DATA SHEET

Multi-Layer Chip Varistors (MLV)

ROHS & Halogen Free

Description

Yageo Multilayer Chip Varistors (MLV) are designed to protect sensitive electronics devices against high voltage transient surges in the low voltage region. They offer excellent transient energy absorption due to improved energy volume distribution and power dissipation. The wide operating voltage and energy range make them suitable for numerous applications on Vcc protection, I/O protection, Keyboard protection, LCD protection and Sensor protection…etc.

Features

1. Excellent clamping voltage
2. Excellent energy dissipation capability
3. Quick response time (<1n sec.)
4. Adjustable capacitance values
5. High reliability
6. High transient current capability
7. Symmetrical Voltage-Current characteristics

Applications

Major application areas for Yageo's Phycomp-branded Multilayer Chip Varistors (MLV) series include:

- Consumer electronic equipment
- Telecommunications
- Notebook

Dimensions

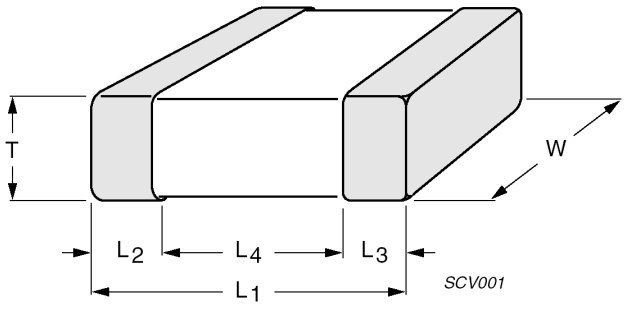


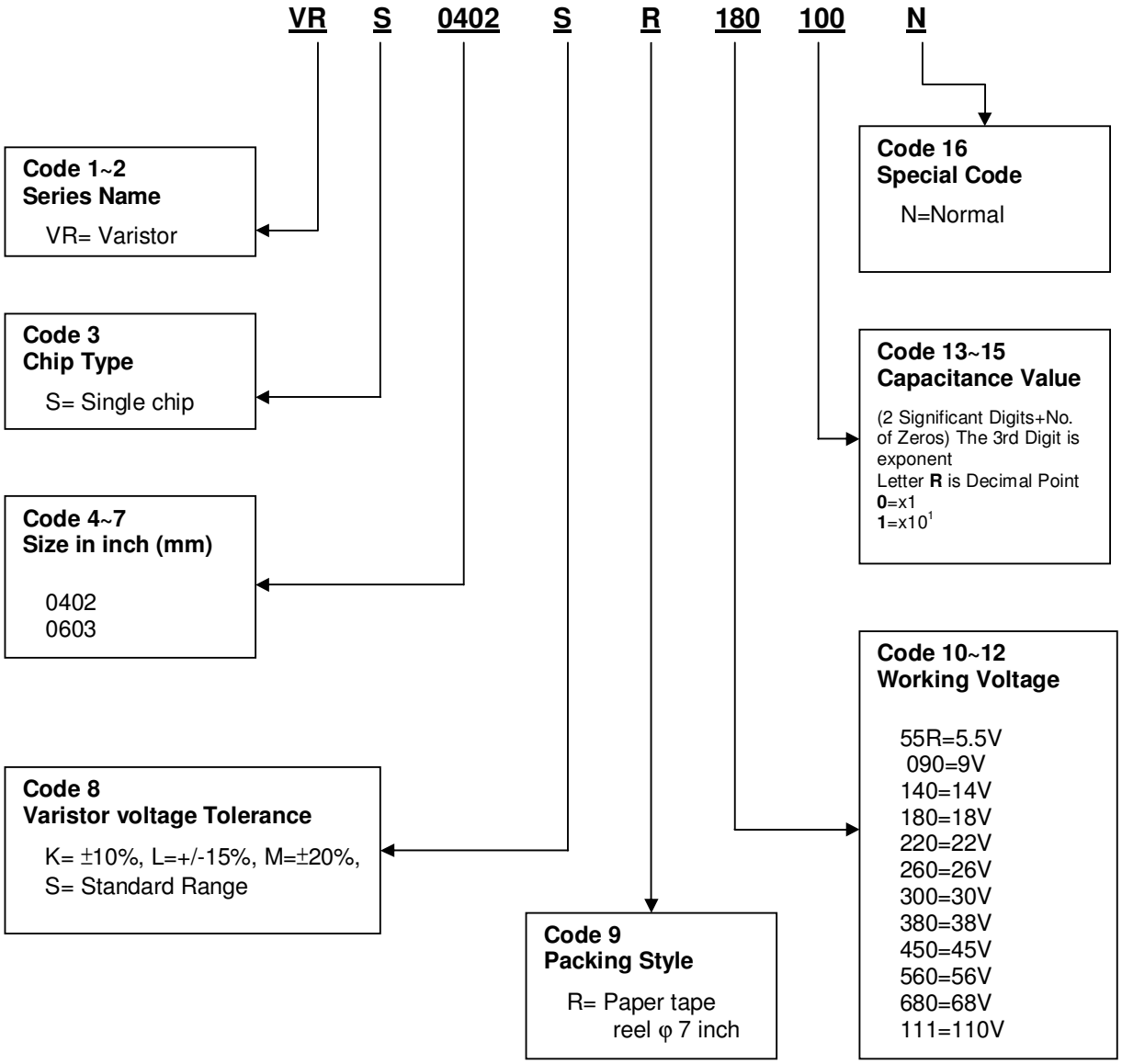
Fig1. outline

Size (inch)	L_1 (mm)	W (mm)	T (mm)		L_2 and L_3		L_4
			MIN.	MAX.	MIN.	MAX.	
0402	1.0 ± 0.10	0.50 ± 0.10	0.40	0.60	0.15	0.30	0.40
0603	1.6 ± 0.10	0.80 ± 0.10	0.70	0.90	0.20	0.60	0.40

Thickness classification and packaging quantities:

Size (Inch)	Thickness Classification (mm)	8mm Tape width/ Amount per reel
		∅180mm; 7"
		Paper
0402	0.50 ± 0.1	10000
0603	0.80 ± 0.1	4000

Ordering Information



Device Rating & Specifications

Table 1
0402 series

