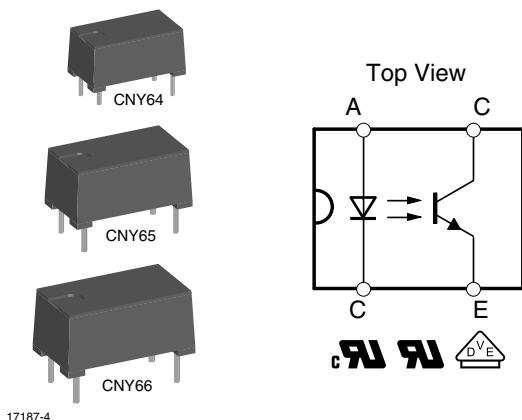


## Optocoupler, Phototransistor Output, Very High Isolation Voltage



### LINKS TO ADDITIONAL RESOURCES



3D Models



Models



Related Documents



Footprints

### DESCRIPTION

The CNY64, CNY65, and CNY66 consist of a phototransistor optically coupled to a gallium arsenide infrared-emitting diode in a 4 pin plastic package.

The single components are mounted opposite one another, providing a distance between input and output for highest safety requirements of > 3 mm.

### APPLICATIONS

Circuits for safe protective separation against electrical shock according to safety class II (reinforced isolation):

- for appl. class I to IV at mains voltage ≤ 300 V
- for appl. class I to IV at mains voltage ≤ 600 V
- for appl. class I to III at mains voltage ≤ 1000 V according to DIN EN 60747-5-5 (VDE 0884-5), suitable for:
  - Switch-mode power supplies
  - Line receiver
  - Computer peripheral interface
  - Microprocessor system interface

### FEATURES

- Rated recurring peak voltage (repetitive)  $V_{ORM} = 1800 V_{peak}$
- Thickness through insulation ≥ 3 mm
- Creepage current resistance according to VDE 0303 / IEC 60112 comparative tracking index: **CTI** ≥ 200
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

### VDE STANDARDS

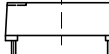
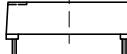
These couplers perform safety functions according to the following equipment standards:

- **DIN EN 60747-5-5 (VDE 0884-5)**  
Optocoupler for electrical safety requirements
- **IEC 60950/EN 60950**  
Office machines
- **VDE 0804**  
Telecommunication apparatus and data processing
- **IEC 60065**  
Safety for mains-operated electronic and related household apparatus
- **VDE 0700/IEC 60335**  
Household equipment
- **VDE 0160**  
Electronic equipment for electrical power installation
- **VDE 0750/IEC60601**  
Medical equipment

### AGENCY APPROVALS

- [UL1577](#)
- [cUL1577](#)
- [DIN EN 60747-5-5 \(VDE 0884-5\)](#)
- [CQC](#)

### ORDERING INFORMATION

|                                                             |  |  |  |                         |                         |                                                                                                              |                                                                                                               |                                                                                                               |
|-------------------------------------------------------------|--|--|--|-------------------------|-------------------------|--------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| <div><div>C</div><div>N</div><div>Y</div><div>6</div></div> |  |  |  | <div><div>#</div></div> | <div><div>x</div></div> | <div>DIP, 400 mil</div>  | <div>DIP, 600 mil</div>  | <div>DIP, 700 mil</div>  |
| PART NUMBER                                                 |  |  |  | PACKAGE<br>OPTION       | CTR<br>BIN              |                                                                                                              |                                                                                                               |                                                                                                               |
| AGENCY CERTIFIED / PACKAGE                                  |  |  |  | CTR (%)                 |                         |                                                                                                              |                                                                                                               |                                                                                                               |
| UL, cUL, VDE                                                |  |  |  | 50 to 300               | 63 to 125               | 100 to 200                                                                                                   |                                                                                                               |                                                                                                               |
| DIP-4 HV, 400 mil, high isolation distance                  |  |  |  | CNY64                   | CNY64A                  | CNY64B                                                                                                       |                                                                                                               |                                                                                                               |
| DIP-4 HV, 600 mil, high isolation distance                  |  |  |  | CNY65                   | CNY65A                  | CNY65B                                                                                                       |                                                                                                               |                                                                                                               |
| DIP-4 HV, 700 mil, high isolation distance                  |  |  |  | CNY66                   | -                       | CNY66B                                                                                                       |                                                                                                               |                                                                                                               |



