1. GENERAL DESCRIPTION

The DL8219 is a countdown timer, which has six internal presettin g intervals: 1; 3; 5 ;15; 30; 60 mins. The selected time is set by connecting appropriate K_i input to V_{cc}. The K_i is priority to K_{i+1}. The timer starts by triggering S key. When the timer is counting, it can be stopped by triggering of the S key. All other key K_i are not affected when counting. Another triggering to S will continue counting again. When countdown time is reached, the LCD displays 00:00, the colon stops flashing and at this moment BZ output will send out a 2K x 8 x 1 signal for 64 seconds. During this alarm signal, triggering S will stop the output. The triggering of S will set the timer again.

1.1 FEATURES

- 4 digit LCD display
- Six fixed times: 1; 3; 5; 15; 30; 60mins
- Alarm sound 2kHz, 64 seconds
- Key tone (bonding option)
- Special alarm output for driving another IC

1.2 FUNCTIONS

- Special alarm output for driving another melody IC
- Internal voltage doubler
- 32,768Hz quartz crystal time base
- Direct drive buzzer
- Single 1.5V battery operation

2. ABSOLUTE MAXIMUM RATINGS ($T_a = 25^oC$)

Characteristic	Symbol	Value	Unit
Supply Voltage	$V_{CC} - V_{SS}$	-0.3 ~ 5.0	V
Input Voltage	V_{IN}	V_{SS} –0.2 to V_{CC} +0.3	V
Operating Temperature	T_A	- 20 ~ + 60	^oC
Storage Temperature	T_{stg}	- 55 ~ + 125	^oC

3. ELECTRICAL CHARACTERISTICS
(Ta = 25^oC, V_{SS} = 0V, V_{CC} = 1.5V, F_{OSC} = 32768 Hz; unless otherwise specified)

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
Operating Voltage	V_{CC}		1.25	1.5	1.70	V
Display Voltage	V_{DD}		2.4	3.0	3.6	V
Supply Current	I_{CC}	Without Load		1.5	3.0	μA
Output High Current	I_{OH}	V_{OH} =1.35V, TM, TRIG Output	-0.3			mA
Output Low Current	I_{OL}	V_{OL} =0.15V, TM, TRIG Output	0.3			mA
		V_{OL} =0.5V, BZ Output	5	10		
Oscillator Built-in Capacitors	C_D			20		pF
Alarm Output Frequency	F_{BD}			2048 x 4 x 1		Hz

4. PIN DESCRIPTION

4.1   K1 ~ K5   Set inputs.
       By connecting one from this input to Vcc the timer sets to initial state: 1; 3; 5; 15; 30 or 60 min, respectively.

4.2   START - Start Input
       This pin acts as Start function.

4.3   BZ - Alarm Output
       This pin is used to drive the piezo buzzer.
       BZ output signal will be as follows when the countdown time reaches zero.
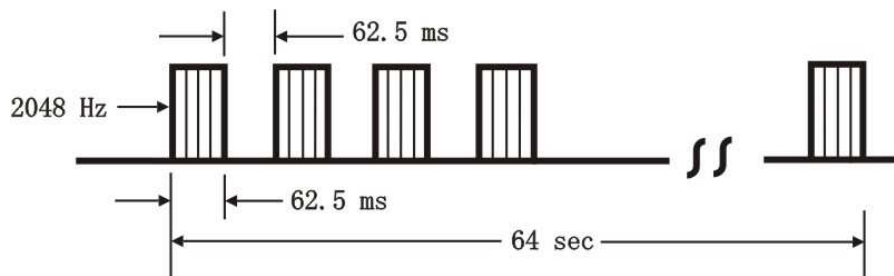
   The above alarm signals will be stopped if any key is triggered during this time period.

4.4   TRIG - LED Output
       This pin is used to drive the LED. LED will flash while BZ sounds (1Hz frequency with 1/16 duty cycle).

4.5   TM - Switch Output
       This Output is normal low, high at count period and low again after count stop.

       V_{DD}, V_{SS} & V_{CC} - Power pins for positive power supply - V_{CC}, ground - V_{SS}, and voltage doubler supply for LCD driving - V_{DD}.

4.7   CAP1 & CAP2 - Voltage Doubler Capacitor
       A capacitor should be connected between these pins.

4.8   OSCI & OSCO - Oscillator Input and Output
       A 32,768Hz quartz crystal oscillator is connected to these pins.

4.9   SEG1 – SEG8 – LCD Segments Driving Pins.

4.10   COM1 – COM2 – LCD Backplane Pins.

4.11   TEST1 – TEST2 – Test Input Pins

4.12   OPT
       Bonding option for touch-tone function: the short alarm signal 62.5ms is sounded when any input beep will pressed. This function is active when this pin is unconnected or connected to V_{CC} and unactive when it is connected to V_{SS}.

