

ELECTRONIC VALVE SPECIFICATIONS

SPECIFICATION CV.7497

ISSUE NO. 1 DATED 3.3.1964

AMENDMENT NO. 1

Page 9

Noise Figure
Under specific conditions.

Delete $f = 1 \text{ Kc/s}$
 $B = 200 \text{ c/s}$

Insert $f = 10 \text{ Kc/s}$
 $B = 2 \text{ Kc/s}$

November, 1964
(229202)

Ministry of Aviation/S.R.D.E.

MILITARY SPECIFICATION

CV 7497

SEMICONDUCTOR DEVICE - TRANSISTOR

Description:- This specification covers the detail requirements for a Silicon Planar NPN General Purpose High Frequency Transistor and is in accordance with K.1007, Issue 3 except as otherwise stated.

Mechanical Dimensions and Outlines:- K.1007, Section B. 10.3.2.4 and 10.4.2.4.

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

Absolute Maximum Ratings:-

Rating	V _{CBO}	V _{CEO}	V _{EB0}	T _{stg}	T _{opr}	Shock	Vib	Total Dissipation		
								Case 25°C	Amb 25°C	Case 100°C
Unit	V	V	V	°C	°C	g	g	W	W	W
Min				-65	-65					
Max	60	45	5.0	+200	+200	1500	20	1.2	0.36	0.68
Note		1				4		2&3	2	2&3

Note 1 Rating refers to high current point where collector to emitter voltage is lowest.

2 Steady state limits.

3 These ratings give a maximum junction temperature of 200°C and a junction to case thermal resistance of 145°C/watt (derating factor of 6.9 mW/°C).

4 Duration 0.5 m sec.

5 Commercial equivalent C64.

CV7497

Primary Electrical Characteristics:-

Characteristic	I_{CBO}	I_{CBO}	h_{FE}	h_{FE}	V_{CE} (sat)	V_{BE} (sat)	f_T	C_{ob}	
Unit	nA	μ A	-	-	V	V	Mc/s	pF	
Min	-	-	65	30	-	0.7	250	2	
Max	10	30	200	-	1.0	0.9	500	4	
CONDITIONS	Temp. °C	25	150	25	-55	25	25	25	
	V_{CB} V	45	45					10	
	I_E mA	0	0						
	I_C mA			10	10	10	10	10	0
	V_{CE} V			5.0	5.0			15	
	I_B mA					1.0	1.0		
	f Mc/s							100	1.0

Characteristic	h_{fe}	h_{ie}	h_{oe}	C_{te}	BV_{EBO}	V_{CBO} (sust)	BV_{CBO}	
Unit		ohms	μ mho	pF	V	V	V	
Min	70	-	-	-	5	45	60	
Max	250	2000	125	10	-	-	-	
CONDITIONS	Temp. °C	25	25	25	25	25	25	
	I_C mA	5.0	5.0	5.0	0	0	10	0.1
	V_{CE} V	5.0	5.0	5.0	5.0			-
	I_E mA					0.1		0
	f Mc/s	0.001	0.001	0.001	1.0			
	I_B mA						0	

Requirements:-

Marking: The device shall be marked first with the CV number and then according to K.1007 Section B. 1.3.4.

Quality Assurance Provisions:-

Destructive Tests: The tests listed in Table 2, Group B Inspection Sub Groups 2, 3 and 4 and Table 3, Group C Inspection, 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 K.1007, Section A, 1.2(o).

Joint Service Catalogue Number:-

CV 7497. 5960-99-037-3758.

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

Ministry of Aviation, Signals Research and Development Establishment, Christchurch, Hampshire, England.

TABLE 1 GROUP A INSPECTION

Examination or Test	Test Conditions		AQL %	Insp. Level	Symbol	Limits		Units
	K.1007/ NATO Ref.	Specific Conditions				Min	Max	
SUB GROUP 1 Visual and Mechanical Inspection	5.1		0.65	I				
SUB GROUP 2 Collector - Base Cut-off Current (1)	7.2.5.1	$V_{CB} = 45V$ $I_E = 0$ $I_C = 10mA$ $V_{CE} = 5.0V$ $t_p = 300\mu s$ Duty cycle = $\leq 1.0\%$	0.65	II	I_{CBO}	-	10	nA
Static Forward Current Transfer Ratio (1)	7.3.4				h_{FE}	65	200	
Collector-Emitter Sustaining Voltage	7.2.2.2	$I_C = 10mA$ $I_B = 0$ $t_p = 300\mu s$ Duty cycle = $\leq 1.0\%$			V_{CEO} (sust)	45	-	V
Collector-Emitter Saturation Voltage	7.3.3	$I_C = 10mA$ $I_B = 1.0mA$			V_{CE} (sat)	-	1.0	V
SUB GROUP 3 Base-Emitter Saturation Voltage	7.3.1	$I_C = 10mA$ $I_B = 1.0mA$	2.5	I	V_{BE} (sat)	0.7	0.9	V

TABLE 1 GROUP A INSPECTION (Cont'd)

