



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

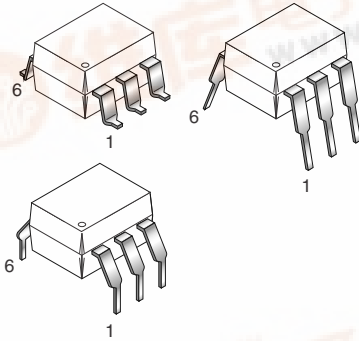
Applications

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

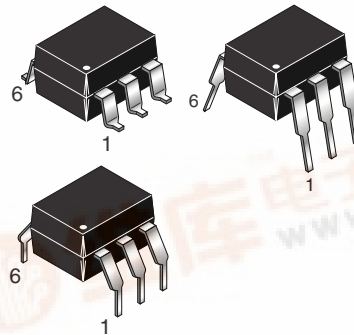
Description

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

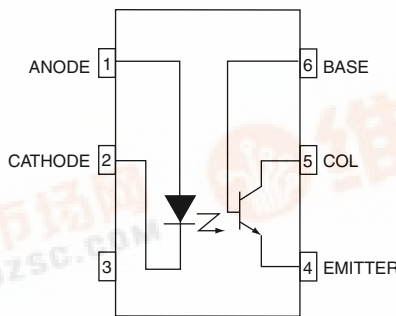
White Package (-M Suffix)



Black Package (No -M Suffix)



Schematic



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



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	
		non -M	135		
		Derate Linearly From 25°C	-M	1.41	mW/°C
			non -M	1.8	
DETECTOR					
Detector Power Dissipation @ 25°C	P _D	-M	150	mW	
		non -M	200		
		Derate Linearly from 25°C	-M	1.76	mW/°C
			non -M	2.67	

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

Individual Component Characteristics

Parameters	Test Conditions	Symbol	Device	Min	Typ	Max	Units	
EMITTER								
Input Forward Voltage	I _F = 60 mA	V _F	-M		1.35	1.65	V	
	I _F = 10 mA		non -M		1.15	1.50		
Capacitance	V _F = 0 V, f = 1.0 MHz	C _J	non -M		50		pF	
			-M		18			
Reverse Leakage Current	V _R = 6 V	I _R	All		0.001	10	μA	
DETECTOR								
Breakdown Voltage	I _C = 1.0 mA, I _F = 0	BV _{CEO}	All	70	100		V	
			Collector to Base	All	70	120		V
			Emitter to Collector	All	7	10		V
Leakage Current	V _{CE} = 10 V, I _F = 0	I _{CEO}	All		1	50	nA	
			Collector to Base	All			20	nA
Capacitance	V _{CE} = 0, f = 1 MHz	C _{CE}	All		8		pF	
			Collector to Base	All		20	pF	
			Emitter to Base	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} = 0, 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)

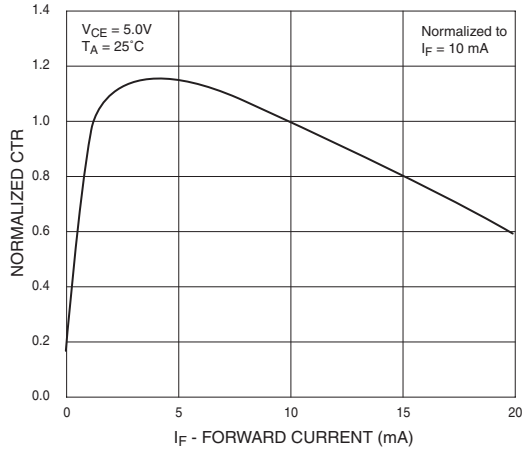


Fig.2 Normalized CTR vs. Forward Current (White Package)

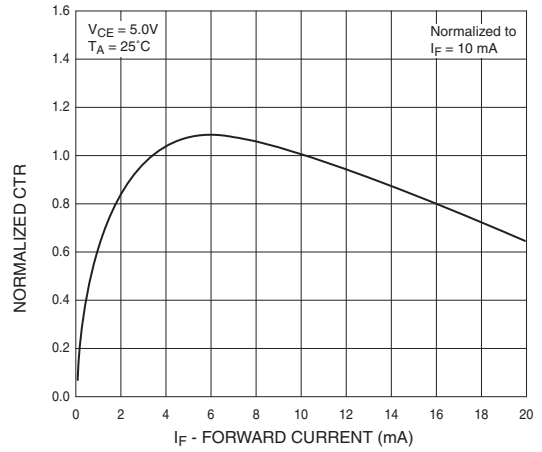


Fig. 3 Normalized CTR vs. Ambient Temperature (Black Package)

