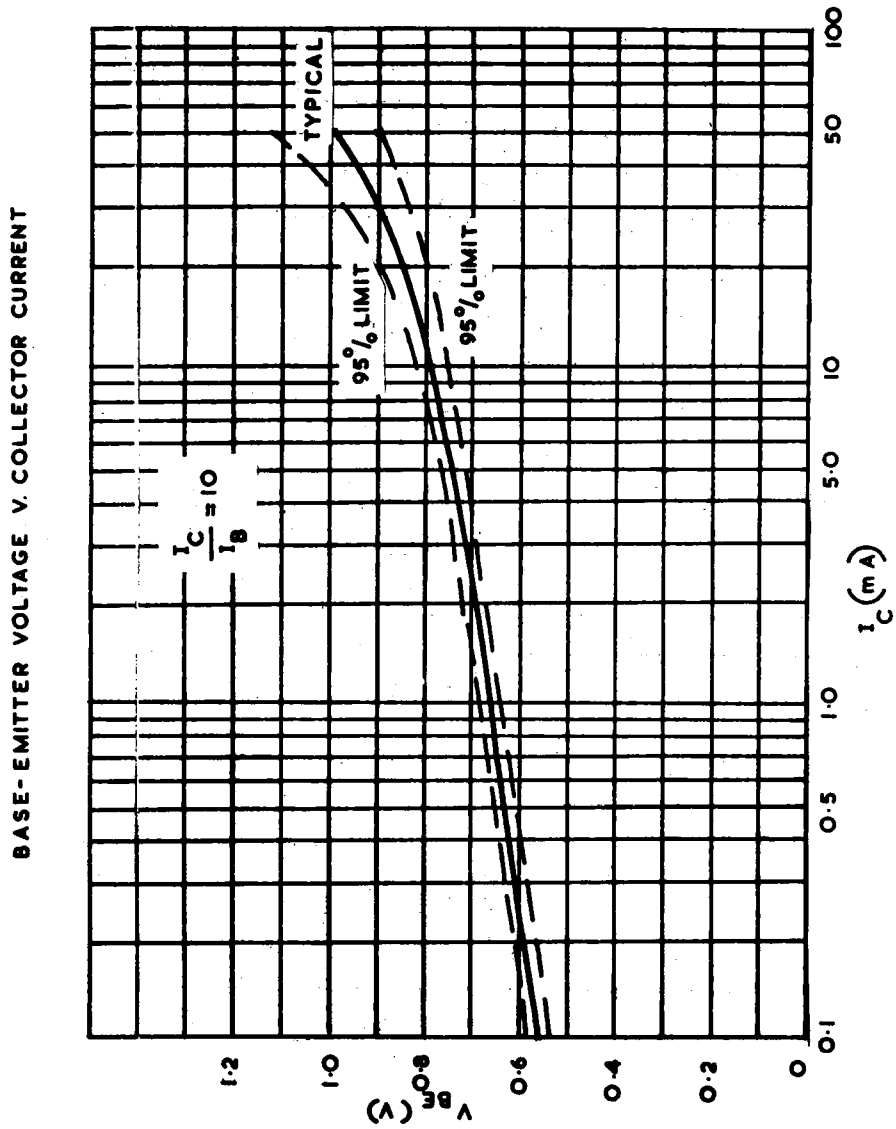


Fig 7

CV7430-31

