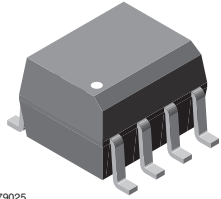
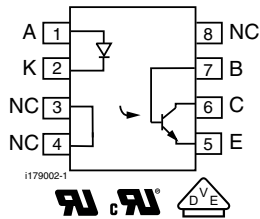


## Optocoupler, Phototransistor Output, with Base Connection in SOIC-8



i179025



### FEATURES

- Isolation test voltage, 4000 V<sub>RMS</sub>
- Industry standard SOIC-8 surface mountable package
- Compatible with dual wave, vapor phase and IR reflow soldering
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC



**RoHS**  
COMPLIANT

### DESCRIPTION

The IL211AT, IL212AT, IL213AT are optically coupled pairs with a gallium arsenide infrared LED and 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.

The IL211AT, IL212AT, IL213AT comes in a standard SOIC-8 small outline package for surface mounting which makes it ideally suited for high density applications with limited space. In addition to eliminating through-holes requirements, this package conforms to standards for surface mounted devices.

A choice of 20 %, 50 %, and 100 % minimum CTR at I<sub>F</sub> = 10 mA makes these optocouplers suitable for a variety of different applications.

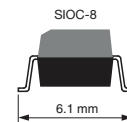
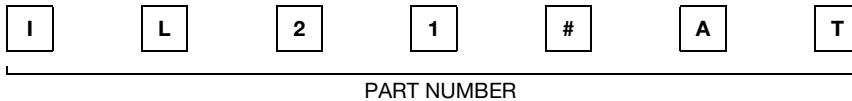
### AGENCY APPROVALS

- UL1577, file no. E52744 system code Y
- cUL - file no. E52744, equivalent to CSA bulletin 5A
- DIN EN 60747-5-2 (VDE 0884) <sup>(1)</sup>
- DIN EN 60747-5-5 (pending) <sup>(1)</sup>

#### Note

<sup>(1)</sup> Available upon request, as option 1

### ORDERING INFORMATION



| AGENCY CERTIFIED/PACKAGE | CTR (%) |         |         |
|--------------------------|---------|---------|---------|
|                          | 10 mA   |         |         |
| UL, cUL                  | > 20    | > 50    | > 100   |
| SIOC-8                   | IL211AT | IL212AT | IL213AT |

### ABSOLUTE MAXIMUM RATINGS (T<sub>amb</sub> = 25 °C, unless otherwise specified)

| PARAMETER                           | TEST CONDITION | SYMBOL                | VALUE | UNIT  |
|-------------------------------------|----------------|-----------------------|-------|-------|
| <b>INPUT</b>                        |                |                       |       |       |
| Peak reverse voltage                |                | V <sub>R</sub>        | 6     | V     |
| Forward continuous current          |                | I <sub>F</sub>        | 60    | mA    |
| Power dissipation                   |                | P <sub>diss</sub>     | 90    | mW    |
| Derate linearly from 25 °C          |                |                       | 1.2   | mW/°C |
| <b>OUTPUT</b>                       |                |                       |       |       |
| Collector emitter breakdown voltage |                | BV <sub>CEO</sub>     | 30    | V     |
| Emitter collector breakdown voltage |                | BV <sub>ECO</sub>     | 7     | V     |
| Collector base breakdown voltage    |                | V <sub>CBO</sub>      | 70    | V     |
| I <sub>C</sub> MAX DC               |                | I <sub>C</sub> MAX DC | 50    | mA    |
| I <sub>C</sub> MAX                  | t < 1 ms       | I <sub>C</sub> MAX    | 100   | mA    |
| Power dissipation                   |                | P <sub>diss</sub>     | 150   | mW    |
| Derate linearly from 25 °C          |                |                       | 2     | mW/°C |

# IL211AT, IL212AT, IL213AT



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

| ABSOLUTE MAXIMUM RATINGS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                           |           |               |                        |
|-------------------------------------------------------------------------------------------------|---------------------------|-----------|---------------|------------------------|
| PARAMETER                                                                                       | TEST CONDITION            | SYMBOL    | VALUE         | UNIT                   |
| <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 $^{\circ}\text{C}$                                                      |                           |           | 3.2           | mW/ $^{\circ}\text{C}$ |
| Storage temperature                                                                             |                           | $T_{stg}$ | - 55 to + 150 | $^{\circ}\text{C}$     |
| Operating temperature                                                                           |                           | $T_{amb}$ | - 55 to + 100 | $^{\circ}\text{C}$     |
| Soldering time                                                                                  | at 260 $^{\circ}\text{C}$ |           | 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.

