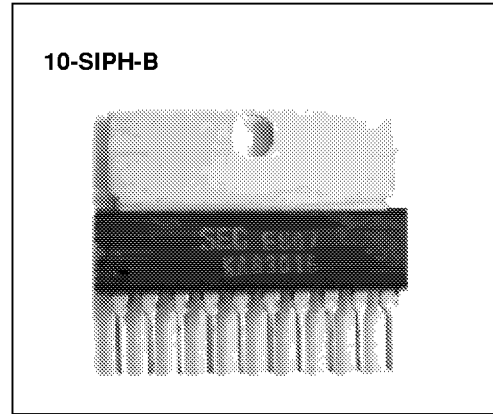


BI-DIRECTIONAL DC MOTOR DRIVER

The KA8301 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 systems. The speed control can be achieved by adjusting the external voltage of the speed control pin.

FEATURES

- Built-in brake function for stable brake characteristics.
- Built-in element to absorb a dash current derived from changing motor direction and braking motor drive.
- External motor speed control pin
- Stable motor direction change.
- Interfaces with CMOS devices.



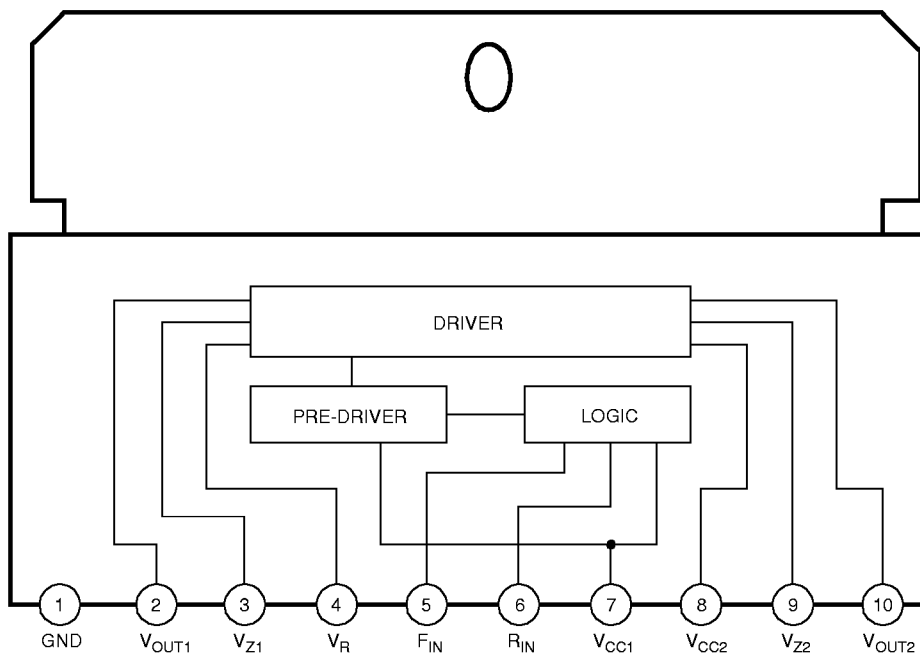
ORDERING INFORMATION

| Device | Package | Operating Temperature |
|--------|-----------|-----------------------|
| KA8301 | 10-SIPH-B | -25°C ~ +75°C |