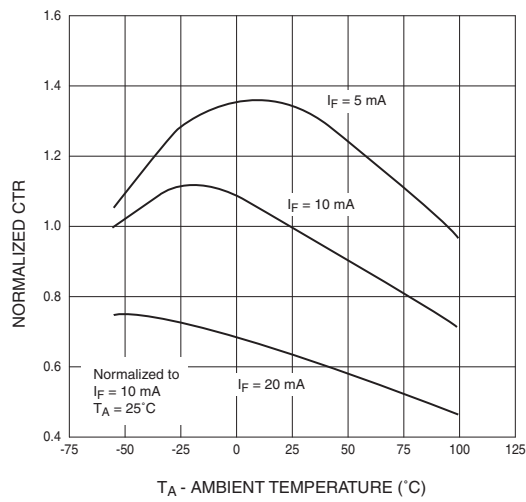


Fig. 4 Normalized CTR vs. Ambient Temperature (White Package)

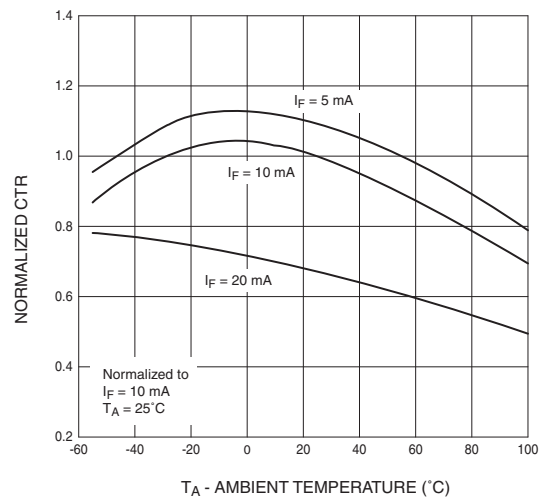


Fig. 5 CTR vs. RBE (Unsaturated) (Black Package)

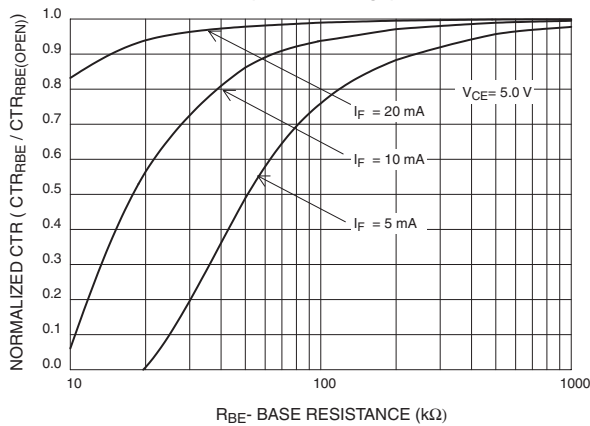


Fig. 6 CTR vs. RBE (Unsaturated) (White Package)

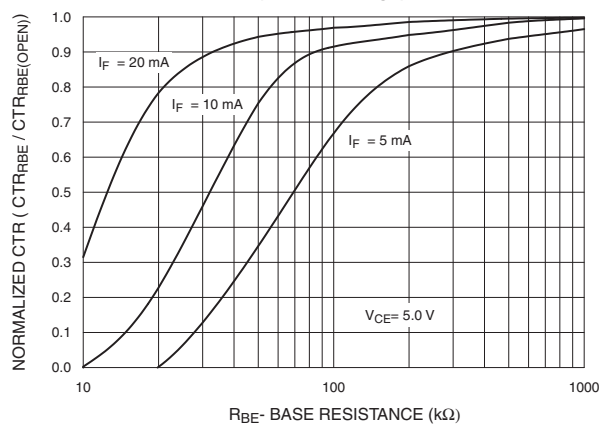


Fig. 7 CTR vs. R_{BE} (Saturated) (Black Package)

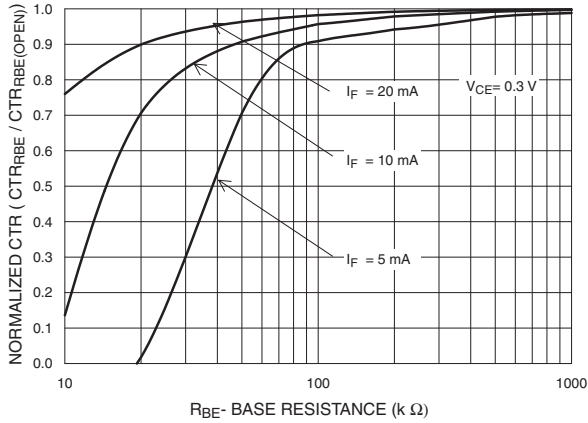


Fig. 8 CTR vs. R_{BE} (Saturated) (White Package)

