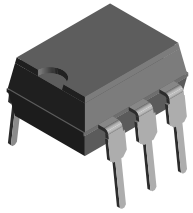
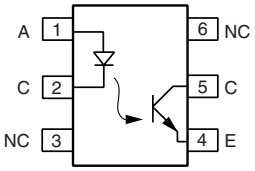
# Optocoupler, Phototransistor Output, no Base Connection






18216

## FEATURES

- Isolation test voltage, 5300 $V_{RMS}$
- No base terminal connection for improved common mode interface immunity
- Long term stability
- Industry standard dual-in-line package
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

Pb-free

e3

RoHS COMPLIANT

## AGENCY APPROVALS

- UL1577, file no. E52744 system code H or J, double protection
- DIN EN 60747-5-5 (VDE 0884) available with option 1
- BSI IEC 60950; IEC 60065
- FIMKO

## DESCRIPTION

The CNY17F is an optocoupler consisting of a gallium arsenide infrared emitting diode optically coupled to a silicon planar phototransistor detector in a plastic plug-in DIP-6 package.

The coupling device is suitable for signal transmission between two electrically separated circuits. The potential difference between the circuits to be coupled is not allowed to exceed the maximum permissible reference voltages.

In contrast to the CNY17 series, the base terminal of the F type is not conected, resulting in a substantially improved common-mode interference immunity.

| ORDER INFORMATION | |
|---|---|
| **PART** | **REMARKS** |
| CNY17F-1 | CTR 40 % to 80 %, DIP-6 |
| CNY17F-2 | CTR 63 % to 125 %, DIP-6 |
| CNY17F-3 | CTR 100 % to 200 %, DIP-6 |
| CNY17F-4 | CTR 160 % to 320 %, DIP-6 |
| CNY17F-1X006 | CTR 40 % to 80 %, DIP-6 400 mil (option 6) |
| CNY17F-1X007 | CTR 40 % to 80 %, SMD-6 (option 7) |
| CNY17F-1X009 | CTR 40 % to 80 %, SMD-6 (option 9) |
| CNY17F-2X006 | CTR 63 % to 125 %, DIP-6 400 mil (option 6) |
| CNY17F-2X007 | CTR 63 % to 125 %, SMD-6 (option 7) |
| CNY17F-2X009 | CTR 63 % to 125 %, SMD-6 (option 9) |
| CNY17F-3X006 | CTR 100 % to 200 %, DIP-6 400 mil (option 6) |
| CNY17F-3X007 | CTR 100 % to 200 %, SMD-6 (option 7) |
| CNY17F-3X009 | CTR 100 % to 200 %, SMD-6 (option 9) |
| CNY17F-4X006 | CTR 160 % to 320 %, DIP-6 400 mil (option 6) |
| CNY17F-4X007 | CTR 160 % to 320 %, SMD-6 (option 7) |
| CNY17F-4X009 | CTR 160 % to 320 %, SMD-6 (option 9) |

**Note**

For additional information on the available options refer to option information.

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
|---|---|---|---|---|
| **INPUT** | | | | |
| Reverse voltage | | $V_R$ | 6 | V |
| DC forward current | | $I_F$ | 60 | mA |
| Surge forward current | t ≤ 10 µs | $I_{FSM}$ | 2.5 | A |
| Power dissipation | | $P_{diss}$ | 100 | mW |
| **OUTPUT** | | | | |
| Collector emitter breakdown voltage | | $BV_{CEO}$ | 70 | V |
| Collector current | | $I_C$ | 50 | mA |
| | t ≤ 1 ms | $I_C$ | 100 | mA |
| Total power dissipation | | $P_{diss}$ | 150 | mW |
| **COUPLER** | | | | |
| Isolation test voltage between emitter and detector | | $V_{ISO}$ | 5300 | $V_{RMS}$ |
| Creepage distance | | | ≥ 7 | mm |
| Clearance distance | | | ≥ 7 | mm |
| Isolation thickness between emitter and detector | | | ≥ 0.4 | mm |
| Comparative tracking index per DIN IEC 112/VDE 0303, part 1 | | | 175 | |
| Isolation resistance | $V_{IO}$ = 500 V | $R_{IO}$ | ≥ $10^{11}$ | Ω |
| Storage temperature range | | $T_{stg}$ | - 55 to + 150 | °C |
| Ambient temperature range | | $T_{amb}$ | - 55 to + 100 | °C |
| Junction temperature | | $T_j$ | 100 | °C |
| Soldering temperature | max. 10 s, dip soldering: distance to seating plane ≥ 1.5 mm | $T_{sld}$ | 260 | °C |

