Hi-Reliability Optically Coupled Isolator

4N22 [A], 4N23 [A], 4N24 [A]
4N48 [A], 4N49 [A, TX, TXV]

Features:

- TO-78 hermetically sealed package
- High current transfer ratio
- 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 TO-78 package. Devices are designed for military and/or harsh environments. The suffix letter "A" denotes the collector is electrically isolated from the case.

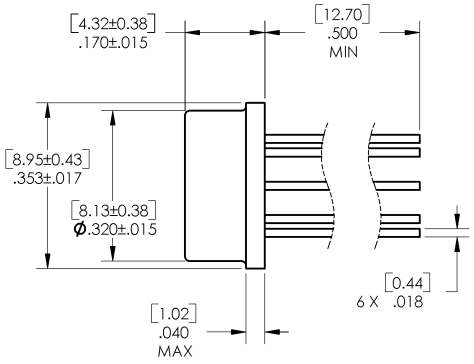
The 4N22, 4N22A, 4N23, 4N23A ,4N24, and 4N24A devices are processed to MIL-PRF-19500/486.
The 4N48, 4N48A, 4N49, 4N49A, 4N49TX and 4N49TXV devices are processed to MIL-PRF-19500/548.

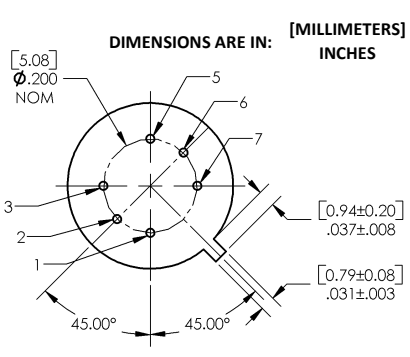
Please contact your local representative or OPTEK for more information.

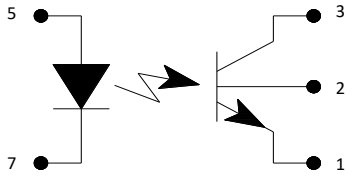
Applications:

- 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)	CTR % Min / Max	I_F (mA) Typ / Max	V_{CE} (Volts) Max	Processing MIL-PRF-19500
4N22 or 4N22A	1	25 / NA	10 / 40	35	486
4N23 or 4N23A		20 / NA			
4N24 or 4N24A		40 / NA			
4N48 or 4N48A		100 / 500	1 / 40	40	548
4N49 or 4N49A		200 / 1,000			
4N49TX					
4N49TXV					







Pin #	Function	Pin #	Function
1	Emitter	5	Anode
2	Base	6	Open
3	Collector	7	Cathode

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Electrical Specifications

Absolute Maximum Ratings (T_A = 25° C unless otherwise noted)

Storage Temperature Range 4N22, 4N22A, 4N23, 4N23A, 4N24, 4N24A 4N48, 4N48A, 4N49, 4N49A, 4N49TX, 4N49TXV	-65° C to +125° C
Operating Temperature Range 4N22, 4N22A, 4N23, 4N23A, 4N24, 4N24A 4N48, 4N48A, 4N49, 4N49A, 4N49TX, 4N49TXV	-55° C to +125° C
Input-to-Output Isolation Voltage [1]	± 1.00 kV_{DC}
Lead Soldering Temperature [1/16 inch (1.6 mm) from case for 5 seconds with soldering iron] [2]	260° C
Input Diode	
Forward DC Current (65° C or below)	40 mA
Reverse Voltage	2 V
Peak Forward Current (1 µs pulse width, 300 pps) 4N22, 4N22A, 4N23, 4N23A, 4N24, 4N24A	1 A
Power Dissipation [3]	60 mW
Output Phototransistor (4N22, 4N22A, 4N23, 4N23A, 4N24, 4N24A)	
Continuous Collector Current	50 mA
Collector-Emitter Voltage	35 V
Collector-Base Voltage	35 V
Emitter-Base Voltage	4 V
Power Dissipation [4]	300 mW
Output Phototransistor (4N48, 4N48A, 4N49, 4N49A)	
Continuous Collector Current	50 mA
Collector-Emitter Voltage	40 V
Collector-Base Voltage	45 V
Emitter-Base Voltage	7.0 V
Power Dissipation [4]	300 mW

