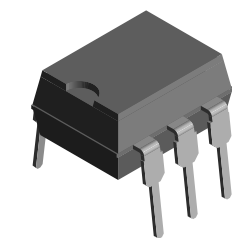
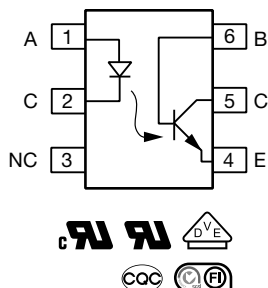




# Optocoupler, Phototransistor Output, With Base Connection



I179004-3



## FEATURES

- Isolation test voltage (1.0 s), 5300 V<sub>RMS</sub>
- $V_{CEsat} = 0.25 (\leq 0.4) \text{ V}$ ,  $I_F = 10 \text{ mA}$ ,  $I_C = 2.5 \text{ mA}$
- Built to conform to VDE requirements
- High quality premium device
- Long term stability
- Storage temperature, -55 °C to +150 °C
- 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

## DESCRIPTION

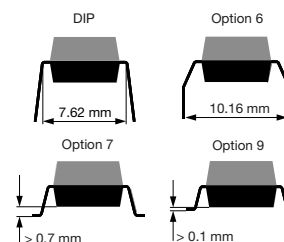
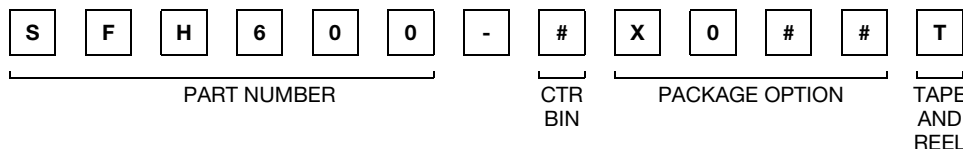
The SFH600 is an optocoupler with a GaAs LED emitter which is optically coupled with a silicon planar phototransistor detector. The component is packaged in a plastic plug-in case, 20 AB DIN 41866.

The coupler transmits signals between two electrically isolated circuits. The potential difference between the circuits to be coupled should not exceed the maximum permissible insulating voltage.

## AGENCY APPROVALS

- [UL 1577](#)
- [cUL](#)
- [DIN EN 60747-5-5 \(VDE 0884\)](#), available with option 1
- [CQC](#)
- [BSI](#)
- [FIMKO](#)

## ORDERING INFORMATION



| AGENCY CERTIFIED / PACKAGE        | CTR (%)                      |              |              |
|-----------------------------------|------------------------------|--------------|--------------|
| UL, cUL, BSI, CQC                 | 63 to 125                    | 100 to 200   | 160 to 320   |
| DIP-6                             | SFH600-1                     | SFH600-2     | SFH600-3     |
| DIP-6, 400 mil, option 6          | -                            | SFH600-2X006 | SFH600-3X006 |
| SMD-6, option 7                   | SFH600-1X007T <sup>(1)</sup> | SFH600-2X007 | SFH600-3X007 |
| SMD-6, option 9                   | SFH600-1X009T                | -            | -            |
| UL, cUL, BSI, CQC, VDE (Option 1) | 63 to 125                    | 100 to 200   | 160 to 320   |
| DIP-6                             | -                            | SFH600-2X001 | SFH600-3X001 |
| DIP-6, 400 mil, option 6          | -                            | SFH600-2X016 | -            |

