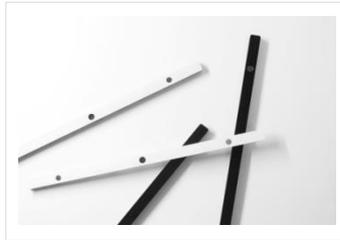


TITANTAG™ DATA SHEET



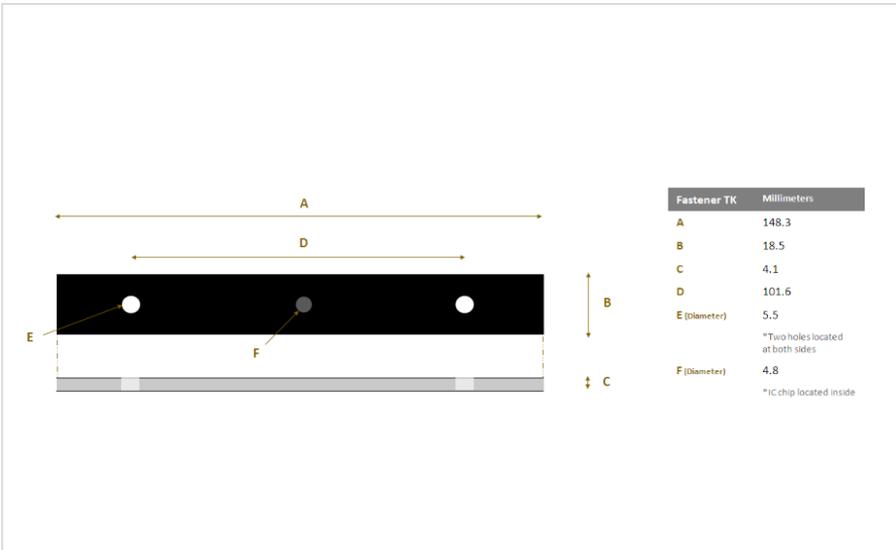
TITANTAG™ Fastener TK

Frequency	UHF 865-868MHz
Protocol	ISO18000-6-C EPC Class 1 Gen2
Dimensions (mm)	W148 H18 T4.1
Weight (gram)	21.4
RFID chip	Alien Higgs3
Memory (bits)	TOTAL 800
	EPC up to 480 User up to 512
Reads (up to meters)	12.0 (On metal)
	11.0 (Off metal)
Human readable marking options	1D/2D Barcode, text& image marking by laser engraving and label printing
Attaching options	Backing adhesive or metal fasteners
Operating temperature	-30<>80°C
Storage temperature	-40<>150°C
IP class	IP68
Year of release	2013
Product code	148184E

[1] Feature



[2] Dimensions



[3] Key materials and processes

Silicon chip Alien Higgs3

- Read sensitivity of -20dBm – Best performing among UHF Gen 2 RFID chips
- Total 800bits memory – EPC 96bits (extendable to 480bits), User 512bits, TID 64 bits, Access& Kill password each 32bits and Lock password 64bits
- Most widely adopted chip for metal mounting UHF RFID tags
- RFcamp has adopted Alien Higgs3 since year of 2008.

www.aliantechnology.com/wp-content/uploads/ALC-360%20Higgs3%202014-12-21.pdf

Antenna PCB FR4, Copper etched, Gold plated

- FR4 (Fire retardant 4, composed of woven fiberglass cloth with an epoxy resin binder) – Most stable and widely applied antenna materials in recent 30 years worldwide, with highest durability and consistent electrical property
- Copper etched antenna has much higher accuracy with lower tolerance than aluminum etched antenna and conductive ink printed antenna, which makes tag performance more consistent with lower read range variance.
- Gold is plated on chip bonded area of copper etched antenna, in order to enhance chip adhesion on antenna as well as electrical interconnection with antenna.

Packaging Double layer PCBs, laminated under high temperature and pressure

- Tag antenna has convoluted structure of two or three layers with copper ground plane, so tag is composed of double layer PCBs, tightly combined and laminated under high pressure and temperature of 200°C for >2 hours.
- Many tag makers copy TITANTAG™ in appearance, but they can not copy tags' durability and read consistency.
- Surface of PCBs is coated with TOYO (black) PSR, best of kind which can protect it against electrical stress and water ingress.

Chip bonding Wire bonded, aluminum or gold

- Unlike other tag makers using flip chip bonding or chip soldering, RFcamp has adopted wire bonding technology since year of 2004.
- Wire bonding, though most complicated and expensive chip bonding method, is most stable in electrical interconnection and most durable in mechanical and temperature stresses. It, with highest precision, is also best fit for working on complicated antenna patterns of double layer PCBs.

