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April 2015

MOC8021M, MOC8050M 6-Pin DIP Photodarlington Optocoupler (No Base Connection)

Features

- High BV_{CEO} :
 - Minimum 50 V (MOC8021M)
 - Minimum 80 V (MOC8050M)
- High Current Transfer Ratio:
 - Minimum 1000% (MOC8021M)
 - Minimum 500% (MOC8050M)
- No Base Connection for Improved Noise Immunity
- Safety and Regulatory Approvals:
 - UL1577, 4,170 $V_{AC_{RMS}}$ for 1 Minute
 - DIN-EN/IEC60747-5-5, 850 V Peak Working Insulation Voltage

Applications

- Appliances, Measuring Instruments
- I/O Interface for Computers
- Programmable Controllers
- Portable Electronics
- Interfacing and Coupling Systems of Different Potentials and Impedance
- Solid State Relays

Description

The MOC8021M and MOC8050M are photodarlington-type optically coupled optocouplers. The devices have a gallium arsenide infrared emitting diode coupled with a silicon darlington phototransistor.

Schematic

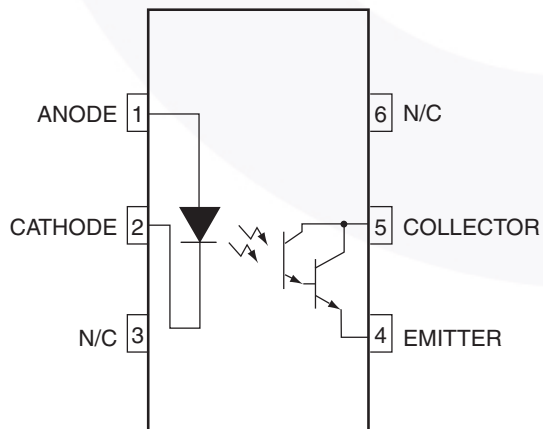


Figure 1. Schematic

Package Outlines

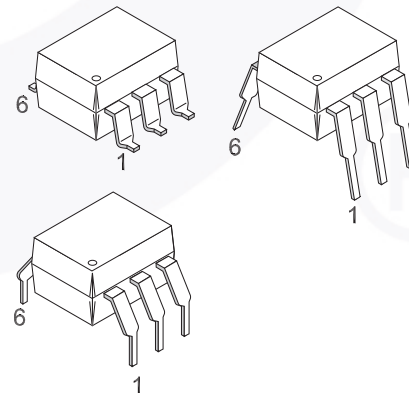


Figure 2. Package Outlines

MOC8021M, MOC8050M — 6-Pin DIP Photodarlington Optocoupler (No Base Connection)

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} × 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} × 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 | Parameter | Value | Unit |
|---------------------|-----------------------------------------------------------|--------------------|-------|
| TOTAL DEVICE | | | |
| T_{STG} | Storage Temperature | -40 to +125 | °C |
| T_{OPR} | Operating Temperature | -40 to +100 | °C |
| T_J | Junction Temperature | -40 to +125 | °C |
| T_{SOL} | Lead Solder Temperature | 260 for 10 seconds | °C |
| P_D | Total Device Power Dissipation @ $T_A = 25^\circ\text{C}$ | 270 | mW |
| | Derate Above 25°C | 2.94 | mW/°C |
| EMITTER | | | |
| I_F | DC/Average Forward Input Current | 60 | mA |
| V_R | Reverse Input Voltage | 3 | V |
| P_D | LED Power Dissipation @ $T_A = 25^\circ\text{C}$ | 120 | mW |
| | Derate Above 25°C | 1.41 | mW/°C |
| DETECTOR | | | |
| I_C | Continuous Collector Current | 150 | mA |
| V_{CEO} | Collector-Emitter Voltage MOC8021M | 50 | V |
| | MOC8050M | 80 | V |
| P_D | Detector Power Dissipation @ $T_A = 25^\circ\text{C}$ | 150 | mW |
| | Derate Above 25°C | 1.76 | mW/°C |

