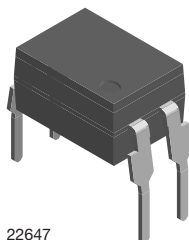
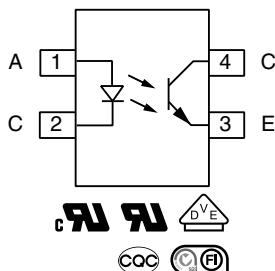


# Low Input Current Optocoupler, Phototransistor Output, High Reliability, 5300 V<sub>RMS</sub>



22647



## DESCRIPTION

The 110 °C rated VO617C feature a high current transfer ratio, low coupling capacitance and high isolation voltage. These couplers have a GaAs infrared diode emitter, which is optically coupled to a silicon planar phototransistor detector, and is incorporated in a plastic DIP-4 package.

The coupling devices are designed for signal transmission between two electrically separated circuits.

## FEATURES

- Copper lead-frame
- Operating temperature from - 55 °C to + 110 °C
- Isolation test voltage, 5300 V<sub>RMS</sub>
- High collector emitter voltage, V<sub>CEO</sub> = 80 V
- Low saturation voltage
- Fast switching times
- Low CTR degradation
- Low coupling capacitance
- End stackable, 0.100" (2.54 mm) spacing
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



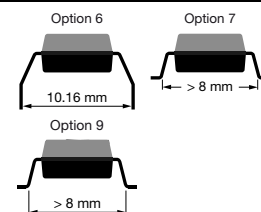
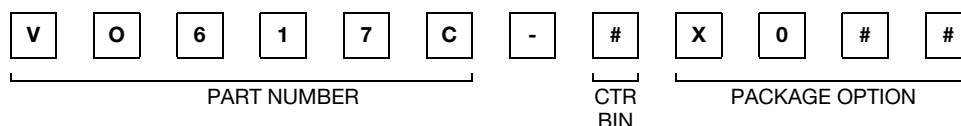
## APPLICATIONS

- AC adapters
- SMPS
- PLC
- Factory automation
- Solar inverter

## AGENCY APPROVALS

- UL1577, file no. E52744
- cUL tested to CSA 22.2 bulletin 5A
- DIN EN 60747-5-5 (VDE 0884), available with option 1
- FIMKO EN 60065 and EN60950-1, file no. FI 27409
- CQC GB8898-2001

## ORDERING INFORMATION



AGENCY CERTIFIED/PACKAGE	CTR (%)			
	5 mA			
UL, cUL, BSI, FIMKO, CQC	40 to 80	63 to 125	100 to 200	160 to 320
DIP-4	-	VO617C-2	-	-
SMD-4, option 9	-	VO617C-2X009T	-	-
VDE, UL, cUL, BSI, FIMKO, CQC	40 to 80	63 to 125	100 to 200	160 to 320
DIP-4	-	VO617C-2X001	VO617C-3X001	VO617C-4X001
DIP-4, 400 mil, option 6	VO617C-1X016	VO617C-2X016	VO617C-3X016	VO617C-4X016
SMD-4, option 7	-	-	VO617C-3X017T1 <sup>(1)</sup>	-

## Notes

- Additional options may be available, please contact the sales office.
- (1) T1 rotation in tape and reel packing.

