VALVE ELECTRONIC
(SEMICONDUCTOR DEVICE)

ADMIRALTY SURFACE WEAPONS ESTABLISHMENT

Specification AD/CV7089.
Issue 1 Dated 1-5-61.
To be read in conjunction with K1007.
Mandatory Sections:- 1, 2, 3, 4, 5.1, 5.2, 5.3, 9 and 15. Other Sections and Appendices as called up by this specification.

SECURITY

Specification	Valve
Unclassified	Unclassified

TYPE OF VALVE: Germanium PNP Alloy Diffused Transistor.
CONSTRUCTION Metal Body.
PROTOTYPE: OC171.

MARKING

CV number and if possible Factory and Date Code. The Collector shall be indicated by a white spot on the body adjacent to the lead.

RATINGS AND CHARACTERISTICS
(Not for Inspection Purposes)

(All limiting values are absolute)

		NOTE
Max. Dissipation in free air at 55°C ambient (mW)	33	A
Max. negative collector - base voltage (V)	20	
Max. negative collector - emitter voltage. (V)	20	B
Max. reverse emitter - base voltage (V)	0.5	
Max. collector current (mA)	10	
Max. emitter current (mA)	10	
Max. reverse emitter current (mA)	1.0	
Typ. junction temperature rise above ambient (°C/mW)	0.6	
Max. Storage temperature (°C)	75	
Min. Storage temperature (°C)	-55	
Min. transition frequency (f_T) (Mc/s)	40	

CONNECTIONS

The leads shall be in line, the sequence being Collector, screen, base, emitter. The screen lead shall be connected to the metal case.

DIMENSIONS

See drawing on page 10.

MOUNTING POSITION

Any

PACKAGING

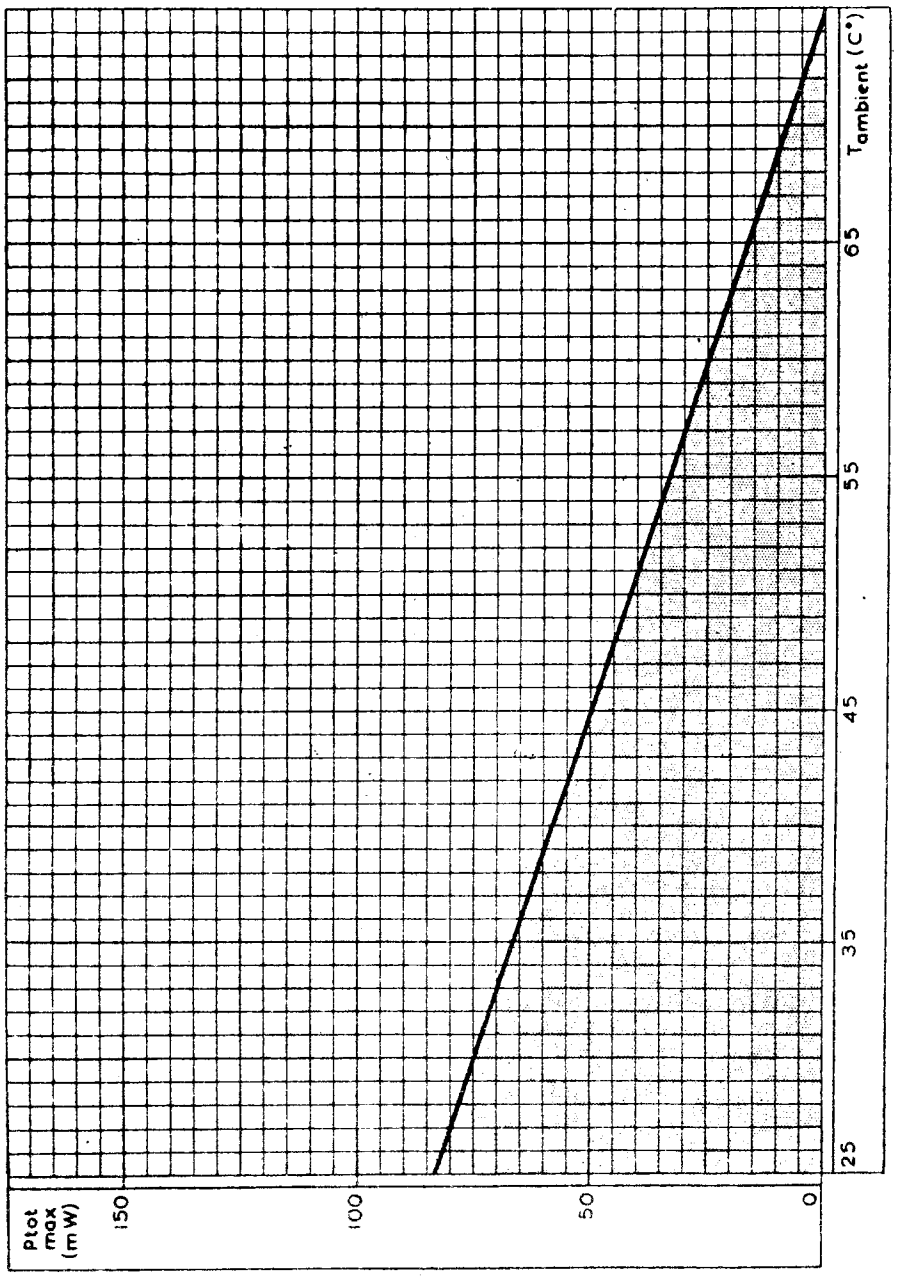
See K1007/14.

