



**THE DATASHEET OF  
4N33SD**



## DESCRIPTION

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

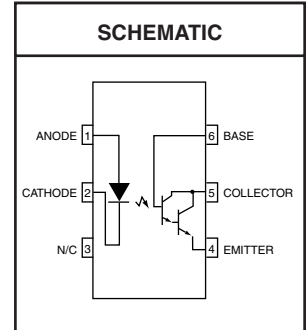
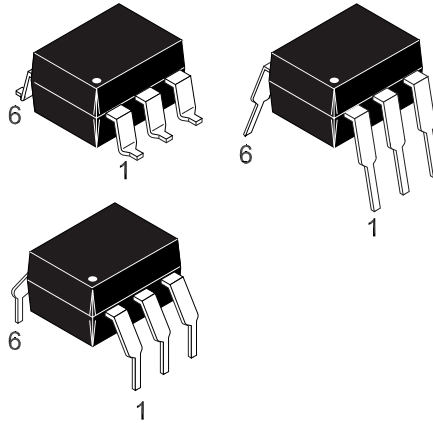
4N29    4N30    4N31    4N32    4N33

## 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<sub>A</sub> = 25°C Unless otherwise specified.)

Parameter	Symbol	Value	Units
<b>TOTAL DEVICE</b>			
Storage Temperature	T <sub>STG</sub>	-55 to +150	°C
Operating Temperature	T <sub>OPR</sub>	-55 to +100	°C
Lead Solder Temperature	T <sub>SOL</sub>	260 for 10 sec	°C
Total Device Power Dissipation @ T <sub>A</sub> = 25°C	P <sub>D</sub>	250	mW
Derate above 25°C		3.3	mW/°C
<b>EMITTER</b>			
Continuous Forward Current	I <sub>F</sub>	80	mA
Reverse Voltage	V <sub>R</sub>	3	V
Forward Current - Peak (300 μs, 2% Duty Cycle)	I <sub>F(pk)</sub>	3.0	A
LED Power Dissipation @ T <sub>A</sub> = 25°C	P <sub>D</sub>	150	mW
Derate above 25°C		2.0	mW/°C
<b>DETECTOR</b>			
Collector-Emitter Breakdown Voltage	BV <sub>CEO</sub>	30	V
Collector-Base Breakdown Voltage	BV <sub>CBO</sub>	30	V
Emitter-Collector Breakdown Voltage	BV <sub>ECO</sub>	5	V
Detector Power Dissipation @ T <sub>A</sub> = 25°C	P <sub>D</sub>	150	mW
Derate above 25°C		2.0	mW/°C
Continuous Collector Current	I <sub>C</sub>	150	mA

<b>4N29</b>	<b>4N30</b>	<b>4N31</b>	<b>4N32</b>	<b>4N33</b>
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**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  Unless otherwise specified.)

**INDIVIDUAL COMPONENT CHARACTERISTICS**

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

**TRANSFER CHARACTERISTICS**

DC Characteristic	Test Conditions	Symbol	Min	Typ	Max	Units
*Collector Output Current <sup>(1,2)</sup> (4N32, 4N33)	( $I_F = 10\text{ mA}$ , $V_{CE} = 10\text{ V}$ , $I_B = 0$ )	$I_C$ (CTR)	50 (500)			mA (%)
(4N29, 4N30)			10 (100)			
(4N31)			5 (50)			
*Saturation Voltage <sup>(2)</sup> (4N29, 4N30, 4N32, 4N33)	( $I_F = 8.0\text{ mA}$ , $I_C = 2.0\text{ mA}$ )	$V_{CE(sat)}$			1.0	V
(4N31)					1.2	

