RCA
Solid State
Division

# RF Power Transistors

## 2N2631
## 2N2876

RCA-2N2876 and 2N2631 are triple-diffused planar transistors of the silicon n-p-n type. These devices are intended for applications in AM, FM, and CW service at frequencies up to 150 Mc.

The 2N2876 utilizes a stud-mounted TO-60 package which is electrically isolated from all the electrodes and is designed to provide excellent performance at very high frequencies. The 2N2631 TO-39 package is identical to the JEDEC TO-5 package except for shorter leads (0.5 inch).

**For Large-Signal, High-Power, VHF Applications in Military and Industrial Communications Equipment**


JEDEC TO-39

JEDEC TO-60

RF SERVICE

**Maximum Ratings,** *Absolute-Maximum Values:*

| | 2N2876 | 2N2631 | |
|---|---|---|---|
| COLLECTOR-TO-BASE VOLTAGE, $V_{CBO}$ | 80 | 80 | max. volts |
| COLLECTOR-TO-EMITTER VOLTAGE: | | | |
| With base open, $V_{CEO}$ | 60 | 60 | max. volts |
| With $V_{BE}$ = -1.5 volts, $V_{CEV}$ | 80 | 80 | max. volts |
| EMITTER-TO-BASE VOLTAGE, $V_{EBO}$ | 4 | 4 | max. volts |
| COLLECTOR CURRENT, $I_C$ | 2.5 | 1.5 | max. amp |
| TRANSISTOR DISSIPATION, $P_T$: | | | |
| At case temperatures up to 25°C | 17.5 | 8.75 | max. watts |
| At case temperatures above 25°C | Derate linearly 100mw/°C | Derate linearly 50 mw/°C | |
| TEMPERATURE RANGE: | | | |
| Storage | -65to+200 | -65to+200 | °C |
| Operating (Junction) | -65to+200 | -65to+200 | °C |
| LEAD TEMPERATURE (During soldering): | | | |
| At distances ≥ 1/32" from ceramic wafer for 10 sec. max. | 230 | - | max. °C |
| At distances ≥ 1/32" from seating surface for 10 sec. max. | - | 230 | max. °C |

- High Power Output, Unneutralized ($P_{OUT}$):
  - 10 w min. at 50 Mc, 3 w min. at 150 Mc — 2N2876
  - 7.5 w min. at 50 Mc, 3 w min. at 150 Mc — 2N2631
- High Voltage Ratings:
  $V_{CBO}$ = 80 volts max.
  $V_{CEO}$ = 60 volts max.
- 100 per cent tested to assure freedom from second breakdown in class A operation at maximum ratings

### RCA-2N2876 Features:

- Low Thermal Resistance ($\theta_{J-C}$)—
  high-thermal-conductivity ceramic insulation between collector and mounting stud
- Isolated Stud Package:
  all three electrodes electrically isolated from case —for design flexibility
  heavy copper mounting stud—for effective contact with heat sink
  pin terminals arranged on a .200" pin-circle diameter —fit commercially available sockets

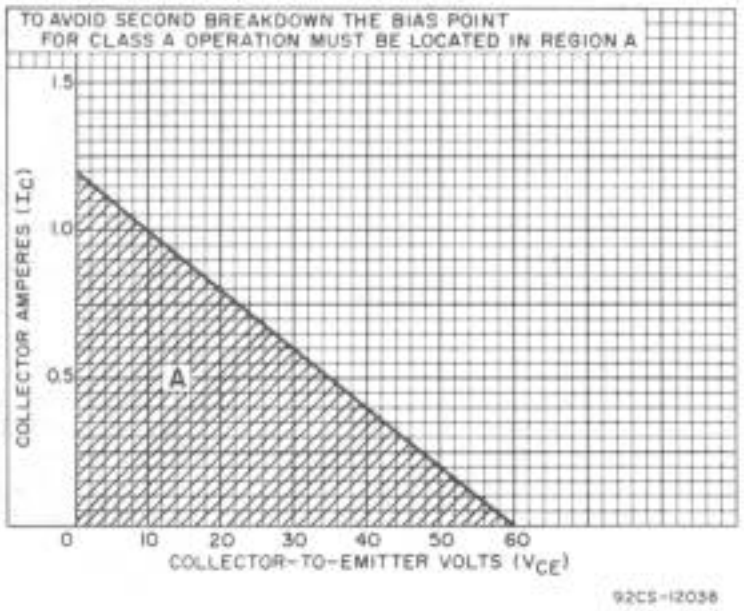



*Fig. 1 - Region of Safe Operation (Without second breakdown) in Class A Service for Type 2N2876.*

