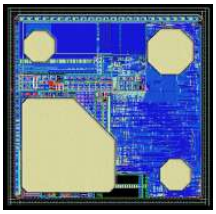
Higgs™-EC With Sentinel™ Memory

High Sensitivity EPCglobal Gen 2 RFID Tag IC

Featuring industry leading **data integrity & reliability**, Higgs-EC™ provides superior **read / write sensitivity** for all high-volume & general applications for the evolving IoT information base.



SENTINEL MEMORY

- High-Volume Retail
- Vehicle Tracking

Applications

- Product Authentication
- Supply-Chain & Logistics

Feature	Description	Benefit
Sentinel™ Memory	**Detects and fixes** single bit errors and **flags** dual bit errors	Safeguarded data and immunity to typical sources of single bit errors (chip damage, low power etc.)
Read sensitivity	Up to -20 dBm*	Allows smaller tags to be designed or larger read & write distances to be realized.
Write sensitivity	Up to -17 dBm*	
Best in class memory reliability	**200,000 write** cycles, two times that of competitors	More robust memory for high-write applications
96 and 128b EPC	Support EPC size up to 128b for flexibility.	Additional 32b allows storing of larger identifying information.
128b user memory	User memory for storage of additional application data.	Enables Higgs-EC to be used in applications where more memory is required.
48b UTID with lower 38b unique serial for SGTIN generation ENHANCED	48b UTID. Lower 38b are duplicated in the EPC for SGTIN generation.	Simplifies retail usage and generation of unique industry standard SGTIN's.
Larger "pads" for improved antenna connectivity ENHANCED	More contact area for antenna connectivity	Reduces inlay to inlay variation and enables less well tuned equipment to produce higher quality inlays

*on a 2.15 dBi gain dipole antenna

Features:

- Designed to meet EPCglobal Gen2 (V1.2.0) and ISO/IEC 18000-6C
- Worldwide operation in the RFID UHF bands (840-960 MHz)
- 512-Bits of NVM/RAM Memory
  - Up to 128-EPC Bits (nominally 96 bits)
  - 128 User Bits
  - **48 Bit Unique TID**
  - 32 Bit Access and 32 bit Kill Passwords
- Pre-Programmed with a unique, unalterable 64-bit serial number
- User Memory can be Block Perma-Locked as well as read password protected in 32 Bit Blocks
- Low power operation for both read and program
- QuickWrite™ / BlastWrite™- High-speed chip & mass programming
- Dynamic Authentication™ - anti-cloning/ anti-counterfeit technology
- Exceptional operating range, up to 13m with appropriate antenna.

Product Overview:

Higgs-EC offers a new approach to RFID. Higgs-EC leverages from the successful and proven Higgs family from Alien Technology® and now adds the industry's most robust memory architecture. As RFID tag volumes grow, even the small percentage of bit errors inherent to semiconductors becomes problematic. Higgs-EC provides a leapfrog in RFID technology by providing **self-correcting memory**.

Memory in Higgs-EC is protected by the "Sentinel" architecture that guards memory by **both** *detecting* single bit corruption regardless of cause **and** then *fixing* the error. As far as the tag user is concerned, the error never happened. Additionally Sentinel detects two bits in error and notifies the reader if this ever happens.

Higgs-EC also provides **class-leading read *and* write sensitivity** enabling smaller tags to be designed or tags to be used across longer distances from the RFID reader antenna. Both read and write sensitivities are enhanced benefiting both types of applications.

Higgs-EC is fully backwards compatible with Alien's other Higgs ICs. For example, Alien's mass-encoding capabilities (*Quick***Write**™ and *Blast***Write**™) and Aliens anti-cloning technology (Dynamic Authentication™) are supported.

Operating Conditions & Electrical Characteristics

Symbol	Parameter	Conditions / Capability	Min	Typ	Max	Units
Operating Conditions						
T_A	Operating Temperature		-50		+85	°C
f_{in}	Operating Frequency		840		960	MHz
Electrical Characteristics						
S_R	Sensitivity during Read	Bare die measurement, 50 Ohm impedance, Calibrated Voyantic™ measurement system		-17.8		dBm
S_w	Sensitivity during Write			-14.8		dBm
I_S	Interference Signal Suppression			-4		dB
R_P	Equivalent input parallel resistance	At -22.5 dBm input power		2,500		Ohms
C_P	Equivalent input parallel Capacitance	At -22.5 dBm input power		0.85		pF
D_{ret}	Data Retention			50		Years
P_{cycl}	Programming Cycles at 25°C			**200,000**		Cycles

Physical Die Characteristics

Dimension	Description	Size	Units
x	Horizontal die length	490	µm
y	Vertical die height	479	µm
z	Die thickness	150 ±10	µm

