DATA SHEET

GPL08A5

LOW VOLTAGE 4KB LCD CONTROLLER

MAR. 23, 2007

Version 1.1

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LOW VOLTAGE 4KB LCD CONTROLLER

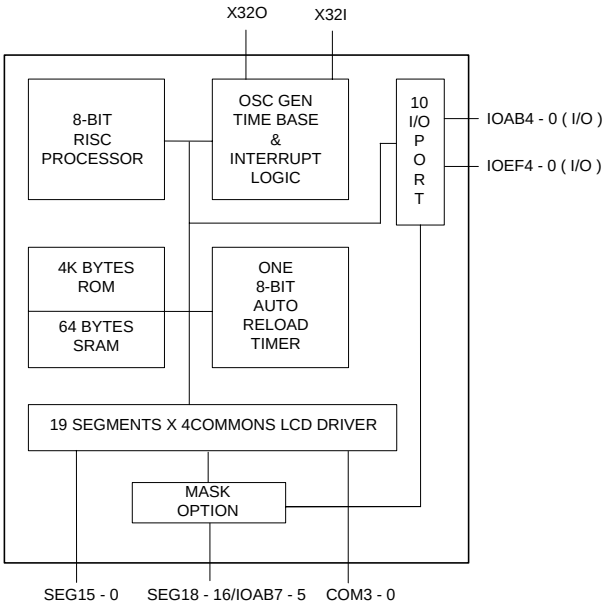
1. GENERAL DESCRIPTION

The GPL08A5, a CMOS 8-bit single chip microprocessor, is designed for low power applications. With only one battery (1.5V), it is capable of processing remarkable LCD graphics. By using advanced technology and mechanism, it contains RAM, ROM, I/Os, an interrupt controller, and an automatic display controller/driver for LCD. In the GPL08A5, a software controllable standby switch is built-in to save the power. It is very suitable for LCD type hand-held products.

2. FEATURES

- Built-in 8-bit RISC processor
- 64-byte SRAM
- 4K-byte ROM
- CPU frequency: 0.3 and 0.55MHz @ 1.5V (code option) (dependent VDD)
- Built-in RC oscillator
- Built-in 32.768KHz oscillator circuit for real clock function
- Watch dog mode (1Hz or 0.5Hz)
- One 8-bit timer
- Low operating voltage: 1.2V - 1.7V
- Rather low standby current
  In standby mode: I_{STBY} < 1μA
- LCD matrix: 19 - 16 segments, 4 commons
- 10 general I/O pins (segment 16, 17, 18 can be defined as I/O)
- LCD 1/2, 1/3 bias, 1/2, 1/3, 1/4 duty
- Provides 5 INT sources
- Power down mode
  (Wake-up source: key input, 2Hz, 16Hz, timer)

3. BLOCK DIAGRAM



Note: SEG18 - 16 can be mask option for IOAB7 - 5. The mask option can be defined as one I/O for one segment.

4. SIGNAL DESCRIPTIONS

Mnemonic	PIN No.	Type	Description
SEG18 - 15 SEG14 - 4 SEG3 - 0	27 - 24 22 - 12 10 - 7	O	LCD driver segment output. SEG18 - 6 can be mask option for IOAB7 - 5.
COM3 - 2 COM1 - 0	42 - 43 1 - 2	O	LCD driver common output.
IOAB4 - 0	32 - 28	I/O	I/O port.
IOEF4 - 0	33 - 37	I/O	I/O port (also for key wake input).
RESET	40	I	System reset input.
X32I	38	I	32.768KHz crystal input (provide LCD frequency).
X32O	39	O	32.768KHz crystal output.
TEST	41	I	Test input.
VDD	11	I	Power input.
VSS	23	I	Ground input.
V3 V45	3 4	I	Inputs for setting LCD bias.
CUP1 CUP2	5 6	I	Inputs for setting LCD bias.

5. FUNCTIONAL DESCRIPTIONS

5.1. ROM Area

The GPL08A5 provides 4K-byte ROM with a LCD driver which is capable to control 4 commons and 19 segments. (Basically, the available ROM for users is 3.75K bytes, the other 0.25K byte of ROM is for test program.)

