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TFT | CHARACTER | UWVD | FSC | SEGMENT | CUSTOM | REPLACEMENT

Character LCD Module

Part Number

C202A1-FTW-YW65

Overview:

- 20x2 Character LCD
- FSTN Gray
- 116.0mm W x 37.0mm H
- Serial Interface
- White LED Backlight
- Transflective
- Wide Temperature
- +5V Input Voltage
- Controller: PIC16F690 & ST7066U
- RoHS Compliant

Description

This is a FSTN (Film Super-Twisted Nematic) Gray Character LCD (Liquid Crystal Display) that can display twenty characters on two lines (20x2). This model is composed of a transflective type LCD Panel, a built-in driver IC and a backlight unit.

Character LCD Features

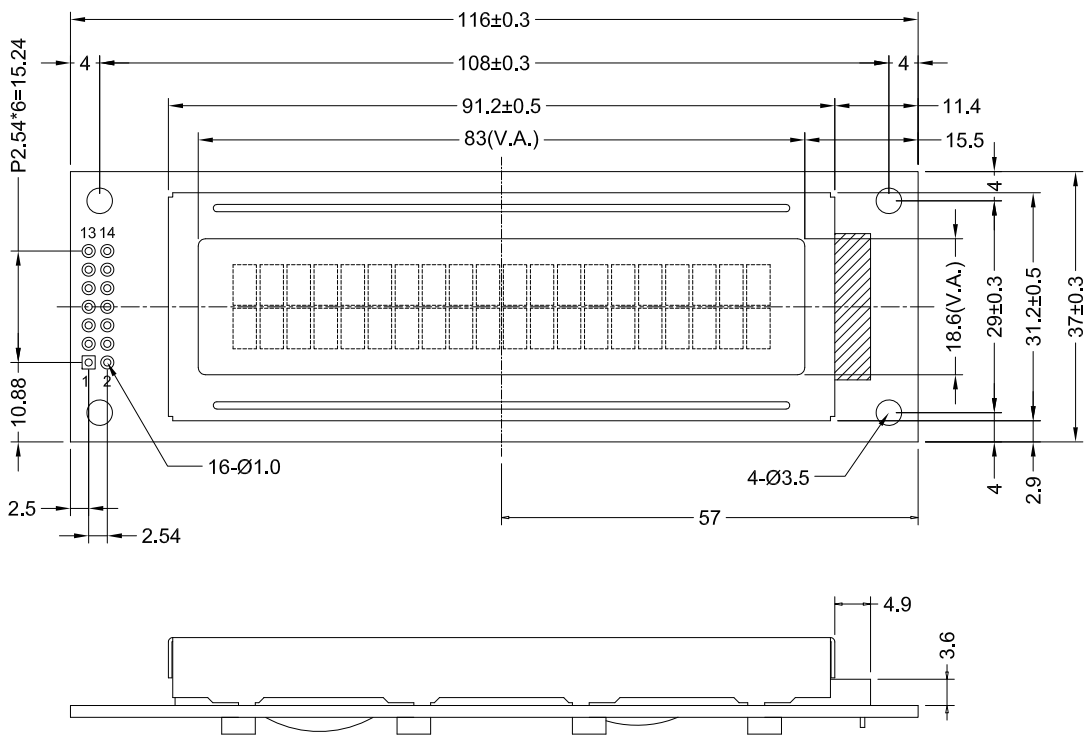
Character Format: 5x8 Dots
Display Format: 20 Characters x 2 Lines
Interface: Serial Interface: I2C, SPI or RS-232(TTL)
Controller: PIC16F690 & ST7066U (or equivalent)
RoHS Compliant

General Information	Specification	Note
LCD Type	FSTN	
Viewing Direction	6 o'clock	
Rear Polarizer	Transflective	
Backlight Type	LED	
Backlight Color	White	
Temperature Range	Wide	
Touch Screen	None	
Controller IC	PIC16F690 & ST7066U	Or equivalent
Pixel Color	Black	
Background Color	Gray	
Interface	Serial Interface: I2C, SPI or RS-232(TTL)	

Mechanical Information

Item	Specification
Module Size	116.0mm L x 37.0mm W
Viewing Area	83.0mm L x 18.6mm W
Character Size	5.55mm H x 3.2mm W
Weight	--

Outline Drawing



PIN	SYMBOL
1	RX
2	VSS
3	VDD
4	NC
5	SPISS
6	SDO
7	SCK/SCL
8	SDI/SDA
9	VSS
10	VDD
11	NC
12	NC
13	NC
14	NC

Notes:

1. Display Mode: FSTN/Positive/Transflective
2. Driving Mode: 1/16 Duty, 1/5 Bias, VDD=5.0V
3. Viewing Angle: 6:00
4. Backlight: White LED
5. Driver IC: ST7066 & PIC16F690
6. Interface: RS232 (TTL) / SPI / I2C
7. Operating Temp: -20^{0}C to 70^{0}C
8. Storage Temp: -30^{0}C to 80^{0}C
9. RoHS Compliant

Model Name: C202A1-FTW-YW65		FocusLCDs.com LCDs MADE SIMPLE®	
General Tol: ± 0.3			
Approvals	Date	Drawing No.:	Scale:
DWN:			
CHK:		Size:	Unit: / Page: 1/1
APP:			

2. Input Terminal Pin Assignment

NO.	Symbol	Description	Connection
1	RX	RS-232(TTL)Serial input port	I/O
2	VSS	Negative Power Supply, Ground	Power supply
3	VDD	Positive Power Supply	Power supply
4	NC	No connect	-
5	SPISS	SPI Slave Select (NC in I2C mode)	I
6	SDO	No connect	-
7	SCK/SCL	Serial Clock	I
8	SDI/SDA	Serial Data In(SPI);Serial Data(I2C)	I
9	VSS	Negative Power Supply, Ground	Power supply
10	VDD	Positive Power Supply	Power supply
11-14	NC	No connect	-

3. LCD Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
View Angle	(V) θ=0°	CR ⩾ 2	-	-	20	deg
	(V) θ=180°	Ta=25°C			40	
	(H) θ=90°		-	-	40	
	(H)θ=180°		-	-	40	
Contrast Ratio	CR		5	-	-	-
Response Time	T rise	Ta=25°C	-	200	300	ms
	T fall		-	250	350	

4. Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Voltage For Logic	V_{DD}-V_{SS}	-	4.5	5.0	5.3	V
Supply Voltage For LCD	V_{LCD}-V_{SS}	Ta=25°C	-	-	-	V
Input High Volt.	V_{IH}	-	4.0	-	5.0	V
Input Low Volt.	V_{IL}	-	0	-	1.0	V
Supply Current	I_{DD}	V_{DD}=5.0V	-	-	8.0	mA
Supply Voltage Of Backlight	V_{LED}	Forward current =30mA Number of LED die 1x2=2	-	4.8	5.0	V

5. Absolute Maximum Rating (Ta=25 ˚C, VSS=0V)

Characteristics	Symbol	Min	Max	Unit
Supply Voltage For Logic	VDD-Vss	-0.3	5.5	V
Input Voltage	VIN	-0.3	VDD+0.5	V
Operating Temperature	TOP	-20	+70	℃
Storage Temperature	TST	-30	+80	℃

NOTE: If the absolute maximum rating of the above parameters is exceeded, even momentarily, the quality of the product may be degraded. Absolute maximum ratings specify the values which the product may be physically damaged if exceeded. Be sure to use the product within the range of the absolute maximum ratings.

6. Communications

I 2C Communication

To enter the I2C mode, place a jumper on I2C.

The default I2C address is 80 (50 hex). The I2C address can be changed to any 8-bit value by command function, with the exception that the LSB (least significant bit) must always be '0'. Once the I2C address has been changed, it will be saved in the system memory, and it will revere back to the default address if either RS232 or SPI protocol is selected.

The I2C interface is capable of receiving data at up to 50KHz-clock rate.

SPI Communication

SPI mode has a normally high idle clock. When Slave Select is LOW, data is sampled on the rising edge of the Clock. The SPI interface can receive data at up to 100KHz clock rate.

SPI Mode 3

CPOL = 1

CPHA = 1

RS232(TTL) Communication

To enter the RS-232 mode, both I2C and SPI should be open.

The RS-232 signal must be 5V TTL compatible. Communication format is 8-bit data, 1 Stop bit, no parity, no handshaking.

Default BAUD rate is 9600 and is changeable with a command function. Once the BAUD rate has been changed, it will be

saved in the system memory, and it will revert to the default address if either I2C or SPI protocol is selected.

ASCII Text

To display normal text, just enter its ASCII number. A number from 0x00 to 0x07 displays the user defined custom character, 0x20 to 0x7F displays the standard set of characters, 0xA0 to 0xFD display characters and symbols that are factory-masked on the ST7066U controller. 0xFE is reserved.

Change the I2C Slave Address

Syntax hexadecimal 0xFE 0x62 [adr]

Parameter

Parameter	Length	Description
[adr]	1 byte	New I^2C address, 0x00 – 0xFE The LSB is always '0'.

