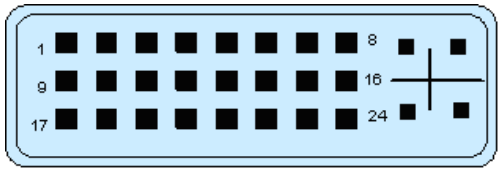
硬件接口

DVI接口：接口类型为标准DVI-I接口。视频输入是通过TMDS数据链路对0、1、2完成。视频输入分辨率1024×768@60Hz。相关信号描述如下：



Pin #	Signal Name	Pin #	Signal Name	Pin #	Signal Name
1	TMDS Data 2-	9	TMDS Data 1-	17	TMDS Data 0-
2	TMDS Data 2+	10	TMDS Data 1+	18	TMDS Data 0+
3	TMDS Data 2/4 Shield	11	TMDS Data 1/3 Shield	19	TMDS Data 0/5 Shield
4	TMDS Data 4-	12	TMDS Data 3-	20	TMDS Data 5-
5	TMDS Data 4+	13	TMDS Data 3+	21	TMDS Data 5+
6	DDC Clock (SCL)	14	+5V Power	22	TMDS Clock Shield
7	DDC Data (SDA)	15	+5V GND	23	TMDS Clock +
8	---	16	Hot Plug Detect	24	TMDS Clock -

重新设定的信号

针脚	名称	方向	功能	电平
4	ASIC_READY	OUT	高电平表示 Ready	3.3V
5	FAN_LOCKED	OUT	高电平表示风扇异常。当前端检测到风扇异常持续 10 秒以上需关闭光机，并将状态反馈给用户	
13	POWERGOOD	IN	开机时前端需要保持低电平，使光机端处于 Reset 状态，以避免光机端初始化动作异常（比如图像正常但风扇停转）。当输入由低电平切换为高电平（保持）后光机驱动电路开始初始化进入工作状态	
20	LAMP_CTRL	IN	光机端默认高电平，开机初始化完毕点灯进入正常工作状态。关机时可由前端控制切换到低电平关闭光源。	
21	LAMP_STATUS	OUT	低电平表示光源点亮	
6	IIC_SCL		IIC Clock/DDC Clock	5.0V
7	IIC_SDA		IIC Data/DDC Data	

软件接口

The protocol used in communicating information to the DDP3021 consists of a serial data bus conforming to the Philips I2C specification, up to 100KHz.

Slave Receive Mode

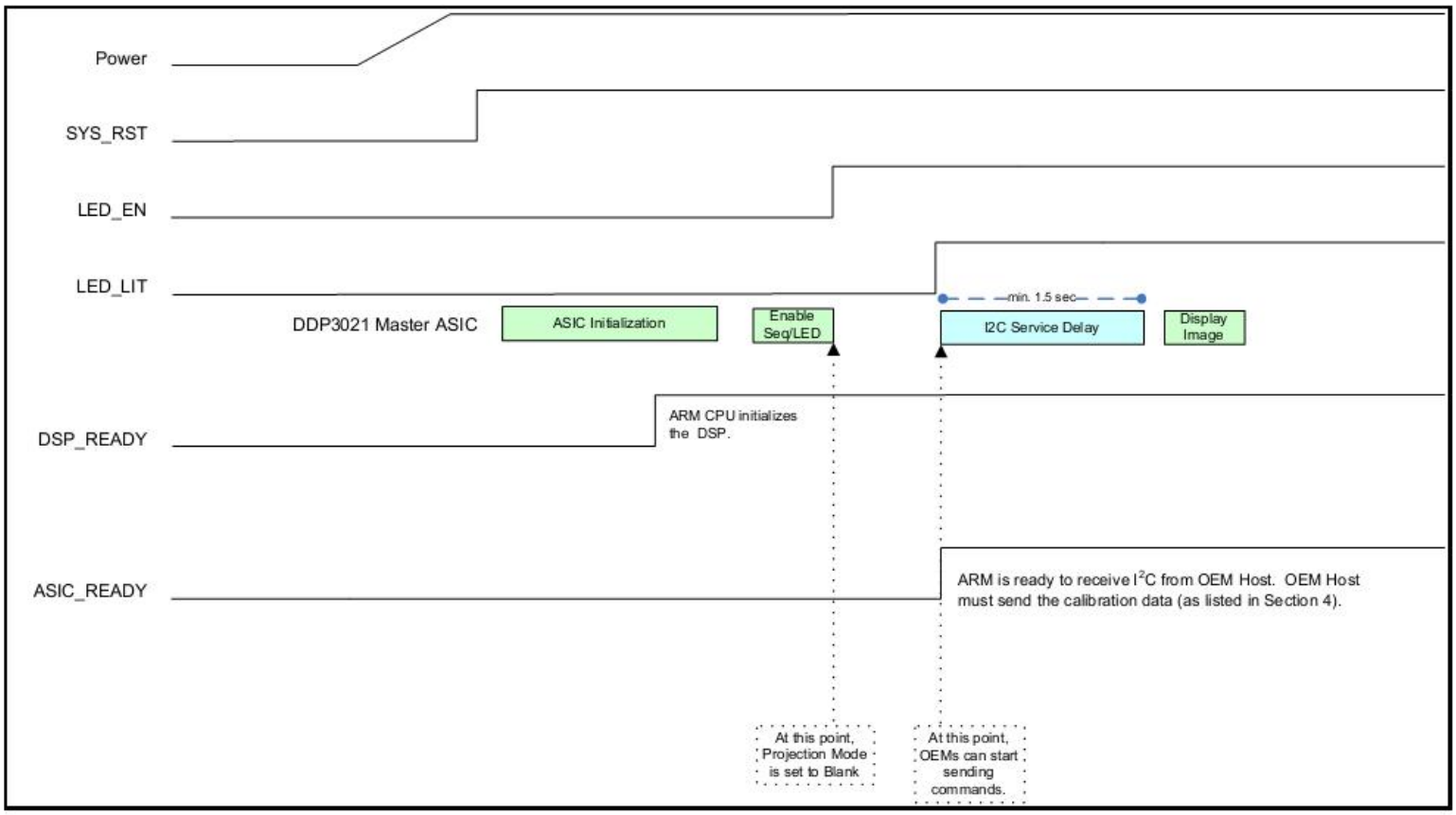
With the DDP3021 operating in the slave-receiver configuration, the first byte following the start condition is the DDP3021 devices write address (34h). The interface consists of a number of sub-address registers each capable of accepting multiple bytes of data. Each command/sub-address accepts a certain number of data bytes.

