

Surface Mount Optically Coupled Isolator

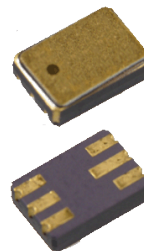
4N24U

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

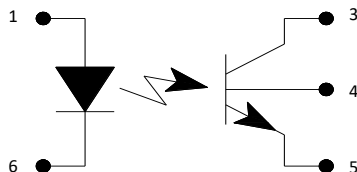
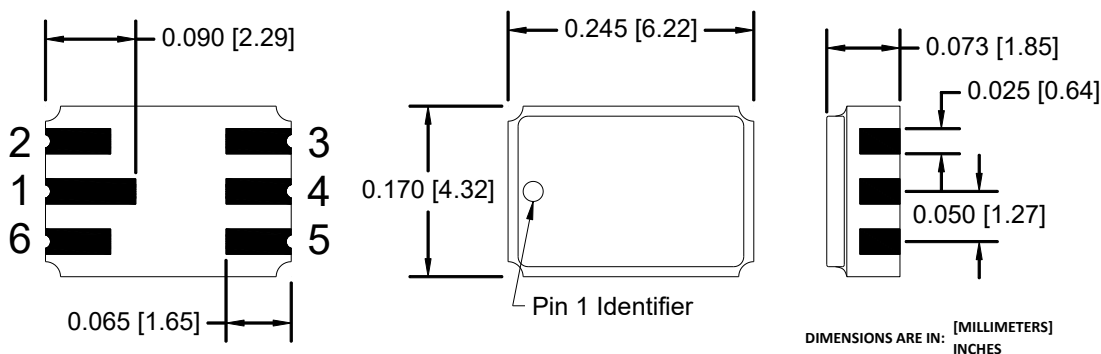
Please contact your local representative or OPTEK for more information.

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
4N24U	1	10 / 40	35	COTS
4N47U		1 / 40	40	COTS
4N47UTX				548
4N47UTXV				COTS
4N48U				548
4N48UTX				COTS
4N48UTXV				548
4N49U				COTS
4N49UTX				548
4N49UTXV				548



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

General Note
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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 ⁽²⁾	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.

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

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
Input LED						
V_F	Forward Voltage					
	4N24U	0.80	-	1.30		$I_F = 10.0\text{ mA}$
	4N24U	1.00	-	1.50		$I_F = 10.0\text{ mA}, T_A = -55^\circ\text{C}$
	4N24U	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		$I_F = 10.0\text{ mA}, T_A = -55^\circ\text{C}$
	4N47U, 4N48U, 4N49U (TX, TXV)	0.70	-	1.30		$I_F = 10.0\text{ mA}, T_A = -100^\circ\text{C}$
I_R	Reverse Current	-	-	100	μA	$V_R = 2.0\text{ V}$
Output Phototransistor						
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage					
	4N24U	35	80	-	V	$I_C = 100\text{ }\mu\text{A}, I_F = 0$
	4N47U Series	40	90	-		
$V_{(BR)ECO}$	Emitter-Collector Breakdown Voltage					
	4N24U	4	6	-	V	$I_E = 100\text{ }\mu\text{A}, I_F = 0$
	4N47U Series	7	10	-		
I_{CEO}	Collector-Emitter Dark Current	-	20	100	nA	$V_{CE} = 20\text{ V}, I_F = 0, I_B = 0, T_A = 25^\circ\text{C}$
		-	-	100	μA	$V_{CE} = 20\text{ V}, I_F = 0, I_B = 0, T_A = 100^\circ\text{C}$
$V_{CE(SAT)}$	Collector Saturation Voltage	-	0.2	0.3	V	$I_F = 20\text{ mA}, I_C = 2\text{ mA}$

