



MICROCHIP

QUALIFICATION REPORT SUMMARY

PCN #: GBNG-15DMKA648

Date:

March 30, 2020

Qualification of an additional fabrication site (Microchip – FAB 4) for Atmel automotive ATMEGA324PB-MBTV01 and ATMEGA324PB-MBT Catalog Part Numbers (CPN) available in 44L VQFN packages.

Purpose: Qualification of an additional fabrication site (Microchip – FAB 4) for Atmel automotive ATMEGA324PB-MBTV01 and ATMEGA324PB-MBT Catalog Part Numbers (CPN) available in 44L VQFN packages.

CCB No.: 2856.001

Qualification Material:

Lot#	#1	#2	#3	#4	#5
Device	Tiny3217	Tiny3217	Tiny3217	Tiny3217	Tiny3217
Wafer Fab	Microchip, Tempe	Microchip, Tempe	Microchip, Tempe	Microchip, Tempe	Microchip, Tempe
Wafer Lot	ASCL200200112.000	ASCL202600167.000	ASCL202800012.000	ASCL201500046.000	ASCL200200111.000
Document #	ML0320200081	ML0320200081	ML0320200081	ML0320200081	ML0320200081
Qual No	QTP#3479	QTP#3939	QTP#3953	QTP#3852	QTP#3479
CN No.	N/A	N/A	N/A	N/A	N/A
Qual Tests	B2, B3+A6, B3+B1	B2, B3+B1	B2, B3+B1	B3+A6	B3+A6

Lot#	#6	#7	#8	#9	#10
Device	Tiny3217	Mega324PB	Mega324PB	Mega328PB	Mega328PB
Wafer Fab	Microchip, Tempe	Microchip, Tempe	Microchip, Tempe	Microchip, Tempe	Microchip, Tempe
Wafer Lot	ASCL201500046.000	ASCL201700151	AG2Z300000	ASCL201800260	AFZ4KG9PNF
Document #	ML0320200081	ML0320200081	ML0320200081	ML0320200081	ML0320200081
Qual No	QTP#3852	QTP#3886	QTP#3301	QTP#3887	QTP#3322
CN No.	N/A	N/A	N/A	N/A	N/A
Qual Tests	E2, E3, E4	B2, B3+B1	E2, E3, E4	B2, B3+B1	E2, E3, E4

Qualification Results:

Test	#	Test Conditions	ss/lot	Lots	A/R	Step	Status	Comment
HTOL	B1	High Temp. Operating Life [125°C] – JESD22 – A108	77	3	0/1	500h 1000h	PASS	3lot passed 1000hrs
ELFR	B2	Early Life Failure Rate [150°C] – AEC-Q100-008	800	3	0/1	24h	PASS	
EDR	B3	NVM Endurance (Pg.& Erase) NVM Data Retention [175°C] AEC-Q100-005	77 77	3 3	0/1 0/1	100kc 1000h	PASS PASS	10kc Flash/ 100kc EE And 1000h for retention

Test	#	Test Conditions	ss/lot	Lots	A/R	Step	Status
HBM / MM	E2	Electrostatic Discharge (HBM & MM) – AEC-Q100-002, 003	3	1	0/1	4kV / 200V	PASS
CDM	E3	Electrostatic Discharge (CDM) – AEC-Q100-011	3	1	0/1	500V 750V 1000V 1500V 2000V	PASS
LU	E4	Latch-up [125°C] – AEC-Q100- 004, JESD78	6	1	0/1	100mA	PASS

Test	#	Test Conditions	ss/lot	Lots	Status
EM	D1	Electromigration JESD61			PASS
Tddb	D2	Time Dependant Dielectric Breakdown JESD35			PASS
HCI	D3	Hot Carrrier Injection JESD60 & 28			PASS
ED	E5	Electrical Distributions AEC-Q100-009	30	3	PASS
FG	E6	Fault Grading AEC-Q100-007 Must be >98%			PASS
CHAR	E7	Characterization AEC-Q003 Test at room, hot, and cold temperatures.	30	1	PASS
EMC	E9	Electromagnetic Compatibility SAE J1752/3 Radiated emissions at room temperature.	1	1	PASS
PAT	F1	Part Average Testing AEC-Q001 Recommended Production Test	All	All	PASS
SBA	F2	Statistical Bin Analysis AEC-Q002 Recommended Production Test	All	All	PASS

Package Qualification:

Misc.	Assembly site	ASCL
	BD Number	BD_59B18_ZCQ_01_00
	MP Code (MPC)	59B18FTXBVA1
	Part Number (CPN)	ATMEGA324PB-MBTVAO
	CCB No.	3324
	Qual ID	QTP3369 Rev. A
Lead-Frame	Paddle size	5.41 x 5.41 mm
	Material	C194
	Surface	Ring
	Treatment	Rough Cu
	Process	Etching
	Lead-lock	No
	Part Number	0044QN023F01
	Lead Plating	Sn Matte
Bond Wire	Material	Au
Die Attach	Part Number	EN-4900GC
	Conductive	Yes
MC	Part Number	G700LA
PKG	PKG Type	VQFN
	Pin/Ball Count	44
	PKG width/size	7x7 mm

