



July 2005

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

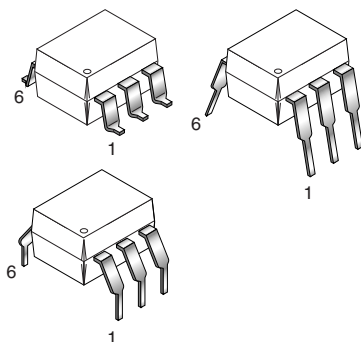
Applications

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

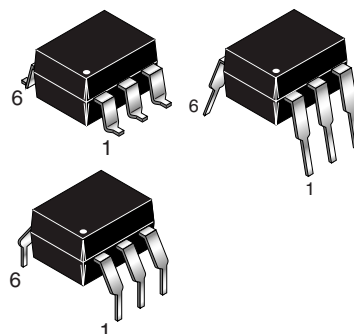
Description

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

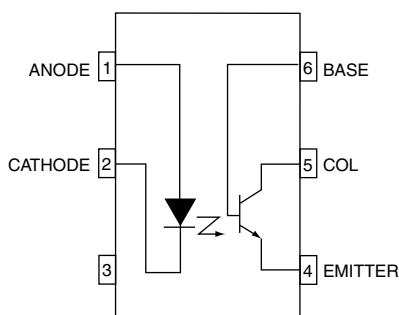
White Package (-M Suffix)



Black Package (No -M Suffix)



Schematic



Parameters	Symbol	Device	Value	Units
TOTAL DEVICE				
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	
EMITTER				
Continuous Forward Current	I _F	-M	60	mA
		non -M	90	
Reverse Voltage	V _R	All	6	V
Forward Current - Peak (1 μs 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	
DETECTOR				
Detector Power Dissipation @ 25°C	P _D	-M	150	mW
		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
EMITTER							
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	μA
DETECTOR							
Breakdown Voltage	$I_C = 1.0\text{ mA}, I_F = 0$ $I_C = 10\text{ }\mu\text{A}, I_F = 0$ $I_E = 100\text{ }\mu\text{A}, I_F = 0$	BV_{CEO}	All	70	100		V
Collector to Emitter		BV_{CBO}	All	70	120		V
Collector to Base		BV_{ECO}	All	7	10		V
Leakage Current	$V_{CE} = 10\text{ V}, I_F = 0$ $V_{CB} = 10\text{ V}, I_F = 0$	I_{CEO} I_{CBO}	All		1	50	nA
Collector to Emitter			All			20	nA
Capacitance	$V_{CE} = 0, f = 1\text{ MHz}$ $V_{CB} = 0, f = 1\text{ MHz}$ $V_{EB} = 0, f = 1\text{ MHz}$	C_{CE}	All		8		pF
Collector to Emitter		C_{CB}	All		20		pF
Collector to Base		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 _{ISO}	Black Package	5300			Vac(rms)*
			'-M' White Package	7500			Vac(pk)
Isolation Resistance	V _{I-O} = 500 VDC	R _{ISO}	All	1011			Ω
Isolation Capacitance	V _{I-O} = Ø, f = 1 MHz	C _{ISO}	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_A = 25°C

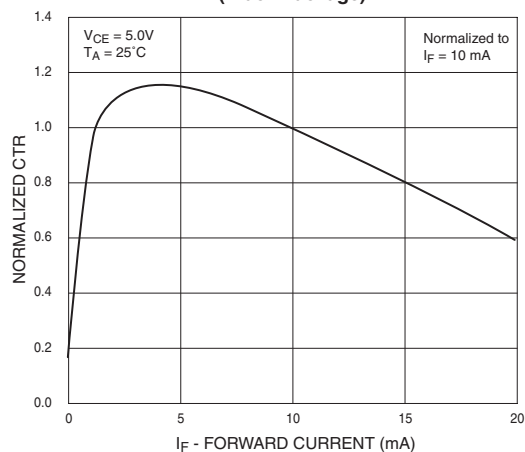
Transfer Characteristics (T_A = 25°C Unless otherwise specified.)

