

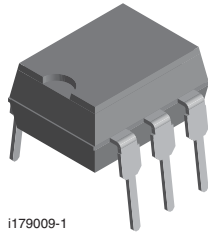


**THE DATASHEET OF  
MOC8101-X009**

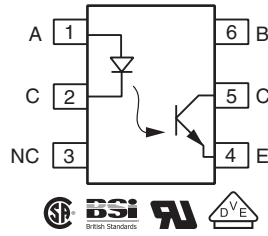




## Optocoupler, Phototransistor Output, no Base Connection



i179009-1



### FEATURES

- Isolation test voltage, 5300 V<sub>RMS</sub>
- No base terminal connection for improved common mode interface immunity
- Long term stability
- Industry standard dual in line package
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC



RoHS COMPLIANT

### DESCRIPTION

The MOC8101, MOC8102, MOC8103, MOC8104, MOC8105 family optocoupler consisting of a gallium arsenide infrared emitting diode optically coupled to a silicon planar phototransistor detector in a plastic plug-in DIP-6 package.

The coupling device is suitable for signal transmission between two electrically separated circuits. The potential difference between the circuits to be coupled should not exceed the maximum permissible reference voltages.

The base terminal of the MOC8101, MOC8102, MOC8103, MOC8104, MOC8105 is not connected, resulting in a substantially improved common mode interference immunity.

### AGENCY APPROVALS

- UL1577, file no. E52744 system code H or J, double protection
- CSA 93751
- BSI IEC 60950; IEC 60065
- DIN EN 60747-5-5 (VDE 0884) available with option 1

| ORDERING INFORMATION     |               |                 |                  |                   |                   |                  |   |                |   |   |   |               |   |         |          |          |          |
|--------------------------|---------------|-----------------|------------------|-------------------|-------------------|------------------|---|----------------|---|---|---|---------------|---|---------|----------|----------|----------|
| M                        | O             | C               | 8                | 1                 | 0                 | #                | - | #              | X | 0 | # | #             | T | DIP-#   | Option 6 | Option 7 | Option 9 |
| PART NUMBER              |               |                 |                  |                   |                   | CTR BIN          |   | PACKAGE OPTION |   |   |   | TAPE AND REEL |   | 7.62 mm | 10.16 mm | > 0.7 mm | > 0.1 mm |
| AGENCY CERTIFIED/PACKAGE |               | CTR (%)         |                  |                   |                   |                  |   |                |   |   |   |               |   |         |          |          |          |
|                          |               | 10 mA           |                  |                   |                   |                  |   |                |   |   |   |               |   |         |          |          |          |
| <b>UL, CSA, BSI</b>      |               | <b>50 to 80</b> | <b>73 to 117</b> | <b>108 to 173</b> | <b>160 to 256</b> | <b>65 to 133</b> |   |                |   |   |   |               |   |         |          |          |          |
| DIP-6                    | MOC8101       | MOC8102         | MOC8103          | MOC8104           | MOC8105           |                  |   |                |   |   |   |               |   |         |          |          |          |
| DIP-6, 400 mil, option 6 | -             | MOC8102-X006    | -                | -                 | -                 |                  |   |                |   |   |   |               |   |         |          |          |          |
| SMD-6, option 9          | MOC8101-X009  | MOC8102-X009    | -                | -                 | -                 |                  |   |                |   |   |   |               |   |         |          |          |          |
| <b>VDE, UL, CSA, BSI</b> |               | <b>50 to 80</b> | <b>73 to 117</b> | <b>108 to 173</b> | <b>160 to 256</b> | <b>65 to 133</b> |   |                |   |   |   |               |   |         |          |          |          |
| DIP-6                    | MOC8101-X001  | -               | MOC8103-X001     | -                 | -                 |                  |   |                |   |   |   |               |   |         |          |          |          |
| DIP-6, 400 mil           | -             | MOC8102-X016    | -                | MOC8104-X016      | -                 |                  |   |                |   |   |   |               |   |         |          |          |          |
| SMD-6, option 7          | MOC8101-X017T | MOC8102-X017T   | -                | -                 | -                 |                  |   |                |   |   |   |               |   |         |          |          |          |
| SMD-6, option 9          | -             | -               | -                | MOC8104-X019T     | -                 |                  |   |                |   |   |   |               |   |         |          |          |          |

### Note

- Additional options may be possible, please contact sales office.



