ELEGOO RFID Tag Data Specification

I. Overview

This document outlines the data structure and content format stored on the RFID tags used in ELEGOO's FDM 3D printing filament spools.

II. Data Structure: EPC-256 Format

The RFID tag uses a 256-bit EPC (Electronic Product Code) Type I format, which is commonly applied in IoT device identification and tracking. The total storage size is 32 bytes (256 bits), with the data fields defined as follows:

Field	Length	Example	Description
Header	8 bits	0x36	EPC-256 identifier
Manufacturer Code	32 bits	0xEEEEEEEE	Identifies ELEGOO as the manufacturer
Filament Code	16 bits	0x0001	Internal filament code by manufacturer
Material (Main)	32 bits	0x00807665 ("PLA")	Material type, stored in ASCII (e.g., "PLA")
Material (Subtype)	32 bits	0x00004346 ("CF")	Material subtype in ASCII (e.g., "CF")
Color Code	24 bits	0xFF3700	Filament color in RGB888 format (e.g., red)
Filament Diameter	16 bits	0x00AF (175)	Filament diameter in tenths of a millimeter (e.g., 1.75mm)
Filament Weight	16 bits	0x03E8 (1000)	Filament weight in grams (e.g., 1000g)
Production Date	16 bits	0x09C6 (2502)	Production date encoded as YYYYMM (e.g., 2025-02)

Reserved	64 bits	0	Reserved for future use

1) Examples of Material Encoding

Material	Hex Code
PLA	0x00807665
PETG	0x80698471
ABS	0x00656683
TPU	0x00848085
PA	0x00008065
CPE	0x00678069
PC	0x00008067
PVA	0x00808665
ASA	0x00658365

2) Examples of Color Encoding (RGB888)

Color	Code
Red	0xFF3700
Green	0x33D700
Blue	0x0080FF
Orange	0xFF8C00
Purple	0x735DF9
White	0xFFFFFF
Black	0x000000
Yellow	0xFFC800
Cyan	0x44F1FF

3) Examples of Diameter Encoding

Diameter (mm)	Hex Code
0.8	0x0050
1.0	0x0064
1.75	0x00AF
2.85	0x011D
3.0	0x012C

4) Examples of Weight Encoding

Weight (g)	Hex Code
50	0x0032
100	0x0064
200	0x00C8
300	0x012C
500	0x01F4
1000	0x03E8

III. RFID Tag Memory Map and Field Allocation

(1) NTAG213 Memory Layout

Page Adr		Byte number within a page				Description
Dec	Hex	0	1	2	3	
0	0h	serial number				Manufacturer data and static lock bytes
1	1h	serial number				
2	2h	serial number	internal	lock bytes	lock bytes	
3	3h	Capability Container (CC)				Capability Container
4	4h	user memory				User memory pages
5	5h					
...	...					
38	26h					
39	27h					
40	28h	dynamic lock bytes			RFUI	Dynamic lock bytes
41	29h	CFG 0				Configuration pages
42	2Ah	CFG 1				
43	2Bh	PWD				
44	2Ch	PACK		RFUI		

aaa-008087

图 5. 存储器组织 NTAG213

Memory Area	Address Range	Purpose	Writable
System Reserved	0x00~0x03	UID, Lock Bits	No
User Memory	0x04~0x27	Store EPC data	Yes (Password required)
Configuration Pages	0x29~0x2C	Configuration, Password Setup, Access Control	Yes (Password required)

(2) Data Field Allocation (User Memory Area)

