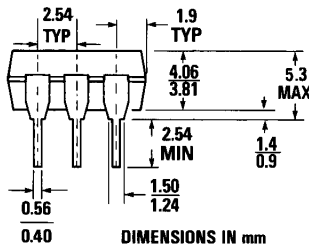
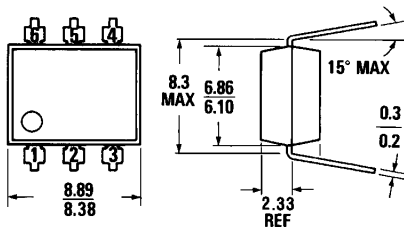
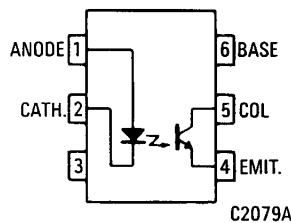


**PACKAGE DIMENSIONS**



DIMENSIONS IN mm  
PACKAGE CODE K

ST1603A



C2079A

Equivalent Circuit

**DESCRIPTION**

The MOC series consists of a Gallium Arsenide IRED coupled with an NPN phototransistor.

**FEATURES**

- High isolation voltage  
5300 VAC RMS—1 minute  
7500 VAC PEAK—1 minute
- High  $BV_{CEO}$  minimum 70 volts
- Current transfer ratio in selected groups:  
MOC8111: 20% min.  
MOC8112: 50% min.  
MOC8113: 100% min.
- Maximum switching time in saturation specified
- Underwriters Laboratory (UL) recognized File #E90700

**APPLICATIONS**

- Power supply regulators
- Digital logic inputs
- Microprocessor inputs
- Appliance sensor systems
- Industrial controls

**ABSOLUTE MAXIMUM RATINGS**

**TOTAL PACKAGE**

|   |                |
|---|----------------|
| Storage temperature   | −55°C to 150°C |
| Operating temperature   | −55°C to 100°C |
| Lead temperature<br>(soldering, 10 sec)                       | 260°C          |
| Total package power dissipation @ 25°C<br>(LED plus detector) | 260 mW         |
| Derate linearly from 25°C                                     | 3.5 mW/°C      |

**INPUT DIODE**

|   |           |
|---|-----------|
| Forward DC current                            | 90 mA     |
| Reverse voltage                               | 6 V       |
| Peak forward current<br>(1 μs pulse, 300 pps) | 3.0 A     |
| Power dissipation 25°C ambient                | 135 mW    |
| Derate linearly from 25°C                     | 1.8 mW/°C |

**OUTPUT TRANSISTOR**

|                           |            |
|---------------------------|------------|
| Power dissipation @ 25°C  | 200 mW     |
| Derate linearly from 25°C | 2.67 mW/°C |

**ELECTRO-OPTICAL CHARACTERISTICS** (25°C Temperature Unless Otherwise Specified)

**INDIVIDUAL COMPONENT CHARACTERISTICS**

| CHARACTERISTIC                            | SYMBOL                          | MIN. | TYP. | MAX. | UNITS         | TEST CONDITIONS                  |
|---|---------------------------------|------|------|------|---------------|----------------------------------|
| <b>INPUT DIODE</b>                        |                                 |      |      |      |               |                                  |
| Forward voltage                           | $V_F$                           |      | 1.3  | 1.50 | V             | $I_F=60\text{ mA}$               |
| Forward voltage temp. coefficient         | $\frac{\Delta V_F}{\Delta T_A}$ |      | -1.8 |      | mV/°C         |                                  |
| Reverse voltage                           | $V_R$                           | 6.0  | 15   |      | V             | $I_R=10\ \mu\text{A}$            |
| Junction capacitance                      | $C_J$                           |      | 50   |      | pF            | $V_F=0\text{ V}, f=1\text{ MHz}$ |
|   |                                 |      | 65   |      | pF            | $V_F=1\text{ V}, f=1\text{ MHz}$ |
| Reverse leakage current                   | $I_R$                           |      | .35  | 10   | $\mu\text{A}$ | $V_R=3.0\text{ V}$               |
| <b>OUTPUT TRANSISTOR</b>                  |                                 |      |      |      |               |                                  |
| Breakdown voltage<br>Collector to emitter | $BV_{CEO}$                      | 70   |      |      | V             | $I_C=1.0\text{ mA}, I_F=0$       |
| Emitter to collector<br>Leakage current   | $BV_{ECO}$                      | 7    |      |      | V             | $I_E=100\ \mu\text{A}, I_F=0$    |
| Collector to emitter                      | $I_{CEO}$                       |      | 5    | 50   | nA            | $V_{CE}=10\text{ V}, I_F=0$      |
| Capacitance<br>Collector to emitter       |                                 |      | 8    |      | pF            | $V_{CE}=0, f=1\text{ MHz}$       |

