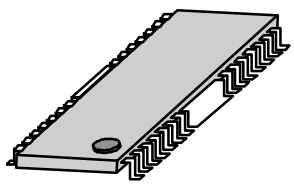
4-CH MOTOR DRIVER

The KA3019D is a monolithic integrated circuit, suitable for a 1-ch (forward.reverse) control DC motor driver and a 3-ch motor driver which drives the focus actuator,tracking actuator, and sled motor of a CD system.

28-SSOPH-375



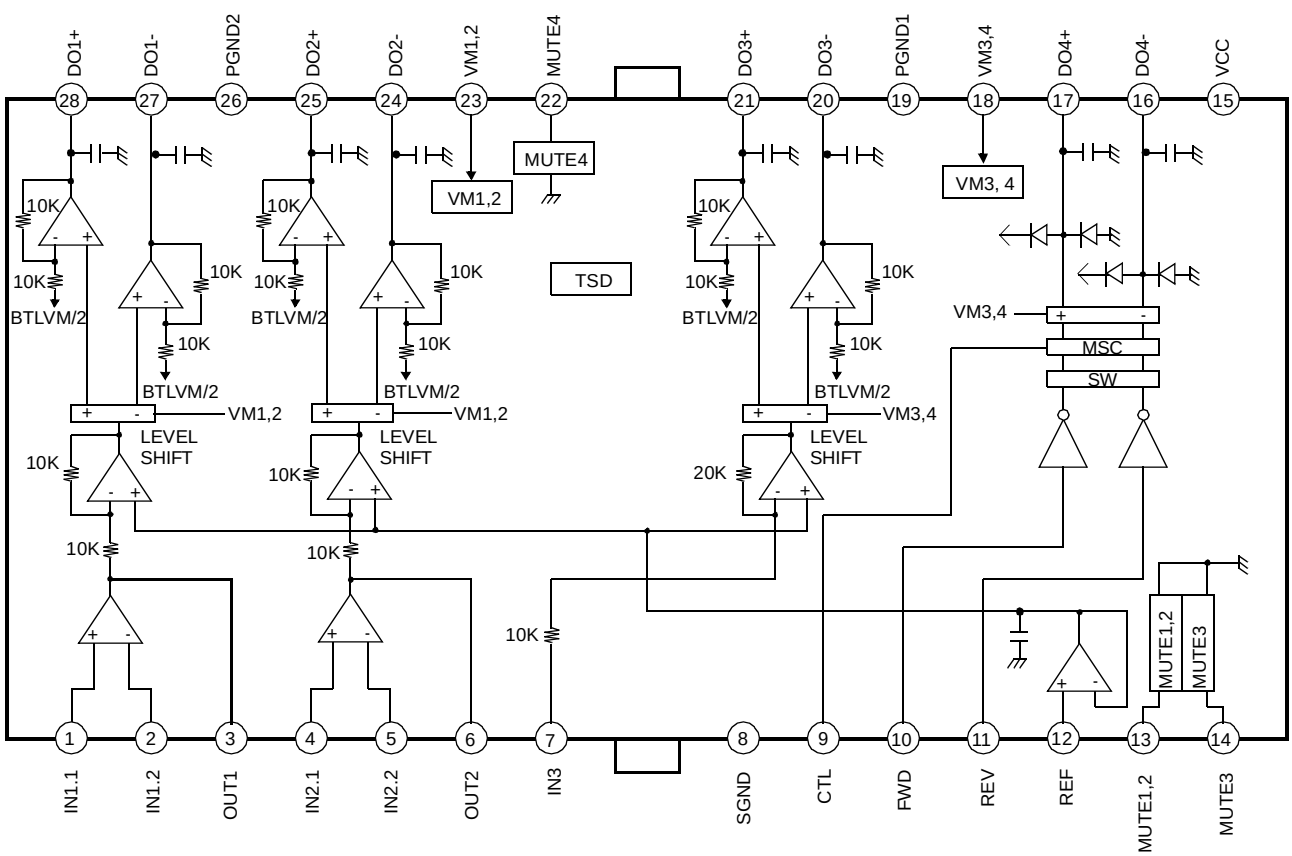
FEATURES

- 3-Channel BTL driver
- 1-Channel forward-Reverse control DC motor driver
- Built-in thermal shutdown circuit
- Built-in mute circuit
- Operating supply voltage: 4.5~13.2V
- Corresponds to 3.3V or 5V DSP