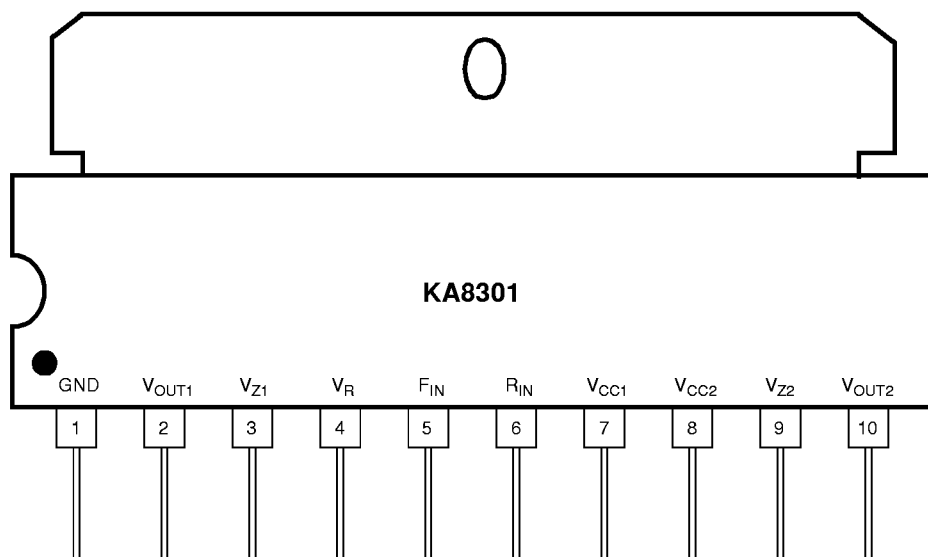
TARGET APPLICATION

- VCR
- Low current DC motor such audio equipment

BLOCK DIAGRAM



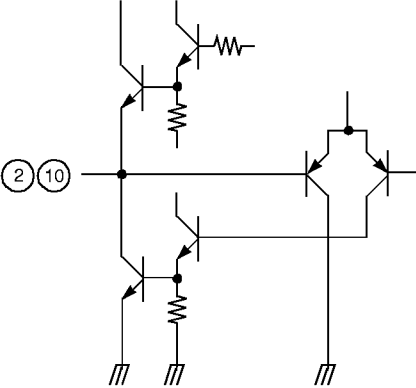
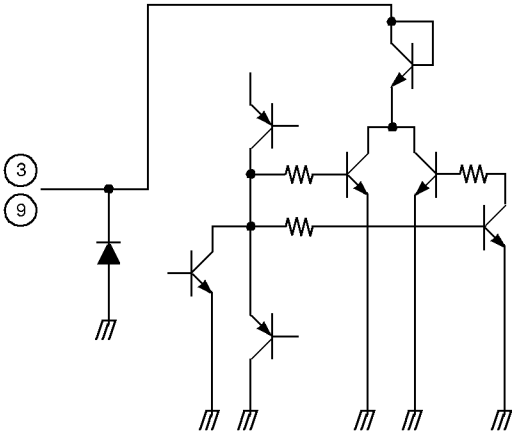
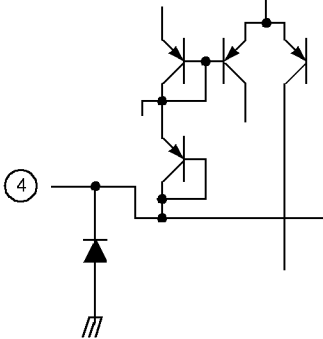
PIN CONFIGURATIONS



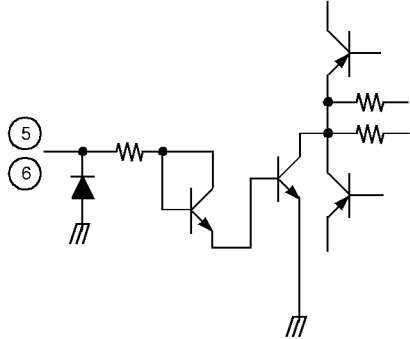
PIN DESCRIPTION

| Pin No. | Symbol | I/O | Description | Pin No. | Symbol | I/O | Description |
|---------|------------|-----|---------------------|---------|------------|-----|-------------------------|
| 1 | GND | – | Ground | 6 | R_{IN} | I | Input 2 |
| 2 | V_{OUT1} | O | Output 1 | 7 | V_{CC1} | – | Supply voltage (Signal) |
| 3 | V_{Z1} | – | Phase compensation | 8 | V_{CC2} | I | Supply voltage (Power) |
| 4 | V_R | I | Motor speed control | 9 | V_{Z2} | I | Phase compensation |
| 5 | F_{IN} | I | Input 1 | 10 | V_{OUT2} | O | Output 2 |

