TYPES

2N1228 — 2N1234
2N1238 — 2N1244

# *Silicon PNP Alloy Junction Transistors*

## DESCRIPTION:

These Hughes® silicon alloy-junction transistors are PNP types intended primarily for switching and amplifying at low and medium current levels at moderate speeds.

These units are characterized by low saturation resistance, medium current handling capabilities, low collector-to-emitter cutoff currents and high collector-to-emitter operating voltages.

Transistors in this series are available in two package styles thus allowing freedom in circuit design based on your individual needs. Types 2N1228 through 2N1234 are assembled into the TO-5 package; 2N1238 through 2N1244 are in the Hughes coaxial package. The sturdy structure of each case style enables them to pass easily the stringent requirements outlined in MIL-S-19500B.

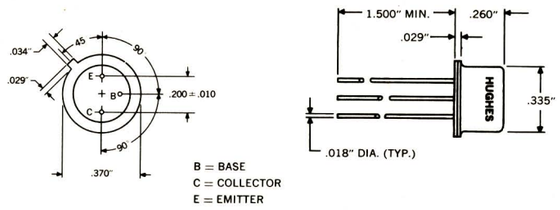
*TO-5 Package* *Coaxial Package*

## ABSOLUTE MAXIMUM RATINGS @ 25° C.

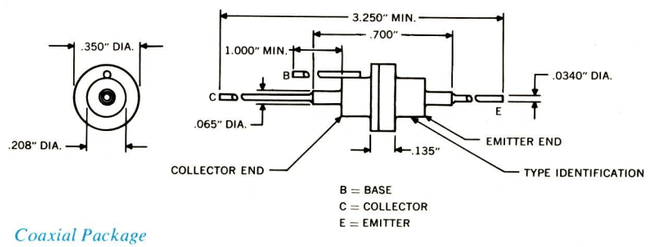
| | *Unit* | *2N1228 2N1238* | *2N1229 2N1239* | *2N1230 2N1240* | *2N1231 2N1241* | *2N1232 2N1242* | *2N1233 2N1243* | *2N1234 2N1244* | *TO-5 Package Coaxial Package* |
|---|---|---|---|---|---|---|---|---|---|
| Collector to Base Voltage ($BV_{CBO}$) | V | 15 | 15 | 35 | 35 | [redacted] 60 | [redacted] 60 | 110 | |
| Emitter to Base Voltage ($BV_{EBO}$) | V | 15 | 15 | 35 | 35 | [redacted] 60 | [redacted] 60 | 110 | |
| Collector to Emitter Voltage ($BV_{CEO}$) | V | 15 | 15 | 35 | 35 | [redacted] 60 | [redacted] 60 | 110 | |

*Power Dissipation: Coaxial Package—1 watt (free air), derate 7.4 mw/°C; 5 watts (heat sink), derate 37 mw/°C*
*TO-5 Package—400 mw (free air), derate 3.0 mw/°C*

