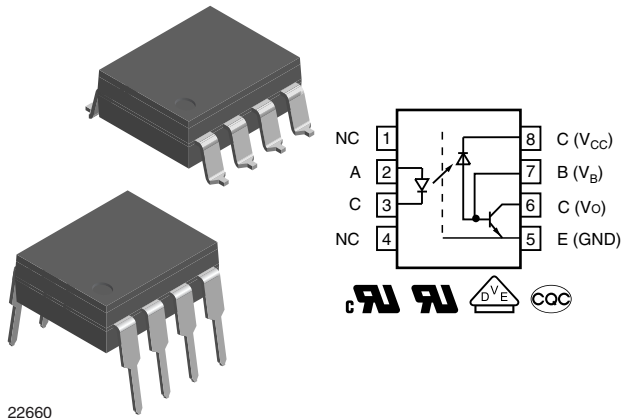


# Widebody, High Isolation, High Speed Optocoupler, 1 MBd



22660

## LINKS TO ADDITIONAL RESOURCES



## DESCRIPTION

1 MBd widebody optocouplers consist of a GaAlAs infrared emitting diode, optically coupled with an integrated photo detector. An integral Faraday shield provides a high level of noise isolation, required by high power switching applications.

Vishay's 1 MBd wide body couplers feature a high level of isolation distance, exhibiting an external creepage distance of > 10 mm. This makes these parts ideal for applications with working voltages exceeding 1000 V.

## FEATURES

- External creepage > 10 mm
- Reinforced isolation
- Internal shield for very high input to output noise isolation
- High common mode interference immunity
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



## APPLICATIONS

- Solar inverters
- Industrial motor drives
- Welding equipment
- Isolated industrial communications
- Noise isolation of sensitive circuits

## AGENCY APPROVALS

The safety application model number covering all products in this datasheet is VOW135 or VOW136 respectively. This model number should be used when consulting safety agency documents.

- [UL](#)
- [cUL](#)
- [DIN EN 60747-5-5 \(VDE 0884-5\)](#)
- [CQC GB4943.1](#)
- [CQC GB8898](#)

| ORDERING INFORMATION  |              |              |
|---|--------------|--------------|
| <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 5px;">V</div> <div style="border: 1px solid black; padding: 2px 5px;">O</div> <div style="border: 1px solid black; padding: 2px 5px;">W</div> <div style="border: 1px solid black; padding: 2px 5px;">1</div> <div style="border: 1px solid black; padding: 2px 5px;">3</div> <div style="border: 1px solid black; padding: 2px 5px;">#</div> <div style="border: 1px solid black; padding: 2px 5px;">-</div> <div style="border: 1px solid black; padding: 2px 5px;">X</div> <div style="border: 1px solid black; padding: 2px 5px;">0</div> <div style="border: 1px solid black; padding: 2px 5px;">#</div> <div style="border: 1px solid black; padding: 2px 5px;">#</div> <div style="border: 1px solid black; padding: 2px 5px;">T</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 5px;"> <div style="text-align: center;">PART NUMBER</div> <div style="text-align: center;">PACKAGE OPTION</div> <div style="text-align: center;">TAPE AND REEL</div> </div> |              |              |
| AGENCY CERTIFIED / PACKAGE  | CTR (%)      |              |
| VDE, UL, cUL, CQC   | ≥ 7          | ≥ 19         |
| DIP-8, 400 mil, widebody  | VOW135-X001  | VOW136-X001  |
| SMD-8, 400 mil, option 7, widebody  | VOW135-X017T | VOW136-X017T |



| <b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |  |                     |             |                    |
|--|--|---------------------|-------------|--------------------|
| PARAMETER  | CONDITIONS   | SYMBOL              | VALUE       | UNIT               |
| <b>INPUT</b>   |  |                     |             |                    |
| Reverse voltage  |  | $V_R$               | 3           | V                  |
| Forward current  |  | $I_F$               | 25          | mA                 |
| Peak forward current   | $t = 1\text{ ms}$ , duty cycle 50 %  | $I_{FM}$            | 50          | mA                 |
| Maximum surge forward current  | $t \leq 1\text{ }\mu\text{s}$ , 300 pulses/s   | $I_{FSM}$           | 1           | A                  |
| Power dissipation  |  | $P_{diss}$          | 45          | mW                 |
| Input junction temperature   |  | $T_{j\text{ max.}}$ | 125         | $^{\circ}\text{C}$ |
| <b>OUTPUT</b>  |  |                     |             |                    |
| Supply voltage   |  | $V_S$               | -0.5 to 30  | V                  |
| Output voltage   |  | $V_O$               | -0.5 to 25  | V                  |
| Emitter base voltage   |  | $V_{EBO}$           | 5           | V                  |
| Average output current   |  | $I_O$               | 8           | mA                 |
| Peak output current  |  | $I_O$               | 16          | mA                 |
| Base current   |  | $I_B$               | 5           | mA                 |
| Power dissipation  |  | $P_{diss}$          | 100         | mW                 |
| Output junction temperature  |  | $T_{j\text{ max.}}$ | 125         | $^{\circ}\text{C}$ |
| <b>COUPLER</b>   |  |                     |             |                    |
| Storage temperature range  |  | $T_{stg}$           | -55 to +150 | $^{\circ}\text{C}$ |
| Ambient temperature range  |  | $T_{amb}$           | -40 to +100 | $^{\circ}\text{C}$ |
| Soldering temperature  | max. $\leq 10\text{ s}$ , dip soldering $\geq 0.5\text{ mm}$ distance from case bottom | $T_{sld}$           | 260         | $^{\circ}\text{C}$ |