**Note**

$T_{amb}$ = 25 °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 ratings for extended periods of the time can adversely affect reliability.

## ELECTRICAL CHARACTERISTCS

| PARAMETER | TEST CONDITION | PART | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|
| **INPUT** | | | | | | | |
| Forward voltage | $I_F$ = 60 mA | | $V_F$ | | 1.25 | 1.65 | V |
| Breakdown voltage | $I_R$ = 10 µA | | $V_{BR}$ | 6 | | | V |
| Reverse current | $V_R$ = 6 V | | $I_R$ | | 0.01 | 10 | µA |
| Capacitance | $V_R$ = 0 V, f = 1 MHz | | $C_O$ | | 25 | | pF |
| Thermal resistance | | | $R_{th}$ | | 750 | | K/W |
| **OUTPUT** | | | | | | | |
| Collector emitter capacitance | $V_{CE}$ = 5 V, f = 1 MHz | | $C_{CE}$ | | 5.2 | | pF |
| Base collector capacitance | $V_{CE}$ = 5 V, f = 1 MHz | | $C_{BC}$ | | 6.5 | | pF |
| Emitter base capacitance | $V_{CE}$ = 5 V, f = 1 MHz | | $C_{EB}$ | | 7.5 | | pF |
| Thermal resistance | | | $R_{th}$ | | 500 | | K/W |
| **COUPLER** | | | | | | | |
| Collector emitter, saturation voltage | $I_F$ = 10 mA, $I_C$ = 2.5 mA | | $V_{CEsat}$ | | 0.25 | 0.4 | V |
| Coupling capacitance | | | $C_C$ | | 0.6 | | pF |
| Collector emitter, leakage current | $V_{CE}$ = 10 V | CNY17F-1 | $I_{CEO}$ | | 2 | 50 | nA |
| | | CNY17F-2 | $I_{CEO}$ | | 2 | 50 | nA |
| | | CNY17F-3 | $I_{CEO}$ | | 5 | 100 | nA |
| | | CNY17F-4 | $I_{CEO}$ | | 5 | 100 | nA |

**Note**

$T_{amb}$ = 25 °C, unless otherwise specified.
Minimum and maximum values were tested requierements. Typical values are characteristics of the device and are the result of engineering evaluations. 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** |
| Current transfer ratio | $I_F$ = 10 mA | CNY17F-1 | CTR | 40 | | 80 | % |
| | | CNY17F-2 | CTR | 63 | | 125 | % |
| | | CNY17F-3 | CTR | 100 | | 200 | % |
| | | CNY17F-4 | CTR | 160 | | 320 | % |
| | $I_F$ = 1.0 mA | CNY17F-1 | CTR | 13 | 30 | | % |
| | | CNY17F-2 | CTR | 22 | 45 | | % |
| | | CNY17F-3 | CTR | 34 | 70 | | % |
| | | CNY17F-4 | CTR | 56 | 90 | | % |

**Note**

Current transfer ratio $I_C/I_F$ at $V_{CE}$ = 5.0 V, 25 °C and collector emitter leakage current by dash number.

