

## High Speed Optocoupler, 1 Mbd, 15 kV/ms CMR, Transistor Output

### Features

- Direct Replacement for HCPL4503
- High Speed Optocoupler without Base Connection
- Isolation Test Voltage: 5300 V<sub>RMS</sub>
- GaAlAs Emitter
- Integrated Detector with Photo diode and Transistor
- High Data Transmission Rate: 1 MBit/s
- TTL Compatible
- Open Collector Output
- Good CTR Linearity Relative to Forward Current
- Field Effect Stable
- Low Coupling Capacitance
- Very High Common Mode Transient Immunity  
dV/dt:  $\geq 15 \text{ kV}/\mu\text{s}$  at  $V_{CM} = 1500 \text{ V}$
- Lead-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

### Agency Approvals

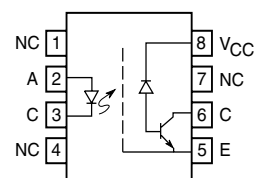
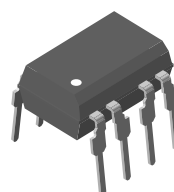
- UL1577, File No. E52744 System Code H or J, Double Protection
- DIN EN 60747-5-2 (VDE0884)  
DIN EN 60747-5-5 pending  
Available with Option 1

### Applications

Data Communications

IGBT Drivers

Programmable Controllers



1179072



### Description

The SFH6345 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 DIP-8 plastic package. The device is similar to the 6N135 but has an additional Faraday shield on the detector which enhances the input-output dv/dt immunity.

Signals can be transmitted between two electrically separated circuits up to frequencies of 2 MHz. The potential difference between the circuits to be coupled should not exceed the maximum permissible reference voltages.

### Order Information

| Part         | Remarks                            |
|--------------|------------------------------------|
| SFH6345      | CTR 30 %, DIP-8                    |
| SFH6345-X006 | CTR 30 %, DIP-8 400 mil (option 6) |
| SFH6345-X007 | CTR 30 %, SMD-8 (option 7)         |
| SFH6345-X009 | CTR 30 %, SMD-8 (option 9)         |

For additional information on the available options refer to Option Information.

## Absolute Maximum Ratings

$T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified

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 Rating for extended periods of the time can adversely affect reliability.

## Input

| Parameter             | Test condition                                    | Symbol     | Value | Unit |
|-----------------------|---------------------------------------------------|------------|-------|------|
| Reverse voltage       |                                                   | $V_R$      | 3     | V    |
| DC forward current    |                                                   | $I_F$      | 25    | mA   |
| Surge forward current | $t_p \leq 1\text{ }\mu\text{s}$ , 300 pulses/sec. | $I_{FSM}$  | 1     | A    |
| Power dissipation     |                                                   | $P_{diss}$ | 45    | mW   |

## Output

| Parameter         | Test condition | Symbol     | Value       | Unit |
|-------------------|----------------|------------|-------------|------|
| Supply voltage    |                | $V_S$      | - 0.5 to 30 | V    |
| Output voltage    |                | $V_O$      | - 0.5 to 25 | V    |
| Output current    |                | $I_O$      | 8           | mA   |
| Power dissipation |                | $P_{diss}$ | 100         | mW   |

## Coupler

| Parameter                                                                                         | Test condition                                                                                 | Symbol    | Value          | Unit               |
|---------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|-----------|----------------|--------------------|
| Isolation test voltage between emitter and detector (refer to climate DIN 40046, part 2, Nov. 74) |                                                                                                | $V_{ISO}$ | 5300           | $V_{RMS}$          |
| Creepage                                                                                          |                                                                                                |           | $\geq 7$       | mm                 |
| Clearance                                                                                         |                                                                                                |           | $\geq 7$       | mm                 |
| Comparative tracking index per DIN IEC 112/VDE 0303, part 1                                       |                                                                                                |           | $\geq 175$     |                    |
| Isolation resistance                                                                              | $V_{IO} = 500\text{ V}$ , $T_{amb} = 25\text{ }^{\circ}\text{C}$                               | $R_{IO}$  | $\geq 10^{12}$ | $\Omega$           |
|                                                                                                   | $V_{IO} = 500\text{ V}$ , $T_{amb} = 100\text{ }^{\circ}\text{C}$                              | $R_{IO}$  | $\geq 10^{11}$ | $\Omega$           |
| 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                                                                             | $t = 10\text{ sec. max}$ , Dip soldering:<br>distance to seating plane<br>$\geq 1.5\text{ mm}$ | $T_{sld}$ | 260            | $^{\circ}\text{C}$ |



## Electrical Characteristics

$T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified

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.

