

QUALITY FLOWS

Version G - 04/06/2014

Reference: 2014-EC-134-Quality flows

Revision History

Version	Date	Author	Description
0			Creation
A			
B			
C			
D	06/2008	V.Briot	1. Update in compliance with MIL-PRF-38535 revH 2. Correction in MLC flow: test at three temperatures added
E	11/2012	C.Ferré	1. Note for Constant acceleration 2. Note for Fine leak
F	07/2013	C.Ferré	Update
G	06/2014	C.Ferré	Correction note for QMLQ and Level B Military PDA, note 10 replaced by note 9

1 Introduction

Design and manufacturing facilities meet international quality standards. Beyond the traditional ISO9001-V2000 registrations, Atmel Aerospace complies either with the MIL-PRF-38535 or the ESCC-QML quality systems.

Atmel Aerospace is fully QML-qualified by the DLA (Defence Logistic Agency) and Aerospace Corporation for level Q (military) and V (space), effective December 1999. Qualification is granted up to 0.18 μ m CMOS technology based products. RHA (Radiation Hardness Assurance) certification is valid from October 2000.

The Atmel 0.35 μ m technology flow was the first-ever ESCC-QML qualified process by ESA (European Space Agency) for space applications. Atmel is, since 2011, ESCC-QML qualified for its 0.18 μ m ASIC technology flow according to ESCC 2549000.

2 Quality Management System (QMS)

Two quality levels are considered in this document.

Level A means that the product is qualified according either to MIL-PRF-38535 or to ESCC9000. With this quality level, procurement specification (PS) is either an Standard Military drawing (SMD) or a ESCC Detail Specification (DS).

Level B means that the product screening and qualification is compliant with MIL-PRF-38535 or ESCC9000, but not formerly qualified by DLA or ESA. In this case, procurement specification is an Atmel Product Specification (PS).

2.1 Engineering samples

This flow applies to devices to be used for system validation on board. It has to be noticed that dice are electrically tested at room temperature only, and no inspection is performed during the assembly, which means that these parts are not suitable for any kind of qualification or flight use.

Table 2- 1 – Engineering samples offering

	Standard Product	ASIC
Reference Document		
Procurement specification	Datasheet	Design Review Document
Wafer Fab		
Standard processes	X	X
Rad Tolerant processes	X	X
Probe Go-no-go	X	X
Assembly		
Package type	Multilayer	Multilayer
Test		
Test 25°C Go-no-go	X	X

Notes:

- Atmel will not accept any responsibility for Engineering samples used outside of the stated conditions and cannot provide device failure analysis in the event of any such issues occurring.

2.2 Space Projects

These flows apply to devices to built with radiation Tolerant or Radiation hardened wafer fabrication processes

