2.8inch Touch Graphic LCD
USER GUIDE

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1. Electrical characteristics

NO	ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
1.	Operating Voltage	V_{DD}	-	-	3.0	3.3	V
2.	Power Supply voltage	V_{LCD}	25°C	12.15±5%			V
3.	Current Supply	I_{DD}	$V_{DD} = 3.0V$	-	750	950	uA

2. Backlight options

NO	COLOR	FORWARD VOLTAGE (V)			FORWARD CURRENT (mA)			MIN BRIGHTNESS (cd/m2) *
		Min	Typ.	Max	Min	Typ.	Max	
1.	Bluish White	-	4.0	-	50	-	80	200
2.								
3.								

3. Interface

8.1	*Display Driver*	ST7541 OR EQUIVALENT	
8.3	Pin No	Symbol	Description
	1	A	Backlight Supply
	2	K	Backlight Ground
	3	RST	Reset pin
	4	SDA	IIC Data bus
	5	SCL	IIC Clock bus
	6	VDD	Logic Power Supply
	7	VSS	Ground
	8	VOUT	Booster Output Voltage
	9	V4	LCD Driving Voltage
	10	V3	LCD Driving Voltage
	11	V2	LCD Driving Voltage
	12	V1	LCD Driving Voltage
	13	V0	LCD Driving Voltage

4. Read/Write timing characteristics (I2C)

(VDD=3.3V, Ta=−30~85°C)

Item	Signal	Symbol	Condition	Rating Min.	Rating Max.	Units
SCL clock frequency	SCL	FSCLK		-	400	kHZ
SCL clock low period	SCL	TLOW		1.3	-	us
SCL clock high period	SCL	THIGH		0.6	-	us
Data set-up time	SI	TSU;Data		100	-	ns
Data hold time	SI	THD;Data		0	0.9	us
SCL,SDA rise time	SCL	TR		20+0.1Cb	300	ns
SCL,SDA fall time	SCL	TF		20+0.1Cb	300	ns
Capacitive load represented by each bus line		Cb		-	400	pF
Setup time for a repeated START condition	SI	TSU;SUA		0.6	-	us
Start condition hold time	SI	THD;STA		0.6	-	us
Setup time for STOP ondition		TSU;STO		0.6	-	us
Tolerable spike width on bus		TSW		-	50	ns
BUS free time between a STOP and StART condition	SCL	TBUF		1.3		us

5. Reset timing

Figure 33

(VDD = 3.3V, Ta=−30~85°C)

Item	Signal	Symbol	Condition	Rating			Units
				Min.	Typ.	Max.	
Reset time		tR		—	—	1	us
Reset "L" pulse width	RST	tRW		1	—	—	us

(VDD = 2.7V, Ta=−30~85°C)

Item	Signal	Symbol	Condition	Rating			Units
				Min.	Typ.	Max.	
Reset time		tR		—	—	1.5	us
Reset "L" pulse width	RST	tRW		1.5	—	—	us

(VDD = 1.8V, Ta=−30~85°C)

Item	Signal	Symbol	Condition	Rating			Units
				Min.	Typ.	Max.	
Reset time		tR		—	—	2.0	us
Reset "L" pulse width	RST	tRW		2.0	—	—	us

