PCN #: 1363
DATE: 01-07-14
PROPOSED SHIP DATE: 04-07-14

Quality Assurance
160 Rio Robles
San Jose, CA 95134

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☐ PROCESS CHANGE NOTICE

☒ PRODUCT CHANGE NOTICE

MAXIM INTEGRATED HEREBY ISSUES NOTIFICATION OF CHANGE
THAT MAY AFFECT THE FOLLOWING CATEGORIES:

☐ DESIGN	☐ WAFER FAB	☒ ASSEMBLY	☐ TEST	☐ ELEC/MECH SPECS

AFFECTED PRODUCT:

Ordering P/N: (See PN listing XLS in PCN Zip file)

CHANGE FROM: 2x2 through 7x7mm QFN packages assembled using gold (Au) bond wire at ASE-CL, with 0.8, 1.3 and 2.0 mil diameters (die from Maxim's S18 fab process) and 1.0 mil diameter wire with die from TSMC's TS18 fab process.	**CHANGE TO:** 2x2 through 7x7mm QFN packages assembled using copper (Cu) bond wire at ASE-CL, with 0.8, 1.3 and 2.0 mil diameters (die from Maxim's S18 fab process) and 1.0 mil diameter bond wire with die from TSMC's TS18 fab process.

JUSTIFICATION: Changing to copper wire for the devices included on this PCN. Please see the attached reliability reports (all with zero failures) that successfully qualify these 2x2 through 7x7 QFN packages at ASE-CL with copper (Cu) wire. Reliability reports R26639FQ (0.8mil Cu wire), R26466FQ (1.3mil CU wire), R26709CQ (2.0mil Cu wire) and R26513FQ (1.0mil CU wire & TSMC die)

TRACEABILITY: Maxim Integrated maintains full traceability by device marking and the packaging labels or shipment packing slip.

Maxim Integrated's Change Notification System is designed to keep our customer base apprised of major product, manufacturing, or facility improvements.

Deborah Meeker

Deborah Meeker / PCN Manager

For further Information, please contact either of the people listed below.

Contact your local Maxim Integrated or Deborah Meeker, PCN Manager

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PACKAGE QUALIFICATION

Rel Project #: R26639FQ

SUMMARY:

All qualification lots assembled at ASE Chung-Li Taiwan have shown good reliability performance. Therefore, assembler ASE Chung-Li (Taiwan) is fully qualified to build 24 leads (4x4x0.8 mm) TQFN lead-free packages with 0.8 mil Pd coated Cu wire. This package, as tested (level 1), is not moisture sensitive, therefore, requires no bake-and-bag precautions for shipment and/or storage.

Sam Chung SMTS, Reliability Engineer	Ping Lin Director, Reliability

1) SUBJECT

ASE Chung-Li (Taiwan) 24L (4x4x0.8 mm) TQFN 0.8 mil Pd coated Cu Wire Lead-Free Package Qualification

2) PURPOSE

To qualify ASE Chung-Li Taiwan assembler to build 24 leads (4x4x0.8 mm) TQFN lead-free package with Sumitomo G700LA molding compound, Cu194 copper leadframe, Hitachi EN4900G conductive die attach, 0.8 mil diameter Pd coated Copper bond wire, and 100% matte tin plating finish. MAX2180AETG+ was used as a test vehicle. Die size is 54x58 mils with no die coating. There are 3 downbonds in this package.

3) SAMPLE DESCRIPTION

REL#	Device	Die Type	Process	Lot #	Package	Backmark	Date Code
R26639A	MAX2180AETG+	WV31A-0B	S18C	SAHU5Q001Q1	24L 4x4 TQFN	Q1	1317
R26639B	MAX2180AETG+	WV31A-0B	S18C	SAHU5Q001Q2	24L 4x4 TQFN	Q2	1317
R26639C	MAX2180AETG+	WV31A-0B	S18C	SAHU5Q001Q3	24L 4x4 TQFN	Q3	1317
R26639D (Control Lot)	MAX2180AETG+	WV31A-0B	S18C	SAHU5Q001Q4	24L 4x4 TQFN	Q4	1317

