



Oct 20, 2014
PPCN #140012

PROCESS/ PRODUCT CHANGE NOTIFICATION

This is to inform you that Micrel Inc has qualified Exposed Pad (E-Pad) MSOP packages at STARS Microelectronics, Thailand as an alternative assembly and test site. This manufacturing subcontractor is in addition to the current Unisem, Malaysia as qualified assembly locations for these products. This change adds more capacity and provides for the flexibility of assembly processing locations. This will enable Micrel to continue to make on-time deliveries to our growing end customers. If you have any questions concerning this change, please contact:

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TYPE OF CHANGE

We are adding STARS as an assembly and test source in addition to the current Unisem. The package type, form, fit and function will not be affected. These products will be shipped with the same packing and shipment format.

EFFECTIVITY

Starting Jan 20, 2015, Micrel will begin to deliver the listed devices from STARS. After Jan 20, 2015, the products shipped to customers could be either assembled from UNISEM or STARS. In order to make on-time deliveries to our growing end customers, we will reserve the flexibility to deliver certain part numbers at earlier date if unexpected material or capacity shortage occurs at UNISEM in the future.

PRODUCT ID (DESCRIPTION)

See the product list in the attached Excel file "PPCN 140012 part list add STARS additional assembly and test site for EPAD MSOP" for Micrel's products that would be assembled and tested at UNISEM or STARS site.

DESCRIPTION OF CHANGE

Micrel has qualified STARS, Thailand for assembly and test of the listed Micrel products. This will provide additional capacity for assembly of these products.



EFFECT OF CHANGE

There is no change in form, fit or function of the product. There is no change in the die, testing procedures, or assembly materials, except the die attach epoxy. The Epoxy is changed from Ablestik ABLEBOND 8290 (UNISEM) to Ablestik ABLEBOND 84-1LMISR4 (STARS). 84-1LMISR4 has higher thermal conductivity than ABLEBOND 8290. The land pattern, lead finish, lead layout, naming, and lead count are the same. There is no change in moisture sensitivity rating.

QUALIFICATION

STARS is Micrel's qualified assembly subcontractor. STARS is already qualified in assembling and testing SOIC, SC70, SOT143, MSOP, SOT-23, and TSOT products in high volume production. Traceability is maintained by date code and lot number, and country of origin (CO) for all products. The parts made at Unisem Ipoh will have a "MY" country of origin mark, and the parts made at STARS will have a "TH" country of origin mark. EPAD MSOP uses the same testers and handlers as the current MSOP production. We attach a representative reliability report for qualifying products assembled at STARS, Thailand.



RELIABILITY REPORT

DATE : 06/09/2014

QUALITY ENG :	PURPOSE:
H.GRIMM	Qualify STARS MICROELECTRONICS, THAILAND Epad MSOP Packages

PART NUMBER	PACKAGE TYPE	ASSEMBLY LOCATION	FAB LOCATION	PROCESS NAME
MIC2165YMME	Epad MSOP-10L	Stars, Thailand	Micrel, San Jose	BCD 0.5
MIC2159YMME	Epad MSOP-10L	Sumitomo G600		BCD 1.2
MIC5281YMME	Epad MSOP-10L	PPF_NiPdAu Leadframe		BCD 2.0

DIE QUALIFICATION RESULTS

TEST DESCRIPTION	METHOD/CONDITIONS	DATE CODE	LOT ID.	168 HR Rej/ss	1000 HR Rej/ss	2000 HR Rej/ss	COMMENTS
HTOL High Temperature Operating Life Test	JESD22, Method 108	1324	BA05487MQA	1/77	0/76	0/76	RQ131209: Non - assembly related defects
	TA= + 125°C	1323	0A01047MEF	0/77	0/77	0/77	
	VCC = Operating max	1323	AA50770MEK	0/77	0/77	0/77	

PACKAGE QUALIFICATION RESULTS

TEST DESCRIPTION	METHOD/CONDITIONS	LOT ID.	DATE CODE	Rej/ss	L3 PRE-CONDITIONING FLOW
<i>Level 3</i> <i>Pre-conditioning Flow</i>	<i>JESD22-A113</i>	1324	BA05487MQA	0/318	STEP1-> ELECTRICAL TEST STEP2-> EXTERNAL VISUAL BAKE 24H + 125C STEP3-> SOAK 40H +60C/60% RH STEP4-> 3X IR REFLOW +260c STEP5-> FLUX IMMERSION STEP6-> RINSE STEP7-> EXTERNAL VISUAL STEP8-> ELECTRICAL TEST
		1324	0A01047MEG	0/190	
		1323	0A01047MEF	0/363	
		1323	AA50770MEK	0/363	
TEST DESCRIPTION	METHOD/CONDITIONS	DATE CODE	LOT ID.	96 HR Rej/ss	COMMENTS
PRESSURE POT <i>With Level 3 Pre- conditioning</i> Tpeak + 260°C 3X Reflow	JESD22-A102 Ta = +121°C/100%RH 15 PSIG	1324	BA05487MQA	0/45	
		1324	0A01047MEG	0/45	
		1323	0A01047MEF	0/45	
		1323	AA50770MEK	0/45	
TEST DESCRIPTION	METHOD/CONDITIONS	DATE CODE	LOT ID.	96 HR Rej/ss	COMMENTS