Electrical Characteristics

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

Individual Component Characteristics

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-----------------|-------------------------------------------------|-----------------------------------------|------|-------|------|---------------|
| EMITTER | | | | | | |
| V_F | Input Forward Voltage | $I_F = 10\text{ mA}$ | | 1.18 | 2.00 | V |
| I_R | Reverse Leakage Current | $V_R = 3.0\text{ V}$ | | 0.001 | 10 | μA |
| DETECTOR | | | | | | |
| BV_{CEO} | Collector-Emitter Breakdown Voltage MOC8021M | $I_C = 1.0\text{ mA}, I_F = 0$ | 50 | 100 | | V |
| | MOC8050M | | 80 | 100 | | V |
| BV_{ECO} | Emitter-Collector Breakdown Voltage | $I_E = 100\text{ }\mu\text{A}, I_F = 0$ | 5 | 10 | | V |
| I_{CEO} | Collector-Emitter Dark Current | $V_{CE} = 60\text{ V}, I_F = 0$ | | | 1 | μA |
| C_{CE} | Capacitance | $V_{CE} = 0\text{ V}, f = 1\text{ MHz}$ | | 8 | | pF |

Transfer Characteristics

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------------------|-------------------------------------------------------------|-------------------------------------------------------------------------|-------|------|------|---------------|
| DC CHARACTERISTICS | | | | | | |
| CTR | Current Transfer Ratio, Collector to Emitter MOC8021M | $I_F = 10\text{ mA}, V_{CE} = 5\text{ V}$ | 1,000 | | | % |
| | MOC8050M | $I_F = 10\text{ mA}, V_{CE} = 1.5\text{ V}$ | 500 | | | % |
| AC CHARACTERISTICS | | | | | | |
| t_{on} | Turn-on Time | $I_F = 5\text{ mA}, V_{CC} = 10\text{ V},$ $R_L = 100\text{ }\Omega$ | | 8.5 | | μs |
| t_{off} | Turn-off Time | $I_F = 5\text{ mA}, V_{CC} = 10\text{ V},$ $R_L = 100\text{ }\Omega$ | | 95 | | μs |

Isolation Characteristics

| Symbol | Characteristic | Test Conditions | Min. | Typ. | Max. | Unit |
|-----------|--------------------------------|--------------------------------------------------------|-----------|------|------|----------------|
| V_{ISO} | Input-Output Isolation Voltage | $t = 1\text{ Minute}$ | 4170 | | | $V_{AC_{RMS}}$ |
| C_{ISO} | Isolation Capacitance | $V_{I-O} = 0\text{ V}, f = 1\text{ MHz}$ | | 0.2 | | pF |
| R_{ISO} | Isolation Resistance | $V_{I-O} = \pm 500\text{ VDC}, T_A = 25^\circ\text{C}$ | 10^{11} | | | Ω |