NOTES

A. See de-rating curve on page 2.

B. This rating applies when $\frac{R_b}{R_e} < 100$ and $R_e > 200\ \Omega$

C. The Joint Service Catalogue Number is: 5960-99-037-2207.



MAXIMUM TOTAL DISSIPATION PLOTTED AGAINST AMBIENT TEMPERATURE

FIG. 1.

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TESTS

K1007	Test	Test Conditions	AQL %	Insp. Level	Symbol	Limits Min.	Limits Max.	Units
	GROUP B							
5.D.2	Collector-base leakage current (1)	V_{CB} = - 6V I_E = 0	0.65	II	I_{CBO}	-	8	µA
	Collector-base leakage current (2)	V_{CB} = - 20V I_E = 0	0.65	II	I_{CBO}		50	µA
5.D.4.1	Static common emitter current gain (1)	V_{CB} = - 6V I_E = 1 mA	0.65	II	h_{FE}	40	-	
5.D.4.1	Static common emitter current gain(2)	V_{CB} = - 2V I_E = 10 mA	0.65	II	h_{FE}	-	400	
	Power Gain	f = 100 Mc/s Fig. 2 page 7.	0.65	II	P.G	10	-	dB
	GROUP C							
5.D.4	Small signal common emitter current gain.	V_{CE} = - 6V I_E = 1 mA d.c. and 0.25 mA a.c. r.m.s. max. superimposed f = 1 kc/s	2.5	I	h_{fe}	40	-	
5.D.2.2	Emitter-base leakage current	V_{BE} = 0.5V I_C = 0	2.5	I	I_{EBO}	-	30	µA
	Feedback Capacitance.	V_{CE} = - 6V I_E = 1 mA f = 450 kc/s Fig. 3 Page 8.	2.5	I	C_{re}	-	2.4	pF
	Feedback base impedance.	V_{CE} = - 6V I_E = 1 mA f = 2 Mc/s Fig. 4 page 9.	2.5	I	Z_{rb}	-	100	Ω
5.D.5.1	Transition frequency	V_{CE} = - 6V I_E = 1 mA f = 25 Mc/s min.	2.5	IA	f_T	40	-	Mc/s
	Noise Figure (1)	V_{CB} = - 6V I_C = 1 mA R_S = 500 Ω f = 10.7 Mc/s.	2.5	IA	N	-	8	dB

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TESTS (Contd.)

K1007	Test	Test Conditions	AQL %	Insp. Level	Symbol	Limits Min.	Limits Max.	Units
	GROUP C (Contd.)							
5.D.2	Collector-base Leakage Current (3)	V_{CB} = - 6V I_E = 0 T amb = 60°C	2.5	IA	I_{CBO}	-	50	µA
	GROUP D							
5.D.6	Noise Figure (2)	V_{CE} = - 6V I_E = 1 mA f = 1 kc/s	6.5	IC	N	-	33	dB
	GROUP E							
10.2	Temperature Cycling.	No voltages. Three cycles, - 55°C to + 75°C. Note 2.		IC				
10.3	Climatic Cycling.	No voltages.						
	Post temperature and climatic cycling tests	Combined AQL	10					
8	Inoperatives		6.5					
	Collector-base leakage current (2).	As in Group B	6.5		I_{CBO}		62	µA
5.D.4.1	Static common emitter current gain (1)	As in Group B	6.5		h_{FE}	35	-	
11.3	Fatigue	No voltages		IC				
	Post Fatigue tests	Combined AQL	10					
8	Inoperatives		6.5					
	Collector-base leakage current (2)	As in Group B	6.5		I_{CBO}		62	µA
5.D.4.1	Static common emitter current gain (1)	As in Group B	6.5		h_{FE}	35		
11.4	Shock	No voltages Hammer angle = 60°		TA				

Post Shock Tests/...

