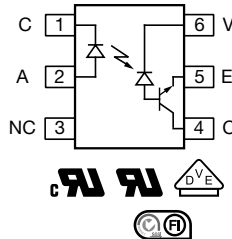
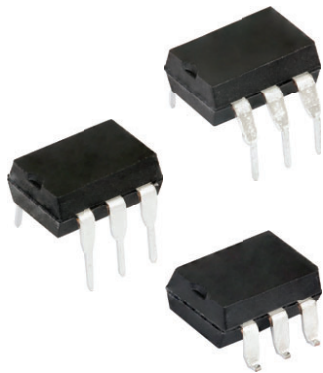




## High Speed Optocoupler, 1 MBd, Transistor Output



### FEATURES

- High CMR of 10 kV/ $\mu$ s
- High speed optocoupler without base connection
- Integrated detector with photo diode and transistor
- TTL compatible
- Guaranteed DC performance overtemperature: 0 °C to 70 °C
- Open collector output
- Supply voltage up to 30 V
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT

### ADDITIONAL RESOURCES



3D Models



Design Tools



Related Documents

### DESCRIPTION

The SFH636 is an optocoupler with a GaAlAs infrared emitting diode, optically coupled to an integrated photo detector consisting of a photo diode and a high speed transistor in a low pinout DIP-6 package. The device is functionally similar to 6N136 except there is no base connection and the foot print is different. Noise and common mode rejection performance is enhanced by not bringing out the base connection.

Signals can be transmitted between two electrically separated circuits up to frequencies of 2 MHz.

### APPLICATIONS

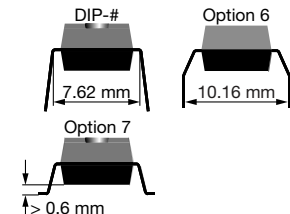
- Data communications
- Programmable controllers
- IGBT logic and MOSFET driver stages
- IPM drivers

### AGENCY APPROVALS

- [UL1577](#)
- [cUL](#)
- [DIN EN 60747-5-5 \(VDE 0884-5\)](#), available with option 1
- [FIMKO](#)

### ORDERING INFORMATION

|             |          |          |          |          |          |          |                |          |          |          |               |
|-------------|----------|----------|----------|----------|----------|----------|----------------|----------|----------|----------|---------------|
| <b>S</b>    | <b>F</b> | <b>H</b> | <b>6</b> | <b>3</b> | <b>6</b> | <b>-</b> | <b>X</b>       | <b>0</b> | <b>#</b> | <b>#</b> | <b>T</b>      |
| PART NUMBER |          |          |          |          |          |          | PACKAGE OPTION |          |          |          | TAPE AND REEL |



| AGENCY CERTIFIED / PACKAGE            | CTR (%)      |
|---------------------------------------|--------------|
| <b>UL, cUL, FIMKO</b>                 | <b>≥ 19</b>  |
| DIP-6                                 | SFH636       |
| SMD-6, option 7                       | SFH636-X007T |
| <b>UL, cUL, FIMKO, VDE (Option 1)</b> | <b>≥ 19</b>  |
| DIP-6                                 | SFH636-X001  |
| DIP-6, option 6                       | SFH636-X016  |
| SMD-6, option 7                       | SFH636-X017T |

### Note

- Additional options may be possible, please contact sales office



| <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                                                                                        |                                                                          | $V_R$      | 3.0         | V                  |
| DC forward current                                                                                     |                                                                          | $I_F$      | 25          | mA                 |
| Surge forward current                                                                                  | $t_p \leq 1.0\text{ }\mu\text{s}$ , 300 pulses/s                         | $I_{FSM}$  | 1.0         | A                  |
| Power dissipation                                                                                      |                                                                          | $P_{diss}$ | 45          | mW                 |
| <b>OUTPUT</b>                                                                                          |                                                                          |            |             |                    |
| Supply voltage                                                                                         |                                                                          | $V_S$      | -0.5 to +30 | V                  |
| Output voltage                                                                                         |                                                                          | $V_O$      | -0.5 to +20 | V                  |
| Output current                                                                                         |                                                                          | $I_O$      | 8           | mA                 |
| Power dissipation                                                                                      |                                                                          | $P_{diss}$ | 100         | mW                 |
| <b>COUPLER</b>                                                                                         |                                                                          |            |             |                    |
| Storage temperature range                                                                              |                                                                          | $T_{stg}$  | -55 to +150 | $^{\circ}\text{C}$ |
| Ambient temperature range                                                                              |                                                                          | $T_{amb}$  | -55 to +100 | $^{\circ}\text{C}$ |
| Junction temperature                                                                                   |                                                                          | $T_j$      | 100         | $^{\circ}\text{C}$ |
| Soldering temperature                                                                                  | Max. 10 s, dip soldering: distance to seating plane $\geq 1.5\text{ mm}$ | $T_{sld}$  | 260         | $^{\circ}\text{C}$ |
| Power dissipation                                                                                      |                                                                          | $P_{diss}$ | 145         | mW                 |

