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.

10-SIPH-B

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.

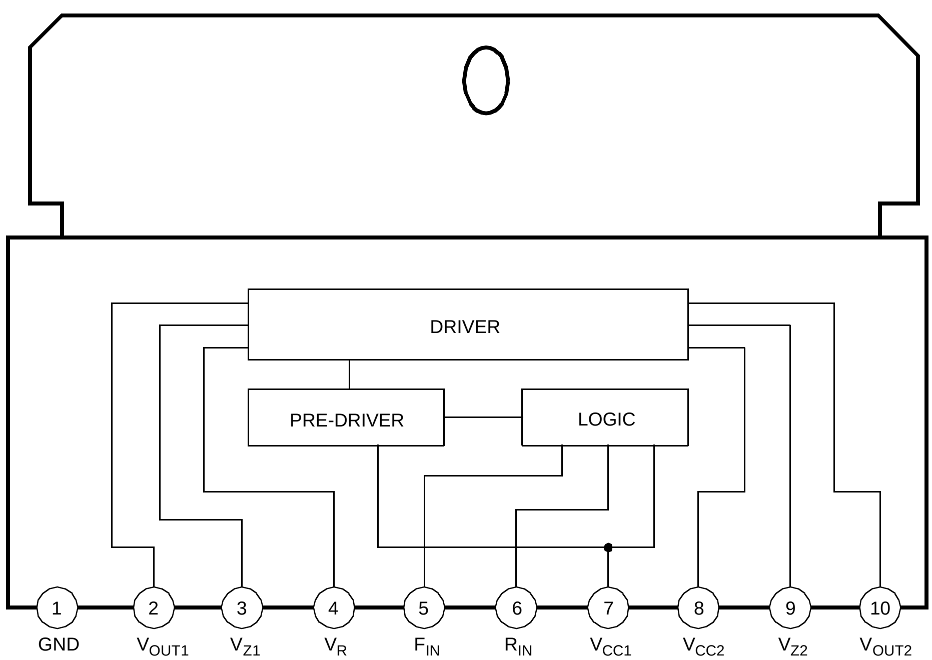
ORDERING INFORMATION

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

TARGET APPLICATION

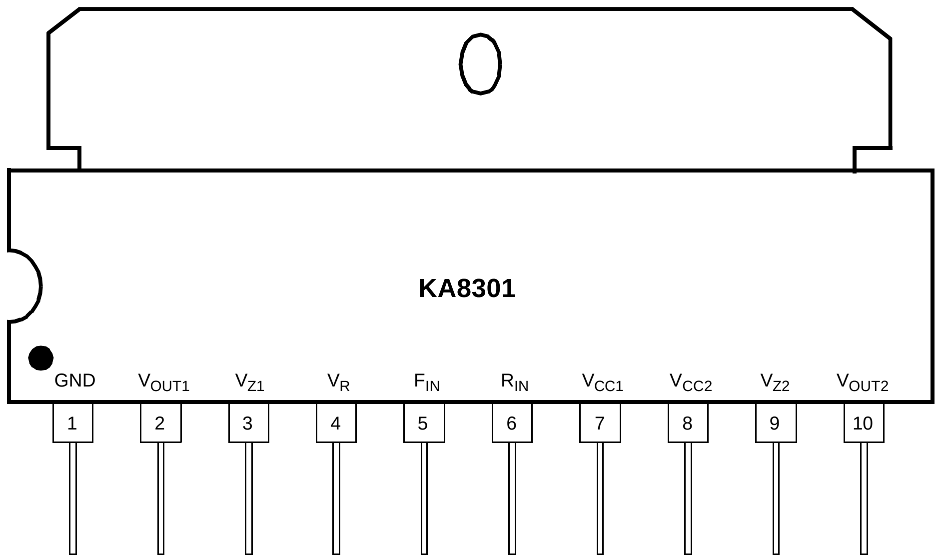
- VCR
- Low current DC motor such audio equipment

