



DL8029 Count up/Count down

General Description

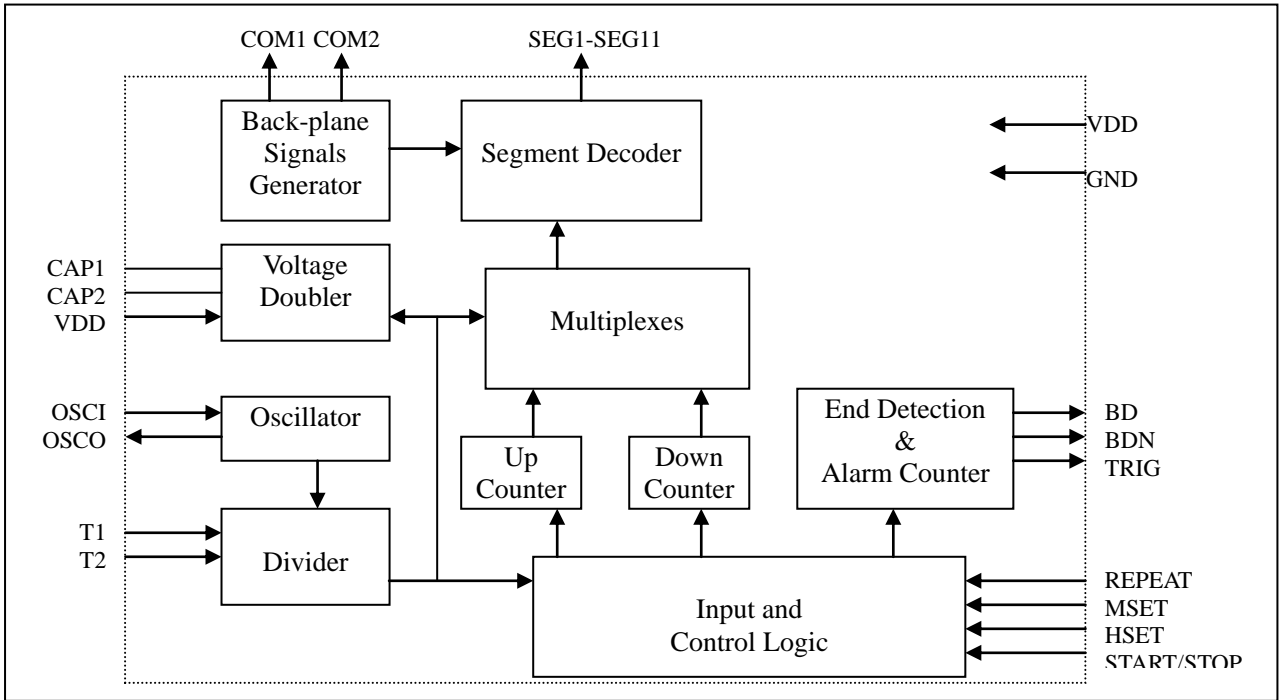
DL8029 is an UP/Down timer IC. It can directly drive a standard 3.5 digit LCD. Maximum countdown time is 20 hours and count up cycle time is 20 minutes. Feasible input options and universal functions give this chip many uses such as parking alarm timer, pillbox timer, kitchen timer, etc.

Features

- ◆ 3.5 digit LCD display
- ◆ Maximum countdown time 20 hours
- ◆ Count-up timer 20 minutes
- ◆ Count-down timer repeat function by option
- ◆ Hours and minutes set independently
- ◆ Timer reset when depressing MSET and HSET simultaneously
- ◆ Directly drives piezoelectric buzzer
- ◆ Special alarm trigger output for switch control or for driving another melody IC
- ◆ 5-minute and 10-minute pre-alarm function
- ◆ Internal voltage doubler
- ◆ 32768Hz quartz crystal time base
- ◆ Single 1.5V battery operation



Function Block Diagram





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DL8029

Pin Description

No.	Name	I/O	Function
1	REPEAT	I	Repeat Control Input (connecting VDD is enable; connecting GND is disable)
2	GND		Negative power supply
3	MSET	I	Minute setting Input
4	STARTSTOP	I	Start or Stop Input
5	CAP2		Voltage doublers capacitor
6	CAP1		Voltage doublers capacitor
7	VEE		Voltage doublers supply
8	COM1	O	LCD common signal output pad
9	BC3	O	LCD segment signal output pads
10	AG3	O	
11	FE3	O	
12	BC2	O	
13	ADG2	O	
14	FE2	O	
15	COLD3	O	
16	BC1	O	
17	AG1	O	
18	FE1	O	
19	KD1	O	
20	COM2	O	LCD common signal output pad
21	OSCO	O	32768Hz crystal oscillator output
22	OSCI	I	32768Hz crystal oscillator input
23	VDD		Positive power supply
24	HSET	I	Hour setting pad
25	BD	O	Piezo buzzer driving output
26	BDN	O	Piezo buzzer driving output
27	TRIG	O	Trigger output
28	T1		Test pad
29	T2		Test pad

