Part No. 084N33

FAIRCHILD
SEMICONDUCTOR™

GENERAL PURPOSE 6-PIN PHOTODARLINGTON OPTOCOUPLERS

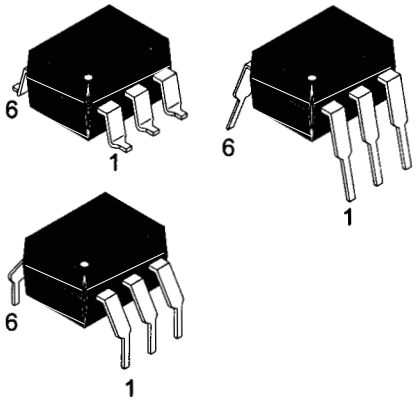
4N29 4N30 4N31 4N32 4N33

DESCRIPTION

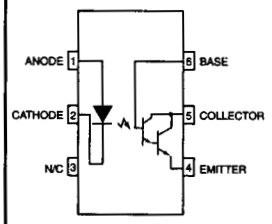
The 4N29, 4N30, 4N31, 4N32, 4N33 have a gallium arsenide infrared emitter optically coupled to a silicon planar photodarlington.

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)



SCHEMATIC



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°C Unless otherwise specified.)

Parameter	Symbol	Value	Units
TOTAL DEVICE			
Storage Temperature	T_{STG}	-55 to +150	°C
Operating Temperature	T_{OPR}	-55 to +100	°C
Lead Solder Temperature	T_{SOL}	260 for 10 sec	°C
Total Device Power Dissipation @ T_A = 25°C	P_D	250	mW
Derate above 25°C		3.3	mW/°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°C	P_D	150	mW
Derate above 25°C		2.0	mW/°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°C	P_D	150	mW
Derate above 25°C		2.0	mW/°C
Continuous Collector Current	I_C	150	mA

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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		V
*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] (4N29, 4N30, 4N31, 4N32, 4N33)	(I_{I-O} ≤ 1 µA, Vrms, t = 1 min.)	V_{ISO}	5300			Vac(rms)
*(4N32)	VDC		2500			V
*(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

