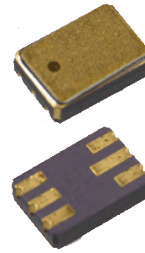


Surface Mount Optically Coupled Isolator

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 _F (mA) Typ / Max	V _{CE} (Volts) Max	Processing MIL-PRF-19500
4N22U	1	10 / 40	35	COTS
4N22UTX				486
4N22UTXV				COTS
4N23U				486
4N23UTX				COTS
4N23UTXV				486
4N24U		1 / 40	40	COTS
4N24UTX				548
4N24UTXV				COTS
4N47U				548
4N47UTX				COTS
4N47UTXV				548
4N48U	1	1 / 40	40	COTS
4N48UTX				548
4N48UTXV				COTS
4N49U				548
4N49UTX				COTS
4N49UTXV				548

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Surface Mount Optically Coupled Isolator

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

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



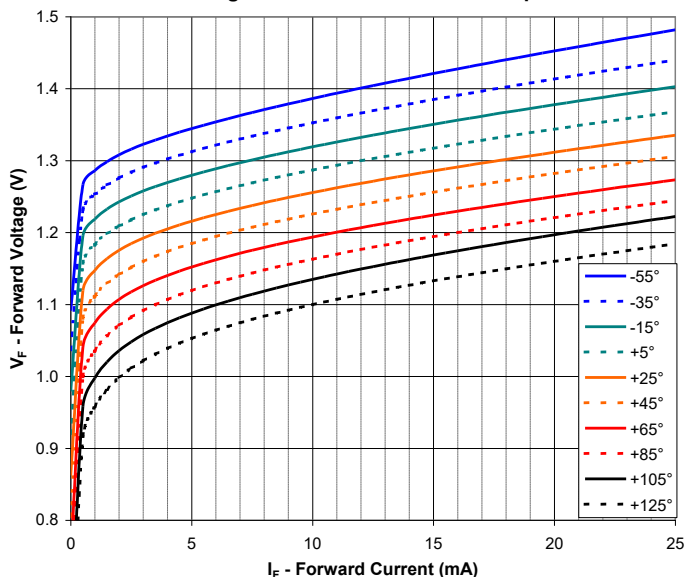
Electrical Specifications

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⁾	100 mW
Output Photosensor	
Collector-Emitter Voltage	35 V
Emitter-Collector Voltage	7.0 V
Power Dissipation ⁽⁵⁾	300 mW

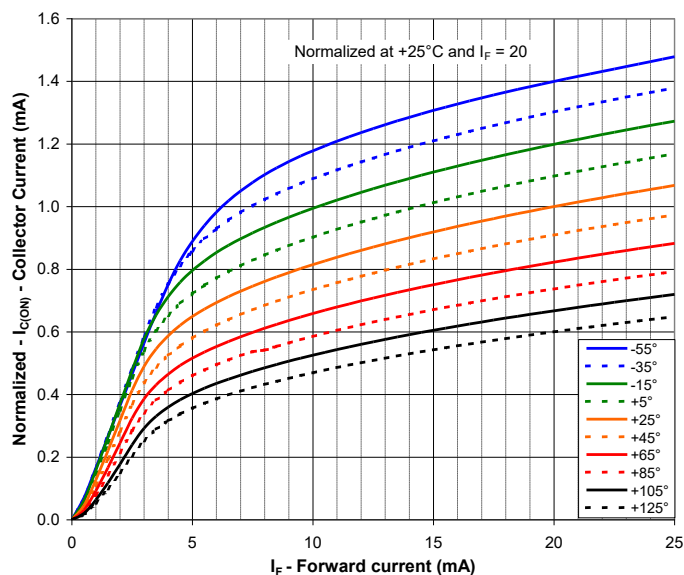
Notes:

- (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 65°C.
- (4) Derate linearly 0.83 mW/°C above 25°C.
- (5) Derate linearly 1.67 mW/°C above 25°C.

Forward Voltage vs Forward Current vs Temperature



Collector Current vs Forward Current vs Temperature



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Surface Mount Optically Coupled Isolator

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

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



Electrical Specifications

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

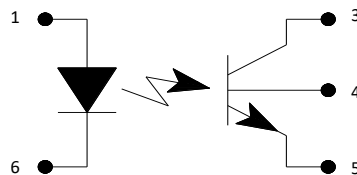
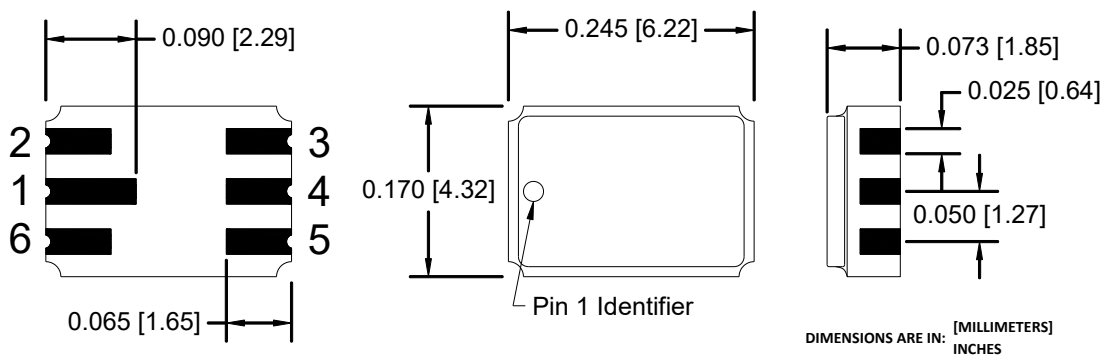
SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
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Input LED