DC Characteristics	Test Conditions	Symbol	Device	Min	Typ	Max	Units
Current Transfer Ratio, Collector to Emitter	I _F = 10 mA, V _{CE} = 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 _F = 10 mA, I _C = 2.5 mA	V _{CE(SAT)}	All			.40	V
AC Characteristics	Test Conditions	Symbol	Device	Min	Typ	Max	Units
Non-Saturated Switching Times							
Turn-On Time (Fig.19 and Fig.20)	R _L = 100 Ω, I _C = 2 mA, V _{CC} = 10 V	t _{on}	non -M			10	μs
Turn-Off Time (Fig.19 and Fig.20)	R _L = 100 Ω, I _C = 2 mA, V _{CC} = 10 V	t _{off}	non -M			10	μs
Delay Time (Fig.19 and Fig.20)	I _F = 10 mA, V _{CC} = 5 V, R _L = 75 Ω	t _d	-M			5.6	μs
Rise Time (Fig.19 and Fig.20)	I _F = 10 mA, V _{CC} = 5 V, R _L = 75 Ω	t _r	-M			4.0	μs
Storage Time (Fig.19 and Fig.20)	I _F = 10 mA, V _{CC} = 5 V, R _L = 75 Ω	t _s	-M			4.1	μs
Fall Time (Fig.19 and Fig.20)	I _F = 10 mA, V _{CC} = 5 V, R _L = 75 Ω	t _f	-M			3.5	μs
Saturated Switching Times							
Turn-On Time (Fig.19 and Fig.20)	I _F = 20 mA, V _{CE} = 0.4 V	t _{on}	CNY17-1			5.5	μs
	I _F = 10 mA, V _{CE} = 0.4 V		CNY17-2, CNY17-3, CNY17-4			8.0	
Rise-Time (Fig.19 and Fig.20)	I _F = 20 mA, V _{CE} = 0.4 V	t _r	CNY17-1			4.0	μs
	I _F = 10 mA, V _{CE} = 0.4 V		CNY17-2, CNY17-3, CNY17-4			6.0	
	I _F = 20 mA, V _{CC} = 5 V, R _L = 1 KΩ		CNY17-1-M			4.0	
	I _F = 10 mA, V _{CC} = 5 V, R _L = 1 KΩ		CNY17-2-M, CNY17-3-M			6.0	
Delay Time (Fig.19 and Fig.20)	I _F = 20 mA, V _{CC} = 5 V, R _L = 1 KΩ	t _d	CNY17-1-M			5.5	μs
	I _F = 10 mA, V _{CC} = 5 V, R _L = 1 KΩ		CNY17-2, CNY17-3			8.0	
Turn-Off Time (Fig.19 and Fig.20)	I _F = 20 mA, V _{CE} = 0.4 V	t _{off}	CNY17-1			34.0	ms
	I _F = 10 mA, V _{CE} = 0.4 V		CNY17-2, CNY17-3, CNY17-4			39.0	

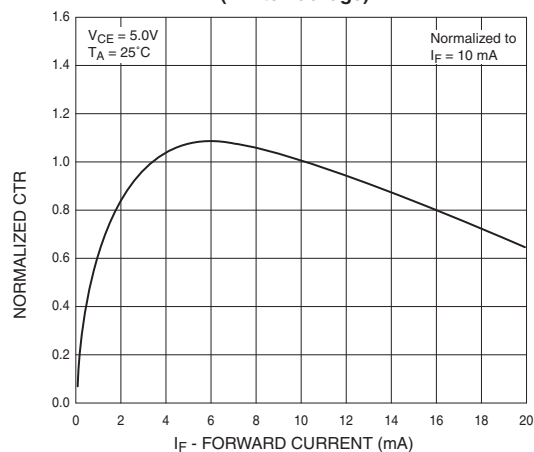
Transfer Characteristics ($T_A = 25^\circ\text{C}$ Unless otherwise specified.) (Continued)

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	μs
	$I_F = 10\text{ mA}, V_{CE} = 0.4\text{V}$		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	μs
	$I_F = 10\text{ mA}, V_{CC} = 5\text{V}, R_L = 1\text{K}\Omega$		CNY17-2-M, CNY17-3-M,			39.0	

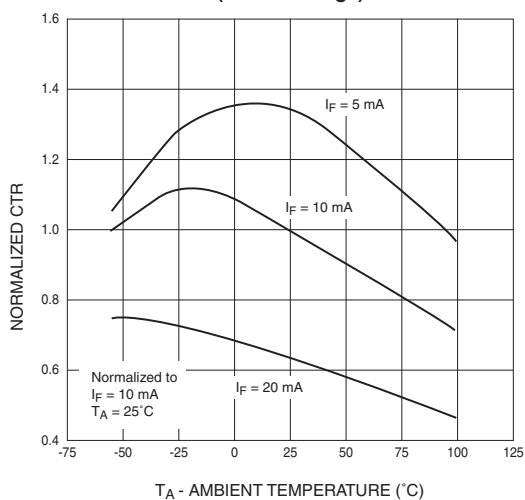
**Fig.1 Normalized CTR vs. Forward Current
(Black Package)**



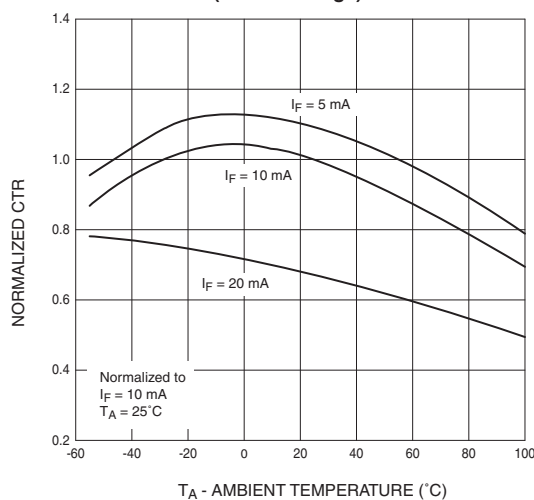
**Fig.2 Normalized CTR vs. Forward Current
(White Package)**



