

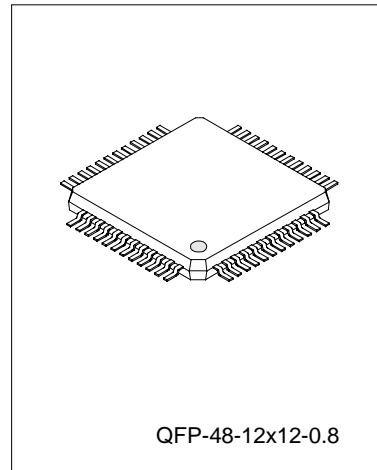
**FREQUENCY AND CLOCK DISPLAY DRIVER**

**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**

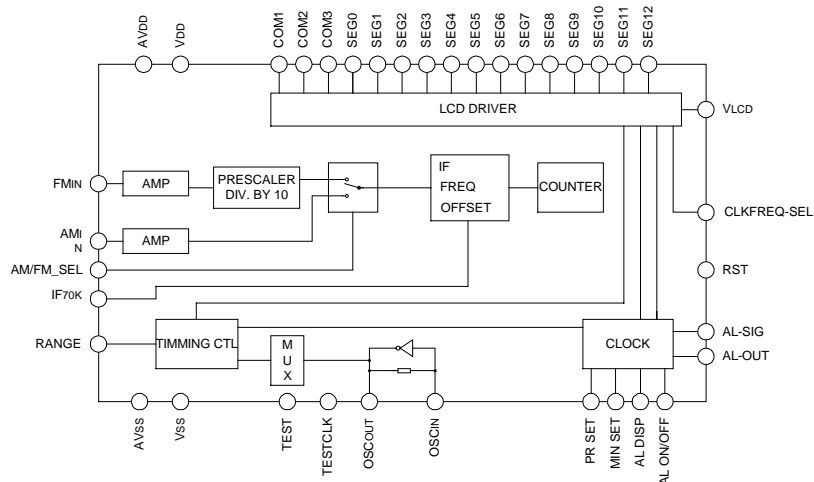
- \* FM input with pre-scaler for radio frequency up to 150 MHz
- \* AM input for radio frequency up to 30 MHz
- \* 3 common, 13 segment, 1/3 bias LCD display drivers which supports 4 digits LCD display
- \* On chip oscillator for external 32.768kHz crystal
- \* 10.7 MHz / 70 kHz I.F. frequency offset 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**

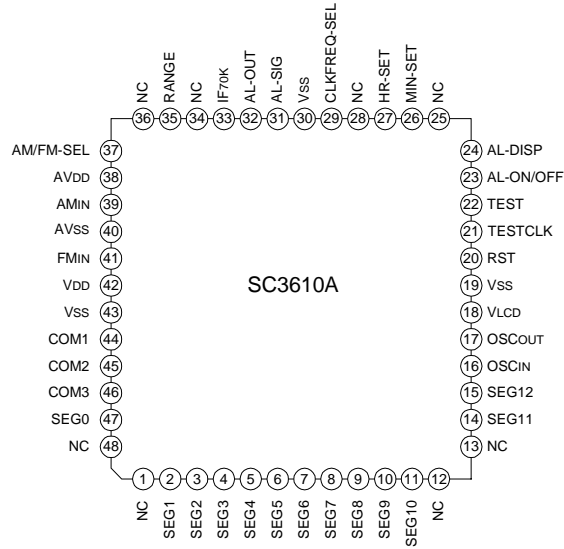
SC3610A	QFP-48-12x12-0.8 Package
SC3610B	QFP-44-10x10-0.8 Package
SC3610C	COB Package (QFP Type)
SC3610D	COB Package (SOP Type)

