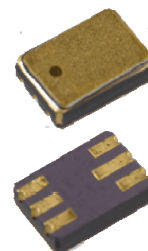


# Surface Mount Optically Coupled Isolator

4N22U, 4N23U, 4N24U (TX, TXV)  
4N47U, 4N48U, 4N49U (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)<br>Typ / Max | V <sub>CE</sub> (Volts)<br>Max | Processing<br>MIL-PRF-195000 |
| 4N22U                | 1                      | 10 / 40                          | 35                             | 486                          |
| 4N22UTX              |                        |                                  |                                |                              |
| 4N22UTXV             |                        |                                  |                                |                              |
| 4N23U                |                        |                                  |                                |                              |
| 4N23UTX              |                        |                                  |                                |                              |
| 4N23UTXV             |                        |                                  |                                |                              |
| 4N24U                |                        |                                  |                                |                              |
| 4N24UTX              |                        |                                  |                                |                              |
| 4N24UTXV             |                        |                                  |                                |                              |
| 4N47U                |                        |                                  | 45                             | 548                          |
| 4N47UTX              |                        |                                  |                                |                              |
| 4N47UTXV             |                        |                                  |                                |                              |
| 4N48U                |                        |                                  |                                |                              |
| 4N48UTX              |                        |                                  |                                |                              |
| 4N48UTXV             |                        |                                  |                                |                              |
| 4N49U                |                        |                                  |                                |                              |
| 4N49UTX              |                        |                                  |                                |                              |
| 4N49UTXV             |                        |                                  |                                |                              |

## General Note

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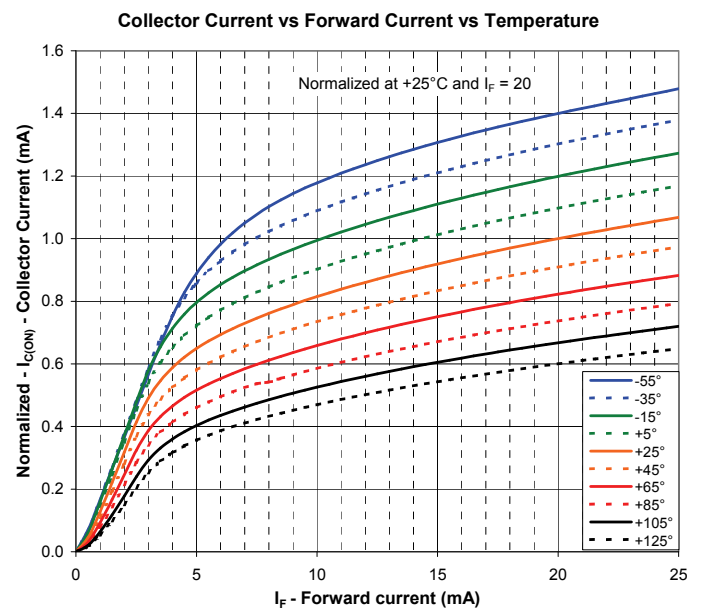
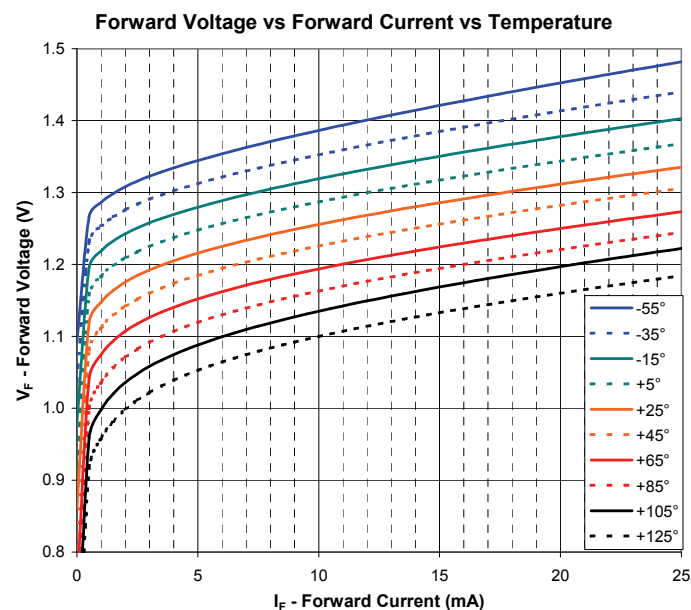
4N22U, 4N23U, 4N24U (TX, TXV)  
4N47U, 4N48U, 4N49U (TX, TXV)



