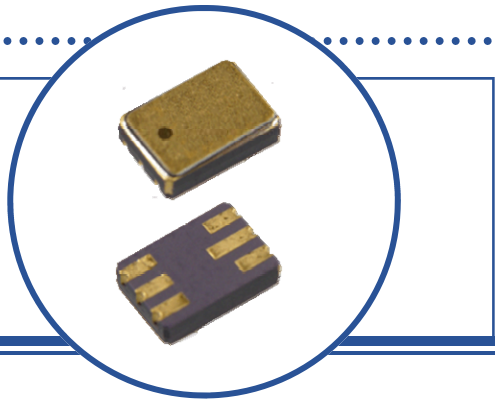
Surface Mount Optically Coupled Isolator
4N22U, 4N23U, 4N24U (COTS, TX, TXV)
4N47U, 4N48U, 4N49U (COTS, TX, TXV)

TT electronics
OPTEK Technology

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 has a 890 nm (for the 4N2_U series) and 935nm (for the 4N4_ series) wavelength 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. Burn-in condition is V_{CE} = 10V, I_F = 40mA, P_D = 275 mW, T_A = 25° C.

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

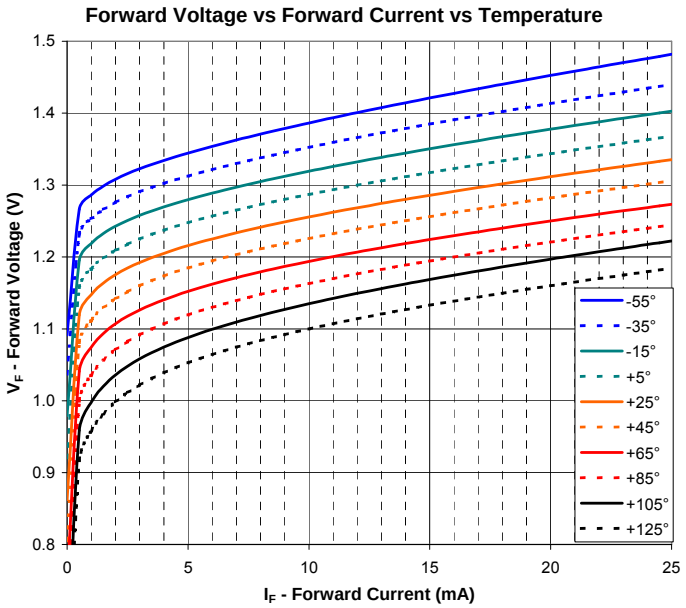
Part Number	LED Peak Wavelength	Sensor	Isolation Voltage (kV)	CTR % Minimum	I_F (mA) Typ / Max	V_{CE} (Volts) Max	Processing MIL-PRF-195000
4N22U	890 nm	Transistor	1	25	10 / 40	35	COTS
4N22UTX							486
4N22UTXV							
4N23U				60			COTS
4N23UTX							486
4N23UTXV							
4N24U				100			COTS
4N24UTX							486
4N24UTXV							
4N47U	935 nm			50		45	COTS
4N47UTX							548
4N47UTXV							
4N48U				100			COTS
4N48UTX							548
4N48UTXV							
4N49U				200			COTS
4N49UTX							548
4N49UTXV							

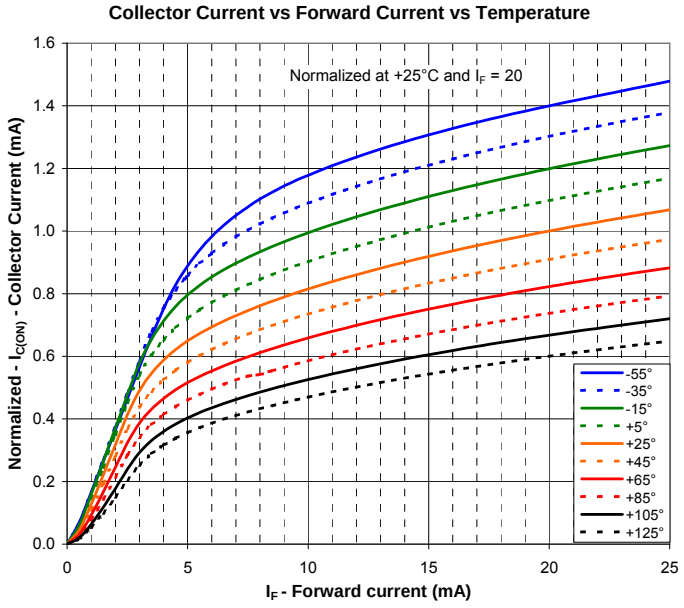
Pb
RoHS

OPTEK reserves the right to make changes at any time in order to improve design and to supply the best product possible.