Yageo Part Number	Size	Varistor Voltage/ Breakdown Voltage	Maximum Continuous Voltage/ Working Voltage	Clamping Voltage @1A	Peak Current	Leakage Current		Capacitance @ 1 V(rms)	
						R.T.(15~35℃)			
		DC @1mA	D.C	8/20μs	8/20μs	Voltage	Current	(pF)	
	(Inch)	(V)	(V) max.	(V) max.	(A) max.	(V)	(uA)	1KHz	1MHz
VRS0402SR55R220N	0402	10~14	5.5	22	2	3	3	22	12
VRS0402SR55R330N	0402	10~14	5.5	22	4	3	3	33	20
VRS0402SR55R500N	0402	10~14	5.5	22	6	3	3	50	30
VRS0402SR55R101N	0402	10~14	5.5	22	10	3	3	100	60
VRS0402MR55R101N	0402	7.2~10.8	5.5	15	10	3	3	100	60
VRS0402MR55R201N	0402	7.2~10.8	5.5	15	15	3	3	200	130
VRS0402MR55R361N	0402	7.2~10.8	5.5	15	20	3	3	360	220
VRS0402MR55R481N	0402	7.2~10.8	5.5	15	20	3	3	480	290
VRS0402MR55R651N	0402	7.2~10.8	5.5	14	30	3	3	650	390
VRS0402LR090201N	0402	10.2~13.8	9	22	15	3	3	200	120
VRS0402SR140500N	0402	18~24	14	38	7	3	3	50	30
VRS0402SR140101N	0402	18~24	14	38	15	3	3	100	60
VRS0402SR140121N	0402	18~24	14	38	15	3	3	120	72
VRS0402KR140161N	0402	16.2~19.8	14	33	20	3	3	160	96
VRS0402LR140251N	0402	15.3~20.7	14	33	20	3	3	250	150
VRS0402SR180030N	0402	50~80	18	130	1	3	0.3	3	2
VRS0402SR180050N	0402	50~80	18	130	2	3	0.3	5	3
VRS0402SR180100N	0402	24~32	18	50	3	3	0.3	10	5.5
VRS0402SR180150N	0402	24~32	18	50	3	3	0.3	15	9
VRS0402SR180270N	0402	24~32	18	50	4	3	0.3	27	15
VRS0402SR180400N	0402	24~32	18	50	4	3	0.3	40	22
VRS0402SR180500N	0402	24~32	18	50	4	3	0.3	50	30
VRS0402KR180820N	0402	21.6~26.4	18	45	10	3	0.3	82	50
VRS0402SR180121N	0402	24~32	18	50	15	3	0.3	120	72
VRS0402SR30030N	0402	50~80	30	130	3	3	0.3	3	2