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

## Notes:

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



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# Surface Mount Optically Coupled Isolator

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



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

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

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

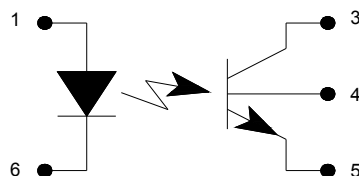
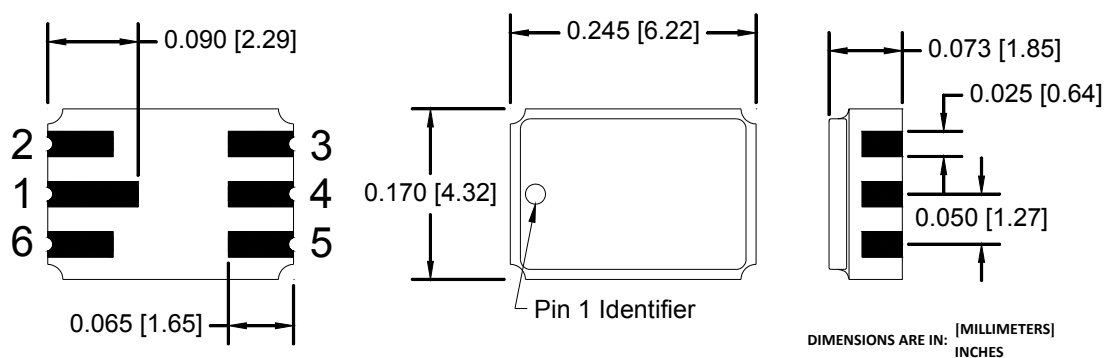
|       |                               |      |   |      |               |                                                        |
|-------|-------------------------------|------|---|------|---------------|--------------------------------------------------------|
| $V_F$ | Forward Voltage               |      |   |      |               |                                                        |
|       | 4N22U, 4N23U, 4N24U (TX, TXV) | 0.80 | - | 1.30 |               | $I_F = 10.0\text{ mA}$                                 |
|       | 4N22U, 4N23U, 4N24U (TX, TXV) | 1.00 | - | 1.50 |               | $I_F = 10.0\text{ mA}, T_A = -55^\circ\text{C}^{(1)}$  |
|       | 4N22U, 4N23U, 4N24U (TX, TXV) | 0.70 | - | 1.20 | V             | $I_F = 10.0\text{ mA}, T_A = -100^\circ\text{C}^{(1)}$ |
|       | 4N47U, 4N48U, 4N49U (TX, TXV) | 0.80 | - | 1.50 |               | $I_F = 10.0\text{ mA}$                                 |
|       | 4N47U, 4N48U, 4N49U (TX, TXV) | 1.00 | - | 1.70 |               | $I_F = 10.0\text{ mA}, T_A = -55^\circ\text{C}^{(1)}$  |
|       | 4N47U, 4N48U, 4N49U (TX, TXV) | 0.70 | - | 1.30 |               | $I_F = 10.0\text{ mA}, T_A = -100^\circ\text{C}^{(1)}$ |
| $I_R$ | Reverse Current               | -    | - | 100  | $\mu\text{A}$ | $V_R = 2.0\text{ V}$                                   |

