

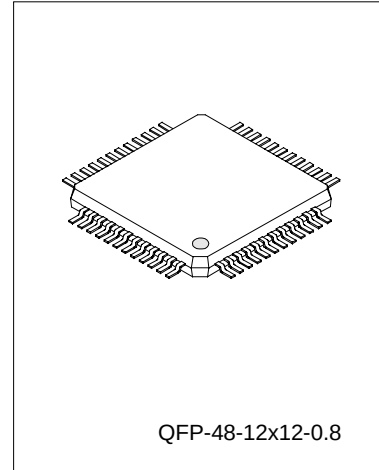
FREQUENCY AND CLOCK DISPLAY DRIVER

DESCRIPTION

The SC3610 is a frequency and clock display driver used for displaying FM/AM radio frequency or a 12 hour alarm clock. By using CMOS technology, it consumes very low power in clock display mode.

FEATURES

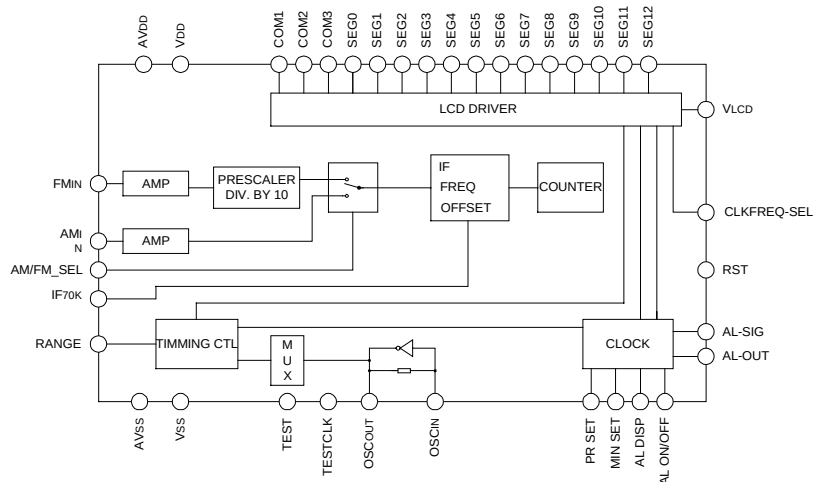
- * FM input with pre-scalar for radio frequency up to 150 MHz
- * AM input for radio frequency up to 30 MHz
- * 3 common, 13 segment, 1/3 bias LCD display drivers which supports 4 digits LCD display
- * On chip oscillator for external 32.768kHz crystal
- * 10.7 MHz / 70 kHz I.F. frequency offset for FM signal and 455kHz I.F. frequency offset for AM signal
- * Internal real time clock in 12 hour display mode
- * Selectable clock or frequency display
- * 1.8V to 3.3V supply voltage



ORDERING INFORMATION

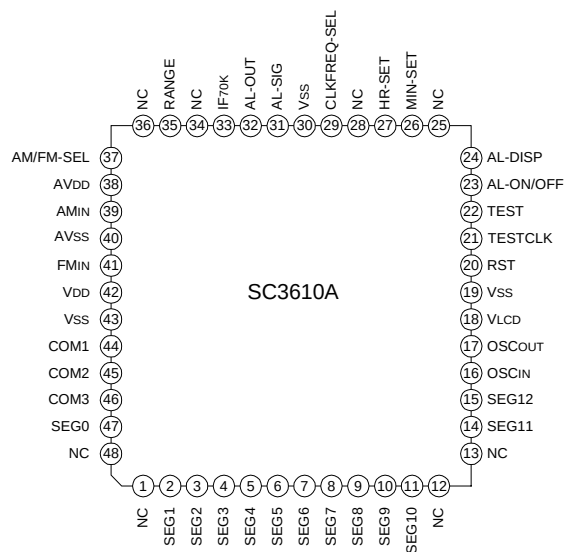
SC3610A	QFP-48-12x12-0.8 Package
SC3610B	QFP-44-10x10-0.8 Package
SC3610C	COB Package (QFP Type)
SC3610D	COB Package (SOP Type)

