

PRODUCT SPECIFICATION

CFAL160128B-F-B2

160 × 3 × 128 GRAPHICS

OLED DISPLAY MODULE

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1 Overview

CFAL160128B-F-B2 is an OLED full colors matrix display module. The characteristics of this display module are high brightness, self-emission, high contrast ratio, slim/thin outline, wide viewing angle, wide temperature range, and low power consumption.

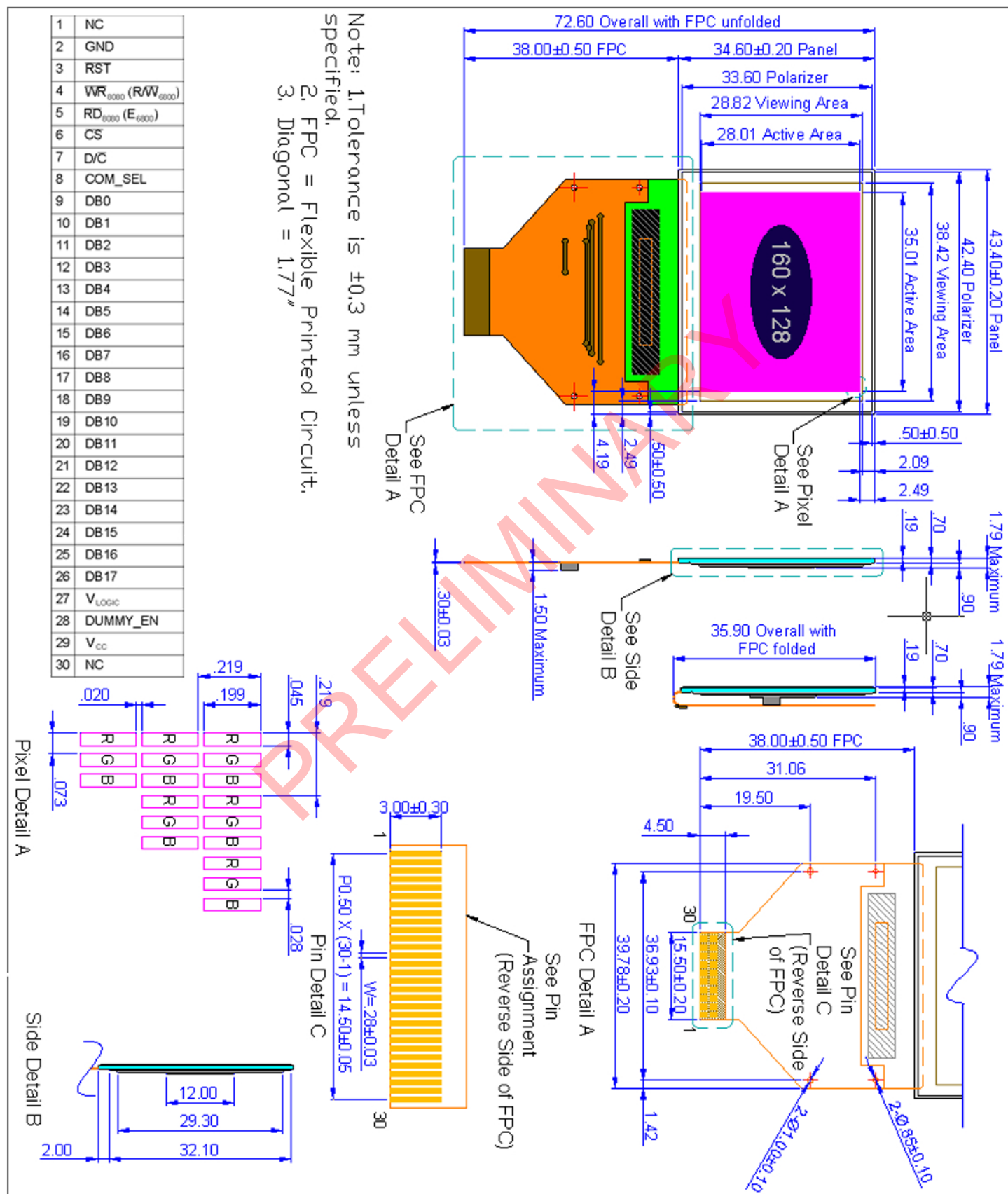
2 Features

- Color: 262K or 6.5K full colors
- $160 \times 3 \times 128$ pixels
- 18/16/9/8 bit parallel data with MPU(I80 and M68 parallel interface)
- Driver IC: LGDP4216

