

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

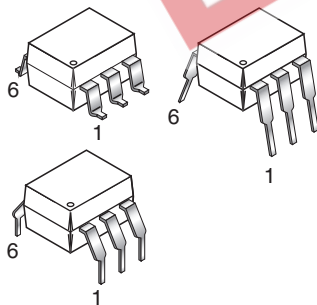
- Low power logic circuits
- Telecommunications equipment
- Portable electronics
- Solid state relays
- Interfacing coupling systems of different potentials and impedances

Description

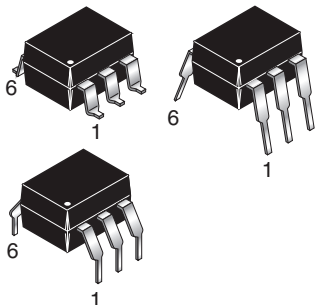
The 4N29, 4N30, 4N31, 4N32, 4N33 have a gallium arsenide infrared emitter optically coupled to a silicon planar photodarlington.

Packages

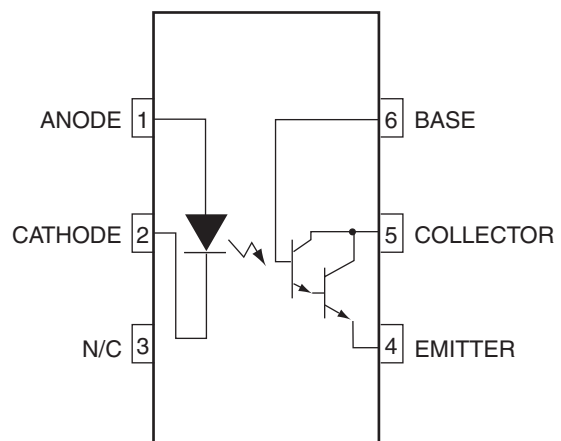
White Package (-M Suffix)



Black Package (No -M Suffix)



Schematic



Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$ Unless otherwise specified.)

Electrical Characteristics ($T_A = 25^\circ\text{C}$ Unless otherwise specified.)**Individual Component Characteristics**

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

Transfer Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
DC CHARACTERISTICS						
$I_{C(CTR)}$	Collector Output Current ^(1, 2)	$I_F = 10\text{mA}$, $V_{CE} = 10\text{V}$, $I_B = 0$				mA (%)
	4N32, 4N33		50 (500)	–	–	
	4N29, 4N30		10 (100)	–	–	
	4N31		5 (50)	–	–	
$V_{CE(SAT)}$	Saturation Voltage ⁽²⁾	$I_F = 8\text{mA}$, $I_C = 2.0\text{mA}$				V
	4N29, 4N30, 4N32, 4N33		–	–	1.0	
	4N31		–	–	1.2	
AC CHARACTERISTICS						
t_{on}	Turn-on Time	$I_F = 200\text{mA}$, $I_C = 50\text{mA}$, $V_{CC} = 10\text{V}$	–	–	5.0	μS
t_{off}	Turn-off Time	$I_F = 200\text{mA}$, $I_C = 50\text{mA}$, $V_{CC} = 10\text{V}$	–	–	100	μS
	4N32, 4N33 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⁾	$I_{I-O} \leq 1\mu\text{A}$, V_{rms} , $t = 1\text{min.}$	5300	–	–	Vac(rms)
	4N29, 4N30, 4N31, 4N32, 4N33					

Typical Performance Curves

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

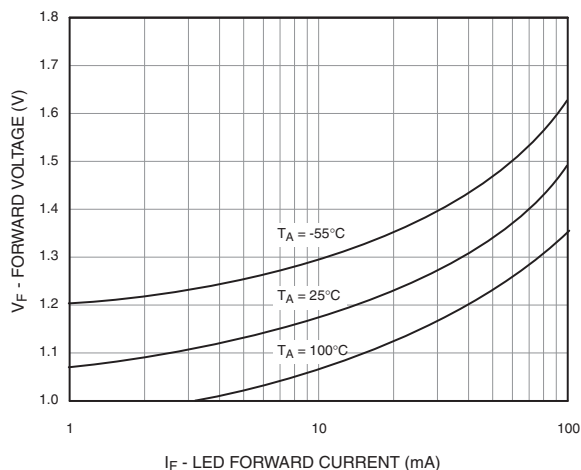


Fig. 2 LED Forward Voltage vs. Forward Current (White Package)