INTERNAL CIRCUIT

| Description | Pin No. | Internal circuit |
|--------------------|---------|--|
| Output | 2, 10 |  |
| Phase compensation | 3, 9 |  |
| Speed control | 4 |  |

INTERNAL CIRCUIT (Continued)

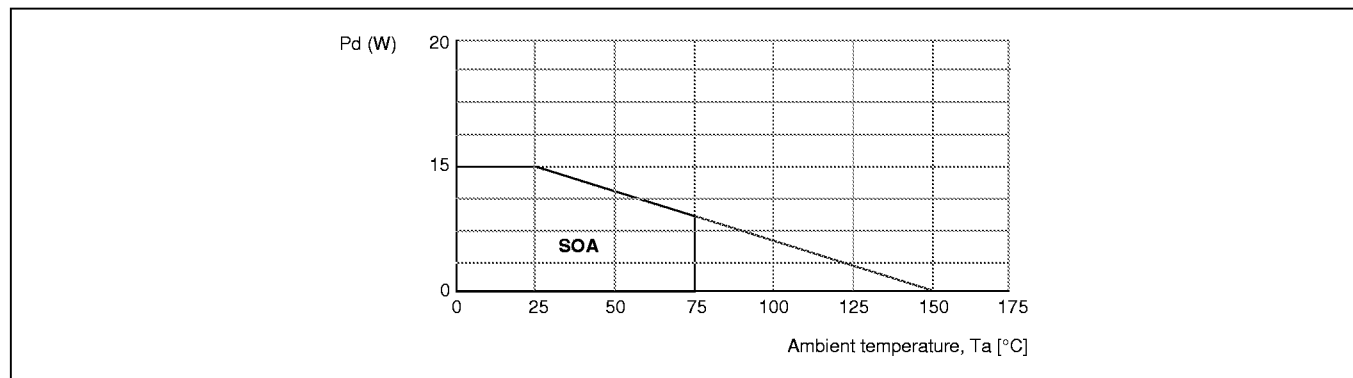
| Description | Pin No. | Internal circuit |
|--------------|---------|--|
| Input | 5, 6 |  |
| SVCC PVCC | 7 8 | |
| GND | 1 | |

ABSOLUTE MAXIMUM RATING (Ta=25°C)

| Characteristics | Symbol | Value | Unit |
|------------------------|-------------|----------------------|------|
| Supply voltage | V_{CCmax} | 18 | V |
| Maximum output current | I_{Omax} | 1.6 ^{note1} | A |
| Power dissipation | P_d | 15 ^{note2} | W |
| Input voltage | V_{IN} | -0.3 ~ V_{CC} | V |
| Operating temperature | T_{OPR} | -25 ~ +75 | °C |
| Storage temperature | T_{STG} | -55 ~ +150 | °C |

NOTES:

- Duty 1/100, pulse width 500μs
- 1) When mounted on glass epoxy PCB (76.2 × 114 × 1.57mm)
- 2) Power dissipation reduces 120mW / °C for using above Ta=25°C
- 3) Do not exceed Pd and SOA.

