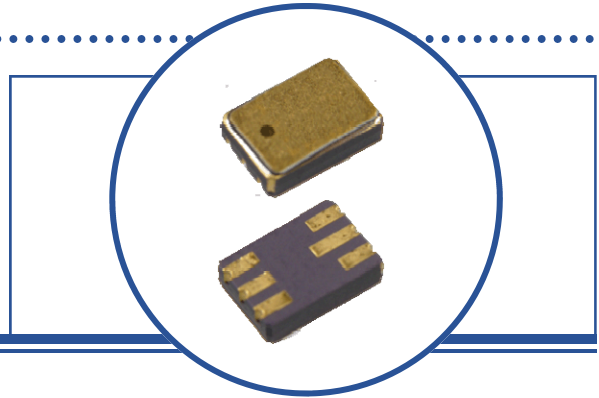


**Surface Mount Optically Coupled Isolator**  
**4N22U, 4N23U, 4N24U (COTS, TX, TXV)**  
**4N47U, 4N48U, 4N49U (COTS, TX, TXV)**



**Features:**

- Surface Mount (SM), Leadless Chip Carrier (LCC)
- 1 kV electrical isolation
- Base contact provided for conventional transistor biasing
- TX and TXV devices processed to MIL-PRF-19500



**Description:**

Each isolator in this series consists of an infrared emitting diode and a NPN silicon phototransistor, which are mounted in a hermetically sealed Surface Mount, 6 Pin package. Devices are designed for military and/or harsh environments.

*The 4N22U, 4N23U and 4N24U (TX, TXV) devices are processed to MIL-PRF-19500/486. The 4N47U, 4N48U and 4N49U (TX, TXV) devices are processed to MIL-PRF-19500/548.*

Please contact your local representative or OPTEK for more information.

**Applications:**

- Military equipment
- High-Reliability environments
- High voltage isolation between input and output
- Electrical isolation in dirty environments
- Industrial equipment
- Medical equipment
- Office equipment

| Ordering Information |                        |                               |                             |                           |
|----------------------|------------------------|-------------------------------|-----------------------------|---------------------------|
| Part Number          | Isolation Voltage (kV) | I <sub>F</sub> (mA) Typ / Max | V <sub>CE</sub> (Volts) Max | Processing MIL-PRF-195000 |
| 4N22U                | 1                      | 10 / 40                       | 35                          | COTS                      |
| 4N22UTX              |                        |                               |                             | 486                       |
| 4N22UTXV             |                        |                               |                             |                           |
| 4N23U                |                        |                               |                             | COTS                      |
| 4N23UTX              |                        |                               |                             | 486                       |
| 4N23UTXV             |                        |                               |                             |                           |
| 4N24U                |                        |                               |                             | COTS                      |
| 4N24UTX              |                        |                               |                             | 486                       |
| 4N24UTXV             |                        |                               |                             |                           |
| 4N47U                |                        |                               | 45                          | COTS                      |
| 4N47UTX              |                        |                               |                             | 548                       |
| 4N47UTXV             |                        |                               |                             |                           |
| 4N48U                |                        |                               |                             | COTS                      |
| 4N48UTX              |                        |                               |                             | 548                       |
| 4N48UTXV             |                        |                               |                             |                           |
| 4N49U                |                        |                               |                             | COTS                      |
| 4N49UTX              |                        |                               |                             | 548                       |
| 4N49UTXV             |                        |                               |                             |                           |



**RoHS**

OPTEK reserves the right to make changes at any time in order to improve design and to supply the best product possible.