## Input

$T_{amb} = 0\text{ to }70\text{ }^{\circ}\text{C}$ , unless otherwise specified, typical values  $T_{amb} = 25\text{ }^{\circ}\text{C}$

| Parameter          | Test condition                          | Symbol     | Min | Typ. | Max | Unit          |
|--------------------|-----------------------------------------|------------|-----|------|-----|---------------|
| Forward voltage    | $I_F = 16\text{ mA}$                    | $V_F$      |     | 1.6  | 1.9 | V             |
| Reverse current    | $V_R = 3\text{ V}$                      | $I_R$      |     | 0.5  | 10  | $\mu\text{A}$ |
| Capacitance        | $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$ | $C_O$      |     | 75   |     | pF            |
| Thermal resistance |                                         | $R_{thja}$ |     | 700  |     | K/W           |

## Output

| Parameter                     | Test condition                                           | Symbol     | Min | Typ. | Max | Unit          |
|-------------------------------|----------------------------------------------------------|------------|-----|------|-----|---------------|
| Supply current, logic high    | $I_F = 0$ , $V_O = \text{open}$ , $V_{CC} = 15\text{ V}$ | $I_{CCH}$  |     | 0.01 | 1   | $\mu\text{A}$ |
|                               |                                                          | $I_{CCH}$  |     | 0.01 | 2   | $\mu\text{A}$ |
| Output current, output high   | $I_F = 0$ , $V_O = V_{CC} = 5.5\text{ V}$                | $I_{OH}$   |     | .003 | 0.5 | $\mu\text{A}$ |
|                               | $I_F = 0$ , $V_O = V_{CC} = 15\text{ V}$                 | $I_{OH}$   |     | .01  | 1   |               |
|                               |                                                          | $I_{OH}$   |     |      | 50  |               |
| Collector-emitter capacitance | $V_{CE} = 5\text{ V}$ , $f = 1\text{ MHz}$               | $C_{CE}$   |     | 3    |     | pF            |
| Thermal resistance            |                                                          | $R_{thja}$ |     | 300  |     | K/W           |

## Coupler

| Parameter                            | Test condition                                                         | Symbol    | Min | Typ. | Max | Unit          |
|--------------------------------------|------------------------------------------------------------------------|-----------|-----|------|-----|---------------|
| Coupling capacitance                 |                                                                        | $C_C$     |     | 0.6  |     | pF            |
| Collector emitter saturation voltage | $I_F = 16\text{ mA}$ , $I_O = 2.4\text{ mA}$ , $V_{CC} = 4.5\text{ V}$ | $V_{OL}$  |     | 0.1  | 0.4 | V             |
| Logic low supply current             | $I_F = 16\text{ mA}$ , $V_O = \text{open}$ , $V_{CC} = 15\text{ V}$    | $I_{CCL}$ |     | 80   | 200 | $\mu\text{A}$ |

## Current Transfer Ratio

| Parameter              | Test condition                                                        | Symbol    | Min | Typ. | Max | Unit |
|------------------------|-----------------------------------------------------------------------|-----------|-----|------|-----|------|
| Current Transfer Ratio | $I_F = 16\text{ mA}$ , $V_O = 0.4\text{ V}$ , $V_{CC} = 4.5\text{ V}$ | $I_C/I_F$ | 19  | 30   |     | %    |
|                        | $I_F = 16\text{ mA}$ , $V_O = 0.5\text{ V}$ , $V_{CC} = 4.5\text{ V}$ | $I_C/I_F$ | 15  |      |     | %    |

## Switching Characteristics

| Parameter                                     | Test condition                                                                  | Symbol    | Min | Typ. | Max | Unit          |
|-----------------------------------------------|---------------------------------------------------------------------------------|-----------|-----|------|-----|---------------|
| Propagation delay time (high-low), see fig. 1 | $I_F = 16 \text{ mA}$ , $V_{CC} = 5 \text{ V}$ ,<br>$R_L = 1.9 \text{ k}\Omega$ | $t_{PHL}$ |     | 0.3  | 0.8 | $\mu\text{s}$ |
| Propagation delay time (low-high), see fig. 1 | $I_F = 16 \text{ mA}$ , $V_{CC} = 5 \text{ V}$ ,<br>$R_L = 1.9 \text{ k}\Omega$ | $t_{PLH}$ |     | 0.3  | 0.8 | $\mu\text{s}$ |