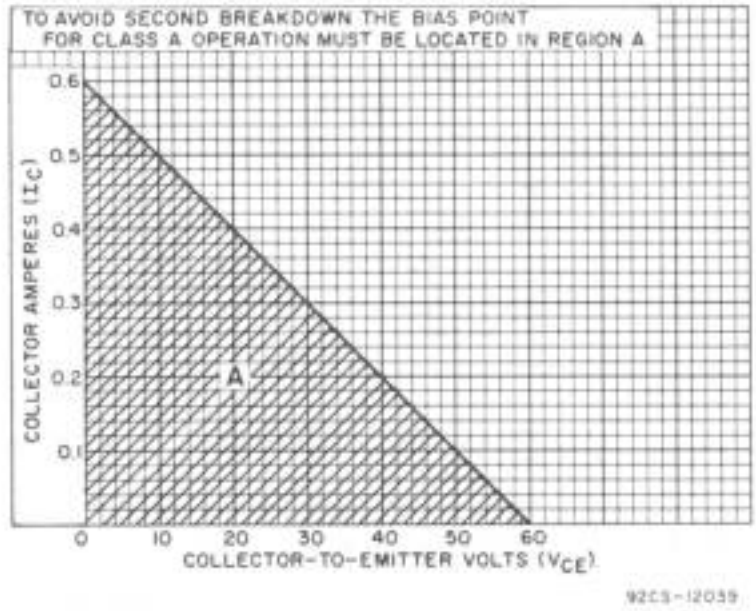



*Fig. 2 - Region of Safe Operation (Without second breakdown) in Class A Service for Type 2N2631.*

## ELECTRICAL CHARACTERISTICS

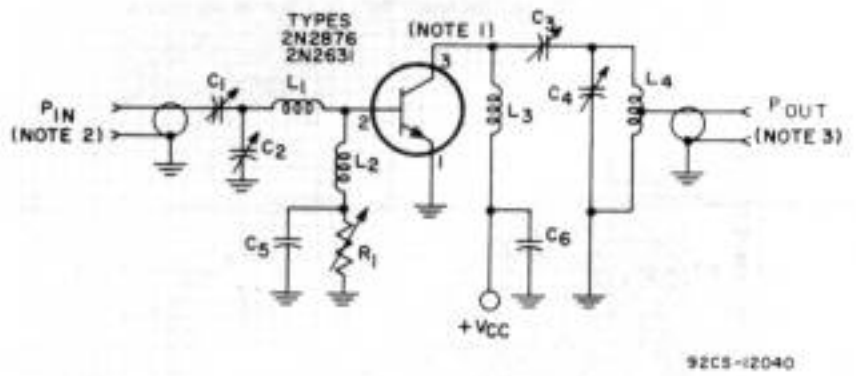
*Case Temperature = 25° C Unless Otherwise Specified*

| Characteristic | Symbol | TEST CONDITIONS | | | | | | LIMITS | | | | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC Collector Volts | | DC Base Volts | DC Current (Milliamperes) | | | 2N2876 | | 2N2631 | | |
| | | $V_{CB}$ | $V_{CE}$ | $V_{BE}$ | $I_E$ | $I_B$ | $I_C$ | Min. | Max. | Min. | Max. | |
| Collector-Cutoff Current | $I_{CBO}$ | 30 | | | 0 | | | - | 0.1 | - | 0.1 | μa |
| Collector-to-Base Breakdown Voltage | $BV_{CBO}$ | | | | 0 | | 0.5 | 80 | - | 80 | - | volts |
| Collector-to-Emitter Breakdown Voltage (Sustaining) | $BV_{CEO}(sus)$ | | | | | 0 | 500* | 60 | - | 60 | - | volts |
| Collector-to-Emitter Breakdown Voltage | $BV_{CEV}$ | | | -1.5 | | | 0.1 | 80 | - | 80 | - | volts |
| Emitter-to-Base Breakdown Voltage | $BV_{EBO}$ | | | | 0.1 | | 0 | 4 | - | 4 | - | volts |
| Collector-to-Emitter Saturation Voltage | $V_{CE}(sat)$ | | | | | 300 | 1.5 amp | - | - | - | 1 | volt |
| | | | | | | 500 | 2.5 amp | - | 1 | - | - | volt |
| Feedback Capacitance (Measured at 140 Kc) | $C_{b'c}$ | 30 | | | 0 | | | - | 20 | - | 20 | pf |
| RF Power Output, Unneutralized (see *Fig. 3*): | $P_{out}$ | | | | | | | | | | | |
| Measured at 50 Mc | | | 28 | | | | 500 | 10[a] | - | - | - | watts |
| 50 Mc | | | 28 | | | | 375 | - | - | 7.5[b] | - | watts |
| 150 Mc | | | 28 | | | | 275 | 3[b] | - | 3[b] | - | watts |
| Gain-Bandwidth Product | $f_T$ | | 28 | | | | 250 | 200 (typ.) | | 200 (typ.) | | Mc |
| Base Spreading Resistance (Measured at 400 Mc) | $r_{bb'}$ | | 28 | | | | 250 | 6.0 (typ.) | | 6.0 (typ.) | | ohms |
| Collector-to-Case Capacitance | $C_C$ | | | | | | | - | 6 | - | - | pf |

* Pulsed. Pulse duration $\leq$ 5 μsec; duty factor $\leq$ 1%.

