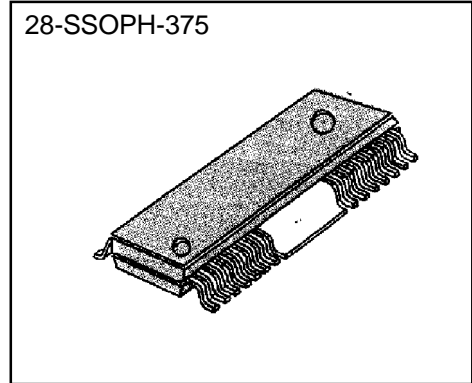


6-CH MOTOR DRIVER

The KA3030D is a monolithic integrated circuit, suitable for a 6-ch motor drivers which drive the focus actuator, tracking actuator, sled motor, spindle motor, loading motor and changer of the CD system.



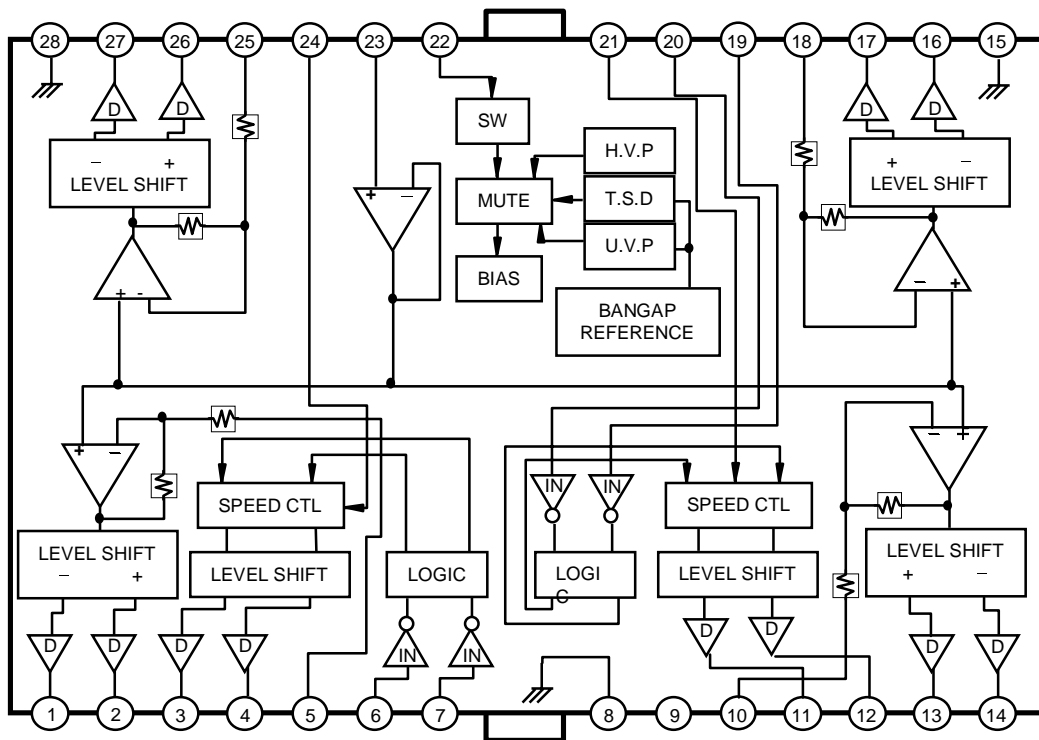
FEATURES

- Wide operating supply voltage range : 4.5V~13.2V
- Built in TSD(thermal shutdown) circuit : 175°C
- Built in protection circuit for under or high voltage
- Built in mute circuit
- Built in speed control circuit
- Built in level shift (V - I converter)

