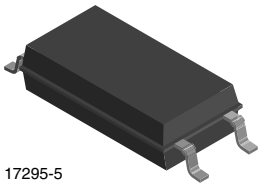
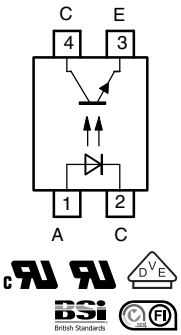
Optocoupler, Phototransistor Output, SOP-4L, Long Mini-Flat Package



17295-5



FEATURES

- SMD low profile 4 lead package
- V_{IORM} = 1050 V
- CTR flexibility available see order information
- Special construction
- Extra low coupling capacitance
- DC input with transistor output
- Creepage distance > 8 mm
- 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 TCLT100. series consists of a phototransistor optically coupled to a gallium arsenide infrared-emitting diode in a 4-lead SOP4L package.

APPLICATIONS

- Switchmode power supplies
- Computer peripheral interface
- Microprocessor system interface

AGENCY APPROVALS

- UL1577, file no. E76222
- CSA (cUL) 22.2 bulletin 5A recognized file no. E-76222
- BSI: BS EN 41003, BS EN 60065 (BS 415), BS EN 60950 (BS 7002), certificate number 7081 and 7402
- DIN EN 60747-5-5 (VDE 0884)
- FIMKO: EN 60950
- CQC

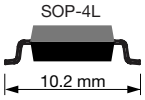
Note

- See the safety standard approval list “Agency Table” for more detailed information.

ORDERING INFORMATION

T	C	L	T	1	0	0	#

PART NUMBER



AGENCY CERTIFIED/PACKAGE	CTR (%)								
	5 mA	10 mA			5 mA				
UL, cUL, VDE, BSI, FIMKO	**50 to 600**	**63 to 125**	**100 to 200**	**160 to 320**	**50 to 150**	**100 to 300**	**80 to 160**	**130 to 260**	**200 to 400**
SOP-4L	TCLT1000	TCLT1002	TCLT1003	TCLT1004	TCLT1005	TCLT1006	TCLT1007	TCLT1008	TCLT1009

Note

- Available only on tape and reel.

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**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		P_{diss}	100	mW
Junction temperature		T_j	125	°C
OUTPUT				
Collector emitter voltage		V_{CEO}	70	V
Emitter collector voltage		V_{ECO}	7	V
Collector current		I_C	50	mA
Collector peak current	$t_p/T = 0.5$, $t_p \leq 10$ ms	I_{CM}	100	mA
Power dissipation		P_{diss}	150	mW
Junction temperature		T_j	125	°C
COUPLER				
Total power dissipation		P_{tot}	250	mW
Operating ambient temperature range		T_{amb}	-55 to +100	°C
Storage temperature range		T_{stg}	-55 to +125	°C
Soldering temperature		T_{sld}	260	°C

Note

- 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.

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
Forward voltage	I_F = 50 mA	V_F	-	1.25	1.6	V
Junction capacitance	V_R = 0 V, f = 1 MHz	C_j	-	50	-	pF
OUTPUT						
Collector emitter voltage	I_C = 1 mA	V_{CEO}	70	-	-	V
Emitter collector voltage	I_E = 100 µA	V_{ECO}	7	-	-	V
Collector emitter cut-off current	V_{CE} = 20 V, I_F = 0 A	I_{CEO}	-	10	100	nA
COUPLER						
Collector emitter saturation voltage	I_F = 10 mA, I_C = 1 mA	V_{CEsat}	-	-	0.3	V
Cut-off frequency	V_{CE} = 5 V, I_F = 10 mA, R_L = 100 Ω	f_c	-	110	-	kHz
Coupling capacitance	f = 1 MHz	C_k	-	0.3	-	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	V_{CE} = 5 V, I_F = 5 mA	TCLT1000	CTR	50	-	600	%
	V_{CE} = 5 V, I_F = 10 mA	TCLT1002	CTR	63	-	125	%
		TCLT1003	CTR	100	-	200	%
		TCLT1004	CTR	160	-	320	%
	V_{CE} = 5 V, I_F = 1 mA	TCLT1002	CTR	22	45	-	%
		TCLT1003	CTR	34	70	-	%
		TCLT1004	CTR	56	100	-	%
	V_{CE} = 5 V, I_F = 5 mA	TCLT1005	CTR	50	-	150	%
		TCLT1006	CTR	100	-	300	%
		TCLT1007	CTR	80	-	160	%
		TCLT1008	CTR	130	-	260	%
		TCLT1009	CTR	200	-	400	%

