KA9258D(KA9258CD)

4-Channel Motor Driver

Features

- 4-CH Balanced Transformerless(BTL) Driver
- Output Gain Adjustable
- Built in OP-Amplifier
- Built in Mute Function
- Built in Thermal Shutdown Circuit (TSD)
- Operating Range 6 ~ 13.2V

Description

The KA9258D is a monolithic integrated circuit, suitable for 4-CH motor driver which drives tracking actuator, focus actuator, sled motor and spindle motor of compack disk player system.

28-SSOPH-375

Typical Applications

- Compact Disk Player (CDP)
- Video Compact Disk Player (VCD)
- Automotive Compact Disk Player
- Other Compact Disk Media

Ordering Information

Device	Package	Operating Temp.
KA9258CD	28-SSOPH-375	-40°C ~ +85°C
KA9258CDTF	28-SSOPH-375	-40°C ~ +85°C

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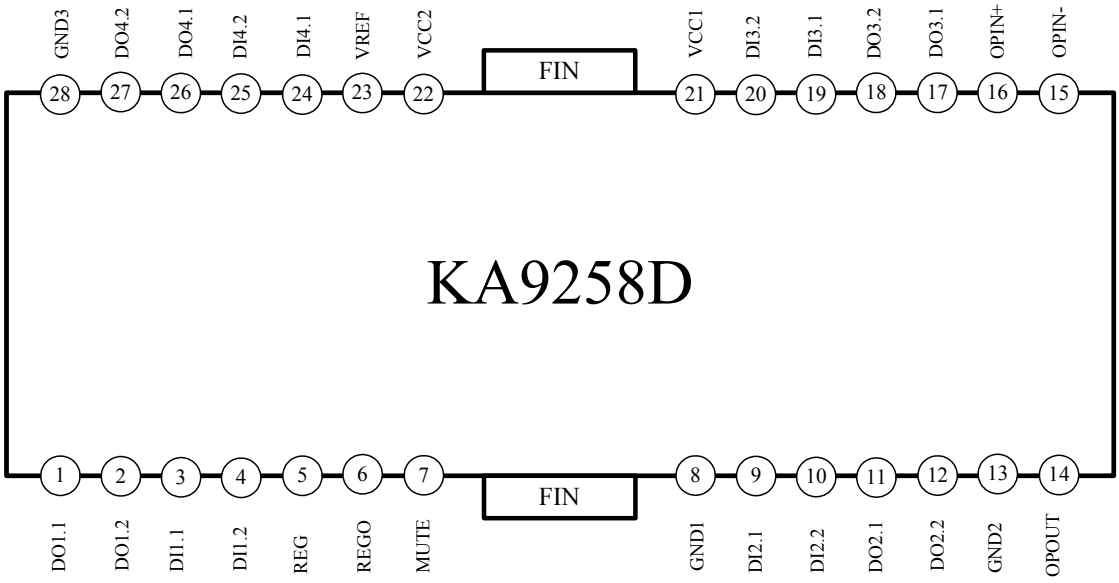
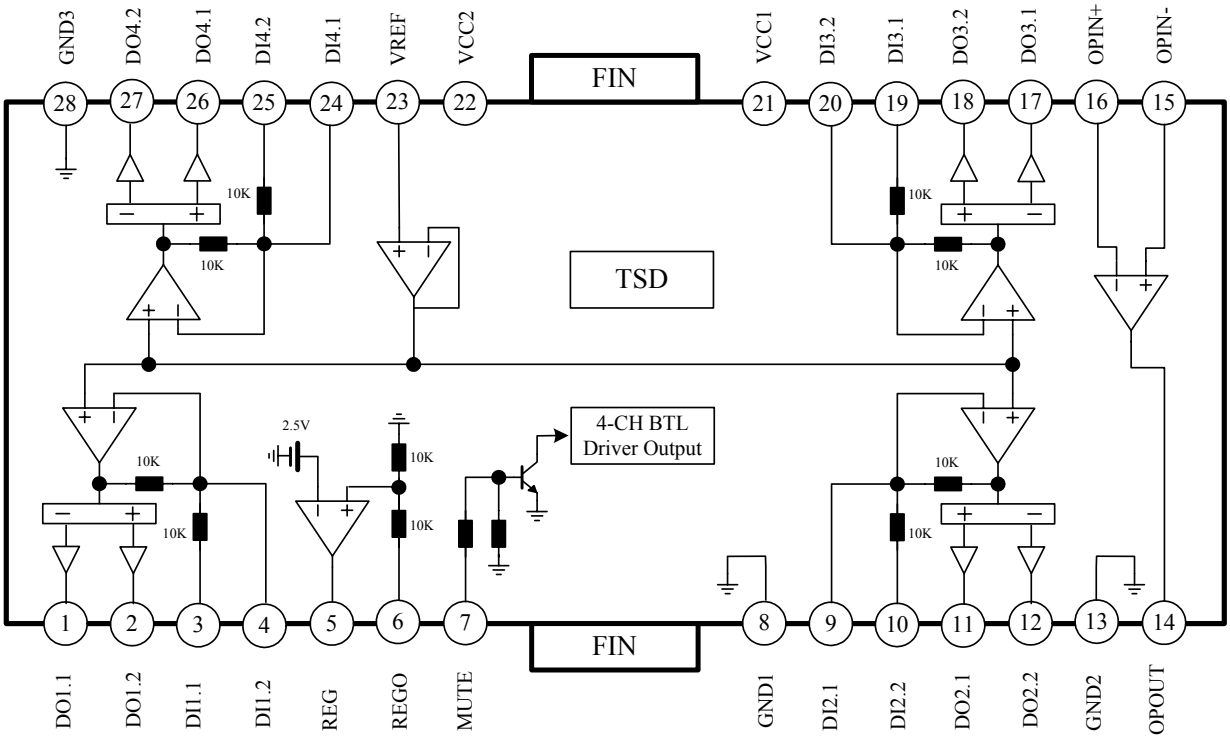
Pin Assignments



