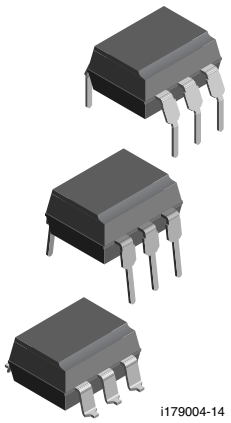
Optocoupler, Phototransistor Output, with Base Connection



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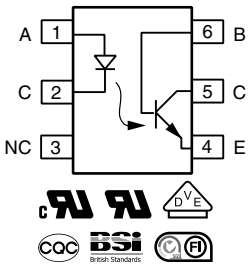


FEATURES

- Isolation test voltage: 5000 V_{RMS}
- Long term stability
- Industry standard dual-in-line package
- Material categorization:
  For definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e3

RoHS COMPLIANT

AGENCY APPROVALS

Safety application model number covering all products in this datasheet is CNY17. This model number should be used when consulting safety agency documents.

- UL file no. E52744
- cUL tested to CSA 22.2 bulletin 5A
- DIN EN 60747-5-5 (VDE 0884-5)
- BSI IEC 60950, IEC 60065
- FIMKO EN60950
- CQC GB8898-2011

DESCRIPTION

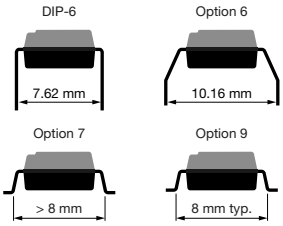
The CNY17 is an optically coupled pair consisting of a gallium arsenide infrared emitting diode optically coupled to a silicon NPN phototransitor.

Signal information, including a DC level, can be transmitted by the device while maintaining a high degree of electrical isolation between input and output.

The CNY17 can be used to replace relays and transformers in many digital interface applications, as well as analog applications such as CRT modulation.

ORDERING INFORMATION

C	N	Y	1	7	-	#	X	0	#	#	T
PART NUMBER						CTR BIN	PACKAGE OPTION				TAPE AND REEL



AGENCY CERTIFIED/PACKAGE	CTR (%)			
UL, cUL, BSI, FIMKO	**40 to 80**	**63 to 125**	**100 to 200**	**160 to 320**
DIP-6	CNY17-1	CNY17-2	CNY17-3	CNY17-4
DIP-6, 400 mil, option 6	CNY17-1X006	CNY17-2X006	CNY17-3X006	CNY17-4X006
SMD-6, option 7	CNY17-1X007T (1)	CNY17-2X007T (1)	CNY17-3X007T (1)	CNY17-4X007T (1)
SMD-6, option 9	CNY17-1X009T (1)	CNY17-2X009T (1)	CNY17-3X009T (1)	CNY17-4X009T (1)
VDE, UL, cUL, BSI, FIMKO	**40 to 80**	**63 to 125**	**100 to 200**	**160 to 320**
DIP-6	CNY17-1X001	CNY17-2X001	CNY17-3X001	CNY17-4X001
DIP-6, 400 mil, option 6	CNY17-1X016	CNY17-2X016	CNY17-3X016	CNY17-4X016
SMD-6, option 7	CNY17-1X017	CNY17-2X017T (1)	CNY17-3X017T (1)	CNY17-4X017T (1)
SMD-6, option 9	-	CNY17-2X019T (1)	-	-

Note

(1) Also available in tubes, do not put T on the end.

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ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
INPUT				
Reverse voltage		V_R	6	V
Forward current		I_F	60	mA
Forward surge current	$t_p \leq 10$ µs	I_{FSM}	2.5	A
LED power dissipation	at 25 °C	P_{diss}	100	mW
OUTPUT				
Collector emitter breakdown voltage		BV_{CEO}	70	V
Emitter base breakdown voltage		BV_{EBO}	7	V
Collector current		I_C	50	mA
	$t_p/T = 0.5$, $t_p \leq 10$ ms	I_C	100	mA
Power dissipation		P_{diss}	150	mW
COUPLER				
Isolation test voltage between emitter and detector	t = 1 min	V_{ISO}	5000	V_{RMS}
Storage temperature		T_{stg}	-55 to +150	°C
Operating temperature		T_{amb}	-55 to +110	°C
Soldering temperature (1)	2 mm from case, ≤ 10 s	T_{sld}	260	°C
Total power dissipation		P_{diss}	250	mW

Notes

- 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.

