



## 6-Pin DIP Optoisolators Transistor Output

The 4N35, 4N36 and 4N37 devices consist of a gallium arsenide infrared emitting diode optically coupled to a monolithic silicon phototransistor detector.

- Current Transfer Ratio — 100% Minimum @ Specified Conditions
- Guaranteed Switching Speeds
- Meets or Exceeds all JEDEC Registered Specifications
- **To order devices that are tested and marked per VDE 0884 requirements, the suffix "V" must be included at end of part number. VDE 0884 is a test option.**

### Applications

- General Purpose Switching Circuits
- Interfacing and coupling systems of different potentials and impedances
- Regulation Feedback Circuits
- Monitor & Detection Circuits
- Solid State Relays

### MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
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#### INPUT LED

Reverse Voltage	$V_R$	6	Volts
Forward Current — Continuous	$I_F$	60	mA
LED Power Dissipation @ $T_A = 25^\circ\text{C}$ with Negligible Power in Output Detector Derate above $25^\circ\text{C}$	$P_D$	120	mW
		1.41	mW/ $^\circ\text{C}$

#### OUTPUT TRANSISTOR

Collector–Emitter Voltage	$V_{CEO}$	30	Volts
Emitter–Base Voltage	$V_{EBO}$	7	Volts
Collector–Base Voltage	$V_{CBO}$	70	Volts
Collector Current — Continuous	$I_C$	150	mA
Detector Power Dissipation @ $T_A = 25^\circ\text{C}$ with Negligible Power in Input LED Derate above $25^\circ\text{C}$	$P_D$	150	mW
		1.76	mW/ $^\circ\text{C}$

#### TOTAL DEVICE

Isolation Source Voltage <sup>(1)</sup> (Peak ac Voltage, 60 Hz, 1 sec Duration)	$V_{ISO}$	7500	Vac(pk)
Total Device Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	250 2.94	mW mW/ $^\circ\text{C}$
Ambient Operating Temperature Range <sup>(2)</sup>	$T_A$	-55 to +100	$^\circ\text{C}$
Storage Temperature Range <sup>(2)</sup>	$T_{stg}$	-55 to +150	$^\circ\text{C}$
Soldering Temperature (10 sec, 1/16" from case)	$T_L$	260	$^\circ\text{C}$

1. Isolation surge voltage is an internal device dielectric breakdown rating.  
For this test, Pins 1 and 2 are common, and Pins 4, 5 and 6 are common.
2. Refer to Quality and Reliability Section in Opto Data Book for information on test conditions.

**Preferred** devices are Motorola recommended choices for future use and best overall value.

GlobalOptoisolator is a trademark of Motorola, Inc.

**4N35\***

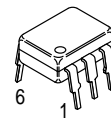
**4N36**

**4N37**

[CTR = 100% Min]

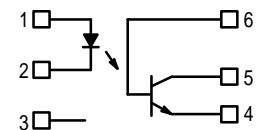
\*Motorola Preferred Device

### STYLE 1 PLASTIC



STANDARD THRU HOLE  
CASE 730A-04

### SCHEMATIC



- PIN 1. LED ANODE  
2. LED CATHODE  
3. N.C.  
4. EMITTER  
5. COLLECTOR  
6. BASE

# 4N35 4N36 4N37

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted)<sup>(1)</sup>

Characteristic	Symbol	Min	Typ <sup>(1)</sup>	Max	Unit
<b>INPUT LED</b>					
Forward Voltage (I <sub>F</sub> = 10 mA)	V <sub>F</sub>	T <sub>A</sub> = 25°C 0.8	1.15	1.5	V
		T <sub>A</sub> = -55°C 0.9	1.3	1.7	
		T <sub>A</sub> = 100°C 0.7	1.05	1.4	
Reverse Leakage Current (V <sub>R</sub> = 6 V)	I <sub>R</sub>	—	—	10	μA
Capacitance (V = 0 V, f = 1 MHz)	C <sub>J</sub>	—	18	—	pF

