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October 2014

CNY171M, CNY172M, CNY173M, CNY174M, CNY17F1M, CNY17F2M, CNY17F3M, CNY17F4M, MOC8106M 6-Pin DIP High BV_{CEO} Phototransistor Optocouplers

Features

- High BV_{CEO}: 70 V Minimum (CNY17XM, CNY17FXM, MOC8106M)
- Closely Matched Current Transfer Ratio (CTR) Minimizes Unit-to-Unit Variation
- Current Transfer Ratio In Select Groups
- Very Low Coupled Capacitance Along With No Chip-to-Pin 6 Base Connection for Minimum Noise Susceptability (CNY17FXM, MOC8106M)
- Safety and Regulatory Approvals:
 - UL1577, 4,170 VAC_{RMS} for 1 Minute
 - DIN-EN/IEC60747-5-5, 850 V Peak Working Insulation Voltage

Applications

- Power Supply Regulators
- Digital Logic Inputs
- Microprocessor Inputs
- Appliance Sensor Systems
- Industrial Controls

Description

The CNY17XM, CNY17FXM, and MOC8106M devices consist of a gallium arsenide infrared emitting diode coupled with an NPN phototransistor in a dual in-line package.

Package Outlines

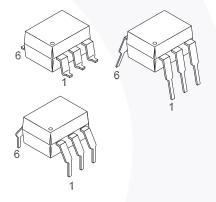
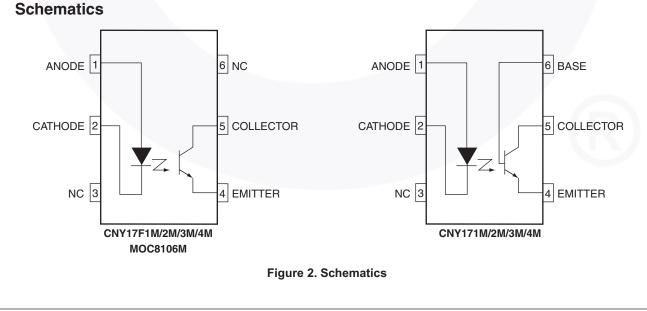


Figure 1. Package Outlines



CNY17XM, CNY17FXM, MOC8106M — 6-Pin DIP High BV_{CEO} Phototransistor Optocouplers

Safety and Insulation Ratings

As per DIN EN/IEC 60747-5-5, this optocoupler is suitable for "safe electrical insulation" only within the safety limit data. Compliance with the safety ratings shall be ensured by means of protective circuits.

Parameter	Characteristics	
Installation Classifications per DIN VDE	< 150 V _{RMS}	I–IV
0110/1.89 Table 1, For Rated Mains Voltage	< 300 V _{RMS}	I–IV
Climatic Classification		55/100/21
Pollution Degree (DIN VDE 0110/1.89)		2
Comparative Tracking Index		175

Symbol	Parameter	Value	Unit
V	Input-to-Output Test Voltage, Method A, $V_{IORM} \times 1.6 = V_{PR}$, Type and Sample Test with t _m = 10 s, Partial Discharge < 5 pC	1360	V _{peak}
V _{PR}	Input-to-Output Test Voltage, Method B, $V_{IORM} \times 1.875 = V_{PR}$, 100% Production Test with $t_m = 1$ s, Partial Discharge < 5 pC	1594	V _{peak}
VIORM	Maximum Working Insulation Voltage	850	V _{peak}
V _{IOTM}	Highest Allowable Over-Voltage	6000	V _{peak}
	External Creepage	≥ 7	mm
	External Clearance	≥ 7	mm
	External Clearance (for Option TV, 0.4" Lead Spacing)	≥ 10	mm
DTI	Distance Through Insulation (Insulation Thickness)	≥ 0.5	mm
Τ _S	Case Temperature ⁽¹⁾	175	°C
I _{S,INPUT}	Input Current ⁽¹⁾	350	mA
P _{S,OUTPUT}	Output Power ⁽¹⁾	800	mW
R _{IO}	Insulation Resistance at T _S , V_{IO} = 500 V ⁽¹⁾	> 10 ⁹	Ω