SAFETY AND INSULATION RATINGS				
PARAMETER	**CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Partial discharge test voltage - routine test	100 %, t_{test} = 1 s	V_{pd}	2	kV
Partial discharge test voltage - lot test (sample test)	t_{Tr} = 60 s, t_{test} = 10 s, (see figure 2)	V_{IOTM}	8	kV_{peak}
		V_{pd}	1.68	kV_{peak}
Isolation test voltage (RMS)		V_{ISO}	5000	V_{RMS}
Insulation resistance	V_{IO} = 500 V	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
Forward current		I_{si}	130	mA
Power dissipation		P_{so}	265	mW
Rated impulse voltage		V_{IOTM}	8	kV
Safety temperature		T_{si}	150	°C
Comparative tracking index		CTI	175	
Clearance distance			8.0	mm
Creepage distance			8.0	mm
Insulation distance (internal)			0.40	mm

Note

- According to DIN EN 60747-5-2 (VDE 0884) (see figure 2). 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.

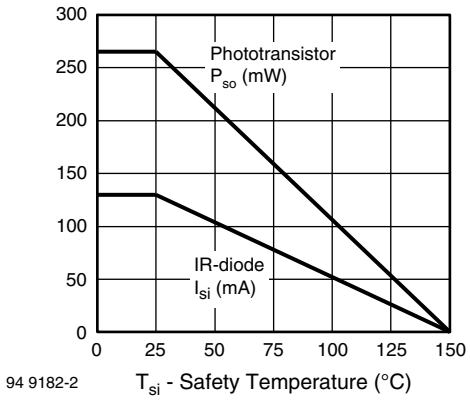


Fig. 1 - Derating Diagram

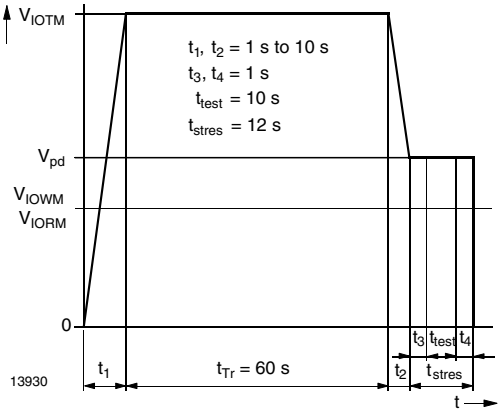


Fig. 2 - Test Pulse Diagram for Sample Test according to DIN EN 60747-5-2 (VDE 0884); IEC60747-5-5

SWITCHING CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Delay time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω, (see figure 3)	t_d	-	3	-	µs
Rise time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω, (see figure 3)	t_r	-	3	-	µs
Fall time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω, (see figure 3)	t_f	-	4.7	-	µs
Storage time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω, (see figure 3)	t_s	-	0.3	-	µs
Turn-on time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω, (see figure 3)	t_{on}	-	6	-	µs
Turn-off time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω, (see figure 3)	t_{off}	-	5	-	µs
Turn-on time	V_S = 5 V, I_F = 10 mA, R_L = 1 kΩ, (see figure 4)	t_{on}	-	9	-	µs
Turn-off time	V_S = 5 V, I_F = 10 mA, R_L = 1 kΩ, (see figure 4)	t_{off}	-	10	-	µs

