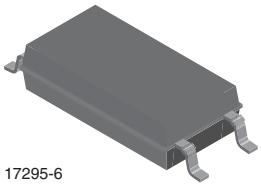
Optocoupler, Phototransistor Output, AC Input, Low Input Current, 4 Pin LSOP, Long Creepage Mini-Flat Package



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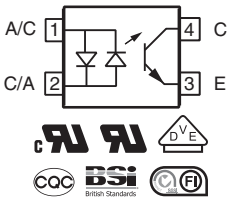


FEATURES

- 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

HALOGEN FREE 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

(All parts are certified under base model VOL628A)

- 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: GB8898-2011, GB4943.1-2011

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**	**63 to 125**	**100 to 200**	**160 to 320**
4 pin LSOP, mini-flat, long creepage	VOL628AT	VOL628A-2T	VOL628A-3T	VOL628A-4T
UL, cUL, BSI, FIMKO, CQC, VDE (option 1)	**50 to 600**	**63 to 125**	**100 to 200**	**160 to 320**
4 pin LSOP, mini-flat, long creepage	-	VOL628A-2X001T	VOL628A-3X001T	VOL628A-4X001T

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				
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

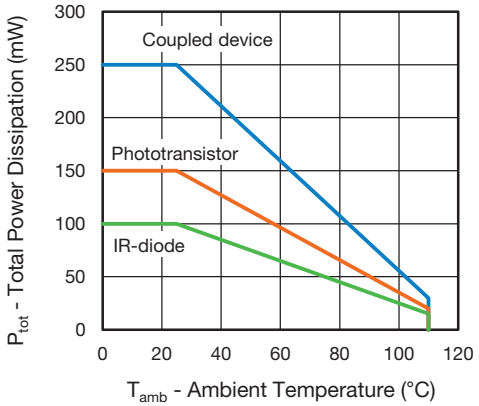


Fig. 1 - Total Power Dissipation vs. Ambient Temperature

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
Reverse current	V_R = 6 V		I_R	-	-	100	µA
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 = 0.32 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
	I_C = 0.8 mA, I_F = ± 1 mA	VOL628A-4T	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-2	CTR	63	-	125	%
		VOL628A-3	CTR	100	-	200	%
		VOL628A-4	CTR	160	-	320	%

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

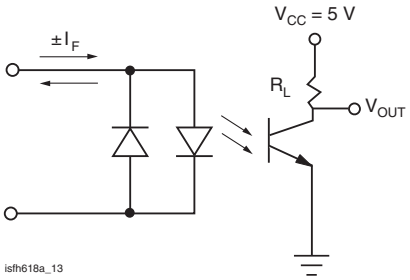


Fig. 2 - Test Circuit

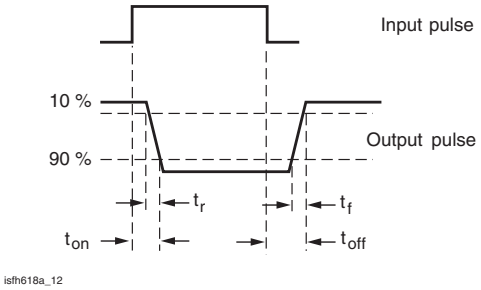


Fig. 3 - Test Circuit and Waveforms

SAFETY AND INSULATION RATINGS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Climatic classification	According to IEC 68 part 1		55 / 110 / 21	
Pollution degree	According to DIN VDE 0109		2	
Comparative tracking index	Insulation group IIIa	CTI	275	
Maximum rated withstanding isolation voltage	According to UL1577, t = 1 min	V_{ISO}	5000	V_{RMS}
Maximum transient isolation voltage	According to DIN EN 60747-5-5	V_{IOTM}	8000	V_{peak}
Maximum repetitive peak isolation voltage	According to DIN EN 60747-5-5	V_{IORM}	1050	V_{peak}
Isolation resistance	T_{amb} = 25 °C, V_{IO} = 500 V	R_{IO}	≥ 10^{12}	Ω
	T_{amb} = 100 °C, V_{IO} = 500 V	R_{IO}	≥ 10^{11}	Ω
	T_{amb} = TS, V_{IO} = 500 V	R_{IO}	≥ 10^{9}	Ω
Output safety power		P_{SO}	265	mW
Input safety current		I_{SI}	130	mA
Input safety temperature		T_S	150	°C
Creepage distance			≥ 8	mm
Clearance distance			≥ 8	mm
Insulation thickness		DTI	≥ 0.4	mm
Input to output test voltage, method B	V_{IORM} x 1.875 = V_{PR}, 100 % production test with t_M = 1 s, partial discharge < 5 pC	V_{PR}	2000	V_{peak}
Input to output test voltage, method A	V_{IORM} x 1.6 = V_{PR}, 100 % sample test with t_M = 10 s, partial discharge < 5 pC	V_{PR}	1680	V_{peak}