Typical Performance Curves

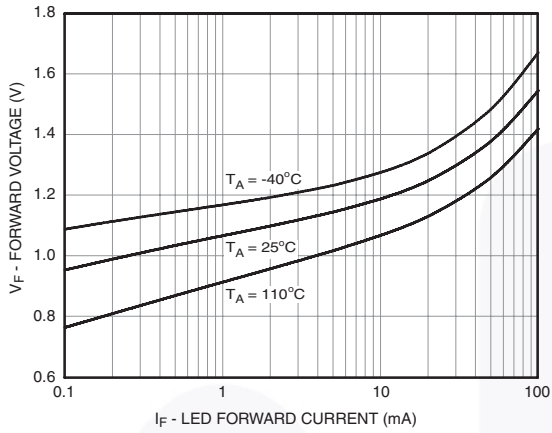


Figure 3. LED Forward Voltage vs. Forward Current

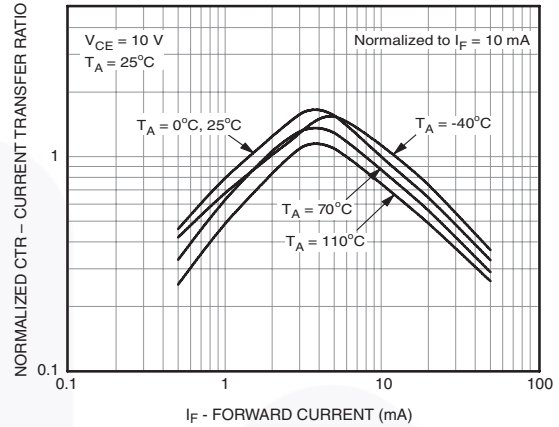


Figure 4. Normalized CTR vs. Forward Current

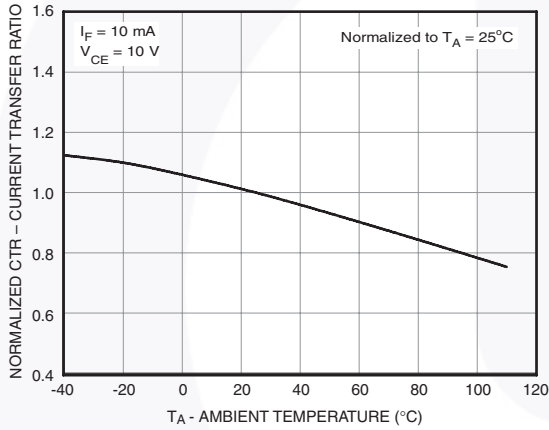


Figure 5. Normalized CTR vs. Ambient Temperature

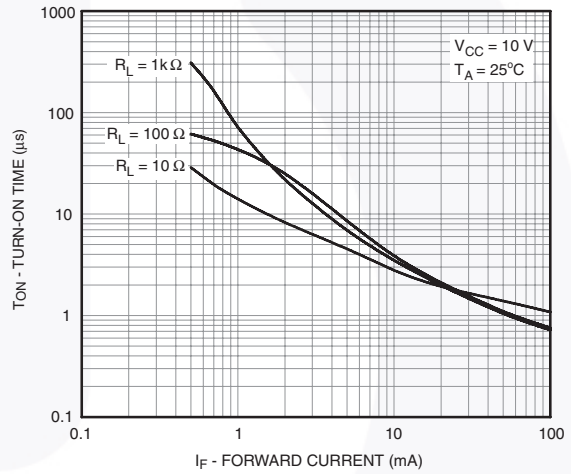


Figure 6. Turn-on Time vs. Forward Current

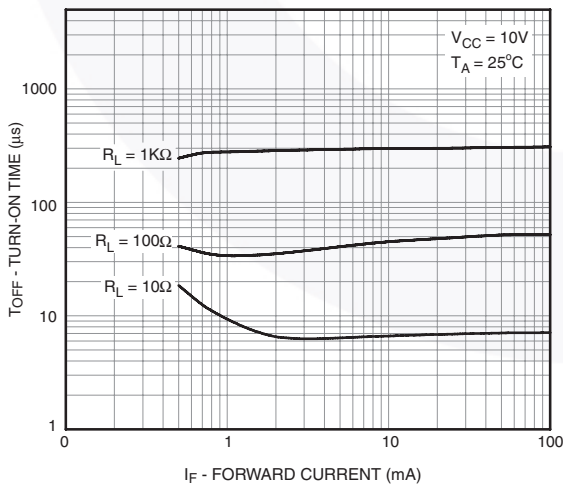


Figure 7. Turn-off Time vs. Forward Current

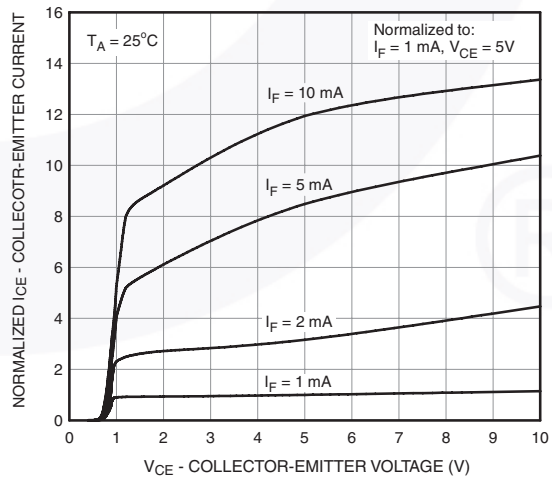


Figure 8. Normalized Collector-Emitter Current vs. Collector-Emitter Voltage

Typical Performance Curves (Continued)

