Graphic Display Module

Part Number

G240128C-FT3-DW63

Overview:

- 240x128 Graphic LCD
- FSTN Gray
- 85x55mm Module
- Parallel and Serial Interface(s)
- RGB LED Backlight

- Transflective
- Wide Temp Range
- 3V
- LCD IC: ST75256
- RoHS Compliant.

Graphic LCD Features
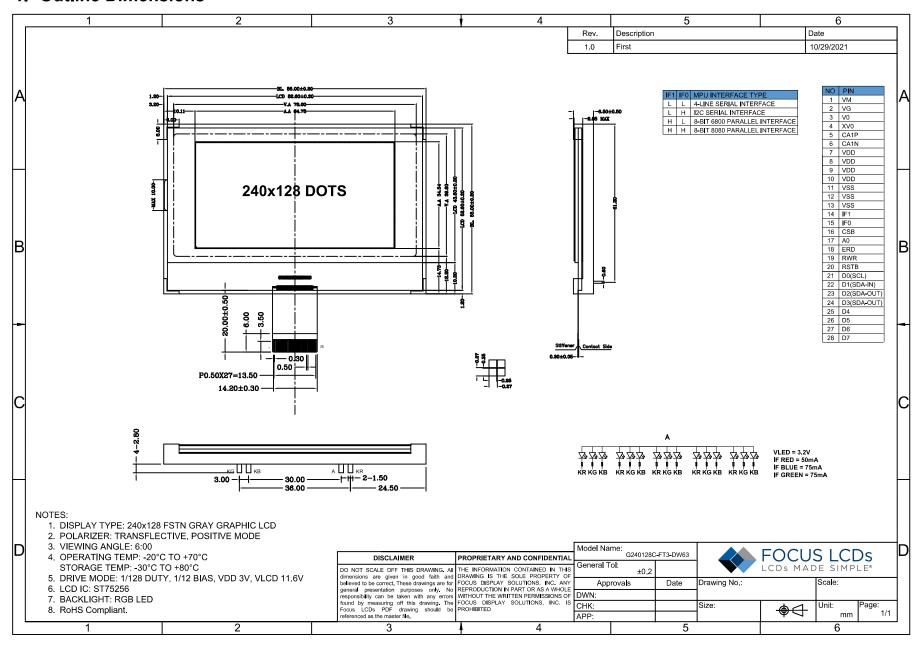
Resolution: 240x128 Dots
Interface(s): Parallel and Serial
RoHS Compliant.

General Information Items	Specification	Unit	Note
	Main Panel		
Viewing Area (VA)	78.6 (H) x 39.6 (V)	mm	--
LCD Type	FSTN Positive	--	--
Viewing Angle	6:00	O'Clock	--
Polarizer	Transflective	--	--
Backlight Type	LED	--	--
Backlight Color	RGB	mm	--
LCD IC	ST75256	--	--
Drive Mode	1/128 Duty, 1/12 Bias	--	--
Operating Temperature	-20 to +70	°C	--
Storage Temperature	-30 to +80	°C	--

Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	--	85.0	--	mm	--
	Vertical (V)	--	55.0	--	mm	--
	Depth (D)	--	6.50	--	mm	--
Weight		--	TBD	--	g	--

1. Outline Dimensions

240x128 DOTS

IF1	IF0	MPU INTERFACE TYPE
L	L	4-LINE SERIAL INTERFACE
L	H	I2C SERIAL INTERFACE
H	L	8-BIT 6800 PARALLEL INTERFACE
H	H	8-BIT 8080 PARALLEL INTERFACE

NO	PIN
1	VM
2	VG
3	V0
4	XV0
5	CA1P
6	CA1N
7	VDD
8	VDD
9	VDD
10	VDD
11	VSS
12	VSS
13	VSS
14	IF1
15	IF0
16	CSB
17	A0
18	ERD
19	RWR
20	RSTB
21	D0(SCL)
22	D1(SDA-IN)
23	D2(SDA-OUT)
24	D3(SDA-OUT)
25	D4
26	D5
27	D6
28	D7

VLED = 3.2V
IF RED = 50mA
IF BLUE = 75mA
IF GREEN = 75mA

NOTES:
1. DISPLAY TYPE: 240x128 FSTN GRAY GRAPHIC LCD
2. POLARIZER: TRANSFLECTIVE, POSITIVE MODE
3. VIEWING ANGLE: 6:00
4. OPERATING TEMP: -20°C TO +70°C
   STORAGE TEMP: -30°C TO +80°C
5. DRIVE MODE: 1/128 DUTY, 1/12 BIAS, VDD 3V, VLCD 11.6V
6. LCD IC: ST75256
7. BACKLIGHT: RGB LED
8. RoHS Compliant.

