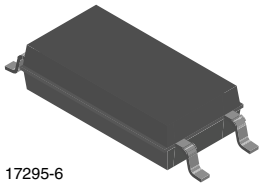
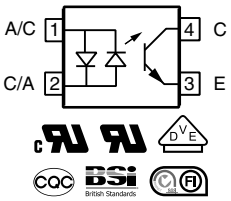
Optocoupler, Phototransistor Output, AC Input, Low Input Current, 4 Pin LSOP, Long Creepage Mini-Flat Package





FEATURES

- Low profile package
- High collector emitter voltage, V_{CEO} = 80 V
- Isolation test voltage, 5000 V_{RMS}
- Low coupling capacitance
- High common mode transient immunity
- Material categorization:
  For definitions of compliance please see www.vishay.com/doc?99912

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

DESCRIPTION

The VOL628A has two GaAs infrared emitting diodes, which are optically coupled to a silicon planar phototransistor detector, and are incorporated in a 4 pin LSOP wide body package.

It features a high current transfer ratio, low coupling capacitance, and high isolation voltage.

The coupling device is designed for signal transmission between two electrically separated circuits.

APPLICATIONS

- Telecom
- Industrial controls
- Battery powered equipment
- Office machines
- Programmable controllers

AGENCY APPROVALS

- UL1577, file no. E76222
- cUL CSA 22.2 bulletin 5A, double protection
- DIN EN 60747-5-5 (VDE 0884-5), available with option 1
- BSI: EN 60065:2002, EN 60950-1:2006
- FIMKO EN60950-1
- CQC: GB8898, GB4943

ORDERING INFORMATION

V	O	L	6	2	8	A	-	#	X	0	0	1	T
PART NUMBER								CTR BIN	PACKAGE OPTION				TAPE AND REEL

AGENCY CERTIFIED/PACKAGE	CTR (%)			
	1 mA			
UL, cUL, BSI, FIMKO, CQC	**50 to 600**	**40 to 80**	**63 to 125**	**100 to 200**
4 pin LSOP, mini-flat, long creepage	VOL628A	VOL628A-1T	VOL628A-2T	VOL628A-3T
UL, cUL, BSI, FIMKO, CQC, VDE (option 1)	**50 to 600**	**40 to 80**	**63 to 125**	**100 to 200**
4 pin LSOP, mini-flat, long creepage	VOL628A-X001T	VOL628A-1X001T	VOL628A-2X001T	VOL628A-3X001T

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
INPUT				
Reverse voltage		V_R	6	V
Power dissipation		P_{diss}	100	mW
Forward current		I_F	± 60	mA
Junction temperature		T_j	125	°C
OUTPUT				
Collector emitter voltage		V_{CEO}	80	V
Emitter collector voltage		V_{ECO}	7	V
Collector current		I_C	50	mA
	t_p/T = 0.5, t_p < 10 ms	I_C	100	mA
Power dissipation		P_{diss}	150	mW
Junction temperature		T_j	125	°C
COUPLER				
Isolation test voltage between emitter and detector		V_{ISO}	5000	V_{RMS}
Total power dissipation		P_{tot}	250	mW
Storage temperature range		T_{stg}	- 55 to + 125	°C
Ambient temperature range		T_{amb}	- 55 to + 110	°C
Soldering temperature (1)	≤ 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.

