

CNY171M, CNY172M, CNY173M, CNY174M, CNY17F1M, CNY17F2M, CNY17F3M, CNY17F4M, MOC8106M, MOC8107M Phototransistor Optocouplers

Features

- UL recognized (File # E90700, Vol. 2)
- VDE recognized
 - Add option V (e.g., CNY17F2VM)
 - File #102497
- Current transfer ratio in select groups
- High BV_{CEO} : 70V minimum (CNY17XM, CNY17FXM, MOC810XM)
- Closely matched current transfer ratio (CTR) minimizes unit-to-unit variation.
- Very low coupled capacitance along with no chip to pin 6 base connection for minimum noise susceptibility (CNY17FXM, MOC810XM)

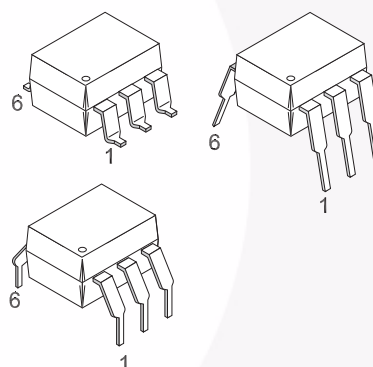
Applications

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

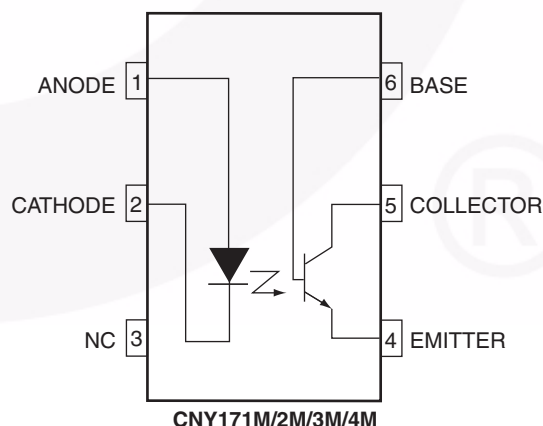
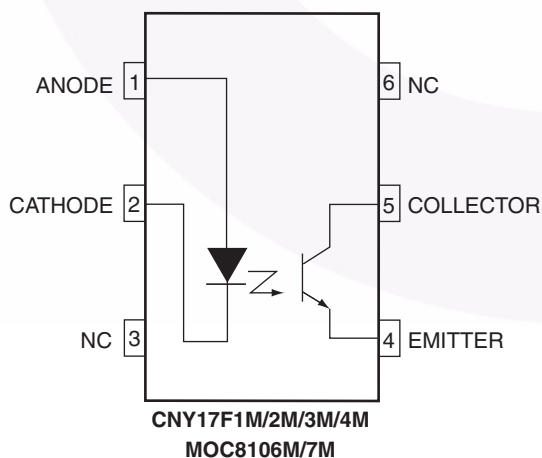
Description

The CNY17XM, CNY17FXM and MOC810XM devices consist of a Gallium Arsenide IRED coupled with an NPN phototransistor in a dual in-line package.

Package Outlines



Schematics



Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameters	Value	Units
TOTAL DEVICE			
T _{STG}	Storage Temperature	-40 to +150	°C
T _{OPR}	Operating Temperature	-40 to +100	°C
T _{SOL}	Lead Solder Temperature	260 for 10 sec	°C
P _D	Total Device Power Dissipation @ 25°C (LED plus detector) Derate Linearly From 25°C	250	mW
		2.94	mW/°C
EMITTER			
I _F	Continuous Forward Current	60	mA
V _R	Reverse Voltage	6	V
I _F (pk)	Forward Current – Peak (1μs pulse, 300pps)	1.5	A
P _D	LED Power Dissipation 25°C Ambient Derate Linearly From 25°C	120	mW
		1.41	mW/°C
DETECTOR			
I _C	Continuous Collector Current	50	mA
V _{CEO}	Collector-Emitter Voltage	70	V
V _{ECO}	Emitter Collector Voltage	7	V
P _D	Detector Power Dissipation @ 25°C Derate Linearly from 25°C	150	mW
		1.76	mW/°C