5.   FUNCTIONAL DESCRIPTION

5.1   After power-on, LCD will display 00:00.

5.2   Timer is set by S switch. The setting is only effective when same from K_i inputs is connected to V_{cc}.
       The set time will be determinate by appropriate K_i input connected to V_{SS} (for $K_i = 1, 2, …, 5$, the time is 1; 3; 5; 15; 30 or 60 min, respectively)

5.3   After the time has been set, triggering the S pin will start the timer.

5.4   When the timer is counting, it will be stopped by triggering of the S pin.

5.5   When countdown time is reached, the LCD displays 00:00 and at this moment, BZ will send out a 2048 x 8 x 1Hz signal for 60 second. During this alarm period, depress S pin will stop the output.

5.6   The triggering of S will set the timer to initial setting time.

6.   4 - DIGIT LCD FORMAT
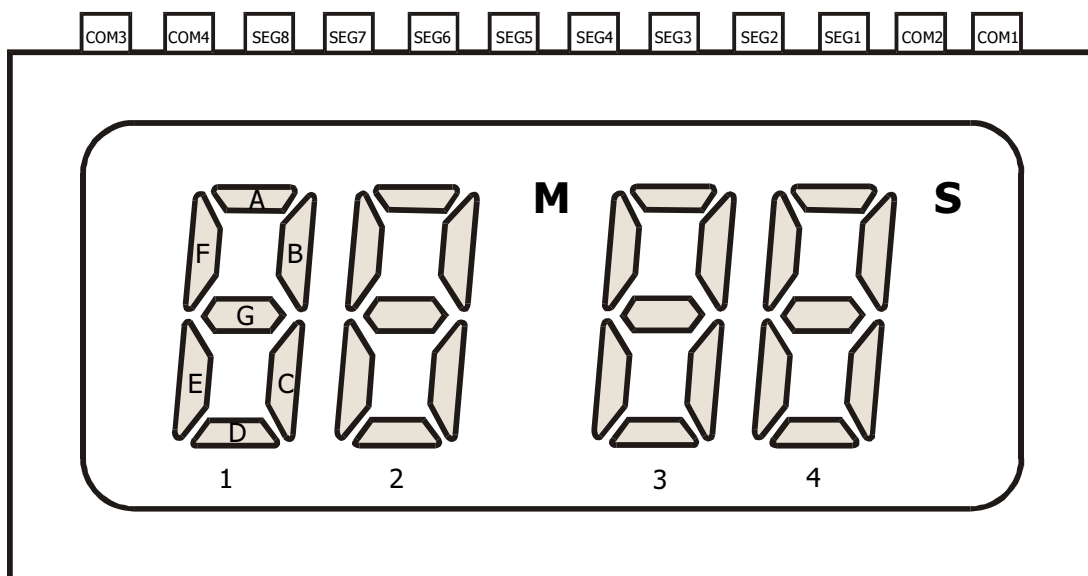
	SEG8	SEG7	SEG6	SEG5	SEG4	SEG3	SEG2	SEG1
COM1	A1	B1	A2	B2	A3	B3	A4	B4
COM2	F1	G1	F2	G2	F3	G3	F4	G4
COM3	E1	C1	E2	C2	E3	C3	E4	C4
COM4	-	D1	-	D2	M, S	D3	-	D4

