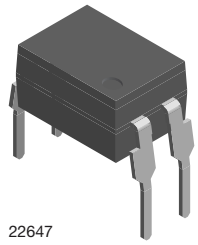
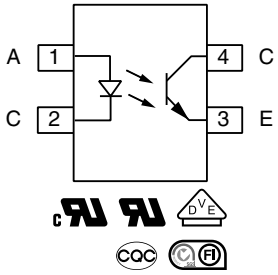
Low Input Current Optocoupler, Phototransistor Output, High Reliability, 5300 V_{RMS}





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 VO615C series 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
- Game consoles

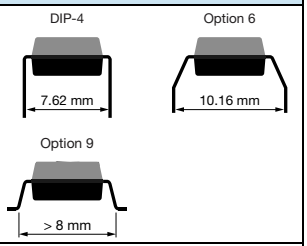
AGENCY APPROVALS

The safety application model number covering all products in this datasheet is VO615C. This model number should be used when consulting safety agency documents.

- UL1577, file no. E52744
- cUL tested to CSA 22.2 bulletin 5A
- DIN EN 60747-5-5 (VDE 0884), available with option 1
- FIMKO EN60065 and EN60950-1, file no. FI 27409
- CQC GB8898-2001

ORDERING INFORMATION

V	O	6	1	5	C	-	#	X	0	#	#	T
PART NUMBER							CTR BIN	PACKAGE OPTION				TAPE AND REEL



AGENCY CERTIFIED/PACKAGE	CTR (%)			
	10 mA			
UL, cUL, FIMKO, CQC	**40 to 80**	**63 to 125**	**100 to 200**	**160 to 320**
DIP-4	VO615C-1	-	-	-
VDE, UL, cUL, FIMKO, CQC (option 1)	**40 to 80**	**63 to 125**	**100 to 200**	**160 to 320**
DIP-4, 400 mil, option 6	-	VO615C-2X016	VO615C-3X016	VO615C-4X016
SMD-4, option 9	-	VO615C-2X019T, VO615C-2X019T1 (1)	-	-

Notes

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

(1) T1 rotation in tape and reel packaging.

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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}	1.5	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
Output 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.

(1) Refer to reflow profile for soldering conditions for surface mounted devices (SMD), and wave profile for soldering conditions for through hole devices (DIP), please go to “Assembly Instructions” (www.vishay.com/doc?80054).

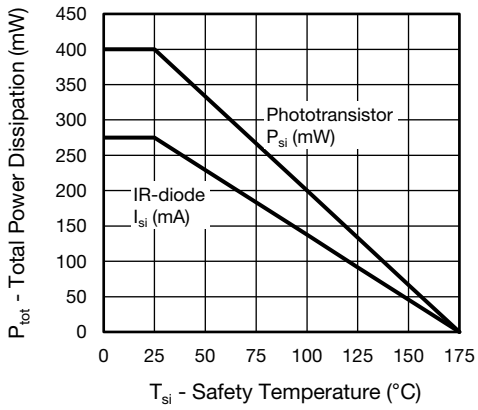

Fig. 1 - Total Power Dissipation vs. Safety Temperature

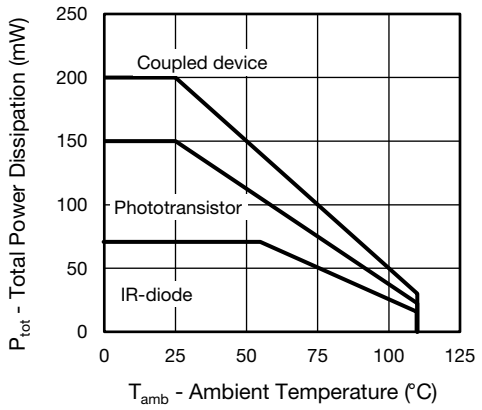

Fig. 2 - Total Power Dissipation vs. Ambient Temperature

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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		1.35	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 = 1 mA	BV_{CEO}	80			V
Emitter collector breakdown voltage	I_E = 100 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_C		0.4		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 = 10 mA, V_{CE} = 5 V	VO615C-1	CTR	40		80	%
		VO615C-2	CTR	63		125	%
		VO615C-3	CTR	100		200	%
		VO615C-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