Description This command sets the I2C address, the address must be an even number, (LSB = 0). The address change requires 20 microsecond to take effect; therefore, the subsequent input must have an appropriate delay. The default I2C address can be restored if SPI or RS232 is selected as the communication mode.
Default 0x50

Changing BAUD Rate

Syntax hexadecimal 0xFE 0x61 [baud]

Parameter

Parameter	Length	Description
[baud]	1 byte	New RS232 BAUD Rate, 1 - 8

Description This command sets the RS232 BAUD rate, the single byte parameter select the desired BAUD rate as in the table below. The new BAUD rate requires 20 microsecond to take effect, therefore, the subsequent input must have an appropriate delay. The default BAUD rate can be restored if I2C or SPI is selected as the communication mode. Illegal parameter input will be discarded.
Default 9600 BAUD

m	
1	300
2	1200
3	2400
4	9600
5	14400
6	19.2K
7	57.6K
8	115.2K

Built In Functions:

Introduction

There several build-in functions in the serial interface to facilitate the LCD control, These functions eliminate the needs for end user to understand the HD44780 instruction set and timing requirements. It also provides control for features that are not accessible with a serial connection.

Turn On Display

Syntax hexadecimal 0xFE 0x41

Parameter

Parameter	Length	Description
None	None	Turn on LCD screen

Description This command turn on the LCD display screen, the display text is not altered.

Default LCD screen is on

Turn Off Display

Syntax hexadecimal 0xFE 0x42

Parameter

Parameter	Length	Description
None	None	Turn off LCD screen

Description This command turn off the LCD display screen, the display text is not altered.

Default LCD screen is on

Set Cursor Position

Syntax hexadecimal 0xFE 0x45 [pos]

Parameter

Parameter	Length	Description
[pos]	1 byte	Put cursor at location specified by [pos], 0x00 to 0x67

Description This command moves the cursor to a specified location where the next character will be displayed. A typical cursor position for a 4-line display is show below; a cursor position outside these ranges will not be viewable.

.	Column	Column20
Line1	0x00	0x13
Line 2	0x40	0x53
Line 3	0x14	0x27
Line 4	0x54	0x67

Default After a reset, the cursor is on position 0x00.

Home Cursor

Syntax	hexadecimal 0xFE	0x46	
Parameter	Parameter	Length	Description
	None	None	Position cursor at line 1 column 1
Description	This command move the cursor to line 1, column 1 of the LCD screen, the display text is not altered.		
Default	None		

Turn On Underline Cursor

Syntax	hexadecimal 0xFE	0x47	
Parameter	Parameter	Length	Description
	None	None	Turn on underline cursor
Description	This command turn on the underline cursor, the cursor position is where the next character will appear.		
Default	The underline cursor is off.		

Turn Off Underline Cursor

Syntax	hexadecimal 0xFE	0x48	
Parameter	Parameter	Length	Description
	None	None	Turn off underline cursor
Description	This command turn off the underline		
Default	cursor. The underline cursor is off.		

Move Cursor Left One Space

Syntax	hexadecimal 0xFE	0x49	
Parameter	Parameter	Length	Description
	None	None	Move cursor left 1 space
Description	This command move the cursor position left 1 space, regardless the cursor is displayed or not, and the displayed character is not altered		
Default	None		

Move Cursor Right One Space

Syntax	hexadecimal 0xFE	0x4A	
Parameter	Parameter	Length	Description
	None	None	Move cursor right 1 space
Description	This command move the cursor position right 1 space, regardless the cursor is displayed or not, and the displayed character is not altered		
Default	None		

Turn On Blinking Cursor

Syntax	hexadecimal 0xFE	0x4B	
Parameter	Parameter	Length	Description
	None	None	Turn on the blinking cursor
Description	This command turn on the blinking cursor, both the cursor and the character on the cursor will blink.		
Default	The blinking cursor is off.		

Turn Off Blinking Cursor

Syntax	hexadecimal 0xFE	0x4C	
Parameter	Parameter	Length	Description
	None	None	Turn off the blinking cursor
Description	This command turn off the blinking cursor.		
Default	The blinking cursor is off.		

Back Space

Syntax	hexadecimal 0xFE	0x4E	
Parameter	Parameter	Length	Description
	None	None	Move cursor back one space and delete the character on the ursor.
Description	This command is destructive backspace, the cursor is moved back one space and the character on the cursor is deleted.		
Default	None.		

