上海贝岭 SHANGHAI BELLING

# BL8023K

***400mA Bi-Direction Relay Driver***

## DESCRIPTION

BL8023K is a bi-direction relay driver circuit, used to control the magnetic latching relay, with large output capability, ultra-low power consumption. It can be widely used in smart meters and other pulses, level control applications.

BL8023K can provide 400mA typical driving current, which will different according to the relay coil resistance. The input High Level Threshold of BL8023K is 2V, making it compatible with most single chip microcontroller.

BL8023K is available in SOT23-6 and SOP-8 packages.

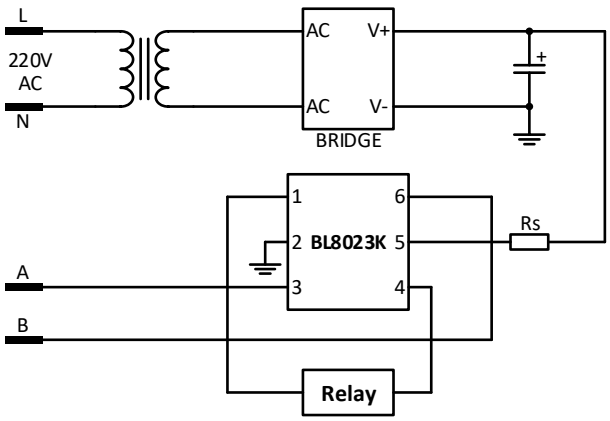
## FEATURES

- 5 to 40V input voltage range
- Low power consumption ($I_Q$<1uA)
- Input high level threshold: 2V, compatible with most single chip microcontroller
- Typical driving current: 400mA
  $R_{DS(ON)}$=7ohm ($V_{IN}$=12V, PMOSFET+NMOSFET)
  $R_{DS(ON)}$=7ohm ($V_{IN}$=30V, PMOSFET+NMOSFET)
- Peak driving current: 500mA@VIN=24V
- Environment temperature: -40°C~85°C
- SOT23-6 and SOP-8 packages

## APPLICATIONS

- Smart Meter

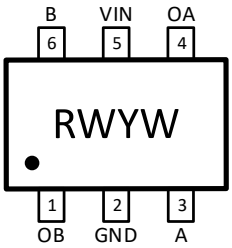
## TYPICAL APPLICATION




## ORDERING INFORMATION

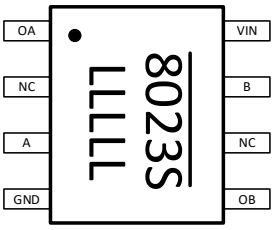
| Part No. | Package | Tape & Reel |
|---|---|---|
| BL8023KCB6TR | SOT23-6 | 3000/Reel |
| BL8023KCD8TR | SOP-8 | 2500/Reel |

## PIN OUT & MARKING




**SOT23-6**

RW: Product Code
YW: Date code




**SOP-8**

$\overline{8023S}$: Product Code
LLLLL: Lot No.

## ABSOLUTE MAXIMUM RATING

| Parameter | | | Value |
|---|---|---|---|
| Supply voltage VIN | | | -0.3V to 40V |
| Input pins | | | -0.3V to 40V |
| Output pins | | | -0.3V to 40V |
| Max operating junction temperature ($T_J$) | | | 150°C |
| Ambient temperature ($T_A$) | | | -40°C to 125°C |
| Package thermal resistance | SOT23-6 | $\theta_{JA}$ | 190°C/W |
| | | $\theta_{JC}$ | 110°C/W |
| | SOP-8 | $\theta_{JA}$ | 128°C/W |
| | | $\theta_{JC}$ | 45°C/W |
| Storage temperature ($T_S$) | | | -40°C to 150°C |
| Lead temperature & time | | | 260°C, 10S |

***Note**: Exceed these limits to damage to the device.*
*Exposure to absolute maximum rating conditions may affect device reliability.*

## RECOMMENDED WORK CONDITIONS

| Parameter | Value |
|---|---|
| Input voltage range | Max. 40V |
| Operating junction temperature ($T_J$) | -40°C to 85°C |

## ELECTRICAL CHARACTERISTICS

($V_{IN}$=12V, $T_A$=25°C)