<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		$V_R$	6	V
Forward current		$I_F$	60	mA
Forward surge current	$t_p \leq 10\text{ }\mu\text{s}$	$I_{FSM}$	2.5	A
Power dissipation	at $25\text{ }^{\circ}\text{C}$	$P_{diss}$	70	mW
<b>OUTPUT</b>				
Collector emitter voltage		$V_{CEO}$	80	V
Emitter collector voltage		$V_{ECO}$	7	V
Collector current		$I_C$	50	mA
	$t_p \leq 1\text{ ms}$		100	mA
Output power dissipation	at $25\text{ }^{\circ}\text{C}$	$P_{diss}$	150	mW
<b>COUPLER</b>				
Isolation test voltage (RMS)	$t = 1\text{ min}$	$V_{ISO}$	5300	$V_{RMS}$
Total power dissipation		$P_{tot}$	200	mW
Operation temperature		$T_{amb}$	- 55 to + 110	$^{\circ}\text{C}$
Storage temperature range		$T_{stg}$	- 55 to + 150	$^{\circ}\text{C}$
Junction temperature		$T_j$	125	$^{\circ}\text{C}$
Soldering temperature <sup>(1)</sup>	2 mm from case, $\leq 10\text{ s}$	$T_{sld}$	260	$^{\circ}\text{C}$

**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.
- Refer to wave profile for soldering conditions for through hole devices (DIP).

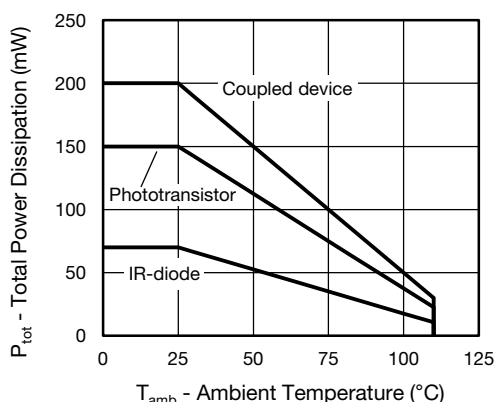


Fig. 1 - Total Power Dissipation vs. Ambient Temperature

<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	$I_F = 60\text{ mA}$	$V_F$		1.1	1.6	V
Reverse current	$V_R = 6\text{ V}$	$I_R$		0.01	10	$\mu\text{A}$
Junction capacitance	$V_R = 0\text{ V}$ , $f = 1\text{ MHz}$	$C_j$		9		pF
<b>OUTPUT</b>						
Collector emitter leakage current	$V_{CE} = 10\text{ V}$	$I_{CEO}$		0.3	100	nA
Collector emitter capacitance	$V_{CE} = 5\text{ V}$ , $f = 1\text{ MHz}$	$C_{CE}$		2.8		pF
Collector emitter breakdown voltage	$I_C = 100\text{ }\mu\text{A}$	$BV_{CEO}$	80			V
Emitter collector breakdown voltage	$I_E = 10\text{ }\mu\text{A}$	$BV_{ECO}$	7			V
<b>COUPLER</b>						
Collector emitter saturation voltage	$I_F = 10\text{ mA}$ , $I_C = 2.5\text{ mA}$	$V_{CEsat}$		0.25	0.4	V
Coupling capacitance	$f = 1\text{ MHz}$	$C_{IO}$		0.3		pF
Cut-off frequency	$I_F = 10\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $R_L = 100\text{ }\Omega$	$f_{ctr}$		110		kHz

**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
$I_C/I_F$	$I_F = 5\text{ mA}$ , $V_{CE} = 5\text{ V}$	VO617C-1	CTR	40		80	%
		VO617C-2	CTR	63		125	%
		VO617C-3	CTR	100		200	%
		VO617C-4	CTR	160		320	%

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

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
NON-SATURATED						
Rise time	$I_C = 2\text{ mA}, V_{CC} = 5\text{ V}, R_L = 100\ \Omega$	$t_r$		3		$\mu\text{s}$
Fall time		$t_f$		3		$\mu\text{s}$
Turn-on time		$t_{on}$		6		$\mu\text{s}$
Turn-off time		$t_{off}$		4		$\mu\text{s}$
SATURATED						
Rise time	$I_F = 1.6\text{ mA}, V_{CC} = 5\text{ V}, R_L = 1.9\text{ k}\Omega$	$t_r$		7		$\mu\text{s}$
Fall time		$t_f$		12		$\mu\text{s}$
Turn-on time		$t_{on}$		9		$\mu\text{s}$
Turn-off time		$t_{off}$		15		$\mu\text{s}$

