

MILITARY SPECIFICATION

CV7588

SEMICONDUCTOR DEVICE - TRANSISTOR

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

Mechanical Dimensions and Outlines:- K.1007, Section B.10.3.1, 10.3.2.4, 10.4.1 and 10.4.2.4 except that dimension '1' shall be 1.4 inches (min.).

Connections:- Lead 1. Emitter, Lead 2. Base, Lead 3. Collector and Case.

Absolute Maximum Ratings:-

Rating	V _{CB}	V _{CE}	V _{EB}	I _C	I _{B(av)}	I _{B(pk)}	I _{E(av)}	I _{E(pk)}	P _{tot}
Unit	V	V	V	mA	mA	mA	mA	mA	mW
Min	-	-	-	-	-	-	-	-	-
Max	60	45	6	50	15	50	65	150	400
Note	1	1	1						2

Rating	T _{opr}	T _{stg}	Shock	Vibration
Unit	°C	°C	g	g
Min	-55	-55	-	-
Max	+175	+175	1500	20
Note			3	

- Note 1 - d.c. or peak.
 2 - See derating curve, Figure 1, Page 11.
 3 - Duration 0.5 m.sec.
 4 - Commercial prototype 2S104.

CV7588

Primary Electrical Characteristics:-

Characteristic	I_{CBO} (1)	I_{CBO} (2)	I_{EBO}	V_{CE} (sat)	h_{fe} (1)	h_{fe} (2)	f_T	C_{ob}	
Unit	nA	μ A	nA	V	-	-	Mc/s	pF	
Min	-	-	-	-	80	40	100	2	
Max	10	1.0	100	1.0	200	-	300	8	
Conditions	T_{amb} °C	25	100	25	25	25	-55	25	25
	V_{CB} V	60	60	-	-	-	-	-	5
	V_{CE} V	-	-	-	-	5	5	5	-
	V_{EB} V	-	-	6	-	-	-	-	-
	I_C mA	-	-	0	10	-	-	-	-
	I_E mA	0	0	-	-	5	5	5	0
	I_B mA	-	-	-	1.0	-	-	-	-
	f Mc/s	-	-	-	-	-	-	30	1.0

Reliability Assurance Requirements:- Under discussion.

Requirements

Marking 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 devices shall be packed according to K.1007, Section A, 1.2(c).

Joint Service Catalogue Number

5960-99-037-3915.

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

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

Sept. 29th, 1964

GROUP A INSPECTION

TABLE 1

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		0.65	I				
<u>SUB GROUP 2</u> Collector-Base Cut-Off Current (1)	7.2.5.1	$V_{CB} = 60V$ $I_E = 0$	0.65	II	I_{CBO}	10		nA
Small Signal Short Circuit Forward Current Transfer Ratio (1)	7.4.2	$V_{CE} = 5V$ $I_E = 5mA$ $f = 1 Kc/s$			h_{fe}	80	200	
Transition Frequency	7.5.2	$V_{CE} = 5V$ $I_E = 5mA$ $f = 30 Mc/s$			f_T	100	300	Mc/s
<u>SUB GROUP 3</u> Collector-Emitter Saturation Voltage	7.3.3	$I_C = 10mA$ $I_B = 1mA$	2.5	I	$V_{CE} (sat)$	-	1.0	V
Emitter-Base Cut-Off Current	7.2.6	$V_{EB} = 6V$ $I_C = 0$			I_{EBO}	-	100	nA

TABLE 1
GROUP A INSPECTION (Cont'd.)

