

# LSI

## Preliminary specification

# LS3013

*4 LED controller*

### Features

- \* 4 LED direct drive
- \* 6 input.
- \* 256 word program control.
- \* 16 x 4 bit RAM.
- \* Low power consumption
- \* 32768 Crystal oscillator/RC oscillator
- \* 3.0V/1.5V operation.

### General Description

The LS3013 is a simple micro-controller for LED application. Internal ROM of 256x10, RAM 16x4. It has 4 direct LED output. All output can be mask option as CMOS/NMOS open drain output. Oscillator is RC or Crystal selected by mask option.

### Functional Description

#### 1. RC Oscillator /Crystal

The LS3013 can use either a crystal oscillator or RC oscillator to provide the internal timing by bonding option.

#### 2. Program ROM

The LS3013 has internal 256x12 bit ROM providing simple operation.

#### 3. Interrupt Control

The LS3013 has 5 different sources of interrupt, namely, POWERUP, F4HZ, F16HZA, F16HZA and F1HZ. The starting address of the interrupt are as follow :

Interrupt	Address
POWERUP	0xff
F1HZ	0xfe
F4HZ	0xfc
F16HZA	0xf9
F16HZA	0xf2

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

#### 3. Program RAM

The system has 16x4bit of program RAM (00H to 0fH) with IO address as follows.

Address	Description	Initialize
0-0xbh	RAM	undefined
0xch	Beep Control Register	0
0xdh	RAM	0
0xeh	S1,S2,S3,S4	0

4. LED driver

The system has 4 LED pad.

The LED pad can either be an open drain NMOS output or CMOS output by mask option.  
 Note that : writing a 1 to the above address will cause the corresponding LED to turn on (NMOS driver) thus equivalent to a low level signal on the output pad.

5. Mask option

Name	Description
FSYSPRB	Power Up Control

6. INA Address

INA ADDRESS	Description
#0	I[0-3] at D[0:3]
#1	I[4:5] at D[0:1], D[2:3] always 0

**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

**Comment**

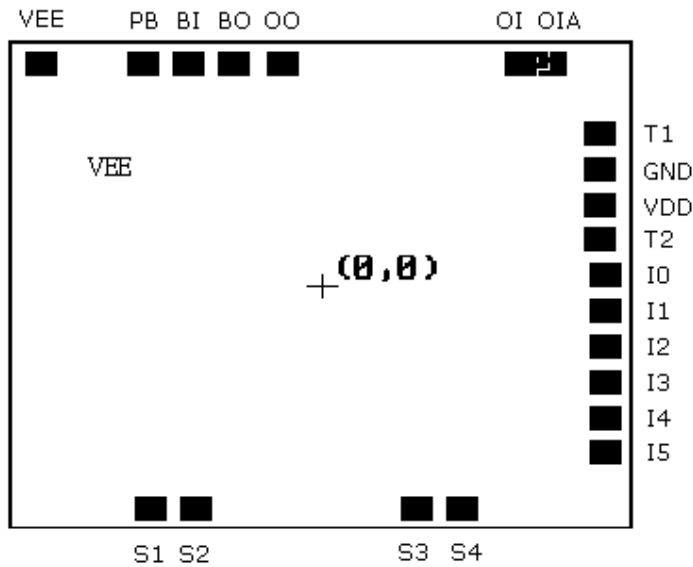
Stress above those listed under "absolute Maximum Ratings" may cause permanent damage to the device. These are stress rating only. Functional operation of this device at these or any other conditions above those indicated in the operational sections of this specification is not implied and exposure to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

**D.C. Electrical Characteristics**

(GND = 0V, Vdd = 1.5V, Ta = 25°C unless otherwise specified)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Supply Voltage	Vdd	1.2	1.5	1.8	V	
Operating current	Idd	-	2	6	μA	No load
OSC. built-in cap	Cd	-	20	-	pF	
OSC. trimmer cap	Ctrim	5	-	35	pF	
Frequency stability	$\Delta f/f$	-	-	10	ppM	Vdd=1.6-1.4
Buzzer output current	Ibd	500	-	-	μA	Vbd-Vss=0.5
LCD frequency	Flcd	-	64	-	Hz	
Segment current	Ilcd	0.15	-	-	μA	Vseg=0.2V
Common current	Icom	3.0	-	-	μA	Vcom=0.2V

### Pad Location



### Application Circuit

