



**FOCUS LCDs**  
LCDs MADE SIMPLE®

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TFT | OLED | CHARACTER | GRAPHIC | UWVD | SEGMENT | CUSTOM

## Graphic Display Module

Part Number

G160100C-FTW-DW63

### Overview:

- 160x100 Graphic LCD
- FSTN, Positive
- 49.2x45.0 mm Module
- I2C Interface(s)
- Gray-White LED Backlight
- Transflective
- Wide Temp Range
- 3.0 V
- LCD IC: ST75160I
- RoHS Compliant

## Graphic LCD Features

Resolution: 160x100 Dots

Interface(s): I2C

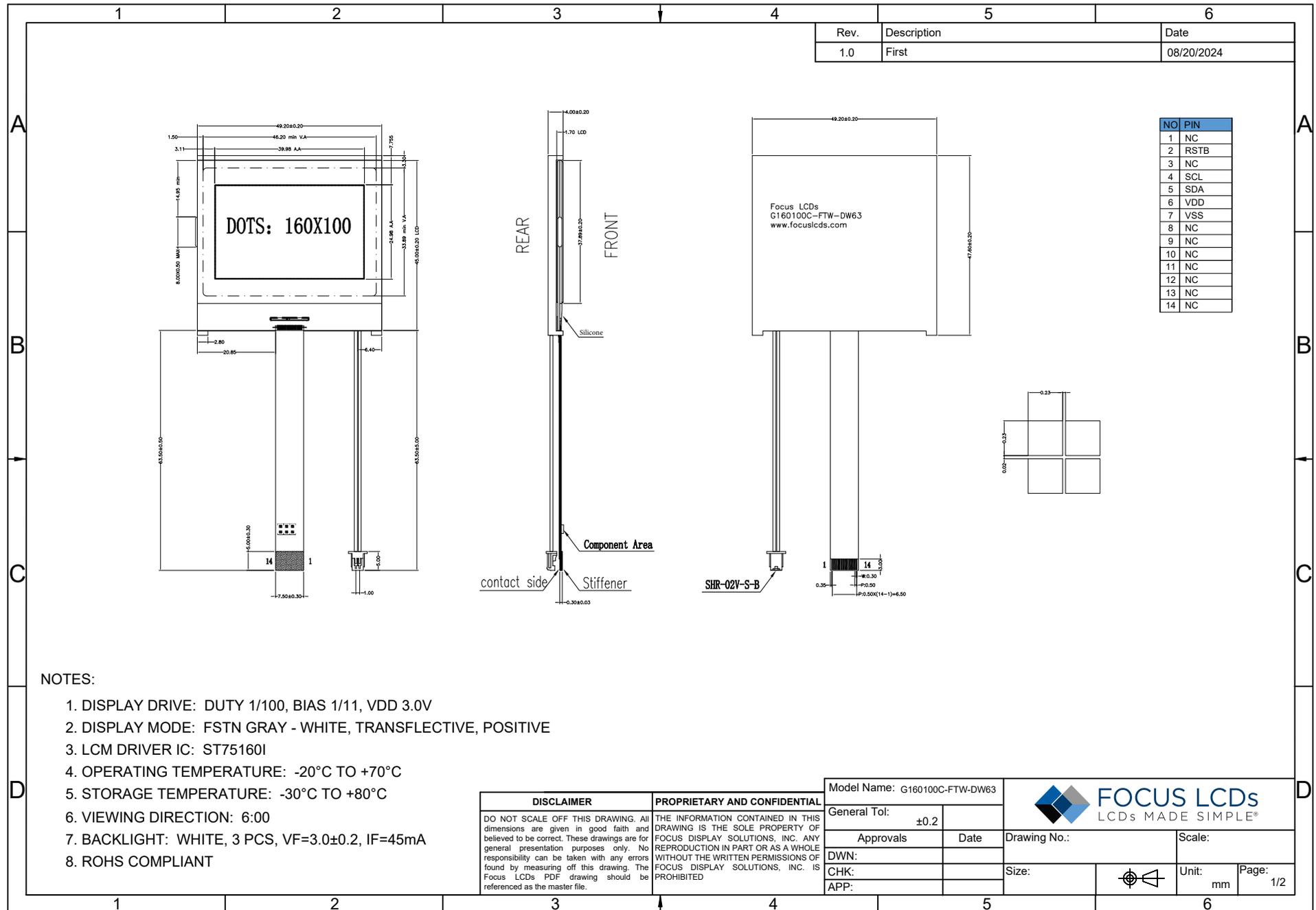
RoHS Compliant.