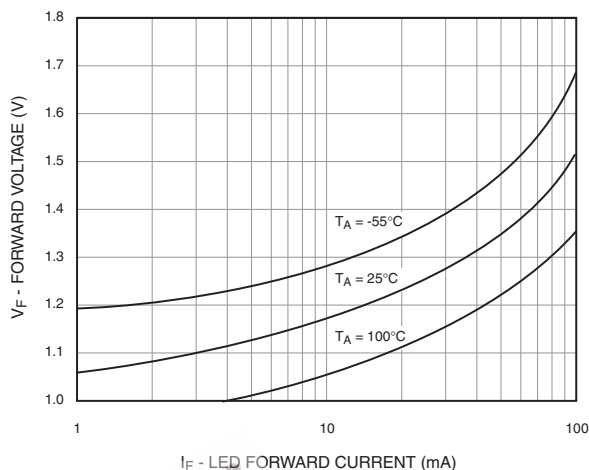


Fig.3 Normalized CTR vs. Forward Current (Black Package)

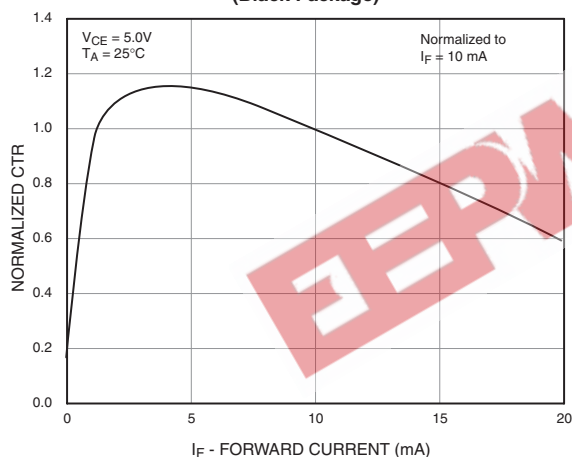


Fig.4 Normalized CTR vs. Forward Current (White Package)

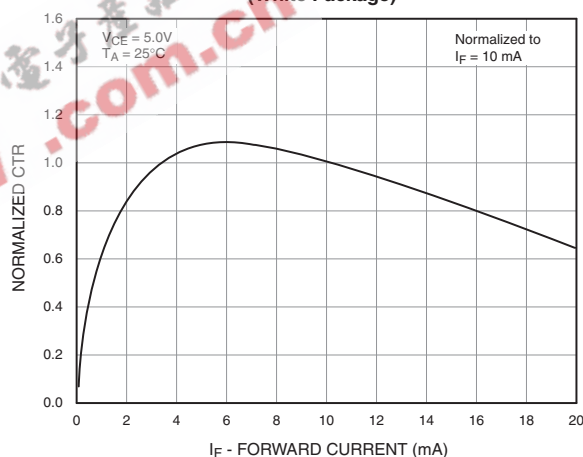


Fig. 5 Normalized CTR vs. Ambient Temperature (Black Package)

