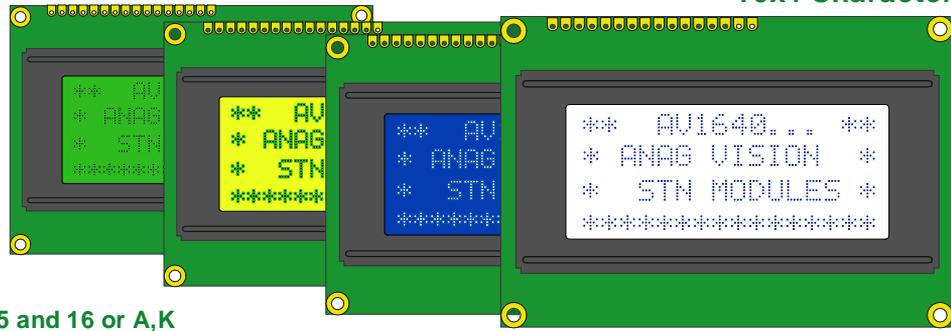# ANAG VISION

16x4 Character

- 5x7 dots with cursor
- 1/16 duty
- +5V single supply
- Controller built in (KS0066 or Equivalent)
- B/L driven by pin1 and 2, 15 and 16 or A,K

Pin Assignment

No.	Symbol	Function
1	Vss	Gnd, 0V
2	Vdd	+5V
3	V0	LCD Drive
4	RS	Function Select
5	R/W	Read/Write
6	E	Enable Signal
7-14	DB0-DB7	Data Bus Line
15	A*	4.2V for LED
16	K	Power Supply for LED 0V

Mechanical Data

Item	Standard Value	Unit
Module Size	87.0 x 60.0	mm
Viewing Area	62.0 x 26.0	mm
Dot Size	0.55 x 0.55	mm
Character Size	2.95 x 4.75	mm

Absolute Maximum Rating

Item	Symbol	Standard Value min.	typ.	max.	Unit
V-Module	Vdd-Vss	-0.3	- - -	7.0	V
V-Input	VI	-0.3	- - -	Vdd	V

Vss=0V, Vdd=5.0V

Electronical Characteristics

Item	Symbol	Condit.	min.	typ.	max.	Unit
Input Voltage	Vdd	Vdd=+5V	4.7	5.0	5.3	V
Supply Curent	Idd	Vdd=+5V	- - -	1.0	1.2	mA
Recommended LC Driving Voltage for Standard Temp. Modules	Vdd-V0	0 °C	4.6	4.8	5.2	V
		25 °C	4.1	4.5	4.7	
		50 °C	3.9	4.2	4.5	
LED Forward Voltage	Vf	25 °C	- - -	4.2	4.6	V
LED Forward Current	If	25 °C	- - -	220	440	mA
LED weiß Voltage *	ILED	3.5 V	50	60	75	mA

Display position

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DD RAM Address	00	01														0F
DD RAM Address	40	41														4F
DD RAM Address	10	11														1F
DD RAM Address	50	51														5F

