

FULLY INTEGRATED RAIN RFID TRANSPONDER

DESCRIPTION

em|aura-air corresponds to the latest generation of EM Microelectronic RAIN RFID devices, providing state-of-the-art EPC Gen2v2 capabilities with integrated on-chip antenna.

Targeted applications and market segments include industrial, automotive, and aerospace track & trace applications as well as asset management. A tag or label based on the em|aura-air provides multiple benefits and usages via the RAIN communication interface like stock inventory, product returns, and data privacy.

Leveraging its integrated coil antenna, em|aura-air can be either used in short-range applications or provide long read range through a magnetically coupled external secondary booster antenna.

The chip supports ISO/IEC18000-63 and EPC™ Gen2v2 protocols and offers a user configurable non-volatile memory.

APPLICATIONS

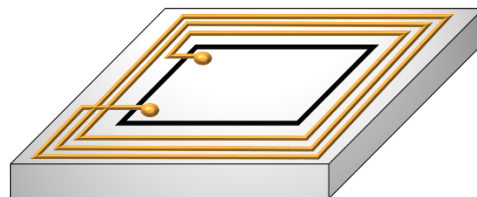
- | Inventory and supply chain management
- | Track & trace
- | Industrial, automotive, and aerospace logistics

FEATURES

- | Advanced RAIN RFID technology
- | ISO/IEC 18000-63 compliant
- | EPC™ Generation-2 Version 2 (Gen2v2) compliant:
 - Alteration EAS compliant
 - Tag Alteration (Core) compliant
- | 96-bit TID unique IC serial number
- | Up to 480-bit EPC/UII encodings
- | 1984-bit User memory
- | Read range :
 - ~10mm in near field communication
 - Up to 10m in far field communication with booster antenna
- | Minimum 100k write cycles endurance
- | Minimum 10 years data retention
- | Extended temperature range: -40°C to +85°C
- | Sawn wafers, 6-mil thickness



RAIN RFID is a trademark of the RAIN RFID Alliance.
EPC is a trademark of EPCglobal Inc.



1. ELECTRICAL SPECIFICATIONS

1.1. ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Min.	Max.	Unit
Storage temperature	T _{STORAGE}	-50	125	°C
RF power at on-chip antenna level ¹⁾	P _{MAX-ABS}		36	dBm
Electrostatic discharge on all pads/pins ²⁾	V _{ESD}	-2000	2000	V

Note 1: 4W EIRP reader output power

Note 2: Human Body Model (HBM; 100pF; 1.5kOhm) for all combinations between pads/pins. ESD measurements are made with die mounted into CDIP packages without on-chip antenna and before applying polyimide (PI) layer over all pads

Stresses above these listed maximum ratings may cause permanent damages to the device. Exposure beyond specified operating conditions may affect device reliability or cause malfunction.

1.2. HANDLING PROCEDURES

This device has built-in protection against high static voltages or electric fields; however, anti-static precautions must be taken as for any other CMOS component. Unless otherwise specified, proper operation can only occur when all terminal voltages are kept within the voltage range. Unused inputs must always be tied to a defined logic voltage level.

1.3. OPERATING CONDITIONS

Parameters	Symbol	Min.	Max.	Unit
Operating temperature	T _{OP}	-40	+85	°C
Operating RF power at on-chip antenna level	P _{MAX-OP}		30	dBm
RF carrier frequency	f _A	860	960	MHz

1.4. ELECTRICAL CHARACTERISTICS

Operating conditions (unless otherwise specified): T_{OP} = 25°C.