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Electrical Specifications

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

SYMBOL	PARAMETER	PART NUMBER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
Coupled							
I_C/I_F	DC Current Transfer Ratio	4N24U	100	-	-	%	$I_F = 10\text{ mA}$, $V_{CE} = 5\text{ V}$
		4N47U	50	-	-	%	$I_F = 2\text{ mA}$, $V_{CE} = 5\text{ V}$
		4N48U	100	-	-		
		4N49U	200	-	-		
$I_{C(ON)}$	On-State Collector Current	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	-	-		$V_{CE} = 5\text{ V}$, $I_B = 0$, $I_F = 2.0\text{ mA}$, $T_A = 100^\circ\text{C}$
$V_{CE(SAT)}$	Collector Saturation Voltage	4N24U	-	-	0.3	V	$I_C = 10.0\text{ mA}$, $I_B = 0$, $I_F = 20\text{ mA}$
			-	-	0.3	V	$I_C = 0.5\text{ mA}$, $I_B = 0$, $I_F = 2.0\text{ mA}$
			-	-	0.3		$I_C = 1.0\text{ mA}$, $I_B = 0$, $I_F = 2.0\text{ mA}$
			-	-	0.3		$I_C = 2.0\text{ mA}$, $I_B = 0$, $I_F = 2.0\text{ mA}$
		4N47U	-	-	-	-	$V_{CE} = 5\text{ V}$, $I_C = 10\text{ mA}$, $I_F = 0\text{ mA}$
			100	-	-		
			100	-	-		
			100	-	-		
t_r & t_f	Rise and Fall Time	4N24U	-	-	20	μs	$V_{CC} = 10\text{ V}$, $I_F = 10\text{ mA}$, $R_L = 100\ \Omega$, Pulse width = 100 ms, Duty cycle = 1 %
			-	-	20	μs	$V_{CC} = 10\text{ V}$, $I_F = 5\text{ mA}$, $R_L = 100\ \Omega$, Pulse width = 100 ms, Duty cycle = 1 %
			-	-	20		
			-	-	20		
		4N47U	-	-	-	-	$V_{CC} = 10\text{ V}$, $I_F = 10\text{ mA}$, $R_L = 100\ \Omega$, Pulse width = 100 ms, Duty cycle = 1 %
			100	-	-		
			100	-	-		
			100	-	-		
R_{IO}	Resistance (Input to Output) ⁽¹⁾		10^{11}	-	-	Ω	$V_{I-O} = \pm 1,000\text{ V}_{DC}$
C_{IO}	Capacitance (Input to Output) ⁽¹⁾		-	-	5.0	pF	$V_{I-O} = 0\text{ V}_{DC}$, $f = 1.0\text{ MHz}$

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Electrical Specifications

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

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
Coupled						
$I_{C(ON)}$	On-State Collector Current					
	4N24U	0.40	-	-		$I_F = 2.0 \text{ mA}$, $V_{CE} = 5 \text{ V}$, $I_B = 0$
	4N24U	10.0	-	-		$I_F = 10.0 \text{ mA}$, $V_{CE} = 5 \text{ V}$, $I_B = 0$
	4N24U	4.00	-	-		$I_F = 10.0 \text{ mA}$, $V_{CE} = 5 \text{ V}$, $I_B = 0$, $T_A = -55^\circ \text{C}$
	4N24U	4.00	-	-		$I_F = 10.0 \text{ mA}$, $V_{CE} = 5 \text{ V}$, $I_B = 0$, $T_A = 100^\circ \text{C}$
	4N47U, 4N47U (TX, TXV)	0.50	-	-		$I_F = 1.0 \text{ mA}$, $V_{CE} = 5.0 \text{ V}$, $I_B = 0$
	4N47U, 4N47U (TX, TXV)	0.70	-	-		$I_F = 2.0 \text{ mA}$, $V_{CE} = 5.0 \text{ V}$, $I_B = 0$, $T_A = -55^\circ \text{C}$
	4N47U, 4N47U (TX, TXV)	0.50	-	-		$I_F = 2.0 \text{ mA}$, $V_{CE} = 5.0 \text{ V}$, $I_B = 0$, $T_A = 100^\circ \text{C}$
	4N48U, 4N48U (TX, TXV)	1.00	-	5		$I_F = 1.0 \text{ mA}$, $V_{CE} = 5.0 \text{ V}$, $I_B = 0$
	4N48U, 4N48U (TX, TXV)	1.40	-	-		$I_F = 2.0 \text{ mA}$, $V_{CE} = 5.0 \text{ V}$, $I_B = 0$, $T_A = -55^\circ \text{C}$
	4N48U, 4N48U (TX, TXV)	1.00	-	-		$I_F = 2.0 \text{ mA}$, $V_{CE} = 5.0 \text{ V}$, $I_B = 0$, $T_A = 100^\circ \text{C}$
	4N49U, 4N49U (TX, TXV)	2.00	-	10		$I_F = 1.0 \text{ mA}$, $V_{CE} = 5.0 \text{ V}$, $I_B = 0$
	4N49U, 4N49U (TX, TXV)	2.80	-	-		$I_F = 2.0 \text{ mA}$, $V_{CE} = 5.0 \text{ V}$, $I_B = 0$, $T_A = -55^\circ \text{C}$
	4N49U, 4N49U (TX, TXV)	2.00	-	-		$I_F = 2.0 \text{ mA}$, $V_{CE} = 5.0 \text{ V}$, $I_B = 0$, $T_A = 100^\circ \text{C}$
					mA	
$I_{CB(ON)}$	On-State Collector Base 4N47U, 4N48U, 4N49U (TX, TXV)	30	-	-	μA	$V_{CB} = 5 \text{ V}$, $I_E = 0$, $I_F = 10 \text{ mA}$
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage					
	4N24U	-	-	0.30		$I_F = 20 \text{ mA}$, $I_C = 2.5 \text{ mA}$, $I_B = 0$
	4N24U	-	-	0.30		$I_F = 20 \text{ mA}$, $I_C = 5.0 \text{ mA}$, $I_B = 0$
	4N24U	-	-	0.30		$I_F = 20 \text{ mA}$, $I_C = 10.0 \text{ mA}$, $I_B = 0$
	4N47U, 4N47U (TX, TXV)	-	-	0.30		$I_F = 2.0 \text{ mA}$, $I_C = 0.5 \text{ mA}$, $I_B = 0$
	4N48U, 4N48U (TX, TXV)	-	-	0.30		$I_F = 2.0 \text{ mA}$, $I_C = 1.0 \text{ mA}$, $I_B = 0$
	4N49U, 4N49U (TX, TXV)	-	-	0.30		$I_F = 2.0 \text{ mA}$, $I_C = 2.0 \text{ mA}$, $I_B = 0$
H_{FE}	DC Current Gain					
	4N24U	400	-	-	V	$V_{CE} = 5.0 \text{ V}$, $I_C = 10.0 \text{ mA}$, $I_F = 0 \text{ mA}$
	4N47U, 4N48U, 4N49U (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)					
	4N24U ⁽¹⁾	10^{11}	-	-	Ω	$V_{I-O} = \pm 1,000 \text{ V}_{DC}$
	4N47U, 4N48U, 4N49U (TX, TXV) ⁽¹⁾	10^{11}	-	-		$V_{I-O} = \pm 1,000 \text{ V}_{DC}$
C_{IO}	Capacitance (Input-to-Output) ⁽¹⁾	-	-	5	pF	$V_{I-O} = 0 \text{ V}$, $f = 1.0 \text{ MHz}$