| <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                                                                                        |                                         | $V_R$      | 5           | V                  |
| Forward current                                                                                        |                                         | $I_F$      | 75          | mA                 |
| Forward surge current                                                                                  | $t_p \leq 10\text{ }\mu\text{s}$        | $I_{FSM}$  | 1.5         | A                  |
| Power dissipation                                                                                      |                                         | $P_{diss}$ | 120         | mW                 |
| Junction temperature                                                                                   |                                         | $T_J$      | 100         | $^{\circ}\text{C}$ |
| <b>OUTPUT</b>                                                                                          |                                         |            |             |                    |
| Collector emitter voltage                                                                              |                                         | $V_{CEO}$  | 32          | V                  |
| Emitter collector voltage                                                                              |                                         | $V_{ECO}$  | 7           | V                  |
| Collector current                                                                                      |                                         | $I_C$      | 50          | mA                 |
| Collector peak current                                                                                 | $t_p/T = 0.5$ , $t_p \leq 10\text{ ms}$ | $I_{CM}$   | 100         | mA                 |
| Power dissipation                                                                                      |                                         | $P_{diss}$ | 130         | mW                 |
| Junction temperature                                                                                   |                                         | $T_J$      | 100         | $^{\circ}\text{C}$ |
| <b>COUPLER</b>                                                                                         |                                         |            |             |                    |
| Total power dissipation                                                                                |                                         | $P_{tot}$  | 250         | mW                 |
| Ambient temperature range                                                                              |                                         | $T_{amb}$  | -55 to +85  | $^{\circ}\text{C}$ |
| Storage temperature range                                                                              |                                         | $T_{stg}$  | -55 to +100 | $^{\circ}\text{C}$ |
| Soldering temperature                                                                                  | 2 mm from case, $\leq 10\text{ s}$      | $T_{sld}$  | 260         | $^{\circ}\text{C}$ |

**Note**

- 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

| <b>ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                                                             |             |      |      |      |      |
|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|-------------|------|------|------|------|
| PARAMETER                                                                                                | TEST CONDITION                                                              | SYMBOL      | MIN. | TYP. | MAX. | UNIT |
| <b>input</b>                                                                                             |                                                                             |             |      |      |      |      |
| Forward voltage                                                                                          | $I_F = 50\text{ mA}$                                                        | $V_F$       | -    | 1.25 | 1.6  | V    |
| Junction capacitance                                                                                     | $V_R = 0$ , $f = 1\text{ MHz}$                                              | $C_j$       | -    | 50   |      | pF   |
| <b>output</b>                                                                                            |                                                                             |             |      |      |      |      |
| Collector emitter voltage                                                                                | $I_C = 1\text{ mA}$                                                         | $V_{CEO}$   | 32   | -    | -    | V    |
| Emitter collector voltage                                                                                | $I_E = 100\text{ }\mu\text{A}$                                              | $V_{ECO}$   | 7    | -    | -    | V    |
| Collector emitter leakage current                                                                        | $V_{CE} = 20\text{ V}$ , $I_F = 0\text{ A}$                                 | $I_{CEO}$   | -    | -    | 200  | nA   |
| <b>coupler</b>                                                                                           |                                                                             |             |      |      |      |      |
| Collector emitter saturation voltage                                                                     | $I_F = 10\text{ mA}$ , $I_C = 1\text{ mA}$                                  | $V_{CEsat}$ | -    | -    | 0.3  | V    |
| Cut-off frequency                                                                                        | $V_{CE} = 5\text{ V}$ , $I_F = 10\text{ mA}$ ,<br>$R_L = 100\text{ }\Omega$ | $f_c$       | -    | 110  | -    | kHz  |
| Coupling capacitance                                                                                     | $f = 1\text{ MHz}$                                                          | $C_k$       | -    | 0.3  | -    | 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** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