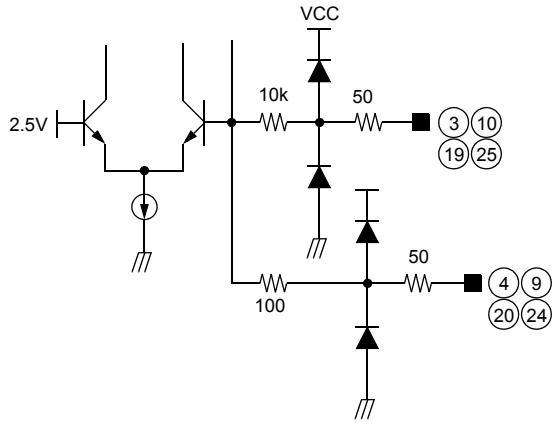
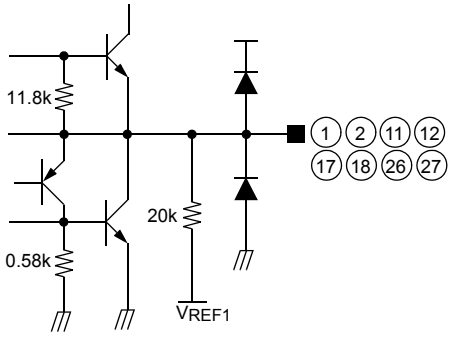
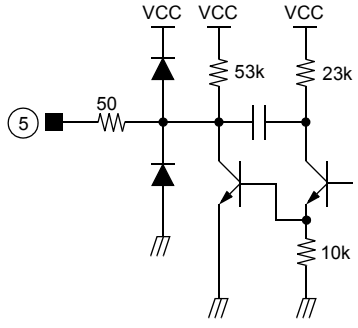
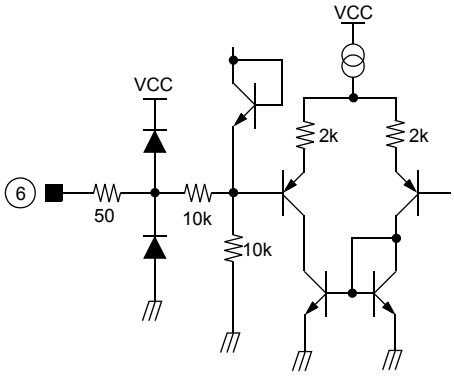
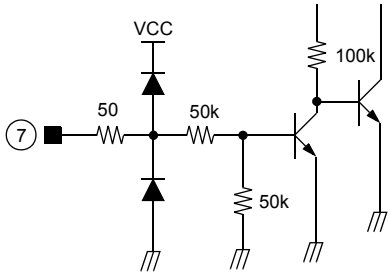
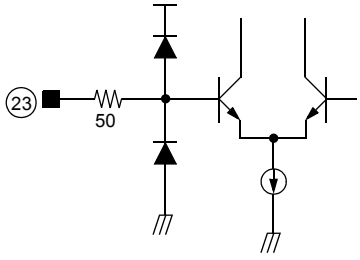
Pin Definitions

