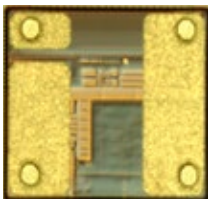
Higgs™ 9

High Capacity GS1 Class 1 Gen 2 RFID Tag IC

Featuring industry leading **data integrity & reliability**, **Higgs 9™** delivers cutting edge **read / write sensitivty** and **flexible memory capacity** designed to fit with today's demanding applications and the evolving IoT information base.



Featuring

SENTINEL™ MEMORY

Applications

- **Aviation**
- **Automotive**
- **Dynamic memory structure**
- **High sensitivity**

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 -22.5 dBm	Allows smaller tags to be designed or larger read & write distances to be realized.
Write sensitivity	Up to -19 dBm	
Best in class memory reliability	**200,000 write** cycles	Robust memory retention (twice that of competition
96 bit expandable EPC	Supports EPC size up to 496b for flexibility.	Additional 400 bits allows storing of larger identifying information.
688 bit user memory	User memory for storage of additional application data.	For applications requiring data beyond EPC (asset data, service history, usage info etc.)
48b UTID with lower 38b unique serial for SGTIN generation	48b UTID. Lower 38b are duplicated in the EPC for SGTIN generation.	For retail and general serialzation
Larger "pads" for improved antenna connectivity	More contact area for antenna connectivity	Increased and more consistent yield inlay to inlay

Features:

- Compliant to GS1 Class 1 Gen 2 and ISO/IEC 18000-6C
- Worldwide operation in the RFID UHF bands (840-960 MHz)
- 1024-Bits of NVM/RAM Memory
  - Up to 496-EPC Bits (nominally 96 bits)
  - Up to 688 User Bits
  - **48 Bit Unique TID**
  - 32 Bit Access and 32 bit Kill Passwords
- Pre-Programmed with a unique, unalterable 48-bit serial number
- User Memory can be Block Perma-Locked as well as read password protected in 256 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:

Featuring pioneering Sentinel Memory™ bit error correction, world class sensitivity, expandable EPC memory and expansive User Memory, **Higgs 9** offers cutting edge performance and data storage capability suitable for today's ever evolving and demanding application base.

Ideal for the high memory requirements of Aviation part tagging / tracking and any application requiring data storage at tag and asset level. In addtion, applications requring asset data and/or longer serialization in the EPC memory area may utilize Higgs 9's configurable EPC memory. Up to 496 bits (124 Hexadecimal characters) may be written to the EPC memory area. This allows increased flexibility to store data such as extended serial numbers, product SKU #, service hours, dates, history etc.

Like all Alien ICs, Higgs 9 is fully backward compatible with the entire Alien IC and Reader porfolio feature-set. 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	+25	+85	°C
f_{in}	Operating Frequency		840		960	MHz
Electrical Characteristics						
S_R	Sensitivity during Read	With 2dBi directivity of dipole			-22.5	dBm
S_w	Sensitivity during Write	With 2dBi directivity of dipole			-19	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	566	µm
y	Vertical die height	453	µm
z	Die thickness	150 +/- 10	µm

Memory Map

Bank	Address	Description	Memory	Bits
User	000h – 2AFh	User	NVM	688
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 – 7Fh	EPC #	NVM	96
	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

