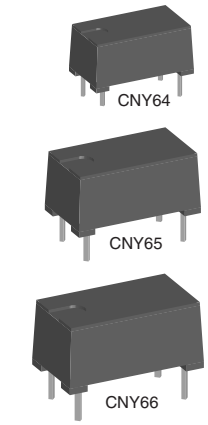
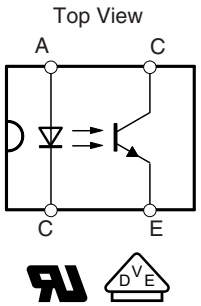
Optocoupler, Phototransistor Output, Very High Isolation Voltage



17187-4



17187-5

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.

VDE STANDARDS

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

- **DIN EN 60747-5-2 (VDE 0884)**
  Optocoupler for electrical safety requirements
- **IEC 60950/EN 60950**
  Office machines
- **VDE 0804**
  Telecommunication apparatus and data processing
- **IEC60065**
  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

FEATURES

- Rated recurring peak voltage (repetitive)
  V_{IORM} = 1450 V_{peak}
- Thickness through insulation ≥ 3 mm
- Creepage current resistance according to VDE 0303/IEC 60112 comparative tracking index: **CTI** ≥ 200
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free

e4

RoHS COMPLIANT

APPLICATIONS

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

- for appl. class I - IV at mains voltage ≤ 300 V
- for appl. class I - IV at mains voltage ≤ 600 V
- for appl. class I - III at mains voltage ≤ 1000 V according to DIN EN 60747-5-2 (VDE 0884), suitable for:

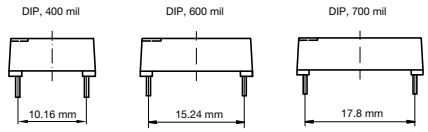
- Switch-mode power supplies
- Line receiver
- Computer peripheral interface
- Microprocessor system interface

AGENCY APPROVALS

- UL1577, file no. E76222 system code H, J, and K
- DIN EN 60747-5-2 (VDE 0884)/DIN EN 60747-5-5 (pending), available with option 1
- VDE related features:
  - rated impulse voltage (transient overvoltage), V_{IOTM} = 12 kV peak
  - isolation test voltage (partial discharge test voltage), V_{pd} = 2.8 kV peak

ORDERING INFORMATION

C	N	Y	6	#	x
PART NUMBER				PACKAGE OPTION	CTR BIN



AGENCY CERTIFIED/PACKAGE	CTR (%)		
UL, 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

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
INPUT				
Reverse voltage		V_R	5	V
Forward current		I_F	75	mA
Forward surge current	$t_p \leq 10$ µs	I_{FSM}	1.5	A
Power dissipation		P_{diss}	120	mW
Junction temperature		T_j	100	°C
OUTPUT				
Collector emitter voltage		V_{CEO}	32	V
Emitter collector voltage		V_{ECO}	7	V
Collector current		I_C	50	mA
Collector peak current	$t_p/T = 0.5$, $t_p \leq 10$ ms	I_{CM}	100	mA
Power dissipation		P_{diss}	130	mW
Junction temperature		T_j	100	°C
COUPLER				
AC isolation test voltage CNY64	t = 1 min	V_{ISO}	8200	V_{RMS}
DC isolation test voltage CNY65	t = 1 s	V_{ISO}	13.9	kV
DC isolation test voltage CNY66	t = 1 s	V_{ISO}	13.9	kV
Total power dissipation		P_{tot}	250	mW
Ambient temperature range		T_{amb}	- 55 to + 85	°C
Storage temperature range		T_{stg}	- 55 to + 100	°C
Soldering temperature	2 mm from case, ≤ 10 s	T_{sld}	260	°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.