Electrical Characteristics ($T_A = 25^\circ\text{C}$ Unless otherwise specified.)⁽¹⁾**Individual Component Characteristics**

Symbol	Parameters	Test Conditions	Device	Min.	Typ.	Max.	Units
EMITTER							
V_F	Input Forward Voltage	$I_F = 60\text{mA}$	CNY17XM, CNY17FXM	1.0	1.35	1.65	V
		$I_F = 10\text{mA}$	MOC810XM	1.0	1.15	1.50	
C_J	Capacitance	$V_F = 0\text{V}$, $f = 1.0\text{MHz}$	All		18		pF
I_R	Reverse Leakage Current	$V_R = 6\text{V}$	All		0.001	10	μA
DETECTOR							
BV_{CEO}	Breakdown Voltage Collector to Emitter	$I_C = 1.0\text{mA}$, $I_F = 0$	All	70	100		V
BV_{CBO}	Collector to Base	$I_C = 10\mu\text{A}$, $I_F = 0$	CNY171M/2M/3M/4M	70	120		
BV_{ECO}	Emitter to Collector	$I_E = 100\mu\text{A}$, $I_F = 0$	All	7	10		
I_{CEO}	Leakage Current Collector to Emitter	$V_{CE} = 10\text{V}$, $I_F = 0$	All		1	50	nA
I_{CBO}	Collector to Base	$V_{CB} = 10\text{V}$, $I_F = 0$	CNY171M/2M/3M/4M			20	nA
C_{CE}	Capacitance Collector to Emitter	$V_{CE} = 0$, $f = 1\text{MHz}$	All		8		pF
C_{CB}	Collector to Base	$V_{CB} = 0$, $f = 1\text{MHz}$	CNY171M/2M/3M/4M		20		pF
C_{EB}	Emitter to Base	$V_{EB} = 0$, $f = 1\text{MHz}$	CNY171M/2M/3M/4M		10		pF

Isolation Characteristics

Symbol	Characteristic	Test Conditions	Min.	Typ.*	Max.	Units
V_{ISO}	Input-Output Isolation Voltage	$f = 60\text{Hz}$, $t = 1\text{sec.}$, $I_{I-O} \leq 2\mu\text{A}^{(4)}$	7500			Vac(pk)
R_{ISO}	Isolation Resistance	$V_{I-O} = 500\text{VDC}^{(4)}$	10^{11}			Ω
C_{ISO}	Isolation Capacitance	$V_{I-O} = \emptyset$, $f = 1\text{MHz}^{(4)}$		0.2		pF

Transfer Characteristics ($T_A = 25^\circ\text{C}$ Unless otherwise specified.)⁽³⁾

Symbol	DC Characteristics		Test Conditions	Min.	Typ.*	Max.	Units
COUPLED							
(CTR) ⁽²⁾	Output Collector Current	MOC8106M	I _F = 10mA, V _{CE} = 10V	50		150	%
		MOC8107M		100		300	
		CNY17F1M	I _F = 10mA, V _{CE} = 5V	40		80	
		CNY17F2M		63		125	
		CNY17F3M		100		200	
		CNY17F4M		160		320	
		CNY171M		40		80	
		CNY172M		63		125	
		CNY173M		100		200	
		CNY174M		160		320	
V _{CE(sat)}	Collector-Emitter Saturation Voltage	CNY17XM/FXM	I _C = 2.5mA, I _F = 10mA			0.4	V
		MOC8106M/7M	I _C = 500μA, I _F = 5.0mA				

