FAIRCHILD
SEMICONDUCTOR®

PHOTOTRANSISTOR OPTOCOUPLERS

DESCRIPTION

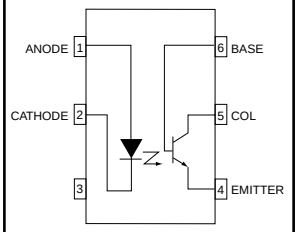
The CNY17 series consists of a Gallium Arsenide IRED coupled with an NPN phototransistor.

CNY17-1 CNY17-3
CNY17-2 CNY17-4

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
  - -File #102497
  - -File #94766
  - -Add option V for white package (e.g., CNY17-2V-M)
  - -Add option '300' for black package (e.g., CNY17-2.300)
- Current transfer ratio in select groups
- High BV_{CEO}—70V minimum

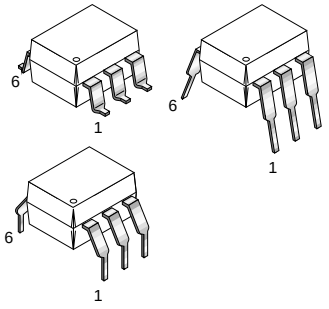
SCHEMATIC



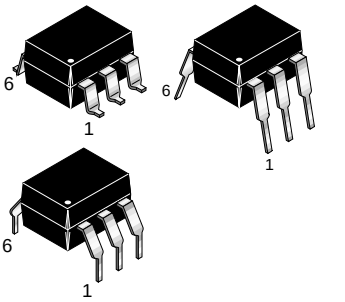
APPLICATIONS

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

WHITE PACKAGE (-M SUFFIX)



BLACK PACKAGE (NO -M SUFFIX)



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
		non -M	260	
Derate Linearly From 25°C		-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	I_F = 60 mA	V_F	-M		1.35	1.65	V
Input Forward Voltage	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 Collector to Emitter	I_C = 1.0 mA, I_F = 0	BV_{CEO}	All	70	100		V
Collector to Base	I_C = 10 µA, I_F = 0	BV_{CBO}	All	70	120		V
Emitter to Collector	I_E = 100 µA, I_F = 0	BV_{ECO}	All	7	10		V
Leakage Current Collector to Emitter	V_{CE} = 10 V, I_F = 0	I_{CEO}	All		1	50	nA
Collector to Base	V_{CB} = 10 V, I_F = 0	I_{CBO}	All			20	nA
Capacitance Collector to Emitter	V_{CE} = 0, f = 1 MHz	C_{CE}	All		8		pF
Collector to Base	V_{CB} = 0, f = 1 MHz	C_{CB}	All		20		pF
Emitter to Base	V_{EB} = 0, f = 1 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_{ISO}	Black Package	5300			Vac(rms)*
			'-M' White Package	7500			Vac(pk)
Isolation Resistance	V_{I-O} = 500 VDC	R_{ISO}	All	10^{11}			Ω
Isolation Capacitance	V_{I-O} = ∅, 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	µs
	I_F = 10 mA, V_{CE} = 0.4 V		CNY17-2, CNY17-3, CNY17-4			39.0	
Fall-Time (Fig.19 and Fig.20)	I_F = 20 mA, V_{CE} = 0.4 V	t_f	CNY17-1			20.0	µs
	I_F = 10 mA, V_{CE} = 0.4 V		CNY17-2, CNY17-3, CNY17-4			24.0	
	I_F = 20 mA, V_{CC} = 5 V, R_L =1 KΩ		CNY17-1-M			20.0	
	I_F = 10 mA, V_{CC} = 5 V, R_L = 1 KΩ		CNY17-2-M,CNY17-3-M			24.0	
Storage Time (Fig.19 and Fig.20)	I_F = 20 mA, V_{CC} = 5 V, R_L =1 KΩ	t_s	CNY17-1-M			34.0	µs
	I_F = 10 mA, V_{CC} = 5 V, R_L =1 KΩ		CNY17-2-M,CNY17-3-M			39.0	