**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.

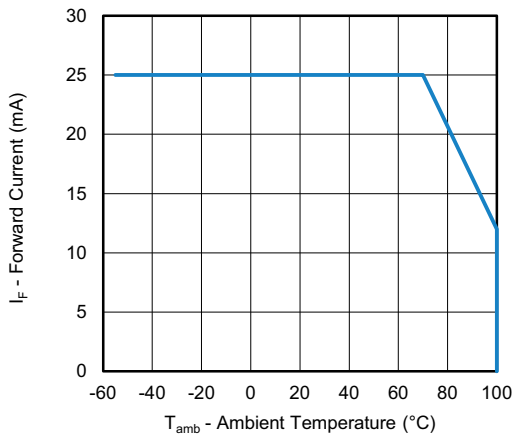


Fig. 1 - Forward Current vs. Ambient Temperature

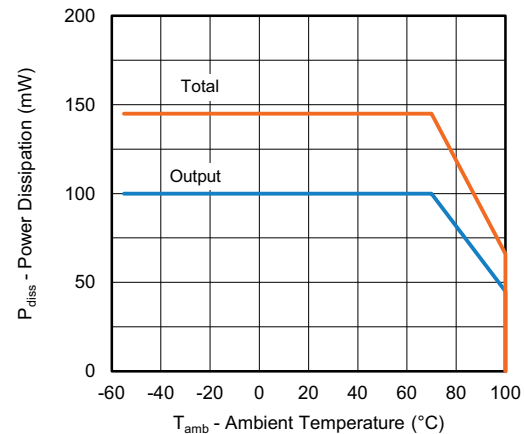


Fig. 2 - Power Dissipation vs. Ambient Temperature



| <b>ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 0\text{ }^{\circ}\text{C}$ to $70\text{ }^{\circ}\text{C}$ ; typical values are at $T_{amb} = 25\text{ }^{\circ}\text{C}$ ) |                                                                                       |           |      |       |      |               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-----------|------|-------|------|---------------|
| PARAMETER                                                                                                                                                                  | TEST CONDITION                                                                        | SYMBOL    | MIN. | TYP.  | MAX. | UNIT          |
| <b>INPUT</b>                                                                                                                                                               |                                                                                       |           |      |       |      |               |
| Forward voltage                                                                                                                                                            | $I_F = 16\text{ mA}$                                                                  | $V_F$     | -    | 1.3   | 1.8  | V             |
| Reverse current                                                                                                                                                            | $V_R = 3\text{ V}$                                                                    | $I_R$     | -    | 0.5   | 10   | $\mu\text{A}$ |
| Input capacitance                                                                                                                                                          | $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$                                               | $C_{IN}$  | -    | 20    | -    | pF            |
| <b>OUTPUT</b>                                                                                                                                                              |                                                                                       |           |      |       |      |               |
| Low level supply current                                                                                                                                                   | $I_F = 16\text{ mA}$ , $V_O = \text{open}$ , $V_{CC} = 15\text{ V}$                   | $I_{CCL}$ | -    | 150   | -    | $\mu\text{A}$ |
| High level supply current                                                                                                                                                  | $I_F = 0\text{ V}$ , $V_O = \text{open}$ , $V_{CC} = 15\text{ V}$ <sup>(1)</sup>      | $I_{CCH}$ | -    | 0.01  | 1    | $\mu\text{A}$ |
|                                                                                                                                                                            | $I_F = 0\text{ V}$ , $V_O = \text{open}$ , $V_{CC} = 15\text{ V}$                     | $I_{CCH}$ | -    | 0.01  | 2    | $\mu\text{A}$ |
|                                                                                                                                                                            | $I_F = 0\text{ V}$ , $V_O = \text{open}$ , $V_{CC} = 5.5\text{ V}$ <sup>(1)</sup>     | $I_{OH}$  | -    | 0.001 | 0.5  | $\mu\text{A}$ |
| High level output current                                                                                                                                                  | $I_F = 0\text{ V}$ , $V_O = \text{open}$ , $V_{CC} = 15\text{ V}$ <sup>(1)</sup>      | $I_{OH}$  | -    | 0.001 | 1    | $\mu\text{A}$ |
|                                                                                                                                                                            | $I_F = 0\text{ V}$ , $V_O = \text{open}$ , $V_{CC} = 15\text{ V}$                     | $I_{OH}$  | -    |       | 50   | $\mu\text{A}$ |
|                                                                                                                                                                            | $I_F = 0\text{ V}$ , $V_O = \text{open}$ , $V_{CC} = 15\text{ V}$                     | $I_{OH}$  | -    |       | 50   | $\mu\text{A}$ |
| Collector emitter capacitance                                                                                                                                              | $V_{CE} = 5\text{ V}$ , $f = 1\text{ MHz}$                                            | $C_{CE}$  | -    | 3     | -    | pF            |
| <b>COUPLER</b>                                                                                                                                                             |                                                                                       |           |      |       |      |               |
| Coupling capacitance                                                                                                                                                       |                                                                                       | $C_{IO}$  | -    | 0.6   | -    | pF            |
| Collector emitter saturation voltage                                                                                                                                       | $I_F = 16\text{ mA}$ , $I_O = 2.4\text{ mA}$ , $V_{CC} = 4.5\text{ V}$ <sup>(1)</sup> | $V_{OL}$  | -    | 0.1   | 0.4  | V             |

**Notes**

- 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.

