



## GRAPHIC MODULE DATA SHEET



Preliminary Data Sheet Release Date 2014-06-25

for

**CFAG240128B-xxx-TZ:**

[CFAG240128B-TFH-TZ](#)

[CFAG240128B-TMI-TZ](#)

[CFAG240128B-TTI-TZ](#)

[CFAG240128B-YYH-TZ](#)

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### CFAG240128B-xxx-TZ Data Sheet Revision History

Data Sheet Preliminary Release: 2014-06-25  
First Data Sheet for new products.

### About Variations

We work continuously to improve our products. Because display technologies are quickly evolving, these products may have component or process changes. Slight variations (for example, contrast, color, or intensity) between lots are normal. If you need the highest consistency, whenever possible, order and arrange delivery for your production runs at one time so your displays will be from the same lot.

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#### About Volatility

This module has volatile memory.

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## MECHANICAL SPECIFICATIONS

### PHYSICAL CHARACTERISTICS

#### CFAG240128-TFH-TZ

ITEM	STANDARD VALUE	UNIT
Number of Dots:	240 × 128	
Module dimension:	144.0×104.0×14.3(MAX)mm	mm
View area:	114.0×64.0mm	mm
Active area:	107.98×57.58mm	mm
Character size:	(L)0.43×(W)0.43 mm	mm
Character pitch:	(L)0.45×(W)0.45mm	mm
LCD type:	FSTN , Positive , transfective (In LCD production, It will occur slightly color difference. We can only guarantee the same color in the same batch.)	
Duty:	1/128	
View direction:	6 o'clock	
Backlight:	LED ,White	

#### CFAG240128-TMI-TZ

LCD type:	STN , transmissive , Negative , Blue (In LCD production, It will occur slightly color difference. We can only guarantee the same color in the same batch.)
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The other Physical Characteristic specifications are the same as CFAG240128-TFH-TZ.

#### CFAG240128-TTI-TZ

LCD type:	FSTN Negative , transmissive , (In LCD production, It will occur slightly color difference. We can only guarantee the same color in the same batch.)
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The other Physical Characteristic specifications are the same as CFAG240128-TFH-TZ.



### CFAG240128-YYH-TZ

LCD type:	STN ,Positive, transfective , yellow green  (In LCD production, It will occur slightly color difference. We can only guarantee the same color in the same batch.)
Duty:	1/128
View direction:	6 o'clock
Backlight:	LED ,Yellow Green

The other Physical Characteristic specifications are the same as CFAG240128-TFH-TZ.

### ADDITIONAL FEATURES

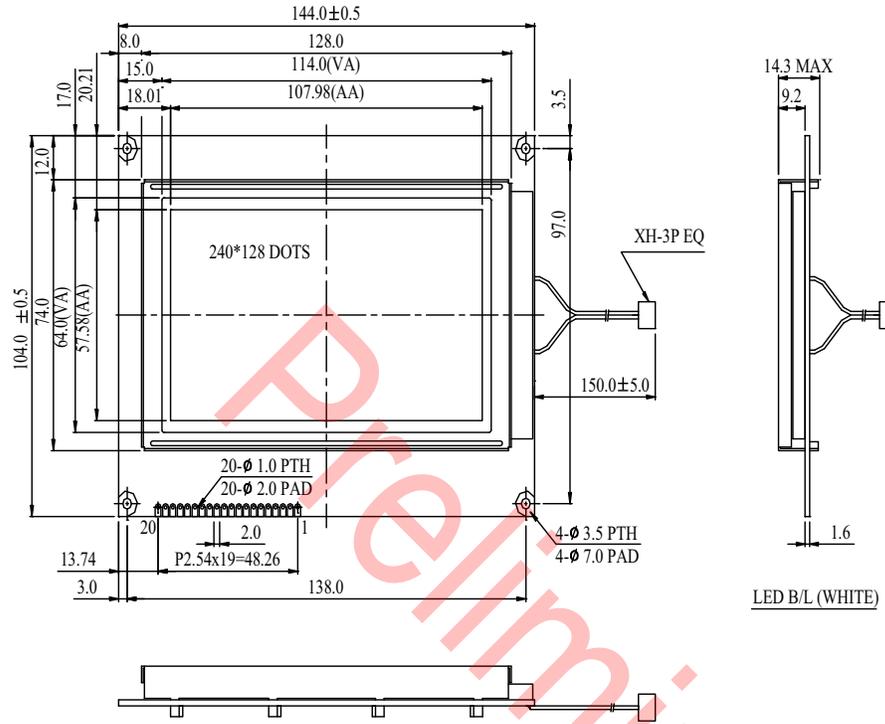
- These display modules have a RAiO RA6963 Dot Matrix LCD Controller LSI. For interface information and other details, see [controller datasheets](#) on our website.
- RoHS compliant. Factory is ISO certified.

