

Hi-Reliability Optically Coupled Isolator

4N22, 4N23, 4N24 [A] (COTS, TX, TXV)

4N47, 4N48, 4N49 [A] (COTS, TX, TXV)



Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Storage Temperature Range 4N22, 4N22A, 4N23, 4N23A, 4N24, 4N24A (COTS, TX, TXV) 4N47, 4N47A, 4N48, 4N48A, 4N49, 4N49A (COTS, TX, TXV)	-65° C to +125° C -55° C to +150° C
Operating Temperature Range 4N22, 4N22A, 4N23, 4N23A, 4N24, 4N24A (COTS, TX, TXV) 4N47, 4N47A, 4N48, 4N48A, 4N49, 4N49A (COTS, TX, TXV)	-65° C to +125° C -55° C to +125° C
Input-to-Output Isolation Voltage	$\pm 1.00\text{ kVDC}^{(1)}$
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 (COTS, TX, TXV)	1 A
Power Dissipation	60 mW ⁽³⁾

Output Sensor (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.

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4N22, 4N23, 4N24 [A] (COTS, TX, TXV)

4N47, 4N48, 4N49 [A] (COTS, TX, TXV)



Electrical Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise noted)

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
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Input Diode

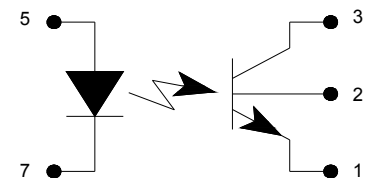
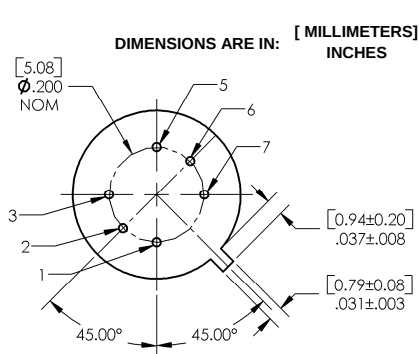
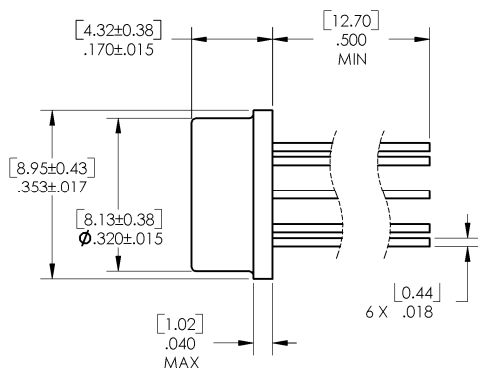
V_F	Forward Voltage					
	4N22, 4N23, 4N24 [A] (COTS, TX, TXV)	0.80	-	1.30		$I_F = 10.0\text{ mA}$
	4N22, 4N23, 4N24 [A] (COTS, TX, TXV)	1.00	-	1.50		$I_F = 10.0\text{ mA}, T_A = -55^\circ\text{C}^{(1)}$
	4N22, 4N23, 4N24 [A] (COTS, TX, TXV)	0.70	-	1.20	V	$I_F = 10.0\text{ mA}, T_A = -100^\circ\text{C}^{(1)}$
	4N47, 4N48, 4N49 [A] (COTS, TX, TXV)	0.80	-	1.50		$I_F = 10.0\text{ mA}$
	4N47, 4N48, 4N49 [A] (COTS, TX, TXV)	1.00	-	1.70		$I_F = 10.0\text{ mA}, T_A = -55^\circ\text{C}^{(1)}$
	4N47, 4N48, 4N49 [A] (COTS, TX, TXV)	0.70	-	1.30		$I_F = 10.0\text{ mA}, T_A = -100^\circ\text{C}^{(1)}$
I_R	Reverse Current	-	-	100	μA	$V_R = 2.0\text{ V}$

