



July 22, 2015  
PPCN #150008

## **PROCESS/ PRODUCT CHANGE NOTIFICATION**

This is to inform you that Micrel has qualified Silver wire bonding process for more SOIC-8L products and certain SC70, SOT23, MSOP, and SOT143 products at STARS, Thailand. This is in addition to the previous PPCN 150003 dated on April 17, 2015. We have now qualified more products with Silver wire bonding process. Micrel will convert the listed Micrel part numbers from the existing Gold wire bonding to Silver wire bonding at STARS starting Oct 22, 2015.

If you have any questions concerning this change, please contact:

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## **TYPE OF CHANGE**

We are converting more SOIC-8L products and certain SC70, SOT23, MSOP, and SOT143 products from existing Au wires manufactured at Stars Microelectronics, Thailand to the Silver wires manufactured at the same site. Except the wire bond material, the package material, type, form, fit and function will not be affected. These products will be tested and drop shipped from our same qualified subcontractors including STARS with the same packing and shipment format.

## **EFFECTIVITY**

Please contact Micrel Sales representative, if needed, to order samples with Silver wire bonding process at STARS.

After Oct 22, 2015, Micrel will begin to test and drop ship the listed devices with Silver wire bonding process. The products shipped could be either with Au wire or Silver wires until the entire inventory with Au wire been depleted.

After Oct 22, 2015, the listed products assembled at Stars with Au wire process could only be ordered under special part numbers. Customers who desire to only use Au wire will need to contact Micrel Sales representative to assign special part numbers.

## **PRODUCT ID (DESCRIPTION)**

See the product list in the attached Excel file "Part list PPCN150008 Conversion of certain products in SOIC SC70 SOT23 SOT143 MSOP to Silver Wire from Gold Wire"



for Micrel's products that would be converted to Silver wire process, assembled, tested, and drop shipped from STARS.

### **DESCRIPTION OF CHANGE**

In addition to the previous PPCN 150003 dated on April 17, 2015, we have now qualified more products with Silver wire bonding process. Micrel will convert the listed Micrel SOIC, SC70, SOT23, MSOP, and SOT143 part numbers from the existing Gold wire bonding to Silver wire bonding at STARS starting Oct 22, 2015. All the listed part numbers produced at Stars will be converted from the existing Au wires to Silver wires after Oct 22, 2015 and assembled at STARS, tested, and drop shipped from our same qualified subcontractors including STARS.

### **EFFECT OF CHANGE**

Except the wire bond material at assembly, there is no change in other assembly material, lead finish, data sheet and the form, fit, or function of the products. The land pattern, lead layout, naming, and lead count are the same. There is no change in the die or testing. There is no change in moisture sensitivity rating.

The parts made with the Silver wires will have an additional code "S" added to the end of date code. The marking on the units with the Silver wires will show "YYWWS". The marking on the units with current Au wire will show "YYWW" only.

Silver wire has shown superior high temperature storage results compared to gold.

### **QUALIFICATION**

STARS is a Micrel qualified subcontractor. The Silver process is already a mass-production process at STARS and shipped to STARS' other customers. Traceability is maintained by date code and lot number for all products. We attach representative reliability reports for qualifying Micrel products assembled with Silver process at STARS.



## RELIABILITY REPORT (SC70\_SOT23\_ SOT143)

DATE: 4/20/2015

<b>QUALITY ENG:</b>		<b>PURPOSE:</b>					
H.Grimm		STARS, THAILAND SC70_SOT23_TSOT23_SOT143_ ASSEMBLY using 1 mil Ag wire					
<b>ASSEMBLY</b>	<b>PACKAGE TYPE :</b>	<b>MSL</b>	<b>MOLD COMP.</b>	<b>DIE</b>	<b>LOT #</b>	<b>DATE CODE</b>	<b>FAB PROCESS</b>
STARS ELECTRONICS, THAILAND	SC70-5L, SOT23-5L, SOT143-4L, TSOT23-5L RoHS,Bromine Free G600 NiPdAu Plating	LEVEL 1	SC70 G600	MIC5365	DA19422MQL	1436	CSI05
			SC70 G600	MIC5213	BA32543MQC	1434	BCC
			SOT23 G600	MIC5205	6A38887MQD	1435	BCC
			SOT143 G600	MIC5018	DA24789MQD	1446	BCD3