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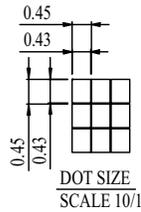


## MODULE OUTLINE DRAWING

CFAG240128-TFH-TZ, CFAG240128-TMI-TZ, AND CFAG240128-TTI-TZ

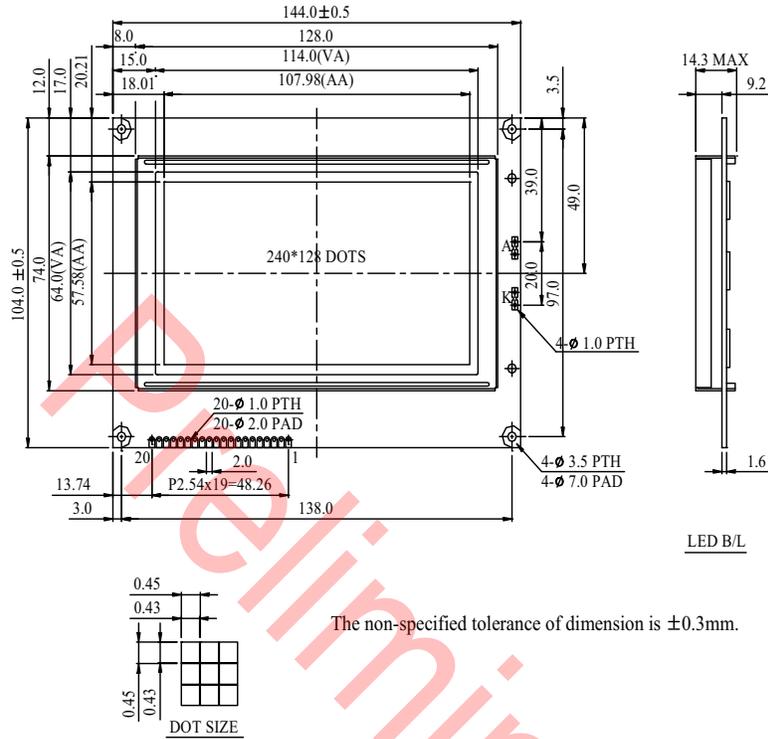


PIN NO.	SYMBOL
1	V <sub>ss</sub>
2	V <sub>dd</sub>
3	V <sub>o</sub>
4	C/D
5	RD
6	WR
7	DB0
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	CE
16	RESET
17	V <sub>ee</sub>
18	MD2
19	FS1
20	NC





