

# CNY17-1, CNY17-3, CNY17-2, CNY17-4 Phototransistor Optocouplers

## Features

- CNY17-1/2/3 are also available in white package by specifying -M suffix (eg. CNY17-2-M)
- UL recognized (File # E90700)
- VDE recognized
  - 102497 for white package
  - Add option V for white package (e.g., CNY17-2V-M)
  - File #102497
  - Add option '300' for black package (e.g., CNY17-2.300)
  - File #94766
- Current transfer ratio in select groups
- High  $BV_{CEO}$ —70V minimum

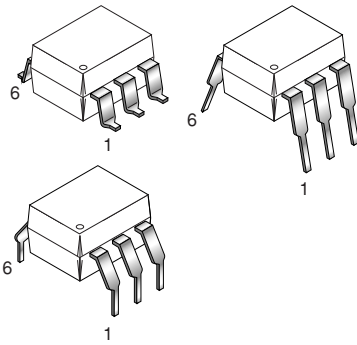
## Applications

- Power supply regulators
- Digital logic inputs
- Microprocessor inputs
- Appliance sensor systems
- Industrial controls

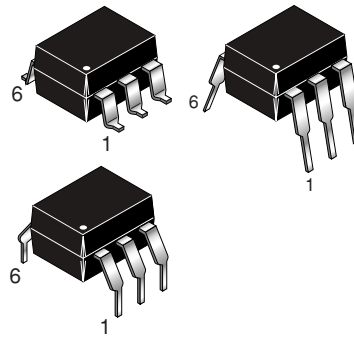
## Description

The CNY17 series consists of a Gallium Arsenide IRED coupled with an NPN phototransistor.

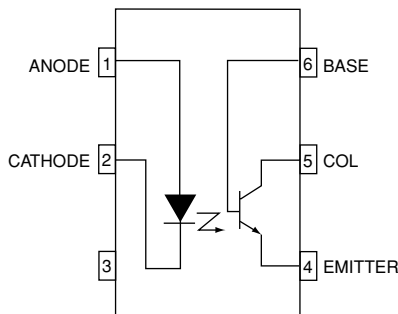
### White Package (-M Suffix)



### Black Package (No -M Suffix)



## Schematic



Parameters	Symbol	Device	Value	Units
<b>TOTAL DEVICE</b>				
Storage Temperature	$T_{STG}$	All	-55 to +150	°C
Operating Temperature	$T_{OPR}$	All	-55 to +100	°C
Lead Solder Temperature	$T_{SOL}$	All	260 for 10 sec	°C
Total Device Power Dissipation @ 25°C (LED plus detector)	$P_D$	-M	250	mW
Derate Linearly From 25°C		non -M	260	
		-M	2.94	mW/°C
		non -M	3.50	
<b>EMITTER</b>				
Continuous Forward Current	$I_F$	-M	60	mA
		non -M	90	
Reverse Voltage	$V_R$	All	6	V
Forward Current - Peak (1 $\mu$ s pulse, 300 pps)	$I_F$ (pk)	-M	1.5	A
		non -M	3.0	
LED Power Dissipation 25°C Ambient	$P_D$	-M	120	mW
Derate Linearly From 25°C		non -M	135	
		-M	1.41	mW/°C
		non -M	1.8	
<b>DETECTOR</b>				
Detector Power Dissipation @ 25°C	$P_D$	-M	150	mW
Derate Linearly from 25°C		non -M	200	
		-M	1.76	mW/°C
		non -M	2.67	

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

**Individual Component Characteristics**

Parameters	Test Conditions	Symbol	Device	Min	Typ	Max	Units
<b>EMITTER</b>							
Input Forward Voltage	$I_F = 60 \text{ mA}$	$V_F$	-M		1.35	1.65	V
	$I_F = 10 \text{ mA}$		non -M		1.15	1.50	
Capacitance	$V_F = 0 \text{ V}, f = 1.0 \text{ MHz}$	$C_J$	non -M		50		pF
			-M		18		
Reverse Leakage Current	$V_R = 6 \text{ V}$	$I_R$	All		0.001	10	$\mu\text{A}$
<b>DETECTOR</b>							
Breakdown Voltage							
Collector to Emitter	$I_C = 1.0 \text{ mA}, I_F = 0$	$BV_{CEO}$	All	70	100		V
Collector to Base	$I_C = 10 \mu\text{A}, I_F = 0$	$BV_{CBO}$	All	70	120		V
Emitter to Collector	$I_E = 100 \mu\text{A}, I_F = 0$	$BV_{ECO}$	All	7	10		V
Leakage Current							
Collector to Emitter	$V_{CE} = 10 \text{ V}, I_F = 0$	$I_{CEO}$	All		1	50	nA
Collector to Base	$V_{CB} = 10 \text{ V}, I_F = 0$	$I_{CBO}$	All			20	nA
Capacitance							
Collector to Emitter	$V_{CE} = 0, f = 1 \text{ MHz}$	$C_{CE}$	All		8		pF
Collector to Base	$V_{CB} = 0, f = 1 \text{ MHz}$	$C_{CB}$	All		20		pF
Emitter to Base	$V_{EB} = 0, f = 1 \text{ MHz}$	$C_{EB}$	All		10		pF

## Isolation Characteristics

Characteristic	Test Conditions	Symbol	Device	Min	Typ**	Max	Units
Input-Output Isolation Voltage	f = 60 Hz, t = 1 min.	V <sub>ISO</sub>	Black Package	5300			Vac(rms)*
			'-M' White Package	7500			Vac(pk)
Isolation Resistance	V <sub>I-O</sub> = 500 VDC	R <sub>ISO</sub>	All	1011			Ω
Isolation Capacitance	V <sub>I-O</sub> = Ø, f = 1 MHz	C <sub>ISO</sub>	Black Package		0.5		pF
			'-M' White Package		0.2		