**QUALIFICATION RESULTS :**

TEST DESCRIPTION	METHOD/CONDITIONS	LOT #	DATE CODE	168 HR Rej/pass	1000 HR Rej/pass	COMMENTS
<b>HTOL High Temperature Operating Life Test</b>  <b>With Level 1 Pre-conditioning</b>  <b>With Level 3 Pre-conditioning</b>	JESD-22, Method A108  TA= + 125°C,  VCC = +5.5V	DA19422MQL	1436	0/77	0/77	MIC5365
		BA32543MQC	1434	0/77	0/77	MIC5213
		6A38887MQD	1435	0/77	0/77	MIC5205
		DA24789MQD	1446	0/77	0/77	MIC5018
		DA24789MQE	1446	0/77	0/77	MIC5018
TEST DESCRIPTION	METHOD/CONDITIONS	LOT ID.	DATE CODE	Rej/ss	L1 PRE-CONDITIONING FLOW	



Pre-conditioning Flow	JESD22-A113	DA19422MQL	1436	0/475	STEP1-> ELECTRICAL TEST STEP2-> EXTERNAL VISUAL BAKE 24H + 125C STEP3-> SOAK 168H +85c/85%rh STEP4-> 3X IR REFLOW +260c STEP5-> FLUX IMMERSION STEP6-> RINSE STEP7-> EXTERNAL VISUAL STEP8-> ELECTRICAL TEST	
With Level 1 Pre-conditioning		BA32543MQC	1434	0/475		
		6A38887MQD	1435	0/475		
With Level 3 Pre-conditioning		DA24789MQD	1446	0/475		
		DA24789MQE	1446	0/475		
		DA24789MQF	1446	0/475		
TEST DESCRIPTION	METHOD/CONDITIONS	LOT #	DATE CODE	96 HR Rej/pass	COMMENTS	
PRESSURE POT	JESD22-A102	DA19422MQL	1436	0/45	MIC5365	
With Level 1 Pre-conditioning	Ta = +121°C/100%RH	BA32543MQC	1434	0/45	MIC5213	
	15 PSIG	6A38887MQD	1435	0/45	MIC5205	
With Level 3 Pre-conditioning		DA24789MQD	1446	0/45	MIC5018	
		DA24789MQE	1446	0/45	MIC5018	
		DA24789MQF	1446	0/45	MIC5018	
TEST DESCRIPTION	METHOD/CONDITIONS	DATE CODE	LOT ID.	96 HR Rej/ss	192 HR Rej/ss	
HAST	JESD22-A110 (BIASED)	DA19422MQL	1436	0/45	0/45	MIC5365
With Level 1 Pre-conditioning		BA32543MQC	1434	0/45	0/45	MIC5213
Tpeak + 260°C 3X Reflow	Ta= +131°C/85%RH	6A38887MQD	1435	0/45	0/45	MIC5205
With Level 3 Pre-conditioning		DA24789MQD	1446	0/45	0/45	MIC5018
		DA24789MQE	1446	0/45	0/45	MIC5018
	JESD22-A118 (UNBIASED)	DA24789MQF	1446	0/45	0/45	MIC5018
TEST DESCRIPTION	METHOD/CONDITIONS	LOT #	DATE CODE	500 cyc Rej/pass	1000 cyc Rej/pass	