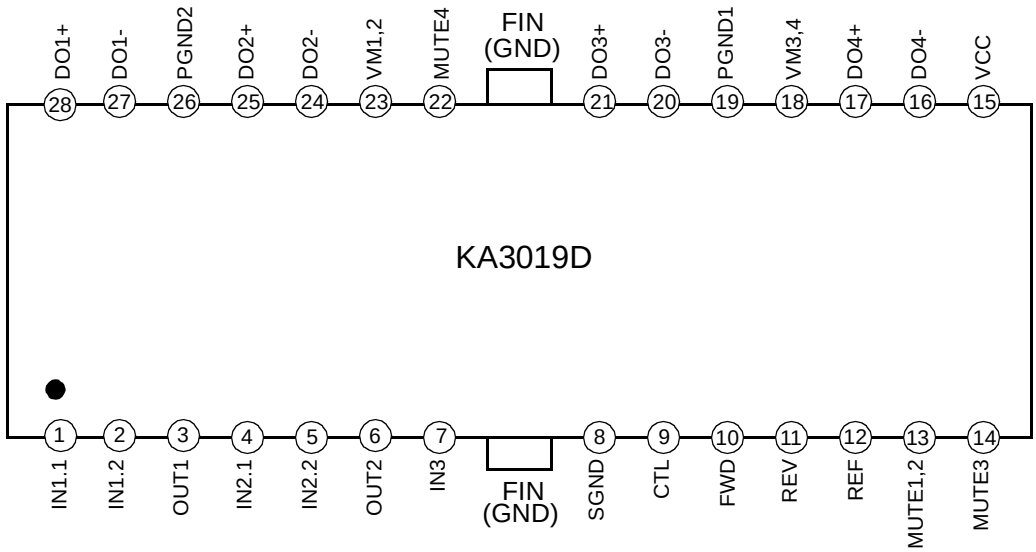
ORDERING INFORMATION

Device	Package	Operating Temperature
KA3019D	28-SSOPH-375	-35 °C ~ 85 °C

BLOCK DIAGRAM



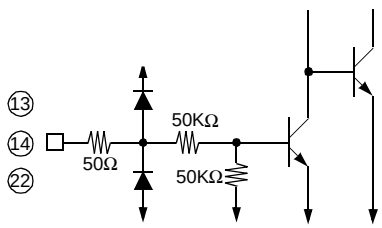
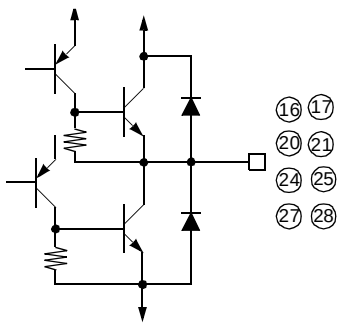
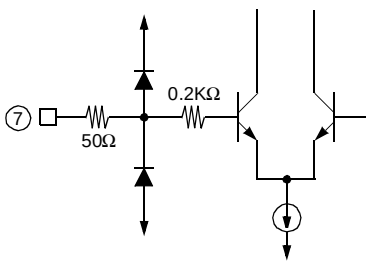
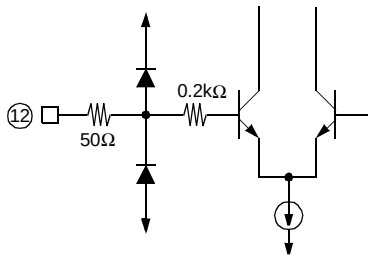
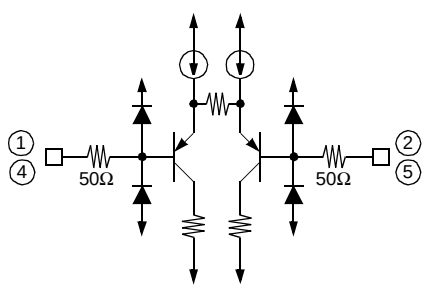
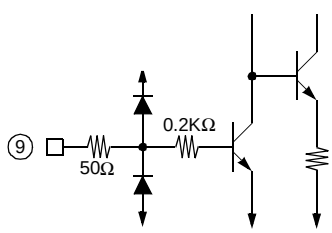
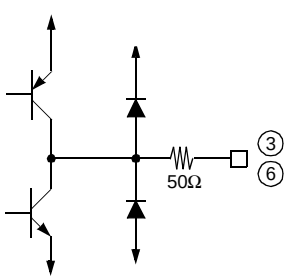
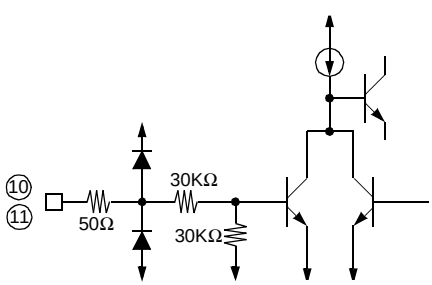
PIN CONFIGURATION