3 Mechanical Data and Part Number

NO.	ITEM	SPECIFICATION	UNIT
1	Dot Matrix	$160(W) \times (RGB) \times 128(H)$	Dot
2	Dot Size	$0.045 (W) \times 0.199 (H)$	mm^2
3	Dot Pitch	$0.073 (W) \times 0.219(H)$	mm^2
4	Pixel Pitch	$0.219 (W) \times 0.219(H)$	mm^2
5	Aperture Rate	56.01	%
6	Active Area	$35.012 (W) \times 28.012 (H)$	mm^2
7	Panel Size	$43.4(W) \times 34.6(H) \times 1.87(D)$	mm^3
8	Diagonal A/A size	1.77	inch
9	Module Weight	TBD	gram

4 Mechanical Drawing



5 Module Interface

Pin No	Symbol	I/O	Description
1	NC	-	No connected.
2	GND	-	Ground
3	RSTB	I	Reset (Active low)
4	WRB	I	Write (Active low, 80 interface), H: Read, L: Write (68 interface)
5	RDB	I	Read (Active low, 80 interface), Enable (68 interface)
6	CSB	I	Chip Select (Active low)
7	RS	I	Address (L: index, H: parameter or data)
8	COM_SEL	I	Data Bit Selection Signal Input
9-26	D0~D17	I/O	An 18bit bus for RGB data.
27	VDD	-	A supply voltage for the logic.
28	DUMMY_EN	O	Dummy scan status output (H : dummy scan, L : normal scan)
29	VCC	-	supply voltage for panel (15v)
30	NC	-	No connected.

6 Absolute Maximum ratings

ITEM	Symbol	MIN	MAX	Unit	Note
supply voltage	VDD	TBD		V	1,2
Diver Supply voltage	VCC	TBD		V	1,2
Operating Temp.	Top	TBD		°C	
Storage Temp	Tstg	TBD		°C	

Note 1: All the above voltages are on the basis of “GND = 0V”.

Note 2: When this module is used beyond the above absolute maximum ratings, permanent breakage of the module may occur. Also, for normal operations, it is desirable to use this module under the conditions according to Section 8. “Electrical Characteristics”. If this module is used beyond these conditions, malfunctioning of the module can occur and the reliability of the module may deteriorate.

7 Electrical Characteristics

7.1 DC Electrical Characteristics

ITEM	Symbol	MIN	TYPE	MAX	Unit
Power Supply Voltage(1)	DVCC,SVCC	10	15	21	V
Power Supply Voltage(2)	IOVDD	2.2		3.3	
Power Supply Voltage(3)	VDD,AVDD	2.2	2.8	2.9	
High-level Input Voltage	V_{IH}	0.7VDD		VDD	V
Low-level input Voltage	V_{IL}	0		0.3VDD	V
High-level Output Voltage	V_H	0.8VDD		VDD	V
Low-level Output Voltage	V_{IL}	0		0.2VDD	V

Note : The V_{PP} input must keep in a stable value; ripple and noise are not allowed.

7.2 Electro-optical Characteristics

Item	Symbol	Test condition	MIN	TYPE	MAX	Unit
Normal mode Current consumption	Icc	All pixels on(1)	-	28	35	mA
Brightness	L_{br}		80	100	-	cd/m ²
View angle						degree

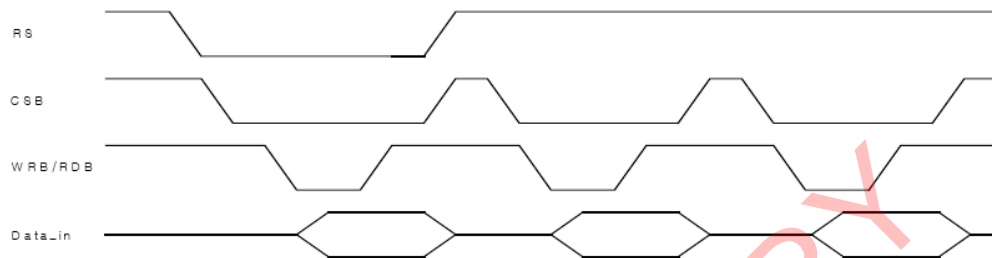
Note 1: VDD = 2.8V, VCC = 15V, 100 cd/m², Frame Rate = 90Hz, , All Display Area Turn on.