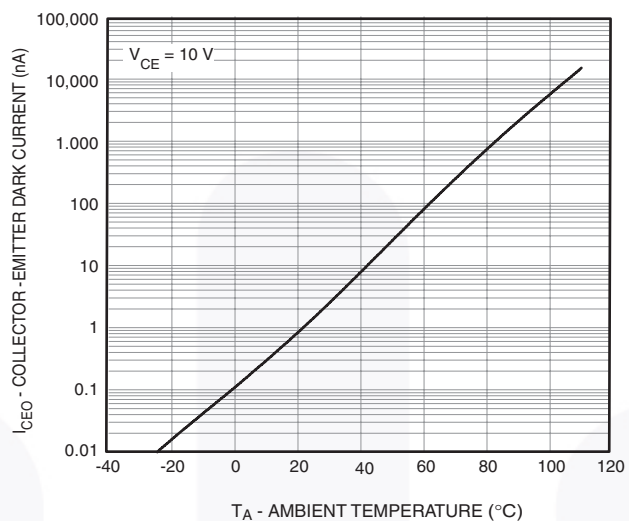


Figure 9. Dark Current vs. Ambient Temperature

Switching Time Test Circuit and Waveform

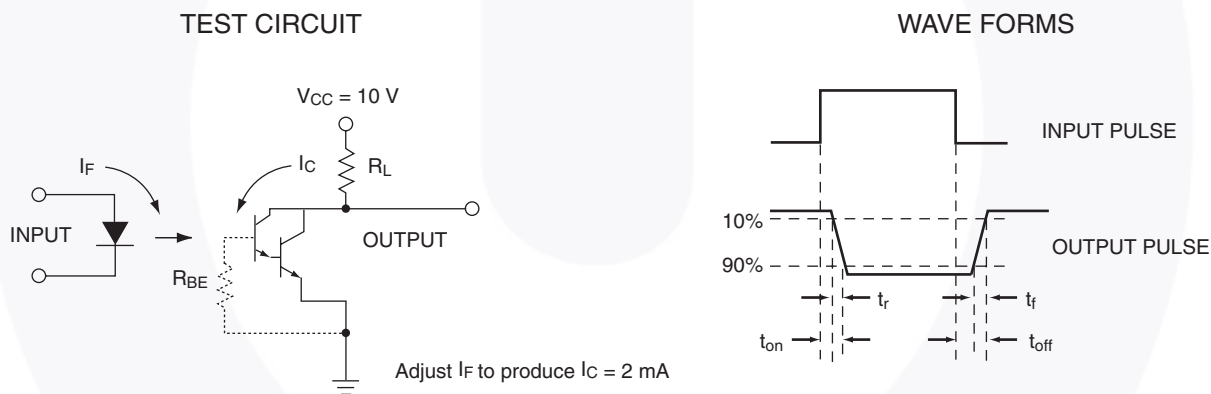


Figure 10. Switching Time Test Circuit and Waveform

Reflow Profile

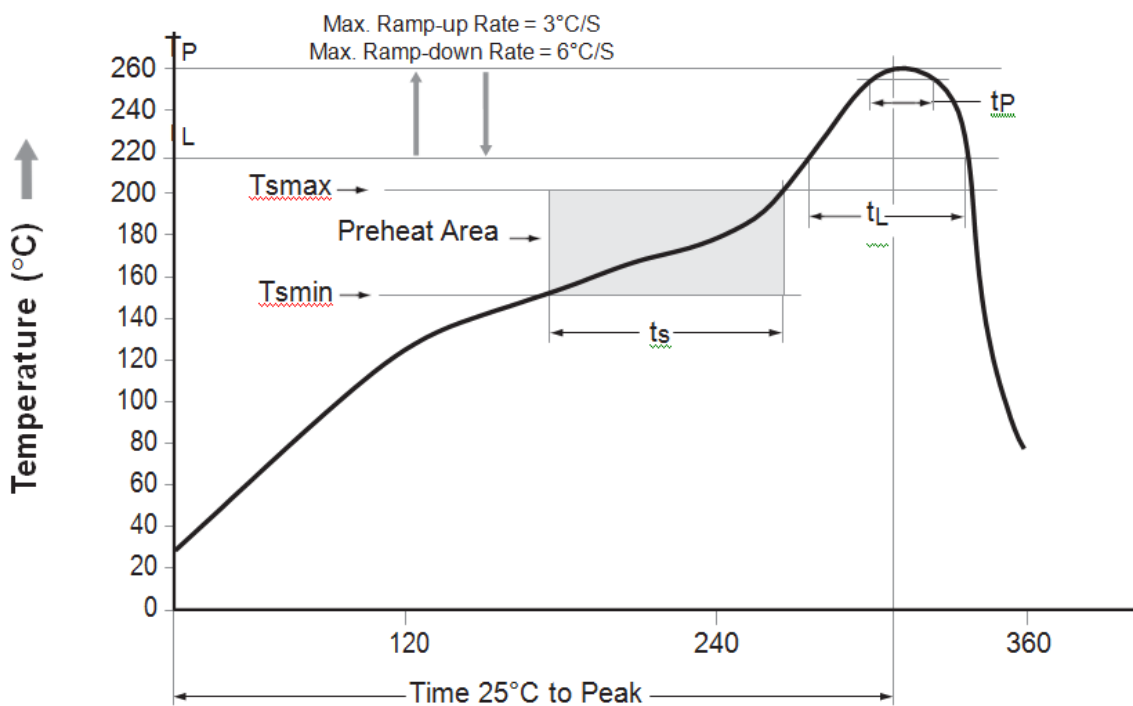


Figure 11. Reflow Profile

Ordering Information

| Part Number | Package | Packing Method |
|--------------|----------------------------------------------------------|----------------------------|
| MOC8021M | DIP 6-Pin | Tube (50 Units) |
| MOC8021SM | SMT 6-Pin (Lead Bend) | Tube (50 Units) |
