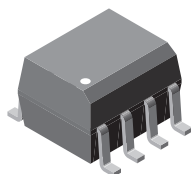
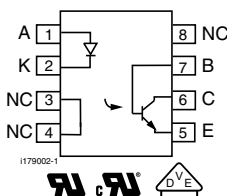




## Optocoupler, Phototransistor Output, with Base Connection in SOIC-8 Package



1179074



### FEATURES

- High  $BV_{CEO}$ , 70 V
- Isolation test voltage, 4000  $V_{RMS}$
- Material categorization:  
for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

RoHS  
COMPLIANT

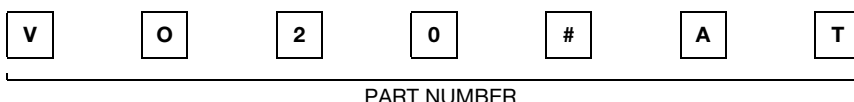
### DESCRIPTION

The VO205AT, VO206AT, VO207AT, VO208AT are optically coupled pairs with a GaAs infrared LED and a silicon NPN phototransistor. Signal information, including a DC level, can be transmitted by the device while maintaining a high degree of electrical isolation between input and output. This family comes in a standard SOIC-8A small outline package for surface mounting which makes them ideally suited for high density application with limited space.

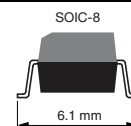
### AGENCY APPROVALS

- [UL](#)
- [cUL](#)
- [DIN EN 60747-5-5 \(VDE 0884-5\)](#), available with option 1

### ORDERING INFORMATION



PART NUMBER



| AGENCY CERTIFIED / PACKAGE | CTR (%)  |           |            |            |
|----------------------------|----------|-----------|------------|------------|
| UL, cUL                    | 40 to 80 | 63 to 125 | 100 to 200 | 160 to 320 |
| SOIC-8                     | VO205AT  | VO206AT   | VO207AT    | VO208AT    |

### ABSOLUTE MAXIMUM RATINGS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

| PARAMETER                                    | TEST CONDITION            | SYMBOL          | VALUE       | UNIT                   |
|----------------------------------------------|---------------------------|-----------------|-------------|------------------------|
| <b>INPUT</b>                                 |                           |                 |             |                        |
| Peak reverse voltage                         |                           | $V_R$           | 6           | V                      |
| Forward continuous current                   |                           | $I_F$           | 60          | mA                     |
| Peak forward current                         | 1 $\mu\text{s}$ , 300 pps | $I_{FM}$        | 1           | A                      |
| Power dissipation                            |                           | $P_{diss}$      | 90          | mW                     |
| Derate linearly from 25 $^{\circ}\text{C}$   |                           |                 | 1.2         | mW/ $^{\circ}\text{C}$ |
| <b>OUTPUT</b>                                |                           |                 |             |                        |
| Collector emitter breakdown voltage          |                           | $BV_{CEO}$      | 70          | V                      |
| Emitter collector breakdown voltage          |                           | $BV_{ECO}$      | 7           | V                      |
| Collector-base breakdown voltage             |                           | $BV_{CBO}$      | 70          | V                      |
| $I_{Cmax}$ , DC                              |                           | $I_{Cmax}$ , DC | 50          | mA                     |
| $I_{Cmax}$                                   | $t < 1\text{ ms}$         | $I_{Cmax}$      | 100         | mA                     |
| Power dissipation                            |                           | $P_{diss}$      | 150         | mW                     |
| Derate linearly from 25 $^{\circ}\text{C}$   |                           |                 | 2           | mW/ $^{\circ}\text{C}$ |
| <b>COUPLER</b>                               |                           |                 |             |                        |
| Isolation test voltage                       |                           | $V_{ISO}$       | 4000        | $V_{RMS}$              |
| Total package dissipation (LED and detector) |                           | $P_{tot}$       | 240         | mW                     |
| Derate linearly from 25 $^{\circ}\text{C}$   |                           |                 | 3.3         | mW/ $^{\circ}\text{C}$ |
| Operating temperature                        |                           | $T_{amb}$       | -40 to +100 | $^{\circ}\text{C}$     |
| Storage temperature                          |                           | $T_{stg}$       | -40 to +150 | $^{\circ}\text{C}$     |
| Soldering time                               | at 260 $^{\circ}\text{C}$ | $T_{sld}$       | 10          | s                      |

#### Note

- 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.