TESTS (CONTD.)

K1007	Test	Test Conditions	AQL %	Insp. Level	Sym-bol	Limits Min.	Limits Max.	Units
	Post Shock Tests	Combined AQL	10					
8	Inoperatives		6.5					
	Collector-base leakage current (2)	As in Group B	6.5		I_{CBO}		62	µA
5.D.4.1	Static common emitter current gain (1)	As in Group B	6.5		h_{FE}	35	-	
11.5	Soldering	No voltages	6.5	IC				
10.1	Lead Fragility	No voltages Note 1.	6.5	IC				
	GROUP F							
13	Life	V_{CE} = 10V T amb. not greater than +65°. PC = max value given by the derating curve, (Fig.1 page 2) corresponding to the chosen T amb.		IA				
13.3	Life Test and point 1000 hrs.	Combined AQL	6.5					
8	Inoperatives		4.0					
	Collector-base leakage current (2)	As in Group B	4.0		I_{CBO}		62	µA
5.D.4.1	Static common emitter current gain (1)	As in Group B	4.0		h_{FE}	35	-	
13.7.1	Change in average $\frac{1}{h_{FE}}$ between 24 hrs. and 1000 hrs.		4.0		$\Delta\frac{1}{h_{FE}}$ (AV)		0.00515	
13.3.3	Life test end points 240 hrs.							
8	Inoperatives	No voltages						
	Collector-base leakage current (2)	As in Group B			I_{CBO}		62	µA
5.D.4.1	Static common emitter current gain(1)	As in Group B.			h_{FE}	35	-	

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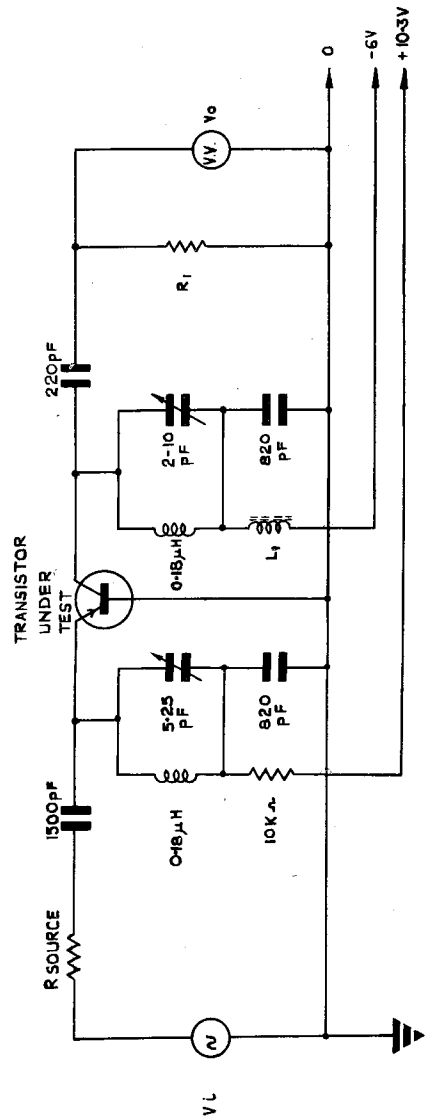
TESTS (CONTD.)

K1007	Test	Test Conditions	AQL %	Insp. Level	Symbol	Limits Min.	Limits Max.	Units
	GROUP F (Contd.)							
13.7.1	Change in average $\frac{1}{h_{FE}}$ between 24 and 240 hrs.				$\Delta \frac{1}{h_{FE}}$ (AV)		0.00285	
13.4	Storage Life (1)	No voltages. t = 150 hrs. T amb. = -55°C		I				
13.5	Storage Life (2)	No voltages. t = 150 hrs. T amb. = 75°C		I				
	Post Storage Life Tests	Combined AQL	2.5					
	Collector-base leakage current (2)	As in Group B			I_{CBO}		62	µA
5.D.4.1	Static common emitter current gain (1)	As in Group B			h_{FE}	35	-	
	GROUP G							
5.32.11	Re-test after 28 days holding period.			100%				
8	Inoperatives		0.5					
5.D.4.1	Static common emitter current gain (1).	As in Group B	2.0		h_{FE}	40		

NOTES

1. Transistors used for this test must have undergone at least 28 cycles of climatic cycling in accordance with K1007, Section 10.3.1 or 10.3.2 or 6 cycles in accordance with Section 10.3.3.

