

Crystalfontz America, Inc.

CUSTOMER		
MODEL	CFAX12864A-WFH	
APPROVAL	BY:	DATA:

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1. Module Classification Information

CFA X 1 2 8 6 4 A - W F H

① ② ③ ④ ⑤ ⑥ ⑦

①	Brand : CRYSTALFONTZ AMERICA, INCORPORATED	
②	Display Type : H→Character Type, G→Graphic Type, X→TAB	
③	Display's logical dimensions: 128 pixels by 64 pixels	
④	Model serials no.	
⑤	Backlight Type :	<p>N→Without backlight</p> <p>B→EL, Blue green</p> <p>D→EL, Green</p> <p>W→EL, White</p> <p>F→CCFL, White</p> <p>Y→LED, Yellow Green</p> <p>A→LED, Amber</p> <p>R→LED, Red</p> <p>O→LED, Orange</p> <p>G→LED, Green</p>
⑥	LCD Mode :	<p>B→TN Positive, Gray</p> <p>N→TN Negative,</p> <p>G→STN Positive, Gray</p> <p>Y→STN Positive, Yellow Green</p> <p>M→STN Negative, Blue</p> <p>F→FSTN Positive</p> <p>T→FSTN Negative</p>
⑦	LCD Polarizer Type/ Temperature range/ View direction	<p>A→Reflective, N.T, 6:00</p> <p>D→Reflective, N.T, 12:00</p> <p>G→Reflective, W. T, 6:00</p> <p>J→Reflective, W. T, 12:00</p> <p>B→Transflective, N.T,6:00</p> <p>E→Transflective, N.T,12:00</p> <p>H→Transflective, W.T,6:00</p> <p>K→Transflective, W.T,12:00</p> <p>C→Transmissive, N.T,6:00</p> <p>F→Transmissive, N.T,12:00</p> <p>I→Transmissive, W. T, 6:00</p> <p>L→Transmissive, W.T,12:00</p>
⑧	Special Code	

2.Precautions in use of LCD Modules

- (1) Avoid applying excessive shocks to the module or making any alterations or modifications to it.
- (2) Don't make extra holes on the printed circuit board, modify its shape or change the components of LCD module.
- (3) Don't disassemble the LCM.
- (4) Don't operate it above the absolute maximum rating.
- (5) Don't drop, bend or twist LCM.
- (6) Soldering: only to the I/O terminals.
- (7) Storage: please storage in anti-static electricity container and clean environment.

3.General Specification

Item	Dimension	Unit
Number of Dots	128*64	
Module dimension(w/o TAB)	34.0x 24.22x 1.8(max)	mm
View area	29.58x 17.98	mm
Active area	25.58x 15.98	mm
Dot size	0.18x 0.23	mm
Dot pitch	0.20x 0.25	mm
LCD type	FSTN, Positive, transfective	
Duty	1/64	
View direction	6 o'clock	
Backlight	EL , White	

4. Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	T_{OP}	-20	-	+70	°C
Storage Temperature	T_{ST}	-30	-	+80	°C
Input Voltage	V_I	V_{SS}	-	V_{DD}	V
Supply Voltage For Logic	$V_{DD}-V_{SS}$	2.4	-	5.5	V
Supply Voltage For LCD	V_O-V_{SS}	4.0	-	15.0	V

5. Electrical Characteristics

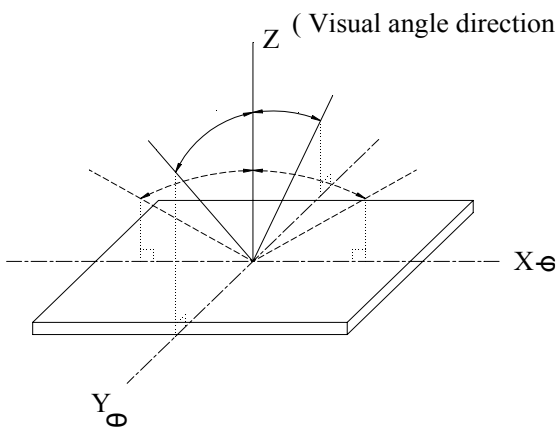
Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage For Logic	$V_{DD}-V_{SS}$	-	2.4	-	5.5	V
Supply Voltage For LCD	$V_{DD}-V_0$	$T_a=-20^{\circ}\text{C}$	-	-	9.2	V
		$T_a=25^{\circ}\text{C}$	-	-	-	V
		$T_a=70^{\circ}\text{C}$	-	8.2	-	V
			7.2	-	-	
Input High Volt.	V_{IH}	-	$0.8 V_{DD}$	-	V_{DD}	V
Input Low Volt.	V_{IL}	-	-	-	$0.2 V_{DD}$	V
Output High Volt.	V_{OH}	-	$V_{DD} - 0.4$	-	-	V
Output Low Volt.	V_{OL}	-	-	-	0.4	V
Supply Current	I_{DD}	$V_{DD}=5\text{V}$	-	1.5	-	mA