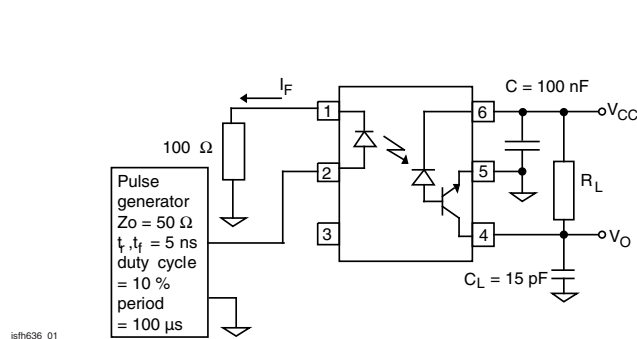
(1)  $T_{amb} = 25\text{ }^{\circ}\text{C}$ 

Fig. 3 - Test Setup

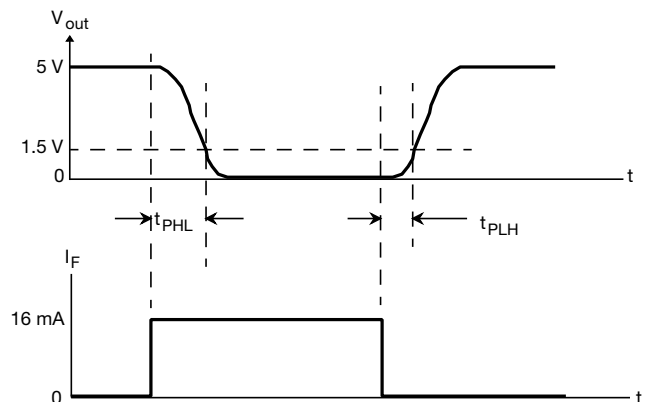


Fig. 4 - Switching Time Measurement

| <b>CURRENT TRANSFER RATIO</b> ( $T_{amb} = 0\text{ }^{\circ}\text{C}$ to $70\text{ }^{\circ}\text{C}$ ; typical values are at $T_{amb} = 25\text{ }^{\circ}\text{C}$ ) |                                                                                      |        |      |      |      |      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------|------|------|------|------|
| PARAMETER                                                                                                                                                              | TEST CONDITION                                                                       | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| $I_C/I_F$                                                                                                                                                              | $I_F = 16\text{ mA}$ , $V_O = 0.4\text{ V}$ , $V_{CC} = 4.5\text{ V}$ <sup>(1)</sup> | CTR    | 19   | 30   | -    | %    |
|                                                                                                                                                                        | $I_F = 16\text{ mA}$ , $V_O = 0.5\text{ V}$ , $V_{CC} = 4.5\text{ V}$                | CTR    | 15   | -    | -    | %    |

**Note**(1)  $T_{amb} = 25\text{ }^{\circ}\text{C}$ 

| <b>SWITCHING CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ ) |                                                                             |           |      |      |      |               |
|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------|------|------|------|---------------|
| PARAMETER                                                                   | TEST CONDITION                                                              | SYMBOL    | MIN. | TYP. | MAX. | UNIT          |
| Propagation delay time (high to low)                                        | $I_F = 16\text{ mA}$ , $V_{CC} = 5.0\text{ V}$ , $R_L = 1.9\text{ k}\Omega$ | $t_{PHL}$ | -    | -    | 0.8  | $\mu\text{s}$ |
| Propagation delay time (low to low)                                         | $I_F = 16\text{ mA}$ , $V_{CC} = 5.0\text{ V}$ , $R_L = 1.9\text{ k}\Omega$ | $t_{PLH}$ | -    | -    | 0.8  | $\mu\text{s}$ |