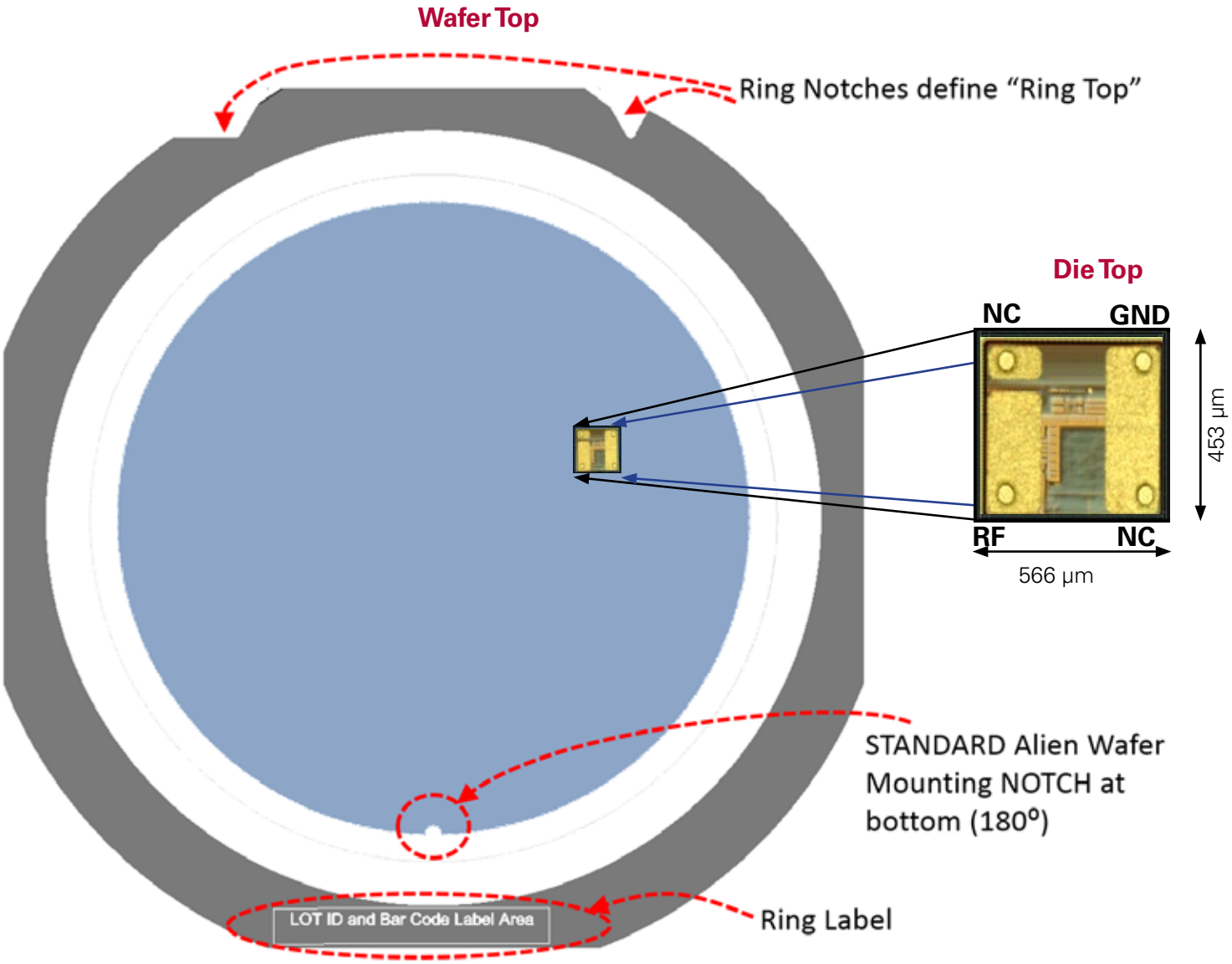
*Higgs 9 follows the XTID TID format which manifests in an additional word between the manufacturer code and the UTID words versus Higgs-3 and Higgs-4. To read the same UTID word in Higgs 9 as in Higgs-4, shift the read loacation by one word. All other memory banks are identical to Higgs-4 (e.g. Reserved, 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 9 = 010 binary)**