*All typicals at $T_A = 25^\circ\text{C}$

Electrical Characteristics (Continued) ($T_A = 25^\circ\text{C}$ Unless otherwise specified.)⁽¹⁾**Transfer Characteristics** (Continued)⁽³⁾

Symbol	AC Characteristics ⁽⁴⁾		Test Conditions	Min.	Typ.*	Max.	Units
NON-SATURATED SWITCHING TIME							
t _{on}	Turn-On Time	All Devices	I _C = 2.0mA, V _{CC} = 10V, R _L = 100Ω		2	10	μs
t _{off}	Turn-Off Time	All Devices	I _C = 2.0mA, V _{CC} = 10V, R _L = 100Ω		3	10	μs
t _d	Delay Time	CNY17XM/XFM	I _F = 10mA, V _{CC} = 5V, R _L = 75Ω			5.6	μs
t _r	Rise Time	All Devices	I _C = 2.0mA, V _{CC} = 10V, R _L = 100Ω		1		μs
		CNY17XM/FXM	I _F = 10mA, V _{CC} = 5V, R _L = 75Ω			4.0	
t _s	Storage Time	CNY17XM/FXM	I _F = 10mA, V _{CC} = 5V, R _L = 75Ω			4.1	μs
t _f	Fall Time	All Devices	I _C = 2.0mA, V _{CC} = 10V, R _L = 100Ω		2		μs
		CNY17XM/FXM	I _F = 10mA, V _{CC} = 5V, R _L = 75Ω			3.5	
SATURATED SWITCHING TIMES							
t _{on}	Turn-on Time	CNY171M/F1M	I _F = 20mA, V _{CC} = 5V, R _L = 1kΩ			5.5	μs
		CNY172M/3M/4M CNY17F2M/F3M/F4M	I _F = 10mA, V _{CC} = 5V, R _L = 1kΩ			8.0	
t _r	Rise Time	CNY171M/F1M	I _F = 20mA, V _{CC} = 5V, R _L = 1kΩ			4.0	μs
		CNY172M/3M/4M CNY17F2M/F3M/F4M	I _F = 10mA, V _{CC} = 5V, R _L = 1kΩ			6.0	
t _d	Delay Time	CNY171M/F1M	I _F = 20mA, V _{CC} = 5V, R _L = 1kΩ			5.5	μs
		CNY172M/3M/4M CNY17F2M/F3M/F4M	I _F = 10mA, V _{CC} = 5V, R _L = 1kΩ			8.0	
t _{off}	Turn-off Time	CNY171M/F1M	I _F = 20mA, V _{CE} = 0.4V			34	μs
		CNY172M/3M/4M CNY17F2M/F3M/F4M	I _F = 10mA, V _{CE} = 0.4V			39	
t _f	Fall Time	CNY171M/F1M	I _F = 20mA, V _{CC} = 5V, R _L = 1kΩ			20.0	μs
		CNY172M/3M/4M CNY17F2M/F3M/F4M	I _F = 10mA, V _{CC} = 5V, R _L = 1kΩ			24.0	
t _s	Storage Time	CNY171M/F1M	I _F = 20mA, V _{CC} = 5V, R _L = 1kΩ			34.0	μs
		CNY172M/3M/4M CNY17F2M/F3M/F4M	I _F = 10mA, V _{CC} = 5V, R _L = 1kΩ			39.0	

*All typicals at $T_A = 25^\circ\text{C}$ **Notes:**

1. Always design to the specified minimum/maximum electrical limits (where applicable).
2. Current Transfer Ratio (CTR) = $I_C/I_F \times 100\%$.
3. For test circuit setup and waveforms, refer to Figures 10 and 11.
4. For this test, Pins 1 and 2 are common, and Pins 4 and 5 are common.

