

26th September 1963

MILITARY SPECIFICATION

SEMICONDUCTOR DEVICE, TRANSISTOR

CV 7448

Description:- This specification covers the detail requirements for a Germanium PNP high frequency bidirectional switching transistor and is in accordance with K 1007, except as otherwise stated.

Mechanical Dimensions and Outlines:- K 1007, Section B. 10.3.1. and 10.4.1. Section D. Appendix 1, Drawings D5A and D5B.

Connections:- Lead 1. Emitter; Lead 2. Base; Lead 3. Collector.

Absolute Maximum Ratings:-

Rating	V _{CB}	V _{CE}	V _{EB}	P _{tot}	T _{stg}	T _j	Shock	Vib.
Unit	V	V	V	mW	°C	°C	g	g
Min.	-	-	-	-	-55	-	-	-
Max.	-20	-6	-20	200	75	75	1500	20
Notes	-	-	-	2	-	-	-	-

Notes:-

1. Collector, base and emitter currents are limited only by the total device dissipation and the fall in current gain at high currents.
2. See derating curve, page 10.
3. Commercial equivalent is ASY 60.

CV 7448

Primary Electrical Characteristics:-

Characteristic		I_{CBO}		$V_{CE(sat)}$	h_{fe}	f_{hfb}	Q_s
Unit		μA		V		Mc/s	nC
Min.					20	8.0	
Max.		-10.0	-60	-0.15	150		3.0
CONDITIONS	T_{amb} °C	25	55	25	25	25	
	V_{CB} V	-20	-20				
	V_{CE} V				-4.5	-4.5	
	I_C mA			-100	-1.0	-1.0	0
	I_B mA			-4.0			-2
Notes				1	1		2

Notes:-

1. Both normal and inverse modes of operation
2. See test later.

Reliability Assurance Requirements

Under discussion

Requirements

Marking The device shall be marked as K 1007. Section B. 1.3.4.1 omitting (b) and (g).
The collector shall be clearly marked with a white dot.

Quality Assurance Provisions

Destructive Tests The tests listed in Table 2. Group B Sub-groups 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, (or as required).

Preparation for Delivery

Packaging The device shall be packed according to K 1007, Section A, 1.2.(c). AIS Size 6.

Joint Service Catalogue Number

5960 - 99 - 037 - 3517

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

The Engineer-in-Chief, General Post Office, S Branch, London.

TABLE 1 GROUP A INSPECTION

Examination or Test	Test Condition		AQL %	Insp. Level	Symbol	Limits		Units
	K 1007/ M110 Ref.	Specific Conditions				min.	max.	
SUB GROUP 1 Visual and Mechanical Inspection	5.1	Excluding physical dimensions	0.65	I				
SUB GROUP 2 Collector - Base Cut-off current Emitter - Base Cut-off current Collector-Emitter Saturation Voltage Emitter - collector Saturation voltage Small Signal Short Circuit Forward Current Transfer Ratio	7.2.5.1.		1.0	II	I _{CB0}	-	10	µA
						V _{CB} - -20V I _E - 0		
	7.2.6.				I _{EB0}	-	10	µA
						V _{EB} - -20V I _C - 0		
	7.3.3.				V _{CE} (sat)	-	-0.15	V
						I _C - -100 mA I _B - -4 mA		
	Note 1				V _{EC} (sat)	-	-0.15	V
						I _E - -100 mA I _B - -4 mA		
	7.4.2.				h _{fe}	20	150	
						V _{CE} - 4.5 V I _C - -1 mA f - 1 Kc/s		

TABLE 1 GROUP A INSPECTION (continued)