| ABSOLUTE MAXIMUM RATINGS (T <sub>amb</sub> = 25 °C, unless otherwise specified) |   |                   |                    |                  |
|---|---|-------------------|--------------------|------------------|
| PARAMETER   | TEST CONDITION  | SYMBOL            | VALUE              | UNIT             |
| <b>INPUT</b>  |   |                   |                    |                  |
| Reverse voltage   |   | V <sub>R</sub>    | 6.0                | V                |
| Forward continuous current  |   | I <sub>F</sub>    | 60                 | mA               |
| Surge forward current   | t ≤ 10 μs   | I <sub>FSM</sub>  | 2.5                | A                |
| Power dissipation   |   | P <sub>diss</sub> | 100                | mW               |
| Derate linearly from 25°C   |   |                   | 1.33               | mW/°C            |
| <b>OUTPUT</b>   |   |                   |                    |                  |
| Collector emitter breakdown voltage   |   | BV <sub>CEO</sub> | 30                 | V                |
| Emitter collector breakdown voltage   |   | BV <sub>ECO</sub> | 7.0                | V                |
| Collector current   |   | I <sub>C</sub>    | 50                 | mA               |
| Derate linearly from 25°C   |   |                   | 2.0                | mW/°C            |
| Power dissipation   |   | P <sub>diss</sub> | 150                | mW               |
| <b>COUPLER</b>  |   |                   |                    |                  |
| Isolation test voltage  |   | V <sub>ISO</sub>  | 5300               | V <sub>RMS</sub> |
| Creepage distance   |   |                   | ≥ 7.0              | mm               |
|   |   |                   | 8.0 <sup>(2)</sup> | mm               |
| Clearance distance  |   |                   | ≥ 7.0              | mm               |
|   |   |                   | 8.0 <sup>(2)</sup> | mm               |
| Isolation thickness between emitter and detector                                |   |                   | ≥ 0.4              | mm               |
| Comparative tracking index per DIN IEC 112/VDE 0303, part 1                     |   | CTI               | 175                |                  |
| Isolation resistance  | V <sub>IO</sub> = 500 V   | R <sub>IO</sub>   | 10 <sup>12</sup>   | Ω                |
| Derate linearly from 25 °C  |   |                   | 3.33               | mW/°C            |
| Total power dissipation   |   | P <sub>tot</sub>  | 250                | mW               |
| Storage temperature   |   | T <sub>stg</sub>  | - 55 to + 150      | °C               |
| Operating temperature   |   | T <sub>amb</sub>  | - 55 to + 100      | °C               |
| Junction temperature  |   | T <sub>j</sub>    | 100                | °C               |
| Soldering temperature <sup>(1)</sup>  | max. 10 s, dip soldering;<br>distance to seating plane ≥ 1.5 mm | T <sub>slid</sub> | 260                | °C               |

**Notes**

- Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of this document. Exposure to absolute maximum ratings for extended periods of the time can adversely affect reliability.
- (1) Refer to reflow profile for soldering conditions for surface mounted devices (SMD). Refer to wave profile for soldering conditions for through hole devices (DIP).
- (2) Applies to wide bending option 6.

| ELECTRICAL CHARACTERISTICS (T <sub>amb</sub> = 25 °C, unless otherwise specified) |   |         |                    |      |      |      |      |
|---|---|---------|--------------------|------|------|------|------|
| PARAMETER   | TEST CONDITION                                    | PART    | SYMBOL             | MIN. | TYP. | MAX. | UNIT |
| <b>INPUT</b>  |   |         |                    |      |      |      |      |
| Forward voltage   | I <sub>F</sub> = 10 mA                            |         | V <sub>F</sub>     |      | 1.25 | 1.5  | V    |
| Breakdown voltage   | I <sub>R</sub> = 10 μA                            |         | V <sub>BR</sub>    | 6.0  |      |      | V    |
| Reverse current   | V <sub>R</sub> = 6.0 V                            |         | I <sub>R</sub>     |      | 0.01 | 10   | μA   |
| Capacitance   | V <sub>R</sub> = 0 V, f = 1.0 MHz                 |         | C <sub>O</sub>     |      | 25   |      | pF   |
| Thermal resistance  |   |         | R <sub>thja</sub>  |      | 750  |      | K/W  |
| <b>OUTPUT</b>   |   |         |                    |      |      |      |      |
| Collector emitter capacitance   | V <sub>CE</sub> = 5.0 V, f = 1.0 MHz              |         | C <sub>CE</sub>    |      | 5.2  |      | pF   |
| Collector emitter dark current  | V <sub>CE</sub> = 10 V, T <sub>amp</sub> = 25 °C  | MOC8101 | I <sub>CEO1</sub>  |      | 1.0  | 50   | nA   |
|   | V <sub>CE</sub> = 10 V, T <sub>amp</sub> = 100 °C | MOC8102 | I <sub>CEO1</sub>  |      | 1.0  |      | μA   |
| Collector emitter breakdown voltage   | I <sub>C</sub> = 1.0 mA                           |         | BV <sub>CEO</sub>  | 30   |      |      | V    |
| Emitter collector breakdown voltage   | I <sub>E</sub> = 100 μA                           |         | BV <sub>ECO</sub>  | 7.0  |      |      | V    |
| Thermal resistance  |   |         | R <sub>thja</sub>  |      | 500  |      | K/W  |
| <b>COUPLER</b>  |   |         |                    |      |      |      |      |
| Saturation voltage collector emitter  | I <sub>F</sub> = 5.0 mA                           |         | V <sub>CEsat</sub> |      | 0.25 | 0.4  | V    |
| Coupling capacitance  |   |         | C <sub>C</sub>     |      | 0.6  |      | pF   |

