



GENERAL PURPOSE 6-PIN PHOTODARLINGTON OPTOCOUPLERS

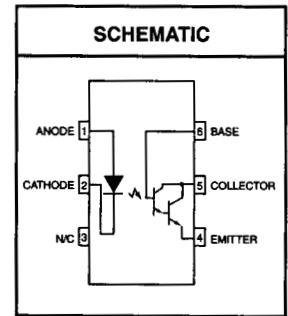
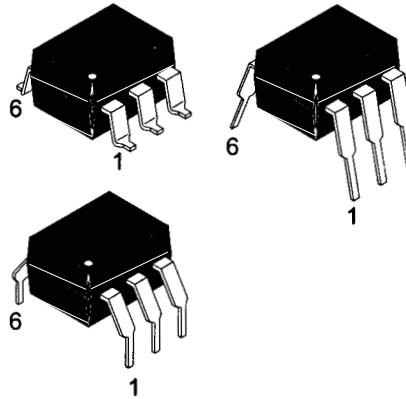
DESCRIPTION

The 4N29, 4N30, 4N31, 4N32, 4N33 have a gallium arsenide infrared emitter optically coupled to a silicon planar photodarlington.

4N29	4N30	4N31	4N32	4N33
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FEATURES

- High sensitivity to low input drive current
- Meets or exceeds all JEDEC Registered Specifications
- VDE 0884 approval available as a test option
-add option .300. (e.g., 4N29.300)



APPLICATIONS

- Low power logic circuits
- Telecommunications equipment
- Portable electronics
- Solid state relays
- Interfacing coupling systems of different potentials and impedances.

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ Unless otherwise specified.)			
Parameter	Symbol	Value	Units
TOTAL DEVICE			
Storage Temperature	T_{STG}	-55 to +150	$^\circ\text{C}$
Operating Temperature	T_{OPR}	-55 to +100	$^\circ\text{C}$
Lead Solder Temperature	T_{SOL}	260 for 10 sec	$^\circ\text{C}$
Total Device Power Dissipation @ $T_A = 25^\circ\text{C}$	P_D	250	mW
Derate above 25°C		3.3	mW/ $^\circ\text{C}$
EMITTER			
Continuous Forward Current	I_F	80	mA
Reverse Voltage	V_R	3	V
Forward Current - Peak (300 μs , 2% Duty Cycle)	$I_{F(pk)}$	3.0	A
LED Power Dissipation @ $T_A = 25^\circ\text{C}$	P_D	150	mW
Derate above 25°C		2.0	mW/ $^\circ\text{C}$
DETECTOR			
Collector-Emitter Breakdown Voltage	BV_{CEO}	30	V
Collector-Base Breakdown Voltage	BV_{CBO}	30	V
Emitter-Collector Breakdown Voltage	BV_{ECO}	5	V
Detector Power Dissipation @ $T_A = 25^\circ\text{C}$	P_D	150	mW
Derate above 25°C		2.0	mW/ $^\circ\text{C}$
Continuous Collector Current	I_C	150	mA

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4N29 4N30 4N31 4N32 4N33

ELECTRICAL CHARACTERISTICS (T_A = 25°C Unless otherwise specified.)

INDIVIDUAL COMPONENT CHARACTERISTICS

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
EMITTER						
*Input Forward Voltage	(I _F = 10 mA)	V _F		1.2	1.5	V
*Reverse Leakage Current	(V _R = 3.0 V)	I _R		0.001	100	μA
*Capacitance	(V _F = 0 V, f = 1.0 MHz)	C		150		pF
DETECTOR						
*Collector-Emitter Breakdown Voltage	(I _C = 100 μA, I _B = 0)	BV _{CEO}	30	60		
*Collector-Base Breakdown Voltage	(I _C = 100 μA, I _E = 0)	BV _{CBO}	30	100		V
*Emitter-Collector Breakdown Voltage	(I _E = 100 μA, I _B = 0)	BV _{ECO}	5.0	8		V
*Collector-Emitter Dark Current	(V _{CE} = 10 V, Base Open)	I _{CEO}		1	100	nA
DC Current Gain	(V _{CE} = 5.0 V, I _C = 500 μA)	h _{FE}		5000		

