General Description:

The IC is for LCD controller.It is the most cost preformance for MCU+SG1620 application.

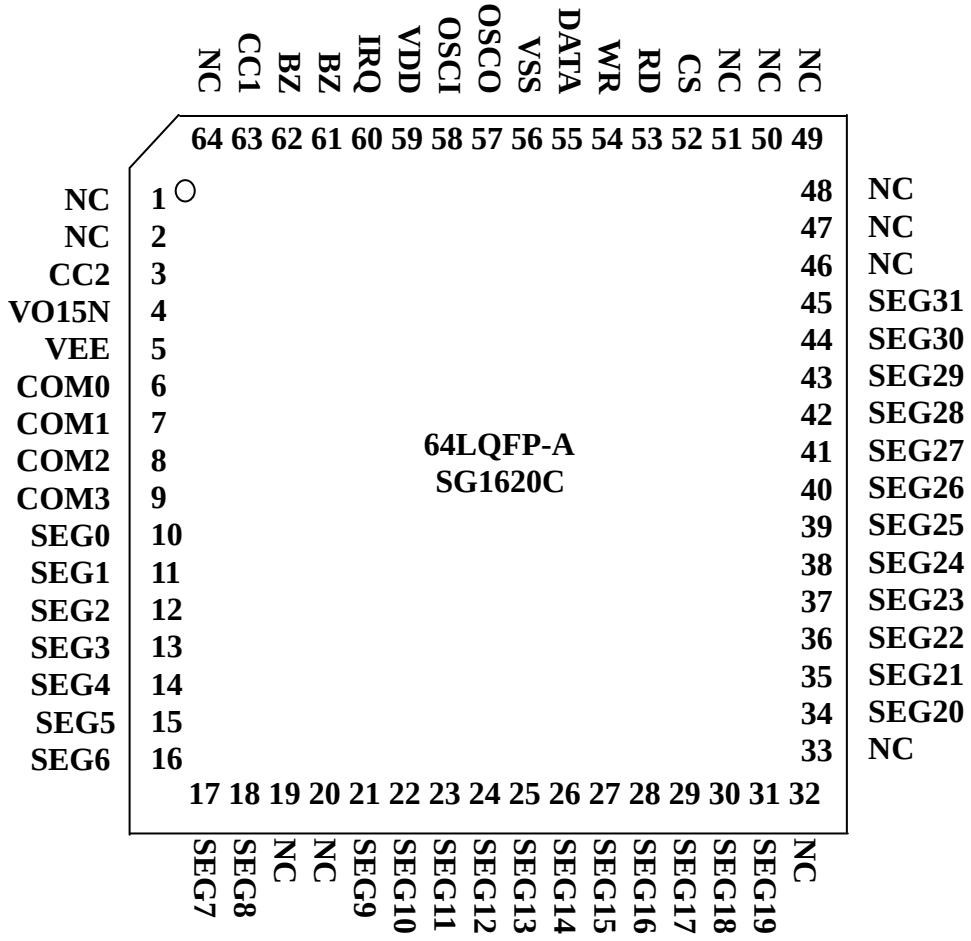
Features:

- ✧ Operating voltage 2.4V-3.3V
- ✧ System clock:- External 32768Hz crystal oscillator
- ✧ Provide 3 pins interface with MCU(RD/ WR/ DATA)
- ✧ Provide Buzzer frequency output
- ✧ Provide Time base timer and watch dog timer function
- ✧ Provide charge pump circuit
- ✧ LCD driver is 32 SEG/4 COM
- ✧ LCD duty is 1/2 duty, 1/3 duty or 1/4 duty
- ✧ LCD bias is 1/2 bias or 1/3 bias
- ✧ Provide internal reset function
- ✧ Provide 64-LQFP package , 48SSOP
- ✧ Low operating current <3uA at 3V

Application:

- LCD controller
- DVD player
- DVR player
- VCD player
- Car Display
- Instrument LCD display
- Home application LCD display
- Telecom LCD display
- MCU + LCD Driver
- LCD modul

