

5.2 MICROCIRCUITS (08)

5.2.1 MICROCHIP ATMEL, France: ATC18RHA

NOTES:

1. LFoundry (LF) in Rousset ceased to supply ATC18RHA chips in December 2013
2. A second source of supply, UMC has been successfully added to the scope of Technology Flow qualification for this technology by Atmel.
3. New designs and fabrication after January 2014 make use of the UMC source.

5.2.1.1 Contact Information

Address	ESCC Chief Inspector
Microchip Atmel Nantes SAS Route de Gachet 44300 Nantes France	Ms V. Lepaludier Tel. +33 2 40 18 1633 FAX +33 2 40 18 1946 Valerie.Lepaludier@atmel.com

5.2.1.2 Qualification

Current Qualification Certificate No.	In QML since:	Type Designation
312B Rev 1	Aug. 2012	Integrated Circuits, Silicon, Monolithic, CMOS, Cell-Based Array, based on Type ATC18RHA

Applicable documents:

ESCC Generic Specification No. [9000](#); ESCC Detail Specification No. [9202/080](#)

Atmel Process Identification Document PID 0030 (LF), PID 32 (UMC) , e2v PID DF 31S 100730 (assembly, common to both sources LF and UMC), HCM SYSTREL PID 11 (for columns attachment).

5.2.1.3 List of Qualified Components

For each ASIC design an ASIC Sheet is produced by Atmel for use in conjunction with the ESCC Detail Specification No. 9202/080. Where the ASIC is not proprietary to the customer the ASIC sheet is published in ESCIES as a supporting document.

ASIC Sheet	Component Type

In the case of ATC18RHA, standard components are also available. These are listed below with their full ESCC Detail Specification:

Detail Specification	Component Type
9512/004	Integrated Circuits, Silicon, 32-bit SPARC Processor, based on Type AT697F
9304/165	Integrated Circuits, Silicon, monolithic, CMOS digital, Field Programmable Gate Array, 280000 gates, based on type ATF280F

5.2.1.4 Technology Flow Abstract

See Notes under Para. 4.2

General Features

ATC18RHA standard cells family is designed with a 0.18µm radiation hard CMOS technology. This offering is based on 6 metal layers at 1.8V +/-0.15V for the core and 3.3V +/-0.3V for the periphery. This family features arrays with up to 7 M gates and 544 pads. With its high speed performance, its low supply current and its radiation hard level, the ATC18RHA is suitable for digital applications working in radiation intensive environment.

Basic Information

- CMOS technology AT58KRHA
- 40 to 70 kgates per mm² - Up to 6.5M gates
- Double supply operation
 - Periphery power supply 3.3V
 - Core power supply 1.8V
- Low supply current :
 - Operating maximum value: 85nW/gate/MHz with a duty cycle at 20%
- I/O Interfaces:
 - Cold sparing
 - High speed LVDS (655 Mps) and LVPECL
 - PCI
- 544 pads (+ 8 pads power only)
- Embedded memories: Compiled and Synthesized
- EDAC library

- Radiation (LF and UMC):
 - No Single Event Latch-Up below a LET Threshold of 80 MeV/mg/cm² at ambient & high temperature
 - SEU hardened DFF's to 30 MeV/mg/cm²
 - Tested up to 300 KRad (Si), Radiation Level is 100 KRad (Si).
- Device Types – per individual custom ASIC sheets and ESCC Detail Specification 9202/080

Component Types

This table presents the available couples (die, package) as defined in the Detail Specifications:

Die	Supply Voltage I/O / core	Max programmable I/O's	Case	Typical Routable gates
ATC18RHA_216	2.5V or 3.3V/1.8V	216	MQFP-F256	1M
ATC18RHA_216	2.5V or 3.3V/1.8V	216	MQFP-F196	1M
ATC18RHA_216	2.5V or 3.3V/1.8V	216	MQFP-F160	1M
AT697F	3.3V/1.8V		MQFP-F256	0.85M
ATC18RHA_324	2.5V or 3.3V/1.8V	324	MQFP-T352	2.2 M
ATC18RHA_324	2.5V or 3.3V/1.8V	324	MQFP-F256	2.2 M
ATC18RHA_324	2.5V or 3.3V/1.8V	324	MQFP-F196	2.2 M
ATC18RHA_324	2.5V or 3.3V/1.8V	324	MQFP-F160	2.2 M
ATC18RHA_324	2.5V or 3.3V/1.8V	324	LGA-349	2.2 M
ATC18RHA_324	2.5V or 3.3V/1.8V	324	CCGA-349	2.2 M
ATC18RHA_404	2.5V or 3.3V/1.8V	404	MQFP-T352	3.5 M
ATC18RHA_404	2.5V or 3.3V/1.8V	404	MQFP-F256	3.5 M
ATC18RHA_404	2.5V or 3.3V/1.8V	404	LGA-472	3.5 M
ATC18RHA_404	2.5V or 3.3V/1.8V	404	LGA-349	3.5 M
ATC18RHA_404	2.5V or 3.3V/1.8V	404	CCGA-472	3.5 M
ATC18RHA_404	2.5V or 3.3V/1.8V	404	CCGA-349	3.5 M
ATC18RHA_504	2.5V or 3.3V/1.8V	504	MQFP-T352	5.5 M
ATC18RHA_504	2.5V or 3.3V/1.8V	504	MQFP-F256	5.5 M
ATC18RHA_504	2.5V or 3.3V/1.8V	504	LGA-625	5.5 M
ATC18RHA_504	2.5V or 3.3V/1.8V	504	LGA-472	5.5 M
ATC18RHA_504	2.5V or 3.3V/1.8V	504	LGA-349	5.5 M
ATC18RHA_504	2.5V or 3.3V/1.8V	504	CCGA-625	5.5 M
ATC18RHA_504	2.5V or 3.3V/1.8V	504	CCGA-472	5.5 M
ATC18RHA_504	2.5V or 3.3V/1.8V	504	CCGA-349	5.5 M
ATC18RHA_544	2.5V or 3.3V/1.8V	544	LGA-625	7 M
ATC18RHA_544	2.5V or 3.3V/1.8V	544	CCGA-625	7 M

5.2.1.5 Technology Flow Definition

The Technology Flow Definition domain covers the design, fabrication, assembly and testing of the ATC18RHA standard cells family.

1. **Design**

The design manual and the ASIC library data books cover design at the Atmel Nantes Design Centre.

– ATC18RHA Design manual	ATD-DE-GR-R0212
– ATC18RHA TOS manual	ATD-DE-GR-R0324
– ATC18RHA Buffers library databook	ATD-TS-LR-R0252
– ATC18RHA Cells library databook	ATD-TS-LR-R0251
– ATC18RHA Memory cells library databook	ATD-TS-LR-R0254
– ATC18RHA specific library databook	ATD-TS-LR-R0253

All ASIC designs will be performed by the customer at the customer site, with Atmel supported tools (front end).

2. **Fabrication**

The ATC58KRHA, processed in UMC Taiwan, is a 0.18µm CMOS, 6 metal, Ti, TiN and AlCu process.

3. **Assembly**

The assembly of ATC18RHA devices is performed at E2V, Grenoble, with the following capabilities:

Die attach	Cyanate Ester (JM7000)
Wire bond	Ultrasonic Wedge, 32µm Al
Lid sealing	Brazed with Au/Sn alloy
Leads	Au plated (MQFP and LGA)

Columns attachment is performed in SERMA HCM, La Rochelle, with the following capabilities:

Columns 85Pb15Sn with Cu ribbon

4. **Control and Test**

The control and test of ATC18RHA devices at Atmel Nantes. It includes Lot Acceptance, Test Flows and Test Procedures, Qualification Test and Reliability Monitoring, Screening and associated electrical tests and inspections.

5. **TCVs and SEC**

The die ATC18RHA_324 is used for both test vehicles. All details are described in the ATC18RHA test chip specification, reference ADF-DE-R0561-CUP.

V41 test vehicle

The V41 is a buffer test vehicle representative of the range of buffers available for performance testing in the MQFP 256 package. It contains standard IO33 buffers, specific IO33 buffers (LVDS, PCI), a PLL, a set of ring oscillators made of different library cells and a set of interconnect lines.

V40 test Vehicle – Technology SEC

The V40 SEC is developed for performance and radiation testing in the MQFP 256 package. It contains a set of memory blocks (compiled memories with and without EDACs and synthesized (on gates) memories made with standard and hardened latches), shift registers chains and a PLL.