<b>TEMP CYCLE</b>  With Level 1 Pre-conditioning  With Level 3 Pre-conditioning	JESD22-A104  Ta = -65°C/+150°C	DA19422MQL	1436	0/45	0/45		
		BA32543MQC	1434	0/45	0/45		
		6A38887MQD	1435	0/45	0/45		
		DA24789MQD	1446	0/45	0/45		
		DA24789MQE	1446	0/45	0/45		
		DA24789MQF	1446	0/45	0/45		
<b>TEST DESCRIPTION</b>	<b>METHOD/CONDITIONS</b>	<b>LOT #</b>	<b>DATE CODE</b>	<b>1000 HR Rej/pass</b>	<b>2000 HR Rej/pass</b>	<b>COMMENTS</b>	
<b>HTSL High Temperature Storage Life</b>  With Level 1 Pre-conditioning  With Level 3 Pre-conditioning	JESD22-A103  Ta = +150°C	DA19422MQL	1436	0/76	0/76	MIC5365	
		BA32543MQC	1434	0/76	0/76	MIC5213	
		6A38887MQD	1435	0/76	0/76	MIC5205	
		DA24789MQD	1446	0/76	0/76	MIC5018	
		DA24789MQE	1446	0/76	0/76	MIC5018	
		DA24789MQF	1446	0/76	0/76	MIC5018	
<b>TEST DESCRIPTION</b>	<b>METHOD/CONDITIONS</b>	<b>LOT #</b>	<b>DATE CODE</b>	<b>250 HR Rej/pass</b>	<b>500 HR Rej/pass</b>	<b>1000 HR Rej/pas s</b>	
<b>HTSL High Temperature Storage Life</b>  With Level 1 Pre-conditioning  With Level 3 Pre-conditioning	JESD22-A103  Ta = +175°C	DA19422MQL	1436	0/76	0/76	0/76	MIC5365
		BA32543MQC	1434	0/76	0/76	0/76	MIC5213
		6A38887MQD	1435	0/76	0/76	0/76	MIC5205
		DA24789MQD	1446	0/76	0/76	0/76	MIC5018
		DA24789MQE	1446	0/76	0/76	0/76	MIC5018
		DA24789MQF	1446	0/76	0/76	0/76	MIC5018
<b>TEST DESCRIPTION</b>	<b>METHOD/CONDITIONS</b>	<b>LOT #</b>	<b>DATE CODE</b>	<b>100 HR Rej/pass</b>	<b>200 HR Rej/pass</b>	<b>400 HR Rej/pas s</b>	<b>COMMENTS</b>



<b>HTSL High Temperature Storage Life</b>  <b>With Level 1 Pre-conditioning</b>  <b>With Level 3 Pre-conditioning</b>	JESD22-A103	DA19422MQL	1436	0/76	0/76	0/76	MIC5365
	<b>Ta = +200°C</b>	BA32543MQC	1434	0/76	0/76	0/76	MIC5213
		6A38887MQD	1435	0/76	0/76	0/76	MIC5205
		DA24789MQD	1446	0/76	0/76	0/76	MIC5018
		DA24789MQE	1446	0/76	0/76	0/76	MIC5018
		DA24789MQF	1446	0/76	0/76	0/76	MIC5018
<b>TEST DESCRIPTION</b>	<b>METHOD/CONDITIONS</b>	<b>LOT NUMBER</b>	<b>DATE CODE</b>	<b>STRESS</b>	<b>RESULT</b> rej/ss	<b>COMMENTS</b>	
<b>ESD-HBM</b>	TA = +25°C R = 1500 Ohms, C = 100 pF  1X +/- Voltage	DA19422MQB	1432	+/-500V +/-1000V +/-1500V +/-2000V	0/3 0/3 0/3 0/3	MIC5365	
<b>FLAMMABILITY</b>	UL-94V-0  Certified	All mold compounds used by Micrel meet this standard. See the UL website on-line list of material flammability certifications. Micrel requires a Certificate of Compliance from the assembly house and we verify the certifications on the web.					

