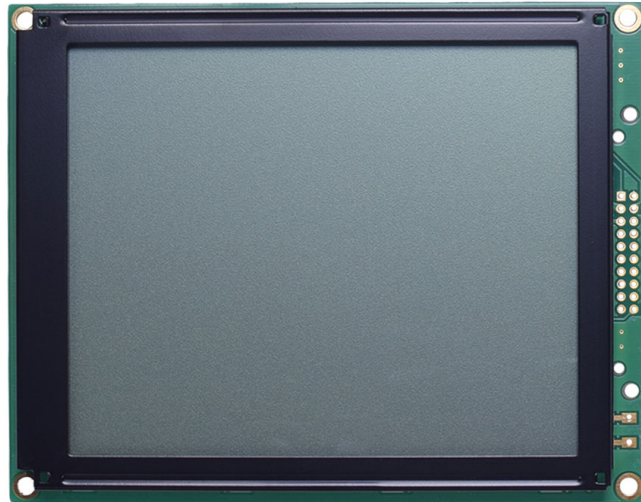


DisplayModule



DM-LCD160128-465
160128 FSTN(+) GRAPHIC LCD WITH
PARALLEL MPU INTERFACE

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1 Revision History

Date	Changes
2015-04-15	First release

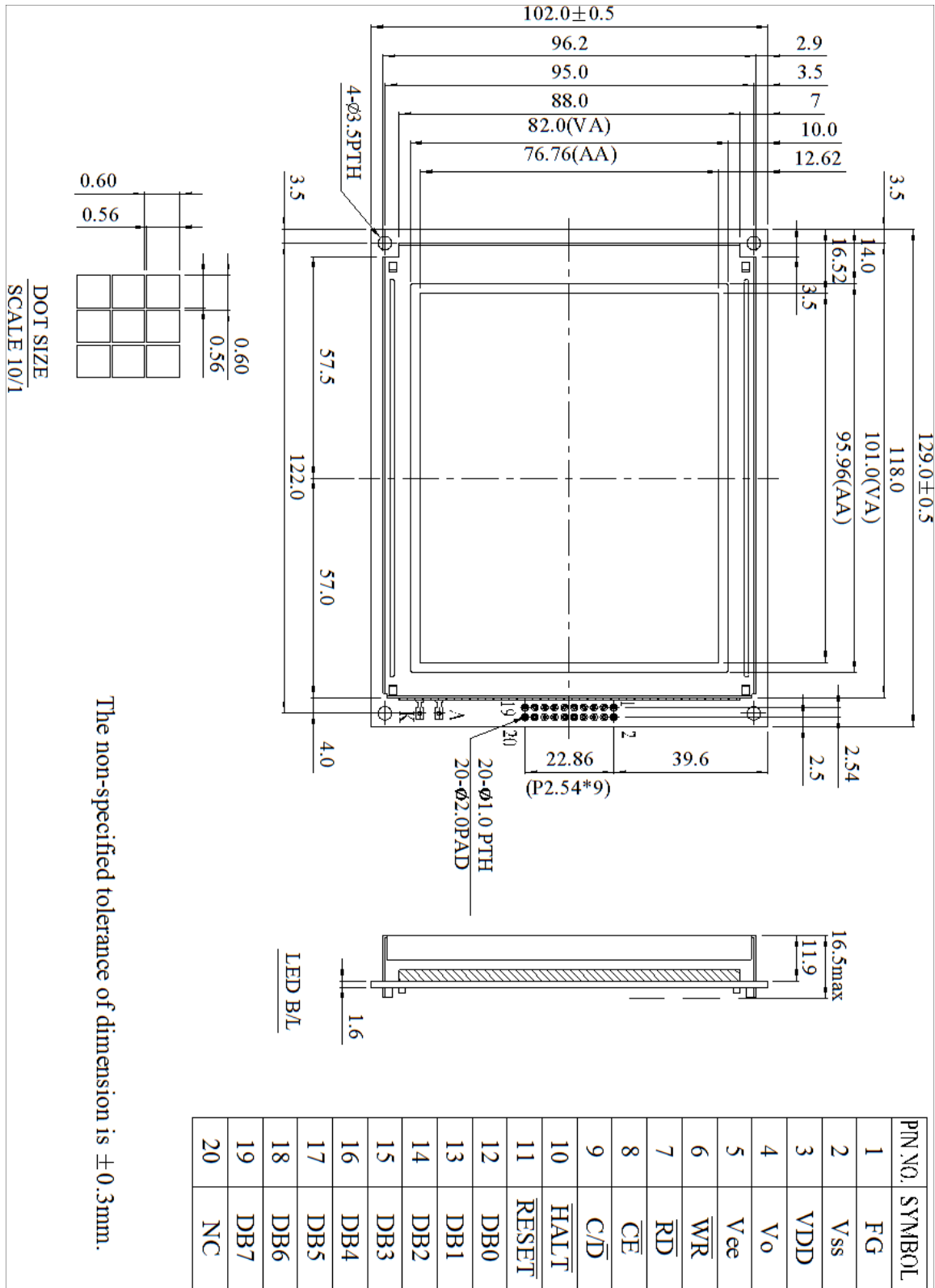
2 Main Features

Item	Specification	Unit
Resolution	160 x 128	dots
Display Mode	FSTN Positive, Transflective	-
Module dimension	129.0 x 102.0 x 16.5(MAX)	mm
Controller IC	RA6963	-
Interface	Parallel MPU Interface	-
Power Supply	5.0	V
View Direction	6:00	-
Duty	1/128	
Backlight	White LED	-
Weight	171.4	g

3 Pin Description

Pin No.	Symbol	Description
1	FG	Frame ground
2	Vss	Ground
3	Vdd	Power supply for logic
4	Vo	Contrast adjustment
5	Vee	Negative Voltage Output
6	/WR	Data write. Write data into RA6963 when WR=L
7	/RD	Data read. Read data from RA6963 when RD=L
8	/CE	Chip enable the controller RA6963
9	C/D	WR=L, C/D=H:Command Write C/D=L:Data write RD=L, C/D=H:Status Read C/D=L:Data read
10	/HALT	Clock operation stop signal
11	/RESET	Reset signal
12	DB0	Data bus line
13	DB1	Data bus line
14	DB2	Data bus line
15	DB3	Data bus line
16	DB4	Data bus line
17	DB5	Data bus line
18	DB6	Data bus line
19	DB7	Data bus line
20	NC	No connection

