



CS1621

RAM Mapping 32 × 4 LCD Controller

Product Specification

Specification Revision History:

Version	Date	Description
2019-07-A1	2019-07	New
2024-12-B1	2024-12	Update the template; modify the content



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1、General Description

CS1621 is an LCD driver controller which can drive a 128-point LCD screen. The circuit has built-in serial communication interface, which can be directly connected with the main control equipment for function setting.

CS1621 has built-in display data RAM, which can map the data in RAM to LCD display. The circuit has built-in LCD bias resistor, which can realize LCD driving function with minimum periphery. The circuit has built-in functions such as clock, buzzer and WDT/ time base generator, which can be applied to various LCD modules and display subsystems.

Features:

- Working voltage: 2.4V to 5.5V
- Maximum 32×4 mode, 4COM,32SEG
- LCD display with 1/2 or 1/3 bias and 1/2, 1/3 or 1/4 duty ratio can be selected.
- Built-in bias resistor
- The VLCD pin is used to adjust the LCD working voltage.
- Internal 32×4bit display RAM
- Internal 256kHz RC oscillator
- External 32kHz crystal oscillator or 256kHz frequency input.
- Built-in serial interface
- Clock sources for eight timebase /WDT clocks
- Buzzer driving signal with selectable frequency
- Support low power standby mode
- Working environment temperature: -40 to 85℃
- Packaging form: SOP24/SSOP24/SOP28/QFP44/SSOP48/LQFP48.



Ordering Information:

Tube packing specifications:

Part number	Packaging form	Marking code	Tube quantity	Boxed tube quantity	Boxed quantity	Notes
CS1621GN NB44.TB	QFP44	CS1621GN	160 PCS/plate	10 plate/box	1600 PCS/box	Dimensions of plastic enclosure: 10.0mm×10.0mm Pin spacing: 0.8mm
CS1621GO SA24.TB	SOP24	CS1621GO	30 PCS/tube	80 tube/box	2400 PCS/box	Dimensions of plastic enclosure: 15.4mm×7.5mm Pin spacing: 1.27mm
CS1621 VB24.TB	SSOP24	CS1621	50 PCS/tube	200 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 8.7mm×3.9mm Pin spacing: 0.635mm
CS1621GO SA28.TB	SOP28	CS1621GO	25 PCS/tube	80 tube/box	2000 PCS/box	Dimensions of plastic enclosure: 17.9mm×7.5mm Pin spacing: 1.27mm
CS1621GO VB48.TB	SSOP48	CS1621GO	30 PCS/tube	80 tube/box	2400 PCS/box	Dimensions of plastic enclosure: 15.9mm×7.5mm Pin spacing: 0.635mm
CS1621 LA48.TB	LQFP48	CS1621	250 PCS/plate	10 plate/box	2500 PCS/box	Dimensions of plastic enclosure: 7.0mm×7.0mm Pin spacing: 0.5mm



Reel packing specifications:

Part number	Packaging form	Marking code	Reel quantity	Boxed reel quantity	Notes
CS1621GO SA24.TR	SOP24	CS1621GO	1250PCS/reel	1250PCS/box	Dimensions of plastic enclosure: 15.4mm×7.5mm Pin spacing: 1.27mm
CS1621 VB24.TR	SSOP24	CS1621	4000PCS/reel	8000PCS/box	Dimensions of plastic enclosure: 8.7mm×3.9mm Pin spacing: 0.635mm
CS1621GO SA28.TR	SOP28	CS1621GO	1250PCS/reel	1250PCS/box	Dimensions of plastic enclosure: 17.9mm×7.5mm Pin spacing: 1.27mm
CS1621GO VB48.TR	SSOP48	CS1621GO	1000PCS/reel	1000PCS/box	Dimensions of plastic enclosure: 15.9mm×7.5mm Pin spacing: 0.635mm

Note: If the physical information is inconsistent with the ordering information, please refer to the actual product.



2、Block Diagram And Pin Description

2.1、Block Diagram

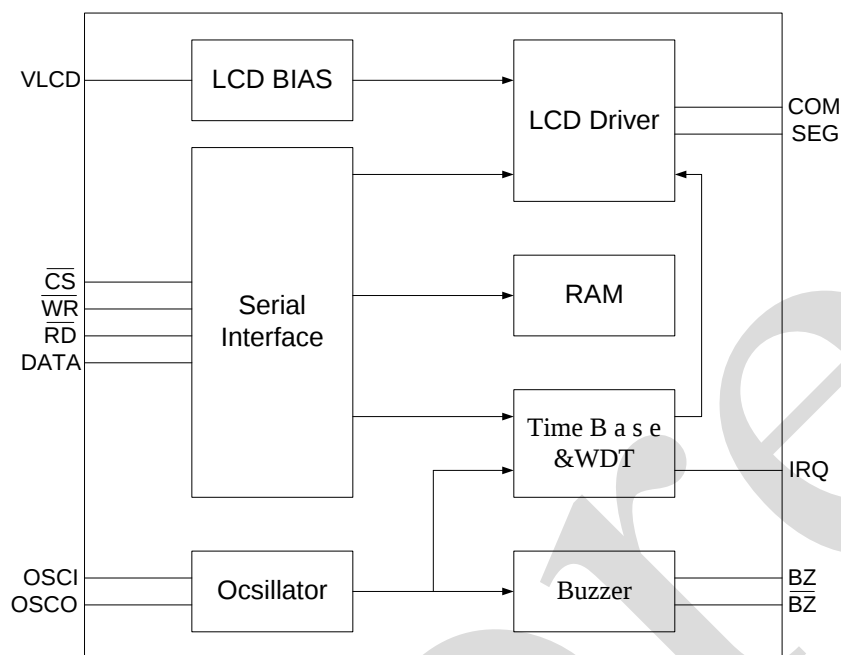


Figure 1 Functional block diagram

Note:

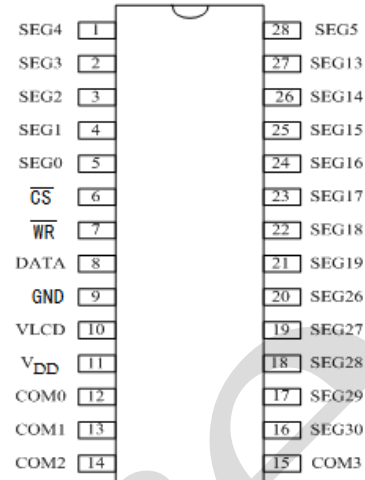
- [1] $\overline{CS}$: chip selection
- [2] BZ, $\overline{BZ}$: Buzzer output
- [3] $\overline{WR}$, $\overline{RD}$, DATA: serial interface
- [4] COM0~COM3, SEG0~SEG31: LCD output
- [5] $\overline{IRQ}$: time reference or WDT overflow output



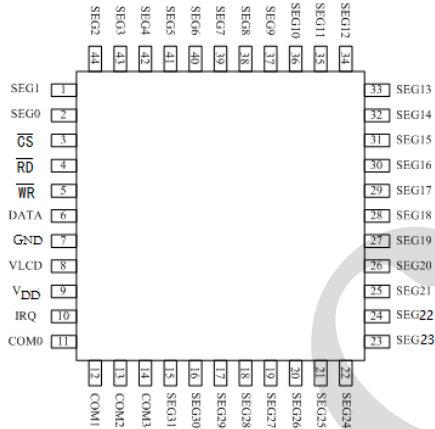
2.2、Pin Configurations



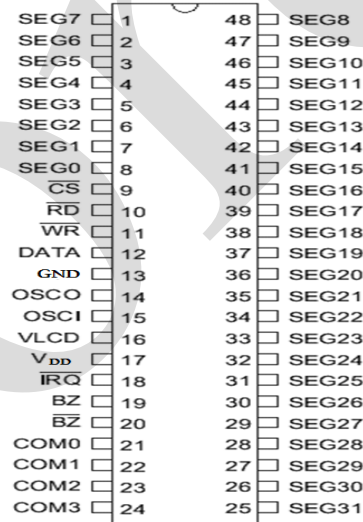
SOP24/SSOP24



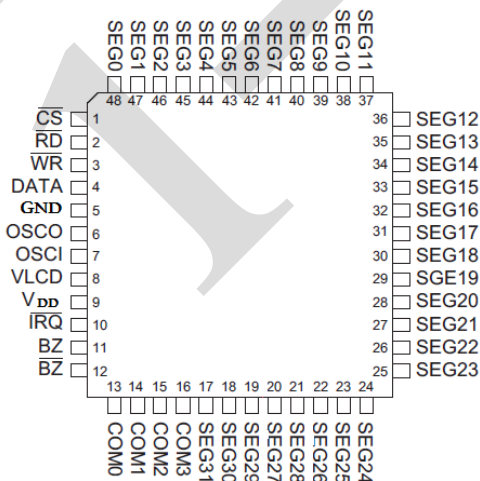
SOP28



QFP44



SSOP48



LQFP48



2.3、Pin Description

PIN number					PIN name	I/O	Explain one's merits and abilities
SOP24/ SSOP24	SOP28	QFP44	SSOP48	LQFP48			
10	6	3	9	1	$\overline{\text{CS}}$	I	Chip selection signal input terminal with built-in pull-up resistor. $\overline{\text{CS}}$ When the logic level is high, data and commands cannot be read and written, and the serial interface circuit is reset.
—	—	4	10	2	$\overline{\text{RD}}$	I	Read operation clock input, built-in pull-up resistor. Data in $\overline{\text{RD}}$ The falling edge of the signal is output to the DATA line.
11	7	5	11	3	$\overline{\text{WR}}$	I	Write operation clock input with built-in pull-up resistor. exist $\overline{\text{WR}}$ On the rising edge of the signal, the DATA on the data line is latched to CS1621.
12	8	6	12	4	DATA	I/O	Serial data input/output terminal with built-in pull-up resistor.
13	9	7	13	5	GND	P	ground
—	—	—	14	6	OSCO	O	OSCI and OSCO ports are connected to a 32.768KHz crystal oscillator for generating the system clock. If the system clock is externally connected, it will pass through the OSCI terminal. If an on-chip RC oscillator is used, OSCI and OSCO can be suspended.
—	—	—	15	7	OSCI	I	
14	10	8	16	8	VLCD	I	LCD power input
15	11	9	17	9	V _{DD}	P	Power Supply
—	—	10	18	10	$\overline{\text{IRQ}}$	O	Time reference or WDT overflow flag, NMOS open-drain output terminal.
—	—	—	19	11	BZ	O	Buzz signal output end
—	—	—	20	12	$\overline{\text{BZ}}$	O	Buzz signal output end
16	12	11	21	13	COM0	O	COM output of LCD
17	13	12	22	14	COM1	O	COM output of LCD
18	14	13	23	15	COM2	O	COM output of LCD
19	15	14	24	16	COM3	O	COM output of LCD
—	—	15	25	17	SEG31	O	SEG output of LCD
—	16	16	26	18	SEG30	O	SEG output of LCD
—	17	17	27	19	SEG29	O	SEG output of LCD
—	18	18	28	21	SEG28	O	SEG output of LCD
—	19	19	29	20	SEG27	O	SEG output of LCD
—	20	20	30	22	SEG26	O	SEG output of LCD
—	—	21	31	23	SEG25	O	SEG output of LCD
—	—	22	32	24	SEG24	O	SEG output of LCD
—	—	24	33	25	SEG23	O	SEG output of LCD
20	—	23	34	26	SEG22	O	SEG output of LCD



