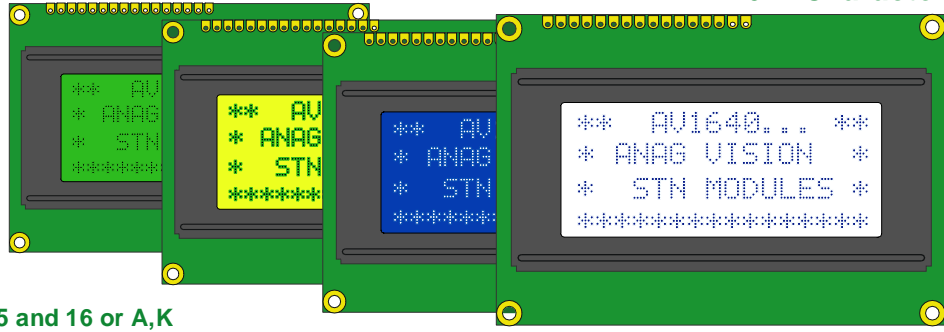


16x4 Character

- 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 | V _{ss} | Gnd, 0V |
| 2 | V _{dd} | +5V |
| 3 | V ₀ | 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 | | | Unit |
|----------|--------------------------------|----------------|------|-----------------|------|
| | | min. | typ. | max. | |
| V-Module | V _{dd-V_{ss}} | -0.3 | --- | 7.0 | V |
| V-Input | V _I | -0.3 | --- | V _{dd} | V |

V_{ss}=0V, V_{dd}=5.0V

Electrical Characteristics

| Item | Symbol | Condit. | Standard Value | | | Unit |
|---|-------------------------------|----------------------|----------------|------|------|------|
| | | | min. | typ. | max. | |
| Input Voltage | V _{dd} | V _{dd} =+5V | 4.7 | 5.0 | 5.3 | V |
| Supply Current | I _{dd} | V _{dd} =+5V | --- | 1.0 | 1.2 | mA |
| Recommended LC Driving Voltage for Standard Temp. Modules | V _{dd-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 | V _f | 25 °C | --- | 4.2 | 4.6 | V |
| LED Forward Current | I _f | 25 °C | --- | 220 | 440 | mA |
| LED weiß Voltage * | I _{LED} | 3.5 V | 50 | 60 | 75 | mA |

LED B/L EL or NO B/L

13.6 MAX 9.0 10.0 MAX 5.2

4-Ø1.0 PTH 4-Ø2.5 PTH 4-Ø5.0 PAD

DOT SIZE

2.95 0.6 0.55 0.6 4.75 0.6

| 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 display may vary slightly depending on different production lots and ambient light. We reserve the right to changes and improvements without prior notice.

Verfügbar STN:

gelb-grün
reflectiv positiv

gelb-grün LED
positiv LED gelb

blau negativ
LED weiß

grau positiv
LED weiß

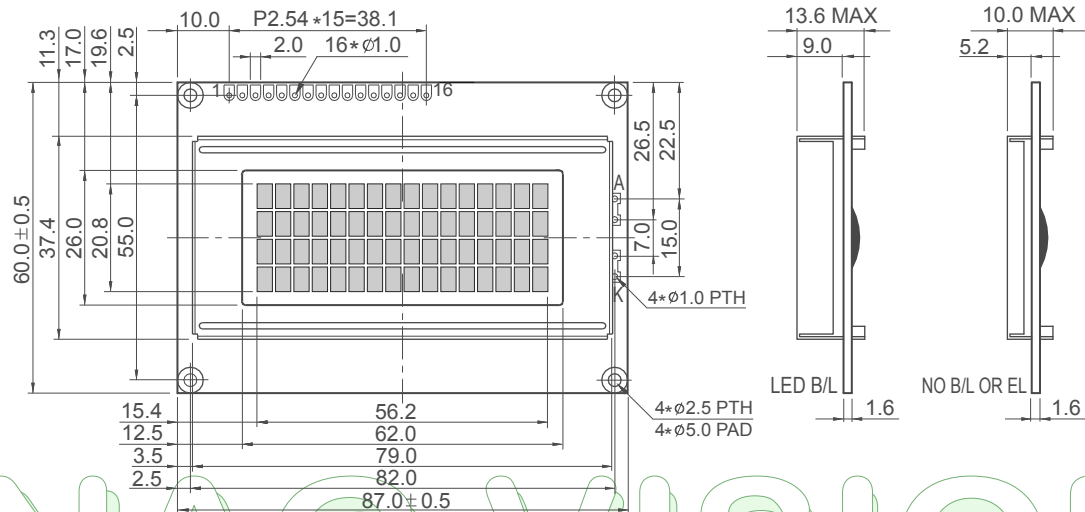
CONRAD Best.-Nr:

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 | | | UNIT |
|----------|---------|----------------|------|------|------|
| | | MIN. | TYP. | MAX. | |
| V-MODULE | VDD-VSS | -0.3 | — | 7.0 | V |
| V-INPUT | VI | -0.3 | — | VDD | |

VSS=0V, VDD=5.0V

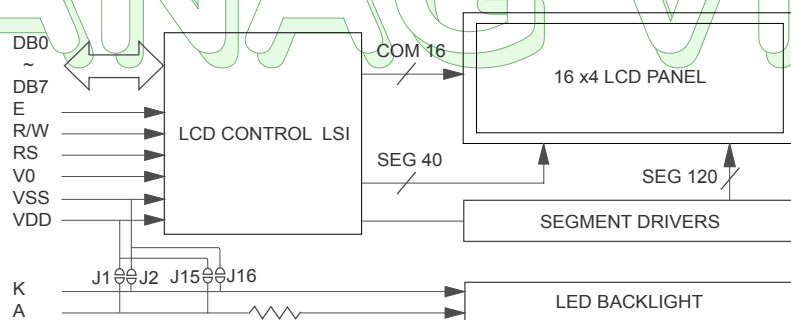
ELECTRICAL CHARACTERISTICS

| ITEM | SYMBOL | CONDIT. | STANDARD VALUE | | | UNIT |
|---|--------|---------|----------------|------|------|------|
| | | | MIN. | TYP. | MAX. | |
| 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

THIS DATA SHEET IS FOR REFERENCE ONLY.
 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.

ANAG VISION



| 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.



TOOΞE
MAΨ

CHARACTER MODULE COMMANDS

COMMANDS/CODES/DESCRIPTION

| 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 $FOSC = 270KHZ$ $40\mu S \times \frac{250}{270} = 37\mu S$ |

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

UPPER 4BIT

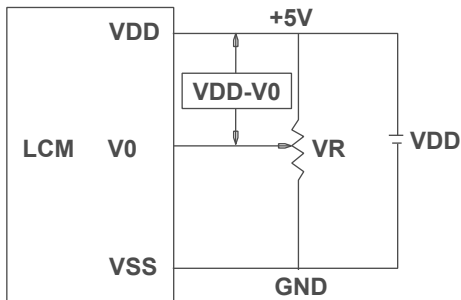
| | | LLLL | LLLH | LLHL | LLHH | LHLL | LHLH | LHHL | LHHH | HLLL | HLLH | HLHL | HLHH | HLLH | HHHL | HHHH |
|-------------|------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| LOWER 4 BIT | CG RAM (1) | | | | | | | | | | | | | | | |
| | (2) | | | | | | | | | | | | | | | |
| | (3) | | | | | | | | | | | | | | | |
| | (4) | | | | | | | | | | | | | | | |
| | (5) | | | | | | | | | | | | | | | |
| | (6) | | | | | | | | | | | | | | | |
| | (7) | | | | | | | | | | | | | | | |
| | (8) | | | | | | | | | | | | | | | |
| | HLLL (1) | | | | | | | | | | | | | | | |
| | HLLH (2) | | | | | | | | | | | | | | | |
| | HLHL (3) | | | | | | | | | | | | | | | |
| | HLHH (4) | | | | | | | | | | | | | | | |
| | HHLL (5) | | | | | | | | | | | | | | | |
| | HHLH (6) | | | | | | | | | | | | | | | |
| | HHHL (7) | | | | | | | | | | | | | | | |
| | HHHH (8) | | | | | | | | | | | | | | | |