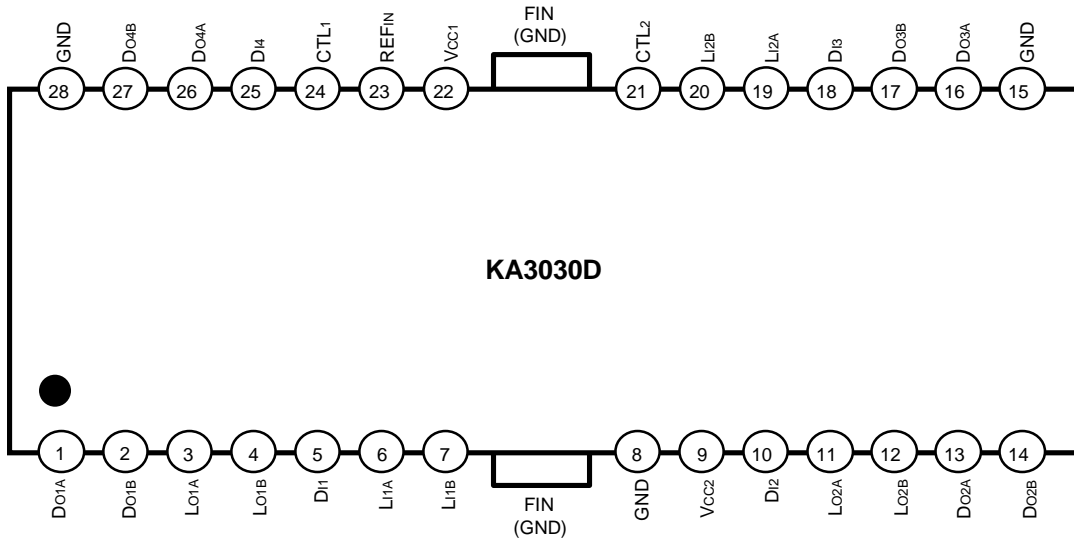
ORDERING INFORMATION

Device	Package	Operating Temperature
KA3030D	28-SSOPH-375	- 20°C ~ 75°C

BLOCK DIAGRAM



PIN CONFIGURATION

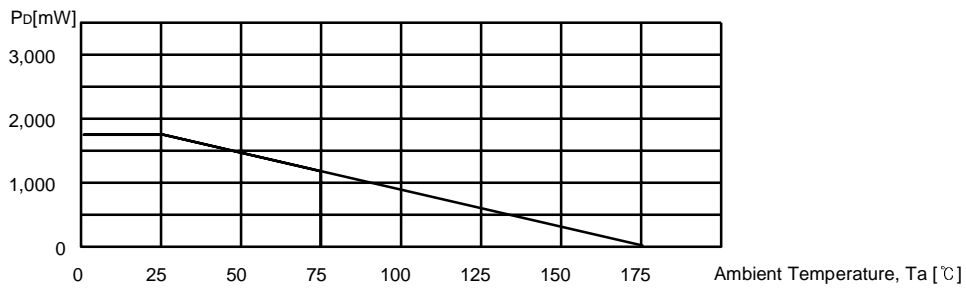


PIN DESCRIPTION

Pin no.	Symbol	I/O	Description	Pin no.	Symbol	I/O	Description
1	DO1A	O	Drive Output 1A (-)	15	GND	-	Ground
2	DO1B	O	Drive Output 1B (+)	16	DO3A	O	Drive Output 3A (-)
3	LO1A	O	Logic Output 1A	17	DO3B	O	Drive Output 3B (+)
4	LO1B	O	Logic Output 1B	18	DI3	I	Drive Input 3
5	DI1	I	Drive Input 1	19	LI2A	I	Logic Input 2A
6	DI1A	I	Logic Input 1A	20	LI2B	I	Logic Input 2B
7	DI1B	I	Logic Input 1B	21	CTL2	I	Speed Control 2
8	GND	-	Ground	22	VCC1	-	Power Supply 1
9	VCC2	-	Supply Voltage 2	23	REFIN	I	Reference & Mute Input
10	DI2	I	Drive Input 2	24	CTL1	I	Speed control 1
11	LO2A	O	Logic Output 2A	25	DI4	I	Drive Input 4
12	LO2B	O	Logic Output 2B	26	DO4A	O	Drive Output 4A (+)
13	DO2A	O	Drive Output 2A (+)	27	DO4B	O	Drive Output 4A (-)
14	DO2B	O	Drive Output 2B (-)	28	GND	-	Ground