Table 2-2. Space Projects

		LEVEL A			LEVEL B	
		MILITARY	SPACE		MILITARY	SPACE
	Applicable Specification	QML-Q flow ⁽¹⁾	QML-V flow ⁽¹⁾	ESCC flow ⁽¹⁾	Atmel Quality Management System	
Reference Document						
MIL-PRF 38535		X	X	-	X	X
ESCC 9000		-	-	X	-	-
PID		-	-	X	-	-
Procurement specification ⁽³⁾		SMD	SMD	DS	PS	PS
Traceability						
Process traceability		X	X	X	X	X
Lot traceability		X	X	X	X	X
Part traceability		-	X	X	-	X
Wafer Fab						
Radiation Tolerant process		X	X	X	X	X
Process monitoring review		X	X	X	X	X
Probe Go-no-go		X	X	X	X	X
Assembly						
Package type		Multilayer	Multilayer	Multilayer	Multilayer	Multilayer
Die inspection	MIL-STD 883 TM 2010 cond B	X	-	-	X	-
	MIL-STD 883 TM 2010 cond A and ESCC 2049000	-	X	X	-	X
Acceptance		-			-	
Sem	ESCC 21400	-	X	X	-	X
Wafer lot acceptance ⁽⁴⁾	MIL-STD 883 TM2018	-	X	X	-	X
Precap ⁽⁵⁾		-	X	X	-	X
High temperature stabilization bake	MIL-STD 883 TM1008	-	X	X	-	X
Thermal Cycling	MIL-STD 883 TM1010 Cond C	X	X	X	X	X
Constant acceleration ⁽⁷⁾	MIL-STD 883 TM2001 Cond E					
Pind Test	MIL-STD 883 TM2020 Cond A	X	X	X	X	X
Fine leak ⁽⁶⁾	MIL-STD 883 TM1014 cond A	X	X	X	X	X
Gross leak	MIL-STD 883 TM1014 Cond C	X	X	X	X	X
Serialisation		-	X	X	-	X
RX	MIL-STD 883 TM2012	-	X	X	-	X
Test						
Test 25°C go-nogo		X	-	-	X	-
Test 25°C with record		-	X	X	-	X
Burn-in 125°C, 160h, VCC +10% ⁽⁸⁾	MIL-STD 883 TM1015	X	-	-	X	-
Burn-in 125°C, 240h, VCC +10% ⁽⁸⁾	MIL-STD 883 TM1015	-	X	X	-	X
Test -55, 25 and 125°C go-nogo		X	-	-	X	-
Test 25°C with record and drift		-	X	X	-	X
Test -55°C, +125°C with record		-	X	X	-	X
PDA		X ⁽⁹⁾	X ⁽⁹⁾	X ⁽¹⁰⁾	X ⁽⁹⁾	X ⁽⁹⁾

Fine leak ⁽⁶⁾	MIL-STD 883 TM1014 cond A	X	(20)	X	X	
Gross leak	MIL-STD 883 TM1014 Cond C	X	(20)	X	X	
FVI	MIL-STD 883 TM2009 ESCC 2059000	X	X	X	X	X
Lot qualification						
electrical test ⁽¹⁰⁾	MIL-PRF 38535 ESCC 9000	0/116 ⁽¹²⁾	0/116 ⁽¹²⁾	-	0/116 ⁽¹²⁾	0/116 ⁽¹²⁾
assembly test ^{(11) (12)}		0/4 ⁽¹¹⁾	0/4 ⁽¹¹⁾	0/5 ^(11, 13)	0/4 ⁽¹¹⁾	0/4 ⁽¹¹⁾
life test		0/22 ^(7, 11, 16, 17, 18)	0/15 ⁽¹¹⁾	0/45 ⁽¹⁵⁾	0/45 ⁽¹⁵⁾	0/45 ^(11,16, 17)
package test	MIL-STD 883 TM 1019 ESCC 22900	0/45 ⁽¹⁵⁾	0/53 ⁽¹⁵⁾	0/15 ⁽¹¹⁾	0/45 ⁽¹⁵⁾	0/45 ⁽¹⁵⁾
Radiation test ^(11, 14)		0/53 ⁽¹⁵⁾	0/53 ⁽¹⁵⁾	0/30 ^(11, 13)	0/53 ⁽¹⁵⁾	0/53 ⁽¹⁵⁾
		-	0/22	0/22	-	0/22
delivery ^(22,23)						
Certificate of Conformity		X	X	X	X	X
Data package		-	X	X	-	X