21	—	25	35	27	SEG21	O	SEG output of LCD
22	—	26	36	28	SEG20	O	SEG output of LCD
23	21	27	37	29	SEG19	O	SEG output of LCD
24	22	28	38	30	SEG18	O	SEG output of LCD
1	23	29	39	31	SEG17	O	SEG output of LCD
2	24	30	40	32	SEG16	O	SEG output of LCD
3	25	31	41	33	SEG15	O	SEG output of LCD
4	26	32	42	34	SEG14	O	SEG output of LCD
5	27	33	43	35	SEG13	O	SEG output of LCD
6	—	34	44	36	SEG12	O	SEG output of LCD
7	—	35	45	37	SEG11	O	SEG output of LCD
8	—	36	46	38	SEG10	O	SEG output of LCD
9	—	37	47	39	SEG9	O	SEG output of LCD
—	—	38	48	40	SEG8	O	SEG output of LCD
—	—	39	1	41	SEG7	O	SEG output of LCD
—	—	40	2	42	SEG6	O	SEG output of LCD
—	28	41	3	43	SEG5	O	SEG output of LCD
—	1	42	4	44	SEG4	O	SEG output of LCD
—	2	43	5	45	SEG3	O	SEG output of LCD
—	3	44	6	46	SEG2	O	SEG output of LCD
—	4	1	7	47	SEG1	O	SEG output of LCD
—	5	2	8	48	SEG0	O	SEG output of LCD

3、Electrical Parameter

3.1、Absolute Maximum Ratings

(T_{amb}=25℃, unless otherwise specified)

Characteristic	Symbol	Conditions	Value	Unit
power supply voltage	V _{DD}	-	-0.3 to 7	V
input voltage	V _{IN}	-	GND-0.3 to V _{DD} +0.3	V
storage temperature	T _{stg}	-	-50 to 125	℃
ambient temperature	T _{amb}	-	-40 to 85	℃
soldering temperature	T _L	10s	260	℃



3.2、Electrical Characteristics

3.2.1、DC Characteristics

(T_{amb}=25℃, GND=0V, unless otherwise specified).

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
operating voltage	V _{DD}	-		2.4	-	5.5	V
operational current	I _{DD1}	No load On-chip RC oscillator	V _{DD} =3V	-	150	300	uA
			V _{DD} =5V	-	300	600	uA
	I _{DD2}	No load Crystal oscillator	V _{DD} =3V	-	60	120	uA
			V _{DD} =5V	-	120	240	uA
	I _{DD3}	No load External clock	V _{DD} =3V	-	100	200	uA
			V _{DD} =5V	-	200	400	uA
Standby current	I _{STB}	No load Shutdown mode	V _{DD} =3V	-	0.1	5	uA
			V _{DD} =5V	-	0.3	10	uA
Input low level	V _{IL}	DATA, $\overline{\text{WR}}$, $\overline{\text{CS}}$, $\overline{\text{RD}}$	V _{DD} =3V	0	-	0.6	V
			V _{DD} =5V	0	-	1.0	V
Input high level	V _{IH}	DATA, $\overline{\text{WR}}$, $\overline{\text{CS}}$, $\overline{\text{RD}}$	V _{DD} =3V	1.8	-	3.0	V
			V _{DD} =5V	3.0	-	5.0	V
DATA, BZ, $\overline{\text{BZ}}$, $\overline{\text{IRQ}}$	I _{OL1}	V _{OL} =0.3V	V _{DD} =3V	0.5	1.2	-	mA
		V _{OL} =0.5V	V _{DD} =5V	1.3	2.6	-	mA
DATA, BZ, $\overline{\text{BZ}}$	I _{OH1}	V _{OH} =2.7V	V _{DD} =3V	-0.4	-0.8	-	mA
		V _{OH} =4.5V	V _{DD} =5V	-0.9	-1.8	-	mA
COM end of LCD Irrigation current	I _{OL2}	V _{OL} =0.3V	V _{DD} =3V	80	150	-	uA
		V _{OL} =0.5V	V _{DD} =5V	150	250	-	uA
COM end of LCD Pull current	I _{OH2}	V _{OH} =2.7V	V _{DD} =3V	-80	-120	-	uA
		V _{OH} =4.5V	V _{DD} =5V	-120	-200	-	uA
SEG end of LCD Irrigation current	I _{OL3}	V _{OL} =0.3V	V _{DD} =3V	60	120	-	uA
		V _{OL} =0.5V	V _{DD} =5V	120	200	-	uA
SEG end of LCD Pull current	I _{OH3}	V _{OH} =2.7V	V _{DD} =3V	-40	-70	-	uA
		V _{OH} =4.5V	V _{DD} =5V	-70	-100	-	uA
pull-up resistor	R _{PH}	DATA, $\overline{\text{WR}}$, $\overline{\text{CS}}$, $\overline{\text{RD}}$	V _{DD} =3V	40	80	150	kΩ
			V _{DD} =5V	30	60	100	kΩ
Built-in resistor at VLCD terminal	R _{vlcd}	VLCD		-	110	-	kΩ