Sending the wrong number of bytes to a sub-address is not an error. If too few bytes are sent, then the entire transaction is ignored. If too many bytes are sent, then the correct number of bytes is used and the extra bytes are ignored.

Slave Transmit Mode

With the Single DDP3021 operating in the slave-transmitter configuration, the first byte following the start condition is DDP3021 device read address (35h). One word of system status will be returned followed by additional bytes containing system hardware values or firmware information.

开机初始化

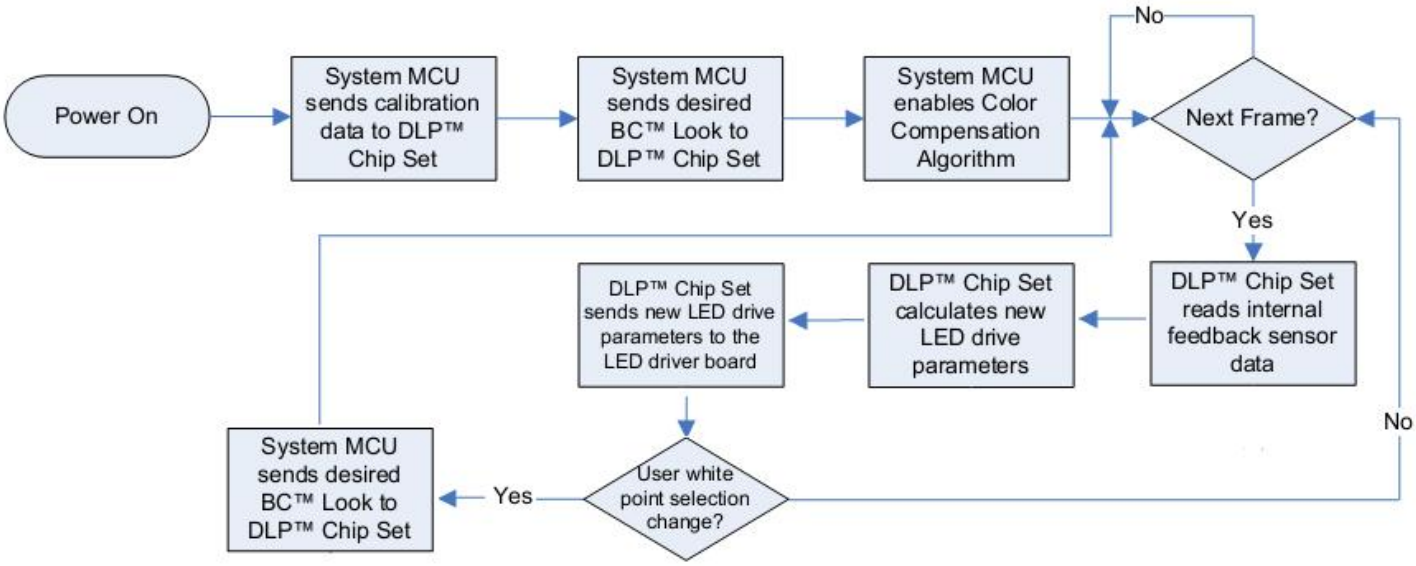


When the power is applied to the ASIC, the ARM CPU performs Power-up Reset Processing. The LED_ENABLE command occurs, and the LEDs are illuminated.. Upon receiving LED_LIT from the driver, the ARM will initialize the DSP and command calibration to occur.

The OEM host must then send the following calibration data to the ARM through the DSP Color Manager Control I^2C Command.

- External Measured Red x,y,L color Point，Green x,y,L color Point，Blue x,y,L color Point
- Measured Internal Color Points
- Disable Calibration Mode and then Enable Color Processing Mode. (DSP Color Manager Control I^2C Command: 0x87.

LED System “Steady-State” Process Flow



系统上电开机，前端 MCU 通过 IIC 总线向 DLP 芯片发送校正数据并初始化 BC Look、启用色彩补偿算法。DLP 芯片组读取每帧 sensor 的反馈数据来计算维持 MCU 设定的 BC Look 所需要的占空比和电流参数，并依据计算结果选择适当占空比、控制 LED 驱动器提供合适电流。

为避免光机端初始化动作异常，开机时前端需要将 POWERGOOD 保持低电平，使光机端处于 Reset 状态，然后再将 POWERGOOD 切换到高电平。光机开始初始化，当 ASIC_READY 变为高电平，前端执行以下指令：