Note:

1. Safety limit values - maximum values allowed in the event of a failure.

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 DE	VICE		
T _{STG}	Storage Temperature	-40 to +125	°C
T _A	Ambient Operating Temperature	-40 to +100	°C
TJ	Junction Temperature	-40 to +125	°C
T _{SOL}	Lead Solder Temperature	260 for 10 seconds	°C
	Total Device Power Dissipation @ 25°C (LED plus detector)	270	mW
PD	Derate Linearly From 25°C	2.94	mW/°C
EMITTER			
I _F	Continuous Forward Current	60	mA
V _R	Reverse Voltage	6	V
l _F (pk)	Forward Current – Peak (1 µs pulse, 300 pps)	1.5	А
P	LED Power Dissipation 25°C Ambient	120	mW
PD	Derate Linearly From 25°C	1.41	mW/°C
DETECTO	2		
Ι _C	Continuous Collector Current	50	mA
V _{CEO}	Collector-Emitter Voltage	70	V
V _{ECO}	Emitter Collector Voltage	7	V
D	Detector Power Dissipation @ 25°C	150	mW
PD	Derate Linearly from 25°C	1.76	mW/°C

Electrical Characteristics

 $T_A = 25^{\circ}C$ unless otherwise specified.

Individual Component Characteristics

Symbol	Parameters	Test Conditions	Device	Min.	Тур.	Max.	Units
EMITTER							
		I _F = 10 mA	All Devices	1.0	1.15	1.50	V
V_{F}	Input Forward Voltage	I _F = 60 mA	CNY17XM, CNY17FXM	1.0	1.35	1.65	V
CJ	Capacitance	V _F = 0 V, f = 1.0 MHz	All Devices		18		pF
I _R	Reverse Leakage Current V _R = 6 V		All Devices		0.001	10	μA
DETECTO	DR						
	Breakdown Voltage						
BV_{CEO}	Collector-to-Emitter	I _C = 1 mA, I _F = 0	All Devices	70	100		V
BV _{CBO}	Collector-to-Base	I _C = 10 μA, I _F = 0	CNY17XM	70	120		V
BV _{ECO}	Emitter-to-Collector	I _E = 100 μA, I _F = 0	All Devices	7	10		V
	Leakage Current						
I _{CEO}	Collector-to-Emitter	V _{CE} = 10 V, I _F = 0	All Devices		1	50	nA
I _{CBO}	Collector-to-Base	V _{CB} = 10 V, I _F = 0	CNY17XM			20	nA
	Capacitance						
C_{CE}	Collector-to-Emitter	V _{CE} = 0, f = 1 MHz	All Devices		8		pF
C _{CB}	Collector-to-Base	V _{CB} = 0, f = 1 MHz	CNY17XM		20		pF
C _{EB}	Emitter-to-Base	V _{EB} = 0, f = 1 MHz	CNY17XM		10		pF

Transfer Characteristics

Symbol	Parameters	Test Conditions	Device	Min.	Тур.	Max.	Units
COUPLE)						
		I _F = 10 mA, V _{CE} = 10 V	MOC8106M	50		150	%
CTR Current Transfer Ratio	$I_F = 10 \text{ mA}, V_{CE} = 5 \text{ V}$	CNY171M, CNY17F1M	40		80	%	
		I _F = 10 mA, V _{CE} = 5 V	CNY172M, CNY17F2M	63		125	%
	I _F = 10 mA, V _{CE} = 5 V	CNY173M, CNY17F3M	100		200	%	
		I _F = 10 mA, V _{CE} = 5 V	CNY174M, CNY17F4M	160		320	%
Collector-Emitter		l _C = 0.5 mA, l _F = 5 mA	MOC8106M			0.4	V
V _{CE(SAT)}	Saturation Voltage	I _C = 2.5 mA, I _F = 10 mA	CNY17XM/CNY17FXM		0.4		v

Electrical Characteristics (Continued)

 $T_A = 25^{\circ}C$ unless otherwise specified.

