# MCA230, MCA231, MCA255

## DESCRIPTION

The MCA230, MCA231 and MCA255 series optocoupler consists of an infrared emitting diode optically coupled to an NPN silicon photodarlington transistor in a space efficient dual in line package.

## FEATURES

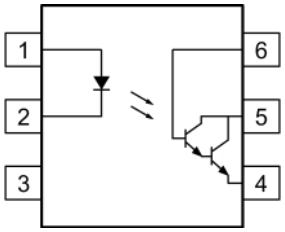
- High AC Isolation voltage 5000$V_{RMS}$
- High Current Transfer Ratio
- Pb Free and RoHS Compliant
- UL Approval E91231

## APPLICATIONS

- Computer Terminals
- Industrial System Controllers
- Measuring Instruments
- Signal Transmission between Systems of Different Potentials and Impedances

## ORDER INFORMATION

- Add G after PN for 10mm lead spacing
- Add SM after PN for Surface Mount
- Add SMT&R after PN for Surface Mount Tape & Reel




1 Anode
2 Cathode
3 NC
4 Emitter
5 Collector
6 Base

## ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25°C)

**Stresses exceeding the absolute maximum ratings can cause permanent damage to the device.**
**Exposure to absolute maximum ratings for long periods of time can adversely affect reliability.**

### Input

| | |
|---|---|
| Forward Current | 60mA |
| Peak Forward Current (1µs, pulse) | 1A |
| Reverse Voltage | 6V |
| Power dissipation | 120mW |
| Power Dissipation Derating Factor (No Derating up to $T_A$ = 100°C) | 3.8mW/°C |

### Output

| | |
|---|---|
| Collector to Emitter Voltage $V_{CEO}$ | |
| MCA230, MCA231 | 30V |
| MCA255 | 55V |
| Collector to Base Voltage $V_{CBO}$ | |
| MCA230, MCA231 | 30V |
| MCA255 | 55V |
| Emitter to Collector Voltage $V_{ECO}$ | 7V |
| Emitter to Base Voltage $V_{EBO}$ | 7V |
| Power Dissipation | 150mW |
| Power Dissipation Derating Factor (No Derating up to $T_A$ = 80°C) | 6.5mW/°C |

### Total Package

| | |
|---|---|
| Total Power Dissipation | 200mW |
| Isolation Voltage | 5000$V_{RMS}$ |
| Operating Temperature | -55 to 100 °C |
| Storage Temperature | -55 to 125 °C |
| Lead Soldering Temperature (10s) | 260°C |

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## ELECTRICAL CHARACTERISTICS ($T_A$ = 25°C unless otherwise specified)

### INPUT

| Parameter | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Forward Voltage | $V_F$ | $I_F$ = 10mA | | 1.2 | 1.5 | V |
| Reverse Current | $I_R$ | $V_R$ = 6V | | | 10 | µA |
| Input Capacitance | $C_{in}$ | $V_F$ = 0V, f = 1MHz | | 50 | | pF |

### OUTPUT

| Parameter | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Collector-Emitter Breakdown Voltage | $BV_{CEO}$ | $I_C$ = 1mA, $I_F$ = 0mA<br>MCA230, MCA231<br>MCA255 | <br>30<br>55 | | | V |
| Emitter-Collector Breakdown Voltage | $BV_{CBO}$ | $I_C$ = 0.1mA, $I_F$ = 0mA<br>MCA230, MCA231<br>MCA255 | <br>30<br>55 | | | V |
| Emitter-Base Breakdown Voltage | $BV_{ECO}$ | $I_E$ = 0.1mA | 7 | | | V |
| Collector-Emitter Dark Current | $I_{CEO}$ | $V_{CE}$ = 10V, $I_F$ = 0mA | | | 100 | nA |