	Rev.	Description	Date
	1.0	First	10/29/2021

Model Name: G240128C-FT3-DW63

General Tol: ±0.2

Approvals	Date
DWN:	
CHK:	
APP:	

FOCUS LCDs
LCDs MADE SIMPLE®

Drawing No.:

Scale:

Size:

Unit: mm

Page: 1/1

2. Input Terminal Pin Assignment

Recommended Connector: FH33-28S-0.5SH(10)

NO.	Symbol	Description	I/O
1	VM	VM is the I/O pin of LCD bias supply voltage	I/O
2	VG	VG is the power of SEG-drivers	S
3	V0	Positive operating voltage of COM-drivers	S
4	XV0	Negative operating voltage of COM-drivers	S
5	CA1P	DC voltage converter. Connect a capacitor between CA1P and CA1N.	I/O
6	CA1N		
7-10	VDD	Power	S
11-13	VSS	GND	S
14	IF1	These pins select interface operation mode.	I
15	IF0		
16	CSB	Chip select input pin	I
17	A0	Determines whether the access is related to data or command	I
18	ERD	Read/write execution control pin	I
19	RWR	Read/write execution control pin	I
20	RSTB	Reset pin	I
21-28	D0-D7	Data Bus	I/O

I: Input, O: Output, S: Supply

IF1	IF0	MPU Interface Type
L	L	4-Line Serial Interface
L	H	I2C Serial Interface
H	L	8-Bit 6800 Parallel Interface
H	H	8-Bit 8080 Parallel Interface

3. LCD Optical Characteristics

Item		Symbol	Condition	Min	Typ.	Max	Unit
Contrast Ratio		CR		--	3	--	
Response Time	On	T_{on}		--	150	250	ms
	Off	T_{off}		--	180	300	ms
Viewing Angle $C_1 \geq 2$, 25°C		Θ	Φ=270°, 9H	--	55	--	degree
		Θ	Φ=90°, 3H	--	55	--	
		Θ	Φ=180°, 12H	--	40	--	
		Θ	Φ=0°, 6H	--	70	--	

4. Electrical Characteristics

4.1 Absolute Maximum Rating

Characteristics	Symbol	Min	Max	Unit
Supply Voltage	VDD	-0.3	4.0	V
	Vout	-0.3	15.0	V
Operating Temperature	TOP	-20	+70	°C
Storage Temperature	TST	-30	+80	°C

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.

4.2 DC Electrical Characteristics

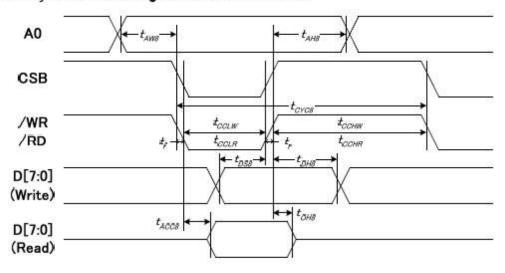| Characteristics		Symbol	Condition	Min	Typ.	Max	Unit
LCD Driving Voltage		VLCD		--	11.6	--	V
Supply Voltage		Logic	VDD-GND	--	3.1	--	V
Input Voltage	H Level	VDD		0.8VDD	--	VDD	V
	L Level	VIH		VSS	--	0.2VDD	V

Condition:
1. VDD = 3.1V
2. 1/128Duty, 1/12 Bias

5.0 Module Function

5.1 Timing Characteristics

14.1 System Bus Timing for 8080 MCU Interface

VDD1 = 1.8 ~ 3.3V, Ta = 25°C

Item	Signal	Symbol	Condition	Min.	Max	Unit
Address setup time	A0	tAW8		20	--	ns
Address hold time		tAH8		0	--	
System Cycle Time (WRITE)	/WR	tCYC8		160	--	
/WR L Pulse Width (WRITE)		tCCLW		70	--	
/WR H Pulse Width (WRITE)		tCCHW		70	--	
System Cycle Time (READ)	RD	tCYC8		400	--	
/RD L Pulse Width (READ)		tCCLR		180		
/RD H Pulse Width (READ)		tCCHR		180		
WRITE Data Setup Time	D[7:0]	tDS8		15	--	
WRITE Data Hold Time		tDH8		15	--	
READ Access Time		tACC8	CL = 30pF	--	100	
READ Output Disable Time		tPH8	CL = 30pF	10	110	

Note:
1. The input signal rise time and fall time (tr, tf) is specified at 15ns or less. When the system cycle time is extremely fast, (tr + tf) ≤ (tCYC8 – tCCLW – tCCHW) for (tr + tf) ≤ (tCYC8 – tCCLR – tCCHR) are specified.
2. All timing is specified using 20% and 80% of VDD1 as the reference.

