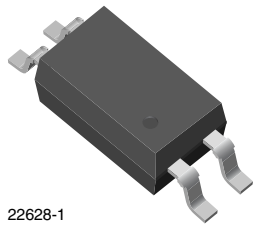
Optocoupler, Phototransistor Output, SSOP-4, Half Pitch, Mini-Flat Package



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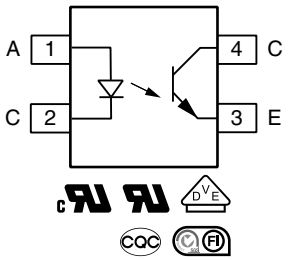


FEATURES

- High CTR with low input current
- SSOP low profile package (half pitch)
- High collector emitter voltage, V_{CEO} = 80 V
- Isolation test voltage = 3750 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 VOS615B series has a GaAs infrared emitting diode emitter, which is optically coupled to a silicon planar phototransistor detector, and is incorporated in a 4-pin 50 mil lead pitch mini-flat package.

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

The coupling devices are designed for signal transmission between two electrically separated circuits.

APPLICATIONS

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

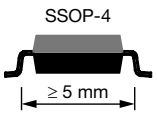
AGENCY APPROVALS

Safety application model number covering all products in this datasheet is VOS615B. This model number should be used when consulting safety agency documents.

- UL1577, file no. E76222, double protection
- cUL, accordance to CSA component acceptance service no. 5A, double protection
- DIN EN 60747-5-5 (VDE 0884-5), available with option 1
- FIMKO EN 60950-1
- CQC GB4943.1-2011 and GB8898-2011 (suitable for installation altitude below 2000 m)

ORDERING INFORMATION

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



AGENCY CERTIFIED/PACKAGE	CTR (%) 10 mA			
UL, cUL, FIMKO, CQC	**50 to 600**	**63 to 125**	**100 to 200**	**160 to 320**
SSOP-4, 50 mil pitch	VOS615BT	-	VOS615B-3T	-
UL, CUL, FIMKO, CQC, VDE (option 1)	**50 to 600**	**63 to 125**	**100 to 200**	**160 to 320**
SSOP-4, 50 mil pitch	VOS615B-X001T	VOS615B-2X001T	VOS615B-3X001T	VOS615B-4X001T

Note

- Additional options may be possible, please contact sales office.

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
Surge forward current	$t_p \leq 10$ µs	I_{FSM}	1.5	A
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
Power dissipation		P_{diss}	150	mW
Junction temperature		T_j	125	°C
COUPLER				
Isolation test voltage between emitter and detector	t = 1 min	V_{ISO}	3750	V_{RMS}
Total power dissipation		P_{tot}	250	mW
Storage temperature range		T_{stg}	-55 to +150	°C
Ambient temperature range		T_{amb}	-55 to +110	°C
Soldering temperature [1]	t = 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.