Memory Map

Bank	Address	Description	Memory	Bits
User	00h – 7Fh	User	NVM	128
TID	60h & above	Device Configuration	ROM-NVM-SRAM	-
	30h – 5Fh	**Unique Tag ID Unalterable****	**NVM**	**48****
	00h – 2Fh	XTID*/TID EPC/TMD/TMDID/TMN	ROM	48*
EPC	20h – 9Fh	EPC #	NVM	128
	10h – 1Fh	EPC-PC	NVM	16
	00h – 0Fh	EPC-CRC	RAM	16
Reserved	20h – 3Fh	RES-Access Pwd, EPC optional	NVM	32
	00h – 1Fh	RES-Kill Pwd	NVM	32

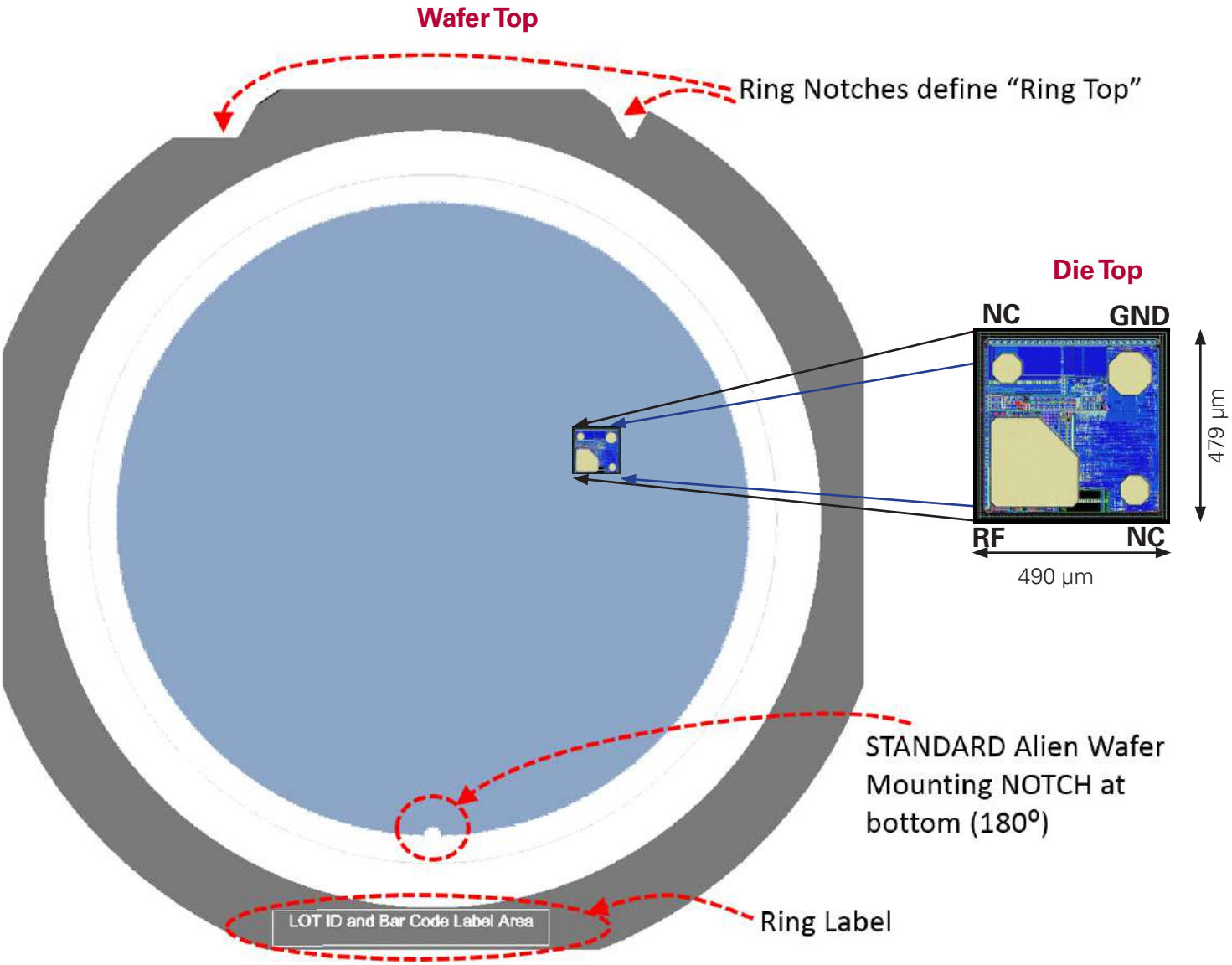
*Higgs-EC follows the XTID TID format which manifests in an additional word between the manufacturer code and the UTID words versus Higgs-3 and Higgs-4. To read the same UTID word in Higgs-EC as in Higgs-4, shift the read location by one word. All other memory banks are identical to Higgs-4 (e.g. Reserved, EPC and User memory are the same as Higgs-4).

