

ELECTRONIC VALVE SPECIFICATIONS

SPECIFICATION CV.7477

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

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

November, 1964

N.229200.

MILITARY SPECIFICATION

CV7477

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_{EBO}	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 C63.

CV7477

Primary Electrical Characteristics

Characteristic		I_{CBO}	I_{CBO}	h_{FE}	h_{FE}	V_{CE} (sat)	V_{BE} (sat)	f_T	C_{ob}
Unit		nA	μA	-	-	V	V	Mc/s	pF
Min		-	-	40	20	-	0.7	250	2
Max		10	30	110	-	1.0	0.9	500	4
CONDITIONS	Temp. °C	25	150	25	-55	25	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_{CEO} (sust)	BV_{CBO}
Unit			ohms	μmho	pF	V	V	V
Min		40	-	-	-	5	45	60
Max		150	1600	100	10	-	-	-
CONDITIONS	Temp. °C	25	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	0.5			-
	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(c).

Joint Service Catalogue Number:

CV 7477 5960-99-037-3669.

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	Sym- bol	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	$V_{CB} = 45V$ $I_E = 0$	0.65	II	I_{CBO}	-	10	nA
Static Forward Current	7.3.4	$I_C = 10mA$			h_{FE}	40	110	
Transfer Ratio (1)		$V_{CE} = 5.0V$ $t_p = 300\mu s$ Duty cycle = $\leq 1.0\%$						
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_{CE0} (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 (1)	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	Test Conditions		AQL %	Insp. Level	Sym-bol	Limits		UNITS
	K.1007/ NATO Ref	Specific Conditions				Min	Max	
SUB GROUP 3 (cont'd) Emitter-Base Breakdown Voltage Collector-Base Breakdown Voltage	7.2.3	$I_C = 0$	6.5	IA	BV_{EBO}	5.0	-	V
		$I_E = 0.1mA$						
	7.2.1	$I_C = 0.1mA$			BV_{CBO}	60	-	V
		$I_E = 0$						
SUB GROUP 4 Collector-Base Cut-off Current (2)	7.2.5.1	$V_{CB} = 45V$			I_{CBO}	-	30	μA
		$I_E = 0$						
	7.3.4	$T_{amb} = 150^\circ C$			h_{FE}	20	-	
		$I_C = 10mA$						
Static Forward Current Transfer Ratio (2)	7.3.4	$V_{CE} = 5.0V$						
		$t_p = 300\mu s$						
	7.3.4	Duty cycle = $\leq 1.0\%$			h_{FE}	30	-	
		$T_{amb} = -55^\circ C$						
Static Forward Current Transfer Ratio (3)	7.3.4	$I_C = 1.0mA$						
		$V_{CE} = 5.0V$						
	7.3.4	$t_p = 300\mu s$						
		Duty cycle = $\leq 1.0\%$						

TABLE 1 GROUP A INSPECTION

Examination or Test	Test Conditions		AQL %	Insp. Level	Sym-bol	Limits		UNITS
	K.1007/ NATO Ref	Specific Conditions				Min	Max	
SUB GROUP 4 (cont'd) Static Forward Current Transfer Ratio (4)	7.3.4	$I_C = 100\mu A$			h_{FE}	20	-	
		$V_{CE} = 5.0V$						
		$t_p = 300\mu s$						
		Duty cycle = $\leq 1.0\%$						
Base Emitter	7.3.1	$I_C = 1.0mA$			$V_{BE}(sat)$	-	0.8	V
Saturation Voltage (2)		$I_B = 0.1mA$						
Output Capacitance	7.4.8	$V_{CB} = 10V$			C_{ob}	2.0	4.0	pF
		$I_C = 0$						
		$f = 1.0Mc/s$						
Emitter Transition		$I_C = 0$			C_{te}	-	10	pF
Capacitance		$V_{BE} = 0.5V$						
		$f = 1.0Mc/s$						

TABLE 2 GROUP B INSPECTION

See Page 3 Quality Assurance Provisions Destructive Tests

Examination or Test	Test Conditions		AQL %	Insp. Level	Sym- bol	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	5.10.2		6.5	IA				
<u>SUB GROUPS 5 and 6</u> Omitted								

TABLE 2 GROUP B INSPECTION (cont'd)

Examination or Test	Test Conditions		AQL %	Insp. Level	Sym-bol	Limits		UNITS
	K.1007/ NATO Ref	Specific Conditions				Min	Max	
SUB GROUP 7 High Temperature Life (non operating)	6.2.1	$T_{stg} = +200^{\circ}\text{C}$ Duration = 1000 hours	4.0	I				
	6.6.1.2.2							
	6.3	$T_{amb} = 25^{\circ}\text{C}$	4.0	IA				
	6.5	$P_C = 360\text{mW}$						
	6.6.1.1	$I_C = 25 - 40\text{mA}$						
SUB GROUP 8 Operating Life	6.6.1.2.2	Duration = 1000 hours						
		Note 1.						
	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}		$\pm 15\%$	
Post Test End Points for Groups 2, 3, 7 & 8								
Collector Base								
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	Test Conditions		AQL %	Insp. Level	Sym-bol	Limits		UNITS
	K.1007/ NATO Ref	Specific Conditions				Min	Max	
SUB GROUP 1 Small Signal Forward Current Transfer Ratio	7.4.2	$I_C = 5mA$	2.5	II	h_{fe}	40	150	
		$V_{CE} = 5.0V$						
		$f = 1 \text{ kc/s}$						
Transition Frequency	7.5.2	$I_C = 10mA$	2.5	II	f_T	250	500	Mc/s
		$V_{CE} = 15V$						
		$f = 100Mc/s$						
Input Impedance	7.4.1	$I_C = 5mA$	2.5	II	h_{ie}	-	1600	ohms
		$V_{CE} = 5V$						
		$f = 1 \text{ kc/s}$						
Output Admittance	7.4.4	$I_C = 5mA$	2.5	II	h_{oe}	-	100	$\mu \text{ mho}$
		$V_{CE} = 5V$						
		$f = 1 \text{ kc/s}$						
Noise Figure	7.6.3	$V_{CE} = 5V$	2.5	II	F	-	5	dB
		$I_C = 100\mu A$						
		$R_g = 1000\Omega$						
		$f = 1 \text{ kc/s}$						
		$B = 200 \text{ c/s}$						

