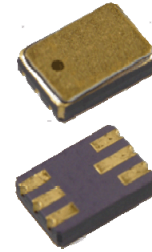


Surface Mount Optically Coupled Isolator

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 4N48U (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 _F (mA) Typ / Max | V _{CE} (Volts) Max | Processing MIL-PRF-195000 |
| 4N22U | 1 | 10 / 40 | 35 | 486 |
| 4N22UTX | | | | |
| 4N22UTXV | | | | |
| 4N23U | | | | |
| 4N23UTX | | | | |
| 4N23UTXV | | | | |
| 4N24U | | | 45 | 548 |
| 4N24UTX | | | | |
| 4N24UTXV | | | | |
| 4N47U | | | | |
| 4N47UTX | | | | |
| 4N47UTXV | | | | |
| 4N48U | | | 45 | 548 |
| 4N48UTX | | | | |
| 4N48UTXV | | | | |
| 4N49U | | | | |
| 4N49UTX | | | | |
| 4N49UTXV | | | | |

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Surface Mount Optically Coupled Isolator

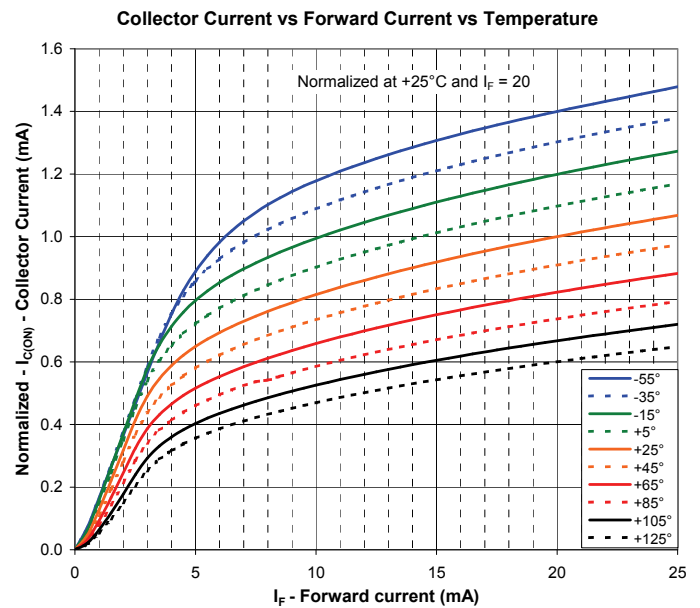
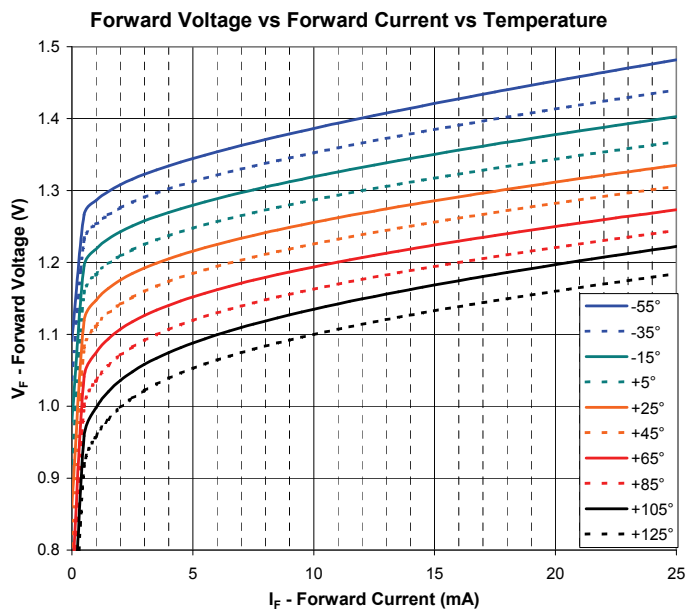
4N22U, 4N23U, 4N24U (TX, TXV)
4N47U, 4N48U, 4N49U (TX, TXV)



| 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 ⁽¹⁾ | ± 1 kVDC |
| Lead Soldering Temperature (1/16" (1.6 mm) from case for 5 seconds with soldering iron) ⁽²⁾ | 260° C |
| Input Diode | |
| Forward DC Current ⁽³⁾ | 50 mA |
| Reverse DC Voltage | 2 V |
| Power Dissipation ⁽⁴⁾ | 300 mW |
| Output Photosensor | |
| Collector-Emitter Voltage | 35 V |
| Emitter-Collector Voltage | 7.0 V |
| Power Dissipation ⁽⁵⁾ | 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 mA/°C above 25°C.
- (5) Derate linearly 1.67 mA/°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° C unless otherwise noted)

