



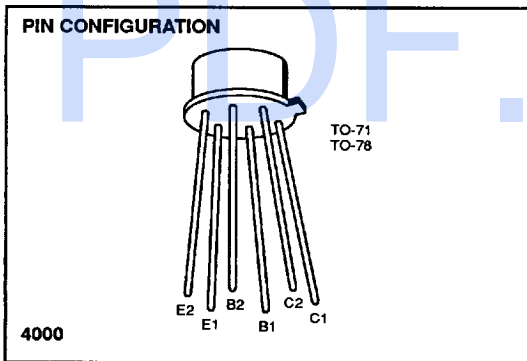
Dielectrically Isolated Monolithic Dual NPN General Purpose Amplifier

T-27-27

2N4044 / 2N4045 / 2N4100 / 2N4878 / 2N4879 / 2N4880

FEATURES

- High Gain at Low Current
- Low Output Capacitance
- Good h_{FE} Match
- Tight V_{BE} Tracking
- Dielectrically Isolated Matched Pairs for Differential Amplifiers



ABSOLUTE MAXIMUM RATINGS
($T_A = 25^\circ\text{C}$ unless otherwise noted)

| | |
|--|---|
| Collector-Base or Collector-Emitter Voltage (Note 1) | |
| 2N4044, 2N4878 | 60V |
| 2N4100, 2N4879 | 55V |
| 2N4045, 2N4880 | 45V |
| Collector-Collector Voltage | 100V |
| Emitter Base Voltage (Note 2) | 7V |
| Collector Current (Note 1) | 10mA |
| Storage Temperature Range | -65°C to $+175^\circ\text{C}$ |
| Operating Temperature Range | -55°C to $+175^\circ\text{C}$ |
| Lead Temperature (Soldering, 10sec) | $+300^\circ\text{C}$ |

| | TO-71 | | TO-78 | |
|---|----------|------------|----------|------------|
| | One Side | Both Sides | One Side | Both Sides |
| Power Dissipation | 200mW | 400mW | 250mW | 500mW |
| Derate above 25°C (mW/ $^\circ\text{C}$) | 1.3 | 2.7 | 1.7 | 3.3 |

NOTE: Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions above those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ORDERING INFORMATION

| Part | Package | Temperature Range |
|---------|--------------------------|---|
| 2N4044 | Hermetic TO-78 | -55°C to $+175^\circ\text{C}$ |
| X2N4044 | Sorted Chips in Carriers | -55°C to $+175^\circ\text{C}$ |
| 2N4045 | Hermetic TO-78 | -55°C to $+175^\circ\text{C}$ |
| X2N4045 | Sorted Chips in Carriers | -55°C to $+175^\circ\text{C}$ |
| 2N4100 | Hermetic TO-78 | -55°C to $+175^\circ\text{C}$ |
| X2N4100 | Sorted Chips in Carriers | -55°C to $+175^\circ\text{C}$ |
| 2N4878 | Hermetic TO-71 | -55°C to $+175^\circ\text{C}$ |
| X2N4878 | Sorted Chips in Carriers | -55°C to $+175^\circ\text{C}$ |
| 2N4879 | Hermetic TO-71 | -55°C to $+175^\circ\text{C}$ |
| X2N4879 | Sorted Chips in Carriers | -55°C to $+175^\circ\text{C}$ |
| 2N4880 | Hermetic TO-71 | -55°C to $+175^\circ\text{C}$ |
| X2N4880 | Sorted Chips in Carriers | -55°C to $+175^\circ\text{C}$ |

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F-27-27

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise specified)

