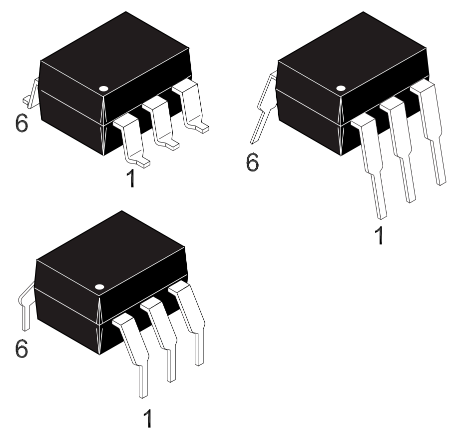
FAIRCHILD SEMICONDUCTOR™

GENERAL PURPOSE 6-PIN PHOTODARLINGTON OPTOCOUPLERS

4N29 4N30 4N31 4N32 4N33

DESCRIPTION

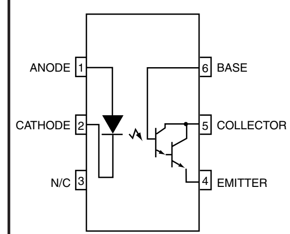
The 4N29, 4N30, 4N31, 4N32, 4N33 have a gallium arsenide infrared emitter optically coupled to a silicon planar photodarlington.