| MOC8021SR2M | SMT 6-Pin (Lead Bend) | Tape and Reel (1000 Units) |
| MOC8021VM | DIP 6-Pin, DIN EN/IEC60747-5-5 Option | Tube (50 Units) |
| MOC8021SVM | SMT 6-Pin (Lead Bend), DIN EN/IEC60747-5-5 Option | Tube (50 Units) |
| MOC8021SR2VM | SMT 6-Pin (Lead Bend), DIN EN/IEC60747-5-5 Option | Tape and Reel (1000 Units) |
| MOC8021TVM | 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 MOC8050M device.

Marking Information

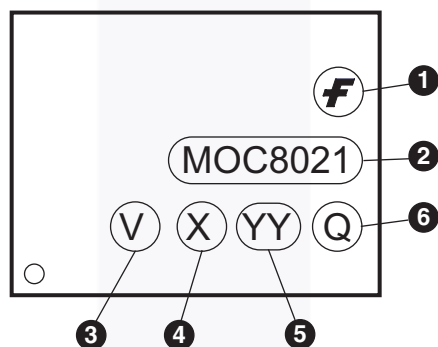
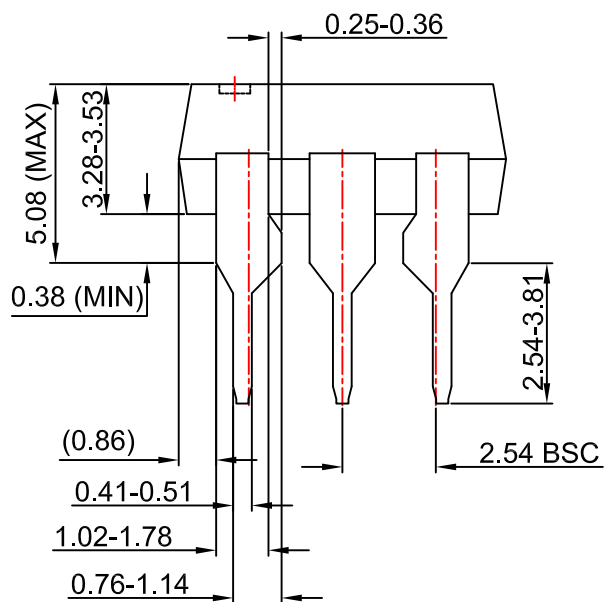
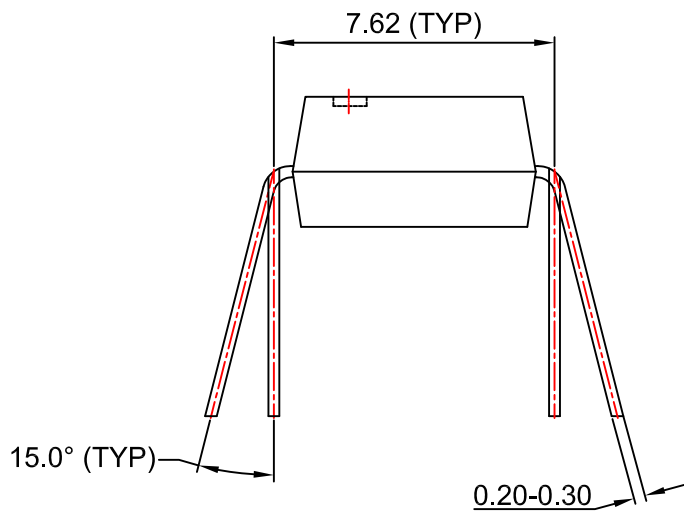
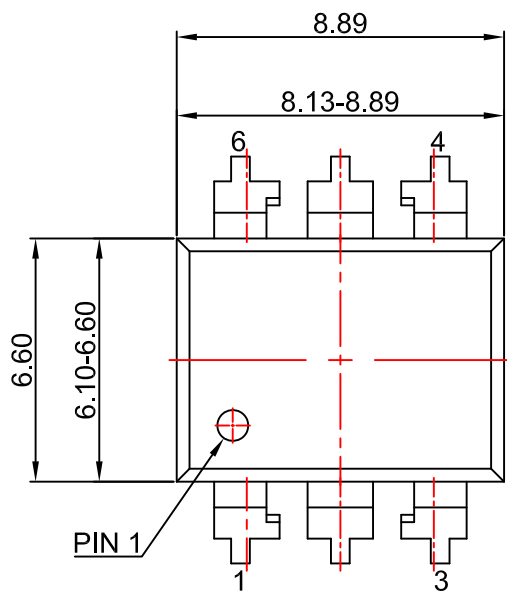