CFAG240128-YYH-TZ

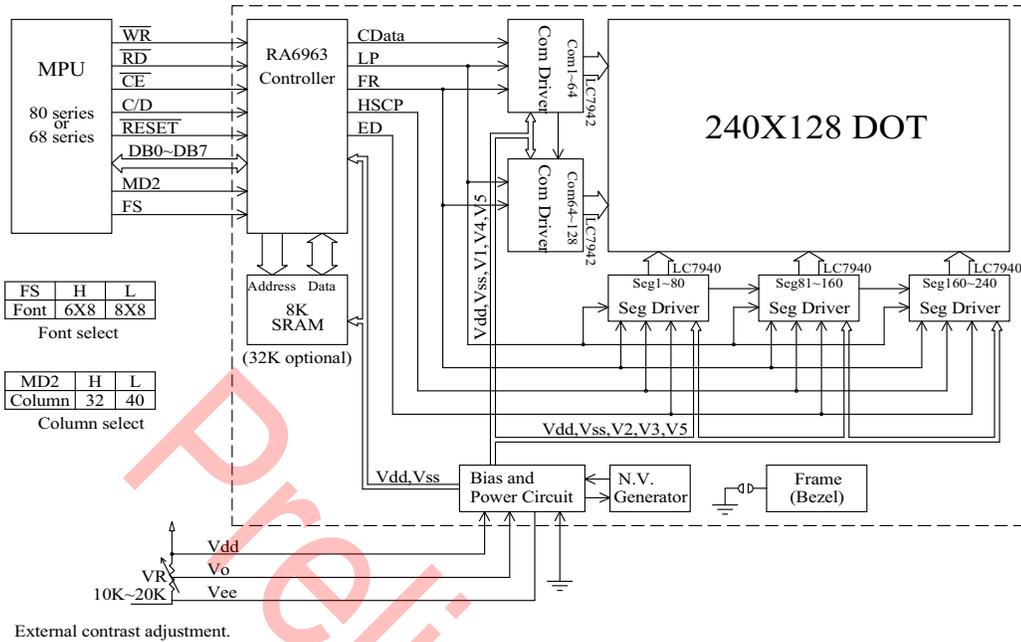


PIN NO.	SYMBOL
1	V <sub>ss</sub>
2	V <sub>dd</sub>
3	V <sub>o</sub>
4	C/D
5	$\overline{\text{RD}}$
6	$\overline{\text{WR}}$
7	DB0
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	$\overline{\text{CE}}$
16	RESET
17	V <sub>ee</sub>
18	MD2
19	FS1
20	NC

The non-specified tolerance of dimension is ±0.3mm.



## SYSTEM BLOCK DIAGRAM



## ELECTRICAL SPECIFICATIONS

### ABSOLUTE MAXIMUM RATINGS

CFAG240128-TFH-TZ

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	$V_{DD}-V_{SS}$	-0.3	-	+7	V
Supply Voltage For LCD	$V_{DD}-V_0$	0	-	21	V
LED forward current	I <sub>LED</sub>	-	-	150	mA

### CFAG240128-TMI-TZ AND CFAG240128-TTI-TZ

The Absolute Maximum specifications are the same as CFAG240128-TFH-TZ except ILED is not listed.

### CFAG240128-YYH-TZ

LED forward current	ILED	-	900	1800	mA
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The other Absolute Maximum specifications are the same as CFAG240128-TFH-TZ.

## RECOMMENDED DC CHARACTERISTICS

### CFAG240128-TFH-TZ

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Voltage For Logic	$V_{DD}-V_{SS}$	-	4.75	5.0	5.25	V
Supply Voltage For LCD	$V_{DD}-V_0$	Ta=-20°C	-	-	21.7	V
		Ta=25°C	-	19.5	-	V
		Ta=+70°C	17.6	-	-	V
Input High Vol	$V_{IH}$	-	0.8V <sub>DD</sub>	-	V <sub>DD</sub>	V
Input Low Vol	$V_{IL}$	-	0	-	0.2 V <sub>DD</sub>	V
Output High Vol	$V_{OH}$	-	V <sub>DD</sub> -0.3	-	V <sub>DD</sub>	V
Output Low Vol.	$V_{OL}$	-	0	-	0.3	V
Supply Current	I <sub>DD</sub>	V <sub>DD</sub> =5V	45	55	60	mA

### CFAG240128-TMI-TZ

Supply Current	I <sub>DD</sub>	V <sub>DD</sub> =5V	-	45	-	mA
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The other Recommended DC Characteristics specifications are the same as CFAG240128-TFH-TZ.

### CFAG240128-TTI-TZ

Supply Current	I <sub>DD</sub>	V <sub>DD</sub> =5V	46	58	65	mA
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The other Recommended DC Characteristics specifications are the same as CFAG240128-TFH-TZ.



**CFAG240128-YYH-TZ**

Supply Current	$I_{DD}$	$V_{DD}=5V$	42.0	55.0	60.0	mA
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The other Recommended DC Characteristics specifications are the same as CFAG240128-TFH-TZ.