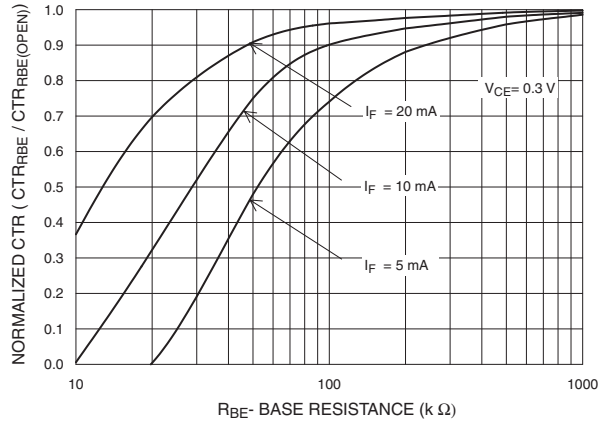


Fig. 9 Switching Speed vs. Load Resistor (Black Package)

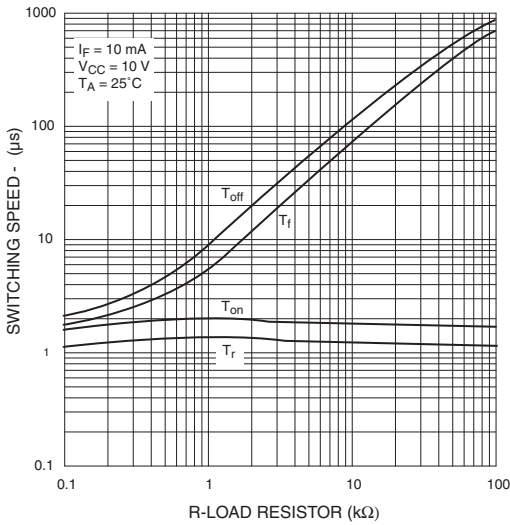


Fig. 10 Switching Speed vs. Load Resistor (White Package)

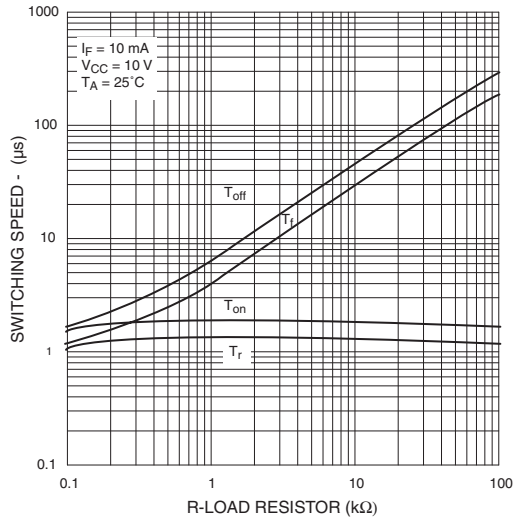


Fig. 11 Normalized t_{on} vs. R_{BE} (Black Package)

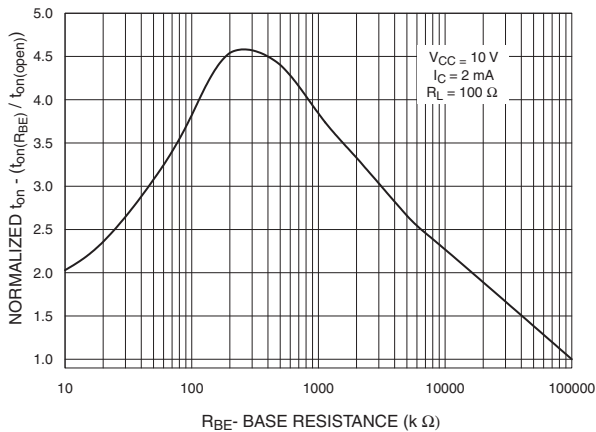


Fig. 12 Normalized t_{on} vs. R_{BE} (White Package)

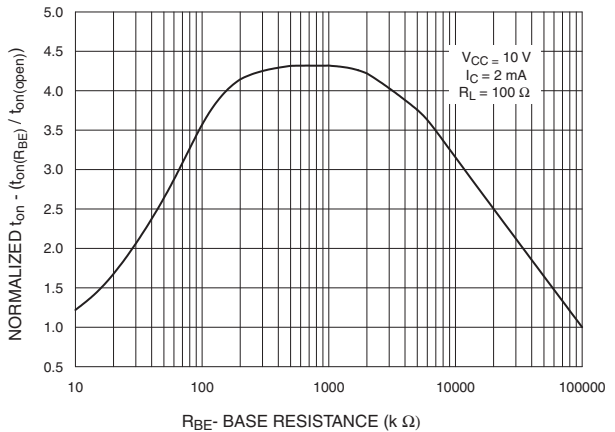


Fig. 13 Normalized t_{off} vs. R_{BE} (Black Package)

