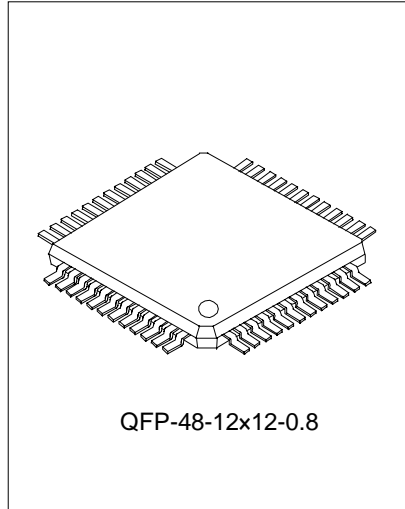


**FREQUENCY AND CLOCK DISPLAY DRIVER**

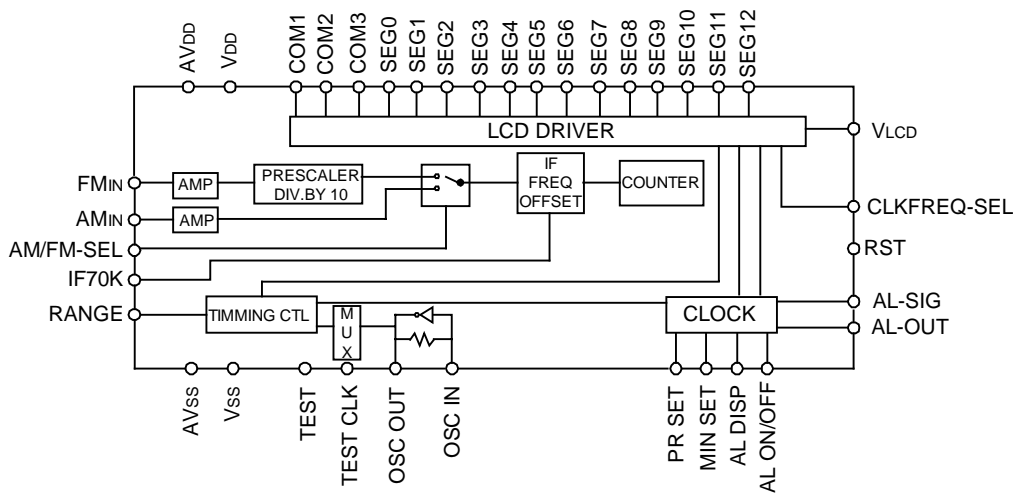
The UTC 6610 is a frequency and clock display driver used for displaying FM/AM radio frequency or a 12 hour alarm clock. By using CMOS technology, it consumes very low power in clock display mode.