Note

\* 5300 Vac(rms) for 1 minute equates to approximately 9000 Vac (pk) for 1 second

\*\* Typical values at T<sub>A</sub> = 25°C

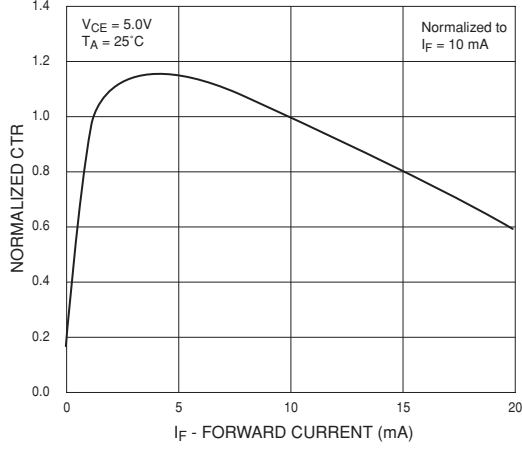
## Transfer Characteristics (T<sub>A</sub> = 25°C Unless otherwise specified.)

DC Characteristics	Test Conditions	Symbol	Device	Min	Typ	Max	Units
Current Transfer Ratio, Collector to Emitter	I <sub>F</sub> = 10 mA, V <sub>CE</sub> = 5 V	CTR	CNY17-1/-1-M	40		80	%
			CNY17-2/-2-M	63		125	
			CNY17-3/-3-M	100		200	
			CNY17-4	160		320	
Saturation Voltage	I <sub>F</sub> = 10 mA, I <sub>C</sub> = 2.5 mA	V <sub>CE(SAT)</sub>	All			.40	V
AC Characteristics	Test Conditions	Symbol	Device	Min	Typ	Max	Units
<b>Non-Saturated Switching Times</b>							
Turn-On Time (Fig.19 and Fig.20)	R <sub>L</sub> = 100 Ω, I <sub>C</sub> = 2 mA, V <sub>CC</sub> = 10 V	t <sub>on</sub>	non -M			10	μs
Turn-Off Time (Fig.19 and Fig.20)	R <sub>L</sub> = 100 Ω, I <sub>C</sub> = 2 mA, V <sub>CC</sub> = 10 V	t <sub>off</sub>	non -M			10	μs
Delay Time (Fig.19 and Fig.20)	I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 75 Ω	t <sub>d</sub>	-M			5.6	μs
Rise Time (Fig.19 and Fig.20)	I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 75 Ω	t <sub>r</sub>	-M			4.0	μs
Storage Time (Fig.19 and Fig.20)	I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 75 Ω	t <sub>s</sub>	-M			4.1	μs
Fall Time (Fig.19 and Fig.20)	I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 75 Ω	t <sub>f</sub>	-M			3.5	μs
<b>Saturated Switching Times</b>							
Turn-On Time (Fig.19 and Fig.20)	I <sub>F</sub> = 20 mA, V <sub>CE</sub> = 0.4 V	t <sub>on</sub>	CNY17-1			5.5	μs
	I <sub>F</sub> = 10 mA, V <sub>CE</sub> = 0.4 V		CNY17-2, CNY17-3, CNY17-4			8.0	
Rise-Time (Fig.19 and Fig.20)	I <sub>F</sub> = 20 mA, V <sub>CE</sub> = 0.4 V	t <sub>r</sub>	CNY17-1			4.0	μs
	I <sub>F</sub> = 10 mA, V <sub>CE</sub> = 0.4 V		CNY17-2, CNY17-3, CNY17-4			6.0	
	I <sub>F</sub> = 20 mA, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 1 KΩ		CNY17-1-M			4.0	
	I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 1 KΩ		CNY17-2-M, CNY17-3-M			6.0	
Delay Time (Fig.19 and Fig.20)	I <sub>F</sub> = 20 mA, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 1 KΩ	t <sub>d</sub>	CNY17-1-M			5.5	μs
	I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 1 KΩ		CNY17-2, CNY17-3			8.0	
Turn-Off Time (Fig.19 and Fig.20)	I <sub>F</sub> = 20 mA, V <sub>CE</sub> = 0.4 V	t <sub>off</sub>	CNY17-1			34.0	ms
	I <sub>F</sub> = 10 mA, V <sub>CE</sub> = 0.4 V		CNY17-2, CNY17-3, CNY17-4			39.0	

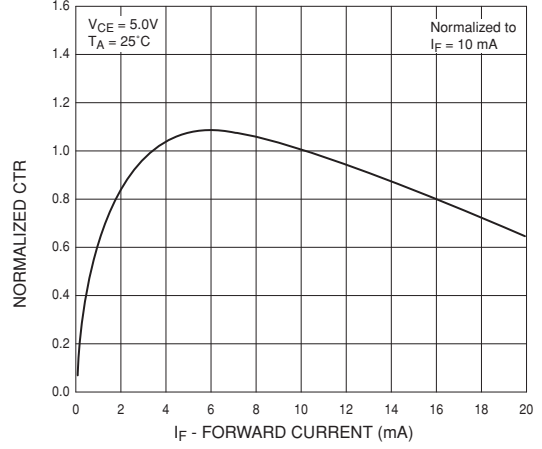
**Transfer Characteristics** ( $T_A = 25^\circ\text{C}$  Unless otherwise specified.) (Continued)

