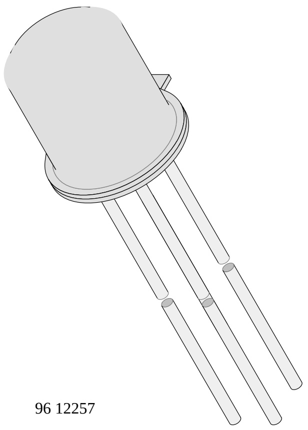
# Optocoupler with Phototransistor Output

## Description

The CNY18 consists of a phototransistor optically coupled to a gallium arsenide infrared emitting diode in a hermetically-sealed 4 lead TO72 metal can package for high reliability requirements.



## Applications

Galvanically separated circuits.

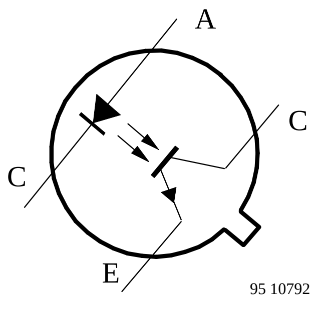
## Features

- Hermetically-sealed case
- DC isolation test voltage: 500 V
- Low coupling capacity
- **C**urrent **T**ransfer **R**atio, CTR selected in groups
- Low temperature coefficient of the CTR

## Order Schematic

| Part Numbers | CTR-Ranking |
|---|---|
| CNY18III | 25 to 50% |
| CNY18IV | 40 to 80% |
| CNY18V | 60 to 120% |

## Pin Connection



## Absolute Maximum Ratings

### Input (Emitter)

| Parameters | Test Conditions | Symbol | Value | Unit |
|---|---|---|---|---|
| Reserve voltage | | $V_R$ | 3 | V |
| Forward current | | $I_F$ | 60 | mA |
| Forward surge current | $t_p \leq 10$ µs | $I_{FSM}$ | 1.5 | A |
| Power dissipation | $T_{amb} \leq 25$°C | $P_V$ | 100 | mW |
| Junction temperature | | $T_j$ | 125 | °C |

### Output (Detector)

| Parameters | Test Conditions | Symbol | Value | Unit |
|---|---|---|---|---|
| Collector emitter voltage | | $V_{CEO}$ | 32 | V |
| Emitter collector voltage | | $V_{ECO}$ | 5 | V |
| Collector current | | $I_C$ | 100 | mA |
| Power dissipation | $T_{amb} \leq 25$°C | $P_V$ | 150 | mW |
| Junction temperature | | $T_j$ | 125 | °C |

### Coupler

| Parameters | Test Conditions | Symbol | Value | Unit |
|---|---|---|---|---|
| DC isolation test voltage | | $V_{IO}$ 1) | 500 | V |
| Total power dissipation | $T_{amb} \leq 25$°C | $P_{tot}$ | 250 | mW |
| Ambient temperature range | | $T_{amb}$ | –55 to +100 | °C |
| Storage temperature range | | $T_{stg}$ | –55 to +125 | °C |
| Soldering temperature | 2 mm from case, t ≤ 10 s | $T_{sd}$ | 260 | °C |

1) Related to standard climate 23/50 DIN 50 014

## Electrical Characteristics

$T_{amb}$ = 25°C

### Input (Emitter)

| Parameters | Test Conditions | Type | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| Forward voltage | $I_F$ = 60 mA | | $V_F$ | | 1.25 | 1.7 | V |
| Reserve current | $V_R$ = 3 V | | $I_R$ | | 0.35 | 10 | μA |

### Output (Detector)

| Parameters | Test Conditions | Type | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| Collector emitter breakdown voltage | $I_C$ = 1 mA | | $V_{(BR)CEO}$ | 32 | | | V |
| Collector dark current | $V_{CE}$ = 10 V, $I_F$ = 0, E = 0 | | $I_{CEO}$ | | 2 | | nA |
| Collector emitter capacitance | f = 1 MHz<br>$V_{CE}$ = 0<br>$V_{CE}$ = 10 V<br>$V_{CE}$ = 30 V | | <br>$C_{CEO}$<br>$C_{CEO}$<br>$C_{CEO}$ | | <br>7<br>3.5<br>2.5 | | <br>pF<br>pF<br>pF |