| <b>ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                            |             |      |      |      |               |
|----------------------------------------------------------------------------------------------------------|--------------------------------------------|-------------|------|------|------|---------------|
| PARAMETER                                                                                                | TEST CONDITION                             | SYMBOL      | MIN. | TYP. | MAX. | UNIT          |
| <b>INPUT</b>                                                                                             |                                            |             |      |      |      |               |
| Forward voltage                                                                                          | $I_F = 10\text{ mA}$                       | $V_F$       | -    | 1.3  | 1.5  | V             |
| Reverse current                                                                                          | $V_R = 6\text{ V}$                         | $I_R$       | -    | 0.1  | 100  | $\mu\text{A}$ |
| Capacitance                                                                                              | $V_R = 0\text{ V}$                         | $C_O$       | -    | 13   | -    | pF            |
| <b>OUTPUT</b>                                                                                            |                                            |             |      |      |      |               |
| Collector emitter breakdown voltage                                                                      | $I_C = 100\text{ }\mu\text{A}$             | $BV_{CEO}$  | 70   | -    | -    | V             |
| Emitter collector breakdown voltage                                                                      | $I_E = 10\text{ }\mu\text{A}$              | $BV_{ECO}$  | 7    | 10   | -    | V             |
| Collector base breakdown voltage                                                                         | $I_C = 100\text{ }\mu\text{A}$             | $BV_{CBO}$  | 100  | -    | -    | V             |
| Collector base current                                                                                   |                                            | $I_{CBO}$   | -    | -    | 1    | nA            |
| Emitter base current                                                                                     |                                            | $I_{EBO}$   | -    | -    | 1    | nA            |
| Collector emitter leakage current                                                                        | $V_{CE} = 10\text{ V}$                     | $I_{CEO}$   | -    | 5    | 50   | nA            |
| Saturation voltage, collector emitter                                                                    | $I_C = 2\text{ mA}$ , $I_F = 10\text{ mA}$ | $V_{CEsat}$ | -    | -    | 0.4  | V             |
| <b>COUPLER</b>                                                                                           |                                            |             |      |      |      |               |
| Capacitance, input to output                                                                             |                                            | $C_{IO}$    | -    | 0.5  | -    | pF            |

**Note**

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

| <b>CURRENT TRANSFER RATIO</b> |                                              |         |        |      |      |      |      |
|-------------------------------|----------------------------------------------|---------|--------|------|------|------|------|
| PARAMETER                     | TEST CONDITION                               | PART    | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| $I_C/I_F$                     | $I_F = 10\text{ mA}$ , $V_{CE} = 5\text{ V}$ | VO205AT | CTR    | 40   | -    | 80   | %    |
|                               |                                              | VO206AT | CTR    | 63   | -    | 125  | %    |
|                               |                                              | VO207AT | CTR    | 100  | -    | 200  | %    |
|                               |                                              | VO208AT | CTR    | 160  | -    | 320  | %    |

| <b>SWITCHING CHARACTERISTICS</b> |                                                                          |           |      |      |      |               |
|----------------------------------|--------------------------------------------------------------------------|-----------|------|------|------|---------------|
| PARAMETER                        | TEST CONDITION                                                           | SYMBOL    | MIN. | TYP. | MAX. | UNIT          |
| Turn-on time                     | $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$ , $V_{CC} = 10\text{ V}$ | $t_{on}$  | -    | 3    | -    | $\mu\text{s}$ |
| Turn-off time                    | $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$ , $V_{CC} = 10\text{ V}$ | $t_{off}$ | -    | 3    | -    | $\mu\text{s}$ |
| Rise time                        | $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$ , $V_{CC} = 10\text{ V}$ | $t_r$     | -    | 3    | -    | $\mu\text{s}$ |
| Fall time                        | $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$ , $V_{CC} = 10\text{ V}$ | $t_f$     | -    | 2    | -    | $\mu\text{s}$ |