ABSOLUTE MAXIMUM RATING (Ta=25°C)

Characteristics	Symbol	Value	Unit
Maximum Supply Voltage	VCC	18	V
Power Dissipation	PD	1700	mW
Maximum Output Current	IOMAX	1	A
Operating Temperature	TOPR	- 25 ~ 75	°C
Storage Temperature	TSTG	- 55 ~ 150	°C



RECOMMENDED OPERATING CONDITION

Characteristics	Symbol	Value	Unit
Operating Supply Voltage	VCC	4.5 ~ 13.2	V

ELECTRICAL CHARACTERISTICS

(Ta = 25°C, VCC = 8V, unless otherwise specified)

Characteristics	Symbol	Test Conditions	Min	Typ	Max	Unit
Quiescent Circuit Current	ICC	Under No Load	8	11	14	mA
Mute On Current	IMUTE	VPIN23=GND	-	3	6	mA
Mute On Voltage	VMON		-	-	0.5	V
Mute Off Voltage	VMOFF		2	-	-	V
Under Voltage Protection	VUVP		-	-	4	V
High Voltage Protection	VHVP		19	-	-	V
FOCUS, TRACKING, SPINLE, SLED, DRIVE PART (RL = 8Ω)						
Input Offset Voltage	VIO		-20	-	20	mV
Output Offset Voltage	VOO	VIN=2.5V	-40	-	40	mV
Max. Output Voltage(1)	VOM1	VCC=5V	2.4	3	-	V
Close Loop Voltage Gain(1)	AVF1	VCC=5V, VIN=0.1Vrms	7.5	9	10.5	dB*
Max. Output Voltage(2)	VOM2	VCC=8V	4.7	5.7	-	V
Close Loop Voltage Gain(2)	AVF2	VCC=8V, VIN=0.1Vrms	7.5	9	10.5	dB
Ripple Rejection Ratio	RR	VIN=0.1Vrms, f=100Hz	40	60	-	dB
Slew Rate	SR	Square Waveform, VOUT=3Vp-p, f=100Hz	-	0.8	-	V/uS*
LOADING, CHANGER DRIVE PART (RL = 45Ω)						
Input High Level Voltage	VIH		2	-	-	V
Input Low Level Voltage	VIL		-	-	0.5	V
Output Voltage(1)	VO1	VCC=5V, VCTL=2.5V	2.6	3.2	3.8	V
Output Voltage(2)	VO2	VCC=8V, VCTL=3.5V	5.2	6.0	6.8	V
Output Load Changing(1)	ΔVRL1	IL=100mA->400mA, High Terminal	-	100	300	mV
Output Load Changing(2)	ΔVRL2	IL=100mA->400mA, Low Terminal	-	100	300	mV
Output Offset Voltage(1)	VOO1	VIN=5V, 5V	-10	-	10	mV
Output Offset Voltage(2)	VOO2	VIN=0V, 0V	-10	-	10	mV

Note) Vcc = Vcc1 (pin22) ≤ Vcc2 (pin9)

Caution) Vcc1 (pin22) must not exceed Vcc2 (pin 9)

APPLICATION INFORMATION

1. REFERENCE INPUT & MUTE CIRCUITS

Pin 23 can be used as a reference input terminal and a mute terminal.

1) Reference Input Circuit

An external allowable reference voltage to PIN23 is normally 2.5V.

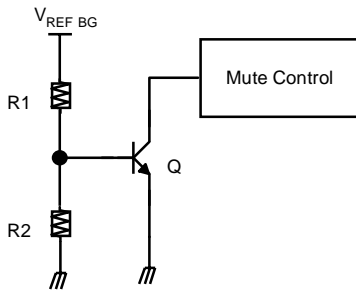
In general conditions PIN23 is used as the reference input terminal and is good to be used between about 2V - 6.5V.

