4N29, 4N30, 4N31, 4N32, 4N33
General Purpose 6-Pin Photodarlington Optocoupler

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

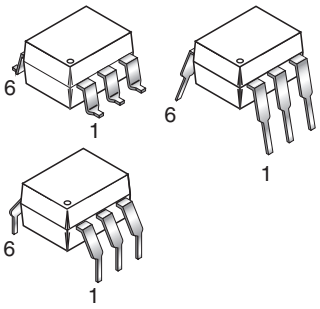
- Low power logic circuits
- Telecommunications equipment
- Portable electronics
- Solid state relays
- Interfacing coupling systems of different potentials and impedances

Description

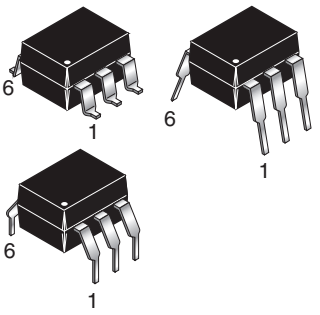
The 4N29, 4N30, 4N31, 4N32, 4N33 have a gallium arsenide infrared emitter optically coupled to a silicon planar photodarlington.

Packages

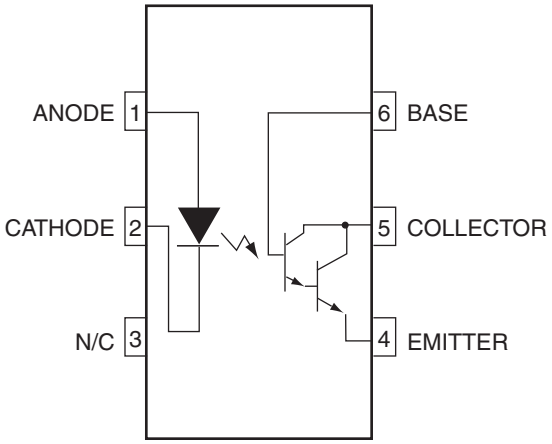
White Package (-M Suffix)



Black Package (No -M Suffix)



Schematic



Absolute Maximum Ratings (T_A = 25°C Unless otherwise specified.)

Symbol	Parameter	Device	Value	Units
TOTAL DEVICE				
T_{STG}	Storage Temperature	Non M	-55 to +150	°C
		M	-40 to +150	
T_{OPR}	Operating Temperature	Non M	-55 to +100	°C
		M	-40 to +100	
T_{SOL}	Lead Solder Temperature	All	260 for 10 sec	°C
P_D	Total Device Power Dissipation @ T_A = 25°C	All	250	mW
	Derate above 25°C		3.3	mW/°C
EMITTER				
I_F	Continuous Forward Current	All	80	mA
V_R	Reverse Voltage	All	3	V
I_F(pk)	Forward Current – Peak (300µs, 2% Duty Cycle)	All	3.0	A
P_D	LED Power Dissipation @ T_A = 25°C	All	150	mW
	Derate above 25°C		2.0	mW/°C
DETECTOR				
BV_{CEO}	Collector-Emitter Breakdown Voltage	All	30	V
BV_{CBO}	Collector-Base Breakdown Voltage	All	30	V
BV_{ECO}	Emitter-Collector Breakdown Voltage	All	5	V
P_D	Detector Power Dissipation @ T_A = 25°C	All	150	mW
	Derate above 25°C		2.0	mW/°C
I_C	Continuous Collector Current	All	150	mA

Electrical Characteristics (T_A = 25°C Unless otherwise specified.)

Individual Component Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
EMITTER						
V_F	Input Forward Voltage*	I_F = 10mA	–	1.2	1.5	V
I_R	Reverse Leakage Current*	V_R = 3.0V	–	0.001	100	µA
C	Capacitance*	V_F = 0V, f = 1.0MHz	–	150	–	pF
DETECTOR						
BV_{CEO}	Collector-Emitter Breakdown Voltage*	I_C = 1.0mA, I_B = 0	30	60	–	V
BV_{CBO}	Collector-Base Breakdown Voltage*	I_C = 100µA, I_E = 0	30	100	–	V
BV_{ECO}	Emitter-Collector Breakdown Voltage*	I_E = 100µA, I_B = 0	5.0	8	–	V
I_{CEO}	Collector-Emitter Dark Current*	V_{CE} = 10V, Base Open	–	1	100	nA
h_{FE}	DC Current Gain	V_{CE} = 5.0V, I_C = 500µA	–	5000	–	

