

Contents

Features

Specifications

Available Wire Diameter

Product Code

Solder Spreading

Flux Sputtering

Slide Soldering Test

Iron Tip Anti-erosion

Other Properties

Handling Guide

Koki no-clean **LEAD FREE** flux cored wire solder

72M Series

REACH Compliant

Product Information



LINE-UP

- S3X - 72M**
- S01X7Ca - 72M**
- S03X7Ca - 72M**
- SB6N - 72M**
- S1XBIG - 72M**



This Product Information contains product performance assessed strictly according to our own test procedures and may not be compatible with results at end-users.



Contents

Features

Specifications

Available Wire Diameter

Product Code

Solder Spreading

Flux Sputtering

Slide Soldering Test

Iron Tip Anti-erosion

Other Properties

Handling Guide

Features

- Significantly improved wettability results in wider process range
- Improved wettability without compromising flux sputtering
- Improved wettability to various metals (brass, nickel, etc...)
- Helps preventing defects (bridging and insufficient solder feeding), owing to improved surface covering property of flux
- Reduced soldering fume for manual soldering
- REACH and RoHS compatible (JIG101- Edition 3)



Contents

Features

Specifications

Available Wire Diameter

Product Code

Solder Spreading

Flux Sputtering

Slide Soldering Test

Iron Tip Anti-erosion

Other Properties

Handling Guide

Specifications

Item		S3X	S03X7Ca	S01X7Ca	S1XBIG	SB6N
Alloy Property	Alloy Composition	Bal. Sn 3.0Ag 0.5Cu	Bal. Sn 0.3Ag 0.7Cu 0.03Co +α	Bal. Sn 0.1Ag 0.7Cu 0.03Co +α	Bal. Sn 1.1Ag 0.7Cu 1.8Bi +Ni	Bal. Sn 3.5Ag 0.5Bi 6.0In
	Melt Point (°C)	217 - 219	217 - 227	217 - 227	211-223	202 - 210
Flux Content (%)		3.2 ± 0.3				
Dryness *1		Pass				
Halide Content(%)*1		<0.01				
Copper Corrosion *1, 2		Pass				
Copper Mirror *1, 2		Pass				
Aqueous Solution Conductivity Test (Ωm)*1		>750				
SIR (Ω) 【 85°C,85%RH,168Hrs】*1		>1 × 10 ⁹				
Migration (Visual) [85°C, 85%RH, DC50V, 1000Hrs] J*1		No evidence of migration (SIR: >1 × 10 ⁹ Ω)				
Flux Type *2		ROL0				
Shelf Life		2 years				

*1 Per JIS Z 3197

*2 Per IPC J-STD-004

* Data based on S3X-72M



Available Wire Diameter

Contents

[Features](#)
[Specifications](#)
[Available Wire Diameter](#)
[Product Code](#)
[Solder Spreading](#)
[Flux Sputtering](#)
[Slide Soldering Test](#)
[Iron Tip Anti-erosion](#)
[Other Properties](#)
[Handling Guide](#)

- 72M series are available in following wire diameter

Wire diameter (mm)	Weight / spool
0.3	0.2 kg / spool
0.4	0.5 kg / spool
0.5	
0.6	
0.8	
1.0	
1.2	

If your desirable wire diameter is not listed, please consult us and we may be able to provide you with solder wire in custom-made wire diameter.



Contents

Features

Specifications

Available Wire Diameter

Product Code

Solder Spreading

Flux Sputtering

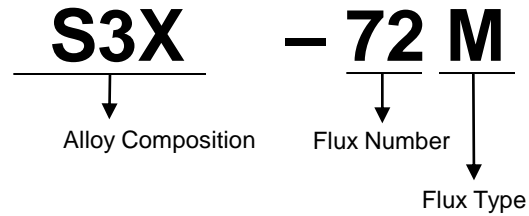
Slide Soldering Test

Iron Tip Anti-erosion

Other Properties

Handling Guide

Product Code



Alloy Composition (%)	S3X : Sn 3.0 Ag 0.5Cu
Flux Type	M : Low or no halide content
Flux Number	Depends on the product

Available alloys: See page 2.