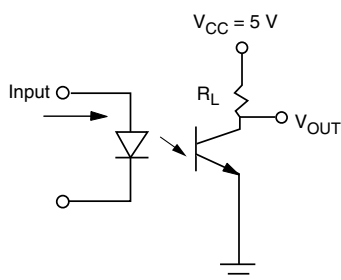


Fig. 2 - Test Circuit

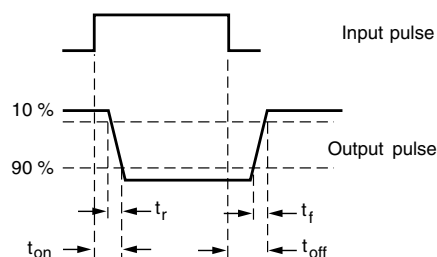


Fig. 3 - Test Circuit and Waveforms

**SAFETY AND INSULATION RATINGS**

PARAMETER		SYMBOL	VALUE	UNIT
MAXIMUM SAFETY RATINGS				
Output safety power		P <sub>SO</sub>	700	mW
Input safety current		I <sub>si</sub>	400	mW
Safety temperature		T <sub>S</sub>	175	°C
Comparative tracking index		CTI	175	
INSULATION RATED PARAMETERS				
Maximum withstanding isolation voltage		V <sub>ISO</sub>	5300	V <sub>RMS</sub>
Maximum transient isolation voltage		V <sub>IOTM</sub>	8000	V <sub>peak</sub>
Maximum repetitive peak isolation voltage		V <sub>IORM</sub>	565	V <sub>peak</sub>
		V <sub>IORM</sub> <sup>(1)</sup>	1140	V <sub>peak</sub>
Insulation resistance	T <sub>amb</sub> = 25 °C, V <sub>DC</sub> = 500 V	R <sub>IO</sub>	10 <sup>12</sup>	Ω
Isolation resistance	T <sub>amb</sub> = 100 °C, V <sub>DC</sub> = 500 V	R <sub>IO</sub>	10 <sup>11</sup>	Ω
Climatic classification (according to IEC 68 part 1)			55/110/21	
Environment (pollution degree in accordance to DIN VDE 0109)			2	
Internal and external creepage	Standard DIP-4		≥ 7	mm
	400 mil DIP-4, SMD-4 option 9		≥ 8	mm
Clearance	Standard DIP-4		≥ 7	mm
	400 mil DIP-4, SMD-4 option 9		≥ 8	mm
Insulation thickness			0.4	mm

**Notes**

- 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.

(1) Only for option 6.

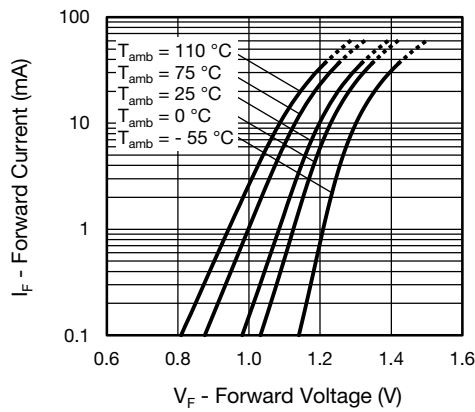
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 4 - Forward Voltage vs. Forward Current

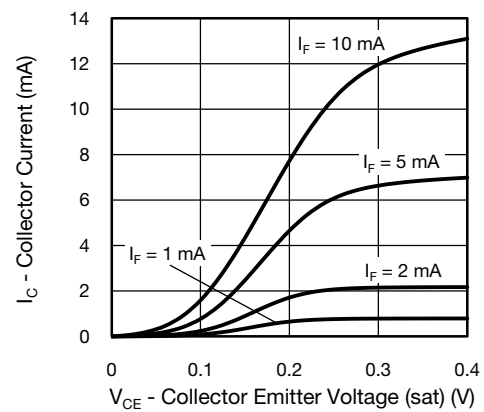


Fig. 7 - Collector Current vs. Collector Emitter Voltage (saturated)