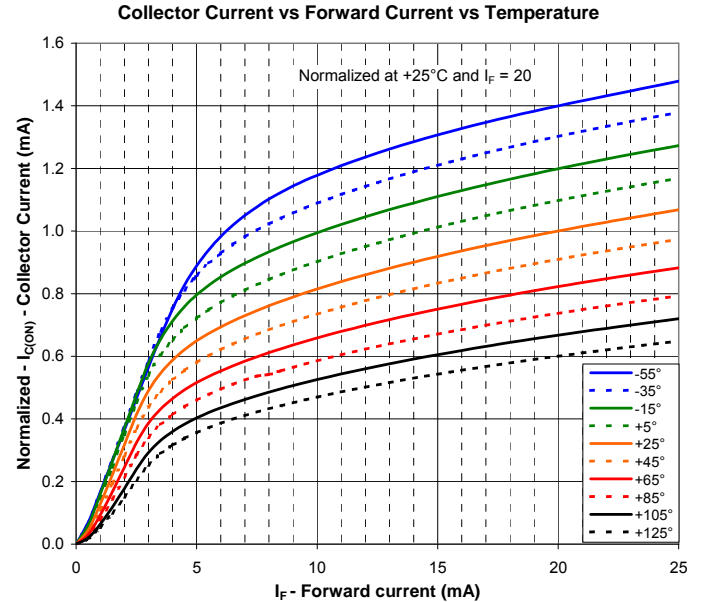
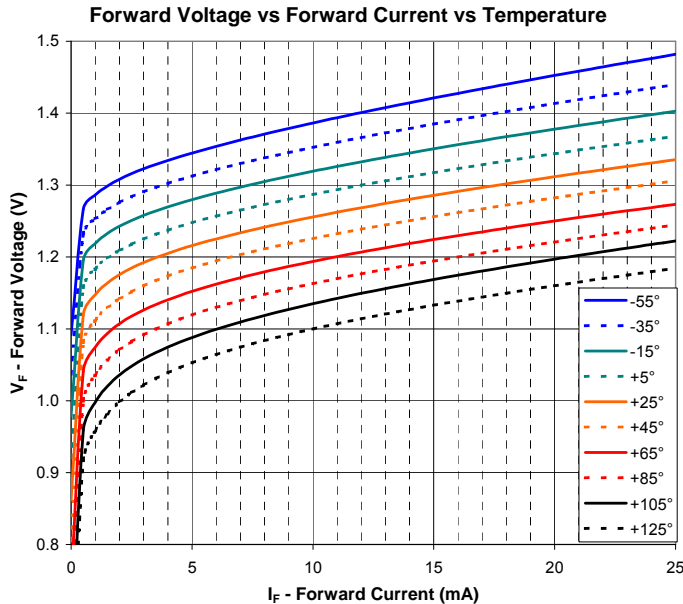
# Surface Mount Optically Coupled Isolator

4N22U, 4N23U, 4N24U (COTS, TX, TXV)  
4N47U, 4N48U, 4N49U (COTS, TX, TXV)



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

|  |                   |
|--|-------------------|
| Storage Temperature  | -65° C to +150° C |
| Operating Temperature  | -55° C to +125° C |
| Input-to-Output Isolation Voltage <sup>(1)(2)</sup>  | ± 1 kVDC          |
| Lead Soldering Temperature (1/16" (1.6 mm) from case for 5 seconds with soldering iron) <sup>(3)</sup> | 260° C            |
| <b>Input Diode</b>   |                   |
| Forward DC Current <sup>(4)</sup>  | 50 mA             |
| Reverse DC Voltage   | 2 V               |
| Power Dissipation <sup>(5)</sup>   | 300 mW            |
| <b>Output Photosensor</b>  |                   |
| Collector-Emitter Voltage  | 35 V              |
| Emitter-Collector Voltage  | 7.0 V             |
| Power Dissipation <sup>(6)</sup>   | 100 mW            |



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# Surface Mount Optically Coupled Isolator

## 4N22U, 4N23U, 4N24U (COTS, TX, TXV)

## 4N47U, 4N48U, 4N49U (COTS, TX, TXV)



### Electrical Characteristics (T<sub>A</sub> = 25° C unless otherwise noted)

| SYMBOL | PARAMETER | MIN | TYP | MAX | UNITS | TEST CONDITIONS |
|--------|-----------|-----|-----|-----|-------|-----------------|
|--------|-----------|-----|-----|-----|-------|-----------------|