(1) Refer to reflow profile for soldering conditions for surface mounted devices (SMD). Refer to wave profile for soldering conditions for through hole devices (DIP).

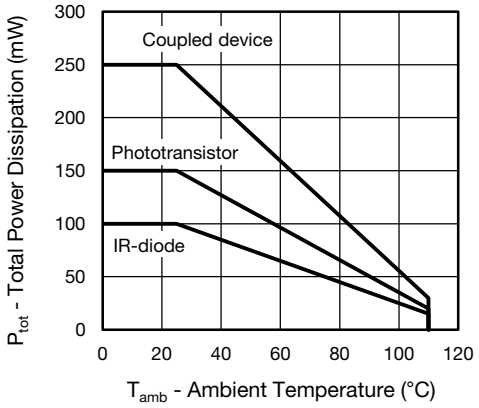

Fig. 1 - Total Power Dissipation vs. Ambient Temperature

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT							
Forward voltage	I_F = 60 mA		V_F		1.39	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

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ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
OUTPUT							
Collector emitter capacitance	V_{CE} = 5 V, f = 1 MHz		C_{CE}		5.2		pF
Collector base capacitance	V_{CE} = 5 V, f = 1 MHz		C_{CB}		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	V_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	CNY17-1	I_{CEO}		2	50	nA
		CNY17-2	I_{CEO}		2	50	nA
		CNY17-3	I_{CEO}		5	100	nA
		CNY17-4	I_{CEO}		5	100	nA

Note

- 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 (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	CNY17-1	CTR	40		80	%
		CNY17-2	CTR	63		125	%
		CNY17-3	CTR	100		200	%
		CNY17-4	CTR	160		320	%
	V_{CE} = 5 V, I_F = 1 mA	CNY17-1	CTR	13	30		%
		CNY17-2	CTR	22	45		%
		CNY17-3	CTR	34	70		%
		CNY17-4	CTR	56	90		%

SWITCHING CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)							
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}		110		kHz
SWITCHING OPERATION (with saturation)							
Turn-on time	I_F = 20 mA	CNY17-1	t_{on}		3		µs
	I_F = 10 mA	CNY17-2	t_{on}		4.2		µs
		CNY17-3	t_{on}		4.2		µs
	I_F = 5 mA	CNY17-4	t_{on}		6		µs
Rise time	I_F = 20 mA	CNY17-1	t_r		2		µs
	I_F = 10 mA	CNY17-2	t_r		3		µs
		CNY17-3	t_r		3		µs
	I_F = 5 mA	CNY17-4	t_r		4.6		µs
Turn-off time	I_F = 20 mA	CNY17-1	t_{off}		18		µs
	I_F = 10 mA	CNY17-2	t_{off}		23		µs
		CNY17-3	t_{off}		23		µs
	I_F = 5 mA	CNY17-4	t_{off}		25		µs
Fall time	I_F = 20 mA	CNY17-1	t_f		11		µs
	I_F = 10 mA	CNY17-2	t_f		14		µs
		CNY17-3	t_f		14		µs
	I_F = 5 mA	CNY17-4	t_f		15		µs

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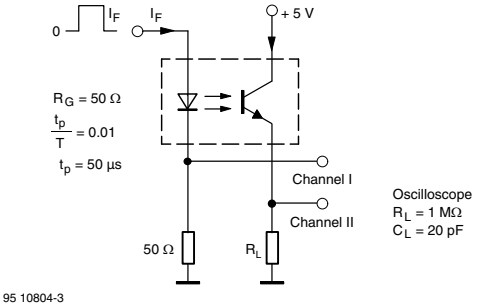