BLOCK DIAGRAM



FAIRCHILD SEMICONDUCTOR TM

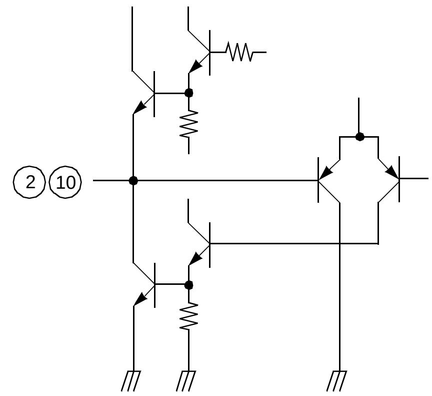
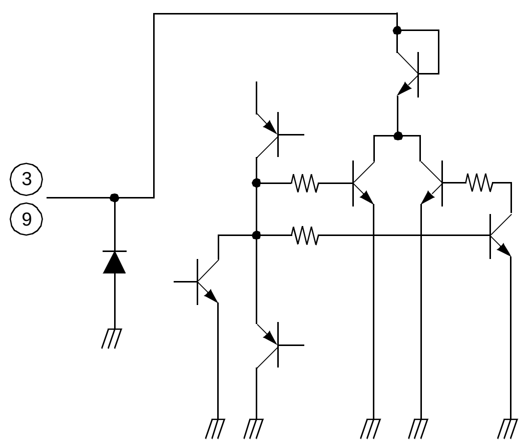
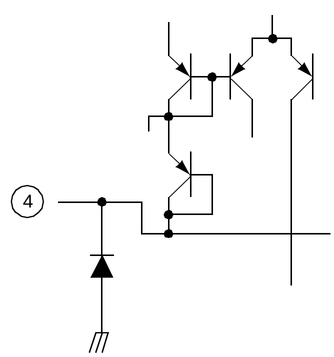
PIN CONFIGURATIONS



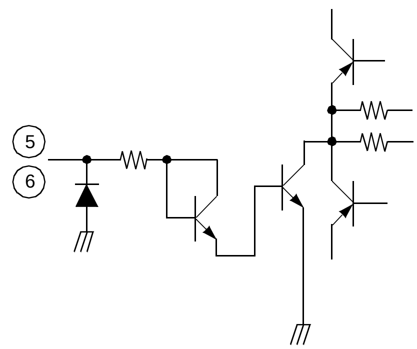
PIN DESCRIPTION

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	

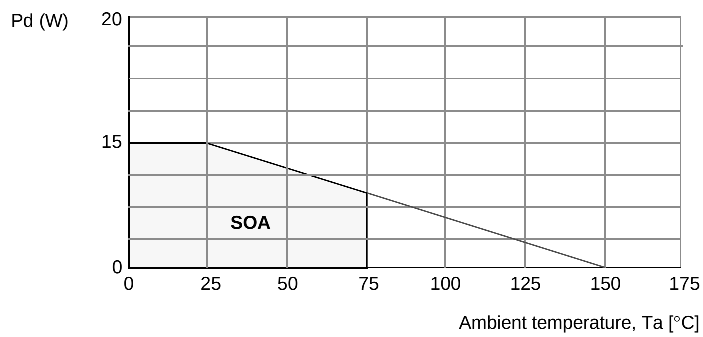
ABSOLUTE MAXIMUM RATING (Ta=25°C)

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:

1. Duty 1/100, pulse width 500µs
2. 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 (Ta=25°C, V_{CC}=12V)

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

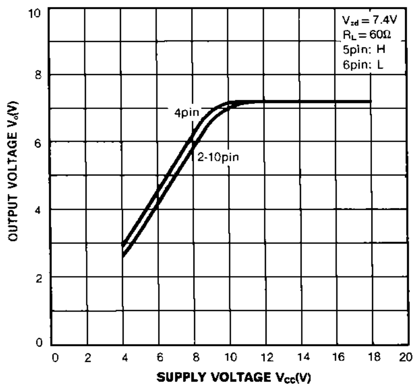
$V_{OUT} = V_{ZD} - V_{CE}(sat)$, where V_{ZD}: a zener voltage applied to pin #4

