Technical Specifications and Register Map For

mLink WS2812 RGB LED Controller (HCMODU0197)

Version: 1.00

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Specifications

Module specifications:

Module code:	HCMODU0197
Supply voltage (VDD):	4.5V to 5.5V
Current consumption (idle):	6.5mA
LED type:	WS2812 5V RGB LEDs
Maximum number of LEDs per module:	200*
Number of colours:	Full 24bit (16,777,215) colours
Brightness:	255 levels with separate on/off control
Interfaces:	4 pin male mLink header, Large WS2812 solderable pads with option 0.1” pin header
I2C Interface speed:	400kbits/s (fast mode)
I2C default address (HEX):	0h5E
Maximum number of modules:	5 with pullups fitted, 112 with pullups removed**
Module dimensions ex headers (LxWxH):	40.5mm x 11mm x 5mm

*LEDs should be powered via an external 5V source when controlling more than 24 LEDs at full brightness

**The maximum number of connected modules will depend on cable lengths and power requirements of each module. Do not exceed 5 mLink modules connected in series with all pullups fitted.

Register Map

Register quick reference table

REGISTER	REG ADD	Reg Bit 7	Reg Bit 6	Reg Bit 5	Reg Bit 4	Reg Bit 3	Reg Bit 2	Reg Bit 1	Reg Bit 0
STATUS	0h00	RESERVED					BUSY	REGERR	I2CERR
I2C ADD (Def = 0h5D)	0h01	NA	I2CADD						
MODULE TYPE	0h02	0h07							
MODULE SUBTYPE	0h03	0h00							
FIRMWARE VERSION	0h04	FWMAV				FWMIV			
RESERVED	0h05 to 0h09	RESERVED							
LED COUNT	0h0A	COUNT							
LED INDEX	0h0B	INDEX							
RED LEVEL	0h0C	RED							
GREEN LEVEL	0h0D	GRN							
BLUE LEVEL	0h0E	BLU							
REFRESH	0h0F	RESERVED							REFRESH
CLEAR	0h10	RESERVED							CLEAR
LED BRIGHTNESS	0h11	BRIGHTNESS							
LED ON/OFF	0h12	RESERVED							ON
RGB ORDER	0h13	RGBORDER							

Status register

Register address: 0h00
Default value: 0h00

7	6	5	4	3	2	1	0
RESERVED					BUSY	REGERR	I2CERR
r					rw	rw	rw

Bits 7:4 Reserved

Bit 2 **BUSY**: Busy status
This bit is set and reset by hardware
0: Module is idle
1: Currently processing an LED buffer clear command

Bit 1 **REGERR**: Register access error
This bit is set by hardware and reset by software
0: No register access error
1: Register access error caused by attempting to access an non-existent register, writing an illegal value to a register, or writing to a read only register

Bit 0 **I2CERR**: I2C bus access error
This bit is set by hardware and reset by software
0: No I2C error
1: An I2C bus error has occurred

Writing any value to this register will clear all bits

I2C Address Register

Register address: 0h01
Default value: 0h5E

7	6	5	4	3	2	1	0
N/A	I2CADD						
r	rw						

Bit 7 N/A: Returns 0
Bits 6:0 **I2CADD**: 7 bit I2C address (default factory reset value = 0h5E)

These bits are set by software
Values written to this register will be stored in non-volatile memory
Valid address range is 0h08 to 0h77. Addresses outside this range will be ignored but will set the **REGERR** bit in the status register.

Before a new address can be written to this register it must first be unlocked by writing bytes 0x55 followed by 0xAA. The new address byte must then be written within 100ms of writing the 0xAA byte otherwise the unlock sequence will timeout and reset.

Module Type Register

Register address: 0h02
Default value: 0h02

7	6	5	4	3	2	1	0
MTYP							
r							

Bits 7:0 **MTYP**: 8 bit value representing the module type.

This register will always return 0h02, signifying this module type is ‘light controller’

Module Subtype Register

Register address: 0h03
Default value: 0h01

7	6	5	4	3	2	1	0
STYP							
r							

Bits 7:0 **STYP**: 8 bit value representing the module subtype.
This register will always return 0h01 for the WS2811 LED controller module.