**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

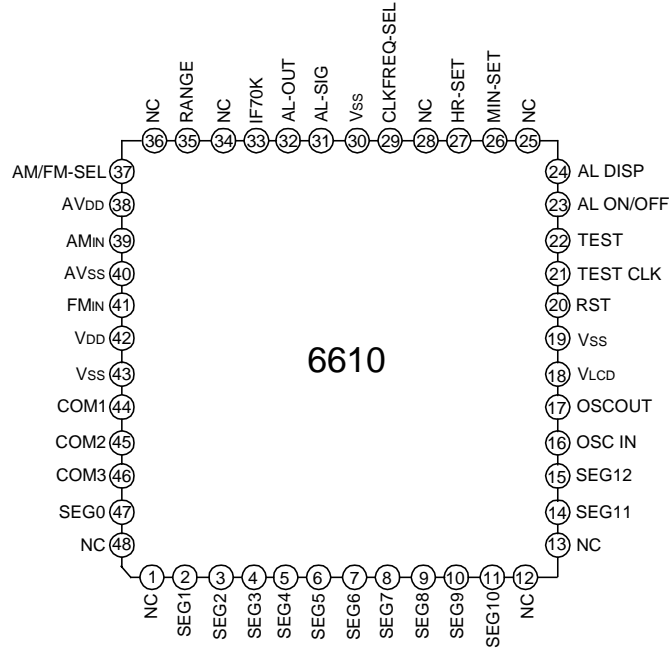


**BLOCK DIAGRAM**

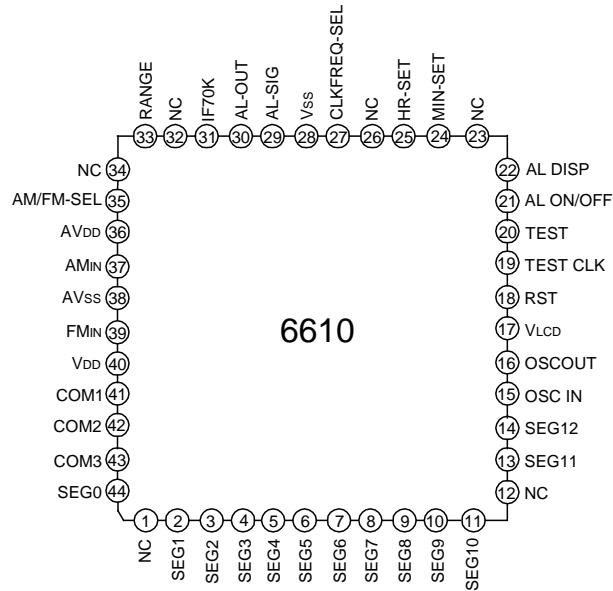


PAD ASSIGNMENT

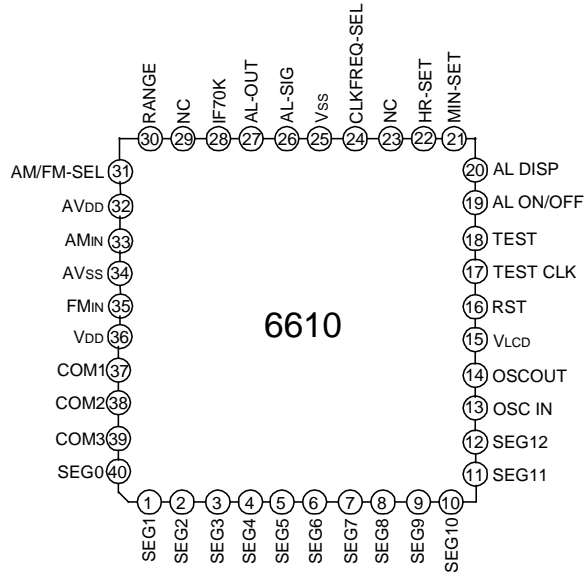
QFP-48- 12x12-0.8 PACKAGE



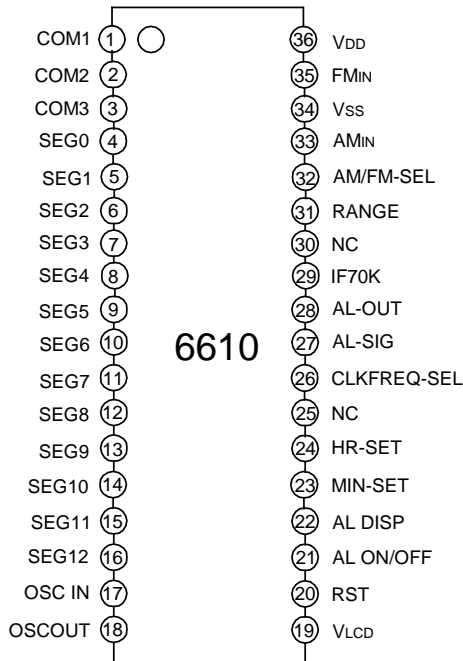
QFP-44- 10 x 10-0.8 PACKAGE



COB PACKAGE, QFP TYPE



COB PACKAGE SOP TYPE



## ABSOLUTE MAXIMUM RATINGS (Ta=25°C, unless otherwise specified)

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	VDD	0.5 ~ 7.0	V
Input Voltage	VIN	-0.5 ~ VDD+0.5	V
Output Voltage	VOUT	-0.5 ~ VDD+0.5	V
Storage Temperature	TSTG	-40 ~ +125	°C
ESD Protection		-2 ~ +2	kV

