

LSI

LS3102

Simple LCD micro-controller

Features :

- * 8 Input pad, 4 I/O, 2 output pad
- * EL driver output.
- * Direct drive buzzer output.
- * 1024x12 bit ROM
- * 73x4 bit of RAM.
- * 28x2, x3, or x4 LCD segment mask option
- * 8 bit tone generator.
- * 4 bit event counter.
- * 12 (of 28 segment) output mask option
- * 32768 Crystal/RC oscillator bonding option
- * Single 3.0V operation.
- * Low cost and low price.

General Description

The LS3102 is a simple micro-controller for LCD application. It has an internal ROM size of 1Kx12bit. A total of 73x4 bit RAM. LCD can be configured to be 1/2, 1/3, 1/4 duty mask option. A total of 28 segment PAD can be configured to be 28x2, 28x3 or 16x4 + 12x3 LCD segment. LCD bias is 1/2. Segment pad S17-S28 can be configured as output pad by mask option. The LS3102 integrates a 8 bit counter for tone/music generation. It also integrates a 4 bit event counter for recording external triggers. It has a total of 8 input pad, 4 I/O pad and 2 output pad. The output pad can be configured to be EL driver output by mask option. It has low power consumption.

Functional Description

1. RC Oscillator /Crystal

The LS3102 can use either a crystal oscillator or RC oscillator to provide the internal timing by mask option.

2. Program ROM

The LSI3102 has internal 1Kx12 bit ROM providing simple operation. It has four internal stack.

3. Interrupt Control

The LSI3102 has 5 different sources of interrupt, namely, POWERUP, F4HZ, F16HZA, F16HZS and F1HZ. The starting address of the interrupt are as follow :

Interrupt	Address
POWERUP	0x3ff
F1HZ	0x3fe
F4HZ	0x3fc
F16HZA	0x3f8
F16HZS	0x3f1

The system generates 16 interrupts for F16HZS in one second but only 11 interrupts for F16HZA. The other 5 interrupts goes to F4HZ (4) and F1HZ (1) interrupts.

3. RAM

The system has 73x4bit of program RAM with IO address as follows.

Address	Description	Initialize
0-0fH	RAM	undefined
10H-1fH	Display RAM	undefined
20-2fH	RAM	undefined
30H	rptrl	undefined
31H	rptrh	undefined
32H	rptrl	undefined
33H	Beep Control	0
34H-3fH	RAM	Undefined
54H-56H	Display RAM	Undefined
58H-5AH	Display RAM	Undefined
5CH-5EH	Display RAM	Undefined
70H	Tone Data Low	Undefined
71H	Tone Data High	Undefined
72H	Tone Control Register	0
73H	IOX Register	0

Address 31H:30H forms a 8 bit address for indirect read/write operation.

Address 32H:30H forms a 8 bit address for indirect read/write operation.

4. Buzzer Control/Tone Generator Control

The system can output 4khz/2khz alarm signal by mask option. The alarm signal is enabled to the output B0, B1 when the Beep Control Register: Bit[0] is high.

Tone Control Registers (70H – 72H) is used to control the Tone Generator to generate music tone signal at the buzzer output pad B0, B1.

5. LCD driver

The system has 16 LCD segment pad with 2/3/4 common pads (mask option) providing 28x2, 28x3 or 16x4 + 12 x3 LCD segment output.

The LCD segment table is shown below :

	COM 1	COM2	COM3	COM4
SEG[1:4]	1CH:D[0:3]	18H:D[0:3]	14H:D[0:3]	10H:D[0:3]
SEG[5:8]	1DH:D[0:3]	19H:D[0:3]	15H:D[0:3]	11H:D[0:3]
SEG[9:12]	1EH:D[0:3]	1AH:D[0:3]	16H:D[0:3]	12H:D[0:3]
SEG[13:16]	1FH:D[0:3]	1BH:D[0:3]	17H:D[0:3]	13H:D[0:3]
SEG[17:20]	5CH:D[0:3]	58H:D[0:3]	54H:D[0:3]	Not implemented
SEG[21:24]	5DH:D[0:3]	59H:D[0:3]	55H:D[0:3]	Not implemented
SEG[25:28]	5EH:D[0:3]	5AH:D[0:3]	56H:D[0:3]	Not implemented