| PARAMETER | TEST CONDITION                               | PART                | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|-----------|----------------------------------------------|---------------------|--------|------|------|------|------|
| $I_C/I_F$ | $V_{CE} = 5\text{ V}$ , $I_F = 10\text{ mA}$ | CNY64, CNY65, CNY66 | CTR    | 50   | -    | 300  | %    |
|           |                                              | CNY64A              | CTR    | 63   | -    | 125  | %    |
|           |                                              | CNY65A              | CTR    | 63   | -    | 125  | %    |
|           |                                              | CNY64B              | CTR    | 100  | -    | 200  | %    |
|           |                                              | CNY65B              | CTR    | 100  | -    | 200  | %    |
|           |                                              | CNY66B              | CTR    | 100  | -    | 200  | %    |

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

| PARAMETER     | TEST CONDITION                                                                      | SYMBOL    | MIN. | TYP. | MAX. | UNIT          |
|---------------|-------------------------------------------------------------------------------------|-----------|------|------|------|---------------|
| Delay time    | $V_S = 5\text{ V}$ , $I_C = 5\text{ mA}$ , $R_L = 100\text{ }\Omega$ , (see Fig. 3) | $t_d$     | -    | 2.6  | -    | $\mu\text{s}$ |
| Rise time     | $V_S = 5\text{ V}$ , $I_C = 5\text{ mA}$ , $R_L = 100\text{ }\Omega$ , (see Fig. 3) | $t_r$     | -    | 2.4  | -    | $\mu\text{s}$ |
| Fall time     | $V_S = 5\text{ V}$ , $I_C = 5\text{ mA}$ , $R_L = 100\text{ }\Omega$ , (see Fig. 3) | $t_f$     | -    | 2.7  | -    | $\mu\text{s}$ |
| Storage time  | $V_S = 5\text{ V}$ , $I_C = 5\text{ mA}$ , $R_L = 100\text{ }\Omega$ , (see Fig. 3) | $t_s$     | -    | 0.3  | -    | $\mu\text{s}$ |
| Turn-on time  | $V_S = 5\text{ V}$ , $I_C = 5\text{ mA}$ , $R_L = 100\text{ }\Omega$ , (see Fig. 3) | $t_{on}$  | -    | 5    | -    | $\mu\text{s}$ |
| Turn-off time | $V_S = 5\text{ V}$ , $I_C = 5\text{ mA}$ , $R_L = 100\text{ }\Omega$ , (see Fig. 3) | $t_{off}$ | -    | 3    | -    | $\mu\text{s}$ |
| Turn-on time  | $V_S = 5\text{ V}$ , $I_F = 10\text{ mA}$ , $R_L = 1\text{ k}\Omega$ , (see Fig. 4) | $t_{on}$  | -    | 25   | -    | $\mu\text{s}$ |
| Turn-off time | $V_S = 5\text{ V}$ , $I_F = 10\text{ mA}$ , $R_L = 1\text{ k}\Omega$ , (see Fig. 4) | $t_{off}$ | -    | 42.5 | -    | $\mu\text{s}$ |