Fig. 2 - Test Circuit, Non-Saturated Operation

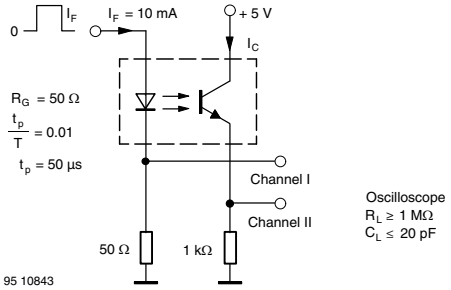

Fig. 3 - Test Circuit, Saturated Operation

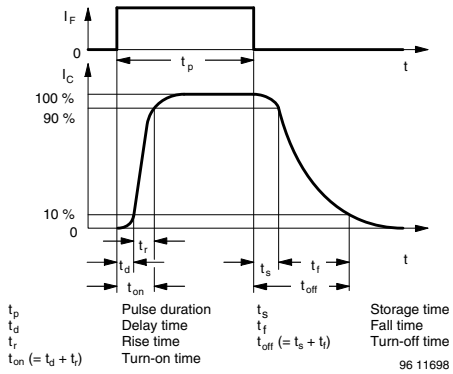

Fig. 4 - Switching Times

SAFETY AND INSULATION RATINGS				
PARAMETER		**SYMBOL**	**VALUE**	**UNIT**
MAXIMUM SAFETY RATINGS				
Output safety power		P_{SO}	700	mW
Input safety current		I_{SI}	400	mA
Safety temperature		T_{SI}	175	°C
Comparative tracking index		CTI	175	
INSULATION RATED PARAMETERS				
Maximum withstanding isolation voltage		V_{ISO}	5000	V_{RMS}
Maximum transient isolation voltage		V_{IOTM}	8000	V_{peak}
Maximum repetitive peak isolation voltage		V_{IORM}	890	V_{peak}
Insulation resistance	T_{amb} = 25 °C, V_{DC} = 500 V	R_{IO}	$\geq 10^{12}$	Ω
Isolation resistance	T_{amb} = 100 °C, V_{DC} = 500 V	R_{IO}	$\geq 10^{11}$	Ω
Climatic classification (according to IEC 68 part 1)			55/115/21	
Environment (pollution degree in accordance to DIN VDE 0109)			2	
Creepage distance	Standard DIP-4		≥ 7	mm
	SMD		≥ 7	mm
Clearance distance	Standard DIP-4		≥ 8	mm
	SMD		≥ 8	mm
Insulation thickness		DTI	≥ 0.4	mm

Note

- As per DIN EN 60747-5-5, § 7.4.3.8.2, this optocoupler is suitable for “safe electrical insulation” only within the safety ratings. Compliance with the safety ratings shall be ensured by means of protective circuits.