Package Material Information

Description (Qual Type)	Maxim Std Qual
Operating Temperature	-40°C to +85°C
Temperature Grade	3
Fab Site	X3
Fab Process	S18C
Die	WV31A-0B
Die Size (mils)	54 x 58
Assembly Location	ASE Chung-Li
Package	24L, 4x4x0.8 mm TQFN
Wire Bond Material	Pd Coated Copper
Die Coat	None
Mold Compound	G700LA
Die Attach	Hitachi EN4900G
Lead Frame	Copper Alloy
Lead Finish	100% Matte Tin

4) QUALIFICATION REQUIREMENTS/ ACCEPTANCE CRITERIA

The reliability test requirements and acceptance criteria are defined as follow:

Table 1: Qualification Tests

Standard Stress Tests	Test Conditions	Sampling Plan
HTOL	150°C, 1000 hours	0/77
Convection Reflow *1	260°C Peak, 3x reflow, MSL 1	0/1000
HAST *2	130°C / 85% R.H. 100 hours, Biased	0/77
Unbiased HAST (information only) *2	130°C / 85% R.H. 300 hours	0/77
Temperature Cycle *2	-65°C to 150°C, 1000 cycles	0/77
High Temperature Storage *2	150°C, 1000 hours	0/77
Wire Bond Pull	Minimum 5 grams	0/200 wires
Bond Crater *2	No oxide damage or bond pad crater	0/20
C-SAM (information only) *2	260· C Peak Temp. (3X)	0/15

Note: *1. Moisture sensitivity level 1 (168 hrs, 85°C/85% RH) is used for preconditioning.
*2. Convection reflow is used as preconditioning.

5) QUALIFICATION TEST RESULTS

All samples from the qualification lots were stressed according to Table 1 and all samples have passed Full qualification requirements.

6) DISCUSSION

Based on 1000 device-hours of 150˚C life test results from three qualification lots, the calculated failure rate is 0.404 FITS at 60% confidence level when derated to 25˚C using activation energy of 0.8eV.

The FIT prediction is based on the followings:

1. The 60% confidence level of failure rate is estimated using Chi square distribution.
2. Arrhenius model is used with Ea=0.8eV
3. Voltage acceleration factor is equal to one in this case.
4. Thermal acceleration factor is (AFt) = exp[(Ea/kb) x (1/Tu – 1/Ts)]
5. FITs calculation: λ = [χ2 (α, df) * 10^9] / [2 x (samples x 1khrs x AFt]

7) CONCLUSION

All qualification lots assembled at ASE Chung-Li have shown good reliability performance. Therefore, assembler ASE Chung-Li Taiwan is fully qualified to build 24 leads (4x4x0.8 mm) TQFN lead-free packages with 0.8 mil Pd coated copper wire assembly.

8) Package Coverage

Packages that can be covered by this qualification result in accordance with Maxim Qual By Extension (QBE) policy are listed as follows:

2x2x0.8 TQFN in S18 process with 0.8 mil Pd Coated Cu wire
3x3x0.8 TQFN in S18 process with 0.8 mil Pd Coated Cu wire
4x4x0.8 TQFN in S18 process with 0.8 mil Pd Coated Cu wire
5x5x0.8 TQFN in S18 process with 0.8 mil Pd Coated Cu wire
6x6x0.8 TQFN in S18 process with 0.8 mil Pd Coated Cu wire
7x7x0.8 TQFN in S18 process with 0.8 mil Pd Coated Cu wire

9) Qualification Test Results/Lot Information

Table 2: Qualification Test Results

Rel#		R26639A (Cu wire)	R26639A (Cu wire)	R26639A (Cu wire)	R26639D (Control Lot, Au wire)
Lot#		SAHU5Q001Q1	SAHU5Q001Q2	SAHU5Q001Q3	SAHU5Q001Q4
Device:		MAX2180AETG+	MAX2180AETG+	MAX2180AETG+	MAX2180AETG+
Die Type:		WV31A-0B	WV31A-0B	WV31A-0B	WV31A-0B
Die Size (mils)		54 x 58	54 x 58	54 x 58	54 x 58
Package Type (code):		T2444-3	T2444-3	T2444-3	T2444-3
Date Code:		1317	1317	1317	1317
Backmark:		Q1	Q2	Q3	Q4
Stress Test	**Duration**	**Result**	**Result**	**Result**	**Result**
HTOL	1000 hrs.	0/77 *4, *5	0/77	0/77	0/77
Convection Reflow *1	MSL 1	0/1000	0/1000	0/1000	0/1000
HAST *2	100 hrs.	0/77 *4	0/77	0/77	0/77
Unbiased HAST *2 (Information only)	300 hrs.	0/77	0/77	0/77	0/77
Temperature Cycling *2	1000X	0/77 *4	0/77	0/77	0/77
High Temp Storage *2	1000 hrs.	0/77 *4	0/77	0/77	0/77
Wire Bond Pull	na	0/207 wires	0/207 wires	0/207 wires	0/207 wires
Bond Crater	na	0/20	0/20	0/20	0/20
C-SAM *2	na	0/15	0/15	0/15	0/15