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

|               |                                                                     |          |          |            |                     |                                                                                                                                       |
|---------------|---------------------------------------------------------------------|----------|----------|------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| $V_{(BR)CEO}$ | Collector-Emitter Breakdown Voltage<br>4N22U Series<br>4N47U Series | 35<br>40 | 80<br>90 | -<br>-     | V                   | $I_C = 100\text{ }\mu\text{A}, I_F = 0$                                                                                               |
| $V_{(BR)ECO}$ | Emitter-Collector Breakdown Voltage<br>4N22U Series<br>4N47U Series | 4<br>7   | 6<br>10  | -<br>-     | V                   | $I_E = 100\text{ }\mu\text{A}, I_F = 0$                                                                                               |
| $I_{CEO}$     | Collector-Emitter Dark Current                                      | -<br>-   | 20<br>-  | 100<br>100 | nA<br>$\mu\text{A}$ | $V_{CE} = 20\text{ V}, I_F = 0, I_B = 0, T_A = 25^\circ\text{C}$<br>$V_{CE} = 20\text{ V}, I_F = 0, I_B = 0, T_A = 100^\circ\text{C}$ |
| $V_{CE(SAT)}$ | Collector Saturation Voltage                                        | -        | 0.2      | 0.3        | V                   | $I_F = 20\text{ mA}, I_C = 2\text{ mA}$                                                                                               |

Notes:

- (1) Measured with input leads shorted together and output leads shorted together. Typical input/output capacitance is 0.06 pF.



| 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 (TX, TXV)  
4N47U, 4N48U, 4N49U (TX, TXV)