## ELECTRICAL CHARACTERISTICS (Ta=25°C, VDD= 3, Unless otherwise specified)

Parameter	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Supply Voltage	VDD					
VDD Supply Current Consumption	IDD1	frequency mode		1.8	3.6	mA
	IDD2	clock mode		55	110	μA
Internal LCD Reference Voltage	VLCD	respect to VDD	2	2.25	2.5	V
LCD Drive Current consumption	ILCD	all segments on			5	μA
LCD Frame Frequency	FLCD			32		Hz
Oscillator Frequency	FOSC			32.768		kHz
FM Input Frequency	FFM	VIN = 0.3 VPP	11.0		150	MHz
AM Input Frequency	FAM	VIN = 0.3 VPP	0.5		30	MHz
FM Input impedance	RIN(FM)	FFM = 120MHz		150		Ω
AM Input impedance	RIN(AM)	FAM = 12MHz		2.0		kΩ
Open Drain Low Level Voltage	VOloc	VDD=3V, Isink =10mA			0.5	V
Low Level Input Voltage	VIL				0.3VDD	V
High Level Input Voltage	VIH		0.7VDD			V
Low Level Output Voltage	VOL	VDD=3V, Isink=4mA			0.4	V
High Level Output Voltage	VOH	VDD=3V, ISOURCE=-4mA	VDD-0.5			V
Schmitt Trigger Positive Threshold	Vt+	VDD=3V		2.3	2.4	V
Schmitt Trigger Negative Threshold	Vt-	VDD=3V	0.6	0.9		V
Schmitt Trigger Input Resistance	RIN+/-	pull-up or pull-down		75		kΩ
Reset Pin pull-up Resistance	RIN-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 μF capacitor between this pin and VSS
21	RST	ISU	Active low power-on reset with pull-up resistor of approx.750kΩ
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
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PAD NO.	SYMBOL	I/O	DESCRIPTION
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  
 D10: 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 FMIN and the AMIN pins respectively. The FM signal then routes through a divide-by-10 dynamic pre-scaler. 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	AM/FM-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	+455kHz	Display AM input frequency 455kHz

\* Suitable to use with TDA7088.

### 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

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):

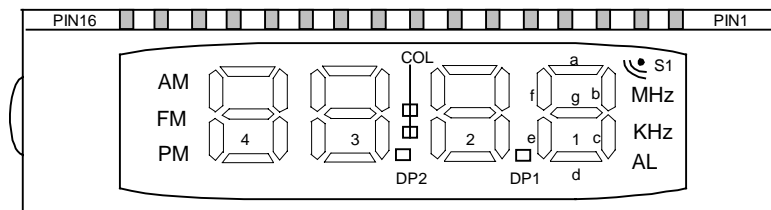
- [HR SET] and [MIN SET] keys will be disabled.
- [AL-DISP] KEY,[AL-ON/OFF] KEY AND AL-SIG output will be enabled.

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

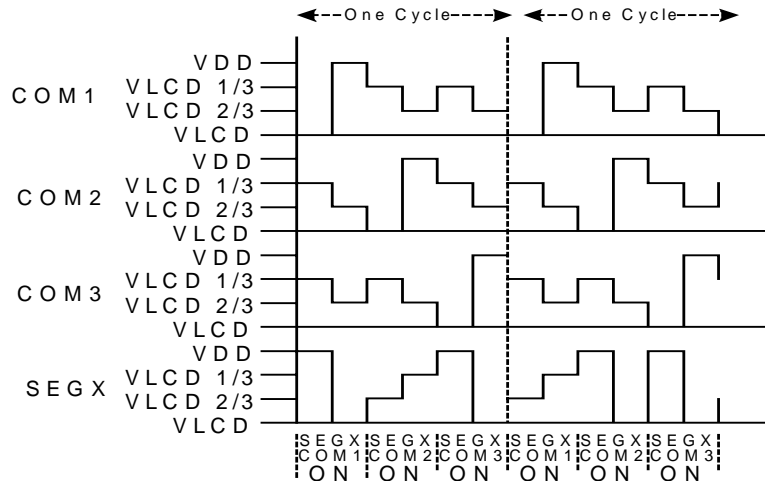
- When in clock mode, it will display and start at AM 7:00.
- When in DTS frequency mode, if CLKFREQ-SEL = High, and FMIN & AMIN pins are grounded, all LCD segments will be turned on(LCD test mode).

