M56754SP

4-CHANNEL ACTUATOR MOTOR DRIVER

DESCRIPTION

The M56754SP is a semiconductor IC developed as the motor driver used for CD-ROM and CD player.
This circuit includes 4-Channel BTL Driver that is able to drive four actuator with one IC.

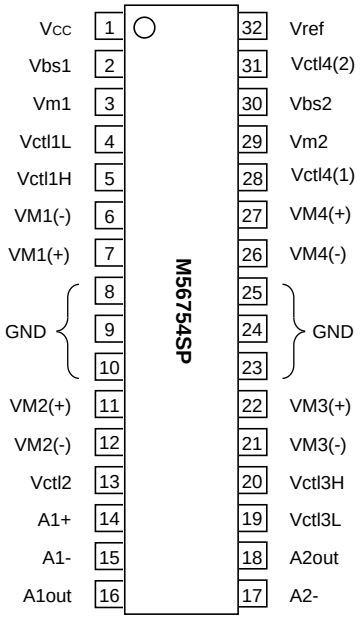
FEATURES

- Low Output saturation voltage(typ:1.35V at 0.5A)
- Large operating supply voltage range(4.5–13.2V)
- Minimum Crossover distortion
- Built-in general operational amplifier

APPLICATION

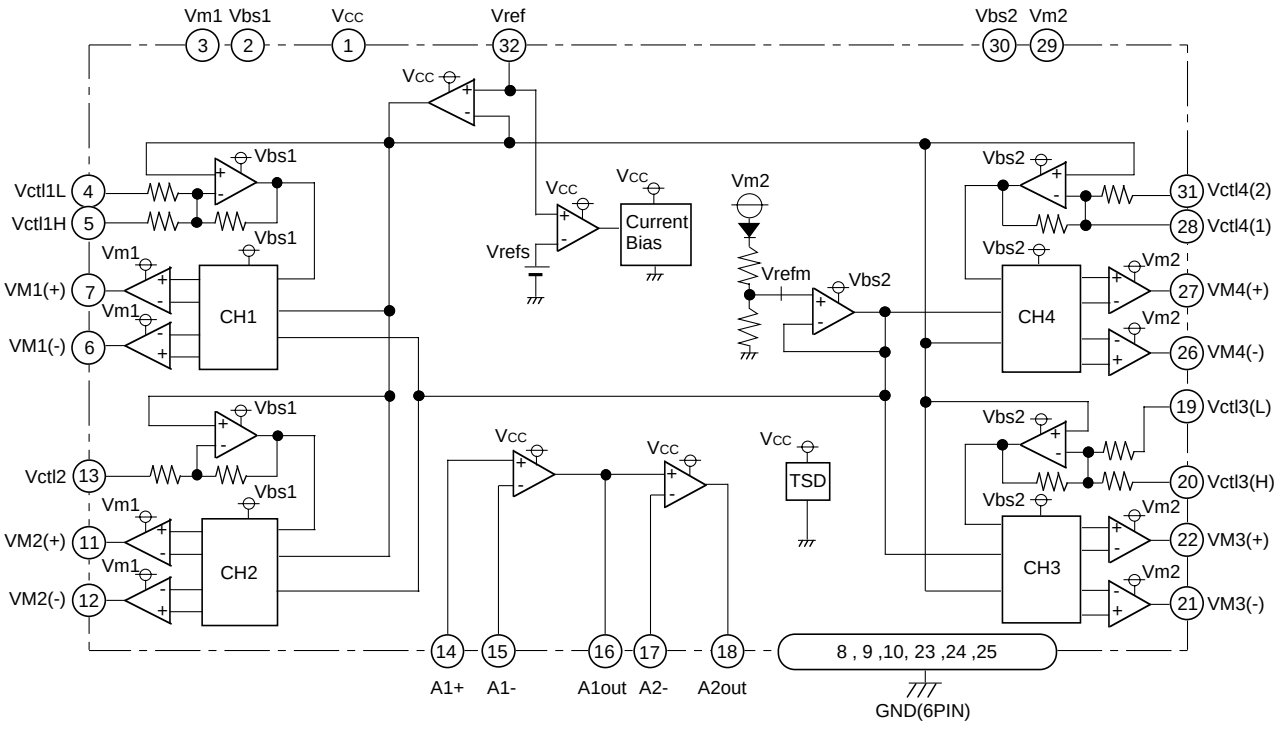
CD-ROM, CD player

PIN CONFIGURATION (TOP VIEW)



