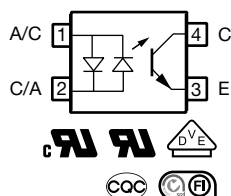
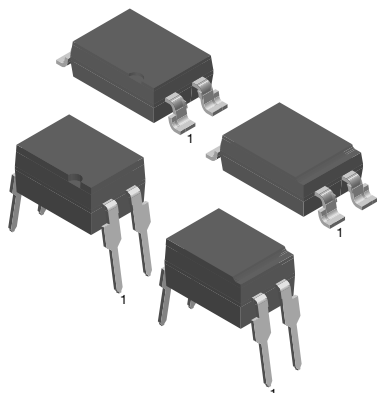


# Optocoupler, Phototransistor Output, AC Input, Low Input Current



## DESCRIPTION

The SFH628A (DIP) and SFH6286 (SMD) feature a high current transfer ratio, low coupling capacitance and high isolation voltage. These couplers have a GaAs infrared emitting diode, which is optically coupled to a silicon planar phototransistor detector, and is incorporated in a plastic DIP-4 or SMD package.

The coupling devices are designed for signal transmission between two electrically separated circuits.

The couplers are end-stackable with 2.54 mm lead spacing. Creepage and clearance distances of > 8 mm are achieved with option 6. This version complies with IEC 60950 (DIN VDE 0805) for reinforced insulation to an operation voltage of 400 V<sub>RMS</sub> or DC.

## FEATURES

- High common mode interference immunity
- Isolation rated voltage 4420 V<sub>RMS</sub>
- Low coupling capacitance
- Good CTR linearity depending on forward current
- Low CTR degradation
- High collector emitter voltage, V<sub>CEO</sub> = 55 V
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT

## LINKS TO ADDITIONAL RESOURCES



[Product Page](#)



[Design Tools](#)

**SPICE**

[Models](#)

## APPLICATIONS

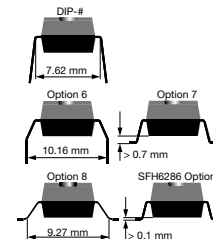
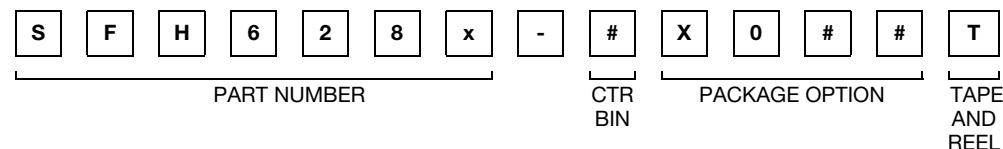
- Telecom
- Industrial controls
- Battery powered equipment
- Office machines

## AGENCY APPROVALS

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



## ORDERING INFORMATION



| AGENCY CERTIFIED / PACKAGE               | CTR (%)        |                               |               |                           |                           |                               |
|------------------------------------------|----------------|-------------------------------|---------------|---------------------------|---------------------------|-------------------------------|
|                                          | SFH628A        |                               |               | SFH6286                   |                           |                               |
| UL, cUL, BSI, FIMKO, CQC                 | 63 to 200      | 100 to 320                    | 160 to 500    | 63 to 200                 | 100 to 320                | 160 to 500                    |
| DIP-4                                    | SFH628A-2      | SFH628A-3                     | SFH628A-4     | -                         | -                         | -                             |
| SFH6286 option                           | -              | -                             | -             | SFH6286-2T <sup>(1)</sup> | SFH6286-3T <sup>(1)</sup> | SFH6286-4T <sup>(1)</sup>     |
| UL, cUL, BSI, FIMKO, CQC, VDE (option 1) | 63 to 200      | 100 to 320                    | 160 to 500    | 63 to 200                 | 100 to 320                | 160 to 500                    |
| DIP-4                                    | -              | SFH628A-3X001                 | -             | -                         | -                         | -                             |
| DIP-4, 400 mil, option 6                 | SFH628A-2X016  | SFH628A-3X016                 | SFH628A-4X016 | -                         | -                         | -                             |
| SMD-4, option 7                          | -              | SFH628A-3X017T <sup>(1)</sup> | -             | -                         | -                         | -                             |
| SMD-4, option 8                          | SFH628A-2X018T | -                             | -             | -                         | -                         | -                             |
| SFH6286 option                           | -              | -                             | -             | SFH6286-2X001T            | SFH6286-3X001T            | SFH6286-4X001T <sup>(1)</sup> |