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

Output Phototransistor

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



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	-	-		$V_{CE} = 10 \text{ V}, I_B = 0, I_F = 10.0 \text{ mA } T_A = 25^\circ\text{C}$
		4N24U	2.5	-	-	mA	$V_{CE} = 10 \text{ V}, I_B = 0, I_F = 10.0 \text{ mA } T_A = -55^\circ\text{C}$
			2.5	-	-		$V_{CE} = 10 \text{ V}, I_B = 0, I_F = 10.0 \text{ mA } T_A = 100^\circ\text{C}$
		4N47U	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	-	-		$V_{CE} = 10 \text{ V}, I_B = 0, I_F = 10.0 \text{ mA } T_A = 25^\circ\text{C}$
		4N48U	4.0	-	-	mA	$V_{CE} = 10 \text{ V}, I_B = 0, I_F = 10.0 \text{ mA } T_A = -55^\circ\text{C}$
			4.0	-	-		$V_{CE} = 10 \text{ V}, I_B = 0, I_F = 10.0 \text{ mA } T_A = 100^\circ\text{C}$
		4N49U	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	-	-		$V_{CE} = 5 \text{ V}, I_B = 0, I_F = 2.0 \text{ mA } T_A = -55^\circ\text{C}$
		4N48U	0.5	-	-	mA	$V_{CE} = 5 \text{ V}, I_B = 0, I_F = 2.0 \text{ mA } T_A = 100^\circ\text{C}$
			1.0	-	5.0		$V_{CE} = 5 \text{ V}, I_B = 0, I_F = 1.0 \text{ mA } T_A = 25^\circ\text{C}$
		4N49U	1.4	-	-	mA	$V_{CE} = 5 \text{ V}, I_B = 0, I_F = 2.0 \text{ mA } T_A = -55^\circ\text{C}$
			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	-	-		$V_{CE} = 5 \text{ V}, I_B = 0, I_F = 2.0 \text{ mA } T_A = -55^\circ\text{C}$
		4N49U	2.0	-	-	mA	$V_{CE} = 5 \text{ V}, I_B = 0, I_F = 2.0 \text{ mA } T_A = 100^\circ\text{C}$
$V_{CE(SAT)}$	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	$V_{I-O} = \pm 1,000 \text{ Vdc}^{(1)}$
C_{IO}	Capacitance (Input to Output)		-	-	5.0	pF	$V_{I-O} = 0 \text{ Vdc}, f = 1.0 \text{ MHz}^{(1)}$

Notes:

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

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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	-	-	mA	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
	4N22U, 4N22U (TX, TXV)	1.00	-	-		I _F = 10.0 mA, V _{CE} = 5 V, I _B = 0, T _A = 100° C
	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
I _{CB(ON)}	4N23U, 4N23U (TX, TXV)	2.50	-	-	I _F = 10.0 mA, V _{CE} = 5 V, I _B = 0, T _A = 100° C	
	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	
	4N24U, 4N24U (TX, TXV)	4.00	-	-	I _F = 10.0 mA, V _{CE} = 5 V, I _B = 0, T _A = 100° C	
	4N47U, 4N47U (TX, TXV)	0.50	-	-	I _F = 1.0 mA, V _{CE} = 5.0 V, I _B = 0	
V _{CE(SAT)}	4N47U, 4N47U (TX, TXV)	0.70	-	-	I _F = 2.0 mA, V _{CE} = 5.0 V, I _B = 0, T _A = -55° C	
	4N47U, 4N47U (TX, TXV)	0.50	-	-	I _F = 2.0 mA, V _{CE} = 5.0 V, I _B = 0, T _A = 100° C	
	4N48U, 4N48U (TX, TXV)	1.00	-	5	I _F = 1.0 mA, V _{CE} = 5.0 V, I _B = 0	
H _{FE}	4N48U, 4N48U (TX, TXV)	1.40	-	-	I _F = 2.0 mA, V _{CE} = 5.0 V, I _B = 0, T _A = -55° C	
	4N48U, 4N48U (TX, TXV)	1.00	-	-	I _F = 2.0 mA, V _{CE} = 5.0 V, I _B = 0, T _A = 100° C	
	4N49U, 4N49U (TX, TXV)	2.00	-	10	I _F = 1.0 mA, V _{CE} = 5.0 V, I _B = 0	
R _{IO}	4N49U, 4N49U (TX, TXV)	2.80	-	-	I _F = 2.0 mA, V _{CE} = 5.0 V, I _B = 0, T _A = -55° C	
	4N49U, 4N49U (TX, TXV)	2.00	-	-	I _F = 2.0 mA, V _{CE} = 5.0 V, I _B = 0, T _A = 100° C	
	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	V	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
C _{IO}	DC Current Gain 4N22U, 4N22U (TX, TXV)	200	-	-	V	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)	10 ¹¹	-	-	Ω	V _{I-O} = ± 1,000 VDC ⁽¹⁾
	4N47U, 4N48U, 4N49U (TX, TXV)	10 ¹¹	-	-		V _{I-O} = ± 1,000 VDC ⁽¹⁾
C _{IO}	Capacitance (Input-to-Output)	-	-	5	pF	V _{I-O} = 0 V, f = 1.0 MHz ⁽¹⁾

Notes:

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

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