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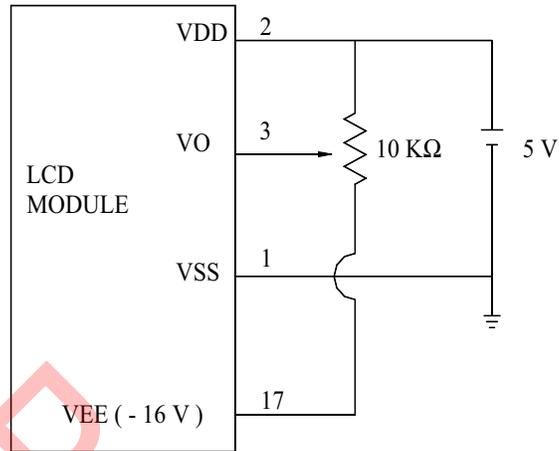


## DETAILS OF INTERFACE PIN FUNCTIONS

Pin No.	Symbol	Level	Description
1	Vss		GND
2	Vdd		Power supply ( +5 V )
3	Vo		Power supply for LCD driver
4	C/D	H / L	WR=L , C/D=H : Command Write C/D=L: Data write RD=L , C/D=H : Status Read C/D=L: Data read
5	RD	L	Data read. Read data from RA6963 when RD = L
6	WR	L	Data write. Write data into RA6963 when WR = L
7	DB0	H / L	Data bus line
8	DB1	H / L	Data bus line
9	DB2	H / L	Data bus line
10	DB3	H / L	Data bus line
11	DB4	H / L	Data bus line
12	DB5	H / L	Data bus line
13	DB6	H / L	Data bus line
14	DB7	H / L	Data bus line
15	CE	L	L : Chip enable
16	RESET	H / L	H : Normal ; L : Initialize RA6963
17	Vee		Negative voltage output
18	MD2	H / L	H: 32 columns ; L: 40 columns
19	FS	H / L	Pins for selection of font ; H : 6 * 8 , L : 8 * 8
20	N.C		No connection



## TYPICAL VO CONNECTIONS FOR DISPLAY CONTRAST



VDD-V0:LCD Operating Voltage(at 25°C)

## ESD (ELECTRO-STATIC DISCHARGE)

The circuitry is industry standard CMOS logic and is susceptible to ESD damage. Please use industry standard antistatic precautions as you would for any other static sensitive devices such as expansion cards, motherboards, or integrated circuits. Ground your body, work surfaces, and equipment.



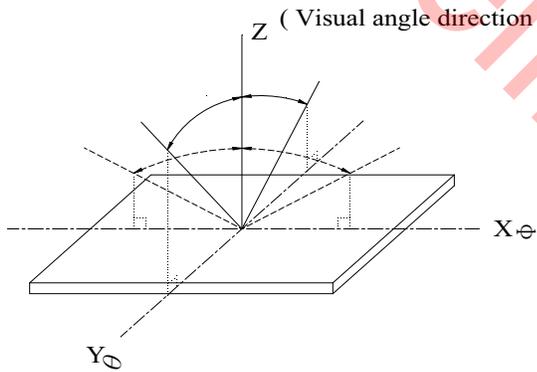
# OPTICAL SPECIFICATIONS

## CFAG240128-TFH-TZ

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
View Angle	(V) $\theta$	CR $\geq$ 2	30		60	deg
	(H) $\phi$	CR $\geq$ 2	-45		45	deg
Contrast Ratio	CR	-		5		-
Response Time	T rise	-		150	200	ms
	T fall	-		150	200	ms