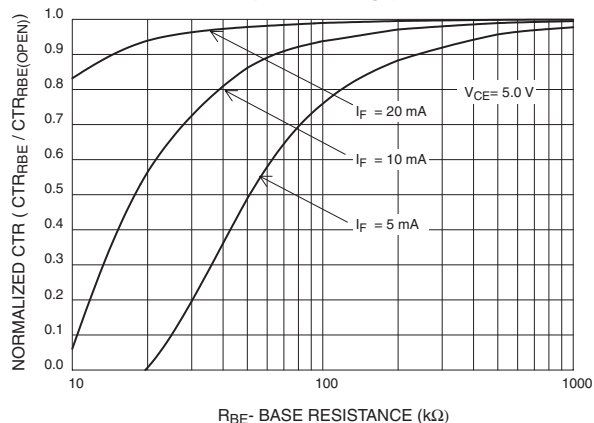
**Fig. 3 Normalized CTR vs. Ambient Temperature
(Black Package)**



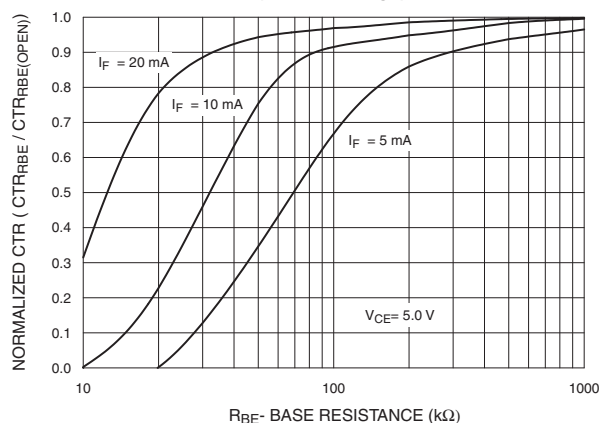
**Fig. 4 Normalized CTR vs. Ambient Temperature
(White Package)**



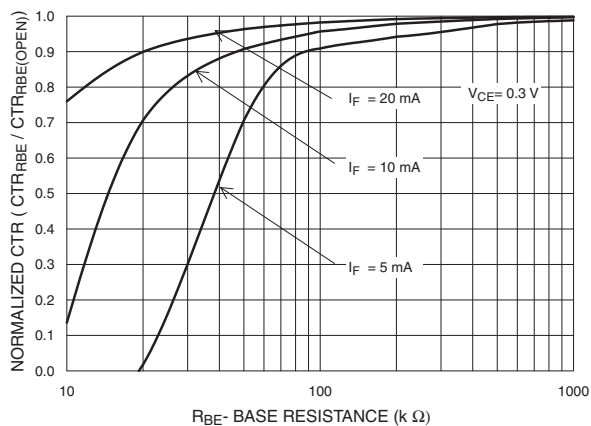
**Fig. 5 CTR vs. RBE (Unsaturated)
(Black Package)**



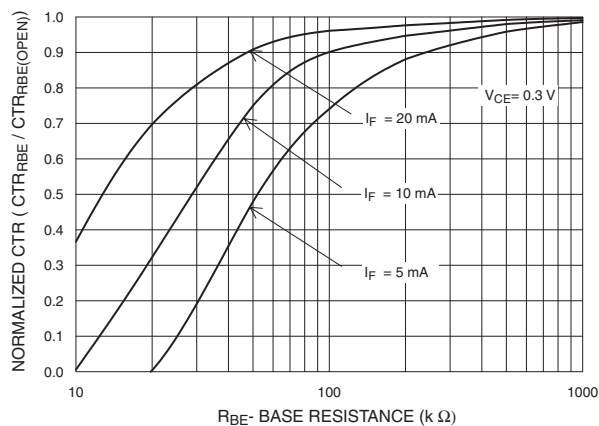
**Fig. 6 CTR vs. RBE (Unsaturated)
(White Package)**



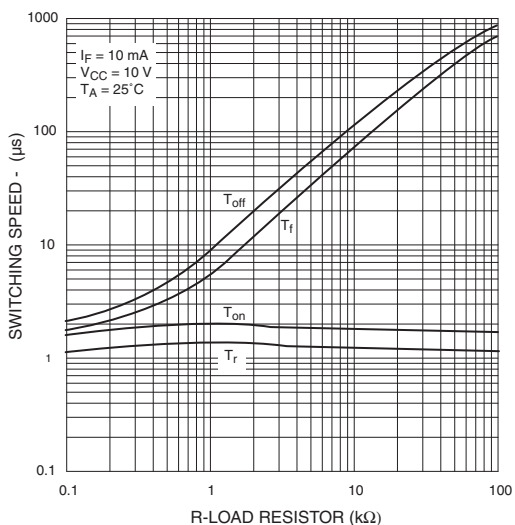
**Fig. 7 CTR vs. R_{BE} (Saturated)
(Black Package)**