Pin Number	Pin Name	I/O	Pin Function Description
1	DO1.1	O	Channel 1 output 1
2	DO1.2	O	Channel 1 output 2
3	DI1.1	I	Channel 1 input 1
4	DI1.2	I	Channel 1 input 2
5	REG	O	External transistor base drive output
6	REO	O	Regulator output
7	MUTE	I	Mute signal input
8	GND1	-	Ground 1
9	DI2.1	I	Channel 2 output 1
10	DI2.2	I	Channel 2 output 2
11	DO2.1	O	Channel 2 input 1
12	DO2.2	O	Channel 2 input 2
13	GND2	-	Ground 2
14	OPOUT	O	OP-amplifier output
15	OPIN(-)	I	OP-amplifier negative input
16	OPIN(+)	I	OP-amplifier positive input
17	DO3.1	O	Channel 3 output 1
18	DO3.2	O	Channel 3 output 2
19	DI3.1	I	Channel 3 input 1
20	DI3.2	I	Channel 3 input 2
21	VCC1	-	Power supply voltage 1
22	VCC2	-	Power supply voltage 2
23	VREF	I	Bias Voltage
24	DI4.1	I	Channel 4 input 1
25	DI4.2	I	Channel 4 input 2
26	DO4.1	O	Channel 4 output 1
27	DO4.2	O	Channel 4 output 2
28	GND3	-	Ground 3

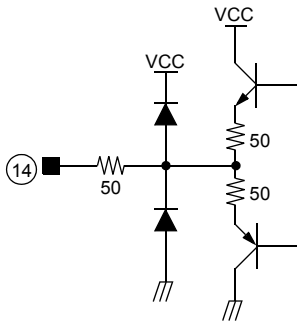
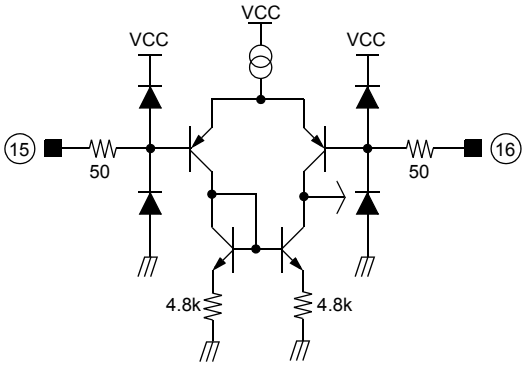
Internal Block Diagram



Equivalent Circuits

Driver Input	Driver Output
	
Regulator	**Regulator Output**
	
Mute Input	**Bias Input**
	

Equivalent Circuits (Continued)

OP-AMP Output	OP-AMP Input
	

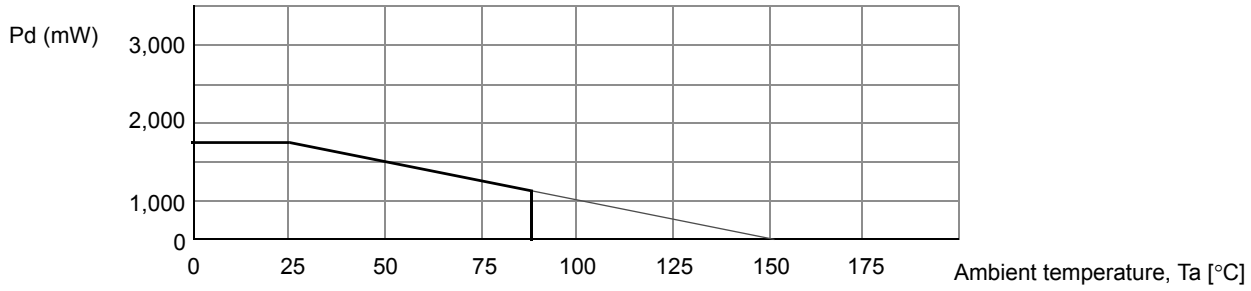
Absolute Maximum Ratings (Ta = 25°C)

Parameter	Symbol	Value	Unit
Supply Voltage	V_{CC}	15	V
Power Dissipation	P_D	1.7[note]	W
Operating Temperature	T_{OPR}	-40 ~ +85	°C
Storage Temperature	T_{STG}	-55 ~ +150	°C
Maximum Output Current	I_{OMAX}	1	A

Note:

1. When mounted on 76.2mm × 114mm × 1.57mm 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).

Power Dissipation Curve



Recommended Operating Condition (Ta = 25°C)