This data sheet is for reference only.
The color of the disply may vary slightly depending on different production lots and ambient light. We reserve the right to changes and improvments without prior notice.
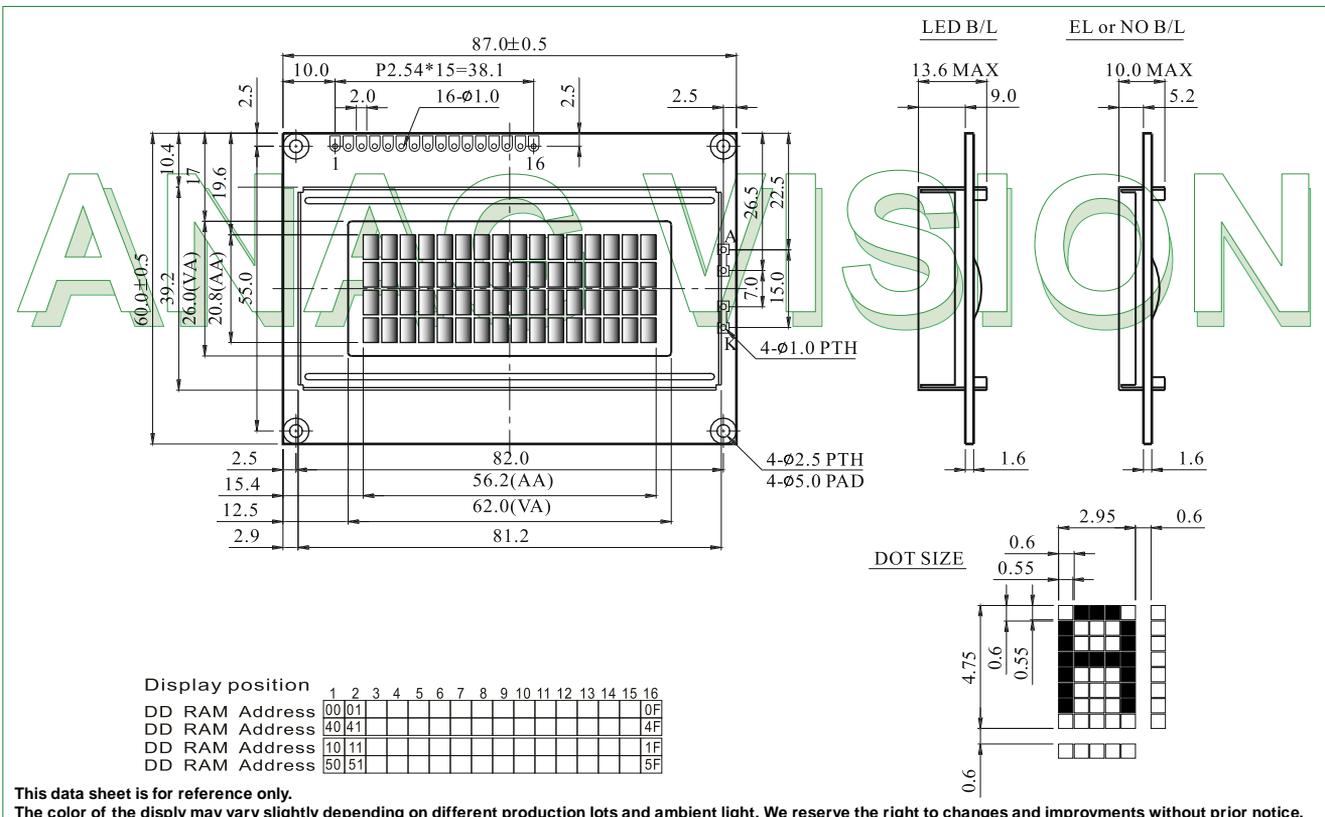
Verfügbar STN:	gelb-grün reflectiv positiv	gelb-grün LED positiv LED gelb	blau negativ LED weiß	grau positv LED weiß
CONRAD Best.-Nr:	183334	184691	181656	181670
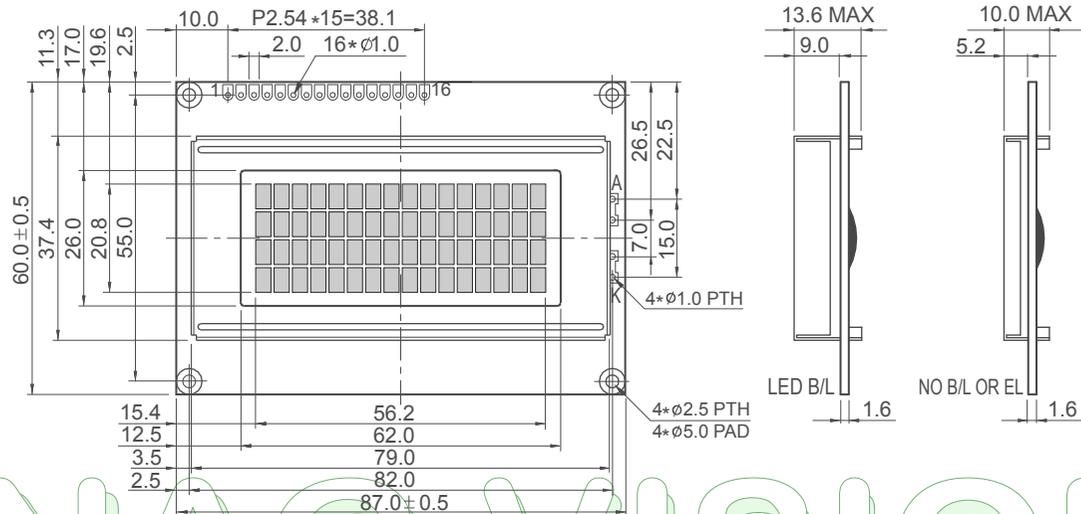
PIN ASSIGNMENT

NO.	SYMBOL	FUNCTION DISCRIPTION
1	VSS	GND, 0V
2	VDD	+5V (+3V ON REQUEST)
3	V0	LCD DRIVE
4	RS	FUNCTION SELECT
5	R/W	READ/WRITE CONTROL
6	E	ENABLE SIGNAL
7-14	DB0-DB7	DATA BUS LINE
15	A*	4.2V FOR LED
16	K	POWER SUPPLY FOR LED 0V

MECHANICAL DATA

ITEM	STANDARD VALUE	UNIT
MODULE SIZE	87.0 x 60.0	MM
VIEWING AREA	62.0 x 26.0	MM
DOT SIZE	0.55 x 0.55	MM
CHARACTER SIZE	2.96 x 4.75	MM

ABSOLUTE MAXIMUM RATING

ITEM	SYMBOL	STANDARD VALUE MIN.	STANDARD VALUE TYP.	STANDARD VALUE MAX.	UNIT
V-MODULE	VDD-VSS	-0.3	—	7.0	V
V-INPUT	VI	-0.3	—	VDD	V

VSS=0V, VDD=5.0V

ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	CONDIT.	MIN.	TYP.	MAX.	UNIT
INPUT VOLTAGE	VDD	VDD=+5V	4.7	5.0	5.3	V
SUPPLY CURRENT	IDD	VDD=+5V	—	1.0	1.2	MA
RECOMMENDED LC DRIVING VOLTAGE FOR STANDARD TEMP. MODULES	VDD-V0	-20 °C	5.0	5.1	5.7	V
		0 °C	4.6	4.8	5.2	
		25 °C	4.1	4.5	4.7	
		50 °C	3.9	4.2	4.5	
		70 °C	3.7	3.9	4.3	
LED FORWARD VOLTAGE	VF	25 °C	—	4.2	4.6	
LED FORWARD CURRENT	IF	25 °C	—	220	440	MA
LED WHITE VOLTAGE*	ILED	*3.5 V	50	60	75	MA

OPTIONS: STN Y/G, STN Y/G, STN BLUE, STN GRAY
MODE/BACKLIGHT: REFL.POS., POS./LEDY, NEG./LEDW, POS./LEDW

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THE COLOR OF THE DISPLAY MAY VARY SLIGHTLY DEPENDING ON DIFFERENT PRODUCTION LOTS AND AMBIENT LIGHT. WE RESERVE THE RIGHT TO CHANGES AND IMPROVMENTS WITHOUT PRIOR NOTICE.
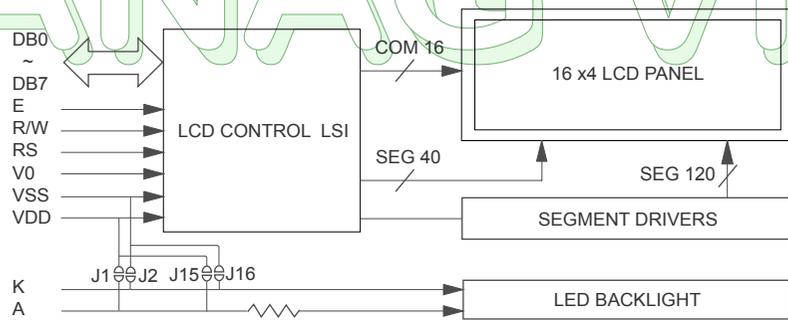
DISPLAY POSITION