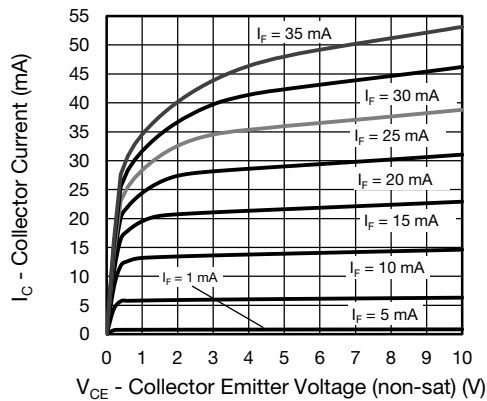


Fig. 5 - Collector Current vs. Collector Emitter Voltage (NS)

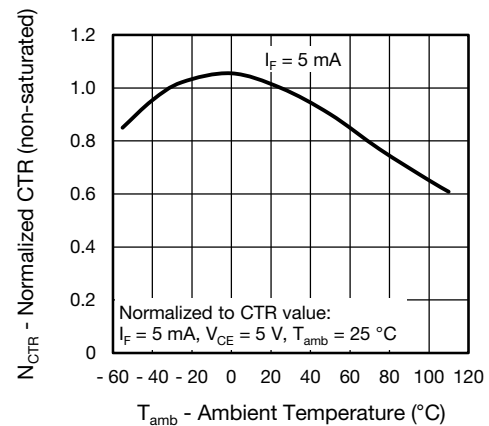


Fig. 8 - Normalized Current Transfer Ratio (non-saturated) vs. Ambient Temperature

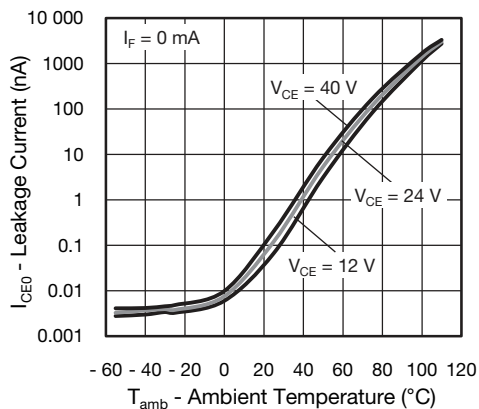


Fig. 6 - Leakage Current vs. Ambient Temperature

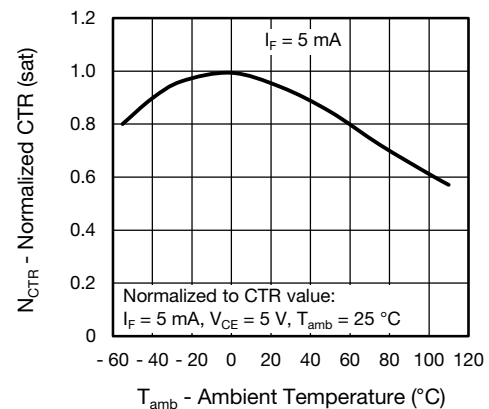


Fig. 9 - Normalized Current Transfer Ratio (saturated) vs. Ambient Temperature

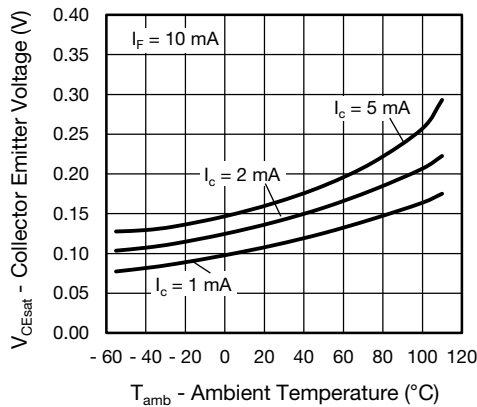


Fig. 10 - Collector Emitter Voltage vs. Ambient Temperature (saturated)