## OUTPUT TRANSISTOR

Collector–Emitter Dark Current (V <sub>CE</sub> = 10 V, T <sub>A</sub> = 25°C) (V <sub>CE</sub> = 30 V, T <sub>A</sub> = 100°C)	I <sub>CEO</sub>	— —	1 —	50 500	nA μA
Collector–Base Dark Current (V <sub>CB</sub> = 10 V)	I <sub>CBO</sub>	—	0.2 100	20 —	nA
Collector–Emitter Breakdown Voltage (I <sub>C</sub> = 1 mA)	V <sub>(BR)CEO</sub>	30	45	—	V
Collector–Base Breakdown Voltage (I <sub>C</sub> = 100 μA)	V <sub>(BR)CBO</sub>	70	100	—	V
Emitter–Base Breakdown Voltage (I <sub>E</sub> = 100 μA)	V <sub>(BR)EBO</sub>	7	7.8	—	V
DC Current Gain (I <sub>C</sub> = 2 mA, V <sub>CE</sub> = 5 V)	h <sub>FE</sub>	—	400	—	—
Collector–Emitter Capacitance (f = 1 MHz, V <sub>CE</sub> = 0)	C <sub>CE</sub>	—	7	—	pF
Collector–Base Capacitance (f = 1 MHz, V <sub>CB</sub> = 0)	C <sub>CB</sub>	—	19	—	pF
Emitter–Base Capacitance (f = 1 MHz, V <sub>EB</sub> = 0)	C <sub>EB</sub>	—	9	—	pF

## COUPLED

Output Collector Current (I <sub>F</sub> = 10 mA, V <sub>CE</sub> = 10 V)	T <sub>A</sub> = 25°C T <sub>A</sub> = -55°C T <sub>A</sub> = 100°C	I <sub>C</sub> (CTR) <sup>(2)</sup>	10 (100) 4 (40) 4 (40)	30 (300) — —	— — —	mA (%)
Collector–Emitter Saturation Voltage (I <sub>C</sub> = 0.5 mA, I <sub>F</sub> = 10 mA)		V <sub>CE(sat)</sub>	—	0.14	0.3	V
Turn–On Time	(I <sub>C</sub> = 2 mA, V <sub>CC</sub> = 10 V, R <sub>L</sub> = 100 Ω) <sup>(3)</sup>	t <sub>on</sub>	—	7.5	10	μs
Turn–Off Time		t <sub>off</sub>	—	5.7	10	
Rise Time		t <sub>r</sub>	—	3.2	—	
Fall Time		t <sub>f</sub>	—	4.7	—	
Isolation Voltage (f = 60 Hz, t = 1 sec)		V <sub>ISO</sub>	7500	—	—	Vac(pk)
Isolation Current <sup>(4)</sup> (V <sub>I–O</sub> = 3550 Vpk)	4N35	I <sub>ISO</sub>	—	—	100	μA
(V <sub>I–O</sub> = 2500 Vpk)	4N36		—	—	100	
(V <sub>I–O</sub> = 1500 Vpk)	4N37		—	8	100	
Isolation Resistance (V = 500 V) <sup>(4)</sup>		R <sub>ISO</sub>	10 <sup>11</sup>	—	—	Ω
Isolation Capacitance (V = 0 V, f = 1 MHz) <sup>(4)</sup>		C <sub>ISO</sub>	—	0.2	2	pF

1. Always design to the specified minimum/maximum electrical limits (where applicable).
2. Current Transfer Ratio (CTR) = I<sub>C</sub>/I<sub>F</sub> × 100%.
3. For test circuit setup and waveforms, refer to Figure 11.
4. For this test, Pins 1 and 2 are common, and Pins 4, 5 and 6 are common.

