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# Small Outline Optoisolators

## Transistor Output

These devices consist of a gallium arsenide infrared emitting diode optically coupled to a monolithic silicon phototransistor detector, in a surface mountable, small outline, plastic package. They are ideally suited for high density applications, and eliminate the need for through–the–board mounting.

- Convenient Plastic SOIC–8 Surface Mountable Package Style
- Closely Matched Current Transfer Ratios
- Minimum $V_{(BR)CEO}$ of 70 Volts Guaranteed
- Standard SOIC–8 Footprint, with 0.050″ Lead Spacing
- Shipped in Tape and Reel, which Conforms to EIA Standard RS481A
- Compatible with Dual Wave, Vapor Phase and IR Reflow Soldering
- High Input–Output Isolation of 3000 Vac (rms) Guaranteed
- UL Recognized File #E54915

**Ordering Information:**

- To obtain MOC205, 206, 207, 208 in Tape and Reel, add R2 suffix to device numbers: R2 = 2500 units on 13″ reel
- To obtain MOC205, 206, 207, 208 in quantities of 50 (shipped in sleeves) — No Suffix

**Marking Information:**

- MOC205 = 205
- MOC206 = 206
- MOC207 = 207
- MOC208 = 208

**Applications:**

- Feedback Control Circuits
- Interfacing and coupling systems of different potentials and impedances
- General Purpose Switching Circuits
- Monitor and Detection Circuits

**MAXIMUM RATINGS** ($T_A$ = 25°C unless otherwise noted)

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| **INPUT LED** | | | |
| Forward Current — Continuous | $I_F$ | 60 | mA |
| Forward Current — Peak (PW = 100 µs, 120 pps) | $I_F(pk)$ | 1.0 | A |
| Reverse Voltage | $V_R$ | 6.0 | V |
| LED Power Dissipation @ $T_A$ = 25°C<br>Derate above 25°C | $P_D$ | 90<br>0.8 | mW<br>mW/°C |
| **OUTPUT TRANSISTOR** | | | |
| Collector–Emitter Voltage | $V_{CEO}$ | 70 | V |
| Collector–Base Voltage | $V_{CBO}$ | 70 | V |
| Emitter–Collector Voltage | $V_{ECO}$ | 7.0 | V |
| Collector Current — Continuous | $I_C$ | 150 | mA |
| Detector Power Dissipation @ $T_A$ = 25°C<br>Derate above 25°C | $P_D$ | 150<br>1.76 | mW<br>mW/°C |

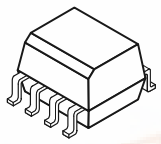
NOTE: Thickness through insulation between input and output ≥ 0.5 mm.

Preferred devices are Motorola recommended choices for future use and best overall value.

**MOC205**
[CTR = 40 – 80%]
**MOC206***
[CTR = 63 – 125%]
**MOC207***
[CTR = 100 – 200%]
**MOC208***
[CTR = 40 – 125%]

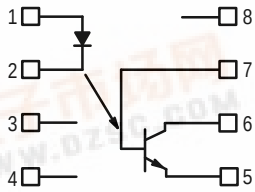
*Motorola Preferred Devices

**SMALL OUTLINE OPTOISOLATORS TRANSISTOR OUTPUT**



CASE 846–01, STYLE 1
PLASTIC

**SCHEMATIC**




1. LED ANODE
2. LED CATHODE
3. NO CONNECTION
4. NO CONNECTION
5. EMITTER
6. COLLECTOR
7. BASE
8. NO CONNECTION

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**MAXIMUM RATINGS — continued** ($T_A$ = 25°C unless otherwise noted)

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| **TOTAL DEVICE** | | | |
| Input–Output Isolation Voltage(1,2) (60 Hz, 1.0 sec. duration) | $V_{ISO}$ | 3000 | Vac(rms) |
| Total Device Power Dissipation @ $T_A$ = 25°C<br>Derate above 25°C | $P_D$ | 250<br>2.94 | mW<br>mW/°C |
| Ambient Operating Temperature Range(3) | $T_A$ | –55 to +100 | °C |
| Storage Temperature Range(3) | $T_{stg}$ | –55 to +150 | °C |
| Lead Soldering Temperature (1/16″ from case, 10 sec. duration) | — | 260 | °C |