**BLOCK DIAGRAM**

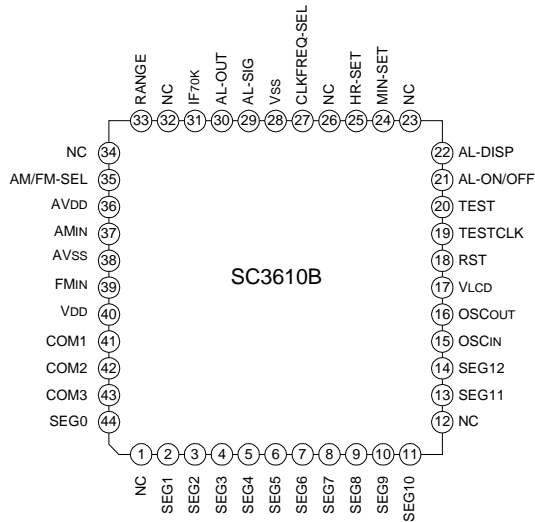


**PAD ASSIGNMENT**

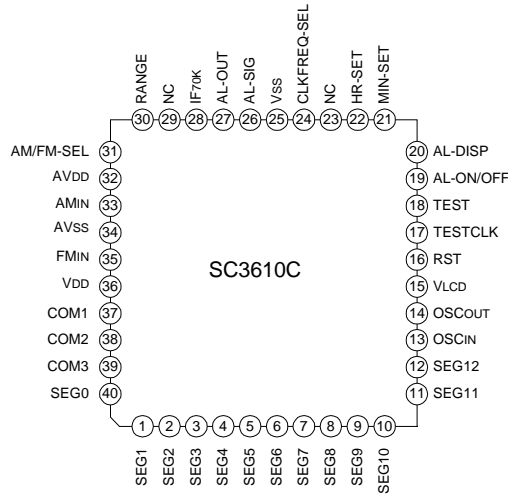
*SC3610A (QFP-48-12x12-0.8 Package)*



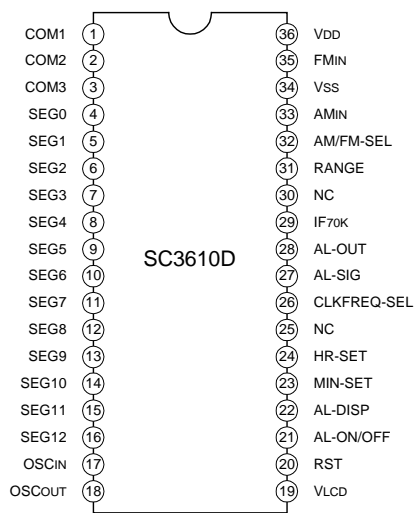
*SC3610B (QFP-44-10x10-0.8 Package)*



SC3610C (COB Package, QFP Type)



SC3610D (COB Package, SOP Type)



## ABSOLUTE MAXIMUM RATING

Characteristic	Symbol	Value	Unit
Supply Voltage	VDD	0.5 ~ 7.0	V
Input or Output Voltage	VIN, VOUT	-0.5 ~ VDD+0.5	V
Storage Temperature	TSTG	-40 ~ +125	°C
ESD Protection		-2 ~ +2	kV

## ELECTRICAL CHARACTERISTICS (VDD = 3V, Temp = 25°C, 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 $\mu$ F capacitor between this pin and VSS
21	RST	ISU	Active low power-on reset with pull-up resistor of approx.750k $\Omega$
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<sub>IN</sub> and the AM<sub>IN</sub> 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).

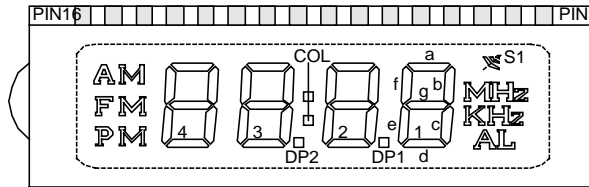
4. LCD pin configuration and 0 to 9 digits segments display configuration.