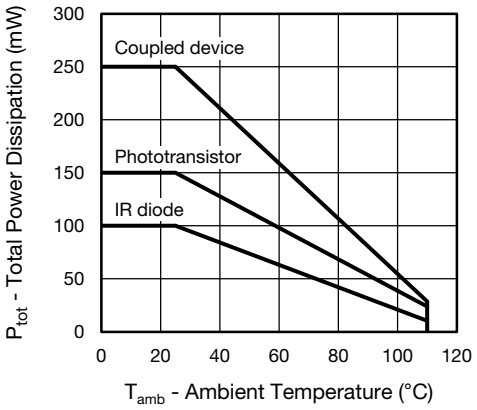


Fig. 1 - Power Dissipation vs. Ambient Temperature

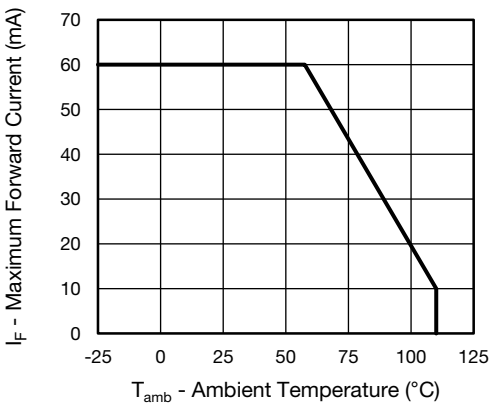


Fig. 2 - Maximum Forward Current vs. Ambient Temperature

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
Forward voltage	I_F = 5 mA	V_F	-	1.18	1.5	V
Reverse current	V_R = 6 V	I_R	-	0.01	10	µA
Capacitance	V_R = 0 V, f = 1 MHz	C_I	-	7.3	-	pF
OUTPUT						
Collector emitter leakage current	V_{CE} = 10 V	I_{CEO}	-	0.3	100	nA
Collector emitter breakdown voltage	I_C = 100 µA	BV_{CEO}	80	-	-	V
Emitter collector breakdown voltage	I_E = 10 µA	BV_{ECO}	7	-	-	V
Collector emitter capacitance	V_{CE} = 5 V, f = 1 MHz	C_{CE}	-	5	-	pF
COUPLER						
Collector emitter saturation voltage	I_F = 5 mA, I_C = 2.5 mA	V_{CEsat}	-	0.25	0.4	V
Cut-off frequency	I_F = 10 mA, V_{CC} = 5 V, R_L = 100 Ω	f_{ctr}	-	155	-	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	VOS615B	CTR	50	-	600	%
		VOS615B-2	CTR	63	-	125	%
		VOS615B-3	CTR	100	-	200	%
		VOS615B-4	CTR	160	-	320	%

SWITCHING CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
NON-SATURATED						
Rise and fall 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 and fall time	I_F = 1.6 mA, V_{CC} = 5 V, R_L = 1.9 kΩ	t_r	-	3	-	µs
Fall time		t_f	-	12	-	µs
Turn-on time		t_{on}	-	4	-	µs
Turn-off time		t_{off}	-	18	-	µs

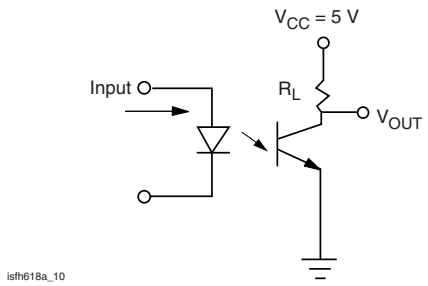


Fig. 3 - Test Circuit

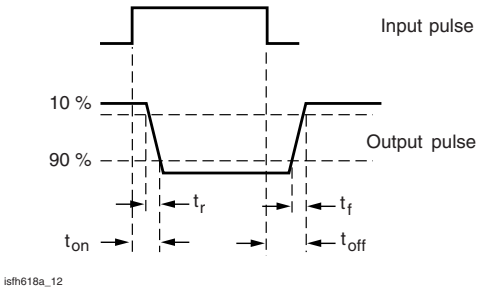


Fig. 4 - Test Circuit and Waveforms

SAFETY AND INSULATION RATINGS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Climatic classification (according to IEC 68 part 1)			55/110/21	
Comparative tracking index		CTI	175	
Maximum rated withstanding isolation voltage	40 % to 60 % RH, AC test of 1 min	V_{ISO}	3750	V_{RMS}
Maximum transient isolation voltage		V_{IOTM}	6000	V
Maximum repetitive peak isolation voltage		V_{IORM}	707	V
Insulation resistance	V_{IO} = 500 V, T_{amb} = 100 °C	R_{IO}	10^{11}	Ω
Isolation resistance (under fault conditions)	V_{IO} = 500 V, T_{amb} = T_{SI}	R_{IO}	10^{9}	Ω
Output safety power		P_{SO}	350	mW
Input safety current		I_{SI}	200	mA
Input safety temperature		T_{SI}	175	°C
Apparent charge test voltage (method A)	V_{IORM} x 1.6 = V_{PR}, type and sample test t_m = 60 s, partial discharge < 5 pC	V_{PR}	1132	V_{peak}
Apparent charge 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}	1326	V_{peak}
Creepage distance			≥ 5	mm
Clearance distance			≥ 5	mm
Insulation thickness		DTI	≥ 0.4	mm
Environment (pollution degree in accordance to DIN VDE 0109)			2	

Note

- As per IEC 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.