Parameters	Symbol	Conditions	Min.	Typ.	Max.	Unit
On-chip antenna inductance ³⁾⁴⁾	L _{OCA}	f _A =866MHz f _A =915MHz		31 34		nH
Tag read distance ⁵⁾⁶⁾⁷⁾⁸⁾	D _{READ}	At resonance frequency		13		mm
Tag write distance ⁵⁾⁶⁾⁷⁾⁸⁾	D _{WRITE}	At resonance frequency		8		mm

Note 3: Measured directly on wafer in stand-alone with a 100Ω differential network analyzer

Note 4: Single-layer three-turn on-chip antenna in a 1.5mm square form with 25μm wire width and 5μm wire space

Note 5: Measured with near-field reader antenna (single-turn loop antenna printed on an FR4 board) matched to 50Ω with 1W output power

Note 6: Interrogator using PR-ASK modulation with link parameters Tari = 25 μs, PR = 1.5, BLF = 256 KHz with Miller-4 encoding

Note 7: On-chip antenna surface parallel to reader antenna surface

Note 8: Read range is dependent of reader antenna model, power and environment

1.5. NVM ELECTRICAL CHARACTERISTICS

Parameters	Symbol	Conditions	Min.	Typ.	Max.	Unit
Erase / write endurance	T _{CYC}	T _{OP} = 25°C	100,000			Cycles
Retention	T _{RET}	T _{OP} = 55°C	10			Years

