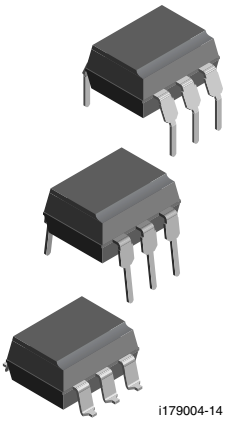
Optocoupler, Phototransistor Output, with Base Connection, 110 °C Rated



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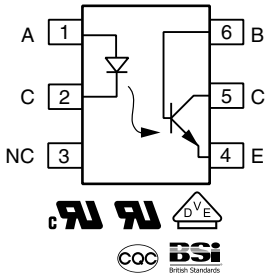


FEATURES

- Operating temperature from -55 °C to +110 °C
- Breakdown 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

APPLICATIONS

- AC adapter
- SMPS
- PLC
- Factory automation
- Game consoles

DESCRIPTION

The CNY117 is a 110 °C rated optocoupler consisting of a gallium arsenide infrared emitting diode optically coupled to a silicon planar phototransistor detector in a plastic plug-in DIP-6 package.

The coupling device is suitable for signal transmission between two electrically separated circuits. The potential difference between the circuits to be coupled is not allowed to exceed the maximum permissible reference voltages.

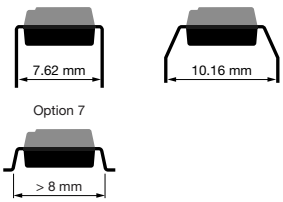
AGENCY APPROVALS

Safety application model number covering all products in this datasheet is CNY117. 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), available with option 1
- BSI: EN 60065, EN 60950-1
- CQC GB8898-2011

ORDERING INFORMATION

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



AGENCY CERTIFIED/PACKAGE	CTR (%)			
UL, cUL, BSI	**40 to 80**	**63 to 125**	**100 to 200**	**160 to 320**
DIP-6	CNY117-1	CNY117-2	CNY117-3	CNY117-4
DIP-6, 400 mil, option 6	CNY117-1X006	CNY117-2X006	CNY117-3X006	CNY117-4X006
SMD-6, option 7	CNY117-1X007T	CNY117-2X007T	CNY117-3X007T	CNY117-4X007T
VDE, UL, cUL, BSI	**40 to 80**	**63 to 125**	**100 to 200**	**160 to 320**
DIP-6	CNY117-1X001	CNY117-2X001	CNY117-3X001	CNY117-4X001
DIP-6, 400 mil, option 6	CNY117-1X016	CNY117-2X016	CNY117-3X016	CNY117-4X016
SMD-6, option 7	CNY117-1X017T	CNY117-2X017T	CNY117-3X017T	CNY117-4X017T

Note

- Additional options may be possible, please contact sales office.

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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	6.0	V
DC forward current		I_F	60	mA
Surge forward current	t ≤ 10 µs	I_{FSM}	2.5	A
Power dissipation		P_{diss}	100	mW
OUTPUT				
Collector emitter breakdown voltage		BV_{CEO}	70	V
Collector current		I_C	50	mA
Collector peak current	t_p/T = 0.5, t_p ≤ 10 ms	I_{CM}	100	mA
Output power dissipation		P_{diss}	150	mW
COUPLER				
Isolation test voltage between emitter and detector referred to standard climate 23/50 DIN 50014	t = 1 min	V_{ISO}	5000	V_{RMS}
Storage temperature range		T_{stg}	-55 to +150	°C
Ambient temperature range		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).

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
OUTPUT							
Collector emitter capacitance	V_{CE} = 5 V, f = 1 MHz		C_{CE}		5.2		pF
Base collector capacitance	V_{CE} = 5 V, f = 1 MHz		C_{BC}		6.5		pF
Emitter base capacitance	V_{CE} = 5 V, f = 1 MHz		C_{EB}		7.5		pF
COUPLER							
Collector emitter, saturation voltage	I_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	CNY117-1	I_{CEO}		2.0	50	nA
		CNY117-2	I_{CEO}		2.0	50	nA
		CNY117-3	I_{CEO}		5.0	100	nA
		CNY117-4	I_{CEO}		5.0	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.