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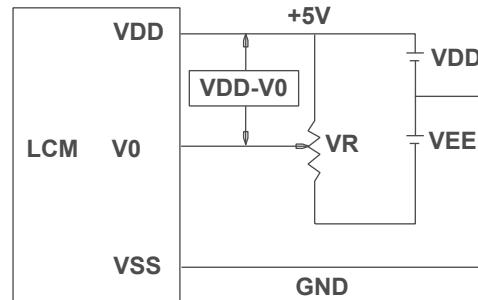
POWER SUPPLY / INTERFACE TO MCU / INFORMATION ON CHARACTER IC AND LED BACKLIGHT

POWER SUPPLY FOR LCD MODULE

1. SINGLE SUPPLY VOLTAGE TYPES (INTERNAL N.V.) 2. DUAL SUPPLY VOLTAGE TYPES



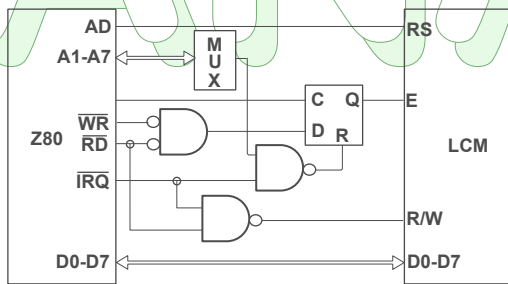
VDD-V0: LCD DRIVING VOLTAGE
R: 10K - 20K



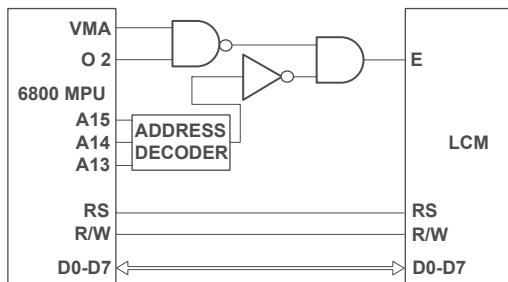
VDD-V0: LCD DRIVING VOLTAGE
R: 10K - 20K