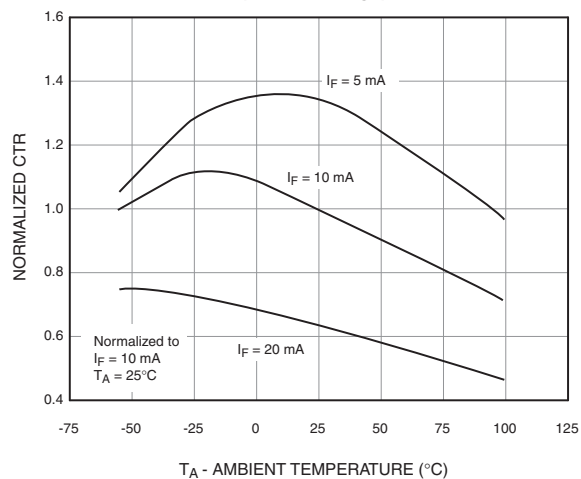
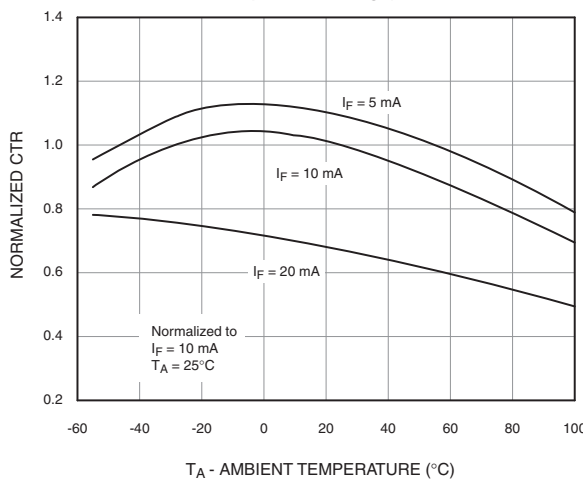
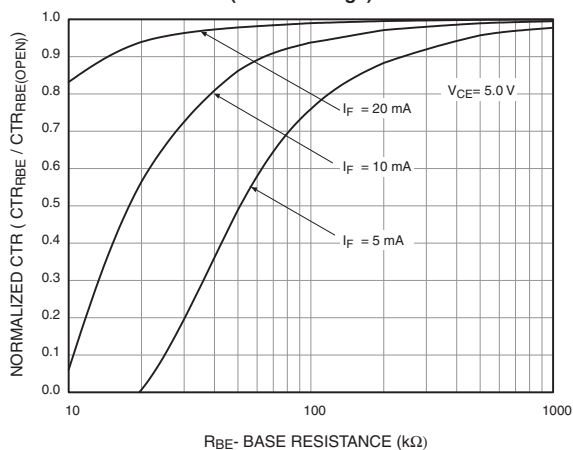


Fig. 6 Normalized CTR vs. Ambient Temperature (White Package)

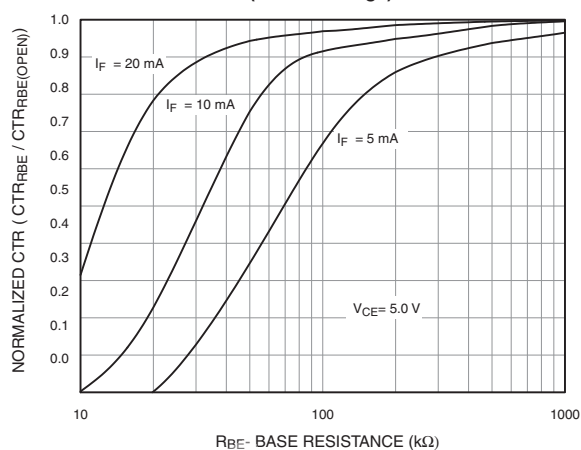


Typical Performance Curves (Continued)

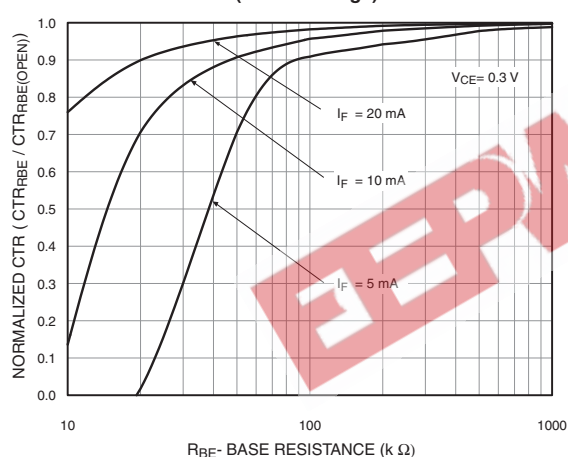
**Fig. 7 CTR vs. R_{BE} (Unsaturated)
(Black Package)**



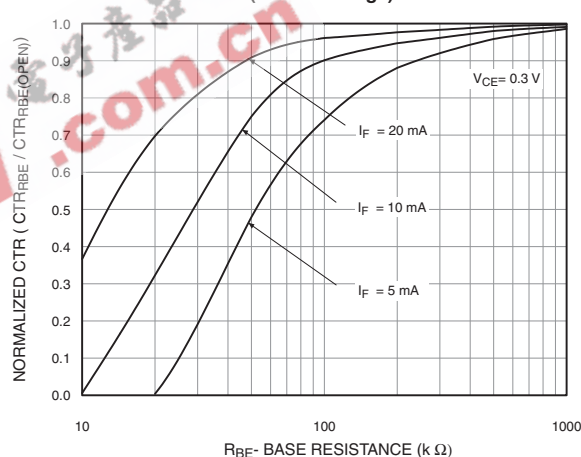
**Fig. 8 CTR vs. R_{BE} (Unsaturated)
(White Package)**



