

AZ DISPLAYS, INC.

COMPLETE LCD SOLUTIONS

SPECIFICATIONS FOR LIQUID CRYSTAL DISPLAY

PART NUMBER:
DATE:

ACM1602U Series
August 16, 2004

AZ DISPLAYS, INC.

1. FEATURES

- * Display mode : STN
- * Background: : Gray or Yellow
- * Polarizer: : Reflective, Transflective, or Transmissive
- * Display Format : 16 X 2 Characters
- * IC : NOVATEK NT7605H-BDT01
- * Driving Method : 1/16 Duty, 1/5 Bias
- * Viewing Direction : Top or Bottom
- * Backlight : None

2. MECHANICAL SPECIFICATIONS

Item	Specification	Unit
Module Size	65.0(W) X 27.7(H) X 1.85max(T)	mm
Viewing Area	61.0MIN (W) X 15.7MIN(H)	mm
Character Font	5 X 7 Dots	
Character Size	2.95(W) X 5.15(H)	mm
Dot Pitch	0.60(W) X 0.65(H)	mm
Dot Size	0.55(W) X 0.60(H)	mm

3. ELECTRICAL SPECIFICATIONS

3-1. Absolute Maximum Ratings (V_{SS}=0V)

Item	Symbol	Standard Value			Unit
		Min.	Typ.	Max.	
Supply Voltage For Logic	V _{DD} -V _{SS}	-0.3	-	7.0	V
Supply Voltage For LCD Drive	V _{DD} -V _L	0	-	V _{DD} +0.3	V
Input Voltage	V _I	0.33	-	V _{DD} +0.3	V
Operating Temp.	T _{OP}	-20	-	+70	°C
Storage Temp.	T _{ST}	-30	-	+80	°C

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3. ELECTRICAL SPECIFICATIONS (Continued)

3-2. Electrical Characteristics (V_{SS}=0V)

Item	Symbol	Test Condition	Min.	Typ.	Max.	Unit	
Logic Supply Voltage	V _{DD} – V _{SS}	T _a =0~50°C	4.5	5.0	5.5	V	
LCD Drive Voltage (Recommended Voltage)	V _{DD} – V _L	T _a =25°C	4.0	4.4	4.9	V	
Input Voltage	“H” Level	V _{IH}	V _{DD} =5V+/- 5%	0.8 V _{DD}	-	V _{DD}	V
	“L” Level			V _{IL}	-0.3	-	0.2 V _{DD}
Output Voltage	“H” Level	V _{OH}	V _{DD} =5V+/- 5%	V _{DD} -0.6	-	-	V
	“L” Level			V _{OL}	-	-	GND+0.6
Current Consumption	I _{DD}	V _{DD} =5V+/- 5% V _{DD} -V ₀ =4.5V	-	1.25	2.0	mA	
Frame Frequency	-	V _{DD} =5V	-	84.3	-	HZ	