## Notes

- Additional options may be possible, please contact sales office
- <sup>(1)</sup> Also available in tubes; do not add T to end

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

| PARAMETER                            | TEST CONDITION                                                           | SYMBOL     | VALUE       | UNIT               |
|--------------------------------------|--------------------------------------------------------------------------|------------|-------------|--------------------|
| <b>INPUT</b>                         |                                                                          |            |             |                    |
| DC forward current                   |                                                                          | $I_F$      | $\pm 50$    | mA                 |
| Surge forward current                | $t \leq 10 \mu\text{s}$                                                  | $I_{FSM}$  | $\pm 2.5$   | A                  |
| Power dissipation                    |                                                                          | $P_{diss}$ | 76          | mW                 |
| <b>OUTPUT</b>                        |                                                                          |            |             |                    |
| Collector emitter voltage            |                                                                          | $V_{CEO}$  | 55          | V                  |
| Emitter collector voltage            |                                                                          | $V_{ECO}$  | 7           | V                  |
| Collector current                    |                                                                          | $I_C$      | 50          | mA                 |
|                                      | $t_p \leq 1 \text{ ms}$                                                  | $I_C$      | 100         | mA                 |
| Power dissipation                    |                                                                          | $P_{diss}$ | 150         | mW                 |
| <b>COUPLER</b>                       |                                                                          |            |             |                    |
| Storage temperature range            |                                                                          | $T_{stg}$  | -55 to +150 | $^{\circ}\text{C}$ |
| Ambient temperature range            |                                                                          | $T_{amb}$  | -55 to +100 | $^{\circ}\text{C}$ |
| Soldering temperature <sup>(1)</sup> | Max. 10 s, dip soldering distance to seating plane $\geq 1.5 \text{ mm}$ | $T_{slid}$ | 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.
- <sup>(1)</sup> Refer to reflow profile for soldering conditions for surface mounted devices (SMD). Refer to wave profile for soldering conditions for through hole devices (DIP).



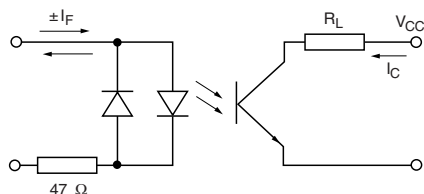
| ELECTRICAL CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                                  |           |             |      |      |      |      |
|---------------------------------------------------------------------------------------------------|--------------------------------------------------|-----------|-------------|------|------|------|------|
| PARAMETER                                                                                         | TEST CONDITION                                   | PART      | SYMBOL      | MIN. | TYP. | MAX. | UNIT |
| INPUT                                                                                             |                                                  |           |             |      |      |      |      |
| Forward voltage                                                                                   | $I_F = \pm 5\text{ mA}$                          |           | $V_F$       | -    | 1.1  | 1.5  | V    |
| Capacitance                                                                                       | $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$          |           | $C_O$       | -    | 45   | -    | pF   |
| Thermal resistance                                                                                |                                                  |           | $R_{thja}$  | -    | 1070 | -    | K/W  |
| OUTPUT                                                                                            |                                                  |           |             |      |      |      |      |
| Collector emitter leakage current                                                                 | $V_{CE} = 10\text{ V}$                           |           | $I_{CEO}$   | -    | 10   | 200  | nA   |
| Collector emitter capacitance                                                                     | $V_{CE} = 5\text{ V}$ , $f = 1\text{ MHz}$       |           | $C_{CE}$    | -    | 7    | -    | pF   |
| Thermal resistance                                                                                |                                                  |           | $R_{thja}$  | -    | 500  | -    | K/W  |
| COUPLER                                                                                           |                                                  |           |             |      |      |      |      |
| Collector emitter saturation voltage                                                              | $I_F = \pm 1\text{ mA}$ , $I_C = 0.5\text{ mA}$  | SFH628A-2 | $V_{CEsat}$ | -    | 0.25 | 0.4  | V    |
|                                                                                                   |                                                  | SFH6286-2 | $V_{CEsat}$ | -    | 0.25 | 0.4  | V    |
|                                                                                                   | $I_F = \pm 1\text{ mA}$ , $I_C = 0.8\text{ mA}$  | SFH628A-3 | $V_{CEsat}$ | -    | 0.25 | 0.4  | V    |
|                                                                                                   |                                                  | SFH6286-3 | $V_{CEsat}$ | -    | 0.25 | 0.4  | V    |
|                                                                                                   | $I_F = \pm 1\text{ mA}$ , $I_C = 1.25\text{ mA}$ | SFH628A-4 | $V_{CEsat}$ | -    | 0.25 | 0.4  | V    |
|                                                                                                   |                                                  | SFH6286-4 | $V_{CEsat}$ | -    | 0.25 | 0.4  | V    |