Note

- According to DIN EN 60747-5-5 (VDE 0884), § 7.4.3.8.2, (see Fig. 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

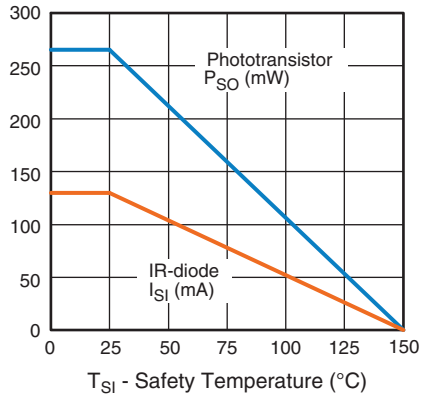


Fig. 4 - Derating Diagram

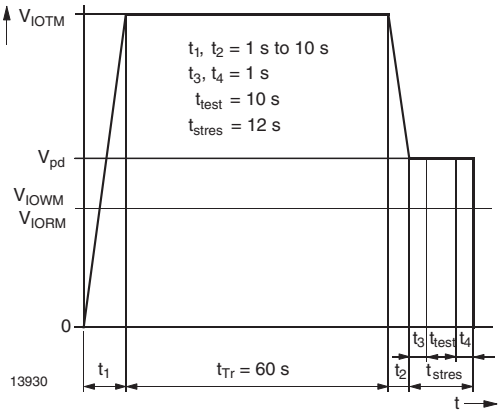


Fig. 5 - Test Pulse Diagram for Sample Test according to DIN EN 60747-5-5

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

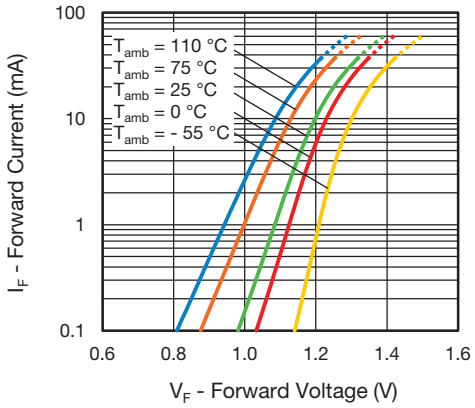


Fig. 6 - Forward Current vs. Forward Voltage

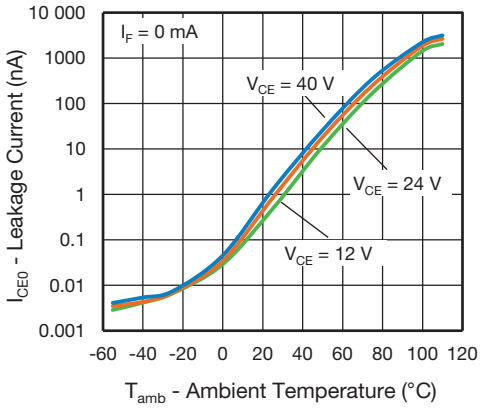


Fig. 8 - Collector Emitter Current vs. Ambient Temperature

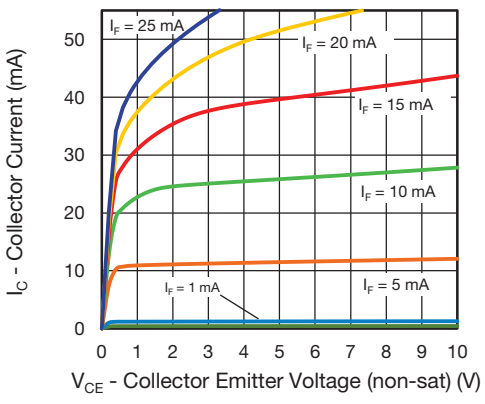


Fig. 7 - Collector Current vs. Collector Emitter Voltage (non-saturated)

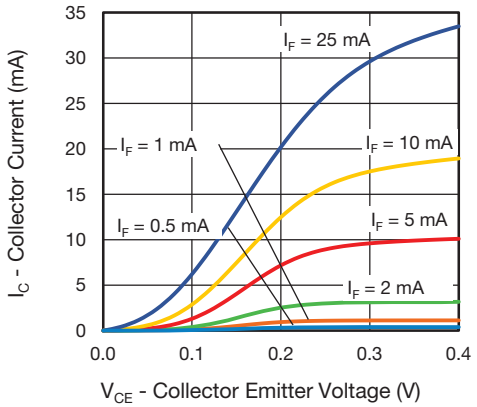


Fig. 9 - Collector Current vs. Collector Emitter Voltage (saturated)