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

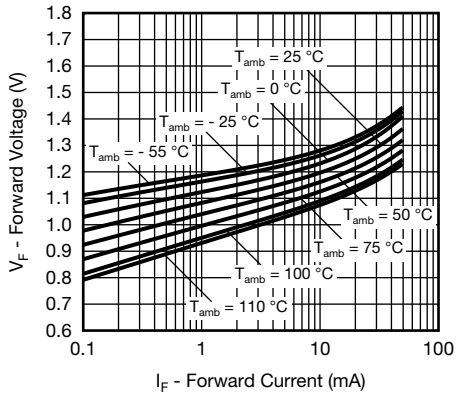

Fig. 5 - Forward Voltage vs. Forward Current

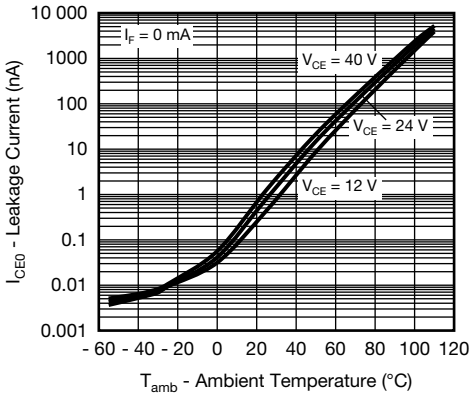

Fig. 8 - Leakage Current vs. Ambient Temperature

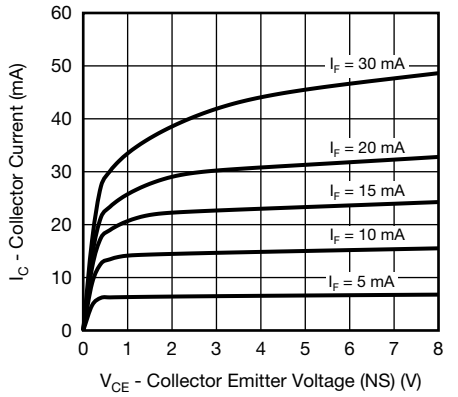

Fig. 6 - Collector Current vs. Collector Emitter Voltage (NS)

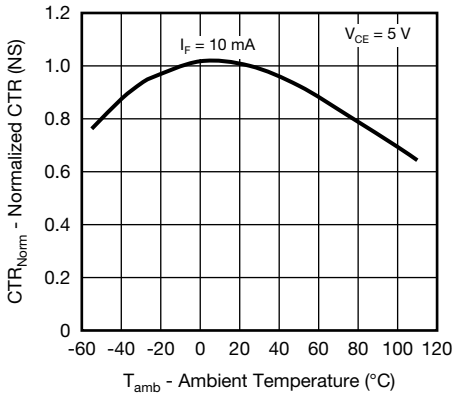

Fig. 9 - Normalized CTR (NS) vs. Ambient Temperature

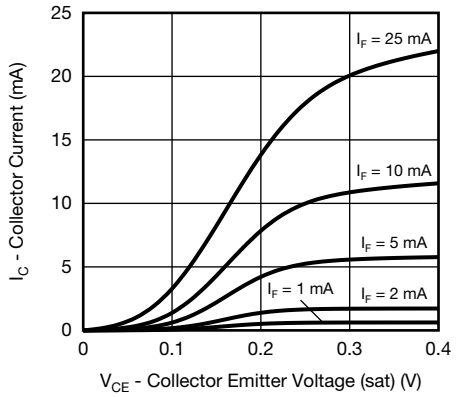

Fig. 7 - Collector Current vs. Collector Emitter Voltage (sat)

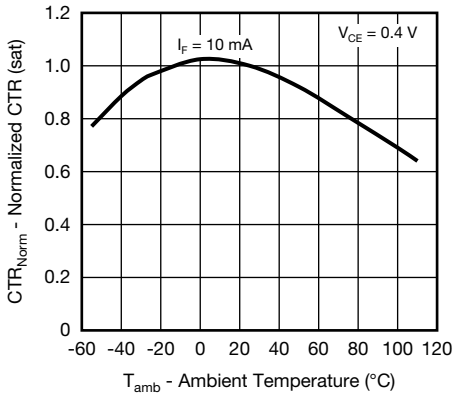

Fig. 10 - Normalized CTR (sat) vs. Ambient Temperature

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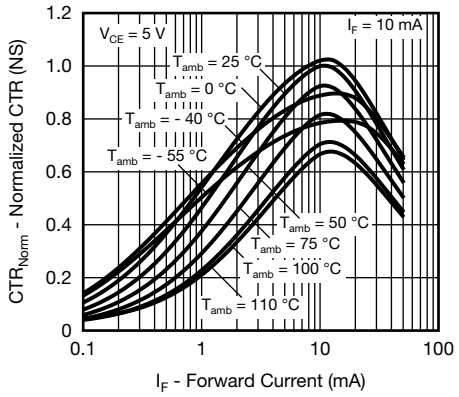