TYPICAL CHARACTERISTICS

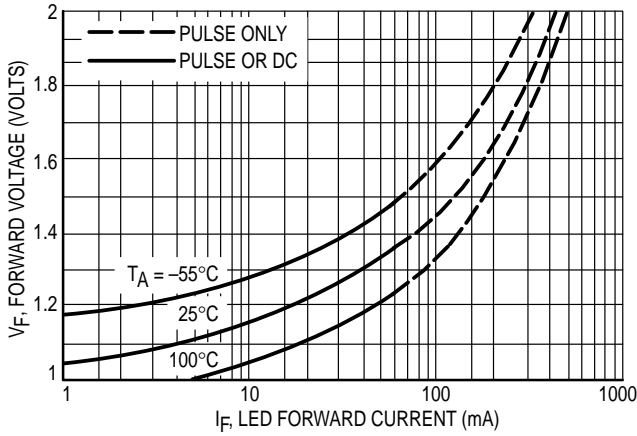


Figure 1. LED Forward Voltage versus Forward Current

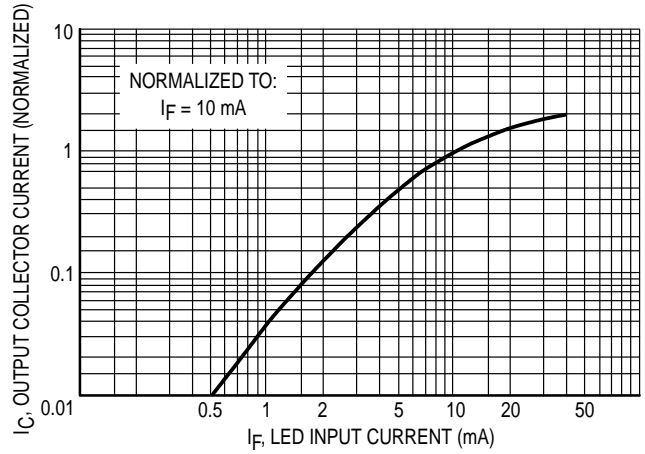


Figure 2. Output Current versus Input Current

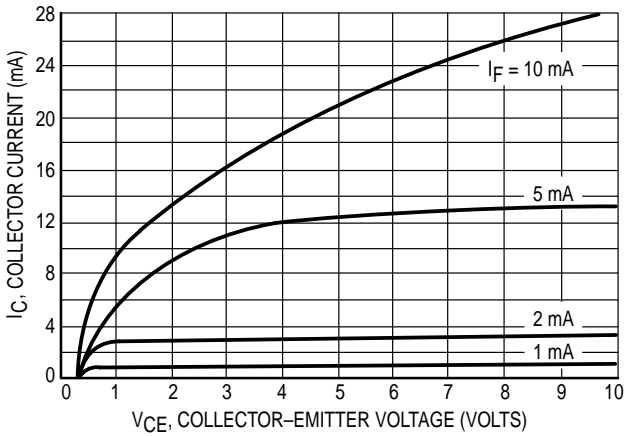


Figure 3. Collector Current versus Collector-Emitter Voltage

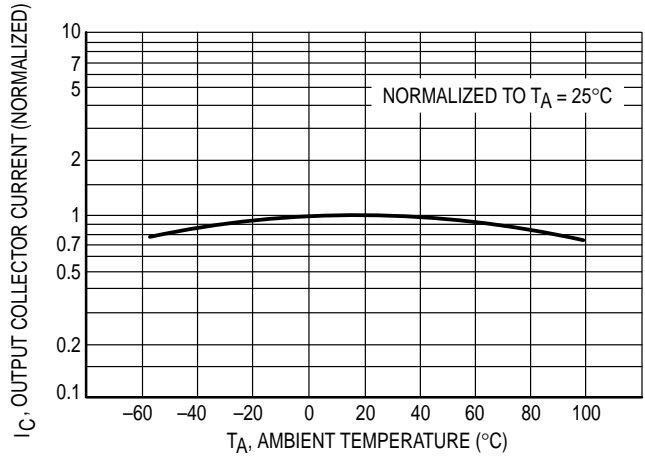