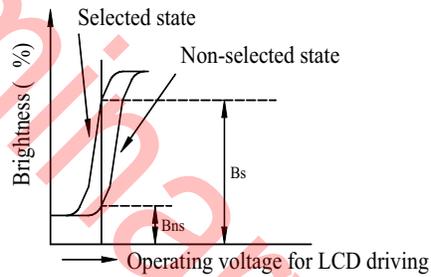
### 6.1 Definitions

#### ■ View Angles

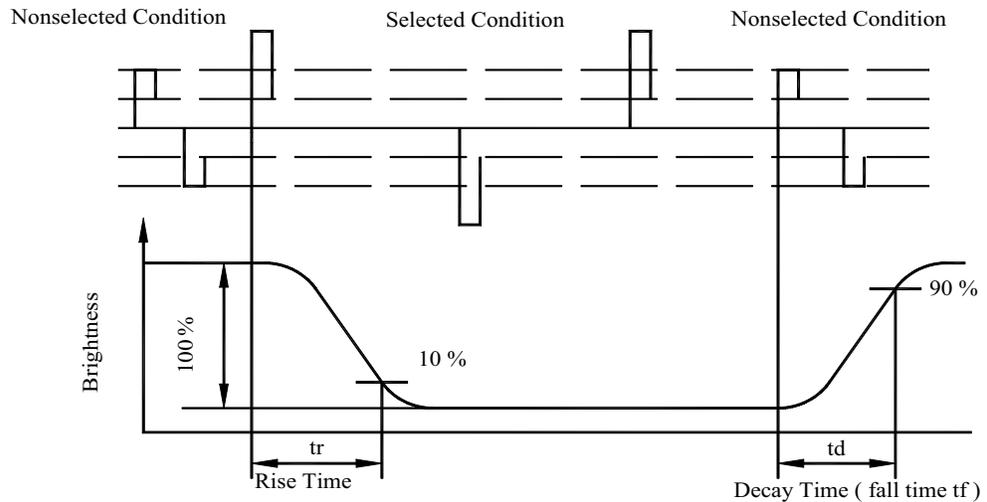


#### ■ Contrast Ratio

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



#### ■ Response Time





## CFAG240128-TMI-TZ

ITEM	SYMBAL	CONDITION	MIN.	TYP.	MAX.	UNIT
View Angle	(V) $\theta$	CR $\geq$ 2	20		40	deg
	(H) $\phi$	CR $\geq$ 2	-30		30	deg
Contrast Ratio	CR	-		3		-
Response Time	T rise	-		200	300	ms
	T fall	-		200	300	ms

## CFAG240128-TTI-TZ

Response Time	T rise	-	-	200	300	ms
	T fall	-	-	150	250	ms

The other Optical specifications are the same as CFAG240128-TFH-TZ.

## CFAG240128-YYH-TZ

ITEM	SYMBAL	CONDITION	MIN.	TYP.	MAX.	UNIT
View Angle	(V) $\theta$	CR $\geq$ 2	20		40	deg
	(H) $\phi$	CR $\geq$ 2	-30		30	deg
Contrast Ratio	CR	-		3		-
Response Time	T rise	-		200	300	ms
	T fall	-		150	250	ms



## LED BACKLIGHT CHARACTERISTICS

### CFAG240128-TFH-TZ AND CFAG240128-TMI-TZ

#### Specification

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION
Supply Current	I <sub>LED</sub>	129.6	144	225	mA	V=3.5V
Supply Voltage	V	3.4	3.5	3.6	V	
Reverse Voltage	V <sub>R</sub>	—	—	8	V	

### CFAG240128-TTI-TZ

Supply Voltage	V	3.7	3.8	3.9	V	
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The other Backlight specifications are the same as CFAG240128-TFH-TZ.

### CFAG240128-YYH-TZ

#### Specification

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION
Supply Current	I <sub>LED</sub>	720	900	1350	mA	V=4.2V
Supply Voltage	V	4.0	4.2	4.4	V	

The other Backlight specifications are the same as CFAG240128-TFH-TZ.



## CHARACTER GENERATOR ROM (CGROM)

CGROM Font - 01

LSB \ MSB	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	!	"	#	\$	%	&	'	(	)	*	+	,	-	.	/	
1	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
2	a	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
3	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
4	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
5	p	q	r	s	t	u	v	w	x	y	z	{		}	~	
6	ü	û	ë	ä	å	ä	ö	ø	ë	ë	ë	ï	ï	ï	ä	ä
7	é	æ	œ	ö	ö	ö	ö	ö	ö	ö	ö	ö	ö	ö	ö	ö

CGROM Font - 02

LSB \ MSB	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	!	"	#	\$	%	&	'	(	)	*	+	,	-	.	/	
1	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
2	a	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
3	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
4	千	万	月	夕	夕	■	ラ	ア	イ	ウ	エ	オ	カ	キ	ク	ケ
5	一	ア	イ	ウ	エ	オ	カ	キ	ク	ケ	コ	サ	シ	ス	セ	ソ
6	タ	チ	ツ	テ	ト	ナ	ニ	ヌ	ネ	ノ	ハ	ヒ	フ	ヘ	ホ	マ
7	ミ	ム	メ	モ	ヤ	ユ	ヨ	リ	ル	レ	ロ	ワ	ン	ン	ン	ン

The RA6963 has two part number - RA6963L2NA and RA6963L2NB. The RA6963L2NA is compatible to T6963C(code 0101) and the default font is Figure 6-13 as above. The RA6963L2NB is compatible to T6963C(code 0201) and the default font is Figure 6-14 as above.

