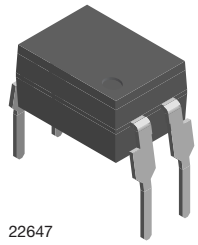
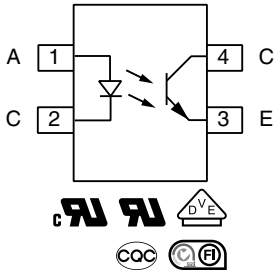
Low Input Current Optocoupler, Phototransistor Output, High Reliability, 5300 V_{RMS}





FEATURES

- Copper lead-frame
- Operating temperature from - 55 °C to + 110 °C
- Isolation test voltage, 5300 V_{RMS}
- High collector emitter voltage, V_{CEO} = 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

Pb-free
e3
RoHS COMPLIANT
HALOGEN FREE
GREEN (5-2008)

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.

APPLICATIONS

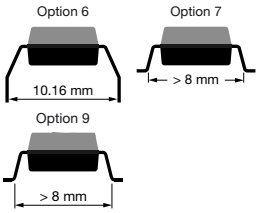
- AC adapters
- SMPS
- PLC
- Factory automation
- Solar inverter

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

V	O	6	1	7	C	-	#	X	0	#	#
PART NUMBER							CTR BIN	PACKAGE OPTION			



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 (1)	-

Notes

- Additional options may be available, please contact the sales office.

(1) T1 rotation in tape and reel packing.

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
Power dissipation	at 25 °C	P_{diss}	70	mW
OUTPUT				
Collector emitter voltage		V_{CEO}	80	V
Emitter collector voltage		V_{ECO}	7	V
Collector current		I_C	50	mA
	$t_p \leq 1$ ms		100	mA
Ouput power dissipation	at 25 °C	P_{diss}	150	mW
COUPLER				
Isolation test voltage (RMS)	t = 1 min	V_{ISO}	5300	V_{RMS}
Total power dissipation		P_{tot}	200	mW
Operation temperature		T_{amb}	- 55 to + 110	°C
Storage temperature range		T_{stg}	- 55 to + 150	°C
Junction temperature		T_j	125	°C
Soldering temperature [1]	2 mm from case, ≤ 10 s	T_{sld}	260	°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.

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

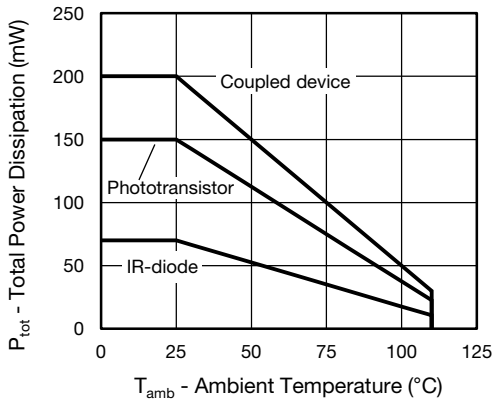


Fig. 1 - Total Power Dissipation vs. Ambient Temperature

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
Forward voltage	I_F = 60 mA	V_F		1.1	1.6	V
Reverse current	V_R = 6 V	I_R		0.01	10	µA
Junction capacitance	V_R = 0 V, f = 1 MHz	C_j		9		pF
OUTPUT						
Collector emitter leakage current	V_{CE} = 10 V	I_{CEO}		0.3	100	nA
Collector emitter capacitance	V_{CE} = 5 V, f = 1 MHz	C_{CE}		2.8		pF
Collector emitter breakdown voltage	I_C = 100 µA	BV_{CEO}	80			V
Emitter collector breakdown voltage	I_E = 10 µA	BV_{ECO}	7			V
COUPLER						
Collector emitter saturation voltage	I_F = 10 mA, I_C = 2.5 mA	V_{CEsat}		0.25	0.4	V
Coupling capacitance	f = 1 MHz	C_{IO}		0.3		pF
Cut-off frequency	I_F = 10 mA, V_{CC} = 5 V, R_L = 100 Ω	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 °C, unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
I_C/I_F	I_F = 5 mA, V_{CE} = 5 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 °C, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
NON-SATURATED						
Rise time	I_C = 2 mA, V_{CC} = 5 V, R_L = 100 Ω	t_r		3		µs
Fall time		t_f		3		µs
Turn-on time		t_{on}		6		µs
Turn-off time		t_{off}		4		µs
SATURATED						
Rise time	I_F = 1.6 mA, V_{CC} = 5 V, R_L = 1.9 kΩ	t_r		7		µs
Fall time		t_f		12		µs
Turn-on time		t_{on}		9		µs
Turn-off time		t_{off}		15		µs