Notes

- 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.

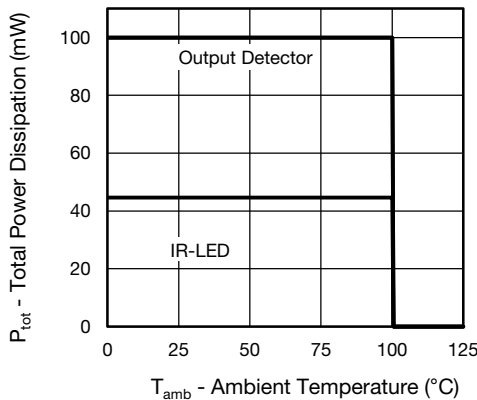


Fig. 1 - Maximum Power vs. Operating Temperature

| <b>ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 0\text{ }^{\circ}\text{C}$ to $70\text{ }^{\circ}\text{C}$ , unless otherwise specified) |  |        |                             |      |      |      |                        |
|---|--|--------|-----------------------------|------|------|------|------------------------|
| PARAMETER   | TEST CONDITION   | PART   | SYMBOL                      | MIN. | TYP. | MAX. | UNIT                   |
| <b>INPUT</b>  |  |        |                             |      |      |      |                        |
| Forward voltage   | $I_F = 16\text{ mA}$   |        | $V_F$                       | -    | 1.38 | 1.9  | V                      |
| Breakdown voltage   | $I_R = 10\text{ }\mu\text{A}$  |        | $V_{BR}$                    | 3    | -    | -    | V                      |
| Reverse current   | $V_R = 3\text{ V}$   |        | $I_R$                       | -    | 0.5  | 10   | $\mu\text{A}$          |
| Input capacitance   | $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$                                |        | $C_I$                       | -    | 36   | -    | pF                     |
| Temperature coefficient of forward voltage  | $I_F = 16\text{ mA}$   |        | $\Delta V_F/\Delta T_{amb}$ | -    | -1.9 | -    | mV/ $^{\circ}\text{C}$ |
| <b>OUTPUT</b>   |  |        |                             |      |      |      |                        |
| Logic low supply current  | $I_F = 16\text{ mA}$ , $V_O = \text{open}$ , $V_{CC} = 15\text{ V}$    |        | $I_{CCL}$                   | -    | 50   | 200  | $\mu\text{A}$          |
| Logic high supply current   | $I_F = 0\text{ A}$ , $V_O = \text{open}$ , $V_{CC} = 15\text{ V}$      |        | $I_{CCH}$                   | -    | 0.02 | 2    | $\mu\text{A}$          |
| Output voltage, output logic low  | $I_F = 16\text{ mA}$ , $V_{CC} = 4.5\text{ V}$ , $I_O = 0.8\text{ mA}$ | VOW135 | $V_{OL}$                    | -    | 0.1  | 0.5  | V                      |
|   | $I_F = 16\text{ mA}$ , $V_{CC} = 4.5\text{ V}$ , $I_O = 2.4\text{ mA}$ | VOW136 | $V_{OL}$                    | -    | 0.1  | 0.5  | V                      |
| Output current, output logic high   | $I_F = 0\text{ mA}$ , $V_O = V_{CC} = 5.5\text{ V}$                    |        | $I_{OH}$                    | -    | 3    | 500  | nA                     |
|   | $I_F = 0\text{ mA}$ , $V_O = V_{CC} = 15\text{ V}$                     |        | $I_{OH}$                    | -    | 0.01 | 1    | $\mu\text{A}$          |
| Output capacitance  | $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$                                |        | $C_O$                       | -    | 3.70 | -    | pF                     |
| <b>COUPLER</b>  |  |        |                             |      |      |      |                        |
| Capacitance (input to output)   | $f = 1\text{ MHz}$   |        | $C_{IO}$                    | -    | 0.9  | -    | pF                     |