Manufacturing Information

Assembly Lot No.	Wafer lot No.	Date Code
AG2Z3C6N5U	8241374GK	1814
AG2Z3C6N5V	8241374GK	1814
AG2Z3C6N5W	8241374GK	1814

Result

Pass

Fail

59B18 Fab 4 in VQFN 44 7x7mm (TXB) wettable at ASCL using 0.8 mil Au wire is qualified at AECQ100 Grade 1 and Moisture/ Reflow Sensitivity Classification Level 3 per IPC/JEDEC J-STD-020E standard. No delamination observed on all the units.

PACKAGE QUALIFICATION REPORT

Test Number (Reference)	Test Condition	Standard/ Method	Qty. (Acc.)	Def/SS	Result	Remarks
<u>Precondition</u> <u>Prior Perform</u> <u>Reliability Tests</u> (At MSL Level 3)	Electrical Test: +25°C System: Magnum	JESD22-A113	693(0)	0/693	Pass	Good Devices
	0hr CSAM Bake 150°C, 24 hrs System: HERAEUS	3 Lots of 231 units	135(0) 693	0/135		
	30°C/60%RH Moisture Soak 192 hrs. System: Climats Excal 5423-HE	IPC/JEDEC J-STD-020D	693			
	3x Convection-Reflow 260°C max System: Mancorp CR.5000F		693 135(0)	0/135	Pass	
	Post CSAM Electrical Test: +25°C System: Magnum		693(0)	0/693	Pass	
Temp Cycle	Stress Condition: (Standard) -65°C to +150°C, 500 Cycles System: VOTSCH VT 7012 S2	JESD22-A104	231(0)		Pass	Parts had been pre-conditioned at 260°C
	Electrical Test: +130°C System: Magnum	3 Lots of 77 units	231(0)	0/231		
	Bond Strength: Wire Pull (Cpk>1.67) Bond Shear (Cpk>1.67)		15(0)	0/15	Pass	See attachment 1
UNBIASED-HAST	Stress Condition: (Standard) +130°C/85%RH, 96 hrs. System: HIRAYAMA HASTEST PC-422R8	JESD22-A118	231(0)		Pass	Parts had been pre-conditioned at 260°C
	Electrical Test: +25°C System: Magnum	3 Lots of 77 units	231(0)	0/231		
BIASED-HAST	Stress Condition: (Standard) +130°C/85%RH, 96 hrs. Bias Volt: 5.5 Volts System: HAST 6000X	JESD22-A110	231(0)		Pass	Parts had been pre-conditioned at 260°C
	Electrical Test: +25°C, +130°C System: Magnum	3 Lots of 77 units	231(0)	0/231		

PACKAGE QUALIFICATION REPORT

Test Number (Reference)	Test Condition	Standard/ Method	Qty. (Acc.)	Def/SS.	Result	Remarks
High Temperature Storage Life	Stress Condition: Bake 175°C, 504 hrs System: HERAEUS Electrical Test : +25°C, +130°C System: Magnum	JESD22-A103 1 Lot of 45 units	45(0) 45(0)	0/45	Pass	
Physical Dimensions	Physical Dimension, 10 units from 3 lot AG2Z3C6N5U AG2Z3C6N5V AG2Z3C6N5W	JESD22-B100/B108	30(0) Units	0/10 0/10 0/10	Pass Pass Pass	Attachment 2
Bond Strength Data Assembly	Wire Pull (Cpk ≥1.67), 30 bonds from a min of 5 units AG2Z3C6N5U AG2Z3C6N5V AG2Z3C6N5W	M2011.8 MIL-STD-883	30 wires	Cpk: 6.058 6.358 6.599	Pass Pass Pass	
Bond Strength Data Assembly	Bond Shear (Cpk ≥1.67), 30 bonds from a min of 5 units AG2Z3C6N5U AG2Z3C6N5V AG2Z3C6N5W	M2011.8 MIL-STD-883	30 wires	Cpk: 6.63 5.536 5.375	Pass Pass Pass	

Attachment 1:
Thermal Cycles 500c WBP and WBS

WBP/WBS Criteria:

WBP / WSP		WBS	
0	no reading	0	no reading
1	neck break	1	ball lift
2	span break	2	ball shear
3	ball bond fail	3	pad lift
4	wedge bond fail/heel break	4	cratering
5	ball metal lift	5	wire shear
6	wedge metal lift	6	intermetallic
7	die fracture	7	reweld
8	substrate fracture	8	other