BLOCK DIAGRAM

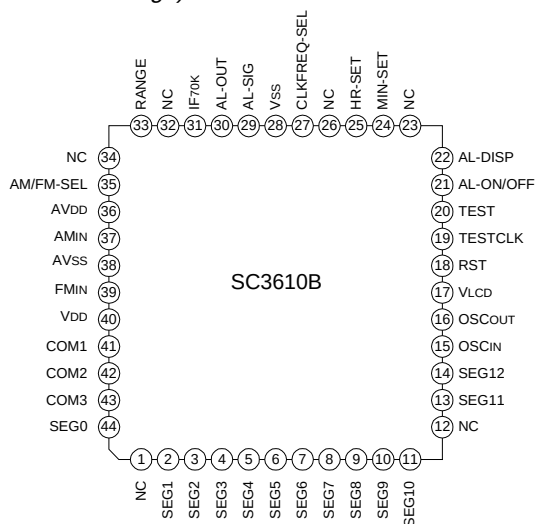


PAD ASSIGNMENT

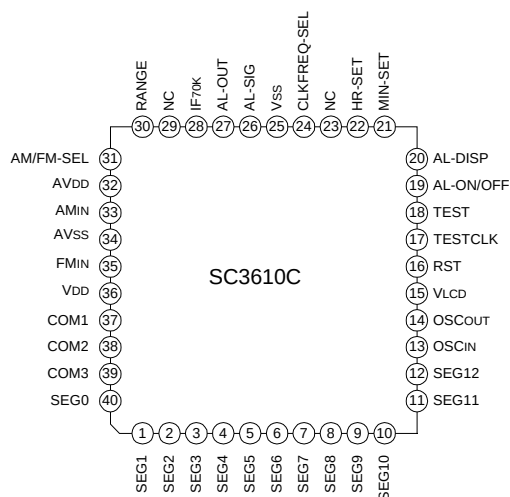
SC3610A (QFP-48-12x12-0.8 Package)



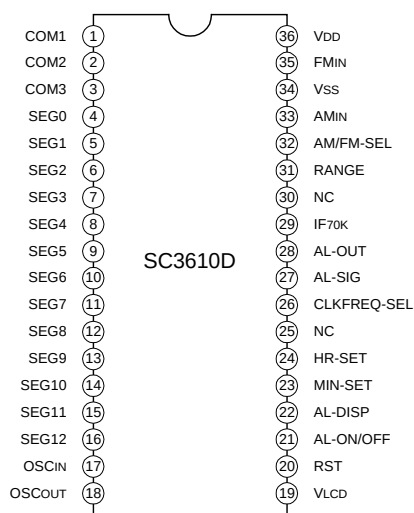
SC3610B (QFP-44-10x10-0.8 Package)



SC3610C (COB Package, QFP Type)



SC3610D (COB Package, SOP Type)



ABSOLUTE MAXIMUM RATING

Characteristic	Symbol	Value	Unit
Supply Voltage	V _{DD}	0.5 ~ 7.0	V
Input or Output Voltage	V _{IN} , V _{OUT}	-0.5 ~ V _{DD} +0.5	V
Storage Temperature	T _{STG}	-40 ~ +125	°C
ESD Protection		-2 ~ +2	kV