**Note**

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

| <b>CURRENT TRANSFER RATIO</b> ( $T_{amb} = 0\text{ }^{\circ}\text{C}$ to $70\text{ }^{\circ}\text{C}$ , unless otherwise specified) |  |        |        |      |      |      |      |
|---|--|--------|--------|------|------|------|------|
| PARAMETER   | TEST CONDITION   | PART   | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| Current transfer ratio  | $I_F = 16\text{ mA}$ , $V_O = 0.4\text{ V}$ , $V_{CC} = 4.5\text{ V}$ , $T_{amb} = 25\text{ }^{\circ}\text{C}$ | VOW135 | CTR    | 7    | 18   | 50   | %    |
|   |  | VOW136 | CTR    | 19   | 24   | 50   | %    |
|   | $I_F = 16\text{ mA}$ , $V_O = 0.5\text{ V}$ , $V_{CC} = 4.5\text{ V}$  | VOW135 | CTR    | 5    | 19   | -    | %    |
|   |  | VOW136 | CTR    | 15   | 25   | -    | %    |

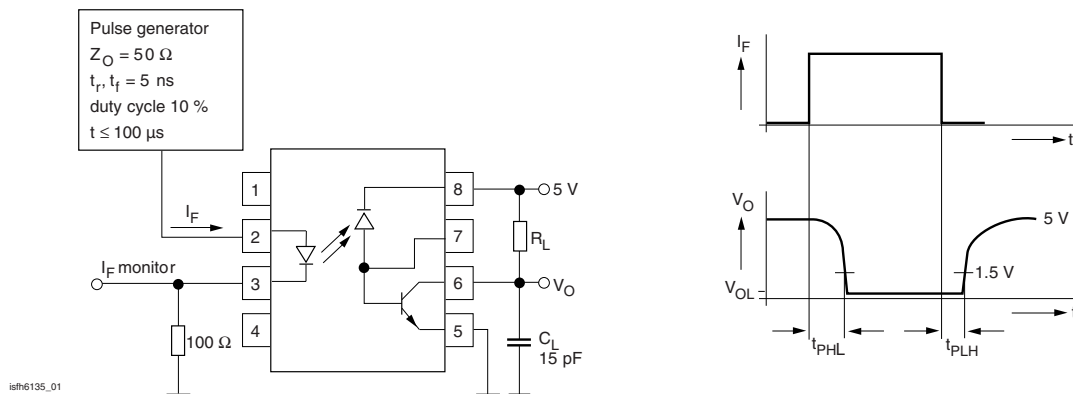


Fig. 2 - Schematics

| <b>SWITCHING CHARACTERISTICS</b> ( $T_{amb} = 0\text{ }^{\circ}\text{C}$ to $70\text{ }^{\circ}\text{C}$ , unless otherwise specified) |   |        |           |      |      |      |               |
|--|---|--------|-----------|------|------|------|---------------|
| PARAMETER  | TEST CONDITION  | PART   | SYMBOL    | MIN. | TYP. | MAX. | UNIT          |
| High to low  | $I_F = 16\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $R_L = 4.1\text{ k}\Omega$ | VOW135 | $t_{PHL}$ | -    | 0.2  | 2.0  | $\mu\text{s}$ |
|  | $I_F = 16\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $R_L = 1.9\text{ k}\Omega$ | VOW136 | $t_{PHL}$ | -    | 0.2  | 1.0  | $\mu\text{s}$ |
| Low to high  | $I_F = 16\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $R_L = 4.1\text{ k}\Omega$ | VOW135 | $t_{PLH}$ | -    | 1.3  | 2.0  | $\mu\text{s}$ |
|  | $I_F = 16\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $R_L = 1.9\text{ k}\Omega$ | VOW136 | $t_{PLH}$ | -    | 0.6  | 1.0  | $\mu\text{s}$ |

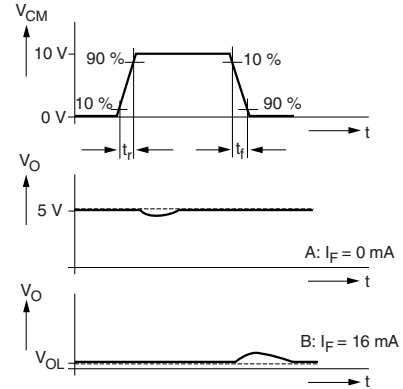
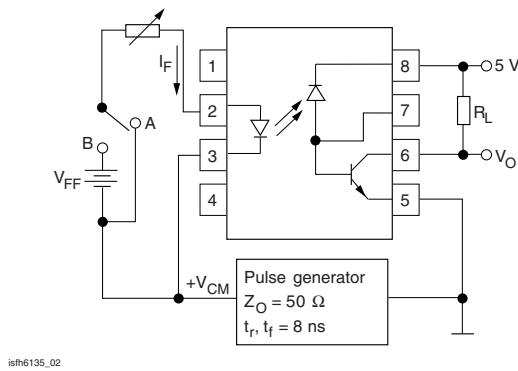