1. 从 EDID EEPROM 读取光机数据 Read DATA1,DATA2,DATA3,DATA4,DATA5,DATA6

EDID EEPROM

前128字节为EDID信息，用于光机与计算机连接时可被正确识别为监视器。

后48字节包含光机个体校正数据。开机初始化时，由前端视频处理板读取相关信息进行初始化。

EDID IC EEPROM Map ：（Device Add ： 0xA0）

	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07	0x08	0x09	0x0A	0x0B	0x0C	0x0D	0x0E	0x0F
0x00	EDID															
…																
0x70																
0x80	Unused															
…																
0xC0																
0xD0	DATA1								DATA2							
0xE0	DATA3								DATA4							
0xF0	DATA5								DATA6							

DATA1 Add： 0xD0—0xD7　　DATA2 Add： 0xD8—0xDF

DATA3 Add： 0xE0—0xE7　　DATA4 Add： 0xE8—0xEF

DATA5 Add： 0xF0—0xF7　　DATA6 Add： 0xF8—0xDF

Example：

	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07	0x08	0x09	0x0A	0x0B	0x0C	0x0D	0x0E	0x0F
…																
0xD0	00	00	58	E2	26	AE	0B	D1	01	00	16	69	5A	E7	21	11
…	…								…							

IIC Device Add 0xA0 , Sub Add 0xD0 ,Read 8 bytes

DATA1 : 00 00 58 E2 26 AE 0B D1

IIC Device Add 0xA0 , Sub Add 0xD8 ,Read 8 bytes

DATA2 : 01 00 16 69 5A E7 21 11

.....

2. 发送数据 （Write : 34 5E DATAX）

依次发送 Data1,DATA2,DATA3,DATA4,DATA5,DATA6

34 5E 00 00 58 E2 26 AE 0B D1

34 5E 01 00 16 69 5A E7 21 11

.....

3. Write : 34 5E 27 00 00 00 00 00 00 01 （USE CCA）

4. Write : 34 5E 87 00 00 00 00 00 00 01 （ WP_EN ）

相关指令表

Device Add	Sub Add	Register Name		
0x34 （Write）	0x0A	Brightness Control		34 0A XX XX XX XX XX XX
	0x0D	BrilliantColor Control		34 0D XX
	0x12	Color Selection		34 12 XX XX XX XX
	0x01	Contrast		34 01 XX XX XX
	0x10	Fan PWM Output Settings		34 10 XX XX XX
	0x09	Gamma Correction		34 09 XX XX
	0x13	Hue, Saturation, and Gain (HSG) Control		34 13 XX XX …… XX (42 bytes)
	0x03	Image Orientation		34 03 XX
	0x02	Projection Mode		34 02 XX
	0x33	Test Patterns		34 33 XX XX
	0x4A	DynamicBlack Level		34 4A 00 XX
0x35 （Read）		System Status		IIC Read 2 bytes
	0x1516	Hue, Saturation, and Gain (HSG) from CCA		IIC Read 44 bytes(2 bytes : system status)
Device Add	DSP R/W	Description	CMD/DATA	
0x34	W--5E R--DE	De-saturation Mode Select	0x27	34 5E 27 00 00 00 00 00 00 XX
		Set DB Level	0x35	34 5E 35 00 00 00 00 00 XX XX
		Color Point Processing Control	0x87	34 5E 87 00 00 00 00 00 00 XX
		Request Driver ADC Value	0xB7	34 DE B7 XX XX 00 00 00 00 00 (Send,then read)

注意：所有 Read/Write 操作数据，光机端不进行保存，重启或复位后，数据丢失。故需要由前端保存相应设置（比如亮度、对比度、BC、Gamma 等），开机时发送给光机。

System Status

The system status register consists of two bytes of data. This register is returned as the first two bytes of every read cycle issued to the DDP3021 device address. The command error and mailbox download complete bits are cleared to zero each time the system status is read. Steady state signals report the latest status and are not cleared each time read.

执行 Write 操作后需要 Read 两个字节的状态字，检查 cmderr 位确认指令执行正确。

Byte 0: System Status MSB

Pgm	r	r	r	ug	ee	r	ssfail

Byte 1: System Status LSB

Rmbs	sslit	cmderr	mbcmp	ac	unlk	sg	rdy

pgm – Programming mode (bootloader active)
- 0: Not in programming mode
- 1: In programming mode

ug – User GPIO Status (For instance fan status)
- 0: HW functional
- 1: HW failure

ee – EEPROM recording status
- 0: not recording
- 1: recording

ssfail – Solid State Failure or ARM to DSP communication issue
- 0: No failure
- 1: Failure

For LED architectures: one or more LED modules have experienced a failure. Specific LED module can be determined through a DSP status command (0x43) described later.

rmbs – RLDRAM Memory test OK
- 0: false
- 1: true

sslit – Solid State Lit – For LED architecture: LED Module is on (this is a reflection of the “lamp lit” signal from the OEM)
- 0: false
- 1: true

cmderr - Command/parameter Error
- 0: false
- 1: true

mbcmp - Mailbox download complete
- 0: incomplete - incorrect number of mailbox words received
- 1: complete - expected number of mailbox words received

ac – Smooth Picture ™ actuator status
- 0: hardware is functional
- 1: hardware failure

unlk - Calibration unlock
- 0: calibration registers are locked
- 1: calibration registers are unlocked