**Note**

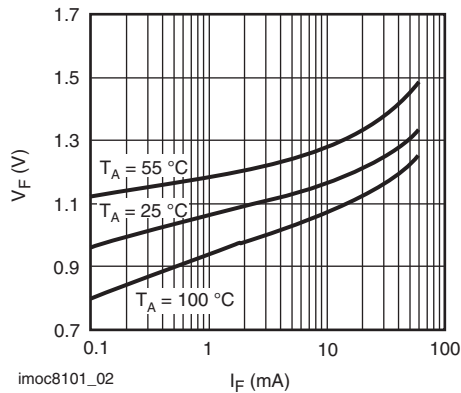
- Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluation. Typical values are for information only and are not part of the testing requirements.



| CURRENT TRANSFER RATIO ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |   |         |        |      |      |      |      |
|---|---|---------|--------|------|------|------|------|
| PARAMETER   | TEST CONDITION                                | PART    | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| Current transfer ratio  | $V_{CE} = 10\text{ V}$ , $I_F = 10\text{ mA}$ | MOC8101 | CTR    | 50   |      | 80   | %    |
|   |   | MOC8102 | CTR    | 73   |      | 117  | %    |
|   |   | MOC8103 | CTR    | 108  |      | 173  | %    |
|   |   | MOC8104 | CTR    | 160  |      | 256  | %    |
|   |   | MOC8105 | CTR    | 65   |      | 133  | %    |

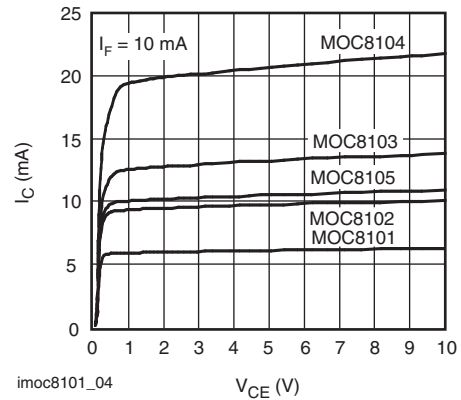
| SWITCHING CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |  |           |      |      |      |               |  |
|--|--|-----------|------|------|------|---------------|--|
| PARAMETER  | TEST CONDITION   | SYMBOL    | MIN. | TYP. | MAX. | UNIT          |  |
| Turn-on time   | $V_{CC} = 10\text{ V}$ , $I_C = 2.0\text{ mA}$ , $R_L = 100\text{ }\Omega$ | $t_{on}$  |      | 3.0  |      | $\mu\text{s}$ |  |
| Turn-off time  | $V_{CC} = 10\text{ V}$ , $I_C = 2.0\text{ mA}$ , $R_L = 100\text{ }\Omega$ | $t_{off}$ |      | 2.3  |      | $\mu\text{s}$ |  |
| Rise time  | $V_{CC} = 10\text{ V}$ , $I_C = 2.0\text{ mA}$ , $R_L = 100\text{ }\Omega$ | $t_r$     |      | 2.0  |      | $\mu\text{s}$ |  |
| Fall time  | $V_{CC} = 10\text{ V}$ , $I_C = 2.0\text{ mA}$ , $R_L = 100\text{ }\Omega$ | $t_f$     |      | 2.0  |      | $\mu\text{s}$ |  |
| Cut off frequency  |  | $f_{co}$  |      | 250  |      | kHz           |  |