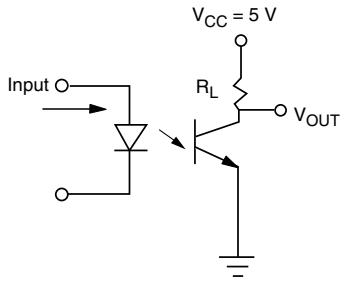

Fig. 3 - Test Circuit

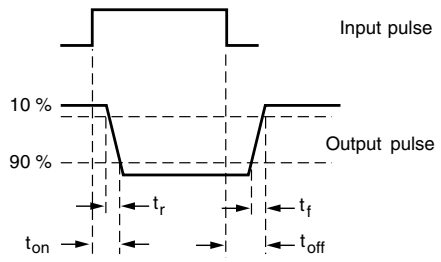

Fig. 4 - Test Circuit and Waveforms

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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}	$\geq 10^{12}$	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)			55/110/21	
Environment (pollution degree in accordance to DIN VDE 0109)			2	
Internal and external creepage	Standard DIP-4		≥ 7	mm
	400 mil DIP-4		≥ 8	mm
Clearance	Standard DIP-4		≥ 7	mm
	400 mil DIP-4		≥ 8	mm
Insulation thickness			0.4	mm

Notes

- As per DIN EN 60747-5-5, 2, § 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)

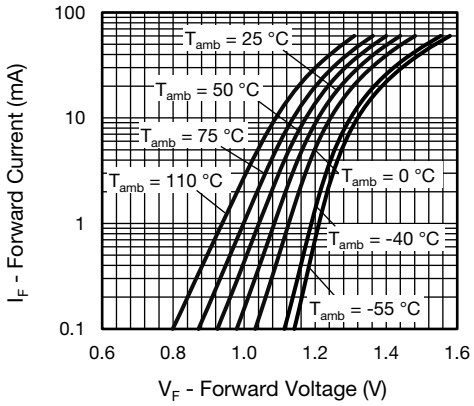

Fig. 5 - Forward Voltage vs. Forward Current

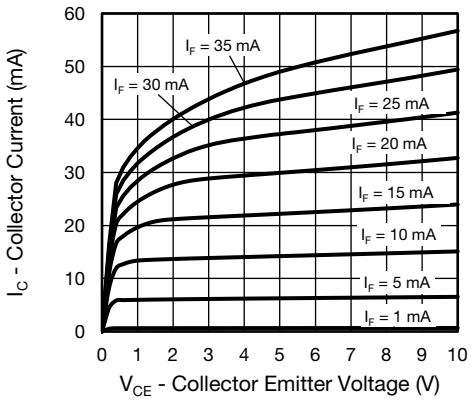

Fig. 6 - Collector Current vs. Collector Emitter Voltage (NS)

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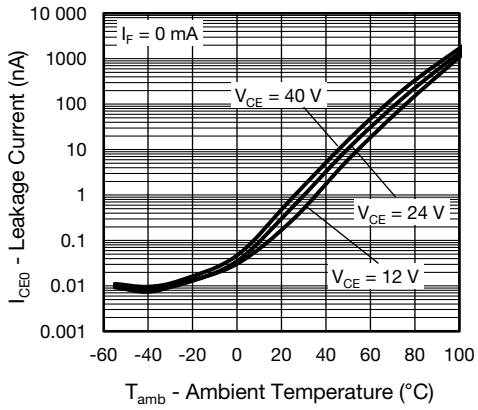