Table 2
0603 series

Yageo Part Number	Size	Varistor Voltage/ Breakdown Voltage	Maximum Continuous Voltage/ Working Voltage	Clamping Voltage @1A	Peak Current	Leakage Current		Capacitance @ 1 V(rms)	
						R.T.(15~35℃)			
		DC @1mA	D.C	8/20μs	8/20μs	Voltage	Current	(pF)	
	(Inch)	(V)	(V) max.	(V) max.	(A) max.	(V)	(uA)	1KHz	1MHz
VRS0603SR55R181N	0603	10~14	5.5	20	20	3	3	180	100
VRS0603MR55R301N	0603	7.2~10.8	5.5	15	30	3	3	300	180
VRS0603MR55R361N	0603	7.2~10.8	5.5	15	30	3	3	360	180
VRS0603SR55R471N	0603	10~14	5.5	19	30	3	3	470	280
VRS0603MR55R681N	0603	7.2~10.8	5.5	15	30	3	3	680	410
VRS0603MR55R901N	0603	7.2~10.8	5.5	15	30	3	3	900	540
VRS0603SR090090N	0603	18~24	9	36	3	3	3	9	5.5
VRS0603LR140361N	0603	15.3~20.7	14	33	30	3	3	360	216
VRS0603SR180030N	0603	50~80	18	130	1	3	0.3	3	2
VRS0603SR180050N	0603	24~32	18	130	2	3	0.3	5	3
VRS0603SR180100N	0603	24~32	18	50	5	3	0.3	10	6
VRS0603SR180150N	0603	24~32	18	50	3	3	0.3	15	10
VRS0603SR180121N	0603	24~32	18	50	20	3	0.3	120	72
VRS0603KR180301N	0603	21.6~26.4	18	44	30	3	0.3	300	180
VRS0603KR220241N	0603	24.3~29.7	22	46	30	3	0.3	240	144
VRS0603KR260251N	0603	29.7~36.3	26	58	20	3	0.3	250	160
VRS0603KR300121N	0603	35.1~42.9	30	70	20	3	0.3	120	72
VRS0603KR380101N	0603	42.3~51.7	38	85	15	3	0.3	100	60
VRS0603KR450800N	0603	50.4~61.6	45	100	10	3	0.3	80	48
VRS0603SR111300N	0603	130~160	110	300	5	3	0.3	30	18

Standard Testing Condition

- Temperature Range: 15℃~35℃
- Humidity: 25%RH~85% RH
- Atmospheric pressure: 86~106 KPa

ESD Test

-. Standard IEC 61000-4-2

-. ESD discharge circuit according to IEC 61000-4-2 (8KV ESD direct contact)

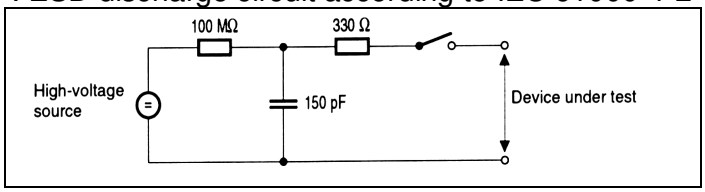


Fig 3. ESD discharge circuit

-. ESD discharge current according to IEC 61000-4-2 as Fig 4

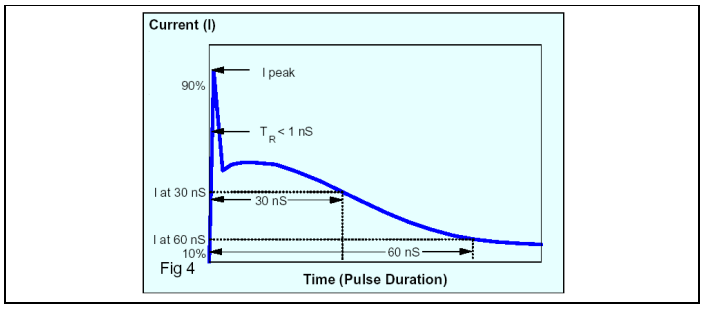


Fig 4

-. Specification of Electrostatic discharge (ESD) Test:
According to Standard EN 61000-4-2.