| SYMBOL | PARAMETER | 2N4044 2N4878 | | 2N4100 2N4879 | | 2N4045 2N4880 | | UNITS | TEST CONDITIONS |
|------------------------|---|------------------|------|------------------|------|------------------|------|-------|--|
| | | MIN | MAX | MIN | MAX | MIN | MAX | | |
| h _{FE} | DC Current Gain | 200 | 600 | 150 | 600 | 80 | 800 | | I _C = 10μA, V _{CE} = 5V |
| | | 225 | | 175 | | 100 | | | I _C = 1.0mA, V _{CE} = 5V |
| | | 75 | | 50 | | 30 | | | I _C = 10μA, V _{CE} = 5V T _A = -55°C |
| V _{BE(on)} | Emitter-Base On Voltage | | 0.7 | | 0.7 | | 0.7 | V | |
| V _{CE(sat)} | Collector Saturation Voltage | | 0.35 | | 0.35 | | 0.35 | | I _C = 1.0mA, I _B = 0.1mA |
| I _{CBO} | Collector Cutoff Current | | 0.1 | | 0.1 | | 0.1 | nA | I _E = 0, V _{CB} = 45V, 30V T _A = 150°C |
| | | | 0.1 | | 0.1 | | 0.1 | μA | |
| I _{EBO} | Emitter Cutoff Current | | 0.1 | | 0.1 | | 0.1 | nA | I _C = 0, V _{EB} = 5V |
| C _{obo} | Output Capacitance (Note 4) | | 0.8 | | 0.8 | | 0.8 | pF | I _E = 0, V _{CB} = 5V, f = 1MHz |
| C _{te} | Emitter Transition Capacitance (Note 4) | | 1 | | 1 | | 1 | pF | I _C = 0, V _{EB} = 0.5V, f = 1MHz |
| C _{C1, C2} | Collector to Collector Capacitance (Note 4) | | 0.8 | | 0.8 | | 0.8 | pF | V _{CC} = 0, f = 1MHz |
| I _{C1, C2} | Collector to Collector Leakage Current | | 5 | | 5 | | 5 | pA | V _{CC} = ±100V |
| V _{CEO(sust)} | Collector to Emitter Sustaining Voltage | 60 | | 55 | | 45 | | V | I _C = 10mA, I _B = 0 |
| f _t | Current Gain Bandwidth Product (Note 4) | 200 | | 150 | | 150 | | MHz | I _C = 10mA, V _{CE} = 10V |
| f _i | Current Gain Bandwidth Product (Note 4) | 20 | | 15 | | 15 | | MHz | I _C = 10μA, V _{CE} = 10V |
| NF | Narrow Band Noise Figure (Note 4) | | 2 | | 3 | | 3 | dB | I _C = 10μA, V _{CE} = 5V R _G = 10kΩ f = 1kHz BW = 200Hz |
| BV _{CBO} | Collector Base Breakdown Voltage | 60 | | 55 | | 45 | | V | I _C = 10μA, I _E = 0 |
| BV _{EB0} | Emitter Base Breakdown Voltage (Note 2) | 7 | | 7 | | 7 | | V | I _E = 10μA, I _C = 0 |

MATCHING CHARACTERISTICS (T_A = 25°C unless otherwise specified)

| | | | | | | | | | |
|---|---|-----|-----|------|-----|-----|----|-------|---|
| h _{FE1} /h _{FE2} | DC Current Gain Ratio (Note 3) | 0.9 | 1 | 0.85 | 1 | 0.8 | 1 | | I _C = 10μA to 1mA, V _{CE} = 5V |
| V _{BE1} - V _{BE2} | Base Emitter Voltage Differential | | 3 | | 5 | | 5 | mV | I _C = 10μA, V _{CE} = 5V |
| I _{B1} - I _{B2} | Base Current Differential | | 5 | | 10 | | 25 | nA | I _C = 10μA, V _{CE} = 5V |
| Δ(V _{BE1} - V _{BE2}) /ΔT | Base Emitter Voltage Differential Change with Temperature | | 3 | | 5 | | 10 | μV/°C | I _C = 10μA, V _{CE} = 5V T _A = -55°C to +125°C |
| Δ(I _{B1} - I _{B2}) /ΔT | Base Current Differential Change with Temperature | | 0.3 | | 0.5 | | 1 | nA/°C | |

SMALL SIGNAL CHARACTERISTICS (T_A = 25°C unless otherwise specified)

| SYMBOL | PARAMETER | TYP. VALUE | UNITS | TEST CONDITIONS |
|-----------------|---------------------------|------------|--------------------|---|
| h _{ib} | Input Resistance | 28 | Ω | I _C = 1mA, V _{CB} = 5V (Note 4) |
| h _{rb} | Voltage Feedback Ratio | 43 | x 10 ⁻³ | |
| h _{fe} | Small Signal Current Gain | 250 | | I _C = 1mA, V _{CE} = 5V (Note 4) |
| h _{ob} | Output Conductance | 60 | μS | |
| h _{ie} | Input Resistance | 9.6 | kΩ | |
| h _{re} | Voltage Feedback Ratio | 42 | x 10 ⁻³ | |
| h _{oe} | Output Conductance | 12 | μS | |

- NOTES:**
- Per transistor.
 - The reverse base-emitter voltage must never exceed 7.0 volts and the reverse base-emitter current must never exceed 10μA.
 - The lowest of two h_{FE} readings is taken as h_{FE1} for purposes of this ratio.
 - For design reference only, not 100% tested.