

1st November, 1963.

MILITARY SPECIFICATION
CV 7460
SEMICONDUCTOR DEVICE

Description:- This specification covers the detail requirements for Germanium PNP Power Transistor and is in accordance with Specification K1007, Issue 3, except as otherwise stated.

Mechanical Dimensions and Outlines:- K1007, Section B 10.3.2.1., 10.3.2.1.1. Type 1, 10.4.2.1.

Connections:- 1-Base, 2-Emitter, Case-Collector.

Absolute Maximum Ratings:-

| Rating | V _{CB} | V _{CE} | I _{CAV} | I _{CM} | I _{EAV} | I _{EM} | I _{ERAV} | I _{ERM} | I _{BAV} | I _{BM} | P _{tot} | T _{stg} | T _m |
|--------|-----------------|-----------------|------------------|-----------------|------------------|-----------------|-------------------|------------------|------------------|-----------------|------------------|------------------|----------------|
| Unit | V | V | mA | mA | mA | mA | mA | mA | mA | mA | W | °C | °C |
| Min. | | | | | | | | | | | | -55 | |
| Max. | -70 | -60 | 700 | 700 | 750 | 750 | 50 | 50 | 50 | 700 | 4.5 | 75 | 75 |
| Note | | 1 | 4 | | 4 | | | | 4 | | 2 | | |

| Rating | Shock | Vibration |
|--------|-------|-----------|
| Unit | g | g |
| Min. | | |
| Max. | 1500 | 20 |
| Note | 3 | |

Notes:-

1. $V_{BE} > + 0.2V$
2. $T_{case} \leq 50^{\circ}C$. See Derating Curve on Page 10.
3. Duration 0.5 mS
4. Averaged over any 50 mS period.
5. Commercial Equivalent AUY10.

Primary Electrical Characteristics

| Characteristic | I_{CBO} | I_{EBO} | I_{CBX} | I_{BBX} | $V_{CE(sust)}$ | $V_{CE(sat)}$ | V_{BE} | h_{FE} | f_T | t_d | t_r | t_f | C_{ob} | $\theta_{(j-c)}$ | | |
|----------------|-----------|-----------|-----------|-----------|--------------------|---------------|----------|----------|-------|--------------------|-------|-------|----------|------------------|--|--|
| Unit | mA | mA | mA | mA | V | V | V | Mc/s | nS | nS | nS | nS | pF | °C/W | | |
| Min. | | | | | | | 40 | 60 | | | | | | | | |
| Max. | 2.0 | 1.0 | 2.0 | 1.0 | 6.0 | -0.45 | | 200 | 200 | 200 | 200 | 200 | 45 | 5.5 | | |
| Conditions | | | | | | | | | | | | | | | | |
| V_{CB} | V | -60 | | | See Fig. 3 Page 11 | | | -10 | -10 | See Fig. 3 Page 11 | | | -60 | | | |
| V_{EB} | V | -1.5 | -1.0 | -1.0 | | | | | | | | | | | | |
| V_{CE} | V | | -60 | -60 | | | | | | | | | | | | |
| I_C | mA | 0 | | | 600 | 600 | 600 | 300 | | | | | 0 | | | |
| I_E | mA | 0 | | | | | 600 | | | | | | | | | |
| I_B | mA | | | | 15 | | | | | | | | | | | |
| T_m | °C | 55 | 55 | 55 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | | | | |

APPLICABLE DOCUMENTS:- T.V.C. Information Sheets Nos. 9 and 10.

REQUIREMENTS:-

Marking: K1007, Section B 1.3.4 omitting (b) from 1.3.4.1.

QUALITY ASSURANCE PROVISIONS:-

Destructive Tests The tests listed in Table II, Group B Inspection, Subgroups 2, 3 and 4 and in Table III, Group C Inspection, Subgroup 2 are considered destructive.

Group C Inspection Inspection shall be conducted on the initial lot and thereafter every 90 days or every fifth lot whichever occurs first.

PREPARATION FOR DELIVERY

Packaging The device shall be packed according to K1007, Section A 1.2(c). Washer and two bushes as shown on Page 12 shall be packed with each device.