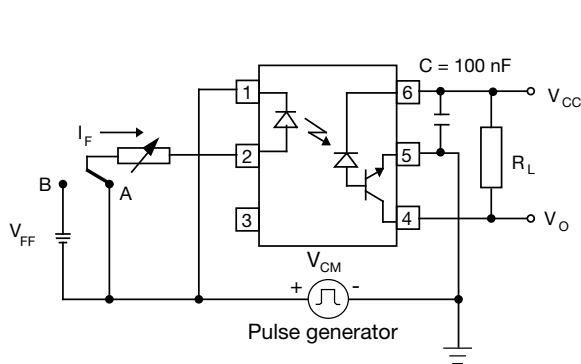


Fig. 5 - Common Mode Transient Test

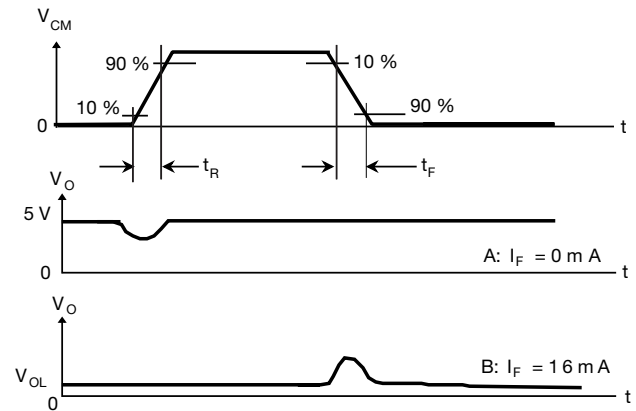


Fig. 6 - Measurement Waveform of CMR

| COMMON MODE TRANSIENT IMMUNITY ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ ) |                                                                                                             |          |      |        |      |                        |
|---------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|----------|------|--------|------|------------------------|
| PARAMETER                                                                 | TEST CONDITION                                                                                              | SYMBOL   | MIN. | TYP.   | MAX. | UNIT                   |
| Common mode transient immunity (high)                                     | $I_F = 0\text{ mA}$ , $V_{CM} = 1500\text{ V}_{PP}$ , $R_L = 1.9\text{ k}\Omega$ , $V_{CC} = 5.0\text{ V}$  | $ CM_H $ | -    | 10 000 | -    | $\text{V}/\mu\text{s}$ |
| Common mode transient immunity (low)                                      | $I_F = 16\text{ mA}$ , $V_{CM} = 1500\text{ V}_{PP}$ , $R_L = 1.9\text{ k}\Omega$ , $V_{CC} = 5.0\text{ V}$ | $ CM_L $ | -    | 10 000 | -    | $\text{V}/\mu\text{s}$ |

| SAFETY AND INSULATION RATINGS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                                                   |            |                |                    |
|------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|------------|----------------|--------------------|
| PARAMETER                                                                                            | TEST CONDITION                                                    | SYMBOL     | VALUE          | UNIT               |
| Climatic classification                                                                              | According to IEC 68 part 1                                        |            | 55 / 100 / 21  |                    |
| Pollution degree                                                                                     | According to DIN VDE 0109                                         |            | 2              |                    |
| Comparative tracking index                                                                           | Insulation group IIIa                                             | CTI        | 175            |                    |
| Maximum rated withstanding isolation voltage                                                         | According to UL1577, $t = 1\text{ min}$                           | $V_{ISO}$  | 4420           | $\text{V}_{RMS}$   |
| Tested withstanding isolation voltage                                                                | According to UL1577, $t = 1\text{ s}$                             | $V_{ISO}$  | 5300           | $\text{V}_{RMS}$   |
| Maximum transient isolation voltage                                                                  | According to DIN EN 60747-5-5                                     | $V_{IOTM}$ | 8000           | $\text{V}_{peak}$  |
| Maximum repetitive peak isolation voltage                                                            | According to DIN EN 60747-5-5                                     | $V_{IORM}$ | 890            | $\text{V}_{peak}$  |
| Isolation resistance                                                                                 | $T_{amb} = 25\text{ }^{\circ}\text{C}$ , $V_{IO} = 500\text{ V}$  | $R_{IO}$   | $\geq 10^{12}$ | $\Omega$           |
|                                                                                                      | $T_{amb} = 100\text{ }^{\circ}\text{C}$ , $V_{IO} = 500\text{ V}$ | $R_{IO}$   | $\geq 10^{11}$ | $\Omega$           |
| Output safety power                                                                                  |                                                                   | $P_{SO}$   | 700            | mW                 |
| Input safety current                                                                                 |                                                                   | $I_{SI}$   | 400            | mA                 |
| Input safety temperature                                                                             |                                                                   | $T_S$      | 175            | $^{\circ}\text{C}$ |
| Creepage distance                                                                                    | DIP-6                                                             |            | $\geq 7$       | mm                 |
| Clearance distance                                                                                   | DIP-6                                                             |            | $\geq 7$       | mm                 |
| Creepage distance                                                                                    | DIP-6, option 6                                                   |            | $\geq 8$       | mm                 |
| Clearance distance                                                                                   | DIP-6, option 6                                                   |            | $\geq 8$       | mm                 |
| Creepage distance                                                                                    | SMD-6, option 7                                                   |            | $\geq 7$       | mm                 |
| Clearance distance                                                                                   | SMD-6, option 7                                                   |            | $\geq 7$       | mm                 |
| Insulation thickness                                                                                 |                                                                   | DTI        | $\geq 0.4$     | mm                 |

**Note**

- As per IEC 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.

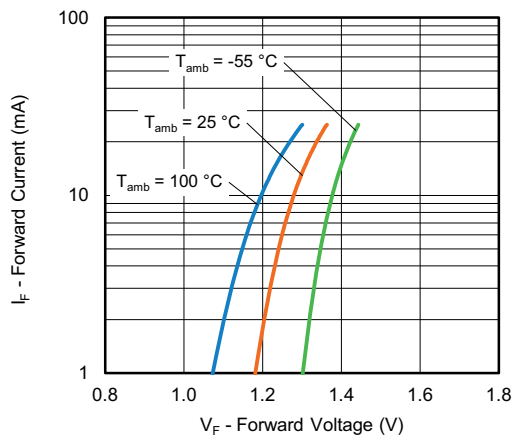
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