INTERFACE TO MCU

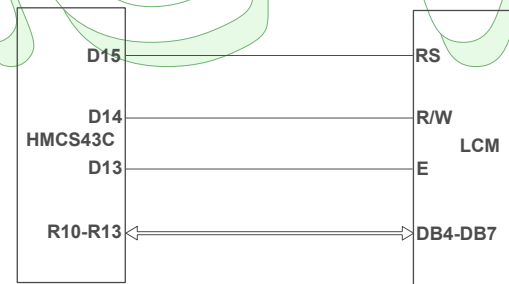
1. INTERFACE TO Z-80 MPU



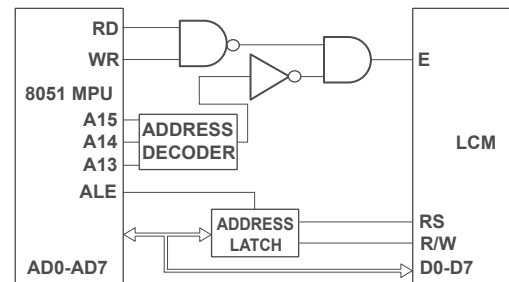
2. INTERFACE TO 6800 MCU



3. INTERFACE TO 4-BIT MPU (HMCS43C)

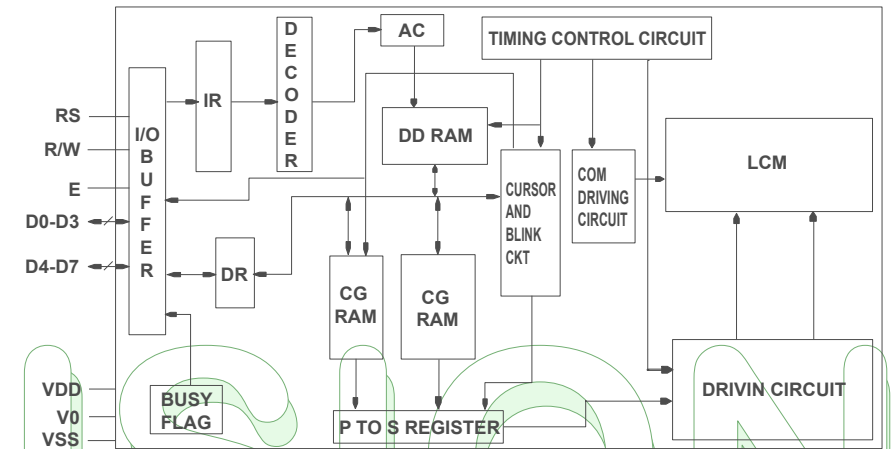


4. INTERFACE TO 8051 MCU



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 ALLOWS 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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INITIALIZATION PROCEDURE

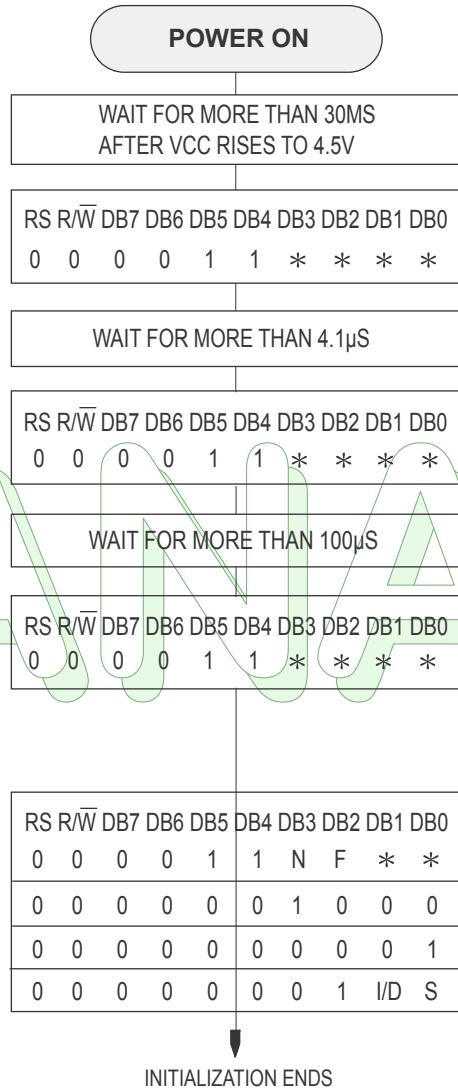


FIGURE1: 8-BIT INTERFACE

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

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

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

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.

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]

