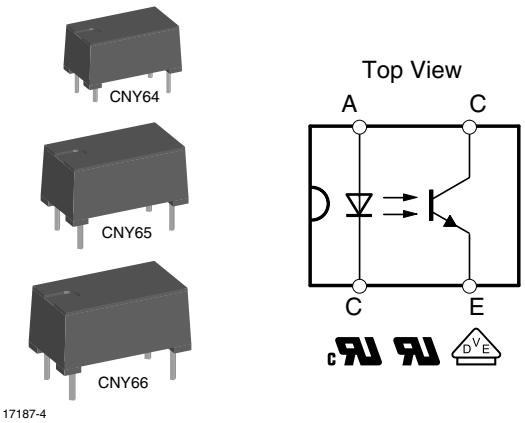
Optocoupler, Phototransistor Output, Very High Isolation Voltage



17187-4

LINKS TO ADDITIONAL RESOURCES

3D Models | SPICE 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_{IORM} = 1450 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

Pb-free

e4

RoHS COMPLIANT

VDE STANDARDS

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

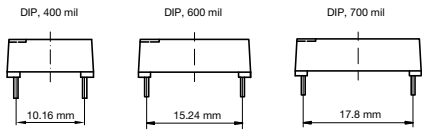
- **DIN EN 60747-5-5 (VDE 0884-5)**
  Optocoupler for electrical safety requirements
- **IEC 60950/EN 60950**
  Office machines
- **VDE 0804**
  Telecommunication apparatus and data processing
- **IEC 60065**
  Safety for mains-operated electronic and related household apparatus
- **VDE 0700/IEC 60335**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

AGENCY APPROVALS

- UL / cUL 1577
- DIN EN 60747-5-5 (VDE 0884-5)

ORDERING INFORMATION

C	N	Y	6	#	x
PART NUMBER				PACKAGE OPTION	CTR 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

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				
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	%

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

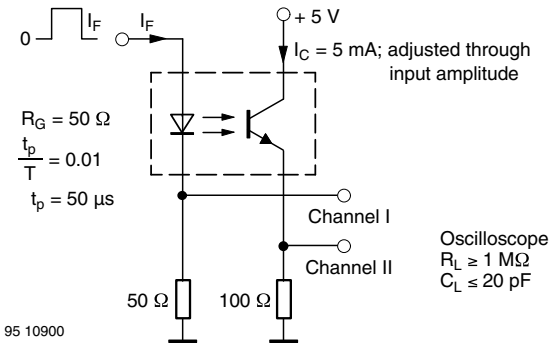


Fig. 1 - Test Circuit, Non-Saturated Operation

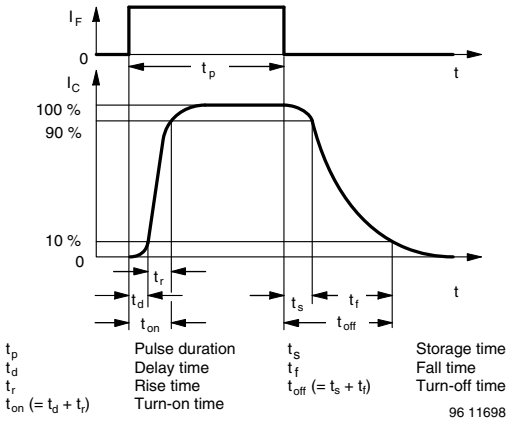


Fig. 3 - Switching Times

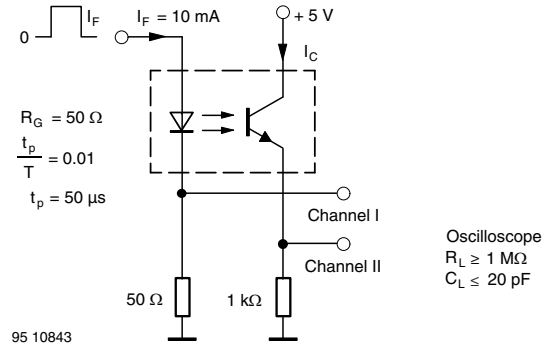


Fig. 2 - Test Circuit, Saturated Operation

SAFETY AND INSULATION RATED PARAMETERS				
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}	1450	V_{peak}
Isolation resistance	T_{amb} = 25 °C, V_{IO} = 500 V	R_{IO}	$\geq 10^{12}$	Ω
	T_{amb} = 100 °C, V_{IO} = 500 V	R_{IO}	$\geq 10^{11}$	Ω
	T_{amb} = TS, V_{IO} = 500 V	R_{IO}	$\geq 10^{9}$	Ω
Output safety power		P_{SO}	250	mW
Input safety current		I_{SI}	120	mA
Input safety temperature		T_S	150	°C
Creepage distance	CNY64		≥ 9.5	mm
Clearance distance			≥ 9.5	mm
Creepage distance	CNY65		≥ 14	mm
Clearance distance			≥ 14	mm
Creepage distance	CNY66		≥ 17	mm
Clearance distance			≥ 17	mm
Insulation thickness		DTI	≥ 3	mm
Input to output test voltage, method B	V_{IORM} x 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} x 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

