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

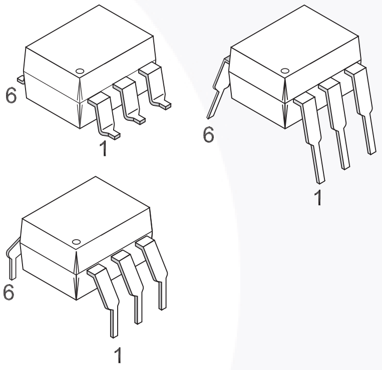
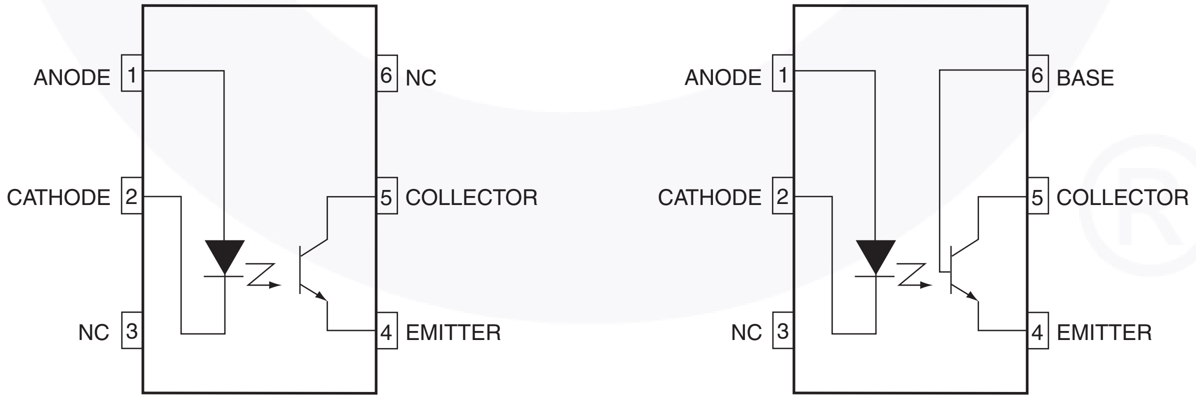


Figure 1. Package Outlines

Schematics



CNY17F1M/2M/3M/4M
MOC8106M

CNY171M/2M/3M/4M

Figure 2. 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–IV
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} x 1.6 = V_{PR}, Type and Sample Test with t_m = 10 s, Partial Discharge < 5 pC	1360	V_{peak}
	Input-to-Output Test Voltage, Method B, V_{IORM} x 1.875 = V_{PR}, 100% Production Test with t_m = 1 s, Partial Discharge < 5 pC	1594	V_{peak}
V_{IORM}	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
T_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 DEVICE			
T_{STG}	Storage Temperature	-40 to +125	°C
T_A	Ambient Operating Temperature	-40 to +100	°C
T_J	Junction Temperature	-40 to +125	ºC
T_{SOL}	Lead Solder Temperature	260 for 10 seconds	°C
P_D	Total Device Power Dissipation @ 25°C (LED plus detector)	270	mW
	Derate Linearly From 25°C	2.94	mW/°C
EMITTER			
I_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	A
P_D	LED Power Dissipation 25°C Ambient	120	mW
	Derate Linearly From 25°C	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	150	mW
	Derate Linearly from 25°C	1.76	mW/°C

Electrical Characteristics

T_A = 25°C unless otherwise specified.

Individual Component Characteristics

Symbol	Parameters	Test Conditions	Device	Min.	Typ.	Max.	Units
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
C_J	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
DETECTOR							
	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.	Typ.	Max.	Units
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 Saturation Voltage	I_C = 0.5 mA, I_F = 5 mA	MOC8106M			0.4	V
		I_C = 2.5 mA, I_F = 10 mA	CNY17XM/CNY17FXM				

Electrical Characteristics (Continued)

T_A = 25°C unless otherwise specified.