**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.

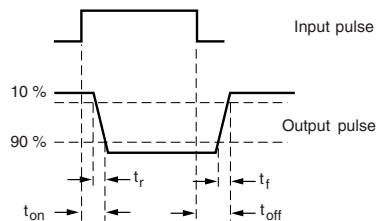
| CURRENT TRANSFER RATIO ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                                     |           |        |      |      |      |      |
|-----------------------------------------------------------------------------------------------|-----------------------------------------------------|-----------|--------|------|------|------|------|
| PARAMETER                                                                                     | TEST CONDITION                                      | PART      | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| $I_C/I_F$                                                                                     | $I_F = \pm 1\text{ mA}$ , $V_{CE} = 0.5\text{ V}$   | SFH628A-2 | CTR    | 63   | -    | 200  | %    |
|                                                                                               |                                                     | SFH6286-2 | CTR    | 63   | -    | 200  | %    |
|                                                                                               | $I_F = \pm 0.5\text{ mA}$ , $V_{CE} = 1.5\text{ V}$ | SFH628A-2 | CTR    | 32   | 100  | -    | %    |
|                                                                                               |                                                     | SFH6286-2 | CTR    | 32   | 100  | -    | %    |
|                                                                                               | $I_F = \pm 1\text{ mA}$ , $V_{CE} = 0.5\text{ V}$   | SFH628A-3 | CTR    | 100  | -    | 320  | %    |
|                                                                                               |                                                     | SFH6286-3 | CTR    | 100  | -    | 320  | %    |
|                                                                                               | $I_F = \pm 0.5\text{ mA}$ , $V_{CE} = 1.5\text{ V}$ | SFH628A-3 | CTR    | 50   | 160  | -    | %    |
|                                                                                               |                                                     | SFH6286-3 | CTR    | 50   | 160  | -    | %    |
|                                                                                               | $I_F = \pm 1\text{ mA}$ , $V_{CE} = 0.5\text{ V}$   | SFH628A-4 | CTR    | 160  | -    | 500  | %    |
|                                                                                               |                                                     | SFH6286-4 | CTR    | 160  | -    | 500  | %    |
|                                                                                               | $I_F = \pm 0.5\text{ mA}$ , $V_{CE} = 1.5\text{ V}$ | SFH628A-4 | CTR    | 80   | 250  | -    | %    |
|                                                                                               |                                                     | SFH6286-4 | CTR    | 80   | 250  | -    | %    |

| SWITCHING CHARACTERISTICS (T <sub>amb</sub> = 25 °C, unless otherwise specified) |                                                                      |                  |      |      |      |      |
|----------------------------------------------------------------------------------|----------------------------------------------------------------------|------------------|------|------|------|------|
| PARAMETER                                                                        | TEST CONDITION                                                       | SYMBOL           | MIN. | TYP. | MAX. | UNIT |
| Turn-on time                                                                     | V <sub>CC</sub> = 5 V, I <sub>C</sub> = 2 mA, R <sub>L</sub> = 100 Ω | t <sub>on</sub>  | -    | 6    | -    | μs   |
| Rise time                                                                        | V <sub>CC</sub> = 5 V, I <sub>C</sub> = 2 mA, R <sub>L</sub> = 100 Ω | t <sub>r</sub>   | -    | 3.5  | -    | μs   |
| Turn-off time                                                                    | V <sub>CC</sub> = 5 V, I <sub>C</sub> = 2 mA, R <sub>L</sub> = 100 Ω | t <sub>off</sub> | -    | 5.5  | -    | μs   |
| Fall time                                                                        | V <sub>CC</sub> = 5 V, I <sub>C</sub> = 2 mA, R <sub>L</sub> = 100 Ω | t <sub>f</sub>   | -    | 5    | -    | μs   |