[a] For $P_{IN}$ = 2 watts.

[b] For $P_{IN}$ = 1 watt.




| | For 50-Mc Operation | For 150-Mc Operation |
|---|---|---|
| $C_1$ $C_2$ $C_3$ $C_4$ | 8-60 pf | 4-40 pf |
| $C_5$ $C_6$ | 0.005 μf | 0.005 μf |
| $L_1$ | 8 turns No. 16 wire, 3/8" ID x 9/16" long | 1 turn No. 16 wire, 1/4" ID x 3/16" long |
| $L_2$ | Ferrite choke, Z = 750 (±20%) ohms | Ferrite choke, Z = 750 (±20%) ohms |
| $L_3$ | 10 μh | 1.5 μh |
| $L_4$ | 7 turns No. 14 wire, 1/2" ID x 7/8" long tap 2 turns from ground end | 3 turns No. 14 wire, 3/8" ID x 3/4" long tap 1-1/2 turns from ground end |
| $R_1$ | 5000 ohms | 50 ohms |

**NOTE 1:** COLLECTOR GROUNDED TO CASE IN TYPE 2N2631; SEE *TERMINAL DIAGRAM*.

**NOTE 2:** GENERATOR IMPEDANCE = 50 OHMS.

**NOTE 3:** LOAD IMPEDANCE = 50 OHMS.

*Fig. 3 - Circuit of Unneutralized Amplifier Used to Measure Power Output of Types 2N2876 and 2N2631.*

