

ELECTRONIC VALVE SPECIFICATIONS

SPECIFICATION CV 7493 ISSUE 1 DATED 12TH DEC. 1963

AMENDMENT NO. 1

Page 8. Against 6.6.1.2.2. Under "Specific Conditions"

Delete: +75°C
Insert: +25°C

Under K1007/NATO Ref.

Delete: 6.6.1.2.2.
Insert: 6.6.1.2.1.

/Page 9.

P.T.O.

Page 9. Against 7.4.1. in Min. and Max. Cols.

Delete: 30 Min. 70 Max.

Insert: 5 Min. 15 Max.

Against 7.4.3. in Max. Col.

Delete: 6.5×10^{-4} Max.

Insert: 9×10^{-4} Max.

Against 7.4.4. in Min. and Max. Cols.

Delete: 15 Min. 17 Max.

Insert: 7 Min. 25 Max.

Ministry of Aviation/R.R.E.

February 1965.

NM.253655

MILITARY SPECIFICATION
CV 7493
SEMICONDUCTOR DEVICE, TRANSISTORS
2N930

Description:- This specification covers the detail requirements for Silicon Planar NPN transistors intended for low level, low noise amplifier applications and is in accordance with K1007 Issue 3 except as otherwise stated.

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

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

Absolute Maximum Ratings:-

RATING	V _{CB}	V _{CE}	V _{EB}	I _C	I _B	I _E	P _{tot}	T _{opr}	T _{stg}	Shock	Vibration
UNIT	V	V	V	mA	mA	mA	mW	°C	°C	g	g
MIN	-	-	-	-	-	-	-	-	-65	-	-
MAX.	45	45	5	30	5	35	300	175	+200	1500	20
NOTE							A			B	

- Notes: A See derating curve Fig. 1 Page 12.
B Duration 0.5 mS.
C Commercial equivalent 2N930

(222047)

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Primary Electrical Characteristics:-

Characteristic		$I_{CES(1)}$	$I_{CES(2)}$	h_{FE}	V_{CE} (sat)	f_T	C_{ob}	F
Unit		nA	μ A	-	V	Mc/s	pF	db
CV7493	Min.	-	-	100	-	30	-	-
	Max.	10	10	300	1.0	-	8	3
Conditions	T_{amb} °C	25	150	25	25	25	25	25
	V_{CB} V	-	-	-	-	-	5	5
	V_{CE} V	45	45	5	-	5	-	-
	V_{EB} V	0	0	-	-	-	-	-
	I_C mA	-	-	.01	10	0.5	-	0.01
	I_E mA	-	-	-	-	-	0	-
	I_B mA	-	-	-	0.5	-	-	-
f Mc/s	-	-	-	-	30	1	10c/s - 10Kc/s	

Reliability Assurance Requirements:- Under discussion

Requirements:-

Marking: The device shall be marked according to K1007, Issue 3. Section B 1.3.4 **Minimum requirements are 1.3.4.1 (a) and (c).**

Quality Assurance Provisions:-

Destructive Tests: The tests listed in Table 2, Group B Inspection, Sub Group 2 and 3 and 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 K1007 Issue 3. Section A.1.2 (c).

Joint Service Catalogue Numbers:-

CV7493 = 5960-99-037-3704

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

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

12th December, 1963

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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	II				
<u>SUB GROUP 2</u> Collector-emitter cut-off current (1)	7.2.5.4	$V_{CE} = 45V$ $V_{BE} = 0$	1.0	II	I_{CES}	-	10	nA
Collector-emitter cut-off current	7.2.5.2	$V_{CE} = 5V$ $I_B = 0$			I_{CEO}	-	2	nA
Emitter-base cut-off current	7.2.6	$V_{EB} = 5V$ $I_C = 0$			I_{EBO}	-	10	nA
Static Forward Current Transfer Ratio (1)	7.3.4	$V_{CE} = 5V$ $I_C = 10\mu A$			h_{FE}	100	300	
Collector-emitter Saturation Voltage	7.3.3	$I_C = 10mA$ $I_B = 0.5mA$ Pulse Duty cycle $\leq 2\%$ Pulse width $\leq 300 \mu s$			$V_{CE (sat)}$	-	1.0	V

TABLE 1 GROUP A INSPECTION (Cont'd)