isfh618a\_11

Fig. 1 - Test Circuit



isfh618a\_12

Fig. 2 - Test Circuit and Waveforms

| SAFETY AND INSULATION RATINGS                |                                                    |                   |                    |                   |
|----------------------------------------------|----------------------------------------------------|-------------------|--------------------|-------------------|
| PARAMETER                                    | TEST CONDITION                                     | SYMBOL            | VALUE              | UNIT              |
| Climatic classification                      | According to IEC 68 part 1                         |                   | 55 / 100 / 21      |                   |
| Comparative tracking index                   |                                                    | CTI               | 175                |                   |
| Maximum rated withstanding isolation voltage | t = 1 min                                          | V <sub>ISO</sub>  | 4420               | V <sub>RMS</sub>  |
| Maximum transient isolation voltage          |                                                    | V <sub>IOTM</sub> | 10 000             | V <sub>peak</sub> |
| Maximum repetitive peak isolation voltage    |                                                    | V <sub>IORM</sub> | 890                | V <sub>peak</sub> |
| Isolation resistance                         | V <sub>IO</sub> = 500 V, T <sub>amb</sub> = 25 °C  | R <sub>IO</sub>   | ≥ 10 <sup>12</sup> | Ω                 |
|                                              | V <sub>IO</sub> = 500 V, T <sub>amb</sub> = 100 °C | R <sub>IO</sub>   | ≥ 10 <sup>11</sup> | Ω                 |
| Output safety power                          |                                                    | P <sub>SO</sub>   | 400                | mW                |
| Input safety current                         |                                                    | I <sub>SI</sub>   | 275                | mA                |
| Safety temperature                           |                                                    | T <sub>S</sub>    | 175                | °C                |
| Creepage distance                            | Standard DIP-4                                     |                   | ≥ 7                | mm                |
| Clearance distance                           | Standard DIP-4                                     |                   | ≥ 7                | mm                |
| Creepage distance                            | 400 mil DIP-4                                      |                   | ≥ 8                | mm                |
| Clearance distance                           | 400 mil DIP-4                                      |                   | ≥ 8                | mm                |
| Insulation thickness                         |                                                    | DTI               | ≥ 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.

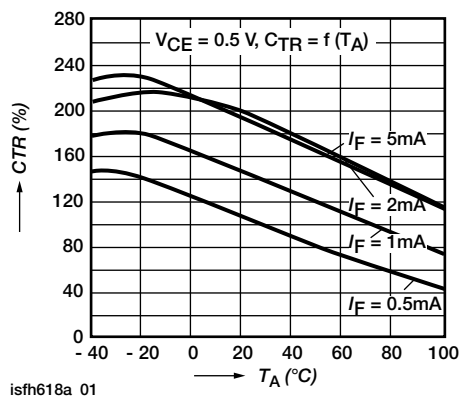
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 3 - Current Transfer Ratio (typ.)

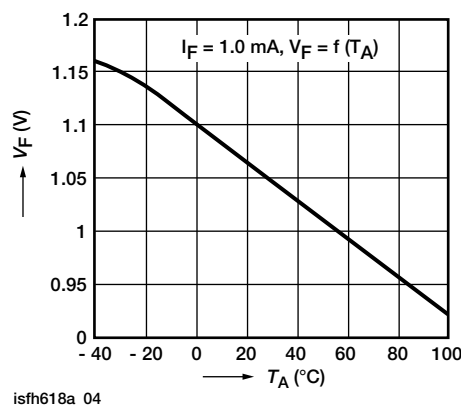


Fig. 6 - Diode Forward Voltage (typ.)