2) Mute Circuit

The following represents the conditions when the external mute is permitted to PIN23.

Mute Voltage	Min.	Typ.	Max.	Device Condition
Mute On Voltage[V]	-	-	0.5	Mute
Mute Off Voltage[V]	2	-	-	Operate

2. THERMAL SHUT-DOWN CIRCUIT

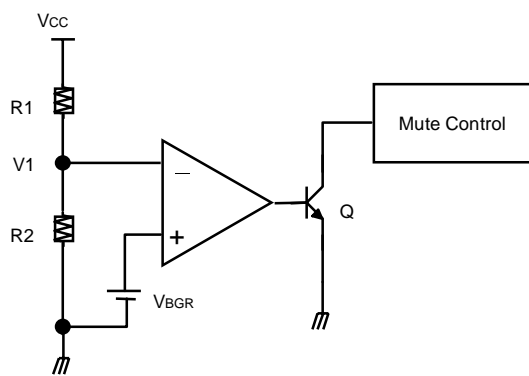


The setting voltage of V_{BE}

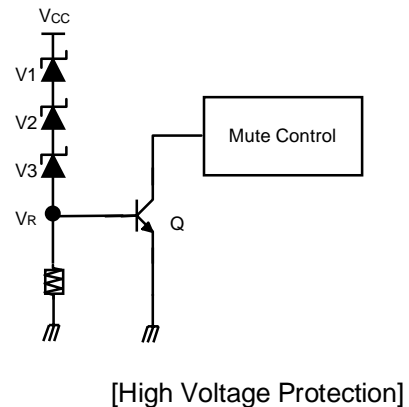
$$V_{BE} = V_{REF\ BG} * R2 / (R1 + R2) = 400mV$$

Because the thermal coefficient of $V_{BE}(Q)$ is $-2mV / 1^{\circ}C$ and if TR Q reaches $175^{\circ}C$ from its normal off state(at $25^{\circ}C$), V_{BE} for turning on Q becomes 400mV, and then Q turns ON and the mute control circuit operates.

3. UNDER/HIGH VOLTAGE PROTECTION CIRCUIT

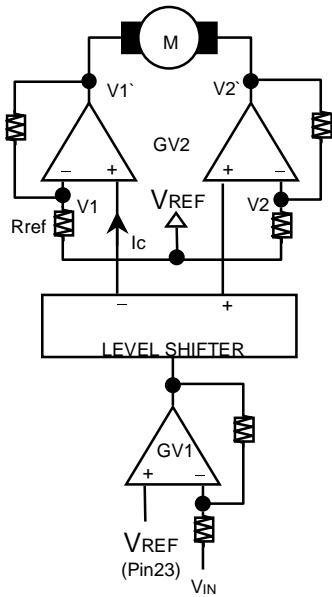


- Normal State : $V_{BGR}=2.5V < V1 = V_{cc} * R2 / (R1 + R2)$
- Mute State : $V1 < V_{BGR}$ (V_{cc} is below 4V)



- Normal State : $Vz = V1 + V2 + V3 + V_R$
- Mute State : $V_{cc} > Vz$ (V_{cc} is above 20V)