Pin Assignments



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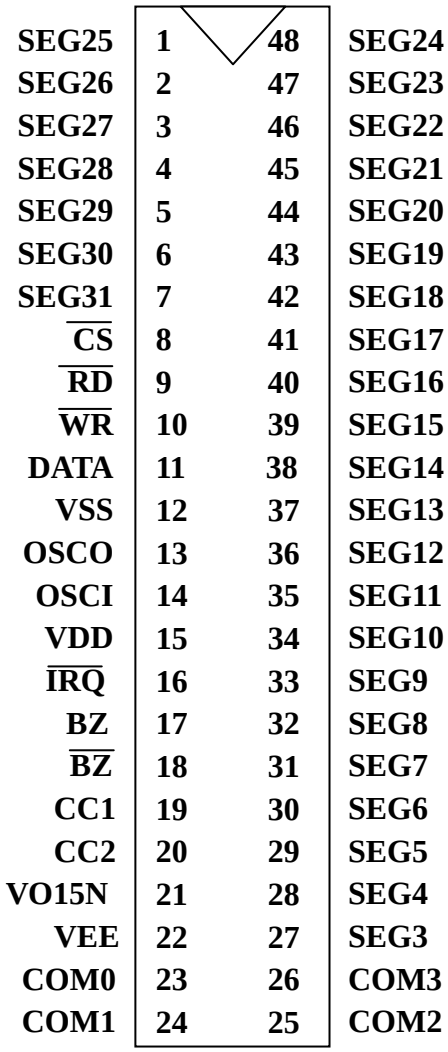
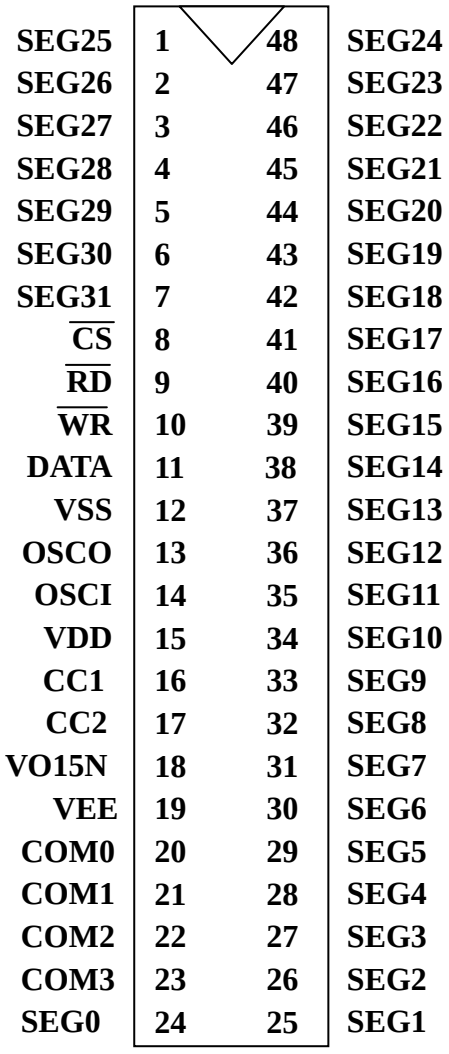


48SSOP-A
SG1620A



48SSOP-B
SG1620D

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. Pin Description

Name	I/O	Description
$\overline{RD}$	I	Interface pin,low active,with internal pull high resistor 50Kohm@3V
$\overline{WR}$	I	Interface pin,low active,with internal pull high resistor 50Kohm@3V
DATA	I/O	Interface pin,low active,with internal pull high resistor 50Kohm@3V
GND	P	Ground
VEE	-	LCD double voltage output
VDD	P	Positive power
VO15N	-	LCD half voltagr output
CC1,CC2	-	External capactor pin for charge pump circuit
COM0-COM3	O	LCD common pin
SEG31-0	O	LCD segment pin
TEST	I	No use, floating or connect to VDD
BZ/ $\overline{BZ}$	O	Buzzer frequency output
$\overline{IRQ}$	O	Timer output,NMOS open drain
OSCI	I	32768Hz crystal oscillator pin or external 256Khz clock input
OSCO	O	32768Hz crystal oscillator pin

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. AC / DC Characteristics

1 *Absolutely max. ratings*

ITEM	SYMBOL	RATING	UNIT
Operating Temperature	Top	-25℃- +75℃	℃
Storage Temperature	Tsto	-50℃- +125℃	℃
Supply Voltage	VDD	5.5	V
Voltage to input terminal	Vin	Vss-0.3 to Vdd+0.3	V

2 D.C. Characteristics

Item	Symbol	Condition		Min.	Typ.	Max.	unit
Operating voltage	VDD			2.4	-	3.3	V
Power consumption current	I_{OPR3}	3V	External Crystal oscillator on, LCD on, no load		1	3	uA
stand by current	Ist	3V	System halt, No load, oscillator off, LCD off			1	uA
Input low voltage for input pin	V_{IL1}	3V	$\overline{RD}$/ $\overline{WR}$/ DATA	0		0.6	V
Input high voltage for input pin	V_{IH1}	3V	$\overline{RD}$/ $\overline{WR}$/ DATA	2.4		3	V
BZ, $\overline{BZ}$, $\overline{IRQ}$, DATA Source Current	I_{OH}	3V	V_{OH}=2.7V		-1.6	-0.6	mA
BZ, $\overline{BZ}$,$\overline{IRQ}$, DATA Sink Current	I_{OL}	3V	V_{OL}=0.3V	0.8	1.8		mA
Segment output ‘H’	IS_{OH}	3V			-90	-30	uA
Segment output ‘L’	IS_{OL}	3V		70	115		uA
Common output ‘H’	IC_{OH}	3V			-140	-70	uA
Common output ‘L’	IC_{OL}	3V		80	145		uA
Pull-High Resistor	R_{PH}	3V	DATA , $\overline{WR}$,$\overline{RD}$,$\overline{CS}$	100	200	300	kΩ