Figure 12. Top Mark

Table 1. Top Mark Definitions

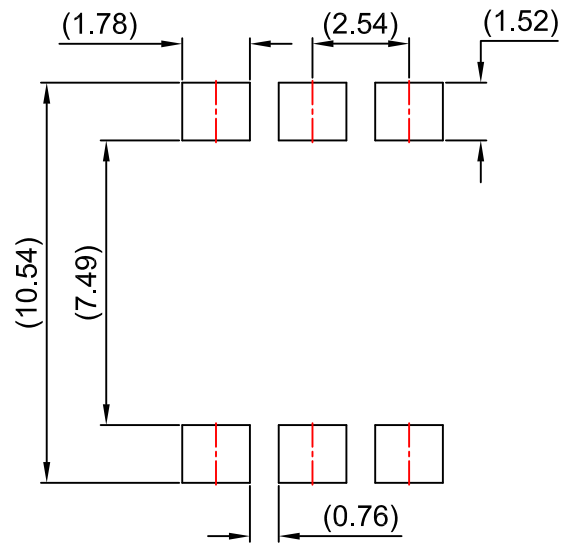
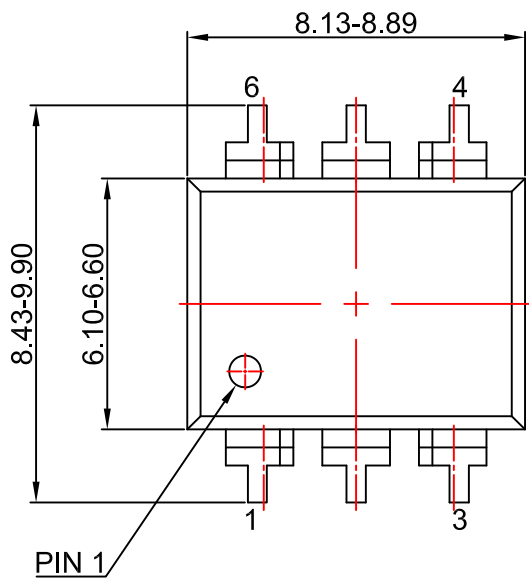
| | |
|---|---------------------------------------------------------------------------------|
| 1 | Fairchild Logo |
| 2 | Device Number |
| 3 | DIN EN/IEC60747-5-5 Option (only appears on component ordered with this option) |
| 4 | One-Digit Year Code, e.g., "5" |
| 5 | Digit Work Week, Ranging from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