PIN DESCRIPTION

Pin No.	Symbol	I/O	Description	Pin No.	Symbol	I/O	Description
1	IN1.1	I	OP-AMP CH1 Input (+)	15	V_{CC}	-	Signal V_{CC}
2	IN1.2	I	OP-AMP CH1 Input (-)	16	DO4-	O	Drive4 Output (-)
3	OUT1	O	OP-AMP CH1 Output	17	DO4+	O	Drive4 Output (+)
4	IN2.1	I	OP-AMP CH2 Input (+)	18	VM3, 4	-	BTL CH3, 4 Power V_{CC}
5	IN2.2	I	OP-AMP CH2 Input (-)	19	PGND1	-	CH3, 4 Power Ground
6	OUT2	O	OP-AMP CH2 Output	20	DO3-	O	Drive3 Output (-)
7	IN3	I	OP-AMP CH3 Input	21	DO3+	O	Drive3 Output (+)
8	SGND	-	Signal Ground	22	MUTE4	-	CH4 Mute
9	CTL	I	CH4 Motor Speed Control	23	VM1,2	-	BTL CH1, 2 Power V_{CC}
10	FWD	I	CH4 Forward	24	DO2-	O	Drive2 Output (-)
11	REV	I	CH4 Reverse	25	DO2+	O	Drive2 Output (+)
12	REF	I	Bias Voltage Input	26	PGND2	-	CH1,2 Power Ground
13	MUTE1,2	I	CH1, 2 Mute	27	DO1-	O	Drive1 Output (-)
14	MUTE3	I	CH3 Mute	28	DO1+	O	Drive1 Output (+)

EQUIVALENT CIRCUITS

MUTE INPUT	POWER OUTPUT
	
CH3 LEVEL SHIFT INPUT	**SIGNAL REFERENCE INPUT**
	
ERROR AMP INPUT	**LOADING CONTROL INPUT**
	
ERROR AMP OUTPUT	**LOADING LOGIC INPUT**
	

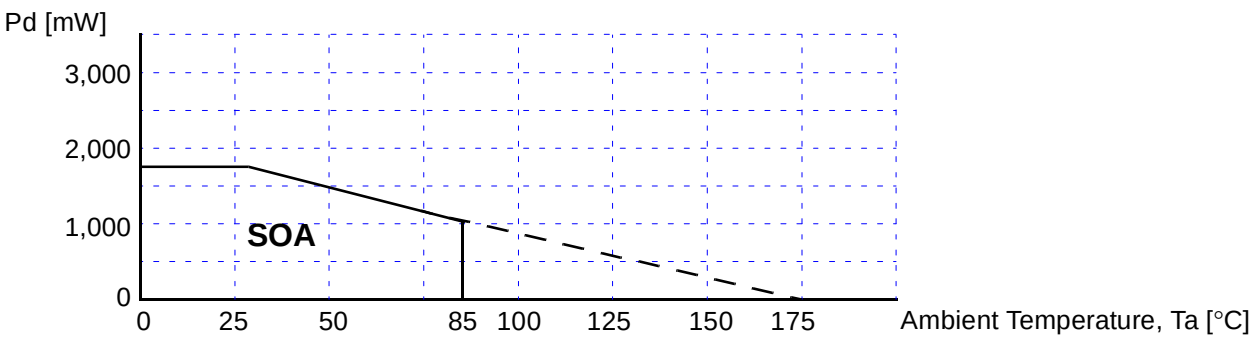
ABSOLUTE MAXIMUM RATINGS (TA = 25 °C)

Characteristics	Symbol	Value	Unit
Maximum supply voltage	V_{CCmax}	18	V
Power dissipation	P_d	1.7_{note}	W
Operating temperature range	T_{opr}	-35 ~ +85	°C
Storage temperature range	T_{stg}	-55 ~ +150	°C

Note: 1. When mounted on a 50mm × 50mm × 1mm PCB (Phenolic resin material).