Functional Description

Count-down Timer Mode

- ◆ After power-on, LCD will display 18:88 for about one second and then return to 0:00.
- ◆ Time is set by the HSET and MSET pins. Time setting is only effective in this mode and the timer must be in the stop or reset state. Each depression of these pins will make the timer count



advance one digit and if it depressed more than two seconds, the timer will count one digit for every 1/4 second. The hour and minute setting are independent. Colon will be on but not flash during the setting.

- ◆ The timer will reset to 0:00 and generate an alarm test, if HSET and MSET are depressed simultaneously. This alarm signal will be on as long as these pins are depressed.
- ◆ After the time has been set, triggering the Start/Stop pin will start the timer and colon will begin to flash (0.5 sec on, 0.5sec off).
- ◆ When the timer is counting, it will be stopped by another triggering of the Start/Stop pin. In this stop state, the colon will be on, but not flash. The timer can also be set during this state. An additional trigger to Start/Stop will terminate this state and start to count from the time which it displays.
- ◆ As countdown time is remains 10 minutes and 5minutes, BD&BDN will send out the pre-alarm signal. A trigger of Start/Stop, HSET or MSET at the same time during this output period, will truncate the output.
- ◆ When countdown time is reached, the LCD displays 0:00 and the colon will be on but not flash. At this moment, BD&BDN will send out a 4K*8*1 signal for one minute. During this alarm period, triggering Start/Stop, HSET or MSET will stop the output. If the repeat function is enabled, the triggering of Start/Stop will restart the countdown timer from the previous setting time. In no repeat mode, Start/Stop trigger will only stop the output.
- ◆ In countdown mode with repeat function enabled, when time is reached and alarming, press any buttons can stop alarm and then only display the previous setting without counting. Press start/stop button again to start for counting down. (During 1 minute alarm, if any buttons has not been pressed, it will display 0:00 and stop alarm. Press start/stop button will only display the previous countdown setting without counting. Press start/stop button again to start for counting down.)
- ◆ In countdown mode with repeat function disabled, when time is reached and alarming, press any buttons can stop alarm and then only display 0:00 without counting. Press start/stop button again to start for count up timer. (During 1 minute alarm, if any buttons has not been pressed, it will display 0:00 and stop alarm. Press start/stop button to start for count up timer.)
- ◆ When this chip is in countdown timer mode, TRIG will send out a DC high level signal and can not be stopped until the timer reaches zero or reset is triggered.

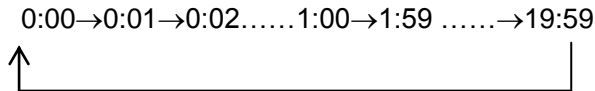
Count-up Timer Mode

- ◆ If repeat function exists, count-up timer start only when the chip has been reset and powered on without a set time. If there is no repeat function depressing Start/Stop key will start the count-up timer when the countdown time reached zero and the alarm output has finished. However, the count-up timer will start by triggering Start/Stop after reset. One special case, if you set time to



0:00 after reset or the count down timer reaches zero with no repeat function, a trigger of the Start/Stop count-up timer start.

- ◆ The count-up timer has a cyclical count of 20 minutes after being started. The counting sequences are listed below:



- ◆ In this mode, it will always display minutes and seconds. In addition, colon is always on and not flashing.
- ◆ While the count-up timer is counting, depressing the Start/Stop key will stop it. Another trigger of Start/Stop will start the timer continuously counting.
- ◆ When the chip is in count up timer mode, the chip can change to count down timer mode after the count-up timer is reset by depressing MSET and HSET at the same time.

Absolute Maximum Ratings ($T_a=25^\circ\text{C}$)

(All voltage referenced to GND)