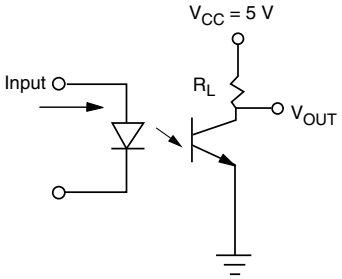


Fig. 2 - Test Circuit

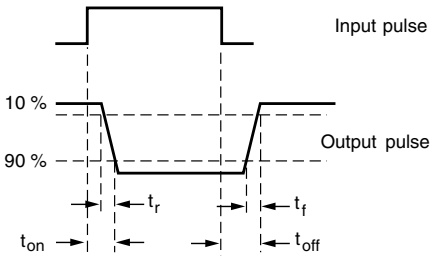


Fig. 3 - Test Circuit and Waveforms

SAFETY AND INSULATION RATINGS				
PARAMETER		SYMBOL	VALUE	UNIT
MAXIMUM SAFETY RATINGS				
Output safety power		P_{SO}	700	mW
Input safety current		I_{si}	400	mW
Safety temperature		T_S	175	°C
Comparative tracking index		CTI	175	
INSULATION RATED PARAMETERS				
Maximum withstanding isolation voltage		V_{ISO}	5300	V_{RMS}
Maximum transient isolation voltage		V_{IOTM}	8000	V_{peak}
Maximum repetitive peak isolation voltage		V_{IORM}	565	V_{peak}
		V_{IORM} (1)	1140	V_{peak}
Insulation resistance	T_{amb} = 25 °C, V_{DC} = 500 V	R_{IO}	10^{12}	Ω
Isolation resistance	T_{amb} = 100 °C, V_{DC} = 500 V	R_{IO}	10^{11}	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 °C, unless otherwise specified)

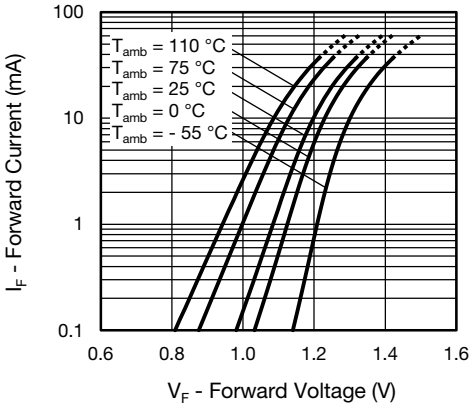


Fig. 4 - Forward Voltage vs. Forward Current

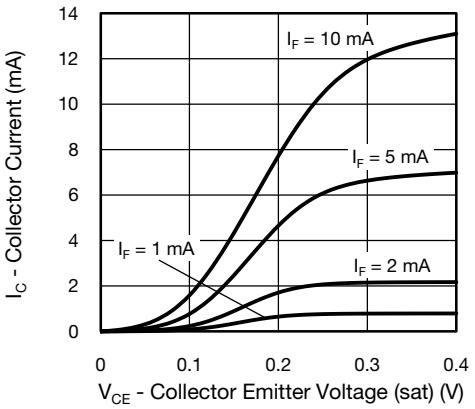


Fig. 7 - Collector Current vs. Collector Emitter Voltage (saturated)