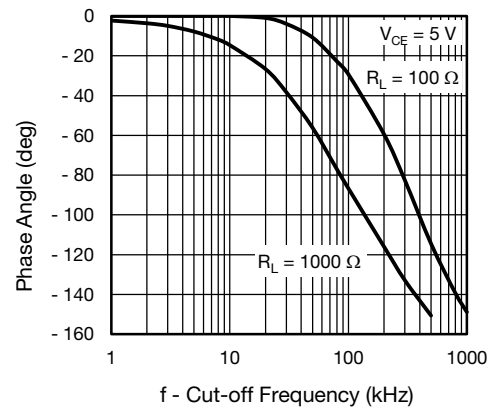


Fig. 13 -  $F_{CTR}$  vs. Phase Angle

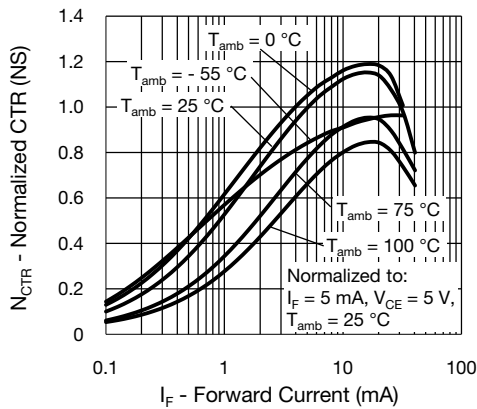


Fig. 11 - Normalized CTR (non-saturated) vs. Forward Current

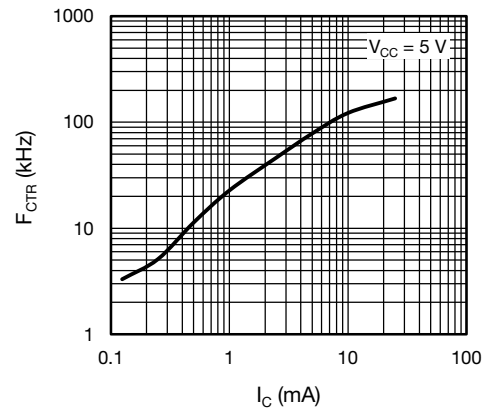


Fig. 14 -  $F_{CTR}$  vs. Collector Current

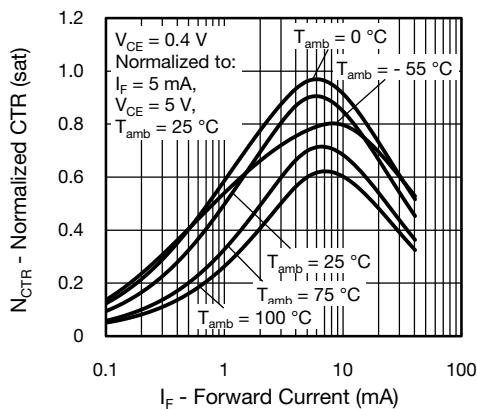


Fig. 12 - Normalized CTR (saturated) vs. Forward Current

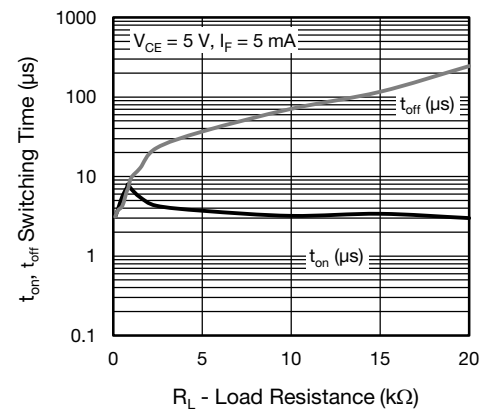