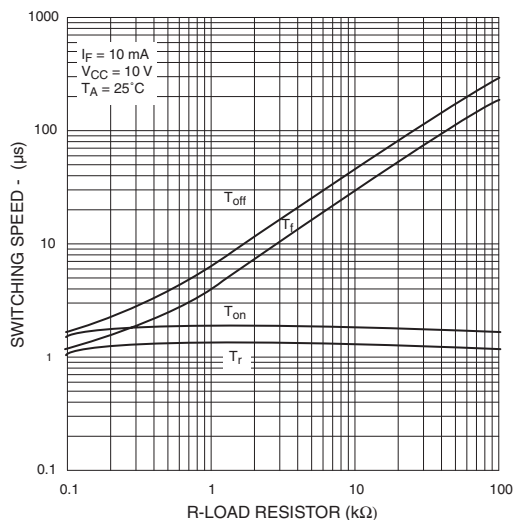
**Fig. 8 CTR vs. R_{BE} (Saturated)
(White Package)**



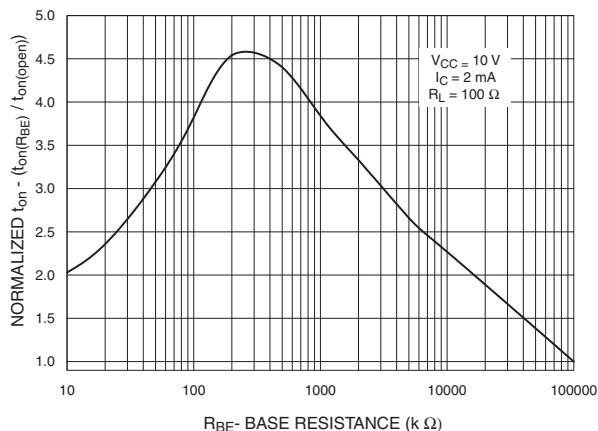
**Fig. 9 Switching Speed vs. Load Resistor
(Black Package)**



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



**Fig. 11 Normalized t_{on} vs. R_{BE}
(Black Package)**



**Fig. 12 Normalized t_{on} vs. R_{BE}
(White Package)**

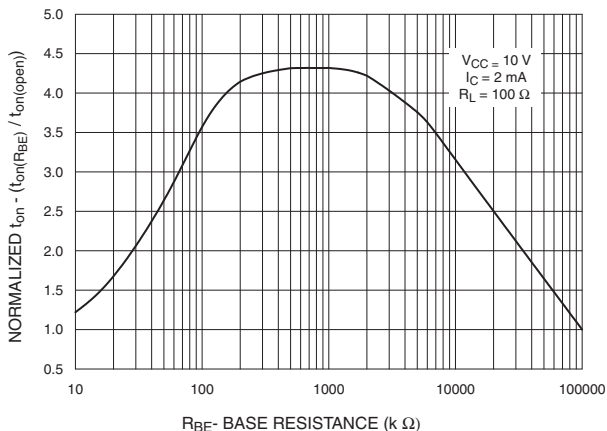


Fig. 13 Normalized t_{off} vs. R_{BE} (Black Package)

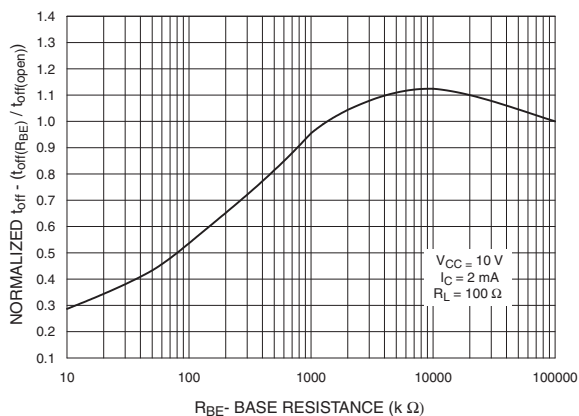


Fig. 14 Normalized t_{off} vs. R_{BE} (White Package)

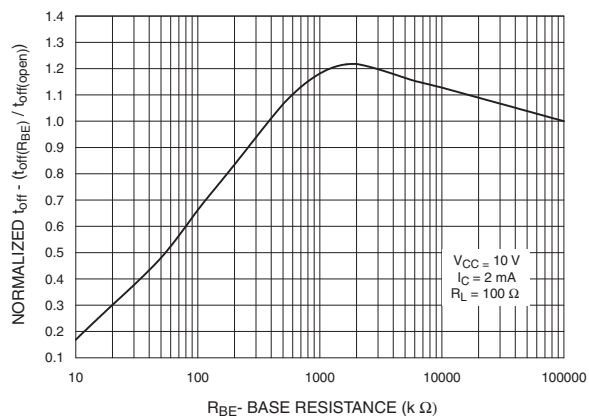


Fig. 15 LED Forward Voltage vs. Forward Current (Black Package)