Contents

Features

Specifications

Available Wire Diameter

Product Code

Solder Spreading

Flux Sputtering

Slide Soldering Test

Iron Tip Anti-erosion

Other Properties

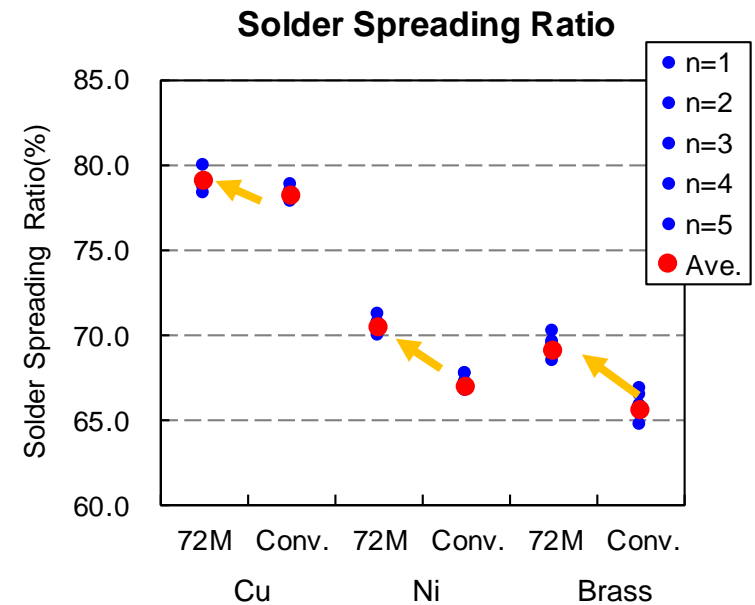
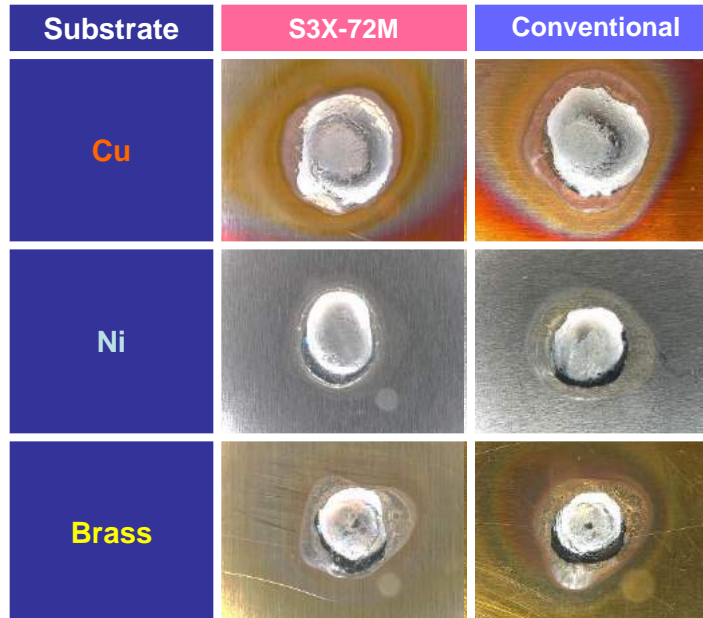
Handling Guide

Solder Spreading

- Test method: in-house method (Calculation based on JIS Z3197)
- Test piece: Cu, Ni and Brass plate (degreased surface with organic solvent)
- Wire diameter: 0.8mm (Ring inner diameter: 1.6mm) * See the picture on right
- Melt condition: Melt on the solder bath at 300°C, hold for 5 seconds



Solder ring for Spreading Test



By a selection of a new activator system, 72M series achieved better oxidation film removability. Shows faster wetting on hard to wet substrate such as Nickel.