## Notes

- Additional options may be possible, please contact sales office

<sup>(1)</sup> Also available in tubes; do not put T on the end



| <b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                                                             |            |             |                    |
|--------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|------------|-------------|--------------------|
| PARAMETER                                                                                              | TEST CONDITION                                                              | SYMBOL     | VALUE       | UNIT               |
| <b>INPUT</b>                                                                                           |                                                                             |            |             |                    |
| Reverse voltage                                                                                        |                                                                             | $V_R$      | 6.0         | V                  |
| DC forward current                                                                                     |                                                                             | $I_F$      | 60          | mA                 |
| Surge forward current                                                                                  | $t_p \leq 10\text{ }\mu\text{s}$                                            | $I_{FSM}$  | 2.5         | A                  |
| Total power dissipation                                                                                |                                                                             | $P_{diss}$ | 100         | mW                 |
| <b>OUTPUT</b>                                                                                          |                                                                             |            |             |                    |
| Collector emitter voltage                                                                              |                                                                             | $V_{CEO}$  | 70          | V                  |
| Emitter base voltage                                                                                   |                                                                             | $V_{EB}$   | 7.0         | V                  |
| Collector current                                                                                      |                                                                             | $I_C$      | 50          | mA                 |
|                                                                                                        | $t = 1.0\text{ ms}$                                                         | $I_C$      | 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 | $^{\circ}\text{C}$ |
| Junction temperature                                                                                   | Max. 10 s, dip soldering                                                    | $T_j$      | 100         | $^{\circ}\text{C}$ |
| Soldering temperature <sup>(1)</sup>                                                                   | Max. 10 s, dip soldering:<br>distance to seating plane $\geq 1.5\text{ mm}$ | $T_{sld}$  | 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
- <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 <sub>amb</sub> = 25 °C, unless otherwise specified) |                                                 |          |                    |      |      |      |      |
|-----------------------------------------------------------------------------------|-------------------------------------------------|----------|--------------------|------|------|------|------|
| PARAMETER                                                                         | TEST CONDITION                                  | PART     | SYMBOL             | MIN. | TYP. | MAX. | UNIT |
| INPUT                                                                             |                                                 |          |                    |      |      |      |      |
| Forward voltage                                                                   | I <sub>F</sub> = 60 mA                          |          | V <sub>F</sub>     | -    | 1.25 | 1.65 | V    |
| Breakdown voltage                                                                 | I <sub>R</sub> = 10 μA                          |          | V <sub>BR</sub>    | 6    | -    | -    | V    |
| Reverse current                                                                   | V <sub>R</sub> = 6 V                            |          | I <sub>R</sub>     | -    | 0.01 | 10   | μA   |
| Capacitance                                                                       | V <sub>F</sub> = 0 V, f = 1 MHz                 |          | C <sub>O</sub>     | -    | 25   | -    | pF   |
| Thermal resistance                                                                |                                                 |          | R <sub>thja</sub>  | -    | 750  | -    | K/W  |
| OUTPUT                                                                            |                                                 |          |                    |      |      |      |      |
| Collector emitter capacitance                                                     | f = 1 MHz, V <sub>CE</sub> = 5 V                |          | C <sub>CE</sub>    | -    | 5.2  | -    | pF   |
| Collector base capacitance                                                        | f = 1 MHz, V <sub>CB</sub> = 5 V                |          | C <sub>CB</sub>    | -    | 6.5  | -    | pF   |
| Emitter base capacitance                                                          | f = 1 MHz, V <sub>EB</sub> = 5 V                |          | C <sub>EB</sub>    | -    | 9.5  | -    | pF   |
| Thermal resistance                                                                |                                                 |          | R <sub>thja</sub>  | -    | 500  | -    | K/W  |
| Collector emitter leakage current                                                 | V <sub>CE</sub> = 10 V                          | SFH600-1 | I <sub>CEO</sub>   | -    | 2    | 35   | nA   |
|                                                                                   |                                                 | SFH600-2 | I <sub>CEO</sub>   | -    | 2    | 35   | nA   |
|                                                                                   |                                                 | SFH600-3 | I <sub>CEO</sub>   | -    | 5    | 70   | nA   |
| COUPLER                                                                           |                                                 |          |                    |      |      |      |      |
| Saturation voltage collector emitter voltage                                      | I <sub>F</sub> = 10 mA, I <sub>C</sub> = 2.5 mA |          | V <sub>CEsat</sub> | -    | 0.25 | 0.4  | V    |
| Capacitance (input to output)                                                     |                                                 |          | C <sub>IO</sub>    | -    | -    | 0.6  | 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