TRANSFER CHARACTERISTICS

DC Characteristic	Test Conditions	Symbol	Min	Typ	Max	Units
*Collector Output Current ^(1,2) (4N32, 4N33)	(I _F = 10 mA, V _{CE} = 10 V, I _B = 0)	I _C (CTR)	50 (500)			mA (%)
(4N29, 4N30)			10 (100)			
(4N31)			5 (50)			
*Saturation Voltage ⁽²⁾ (4N29, 4N30, 4N32, 4N33)	(I _F = 8.0 mA, I _C = 2.0 mA)	V _{CE(sat)}			1.0	V
(4N31)					1.2	

TRANSFER CHARACTERISTICS

AC Characteristic	Test Conditions	Symbol	Min	Typ	Max	Units
Turn-on Time ⁽³⁾	(I _F = 200 mA, I _C = 50 mA, V _{CC} = 10 V) (Fig.7)	t _{on}			5.0	μs
Turn-off Time ⁽³⁾ (4N32, 4N33)			t _{off}		100	
(4N29, 4N30, 4N31)					40	
Bandwidth ^(4,5)		BW		30		KHz

ISOLATION CHARACTERISTICS

Characteristic	Test Conditions	Symbol	Min	Typ	Max	Units
Input-Output Isolation Voltage ⁽⁶⁾	(I _{I-O} ≤ 1 μA, V _{rms} , t = 1 min.)	V _{ISO}	5300			Vac(rms)
(4N29, 4N30, 4N31, 4N32, 4N33)						
* (4N32)			VDC	2500		
* (4N33)	VDC	1500				
Isolation Resistance ⁽⁶⁾	(V _{I-O} = 500 VDC)	R _{ISO}		10 ¹¹		Ω
Isolation Capacitance ⁽⁶⁾	(V _{I-O} = ∅, f = 1 MHz)	C _{ISO}		0.8		pf

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Fig. 1 Output Current vs. Input Current