AC Characteristics

Symbol	Parameters	Test Conditions	Device	Min.	Тур.	Max.	Units
NON-SAT	URATED SWITC	CHING TIME					
t _{on}	Turn-On Time	$I_{\rm C}$ = 2.0 mA, V _{CC} = 10 V, R _L = 100 Ω	All Devices		2.0	10.0	μs
t _{off}	Turn-Off Time	$I_{\rm C}$ = 2.0 mA, V _{CC} = 10 V, R _L = 100 Ω	All Devices		3.0	10.0	μs
t _d	Delay Time	I_F = 10 mA, V_{CC} = 5 V, R_L = 75 Ω	CNY17XM/CNY17FXM			5.6	μs
t _r	Rise Time	I_F = 10 mA, V_{CC} = 5 V, R_L = 75 Ω	CNY17XM/CNY17FXM			4.0	μs
ts	Storage Time	I_F = 10 mA, V_{CC} = 5 V, R_L = 75 Ω	CNY17XM/CNY17FXM			4.1	μs
t _f	Fall Time	I_F = 10 mA, V_{CC} = 5 V, R_L = 75 Ω	CNY17XM/CNY17FXM			3.5	μs
SATURA	TED SWITCHING	TIMES					
		I_F = 20 mA, V_{CC} = 5 V, R_L = 1 k Ω	CNY171M/F1M			5.5	μs
t _d	Delay Time	I_F = 10 mA, V_{CC} = 5 V, R_L = 1 k Ω	CNY172M/3M/4M CNY17F2M/F3M/F4M			8.0	μs
		I_F = 20 mA, V _{CC} = 5 V, R _L = 1 kΩ	CNY171M/F1M			4.0	μs
t _r	Rise Time	I_F = 10 mA, V_{CC} = 5 V, R_L = 1 k Ω	CNY172M/3M/4M CNY17F2M/F3M/F4M			6.0	μs
	/	I_F = 20 mA, V_{CC} = 5 V, R_L = 1 k Ω	CNY171M/F1M			34.0	μs
t _s	Storage Time	I_F = 10 mA, V_{CC} = 5 V, R_L = 1 k Ω	CNY172M/3M/4M CNY17F2M/F3M/F4M			39.0	μs
		I_F = 20 mA, V_{CC} = 5 V, R_L = 1 k Ω	CNY171M/F1M			20.0	μs
t _f	Fall Time	I_F = 10 mA, V_{CC} = 5 V, R_L = 1 k Ω	CNY172M/3M/4M CNY17F2M/F3M/F4M			24.0	μs

Isolation Characteristics

Symbol	Characteristic	Test Conditions	Min.	Тур.	Max.	Units
V _{ISO}	Input-Output Isolation Voltage	t = 1 Minute	4170			VAC _{RMS}
C _{ISO}	Isolation Capacitance	V _{I-O} = 0 V, f = 1 MHz		0.2		pF
R _{ISO}	Isolation Resistance	V _{I-O} = ±500 VDC, T _A = 25°C	10 ¹¹			Ω