PD GRAPH**RECOMMENED OPERATING CONDITIONS (Ta=25°C)**

| Characteristics | Symbol | Value | Unit |
|--------------------------|----------|--------|------|
| Operating supply voltage | V_{CC} | 8 ~ 18 | V |

ELECTRICAL CHARACTERISTICS ($T_a=25^\circ\text{C}$, $V_{CC}=12\text{V}$)

| Characteristic | Symbol | Test conditions | Min. | Typ. | max. | Unit |
|------------------------------|--------------|---|------|------|------|---------------|
| Quiescent current | I_Q | Pin5 & 6: GND, $R_L=\infty$ | 3 | 5.5 | 20 | mA |
| Min. input-on current 1 | I_{IN1} | $R_L=\infty$, pin5= I_{IN1} , pin6=L | – | 10 | 50 | μA |
| Min. input-on current 2 | I_{IN2} | $R_L=\infty$, pin5=L, pin6= I_{IN2} | – | 10 | 50 | μA |
| Input threshold voltage 1 | V_{INTH1} | $R_L=\infty$, pin5= V_{INTH1} , pin6=L | 0.7 | 1.3 | 2.0 | V |
| Input threshold voltage 2 | V_{INTH2} | $R_L=\infty$, pin5=L, pin6= V_{INTH2} | 0.7 | 1.3 | 2.0 | V |
| Output leakage current 1 | I_{OL1} | $R_L=\infty$, pin5 & 6=GND | – | – | 1 | mA |
| Output leakage current 2 | I_{OL2} | $R_L=\infty$, pin5 & 6=GND | – | – | 1 | mA |
| Zener current 1 | I_{Z1} | $R_L=\infty$, pin5=H, pin6=L | – | 0.85 | 1.5 | mA |
| Zener current 2 | I_{Z2} | $R_L=\infty$, pin5=L, pin6=H | – | 0.85 | 1.5 | mA |
| Output voltage 1 | V_{O1} | $R_L=60\Omega$, pin5=H, pin6=L | 6.6 | 7.2 | – | V |
| Output voltage 2 | V_{O2} | $R_L=60\Omega$, pin5=L, pin6=H | 6.6 | 7.1 | – | V |
| Saturation voltage (Pin10-1) | V_{CE10-1} | $R_L=R_C=\infty$, pin5=H, pin6=L, $I_{SINK}=100\text{mA}$ | – | 0.83 | 1.5 | V |
| Saturation voltage (Pin2-1) | V_{CE2-1} | $R_L=R_C=\infty$, pin5=L, pin6=H, $I_{SINK}=100\text{mA}$ | – | 0.83 | 1.5 | V |
| Saturation voltage (Pin8-2) | V_{CE8-2} | $R_L=R_C=\infty$, pin5=H, pin6=L, $I_{SOURCE}=100\text{mA}$ | – | 0.83 | 1.5 | V |
| Saturation voltage (Pin8-10) | V_{CE8-10} | $R_L=R_C=\infty$, pin5=L, pin6=H, $I_{SOURCE}=100\text{mA}$ | – | 0.83 | 1.5 | V |

APPLICATION INFORMATIONS

1. FORWARD AND REVERSE CONTROL LOGIC

| Pin #5 | Pin #6 | Pin #2 | Pin #10 | Function |
|------------|------------|--------|---------|----------|
| L (0.7V ↓) | L (0.7V ↓) | L | L | Brake |
| L (0.7V ↓) | H (2.0V ↑) | L | H | Reverse |
| H (2.0V ↑) | L (0.7V ↓) | H | L | Forward |
| H (2.0V ↑) | H (2.0V ↑) | H | H | Brake |

- If pin #5=H, pin #6=L, load current flows from pin #2 to pin #10 through a motor.
- If pin #5=L, pin #6=H, load current flows from pin #10 to pin #2 through a motor.
- If pin #5=pin #6=L or pin #5=pin #6=H, the KA8301 stops supplying the power to motor while absorbing counter EMF from the motor as a brake.

2. RUSH CURRENT ABSORBING CIRCUIT

If a high voltage generated during reversing operation is applied across pin #2 and pin #10, an internal comparator activates the rush current absorbing circuit.

3. DRIVE STAGE

In the forward mode, the drive 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.