**TRANSFER CHARACTERISTICS**

| DC CHARACTERISTICS                              | SYMBOL        | MIN. | TYP. | MAX. | UNITS | TEST CONDITIONS                       |
|---|---------------|------|------|------|-------|---------------------------------------|
| Current Transfer Ratio,<br>collector to emitter | CTR           |      |      |      | %     | $I_F=10\text{ mA}; V_{CE}=5\text{ V}$ |
| MOC8111   |               | 20   |      |      |       |                                       |
| MOC8112   |               | 50   |      |      |       |                                       |
| MOC8113   |               | 100  |      |      |       |                                       |
| Saturation voltage                              | $V_{CE(SAT)}$ |      | 0.27 | .40  | V     | $I_F=10\text{ mA}; I_C=2.5\text{ mA}$ |

**TRANSFER CHARACTERISTICS**

| AC CHARACTERISTICS            | SYMBOL    | MIN. | TYP. | MAX. | UNITS         | TEST CONDITIONS  |
|-------------------------------|-----------|------|------|------|---------------|--|
| <b>SWITCHING TIMES</b>        |           |      |      |      |               |  |
| Non-saturated<br>Turn-on time | $t_{on}$  |      | 6.0  | 10   | $\mu\text{s}$ | $R_L=100\ \Omega; I_C=2\text{ mA}; V_{CC}=10\text{ V}$ |
| Turn-off time                 | $t_{off}$ |      | 5.5  | 10   | $\mu\text{s}$ | See Fig. 10.   |

**ELECTRO-OPTICAL CHARACTERISTICS**  
(25°C Temperature Unless Otherwise Specified) (Cont'd)

**TRANSFER CHARACTERISTICS (Cont'd)**

| AC CHARACTERISTICS               | SYMBOL    | MIN. | TYP. | MAX. | UNITS   | TEST CONDITIONS             |
|----------------------------------|-----------|------|------|------|---------|-----------------------------|
| <b>SATURATED SWITCHING TIMES</b> |           |      |      |      |         |                             |
| Turn-on time                     | $t_{on}$  |      |      |      |         |                             |
| MOC8111                          |           |      | 3.0  | 5.5  | $\mu$ S | $I_F=20$ mA, $V_{CE}=0.4$ V |
| MOC8112, MOC8113                 |           |      | 4.2  | 8.0  | $\mu$ S | $I_F=10$ mA, $V_{CE}=0.4$ V |
| Rise-time                        | $t_r$     |      |      |      |         |                             |
| MOC8111                          |           |      | 2.0  | 4.0  | $\mu$ S | $I_F=20$ mA, $V_{CE}=0.4$ V |
| MOC8112, MOC8113                 |           |      | 3.0  | 6.0  | $\mu$ S | $I_F=10$ mA, $V_{CE}=0.4$ V |
| Turn-off time                    | $t_{off}$ |      |      |      |         |                             |
| MOC8111                          |           |      | 18   | 34   | $\mu$ S | $I_F=20$ mA, $V_{CE}=0.4$ V |
| MOC8112, MOC8113                 |           |      | 23   | 39   | $\mu$ S | $I_F=10$ mA, $V_{CE}=0.4$ V |
| Fall-time                        | $t_f$     |      |      |      |         |                             |
| MOC8111                          |           |      | 11   | 20   | $\mu$ S | $I_F=20$ mA, $V_{CE}=0.4$ V |
| MOC8112, MOC8113                 |           |      | 14   | 24   | $\mu$ S | $I_F=10$ mA, $V_{CE}=0.4$ V |