| SWITCHING CHARACTERISTICS | | | | | | | |
|---|---|---|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **PART** | **SYMBOL** | **MIN.** | **TYP.** | **MAX.** | **UNIT** |
| **LINEAR OPERATION** (without saturation) | | | | | | | |
| Turn-on time | $I_F$ = 10 mA, $V_{CC}$ = 5 V, $R_L$ = 75 Ω | | $t_{on}$ | | 3 | | µs |
| Rise time | $I_F$ = 10 mA, $V_{CC}$ = 5 V, $R_L$ = 75 Ω | | $t_r$ | | 2 | | µs |
| Turn-off time | $I_F$ = 10 mA, $V_{CC}$ = 5 V, $R_L$ = 75 Ω | | $t_{off}$ | | 2.3 | | µs |
| Fall time | $I_F$ = 10 mA, $V_{CC}$ = 5 V, $R_L$ = 75 Ω | | $t_f$ | | 2 | | µs |
| Cut-off frequency | $I_F$ = 10 mA, $V_{CC}$ = 5 V, $R_L$ = 75 Ω | | $f_{CO}$ | | 250 | | kHz |
| **SWITCHING OPERATION** (with saturation) | | | | | | | |
| Turn-on time | $I_F$ = 20 mA | CNY17F-1 | $t_{on}$ | | 3 | | µs |
| | $I_F$ = 10 mA | CNY17F-2 | $t_{on}$ | | 4.2 | | µs |
| | | CNY17F-3 | $t_{on}$ | | 4.2 | | µs |
| | $I_F$ = 5 mA | CNY17F-4 | $t_{on}$ | | 6 | | µs |
| Rise time | $I_F$ = 20 mA | CNY17F-1 | $t_r$ | | 2 | | µs |
| | $I_F$ = 10 mA | CNY17F-2 | $t_r$ | | 3 | | µs |
| | | CNY17F-3 | $t_r$ | | 3 | | µs |
| | $I_F$ = 5 mA | CNY17F-4 | $t_r$ | | 4.6 | | µs |
| Turn-off time | $I_F$ = 20 mA | CNY17F-1 | $t_{off}$ | | 18 | | µs |
| | $I_F$ = 10 mA | CNY17F-2 | $t_{off}$ | | 23 | | µs |
| | | CNY17F-3 | $t_{off}$ | | 23 | | µs |
| | $I_F$ = 5 mA | CNY17F-4 | $t_{off}$ | | 25 | | µs |
| Fall time | $I_F$ = 20 mA | CNY17F-1 | $t_f$ | | 11 | | µs |
| | $I_F$ = 10 mA | CNY17F-2 | $t_f$ | | 14 | | µs |
| | | CNY17F-3 | $t_f$ | | 14 | | µs |
| | $I_F$ = 5 mA | CNY17F-4 | $t_f$ | | 15 | | µs |

## TYPICAL CHARACTERISTICS

$T_{amb}$ = 25 °C, unless otherwise specified

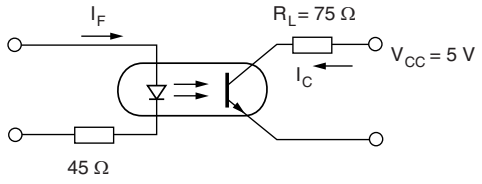



Fig. 1 - Linear Operation (without Saturation)

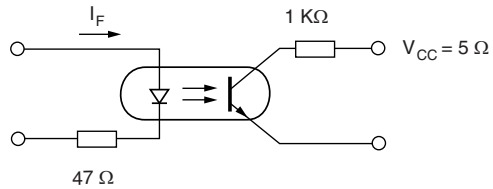



Fig. 2 - Switching Operation (with Saturation)