DC Characteristics	Test Conditions	Symbol	Device	Min	Typ	Max	Units
Fall-Time (Fig. 19 and Fig. 20)	$I_F = 20 \text{ mA}, V_{CE} = 0.4\text{V}$	$t_f$	CNY17-1			20.0	$\mu\text{s}$
	$I_F = 10 \text{ mA}, V_{CE} = 0.4\text{V}$		CNY17-2, CNY17-3, CNY17-4			24.0	
	$I_F = 20 \text{ mA}, V_{CC} = 5\text{V}, R_L = 1\text{K}\Omega$		CNY17-1-M			20.0	
	$I_F = 10 \text{ mA}, V_{CC} = 5\text{V}, R_L = 1\text{K}\Omega$		CNY17-2-M, CNY17-3-M,			24.0	
Storage Time (Fig. 19 and Fig. 20)	$I_F = 20 \text{ mA}, V_{CC} = 5\text{V}, R_L = 1\text{K}\Omega$	$t_s$	CNY17-1-M			34.0	$\mu\text{s}$
	$I_F = 10 \text{ mA}, V_{CC} = 5\text{V}, R_L = 1\text{K}\Omega$		CNY17-2-M, CNY17-3-M,			39.0	

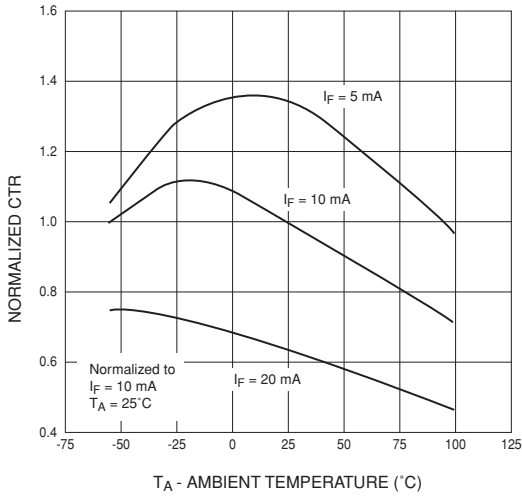
**Fig.1 Normalized CTR vs. Forward Current (Black Package)**



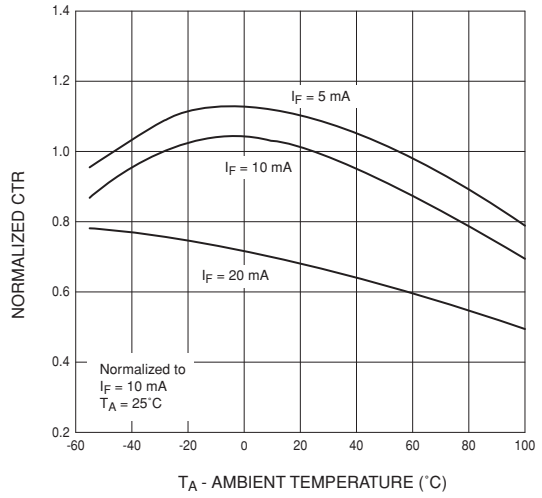
**Fig.2 Normalized CTR vs. Forward Current (White Package)**



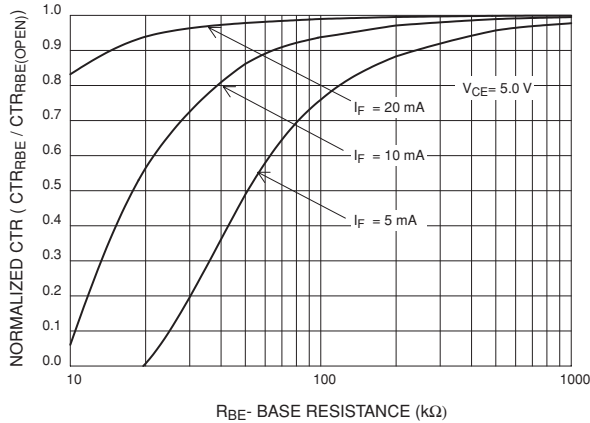
**Fig.3 Normalized CTR vs. Ambient Temperature (Black Package)**



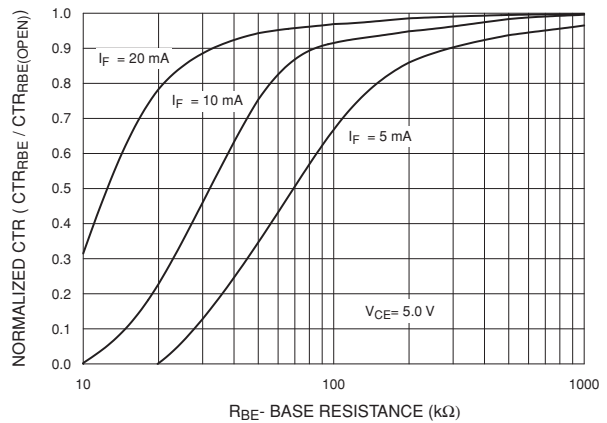
**Fig.4 Normalized CTR vs. Ambient Temperature (White Package)**



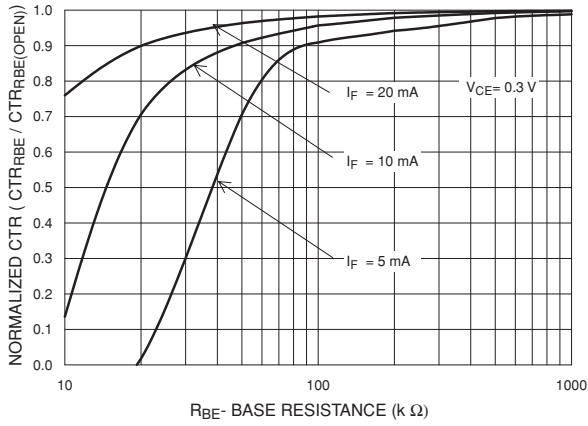
**Fig.5 CTR vs. R\_BE (Unsaturated) (Black Package)**



