THE DATASHEET OF

4N49

Hi-Reliability Optically Coupled Isolator

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

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 (TX, TXV) devices are processed to MIL-PRF-19500/486.
The 4N47, 4N47A, 4N48, 4N48A, 4N49, and 4N49A (TX, TXV) 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-195000
4N22 or 4N22A	1	25 / NA	10 / 40	35	486
4N22TX or 4N22ATX (Obsolete)					
4N22TXV or 4N22ATXV (Obsolete)					
4N23 or 4N23A		20 / NA			
4N23TX or 4N23ATX (Obsolete)					
4N23TXV or 4N23ATXV (Obsolete)					
4N24 or 4N24A		40 / NA			
4N24TX or 4N24ATX (Obsolete)					
4N24TXV or 4N24ATXV (Obsolete)					
4N47 or 4N47A (Obsolete)		50 / NA	1 / 40	40	548
4N47TX or 4N47ATX (Obsolete)					
4N47TXV or 4N47ATXV (Obsolete)					
4N48 (4N48A Obsolete)		100 / 500			
4N48TX or 4N48ATX (Obsolete)					
4N48TXV or 4N48ATXV (Obsolete)					
4N49 or 4N49A		200 / 1,000			
4N49TX or 4N49ATX (Obsolete)					
4N49TXV or 4N49ATXV (Obsolete)					

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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 (TX, TXV) 4N47, 4N47A, 4N48, 4N48A, 4N49, 4N49A (TX, TXV)	-65° C to +125° C
Operating Temperature Range 4N22, 4N22A, 4N23, 4N23A, 4N24, 4N24A (TX, TXV) 4N47, 4N47A, 4N48, 4N48A, 4N49, 4N49A (TX, TXV)	-55° C to +125° C
Input-to-Output Isolation Voltage	± 1.00 kVDC(1)
Lead Soldering Temperature [1/16 inch (1.6 mm) from case for 5 seconds with soldering iron]	260° C(2)
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 (TX, TXV)	1 A
Power Dissipation	60 mW(3)
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	300 mW(4)
Output Phototransistor (4N47, 4N47A, 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	300 mW(4)

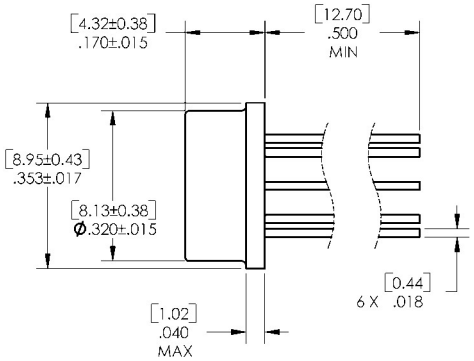
Notes:
1. Measured with input leads shorted together and output leads shorted together.
2. RMA flux is recommended. Duration can be extended to 10 seconds maximum when flow soldering.
3. Derate linearly 1.0 mW/° C above 65° C.
4. Derate linearly 3.0 mW/° C above 25° C.

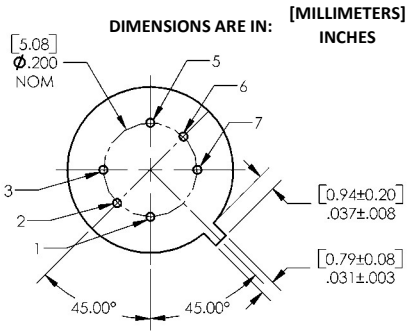
Electrical Specifications

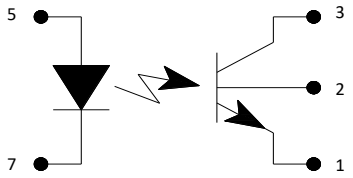
Electrical Characteristics (T_A = 25° C unless otherwise noted)