Parameter	Symbol	Value	Unit
Operating Supply Voltage	V_{OPR}	6 ~ 13.2	V

Electrical Characteristics (Ta = 25°C)

(Ta=25°C, V_{CC}=8V, R_L=8Ω, f=1kHz, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
REGULATOR PART						
Regulator Output Voltage	V_{REG}	I_L=100mA	4.75	5	5.25	V
Load Regulation	ΔV_{RL}	I_L=0 ~ 200mA	-40.0	0	10.0	mV
Line Regulation	ΔV_{CC}	I_L=200mA, V_{CC}=6 ~ 9V	-10.0	0	20.0	mV
DRIVER PART (EXCEPT FOR LOADING MOTOR DRIVER)						
Quiescent Circuit Current	I_{CCQ}	V_I = 0	5.5	9.5	13.5	mA
Input Offset Voltage (Note1)	V_{OF}	-	-5.0	0	5.0	mV
Output Offset Voltage	V_{OO}	V_{CC}= 13V	-50	0	50	
Maximum Sink Current	I_{SINK}	R_L= 4Ω, V_{CC}	0.5	0.8	-	A
Maximum Source Current	I_{SOURCE}	R_L= 4Ω, GND	0.5	0.8	-	
Maximum Output Voltage	V_{OM}	V_I = 2V_{RMS}, 1kHz	2.5	3.0	-	V
Closed Loop Voltage Gain	A_{VF}	V_I = 0.1V_{RMS}, 1kHz	4.5	6.5	7.5	dB
Ripple Rejection Ratio (Note1)	RR	V_I = -20dB, 120Hz	60.0	80.0	-	
Slew Rate (Note1)	SR	100Hz, Square wave	1.0	2.0	-	V/μs
LOADING MOTOR DRIVER PART (UNLESS OTHERWISE SPECIFIED, VCTL=OPENED)						
Input Offset Voltage	V_{OF1}	-	-5	-	+5	mA
Input Bias Current	I_{B1}	-	-	-	300	nA
High Level Output Voltage	V_{OH1}	-	6	-	-	V
Low Level Output Voltage	V_{OL1}	-	-	-	1.8	V
Output Sink Current	I_{SINK1}	RL= 50Ω, GND	10	40	-	mA
Output Source Current	$I_{SOURCE1}$	RL= 50Ω, V_{CC}	10	50	-	mA
Open Loop Voltage Gain	G_{VO1}	V_{IN} = -75dB, f =1kHz	65	78	-	dB
Ripple Rejection Ratio (Note1)	RR1	V_{IN} = -20dB, f =120kHz	50	70	-	dB
Slew Rate (Note1)	SR1	Square, V_{OUT} = 2Vp-p, f = 120kHz	0.5	1	-	V/μs
Common Mode Rejection Ratio	CMRR1	V_{IN} = -20dB, f =1kHz	70	84	-	dB

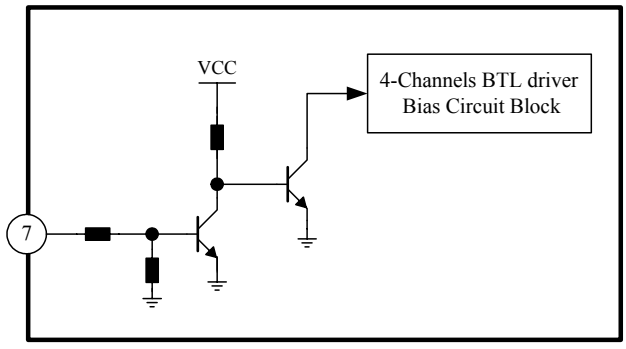
Note :

1. Guranteed Design Value

Application Information

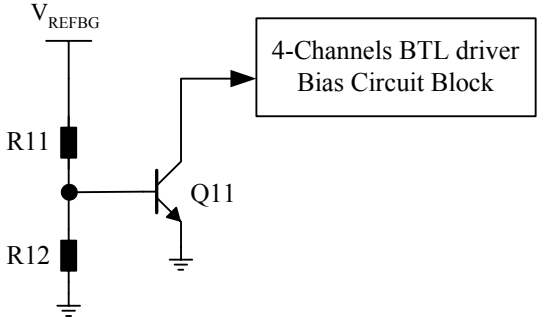
1. Mute Function

Pin 7	Mute circuit
High	Mute-off
Low	Mute-on
Open	Mute-on



- When the mute (pin 7) is high level, the bias circuit of BTL driver is activated. On the other hand, when the mute (pin7) is open or low level, the bias circuit of BTL driver is disabled. So that the 4-channels BTL driver output circuit will be muted.