3.2.2、AC Characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
System clock	f_{SYS1}	On-chip RC oscillator	$V_{DD}=3V$	-	256	kHz
			$V_{DD}=5V$	-	256	kHz
	f_{SYS2}	Crystal oscillator	$V_{DD}=3V$	-	32.768	kHz
			$V_{DD}=5V$	-	32.768	kHz
	f_{SYS3}	External clock	$V_{DD}=3V$	-	256	kHz
			$V_{DD}=5V$	-	256	kHz
LCD clock	f_{LCD}	On-chip RC oscillator	-	-	$f_{SYS1}/768$	Hz
		Crystal oscillator	-	-	$f_{SYS2}/96$	Hz
		External clock	-	-	$f_{SYS3}/768$	Hz
LCD COM end cycle	t_{COM}	N: COM terminal number	-	-	n/f_{LCD}	s
Serial data clock (WRPIN)	f_{CLK1}	Duty cycle 50%	$V_{DD}=3V$	4	-	150 kHz
			$V_{DD}=5V$	4	-	300 kHz
Serial data clock (RDPIN)	f_{CLK2}	Duty cycle 50%	$V_{DD}=3V$	-	-	75 kHz
			$V_{DD}=5V$	-	-	150 kHz
Buzzer output frequency	f_{TONE}	On-chip RC oscillator	-	-	2.0	kHz
Serial interface reset pulse width	t_{CS}	$\overline{CS}$	-	-	250	ns
$\overline{WR}$, $\overline{RD}$ Input pulse width	t_{CLK}	Write mode	$V_{DD}=3V$	3.34	-	us
		Reading mode	-	6.67	-	us
		Write mode	$V_{DD}=5V$	1.67	-	us
		Reading mode	-	3.34	-	us
Serial data clock rise/fall time	t_r, t_f	-	$V_{DD}=3V$	-	120	ns
			$V_{DD}=5V$	-	120	ns
Serial data to $\overline{WR}$, $\overline{RD}$ Clock setup time	t_{SU}	-	$V_{DD}=3V$	-	120	ns
			$V_{DD}=5V$	-	120	ns
Serial data to $\overline{WR}$, $\overline{RD}$ Holding time of clock	t_h	-	$V_{DD}=3V$	-	120	ns
			$V_{DD}=5V$	-	120	ns
$\overline{CS}$ arrive $\overline{WR}$, $\overline{RD}$ Clock setup time	t_{SUL}	-	$V_{DD}=3V$	-	100	ns
			$V_{DD}=5V$	-	100	ns
$\overline{CS}$ arrive $\overline{WR}$, $\overline{RD}$ Holding time of clock	t_{h1}	-	$V_{DD}=3V$	-	100	ns
			$V_{DD}=5V$	-	100	ns



