Crystalfontz America, Inc.

CUSTOMER	
MODEL	**CFAX12864C-WGH**
APPROVAL	BY: DATA:

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY

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1.Module Classification Information

CFA X 1 2 8 6 4 C - W G H

   ① ②   ③   ④   ⑤⑥⑦

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:	N→Without backlight	
		B→EL, Blue green	A→LED, Amber
		D→EL, Green	R→LED, Red
		W→EL, White	O→LED, Orange
		F→CCFL, White	G→LED, Green
		Y→LED, Yellow Green	
⑥	LCD Mode:	B→TN Positive, Gray	T→FSTN Negative
		N→TN Negative,	
		G→STN Positive, Gray	
		Y→STN Positive, Yellow Green	
		M→STN Negative, Blue	
		F→FSTN Positive	
⑦	LCD Polarizer Type/ Temperature range/ View direction	A→Reflective, N.T, 6:00	**H→Transflective, W.T,6:00**
		D→Reflective, N.T, 12:00	K→Transflective, W.T,12:00
		G→Reflective, W. T, 6:00	C→Transmissive, N.T,6:00
		J→Reflective, W. T, 12:00	F→Transmissive, N.T,12:00
		B→Transflective, N.T,6:00	I→Transmissive, W. T, 6:00
		E→Transflective, N.T.12:00	L→Transmissive, W.T,12:00
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 Characters	128 characters x 64 Lines	-
Module dimension	56.0 x 42.5 x 2.4(MAX)	mm
View area	52.0x 33.5	mm
Active area	47.76x 30.29	mm
Dot size	0.37 x 0.42	mm
Dot pitch	0.35 x 0.4	mm
LCD type	STN, Positive, Transflective, Gray	
Duty	1/64	
View direction	6 o'clock	
Backlight Type	EL, White	

4.Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	T_{OP}	-20	-	+70	℃
Storage Temperature	T_{ST}	-30	-	+80	℃
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	Ta=-20℃	-	-	9.2	V
		Ta=25℃			-.	V
		Ta=+70℃	-	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}=5V	-	1.5	-	mA

6.Optical Characteristics

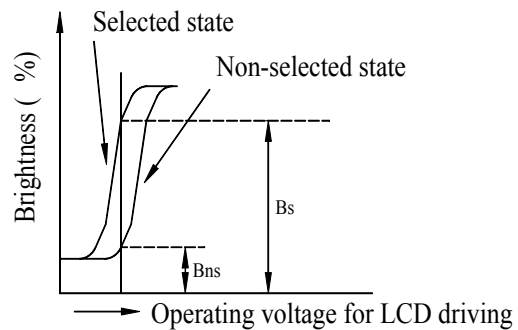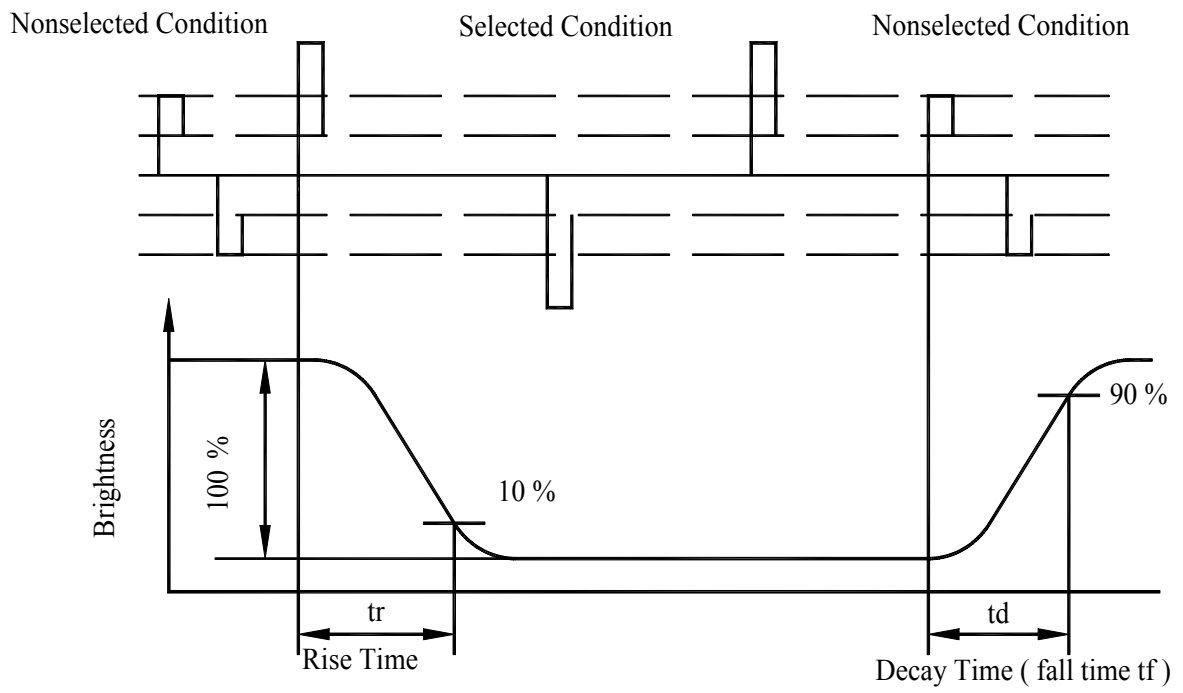| Item	Symbol	Condition	Min	Typ	Max	Unit
View Angle	(V)θ	CR≧2	10	-	40	deg
	(H)φ	CR≧2	-30	-	30	deg
Contrast Ratio	CR	-	-	5	-	-
Response Time	T rise	-	-	110	220	ms
	T fall	-	-	260	520	ms