Note: *1. Moisture sensitivity level 1 (168 hrs, 85°C/85% RH) is used for preconditioning.
*2. Convection reflow is used as preconditioning.
*3. Extended to 200 hours for information only!
*4. All electrical tests pre- and post-stress were performed at +25°C & +85°C.
*5: Electrical test pre- and post-HTOL stress was also performed at -40°C.

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PACKAGE QUALIFICATION

Rel Project #: R26466FQ

SUMMARY:

All qualification lots assembled at ASE Chung-Li Taiwan have shown good reliability performance. Therefore, assembler ASE Chung-Li (Taiwan) is fully qualified to build 28 leads (5x5x0.8 mm) TQFN lead-free packages with 1.3 mil Pd coated Cu wire. This package, as tested (level 1), is not moisture sensitive, therefore, requires no bake-and-bag precautions for shipment and/or storage.

Sam Chung SMTS, Reliability Engineer	Ping Lin Director, Reliability

1) SUBJECT

ASE Chung-Li (Taiwan) 28L 5x5x0.8 mm TQFN with 1.3 mil Pd coated Cu Wire Lead-Free Package Qualification

2) PURPOSE

To qualify ASE Chung-Li Taiwan assembler to build 28 leads (5x5x0.8 mm) TQFN lead-free package with Sumitomo G700LA molding compound, Cu194 copper leadframe, Hitachi EN4900G conductive die attach, 1.3 mil diameter Pd coated Copper bond wire, and 100% matte tin plating finish. MAX15091ETI+ was used as a test vehicle. Die size is 140x83 mils with no die coating.

3) SAMPLE DESCRIPTION

REL#	Device	Die Type	Process	Lot #	Package	Backmark	Date Code
R26466A	MAX15091ETI+	NQ90A-1B	S18.8_CUP	SAKJ2Q002Q7	5x5 TQFN 1.3 mil Cu	Q7	1314
R26466B	MAX15091ETI+	NQ90A-1B	S18.8_CUP	SAKJ2Q002Q8	5x5 TQFN 1.3 mil Cu	Q8	1314
R26466C	MAX15091ETI+	NQ90A-1B	S18.8_CUP	SAKJ2Q002Q9	5x5 TQFN 1.3 mil Cu	Q9	1314
R26466D (Control Lot)	MAX15091ETI+	NQ90A-1B	S18.8_CUP	SAKJ2Q002Q0	5x5 TQFN 1.3 mil Au	Q0	1314

Package Material Information

Description (Qual Type)	Maxim Std Qual
Operating Temperature	-40°C to +85°C
Temperature Grade	3
Fab Site	X3
Fab Process	S18UM3
Die	NQ90A-1B
Die Size (mils)	140 x 83
Assembly Location	ASE Chung-Li Taiwan
Package	5x5x0.8 mm TQFN
Wire Bond Material	1.3 mil Pd Coated Copper
Die Coat	None
Mold Compound	G700LA
Die Attach	Hitachi EN4900G
Lead Frame	Copper Alloy
Lead Finish	100% Matte Tin

4) QUALIFICATION REQUIREMENTS/ ACCEPTANCE CRITERIA

The reliability test requirements and acceptance criteria are defined as follow:

Table 1: Qualification Tests

Standard Stress Tests	Test Conditions	Sampling Plan
High Temperature Operating Life Test (HTOL)	Tj=135°C, 1000 hours	0/77
Convection Reflow *1	260°C Peak, 3x reflow, MSL 1	0/1000
HAST *2	130°C / 85% R.H. 100 hours, Biased	0/77
Unbiased HAST (information only) *2	130°C / 85% R.H. 500 hours	0/77
Temperature Cycle *2	-65°C to 150°C, 1000 cycles	0/77
High Temperature Storage *2	150°C, 1000 hours	0/77
Wire Bond Pull	Minimum 5 grams	0/200 wires
Bond Crater *2	No oxide damage or bond pad crater	0/20
C-SAM (information only) *2	Post reflow samples	0/15

Note: *1. Moisture sensitivity level 1 (168 hrs, 85°C/85% RH) is used for preconditioning.
*2. Convection reflow is used as preconditioning.