JOINT SERVICE CATALOGUE NUMBER

5960-99-037-3595

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

Admiralty Surface Weapons Establishment,
Portsdown, Cosham,
Portsmouth, Hants.

GROUP A INSPECTION

Table I

| Examination or Test | K1007/ NATO Ref. | Test Conditions | | AQL % | Insp. Level | Symbol | Limits | | Units |
|---|---------------------|---|--|----------|----------------|-----------|--------|-------|-------|
| | | Specific Conditions | | | | | Min. | Max. | |
| <u>SUBGROUP 1</u> Visual and Mechanical Inspection | 5.1 | Excluding Physical Dimensions | | 0.65 | I | | | | |
| <u>SUBGROUP 2</u> Collector - Emitter Cut- off Current, Emitter- Base Reverse Biased | 7.2.5.5. | $T_M = 55^\circ C$ $V_{CE} = -60V$ $V_{BE} = 1V$ | | 0.65 | II | ICBX | | 2.0 | mA |
| Static Value of Short- Circuit Forward Current Transfer Ratio | 7.3.4.1. | $V_{CB} = -10V$ $I_E = 600 \text{ mA}$ Pulse Method | | | | h_{FE} | 40 | | |
| <u>SUBGROUP 3</u> Base-Emitter Voltage, non-saturated | 7.3.2. | $V_{CE} = -10V$ $I_C = 600 \text{ mA}$ Pulse Method | | 4.0 | I | V_{BE} | | -0.45 | V |
| Emitter-Base Cut-off Current | 7.2.6. | $V_{EB} = -1.5V$ $I_C = 0$ $T_M = 55^\circ C$ | | | | I_{EBO} | | 1.0 | mA |

Table I GROUP A INSPECTION Cont'd

| Examination or Test | K1007/ NATO Ref. | Test Conditions Specific Conditions | AQL % | Insp. Level | Symbol | Limits | | Units |
|--|---------------------|--|----------|----------------|---------------------------|--------|------|-------|
| | | | | | | Min. | Max. | |
| <u>SUBGROUP 3 Cont'd</u> | | | | | | | | |
| Collector - Base Cut-off Current. | 7.2.5.1. | V _{CB} = -60V I _E = 0 T _M = 55°C | | | I _{CBO} | | 2.0 | mA |
| Base Current, Emitter- Base Reverse Biased. | 7.2.5.5. | V _{CE} = -60V V _{BE} = 1V T _M = 55°C Circuit as Fig. 7.2.5.5./1 with current meter in Base Lead. | | | I _{BBX} | | 1.0 | mA |
| Collector - Emitter Saturation Voltage. | 7.3.3. | Fig. 7.3.1./3 I _C = 600 mA I _B = 15 mA Pulse duration = 10 μs p.r.f. = 1 kc/s See Fig. 3 page 11 | | | V _{CE} (Sat) | | 6 | V |
| Sustaining Voltage. | | | | | V _{CE} (Sust) | | 30 | V |

Table I
GROUP A INSPECTION Cont'd

| Examination or Test | Test Conditions | | Insp. Level | Symbol | Limits | | Units |
|---|---------------------|---|----------------|----------|--------|------|-------|
| | K1007/ NATO Ref. | Specific Conditions | | | Min. | Max. | |
| <u>SUBGROUP 3 Cont'd</u> Transition Frequency. | 7.5.2. | $V_{CB} = -10V$ $I_C = 300\text{ mA}$ | | f_T | 60 | 200 | Mc/s |
| <u>SUBGROUP 4</u> Output Capacitance. | 7.4.8. | $V_{CB} = -60V$ $I_C = 0$ $f = 1\text{ Mc/s}$ | IA | C_{ob} | | 45 | pF |
| Delay Time. | | See Fig. 3 Page 11 | | t_d | | 200 | nS |
| Rise Time. | | See Fig. 3 Page 11 | | t_r | | 200 | nS |
| Fall Time. | | See Fig. 3 Page 11 | | t_f | | 200 | nS |