#### Input Diode (See OP165 or OP265 for additional information - for reference only)

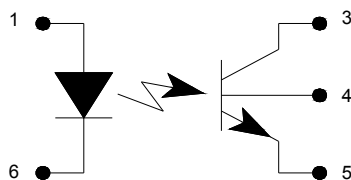
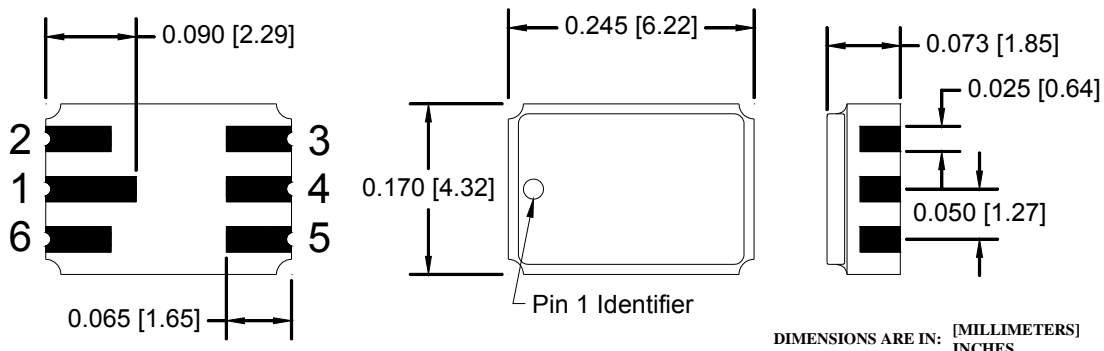
|                |                                      |      |   |      |    |   |
|----------------|--------------------------------------|------|---|------|----|---|
| V <sub>F</sub> | Forward Voltage                      |      |   |      |    |   |
|                | 4N22, 4N23, 4N24 [A] (COTS, TX, TXV) | 0.80 | - | 1.30 |    | I <sub>F</sub> = 10.0 mA  |
|                | 4N22, 4N23, 4N24 [A] (COTS, TX, TXV) | 1.00 | - | 1.50 |    | I <sub>F</sub> = 10.0 mA, T <sub>A</sub> = -55° C <sup>(1)</sup>  |
|                | 4N22, 4N23, 4N24 [A] (COTS, TX, TXV) | 0.70 | - | 1.20 | V  | I <sub>F</sub> = 10.0 mA, T <sub>A</sub> = -100° C <sup>(1)</sup> |
|                | 4N47, 4N48, 4N49 [A] (COTS, TX, TXV) | 0.80 | - | 1.50 |    | I <sub>F</sub> = 10.0 mA  |
|                | 4N47, 4N48, 4N49 [A] (COTS, TX, TXV) | 1.00 | - | 1.70 |    | I <sub>F</sub> = 10.0 mA, T <sub>A</sub> = -55° C <sup>(1)</sup>  |
| I <sub>R</sub> | Reverse Current                      | -    | - | 100  | μA | V <sub>R</sub> = 2.0 V  |
|                | 4N47, 4N48, 4N49 [A] (COTS, TX, TXV) | 0.70 | - | 1.30 |    | I <sub>F</sub> = 10.0 mA, T <sub>A</sub> = -100° C <sup>(1)</sup> |