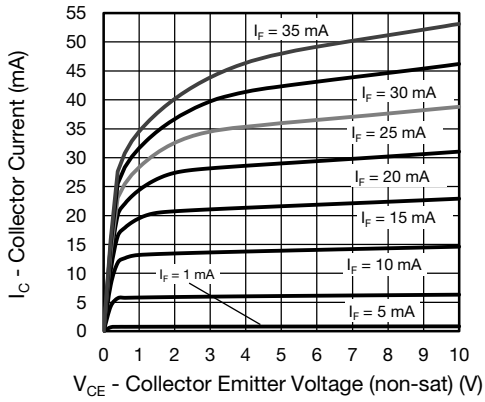


Fig. 5 - Collector Current vs. Collector Emitter Voltage (NS)

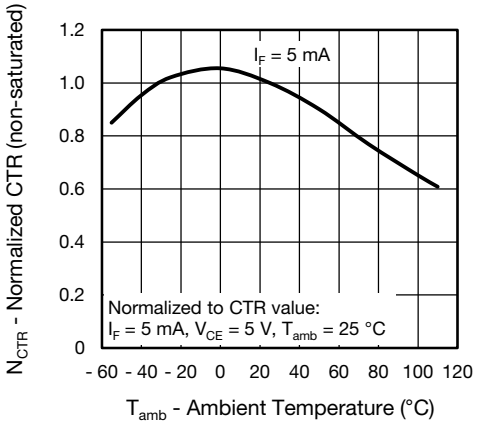


Fig. 8 - Normalized Current Transfer Ratio (non-saturated) vs. Ambient Temperature

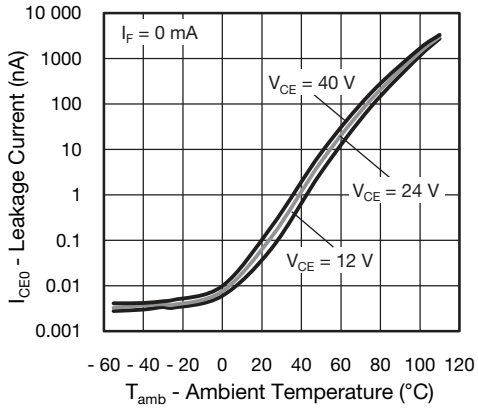


Fig. 6 - Leakage Current vs. Ambient Temperature

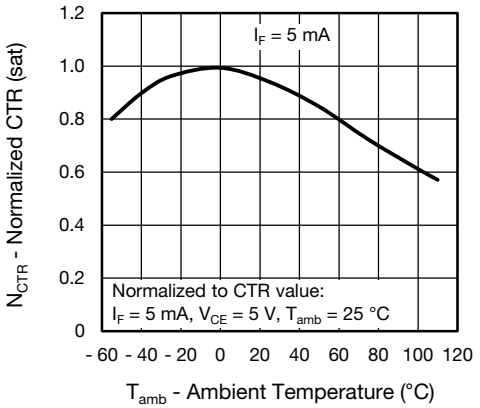


Fig. 9 - Normalized Current Transfer Ratio (saturated) vs. Ambient Temperature

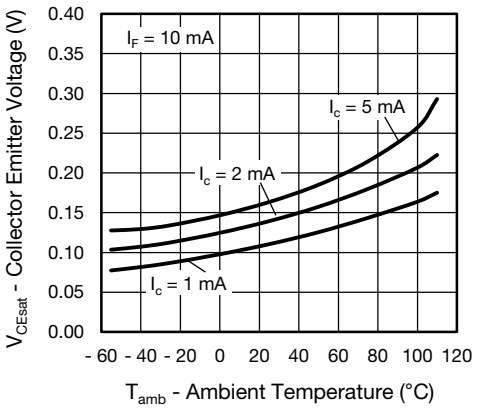


Fig. 10 - Collector Emitter Voltage vs. Ambient Temperature (saturated)