ELECTRICAL CHARACTERISTICS (V_{DD} = 3V, Temp = 25°C, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Supply Voltage	V _{DD}					
V _{DD} Supply Current Consumption	I _{DD1}	frequency mode	--	1.8	3.6	mA
	I _{DD2}	clock mode	--	55	110	μA
Internal LCD Reference Voltage	V _{LCD}	respect to V _{DD}	2	2.25	2.5	V
LCD Drive Current consumption	I _{LCD}	all segments on	--	--	5	μA
LCD Frame Frequency	F _{LCD}		--	32	--	Hz
Oscillator Frequency	F _{OSC}		--	32.768	--	kHz
FM Input Frequency	F _{FM}	V _{IN} = 0.3 V _{PP}	11.0	--	150	MHz
AM Input Frequency	F _{AM}	V _{IN} = 0.3 V _{PP}	0.5	--	30	MHz
FM Input impedance	R _{IN(FM)}	F _{FM} = 120MHz	--	150	--	Ω
AM Input impedance	R _{IN(AM)}	F _{AM} = 12MHz	--	2.0	--	kΩ
Open Drain Low Level Voltage	V _{OLoc}	V _{DD} =3V, I _{sink} = 10mA	--	--	0.5	V
Low Level Input Voltage	V _{IL}		--	--	0.3V _{DD}	V
High Level Input Voltage	V _{IH}		0.7V _{DD}	--	--	V
Low Level Output Voltage,	V _{OL}	V _{DD} =3V, I _{sink} =4mA	--	--	0.4	V
High Level Output Voltage	V _{OH}	V _{DD} =3V, I _{SOURCE} =-4mA	V _{DD} -0.5	--	--	V
Schmitt Trigger Positive Threshold	V _{t+}	V _{DD} =3V	--	2.3	2.4	V
Schmitt Trigger Negative Threshold	V _{t-}	V _{DD} =3V	0.6	0.9	--	V
Schmitt Trigger Input Resistance	R _{IN+/-}	pull-up or pull-down	--	75	--	kΩ
Reset Pin pull-up Resistance	R _{IN-UP}		--	750	--	kΩ

PAD DESCRIPTION

Pad No.	Symbol	I/O	Description
1	VDD	--	Supply voltage
2 ~ 4	COM1 ~ COM3	OL	LCD common drive signal for driving LCD display
5 ~ 17	SEG0 ~ SEG12	OL	LCD segment drive signal for driving LCD display
18	OSCI	I	32.768 kHz crystal oscillator input pin
19	OSCO	O	32.768 kHz crystal oscillator output pin
20	VLCD	O	LCD Supply voltage. Connects a 0.1 μ F capacitor between this pin and Vss
21	RST	ISU	Active low power-on reset with pull-up resistor of approx.750k Ω
22	TESTCLK	ISD	For testing use only with internal pull-down
23	TEST	ISD	When high, the chip will enter test mode
24	AL-ON/OFF	ISU	Alarm function on or off in toggle mode. Internal pull up input
25	AL-DISP	ISU	When pressed, will display the alarm time. Internal pull up input
26	MIN-SET	ISU	Minute setting for time and alarm(together with AL-DISP). Internal pull up.
27	HR-SET	ISU	Hour setting for time and alarm(together with AL-DISP). Internal pull up.
28	NC	--	No connection
29	CLKFREQ-SEL	ISD	Clock or frequency display mode. Internal pull-down input. When low, clock will be displayed. When high, radio frequency will be displayed.
30	Vss	--	Ground pin
31	AL-SIG	OD10	Open drain alarm signal output, active low.
32	AL-OUT	O4	Alarm output at 1kHz with 0.2 sec on and 0.2 sec off, push-pull output.
33	IF70k	ISD	Select IF offset in FM mode. H:70kHz, L:10.7kHz
34	NC	--	No connection
35	RANGE	ISU	For frequency counting mode only, Range = H or L, gate time = 0.1S
36	AM/FM-SEL	ISU	AM/FM mode selection. High for AM and low for FM, internal pull-up.
37	AVDD	--	Analog Supply voltage
38	AMIN	--	AM signal input, 0.3V peak to peak, 500kHz to 30MHz.
39	AVSS	--	Analog Ground pin.
40	FMIN	--	FM signal input, 0.3V peak to peak, 11-150MHz.

Note:

I	Oscillator Input Pad	O	Oscillator Output Pad
ISU	Schmitt trigger input pad with pull-up	OD10	Open Drain with 10mA output driving
ISD	Schmitt trigger input pad with pull-down	O4	Push-pull output pad with 4mA driving
		OL	LCD segment and common output pad

FUNCTIONAL DESCRIPTION

1. RADIO FREQUENCY DISPLAY OPERATION (DTS MODE):

The FM and AM local oscillator output generated from the external RF receiver enters a high gain input comparator through the FM_{IN} and the AM_{IN} pins respectively. The FM signal then routes through a divide-by-10 dynamic pre-scalar. Depending on the state of the AM/FM-SEL pin, the FM and AM signal will be selected and enters the IF frequency offset block. Depending on the FM/AM selection, 10.7MHz/70kHz or 455kHz I.F. frequency will be subtracted or added from the input signal.