| SYMBOL         | PARAMETER                          | PART<br>NUMBER | MIN       | TYP | MAX  | UNITS         | TEST CONDITIONS                                                                                                |
|----------------|------------------------------------|----------------|-----------|-----|------|---------------|----------------------------------------------------------------------------------------------------------------|
| <b>Coupled</b> |                                    |                |           |     |      |               |                                                                                                                |
| $I_C/I_F$      | 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<br>Collector Current      | 4N22U          | 0.15      | -   | -    | mA            | $V_{CE} = 10 \text{ V}$ , $I_B = 0$ , $I_F = 2.0 \text{ mA}$ $T_A = 25^\circ\text{C}$                          |
|                |                                    |                | 2.50      | -   | -    |               | $V_{CE} = 10 \text{ V}$ , $I_B = 0$ , $I_F = 10.0 \text{ mA}$ $T_A = 25^\circ\text{C}$                         |
|                |                                    |                | 1.00      | -   | -    |               | $V_{CE} = 10 \text{ V}$ , $I_B = 0$ , $I_F = 10.0 \text{ mA}$ $T_A = -55^\circ\text{C}$                        |
|                |                                    |                | 1.00      | -   | -    |               | $V_{CE} = 10 \text{ V}$ , $I_B = 0$ , $I_F = 10.0 \text{ mA}$ $T_A = 100^\circ\text{C}$                        |
|                |                                    | 4N23U          | 0.2       | -   | -    | mA            | $V_{CE} = 10 \text{ V}$ , $I_B = 0$ , $I_F = 2.0 \text{ mA}$ $T_A = 25^\circ\text{C}$                          |
|                |                                    |                | 6.0       | -   | -    |               | $V_{CE} = 10 \text{ V}$ , $I_B = 0$ , $I_F = 10.0 \text{ mA}$ $T_A = 25^\circ\text{C}$                         |
|                |                                    |                | 2.5       | -   | -    |               | $V_{CE} = 10 \text{ V}$ , $I_B = 0$ , $I_F = 10.0 \text{ mA}$ $T_A = -55^\circ\text{C}$                        |
|                |                                    |                | 2.5       | -   | -    |               | $V_{CE} = 10 \text{ V}$ , $I_B = 0$ , $I_F = 10.0 \text{ mA}$ $T_A = 100^\circ\text{C}$                        |
|                |                                    | 4N24U          | 0.4       | -   | -    | mA            | $V_{CE} = 10 \text{ V}$ , $I_B = 0$ , $I_F = 2.0 \text{ mA}$ $T_A = 25^\circ\text{C}$                          |
|                |                                    |                | 10.0      | -   | -    |               | $V_{CE} = 10 \text{ V}$ , $I_B = 0$ , $I_F = 10.0 \text{ mA}$ $T_A = 25^\circ\text{C}$                         |
|                |                                    |                | 4.0       | -   | -    |               | $V_{CE} = 10 \text{ V}$ , $I_B = 0$ , $I_F = 10.0 \text{ mA}$ $T_A = -55^\circ\text{C}$                        |
|                |                                    |                | 4.0       | -   | -    |               | $V_{CE} = 10 \text{ V}$ , $I_B = 0$ , $I_F = 10.0 \text{ mA}$ $T_A = 100^\circ\text{C}$                        |
|                |                                    | 4N47U          | 0.5       | -   | -    | mA            | $V_{CE} = 5 \text{ V}$ , $I_B = 0$ , $I_F = 1.0 \text{ mA}$ $T_A = 25^\circ\text{C}$                           |
|                |                                    |                | 0.7       | -   | -    |               | $V_{CE} = 5 \text{ V}$ , $I_B = 0$ , $I_F = 2.0 \text{ mA}$ $T_A = -55^\circ\text{C}$                          |