notes

- (1) Alternative methods could be introduced after Space Agency's approval, Customer will be notified
- (2) For ESCC qualified products according to ESCC 2549000
- (3) For ASIC devices, dedicated procurement specification ((AID or Asic Sheet) has to be approved latest at prototypes Approval
- (4) Wafer lot Acceptance includes Wafer thickness, Metallization thickness, SEM, Glassivation thickness, QBD (charge in oxide), Parametric tests Review and radiation test report if applicable
- (5) Precap is carried out by Atmel Quality representative
- (6) Fine leak is done with 'fixed' method, A1 according to MIL-STD 883 TM1014 until package lead cap diagonal dimension is less than 30 mm and "flexible method" for package lead cap diagonal dimension is equal and more than 30 mm.
- (7) Note done: DLA QML optimization
- (8) Alternative temperature and time combinations per MIL-STD 883 method 1015 are permissible
- (9) Rejects at room temperature taken in account. Limit at 5% with 3% functional
- (10) Rejects at three temperatures taken in account. Limit at 5%
- (11) lot by lot test
- (12) For solderability test, for J and L lead packages, one lead on two is untested to avoid bridging during the test
- (13) Alternative method may be introduced according to MIL-STD 883 TM 5005
- (14) If required in the Purchase Order
- (15) Periodic test
- (16) Solderability is performed lot by lot on 5 parts.
- (17) Test performed with 45 parts for 1000 hours or 22 parts during 2000 hours at 125°C. For lot less than or equal to 200 parts, the number of devices shall be greater of 5 or 10% of the lot, SEC results (for the 3 previous months) shall supplement devices to result in a sample of 22 parts. For ASIC, the sample is fixed at 5 parts with the balance being made up of the SEC.
- (18) Alternative temperature and time combinations per MIL-STD 883 method 1005 are permissible
- (19) Parts packing compliant with ESCC 20600
- (20) Parts held for a period exceeding 36 months are re-screening as minimum versus MIL-M-38510

2.3 Military Projects

These flows apply to devices built with standard fabrication processes.

Table 2-3. Military Projects

		LEVEL A	LEVEL B
	Applicable Specification	QML-Q flow ⁽¹⁾	Atmel Quality Management System
Reference Document			
MIL-PRF 38535		X	X
Procurement specification		SMD ⁽²⁾	PS
Traceability			
Process traceability		X	X
Lot traceability		X	X
Part traceability		-	-
Wafer Fab			
Standard processes		X	X
Process monitoring review		X	X
Probe Go-no-go		X	X
Assembly			
Package type		Multilayer	Multilayer
Die inspection			
	Atmel spec	-	-
	MIL-STD 883 TM2010 Cond B	X	X
Thermal Cycling	MIL-STD 883 TM1010 Cond C	X	X
Constant acceleration ⁽³⁾	MIL-STD 883 TM2001 Cond E		
Pind Test	MIL-STD 883 TM2020 Cond A	-	-
Fine leak ⁽⁴⁾	MIL-STD 883 TM1014 cond A	X	X
Gross leak	MIL-STD 883 TM1014 Cond C	X	X
Test			
Test 25°C Go-no-go		X	X
Burn-in 150°C, 80h, VCC +10% ⁽⁵⁾	MIL-STD 883 TM1015	X	X
Test 25°C Go-no-go		X	X
Test -55°C, +125°C Go-no-go		X	X
Fine leak ⁽⁴⁾	MIL-STD 883 TM1014 Cond A	X	X
Gross leak	MIL-STD 883 TM1014 Cond C	X	X
FVI	MIL-STD 883 TM2009	X	X
Lot qualification			
electrical test ^(5, 6)		0/116	0/116
assembly test ^(5, 8)		0/4	0/4
life test ⁽⁷⁾	MIL-PRF 38535	0/45 ⁽⁸⁾	0/45 ⁽⁸⁾
package test ⁽⁷⁾		0/53 ⁽⁸⁾	0/53 ⁽⁸⁾
Delivery ⁽¹⁰⁾			
Certificate of Conformity		X	X

notes

- (1) Alternative methods could be introduced after Agency approval, Customer will be notified
- (2) For ASIC devices, dedicated AID has to be approved latest at Prototypes Approval
- (3) Note done: DLA QML optimization
- (4) Fine leak is done with 'fixed' method, A1 according to MIL-STD 883 TM1014 for package with diagonal is less than 30mm and done with flexible method for package with diagonal is equal or more than 30mm
- (5) Alternative temperature and time combinations per MIL-STD 883 method 1015 are permissible
- (6) Lot by lot test
- (7) Alternative method may be introduced according to MIL-STD 883 TM 5005
- (8) Periodic test
- (9) For solderability test, for J and L lead packages, one lead on two is untested to avoid bridging during the test
- (10) Parts held for a period exceeding 36 months are re-screening as minimum versus Mil-M-38510