Examination or Test	K 1007/ NATO Ref.	Test Condition		AQL %	Insp. Level	Symbol	Limits		Units
		Specific Conditions	min.				max.		
Stored Charge	Note 2	$I_B = 2 \text{ mA}$ $I_C = 0$ $V_g = 10 \text{ V}$				Q_s	-	3.0	nC
<u>SUB GROUP 3</u> Base-Emitter Saturation Voltage	7.3.1	$I_C = -100 \text{ mA}$ $I_B = -4 \text{ mA}$		4.0	I	$V_{BE} \text{ (sat)}$	-	0.8	V
Collector - Base Cut-off current	7.2.5.1.	$V_{CB} = -20 \text{ V}$ $I_E = 0$ $T_{amb} = 55^\circ \text{C}$				I_{CB0}	-	60	μA
Emitter - Base Cut-off current	7.2.6.	$V_{EB} = -20 \text{ V}$ $I_C = 0$ $T_{amb} = 55^\circ \text{C}$				I_{EB0}	-	60	μA
Cut-off frequency	7.5.1.	$V_{CB} = -4.5 \text{ V}$ $I_C = 1 \text{ mA}$				f_{afb}	8.0	-	Mc/s
<u>SUB GROUP 4</u> Output Capacitance	7.4.8.	$V_{CB} = -6 \text{ V}$, $f = 1 \text{ Mc/s}$ $I_E = 0$		4.0	IA	C_{ob}	-	22	pF

TABLE 2 GROUP B INSPECTION
See Quality Assurance Provisions Page 3 Destructive Tests

Examination of Test	Test Condition		AQL %	INSP. Level	Symbol	Limits		Units
	K 1007/ NATO Ref.	Specific Conditions				min.	max.	
Physical <u>SUB GROUP 1</u>	5-1	According to 10-3, 10-4 and Section D, Appendix 1 drawings D5A and D5B	6-5	IC				