Outline 32P4B

BLOCK DIAGRAM



PIN DESCRIPTIONS

Pin No.	Symbol	Function	Pin No.	Symbol	Function
①	Vcc	5V power supply	⑰	A2-	OP amp. 2 inverted input terminal
②	Vbs1	Boot strap power supply terminal 1	⑱	A2out	OP amp. 2 output terminal
③	Vm1	Motor power supply terminal 1	⑲	Vctl3L	CH3 amp. L gain input terminal
④	Vctl1L	CH1 amp. L gain input terminal	⑳	Vctl3H	CH3 amp. H gain input terminal
⑤	Vctl1H	CH1 amp. H gain input terminal	㉑	VM3(-)	CH3 amp. inverted output terminal
⑥	VM1(-)	CH1 amp. inverted output terminal	㉒	VM3(+)	CH3 amp. non-inverted output terminal
⑦	VM1(+)	CH1 amp. non-inverted output terminal	㉓–㉕	GND	GND
⑧–⑩	GND	GND	㉖	VM4(-)	CH4 amp. inverted output terminal
⑪	VM2(+)	CH2 amp. non-inverted output terminal	㉗	VM4(+)	CH4 amp. non-inverted output terminal
⑫	VM2(-)	CH2 amp. inverted output terminal	㉘	Vctl4(1)	CH4 amp. input terminal 1
⑬	Vctl2	CH2 amp. input terminal	㉙	Vm2	Motor power supply terminal 2
⑭	A1+	OP amp. 1 non-inverted input terminal	㉚	Vbs2	Boot strap power supply terminal 2
⑮	A1-	OP amp. 1 inverted input terminal	㉛	Vctl4(2)	CH4 amp. input terminal 2
⑯	A1out	OP amp. 1 output terminal	㉜	Vref	Reference voltage input terminal

ABSOLUTE MAXIMUM RATING (Ta=25˚C)

Symbol	Parameter	Condition	Rating	Unit
Vbs	Supply voltage	②, ㉚ pin	15	V
Vm	Supply voltage	③, ㉙ pin	15	V
Vcc	Supply voltage	① pin	7	V
Io	Output current		700	mA
Vin	Maximum Input Voltage of each Terminal	④, ⑤, ⑬, ⑭, ⑮, ⑰, ⑲, ⑳, ㉘, ㉛, ㉜ pin	0–Vcc	V
Pt	Power Dissipation	With infinite heatsink	4.5	W
		Without heatsink	1.75	
Kθ	Thermal derating	With infinite heatsink	36	mW/˚C
		Without heatsink	14	
Tj	Junction temperature		150	˚C
Topr	Operating temperature		-10–75	˚C
Tstg	Storage temperature		-40–125	˚C

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Limits			Unit
		Min.	Typ.	Max.	
Vcc	5V Power Supply Voltage	4.5	5.0	5.5	V
Vm1,Vm2	Motor Power Supply Voltage	—	5.0	—	V
Vbs1,Vbs2	Boot Strap Supply Voltage	—	Vm+1	—	V

ELECTRICAL CHARACTERISTICS

(Ta=25˚C, Vcc=Vbs1=Vbs2=Vm1=Vm2=5V, no-load unless otherwise noted)