**CURRENT TRANSFER RATIO**

| PARAMETER                            | TEST CONDITION       | PART     | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|--------------------------------------|----------------------|----------|--------|------|------|------|------|
| $I_C/I_F$ at $V_{CE} = 5.0\text{ V}$ | $I_F = 10\text{ mA}$ | SFH600-1 | CTR    | 63   | -    | 125  | %    |
|                                      |                      | SFH600-2 | CTR    | 100  | -    | 200  | %    |
|                                      |                      | SFH600-3 | CTR    | 160  | -    | 320  | %    |
|                                      | $I_F = 1\text{ mA}$  | SFH600-1 | CTR    | 22   | 45   | -    | %    |
|                                      |                      | SFH600-2 | CTR    | 34   | 70   | -    | %    |
|                                      |                      | SFH600-3 | CTR    | 56   | 90   | -    | %    |

**SWITCHING CHARACTERISTICS**

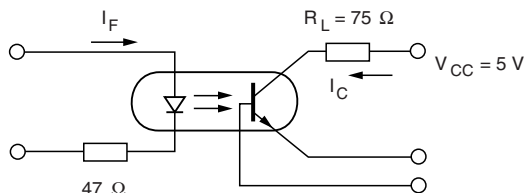
| PARAMETER            | TEST CONDITION                             | PART     | SYMBOL    | MIN. | TYP. | MAX. | UNIT          |
|----------------------|--------------------------------------------|----------|-----------|------|------|------|---------------|
| <b>NON-SATURATED</b> |                                            |          |           |      |      |      |               |
| Current              | $V_{CC} = 5\text{ V}$ , $R_L = 75\ \Omega$ |          | $I_F$     | -    | 10   | -    | mA            |
| Rise time            | $V_{CC} = 5\text{ V}$ , $R_L = 75\ \Omega$ |          | $t_r$     | -    | 2    | -    | $\mu\text{s}$ |
| Fall time            | $V_{CC} = 5\text{ V}$ , $R_L = 75\ \Omega$ |          | $t_f$     | -    | 2.5  | -    | $\mu\text{s}$ |
| Turn-on time         | $V_{CC} = 5\text{ V}$ , $R_L = 75\ \Omega$ |          | $t_{on}$  | -    | 3.2  | -    | $\mu\text{s}$ |
| Turn-off time        | $V_{CC} = 5\text{ V}$ , $R_L = 75\ \Omega$ |          | $t_{off}$ | -    | 3    | -    | $\mu\text{s}$ |
| Cut-off frequency    | $V_{CC} = 5\text{ V}$ , $R_L = 75\ \Omega$ |          | $F_{CO}$  | -    | 250  | -    | kHz           |
| <b>SATURATED</b>     |                                            |          |           |      |      |      |               |
| Current              |                                            | SFH600-1 | $I_F$     | -    | 10   | -    | mA            |
|                      |                                            | SFH600-2 | $I_F$     | -    | 10   | -    | mA            |
|                      |                                            | SFH600-3 | $I_F$     | -    | 5    | -    | mA            |
| Rise time            |                                            | SFH600-1 | $t_r$     | -    | 3    | -    | $\mu\text{s}$ |
|                      |                                            | SFH600-2 | $t_r$     | -    | 3    | -    | $\mu\text{s}$ |
|                      |                                            | SFH600-3 | $t_r$     | -    | 4    | -    | $\mu\text{s}$ |
| Fall time            |                                            | SFH600-1 | $t_f$     | -    | 12   | -    | $\mu\text{s}$ |
|                      |                                            | SFH600-2 | $t_f$     | -    | 12   | -    | $\mu\text{s}$ |
|                      |                                            | SFH600-3 | $t_f$     | -    | 14   | -    | $\mu\text{s}$ |
| Turn-on time         |                                            | SFH600-1 | $t_{on}$  | -    | 4.5  | -    | $\mu\text{s}$ |
|                      |                                            | SFH600-2 | $t_{on}$  | -    | 4.5  | -    | $\mu\text{s}$ |
|                      |                                            | SFH600-3 | $t_{on}$  | -    | 5.8  | -    | $\mu\text{s}$ |
| Turn-off time        |                                            | SFH600-1 | $t_{off}$ | -    | 21   | -    | $\mu\text{s}$ |
|                      |                                            | SFH600-2 | $t_{off}$ | -    | 21   | -    | $\mu\text{s}$ |
|                      |                                            | SFH600-3 | $t_{off}$ | -    | 24   | -    | $\mu\text{s}$ |