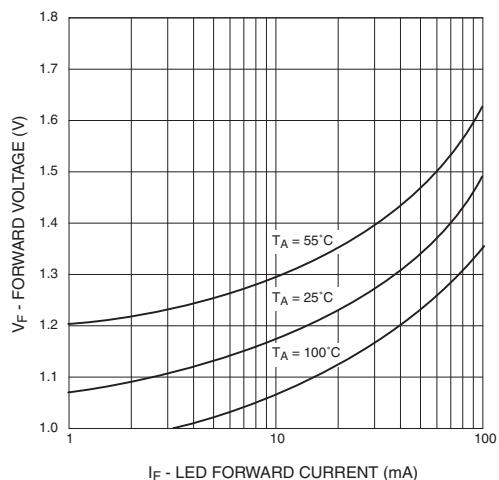


Fig. 16 LED Forward Voltage vs. Forward Current (White Package)

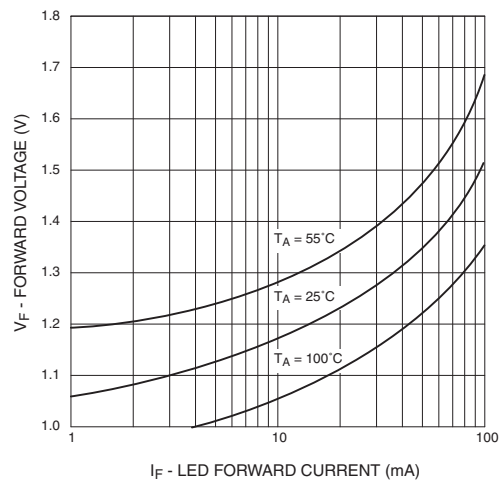


Fig. 17 Collector Current vs. Collector-Emitter Saturation Voltage

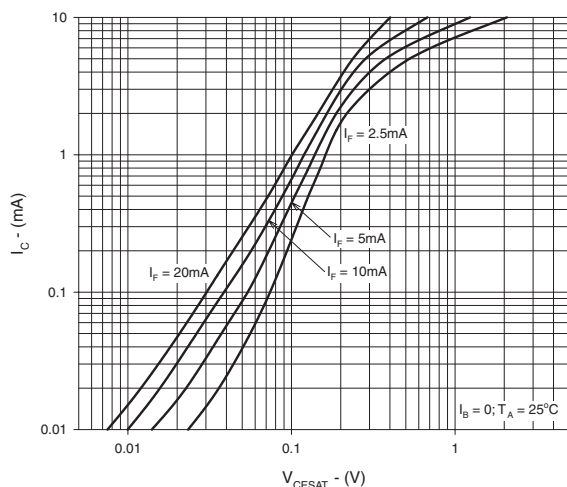
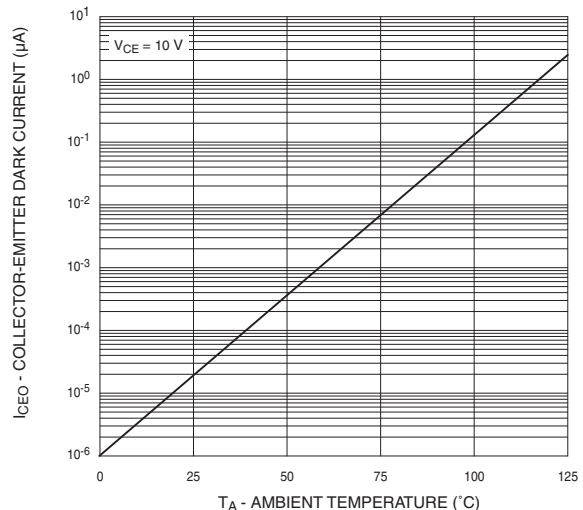


Fig. 18 Dark Current vs. Ambient Temperature (Black Package)