|                |                                    |                | 0.5       | -   | -    |               | $V_{CE} = 5 \text{ V}$ , $I_B = 0$ , $I_F = 2.0 \text{ mA}$ $T_A = 100^\circ\text{C}$                          |
|                |                                    |                | 0.5       | -   | -    |               | $V_{CE} = 5 \text{ V}$ , $I_B = 0$ , $I_F = 2.0 \text{ mA}$ $T_A = 100^\circ\text{C}$                          |
|                |                                    | 4N48U          | 1.0       | -   | 5.0  | mA            | $V_{CE} = 5 \text{ V}$ , $I_B = 0$ , $I_F = 1.0 \text{ mA}$ $T_A = 25^\circ\text{C}$                           |
|                |                                    |                | 1.4       | -   | -    |               | $V_{CE} = 5 \text{ V}$ , $I_B = 0$ , $I_F = 2.0 \text{ mA}$ $T_A = -55^\circ\text{C}$                          |
|                |                                    |                | 1.0       | -   | -    |               | $V_{CE} = 5 \text{ V}$ , $I_B = 0$ , $I_F = 2.0 \text{ mA}$ $T_A = 100^\circ\text{C}$                          |
|                |                                    |                | 1.0       | -   | -    |               | $V_{CE} = 5 \text{ V}$ , $I_B = 0$ , $I_F = 2.0 \text{ mA}$ $T_A = 100^\circ\text{C}$                          |
|                |                                    | 4N49U          | 2.0       | -   | 10.0 | mA            | $V_{CE} = 5 \text{ V}$ , $I_B = 0$ , $I_F = 1.0 \text{ mA}$ $T_A = 25^\circ\text{C}$                           |
|                |                                    |                | 2.8       | -   | -    |               | $V_{CE} = 5 \text{ V}$ , $I_B = 0$ , $I_F = 2.0 \text{ mA}$ $T_A = -55^\circ\text{C}$                          |
|                |                                    |                | 2.0       | -   | -    |               | $V_{CE} = 5 \text{ V}$ , $I_B = 0$ , $I_F = 2.0 \text{ mA}$ $T_A = 100^\circ\text{C}$                          |
|                |                                    |                | 2.0       | -   | -    |               | $V_{CE} = 5 \text{ V}$ , $I_B = 0$ , $I_F = 2.0 \text{ mA}$ $T_A = 100^\circ\text{C}$                          |
| $V_{CE(SAT)}$  | Collector<br>Saturation<br>Voltage | 4N22U          | -         | -   | 0.3  | V             | $I_C = 2.5 \text{ mA}$ , $I_B = 0$ , $I_F = 20 \text{ mA}$                                                     |
|                |                                    | 4N23U          | -         | -   | 0.3  |               | $I_C = 5.0 \text{ mA}$ , $I_B = 0$ , $I_F = 20 \text{ mA}$                                                     |
|                |                                    | 4N24U          | -         | -   | 0.3  |               | $I_C = 10.0 \text{ mA}$ , $I_B = 0$ , $I_F = 20 \text{ mA}$                                                    |
|                |                                    | 4N47U          | -         | -   | 0.3  | V             | $I_C = 0.5 \text{ mA}$ , $I_B = 0$ , $I_F = 2.0 \text{ mA}$                                                    |
|                |                                    | 4N48U          | -         | -   | 0.3  |               | $I_C = 1.0 \text{ mA}$ , $I_B = 0$ , $I_F = 2.0 \text{ mA}$                                                    |
|                |                                    | 4N49U          | -         | -   | 0.3  |               | $I_C = 2.0 \text{ mA}$ , $I_B = 0$ , $I_F = 2.0 \text{ mA}$                                                    |
| $h_{FE}$       | 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)       |                | $10^{11}$ | -   | -    | $\Omega$      | $V_{I-O} = \pm 1,000 \text{ Vdc}$                                                                              |
| $C_{IO}$       | Capacitance (Input to Output)      |                | -         | -   | 5.0  | pF            | $V_{I-O} = 0 \text{ Vdc}$ , $f = 1.0 \text{ MHz}$                                                              |