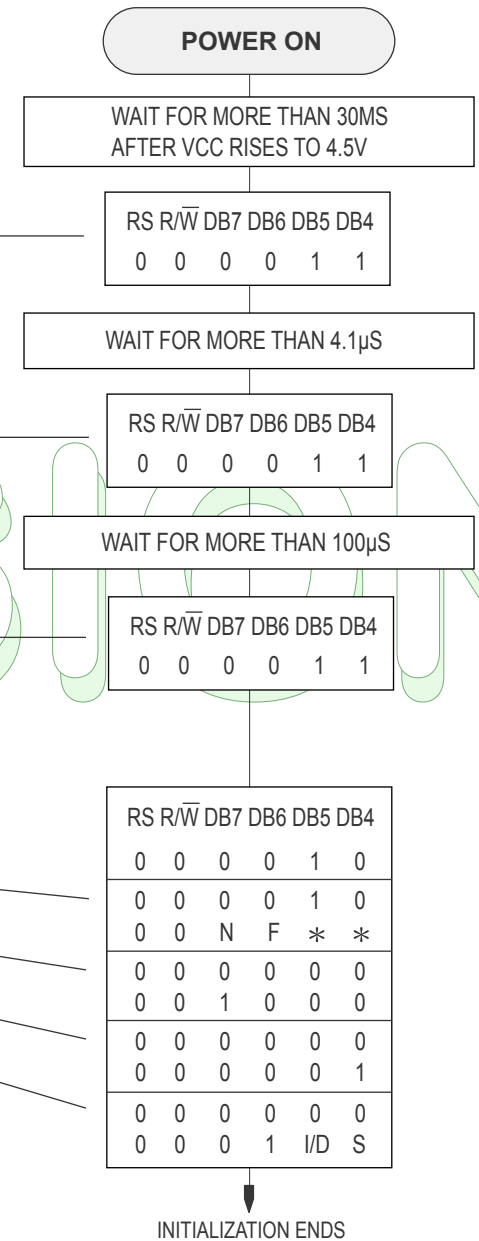


FIGURE2: 4-BIT INTERFACE

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

CHARACTER MODULE COMMANDS

COMMANDS/CODES/DESCRIPTION

| 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 $40\mu S \times \frac{250}{270} = 37\mu S$ | |

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

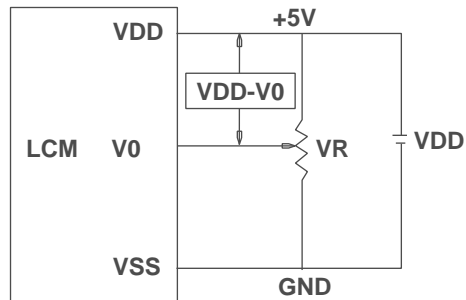
| | | UPPER 4BIT | | | | | | | | | | | | | | | |
|-------------|----------|------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|--|
| | | LLLL | LLLH | LLHL | LLHH | LHLH | LHHL | LHHH | HLLL | HLLH | HLHL | HLHH | HHLH | HHHL | HHHL | HHHH | |
| LOWER 4 BIT | LLLL (1) | CG RAM (1) | | | | | | | | | | | | | | | |
| | LLLH (2) | | | | | | | | | | | | | | | | |
| | LLHL (3) | | | | | | | | | | | | | | | | |
| | LLHH (4) | | | | | | | | | | | | | | | | |
| | LHLL (5) | | | | | | | | | | | | | | | | |
| | LHLH (6) | | | | | | | | | | | | | | | | |
| | LHHL (7) | | | | | | | | | | | | | | | | |
| | LHHH (8) | | | | | | | | | | | | | | | | |
| HLLL (1) | | | | | | | | | | | | | | | | | |
| HLLH (2) | | | | | | | | | | | | | | | | | |
| HLHL (3) | | | | | | | | | | | | | | | | | |
| HLHH (4) | | | | | | | | | | | | | | | | | |
| HHLL (5) | | | | | | | | | | | | | | | | | |
| HHLH (6) | | | | | | | | | | | | | | | | | |
| HHHL (7) | | | | | | | | | | | | | | | | | |
| HHHH (8) | | | | | | | | | | | | | | | | | |

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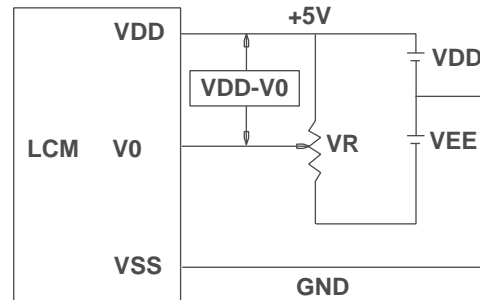
POWER SUPPLY / INTERFACE TO MCU / INFORMATION ON CHARACTER IC AND LED BACKLIGHT