**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 | $t = 1\text{ min}$                                              | $V_{ISO}$  | 4420           | $V_{RMS}$        |
| Maximum transient isolation voltage          |                                                                 | $V_{IOTM}$ | 10 000         | V                |
| Maximum repetitive peak isolation voltage    |                                                                 | $V_{IORM}$ | 890            | V                |
| Isolation resistance                         | $V_{IO} = 500\text{ V}$ , $T_{amb} = 25\text{ }^\circ\text{C}$  | $R_{IO}$   | $\geq 10^{12}$ | $\Omega$         |
|                                              | $V_{IO} = 500\text{ V}$ , $T_{amb} = 100\text{ }^\circ\text{C}$ | $R_{IO}$   | $\geq 10^{11}$ | $\Omega$         |
| Output safety power                          |                                                                 | $P_{SO}$   | 400            | mW               |
| Input safety current                         |                                                                 | $I_{SI}$   | 275            | mA               |
| Input safety temperature                     |                                                                 | $T_{SI}$   | 175            | $^\circ\text{C}$ |
| Creepage distance                            |                                                                 |            | $\geq 7$       | mm               |
| Clearance distance                           |                                                                 |            | $\geq 7$       | mm               |
| Insulation thickness                         |                                                                 | DTI        | $\geq 0.4$     | mm               |

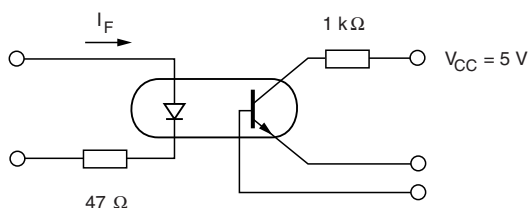
**Note**

- 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)


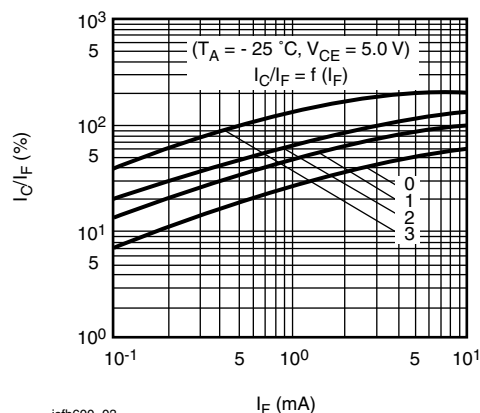
isfh600\_01

Fig. 1 - Linear Operation (without saturation)



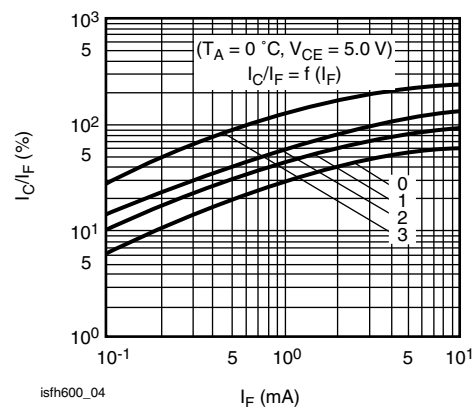
isfh600\_02

Fig. 2 - Switching Operation (with saturation)



