

# LSI

# LS3201

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*84 dot LCD micro-controller*

## **Features :**

- \* 8 Input, 4 I/O pad
- \* Direct drive buzzer output.
- \* 2048x12 bit ROM
- \* 80x4 bit of RAM.
- \* 28x2, x3 LCD segment
- \* 8 bit event counter/Tone Generator.
- \* 1/2 bias, 1/3 duty LCD format
- \* 32768 Crystal/RC oscillator bonding option
- \* Single 3.0V operation.

## **General Description**

The LSI3201 is a micro-controller for LCD timer, sport meter application. It has an internal ROM size of 2Kx12bit. A 80x4 bit of RAM. 32x2, x3 LCD segment. A 8 bit event counter to record external event. It is suitable for timer, calendar sport meter function.

**Functional Description**

## 1. RC Oscillator /Crystal

The LS3201 can use either a crystal oscillator or RC oscillator to provide the internal timing by mask option.

## 2. Program ROM

The LSI3201 has internal 2Kx12 bit ROM providing simple operation. It has four internal stack.

## 3. Interrupt Control

The LSI3201 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	0
F1HZ	1
F4HZ	2
F16HZA	3
F16HZS	4

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 80x4bit of program RAM with IO address as follows.

Address	Status	Description	Initialize
0-13H	R/W	RAM	undefined
14H-1fH	R/W	Display RAM	undefined
20-2fH	R/W	RAM	undefined
30H	R/W	rptrl	undefined
31H	R/W	rptrh	undefined
32H	R/W	rptr1h	undefined
33H	R/W	Beep Control	0
34H-3fH	R/W	RAM	Undefined
50H-53H	R/W	RAM	Undefined
54H-5fH	R/W	Display RAM	Undefined
70H	W	Tone Data Low	Undefined
70H	R	Tone Data Low Value	Undefined
71H	W	Tone Data High	Undefined
71H	R	Tone Data High Value	Undefined
72H	W	Tone Control Register	0
72H	R	Tone Status	0
73H	W	IO Register	0
73H	R	Timer 1	0
74H	W	Tone 2 Control	0
75H	W	Tone frequency control	0
76H	W	FPC Control	0
76H	R	Timer 2 Control	0
77H	W	FIO Control	

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.

Address 1H:0H forms a 8bit address for indirect read/write operation for pointer read/write.

Address 3H:2H forms a 8bit address for indirect read/write operation for pointer1 read/write.

Indirect address is specified, for example, as rINC #op

Indirect Operand (#op)	Resulting address
#0	RptrH.RptrL
#1	Rpt1H.RptrL

#### 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 BD[0:1] 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 28 LCD segment pad with 2/3/4 common pads (mask option) providing 28x2, 28x3 LCD segment output.

The LCD segment table is shown below :

	COM 1	COM2	COM3
SEG[1:4]	1CH:D[0:3]	18H:D[0:3]	14H:D[0:3]
SEG[5:8]	1DH:D[0:3]	19H:D[0:3]	15H:D[0:3]
SEG[9:12]	1EH:D[0:3]	1AH:D[0:3]	16H:D[0:3]
SEG[13:16]	1FH:D[0:3]	1BH:D[0:3]	17H:D[0:3]
SEG[17:20]	5CH:D[0:3]	58H:D[0:3]	54H:D[0:3]
SEG[21:24]	5DH:D[0:3]	59H:D[0:3]	55H:D[0:3]
SEG[25:28]	5EH:D[0:3]	5AH:D[0:3]	56H:D[0:3]

**Pin Assignment**

<b>DESIGNATION</b>	<b>TYPE</b>	<b>DESCRIPTION</b>
B [0:1]	OUTPUT	Buzzer output
F512, VCAP	OUTPUT	Halfer output
VEE	OUTPUT	Halfer voltage
T2, T1	INPUT (PL)	TEST pin
COSCO	OUTPUT	32KHz oscillator output
COSCI	INPUT	32KHz oscillator input
VDD	POWER	+1.5V power supply
GND	POWER	Ground
I[0:7]	INPUT(PH)	Input key/option
IO[0:3]	INPUT(PH)/OUTPUT	Input /Output.
R[0:1]	OUTPUT	Trigger output (r[0:1])
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**