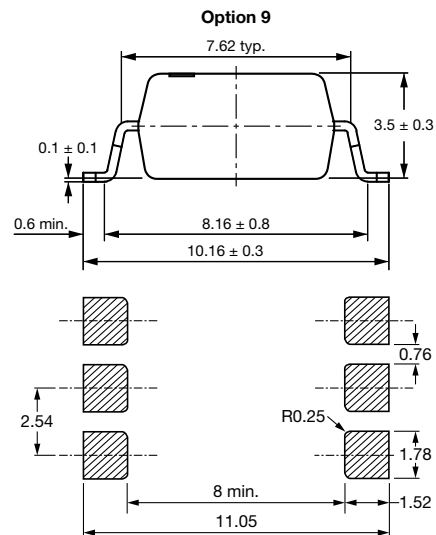
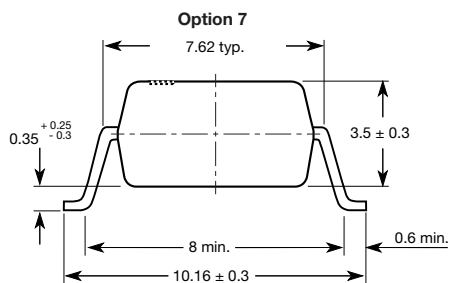
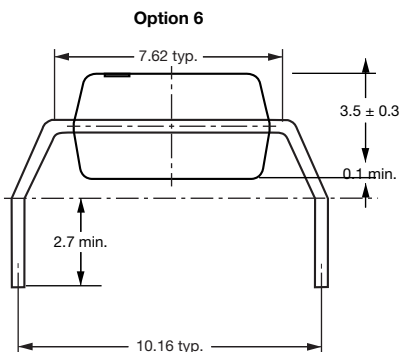
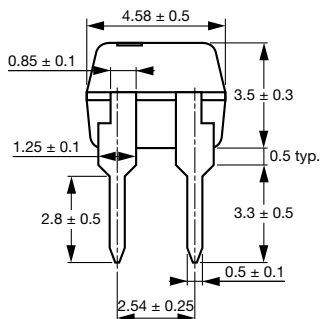
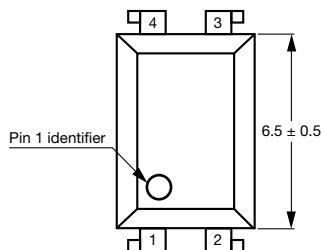
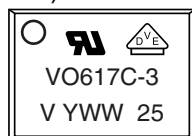


Fig. 15 - Switching Time vs. Load Resistance

**PACKAGE DIMENSIONS** in millimeters


i178027-25

**PACKAGE MARKING** (example of VO617C-3X016)

**Note**

- Option information is not marked.