### Coupler

| Parameters | Test Conditions | Type | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| DC isolation test voltage | t = 1 s | | $V_{IO}$ 1) | 500 | | | V |
| Isolation resistance | $V_{IO}$ = 500 V, 40% relative humidity | | $R_{IO}$ 1) | $10^{10}$ | | | Ω |
| $I_C/I_F$ | $V_{CE}$ = 5 V, $I_F$ = 10 mA | **Group III**<br>**IV**<br>**V** | CTR<br>CTR<br>CTR | 0.25<br>0.40<br>0.60 | | 0.50<br>0.80<br>1.2 | |
| Collector emitter saturation voltage | $I_C$ = 1 mA, $I_F$ = 10 mA | | $V_{CEsat}$ | | | 0.2 | V |
| Cut-off frequency | $V_{CE}$ = 5 V, $I_F$ = 10 mA, $R_L$ = 100 Ω | | $f_c$ | | 170 | | kHz |
| Coupling capacitances | f = 1 MHz | | | | | | |
| A and C short-cctd. | E and C short-cctd.<br>C (E earthed)<br>E (C earthed) | | $C_k$<br>$C_k$<br>$C_k$ | | 1.4<br>1.1<br>0.1 | | pF<br>pF<br>pF |

1) Related to standard climate 23/50 DIN 50014

## Switching Characteristics

$V_S = 5$ V

| Type | $R_L = 100\ \Omega$ (see figure 2) | | | | | | | $R_L = 1\ k\Omega$ (see figure 3) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $t_d$[µs] | $t_r$[µs] | $t_{on}$[µs] | $t_s$[µs] | $t_f$[µs] | $t_{off}$[µs] | $I_C$[mA] | $t_{on}$[µs] | $t_{off}$[µs] | $I_F$[mA] |
| CNY18 | 2.6 | 2.4 | 5.0 | 0.3 | 2.7 | 30 | 5 | 11 | 13.5 | 20 |

