

**4N22**

**4N23** JAN, JANTX, JANTXV, AND JANS SINGLE CHANNEL OPTOCOUPPLERS

**4N24**



07/07/03

**Features:**

- Qualified to MIL-PRF-19500/486
- Collector in electrical contact with case
- Overall current gain: 1.5 typical (4N24)
- Base lead provided for conventional transistor biasing
- Rugged package
- High gain, high voltage transistor
- +1kV electrical isolation

**Applications:**

- Eliminate ground loops
- Level shifting
- Line receiver
- Switching power supplies
- Motor control

**DESCRIPTION**

A Gallium Aluminum Arsenide (GaAlAs) infrared LED and a high gain N-P-N silicon phototransistor packaged in a hermetically sealed metal case. The **4N22**, **4N23** and **4N24**'s can be tested to customer specifications.

**\*ABSOLUTE MAXIMUM RATINGS**

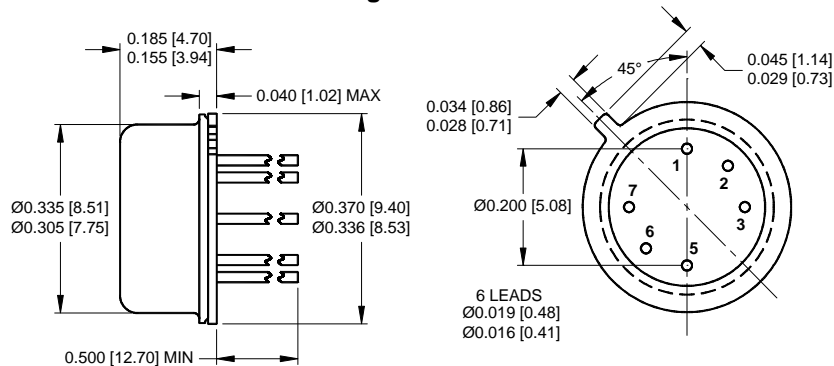
|                                                                                                    |                 |
|----------------------------------------------------------------------------------------------------|-----------------|
| Input to Output Voltage .....                                                                      | ±1kV            |
| Emitter-Collector Voltage .....                                                                    | 4V              |
| Collector-Emitter Voltage .....                                                                    | 35V             |
| Collector-Base Voltage .....                                                                       | 35V             |
| Reverse Input Voltage .....                                                                        | 2V              |
| Input Diode Continuous Forward Current at (or below) 25°C Free-Air Temperature (see note 1) .....  | 40mA            |
| Peak Forward Input Current (Value applies for $t_w \leq 1\mu s$ PRR < 300 pps) .....               | 1A              |
| Continuous Collector Current .....                                                                 | 50mA            |
| Continuous Transistor Power Dissipation at (or below) 25°C Free-Air Temperature (see Note 2) ..... | 300mW           |
| Storage Temperature .....                                                                          | -65°C to +125°C |
| Operating Free-Air Temperature Range .....                                                         | -55°C to +125°C |
| Lead Solder Temperature (10 seconds max., 1/16" from case) .....                                   | 240°C           |

**Notes:**

1. Derate linearly to 125°C free-air temperature at the rate of 0.40 mA/°C above 65°C.
2. Derate linearly to 125°C free-air temperature at the rate of 5 mW/°C above 65°C.

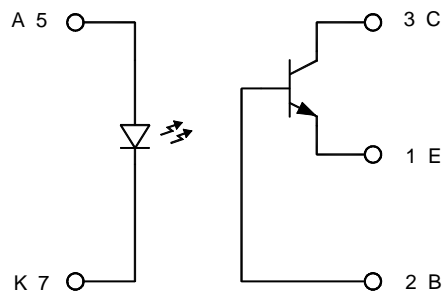
- JEDEC registered data

**Package Dimensions**



ALL LINEAR DIMENSIONS ARE IN INCHES [MILLIMETERS].

**Schematic Diagram**



COLLECTOR IS COMMON TO CASE.

