# Displaytech Ltd.

Website: www.displaytech.com.hk

# LCD Module Product Specification

# Product: DT018ATFT 1.8'' TFT Display Module (128RGBx160DOTS)

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8 March 2011.

### 1. REVISION RECORD

VERSION	CHANGES	DATE
1.0	Initial revision	8 March 2011

DT018ATFT

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#### 2. Introduction

**DT018ATFT** is a display module that contains a TFT display with a 160 \* 128 RGB resolution. The driver used for this project is the Ilitek **ILI9163C** or **compatible** and can display 262K colors. The driver is mounted on the glass and the interconnection via FPC including components to drive the display module.

#### 3. General Specifications

Item	Specification	Unit
LCD mode	Transmissive	
Resolution	128(RGB)	Line
Kesolution	160	Line
Diagonal Size	1.8	Inch
Overall Size	34.00	mm
Overall Size	46.70	mm
A stive area	28.03	mm
Active area	35.04	mm
Optimum Viewing Direction	6 o'clock	
Driver IC	ILI9163C	
Interface type	MCU parallel / RGB (1)	
Colours	262K	
Operation temperature range ( <b>DT018ATFT</b> )	-20~70	°C
Storage temperature range (DT018ATFT)	-30~80	°C

#### **Remarks:**

- (1) Serial interface is available, but not recommendable, as the speed of it is very slow.
- (2) Recommended mating connector: Hirose FH19SC-45S-0.5SH, FH12S-45S-0.5SH; or

Molex 0512964593, 0512964594; or equivalent

- (3) Color tune may be changed slightly by temperature and driving voltage.
- (4) RoHS compliant.

#### **Component Life Cycle**

- 1) Storage Life: min. 1 Year
- 2) Operation Life (\*1): min. 43 x 10<sup>3</sup> h (24hr/day x 7days/week x 52weeks/year x 5years) (Not include backlight)
- 3) Storage and Operation Life Times are defined for a temperature of +25°C

#### Notes:

\*1. Operation life ends when one of the listed faults occurs:

- The on/off response-times reach 1.5 times of the max. value specified for a new display
- The contrast is reduced to 0.5 of the original contrast value
- Loss of function
- The number of cosmetic defects exceeds the maximum defined

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#### 4. Mechanical Drawing

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## 5. Interface Description

Pin no	Symbol	I/O	Description							
1	LEDA		Backlight anode.							
2	LED K1		Backlight cathode K1							
3	LED K2		Backlight cathode K2							
			MCU parallel interface type selection							
4	IM0		IM1	IM0		Parallel interface				
			0	0	МС	U 8-bit Parallel				
		Ι	0	1	МС	U 16-bit Parallel				
5	11/1		1	0	MC	U 9-bit Parallel				
5	IM1		1	1	MC	U 18-bit Parallel				
6	IM2	Ι	- IM2 = '1'; Paralle	el Interfa	ce	erial interface select				
			-IM2 = '0'; Serial			• .• •				
7	DCMO	т	RGB and MCU int							
7	RCM0	Ι	RCM		M0	Resolution selection				
			0	X		MCU interface mode				
8	RCM1	Ι	1	0		RGB interface(1)				
		_	1	1		RGB interface(2)				
9	SDA	Ι	The data is input of falling edge of the When RCM1, RCM GND level. If not used, please	When RCM1, RCM0='1X'(RGB I/F), serial input/output signal in serial I/F mode. The data is input on the rising edge of the SCL signal. The data is output on the falling edge of the SCL signal. When RCM1, RCM0='0X'(MCU I/F), this pin is not used, and fix at VDDI or GND level. If not used, please fix this pin at VDDI or GND level.						
10	VCC		Power supply 2.8V							
11	GND / VSS		Power ground 0V	Power ground 0V						
12	RD	Ι	6800-parallel inter In 8080-parallel int In 6800-parallel int	face. terface, i terface, i	f not u f not u	face and Read/ Write operation enable pir sed, please connect this pin to VDDI. sed, please connect this pin to VDDI or G	ND.			
13	RS	Ι	Display data / Com RS='1': Display da RS='0': Command If not used, please	ita. data.		n pin in parallel and SCL in 3-pin SPI intent of the first of the second se	rface.			
14~31	DB17~DB0	I/O	When– RCM='0' ( and D0 is also the s	MCU I/I	F), D[1 out/ ou	[7:0] are used to MCU parallel interface d tput signal in SPI interface mode. t used and should be connected to ground.				
32	TE	0	Tearing effect outp	ut pin to nis pin is	synch not ac	ronies MCU to frame writing, activated by				
33	RES	Ι	Chip reset pin ("Low Active"). This signal low will reset the device and must be applied to properly initialize the chip.							
34	CS	Ι	Chip select input p This pin can be per							
35	WR	Ι	This pin can be permanently fixed "Low" in MCU interface mode only.Write enable in parallel interface.WR: for 8080 MCUR/WX: for 6800 MCURS: for 4-wire SPIIf not used, please connect this pin to VDDI or GND.							