#### Output Photosensor (See OP505 for additional information - for reference only)

|                      |   |          |          |            |          |   |
|----------------------|---|----------|----------|------------|----------|---|
| V <sub>(BR)CEO</sub> | Collector-Emitter Breakdown Voltage<br>4N22U Series<br>4N47U Series | 35<br>40 | 80<br>90 | -<br>-     | V        | I <sub>C</sub> = 100 μA, I <sub>F</sub> = 0   |
| V <sub>(BR)ECO</sub> | Emitter-Collector Breakdown Voltage<br>4N22U Series<br>4N47U Series | 4<br>7   | 6<br>10  | -<br>-     | V        | I <sub>E</sub> = 100 μA, I <sub>F</sub> = 0   |
| I <sub>CEO</sub>     | Collector-Emitter Dark Current                                      | -<br>-   | 20<br>-  | 100<br>100 | nA<br>μA | V <sub>CE</sub> = 20 V, I <sub>F</sub> = 0 I <sub>B</sub> = 0 T <sub>A</sub> = 25° C<br>V <sub>CE</sub> = 20 V, I <sub>F</sub> = 0 I <sub>B</sub> = 0 T <sub>A</sub> = 100° C |
| V <sub>CE(SAT)</sub> | Collector Saturation Voltage  | -        | 0.2      | 0.3        | V        | I <sub>F</sub> = 20 mA, I <sub>C</sub> = 2 mA   |

#### Notes:

- (1) Measured with input and output leads shorted. Typical input/output capacitance is 0.06 pF.
- (2) UL recognition is for 3500 VAC for one minute.
- (3) RMA flux is recommended. The duration can be extended to 10 seconds maximum when flow soldering.
- (4) Derate linearly 0.67 mA/°C above 25° C.
- (5) Derate linearly 0.83 mA/°C above 25° C.
- (6) Derate linearly 1.67 mA/°C above 25° C.



| Pin # | LED     | Pin # | Transistor |
|-------|---------|-------|------------|
| 2     | N/A     | 3     | Collector  |
| 1     | Anode   | 4     | Base       |
| 6     | Cathode | 5     | Emitter    |

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**Surface Mount Optically Coupled Isolator**  
**4N22U, 4N23U, 4N24U (COTS, TX, TXV)**  
**4N47U, 4N48U, 4N49U (COTS, TX, TXV)**