4. FOCUS, TRACKING, SPINDLE, SLED DRIVE CIGUITS

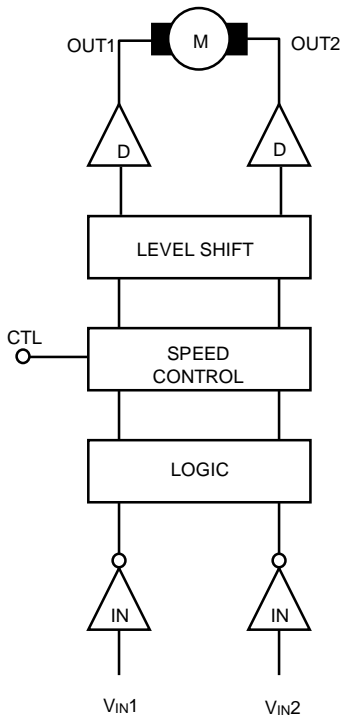


$GV = 20\log(V_o/V_{IN}) = GV1 + GV2 = 3.5dB + 6dB = 9.5dB$
 V_{ref} is fixed to 2.5V as the external bias voltage and the input signal through the V_{IN} is amplified to about 9.5dB through two state AMP. In the level shift circuitry, the input signal is transformed into the current so that the voltage $V1$ and $V2$ are shifted to $V1'$ and $V2'$ respectively.
 $V1' = V1 + (I_c * V_{REF}) = V1 + \Delta V$
 $V2' = V2 - (I_c * V_{REF}) = V2 - \Delta V$

Because $V1$ and $V2$ voltages, in their initial state, are equal, the voltage, V_M , on the sides of the motor is following
 $V_M = V1' - V2' = \Delta V - (-) \Delta V = 2\Delta V$

∴ Rotation occurs due to $2\Delta V$ voltage difference at both sides of the motor.

5. LOADING, CHANGER DRIVE CIRCUITS



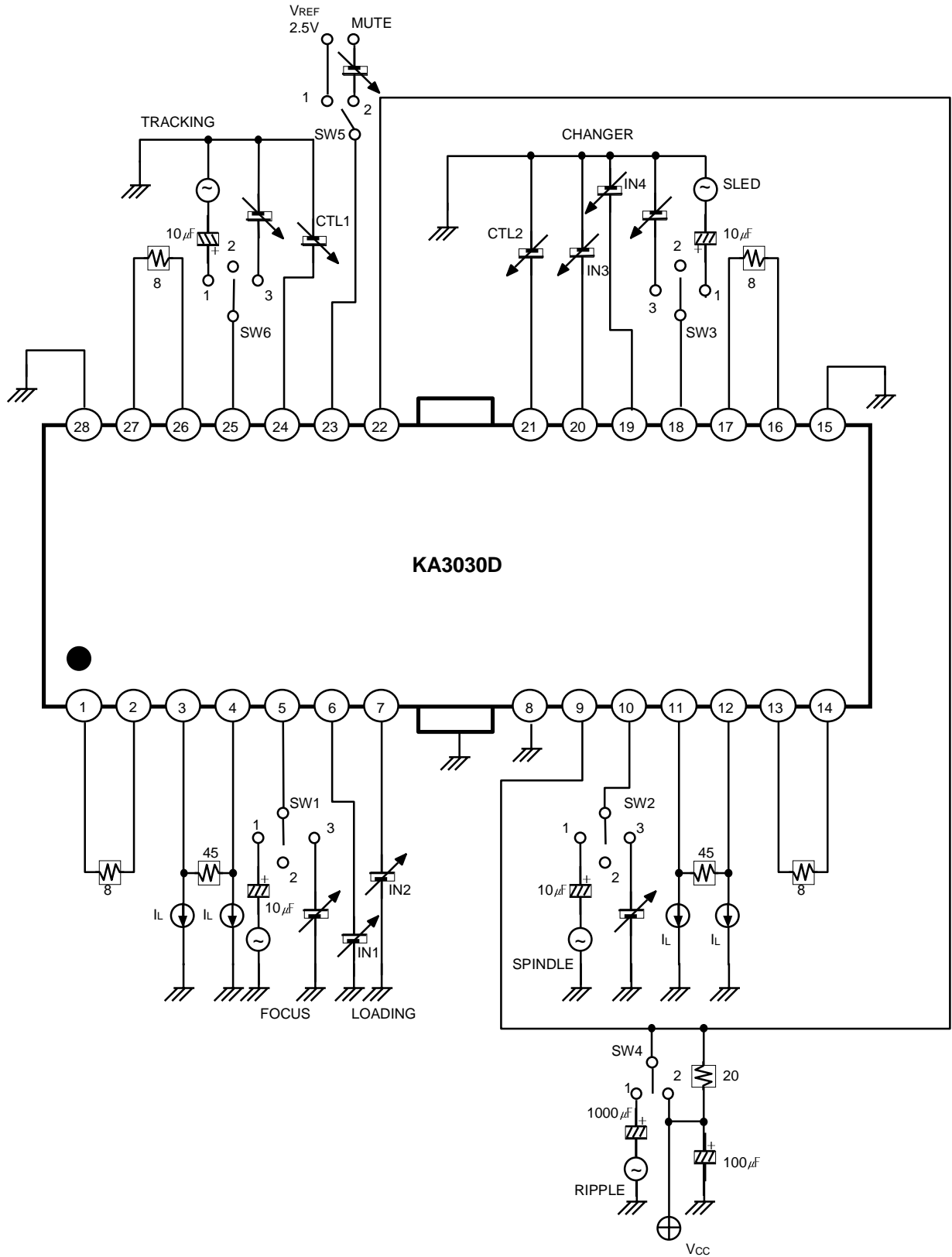
The logic signals, input from the MCU, is inverted in the inverter and can control the changes of the output properties, that depend on the input signal. There properties are shown in the table below.