General Information Items	Specification	Unit	Note
	Main Panel		
Viewing Area (VA)	46.2 (H) x 33.89 (V)	mm	--
LCD Type	FSTN Positive	--	--
Viewing Angle	6:00	O'Clock	--
Polarizer	Transflective	--	--
Backlight Type	LED	--	--
Backlight Color	White	--	--
LCD IC	ST75160I	--	--
Drive Mode	1/100 Duty, 1/11 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)	--	49.2	--	mm	--
	Vertical (V)	--	45.0	--	mm	--
	Depth (D)	--	4.0	--	mm	--
Weight		--	13.0	--	g	Approximate

# 1. Outline Dimensions

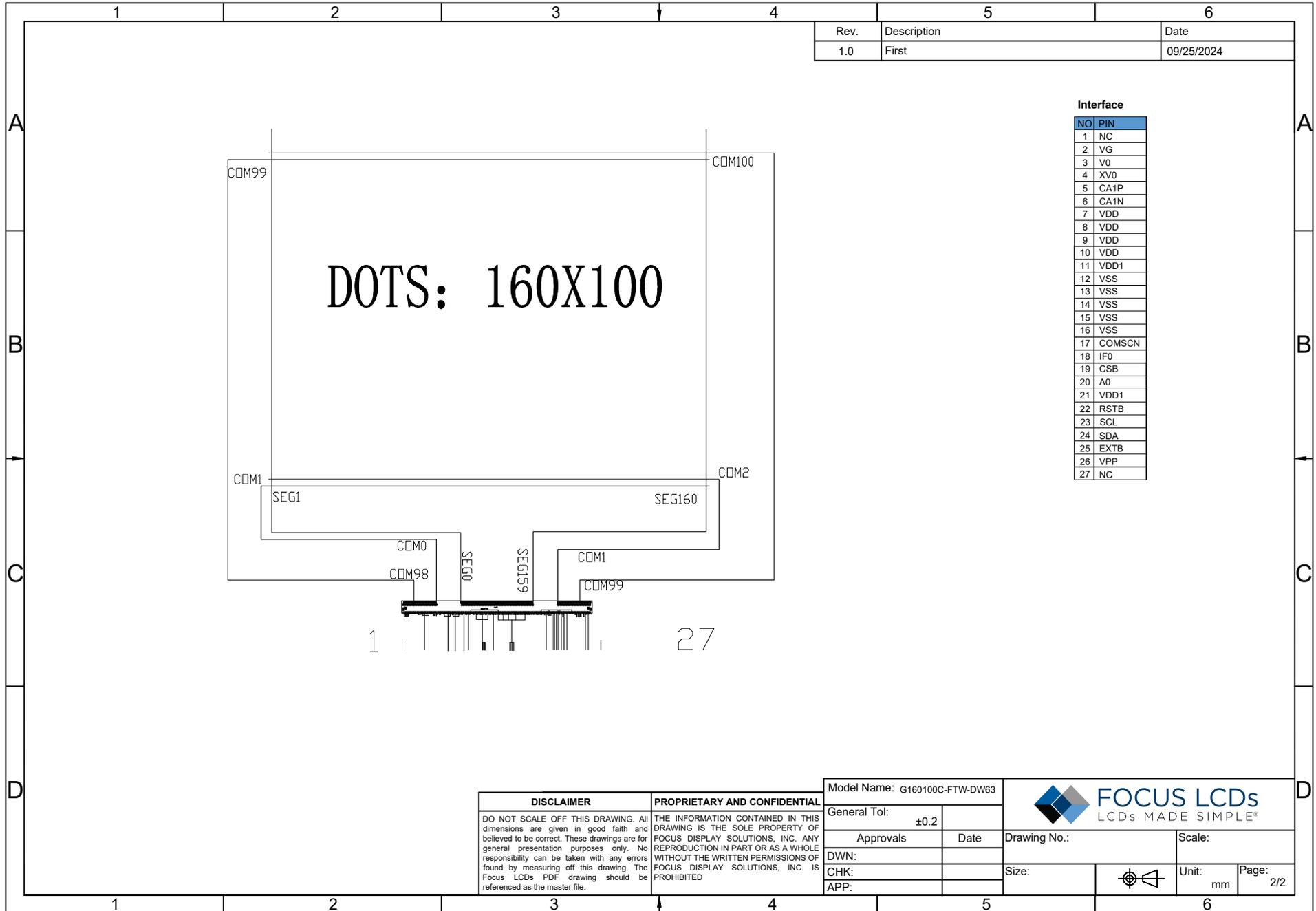


**NOTES:**

1. DISPLAY DRIVE: DUTY 1/100, BIAS 1/11, VDD 3.0V
2. DISPLAY MODE: FSTN GRAY - WHITE, TRANSFLECTIVE, POSITIVE
3. LCM DRIVER IC: ST751601
4. OPERATING TEMPERATURE: -20°C TO +70°C
5. STORAGE TEMPERATURE: -30°C TO +80°C
6. VIEWING DIRECTION: 6:00
7. BACKLIGHT: WHITE, 3 PCS, VF=3.0±0.2, IF=45mA
8. ROHS COMPLIANT

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Model Name: G160100C-FTW-DW63		 <b>FOCUS LCDs</b> LCDs MADE SIMPLE®	
General Tol:	±0.2		
Approvals	Date	Drawing No.:	Scale:
DWN:		Size:	Unit: mm
CHK:		Page:	1/2
APP:			