2. Power dissipation reduces 13.6mW/°C for using above Ta = 25°C

3. Do not exceed Pd and SOA(Safe operating area).



RECOMMENDED OPERATING CONDITIONS

Characteristics	Symbol	Value			Unit
		Min	Typ	Max	
Supply Voltage	Vcc	4.5	-	13.2	V

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, Ta = 25 °C, V_{CC} = VM12 = VM3,4 = 5V)

Characteristics	Symbol	Conditions	Spec			Unit
			Min	Typ	Max	
Quiescent Current	I_{CC}	Vin = 0V	-	8	12	mA
Mute On Current	Imute	Mute Pin = GND	-	1	3	mA
Mute On Voltage	Vmon		-	-	0.5	V
Mute Off Voltage	Vmoff		2	-	-	V
DRIVE PART						
Input Offset Voltage	Vio		-20	-	+20	mV
Output Offset Voltage	Voo	Vin = 2.5V	-20	-	+20	mV
Maximum Output Voltage1	Vom1	Vcc = 8V, RL = 8Ω (CH1, 2)	4	5.7	-	V
Maximum Output Voltage2	Vom2	Vcc = 12V, RL = 24Ω (CH3)	7	9	-	V
Close Loop Voltage Gain1	Gvc1	f = 1KHz, Vin = 0.1Vrms (CH1, 2)	10.5	12	13.5	dB
Close Loop Voltage Gain2	Gvc2	f = 1KHz, Vin = 0.1Vrms (CH3)	16	18	20	dB
Ripple Rejection Ratio	RR	Vin = 0.1Vrms, f = 120Hz	-	60	-	dB
Slew Rate	SR	Vo = 2Vp-p, f = 120KHz	-	0.8	-	V/us
ERROR OP AMP PART						
Input Offset Voltage	Vofop		-10	-	+10	mV
Input Bias Current	Ibop		-	-	300	nA
High Level Output Voltage	Vohop	Vcc = 5V, RL = 10KΩ	4.5	4.8	-	V
Low Level Output Voltage	Volop	Vcc = 5V, RL = 10KΩ	-	0.2	0.5	V
Output Sink Current	Isink	Vcc = 5V, RL = 1KΩ	1	2	-	mA
Output Source Current	Isource	Vcc = 5V, RL = 1KΩ	1	2	-	mA
Open Loop Voltage Gain	Gvo	Vin = -75dB, f = 1KHz	-	75	-	dB
Ripple Rejection Ratio	RRop	Vin = -20dB, f = 120Hz	-	65	-	dB
Slew Rate	Srop	f = 120KHz, 2Vp-p	-	1	-	V/us
Common Mode Rejection Ratio	CMRR	Vin = -20dB, f = 1KHz	-	80	-	dB
Common Mode Input Range	Vicm	Vcc = 8V	-0.3	-	6.8	V

Characteristics	Symbol	Conditions	Spec			Unit
			Min	Typ	Max	
TRAY DRIVE PART (V_{CC} = VM34 = 8V, RL = 45Ω)						
Input High Level Voltage	Vih		2	-	-	V
Input Low Level Voltage	Vil		-	-	0.5	V
Output Voltage1	Vo1	Vcc = 8V,Vctl = 3.5V	5.2	6	6.8	V
Output Voltage2	Vo2	Vcc = 13V,Vctl = 4.5V	7.5	8.5	9.5	V
Output Load Regulatoin	ΔV_{RL}		-	300	700	mV
Output Offset Voltage1	Voo1	Vin = 5V	-10	-	+10	mV
Output Offset Voltage1	Voo2	Vin = 5V	-10	-	+10	mV

APPLICATION INFORMATION

1. REFERENCE INPUT

Pin 12 (REF) is a reference Input pin.