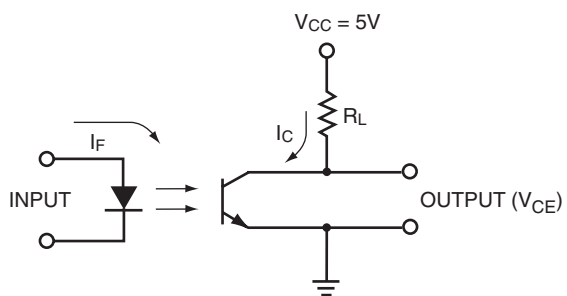


Figure 19. Switching Time Test Circuit

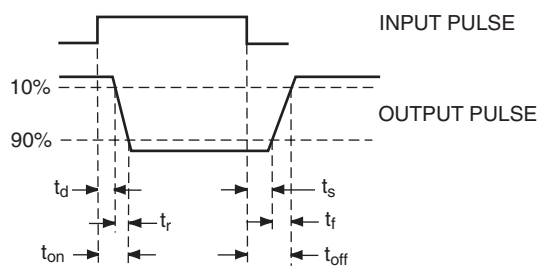
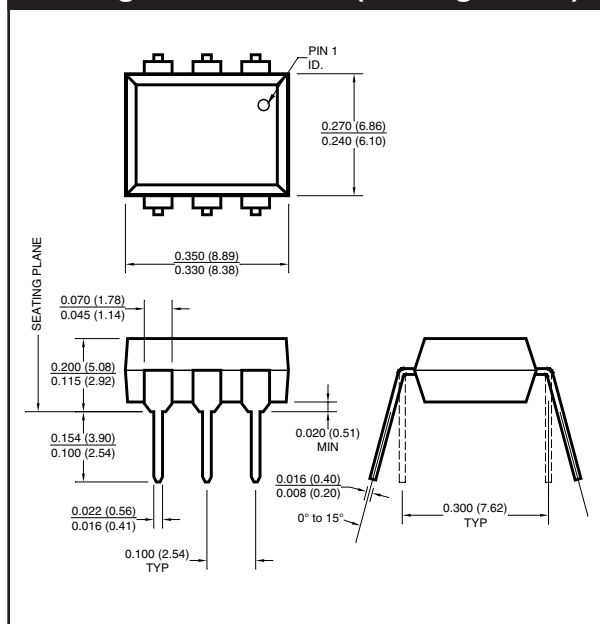


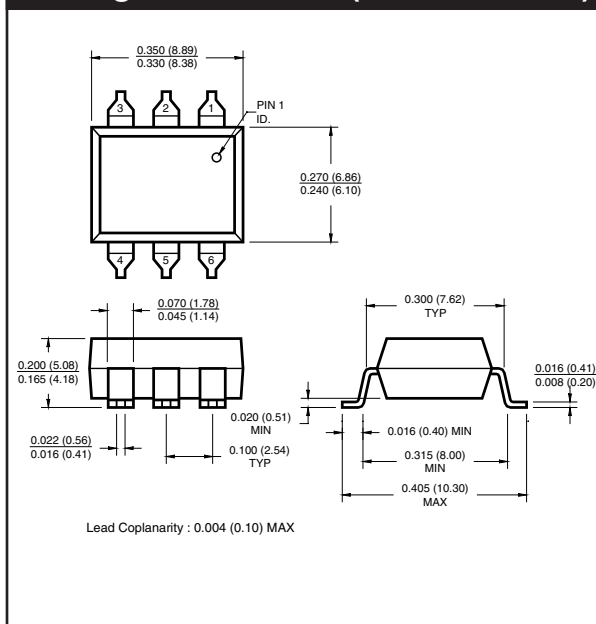
Figure 20. Switching Time Test Circuit

Black Package (No -M Suffix)

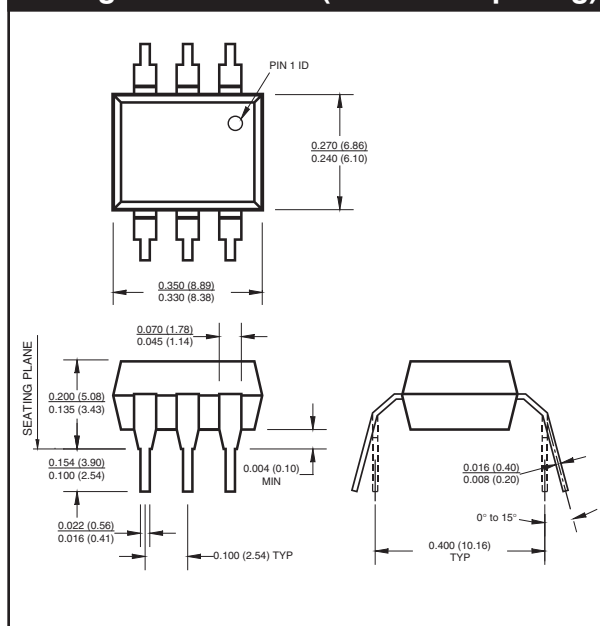
Package Dimensions (Through Hole)



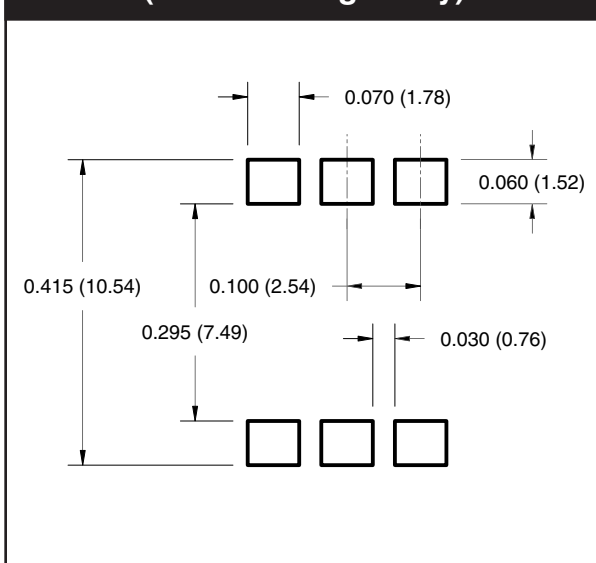
Package Dimensions (Surface Mount)