Fig. 7 - Leakage Current vs. Ambient Temperature

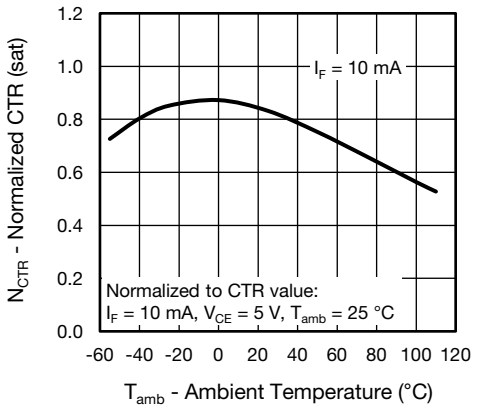

Fig. 10 - Normalized Current Transfer Ratio (saturated) vs. Ambient Temperature

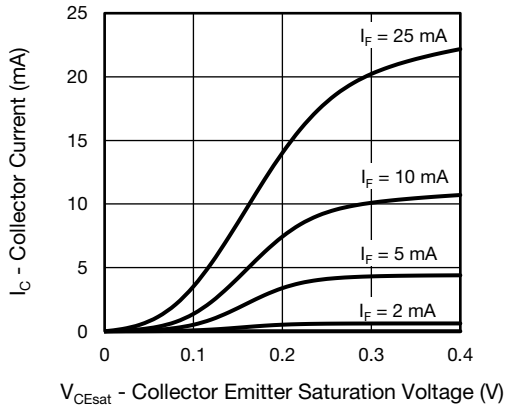

Fig. 8 - Collector Current vs. Collector Emitter Voltage (saturated)

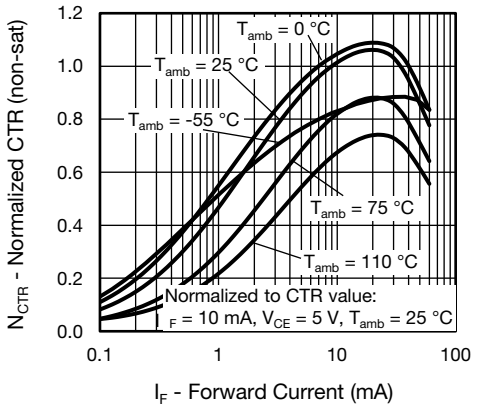

Fig. 11 - Normalized CTR (non-saturated) vs. Forward Current

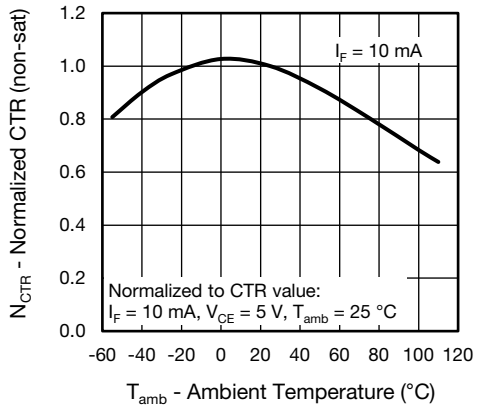

Fig. 9 - Normalized Current Transfer Ratio (non-saturated) vs. Ambient Temperature

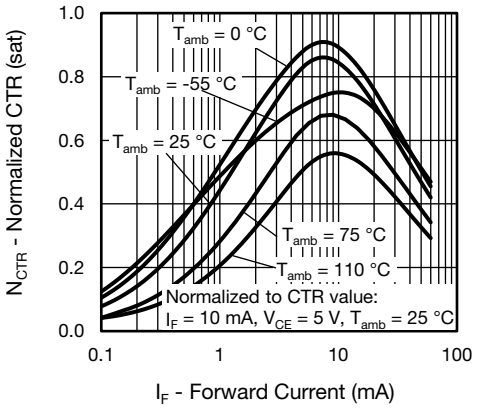

Fig. 12 - Normalized CTR (saturated) vs. Forward Current

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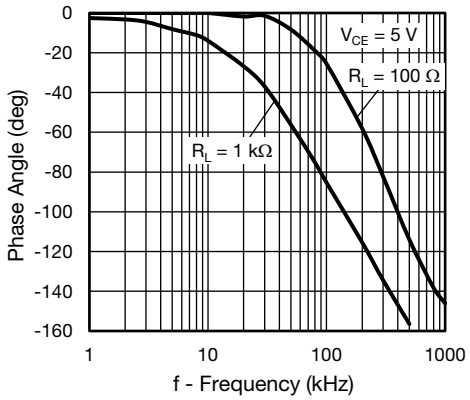