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
Input Diode						
V_F	Forward Voltage					
	4N22, 4N23, 4N24 [A] (TX, TXV)	0.80	-	1.30		I_F = 10.0 mA
	4N22, 4N23, 4N24 [A] (TX, TXV)	1.00	-	1.50		I_F = 10.0 mA, T_A = -55° C(1)
	4N22, 4N23, 4N24 [A] (TX, TXV)	0.70	-	1.20	V	I_F = 10.0 mA, T_A = -100° C(1)
	4N47, 4N48, 4N49 [A] (TX, TXV)	0.80	-	1.50		I_F = 10.0 mA
	4N47, 4N48, 4N49 [A] (TX, TXV)	1.00	-	1.70		I_F = 10.0 mA, T_A = -55° C(1)
	4N47, 4N48, 4N49 [A] (TX, TXV)	0.70	-	1.30		I_F = 10.0 mA, T_A = -100° C(1)
I_R	Reverse Current	-	-	100	µA	V_R= 2.0 V
Output Phototransistor						
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage					
	4N22, 4N23, 4N24 [A] (TX, TXV)	35	-	-	V	I_C = 1.0 mA, I_B= 0, I_F = 0
	4N47, 4N48, 4N49 [A] (TX, TXV)	40	-	-		I_C = 1.0 mA, I_B= 0, I_F = 0
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage					
	4N22, 4N23, 4N24 [A] (TX, TXV)	35	-	-	V	I_C = 100 µA, I_B= 0, I_F = 0
	4N47, 4N48, 4N49 [A] (TX, TXV)	45	-	-		I_C = 100 µA, I_B= 0, I_F = 0
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage					
	4N22, 4N23, 4N24 [A] (TX, TXV)	4	-	-	V	I_E = 100 µA, I_C= 0, I_F = 0
	4N47, 4N48, 4N49 [A] (TX, TXV)	7	-	-		I_E = 100 µA, I_C= 0, I_F = 0
I_{CEO}	Collector-Emitter Dark Current					
	4N22, 4N23, 4N24 [A] (TX, TXV)	-	-	100	nA	V_{CE} = 20 V, I_B= 0, I_F = 0
	4N47, 4N48, 4N49 [A] (TX, TXV)	-	-	100	µA	V_{CE} = 20 V, I_B= 0, I_F = 0, T_A = 100° C(2)
$I_{C(OFF)}$	Collector-Emitter Dark Current					
	4N22, 4N23, 4N24 [A] (TX, TXV)	-	-	100	nA	V_{CE} = 20 V, I_B= 0, I_F = 0
	4N47, 4N48, 4N49 [A] (TX, TXV)	-	-	100	µA	V_{CE} = 20 V, I_B= 0, I_F = 0, T_A = 100° C(1)
$I_{CB(OFF)}$	Collector-Base Dark Current					
	4N22, 4N23, 4N24 [A] (TX, TXV)	-	-	10	nA	V_{CB} = 20 V, I_E= 0, I_F = 0
	4N47, 4N48, 4N49 [A] (TX, TXV)	-	-	10	nA	