5) QUALIFICATION TEST RESULTS

All samples from the qualification lots were stressed according to Table 1 and all samples have passed Full qualification requirements. This package has been tested to MSL 1 per J-STD-020D1 and passed, thus this package is not moisture sensitive.

6) DISCUSSION

Based on 1000 device-hours of 135˚C life test results from three qualification lots, the calculated failure rate is 0.904 FITS at 60% confidence level when derated to 25˚C using activation energy of 0.8eV.

The FIT prediction is based on the followings:

1. The 60% confidence level of failure rate is estimated using Chi square distribution.
2. Arrhenius model is used with Ea=0.8eV
3. Voltage acceleration factor is equal to one in this case.
4. Thermal acceleration factor is (AFt) = exp[(Ea/kb) x (1/Tu – 1/Ts)]
5. FITs calculation: λ = [χ2 (α, df) * 10^9] / [2 x (samples x 1khrs x AFt]

7) CONCLUSION

All qualification lots assembled at ASE Chung-Li Taiwan have shown good reliability performance. Therefore assembly vendor ASE Chung-Li Taiwan is qualified to build 28 leads (5x5x0.8 mm) TQFN lead-free packages with 1.3 mil Pd coated copper wire.

8) Package Coverage

Packages that can be covered by this qualification result in accordance with Maxim Qual By Extension (QBE) policy are listed as follows:

2x2x0.8 TQFN in S18 process with 1.3 mil Pd Coated Cu wire
3x3x0.8 TQFN in S18 process with 1.3 mil Pd Coated Cu wire
4x4x0.8 TQFN in S18 process with 1.3 mil Pd Coated Cu wire
5x5x0.8 TQFN in S18 process with 1.3 mil Pd Coated Cu wire
6x6x0.8 TQFN in S18 process with 1.3 mil Pd Coated Cu wire
7x7x0.8 TQFN in S18 process with 1.3 mil Pd Coated Cu wire

9) Qualification Test Results/Lot Information

Table 2: Qualification Test Results

Rel#		R26466A (Cu wire)	R26466B (Cu wire)	R26466C (Cu wire)	R26466D (Control Lot, Au wire)
Lot#		SAKJ2Q002Q7	SAKJ2Q002Q8	SAKJ2Q002Q9	SAKJ2Q002Q0
Device:		MAX15091ETI+	MAX15091ETI+	MAX15091ETI+	MAX15091ETI+
Die Type:		NQ90A-1B	NQ90A-1B	NQ90A-1B	NQ90A-1B
Die Size (mils)		140x83	140x83	140x83	140x83
Package Type (code):		T2855	T2855	T2855	T2855
Date Code:		1314	1314	1314	1314
Backmark:		Q7	Q8	Q9	Q0
Stress Test	**Duration**	**Result**	**Result**	**Result**	**Result**
HTOL	1000 hrs.	0/77 *4, *5	0/77	0/77	0/77
Convection Reflow *1	MSL 1	0/1000	0/1000	0/1000	0/1000
HAST *2	100 hrs.	0/77 *4 (200 hrs. – 0/44 *3)	0/77 (200 hrs. – 0/44 *3)	0/77 (200 hrs. – 0/44 *3)	0/77
Unbiased HAST *2 (Information only)	500 hrs.	0/77	0/77	0/77	0/77
Temperature Cycling *2	1000X	0/77 *4	0/77	0/77	0/77
High Temp Storage *2	1000 hrs.	0/77 *4	0/77	0/77	0/77
Wire Bond Pull		0/200 wires	0/200 wires	0/200 wires	0/200 wires
Bond Crater		0/20	0/20	0/20	0/20
C-SAM *2 (information only)		0/15	0/15	0/15	0/15

Note: *1. Moisture sensitivity level 1 (168 hrs, 85°C/85% RH) is used for preconditioning.
*2. Convection reflow is used as preconditioning.
*3. Extended to 200 hours for information only!
*4. All electrical tests pre- and post-stress were performed at +25°C & +85°C.
*5: Electrical test pre- and post-HTOL stress was also performed at -40°C.