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CURRENT TRANSFER RATIO (T_{amb} = 25 °C, unless otherwise specified)							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Current transfer ratio	I_F = 10 mA	CNY117-1	CTR	40		80	%
		CNY117-2	CTR	63		125	%
		CNY117-3	CTR	100		200	%
		CNY117-4	CTR	160		320	%
	I_F = 1.0 mA	CNY117-1	CTR	13	30		%
		CNY117-2	CTR	22	45		%
		CNY117-3	CTR	34	70		%
		CNY117-4	CTR	56	90		%

Note

- Current transfer ratio I_C/I_F at V_{CE} = 5.0 V, 25 °C and collector emitter leakage current by dash number.

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} = 5.0 V, R_L = 75 Ω		t_{on}		3.0		µs
Rise time	I_F = 10 mA, V_{CC} = 5.0 V, R_L = 75 Ω		t_r		2.0		µs
Turn-off time	I_F = 10 mA, V_{CC} = 5.0 V, R_L = 75 Ω		t_{off}		2.3		µs
Fall time	I_F = 10 mA, V_{CC} = 5.0 V, R_L = 75 Ω		t_f		2.0		µs
Cut-off frequency	I_F = 10 mA, V_{CC} = 5.0 V, R_L = 75 Ω		f_{CO}		110		kHz
SWITCHING OPERATION (with saturation)							
Turn-on time	I_F = 20 mA	CNY117-1	t_{on}		3.0		µs
	I_F = 10 mA	CNY117-2	t_{on}		4.2		µs
		CNY117-3	t_{on}		4.2		µs
	I_F = 5.0 mA	CNY117-4	t_{on}		6.0		µs
Rise time	I_F = 20 mA	CNY117-1	t_r		2.0		µs
	I_F = 10 mA	CNY117-2	t_r		3.0		µs
		CNY117-3	t_r		3.0		µs
	I_F = 5.0 mA	CNY117-4	t_r		4.6		µs
Turn-off time	I_F = 20 mA	CNY117-1	t_{off}		18		µs
	I_F = 10 mA	CNY117-2	t_{off}		23		µs
		CNY117-3	t_{off}		23		µs
	I_F = 5.0 mA	CNY117-4	t_{off}		25		µs
Fall time	I_F = 20 mA	CNY117-1	t_f		11		µs
	I_F = 10 mA	CNY117-2	t_f		14		µs
		CNY117-3	t_f		14		µs
	I_F = 5.0 mA	CNY117-4	t_f		15		µs

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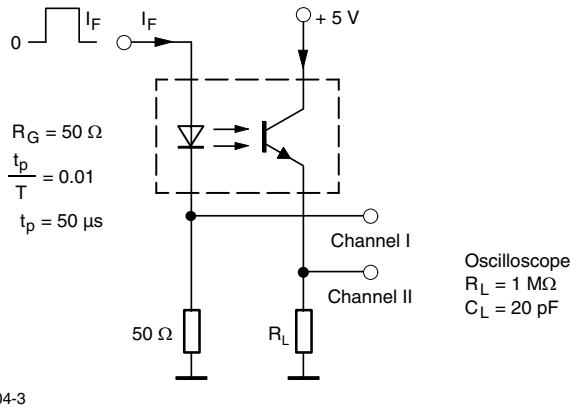

Fig. 1 - Test Circuit, Non-Saturated Operation

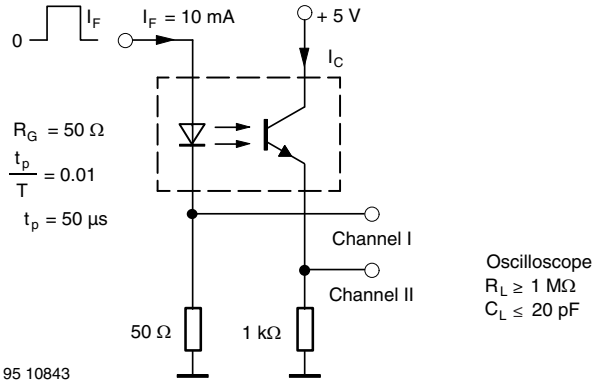

Fig. 2 - Test Circuit, Saturated Operation

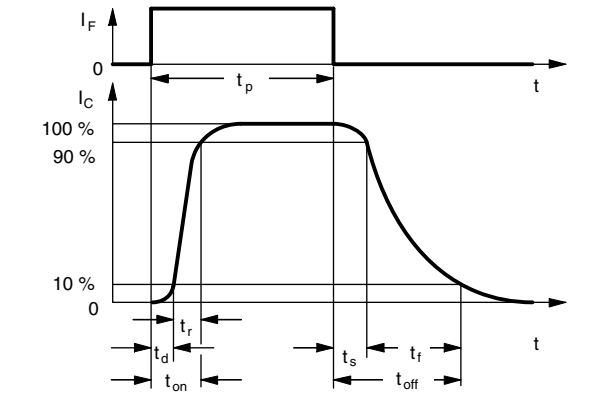

Fig. 3 - Switching Times

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)