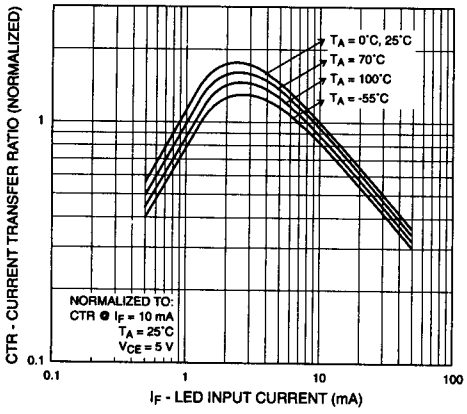


Fig. 2 Current Transfer Ratio vs. Ambient Temperature

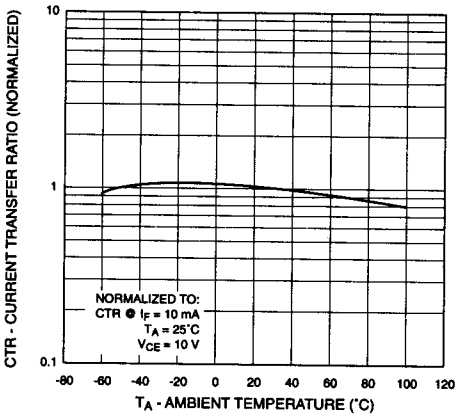


Fig. 3 Collector Current vs. Collector-Emitter Voltage

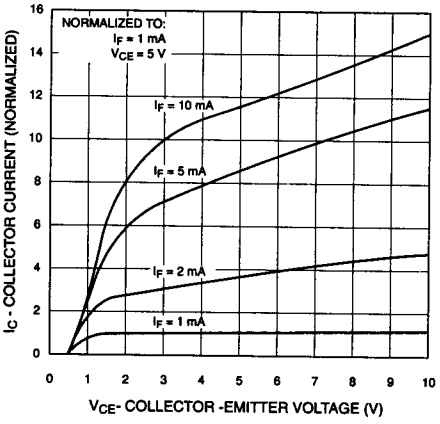


Fig. 4 Dark Current vs. Ambient Temperature

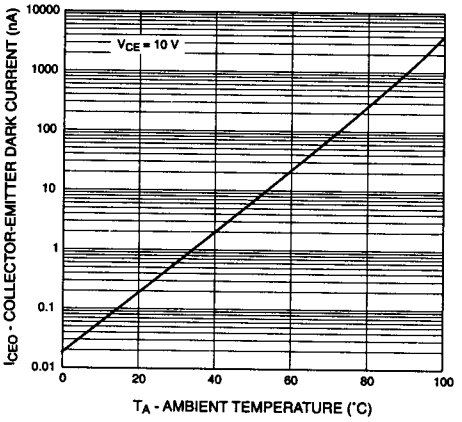


Fig. 5 Turn-On Time vs. Input Current

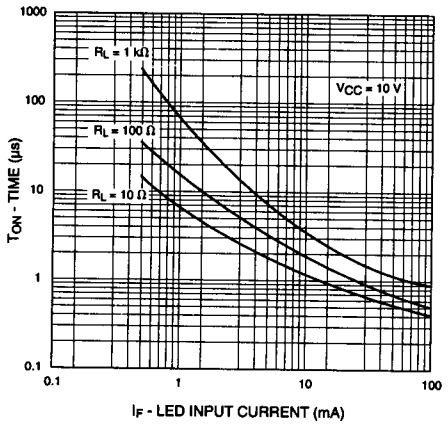
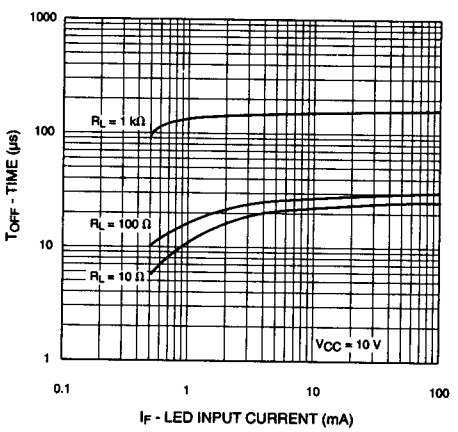