LCD Display Range:

Mode	Range	Display range (on LCD)	Step	Resolution
FM	H	11.00 MHz to 99.99 MHz	10kHz	1kHz
	L	11.00 MHz to 149.9 kHz	100kHz	10kHz
AM	H	500 kHz to 9999 kHz	1kHz	100kHz
	L	0.5 MHz to 29.99 MHz	10kHz	1kHz

Note:1 When counter frequency overflow, MSB will not be displayed.

IF Offset for different application:

IF70K	AMFM-SEL	IF Offset	Operation
0	0	+10.7MHz	Display FM input frequency 10.7MHz
0	1	+455kHz	Display AM input frequency 455kHz
1	0	-70 kHz*	Display FM input frequency +70kHz
1	1	+455 kHz	Display AM input frequency 455kHz

* Suitable to use with Silan SC1088

2. CLOCK FUNCTION:

1) The clock will be advanced in the following flow:

PM 12:00 → PM 11:59 → AM 12:00 → 11:59

2) The [:] sign is the second indicator and will blink at a rate of 2Hz

3) TIME SETTING:

- Pressing the keys combination of [TIME SET] [HR SET] or [TIME SET] [MIN SET] will enter the time setting mode.
- One digit will be incremented after entering the alarm setting mode. Keep pressing the keys combination for more than 0.5 seconds will make the digit to be advanced at a rate of 2Hz.

4) ALARM TIME SETTING:

- Pressing the keys combination of [AL DISP] [HR SET] or [AL DISP] [MIN SET] will enter the alarm time setting mode. The [AL] indicator will turn on and the [:] sign will stop blinking.
- One digit will be incremented after entering the alarm setting mode. Keep pressing the keys combination

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for more than 0.5 seconds will make the digit to be advanced at a rate of 2Hz.

5) ALARM FUNTION:

- AL OUT output pin will output an alarm frequency of 1024Hz at 0.2 sec on and 0.2 sec off.
- AL OUT pin can be used to direct drive a piezo buzzer.
- When alarm is active, AL OUT output can be disabled by pressing the [AL-ON/OFF] key or it will turn off automatically after 3 minutes lapse.
- AL-SIG pin is an open drain output (active low). Once alarm is activated, AL-SIG can be disabled by pressing [AL-ON/OFF] key or it will turn off automatically after one hour time lapse.
- When [AL DISP] is pressed, alarm setting time will be displayed on the LCD and the [AL] indicator will be on.
- The [AL-ON/OFF] pin will toggle the [🔔] indicator to turn on of off the alarm function. When the indicator is on, alarm function is on.

6) 32.768kHz crystal is used for the reference frequency.

7) After Power-on-reset (RST):

- [HR SET] and [MIN SET] keys will be disabled.
- [AL-DISP] KEY,[AL-ON/OFF] KEY AND AL-SIG output will be enabled.

3. After POWER-ON-SET(RST):

- When in clock mode, it will display and start at AM 7:00.
- When in DTS frequency mode, if CLKFREQ-SEL = High, and FMIN & AMIN pins are grounded, all LCD segments will be turned on(LCD test mode).

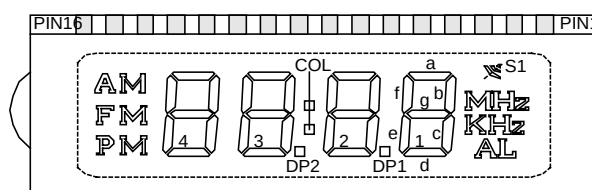
4. LCD pin configuration and 0 to 9 digits segments display configuration.