**4N22, 4N23, and 4N24**

**JAN, JANTX, JANTXV, AND JANS SINGLE CHANNEL OPTOCOUPLEDERS**

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**\*ELECTRICAL CHARACTERISTICS INPUT LED**  $T_A = 25^\circ\text{C}$  Unless otherwise specified

| PARAMETER                          | SYMBOL | MIN | MAX | UNITS | TEST CONDITIONS     | NOTE |
|------------------------------------|--------|-----|-----|-------|---------------------|------|
| Input Diode Static Reverse Current | $I_R$  |     | 100 | nA    | $V_R = 2V$          |      |
| Input Diode Static Forward Voltage | $V_F$  | 1   | 1.5 | V     | $I_F = 10\text{mA}$ |      |
|                                    |        | 0.8 | 1.3 |       |                     |      |
|                                    |        | 0.7 | 1.2 |       |                     |      |

**\*OUTPUT TRANSISTOR**  $T_A = 25^\circ\text{C}$  Unless otherwise specified

| PARAMETER                           | SYMBOL        | MIN | MAX | UNITS | TEST CONDITIONS                          | NOTE |
|-------------------------------------|---------------|-----|-----|-------|------------------------------------------|------|
| Collector-Base Breakdown Voltage    | $V_{(BR)CBO}$ | 35  |     | V     | $I_C = 100\mu\text{A}, I_E = 0, I_F = 0$ |      |
| Collector-Emitter Breakdown Voltage | $V_{(BR)CEO}$ | 35  |     | V     | $I_C = 1\text{mA}, I_B = 0, I_F = 0$     |      |
| Emitter-Base Breakdown Voltage      | $V_{(BR)EBO}$ | 4   |     | V     | $I_B = 0, I_E = 100\mu\text{A}, I_F = 0$ |      |

**\*COUPLED CHARACTERISTICS**  $T_A = 25^\circ\text{C}$  Unless otherwise specified

| PARAMETER                            | SYMBOL        | MIN       | MAX | UNITS         | TEST CONDITIONS                                    | NOTE |
|--------------------------------------|---------------|-----------|-----|---------------|----------------------------------------------------|------|
| On State Collector Current           | $I_{C(ON)}$   | 0.15      |     | mA            | $V_{CE} = 5V, I_B = 0, I_F = 2\text{mA}$           |      |
|                                      |               | 0.2       |     |               |                                                    |      |
|                                      |               | 0.4       |     |               |                                                    |      |
| On State Collector Current           | $I_{C(ON)}$   | 2.5       |     | mA            | $V_{CE} = 5V, I_B = 0, I_F = 10\text{mA}$          |      |
|                                      |               | 6         |     |               |                                                    |      |
|                                      |               | 10        |     |               |                                                    |      |
| On State Collector Current           | $I_{C(ON)}$   | 1         |     | mA            | $V_{CE} = 5V, I_B = 0, I_F = 10\text{mA}$          |      |
| -55°C                                |               | 2.5       |     |               |                                                    |      |
|                                      |               | 4         |     |               |                                                    |      |
| On State Collector Current           | $I_{C(ON)}$   | 1         |     | mA            | $V_{CE} = 5V, I_B = 0, I_F = 10\text{mA}$          |      |
| +100°C                               |               | 2.5       |     |               |                                                    |      |
|                                      |               | 4         |     |               |                                                    |      |
| Off State Collector Current          | $I_{C(OFF)}$  |           | 100 | nA            | $V_{CE} = 20V, I_B = 0, I_F = 0\text{mA}$          |      |
| +25°C                                |               |           | 100 | $\mu\text{A}$ | $V_{CE} = 20V, I_B = 0, I_F = 0\text{mA}$          |      |
| Off State Collector Current          | $I_{C(OFF)}$  |           | 100 | $\mu\text{A}$ | $V_{CE} = 20V, I_B = 0, I_F = 0\text{mA}$          |      |
| +100°C                               |               |           | 100 | $\mu\text{A}$ | $V_{CE} = 20V, I_B = 0, I_F = 0\text{mA}$          |      |
| Collector-Emitter Saturation Voltage | $V_{CE(SAT)}$ |           | 0.3 | V             | $I_C = 2.5\text{mA}, I_B = 0, I_F = 20\text{mA}$   |      |
|                                      |               |           | 0.3 | V             | $I_C = 5\text{mA}, I_B = 0, I_F = 20\text{mA}$     |      |
|                                      |               |           | 0.3 | V             | $I_C = 10\text{mA}, I_B = 0, I_F = 20\text{mA}$    |      |
| Input to Output Resistance           | $R_{I-O}$     | $10^{11}$ |     | $\Omega$      | $V_{IN-OUT} = 1\text{kV}$                          | 1    |
| Input to Output Capacitance          | $C_{I-O}$     |           | 5   | pF            | $F = 1\text{MHz}, V_{IN-OUT} = 1\text{kV}$         | 1    |
| Rise Time                            | $t_r$         |           | 15  | $\mu\text{s}$ | $V_{CC} = 10V, I_F = 10\text{mA}, R_L = 100\Omega$ |      |
|                                      |               |           | 15  | $\mu\text{s}$ |                                                    |      |
|                                      |               |           | 20  | $\mu\text{s}$ |                                                    |      |
| Fall Time                            | $t_f$         |           | 15  | $\mu\text{s}$ | $V_{CC} = 10V, I_F = 10\text{mA}, R_L = 100\Omega$ |      |
|                                      |               |           | 15  | $\mu\text{s}$ |                                                    |      |
|                                      |               |           | 20  | $\mu\text{s}$ |                                                    |      |