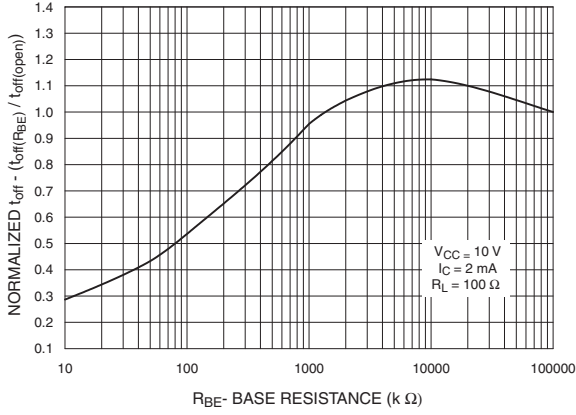


Fig. 14 Normalized t_{off} vs. R_{BE} (White Package)

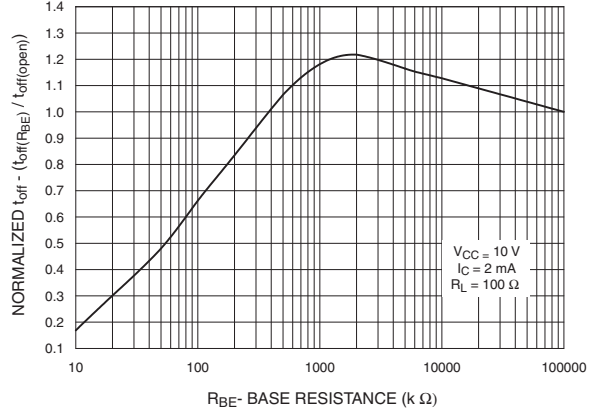


Fig. 15 LED Forward Voltage vs. Forward Current (Black Package)

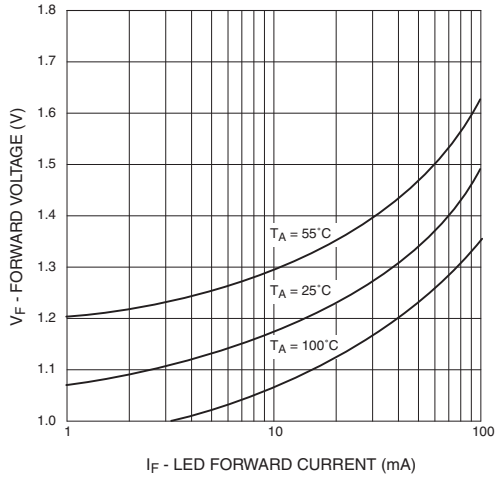


Fig. 16 LED Forward Voltage vs. Forward Current (White Package)