Typical Performance Characteristics

Fig. 1 Normalized CTR vs. Forward Current

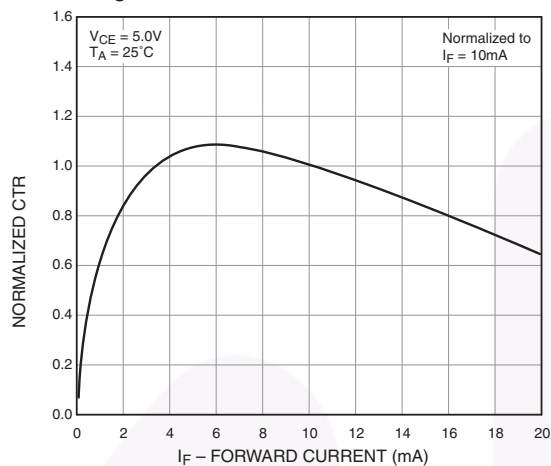


Fig. 2 Normalized CTR vs. Ambient Temperature

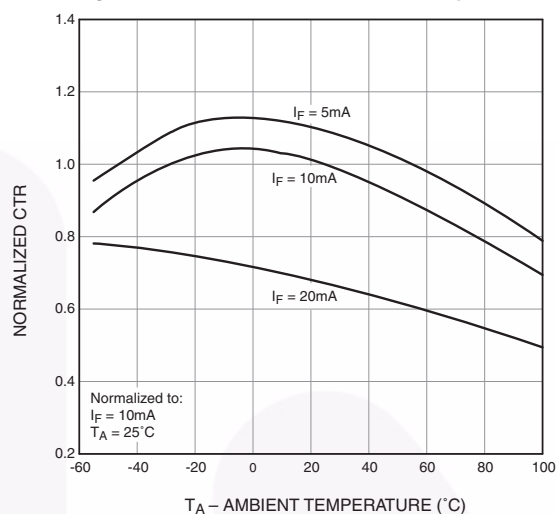


Fig. 3 CTR vs. R_BE (Unsaturated)

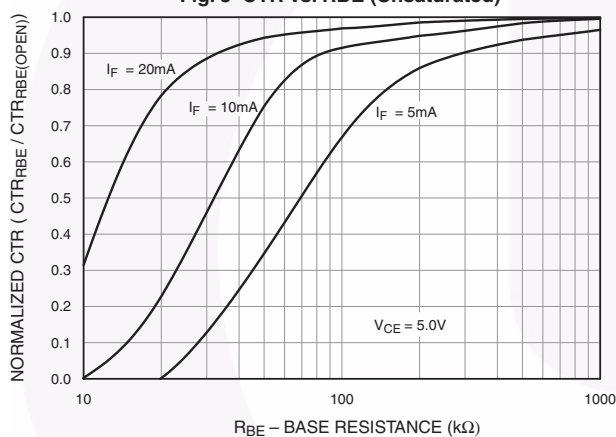


Fig. 4 CTR vs. R_BE (Saturated)