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PACKAGE QUALIFICATION

Rel Project #: 26709CQ

SUMMARY:

Assembler ASE Chung-Li Taiwan is conditionally qualified to build 16L (4x4x0.8 mm) lead-free 2.0 mil Pd coated copper wire TQFN package. All qualification lots have passed Maxim conditional qualification requirements. In addition, this package has completed moisture soak level 1 testing per JEDEC J-STD-020D, and solder reflow test at 260°C peak temperature (Tp).

Thomas Huang SMTS, Reliability Engineer	Alex Arreola PMTS, Reliability Engineer	Ping Lin Director, Reliability

1) SUBJECT

ASE Chung-Li Taiwan 16L (4x4x0.8 mm), 2.0 mil Pd Coated Copper Wire Lead-Free TQFN Package and Assembly Site Qualification.

2) PURPOSE

Qualify assembler ASE Chung-Li Taiwan to build 16L (4x4x0.8 mm) Pb-Free TQFN package with 2.0 mil diameter Pd coated Cu bond wire for S18.8 CUP process, Sumitomo G700LA molding compound, 100% matte tin plate finish, C194 copper lead-frame, and conductive Hitachi EN4900G die attach. MAX16962RATEA/V+ in 16L (4x4x0.8 mm) Lead-Free TQFN package was used as the test vehicle. There is no down bond and ground bond in this package.

3) SAMPLE DESCRIPTION

REL#	Device	Die Type	Process	Lot #	Package	Backmark	Date Code
R26709A	MAX16962RATEA /V+	AP28Z	S18.8_CUP	SAGC3A006Q1	16L (4x4x0.8mm) TQFN, T1644+4C	Q1	1323
R26709B	MAX16962RATEA /V+	AP28Z	S18.8_CUP	SAGC3A006Q2	16L (4x4x0.8mm) TQFN, T1644+4C	Q2	1323
R26709C	MAX16962RATEA /V+	AP28Z	S18.8_CUP	SAGC3A006Q3	16L (4x4x0.8mm) TQFN, T1644+4C	Q3	1323
R26709D	MAX16962RATEA /V+	AP28Z	S18.8_CUP	SAGC3A006Q4	16L (4x4x0.8mm) TQFN, T1644+4C Control lot Au wire	Q4	1323

Package Material Information

Description (Qual Type)	Maxim Std Qual
Operating Temperature	-40C to 125C
Temperature Grade	1
Fab Site	X3
Fab Process	S18.8_CUP
Die	AP28Z
Die Size (mils)	64.96X86.22
Assembly Location	ASE Chung-Li Taiwan
Package	T1644+4C
Wire Bond Material	Cu, 2 mils
Die Coat	N/A
Mold Compound	Sumitomo G700LA
Die Attach	Hitachi EN4900G
Lead Frame	C194 Cu
Lead Finish	100% Matte Tin

4) CONDITIONAL QUALIFICATION REQUIREMENTS/ ACCEPTANCE CRITERIA

The reliability test requirements and acceptance criteria are defined as follow:

Table 1: Qualification Tests

Standard Stress Tests	Test Conditions	Sampling Plan
High Temp. Operating Life Test (HTOL) *3.	135°C, 500 hours	0/77
Convection Reflow *1	260°C Peak, 3x reflow, MSL 1	0/250
HAST *1,2,3	130°C / 85% R.H. 100 hours HAST	0/45
Temperature Cycle *1,2,3	-65°C to 150°C, 500 cycles	0/77
High Temperature Storage *1,2,3	150°C, 500 hours	0/77
Wire Bond Pull	Minimum 5 grams	0/200 wires
Bond Crater *1,2	No oxide damage or bond pad crater	0/20
CSAM (for information only)	Post reflow	0/20
uHAST *1,2,3 (for information only)	130°C / 85% R.H. 200 hours HAST, unbiased	0/77

Note: *1. Moisture sensitivity level 1 (85°C/85% RH 168hrs) is used as preconditioning.
*2. Use reflow as preconditioning.
*3. All electrical tests pre- and post-stress were performed at +25°C & +125°C (only on first lot).
Electrical test pre- and post-HTOL stress was also performed at -40°C (only on first lot).

5) QUALIFICATION TEST RESULTS

All samples from the qualification lots were stressed according to Table 1 and all samples have passed conditional qualification requirements. Samples also passed MSL 1 per JEDEC J-STD-020D specification.