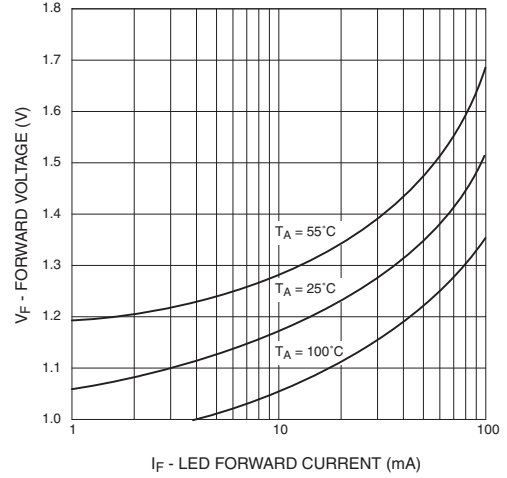


Fig. 17 Collector Current vs. Collector-Emitter Saturation Voltage

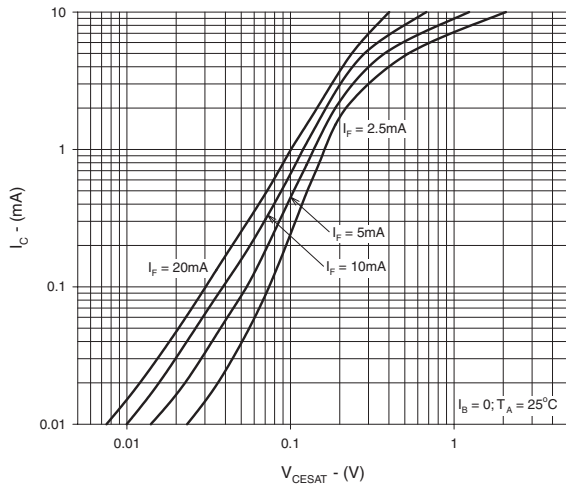
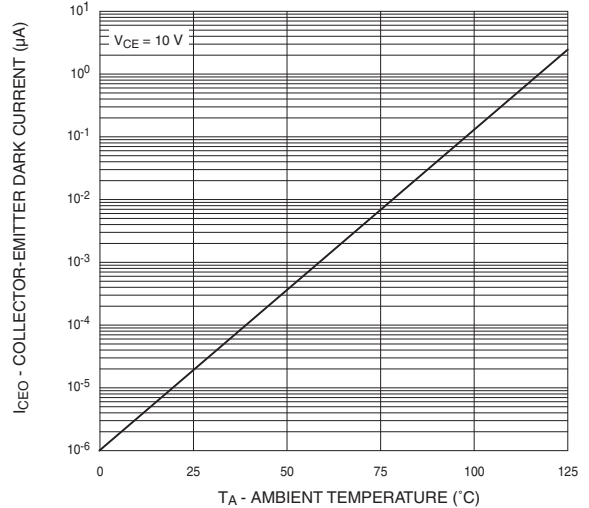


Fig. 18 Dark Current vs. Ambient Temperature (Black Package)



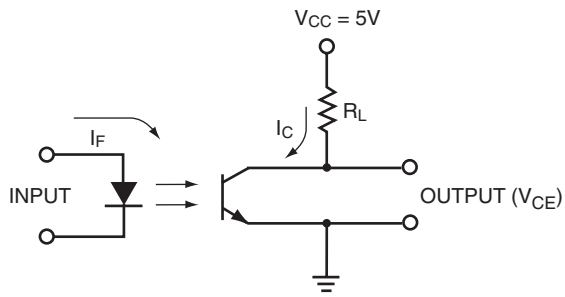


Figure 19. Switching Time Test Circuit

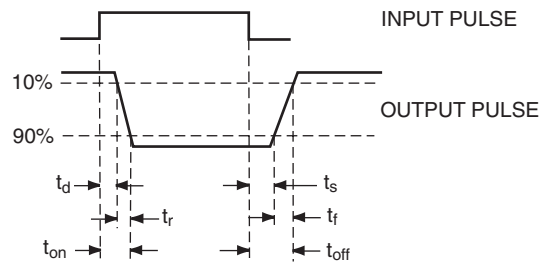
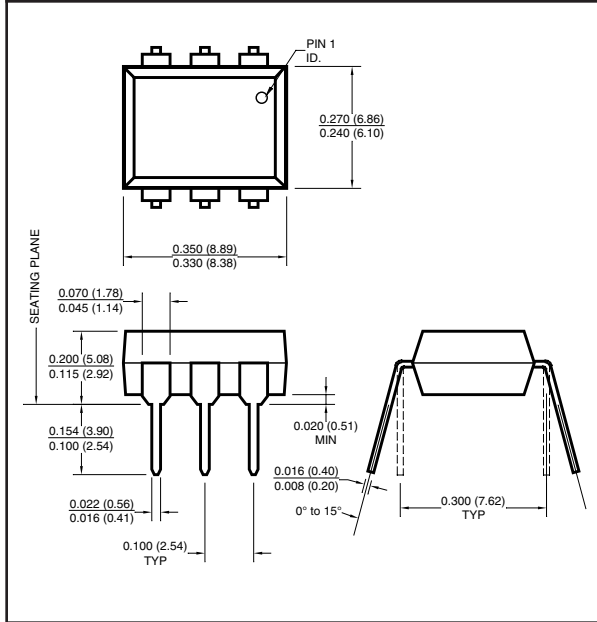


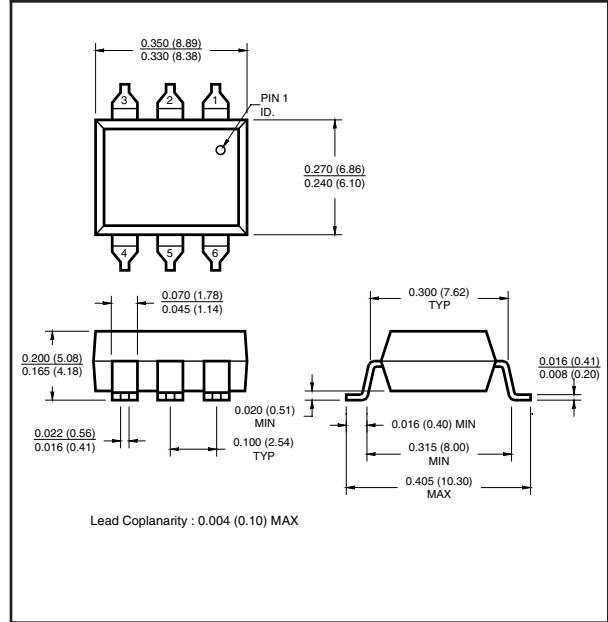
Figure 20. Switching Time Test Circuit

Black Package (No -M Suffix)