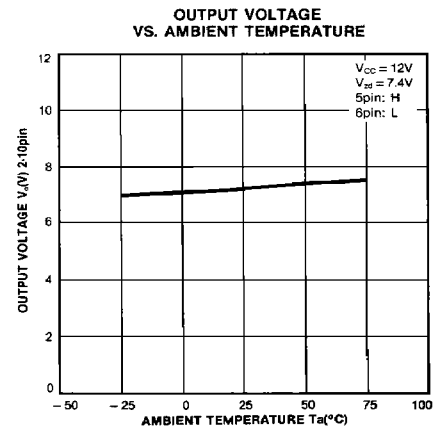
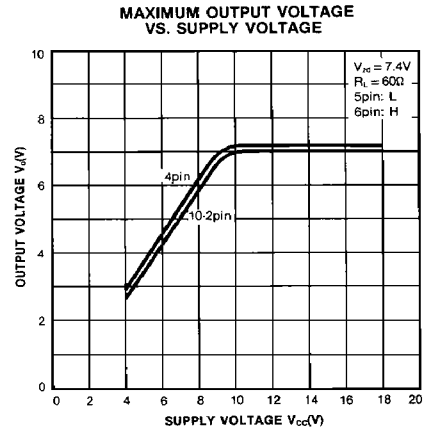
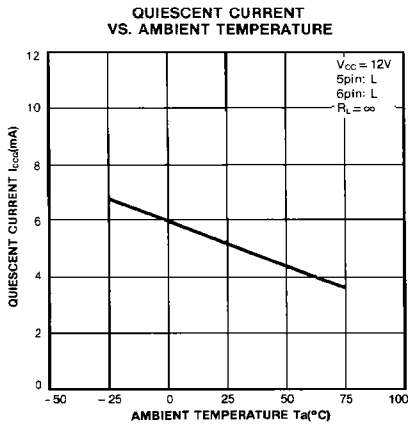
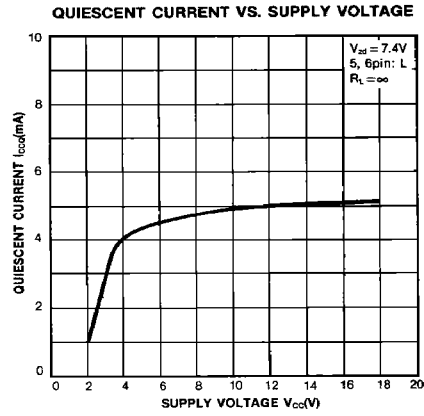
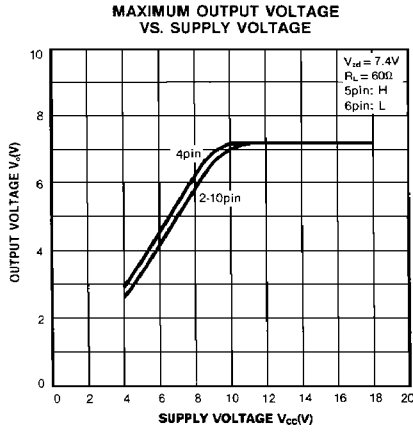
The output voltage (V_{OUT}) applied to the motor is given by the followings;

$$V_{OUT} = V_{ZD} - V_{CE(sat)}, \text{ where } V_{ZD}: \text{ a zener voltage applied to pin \#4}$$