## DIMENSIONS *maximum unless otherwise stated*




*TO-5 Package*



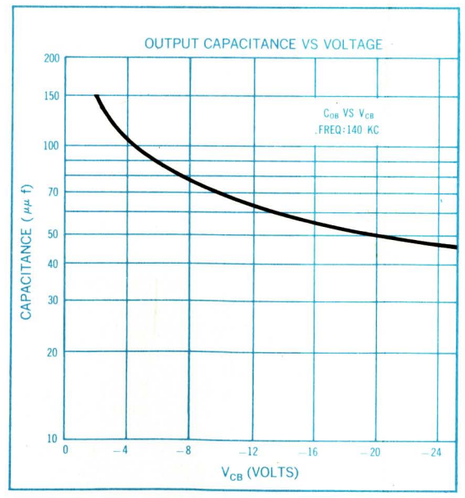

*Coaxial Package*

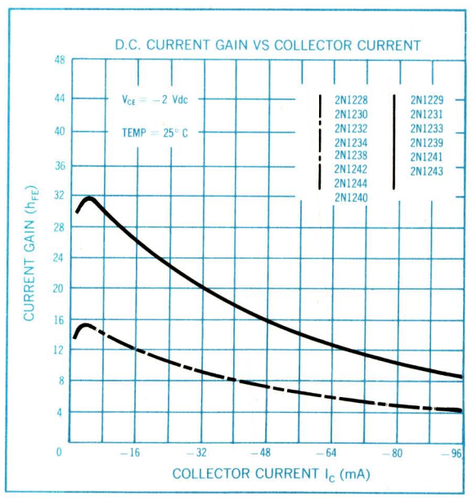
## SPECIFICATIONS

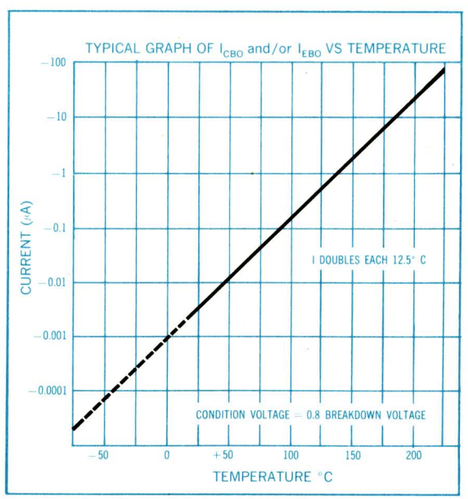
| D.C. CHARACTERISTICS | Conditions | Symbol | Unit | 2N1228 2N1238 | | | 2N1229 2N1239 | | | 2N1230 2N1240 | | | 2N1231 2N1241 | | | 2N1232 2N1242 | | | 2N1233 2N1243 | | | 2N1234 2N1244 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | min | typ | max | min | typ | max | min | typ | max | min | typ | max | min | typ | max | min | typ | max | min | typ | max |
| D.C. Current Gain | $V_{CE} = -2V$ $I_C = -10mA$ | $h_{FE}$ | | | 14 | | | 30 | | | 14 | | | 30 | | | 14 | | | 30 | | | 14 | |
| Collector & Emitter Cutoff Current | $V_{CB} = -12V, 30V$ 50V, 90V | $I_{CBO}$ ; $I_{EBO}$ | μAdc | | −0.01 | −0.1 (@−12Vdc) | | −0.01 | −0.1 (@−12Vdc) | | −0.01 | −0.1 (@−30Vdc) | | −0.01 | −0.1 (@−30Vdc) | | −0.01 | −0.1 (@−50Vdc) | | −0.01 | −0.1 (@−50Vdc) | | −0.01 | −0.1 (@−90Vdc) |
| Collector to Emitter Saturation Voltage | $I_C = -10mA$ $I_B = -2mA$ | $V_{CE}$ | Vdc | | −0.1 | −0.2 | | −0.1 | −0.2 | | −0.1 | −0.2 | | −0.1 | −0.2 | | −0.1 | −0.2 | | −0.1 | −0.2 | | −0.1 | −0.2 |
| Base to Emitter Saturation Voltage | $I_C = -10mA$ $I_B = -2mA$ | $V_{BE}$ | Vdc | | −0.7 | −1.3 | | −0.7 | −1.3 | | −0.7 | −1.3 | | −0.7 | −1.3 | | −0.7 | −1.3 | | −0.7 | −1.3 | | −0.7 | −1.3 |
| SMALL SIGNAL CHARACTERISTICS Freqùency Cutoff | $V_{CB} = -5V$ $I_E = 1mA$ | | Mc | | 1.2 | | | 1.2 | | | 1.2 | | | 1.2 | | | 1.0 | | | 1.0 | | | 0.8 | |
| A.C. Current Gain, Maximum | See Note 1 | $h_{fe}$ | | 14 | | 32 | 28 | | 65 | 14 | | 32 | 28 | | 65 | 14 | | 32 | 28 | | 65 | 14 | | 32 |
| Input Impedance | See Note 1 | $h_{ib}$ | ohms | | 30 | | | 30 | | | 30 | | | 30 | | | 30 | | | 30 | | | 30 | |
| Output Admittance | See Note 1 | $h_{ob}$ | μmhos | | 1.2 | | | 1.2 | | | 1.2 | | | 1.2 | | | 1.2 | | | 1.2 | | | 1.2 | |
| Reverse Transfer Voltage Ratio | See Note 1 | $h_{rb}$ | | | $15x10^{-4}$ | | | $15x10^{-4}$ | | | $8x10^{-4}$ | | | $8x10^{-4}$ | | | $4x10^{-4}$ | | | $4x10^{-4}$ | | | $4x10^{-4}$ | |
| Collector Output Capacity | See Note 1 | $C_{ob}$ | μμf | | 95 | | | 95 | | | 95 | | | 95 | | | 95 | | | 95 | | | 95 | |
| Noise Figure | See Note 1 | NF | db | | 10 | | | 10 | | | 10 | | | 10 | | | 10 | | | 10 | | | 10 | |

