



Pages 1 to 15

## **ESCC QUALIFIED MANUFACTURERS LIST**

**REP006**

**ISSUE 4**

**Updated 26-November-2009**



Document Custodian: European Space Agency - see <https://spacecomponents.org>

### **LEGAL DISCLAIMER AND COPYRIGHT**

European Space Agency, Copyright © 2009. All rights reserved.

The European Space Agency disclaims any liability or responsibility, to any person or entity, with respect to any loss or damage caused, or alleged to be caused, directly or indirectly by the use and application of this ESCC publication.

This publication, without the prior permission of the European Space Agency and provided that it is not used for a commercial purpose, may be:

- copied in whole, in any medium, without alteration or modification.
- copied in part, in any medium, provided that the ESCC document identification, comprising the ESCC symbol, document number and document issue, is removed.

**DOCUMENTATION CHANGE NOTICE**

(Refer to <https://escies.org> for ESCC DCR content)

| DCR No. | CHANGE DESCRIPTION   |
|---------|--|
| 545     | Document updated to clarify Vishay S.A. variants with established reliability per DCR. |

## **FOREWORD**

This document contains a list of qualified manufacturers that have been certified by the European Space Agency for Technology Flows to the rules of the ESCC System with principle reference to ESCC Basic Specification No. 25400.

The qualified electronic components produced from the Technology Flows are intended for use in ESA and other spacecraft and associated equipment in accordance with the requirements of the ECSS Standard ECSS-Q-60.

Each Technology Flow qualification and its subsequent maintenance is monitored and overseen by the ESCC Executive. ESA certifies the qualification upon receipt of a formal application from the Executive stating that all applicable ESCC requirements have been met by the pertinent manufacturer. The qualified status of a Technology Flow is noted by an entry in this document, a corresponding entry in the European Space Components Information Exchange System, ESCIES, and the issue of a certificate to the qualified manufacturer.

**TABLE OF CONTENTS**

|                  |  |                 |
|------------------|--|-----------------|
|                  | <b><u>FOREWORD</u></b>                   | <b><u>4</u></b> |
| <b><u>1.</u></b> | <b><u>PROMOTION</u></b>                  | <b><u>6</u></b> |
| <b><u>2.</u></b> | <b><u>PROCURER'S RESPONSIBILITY</u></b>  | <b><u>6</u></b> |
| <b><u>3.</u></b> | <b><u>QML ORGANISATION</u></b>           | <b><u>6</u></b> |
| 3.1              | Technology Flows                         | 6               |
| 3.2              | Qualified Components                     | 6               |
| 3.3              | Type Designation                         | 6               |
| 3.4              | Component Characteristics                | 6               |
| 3.5              | Manufacturer                             | 6               |
| <b><u>4.</u></b> | <b><u>REVISION PROCEDURE</u></b>         | <b><u>7</u></b> |
| <b><u>5.</u></b> | <b><u>QUALIFIED TECHNOLOGY FLOWS</u></b> | <b><u>7</u></b> |
| 5.1              | Atmel                                    | 7               |
| 5.2              | Vishay S.A. France                       | 12              |

**1. PROMOTION**

It is permitted to advertise the ESCC qualification status of a component provided such publicity or advertisement does not state or imply that the component is the only qualified one of that particular type, range or family.

**2. PROCURER'S RESPONSIBILITY**

When procuring ESCC qualified components, the procurer is responsible for ensuring that the qualification status is valid and that delivered components fulfil the specified requirements of the applicable ESCC specifications. The procurer is advised to utilise the ESCC non-conformance system, per ESCC Basic Specification No. 22800, in the event that a qualified manufacturer delivers non-conforming components.

**3. QML ORGANISATION****3.1 TECHNOLOGY FLOWS**

The individual Technology Flows are listed in this document by manufacturer in alphabetical order. They may also be found on the ESCIES web site, <https://escies.org>.