Examination or Test	K1007/NATO Ref.	TEST CONDITIONS		AQL %	Insp Level	Sym-bol	LIMITS		Units
		SPECIFIC CONDITIONS					Min.	Max.	
<u>SUB GROUP 3</u> Static Forward Current Transfer Ratio (2)	7.3.4	$V_{CE} = 5V$	h_{FE}	4.0	I	h_{FE}	150	-	
		$I_C = 500 \mu A$							
Static Forward Current Transfer Ratio (3)	7.3.4	$V_{CE} = 5V$	h_{FE}	4.0	I	h_{FE}	200	600	
		$I_C = 10mA$ Pulse Duty Cycle $\leq 2\%$ Pulse width $\leq 300\mu S$							
Small Signal Forward Current Transfer Ratio	7.4.2	$V_{CE} = 5V$	h_{fe}	4.0	I	h_{fe}	150	-	
		$I_C = 1mA$ $f = 1Kc/s$							
Base-emitter Saturation Voltage	7.3.1	$I_C = 10mA$	V_{BE} (sat)	4.0	I	V_{BE} (sat)	-	1.0	V
		$I_B = 0.5mA$ Pulse Duty Cycle $\leq 2\%$ Pulse width $\leq 300 \mu S$							

TABLE 1 GROUP A INSPECTION (Cont'd)

Examination or Test	K1007/NATO Ref.	TEST CONDITIONS		AQL %	Insp Level	Sym-bol	LIMITS		Units
		SPECIFIC CONDITIONS					Min.	Max.	
Noise Figure		$V_{CE} = 5V$ $I_C = 10\mu A$ $R_g = 10K\Omega$ Bandwidth 10c/s - 10Kc/s				F	-	3	dB
<u>SUB GROUP 4</u> Collector-emitter cut-off current (2)	7.2.5.4	See Note 3 $T_{amb} = 150^\circ C$ $V_{CE} = 45V$ $V_{BE} = 0$	IA	4		I_{CES}	-	10	μA
Static Forward Current Transfer Ratio (4)	7.3.4	$T_{amb} = 55^\circ C$ $V_{CE} = 5V$ $I_C = 10\mu A$				h_{FE}	20	-	
Small Signal Forward Current Transfer Ratio	7.5.2	$V_{CE} = 5V$ $I_C = 500\mu A$ $f = 30Mc/s$				h_{fe}	1		
Collector Base Capacitance	7.4.8	$V_{CB} = 5V$ $I_E = 0$ $f = 1 Mc/s$				C_{ob}	-	8	pF

TABLE 2 GROUP B INSPECTION
See Page 3. Quality Assurance Provisions

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	5.13		4.0	IA				
Temperature Cycling	5.5	-65°C to +200°C						
Moisture Resistance	5.3							
<u>SUB GROUP 3</u> Vibration Fatigue	5.15.1		4.0	IA				
Lead Fatigue	5.10.2	3 cycles	6.5	IA				
<u>SUB GROUP 5</u> Omitted								
<u>SUB GROUP 6</u> Omitted								
<u>SUB GROUP 7</u> High Temperature	6.2.1	T _{stg} = 200°C	4.0	I				Note 1
Life	6.6.1.2.2	Duration 1000 hours						

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.	
SUB GROUP 8 Operating Life	6.3	<p>T_{amb} at any single temperature between $+75^{\circ}C$ and $+150^{\circ}C$. $V_{CB} = 30V$ min. P_{tot} corresponding to the appropriate temperature on the derating curve. Duration 1000 hours.</p>	4.0	IA					
	6.6.1.2.2								
<u>Post Test End Points for Sub Groups 2, 3 and 8</u> Collector-Emitter cut-off Current (1) Static Forward Current Transfer Ratio (1)	7.2.5.4	<p>$V_{CE} = 45V$ $I_E = 0$ $V_{CE} = 5V$ $I_C = 10\mu A$</p>			I _{CES}		-	20	nA
	7.3.4								