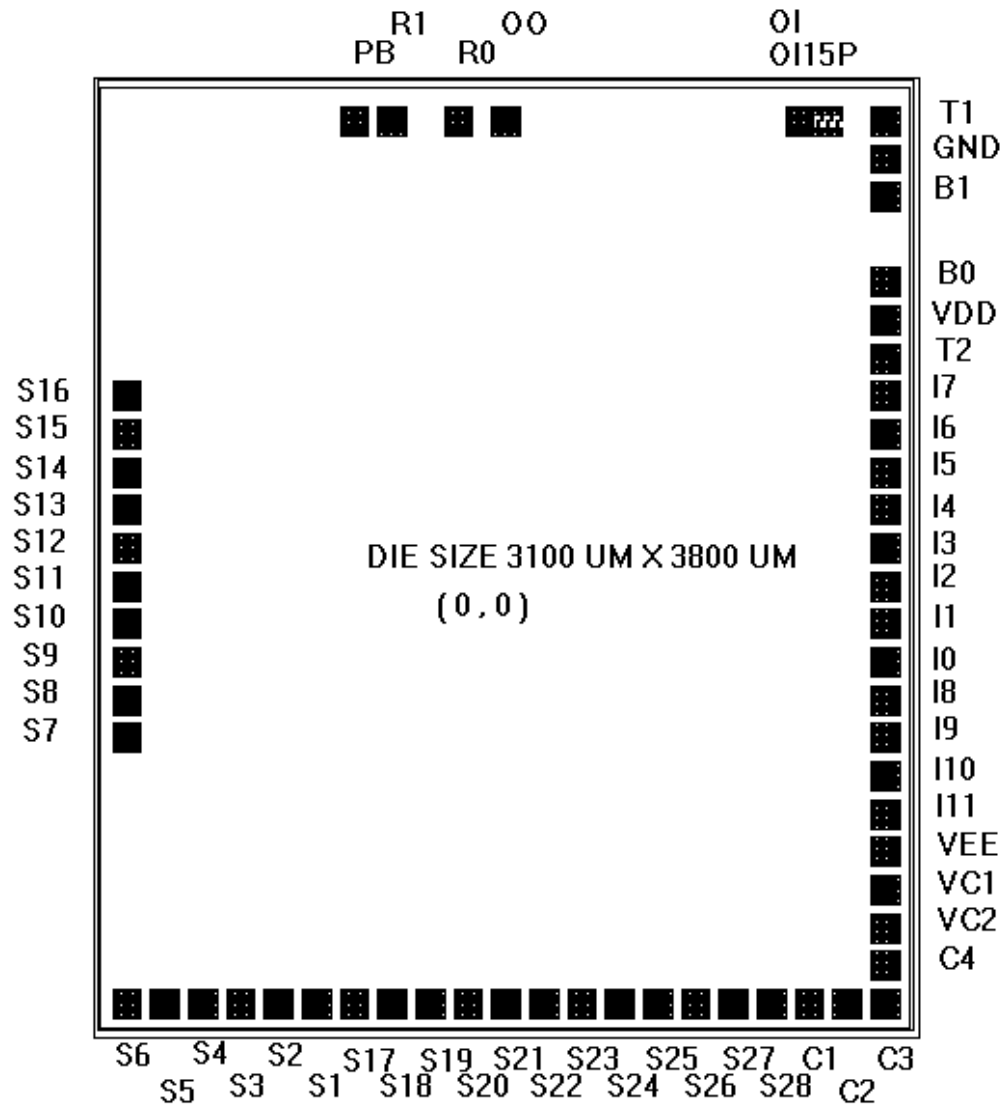
Stress above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress rating only. Functional operation of this device at these or any other conditions above those indicated in the operational sections of this specification is not implied and exposure to obsolete 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	-	4	7	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

Bonding Pad



## Pad location

PAD	X( $\mu\text{m}$ )	Y( $\mu\text{m}$ )	PAD	X( $\mu\text{m}$ )	Y( $\mu\text{m}$ )
S1	-724.8	-1853.0	GND	1387.0	1540.0
S2	-923.0	-1853.0	B1	1387.0	1383.0
S3	-1055.0	-1853.0	B0	1387.0	1074.0
S4	-1193.0	-1853.0	VDD	1387.0	932.0
S5	-1326.0	-1853.0	T2	1387.0	792.0
S6	-1462.0	-1853.0	I7	1387.0	623.0
S7	-1849.0	-228.0	I6	1387.0	473.0
S8	-1849.0	-920.0	I5	1387.0	327.0
S9	-1849.0	420.0	I4	1387.0	177.0
S10	-1849.0	174.0	I3	1387.0	310.0
S11	-1849.0	305.0	I2	1387.0	-111.0
S12	-1849.0	438.0	I1	1387.0	-264.0
S13	-1849.0	573.0	I0	1387.0	-417.0
S14	-1849.0	705.0	I8	1387.0	-576.0
S15	-1849.0	842.0	I9	1387.0	-726.0
S16	-1849.0	979.0	I10	1387.0	-857.0
PB	-590.0	1749.0	I11	1387.0	-1025.0
R0	-850.0	1749.0	VEE	1387.0	-1234.0
R1	-457.0	1749.0	VC1	1387.0	-1367.0
OO	640.0	1749.0	VC2	1387.0	-1503.0
OI	1144.0	1749.0	C4	1387.0	-1636.0
OI15P	1260.0	1749.0	C3	1343.0	-1853.0
T1	1383.0	1749.0	C2	1210.0	-1853.0
			C1	1081.0	-1853.0
			S28	948.0	-1853.0
			S27	816.0	-1853.0
			S26	684.0	-1853.0
			S25	546.0	-1853.0
			S24	412.0	-1853.0
			S23	280.0	-1853.0
			S22	146.0	-1853.0
			S21	120.0	-1853.0
			S20	-123.0	-1853.0
			S19	-258.0	-1853.0
			S18	-392.0	-1853.0
			S17	-589.0	-1853.0