LED Dongle USB Protocol

Application Note for 32-bit NuMicro® Family

Document Information

Abstract	This document introduces the USB protocol from PC AP Tool to control LED Dongle.
Apply to	LED Dongle which using Nuvoton M032.

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1 Overview

LED Dongle uses USB interface to connect with PC. The USB Class is HID and VID is **0x0416**, PID is **0x0125**.

There are 4 kinds of command from PC AP Tool:

- General Command
  This kind of command is used to get FW version, get FW checksum, start ISP process, or transmit music volume.
- LED Stripe Set Command
  This kind of command is used to set LED numbers on stripe, RG swap, direction, and Independent/Sync mode.
- Mode Set Command
  This kind of command is used to set LED lighting mode, LED color (R, G, B), brightness and speed
- AP Sync Command
  This kind of command is used to set each LED color from AP Tool.

2 General Command

Uses 0x01 as Report ID.

2.1 Get FW Version (0xA0)

Get FW version from LED Dongle, which includes major and minor bytes.

2.1.1 Host ask Device

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Report ID	Command	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved

- **Report ID:**
  0x01
- **Command:**
  0xA0
- **Reserved:**
  0x00

2.1.2 Device reply Host

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Report ID	Command	Major	Minor	Reserved	Reserved	Reserved	Reserved

- **Report ID:**
  0x01
- **Command:**
  0x5A
- **Major:**
  Based on FW version
- **Minor:**
  Based on FW version
- **Reserved:**
  0x00

2.2 Get FW Checksum (0xA1)

Get FW checksum from LED Dongle.

2.2.1 Host ask Device

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Report ID	Command	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved

• **Report ID:** 0x01 • **Command:** 0xA1 • **Reserved:** 0x00		

2.2.2 Device reply Host

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Report ID	Command	Checksum		Reserved	Reserved	Reserved	Reserved

• **Report ID:** 0x01 • **Command:** 0x5A • **Checksum:** Byte 3 is Low Byte Byte 4 is High Byte • **Reserved:** 0x00		

2.3 Start ISP Process (0xB0)

Ask LED Dongle to enter ISP process. LED Dongle will restart and boot from LDROM to continue ISP Process based on Nuvoton USB ISP.

2.3.1 Host ask Device

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Report ID	Command	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved

• **Report ID:** 0x01 • **Command:** 0xB0 • **Reserved:** 0x00		

2.4 Set Music Volume (0xC0)

Set music volume and action to Device.

2.4.1 Host set Device

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Report ID	Command	Area	Music Volume			Action	Reserved

- **Report ID:**
  0x01

- **Command:**
  0xC0

- **Area:**
  0x01 = Area 1 (Stripe 1, PD.3)
  0x02 = Area 2 (Stripe 2, PC.3)
  0x04 = Area 3 (Not Used)
  0x08 = Area 4 (Not Used)
  0x10 = Area 5 (Not Used)
  0x20 = Area 6 (Not Used)
  0x40 = Area 7 (Not Used)
  0x80 = Area 8 (Not Used)
  0xFF = All Area

- **Music Volume:**
  Byte 4 is Main Volume
  Byte 5 is Left Volume
  Byte 6 is Right Volume

- **Action:**
  0x01 = POP
  Whole stripe color is based on volume.
  Blue (Min.) <=> Red (Max.)
  0x02 = JAZZ
  Lighten LED number based on volume.
  0x03 = Mixed
  Mixed POP and JAZZ mode.
  Lighten LED number and color based on volume.

- **Reserved:**
  0x00

3 LED Stripe Set Command

Uses 0x02 as Report ID.

3.1 Set LED Stripe Configuration

Set LED numbers on stripe, RG swap, direction, and Independent/Sync Mode..

3.1.1 Host set Device

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Report ID	Area	LED Numbers	RG Swap	Direction	AP Sync	Reserved	Reserved

• **Report ID:** 0x02 • **Area:** 0x01 = Area 1 (Stripe 1, PD.3) 0x02 = Area 2 (Stripe 2, PC.3) 0x04 = Area 3 (Not Used) 0x08 = Area 4 (Not Used) 0x10 = Area 5 (Not Used) 0x20 = Area 6 (Not Used) 0x40 = Area 7 (Not Used) 0x80 = Area 8 (Not Used) 0xFF = All Area	• **LED Numbers:** 1 ~ 100 (Max.) • **RG Swap:** 0x00 = GRB Type 0x01 = RGB Type • **Direction:** 0x00 = Forward 0x01 = Backward • **AP Sync:** 0x00 = Disable 0x01 = Enable • **Reserved:** 0x00	

4 Mode Set Command

Uses 0x03 as Report ID.

4.1 Set Lighting Mode Configuration

Set LED lighting mode, LED color (R, G, B), brightness and speed.

4.1.1 Host set Device

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Report ID	Area	Lighting Mode	Color R	Color G	Color B	Brightness	Speed

- **Report ID:**
  0x03
- **Area:**
  0x01 = Area 1 (Stripe 1, PD.3)
  0x02 = Area 2 (Stripe 2, PC.3)
  0x04 = Area 3 (Not Used)
  0x08 = Area 4 (Not Used)
  0x10 = Area 5 (Not Used)
  0x20 = Area 6 (Not Used)
  0x40 = Area 7 (Not Used)
  0x80 = Area 8 (Not Used)
  0xFF = All Area

- **Lighting Mode:**
  0x10: LED_OFF
  0x11: LED_STATIC
  0x12: LED_BREATHING
  0x13: LED_STROBE
  0x14: LED_CYCLING
  0x15: LED_RANDOM
  0x16: LED_MUSIC
  0x17: LED_WAVE
  0x18: LED_SPRING
  0x19: LED_WATER
  0x1A: LED_RAINBOW

- **Color R:**
  0x00 ~ 0xFF
- **Color G:**
  0x00 ~ 0xFF
- **Color B:**
  0x00 ~ 0xFF
- **Brightness:**
  0x00 (Min.) ~ 0xFF (Max.)
- **Speed**
  0x00 (Fast) ~ 0xFF (Slow)

Note: Not implemented yet.

5 AP Sync Command

Uses 0x04 as Report ID.

Uses set feature report to transmit.

5.1 Set LED Sync Color

Set each LED color from AP Tool.

5.1.1 Host set Device

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Report ID	Area	LED 1 Color			LED 2 Color		
Byte 9	Byte 10	Byte 11	.....		Byte 300	Byte 301	Byte 302
LED 3 Color			.....		LED 100 Color		

- **Report ID:**
  0x03

- **Area:**
  0x01 = Area 1 (Stripe 1, PD.3)
  0x02 = Area 2 (Stripe 2, PC.3)
  0x04 = Area 3 (Not Used)
  0x08 = Area 4 (Not Used)
  0x10 = Area 5 (Not Used)
  0x20 = Area 6 (Not Used)
  0x40 = Area 7 (Not Used)
  0x80 = Area 8 (Not Used)
  0xFF = All Area

- **LED n Color:**
  Byte (n – 1)*3 + 3 is Color R
  Byte (n – 1)*3 + 4 is Color G
  Byte (n – 1)*3 + 5 is Color B

Revision History

Date	Revision	Description
2021.8.25	1.00	1. Initial version.

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