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

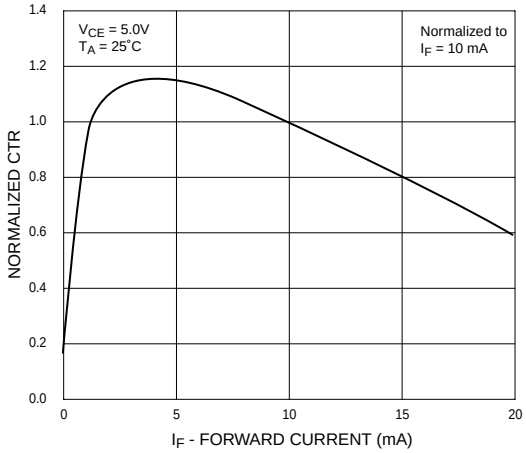


Fig.2 Normalized CTR vs. Forward Current (White Package)

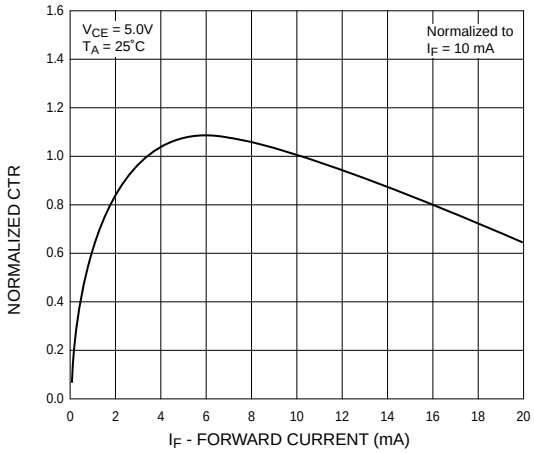


Fig. 3 Normalized CTR vs. Ambient Temperature (Black Package)

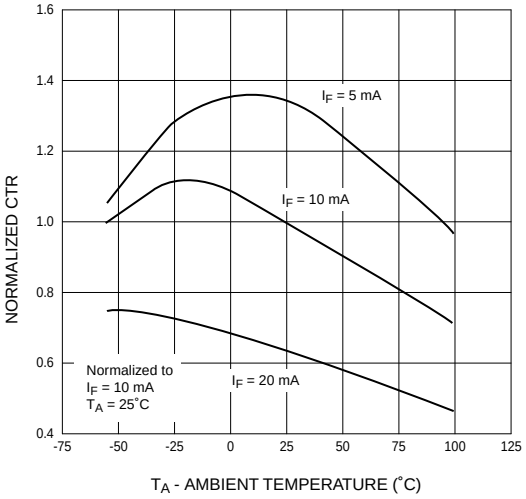


Fig. 4 Normalized CTR vs. Ambient Temperature (White Package)

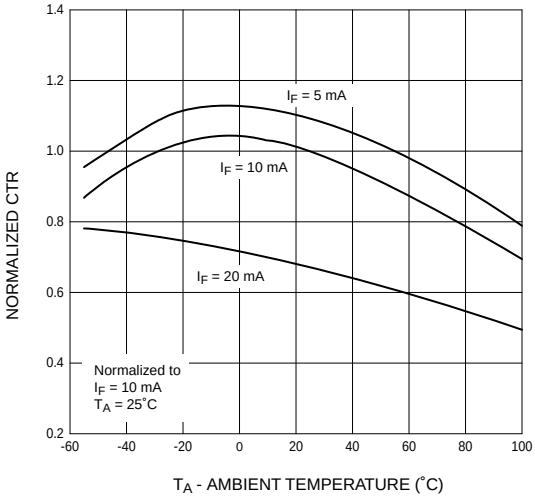


Fig. 5 CTR vs. RBE (Unsaturated) (Black Package)

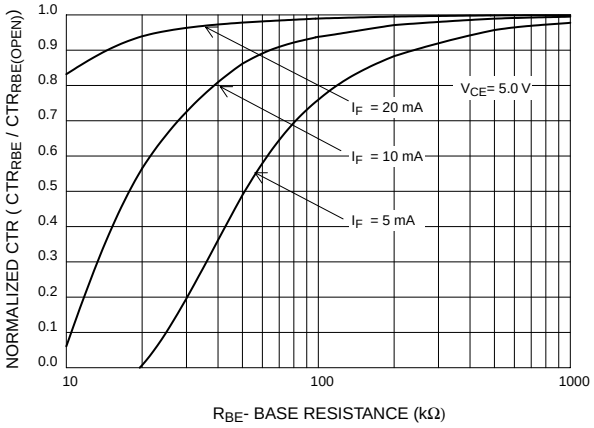


Fig. 6 CTR vs. RBE (Unsaturated) (White Package)