<u>SUB GROUP 2</u> Solderability Temperature Cycling Moisture Resistance	5-13 5-5 5-3	-55oc to + 70oc	4-0	IA				
<u>SUB GROUP 3</u> Vibration Fatigue	5-15-1		4-0	I Note 3				
<u>SUB GROUP 4</u> Lead Fatigue	5-10-2	3 cycles	6-5	IA				
<u>SUB GROUP 5</u> Omitted								
<u>SUB GROUP 6</u> Omitted								

TABLE 2 GROUP B INSPECTION (continued)

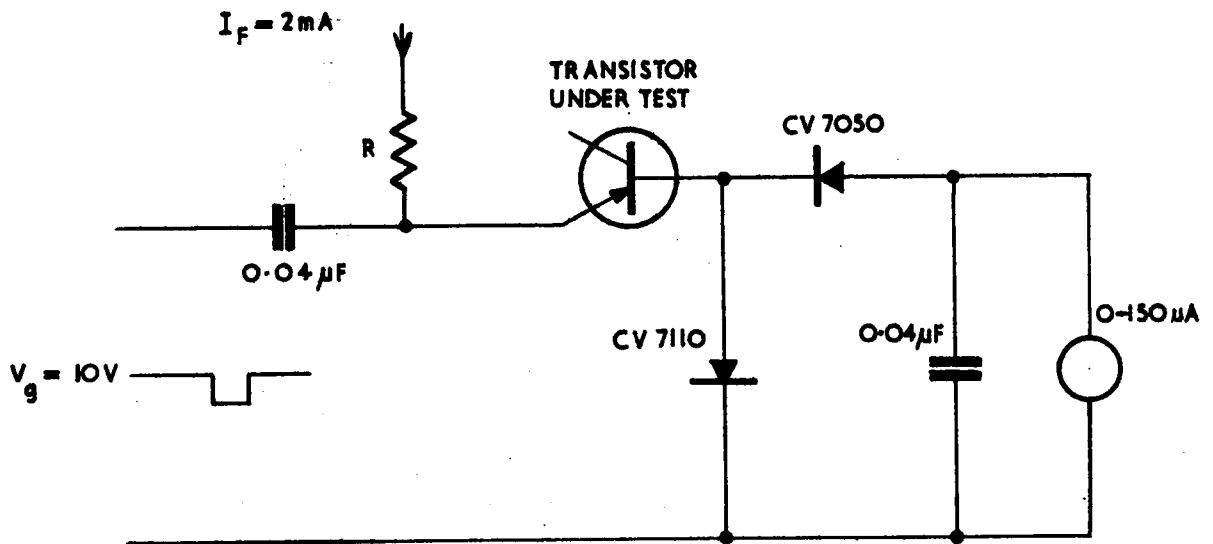
Examination or Test	K 1007/ NATO Ref.	Test Condition Specific Conditions	AQL %	Insp. Level	Symbol	Limits		Units
						min.	max.	
<u>SUB GROUP 7</u> Omitted								
<u>SUB GROUP 8</u> Operating Life	6.3 6.6 6.6.1.2.2	Tamb at any single temperature between 25°C and 75°C with the corresponding Ptot given on the derating curve, page 10 VC8 = -10V minimum Duration 1000 hours						
Post Test End Points for <u>SUB GROUPS 2, 3 and 8</u> Collector - Base Cut-off current	7.2.5.1	As in Group A, Sub Group 2			IC80	-	15	µA
Emitter - Base Cut-off current	7.2.6	As in Group A, Sub Group 2			IE80	-	15	µA
Collector - Emitter Saturation Voltage	7.3.3	IC = -100 mA IB = -6.0 mA			VCE (sat)	-	0.15	V
Emitter - Collector Saturation Voltage	Note 1	IE = -100 mA IB = -6.0 mA			VEC (sat)	-	0.15	V

