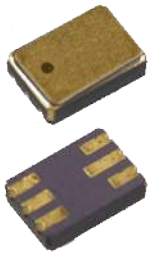
Surface Mount Optically Coupled Isolator

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)				

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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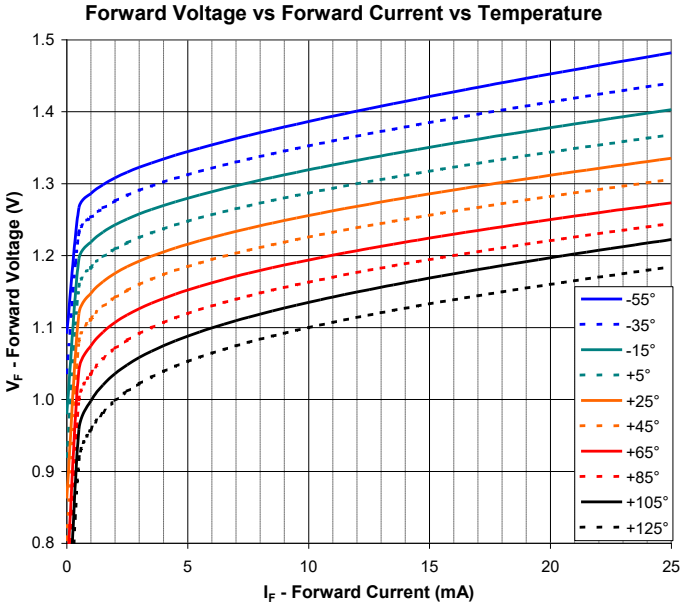
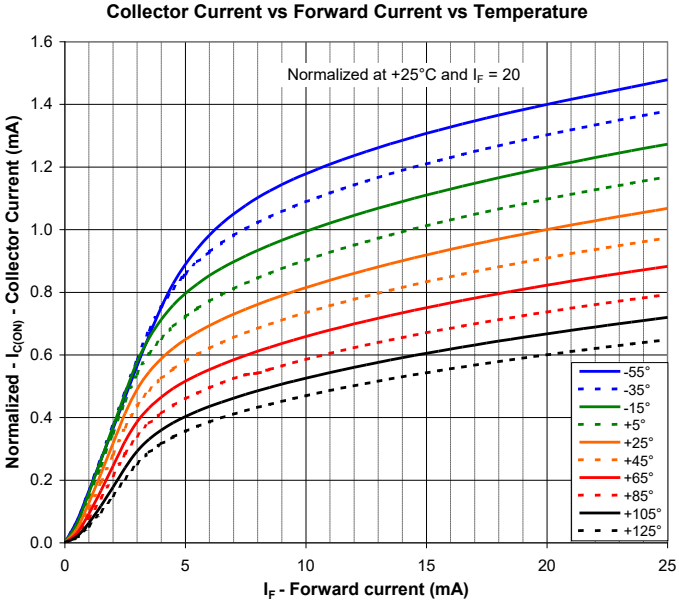
Electrical Specifications

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.

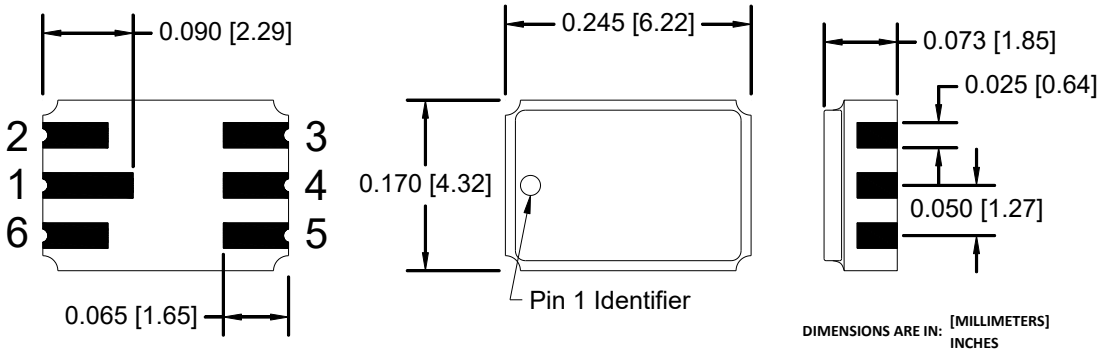


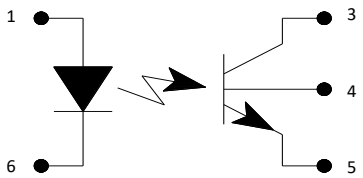


Electrical Specifications

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.