

KA3082

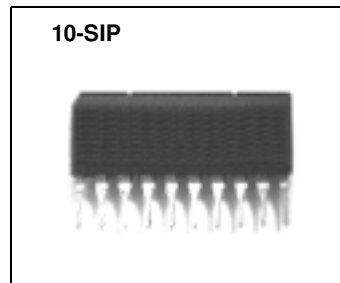
Bi-Directional DC Motor Driver

Features

- Built-in Brake Function for Stable Brake Characteristics.
- Built-in Element to Absorb a Surge Current Derived From Changing Motor Direction and Braking Motor Drive.
- Motor Speed Control by an External Voltage.
- Stable Motor Direction Change.
- Interfaces With CMOS Devices.
- Built-in the Thermal Shut Down Circuit (165°C).
- Low Standby Current. (6.5mA)

Description

The KA3082 is a monolithic integrated circuit designed for driving bi-directional DC motor with braking and speed control, and it is suitable for the loading motor driver of VCR, CDP, and TOY systems. The speed control can be achieved by adjusting the external voltage of the speed control pin. It has two pins of logic inputs for controlling the forward/ reverse and braking.



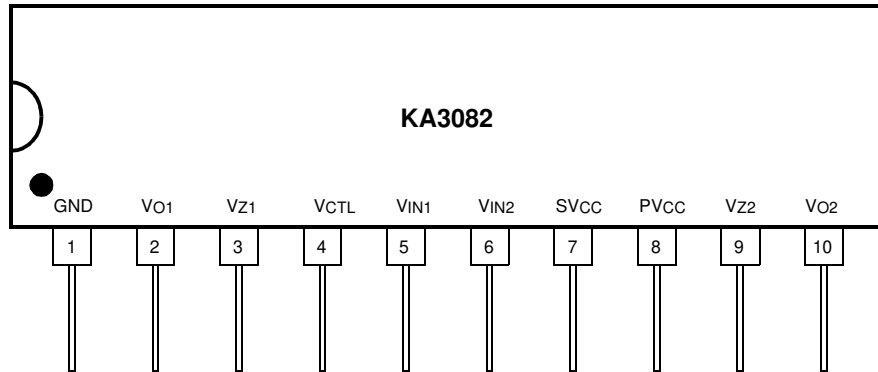
Target Applications

- Video Cassette Recorder (VCR) Loading Motor
- Low Current DC Motor Such as Audio or Video Equipment.
- General DC Motor

Ordering Information

| Device | Package | Operating Temp. |
|---------|---------|-----------------|
| KA3082B | 10-SIP | -25°C ~ +75°C |

