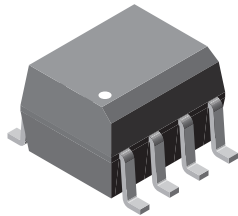
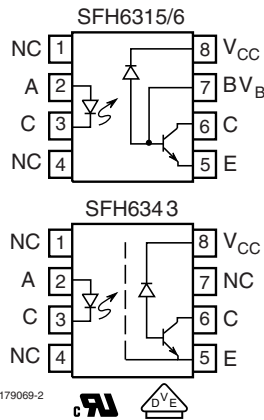


High Speed Optocoupler, 1 MBd, Transistor Output



i179074



i179069-2



FEATURES

- Surface mountable
- Industry standard SOIC-8 footprint
- Compatible with infrared vapor phase reflow and wave soldering processes
- Isolation test voltage, 4000 V_{RMS}
- Very high common mode transient immunity: 15000 V/μs at V_{CM} = 1500 V guaranteed (SFH6343)
- High speed: 1 MBd
- TTL compatible
- Guaranteed AC and DC performance temperature: 0 °C to 70 °C
- Open collector output
- Pin compatible with agilent (HP) optocouplers
 - SFH6315T - HCPL0500
 - SFH6316T - HCPL0501
 - SFH6343T - HCPL0453
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC



RoHS
COMPLIANT

DESCRIPTION

The SFH6315T, SFH6316T, SFH6343T, high speed optocouplers, each consists of a GaAlAs infrared emitting diode, optically coupled with an integrated photo detector and a high speed transistor. The photo detector is junction isolated from the transistor to reduce miller capacitance effects. The open collector output function allows circuit designers to adjust the load conditions when interfacing with different logic systems such as TTL, CMOS, etc.

Because the SFH6343T has a faraday shield on the detector chip, it can also reject and minimize high input to output common mode transient voltages. There is no base connection, further reducing the potential electrical noise entering the package.

The SFH6315T, SFH6316T, SFH6343T are packaged in industry standard SOIC-8 packages and are suitable for surface mounting.

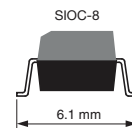
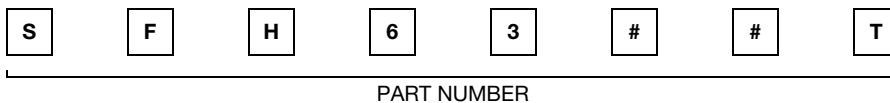
APPLICATIONS

- Line receivers
- Logic ground isolation
- Analog signal ground isolation
- Replace pulse transformers

AGENCY APPROVALS

- UL1577, file no. E52744 system code Y
- cUL - file no. E52744, equivalent to CSA bulletin 5A
- DIN EN 60747-5-5 (VDE 0884) available with option 1

ORDERING INFORMATION



| AGENCY CERTIFIED/ PACKAGE | CTR (%) | | |
|---------------------------|-------------------------|-------------------------|-------------------------|
| UL, cUL | ≥ 5 | ≥ 15 | NO BASE CONNECTION |
| SOIC-8 | SFH6315T ⁽¹⁾ | SFH6316T ⁽¹⁾ | SFH6343T ⁽¹⁾ |

Note

⁽¹⁾ Also available in tubes; do not add T to end

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)

| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
|-----------------------|-------------------------------------|-------------------|-------|------|
| INPUT | | | | |
| Reverse voltage | | V _R | 3 | V |
| DC forward current | | I _F | 25 | mA |
| Surge forward current | t _p ≤ 1 μs, 300 pulses/s | I _{FSM} | 1 | A |
| Power dissipation | T _{amb} ≤ 70 °C | P _{diss} | 45 | mW |