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

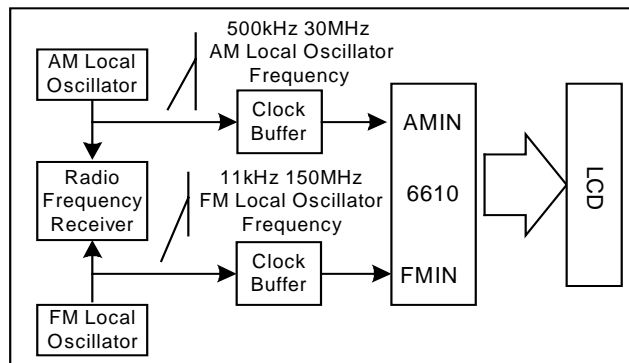
PIN	FUNCTION	LCD MAPPING		
1	COM1	COM1		
2	COM2		COM2	
3	COM3			COM3
4	SEG0	kHz	MHz	
5	SEG1	AL	DIG1-c	DIG1-b
6	SEG2	DIG1-d	DIG1-g	DIG1-a
7	SEG3	DP1	DIG1-e	DIG1-f
8	SEG4	DP2	DIG2-c	DIG2-b
9	SEG5	DIG2-d	DIG2-g	DIG2-a
10	SEG6	:	DIG2-e	DIG2-f
11	SEG7	AM	DIG3-c	DIG3-b
12	SEG8	DIG3-d	DIG3-g	DIG3-a
13	SEG9		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



LCD TIMMING WAVEFORMS



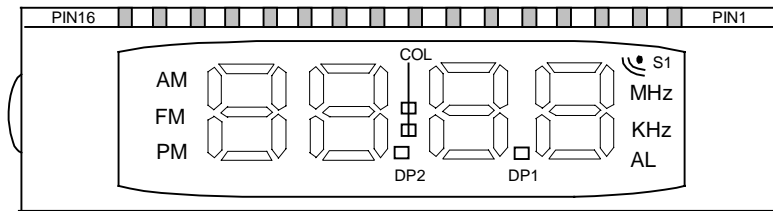
SUGGESTED APPLICATION



TYPICAL LCD LAYOUT

Counter Only Mode

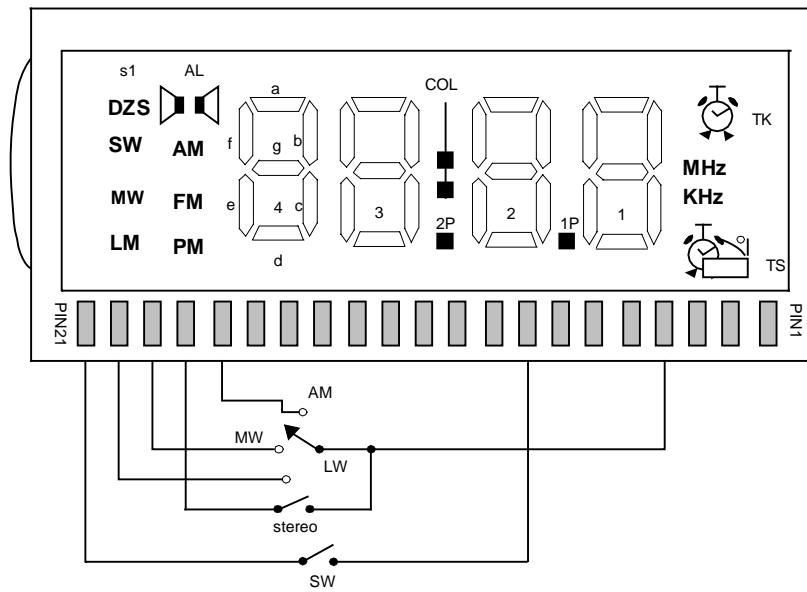
PIN	COM1	COM2	COM3
1	COM1		
2		COM2	
3			COM3
4	kHz	MHz	S1
5	AL	1C	1B
6	1D	1G	1A
7	DP1	1E	1F
8	DP2	2C	2B
9	2D	2G	2A
10	COL	2E	2F
11	AM	3C	3B
12	3D	3G	3A
13		3E	3F
14	FM	4C	4B
15	4D	4G	4A
16	PM	4E	4F