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Pin no	Symbol	I/O	Description		
36	36 PCLK		DCLV	т	Pixel clock signal in RGB I/F mode.
50	FULK	1	-If it's not used, please fix this pin at GND level.		
37	DE	т	Data enable signal in RGB I/F mode.		
57	DE	1	-If it's not used, please fix this pin at GND level.		
38	HS	т	Horizontal sync. signal in RGB I/F mode.		
58	38 HS I		-If it's not used, please fix this pin at GND level.		
20	39 VS I		VS	т	Vertical sync. signal in RGB I/F mode.
39			-If it's not used, please fix this pin at GND level.		
40	GND / VSS		Power ground 0V		
41	VDDIO		Logic power supply 2.8V		
42	NC (X+)		No connection (X+ of touch screen)		
43	NC (Y-)		No connection (Y- of touch screen)		
44	NC (X-)		No connection (X- of touch screen)		
45	NC (Y+)		No connection (Y+ of touch screen)		

### 6. Absolute Maximum Ratings

				(Ta=25°C)
Item	Symbol	Min.	Max.	Unit
Power supply voltage	VCC	-0.3	+ 4.6	V
Logic signal input/output voltage	Vcc	-0.3	+ 4.6	V
Operating Temperature	ТОР	-20	+70	°C
Storage Temperature	TST	-30	+80	°C

Note:

- When temperature is below 0°C, the response time of liquid crystal (LC) will be slower and the color of panel will be darker.
- If module driving condition exceeds the absolute maximum ratings, permanent damaged may be ٠ resulted. If module is driven within the absolute maximum ratings but exceeded the DC characteristics, mal-function may be resulted.
- VDD/VCC > VSS

#### 7. Electrical Characteristics

**DC** Characteristics

					(Vss=0V, Ta	=25°C)
Item	Symbol	Condition	Min.	Тур.	Max.	Unit
Power supply	VCC / VDD		2.5	2.8	3.3	V
Input voltage "H"	VIH		0.7 VCC		VCC	V
Input voltage "L"	VIL		VSS		0.3 VCC	V
Output voltage "H"	VOH	IOL=-1.0mA	0.8 VCC		VCC	V
Output voltage "L"	VOL	IOL=1.0mA	VSS		0.2 VCC	V

#### 8. Display Controller /Power Supply Timing

See Display Controller Specification: Ilitek ILI9163C

#### 9. Backlight specification

(Vcc=3.0V, Vss=0V, Ta=2							
Item	Symbol	Condition	Min	Тур	Max	Unit	Note
Supply voltage	Vf	If=20mA x2	2.9		3.5	V	1
Forward current	If			40		mA	2
Uniformity	ΔBp		80			%	
Color coordination	Х	If=30mA	0.260		0.305		
Color coordination	Y	-	0.265		0.305		

LED circuit diagram:



Constant current If=20x2mA; Vf=3.2±0.3V(typ)

Note:

- 1) The LED's driver mode needs to be constant current mode.
- 2) Permanent damage to the device may occur if maximum values are exceeded. Functional operation should be restricted to the conditions described under normal operating conditions.