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| $V_{IN}$ | Input voltage range | | 5 | | 40 | V |
| $I_Q$ | Quiescent current | | | | 1 | uA |
| $R_{DS(ON)}$ | Switch $R_{DS(ON)}$ | $V_{IN}$=12V, $R_L$=75ohm | | 7 | 10 | ohm |
| | | $V_{IN}$=30V, $R_L$=75ohm | | 7 | 10 | ohm |
| | | $V_{IN}$=12V, $R_L$=40ohm | | 7 | 10 | ohm |
| $V_{TH}$ | ON input high voltage | $V_{IN}$=12V | | 2 | | V |
| $R_{IN}$ | Equivalent input resistor | | | 20 | | Kohm |
| $V_{SD}$ | Fly-wheel diode forward voltage | Is=1A | | 1.4 | 1.5 | V |
| $T_R$ | Rise time | $V_{IN}$=12V, $R_L$=75ohm | | 560 | | ns |
| $T_{D(ON)}$ | Turn on delay time | $V_{IN}$=12V, $R_L$=75ohm | | 1400 | | ns |
| $T_F$ | Fall time | $V_{IN}$=12V, $R_L$=75ohm | | 200 | | ns |
| $T_{D(OFF)}$ | Turn off delay time | $V_{IN}$=12V, $R_L$=75ohm | | 800 | | ns |

## LOGIC FUNCTION TABLE

| Input A | Input B | Output OA | Output OB | RELAY RESPONSE |
|---|---|---|---|---|
| 1 | 0 | 1 | 0 | ON |
| 0 | 1 | 0 | 1 | OFF |
| 0 | 0 | High-impedance | High-impedance | Hold |
| 1 | 1 | High-impedance | High-impedance | Hold |

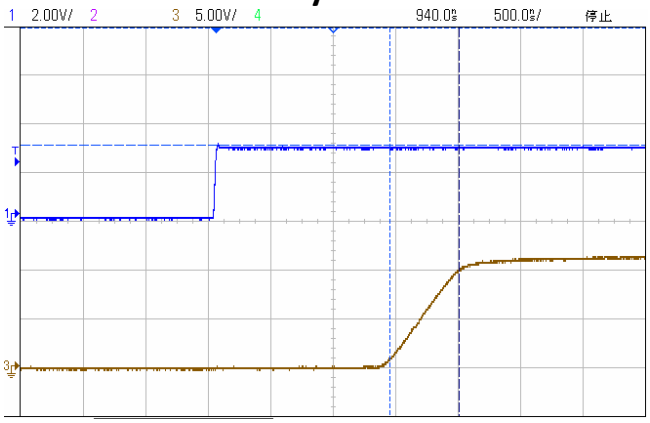
## PIN DESCRIPTION

| NAME | PIN # | | DESCRIPTION |
|---|---|---|---|
| | SOT23-6 | SOP-8 | |
| OA | 4 | 1 | Output A. |
| NC | - | 2, 6 | Not connected. |
| A | 3 | 3 | Input A. |
| GND | 2 | 4 | Ground. |
| OB | 1 | 5 | Output B. |
| B | 6 | 7 | Input B. |
| VIN | 5 | 8 | Supply input voltage. |

## ELECTRICAL PERFORMANCE

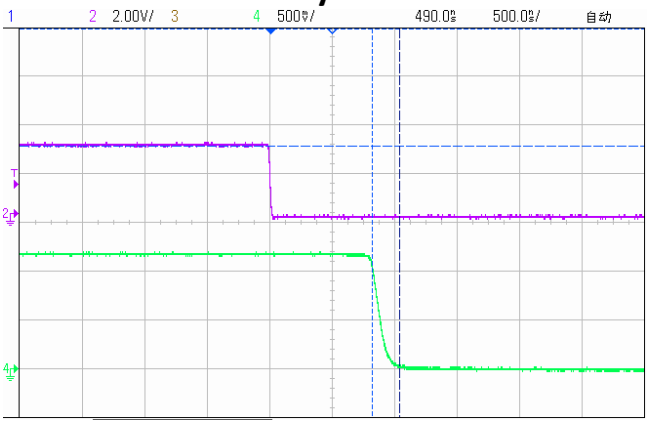
Tested under $T_A$=25°C, unless otherwise specified.