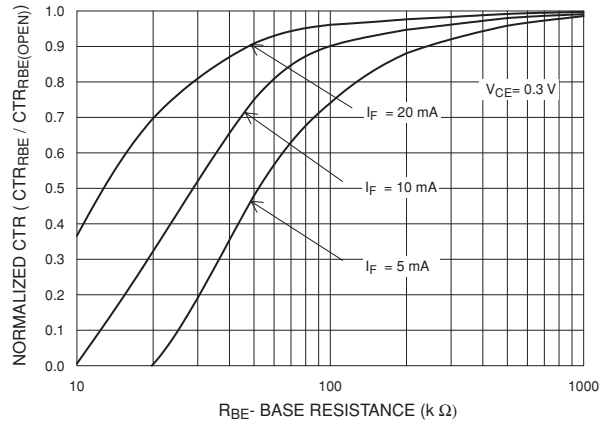
**Fig.6 CTR vs. R\_BE (Unsaturated) (White Package)**



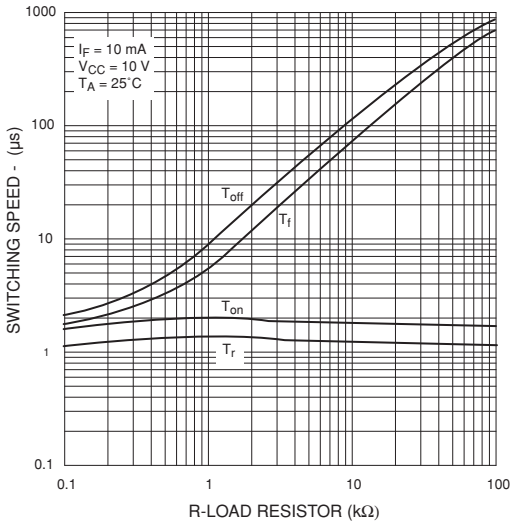
**Fig. 7 CTR vs. RBE (Saturated)  
(Black Package)**



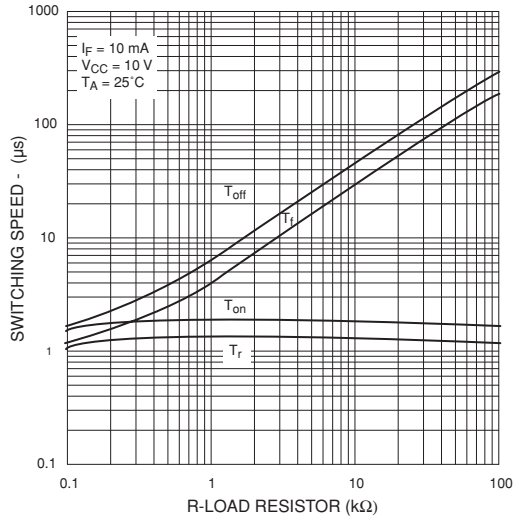
**Fig. 8 CTR vs. RBE (Saturated)  
(White Package)**



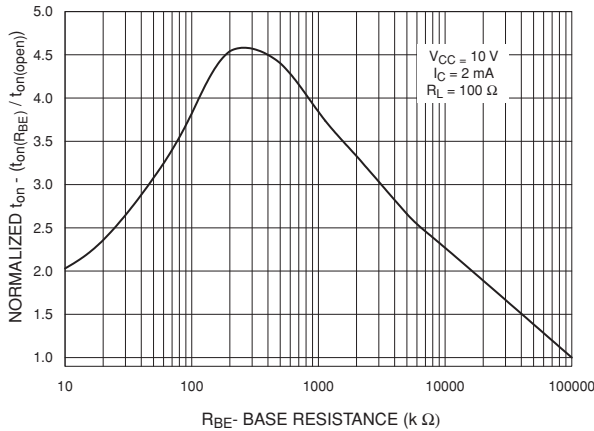
**Fig. 9 Switching Speed vs. Load Resistor  
(Black Package)**



**Fig. 10 Switching Speed vs. Load Resistor  
(White Package)**



**Fig. 11 Normalized t\_on vs. RBE  
(Black Package)**



**Fig. 12 Normalized t\_on vs. RBE  
(White Package)**

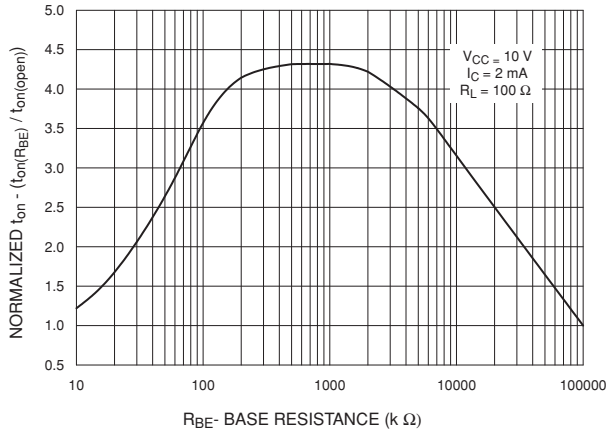


Fig. 13 Normalized  $t_{off}$  vs.  $R_{BE}$  (Black Package)

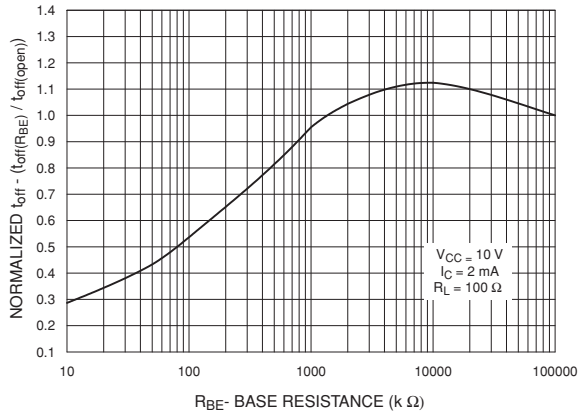


Fig. 14 Normalized  $t_{off}$  vs.  $R_{BE}$  (White Package)

