

MILITARY SPECIFICATION

CV 7462-3

SEMICONDUCTOR DEVICE TRANSISTORS

2N2411, 2N2412.

Description: This specification covers the detail requirements for PNP Silicon Planar Epitaxial High Speed Switching Transistors, 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, Lead 3 - Collector

Absolute Maximum Ratings:

Rating	V _{CB}	V _{CE}	V _{EB}	I _C	P _{tot}	T _{stg}	T _o	Shock	Vibration
Unit	V	V	V	mA	mW	°C	°C	g	g
Min.						-65			
Max.	25	20	5	100	300	+200	+200	1500	20
Note	A	A	A	A	B			C	

- Notes:**
- A Peak or d.c.
 - B At T_{amb} = 25°C See derating curve Fig. 1 Page 10.
 - C For 0.5ms

CV 7462-3

Primary Electrical Characteristics:

Characteristic		I_{CES} (1)	I_{CES} (2)	h_{FE}	V_{CE} (sat)	h_{fe}
Unit		nA	μ A	-	V	-
CV7462	Min.	-	-	20	-	1.4
	Max.	10	10	60	0.2	-
CV7463	Min.	-	-	40	-	1.4
	Max.	10	10	120	0.2	-
Conditions	T_{amb} °C	25	150	25	25	25
	V_{CE} V	-25	-25	-0.5	-	-10
	V_{BE} V	0	0	-	-	-
	I_C mA	-	-	-10	-10	-10
	I_B mA	-	-	-	-1	-
	f Mc/s	-	-	-	-	100

Reliability Assurance Requirements:- Under discussion

Requirements:

Marking The device shall be marked first with the CV number and then according to K1007 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 K1007, Section A, 1.2(c).

JOINT SERVICE CATALOGUE NUMBER

CV7462 = 5960-99-037-3609

CV7463 = 5960-99-037-3610

This specification has been prepared by, and the Qualification Approval Authority is:-
Ministry of Aviation, Royal Radar Establishment, Malvern, Worcs.

TABLE 1 GROUP A INSPECTION

Examination or Test	K1007/MATO Ref.	TEST CONDITIONS		AQL %	Insp. Level	Sym-bol	LIMITS		Units
		Special Conditions	Excluding Physical Dimensions				Min.	Max.	
<u>SUB GROUP 1</u> Visual and Mechanical Inspection	5.1			0.65	I				
<u>SUB GROUP 2</u> Collector-Emitter Cut-off Current	7.2.5.4	$V_{CE} = -25V$	$V_{EB} = 0$	1.0	II	I_{CES}	-	10	nA
Emitter-Base Cut-off Current	7.2.6	$V_{EB} = -5V$	$I_C = 0$			I_{EBO}	-	10	nA
Static Forward Current Transfer Ratio	7.3.4	$V_{CE} = -0.5V$ Duty Cycle 2% Pulse width 300 μS	$I_C = -10mA$ CV7462 CV7463			h_{FE}	20 40	60 120	- -
Collector Emitter Breakdown Voltage	7.2.2.2	$I_C = 10mA$ Pulse Test Duty cycle 2% Pulse width = 300 μS				BV_{CEO}	20	-	V
Collector-Emitter Saturation Voltage	7.3.3	$I_C = -10mA$ $I_B = -1mA$ Pulse test. Duty cycle 2% Pulse width = 300 μS				$V_{CE(sat)}$	-	0.2	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> Base-Emitter Voltage	7.3.1	$I_C = -10mA$ Pulse Test Duty cycle = 2% Pulse width = 300 μs	$I_B = -1mA$	4	I	V_{BE}	0.7 +	0.9	V
Short circuit forward current transfer ratio at high frequency	7.5.2	$V_{CE} = -10V$ $f = 100Mc/s$	$I_C = -10mA$			h_{fe}	1.4	-	-
Static forward current transfer ratio	7.3.4	$V_{CE} = -0.5V$ CV7462 CV7463	$I_C = 50 \mu A$			h_{FE}	10 20	- -	- -
Static forward current transfer ratio	7.3.4	$V_{CE} = -1V$ $I_C = 50mA$ Pulse Measurement Pulse width = 300 μs CV 74.6.2 CV 74.6.3				h_{FE}	10 20	- -	- -
Turn on time	-	See Figure 2 page 10				t_{on}	-	25	nS
Turn off time	-	See Figure 2 page 10				t_{off}	-	100	nS