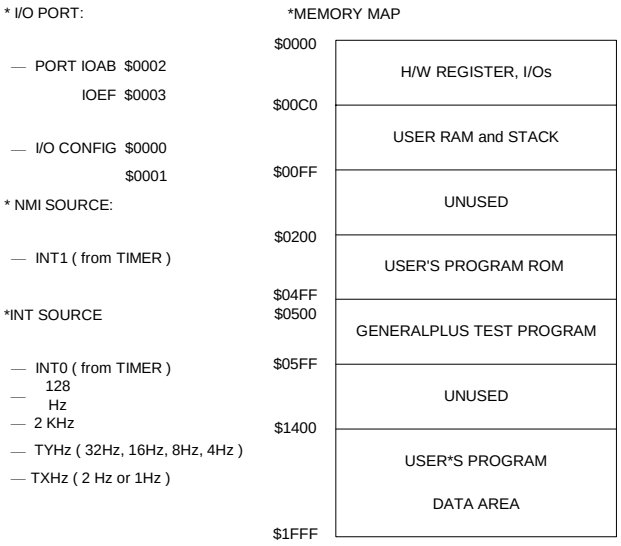
5.2. Stop Clock Mode

The GPL08A5 provides a power saving mode for those applications required very low stand-by current. Users can simply enable the wake-up sources to stop the CPU clock by writing the STOP CLOCK Register ($09). Thus CPU will go to stand-by mode and the RAM and I/Os remains in their previous states until being woken up. There are three wake-up sources in the GPL08A5, Port IOEF wake-up, TIMER wake-up, and 2 Hz or 16Hz wake-up. After the GPL08A5 is woken up, the internal CPU will go to the next state of Sleep. Wake-up action will not affect RAM and I/Os.

5.3. LCD Controller

The GPL08A5 contains a LCD driver which is capable to control 4 commons and 19 segments. In normal operation, the segments send data to LCD port from RAM buffer, and segment 16, 17, 18 can be used as I/O port. The LCD driver of the GPL08A5 is designed to fit most LCD specifications. It can either be programmed as 1/2 or 1/3 bias. The duty is also programmable as 1/2, 1/3 or 1/4 duty.

5.4. Map of Memory and I/Os



5.5. Timer/Counter

The GPL08A5 contains an 8-bit timer. In the timer mode, TMA is a re-loadable up-counter. The timer will automatically be reloaded to the user's preset value and up count again.

The clock source of the timer can be selected as the following:

Timer/Counter		Addr.	Clock Source
TMA	8-BIT TIMER	$0025	CPU CLOCK (T) or CLK32K (32768Hz or CPU clock / 8)

6. ELECTRICAL SPECIFICATIONS

6.1. Absolute Maximum Ratings

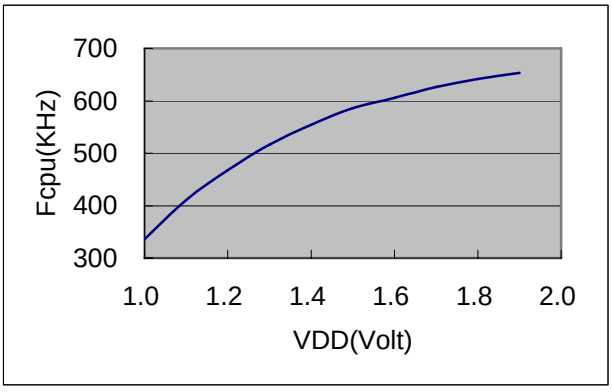
Characteristics	Symbol	Ratings
DC Supply Voltage	V_+	< 1.7V
Input Voltage Range	V_{IN}	-0.5V to V_+ + 0.5V
Operating Temperature	T_A	0℃ to +60℃
Storage Temperature	T_{STO}	-50℃ to +150℃

Note: Stresses beyond those given in the Absolute Maximum Rating table may cause operational errors or damage to the device. For normal operational conditions see AC/DC Electrical Characteristics.