Firmware Version Register

Register address: 0h04
Default value: 0hXX

7	6	5	4	3	2	1	0
FWMAV				FWMIV			
r				r			

Bits 7:4 **FWMAV**: 4 bit value representing the modules major firmware version
Bits 3:0 **FWMAV**: 4 bit value representing the modules minor firmware version

LED Count

Register address: 0h0A
Default value: 0hC8

7	6	5	4	3	2	1	0
COUNT							
rw							

Bits 7:0 **COUNT[7:0]**: Sets the number of LEDs to drive
This register is set and reset by software.

Sets the number of LEDs that the module will write to when a refresh command is received. This value should be set to the physical number of LEDs connected to the module.
The maximum value that can be written to this register is 200. Values higher than 200 will be ignored.

LED Index

Register address: 0h0B
Default value: 0h00

7	6	5	4	3	2	1	0
INDEX							
rw							

Bits 7:0 **INDEX[7:0]**: Sets the index of the LED to modify.
This register is set and reset by software.

Sets the LED index that the RED, GRN, BLU register will modify when written to where:
0 = the first LED connected to the module
INDEX - 1 = the last LED connected to the module.

Red Level

Register address: 0h0C
Default value: 0h00

7	6	5	4	3	2	1	0
RED							
rw							

Bits 7:0 **RED[7:0]**: Sets the red level
This register is set and reset by software.

Sets the red level of the LED indexed by the INDEX register where:
0 = red level off
255 = red level maximum

Note that the UPDATE register must be written to update the LED with the new red value.

Green Level

Register address: 0h0D
Default value: 0h00

7	6	5	4	3	2	1	0
GRN							
rw							

Bits 7:0 **GRN[7:0]**: Sets the green level
This register is set and reset by software.

Sets the green level of the LED indexed by the INDEX register where:
0 = green level off
255 = green level maximum

Note that the UPDATE register must be written to update the LED with the new red value.

Blue Level

Register address: 0h0E
Default value: 0h00

7	6	5	4	3	2	1	0
BLU							
rw							

Bits 7:0 **BLU[7:0]**: Sets the blue level
This register is set and reset by software.

Sets the red level of the LED indexed by the INDEX register where:
0 = blue level off
255 = blue level maximum

Note that the UPDATE register must be written to update the LED with the new red value.

Refresh

Register address: 0h0F
Default value: NA

7	6	5	4	3	2	1	0
RESERVED							REFRESH
w							

Bits 7:1 Reserved
Bit 0 **REFRESH**: Writes the contents of the led buffer to WS2812 LED(s)

This bit is set by software and reset by hardware.

Writing a 1 to this bit will cause the current RGB levels held in the modules buffer to be written out to the LEDs.

Note: To maintain accurate timings of the WS2812 interface, the module will not respond to I2C accesses whilst the LEDs are being written to.

Clear

Register address: 0h10
Default value: NA

7	6	5	4	3	2	1	0
RESERVED							CLEAR
w							

Bits 7:1 Reserved
Bit 0 **CLEAR**: Clears the LED buffer

This bit is set by software and reset by hardware.

Writing a 1 to this bit will cause the contents of the LED buffer to be filled with 0x00. Any previous RGB values will be overwritten.

After writing to this bit the BUSY bit in the status register can be polled to determine when this action has been completed.

LED Brightness

Register address: 0h11
Default value: 0hFF

7	6	5	4	3	2	1	0
BRIGHTNESS							
rw							

Bits 7:0 **BRIGHTNESS[7:0]**: Master LED brightness
This register is set and reset by software.

Sets the maximum RGB level for all LEDs where:
0 = All LEDs off
255 = Maximum brightness level

When setting a value less than 255 (maximum) any values written to the RED, GREEN, & BLUE LEVEL registers will be proportionally scaled to this value.

LED ON/OFF

Register address: 0h12
Default value: 0x01

7	6	5	4	3	2	1	0
RESERVED							ON
w							

Bits 7:1 Reserved
Bit 0 **ON**: Turns all LEDs on or off
This bit is set and reset by software.

Turns all LEDs on or off where:
0 = All LEDs off
1 = All LEDs on

After writing this bit the LEDs will be written with either 0x00’s (ON bit = 0), or the current contents of the LED buffer (ON bit = 1).

RGB Order

Register address: 0h13
Default value: 0h00

7	6	5	4	3	2	1	0
RGBORDER							
rw							

Bits 7:0 **RGBORDER[7:0]**: RGB LED order

This register is set and reset by software.

Sets the RGB order of the LEDs where:

0 = LEDs will be written to in the order of RGB

1 = LEDs will be written to in the order of GRB