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> Collector-Base Capacitance	7.4.8	$V_{CB} = -5V$ $I_E = 0$ $f = 1 \text{ Mc/s}$	4.0	1A	C_{ob}	-	5	pF
		$V_{EB} = -0.5V$ $I_C = 0$ $f = 1 \text{ Mc/s}$				-	8	pF
Emitter-Base Capacitance	-	$T_{amb} = 150^\circ C$ $V_{CE} = -25V$ $V_{EB} = 0$			I_{CES}	-	10	μA
Collector-Emitter Cut-off current	7.2.5.4	$T_{amb} = -55^\circ C$ $V_{CE} = -0.5V$ $I_C = -10mA$			h_{FE}	10	-	-
Static forward current transfer ratio	7.3.4	Pulse Test. Duty Cycle 2% Pulse width = 300 μs CV7462 CV7463				20	-	-

TABLE 2 GROUP B INSPECTION

Examination or Test	K1007/NATO Ref.	TEST CONDITIONS		AQL %	Insp. Level	Sym- bol	LIMITS		Units
		Specific Conditions					Min.	Max.	
<u>SUB GROUP 1</u> Physical Dimension	5.1	According to 10.3 and 10.4 drawings 10.3.2.4 and 10.4.2.4.		6.5	I _C				
<u>SUB GROUP 2</u> Solderability Temperature Cycling Moisture Resistance	5.1.3 5.5 5.3.1	-65°C to +200°C		4	IA				
<u>SUB GROUP 3</u> Vibration Fatigue	5.15.1			4	I Note 1				
<u>SUB GROUP 4</u> Lead Fatigue	5.10.1	3 cycles		6.5	IA				
<u>SUB GROUP 5</u> Omitted									
<u>SUB GROUP 6</u> Omitted									

TABLE 2 GROUP B 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 7</u> High Temperature Life (Non operating) Life-non operating	6.2.1	T _{stg} = 200°C Duration 1000 hours	4	1 Note 1				
	6.6.1.2.2							
<u>SUB GROUP 8</u> Operating life	6.3	T _{amb} at any single temperature between +25°C and +150°C with the corresponding P _{tot} given on the derating curve Fig. 1 Page 10. V _{CB} = 10V Min. Duration = 1000 hours.	4.0	IA				
	6.6.1.2.2							
Post Test End Points for Sub Groups 2, 3, 7, 8								
Collector Emitter cut off current	7.2.5.4	V _{CE} = -25V V _{EB} = 0			I _{CES}	-	50	nA
Static forward current transfer ratio	7.3.4	V _{CE} = -0.5V I _C = 10mA Pulse Test. Duty Cycle 2% Pulse width = 300 μs CV7462 CV7463			h _{FE}		16 32	72 144
								- -

TABLE 3 GROUP C INSPECTION

Examination or Test	TEST CONDITIONS		AQI %	Insp. Level	Sym- bol	LIMITS		Units
	K1007/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				
Post Test End Points		As Group B						