6. Optical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
View Angle	(V) θ	$CR \geq 2$	10	-	40	deg
	(H) ϕ	$CR \geq 2$	-30	-	30	deg
Contrast Ratio	CR	-	-	5	-	-
Response Time	T rise	-	-	110	220	ms
	T fall	-	-	260	520	ms

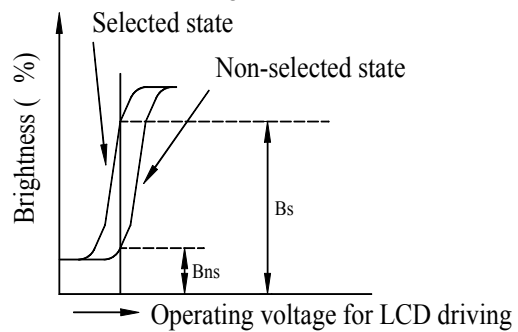
6.1 Definitions

■ View Angles

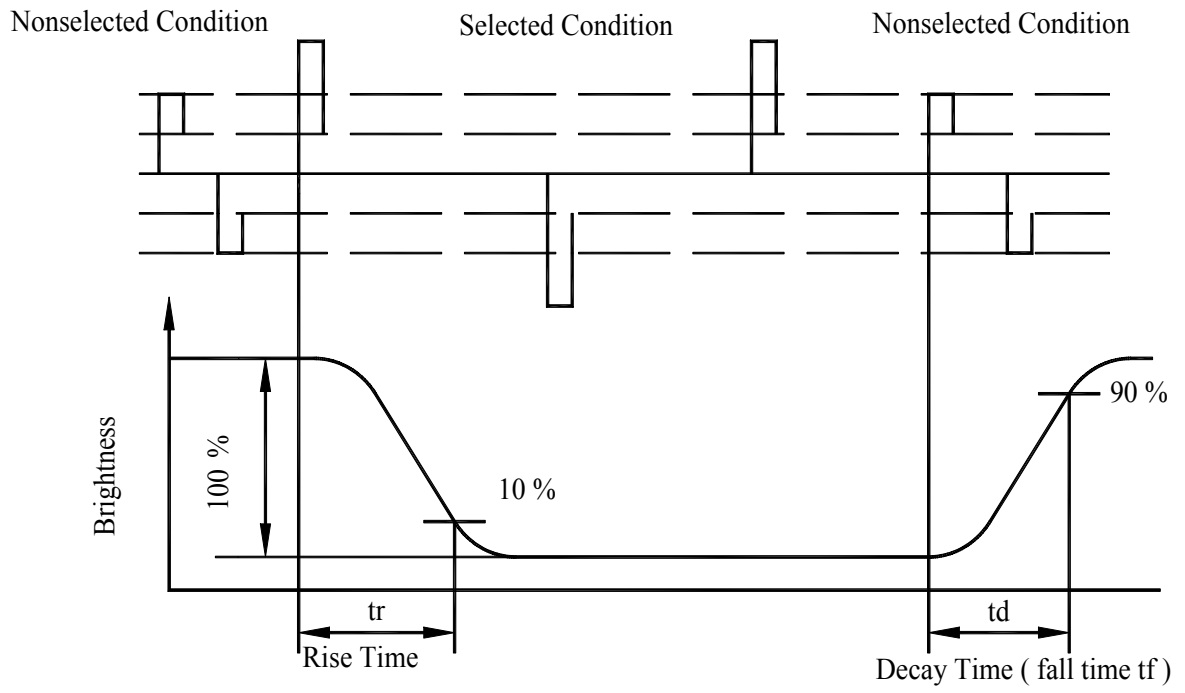


■ Contrast Ratio

$$CR = \frac{\text{Brightness at selected state (BS)}}{\text{Brightness at non-selected state (Bns)}}$$