TABLE 3 GROUP C INSPECTION
See Page 3, Quality Assurance Provisions, Group C Inspection

Examination or Test	Test Condition		AQL %	Insp. Level	Symbol	Limits		Units
	K 1007/ NATO Ref.	Specific Conditions				min.	max.	
<u>SUB GROUP 1</u> Omitted <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 For SUB GROUP 2</u> Collector - Base Cut-off current Emitter - Base Cut-off current Collector - Emitter Saturation Voltage Emitter - Collector Saturation Voltage	7.2.5.1. 7.2.6. 7.3.3. Note 1	As in Group A, Sub Group 2 As in Group A, Sub Group 2 I _C = -100 mA I _G = -6-0 mA I _E = -100 mA I _G = -6-0 mA			I _{CR0} I _{EB0} V _{CE (sat)} V _{EC (sat)}	- - - -	15 15 0-15 0-15	μA μA V V

Notes:-

1. This measurement shall be made as in clause 7.3.3, except that the emitter and collector terminals shall be changed.
2. The stored charge test shall be measured in the circuit shown below.
3. Sample size not to exceed 125.



R = Dependent on voltage source
P.R.F. = 10 Kc/s

Pulse rise time over 10% to 90% of amplitude not greater than 10 nS.

Pulse generator impedance = 100 ohms

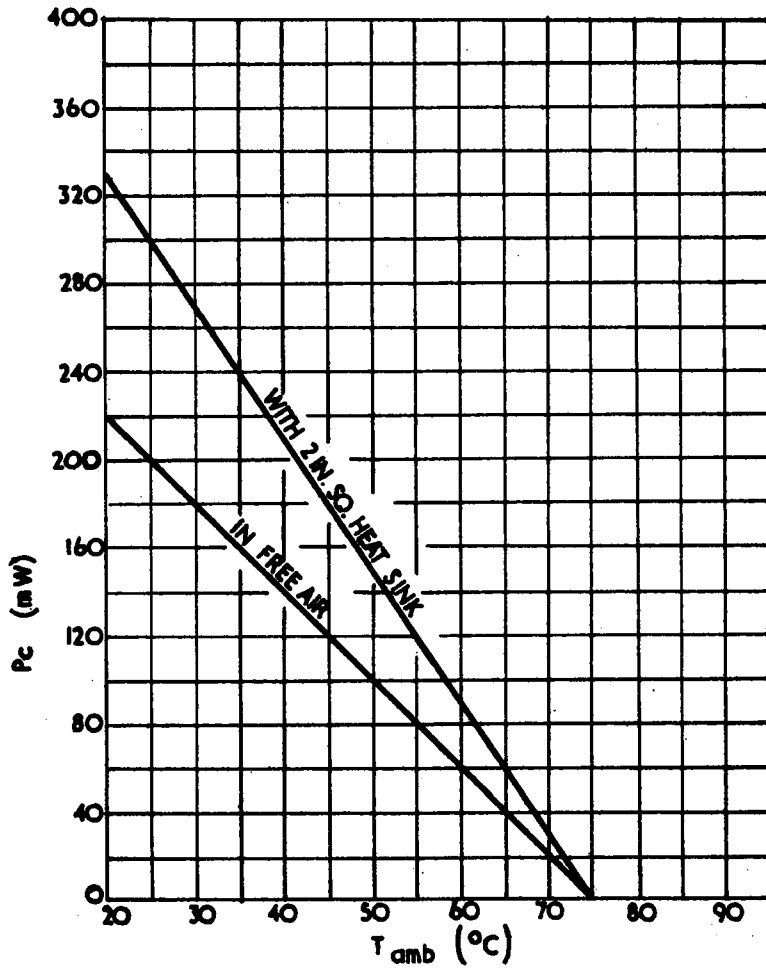
$$\text{Stored charge } Q_S = \frac{I_0 - I_f}{f}$$