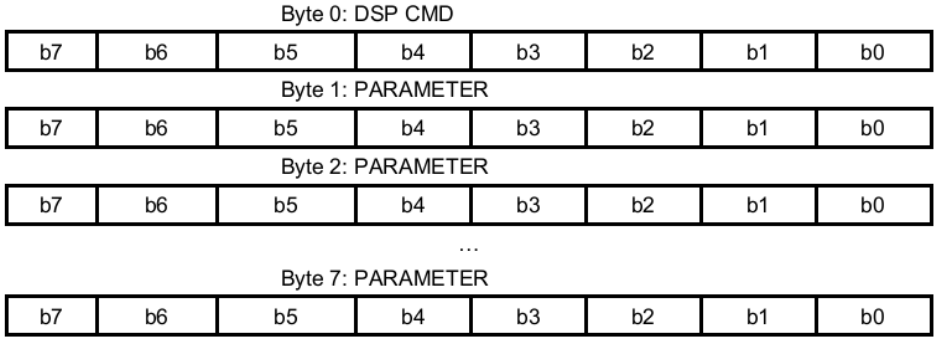
sg - System good status
- 0: something is wrong
- 1: all hardware is functional

rdy - System Ready
- 0: the system is currently busy (initializing, executing a command, etc.)
- 1: the system is ready to execute a command

r – Reserved; MAY NOT BE 0

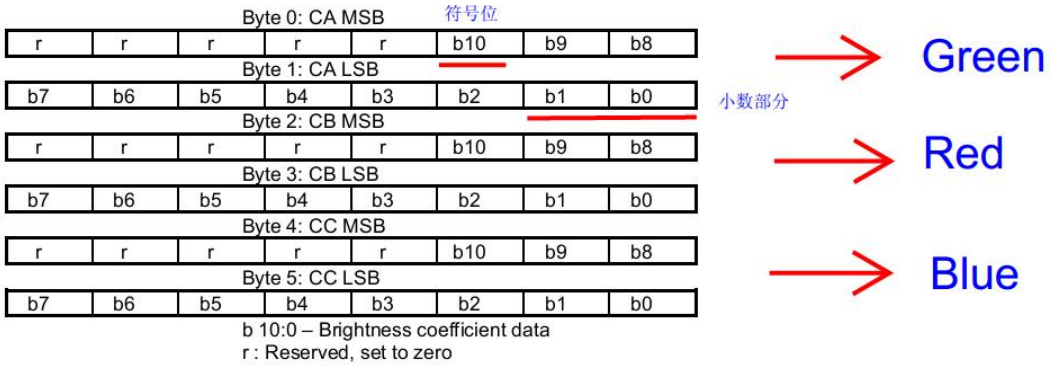
Color Point Processing – DSP Commands (Write – 5Eh; Read – DEh)

The DSP Color Point Processing commands allow for I2C communications to the LED Illumination module and the LED DSP Controller. Various actions may be requested through selection of the appropriate DSP CMD.



亮度控制

Brightness Control (Write – 0ah)



Coefficient MSBYTE Bit Values

					B10	B9	B8
					SIGN	2**7	2**6

Coefficient LSBYTE Bit Values

B7	B6	B5	B4	B3	B2	B1	B0
2**5	2**4	2**3	2**2	2**1	2**0	2**-1	2**-2

Binary Point

The Brightness Control provides the ability to change the minimum black level for each of the input channels (A/G/Y, B/R/Cr and C/B/Cb) independent of the maximum white level and offset for that channel. The brightness coefficients (CA, CB & CC) are signed, 11-bit (s8.2), 2's complement values between –256.00 and 255.75, inclusive.

Default : 00 00 00 00 00 00

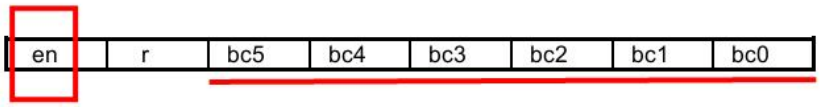
Example :

设置 Red 亮度值 10 : 34 0A 00 00 00 28 00 00

设置 Green 亮度-10 : 34 0A 07 d8 00 00 00 00

BC LOOK

BrilliantColor™ Control (Write – 0dh)



en (7) – Enable Brilliant Color Processing
bc(5:0) – BrilliantColor™ mode selection
0: BC look 1
1: BC look 2
2: BC look 3
3: BC look 4
.
.
.
.
63: BC look 64