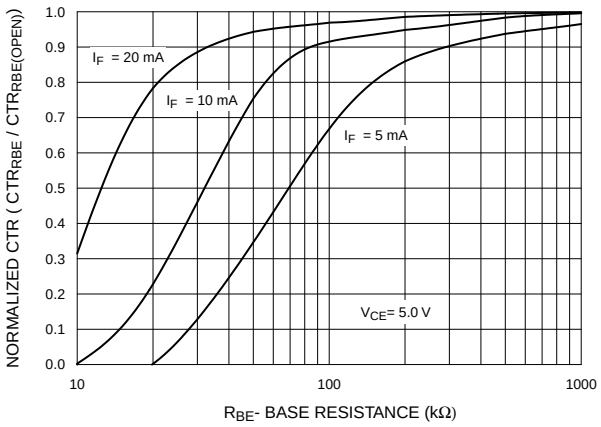


Fig. 7 CTR vs. RBE (Saturated) (Black Package)

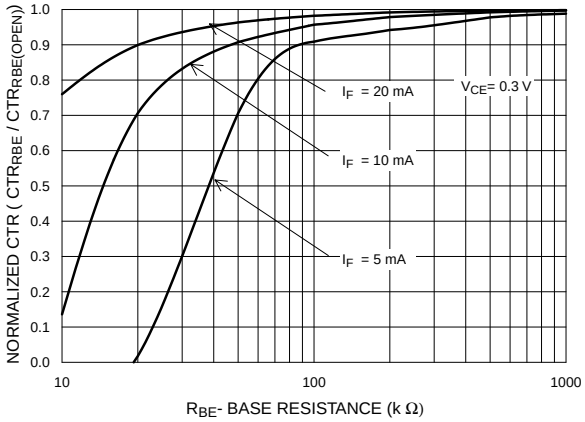


Fig. 8 CTR vs. RBE (Saturated) (White Package)

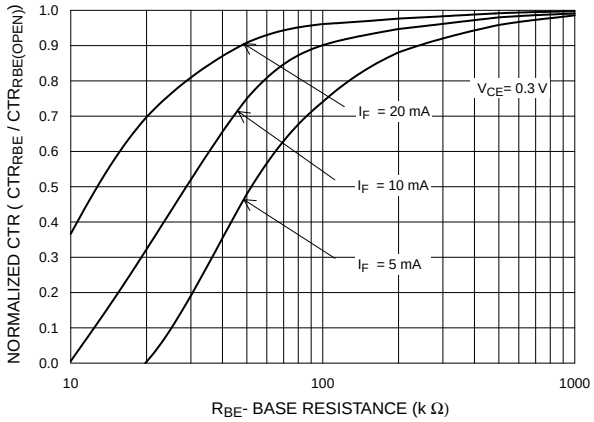


Fig. 9 Switching Speed vs. Load Resistor (Black Package)

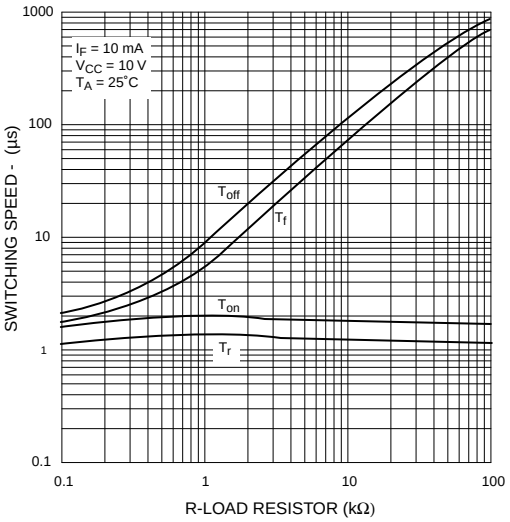


Fig. 10 Switching Speed vs. Load Resistor (White Package)