6. EL Driver

R0, R1 can be configured as general output or E.L. output. When it is configured as E.L. output, the EL output frequency can also be mask selected as follow :

PUMP FREQUENCY, R0	A.C. FREQUENCY, R1	E.L. DUTY CYCLE
32KHZ	F512HZ	1/4
16KHZ	F256HZ	2/4
8KHZ	TONE GENERATOR CONTROL	3/4

7. Mask option

Name	description
BZ2K/4K	buzzer frequency
BZ[0], BZ[1]	buzzer control
FSYSPRB	Power Up Control

Pin Assignment

DESIGNATION	TYPE	DESCRIPTION
B [0:1]	OUTPUT	Buzzer output
VC1, VC2	OUTPUT	Halfer output
VEE	OUTPUT	Halfer voltage
T2, T1	INPUT (PL)	TEST pin
OO	OUTPUT	oscillator output
OI	INPUT	oscillator input
VDD	POWER	+3.0V power supply
GND	POWER	Ground
I[0:7]	INPUT(PL)	Input key/option
IO[0:3]	INPUT(PH)/OUTPUT	Input /Output.
R[0:1]	OUTPUT	Output /EL output
C[1:4]	OUTPUT	LCD Common output
S[1:28]	OUTPUT	LCD Segment output

Note: (PL) – pull low
(PH) - pull high

Absolute Maximum Ratings

Supply voltage Vdd - Vss.....0 to 5V

Input voltage Vin.....Vss to Vdd

Operating temperature Top-10°C to 60°C

Storing temperature Tst-40°C to 70°C

***Comments**

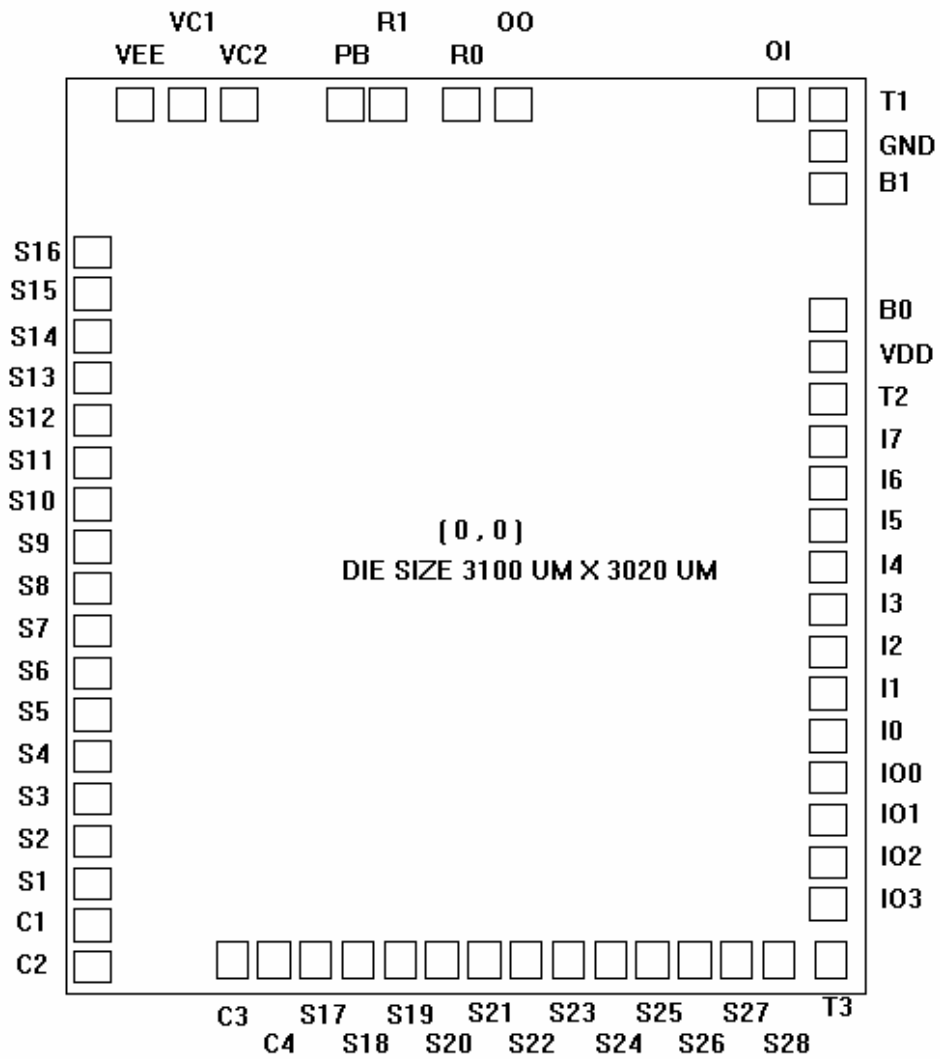
Stress above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress rating only. Functional operation of this device at these or any other conditions above those indicated in the operational sections of this specification is not implied and exposure to absolute maximum rating conditions for extended periods may affect device reliability.