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







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

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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 (TX, TXV)	0.15	-	-		I_F = 2.0 mA, V_{CE} = 5 V, I_B = 0
	4N22, 4N22A (TX, TXV)	2.50	-	-		I_F = 10.0 mA, V_{CE} = 5 V, I_B = 0
	4N22, 4N22A (TX, TXV)	1.00	-	-		I_F = 10.0 mA, V_{CE} = 5 V, I_B = 0, T_A = -55° C[1]
	4N22, 4N22A (TX, TXV)	1.00	-	-		I_F = 10.0 mA, V_{CE} = 5 V, I_B = 0, T_A = 100° C[1]
	4N23, 4N23A (TX, TXV)	0.20	-	-		I_F = 2.0 mA, V_{CE} = 5 V, I_B = 0
	4N23, 4N23A (TX, TXV)	6.00	-	-		I_F = 10.0 mA, V_{CE} = 5 V, I_B = 0
	4N23, 4N23A (TX, TXV)	2.50	-	-		I_F = 10.0 mA, V_{CE} = 5 V, I_B = 0, T_A = -55° C[1]
	4N23, 4N23A (TX, TXV)	2.50	-	-		I_F = 10.0 mA, V_{CE} = 5 V, I_B = 0, T_A = 100° C[1]
	4N24, 4N24A (TX, TXV)	0.40	-	-		I_F = 2.0 mA, V_{CE} = 5 V, I_B = 0
	4N24, 4N24A (TX, TXV)	10.0	-	-		I_F = 10.0 mA, V_{CE} = 5 V, I_B = 0
	4N24, 4N24A (TX, TXV)	4.00	-	-		I_F = 10.0 mA, V_{CE} = 5 V, I_B = 0, T_A = -55° C[1]
	4N24, 4N24A (TX, TXV)	4.00	-	-		I_F = 10.0 mA, V_{CE} = 5 V, I_B = 0, T_A = 100° C[1]
	4N47, 4N47A (TX, TXV)	0.50	-	-		I_F = 1.0 mA, V_{CE} = 5.0 V, I_B = 0
	4N47, 4N47A (TX, TXV)	0.70	-	-		I_F = 2.0 mA, V_{CE} = 5.0 V, I_B = 0, T_A = -55° C[1]
	4N47, 4N47A (TX, TXV)	0.50	-	-		I_F = 2.0 mA, V_{CE} = 5.0 V, I_B = 0, T_A = 100° C[1]
	4N48, 4N48A (TX, TXV)	1.00	-	5		I_F = 1.0 mA, V_{CE} = 5.0 V, I_B = 0
	4N48, 4N48A (TX, TXV)	1.40	-	-		I_F = 2.0 mA, V_{CE} = 5.0 V, I_B = 0, T_A = -55° C[1]
	4N48, 4N48A (TX, TXV)	1.00	-	-		I_F = 2.0 mA, V_{CE} = 5.0 V, I_B = 0, T_A = 100° C[1]
	4N49, 4N49A (TX, TXV)	2.00	-	10		I_F = 1.0 mA, V_{CE} = 5.0 V, I_B = 0
	4N49, 4N49A (TX, TXV)	2.80	-	-		I_F = 2.0 mA, V_{CE} = 5.0 V, I_B = 0, T_A = -55° C[1]
	4N49, 4N49A (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] (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] (TX, TXV)	-	-	0.30		I_F = 20 mA, I_C = 2.5 mA, I_B = 0
	4N22, 4N23, 4N24 [A] (TX, TXV)	-	-	0.30		I_F = 20 mA, I_C = 5.0 mA, I_B = 0
	4N22, 4N23, 4N24 [A] (TX, TXV)	-	-	0.30		I_F = 20 mA, I_C = 10.0 mA, I_B = 0
	4N47, 4N47A (TX, TXV)	-	-	0.30		I_F = 2.0 mA, I_C = 0.5 mA, I_B = 0
	4N48, 4N48A (TX, TXV)	-	-	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 (TX, TXV)	>300	-	-		V_{CE} = 5.0 V, I_C = 10.0 mA, I_F = 0 mA
	4N23, 4N23A (TX, TXV)		-	-		
	4N24, 4N24A (TX, TXV)		-	-		
	4N47, 4N48, 4N49 [A] (TX, TXV)		-	-		
R_{IO}	Resistance (Input-to-Output)				Ω	
	4N22, 4N23, 4N24 [A] (TX, TXV)	10^{11}	-	-		V_{I-O} = ± 1000 VDC[3]
	4N47, 4N48, 4N49 [A] (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]