Fig. 11 - Normalized CTR (NS) vs. Forward Current

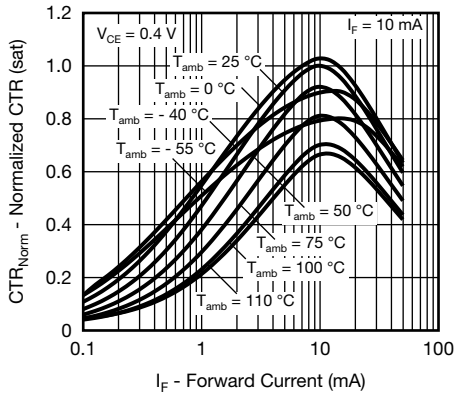

Fig. 12 - Normalized CTR (sat) vs. Forward Current

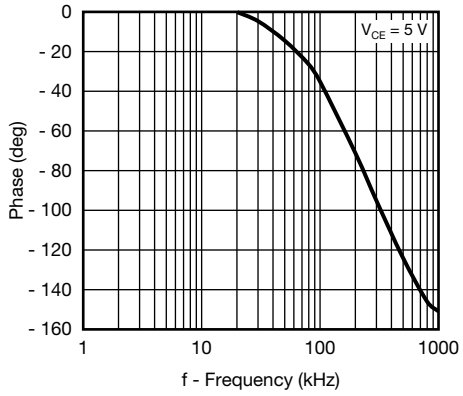

Fig. 13 - CTR Frequency vs. Phase Angle

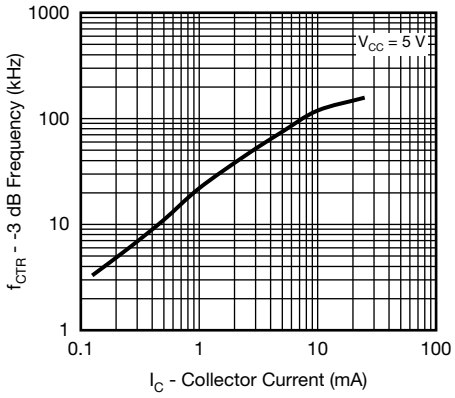

Fig. 14 - CTR -3 dB Frequency vs. Collector Current

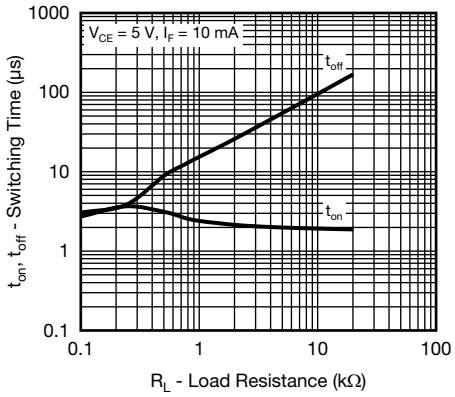

Fig. 15 - Switching Time vs. Load Resistance

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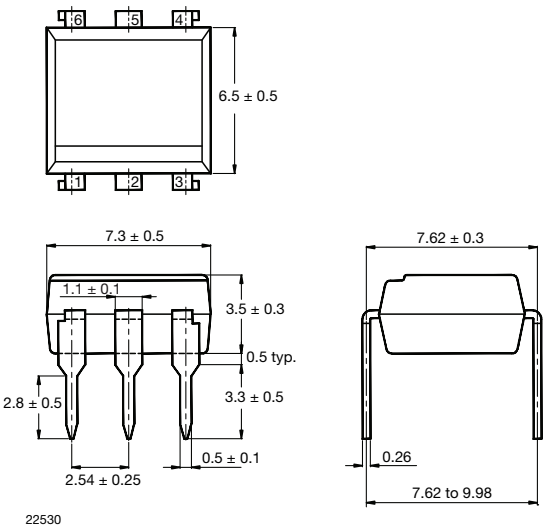
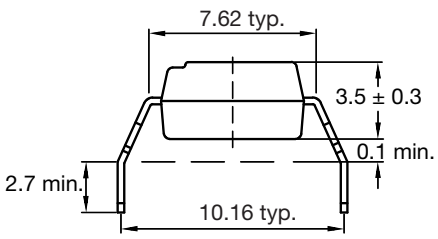
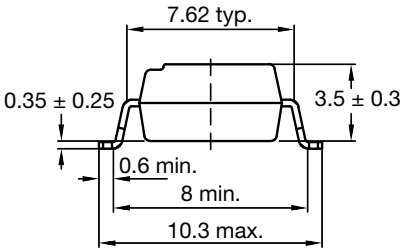
PACKAGE DIMENSIONS in millimeters