2. TSD (Thermal Shutdown) Function



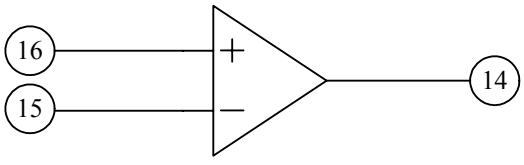
- The $V_{REF\ BG}$ is the output voltage of the band-gap-referenced biasing circuit and acts as the input voltage of the TSD circuit.
- The base-emitter voltage of the transistor, Q11 is designed to turn-on at below voltage.
-

$$V_{BE} = \frac{V_{REFBG} \times R12}{R11 + R12} = 460[mV]$$

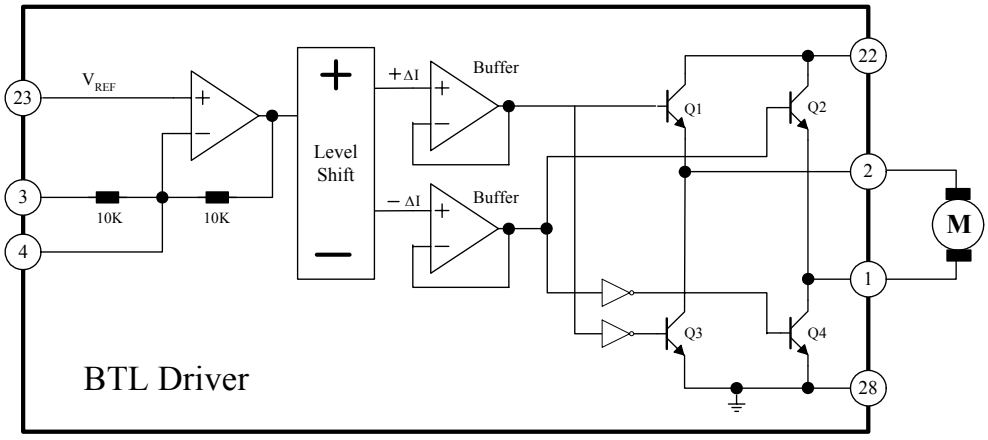
- When the chip temperature rises up to 175°C, then the turn-on voltage of the Q11 would drop down to 460mV. Hence, the Q11 would turn on so the output circuit will be muted. The TSD circuit has the hysteresis temperature of 25°C.

3. OP-AMP

- General OP-amplifier is integrated in the IC for user's convenience.

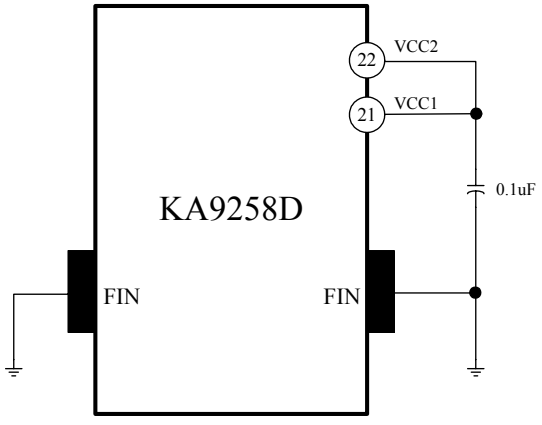


4. Balanced Transformerless(BTL) Driver



- The voltage, V_{REF}, is the reference voltage given by the bias voltage of the pin #23.
- The input signal through the pin #3 is amplified by 10K/10K times and then fed to the level shift.
- The level shift produces the current due to the difference between the input signal and the arbitrary reference signal. The current produced as +ΔI and −ΔI is fed into the driver buffer.
- Driver Buffer operates the power transistor of the output stage according to the state of the input signal.
- The output stage is the BTL driver and the motor is rotating in forward direction by operating transistor Q1 and Q4. On the other hand, if transistor Q2 and Q3 is operating, the motor is rotating in reverse direction
- When the input voltage through the pin #3 is below the V_{REF}, then the direction of the motor in forward direction.
- When the input voltage through the pin #3 is above the V_{REF}, then the direction of the motor in reverse direction.
- If it is desired to change the gain, then the pin #4 or #24 can be used.

5. Connect a by-pass capacitor, 0.1μF between the supply voltage source.



- Radiation FIN is connecting to the internal GND of the package.
  Connect the FIN to the external GND.