SFH6315T, SFH6316T, SFH6343T



Vishay Semiconductors High Speed Optocoupler, 1 MBd,
Transistor Output

| ABSOLUTE MAXIMUM RATINGS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified) | | | | |
|--|--|------------|----------------|--------------------|
| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
| OUTPUT | | | | |
| 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 | $T_{amb} \leq 70\text{ }^{\circ}\text{C}$ | P_{diss} | 100 | mW |
| COUPLER | | | | |
| Isolation test voltage between emitter and detector | | V_{ISO} | 4000 | V_{RMS} |
| Pollution degree (DIN VDE 0110) | | | 2 | |
| Creepage distance | | | ≥ 4 | mm |
| Clearance distance | | | ≥ 4 | mm |
| Comparative tracking index per DIN IEC 112/VDE 0303 part 1 | | CTI | 175 | |
| Isolation resistance | $V_{IO} = 500\text{ V}$, $T_{amb} = 25\text{ }^{\circ}\text{C}$, $R_{ISOL}^{(1)}$ | R_{IO} | $\geq 10^{12}$ | Ω |
| | $V_{IO} = 500\text{ V}$, $T_{amb} = 100\text{ }^{\circ}\text{C}$, $R_{ISOL}^{(1)}$ | R_{IO} | $\geq 10^{11}$ | Ω |
| 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 ⁽²⁾ | max. 10 s, dip soldering distance to seating plane $\geq 1.5\text{ mm}$ | | 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.

⁽¹⁾ Device considered a two-terminal device: pins 1, 2, 3, and 4 shorted together and pins 5, 6, 7, and 8 shorted together.

⁽²⁾ Refer to reflow profile for soldering conditions for surface mounted devices.

| ELECTRICAL CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified) | | | | | | | |
|--|---|----------|---------------|------|-------|------|------------------------------|
| PARAMETER | TEST CONDITION | PART | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| INPUT | | | | | | | |
| Forward voltage | $I_F = 16\text{ mA}$, $25\text{ }^{\circ}\text{C}$ | | V_F | | 1.6 | 1.8 | V |
| | | | V_F | | 1.6 | 1.9 | V |
| Reverse current | $V_R = 3\text{ V}$ | | I_R | | 0.5 | 10 | μA |
| Capacitance | $f = 1\text{ MHz}$, $V_F = 0\text{ V}$ | | C_{IN} | | 75 | | pF |
| Temperature coefficient of | $I_F = 16\text{ mA}$ | | $\Delta V_F/$ | | - 1.7 | | $\text{mW}/^{\circ}\text{C}$ |
| OUTPUT | | | | | | | |
| Logic low supply current | $I_F = 16\text{ mA}$, $V_O = \text{open}$, $V_{CC} = 15\text{ V}$ | | I_{CCL} | | 200 | | μA |
| Logic high supply current | $I_F = 0\text{ mA}$, $V_O = \text{open}$, $V_{CC} = 15\text{ V}$; $25\text{ }^{\circ}\text{C}$ | | I_{CCH} | | 0.001 | 1 | μA |
| | | | I_{CCH} | | 0.001 | 2 | μA |
| Logic low output voltage | $I_F = 16\text{ mA}$, $V_{CC} = 4.5\text{ V}$, $I_O = 1.1\text{ mA}$ | SFH6315T | V_{OL} | | 0.15 | 0.4 | V |
| | $I_F = 16\text{ mA}$, $V_{CC} = 4.5\text{ V}$, $I_O = 0.8\text{ mA}$ | SFH6315T | V_{OL} | | 0.15 | 0.5 | V |
| | $I_F = 16\text{ mA}$, $V_{CC} = 4.5\text{ V}$, $I_O = 3\text{ mA}$ | SFH6316T | V_{OL} | | 0.15 | 0.4 | V |
| | $I_F = 16\text{ mA}$, $V_{CC} = 4.5\text{ V}$, $I_O = 2.4\text{ mA}$ | SFH6343T | V_{OL} | | 0.15 | 0.5 | V |
| | $I_F = 16\text{ mA}$, $V_{CC} = 4.5\text{ V}$, $I_O = 2.4\text{ mA}$ | SFH6316T | V_{OL} | | 0.15 | 0.5 | V |
| | $I_F = 16\text{ mA}$, $V_{CC} = 4.5\text{ V}$, $I_O = 2.4\text{ mA}$ | SFH6343T | V_{OL} | | 0.15 | 0.5 | V |
| Logic high output current | $I_F = 0\text{ mA}$, $V_O = V_{CC} = 5.5\text{ V}$, $25\text{ }^{\circ}\text{C}$ | | I_{OH} | | 0.003 | 0.5 | μA |
| | $I_F = 0\text{ mA}$, $V_O = V_{CC} = 15\text{ V}$, $25\text{ }^{\circ}\text{C}$ | | I_{OH} | | 0.01 | 1 | μA |
| | $I_F = 0\text{ mA}$, $V_O = V_{CC} = 15\text{ V}$ | | I_{OH} | | | 50 | μA |

