6-Pin DIP High B_{VCEO} Phototransistor Optocouplers

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.

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 Susceptibility (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



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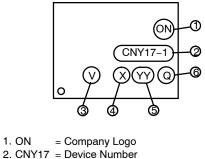
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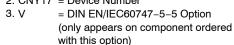


PDIP6 CASE 646BZ

PDIP6 CASE 646BX

MARKING DIAGRAM





- 4 X = One-Digit Year Code
- 5. YY = Digit Work Week
- 6. Q = Assembly Package Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 8 of this data sheet.

SCHEMATICS

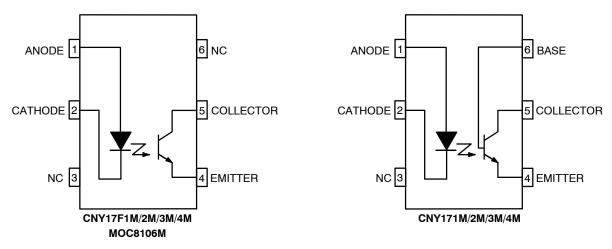


Figure 1. Schematics

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

Symbol	Parameter	Value	Unit
V _{PR}	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	Vpeak
	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	Vpeak
V _{IORM}	Maximum Working Insulation Voltage	850	Vpeak
V _{IOTM}	Highest Allowable Over-Voltage	6000	Vpeak
	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
Ts	Case Temperature (Note 1)	175	°C
I _{S, INPUT}	Input Current (Note 1)	350	mA
P _{S, OUTPUT}	Output Power (Note 1)	800	mW
R _{IO}	Insulation Resistance at T_S , V_{IO} = 500 V (Note 1)	> 10 ⁹	Ω

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

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Units
TOTAL DEVICE			
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
PD	Total Device Power Dissipation @ 25°C (LED plus detector)	270	mW
	Derate Linearly From 25°C	2.94	mW/°C
EMITTER			
١ _F	Continuous Forward Current	60	mA
V _R	Reverse Voltage	6	V
I _F (pk)	Forward Current – Peak (1 µs pulse, 300 pps)	1.5	А
PD	LED Power Dissipation 25°C Ambient	120	mW
	Derate Linearly From 25°C	1.41	mW/°C
DETECTOR			
Ι _C	Continuous Collector Current	50	mA
V _{CEO}	Collector-Emitter Voltage	70	V
V _{ECO}	Emitter Collector Voltage	7	V
PD	Detector Power Dissipation @ 25°C	150	mW
	Derate Linearly from 25°C	1.76	mW/°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

ELECTRICAL CHARACTERISTICS

(T_A = 25°C unless otherwise specified)

INDIVIDUAL COMPONENT CHARACTERISTICS

Symbol	Parameter	Test Conditions	Device	Min.	Тур.	Max.	Unit
EMITTER	•			-	-		
V _F	Input Forward Voltage	I _F = 10 mA	All Devices	1.0	1.15	1.50	V
		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	R						
	Breakdown Voltage						
BV_{CEO}	Collector-to-Emitter	l _C = 1 mA, l _F = 0	All Devices	70	100		V
BV_{CBO}	Collector-to-Base	$I_{C} = 10 \ \mu A, \ I_{F} = 0$	CNY17XM	70	120		V
BV _{ECO}	Emitter-to-Collector	$I_{E} = 100 \ \mu A, \ I_{F} = 0$	All Devices	7	10		V
	Leakage Current						
I _{CEO}	Collector-to-Emitter	$V_{CE} = 10 \text{ V}, \text{ I}_{F} = 0$	All Devices		1	50	nA
I _{CBO}	Collector-to-Base	V _{CB} = 10 V, I _F = 0	CNY17XM			20	nA
						Ī	

	Breakdown Voltage Collector-to-Emitter			70	100		V
BV _{CEO}	Collector-to-Emitter	l _C = 1 mA, l _F = 0	All Devices	70	100		V
BV _{CBO}	Collector-to-Base	$I_{C} = 10 \ \mu A, \ I_{F} = 0$	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	Parameter	Test Conditions	Device	Min.	Тур.	Max.	Unit	
COUPLED	COUPLED							
CTR	Current Transfer Ratio	I _F = 10 mA, V _{CE} = 10 V	MOC8106M	50		150	%	
		I _F = 10 mA, V _{CE} = 5 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	%	
V _{CE(SAT)}	Collector-Emitter	I _C = 0.5 mA, I _F = 5 mA	MOC8106M			0.4	V	
	Saturation Voltage	I _C = 2.5 mA, I _F = 10 mA	CNY17XM/CNY17FXM					

AC CHARACTERISTICS

Symbol	Parameter	Test Conditions	Device	Min.	Тур.	Max.	Unit	
NON-SATU	NON-SATURATED SWITCHING TIME							
ton	Turn-On Time	I_{C} = 2.0 mA, V_{CC} = 10 V, R_{L} = 100 Ω	All Devices		2.0	10.0	μs	
toff	Turn-Off Time	I_{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	
t _s	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	