TABLE 3 GROUP C INSPECTION (cont'd)

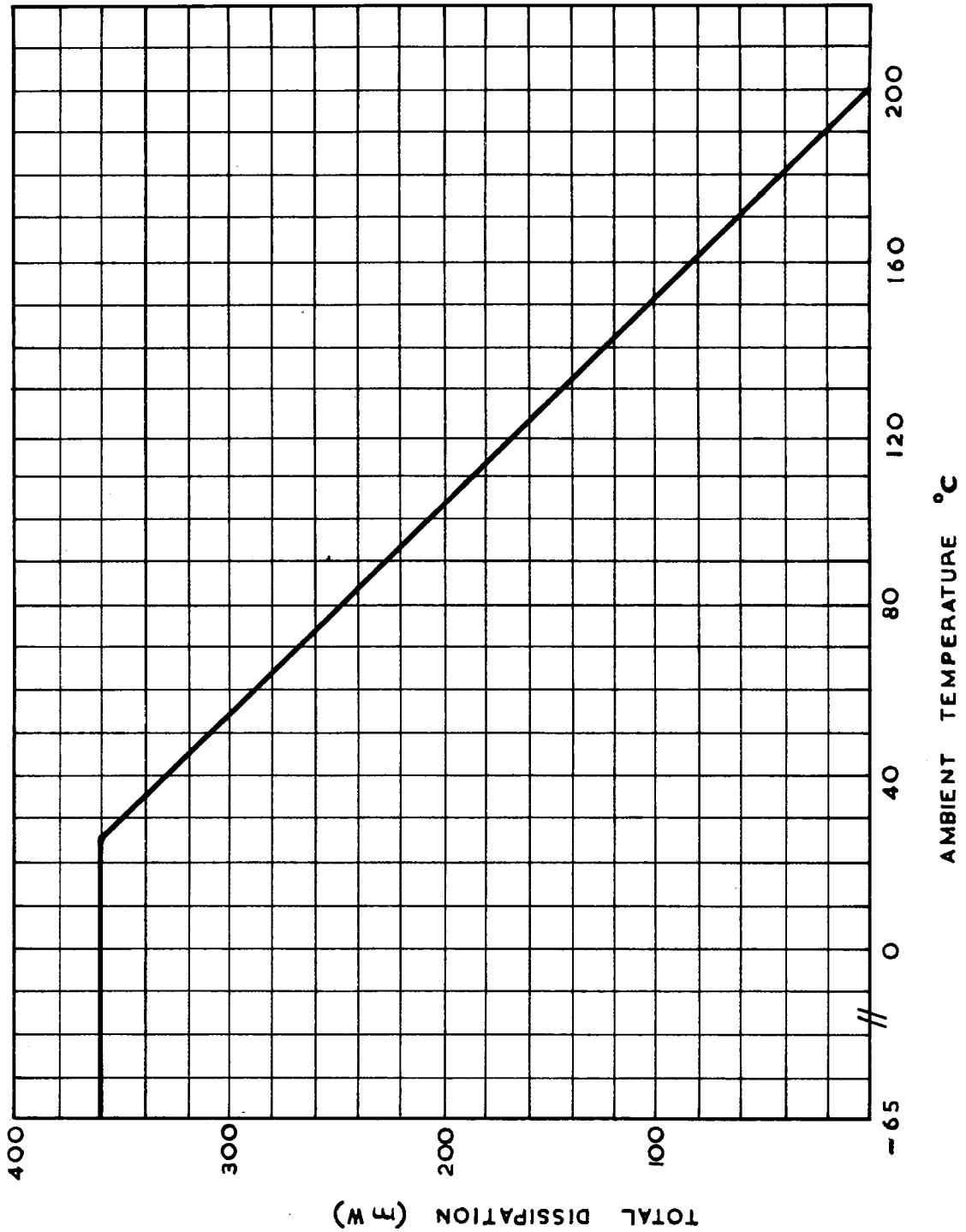
Examination or Test	Test Conditions		AQL %	Insp. Level	Sym- bol	Limits		UNITS
	K.1007/ NATO Ref.	Specific Conditions				Min	Max	
SUB GROUP 2 Shock (non operating)	5.17.1	5 blows in each of 3 mutually perpen- dicular directions	6.5	IA				
Post Test End Points As for GROUP B Sub Groups 2,3,7 & 8								

NOTES

1. Alternatively the 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



3RD MARCH 1964.

PAGE II