6. Application circuit

NOTE:
1. R = 10KOHM
2. C1 ~ C4 = 0.1uF ~ 1uF
3. C5 = 1uF ~ 4.7uF

7. Instruction set (I2C)

Instruction	A0	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Description
Mode Set	0	0	0	0	1	1	1	0	0	0	2-byte command Set FR (Frame Rate) and BE (Booster Efficiency)
	0	0	FR3	FR2	FR1	FR0	0	BE	x'	0	
Read display data	1	1	Read data								Read data into DDRAM
Write display data	1	0	Write data								Write data into DDRAM
Read status	0	1	BUSY	ON	RES	MF2	MF1	MF0	DS1	DS0	Read the internal status
ICON control ON/OFF	0	0	1	0	1	0	0	0	1	ICON	ICON=0: ICON disable ICON=1: ICON enable & set page address to 16
Set page address	0	0	1	0	1	1	P3	P2	P1	P0	Set page address
Set column address MSB	0	0	0	0	0	1	0	Y7	Y6	Y5	Set column address MSB
Set column address LSB	0	0	0	0	0	0	Y4	Y3	Y2	Y1	Set column address LSB
Set Read-modify-Write	0	0	1	1	1	0	0	0	0	0	DDRAM address control: Read: No change Write: column address +1
Reset Read-modify-Write	0	0	1	1	1	0	1	1	1	0	Release read-modify-write
Display ON/OFF	0	0	1	0	1	0	1	1	1	D	D=0: Display OFF D=1: Display ON
Set Initial Display Line	0	0	0	1	0	0	0	0	x'	x'	2-byte command Specify the initial display line to realize vertical scrolling
	0	0	x'	S6	S5	S4	S3	S2	S1	S0	
Set Initial COM0	0	0	0	1	0	0	0	1	x'	x'	2-byte command Specify the first COM0 to move display window
	0	0	x'	C6	C5	C4	C3	C2	C1	C0	
Set Partial Display Duty	0	0	0	1	0	0	1	0	x'	x'	2-byte command Set partial display line number
	0	0	L7	L6	L5	L4	L3	L2	L1	L0	
Set N-line Inversion	0	0	0	1	0	0	1	1	x'	x'	2-byte command Set N-line inversion register
	0	0	x'	x'	x'	N4	N3	N2	N1	N0	
Release N-line Inversion	0	0	1	1	1	0	0	1	0	0	Exit N-line inversion mode
Reverse Display ON/OFF	0	0	1	0	1	0	0	1	1	REV	REV=0: normal display REV=1: reverse display
Entire Display ON/OFF	0	0	1	0	1	0	0	1	0	EON	EON=0: normal display EON=1: entire display ON

Instruction	A0	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Description
Power Control	0	0	0	0	1	0	1	VC	VR	VF	Set power circuits ON/OFF
Select DC-DC step-up	0	0	0	1	1	0	0	1	DC1	DC0	Select built-in booster step
Select Regulator Register	0	0	0	0	1	0	0	R2	R1	R0	Select the internal resistance ratio of the regulator resistor
Select Electronic Volume	0	0	1	0	0	0	0	0	0	1	2-byte command
	0	0	x'	x'	EV5	EV4	EV3	EV2	EV1	EV0	Adjust contrast level
Select LCD bias	0	0	0	1	0	1	0	B2	B1	B0	Select LCD bias
High Power Mode	0	0	1	1	1	1	0	1	1	1	2-byte command
	0	0	0	0	0	1	1	0	1	0	Enable High Power Mode
High Power Mode Control	0	0	1	1	1	1	0	0	1	1	2-byte command
	0	0	0	0	0	0	1	1	0	1	Controls high driving mode
SHL select	0	0	1	1	0	0	SHL	x'	x'	x'	COM bi-directional selection SHL=0: normal direction SHL=1: reverse direction
ADC select	0	0	1	0	1	0	0	0	0	ADC	SEG bi-direction selection ADC=0: normal direction ADC=1: reverse direction
Oscillator ON	0	0	1	0	1	0	1	0	1	1	Start the built-in oscillator
Set power save mode	0	0	1	0	1	0	1	0	0	P	P=0: normal mode P=1: sleep mode
Release power save mode	0	0	1	1	1	0	0	0	0	1	Release power save mode
RESET	0	0	1	1	1	0	0	0	1	0	Software reset Refer to RESET CIRCUIT
Set display data length (DDL)	x'	x'	1	1	1	0	1	0	0	0	2-byte command
	x'	x'	D7	D6	D5	D4	D3	D2	D1	D0	Specify the number of data bytes. (3-Line SPI only)
Set FRC/PWM mode	0	0	1	0	0	1	0	FRC	PWM1	PWM0	FRC: 1=3FRC, 0=4FRC PWM[1:0]: (0,0)=(0,1)=9PWM (1,0)=12PWM (1,1)=15PWM
NOP	0	0	1	1	1	0	0	0	1	1	No operation
Test Instruction	0	0	1	1	1	1	x'	x'	x'	x'	Don't use this instruction