**TRANSFER CHARACTERISTICS**

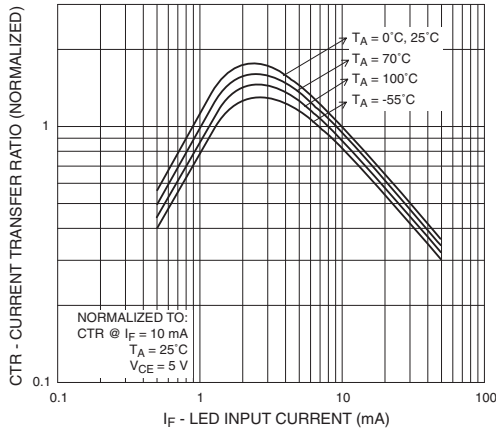
AC Characteristic	Test Conditions	Symbol	Min	Typ	Max	Units
Turn-on Time <sup>(3)</sup>	( $I_F = 200\text{ mA}$ , $I_C = 50\text{ mA}$ , $V_{CC} = 10\text{ V}$ ) (Fig.7)	$t_{on}$			5.0	$\mu\text{s}$
Turn-off Time <sup>(3)</sup> (4N32, 4N33)					100	
(4N29, 4N30, 4N31)			$t_{off}$			
Bandwidth <sup>(4,5)</sup>		BW		30		KHz

**ISOLATION CHARACTERISTICS**

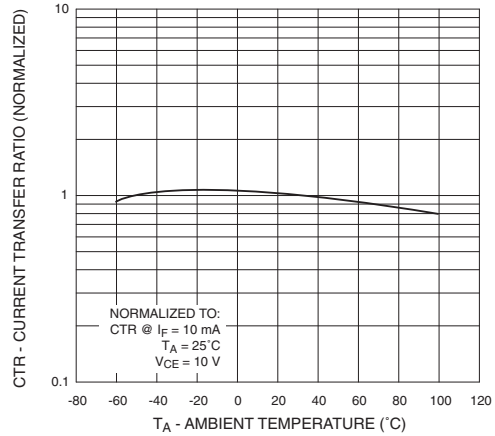
Characteristic	Test Conditions	Symbol	Min	Typ	Max	Units
Input-Output Isolation Voltage <sup>(6)</sup> (4N29, 4N30, 4N31, 4N32, 4N33)	( $I_{I-O} \leq 1\ \mu\text{A}$ , $V_{rms}$ , $t = 1\text{ min.}$ )	$V_{ISO}$	5300			$V_{ac(rms)}$
* (4N32)			VDC	2500		V
* (4N33)			VDC	1500		
Isolation Resistance <sup>(6)</sup>	( $V_{I-O} = 500\text{ VDC}$ )	$R_{ISO}$		$10^{11}$		$\Omega$
Isolation Capacitance <sup>(6)</sup>	( $V_{I-O} = \emptyset$ , $f = 1\text{ MHz}$ )	$C_{ISO}$		0.8		pf

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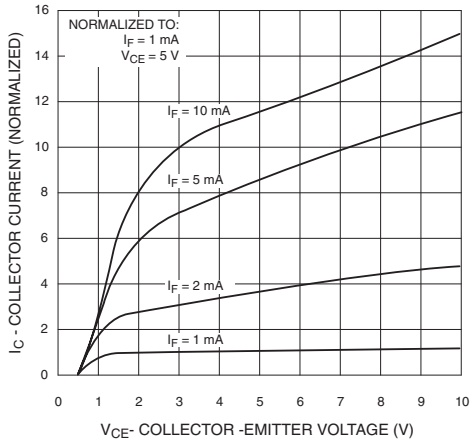
**Fig. 1 Output Current vs. Input Current**



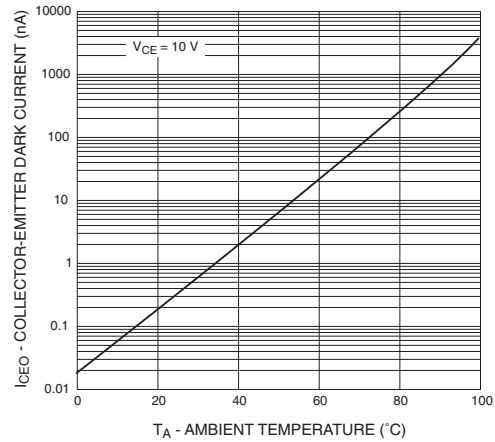
**Fig. 2 Current Transfer Ratio vs. Ambient Temperature**