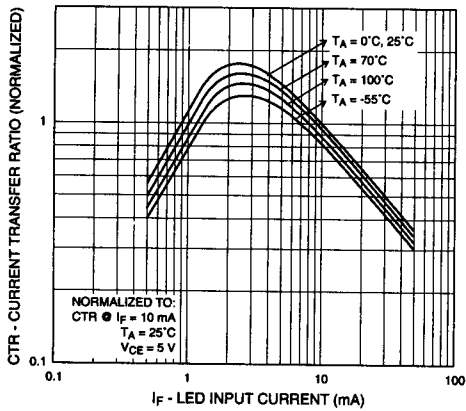


Fig. 2 Current Transfer Ratio vs. Ambient Temperature

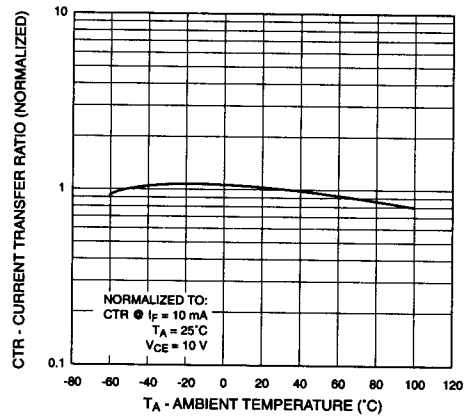


Fig. 3 Collector Current vs. Collector-Emitter Voltage

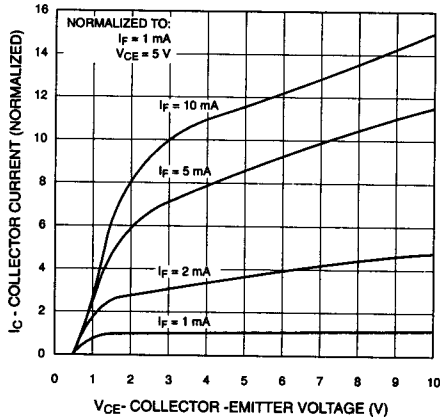


Fig. 4 Dark Current vs. Ambient Temperature

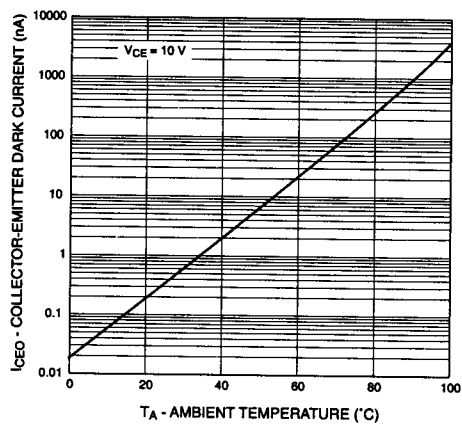


Fig. 5 Turn-On Time vs. Input Current

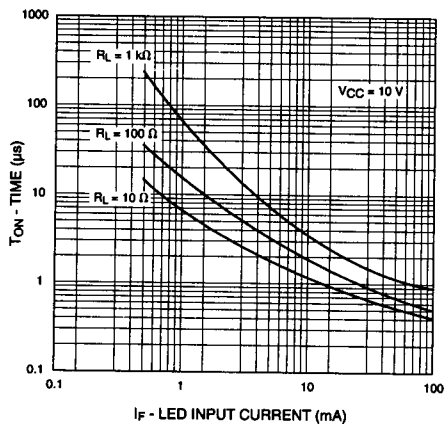
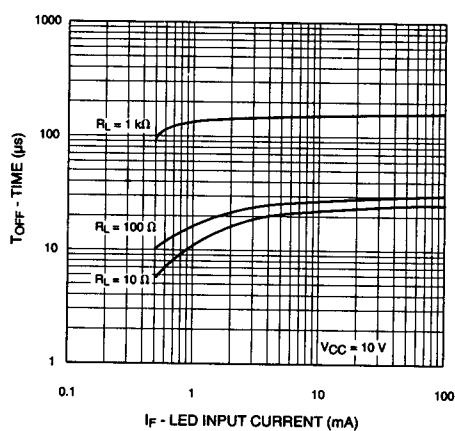


Fig. 6 Turn-Off Time vs. Input Current



4N29 4N30 4N31 4N32 4N33

TYPICAL ELECTRO-OPTICAL CHARACTERISTIC CURVES

(25°C Free air temperature unless otherwise specified) (Cont.)