Fig. 7 - Forward Current vs. Forward Voltage

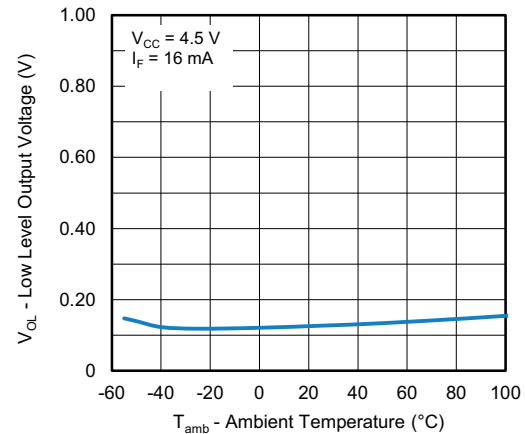


Fig. 10 - Low Level Output Voltage vs. Ambient Temperature

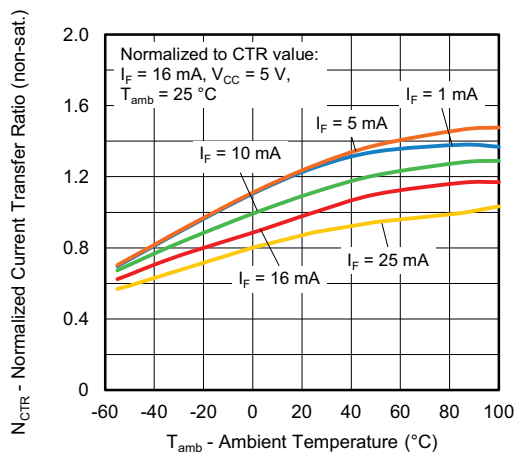