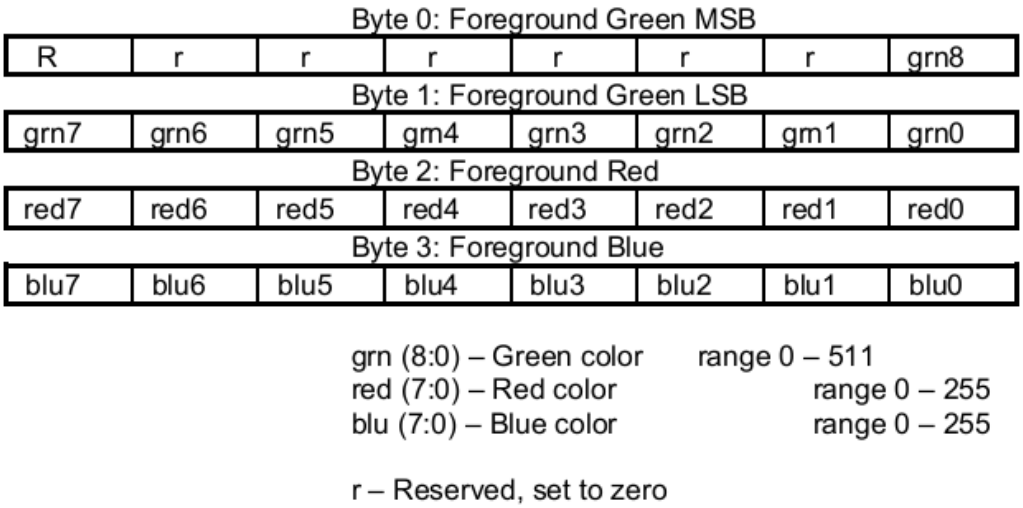
r – Reserved, set to zero

Default ： 80
Example ： 色域 NTSC ， 7500K ， 不叠加 ： 34 0D 85

BC LOOK					
序号			序号		
0	Non-Overlap	R709 - 9300K	18	30% Overlap	NTSC-6500 overlap
1	Non-Overlap	R709 - 7500K	19	30% Overlap	NTSC-3200 overlap
2	Non-Overlap	R709 - 6500K	20	30% Overlap	Wide-9300 overlap
3	Non-Overlap	R709 - 3200K	21	30% Overlap	Wide-7500 overlap
4	Non-Overlap	NTSC-9300	22	30% Overlap	Wide-6500 overlap
5	Non-Overlap	NTSC-7500	23	30% Overlap	Wide-3200 overlap
6	Non-Overlap	NTSC-6500	24	50% Overlap	R709 - 9300K Overlap
7	Non-Overlap	NTSC-3200	25	50% Overlap	R709 - 7500K Overlap
8	Non-Overlap	Wide-9300	26	50% Overlap	R709 - 6500K Overlap
9	Non-Overlap	Wide-7500	27	50% Overlap	R709 - 3200K Overlap
10	Non-Overlap	Wide-6500	28	50% Overlap	NTSC-9300 Overlap
11	Non-Overlap	Wide-3200	29	50% Overlap	NTSC-7500 overlap
12	30% Overlap	R709 - 9300K Overlap	30	50% Overlap	NTSC-6500 overlap
13	30% Overlap	R709 - 7500K Overlap	31	50% Overlap	NTSC-3200 overlap
14	30% Overlap	R709 - 6500K Overlap	32	50% Overlap	Wide-9300 overlap
15	30% Overlap	R709 - 3200K Overlap	33	50% Overlap	Wide-7500 overlap
16	30% Overlap	NTSC-9300 Overlap	34	50% Overlap	Wide-6500 overlap
17	30% Overlap	NTSC-7500 overlap	35	50% Overlap	Wide-3200 overlap

前景色设置（Test Patterns）

Color Selection (Write - 12h)

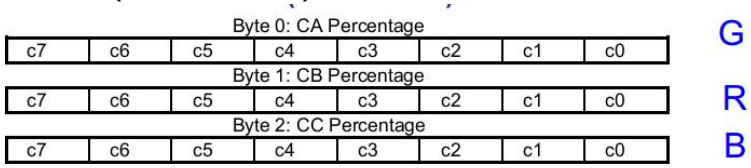


Four bytes are sent to describe the foreground color.
Foreground color is used for the solid field test pattern

Default ： 01 FF FF FF
Example ：
设置 Red 值 128 ： 34 12 00 00 80 00

对比度

Contrast (Write - 01h)



c(7:0) – Contrast percentage gain for a data channel
Range: 32h – 96h

Each contrast byte controls the gain applied to the maximum white level for a given data channel independent from the minimum black level and offset for that channel. The contrast gain has a range from 0.5 to 1.5 (50% to 150%) with 1.0 (100%) being nominal. The desired gain is achieved by sending the percentage gain for each data channel as a number between 32h and 96h (50 and 150 decimal) in these bytes.

Default ： 64 64 64 （100）

Example ：

34 01 64 64 64

风扇转速控制

Fan PWM Output Settings (Write – 10h)

Byte 0: Fan1 PWM Output Settings							
F1os7	F1os6	F1os5	F1os4	F1os3	F1os2	F1os1	F1os0
Byte 1: Fan2 PWM Output Settings							
F2os7	F2os6	F2os5	F2os4	F2os3	F2os2	F2os1	F2os0
Byte 2: Fan3 PWM Output Settings							
F3os7	F3os6	F3os5	F3os4	F3os3	F3os2	F3os1	F3os0

F1os (7:0) – Fan1 PWM Output Setting
Range: 0 = off
30%-100% in 5% increments (0x1e – 0x64)

F2os (7:0) – Fan2 PWM Output Setting
Range: 0 = off
30%-100% in 5% increments (0x1e – 0x64)

F3os (7:0) – Fan3 PWM Output Setting
Range: 0 = off
30%-100% in 5% increments (0x1e – 0x64)

r - Reserved, set to zero.

PWM duty cycle values will be rounded down to the nearest 5%. PWM duty cycle values that are less than 30% will be treated as 0 (off).

Default : 64 64 64 （100%）
Example :
34 10 64 64 64

Gamma Table

Gamma Correction (Write – 09h)

Byte 0: Degamma control MSB

dgm15	dgm14	r	r	r	r	r	r

Byte 1: Degamma control LSB

r	r	r	degs4	degs3	degs2	degs1	degs0

dgm(15:14) – Degamma mode
- 01: Degamma enabled
- 11: Degamma disabled

degs(4:0) – Degamma Table Selection.
- 00h: TI Film
- 01h: TI Graphics Enhanced
- 02h: TI Video Enhanced (NTSC, PAL, SECAM)
- 03h: Linear
- 04h-13h: OEM defined tables
- 14h-FFh: reserved

r – Reserved, set to zero

Default : 40 00
Example : 34 09 40 01

HSG Control

Hue, Saturation, and Gain (HSG) Control (Write – 13h)

This command is used to adjust gain, saturation, and hue for red, green, blue, cyan, magenta, and yellow colors, and the red, green, and blue gains for the white color.