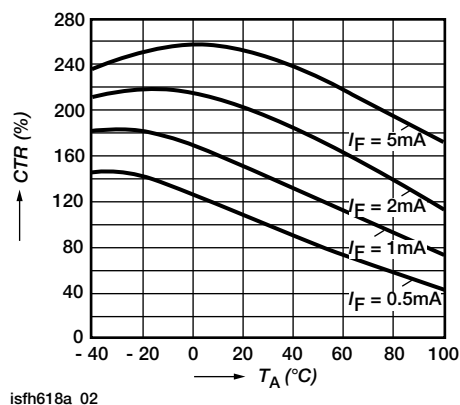


Fig. 4 - Current Transfer Ratio (typ.)

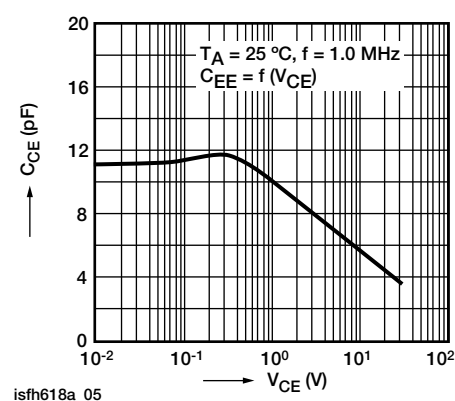


Fig. 7 - Transistor Capacitance

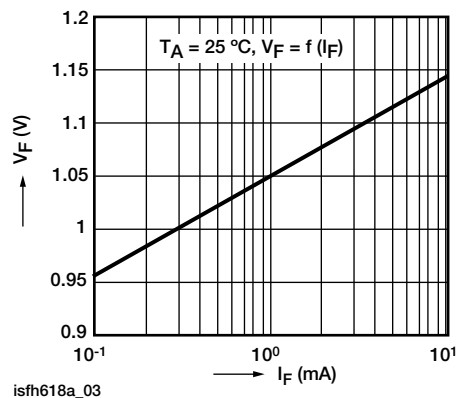


Fig. 5 - Diode Forward Voltage (typ.)