## TYPICAL OPERATION CHARACTERISTICS FOR TYPE 2N2876

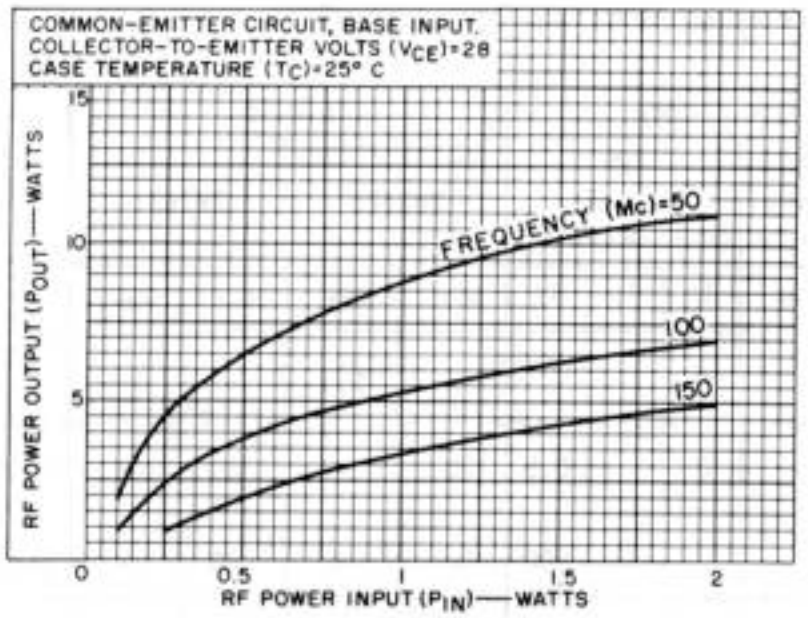



*Fig. 4*

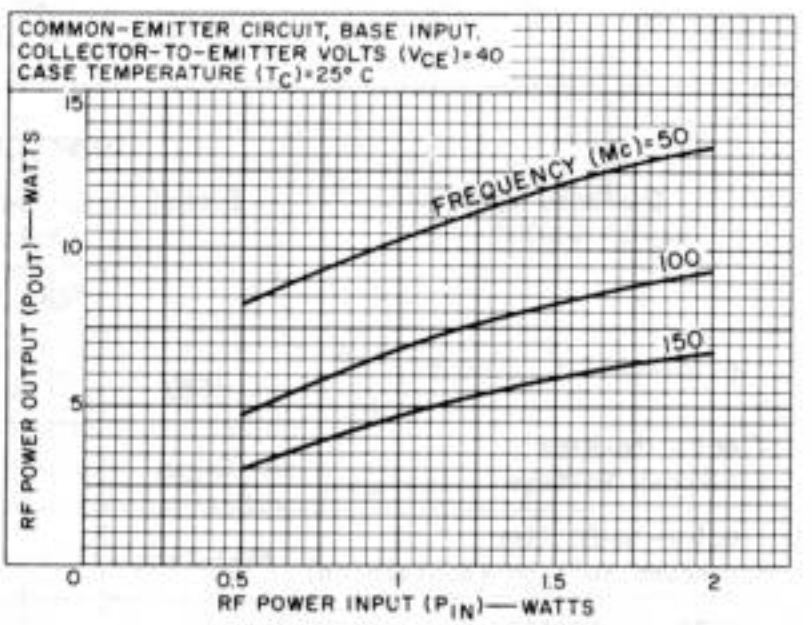
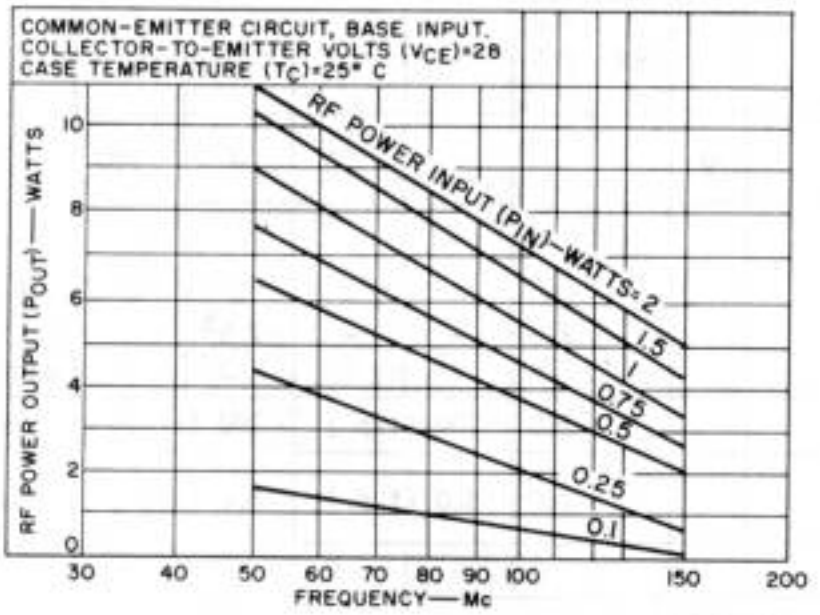
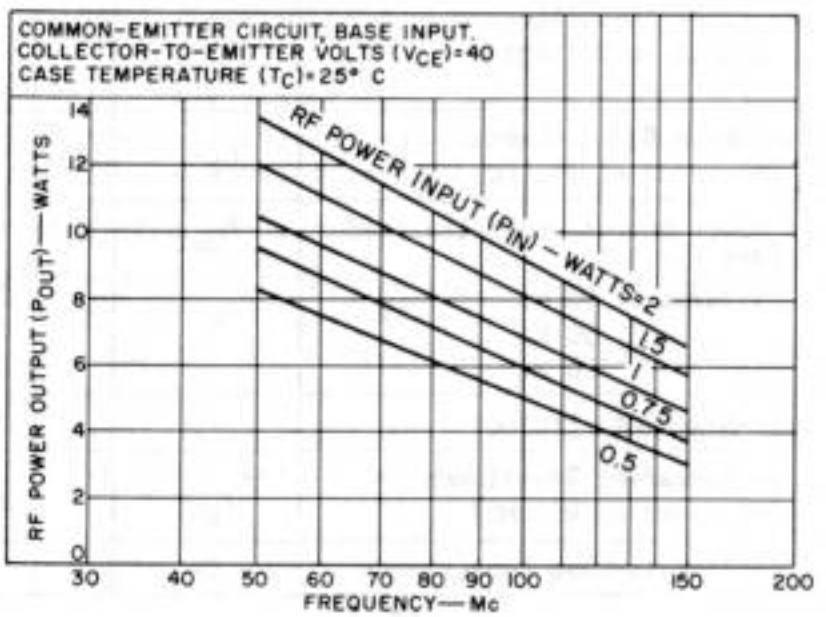