3 A.C. Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	unit
System clock	f_{SYS}	Crystal oscillator @3v (32Khz)		32.768		KHz
LCD frame frequency	F_{LCD1}	1/2 duty		64		HZ
	F_{LCD2}	1/3 duty		85.3		
	F_{LCD3}	1/4 duty		64		
Serial interface CKWB pin	F_{WR}	@3V,Clock duty 50%			150	KHz
Serial interface CKRB pin	F_{RD}	@3V,Clock duty 50%			75	KHz

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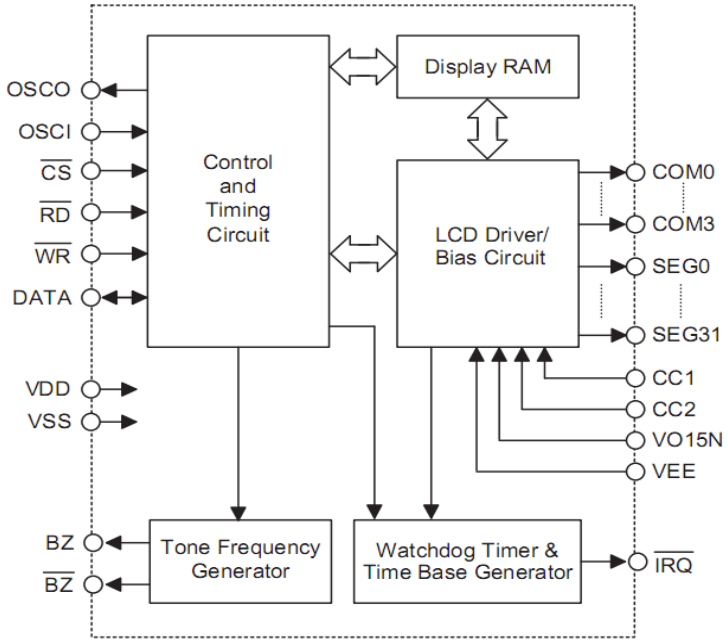
. Block Diagram



Note: CS: Chip selection
BZ, BZ: Tone outputs
WR, RD, DATA: Serial interface
COM0~COM3, SEG0~SEG31: LCD outputs
IRQ: Time base or WDT overflow output
VO15N: Half voltage circuit output pin
VEE: Double voltage circuit output pin
CC1/CC2: External capacitor pin, for double voltage and half voltage circuit use

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. Function Description

1 Control register format table

Function	Pre-code	Mode Code	Control code	
			Address	Data
Command	1	00	C7C6C5C4--C3C2C1C0--x	
Write	1	01	x-A4A3A2A1A0	B0B1B2B3
Read	1	10	x-A4A3A2A1A0	B0B1B2B3

	Function name	Control code C7C6C5C4--C3C2C1C0--x	Function description	Initial State
System initial	L2B2D	0010—00x0—x	Select 1/2 bias,1/2 duty	
	L2B3D	0010—01x0—x	Select 1/2 bias,1/3 duty	
	L2B4D	0010—10x0—x	Select 1/2 bias,1/4 duty	
	L3B2D	0010—00x1—x	Select 1/3 bias,1/2 duty	
	L3B3D	0010—01x1—x	Select 1/3 bias,1/3 duty	
	L3B4D	0010—10x1—x	Select 1/3 bias,1/4 duty	
	BZ4K	010x—xxxx—x	Select buzzer frequency is 4Khz	
	BZ2K	011x—xxxx—x	Select buzzer frequency is 2Khz	
System control	SysOff	0000—0000—x	Disable system oscillator OFF & LCD circuit OFF	V
	SysOn	0000—0001—x	Enable system oscillator ON	
	LCDoff	0000—0010—x	LCD circuit OFF	V
	LCDon	0000—0011—x	LCD circuit ON	
	BZdis	0000—1000—x	Disable Buzzer output	V
	$\overline{\text{IRQ}}$dis	100x—0xxx—x	Disable $\overline{\text{IRQ}}$ output	V
	$\overline{\text{IRQ}}$en	100x—1xxx—x	Enable $\overline{\text{IRQ}}$ output	
Others	No used	1110—0000—x	Don’t use	
	Default	1110—0011—x	Don’t use	V