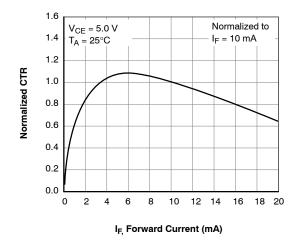
SATURATED SWITCHING TIME

t _d	Delay Time	$I_F = 20 \text{ mA}, V_{CC} = 5 \text{ V}, \text{R}_L = 1 \text{k} \Omega$	CNY171M/F1M	5.5	μs
		$I_{F} = 10 \text{ mA}, V_{CC} = 5 \text{V}, \text{R}_{L} = 1 \text{k} \Omega$	CNY172M/3M/4M CNY17F2M/F3M/F4M	8.0	μs
t _r	Rise Time	I_F = 20 mA, V_{CC} = 5 V, R_L = 1 k Ω	CNY171M/F1M	4.0	μs
		I_F = 10 mA, V_{CC} = 5 V, R_L = 1 k Ω	CNY172M/3M/4M CNY17F2M/F3M/F4M	6.0	μs
ts	Storage Time	I_F = 20 mA, V_{CC} = 5 V, R_L = 1 k Ω	CNY171M/F1M	34.0	μs
		I_F = 10 mA, V_{CC} = 5 V, R_L = 1 k Ω	CNY172M/3M/4M CNY17F2M/F3M/F4M	39.0	μs
t _f	Fall Time	I_F = 20 mA, V_{CC} = 5 V, R_L = 1 k Ω	CNY171M/F1M	20.0	μs
		$I_{F} = 10 \text{ mA}, V_{CC} = 5 \text{V}, \text{R}_{L} = 1 \text{k} \Omega$	CNY172M/3M/4M CNY17F2M/F3M/F4M	24.0	μs

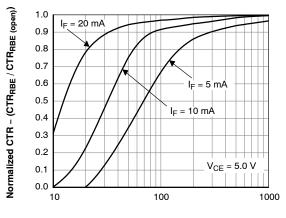
ISOLATION CHARACTERISTICS

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
VISO	Input-Output Isolation Voltage	t = 1 Minute	4170			VAC _{RMS}
CISO	Isolation Capacitance	V _{I-O} = 0 V, f = 1 MHz		0.2		pF
RISO	Isolation Resistance	V_{I-O} = ±500 VDC, T_A = 25°C	10 ¹¹			Ω

TYPICAL PERFORMANCE CHARACTERISTICS

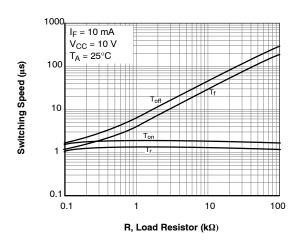






 $\textbf{R}_{\textbf{BE},}$ Base Resistance (k $\Omega)$

Figure 4. CTR vs. RBE (Unsaturated)





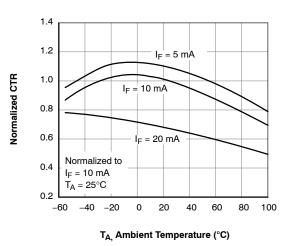
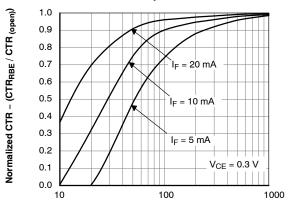
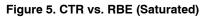


Figure 3. Normalized CTR vs. Ambient Temperature



 $\textbf{R}_{BE,}$ Base Resistance (k $\Omega)$



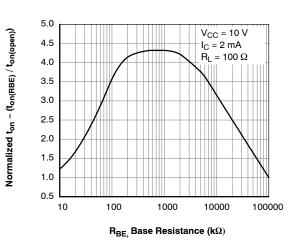


Figure 7. Normalized ton vs. RBE

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

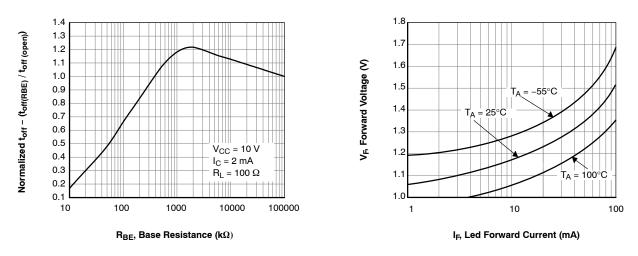
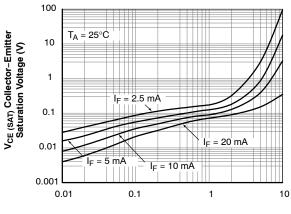
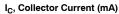




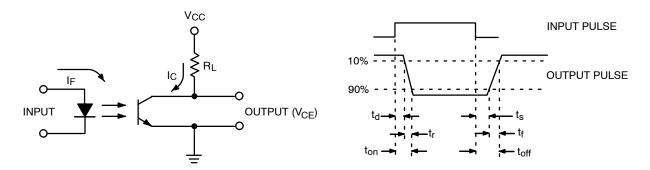
Figure 9. LED Forward Voltage vs. Forward Current