6. Radiation Characteristics

The AT58KRHA family has been developed to fulfil the following characteristics in terms of radiation tolerance:

- No Single Event Latch-up below a LET Threshold of 80MeV/mg/cm² at high temperature
- Availability of SEU hardened flip-flops
- Total dose capability over 100Krad (Si)
-

5.2.1.6 Manufacturing sites

Design: Atmel Nantes, BP70602, 44306 Nantes Cedex 3, France

Wafer Fabrication: UMC Fab 8S, Hsin-Chu, Taiwan

Assembly: e2v Grenoble, BP123, 38521 Saint-Egrève Cedex, France

HCM SYSTREL, 34 Av. Joliot Curie, ZI Perigny, 17185 Perigny Cedex, France

Control and Test: Atmel Nantes, BP70602, 44306 Nantes Cedex 3, France

5.2.2 MICROCHIP ATMEL, FRANCE: ATMX150RHA

5.2.2.1 Contact Information

Address	ESCC Chief Inspector
Microchip Atmel Nantes SAS Route de Gachet 44300 Nantes France	Ms V. Lepaludier Tel. +33 2 40 18 1633 FAX +33 2 40 18 1946 Valerie.Lepaludier@atmel.com

5.2.2.2 Qualification

Current Qualification Certificate No.	In QML since:	Type Designation
342 rev1	Aug. 2016	Integrated Circuits, Silicon, Monolithic, CMOS, Cell-Based Array, based on Type ATMX150RHA – Ph1 Digital only 7 M gates 5ML

Applicable documents:

ESCC Generic Specification No. [9000](#); ESCC Detail Specification No. [9202/083](#)

Atmel Process Identification Document PID 37, e2v PID DF 31S 100730 (assembly), HCM SYSTREL PID 11 (for columns attachment).

5.2.2.3 List of Qualified Components

For each ASIC design an ASIC Sheet is produced by Atmel for use in conjunction with the ESCC Detail Specification No. 9202/083. Where the ASIC is not proprietary to the customer the ASIC sheet is published in ESCIES as a supporting document.

ASIC Sheet	Component Type

5.2.2.4 Technology Flow Abstract

General features

The ATMX150RHA ASIC family is designed with a 0.15µm Radiation-Hardened CMOS technology, 5 metal layers, with 1.8V +/-0.15V for the core and 2.5+/-0.25V or 3.3V +/-0.3V for the periphery supplies. This family arrays up to 7 M gates and more than 500 pads.

With its high speed performance, its low supply current and its radiation hard level, the ATMX150RHA is suitable for digital applications working in radiation intensive environment.

Basic information

CMOS technology AT77K9RHA

- 40 to 70 kgates per mm²
- Up to 7M gates
- Double supply operation:

- Periphery power supply 2.5V & 3.3V
 - Core power supply 1.8V
- Operating maximum value of 8.8 nA/gate/MHz with a duty cycle at 20%
- I/O Interfaces:
 - Cold sparing
 - High speed LVDS (655 Mps) and LVPECL
 - PCI
- 544 pads (+ 8 pads power only)
- Compiled memory cells (ROM, SRAM, DPRAM, register files)
- Radiation:
 - No Single Event Latch-Up below an LET Threshold of 86 MeV/mg/cm² at high temperature.
 - SEU Hardened DFF's to 18 MeV/mg/ cm²
 - TID Radiation Capability of 100 kRads (Si).
- Device Types – per individual custom ASIC sheets and ESCC Detail Specification [9202/083](#)

Component Types

This table presents the available couples (die, package) as defined in the Detail Specifications:

Die	Supply Voltage I/O / core	Max programmable I/O's	Case	Typical Routeable gates
ATMX150RHA_216	2.5V or 3.3V/1.8V	216	MQFP-F256	1M
ATMX150RHA_216	2.5V or 3.3V/1.8V	216	MQFP-F196	1M
ATMX150RHA_216	2.5V or 3.3V/1.8V	216	MQFP-F160	1M
ATMX150RHA_324	2.5V or 3.3V/1.8V	324	MQFP-T352	2.2 M
ATMX150RHA_324	2.5V or 3.3V/1.8V	324	MQFP-F256	2.2 M
ATMX150RHA_324	2.5V or 3.3V/1.8V	324	MQFP-F196	2.2 M
ATMX150RHA_324	2.5V or 3.3V/1.8V	324	MQFP-F160	2.2 M
ATMX150RHA_324	2.5V or 3.3V/1.8V	324	LGA-349	2.2 M
ATMX150RHA_324	2.5V or 3.3V/1.8V	324	CCGA-349	2.2 M
ATMX150RHA_404	2.5V or 3.3V/1.8V	404	MQFP-T352	3.5 M
ATMX150RHA_404	2.5V or 3.3V/1.8V	404	MQFP-F256	3.5 M
ATMX150RHA_404	2.5V or 3.3V/1.8V	404	LGA-472	3.5 M
ATMX150RHA_404	2.5V or 3.3V/1.8V	404	LGA-349	3.5 M
ATMX150RHA_404	2.5V or 3.3V/1.8V	404	CCGA-472	3.5 M
ATMX150RHA_404	2.5V or 3.3V/1.8V	404	CCGA-349	3.5 M
ATMX150RHA_504	2.5V or 3.3V/1.8V	504	MQFP-T352	5.5 M
ATMX150RHA_504	2.5V or 3.3V/1.8V	504	MQFP-F256	5.5 M
ATMX150RHA_504	2.5V or 3.3V/1.8V	504	LGA-625	5.5 M
ATMX150RHA_504	2.5V or 3.3V/1.8V	504	LGA-472	5.5 M
ATMX150RHA_504	2.5V or 3.3V/1.8V	504	LGA-349	5.5 M
ATMX150RHA_504	2.5V or 3.3V/1.8V	504	CCGA-625	5.5 M
ATMX150RHA_504	2.5V or 3.3V/1.8V	504	CCGA-472	5.5 M
ATMX150RHA_504	2.5V or 3.3V/1.8V	504	CCGA-349	5.5 M
ATMX150RHA_544	2.5V or 3.3V/1.8V	544	LGA-625	7 M
ATMX150RHA_544	2.5V or 3.3V/1.8V	544	CCGA-625	7 M