**ISOLATION CHARACTERISTICS**

| CHARACTERISTICS       | SYMBOL    | MIN.      | TYP. | MAX. | UNITS         | TEST CONDITIONS                   |
|-----------------------|-----------|-----------|------|------|---------------|-----------------------------------|
| Isolation voltage     | $V_{iso}$ | 5300      |      |      | $V_{AC}$ RMS  | $I_{i0} \leq 1$ $\mu$ A, 1 minute |
|                       | $V_{iso}$ | 7500      |      |      | $V_{AC}$ PEAK | $I_{i0} \leq 1$ $\mu$ A, 1 minute |
| Isolation resistance  | $R_{iso}$ | $10^{11}$ |      |      | ohms          | $V_{i0}=500$ VDC                  |
| Isolation capacitance | $C_{iso}$ |           | 0.5  |      | pF            | $f=1$ MHz                         |

**ELECTRICAL CHARACTERISTIC CURVES**  
(25°C Free Air Temperature Unless Otherwise Specified)

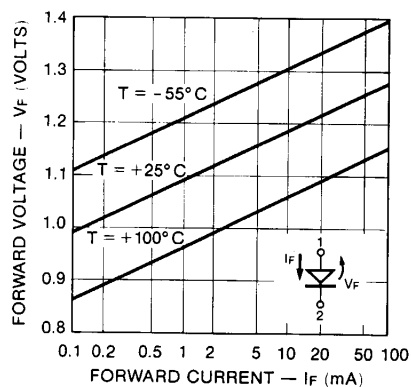


Fig. 1. Forward Voltage vs. Current

C1686

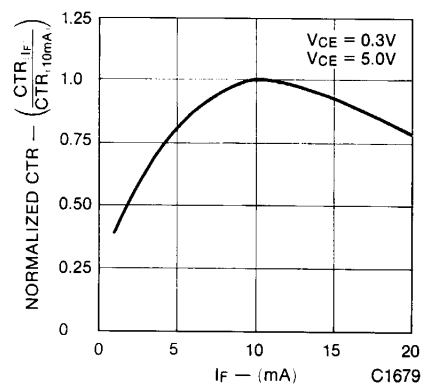


Fig. 2. Normalized CTR vs. Forward Current

C1679

**ELECTRO-OPTICAL CHARACTERISTICS**  
(25°C Temperature Unless Otherwise Specified) (Cont'd)

**TRANSFER CHARACTERISTICS** (Cont'd)

| AC CHARACTERISTICS               | SYMBOL    | MIN. | TYP. | MAX. | UNITS   | TEST CONDITIONS             |
|----------------------------------|-----------|------|------|------|---------|-----------------------------|
| <b>SATURATED SWITCHING TIMES</b> |           |      |      |      |         |                             |
| Turn-on time                     | $t_{on}$  |      |      |      |         |                             |
| MOC8111                          |           |      | 3.0  | 5.5  | $\mu$ S | $I_F=20$ mA, $V_{CE}=0.4$ V |
| MOC8112, MOC8113                 |           |      | 4.2  | 8.0  | $\mu$ S | $I_F=10$ mA, $V_{CE}=0.4$ V |
| Rise-time                        | $t_r$     |      |      |      |         |                             |
| MOC8111                          |           |      | 2.0  | 4.0  | $\mu$ S | $I_F=20$ mA, $V_{CE}=0.4$ V |
| MOC8112, MOC8113                 |           |      | 3.0  | 6.0  | $\mu$ S | $I_F=10$ mA, $V_{CE}=0.4$ V |
| Turn-off time                    | $t_{off}$ |      |      |      |         |                             |
| MOC8111                          |           |      | 18   | 34   | $\mu$ S | $I_F=20$ mA, $V_{CE}=0.4$ V |
| MOC8112, MOC8113                 |           |      | 23   | 39   | $\mu$ S | $I_F=10$ mA, $V_{CE}=0.4$ V |
| Fall-time                        | $t_f$     |      |      |      |         |                             |
| MOC8111                          |           |      | 11   | 20   | $\mu$ S | $I_F=20$ mA, $V_{CE}=0.4$ V |
| MOC8112, MOC8113                 |           |      | 14   | 24   | $\mu$ S | $I_F=10$ mA, $V_{CE}=0.4$ V |