Contents

Features

Specifications

Available Wire Diameter

Product Code

Solder Spreading

Flux Sputtering

Slide Soldering Test

Iron Tip Anti-erosion

Other Properties

Handling Guide

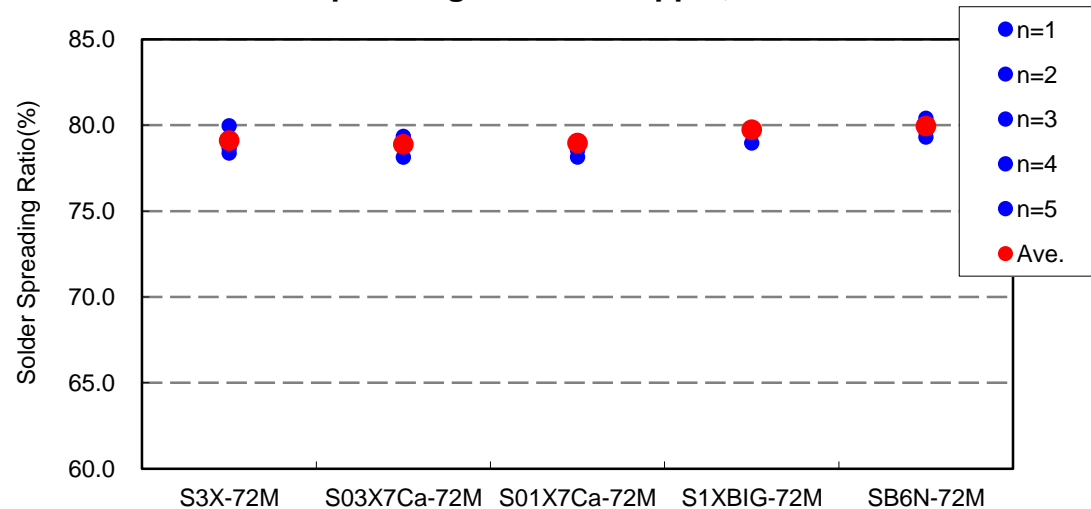
Solder Spreading - Copper substrate

- Test method: In-house method (Calculation based on JIS Z 3197)
- Test piece: Copper plate (Degreased surface with organic solvent)
- Wire diameter: 0.8mm (Ring inner diameter: 1.6mm) * See the picture on right
- Melt condition: Melt on the solder bath at 300°C, hold for 5 seconds



Solder ring for Spreading Test

Solder Spreading Ratio on Copper, 300°C 5 Sec.



Low-Ag solder alloy (S03X7Ca and S01X7Ca), hybrid low-Ag solder alloy (S1XBIG) and high reliability solder alloy (SB6N) perform equivalent wettability to S3X.



