SN100C® Lead-Free Solder Alloys

Introduction

FCT Assembly, Inc. Solders division has partnered with Nihon Superior to manufacture their patented SN100C (Sn/Cu/Ni/Ge) solder alloy in North America. SN100C out-performs other lead-free alloys used for wave and selective soldering. SN100C is significantly less costly than silver containing alloys and conforms to J-STD-006 requirements.

Attributes

- Excellent wetting and drainage which reduces the potential for bridging and shorts.
- Bright and shiny solder joints.
- Low drossing and low cost of operation.
- Stabilized Cu_6Sn_5 intermetallic which improves solder joint reliability.
- Conforms to J-STD-006 requirements.

Characteristic	SN100C	Sn/0.7Cu	SAC405	SAC305	SACX0307
Smooth shiny joints	Yes	No	No	No	No
Reactivity to equipment	Low	High	High	High	High
Eutectic	Yes	Yes	Yes	No	No
Contains Bismuth	No	No	No	No	Yes
Easy solder pot management	Yes	No	No	No	No
Low cost	Yes	Yes	No	No	Yes
Low drossing	Yes	No	No	No	No

Application

Solder Alloy Name	Elemental Composition (approximate % wt)	Application	Melting Range (°C)
SN100C	Sn/0.6Cu/0.055Ni/<0.01Ge	Wave, selective, dip, reflow, wire soldering	227
SN100Ce	Sn/0.055Ni/<0.01Ge	Additive used for SN100C solder pots when copper is high	230-232
SN100CL	Sn/0.6Cu/0.055Ni/<0.01Ge	Hot Air Solder Level (HASL) startup alloy	227
SN100CLe	Sn/0.055Ni/<0.01Ge	HASL replenishment alloy used to maintain copper within specifications	230-232
SN100C3	Sn/3.0Cu/0.055Ni/<0.01Ge	High temperature tinning and dip soldering	227 - 310
SN100C4	Sn/4.0Cu/0.055Ni/<0.01Ge	High temperature tinning and dip soldering	227 - 340

SN100C performs equally well in wave, selective, static, reflow, and wire soldering applications. SN100C3 and SN100C4 have been developed for high temperature dipping applications and can be used for tinning of fine copper wires at temperatures up to 400 °C. SN100CL has been developed for use in lead-free HASL systems and provides a smooth bright solder finish with a shelf life of over 1 year.

Wave Solder Parameters	Sn63/Pb37	SN100C
Immersion depth in wave	½ to ⅔ of the board thickness	½ to ⅔ of the board thickness
Top side preheat temperature	80 to 100 °C	90 to 120 °C
Bottom side preheat temperature	25 to 35 °C higher than the top side	25 to 35 °C higher than the top side
Preheat ramp rate maximum	2 °C / second maximum	2 °C / second maximum
Conveyor speed	4 to 6 ft/min (1.2 - 1.8 m/min)	3 to 6 ft/min (0.9 - 1.8 m/min)
Contact time in wave	2 to 4 seconds	3 to 6 seconds
Solder pot temperature	230 to 260 °C	250 to 275 °C

- These parameters are general guidelines. The optimum settings may be different depending upon the process, equipment, components and circuit boards.

Selective Solder Parameters	Sn63/Pb37	SN100C
Top side preheat temperature	80 to 100 °C	90 to 120 °C
Bottom side preheat temperature	25 to 35 °C higher than the top side	25 to 35 °C higher than the top side
Preheat ramp rate maximum	2 °C / second maximum	2 °C / second maximum
Movement rate while soldering	5 to 15 in/min	5 to 15 in/min
Contact time	1 to 3 seconds	1 to 4 seconds
Solder pot temperature	280 to 310 °C	290 to 320 °C

- These parameters are general guidelines. The optimum settings may be different depending upon the process, equipment, components and circuit boards.

One of the major differences between SN100C and standard Sn63/Pb37 is the difference between the processing temperature and the melting point of the alloys. Because the differences are much smaller with SN100C, care must be taken to ensure the process settings are optimized:

- Close off openings
- Adjust damper to reduce drafts
- Minimize the gap between preheaters and the solder pot
- Ensure cooling fans blow away from the solder pot

FCT Solder provides solder analysis and reporting services to our customers. Regular analysis of SN100C solder is recommended. Contact customer service at cs@fctassembly.com for more details.

