

# LM114/H, LM114A/AH

## Monolithic Dual NPN

### General Purpose Amplifier



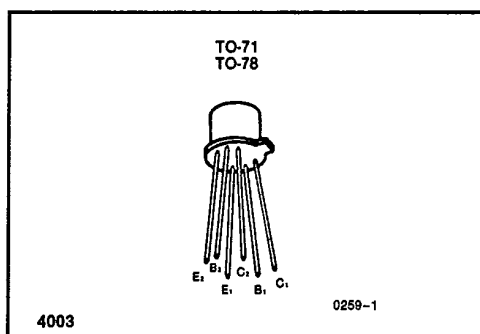
LM114/H, LM114A/AH

#### GENERAL DESCRIPTION

These devices contain a pair of junction-isolated NPN transistors fabricated on a single silicon substrate. This monolithic structure makes possible extremely tight parameter matching at low cost. Further, advanced processing techniques yield exceptionally high current gains at low collector currents, virtual elimination of "popcorn noise," low leakages and improved long-term stability.

Although designed primarily for high breakdown voltage and exceptional DC characteristics, these transistors have surprisingly good high-frequency performance. The gain-bandwidth product is 300MHz with 1mA collector current and 5V collector-base voltage and 22MHz with 10 $\mu$ A collector current. Typical collector-base capacitance is only 1.6 pF at 5V.

#### PIN CONFIGURATION



#### FEATURES

- Low Offset Voltage
- Low Drift
- High Current Gain
- Tight Beta Match
- High Breakdown Voltage
- Matching Guaranteed Over A 0V to 45V Collector-Base Voltage Range
- CMRR > 100dB

#### ABSOLUTE MAXIMUM RATINGS

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

|  |   |
|--|---|
| Collector-Base Voltage (1)                     | 45V   |
| Collector-Emitter Voltage (1)                  | 45V   |
| Collector-Collector Voltage                    | 45V   |
| Emitter-Base Voltage (1)                       | 6V  |
| Collector Current (1)                          | 20mA  |
| Storage Temperature Range                      | $-65^\circ\text{C}$ to $+200^\circ\text{C}$ |
| Operating Temperature Range                    | $-55^\circ\text{C}$ to $+150^\circ\text{C}$ |
| Lead Temperature (Soldering, 10sec)            | $+300^\circ\text{C}$                        |
| Power Dissipation ( $T_C = 25^\circ\text{C}$ ) | 800mW                                       |
| Derate above $25^\circ\text{C}$                | 14mW/ $^\circ\text{C}$                      |

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

| TO-71  | TO-78   |
|--------|---------|
| LM114  | LM114H  |
| LM114A | LM114AH |

#### ELECTRICAL CHARACTERISTICS (NOTE 2)

| Symbol            | Parameter             | Test Conditions                                       | Maximum Limits |          | Units |
|-------------------|-----------------------|---|----------------|----------|-------|
|                   |                       |   | LM114A, AH     | LM114, H |       |
| $V_{BE1-2}$       | Offset Voltage        | $1\mu\text{A} \leq I_C \leq 100\mu\text{A}$           | 0.5            | 2.0      | mV    |
| $I_{B1-2}$        | Offset Current        | $I_C = 10\mu\text{A}$                                 | 2.0            | 10       | nA    |
|                   | Bias Current          | $I_C = 1\mu\text{A}$                                  | 0.5            | 40       | nA    |
|                   |                       | $I_C = 10\mu\text{A}$                                 | 20             |          |       |
|                   |                       | $I_C = 1\mu\text{A}$                                  | 3.0            |          |       |
| $\Delta V_{BE}/V$ | Offset Voltage Change | $0V \leq V_{CB} \leq V_{MAX}$ , $I_C = 10\mu\text{A}$ | 0.2            | 1.5      | mV    |
| $\Delta I_B/V$    | Offset Current Change |   | 1.0            | 4.0      | nA    |

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NOTE: All typical values have been characterized but are not tested.

## LM114/H, LM114A/AH

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T-29-27

LM114/H, LM114A/AH

ELECTRICAL CHARACTERISTICS (Continued) ( $T_A = 25^\circ\text{C}$  unless otherwise specified)

| Symbol                     | Parameter                           | Test Conditions  | Maximum Limits |          | Units                        |
|----------------------------|-------------------------------------|--|----------------|----------|------------------------------|
|                            |                                     |  | LM114A, AH     | LM114, H |                              |
| $\Delta V_{BE}/\Delta T$   | Offset Voltage Drift                | $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ , $I_C = 10\mu\text{A}$ | 2.0            | 10       | $\mu\text{V}/^\circ\text{C}$ |
| $\Delta I_{B1-2}/\Delta T$ | Offset Current                      |  | 12             | 50       | nA                           |
| $\Delta I_B/\Delta T$      | Bias Current                        |  | 60             | 150      |                              |
| $I_{CBO}$                  | Collector-Base Leakage Current      | $V_{CB} = V_{MAX}$   | 10             | 50       | pA                           |
| $I_{CEO}$                  | Collector-Emitter Leakage Current   | $T_A = 125^\circ\text{C}$ (Note 3)   | 10             | 50       | nA                           |
|                            |                                     | $V_{CE} = V_{MAX}$ , $V_{EB} = 0\text{V}$                                    | 50             | 200      | pA                           |
| $I_{C1-C2}$                | Collector-Collector Leakage Current | $T_A = 125^\circ\text{C}$ (Note 3)   | 50             | 200      | nA                           |
|                            |                                     | $V_{CC} = V_{MAX}$   | 100            | 300      | pA                           |
|                            |                                     | $T_A = 125^\circ\text{C}$ (Note 3)   | 100            | 300      | nA                           |

NOTES: 1. Per transistor.

2. These specifications apply for  $T_A = +25^\circ\text{C}$  and  $0\text{V} \leq V_{CB} \leq V_{MAX}$ , unless otherwise specified. For the LM114 and LM114A,  $V_{MAX} = 30\text{V}$ .

3. For design reference only, not 100% tested.

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NOTE: All typical values have been characterized but are not tested.