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

DISPLAY RAM ADDRESS

00	01															0F
40	41															4F
10	11															1F
50	51															5F

◦ **5x7 DOTS WITH CURSOR** ◦ **1/16 DUTY** ◦ **+5V SINGLE SUPPLY** ◦ **BUILT IN CONTROLLER (ST0066 OR EQUIVALENT)** ◦ **B/L DRIVEN BY PIN 1 AND 2, 15 AND 16 OR A,K**

AV1640	16x4 CHARACTERS		ALL DIMENSIONS ARE IN MM. TOLERANCE IS +/-0.3 UNLESS OTHERWISE NOTED.	ΤΟΟΣΕ ΜΑΨ

CHARACTER MODULE COMMANDS

COMMANDS/CODES/DISCRIPTION

COMMAND	CODE										DESCRIPTION	EXECUTING TIME (FOSC = 270KHZ)
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
CLEAR DISPLAY	0	0	0	0	0	0	0	0	0	1	CLEAR THE DISPLAY AND RETURN THE CURSOR TO THE HOME POSITION (ADDRESS 0)	82µS - 1.64MS
RETURN HOME	0	0	0	0	0	0	0	0	1	*	RETURN THE CURSOR TO THE HOME POSITION (ADDRESS 0); ALSO RETURN A SHIFTED DISPLAY TO THE HOME POSITION. DDRAM CONTENTS REMAIN UNCHANGED.	40µS - 1.64MS
ENTRY MODE SET	0	0	0	0	0	0	0	1	I/D	S	SET THE CURSOR`S MOVE DIRECTION AND ENABLE/DISABLE THE DISPLAY	40µS
DISPLAY ON/OFF CONTROL	0	0	0	0	0	0	1	D	C	B	TURN THE DISPLAY ON/OFF(D), OR THE CURSOR ON/OFF(C), AND BLINK OF THE CHARACTER AT THE CURSOR POSITION(B).	40µS
CURSOR & DISPLAY SHIFT	0	0	0	0	0	1	S/C	R/L	*	*	MOVE THE CURSOR AND SHIFT THE DISPLAY WITHOUT CHANGING DD RAM CONTENTS.	40µS
FUNCTION SET	0	0	0	0	1	DL	N	F	*	*	SET THE DATA WIDTH(DL), THE NUMBER OF LINES IN DISPLAY(L), AND THE CHARACTER FONT(F).	40µS
SET CG RAM ADDRESS	0	0	0	1			ACG				SET THE CG RAM ADDRESS. CG RAM DATA CAN BE READ OR ALTERED AFTER MAKING THIS SETTING.	40µS
SET DD RAM ADDRESS	0	0	1				ADD				SET DD RAM ADDRESS. DATA MAY BE WRITTEN OR READ AFTER MAKING THIS SETTING	40µS
READ BUSY FLAG & ADDRESS	0	1	BF				AC				READ THE BUSY FLAG(BF) INDICATING THAT AN INTERNAL OPERATION IS BEING PERFORMED AND READ THE ADDRESS COUNTER CONTENTS.	1µS
WRITE DATA TO CG RAM OR DD RAM	1	0				WRITE DATA					WRITE DATA INTO DD RAM OR CG RAM.	43µS
READ DATA FROM CG OR DD RAM	1	1				READ DATA					READ DATA FROM DD RAM OR CG RAM.	43µS

I/D=1: INCREMENT   I/D=0 DECREMENT
S=1: ACCOMPANIES DISPLAY SHIFT
S/C=1: DISPLAY SHIFT   S/C=0 CURSOR MOVE
R/L=1 SHIFT TO THE RIGHT
R/L=0: SHIFT TO THE LEFT
DL=1: 8 BITS   DL=0: 4 BITS
N=1: 5X10 DOTS   N=0: 5X7 DOTS
BF=1: BUSY
BF=0: CAN ACCEPT DATA
" * ": DON`T CARE FOSC: 27KHZ

DD RAM: DISPLAY DATA RAM
CG RAM: CHARACTER GENERATOR RAM

ACG: CG RAM ADDRESS

ADD: DD RAM ADDRESS
    CORRESPONDS TO CURSOR ADDRESS

AC: ADDRESS COUNTER USED FOR BOTH DD
    AND CG RAM ADDRESS.

EXECUTION TIME CHANGES WITH CHANGE IN INTERNAL OSCILLATION FREQUENCY (FOSC).

EXAMPLE: WHEN FOSC = 270KHZ

$40µS \times \frac{250}{270} = 37µS$

FONT TABLE CHARACTER TYPES (STD. ENGL./JAP.)

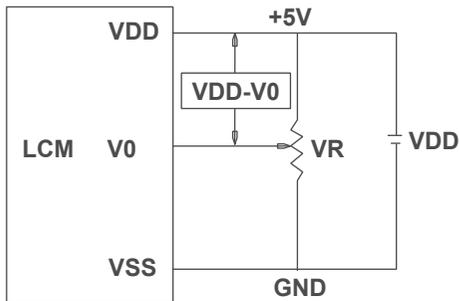INSTRUCTIONS AV CHARACTER MODULES

INSTRUCTIONS AND FONT TABLE ENGL./JAPANESE FOR STANDARD CHARACTER MODULES.