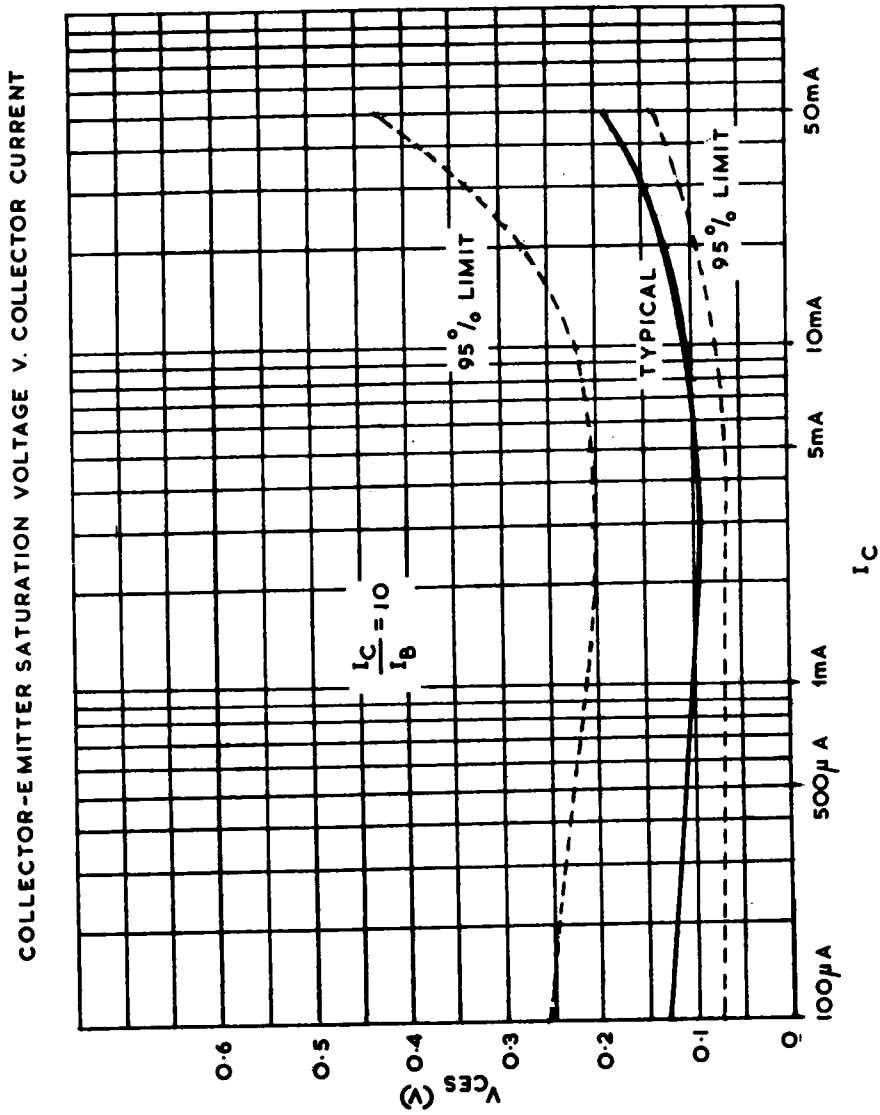


Fig 8

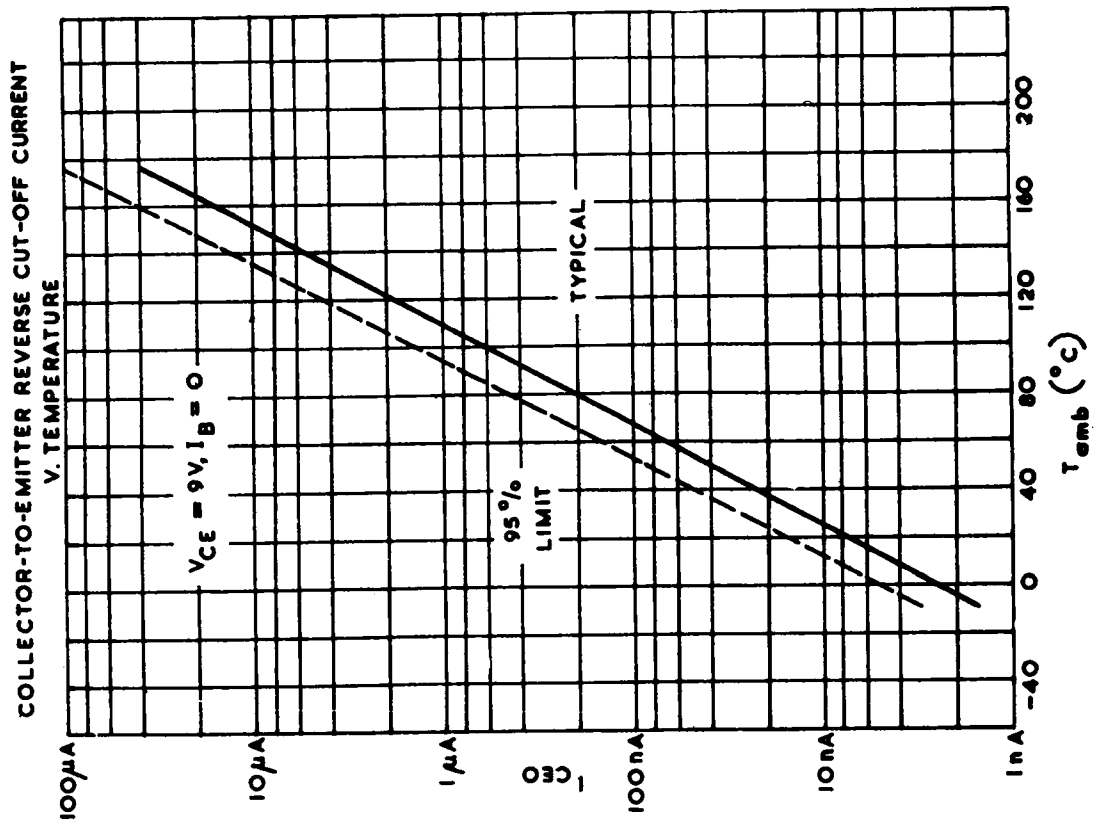