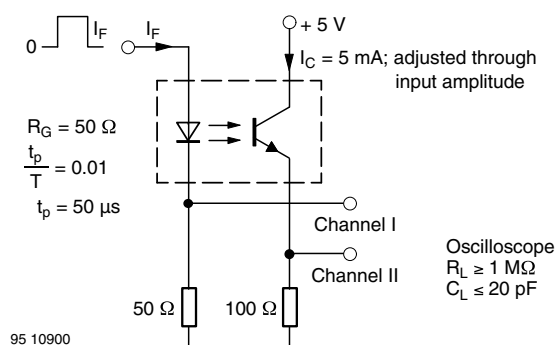


Fig. 1 - Test Circuit, Non-Saturated Operation

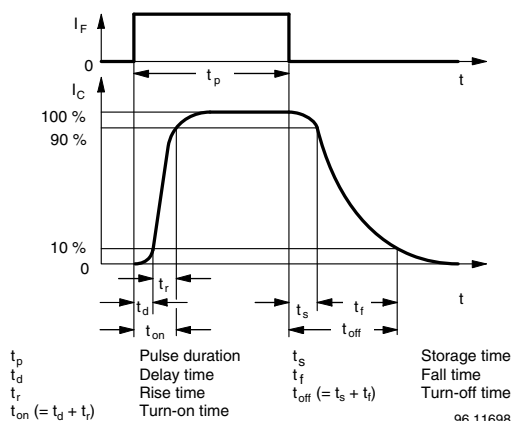


Fig. 3 - Switching Times

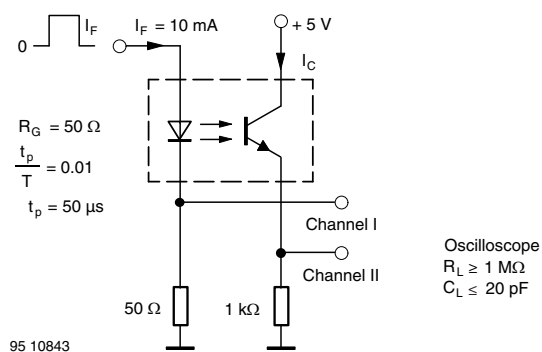


Fig. 2 - Test Circuit, Saturated Operation

| SAFETY AND INSULATION RATINGS                |                                                                                                      |            |                |             |
|----------------------------------------------|------------------------------------------------------------------------------------------------------|------------|----------------|-------------|
| PARAMETER                                    | TEST CONDITION                                                                                       | SYMBOL     | VALUE          | UNIT        |
| Climatic classification                      | According to IEC 68 part 1                                                                           |            | 55 / 85 / 21   |             |
| Pollution degree                             | According to DIN VDE 0109                                                                            |            | 2              |             |
| Comparative tracking index                   | Insulation group IIIa                                                                                | CTI        | 200            |             |
| Maximum rated withstanding isolation voltage | According to UL1577, t = 1 min                                                                       | $V_{ISO}$  | 8200           | $V_{RMS}$   |
| Tested withstanding isolation voltage        | According to UL1577, t = 1 s                                                                         | $V_{ISO}$  | 13 900         | $V_{peak}$  |
| Maximum transient isolation voltage          | According to DIN EN 60747-5-5                                                                        | $V_{IOTM}$ | 12 000         | $V_{peak}$  |
| Maximum repetitive peak isolation voltage    | According to DIN EN 60747-5-5                                                                        | $V_{IORM}$ | 1800           | $V_{peak}$  |
| Isolation resistance                         | $T_{amb} = 25^{\circ}C, V_{IO} = 500 V$                                                              | $R_{IO}$   | $\geq 10^{12}$ | $\Omega$    |
|                                              | $T_{amb} = 100^{\circ}C, V_{IO} = 500 V$                                                             | $R_{IO}$   | $\geq 10^{11}$ | $\Omega$    |
|                                              | $T_{amb} = TS, V_{IO} = 500 V$                                                                       | $R_{IO}$   | $\geq 10^9$    | $\Omega$    |
| Output safety power                          |                                                                                                      | $P_{SO}$   | 250            | mW          |
| Input safety current                         |                                                                                                      | $I_{SI}$   | 120            | mA          |
| Input safety temperature                     |                                                                                                      | $T_S$      | 150            | $^{\circ}C$ |
| Creepage distance                            | CNY64                                                                                                |            | $\geq 9.5$     | mm          |
| Clearance distance                           |                                                                                                      |            | $\geq 9.5$     | mm          |
| Creepage distance                            | CNY65                                                                                                |            | $\geq 14$      | mm          |
| Clearance distance                           |                                                                                                      |            | $\geq 14$      | mm          |
| Creepage distance                            | CNY66                                                                                                |            | $\geq 17$      | mm          |
| Clearance distance                           |                                                                                                      |            | $\geq 17$      | mm          |
| Insulation thickness                         |                                                                                                      | DTI        | $\geq 3$       | mm          |
| Input to output test voltage, method B       | $V_{IORM} \times 1.875 = V_{PR}$ , 100 % production test with $t_M = 1 s$ , partial discharge < 5 pC | $V_{PR}$   | 3375           | $V_{peak}$  |
| Input to output test voltage, method A       | $V_{IORM} \times 1.6 = V_{PR}$ , 100 % sample test with $t_M = 10 s$ , partial discharge < 5 pC      | $V_{PR}$   | 2880           | $V_{peak}$  |