Typical Performance Characteristics

- Test contrions: V_{REF}=2.5[V], Mute : OFF

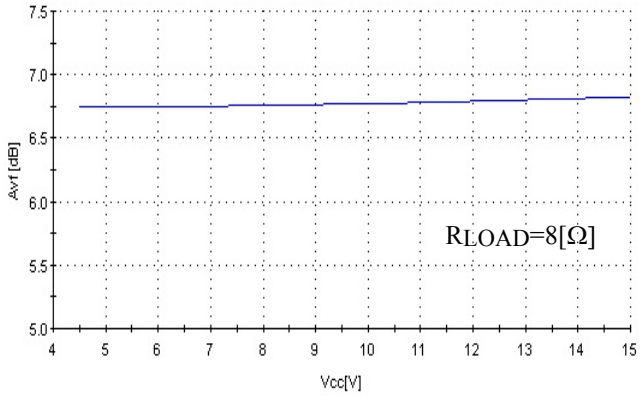


Figure 1. V_{CC} vs. AVF

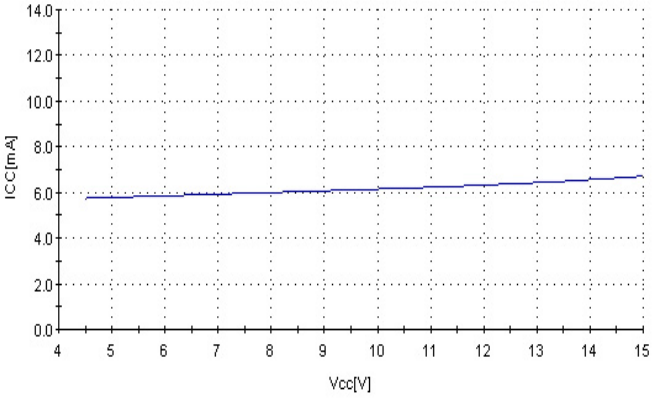


Figure 2. V_{CC} vs. I_{CC}