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# Surface Mount Optically Coupled Isolator

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



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

| SYMBOL               | PARAMETER                                                             | MIN              | TYP | MAX  | UNITS | TEST CONDITIONS                                                                                              |
|----------------------|-----------------------------------------------------------------------|------------------|-----|------|-------|--------------------------------------------------------------------------------------------------------------|
| <b>Coupled</b>       |                                                                       |                  |     |      |       |                                                                                                              |
| I <sub>C(ON)</sub>   | On-State Collector Current<br>4N22U, 4N22U (TX, TXV)                  | 0.15             | -   | -    | mA    | I <sub>F</sub> = 2.0 mA, V <sub>CE</sub> = 5 V, I <sub>B</sub> = 0                                           |
|                      | 4N22U, 4N22U (TX, TXV)                                                | 2.50             | -   | -    |       | I <sub>F</sub> = 10.0 mA, V <sub>CE</sub> = 5 V, I <sub>B</sub> = 0                                          |
|                      | 4N22U, 4N22U (TX, TXV)                                                | 1.00             | -   | -    |       | I <sub>F</sub> = 10.0 mA, V <sub>CE</sub> = 5 V, I <sub>B</sub> = 0, T <sub>A</sub> = -55° C <sup>(1)</sup>  |
|                      | 4N22U, 4N22U (TX, TXV)                                                | 1.00             | -   | -    |       | I <sub>F</sub> = 10.0 mA, V <sub>CE</sub> = 5 V, I <sub>B</sub> = 0, T <sub>A</sub> = 100° C <sup>(1)</sup>  |
|                      | 4N23U, 4N23U (TX, TXV)                                                | 0.20             | -   | -    |       | I <sub>F</sub> = 2.0 mA, V <sub>CE</sub> = 5 V, I <sub>B</sub> = 0                                           |
|                      | 4N23U, 4N23U (TX, TXV)                                                | 6.00             | -   | -    |       | I <sub>F</sub> = 10.0 mA, V <sub>CE</sub> = 5 V, I <sub>B</sub> = 0                                          |
|                      | 4N23U, 4N23U (TX, TXV)                                                | 2.50             | -   | -    |       | I <sub>F</sub> = 10.0 mA, V <sub>CE</sub> = 5 V, I <sub>B</sub> = 0, T <sub>A</sub> = -55° C <sup>(1)</sup>  |
| I <sub>C(ON)</sub>   | 4N23U, 4N23U (TX, TXV)                                                | 2.50             | -   | -    |       | I <sub>F</sub> = 10.0 mA, V <sub>CE</sub> = 5 V, I <sub>B</sub> = 0, T <sub>A</sub> = 100° C <sup>(1)</sup>  |
|                      | 4N24U, 4N24U (TX, TXV)                                                | 0.40             | -   | -    | mA    | I <sub>F</sub> = 2.0 mA, V <sub>CE</sub> = 5 V, I <sub>B</sub> = 0                                           |
|                      | 4N24U, 4N24U (TX, TXV)                                                | 10.0             | -   | -    |       | I <sub>F</sub> = 10.0 mA, V <sub>CE</sub> = 5 V, I <sub>B</sub> = 0                                          |
|                      | 4N24U, 4N24U (TX, TXV)                                                | 4.00             | -   | -    |       | I <sub>F</sub> = 10.0 mA, V <sub>CE</sub> = 5 V, I <sub>B</sub> = 0, T <sub>A</sub> = -55° C <sup>(1)</sup>  |
|                      | 4N24U, 4N24U (TX, TXV)                                                | 4.00             | -   | -    |       | I <sub>F</sub> = 10.0 mA, V <sub>CE</sub> = 5 V, I <sub>B</sub> = 0, T <sub>A</sub> = 100° C <sup>(1)</sup>  |
|                      | 4N47U, 4N47U (TX, TXV)                                                | 0.50             | -   | -    |       | I <sub>F</sub> = 1.0 Ma, V <sub>CE</sub> = 5.0 V, I <sub>B</sub> = 0                                         |
|                      | 4N47U, 4N47U (TX, TXV)                                                | 0.70             | -   | -    |       | I <sub>F</sub> = 2.0 mA, V <sub>CE</sub> = 5.0 V, I <sub>B</sub> = 0, T <sub>A</sub> = -55° C <sup>(1)</sup> |
|                      | 4N47U, 4N47U (TX, TXV)                                                | 0.50             | -   | -    |       | I <sub>F</sub> = 2.0 mA, V <sub>CE</sub> = 5.0 V, I <sub>B</sub> = 0, T <sub>A</sub> = 100° C <sup>(1)</sup> |
| I <sub>C(ON)</sub>   | 4N48U, 4N48U (TX, TXV)                                                | 1.00             | -   | 5    | mA    | I <sub>F</sub> = 1.0 mA, V <sub>CE</sub> = 5.0 V, I <sub>B</sub> = 0                                         |
|                      | 4N48U, 4N48U (TX, TXV)                                                | 1.40             | -   | -    |       | I <sub>F</sub> = 2.0 mA, V <sub>CE</sub> = 5.0 V, I <sub>B</sub> = 0, T <sub>A</sub> = -55° C <sup>(1)</sup> |