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

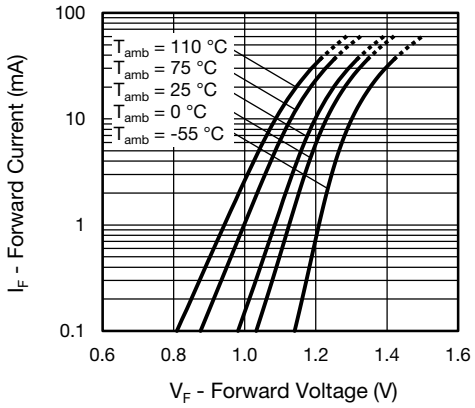


Fig. 5 - Forward Voltage vs. Forward Current

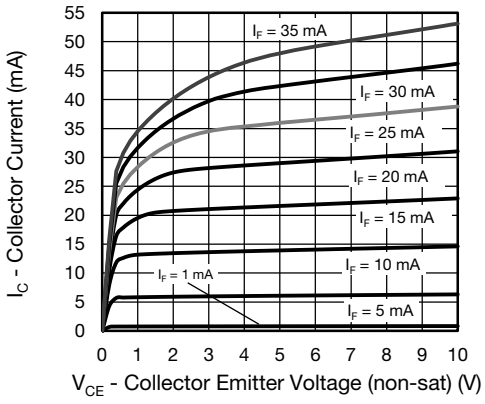


Fig. 6 - Collector Current vs. Collector Emitter Voltage

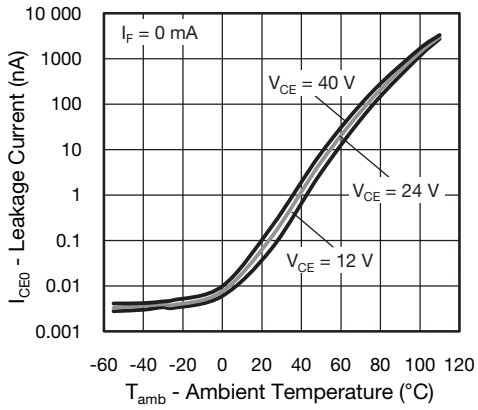


Fig. 7 - Leakage Current vs. Ambient Temperature

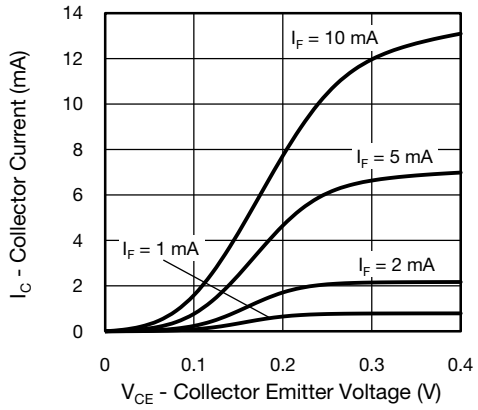


Fig. 8 - Collector Current vs. Collector Emitter Voltage

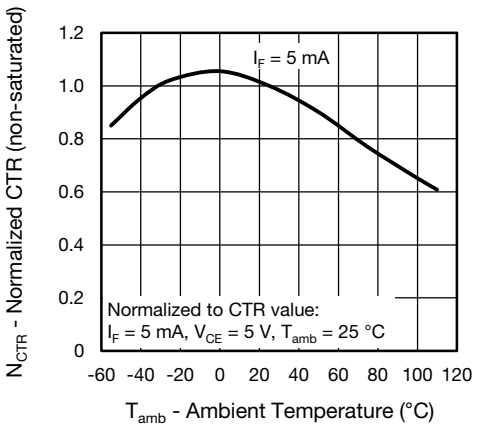


Fig. 9 - Normalized Current Transfer Ratio (non-saturated) vs. Ambient Temperature