Fig. 6 Turn-Off Time vs. Input Current



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TYPICAL ELECTRO-OPTICAL CHARACTERISTIC CURVES

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

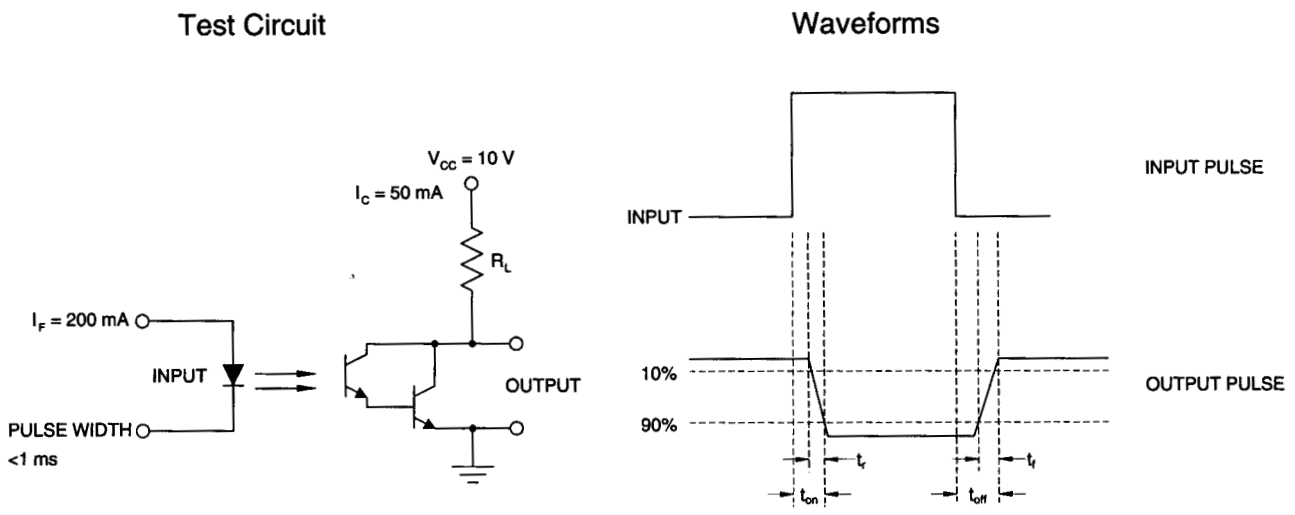

Fig. 7 Switching Time Test Circuit and Waveforms

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 V.
2. Pulse test: pulse width = 300μs, duty cycle ≤ 2.0% .
3. For test circuit setup and waveforms, refer to figure 7..
4. I_F adjusted to I_C = 2.0 mA and I_C = 0.7 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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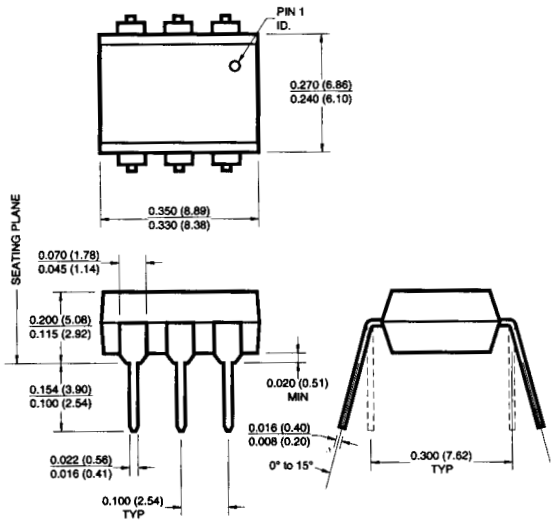
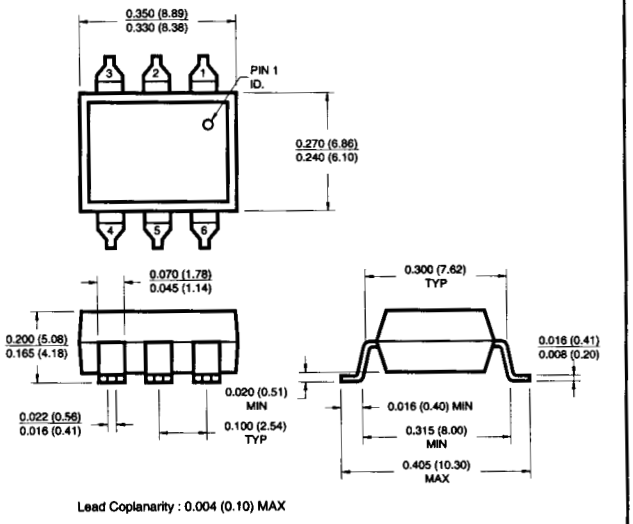
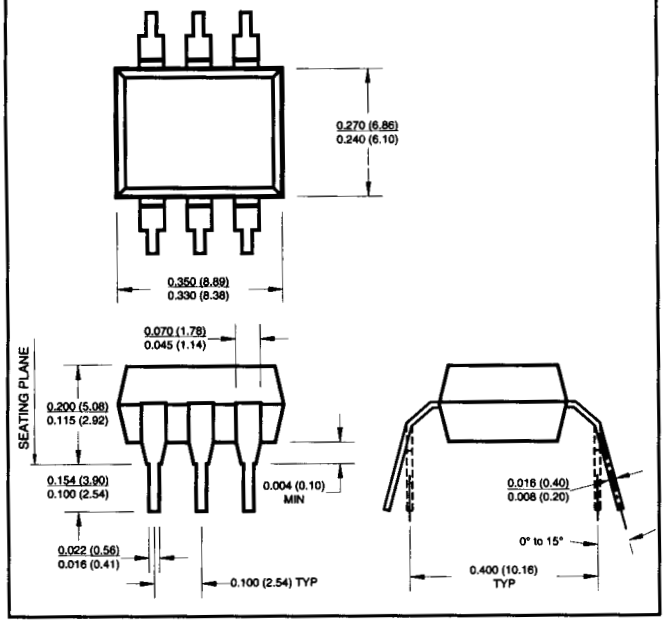
Package Dimensions (Through Hole)



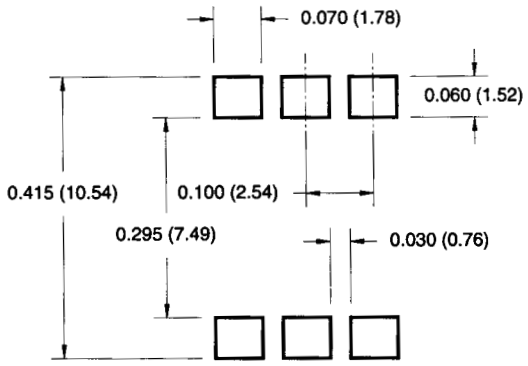
Package Dimensions (Surface Mount)



Package Dimensions (0.4"Lead Spacing)



Recommended Pad Layout for Surface Mount Leadform



NOTE

All dimensions are in inches (millimeters)

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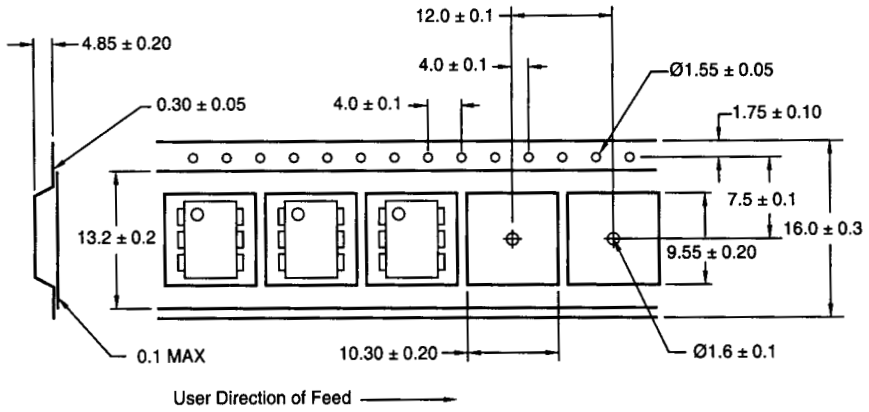
ORDERING INFORMATION

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