7.3 AC Electrical Characteristics

I80 Series CPU

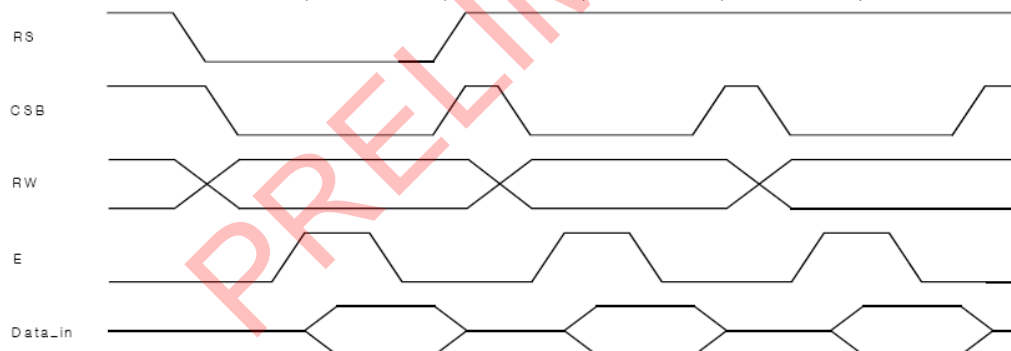
(Maximum input frequency: 10MHz)

Function	CSB	WRB	RDB	RS	D
Write Command	L	↑	H	L	Index
Write Parameter Or Data	L	↑	H	H	Parameter or Data
Read Parameter Or Data	L	H	↑	H	Parameter or Data



M68 Series CPU

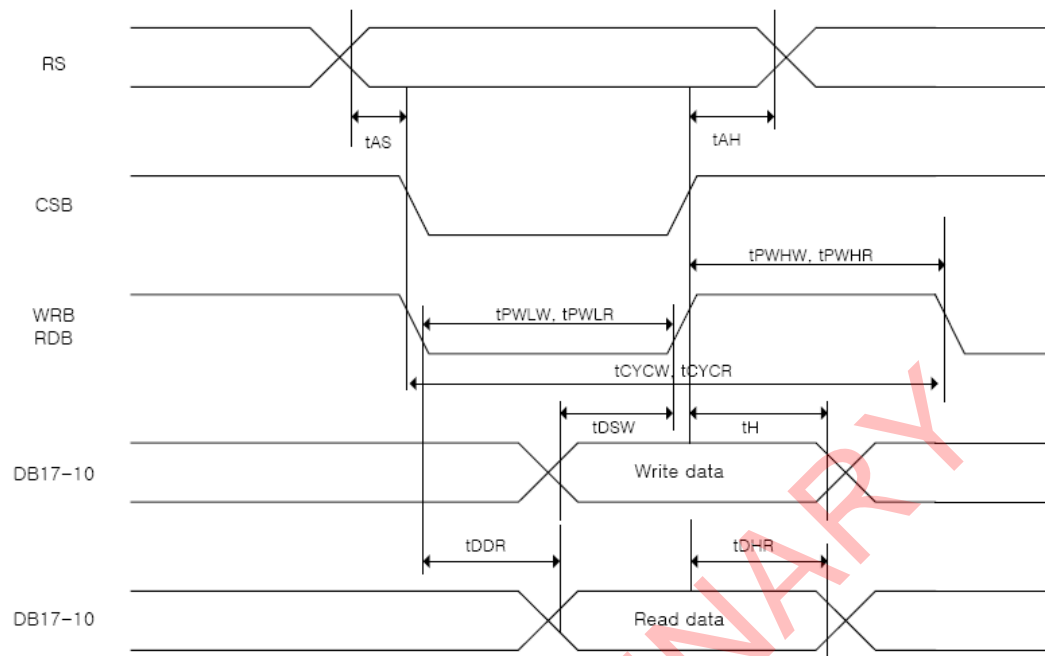
Function	CSB	RW	E	RS	D
Write Command	L	L	↓	L	Index
Write Parameter Or Data	L	L	↓	H	Parameter or Data
Read Parameter Or Data	L	H	↓	H	Parameter or Data



M68 Series Parallel Interface

When M68 series parallel data transfer has been selected, data is written to the controller at the falling edge of the E signal when the RW signal is low. During the data read operation, the data bus enters the output status when the RW signal is high, output valid data at the rising edge of the E signal, and enters the high-impedance state at the falling edge of the RW signal.