Package Dimensions (0.4" Lead Spacing)



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

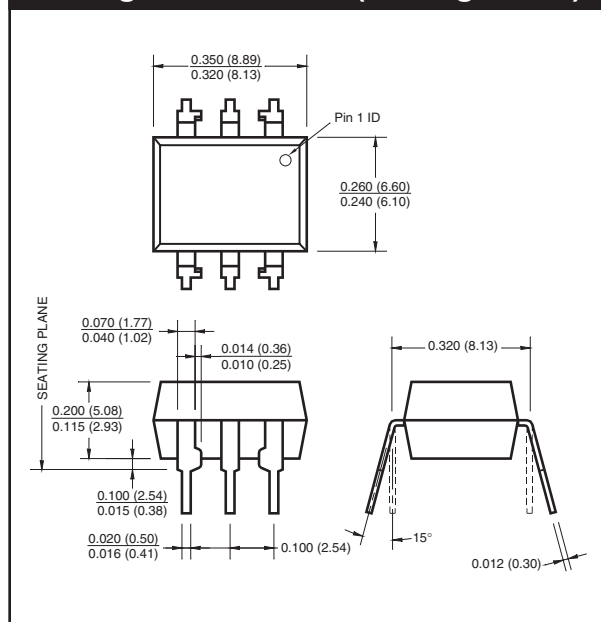


NOTE

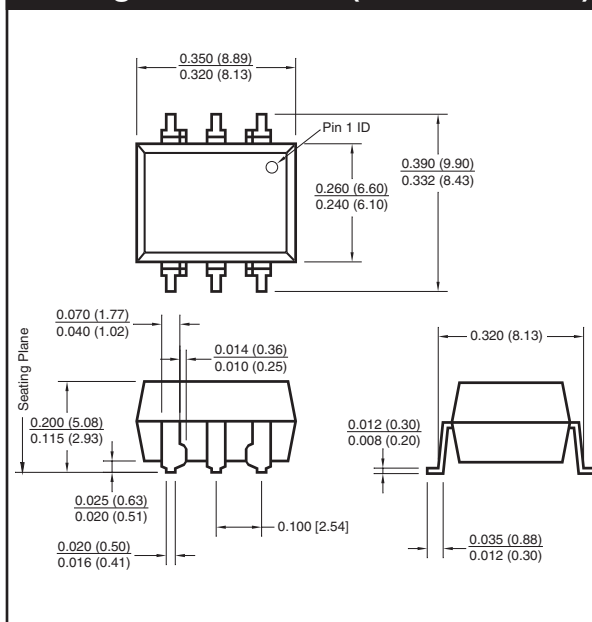
All dimensions are in inches (millimeters)

White Package (-M Suffix)

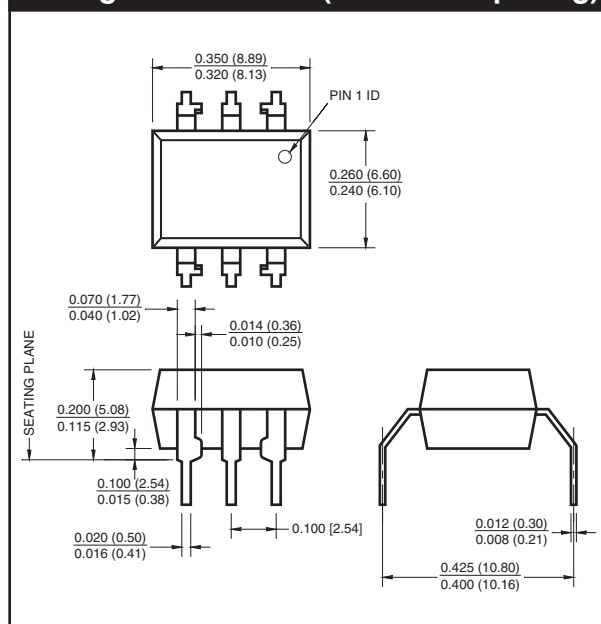
Package Dimensions (Through Hole)