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
Forward voltage	I_F = 50 mA	V_F		1.25	1.6	V
Junction capacitance	V_R = 0, f = 1 MHz	C_j		50		pF
OUTPUT						
Collector emitter voltage	I_C = 1 mA	V_{CEO}	32			V
Emitter collector voltage	I_E = 100 µA	V_{ECO}	7			V
Collector emitter leakage current	V_{CE} = 20 V, I_F = 0 A	I_{CEO}			200	nA
COUPLER						
Collector emitter saturation voltage	I_F = 10 mA, I_C = 1 mA	V_{CEsat}			0.3	V
Cut-off frequency	V_{CE} = 5 V, I_F = 10 mA, R_L = 100 Ω	f_c		110		kHz
Coupling capacitance	f = 1 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 °C, unless otherwise specified)							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
I_C/I_F	V_{CE} = 5 V, I_F = 10 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	%

SAFETY AND INSULATION RATED PARAMETERS						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Partial discharge test voltage - routine test	100 %, t_{test} = 1 s	V_{pd}	2.8			kV
Partial discharge test voltage - lot test (sample test)	t_{Tr} = 60 s, t_{test} = 10 s, (see fig. 2)	V_{pd}	2.2			kV
Insulation resistance	V_{IO} = 500 V, T_{amb} = 25 °C	R_{IO}	10^{12}			Ω
	V_{IO} = 500 V, T_{amb} = 100 °C	R_{IO}	10^{11}			Ω
	V_{IO} = 500 V, T_{amb} = 150 °C (construction test only)	R_{IO}	10^{9}			Ω
Forward current		I_{SI}			120	mA
Power dissipation		P_{SO}			250	mW
Rated impulse voltage		V_{IOTM}			12	kV
Safety temperature		T_{SI}			150	°C

Note

- According to DIN EN 60747-5-2 (see fig. 2). 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.

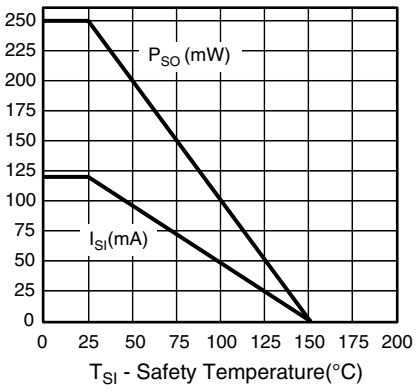


Fig. 1 - Safety Derating Diagram

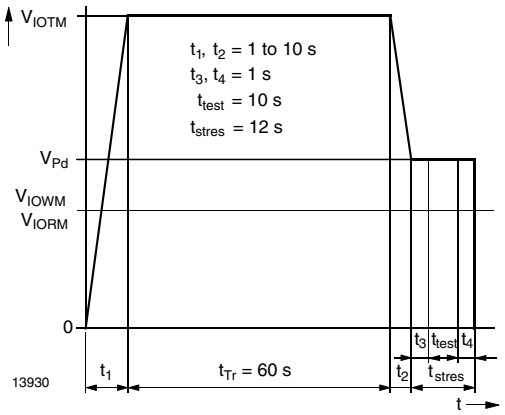


Fig. 2 - Test Pulse Diagram for Sample Test According to DIN EN 60747-5-2 (VDE 0884); IEC60747-5-5

SWITCHING CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Delay time	V_S = 5 V, I_C = 5 mA, R_L = 100 Ω, (see fig. 3)	t_d		2.6		µs
Rise time	V_S = 5 V, I_C = 5 mA, R_L = 100 Ω, (see fig. 3)	t_r		2.4		µs
Fall time	V_S = 5 V, I_C = 5 mA, R_L = 100 Ω, (see fig. 3)	t_f		2.7		µs
Storage time	V_S = 5 V, I_C = 5 mA, R_L = 100 Ω, (see fig. 3)	t_s		0.3		µs
Turn-on time	V_S = 5 V, I_C = 5 mA, R_L = 100 Ω, (see fig. 3)	t_{on}		5		µs
Turn-off time	V_S = 5 V, I_C = 5 mA, R_L = 100 Ω, (see fig. 3)	t_{off}		3		µs
Turn-on time	V_S = 5 V, I_F = 10 mA, R_L = 1 kΩ, (see fig. 4)	t_{on}		25		µs
Turn-off time	V_S = 5 V, I_F = 10 mA, R_L = 1 kΩ, (see fig. 4)	t_{off}		42.5		µs