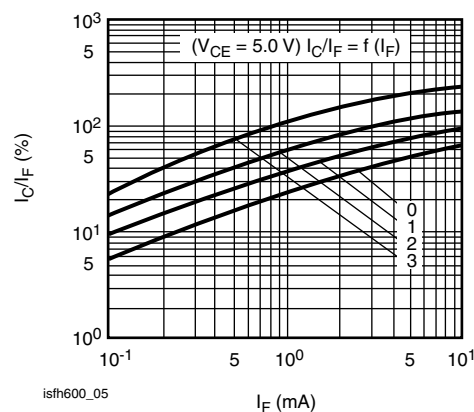
isfh600\_03

Fig. 3 - Current Transfer Ratio vs. Diode Current



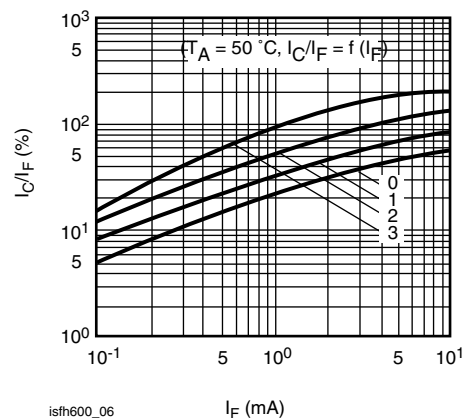
isfh600\_04

Fig. 4 - Current Transfer Ratio vs. Diode Current



isfh600\_05

Fig. 5 - Current Transfer Ratio vs. Diode Current



isfh600\_06

Fig. 6 - Current Transfer Ratio vs. Diode Current

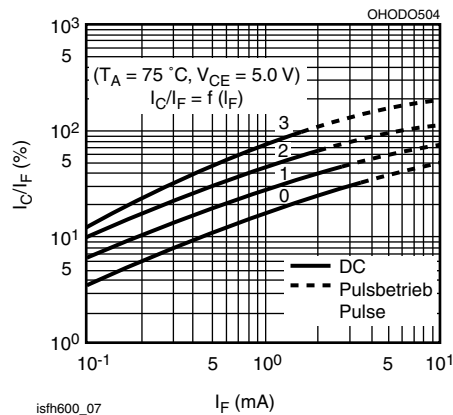


Fig. 7 - Current Transfer Ratio vs. Diode Current

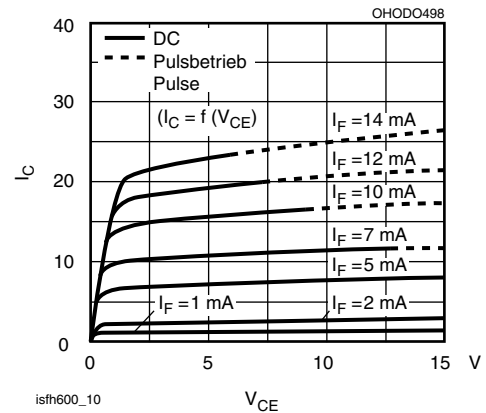


Fig. 10 - Output Characteristics SFH600-2, SFH600-3