**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)



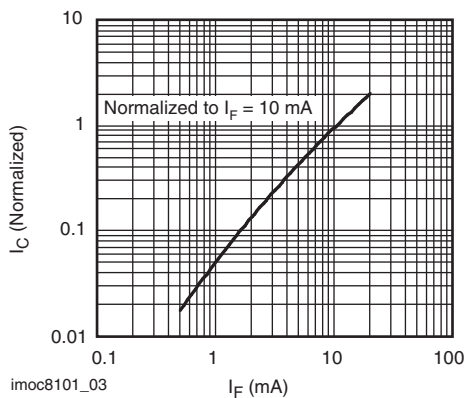
imoc8101\_02

Fig. 1 - Forward Voltage vs. Forward Current



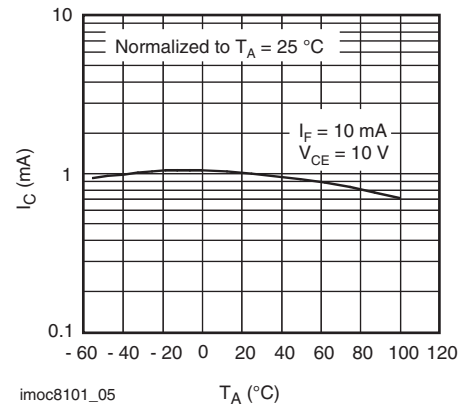
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Fig. 3 - Collector Current vs. Collector Emitter Voltage



imoc8101\_03

Fig. 2 - Collector Current vs. LED Forward Current



imoc8101\_05

Fig. 4 - Collector Current vs. Ambient Temperature

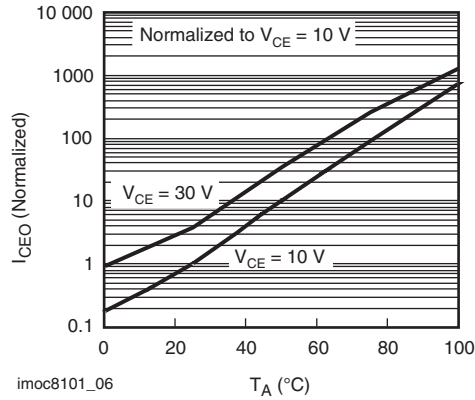


Fig. 5 - Collector Emitter Dark Current vs. Ambient Temperature

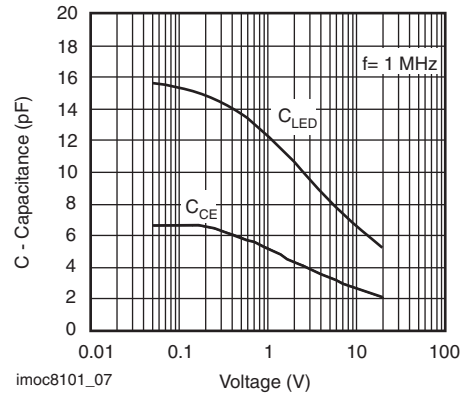
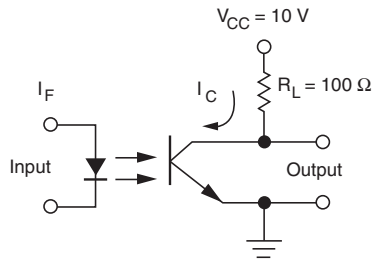
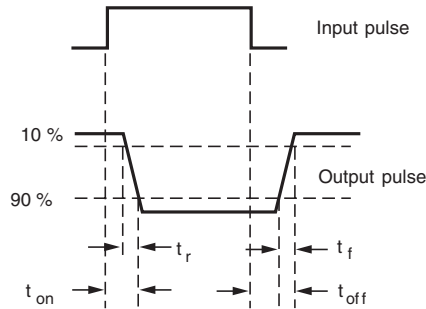


