

Higgs™-3 Features

April 10, 2008



Higgs 3 – The Next Generation

Attribute	Feature	Application
Authentication	<ul style="list-style-type: none"> • Unique 64 Bit TID • Factory Programmed • Unalterable 	<ul style="list-style-type: none"> • Anti-Counterfeiting • Product Diversion • Product Recalls
Security	<ul style="list-style-type: none"> • Read & Write Password • 32 Bit Passwords • Block Level Access 	<ul style="list-style-type: none"> • Anti-Snooping • Public / Private Data • Authorized Access
Memory	<ul style="list-style-type: none"> • 512 Bits of User Memory • Extensible EPC Number • High Speed Programming 	<ul style="list-style-type: none"> • Service History • Chain of Custody • Legacy Part Numbers
Interoperability	<ul style="list-style-type: none"> • Compatible / Interoperable • Designed to EPC 1.2 • All Mand. & Opt. Cmds. 	<ul style="list-style-type: none"> • Works with Gen 2 Readers
Sensitivity	<ul style="list-style-type: none"> • 25% > Higgs-2 • 50% > The Competition 	<ul style="list-style-type: none"> • Difficult Materials • Smaller Tags • High Read Rates



Higgs-3 Authentication

- **Unique 64-bit TID** [1.8×10^{19} Unique Numbers]
- **Factory Pre-programmed (Default)**
 - Can not be changed once programmed
- **Applications**
 - Anti-Counterfeiting, Product Diversion, Product Recall



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Public Information



Higgs-3 Authentication

Tag #1: Authentic Tag

96-bit Factory Programmed Unique TID

E200 3412 3333 2222 1111 0000



96-bit EPC ID

1111 2222 3333 4444 5555 6666

Tag #2: Attempted Duplicate Tag

Note: TID is
Factory
Programmed
and Unique

96-bit Factory Programmed Unique TID

E200 3412 3333 2222 1111 0001



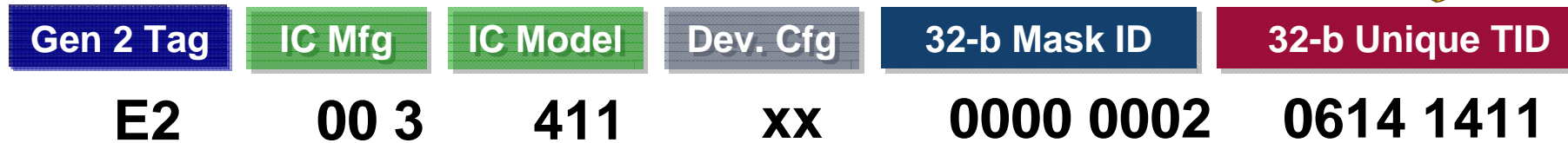
96-bit EPC ID

1111 2222 3333 4444 5555 6666



Higgs-2 Data Structure (Reference Only)

Tag Identifier (TID) – Permanent Data



Typical 96- bit EPC Tag Structure



User Memory

No User Memory



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Public Information



Higgs-3 Data Structure

Tag Identifier (TID) – Permanent Data



Gen 2 Tag	IC Mfg	IC Model	64-bit Factory Programmed Unique ID
E2	00 3	412	0614 1411 0073 4886

Typical 96- bit EPC Tag Structure

Header	Filter	Partition	Company Prefix	Item Reference	Serial Number
48	3	5	0614141	100734	203886

Extended User Memory

512-bits (64 Chars)

9064 6431 2073 4836 0604 2471 9073...4883



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Public Information



Higgs-3 Security

- **32-bit Access Password**
 - Bank & Block Level Access Control
 - Read and/or Write Access
- **Gen 2 Bank Commands** [Reserved, EPC, TID, User]
 - Lock – Prevents Writing to a Bank
 - Unlock – Re-enables Writing to a Bank
 - PermaLock – Prevents Writing to a Bank; Permanent
 - PermaUnlock – Enables Writing to a Bank; Permanent
- **Gen 2 Block Commands** [User Memory Bank]
 - BlockPermaLock – Gen 2 v 1.2 Optional Command
 - Prevents Writing to a Block; Permanent
 - BlockReadLock – Alien Custom Command
 - Prevents Reading a Block