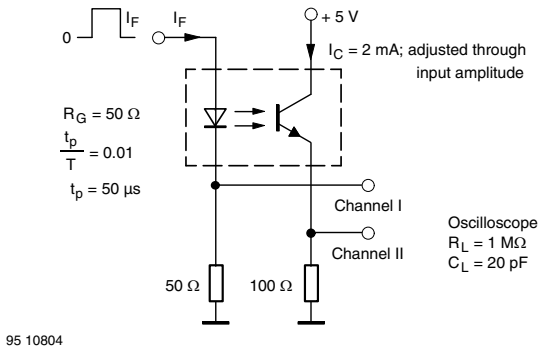


Fig. 3 - Test Circuit, Non-Saturated Operation

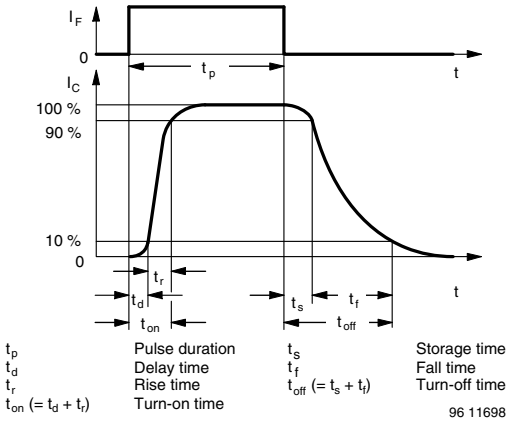


Fig. 5 - Switching Times

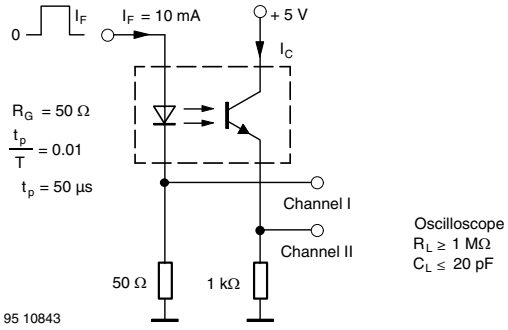


Fig. 4 - Test Circuit, Saturated Operation

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

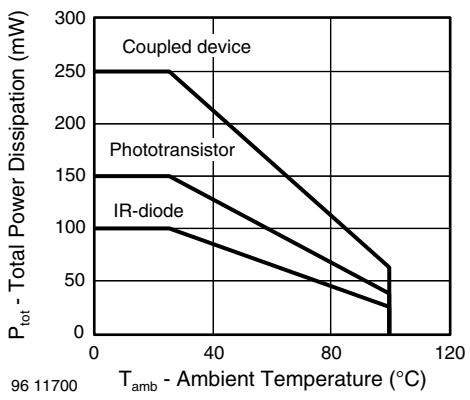


Fig. 6 - Total Power Dissipation vs. Ambient Temperature

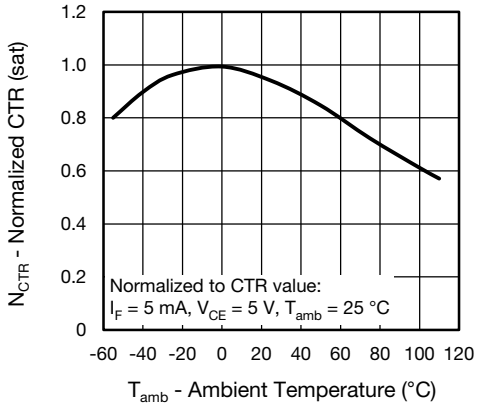


Fig. 9 - Normalized Current Transfer Ratio (saturated) vs. Ambient Temperature

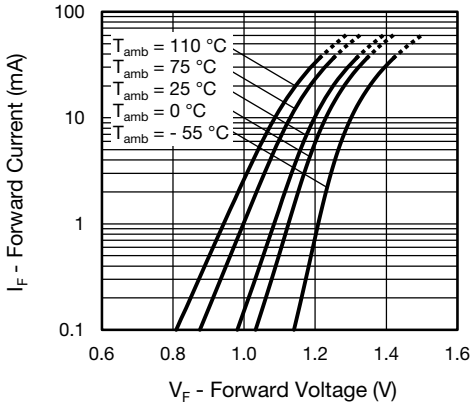


Fig. 7 - Forward Current vs. Forward Voltage

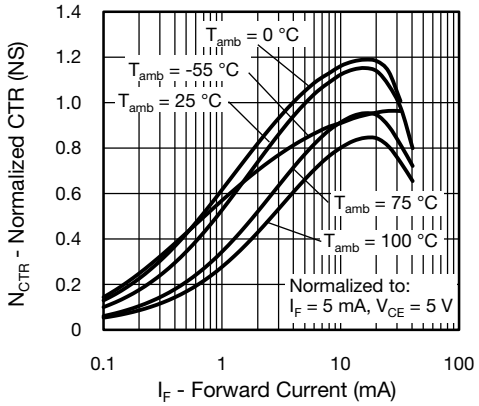


Fig. 10 - Normalized Current Transfer Ratio (non-saturated) vs. Forward Current

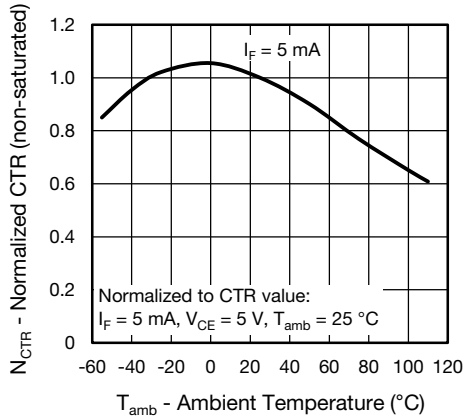


Fig. 8 - Normalized Current Transfer Ratio (non-saturated) vs. Ambient Temperature