AC Characteristics

Symbol	Parameters	Test Conditions	Device	Min.	Typ.	Max.	Units
NON-SATURATED SWITCHING TIME							
t_{on}	Turn-On Time	I_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_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 TIMES							
t_d	Delay Time	I_F = 20 mA, V_{CC} = 5 V, R_L = 1 kΩ	CNY171M/F1M			5.5	μs
		I_F = 10 mA, V_{CC} = 5 V, R_L = 1 kΩ	CNY172M/3M/4M CNY17F2M/F3M/F4M			8.0	μs
t_r	Rise Time	I_F = 20 mA, V_{CC} = 5 V, R_L = 1 kΩ	CNY171M/F1M			4.0	μs
		I_F = 10 mA, V_{CC} = 5 V, R_L = 1 kΩ	CNY172M/3M/4M CNY17F2M/F3M/F4M			6.0	μs
t_s	Storage Time	I_F = 20 mA, V_{CC} = 5 V, R_L = 1 kΩ	CNY171M/F1M			34.0	μs
		I_F = 10 mA, V_{CC} = 5 V, R_L = 1 kΩ	CNY172M/3M/4M CNY17F2M/F3M/F4M			39.0	μs
t_f	Fall Time	I_F = 20 mA, V_{CC} = 5 V, R_L = 1 kΩ	CNY171M/F1M			20.0	μs
		I_F = 10 mA, V_{CC} = 5 V, R_L = 1 kΩ	CNY172M/3M/4M CNY17F2M/F3M/F4M			24.0	μs

Isolation Characteristics

Symbol	Characteristic	Test Conditions	Min.	Typ.	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

Typical Performance Characteristics

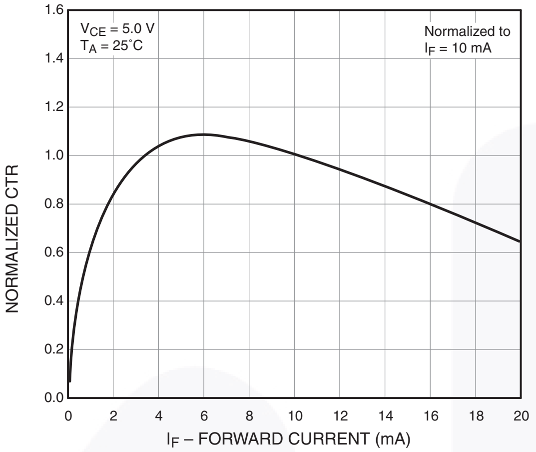


Figure 3. Normalized CTR vs. Forward Current

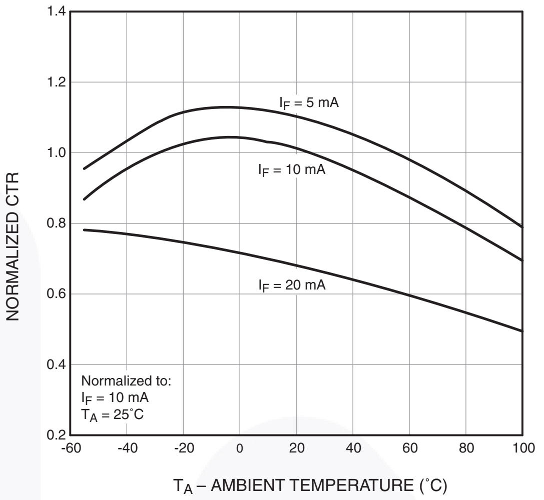


Figure 4. Normalized CTR vs. Ambient Temperature

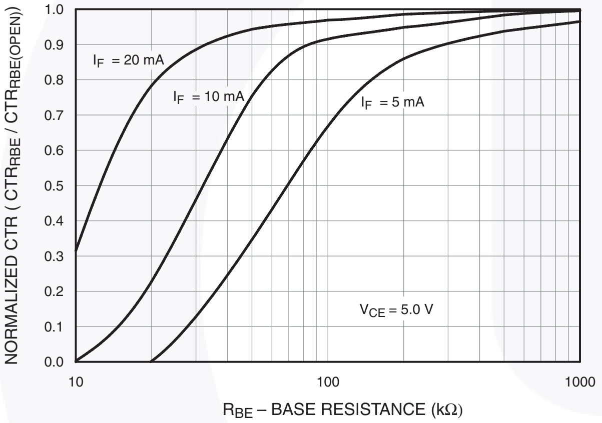


Figure 5. CTR vs. RBE (Unsaturated)