Higgs-3 Bank / Block Structure

Reserve Bank (0)

Kill Password

Access Password

EPC Bank (1)

EPC Number

TID Bank (2)

Gen 2 Tag

IC Mfg

IC Model

64-bit Factory Programmed Unique ID

User Bank (3)

Block 1

Block 2

Block 3

Block 4

Block 5

Block 6

Block 7

Block 8



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Public Information



User Memory Security States

USER MEMORY - BANK 3	Access Password	Write Permissions	Read Permissions
	User Memory	[BlockPermaLock]	[BlockReadLock]
		Block 1 (Bits 1-64)	1
	Block 2 (Bits 65-128)	1	0
	Block 3 (Bits 129-192)	0	1
	Block 4 (Bits 193-256)	1	0
	Block 5 (Bits 257-320)	0	0
	Block 6 (Bits 321-384)	0	0
	Block 7 (Bits 385-448)	0	0
	Block 8 (Bits 449-512)	0	0



Higgs-3 Memory

- **512-bits of User Memory**
- **EPC Number Extensible to 496-bits (Protocol Limit)**
 - Exchange with User Memory
- **Memory Commands to Accelerate Loading Data**
 - **BlockWrite**
 - Writes “blocks” of Data to Limit of Bank
 - **FastLoad – Alien Custom Command**
 - Loads EPC & TID Lock Bits
 - **LoadImage – Alien Custom Command**
 - Loads User, EPC & TID Lock Bits
- **Applications**
 - Legacy Part Numbers, Service Records, Chain of Custody
 - Other Standard Part Numbering Conventions



EPC Number Extension vs. User Memory

Default Memory Configuration (Max User Bits)

EPC

User Memory

96-bits

512-bits

Exemplary Memory Configuration (split EPC / User Bits)

SGTIN-198

User Memory

208-bits

384-bits

Exemplary Memory Configuration (Max EPC bits)