D.C. Electrical Characteristics

(GND = 0V, Vdd = 3.0V, Ta = 25°C unless otherwise specified)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Supply Voltage	Vdd	2.5	3.0	3.6	V	
Operating current	Idd	-	3	6	μA	No load
OSC. built-in cap	Cd	-	20	-	pF	
OSC. trimmer cap	Ctrim	5	-	35	pF	
Buzzer output current	Ib	500	-	-	μA	Vbd-Vss=0.5
LCD frequency	Flcd	-	64	-	Hz	
Segment current	Is	0.15	-	-	μA	Vseg=0.2V
Common current	Ic	3.0	-	-	μA	Vcom=0.2V
Trigger output current	Ir	100	-	-	μA	Vr-Vss=0.5

Pad Diagram



Pad location

PAD	X(μm)	Y(μm)	PAD	X(μm)	Y(μm)
C2	-1500.0	-1500.0	GND	+1372.0	+1282.0
C1	-1500.0	-1366.0	B1	+1372.0	+1129.0
S1	-1500.0	-1232.0	B0	+1372.0	+821.0
S2	-1500.0	-1098.0	VDD	+1372.0	+676.0
S3	-1500.0	-963.0	T2	+1372.0	+538.0
S4	-1500.0	-766.0	I7	+1372.0	+368.0
S5	-1500.0	-632.0	I6	+1372.0	+220.0
S6	-1500.0	-434.0	I5	+1372.0	+72.0
S7	-1500.0	-300.0	I4	+1372.0	-75.0
S8	-1500.0	-102.0	I3	+1372.0	-224.0
S9	-1500.0	+31.0	I2	+1372.0	-371.0
S10	-1500.0	+229.0	I1	+1372.0	-519.0
S11	-1500.0	+363.0	I0	+1372.0	-667.0
S12	-1500.0	+561.0	IO0	+1372.0	-830.0
S13	-1500.0	+695.0	IO1	+1372.0	-979.0
S14	-1500.0	+892.0	IO2	+1372.0	-1127.0
S15	-1500.0	+1027.0	IO3	+1372.0	-1276.0
S16	-1500.0	+1224.0	T3	+1343.0	-1510.0
VEE	-1322.0	+1350.0	S28	+1209.0	-1510.0
VC1	-1189.0	+350.0	S27	+1076.0	-1510.0
VC2	-1055.0	+1492.0	S26	+942.0	-1510.0
PB	-605.0	+1492.0	S25	+807.0	-1510.0
R0	-569.0	+1492.0	S24	+674.0	-1510.0
R1	-100.0	+1492.0	S23	+539.0	-1510.0
OO	+49.0	+1492.0	S22	+405.0	-1510.0
OI	+1229.0	+1482.0	S21	+271.0	-1510.0
T1	+1371.0	+1482.0	S20	+128.0	-1510.0
			S19	-70.0	-1510.0
			S18	-204.0	-1510.0
			S17	-401.0	-1510.0
			C4	-536.0	-1510.0
			C4	-734.0	-1510.0

APPLICATION CIRCUIT