4、Function Description

4.1、Instruction List

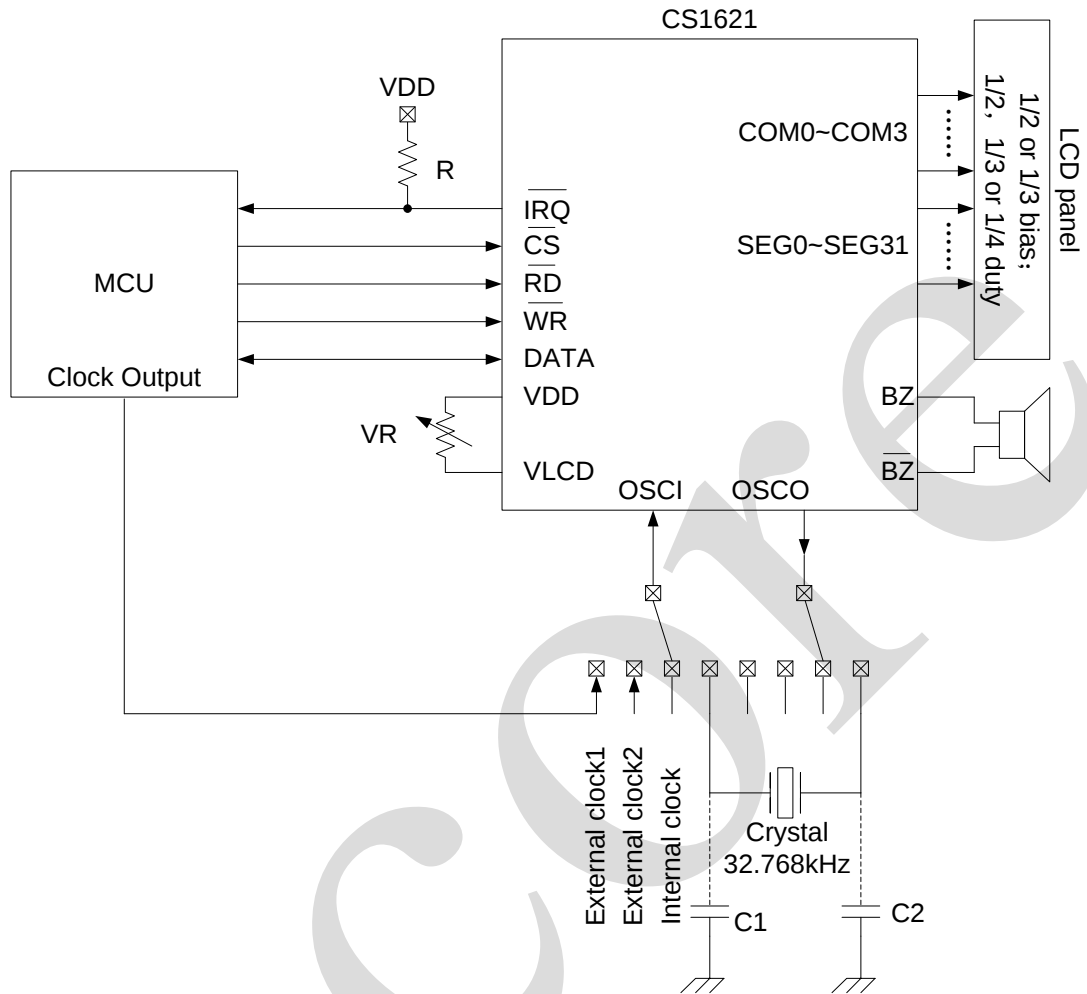
	Nominal name	Instruction code	Command code	Work energy	Open preset reset
RAM operation	READ	110	A5A4A3A2A1A0D0D1D2D3	Read data in RAM	-
	WRITE	101	A5A4A3A2A1A0D0D1D2D3	Write data into RAM	-
	READ-MODIFY-WRITE	101	A5A4A3A2A1A0D0D1D2D3	Read and write RAM	-
System enabling	SYS DIS	100	0000_0000_X	Turn off the system oscillator and LCD bias generator at the same time.	Yes
	SYS EN	100	0000_0001_X	Turn on the system oscillator	-
display switch	LCD OFF	100	0000_0010_X	Turn off the LCD bias generator	Yes
	LCD ON	100	0000_0011_X	Turn on the LCD bias generator.	-
Time base control	TIMER DIS	100	0000_0100_X	Prohibit time reference output	-
	TIMER EN	100	0000_0110_X	Allow time reference output	-
	CLR TIMER	100	0000_11XX_X	Clear the contents of the time base generator.	-
Watchdog control	WDT DIS	100	0000_0101_X	Disable WDT pause flag output	-
	WDT EN	100	0000_0111_X	Allow WDT pause flag output	-
	CLR WDT	100	0000_111X_X	Clear WDT content	-
Buzzer control	TONE OFF	100	0000_1000_X	Turn off buzzer output.	Yes
	TONE ON	100	0000_1001_X	Turn on the buzzer output	-
	TONE 4K	100	010X_XXXX_X	Buzzing frequency: 4KHz	-
	TONE 2K	100	011X_XXXX_X	Buzzing frequency: 2KHz	-
Clock source selection	XTAL 32K	100	0001_01XX_X	The system clock is a crystal oscillator.	-
	RC 256K	100	0001_10XX_X	The system clock is an on-chip RC oscillator.	Yes
	EXT 256K	100	0001_11XX_X	The system clock is 1/2 of external clock LCD.	-
Bias selection	BIAS 1/2	100	0010_abX0_X	LCD 1/2 bias state Ab=00: 2COM terminal Ab=01: 3COM end Ab=10: 4COM terminal	-
	BIAS 1/3	100	0010_abX1_X	LCD 1/3 bias state Ab=00: 2COM terminal Ab=01: 3COM end Ab=10: 4COM terminal	-
IRQ control	IRQDIS	100	100X_0XXX_X	prohibit $\overline{IRQ}$ output	Yes
	IRQEN	100	100X_1XXX_X	allow $\overline{IRQ}$ output	-
frequency selection	F1	100	101X-X000_X	Time base /WDT clock output: 1Hz WDT pause flag delay: 4s	-



	F2	100	101X_X001_X	Time base /WDT clock output: 2Hz WDT pause flag delay: 2s	-
	F4	100	101X_X010_X	Time base /WDT clock output: 4Hz WDT pause flag delay: 1s	-
	F8	100	101X_X011_X	Time base /WDT clock output: 8Hz WDT pause flag delay: 1/2s	-
	F16	100	101X_X100_X	Time base /WDT clock output: 16Hz WDT pause flag delay: 1/4s	-
	F32	100	101X_X101_X	Time base /WDT clock output: 32Hz WDT pause flag delay: 1/8s	-
	F64	100	101X_X110_X	Time base /WDT clock output: 64Hz WDT pause flag delay: 1/16s	-
	F128	100	101X_X111_X	Time base /WDT clock output: 128Hz WDT pause flag delay: 1/32s	Yes
Mode selection	TOPT	100	1110_0000_X	Test mode	-
	TNORMAL	100	1110_0011_X	standard mode	Yes