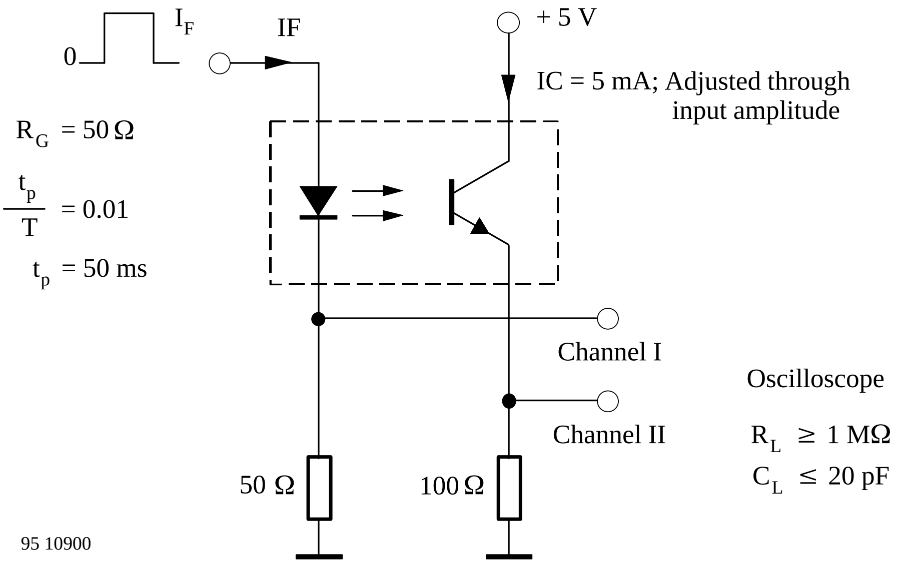


Figure 1. Test circuit, non-saturated operation

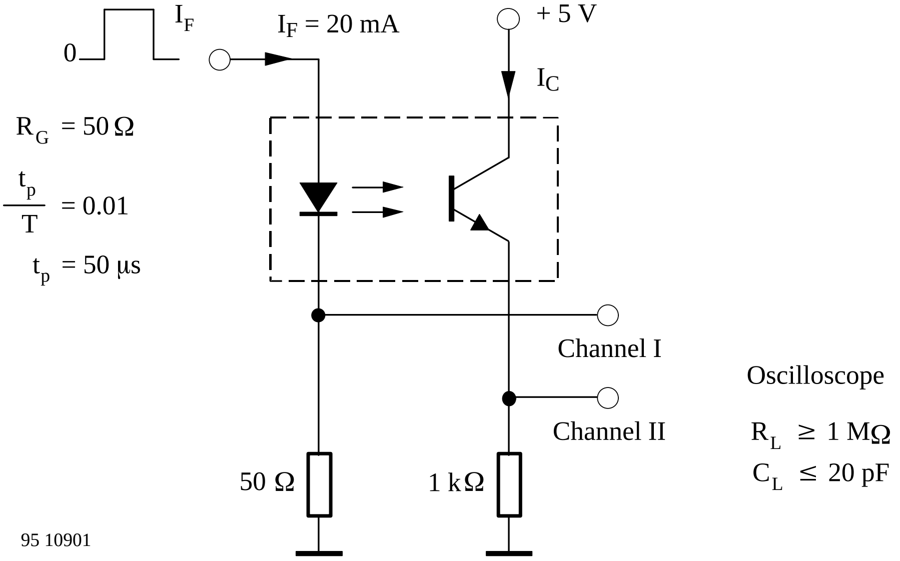


Figure 2. Test circuit, saturated operation

## Typical Characteristics ($T_{amb}$ = 25°C, unless otherwise specified)

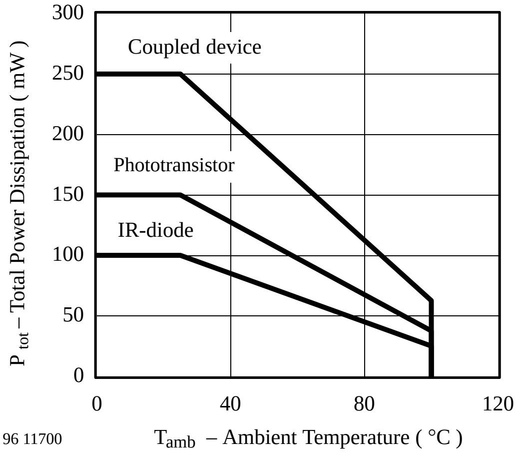


Figure 3. Total Power Dissipation vs. Ambient Temperature

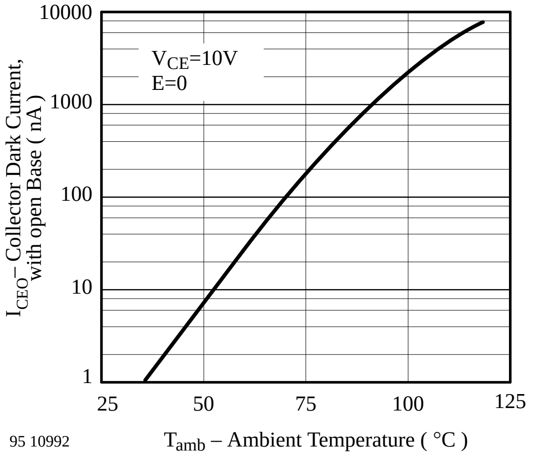


Figure 6. Collector Dark Current vs. Ambient Temperature

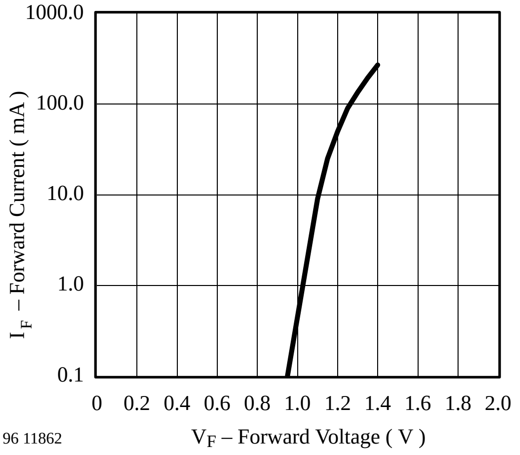


Figure 4. Forward Current vs. Forward Voltage