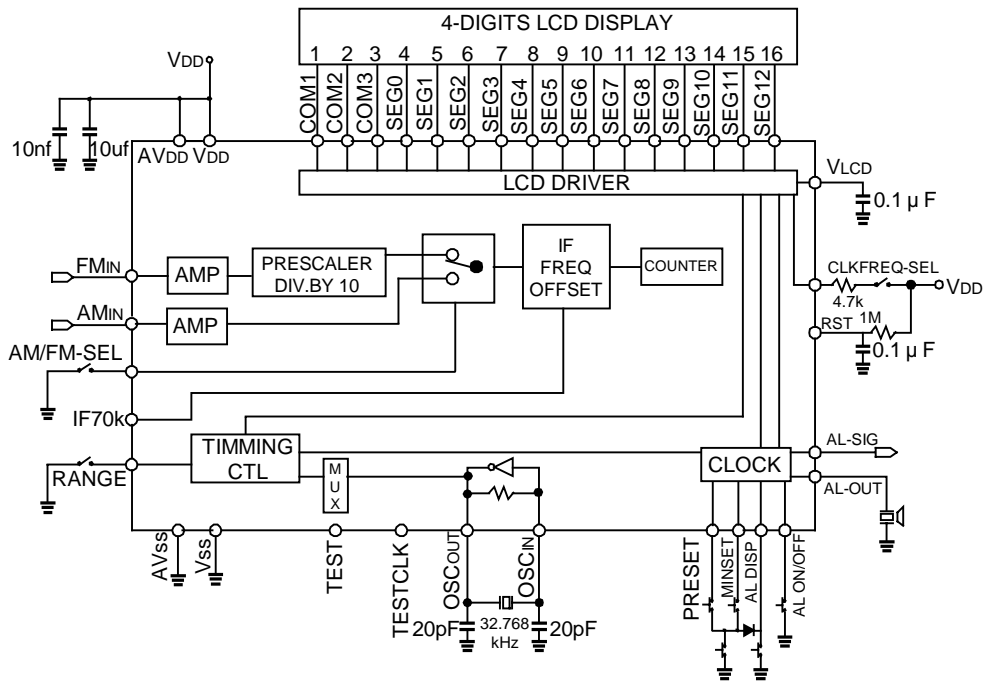
Clock and Counter Mode

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		

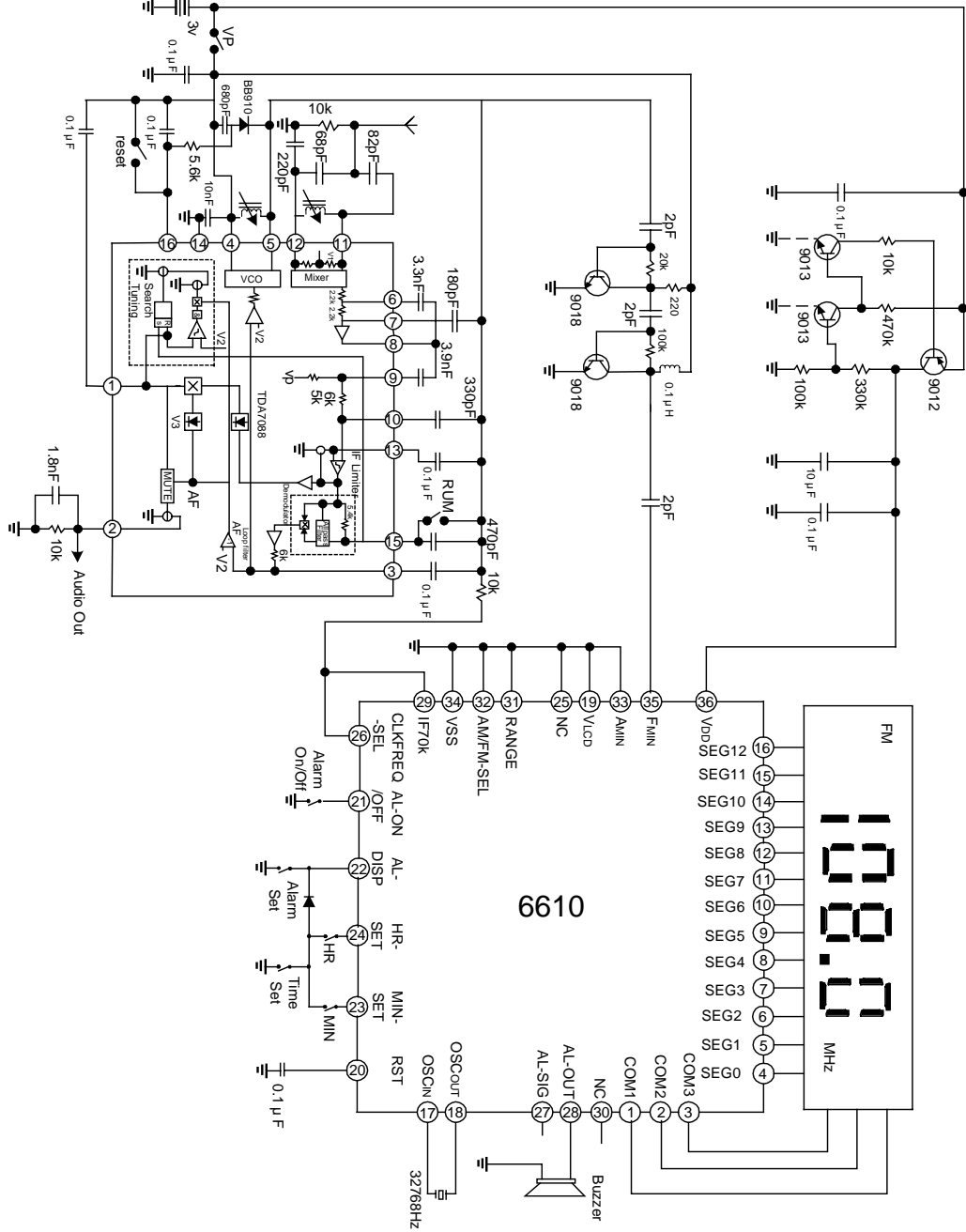




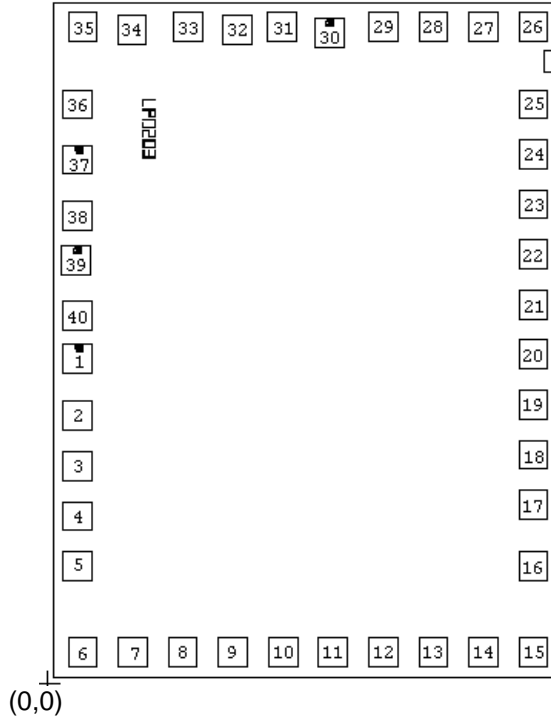
TYPICAL APPLICATION CIRCUITS 1



TYPICAL APPLICATION CIRCUITS 2



PAD COORDINATES



CHIP SIZE: 2.02 x2.70mm

PAD COORDINATES

# UTC 6610

# CMOS IC

PAD No.	X	Y	PAD No.	X	Y