1) Reference Input

The applied voltage at the reference input pin must be between 2 (V) and 6.5 (V), when Vcc = 8.5V.

2. SEPARATED CHANNEL MUTE FUNCTION

These pins are used for individual channel mute operation.

1) When the mute pins (pin13,14 and 22) are Low level, the mute circuits are enabled and the output circuits are muted.
2) When the voltage of the mute pins (pin13,14 and 22) are High level, the mute circuits are disabled and the output circuits operate normally.

Mute1, 2 (pin 13)-CH1, 2 mute control input pin.

Mute3 (pin 14)-CH3 mute control input pin. Mute4(pin22) - CH4 mute control input pin.

3. PROTECTION FUNCTION

Thermal Shutdown (TSD)

1) If the chip temperature rises above 175 °C the thermal shutdown (TSD) circuit is activated and the output circuit is in the Mute state, that is Off state.

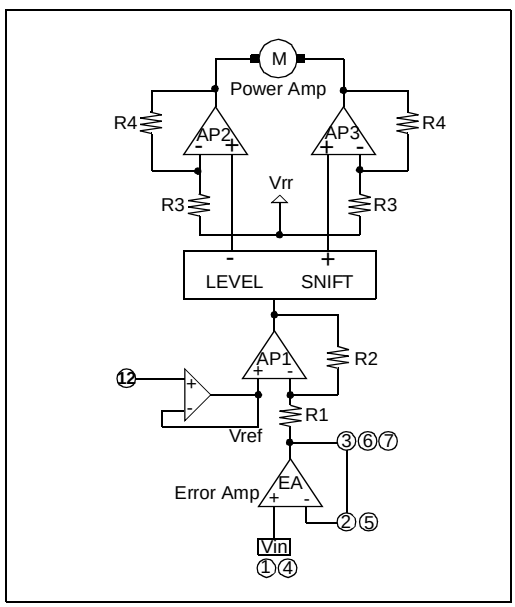
The TSD circuit has a temperature hysteresis of 25 °C.

4. FOCUS, TRACKING ACTUATOR, SLED MOTOR DRIVE PART

1) The reference voltage REF is given externally through pin 12.
2) The error amp output signal is amplified by R2/R1 times and then fed to the level shift circuit.
3) The level shift circuit produces the differential output voltages and drives the two output power amplifiers.

Since the differential gain of the output amplifiers is equal to $2 \times (1+ R4/R3)$, the output signal of the error amp is amplified by $(R2/R1) \times 2 \times (1+R4/R3)$.

4) If the total gain is insufficient, the input error amp can be used to increase the gain.
5) The bias voltage (Vrr) is about a half of the supply voltage(VM).

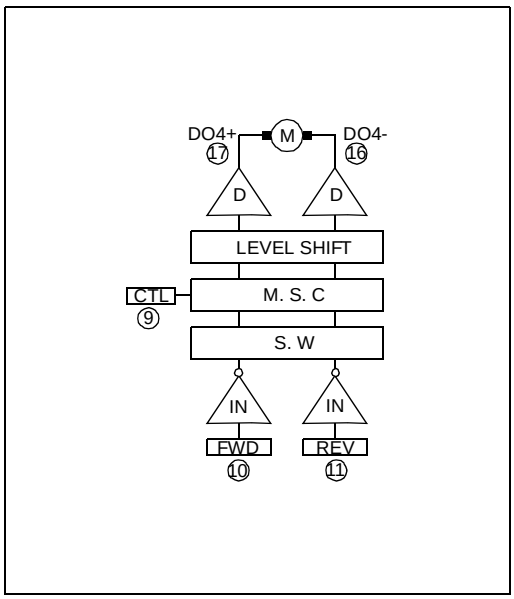


5. TRAY, CHANGE MOTOR DRIVE PART

1) Rotational Direction Control

The forward and reverse rotational direction is controlled by FWD (pin 10) and REV (pin 11) inputs. Conditions are as follows.