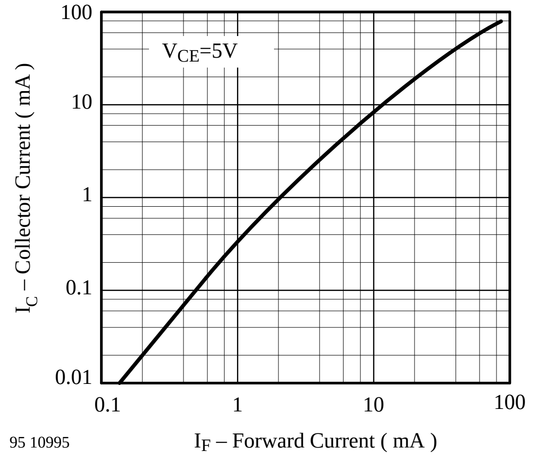


Figure 7. Collector Current vs. Forward Current

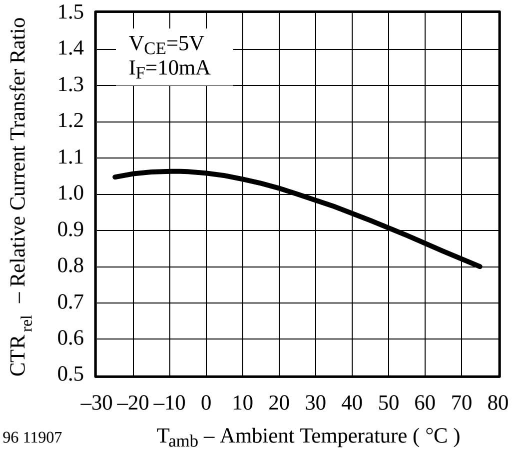


Figure 5. Rel. Current Transfer Ratio vs. Ambient Temperature

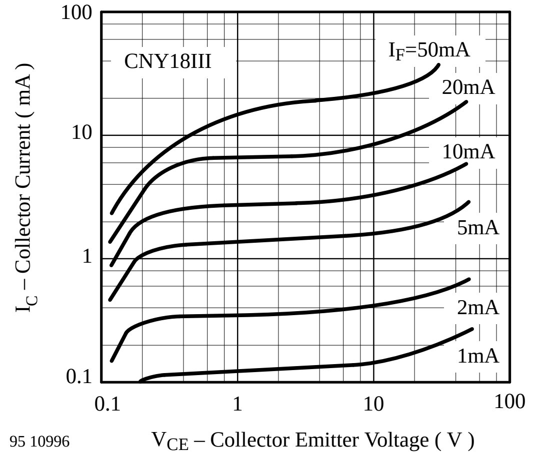


Figure 8. Collector Current vs. Collector Emitter Voltage

## **Typical Characteristics** ($T_{amb}$ = 25°C, unless otherwise specified)

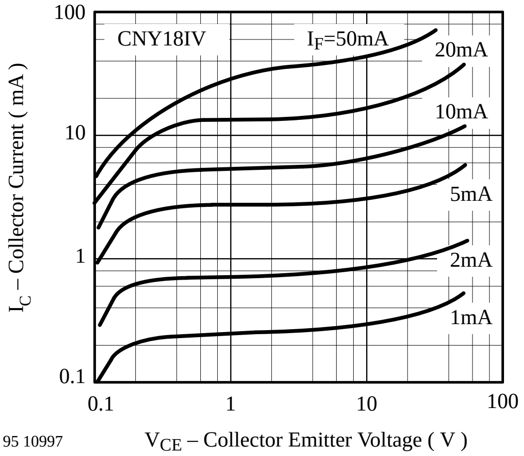


Figure 9. Collector Current vs. Collector Emitter Voltage

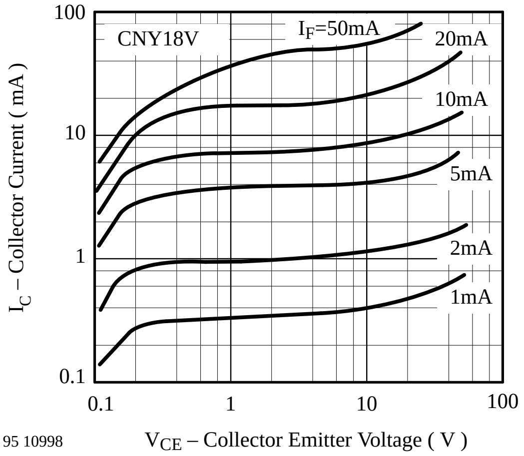


Figure 10. Collector Current vs. Collector Emitter Voltage