4 Mechanical Drawing



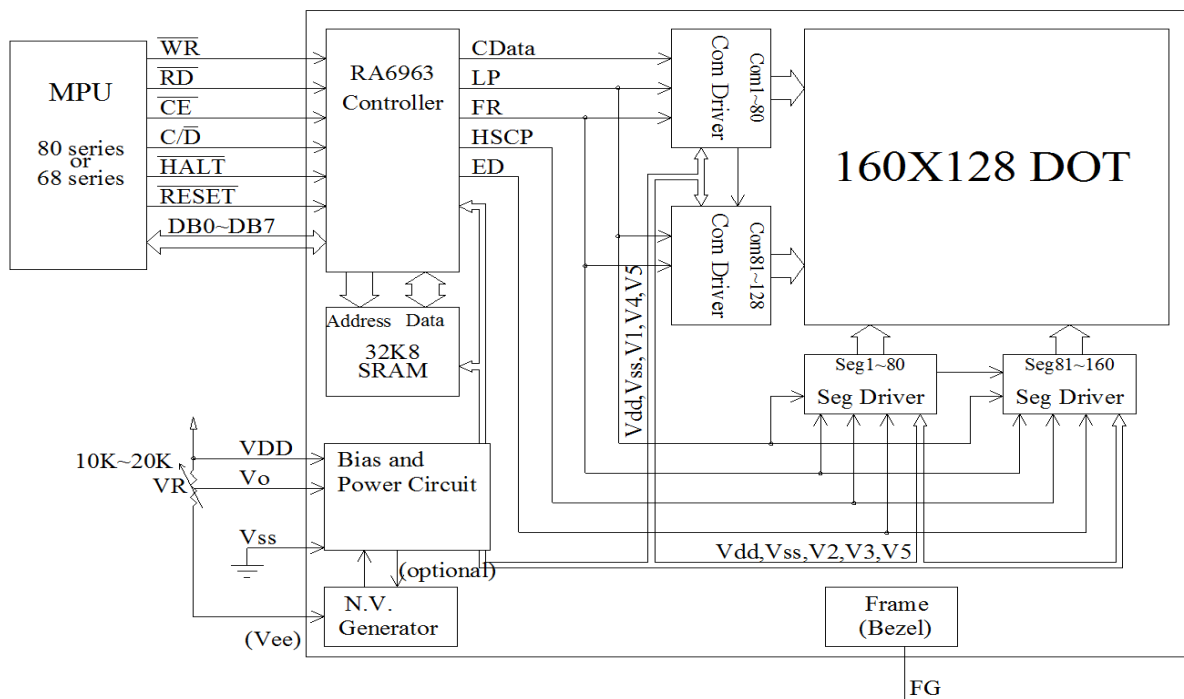
5 Electrical Characteristics

Item	Symbol	Condition	Min	Typ.	Max	Unit
Supply Voltage For Logic	VDD		3.0	-	5.5	V
Supply Current	IDD	VDD=5.0V	30	42	50	mA
Low Level Input Voltage	V _{IL}		0	-	0.2VDD	V
High Level Input Voltage	V _{IH}		0.8VDD	-	VDD	V
Low Level Output Voltage	V _{OL}		0		0.3	V
High Level Output Voltage	V _{OH}		VDD-0.3		VDD	V
Backlight Supply Voltage	V		3.4	3.5	3.6	V
Backlight Supply Current	I _{LED}			128	160	mA
Operating Temperature	TOP	Absolute Max	-20	-	+70	°C
Storage Temperature	TST	Absolute Max	-30	-	+80	°C