TABLE 3 GROUP C INSPECTION

See Page 3 Quality Assurance Provisions

Examination or Test	TEST CONDITIONS		AQL %	Insp Level	Sym- bol	LIMITS		Units
	K1007/NATO Ref.	SPECIFIC CONDITIONS				Min.	Max.	
<u>SUB GROUP 1</u> Collector-emitter Breakdown Voltage	7.2.2.1	$I_C = 10\text{mA}$ $I_B = 0$ Pulse duration $\leq 300 \mu\text{Sec}$ Duty Cycle $\leq 2\%$	1.0	II	EV_{CEO}	45		
Small-signal short- circuit input impedance	7.4.1	$V_{CE} = 5\text{V}$ $I_C = 1\text{mA}$ $f = 1 \text{Kc/s}$			h_{ie}	30	70	kohms
Small-signal open- circuit reverse voltage transfer ratio	7.4.3	$V_{CE} = 5\text{V}$ $I_C = 1 \text{mA}$ $f = 1 \text{Kc/s}$			h_{re}	-	6.5×10^{-4}	
Small-signal open- circuit output admittance	7.4.4	$V_{CE} = 5\text{V}$ $I_C = 1 \text{mA}$ $f = 1 \text{Kc/s}$			h_{oe}	15	17	μmhos
<u>SUB GROUP 2</u> Shock	5.17.1	Non operating. 5 blows in each of 3 mutually perpendicular directions	6.5	IA				

TABLE 3 GROUP C INSPECTION (Cont'd)

Examination or Test	K1007/NATO Ref.	TEST CONDITIONS SPECIFIC CONDITIONS	AQL %	Insp Level	Sym- bol	LIMITS		Units
						Min.	Max.	
<u>Post Test End Points</u> Collector-Emitter out- off Current (1) Static Forward Current Transfer Ratio (1)	7.2.5.4	$V_{CE} = 45V$ $I_E = 0$			I_{CES}	-	20	nA
	7.3.4	$V_{CE} = 5V$ $I_C = 10\mu A$			h_{FE}	80	360	