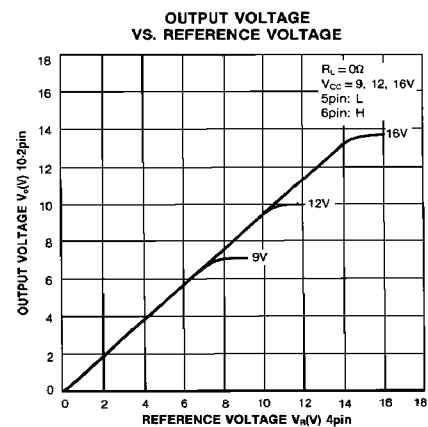
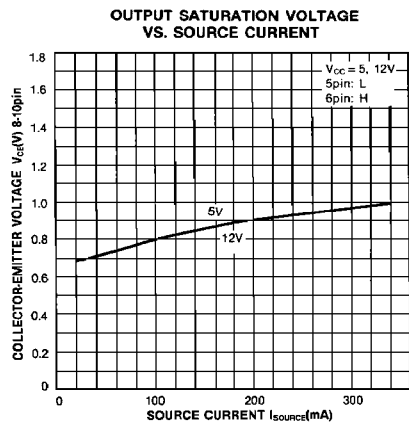
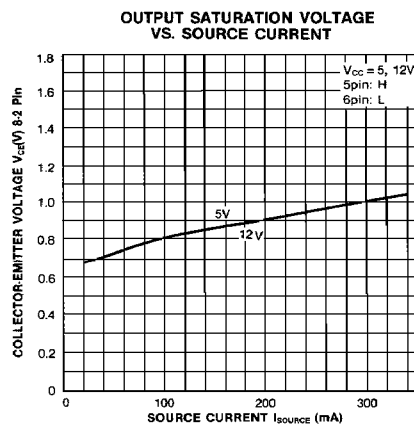
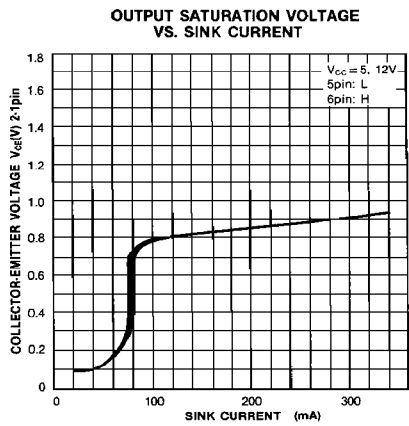
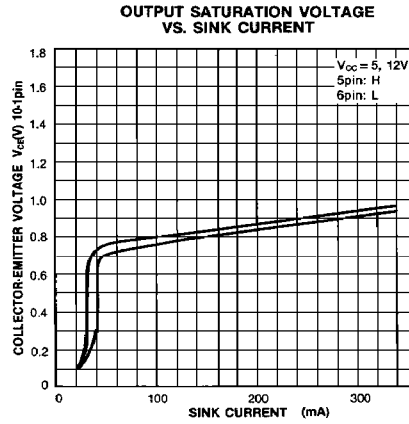
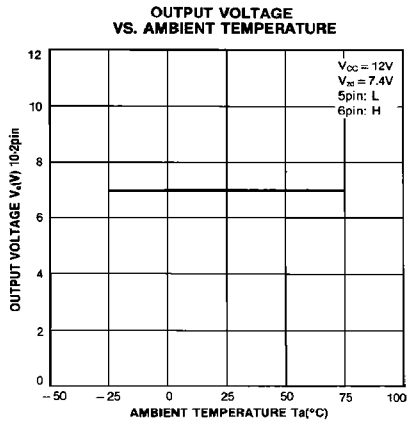
If pin #4 is left open, the output voltage is given by the followings;

