## LOADING MOTOR DRIVER

The KA8330 is a monolitic integrated circuit designed to perform bi-directional DC motor driving, braking and speed control for VCRs , CDPs, and Toys.
The speed control can be achieved by adjusting the external voltage of the motor speed control pin. And it has two pins of logic inputs for controlling the direction such as forward/reverse and braking.

10-SIP

## FEATURES

- **Stable braking characteristics by built-in braking function**
- **Built-in element to absorb dash current derived from changing motor direction and braking motor driving**
- **Built-in external motor speed control pin**
- **Stable driving direction change**
- **CMOS logic level compatible input level**

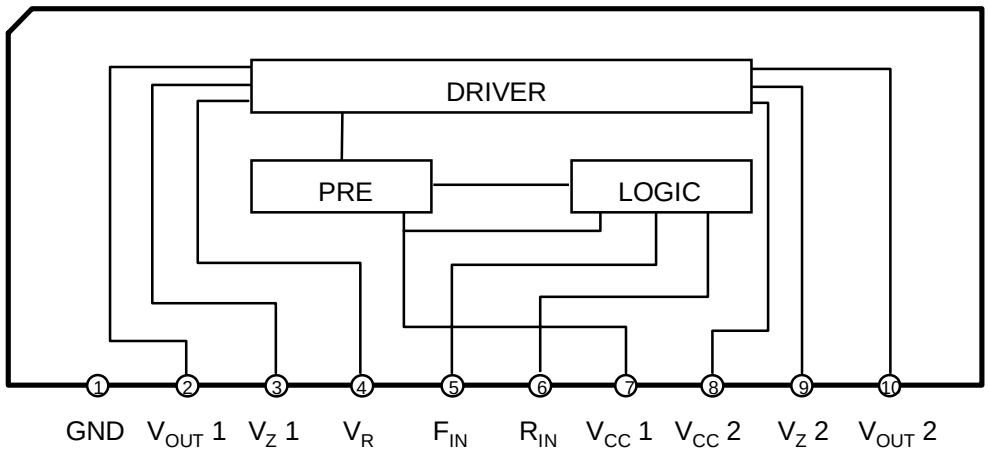
## TYPICAL APPLICATIONS

- **VCR**
- **CDP**
- **TOY**

## ORDERING INFORMATION

| Device | Package | Operating Temperature |
|---|---|---|
| KA8330 | 10-SIP | -25℃ ~ +75℃ |

## BLOCK DIAGRAM



## PIN DESCRIPTION

| Pin No. | Symbol | I/O | Description |
|---|---|---|---|
| 1 | GND | | Ground |
| 2 | $V_{OUT}$ 1 | O | Motor drive output 1 |
| 3 | $V_Z$ 1 | I | Capacitor connection |
| 4 | $V_R$ | I | Motor speed control pin. Zener diode connection. |
| 5 | $F_{IN}$ | I | Motor turning direction selection pin. CMOS logic input. |
| 6 | $R_{IN}$ | I | Motor turning direction selection pin. CMOS logic input. |
| 7 | $V_{CC}$ 1 | | Power supply pin for IC |
| 8 | $V_{CC}$ 2 | | Power supply pin for driver circuit |
| 9 | $V_Z$ 2 | I | Capacitor connection |
| 10 | $V_{OUT}$ 2 | O | Motor drive output 2 |

## ABSOLUTE MAXIMUM RATINGS (Note 1 & 2)

| Characteristics | Symbol | Value | Unit |
|---|---|---|---|
| Supply Voltage | $V_{CC}$ | 18 | V |
| Input Voltage | $V_{IN}$ | -0.3 to $V_{CC}$ | V |
| Output Current | $I_{OUT}$ | 1.6 (Note3) | A |
| Operating Temperature Range | $T_{OPR}$ | -25 to + 75 | ℃ |
| Storage Temperature Range | $T_{STG}$ | - 55 to + 125 | ℃ |
| Power Dissipation | $P_D$ | 2.2 | W |
| ESD Susceptibility (Note 4) | $V_{ESD}$ | ± 1,500 | V |

Note 1 : ABSOLUTE MAXIMUM RATINGS are those values beyond which the device may be damaged permanently. Normal operation is not guaranteed at or above these extremes.
Note 2 : All voltages are measured with respect to the GND voltage level unless otherwise specified.
Note 3 : Duty 1/100, pulse width 500㎲
Note 4 : 100pF discharged through a 1.5㏀ resistor (Human body model).