|                      | 4N48U, 4N48U (TX, TXV)                                                | 1.00             | -   | -    |       | I <sub>F</sub> = 2.0 mA, V <sub>CE</sub> = 5.0 V, I <sub>B</sub> = 0, T <sub>A</sub> = 100° C <sup>(1)</sup> |
| I <sub>C(ON)</sub>   | 4N49U, 4N49U (TX, TXV)                                                | 2.00             | -   | 10   | mA    | I <sub>F</sub> = 1.0 mA, V <sub>CE</sub> = 5.0 V, I <sub>B</sub> = 0                                         |
|                      | 4N49U, 4N49U (TX, TXV)                                                | 2.80             | -   | -    |       | I <sub>F</sub> = 2.0 mA, V <sub>CE</sub> = 5.0 V, I <sub>B</sub> = 0, T <sub>A</sub> = -55° C <sup>(1)</sup> |
|                      | 4N49U, 4N49U (TX, TXV)                                                | 2.00             | -   | -    |       | I <sub>F</sub> = 2.0 mA, V <sub>CE</sub> = 5.0 V, I <sub>B</sub> = 0, T <sub>A</sub> = 100° C <sup>(1)</sup> |
| I <sub>CB(ON)</sub>  | On-State Collector Base<br>4N47U, 4N48U, 4N49U (TX, TXV)              | 30               | -   | -    | μA    | V <sub>CB</sub> = 5 V, I <sub>E</sub> = 0, I <sub>F</sub> = 10 mA                                            |
| V <sub>CE(SAT)</sub> | Collector-Emitter Saturation Voltage<br>4N22U, 4N23U, 4N24U (TX, TXV) | -                | -   | 0.30 | V     | I <sub>F</sub> = 20 mA, I <sub>C</sub> = 2.5 mA, I <sub>B</sub> = 0                                          |
|                      | 4N22U, 4N23U, 4N24U (TX, TXV)                                         | -                | -   | 0.30 |       | I <sub>F</sub> = 20 mA, I <sub>C</sub> = 5.0 mA, I <sub>B</sub> = 0                                          |
|                      | 4N22U, 4N23U, 4N24U (TX, TXV)                                         | -                | -   | 0.30 |       | I <sub>F</sub> = 20 mA, I <sub>C</sub> = 10.0 mA, I <sub>B</sub> = 0                                         |
|                      | 4N47U, 4N47U (TX, TXV)                                                | -                | -   | 0.30 |       | I <sub>F</sub> = 2.0 mA, I <sub>C</sub> = 0.5 mA, I <sub>B</sub> = 0                                         |
|                      | 4N48U, 4N48U (TX, TXV)                                                | -                | -   | 0.30 |       | I <sub>F</sub> = 2.0 mA, I <sub>C</sub> = 1.0 mA, I <sub>B</sub> = 0                                         |
|                      | 4N49U, 4N49U (TX, TXV)                                                | -                | -   | 0.30 |       | I <sub>F</sub> = 2.0 mA, I <sub>C</sub> = 2.0 mA, I <sub>B</sub> = 0                                         |
|                      | 4N49U, 4N49U (TX, TXV)                                                | -                | -   | 0.30 |       | I <sub>F</sub> = 2.0 mA, I <sub>C</sub> = 2.0 mA, I <sub>B</sub> = 0                                         |
| H <sub>FE</sub>      | DC Current Gain<br>4N22U, 4N22U (TX, TXV)                             | 200              | -   | -    | V     | V <sub>CE</sub> = 5.0 V, I <sub>C</sub> = 10.0 mA, I <sub>F</sub> = 0 mA                                     |
|                      | 4N23U, 4N23U (TX, TXV)                                                | 300              | -   | -    |       | V <sub>CE</sub> = 5.0 V, I <sub>C</sub> = 10.0 mA, I <sub>F</sub> = 0 mA                                     |
|                      | 4N24U, 4N24U (TX, TXV)                                                | 400              | -   | -    |       | V <sub>CE</sub> = 5.0 V, I <sub>C</sub> = 10.0 mA, I <sub>F</sub> = 0 mA                                     |
|                      | 4N47U, 4N48U, 4N49U (TX, TXV)                                         | 100              | -   | -    |       | V <sub>CE</sub> = 5.0 V, I <sub>C</sub> = 10.0 mA, I <sub>F</sub> = 0 mA                                     |
| R <sub>IO</sub>      | Resistance (Input-to-Output)<br>4N22U, 4N23U, 4N24U (TX, TXV)         | 10 <sup>11</sup> | -   | -    | Ω     | V <sub>I-O</sub> = ± 1,000 VDC <sup>(2)</sup>                                                                |
|                      | 4N47U, 4N48U, 4N49U (TX, TXV)                                         | 10 <sup>11</sup> | -   | -    |       | V <sub>I-O</sub> = ± 1,000 VDC <sup>(2)</sup>                                                                |
| C <sub>IO</sub>      | Capacitance (Input-to-Output)                                         | -                | -   | 5    | pF    | V <sub>I-O</sub> = 0 V, f = 1.0 MHz <sup>(2)</sup>                                                           |

General Note  
TT Electronics reserves the right to make changes in product specification without notice or liability. All information is subject to TT Electronics' own data and is considered accurate at time of going to print.

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