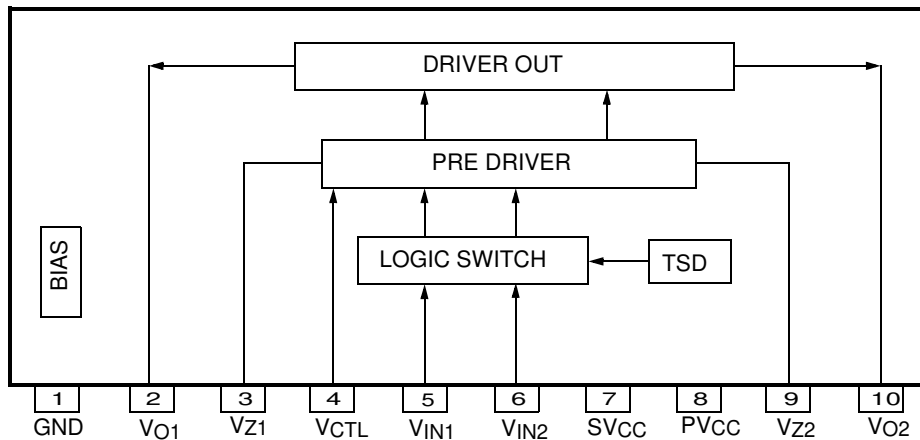
Pin Assignments



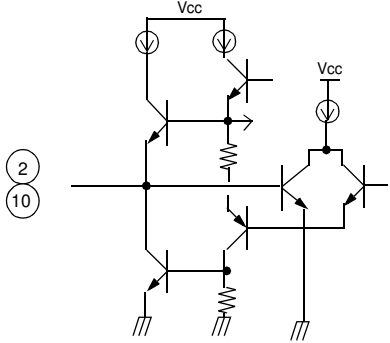
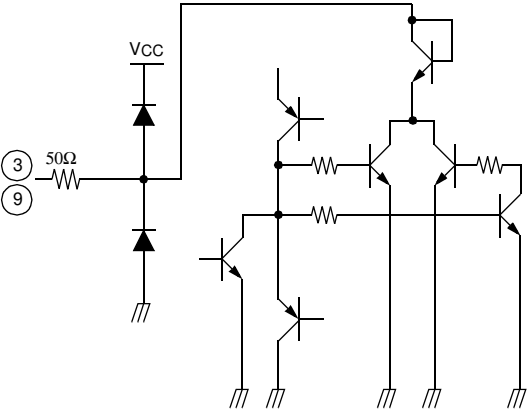
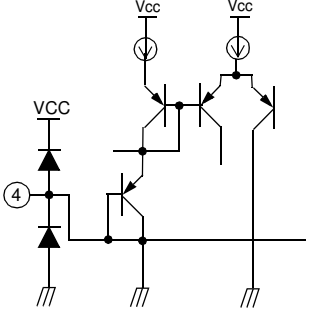
Pin Definitions

| Pin Number | Pin Name | I/O | Pin Function Description |
|------------|----------|-----|--------------------------|
| 1 | GND | - | Ground |
| 2 | VO1 | O | Output 1 |
| 3 | VZ1 | - | Phase Compensation |
| 4 | VCTL | I | Motor Speed Control |
| 5 | VIN1 | I | Input 1 |
| 6 | VIN2 | I | Input 2 |
| 7 | SVCC | - | Supply Voltage (Signal) |
| 8 | PVCC | - | Supply Voltage (Power) |
| 9 | VZ2 | - | Phase Compensation |
| 10 | VO2 | O | Output 2 |

Internal Block Diagram



Equivalent Circuits

| Description | Pin No. | Internal Circuit |
|--------------------|---------|--|
| Output | 2, 10 |  |
| Phase Compensation | 3, 9 |  |
| Speed Control | 4 |  |

Equivalent Circuit (Continued)

| Description | Pin No. | Internal Circuit |
|--------------|---------|------------------|
| Input | 5, 6 | |
| SVCC PVCC | 7 8 | |

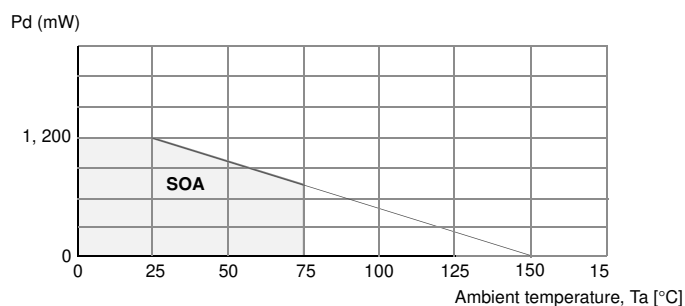
Absolute Maximum Ratings (Ta=25°C)

| Parameter | Symbol | Value | Unit | Remark |
|-----------------------|-------------------|----------------------|------|--------|
| Supply Voltage | VCCmax | 18 | V | - |
| Maxium Output Current | I _{Omax} | 1.6 ^{note1} | A | - |
| Power Dissipation | P _d | 1.2 ^{note2} | W | - |
| Operating Temperature | TOPR | -25 ~ +75 | °C | - |
| Storage Temperature | TSTG | -55 ~ +125 | °C | - |

Note:

- Duty 1 / 100, pulse width 500μs
- 1) When mounted on glass epoxy PCB (76.2 × 114 × 1.57mm)
2) Power dissipation reduces 9.6mV / °C for using above Ta=25°C.
3) Do not exceed P_d and SOA(Safe Operating Area).