**Note**

- According to DIN EN 60747-5-5. This optocoupler is suitable for safe electrical isolation only within the safety ratings. Compliance with the safety ratings shall be ensured by means of suitable protective circuits

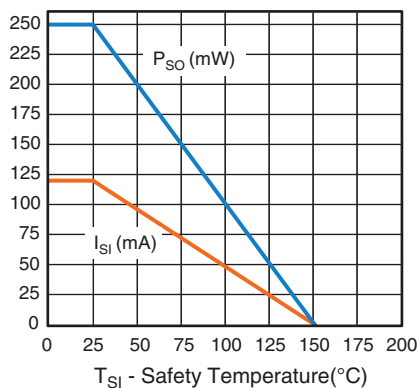


Fig. 4 - Safety Derating Diagram

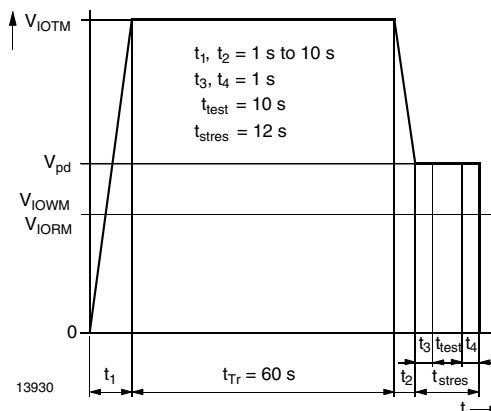


Fig. 5 - Test Pulse Diagram for Sample Test According to DIN EN 60747-5-5 (VDE 0884-5); IEC60747-5-5

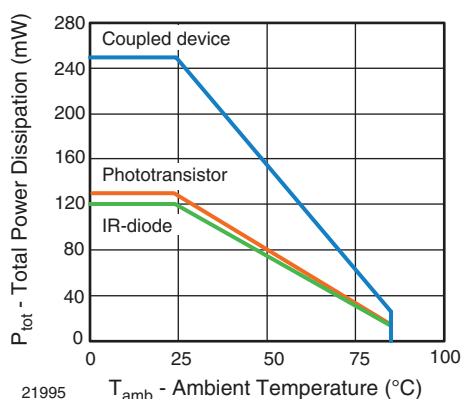
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 6 - Total Power Dissipation vs. Ambient Temperature