### COUPLED

| Parameter | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Current transfer ratio | CTR | $I_F$ = 10mA, $V_{CE}$ = 5V<br>MCA230, MCA255<br>MCA231 | <br>100<br>200 | | | % |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | MCA230, MCA255<br>$I_F$ = 50mA, $I_C$ = 50mA<br>MCA231<br>$I_F$ = 1mA, $I_C$ = 2mA<br>$I_F$ = 5mA, $I_C$ = 10mA<br>$I_F$ = 10mA, $I_C$ = 50mA | | | <br>1.0<br><br><br>1.0<br>1.0<br>1.2 | V |
| Input-Output Capacitance | $C_{IO}$ | $V_{IO}$ = 0V, f = 1MHz | | 0.8 | | pF |

## ELECTRICAL CHARACTERISTICS ($T_A$ = 25°C unless otherwise specified)

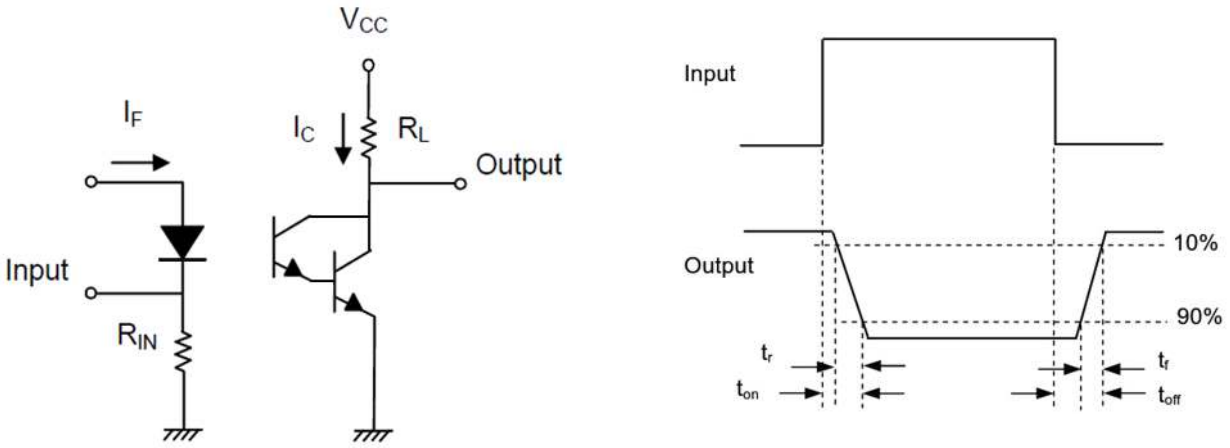
### SWITCHING

| Parameter | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Output Turn On Time | $t_{ON}$ | $V_{CC}$ = 10V, $I_F$ = 10mA<br>$R_L$ = 100Ω | | 25 | | µs |
| Output Turn Off Time | $t_{OFF}$ | | | 18 | | µs |

### ISOLATION

| Parameter | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Isolation Voltage | $V_{ISO}$ | R.H. = 40% to 60%, t = 1 min<br>Note 1 | 5000 | | | $V_{RMS}$ |
| Isolation Resistance | $R_{I-O}$ | $V_{I-O}$ = 500VDC<br>R.H. = 40% to 60%<br>Note 1 | $10^{11}$ | | | Ω |

Note 1 : Measured with input leads shorted together and output leads shorted together.