Transfer Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
DC CHARACTERISTICS						
$I_{C(CTR)}$	Collector Output Current*(1, 2)	I_F = 10mA, V_{CE} = 10V, I_B = 0				
	4N32, 4N33		50 (500)	–	–	mA (%)
	4N29, 4N30		10 (100)	–	–	
	4N31		5 (50)	–	–	
$V_{CE(SAT)}$	Saturation Voltage*(2)	I_F = 8mA, I_C = 2.0mA				
	4N29, 4N30, 4N32, 4N33		–	–	1.0	V
	4N31		–	–	1.2	
AC CHARACTERISTICS						
t_{on}	Turn-on Time	I_F = 200mA, I_C = 50mA, V_{CC} = 10V	–	–	5.0	µS
t_{off}	Turn-off Time					
	4N32, 4N33	I_F = 200mA, I_C = 50mA, V_{CC} = 10V	–	–	100	µS
	4N29, 4N30, 4N31		–	–	40	
BW	Bandwidth(3, 4)		–	30	–	kHz

Isolation Characteristics

Symbol	Characteristic	Test Conditions	Min.	Typ.	Max.	Units
V_{ISO}	Input-Output Isolation Voltage(5)					
	4N29, 4N30, 4N31, 4N32, 4N33	$I_{I-O} \leq$ 1µA, Vrms, t = 1min.	5300	–	–	Vac(rms)
	4N32*	VDC	2500	–	–	V
	4N33*	VDC	1500	–	–	
R_{ISO}	Isolation Resistance(5)	V_{I-O} = 500VDC	–	10^{11}	–	Ω
C_{ISO}	Isolation Capacitance(5)	V_{I-O} = Ø, f = 1MHz	–	0.8	–	pF

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} @ 10V.
2. Pulse test: pulse width = 300µs, duty cycle ≤ 2.0% .
4. I_F adjusted to I_C = 2.0mA and I_C = 0.7mA rms.
5. The frequency at which I_C is 3dB down from the 1kHz value.
6. For this test, LED pins 1 and 2 are common, and phototransistor pins 4, 5 and 6 are common.

Typical Performance Curves

Fig. 1 LED Forward Voltage vs. Forward Current (Black Package)

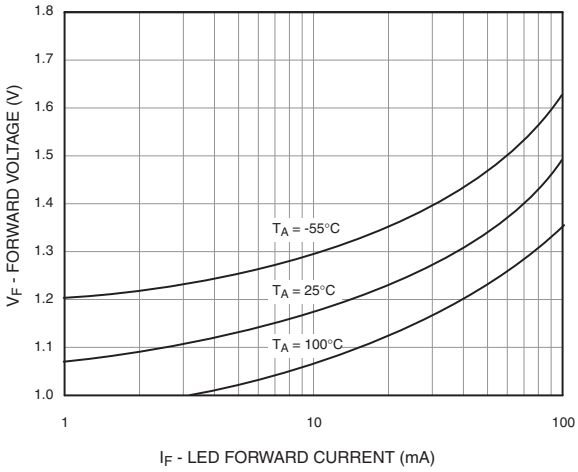


Fig. 2 LED Forward Voltage vs. Forward Current (White Package)

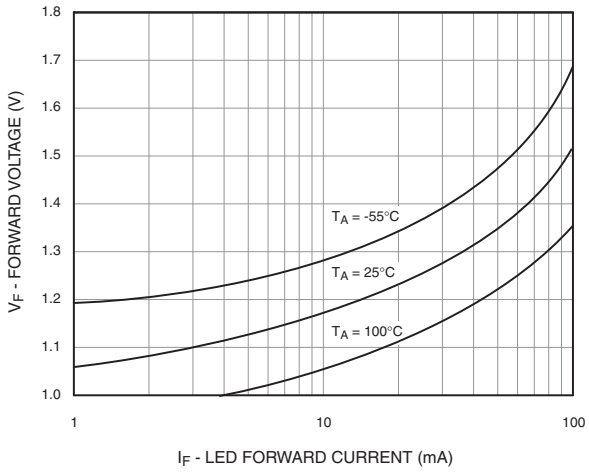


Fig.3 Normalized CTR vs. Forward Current (Black Package)

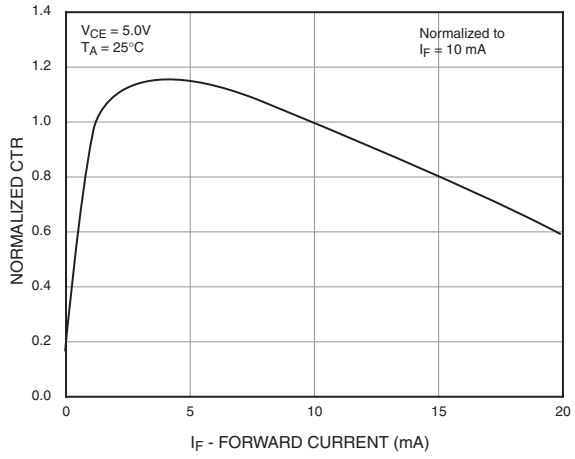


Fig.4 Normalized CTR vs. Forward Current (White Package)