POWER SUPPLY FOR LCD MODULE

1. SINGLE SUPPLY VOLTAGE TYPES (INTERNAL N.V.) 2. DUAL SUPPLY VOLTAGE TYPES



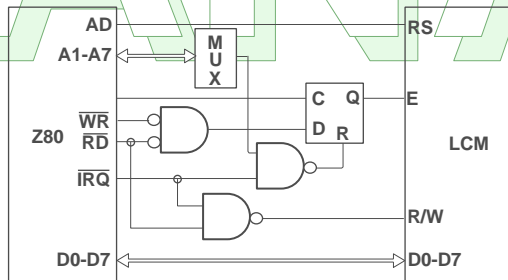
VDD-V0: LCD DRIVING VOLTAGE
R: 10K - 20K



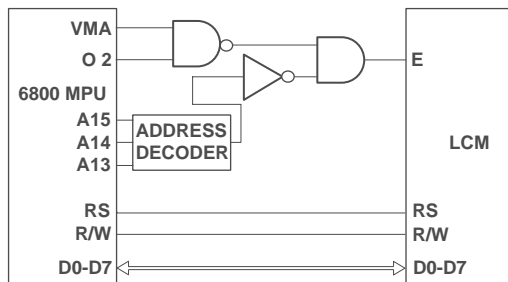
VDD-V0: LCD DRIVING VOLTAGE
R: 10K - 20K

INTERFACE TO MCU

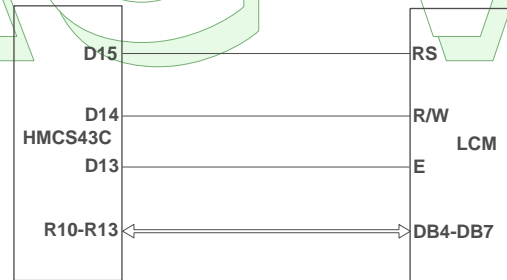
1. INTERFACE TO Z-80 MPU



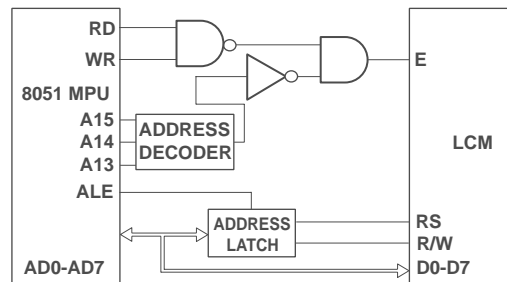
2. INTERFACE TO 6800 MCU



3. INTERFACE TO 4-BIT MPU (HMCS43C)

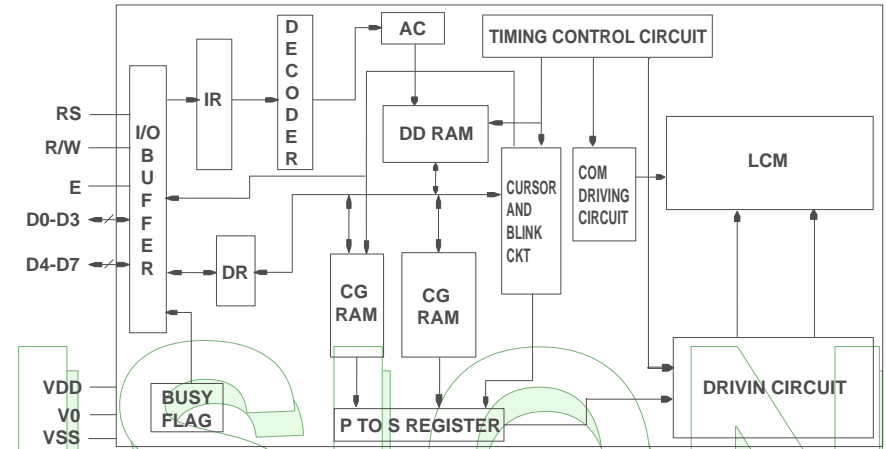


4. INTERFACE TO 8051 MCU



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 ALLOWS THE USER TO DESIGN AND REWRITE CHARACTER PATTERNS ACCORDING TO 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.