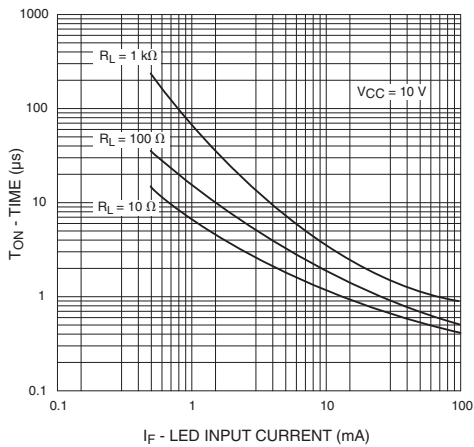
**Fig. 3 Collector Current vs. Collector-Emitter Voltage**



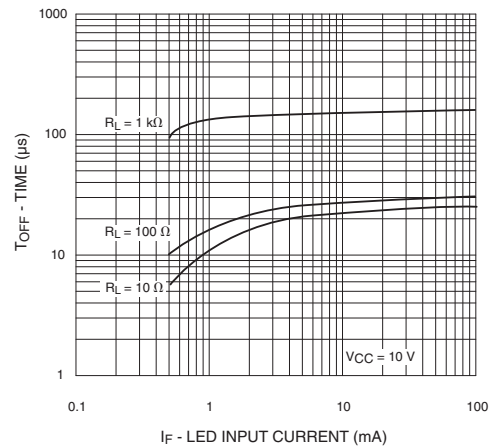
**Fig. 4 Dark Current vs. Ambient Temperature**



**Fig. 5 Turn-On Time vs. Input Current**



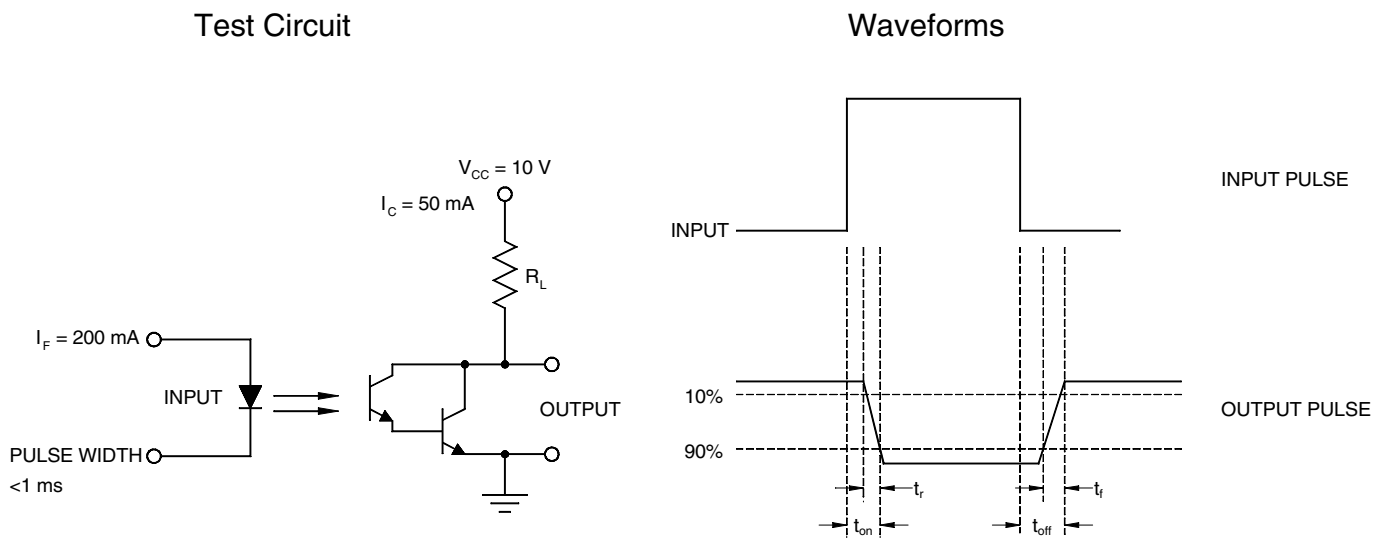
**Fig. 6 Turn-Off Time vs. Input Current**



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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**