180 Series Interface Timing Characteristics



Item		Symbol	Unit	Min	Typ	Max
Bus cycle	Write	tCYCW	ns	100		
	Read	tCYCR	ns	100		
Write "Low" level pulse width	Write	tPWLW	ns	40		
Read "Low" level pulse width	Read	tPWLW	ns	40		
Write "High" level pulse width	Write	tPWHW	ns	40		
Read "High" level pulse width	Read	tPWHR	ns	40		
Setup time	Write (RS~CSB, WRB)	tAS	ns	0		
	Read (RS~CSB, RDB)		ns	0		
Address hold time		tAH	ns			
Write data setup time		tDSW	ns			
Write data hold time		tH	ns			
Read data delay time		tDDR	ns	10		
Read data hold time		tDHR	ns	10		

Interface Selection

C86 (interface selection Pin)	CSB	RS	RW	WRB	D
H (M68 series MPU)	CSB	RS	E	R/W	D [17:0]
L (180 series MPU)	CSB	RS	RDB	WRB	D [17:0]

8 Display Control Instruction

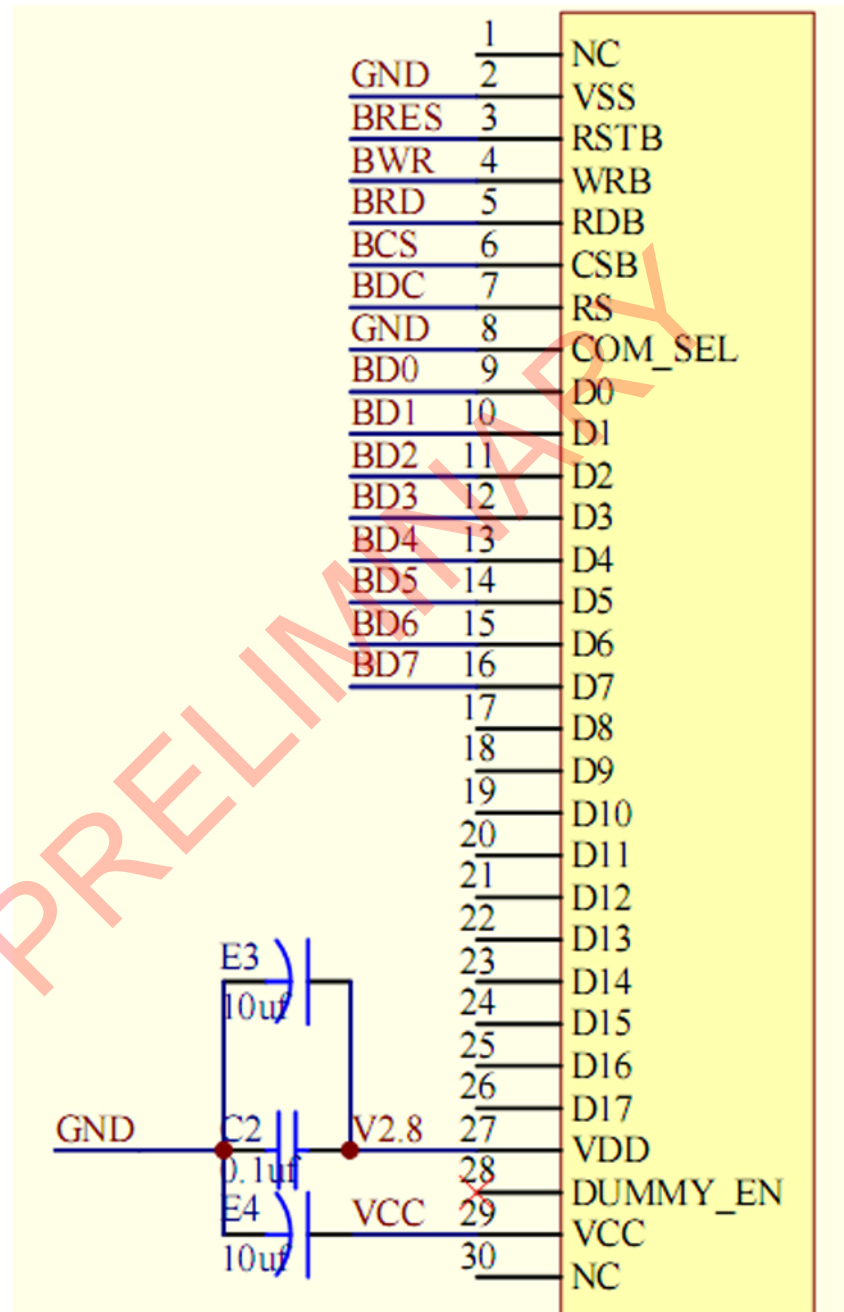
Refer to IC Spec.: LGDP4216

	D7	D6	D5	D4	D3	D2	D1	D0
0x00	DISP(0)	-	-	DIR(0)	BGR(0)	-	-	RESET(0)
0x01	-	WR_DIR(101)			-	IF_MODE(000)		
0x02	-	-	-	DIS_SZ(0)	-	DIS_FRAME(010)		
0x03	-	-	-	-	-	-	SCAN_DIR(0)	SCAN_SEQ(0)
0x04	-	-	-	-	-	-	-	DIS_ROT
0x05	WR_DATA							
0x06	AD_X(10011111)							
0x07	-	AD_Y(0000000)						
0x08	MXSTART(00000000)							
0x09	MXEND(10011111)							
0x0a	-	MYSTART(0000000)						
0x0b	-	MYEND(1111111)						
0x0c	SETTING DISABLE							
0x0d	-	-	-	-	-	-	-	PCDR(0)
0x0e-0f	SETTING DISABLE							
0x10	-	SAVE_TIME_SS(000)			-	DISP_TIME_SS(000)		
0x11	STEP_TIME_SS0(0000)				-	IMAGE_STOP_TIME0(000)		
0x12	STEP_TIME_SS1(0000)				-	IMAGE_STOP_TIME1(000)		
0x13	STEP_TIME_SS2(0000)				-	IMAGE_STOP_TIME2(000)		
0x14	-	SSMP0(000)			-	SSM(000)		
0x15	-	SSMP2(000)			-	SSMP1(000)		
0x16	PV_SEL0(00)		COL_FADE_STEP0(00)		SCRL_DIR0(00)		FADE_MODE0(11)	