ΤΟΟΣΕ ΙΥΝΙ

POWER SUPPLY FOR LCD MODULE

1.SINGLE SUPPLY VOLTAGE TYPES (INTERNAL N.V.)

VDD-V0: LCD DRIVING VOLTAGE
R: 10K - 20K

2. DUAL SUPPLY VOLTAGE TYPES
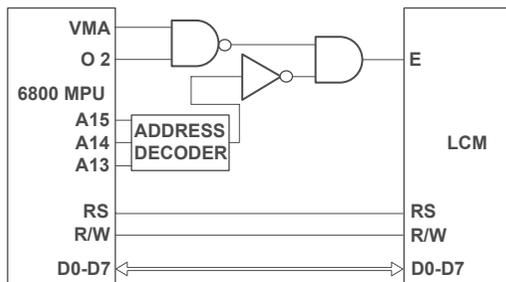
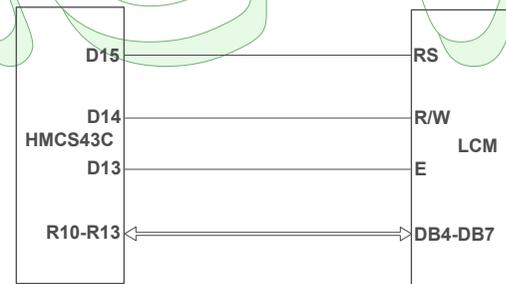VDD-V0: LCD DRIVING VOLTAGE
R: 10K - 20K

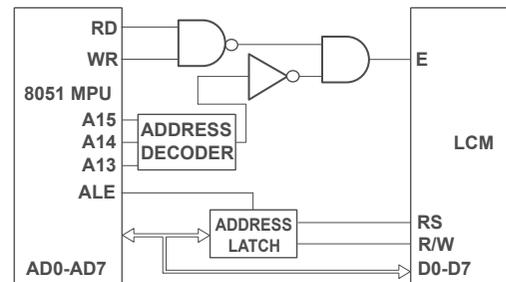## INTERFACE TO MCU

1. INTERFACE TO Z-80 MPU

2. INTERFACE TO 6800 MCU

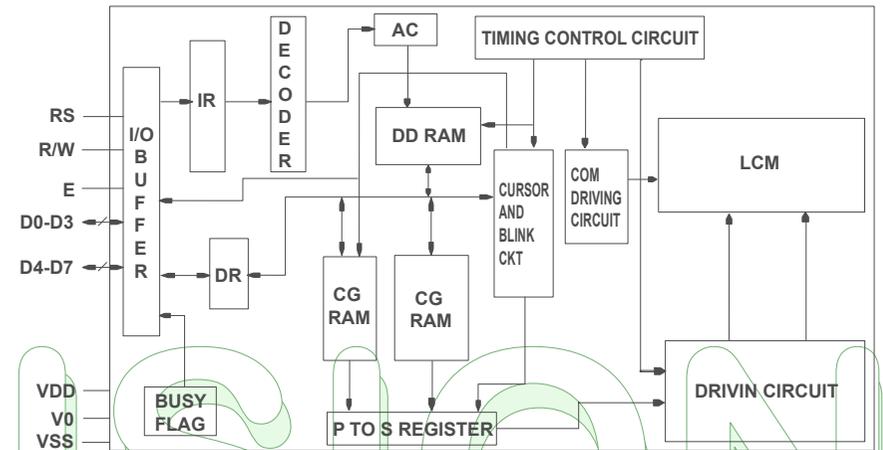### 3. INTERFACE TO 4-BIT MPU (HMCS43C)

4. INTERFACE TO 8051 MCU

CHARACTER BLOCK DIAGRAM AND LED BACKLIGHT

CHARACTER BLOCK IC DIAGRAM

- DATA REGISTER (DR) IS REGULARLY USED FOR TEMPORARY STORAGE OF DATA READ/WRITE FROM/INTO DD RAM AND CG RAM.
- INSTRUCTION REGISTER (IR) IS USED FOR STORING INSTRUCTION CODES AND ADDRESS INFORMATION OF THE DISPLAY DATA (DD) RAM AND CHARACTER GENERATOR (CG) RAM.
- BUSY FLAG (BF) IS "1" WHEN THE LCM IS IN INTERNAL OPERATION AND CANNOT ACCEPT THE NEXT INSTRUCTION OR DATA.
- CHARACTER GENERATOR (CG) ROM GENERATES CHARACTER PATTERNS FROM 8-BIT CODE. THE CG ROM PROVIDES 192 CHARACTER PATTERNS.
- CHARACTER GENERATOR (CG) RAM ALLOWES THE USER TO DESIGN AND REWRITE CHARACTER PATTERNS ACCORDING THE PROGRAM.
- ADDRESS COUNTER (AC) IS USED TO GIVE THE ADDRESS INFORMATION OF THE DD RAM AND CG RAM.
- DISPLAY DATA (DD) RAM IS USED TO STORE THE DISPLAY DATA EXPRESSED BY 8-BIT CHARACTER CODE. THE CAPACITY IS 80 X 8 BITS AND 80 CHARACTERS CAN BE STORED.
- CURSOR AND BLINK CONTROL GENERATES THE CURSOR AND BLINK.

USAGE OF LED BACKLIGHT

THERE ARE THREE POSSIBILITIES TO USE LED BACKLIGHT IN ANAG VISION CHARACTER MODULES.

- DRIVING THE LED THROUGH A CURRENT LIMITING RESISTANCE (RA) WHICH IS ALREADY INCLUDED IN THE LCM, BY EXTERNAL 5V TO J1 AND J2 BETWEEN PIN 1 AND PIN 2.
- PROVIDING 5V BY PIN 15 AND 16 OF THE INTERFACE TO DRIVE THE LED, J15 AND J16 MUST BE SHORTENED AND RA = 3~7 OHMS IN THIS CASE.
- PROVIDING 4.2V BY DIRECT CONNECTION TO THE LED THROUGH A CURRENT LIMITING RESISTANCE.