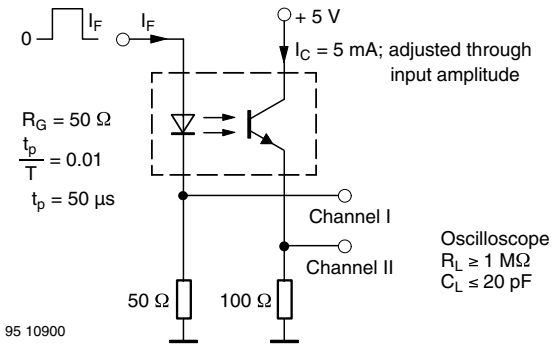


Fig. 3 - Test Circuit, Non-Saturated Operation

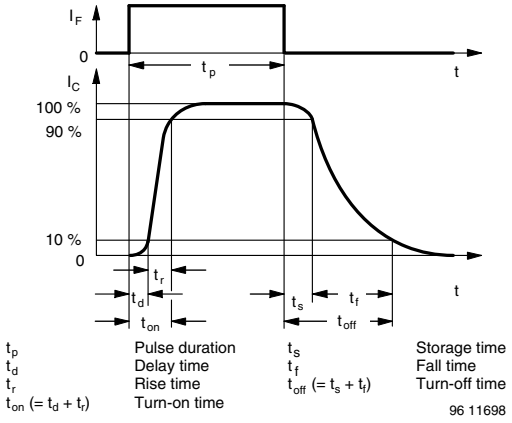


Fig. 5 - Switching Times

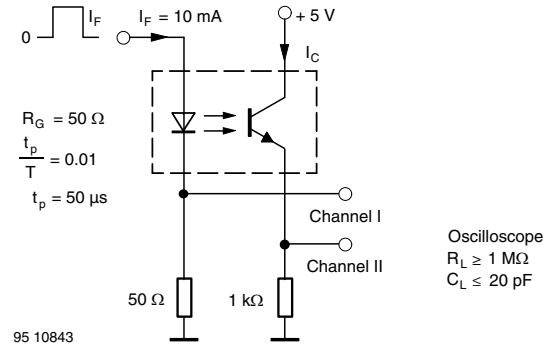


Fig. 4 - Test Circuit, Saturated Operation

TYPICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)