| ELECTRICAL CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                               |      |             |      |      |      |               |
|---------------------------------------------------------------------------------------------------|-------------------------------|------|-------------|------|------|------|---------------|
| PARAMETER                                                                                         | TEST CONDITION                | PART | 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                                                               | $I_C = 10\text{ }\mu\text{A}$ |      | $BV_{CEO}$  | 30   |      |      | V             |
| Emitter collector breakdown voltage                                                               | $I_E = 10\text{ }\mu\text{A}$ |      | $BV_{ECO}$  | 7    |      |      | V             |
| Collector dark current                                                                            | $V_{CE} = 10\text{ V}$        |      | $I_{CEO}$   |      | 5    | 50   | nA            |
| Collector emitter capacitance                                                                     | $V_{CE} = 0\text{ V}$         |      | $C_{CE}$    |      | 10   |      | pF            |
| <b>COUPLER</b>                                                                                    |                               |      |             |      |      |      |               |
| Saturation voltage, collector emitter                                                             | $I_F = 10\text{ mA}$          |      | $V_{CEsat}$ |      |      | 0.4  | V             |
| Isolation test voltage                                                                            | 1 s                           |      | $V_{ISO}$   | 4000 |      |      | $V_{RMS}$     |
| Capacitance (input to output)                                                                     |                               |      | $C_{IO}$    |      | 0.5  | 50   | pF            |
| Resistance (input to output)                                                                      |                               |      | $R_{IO}$    |      | 100  |      | G $\Omega$    |
| Collector emitter breakdown voltage                                                               | $I_C = 10\text{ }\mu\text{A}$ |      | $BV_{CEO}$  | 30   |      |      | V             |

## 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.

| CURRENT TRANSFER RATIO |                                              |         |        |      |      |      |      |
|------------------------|----------------------------------------------|---------|--------|------|------|------|------|
| PARAMETER              | TEST CONDITION                               | PART    | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| Current transfer ratio | $I_F = 10\text{ mA}$ , $V_{CE} = 5\text{ V}$ | IL211AT | CTR    | 20   | 50   |      | %    |
|                        |                                              | IL212AT | CTR    | 50   | 80   |      | %    |
|                        |                                              | IL213AT | CTR    | 100  | 130  |      | %    |

| SWITCHING CHARACTERISTICS |                                                                             |      |                      |      |      |      |               |
|---------------------------|-----------------------------------------------------------------------------|------|----------------------|------|------|------|---------------|
| PARAMETER                 | TEST CONDITION                                                              | PART | SYMBOL               | MIN. | TYP. | MAX. | UNIT          |
| Switching time            | $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$ ,<br>$V_{CC} = 10\text{ V}$ |      | $t_{on}$ , $t_{off}$ |      | 3    |      | $\mu\text{s}$ |



# IL211AT, IL212AT, IL213AT

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

## SAFETY AND INSULATION RATINGS

| PARAMETER                                               | TEST CONDITION | SYMBOL | MIN. | TYP.      | MAX. | UNIT |
|---------------------------------------------------------|----------------|--------|------|-----------|------|------|
| Climatic classification<br>(according to IEC 68 part 1) |                |        |      | 55/100/21 |      |      |
| Comparative tracking index                              |                | CTI    | 175  |           | 399  |      |
| $V_{IOTM}$                                              |                |        | 6000 |           |      | V    |
| $V_{IORM}$                                              |                |        | 560  |           |      | V    |
| $P_{SO}$                                                |                |        |      |           | 350  | mW   |
| $I_{SI}$                                                |                |        |      |           | 150  | mA   |
| $T_{SI}$                                                |                |        |      |           | 165  | °C   |
| Creepage distance                                       |                |        | 4    |           |      | mm   |
| Clearance distance                                      |                |        | 4    |           |      | 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 ( $T_{amb} = 25\text{ °C}$ , unless otherwise specified)