LOGIC INPUT A	PIN6, PIN19	H	H	L	L
LOGIC INPUT B	PIN7, PIN20	H	L	H	L
OUTPUT TYPE		OFF	ON	ON	OFF
LOGIC OUTPUT A	PIN3, PIN11		*H	L	
LOGIC OUTPUT B	PIN4, PIN12		L	H	

*H : When high voltage is permitted to logic input A and voltage is permitted to logic input B, among the output terminals, the logic output A is the high voltage terminal.

Note) V_{CTL} : When the motor speed control voltage is permitted between 0V - 4V, the motor varies its speed. Between 4V - 5V, the motor can be used at constant speed and over 5.8V, the motor should not be used. Furthermore, when $V_{CC}=5V$, V_{CTL} voltage should not be permitted to exceed 3V.

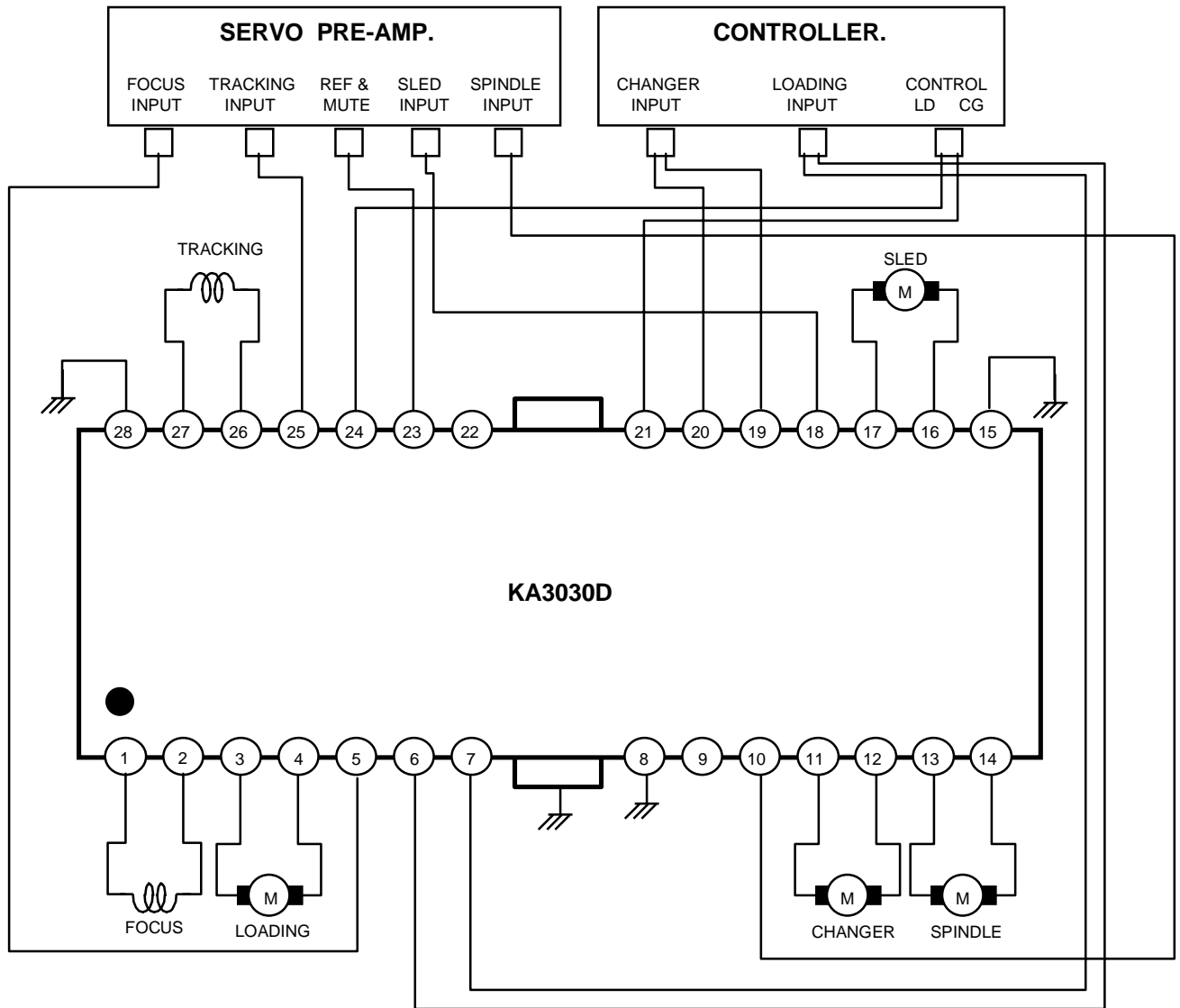
TEST CIRCUIT



TEST CIRCUIT
(SWITCH CONDITION)

Characteristics	Symbol	Switch Number						Remark
		SW1	SW2	SW3	SW4	SW5	SW6	
Quiescent Circuit Current	ICC	2	2	2	2	1	2	RL = ∞
Mute On Current	IMUTE	2	2	2	2	2	2	
Mute On Voltage	VMON	2	2	2	2	2	2	
Mute Off Voltage	VMOFF	2	2	2	2	2	2	