Clear Screen

Syntax	hexadecimal 0xFE	0x51	
Parameter	Parameter	Length	Description
	None	None	Clear LCD and move cursor to line 1 column 1.
Description	This command clears the entire display and place the cursor at line 1 column 1.		
Default	None.		

Set Display Contrast

Syntax	hexadecimal 0xFE	0x52	[contrast]	
Parameter	Parameter	Length	Description	
	[contrast]	1 byte	Set the display contrast, value between 1 to 50	
Description	This command set the LCD character display contrast, the contrast setting is between 1 to 50, where 50 is the highest contrast.			
Default	Default contrast value is 40.			

Set Backlight Brightness

Syntax hexadecimal 0xFE 0x53 [brightness]

Parameter

Parameter	Length	Description
[brightness]	1 byte	Set the LCD backlight brightness level, value between 1 to 16

Description This command set the LCD display backlight brightness level, the value is between 1 to 16.

Default Default contrast value is 1.

Load Custom Characters

Syntax hexadecimal 0xFE 0x54 [addr] [d0 …d7]

Parameter

Parameter	Length	Description
[addr]	1 byte	Custom character address, 0 – 7
[D0..D7]	8 bytes	Custom character pattern bit map

Description There are space for eight user defined custom characters, this command load the custom character into one of the eight locations. The custom character pattern is bit mapped into 8 data bytes, the bit map for Spanish character '¿' is shown in table below, to display the custom character, user simply enter the address of the character (0 to 8).

Default None.

Bit	7	6	5	4	3	2	1	0	Hex
Byte 1	0	0	0	0	0	1	0	0	0x04
Byte 2	0	0	0	0	0	0	0	0	0x00
Byte 3	0	0	0	0	0	1	0	0	0x04
Byte 4	0	0	0	0	1	0	0	0	0x08
Byte 5	0	0	0	1	0	0	0	0	0x10
Byte 6	0	0	0	1	0	0	0	1	0x11
Byte 7	0	0	0	0	1	1	1	0	0x0E
Byte 8	0	0	0	0	0	0	0	0	0x00

Shift Display to the Left

Syntax hexadecimal 0xFE 0x55

Parameter

Parameter	Length	Description
None	None	Shift the LCD screen to the left one Place.

Description This command shift the display one place to the left, the cursor position also moves with the display, and the display data is not altered.

Default None

Shift Display to the Right

Syntax hexadecimal 0xFE 0x56

Parameter

Parameter	Length	Description
None	None	Shift the LCD screen to the right one Place.

Description This command shift the display one place to the right, the cursor position also moves with the display, and the display data is not altered.

Default None

Display Firmware Version Number

Syntax hexadecimal 0xFE 0x70

Parameter

Parameter	Length	Description
None	None	Display the firmware version number.

Description This command display the micro-controller firmware version number.

Default None.

Display RS232 Baud Rate

Syntax hexadecimal 0xFE 0x71

Parameter

Parameter	Length	Description
None	None	Display Baud Rate

Description This command display the current RS232 BAUD rate.

Default None.

Display I^2C Address

Syntax hexadecimal 0xFE 0x72

Parameter

Parameter	Length	Description
None	None	Display I^2C Address

Description This command display the current I^2C slave address.

Default None.

Table of Commands

Prefix	CMD	Param	Description
0xFE	0x41	None	Display on
0xFE	0x42	None	Display off
0xFE	0x45	1 Byte	Set cursor
0xFE	0x46	None	Cursor home
0xFE	0x47	None	Underline cursor on
0xFE	0x48	None	Underline cursor off
0xFE	0x49	None	Move cursor left one place
0xFE	0x4A	None	Move cursor right one place
0xFE	0x4B	None	Blinking cursor on
0xFE	0x4C	None	Blinking cursor off
0xFE	0x4E	None	Backspace
0xFE	0x51	None	Clear screen
0xFE	0x52	1 Byte	Set contrast
0xFE	0x53	1 Byte	Set backlight brightness
0xFE	0x54	9 Byte	Load custom character
0xFE	0x55	None	Move display one place to the left
0xFE	0x56	None	Move display one place to the right
0xFE	0x61	1 Byte	Change RS232 BAUD rate 232
0xFE	0x62	1 Byte	Change I2C address
0xFE	0x70	None	Display firmware version number
0xFE	0x71	None	Display RS232 BAUD rate
0xFE	0x72	None	Display I2C address
0xFE	0xFE	1 Byte	Send control byte to