Pin	Function	LCD Mapping		
1	COM1	COM1	--	--
2	COM2	--	COM2	--
3	COM3	--	--	COM3
4	SEG0	kHz	MHz	🔔
5	SEG1	AL	DIG1-c	DIG1-b
6	SEG2	DIG1-d	DIG1-g	DIG1-a
7	SEG3	DP1	DIG1-e	DIG1-f
8	SEG4	DP2	DIG2-c	DIG2-b
9	SEG5	DIG2-d	DIG2-g	DIG2-a
10	SEG6	:	DIG2-e	DIG2-f

(To be continued)

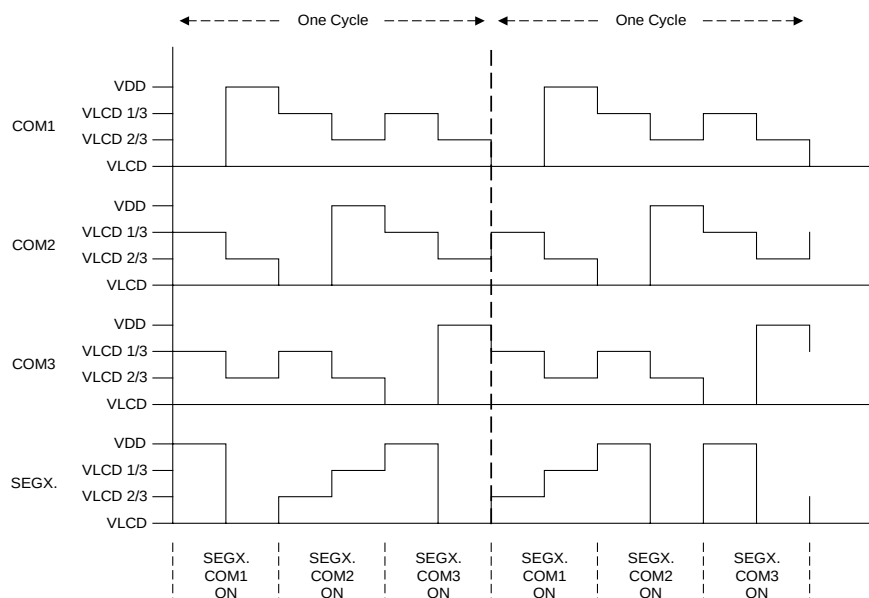
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Pin	Function	LCD Mapping		
11	SEG7	AM	DIG3-c	DIG3-b
12	SEG8	DIG3-d	DIG3-g	DIG3-a
13	SEG9	--	DIG3-e	DIG3-f
14	SEG10	FM	DIG4-c	DIG4-b
15	SEG11	DIG4-d	DIG4-g	DIG4-a
16	SEG12	PM	DIG34-e	DIG4-f