Although RA6963 provide a extra internal command for MCU to select both font of above, but you do not need to change the software to select the font that if you chose the right part number.



# MODULE RELIABILITY AND LONGEVITY

## MODULE RELIABILITY

PART NUMBER	SPECIFICATION
CFAG240128-xxx-TZ	Brightness will be >50% of a new module's initial brightness for at least 50,000 hours of operation when supply to each LED is below TBD mA.
<p><i>Under operating and storage temperature specification limitations, humidity noncondensing) RH up to 65%, and no exposure to direct sunlight. Value listed above is approximate and represents typical lifetime.</i></p> <p><i>The white LEDs dim over time, especially if driven with high currents. The dimming may not be noticeable when a single display is installed. However, if a new display is installed next to a display that has been on continuously for a very long time, you will see the difference. To preserve the lifetime of white LEDs, we recommend that white LED backlights are dimmed or turned off when not needed. Also, please do not use more current than you need to achieve your brightness requirements.</i></p>	

## MODULE LONGEVITY (EOL/REPLACEMENT POLICY)

CrystalFontz is committed to making all of our modules available for as long as possible. For each module we introduce, we intend to offer it indefinitely. We do not preplan a module's obsolescence. The majority of modules we have introduced are still available.

We recognize that discontinuing a module may cause problems for some customers. However, rapidly changing technologies, component availability, or low customer order levels may force us to discontinue ("End of Life" EOL) a module. For example, we must occasionally discontinue a module when a supplier discontinues a component or a manufacturing process becomes obsolete. When we discontinue a module, we will do our best to find an acceptable replacement module with the same fit, form, and function.

In most situations, you will not notice a difference when comparing a "fit, form, and function" replacement module to the discontinued module. However, sometimes a change in component or process for the replacement module results in a slight variation, perhaps an improvement, over the previous design.

Although the replacement module is still within the stated Data Sheet specifications and tolerances of the discontinued module, changes may require modification to your circuit and/or firmware. Possible changes include:

- **Backlight LEDs.** Brightness may be affected (perhaps the new LEDs have better efficiency) or the current they draw may change (new LEDs may have a different VF).
- **Controller.** A new controller may require minor changes in your code.
- **Component tolerances.** Module components have manufacturing tolerances. In extreme cases, the tolerance stack can change the visual or operating characteristics.

Please understand that we avoid changing a module whenever possible; we only discontinue a module if we have no other option. We will post Part Change Notices on the product's web page as soon as possible. If interested, you can subscribe to future part change notifications.



## CARE AND HANDLING PRECAUTIONS

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For optimum operation of the module and to prolong its life, please follow the precautions below. Excessive voltage will shorten the life of the module. You must drive the display within the specified voltage limit. See [Absolute Maximum Ratings \(Pg. 9\)](#).

### HANDLING CAUTION FOR MODULES SHIPPED IN TRAYS

If you receive modules packed in trays, handle trays carefully by supporting the entire tray. Trays were made to immobilize the modules inside their packing carton. Trays are not designed to be rigid. Do not carry trays by their edges; trays and modules may be damaged.

### ESD (ELECTRO-STATIC DISCHARGE)

The circuitry is industry standard CMOS logic and is susceptible to ESD damage. Please use industry standard antistatic precautions as you would for any other static sensitive devices such as expansion cards, motherboards, or integrated circuits. Ground your body, work surfaces, and equipment.

### DESIGN AND MOUNTING

- The exposed surface of the “glass” is actually a polarizer laminated on top of the glass. To protect the soft plastic polarizer from damage, the module ships with a protective film over the polarizer. Please peel off the protective film slowly. Peeling off the protective film abruptly may generate static electricity.
- The polarizer is made out of soft plastic and is easily scratched or damaged. When handling the module, avoid touching the polarizer. Finger oils are difficult to remove.
- To protect the soft plastic polarizer from damage, place a transparent plate (for example, acrylic, polycarbonate, or glass) in front of the module, leaving a small gap between the plate and the display surface. We use GE HP-92 Lexan, which is readily available and works well.
- Do not disassemble or modify the module.
- Do not reverse polarity to the power supply connections. Reversing polarity will immediately ruin the module.
- Use care to keep the exposed terminals clean. Contamination, including fingerprints may make soldering difficult, and the reliability of the soldered connection poor.