6) DISCUSSION

Based on 80,000 device-hours of 135˚C life test results from three qualification lots, the calculated failure rate is 2.6 FITS at 60% confidence level when derated to 25˚C using activation energy of 0.8eV.

The FIT prediction is based on the followings:

1. The 60% confidence level of failure rate is estimated using Chi square distribution.
2. Arrhenius model is used with Ea=0.8eV
3. Voltage acceleration factor is equal to one in this case.

4. Thermal acceleration factor is (AFt) = exp[(Ea/kb) x (1/Tu – 1/Ts)]
5. FITs calculation: λ = [χ2 (α, df) * 10^9] / [2 x (samples x 1khrs x AFt]

7) CONCLUSION

All qualification lots assembled at ASE Chung-Li Taiwan have shown good reliability performance. Therefore, assembler ASE Chung-Li Taiwan is conditionally qualified to build 16L (4x4x0.8 mm) Lead-Free 2.0 mil Pd Coated Copper Wire TQFN Package.

8) Package Coverage

Packages that can be covered by this qualification result in accordance with Maxim Qual By Extension (QBE) policy are listed as follows:

2x2 TQFN in S18 process with 2.0 mil Pd Coated Cu wire
3x3 TQFN in S18 process with 2.0 mil Pd Coated Cu wire
4x4 TQFN in S18 process with 2.0 mil Pd Coated Cu wire
5x5 TQFN in S18 process with 2.0 mil Pd Coated Cu wire
6x6 TQFN in S18 process with 2.0 mil Pd Coated Cu wire
7x7 TQFN in S18 process with 2.0 mil Pd Coated Cu wire

9) Qualification Test Results/Lot Information

Table 2: Qualification Test Results

Rel#		R26709A	R26709B	R26709C	R26709D
Lot#		SAGC3A006Q1 (Cu wire)	SAGC3A006Q2 (Cu Wire)	SAGC3A006Q3 (Cu Wire)	SAGC3A006Q4 (Control Lot Au Wire)
Device:		MAX16962RATEA/V+	MAX16962RATEA/V+	MAX16962RATEA/V+	MAX16962RATEA/V+
Die Type:		AP28Z	AP28Z	AP28Z	AP28Z
Die Size (mils)		96X86.22	96X86.22	96X86.22	96X86.22
Package Type (code):		T1644+4C	T1644+4C	T1644+4C	T1644+4C
Date Code:		1323	1323	1323	1323
Backmark:		Q1	Q2	Q3	Q4
Stress Test	**Duration**	**Result**	**Result**	**Result**	**Result**
HTOL 135C *3	500 hrs	0/80	0/40	0/40	N/A
Convection Reflow *1	MSL 1, 260C, 3x	0/1000	0/1000	0/999	0/1000
HAST *1,2,3	192 hrs	0/45	0/45	0/45	0/45
uHAST *1,2,3 (info only)	200 hrs	0/80	0/79	0/80	0/80
Temperature Cycling *1,2,3	1000 cycles	0/80	0/80	0/80	0/80
High Temp Storage *1,2,3	500 hrs	0/80	0/80	0/80	0/80
Wire Bond Pull	Fresh	0/195 wires	0/195 wires	0/195 wires	0/195 wires
Wire Bond Pull (info only) *1,2	Post TCT 1000x	0/210	0/210	0/210	0/210
Bond Crater *1,2	Post Reflow	0/20	0/20	0/20	0/20
CSAM (info only) *1,2	Post Reflow	0/20	0/20	0/20	0/20

Note:
*1. Moisture sensitivity level 1 (85°C/85% RH 168hrs) is used as preconditioning.
*2. Used convention reflow as preconditioning.
*3. All electrical tests pre- and post-stress were performed at +25°C & +125°C (only on first lot).
Electrical test pre- and post-HTOL stress was also performed at -40°C (only on first lot).

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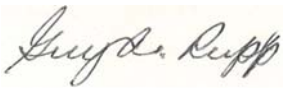
PACKAGE QUALIFICATION

Rel Project #: R26513FQ

SUMMARY:

All qualification lots assembled at ASE Chung-Li Taiwan have shown good reliability performance. Therefore, assembler ASE Chung-Li Taiwan is qualified to build 44L 7x7x0.75 mm Pb-Free TQFN Package with 1.0 mil Pd-coated Cu Wire for TSMC 0.18um OBV Fab process devices. This package as tested (MSL-1) is not moisture sensitive and does not require bake-and-bag precautions for shipment and storage.