Power Dissipation Curve



Recommended Operating Conditions (Ta=25°C)

| Parameter | Symbol | Operating voltage range | Unit |
|--------------------------|------------|-------------------------|------|
| Operating Supply Voltage | SVCC, PVCC | 7 ~ 18 | V |

Note:

Caution 1) $PVCC \leq SVCC$

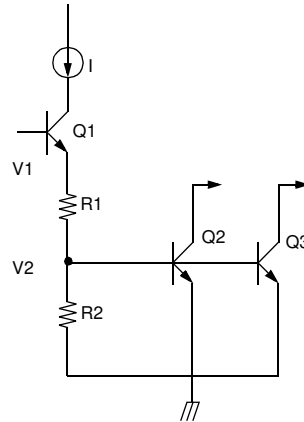
Caution 2) When PVCC is above 16V, the VCTL must be opened or $8.5 \leq VCTL \leq PVCC$

Electrical Characteristics (Ta=25°C, VCC=SVCC=PVCC=12V)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|------------------------------|--------|-------------------------|------|------|------|------|
| Quiescent Current | ICC2 | Pin5 & 6: GND, RL=∞ | 4 | 6.5 | 9.5 | mA |
| Min. Input-on Current 1 | IIN1 | RL=∞, pin5=IIN1, pin6=L | - | 10 | 30 | μA |
| Min. Input-on Current 2 | IIN2 | RL=∞, pin5=L, pin6=IIN | - | 10 | 30 | μA |
| Input Threshold Voltage 1 | VITH1 | RL=∞, pin5=VIN, pin6=L | 1.0 | 1.3 | 1.6 | V |
| Input Threshold Voltage 2 | VITH2 | RL=∞, pin5=L, pin6=VIN | 1.0 | 1.3 | 1.6 | V |
| Output Leakage Current 1 | IOL1 | RL=∞, pin5 & 6=GND | - | 0.01 | 1 | mA |
| Output Leakage Current 2 | IOL2 | RL=∞, pin5 & 6=GND | - | 0.01 | 1 | mA |
| Zener Current 1 | Iz1 | RL=∞, pin5=H, pin6=L | - | 0.85 | 1.5 | mA |
| Zener Current 2 | Iz2 | RL=∞, pin5=L, pin6=H | - | 0.85 | 1.5 | mA |
| Output Voltage 1 | VO1 | RL=60Ω, pin5=H, pin6=L | 6.6 | 7.2 | 7.6 | V |
| Output Voltage 2 | VO2 | RL=60Ω, pin5=L, pin6=H | 6.6 | 7.2 | 7.6 | V |
| Saturation Voltage 1 (Upper) | V SAT1 | IO=300mA | - | 1.9 | 2.3 | V |
| Saturation Voltage 2 (Upper) | VSAT2 | IO=500mA | - | 1.9 | 2.3 | V |
| Saturation Voltage 1 (Lower) | VSAT3 | IO=300mA | - | 0.25 | 0.5 | V |
| Saturation Voltage 2 (Lower) | VSAT4 | IO=500mA | - | 0.4 | 0.65 | V |

Application Information

1. Thermal Shut Down Circuit



When $T_a = 25^\circ\text{C}$, Q2 & Q3 are Turn-off and output stage operate normally.

$$V_1 = I \times (R_1 + R_2)$$

$$V_2 = R_2 / (R_1 + R_2) \times V_1 = 0.37\text{V}$$

When $T_a = 165^\circ\text{C}$, Q2 & Q3 become Turn-on and it turn-off the output stage.

$$0.70\text{V} - 0.37\text{V} = 330\text{mV} \text{ (When Q2 \& Q3 are Turn-on, } V_{beQ2} = V_{beQ3} = 0.70\text{V)}$$

And temperature coefficient of Q2 = Q3 = $-2\text{mV}/^\circ\text{C}$

$$\therefore \text{T.S.D: } 330\text{mV} / 2\text{mV} = 165^\circ\text{C}$$

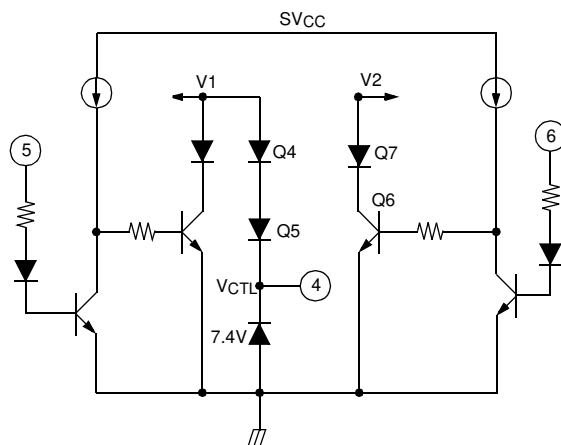
2. Logic Input & Output Table

| Input | | Output | | Motor |
|--------|--------|--------|---------|---------|
| Pin #5 | Pin #6 | Pin #2 | Pin #10 | |
| Low | Low | Low | Low | Brake |
| High | Low | High | Low | Forward |
| Low | High | Low | High | Reverse |
| High | High | Low | Low | Brake |

Input High is above 2.0V.