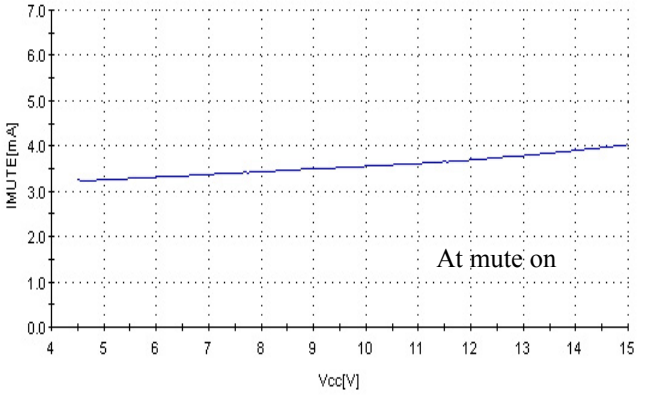


Figure 3. V_{CC} vs. I_{MUTE}

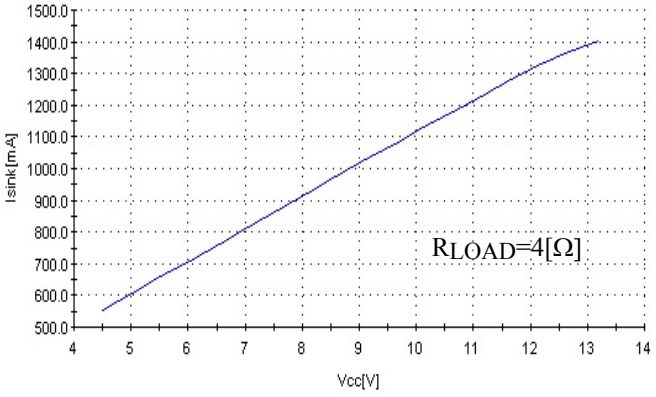


Figure 4. V_{CC} vs. I_{SINK}

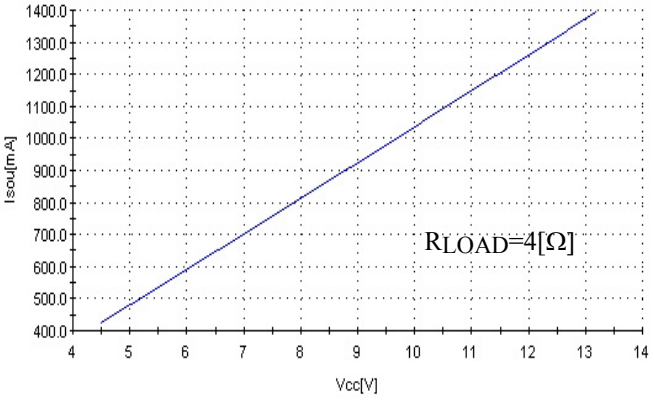


Figure 5. V_{CC} vs. I_{SOU}