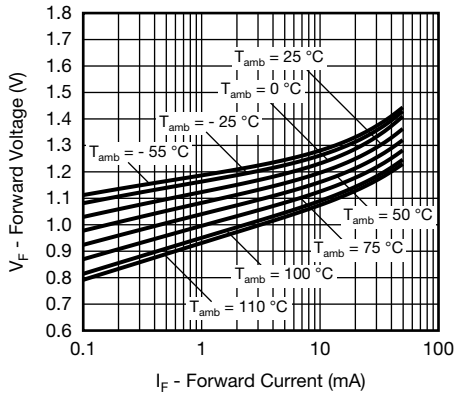

Fig. 4 - Forward Voltage vs. Forward Current

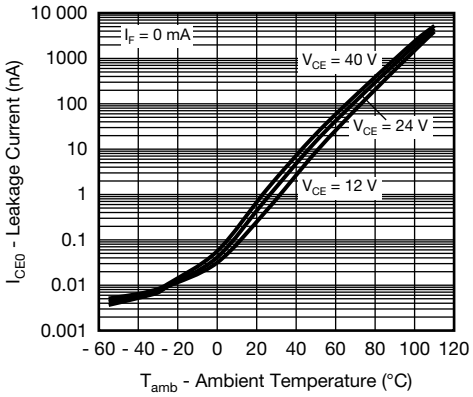

Fig. 7 - Leakage Current vs. Ambient Temperature

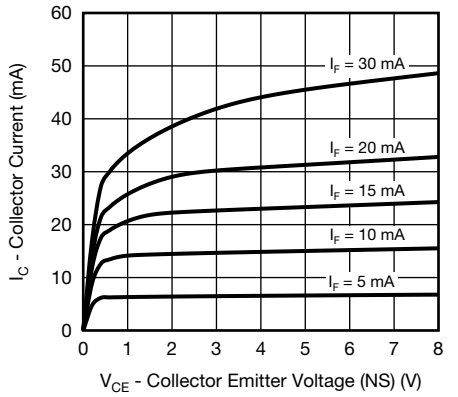

Fig. 5 - Collector Current vs. Collector Emitter Voltage (NS)

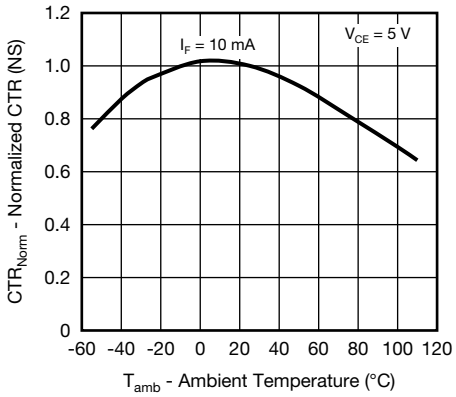

Fig. 8 - Normalized CTR (NS) vs. Ambient Temperature

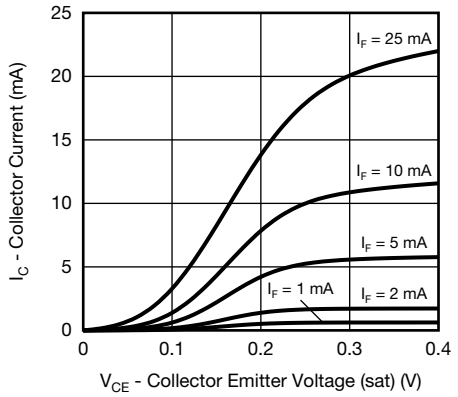

Fig. 6 - Collector Current vs. Collector Emitter Voltage (sat)