2. The sample of transistors shall be subjected to conditioning in accordance with K1007, Section 10.1 and shall then be subjected to temperature cycling and climatic cycling in sequence and shall then pass the post temperature and post climatic cycling tests.



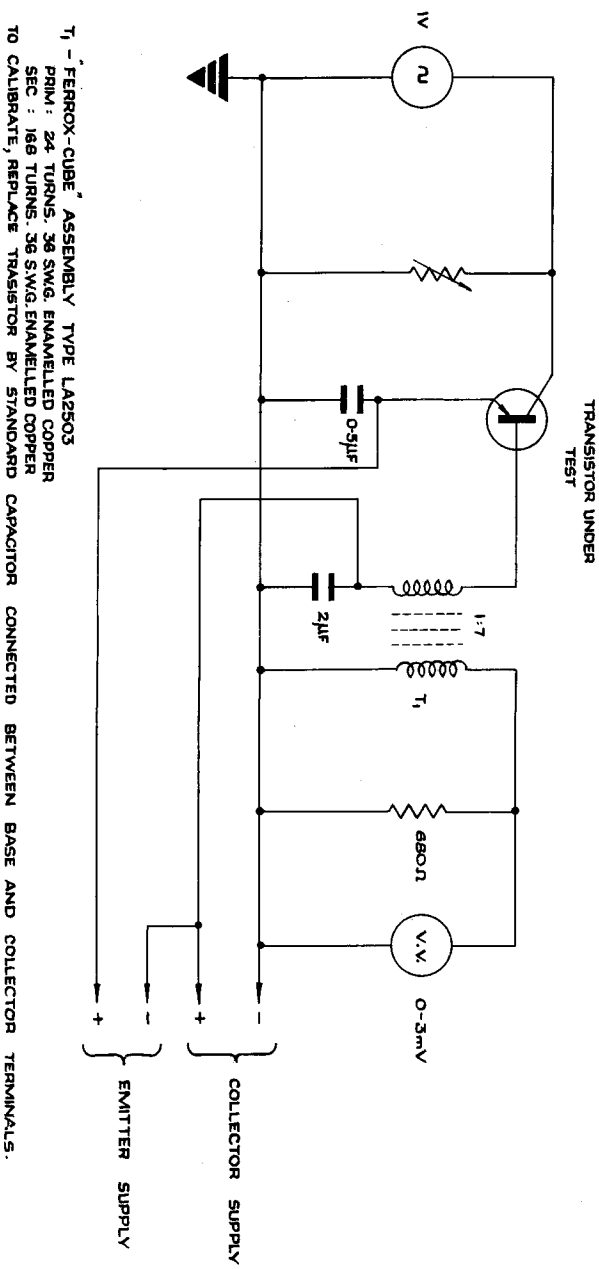
R SOURCE = 60 Ω

R_1 IS CHOSEN SO THAT THE TOTAL IMPEDANCE OF THE OUTPUT CIRCUIT (AS SEEN BY THE COLLECTOR) IS 33 K Ω

L_1 —— 3 TURNS WOUND THROUGH "FERROX-CUBE" BEAD TYPE FX 1898

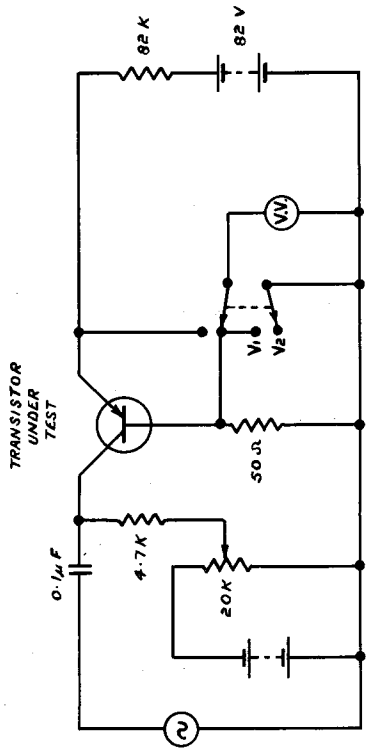
POWER GAIN = $10 \log \left(\frac{Vo}{Vi}\right)^2 \frac{4 R_{SOURCE}}{R_L}$