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

Fig. 1 Output Current vs. Input Current

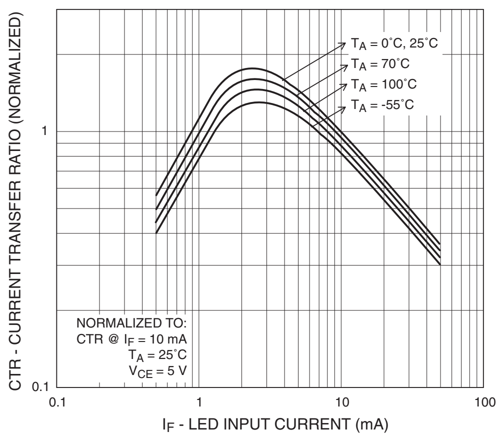


Fig. 2 Current Transfer Ratio vs. Ambient Temperature

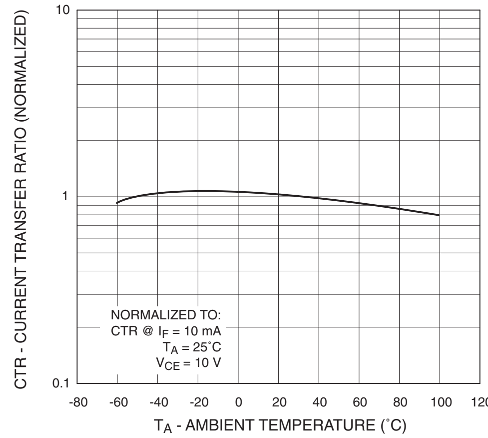


Fig. 3 Collector Current vs. Collector-Emitter Voltage

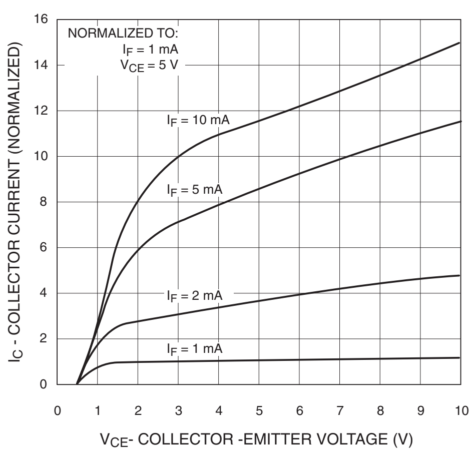


Fig. 4 Dark Current vs. Ambient Temperature

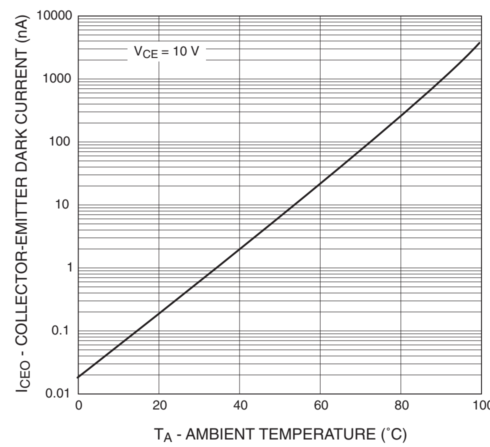


Fig. 5 Turn-On Time vs. Input Current

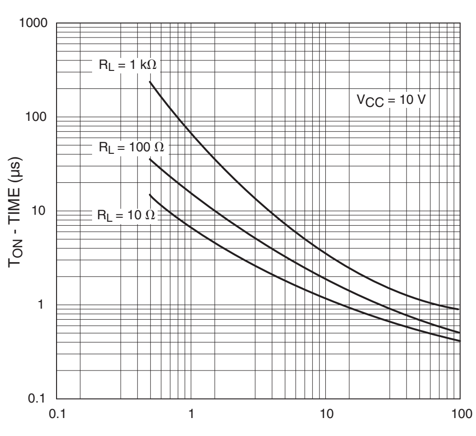
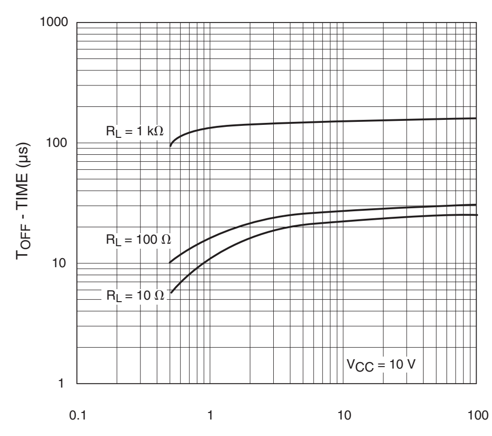