Fig. 3 - Common Mode Interference Immunity

| COMMON MODE TRANSIENT IMMUNITY ( $T_{amb} = 0\text{ }^{\circ}\text{C}$ to $70\text{ }^{\circ}\text{C}$ , unless otherwise specified) |   |        |        |      |      |      |                        |
|--|---|--------|--------|------|------|------|------------------------|
| PARAMETER  | TEST CONDITION  | PART   | SYMBOL | MIN. | TYP. | MAX. | UNIT                   |
| High   | $V_{CM} = 10\text{ V}_{PP}$ , $V_{CC} = 5\text{ V}$ , $I_F = 0\text{ mA}$ , $R_L = 4.1\text{ k}\Omega$  | VOW135 | $CM_H$ | 1000 | -    | -    | $\text{V}/\mu\text{s}$ |
|  | $V_{CM} = 10\text{ V}_{PP}$ , $V_{CC} = 5\text{ V}$ , $I_F = 0\text{ mA}$ , $R_L = 1.9\text{ k}\Omega$  | VOW136 | $CM_H$ | 1000 | -    | -    | $\text{V}/\mu\text{s}$ |
| Low  | $V_{CM} = 10\text{ V}_{PP}$ , $V_{CC} = 5\text{ V}$ , $I_F = 16\text{ mA}$ , $R_L = 4.1\text{ k}\Omega$ | VOW135 | $CM_L$ | 1000 | -    | -    | $\text{V}/\mu\text{s}$ |
|  | $V_{CM} = 10\text{ V}_{PP}$ , $V_{CC} = 5\text{ V}$ , $I_F = 16\text{ mA}$ , $R_L = 1.9\text{ k}\Omega$ | VOW136 | $CM_L$ | 1000 | -    | -    | $\text{V}/\mu\text{s}$ |

| SAFETY AND INSULATION RATINGS                                |  |            |                |                    |
|--|--|------------|----------------|--------------------|
| PARAMETER  |  | SYMBOL     | VALUE          | UNIT               |
| Climatic classification (according to IEC 68 part 1)         |  |            | 55 / 100 / 21  |                    |
| Comparative tracking index                                   |  | CTI        | 250            |                    |
| Maximum rated withstanding isolation voltage                 | $t = 1\text{ min}$   | $V_{ISO}$  | 5300           | $V_{RMS}$          |
| Maximum transient isolation voltage                          |  | $V_{IOTM}$ | 8000           | $V_{peak}$         |
| Maximum repetitive peak isolation voltage                    |  | $V_{IORM}$ | 1414           | $V_{peak}$         |
| Insulation resistance  | $T_{amb} = 25\text{ }^{\circ}\text{C}$ , $V_{DC} = 500\text{ V}$   | $R_{IO}$   | $\geq 10^{12}$ | $\Omega$           |
|  | $T_{amb} = 100\text{ }^{\circ}\text{C}$ , $V_{DC} = 500\text{ V}$  | $R_{IO}$   | $\geq 10^{11}$ | $\Omega$           |
| Output safety power  |  | $P_{SO}$   | 700            | mW                 |
| Input safety current   |  | $I_{SI}$   | 400            | mA                 |
| Safety temperature   |  | $T_S$      | 150            | $^{\circ}\text{C}$ |
| Clearance distance (DIP-8, widebody)                         |  |            | $\geq 10$      | mm                 |
| Creepage distance (DIP-8, widebody)                          |  |            | $\geq 10$      | mm                 |
| Insulation thickness   |  | DTI        | $\geq 0.4$     | mm                 |
| Input to output test voltage, method B                       | $V_{IORM} \times 1.875 = V_{PR}$ , 100 % production test with $t_M = 1\text{ s}$ , partial discharge $< 5\text{ pC}$ | $V_{PR}$   | 2651           | $V_{peak}$         |
| Input to output test voltage, method A                       | $V_{IORM} \times 1.6 = V_{PR}$ , 100 % production test with $t_M = 10\text{ s}$ , partial discharge $< 5\text{ pC}$  | $V_{PR}$   | 2262           | $V_{peak}$         |
| Environment (pollution degree in accordance to DIN VDE 0109) |  |            | 2              |                    |

**Note**

- As per DIN EN 60747-5-5, § 7.4.3.8.2, 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)