**Coupled**

|               |                               |       |                  |    |   |               |   |
|---------------|-------------------------------|-------|------------------|----|---|---------------|---|
| $I_C/I_F$     | DC Current Transfer Ratio     | 4N22U | 25               | -  | -   | %             | $I_F = 10 \text{ mA}, V_{CE} = 5 \text{ V}$   |
|               |                               | 4N23U | 60               | -  | -   |               |   |
|               |                               | 4N24U | 100              | -  | -   |               |   |
|               |                               | 4N47U | 50               | -  | -   | %             | $I_F = 2 \text{ mA}, V_{CE} = 5 \text{ V}$  |
|               |                               | 4N48U | 100              | -  | -   |               |   |
|               |                               | 4N49U | 200              | -  | -   |               |   |
| $I_{C(ON)}$   | On-State Collector Current    | 4N22U | 0.15             | -  | -   | mA            | $V_{CE} = 10 \text{ V}, I_B = 0, I_F = 2.0 \text{ mA } T_A = 25^\circ\text{C}$<br>$V_{CE} = 10 \text{ V}, I_B = 0, I_F = 10.0 \text{ mA } T_A = 25^\circ\text{C}$<br>$V_{CE} = 10 \text{ V}, I_B = 0, I_F = 10.0 \text{ mA } T_A = -55^\circ\text{C}$<br>$V_{CE} = 10 \text{ V}, I_B = 0, I_F = 10.0 \text{ mA } T_A = 100^\circ\text{C}$ |
|               |                               |       | 2.50             | -  | -   |               |   |
|               |                               |       | 1.00             | -  | -   |               |   |
|               |                               |       | 1.00             | -  | -   |               |   |
|               |                               | 4N23U | 0.2              | -  | -   | mA            | $V_{CE} = 10 \text{ V}, I_B = 0, I_F = 2.0 \text{ mA } T_A = 25^\circ\text{C}$<br>$V_{CE} = 10 \text{ V}, I_B = 0, I_F = 10.0 \text{ mA } T_A = 25^\circ\text{C}$<br>$V_{CE} = 10 \text{ V}, I_B = 0, I_F = 10.0 \text{ mA } T_A = -55^\circ\text{C}$<br>$V_{CE} = 10 \text{ V}, I_B = 0, I_F = 10.0 \text{ mA } T_A = 100^\circ\text{C}$ |
|               |                               |       | 6.0              | -  | -   |               |   |
|               |                               |       | 2.5              | -  | -   |               |   |
| 4N24U         | 0.4                           | -     | -                | mA | $V_{CE} = 10 \text{ V}, I_B = 0, I_F = 2.0 \text{ mA } T_A = 25^\circ\text{C}$<br>$V_{CE} = 10 \text{ V}, I_B = 0, I_F = 10.0 \text{ mA } T_A = 25^\circ\text{C}$<br>$V_{CE} = 10 \text{ V}, I_B = 0, I_F = 10.0 \text{ mA } T_A = -55^\circ\text{C}$<br>$V_{CE} = 10 \text{ V}, I_B = 0, I_F = 10.0 \text{ mA } T_A = 100^\circ\text{C}$ |               |   |
|               | 10.0                          | -     | -                |    |   |               |   |
|               | 4.0                           | -     | -                |    |   |               |   |
| 4N47U         | 0.5                           | -     | -                | mA | $V_{CE} = 5 \text{ V}, I_B = 0, I_F = 1.0 \text{ mA } T_A = 25^\circ\text{C}$<br>$V_{CE} = 5 \text{ V}, I_B = 0, I_F = 2.0 \text{ mA } T_A = -55^\circ\text{C}$<br>$V_{CE} = 5 \text{ V}, I_B = 0, I_F = 2.0 \text{ mA } T_A = 100^\circ\text{C}$   |               |   |
|               | 0.7                           | -     | -                |    |   |               |   |
|               | 0.5                           | -     | -                |    |   |               |   |
| 4N48U         | 1.0                           | -     | 5.0              | mA | $V_{CE} = 5 \text{ V}, I_B = 0, I_F = 1.0 \text{ mA } T_A = 25^\circ\text{C}$<br>$V_{CE} = 5 \text{ V}, I_B = 0, I_F = 2.0 \text{ mA } T_A = -55^\circ\text{C}$<br>$V_{CE} = 5 \text{ V}, I_B = 0, I_F = 2.0 \text{ mA } T_A = 100^\circ\text{C}$   |               |   |