SWITCHING TEST CIRCUIT AND WAVEFORMS





REFLOW PROFILE

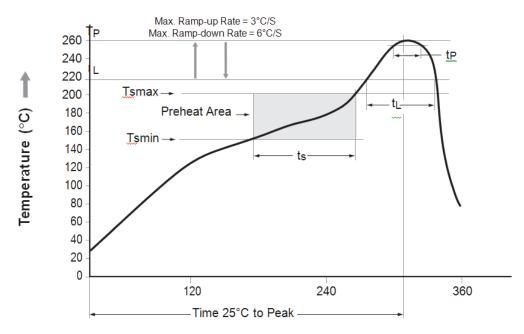


Figure 12. Reflow Profile

Profile Feature	Pb – Free Assembly Profile
Temperature Min. (Tsmin)	150°C
Temperature Max. (Tsmax)	200°C
Time (t _S) from (Tsmin to Tsmax)	60–120 seconds
Ramp – up Rate (t to t _P)	3°C/second max.
Liquidous Temperature (T _L)	217°C
Time (t_L) Maintained Above (T_L)	60–150 seconds
Peak Body Package Temperature	260°C +0°C / -5°C
Time (t _P) within 5°C of 260°C	30 seconds
Ramp – down Rate (T_P to T_L)	6°C / second max.
Time 25°C to Peak Temperature	8 minutes max.

Table 1. 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)

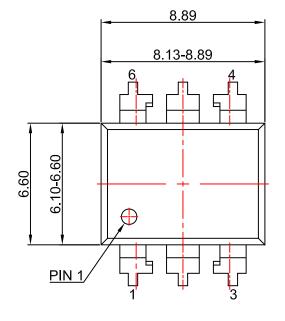
+For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

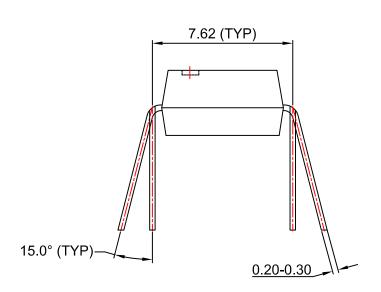
2. The product orderable part number system listed in this table also applies to the CNY17FXM product family and the MOC8106M device.

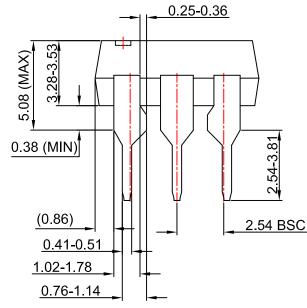


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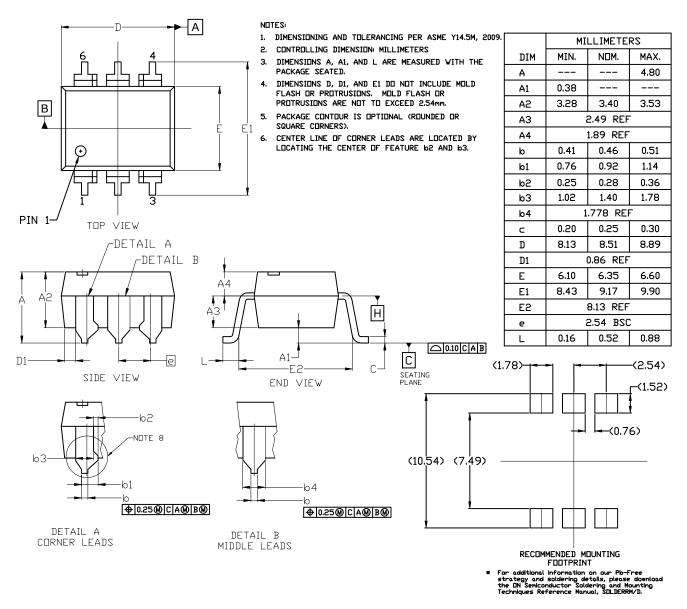
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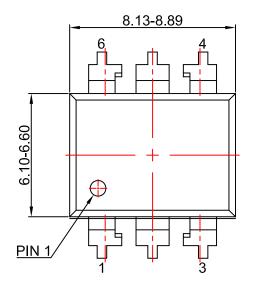


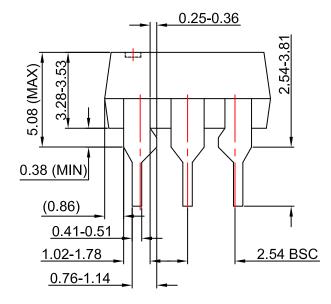
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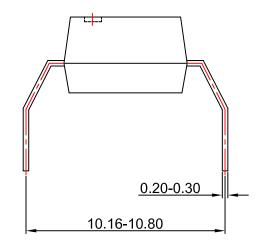


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