Contents

Features

Specifications

Available Wire Diameter

Product Code

Solder Spreading

Flux Sputtering

Slide Soldering Test

Iron Tip Anti-erosion

Other Properties

Handling Guide

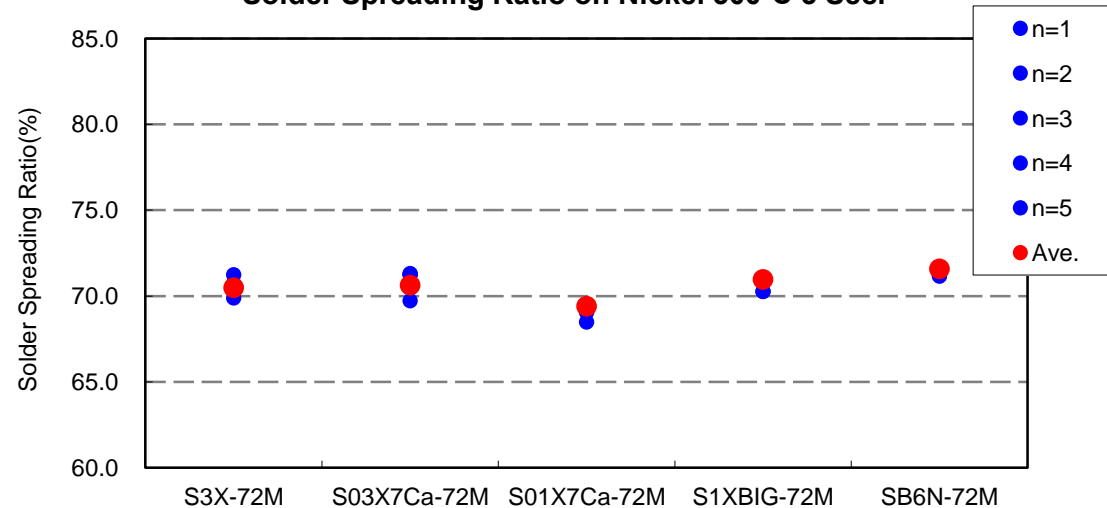
Solder Spreading – Nickel substrate

- Test method: In-house method (Calculation based on JIS Z3197)
- Test piece: Nickel plate (Degreased surface with organic solvent)
- Wire diameter: 0.8mm (Ring inner diameter: 1.6mm) * See the picture on right
- Melt condition: Melt on the solder bath at 300°C, hold for 5 seconds



Solder ring for Spreading Test

Solder Spreading Ratio on Nickel 300°C 5 Sec.



72M shows good wetting on hard to wet Nickel substrate compare to conventional product. In addition, low-Ag solder alloy, hybrid low-Ag solder alloy and high reliability solder alloy perform equivalent wettability to S3X.



Contents

Features

Specifications

Available Wire Diameter

Product Code

Solder Spreading

Flux Sputtering

Slide Soldering Test

Iron Tip Anti-erosion

Other Properties

Handling Guide

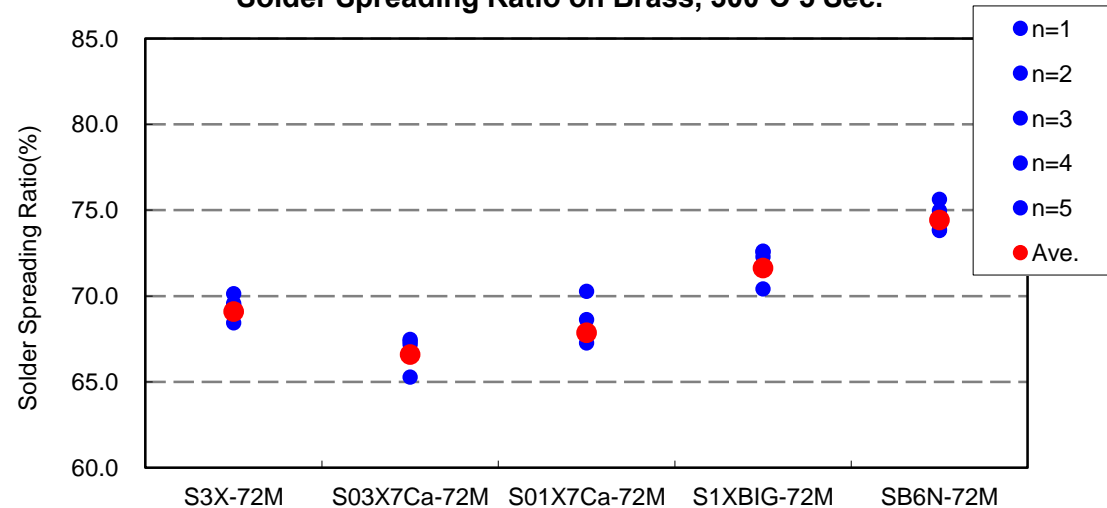
Solder Spreading – Brass substrate

- Test method: In-house method (Calculation based on JIS Z3197)
- Test piece: Brass plate (Degreased surface with organic solvent)
- Wire diameter: 0.8mm (Ring inner diameter: 1.6mm) * See the picture on right
- Melt condition: Melt on the solder bath at 300°C, hold for 5 seconds



Solder ring for Wettability Test

Solder Spreading Ratio on Brass, 300°C 5 Sec.



As for the Brass, low-Ag solder alloy, hybrid low-Ag solder alloy and high reliability alloy shows equivalent spreading as compared to S3X. In particular, SB6N shows 5% improvement on spreading.