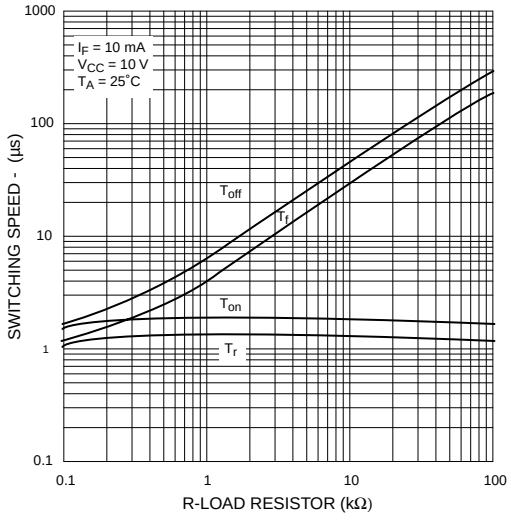


Fig. 11 Normalized t_{on} vs. R_{BE} (Black Package)

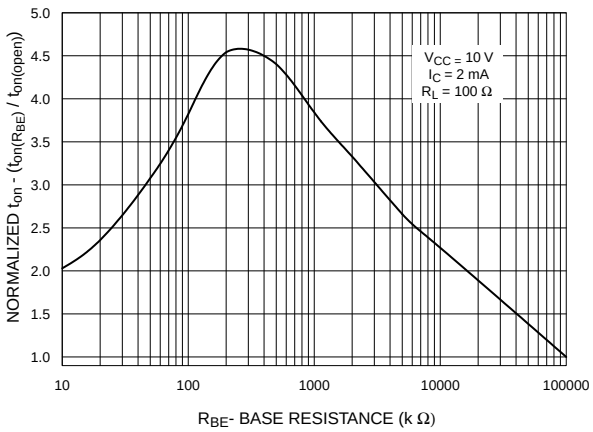


Fig. 12 Normalized t_{on} vs. R_{BE} (White Package)

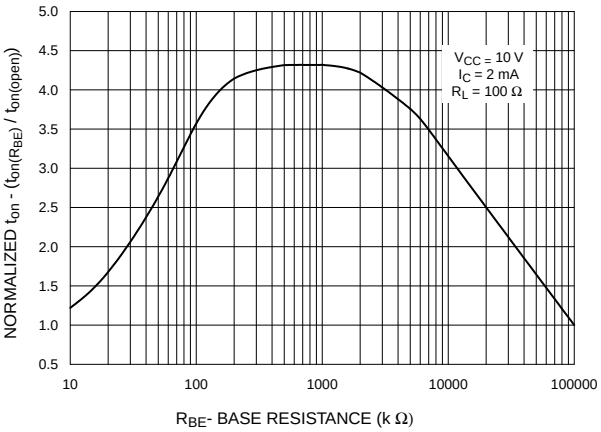


Fig. 13 Normalized t_{off} vs. R_{BE} (Black Package)

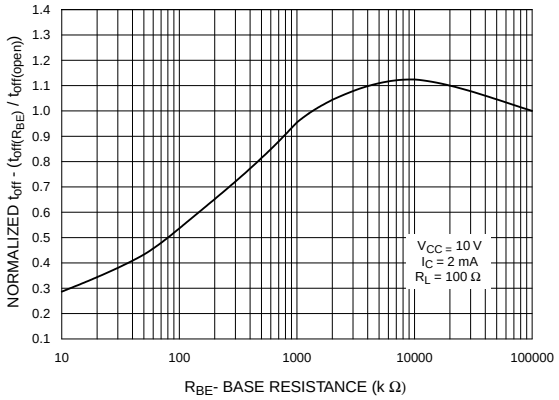


Fig. 14 Normalized t_{off} vs. R_{BE} (White Package)

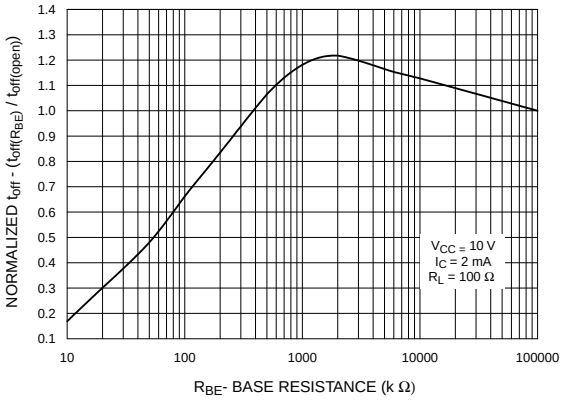


Fig. 15 LED Forward Voltage vs. Forward Current (Black Package)