**ELECTRICAL CHARACTERISTICS** ($T_A$ = 25°C unless otherwise noted)(4)

| Characteristic | Symbol | Min | Typ(4) | Max | Unit |
|---|---|---|---|---|---|
| **INPUT LED** | | | | | |
| Forward Voltage ($I_F$ = 10 mA) | $V_F$ | — | 1.15 | 1.5 | V |
| Reverse Leakage Current ($V_R$ = 6.0 V) | $I_R$ | — | 0.1 | 100 | μA |
| Capacitance | C | — | 18 | — | pF |
| **OUTPUT TRANSISTOR** | | | | | |
| Collector–Emitter Dark Current ($V_{CE}$ = 10 V, $T_A$ = 25°C) | $I_{CEO}1$ | — | 1.0 | 50 | nA |
| ($V_{CE}$ = 10 V, $T_A$ = 100°C) | $I_{CEO}2$ | — | 1.0 | — | μA |
| Collector–Emitter Breakdown Voltage ($I_C$ = 100 μA) | $V_{(BR)CEO}$ | 70 | 120 | — | V |
| Emitter–Collector Breakdown Voltage ($I_E$ = 100 μA) | $V_{(BR)ECO}$ | 7.0 | 7.8 | — | V |
| Collector–Emitter Capacitance (f = 1.0 MHz, $V_{CE}$ = 0) | $C_{CE}$ | — | 7.0 | — | pF |
| **COUPLED** | | | | | |
| Output Collector Current ($I_F$ = 10 mA, $V_{CE}$ = 10 V)<br>MOC205<br>MOC206<br>MOC207<br>MOC208 | $I_C$ (CTR)(5) | 4.0 (40)<br>6.3 (63)<br>10 (100)<br>4.0 (40) | 6.0 (60)<br>9.4 (94)<br>15 (150)<br>8.0 (80) | 8.0 (80)<br>12.5 (125)<br>20 (200)<br>12.5 (125) | mA (%) |
| Collector–Emitter Saturation Voltage ($I_C$ = 2.0 mA, $I_F$ = 10 mA) | $V_{CE(sat)}$ | — | 0.15 | 0.4 | V |
| Turn–On Time ($I_C$ = 2.0 mA, $V_{CC}$ = 10 V, $R_L$ = 100 Ω) | $t_{on}$ | — | 3.0 | — | μs |
| Turn–Off Time ($I_C$ = 2.0 mA, $V_{CC}$ = 10 V, $R_L$ = 100 Ω) | $t_{off}$ | — | 2.8 | — | μs |
| Rise Time ($I_C$ = 2.0 mA, $V_{CC}$ = 10 V, $R_L$ = 100 Ω) | $t_r$ | — | 1.6 | — | μs |
| Fall Time ($I_C$ = 2.0 mA, $V_{CC}$ = 10 V, $R_L$ = 100 Ω) | $t_f$ | — | 2.2 | — | μs |
| Input–Output Isolation Voltage (f = 60 Hz, t = 1.0 sec.)(1,2) | $V_{ISO}$ | 3000 | — | — | Vac(rms) |
| Isolation Resistance ($V_{I–O}$ = 500 V)(2) | $R_{ISO}$ | $10^{11}$ | — | — | Ω |
| Isolation Capacitance ($V_{I–O}$ = 0, f = 1.0 MHz)(2) | $C_{ISO}$ | — | 0.2 | — | pF |

1. Input–Output Isolation Voltage, $V_{ISO}$, is an internal device dielectric breakdown rating.
2. For this test, pins 1 and 2 are common, and pins 5, 6 and 7 are common.
3. Refer to Quality and Reliability Section in Opto Data Book for information on test conditions.
4. Always design to the specified minimum/maximum electrical limits (where applicable).
5. Current Transfer Ratio (CTR) = $I_C/I_F$ x 100%.