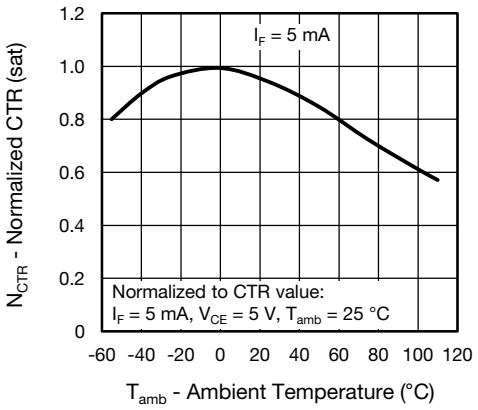


Fig. 10 - Normalized Current Transfer Ratio (saturated) vs. Ambient Temperature

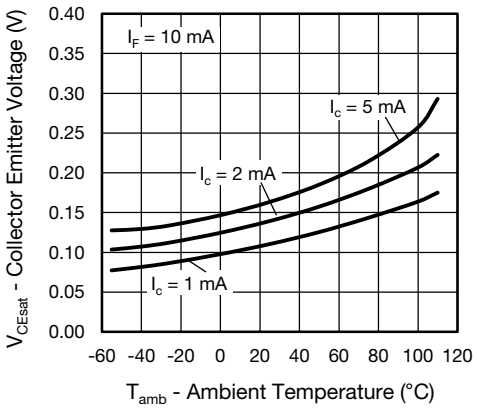


Fig. 11 - Collector Emitter Voltage vs. Ambient Temperature

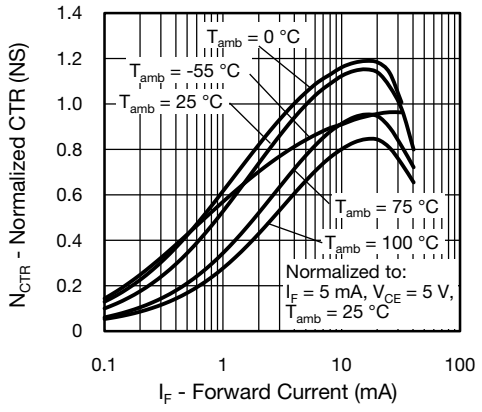


Fig. 12 - Normalized CTR (non-saturated) vs. Forward Current

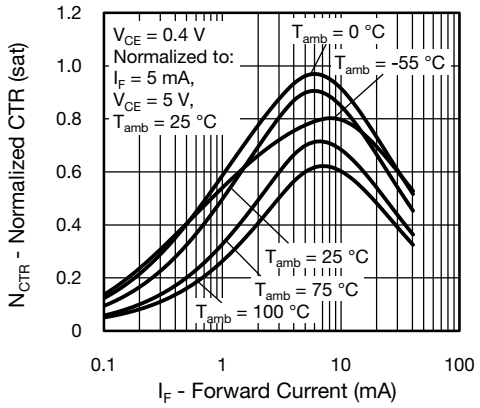


Fig. 13 - Normalized CTR (saturated) vs. Forward Current

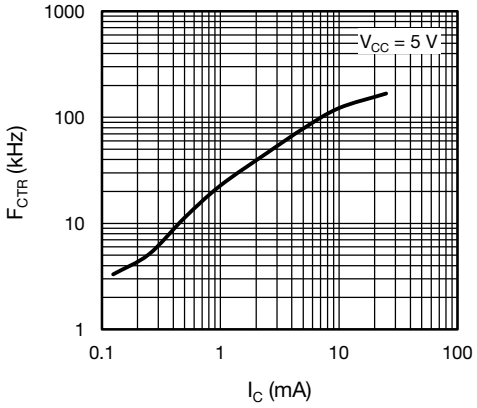