5、 Typical Application Circuit

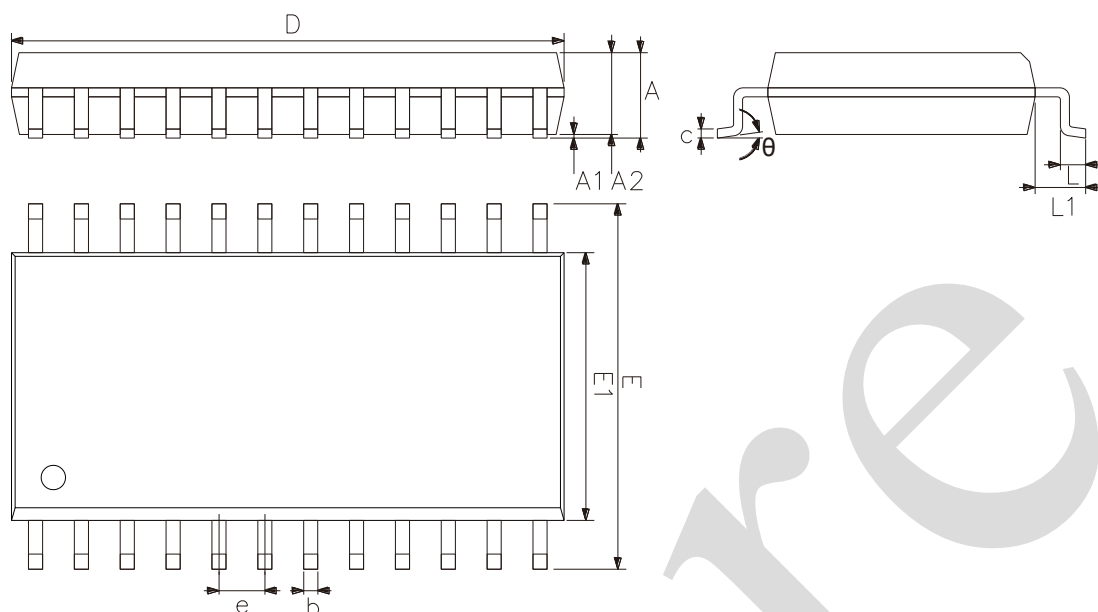
5.1、 Application Line





6、Package Information

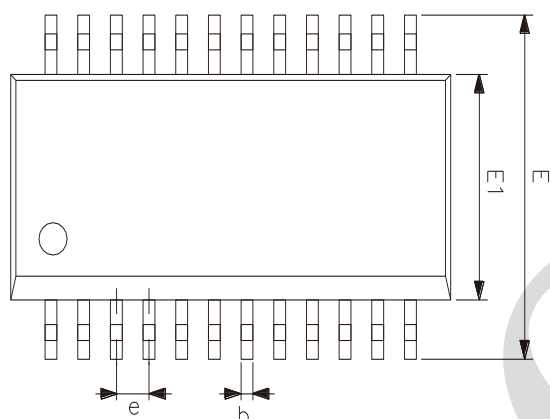
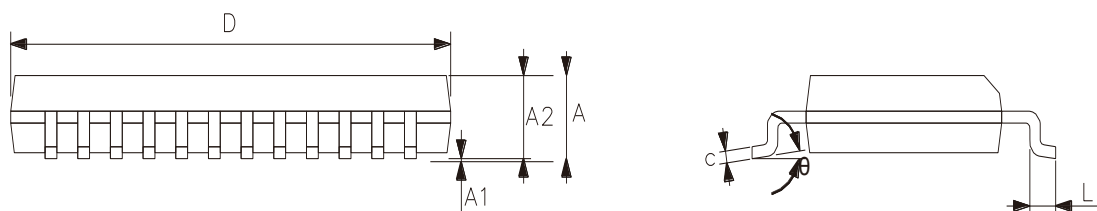
6.1、SOP24



2023/12/A	Dimensions In Millimeters	
Symbol	Min.	Max.
A	2.35	2.65
A1	0.10	0.30
A2	2.13	2.44
b	0.39	0.47
c	0.25	0.30
D	15.19	15.55
E	10.10	10.57
E1	7.40	7.62
e	1.27	
L	0.41	1.00
L1	1.30	1.50
θ	0°	8°



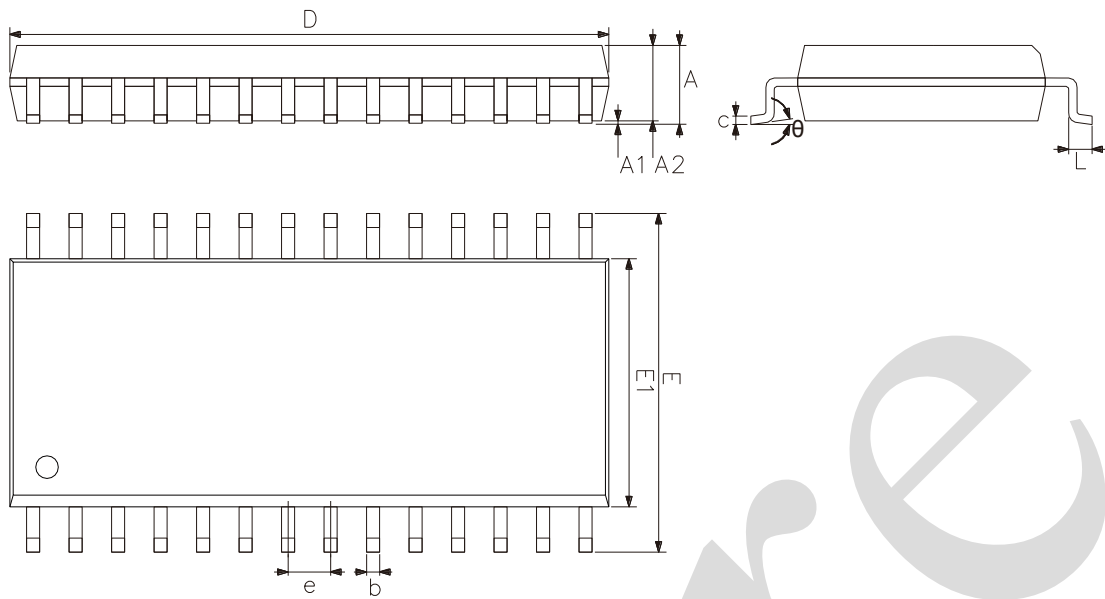
6.2、SSOP24



2023/12/A	Dimensions In Millimeters	
Symbol	Min	Max
A	1.35	1.75
A1	0.10	0.25
A2	1.30	1.55
b	0.23	0.47
c	0.19	0.26
D	8.45	8.85
E	5.80	6.20
E1	3.70	4.10
e	0.635	
L	0.40	0.80
θ	0°	8°