6.1　Definitions

■View Angles
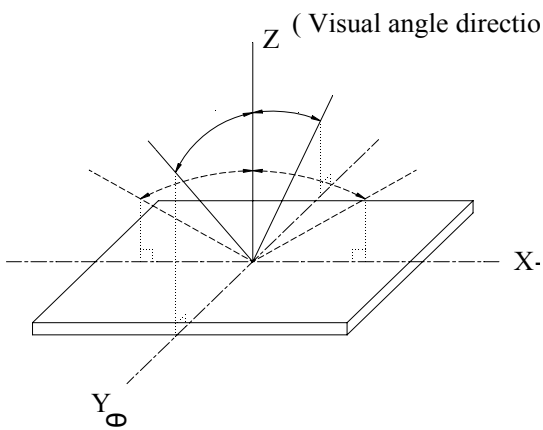
■Contrast Ratio

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

■ Response Time

7.Interface Description

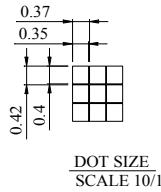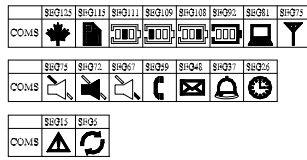| Pin No.	Symbol	I/O	Description
1	NC	-	No connection
2	TEMPS	I	Selects temperature coefficient of the reference voltage TEMPS="L": -0.05%℃, TEMPS="H": -0.2%℃
3	INTRS	I	Internal resistors select pin This pin selects the resistors for adjusting V0 voltage level. INTRS="H": use the internal resistor. INTRS="L": 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="H": 4V (VDD>4V) BSTS="L": VDD (2.4V≦VDD≦5.5V) When BSTS pin is "L", VDD must be higher than 4V in our 4-time boosting.
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

Pin No.	Symbol	I/O	Description
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
 	
27
	DUTY1
	
	DUTY0
		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

28~35	DB7~DB0	I/O	8-bit bi-directional data bus that is connected to the standard 8-bit microprocessor data bus. When the serial interface selected(PS="L") DB0~DB5: high impedance DB6: serial input clock (SCLK) DB7: serial input data (SID) When chip select is not active, DB0~DB7 may be high impedance.
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 41	CS2 CS1B	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.
42	DISP	I/O	LCD display blanking control input /output When KS0713 is used in master/slave mode (multi-chip), the DISP pins

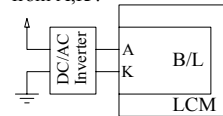| Pin No.	Symbol	I/O	Description
			must be connected each other. MS="H": output MS="L": input
43	CL	I/O	Display clock input/output pin When the KS0713 is used in master/slave mode (multi-chip), the CL pins must be connected each other.
44	M	I/O	LCD AC signal input /output pin When KS0713 is used in 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.Contour Drawing & Block Diagram