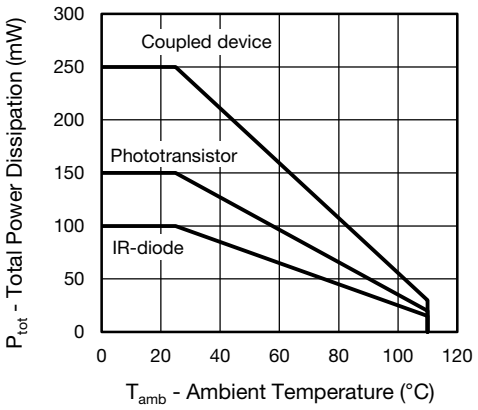


Fig. 1 - Total Power Dissipation vs. Ambient Temperature

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT							
Forward voltage	I_F = ± 5 mA		V_F		1.16	1.5	V
Capacitance	V_R = 0 V, f = 1 MHz		C_O		45		pF
OUTPUT							
Collector emitter leakage current	V_{CE} = 10 V, I_F = 0 A		I_{CEO}		10	200	nA
Collector emitter capacitance	V_{CE} = 5 V, f = 1 MHz		C_{CE}		7		pF
COUPLER							
Collector emitter saturation voltage	I_C = 0.2 mA, I_F = ± 1 mA	VOL628A	V_{CEsat}		0.25	0.4	V
	I_C = 0.2 mA, I_F = ± 1 mA	VOL628A-1T	V_{CEsat}		0.25	0.4	V
	I_C = 0.32 mA, I_F = ± 1 mA	VOL628A-2T	V_{CEsat}		0.25	0.4	V
	I_C = 0.5 mA, I_F = ± 1 mA	VOL628A-3T	V_{CEsat}		0.25	0.4	V
Coupling capacitance	f = 1 MHz		C_C		0.25		pF

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 = ± 1 mA, V_{CE} = 5 V	VOL628A	CTR	50		600	%
		VOL628A-1	CTR	40		80	%
		VOL628A-2	CTR	63		125	%
		VOL628A-3	CTR	100		200	%

SWITCHING CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Turn on time	V_{CC} = 5 V, I_C = 2 mA, R_L = 100 Ω	t_{on}		6		µs
Rise time	V_{CC} = 5 V, I_C = 2 mA, R_L = 100 Ω	t_r		3.5		µs
Turn off time	V_{CC} = 5 V, I_C = 2 mA, R_L = 100 Ω	t_{off}		5.5		µs
Fall time	V_{CC} = 5 V, I_C = 2 mA, R_L = 100 Ω	t_f		5		µs

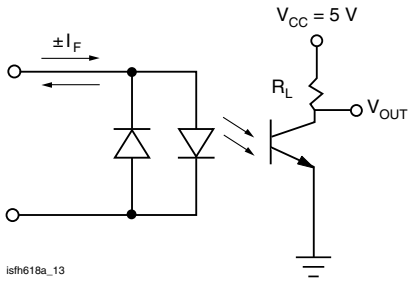


Fig. 2 - Test Circuit

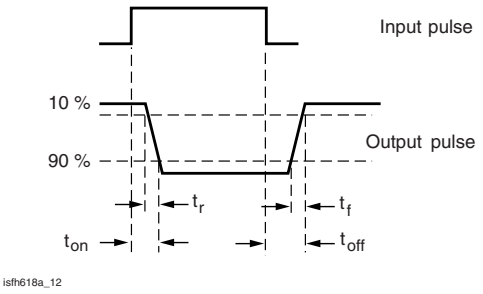


Fig. 3 - Test Circuit and Waveforms

SAFETY AND INSULATION RATED PARAMETERS						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Partial discharge test voltage - routine test	100 %, t_{test} = 1 s	V_{pd}	2			kV_{peak}
Partial discharge test voltage - lot test (sample test)	t_{Tr} = 60 s, t_{test} = 10 s, (see figure 4)	V_{IOTM}			8	kV_{peak}
		V_{pd}	1.68			kV_{peak}
Insulation voltage		V_{IORM}			1050	V_{peak}
Insulation resistance	V_{IO} = 500 V, T_{amb} = 25 °C	R_{IO}	10^{12}			Ω
	V_{IO} = 500 V, T_{amb} = 100 °C	R_{IO}	10^{11}			Ω
	V_{IO} = 500 V, T_{amb} = 150 °C (construction test only)	R_{IO}	10^9			Ω
Safety rating - maximum input current		I_{si}			130	mA
Safety rating - maximum power dissipation		P_{SO}			265	mW
Safety rating - maximum ambient temperature		T_{si}			150	°C
Clearance distance			8			mm
Creepage distance			8			mm
Insulation distance (internal)			0.4			mm

Note

- According to DIN EN 60747-5-5 (VDE 0884), § 7.4.3.8.2, (see figure 4). This optocoupler is suitable for safe electrical isolation only within the safety ratings. Compliance with the safety ratings shall be ensured by means of suitable protective circuits.