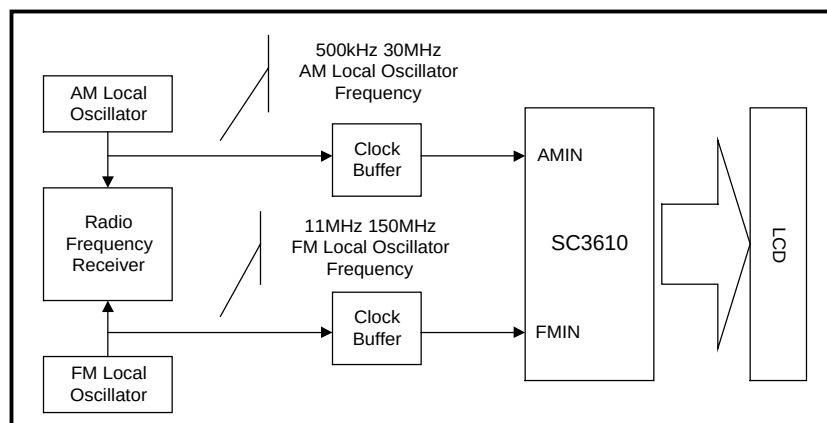


0 1 2 3 4 5 6 7 8 9

LCD TIMING WAVEFORMS



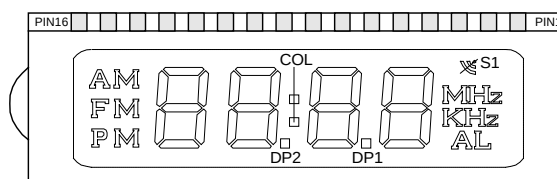
SUGGESTED APPLICATION



TYPEICAL LCD LAYOUT

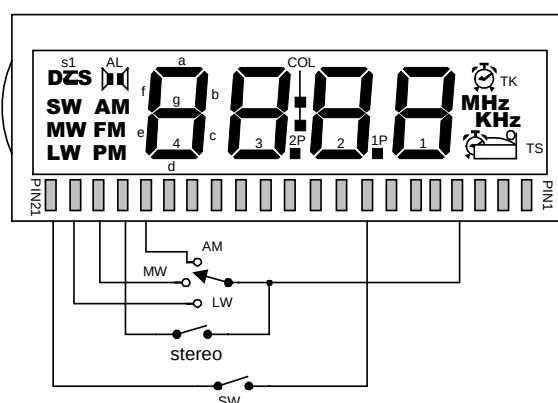
Counter Only Mode

PIN	COM1	COM2	COM3
1	COM1	--	--
2	--	COM2	--
3	--	--	COM3
4	kHz	MHz	S1
5	AL	1C	1B
6	1D	1G	1A
7	DP1	1E	1F
8	DP2	2C	2B
9	2D	2G	2A
10	COL	2E	2F
11	AM	3C	3B
12	3D	3G	3A
13	--	3E	3F
14	FM	4C	4B
15	4D	4G	4A
16	PM	4E	4F



Clock and Counter Mode

PIN	COM1	COM2	COM3
1	COM1	--	--
2	--	COM2	--
3	--	--	COM3
4	kHz	MHz	TK
5	TS	1C	1B
6	1D	1G	1A
7	1P	1E	1F
8	2P	2C	2B
9	2D	2G	2A
10	COL	2E	2F
11	--	3C	3B
12	3D	3G	3A
13	S1	3E	3F
14	FM	4C	4B
15	4D	4G	4A
16	PM	4E	4F
17	AM		
18		AL	
19	MW		
20	LW		
21	SW		

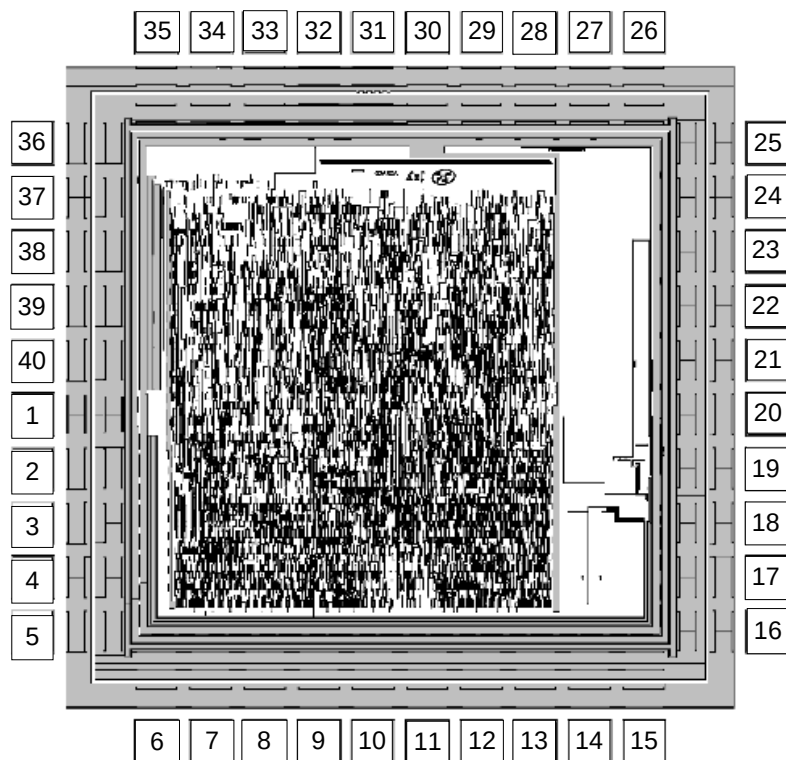


The block diagram illustrates the architecture of a 4-DIGITS LCD DISPLAY. At the top, the display panel is shown with 16 pins labeled COM1 through COM12 and SEG0 through SEG12. The system includes several functional blocks:

- LCD DRIVER**: Receives signals from the display panel and provides VLCD power.
- CLOCK**: Generates clock signals for the system, including PR SET, MIN SET, AL DISP, and AL ON/OFF.
- TIMING CTL**: Manages timing for the display, connected to RANGE, AVSS, VSS, and TEST inputs.
- MUX**: A multiplexer that routes signals between the TIMING CTL and the CLOCK block.
- IF FREQ OFFSET**: Processes intermediate frequency signals, receiving input from the PRESCALER DIV. BY 10 and outputting to the COUNTER.
- COUNTER**: Counts pulses from the IF FREQ OFFSET block and outputs CLKFREQ-SEL and RST signals.
- AMP**: Two amplifiers processing FMIN and AMI signals, with their outputs selected by the AM/FM-SEL switch.
- PRESACALER DIV. BY 10**: Divides the input frequency by 10 before it reaches the IF FREQ OFFSET block.

 Power supply connections include VDD, AVDD, VSS, and AVSS. Various passive components like capacitors (0.1µF, 10nF, 1µF) and resistors (4.7kΩ, 1MΩ) are used for decoupling and signal conditioning. The diagram also shows control inputs like TEST, OSCIN, and OSCOUT, along with a speaker symbol indicating audio output capability.

CHIP TOPOGRAPHY



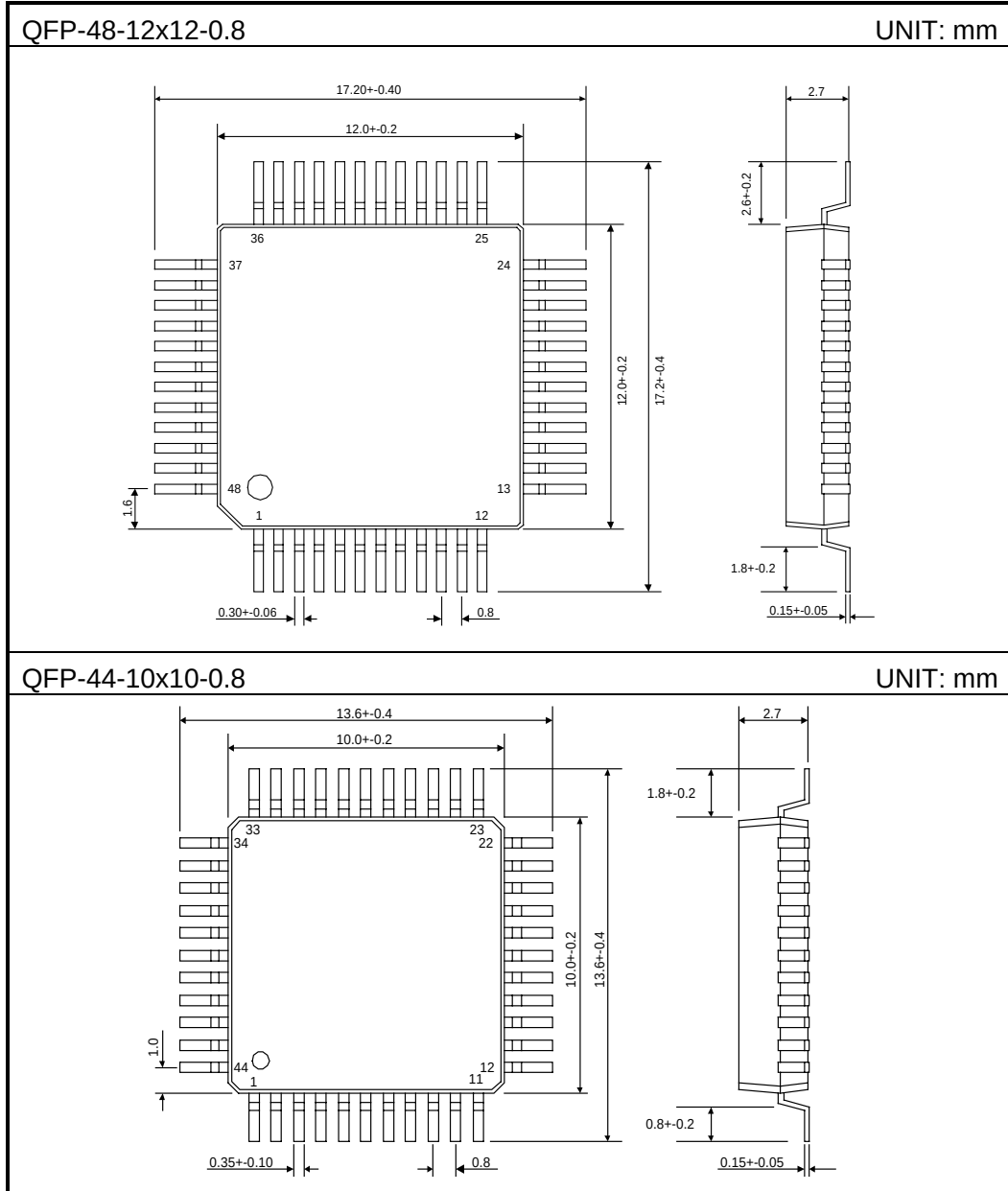
Chip Size: 2.72mmx2.88mm

PAD COORDINATES (Unit: μm)

PAD NO.	X	Y	PAD NO.	X	Y
1	-70	925	21	70	-925
2	-205	925	22	205	-925
3	-340	925	23	340	-925
4	-475	925	24	475	-925
5	-615	925	25	610	-925
6	-890	615	26	890	-615
7	-890	475	27	890	-475
8	-890	340	28	890	-340
9	-890	205	29	890	205
10	-890	70	30	890	-70
11	-890	-70	31	890	70
12	-890	-205	32	890	205
13	-890	-340	33	890	340
14	-890	-475	34	890	475
15	-890	-615	35	890	610
16	-615	-925	36	615	925
17	-475	-925	37	475	925
18	-340	-925	38	340	925
19	-205	-925	39	205	925
20	-70	-925	40	70	925

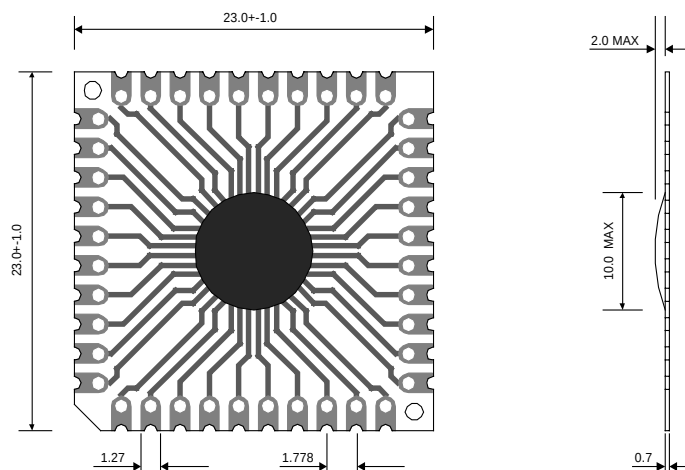
Note: The original point of the coordinate is the die center.

PACKAGE OUTLINE



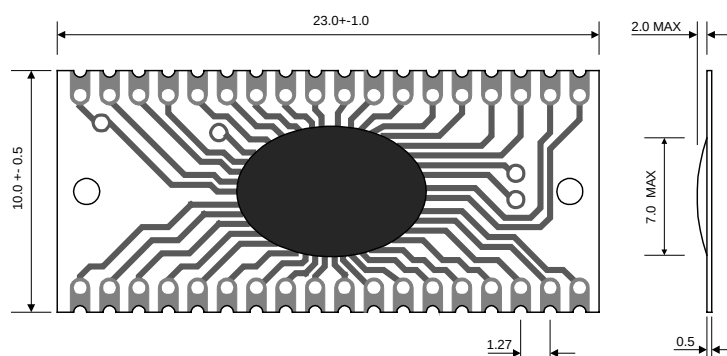
COB PACKAGE (QFP TYPE)

UNIT: mm



COB PACKAGE (SOP TYPE)

UNIT: mm





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- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

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