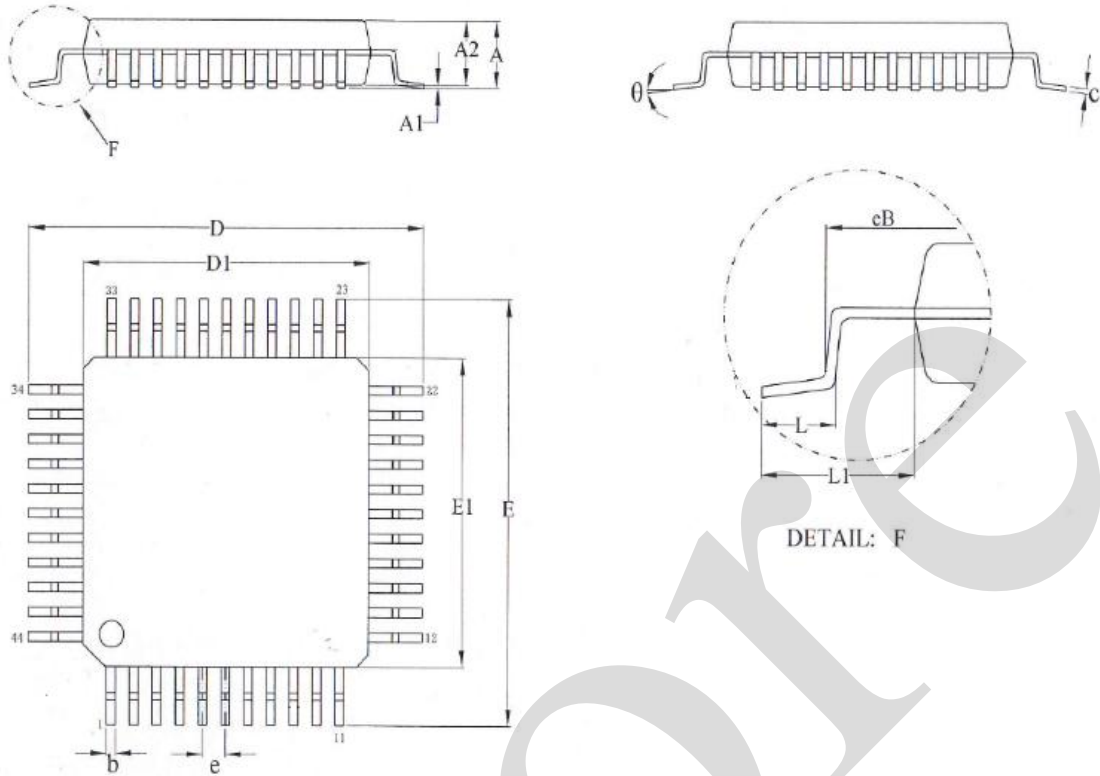
6.3、SOP28



2023/12/A	Dimensions In Millimeters	
Symbol	Min.	Max.
A	2.15	2.75
A1	0.03	0.30
A2	2.05	2.44
b	0.35	0.51
c	0.20	0.36
D	17.70	18.30
E	10.00	10.65
E1	7.30	7.70
e	1.27	
L	0.40	1.27
θ	0°	8°



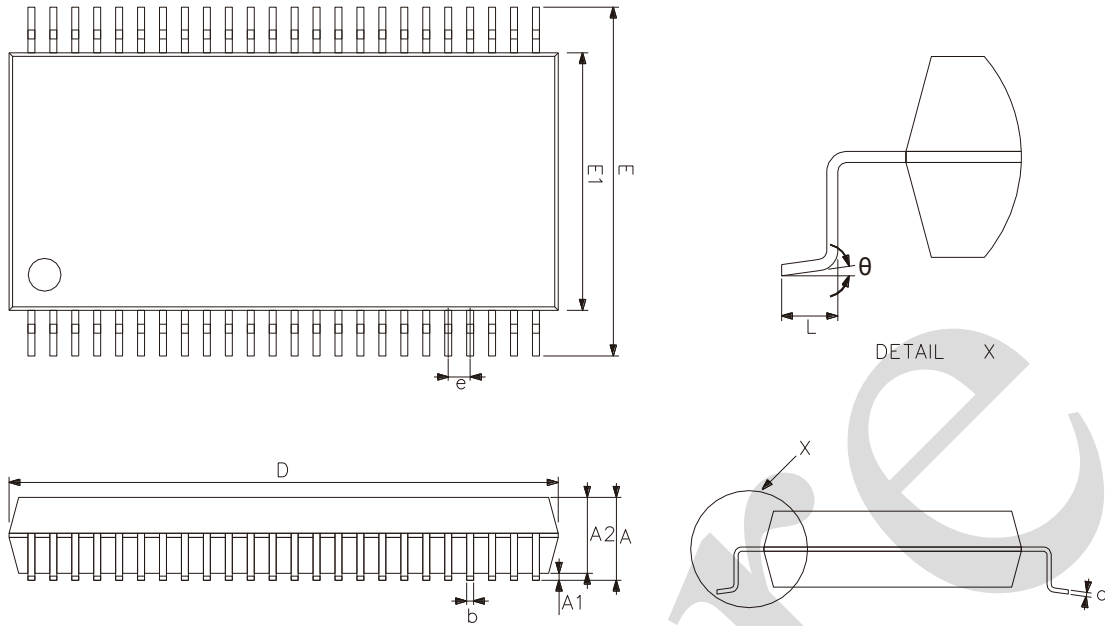
6.4、QFP44



2023/12/A	Dimensions In Millimeters	
Symbol	Min	Max
A	—	2.35
A1	0.05	0.15
A2	2.05	2.15
b	0.28	0.36
c	0.15	0.19
D	13.00	13.40
D1	9.90	10.10
E	13.00	13.40
E1	9.90	10.10
eB	11.59	11.89
e	0.80	
L	0.78	0.98
L1	1.60	
θ	0°	7°