1	99	1258	21	1899	1473
2	99	1033	22	1899	1670
3	99	835	23	1899	1868
4	99	637	24	1899	2066
5	99	440	25	1899	2263
6	120	98	26	1899	2570
7	318	98	27	1701	2570
8	516	98	28	1504	2570
9	713	98	29	1306	2570
10	911	98	30	1093	2547
11	1108	98	31	908	2570
12	1306	98	32	732	2558
13	1504	98	33	538	2570
14	1701	98	34	314	2556
15	1899	98	35	120	2570
16	1899	440	36	99	2263
17	1899	682	37	99	2045
18	1899	880	38	99	1823
19	1899	1078	39	95	1648
20	1899	1275	40	99	1428

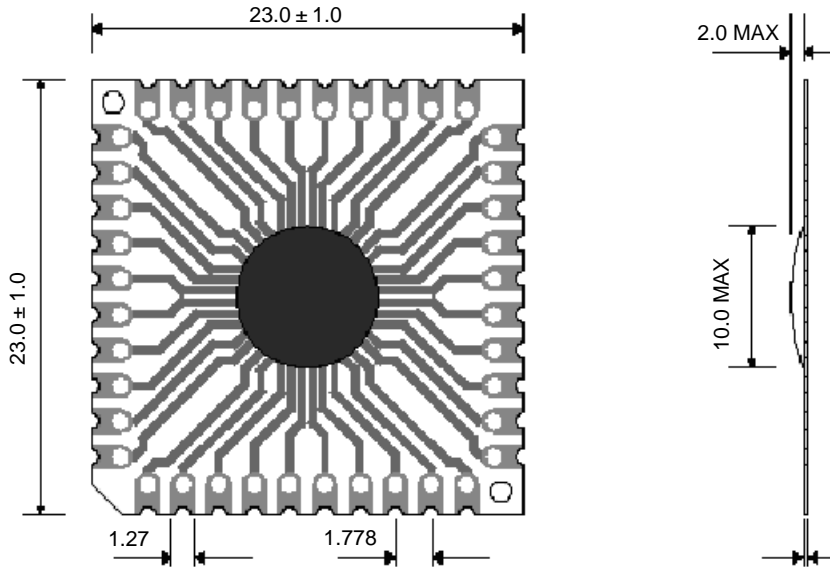
(Unit :  $\mu$  m)

# UTC 6610

# CMOS IC

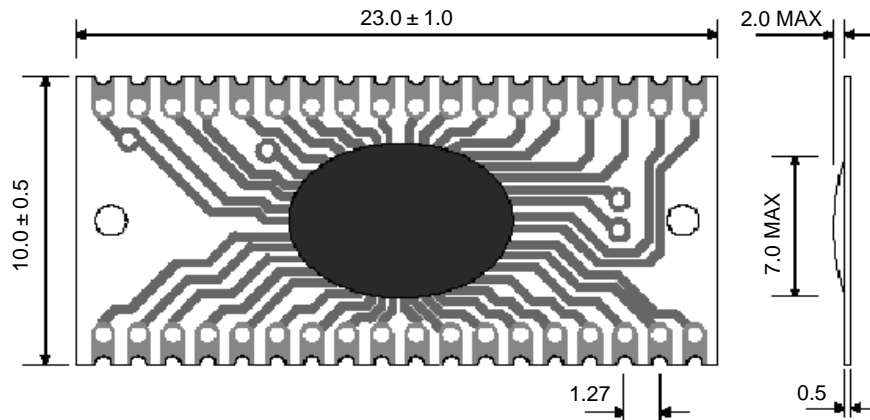
COB PACKAGE (QFP TYPE)

(UNIT: mm)



COB PACKAGE (SOP TYPE)

(UNIT: mm)



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