# RCL Semiconductors Ltd.

## Flashing EL Lamp Driver IC C1003

### GENERAL DESCRIPTION

C1003 is a poly gate CMOS integrated circuit which is designed to drive an Electoluminescence Lamp (EL) to light with flashing. It supplies three input pins to control three ELs or four ELs to flash, which is selected by OP3. C1003 also can flash with two functions: one direction or bi-directions flash which is selected by OP2. C1003 can flash during six cycles then full on during three cycles, or all flash during 9 cycles which is decided by OP1. The flash time can be decided by built-in oscillator. Positive and negative triggers are available.

C1003 series product can be widely used in the back light of digital watch, analogy watch, calculator etc.

### FUNCTIONS

- Power supply: 1.5V ~ 4.5V
- DC to AC conversion by a few external components
- Built-in RC oscillator
- Three internal function control inputs:
  OP1: flashing mode control
  OP2: flashing in one or bi-directions control
  OP3: 3 or 4 ELS flashing control

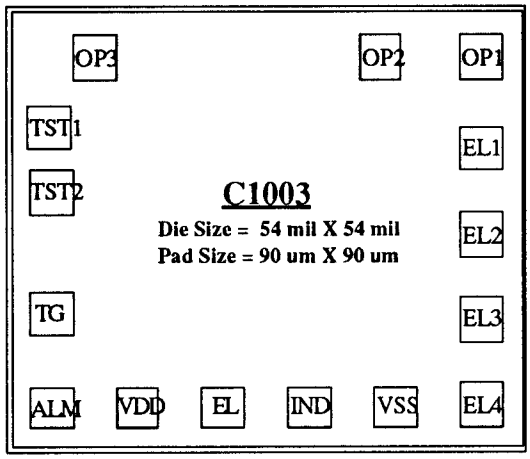
### FEATURES

- Economical solution for EL display
- CMOS process with low power consumption and high stability
- Min. external components application.

### FUNCTION CONTROL TABLE

| Pin Name | Function Description |
|---|---|
| OP1 | When OP1 is open, C1003 flashes 6 cycles and keeps on 3 cycles then turns off; when it is connected to Vss, C1003 will flashed 9 cycles then off. |
| OP2 | When OP2 is open, C1003 flashes in one-direction;<br>when it is connected to Vss, C1003 flashed in bi-direction |
| OP3 | When OP3 is open, there are 3 ELs output in C1003<br>when it is connected to Vss, there are 4 ELs output in C1003 |

### PAD DIAGRAM




| PIN | DESCRIPTION |
|---|---|
| TST1, TST2 | Test Pins |
| TG | Trigger input pin active at high |
| ALM | Trigger input pin active at low |
| VDD | Positive power supply |
| EL | DC to AC converter output |
| IND | DC to AC converter output |
| Vss | Negative power supply |
| EL1 ~ EL4 | EL output control pins |
| OP1 ~ OP3 | Option pins for flash function |

Note: Substrate should be connected to VDD

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## ABSOLUTE MAXIMUM RATINGS
( Ta= 25 °C)

| Parameter | Symbol | Limits |
|---|---|---|
| Power supply voltage range | $V_{DD}$ - $V_{SS}$ | - 0.3V to + 5.0V |
| Input voltage range | Vin | $V_{SS}$ - 0.3 to $V_{DD}$ + 0.3 |
| Operating temperature range | $T_A$ | 0 to +60°C |
| Storage temperature range | Tstg | -40 to +70°C |