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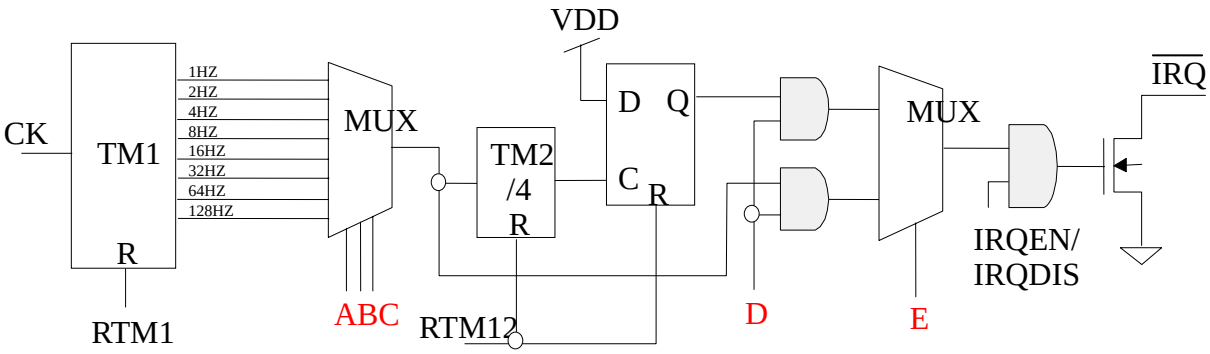
	Function name	Control code C7C6C5C4--C3C2C1C0--x	Function description		Initial State
IRQ Output control	TMS	0000—01DE—x			
		DE=00	TM1 off		
		DE=01	TM2 off		
		DE=10	TM1 on		
		DE=11	TM2 on		
	RTM1	0000—1101—x	Reset TM1 Counter		
	RTM12	0000—111x—x	Reset TM2 Counter		
	TMP	101x—0ABC—x	TM1 on (pulse output)	TM2 on (one shot output)	
		ABC=000	IRQ=1HZ	IRQ=0 after 4S	
		ABC=001	IRQ=2HZ	IRQ=0 after 2S	
		ABC=010	IRQ=4HZ	IRQ=0 after 1S	
		ABC=011	IRQ=8HZ	IRQ=0 after 500ms	
		ABC=100	IRQ=16HZ	IRQ=0 after 250ms	
		ABC=101	IRQ=32HZ	IRQ=0 after 125ms	
		ABC=110	IRQ=64HZ	IRQ=0 after 62.5ms	
		ABC=111	IRQ=128HZ	IRQ=0 after 31.25ms	

＊ IRQ output pulse width is 8 system clock(TM1) and edge output(TM2).



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2 LCD RAM Mapping

A4A3A2A1A0	COM0	COM1	COM2	COM3
	Bit0	Bit1	Bit2	Bit3
00_H	SEG0			
01_H	SEG1			
02_H	SEG2			
03_H	SEG3			
04_H	SEG4			
05_H	SEG5			
06_H	SEG6			
07_H	SEG7			
08_H	SEG8			
09_H	SEG9			
$0A_H$	SEG10			
$0B_H$	SEG11			
$0C_H$	SEG12			
$0D_H$	SEG13			
$0E_H$	SEG14			
$0F_H$	SEG15			
10_H	SEG16			
11_H	SEG17			
12_H	SEG18			
13_H	SEG19			
14_H	SEG20			
15_H	SEG21			
16_H	SEG22			
17_H	SEG23			
18_H	SEG24			
19_H	SEG25			
$1A_H$	SEG26			
$1B_H$	SEG27			
$1C_H$	SEG28			
$1D_H$	SEG29			
$1E_H$	SEG30			
$1F_H$	SEG31			

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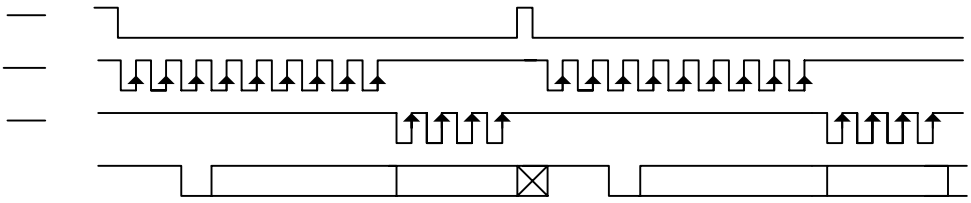
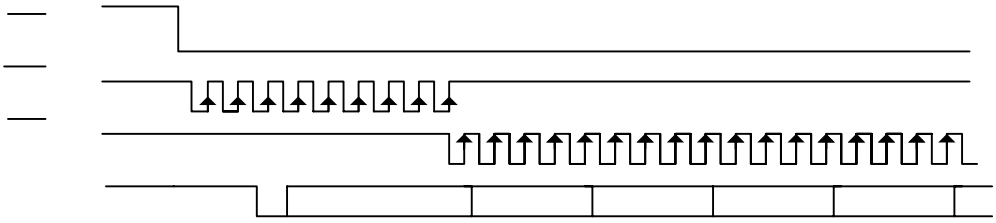
3 Serial interface format