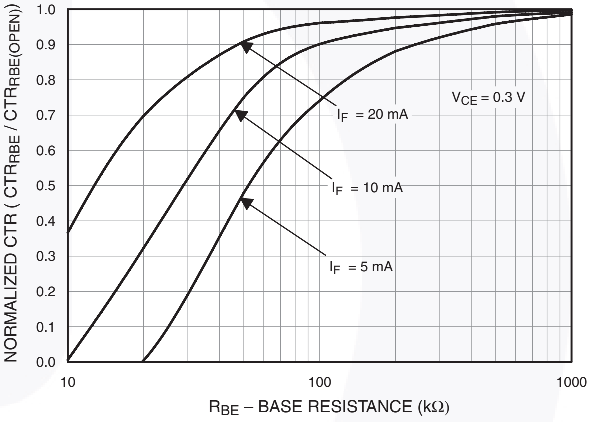


Figure 6. CTR vs. RBE (Saturated)

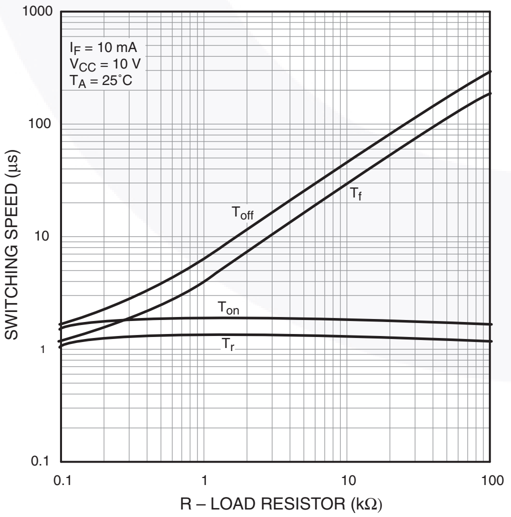


Figure 7. Switching Speed vs. Load Resistor

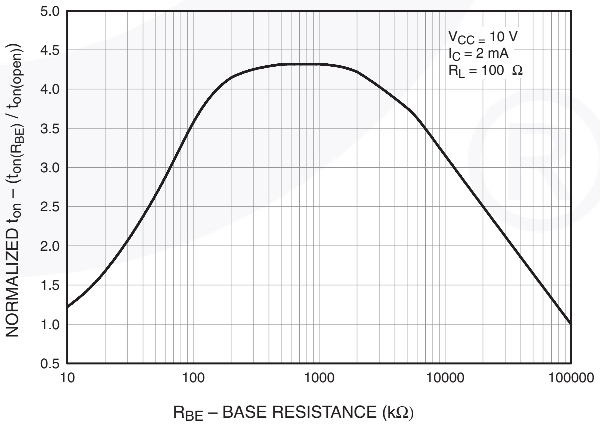


Figure 8. Normalized t_{on} vs. R_{BE}

Typical Performance Characteristics (Continued)