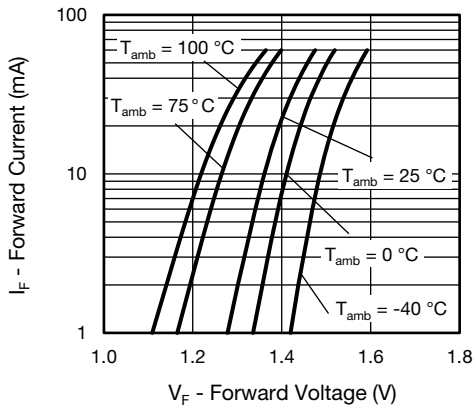


Fig. 4 - Output Current vs. Forward Voltage

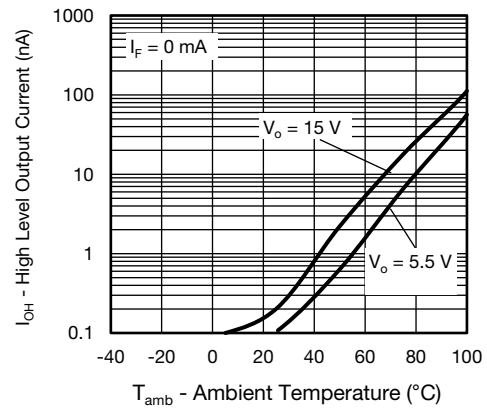


Fig. 7 - Logic High Level Output Current vs. Temperature

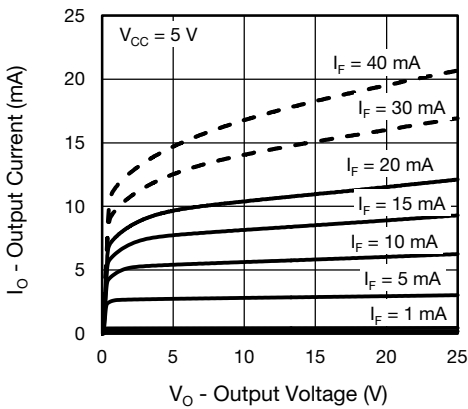


Fig. 5 - Output Current vs. Output Voltage

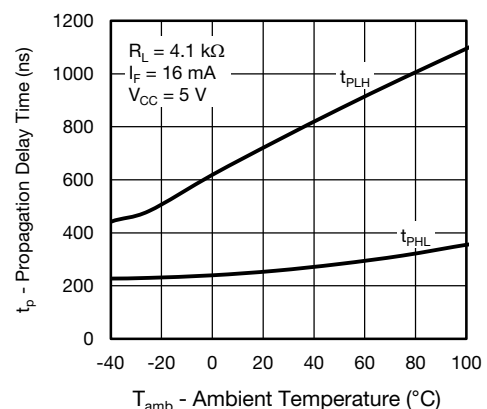


Fig. 8 - Propagation Delay vs. Ambient Temperature - VOW135

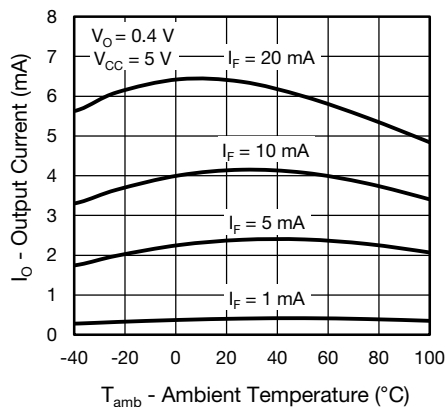


Fig. 6 - Output Current vs. Temperature

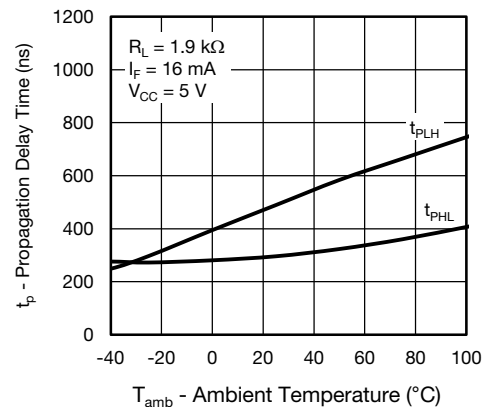