Application Examples

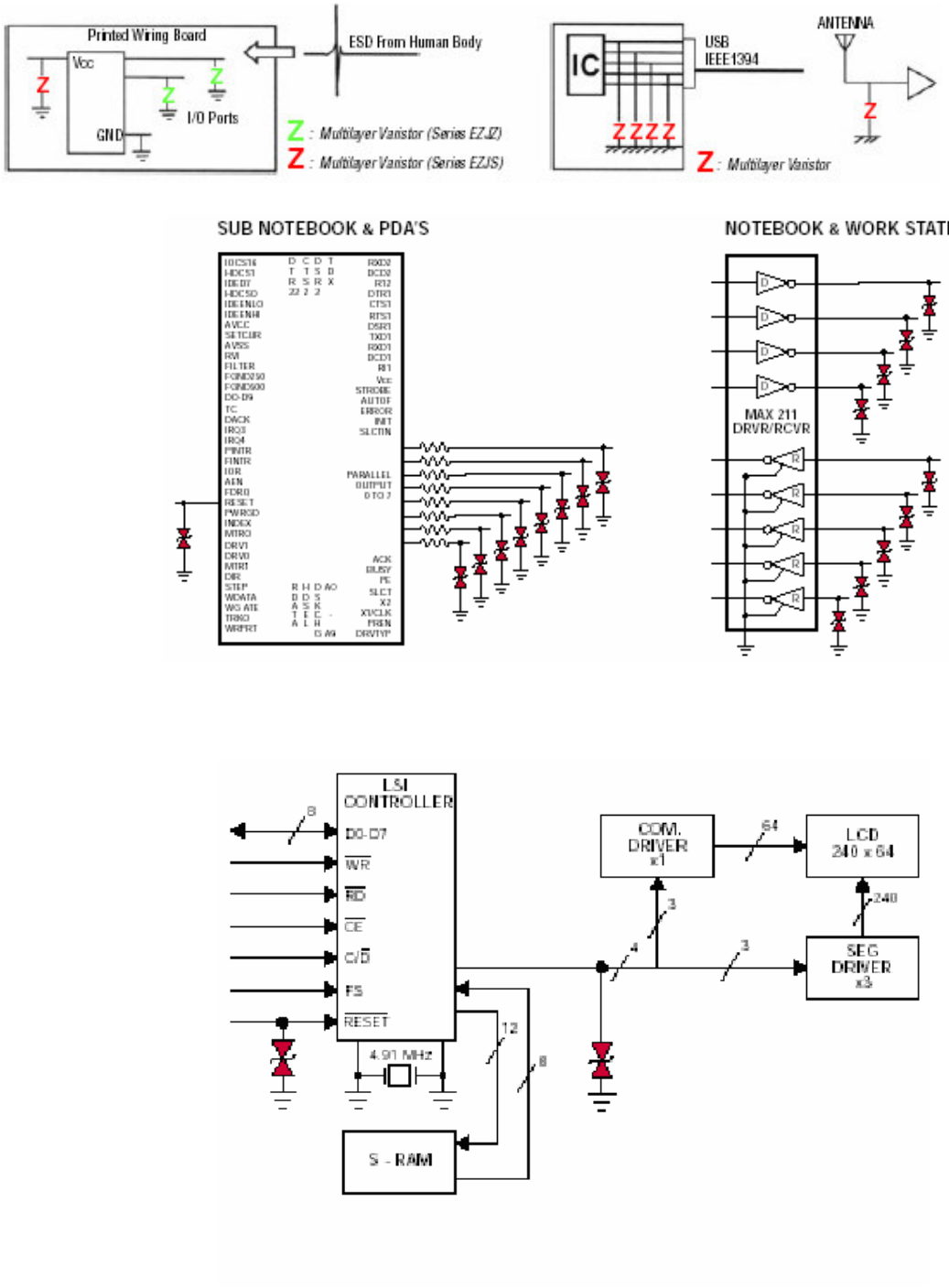


Fig 5. Application Examples

Test Condition & Test Method

CECC 42000	IEC 1051-1	Test item	Test condition / Test method	Specification
4.6	4.7	Capacitance	Measuring frequency: 1KHz Measuring voltage: 1.0 Volt Measuring temperature: 25°C	Capacitance Tolerance: ● >5pF: + / - 30%@1KHz ● 3pF~5pF:+80%/-20% @1KHz ● < 3pF: +80%/-20% @1MHz
4.9	4.10	Bending	To be soldered on the glass-epoxy (thickness 1.6mm), the load shall be put on the board bends 1mm.	No mechnical damage shall be caused.
4.10	4.11	Solderability	Solder bath temp. : 235±5 °C 2.Immersion time : 2±0.5s	Dissolution of the each terminations shall not exceed 10%
4.10.2	4.12	Resistance to soldering heat	1.Solder bath temp. : 260±5 °C 2.Immersion time : 10±0.5 s	$\Delta V_{1mA}/V_{1mA}$<10%
4.12	4.13	Rapid change of Temperature	-40℃ to +85℃, 5 cycles with 30 minutes duration	$\Delta V_{1mA}/V_{1mA}$<10%