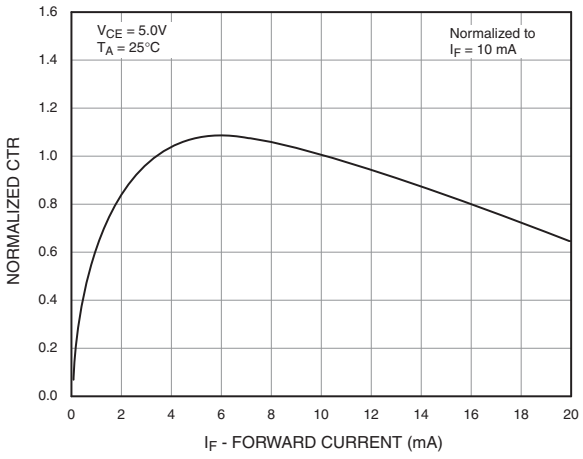


Fig. 5 Normalized CTR vs. Ambient Temperature (Black Package)

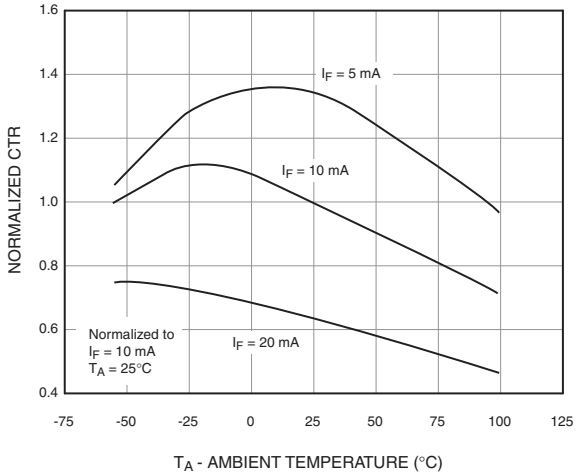
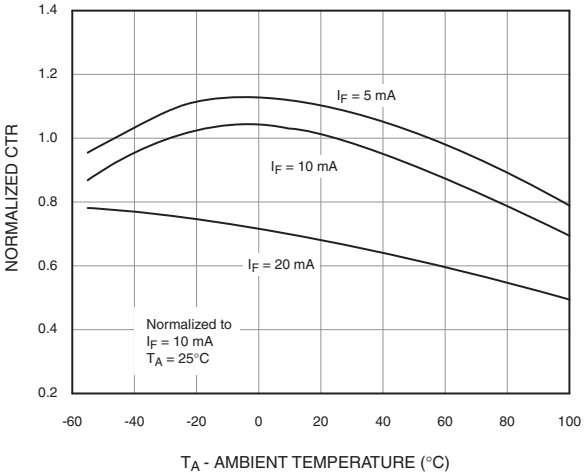


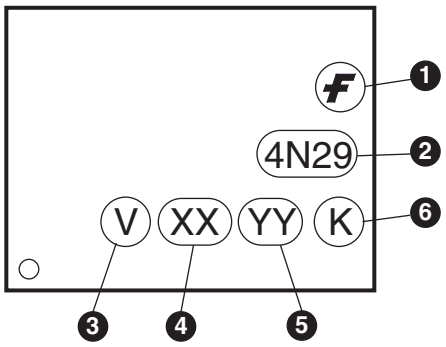
Fig. 6 Normalized CTR vs. Ambient Temperature (White Package)



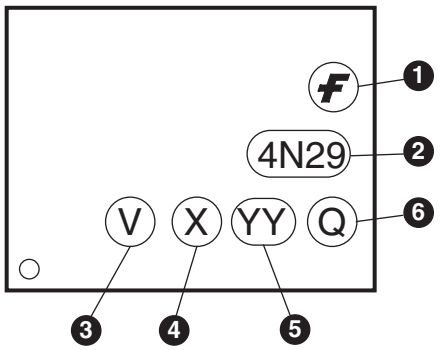
Ordering Information

Black Package (No Suffix)	Example	White Package (-M Suffix)	Example	Option
No Suffix	4N32	No Suffix	4N32M	Standard Through Hole Device
.S	4N32S	S	4N32SM	Surface Mount Lead Bend
.SD	4N32SD	SR2	4N32SR2M	Surface Mount; Tape and reel
.W	4N32W	T	4N32TM	0.4" Lead Spacing
.300	4N32300	V	4N32VM	VDE 0884
.300W	4N32300W	TV	4N32TVM	VDE 0884, 0.4" Lead Spacing
.3S	4N323S	SV	4N32SVM	VDE 0884, Surface Mount
.3SD	4N323SD	SR2V	4N32SR2VM	VDE 0884, Surface Mount, Tape & Reel

Marking Information



Black Package, No Suffix



White Package, -M Suffix

Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	One or two digit year code • Two digits for black package parts, e.g., '07' • One digit for white package parts, e.g., '7'
5	Two digit work week ranging from '01' to '53'
6	Assembly package code

*Note – Parts built in the white package (M suffix) that do not have the 'V' option (see definition 3 above) that are marked with date code '325' or earlier are marked in the portrait format.