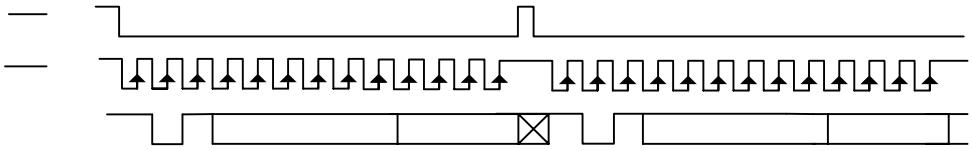
A. Read mode(Command Code:110)



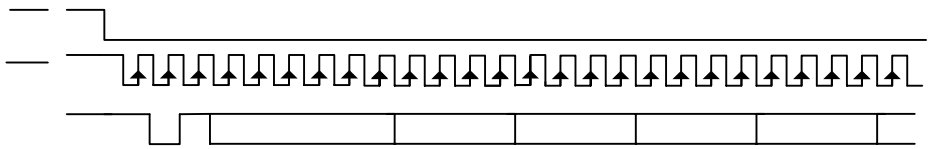
B.Read mode(Successive Address Reading)



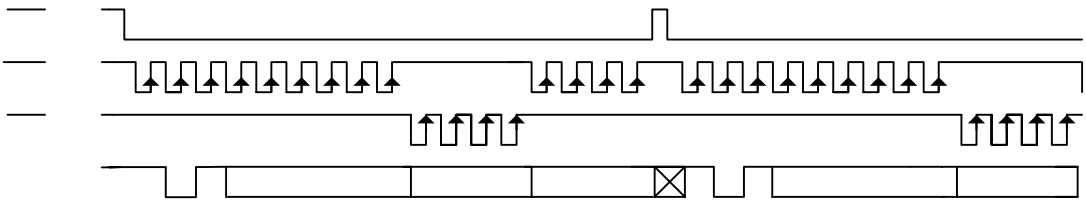
C.Write mode (Command Code:101)



D.Write mode (Successive Address Writing)



E.Read-modfy-write mode(Command Code:101)



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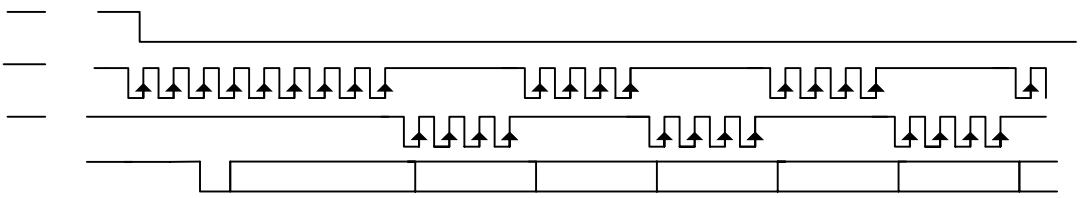
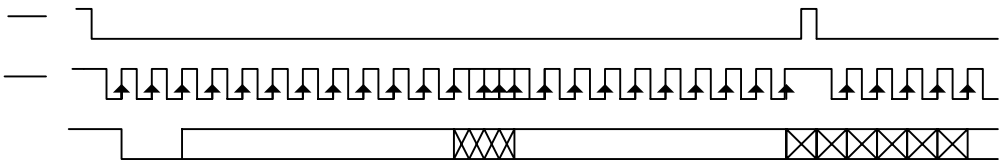
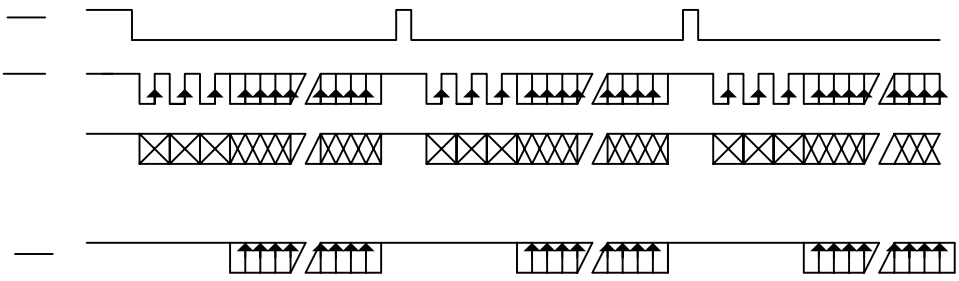
F.Read-modfy-write mode (Successive Address Accessing)