Ordering Information

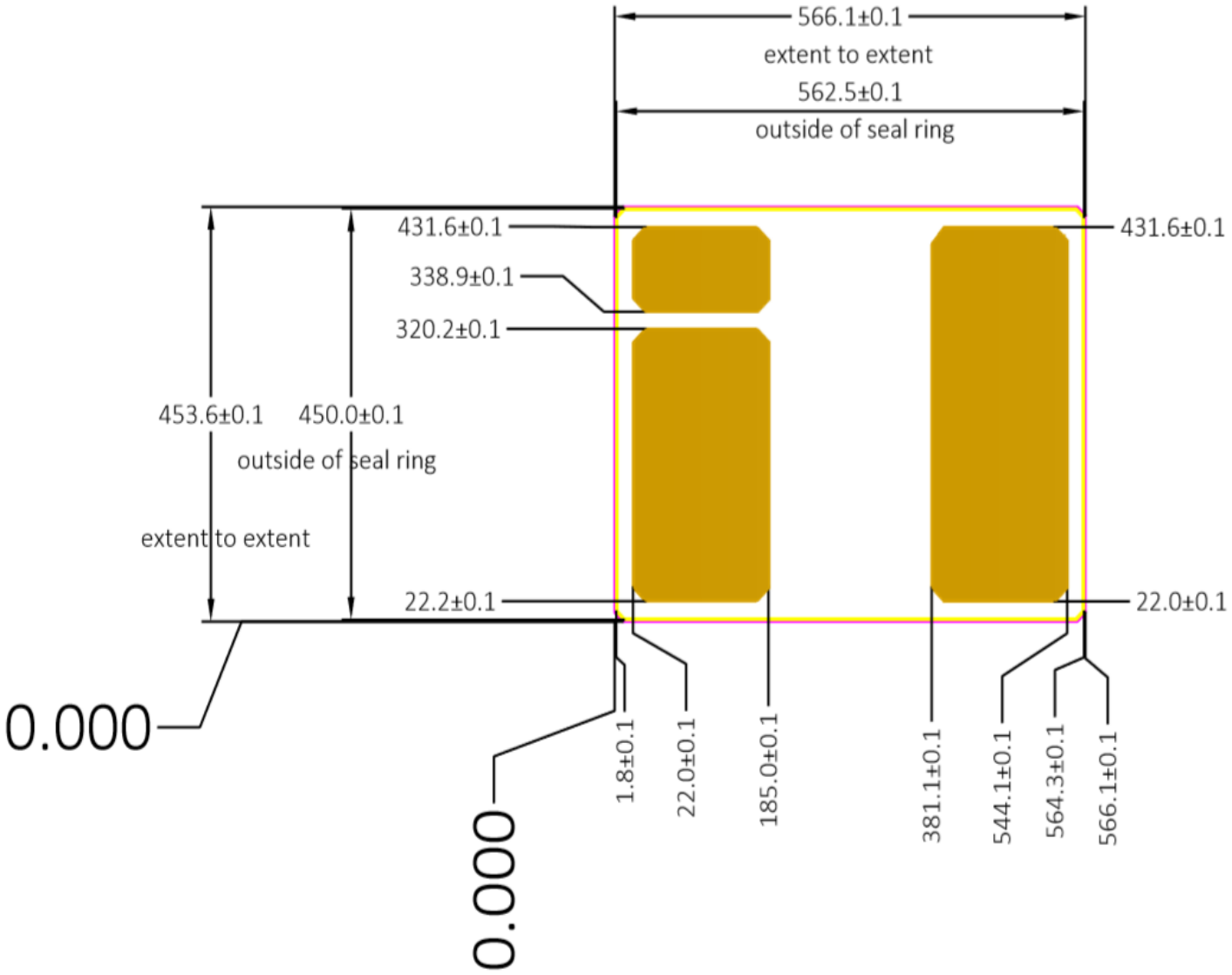
Part	Model Number	Description
Higgs 9™ IC	ALC-390-IC	Bumped, Tested, Ground & Sawn IC's. Provided on 8 Inch Wafer, UV Tape Mounted (SEMI/JIS Standard Metal Film Frame)

Wafer and Die Size and Orientation



Pad Placement and Dimensions

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



February 4, 2019

Alien Technology
845 Embedded Way.
San Jose, CA 95138
www.alientechnology.com