Table II GROUP B INSPECTION

| Examination OR Test | Test Conditions | | AQL % | Insp. Level | Symbol | Limits | | Units |
|--|---------------------|--|----------|----------------|--------|--------|------|-------|
| | K1007/ NATO Ref. | Specific Conditions | | | | Min. | Max. | |
| <u>SUBGROUP 1</u> Physical Dimensions | 5.1 | According to Drawings 10.3.2.1, 10.3.2.1.1. and 10.4.2.1. | 6.5 | IC | | | | |
| <u>SUBGROUP 2</u> Solderability Temperature Cycling Moisture Resistance | 5.13 5.5 5.3 | -55°C to +75°C | 4.0 | IA | | | | |
| <u>SUBGROUP 3</u> Vibration Fatigue | 5.15 | Non-operating | 4.0 | IA | | | | |
| <u>SUBGROUP 5</u> Omitted. | | | | | | | | |
| <u>SUBGROUP 6</u> Omitted. | | | | | | | | |
| <u>SUBGROUP 7</u> High Temperature Life (Non-operating) | 6.2.1. 6.6.1.2.2 | Tamb. = 75°C t = 1000 hours | 4.0 | I | | | | |

Table II
GROUP B INSPECTION Cent'd

| Examination or Test | Test Conditions | | AQL % | Insp. Level | Symbol | Limits | | Units |
|---|-----------------------------------|--|-------|-------------|-----------------------------|--------|------|-------|
| | K1007/ NATO Ref. | Specific Conditions | | | | Min. | Max. | |
| <u>SUBGROUP 8</u> Operating Life | 6.3 6.5 6.6.1 6.6.1.2.2. | T_M between +25°C and +70°C $V_{CB} \geq \frac{1}{2} V_{CB \text{ max.}}$ P_{tot} = max. value given derating curve on Page 10 corresponding to the chosen T_M | 4.0 | IA | | | | |
| <u>Post Test End Points for Subgroups 2, 3, 7 and 8</u> Collector-Emitter Cut-off Current, Emitter-Base Reverse Biased. Static Value of Short-Circuit Forward Current Transfer Ratio. | 7.2.5.5. | As in Group A Inspection, Subgroup 2. As in Group A Inspection, Subgroup 2. | | | ICBX h _{FE} | 2.5 | 30 | mA |

Table III GROUP C INSPECTION

| Examination or Test | Test Conditions | | AQL % | Insp. Level | Symbol | Limits | | Units |
|---|---------------------|--|----------|----------------|--------|--------|------|-------|
| | K1007/ NATO Ref. | Specific Conditions | | | | Min. | Max. | |
| <u>SUBGROUP 1</u> | | | | | | | | |
| Omitted. | | | | | | | | |
| <u>SUBGROUP 2</u> | | | | | | | | |
| Shock | 5.17 | Non-operating. Five blows each orientation Y ₁ , Y ₂ , X and Z | | 6.5 | IA | | | |
| <u>Post Test End Points for Subgroup 2</u> | | | | | | | | |
| Collector - Emitter Cut-off Current, Emitter-Base Reverse Biased. | 7.2.5.5 | As in Group A, Subgroup 2. | | | ICBX | | 2.5 | mA |
| Static Value of Short-Circuit Forward Current Transfer Ratio. | | As in Group A, Subgroup 2. | | | hFE | | 30 | |