Symbol	Parameter		Test conditions	Limits			Unit
				Min.	Typ.	Max.	
Icc1	Power supply circuit	Circuit current 1 on no-signal	②,③,㉙,㉚ pin current	——	32	44	mA
Icc2		Circuit current 2 on no-signal	① pin current	——	10	14	mA
Vrefm	Spindle driver	Vrefm voltage		——	2.15	——	V
Vospm		Spindle driver Output voltage D range	Io=0.5A Vrefm reference	-1.55	——	1.55	V
Vsat1	BTL driver	Output saturation voltage	Top and bottom saturation voltage of output power Tr (Io=0.5A)	——	1.35	1.9	V
Vsat2		Output saturation voltage (At boot)	Top and bottom saturation voltage of output power Tr (Io=0.5A)	——	0.7	1.0	V
Vofs1.2.3		Output amp., Offset voltage	1,2,3ch amp., Vref=2.5V, 10kΩ connection between Vctl and Vref	-40	——	+40	mV
Vofs4		Output amp., Offset voltage	4ch amp., Vref=2.5V 10kΩ connection between Vctl and Vref	-70	——	+70	mV
Gain1L	Gain between input and output	Gain L between CH1 input and output	{VM1(+)-VM1(-)} / (Vctl1L-Vref) (Vctl1L=④pin)	6.2	6.7	7.2	dB
Gain1H		Gain H between CH1 input and output	{VM1(+)-VM1(-)} / (Vctl1H-Vref) (Vctl1H=⑤pin)	18.8	19.3	19.8	dB
Gain2		Gain between CH2 input and output	{VM2(+)-VM2(-)} / (Vctl2-Vref) (Vctl2= ⑬ pin)	31.8	32.3	32.8	dB
Gain3L		Gain L between CH3 input and output	{VM3(+)-VM3(-)} / (Vctl3L-Vref) (Vctl3L= ⑲ pin)	5.1	5.6	6.1	dB
Gain3H		Gain H between CH3 input and output	{VM3(+)-VM3(-)} / (Vctl3H-Vref) (Vctl3H= ⑳ pin)	10.2	10.7	11.2	dB
Gain41		Gain 1 between CH4 input and output	{VM4(+)-VM4(-)} / {Vctl4(1)-Vref} (10kΩ connection with Vctl4(1)=㉘pin)	22.6	25.0	27.2	dB
Gain42		Gain 2 between CH4 input and output	{VM4(+)-VM4(-)} / {Vctl4(2)-Vref} (Vctl4L=㉛pin)	36.5	37.0	37.5	dB
Vrefin	Vref amp.	Vref amp. input voltage range		Vrefs	2.5	Vcc-1.2	V
Vrefs		Vref supervisory voltage	Turn off the bias when the Vref input voltage is less than or equal to the value at right.	——	1.4	1.7	V
Vopin	OP amp.	Operational amp. input voltage range		0.5	——	Vcc-1.0	V
Vopout		Operational amp. output voltage range	Io=±2mA	0.5	——	Vcc-1.0	V
Vofsop		Operational amp. offset voltage	Vin=2.5V	-10	——	+10	mV
Ibop		Operational amp. input current	Vin=2.5V	-1	-0.15	0	µA
Ibofs		Operational amp. input current offset		-100	0	+100	nA
GB		Operational amp. GB product		2.3	4	——	MHz

CHECK ITEMS FOR EVALUATION

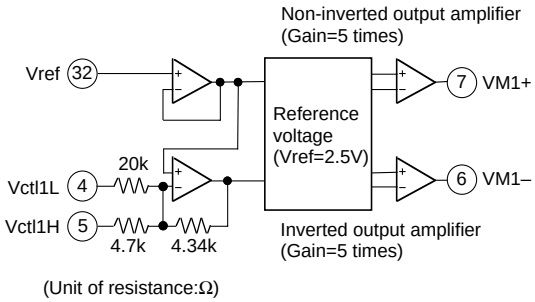
	Symbol	Parameter	Test conditions	Limits			Unit
				Min.	Typ.	Max.	
1	Ttsd	Thermal Shutdown Operating Temperature		——	165	——	˚C
2	THtsd	Thermal Shutdown Hysteresis Temperature		——	40	——	˚C

The thermal shutdown temperature shown in this table does not assure the above thermal shutdown operating temperature range of the device operation. The operating assurance range of the device covers up to Tjmax defined with the absolute maximum rating. The thermal shutdown operation shown in this table is a thermal protection circuit applied when the temperature exceeds this Tjmax by mistake. Therefore, be sure to operate this device at the temperature lower than or equal to Tj=150˚C.