	
Guy Rupp, Senior Principal MTS, Reliability	Ping Lin, Director, Reliability

1) **SUBJECT**

ASE Chung-Li Taiwan, 44L 7x7x0.75 mm Pb-Free 1.0 mil Pd-Coated Cu Wire TQFN Package and Assembly Site Qualification.

2) **PURPOSE**

Qualify assembler ASE Chung-Li Taiwan to build 44L 7x7x0.75 mm Pb-Free Cu Wire TQFN Sawn Package with 1.0 mil diameter Pd-coated Cu bond wire for TSMC 0.18 um OBV Fab process, Sumitomo G700LA Green mold compound, Hitachi EN4900GC Ag filled die attach epoxy, CDA194 etched copper lead frame with Ag-Ring plating for down bonds, 100% matte-Sn lead plating, and 8 mil wafer backgrind thickness. Part number MAXQ610J with package code T4477+2C was used as the reliability test vehicle. There are 5 down bonds and 4 ground bonds in this package.

3) **SAMPLE DESCRIPTION**

REL#	Device	Die Type	Process	Lot #	Package	Topmark	Date Code
R26513A (50498)	MAXQ610J	T0068A, AJF2	TS182P5MURC	ZX133775AC -QUAL	T4477+2C, 44L TQFN	MAXQ610J 0000 1310B1 775AC / +	1310
R26513B (50521)	MAXQ610J	T0068A, AJF2	TS182P5MURC	ZX133775AD -QUAL	T4477+2C, 44L TQFN	MAXQ610J 0000 1310B1 775AD / +	1310
R26513C (50522)	MAXQ610J	T0068A, AJF2	TS182P5MURC	ZX133775AE -QUAL	T4477+2C, 44L TQFN	MAXQ610J 0000 1310B1 775AE / +	1310
R26513D (50523)	MAXQ610J	T0068A, AJF2	TS182P5MURC	ZX133775AF -CONT	T4477+2, 44L TQFN (Au-Wire Control Lot)	MAXQ610J 0000 1310B1 775AF / +	1310

Package Material Information

Description (Qual Type)	Maxim Std Qual
Operating Temperature	0°C to 70°C
Temperature Grade	4
Fab Site	TSMC 8”
Fab Process	TS182P5MURC
Die	T0068A, AJF2
Die Size (mils)	81X79
Assembly Location	ASE Chung-Li Taiwan
Package	T4477+2C, 44L 7x7mm Pb-Free TQFN
Wire Bond Material	Pd-Coated Cu
Die Coat	None
Mold Compound	Sumitomo G700LA, Green
Die Attach	Hitachi EN4900GC Ag-Filled Epoxy
Lead Frame	CDA194 etched copper w/ Ag-Ring plating

Lead Finish	100% Matte-Sn w/ Anneal Bake

4) QUALIFICATION REQUIREMENTS/ ACCEPTANCE CRITERIA

The reliability test requirements and acceptance criteria are defined as follow:

Table 1: Qualification Tests

Standard Stress Tests	Test Conditions	Sampling Plan
HTOL *3	125°C, 1000 hours	0/48
Convection Reflow	260°C Peak, 3x reflow, MSL 1	0/1000
CSAM and Thru-Scan Imaging *2 (for information only)	Post 3x reflow samples	0/15
Biased HAST *1,3	130°C / 85% R.H. 96 hours HAST	0/45
Biased HAST *1,3 (for information only)	130°C / 85% R.H. 192 hours HAST	0/45
Unbiased HAST *1,3 (for information only)	130°C / 85% R.H. 500 hours UHAST	0/77
Temperature Cycle *1,3	-55°C to +125°C, 1000 cycles	0/80
High Temperature Storage *1,3	150°C, 1000 hours	0/77
Wire Bond Pull	Minimum 5 grams	0/200 wires
Bond Crater *2	No oxide damage or bond pad crater	0/20
Solderability	8 hrs steam aging.	0/15
Physical Dimensions	Per package POD	0/10

Note: *1. Convection reflow is used as preconditioning for SMD packages.
*****2. Use reflow as preconditioning.
*****3**.** All electrical tests pre- and post-stress were performed at +25°C.