Fig 1

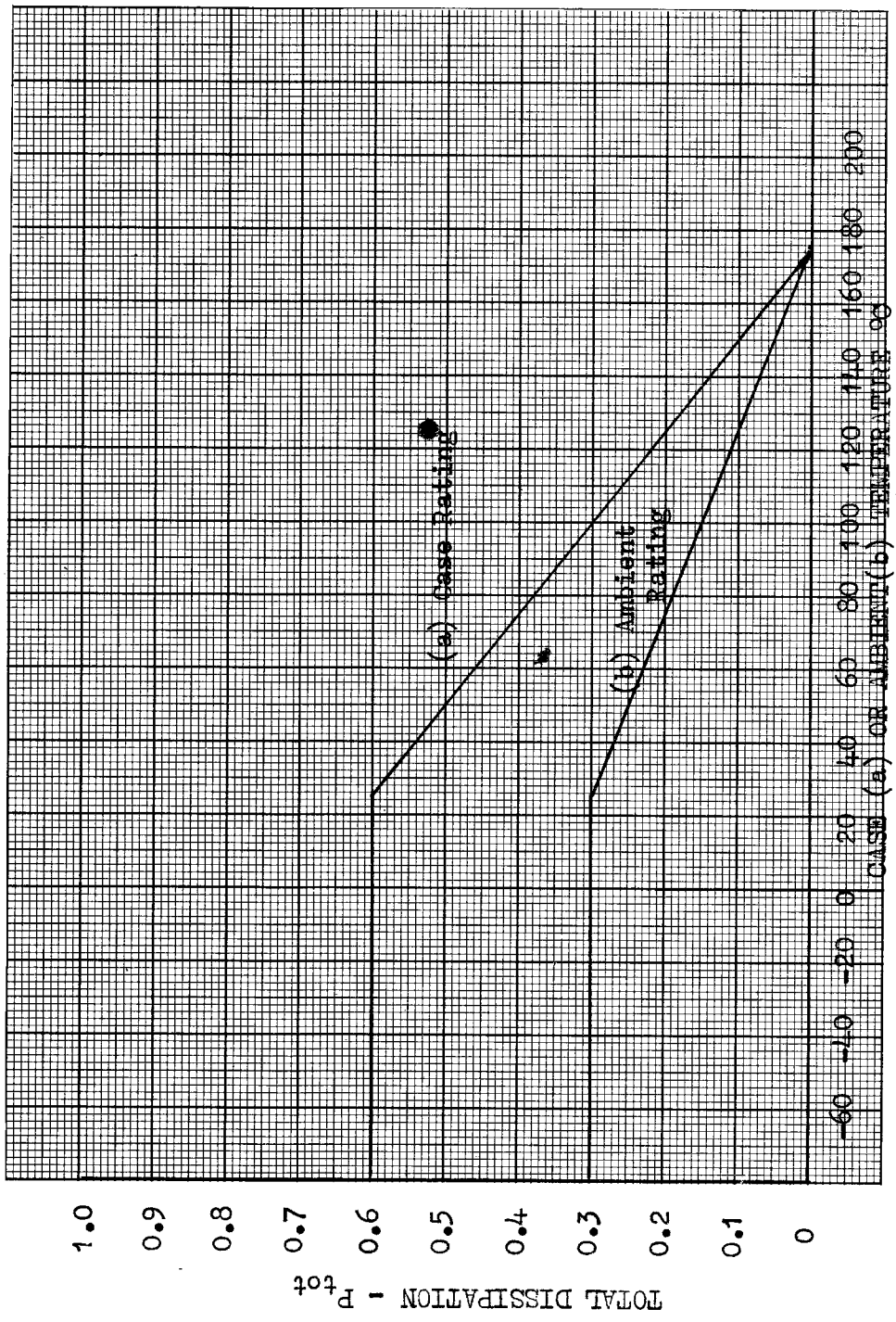


Fig 2

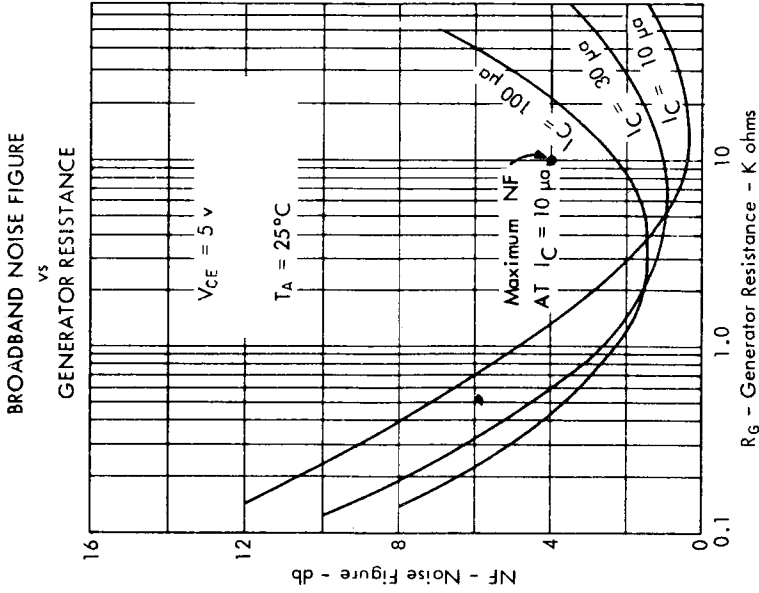
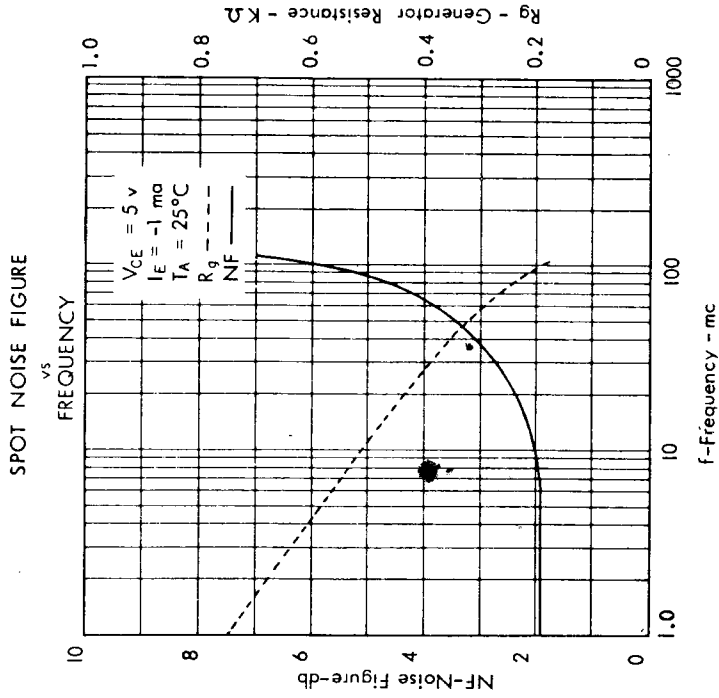


Fig 3



NOTE: R_g adjusted at each frequency to value shown on curve above.