| ELECTRICAL CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified) | | | | | | | |
|---|--------------------|------|----------|------|------|------|---------------|
| PARAMETER | TEST CONDITION | PART | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| COUPLER | | | | | | | |
| Capacitance (input to output) ⁽¹⁾ | $f = 1\text{ MHz}$ | | C_{IO} | | 0.4 | | μF |

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⁾ A 0.1 μF bypass capacitor connected between pins 5 and 8 is recommended.

| CURRENT TRANSFER RATIO | | | | | | | |
|------------------------|---|----------|--------|------|------|------|------|
| PARAMETER | TEST CONDITION | PART | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| Current transfer ratio | $V_O = 0.4\text{ V}, I_F = 16\text{ mA}, V_{CC} = 4.5\text{ V}, 25\text{ }^{\circ}\text{C}$ | SFH6315T | CTR | 7 | 16 | 50 | % |
| | $V_O = 0.5\text{ V}, I_F = 16\text{ mA}, V_{CC} = 4.5\text{ V}$ | SFH6315T | CTR | 5 | 17 | | % |
| | $V_O = 0.4\text{ V}, I_F = 16\text{ mA}, V_{CC} = 4.5\text{ V}, 25\text{ }^{\circ}\text{C}$ | SFH6316T | CTR | 19 | 35 | 50 | % |
| | $V_O = 0.4\text{ V}, I_F = 16\text{ mA}, V_{CC} = 4.5\text{ V}, 25\text{ }^{\circ}\text{C}$ | SFH6343T | CTR | 19 | 35 | 50 | % |
| | $V_O = 0.5\text{ V}, I_F = 16\text{ mA}, V_{CC} = 4.5\text{ V}$ | SFH6343T | CTR | 15 | 36 | | % |
| | $V_O = 0.5\text{ V}, I_F = 16\text{ mA}, V_{CC} = 4.5\text{ V}$ | SFH6316T | CTR | 15 | 36 | | % |

Note

- Current transfer ratio in percent equals the ratio of output collector current (I_O) to the forward LED input current (I_F) times 100. A 0.1 μF bypass capacitor connected between pins 5 and 8 is recommended.

