

## AND1013ST-LED Intelligent Character Display

The AND1013ST is an STN, Transflective, Negative, Wide Temperature range liquid crystal display. It has a rear polarizer, yellow green LED backlight, 6 o'clock viewing direction and black frame

### Features

- STN Gray Negative, Transflective
- 160 x 128 Dot
- Yellow Green LED Backlight
- 6 o'clock Viewing Direction
- Wide Temperature Range
- LCD Module 1/64 Duty
- **ROHS Compliant**

Product specifications contained herein may be changed without prior notice. It is therefore advisable to contact Purdy Electronics before proceeding with the design of equipment incorporating this product.

### Mechanical Characteristics

Item	Standard Value	Unit
Number of Characters	160 x 128	dots
Outline Dimensions	129.0 (W) * 102.0 (H) * 12.8 (19.2) (D) max	mm
Viewing Area	101.0 (W) x 82.0 (H)	mm
Dot Size	0.54 (W) x 0.54 (H)	mm
Dot Pitch	0.58 (W) x 0.58 (H)	mm
LCD Type	STN, Negative, Transflective	
Duty	1/128	
Controller	T6963C / Toshiba	
DC/DC Converter	With	

### Electrical Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit
Power Supply for Logic	VDD-VSS	-0.3	5.5	Volt
Power Supply for LCD	VDD-VEE	0	24.0	Volt
Input Voltage	V1	-0.3	VDD	Volt
LED Power Dissipation	PAD	—	3380	mW
LED Forward Current	IAF	—	735	mA
LED Reverse Voltage	VR		8	V

**Electrical Characteristics**

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Power Supply for Logic	VDD-VSS	—	4.5	5.0	5.5	V
Power Supply for LCD	VEE-VSS	—	-14.2	-15.0	-15.9	V
Input Voltage	VIL	L Level	0	—	0.6	V
	VIH	H Level	2.2	—	VDD	V
	VDD-VO	Ta = 0°C	—	—	—	V
		Ta = 25°C	16.9	18.0	19.2	V
Ta = 50°C		—	—	—	V	
Power Supply Current for LCM	IDD	VDD=5V	—	17.5	23.0	mA
	Iout	VDD-VEE=18V	—	5.0	—	
LED Forward Voltage	VF	If=490 mA	—	4.1	4.6	V
LED Forward Current	IF	—	—	490	—	mA
LED Reverse Current	IR	VR=8V	—	—	0.2	mA

**Optical Characteristics**

Item	Symbol	Condition	Min.	Typ.	Max.	Degree
Viewing Angle Range	$\phi$ f (12 o'clock)	When Cr $\geq$ 1.4	—	20	—	degree
	$\phi$ b (6 o'clock)		—	40	—	
	$\phi$ l (9 o'clock)		—	30	—	
	$\phi$ r (3 o'clock)		—	30	—	
Rise Time	Tr	VDD-VO=18 V Ta=25°C	—	175	—	mS
Fall Time	Tf		—	170	—	
Frame Frequency	Frm		—	64	—	Hz
Contrast	Cr		—	4.5	—	
Brightness of Backlight	L	IF=490 mA	120	180	—	cd/m <sup>2</sup>
Peak Emission Wavelength	$\lambda$ P		567	570	577	nm

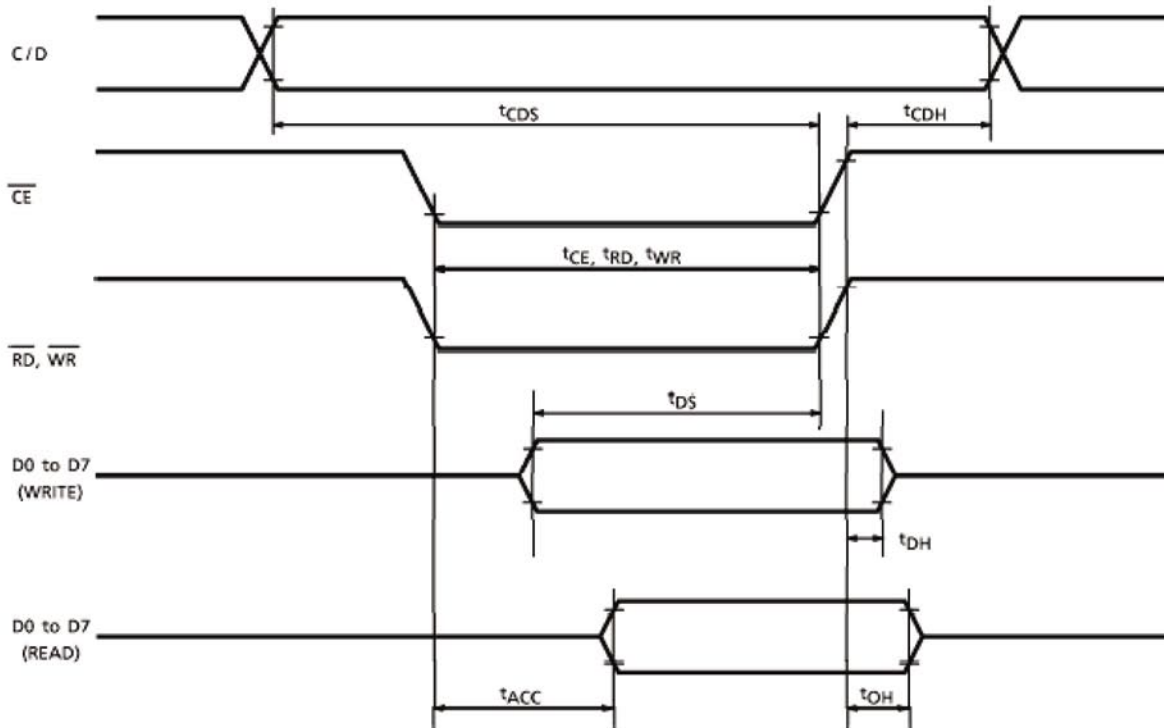
**Environmental Absolute Maximum Ratings - Wide Temperature**