0x17	PV_SEL1(00)		COL_FADE_STEP1(00)		SCRL_DRI1(00)		FADE_MODE1(11)	
0x18	PV_SEL2(00)		COL_FADE_STEP2(00)		SCRL_DRI2(00)		FADE_MODE2(11)	
0x19	-	-	FADE_STOP_LEVEL0(000000)					
0x1a	-	-	FADE_STOP_LEVEL1(000000)					
0x1b	-	-	FADE_STOP_LEVEL2(000000)					
0x1c	X_LIMIT0(00000000)							
0x1d	X_LIMIT1(10011111)							
0x1e	-	Y_LIMIT0(0000000)						
0x1f	-	Y_LIMIT1(1111111)						
0x20	DIS_CHARGE_TIME_R(00000000)							
0x21	DIS_CHARGE_TIME_G(00000000)							
0x22	DIS_CHARGE_TIME_B(00000000)							

0x23	R_PEAK_TIME(00000100)							
0x24	G_PEAK_TIME(00000110)							
0x25	B_PEAK_TIME(00001000)							
0x26	-	-	SCAN_TIME(000000)					
0x27	-	-	-	BP_EN(0)	-	-	-	BP_MODE(0)
0x28	FLM_LINE(01111111)							
0x29-0x3f	SETTING DISABLE							
0x40	-	R_LUT(0000000)						
0x41	-	G_LUT(0000000)						
0x42	-	B_LUT(0000000)						
0x43								LUT_BP(0)
0x44-0x4f	SETTING DISABLE							
0x50	R_CURRENT(01010000)							
0x51	G_CURRENT(01010000)							
0x52	B_CURRENT(01010000)							
0x53	R_PEAK_DC_CURRENT(000)			R_PEAK_CURRENT(00011)				
0x54	G_PEAK_DC_CURRENT(000)			G_PEAK_CURRENT(00011)				
0x55	B_PEAK_DC_CURRENT(000)			B_PEAK_CURRENT(00011)				
0x56						BP2_CURRENT(010)		
0x57	SETTING DISABLE -							
0x58	SETTING DISABLE							
0x59	SETTING DISABLE							
0x5a								GRAY_LEVEL(0)
0x5a-0x5f	SETTING DISABLE							
0x60						SCAN_VOLTAGE(000)		
0x61			SCAN_DRV(00)			SCAN_BIAS(100)		
0x62-0x9f	SETTING DISABLE							
0xa0								STBY(0)
0xa1						GPO(00)		
0xa2				TEST(0)		TEST_PAT(000)		
0xa3								FOSC_TEST(0)
0xa4		OFF_STEP_TIME(000)						OFF_SET(0)
0xa5			OFF_GRAY(000000)					
0xa6-0xaf	SETTING DISABLE							