Note: 1. $V_{CB} = -5V$; $I_E = 1mAdc$; $F = 1Kc$

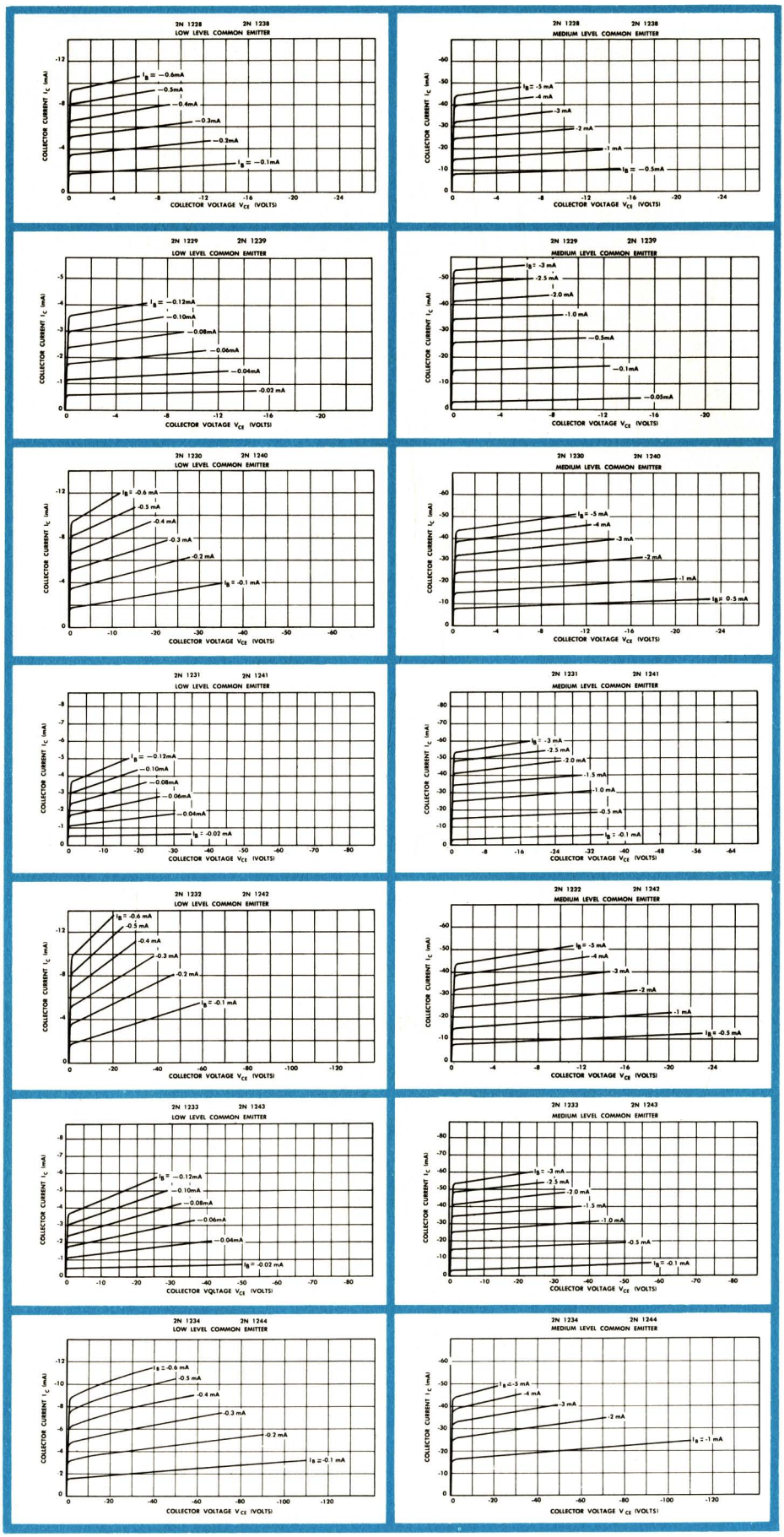
## TYPICAL CHARACTERISTICS



## COLLECTOR CHARACTERISTICS @25°C.




*Collector current limited by power dissipation*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PRINTED IN U.S.A.