$$V_{OUT} = V_{CC1} - V_{CE(sat, pnp)} - 2V_F - V_{CE(sat)}$$

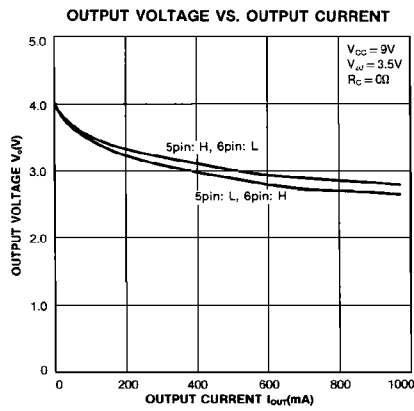
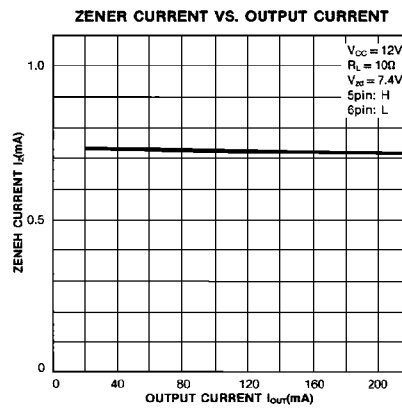
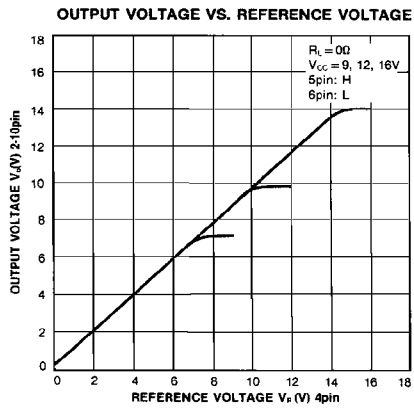
CHARACTERISTIC GRAPHS



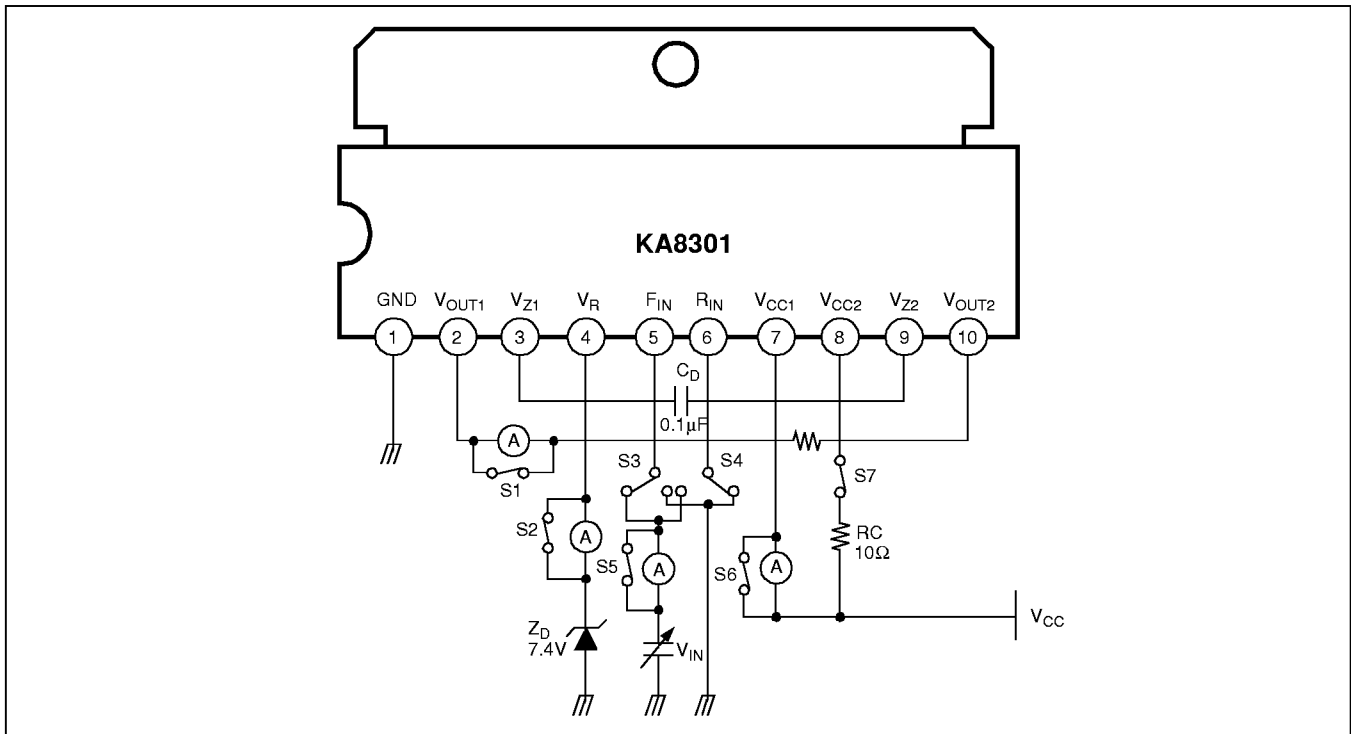
CHARACTERISTIC GRAPHS (Continued)