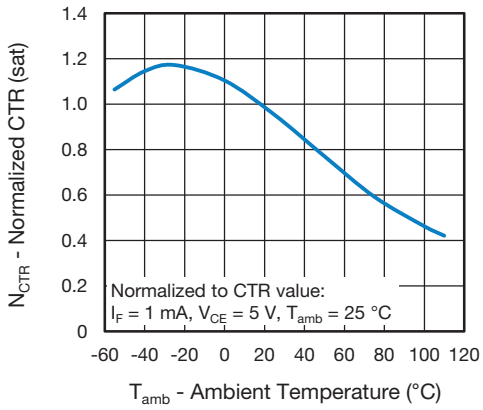


Fig. 10 - Normalized Current Transfer Ratio vs. Ambient Temperature (saturated)

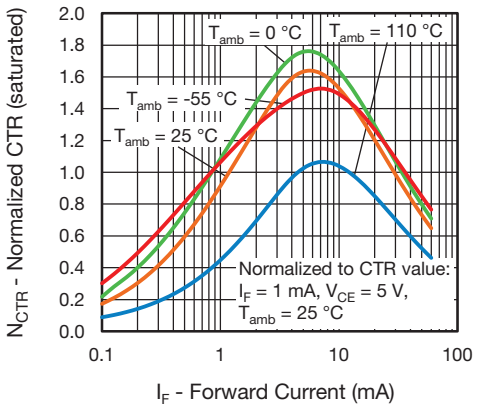


Fig. 13 - Normalized Current Transfer Ratio (saturated) vs. Forward Current

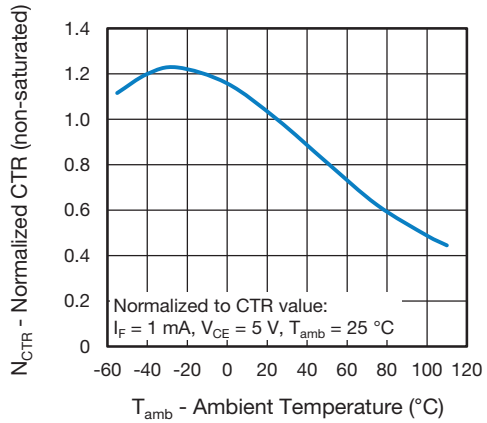


Fig. 11 - Normalized Current Transfer Ratio vs. Ambient Temperature (non-saturated)