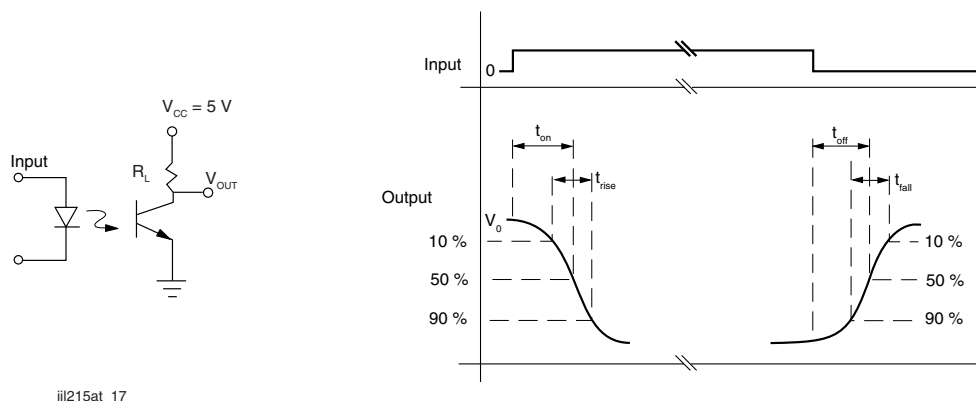


Fig. 1 - Switching Test Circuit

**COMMON MODE TRANSIENT IMMUNITY**

| PARAMETER                                    | TEST CONDITION                                                                      | SYMBOL     | MIN. | TYP. | MAX. | UNIT                   |
|----------------------------------------------|-------------------------------------------------------------------------------------|------------|------|------|------|------------------------|
| Common mode transient immunity at logic high | $V_{CM} = 1000\text{ V}_{P-P}$ , $R_L = 1\text{ k}\Omega$ ,<br>$I_F = 0\text{ mA}$  | $ C_{MH} $ | -    | 5000 | -    | $\text{V}/\mu\text{s}$ |
| Common mode transient immunity at logic low  | $V_{CM} = 1000\text{ V}_{P-P}$ , $R_L = 1\text{ k}\Omega$ ,<br>$I_F = 10\text{ mA}$ | $ C_{ML} $ | -    | 5000 | -    | $\text{V}/\mu\text{s}$ |

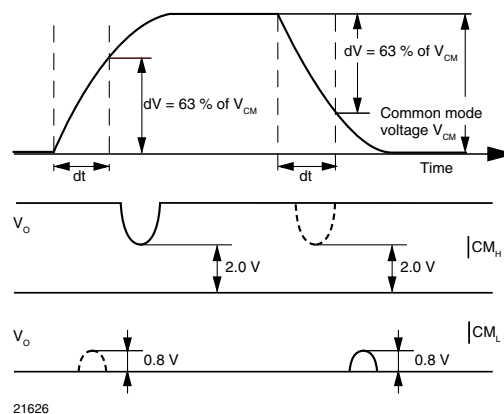
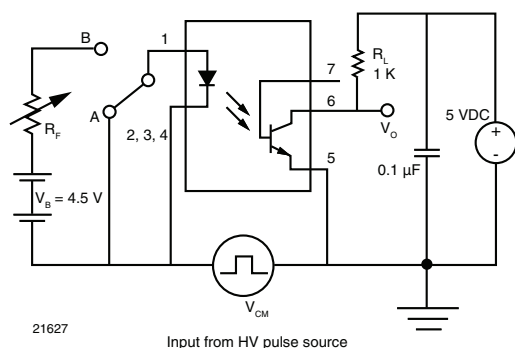


Fig. 2 - Test Circuit for Common Mode Transient Immunity

**SAFETY AND INSULATION RATINGS**

| PARAMETER                                            | TEST CONDITION | SYMBOL     | MIN. | TYP.          | MAX. | UNIT               |
|------------------------------------------------------|----------------|------------|------|---------------|------|--------------------|
| Climatic classification (according to IEC 68 part 1) |                |            | -    | 40 / 100 / 21 | -    |                    |
| Pollution degree                                     |                |            | -    | 2             | -    |                    |
| Comparative tracking index                           |                | CTI        | 175  | -             | 399  |                    |
| Isolation test voltage                               | 1 s            | $V_{ISO}$  | 4000 | -             | -    | $V_{RMS}$          |
| Peak transient overvoltage                           |                | $V_{IOTM}$ | 6000 | -             | -    | V                  |
| Peak insulation voltage                              |                | $V_{IORM}$ | 560  | -             | -    | V                  |
| Resistance (input to output)                         |                | $R_{IO}$   | -    | 100           | -    | $G\Omega$          |
| Safety rating - power output                         |                | $P_{SO}$   | -    | -             | 350  | mW                 |
| Safety rating - input current                        |                | $I_{SI}$   | -    | -             | 150  | mA                 |
| Safety rating - temperature                          |                | $T_{SI}$   | -    | -             | 165  | $^{\circ}\text{C}$ |
| External creepage distance                           |                |            | 4    | -             | -    | mm                 |
| External clearance distance                          |                |            | 4    | -             | -    | mm                 |
| Internal creepage distance                           |                |            | 3.3  | -             | -    | mm                 |
| Insulation thickness                                 |                |            | 0.2  | -             | -    | mm                 |

**Note**

- As per IEC 60747-5-2, §7.4.3.8.1, this optocoupler is suitable for "safe electrical insulation" only within the safety ratings. Compliance with the safety ratings shall be ensured by means of protective circuits.