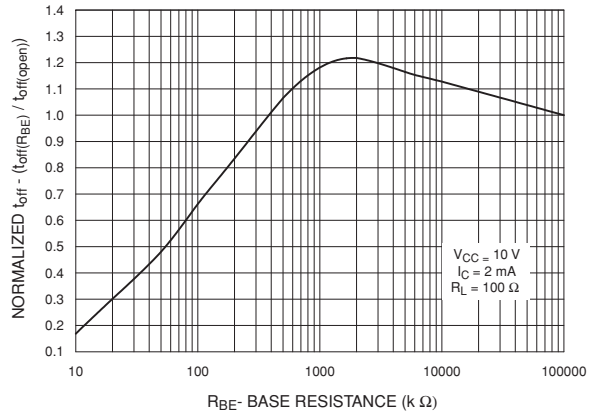


Fig. 15 LED Forward Voltage vs. Forward Current (Black Package)

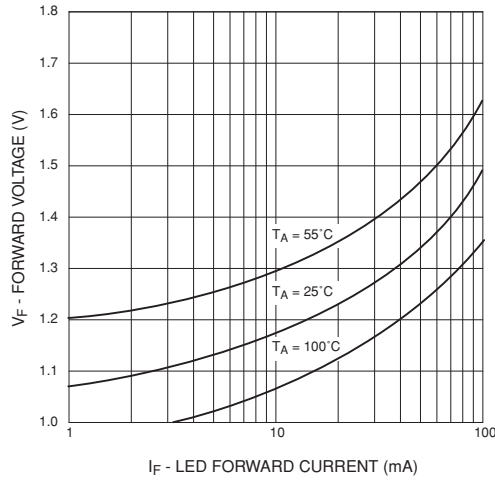


Fig. 16 LED Forward Voltage vs. Forward Current (White Package)

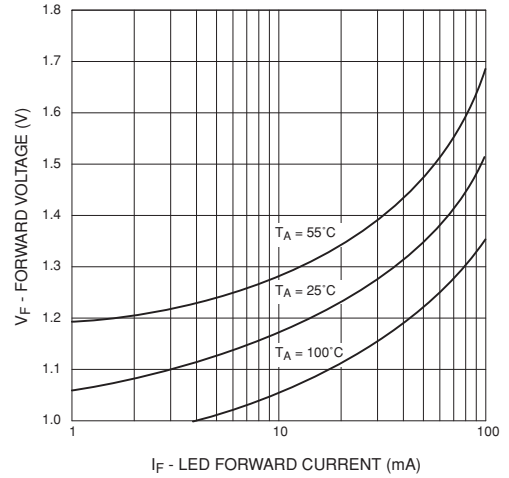


Fig. 17 Collector Current vs. Collector-Emitter Saturation Voltage

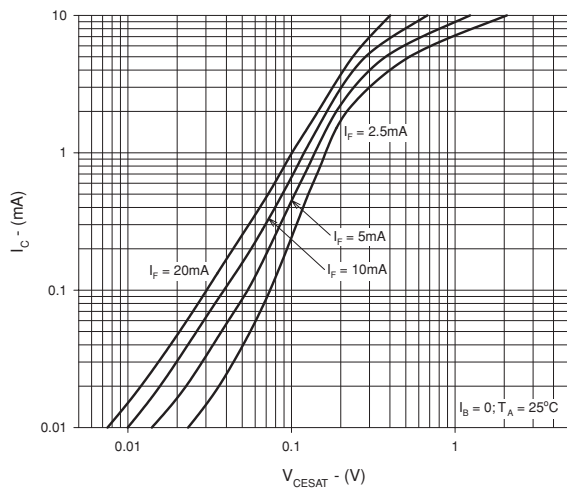
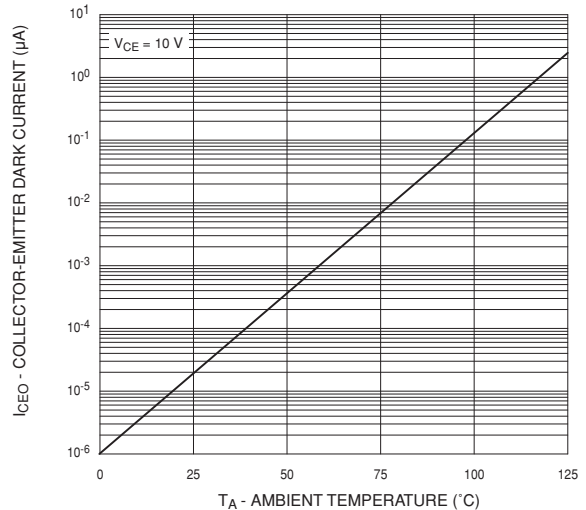


Fig. 18 Dark Current vs. Ambient Temperature (Black Package)