Fig 9

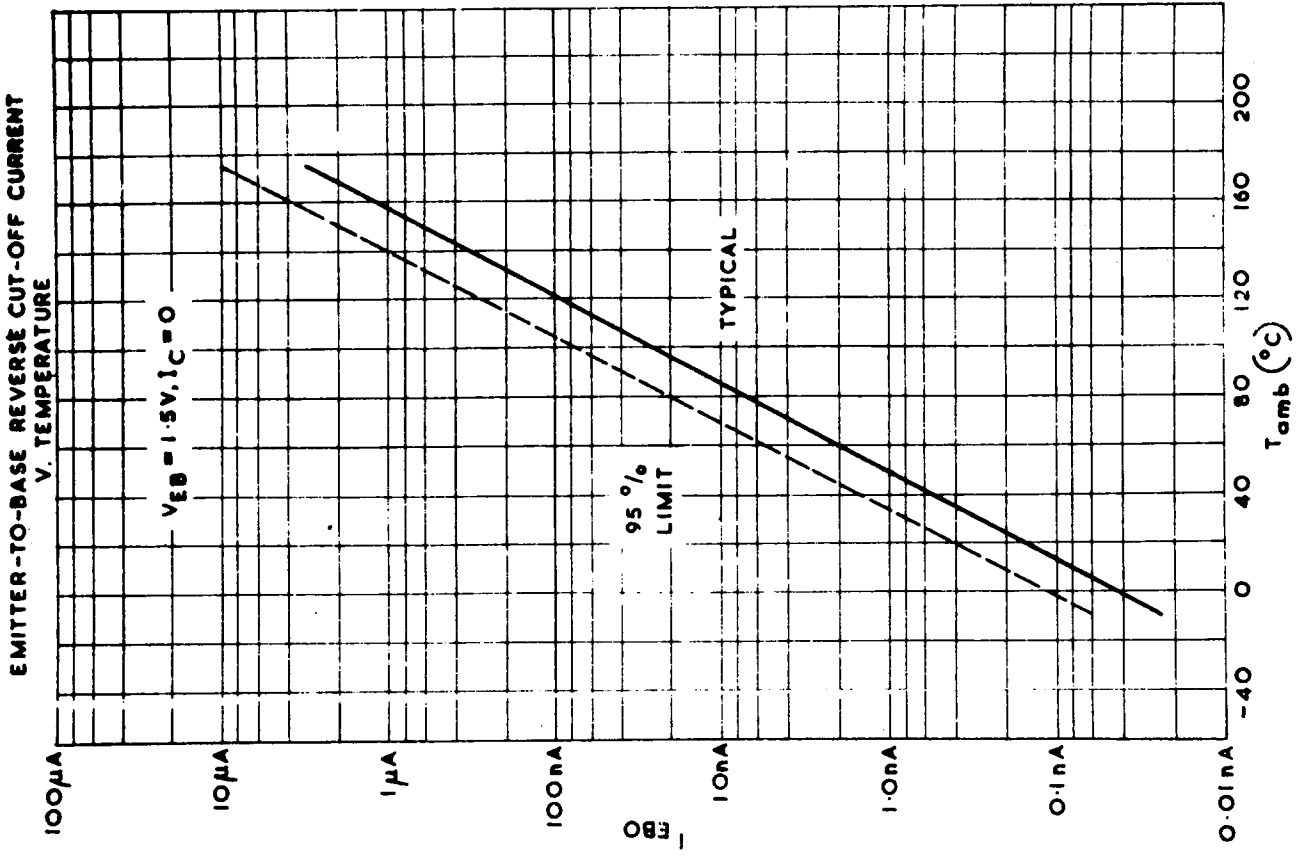


Fig 10