Contents

Features

Specifications

Available Wire Diameter

Product Code

Solder Spreading

Flux Sputtering

Slide Soldering Test

Iron Tip Anti-erosion

Other Properties

Handling Guide



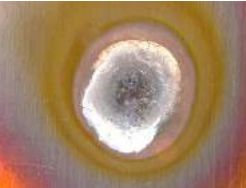
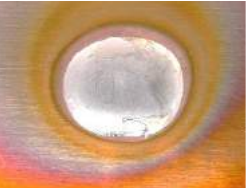











Solder Spreading – Summary

- Test method: In-house method (Calculation based on JIS Z3197)
- Test piece: Cu, Ni and Brass plate (Degreased surface with organic solvent)
- Wire diameter: 0.8mm (Ring inner diameter: 1.6mm) * See the picture on right
- Melt condition: Melt on the solder bath at 300°C, hold for 5 seconds



Solder ring for Spreading Test

■ Actual pictures of solder spreading

Substrate	S3X-72M	S03X7Ca-72M	S01X7Ca-72M	S1XBIG-72M	SB6N-72M
Cu					
Ni					
Brass					

By changing the activator, 72M series achieved better oxidation film removability.
Low Ag solder alloy, hybrid low-Ag solder alloy and high reliability alloy show equivalent wettability to S3X.



Contents

Features

Specifications

Available Wire Diameter

Product Code

Solder Spreading

Flux Sputtering

Slide Soldering Test

Iron Tip Anti-erosion

Other Properties

Handling Guide

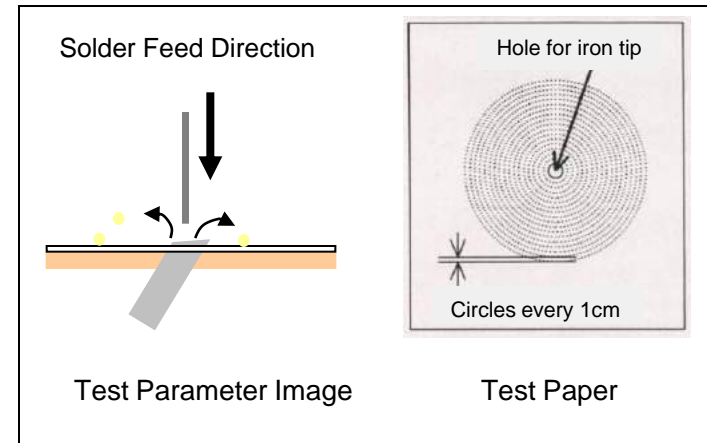
Flux Sputtering

- Test method : in-house method*
- Iron tip temperature: 330, 350 and 380°C
- Test wire diameter: 0.8mm
- Wire feeding speed: 1cm/2 Sec. (8 Sec. interval)
- Wire feed amount: 30 shots
- Sample size: n=3 (Average of n=3 shown in the graph below)

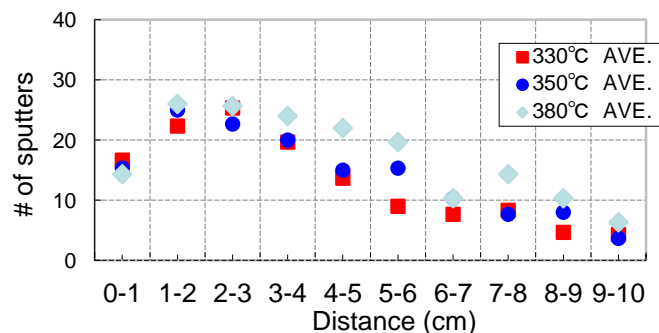
*About in-house Flux Sputtering Test:

Koki's in-house Flux Sputtering Test is performed as following.

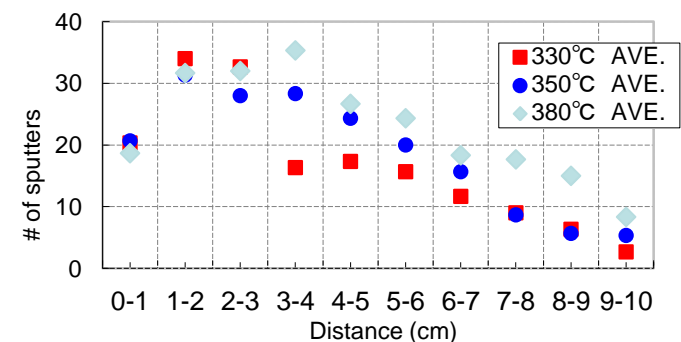
1. Place the test paper level to the iron tip
2. Feed flux-cored wire solder at right angled to the iron tip at the feeding speed as described above.
3. After feeding 30 shots, remove test paper and count sputtered flux



S3X-72M Flux Sputtering Test Result



Conv. Prod. Flux Sputtering Test Result



Even with superior wettability than conventional product, flux sputtering is reduced on S3X-72M.