**NOTES:**

- These parameters are measured between all phototransistor leads shorted together and with both input diode leads shorted together.

**RECOMMENDED OPERATING CONDITIONS:**

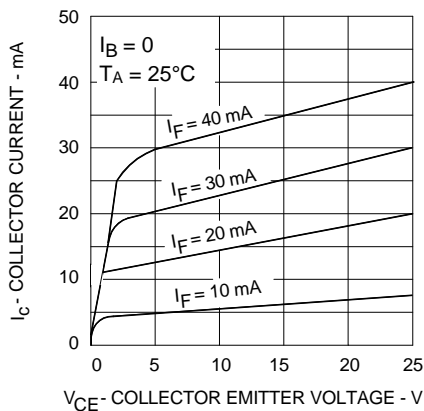
| PARAMETER                 | SYMBOL   | MIN | MAX | UNITS         |
|---------------------------|----------|-----|-----|---------------|
| Input Current, Low Level  | $I_{FL}$ | 0   | 1   | $\mu\text{A}$ |
| Input Current, High Level | $I_{FH}$ | 2   | 10  | mA            |
| Supply Voltage            | $V_{CC}$ | 5   | 10  | V             |

SELECTION GUIDE

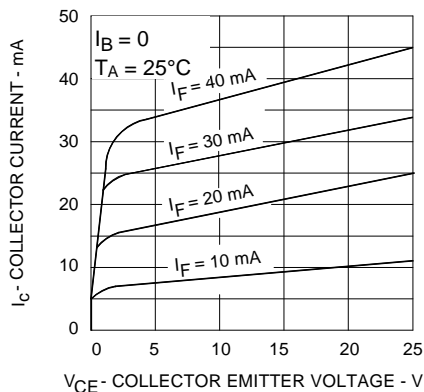
| PART NUMBER | PART DESCRIPTION |
|-------------|------------------|
| 4N22        | Commercial       |
| 4N23        | Commercial       |
| 4N24        | Commercial       |
| JAN4N22     | JAN Screened     |
| JAN4N23     | JAN Screened     |
| JAN4N24     | JAN Screened     |
| JANTX4N22   | JANTX Screened   |
| JANTX4N23   | JANTX Screened   |
| JANTX4N24   | JANTX Screened   |
| JANTXV4N22  | JANTXV Screened  |
| JANTXV4N23  | JANTXV Screened  |
| JANTXV4N24  | JANTXV Screened  |
| JANS4N22    | JANS Screened    |
| JANS4N23    | JANS Screened    |
| JANS4N24    | JANS Screened    |

\* JEDEC registered

**4N22**  
COLLECTOR CURRENT  
VS  
COLLECTOR-EMITTER VOLTAGE



**4N23**  
COLLECTOR CURRENT  
VS  
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**4N24**  
COLLECTOR CURRENT  
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COLLECTOR-EMITTER VOLTAGE