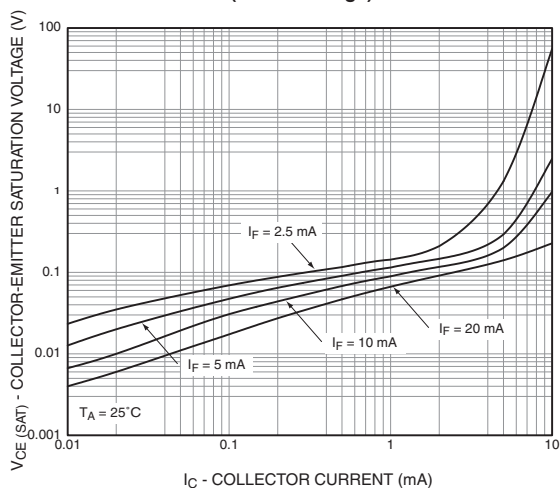
**Fig. 9 CTR vs. R_{BE} (Saturated)
(Black Package)**



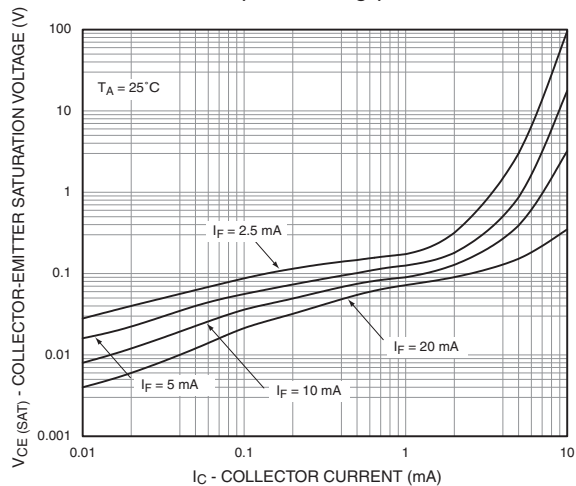
**Fig. 10 CTR vs. R_{BE} (Saturated)
(White Package)**



**Fig. 11 Collector-Emitter Saturation Voltage vs Collector Current
(Black Package)**



**Fig. 12 Collector-Emitter Saturation Voltage vs Collector Current
(White Package)**



Typical Performance Curves (Continued)

Fig. 13 Switching Speed vs. Load Resistor (Black Package)

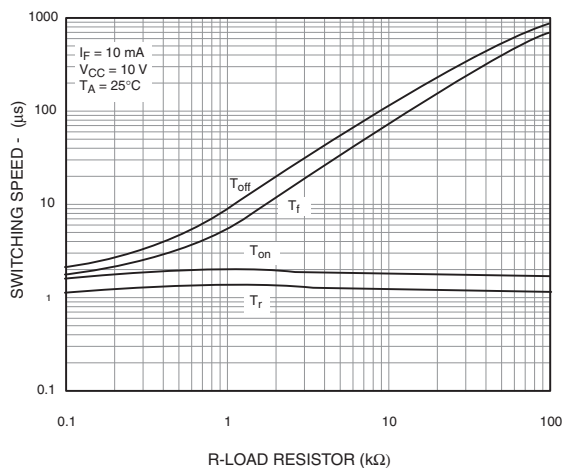


Fig. 14 Switching Speed vs. Load Resistor (White Package)

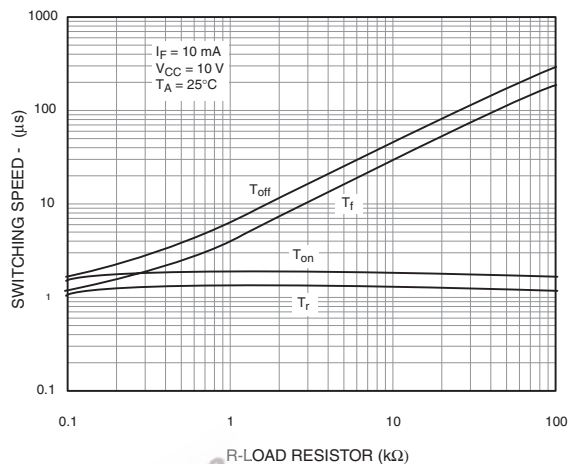


Fig. 15 Normalized t_{on} vs. R_{BE} (Black Package)