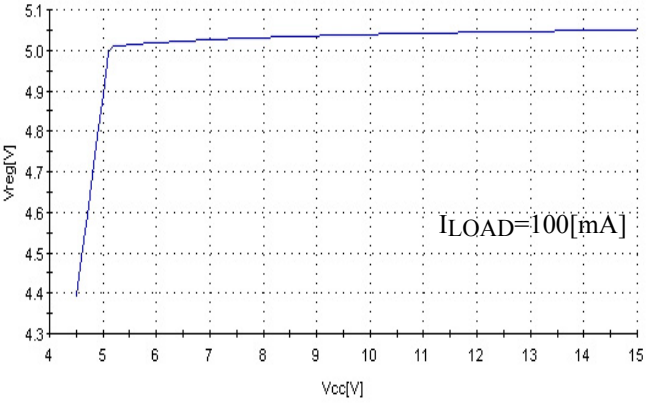
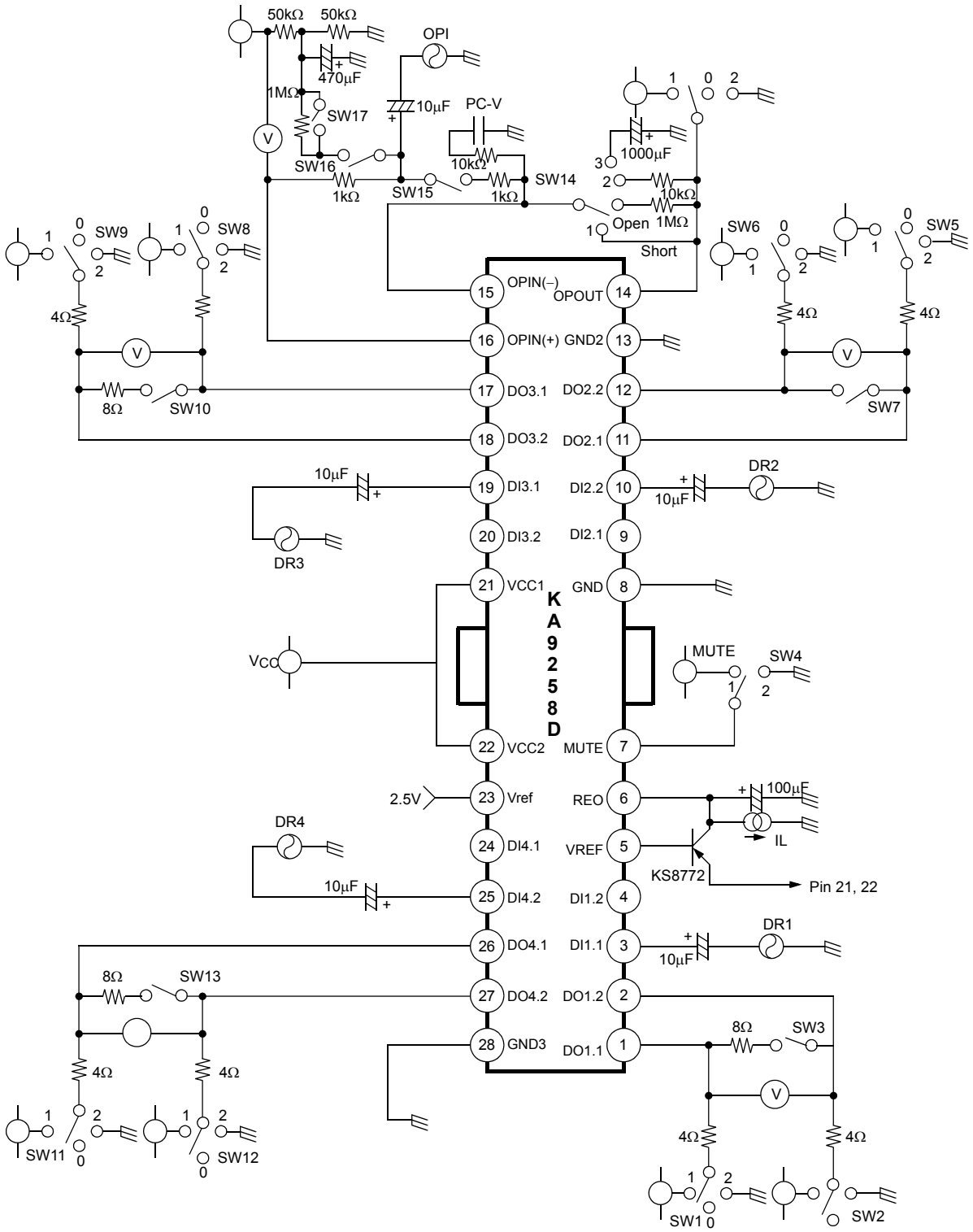
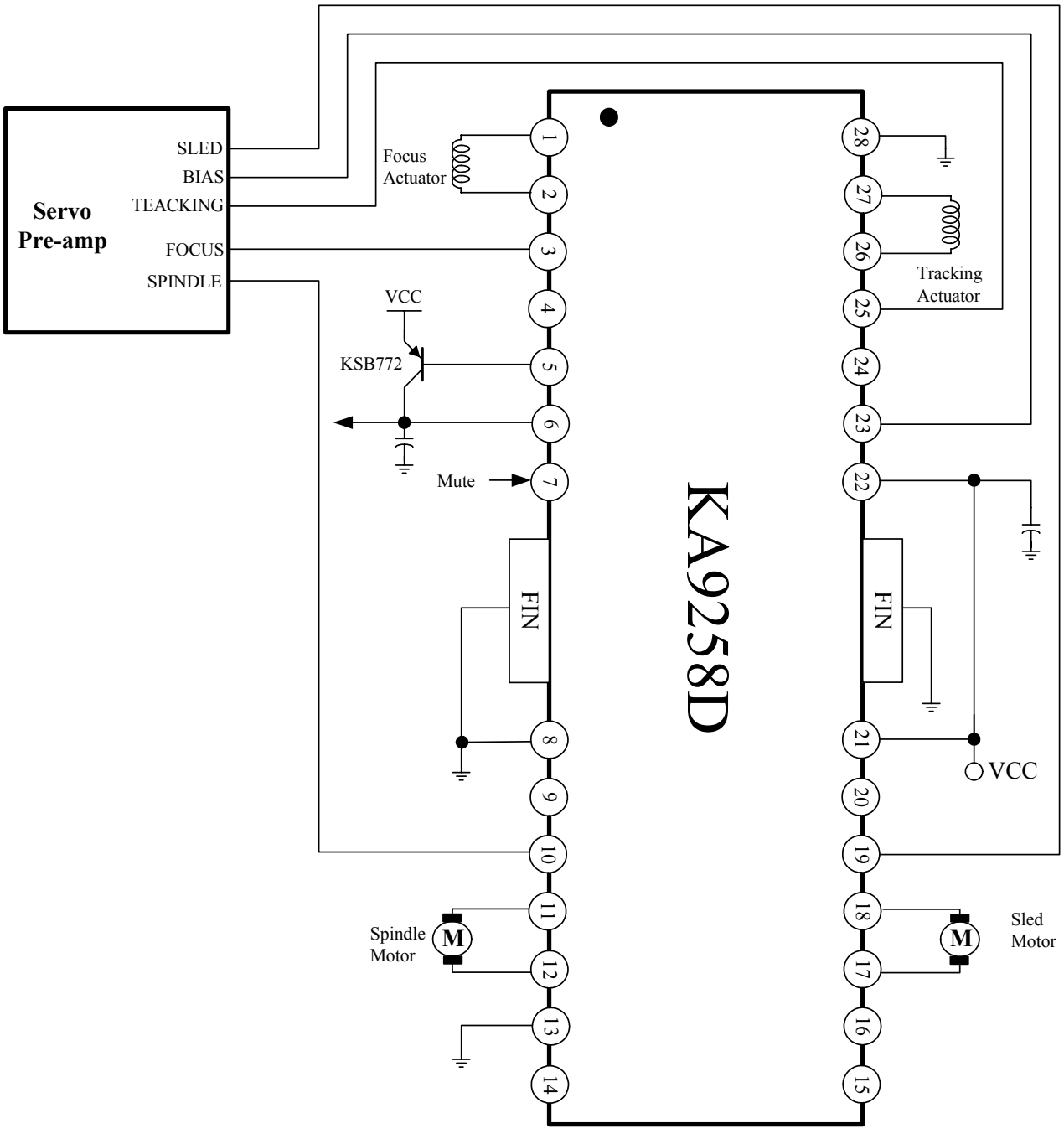


Figure 6. V_{CC} vs. V_{REG}

Test Circuits



Application Circuits



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