BASIC CHARACTERISTICS

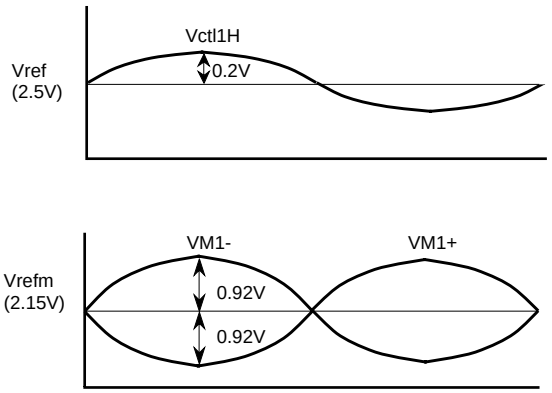
Input/output Characteristics of Amplifier

CH1 AMP.

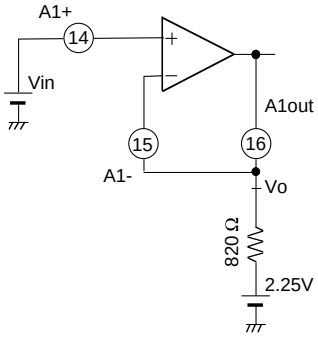


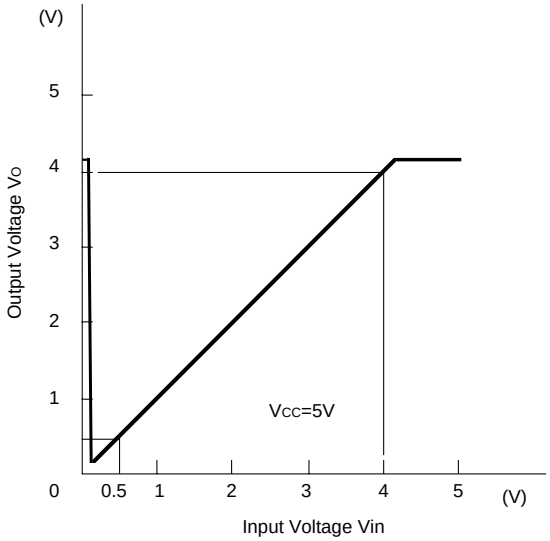
(Unit of resistance:Ω)

Input/output voltage for Vctl/1H(⑤ pin) input



OPERATIONAL AMP.