*Fig. 6*



## TYPICAL OPERATION CHARACTERISTICS FOR TYPE 2N2631

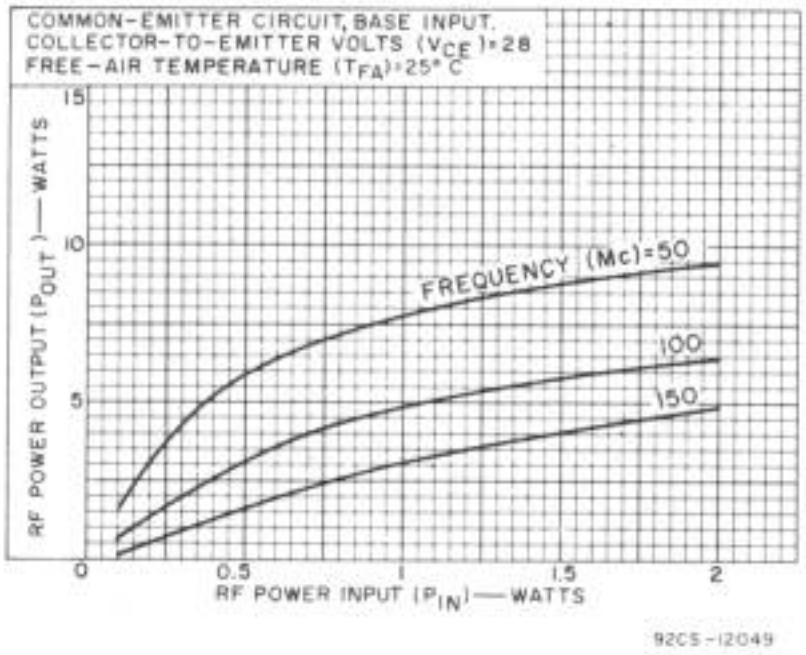



*Fig. 8*

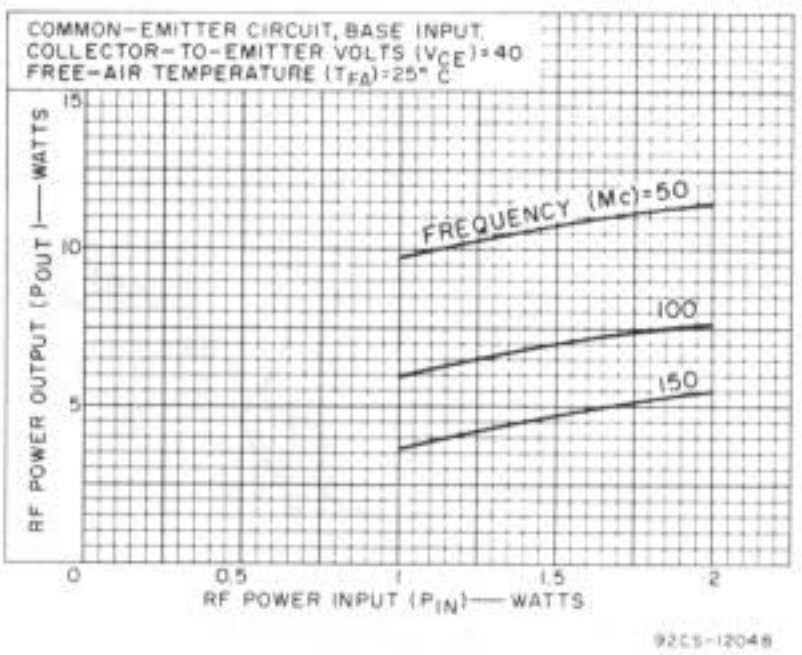