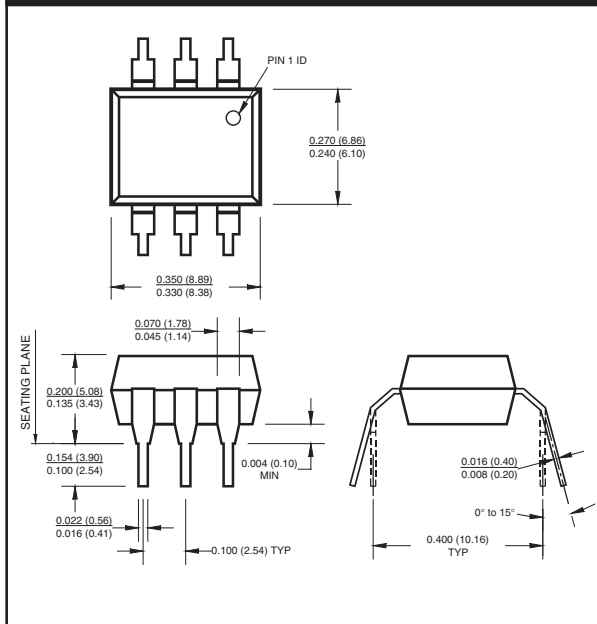
Package Dimensions (Through Hole)



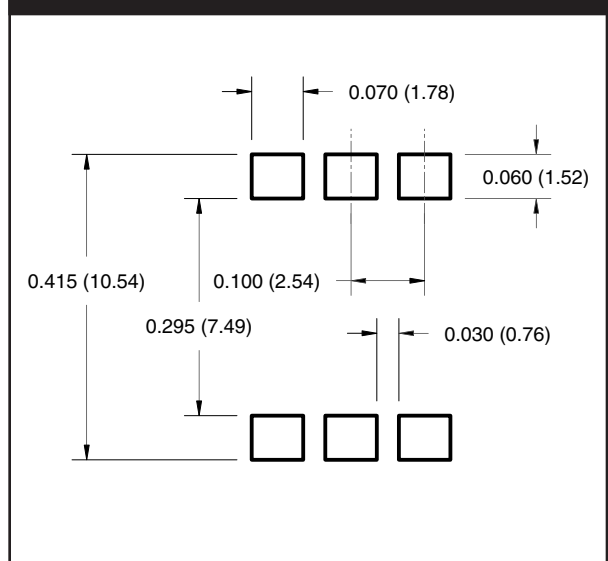
Package Dimensions (Surface Mount)



Package Dimensions (0.4" Lead Spacing)