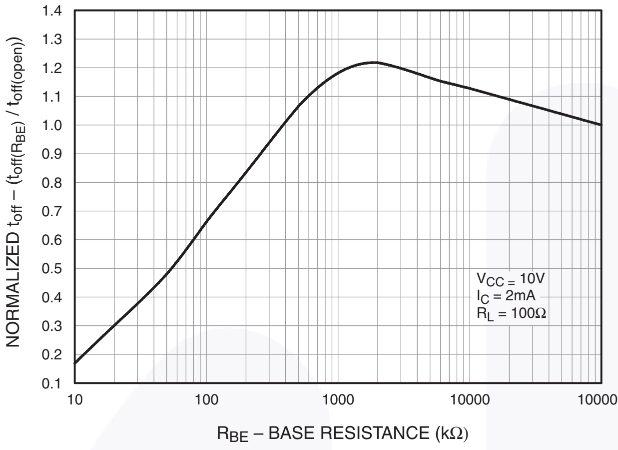


Figure 9. Normalized t_{off} vs. R_{BE}

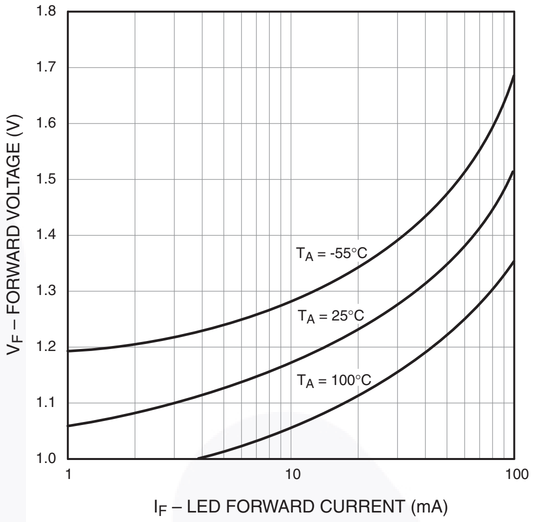


Figure 10. LED Forward Voltage vs. Forward Current

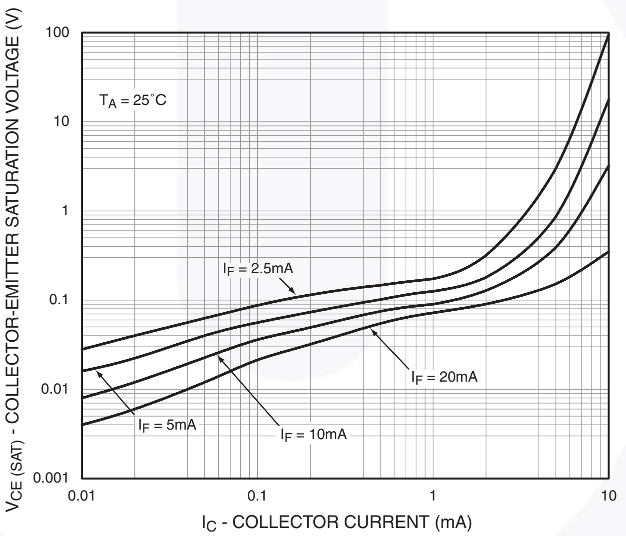


Figure 11. Collector-Emitter Saturation Voltage vs. Collector Current

Switching Test Circuit and Waveforms