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

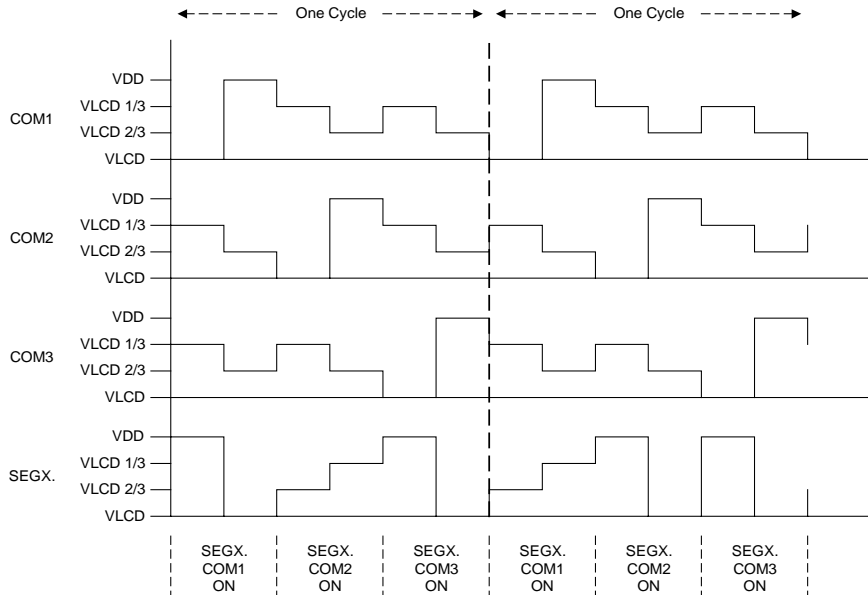
(To be continued)

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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