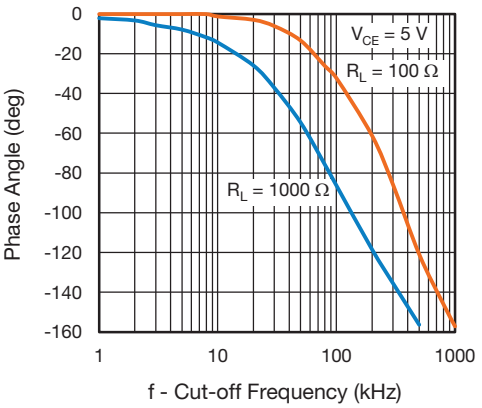


Fig. 14 - Phase Angle vs. Frequency

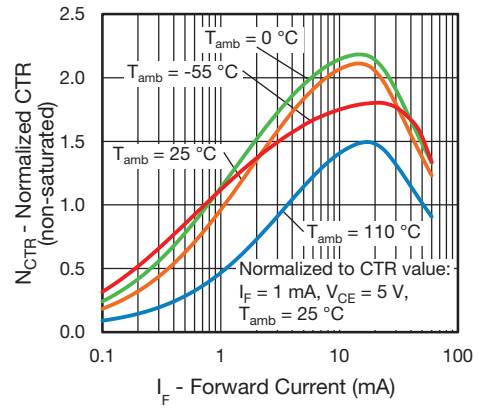


Fig. 12 - Normalized Current Transfer Ratio (non-saturated) vs. Forward Current

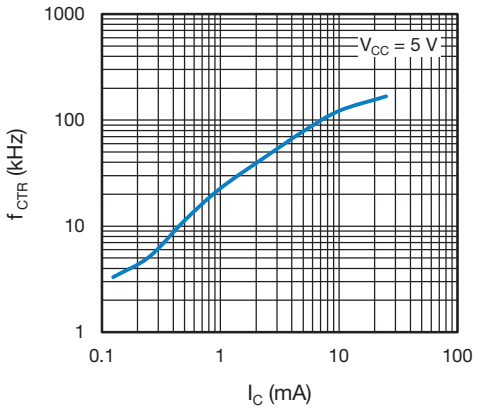


Fig. 15 - f_{CTR} vs. Collector Current

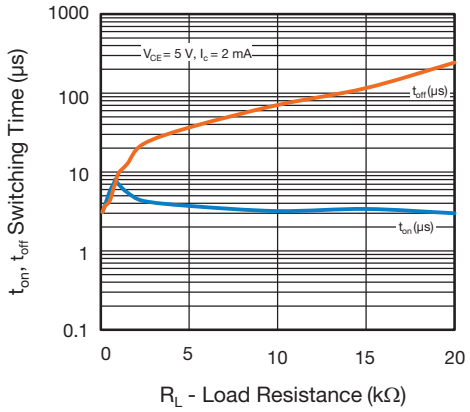


Fig. 16 - Switching Time vs. Load Resistance

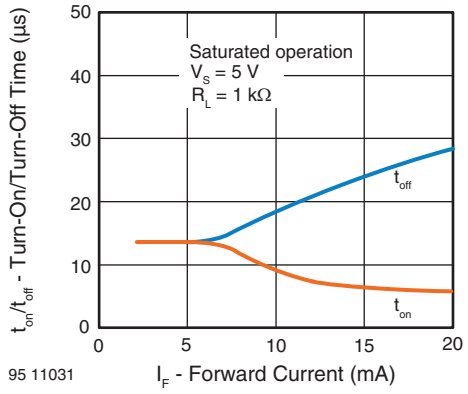


Fig. 18 - Turn-On/Turn-Off Time vs. Forward Current

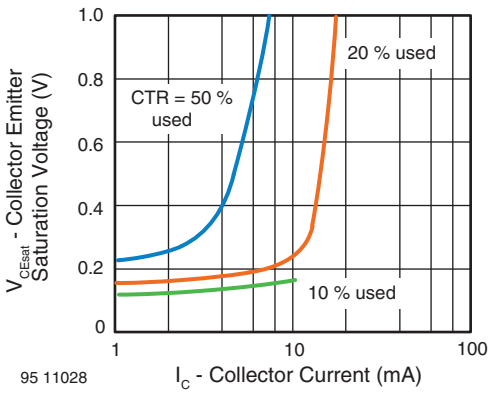


Fig. 17 - Collector Emitter Saturation Voltage vs. Collector Current

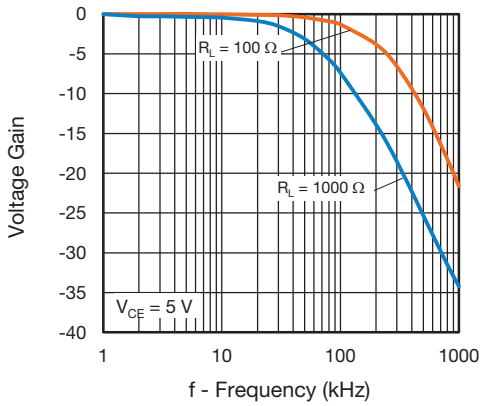
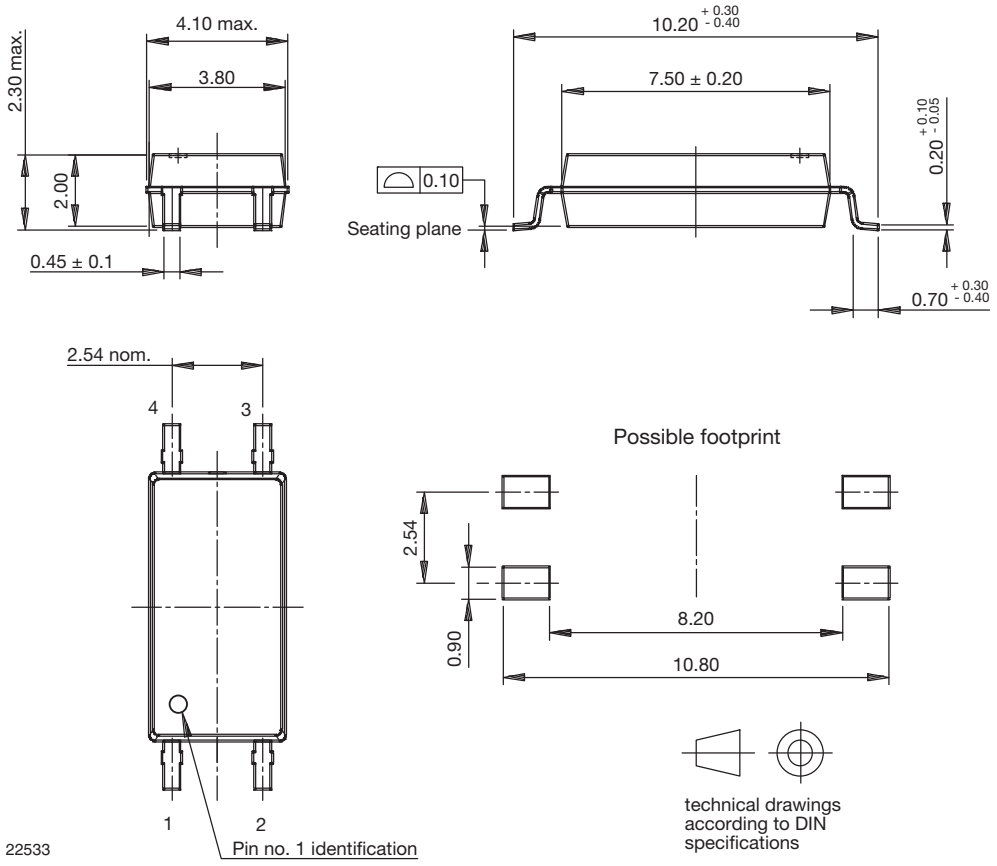
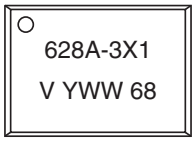