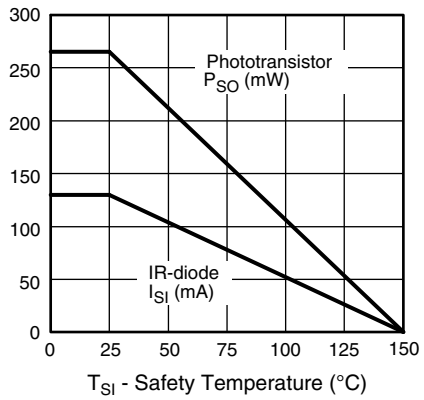


Fig. 4 - Derating Diagram

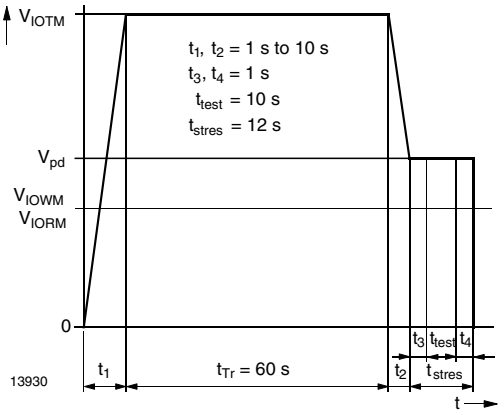


Fig. 5 - Test Pulse Diagram for Sample Test according to DIN EN 60747-5-5

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

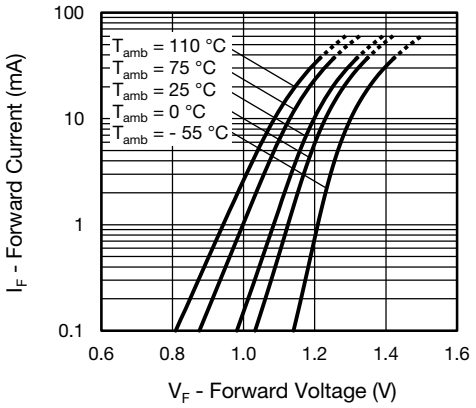


Fig. 6 - Forward Voltage vs. Forward Current

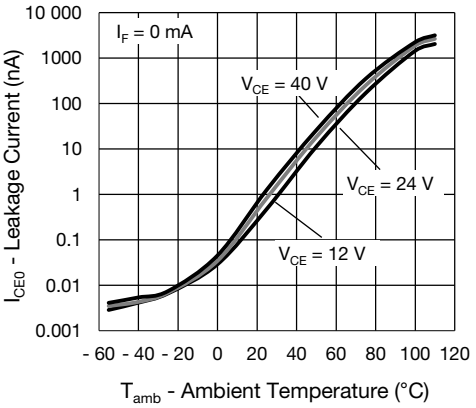


Fig. 8 - Collector Emitter Current vs. Ambient Temperature

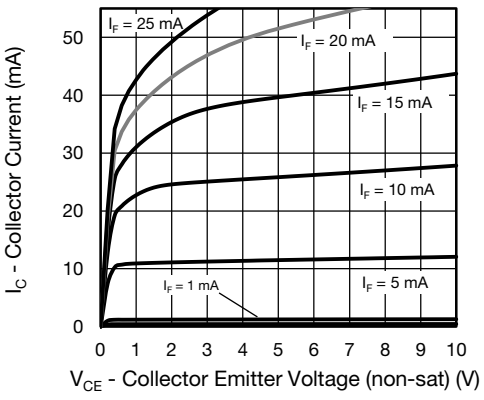


Fig. 7 - Collector Current vs. Collector Emitter Voltage (non-saturated)

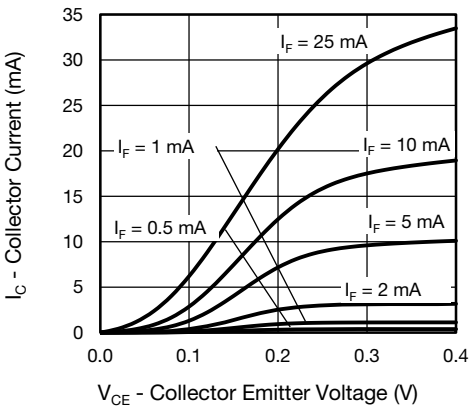


Fig. 9 - Collector Current vs. Collector Emitter Voltage (saturated)