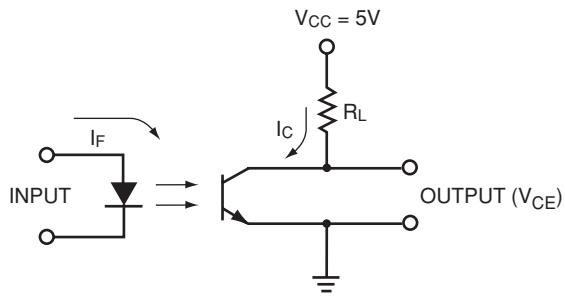


Figure 19. Switching Time Test Circuit

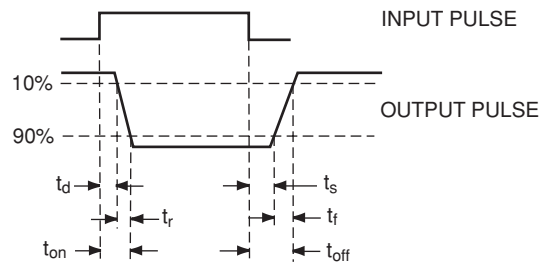
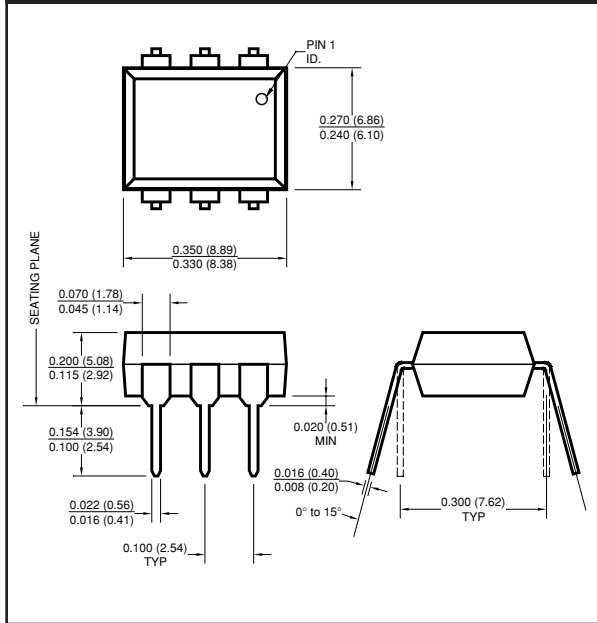