G.Command mode (Command Code:100)



H.Mode (Data and command mode)



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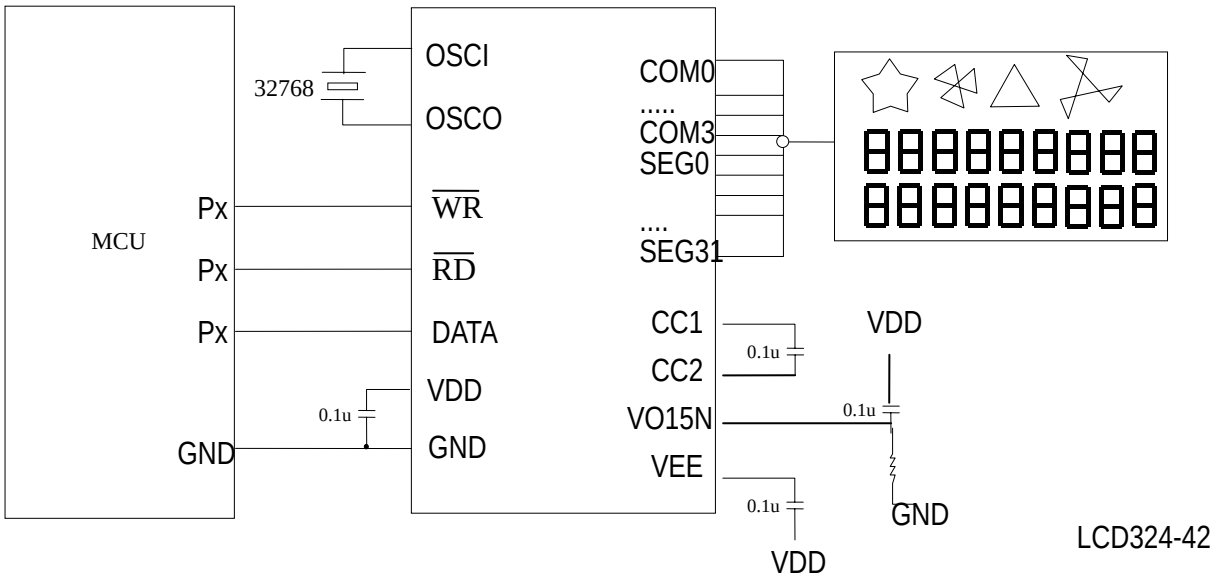
Application circuit



Application note: The 0.1uF capacitor is between VDD and GND. Its PCB layout must be very closed to SG1620 pin to be sure the anti-noise capability.

The table illustrates the suggestion value of capacities (C1, C2)

Crystal Error	Capacity Value
±10ppm	0~10p
10~20ppm	10~20p

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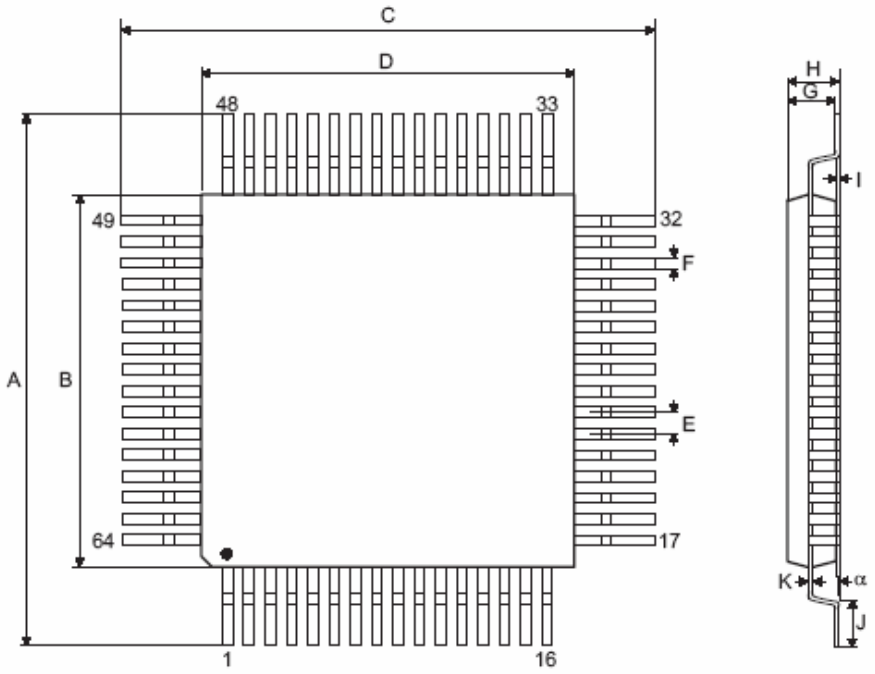
. Package Information