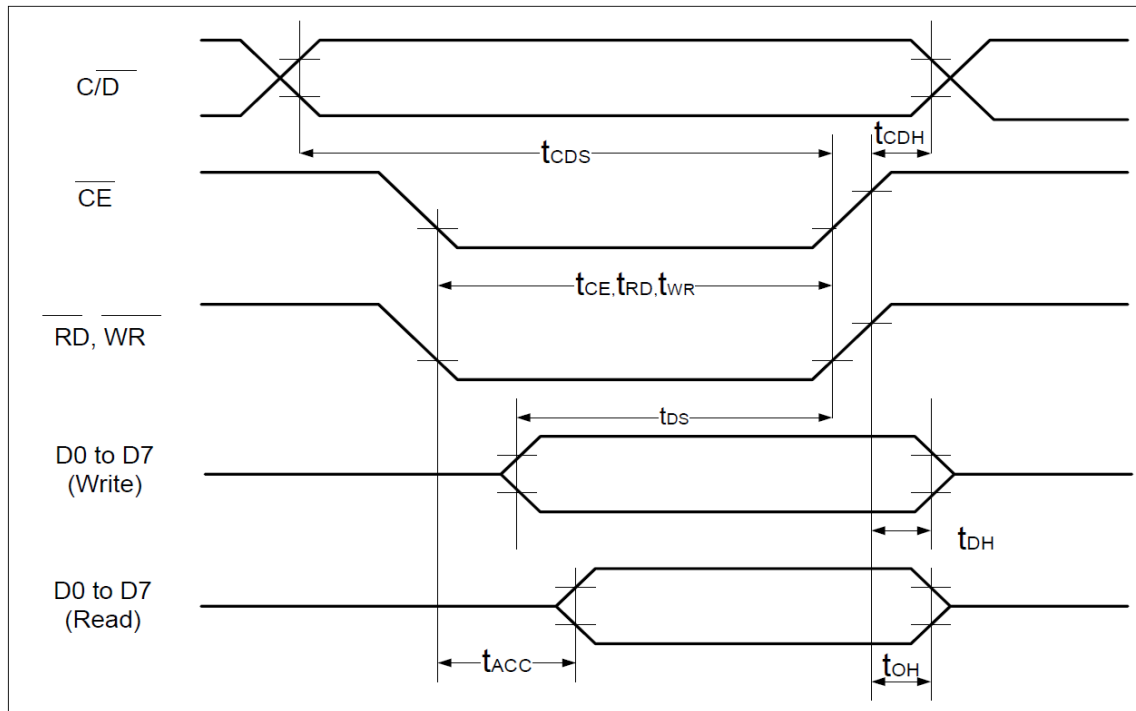
6 Optical Characteristics

Item	Symbol	Min	Typ	Max	Unit	Note
View Angles Top	AV		30		°	
View Angles Bottom	AV		60		°	
View Angles Left	AH		45		°	
View Angles Right	AH		45		°	
Response Time (25°C)	Tr + Tf		300	400	ms	
Contrast Ratio	CR		5			
Luminance (Without LCD)	Ly	480	600		cd/m ²	

7 Block Diagram



8 Timing Characteristics



Symbol	Parameter	Min	Typ	Max	Unit
T_{CDS}	C/D Set Up Time	100	-	-	ns
T_{CDH}	C/D Hold Time	10	-	-	ns
T_{CE}, T_{RD}, T_{WR}	CE, RD, WR Pulse Width	80	-	-	ns
T_{DS}	Data SetUp Time	80	-	-	ns
T_{DH}	Data Hold Time	40	-	-	ns
T_{ACC}	Access Time	-	-	150	ns
T_{DOH}	Output Hold Time	10	-	50	ns

9 Commands

Command	Code	D1	D2	Function
Registers Setting	00100001	X address	Y address	Set cursor pointer
	00100010	Data	00h	Set Offset Register
	00100100	Low address	High address	Set Address pointer
Set Control Word	01000000	Low address	High address	Set Text Home Address
	01000001	Columns	00h	Set Text Area
	01000010	Low address	High address	Set Graphic Home Address
	01000011	Columns	00h	Set Graphic Area
Mode Set	1000X000	--	--	OR mode
	1000X001	--	--	EXOR mode
	1000X011	--	--	AND mode
	1000X100	--	--	Text Attribute mode
	10000XXX	--	--	Internal CG ROM mode
	10001XXX	--	--	External CG RAM mode
Display Mode	10010000	--	--	Display off
	1001XX10	--	--	Cursor on, blink off
	1001XX11	--	--	Cursor on, blink on
	100101XX	--	--	Text on, graphic off
	100110XX	--	--	Text off, graphic on
	100111XX	--	--	Text on, graphic on
Cursor Pattern Select	10100000	--	--	1-line cursor
	10100001	--	--	2-line cursor
	10100010	--	--	3-line cursor
	10100011	--	--	4-line cursor
	10100100	--	--	5-line cursor
	10100101	--	--	6-line cursor
	10100110	--	--	7-line cursor
	10100111	--	--	8-line cursor
Data Read/Write	11000000	Data	--	Data Write and Increment ADP
	11000001	--	--	Data Read and Increment ADP
	11000010	Data	--	Data Write and Decrement ADP
	11000011	--	--	Data Read and Decrement ADP
	11000100	Data	--	Data Write and Non-variable ADP
	11000101	--	--	Data Read and Non-variable ADP
Data auto Read/Write	10110000	--	--	Set Data Auto Write
	10110001	--	--	Set Data Auto Read
	10110010	--	--	Auto Reset
Screen Peek	11100000	--	--	Screen Peek
Screen Copy	11101000			Screen Copy
Bit Set/Reset	11110XXX	--	--	Bit Reset
	11111XXX	--	--	Bit Set
	1111X000	--	--	Bit 0 (LSB)
	1111X001	--	--	Bit 1
	1111X010	--	--	Bit 2
	1111X011	--	--	Bit 3
	1111X100	--	--	Bit 4
	1111X101	--	--	Bit 5
	1111X110	--	--	Bit 6
	1111X111	--	--	Bit 7 (MSB)
Screen Reverse	11010000	Data	--	Whole screen reverse