Fig. 15 - F_{CTR} vs. Collector Current

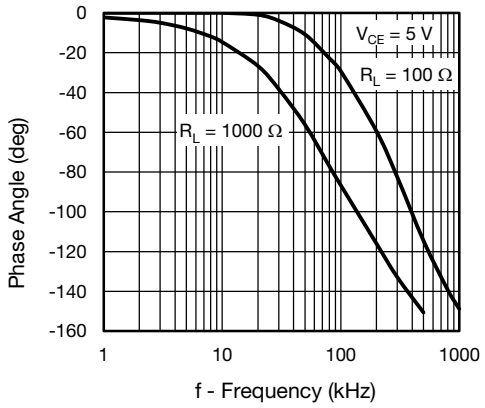


Fig. 14 - F_{CTR} vs. Phase Angle

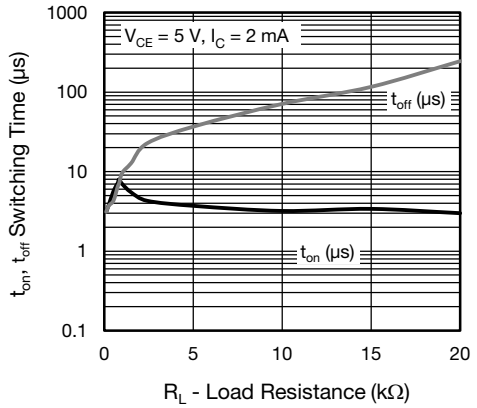
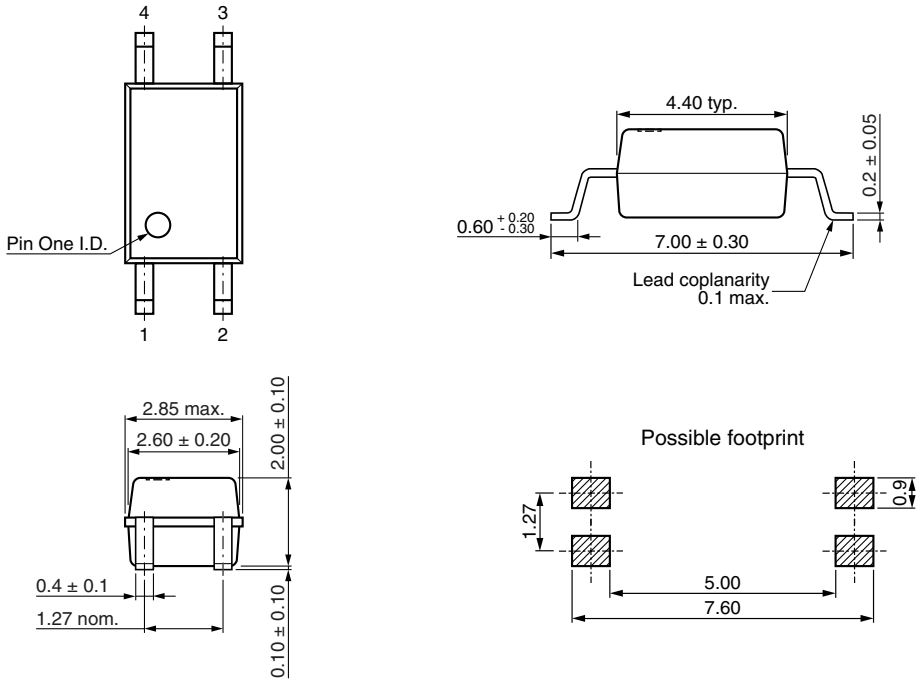
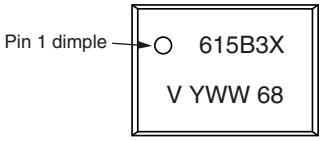


Fig. 16 - Switching Time vs. Load Resistance

PACKAGE DIMENSIONS (in millimeters)



PACKAGE MARKING (example of VOS617B-3X001T)



Notes

- Option 1 is reflected with letter “X”.
- Tape and reel suffix (T) is not part of the package marking.