Examination or Test	Test Conditions		AQL %	Insp. Level	Sym-bol	Limits		Units
	K1007/ NATO Ref.	Specific Conditions				Min	Max	
<u>SUB GROUP 4</u> Small Signal Short Circuit Forward Current Transfer Ratio (2)	7.4.2	As in Sub-Group 2 $T_{amb} = -55^{\circ}C$	4.0	IA	h_{fe}	40	-	
Collector-Base Cut-Off Current (2)	7.2.5.1	As in Sub-Group 2 $T_{amb} = +100^{\circ}C$			I_{CBO}	-	1.0	μA
Output Capacitance	7.4.8	$V_{CB} = 5V$ $I_E = 0$ $f = 1 Mc/s$			C_{ob}	2	8	pF

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
	K1007/ NATO Ref.	Specific Conditions				Min	Max	
<u>SUB GROUP 1</u> Physical Dimensions	5.1	According to 10.3 and 10.4, drawings 10.3.2.4 and 10.4.2.4 except that dimension 'l' shall be 1.4 inches (min).	6.5	IC				
<u>SUB GROUP 2</u> Solderability	5.13		4.0	IA				
Temperature Cycling	5.5	-55°C to +150°C						
Moisture Resistance	5.3							
<u>SUB GROUP 3</u> Vibration Fatigue	5.15.1		4.0	IA				
Constant Acceleration	5.14.1	20,000 g.	4.0	IA				
<u>SUB GROUP 4</u> Lead Fatigue	5.10.2	3 cycles	6.5	IA				
<u>SUB GROUP 5 and 6</u> Omitted								

TABLE 2 GROUP B INSPECTION (Cont'd.)

Examination or Test	K.1007/ NATO Ref.	Test Conditions		AQL %	Insp. Level	Sym- bol	Limits		Units
		Specific Conditions					Min	Max	
SUB GROUP 7 High Temperature Life (non-operating)	6.2.1	$T_{stg} = +150^{\circ}C$		4.0	I				
	6.6.1.2.2	Duration = 1000 hours							
SUB GROUP 8 Operating Life (1)	6.3	T_{amb} at any single temperature between $25^{\circ}C$ and $125^{\circ}C$ with the corresponding P_{tot} given by the derating curve Page 11.		4.0	III				
		$V_{CE} = 30V$ (min) Duration = 72 hrs. (min)							
POST TEST END POINTS FOR SUB GROUPS 2, 3 and 7. Collector-Base Cut-Off Current (1)	7.2.5.1	As in Group A Sub-Group 2				I_{CBO}	-	50	nA

TABLE 2 GROUP B INSPECTION (Cont'd)

Examination or Test	K.1007/ NATO Ref.	Test Conditions Specific Conditions	AQL %	Insp. Level	Sym- bol	Limits		Units
						Min	Max	
Small Signal Short Circuit Forward Current Transfer Ratio (1)	7.4.2	As in Group A Sub-Group 2			h_{fe}	68	230	
<u>POST OPERATING LIFE (1)</u> <u>TEST END POINTS</u> Collector-Base Cut-Off Current (1)	7.2.5.1	As in Group A Sub-Group 2	0.65		I_{CBO}	-	50	nA
Small Signal Short Circuit Forward Current Transfer Ratio	7.4.2	As in Group A Sub-Group 2	0.65		h_{fe}	68	230	

TABLE 3

GROUP C INSPECTION

See Page 3. Quality Assurance Provision GROUP C Inspection

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> Omitted								
<u>SUB GROUP 2</u> Shock	5.17.1	Non-operating. 5 blows in each of 3 mutually perpendicular directions.	6.5	IA				
<u>SUB GROUP 3</u> Operating Life (2) (See Note 1)	6.3 6.6 4.5.2.1.1.1	As for Operating Life (1) Duration 1000 hrs. min.	4.0	IA				
<u>POST TEST END POINTS FOR SUB-GROUP 2.</u> Collector Base Cut-Off Current (1)	7.2.5.1	As in Group A Sub-Group 2			I _{CBO}	-	50	na
Small Signal Short Circuit Forward Current Transfer Ratio.	7.4.2	As in Group A Sub-Group 2			h _{fe}	68	230	

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	
<u>POST TEST END POINT FOR SUB GROUP 3.</u>								
Collector-Base Cut-Off Current (1)	7.2.5.1	As in Group A, Sub-Group 2			I _{CBO}	-	50	nA
Small Signal Short Circuit Forward Current Transfer Ratio.	7.4.2	As in Group A, Sub-Group 2			h _{fe}	-	+15	%

NOTES

1. K.1007, 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.

FIG. 1.
DERATING CURVE