## TYPICAL CHARACTERISTICS

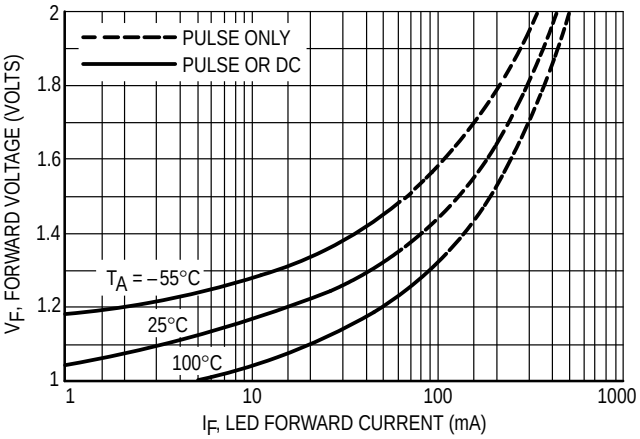



**Figure 1. LED Forward Voltage versus Forward Current**

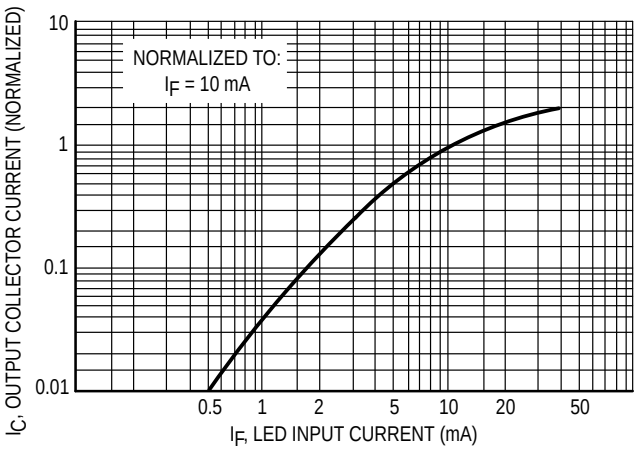



**Figure 2. Output Current versus Input Current**

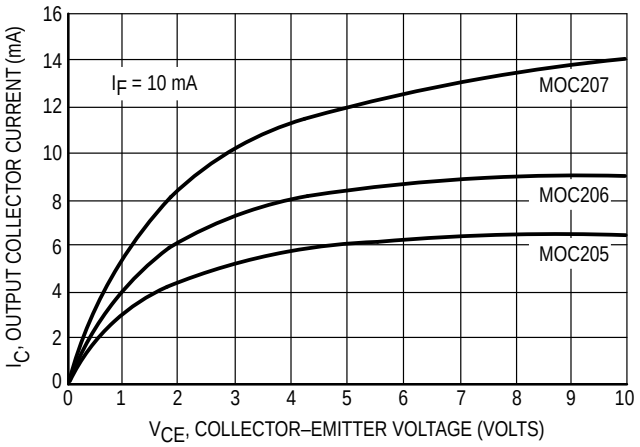



**Figure 3. Output Current versus Collector–Emitter Voltage**

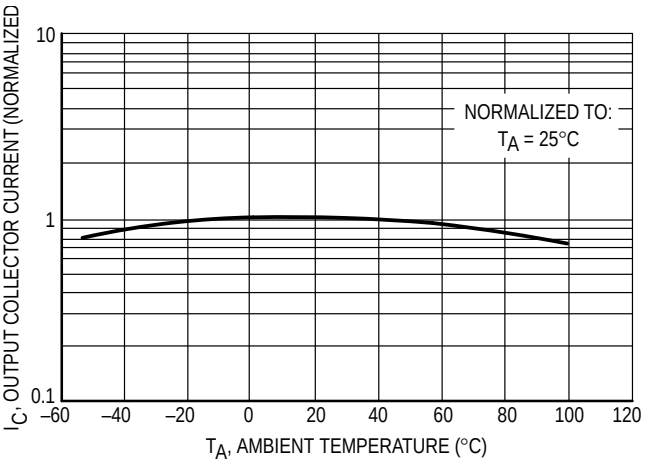



**Figure 4. Output Current versus Ambient Temperature**

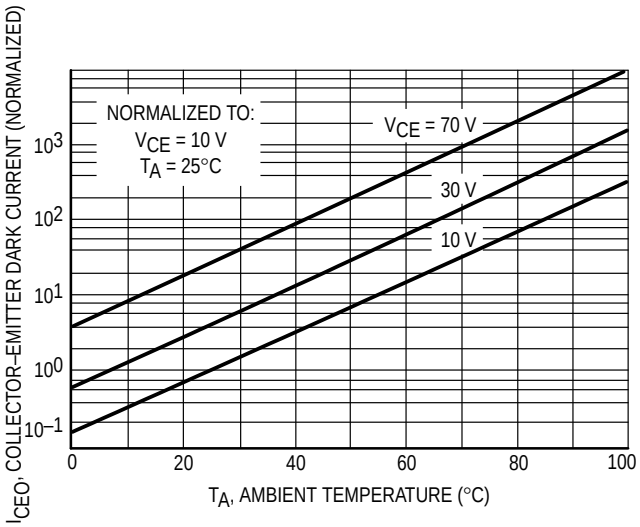



**Figure 5. Dark Current versus Ambient Temperature**

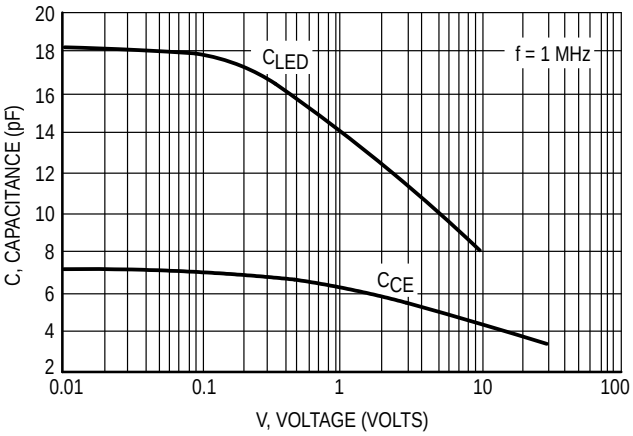