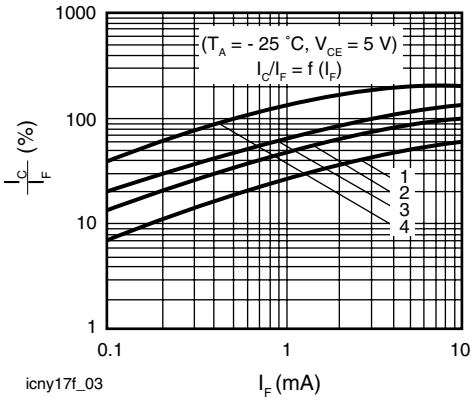



Fig. 3 - Current Transfer Ratio vs. Diode Current

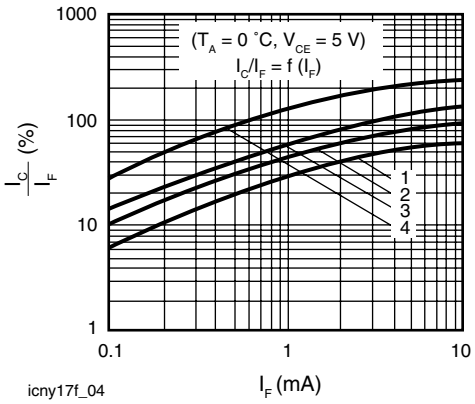



Fig. 4 - Current Transfer Ratio vs. Diode Current

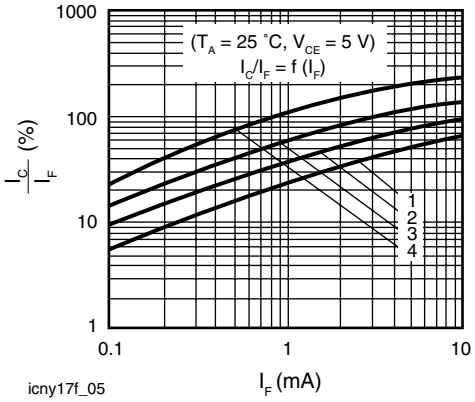



Fig. 5 - Current Transfer Ratio vs. Diode Current

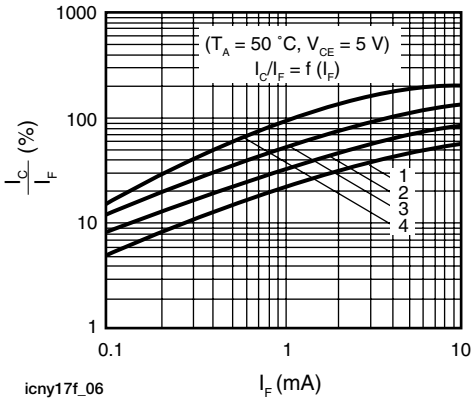



Fig. 6 - Current Transfer Ratio vs. Diode Current

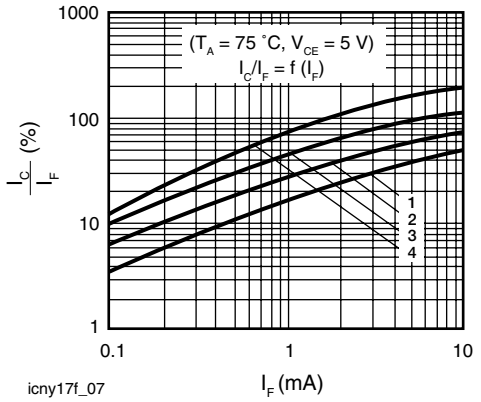



Fig. 7 - Current Transfer Ratio vs. Diode Current

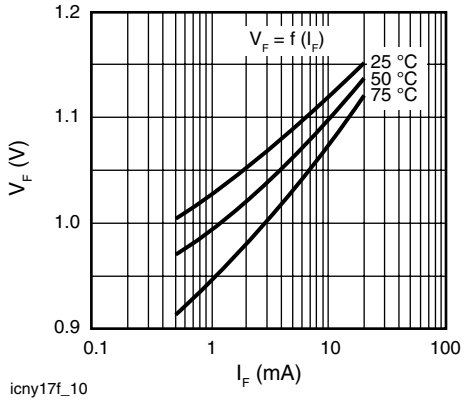