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THE COLOR OF THE DISPLAY MAY VARY SLIGHTLY DEPENDING ON DIFFERENT PRODUCTION LOTS AND AMBIENT LIGHT. WE RESERVE THE RIGHT TO CHANGES AND IMPROVMENTS WITHOUT PRIOR NOTICE.
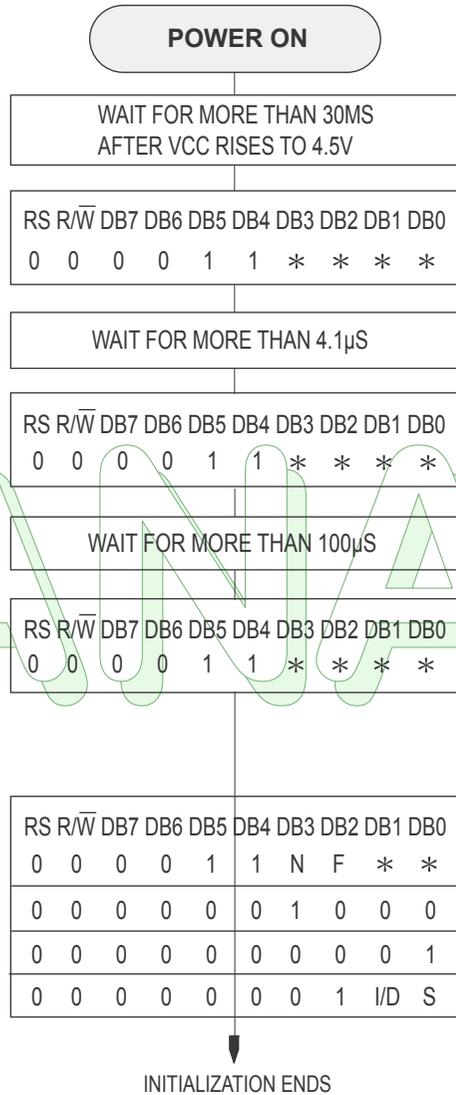
INITIALIZATION PROCEDURE

INITIALIZATION BY SETTING THE SOFTWARE [CHARACTER TYPE LCM]. REFERE TO FIGURES 1 AND 2 FOR PROCEDURES ON 8-BIT AND 4-BIT INITIALIZATION ACCORDINGLY.

FIGURE1: 8-BIT INTERFACE

POWER ON

WAIT FOR MORE THAN 30MS AFTER VCC RISES TO 4.5V

RS	R/W̄	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	1	1	*	*	*	*

— BF CANNOT BE CHECKED BEFORE THIS INSTRUCTION. FUNCTION SET INTERFACE IS 8 BITS LONG.

WAIT FOR MORE THAN 4.1μS

RS	R/W̄	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	1	1	*	*	*	*

— BF CANNOT BE CHECKED BEFORE THIS INSTRUCTION. FUNCTION SET INTERFACE IS 8 BITS LONG.

WAIT FOR MORE THAN 100μS

RS	R/W̄	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	1	1	*	*	*	*

— BF CANNOT BE CHECKED BEFORE THIS INSTRUCTION. FUNCTION SET INTERFACE IS 8 BITS LONG.

BF CAN BE CHECKED AFTER THE FOLLOWING INSTRUCTIONS. IF THE BF IS NOT CHECKED, THE WAITING TIME BETWEEN INSTRUCTIONS IS LONGER THAN THE INSTRUCTION EXECUTION TIME.

RS	R/W̄	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	1	1	N	F	*	*
0	0	0	0	0	0	1	0	0	0
0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	1	I/D	S

— FUNCTION SET [INTERFACE IS 8 BITS LONG. THE NUMBER OF DISPLAY LINES AND CHARACTERS IS SPECIFIED. NEITHER CANNOT BE CHANGED AFTERWARDS].
— DISPLAY OFF
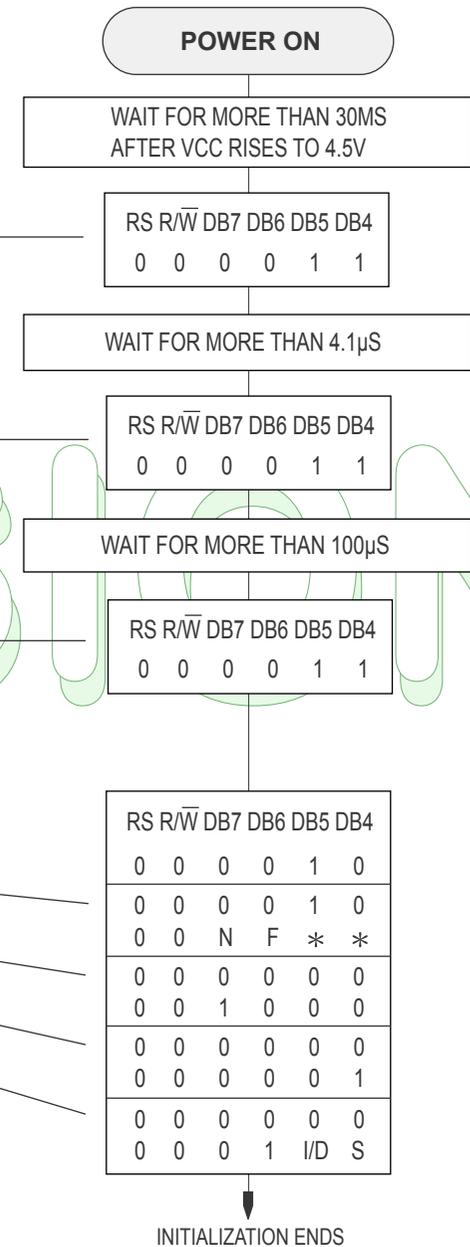— DISPLAY CLEAR
— ENTRY MODE SET [COND.: FOSC=270KHZ]