■ Response Time



7. Interface Description

Pin	Symbol	I/O	Description
1	NC	-	No connection
2	TEMPS	I	Selects temperature coefficient of the reference voltage TEMPS="L": -0.05%°C, TEMPS="H": -0.2%°C
3	INTRS	I	Internal resistors select pin This pin selects the resistors for adjusting V0 voltage level. INTRS="H": use the internal resistor. INTRS="L": use the external resistor. V0 voltage is controlled with VR pin and external resistive divider.
4	HPM	I	Power control pin of the power supply circuit for LCD driver. HPM="H": high power mode HPM="L": normal power mode This pin is valid in master operation.
5	DCDC5B	I	5times boosting circuit enable input pin. When this pin is low in 4 times boosting circuit, the 5-time boosting voltage appears at VOUT.
6	BSTS	I	Select input voltage of the built-in voltage converter. Voltage converter input BSTS="L": 4V (VDD>4V) BSTS="H": VDD (2.4V≤VDD≤3.6V) When BSTS pin is "L", VDD must be higher than 4V in four times boosting. NOTE: Because the maximum voltage of VDD has been changed to 3.6V, we strongly recommend that BSTS pin should be fixed to "H"
7~11	V0~V4	I/O	LCD driver supply voltages. The voltage determined by LCD pixel is impedance-converted by an operational amplifier for application. Voltages should have the following relational; V0≥V1≥V2≥V3≥V4≥VSS
12	VR	I	V0 voltage adjustment pin. It is valid only when on-chip resistors are not used(INTRS="L")
13	C2-	O	Capacitor 2 negative connection pin for voltage converter.
14	C2+	O	Capacitor 2 positive connection pin for voltage converter.
15	C1-	O	Capacitor 1 negative connection pin for voltage converter.
16	C1+	O	Capacitor 1 positive connection pin for voltage converter.
17	C3-	O	Capacitor 1 negative connection pin for voltage converter.
18	C3+	O	Capacitor 1 positive connection pin for voltage converter.
19	VOUT	I/O	Voltage converter input/output pin.
20	VDD	-	Power supply pin for logic.
21	VSS	-	Ground pin, connected to 0V

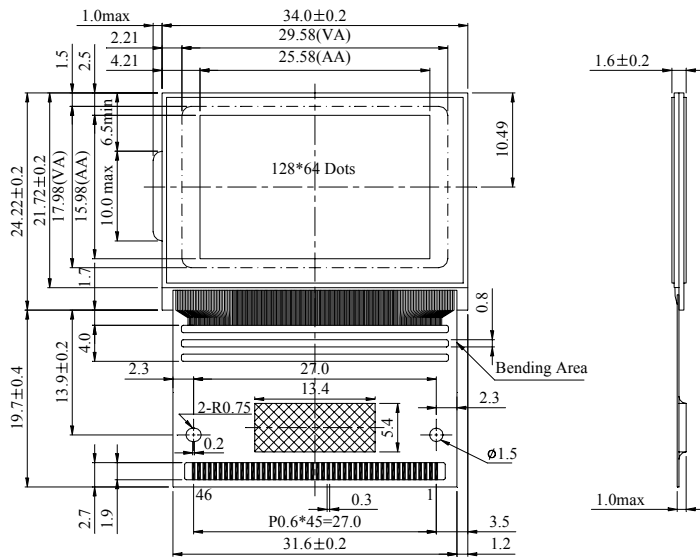
22	PS	I	Parallel/Serial data input select pin. Interface Data Read/Write Serial clock PS="H": Parallel DB0~DB7 E_RD,RW_WR - PS="L": Serial SID(DB7) Write only SCLK(DB6) In serial mode, it is impossible to read data from the on-chip RAM. And DB0 to DB5 are high impedance and E_RD and RW WR must be fixed to either "H" or "L".
23	MI	I	Microprocessor interface selects pin. MI="H": 6800-series MPU interface MI="L": 8080-series MPU interface
24	CLS	I	Built-in oscillator circuit enable/disable select pin. CLS="H": enable CLS="L": disable(external display clock input from CL pin)
25	MS	I	Master or Slave mode operation select pin. MS="H" : master operation MS="L" : slave operation
26	DUTY1	I	The LCD driver duty ratio depends on the following table DUTY1 DUTY0 Duty ratio L L 1/33 L H 1/49 H L 1/65
27	DUTY0		
28~35	DB7~DB0		
36	E_RD	I	When connected to 80-family MPU: Read enable clock input pin. When /RD is "L", DB0~DB7 are in an output status When connected to 68-family MPU: RW = "H": When E is "H", DB0~DB7 are in an output status RW = "L": The data on DB0~DB7 are latched at the falling edge of the E signal
37	RW_WR	I	When connected to 80-family MPU: Write enable clock input pin. The data ON DB0~DB7 are latched at the rising edge of the /WR signal. When connected to 68-family MPU: RW = "H": read RW = "L": write
38	RS	I	Register select pin RS="H": DB0~DB7 are display data RS="L": DB0~DB7 are control data
39	RESETB	I	Reset input pin When RESETB is "L", initialization is executed.
40	CS2	I	Chip select input pins Data/instruction I/O enable only when CS1B is "L" and CS2 is "H". When chip select is non-active, DB0~DB7 may be high impedance.
41	CS1B		