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][2]	± 1 kVDC
Lead Soldering Temperature (1/16" (1.6 mm) from case for 5 seconds with soldering iron)[3]	260° C
Input Diode	
Forward DC Current[4]	50 mA
Reverse DC Voltage	2 V
Power Dissipation[5]	300 mW
Output Photosensor	
Collector-Emitter Voltage	35 V
Emitter-Collector Voltage	7.0 V
Power Dissipation[6]	100 mW





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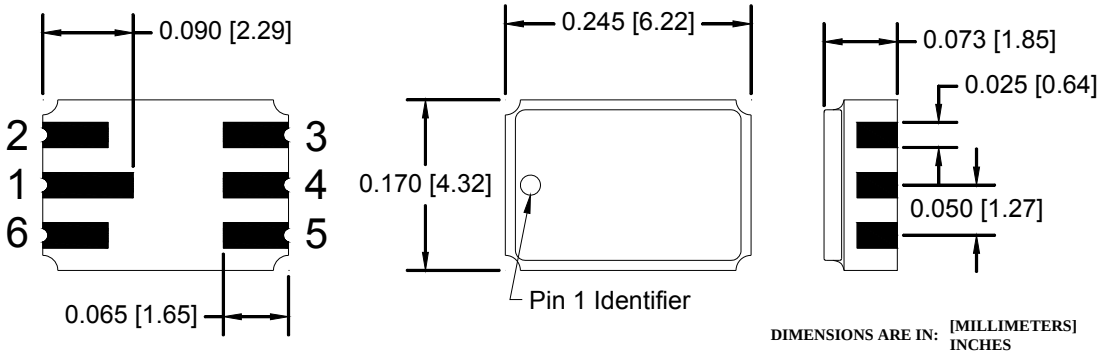
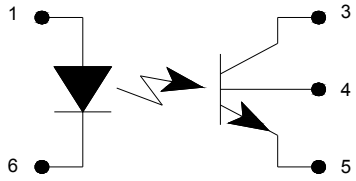
Electrical Characteristics (T_A = 25° C unless otherwise noted)

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
Input Diode (See OP165 or OP265 for additional information - for reference only)						
V_F	Forward Voltage 4N22, 4N23, 4N24 [A] (COTS, TX, TXV) 4N22, 4N23, 4N24 [A] (COTS, TX, TXV) 4N22, 4N23, 4N24 [A] (COTS, TX, TXV) 4N47, 4N48, 4N49 [A] (COTS, TX, TXV) 4N47, 4N48, 4N49 [A] (COTS, TX, TXV) 4N47, 4N48, 4N49 [A] (COTS, TX, TXV)	 0.80 1.00 0.70 0.80 1.00 0.70	 - - - - - -	 1.30 1.50 1.20 1.50 1.70 1.30	V	 I_F = 10.0 mA I_F = 10.0 mA, T_A = -55° C(1) I_F = 10.0 mA, T_A = -100° C(1) I_F = 10.0 mA I_F = 10.0 mA, T_A = -55° C(1) I_F = 10.0 mA, T_A = -100° C(1)
I_R	Reverse Current	-	-	100	µA	V_R = 2.0 V
Output Photosensor (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 and output leads shorted. Typical input/output capacitance is 0.06 pF.
(2) UL recognition is for 3500 VAC for one minute.
(3) RMA flux is recommended. The duration can be extended to 10 seconds maximum when flow soldering.
(4) Derate linearly 0.67 mA/°C above 25°C.
(5) Derate linearly 0.83 mA/°C above 25°C.
(6) Derate linearly 1.67 mA/°C above 25°C.





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

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 = 100Ω, Pulse width = 100 ms, Duty cycle = 1%
		4N47U 4N48U 4N49U	- - -	- - -	20 20 20	µs	V_{CC} = 10 V, I_F = 5 mA, R_L = 100Ω, Pulse width = 100 ms, Duty cycle = 1%
R_{IO}	Resistance (Input to Output)		10_{11}	-	-	Ω	V_{IO} = ±1,000 Vdc
C_{IO}	Capacitance (Input to Output)		-	-	5.0	pF	V_{IO} = 0 Vdc, f = 1.0 MHz