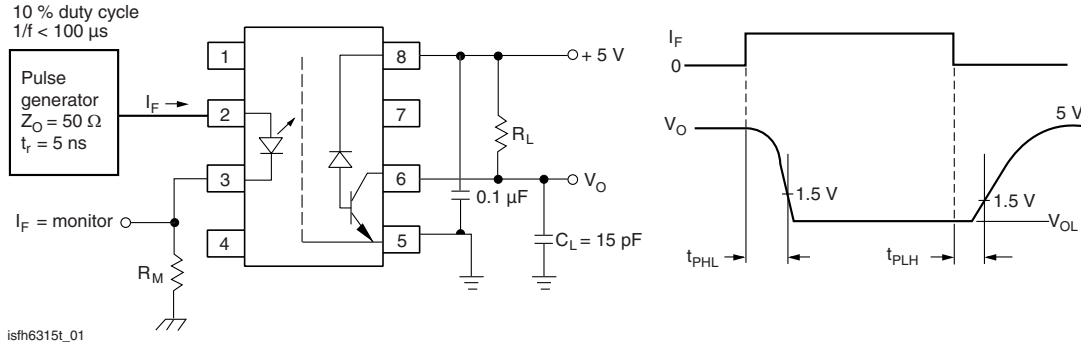


Fig. 1 - Test Circuit for Switching Times

| SWITCHING CHARACTERISTICS | | | | | | | |
|---|----------------------------|----------|-----------------|------|------|------|---------------|
| PARAMETER | TEST CONDITION | PART | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| Propagation delay time to logic low at output (see fig. 1) | $R_L = 4.1\text{ K}\Omega$ | SFH6315T | $t_{PHL}^{(1)}$ | | 0.5 | 1.5 | μs |
| | | SFH6315T | t_{PHL} | | 0.5 | 2 | μs |
| | $R_L = 1.9\text{ K}\Omega$ | SFH6316T | t_{PHL} | | 0.25 | 0.8 | μs |
| | | SFH6343T | t_{PHL} | | 0.25 | 1 | μs |
| Propagation delay time to logic high at output (see fig. 1) | $R_L = 4.1\text{ K}\Omega$ | SFH6315T | $t_{PLH}^{(1)}$ | | 0.5 | 1.5 | μs |
| | | SFH6315T | t_{PLH} | | 0.5 | 2 | μs |
| | $R_L = 1.9\text{ K}\Omega$ | SFH6316T | t_{PLH} | | 0.5 | 0.8 | μs |
| | | SFH6343T | t_{PLH} | | 0.5 | 1 | μs |

Notes

- Over recommended temperature ($T_{amb} = 0\text{ }^{\circ}\text{C}$ to $70\text{ }^{\circ}\text{C}$), $V_{CC} = 5\text{ V}$, $I_F = 16\text{ mA}$ unless otherwise specified. The 1.9 kW load represents 1 TTL unit load of 1.6 mA and the 5.6 kW pull-up resistor. The 4.1 kW load represents 1 LSTTL unit load of 0.36 mA and the 6.1 kW pull-up resistor.

⁽¹⁾ $T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified.

SFH6315T, SFH6316T, SFH6343T



Vishay Semiconductors High Speed Optocoupler, 1 MBd,
Transistor Output

| COMMON MODE TRANSIENT IMMUNITY | | | | | | | |
|--|--|----------|----------|------|------|------|-------------|
| PARAMETER | TEST CONDITION | PART | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| Common mode transient immunity at logic high level output (see fig. 2) | $R_L = 4.1\text{ k}\Omega$, $I_F = 0\text{ mA}$, $V_{CM} = 10\text{ V}_{P-P}$ | SFH6315T | $ CM_H $ | | 1 | | kV/ μ s |
| | $R_L = 1.9\text{ k}\Omega$, $I_F = 0\text{ mA}$, $V_{CM} = 1500\text{ V}_{P-P}$ | SFH6316T | $ CM_H $ | | 1 | | kV/ μ s |
| | | SFH6343T | $ CM_H $ | 15 | 30 | | kV/ μ s |
| Common mode transient immunity at logic low level output (see fig. 2) | $R_L = 4.1\text{ k}\Omega$, $I_F = 16\text{ mA}$, $V_{CM} = 10\text{ V}_{P-P}$ | SFH6315T | $ CM_L $ | | 1 | | kV/ μ s |
| | $R_L = 1.9\text{ k}\Omega$, $I_F = 16\text{ mA}$, $V_{CM} = 10\text{ V}_{P-P}$ | SFH6316T | $ CM_L $ | | 1 | | kV/ μ s |
| | | SFH6343T | $ CM_L $ | 15 | 30 | | kV/ μ s |