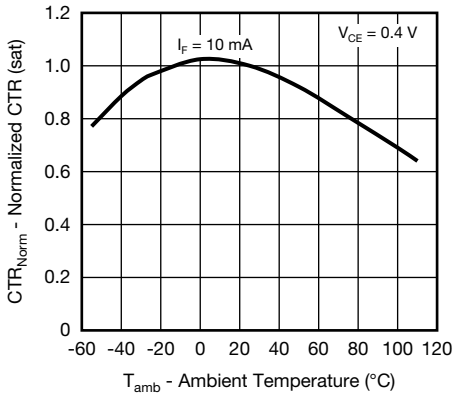

Fig. 9 - Normalized CTR (sat) vs. Ambient Temperature

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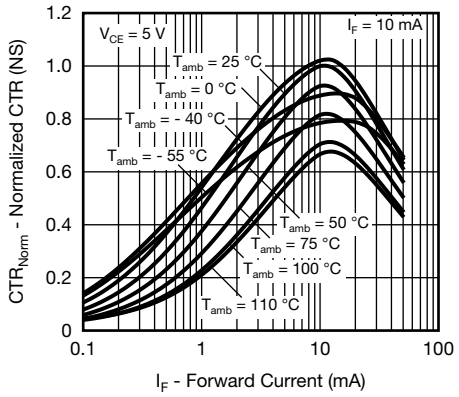