72M gave more repeatable results irrespective of the temperature at which it is tested.



Contents

Features

Specifications

Available Wire Diameter

Product Code

Solder Spreading

Flux Sputtering

Slide Soldering Test

Iron Tip Anti-erosion

Other Properties

Handling Guide

Slide Soldering Test

- Equipment: UNIX-412R (Japan Unix)
Iron Tip: P1V10-23
- Test PCB: FR-4 OSP (TH dia. 1.0mm, t=1.6mm)
- Connector: 2.54mm pitch L angled pin header, 20 pins (Misumi)
- Wire diameter: 0.5mmφ

Test condition

- Slide speed: 6mm/s
- Wire feed speed: 29mm/s
- Wire feed amount: 300mm
- Iron tip temp.: 330, 350 and 380°C
- Sample size: n=2 (4 rows of 20 pins, 80 pins)

Temp.	S3X-72M		Conventional Product	
	Soldered side	Back side	Soldered side	Back side
330°C				 Insufficient wetting
350°C				 Insufficient wetting
380°C				 Insufficient wetting



→ few flux residue cracks



→ major flux residue cracking

Faster wetting than conventional product prevents insufficient wetting and spreading.

72M series also inhibits flux residue cracking.



Contents

Features

Specifications

Available Wire Diameter

Product Code

Solder Spreading

Flux Sputtering

Slide Soldering Test

Iron Tip Anti-erosion




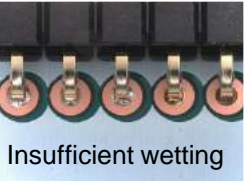








Other Properties

Handling Guide

Slide Soldering Test – Faster slide speed

- Equipment: UNIX-412R (Japan Unix)
Iron Tip: P1V10-23
- Test PCB: FR-4 OSP (TH dia. 1.0mm, t=1.6mm)
- Connector: 2.54mm pitch L angled pin header, 20 pins (Misumi)
- Wire diameter: 0.5mm

- Test condition
- Slide speed: 13mm/s
 - Wire feed speed: 62mm/s
 - Wire feed amount: 300mm
 - Iron tip temp.: 330, 350 and 380°C
 - Sample size: n=2 (4 rows of 20 pins, 80 pins total)

Temp.	S3X-72M		Conventional Product	
	Soldered side	Back side	Soldered side	Back side
330°C			 Bridging	 Insufficient wetting
350°C			 Bridging	 Insufficient wetting
380°C			 Bridging	 Insufficient wetting



→ few flux residue cracks



→ major flux residue cracking

Even at higher slide speeds, bridging and spreading is successfully prevented due to faster wetting rates

Also, it can be seen that the flux cracking is inhibited completely in 72M series.



Contents

Features

Specifications

Available Wire Diameter

Product Code

Solder Spreading

Flux Sputtering

Slide Soldering Test

Iron Tip Anti-erosion

Other Properties

Handling Guide

Slide Soldering Test – Color of flux residue

- Equipment: UNIX-412R (Japan Unix)
Iron Tip: P1V10-23
- Test PCB: FR-4 OSP (TH dia. 1.0mm, t=1.6mm)
→ Vicinity of land painted in white for better visual
- Wire diameter: 0.5mm

- Test condition
- Slide speed: **13mm/s**
 - Wire feed speed: **62mm/s**
 - Wire feed amount: 300mm
 - Iron tip temp.: 330, 350 and 380°C
 - Sample size: n=1 (2 rows by 20 TH, 40 TH total)

Item	Temp.	S3X-72M		Conventional Product	
Flux Residue Color	330°C				
	350°C				
	380°C				

The color of flux residue of the 72M series is much lighter than that of conventional product at various temperature ranges tested.