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

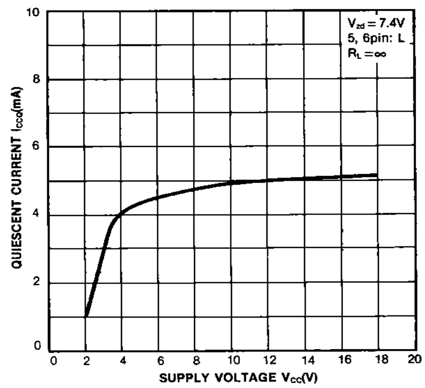
$V_{OUT} = V_{CC1} - V_{CE}(sat, pnp) - 2V_F - V_{CE}(sat)$

CHARACTERISTIC GRAPHS

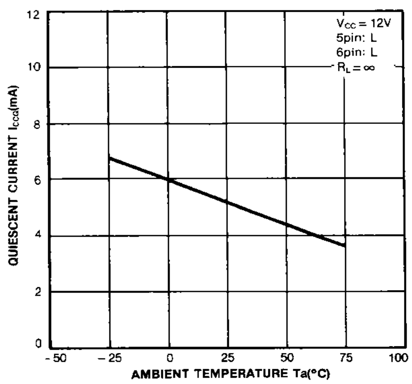
MAXIMUM OUTPUT VOLTAGE
VS. SUPPLY VOLTAGE



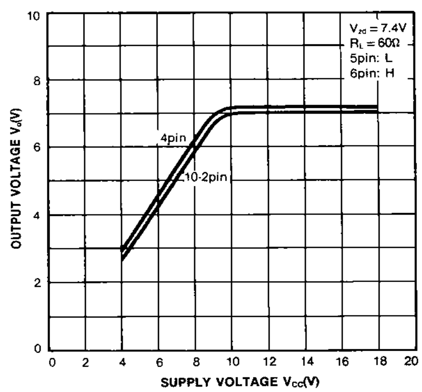
QUIESCENT CURRENT VS. SUPPLY VOLTAGE



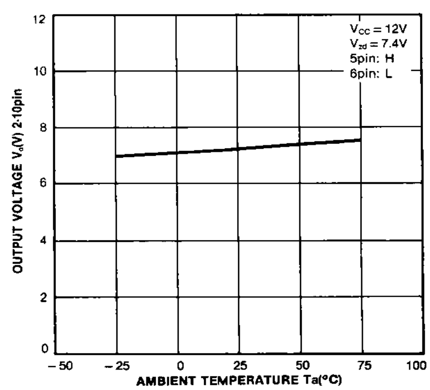
QUIESCENT CURRENT
VS. AMBIENT TEMPERATURE



MAXIMUM OUTPUT VOLTAGE
VS. SUPPLY VOLTAGE

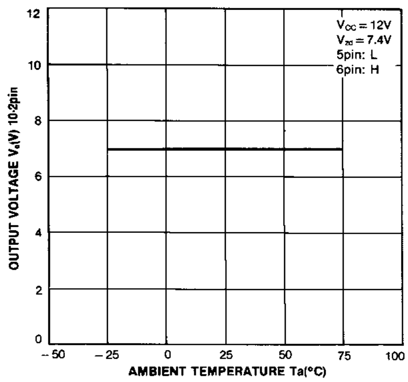


OUTPUT VOLTAGE
VS. AMBIENT TEMPERATURE

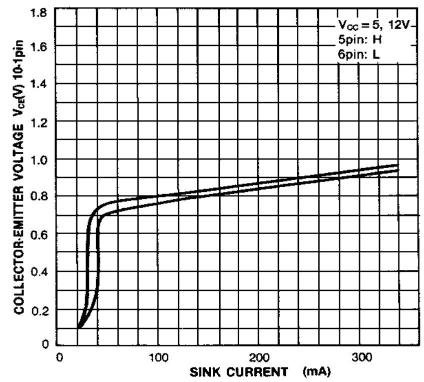


CHARACTERISTIC GRAPHS (Continued)