Field	Bit Length	Start Address (Hex)	Example (Hex)	Memory Block Notes

Header	8	0x04	36	Occupies First byte of Block 0x04, the last 3 bytes are used for the manufacturer's code
Manufacturer Code	32	0x05	EEEEEEEE	**0x05 - 0x08** (Remaining 3 bytes of Block 0x04 + first byte of Block 0x05)
Filament Code	16	0x09	0001	**0x09 - 0x0A** (Last 2 bytes of Block 0x05 + first 0 bytes of Block 0x06)
Material Name	32	0x0B	504C4120	**0x0B - 0x0E** (Last 3 bytes of Block 0x06 +first byte of Block 0x07)
Material Supplement	32	0x0F	43463230	**0x0F - 0x12** (Last 2 bytes of Block 0x07 +first 2 bytes of Block 0x08)
Color Code	24	0x13	FF3700	**0x13 - 0x15** (Last byte of Block 0x08 +first 3 bytes of Block 0x09)
Filament Diameter	16	0x16	00AF	**0x16 - 0x17** (Last byte of Block 0x09 + first byte of Block 0x0A)
Filament Weight	16	0x18	03E8	**0x18 - 0x19** (2nd and 3rd bytes of Block 0x0A)

Production Date	16	0x1A	09C6	**0x1A - 0x1B** (Last byte of Block 0x0A + first byte of Block 0x0B)
Reserved	64	0x1C	0x00000000	**0x1C - 0x2F** (Occupy Blocks 0x0C~0x0F continuously)

(3) Password Authentication Configuration

Field	Address (Hex)	Example (Hex)	Description
Password A	0x2B	0xA0A1A2A3	Authentication password (4 bytes)
Access Control	0x2C	0x5F078069	Read/write permissions (password required)

(4) Notes

1) **Data Alignment Rules**

a. Block Size Rule: The NTAG213 memory is organized in 4-byte blocks. All data must be written on block-aligned addresses.

b. Padding Rule: Fields that are not a multiple of 4 bytes must be padded with zeros to fill the block.

IV. Example

For a filament spool with the following specs:
Diameter: 1.75mm
Weight: 1000g
Color: Red
Material: PLA-CF
Production Date: February 2025

The RFID tag would be programmed as:

Field	Value
Header	0x36
Manufacturer Code	0xEEEEEEEE
Filament Code	0x0001
Material (Main)	0x504C4120
Material Supplement	0x43463230
Color Code	0xFF3700
Filament Diameter	0x00AF
Filament Weight	0x03E8
Production Date	0x09C6

V. Code Implementation

VI. Appendix

VII. Version History

Version	Date	Description	Author
1.0	2025-02-10	Initial release	Yongliang Tan

Filament Color Encoding Rules

1. Encoding Rules

Basic Color Code - Color Category - Brightness Level- Filament ID

2. Basic Color Code

The basic color code is a standard way of coding based on the RGB color model, with a total of 6 characters indicating the intensity of red, green, and blue colors (from 00 to FF). For example：

#FF0000: Pure red

#00FF00: Pure green

#0000FF: Pure blue

3. Color Categories

Colors are classified into major categories, each with an abbreviation:

-PR: Primary Colors: Red, Blue, Yellow, White

-SE: Secondary Colors: Green, Orange, Purple

-AC: Accent Colors: Pink, Brown, Cyan

-MT: Metallic Colors: Gold, Silver

-GL: Glitter Colors: Glitter Pink, Glitter Blue

-TR：Transparent Colors: Clear, Translucent

4. Brightness Levels

Each color can be assigned a brightness level:

-L：Light

-M：Medium

-D：Dark

5. Filament ID

Each unique color is assigned a numerical ID for indexing and management:

-001、-002、-003 etc.

6. Color Code Reference Table

ID	Basic Color Code	Color Name	Color Category	Brigh tness	Full Code
001	**#FF3700**	Red	PR	D	**#FF3700-PR-D-001**

002	**#33D700**	Green	SE	M	**#33D700-SE-M-002**
003	**#0080FF**	Blue	PR	L	**#0080FF-PR-L-003**
004	**#FF8C00**	Orange	SE	M	**#FF8C00-SE-M-004**
005	**#735DF9**	Purple	SE	D	**#735DF9-SE-D-005**
009	**#FFFFFF**	White	SE	L	**#FFFFFF-AC-L-009**
010	**#000000**	Black	AC	D	**#000000-AC-D-010**
011	**#FFC800**	Yellow	PR	D	**#FFC800-PR-D-011**
012	**#44F1FF**	Cyan	PR	D	**#44F1FF-PR-D-011**

7、Operator Panel Color Definition (Screen, Slicing software, Web)