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Drawing No.:	Scale:
Size:	Unit: mm
Page: 2/2	

## 2. Input Terminal Pin Assignment

NO.	Symbol	Description	I/O
1	NC	No Connection.	--
2	RSTB	Reset input pin. When RSTB is "L", internal initialization procedure is executed.	I
3	NC	No Connection.	--
4	SCL	Serial input clock.	I
5	SDA	Serial input data.	I
6	VDD	Power.	P
7	VSS	Power.	P
8	NC	No Connection.	--
9	NC	No Connection.	--
10	NC	No Connection.	--
11	NC	No Connection.	--
12	NC	No Connection.	--
13	NC	No Connection.	--
14	NC	No Connection.	--

I: Input, O: Output, P: Power

## 3. LCD Optical Characteristics

Item	Symbol	Condition	Min	Typ.	Max	Unit	
Contrast Ratio	CR		--	5	--		
Response Time	On	$T_{on}$	--	150	250	ms	
	Off	$T_{off}$	--	180	300	ms	
Viewing Angle $C_1 \geq 2$ , 25°C	Hor.	$\Theta_L$	$\Phi=270^\circ$ , 9H	--	55	--	degree
		$\Theta_R$	$\Phi=90^\circ$ , 3H	--	55	--	
	Ver.	$\Theta_T$	$\Phi=180^\circ$ , 12H	--	40	--	
		$\Theta_B$	$\Phi=0^\circ$ , 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	19.0	V
Input Voltage	Vin	-0.3	VDD+0.3	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