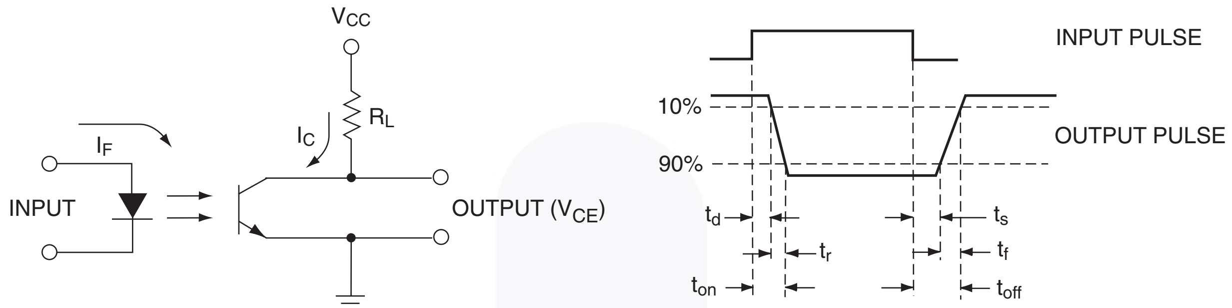


Figure 12. Switching Test Circuit and Waveforms

Reflow Profile

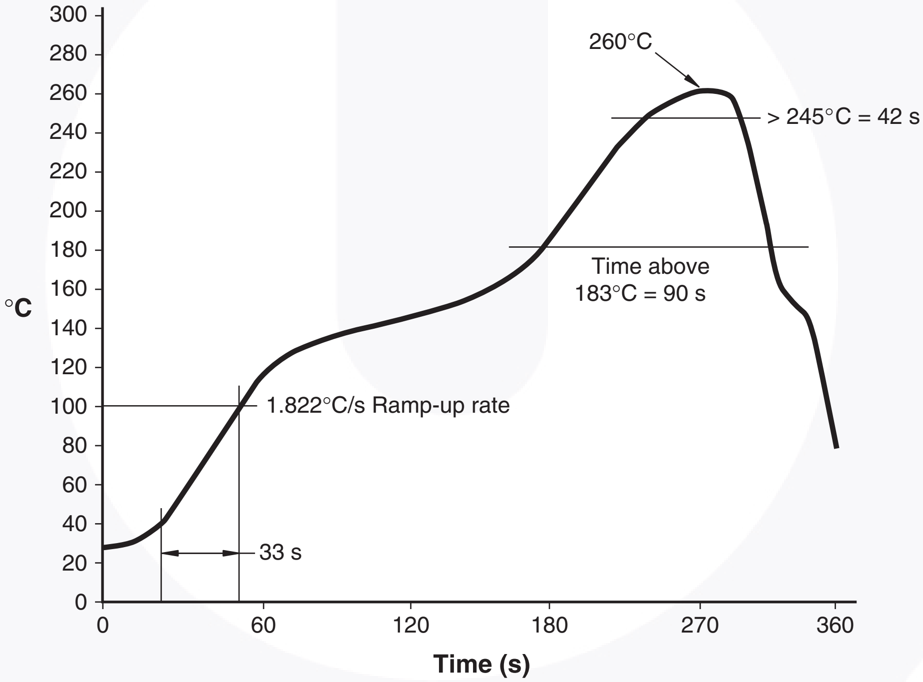


Figure 13. Reflow Profile

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

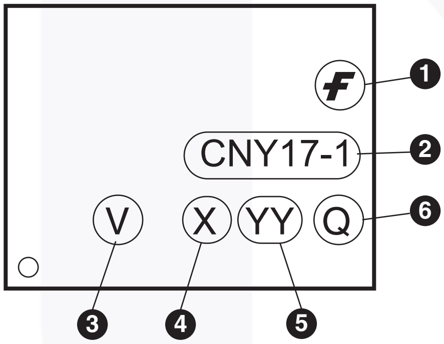
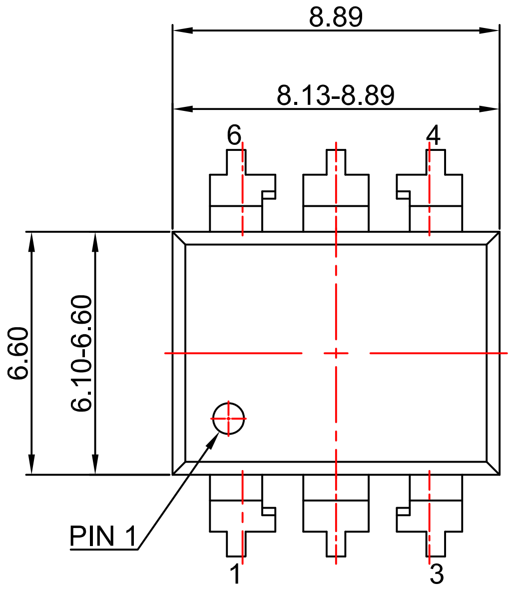
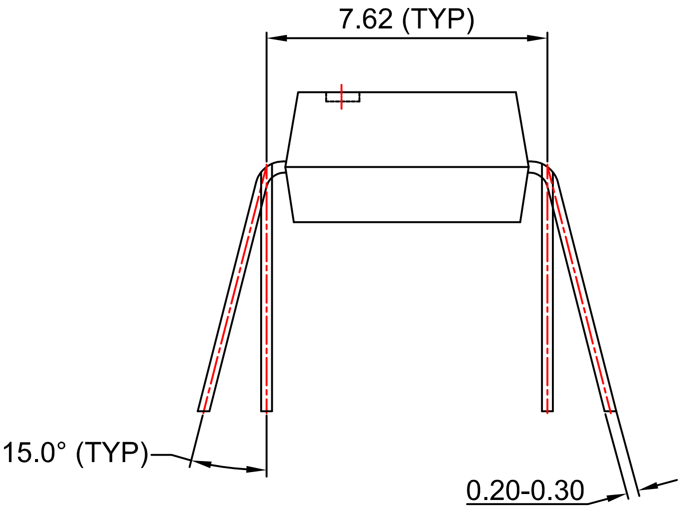