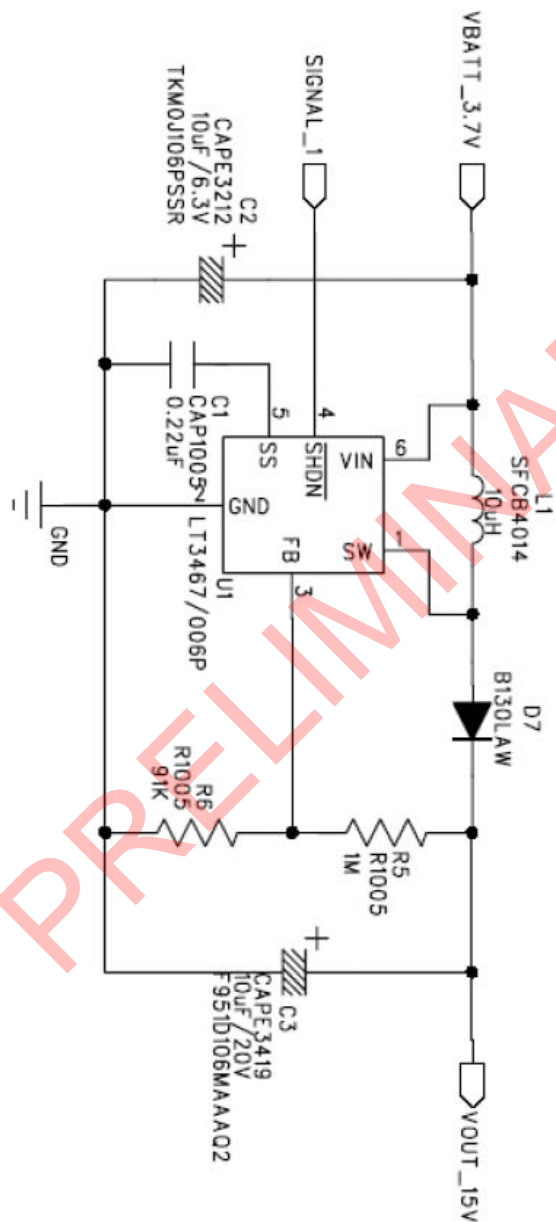
9 Application

9.1 APPLICATION CIRCUIT



Power Block for 1.77" OLED Unit

Power DC-DC Converter LT3467



9.2 Revision history for 1.77" OLED Optimum Driving Setting

1.77" OLED Optimum Driving Setting1

◆ Driving Procedure

Luminance = 140 nit (Vcc=15V) CIE = (0.29, 0.31)
Zener Diode = Red 3.0V, Green 2.7V, Blue 3.0V $R_{OSC} = 15\text{ k}\Omega$, $R_{REF} = 18\text{ k}\Omega$

Power ON 1 : VDD=2.8[V]



Hardware Reset (Pin name: RSTB)



Register	Parameter	Description
0XA1	0X03	GPO<0>



Power ON 2 : VBAT=3.7[V]

✎ GPO<0> signal turns on DC-DC converter to supply Vcc(18V).

✎ VBAT(3.7V) inputs DC-DC Converter.