Output Phototransistor

$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage					
	4N22, 4N23, 4N24 [A] (COTS, TX, TXV)	35	-	-	V	$I_C = 1.0\text{ mA}, I_B = 0, I_F = 0$
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage					
	4N22, 4N23, 4N24 [A] (COTS, TX, TXV)	35	-	-	V	$I_C = 100\text{ }\mu\text{A}, I_B = 0, I_F = 0$
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage					
	4N22, 4N23, 4N24 [A] (COTS, TX, TXV)	4	-	-	V	$I_E = 100\text{ }\mu\text{A}, I_C = 0, I_F = 0$
I_{CEO}	Collector-Emitter Dark Current					
	4N22, 4N23, 4N24 [A] (COTS, TX, TXV)	-	-	100	nA	$V_{CE} = 20\text{ V}, I_B = 0, I_F = 0$
$I_{C(OFF)}$	Collector-Emitter Dark Current					
	4N22, 4N23, 4N24 [A] (COTS, TX, TXV)	-	-	100	nA	$V_{CE} = 20\text{ V}, I_B = 0, I_F = 0$
$I_{CB(OFF)}$	Collector-Base Dark Current					
	4N22, 4N23, 4N24 [A] (COTS, TX, TXV)	-	-	10	nA	$V_{CB} = 20\text{ V}, I_E = 0, I_F = 0$

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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4N22, 4N23, 4N24 [A] (COTS, TX, TXV)

4N47, 4N48, 4N49 [A] (COTS, TX, TXV)



Electrical Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise noted)

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

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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4N22, 4N23, 4N24 [A] (COTS, TX, TXV)

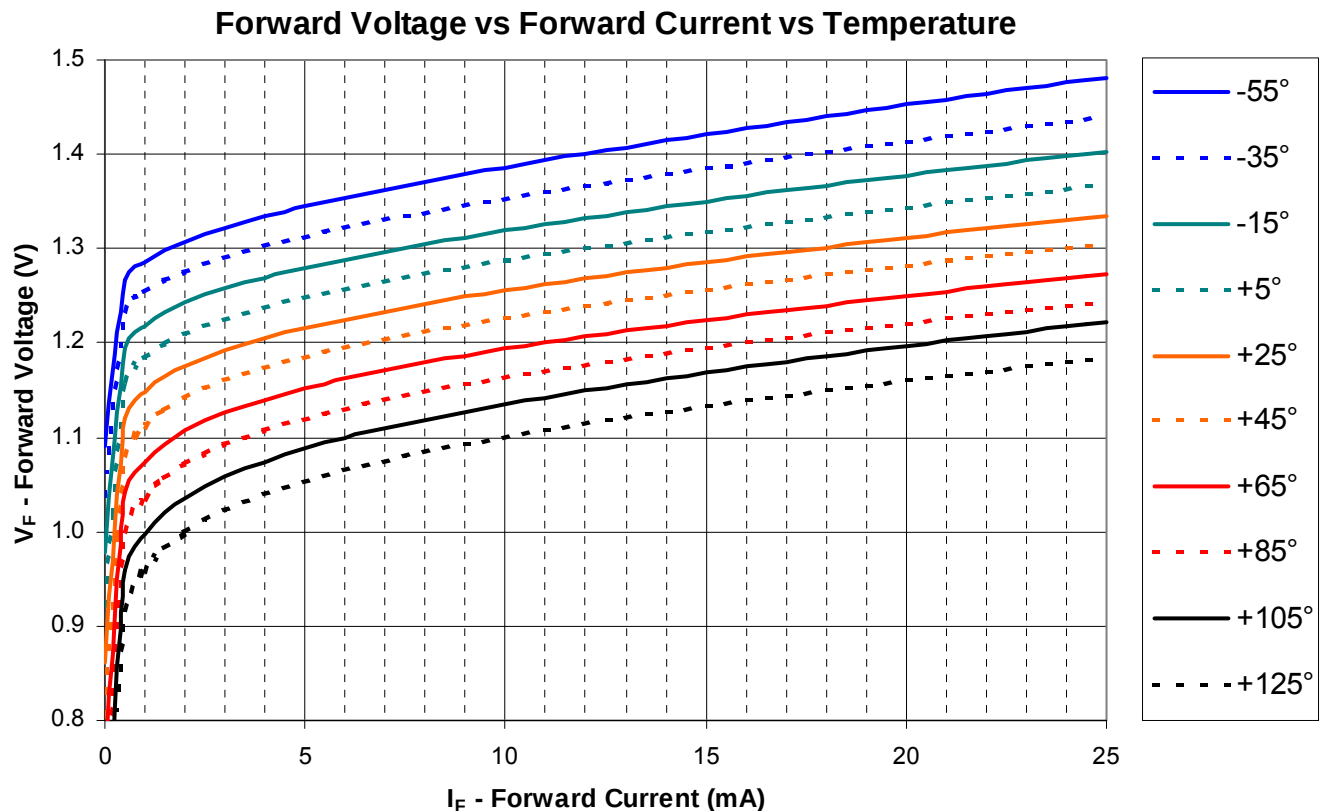
4N47, 4N48, 4N49 [A] (COTS, TX, TXV)