Input		Output		
FWD	REV	DO4+	DO4-	State
H	H	H	H	Stop
H	L	H	L	Forward
L	H	L	H	Reverse
L	L	L	L	Stop

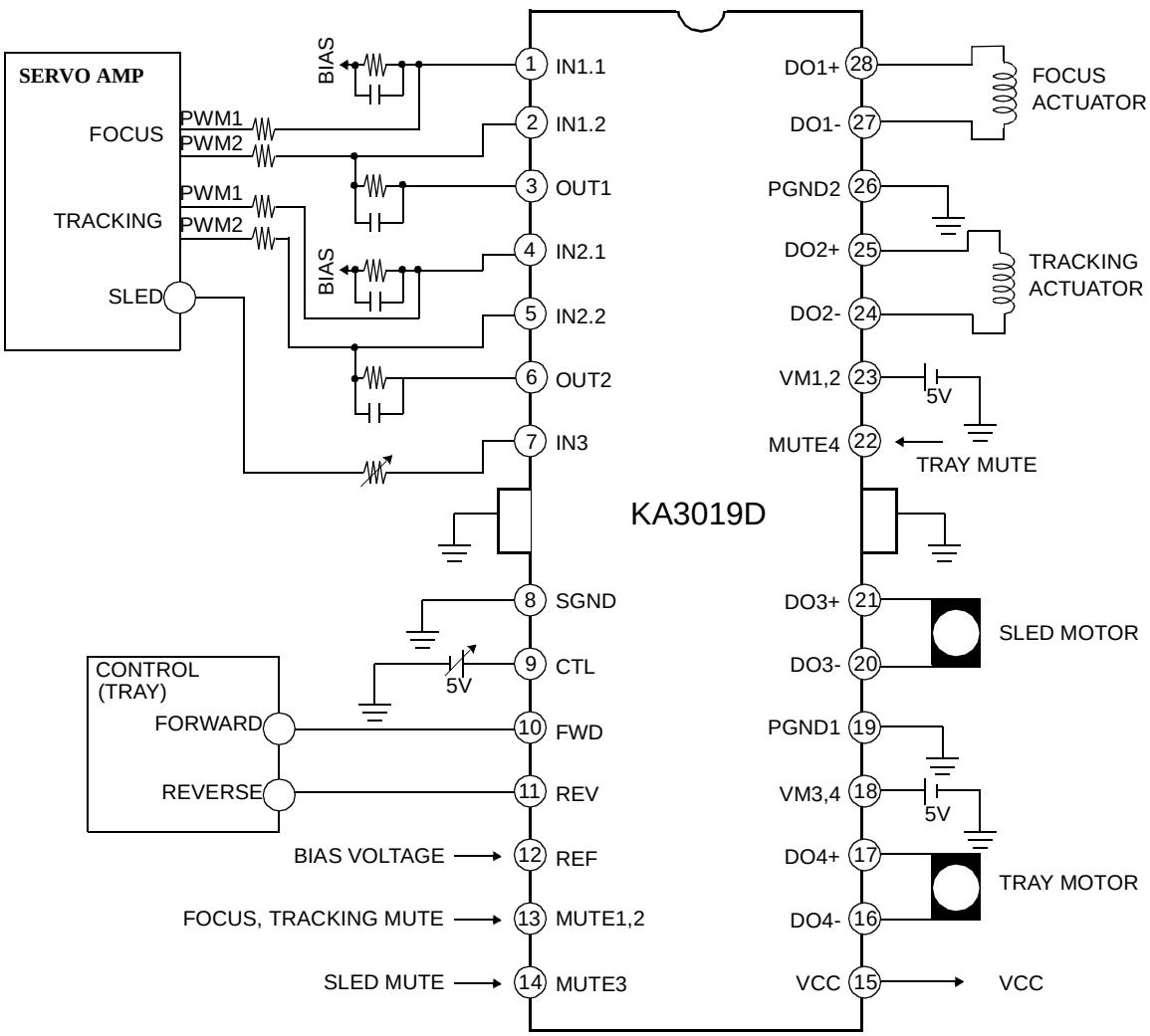


2) Motor Speed Control

- The motor speed is proportional to the difference voltage between the pin17(DO4+) and the pin16(DO4-).
- By applying the voltage to the pin9 of CTL, the motor speed can be controlled and it is linearly proportional to the applied control voltage.
- When both VM3,4 and Vcc are 5V, and the applied control voltage is higher than 4V, the motor speed is not proportional to the control voltage but the motor speed becomes constant.
- If the pin9 is opened,the motor torque becomes maximum.
- The maximum output swing is 10.4, when VM3,4 and Vcc are 12V.