1.77" OLED Optimum Driving Setting2

◆ Register Setting

Initial Function(1'st Procedure)		
Register	Parameter	Description
0X61	0X00	Scan Regulator Off
0X60	0X00	-
0X01	0X50	Display 2
0X06	0X9F	X-Start Address
0X02	0X03	Display 3
0X43	0X00	Enable gamma
0X03	0X01	Scan direction
0X27	0X01	BP_mode
0X20	0X07	Discharge R
0X21	0X07	Discharge G
0X22	0X07	Discharge B
0X23	0X08	R-Peak time
0X24	0X28	G-Peak time
0X25	0X1B	B-Peak time
0X50	0X6E	Dot current R
0X51	0X11	Dot current G
0X52	0X1E	Dot current B
0X26	0X09	Scan time
0X5A	0X00	Data gray level

※ Each Register's explanation sees Drive IC(LGDP4216) Spec.
and value will be modified.

① 65K colors and Portrait

Register[0X01]→Parameter[0X51]

Register[0X06]→Parameter[0X9F]

② 65K colors and Landscape

Register[0X01]→Parameter[0X01]

Register[0X06]→Parameter[0X00]

③ 260K colors and Portrait (Present parameter)

Register[0X01]→Parameter[0X50]

Register[0X06]→Parameter[0X9F]

④ 260K colors and Landscape

Register[0X01]→Parameter[0X00]

Register[0X06]→Parameter[0X00]

Initial Function(2'nd Procedure)		
Register	Parameter	Description
0X53	0X03	R-Peak current set
0X54	0X1F	G-Peak current set
0X55	0X1F	B-Peak current set
0X40	Next Page	R-Gamma
0X41	Next Page	G-Gamma
0X42	Next Page	B-Gamma
0X00	0X80	Display on

R/G/B Gamma parameter																	
Register	Parameter (Hex)																Description
0X40	00	00	00	00	00	00	00	00	02	03	05	07	09	0B	0D	0E	R-Gamma
	10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1E	1F	21	
	23	25	27	2A	2C	2E	30	33	35	38	3A	3C	3F	41	44	46	
	49	4C	4E	51	54	57	5B	5E	62	65	69	6D	72	76	7B	7F	
0X41	00	00	00	00	00	00	00	00	02	03	05	07	09	0B	0D	0E	G-Gamma
	10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1E	1F	21	
	23	25	27	2A	2C	2E	30	33	35	38	3A	3C	3F	41	44	46	
	49	4C	4E	51	54	57	5B	5E	62	65	69	6D	72	76	7B	7F	
0X42	00	00	00	00	00	00	00	00	02	03	05	07	09	0B	0D	0E	B-Gamma
	10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1E	1F	21	
	23	25	27	2A	2C	2E	30	33	35	38	3A	3C	3F	41	44	46	
	49	4C	4E	51	54	57	5B	5E	62	65	69	6D	72	76	7B	7F	

◆ About R/G/B-Gamma:

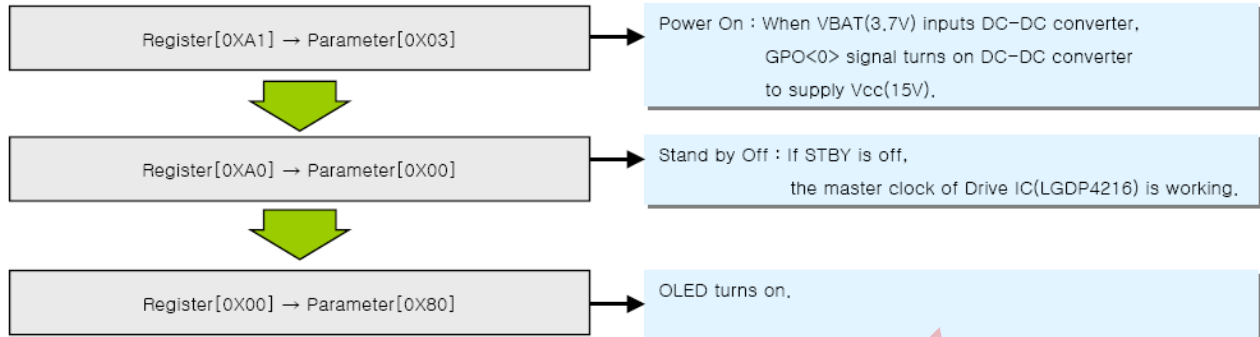
Total parameters of each register are 64[EA].

So you must write one register, and then continuously 64 times parameters.