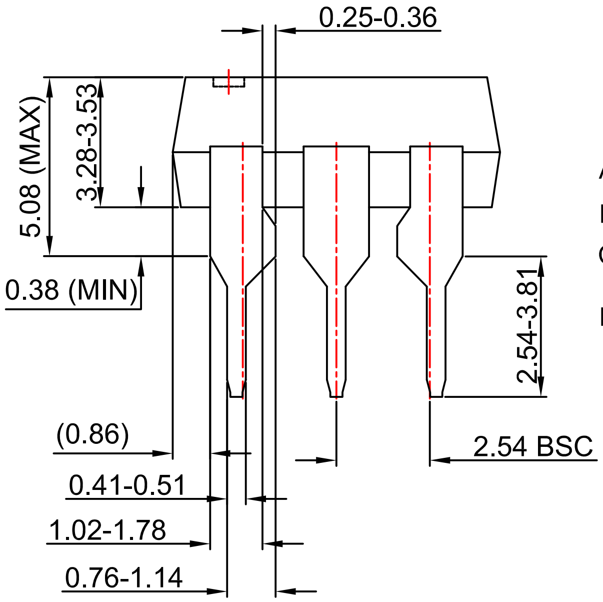
Figure 14. Top Mark

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







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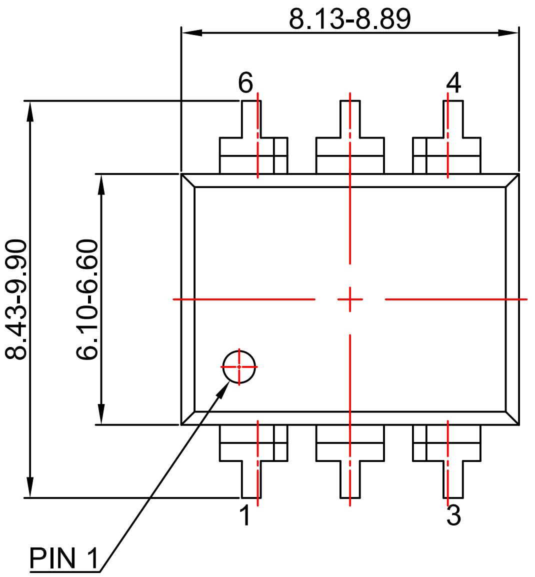
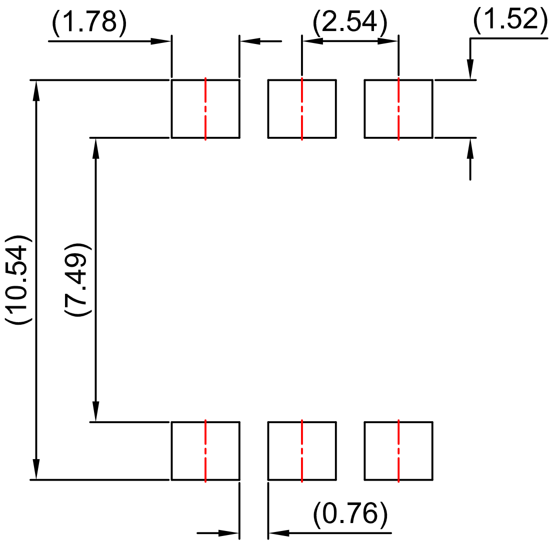
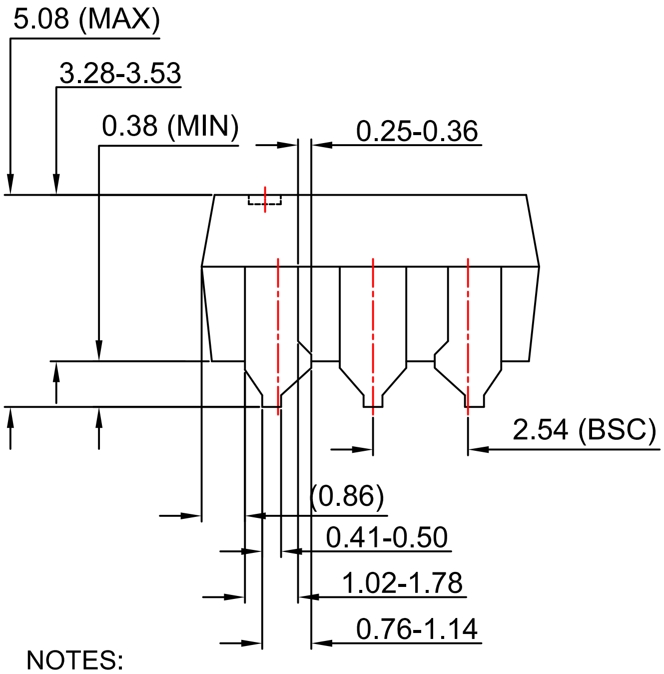
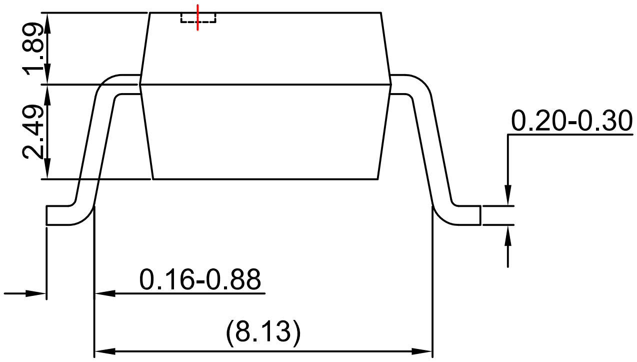