Notes:
1. Measured with input leads shorted together and output leads shorted together.
2. RMA flux is recommended. Duration can be extended to 10 seconds maximum when flow soldering.
3. Derate linearly 1.0 mW/° C above 65° C.
4. Derate linearly 3.0 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 Diode						
V_F	Forward Voltage					
	4N22, 4N23, 4N24 [A]	0.80	-	1.30		I_F = 10.0 mA
	4N22, 4N23, 4N24 [A] (1)	1.00	-	1.50		I_F = 10.0 mA, T_A = -55° C
	4N22, 4N23, 4N24 [A] (1)	0.70	-	1.20	V	I_F = 10.0 mA, T_A = -100° C
	4N48, 4N49 [A], 4N49TX, 4N49TXV	0.80	-	1.50		I_F = 10.0 mA
	4N48, 4N49 [A], 4N49TX, 4N49TXV (1)	1.00	-	1.70		I_F = 10.0 mA, T_A = -55° C
	4N48, 4N49 [A], 4N49TX, 4N49TXV (1)	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					
	4N22, 4N23, 4N24 [A]	35	-	-	V	I_C = 1.0 mA, I_B = 0, I_F = 0
	4N48, 4N49 [A], 4N49TX, 4N49TXV	40	-	-		I_C = 1.0 mA, I_B = 0, I_F = 0
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage					
	4N22, 4N23, 4N24 [A]	35	-	-	V	I_C = 100 µA, I_B = 0, I_F = 0
	4N48, 4N49 [A], 4N49TX, 4N49TXV	45	-	-		I_C = 100 µA, I_B = 0, I_F = 0
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage					
	4N22, 4N23, 4N24 [A]	4	-	-	V	I_E = 100 µA, I_C= 0, I_F = 0
	4N48, 4N49 [A], 4N49TX, 4N49TXV	7	-	-		I_E = 100 µA, I_C= 0, I_F = 0
I_{CEO}	Collector-Emitter Dark Current					
	4N22, 4N23, 4N24 [A]	-	-	100	nA	V_{CE} = 20 V, I_B = 0, I_F = 0
	4N48, 4N49 [A], 4N49TX, 4N49TXV (2)	-	-	100	µA	V_{CE} = 20 V, I_B = 0, I_F = 0, T_A = 100° C
$I_{C(OFF)}$	Collector-Emitter Dark Current					
	4N22, 4N23, 4N24 [A]	-	-	100	nA	V_{CE} = 20 V, I_B = 0, I_F = 0
	4N48, 4N49 [A], 4N49TX, 4N49TXV (1)	-	-	100	µA	V_{CE} = 20 V, I_B = 0, I_F = 0, T_A = 100° C
$I_{CB(OFF)}$	Collector-Base Dark Current					
	4N22, 4N23, 4N24 [A]	-	-	10	nA	V_{CB} = 20 V, I_E = 0, I_F = 0
	4N48, 4N49 [A], 4N49TX, 4N49TXV	-	-	10	nA	

Notes:
1. Guaranteed but not tested.
2. Sample tested, LTPD = 10.