Electrical Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise noted)

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
Coupled						
T_R	Output Rise Time	-	-	15	μs	$V_{CC} = 10.0\text{ V}$, $I_F = 10.0\text{ mA}$, $R_L = 100\text{ mA}$
	4N22A (TX, TXV)	-	-	15		$V_{CC} = 10.0\text{ V}$, $I_F = 10.0\text{ mA}$, $R_L = 100\text{ mA}$
	4N23A (TX, TXV)	-	-	20		$V_{CC} = 10.0\text{ V}$, $I_F = 10.0\text{ mA}$, $R_L = 100\text{ mA}$
	4N24A (TX, TXV)	-	-	20		$V_{CC} = 10.0\text{ V}$, $I_F = 5.0\text{ mA}$, $R_L = 100\text{ }\Omega$
	4N47 (TX, TXV)	-	-	20		$V_{CC} = 10.0\text{ V}$, $I_F = 5.0\text{ mA}$, $R_L = 100\text{ }\Omega$
	4N48 (TX, TXV)	-	-	25		$V_{CC} = 10.0\text{ V}$, $I_F = 5.0\text{ mA}$, $R_L = 100\text{ }\Omega$
T_F	Output Fall Time	-	-	15	μs	$V_{CC} = 10.0\text{ V}$, $I_F = 10.0\text{ mA}$, $R_L = 100\text{ }\Omega$
	4N22A (TX, TXV)	-	-	15		$V_{CC} = 10.0\text{ V}$, $I_F = 10.0\text{ mA}$, $R_L = 100\text{ }\Omega$
	4N23A (TX, TXV)	-	-	20		$V_{CC} = 10.0\text{ V}$, $I_F = 10.0\text{ mA}$, $R_L = 100\text{ }\Omega$
	4N24A (TX, TXV)	-	-	20		$V_{CC} = 10.0\text{ V}$, $I_F = 5.0\text{ mA}$, $R_L = 100\text{ }\Omega$
	4N47 (TX, TXV)	-	-	20		$V_{CC} = 10.0\text{ V}$, $I_F = 5.0\text{ mA}$, $R_L = 100\text{ }\Omega$
	4N48 (TX, TXV)	-	-	25		$V_{CC} = 10.0\text{ V}$, $I_F = 5.0\text{ mA}$, $R_L = 100\text{ }\Omega$