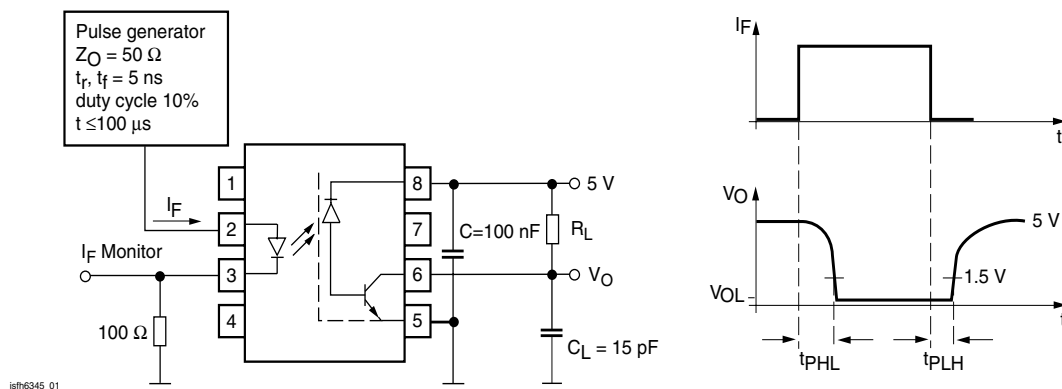


Figure 1. Switching times (typ.)

## Common Mode Transient Immunity

| Parameter                                         | Test condition                                                                                                    | Symbol   | Min | Typ. | Max | Unit                    |
|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|----------|-----|------|-----|-------------------------|
| Common mode transient immunity (high), see fig. 2 | $I_F = 0$ , $V_{CM} = 1500 \text{ V}_{P-P}$ ,<br>$R_L = 1.9 \text{ k}\Omega$ , $V_{CC} = 5 \text{ V}$             | $ CM_H $ | 15  | 30   |     | $\text{kV}/\mu\text{s}$ |
| Common mode transient immunity (low), see fig. 2  | $I_F = 16 \text{ mA}$ , $V_{CM} = 1500 \text{ V}_{P-P}$ ,<br>$R_L = 1.9 \text{ k}\Omega$ , $V_{CC} = 5 \text{ V}$ | $ CM_L $ | 15  | 30   |     | $\text{kV}/\mu\text{s}$ |