Note

- Common mode transient immunity in a logic high level is the maximum tolerable (positive) dV_{CM}/dt on the leading edge of the common mode pulse (V_{CM}) to assure that the output will remain in a logic high state (i.e., $V_O > 2\text{ V}$). Common mode transient immunity in a logic low level is the maximum tolerable (negative) dV_{CM}/dt on the trailing edge of the common mode pulse signal (V_{CM}) to assure that the output will remain in a logic low state, i.e., $V_O > 0.8\text{ V}$.
The 1.9 k Ω load represents 1 TTL unit load of 1.6 mA and the 5.6 k Ω pull-up resistor.
The 4.1 k Ω load represents 1 LSTTL unit load of 0.36 mA and the 6.1 k Ω pull-up resistor.

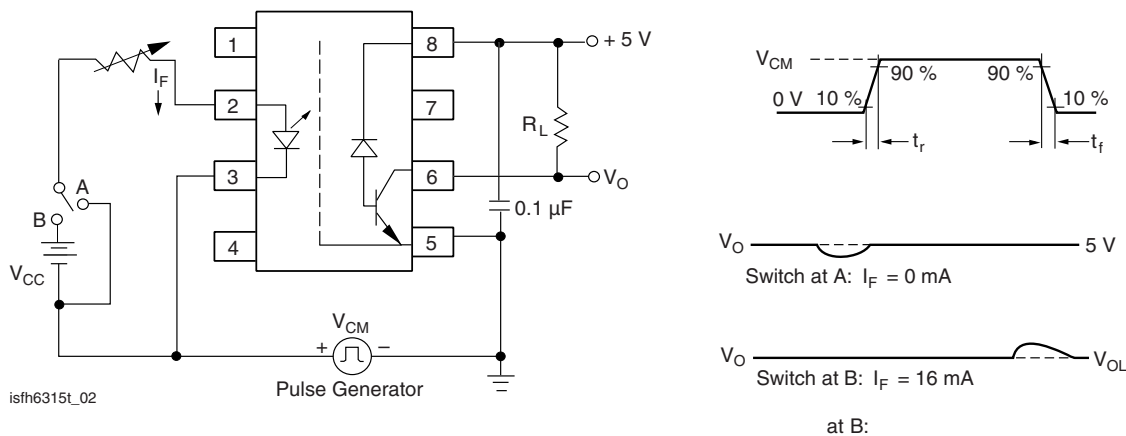


Fig. 2 - Test Circuit for Transient Immunity and Typical Waveforms

| SAFETY AND INSULATION RATINGS | | | | | | | |
|--|----------------|--------|------|-----------|------|--------------|--|
| PARAMETER | TEST CONDITION | SYMBOL | MIN. | TYP. | MAX. | UNIT | |
| Climatic Classification (according to IEC 68 part 1) | | | | 55/100/21 | | | |
| Comparative Tracking Index | | CTI | 175 | | 399 | | |
| V_{IOTM} | | | 6000 | | | V | |
| V_{IORM} | | | 560 | | | V | |
| P_{SO} | | | | | 350 | mW | |
| I_{SI} | | | | | 150 | mA | |
| T_{SI} | | | | | 165 | $^{\circ}$ C | |
| Creepage distance | | | 4 | | | mm | |
| Clearance distance | | | 4 | | | mm | |
| Insulation thickness | | | 0.2 | | | mm | |

Note

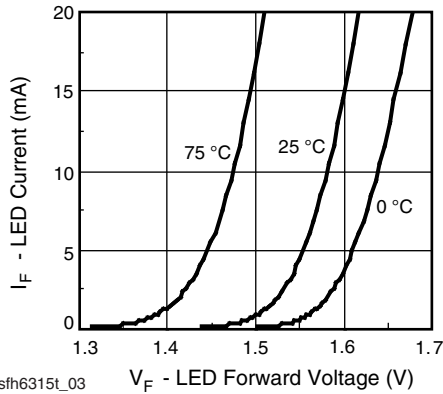
- As per IEC 60747-5-5, §7.4.3.8.1, this optocoupler is suitable for "safe electrical insulation" only within the safety ratings. Compliance with the safety ratings shall be ensured by means of protective circuits.