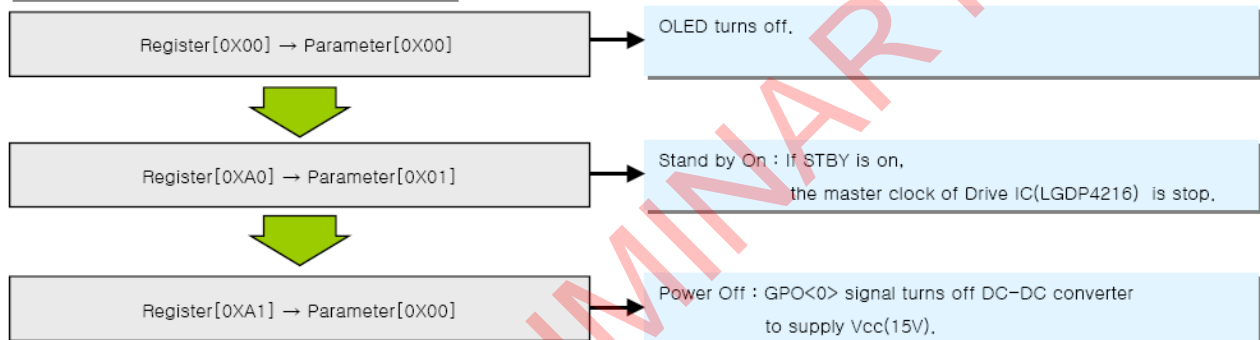
These parameters procedure is 1'st column{row(left → right)}, 2'nd column{row(left → right)}, 3'rd column{row(left → right)},
final column{row(left → right)}.

1.77" OLED Optimum Driving Setting3

◆ Display On Procedure



◆ Display Off and Power Off Procedure



10 Precautions for operation and Storage

10.1 Precautions for Operation

- (1) Since OLED panel is made of glass, in order to prevent from glass broken, please do not apply any mechanical shock or impact or excessive force to it when installing the OLED module. Any strong mechanical impact due to falling dropping etc. may cause damage (breakage or cracking).
- (2) The polarizer on the OLED surface is made of soft material and is easily scratched. Please take most care when handing.
- (3) If OLED surface is contaminated, please wipe it off gently by using moisten soft cloth with normal ethanol, do not use acetone, ketone, isopropyl alcohol or water. If there is saliva or water on the OLED surface, please wipe it off immediately.
- (4) When handling OLED module, please be sure that the body and the tools are properly rounded. And do not touch I/O pins with bare hands or contaminate I/O pins, it will cause disconnection or defective insulation of terminals.
- (5) Do not attempt to disassemble or process the OLED module.
- (6) OLED module should be used under recommended operating conditions shown in the specification. Since the higher voltage leads to the shorter lifetime, be sure to use the specified operating voltage.
- (7) Foggy dew, moisture condensation or water droplets deposited on surface and contact terminals will cause polarizer stain or damage, the deteriorated display quality and electrochemical reaction then leads to the shorter life time and permanent damage to the module probably. Please pay attention to the environmental temperature and humidity.

10.2 Soldering

- (8) Use the high quality solder. (60-63% tin mixed with lead)
- (9) Iron: no higher than 260°C and less than 3~4 sec during soldering.
- (10) Soldering: only to the I/O terminals.
- (11) Rewiring: no more than 3 times.

10.3 Precautions for Storage

- (12) Please store OLED module in a dark place, avoid exposure to sunlight, the light of fluorescent lamp or any ultraviolet ray.
- (13) Keep the environment temperature at between 10°C and 35°C and the relative humidity less than 60%. Avoid high temperature, high humidity.
- (14) That keeps the OLED modules stored in the container shipped from supplier before using them is recommended.
- (15) Do not leave any article on the OLED module surface for an extended period of time.

10.4 Warranty period

Crystalfontz America, Inc. warrants for a period of 12 months from the shipping date when stored or used under normal condition

11 Test Status

11.1 Content of Reliability Tests

TEST ITEM	TEST CONDITION	Criteria
High temperature storage	80°C, 120 hours	The brightness should be greater than 50% of the initial brightness. The operational functions work
Low temperature storage	-30°C, 120 hours	
Humidity (storage)	60°C, 90% RH, 120 hours	
High temperature (operating)	70°C, 120 hours	
Low temperature (operating)	-20°C, 120 hours	

- All operation tests are conducted in all display on pattern.

PRELIMINARY