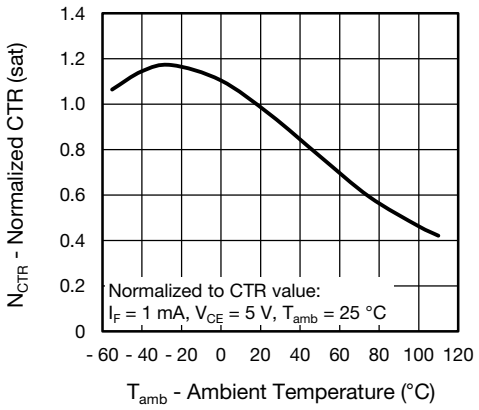


Fig. 10 - Normalized Current Transfer Ratio vs. Ambient Temperature (saturated)

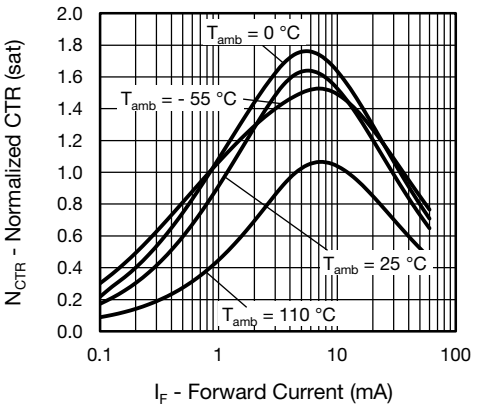


Fig. 13 - Current Transfer Ratio vs. Forward Current (non-saturated) Normalized to 1 mA at 25 °C

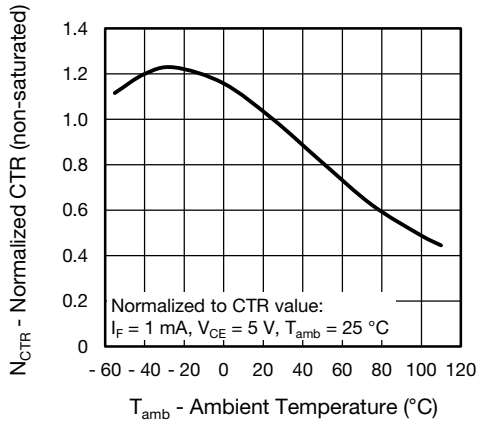


Fig. 11 - Normalized Current Transfer Ratio vs. Ambient Temperature (non-saturated)

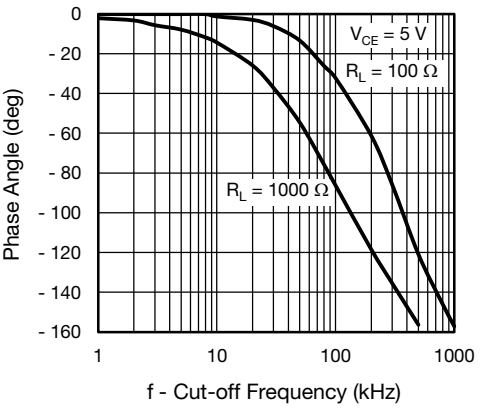


Fig. 14 - f_{CTR} vs. Phase Angle

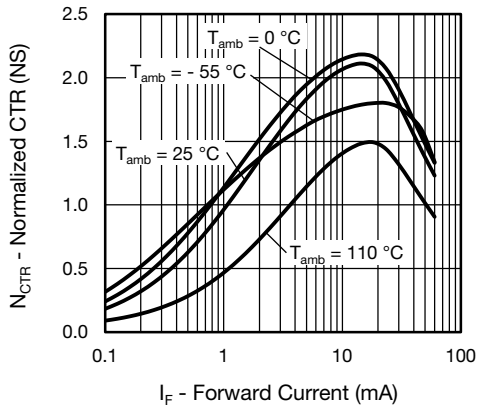


Fig. 12 - Current Transfer Ratio vs. Forward Current (saturated) Normalized to 1 mA at 25 °C