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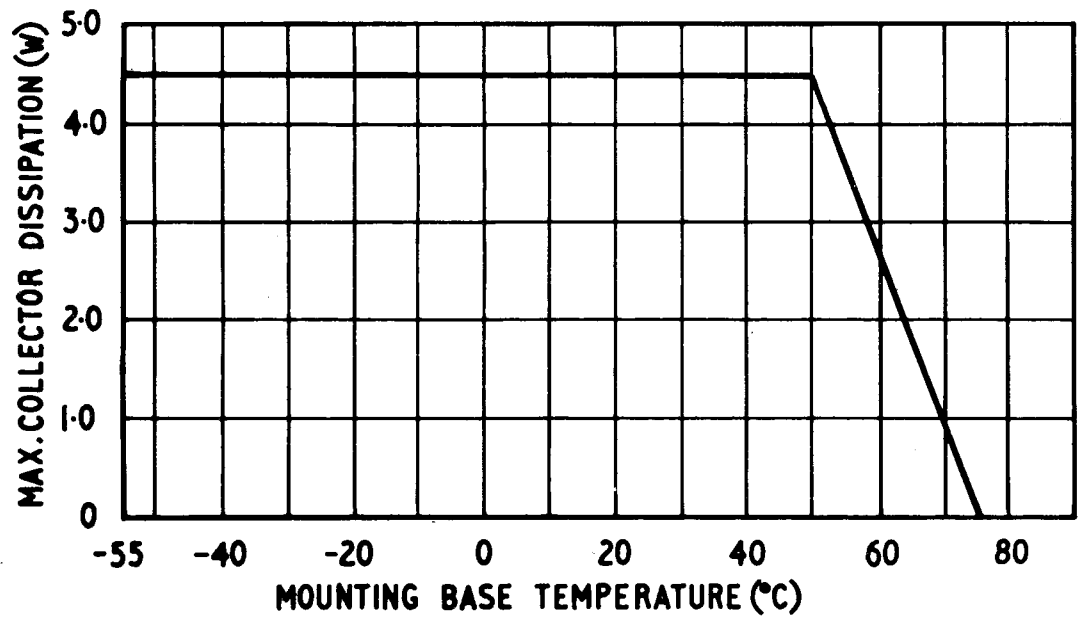