Fig. 10 - Forward Voltage

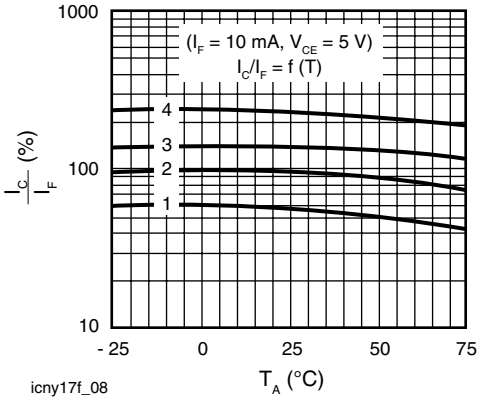



Fig. 8 - Current Transfer Ratio (CTR) vs. Temperature

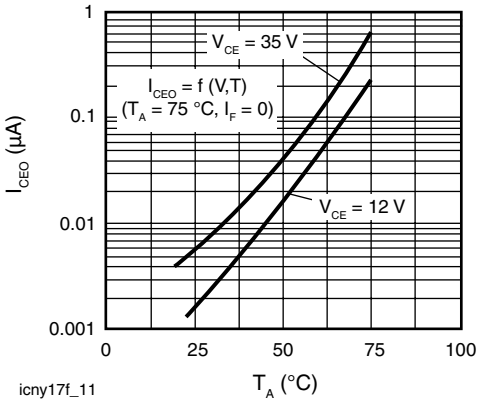



Fig. 11 - Collector Emitter Off-state Current

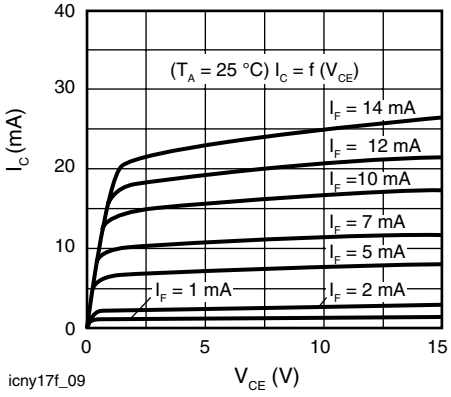



Fig. 9 - Output Characteristics CNY17F-2, -3

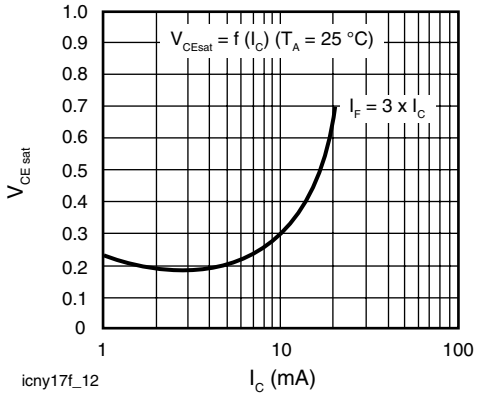



Fig. 12 - Saturation Voltage vs. Collector Current and Modulation Depth CNY17F-1

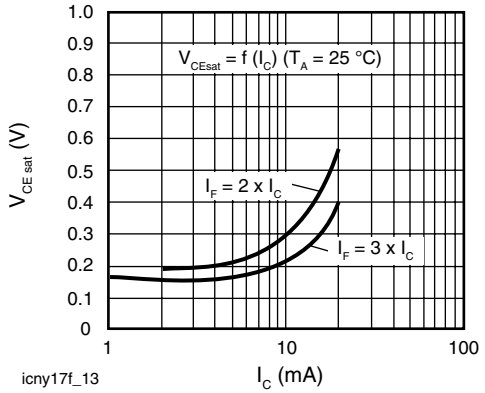



Fig. 13 - Saturation Voltage vs. Collector Current and Modulation Depth CNY17F-2