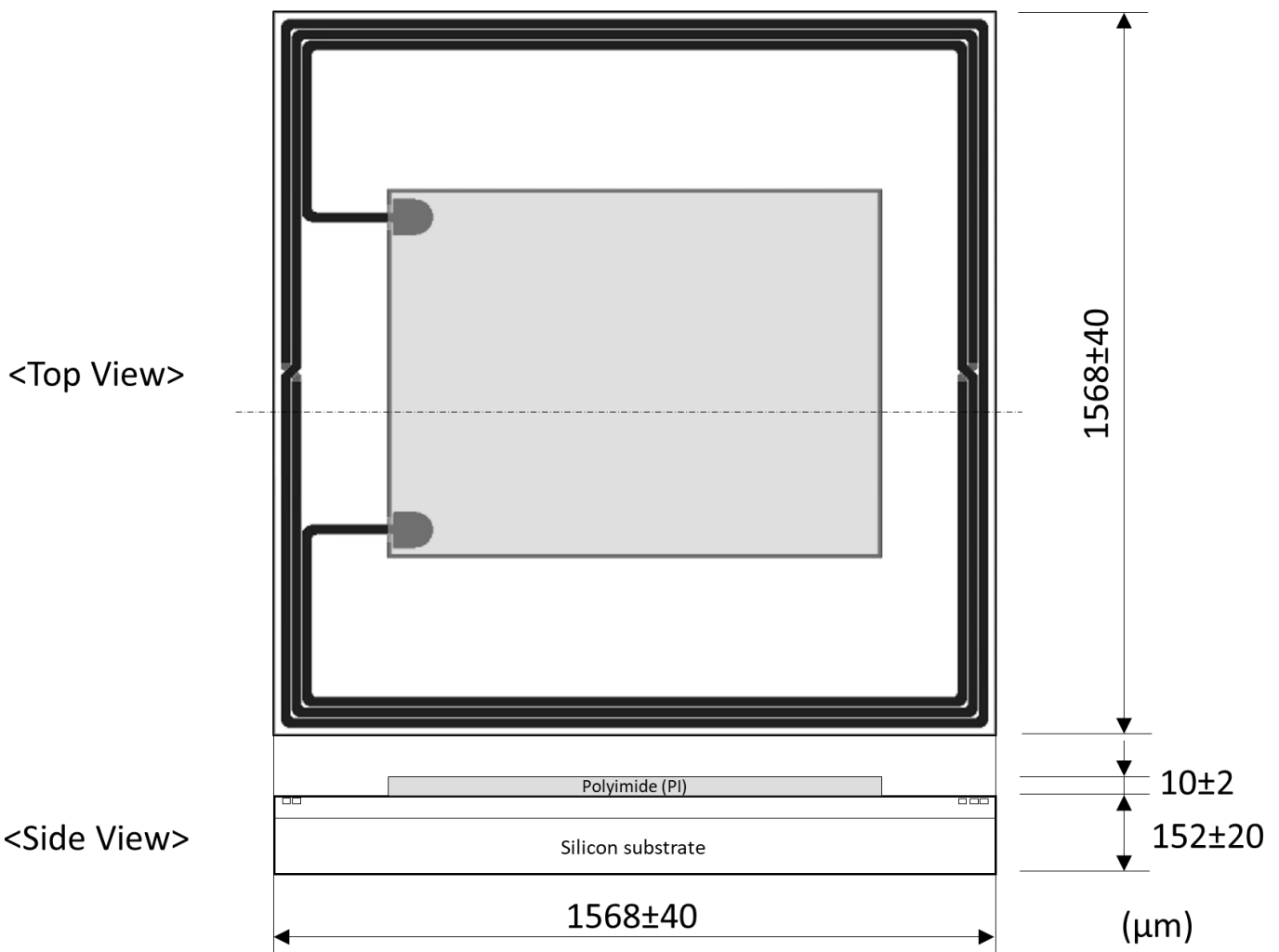
2. PRODUCT OVERVIEW

em|aura-air is used in passive transponder applications and includes an integrated coil antenna, supporting direct short-range communication as well as long range communication using an external secondary antenna. It is powered by the RF energy transmitted by the UHF reader, which is received by the on-chip antenna and then rectified to generate a supply voltage for the IC.

This device is compliant with the following UHF standards:

- "ISO/IEC 18000-63:2015 Information technology – Radio frequency identification for item management – Part 63: Parameters for air interface communications at 860 MHz to 960 MHz Type C", Publication Date: 2015-10
- "EPC™ Radio-Frequency Identity Protocols, Generation-2 UHF RFID, Specification for RFID Air Interface Protocol for Communications at 860 MHz - 960 MHz, Release 2.1, Ratified, Jul 2018" from GS1 EPCglobal Inc.

3. IC DIAGRAM



4. ORDERING INFORMATION

The versions below are considered standard and should be readily available. For other delivery form, please contact EM Microelectronic-Marin S.A. For samples, please order exclusively from the standard versions.

Part Number	Package / Die Form	Delivery Form
EM4018V02WB6P	Sawn wafer + PI only – thickness of 6 mils	T&R / Blister



5. PRODUCT SUPPORT

This document is a short datasheet, an extract from a full datasheet with the same product type number(s) and title. It is intended to be used as a quick reference only and therefore should not be relied upon to contain detailed and full information.

For detailed and complete information see the relevant full datasheet, which is available on request through our website at www.emmicroelectronic.com by using the contact form. Questions can be submitted to rfidsupport@emmicroelectronic.com.

EM Microelectronic-Marin SA ("EM") makes no warranties for the use of EM products, other than those expressly contained in EM's applicable General Terms of Sale, located at <http://www.emmicroelectronic.com>. EM assumes no responsibility for any errors which may have crept into this document, reserves the right to change devices or specifications detailed herein at any time without notice, and does not make any commitment to update the information contained herein.

No licenses to patents or other intellectual property rights of EM are granted in connection with the sale of EM products, neither expressly nor implicitly.

In respect of the intended use of EM products by customer, customer is solely responsible for observing existing patents and other intellectual property rights of third parties and for obtaining, as the case may be, the necessary licenses. This specific RFID product is manufactured under one or more licenses, which contain certain exclusions. This product may not be sold, used, leased, offered for sale, or otherwise transferred, exported, and imported in the Transportation Market. "Transportation Market" means (i) Electronic Toll and Traffic Management (ETTM), (ii) Public Sector Vehicle Registration, Inspection and Licensing Programs, (iii) Railroad Locomotive and Wagon Tracking, (iv) airport based ground transportation management systems (GTMS) and taxi dispatch, (v) revenue based parking, and (vi) vehicle initiated mobile payment applications, where the RFID sticker/tag is initially attached to the vehicle but not incorporated at the point of vehicle manufacture.

Important note: The use of EM products as components in medical devices and/or medical applications, including but not limited to, safety and life supporting systems, where malfunction of such EM products might result in damage to and/or injury or death of persons is expressly prohibited, as EM products are neither destined nor qualified for use as components in such medical devices and/or medical applications. The prohibited use of EM products in such medical devices and/or medical applications is exclusively at the risk of the customer.