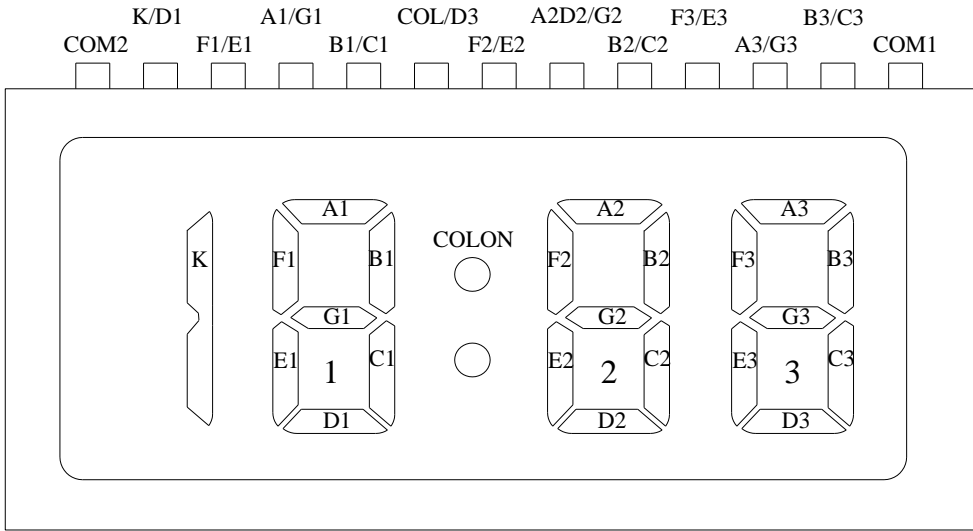
Item	Symbol	Rating	Unit
Supply Voltage	V_{DD}	0 ~ 2.0	V
Input / Output Voltage	V_I/V_O	GND-0.5 ~ VDD+0.5	V
Operating Temperature	T_{DD}	-20 ~ +60	$^\circ\text{C}$
Storage Temperature	T_{ST}	-40 ~ +70	$^\circ\text{C}$

Electrical Characteristics ($T_a=25^\circ\text{C}$, $V_{DD}=1.5\text{V}$, $GND=0\text{V}$, $F_{osc}=32768\text{Hz}$)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Operating Voltage	V_{DD} V_{EE}			1.5 - 1.5		V
Supply Current	I_{DD}	Without Load	---	1.5	3	μA
Buzzer Driving Current	I_{BD}	$V_{DD}=1\text{V}$	200			μA
TRIG Driving Current	I_T	$V_{OH}=1.2\text{V}$	200			μA
Alarm Output Frequency	F_{DD}		4096*8*1			Hz
LCD Driving Current	I_{LCD}		0.1			μA
Oscillator Start up Time	T_{OS}	$V_{DD}=1.2\text{V}$			2	sec