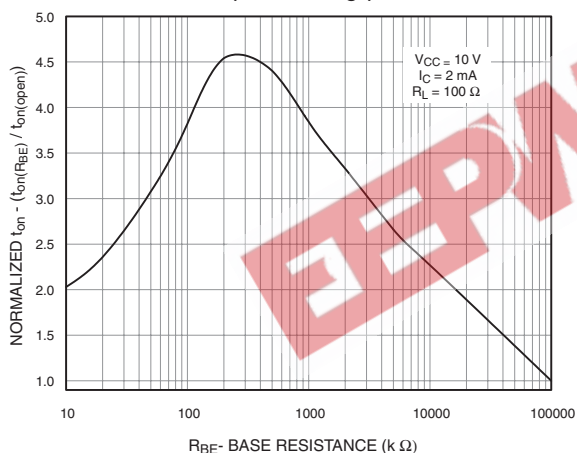


Fig. 16 Normalized t_{on} vs. R_{BE} (White Package)

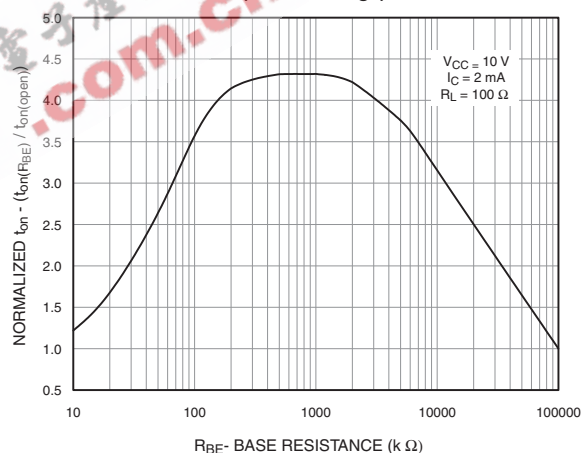


Fig. 17 Normalized t_{off} vs. R_{BE} (Black Package)

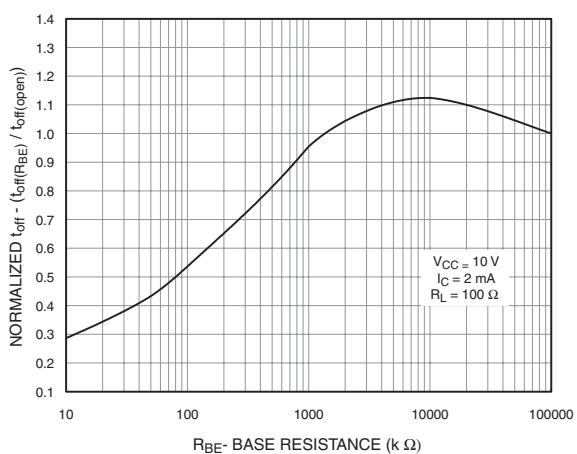
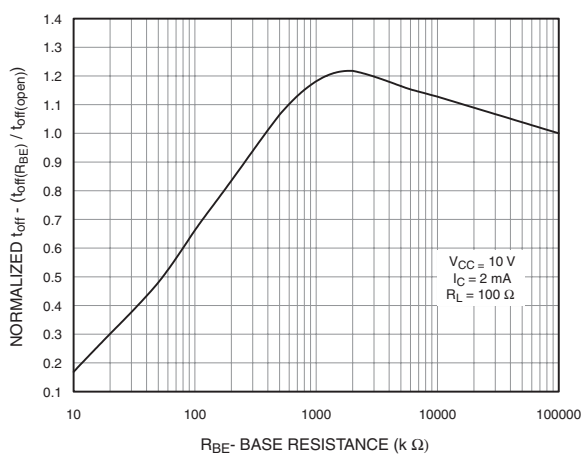


Fig. 18 Normalized t_{off} vs. R_{BE} (White Package)



Typical Performance Curves (Continued)