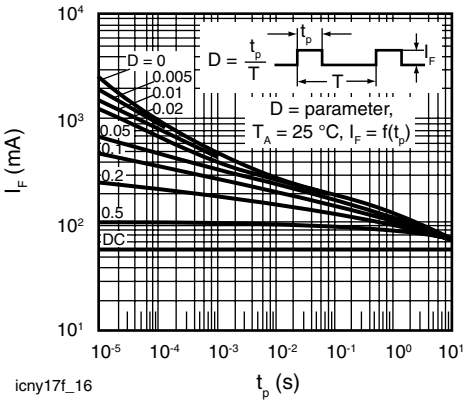



Fig. 16 - Permissible Pulse Load

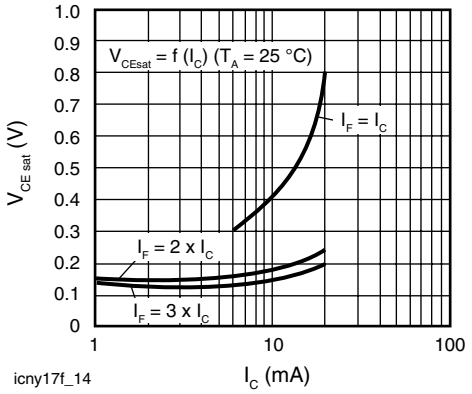



Fig. 14 - Saturation Voltage vs. Collector Current and Modulation Depth CNY17F-3

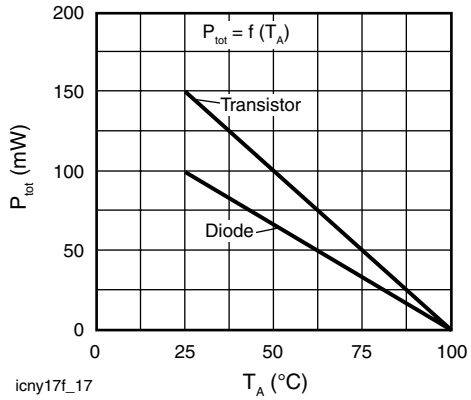



Fig. 17 - Permissible Power Dissipation for Transistor and Diode

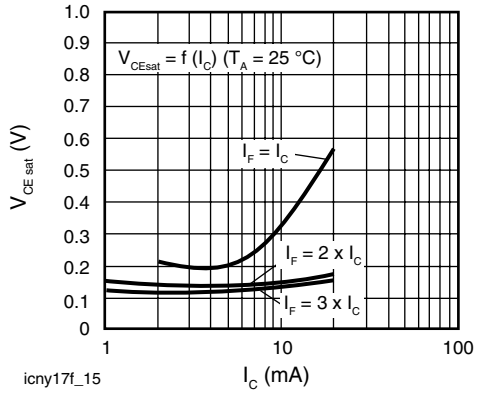



Fig. 15 - Saturation Voltage vs. Collector Current and Modulation Depth CNY17F-4

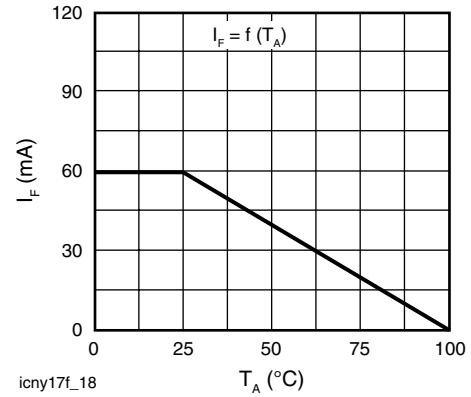



Fig. 18 - Permissible Forward Current Diode