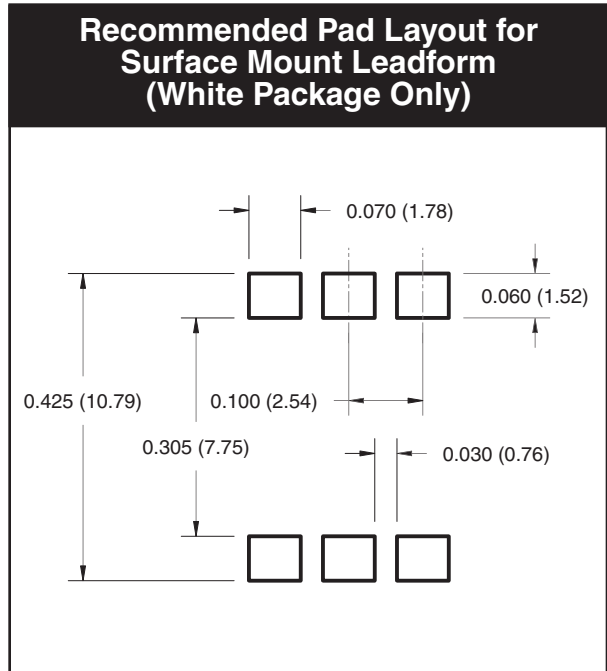
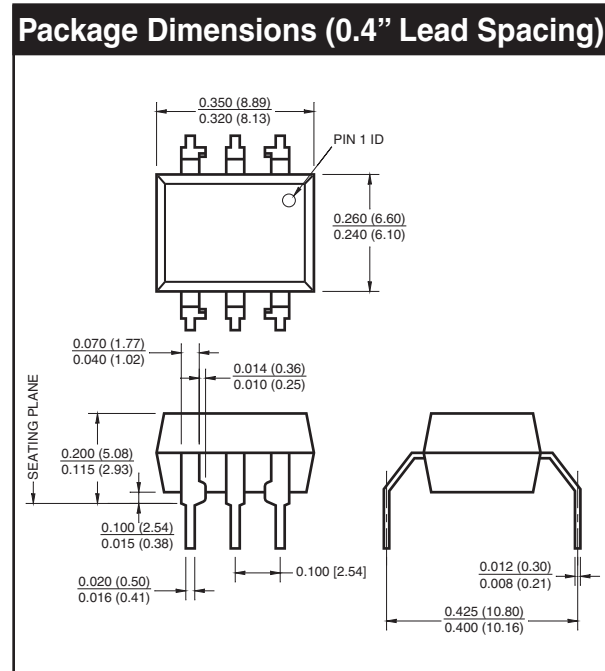
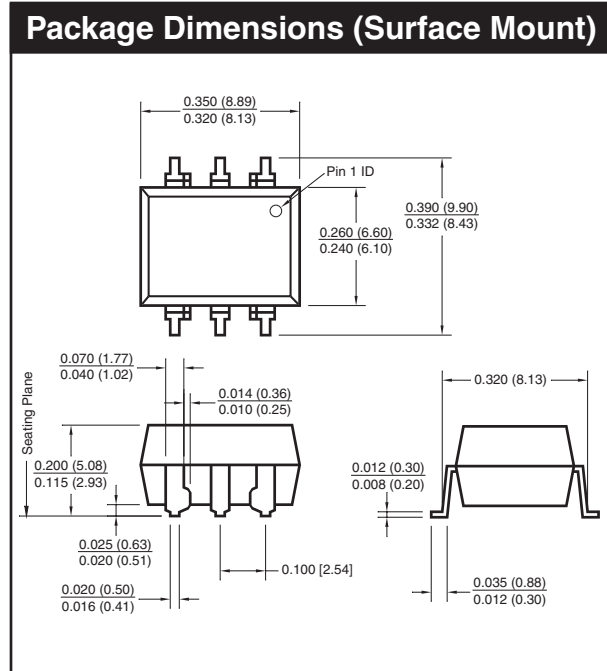
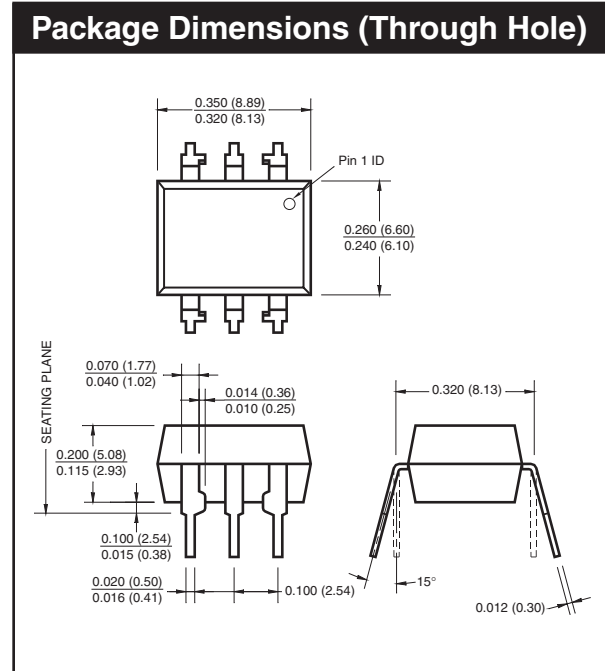
Recommended Pad Layout for Surface Mount Leadform (Black Package Only)



NOTE

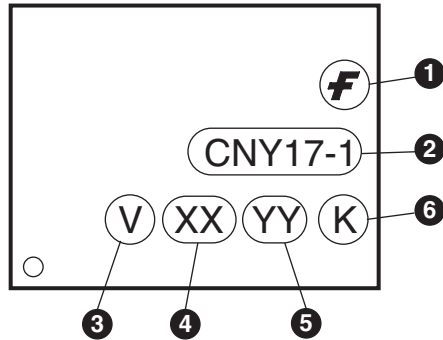
All dimensions are in inches (millimeters)

White Package (-M Suffix)



NOTE
All dimensions are in inches (millimeters)