FIG.1 DISSIPATION RATING CURVE

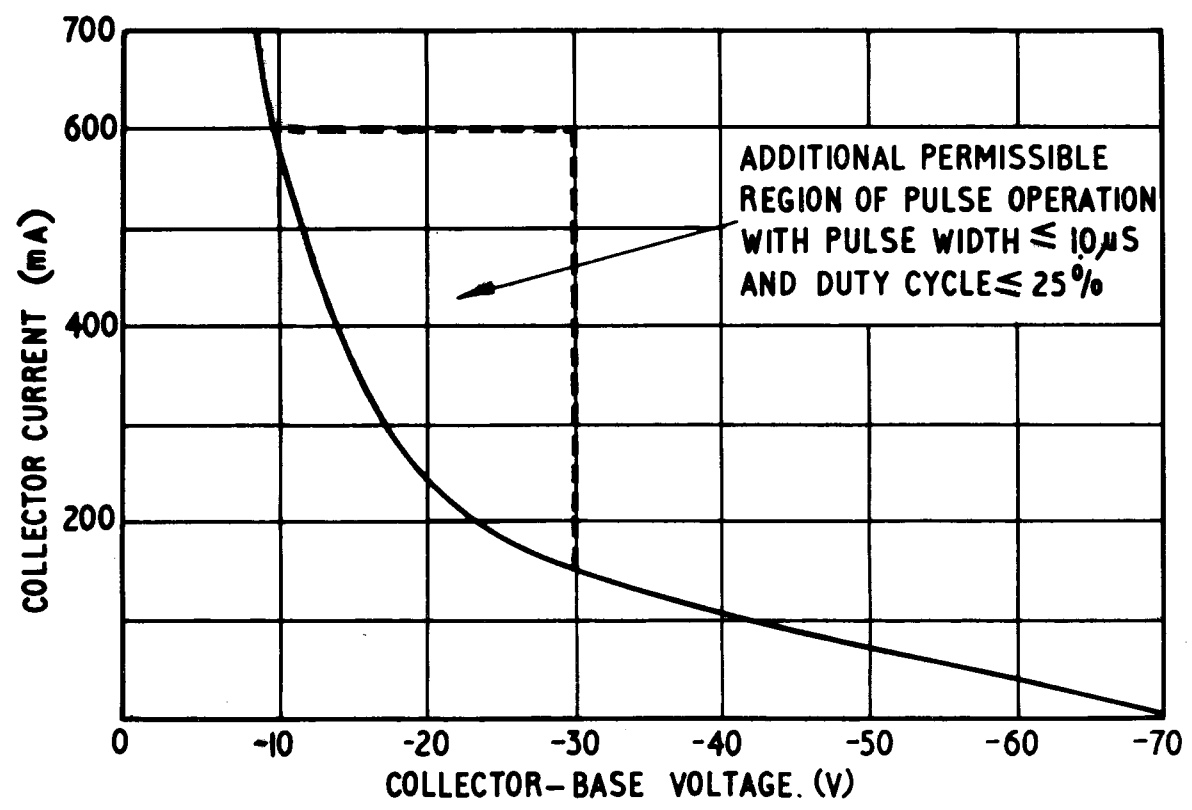
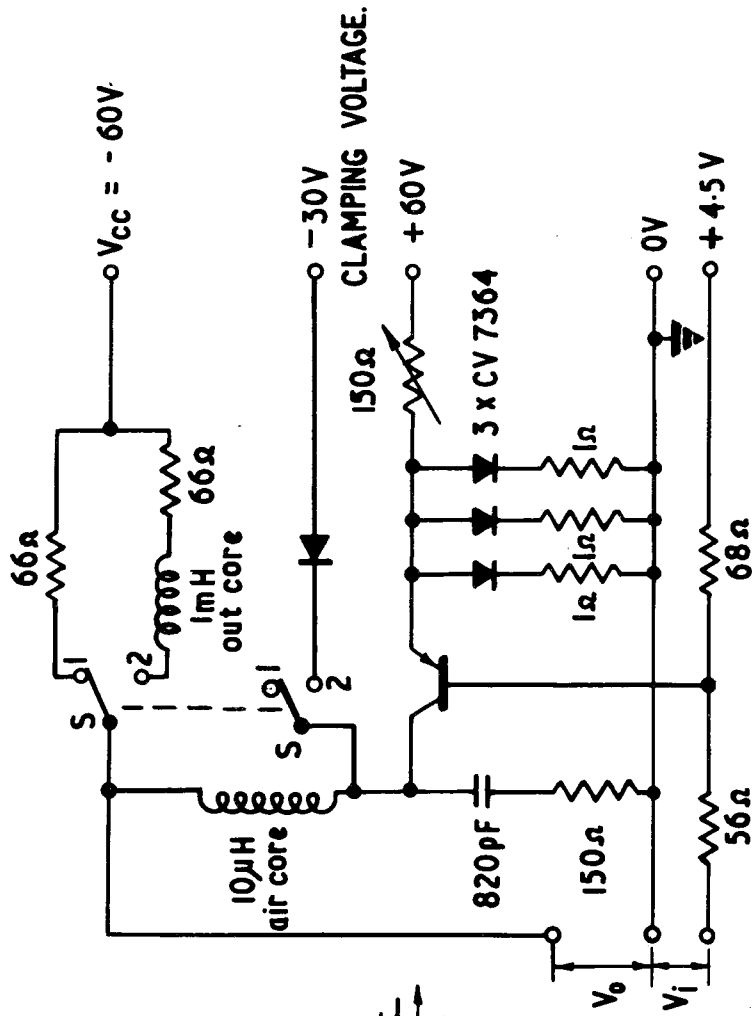
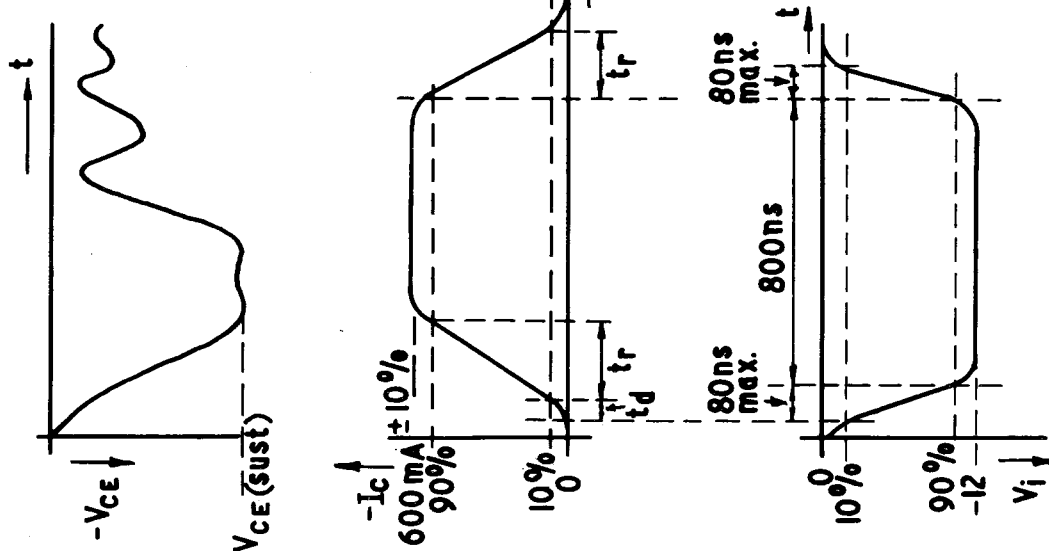