Figure 4. Output Current versus Ambient Temperature

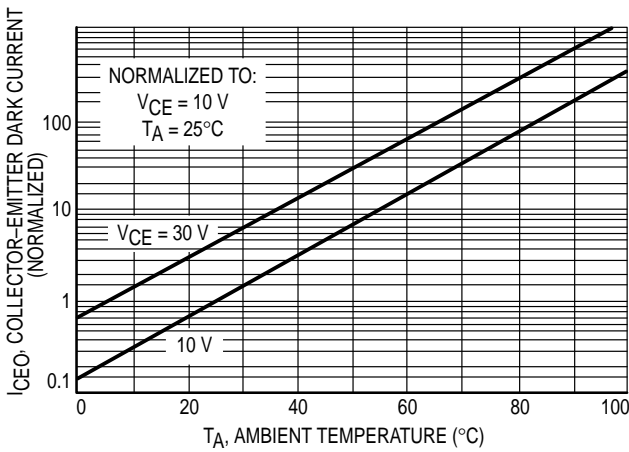


Figure 5. Dark Current versus Ambient Temperature

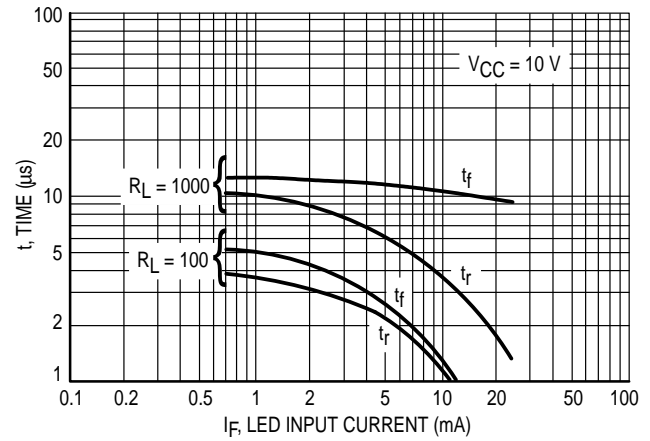


Figure 6. Rise and Fall Times (Typical Values)

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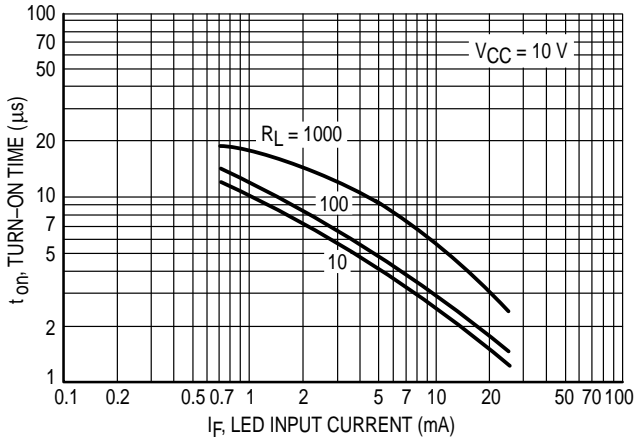