LAND PATTERN RECOMMENDATION





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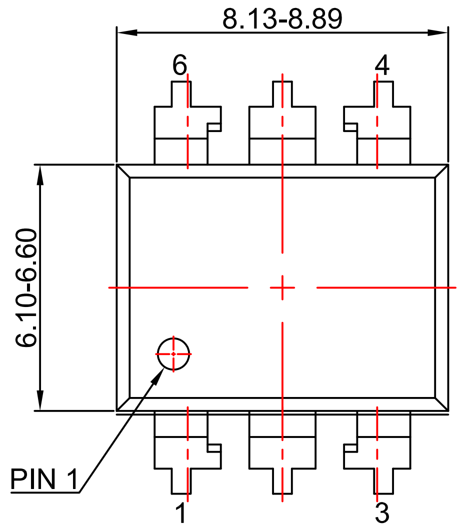

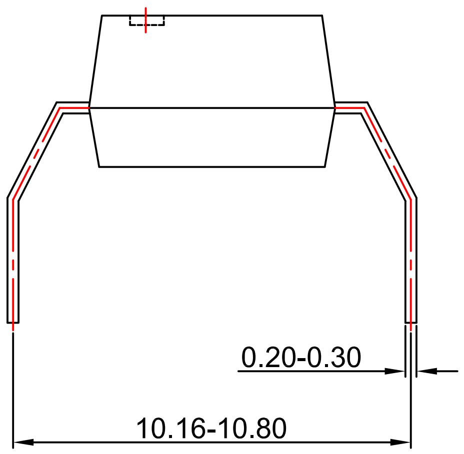

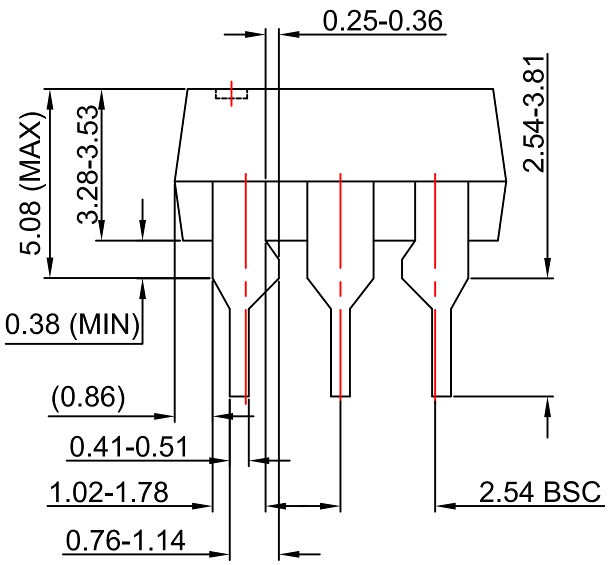

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