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

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

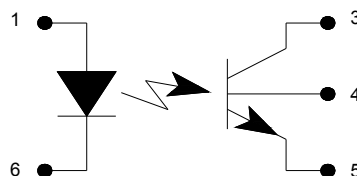
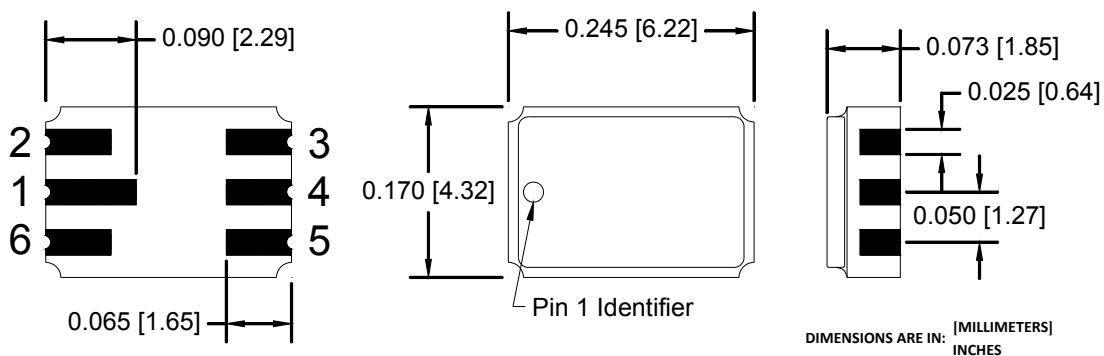
| | | | | | | |
|----------------|-------------------------------|------|---|------|----|---|
| V _F | Forward Voltage | | | | | |
| | 4N22U, 4N23U, 4N24U (TX, TXV) | 0.80 | - | 1.30 | | I _F = 10.0 mA |
| | 4N22U, 4N23U, 4N24U (TX, TXV) | 1.00 | - | 1.50 | | I _F = 10.0 mA, T _A = -55° C ⁽¹⁾ |
| | 4N22U, 4N23U, 4N24U (TX, TXV) | 0.70 | - | 1.20 | V | I _F = 10.0 mA, T _A = -100° C ⁽¹⁾ |
| | 4N47U, 4N48U, 4N49U (TX, TXV) | 0.80 | - | 1.50 | | I _F = 10.0 mA |
| | 4N47U, 4N48U, 4N49U (TX, TXV) | 1.00 | - | 1.70 | | I _F = 10.0 mA, T _A = -55° C ⁽¹⁾ |
| | 4N47U, 4N48U, 4N49U (TX, TXV) | 0.70 | - | 1.30 | | I _F = 10.0 mA, T _A = -100° C ⁽¹⁾ |
| I _R | Reverse Current | - | - | 100 | μA | V _R = 2.0 V |

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

| | | | | | | |
|----------------------|---|----------|----------|------------|----------|---|
| V _{(BR)CEO} | Collector-Emitter Breakdown Voltage 4N22U Series 4N47U Series | 35 40 | 80 90 | - - | V | I _C = 100 μA, I _F = 0 |
| V _{(BR)ECO} | Emitter-Collector Breakdown Voltage 4N22U Series 4N47U Series | 4 7 | 6 10 | - - | V | I _E = 100 μA, I _F = 0 |
| I _{CEO} | Collector-Emitter Dark Current | - - | 20 - | 100 100 | nA μA | V _{CE} = 20 V, I _F = 0 I _B = 0 T _A = 25° C V _{CE} = 20 V, I _F = 0 I _B = 0 T _A = 100° C |
| V _{CE(SAT)} | Collector Saturation Voltage | - | 0.2 | 0.3 | V | I _F = 20 mA, I _C = 2 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 NUMBER | MIN | TYP | MAX | UNITS | TEST CONDITIONS |
|----------------|-------------------------------|-------------|-----------|-----|--|---------------|---|
| 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 | - | - | % | $I_F = 2 \text{ mA}, V_{CE} = 5 \text{ V}$ |
| | | 4N47U | 50 | - | - | | |
| | | 4N48U | 100 | - | - | % | $I_F = 2 \text{ mA}, V_{CE} = 5 \text{ V}$ |
| | | 4N49U | 200 | - | - | | |
| $I_{C(ON)}$ | On-State Collector Current | 4N22U | 0.15 | - | - | mA | $V_{CE} = 10 \text{ V}, I_B = 0, I_F = 2.0 \text{ mA } T_A = 25^\circ\text{C}$ |
| | | | 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 | - | - | | $V_{CE} = 5 \text{ V}, I_B = 0, I_F = 2.0 \text{ mA } T_A = 100^\circ\text{C}$ | | |
| 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 | - | - | | $V_{CE} = 5 \text{ V}, I_B = 0, I_F = 2.0 \text{ mA } T_A = 100^\circ\text{C}$ | | |
| 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 | - | - | | $V_{CE} = 5 \text{ V}, I_B = 0, I_F = 2.0 \text{ mA } T_A = 100^\circ\text{C}$ | | |
| $V_{CE(SAT)}$ | Collector Saturation 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 | μs | $V_{CC} = 10 \text{ V}, I_F = 10 \text{ mA}, R_L = 100\Omega,$ Pulse width = 100 ms, Duty cycle = 1% |
| | | 4N23U | - | - | 15 | | |
| | | 4N24U | - | - | 20 | | |
| | | 4N47U | - | - | 20 | μs | $V_{CC} = 10 \text{ V}, I_F = 5 \text{ mA}, R_L = 100\Omega,$ Pulse width = 100 ms, Duty cycle = 1% |
| | | 4N48U | - | - | 20 | | |
| | | 4N49U | - | - | 20 | | |
| R_{IO} | Resistance (Input to Output) | | 10^{11} | - | - | Ω | $V_{I-O} = \pm 1,000 \text{ Vdc}$ |
| 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_A = 25°C unless otherwise noted)

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

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