5.2.2.5 Technology Flow Definition

The Technology Flow covers the design, fabrication, assembly and testing of the ATMX150RHA standard cells ASIC family.

1. **Design**

The design manual and the ASIC library data books cover the design in the Atmel Nantes Design Centers:

ATMX150RHA design manual	2012_EC_054_ELE
ATMX150RHA TOS (Test Oriented Simulation) Manual	ATD-DE-GR-R0324
ATMX150RHA supply & ESD buffer databook	2012_EC_055_ELE
ATMX150RHA buffer 3.3V databook	2012_EC_051_ELE
ATMX150RHA buffer 2.5V databook	2012_EC_052_ELE
ATMX150RHA Cells library databook	2012_EC_050_ELE
ATMX150RHA memory cells library databook	2012_EC_053_ELE
ATMX150RHA power grid verification flow	2014_EC_131-ELE

All ASIC designs will be performed by customer at customer site, with Atmel supported tools (front end).

2. **Fabrication**

The AT77K9RHA, processed in UMC Taiwan, is a 0.15 μm CMOS, 5 metal, Ti, TiN and AlCu process.

3. **Assembly**

The assembly of ATMX150RHA devices is performed in e2v, Grenoble, with the following capabilities:

Die attach	Cyanate Ester (JM7000)
Wire bond	Ultrasonic Wedge, 32 μm Al
Lid sealing	Brazed with Au/Sn alloy
Leads	Au plated (MQFP and LGA)

Columns attachment is performed in SERMA HCM, La Rochelle, with the following capabilities:
Columns 85Pb15Sn with Cu ribbon

4. **Control & Test**

The control and test of ATMX150RHA devices is performed in Atmel Nantes. It includes Lot Acceptance, Test Flows and Test Procedures, Qualification Test and Reliability Monitoring, Screening and associated electrical tests and inspections.

5. **TCVs and SEC**

The die ATMX150RHA_324 is used for both test vehicles. All details are described in the ATMX150RHA test chip specification, reference 2012_EC_024.

V55 test vehicle. The V55 is a buffer test vehicle representative of the range of buffers available for performance testing in the MQFP 256 package. It contains standard IO33 buffers, specific IO33 buffers (LVDS, PCI), a PLL, a set of ring oscillators made of different library cells and a set of interconnect lines

V54 test Vehicle V54 – Technology SEC. The V54 SEC is developed for performance and radiation testing in the MQFP 256 package. It contains a set of memory blocks (compiled memories with and without EDACs and synthesized (on gates) memories made with standard and hardened latches), shift registers chains and a PLL.

6. Radiation Characteristics

The AT77K9RHA technology has been developed to fulfil the following characteristics:

- Total dose capability over 100 kRads (Si).
- No Single Event Latchup below a LET threshold of 86 MeV/mg/cm² at high temperature.
- Availability of SEU hardened cells.

5.2.2.6 Manufacturing sites

Design: Atmel Nantes, BP70602, 44306 Nantes Cedex 3, France

Wafer Fabrication: UMC Fab 8C, Hsin-Chu, Taiwan

Assembly: e2v Grenoble, BP123, 38521 Saint-Egrève Cedex, France

HCM SYSTREL, 34 Av. Joliot Curie, ZI Perigny, 17185 Perigny Cedex, France

Control and Test: Atmel Nantes, BP70602, 44306 Nantes Cedex 3, France