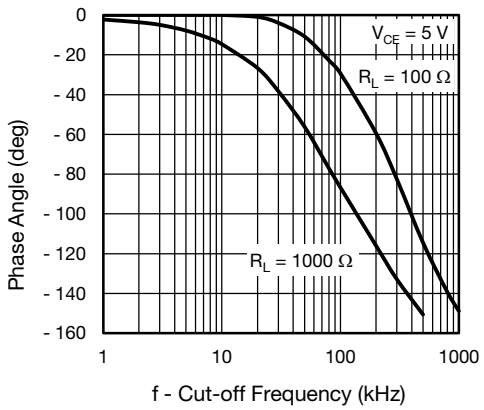


Fig. 13 - F_{CTR} vs. Phase Angle

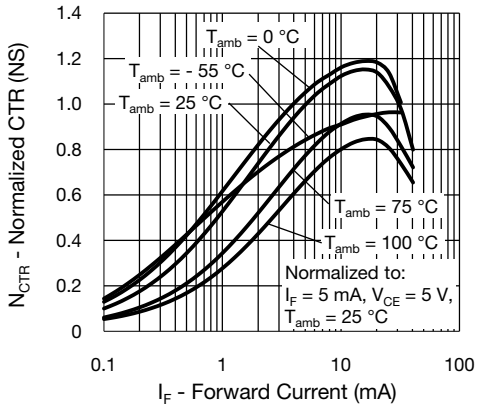


Fig. 11 - Normalized CTR (non-saturated) vs. Forward Current

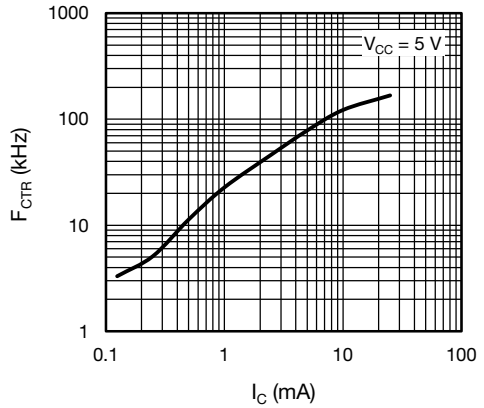