Fig. 19 Dark Current vs. Ambient Temperature

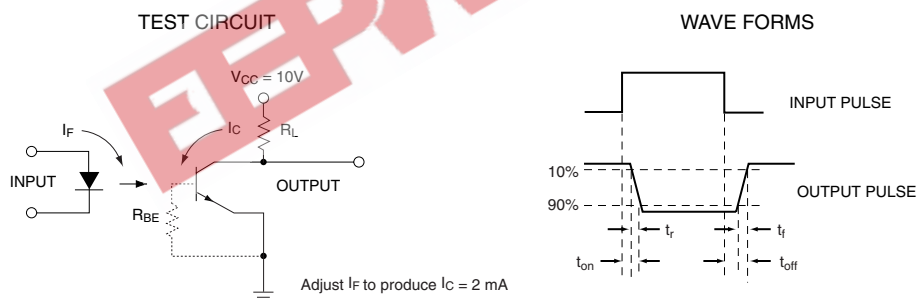
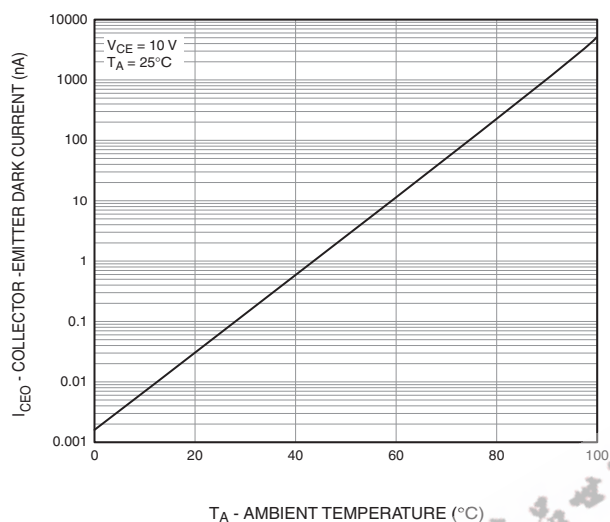
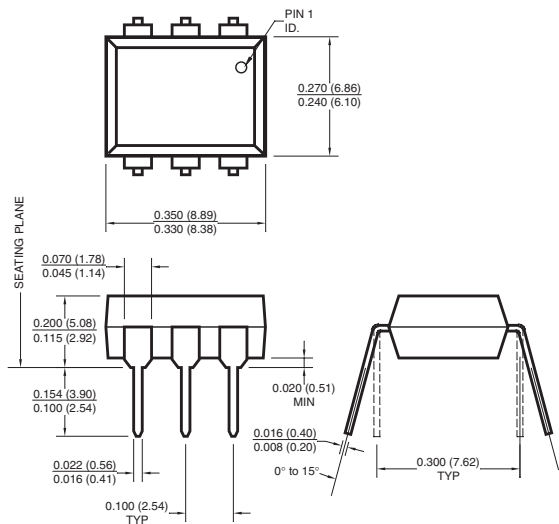


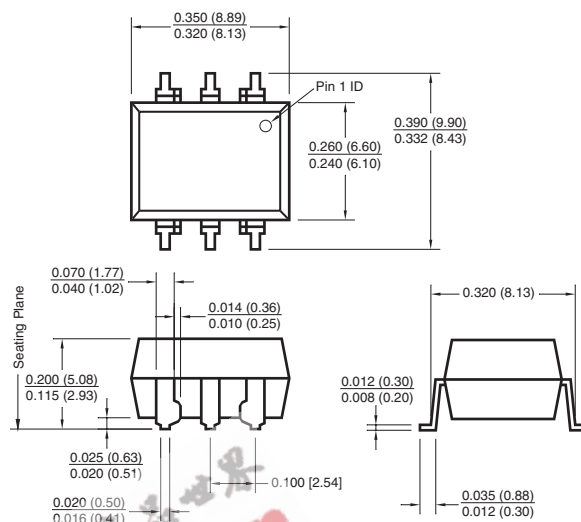
Figure 20. Switching Time Test Circuit and Waveforms

Black Package (No -M Suffix)

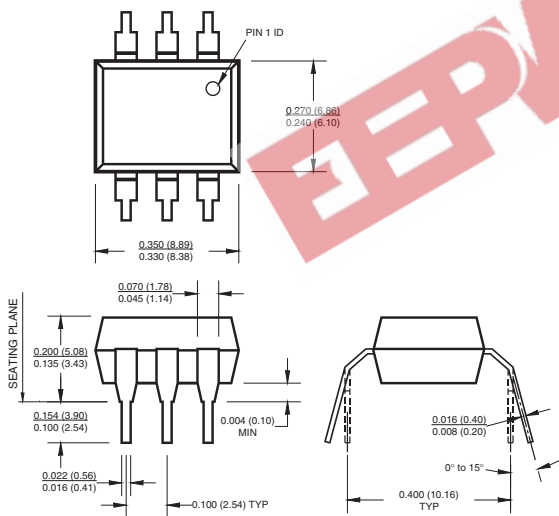
Package Dimensions (Through Hole)