7.   APPLICATION CIRCUIT
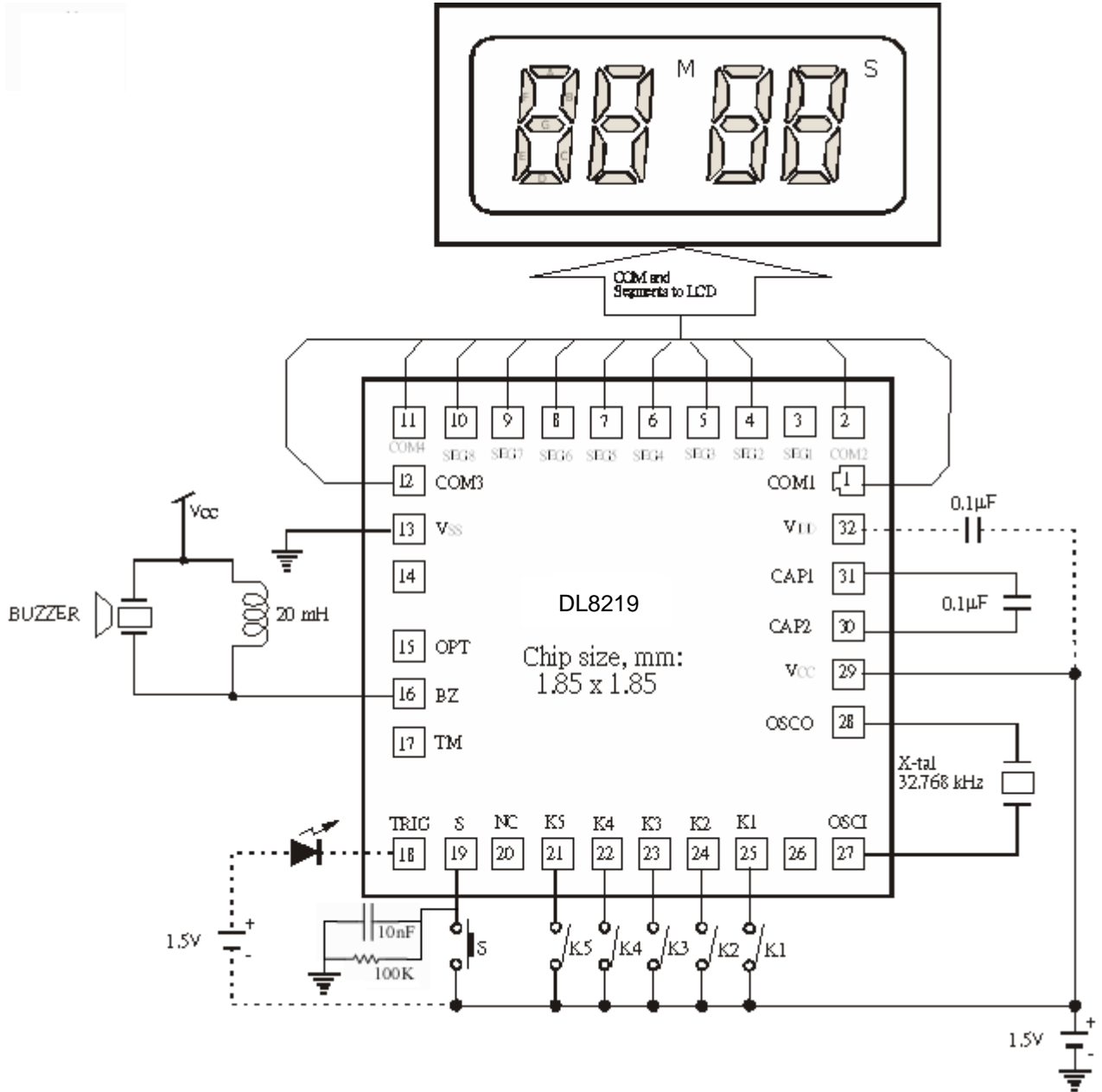
K5	K4	K3	K2	K1	Timer
OPEN	OPEN	OPEN	OPEN	OPEN	1 min
OPEN	OPEN	OPEN	OPEN	CLOSE	3mins
OPEN	OPEN	OPEN	CLOSE	CLOSE	5mins
OPEN	OPEN	CLOSE	CLOSE	CLOSE	15mins
OPEN	CLOSE	CLOSE	CLOSE	CLOSE	30mins
CLOSE	CLOSE	CLOSE	CLOSE	CLOSE	60mins

NOTE: The die area must be floated or connected to V_{SS}.

8.   PAD LAYOUT
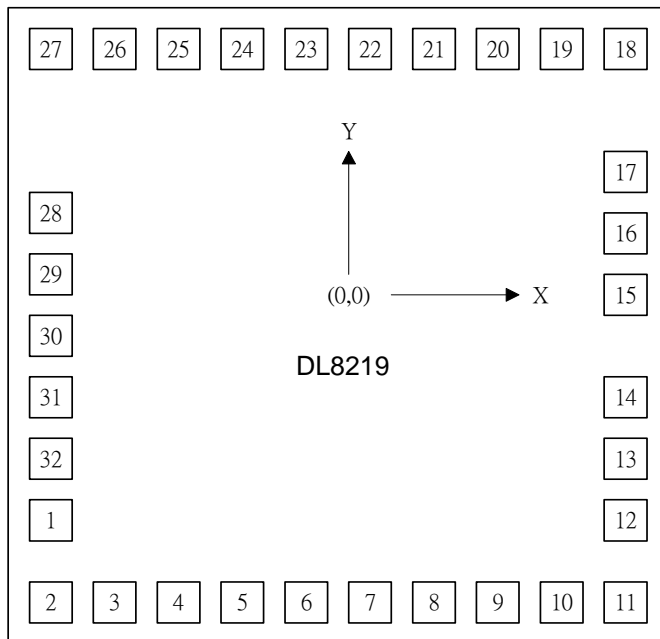
Chip size : 1850 x 1850
Pad size   : 110 x 110
Unit   : μm

The chip substrate must be floated or connected to V_{SS}

9.   PAD LOCATION (Unit:μm)

Pad No.	Pad Name	X	Y	Pad No.	Pad Name	X	Y
1	COM1	-770	-560	17	TM	770	370
2	COM2	-770	-770	18	TRIG	770	770
3	SEG1	-600	-770	19	S	590	770
4	SEG2	-430	-770	20	NC	420	770
5	SEG3	-260	-770	21	K5	250	770
6	SEG4	-90	-770	22	K4	80	770
7	SEG5	80	-770	23	K3	-90	770
8	SEG6	250	-770	24	K2	-260	770
9	SEG7	420	-770	25	K1	-430	770
10	SEG8	590	-770	26	TEST	-600	770
11	COM4	770	-770	27	OSCI	-770	770
12	COM3	770	-560	28	OSCO	-770	300
13	V_{SS}	770	-390	29	V_{CC}	-770	130
14	TEST	770	-220	30	CAP2	-770	-40
15	OPT	770	30	31	CAP1	-770	-210
16	BZ	770	200	32	V_{DD}	-770	-390