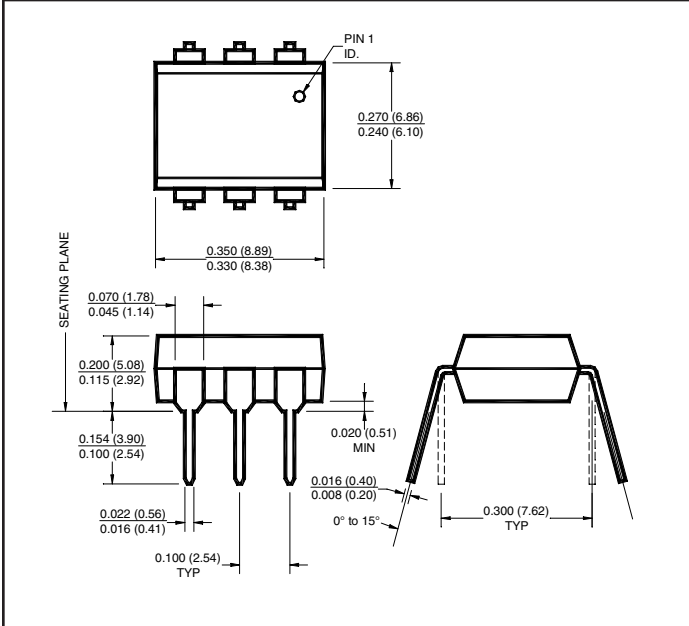
**Notes**

\* Indicates JEDEC registered data.

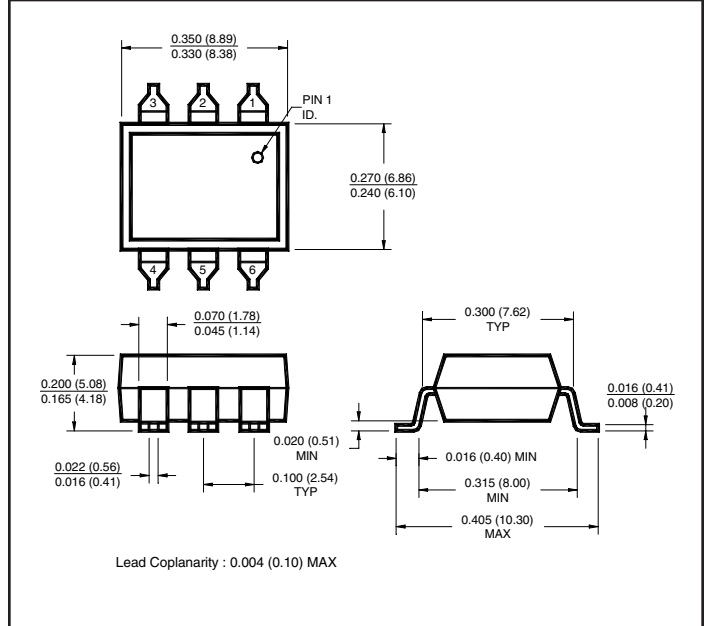
1. The current transfer ratio ( $I_C/I_F$ ) is the ratio of the detector collector current to the LED input current with  $V_{CE} @ 10 \text{ V}$ .
2. Pulse test: pulse width =  $300 \mu\text{s}$ , duty cycle  $\leq 2.0\%$ .
3. For test circuit setup and waveforms, refer to figure 7..
4.  $I_F$  adjusted 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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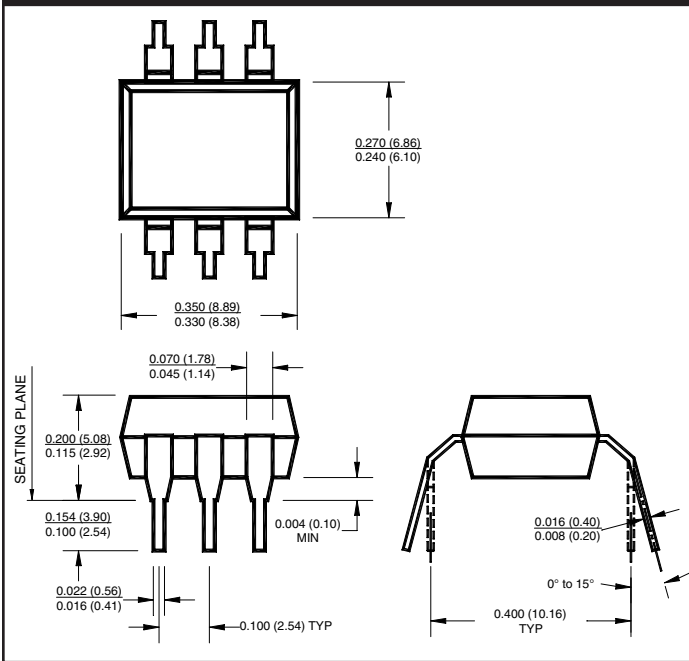
## Package Dimensions (Through Hole)