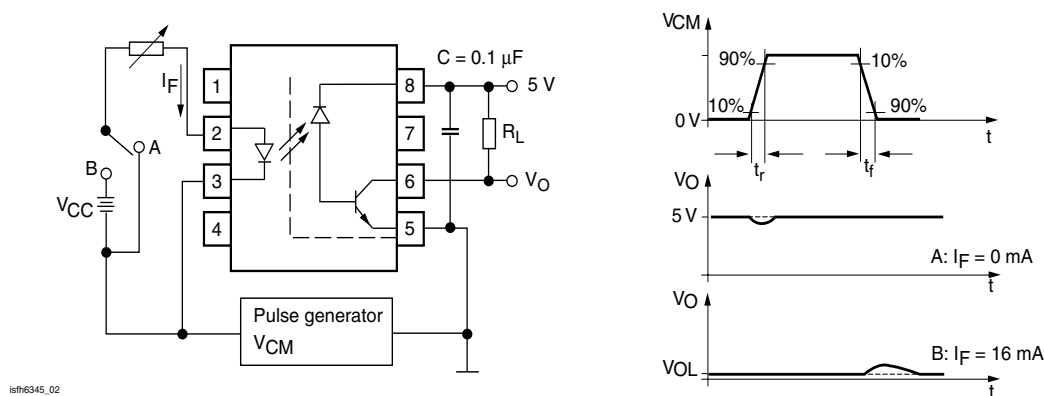


Figure 2. Common mode transient immunity

## Typical Characteristics ( $T_{amb} = 25^{\circ}\text{C}$ unless otherwise specified)

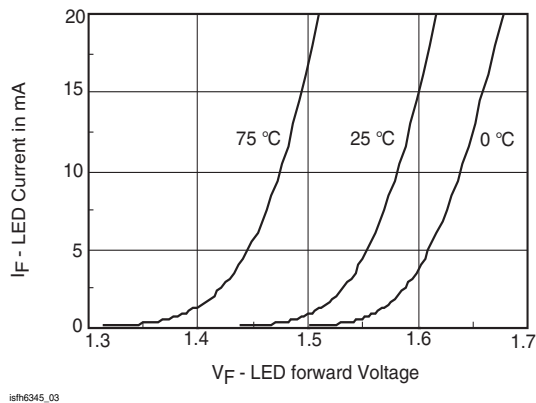


Figure 3. Logic high output current vs. temperature

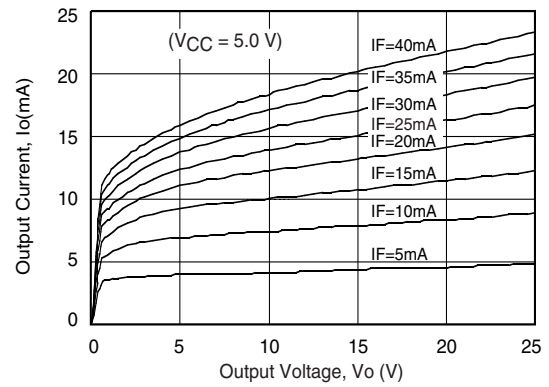


Figure 6. Output Current vs. Output Voltage

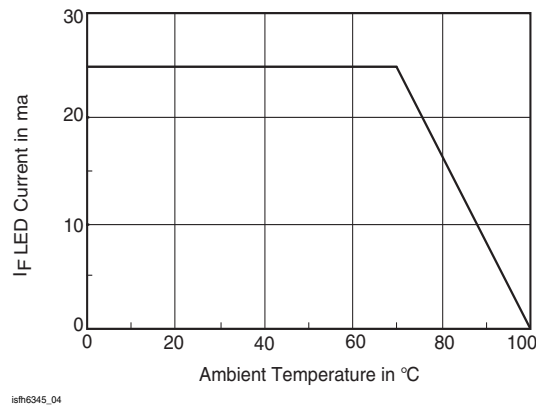


Figure 4. Permissible Forward LED Current vs. Temperature

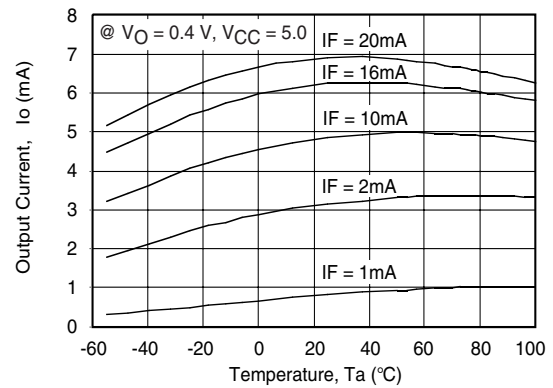


Figure 7. Output Current vs. Temperature

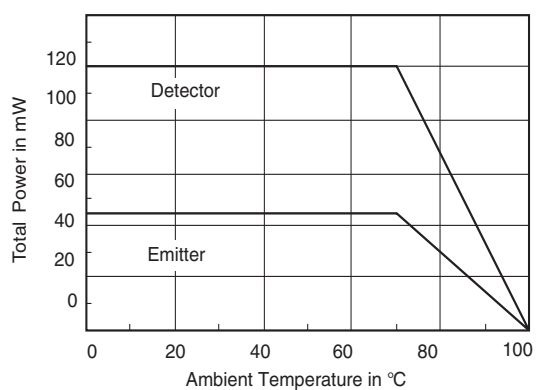


Figure 5. Permissible Power Dissipation vs. Temperature

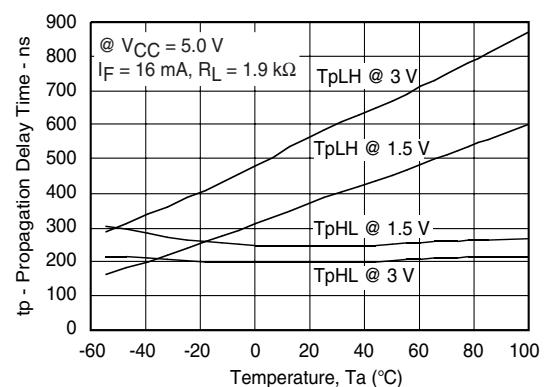


Figure 8. Propagation Delay vs. Ambient Temperature

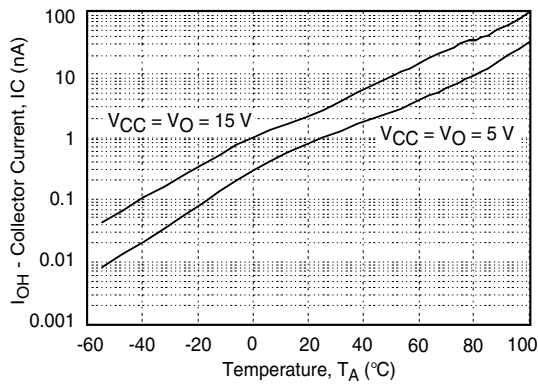


Figure 9. Logic high output current vs. temperature