FIG.2 COLLECTOR CURRENT RATING CURVE

CIRCUIT FOR MEASURING DELAY, RISE AND FALL TIMES, AND SUSTAINING VOLTAGE.



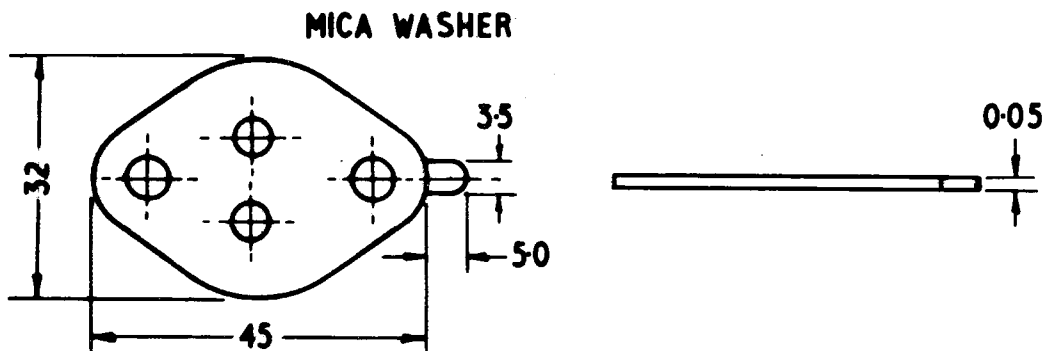
SOURCE IMPEDANCE = 50Ω ALL RESISTORS ± 1%