SFH6315T, SFH6316T, SFH6343T

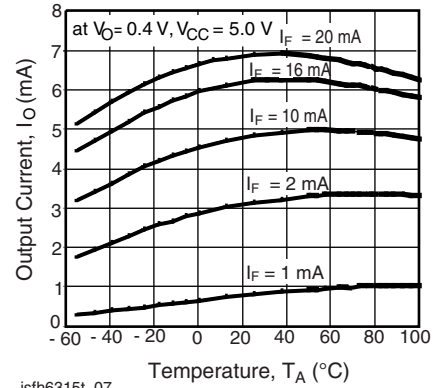
High Speed Optocoupler, 1 MBd, Vishay Semiconductors
Transistor Output

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



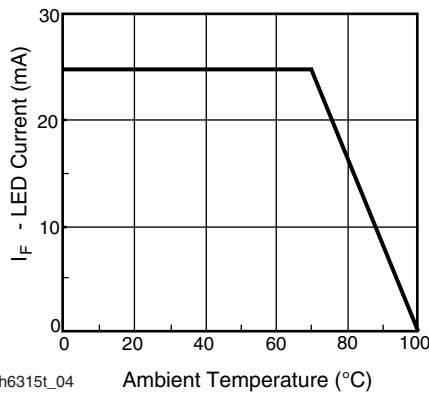
isfh6315t_03

Fig. 3 - LED Forward Current vs. Forward Voltage



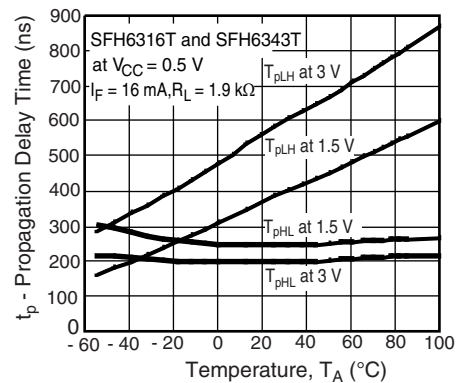
isfh6315t_07

Fig. 6 - Output Current vs. Temperature



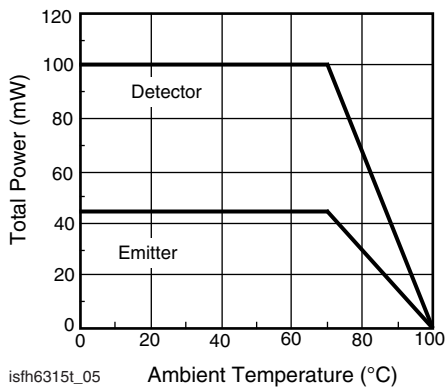
isfh6315t_04

Fig. 4 - Permissible Forward LED Current vs. Temperature



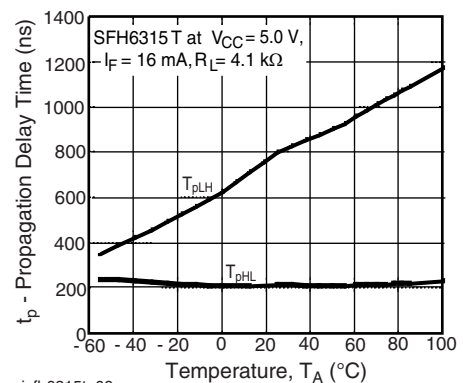
isfh6315t_08

Fig. 7 - Propagation Delay vs. Temperature SFH6316T and SFH6343T



isfh6315t_05