Fig. 6 Turn-Off Time vs. Input Current



TYPICAL ELECTRO-OPTICAL CHARACTERISTIC CURVES

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

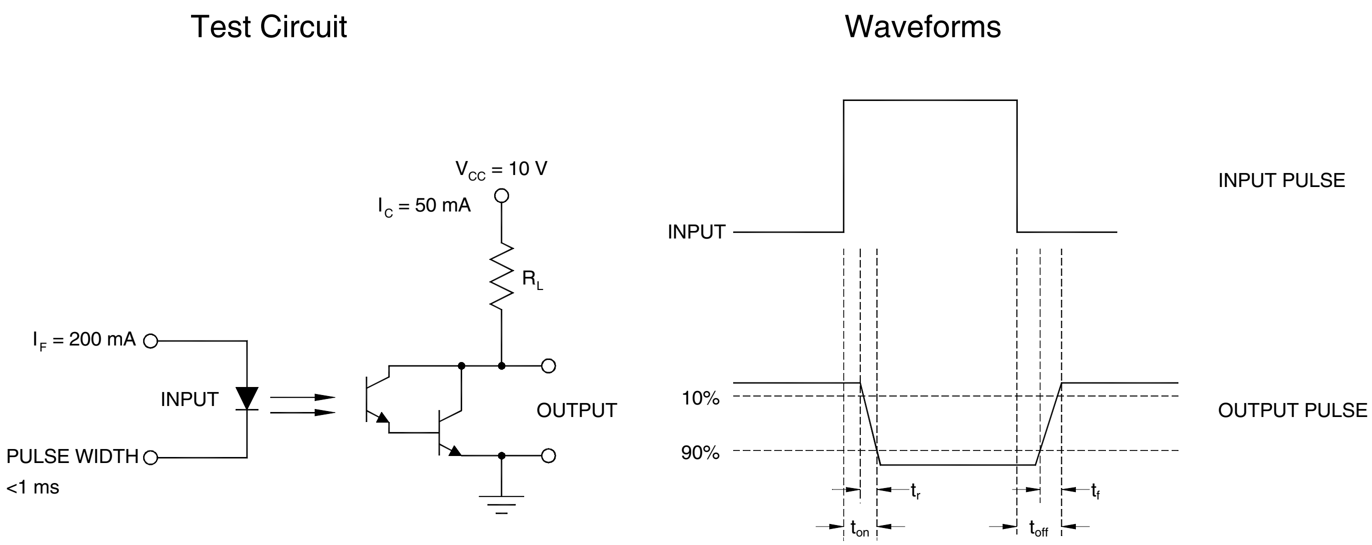


Fig. 7 Switching Time Test Circuit and Waveforms

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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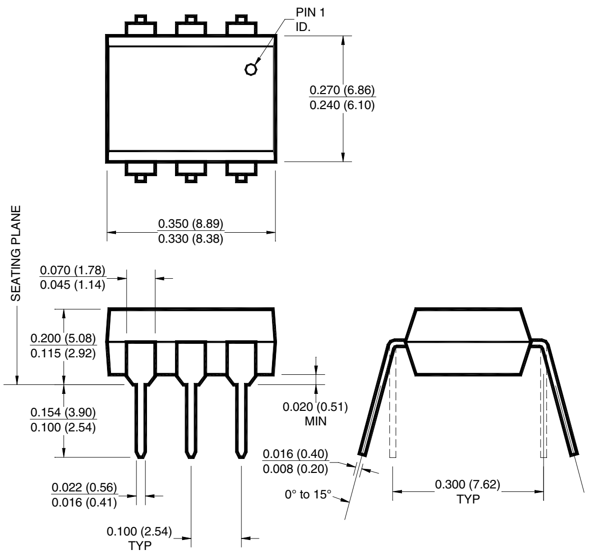
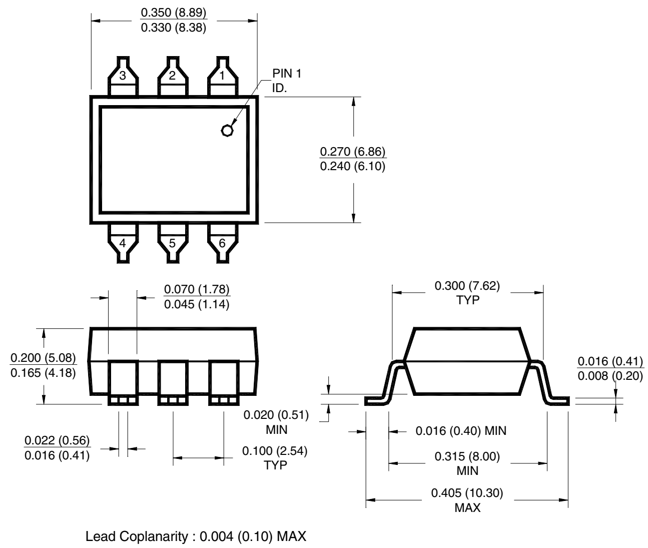
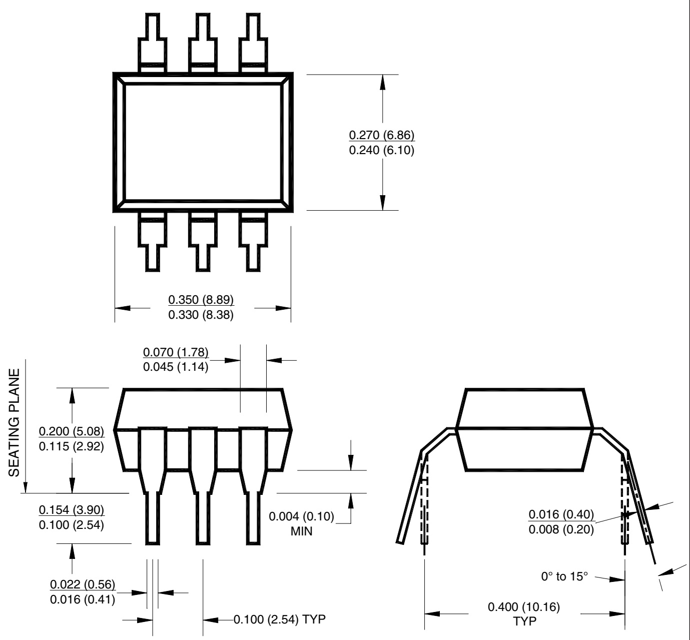
Package Dimensions (Through Hole)