Built-in Font Table

Lower 4 Bits \ Upper 4 Bits	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
xxxx0000	CG RAM (1)			0	@	P	`	p				—	9	三	α	p
xxxx0001	(2)		!	1	A	Q	a	q			。	ア	チ	ム	ä	q
xxxx0010	(3)		"	2	B	R	b	r			「	イ	ツ	メ	ß	θ
xxxx0011	(4)		#	3	C	S	c	s			」	ウ	テ	モ	ε	∞
xxxx0100	(5)		$	4	D	T	d	t			、	エ	ト	ヤ	μ	Ω
xxxx0101	(6)		%	5	E	U	e	u			・	オ	ナ	ユ	σ	ü
xxxx0110	(7)		&	6	F	V	f	v			ヲ	カ	ニ	ヨ	ρ	Σ
xxxx0111	(8)		'	7	G	W	g	w			ァ	キ	ヌ	ラ	g	π
xxxx1000	(1)		(	8	H	X	h	x			ィ	ク	ネ	リ	√	x̄
xxxx1001	(2)		)	9	I	Y	i	y			ゥ	ケ	ノ	ル	-1	y
xxxx1010	(3)		*	:	J	Z	j	z			ェ	コ	ハ	レ	j	千
xxxx1011	(4)		+	;	K	[	k	{			ォ	サ	ヒ	ロ	ˣ	万
xxxx1100	(5)		,	<	L	¥	l	|			ャ	シ	フ	ワ	¢	円
xxxx1101	(6)		-	=	M	]	m	}			ュ	ス	ヘ	ン	£	÷
xxxx1110	(7)		.	>	N	^	n	→			ョ	セ	ホ	゛	ñ	
xxxx1111	(8)		/	?	O	_	o	←			ッ	ソ	マ	゜	ö	■

9. Cautions and Handling

General Precautions:

1. LCD panel is made of glass. Avoid excessive mechanical shock or applying strong pressure onto the surface of display area.
2. The polarizer used on the display surface is easily scratched and damaged. Extreme care should be taken when handling. To clean dust or dirt off the display surface, wipe gently with cotton, or other soft material soaked with isoproply alcohol, ethyl alcohol or trichlorotriflorothan. Do not use water, ketone or aromatics and never scrub hard.
3. Do not tamper in any way with the tabs on the metal frame.
4. Do not make any modification on the PCB without consulting.
5. When mounting the LCM, make sure that the PCB is not under any stress such as bending or twisting. Elastomer contacts are very delicate and missing pixels could result from slight dislocation of any of the elements.
6. Avoid pressing on the metal bezel, otherwise the elastomer connector could be deformed and lose contact, resulting in missing pixels and cause rainbow on the display.
7. Be careful not to touch or swallow liquid crystal that might leak from a damaged cell. Any liquid crystal adheres to skin or clothes, wash it off immediately with soap and water.

Static Electricity Precautions:

1. CMOS-LSI is used for the module circuit; therefore, operators should be grounded whenever he/she comes into contact with the module.
2. Do not touch any of the conductive parts such as the LSI pads, the copper leads on the PCB and the interface terminals with any parts of the human body.
3. Do not touch the connection terminals of the display with bare hand; it will cause disconnection or defective insulation of terminals.
4. The modules should be kept in anti-static bags or other containers resistant to static for storage.
5. Only properly grounded soldering irons should be used.
6. If an electric screwdriver is used, it should be grounded and shielded to prevent sparks.
7. The normal static prevention measures should be observed for work clothes and working benches.
8. Since dry air is inductive to static, a relative humidity of 50-60% is recommended.

Soldering Precautions:

1. Soldering should be performed only on the I/O terminals.
2. Use soldering irons with proper grounding and no leakage.
3. Soldering temperature: 280°C+10°C
4. Soldering time: 3 to 4 second.
5. Use eutectic solder with resin flux filling.
6. If flux is used, the LCD surface should be protected to avoid spattering flux.
7. Flux residue should be removed.

Operation Precautions:

1. The viewing angle can be adjusted by varying the LCD driving voltage Vo.
2. Since applied DC voltage causes electro-chemical reactions, which deteriorate the display, the applied pulse waveform should be a symmetric waveform such that no DC component remains. Be sure to use the specified operating voltage.
3. Driving voltage should be kept within specified range; excess voltage will shorten display life.
4. Response time increases with decrease in temperature.
5. Display color may be affected at temperatures above its operational range.
6. Keep the temperature within the specified range usage and storage. Excessive temperature and humidity could cause polarization degradation, polarizer peel-off or generate bubbles.
7. For long-term storage over 40□C is required, the relative humidity should be kept below 60%,and avoid