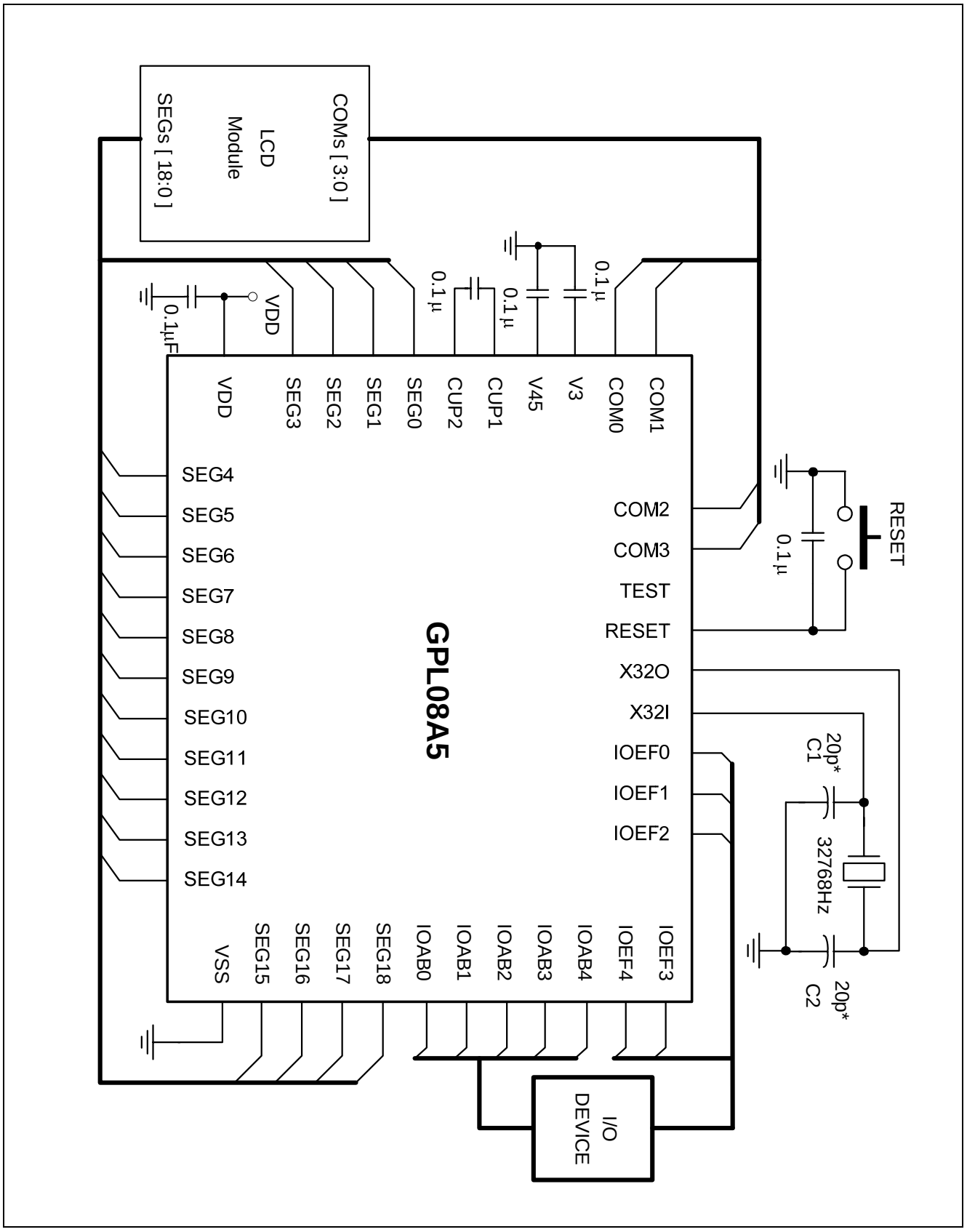
6.2. DC Characteristics

Characteristics	Symbol	Limit			Unit	Test Condition
		Min.	Typ.	Max.		
Operating Voltage	VDD	1.2	-	1.7	V	-
Halt Current 1	I_{HALT1}	-	3.0	-	μA	F_{CPU} = 0.3MHz @ 1.5V No load use 32768Hz crystal
Halt Current 2	I_{HALT2}	-	16	-	μA	F_{CPU} = 0.3MHz @ 1.5V No load no use 32768Hz crystal
Operating Current	I_{OP}	-	45	-	μA	F_{CPU} = 0.3MHz @ 1.5V, no load
Standby Current	I_{STBY}	-	-	1.0	μA	VDD = 1.5V, 32768 Hz OFF
Input High Level	V_{IH}	1.1	-	-	V	VDD = 1.5V
Input Low Level	V_{IL}	-	-	0.5	V	VDD = 1.5V
Output High Current (I/O)	I_{OH}	-	-1.0	-	mA	VDD = 1.5V V_{OH} = 1.0V
Output Sink Current (I/O)	I_{OL}	-	2.5	-	mA	VDD = 1.5V V_{OL} = 0.5V
CPU Clock	F_{CPU}	-	0.3	-	MHz	0.3, 0.55 MHz by code option VDD = 1.5V
		-	0.55	-		