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Electrical Specifications

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	0.15	-	-		I_F = 2.0 mA, V_{CE} = 5 V, I_B = 0
	4N22, 4N22A	2.50	-	-		I_F = 10.0 mA, V_{CE} = 5 V, I_B = 0
	4N22, 4N22A (1)	1.00	-	-		I_F = 10.0 mA, V_{CE} = 5 V, I_B = 0, T_A = -55° C
	4N22, 4N22A (1)	1.00	-	-		I_F = 10.0 mA, V_{CE} = 5 V, I_B = 0, T_A = 100° C
	4N23, 4N23A	0.20	-	-		I_F = 2.0 mA, V_{CE} = 5 V, I_B = 0
	4N23, 4N23A	6.00	-	-		I_F = 10.0 mA, V_{CE} = 5 V, I_B = 0
	4N23, 4N23A (1)	2.50	-	-		I_F = 10.0 mA, V_{CE} = 5 V, I_B = 0, T_A = -55° C
	4N23, 4N23A (1)	2.50	-	-		I_F = 10.0 mA, V_{CE} = 5 V, I_B = 0, T_A = 100° C
	4N24, 4N24A	0.40	-	-		I_F = 2.0 mA, V_{CE} = 5 V, I_B = 0
	4N24, 4N24A	10.0	-	-		I_F = 10.0 mA, V_{CE} = 5 V, I_B = 0
	4N24, 4N24A (1)	4.00	-	-		I_F = 10.0 mA, V_{CE} = 5 V, I_B = 0, T_A = -55° C
	4N24, 4N24A (1)	4.00	-	-		I_F = 10.0 mA, V_{CE} = 5 V, I_B = 0, T_A = 100° C
	4N48, 4N48A	1.00	-	5		I_F = 1.0 mA, V_{CE} = 5.0 V, I_B = 0
	4N48, 4N48A (1)	1.40	-	-		I_F = 2.0 mA, V_{CE} = 5.0 V, I_B = 0, T_A = -55° C
	4N48, 4N48A (1)	1.00	-	-		I_F = 2.0 mA, V_{CE} = 5.0 V, I_B = 0, T_A = 100° C
	4N49, 4N49A (TX, TXV)	2.00	-	10		I_F = 1.0 mA, V_{CE} = 5.0 V, I_B = 0
	4N49, 4N49A (TX, TXV) (1)	2.80	-	-		I_F = 2.0 mA, V_{CE} = 5.0 V, I_B = 0, T_A = -55° C
	4N49, 4N49A (TX, TXV) (1)	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	
	4N48, 4N49 [A], 4N49TX, 4N49TXV	30	-	-		V_{CB} = 5 V, I_E = 0, I_F = 10 mA
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage				V	
	4N22, 4N23, 4N24 [A]	-	-	0.30		I_F = 20 mA, I_C = 2.5 mA, I_B = 0
	4N22, 4N23, 4N24 [A]	-	-	0.30		I_F = 20 mA, I_C = 5.0 mA, I_B = 0
	4N22, 4N23, 4N24 [A]	-	-	0.30		I_F = 20 mA, I_C = 10.0 mA, I_B = 0
	4N48, 4N48A	-	-	0.30		I_F = 2.0 mA, I_C = 1.0 mA, I_B = 0
	4N49, 4N49A (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	>300	-	-		V_{CE} = 5.0 V, I_C = 10.0 mA, I_F = 0 mA
	4N23, 4N23A		-	-		
	4N24, 4N24A		-	-		
	4N48, 4N49 [A], 4N49TX, 4N49TXV		-	-		
R_{IO}	Resistance (Input-to-Output)				Ω	
	4N22, 4N23, 4N24 [A] (3)	10^{11}	-	-		V_{I-O} = ± 1000 V_{DC}
	4N48, 4N49 [A], 4N49TX, 4N49TXV (3)	10^{11}	-	-		V_{I-O} = ± 1000 V_{DC}
C_{IO}	Capacitance (Input-to-Output) (3)	-	-	5	pF	V_{I-O} = 0 V, f = 1.0 MHz

Notes:
1. Guaranteed but not tested.
2. Sample tested, LTPD = 10.
3. Measured with input leads shorted together and output leads shorted together.