Lot: AG2Z3C6N5U _WBP

Bond Diameter: 0.8 mil

Reading Comment:		WBP Wire Bond Pull break force post TC_-65C-150C_500x			
Min	5.70	Break Code Summary			
Max	7.20	# of Break Code 1	16	# of Break Code 4	0
Average	6.60	# of Break Code 2	14	# of Break Code 5	0
Stdev	0.400	# of Break Code 3	0	# of Break Code 6	0
cpk _{L_Side}	4.04	Min > $\mu-3\sigma$	YES	# outliers	0

Lot: AG2Z3C6N5U _WBS

Bond Diameter: 1.9 mil

Reading Comment:		WBS Wire Ball Shear break force post TC_-65C-150C_500x			
Min	27.2	Break Code Summary			
Max	35.2	# of Break Code 1	0	# of Break Code 4	0
Average	30.7	# of Break Code 2	30	# of Break Code 5	0
Stdev	1.850	# of Break Code 3	0	# of Break Code 6	0
cpk _{L_Side}	3.26	Min > $\mu-3\sigma$	YES	# outliers	0

Lot: AG2Z3C6N5V_WBP

Bond Diameter: 0.8 mil

Reading Comment:		WBP Wire Bond Pull break force post TC_-65C-150C_500x				
Min	5.80	Break Code				
Max	7.10	# of Break Code 1	24	# of Break Code 4	0	
Average	6.50	# of Break Code 2	6	# of Break Code 5	0	
Stdev	0.350	# of Break Code 3	0	# of Break Code 6	0	
cpk _{L_Side}	4.52	Min > μ -3S	YES		# outliers	0

Lot: AG2Z3C6N5V_WBS

Bond Diameter: 1.9 mil

Reading Comment:		WBS Wire Ball Shear break force post TC_-65C-150C_500x				
Min	26.6	Break Code				
Max	31.9	# of Break Code 1	0	# of Break Code 4	0	
Average	29.5	# of Break Code 2	30	# of Break Code 5	0	
Stdev	1.320	# of Break Code 3	0	# of Break Code 6	0	
cpk _{L_Side}	4.28	Min > μ -3S	YES		# outliers	0

Lot: AG2Z3C6N5W_WBP

Bond Diameter: 0.8 mil

Reading Comment:		WBP Wire Bond Pull break force post TC_-65C-150C_500x				
Min	5.40	Break Code				
Max	7.10	# of Break Code 1	19	# of Break Code 4	1	
Average	6.50	# of Break Code 2	10	# of Break Code 5	0	
Stdev	0.380	# of Break Code 3	0	# of Break Code 6	0	
cpk _{L_Side}	4.17	Min > μ -3S	YES		# outliers	0

Lot: AG2Z3C6N5W_WBS

Bond Diameter: 1.9 mil

Reading Comment:		WBS Wire Ball Shear break force post TC_-65C-150C_500x				
Min	29.6	Break Code				
Max	33.6	# of Break Code 1	0	# of Break Code 4	0	
Average	31.1	# of Break Code 2	30	# of Break Code 5	0	
Stdev	0.990	# of Break Code 3	0	# of Break Code 6	0	
cpk _{L_Side}	6.24	Min > μ -3S	YES		# outliers	0

Attachment 2 Package Dimension (Assembly Data)

AG2Z3C6N5U

	A	A1	A2	A3	b	D	D2 (=J)	E	E2 (=K)	e	L
MIN	0.8	0	0.6	0.153	0.18	6.9	5.1	6.9	5.1	0.45	0.5
MAX	0.9	0.05	0.7	0.253	0.28	7.1	5.3	7.1	5.3	0.55	0.6
Unit 1	0.868	0.019	0.663	0.205	0.249	6.973	5.198	6.970	5.200	0.502	0.540
Unit 2	0.870	0.021	0.667	0.203	0.251	6.969	5.201	6.979	5.202	0.507	0.542
Unit 3	0.873	0.018	0.661	0.212	0.248	6.976	5.199	6.978	5.204	0.500	0.545
Unit 4	0.869	0.022	0.669	0.200	0.246	6.974	5.201	6.980	5.201	0.503	0.541
Unit 5	0.872	0.024	0.666	0.206	0.250	6.971	5.200	6.977	5.199	0.498	0.543
Unit 6	0.871	0.019	0.668	0.203	0.247	6.974	5.198	6.971	5.205	0.503	0.542
Unit 7	0.875	0.020	0.670	0.205	0.252	6.970	5.201	6.978	5.200	0.506	0.544
Unit 8	0.877	0.023	0.669	0.208	0.248	6.977	5.199	6.977	5.204	0.500	0.547
Unit 9	0.873	0.021	0.662	0.211	0.251	6.975	5.202	6.980	5.201	0.499	0.540
Unit 10	0.869	0.018	0.665	0.204	0.249	6.972	5.200	6.979	5.203	0.505	0.546
Max	0.877	0.024	0.670	0.212	0.252	6.977	5.202	6.980	5.205	0.507	0.547
Min	0.868	0.018	0.661	0.200	0.246	6.969	5.198	6.970	5.199	0.498	0.540
Ave	0.872	0.021	0.666	0.206	0.249	6.973	5.200	6.977	5.202	0.502	0.543
Std	0.003	0.002	0.003	0.004	0.002	0.003	0.001	0.004	0.002	0.003	0.002