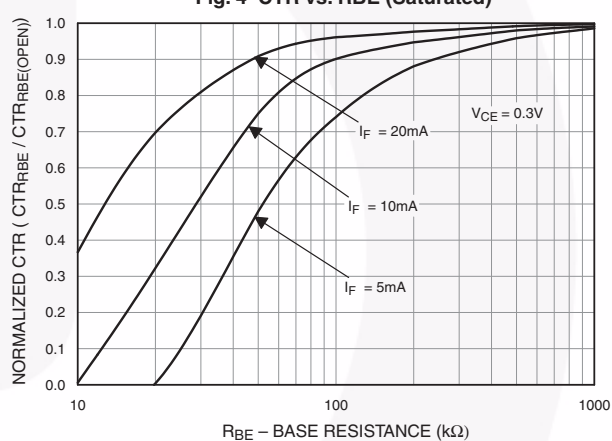


Fig. 5 Switching Speed vs. Load Resistor

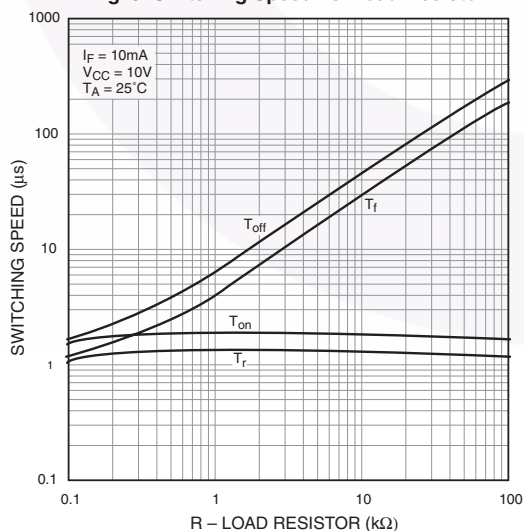
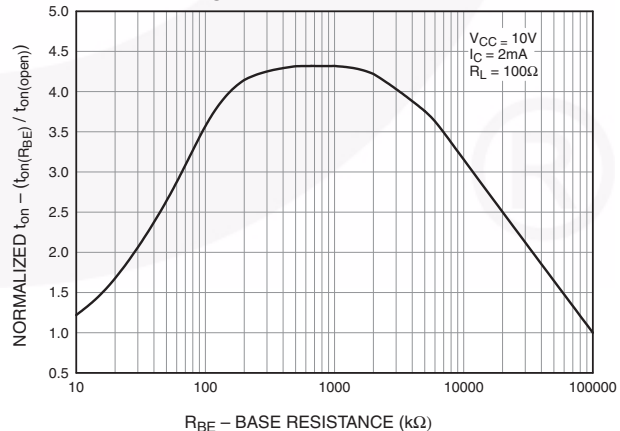


Fig. 6 Normalized t_{on} vs. R_{BE}



Typical Performance Characteristics (Continued)