				Data Bit 0 0 : Normal 1 : Reverse
Blink Time	01010000	Data	Don't care (Note)	If Frame = 60Hz Data Bit 2:0 000 : 0.066s 001 : 0.25s 010 : 0.5s (Default) 011 : 0.75s 100 : 1s 101 : 1.25s 110 : 1.5s 111 : 2s
Cursor Auto Moving	01100000	Data	Don't care (Note)	Data Bit 0 0 : Disable.(Default) 1 : Enable.
CGROM Font Select	01110000	Data	Don't care (Note)	Data Bit 1:0 00 : Do not care.(Default) 01 : Do not care. 10 : CGROM Font-01. 11 : CGROM Font-02.

Note:In these functions, it must be sent two data before sending the command, but the contents of the second datum (D2) can be any values.

10 Built-in Font Table

CGROM Font - 01

LSB \ MSB	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		!	"	#	\$	%	&	'	()	*	+	,	-	.	/
1	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
2	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
3	P	Q	R	S	T	U	U	W	X	Y	Z	[\]	^	_
4	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
5	p	q	r	s	t	u	v	w	x	y	z	{		}	~	
6	Q	ü	ë	ä	ä	ä	ä	ö	ö	ö	ö	ï	ï	ï	ä	ä
7	É	æ	Æ	ö	ö	ö	ö	ö	ö	ö	ö	ø	ø	ø	¥	℞

CGROM Font - 02

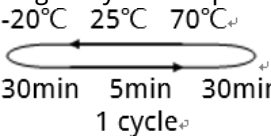
LSB \ MSB	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		!	"	#	\$	%	&	'	()	*	+	,	-	.	/
1	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
2	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
3	P	Q	R	S	T	U	U	W	X	Y	Z	[]	^	_	
4	千	万	月	夕	夕	■	ヲ	ア	イ	ウ	エ	オ	カ	ユ	ヨ	ワ
5	一	ア	イ	ウ	エ	オ	カ	キ	ク	ケ	コ	サ	シ	ス	セ	ソ
6	タ	チ	ツ	テ	ト	ナ	ニ	ヌ	ネ	ノ	ハ	ヒ	フ	ヘ	ホ	マ
7	ミ	ム	メ	モ	カ	ユ	ヨ	ラ	リ	ル	レ	ロ	ワ	ン	°	°

11 Driver/Controller Information

Built-in RA6963 IC

<https://drive.google.com/file/d/0B5IkVYnewKTGSHpZa2t2aIN6WFk/view?usp=sharing>

12 Reliability

Test Item	Content of Test	Test Condition	Note
High Temperature Storage	Endurance test applying the high storage temperature for a long time.	80°C 200hrs	2
Low Temperature Storage	Endurance test applying the high storage temperature for a long time.	-30°C 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70°C 200hrs	-
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20 °C 200hrs	1
High Temperature/ Humidity Operation	The module should be allowed to stand at 60°C,90%RH max, for 96hrs under no-load condition excluding the polarizer. Then taking it out and drying it at normal temperature.	60°C,90%RH 96hrs	1,2
Thermal Shock Resistance	The sample should be allowed stand the following 10 cycles of operation. 	-20°C/70°C 10 cycles	-
Vibration Test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude: 15mm; Vibration: 10~55Hz; One cycle 60 seconds to 3 directions of X, Y, Z, for each 16 minutes.	3
Static Electricity Test	Endurance test apply the electric stress to the terminal.	VS=800V, RS=1.5kΩ, CS=100pF, 1 time.	-

Note1: No dew condensation to be observed.

Note2: The function test shall be conducted after 4 hours storage at the normal. Temperature and humidity after remove from the rest chamber.

Note3: Test performed on product itself, not inside a container

13 Warranty and Conditions

<http://www.displaymodule.com/pages/faq>