LCD Format

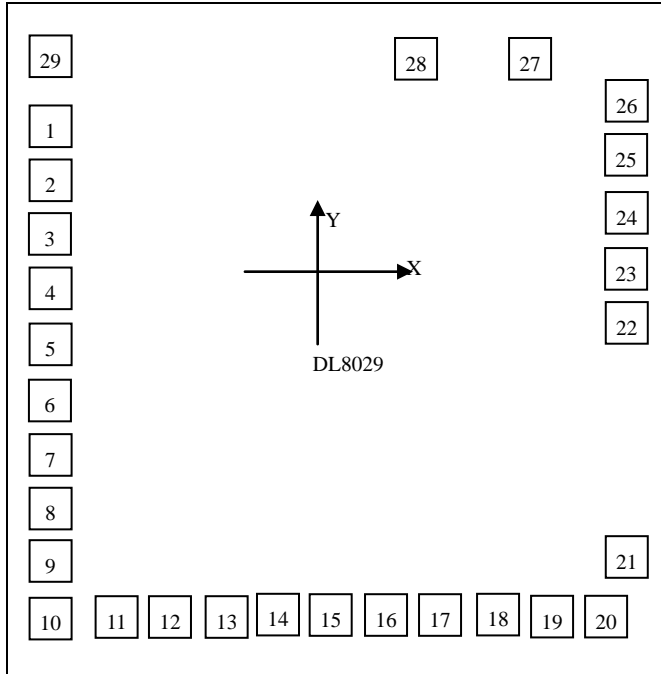


Voltage: 3V
1/2 Bias, 1/2Duty

COM2	K	F1	A1	B1	COL	F2	A2D2	B2	F3	A3	B3	
	D1	E1	G1	C1	D3	E2	G2	C2	E3	G3	C3	COM1



Pad Diagram



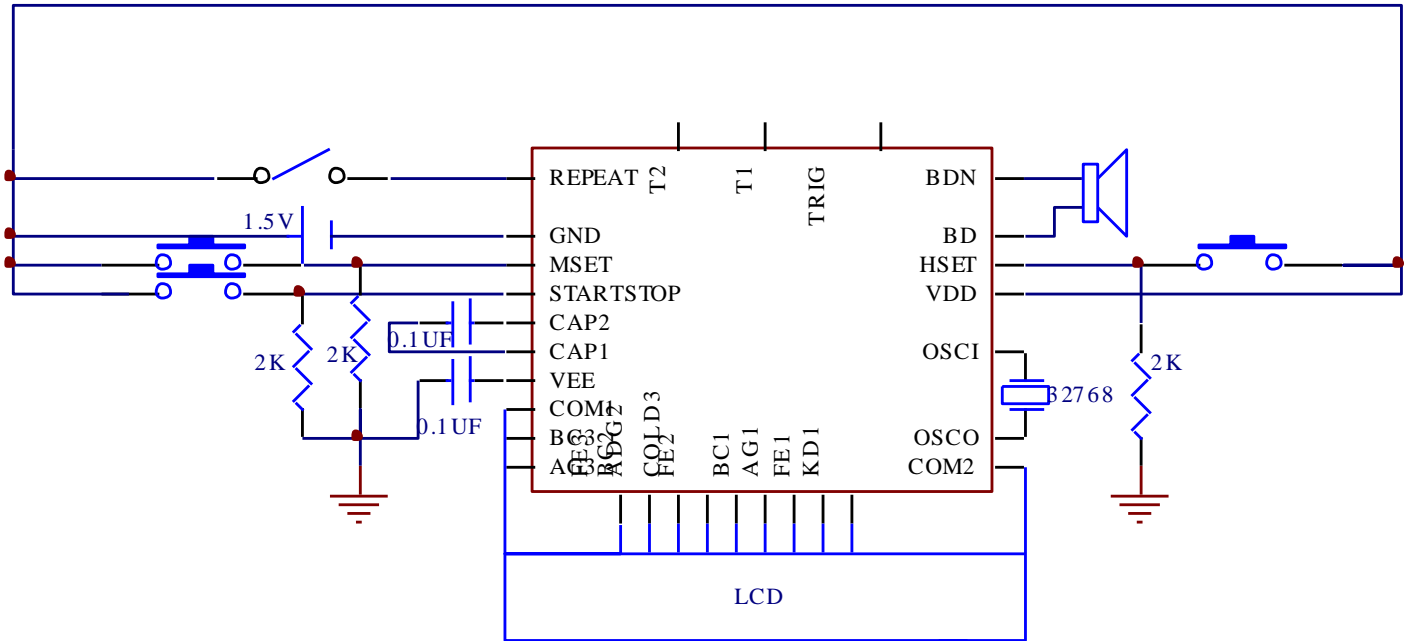
Chip size: (1770 , 2160) Unit: μm

Note: The Substrate should be connected to VDD.

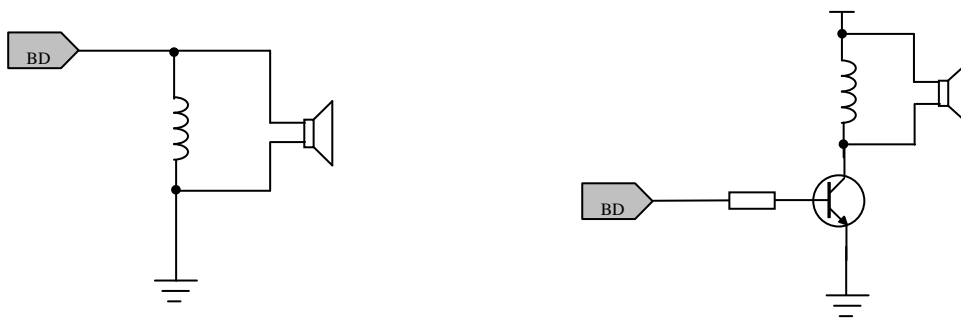
No.	Pad Name	X	Y
1	REPEAT	-703	754
2	GND	-703	602
3	MSET	-703	462
4	STARTSTOP	-703	322
5	CAP2	-703	122
6	CAP1	-703	-125
7	VEE	-702	-325
8	COM1	-702	-465
9	BC3	-702	-605
10	AG3	-703	-898
11	FE3	-562	-898
12	BC2	-423	-898
13	ADG2	-282	-898
14	FE2	-142	-898
15	COLD3	-2	-898
16	BC1	-138	-898
17	AG1	278	-898
18	FE1	418	-898
19	KD1	558	-898
20	COM2	698	-898
21	OSCO	702	-606
22	OSCI	703	67
23	VDD	703	206
24	HSET	703	345
25	BD	696	545
26	BDN	696	783
27	TRIG	495	895
28	T1	297	894
29	T2	-703	895



Application Circuit



If the sound of buzzer is not loud enough, please choose one of the following two circuits.



Notice

- The information contained herein could be changed without notice owing to product and /or technical improvements. Please make sure before using the product that the information you are referring to is up-to-date.
- No responsibility is assumed by us for any consequence resulting from any wrong or improper operation, etc.of the product.