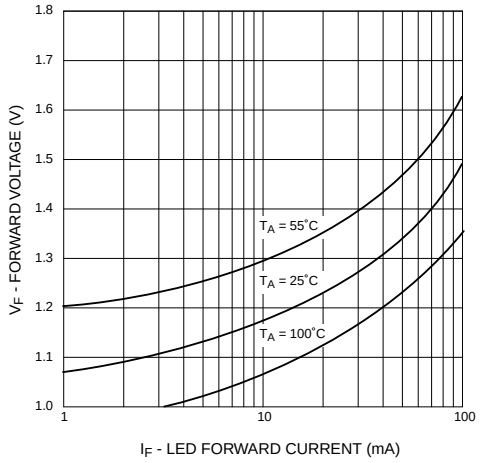


Fig. 16 LED Forward Voltage vs. Forward Current (White Package)

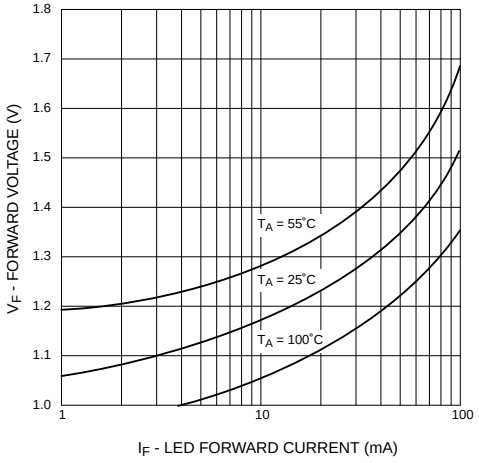


Fig. 17 Collector Current vs. Collector-Emitter Saturation Voltage

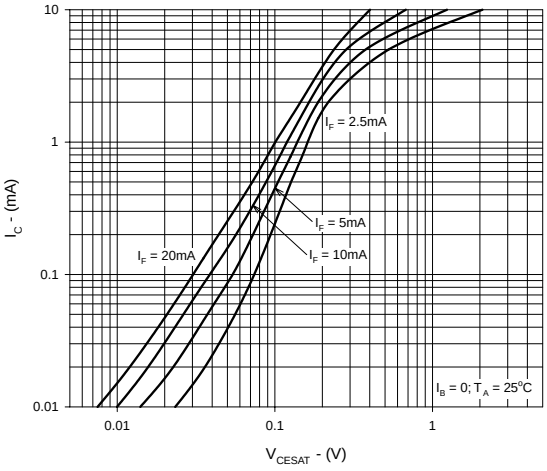
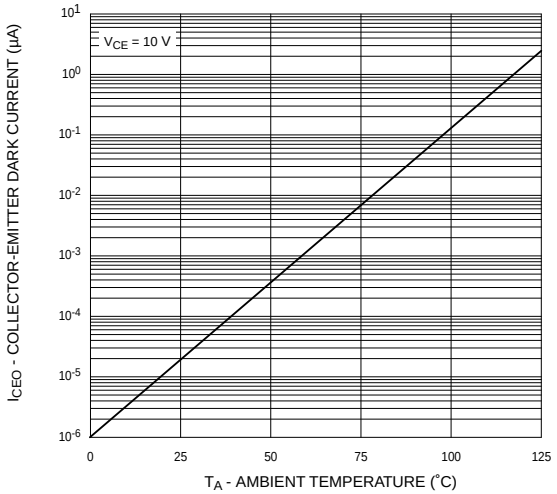


Fig. 18 Dark Current vs. Ambient Temperature (Black Package)