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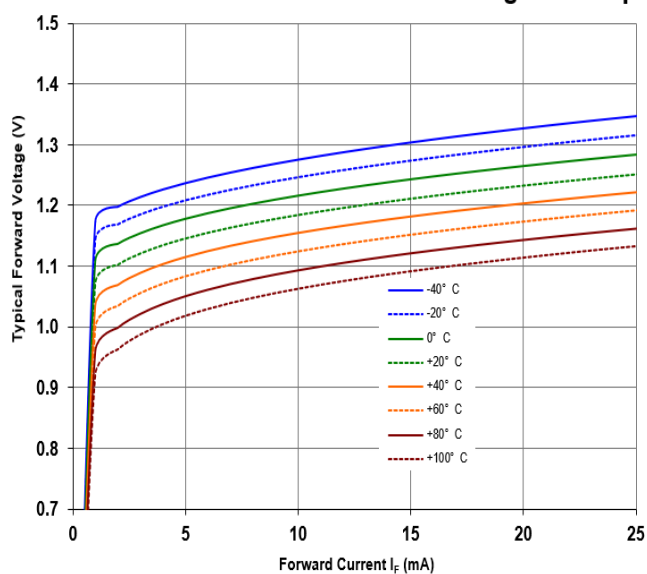
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4N47U, 4N48U, 4N49U (TX, TXV)

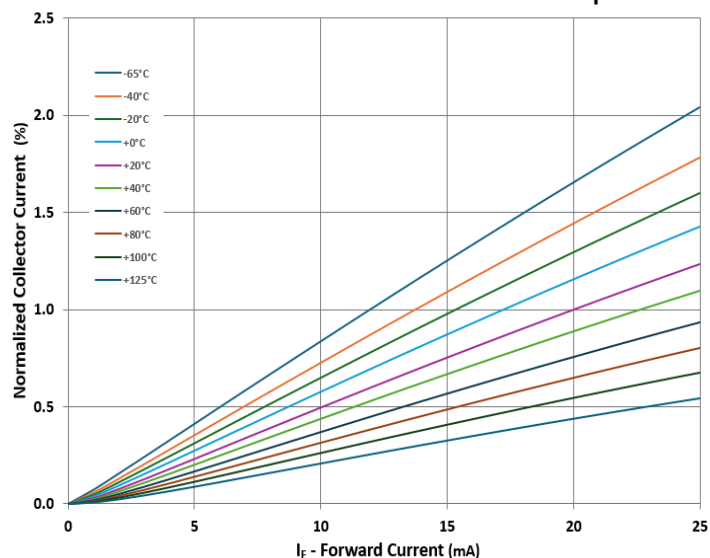


Typical Performance Curves

LED Forward Current vs Forward Voltage vs Temp



Collector Current vs Forward Current vs Temp



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