Input Low is below 0.7V.

3. Logic Switch Circuit



This circuit define reference voltage of output.

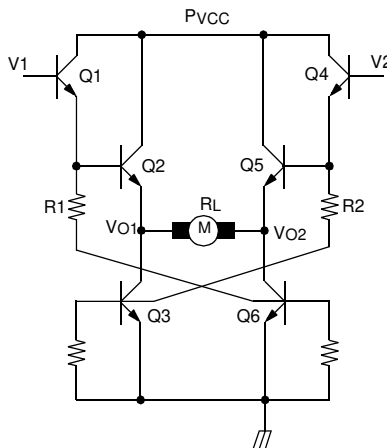
When pin #5 is "H" and pin #6 is "L",

$$- V1 = V_{ZD} + V_{BEQ4} + V_{BEQ5} \approx 8.9V$$

$$- V2 = V_{BEQ7} + V_{SATQ6} \approx 0.87V$$

V1 and V2 are related with the output voltage of the motor and change according to the voltage of pin #4 (VCTL).

4. Drive Output Circuit



$$V1 = 8.9V$$

$$V2 = 0.87V$$

$$VO1 = V1 - V_{BEQ1} - V_{BEQ2}$$

$$VO2 = V_{Q6SAT}$$

$$VO = VO1 - VO2$$

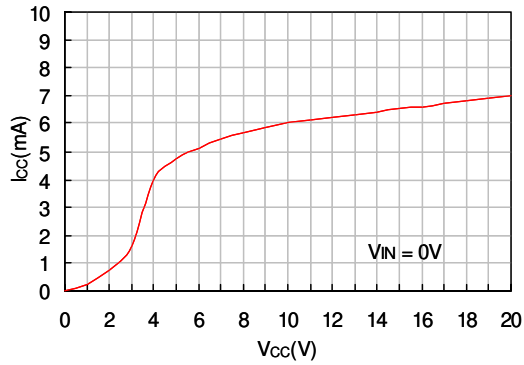
$$= V1 - V_{BEQ1} - V_{BEQ2} - V_{Q6SAT}$$