(64-LQFP)



Symbol	Dimensions in mm		
	Min.	Nom.	Max.
A	8.9	—	9.1
B	6.9	—	7.1
C	8.9	—	9.1
D	6.9	—	7.1
E	—	0.4	—
F	0.13		0.23
G	1.35	—	1.45
H	—	—	1.6
I	0.05	—	0.15
J	0.45	—	0.75
K	0.09	—	0.20
α	0°	—	7°

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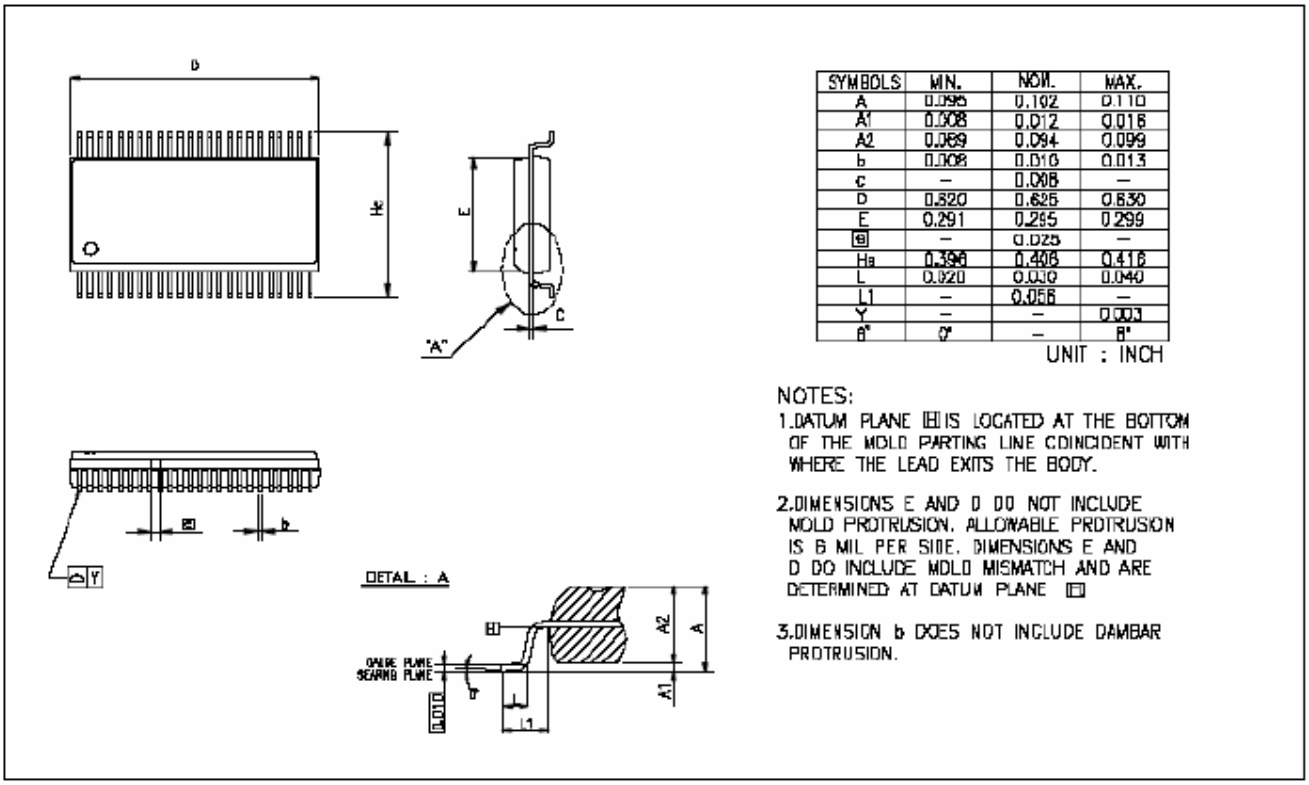
(48-SSOP)



SYMBOLS	MIN.	NOM.	MAX.
A	0.095	0.102	0.110
A1	0.008	0.012	0.016
A2	0.089	0.094	0.099
b	0.008	0.010	0.013
c	–	0.008	–
D	0.620	0.625	0.630
E	0.291	0.295	0.299
e	–	0.025	–
He	0.396	0.406	0.416
L	0.020	0.030	0.040
L1	–	0.056	–
Y	–	–	0.003
θ°	0°	–	8°

UNIT : INCH

NOTES:

1.DATUM PLANE H IS LOCATED AT THE BOTTOM OF THE MOLD PARTING LINE COINCIDENT WITH WHERE THE LEAD EXITS THE BODY.