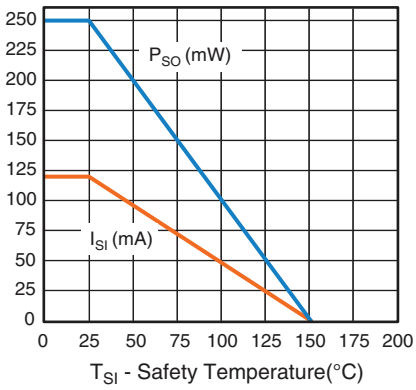


Fig. 4 - Safety Derating Diagram

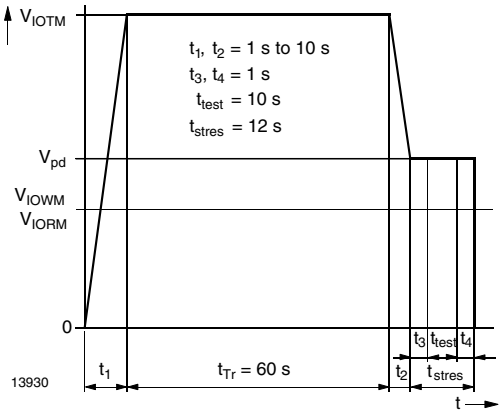


Fig. 5 - Test Pulse Diagram for Sample Test According to DIN EN 60747-5-5 (VDE 0884-5); IEC60747-5-5