### Turn on delay and rise time



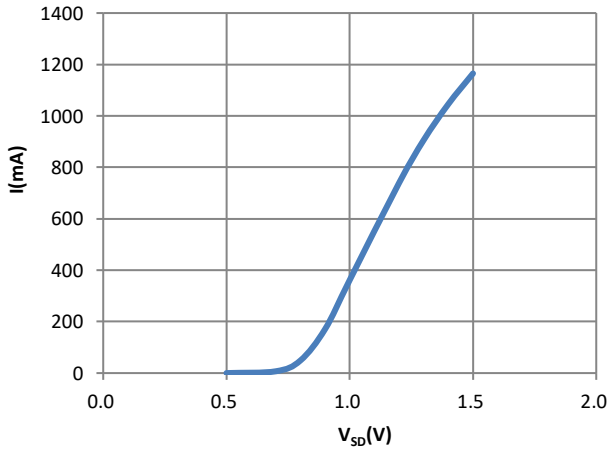

Ch1—Input, Ch3—Output

### Turn off delay and fall time

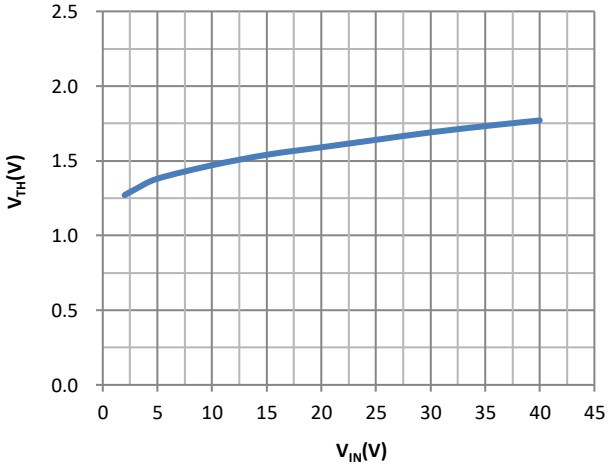



Ch2—Input, Ch4—Output

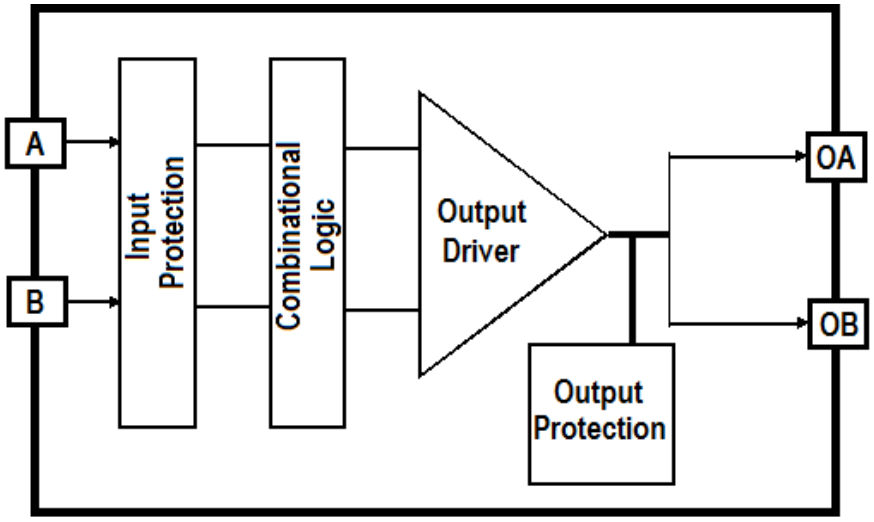
### Forward Voltage




### $V_{TH}$ vs. $V_{IN}$



## BLOCK DIAGRAM

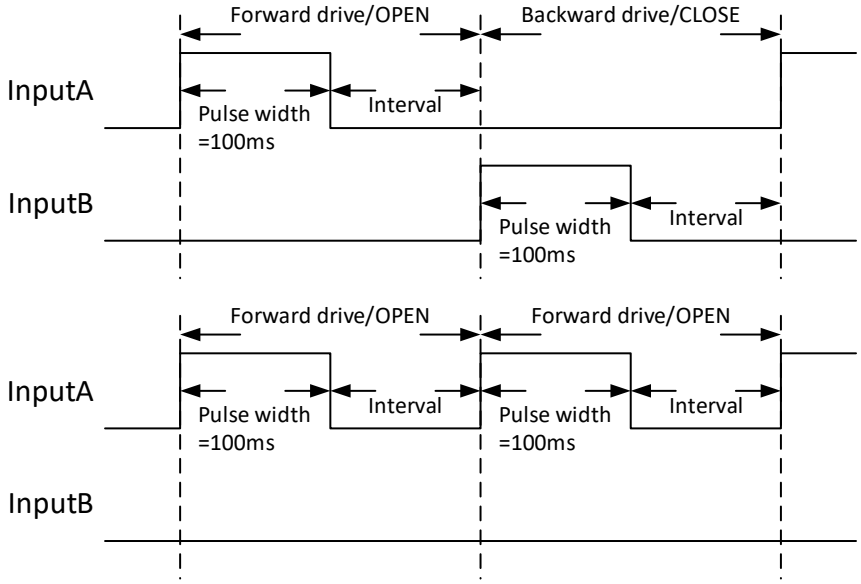


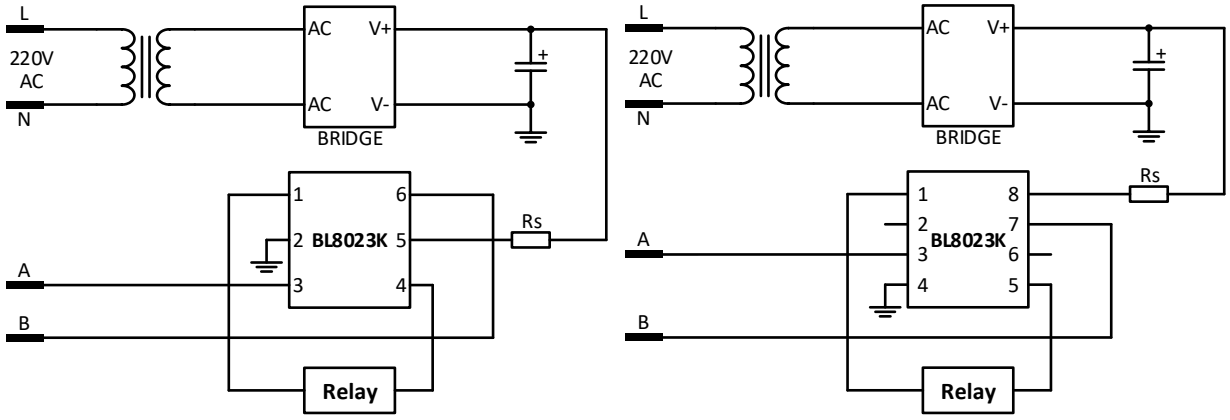

## DETAILED DESCRIPTION

***Pulse Triggering***

If input is driven by square pulse, connect the inputs to the pulse source directly. Relay will operate as logic table stated ($V_{IN}$ should be less than the power supply voltage, $R_S$ is current-limiting resistor, it can be ignored in the voltage is below 20V, i.e. $R_S$=0).

The recommended pulse width=100ms. The length of the intervals should be longer than 100ms. These intervals include: intervals between forward drive pulse and next backward drive pulse, intervals between forward drive pulse and next forward drive pulse, intervals between backward drive pulse and next backward drive pulse, intervals between backward drive pulse and next backward drive pulse.