Fig. 19 - Voltage Gain vs. Cut-off Frequency

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)

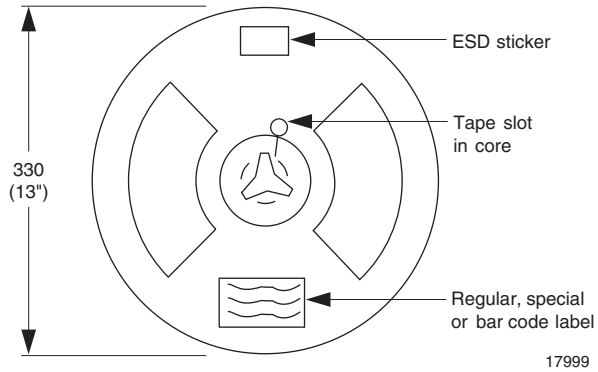


Fig. 20 - Reel Dimensions (3000 units per reel)

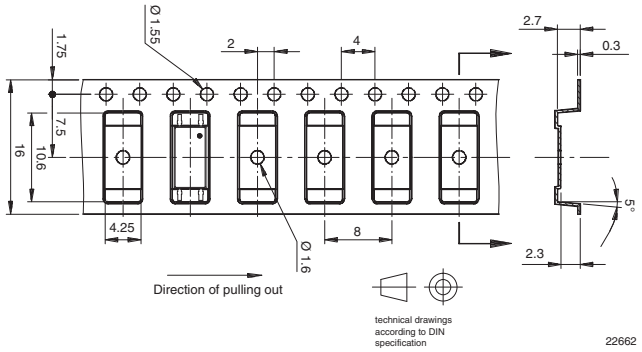


Fig. 21 - Tape Dimensions

SOLDER PROFILE

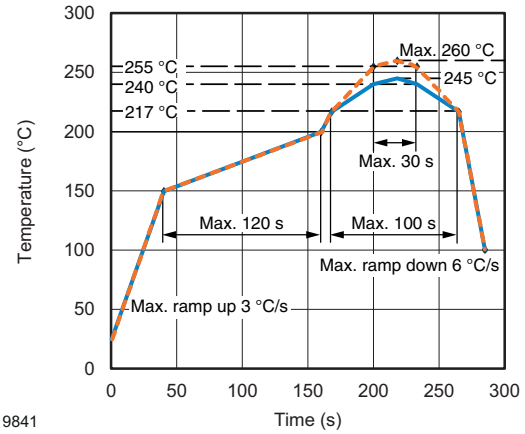


Fig. 22 - Lead (Pb)-free Reflow Solder Profile according to J-STD-020

HANDLING AND STORAGE CONDITIONS

ESD level: HBM class 2

Floor life: unlimited

Conditions: T_{amb} < 30 °C, RH < 85 %

Moisture sensitivity level 1, according to J-STD-020

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