100

1000

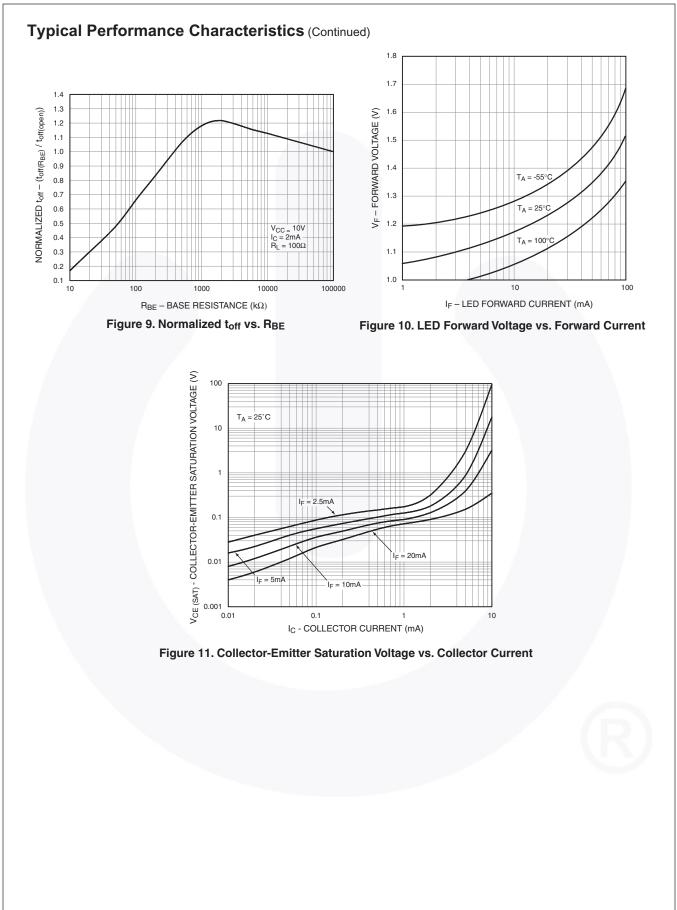
1.6 $V_{CE} = 5.0 V$ $T_A = 25^{\circ}C$ Normalized to I_F = 10 mA 1.2 1.4 $l_{\rm E} = 5 \, \rm{mA}$ 1.2 1.0 $I_F = 10 \text{ mA}$ NORMALIZED CTR 1.0 **NORMALIZED CTR** 0.8 0.8 $I_{\rm F} = 20 \, {\rm mA}$ 0.6 0.6 0.4 0.4 Normalized to: I_F = 10 mA 0.2 T_A = 25°C 0.2 0.0 -60 -40 -20 0 20 40 60 80 0 2 18 20 4 6 8 10 12 14 16 IF - FORWARD CURRENT (mA) T_A – AMBIENT TEMPERATURE (°C) Figure 3. Normalized CTR vs. Forward Current Figure 4. Normalized CTR vs. Ambient Temperature 1.0 NORMALIZED CTR (CTR_{RBE} / CTR_{RBE}(OPEN)) 1.0 NORMALIZED CTR (CTR_{RBE} / CTR_{RBE}(OPEN)) 0.9 0.9 $I_F = 20 \text{ mA}$ 0.8 0.8 $I_{\rm F} = 10 \, {\rm m/}$ = 5 mA $V_{CF} = 0.3 V$ 0.7 0.7 20 n 0.6 0.6 0.5 0.5 = 10 mA IF. 0.4 0.4 0.3 0.3 $I_F = 5 \text{ mA}$ 0.2 0.2 V_{CE} = 5.0 V 0.1 0.1 0.0 0.0 10 100 1000 10 100 R_{BE} – BASE RESISTANCE (k Ω) $R_{BE} - BASE RESISTANCE (k\Omega)$ Figure 5. CTR vs. RBE (Unsaturated) Figure 6. CTR vs. RBE (Saturated) 1000 $I_F = 10 \text{ mA}$ $V_{CC} = 10 \text{ V}$ $T_A = 25^{\circ}\text{C}$ 5.0 100 $V_{CC} = 10 V$ $I_{C} = 2 mA$ $R_{L} = 100 \Omega$ $\mathsf{NORMALIZED} \ t_{\mathsf{on}} - (t_{\mathsf{on}(\mathsf{R}_{\mathsf{BE}})} \ / \ t_{\mathsf{on}(\mathsf{open})})$ 4.5 SWITCHING SPEED (µs) 4.0 10 3.5 3.0 Т 2.5 T_r 2.0 1.5 1.0 0.1 0.5 **L** 10 0.1 10 100 100 1000 10000 R – LOAD RESISTOR (kΩ) R_{BE} – BASE RESISTANCE (k Ω) Figure 8. Normalized ton vs. RBE Figure 7. Switching Speed vs. Load Resistor