Fig. 8 - Normalized Current Transfer Ratio (non-sat.) vs. Ambient Temperature

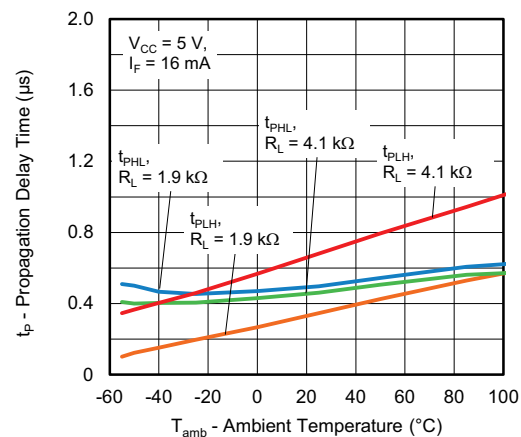


Fig. 11 - Propagation Delay Time vs. Ambient Temperature

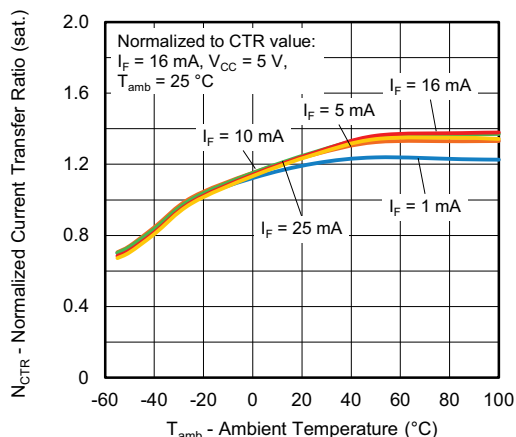
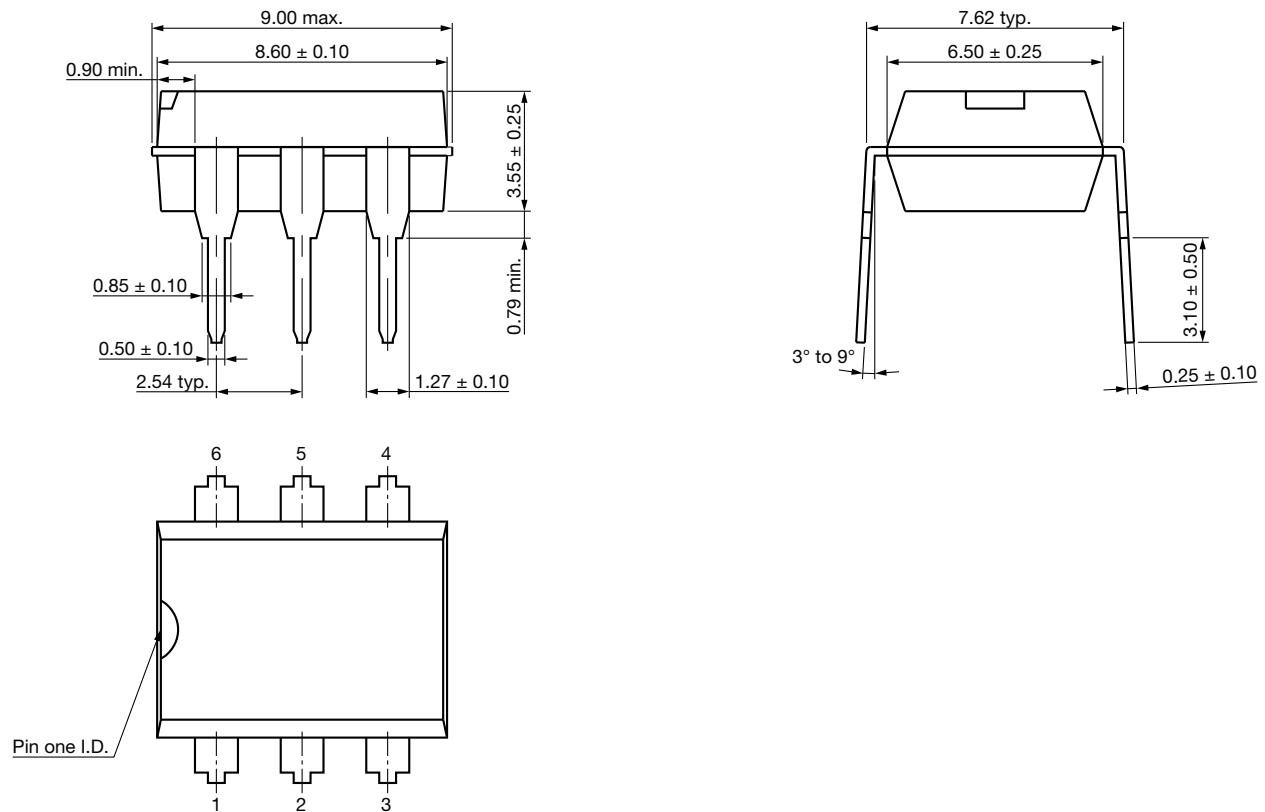
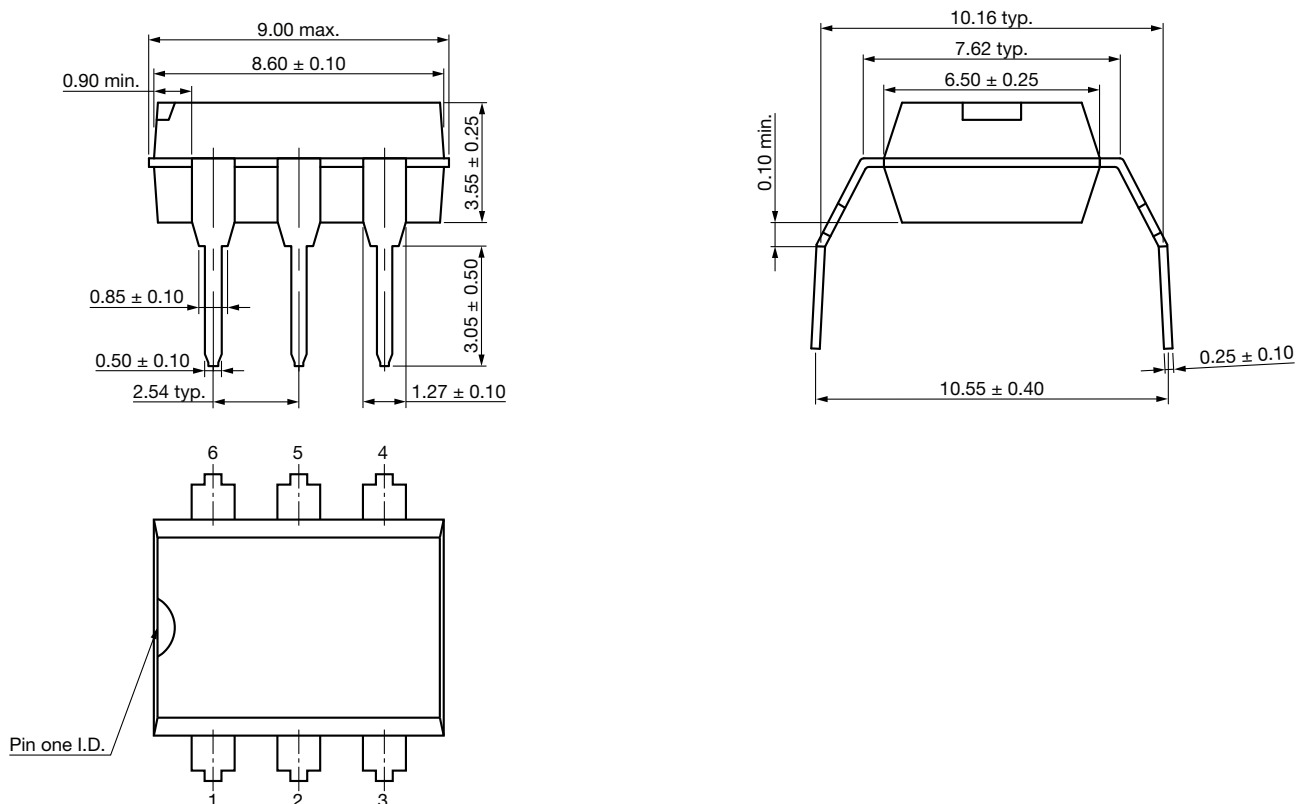
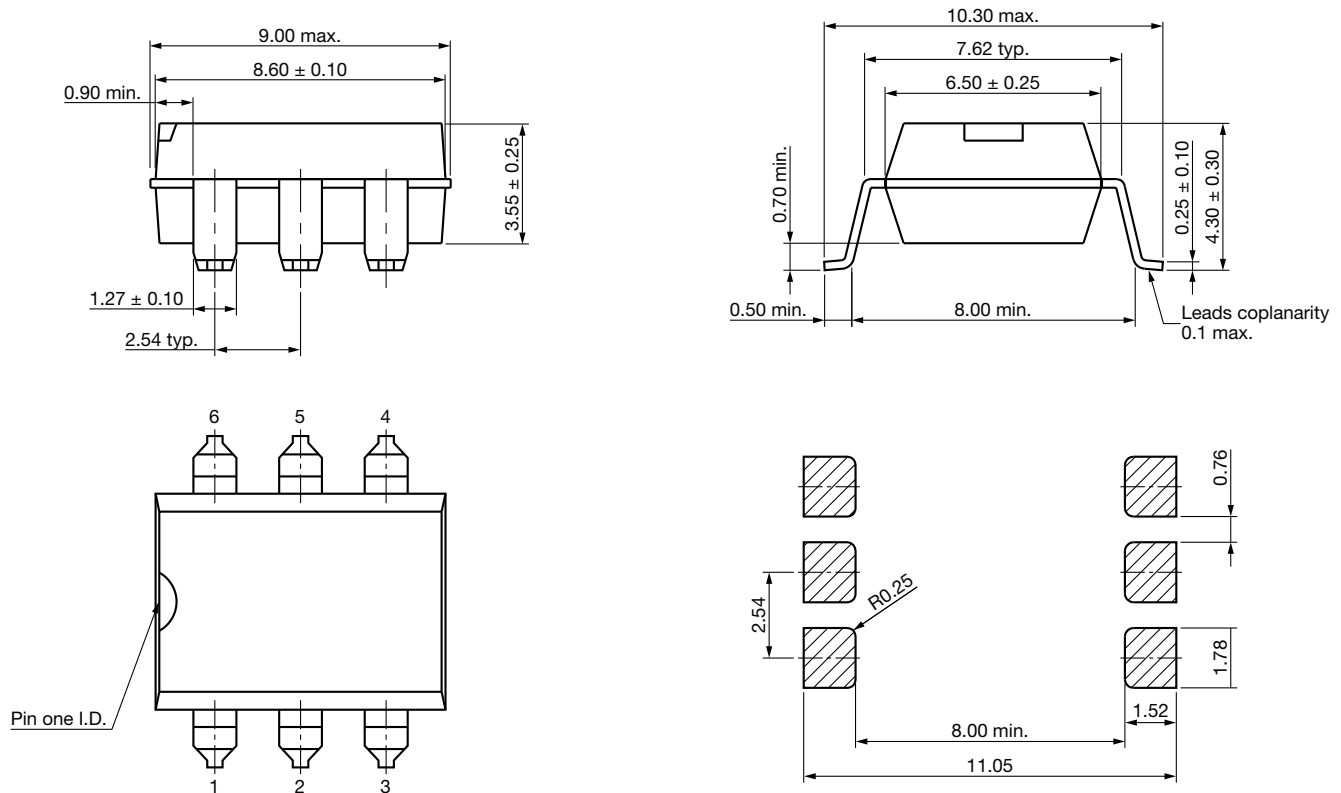