### AVOID SHOCK, IMPACT, TORQUE, OR TENSION

- Do not expose the module to strong mechanical shock, impact, torque, or tension.
- Do not drop, toss, bend, or twist the module.
- Do not place weight or pressure on the module.

### IF PANEL BREAKS

All electronics may contain harmful substances. Avoid contamination by using care to avoid damage during handling. If any residues, gases, powders, liquids, or broken fragments come in contact with your skin, eyes, mouth, or lungs, immediately contact your local poison control or emergency medical center.



## HOW TO CLEAN

1. Turn display off.
2. Use the removable protective film to remove smudges (for example, fingerprints) and any foreign matter. If you no longer have the protective film, use standard transparent office tape (for example, Scotch® brand “Crystal Clear Tape”).
3. If the polarizer is dusty, you may carefully blow it off with clean, dry, oil-free compressed air.
4. If you must clean with a liquid, never use glass cleaners, as they may contain ammonia or alcohol that will damage the polarizer over time. Never apply liquids directly on the polarizer. Long contact with moisture may permanently spot or stain the polarizer. Use filtered water to slightly moisten a clean lint-free microfiber cloth designed for cleaning optics. (For example, use a cloth sold for cleaning plastic eyeglasses.)
5. The plastic is easily scratched or damaged. Use a light touch as you clean the polarizer. Wipe gently.
6. Use a dry microfiber cloth to remove any trace of moisture before turning on the display.
7. Gently wash the microfiber cloths in warm, soapy water and air dry before reuse.

## OPERATION

- We do not recommend connecting this module to a PC's parallel port as an end product. This module is not “user friendly” and connecting it to a PC's parallel port is often difficult, frustrating, and can result in a “dead” display due to mishandling. For more information, see our forum thread at <http://www.crystalfontz.com/forum/showthread.php?s=&threadid=3257>.
- Your circuit should be designed to protect the module from ESD and power supply transients.
- Observe the operating temperature limitations. Operation outside of these limits may shorten life and/or harm display. Changes in temperature can result in changes in contrast.
  - At lower temperatures of this range, response time is delayed.
  - At higher temperatures of this range, display becomes dark. (You may need to adjust the contrast.)
- Operate away from dust, moisture, and direct sunlight.

## STORAGE AND RECYCLING

- Store in an ESD-approved container away from dust, moisture, and direct sunlight, fluorescent lamps, or any ultraviolet ray.
- Observe the storage temperature limitations. Rapid temperature changes can cause moisture to form, resulting in permanent damage.
- Do not allow weight to be placed on the modules while they are in storage.
- Please recycle your outdated Crystalfontz modules at an approved facility.



## APPENDIX A: QUALITY ASSURANCE STANDARDS

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### INSPECTION CONDITIONS

- Environment
  - Temperature: 25±5°C
  - Humidity: 30~85% RH (noncondensing)
- For visual inspection of active display area
  - Source lighting: two 20-Watt or one 40-Watt fluorescent light
  - Display adjusted for best contrast
  - Viewing distance: 30±5 cm (about 12 inches)
  - Viewing angle: inspect at 45° angle of vertical line right and left, top and bottom

### COLOR DEFINITIONS

We try to describe the appearance of our modules as accurately as possible. For the photos, we adjust for optimal appearance. Actual display appearance may vary due to (1) different operating conditions, (2) small variations of component tolerances, (3) inaccuracies of our camera, (4) color interpretation of the photos on your monitor, and/or (5) personal differences in the perception of color.

### ACCEPTANCE SAMPLING

DEFECT TYPE	AQL*
Major	≤.65%
Minor	<1.0%
* Acceptable Quality Level: maximum allowable error rate or variation from standard	

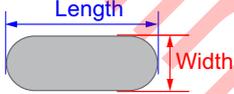
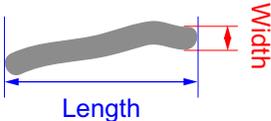
### DEFECTS CLASSIFICATION

Defects are defined as:

- Major Defect: results in failure or substantially reduces usability of unit for its intended purpose.
- Minor Defect: deviates from standards but is not likely to reduce usability for its intended purpose.