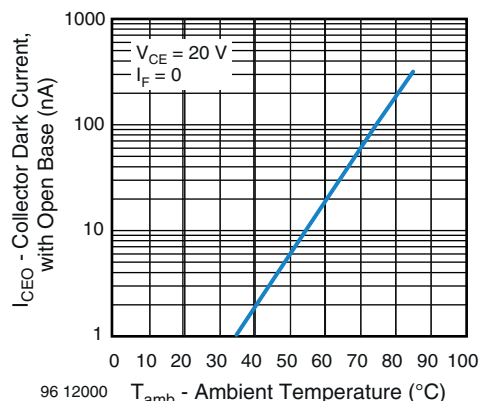


Fig. 9 - Collector Dark Current vs. Ambient Temperature

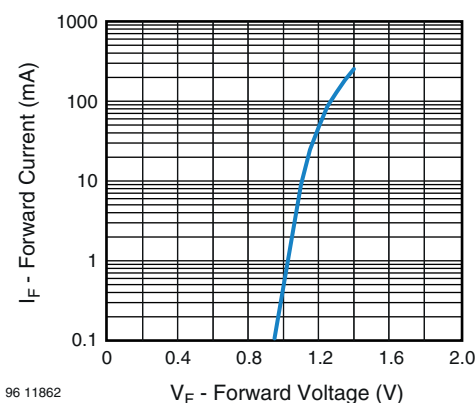


Fig. 7 - Forward Current vs. Forward Voltage

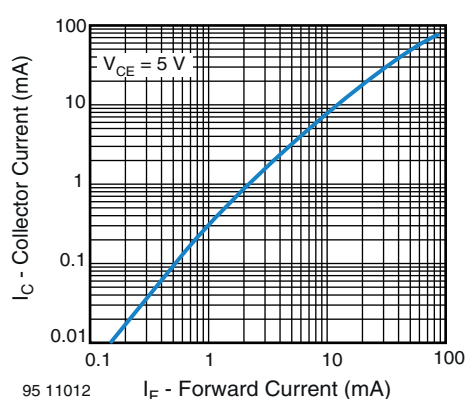


Fig. 10 - Collector Current vs. Forward Current

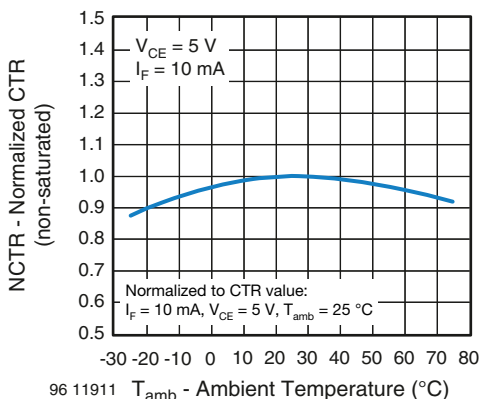


Fig. 8 - Normalized CTR (non-saturated) vs. Ambient Temperature

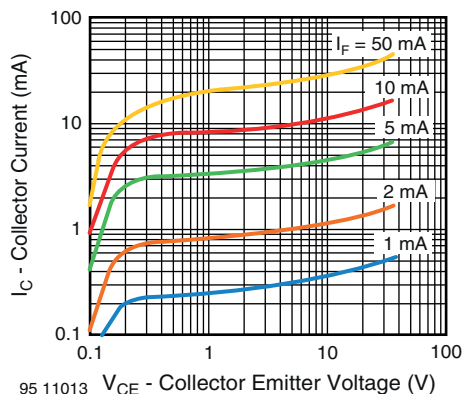


Fig. 11 - Collector Current vs. Collector Emitter Voltage

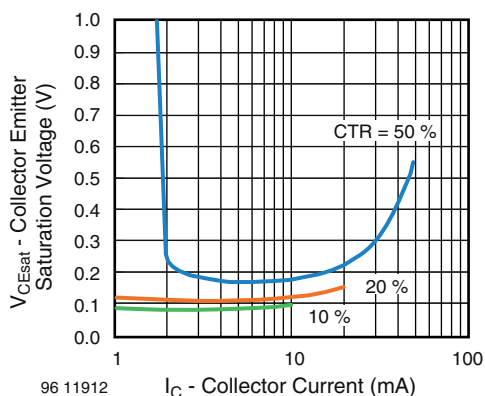


Fig. 12 - Collector Emitter Saturation Voltage vs. Collector Current

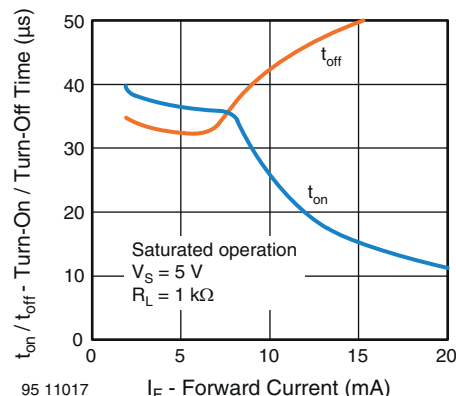


Fig. 14 - Turn-on / Turn-off Time vs. Collector Current