INITIALIZATION ENDS

FIGURE2: 4-BIT INTERFACE

POWER ON

WAIT FOR MORE THAN 30MS AFTER VCC RISES TO 4.5V

RS	R/W̄	DB7	DB6	DB5	DB4
0	0	0	0	1	1

WAIT FOR MORE THAN 4.1μS

RS	R/W̄	DB7	DB6	DB5	DB4
0	0	0	0	1	1

WAIT FOR MORE THAN 100μS

RS	R/W̄	DB7	DB6	DB5	DB4
0	0	0	0	1	1

RS	R/W̄	DB7	DB6	DB5	DB4
0	0	0	0	1	0
0	0	0	0	1	0
0	0	N	F	*	*
0	0	0	0	0	0
0	0	1	0	0	0
0	0	0	0	0	0
0	0	0	0	0	1
0	0	0	0	0	0
0	0	0	1	I/D	S

INITIALIZATION ENDS

INITIALIZING AV CHARACTER MODULES

INITIALIZATION PROCEDURE ON 8-BIT AND 4-BIT INTERFACES OF STANDARD CHARACTER MODULES.

ΤΟΟΣΕ
ΙΥΝΙ

CHARACTER MODULE COMMANDS

COMMANDS/CODES/DISCRIPTION

COMMAND	CODE										DESCRIPTION	EXECUTING TIME (FOSC = 270KHZ)
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
CLEAR DISPLAY	0	0	0	0	0	0	0	0	0	1	CLEAR THE DISPLAY AND RETURN THE CURSOR TO THE HOME POSITION (ADDRESS 0)	82µS - 1.64MS
RETURN HOME	0	0	0	0	0	0	0	0	1	*	RETURN THE CURSOR TO THE HOME POSITION (ADDRESS 0); ALSO RETURN A SHIFTED DISPLAY TO THE HOME POSITION. DDRAM CONTENTS REMAIN UNCHANGED.	40µS - 1.64MS
ENTRY MODE SET	0	0	0	0	0	0	0	1	I/D	S	SET THE CURSOR`S MOVE DIRECTION AND ENABLE/DISABLE THE DISPLAY	40µS
DISPLAY ON/OFF CONTROL	0	0	0	0	0	0	1	D	C	B	TURN THE DISPLAY ON/OFF(D), OR THE CURSOR ON/OFF(C), AND BLINK OF THE CHARACTER AT THE CURSOR POSITION(B).	40µS
CURSOR & DISPLAY SHIFT	0	0	0	0	0	1	S/C	R/L	*	*	MOVE THE CURSOR AND SHIFT THE DISPLAY WITHOUT CHANGING DD RAM CONTENTS.	40µS
FUNCTION SET	0	0	0	0	1	DL	N	F	*	*	SET THE DATA WIDTH(DL), THE NUMBER OF LINES IN DISPLAY(L), AND THE CHARACTER FONT(F).	40µS
SET CG RAM ADDRESS	0	0	0	1	ACG						SET THE CG RAM ADDRESS. CG RAM DATA CAN BE READ OR ALTERED AFTER MAKING THIS SETTING.	40µS
SET DD RAM ADDRESS	0	0	1	ADD							SET DD RAM ADDRESS. DATA MAY BE WRITTEN OR READ AFTER MAKING THIS SETTING.	40µS
READ BUSY FLAG & ADDRESS	0	1	BF	AC							READ THE BUSY FLAG(BF) INDICATING THAT AN INTERNAL OPERATION IS BEING PERFORMED AND READ THE ADDRESS COUNTER CONTENTS.	1µS
WRITE DATA TO CG RAM OR DD RAM	1	0	WRITE DATA								WRITE DATA INTO DD RAM OR CG RAM.	43µS
READ DATA FROM CG OR DD RAM	1	1	READ DATA								READ DATA FROM DD RAM OR CG RAM.	43µS

I/D=1: INCREMENT   I/D=0 DECREMENT
S=1: ACCOMPANIES DISPLAY SHIFT
S/C=1: DISPLAY SHIFT   S/C=0 CURSOR MOVE
R/L=1 SHIFT TO THE RIGHT
R/L=0: SHIFT TO THE LEFT
DL=1: 8 BITS   DL=0: 4 BITS
N=1: 5X10 DOTS   N=0: 5X7 DOTS
BF=1: BUSY
BF=0: CAN ACCEPT DATA
" * ": DON`T CARE FOSC: 27KHZ

DD RAM: DISPLAY DATA RAM
CG RAM: CHARACTER GENERATOR RAM

ACG: CG RAM ADDRESS

ADD: DD RAM ADDRESS
      CORRESPONDS TO CURSOR ADDRESS

AC: ADDRESS COUNTER USED FOR BOTH DD AND CG RAM ADDRESS.

EXECUTION TIME CHANGES WITH CHANGE IN INTERNAL OSCILLATION FREQUENCY (FOSC).

EXAMPLE: WHEN FOSC = 270KHZ

$40µS \times \frac{250}{270} = 37µS$
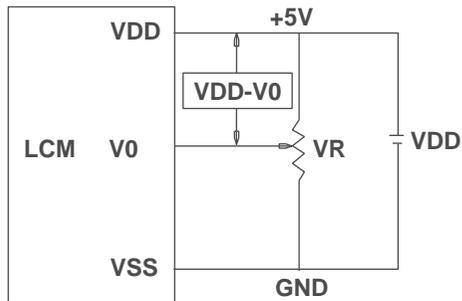
FONT TABLE CHARACTER TYPES (STD. ENGL./JAP.)

UPPER 4BIT

THIS DATA SHEET IS FOR REFERENCE ONLY. WE RESERVE THE RIGHT TO CHANGES AND IMPROVMENTS WITHOUT PRIOR NOTICE.