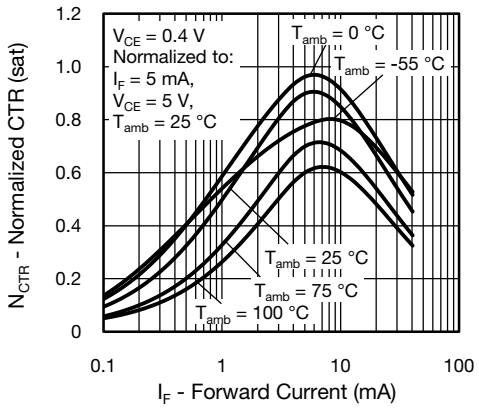


Fig. 11 - Normalized Current Transfer Ratio (saturated) vs. Forward Current

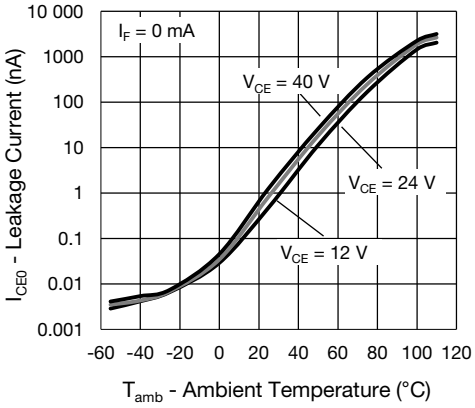


Fig. 12 - Collector Dark Current vs. Ambient Temperature

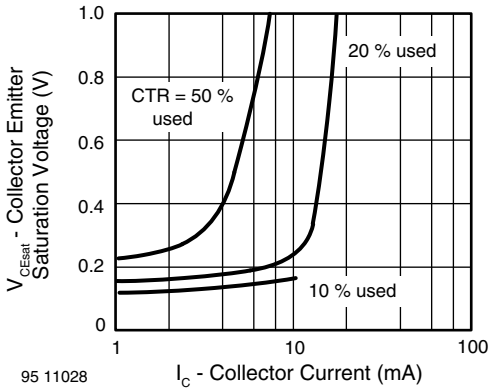


Fig. 15 - Collector Emitter Saturation Voltage vs. Collector Current

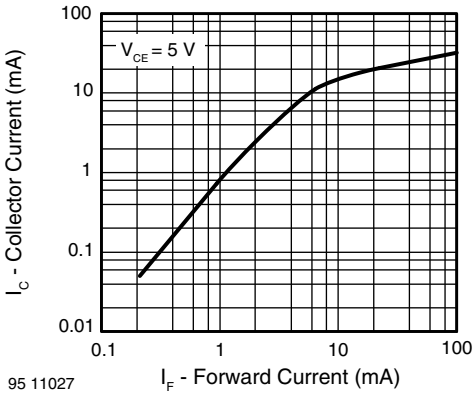


Fig. 13 - Collector Current vs. Forward Current