Typical Performance Curves



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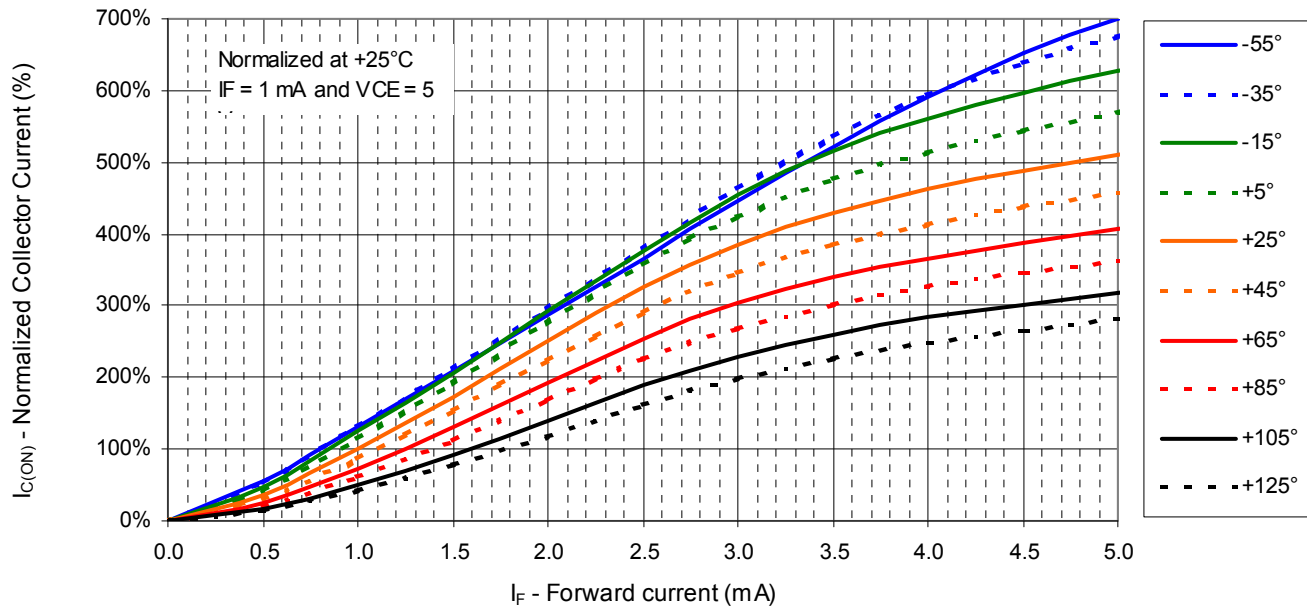
4N22, 4N23, 4N24 [A] (COTS, TX, TXV)

4N47, 4N48, 4N49 [A] (COTS, TX, TXV)

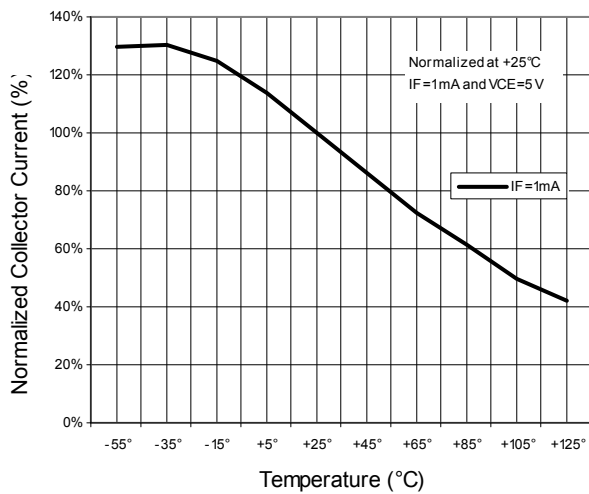


Typical Performance Curves

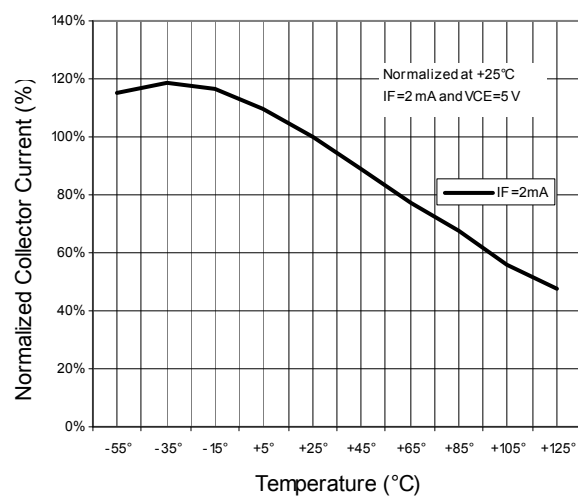
Collector Current vs Forward Current vs Temperature



Normalized Collector Current Vs Temperature



Normalized Collector Current Vs Temperature



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