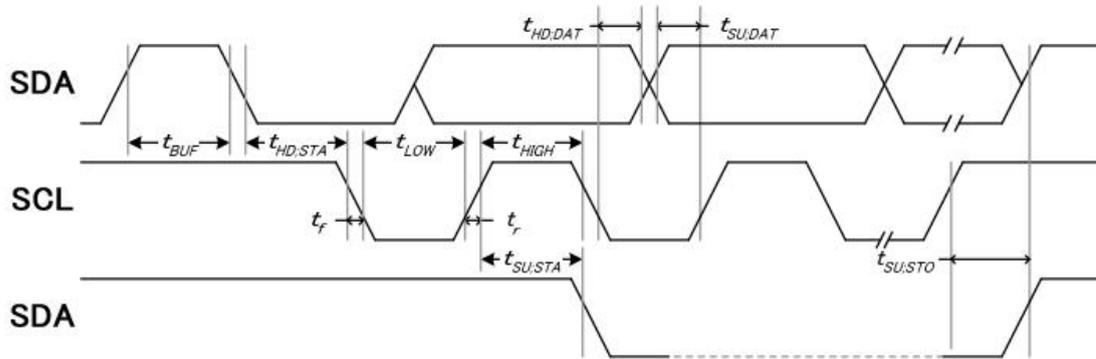
Characteristics	Symbol	Condition	Min	Typ.	Max	Unit
LCD Driving Voltage	VLCD		--	11.50	--	V
Supply Voltage	Logic	VDD-GND	--	3.0	--	V
Input Voltage	H Level	VDD	0.7VDD	--	VDD	V
	L Level	VIH	VSS	--	0.3VDD	V

**Condition:**

1. VDD = 3.0V
2. 1/100 Duty, 1/11 Bias

## 5.0 Module Function

### 5.1 Timing Characteristics



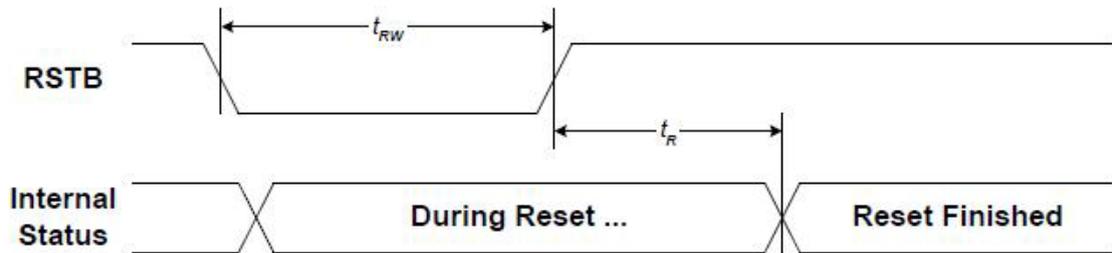
VDD1 = 1.8~3.3V, Ta = 25°C

Item	Signal	Symbol	Condition	Rating		Unit
				Min.	Max.	
SCL clock frequency	SCL	fSCL		-	400	KHZ
SCL clock low period		tLOW		1.3	-	
SCL clock high period		tHIGH		0.6	-	
Data set-up time	SDA	tSU;Data		0.1	-	us
Data hold time		tHD;Data		0	0.9	
Setup time for a repeated START condition		tSU;STA		0.6	-	
Start condition hold time		tHD;STA		0.6	-	
Setup time for STOP condition		tSU;STO		0.6	-	
Bus free time between a STOP and START		tBUF		0.1	-	
Signal rise time	SCL	tr		20+0.1Cb	300	ns
Signal fall time		tf		20+0.1Cb	300	
Capacitive load represented by each bus line	SDA	Cb		-	400	pF
Tolerable spike width on bus		tSW		-	50	ns

Note:

- All timing is specified using 20% and 80% of VDD1 as the standard.