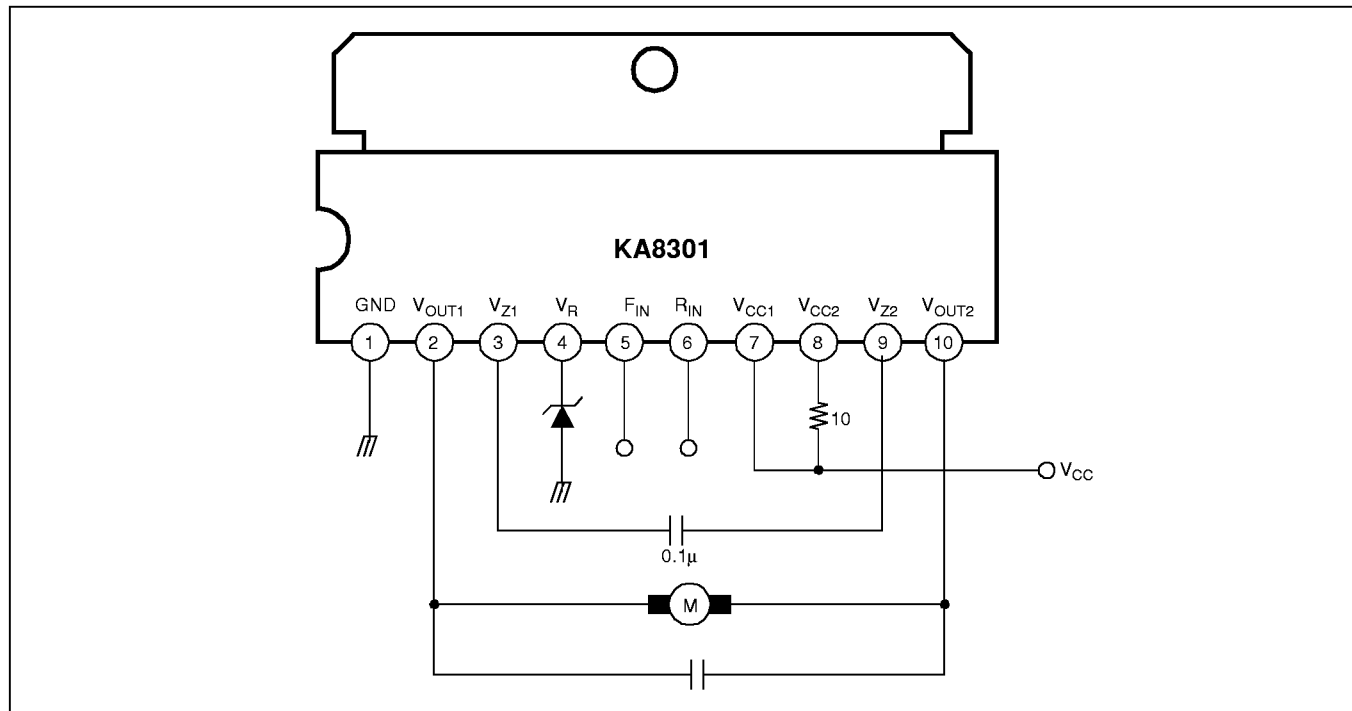
CHARACTERISTIC GRAPHS (Continued)



TEST CIRCUIT



APPLICATION CIRCUIT



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