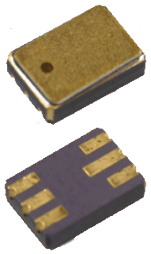
Surface Mount Optically Coupled Isolator

4N24U, 4N47U, 4N49U (TX)



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-19500
4N22U (Obsolete)	1	10 / 40	35	COTS
4N22UTX (Obsolete)				486
4N22UTXV (Obsolete)				
4N23U (Obsolete)				COTS
4N23UTX (Obsolete)				486
4N23UTXV (Obsolete)				
4N24U				COTS
4N24UTX (Obsolete)				486
4N24UTXV (Obsolete)				
4N47U		1 / 40	40	COTS
4N47UTX (Obsolete)				548
4N47UTXV (Obsolete)				
4N48U (Obsolete)				COTS
4N48UTX (Obsolete)				548
4N48UTXV (Obsolete)				
4N49U				COTS
4N49UTX				548
4N49UTXV (Obsolete)				

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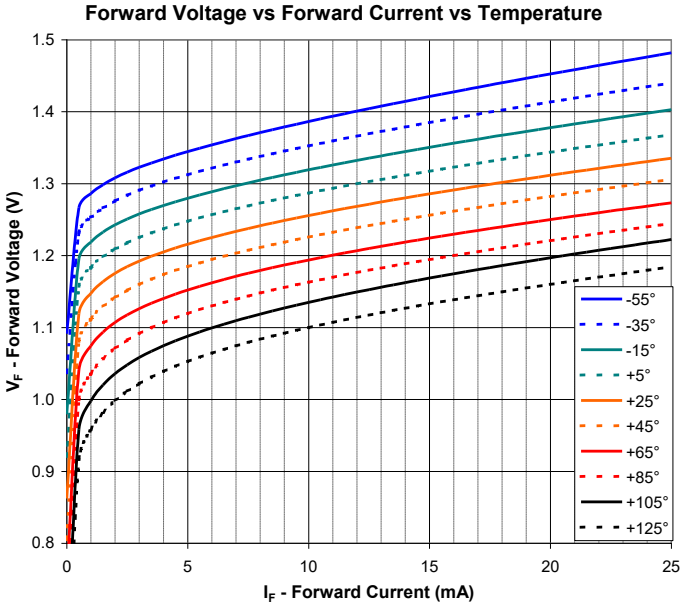
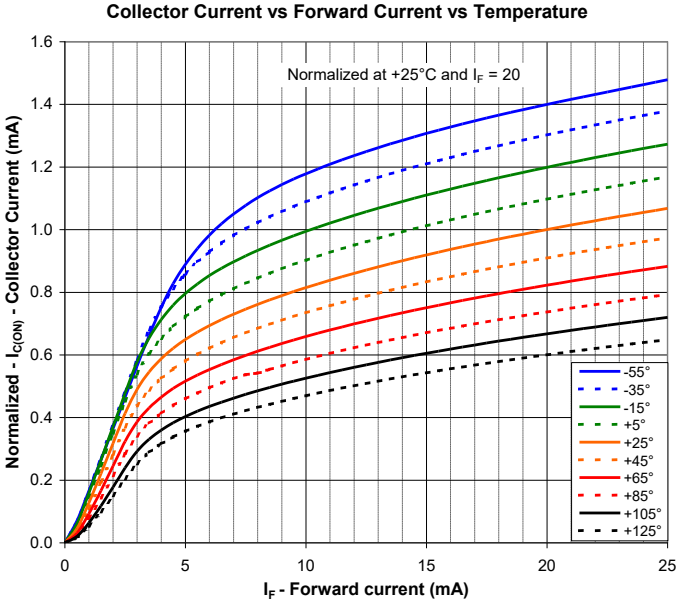
Electrical Specifications

Absolute Maximum Ratings (T_A = 25° 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.