HAST <i>With Level 3 Pre-conditioning</i> Tpeak + 260°C 3X Reflow	JESD22-A110 (BIASED)	1324	BA05487MQA	0/45			
	Ta= +131°C/85%RH	1324	0A01047MEG	0/45			
	JESD22-A118 (UNBIASED)	1323	0A01047MEF	0/45			
		1323	AA50770MEK	0/45			
TEST DESCRIPTION	METHOD/CONDITIONS	DATE CODE	LOT ID.	1000 CY Rej/ss	COMMENTS		
TEMP CYCLE <i>With Level 3 Pre-conditioning</i> Tpeak + 260°C 3X Reflow	JESD22-A104	1324	BA05487MQA	0/45			
	Ta = -65°C / +150°C	1324	0A01047MEG	0/45			
	Ta = -40°C / +125°C	1323	0A01047MEF	0/45			
		1323	AA50770MEK	0/45			
TEST DESCRIPTION	METHOD/CONDITIONS	DATE CODE	LOT ID.	1000 HR Rej/ss	2000 HR Rej/ss	COMMENTS	
HTSL <i>High Temperature Storage Life</i> <i>With Level 3 Pre-conditioning</i>	JESD22-A103	1324	BA05487MQA	0/76	0/76		
	Ta = +150°C	1323	0A01047MEF	0/76	0/76		
		1323	AA50770MEK	0/76	0/76		
TEST DESCRIPTION	METHOD/CONDITIONS	DEVICES	LOT ID.	P / F	COMMENTS		
PHYSICAL DIMENSIONS	MIL STD 883	MIC2159	0A01047MEF	30 / 0			
	SS= 30/LOT	MIC5281	AA50770MEK	30 / 0			
	Cpk >1.66						
TEST DESCRIPTION	METHOD/CONDITIONS	DEVICES	LOT ID.	P / F	COMMENTS		
RADIOGRAPHIC X-RAY	MIL STD 883 TM2010	MIC2165	BA05487MQA	5 / 0			
		MIC2159	0A01047MEF	5 / 0			
TEST DESCRIPTION	METHOD/CONDITIONS	WIRE	LOT ID.	MIN	MAX	AVE	CpK
WIRE PULL	MIL STD 883 TM2011	1.0	0A01047MEG	9.08	11.78	10.44	4.31
	SS=30	1.0	0A01047MEF	9.33	11.49	10.67	5.31
		1.3	AA50770MEK	12.94	19.04	17.16	2.86
		1.3	AA50770MEL	15.23	18.68	17.42	5.18
TEST DESCRIPTION	METHOD/CONDITIONS	DATE CODE	LOT ID.	MIN	MAX	AVE	CpK



BALL SHEAR	ASTM F-1269-89	1.0	0A01047MEG	29.82	35.60	32.79	2.13
	SS=30	1.0	0A01047MEF	30.16	36.94	33.33	2.11
		1.3	AA50770MEK	39.01	49.72	43.19	2.04
		1.3	AA50770MEL	38.34	50.45	41.58	2.14
TEST DESCRIPTION	METHOD/CONDITIONS	DEVICES	LOT ID.	P / F	P / F	COMMENTS	
SOLDERABILITY	JESD22-B102	MIC2159	0A01047MEG	5 / 0			
			0A01047MEF	5 / 0			
		MIC5281	AA50770MEK	5 / 0			
			AA50770MEL	5 / 0			
NOTES: STARS has passed the Package Reliability Tests required for production release.							
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.					