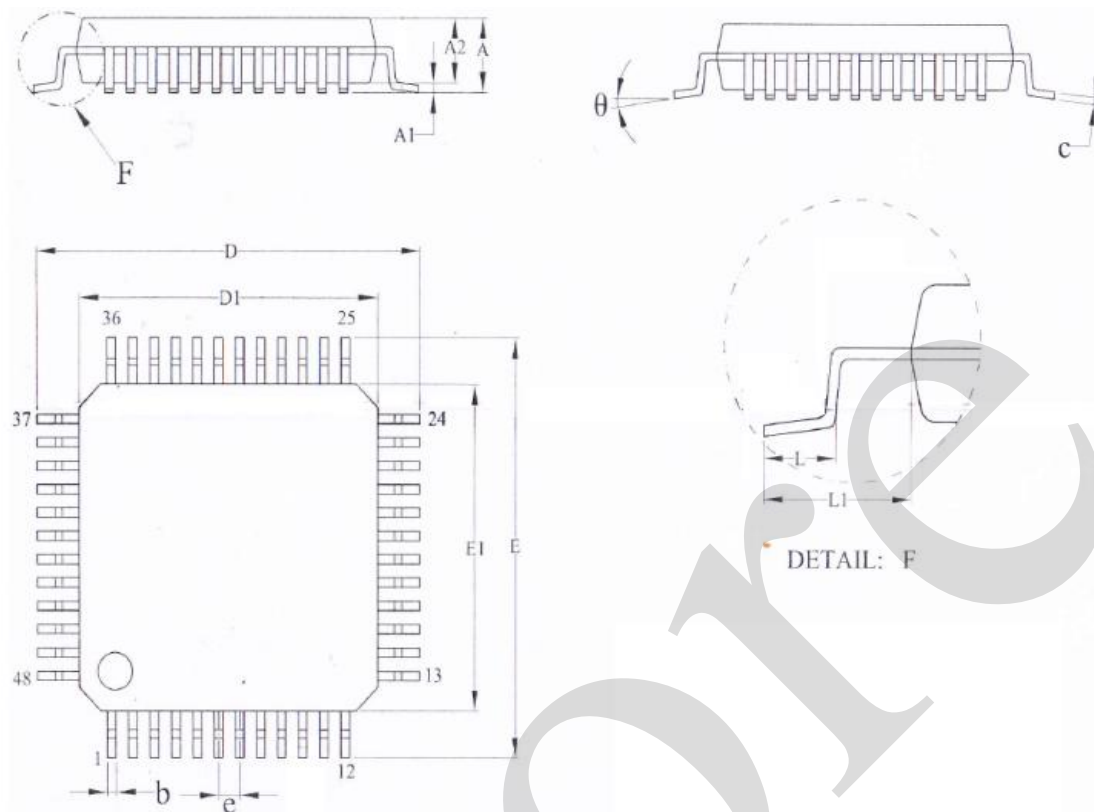
6.5、SSOP48



2023/12/A	Dimensions In Millimeters	
Symbol	Min	Max
A	—	2.85
A1	0.15	0.45
A2	2.10	2.45
b	0.20	0.35
c	0.12	0.25
D	15.60	16.05
E	9.80	10.80
E1	7.35	7.65
e	0.635	
L	0.56	0.95
θ	0°	8°



6.6、LQFP48



2023/12/A	Dimensions In Millimeters	
Symbol	Min	Max
A	1.45	1.65
A1	0.05	0.20
A2	1.30	1.50
b	0.17	0.27
c	0.09	0.20
D	8.80	9.20
D1	6.90	7.10
E	8.80	9.20
E1	6.90	7.10
e	0.50	
L	0.43	0.80
L1	1.00	
θ	0°	10°



7、Statements And Notes

7.1、The name and content of Hazardous substances or Elements in the product

Part name	Hazardous substances or Elements									
	Lead and lead compounds	Mercury and mercury compounds	Cadmium and cadmium compounds	Hexavalent chromium compounds	Polybrominated biphenyls	Polybrominated biphenyl ethers	Dibutyl phthalate	Butylbenzyl phthalate	Di-2-ethylhexyl phthalate	Diisobutyl phthalate
Lead frame	○	○	○	○	○	○	○	○	○	○
Plastic resin	○	○	○	○	○	○	○	○	○	○
Chip	○	○	○	○	○	○	○	○	○	○
The lead	○	○	○	○	○	○	○	○	○	○
Plastic sheet installed	○	○	○	○	○	○	○	○	○	○
explanation	○: Indicates that the content of hazardous substances or elements in the detection limit of the following the SJ/T11363-2006 standard. ×: Indicates that the content of hazardous substances or elements exceeding the SJ/T11363-2006 Standard limit requirements.									

7.2、Notes

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