NOTE: 1) Duty Ratio=1/16, Bias Ratio=1/5

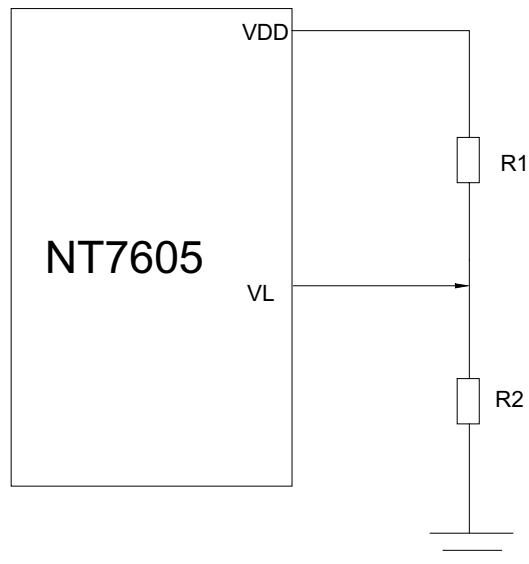
2) Measuring in Dots ON-state

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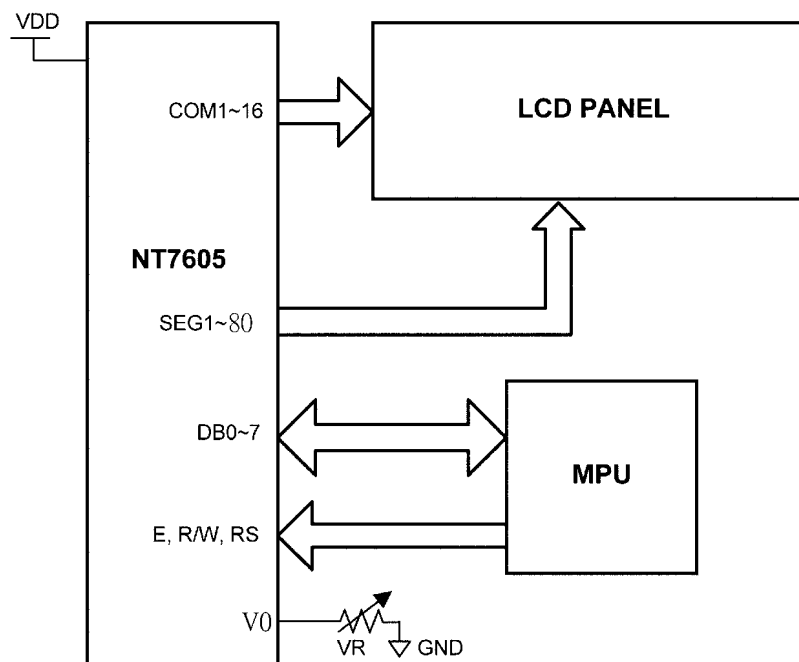
4. BLOCK DIAGRAM AND POWER SUPPLY

4-1. POWER SUPPLY



Note : $V_{op} = V_{DD} - V_L$; $R1 + R2 = 10K\text{-}\Omega \sim 20K\text{-}\Omega$

4-2. BLOCK DIAGRAM



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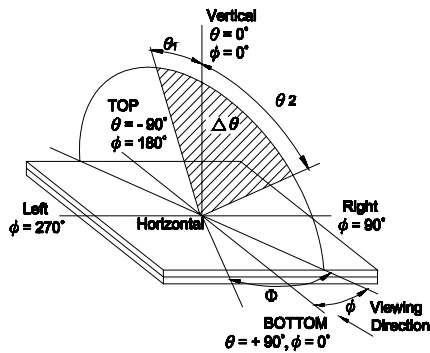
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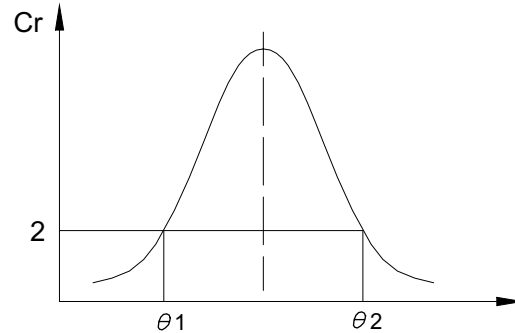
5. ELECTRO – OPTICAL CHARACTERISTICS

Item	Symbol	Temp.	Min.	Typ.	Max.	Unit	Conditions	Note
Viewing Angle	$\theta_2 - \theta_1$	25C	30	100	-	Deg.	-	1,2
	ϕ		80	93	-			
Contrast Ratio	Cr	25C	2	3.38	5.67	-	$\theta = 0^\circ$ $\phi = 0^\circ$	3
Response Time(rise)	Tr	25C	-	64	250	ms	$\theta = 0^\circ$ $\phi = 0^\circ$	4
		0C	-	950	1150			
Response Time(fall)	Tf	25C	-	120	250	ms	$\theta = 0^\circ$ $\phi = 0^\circ$	4
		0C	-	950	1150			

