MLC852A

8-Bit micro-controller with 1120 dots LCD driver

Features

- Single chip 8-bit micro-controller
- Operating voltage: 2.4V to 5.5V
- Memory :
  - Program ROM: 64K Bytes
  - Data RAM (stack RAM included) : 3328 Bytes (0000h ~ 0CFFh)
  - LCD RAM : 144 Bytes
- 20 input/output pins:
  - Dedicated I/O pins: P0[0:3]
  - Share pin I/O:
    - P0[4]/SEG[69]
    - P0[5:7]/SEG[66:64]
    - P1[0:1]/UART(TX, RX)
    - P2[0:7]/SEG[63:56]
    - P3[0:1]/SEG[68:67]/(SDIO, SCLK)
- Half duplex UART function
- Build-in Megawin e-flash interface
- Dedicated SPK pin for tone/DAC
- LCD driver output:
  - Max 70 segment × 16 common
  - 1/16 duty 1/5 bias driving mode
  - Build-in voltage regulator and pumper to generate LCD voltage for LCD driver
  - 10 level programmable frame rate from 56.7Hz to 113.8Hz
  - 16-level adjustable VLCD from 3.5 V to 5.75 V
- One 8-bit resolution DAC output
- Programmable sample rate for voice/melody function
- Two reloadable 8-bit timers
- Two dividers

  One 14-bit divider with the clock source from sub-oscillator to generate a 2-Hz interrupt

  One 7-bit divider with the clock source from main oscillator
- Build-in dual oscillation circuit:
  - Ring oscillator up to
    5MHz at 3.6V – 5.5V
    4MHZ at 2.4V – 3.4V
    for main oscillator (Fosc)
  - 32768Hz crystal oscillator for sub-oscillator (F_{x32})
- Build-in 8-level battery-low detector circuit

2003/09 version_A3
MEGAWIN

General Description

MLC852A is a cost effective, high performance 8-bit micro-controller of MEGAWIN. It integrates an 8-bit pipeline CPU core, 64KB ROM, 3328B RAM, two 8-bit timers, 1120 dots LCD driver, 20 I/O pins and other system control circuits into a single chip. MLC852A build in an UART interface circuit, which could be used to system link with other devices. An e-flash interface is useful for the external memory application. The MLC852A provides a build-in oscillator as clock source. It is suitable for data bank product, hand-held game, toy controllers and other products' applications.

PAD Description

PAD Name	I/O	Description
P0.0 ~ P0.3	I/O	Programmable I/O ports with interrupt function P0.4 share with DAC/tone output
SPK	O	Tone/DAC output
P1.0 ~ P1.1/(TX, RX)	I/O	1. Port 1 bit0 ~ bit1 2. UART interface
GND, VDD	P	Power pins
OSCI	I	Ring oscillator input pin. Connect to external resistor
X32I	I	32768 Hz crystal input
X32O	O	32768 Hz crystal output
/RES	I	System reset pin (low active)
COM0 ~ COM15	O	LCD common signals output pins
SEG0 ~ SEG56	O	LCD segment signals output pins
SEG69	I/O	1. LCD segment signals output pins 2. Port 0 bit4
SEG56 ~ SEG63/P2.7 ~ P2.0	I/O	1. LCD segment signals output pins 2. Port 2 bit0 ~ bit7
SEG68 ~ SEG67/(SDIO, SCLK)/P3.0 ~P3.1	I/O	1. LCD segment signals output pins 2. e_Flash interface 3. Port 3 bit0 ~ bit1
SEG66 ~ SEG64/P0.5 ~P0.7	I/O	1. LCD segment signals output pins 2. Port 0 bit5 ~ bit7
VLCD, V1 ~ V4	O	Outputs for VLCD bias
CUP1 – CUP4	O	Charge pump capacitor interconnection pins

Total 108 pins

Absolute Maximum Rating

PARAMETER	RATING	UNIT
Supply Voltage to Ground Potential	-0.3 to +5.0	V
Applied Input / Output Voltage	-0.3 to +5.0	V
Power Dissipation	60	mW
Ambient Operating Temperature	0 to +70	°C
Storage Temperature	-55 to +150	°C

Note: Exposure to conditions beyond those listed under Absolute Maximum Ratings may adversely affect the life and reliability of the device.