**ISOLATION CHARACTERISTICS**

| CHARACTERISTICS       | SYMBOL    | MIN.      | TYP. | MAX. | UNITS         | TEST CONDITIONS                   |
|-----------------------|-----------|-----------|------|------|---------------|-----------------------------------|
| Isolation voltage     | $V_{iso}$ | 5300      |      |      | $V_{AC}$ RMS  | $I_{i0} \leq 1$ $\mu$ A, 1 minute |
|                       | $V_{iso}$ | 7500      |      |      | $V_{AC}$ PEAK | $I_{i0} \leq 1$ $\mu$ A, 1 minute |
| Isolation resistance  | $R_{iso}$ | $10^{11}$ |      |      | ohms          | $V_{i0}=500$ VDC                  |
| Isolation capacitance | $C_{iso}$ |           | 0.5  |      | pF            | $f=1$ MHz                         |

**ELECTRICAL CHARACTERISTIC CURVES**  
(25°C Free Air Temperature Unless Otherwise Specified)

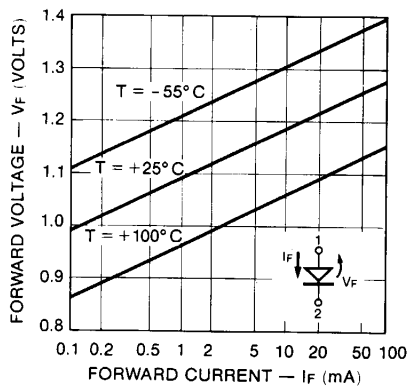


Fig. 1. Forward Voltage vs. Current

C1686

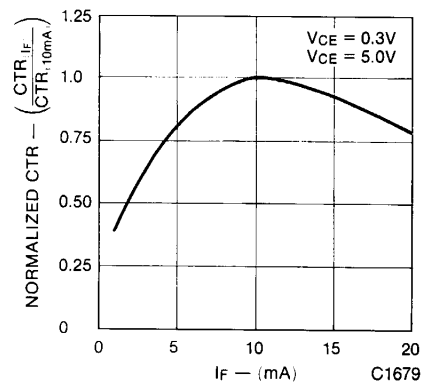


Fig. 2. Normalized CTR vs. Forward Current

C1679

**ELECTRICAL CHARACTERISTIC CURVES**  
(25°C Free Air Temperature Unless Otherwise Specified) (Cont'd)

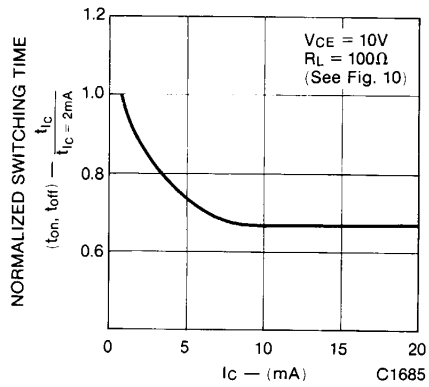


Fig. 5. Switching Time vs. IC

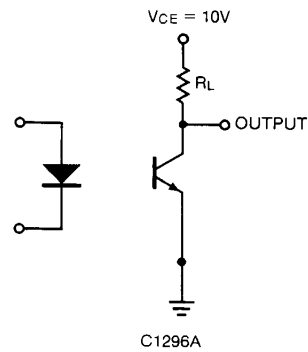


Fig. 6. Switching Time Test Circuit

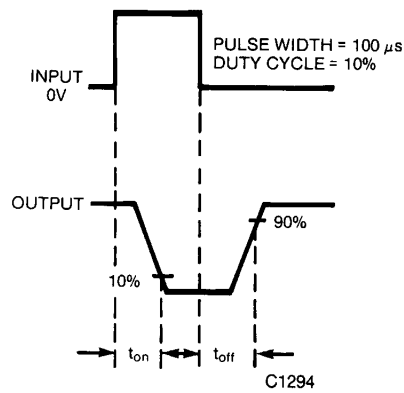


Fig. 7. Switching Time Waveforms



## PHOTOTRANSISTOR OPTOCOUPLEDERS

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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.