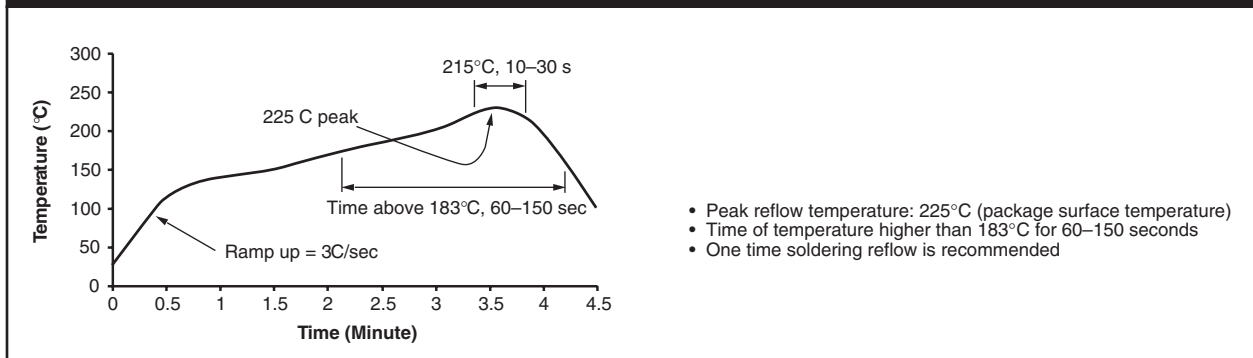
Marking Information

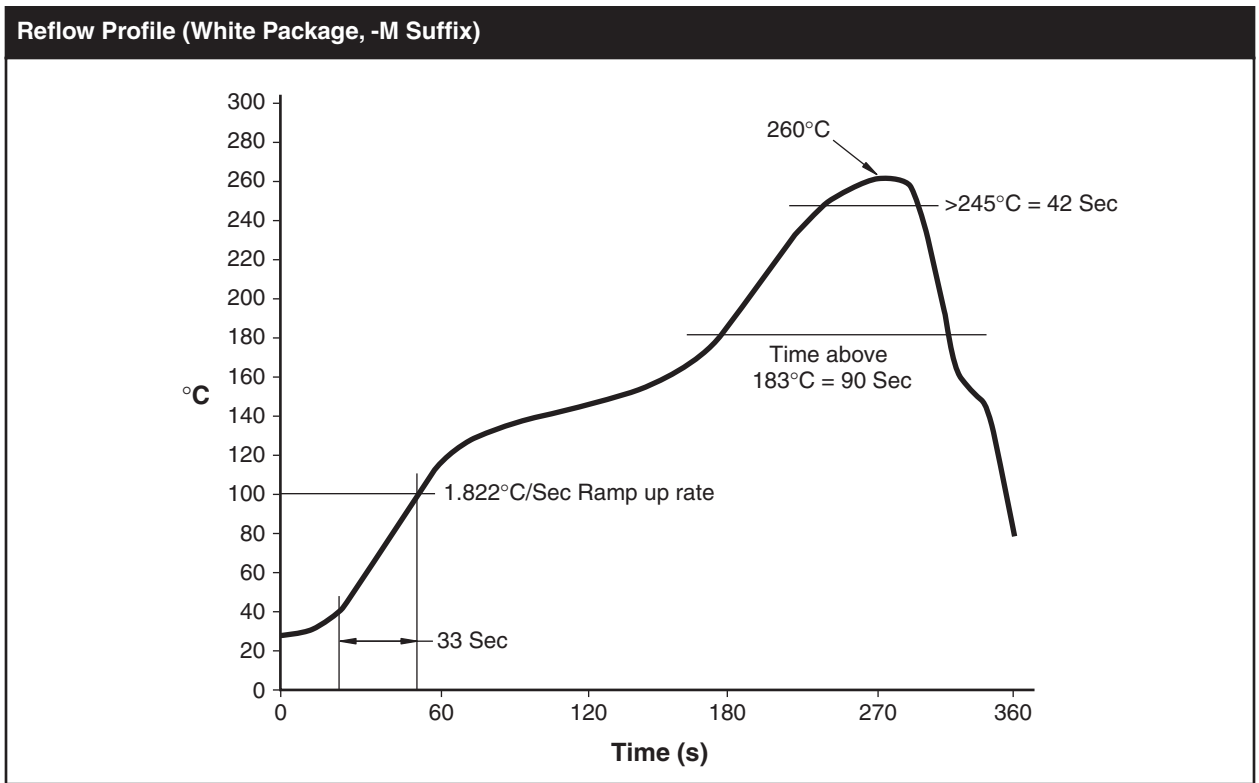


Definitions

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)





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EcoSPARK™	I ² C™	MSXPro™	RapidConnect™	UniFET™
E ² CMOS™	i-Lo™	OCX™	μSerDes™	VCX™
EnSigna™	ImpliedDisconnect™	OCXPro™	SILENT SWITCHER®	Wire™
FACT™	IntelliMAX™	OPTOLOGIC®	SMART START™	
FACT Quiet Series™		OPTOPLANAR™	SPM™	
Across the board. Around the world.™		PACMAN™	Stealth™	
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		PowerEdge™	SuperSOT™-6	

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PRODUCT STATUS DEFINITIONS

Definition of Terms

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