**Switching Time Test Circuit and Waveforms**

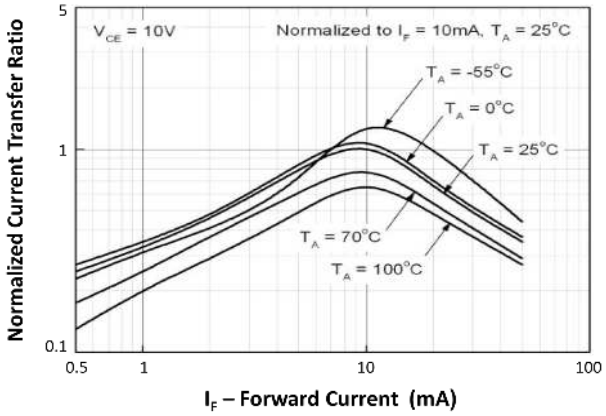



**Fig 1 Normalized Current Transfer Ratio vs Forward Current**

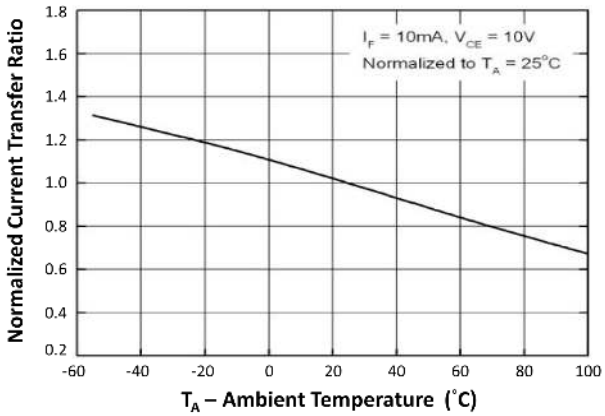



**Fig 2 Normalized Current Transfer Ratio vs Ambient Temperature**

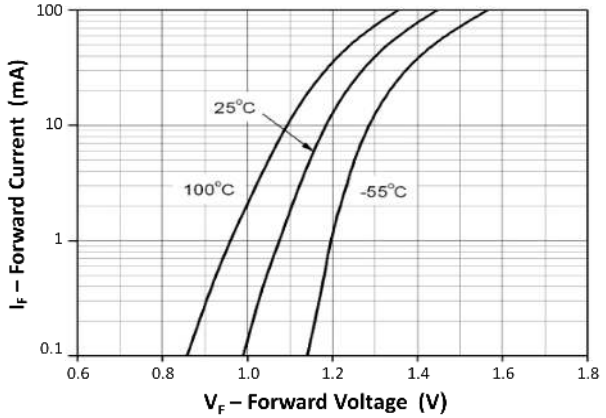



**Fig 3 Forward Current vs Forward Voltage**

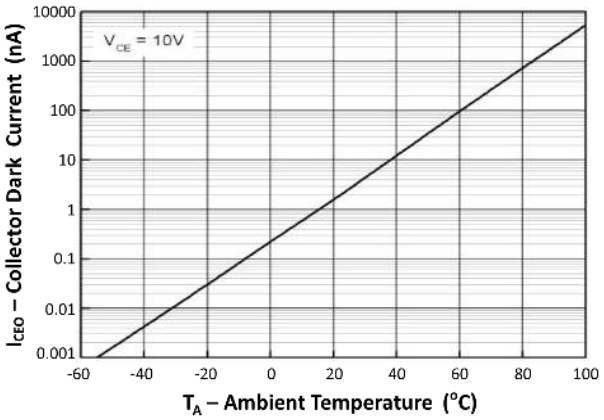



**Fig 4 Collector Dark Current vs Ambient Temperature**

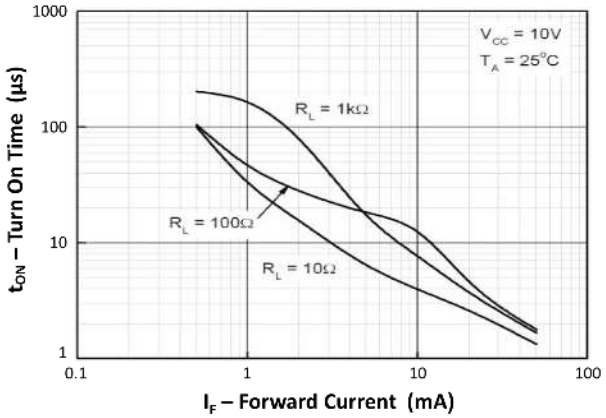



**Fig 5 Turn On Time vs Forward Current**

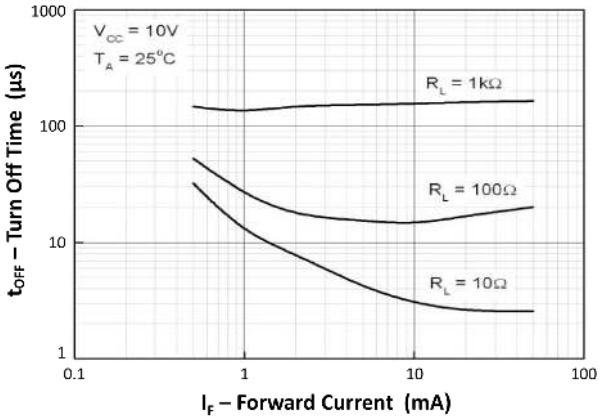