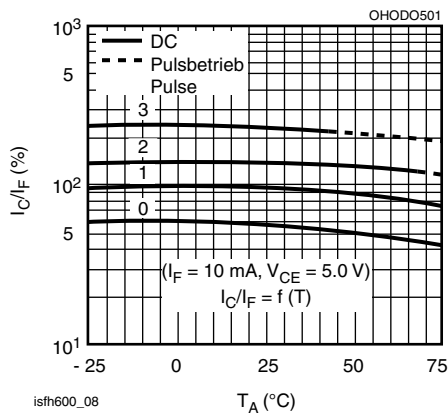


Fig. 8 - Current Transfer Ratio (CTR) vs. Temperature

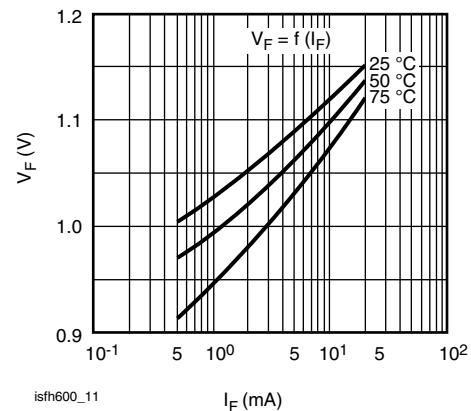


Fig. 11 - Forward Voltage

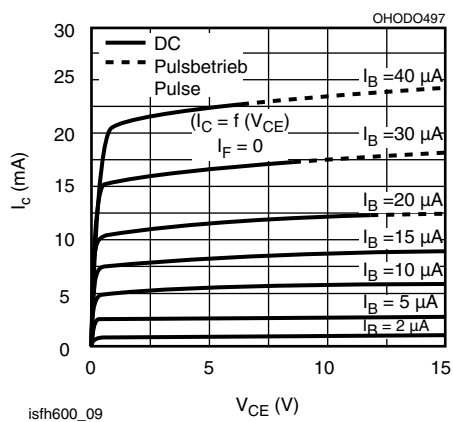


Fig. 9 - Transistor Characteristics SFH600-2, SFH600-3

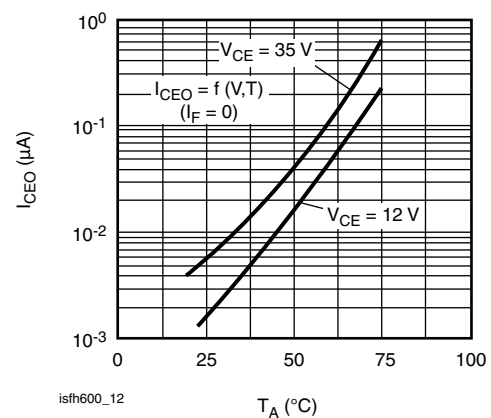


Fig. 12 - Collector Emitter Off-State Current

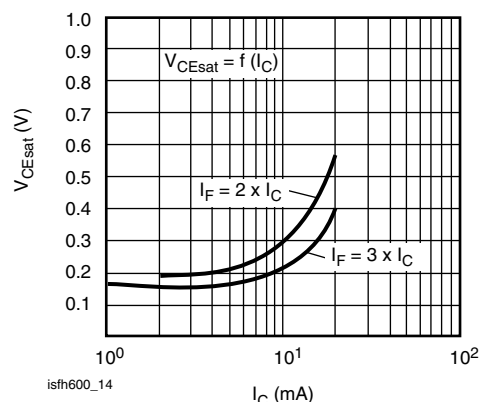


Fig. 13 - Saturation Voltage vs. Collector Current and Modulation Depth SFH600-1

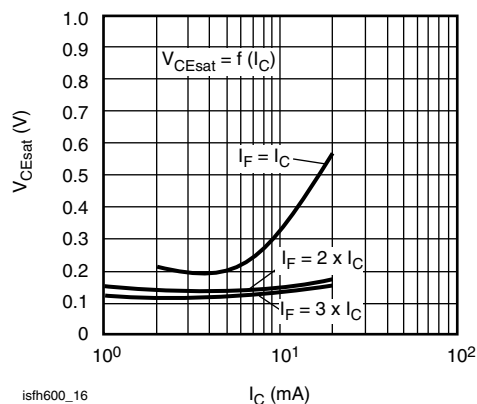


Fig. 16 - Permissible Pulse Load