SWITCH POSITION:- 1. FOR MEASURING t_d , t_r AND t_f

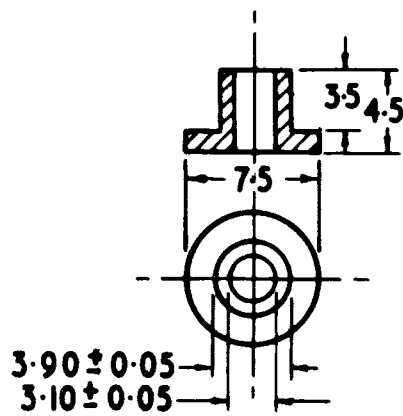
2. FOR MEASURING $V_{CE(sust)}$

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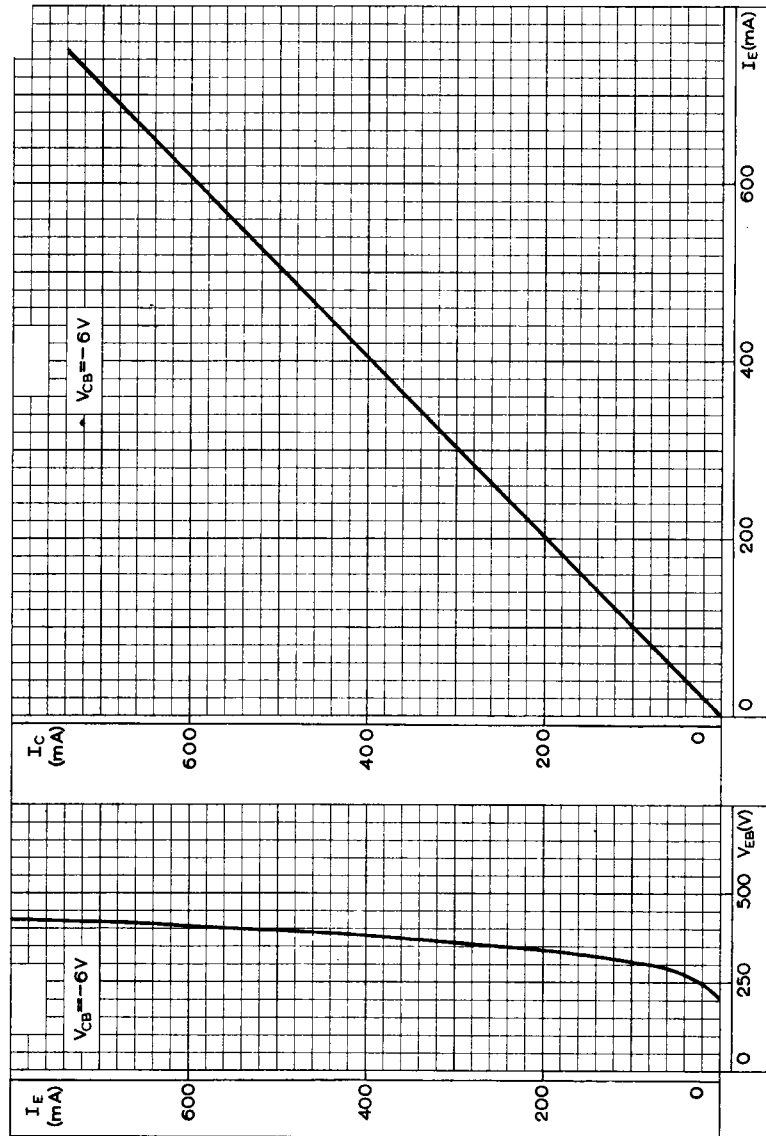
DETAILS OF ITEMS TO BE SUPPLIED WITH EACH DEVICE