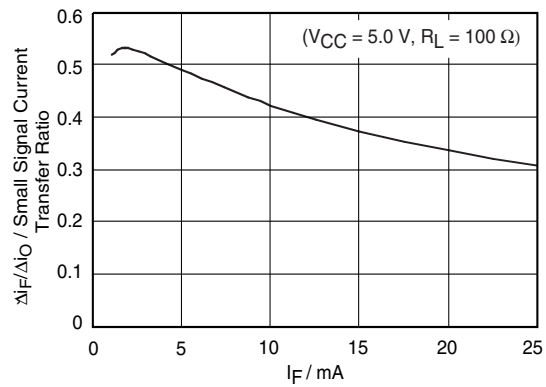
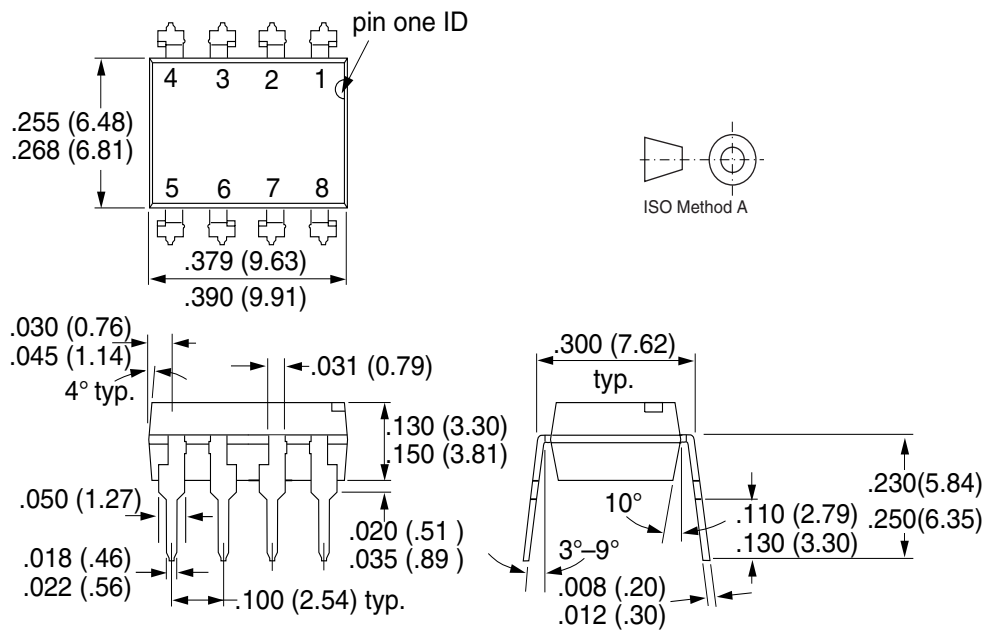
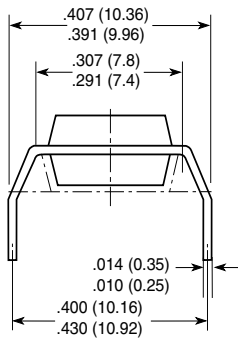


Figure 10. Small Signal Current Transfer Ratio vs. Quiescent Input Current

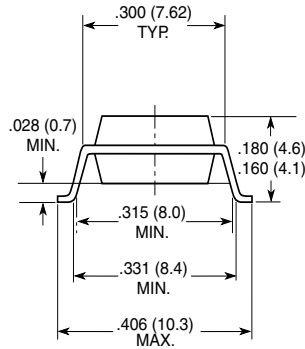
## Package Dimensions in Inches (mm)



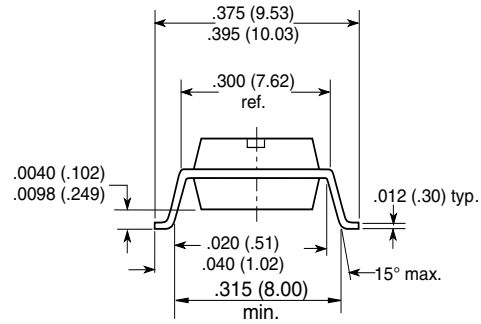
**Option 6**



**Option 7**



**Option 9**



18450

## Ozone Depleting Substances Policy Statement

It is the policy of Vishay Semiconductor GmbH to

1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Vishay Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Vishay Semiconductor GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

We reserve the right to make changes to improve technical design  
and may do so without further notice.

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