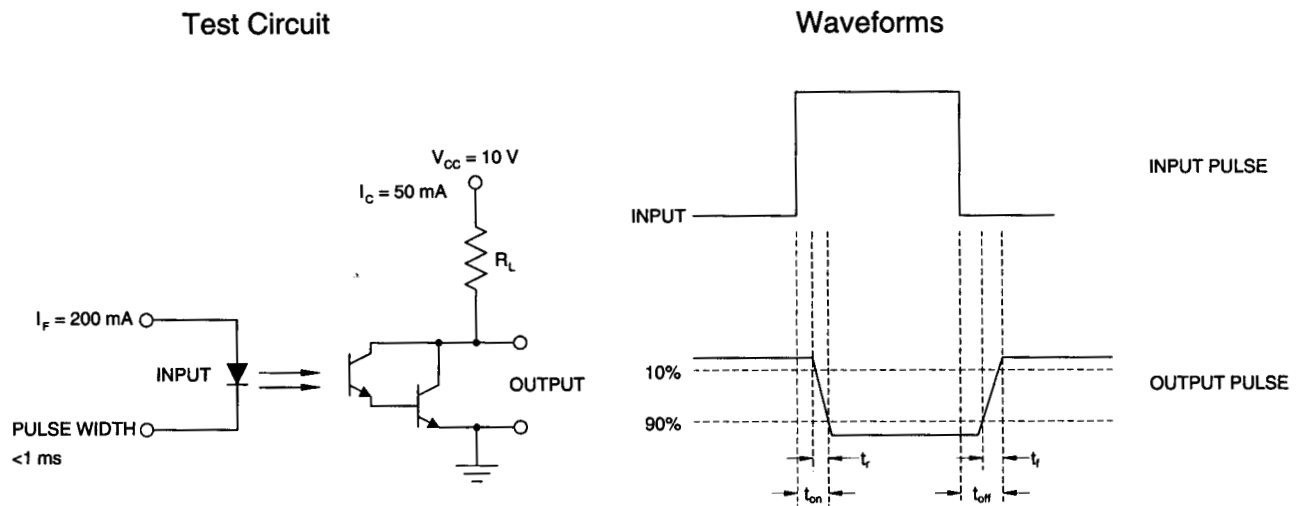


Fig. 7 Switching Time Test Circuit and Waveforms

Notes

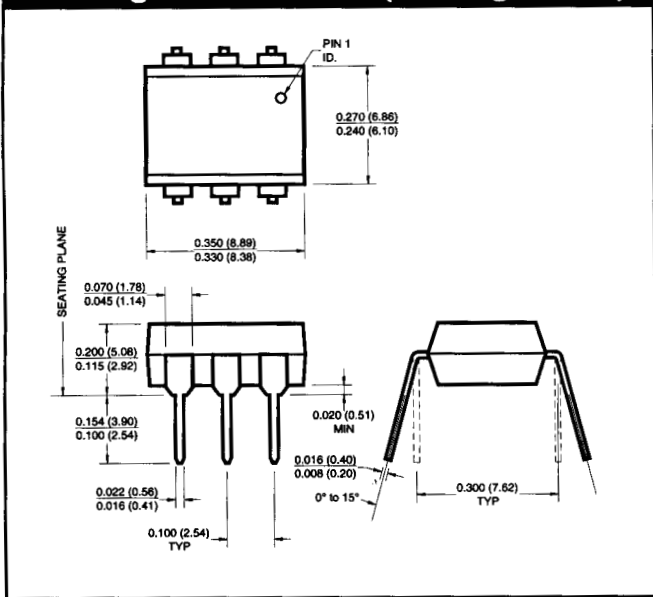
* Indicates JEDEC registered data.

1. The current transfer ratio (I_C/I_F) is the ratio of the detector collector current to the LED input current with $V_{CE} @ 10 \text{ V}$.
2. Pulse test: pulse width = $300 \mu\text{s}$, duty cycle $\leq 2.0\%$.
3. For test circuit setup and waveforms, refer to figure 7.
4. I_F adjusted to $I_C = 2.0 \text{ mA}$ and $I_C = 0.7 \text{ mA rms}$.
5. The frequency at which I_C is 3dB down from the 1 KHz value.
6. For this test, LED pins 1 and 2 are common, and phototransistor pins 4,5 and 6 are common.

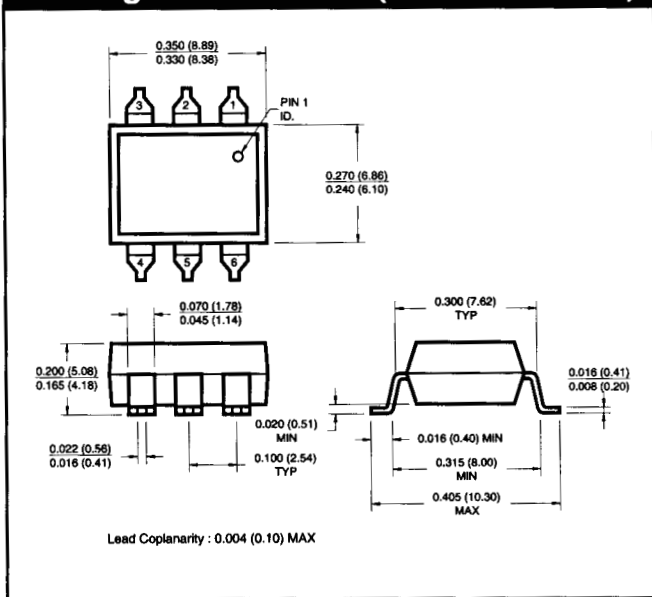
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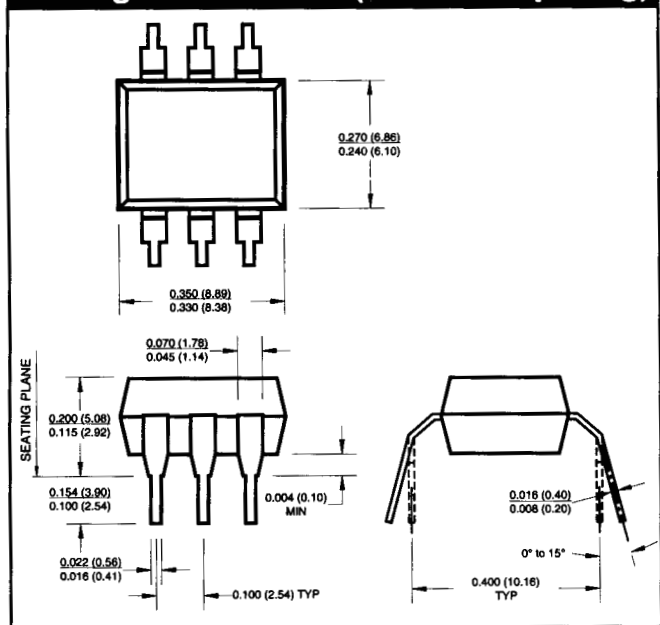
Package Dimensions (Through Hole)