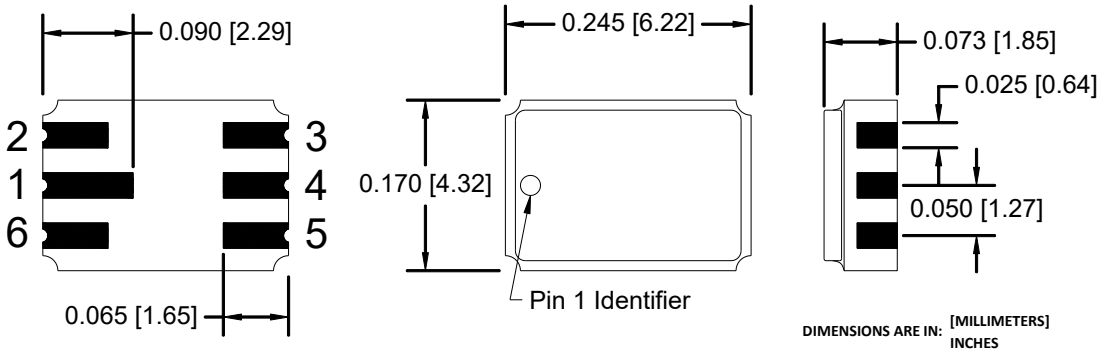


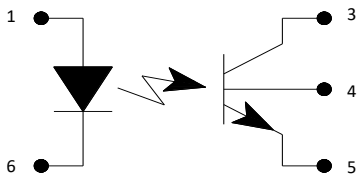


Electrical Specifications

Electrical Characteristics (T_A = 25° C unless otherwise noted)

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
Input LED						
V_F	Forward Voltage					
	4N22U, 4N23U, 4N24U (TX, TXV)	0.80	-	1.30	V	I_F = 10.0 mA
	4N22U, 4N23U, 4N24U (TX, TXV)	1.00	-	1.50		I_F = 10.0 mA, T_A = -55° C
	4N22U, 4N23U, 4N24U (TX, TXV)	0.70	-	1.20		I_F = 10.0 mA, T_A = -100° C
	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
	4N47U, 4N48U, 4N49U (TX, TXV)	0.70	-	1.30		I_F = 10.0 mA, T_A = -100° C
I_R	Reverse Current	-	-	100	µA	V_R = 2.0 V
Output Phototransistor						
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage					
	4N22U Series	35	80	-	V	I_C = 100 µA, I_F = 0
	4N47U Series	40	90	-		
$V_{(BR)ECO}$	Emitter-Collector Breakdown Voltage					
	4N22U Series	4	6	-	V	I_E = 100 µA, I_F = 0
	4N47U Series	7	10	-		
I_{CEO}	Collector-Emitter Dark Current	-	20	100	nA	V_{CE} = 20 V, I_F = 0, I_B= 0, T_A = 25° C
		-	-	100	µA	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