APPLICATION CIRCUIT1

(Diffential PWM Control Mode)

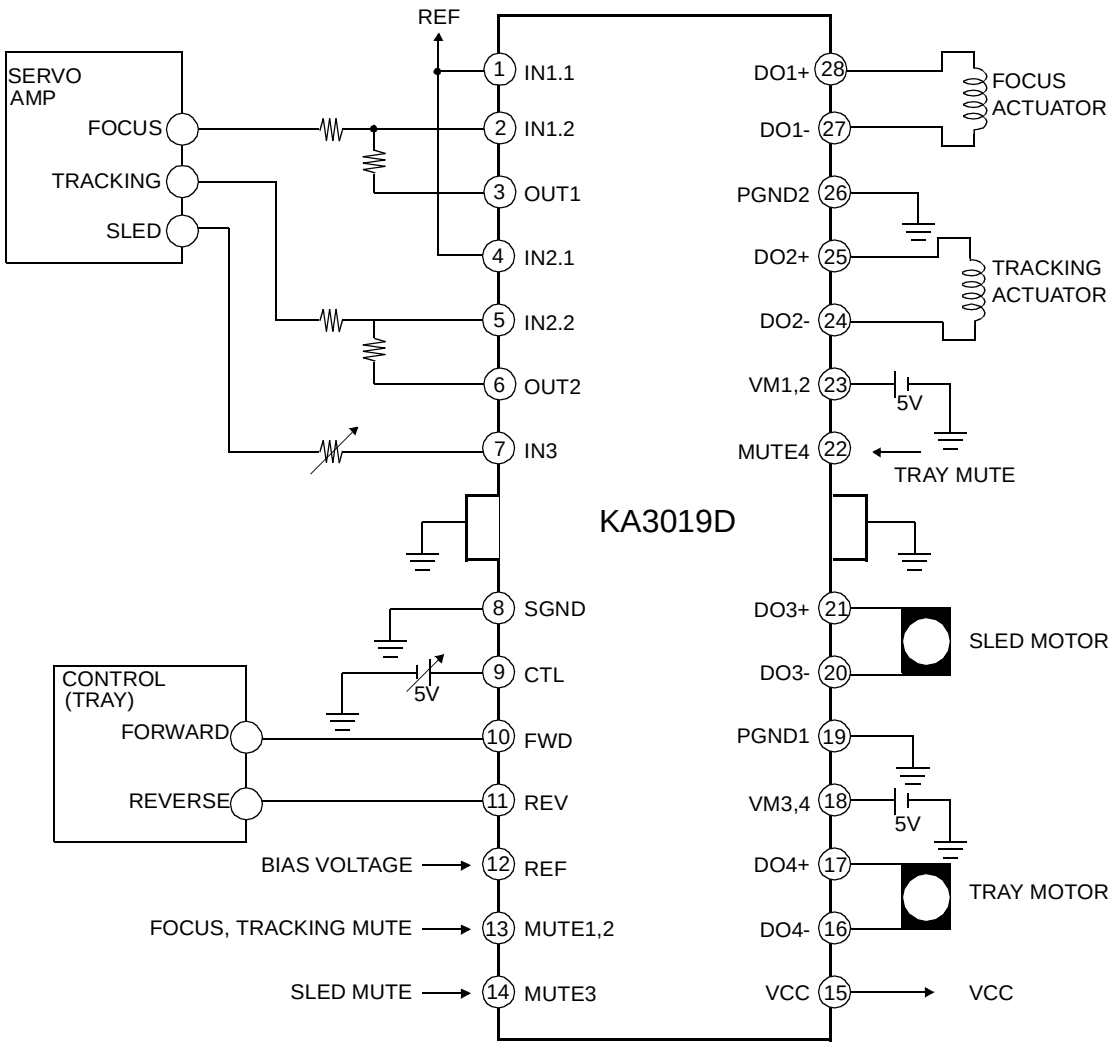


THERMAL SHUT DOWN CIRCUIT

The IC is broken down by the heat when overload condition continues for a long time. So, KA3019D has a thermal shut down circuit to prevent this case. At that time temperature of the IC rises over 175 °C, the circuit is operating and protects the IC against breakdown.

APPLICATION CIRCUIT2

(Voltage Control Mode)



PACKAGE DIMENSION

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