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

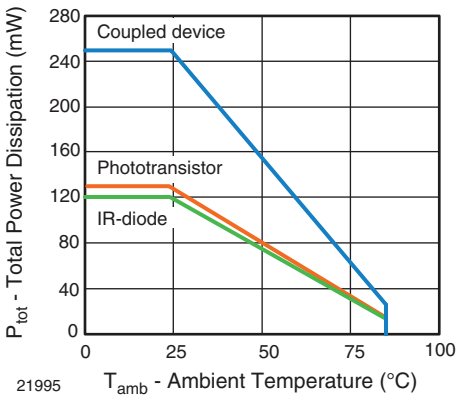


Fig. 6 - Total Power Dissipation vs. Ambient Temperature

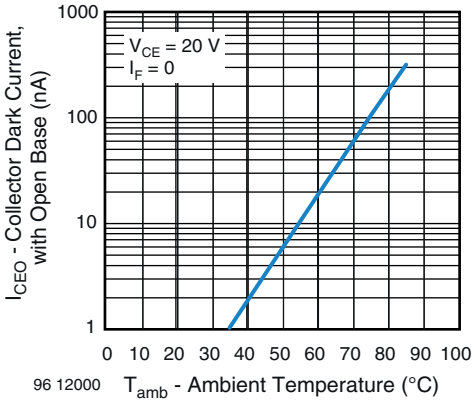


Fig. 9 - Collector Dark Current vs. Ambient Temperature

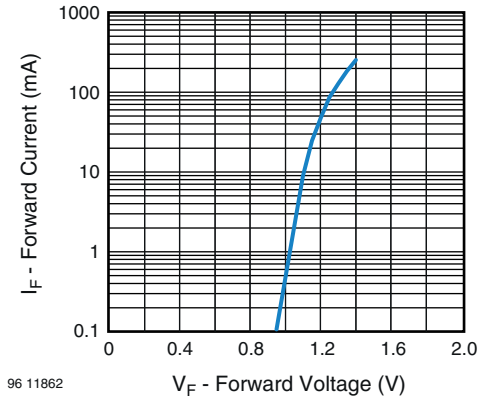


Fig. 7 - Forward Current vs. Forward Voltage

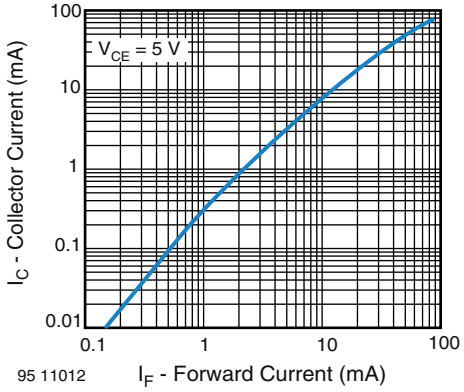


Fig. 10 - Collector Current vs. Forward Current

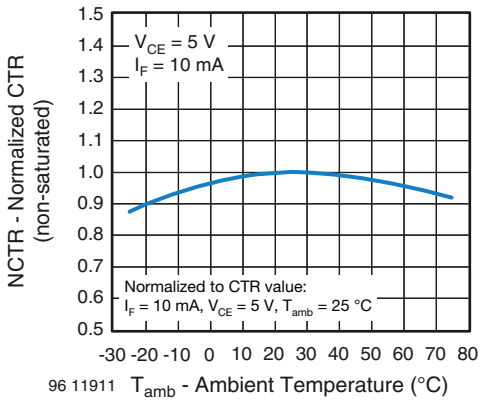


Fig. 8 - Normalized CTR (non-saturated) vs. Ambient Temperature