THIS DATA SHEET IS FOR REFERENCE ONLY.
THE COLOR OF THE DISPLAY MAY VARY SLIGHTLY DEPENDING ON DIFFERENT PRODUCTION LOTS AND AMBIENT LIGHT. WE RESERVE THE RIGHT TO CHANGES AND IMPROVEMENTS WITHOUT PRIOR NOTICE.

INITIALIZATION PROCEDURE

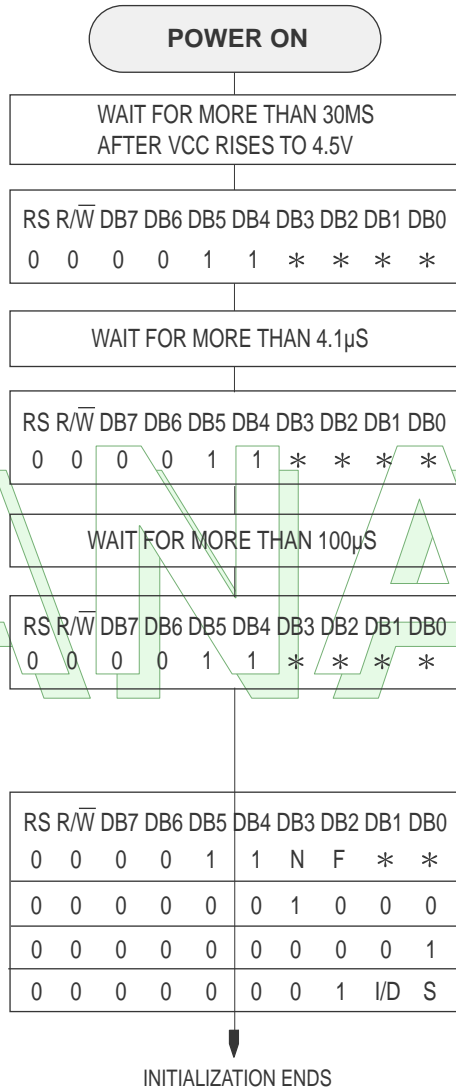


FIGURE1: 8-BIT INTERFACE

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

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

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

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.

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]

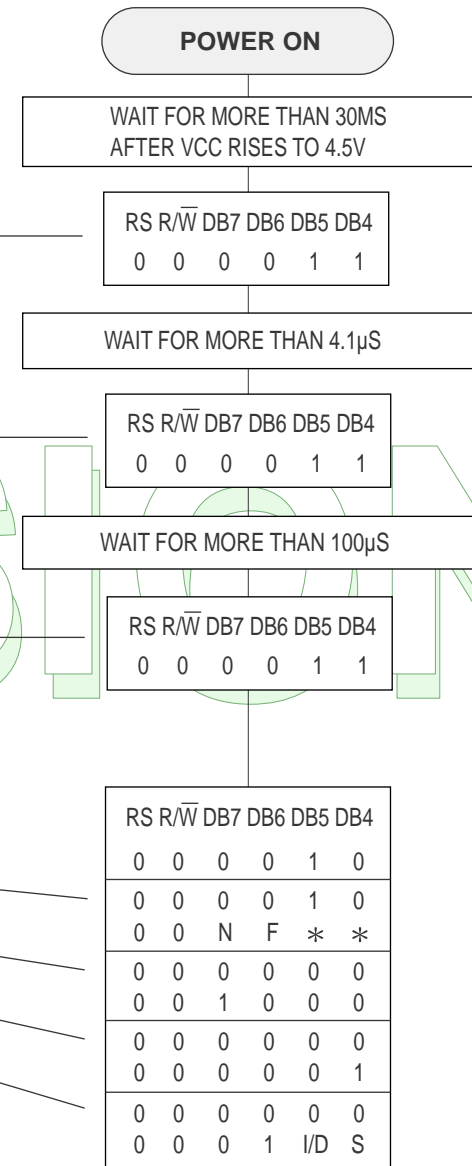


FIGURE2: 4-BIT INTERFACE

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