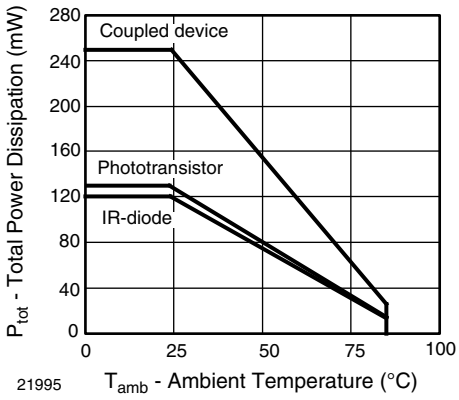


Fig. 6 - Total Power Dissipation vs. Ambient Temperature

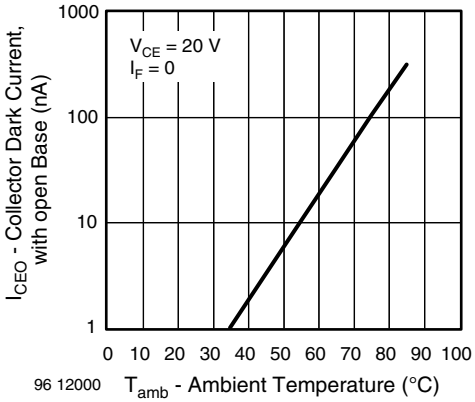


Fig. 9 - Collector Dark Current vs. Ambient Temperature

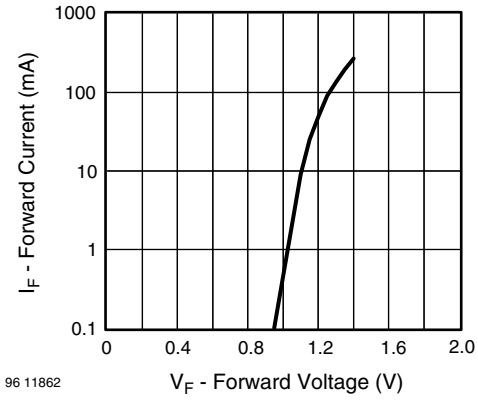


Fig. 7 - Forward Current vs. Forward Voltage

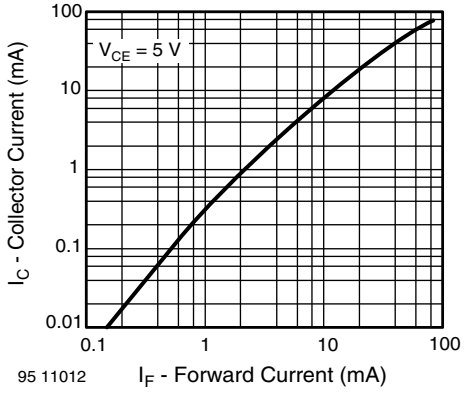


Fig. 10 - Collector Current vs. Forward Current

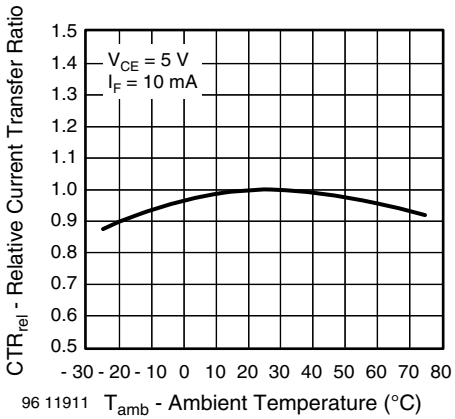


Fig. 8 - Relative Current Transfer Ratio vs. Ambient Temperature