#### **10.Optical Characteristics**

	(Vcc=2.8V, Vss=0V, Ta=25°C)								
Item		Symbol	Condition	Min	Тур	Max	Unit	Note	
Brightness		Bp	$\theta = 0^{\circ}$	250	280		cd/m <sup>2</sup>	1	
Uniformity		ΔBp	Ф=0°	80			%	1, 2	
ν ·		θ1 (Φ=90° or 270°)		-65 ~ 65 -50 ~ 40					
Viewing Angle		$ \begin{array}{c} \theta 2 \\ (\Phi=0^{\circ} \\ or \\ 180^{\circ}) \end{array} $	Cr≥10				deg	3	
Contrast rat	tio	Cr	θ=0°		350			4	
Response Ti	me	Tr Tf	$\Phi=0^{\circ}$		30		ms	5	
	White	Х	_	0.2451	0.2951	0.3451	-		
×	w mite	у		0.2664	0.3164	0.3664			
y) icit	Red	Х		0.5333	0.5833	0.6333			
(x, nati	Neu	у	$\theta = 0^{\circ}$	0.2804	0.3304	0.3804		1,6	
CIE (x,y) Chromaticity	Green	Х	$\Phi=0^{\circ}$	0.2913	0.3413	0.3913			
Chr	Green	у	$\Phi_{-0}$	0.5314	0.5814	0.6314			
0	Blue	Х		0.1036	0.1536	0.2036			
		у		0.0465	0.0965	0.1465			
NTSC Ratio	)	S			51		%		

L/6

L/3

Г/3

Note 1: The data are measured after LEDs are turned on for 5 minutes. LCM displays full white. The brightness is the average value of 9 measured spots. Measurement equipment PR-705 (Φ8mm)

Measuring condition:

- Measuring surroundings: Dark room.
- Measuring temperature: Ta=25°C.
- Adjust operating voltage to get optimum contrast at the center of the display.

Measured value at the center point of LCD panel after more than 5 minutes while backlight turning on.



Note 2: The luminance uniformity is calculated by using following formula.  $\Delta Bp = Bp (Min.) / Bp (Max.) \times 100 (\%)$  Bp (Max.) = Maximum brightness in 9 measured spotsBp (Min.) = Minimum brightness in 9 measured spots.



Measurement equipment PR-705 (Φ8mm)

Note 3: The definition of viewing angle: Refer to the graph below marked by  $\theta$  and  $\Phi$ 



Note 4: The definition of contrast ratio (Test LCM using PR-705):

Contrast Ratio (CR) =  $\frac{\text{Luminance When LCD is at "White" state}}{\text{Luminance When LCD is at "Discussion"}}$ 

Luminance When LCD is at "Black" state

(Contrast Ratio is measured in optimum common electrode voltage)

Note 5: Definition of Response time. (Test LCD using DMS501):

The output signals of photo detector are measured when the input signals are changed from "black" to "white" (falling time) and from "white" to "black" (rising time), respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below.



Note 6: Definition of Color of CIE Coordinate and NTSC Ratio.



#### **11. Safety Precaution**

Handling precautions:

• This device is susceptible to Electro-Static Discharge (ESD) damage. Observe Anti-Static precautions.

Power supply precautions:

- Identify and, at all times, observe absolute maximum ratings for both logic and LC drivers. Note that there is some variance between models.
- Prevent the application of reverse polarity to VCC and GND, however briefly.
- Use a clean power source free from transients. Power up conditions are occasionally "jolting" and may exceed the maximum ratings of the modules.
- The VCC power of the module should also supply the power to all devices that may access the display. Don't allow the data bus to be driven when the logic supply to the module is turned off.

Operating precautions:

- DO NOT plug or unplug the module when the system is powered up.
- Minimize the cable length between the module and host MPU.
- Operate the module within the limits of the modules temperature specifications.

Mechanical/Environmental precautions:

- Improper soldering is the major cause of module difficulty. Use of flux cleaner is not recommended as they may seep under the elastomeric connection and cause display failure.
- Mount the module so that it is free from torque and mechanical stress.
- Surface of the LCD panel should not be touched or scratched. The display front surface is an easily scratched, plastic polarizer. Avoid contact and clean only when necessary with soft, absorbent cotton dampened with petroleum benzene.
- Always employ anti-static procedure while handling the module.
- Prevent moisture build-up upon the module and observe the environmental constraints for storage temperature and humidity.
- Do not store in direct sunlight
- If leakage of the liquid crystal material should occur, avoid contact with this material, particularly ingestion. If the body or clothing becomes contaminated by the liquid crystal material, wash thoroughly with water and soap