AG2Z3C6N5V

	A	A1	A2	A3	b	D	D2 (=J)	E	E2 (=K)	e	L
MIN	0.8	0	0.6	0.153	0.18	6.9	5.1	6.9	5.1	0.45	0.5
MAX	0.9	0.05	0.7	0.253	0.28	7.1	5.3	7.1	5.3	0.55	0.6
Unit 1	0.871	0.023	0.667	0.204	0.250	6.974	5.197	6.971	5.201	0.503	0.541
Unit 2	0.870	0.020	0.668	0.202	0.252	6.970	5.202	6.978	5.203	0.507	0.543
Unit 3	0.869	0.018	0.662	0.207	0.249	6.977	5.200	6.977	5.206	0.501	0.544
Unit 4	0.868	0.022	0.665	0.203	0.247	6.975	5.203	6.981	5.200	0.502	0.542
Unit 5	0.872	0.019	0.664	0.200	0.248	6.972	5.201	6.979	5.204	0.499	0.545
Unit 6	0.867	0.021	0.669	0.198	0.246	6.973	5.199	6.970	5.203	0.502	0.540
Unit 7	0.873	0.017	0.666	0.207	0.251	6.969	5.202	6.979	5.201	0.506	0.542
Unit 8	0.874	0.023	0.664	0.210	0.249	6.976	5.202	6.978	5.199	0.502	0.544
Unit 9	0.872	0.020	0.670	0.202	0.247	6.974	5.200	6.980	5.204	0.503	0.543
Unit 10	0.871	0.019	0.668	0.203	0.248	6.971	5.201	6.977	5.200	0.499	0.541
Max	0.874	0.023	0.670	0.210	0.252	6.977	5.203	6.981	5.206	0.507	0.545
Min	0.867	0.017	0.662	0.198	0.246	6.969	5.197	6.970	5.199	0.499	0.540
Ave	0.871	0.020	0.666	0.204	0.249	6.973	5.201	6.977	5.202	0.502	0.543
Std	0.002	0.002	0.003	0.004	0.002	0.003	0.002	0.004	0.002	0.003	0.002

AG2Z3C6N5W

	A	A1	A2	A3	b	D	D2 (=J)	E	E2 (=K)	e	L
MIN	0.8	0	0.6	0.153	0.18	6.9	5.1	6.9	5.1	0.45	0.5
MAX	0.9	0.05	0.7	0.253	0.28	7.1	5.3	7.1	5.3	0.55	0.6
Unit 1	0.862	0.016	0.637	0.225	0.251	6.977	5.213	6.976	5.211	0.497	0.549
Unit 2	0.869	0.021	0.642	0.227	0.248	6.971	5.215	6.968	5.212	0.496	0.541
Unit 3	0.872	0.014	0.653	0.219	0.245	6.978	5.208	6.969	5.207	0.500	0.542
Unit 4	0.868	0.020	0.648	0.220	0.249	6.974	5.214	6.965	5.204	0.492	0.541
Unit 5	0.872	0.018	0.639	0.233	0.248	6.975	5.210	6.973	5.205	0.497	0.540
Unit 6	0.874	0.022	0.644	0.230	0.250	6.979	5.208	6.972	5.210	0.496	0.543
Unit 7	0.870	0.017	0.642	0.228	0.249	6.973	5.211	6.967	5.206	0.500	0.542
Unit 8	0.868	0.019	0.642	0.226	0.248	6.974	5.213	6.980	5.204	0.497	0.546
Unit 9	0.874	0.021	0.638	0.228	0.246	6.976	5.207	6.976	5.206	0.494	0.545
Unit 10	0.869	0.023	0.637	0.232	0.248	6.980	5.210	6.978	5.210	0.495	0.542
Max	0.874	0.023	0.653	0.233	0.251	6.980	5.215	6.980	5.212	0.500	0.549
Min	0.862	0.014	0.637	0.219	0.245	6.971	5.207	6.965	5.204	0.492	0.540
Ave	0.870	0.019	0.642	0.227	0.248	6.976	5.211	6.972	5.208	0.496	0.543
Std	0.004	0.003	0.005	0.005	0.002	0.003	0.003	0.005	0.003	0.002	0.003