Byte 0: Red Gain (MSB)							
red_gain15	Red_gain14	red_gain13	red_gain12	red_gain11	red_gain10	red_gain9	red_gain8
Byte 1: Red Gain (LSB)							
red_gain7	Red_gain6	red_gain5	red_gain4	red_gain3	red_gain2	red_gain1	red_gain0
Byte 2: Red Saturation (MSB)							
red_sat15	Red_sat14	red_sat13	red_sat12	red_sat11	red_sat10	red_sat9	red_sat8
Byte 3: Red Saturation (LSB)							
red_ sat7	Red_ sat6	red_ sat5	red_ sat4	red_ sat3	red_ sat2	red_ sat1	red_sat0
Byte 4: Red Hue (MSB)							
red_hue15	Red_hue14	red_hue13	red_hue12	red_hue11	red_hue10	red_hue9	red_hue8
Byte 5: Red Hue (LSB)							
red_ hue7	Red_ hue6	red_ hue5	red_ hue4	red_ hue3	red_ hue2	red_ hue1	red_hue0

...

HSG Byte 36 (MSB)							
w_rg15	w_rg14	w_rg13	w_rg12	w_rg11	w_rg10	w_rg9	w_rg8
HSG Byte 37 (LSB)							
w_rg7	w_rg6	w_rg5	w_rg4	w_rg3	w_rg2	w_rg1	w_rg0
HSG Byte 38 (MSB)							
w_gg15	w_gg14	W_gg13	w_gg12	w_gg11	w_gg10	w_gg9	w_gg8
HSG Byte 39 (LSB)							
w_gg7	w_gg6	w_gg5	w_gg4	w_gg3	w_gg2	w_gg1	w_gg0
HSG Byte 40 (MSB)							
w_bg15	w_bg14	W_bg13	w_bg12	w_bg11	w_bg10	w_bg9	w_bg8
HSG Byte 41 (LSB)							
w_bg7	W_bg6	w_bg5	w_bg4	w_bg3	w_bg2	w_bg1	w_bg0

Bytes 0-5: Red Gain, Saturation, Hue
Bytes 6-11: Green Gain, Saturation, Hue
Bytes 12-17: Blue Gain, Saturation, Hue
Bytes 18-23: Cyan Gain, Saturation, Hue
Bytes 24-29: Magenta Gain, Saturation, Hue
Bytes 30-35: Yellow Gain, Saturation, Hue

_Gain(0-15) – Gain in signed 1.14 format. Range: >= 0, < 2. Max= 1.99993896484375

_Sat(0-15) – Saturation in signed 1.14 format. Range: >= 0, < 2. Max= 1.99993896484375

_Hue(0-15) – Hue in signed 1.14 format. Range: >= -1, <= 1.

Bytes 36-41: White color Red Gain, Green Gain, Blue Gain:

w_rg(0-15) – Red gain for white color. Signed 1.14 format; Range: >=0< 2; Max= 1.99993896484375

w_gg(0-15) – Green gain for white color. Signed 1.14 format; Range: >= 0, < 2; Max= 1.99993896484375

w_bg(0-15) – Blue gain for white color. Signed 1.14 format; Range: >= 0, < 2; Max= 1.99993896484375

All 21 words (42 bytes) must be sent as one contiguous block to ensure the values are updated.
Sending tables with bad data values will likely result in unacceptable screen images.

Read HSG from CCA

Hue, Saturation, and Gain (HSG) from CCA (Read-only – 1516h)

This command is used to read the hue, saturation and gain values for red, green, blue, cyan, magent and yellow colors, along with the red, green, and blue component of the white color. Use this comma to obtain the equivalent HSG values after setting the CCA registers.

Byte 0: Red Gain (MSB)

red_gain15	Red_gain14	red_gain13	red_gain12	red_gain11	red_gain10	red_gain9	red_gain8

Byte 1: Red Gain (LSB)

red_gain7	Red_gain6	red_gain5	red_gain4	red_gain3	red_gain2	red_gain1	red_gain0

Byte 2: Red Saturation (MSB)

red_sat15	Red_sat14	red_sat13	red_sat12	red_sat11	red_sat10	red_sat9	red_sat8

Byte 3: Red Saturation (LSB)

red_ sat7	Red_ sat6	red_ sat5	red_ sat4	red_ sat3	red_ sat2	red_ sat1	red_sat0

Byte 4: Red Hue (MSB)

red_hue15	Red_hue14	red_hue13	red_hue12	red_hue11	red_hue10	red_hue9	red_hue8

Byte 5: Red Hue (LSB)

red_ hue7	Red_ hue6	red_ hue5	red_ hue4	red_ hue3	red_ hue2	red_ hue1	red_hue0

...

HSG Byte 36 (MSB)

w_rg15	w_rg14	w_rg13	w_rg12	w_rg11	w_rg10	w_rg9	w_rg8

HSG Byte 37 (LSB)

w_rg7	w_rg6	w_rg5	w_rg4	w_rg3	w_rg2	w_rg1	w_rg0

HSG Byte 38 (MSB)

w_gg15	w_gg14	W_gg13	w_gg12	w_gg11	w_gg10	w_gg9	w_gg8

HSG Byte 39 (LSB)

w_gg7	w_gg6	w_gg5	w_gg4	w_gg3	w_gg2	w_gg1	w_gg0

HSG Byte 40 (MSB)

w_bg15	w_bg14	W_bg13	w_bg12	w_bg11	w_bg10	w_bg9	w_bg8

HSG Byte 41 (LSB)

w_bg7	W_bg6	w_bg5	w_bg4	w_bg3	w_bg2	w_bg1	w_bg0

Bytes 0-5: Red Gain, Saturation, Hue
Bytes 6-11: Green Gain, Saturation, Hue
Bytes 12-17: Blue Gain, Saturation, Hue
Bytes 18-23: Cyan Gain, Saturation, Hue
Bytes 24-29: Magenta Gain, Saturation, Hue
Bytes 30-35: Yellow Gain, Saturation, Hue

_Gain(0-15) – Gain in signed 1.14 format. Range: >= 0, < 2. Max= 1.99993896484375

_Sat(0-15) – Saturation in signed 1.14 format. Range: >= 0, < 2. Max= 1.99993896484375

_Hue(0-15) – Hue in signed 1.14 format. Range: >= -1, <= 1.