Maximized EPC Scheme

User Memory

496-bits

64-bits

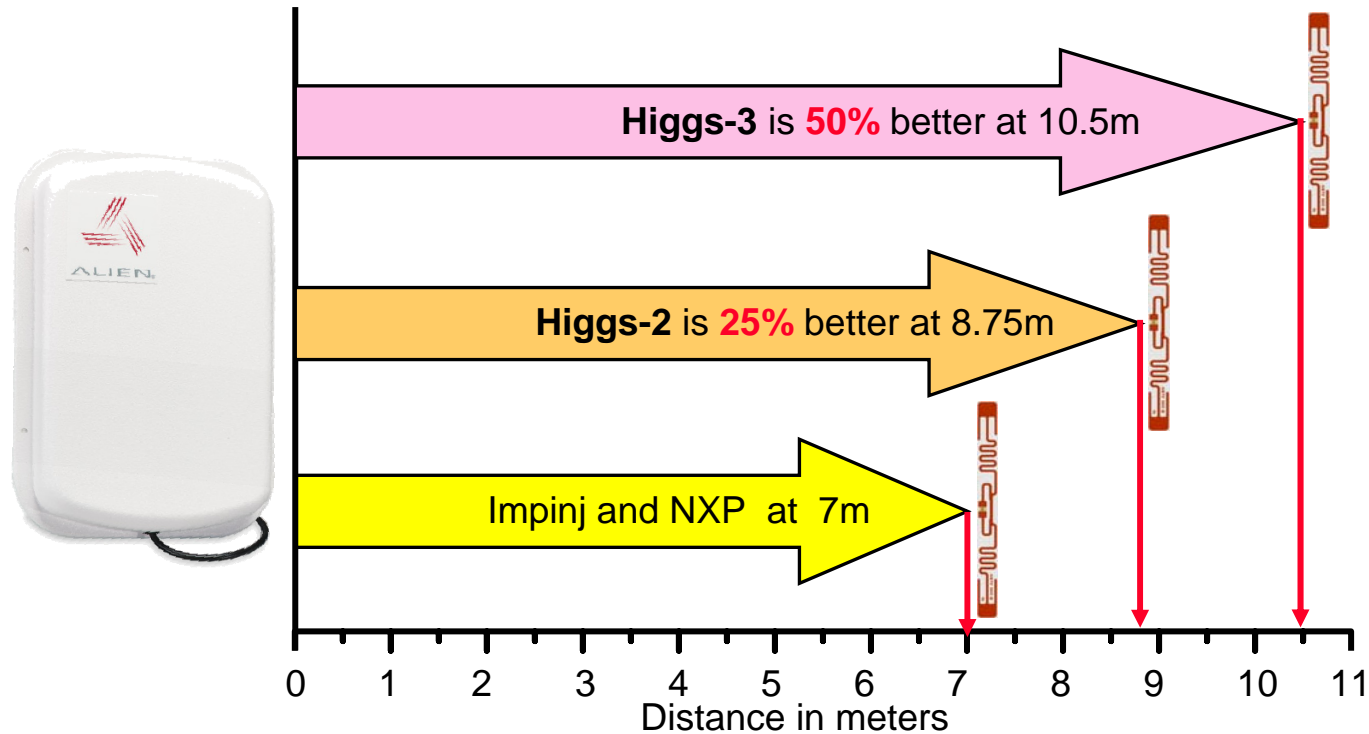


Higgs-3 Interoperability

- **EPC Gen 2 Certification**
 - Compatibility & Interoperability Completed
 - Initial Release – EPC v1.10 with Enhancements
 - Designed to – EPC v1.2 (Pending Ratification)
- **Commands Supported**
 - All Mandatory & Optional Commands
 - Item Level Commands
 - Custom Commands
 - **FastLoad** - Loads just EPC and Lock Bits
 - **LoadImage** - Loads and Entire Image File



Higgs-3 Sensitivity

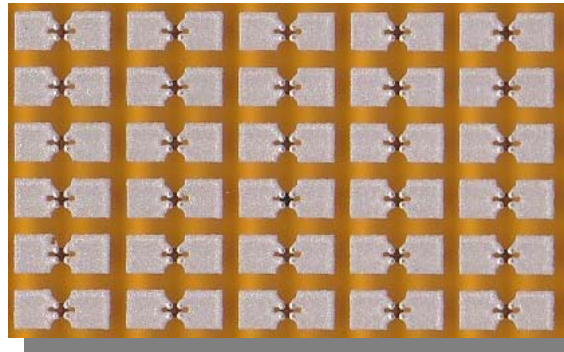


Note: All silicon testing conducted with optimized Squiggle antenna design (e.g. ALN-9440, ALN-9540 and ALN-9640 inlays) to isolate IC performance vs. introducing tag antenna differences.

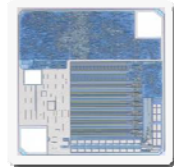


Higgs™3 RFID IC Packaging Options

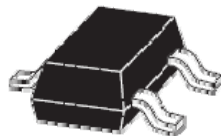
STRAPS



FLIP CHIP



SMD



Consult with Alien for specific options and availability.



Higgs-3 Summary

- **The Next Generation of RFID ICs**
 - Authentication / Security
 - 64-b Unique Serial Number & Read Password
 - Extended Memory
 - 512-b Memory; Extensible EPC, Addressable Blocks
 - More Sensitivity
 - Even better Higgs-2; the Industry's Best
- **Complements Higgs-2**
 - Some Customers simply need a 96-bit EPC Number
- **Available in Strap, Flip Chip, SMD**
 - Addressing Customer Demand