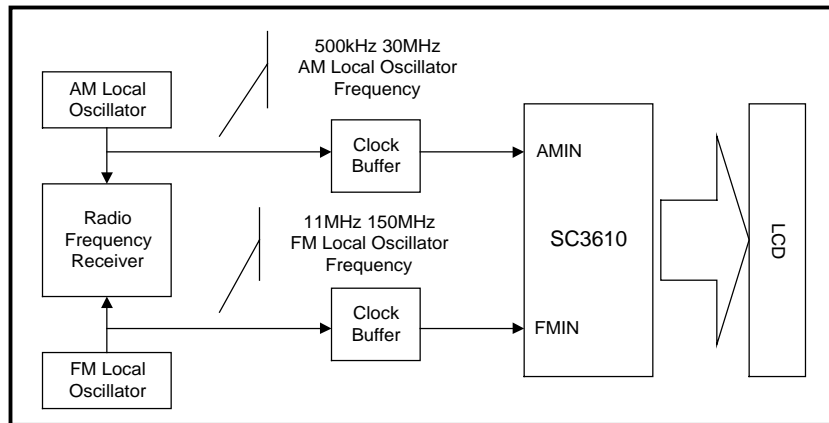


**LCD TIMING WAVEFORMS**





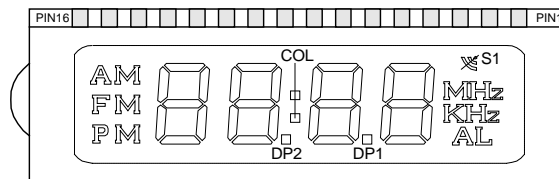
**SUGGESTED APPLICATION**



**TYPEICAL LCD LAYOUT**

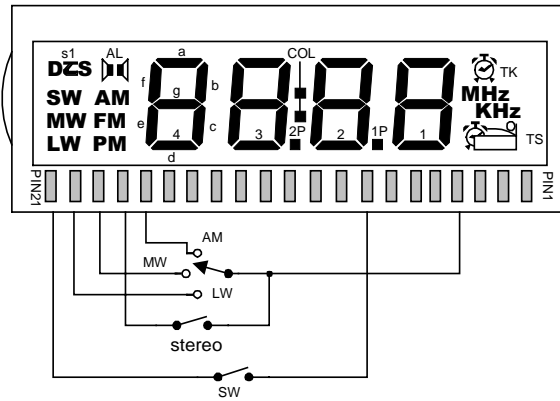
*Counter Only Mode*

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

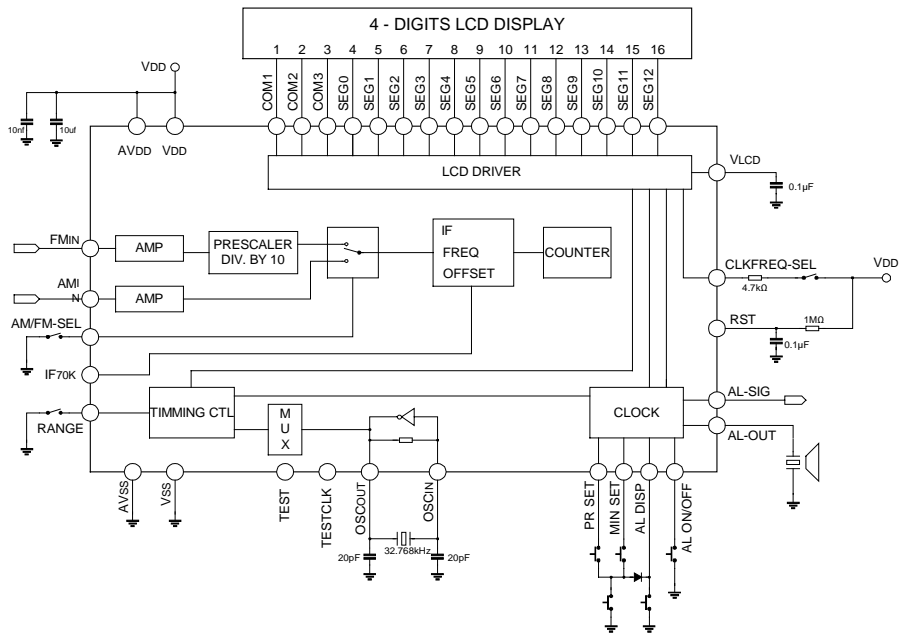


*Clock and Counter Mode*

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		

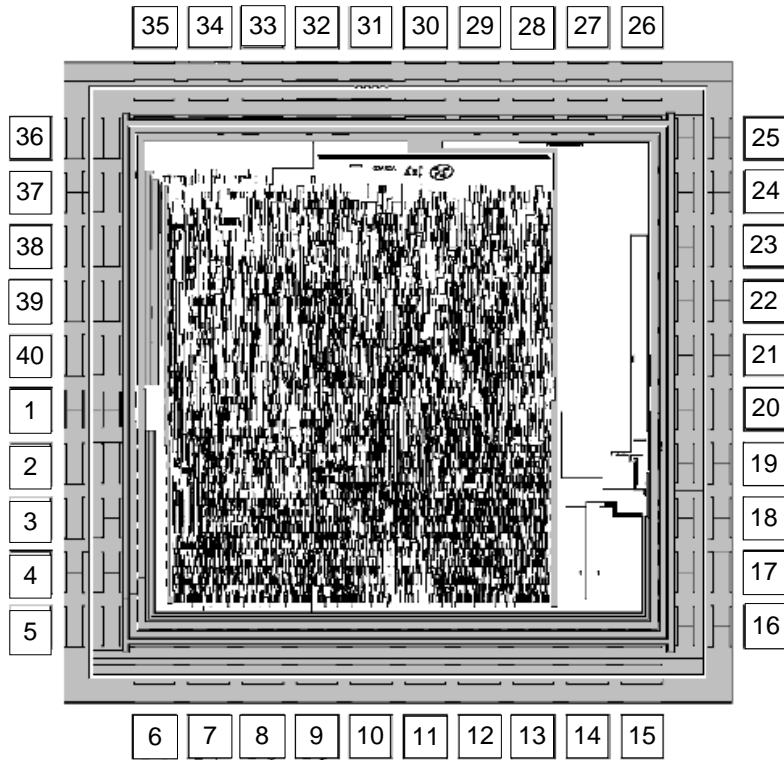


**TYPICAL APPLICATION CIRCUITS (1)**





**CHIP TOPOGRAPHY**



Chip Size: 2.72mmx2.88mm

**PAD COORDINATES** (Unit:  $\mu\text{m}$ )

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**