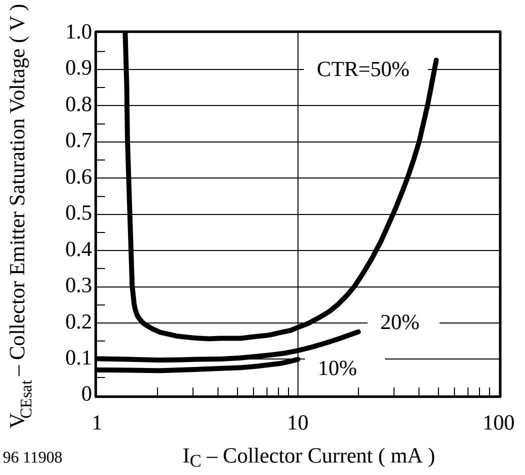


Figure 11. Collector Emitter Sat. Voltage vs. Collector Current

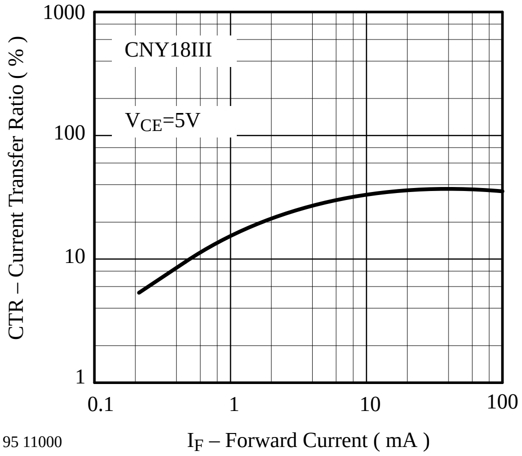


Figure 12. Current Transfer Ratio vs. Forward Current

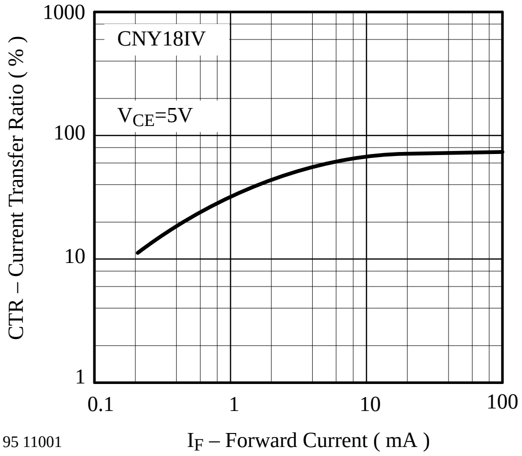


Figure 13. Current Transfer Ratio vs. Forward Current

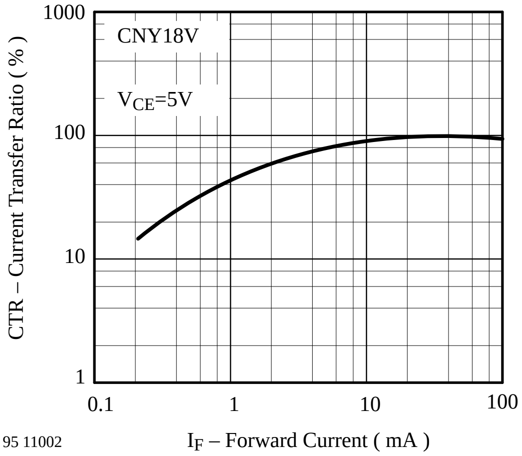


Figure 14. Current Transfer Ratio vs. Forward Current

## Typical Characteristics ($T_{amb}$ = 25°C, unless otherwise specified)

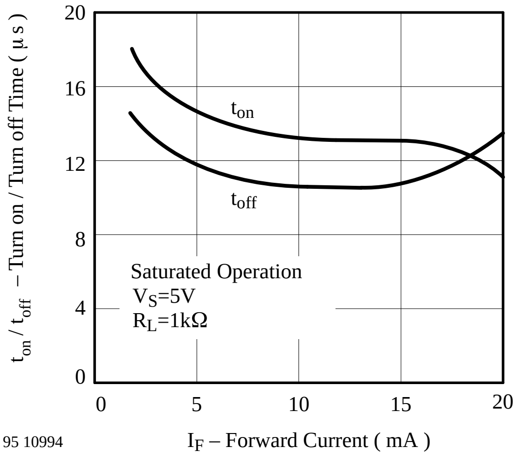


Figure 15. Turn on / off Time vs. Forward Current