The controlling ESCC specifications are identified and a Technology Flow Abstract is provided to describe the main features of the qualified Technology Flow.

**3.2 QUALIFIED COMPONENTS**

Under each technology flow a list of the qualified components is provided. As new components are specified in an ESCC Detail Specification and are produced within the Technology Flow the list will be updated accordingly.

**3.3 TYPE DESIGNATION**

Wherever possible the referenced type (style) designations are derived from industrial standards (i.e., JEDEC, PRO-ELECTRON, MIL, IEC and CECC). The purpose is to identify the similarity of a listed qualified component, to a standard type designation. Where no standardised type designation is applicable the manufacturer's designation is referenced.

**3.4 COMPONENT CHARACTERISTICS**

The electrical characteristics described in the Technology Flow Abstract are provided for guidance only and, unless otherwise stated, are specified at +25°C. The precise characteristics of the qualified component are defined in the referenced ESCC specifications.

**3.5 MANUFACTURER**

Contact information and plant locations are indicated in the individual Technology Flow listings. Contact information may also be found in the ESCC QML section of the ESCIES web site, <https://escies.org>.

**4. REVISION PROCEDURE**

Amendments to earlier issues of the ESCC QML, implemented herein, are indicated by the issue date and by the content of the relevant "Document Change Request".

**5. QUALIFIED TECHNOLOGY FLOWS**

The following Technology Flows are qualified:

**5.1 ATMEL**

**Contact Information**

| Address  | ESCC Chief Inspector   |
|--|--|
| Atmel Nantes<br>BP 70602<br>44306 Nantes Cedex 3<br>France | Mr C. Ferré<br>Tel. +33 24 01 81 913<br>FAX +33 24 01 81 946 |

**Initial Qualification**

| Qualification Certificate No. | Validity Dates        | Type Designation   |
|-------------------------------|-----------------------|--|
| 278                           | Dec. 2006 - Dec. 2008 | Integrated Circuits, Silicon Monolithic, CMOS Gate/ Embedded Array based on type MH1RT |

**Maintenance of Qualification**

| Qualification Certificate No. | Validity Dates | Comment |
|-------------------------------|----------------|---------|
|                               |                |         |
|                               |                |         |
|                               |                |         |
|                               |                |         |
|                               |                |         |
|                               |                |         |
|                               |                |         |

**Applicable Documents**

ESCC Generic Specification No. 9000

ESCC Detail Specification No. 9202/076

Atmel Process Identification Document PID 0026

**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. 9202/076. Where the ASIC is not proprietary to the customer the ASIC sheet is published in ESCIES as a supporting document. Availability of the ASIC sheet is indicated in the table by an \* in the final column.

| ASIC Sheet | Component Type                             | ESCIES |
|------------|--|--------|
| FPK        | Integrated Motor Controller for Mechanisms | *      |
|            |  |        |
|            |  |        |
|            |  |        |
|            |  |        |
|            |  |        |
|            |  |        |

**Technology Flow Abstract**

1. Technology Flow

The MH1RT gate array family is designed with a 0.35µm radiation tolerant CMOS technology. The offering is based on a 4 metal layer 3.3volts AT56KRT process.

The family features arrays with up to 1.6 million routeable gates and 596 pads. The MH1RT is suitable for high speed, low power digital applications working in a radiation intensive environment.

The Technology Flow covers the foundry design, fabrication, assembly and testing of the MH1RT Sea of Gates family.