Fig. 6 - Capacitance vs. Voltage



Test circuit

imoc81010\_01

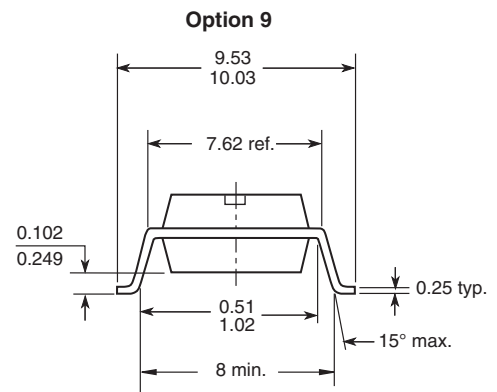
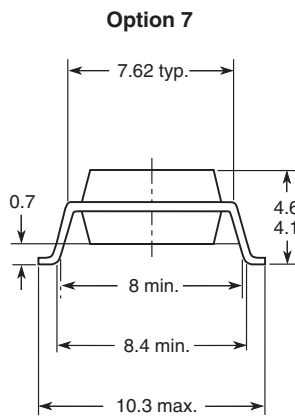
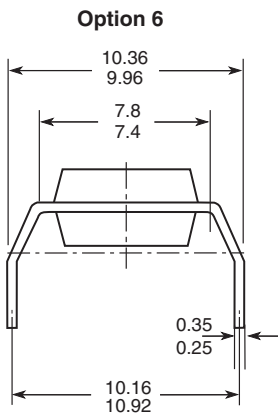
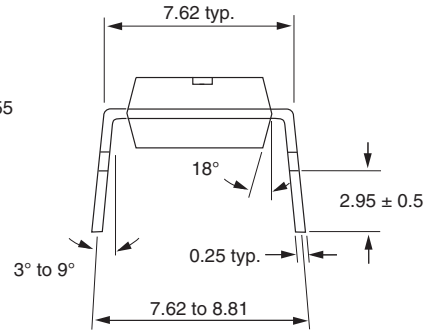
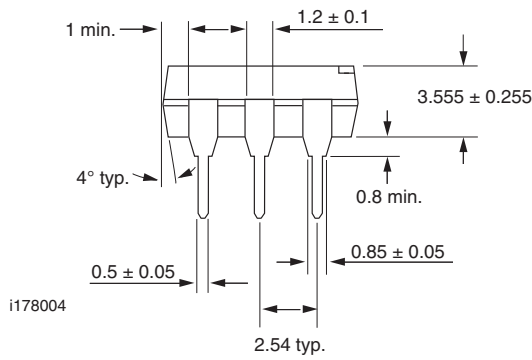
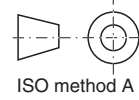
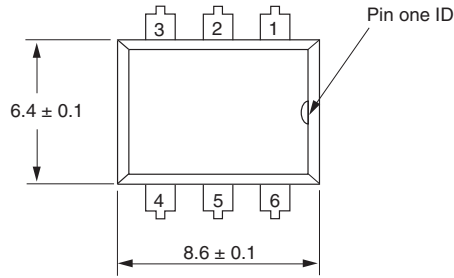


Waveforms

Fig. 7 - Switching Time Test Circuit and Waveforms



## PACKAGE DIMENSIONS in millimeters

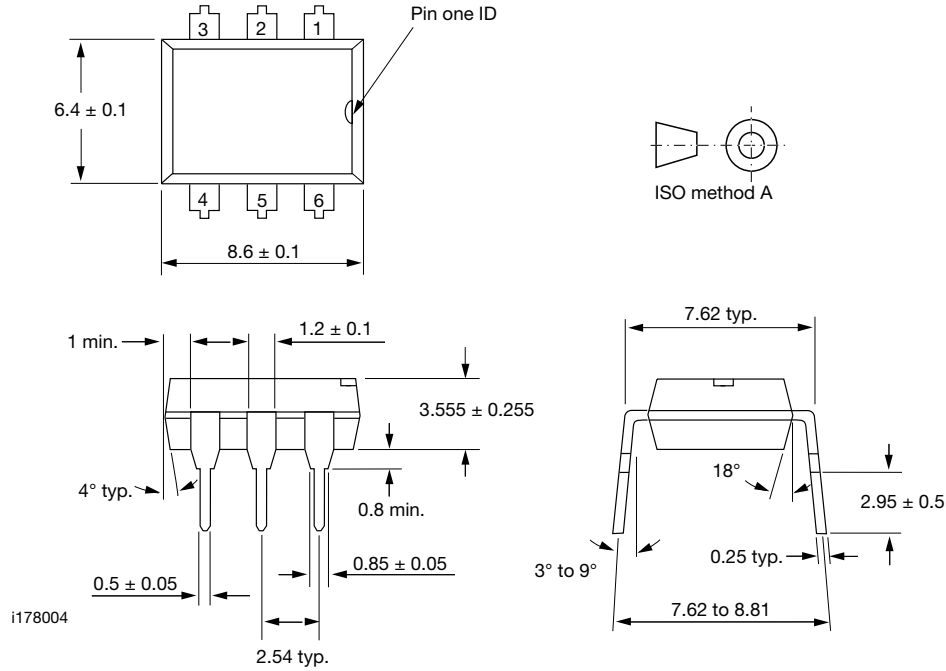


18450



# DIP-6A

## PACKAGE DIMENSIONS in inches (millimeters)



### Note

The information in this document provides generic information but for specific information on a product the appropriate product datasheet should be used.



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