POWER SUPPLY FOR LCD MODULE

1. SINGLE SUPPLY VOLTAGE TYPES (INTERNAL N.V.)

VDD-V0: LCD DRIVING VOLTAGE
R: 10K - 20K

2. DUAL SUPPLY VOLTAGE TYPES
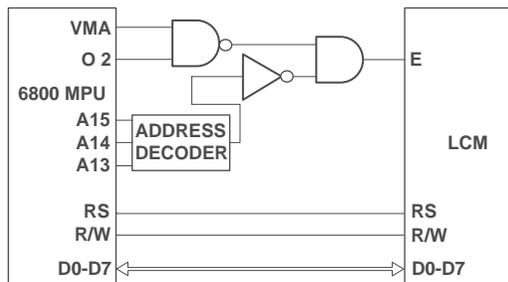
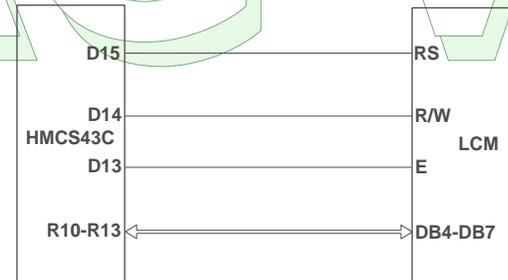VDD-V0: LCD DRIVING VOLTAGE
R: 10K - 20K
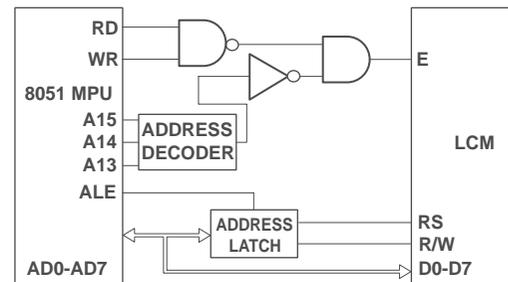
INTERFACE TO MCU

1. INTERFACE TO Z-80 MPU

2. INTERFACE TO 6800 MCU

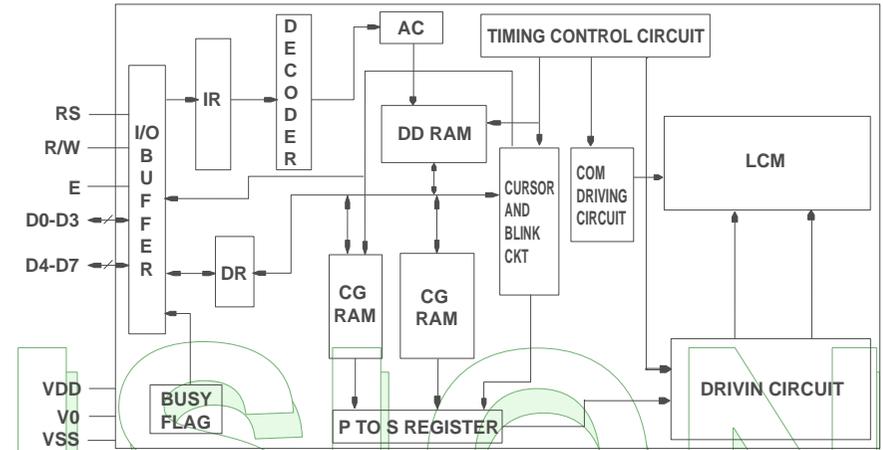### 3. INTERFACE TO 4-BIT MPU (HMCS43C)

4. INTERFACE TO 8051 MCU

CHARACTER BLOCK DIAGRAM AND LED BACKLIGHT

CHARACTER BLOCK IC DIAGRAM

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- INSTRUCTION REGISTER (IR) IS USED FOR STORING INSTRUCTION CODES AND ADDRESS INFORMATION OF THE DISPLAY DATA (DD) RAM AND CHARACTER GENERATOR (CG) RAM.
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- ADDRESS COUNTER (AC) IS USED TO GIVE THE ADDRESS INFORMATION OF THE DD RAM AND CG RAM.
- DISPLAY DATA (DD) RAM IS USED TO STORE THE DISPLAY DATA EXPRESSED BY 8-BIT CHARACTER CODE. THE CAPACITY IS 80 X 8 BITS AND 80 CHARACTERS CAN BE STORED.
- CURSOR AND BLINK CONTROL GENERATES THE CURSOR AND BLINK.

USAGE OF LED BACKLIGHT

THERE ARE THREE POSSIBILITIES TO USE LED BACKLIGHT IN ANAG VISION CHARACTER MODULES.

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- PROVIDING 5V BY PIN 15 AND 16 OF THE INTERFACE TO DRIVE THE LED, J15 AND J16 MUST BE SHORTENED AND RA = 3~7 OHMS IN THIS CASE.
- PROVIDING 4.2V BY DIRECT CONNECTION TO THE LED THROUGH A CURRENT LIMITING RESISTANCE.

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CONNECTING AV CHARACTER MODULES