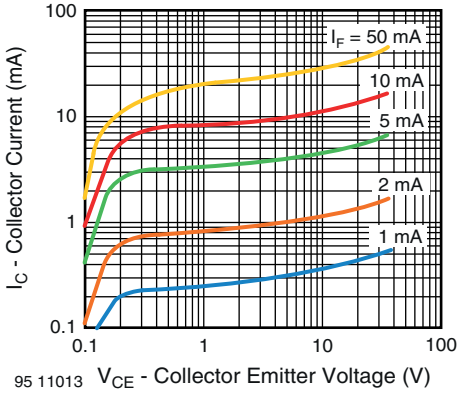


Fig. 11 - Collector Current vs. Collector Emitter Voltage

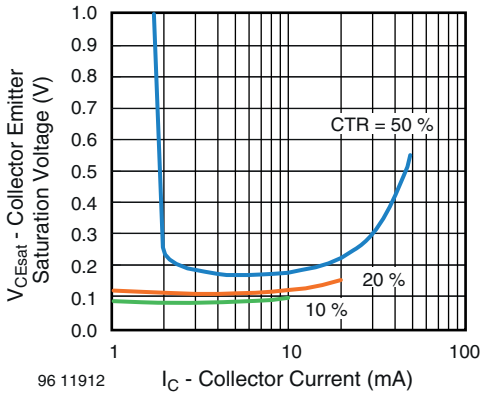


Fig. 12 - Collector Emitter Saturation Voltage vs. Collector Current

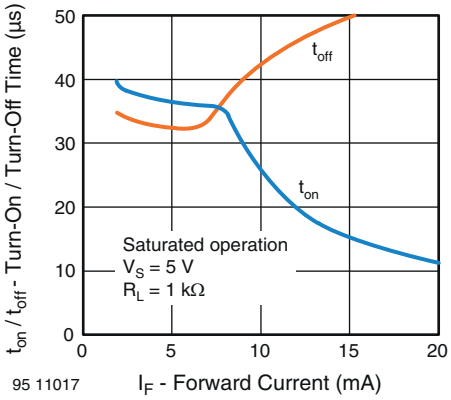


Fig. 14 - Turn-on / Turn-off Time vs. Collector Current

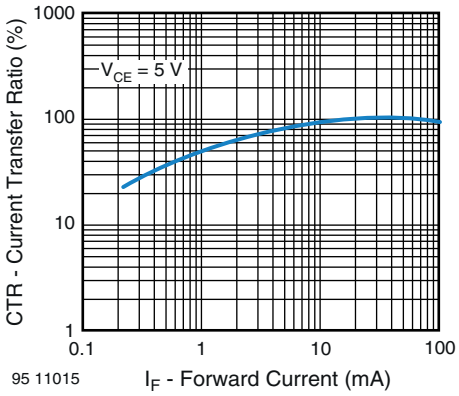


Fig. 13 - Current Transfer Ratio vs. Forward Current

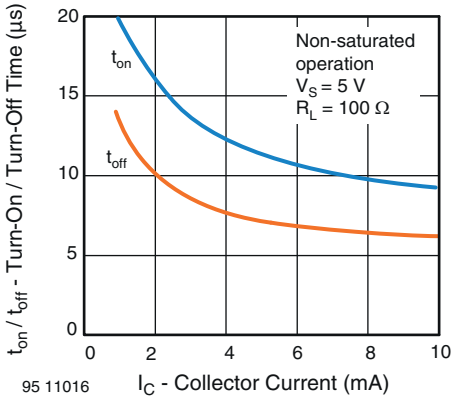
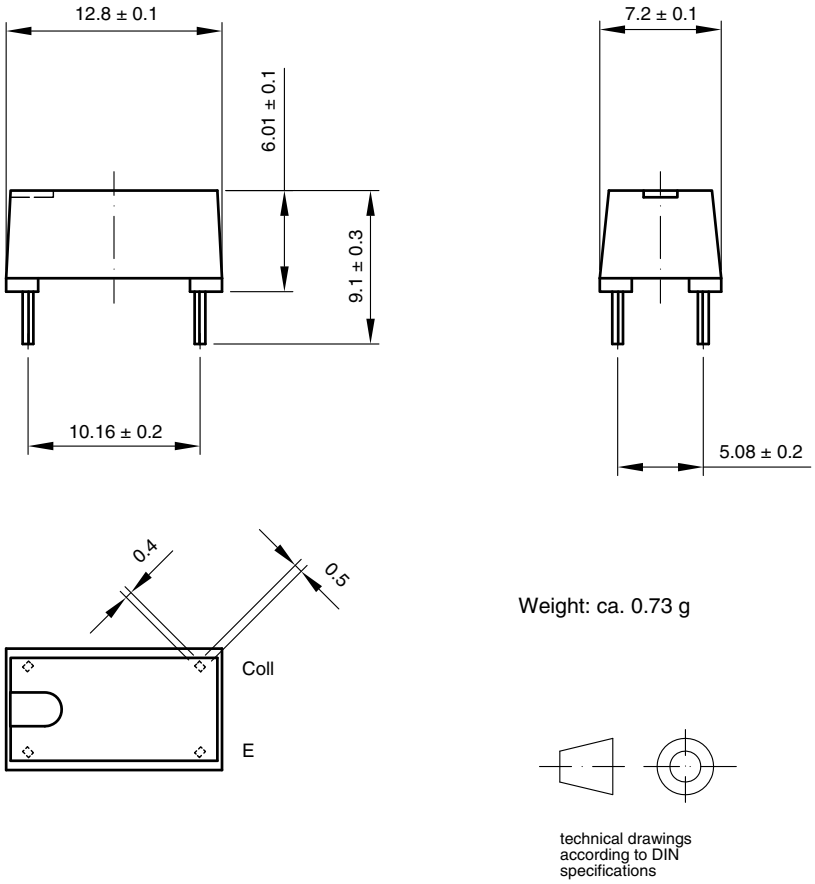