where I_f = current reading on meter with $I_f = 0$

I_0 = current reading on meter with $I_f = 2 \text{ mA}$

DERATING CURVE

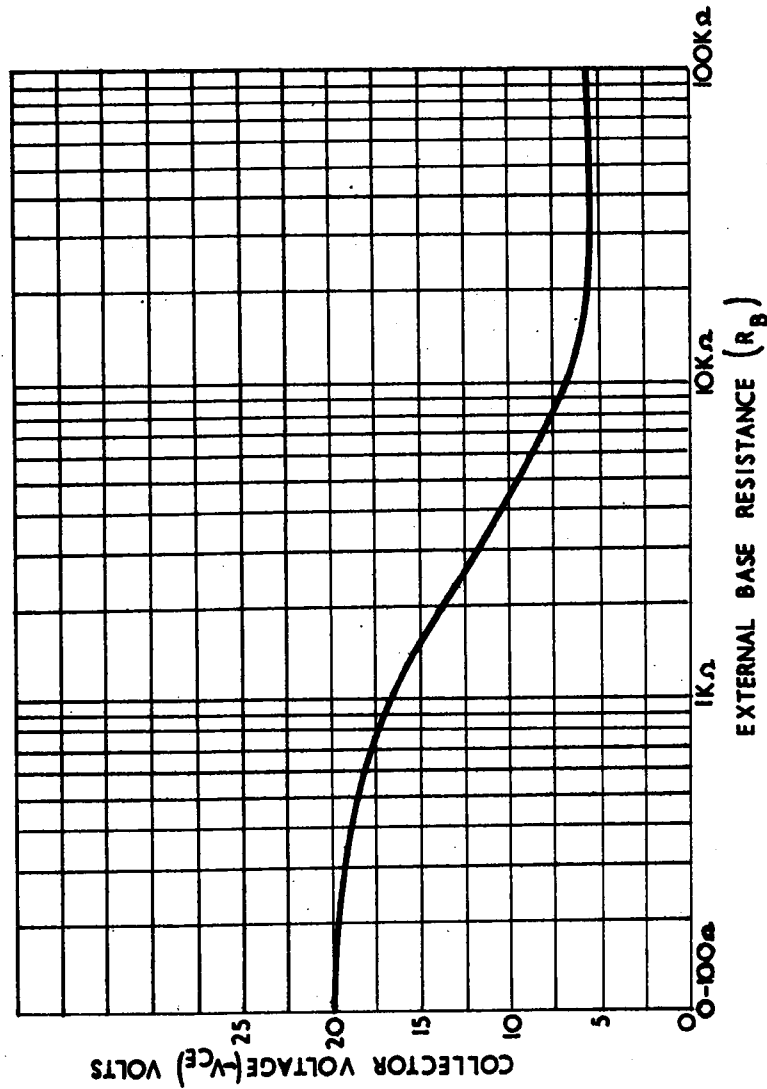
MAXIMUM COLLECTOR DISSIPATION



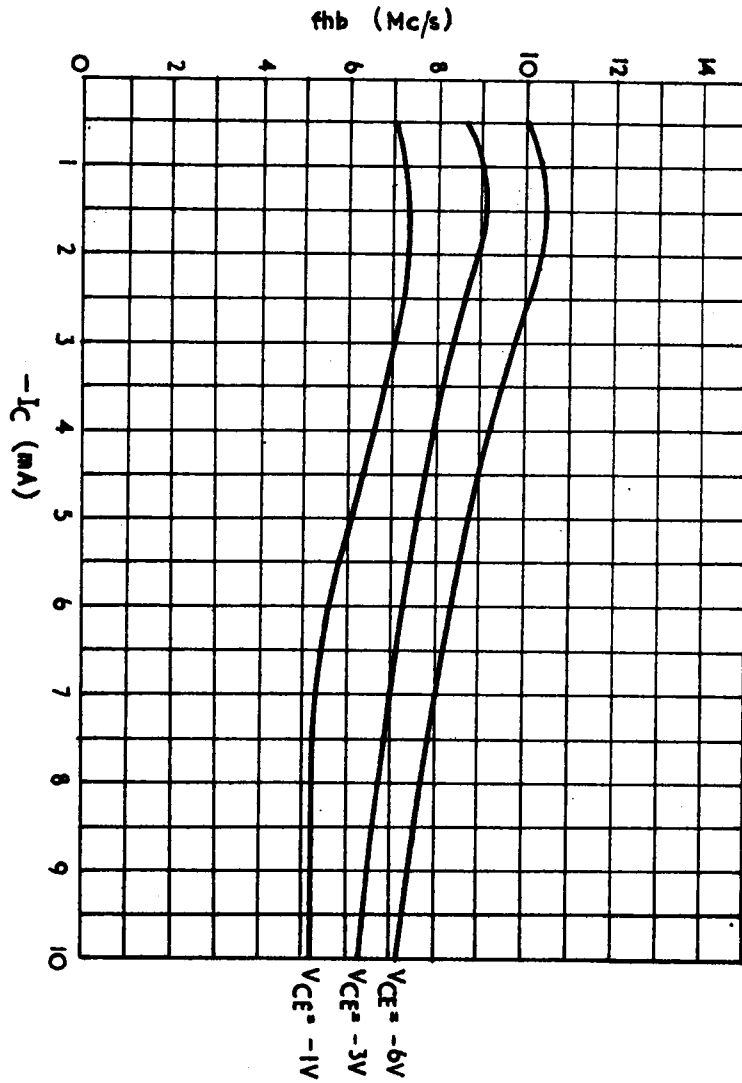
APPLICATION DATA FIG. 1.