2.DIMENSIONS E AND D DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 6 MIL PER SIDE. DIMENSIONS E AND D DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE H

3.DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION.

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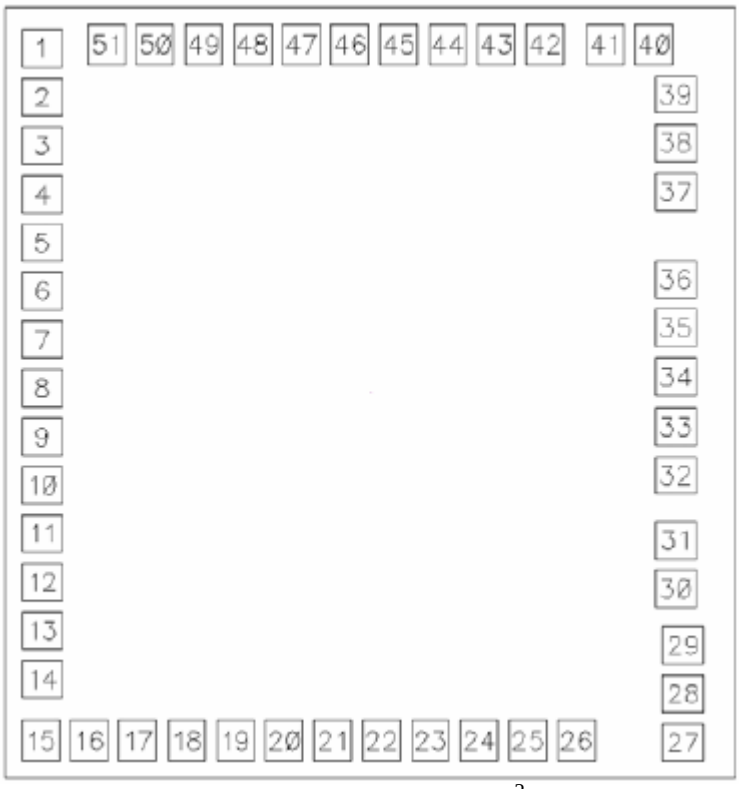
SG1620 Pad Coordinate Diagram



OUTLINE SIZE: 1650 × 1750 um^2

SUBSTRATE floating (recommend) or VSS

NO	NAME	X	Y
1	SEG6	-740.300	780.050
2	SEG7	-740.300	670.050
3	SEG8	-740.300	560.050
4	SEG9	-740.300	450.050
5	SEG10	-740.300	340.050
6	SEG11	-740.300	230.050
7	SEG12	-740.300	120.050
8	SEG13	-740.300	10.050
9	SEG14	-740.300	-99.950
10	SEG15	-740.300	-209.950
11	SEG16	-740.300	-319.950
12	SEG17	-740.300	-429.950
13	SEG18	-740.300	-539.950
14	SEG19	-740.300	-649.950

15	SEG20	-744.300	-789.950
16	SEG21	-634.300	-789.950
17	SEG22	-524.300	-789.950
18	SEG23	-414.300	-789.950
19	SEG24	-304.300	-789.950
20	SEG25	-194.300	-789.950
21	SEG26	-84.300	-789.950
22	SEG27	25.700	-789.950
23	SEG28	135.700	-789.950
24	SEG29	245.700	-789.950
25	SEG30	355.700	-789.950
26	SEG31	465.700	-789.950
27	CSB	706.550	-793.550
28	RDB	706.550	-683.550
29	WRB	706.550	-573.550
30	DATA	689.700	-445.450
31	VSS	689.700	-334.300
32	OSCO	689.700	-187.150
33	OSCI	689.700	-77.150
34	VDD	689.700	34.850
35	IRQB	689.700	146.850
36	BZ	689.700	256.850
37	BZB	689.700	455.750
38	CC1	689.700	565.750
39	CC2	689.700	675.750
40	VO15N	640.700	789.950
41	VEE	530.700	789.950
42	COM0	394.700	789.950
43	COM1	284.700	789.950
44	COM2	174.700	789.950
45	COM3	64.700	789.950
46	SEG0	-45.300	789.950
47	SEG1	-155.300	789.950
48	SEG2	-265.300	789.950
49	SEG3	-375.300	789.950
50	SEG4	-485.300	789.950
51	SEG5	-595.300	789.950

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