DC Characteristics

(V_{DD}-V_{SS} =3 V, F_{OSC} = 4MHz, Ta = 25° C; unless otherwise specified)

PARAMETER	SYM.	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Op. Voltage	V_{DD}	-	2.4	-	5.5	V
Op. Current	I_{OP1}	Normal mode Main clock: 4Mhz sub clock: 32768 Hz CPU clock: 1Mhz LCD on no load VDD = 3V	-	0.6		mA
	I_{OP2}	Halt mode Main clock: off Sub clock: 32768 Hz CPU off LCD on no load VDD = 3V		25		uA
	I_{OP3}	Main clock: off Sub clock: 32768 Hz LCD off 2Hz on VDD = 3V		3		uA
Standby Current	I_{STB}	No load	-	1	3	μA
DAC output driving current	I_{DAC}	DAC_DRV = 00H	-	1.9	-	mA
		DAC_DRV = 01H	-	2.6	-	
		DAC_DRV = 02H	-	3.8	-	
		DAC_DRV = 03H	-	5.0	-	
Input High Voltage	V_{IH}	-	0.8 V_{DD}	-	V_{DD}	V
Input Low Voltage	V_{IL}	-	0	-	0.4	V
Battery-low Indicate Voltage	V_{BL1}	BL_CR.4=0, (BL_CR.3, BL_CR.2, BL_CR.1 = 111)	2.61	2.9	3.19	V
	V_{BL2}	BL_CR.4=1, (BL_CR.3, BL_CR.2, BL_CR.1 = 111)	3.92	4.35	4.79	
Port 0, 1, 2, 3 drive current	I_{OH}	V_{OH} = 3.6V, V_{DD} = 4.5V	-	1.8	-	mA
Port 0, 1, 2, 3 sink current	I_{OL0}	V_{OL} = 0.4V, V_{DD} = 4.5V	-	3.0	-	mA
SEG0 ~ SEG69 drive current	I_{OH1}	V_{OH} = 2.4V, V_{LCD} = 3.0V	0.3	-	-	μA
SEG0 ~ SEG69 sink current	I_{OL1}	V_{OL} = 0.4V, V_{LCD} = 0.0V	0.4	-	-	μA
Internal Pull-high Resistor for port p0.0~0.3/ p1/p2/p3	R_{PH1}	V_{IL} = 0V		50K		Ω
	R_{PH2}	V_{IL} = 0V		250K		
Internal Pull-high Resistor for port p0.4~0.7	R_{PH1}	V_{IL} = 0V		60K		Ω
	R_{PH2}	V_{IL} = 0V		400K		