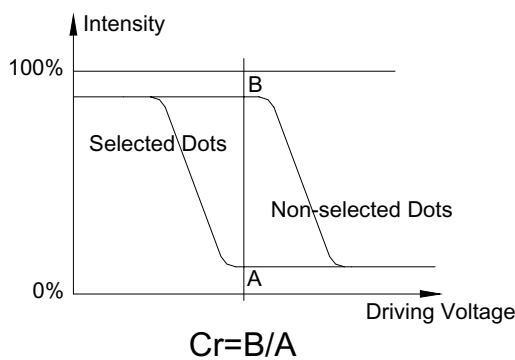
Note1 . Definition of Angle θ & ϕ



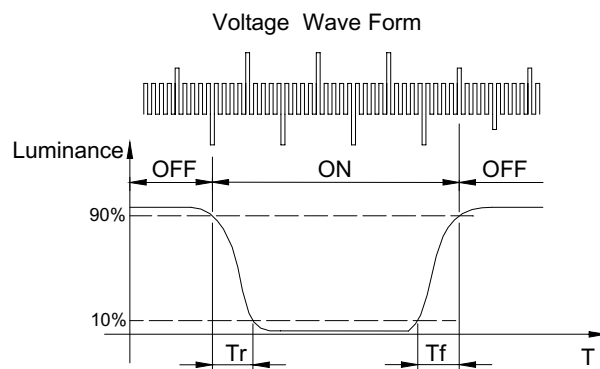
Note2. Definition of Viewing Angle θ_1 & θ_2



Note3 . Definition of Contrast Cr



Note4. Definition of Optical Response



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6. TERMINAL PIN FUNCTION

6-1. Interface Pin Function Description

Pin NO.	Symbol	I / O	Functions
1	VSS	P	Power supply (VSS=0V)
2	VL	P	LCD Operating Voltage
3	VDD	P	+5V
4	RS	I	Register select signal
5	R/W	I	Read/Write control signal
6	E	I	Enable signal (Schmitt trigger input)
7	DB0	I/O	Lower 4 tri-state bi-directional data bus for transmitting data between MPU and NT7605. Not used during 4-bit operation.
8	DB1		
9	DB2		
10	DB3		
11	DB4	I/O	Higher 4 tri-state bi-directional data bus for transmitting data between MPU and NT7605. DB7 is also used as busy flag.
12	DB5		
13	DB6		
14	DB7		

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7.TIMING CHARACTERISTICS

Symbol	Parameter	Min.	Typ.	Max.	Unit	Conditions
t _{CYCE}	Enable Cycle Time	500	-	-	ns	Figure 2
t _{WHE}	Enable "H" Level Pulse Width	300	-	-	ns	Figure 2
t _{RE} , t _{FE}	Enable Rise/Fall Time	-	-	25	ns	Figure 2
t _{AS}	RS, R/W Setup Time	60 ¹	-	-	ns	Figure 2
		100 ²				
t _{AH}	RS, R/W Address Hold Time	10	-	-	ns	Figure 2
t _{DS}	Data Output Delay	100	-	-	ns	Figure 2
t _{DHW}	Data Hold Time	10	-	-	ns	Figure 2

Notes: 1: 8-bit operation mode
2: 4-bit operation mode

Read Operation

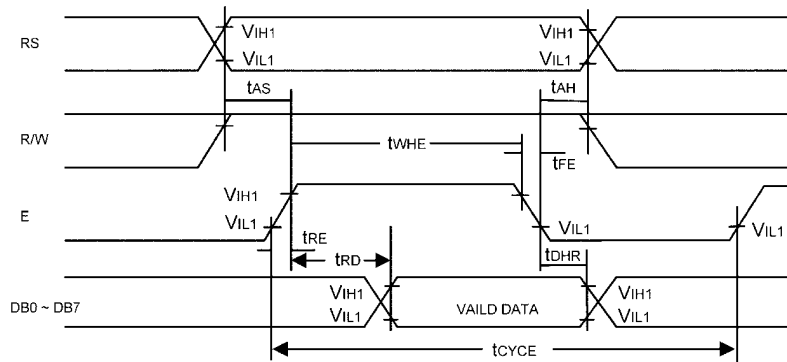


Figure 1. Bus Read Operation Sequence
(Reading out data from NT7605 to MPU)