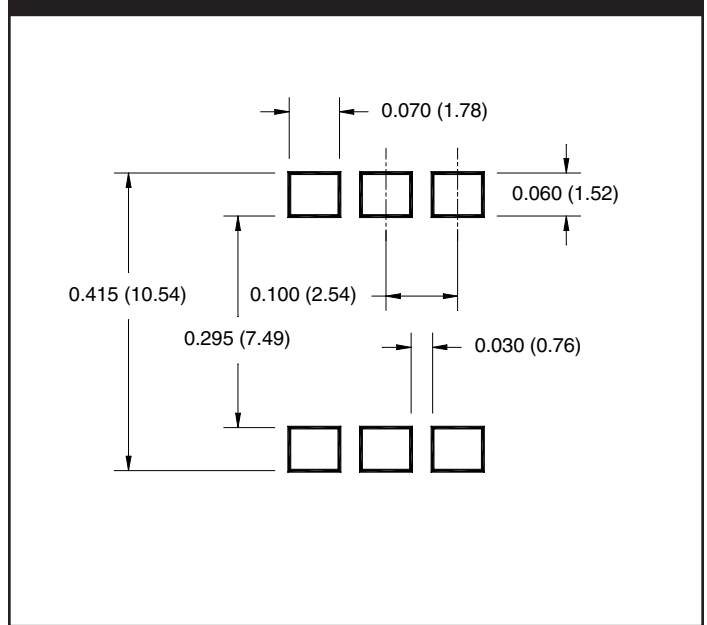
## Package Dimensions (Surface Mount)



## Package Dimensions (0.4" Lead Spacing)



## Recommended Pad Layout for Surface Mount Leadform



**NOTE**

All dimensions are in inches (millimeters)

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

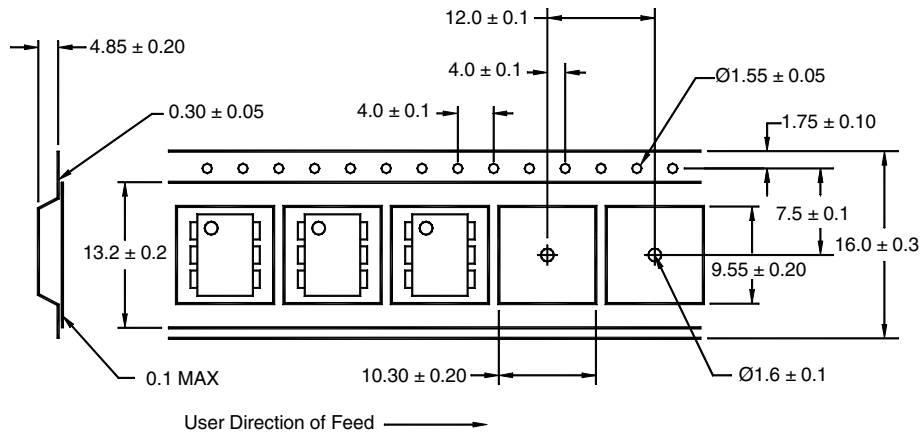
United States 800-533-6786 • France 33 [0] 1.45.18.78.78 • Germany 49 [0] 89/96.30.51 • United Kingdom 44 [0] 1296 394499 • Asia/Pacific 603-7248193

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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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