**PACKING INFORMATION**

DEVICE PER TUBE			
TYPE	UNITS/TUBE	TUBES/BOX	UNITS/BOX
DIP-4	100	40	4000

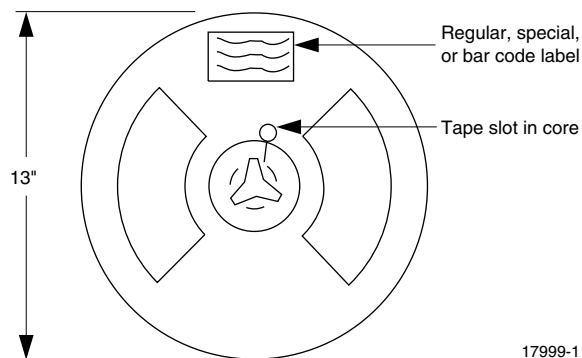


Fig. 16 - Tape and Reel Shipping Medium

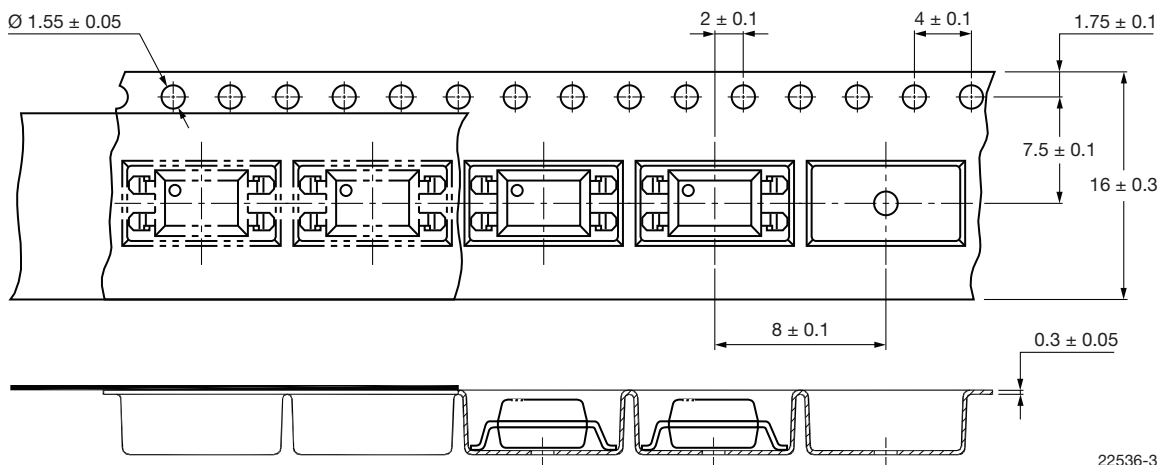


Fig. 17 - Tape Packing for Option 7 and 9 (1000 units per reel)

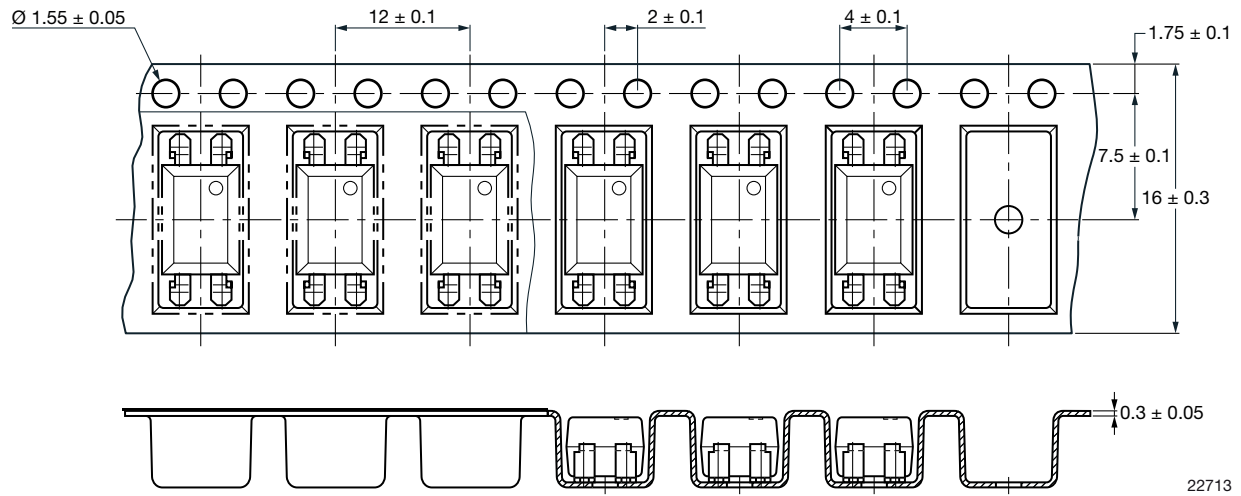


Fig. 18 - Tape Packing for Option 7 and 9, T1 rotation (2000 units per reel)





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