[4] Performance

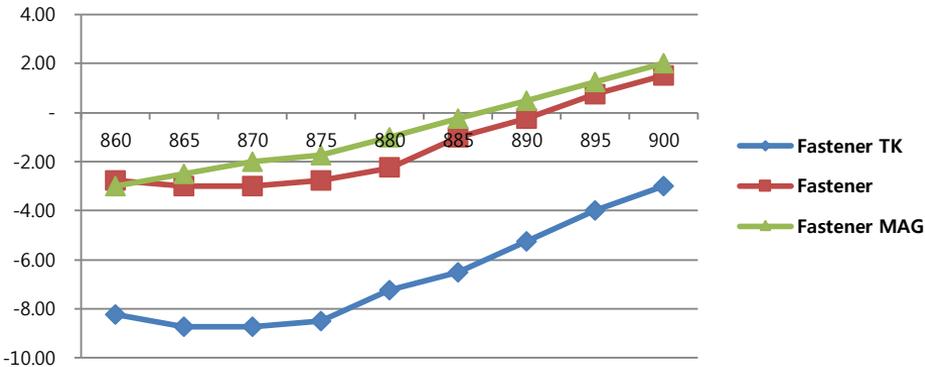
• Performance table

Up to meters*	On metal	Off metal
Fixed reader 2W ERP	12.0	11.0
Handheld reader 0.5W ERP	7.0	7.0

• Comparison with neighboring tags

MHz	860	865	870	875	880	885	890	895	900
Fastener TK	- 8.25	- 8.75	- 8.75	- 8.50	- 7.25	- 6.50	- 5.25	- 4.00	- 3.00
Fastener	- 2.75	- 3.00	- 3.00	- 2.75	- 2.25	- 1.00	- 0.25	0.75	1.50
Fastener MAG	- 3.00	- 2.50	- 2.00	- 1.75	- 1.00	- 0.25	0.50	1.25	2.00

*dBm



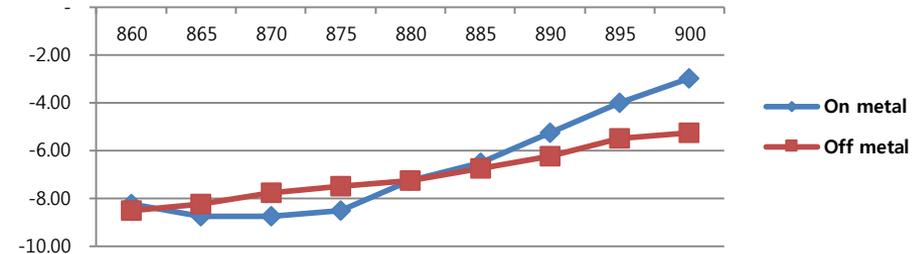
•Fastener TK reads up to 12.0 meters on metal, almost double of Fastener and 50% longer than Fastener MAG. It's one of best performing among 4mm thick metal tags with most stable and consistent read, as its flat and gentle slope of sensitivity curve shows.

•It s read performance varies upon tag location, orientation, direction, RF environments, etc.. Unlike other TITAN tags, its read performance is still same, even when space or backing adhesive between tag and metal surface gets thicker.

• Comparison: on vs. off metal

*dBm

MHz	860	865	870	875	880	885	890	895	900
On metal	- 8.25	- 8.75	- 8.75	- 8.50	- 7.25	- 6.50	- 5.25	- 4.00	- 3.00
Off metal	- 8.50	- 8.25	- 7.75	- 7.50	- 7.25	- 6.75	- 6.25	- 5.50	- 5.25

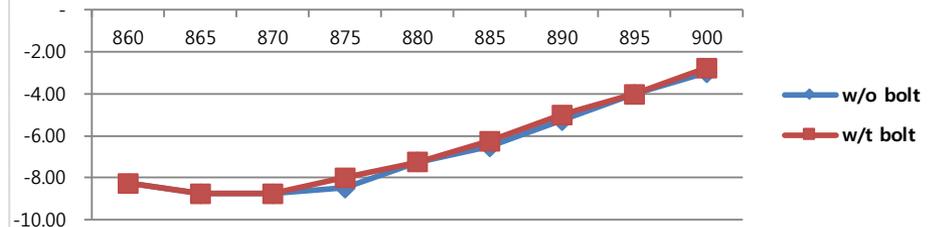


•Fastener TK reads 10% shorter off metal (or on non metal surface). It can be applied for BOTH metal and off metal application.