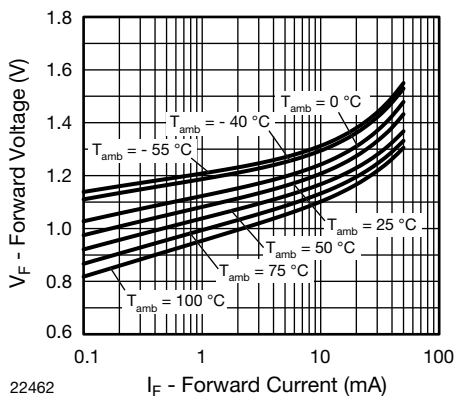


Fig. 1 - Forward Voltage vs. Forward Current

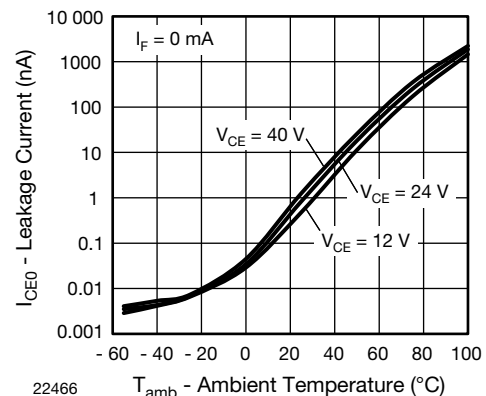


Fig. 3 - Leakage Current vs. Ambient Temperature

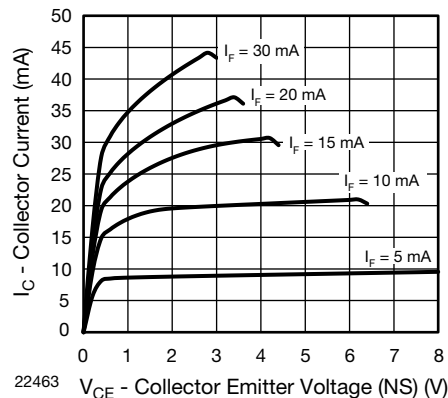


Fig. 2 - Collector Current vs. Collector Emitter Voltage (NS)

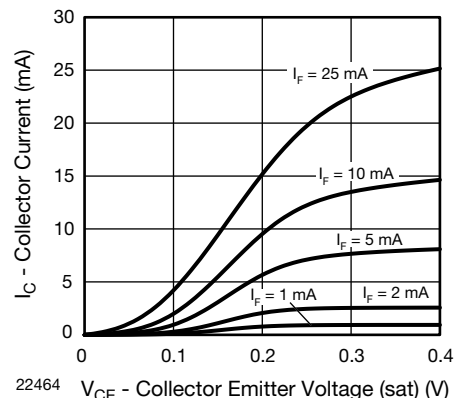


Fig. 4 - Collector Current vs. Collector Emitter Voltage (sat)