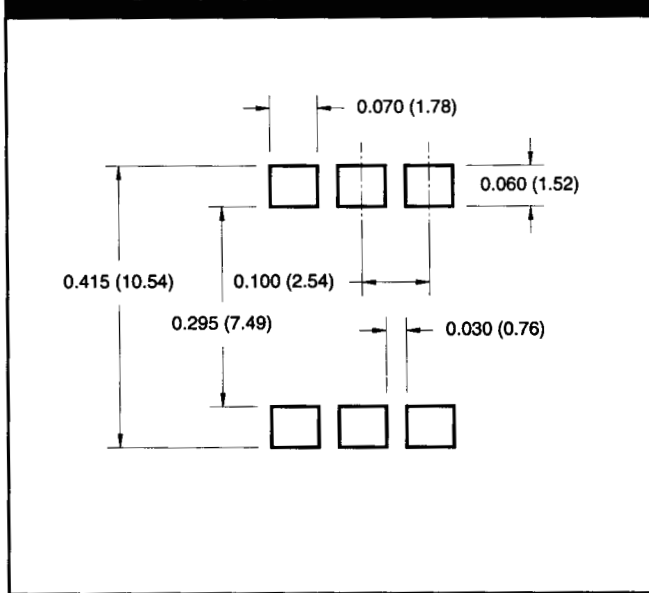
Package Dimensions (Surface Mount)



Package Dimensions (0.4" Lead Spacing)



Recommended Pad Layout for Surface Mount Leadform



NOTE

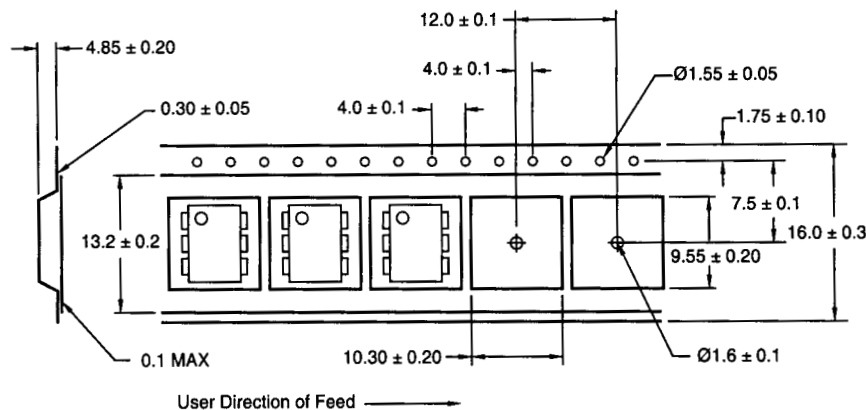
All dimensions are in inches (millimeters)

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ORDERING INFORMATION

Option	Order Entry Identifier	Description
S	.S	Surface Mount Lead Bend
SD	.SD	Surface Mount; Tape and reel
W	.W	0.4" Lead Spacing
300	.300	VDE 0884
300W	.300W	VDE 0884, 0.4" Lead Spacing
3S	.3S	VDE 0884, Surface Mount
3SD	.3SD	VDE 0884, Surface Mount, Tape & Reel

QT Carrier Tape Specifications ("D" Taping Orientation)



NOTE

All dimensions are in millimeters

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