## 14.6 Reset Timing



VDD1 = 1.8~3.3V, Ta = -40~80°C

Item	Symbol	Condition	Min.	Max.	Unit
Reset time	tR		—	1	ms
Reset "L" pulse width	tRW		1	—	ms

## 5.2 LCM Application

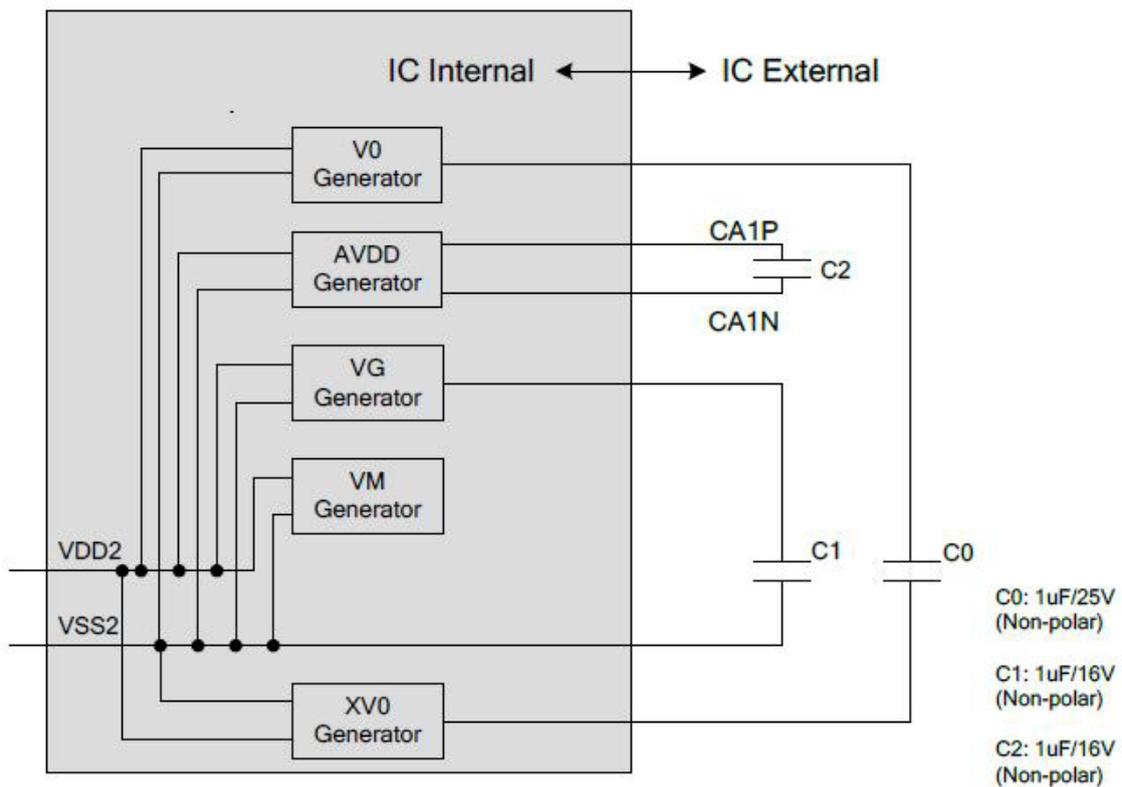


Figure 37 Internal Power Supply Circuit

Note:

1. C0: 1uF/25V~2.2uF/25V (Default 1uF/25V)
2. C1: 1uF/16V~2.2uF/16V (Default 1uF/16V)
3. C2: 1uF/16V~2.2uF/16V (Default 1uF/16V)