FIG 2. CIRCUIT FOR MEASURING 100 Mc/s POWER GAIN



T_1 - "FERROX-CUBE" ASSEMBLY TYPE LA2503
PRIM: 24 TURNS. 38 SW.G. ENAMELLED COPPER
SEC : 168 TURNS. 36 S.W.G. ENAMELLED COPPER
TO CALIBRATE, REPLACE TRASISTOR BY STANDARD CAPACITOR CONNECTED BETWEEN BASE AND COLLECTOR TERMINALS.

FIG. 3. CIRCUIT FOR MEASURING FEED-BACK CAPACITANCE



$$|Z_{rb}| = \frac{V_1}{V_2} 50\Omega$$

FIG. 4. CIRCUIT FOR MEASURING FEEDBACK BASE IMPEDANCE

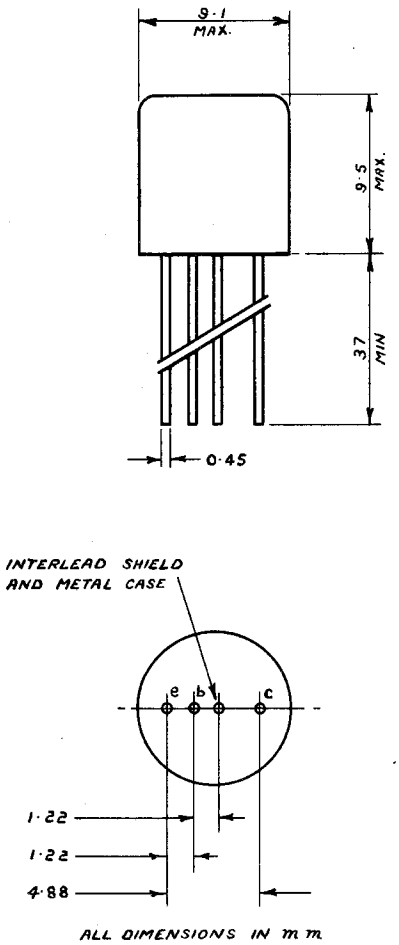
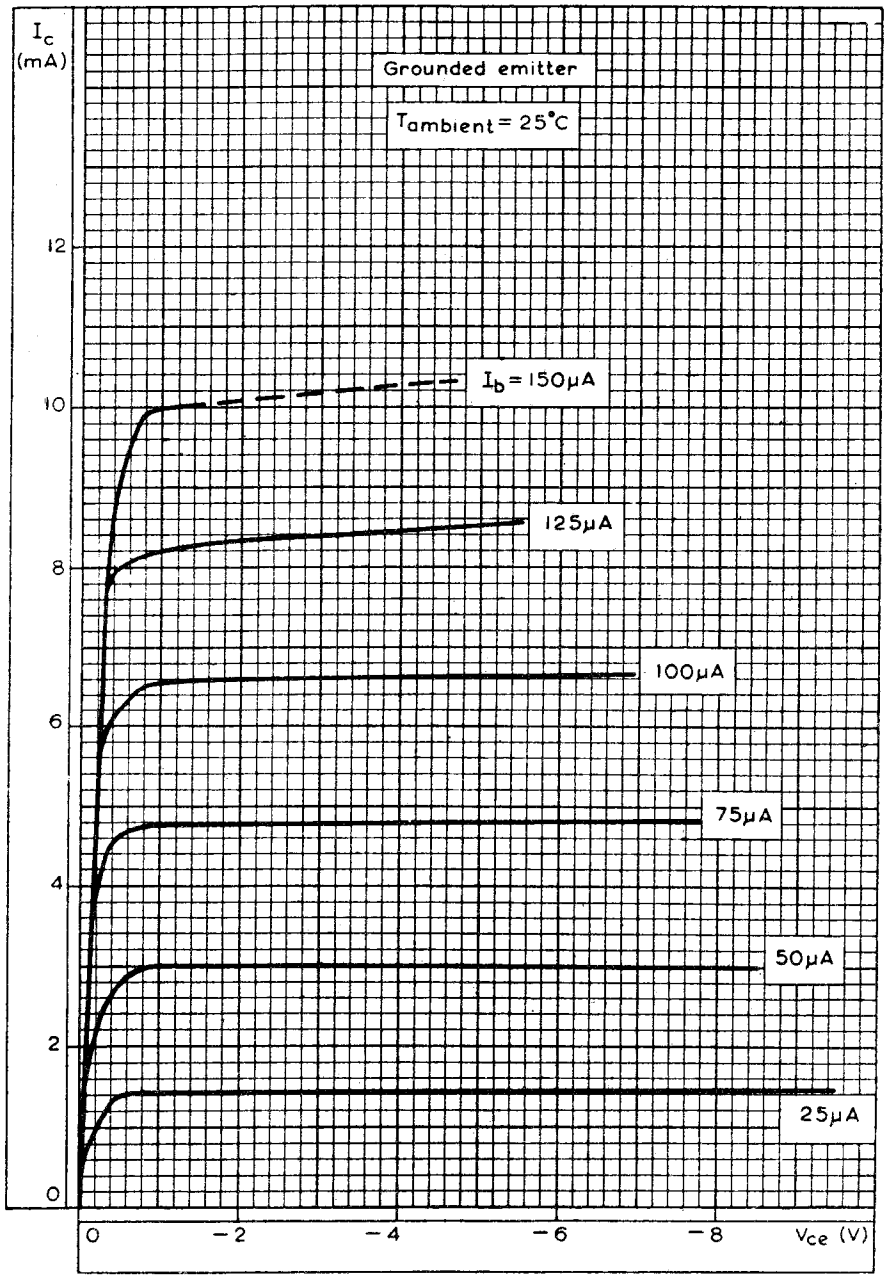
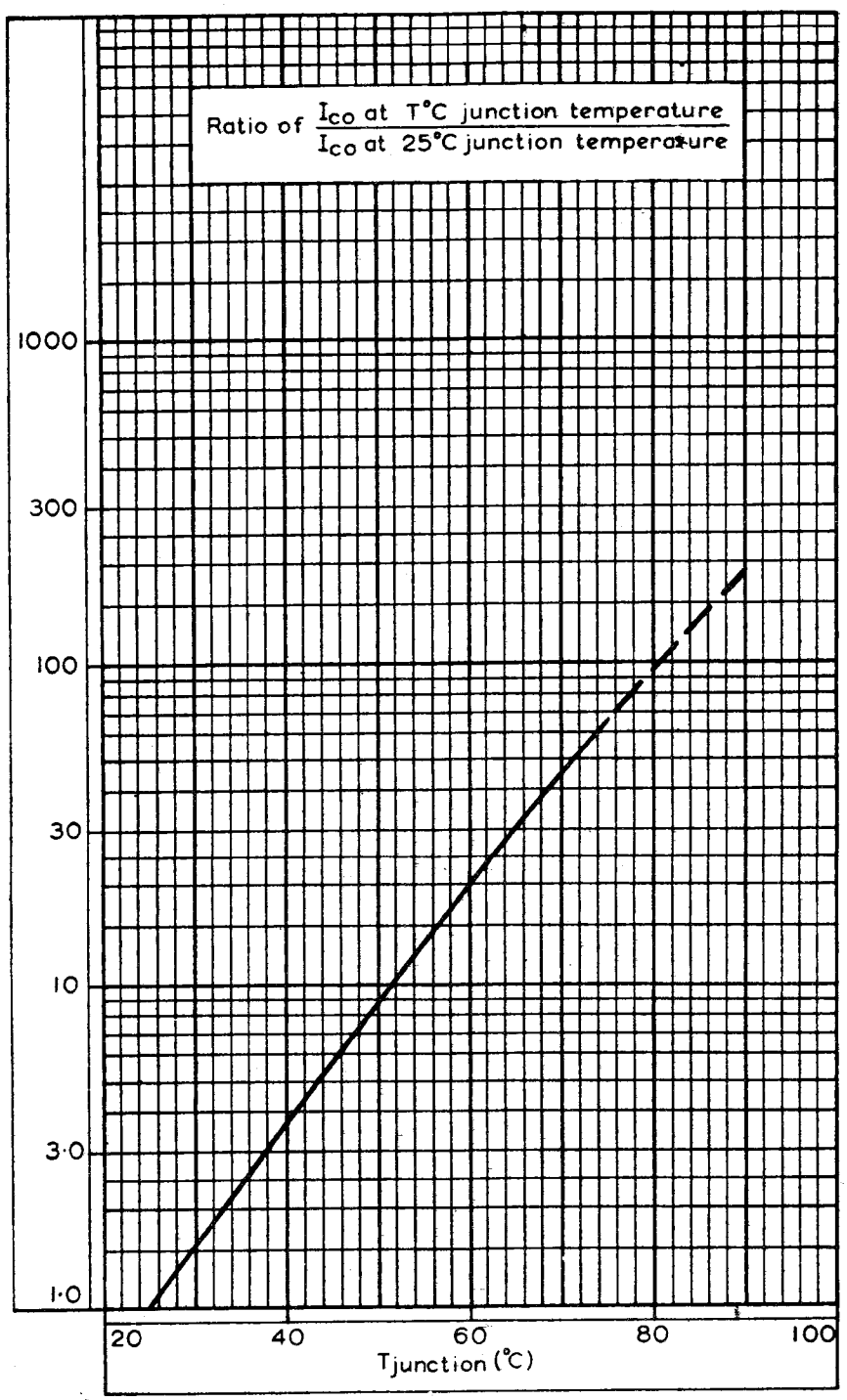