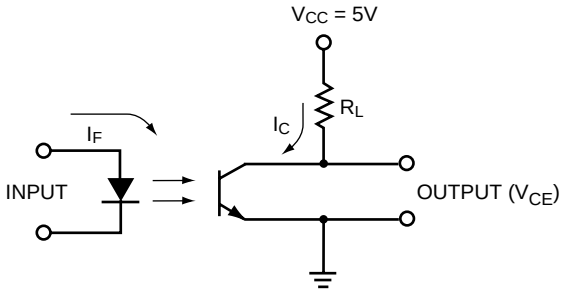


Figure 19. Switching Time Test Circuit

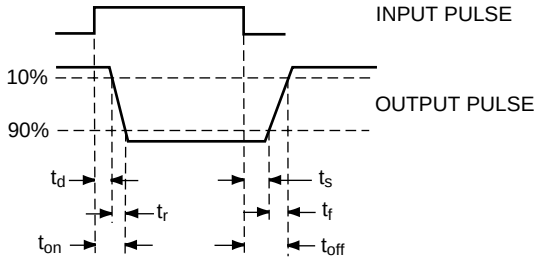
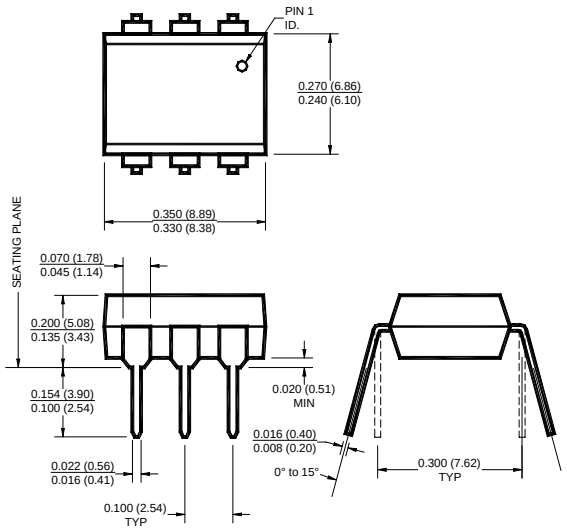


Figure 20. Switching Time Waveforms

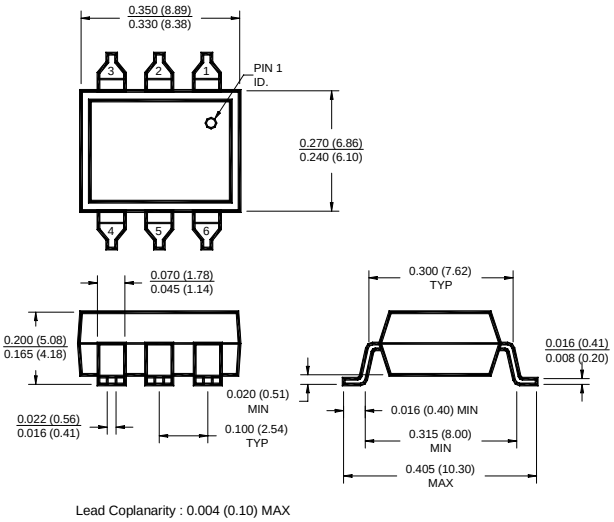
Black Package (No -M Suffix)

CNY17-1	CNY17-3
CNY17-2	CNY17-4

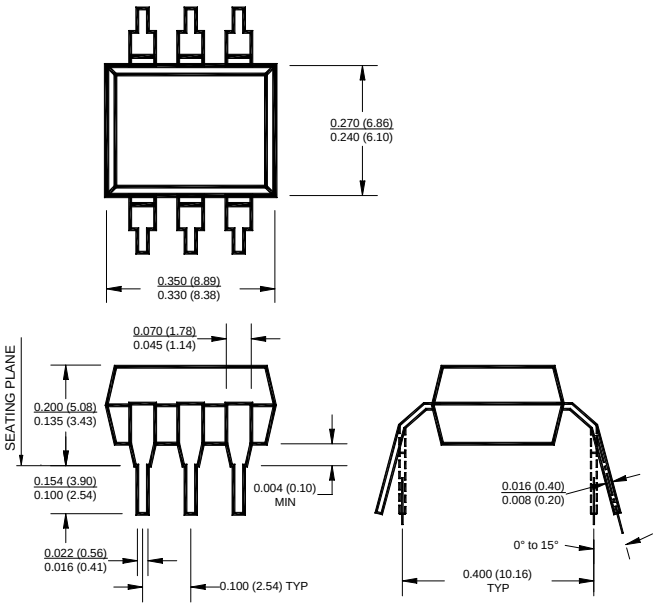
Package Dimensions (Through Hole)