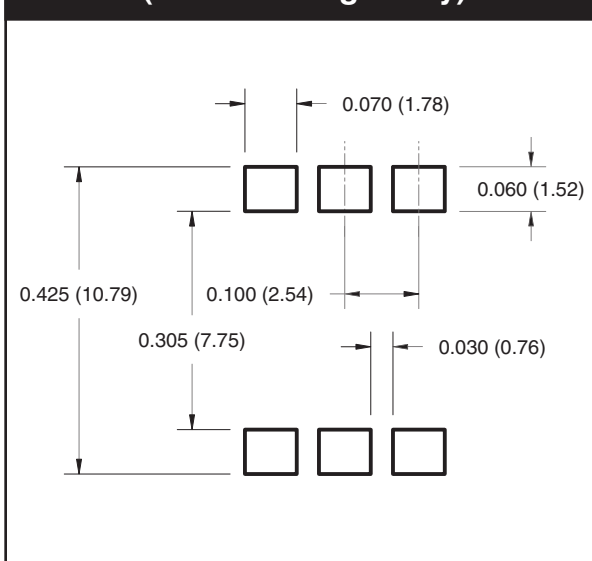
Package Dimensions (Surface Mount)



Package Dimensions (0.4" Lead Spacing)



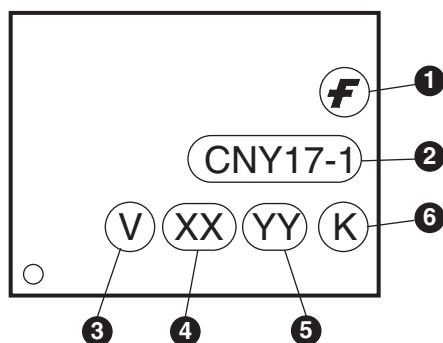
Recommended Pad Layout for Surface Mount Leadform (White Package Only)



NOTE

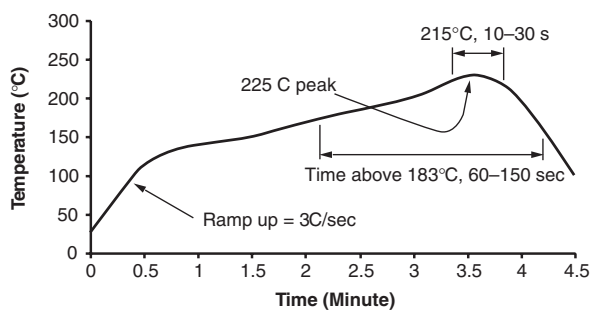
All dimensions are in inches (millimeters)

Marking Information



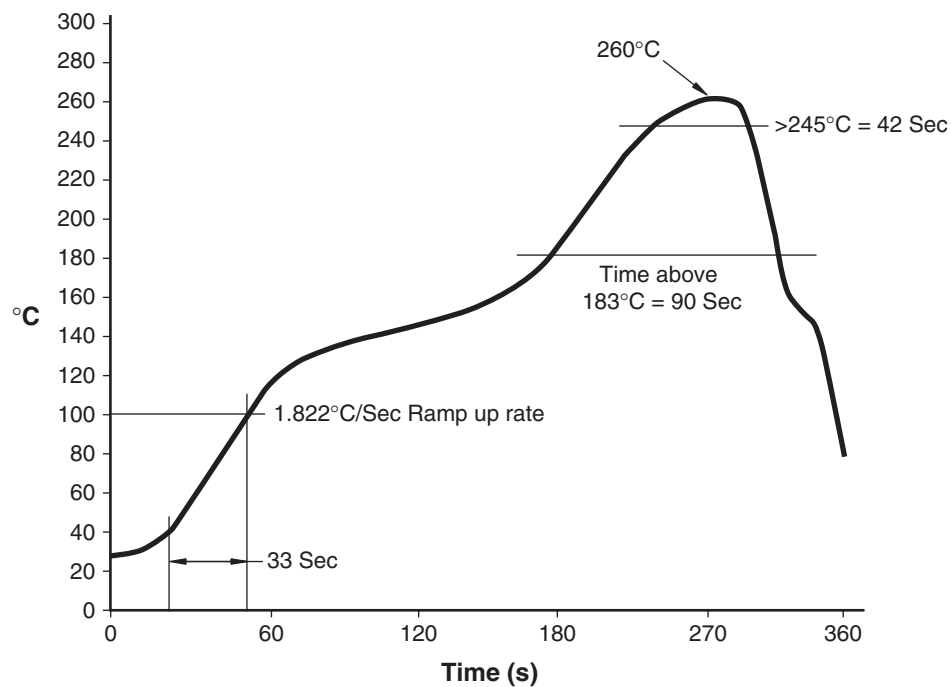
Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	Two digits year code, e.g., '03'
5	Two digit work week ranging from '01' to '53'
6	Assembly package code

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)



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E ² CMOS [™]	i-Lo [™]	OCX [™]	μSerDes [™]	VCX [™]
EnSigna [™]	ImpliedDisconnect [™]	OCXPro [™]	SILENT SWITCHER [®]	Wire [™]
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Across the board. Around the world. [™]		PACMAN [™]	Stealth [™]	
The Power Franchise [®]		POP [™]	SuperFET [™]	
Programmable Active Droop [™]		Power247 [™]	SuperSOT [™] -3	
		PowerEdge [™]	SuperSOT [™] -6	

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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.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

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