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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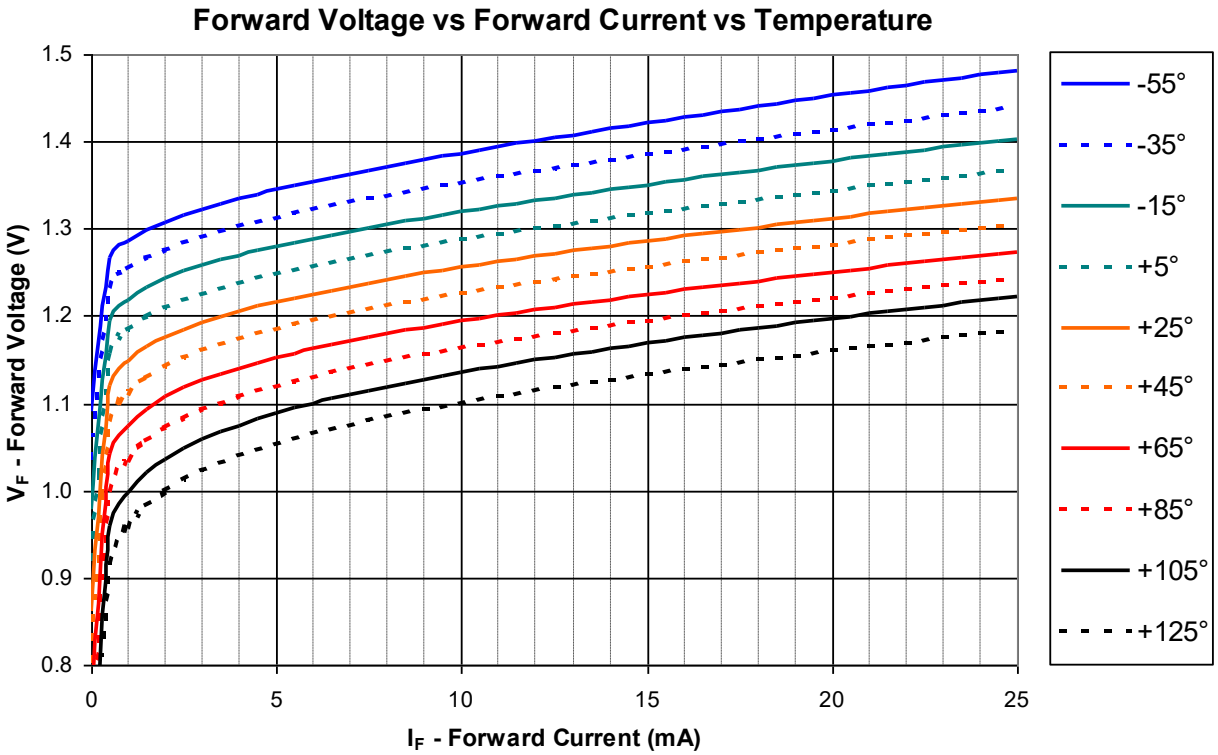
Electrical Specifications

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

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
Coupled						
t_r	Output Rise Time					
	4N22A (TX, TXV)	-	-	15	µs	V_{CC} = 10.0 V, I_F = 10.0 mA, R_L = 100 mA
	4N23A (TX, TXV)	-	-	15		V_{CC} = 10.0 V, I_F = 10.0 mA, R_L = 100 mA
	4N24A (TX, TXV)	-	-	20		V_{CC} = 10.0 V, I_F = 10.0 mA, R_L = 100 mA
	4N47 (TX. TXV)	-	-	20		V_{CC} = 10.0 V, I_F = 5.0 mA, R_L = 100 Ω
	4N48 (TX. TXV)	-	-	20		V_{CC} = 10.0 V, I_F = 5.0 mA, R_L = 100 Ω
	4N49 (TX. TXV)	-	-	25		V_{CC} = 10.0 V, I_F = 5.0 mA, R_L = 100 Ω
t_f	Output Fall Time					
	4N22A (TX, TXV)	-	-	15	µs	V_{CC} = 10.0 V, I_F = 10.0 mA, R_L = 100 Ω
	4N23A (TX, TXV)	-	-	15		V_{CC} = 10.0 V, I_F = 10.0 mA, R_L = 100 Ω
	4N24A (TX, TXV)	-	-	20		V_{CC} = 10.0 V, I_F = 10.0 mA, R_L = 100 Ω
	4N47 (TX. TXV)	-	-	20		V_{CC} = 10.0 V, I_F = 5.0 mA, R_L = 100 Ω
	4N48 (TX. TXV)	-	-	20		V_{CC} = 10.0 V, I_F = 5.0 mA, R_L = 100 Ω
	4N49 (TX. TXV)	-	-	25		V_{CC} = 10.0 V, I_F = 5.0 mA, R_L = 100 Ω