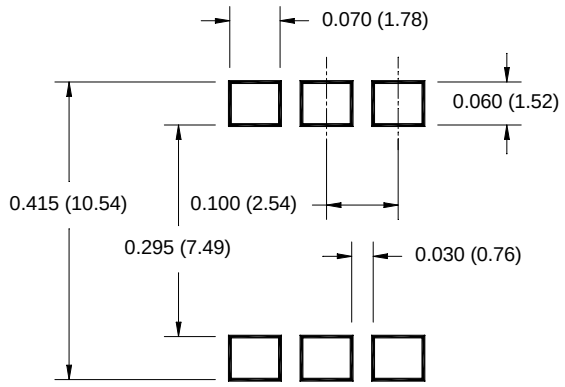
Package Dimensions (Surface Mount)



Package Dimensions (0.4”Lead Spacing)



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



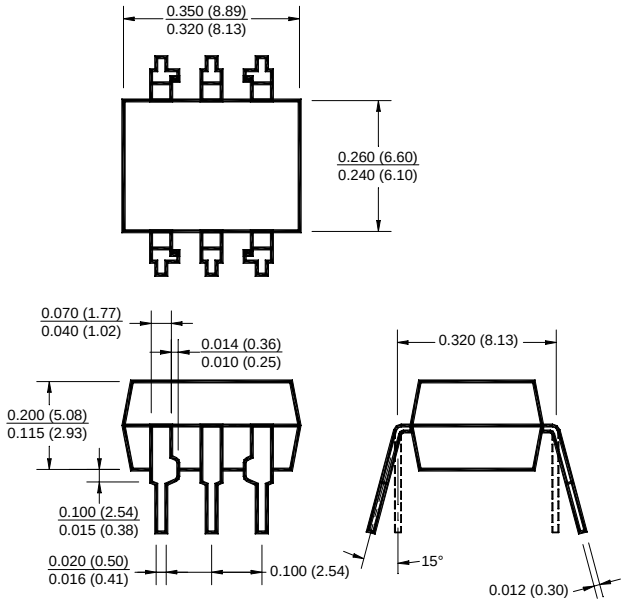
NOTE

All dimensions are in inches (millimeters)

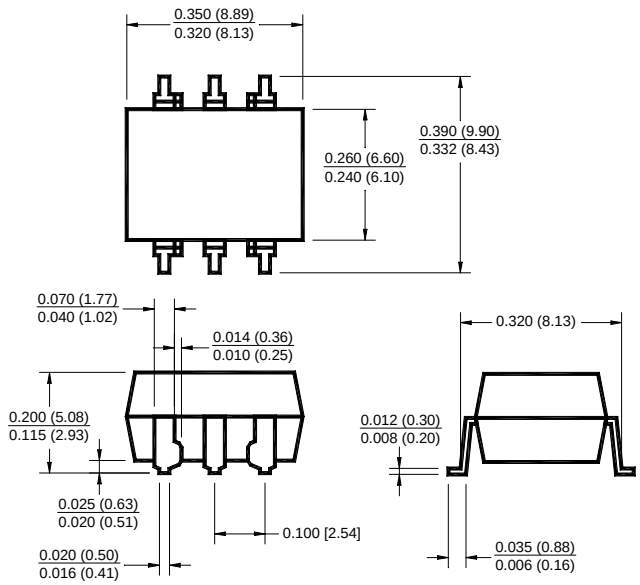
CNY17-1	CNY17-3
CNY17-2	CNY17-4

White Package (-M Suffix)

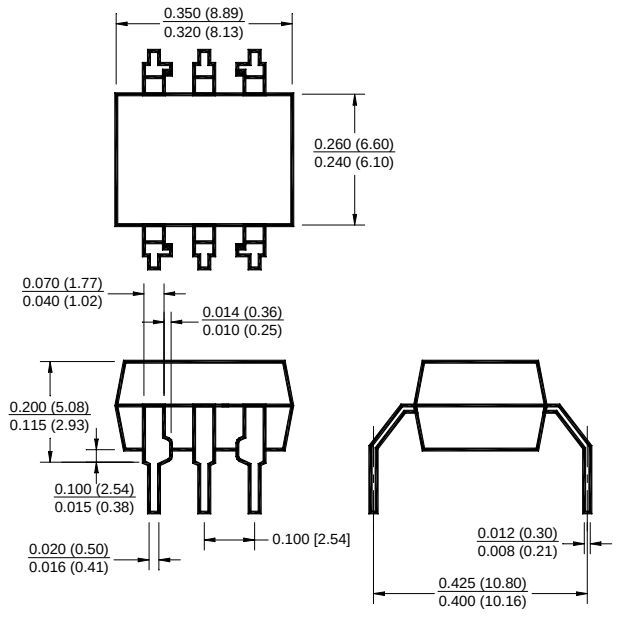
Package Dimensions (Through Hole)