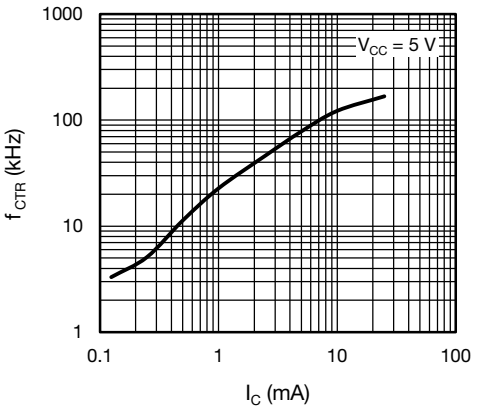


Fig. 15 - Cut-off Frequency (- 3 dB) vs. Collector Current

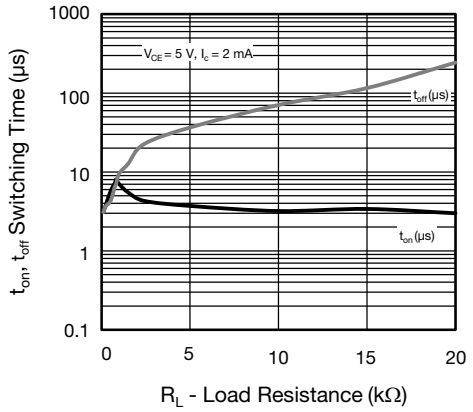


Fig. 16 - Switching Time vs. Load Resistance

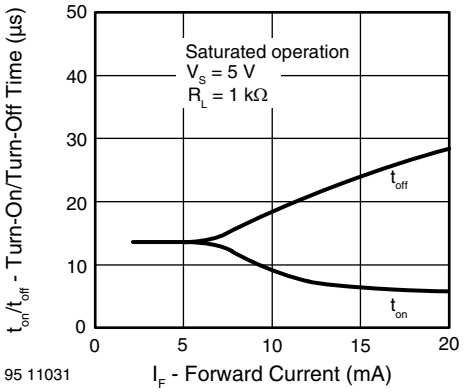


Fig. 18 - Turn-On/Turn-Off Time vs. Forward Current

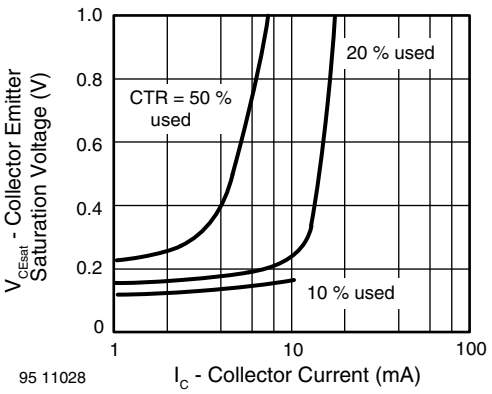


Fig. 17 - Collector Emitter Saturation Voltage vs. Collector Current

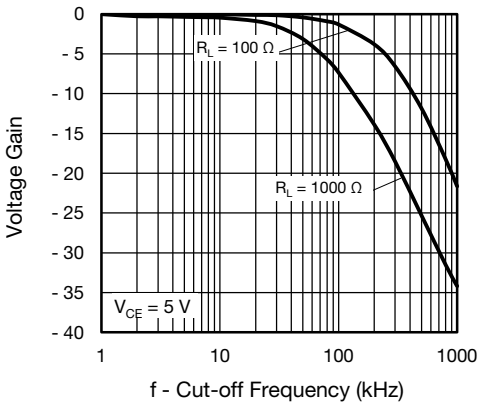
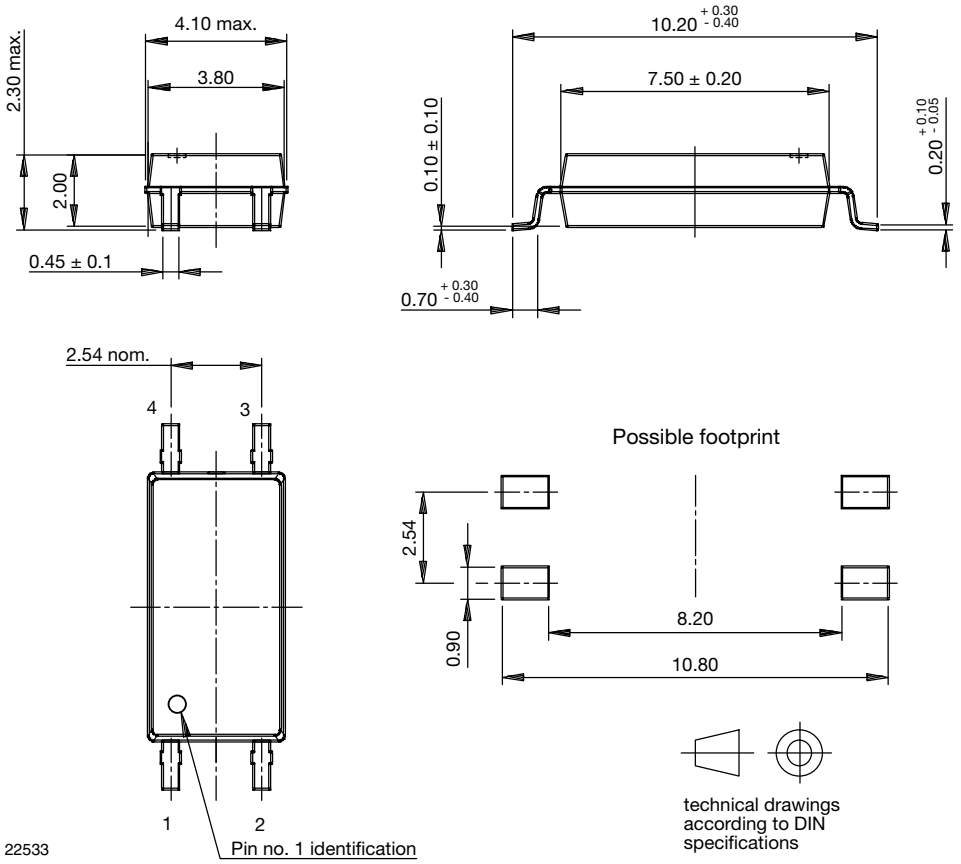
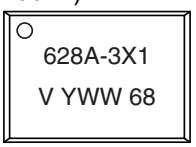