Fig. 5 - Permissible Power Dissipation vs. Temperature



isfh6315t_09

Fig. 8 - Propagation Delay vs. Temperature SFH6315T

SFH6315T, SFH6316T, SFH6343T



Vishay Semiconductors High Speed Optocoupler, 1 MBd,
Transistor Output

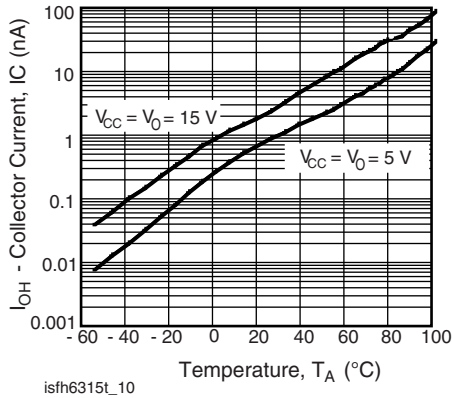


Fig. 9 - Logic High Output Current vs. Temperature

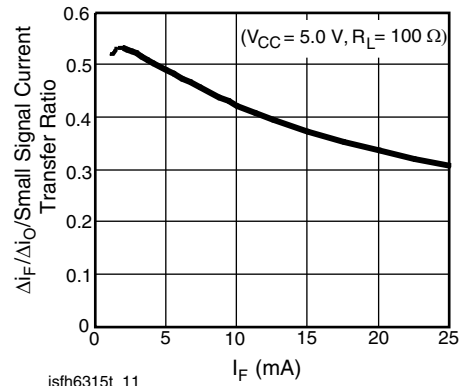
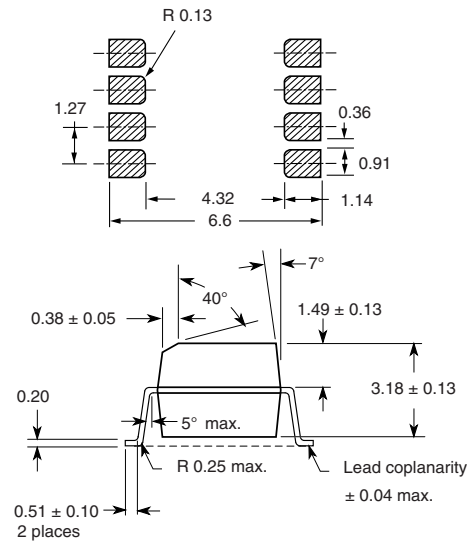
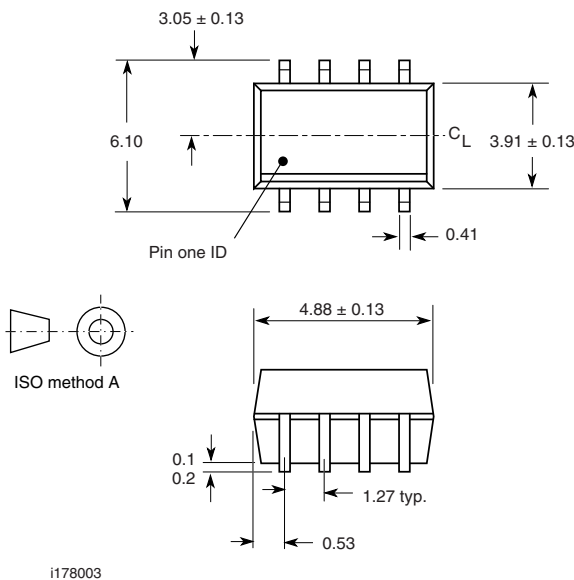
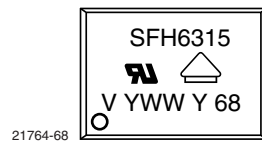


Fig. 10 - Small Signal Current Transfer Ratio vs. Input Current

PACKAGE DIMENSIONS in millimeters



PACKAGE MARKING





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