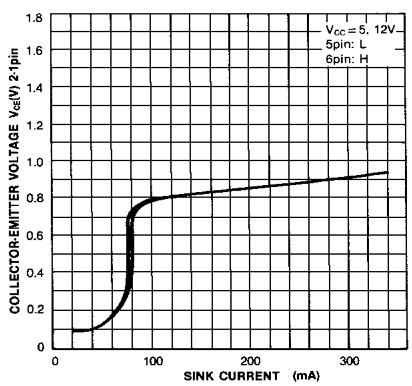
OUTPUT VOLTAGE VS. AMBIENT TEMPERATURE



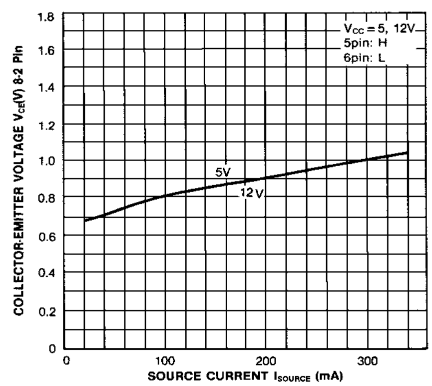
OUTPUT SATURATION VOLTAGE VS. SINK CURRENT



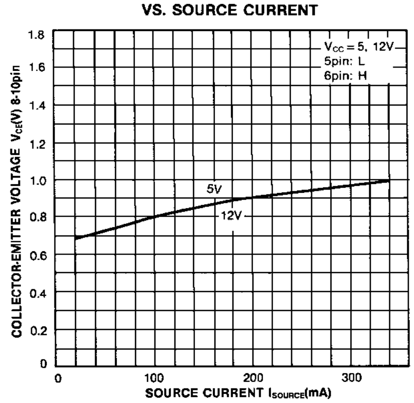
OUTPUT SATURATION VOLTAGE VS. SINK CURRENT



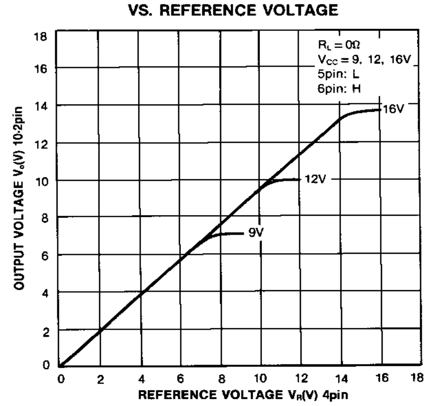
OUTPUT SATURATION VOLTAGE VS. SOURCE CURRENT



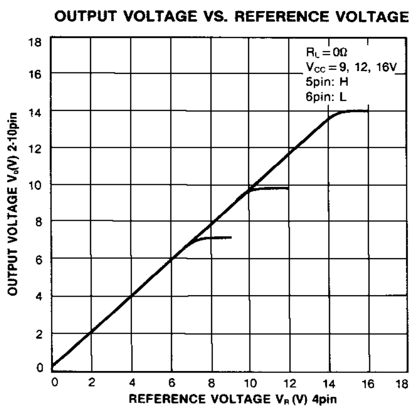
OUTPUT SATURATION VOLTAGE VS. SOURCE CURRENT