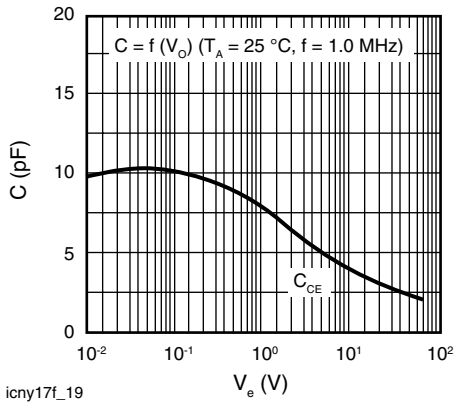
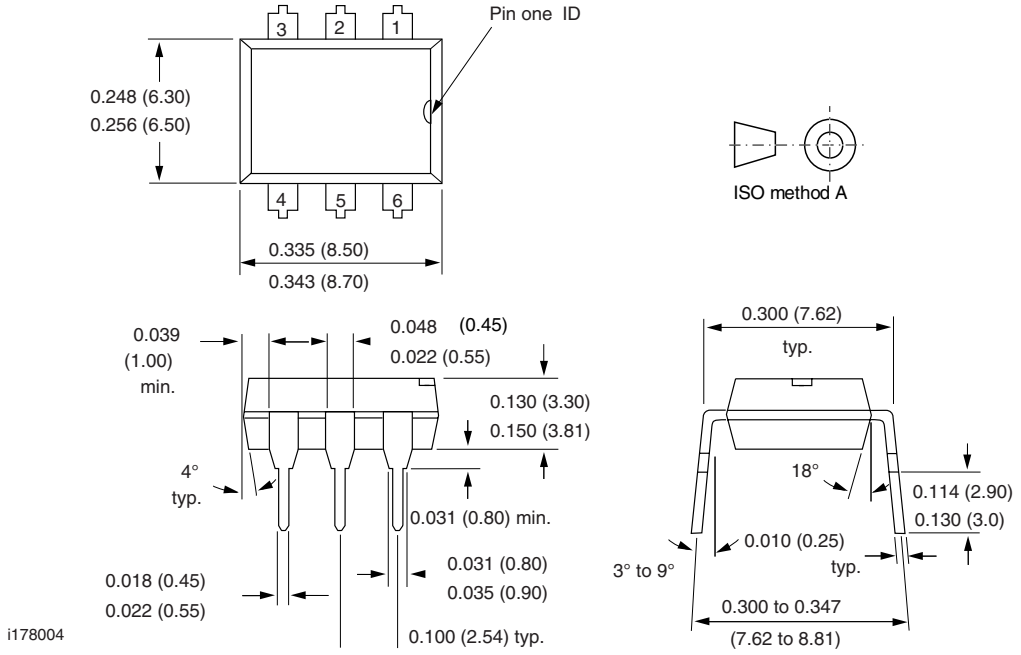
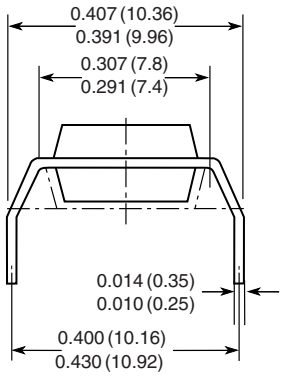



Fig. 19 - Transistor Capacitance

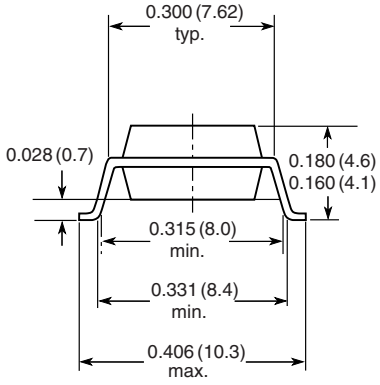
**PACKAGE DIMENSIONS** in inches (millimeters)



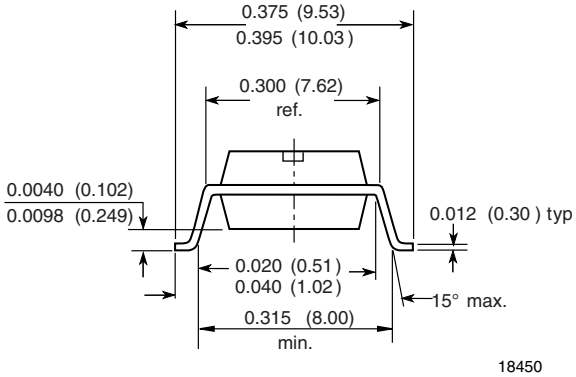
**Option 6**




**Option 7**




**Option 9**



## 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.



Vishay Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany

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