Figure 7. Turn-On Switching Times

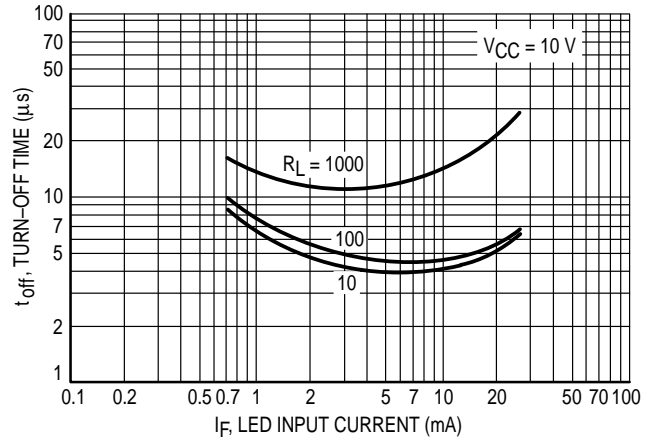


Figure 8. Turn-Off Switching Times

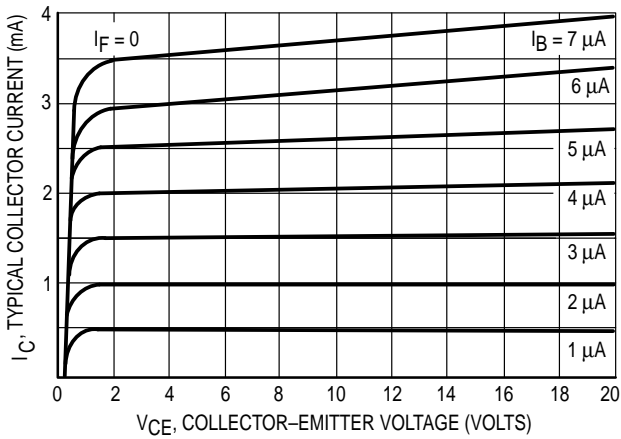


Figure 9. DC Current Gain (Detector Only)