Bytes 36-41: White color Red Gain, Green Gain, Blue Gain:

w_rg(0-15) – Red gain for white color. Signed 1.14 format; Range: >=0< 2; Max= 1.99993896484375

w_gg(0-15) – Green gain for white color. Signed 1.14 format; Range: >= 0, < 2; Max= 1.99993896484375

w_bg(0-15) – Blue gain for white color. Signed 1.14 format; Range: >= 0, < 2; Max= 1.99993896484375

图像方向

Image Orientation (Write - 03h)

r	r	r	r	r	r	ew	ns

ew - east/west flip.
- 0: normal (front projection and projector right-side up **OR** rear projection and projector upside-down)
- 1: flip (rear projection and projector right-side up **OR** front projection and projector upside-down)

ns - north/south flip.
- 0: normal (projector right-side up)
- 1: flip (projector upside down)

r - Reserved, set to zero.

East/West flip is used to permit the design to operate in both rear-projection and front-projection applications. North/South Flip is used to permit the design to operate in both normal and mechanically inverted applications. East/West flip function flips the image horizontally. North/South flip function flips the image vertically. North/South/West/East flip functions change the position of “horizontal starting column” and “vertical starting line”, flipping it along a major axis, but not the meaning of those terms.

Default : 01
Example : 34 03 03

投影模式

Projection Mode (Write - 02h)

pm2	pm1	pm0	r	r	r	r	r

pm (7:5) - Projection Mode.

- 000: Video Curtain - A solid color Video Curtain, defined by the foreground color of the Color Select command (see Section 7.5), will be displayed in place of the source image.
- 001: Test Patterns –The test pattern selected with the Test Pattern command (see Section 12.7) will be displayed in place of the source image.
- 010: Blank - The lamp is enabled, however the display will be blanked to black and no image of any kind can be displayed. Blank mode should be used during any source or channel change.
- 100: Freeze –The last Normal source image will be kept on the screen and will not update until Projection Mode is returned to “Normal”.
- 011: Illumination Off – Optionally (selectable through DLP Composer ™ tool) the DMD device can go into a 50/50 duty cycle mode. It is recommended that the power will be supplied for at least 3 minutes after issuing this command. The illumination source will be turned off. The DMD will still be powered down normally when power is removed.
- 110: Normal - The selected source will be displayed.
- 101: Custom Test Patterns – Due to the slow load time of custom test patterns this mode is for calibration use only. Pre-compressed test pattern images stored in flash and selected with the Custom Test Pattern command will be displayed in place of the source image. See Section 12.1 for the selection of Custom Test Patterns.

r - Reserved, set to zero.

Default : C0 （Normal）
Example : 34 02 20

Test Patterns

Test Patterns (Write – 33h)

Byte 0:

r	r	r	r	tp3	tp2	tp1	tp0

Byte1:

tpp7	tpp6	tpp5	tpp4	tpw3	tpw2	tpw1	tpw0

tp(3:0) – Test Pattern
- 0000: Solid Field
- 0001: Horizontal Ramp
- 0010: Vertical Ramp
- 0011: Horizontal Lines
- 0100: Diagonal Lines
- 0101: Vertical Lines
- 0110: Grid
- 0111: Checkerboard
- 1000: ANSI Checkerboard

tpp(7:4) - Test Pattern Period
How often the pattern repeats

tpw(3:0) – Test Pattern Width
The width of each line in the pattern

r – Reserved, set to zero

The color used for the Solid Field test pattern is determined by the foreground color chosen through the Color Selection command (See *Section 7.5 Color Selection (Write - 12h)* on page 20). All other patterns use Black and White. Test patterns are enabled using the Projection Mode command (See *Section 7.25 Projection Mode (Write - 02h)* on page 36).

The Horizontal and Vertical ramp patterns are made up of multiple ramps.

The Test Pattern Period is the number of pixels in the pattern before it repeats. For best results, this value should be a power of 2 and larger than Test Pattern Width. Does not apply to solid or ramp patterns (0,1,2).

Test Pattern Width is the width of the line (in pixels). For best results, this value should be a power of 2 and less than or equal to half of the Test Pattern Period. Does not apply to solid or ramp patterns (0,1,2).

For checkerboard, byte 1 (normally, the period and width) is treated as a single, 8-bit value that indicates the width and height (in pixels) of each square.

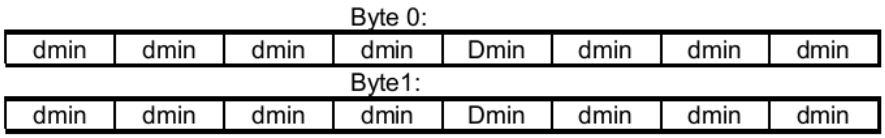
The Test Pattern Generator VSync command should be used to set the internal VSync rate for the Test Pattern Generator mode.

Default ： 00 F0
Example ：

通过 Projection Mode 切换到 Test Patterns ： 34 02 20
图像显示白色（因 Test Patterns 默认设置为 Solid Filed ，Color Selection 默认设置为 01 FF FF FF）
更改 Solid Filed 当前色彩为绿色 ：34 12 01 FF 00 00
通过 Projection Mode 切换到 Normal，正常显示外部图像：34 02 C0

DynamicBlack Level

DynamicBlack Level (Write – 4Ah)



dmin(15:0) – DynamicBalck ™ min aperture setting (Range 1- 254)

This command directly sets the PWM value for DynamicBlack™.