*Fig. 10*

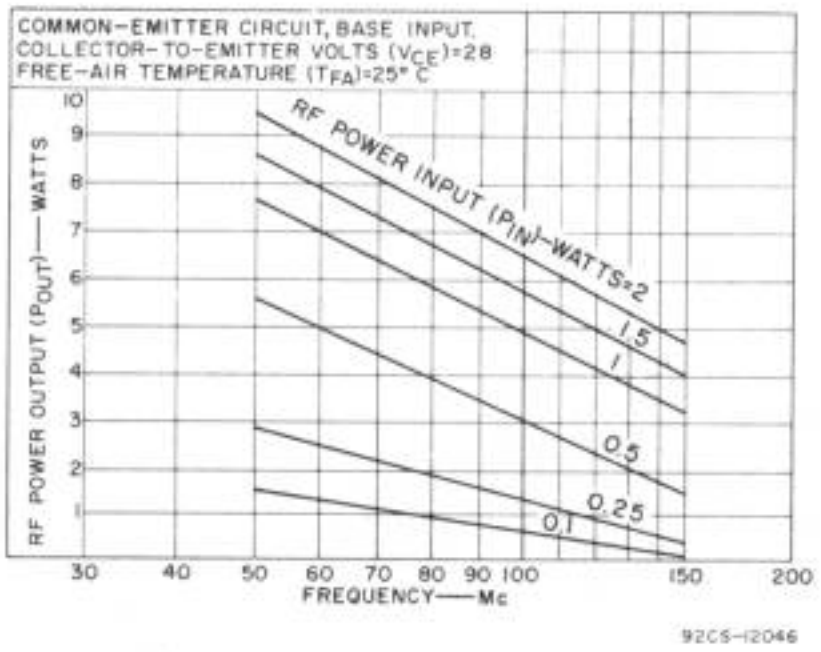



*Fig. 9*

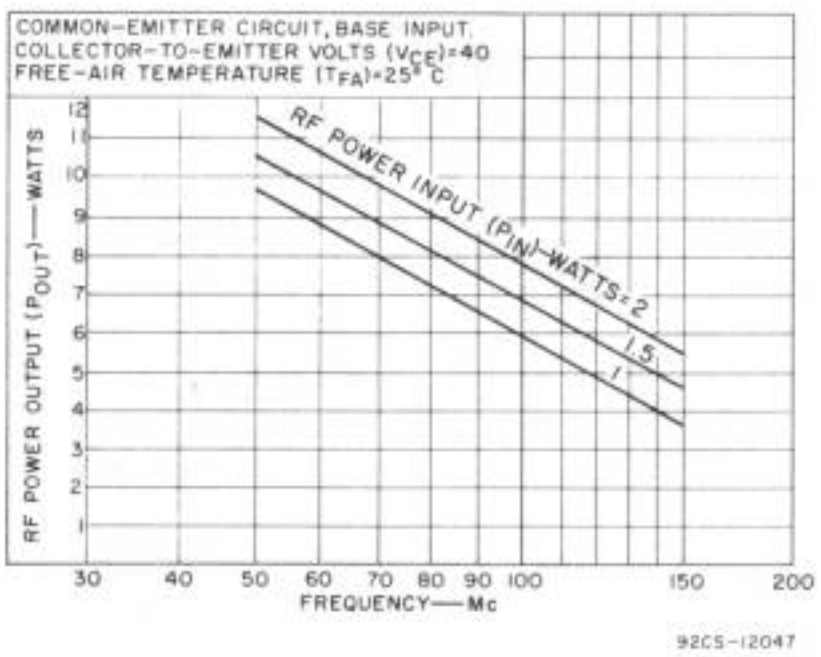
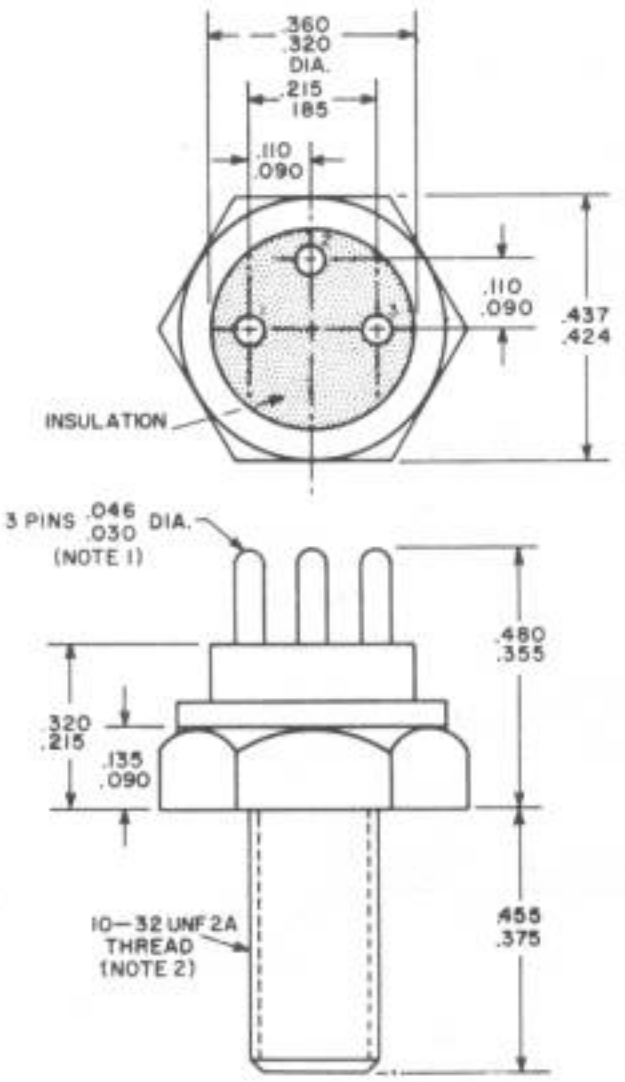