## RECOMMENDED OPERATING CONDITIONS ($T_a$ = 25 ℃)

| Characteristics | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Supply Voltage | $V_{CC}$ | 8 | 12 | 16 | V |

## ELECTRICAL CHARACTERISTICS

(IC Specifications : $V_{CC}$ = 12V, GND = 0V, $T_a$ = 25 ℃, unless otherwise specified.)

| Characteristics | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Quiescent Current | $I_{CCQ}$ | Pin 5, 6=GND, $R_L$=∞ | 3 | 5.5 | 10 | ㎃ |
| Minimum Input On Current 1 | $I_{IN}1$ | Pin5=$I_{IN}1$,Pin6=L, $R_L$=∞ | | 10 | 50 | ㎂ |
| Minimum Input On Current 2 | $I_{IN}2$ | Pin5=L,Pin6=$I_{IN}2$, $R_L$=∞ | | 10 | 50 | ㎂ |
| Input Threshold Voltage 1 | $V_{INTH}1$ | Pin5=$V_{INTH}1$,Pin6=L, $R_L$=∞ | 0.7 | 1.3 | 2.0 | V |
| Input Threshold Voltage 2 | $V_{INTH}1$ | Pin5=L,Pin6=$V_{INTH}2$, $R_L$=∞ | 0.7 | 1.3 | 2.0 | V |
| Output Leakage Current 1 | $I_{OL}1$ | Pin5, 6=GND, $R_L$=∞ | | | 1 | ㎃ |
| Output Leakage Current 2 | $I_{OL}2$ | Pin5, 6=GND, $R_L$=∞ | | | 1 | ㎃ |
| Zener Current 1 | $I_Z1$ | Pin5=H,Pin 6=L, $R_L$=∞ | | 0.85 | 1.5 | ㎃ |
| Zener Current 2 | $I_Z2$ | Pin5=L,Pin 6=H, $R_L$=∞ | | 0.85 | 1.5 | ㎃ |
| Output Voltage 1 | $V_O1$ | Pin5=H,Pin 6=L, $R_L$=60Ω | 6.6 | 7.2 | | V |
| Output Voltage 2 | $V_O2$ | Pin5=L,Pin 6=H, $R_L$=60Ω | 6.6 | 7.1 | | V |
| Saturation Voltage Pin 10-1 | $V_{CE10-1}$ | $I_{SINK}$=100㎃<br>Pin5=H,Pin 6=L, $R_L$,$R_C$=∞ | | 0.83 | 1.5 | V |
| Saturation Voltage Pin 2-1 | $V_{CE2-1}$ | $I_{SINK}$=100㎃<br>Pin5=L,Pin 6=H, $R_L$,$R_C$=∞ | | 0.83 | 1.5 | V |
| Saturation Voltage Pin 8-2 | $V_{CE8-2}$ | $I_{SOURCE}$=100㎃<br>Pin5=H,Pin 6=L, $R_L$,$R_C$=∞ | | 0.83 | 1.5 | V |
| Saturation Voltage Pin 8-10 | $V_{CE8-10}$ | $I_{SOURCE}$=100㎃<br>Pin5=L,Pin 6=H, $R_L$,$R_C$=∞ | | 0.83 | 1.5 | V |

Note 5 : Specifications are subject to change without notice.

## FUNCTIONAL DESCRIPTION

- **Forward & Reverse Control Logic**
  If $F_{IN}$ (pin 5) = 믹?& $R_{IN}$ (pin 6) = 밚? load current ($I_L$) flows from $V_{OUT}1$(pin 2) to $V_{OUT}2$ (pin 10),
  if $F_{IN}$ =밚?& $R_{IN}$ = 믹? load current ($I_L$) flows from $V_{OUT}2$ to $V_{OUT}1$.

- **Forced Stop Logic**
  If $F_{IN}$ & $R_{IN}$ = 믹?or 밚? the device stops supplying power to motor while absorbing inverse electromotive force from the motor as a brake.

- **Rush Current Absorbing Circuit**
  If a high voltage generated during reversing operating is applied across $V_{OUT}1$ & $V_{OUT}2$, an internal comparator activates the rush-current-absorbing-circuit.

- **Driving Stage**
  In the forward mode, the driving stage supplies a load current to the motor from pin 2 to pin 10. In the reverse mode, it supplies the current from pin 10 to pin 2.
  The output voltage $V_{OUT}$ applied to the motor is given by the following method :

  $V_{OUT(V)} = V_{ZD} - V_{CE(SAT)}$

  $V_{ZD}$ : Zener Voltage applied to pin 4.
  If pin 4 is left open, the output voltage is given by the following method :