|                   | Scope   | Site   |
|-------------------|---|--|
| Design Centre     | Array Sizes:<br>- 99K<br>- 156K<br>- 242K<br>- 332K<br>- 3V and 5V tolerant/compliant                             | Atmel Nantes<br>BP 70602<br>44306 Nantes Cedex 3<br>France           |
| Wafer Fabrication | Process Flow: AT56KLRT  | Atmel Rousset<br>Zone Industrielle<br>131106 Rousset Cedex<br>France |
| Assembly          | Packages:<br>- Multilayer Quad Flat Pack<br>196, 256, 352 pins<br>- Multilayer Column Grid Array<br>349, 472 pins | E2V Grenoble<br>BP 123<br>38521 Saint-Egrève Cedex<br>France         |



|      | Scope  | Site  |
|------|--|---|
| Test | Lot Formation<br>Wafer Acceptance Inspection<br>- SEM<br>- Wafer Lot Acceptance<br>In-process Inspection<br>Test<br>Testing Flow<br>Sampling Plans<br>Test Procedures<br>- Test Vector Generation<br>- Test Program Validation<br>Customer Source Inspection<br>Qualification Testing<br>Lot Acceptance<br>Support Qualification Test Plan/Report<br>Technology Characterization<br>Reliability Monitoring<br><br>Incoming Inspection<br>Final Test<br>- Credence, Type Octet<br>Screening<br>External Visual Inspection | Atmel Nantes<br>BP 70602<br>44306 Nantes Cedex 3<br>France<br><br><br><br><br><br><br><br><br><br><br>MHS Nantes<br>92, route de Gachet<br>La Chantrerie<br>BP60601<br>44306 Nantes Cedex 3 |

(a) Basic Information

- 0.35µm CMOS technology AT56KRT Process.
- High Speed Performance
  - 170 ps typical gate delay (NAND, fanout 2) @ 3V
  - 800 MHz typical toggle frequency @ 3.3V
- Triple Supply Operation
  - 3.3, 3 and 2.55 V operation
  - 5V compliant
  - 5V tolerant
- Low Supply Current
  - Operating Maximum Value  
0.32 µW/gate/MHz @ 2.5V,  
0.54 µW/gate/MHz @ 3V,  
0.69 µW/gate/MHz @ 3.3V
  - Maximum Stand-by Value  
4nA/gate@ 2.5V  
5nA/gate@ 3 and 3.3V
- 472 pins maximum (MCGA 472 package)
- I/O Interface
  - CMOS, LVTTTL, LVDDDS, PCI, USB
  - Output Currents Programmable from 2 to 24 mA, by Steps of 2 mA
  - Cold Sparing Buffers (2µA maximum leakage current at 3.6V and 125°C)

- Radiation
  - qualified to 1000 Gy(Si) letter R per ESCC Basic Specification No. 22900, tested successfully to 2000 Gy(Si)
  - No Single Event Latch-up below a LET Threshold of 70 MeV/mg/cm<sup>2</sup>
  - SEU Hardened Flip-flops
- Four Arrays and Four Composite Arrays
  - Device Types  
Refer to ESCC Detail Specification No. 9202/076

(b) Component Types

This table presents the available couples (array, package) as defined in the Variants table in the Detail Specification.

| Array Designation | TH1099E  | TH1156E  | TH1242E  | TH1332E  |
|-------------------|----------|----------|----------|----------|
|                   | TH1M099E | TH1M156E | TH1M242E | TH1M332E |
| Array size        | 99K      | 156K     | 242K     | 332K     |
| Package           |          |          |          |          |
| MQFP-T352         | X        | X        | X        | X        |
| MQFP-F256         | X        | X        | X        |          |
| MQFP-F196         | X        |          |          |          |
| MCGA 472          |          | X        | X        | X        |
| MCGA 349          | X        | X        | X        |          |

2. Design

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

- MH1RT Design Manual ATD-TS-LR-R0232
- MH1RT 2V5 ASIC Library Data book ATD-TS-LR-R0236
- MH1RT 3V ASIC Library Data book ATD-TS-LR-R0235
- MH1RT 3V3 ASIC Library Data book ATD-TS-LR-R0238

ASIC designs are performed by the Atmel customer at their own site, with Atmel supported tools (front end) provided as a design tool kit.

3. Fabrication

The AT56KRT Radiation Tolerant process at Atmel Rousset is a 0.35µm CMOS, 4 metal, Ti, TiN and AlCu process.