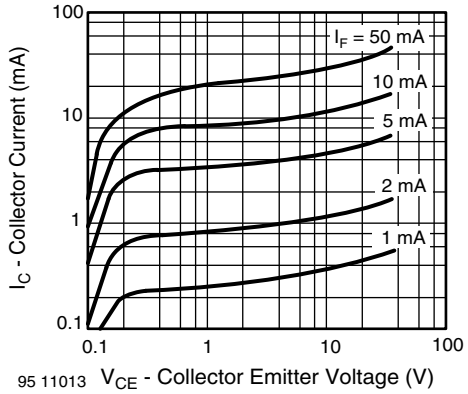


Fig. 11 - Collector Current vs. Collector Emitter Voltage

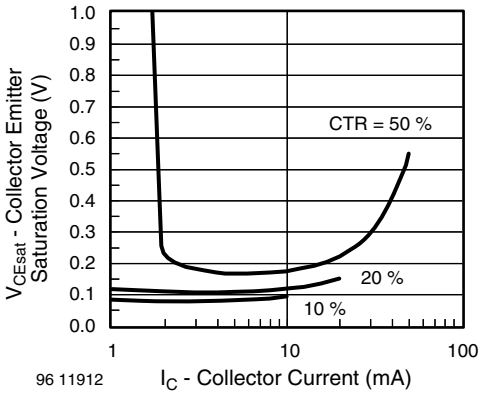


Fig. 12 - Collector Emitter Saturation Voltage vs. Collector Current

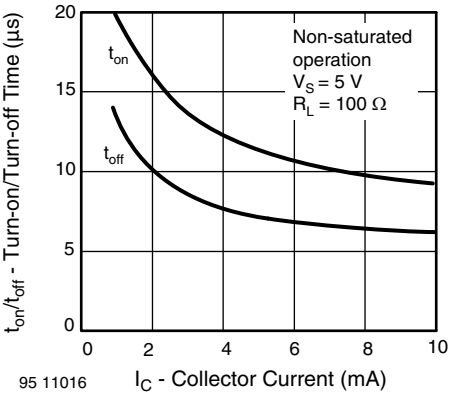


Fig. 15 - Turn-on/Turn-off Time vs. Forward Current

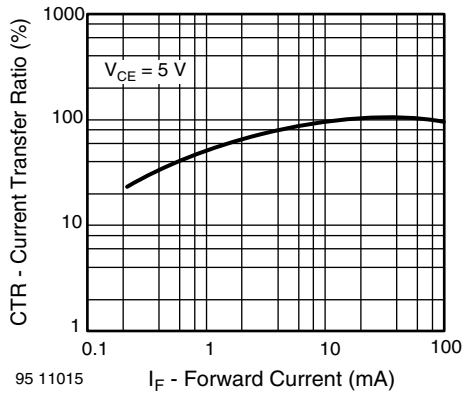


Fig. 13 - Current Transfer Ratio vs. Forward Current

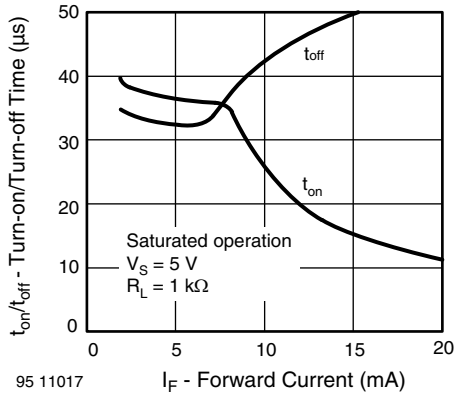
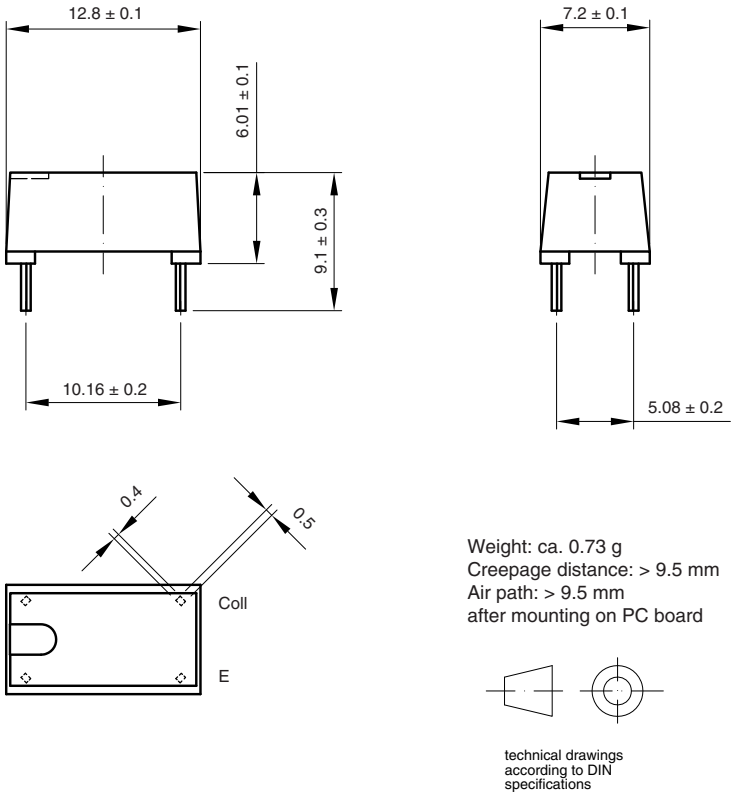