Contents

Features

Specifications

Available Wire Diameter

Product Code

Solder Spreading

Flux Sputtering

Slide Soldering Test

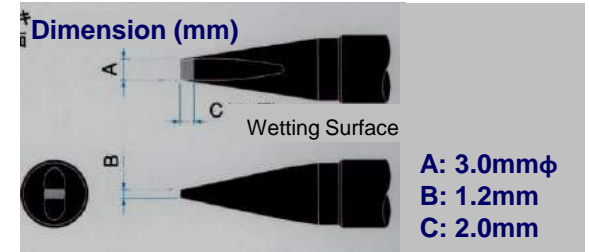
Iron Tip Anti-erosion

Other Properties

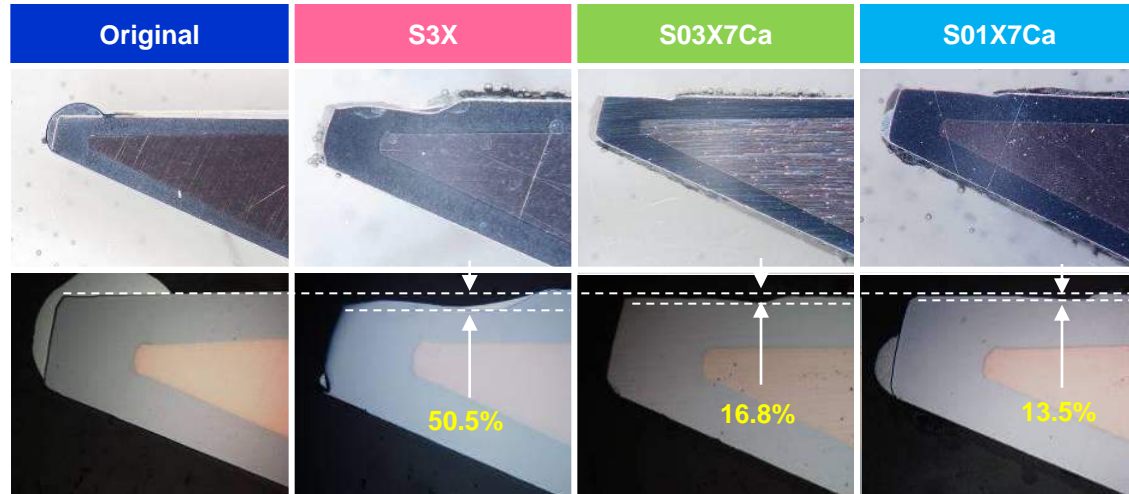
Handling Guide

Iron Tip Anti-erosion Property - S01X7Ca & S03X7Ca

- Equipment: UNIX-412R (Japan Unix)
- Iron tip temp.: 400°C (Iron Tip: P3DR)
- Wire diameter: 0.8 mm
- Wire feed condition: Amount =5.0mm/shot, tact =1.0mm/sec.
- Number of soldering shot: 10,000 shots



Iron Tip Shape



By adding Cobalt (Co) on S01X7Ca and S03X7Ca, iron tip erosion is observed to be significantly reduced as compared to SAC305, a typical lead free solder.