PACKAGING INFORMATION (TAPE AND REEL) (in millimeters)

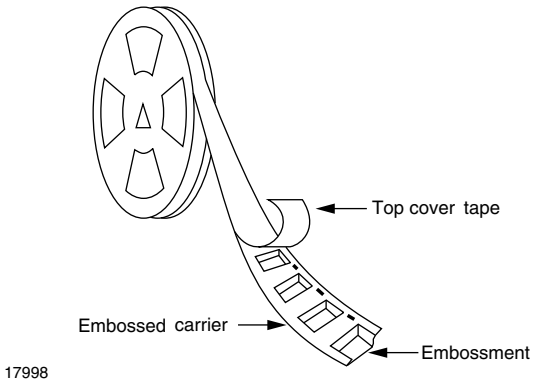


Fig. 17 - Tape and Reel Shipping Medium

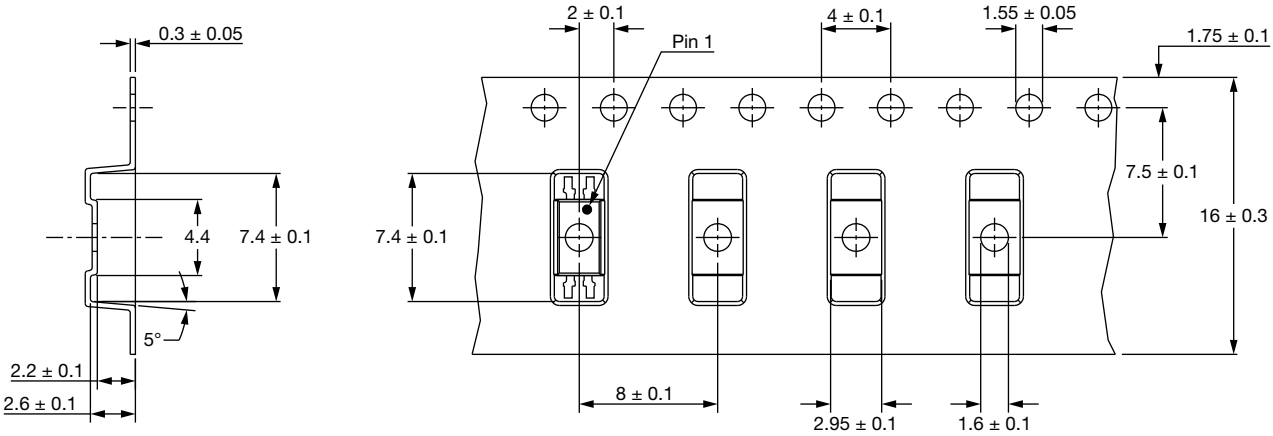


Fig. 18 - Tape and Reel Packing (3000 parts per reel)

SOLDER PROFILES

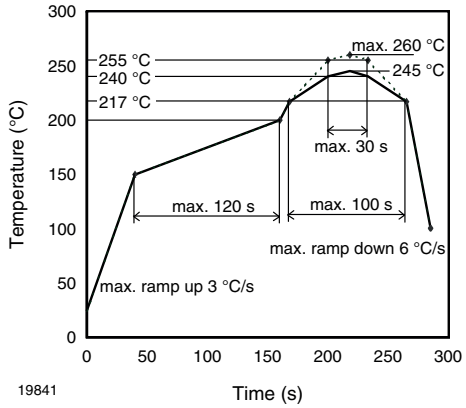


Fig. 19 - Lead (Pb)-free Reflow Solder Profile According to J-STD-020 for SMD Devices

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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