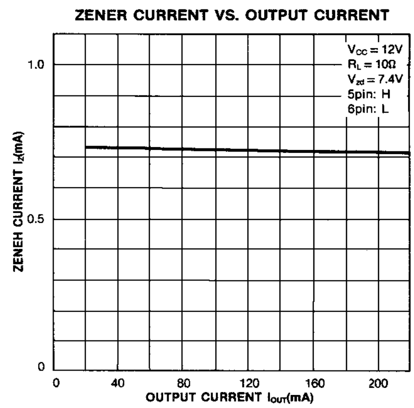


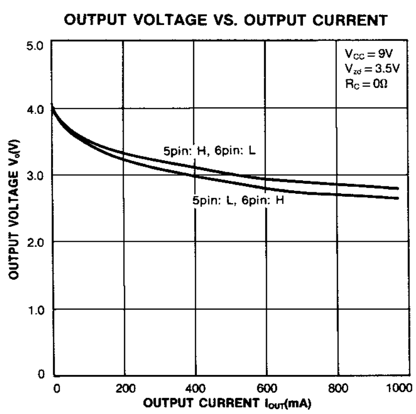
OUTPUT VOLTAGE VS. REFERENCE VOLTAGE



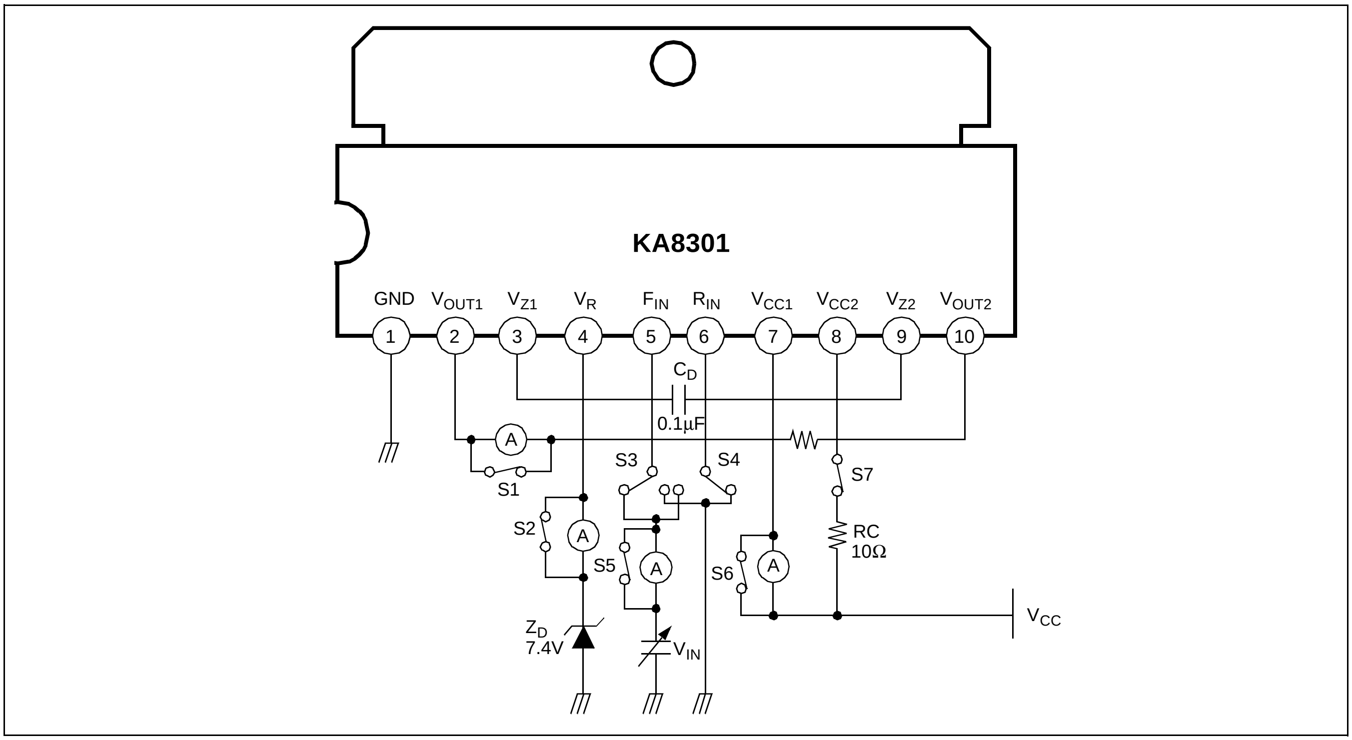
CHARACTERISTIC GRAPHS (Continued)