NOTES

1. Maximum sample size 125

FIG 1

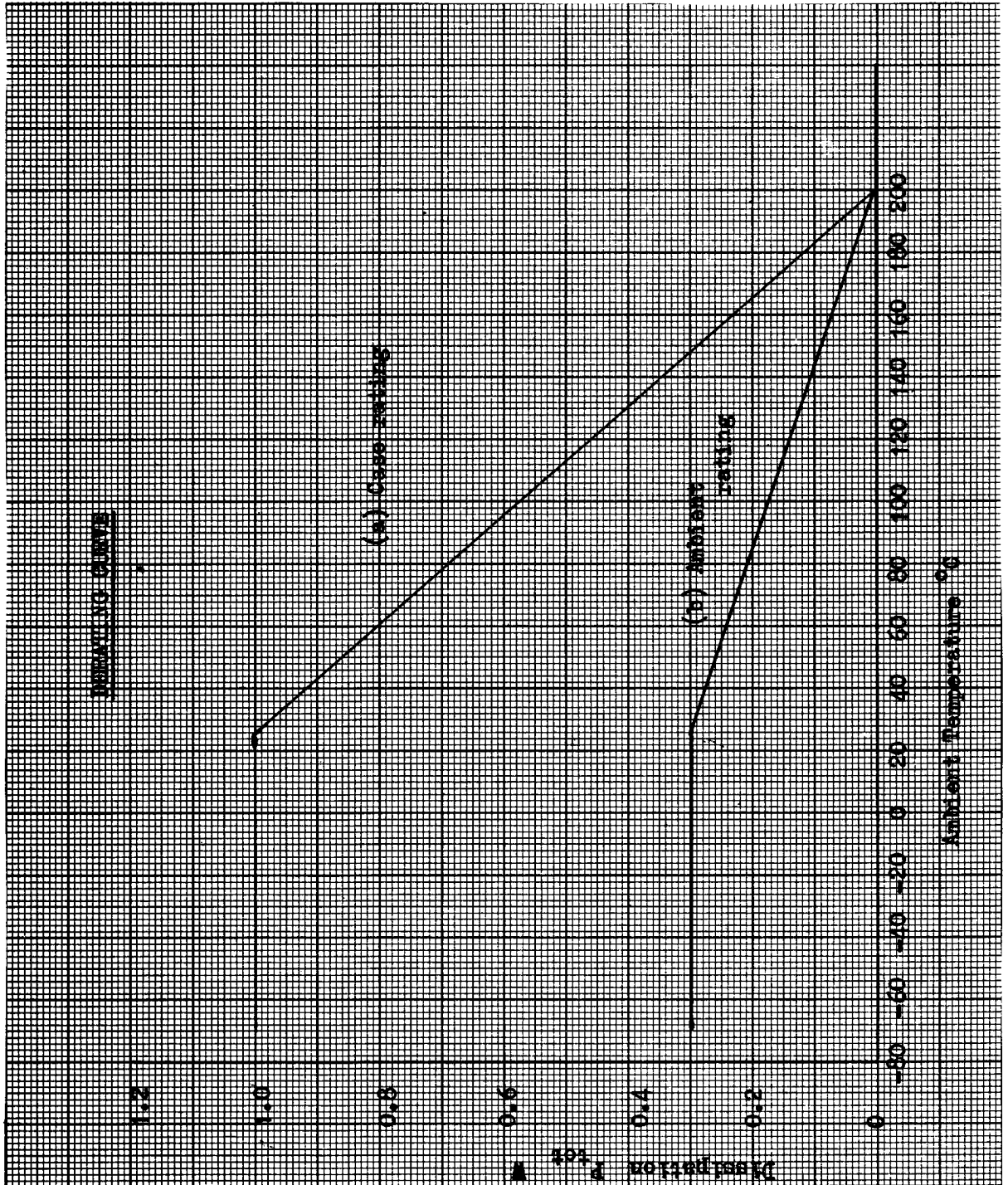


FIG 2

TEST CONDITIONS

Turn "on" time - t_{on}

$I_C = 10\text{mA}$

$I_{B1} = -2.5\text{mA}$

$V_{BE}(\text{off}) = +1.2\text{V}$

Turn "off" time - t_{off}

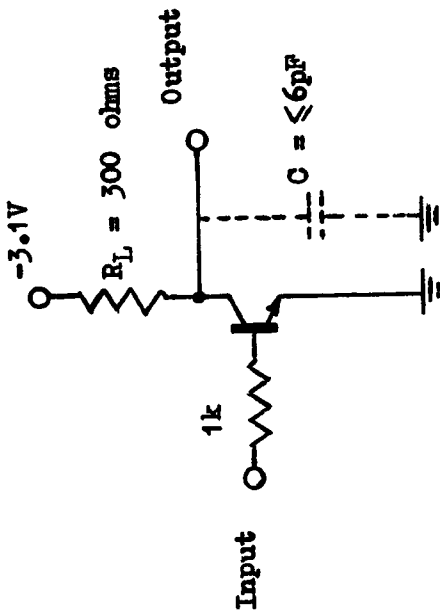
$I_C = 10\text{mA}$

$I_{B1} = -2.5\text{mA}$

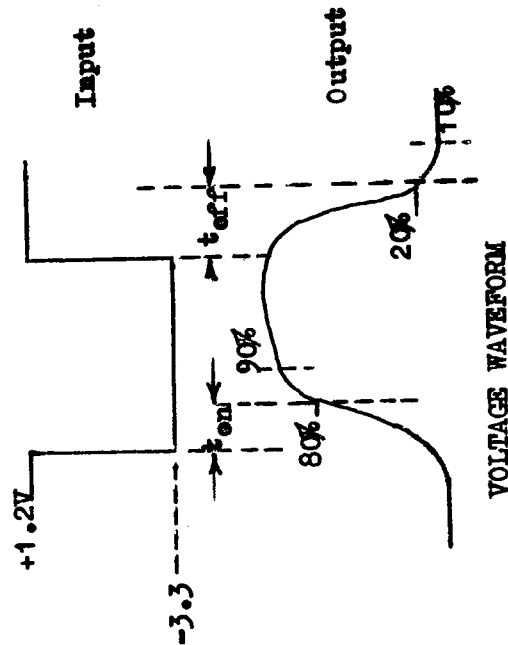
$I_{B2} = +2\text{mA}$

Note:-

- (a) Voltage and current values are nominal; exact values vary slightly with transistor parameters.
- (b) The 80% and 20% definitions for t_{ON} and t_{OFF} apply where a test set is used which defines the 100% value at more than 100 ns after pulse commencement, e.g. Lumatron 420.



SWITCHING TIME EQUIVALENT CIRCUIT



VOLTAGE WAVEFORM