|               | 1.4                           | -     | -                |    |   |               |   |
|               | 1.0                           | -     | -                |    |   |               |   |
| 4N49U         | 2.0                           | -     | 10.0             | mA | $V_{CE} = 5 \text{ V}, I_B = 0, I_F = 1.0 \text{ mA } T_A = 25^\circ\text{C}$<br>$V_{CE} = 5 \text{ V}, I_B = 0, I_F = 2.0 \text{ mA } T_A = -55^\circ\text{C}$<br>$V_{CE} = 5 \text{ V}, I_B = 0, I_F = 2.0 \text{ mA } T_A = 100^\circ\text{C}$   |               |   |
|               | 2.8                           | -     | -                |    |   |               |   |
|               | 2.0                           | -     | -                |    |   |               |   |
| $V_{CE(SAT)}$ | Collector Saturation Voltage  | 4N22U | -                | -  | 0.3   | V             | $I_C = 2.5 \text{ mA}, I_B = 0, I_F = 20 \text{ mA}$<br>$I_C = 5.0 \text{ mA}, I_B = 0, I_F = 20 \text{ mA}$<br>$I_C = 10.0 \text{ mA}, I_B = 0, I_F = 20 \text{ mA}$   |
|               |                               | 4N23U | -                | -  | 0.3   |               |   |
|               |                               | 4N24U | -                | -  | 0.3   |               |   |
|               |                               | 4N47U | -                | -  | 0.3   | V             | $I_C = 0.5 \text{ mA}, I_B = 0, I_F = 2.0 \text{ mA}$<br>$I_C = 1.0 \text{ mA}, I_B = 0, I_F = 2.0 \text{ mA}$<br>$I_C = 2.0 \text{ mA}, I_B = 0, I_F = 2.0 \text{ mA}$   |
|               |                               | 4N48U | -                | -  | 0.3   |               |   |
|               |                               | 4N49U | -                | -  | 0.3   |               |   |
| $h_{FE}$      | DC Current Gain               | 4N22U | 200              | -  | -   | -             | $V_{CE} = 5 \text{ V}, I_C = 10 \text{ mA}, I_F = 0 \text{ mA}$   |
|               |                               | 4N23U | 300              | -  | -   |               |   |
|               |                               | 4N24U | 400              | -  | -   |               |   |
|               |                               | 4N47U | 100              | -  | -   |               |   |
|               |                               | 4N48U | 100              | -  | -   |               |   |
|               |                               | 4N49U | 100              | -  | -   |               |   |
| $t_r \& t_f$  | Rise and Fall Time            | 4N22U | -                | -  | 15  | $\mu\text{s}$ | $V_{CC} = 10 \text{ V}, I_F = 10 \text{ mA}, R_L = 100\Omega,$<br>Pulse width = 100 ms, Duty cycle = 1%   |
|               |                               | 4N23U | -                | -  | 15  |               |   |
|               |                               | 4N24U | -                | -  | 20  |               |   |
|               |                               | 4N47U | -                | -  | 20  | $\mu\text{s}$ | $V_{CC} = 10 \text{ V}, I_F = 5 \text{ mA}, R_L = 100\Omega,$<br>Pulse width = 100 ms, Duty cycle = 1%  |
|               |                               | 4N48U | -                | -  | 20  |               |   |
|               |                               | 4N49U | -                | -  | 20  |               |   |
| $R_{IO}$      | Resistance (Input to Output)  |       | 10 <sub>11</sub> | -  | -   | $\Omega$      | $V_{IO} = \pm 1,000 \text{ Vdc}$  |
| $C_{IO}$      | Capacitance (Input to Output) |       | -                | -  | 5.0   | pF            | $V_{IO} = 0 \text{ Vdc}, f = 1.0 \text{ MHz}$   |