Write Operation

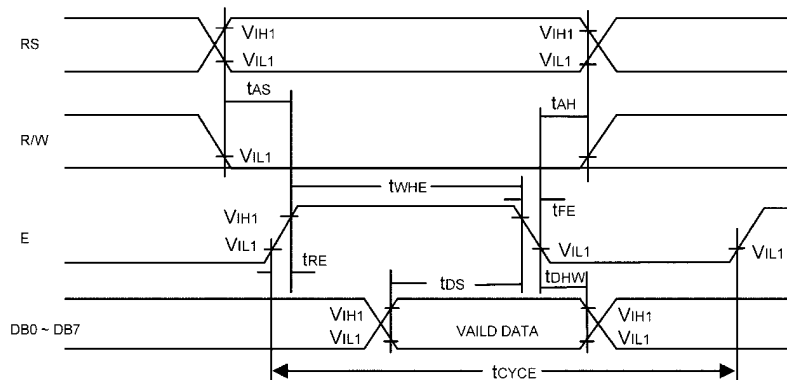


Figure 2. Bus Write Operation Sequence
(Writing data from MPU to NT7605)

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9. FONT TABLE

		Higher 4-bit (D4 to D7) of Character Code (Hexadecimal)																			
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F				
Lower 4-bit (D0 to D3) of Character Code (Hexadecimal)	0	CG RAM (1)			0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
	1	CG RAM (2)		!	1	A	2	a													
	2	CG RAM (3)		"	2	R	r														
	3	CG RAM (4)		#	3	S	s														
	4	CG RAM (5)		*	4	T	t														
	5	CG RAM (6)		%	5	E	e														
	6	CG RAM (7)		@	6	F	f														
	7	CG RAM (8)		'	7	G	g														
	8	CG RAM (1)		@	H	X	x														
	9	CG RAM (2)		>	9	Y	y														
	A	CG RAM (3)		*	#	J	Z	z													
	B	CG RAM (4)		+	;	K	k														
	C	CG RAM (5)		.	<	L	l														
	D	CG RAM (6)		-	=	M	m														
	E	CG RAM (7)		.	>	N	n														
	F	CG RAM (8)		/	?	O	o														