## ACCEPTANCE STANDARDS

#	DEFECT TYPE	ACCEPTANCE STANDARDS CRITERIA			MAJOR/ MINOR	
1	Electrical defects	1. No display, display malfunctions, or shorted segments. 2. Current consumption exceeds specifications.			Major	
2	Viewing area defect	Viewing area does not meet specifications).			Major	
3	Contrast adjustment defect	Contrast adjustment fails or malfunctions.			Major	
4	Blemishes or foreign matter on display segments		<i>Defect Size (mm)</i>	<i>Acceptable Qty</i>	Minor	
			≤0.3	3		
			≤2 defects within 10 mm of each other			
5	Other blemishes or foreign matter outside of display segments	Defect size = (A + B)/2 	<i>Defect Size (mm)</i>	<i>Acceptable Qty</i>	Minor	
			≤0.15	Ignore		
			0.15 to 0.20	3		
			0.20 to 0.25	2		
			0.25 to 0.30	1		
6	Dark lines or scratches in display area		<i>Defect Width (mm)</i>	<i>Defect Length (mm)</i>	<i>Acceptable Qty</i>	Minor
			≤0.03	≤3.0	3	
			0.03 to 0.05	≤2.0	2	
			0.05 to 0.08	≤2.0	1	
			0.08 to 0.10	≤3.0	0	
			≥0.10	>3.0	0	
7	Bubbles between polarizer film and glass		<i>Defect Size (mm)</i>	<i>Acceptable Qty</i>	Minor	
			≤0.20	Ignore		
			0.20 to 0.40	3		
			0.40 to 0.60	2		
			≥0.60	0		



#	DEFECT TYPE	ACCEPTANCE STANDARDS CRITERIA (Continued)	MAJOR/ MINOR							
8	Display pattern defect		Minor							
		<table border="1"> <tr> <th>Dot Size (mm)</th> <th>Acceptable Qty</th> </tr> <tr> <td><math>((A+B)/2) \leq 0.2</math></td> <td rowspan="4"> <math>\leq 3</math> total defects  <math>\leq 2</math> pinholes per digit                 </td> </tr> <tr> <td><math>C &gt; 0</math></td> </tr> <tr> <td><math>((D+E)/2) \leq 0.25</math></td> </tr> <tr> <td><math>((F+G)/2) \leq 0.25</math></td> </tr> </table>		Dot Size (mm)	Acceptable Qty	$((A+B)/2) \leq 0.2$	$\leq 3$ total defects $\leq 2$ pinholes per digit	$C > 0$	$((D+E)/2) \leq 0.25$	$((F+G)/2) \leq 0.25$
		Dot Size (mm)		Acceptable Qty						
		$((A+B)/2) \leq 0.2$		$\leq 3$ total defects $\leq 2$ pinholes per digit						
		$C > 0$								
$((D+E)/2) \leq 0.25$										
$((F+G)/2) \leq 0.25$										
9	Backlight defects	<ol style="list-style-type: none"> <li>Light fails or flickers.*</li> <li>Color and luminance do not correspond to specifications.*</li> <li>Exceeds standards for display's blemishes or foreign matter (<a href="#">see test 5, Pg. 22</a>), and dark lines or scratches (<a href="#">see test 6, Pg. 22</a>).</li> </ol> <p><i>*Minor if display functions correctly. Major if the display fails.</i></p>	Minor							
10	COB defects	<ol style="list-style-type: none"> <li>Pinholes <math>&gt; 0.2</math> mm.</li> <li>Seal surface has pinholes through to the IC.</li> <li>More than 3 locations of sealant beyond 2 mm of the sealed areas.</li> </ol>	Minor							
11	PCB defects	<ol style="list-style-type: none"> <li>Oxidation or contamination on connectors.*</li> <li>Wrong parts, missing parts, or parts not in specification.*</li> <li>Jumpers set incorrectly.</li> <li>Solder (if any) on bezel, LED pad, zebra pad, or screw hole pad is not smooth.</li> </ol> <p><i>*Minor if display functions correctly. Major if the display fails.</i></p>	Minor							
12	Soldering defects	<ol style="list-style-type: none"> <li>Unmelted solder paste.</li> <li>Cold solder joints, missing solder connections, or oxidation.*</li> <li>Solder bridges causing short circuits.*</li> <li>Solder balls.</li> </ol> <p><i>*Minor if display functions correctly. Major if the display fails.</i></p>	Minor							