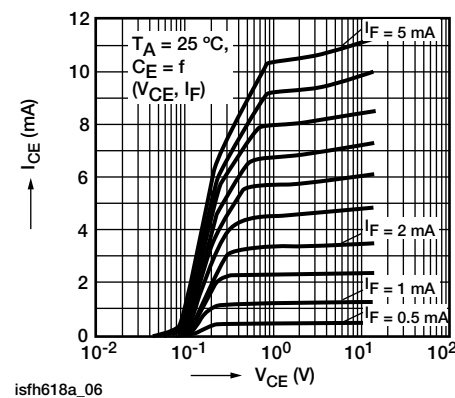


Fig. 8 - Output Characteristics

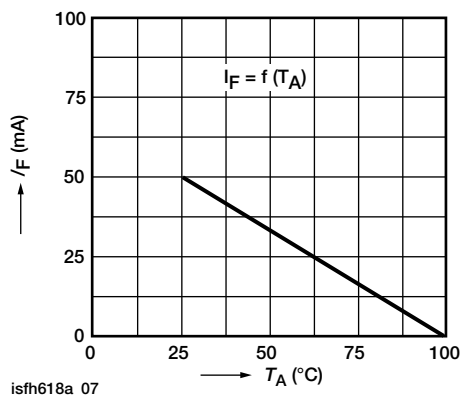


Fig. 9 - Permissible Forward Current Diode

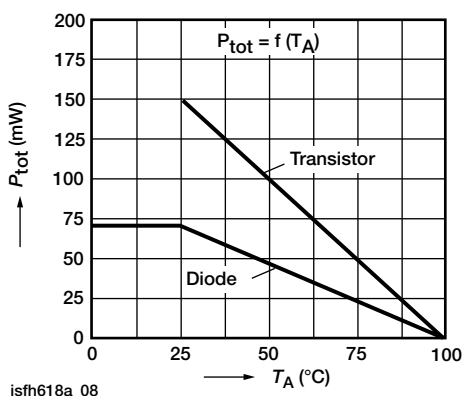


Fig. 10 - Permissible Power Dissipation

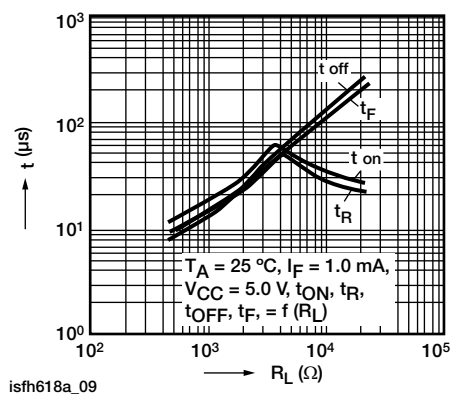
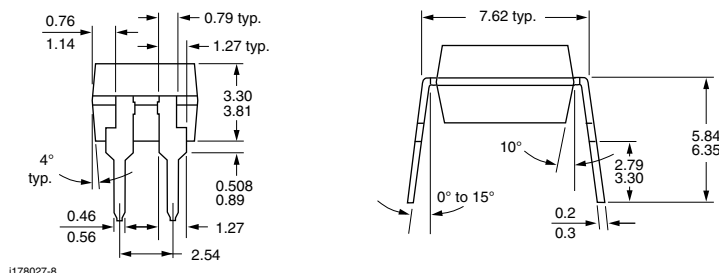
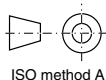
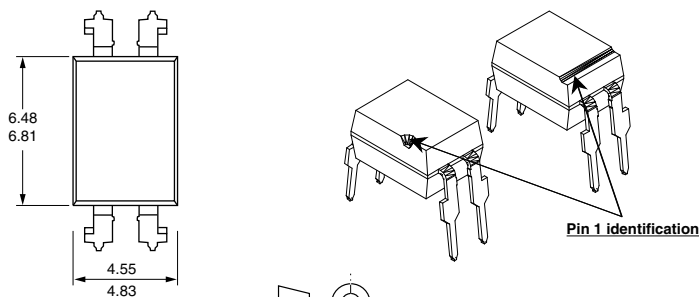


Fig. 11 - Switching Times (Typ.)

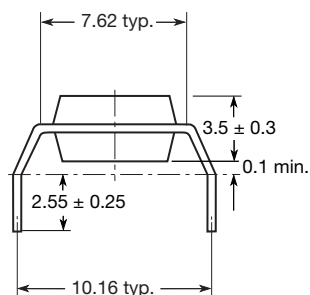


## PACKAGE DIMENSIONS in millimeters

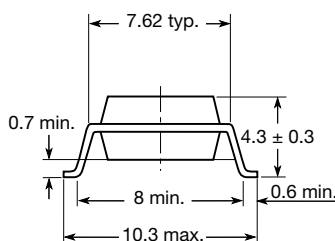


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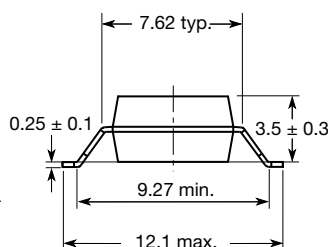
Option 6



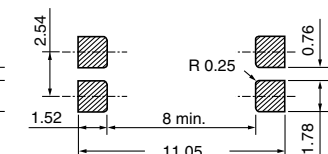
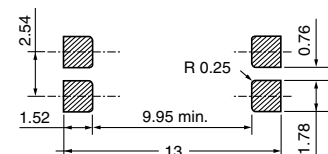
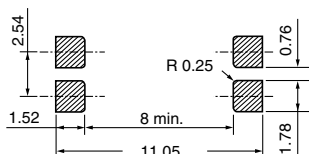
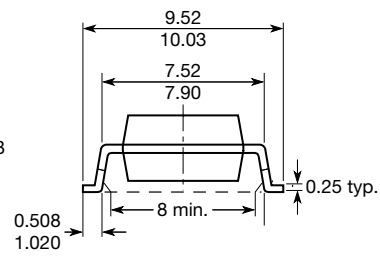
Option 7



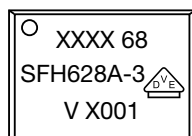
Option 8



SFH6286 Option



## PACKAGE MARKING (example)



### Notes

- XXXX = LMC (lot marking code)
- Only options 1, 7, and 8 are reflected in the package marking
- The VDE logo is only marked on option1 parts
- Tape and reel suffix (T) is not part of the package marking



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