Fig. 7 Normalized t_{off} vs. R_{BE}

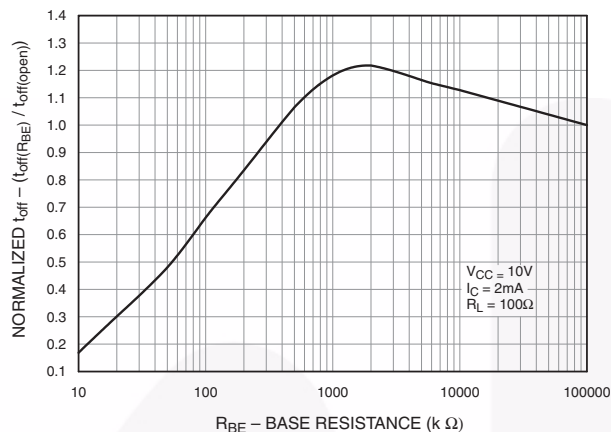


Fig. 8 LED Forward Voltage vs. Forward Current

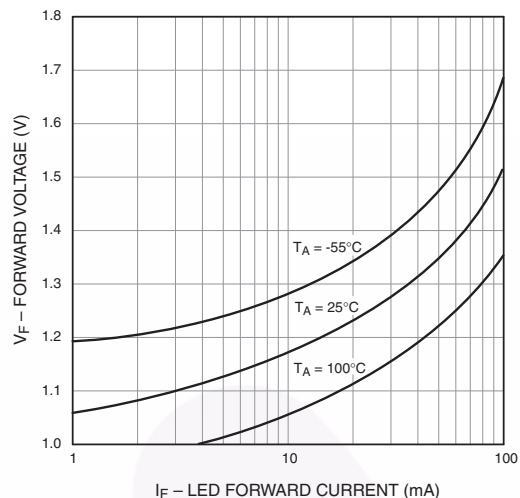


Fig. 9 Collector-Emitter Saturation Voltage vs Collector Current

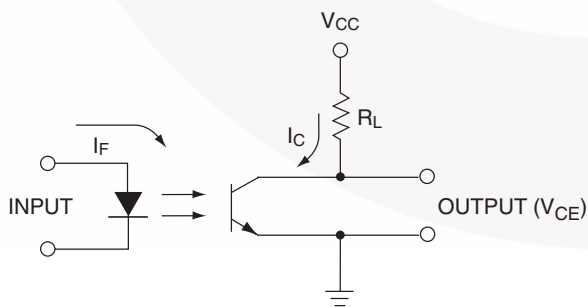
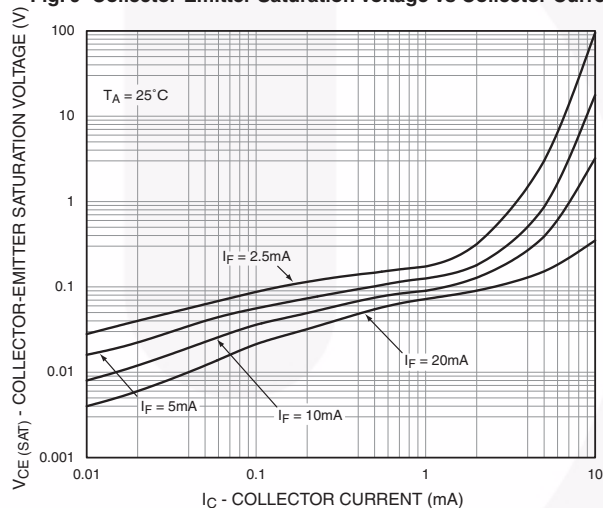


Figure 10. Switching Time Test Circuit

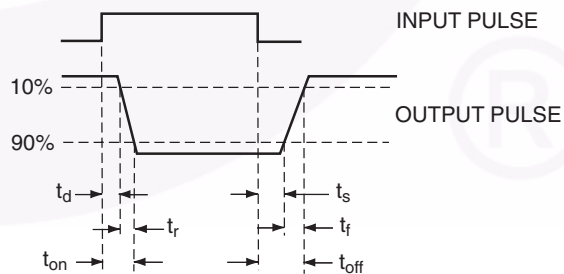
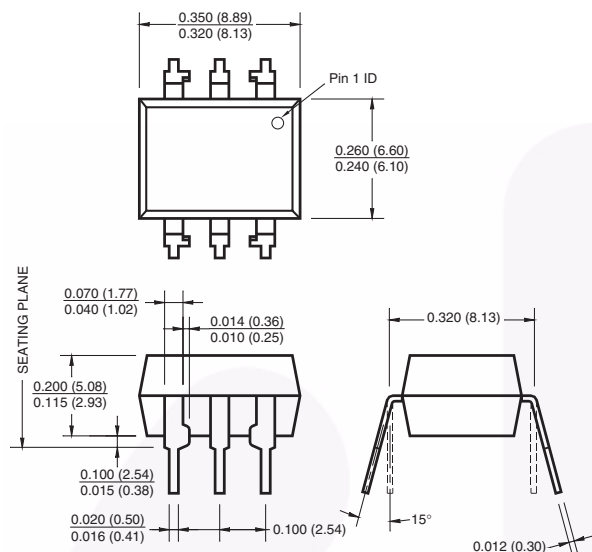