*Fig. 11*

## DIMENSIONAL OUTLINES

### 2N2876



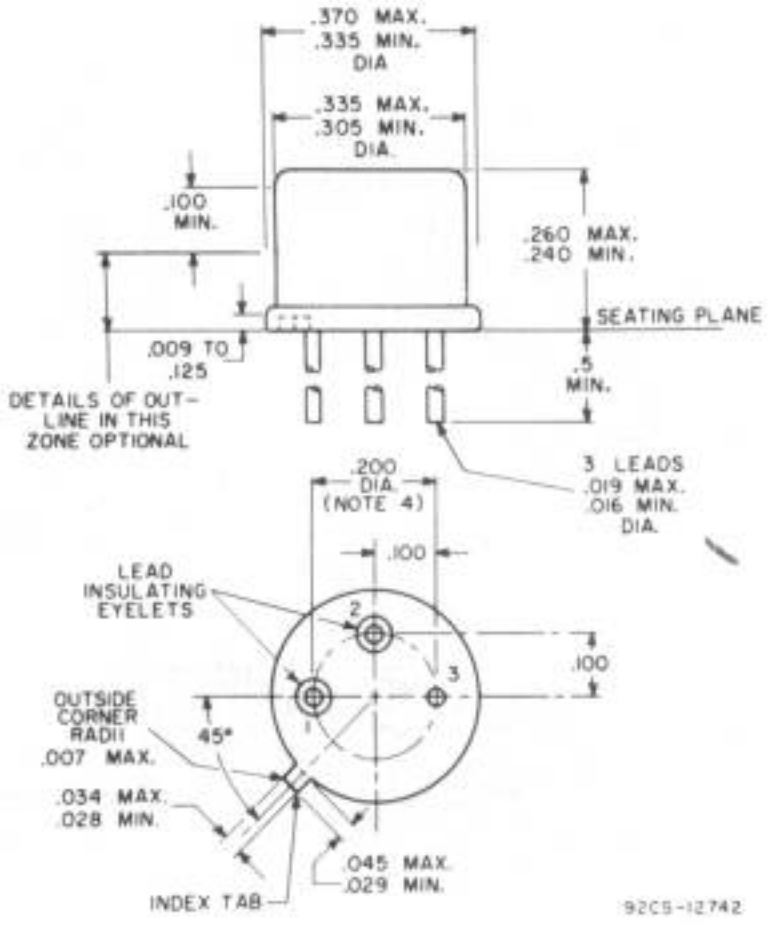

92CS-12045R5

**NOTE 1:** THE PIN SPACING PERMITS INSERTION IN ANY SOCKET HAVING A PIN-CIRCLE DIAMETER OF 0.200" AND CONTACTS WHICH WILL ACCOMMODATE PINS HAVING A DIAMETER OF 0.035" MIN., 0.045" MAX.

**NOTE 2:** THE TORQUE APPLIED TO A 10-32 HEX NUT ASSEMBLED ON THE THREAD DURING INSTALLATION SHOULD NOT EXCEED 12 INCH-POUNDS.

**NOTE 3:** THIS DEVICE MAY BE OPERATED IN ANY POSITION.

### 2N2631




92CS-12742

**NOTE 1:** THIS ZONE IS CONTROLLED FOR AUTOMATIC HANDLING. THE VARIATION IN ACTUAL DIAMETER WITHIN THE ZONE SHALL NOT EXCEED 0.010".

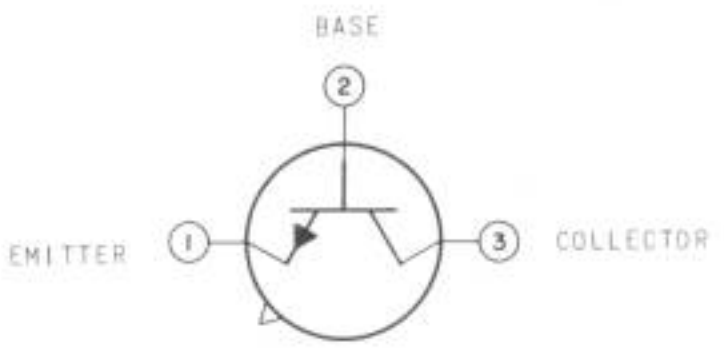
**NOTE 2:** THE SPECIFIED LEAD DIAMETER APPLIES IN THE ZONE BETWEEN 0.050" AND 0.250" FROM THE SEATING PLANE. BETWEEN 0.250" AND 1.5", A MAXIMUM OF 0.021" DIAMETER IS HELD. OUTSIDE OF THESE ZONES THE LEAD DIAMETER IS NOT CONTROLLED.

**NOTE 3:** MEASURED FROM MAX. DIAMETER OF THE ACTUAL DEVICE.

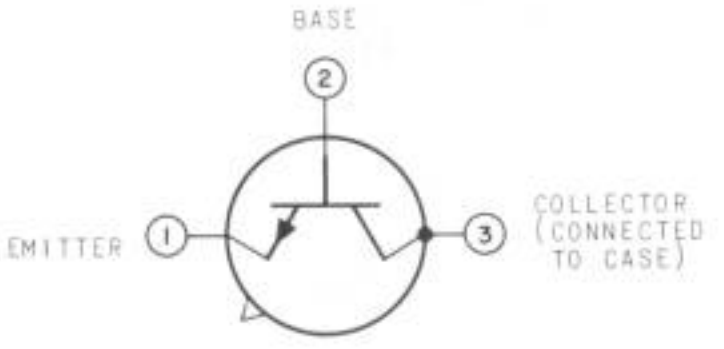
**NOTE 4:** LEADS HAVING MAXIMUM DIAMETER (0.019") MEASURED IN GAUGING PLANE OF 0.054" + 0.001" − 0.000" BELOW THE SEATING PLANE OF THE DEVICE SHALL BE WITHIN 0.007" OF THEIR TRUE LOCATIONS RELATIVE TO A MAXIMUM-WIDTH TAB.