128*64 Dots

Bending Area

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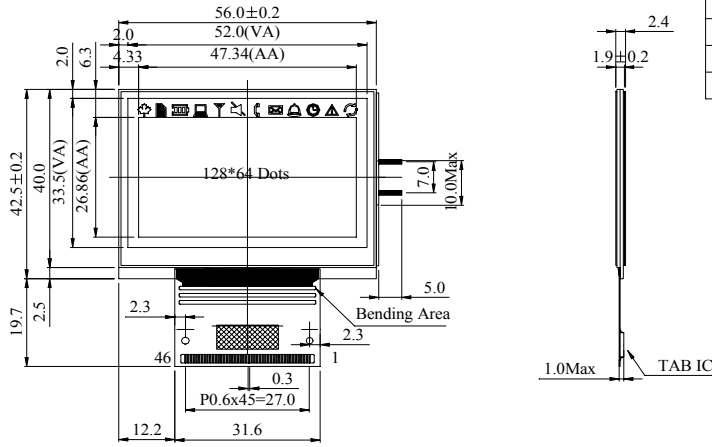
42	DISP	21	Vss	PIN NO.	SYMBOL
43	CL	22	PS	1	NC
44	M	23	MI	2	TEMPS
45	FRS	24	CLS	3	INTRS
46	NC	25	MS	4	HPM
		26	DUTY1	5	DCDC5B
		27	DUTY0	6	BSTS
		28	DB7	7	V4
		29	DB6	8	V3
		30	DB5	9	V2
		31	DB4	10	V1
		32	DB3	11	V0
		33	DB2	12	VR
		34	DB1	13	C2-
		35	DB0	14	C2+
		36	E_RD	15	C1-
		37	RW_WR	16	C1+
		38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

The non-specified tolerance of dimension is ¡Ó0.15 mm .

COMS	SEG125	SEG115	SEG111	SEG109	SEG108	SEG92	SEG81	SEG75

COMS	SEG75	SEG72	SEG67	SEG59	SEG48	SEG37	SEG26

COMS	SEG15	SEG5

0.37
0.35
0.42
0.4

DOT SIZE
SCALE 10/1

EL B/L drive directly
from A,K .

DC/AC Inverter

A
K

B/L

LCM

Display Data RAM

Page Address P3,P2,P1,P0	Data	RAM address																				Line Address (HEX)	Com Output
0,0,0,0	DB0																					00	COM1
	DB1																					01	COM2
	DB2																					02	COM3
	DB3																					03	COM4
	DB4																					04	COM5
	DB5																					05	COM6
	DB6																					06	COM7
	DB7																					07	COM8
⌇																						⌇	⌇
0,1,1,1	DB0																					38	COM57
	DB1																					39	COM58
	DB2																					3A	COM59
	DB3																					3B	COM60
	DB4																					3C	COM61
	DB5																					3D	COM62
	DB6																					3E	COM63
	DB7																					3F	COM64
0,1,1,1	DB0																					40	COM65

Column Address	ADC=0	83	82	81	80	7F	7E	7D	7C	7B	7A	~	5	4	3	2	1	0
	ADC=1	0	1	2	3	4	5	6	7	8	9	~	7E	7F	80	81	82	83
Segment Output		132	131	130	129	128	127	126	125	124	123	~	6	5	4	3	2	1

Boosting Circuit

VOUT=2x(VDD-VSS)

VDD
VDD
VOUT
C3+
C3-
C2+
C2-
C1+
C1-
DCDC5
DCDC5
VSS
C1
C1
VDD

VOUT=3x(VDD-VSS)

VDD
VDD
VOUT
C3+
C3-
C2+
C2-
C1+
C1-
DCDC5
VSS
C1
C1
C1
VDD

VOUT=4x(VDD-VSS)

VDD
VDD
VOUT
C3+
C3-
C2+
C2-
C1+
C1-
DCDC5
VSS
C1
C1
C1
C1
VDD

VOUT=5x(VDD-VSS)

VDD
VDD
VOUT
C3+
C3-
C2+
C2-
C1+
C1-
DCDC5
VSS
C1
C1
C1
C1

VDD

NC
TEMPS
INTRS
HPM
DCDC5B
BSTS
V4
V3
V2
V1
V0
VR
C2-
C2+
C1-
C1+
C3-
C3+
VOUT
VDD
VSS
PS
MI
CLS
MS
DUTY1
DUTY0
DB7(SID)
DB6(SCLK)
DB5
DB4
DB3
DB2
DB1
DB0
E_RD
RW_WR
RS
RESETB
CS2
CS1B
DISP
CL
M
FRS
NC

To MPU

Application Circuit

9.Backlight Information

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION
Drive Voltage	Vmax	78	—	85	Vrms	25□C
Drive Wave	Fmax	400	—	1000	Hz	25□C
Brightness		65	-	-	cd/m^2	78~85Vrms/400~1000Hz
Power Consumption		-	43.55	-	mW	78~85Vrms/400~1000Hz
Chromatism	X	-	0.330	-	-	78~85Vrms/400~1000Hz
	Y	-	0.365	-	-	78~85Vrms/400~1000Hz
Life time		5000			hour	78~85Vrms/400~1000Hz
Color		White			-	-