Figure 20. Switching Time Test Circuit

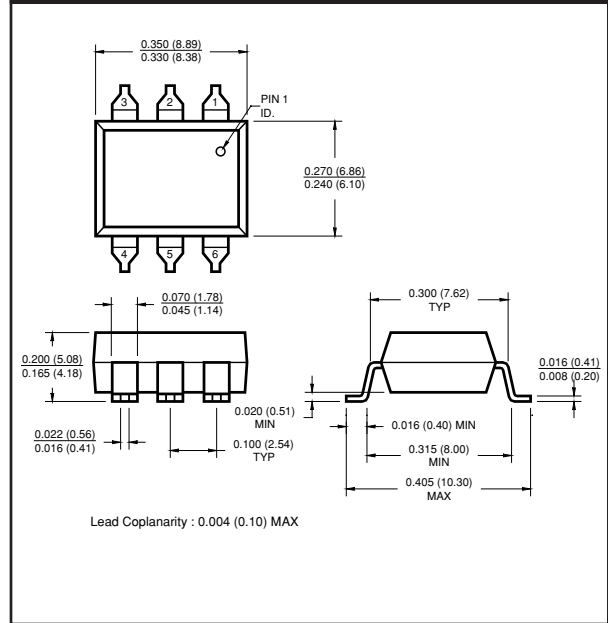


**Black Package (No -M Suffix)**

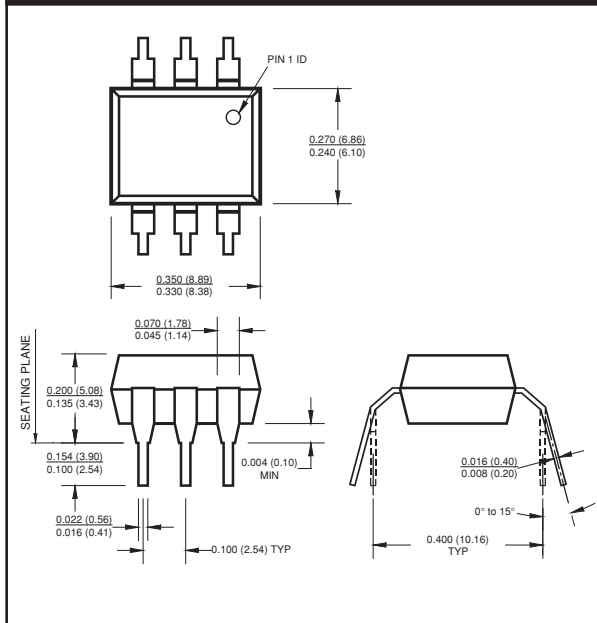
**Package Dimensions (Through Hole)**



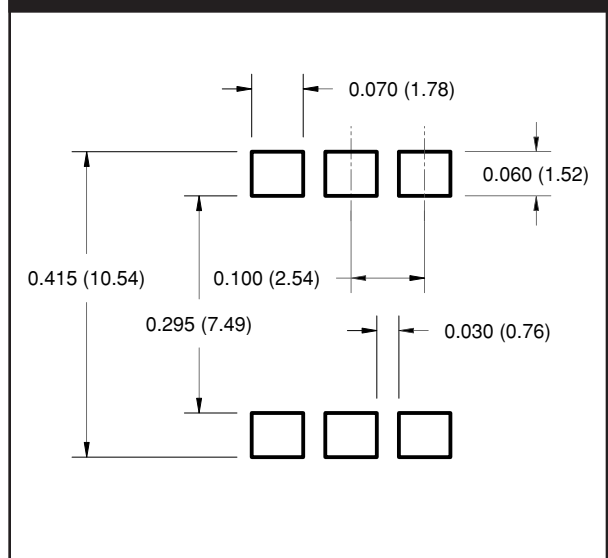
**Package Dimensions (Surface Mount)**



**Package Dimensions (0.4" Lead Spacing)**



**Recommended Pad Layout for Surface Mount Leadform (Black Package Only)**

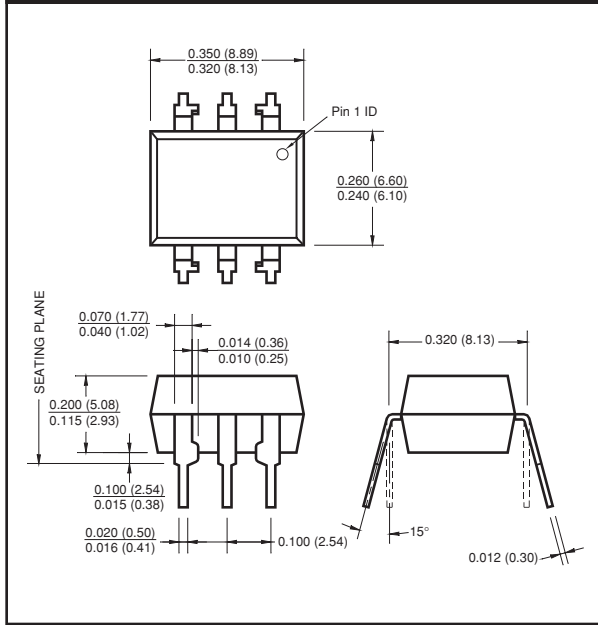


**NOTE**

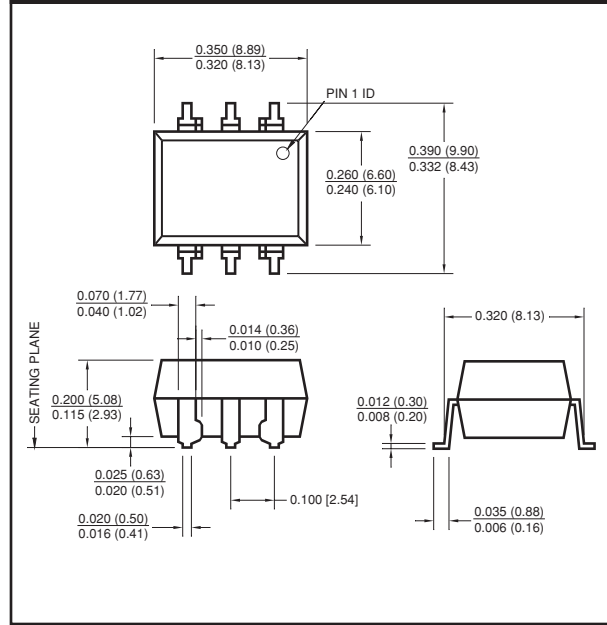
All dimensions are in inches (millimeters)

**White Package (-M Suffix)**

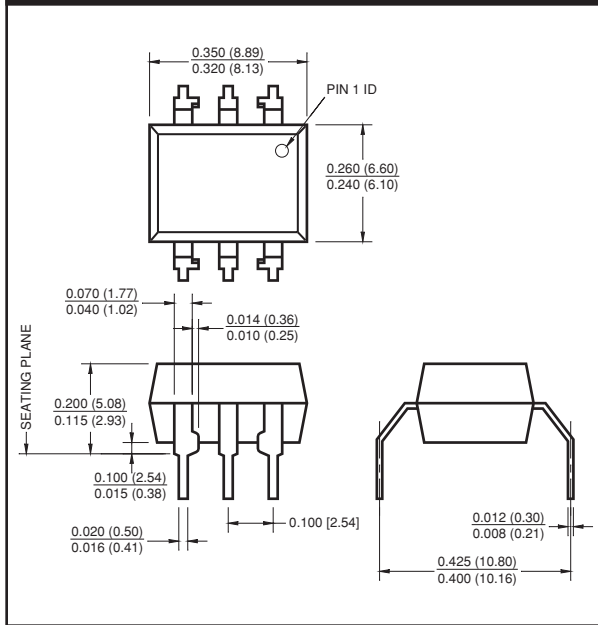
**Package Dimensions (Through Hole)**



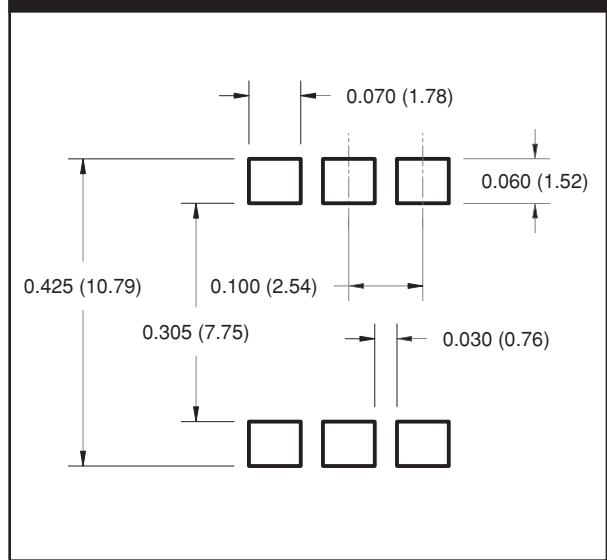
**Package Dimensions (Surface Mount)**



**Package Dimensions (0.4" Lead Spacing)**



**Recommended Pad Layout for Surface Mount Leadform (White Package Only)**



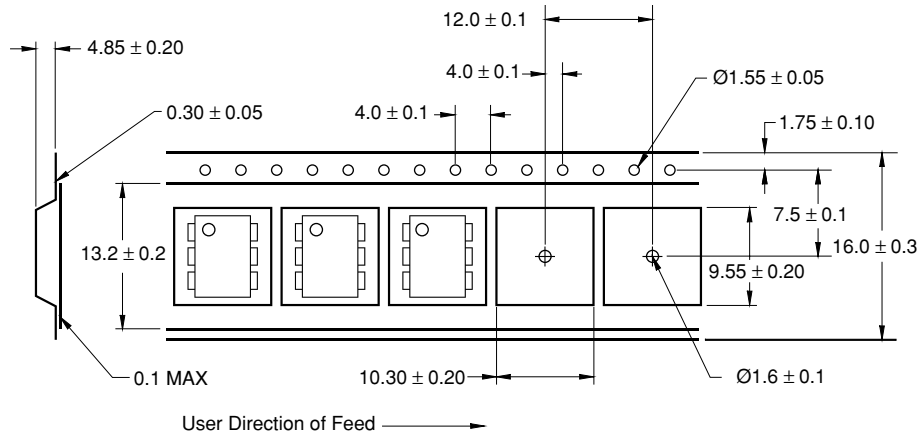
**NOTE**

All dimensions are in inches (millimeters)