Fig. 15 - Turn-On / Turn-Off Time vs. Forward Current

PACKAGE DIMENSIONS in millimeters **FOR CNY64**

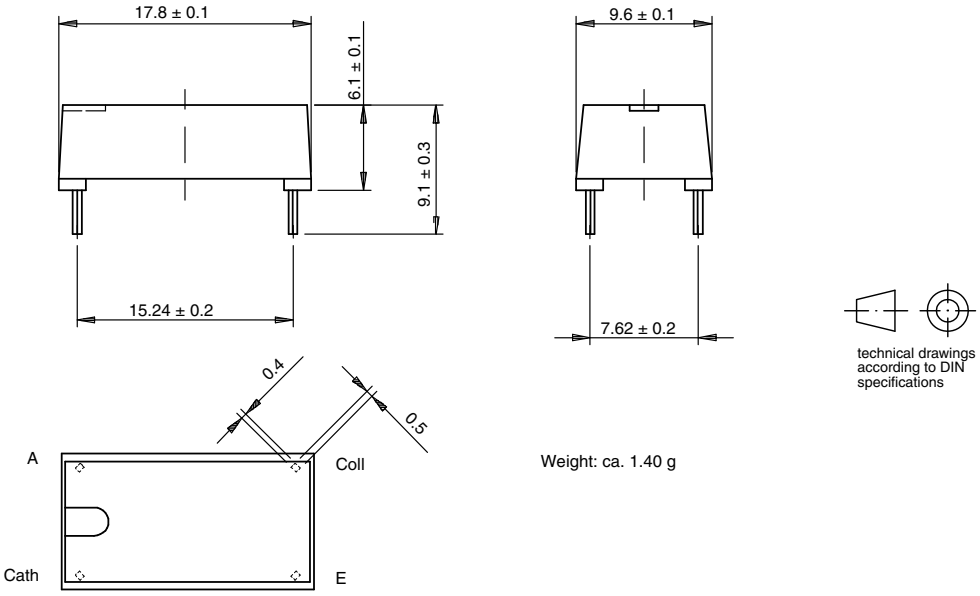


Weight: ca. 0.73 g

technical drawings
according to DIN
specifications

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

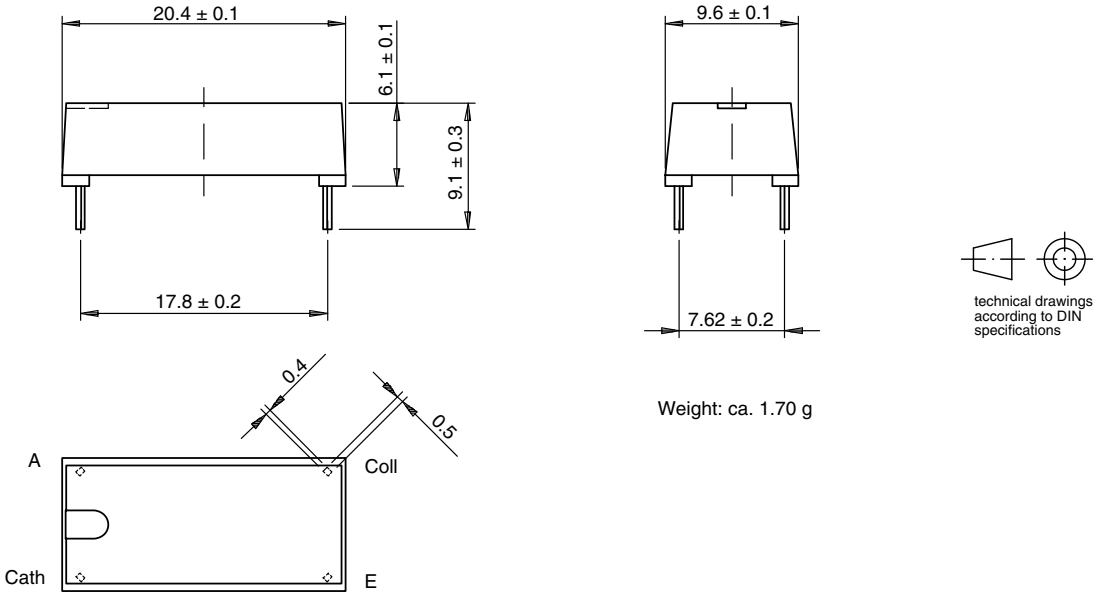
PACKAGE DIMENSIONS in millimeters FOR CNY65



Weight: ca. 1.40 g

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

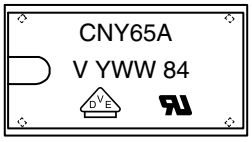
PACKAGE DIMENSIONS in millimeters FOR CNY66



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

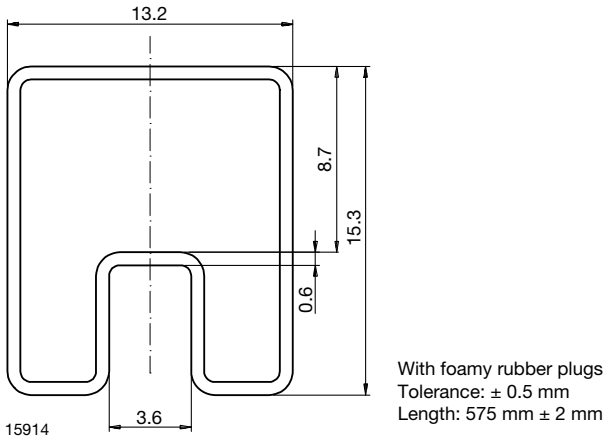


Fig. 16 - Tube Dimensions

SOLDER PROFILES

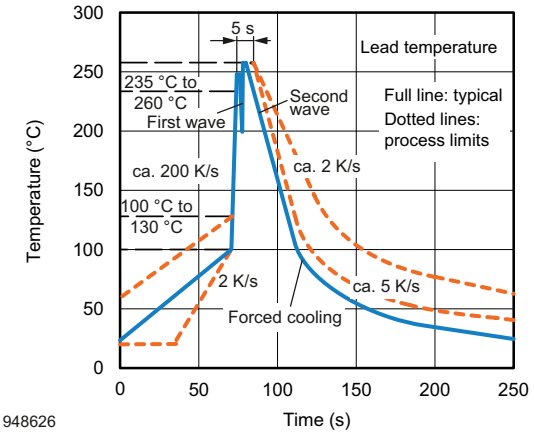


Fig. 17 - Wave Soldering Double Wave Profile According to J-STD-020 for Through-Hole Devices

HANDLING AND STORAGE CONDITIONS

ESD level: HBM class 2

Floor life: unlimited

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

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

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