5) QUALIFICATION TEST RESULTS

All samples from the qualification lots were stressed according to Table 1 and all samples have passed Full qualification requirements. This package as tested (MSL-1) is not moisture sensitive and does not require bake-and-bag precautions for shipment and storage.

6) DISCUSSION

Based on 144,000 device-hours of 125˚C life test results from three qualification lots, the calculated failure rate is 2.55 FITS at 60% confidence level when derated to 25˚C using activation energy of 0.8eV.

The FIT prediction is based on the followings:

1. The 60% confidence level of failure rate is estimated using Chi square distribution.
2. Arrhenius model is used with Ea=0.8eV
3. Voltage acceleration factor is equal to one in this case.
4. Thermal acceleration factor is (AFt) = exp[(Ea/kb) x (1/Tu – 1/Ts)]

5. FITs calculation: λ = [χ2 (α, df) * 10^9] / [2 x (samples x 1khrs x AFt]

7) CONCLUSION

All qualification lots assembled at ASE Chung-Li Taiwan have shown good reliability performance. Therefore assembly vendor ASE Chung-Li Taiwan is qualified to build 44L 7x7x0.75 mm Pb-Free Cu Wire TQFN Package.

8) Package Coverage

Packages that can be covered by this qualification result in accordance with Maxim Qual By Extension (QBE) policy are listed as follows:

2x2x0.8 TQFN in TSMC 0.18um OBV fab process with 1.0 mil Pd Coated Cu wire
3x3x0.8 TQFN in TSMC 0.18um OBV fab process with 1.0 mil Pd Coated Cu wire
4x4x0.8 TQFN in TSMC 0.18um OBV fab process with 1.0 mil Pd Coated Cu wire
5x5x0.8 TQFN in TSMC 0.18um OBV fab process with 1.0 mil Pd Coated Cu wire
6x6x0.8 TQFN in TSMC 0.18um OBV fab process with 1.0 mil Pd Coated Cu wire
7x7x0.8 TQFN in TSMC 0.18um OBV fab process with 1.0 mil Pd Coated Cu wire

9) Qualification Test Results/Lot Information

Table 2: Qualification Test Results

Rel#		R26513A (50498)	R26513B (50521)	R26513C (50522)	R26513D (50523)
Lot#		ZX133775AC-QUAL	ZX133775AD-QUAL	ZX133775AE-QUAL	ZX133775AF-CONT
Device:		MAXQ610J	MAXQ610J	MAXQ610J	MAXQ610J
Die Type:		T0068A, AJF2	T0068A, AJF2	T0068A, AJF2	T0068A, AJF2
Die Size (mils)		81X79	81X79	81X79	81X79
Package Type (code):		TQFN (T4477+2C)	TQFN (T4477+2C)	TQFN (T4477+2C)	TQFN (T4477+2C)
Date Code:		1310	1310	1310	1310
Topmark:		MAX610J / 0000 / 1310B1 / 775AC / +	MAX610J / 0000 / 1310B1 / 775AD / +	MAX610J / 0000 / 1310B1 / 775AE / +	MAX610J / 0000 / 1310B1 / 775AF / +
Stress Test	**Duration**	**Result**	**Result**	**Result**	**Result**
HTOL 135C [*1]	1000 Hr	0/48	0/48	0/48	0/48 (500 Hr)
Convection Reflow	MSL-3, 3X	0/1000	0/1000	0/1000	0/1000
CSAM and Thru-Scan [*2] (for information only)	Post Reflow	0/15	0/15	0/15	0/15
Biased HAST [*1]	96 Hr	0/45	0/45	0/45	0/45
Biased HAST [*1,2] (for information only)	192 Hr	0/45	0/45	0/45	–
Unbiased HAST [*1] (for information only)	500 Hr	0/77	0/77	0/77	0/45
Temperature Cycling [*1]	1000 Cyc	0/80	0/80	0/80	0/80
High Temp Storage [*1]	1000 Hr	0/77	0/77	0/77	0/77
Wire Bond Pull (Wires)	T(0) 500 TC	0/200 0/200	0/200 0/200	0/200 0/200	0/200 0/200
Bond Crater	T(0)	0/20	0/20	0/20	0/20
Solderability Pb-Free Solderability SnPb	T(0)	0/15 0/15	0/15 0/15	0/15 0/15	0/15 0/15
Physical Dimensions	T(0)	0/10	0/10	0/10	0/10

Note 1: *1: All electrical tests pre- and post-stress were performed at +25°C.