FIG. 5. OUTLINE DRAWING

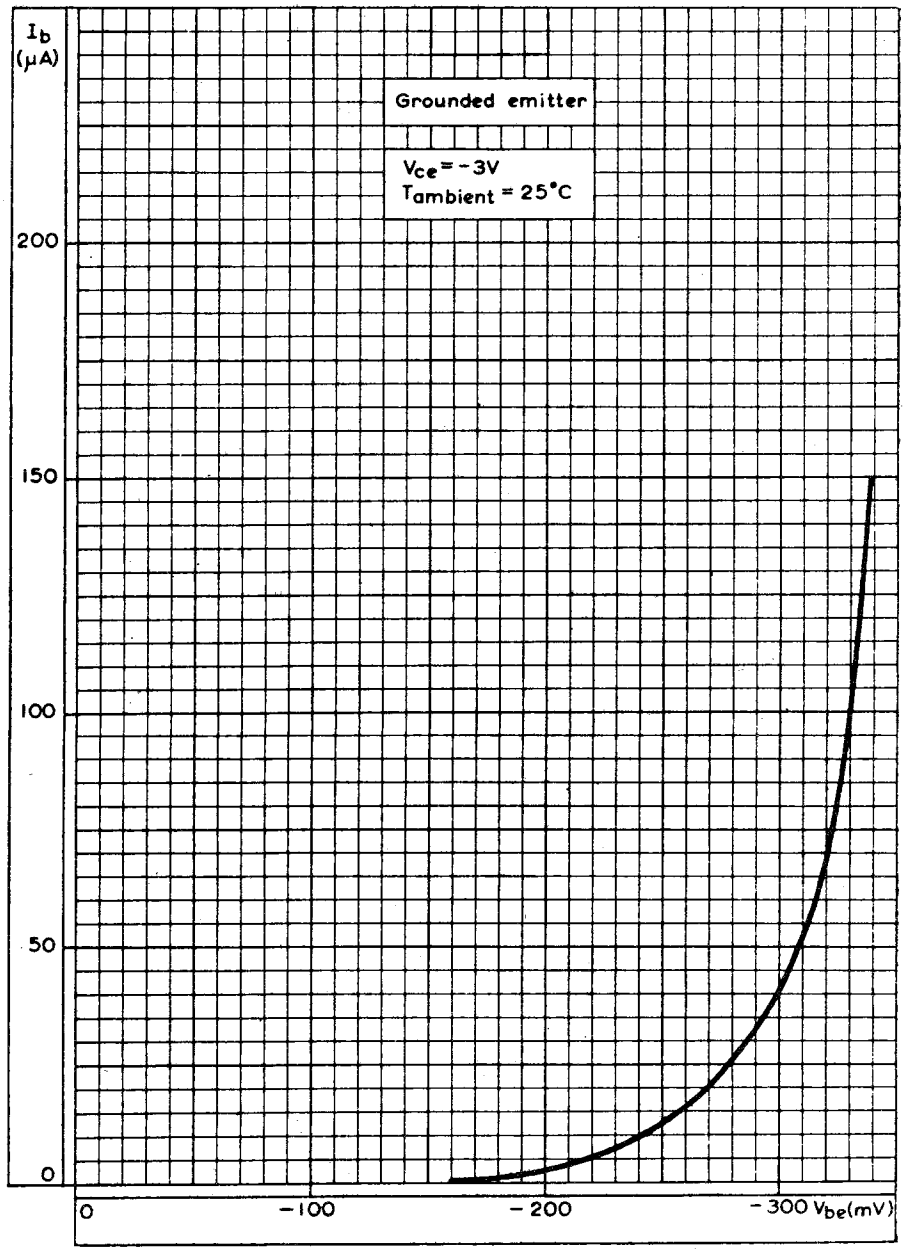


OUTPUT CHARACTERISTIC. GROUNDED EMITTER

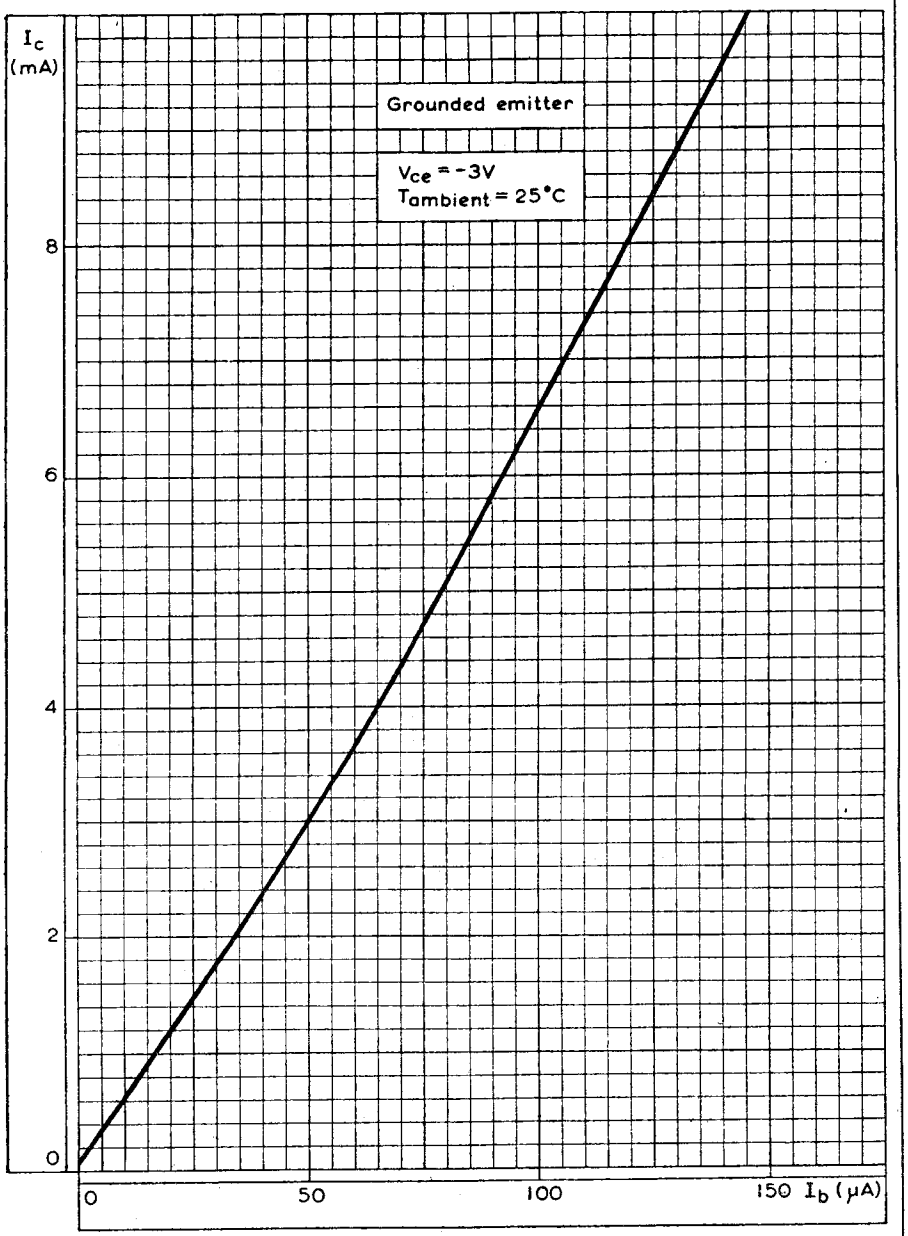
Z.22398.



VARIATION OF I_{co} WITH JUNCTION TEMPERATURE



INPUT CHARACTERISTIC. GROUNDED EMITTER



TRANSFER CHARACTERISTIC. GROUNDED EMITTER