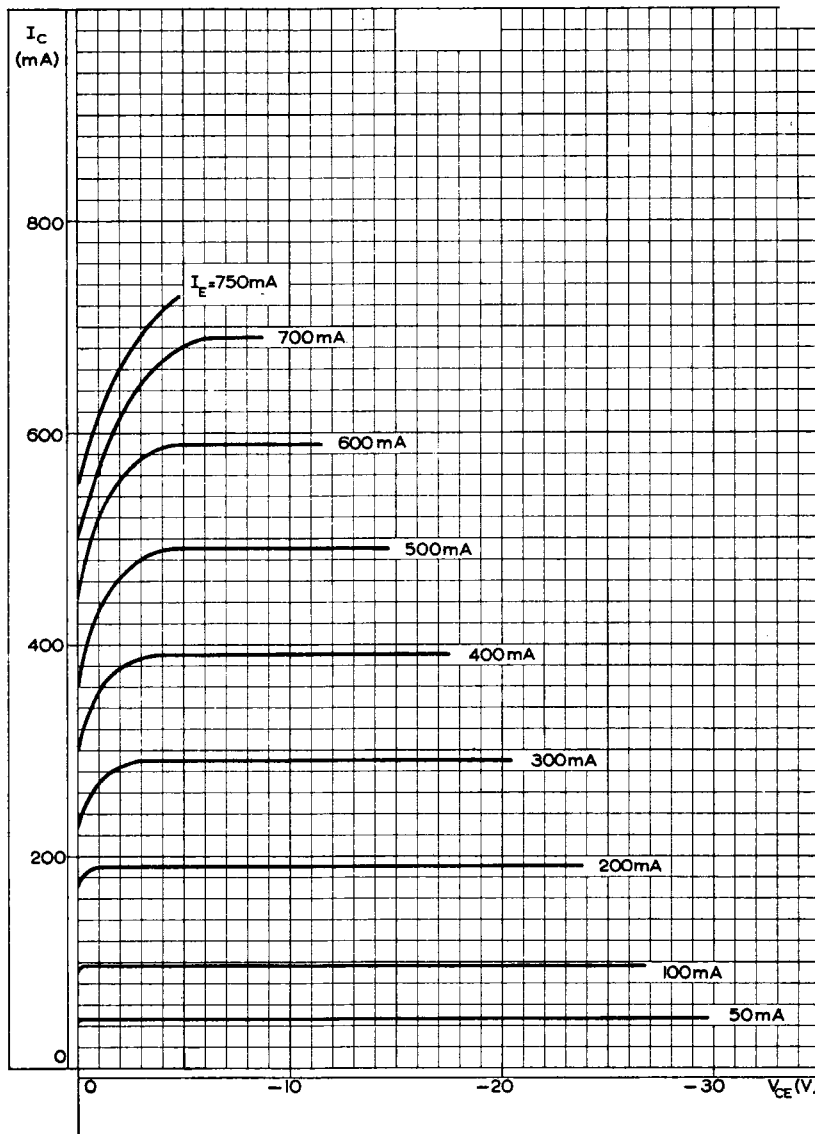
INSULATING BUSH



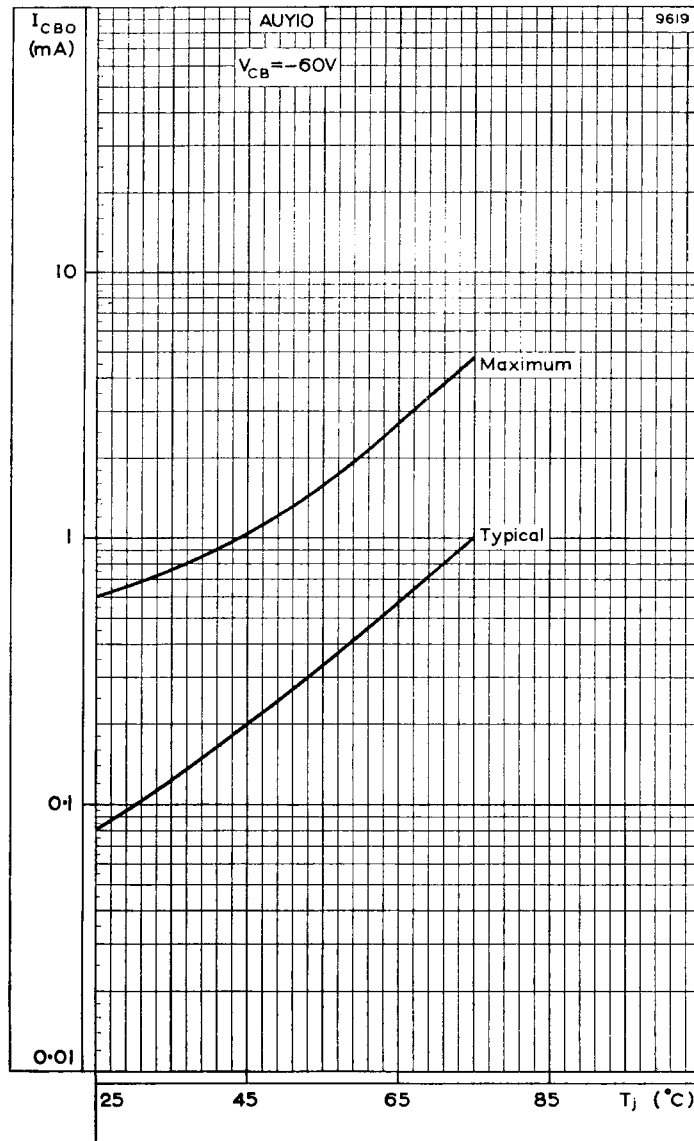
ALL DIMENSIONS IN MM.



INPUT AND TRANSFER CHARACTERISTICS. GROUNDED BASE



OUTPUT CHARACTERISTIC. GROUNDED BASE



VARIATION OF LEAKAGE CURRENT WITH JUNCTION TEMPERATURE.
 $V_{cb} = -60V$