  $V_{OUT(V)} = V_{CC}1 - V_{CE(SAT\ PNP)} - 2V_{BE} - V_{CE(SAT)}$

## TEST CIRCUIT

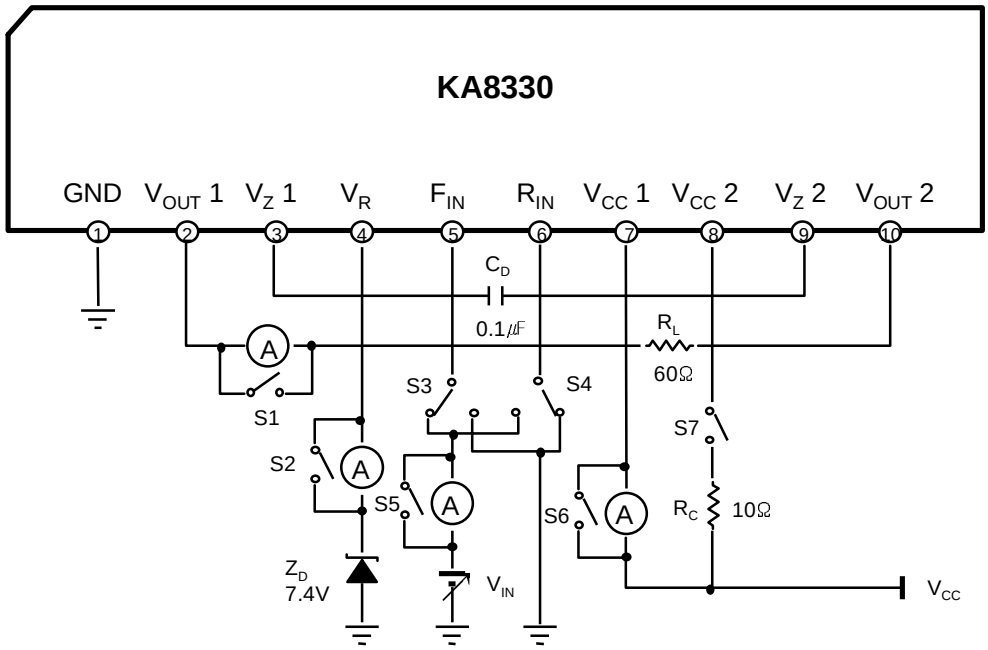



Table 1. Logic Truth Table

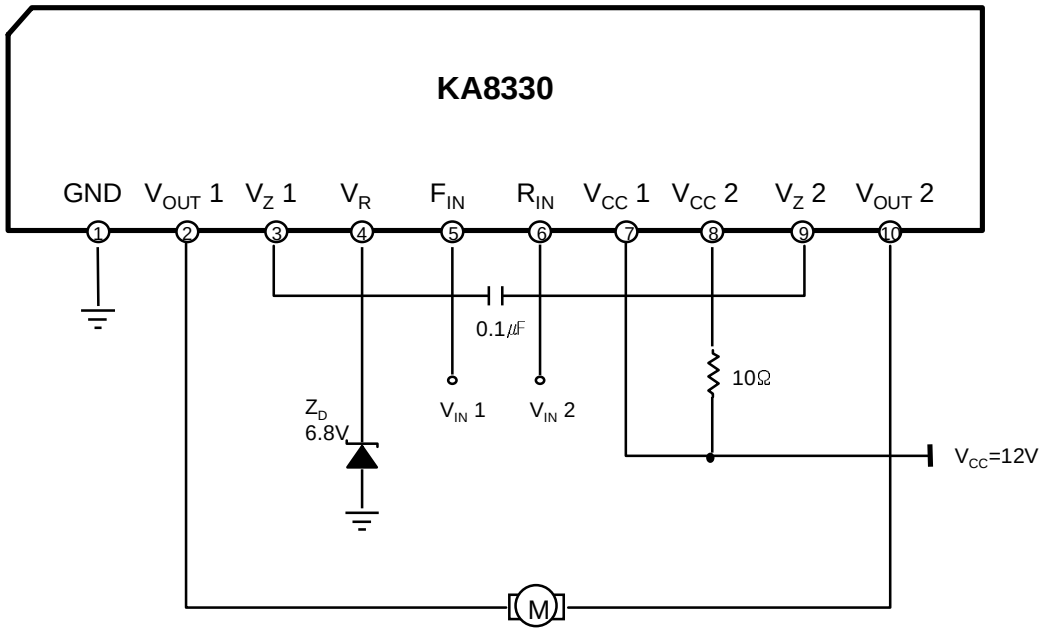
| $F_{IN}$ (Pin 5) | $R_{IN}$ (Pin 6) | $V_{OUT}$ 1(Pin 2) | $V_{OUT}$ 2 (Pin 10) | Note |
|---|---|---|---|---|
| L (Note 6) | L | L | L | Braking |
| L | H | L | H | Reverse |
| H | L | H | L | Forward |
| H | H | L | L | Braking |