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

SYMBOL	PARAMETER	PART NUMBER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
Coupled							
I_C/I_F	DC Current Transfer Ratio	4N22U 4N23U 4N24U	25 60 100	- - -	- - -	%	I_F = 10 mA, V_{CE} = 5 V
		4N47U 4N48U 4N49U	50 100 200	- - -	- - -	%	I_F = 2 mA, V_{CE} = 5 V
$I_{C(ON)}$	On-State Collector Current	4N22U	0.15 2.50 1.00 1.00	- - - -	- - - -	mA	V_{CE} = 10 V, I_B = 0, I_F = 2.0 mA, T_A = 25° C V_{CE} = 10 V, I_B = 0, I_F = 10.0 mA, T_A = 25° C V_{CE} = 10 V, I_B = 0, I_F = 10.0 mA, T_A = -55° C V_{CE} = 10 V, I_B = 0, I_F = 10.0 mA, T_A = 100° C
		4N23U	0.2 6.0 2.5 2.5	- - - -	- - - -	mA	V_{CE} = 10 V, I_B = 0, I_F = 2.0 mA, T_A = 25° C V_{CE} = 10 V, I_B = 0, I_F = 10.0 mA, T_A = 25° C V_{CE} = 10 V, I_B = 0, I_F = 10.0 mA, T_A = -55° C V_{CE} = 10 V, I_B = 0, I_F = 10.0 mA, T_A = 100° C
		4N24U	0.4 10.0 4.0 4.0	- - - -	- - - -	mA	V_{CE} = 10 V, I_B = 0, I_F = 2.0 mA, T_A = 25° C V_{CE} = 10 V, I_B = 0, I_F = 10.0 mA, T_A = 25° C V_{CE} = 10 V, I_B = 0, I_F = 10.0 mA, T_A = -55° C V_{CE} = 10 V, I_B = 0, I_F = 10.0 mA, T_A = 100° C
		4N47U	0.5 0.7 0.5	- - -	- - -	mA	V_{CE} = 5 V, I_B = 0, I_F = 1.0 mA, T_A = 25° C V_{CE} = 5 V, I_B = 0, I_F = 2.0 mA, T_A = -55° C V_{CE} = 5 V, I_B = 0, I_F = 2.0 mA, T_A = 100° C
		4N48U	1.0 1.4 1.0	- - -	5.0 - -	mA	V_{CE} = 5 V, I_B = 0, I_F = 1.0 mA, T_A = 25° C V_{CE} = 5 V, I_B = 0, I_F = 2.0 mA, T_A = -55° C V_{CE} = 5 V, I_B = 0, I_F = 2.0 mA, T_A = 100° C
		4N49U	2.0 2.8 2.0	- - -	10.0 - -	mA	V_{CE} = 5 V, I_B = 0, I_F = 1.0 mA, T_A = 25° C V_{CE} = 5 V, I_B = 0, I_F = 2.0 mA, T_A = -55° C V_{CE} = 5 V, I_B = 0, I_F = 2.0 mA, T_A = 100° C
$V_{CE(SAT)}$	Collector Saturation Voltage	4N22U 4N23U 4N24U	- - -	- - -	0.3 0.3 0.3	V	I_C = 2.5 mA, I_B = 0, I_F = 20 mA I_C = 5.0 mA, I_B = 0, I_F = 20 mA I_C = 10.0 mA, I_B = 0, I_F = 20 mA
		4N47U 4N48U 4N49U	- - -	- - -	0.3 0.3 0.3	V	I_C = 0.5 mA, I_B = 0, I_F = 2.0 mA I_C = 1.0 mA, I_B = 0, I_F = 2.0 mA I_C = 2.0 mA, I_B = 0, I_F = 2.0 mA
h_{FE}	DC Current Gain	4N22U 4N23U 4N24U	200 300 400	- - -	- - -	-	V_{CE} = 5 V, I_C = 10 mA, I_F = 0 mA
		4N47U 4N48U 4N49U	100 100 100	- - -	- - -		
t_r & t_f	Rise and Fall Time	4N22U 4N23U 4N24U	- - -	- - -	15 15 20	µs	V_{CC} = 10 V, I_F = 10 mA, R_L = 100 Ω, Pulse width = 100 ms, Duty cycle = 1 %
		4N47U 4N48U 4N49U	- - -	- - -	20 20 20	µs	V_{CC} = 10 V, I_F = 5 mA, R_L = 100 Ω, Pulse width = 100 ms, Duty cycle = 1 %
R_{IO}	Resistance (Input to Output)		10^{11}	-	-	Ω	V_{I-O} = ±1,000 Vdc (1)
C_{IO}	Capacitance (Input to Output)		-	-	5.0	pF	V_{I-O} = 0 Vdc, 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.

Electrical Characteristics (T_A = 25° C unless otherwise noted)

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
Coupled						
$I_{C(ON)}$	On-State Collector Current				mA	
	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
	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
	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
	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
	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
	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
$I_{CB(ON)}$	On-State Collector Base				µA	
	4N47U, 4N48U, 4N49U (TX, TXV)	30	-	-		V_{CB} = 5 V, I_E = 0, I_F = 10 mA
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage				V	
	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				V	
	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)				Ω	
	4N22U, 4N23U, 4N24U (TX, TXV)	10^{11}	-	-		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.