5.3 Command Table

Instruction	A0	R/W	Command Byte								Description
			D7	D6	D5	D4	D3	D2	D1	D0	
Extension Command	0	0	0	0	1	1	EXT1	0	0	EXT0	Set extension instruction.
Ext [1:0]=0,0 (Extension Command 1)											
Display ON/OFF	0	0	1	0	1	0	1	1	1	DSP	Set LCD display DSP=0: Display Off DSP=1: Display On
Inverse Display	0	0	1	0	1	0	0	1	1	INV	Set inverse display INV=0: Normal Display INV=1: Inverse Display
All Pixel ON/OFF	0	0	0	0	1	0	0	0	1	AP	Set all pixel on mode, only for monochrome display. AP=0: All pixel off mode AP=1: All pixel on mode
Display Control	0	0	1	1	0	0	1	0	1	0	Set display control LCD: Set CL dividing ratio DT[7:0]: Set the number of duty LF[4:0]: Set N-Line inversion counter FI: Set the inversion type of frame at the end of common scan cycle
	1	0	0	0	0	0	0	CLD	0	0	
	1	0	DT7	DT6	DT5	DT4	DT3	DT2	DT1	DT0	
	1	0	0	0	LF4	F1	LF3	LF2	LF1	LF0	
Power Save	0	0	1	0	0	1	0	1	0	SLP	Set power save mode. SLP=0: Sleep out mode SLP=1: Sleep in mode
Set Page Address	0	0	0	1	1	1	0	1	0	1	Set page address Starting page address: 00h≤YS≤28h Ending page address: YS≤YE≤28H
	1	0	YS7	YS6	YS5	YS4	YS3	YS2	YS1	YS0	
	1	0	YE7	YE6	YE5	YE4	YE3	YE2	YE1	YE0	
Set Column Address	0	0	0	1	1	1	0	1	0	1	Set column address Starting column address: 00h≤XS≤FFh Ending column address: XS≤XE≤FFh
	1	0	XS7	XS6	XS5	XS4	XS3	XS2	XS1	XS0	
	1	0	XE7	XE6	XE5	XE4	XE3	XE2	XE1	XE0	
Data Scan Direction	0	0	1	0	1	1	1	1	0	0	Set normal/inverse display of address and address scan direction
	1	0	0	0	0	0	0	MV	MX	MY	
Write Data	0	0	0	1	0	1	1	1	0	0	Write data to DDRAM
	1	0	D7	D6	D5	D4	D3	D2	D1	D0	
Read Data	0	0	0	1	0	1	1	1	0	1	Read data from DDRAM (Only for parallel interface and I2C)
	1	1	D7	D6	D5	D4	D3	D2	D1	D0	
Partial In	0	0	1	0	1	0	1	0	0	0	Set partial area Starting partial display address: 00h≤PTS≤A1h
	1	0	PTE7	PTE6	PTE5	PTE4	PTE3	PTE2	PTE1	PTE0	