$$I_{RL} = (VO1 - VO2) / R_L$$

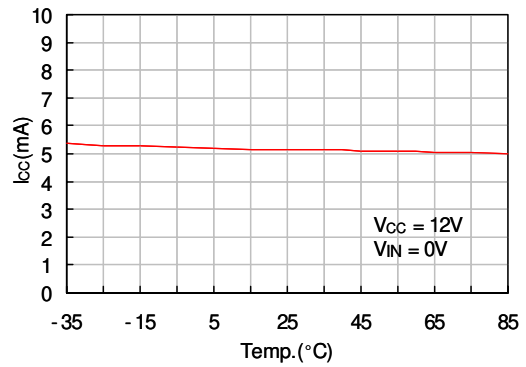
Typical Performance Characteristics

CHARACTERISTIC GRAPHS

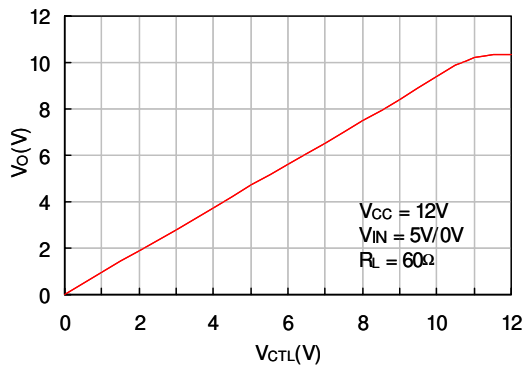
1. V_{CC} vs I_{CC}



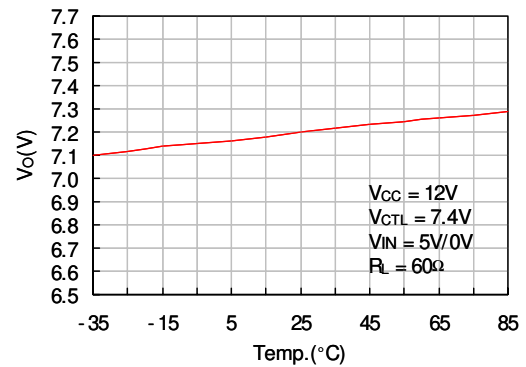
2. Temperature vs I_{CC}



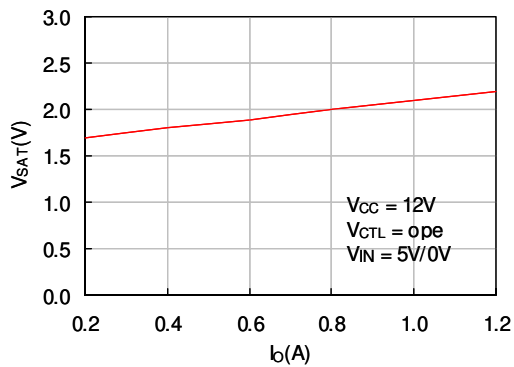
3. V_{CTL} vs. V_o



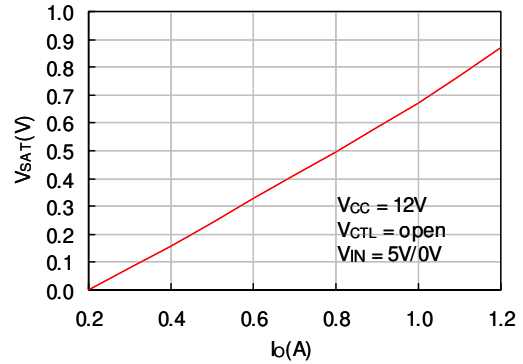
4. Temperature vs. V_o



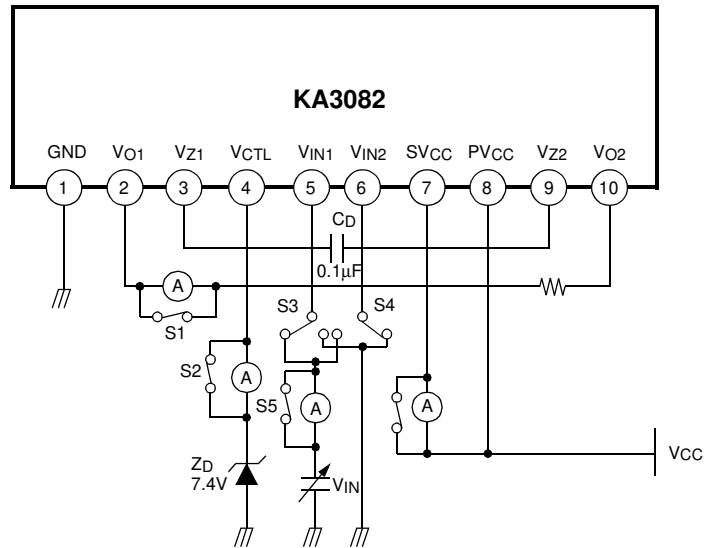
5. I_o vs. V_{SAT} (UPPER)



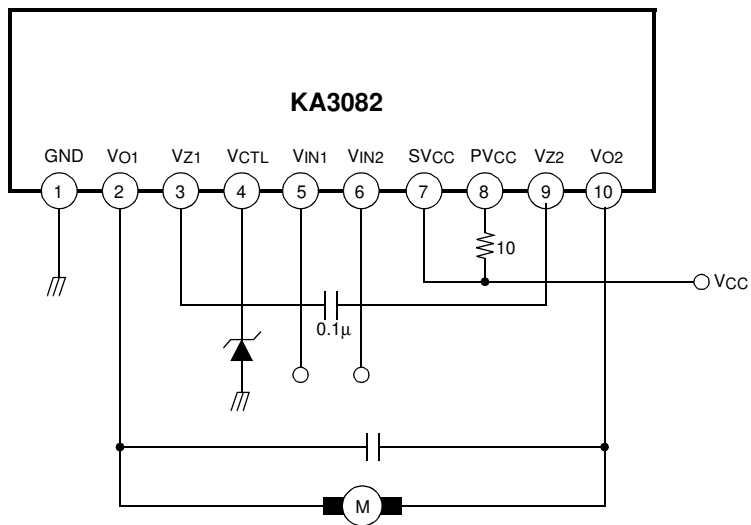
5. I_o vs. V_{SAT} (LOWER)



Test Circuits



Typical Application Circuits



DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.