Note 6 : Input Level 밀?> 2.0V
Input Level 밟?< 0.7V

Note 7 : Under any condition, to prevent malfunction, note that $V_{CC}$ 2 (pin 8) should not be open(off) later than $V_{CC}$ 1(pin 7) after turnning on $V_{CC}$ 1 and $V_{CC}$ 2 . Anytime $V_{CC}$ 1 and $V_{CC}$ 2 are always on/off together.
The following is a case of the fatal damage to KA8330:

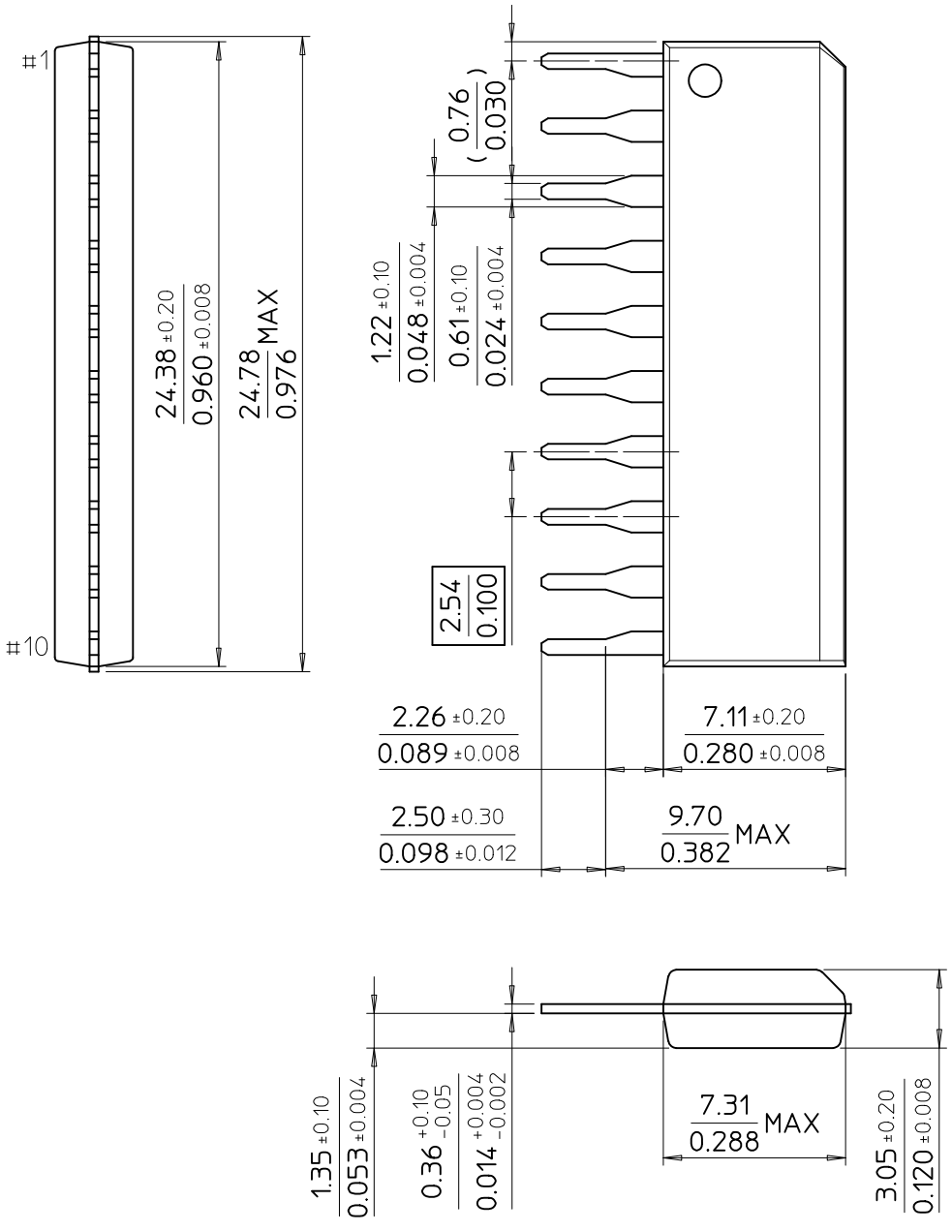
| SW1 | SW2 | SW3 | SW4 | SW5 | SW6 | **SW7** |
|---|---|---|---|---|---|---|
| ON/OFF | OFF | H | L | ON | ON | **ON→OFF**<br>**ON→OFF→ON** |

**TYPICAL APPLICATION** (6V Motor Connection)



# 10-SIP

Dimensions in Milimeters/Inches

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