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**Surface Mount Optically Coupled Isolator**  
**4N22U, 4N23U, 4N24U (COTS, TX, TXV)**  
**4N47U, 4N48U, 4N49U (COTS, TX, TXV)**



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

| SYMBOL                               | PARAMETER   | MIN       | TYP  | MAX  | UNITS  | TEST CONDITIONS  |
|--------------------------------------|---|-----------|------|------|--|--|
| <b>Coupled</b>                       |   |           |      |      |  |  |
| $I_{C(ON)}$                          | On-State Collector Current                                      |           |      |      |  |  |
|                                      | 4N22, 4N22A (COTS, TX, TXV)                                     | 0.15      | -    | -    |  | $I_F = 2.0\text{ mA}, V_{CE} = 5\text{ V}, I_B = 0$                                  |
|                                      | 4N22, 4N22A (COTS, TX, TXV)                                     | 2.50      | -    | -    |  | $I_F = 10.0\text{ mA}, V_{CE} = 5\text{ V}, I_B = 0$                                 |
|                                      | 4N22, 4N22A (COTS, TX, TXV)                                     | 1.00      | -    | -    |  | $I_F = 10.0\text{ mA}, V_{CE} = 5\text{ V}, I_B = 0, T_A = -55^\circ\text{C}^{(1)}$  |
|                                      | 4N22, 4N22A (COTS, TX, TXV)                                     | 1.00      | -    | -    |  | $I_F = 10.0\text{ mA}, V_{CE} = 5\text{ V}, I_B = 0, T_A = 100^\circ\text{C}^{(1)}$  |
|                                      | 4N23, 4N23A (COTS, TX, TXV)                                     | 0.20      | -    | -    |  | $I_F = 2.0\text{ mA}, V_{CE} = 5\text{ V}, I_B = 0$                                  |
|                                      | 4N23, 4N23A (COTS, TX, TXV)                                     | 6.00      | -    | -    |  | $I_F = 10.0\text{ mA}, V_{CE} = 5\text{ V}, I_B = 0$                                 |
|                                      | 4N23, 4N23A (COTS, TX, TXV)                                     | 2.50      | -    | -    |  | $I_F = 10.0\text{ mA}, V_{CE} = 5\text{ V}, I_B = 0, T_A = -55^\circ\text{C}^{(1)}$  |
|                                      | 4N23, 4N23A (COTS, TX, TXV)                                     | 2.50      | -    | -    |  | $I_F = 10.0\text{ mA}, V_{CE} = 5\text{ V}, I_B = 0, T_A = 100^\circ\text{C}^{(1)}$  |
|                                      | 4N24, 4N24A (COTS, TX, TXV)                                     | 0.40      | -    | -    |  | $I_F = 2.0\text{ mA}, V_{CE} = 5\text{ V}, I_B = 0$                                  |
|                                      | 4N24, 4N24A (COTS, TX, TXV)                                     | 10.0      | -    | -    |  | $I_F = 10.0\text{ mA}, V_{CE} = 5\text{ V}, I_B = 0$                                 |
|                                      | 4N24, 4N24A (COTS, TX, TXV)                                     | 4.00      | -    | -    |  | $I_F = 10.0\text{ mA}, V_{CE} = 5\text{ V}, I_B = 0, T_A = -55^\circ\text{C}^{(1)}$  |
|                                      | 4N24, 4N24A (COTS, TX, TXV)                                     | 4.00      | -    | -    |  | $I_F = 10.0\text{ mA}, V_{CE} = 5\text{ V}, I_B = 0, T_A = 100^\circ\text{C}^{(1)}$  |
|                                      | 4N47, 4N47A (COTS, TX, TXV)                                     | 0.50      | -    | -    |  | $I_F = 1.0\text{ mA}, V_{CE} = 5.0\text{ V}, I_B = 0$                                |
|                                      | 4N47, 4N47A (COTS, TX, TXV)                                     | 0.70      | -    | -    |  | $I_F = 2.0\text{ mA}, V_{CE} = 5.0\text{ V}, I_B = 0, T_A = -55^\circ\text{C}^{(1)}$ |
|                                      | 4N47, 4N47A (COTS, TX, TXV)                                     | 0.50      | -    | -    |  | $I_F = 2.0\text{ mA}, V_{CE} = 5.0\text{ V}, I_B = 0, T_A = 100^\circ\text{C}^{(1)}$ |
| 4N48, 4N48A (COTS, TX, TXV)          | 1.00  | -         | 5    |      | $I_F = 1.0\text{ mA}, V_{CE} = 5.0\text{ V}, I_B = 0$                                |  |