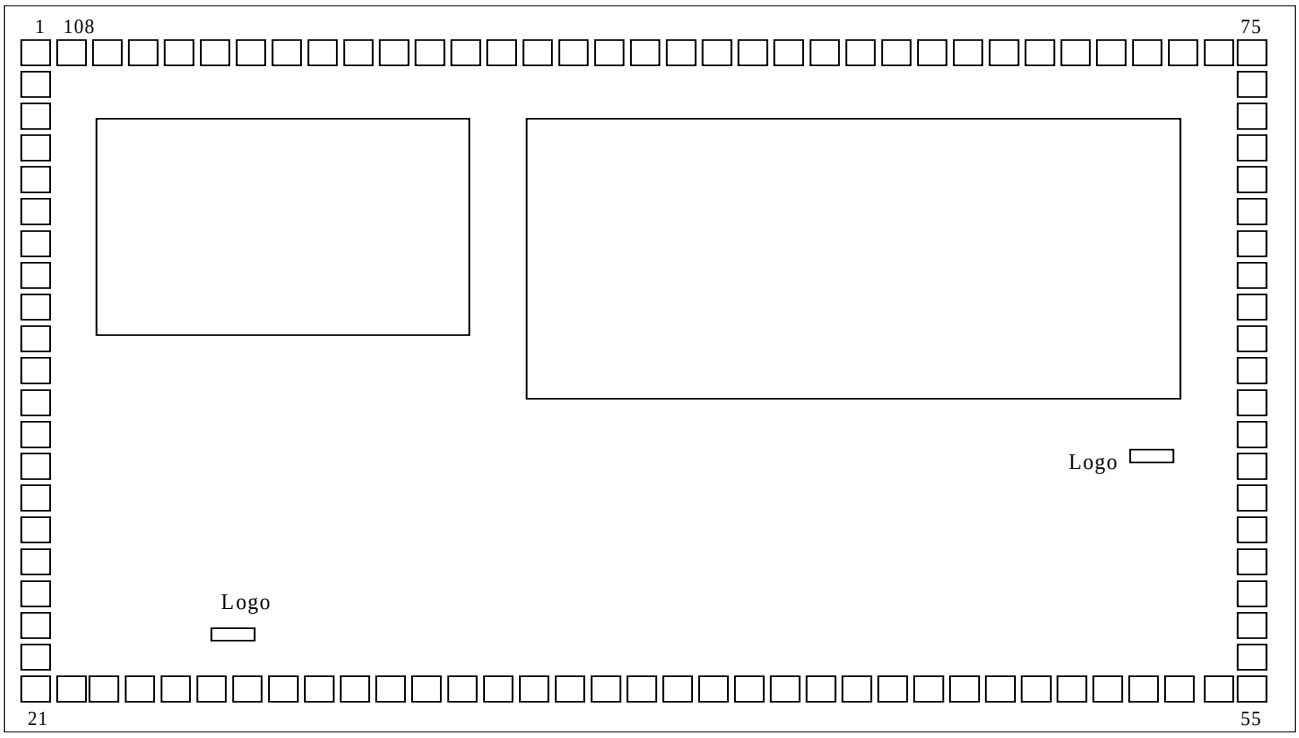
Note: SEG68/SEG67 == SDIO/SCLK == P3.0/P3.1

AC Characteristics

(Ta = 25° C; unless otherwise specified)

PARAMETER	SYM.	CONDITIONS	MIN.	TYP.	MAX.	UNIT
CPU Op. Frequency	F_{CPU}	R, V_{DD} = 3.6V	1	5	-	MHz
Frequency Deviation by Voltage Drop for RC Oscillator	$\frac{\Delta f}{f}$	$\frac{f(4.5V) - f(3.9V)}{f(4.5V)}$	-	7	10	%
POR duration	T_{POR}	F_{OSC} = 6 MHz	10	15	50	mS

Pad Assignment



1	SEG8	15	COM10	29	CUP4	43	P0.2	57	SEG60	71	SEG46	85	SEG32	99	SEG18
2	SEG7	16	COM9	30	V1	44	P0.1	58	SEG59	72	SEG45	86	SEG31	100	SEG17
3	SEG6	17	COM8	31	V2	45	P0.0	59	SEG58	73	SEG44	87	SEG30	101	SEG16
4	SEG5	18	COM7	32	V3	46	P1.1	60	SEG57	74	SEG43	88	SEG29	102	SEG15
5	SEG4	19	COM6	33	V4	47	P1.0	61	SEG56	75	SEG42	89	SEG28	103	SEG14
6	SEG3	20	COM5	34	VLCD	48	SEG69	62	SEG55	76	SEG41	90	SEG27	104	SEG13
7	SEG2	21	COM4	35	VDD	49	SEG68	63	SEG54	77	SEG40	91	SEG26	105	SEG12
8	SEG1	22	COM3	36	X32O	50	SEG67	64	SEG53	78	SEG39	92	SEG25	106	SEG11
9	SEG0	23	COM2	37	X32I	51	SEG66	65	SEG52	79	SEG38	93	SEG24	107	SEG10
10	COM15	24	COM1	38	/RES	52	SEG65	66	SEG51	80	SEG37	94	SEG23	108	SEG9
11	COM14	25	COM0	39	OSCI	53	SEG64	67	SEG50	81	SEG36	95	SEG22		
12	COM13	26	CUP1	40	VSS	54	SEG63	68	SEG49	82	SEG35	96	SEG21		
13	COM12	27	CUP2	41	SPK	55	SEG62	69	SEG48	83	SEG34	97	SEG20		
14	COM11	28	CUP3	42	P0.3	56	SEG61	70	SEG47	84	SEG33	98	SEG19		