Fig. 9 - Propagation Delay vs. Ambient Temperature - VOW136

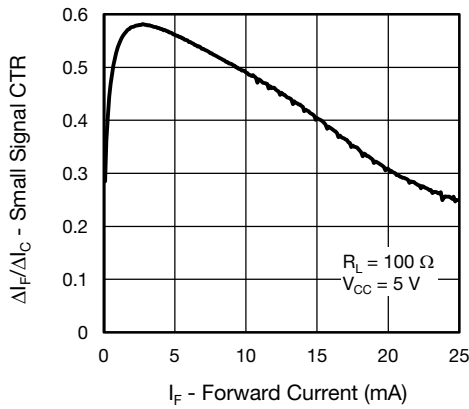


Fig. 10 - Small Signal Current Transfer Ratio vs. Forward Current

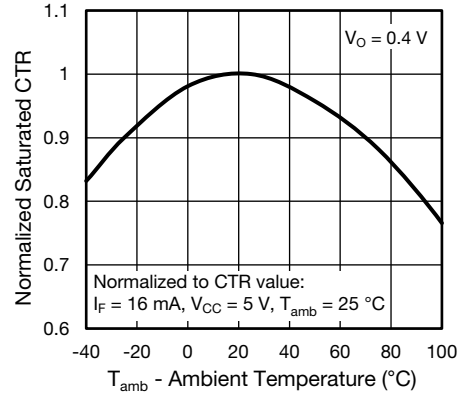


Fig. 13 - Normalized Saturated CTR vs. Ambient Temperature

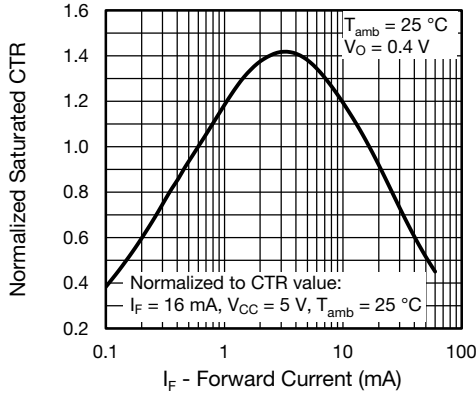


Fig. 11 - Normalized Saturated CTR vs. Forward Current

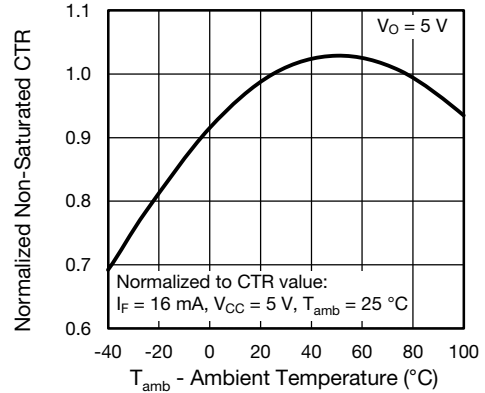


Fig. 14 - Normalized Non-Saturated CTR vs. Ambient Temperature

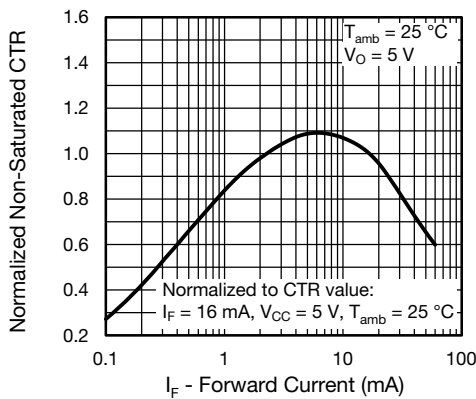
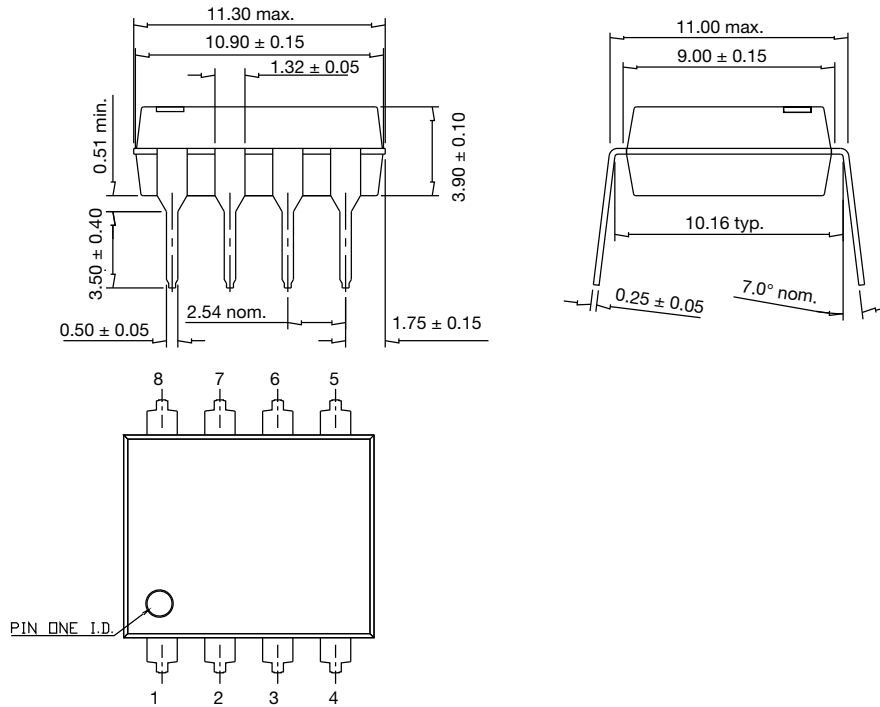