Pulse triggering application diagram

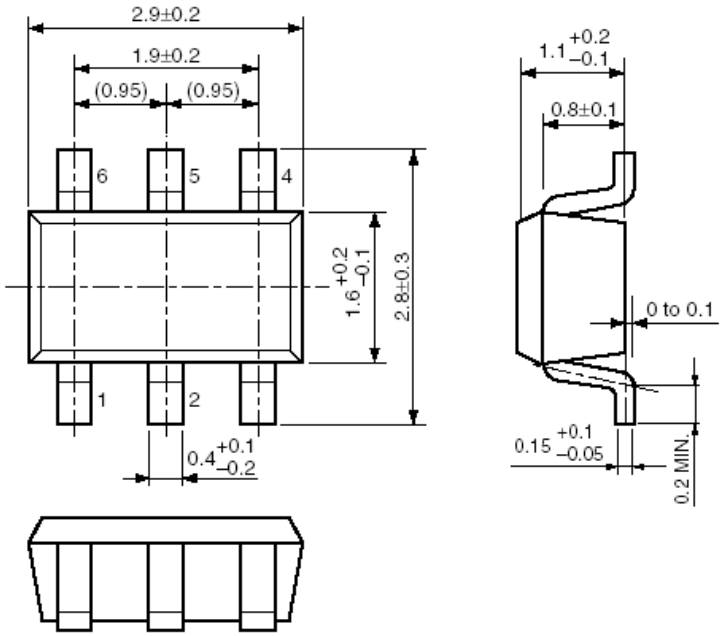
***Relay free-wheel***

Relay from ON to OFF, the energy stored in the relay inductor released by the chip's internal body diode and the relay inductor. Until the end of the release of this energy, relay proceeding to the next operation.

## PACKAGE OUTLINE

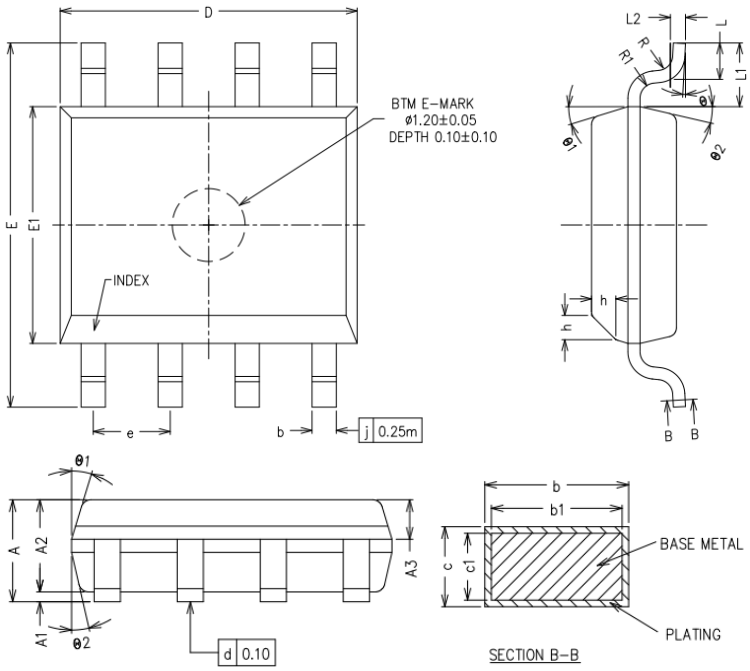
| Package | SOT23-6 | Devices per reel | 3000 | Unit | mm |
|---|---|---|---|---|---|

Package specification:



| Package | SOP-8 | Devices per reel | 2500 | Unit | mm |
|---|---|---|---|---|---|

Package specification:




COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

| SYMBOL | MIN | NOM | MAX |
|---|---|---|---|
| A | 1.35 | 1.55 | 1.75 |
| A1 | 0.10 | – | 0.25 |
| A2 | 1.30 | 1.40 | 1.50 |
| A3 | 0.50 | 0.60 | 0.70 |
| b | 0.38 | – | 0.47 |
| b1 | 0.37 | 0.40 | 0.43 |
| c | 0.17 | – | 0.25 |
| c1 | 0.17 | 0.20 | 0.23 |
| D | 4.80 | 4.90 | 5.00 |
| E | 5.80 | 6.00 | 6.20 |
| E1 | 3.80 | 3.90 | 4.00 |
| e | 1.17 | 1.27 | 1.37 |
| L | 0.45 | 0.60 | 0.80 |
| L1 | | 1.04REF | |
| L2 | | 0.25BSC | |
| R | 0.07 | – | – |
| R1 | 0.07 | – | – |
| h | 0.30 | 0.40 | 0.50 |
| θ | 0° | – | 8° |
| θ1 | 15° | 17° | 19° |
| θ2 | 11° | 13° | 15° |