4. Assembly

Atmel Nantes assembles the MH1RT devices at E2V Grenoble. This Technology Flow covers the following capabilities.

| Package | Die Attach                     | Wire Bond                     | Lid Seal                          | Leads     |
|---------|--------------------------------|-------------------------------|-----------------------------------|-----------|
| MQFP    | Silver Glass<br>(QMI2569)      | Ultrasonic<br>Wedge, 32 μm Al | Brazed Sealed<br>with Au/Sn Alloy | Au Plated |
| MCGA    | MCGA Cyanate Ester<br>(JM7600) | Ultrasonic<br>Wedge, 32 μm Al | Brazed Sealed<br>with Au/Sn Alloy | Sn/Pb     |

5. Test

TCVs and SEC

The TH1156E matrix is used for both test vehicles.

(a) Test Vehicle V37

The V37 is a buffer test vehicle representative of the range of buffers available for performance testing in the MQFP 256 package.

(b) Test Vehicle V38

The V38 is developed for performance and radiation testing in the MQFP 256 package. It tests the following library elements;

- LVDS input and output buffers
- PCI 3V and 5V output buffers
- PLL (125 MHz and 250 MHz)
- DPRAM memory cell for GENESYS tool

(c) SEC

The standard evaluation circuit for reliability testing is the 65609E.

6. Radiation Characteristics

The MH1RT family has been developed to fulfil the following characteristics in terms of radiation tolerance:

- Tested up to 2000 Gy(Si)
- No Single Event Latch-up below a LET Threshold of 70MeV/mg/cm<sup>2</sup>
- Availability in the library of SEU hardened cells

The radiation capability of the MH1RT family has been tested during development and evaluated in total dose and for single event effects to confirm the stated characteristics. Lot radiation verification testing is performed if specified by the procurer's purchase order requirements.

5.2 VISHAY S.A. FRANCE  
**Contact Information**

| Address  | ESCC Chief Inspector  |
|--|---|
| Vishay S.A.<br>Division Résistances de Très Haute Précision<br>199, Boulevard de la Madeleine<br>B.P. 1159<br>06003 Nice Cedex 1<br>France | Mr. E. Quehen<br>Tel: +33 4 93 37 27 27<br>FAX: +33 4 93 37 27 26<br>EMAIL: Erwan.Quehen@vishay.com |

**Initial Qualification**

| Qualification Certificate No. | Validity Dates        | Type Designation  |
|-------------------------------|-----------------------|---|
| 287                           | Feb. 2009 - Feb. 2011 | Thin Film Technology for Chip, Wraparound, Single and Network Resistors, Fixed, Based on Types P for Single Chip, PRA and CNW for Resistor Networks |

**Maintenance of Qualification**

| Qualification Certificate No. | Validity Dates       | Comment                                |
|-------------------------------|----------------------|--|
| 287A                          | Feb. 2009- Feb. 2011 | CNES application no. 287A and DCR 528. |
|                               |                      |  |
|                               |                      |  |
|                               |                      |  |
|                               |                      |  |
|                               |                      |  |

**Applicable Documents**

ESCC Generic Specification No. 4001

ESCC Detail Specification Nos. 4001/023, 4001/025

Vishay S.A. Process Identification Document PID PID-TFD P PRA CNW

**List of Qualified Components**

| Variant No. By Form Factor | Component Type                 | ESCC Detail Specification |
|----------------------------|--------------------------------|---------------------------|
| 09                         | P 0603 FR Failure Rate Level R | 4001/023                  |
| 01 and 05                  | P 0603 HR                      | 4001/023 (1)              |
| 10                         | P 0805 FR Failure Rate Level R | 4001/023                  |
| 02 and 06                  | P 0805 HR                      | 4001/023 (1)              |
| 11                         | P 1206 FR Failure Rate Level R | 4001/023                  |
| 03 and 07                  | P 1206 HR                      | 4001/023 (1)              |
| 12                         | P 2010 FR Failure Rate Level R | 4001/023                  |
| 04 and 08                  | P 2010 HR                      | 4001/023 (1)              |
| 01 to 07 and 22 to 28      | PRA 100 HR                     | 4001/025                  |
| 08 to 14 and 29 to 35      | PRA 135 HR                     | 4001/025                  |
| 15 to 21 and 36 to 42      | PRA 182 HR                     | 4001/025                  |

**NOTES:**

- Note that gold finish variants are not intended for de-golding and tinning.