Fig. 9 - Normalized Current Transfer Ratio (sat.) vs. Ambient Temperature

**PACKAGE DIMENSIONS****DIP-6****DIP-6, Option 6**



## SMD-6, Option 7



## PACKAGE MARKING

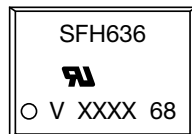


Fig. 12 - Example of SFH636

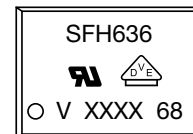


Fig. 13 - Example of SFH636-X017T

## Notes

- XXXX = LMC (lot marking code)
- VDE logo is only marked on option 1 parts
- Tape and reel suffix (T) is not part of the package marking





## DIP-6, Option 6

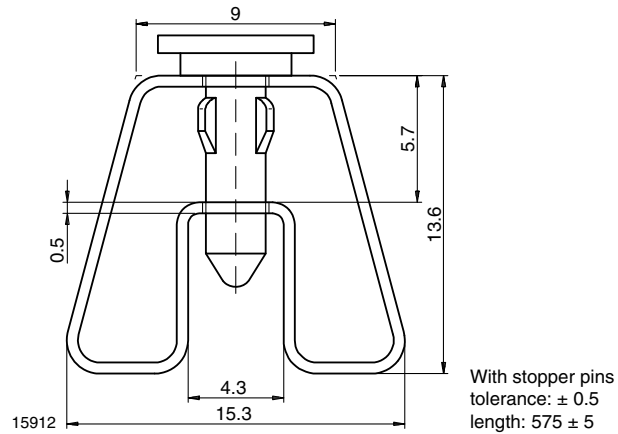


Fig. 16 - Tube Shipping Medium

## Tape and Reel

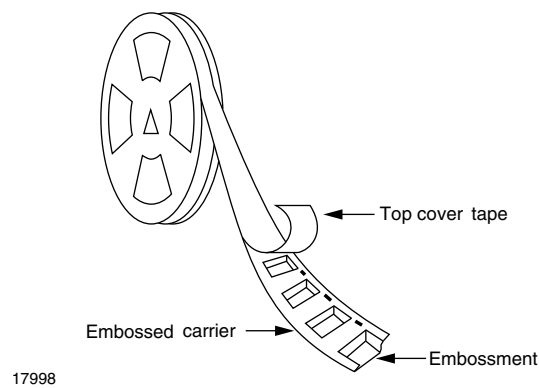


Fig. 17 - Tape and Reel Shipping Medium

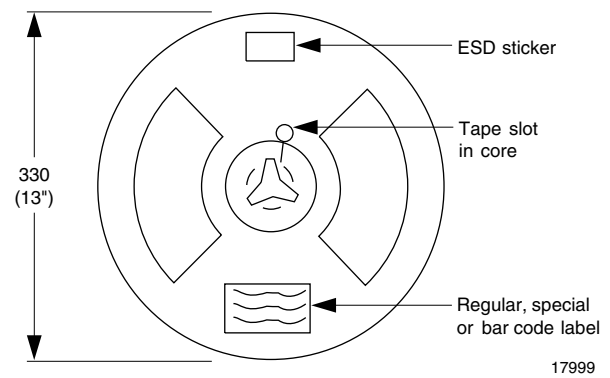


Fig. 18 - Tape and Reel Shipping Medium

## SMD-6, Option 7

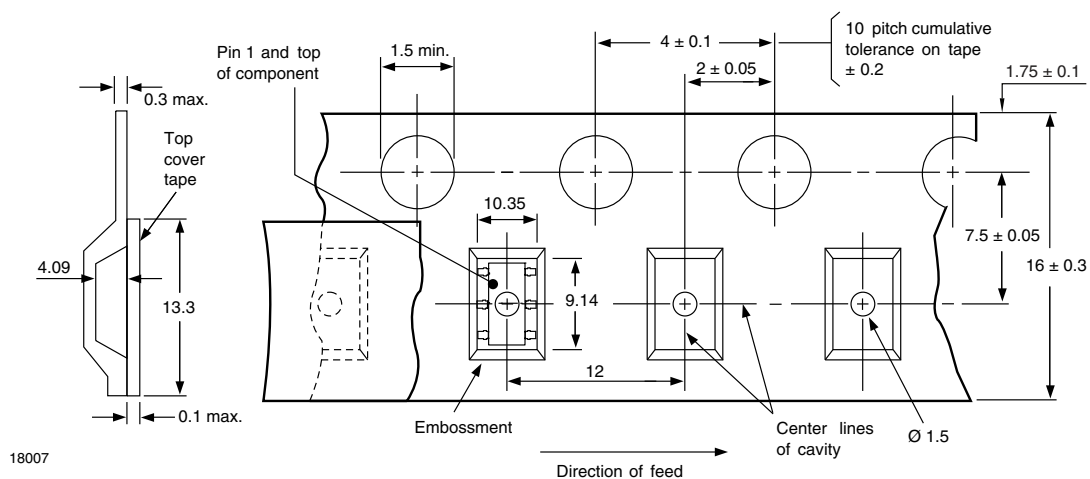


Fig. 19 - Tape and Reel Packing (1000 pieces on Reel)



## SOLDER PROFILES

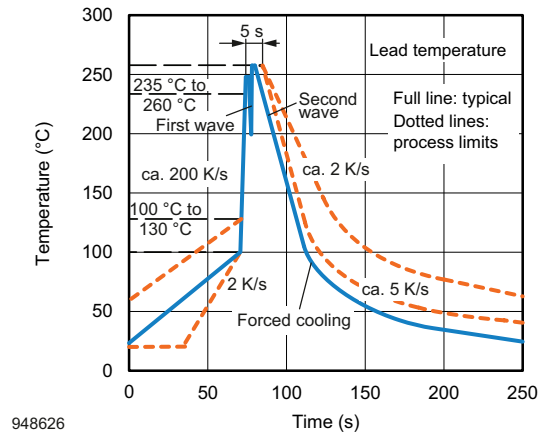


Fig. 20 - Wave Soldering Double Wave Profile According to J-STD-020 for DIP Devices

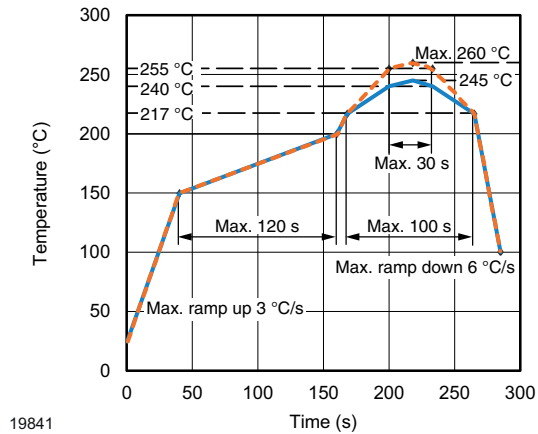


Fig. 21 - Lead (Pb)-free Reflow Solder Profile According to J-STD-020 for SMD Devices

## 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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