Command											Description
											Ending partial display address: 00h≤PTE≤A1h
Partial Out	0	0	1	0	1	0	1	0	0	1	Exit the partial mode
Read/Modify/Write In	0	0	1	1	1	0	0	0	0	0	Enable read modify write
Read/Modify/Write Out	0	0	1	1	1	0	1	1	1	0	Disable read modify write
Scroll Area	0	0	1	0	1	0	1	0	1	0	Set scroll area TL[7:0]: Set top line address BL[7:0]: Set bottom line address NSL[7:0]: Number of specified line SCM[1:0]: Area scroll mode
	1	0	TL7	TL6	TL5	TL4	TL3	TL2	TL1	TL0	
	1	0	BL7	BL6	BL5	BL4	BL3	BL2	BL1	BL0	
	1	0	NSL7	NSL6	NSL5	NSL4	NSL3	NSL2	NSL1	NSL0	
	1	0	0	0	0	0	0	0	SCM1	SCM0	
Set Start Line	0	0	1	0	1	0	1	0	1	1	Set scroll start address 00h≤SL≤A1h
	1	0	SL7	SL6	SL5	SL4	SL3	SL2	SL1	SL0	
OSC ON	0	0	1	1	0	1	0	0	0	1	Turn on the internal oscillator
OSC OFF	0	0	1	1	0	1	0	0	1	0	Turn off the internal oscillator
Power Control	0	0	0	0	1	0	0	0	0	0	Power circuit operation VB=0: OFF, VB=1: ON VF=0: OFF, VF=1: ON VR=0: OFF, VR=1: ON
	1	0	0	0	0	0	VB	0	VF	VR	
Set Vop	0	0	1	0	0	0	0	0	0	1	Set Vop
	1	0	0	0	Vop5	Vop4	Vop3	Vop2	Vop1	Vop0	
	1	0	0	0	0	0	0	Vop8	Vop7	Vop60	
Vop Control	0	0	1	1	0	1	0	1	1	VOL	Control Vop VOL=0: Vop increase one step VOL=1: Vop decrease one step
Read Register Mode	0	0	0	1	1	1	1	1	0	REG	Set read register mode REG=0: Read the register value of Vop[5:0] REG=1: Read the register value of Vop[8:6]
Nop	0	0	0	0	1	0	0	1	0	1	No operation
Read Status (Parallel and I2C)	0	1	D7	D6	D5	D4	D3	D2	D1	D0	Read status byte (Parallel and I2C)
Read Status (4-Line and 3-Line SPI)	0	0	1	1	1	1	1	1	1	0	Read status byte (4-Line and 3-Line SPI)
	0	1	D7	D6	D5	D4	D3	D2	D1	D0	
Data Format Select	0	0	0	0	0	0	1	DO	0	0	DO=0: LSB on bottom (Default) DO=1: LSB on top
Display Mode	0	0	1	1	1	1	0	0	0	0	Set display mode

	1	0	0	0	0	1	0	0	0	DM	DM=1: Mono (Default) DM=1: 4 Gray scale mode
Set ICON	0	0	0	1	1	1	0	1	1	ICON	Enable/Disable ICON RAM ICON=1: Enable ICON RAM ICON=0: Disable ICON RAM
Set Master/Slave	0	0	0	1	1	0	1	1	1	MS	Select Master or Slave mode MS=0: CMD for Master (Default) MS=1: CMD for Slave
Ext [1:0]=0,1 (Extension Command 2)											
Set Gray Level	0	0	0	0	1	0	0	0	0	0	Set gray scale level GL[4:0]: Set Light Gray Level GD[4:0]: Set Dark Gray Level
	1	0	0	0	0	0	0	0	0	0	
	1	0	0	0	0	0	0	0	0	0	
	1	0	0	0	0	0	0	0	0	0	
	1	0	0	0	0	GL4	GL3	GL2	GL1	GL0	
	1	0	0	0	0	GL4	GL3	GL2	GL1	GL0	
	1	0	0	0	0	GL4	GL3	GL2	GL1	GL0	
	1	0	0	0	0	0	0	0	0	0	
	1	0	0	0	0	0	0	0	0	0	
	1	0	0	0	0	GD4	GD3	GD2	GD1	GD0	
	1	0	0	0	0	0	0	0	0	0	
	1	0	0	0	0	0	0	0	0	0	
	1	0	0	0	0	GD4	GD3	GD2	GD1	GD0	
	1	0	0	0	0	GD4	GD3	GD2	GD1	GD0	
	1	0	0	0	0	GD4	GD3	GD2	GD1	GD0	
	1	0	0	0	0	0	0	0	0	0	
	1	0	0	0	0	0	0	0	0	0	
Analog Circuit Set	0	0	0	0	1	1	0	0	1	0	Set analog circuit BE[1:0]: Booster efficiency set BS[2:0]: Set bias ratio
	1	0	0	0	0	0	0	0	0	0	
	1	0	0	0	0	0	0	0	BE1	BE0	
	1	0	0	0	0	0	0	BS2	BS1	BS0	
Booster Level	0	0	0	1	0	1	0	0	0	1	Set booster level BST=0: X8 BST=1: X10
	1	0	1	1	1	1	1	0	1	BST	