| 4N48, 4N48A (COTS, TX, TXV)          | 1.40  | -         | -    |      | $I_F = 2.0\text{ mA}, V_{CE} = 5.0\text{ V}, I_B = 0, T_A = -55^\circ\text{C}^{(1)}$ |  |
| 4N48, 4N48A (COTS, TX, TXV)          | 1.00  | -         | -    |      | $I_F = 2.0\text{ mA}, V_{CE} = 5.0\text{ V}, I_B = 0, T_A = 100^\circ\text{C}^{(1)}$ |  |
| 4N49, 4N49A (COTS, TX, TXV)          | 2.00  | -         | 10   |      | $I_F = 1.0\text{ mA}, V_{CE} = 5.0\text{ V}, I_B = 0$                                |  |
| 4N49, 4N49A (COTS, TX, TXV)          | 2.80  | -         | -    |      | $I_F = 2.0\text{ mA}, V_{CE} = 5.0\text{ V}, I_B = 0, T_A = -55^\circ\text{C}^{(1)}$ |  |
| 4N49, 4N49A (COTS, TX, TXV)          | 2.00  | -         | -    |      | $I_F = 2.0\text{ mA}, V_{CE} = 5.0\text{ V}, I_B = 0, T_A = 100^\circ\text{C}^{(1)}$ |  |
| $I_{CB(ON)}$                         | On-State Collector Base<br>4N47, 4N48, 4N49 [A] (COTS, TX, TXV) | 30        | -    | -    | $\mu\text{A}$  | $V_{CB} = 5\text{ V}, I_E = 0, I_F = 10\text{ mA}$                                   |
| $V_{CE(SAT)}$                        | Collector-Emitter Saturation Voltage                            |           |      |      |  |  |
|                                      | 4N22, 4N23, 4N24 [A] (COTS, TX, TXV)                            | -         | -    | 0.30 |  | $I_F = 20\text{ mA}, I_C = 2.5\text{ mA}, I_B = 0$                                   |
|                                      | 4N22, 4N23, 4N24 [A] (COTS, TX, TXV)                            | -         | -    | 0.30 |  | $I_F = 20\text{ mA}, I_C = 5.0\text{ mA}, I_B = 0$                                   |
|                                      | 4N22, 4N23, 4N24 [A] (COTS, TX, TXV)                            | -         | -    | 0.30 | $\text{V}$   | $I_F = 20\text{ mA}, I_C = 10.0\text{ mA}, I_B = 0$                                  |
|                                      | 4N47, 4N47A (COTS, TX, TXV)                                     | -         | -    | 0.30 |  | $I_F = 2.0\text{ mA}, I_C = 0.5\text{ mA}, I_B = 0$                                  |
|                                      | 4N48, 4N48A (COTS, TX, TXV)                                     | -         | -    | 0.30 |  | $I_F = 2.0\text{ mA}, I_C = 1.0\text{ mA}, I_B = 0$                                  |
| 4N49, 4N49A (COTS, TX, TXV)          | -   | -         | 0.30 |      | $I_F = 2.0\text{ mA}, I_C = 2.0\text{ mA}, I_B = 0$                                  |  |
| $H_{FE}$                             | DC Current Gain   |           |      |      |  |  |
|                                      | 4N22, 4N22A (COTS, TX, TXV)                                     | 200       | -    | -    | $\text{V}$   | $V_{CE} = 5.0\text{ V}, I_C = 10.0\text{ mA}, I_F = 0\text{ mA}$                     |
|                                      | 4N23, 4N23A (COTS, TX, TXV)                                     | 300       | -    | -    |  | $V_{CE} = 5.0\text{ V}, I_C = 10.0\text{ mA}, I_F = 0\text{ mA}$                     |
|                                      | 4N24, 4N24A (COTS, TX, TXV)                                     | 400       | -    | -    |  | $V_{CE} = 5.0\text{ V}, I_C = 10.0\text{ mA}, I_F = 0\text{ mA}$                     |
| 4N47, 4N48, 4N49 [A] (COTS, TX, TXV) | 100   | -         | -    |      | $V_{CE} = 5.0\text{ V}, I_C = 10.0\text{ mA}, I_F = 0\text{ mA}$                     |  |
| $R_{IO}$                             | Resistance (Input-to-Output)                                    |           |      |      |  |  |
|                                      | 4N22, 4N23, 4N24 [A] (COTS, TX, TXV)                            | $10^{11}$ | -    | -    | $\Omega$   | $V_{IO} = \pm 1.0\text{ VDC}^{(3)}$  |
| 4N47, 4N48, 4N49 [A] (COTS, TX, TXV) | $10^{11}$   | -         | -    |      | $V_{I-O} = \pm 1000\text{ VDC}^{(3)}$  |  |
| $C_{IO}$                             | Capacitance (Input-to-Output)                                   | -         | -    | 5    | $\text{pF}$  | $V_{I-O} = 0\text{ V}, f = 1.0\text{ MHz}^{(3)}$                                     |

OPTEK reserves the right to make changes at any time in order to improve design and to supply the best product possible.

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