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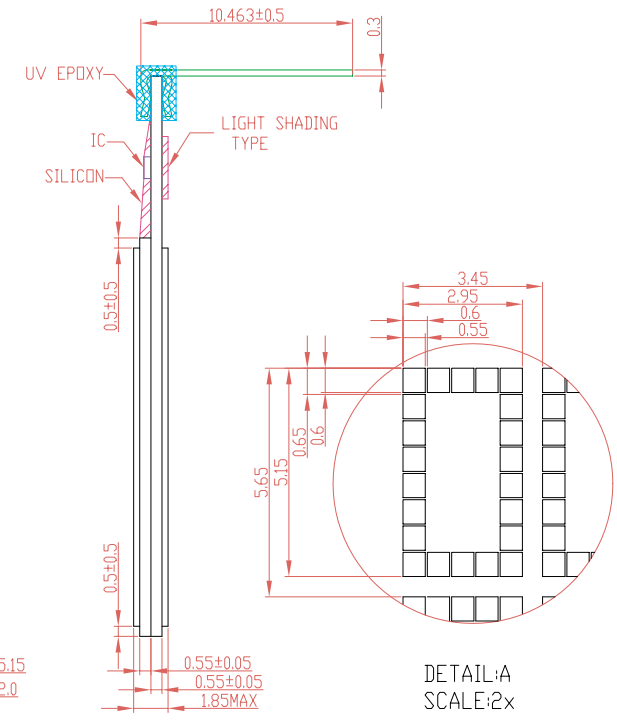
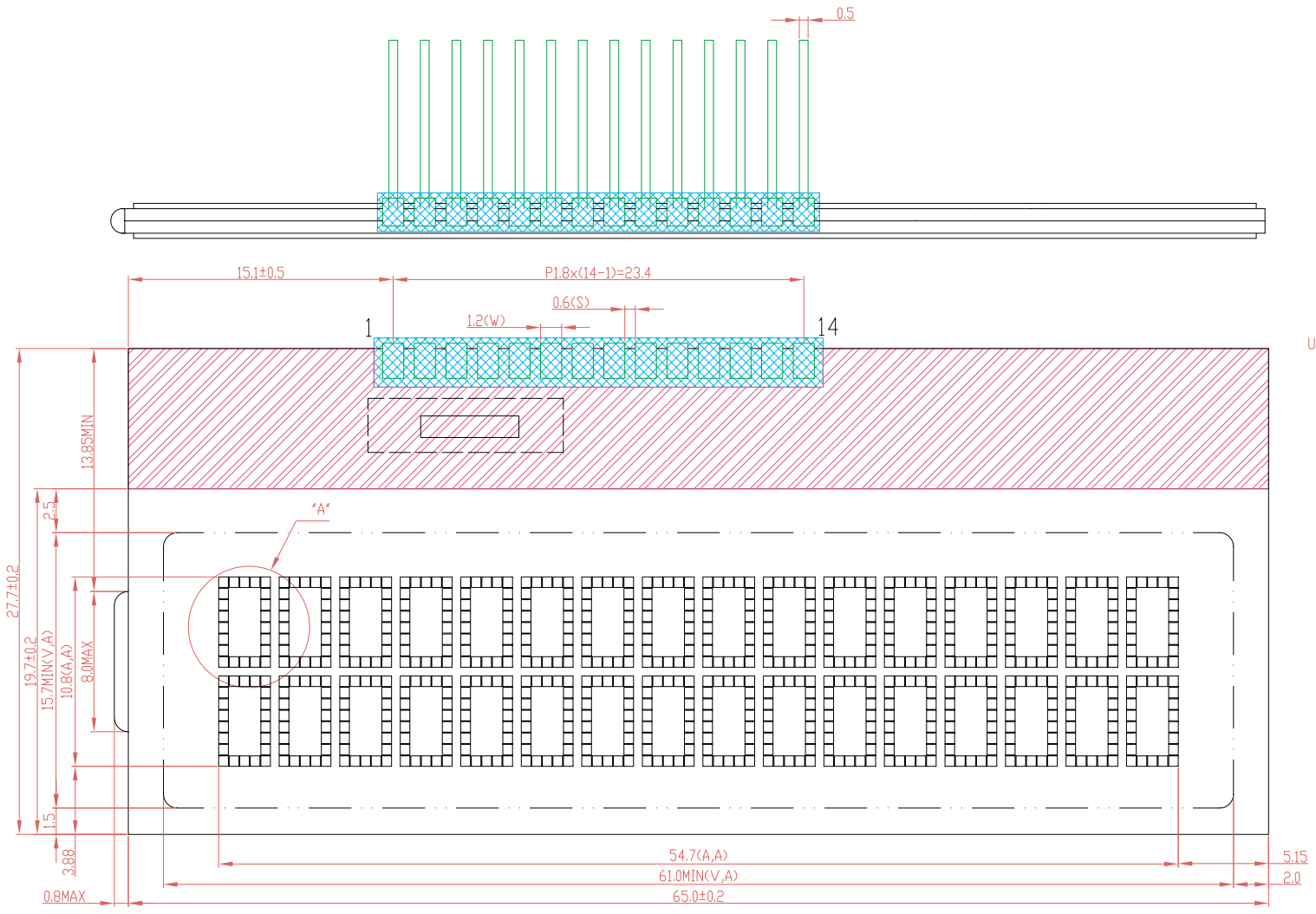
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REV	REVISION RECORD	DATE	APPROVED	NAME
△				



DETAIL:A
SCALE:2x

NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SYMBOL	VSS	VL	VDD	RS	RW	E	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7

	TOLERANCE	MATERIAL	FINISH	AZ DISPLAYS, INC. ACM1602U Series FILE NAME 205\DLF\GX1602D5
	VERSION	SCALE	UNIT	
	DATE	APPROVED	DRAWN	
	2004.04.07		劉峰	