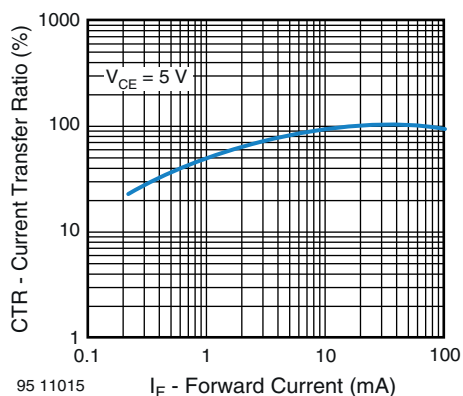


Fig. 13 - Current Transfer Ratio vs. Forward Current

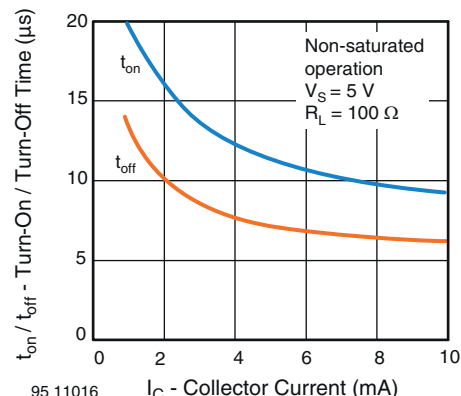
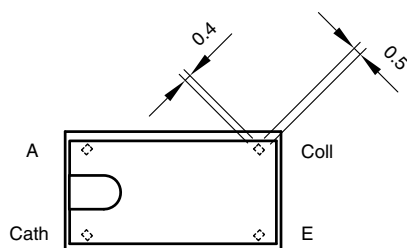
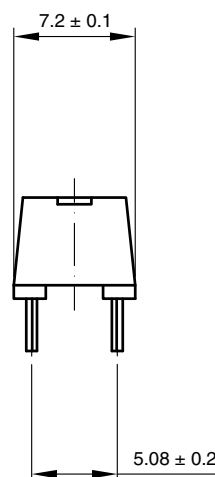
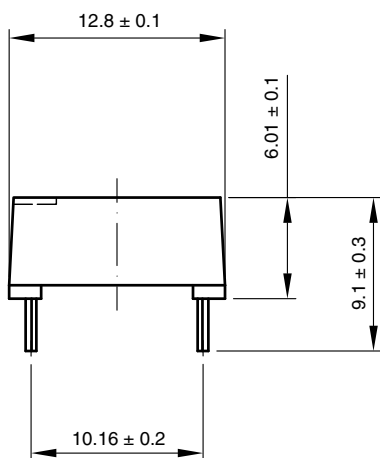


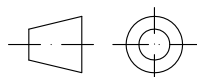
Fig. 15 - Turn-On / Turn-Off Time vs. Forward Current



**PACKAGE DIMENSIONS** in millimeters **FOR CNY64**



Weight: ca. 0.73 g



technical drawings  
according to DIN  
specifications

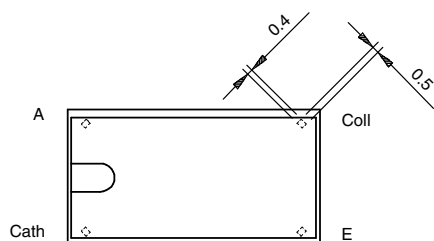
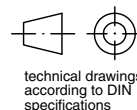
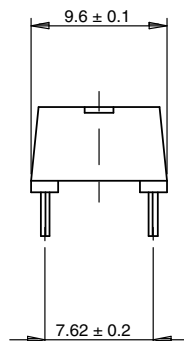
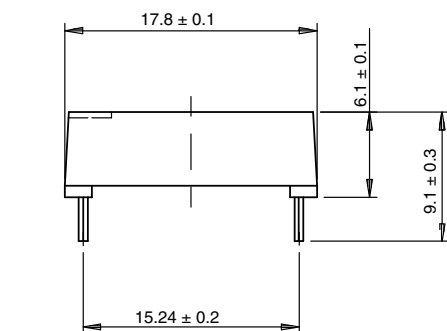
Drawing-No.: 6.544-5038.01-4