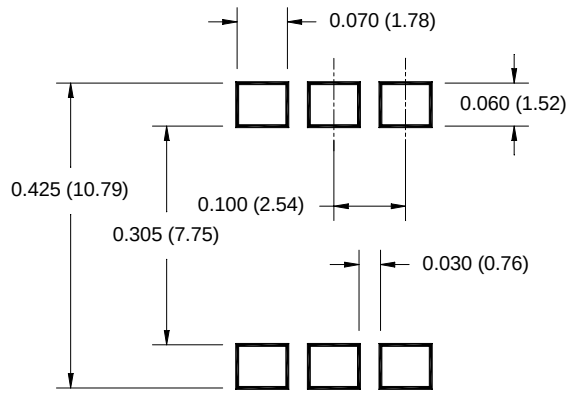
Package Dimensions (Surface Mount)



Package Dimensions (0.4”Lead Spacing)



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



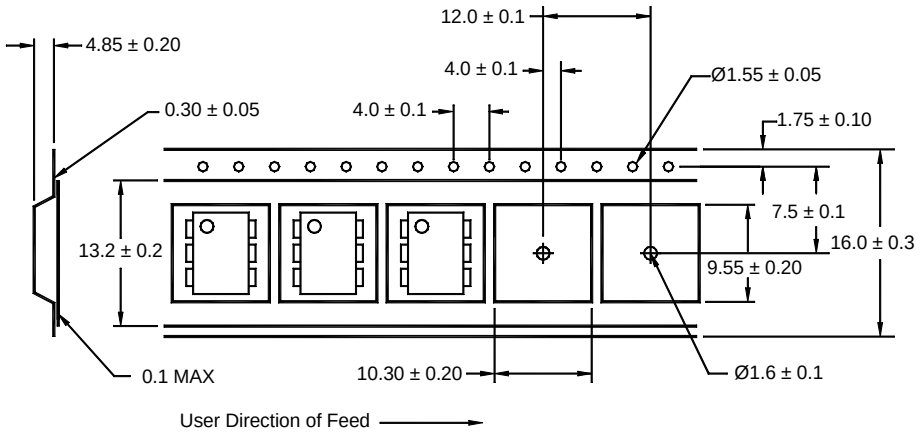
NOTE

All dimensions are in inches (millimeters)

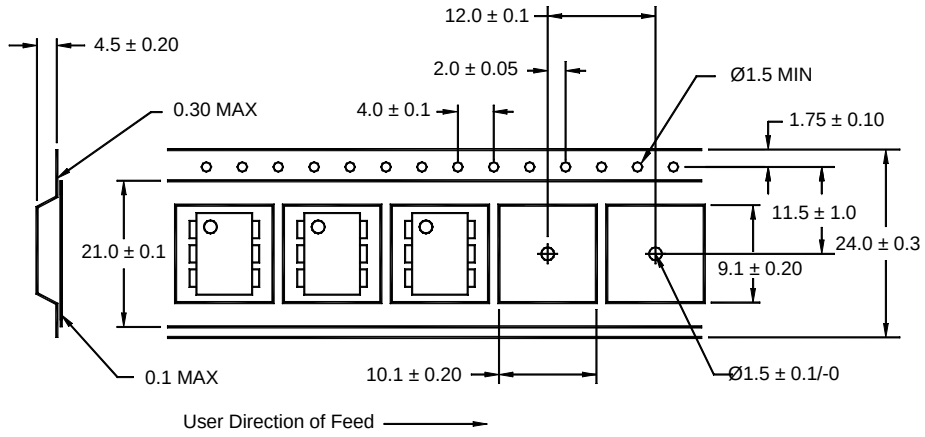
ORDERING INFORMATION

Option	Black Package (No Suffix)	White Package (-m Suffix)	Description
	Order Entry Idenifier		
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)



NOTE

All dimensions are in inches (millimeters)

DISCLAIMER

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1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body,or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in labeling, can be reasonably expected to result in a significant injury of the user.

2. A critical component in 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.