4.17	4.18	Damp heat	40℃,90~95% RH with Max. Operating Voltage for 1000+/-12 hrs	$\Delta V_{1mA}/V_{1mA}$<10%
4.19	4.20	Endurance	85℃ with Max. Operating Voltage for 1000+/-12 hrs	$\Delta V_{1mA}/V_{1mA}$<10%
4.20	4.20	Endurance at upper category temperature	85±2℃ for 1000+/-12hrs.	$\Delta V_{1mA}/V_{1mA}$<10%
		Adhesion	Solder chip on PCB and applied 2N(0.2Kg) for 10 seconds	No visible damage.
		Cold temperature storage	-40±2℃ for 1000 +/-12hrs.	$\Delta V_{1mA}/V_{1mA}$<10%

△ After each test has been done, the tested chips shall be left in room ambient for 1~2 hours then measure the breakdown voltage.

Soldering Condition

Typical examples of soldering processes that provide reliable joints without any damage are given in fig. 6, 7 & 8

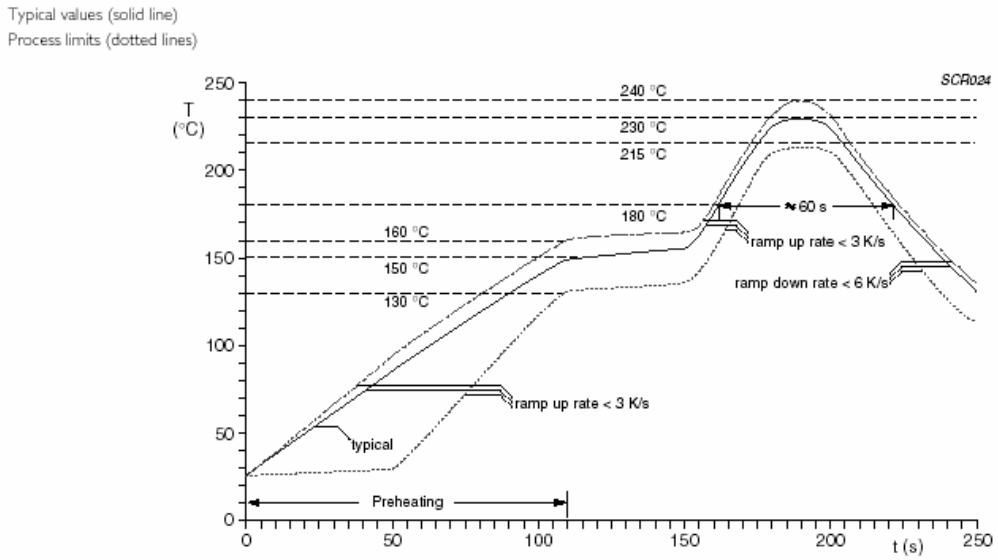


Fig. 6 Infrared soldering, forced air convection reflow soldering-temperature/time profile for SnPb solders