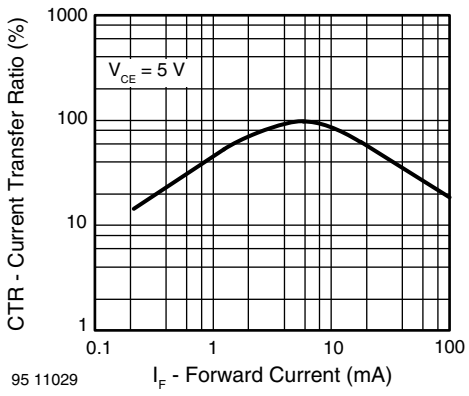


Fig. 16 - Current Transfer Ratio vs. Forward Current

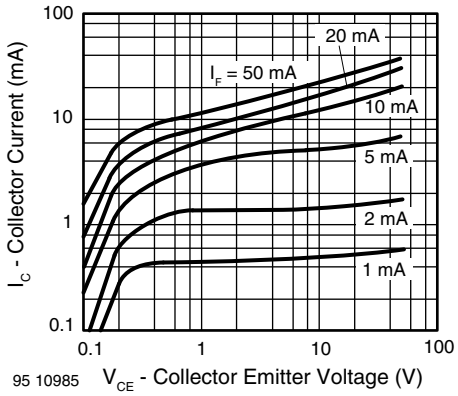


Fig. 14 - Collector Current vs. Collector Emitter Voltage

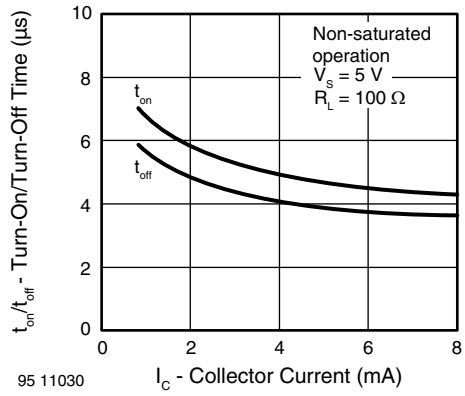


Fig. 17 - Turn-on/off Time vs. Collector Current

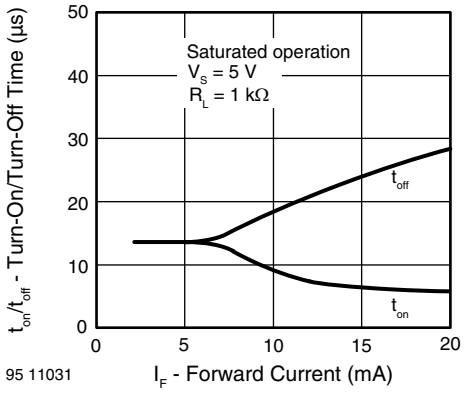
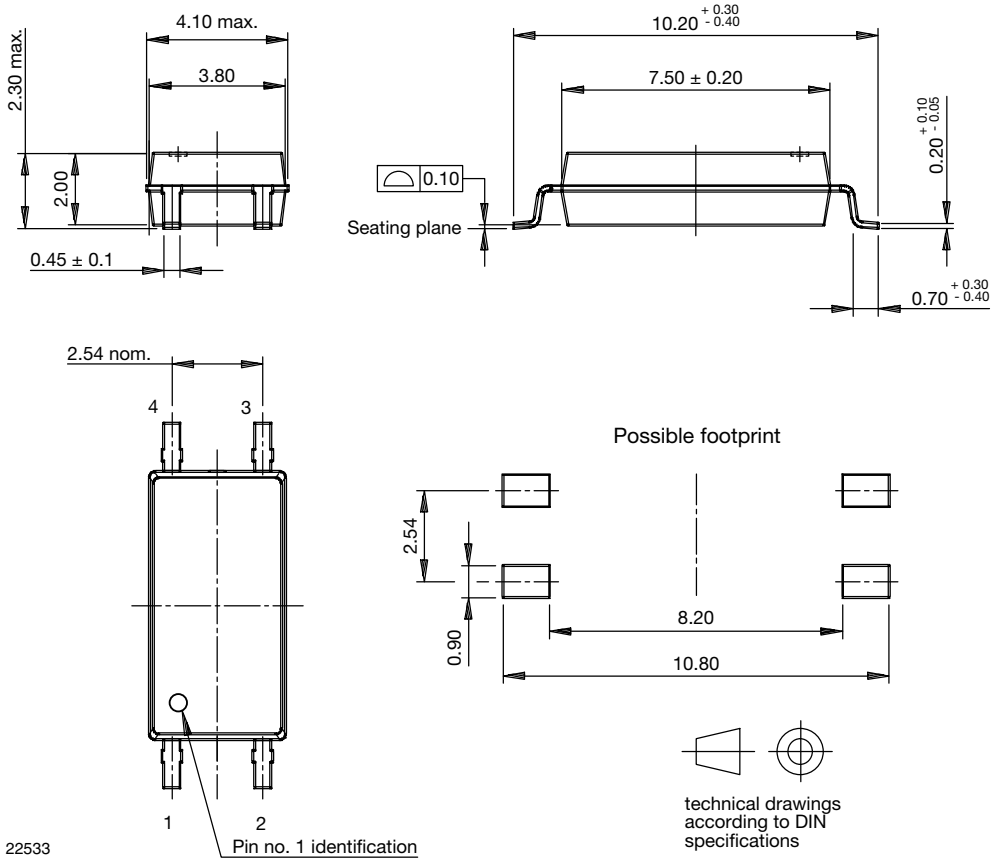
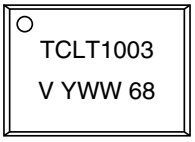