**Technology Flow Abstract**

- Technology Flow

The thin film technology for chip, fixed, wraparound, single and network resistors are designed on types based on P for single chip, PRA for 2 to 8 resistors of similar value and CNW for 2 to 8 resistors with at least two different values with the same form factor as PRA.

| Technology Flow | Scope   | Site   |
|-----------------|---|--|
| Design Centre   | Single resistor chips in 0605, 0805, 1206 and 2010 formats<br>2 to 8 resistors of similar value in formats 0603, 0805 and 1206<br>2 to 8 resistors with at least 2 different values with the same form factor, 0603, 0805 or 1206 | Vishay S.A.<br>Division Résistances de Très Haute Précision<br>199, Boulevard de la Madeleine<br>B.P. 1159<br>06003 Nice Cedex 1<br>France |
| Fabrication     | Film deposition<br>Photolithography<br>Thermal treatment<br>Passivation<br>Thermal stabilization and control  | As above   |
| Assembly        | Laser trim<br>Protective layer<br>Termination and Test  | As above   |
| Test            | Chart 2, 3 and 4<br>Periodic Testing  | As above   |

(a) Basic Information

The technology consists of:

- Substrate: High purity alumina (99.5%)
- Resistive Layer: Nickel chromium
- Protection: Silicon Nitride
- Termination: Nickel barrier
- Processes: Thin film deposition
- Finish: SnPbAg or Au

Critical resistance by style:

- P 0603 FR: 25 k $\Omega$
- P 0603 HR: 12.25 k $\Omega$
- P 0805 FR: 80k $\Omega$
- P 0805 HR: 45 k $\Omega$
- P 1206 FR: 90 k $\Omega$
- P 1206 HR: 40 k $\Omega$
- P 2010 FR: 80k $\Omega$
- P 2010 HR: 45 k $\Omega$
- PRA 100: 12.25 k $\Omega$
- PRA 135: 56.25 k $\Omega$
- PRA 182: 100 k $\Omega$

(b) Component Types

The available formats are defined in the variants table in the Detail Specifications.

Variants with established reliability in accordance with Basic specification No. 26000 are designated with an "FR" suffix here for convenience. Variants 09, 10, 11 and 12 have established reliability level 'R' at 60% confidence level.

2. Design

The design manual covers the design rules and limits:

- HP-BE/001 (Maîtrise de la conception)
- HP-BE/004 (Données technologiques, Règles d'implémentation, Performances)

Critical design characteristics:

- Minimum metal width: 10 $\mu$ m
- Power dissipation lower than 250mW/mm<sup>2</sup>
- Current density lower than 7000 A/mm<sup>2</sup>
- Electrical field lower than 5V/ $\mu$ m

3. Fabrication/Assembly

The manufacturing flows and procedures are described in section 4 of Vishay S.A.PID.

4. Test

Complete test sequence as detailed in ESCC Generic 4001 and the relevant Detail Specifications is conducted by Vishay S.A..

The deletion of the Third Harmonic Control requirement from ESCC Detail Specification No. 4001/023 for thin film wraparound technology is documented in reference report MAT/3HC/07.02 revision 3 dated 2007-06-20.

For variants with established reliability the efficiency of the Overload Test is increased with

the implementation of a resistance change rejection criteria of 500 ppm and approved by TRB decisions on 2007-04-04.

5. Radiation Characteristics

The resistors covered in this technology domain is considered insensitive to radiation effects.