Tel.: +49 89 89979764
Fax: +49 89 89979765

Email: info@dst-gmbh.de
Internet: www.dst-gmbh.de

POWER SUPPLY FOR LCD MODULE/INTERFACE TO MCU
CHARACTER BLOCK DIAGRAM AND LED BACKLIGHT

ΤΟΟΣΕ
ΙΥΝΙ

INITIALIZATION PROCEDURE
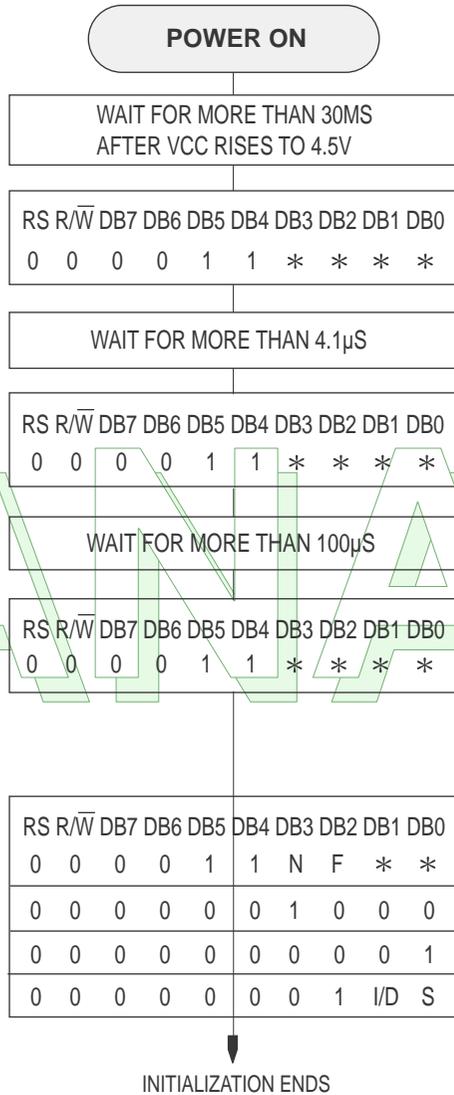
INITIALIZATION BY SETTING THE SOFTWARE [CHARACTER TYPE LCM]. REFERE TO FIGURES 1 AND 2 FOR PROCEDURES ON 8-BIT AND 4-BIT INITIALIZATION ACCORDINGLY.

FIGURE1: 8-BIT INTERFACE

POWER ON

WAIT FOR MORE THAN 30MS AFTER VCC RISES TO 4.5V

RS	R/W̄	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	1	1	*	*	*	*

— BF CANNOT BE CHECKED BEFORE THIS INSTRUCTION. FUNCTION SET INTERFACE IS 8 BITS LONG.

WAIT FOR MORE THAN 4.1µS

RS	R/W̄	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	1	1	*	*	*	*

— BF CANNOT BE CHECKED BEFORE THIS INSTRUCTION. FUNCTION SET INTERFACE IS 8 BITS LONG.

WAIT FOR MORE THAN 100µS

RS	R/W̄	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	1	1	*	*	*	*

— BF CANNOT BE CHECKED BEFORE THIS INSTRUCTION. FUNCTION SET INTERFACE IS 8 BITS LONG.

BF CAN BE CHECKED AFTER THE FOLLOWING INSTRUCTIONS. IF THE BF IS NOT CHECKED, THE WAITING TIME BETWEEN INSTRUCTIONS IS LONGER THAN THE INSTRUCTION EXECUTION TIME.

RS	R/W̄	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	1	1	N	F	*	*
0	0	0	0	0	0	1	0	0	0
0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	1	I/D	S

— FUNCTION SET [INTERFACE IS 8 BITS LONG. THE NUMBER OF DISPLAY LINES AND CHARACTERS IS SPECIFIED. NEITHER CANNOT BE CHANGED AFTERWARDS].

— DISPLAY OFF
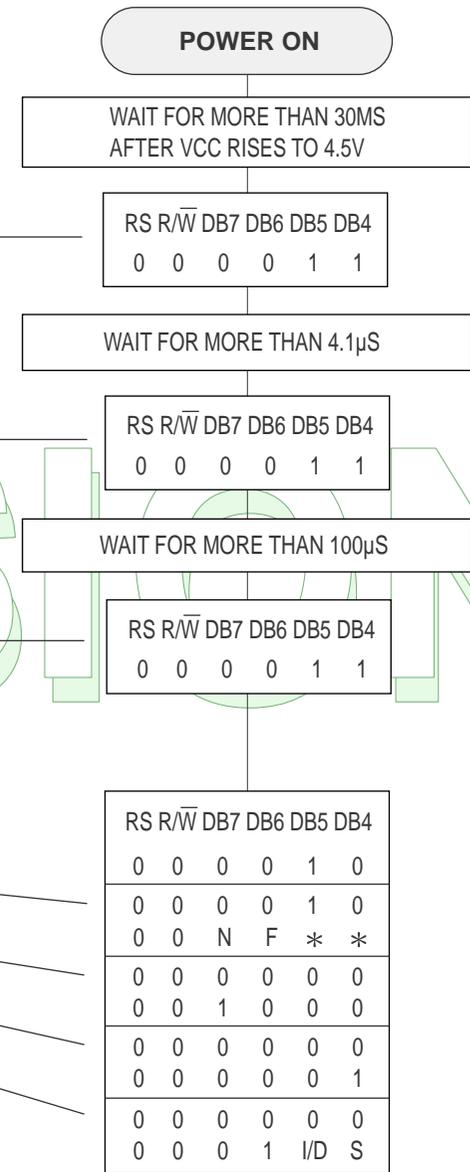
— DISPLAY CLEAR

— ENTRY MODE SET [COND.: FOSC=270KHZ]

INITIALIZATION ENDS

FIGURE2: 4-BIT INTERFACE

POWER ON

WAIT FOR MORE THAN 30MS AFTER VCC RISES TO 4.5V

RS	R/W̄	DB7	DB6	DB5	DB4
0	0	0	0	1	1

WAIT FOR MORE THAN 4.1µS

RS	R/W̄	DB7	DB6	DB5	DB4
0	0	0	0	1	1

WAIT FOR MORE THAN 100µS

RS	R/W̄	DB7	DB6	DB5	DB4
0	0	0	0	1	1

RS	R/W̄	DB7	DB6	DB5	DB4
0	0	0	0	1	0
0	0	0	0	1	0
0	0	N	F	*	*
0	0	0	0	0	0
0	0	1	0	0	0
0	0	0	0	0	0
0	0	0	0	0	1
0	0	0	0	0	0
0	0	0	1	I/D	S

INITIALIZATION ENDS