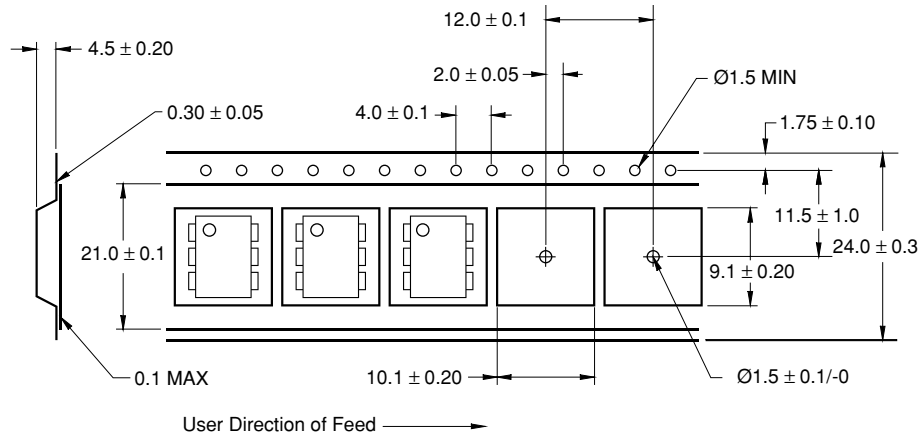
### Ordering Information

Option	Black Package (No Suffix)	White Package (-M Suffix)	Description
<b>Order Entry Identifier</b>			
S	.S	S	Surface Mount Lead Bend
SD	.SD	SR2	Surface Mount; Tape and reel
W	.W	T	0.4" Lead Spacing
300	.300	V	VDE 0884
300W	.300W	TV	VDE 0884, 0.4" Lead Spacing
3S	.3S	SV	VDE 0884, Surface Mount
3SD	.3SD	SR2V	VDE 0884, Surface Mount, Tape & Reel

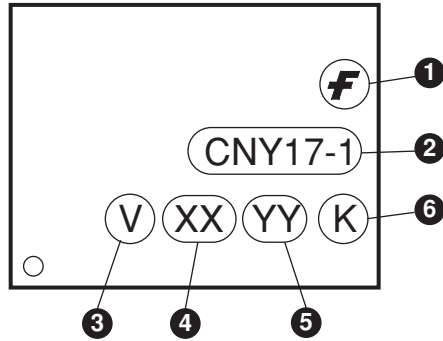
### Carrier Tape Specifications (Black Package, No Suffix)



### Carrier Tape Specifications (White Package, -M Suffix)



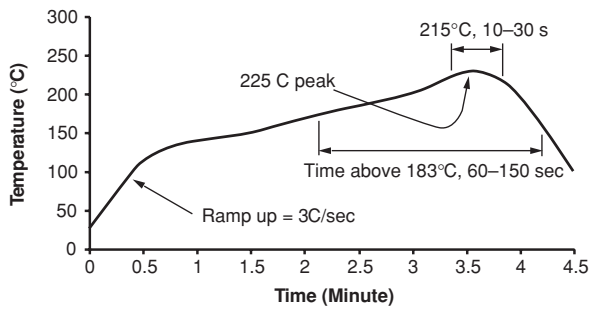
## Marking Information



### Definitions

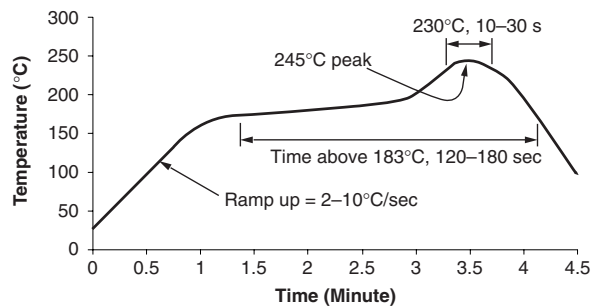
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	Two digits year code, e.g., '03'
5	Two digit work week ranging from '01' to '53'
6	Assembly package code

### 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

### Reflow Profile (White Package, -M Suffix)



- Peak reflow temperature: 245°C (package surface temperature)
- Time of temperature higher than 183°C for 120–180 seconds
- One time soldering reflow is recommended

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CoolFET™	FRFET™	MicroFET™	PowerTrench®	SuperSOT™-6
CROSSVOLT™	GlobalOptoisolator™	MicroPak™	QFET®	SuperSOT™-8
DOME™	GTO™	MICROWIRE™	QS™	SyncFET™
EcoSPARK™	HiSeC™	MSX™	QT Optoelectronics™	TinyLogic®
E <sup>2</sup> CMOS™	IC™	MSXPro™	Quiet Series™	TINYOPTO™
EnSigna™	i-Lo™	OCX™	RapidConfigure™	TruTranslation™
FACT™	ImpliedDisconnect™	OCXPro™	RapidConnect™	UHC™
FACT Quiet Series™		OPTOLOGIC®	μSerDes™	UltraFET®
Across the board. Around the world.™		OPTOPLANAR™	SILENT SWITCHER®	UniFET™
The Power Franchise®		PACMAN™	SMART START™	VCX™
Programmable Active Droop™		POP™	SPM™	

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

**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.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
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