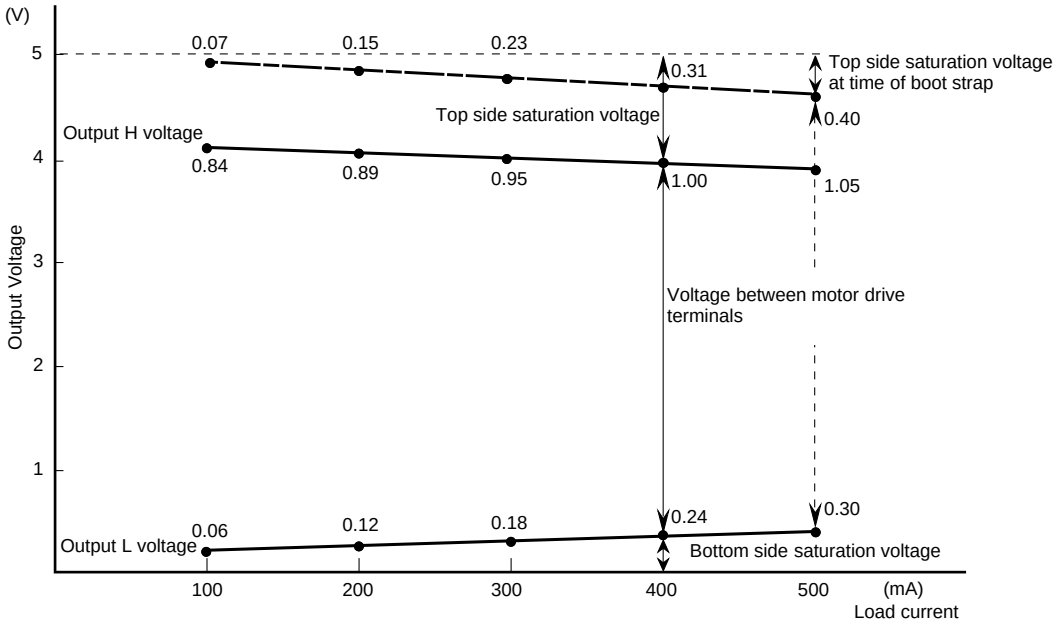




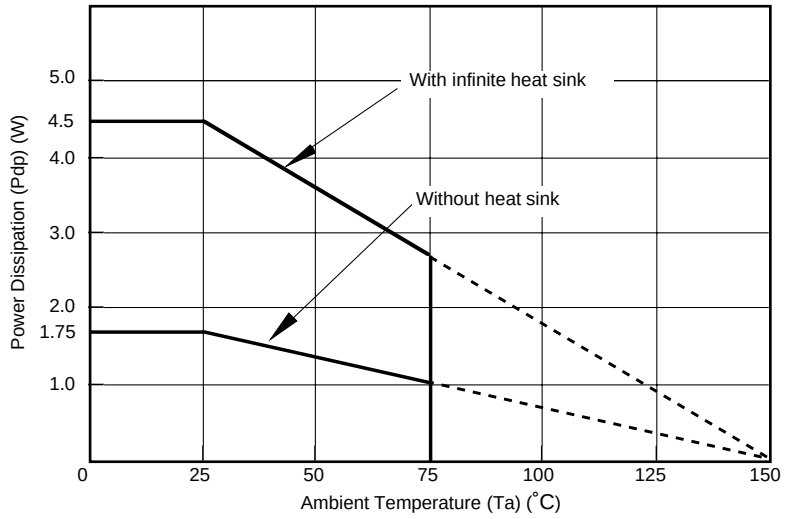
Output Saturation Voltage–Load Current Characteristics