## TERMINAL DIAGRAMS
(Bottom View)

### 2N2876




### 2N2631



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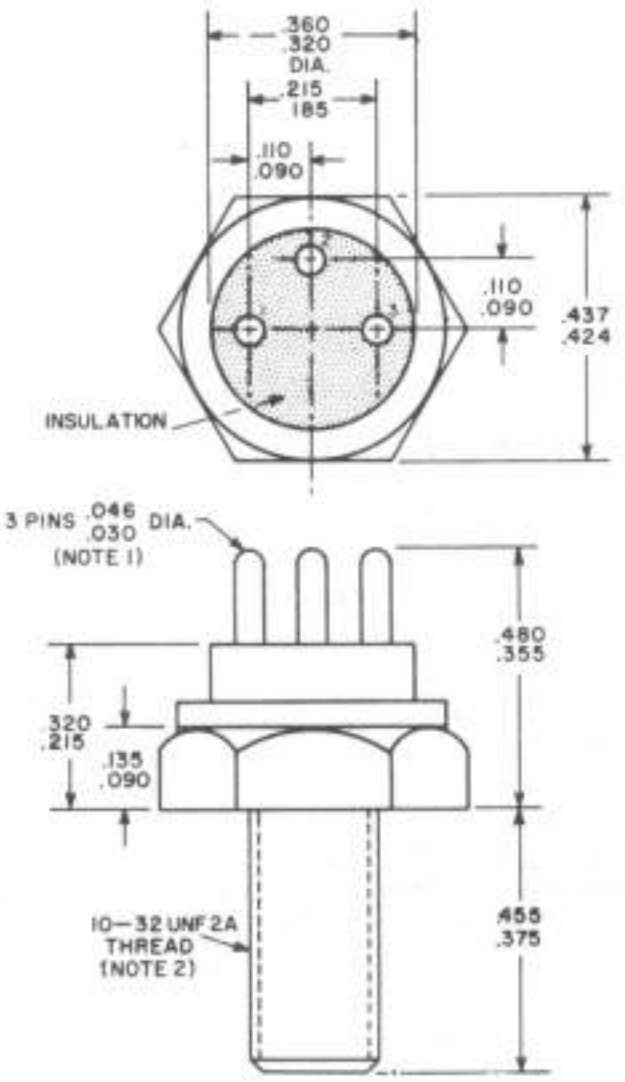


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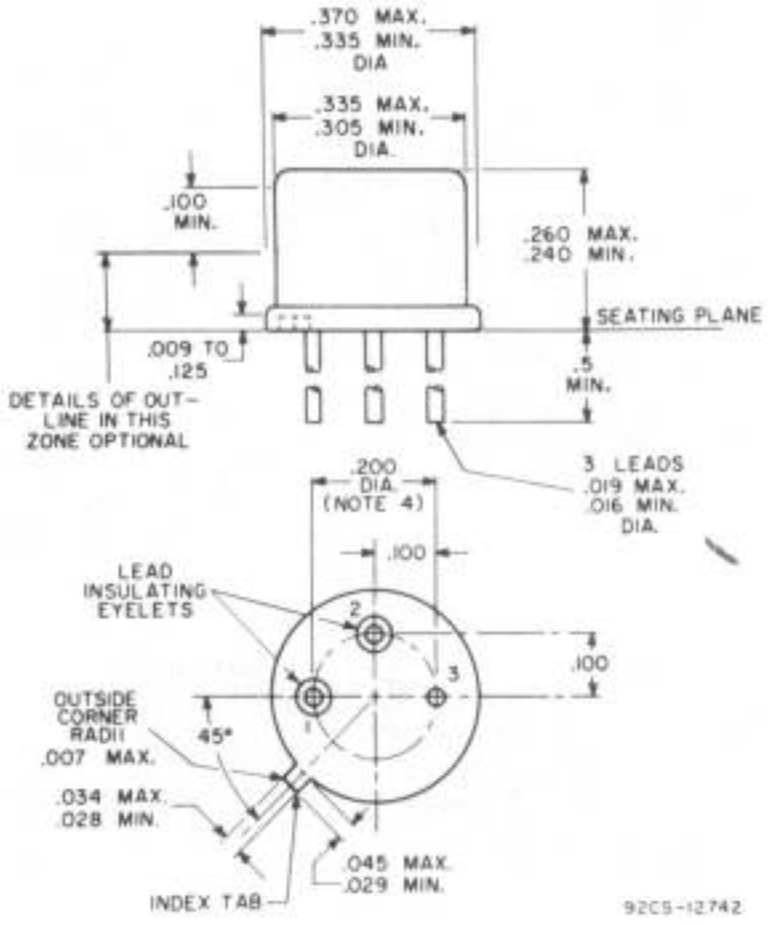


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(Bottom View)

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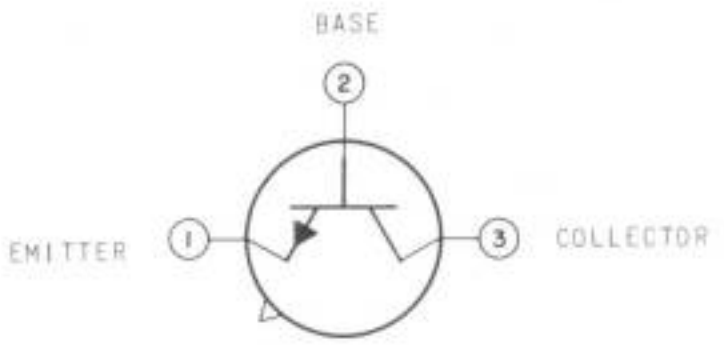


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