VOLTAGE DERATING v EXTERNAL BASE RESISTANCE

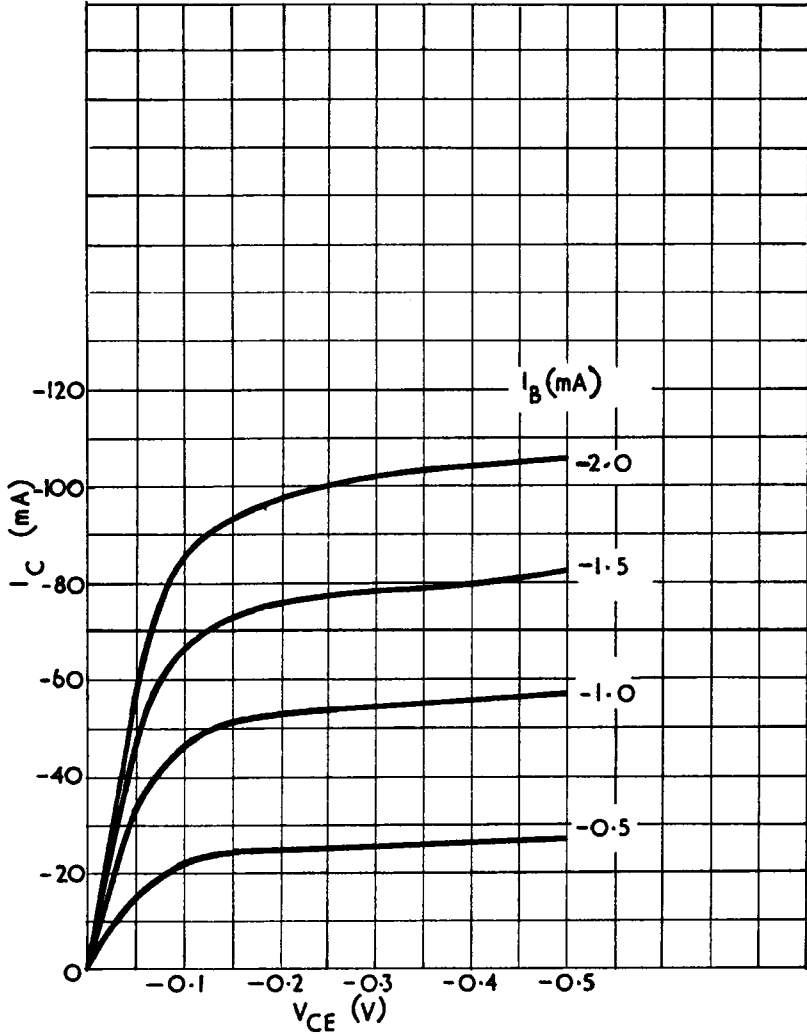
$T_{amb} = 25^{\circ}C$



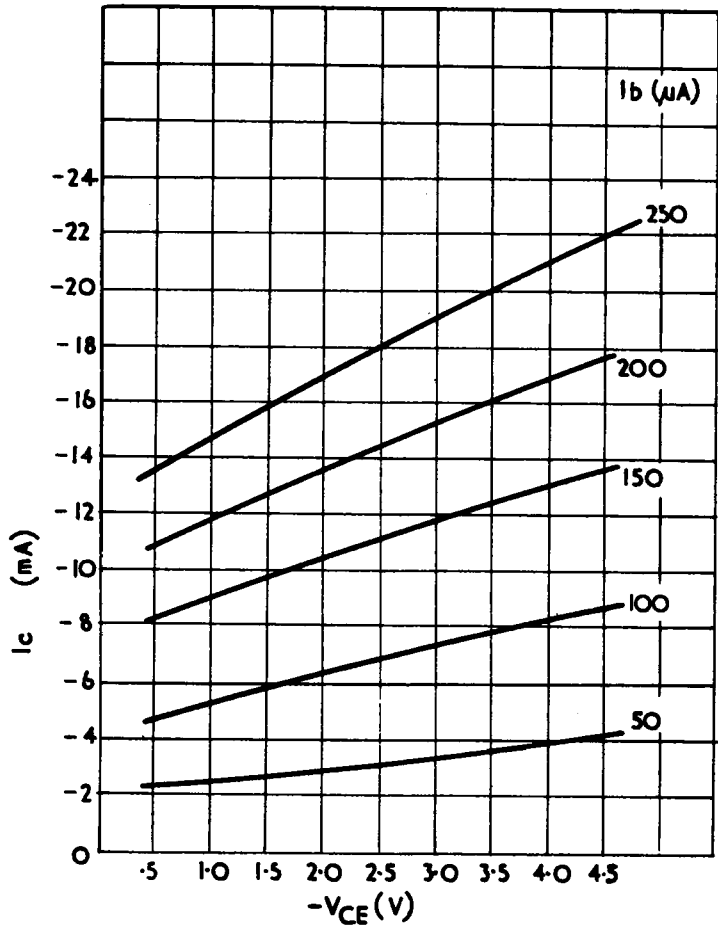
APPLICATION DATA FIG 2
TYPICAL VARIATION OF CUT-OFF FREQUENCY WITH OPERATING POINT
f_{hb} VERSUS I_C



APPLICATION DATA FIG. 3.
COLLECTOR CHARACTERISTIC UP TO -0.5V



APPLICATION DATA FIG. 4.
COLLECTOR CHARACTERISTIC UP TO -4.5V



APPLICATION DATA. FIG. 5.
TYPICAL VARIATION OF OUTPUT CAPACITANCE WITH OPERATING POINT.