Fig. 10 - Normalized CTR (NS) vs. Forward Current

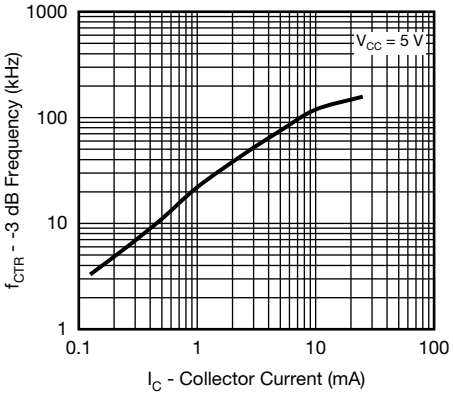

Fig. 13 - CTR -3 dB Frequency vs. Collector Current

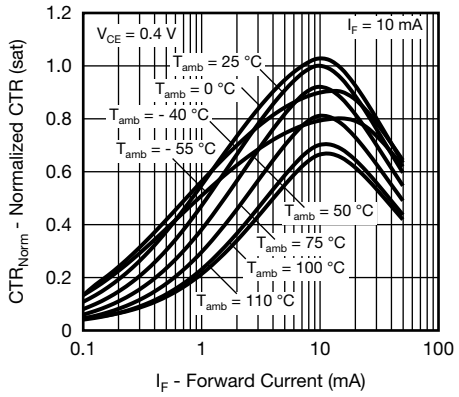

Fig. 11 - Normalized CTR (sat) vs. Forward Current

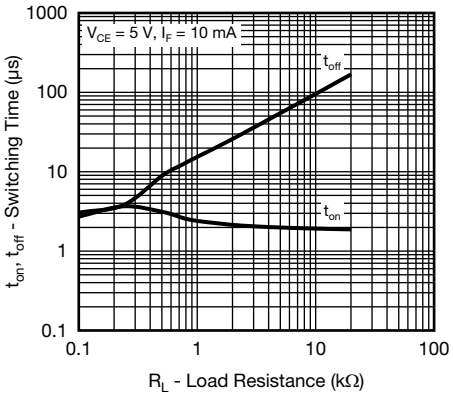

Fig. 14 - Switching Time vs. Load Resistance

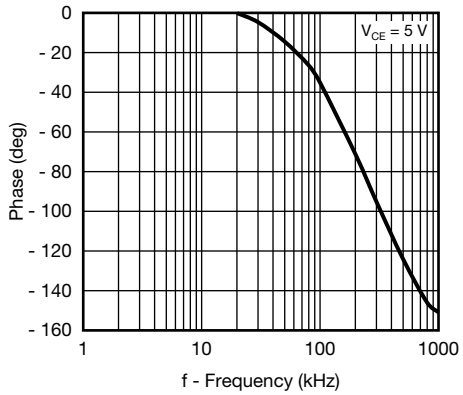

Fig. 12 - CTR Frequency vs. Phase Angle

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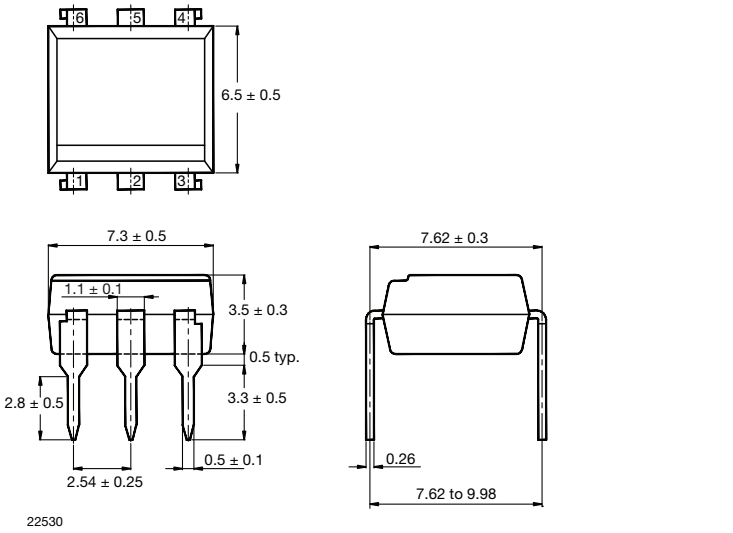
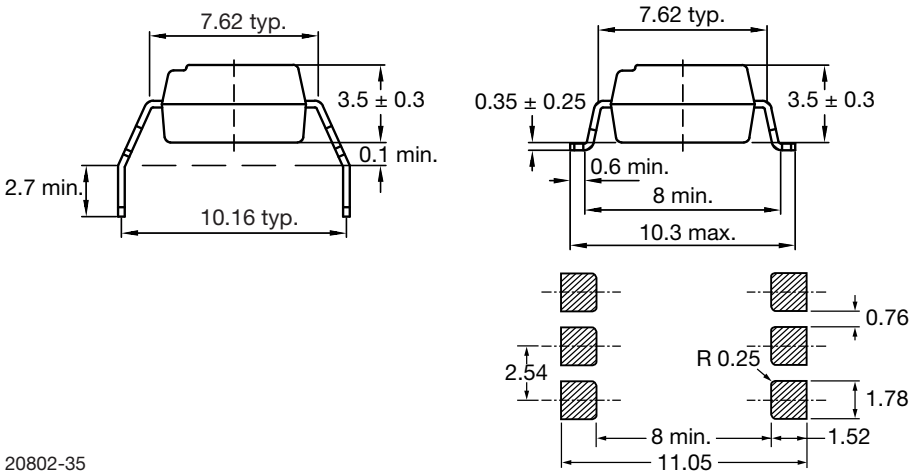
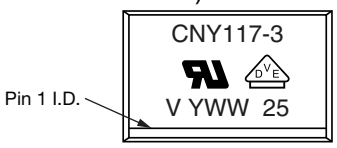
PACKAGE DIMENSIONS in millimeters



Option 6 **Option 7**



PACKAGE MARKING (Example of CNY117-3X017T)



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

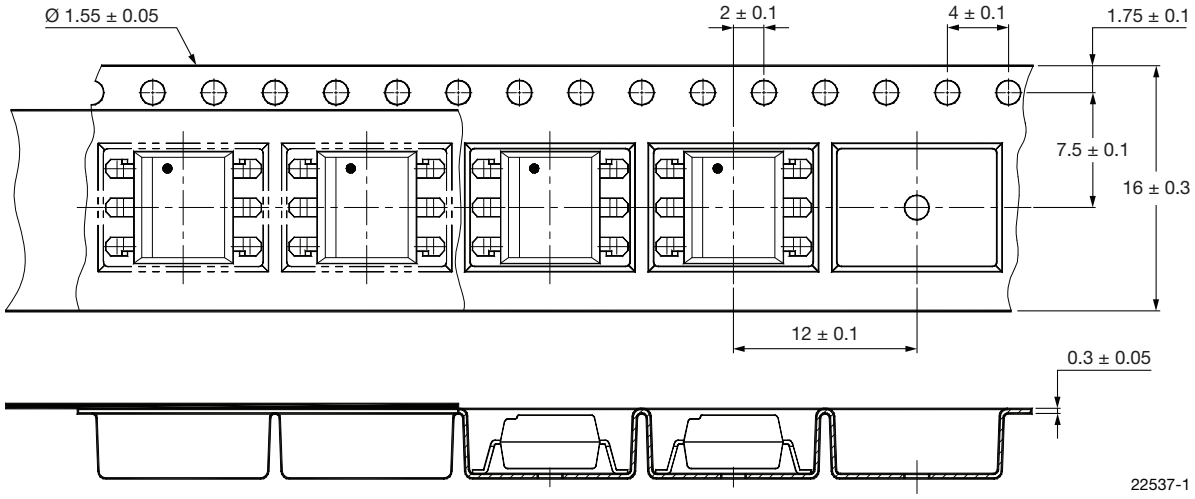

Fig. 15 - Tape and Reel Drawing, 1000 Units per Reel

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