Fig. 19 - Voltage Gain vs. Cut-off Frequency

PACKAGE DIMENSIONS in millimeters



PACKAGE MARKING (example of VOL628A-3X001T)



Notes

- Only option 1 is reflected in the package marking with the characters “X1”.
- Tape and reel suffix (T) is not part of the package marking.

TAPE AND REEL DIMENSIONS in millimeters

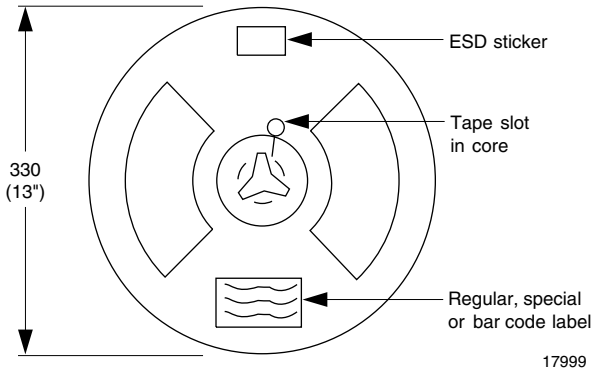


Fig. 20 - Reel Dimensions (3000 units per reel)

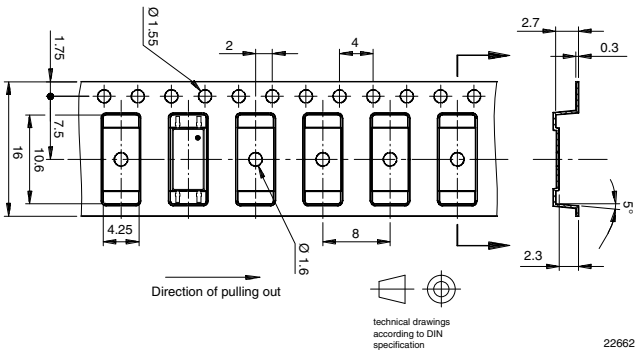


Fig. 21 - Tape Dimensions

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