Fig. 18 - Turn-on/off Time vs. Forward Current

PACKAGE DIMENSIONS (in millimeters)



PACKAGE MARKING (example)



TAPE AND REEL DIMENSIONS (in millimeters)

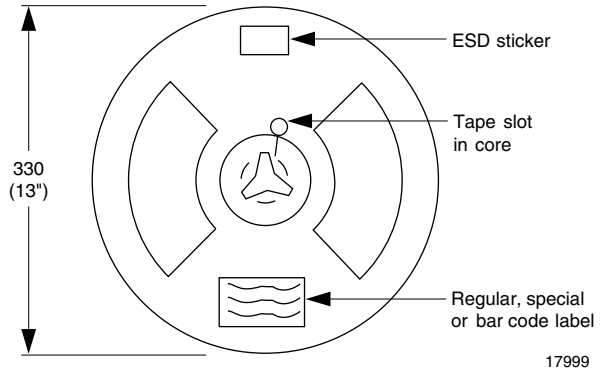


Fig. 19 - Reel Dimensions (3000 units per reel)

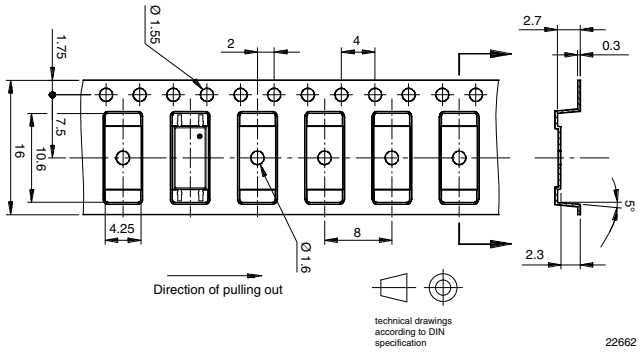


Fig. 20 - Tape Dimensions

SOLDER PROFILE

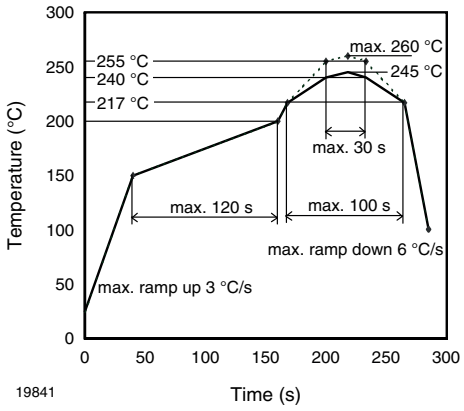


Fig. 21 - Lead (Pb)-free Reflow Solder Profile
according to J-STD-020

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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