• Comparison: with metal bolt in vs. without it in

*dBm

MHz	860	865	870	875	880	885	890	895	900
w/o bolt	- 8.25	- 8.75	- 8.75	- 8.50	- 7.25	- 6.50	- 5.25	- 4.00	- 3.00
w/t bolt	- 8.25	- 8.75	- 8.75	- 8.00	- 7.25	- 6.25	- 5.00	- 4.00	- 2.75



•Fastener TK reads same, regardless of whether it is fastened with metal bolt in two holes (located on center of both ends) or not. Stainless steel M4 bolt with round head is best fit for Fastener.

*dBm : Minimum power tag needs in order to respond to RFID reader.

[5] Durability

• Temperature stress

Test methods	Descriptions	Pass/Fail
150°C, 6hrs	Stored in convection oven at 150C, 6hrs	Pass
-45<>85°C, 50 cycles	Stored in temperature shock chamber for 50 cycles – One cycle includes 30 min. at -45C, 30 min, transition, 30min. at 85C and 30min. transition.	Pass
85°C/85%, 24hrs	Stored in humidity chamber at 85C/85%RH for 24 hours	Pass
Boiling water, 6 hrs	Immersed in boiling water for 6 hours	Pass

• Ingression www.dsmt.com/resources/ip-rating-chart

IP Class	IP68	1.5 meter deep immersion, 1hr
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• Mechanical stress

Test methods	Descriptions	Pass/Fail
Iron ball fall test	Free fall of 1kg iron ball from 1.5meters height on anyside of tag - 50 times	Pass
Vibration	IEC60068-2-6-64	Pass
Drop& topple	IEC60068-2-31	Pass
Shock (acceleration)	IEC60068-2-27	Pass
Pressure	50 Bar on any side of tag, 50 times	Pass

• Chemical stress

Chemicals	Descriptions	Pass/Fail
Alkali	NaOH (10%, pH13) Immersed 24 hrs.	Pass
Acid	Sulfuric acid (10%, pH2) Immersed 24 hrs.	Pass
Petroleum	Gasoline, Diesel, Kerosene, lubricating oil Immersed 24 hrs.	Pass
Alcohol	Methanol, Ethanol Immersed 24 hrs.	Pass
Surfactant	Solvent for metal tool oils Immersed 24 hrs.	Pass
Salt water	IEC60068-2-11	Pass

• Electrical stress

ESD	IEC61000-4-2 (LEVEL4 – 8KV)	PASS
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[6] Service Options

• Chip encoding service

- Encodes EPC memory sector only*.
- Encodes tags with 4 multiple digits - from 16 bits (4 digits decimal or hex or ASCII) up to 480 bits (120 digits decimal or hex or ASCII) - upon customers' request.
- Unless requested by customer, all tags are encoded with 24 digits decimal (Date 8 digits + Serial 16 digits), before shipped to customers. For example, code 201508140000000000001278 tells that tag was 1278th encoded on August 14, 2015.
- Tag code can be permanently locked with password of 8 digits decimal or hex, upon customer's request.

* For special encoding service (e.g. TID to EPC or user memory encoding), please ask RfCamp.

• Label & printing service

- Provides fast and reasonably priced custom label service with printing variable data, barcode and logo.
- Label material is water proof and "hard to tear off" polysynthetic.



• Laser engraving & direct printing service

- With CO2 laser, tag surface is precisely and permanently etched into variable data, barcode and logo with black and yellow contrast.
- With silk screen printing or pad printing method, tag surface is permanently printed with various colored logo or text.



• Backing adhesive

- Unless requested otherwise, RfCamp recommends and applies 3M468MP or 3M9472LE (Aka. 3M300LSE) double sided adhesive tapes for general applications. For harsh environments, RfCamp recommends 3M VHB tapes.
- For stronger adhesion, RfCamp suggests glue solutions such as Cemedine's Super X or Loctite's double compound epoxies.
- For special solution, please ask RfCamp.

• Fasteners & brackets

- For some small TITANTAGs, metal fastener may adversely affect tag read performance, so please ask RfCamp for suitable solution.
- Upon customer's request, RfCamp develops metal based brackets for special applications, with optimal tag performance.



• Encapsulations

- For special environment requiring enhanced chemical durability, RfCamp applies special coating materials over tag.
- Upon customer's request, RfCamp develops injection molded ruggedized case or rubber (polyurethane or silicone) based encapsulation.