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

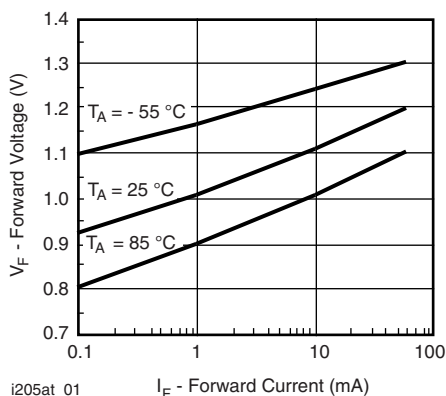


Fig. 3 - Forward Voltage vs. Forward Current

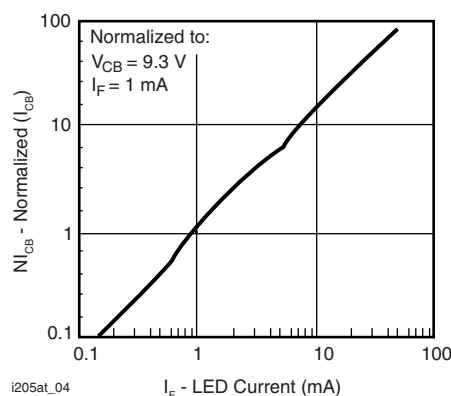


Fig. 6 - Normalized Collector-Base Photocurrent vs. LED Current

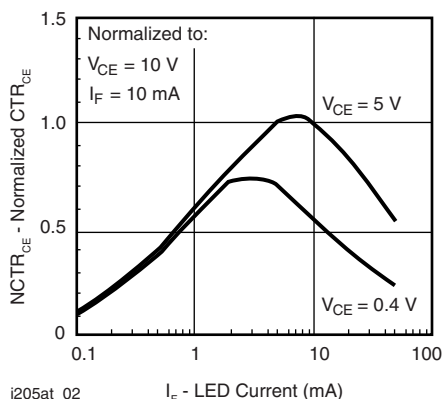


Fig. 4 - Normalized Non-Saturated and Saturated  $CTR_{CE}$  vs. LED Current

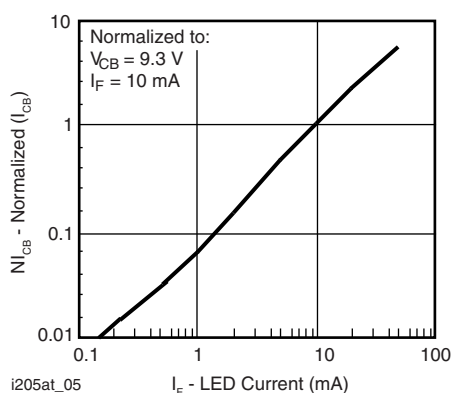


Fig. 7 - Normalized Collector-Base Photocurrent vs. LED Current

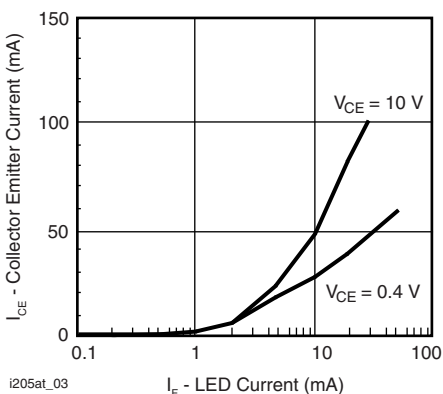


Fig. 5 - Collector Emitter Current vs. LED Current

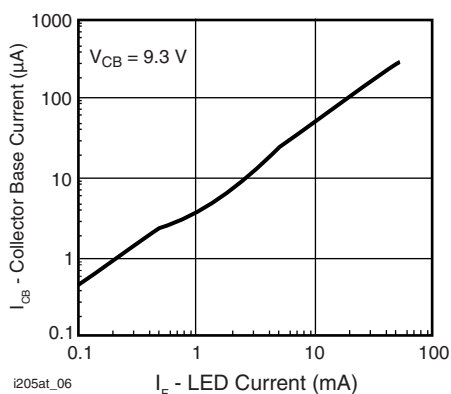