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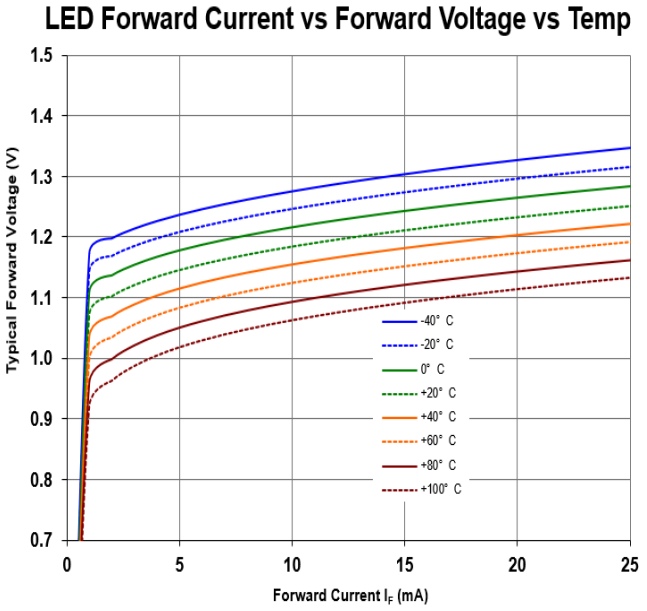
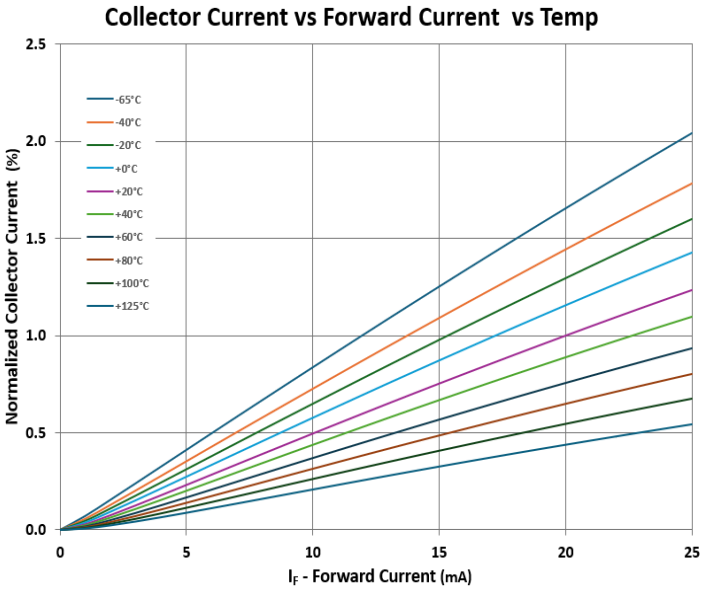
Electrical Characteristics (T_A = 25° C unless otherwise noted)

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
Coupled						
t_r	Output Rise Time					
	4N22A	-	-	15	µs	V_{CC} = 10.0 V, I_F = 10.0 mA, R_L = 100 Ω
	4N23A	-	-	15	µs	V_{CC} = 10.0 V, I_F = 10.0 mA, R_L = 100 Ω
	4N24A	-	-	20	µs	V_{CC} = 10.0 V, I_F = 10.0 mA, R_L = 100 Ω
	4N48	-	-	20	µs	V_{CC} = 10.0 V, I_F = 5.0 mA, R_L = 100 Ω
	4N49 (TX, TXV)	-	-	25	µs	V_{CC} = 10.0 V, I_F = 5.0 mA, R_L = 100 Ω
t_f	Output Fall Time					
	4N22A	-	-	15	µs	V_{CC} = 10.0 V, I_F = 10.0 mA, R_L = 100 Ω
	4N23A	-	-	15	µs	V_{CC} = 10.0 V, I_F = 10.0 mA, R_L = 100 Ω
	4N24A	-	-	20	µs	V_{CC} = 10.0 V, I_F = 10.0 mA, R_L = 100 Ω
	4N48	-	-	20	µs	V_{CC} = 10.0 V, I_F = 5.0 mA, R_L = 100 Ω
	4N49 (TX, TXV)	-	-	25	µs	V_{CC} = 10.0 V, I_F = 5.0 mA, R_L = 100 Ω