6.2.1. The relationships between the F_{CPU} and the VDD



7. APPLICATION CIRCUIT

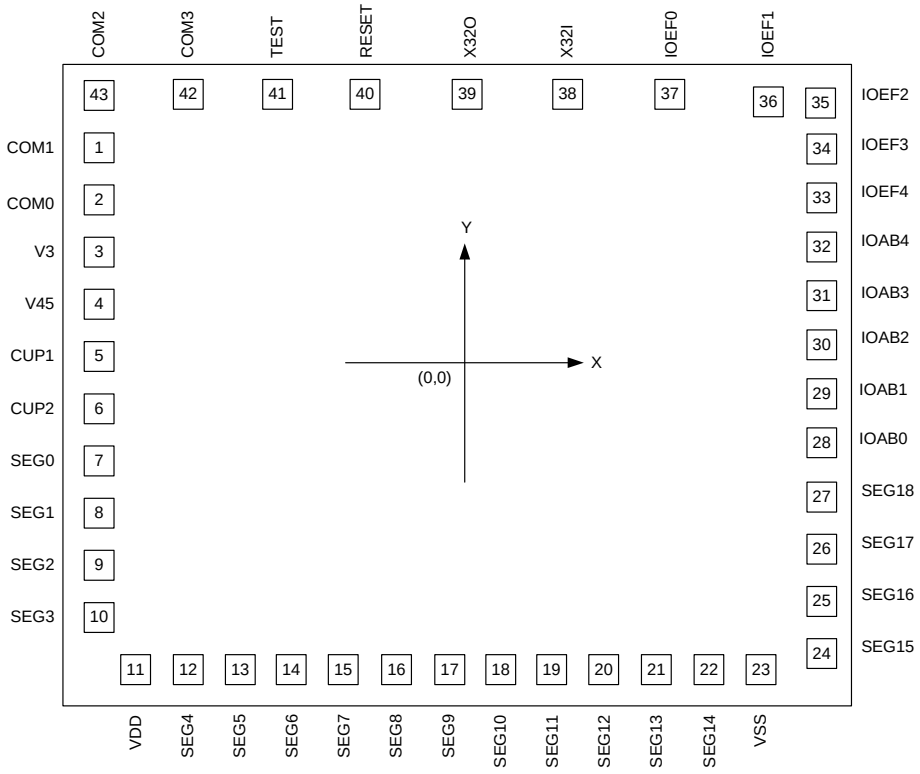


Note: The 0.1µF capacitor between VDD and VSS should be placed to IC as close as possible.

Note*: C1/C2 values in above application circuit are for design guidance only. Different capacitor values may be required for different crystal used. Usually, the values of C1/C2 are in the range 12~20pF.

8. PACKAGE/PAD LOCATIONS

8.1. PAD Assignment



This IC substrate should be connected to VSS

Note: The 0.1μF capacitor between VDD and VSS should be placed to IC as close as possible.

8.2. Ordering Information

Product Number	Package Type
GPL08A5 - NnnV - C	Chip form

Note1: Code number is assigned for customer.

Note2: Code number (N = A - Z or 0 - 9, nn = 00 - 99); version (V = A - Z).

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10. REVISION HISTORY

Date	Revision #	Description	Page
MAR. 23, 2007	1.1	1. 2. FEATURES, CPU frequency: 0.15, 0.3 and 0.5MHz@ 1.5V…->delete 0.15. 2. Delete OSC Frequency in section 6.2. DC Characteristics. 3. Modify CPU Clock values in section 6.2. DC Characteristics. 4. Modify APPLICATION CIRCUIT in section 7.	3 6 6 7
MAR. 06, 2006	1.0	Original	8