Contents

Features

Specifications

Available Wire Diameter

Product Code

Solder Spreading

Flux Sputtering

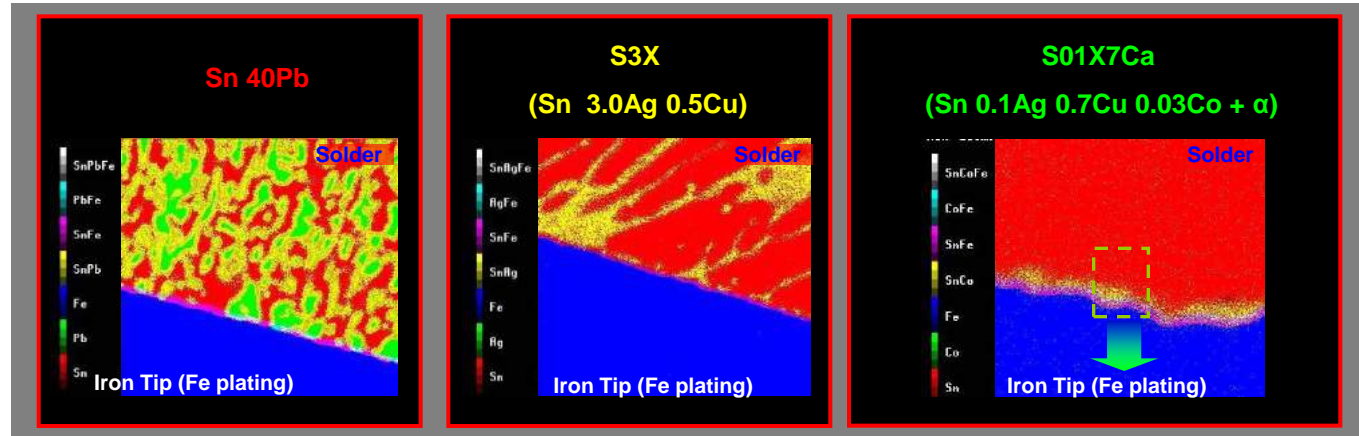
Slide Soldering Test

Iron Tip Anti-erosion

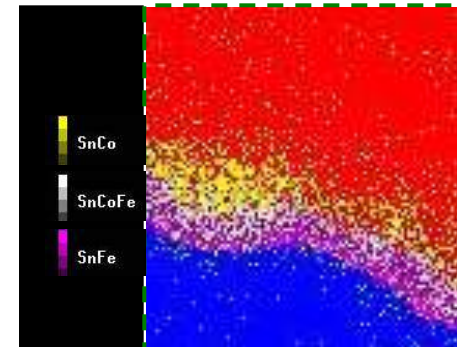
Other Properties

Handling Guide

Mechanism of Iron Tip Anti-erosion - S01X7Ca / S03X7Ca



With leaded solder such as Sn60/Pb40, scattered Pb molecules on the interface form Pb-Fe compound inhibiting Fe dispersion, thus preventing erosion of iron tip.



A typical lead free solder alloy, such as SAC305, Fe constantly diffuses into the solder, and therefore, iron tip erosion is accelerated. S01X7Ca / S03X7Ca contains Co as an additive, which replaces Fe in Sn-Fe compound and forms three barrier layers (Fe plating> Sn-Fe Sn-Co-Fe> Sn-Co). These barrier layers inhibits Fe diffusion into the solder, and prevents iron tip erosion.



Contents

Features

Specifications

Available Wire Diameter

Product Code

Solder Spreading

Flux Sputtering

Slide Soldering Test

Iron Tip Anti-erosion

Other Properties

Handling Guide

Other Properties

Test Item	Test Result	Test Standard
Dryness of the Flux Residue	Pass	JIS Z 3197
Solution Resistivity ($\Omega \cdot m$)	805	JIS Z 3197
Halide Content(%)	<0.01	JIS Z 3197
Copper Mirror Corrosion	Pass	JIS Z 3197 IPC J-STD-004
Copper Plate Corrosion	Pass	JIS Z 3197 IPC J-STD-004
SIR(Ω)	$1.2 \times 10^{10}\Omega$	(85°C,85%RH,168Hrs in chamber)
Electromigration	No evidence of electromigration	(85°C/85%RH/1000Hrs/DC50V in chamber)

* Data based on test with S3X-72M



Contents

Features

Specifications

Available Wire Diameter

Product Code

Solder Spreading

Flux Sputtering

Slide Soldering Test

Iron Tip Anti-erosion

Other Properties

Handling Guide

Handling Guide a

1. Recommended Iron Tip Temperature: 330 – 380°C

Adjust temperature according to wire diameter, specific heat of the component and feeding tact. Excessively high temperature causes flux to carbonize which inhibits heat conductance of the iron tip.

2. Shelf Life: 2 years from the manufacturing date

Activation of the flux will not significantly deteriorate during the shelf life; however, formation of the oxidation film on the product surface may cause dross in the flux residue.

Store wire solders in a cold place with little temperature variance throughout the year. Avoid high temperature and high humidity.

*** How to interpret Lot Number**