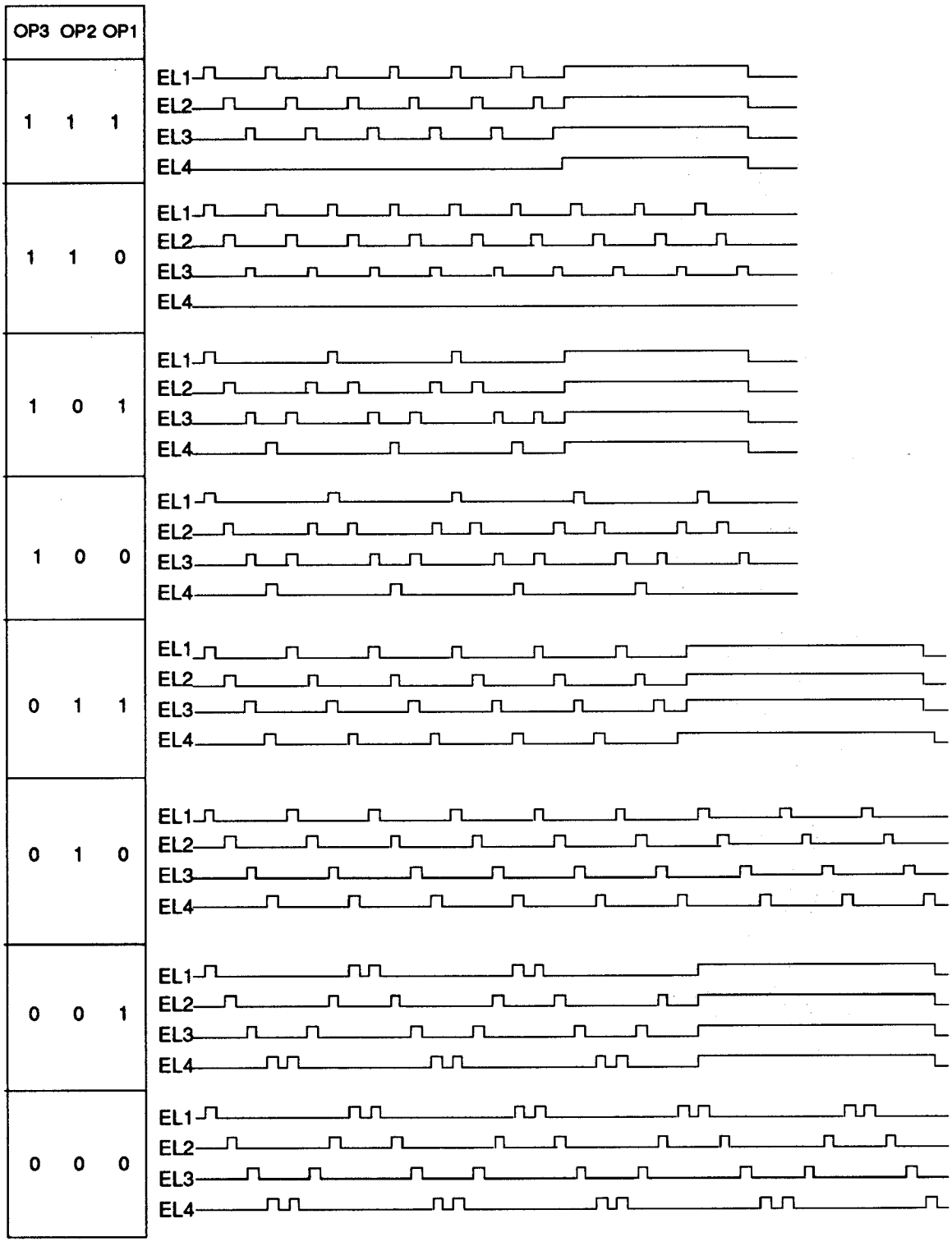
## DC ELECTRICAL CHARACTERISTICS
Unless otherwise specified, Ta = 25°C, $V_{DD}$ = 3.0V, Vss = 0V

| Characteristics | Symbol | Min. | Typ. | Max. | Unit | Test Conditions |
|---|---|---|---|---|---|---|
| Operating voltage range | $V_{DD}$ | 1.3 | 3.0 | 4.5 | V | — |
| Standard current | $I_{DD}$ | -- | 0.1 | 1 | μA | *no load |
| IND Output Source Current | $I_{OH1}$ | 3.0 | 4.6 | -- | mA | $V_{OH}$ = 0.8V |
| EL Output Source Current | $I_{OH2}$ | 1.0 | 2.2 | -- | mA | $V_{OH}$ = 0.8V |
| IND Ouput Sink Current | $I_{OL1}$ | 10 | 20 | -- | mA | $V_{OL}$ = 0.8V |
| EL Ouput Sink Current | $I_{OL2}$ | 2.0 | 4.0 | -- | mA | $V_{OL}$ = 0.8V |
| Oscillator Starting Voltage | $V_{STP}$ | 1.3 | -- | -- | V | — |
| Oscillator Frequency | Fosc | 400 | 500 | 670 | KHZ | $V_{DD}$ = 3.0V |