Fig. 14 - F_{CTR} vs. Collector Current

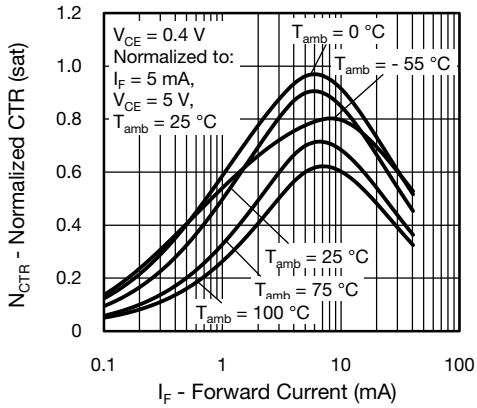


Fig. 12 - Normalized CTR (saturated) vs. Forward Current

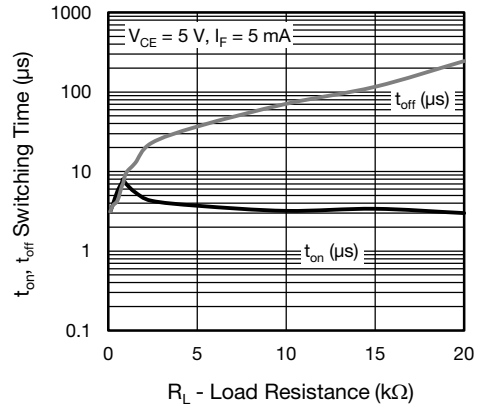
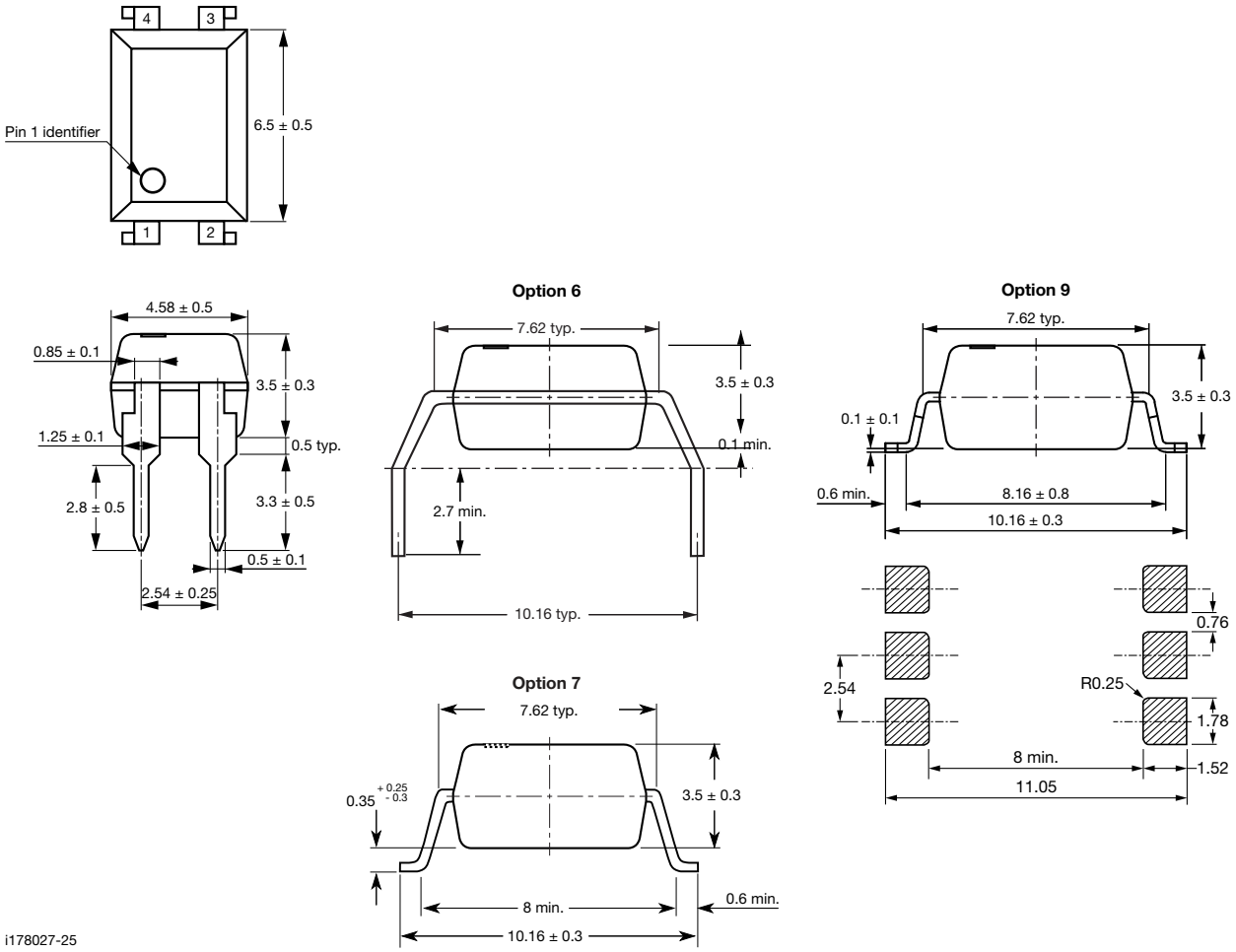
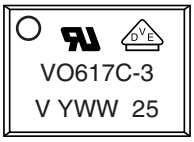