Typical Performance Curves



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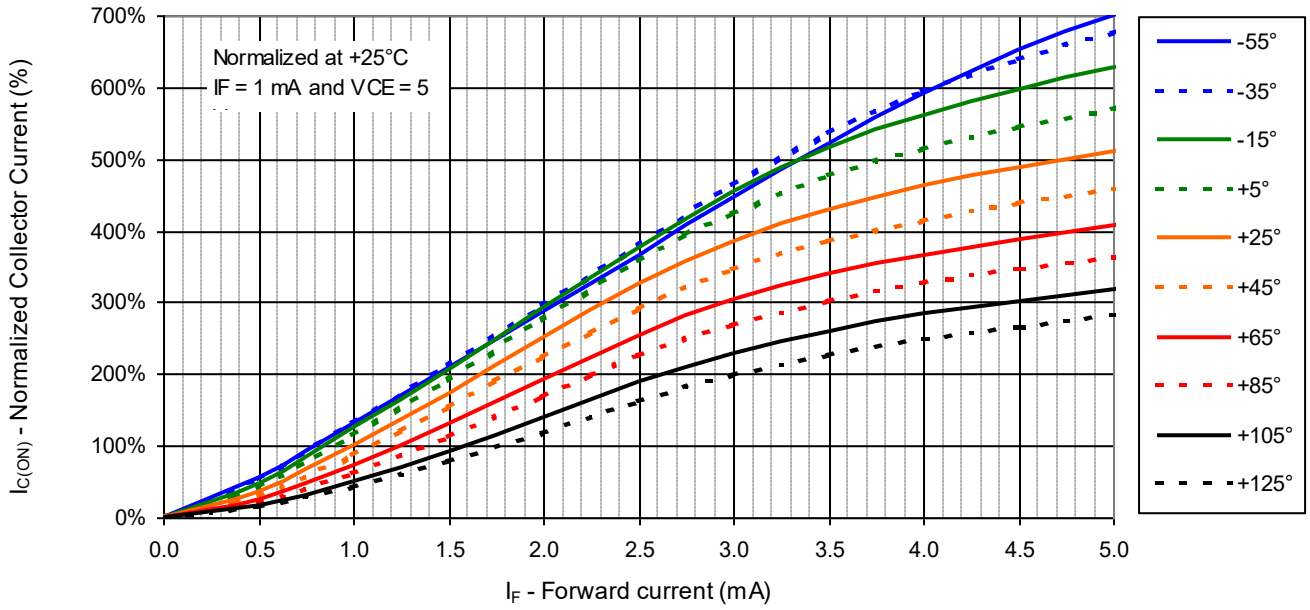
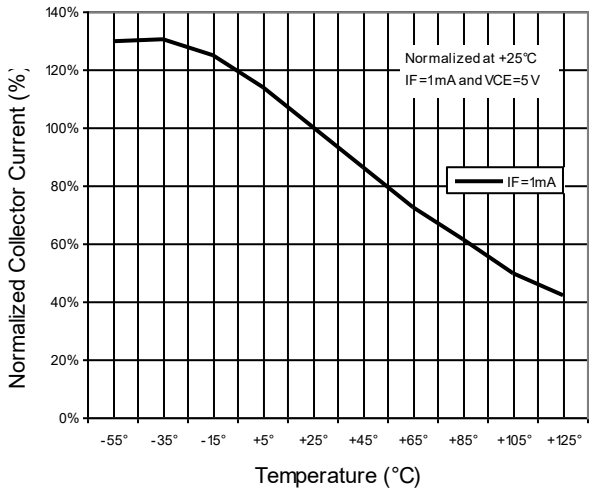
Typical Performance Curves

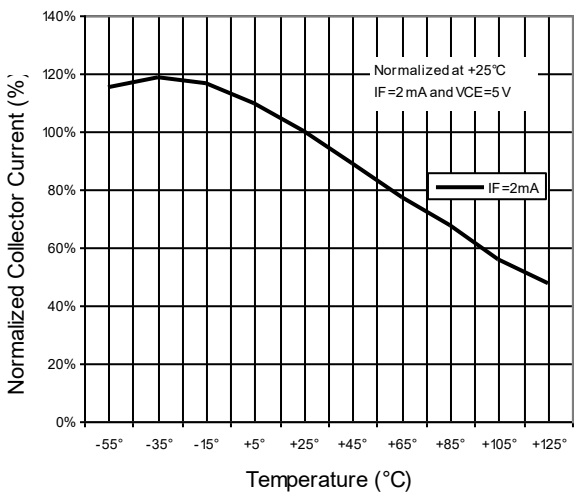
Collector Current vs Forward Current vs Temperature



Normalized Collector Current Vs Temperature



Normalized Collector Current Vs Temperature



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