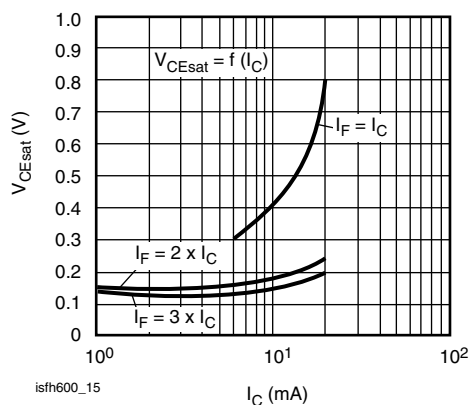


Fig. 14 - Saturation Voltage vs. Collector Current and Modulation Depth SFH600-2

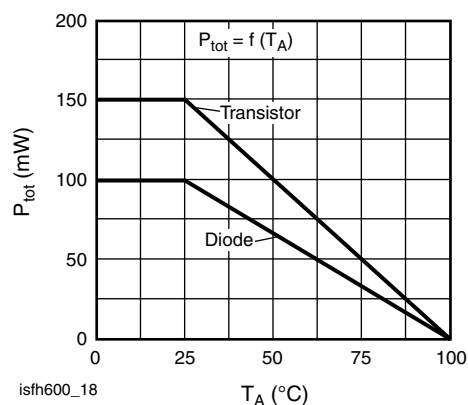


Fig. 17 - Permissible Power Dissipation for Transistor and Diode

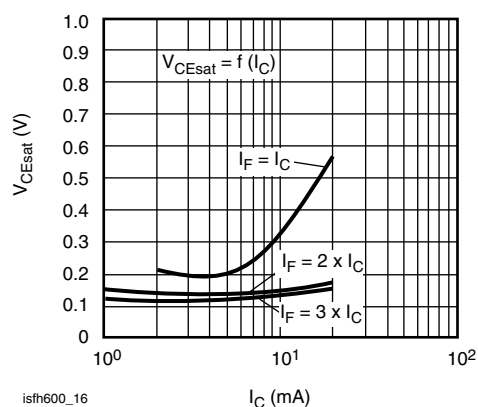


Fig. 15 - Saturation Voltage vs. Collector Current and Modulation Depth SFH600-3

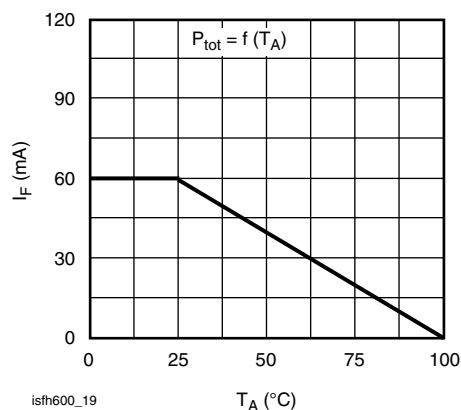


Fig. 18 - Permissible Forward Current Diode

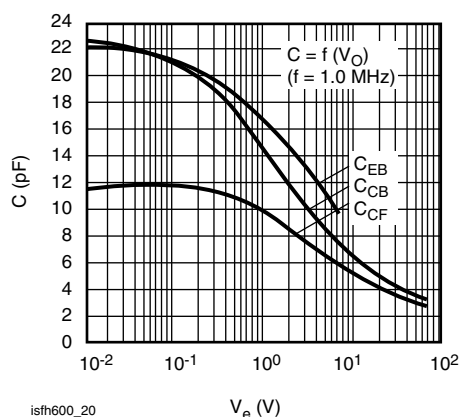
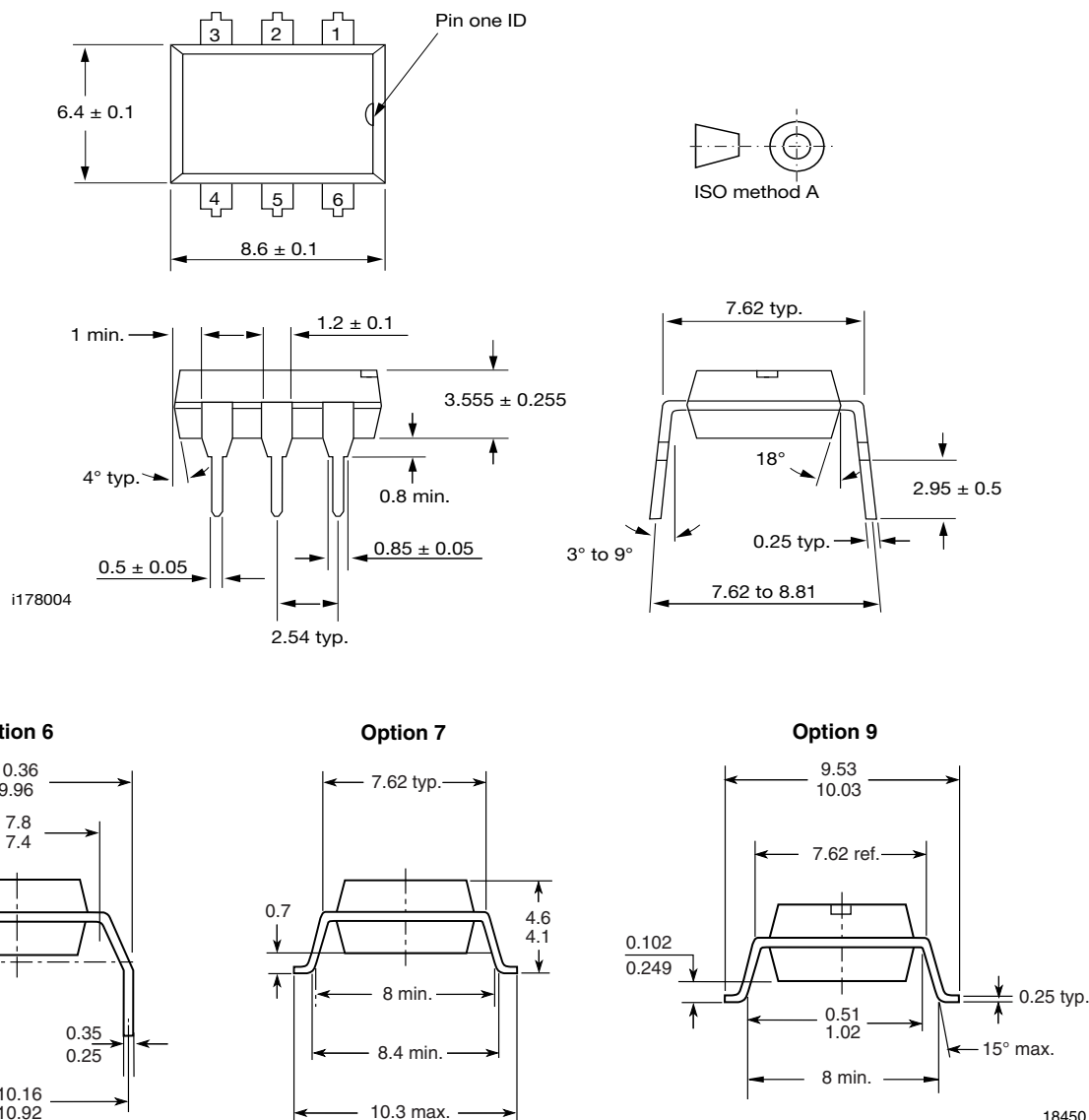