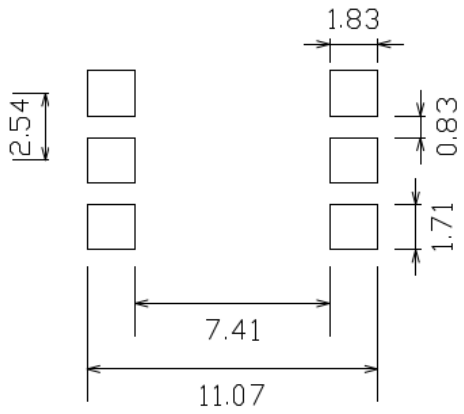



**Fig 6 Turn Off Time vs Forward Current**

## ORDER INFORMATION

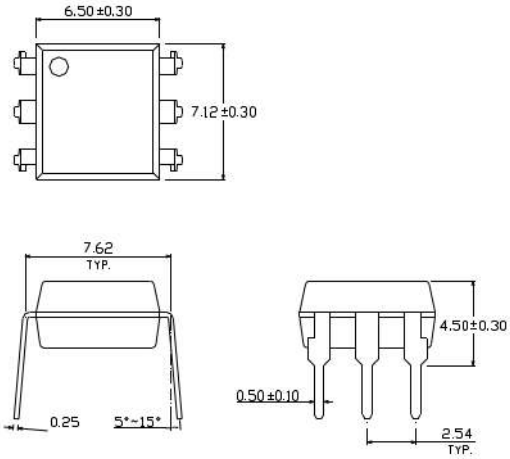
| MCA230, MCA231, MCA255 | | | |
|---|---|---|---|
| **After PN** | **PN** | **Description** | **Packing quantity** |
| None | MCA230, MCA231, MCA255 | Standard DIP6 | 65 pcs per tube |
| G | MCA230G, MCA231G, MCA255G | 10mm Lead Spacing | 65 pcs per tube |
| SM | MCA230SM, MCA231SM, MCA255SM | Surface Mount | 65 pcs per tube |
| SMT&R | MCA230SMT&R, MCA231SMT&R, MCA255SMT&R | Surface Mount Tape and Reel | 1000 pcs per reel |