****Lower 38 bits contain a unique serial number that is already copied to the lower 38b of the EPC. These lower 38b of the UTID may be copied again if the EPC is deleted. The 38b consist of a lower 35 serial number + 3b Alien chip ID (Higgs-EC = 010 binary)**

Ordering Information

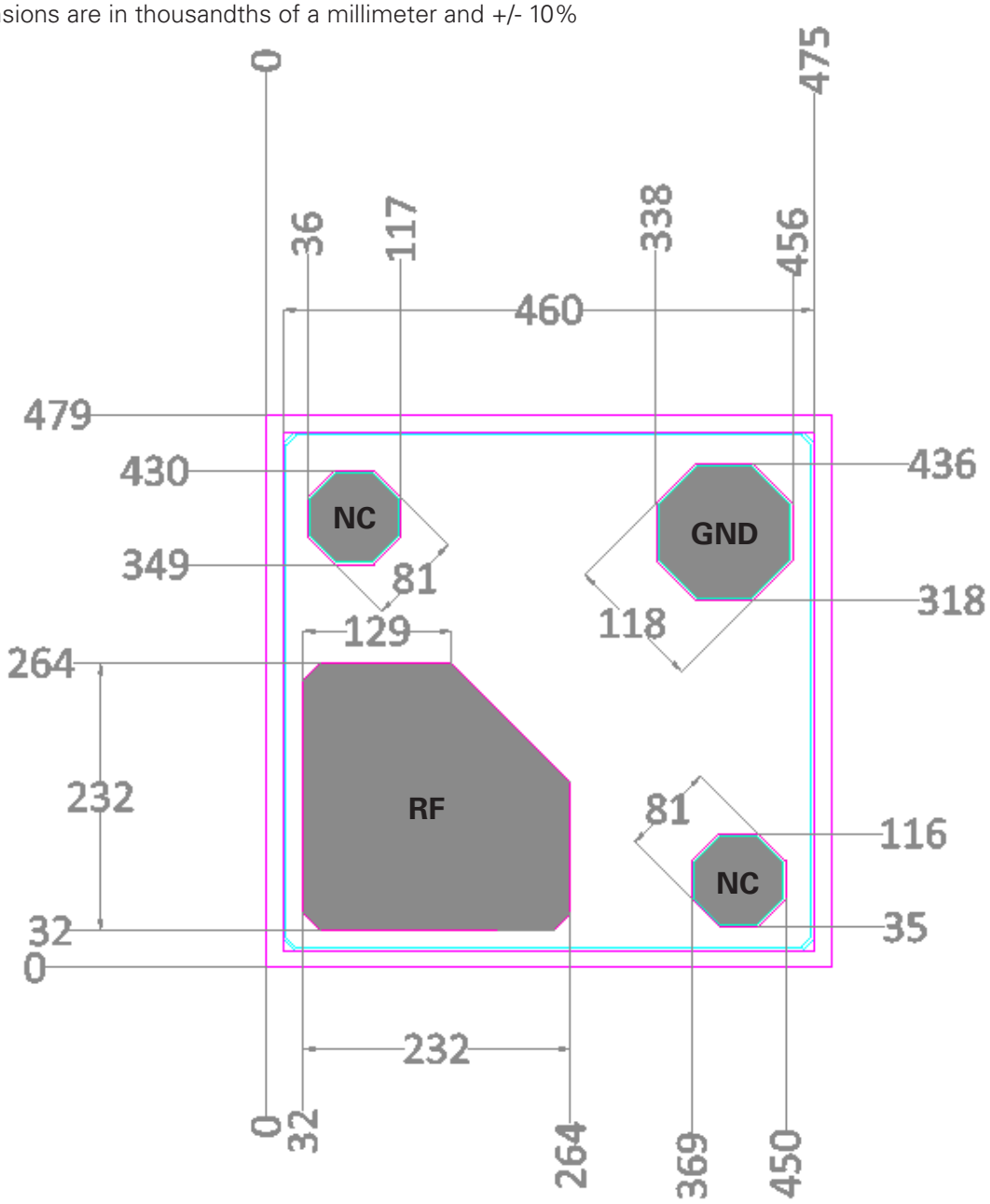
Part	Model Number	Description
Higgs™ EC IC	ALC-380-IC2	Bumped, Tested, Ground & Sawn IC's. Provided on 8 Inch Wafer, UV Tape Mounted (SEMI/JIS Standard Metal Film Frame)

Wafer and Die Size and Orientation



Pad Placement and Dimensions

All dimensions are in thousandths of a millimeter and +/- 10%



February 21, 2020

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