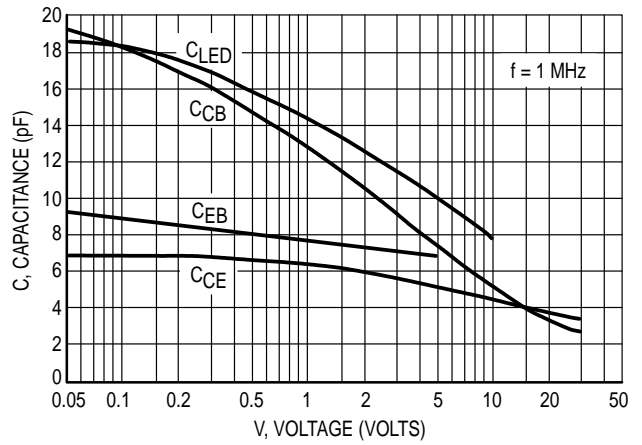


Figure 10. Capacitances versus Voltage

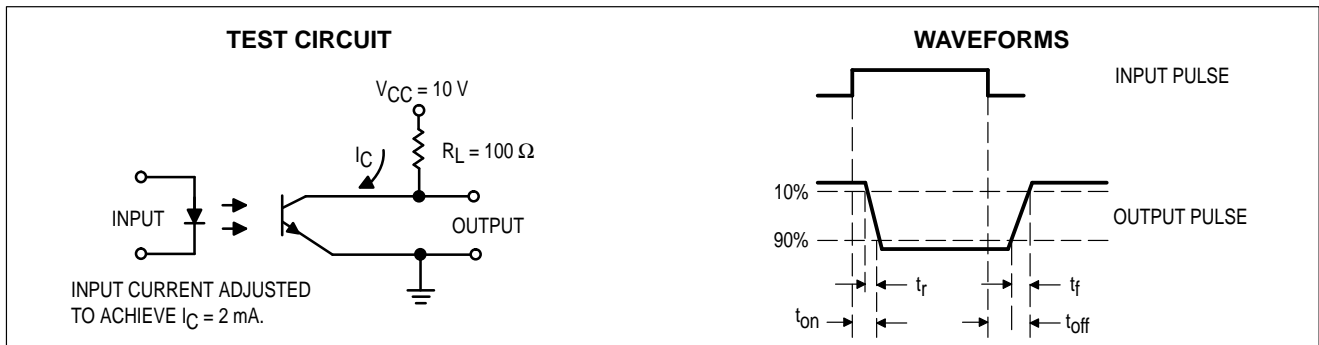
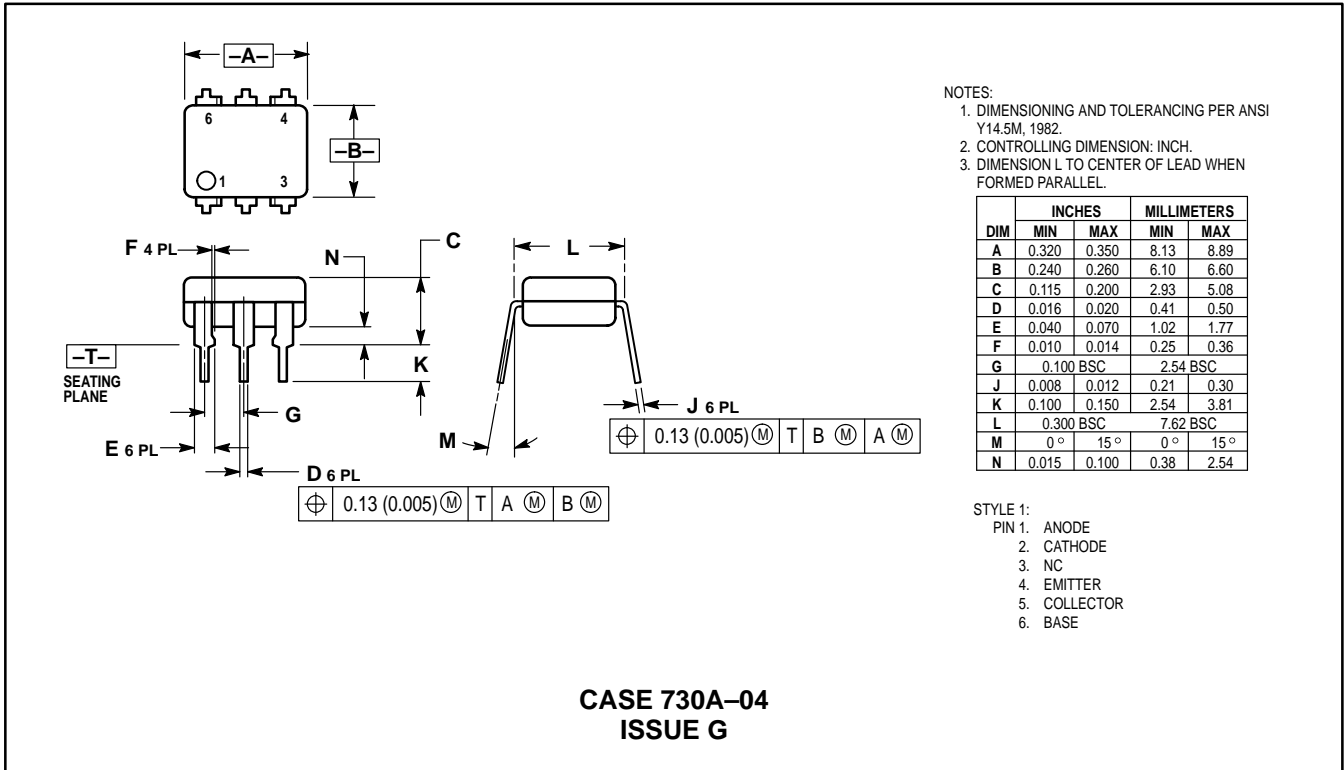


Figure 11. Switching Time Test Circuit and Waveforms

PACKAGE DIMENSIONS



# 4N35 4N36 4N37



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.320	0.350	8.13	8.89
B	0.240	0.260	6.10	6.60
C	0.115	0.200	2.93	5.08
D	0.016	0.020	0.41	0.50
E	0.040	0.070	1.02	1.77
F	0.010	0.014	0.25	0.36
G	0.100 BSC		2.54 BSC	
J	0.008	0.012	0.21	0.30
K	0.100	0.150	2.54	3.81
L	0.400	0.425	10.16	10.80
N	0.015	0.040	0.38	1.02

**\*Consult factory for leadform option availability**

**CASE 730D-05  
ISSUE D**

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