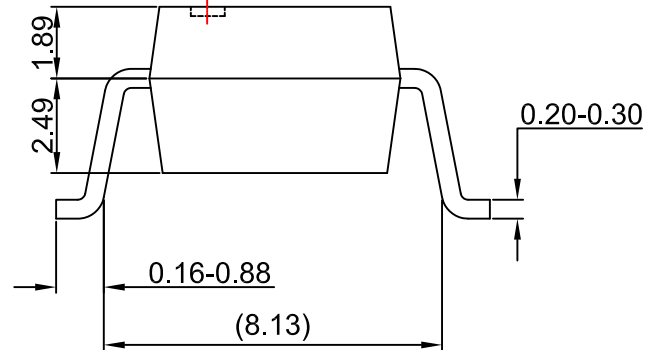
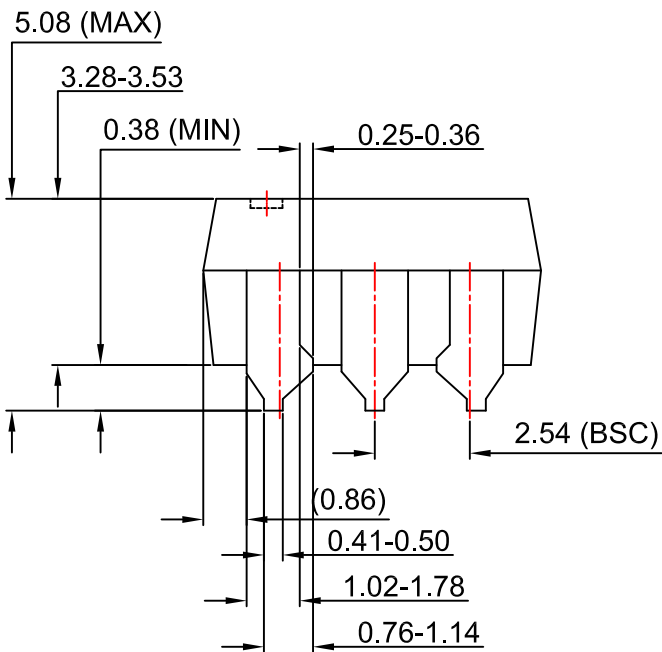
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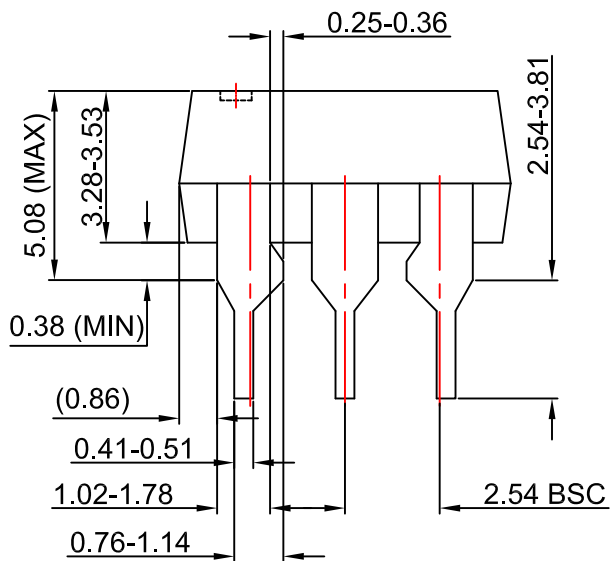
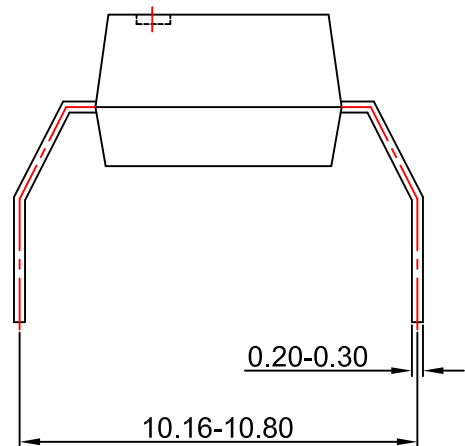
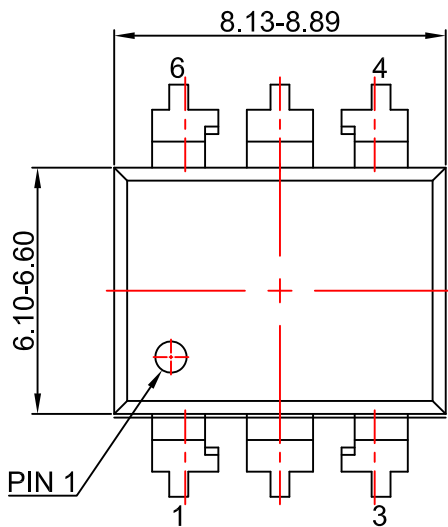
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