**Conclusion: STARS Ag Wire bonding passed the Reliability Tests required for production release.**



## RELIABILITY REPORT (MSOP)

DATE: 7/6/2015

QUALITY ENG:	PURPOSE:						
H.Grimm	STARS, THAILAND MSOP_ ASSEMBLY using 1 mil Ag wire						
ASSEMBLY	PACKAGE TYPE :	MSL	MOLD COMP.	DIE	LOT #	DATE CODE	FAB PROCESS
STARS ELECTRONICS, THAILAND	MSOP_8L MSOP_10L RoHS,Bromine Free G600 NiPdAu Plating	LEVEL 1	MSOP G600	MICRF112	PC62811.MQD	1436	AMS035
			MSOP G600	MICRF112	PC62811.MQF	1438	AMS035
			MSOP G600	MIC2124	DA03096MQC	1442	BCD05

### QUALIFICATION RESULTS :

TEST DESCRIPTION	METHOD/CONDITIONS	LOT #	DATE CODE	168 HR Rej/pass	1000 HR Rej/pass	COMMENTS
HTOL  <i>High Temperature Operating Life Test</i>  With Level 1 Pre-conditioning	JESD-22, Method A108  TA= + 125°C,  VCC = +5.5V	PC62811.MQF	1438	0/77	0/77	
		DA03096MQC	1442	0/77	0/77	
TEST DESCRIPTION	METHOD/CONDITIONS	LOT ID.	DATE CODE	Rej/ss	L1 PRE-CONDITIONING FLOW	
Level 1  Pre-conditioning Flow	JESD22-A113	PC62811.MQD	1436	0/475	STEP1-> ELECTRICAL TEST STEP2-> EXTERNAL VISUAL BAKE 24H + 125C STEP3-> SOAK 168H +85c/85%rh STEP4-> 3X IR REFLOW +260c STEP5-> FLUX IMMERSION STEP6-> RINSE STEP7-> EXTERNAL VISUAL STEP8-> ELECTRICAL TEST	
		PC62811.MQF	1438	0/475		
		DA03096MQC	1442	0/440		
TEST DESCRIPTION	METHOD/CONDITIONS	LOT #	DATE CODE	96 HR Rej/pass	COMMENTS	
PRESSURE POT  With Level 1 Pre-conditioning	JESD22-A102  Ta = +121°C/100%RH  15 PSIG	PC62811.MQD	1436	0/45		
		PC62811.MQF	1438	0/45		
		DA03096MQC	1442	0/45		
TEST DESCRIPTION	METHOD/CONDITIONS	LOT #	DATE CODE	96 HR Rej/pass	192 HR Rej/pass	COMMENTS
HAST  With Level 1 Pre-conditioning  Tpeak + 260°C 3X Reflow	JESD22-A110 (BIASED)  Ta= +131°C/85%RH  JESD22-A118 (UNBIASED)	PC62811.MQD	1436	0/44	0/44	*EOS
		PC62811.MQF	1438	1/45*	0/44	
		DA03096MQC	1442	0/45	0/45	



TEST DESCRIPTION	METHOD/CONDITIONS	LOT #	DATE CODE	500 cyc Rej/pass	1000 cyc Rej/pass	COMMENTS	
<b>TEMP CYCLE</b>  With Level 1 Pre-conditioning	JESD22-A104  Ta = -65°C/+150°C	MICRF112	1436	0/45	0/45		
		MICRF112	1438	0/45	0/45		
		MIC2124	1442	0/45	0/45		
TEST DESCRIPTION	METHOD/CONDITIONS	LOT #	DATE CODE	1000 HR Rej/pass	2000 HR Rej/pass	COMMENTS	
<b>HTSL High Temperature Storage Life</b>  With Level 1 Pre-conditioning	JESD22-A103  Ta = +150°C	PC62811.MQD	1436	0/76	0/76		
		PC62811.MQF	1438	0/76	0/76		
		DA03096MQC	1442	0/76	0/76		
TEST DESCRIPTION	METHOD/CONDITIONS	LOT #	DATE CODE	250 HR Rej/pass	500 HR Rej/pass	1000 HR Rej/pass	
<b>HTSL High Temperature Storage Life</b>  With Level 1 Pre-conditioning	JESD22-A103  Ta = +175°C	PC62811.MQD	1436	0/76	0/76	0/76	
		PC62811.MQF	1438	0/76	0/76	0/76	
		DA03096MQC	1442	0/76	0/76	0/76	
TEST DESCRIPTION	METHOD/CONDITIONS	PART #	DATE CODE	STRESS	RESULT Rej/pass	COMMENTS	
<b>ESD-HBM</b>	TA = +25°C R = 1500 Ohms, C = 100 pF  1X +/- Voltage	MICRF112	1436	+/-500V +/-1000V +/-1500V +/-2000V	0/3 0/3 0/3 0/3		
		MIC2124	1442	+/-500V +/-1000V +/-1500V +/-2000V	0/3 0/3 0/3 3/3		
TEST DESCRIPTION	METHOD/CONDITIONS	PART #	DATE CODE	STRESS	RESULT rej/ss	COMMENTS	
<b>LATCH-UP</b>	JESD-78, TA = +25°C  I/O TRIGGER @+/-200mA, O/V TEST @ ABS MAX VCC OR 1.5X VCC	MICRF112	1436	I/O LU O/V LU	0/6 0/6		
		MIC2124	1442	I/O LU O/V LU	0/6 0/6		
<b>FLAMMABILITY</b>	UL-94V-0  Certified	All mold compounds used by Micrel meet this standard. See the UL website on-line list of material flammability certifications. Micrel requires a Certificate of Compliance from the assembly house and we verify the certifications on the web.					