Item	Operating		Storage	
	Min.	Max.	Min.	Max.
Ambient Temperature	-20 °C	+70 °C	-30 °C	+80 °C
Humidity (without condensation)	Note 1,2		Note 1,3	

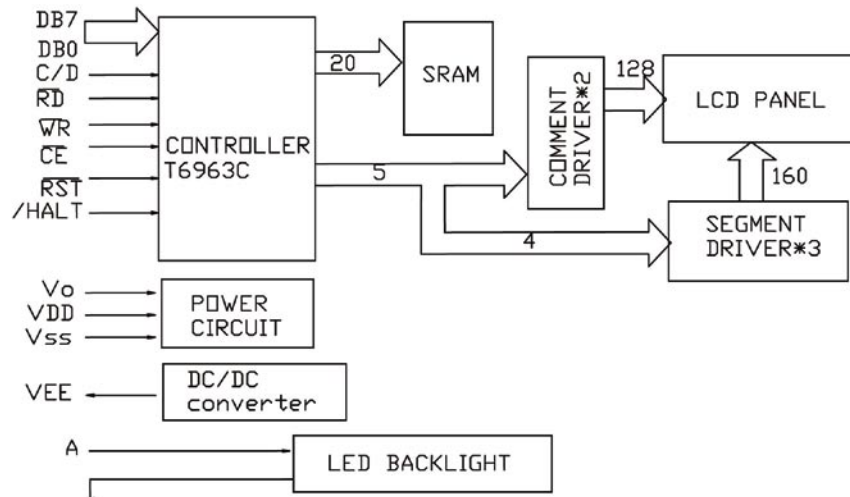
Note 1: Background color changes slightly depending on ambient temperature. This phenomenon is reversible.  
 Note 2: Ta  $\leq$  70°C: 75 RH max; Ta > 70 °C: absolute humidity must be lower than the humidity of 75% RH at 70°C  
 Note 3: Ta at -30°C will be <48 hrs, at 80°C will be <120 hrs when humidity is higher than 75%.

AC Characteristics - Bus Timing (V<sub>ss</sub>=0V, V<sub>DD</sub>=5V)

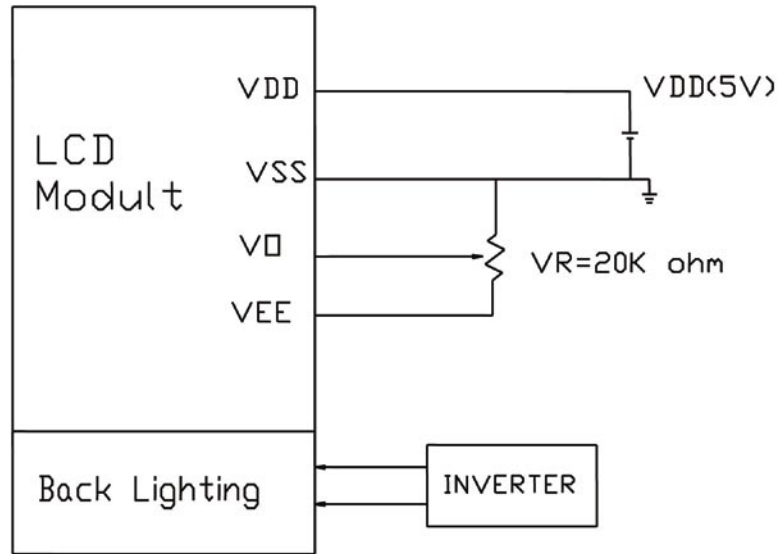
Item	Symbol	Min.	Typ.	Max.	Unit
C/D Set-up Time	t <sub>CDS</sub>	100	—	—	ns
C/D Hold Time	t <sub>CDH</sub>	10	—	—	ns
CE, RD, WR Pulse Width	t <sub>CDS</sub> , t <sub>RD</sub> , t <sub>WR</sub>	80	—	—	ns
Data Set-Up Time	t <sub>DS</sub>	80	—	—	ns
Data Hold Time	t <sub>DH</sub>	40	—	—	ns
Access Time	t <sub>ACC</sub>	—	—	150	ns
Output Hold Time	t <sub>OH</sub>	10	—	50	ns