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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	
	4N22, 4N22A (COTS, TX, TXV)	0.15	-	-		I_F = 2.0 mA , V_{CE} = 5 V, I_B = 0
	4N22, 4N22A (COTS, TX, TXV)	2.50	-	-		I_F = 10.0 mA , V_{CE} = 5 V, I_B = 0
	4N22, 4N22A (COTS, TX, TXV)	1.00	-	-		I_F = 10.0 mA , V_{CE} = 5 V, I_B = 0, T_A = -55° C(1)
	4N22, 4N22A (COTS, TX, TXV)	1.00	-	-		I_F = 10.0 mA , V_{CE} = 5 V, I_B = 0, T_A = 100° C(1)
	4N23, 4N23A (COTS, TX, TXV)	0.20	-	-		I_F = 2.0 mA , V_{CE} = 5 V, I_B = 0
	4N23, 4N23A (COTS, TX, TXV)	6.00	-	-		I_F = 10.0 mA , V_{CE} = 5 V, I_B = 0
	4N23, 4N23A (COTS, TX, TXV)	2.50	-	-		I_F = 10.0 mA , V_{CE} = 5 V, I_B = 0, T_A = -55° C(1)
	4N23, 4N23A (COTS, TX, TXV)	2.50	-	-		I_F = 10.0 mA , V_{CE} = 5 V, I_B = 0, T_A = 100° C(1)
	4N24, 4N24A (COTS, TX, TXV)	0.40	-	-		I_F = 2.0 mA , V_{CE} = 5 V, I_B = 0
	4N24, 4N24A (COTS, TX, TXV)	10.0	-	-		I_F = 10.0 mA , V_{CE} = 5 V, I_B = 0
	4N24, 4N24A (COTS, TX, TXV)	4.00	-	-		I_F = 10.0 mA , V_{CE} = 5 V, I_B = 0, T_A = -55° C(1)
	4N24, 4N24A (COTS, TX, TXV)	4.00	-	-		I_F = 10.0 mA , V_{CE} = 5 V, I_B = 0, T_A = 100° C(1)
	4N47, 4N47A (COTS, TX, TXV)	0.50	-	-		I_F = 1.0 Ma, V_{CE} = 5.0 V, I_B = 0
	4N47, 4N47A (COTS, TX, TXV)	0.70	-	-		I_F = 2.0 mA, V_{CE} = 5.0 V, I_B = 0, T_A = -55° C(1)
	4N47, 4N47A (COTS, TX, TXV)	0.50	-	-		I_F = 2.0 mA, V_{CE} = 5.0 V, I_B = 0, T_A = 100° C(1)
	4N48, 4N48A (COTS, TX, TXV)	1.00	-	5		I_F = 1.0 mA, V_{CE} = 5.0 V, I_B = 0
	4N48, 4N48A (COTS, TX, TXV)	1.40	-	-		I_F = 2.0 mA, V_{CE} = 5.0 V, I_B = 0, T_A = -55° C(1)
	4N48, 4N48A (COTS, TX, TXV)	1.00	-	-		I_F = 2.0 mA, V_{CE} = 5.0 V, I_B = 0, T_A = 100° C(1)
	4N49, 4N49A (COTS, TX, TXV)	2.00	-	10		I_F = 1.0 mA, V_{CE} = 5.0 V, I_B = 0
	4N49, 4N49A (COTS, TX, TXV)	2.80	-	-		I_F = 2.0 mA, V_{CE} = 5.0 V, I_B = 0, T_A = -55° C(1)
	4N49, 4N49A (COTS, 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				µA	
	4N47, 4N48, 4N49 [A] (COTS, TX, TXV)	30	-	-		V_{CB} = 5 V, I_E = 0, I_F = 10 mA
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage				V	
	4N22, 4N23, 4N24 [A] (COTS, TX, TXV)	-	-	0.30		I_F = 20 mA , I_C = 2.5 mA, I_B = 0
	4N22, 4N23, 4N24 [A] (COTS, TX, TXV)	-	-	0.30		I_F = 20 mA , I_C = 5.0 mA, I_B = 0
	4N22, 4N23, 4N24 [A] (COTS, TX, TXV)	-	-	0.30		I_F = 20 mA , I_C = 10.0 mA, I_B = 0
	4N47, 4N47A (COTS, TX, TXV)	-	-	0.30		I_F = 2.0 mA, I_C = 0.5 mA, I_B = 0
	4N48, 4N48A (COTS, TX, TXV)	-	-	0.30		I_F = 2.0 mA, I_C = 1.0 mA, I_B = 0
	4N49, 4N49A (COTS, TX, TXV)	-	-	0.30		I_F = 2.0 mA, I_C = 2.0 mA, I_B = 0
H_{FE}	DC Current Gain				V	
	4N22, 4N22A (COTS, TX, TXV)	200	-	-		V_{CE} = 5.0 V , I_C = 10.0 mA, I_F = 0 mA
	4N23, 4N23A (COTS, TX, TXV)	300	-	-		V_{CE} = 5.0 V , I_C = 10.0 mA, I_F = 0 mA
	4N24, 4N24A (COTS, TX, TXV)	400	-	-		V_{CE} = 5.0 V , I_C = 10.0 mA, I_F = 0 mA
	4N47, 4N48, 4N49 [A] (COTS, TX, TXV)	100	-	-		V_{CE} = 5.0 V , I_C = 10.0 mA, I_F = 0 mA
R_{IO}	Resistance (Input-to-Output)				Ω	
	4N22, 4N23, 4N24 [A] (COTS, TX, TXV)	10^{11}	-	-		V_{10} = ± 1.0 VDC(3)
	4N47, 4N48, 4N49 [A] (COTS, TX, TXV)	10^{11}	-	-		V_{I-O} = ± 1000 VDC(3)
C_{IO}	Capacitance (Input-to-Output)	-	-	5	pF	V_{I-O} = 0 V, f = 1.0 MHz(3)