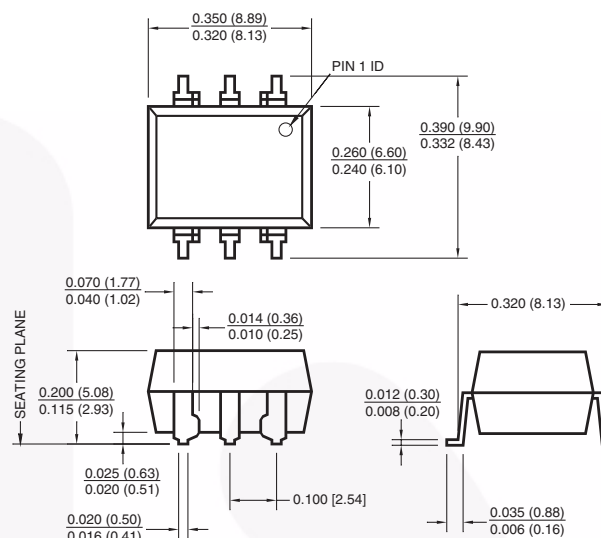
Figure 11. Switching Time Waveforms

Package Dimensions

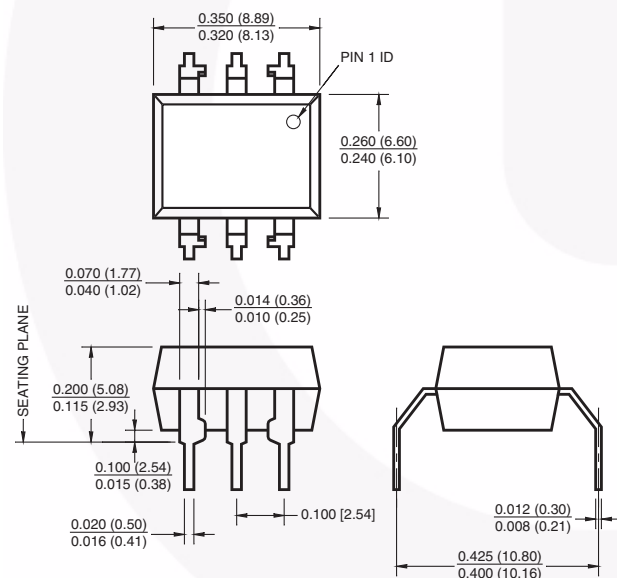
Through Hole



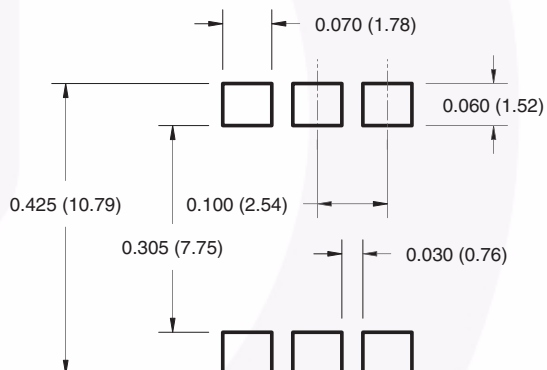
Surface Mount



0.4" Lead Spacing



Recommended Pad Layout for Surface Mount Leadform



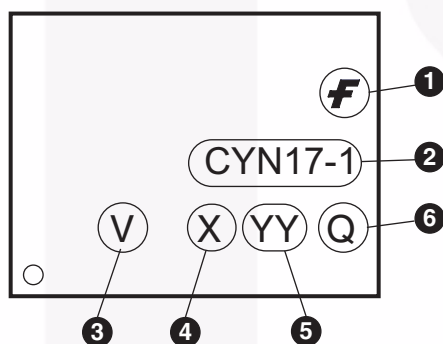
Note:

All dimensions are in inches (millimeters)