Technical Specifications

TEST	SOLDER ALLOY			TEST METHOD
Name	SAC305	SN100C	Sn63/Pb37	
Alloy System	Sn-Ag-Cu	Sn-Cu-Ni-Ge	Sn-Pb	
Melting Temperature (°C)	217-220	227	183	DSC
Specific Gravity	7.5	7.4	8.4	S.G. Measuring Apparatus

Specific Heat (J/kg*K)		220			220			176			Estimated
Thermal Conductivity (J/m*s*K)		64			64			50			Estimated
Tensile Strength (M*Pa)		52			32			44			10mm/min (25°C)
Elongation (%)		27			48			25			10mm/min (25°C)
Spread Factor (%)	230°C	77			-			91			JIS Z 3197 (NS-828A FLUX)
	240°C	77			77			92			
	250°C	77			77			93			
	260°C	78			78			93			
	280°C	-			78			-			
Wettability		Ta	Tb	Fmax	Ta	Tb	Fmax	Ta	Tb	Fmax	Wetting Balance 0.3x3.5x25 mm Copper Test Piece Ta-Zero Cross Time Tb-Wetting Time Force
	240°C	0.72	2.10	0.213	1.0	4.53	0.159	0.12	0.80	0.195	
	250°C	0.37	1.46	0.213	0.86	2.79	0.181	0.11	0.64	0.200	
	260°C	0.23	0.81	0.192	0.47	1.46	0.186	0.10	0.41	0.206	
	270°C	0.21	0.48	0.192	0.31	0.8	0.192	0.07	0.31	0.211	
Electrical Resistance (μΩm)		0.15			0.13			0.17			Four Terminal Method
Copper Erosion Rate At 260°C		Approx. 2 minutes			Approx. 2 minutes			Approx. 1 minute			Time for Complete Erosion of 1.8mm Dia. Wire
Creep Strength (Time to Failure)		>300 HRS			>300 HRS			20 HRS			145°C, 1KG Load
		>300 HRS			>300 HRS			3 HRS			150°C, 1KG Load
		>300 HRS			>300 HRS			7 MIN			180°C, 1KG Load
THERMAL SHOCK		>1000 CYCLES			>1000 CYCLES			500-600 CYCLES			-40/+80°C Each 1 HR
ELECTROMIGRATION		>1000 HRS			>1000 HRS			> 1000 HRS			40°C, 95%RH & 85°C, 85%RH
WHISKER TEST		>1000 HRS			>1000 HRS			>1000 HRS			50°C

Product Packaging

Solder Form*	Packaging	Part Number	Net Weight (Lbs)
SN100C trapezoidal bar	Box	BARSN100CB25	25
SN100C trapezoidal bar	Box	BARSN100CB25-N	25

SN100C triangle bar	Box	BARSN100CB25T	25
SN100C feeder bar	Box	BARSN100CFB50	50
SN100Ce trapezoidal bar	Box	BARSN100CEB25	25
SN100Ce trapezoidal bar	Box	BARSN100CEB25-N	25
SN100Ce triangle bar	Box	BARSN100CEB25T	25
SN100Ce feeder bar	Box	BARSN100CEFB50	50
SN100C4 trapezoidal bar	Box	BARSN100C4B25	25
SN100C wire solder, solid core, 0.78”	Spool	WIRELFSN100CFEHL	10
SN100C wire solder, solid core, 0.93”	Spool	WIRELFSN100CFEKL	10
SN100C wire solder, solid core, 0.125”	Spool	WIRELFSN100CFAIL	1
SN100C wire solder, solid core, 0.125”	Spool	WIRELFSN100CFDIL	5
SN100C wire solder, solid core, 0.125”	Spool	WIRELFSN100CFFIL	20

*Other forms, packages and weights of solder may be available upon request.

Compatible Products

AO1000 antioxidant additive.
Nickel 10 additive.

Storage and Handling

- Shelf life is 5 years when stored between 50 to 90 °F (10 and 32 °C) in a standard warehouse or office environment.
- Store inside of the original packaging to prevent contamination from dust or moisture.

Safety

Wear heat resistant gloves and safety glasses when working around hot solder. Be careful to avoid splashing molten solder during additions. Follow the guidelines in the Safety Data Sheet (SDS).