Fig. 13 - Phase Angle vs. Frequency

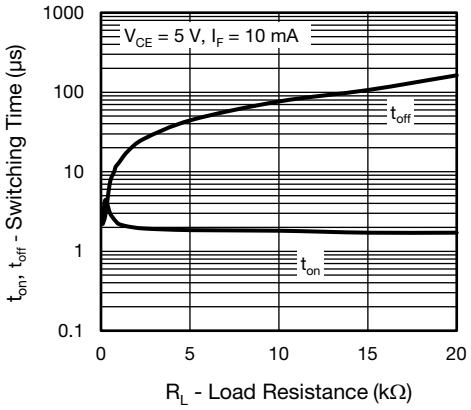

Fig. 15 - Switching Time vs. Load Resistance

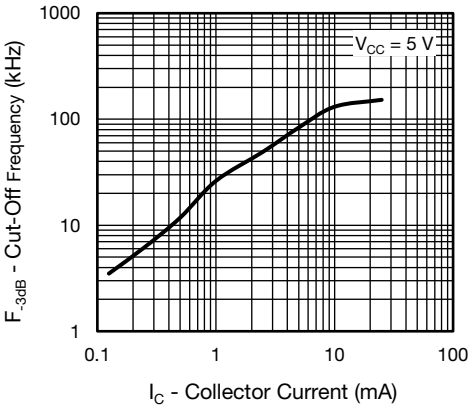

Fig. 14 - Frequency vs. Collector Current

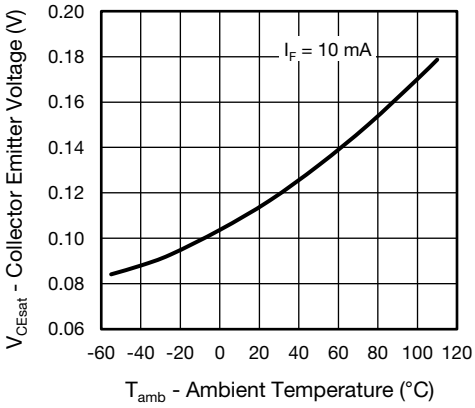

Fig. 16 - Collector Emitter Voltage vs. Ambient Temperature (saturated)

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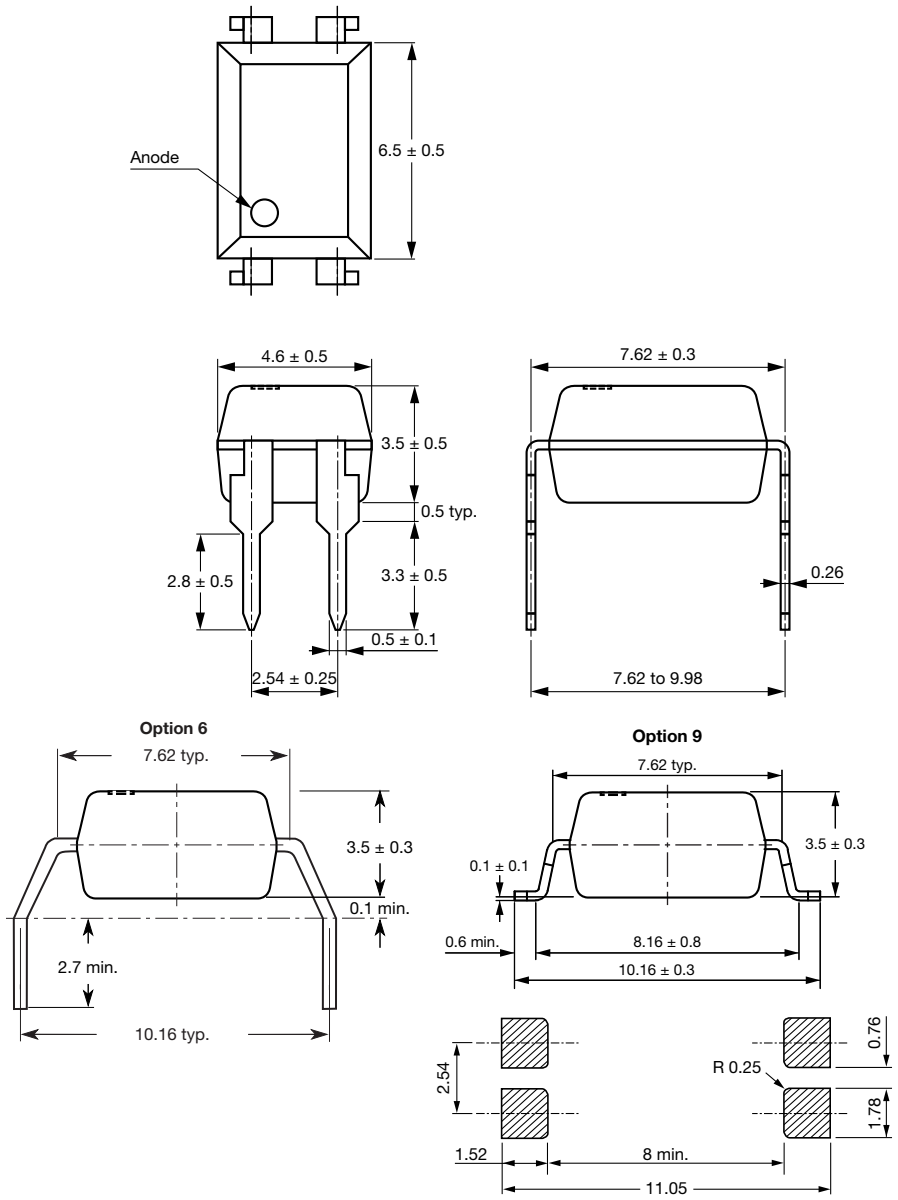
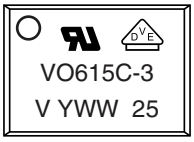
PACKAGE DIMENSIONS in millimeters