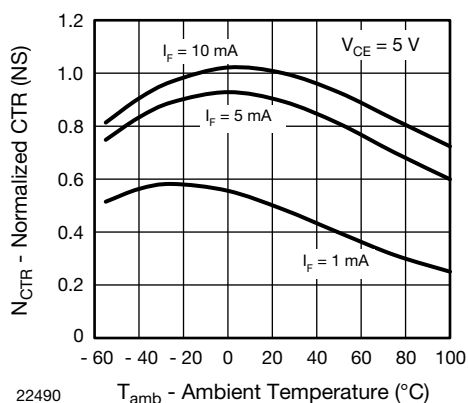


Fig. 5 - Normalized CTR (NS) vs. Ambient Temperature

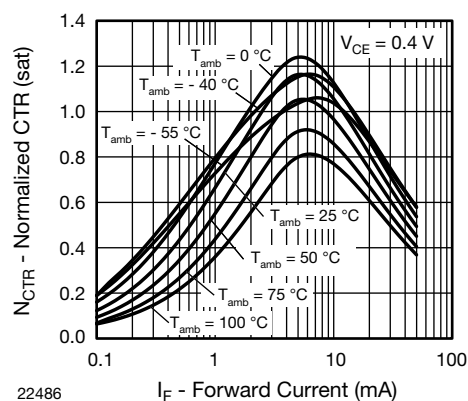


Fig. 8 - Normalized CTR (sat) vs. Forward Current

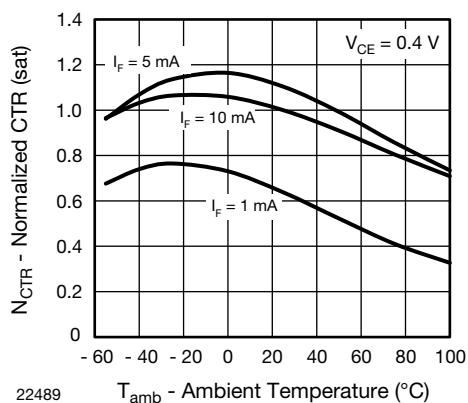


Fig. 6 - Normalized CTR (sat) vs. Ambient Temperature

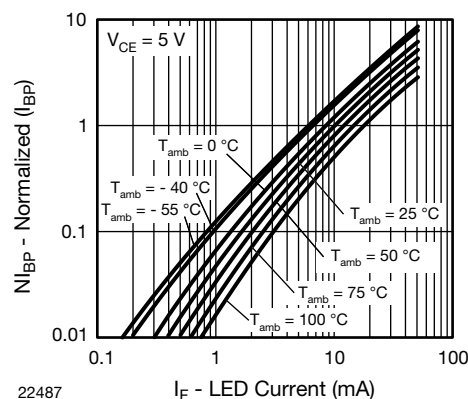


Fig. 9 - Normalized Photocurrent vs. LED Current

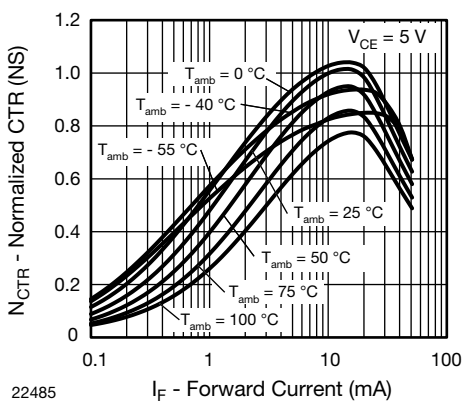


Fig. 7 - Normalized CTR (NS) vs. Forward Current

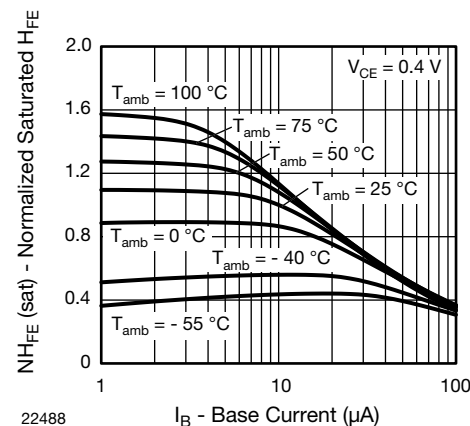


Fig. 10 - Normalized Saturated  $H_{FE}$  vs. Base Current



## IL211AT, IL212AT, IL213AT

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