42	DISP	I/O	LCD display blanking control input /output When KS0713 is used in master/slave mode (multi-chip), the DISP pins must be connected each other. MS="H": output MS="L": input
43	CL	I/O	Display clock input/output pin When the KS0713 is used in master/slave mode (multi-chip), the CL pins must be connected each other.
44	M	I/O	LCD AC signal input /output pin When KS0713 is used in master/slave mode (multi-chip), the M pins must be connected each other. MS="H": output MS="L": input
45	FRS	O	Static driver segment output pin This pin is used together with the M pin.
46	NC	-	No connection.

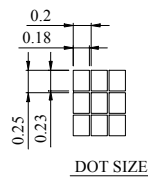
8.Backlight Information

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION
Drive Voltage	Vmax	75	—	85	Vrms	25°C
Drive Wave	Fmax	300	—	1000	Hz	25°C
Brightness		16	20	-	cd/m ²	75~85Vrms/300~400 Hz
Power Consumption		-	13.5	-	mW	75~85Vrms/300~400 Hz
Chromatism	X	-	0.2901	-	-	75~85Vrms/300~400 Hz
	Y	-	0.3608	-	-	75~85Vrms/300~400 Hz
Life time		5000			hour	75~85Vrms/300~400 Hz
Color		White			-	-

8. Contour Drawing & Block Diagram



42	DISP	21	Vss	PIN NO.	SYMBOL
43	CL	22	PS	1	NC
44	M	23	MI	2	TEMPS
45	FRS	24	CLS	3	INTRS
46	NC	25	MS	4	HPM
26	DUTY1	5	DCDC5B		
27	DUTY0	6	BSTS		
28	DB7	7	V4		
29	DB6	8	V3		
30	DB5	9	V2		
31	DB4	10	V1		
32	DB3	11	V0		
33	DB2	12	VR		
34	DB1	13	C2-		
35	DB0	14	C2+		
36	E_RD	15	C1-		
37	RW_WR	16	C1+		
38	RS	17	C3-		
39	RESETB	18	C3+		
40	CS2	19	Vout		
41	CS1B	20	Vdd		

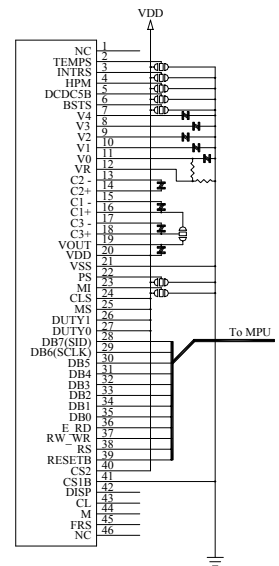
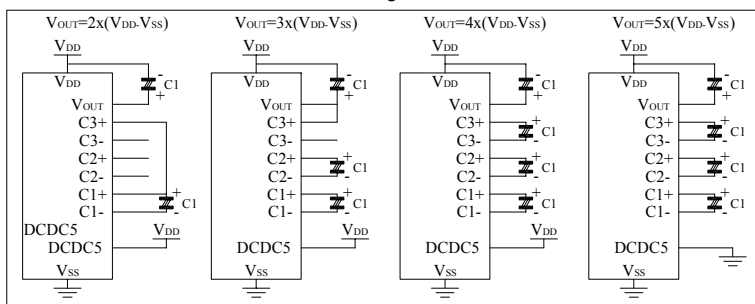


The non-specified tolerance of diemnsion is ±0.15mm.

Display Data RAM

Page Address	Data	RAM address	Line Address (HEX)	Com Output
0,0,0	DB0		00	COM1
	DB1		01	COM2
	DB2		02	COM3
	DB3		03	COM4
	DB4		04	COM5
	DB5		05	COM6
	DB6		06	COM7
	DB7		07	COM8
0,1,1	DB0		38	COM57
	DB1		39	COM58
	DB2		3A	COM59
	DB3		3B	COM60
	DB4		3C	COM61
	DB5		3D	COM62
	DB6		3E	COM63
	DB7		3F	COM64
0,1,1	DB0		40	COM65
Column Address	ADC=0	83 82 81 80 7E 7D 7C 7B 7A	5 4 3 2 1 0	
Address	ADC=1	0 1 2 3 4 5 6 7 8 9	7F 7E 80 81 82 83	
Segment Output		13 131 130 129 128 127 126 125 124 123	6 5 4 3 2 1	

Boosting Circuit



Application Circuit