**Conclusion: STARS Ag Wire bonding passed the Reliability Tests required for production release.**





## RELIABILITY REPORT (SOIC extended time)

**DATE: 5/27/2015 (Extended time points in red texts compared to previous PPCN150003)**

<b>QUALITY ENG:</b>	<b>PURPOSE:</b>						
H.Grimm	STARS, THAILAND ASSEMBLY using TANAKA SEC 2mil Ag-Alloy Wire (Qual Vehicle MIC2026)						
<b>ASSEMBLY</b>	<b>PACKAGE TYPE :</b>	<b>MSL</b>	<b>M/C</b>	<b>DIE ATTACH</b>	<b>Qual Lot #</b>	<b>DATE CODE</b>	<b>FAB PROCESS</b>
STARS ELECTRONICS, THAILAND	SOIC-8L RoHS, Bromine Free ASM PPF NiPdAu Plating	LEVEL 1	EME G600	2200D	BA38061MEL	1437	BCD2
					BA38061MEM	1438	BCD2
					BA38061MEN	1439	BCD2

### QUALIFICATION RESULTS :

TEST DESCRIPTION	METHOD/CONDITIONS	LOT #	DATE CODE	168 HR Rej/pass	1000 HR Rej/pass	2000 HR Rej/pass	COMMENTS
<b>HTOL</b>  <i>High Temperature Operating Life Test</i>  With Level 1 Pre-conditioning	JESD-22, Method A108  TA= + 125°C,  VCC = +5.5V	BA38061MEL	1437	0/77	0/77	0/77	
		BA38061MEM	1438	0/77	0/77	0/77	
		BA38061MEN	1439	0/77	0/77	0/77	
TEST DESCRIPTION	METHOD/CONDITIONS	LOT ID.	DATE CODE	Rej/ss	L1 PRE-CONDITIONING FLOW		
<b>Level 1</b>  Pre-conditioning Flow	<b>JESD22-A113</b>	BA38061MEL	1437	0/453	STEP1-> ELECTRICAL TEST STEP2-> EXTERNAL VISUAL BAKE 24H + 125C STEP3-> SOAK 168H +85c/85%rh STEP4-> 3X IR REFLOW +260c STEP5-> FLUX IMMERSION STEP6-> RINSE STEP7-> EXTERNAL VISUAL STEP8-> ELECTRICAL TEST		
		BA38061MEM	1438	0/450			
		BA38061MEN	1439	0/450			
TEST DESCRIPTION	METHOD/CONDITIONS	LOT #	DATE CODE	168 HR Rej/pass	COMMENTS		
<b>PRESSURE POT</b>  With Level 1 Pre-conditioning	JESD22-A102  Ta = +121°C/100%RH  15 PSIG	BA38061MEL	1437	0/45			
		BA38061MEM	1438	0/45			
		BA38061MEN	1439	0/45			
TEST DESCRIPTION	METHOD/CONDITIONS	LOT #	DATE CODE	500 cyc Rej/pass	1000 cyc Rej/pass	COMMENTS	