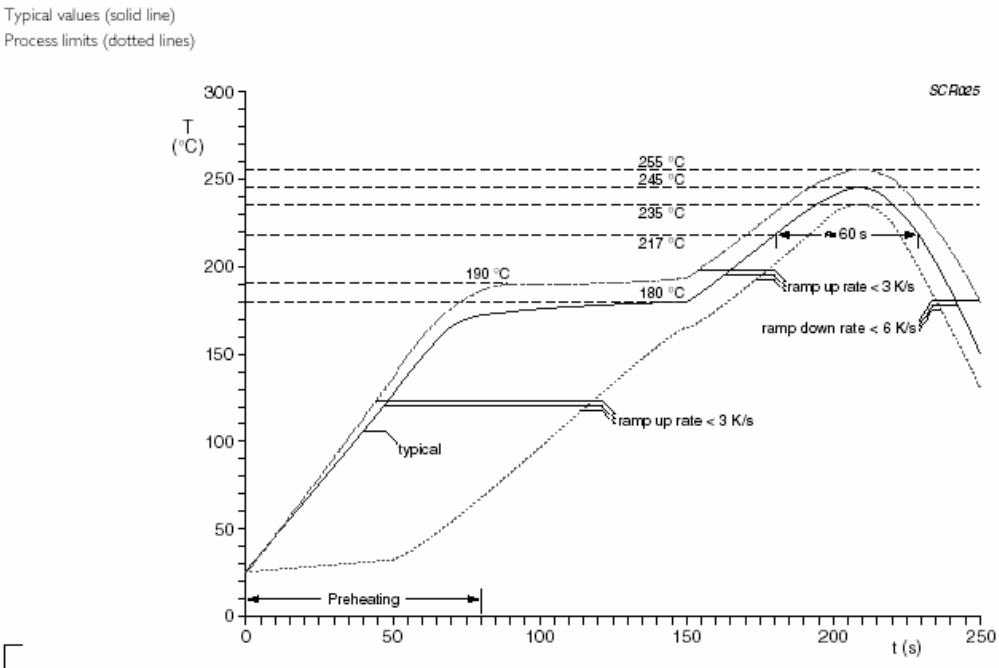


Fig. 7 Infrared soldering, forced air convection reflow soldering-temperature/time profile for SnAgCu solders

Typical values (solid line)
Process limits (dotted lines)
The resistors may be soldered twice in accordance with this method if desired

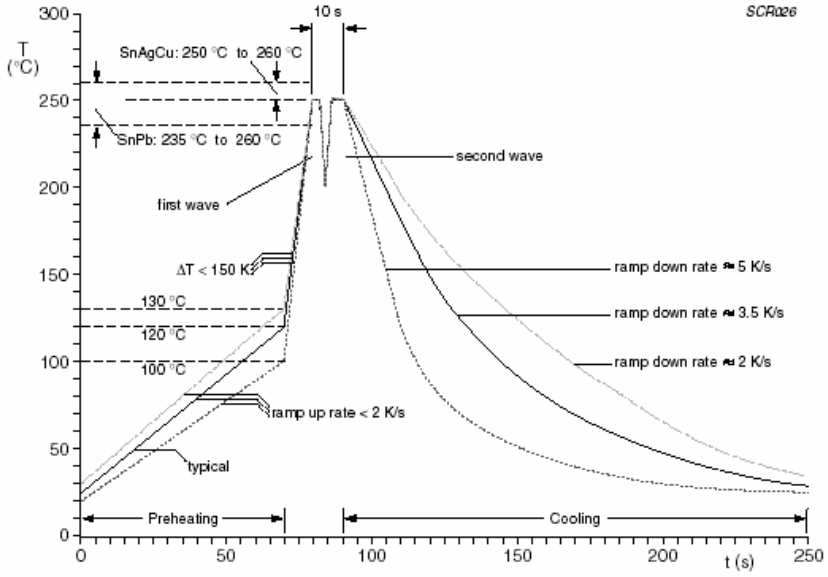


Fig. 8 Double wave soldering for SnPb and leadfree SnAgCu solder– temperature/time profile (terminal temperature)