Fig. 14 - Turn-on/Turn-off Time vs. Collector Current

PACKAGE DIMENSIONS in millimeters **FOR CNY64**

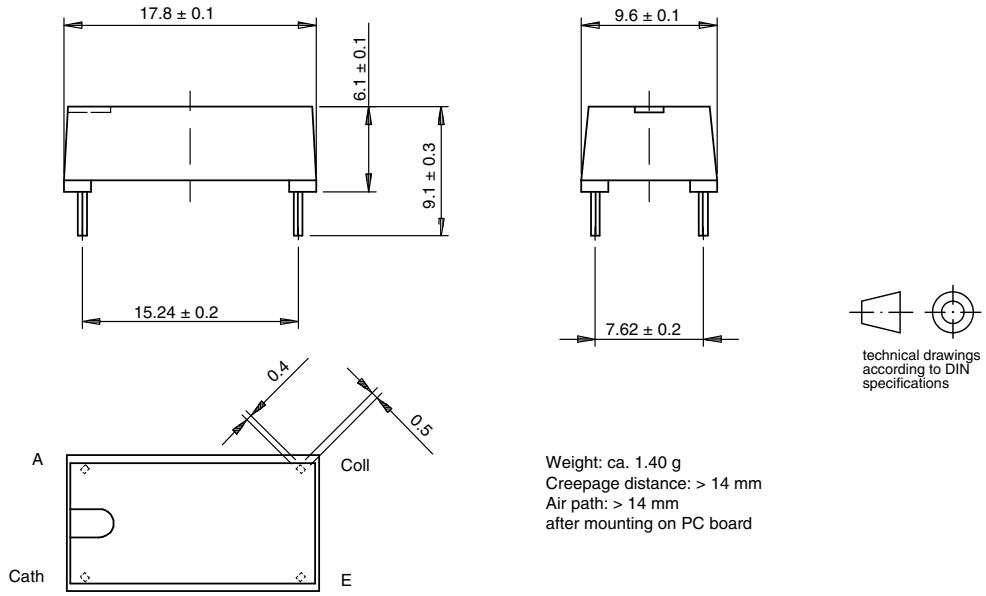


Weight: ca. 0.73 g
Creepage distance: > 9.5 mm
Air path: > 9.5 mm
after mounting on PC board

technical drawings
according to DIN
specifications

Drawing-No.: 6.544-5038.01-4
Issue: 2; 10.11.98
14765

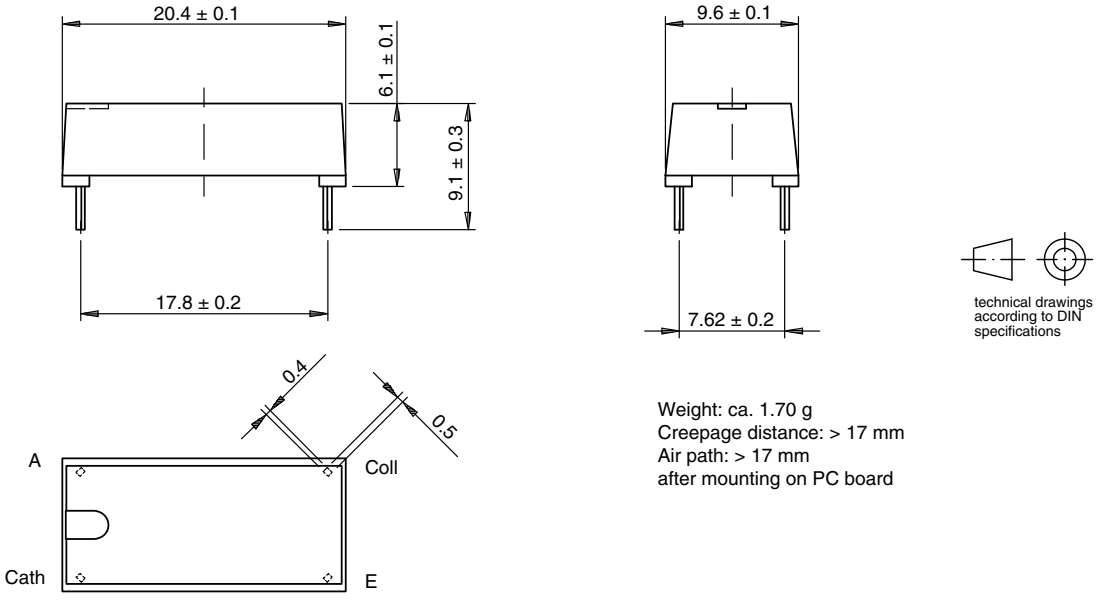
PACKAGE DIMENSIONS in millimeters FOR CNY65



Weight: ca. 1.40 g
Creepage distance: > 14 mm
Air path: > 14 mm
after mounting on PC board

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

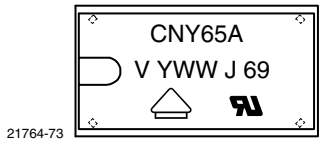
PACKAGE DIMENSIONS in millimeters FOR CNY66



Weight: ca. 1.70 g
Creepage distance: > 17 mm
Air path: > 17 mm
after mounting on PC board

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

PACKAGE MARKING



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