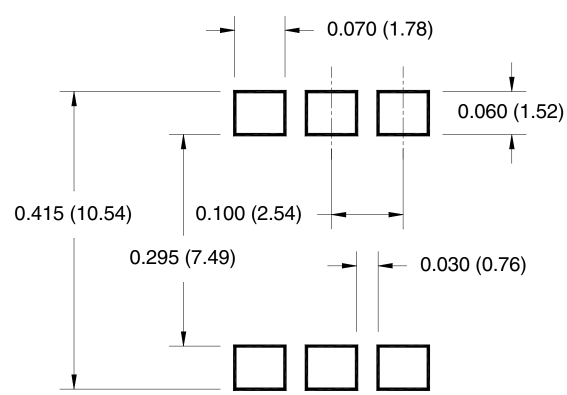
Package Dimensions (Surface Mount)



Package Dimensions (0.4"Lead Spacing)



Recommended Pad Layout for Surface Mount Leadform



NOTE

All dimensions are in inches (millimeters)

Call QT Optoelectronics for more information or the phone number of your nearest distributor.

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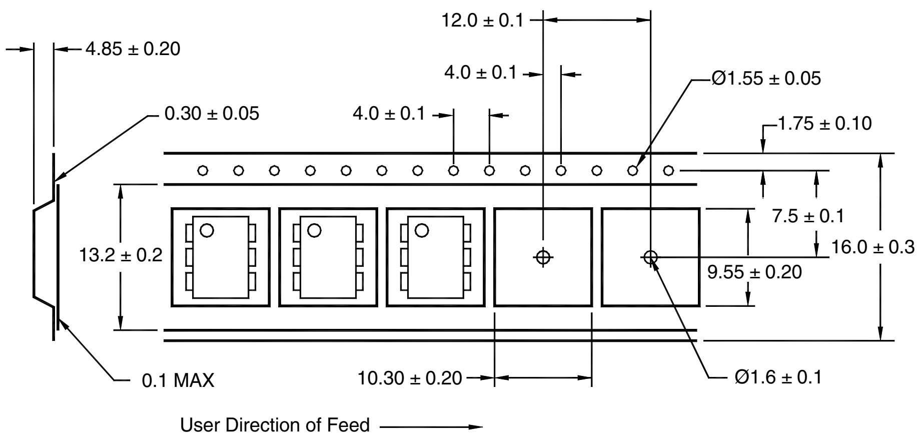
ORDERING INFORMATION

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

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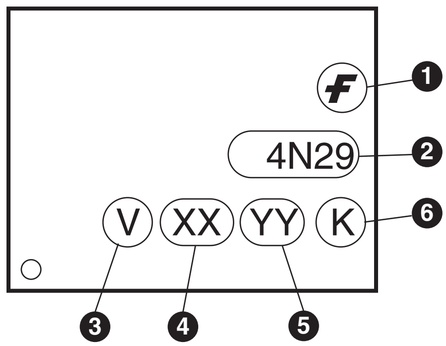
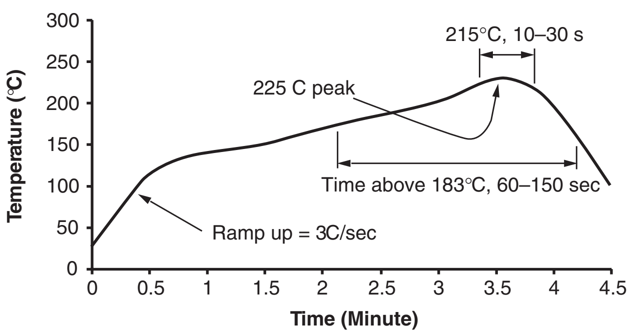
MARKING INFORMATION



Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	Two digit year code, e.g., '03'
5	Two digit work week ranging from '01' to '53'
6	Assembly package code

Reflow Profile (Black Package, No Suffix)



- Peak reflow temperature: 225°C (package surface temperature)
- Time of temperature higher than 183°C for 60–150 seconds
- One time soldering reflow is recommended

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PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
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Rev. I13