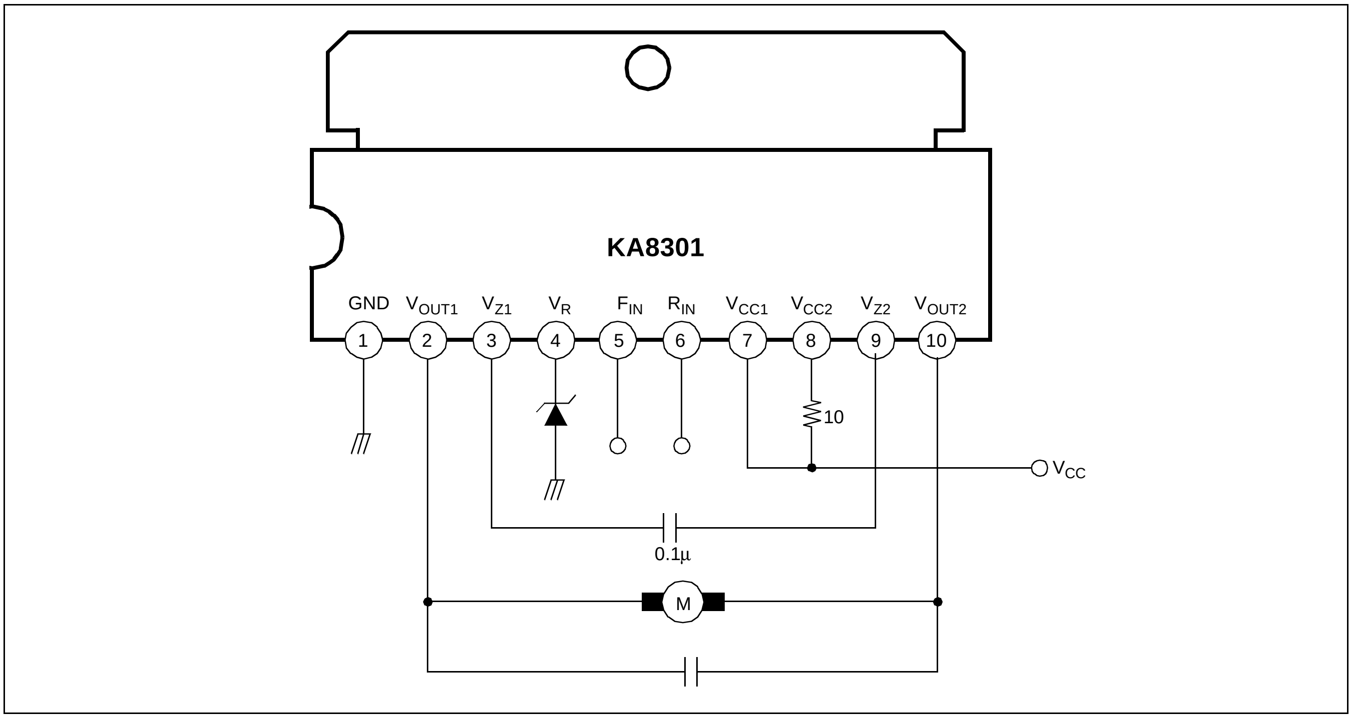




TEST CIRCUIT



APPLICATION CIRCUIT



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