### 5.3 Command Table

INSTRUCTION	A0	RW	COMMAND BYTE								DESCRIPTION
			D7	D6	D5	D4	D3	D2	D1	D0	
1.Extension Command	0	0	0	0	1	1	EXT1	0	0	EXT0	Set extension instruction
Ext[1:0]=0,0 (Extension Command 1)											
2.Display ON/OFF	0	0	1	0	1	0	1	1	1	DSP	Set LCD display DSP=0: Display off DSP=1: Display on
3.Inverse Display	0	0	1	0	1	0	0	1	1	INV	Set inverse display INV=0: Normal display INV=1: Inverse display
4.All Pixel ON/OFF	0	0	0	0	1	0	0	0	1	AP	Set all pixel on mode AP=0: All pixel off mode AP=1: All pixel on mode
5.Display Control	0	0	1	1	0	0	1	0	1	0	Set display control CLD :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	FI	LF3	LF2	LF1	LF0	
6.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
7.Set Page Address	0	0	0	1	1	1	0	1	0	1	Set page address Starting page address: 00h ≤ YS ≤ 27h Ending page address: YS ≤ YE ≤ 27h
	1	0	YS7	YS6	YS5	YS4	YS3	YS2	YS1	YS0	
	1	0	YE7	YE6	YE5	YE4	YE3	YE2	YE1	YE0	
8.Set Column Address	0	0	0	0	0	1	0	1	0	1	Set column address Starting column address: 00h ≤ XS ≤ 9Fh Ending column address: XS ≤ XE ≤ 9Fh
	1	0	XS7	XS6	XS5	XS4	XS3	XS2	XS1	XS0	
	1	0	XE7	XE6	XE5	XE4	XE3	XE2	XE1	XE0	
9.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	0	
10.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	
11.Read Data	0	0	0	1	0	1	1	1	0	1	Read data from DDRAM (Only for parallel interface and I <sup>2</sup> C)
	1	1	D7	D6	D5	D4	D3	D2	D1	D0	
12.Partial In	0	0	1	0	1	0	1	0	0	0	Set partial area Starting partial display address: 00h ≤ PTS ≤ 9Fh Ending partial display address: 00h ≤ PTE ≤ 9Fh
	1	0	PTS7	PTS6	PTS5	PTS4	PTS3	PTS2	PTS1	PTS0	
	1	0	PTE7	PTE6	PTE5	PTE4	PTE3	PTE2	PTE1	PTE0	



INSTRUCTION	A0	RW	COMMAND BYTE								DESCRIPTION	
			D7	D6	D5	D4	D3	D2	D1	D0		
29.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	
Ext[1:0]=0,1 (Extension Command 2)												
30. 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	0	GL4	GL3	GL2	GL1		GL0
	1	0	0	0	0	0	GL4	GL3	GL2	GL1		GL0
	1	0	0	0	0	0	0	0	0	0		0
	1	0	0	0	0	0	0	0	0	0		0
	1	0	0	0	0	0	0	0	0	0		0
	1	0	0	0	0	0	0	0	0	0		0
	1	0	0	0	0	0	GD4	GD3	GD2	GD1		GD0
	1	0	0	0	0	0	0	0	0	0		0
	1	0	0	0	0	0	GD4	GD3	GD2	GD1		GD0
	1	0	0	0	0	0	GD4	GD3	GD2	GD1		GD0
31.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	0	BS2	BS1		BS0
32.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		
33. Driving Select	0	0	0	1	0	0	0	0	0	DS	Power type DS=0: Internal (Default) DS=1 :External	
34.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		
35.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		
36.OTP Control Out	0	0	1	1	1	0	0	0	0	1	OTP control out	
37.OTP Write	0	0	1	1	1	0	0	0	1	0	OTP write	
38.OTP Read	0	0	1	1	1	0	0	0	1	1	OTP read	

INSTRUCTION	A0	RW	COMMAND BYTE								DESCRIPTION
			D7	D6	D5	D4	D3	D2	D1	D0	
39.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	
40.OTP Programming Setting	0	0	1	1	1	0	0	1	0	1	OTP programming setting
	1	0	0	0	0	0	0	1	1	1	
41.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	
42.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	
43.Temperature Gradient Compensation	0	0	1	1	1	1	0	1	0	0	Set temperature gradient compensation coefficient
	1	0	MT13	MT12	MT11	MT10	1	1	1	1	
	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)											
44.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 °C 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.