(Vbs=Vm=Vcc=5V) : ——————

(Vbs=12V,Vm=Vcc=5V) at time of Boot strap : — — — — —

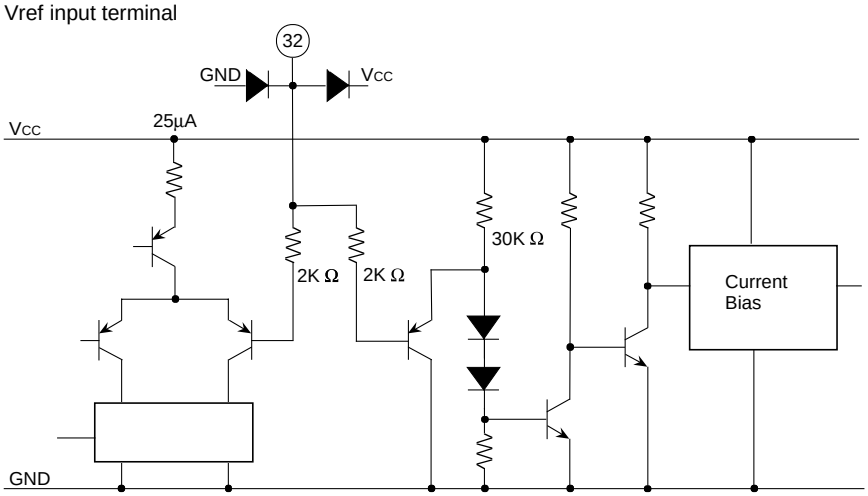


Thermal derating

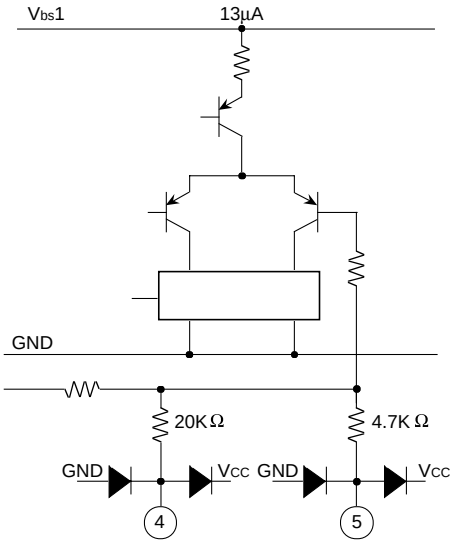


INPUT/OUTPUT EQUIVALENT CIRCUIT

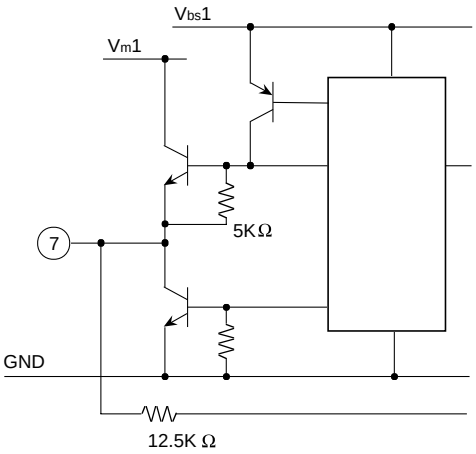
Vref input terminal



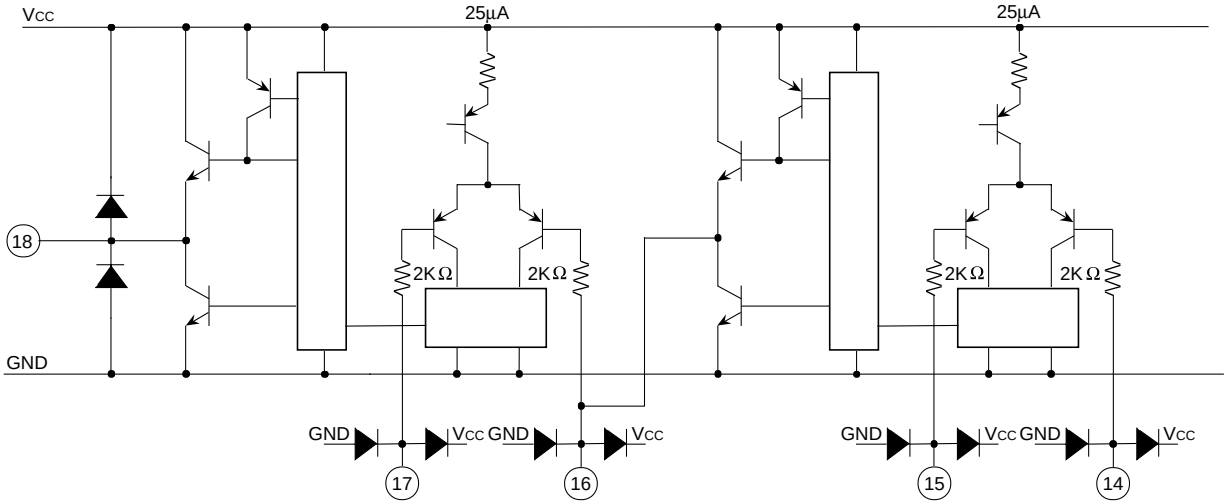
CH1 amp. input terminal



BTL driver output terminal



Operation Amp. Input/Output Terminal



APPLICATION EXAMPLE