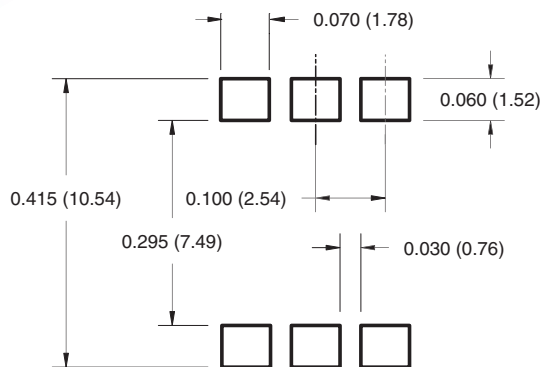
Package Dimensions (Surface Mount)



Package Dimensions (0.4" Lead Spacing)



Recommended Pad Layout for Surface Mount Leadform

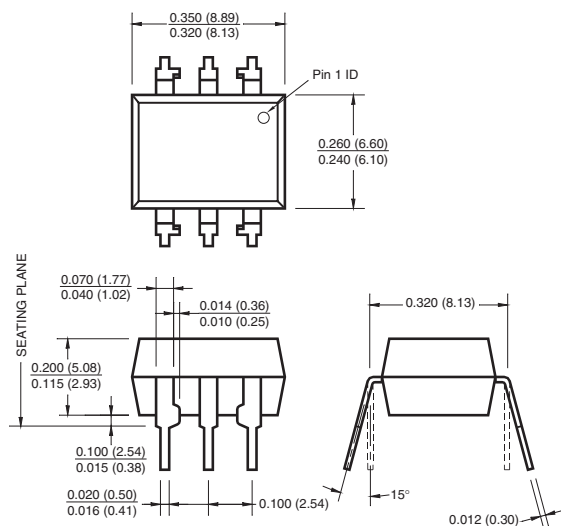


Note:

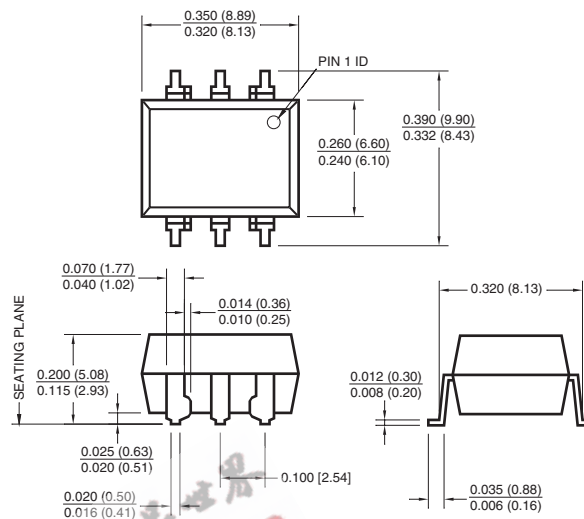
All dimensions are in inches (millimeters).

White Package (-M Suffix)

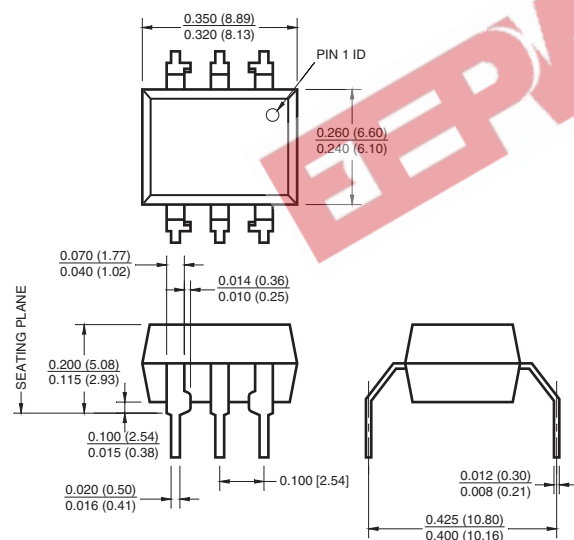
Package Dimensions (Through Hole)