Ordering Information

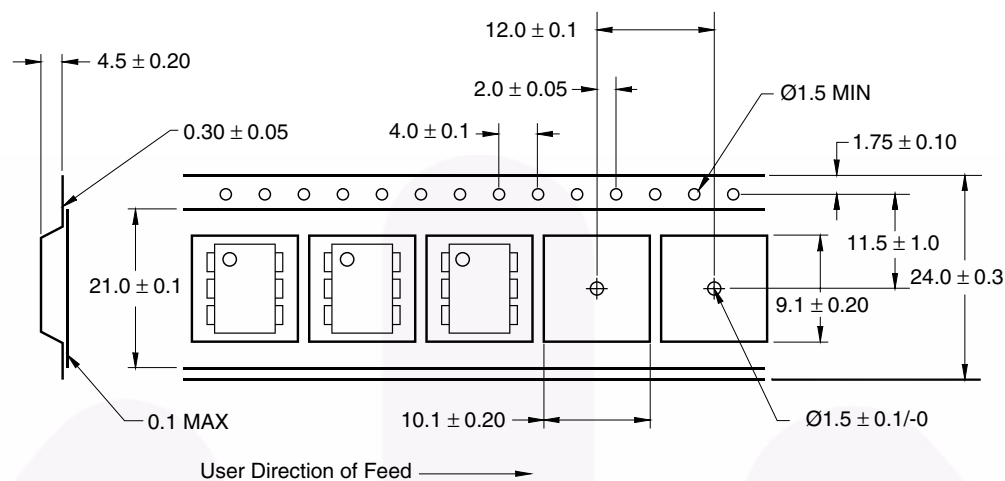
Option	Order Entry Identifier (Example)	Description
No option	CYN171M	Standard Through Hole Device
S	CYN171SM	Surface Mount Lead Bend
SR2	CYN171SR2M	Surface Mount; Tape and Reel
T	CYN171TM	0.4" Lead Spacing
V	CYN171VM	VDE 0884
TV	CYN171TVM	VDE 0884, 0.4" Lead Spacing
SV	CYN171SVM	VDE 0884, Surface Mount
SR2V	CYN171SR2VM	VDE 0884, Surface Mount, Tape and Reel

Marking Information

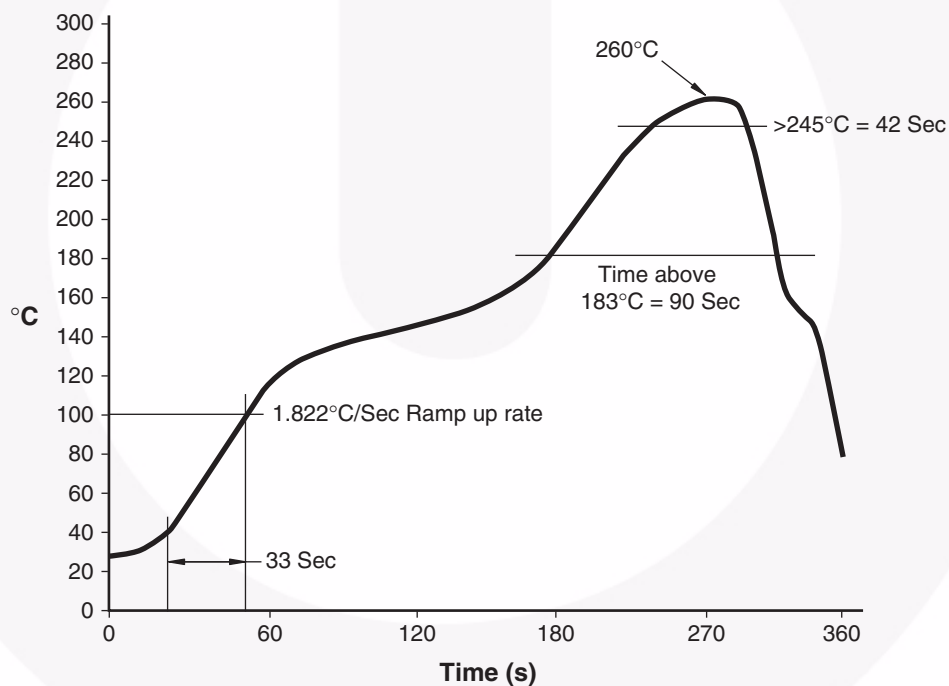


Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	One digit year code, e.g., '7'
5	Two digit work week ranging from '01' to '53'
6	Assembly package code

Carrier Tape Specification

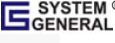


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Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	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.
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