TEMP CYCLE  With Level 1 Pre-conditioning	JESD22-A104	BA38061MEL	1437	0/45	0/45		
	Ta = -65°C/+150°C	BA38061MEM	1438	0/45	0/45		
		BA38061MEN	1439	0/45	0/45		
TEST DESCRIPTION	METHOD/CONDITIONS	LOT #	DATE CODE	1000 HR Rej/pass	2000 HR Rej/pass	3000 HR Rej/pass	COMMENTS
HTSL High Temperature Storage Life  With Level 1 Pre-conditioning	JESD22-A103	BA38061MEL	1437	0/76	0/76	0/76	
	Ta = +150°C	BA38061MEM	1438	0/76	0/76	0/76	
		BA38061MEN	1439	0/76	0/76	0/76	
TEST DESCRIPTION	METHOD/CONDITIONS	LOT #	DATE CODE	250 HR Rej/pass	500 HR Rej/pass	1000 HR Rej/pass	COMMENTS
HTSL High Temperature Storage Life  With Level 1 Pre-conditioning	JESD22-A103	BA38061MEL	1437	0/76	0/76	0/76	
	Ta = +175°C	BA38061MEM	1438	0/76	0/76	0/76	
		BA38061MEN	1439	0/76	0/76	0/76	
TEST DESCRIPTION	METHOD/CONDITIONS	LOT #	DATE CODE	100 HR Rej/pass	200 HR Rej/pass	411 HR Rej/pass	COMMENTS
HTSL High Temperature Storage Life  With Level 1 Pre-conditioning	JESD22-A103	BA38061MEL	1437	0/76	0/76	0/76	Info only test
	Ta = +200°C	BA38061MEM	1438	0/76	0/76	0/76	
		BA38061MEN	1439	0/76	0/76	0/76	
TEST DESCRIPTION	METHOD/CONDITIONS	DATE CODE	LOT ID.	96 HR Rej/ss	192 HR Rej/ss	COMMENTS	
HAST  With Level 1 Pre-conditioning	JESD22-A110 (BIASED)	BA38061MEL	1437	0/45	0/45		
	Ta= +130°C/85%RH	BA38061MEM	1438	0/45	0/45		
		BA38061MEN	1439	0/45	0/45		
TEST DESCRIPTION	METHOD/CONDITIONS	LOT #	DATE CODE	RESULT	COMMENTS		
SOLDER IRON	JESD22-B106B  5 seconds @+380°C	BA38061MEL	1437	0/5			
TEST DESCRIPTION	METHOD/CONDITIONS	LOT NUMBER	DATE CODE	STRESS	RESULT rej/ss	COMMENTS	
ESD-HBM	TA = +25°C R = 1500 Ohms, C = 100 pF  1X +/- Voltage	BA38061MEM	1438	+/-500V	0/6	3 samples from each lot per voltage level. Device passes 2kV HBM	
		BA38061MEN	1439	+/-1000V +/-1500V +/-2000V	0/6 0/6 0/6		



TEST DESCRIPTION	METHOD/CONDITIONS	LOT NUMBER	DATE CODE	STRESS	RESULT rej/ss	COMMENTS
LATCH-UP	JESD-78, TA = +25°C  I/O TRIGGER @+/-200mA, O/V TEST @ ABS MAX VCC OR 1.5X VCC	BA38061MEL	1437	I/O LU O/V LU	0/6 0/6	
FLAMMABILITY	UL-94V-0  Certified	All mold compounds used by Micrel meet this standard. See the UL website on-line list of material flammability certifications. Micrel requires a Certificate of Compliance from the assembly house and we verify the certifications on the web.				

**Conclusion: STARS Ag Wire bonding passed the Reliability Tests required for production release.**