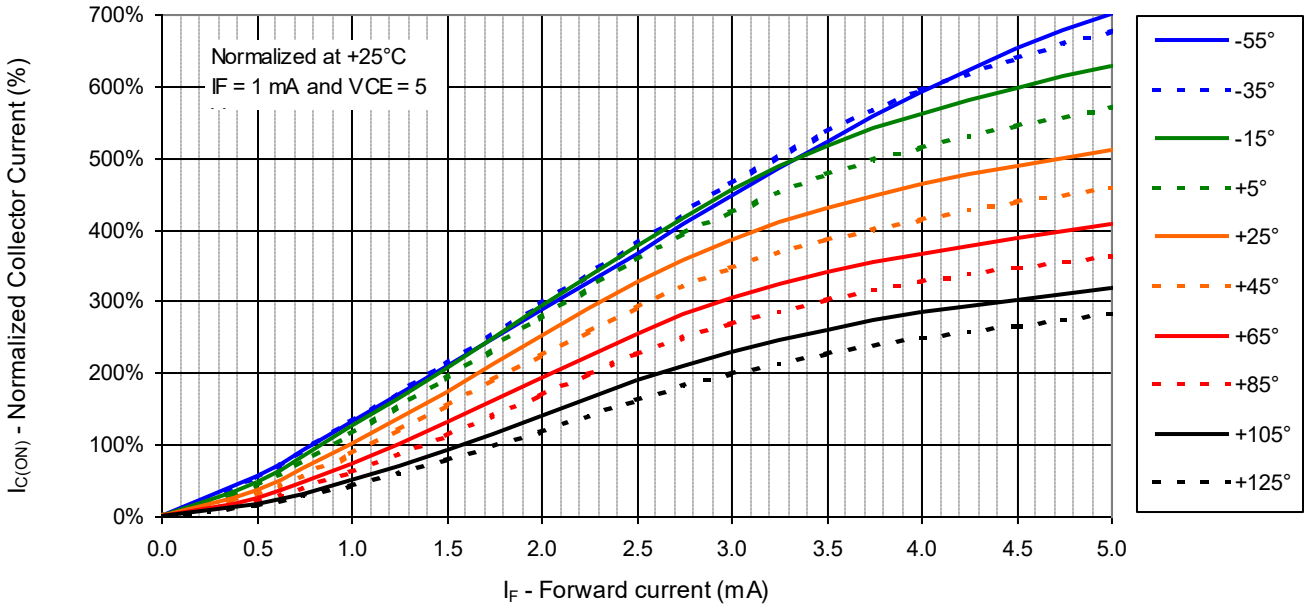
Typical Performance Curves



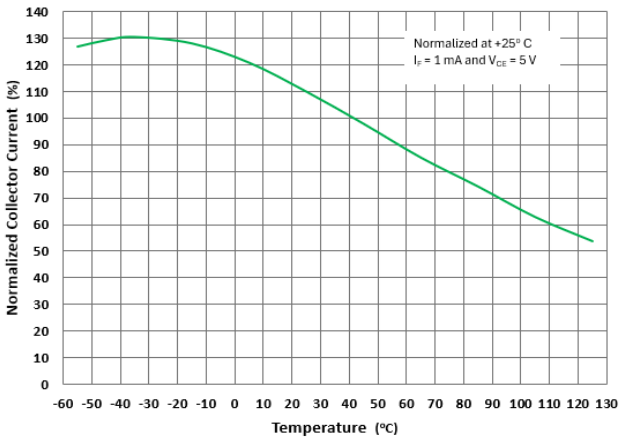


Typical Performance Curves

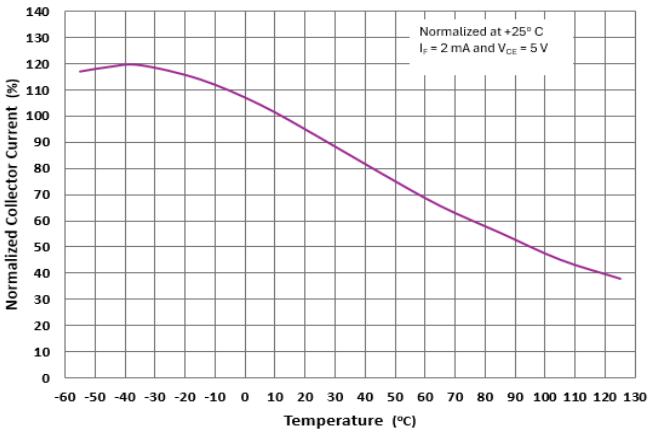
Collector Current vs Forward Current vs Temperature



Collector Current vs Temperature



Collector Current vs Temperature



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