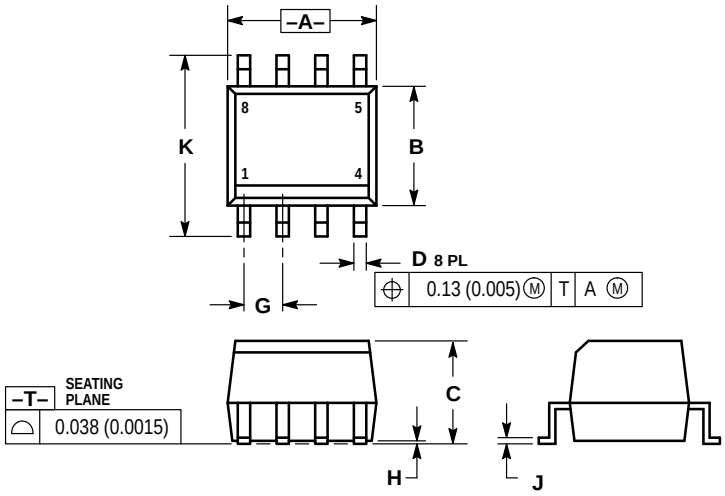



**Figure 6. Capacitance versus Voltage**

## PACKAGE DIMENSIONS




NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 0.182 | 0.202 | 4.63 | 5.13 |
| B | 0.144 | 0.164 | 3.66 | 4.16 |
| C | 0.123 | 0.143 | 3.13 | 3.63 |
| D | 0.011 | 0.021 | 0.28 | 0.53 |
| G | 0.050 BSC | | 1.27 BSC | |
| H | 0.003 | 0.008 | 0.08 | 0.20 |
| J | 0.006 | 0.010 | 0.16 | 0.25 |
| K | 0.224 | 0.244 | 5.69 | 6.19 |

STYLE 1:
PIN 1. ANODE
2. CATHODE
3. NC
4. NC
5. EMITTER
6. COLLECTOR
7. BASE
8. NC

**CASE 846–01**
**ISSUE B**

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