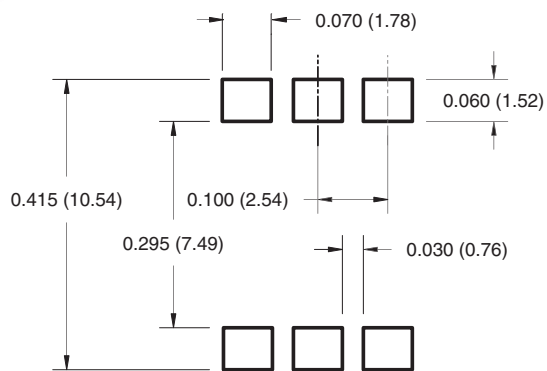
Package Dimensions (Surface Mount)



Package Dimensions (0.4" Lead Spacing)



Recommended Pad Layout for Surface Mount Leadform



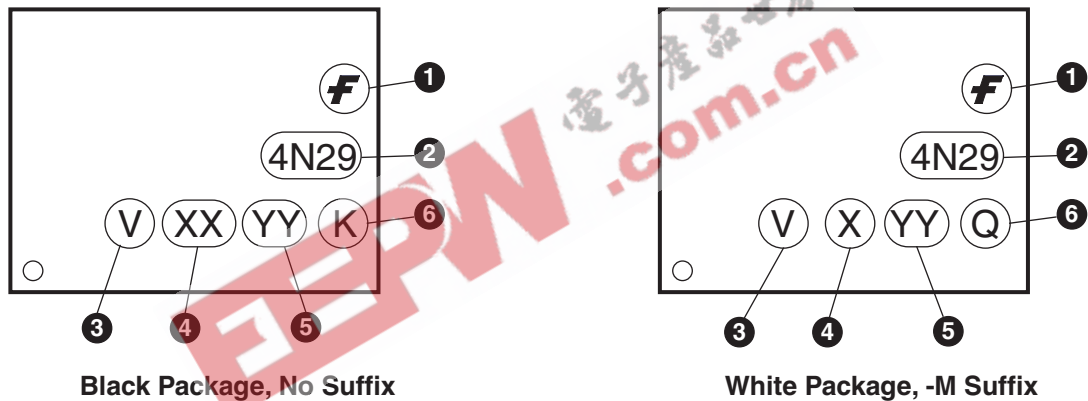
Note:

All dimensions are in inches (millimeters).

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

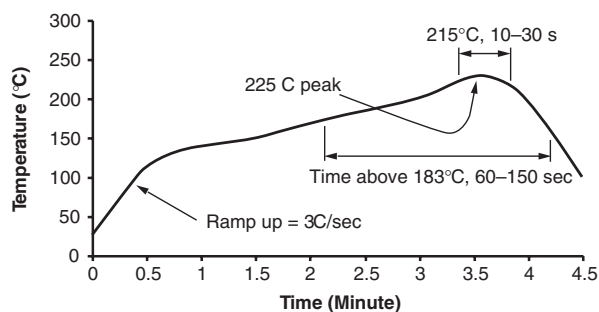


Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	One or two digit year code • Two digits for black package parts, e.g., '07' • One digit for white package parts, e.g., '7'
5	Two digit work week ranging from '01' to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

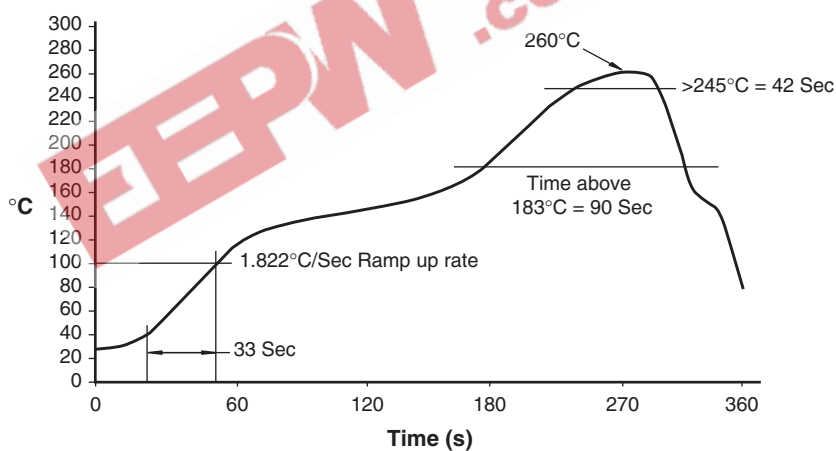
Reflow Soldering Profile

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

White Package, -M Suffix





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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; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	