Block Diagram



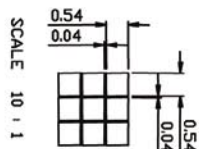
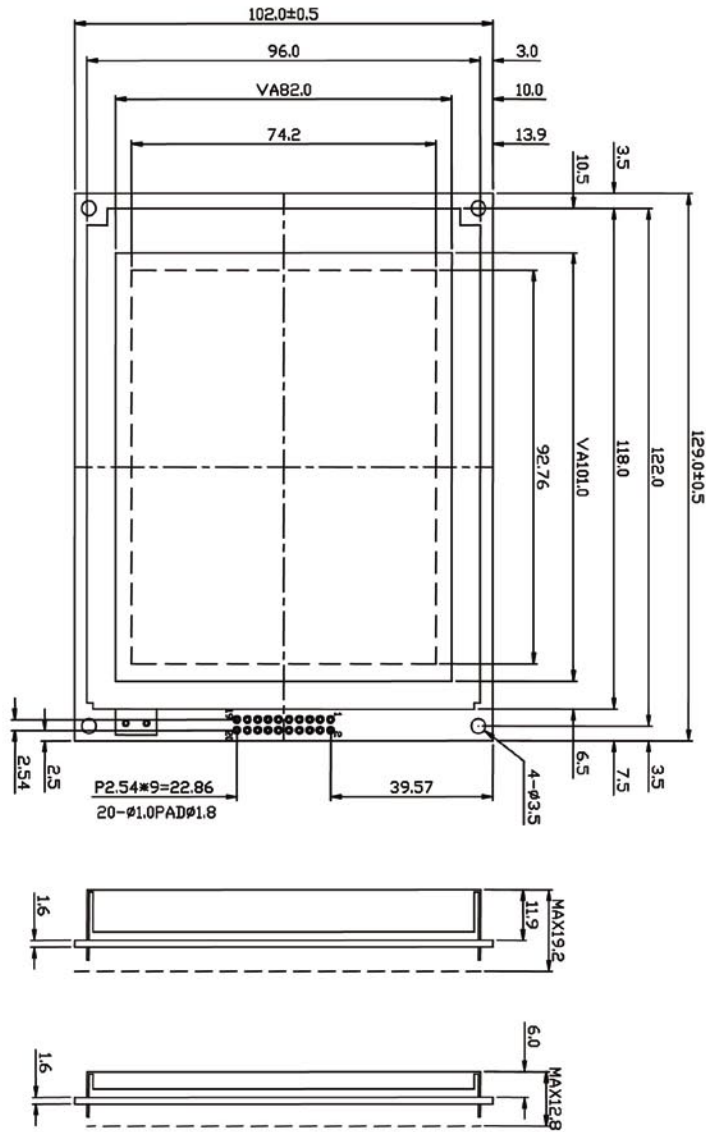
Power Supply



Interface Pin Assignment

Pin No.	Pin Out	Function Description	Pin No.	Pin Out	Function Description
1	FG	Frame Ground	11	/RESET	Reset Signal
2	VSS	Power Supply Ground	12	DB0	Data Bit 0
3	VCC	Power Supply Voltage	13	DB1	Data Bit 1
4	V0	Contrast Adjustment Voltage	14	DB2	Data Bit 2
5	VEE	Power Supply Voltage for LCD	15	DB3	Data Bit 3
6	/WR	Data Write	16	DB4	Data Bit 4
7	/RD	Data Read	17	DB5	Data Bit 5
8	/CE	Enable Signal	18	DB6	Data Bit 6
9	C/D	H: Instruction Code, L: Data Code	19	DB7	Data Bit 7
10	/HALT	Stop the Oscillatuion of Clock	20	A	LED Backlight (+)

### Mechanical Drawing



SCALE 10 : 1

PIN NO.	SIGNAL
1	FG
2	VSS
3	VCC
4	VO
5	VEE
6	/MR
7	/RD
8	/CE
9	C/D
10	/HALT
11	/RESET
12	DB0
13	DB1
14	DB2
15	DB3
16	DB4
17	DB5
18	DB6
19	DB7
20	A