Unless otherwise specified, Ta = 25°C, $V_{DD}$ = 1.5V, Vss = 0V

| Characteristics | Symbol | Min. | Typ. | Max. | Unit | Test Conditions |
|---|---|---|---|---|---|---|
| Operating voltage range | $V_{DD}$ | 1.3 | 1.5 | 4.5 | V | — |
| Standard current | $I_{DD}$ | -- | 0.1 | 1 | μA | *no load |
| IND Output Source Current | $I_{OH1}$ | 0.5 | 0.8 | -- | mA | $V_{OH}$ = 0.8V |
| EL Output Source Current | $I_{OH2}$ | 0.2 | 0.4 | -- | mA | $V_{OH}$ = 0.8V |
| IND Ouput Sink Current | $I_{OL1}$ | 3.0 | 10 | -- | mA | $V_{OL}$ = 0.8V |
| EL Ouput Sink Current | $I_{OL2}$ | 0.3 | 0.8 | -- | mA | $V_{OL}$ = 0.8V |
| Oscillator Starting Voltage | $V_{STP}$ | 1.3 | -- | -- | V | — |
| Oscillator Frequency | Fosc | 400 | 500 | 670 | KHZ | $V_{DD}$ = 1.5V |

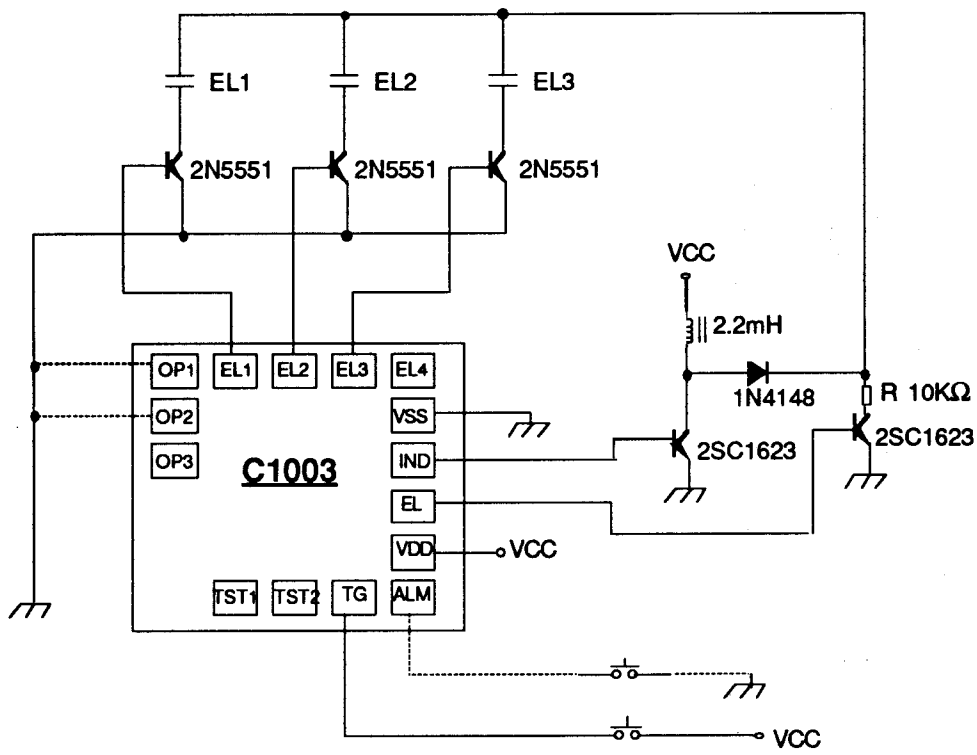
## C1003 Waveform



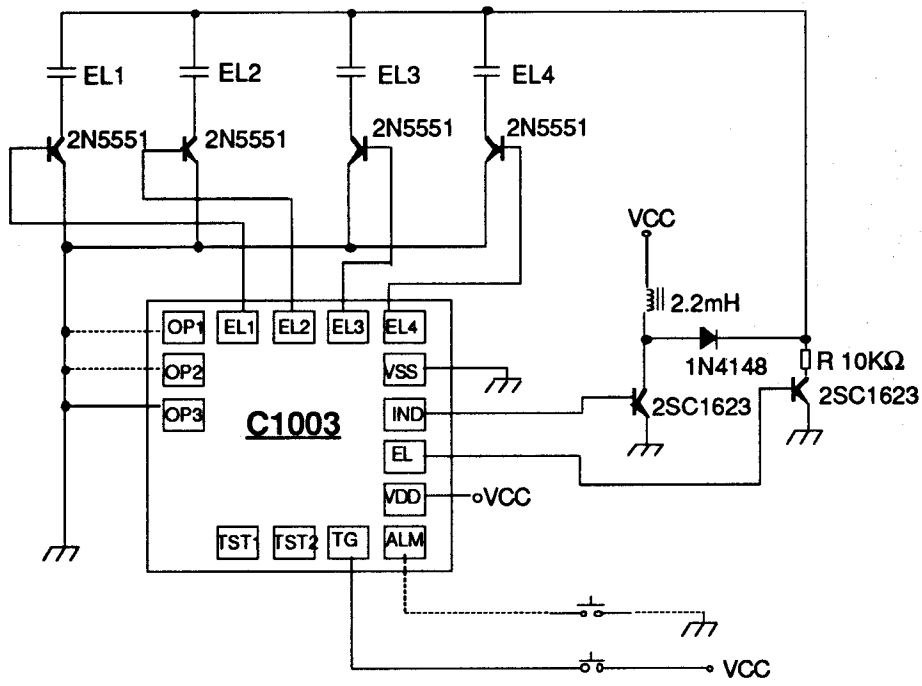

Note : 0 = VSS; 1 = Open

## APPLICATION CIRCUITS

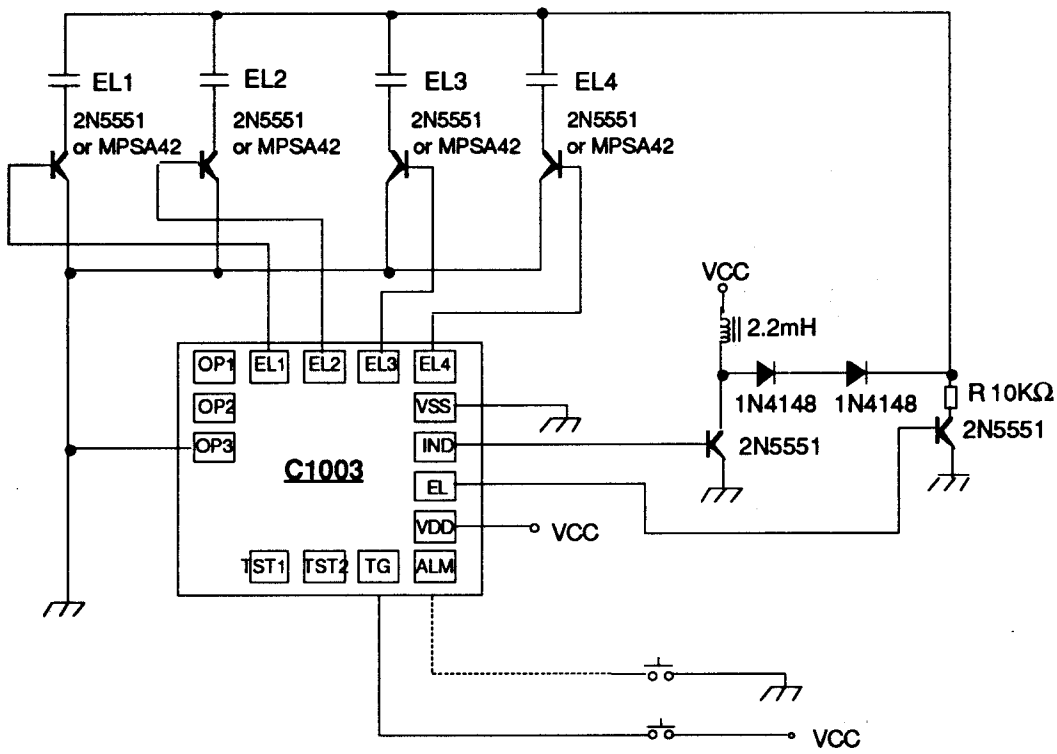
1) 3 ELS output with build-in flash time




2) 4 ELS output with build-in flash time



3) 4 ELS output with build-in flash time and super brightness circuit




## PCB LAYOUT RULE

1. VDD and VSS must be separate by different path for routing between high voltage signal and IC. Like shown below.
2. Between VDD and VSS nearest IC pre-placement a cap. space for reduce noise interference. The cap value may be 0.1μF or 0.2μF.
3. If there is a crystal must be far away from high voltage signal.
4. If space is enough please placing VSS signal between high voltage signal and digital signal.