Fig. 12 - Normalized Non-Saturated CTR vs. Forward Current

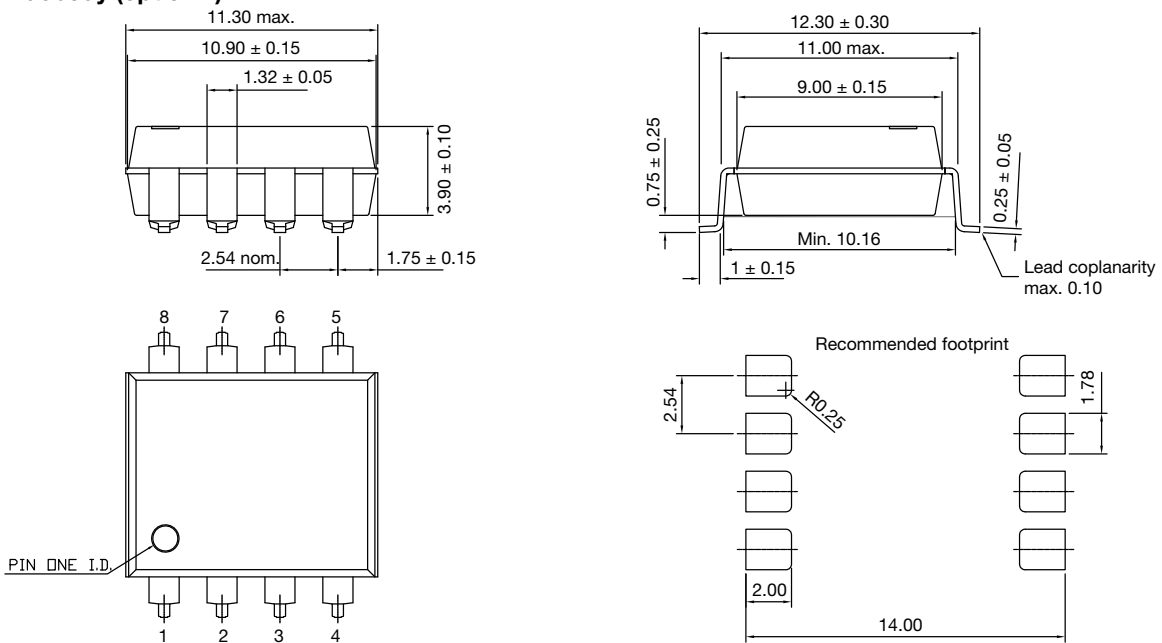


### PACKAGE DIMENSIONS in millimeters

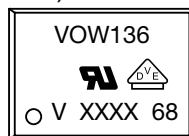
#### DIP-8, widebody



#### SMD-8, widebody (option 7)



#### PACKAGE MARKING (example of VOW136-X017T)



#### Notes

- XXXX = LMC (lot marking code)
- Tape and reel suffix (T) is not part of the package marking