Fig. 19 - Transistor Capacitance

**PACKAGE DIMENSIONS** in inches (millimeters)



**PACKAGE MARKING** (example)

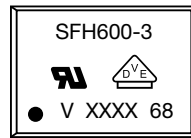


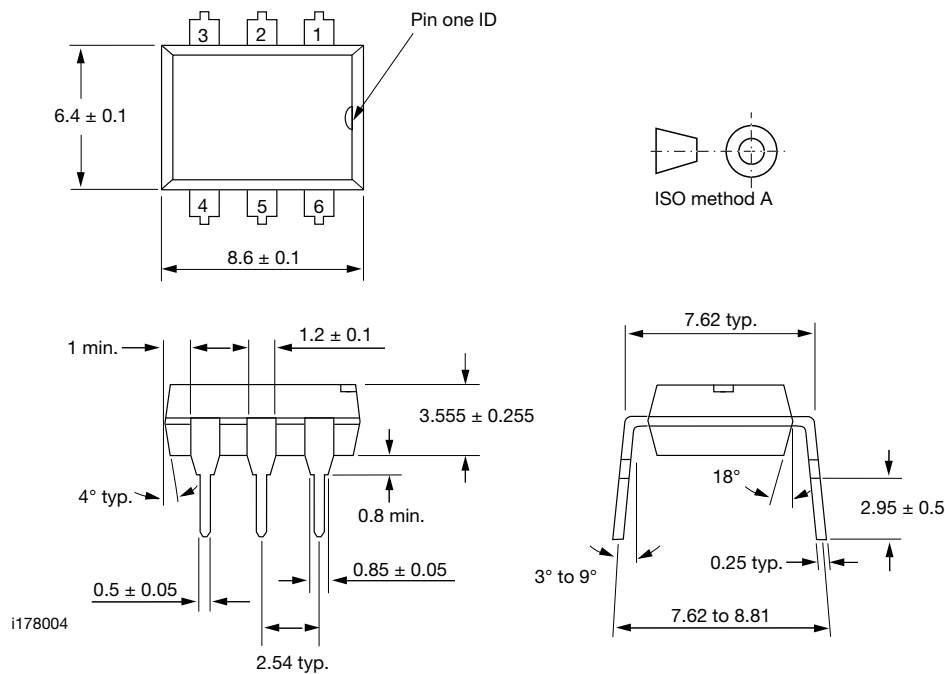
Fig. 20 - Example of SFH600-3X001

**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-6A

## PACKAGE DIMENSIONS in inches (millimeters)



### Note

The information in this document provides generic information but for specific information on a product the appropriate product datasheet should be used.



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