Instruction	A0	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Description
White palette (1st/2nd frame)	0	0	1	0	0	0	1	0	0	0	Set white mode palette
set PWM pulse width	0	0	WB3	WB2	WB1	WB0	WA3	WA2	WA1	WA0	1st/2nd frame
White palette (3rd/4th frame)	0	0	1	0	0	0	1	0	0	1	Set white mode palette
set PWM pulse width	0	0	WD3	WD2	WD1	WD0	WC3	WC2	WC1	WC0	3rd/4th frame
Light palette (1st/2nd frame)	0	0	1	0	0	0	1	0	1	0	Set light gray mode palette
set PWM pulse width	0	0	LB3	LB2	LB1	LB0	LA3	LA2	LA1	LA0	1st/2nd frame
Light palette (3rd/4th frame)	0	0	1	0	0	0	1	0	1	1	Set light gray mode palette
set PWM pulse width	0	0	LD3	LD2	LD1	LD0	LC3	LC2	LC1	LC0	3rd/4th frame
Dark palette (1st/2nd frame)	0	0	1	0	0	0	1	1	0	0	Set dark gray mode palette
set PWM pulse width	0	0	DB3	DB2	DB1	DB0	DA3	DA2	DA1	DA0	1st/2nd frame
Dark palette (3rd/4th frame)	0	0	1	0	0	0	1	1	0	1	Set dark gray mode palette
set PWM pulse width	0	0	DD3	DD2	DD1	DD0	DC3	DC2	DC1	DC0	3rd/4th frame
Black palette (1st/2nd frame)	0	0	1	0	0	0	1	1	1	0	Set black mode palette
set PWM pulse width	0	0	BB3	BB2	BB1	BB0	BA3	BA2	BA1	BA0	1st/2nd frame
Black palette (3rd/4th frame)	0	0	1	0	0	0	1	1	1	1	Set black mode palette
set PWM pulse width	0	0	BD3	BD2	BD1	BD0	BC3	BC2	BC1	BC0	3rd/4th frame

8. Block diagram and power supply

9. Layout

NOTE:
1. GENERAL TOLERANCE ±0.3
2. BACKLIGHT : 4 BLUISH WHITE LED.
3. LCD : FSTN,POSITIVE,B/W,TRANSMISSIVE
4. OPERATION TEST : -20°~+70°
5. STORAGE TEST : -20°~+70°
6.VIEWING ANGLE : 6.0 O'CLOCK

CHANGE FPC POSITION & ADD NOTE
ADAM-14 JAN 2013
CHANGE DST THICKNESS 0.6mm
ADAM-14 MARCH 2013
ADD C-C SECTION
AZHAR 27-03-2013
REVISE NOTE
AZHAR 09-05-2013
ADD NOTE
ADAM 28-08-2013
INCREASE STIFFENER WIDTH
AZHAR 03-04-2014

RECOMEMENDED VIEWING AREA IS 48MM X 49MM
FOR DOUBLE SIDE TAPE OF TOUCH GLASS

DETAIL A 2:1
DETAIL B 2:1

CN1
13
1

STIFFENER
CONTACT SIDE

LOT NO STICKER

C-C SECTION
TOUCH PANEL
LCD
HOUSING
DST

PIN OUT CN1	
NO	SYMBOL
1	A
2	K
3	RST
4	SDA
5	SCL
6	VDD
7	VSS
8	VOUT
9	V4
10	V3
11	V2
12	V1
13	V0