**PACKING INFORMATION** (tape and reel)

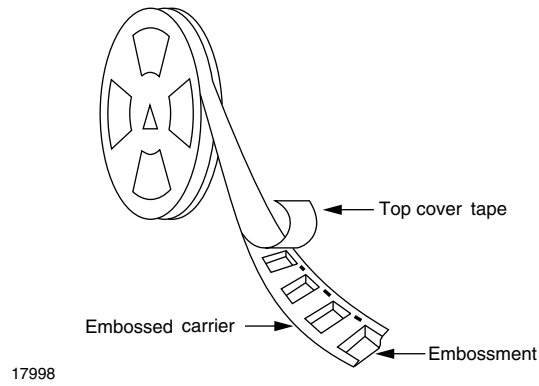


Fig. 15 - Tape and Reel Shipping Medium

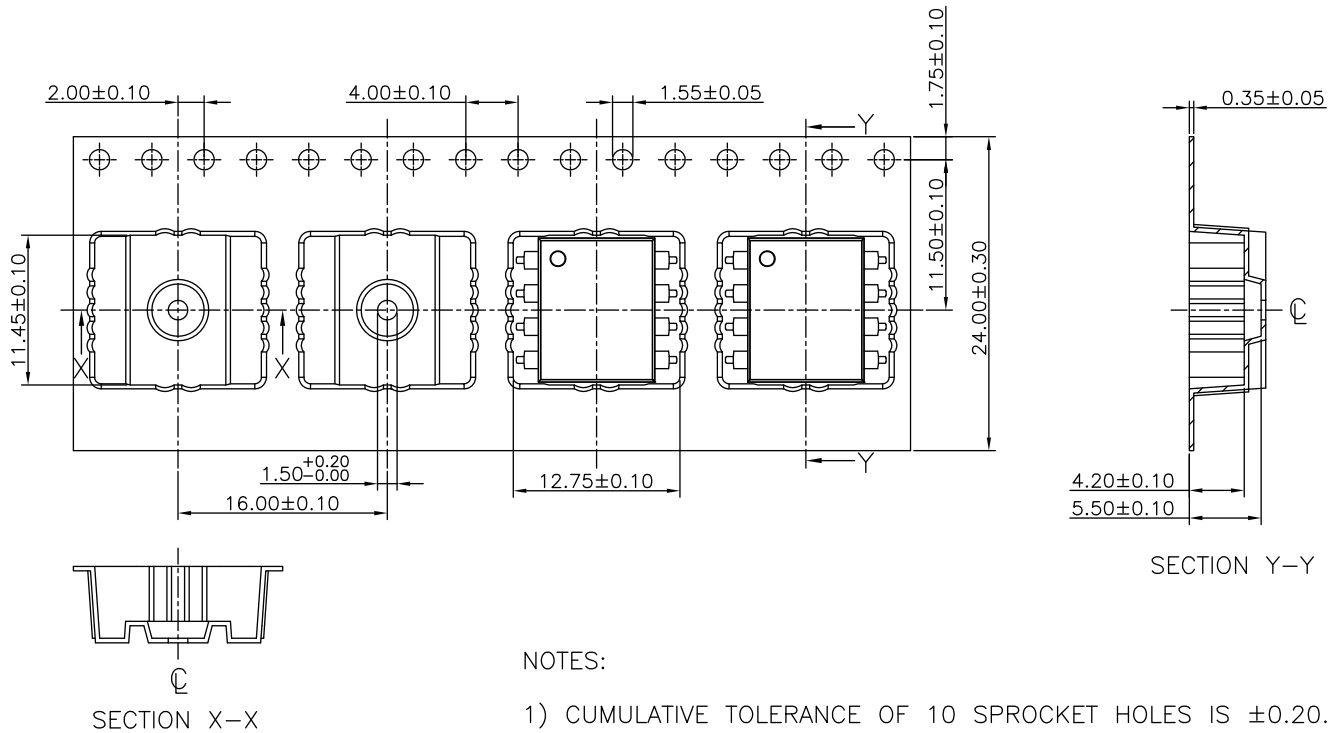


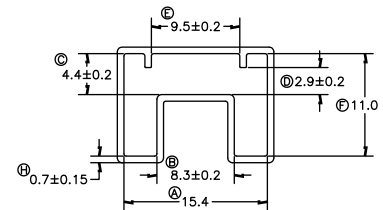
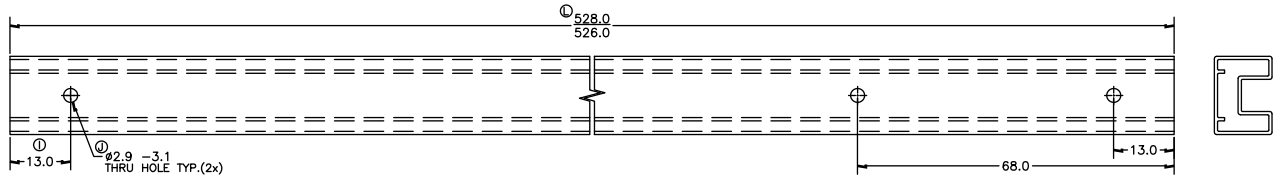
Fig. 16 - Tape and Reel Packing Option 7 (750 parts per reel)





**PACKING INFORMATION** (tubes)

| DEVICE PER TUBE |            |          |           |
|-----------------|------------|----------|-----------|
| TYPE            | UNITS/TUBE | TUBE/BOX | UNITS/BOX |
| DIP-8, widebody | 40         | 30       | 1200      |

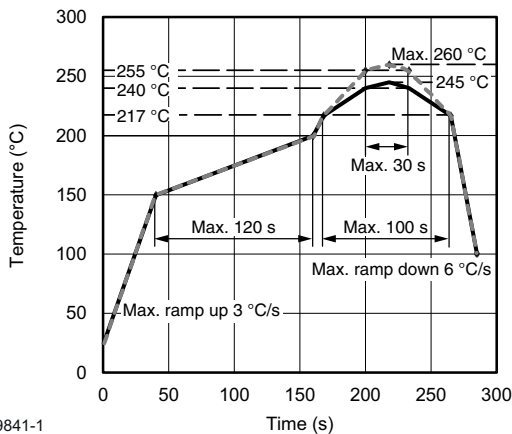


|               |       |
|---------------|-------|
| TUBE COLOUR:  | CLEAR |
| PRINT COLOUR: | -     |

1. ALL DIMENSIONS ARE IN MILLIMETERS, U.O.S.

1. ALL TUBE TOLERANCES TO BE  $\pm 0.25$  UNLESS OTHERWISE SPECIFIED.
2. ALL RADII AND ANGLES REFERENCE ONLY, UNLESS OTHERWISE SPECIFIED.

**SOLDER PROFILES**



19841-1

Fig. 17 - Lead (Pb)-free Reflow Solder Profile According to J-STD-020 for SMD Devices

**HANDLING AND STORAGE CONDITIONS**

ESD level: HBM class 2

Floor life: unlimited

Conditions:  $T_{amb} < 30\text{ °C}$ , RH < 85 %

Moisture sensitivity level 1, according to J-STD-020



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