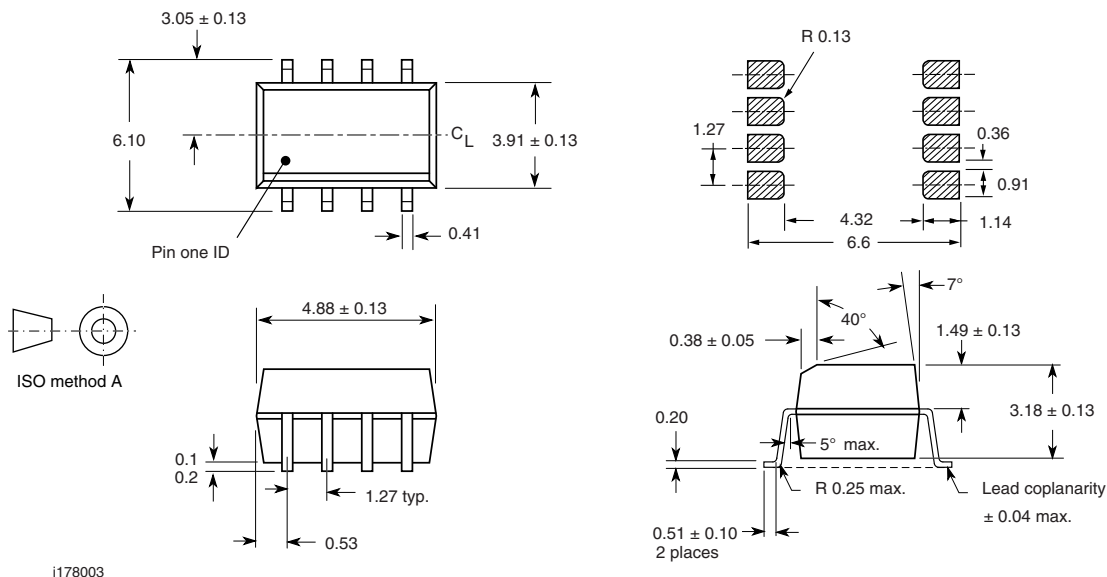
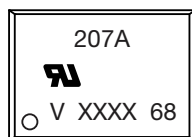


Fig. 8 - Collector Base Photocurrent vs. LED Current

**PACKAGE DIMENSIONS** in millimeters

**PACKAGE MARKING** (example of VO207AT)

**Note**

- XXXX = LMC (lot marking code)

**TAPE AND REEL PACKAGING**

Dimensions in millimeters

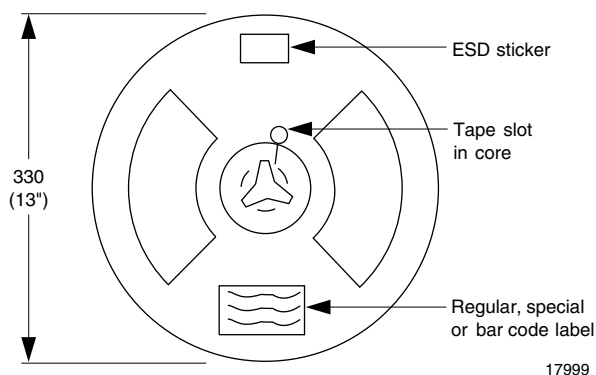


Fig. 9 - Tape and Reel Shipping Medium  
(EIA-481, revision A, and IEC 60286), 2000 units per reel

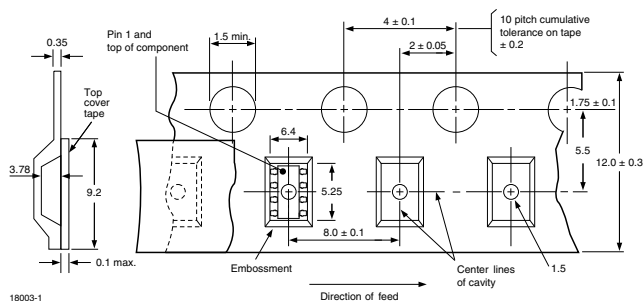


Fig. 10 - Tape Dimensions, 2000 Parts per Reel



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