PACKAGE MARKING (Example of VO615C-3X016)



Note

- Option information is not marked.

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PACKING INFORMATION

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

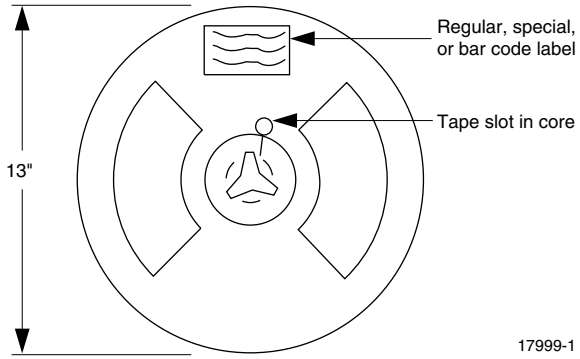

Fig. 17 - Tape and Reel Shipping Medium

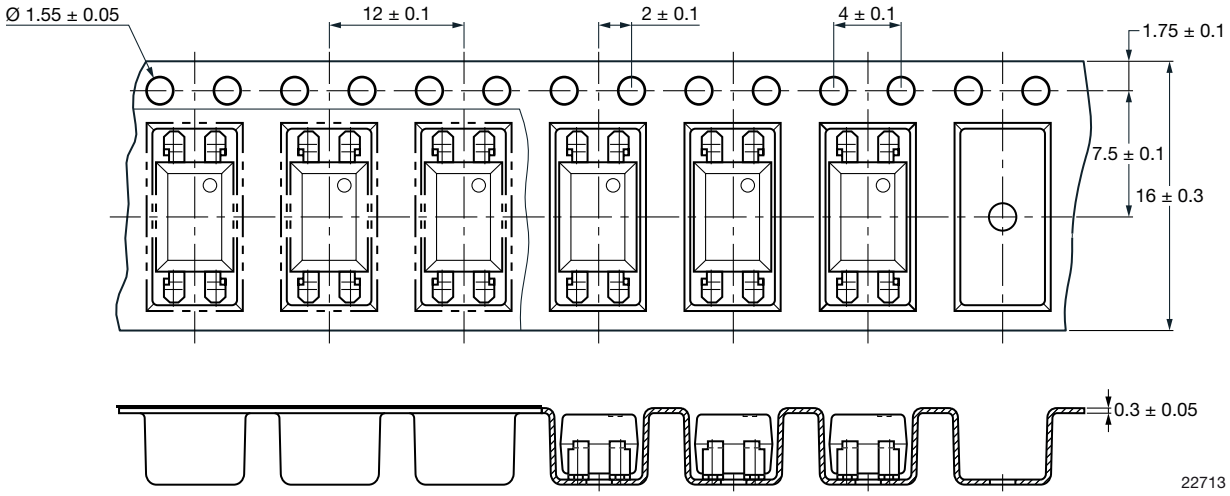

Fig. 18 - Tape Packing for Option 7 and 9, T1 rotation (2000 units per reel)

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