Name	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	Description
Driving Select	0	0	0	1	0	0	0	0	0	DS	Power type DS=0: Internal (Default) DS=1: External
Auto Read Control	0	0	1	1	0	1	0	1	1	1	Set auto-read instruction. XARD=0: Enable auto read XARD=1: Disable auto read
	1	0	1	0	0	XARD	1	1	1	1	
OTP WR/RD Control	0	0	1	1	1	0	0	0	0	0	OTP WR/RD control WR/RD=0: Enable OTP read WR/RD=1: Enable OTP write
	1	0	0	0	WR/RD	0	0	0	0	0	
OTP Control Out	0	0	1	1	1	0	0	0	0	1	OTP Control out
OTP Write	0	0	1	1	1	0	0	0	1	0	OTP Write
OTP Read	0	0	1	1	1	0	0	0	1	1	OTP Read
OTP Selection Control	0	0	1	1	1	0	0	1	0	0	OTP selection control Ctrl=1: Disable OTP Selection Ctrl=0: Enable OTP Selection
	1	0	1	Ctrl	0	1	1	0	0	1	
OTP Programming Setting	0	0	1	1	1	0	0	1	0	1	OTP programming setting
	1	0	0	0	0	0	1	1	1	1	
Frame Rate	0	0	1	1	1	1	0	0	0	0	Frame rate setting in different temperature range
	1	0	0	0	0	FRA4	FRA3	FRA2	FRA1	FRA0	
	1	0	0	0	0	FRB4	FRB3	FRB2	FRB1	FRB0	
	1	0	0	0	0	FRC4	FRC3	FRC2	FRC1	FRC0	
	1	0	0	0	0	FRD4	FRD3	FRD2	FRD1	FRD0	
Temperature Range	0	0	1	1	1	1	0	0	1	0	Temperature range setting
	1	0	0	TA6	TA5	TA4	TA3	TA2	TA1	TA0	
	1	0	0	TB6	TB5	TB4	TB3	TB2	TB1	TB0	
	1	0	0	TC6	TC5	TC4	TC3	TC2	TC1	TC0	
Temperature Gradient Compensation	0	0	1	1	1	1	0	1	0	0	Set temperature gradient compensation coefficient.
	1	0	MT13	MT12	MT11	MT10	MT03	MT02	MT01	MT00	
	1	0	MT33	MT32	MT31	MT30	MT23	MT22	MT21	MT20	
	1	0	MT53	MT52	MT51	MT50	MT43	MT42	MT41	MT40	
	1	0	MT73	MT72	MT71	MT70	MT63	MT62	MT61	MT60	
	1	0	MT93	MT92	MT91	MT90	MT83	MT82	MT81	MT80	
	1	0	MTB3	MTB2	MTB1	MTB0	MTA3	MTA2	MTA1	MTA0	

	1	0	MTD3	MTD2	MTD1	MTD0	MTC3	MTC2	MTC1	MTC0	
	1	0	MTF3	MTF2	MTF1	MTF0	MTE3	MTE2	MTE1	MTE0	

Ext [1:0]=1,1 (Extension Command 4)											
Enable OTP	0	0	1	1	0	1	0	1	1	0	Enable OTP EOTP=0: Disable (Default) EOTP=1: Enable
	1	0	0	0	0	EOTP	0	0	0	0	

6.0 Cautions and Handling Precautions

6.1 Handling and Operating the Module

1. When the module is assembled, it should be attached to the system firmly. Do not warp or twist the module during assembly work.

2. Protect the module from physical shock or any force. In addition to damage, this may cause improper operation or damage to the module and back-light unit.

3. Note that polarizer is very fragile and could be easily damaged. Do not press or scratch the surface.

4. Do not allow drops of water or chemicals to remain on the display surface. If you have the droplets for a long time, staining and discoloration may occur.

5. If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.

6. The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane. Do not use ketene type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

7. If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs, or clothes, it must be washed away thoroughly with soap.

8. Protect the module from static; it may cause damage to the CMOS ICs.

9. Use fingerstalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

10. Do not disassemble the module.

11. Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.

12. Pins of I/F connector shall not be touched directly with bare hands.

13. Do not connect, disconnect the module in the "Power ON" condition.

14. Power supply should always be turned on/off by the item Power On Sequence & Power Off Sequence.

6.2 Storage and Transportation

1. Do not leave the panel in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35 ℃ and relative humidity of less than 70%

2. Do not store the TFT-LCD module in direct sunlight.

3. The module shall be stored in a dark place. When storing the modules for a long time, be sure to adopt effective measures for protecting the modules from strong ultraviolet radiation, sunlight, or fluorescent light.

4. It is recommended that the modules should be stored under a condition where no condensation is allowed. Formation of dewdrops may cause an abnormal operation or a failure of the module. In particular, the greatest possible care should be taken to prevent any module from being operated where condensation has occurred inside.

5. This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.