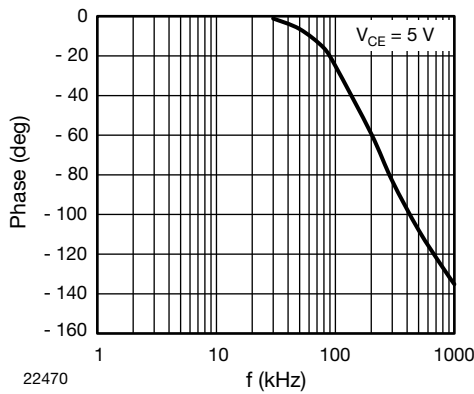


Fig. 11 -  $F_{CTR}$  vs. Phase Angle

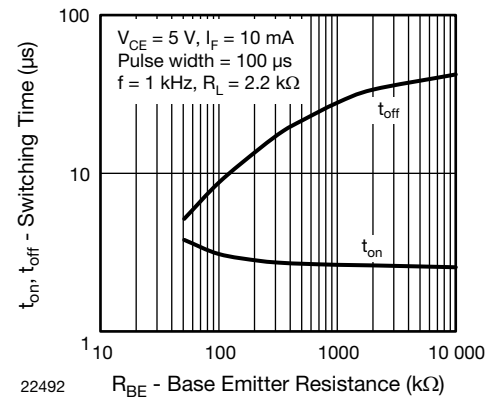


Fig. 14 - Switching Time vs. Base Emitter Resistance

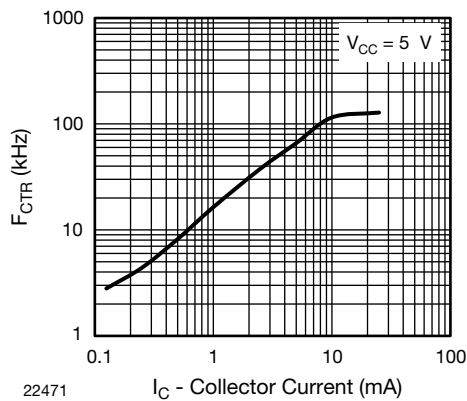


Fig. 12 -  $F_{CTR}$  vs.  $I_C$

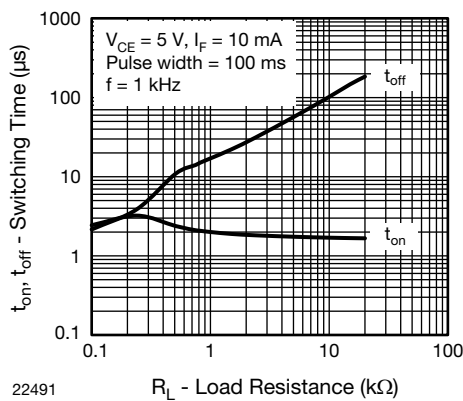


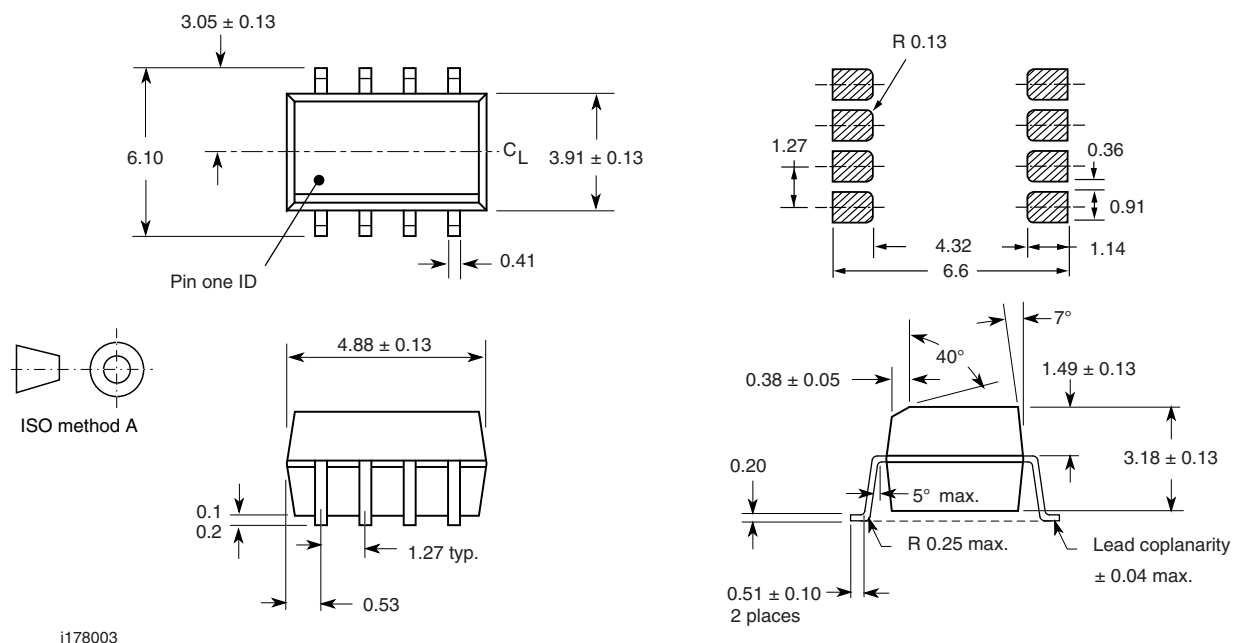
Fig. 13 - Switching Time vs. Load Resistance

# IL211AT, IL212AT, IL213AT

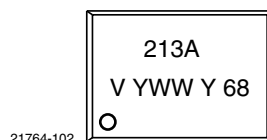
Vishay Semiconductors Optocoupler, Phototransistor Output,  
with Base Connection in SOIC-8 Package



## PACKAGE DIMENSIONS in millimeters



## PACKAGE MARKING (example)





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