External part number	PackageType	External part number	PackageType
MIC4126YMME	eP-MSOP-08L	MIC5356-SGYMME TR	eP-MSOP-08L
MIC4126YMME TR	eP-MSOP-08L	MIC5357-GFYMME	eP-MSOP-08L
MIC4223YMME	eP-MSOP-08L	MIC5357-GFYMME TR	eP-MSOP-08L
MIC4223YMME TR	eP-MSOP-08L	MIC5357-MGYMME	eP-MSOP-08L
MIC4224YMME	eP-MSOP-08L	MIC5357-MGYMME TR	eP-MSOP-08L
MIC4224YMME TR	eP-MSOP-08L	MIC5357-SGYMME	eP-MSOP-08L
MIC4225YMME	eP-MSOP-08L	MIC5357-SGYMME TR	eP-MSOP-08L
MIC4225YMME TR	eP-MSOP-08L	MIC5357-SMYMME	eP-MSOP-08L
MIC44F18YMME	eP-MSOP-08L	MIC5357-SMYMME TR	eP-MSOP-08L
MIC44F18YMME TR	eP-MSOP-08L	SY100EP16VSKY	eP-MSOP-08L
MIC44F19YMME	eP-MSOP-08L	MIC4127YMME	eP-MSOP-08L
MIC44F19YMME TR	eP-MSOP-08L	MIC4127YMME TR	eP-MSOP-08L
MIC44F20YMME	eP-MSOP-08L	MIC4128YMME	eP-MSOP-08L
MIC44F20YMME TR	eP-MSOP-08L	MIC4128YMME TR	eP-MSOP-08L
MIC47100-08YMME	eP-MSOP-08L	MIC2036CYMME	eP-MSOP-10L
MIC47100-08YMME TR	eP-MSOP-08L	MIC2036CYMME TR	eP-MSOP-10L
MIC47100-10YMME	eP-MSOP-08L	MIC2159YMME	eP-MSOP-10L
MIC47100-10YMME TR	eP-MSOP-08L	MIC2159YMME TR	eP-MSOP-10L
MIC47100-12YMME	eP-MSOP-08L	MIC2165YMME	eP-MSOP-10L
MIC47100-12YMME TR	eP-MSOP-08L	MIC2165YMME TR	eP-MSOP-10L
MIC47100YMME	eP-MSOP-08L	MIC2166YMME	eP-MSOP-10L
MIC47100YMME TR	eP-MSOP-08L	MIC2166YMME TR	eP-MSOP-10L
MIC5281-3.3YMME	eP-MSOP-08L	MIC2169BYMME	eP-MSOP-10L
MIC5281-3.3YMME TR	eP-MSOP-08L	MIC2169BYMME TR	eP-MSOP-10L
MIC5281-5.0YMME	eP-MSOP-08L	MIC4720YMME	eP-MSOP-10L
MIC5281-5.0YMME TR	eP-MSOP-08L	MIC4720YMME TR	eP-MSOP-10L
MIC5281YMME	eP-MSOP-08L	MIC4723YMME	eP-MSOP-10L
MIC5281YMME TR	eP-MSOP-08L	MIC4723YMME TR	eP-MSOP-10L
MIC5282-3.3YMME	eP-MSOP-08L	MIC4724YMME	eP-MSOP-10L
MIC5282-3.3YMME TR	eP-MSOP-08L	MIC4724YMME TR	eP-MSOP-10L
MIC5282-5.0YMME	eP-MSOP-08L	MIC4812YMME	eP-MSOP-10L
MIC5282-5.0YMME TR	eP-MSOP-08L	MIC4812YMME TR	eP-MSOP-10L
MIC5282YMME	eP-MSOP-08L	MIC61150-10YMME	eP-MSOP-10L
MIC5282YMME TR	eP-MSOP-08L	MIC61150-10YMME TR	eP-MSOP-10L
MIC5355-G4YMME	eP-MSOP-08L	MIC61150YMME	eP-MSOP-10L
MIC5355-G4YMME TR	eP-MSOP-08L	MIC61150YMME TR	eP-MSOP-10L
MIC5355-JGYMME	eP-MSOP-08L	MIC61300-10YMME	eP-MSOP-10L
MIC5355-JGYMME TR	eP-MSOP-08L	MIC61300-10YMME TR	eP-MSOP-10L
MIC5355-S4YMME	eP-MSOP-08L	MIC61300YMME	eP-MSOP-10L
MIC5355-S4YMME TR	eP-MSOP-08L	MIC61300YMME TR	eP-MSOP-10L
MIC5355-SCYMME	eP-MSOP-08L	SPN030039Y	eP-MSOP-10L
MIC5355-SCYMME TR	eP-MSOP-08L	SPN030039Y TR	eP-MSOP-10L
MIC5355-SGYMME	eP-MSOP-08L	SY88303BLEY	eP-MSOP-10L
MIC5355-SGYMME TR	eP-MSOP-08L	SY88305BLEY	eP-MSOP-10L
MIC5356-G4YMME	eP-MSOP-08L	SY88307BLEY	eP-MSOP-10L
MIC5356-G4YMME TR	eP-MSOP-08L	SY88309BLEY	eP-MSOP-10L
MIC5356-JGYMME	eP-MSOP-08L	SY88313BLEY	eP-MSOP-10L
MIC5356-JGYMME TR	eP-MSOP-08L	SY88315BLEY	eP-MSOP-10L
MIC5356-S4YMME	eP-MSOP-08L	SY88343BLEY	eP-MSOP-10L
MIC5356-S4YMME TR	eP-MSOP-08L	SY88345BLEY	eP-MSOP-10L
MIC5356-SCYMME	eP-MSOP-08L	SY88347DLEY	eP-MSOP-10L
MIC5356-SCYMME TR	eP-MSOP-08L	SY88403BLEY	eP-MSOP-10L
MIC5356-SGYMME	eP-MSOP-08L	SY88843VEY	eP-MSOP-10L
SY88973VEY	eP-MSOP-10L	SY88973VEY	eP-MSOP-10L