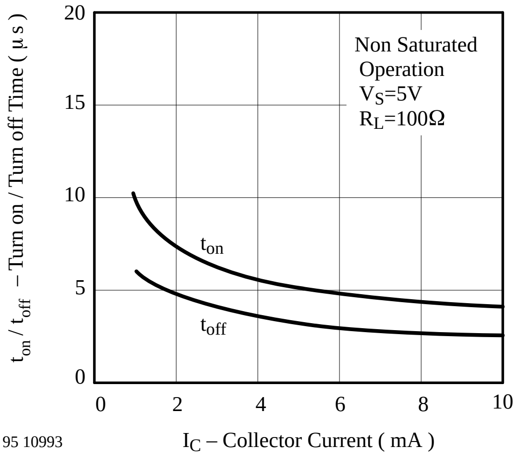
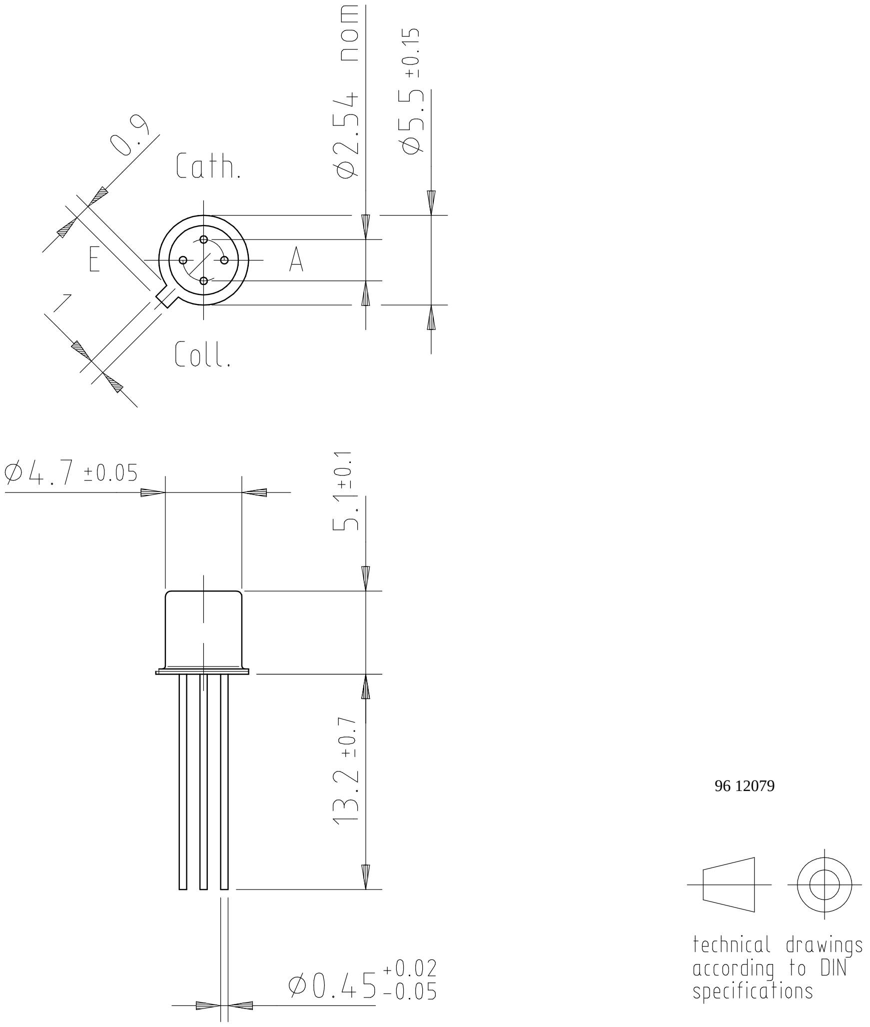


Figure 16. Turn on / off Time vs. Collector Current

## Dimensions in mm



## Ozone Depleting Substances Policy Statement

It is the policy of **TEMIC TELEFUNKEN microelectronic 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.

**TEMIC TELEFUNKEN microelectronic GmbH** semiconductor division 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.

**TEMIC** can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

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