1.4

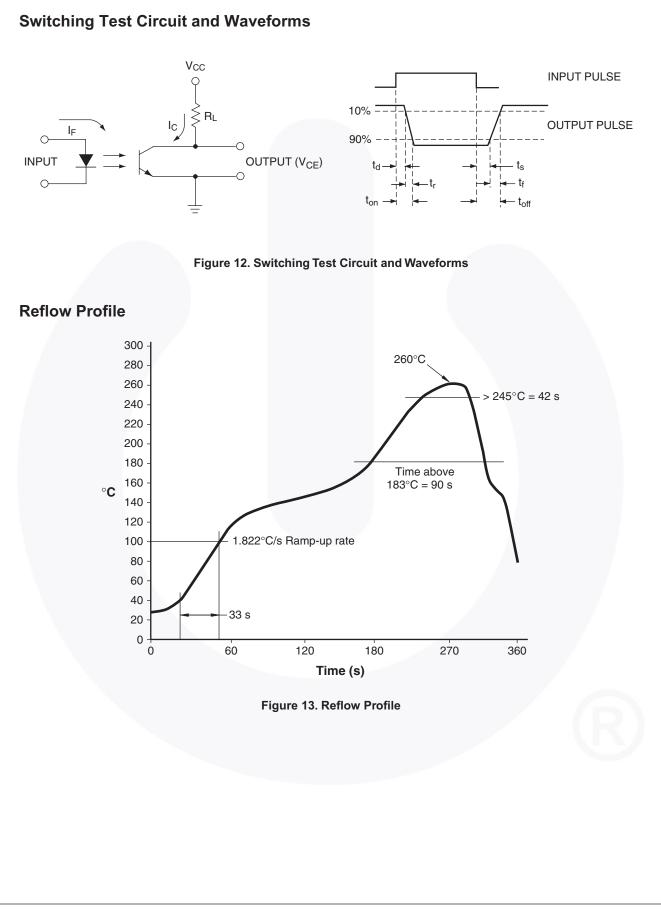
©2006 Fairchild Semiconductor Corporation CNY17XM, CNY17FXM, MOC8106M Rev. 1.1.2

Typical Performance Characteristics

100000



7



Ordering Information

Part Number	Package	Packing Method
CNY171M	DIP 6-Pin	Tube (50 Units)
CNY171SM	SMT 6-Pin (Lead Bend)	Tube (50 Units)
CNY171SR2M	SMT 6-Pin (Lead Bend)	Tape and Reel (1000 Units)
CNY171TM	DIP 6-Pin, 0.4" Lead Spacing	Tube (50 Units)
CNY171VM	DIP 6-Pin, DIN EN/IEC60747-5-5 Option	Tube (50 Units)
CNY171SVM	SMT 6-Pin (Lead Bend), DIN EN/IEC60747-5-5 Option	Tube (50 Units)
CNY171SR2VM	SMT 6-Pin (Lead Bend), DIN EN/IEC60747-5-5 Option	Tape and Reel (1000 Units)
CNY171TVM	DIP 6-Pin, 0.4" Lead Spacing, DIN EN/IEC60747-5-5 Option	Tube (50 Units)

Note:

2. The product orderable part number system listed in this table also applies to the CNY17FXM product family and the MOC8106M device.

Marking Information

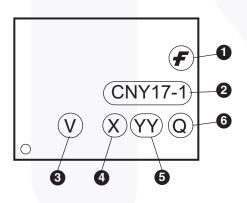


Figure 14. Top Mark

Table 1. Top Mark Definitions

1	Fairchild Logo		
2	Device Number		
3	DIN EN/IEC60747-5-5 Option (only appears on component ordered with this option)		
4	One-Digit Year Code, e.g., "4"		
5	Digit Work Week, Ranging from "01" to "53"		
6	Assembly Package Code		











NOTES:

- A) NO STANDARD APPLIES TO THIS PACKAGE.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSION
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No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

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