Fig. 15 - Switching Time vs. Load Resistance

PACKAGE DIMENSIONS in millimeters



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

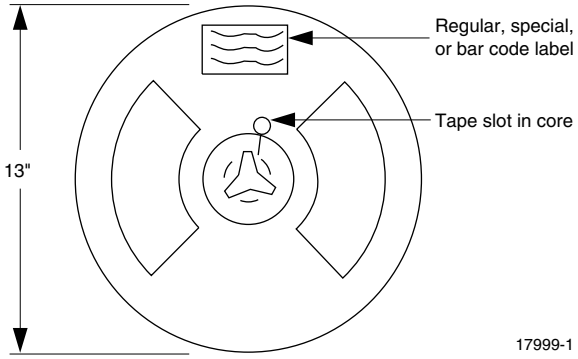


Fig. 16 - Tape and Reel Shipping Medium

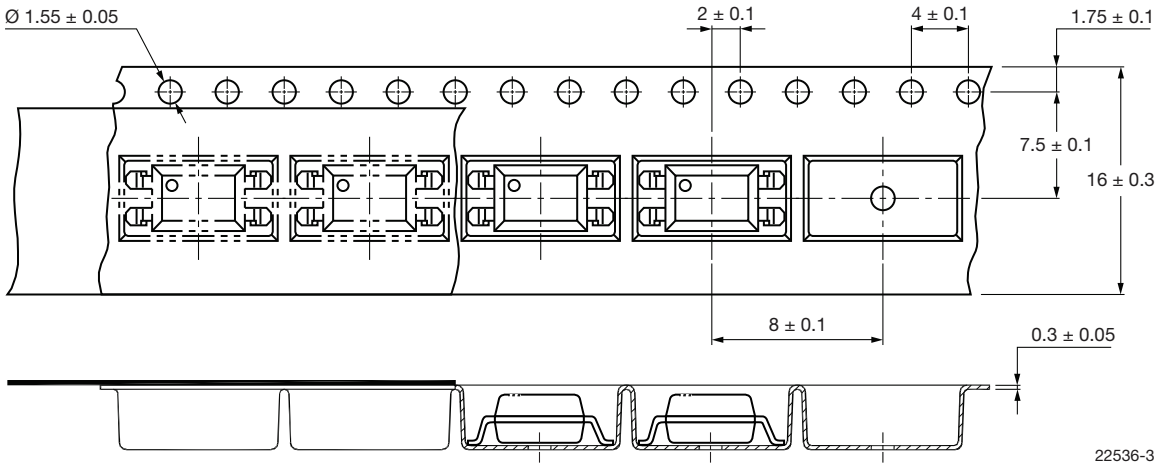


Fig. 17 - Tape Packing for Option 7 and 9 (1000 units per reel)

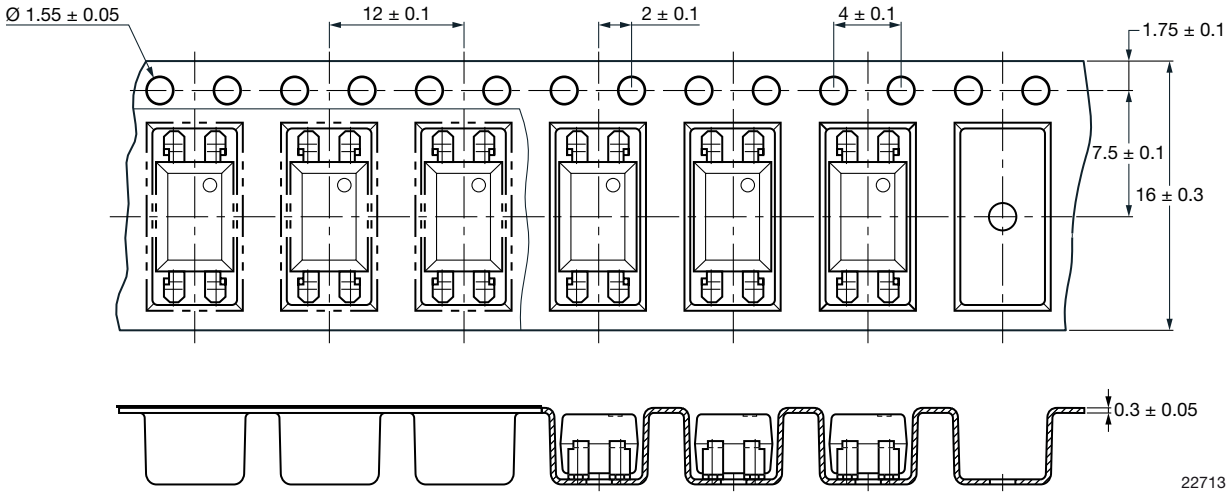


Fig. 18 - Tape Packing for Option 7 and 9, T1 rotation (2000 units per reel)

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