Under Voltage Protection	VUVP	2	2	2	2	1	2	
High Voltage Protection	VHVP	2	2	2	2	1	2	
FOCUS, TRACKING, SPINLE, SLED, DRIVE PART								
Input Offset Voltage	V _{IO}	2	2	2	2	1	2	RL = 8Ω
Output Offset Voltage	V _{OO}	2	2	2	2	1	2	
Max. Output Voltage(1)	V _{OM1}	3	3	3	2	1	3	
Close Loop Voltage Gain(1)	AV _{F1}	1	1	1	2	1	1	
Max. Output Voltage(2)	V _{OM2}	3	3	3	2	1	3	
Close Loop Voltage Gain(2)	AV _{F2}	1	1	1	2	1	1	
Ripple Rejection Ratio	RR	3	3	3	1	1	3	
Slew Rate	SR	1	1	1	2	1	1	
LOADING, CHANGER DRIVE PART								
Input High Level Voltage	V _{IH}	2	2	2	2	1	2	RL = 45Ω
Input Low Level Voltage	V _{IL}	2	2	2	2	1	2	
Output Voltage(1)	V _{O1}	2	2	2	2	1	2	
Output Voltage(2)	V _{O2}	2	2	2	2	1	2	
Output Load Changing(1)	ΔV _{RL1}	2	2	2	2	1	2	
Output Load Changing(2)	ΔV _{RL2}	2	2	2	2	1	2	
Output Offset Voltage(1)	V _{OO1}	2	2	2	2	1	2	
Output Offset Voltage(2)	V _{OO2}	2	2	2	2		2	

APPLICATION CIRCUIT



PACKAGE DIMENSIONS (Unit : mm)

28-SSOPH-375