## RECOMMENDED PAD LAYOUT FOR SMD (mm)

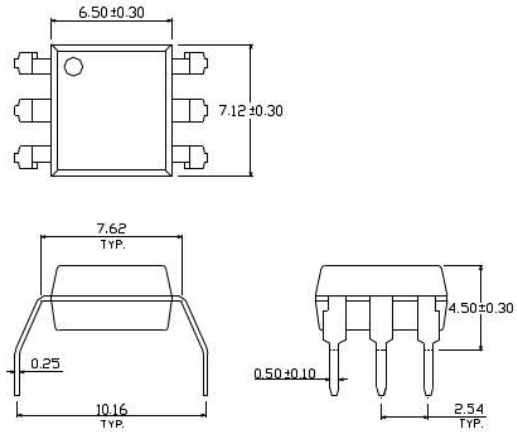


## PACKAGE DIMENSIONS (mm)

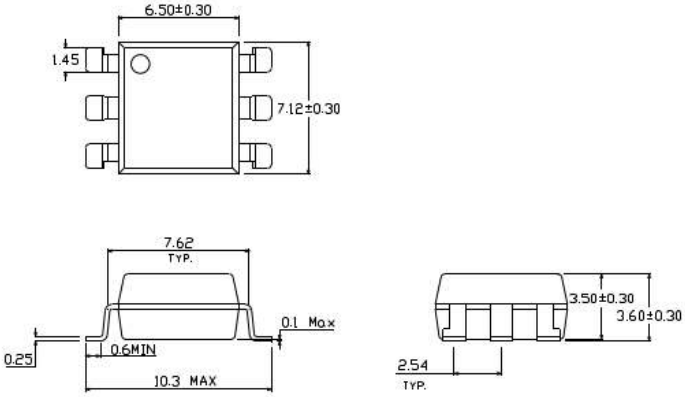
**DIP**



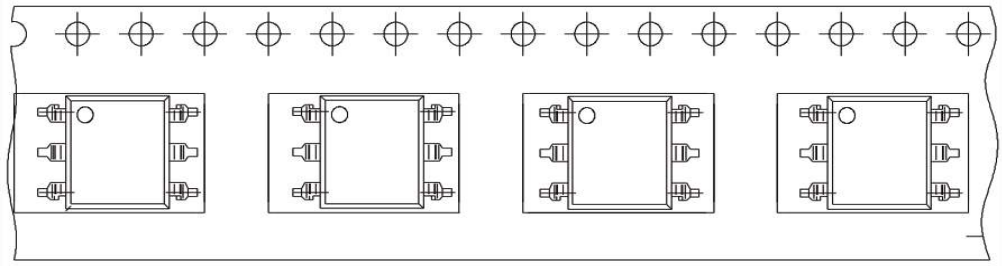

**G Form**



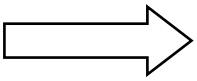

**Surface Mount**

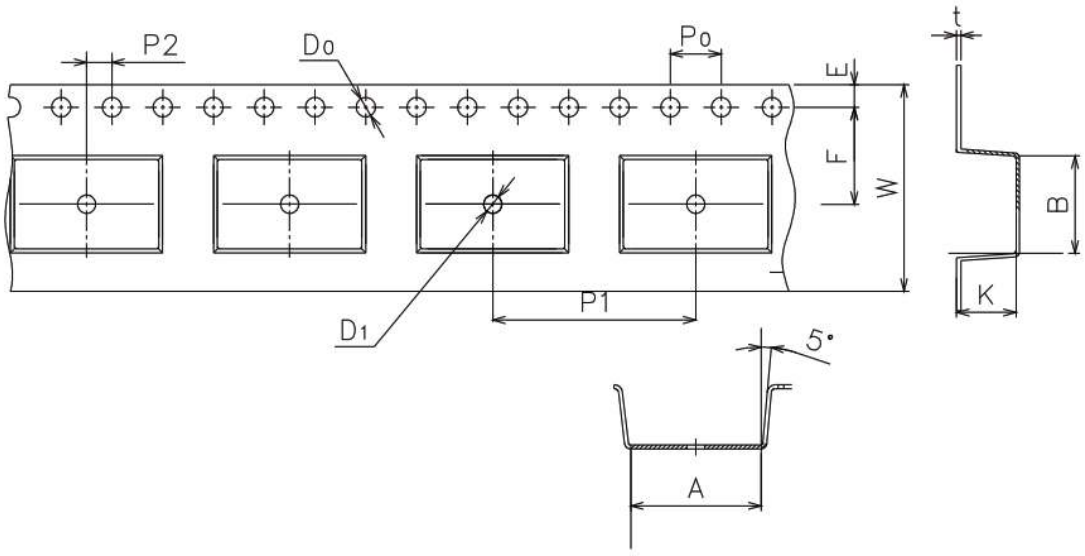


## TAPE AND REEL PACKAGING



Direction of Feed from Reel

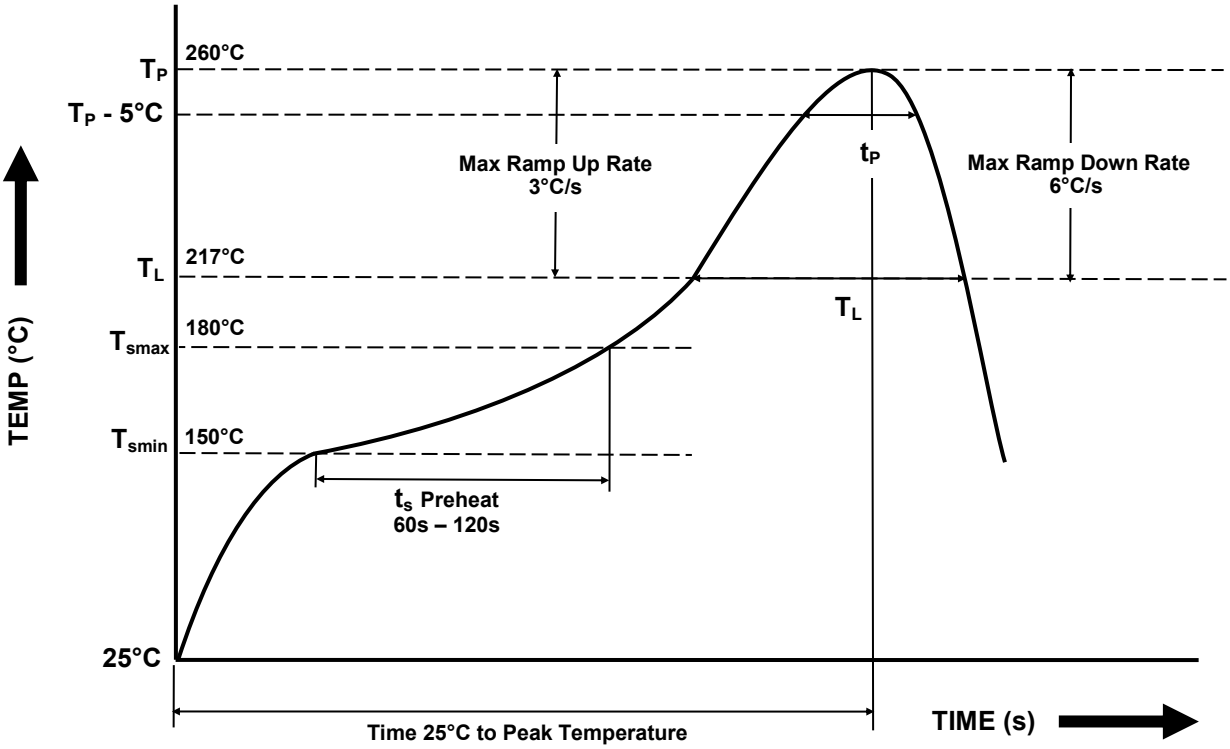





| Dimension No. | A | B | $D_0$ | $D_1$ | E | F |
|---|---|---|---|---|---|---|
| Dimension( mm) | 10.8±0.1 | 7.55±0.1 | 1.5±0.1 | 1.5+0.1/-0 | 1.75±0.1 | 7.5±0.1 |
| Dimension No. | $P_0$ | P1 | P2 | t | W | K |
| Dimension (mm) | 4.0±0.15 | 12±0.1 | 2.0±0.1 | 0.35±0.03 | 16.0±0.2 | 4.5±0.1 |

## IR REFLOW SOLDERING TEMPERATURE PROFILE

**One Time Reflow Soldering is Recommended.**
**Do not immerse device body in solder paste.**




| Profile Details | Conditions |
|---|---|
| **Preheat**<br>- Min Temperature ($T_{SMIN}$)<br>- Max Temperature ($T_{SMAX}$)<br>- Time $T_{SMIN}$ to $T_{SMAX}$ ($t_s$) | <br>150°C<br>180°C<br>60s - 120s |
| **Soldering Zone**<br>- Peak Temperature ($T_P$)<br>- Liquidous Temperature ($T_L$)<br>- Time within 5°C of Actual Peak Temperature ($T_P$ – 5°C)<br>- Time maintained above $T_L$ ($t_L$)<br>- Ramp Up Rate ($T_L$ to $T_P$)<br>- Ramp Down Rate ($T_P$ to $T_L$) | <br>260°C<br>217°C<br>20s<br>60s<br>3°C/s max<br>3 - 6°C/s |
| Average Ramp Up Rate ($T_{smax}$ to $T_P$) | 3°C/s max |
| Time 25°C to Peak Temperature | 8 minutes max |

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