Issue: 2; 10.11.98

14765



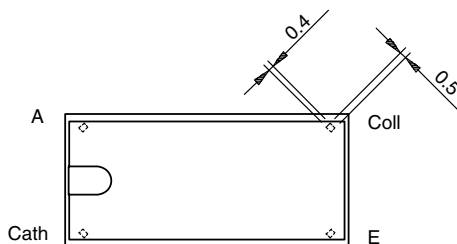
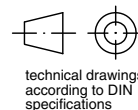
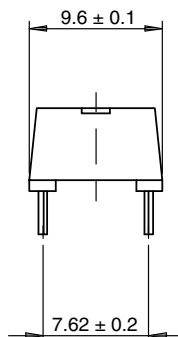
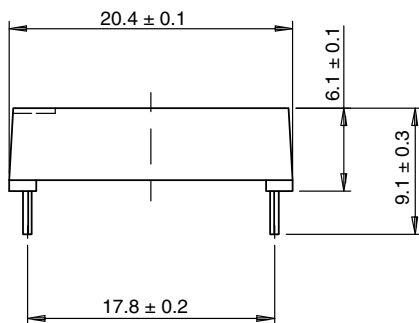
## PACKAGE DIMENSIONS in millimeters FOR CNY65



Weight: ca. 1.40 g

Drawing-No.: 6.544-5036.01-1  
Issue: 2; 10.11.98  
14763

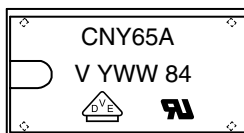
## PACKAGE DIMENSIONS in millimeters FOR CNY66



Weight: ca. 1.70 g

Drawing-No.: 6.544-5037.01-4  
Issue: x; 10.11.98  
14764

## PACKAGE MARKING (example of CNY65A)



| TUBE INFORMATION |            |           |           |
|------------------|------------|-----------|-----------|
| TYPE             | UNITS/TUBE | TUBES/BOX | UNITS/BOX |
| CNY64            | 40         | 50        | 2000      |
| CNY65            | 30         | 35        | 1050      |
| CNY66            | 25         | 35        | 875       |

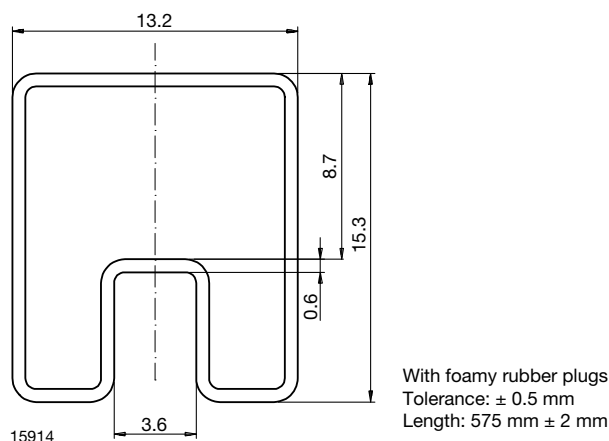


Fig. 16 - Tube Dimensions

## SOLDER PROFILES

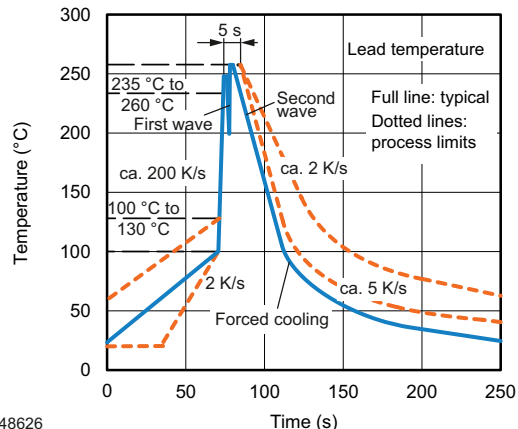


Fig. 17 - Wave Soldering Double Wave Profile According to J-STD-020 for Through-Hole Devices

## HANDLING AND STORAGE CONDITIONS

ESD level: HBM class 2

Floor life: unlimited

Conditions:  $T_{amb} < 30\text{ °C}$ ,  $RH < 85\%$ 

Moisture sensitivity level 1, according to J-STD-020



## Disclaimer

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