Default : 00 01
Example : 34 4A 00 64

De-saturation Mode Select

De-saturation Mode Select (Command 0x27)

The default mode for de-saturation is disabled, or off. This command allows selecting between turning off de-saturation, or enabling de-saturation via CCA.

Byte 0: DSP CMD

0	0	1	0	0	1	1	1

Byte 1: Reserved

0	0	0	0	0	0	0	0

Byte 2: Reserved

0	0	0	0	0	0	0	0

Byte 3: Reserved

0	0	0	0	0	0	0	0

Byte 4: Reserved

0	0	0	0	0	0	0	0

Byte 5: Reserved

0	0	0	0	0	0	0	0

Byte 6: Reserved

0	0	0	0	0	0	0	0

Byte 7: Mode (LSB)

0	0	0	0	0	0	M_1	M_0

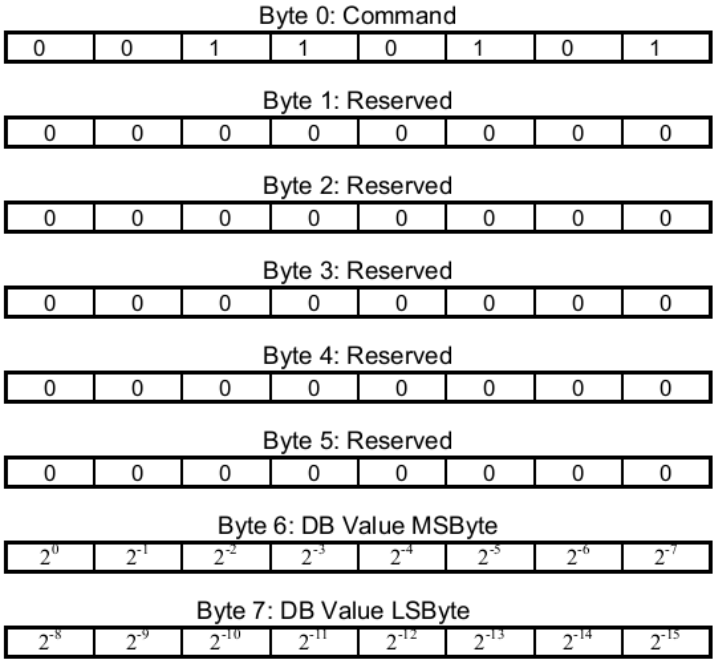
Where:

M[1:0] 0 = Off - No Desaturation. [Default]
1 = De-saturation via CCA
2 = De-saturation via current.

Default : 27 00 00 00 00 00 00 00
Example : 34 5E 27 00 00 00 00 00 00 01

DB Level

Set DB Level (Command 0x35)
This command sets the percentage DynamicBlack™ attenuation level that the DSP will use to scale the LED driver current values.



DynamicBlack™ Value[15:0]. Format is u1.15 expressed as a percentage, where 1.0 is 100 % current level, or no attenuation.

Default : 35 00 00 00 00 00 80 00
Example : 34 5E 35 00 00 00 00 00 40 00

Request Driver ADC Value

Request Driver ADC Value (Command 0xB7)

Byte 0: DSP CMD

1	0	1	1	0	1	1	1

Byte 1: Requested Color

0	0	0	0	C3	C2	C1	C0

Byte 2: ADC Measurement Number

0	0	0	0	M3	M2	M1	M0

Byte 3: Reserved

0	0	0	0	0	0	0	0

Byte 4: Reserved

0	0	0	0	0	0	0	0

Byte 5: Reserved

0	0	0	0	0	0	0	0

Byte 6: Reserved

0	0	0	0	0	0	0	0

Byte 7: Reserved

0	0	0	0	0	0	0	0

Where:

C[3:0] = Requested Color

0=red
1=green
2=blue
3=yellow
4=cyan
5=magenta
6=white
7=IR
8-15=reserved

M[3:0] = ADC # to return measurement from

Upon receipt of this command, the LED DSP Controller places the requested measurement values into the I2C Output FIFO. These values may then be read using I2C.

Byte 0: ADC Value MSByte

ADC15	ADC14	ADC13	ADC12	ADC11	ADC10	ADC9	ADC8

Byte 1: ADC Value LSByte

ADC7	ADC6	ADC5	ADC4	ADC3	ADC2	ADC1	ADC0

Color Point Processing Control

Color Point Processing Control (Command 0x87)

The Color Point Processing Control command enables or disables Calibration mode and enables or disables the Color Point Processing function.

Byte 0: DSP CMD

1	0	0	0	0	1	1	1

Byte 1: Reserved

0	0	0	0	0	0	0	0

Byte 2: Reserved

0	0	0	0	0	0	0	0

Byte 3: Reserved

0	0	0	0	0	0	0	0

Byte 4: Reserved

0	0	0	0	0	0	0	0

Byte 5: Reserved

0	0	0	0	0	0	0	0

Byte 6: Reserved

0	0	0	0	0	0	0	0

Byte 7: Color Point Processing Control

0	0	0	0	0	CURCCA	CAL_EN	WP_EN

Where:

WP_EN	0:	Disable	Controls if White Point Correction Algorithm is Enabled.
	1:	Enable	
CAL_EN	0:	Disable	Controls if Calibration mode is Enabled.
	1:	Enable	
CURCCA	0:	User Current	When WP_EN=1, this field determines which method the DSP uses to control the white point.
	1:	Use CCA	

CAL_EN : 34 5E 87 00 00 00 00 00 00 02
WP_EN : 34 5E 87 00 00 00 00 00 00 01