Examination or Test	K.1007/ NATO Ref.	Test Conditions		AQL %	Insp. Level	Symbol	Limits		Units
		Specific Conditions					Min	Max	
<u>SUB GROUP 3 (Cont'd)</u>									
Emitter-Base Breakdown Voltage	7.2.3	$I_C = 0$ $I_E = 0.1mA$				V_{EBO}	5.0	-	V
Collector-Base Breakdown Voltage	7.2.1	$I_C = 0.1mA$ $I_E = 0$				V_{CBO}	60	-	V
<u>SUB GROUP 4</u>				6.5	IA				
Collector-Base Cut-Off Current (2)	7.2.5.1	$V_{CB} = 45V$ $I_E = 0$ $T_{amb} = 150^\circ C$				I_{CBO}	-	30	μA
Static Forward Current Transfer Ratio (2)	7.3.4	$I_C = 10mA$ $V_{CE} = 5.0V$ $t_p = 300\mu s$ Duty cycle = $\leq 1.0\%$ $T_{amb} = -55^\circ C$				h_{FE}	30	-	
Static Forward Current Transfer Ratio (3)	7.3.4	$I_C = 1.0mA$ $V_{CE} = 5.0V$ $t_p = 300\mu s$ Duty cycle = $\leq 1.0\%$				h_{FE}	40	-	

TABLE 1 GROUP A INSPECTION (Cont'd)

Examination or Test	K.1007/ NATO Ref.	Test Conditions		AQL %	Insp. Level	Symbol	Limits		Units
		Specific Conditions					Min	Max	
SUB GROUP 4 (Cont'd) Static Forward Current Transfer Ratio (4)	7.3.4	I_C	= 100 μ A			h_{FE}	35	-	
		V_{CE}	= 5.0V						
		t_p	= 300 μ s						
		Duty cycle	= \leq 1.0%						
Base Emitter Saturation Voltage	7.3.1	I_C	= 1.0mA			V_{BE} (sat)	-	0.8	V
		I_B	= 0.1mA						
Output Capacitance	7.4.8	V_{CB}	= 10V			C_{ob}	2.0	4.0	pF
		I_C	= 0						
		f	= 1.0Mc/s						
Emitter Transition Capacitance		I_C	= 0			C_{te}	-	10	pF
		V_{BE}	= 0.5V						
		f	= 1.0Mc/s						

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

Examination or Test	Test Conditions		AQL %	Insp. Level	Symbol	Limits		Units
	K.1007/ 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	5.13		4.0	IA				
Temperature Cycling	5.5	-65°C to +200°C						
Moisture Resistance	5.3.1							
<u>SUB GROUP 3</u> Vibration Fatigue	5.15.1	Non-operating	4.0	IA				
Constant Acceleration	5.14.1	20,000g	4.0	IA				
<u>SUB GROUP 4</u> Lead Fatigue	5.10.1		6.5	IA				
<u>SUB GROUPS 5 & 6</u> Omitted								

TABLE 2 GROUP B INSPECTION (Cont'd)

Examination or Test	Test Conditions		AQL %	Insp. Level	Symbol	Limits		Units
	K.1007/ NATO Ref.	Specific Conditions				Min	Max	
<u>SUB GROUP 7</u> <u>High Temperature Life</u> (non operating)	6.2.1	$T_{stg} = +200^{\circ}C$ Duration = 1000 hours	4.0	I				
	6.6.1.2.2							
<u>SUB GROUP 8</u> <u>Operating Life</u>	6.3	$T_{amb} = 25^{\circ}C$	4.0	IA				
	6.5	$P_C = 360mW$						
	6.6.1.1	$I_C = 25 - 40mA$						
	6.6.1.2.2	Duration = 1000 hours Note 1						
<u>Post Test End Points</u> <u>for Groups 2, 3, 7 & 8.</u> Collector Base	7.2.5.1	As in Group A, Sub Group 2			I_{CBO}	-	20	nA
	7.3.4	As in Group A. Sub Group 2			Δh_{FE}			$\pm 15\%$
Cut-off Current (1) Static Forward Current Transfer Ratio (1)								

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

Examination or Test	K.1007/ NATO Ref.	Test Conditions		AQL %	Insp. Level	Symbol	Limits		Units
		Specific Conditions					Min	Max	
SUB GROUP 1 Small Signal Forward Current Transfer Ratio	7.4.2	I_C	= 5mA	2.5	II	h_{FE}	70	250	
		V_{CE}	= 5.0V						
		f	= 1 Kc/s						
Transition Frequency	7.5.2	I_C	= 10mA	2.5		f_T	250	500	Mc/s
		V_{CE}	= 15V						
		f	= 100Mc/s						
Input Impedance	7.4.1	I_C	= 5mA			h_{ie}	-	2000	ohms
		V_{CE}	= 5V						
		f	= 1 Kc/s						
Output Admittance	7.4.4	I_C	= 5mA			h_{oe}	-	125	μ mho
		V_{CE}	= 5V						
		f	= 1 Kc/s						
Noise Figure	7.6.3	V_{CE}	= 5V			F	-	5	dB
		I_C	= 100 μ A						
		R_g	= 1000 Ω						
		f	= 1 Kc/s						
		B	= 200c/s						

TABLE 3 GROUP C INSPECTION (Cont'd)

Examination or Test	Test Conditions		AQL %	Insp. Level	Symbol	Limits		Units
	K.1007/ NATO Ref.	Specific Conditions				Min	Max	
<u>SUB GROUP 2</u> Shock (non operating) <u>Post Test End Points</u> As for GROUP B Sub Groups 2, 3, 7 & 8.	5.17.1	5 blows in each of 3 mutually perpendicular directions.	6.5	IA				

NOTES

- 1 Alternatively the life test may be carried out under the following conditions:-
 $V_{CB} = 10V$, T_{amb} between $25^{\circ}C$ and $150^{\circ}C$, P_{tot} max value given by the derating curve on page 11 corresponding to the chosen T_{amb} .

FIG. I.
DERATING CURVE.