Option 6



Option 7



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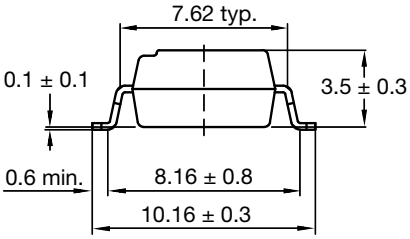

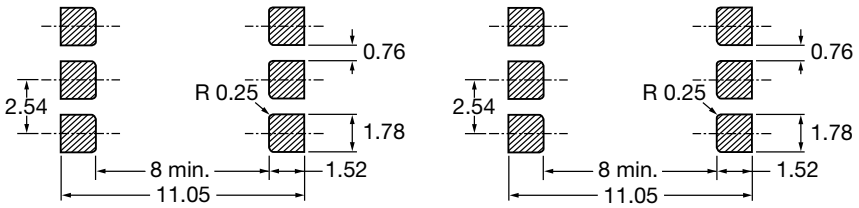

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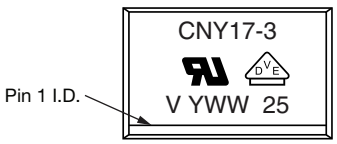
PACKAGE MARKING



Notes

- VDE logo is only marked on option 1 parts. Option information is not marked on the part.
- Tape and reel suffix (T) is not part of the package marking.

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TUBE AND TAPE INFORMATION

DEVICES PER TUBE			
TYPE	**UNITS/TUBE**	**TUBES/BOX**	**UNITS/BOX**
DIP-6	50	40	2000

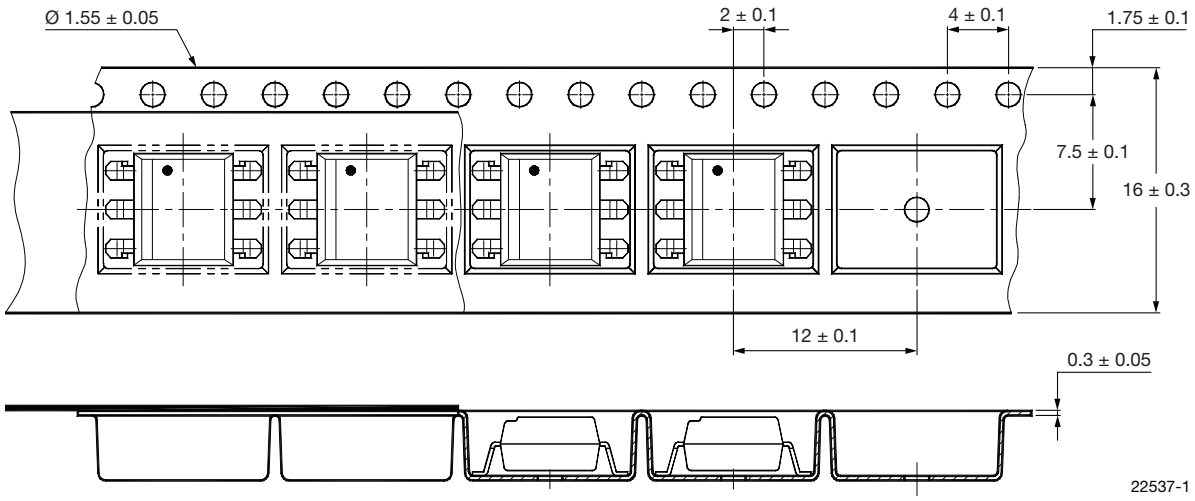

Fig. 16 - Tape and Reel Drawing, 1000 Units per Reel

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