M63000SP

4-CHANNEL ACTUATOR MOTOR DRIVER

DESCRIPTION

The M63000SP is a semiconductor IC developed as the motor driver used to CD Player,CD-ROM.
This circuit includes Standby circuit,TSD circuit and 4-Channel BTL Driver that is able to drive four actuators with one IC.

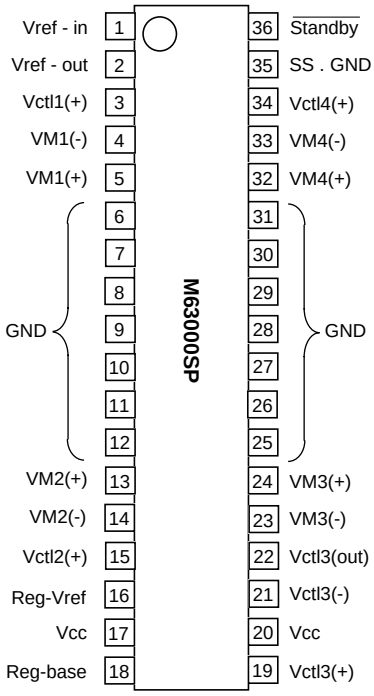
FEATURES

- Low Output saturation voltage (typ:1.35V,at 0.5A)
- Large Operating supply voltage range(4.5–15V)
- Minimum Crossover distortion

APPLICATION

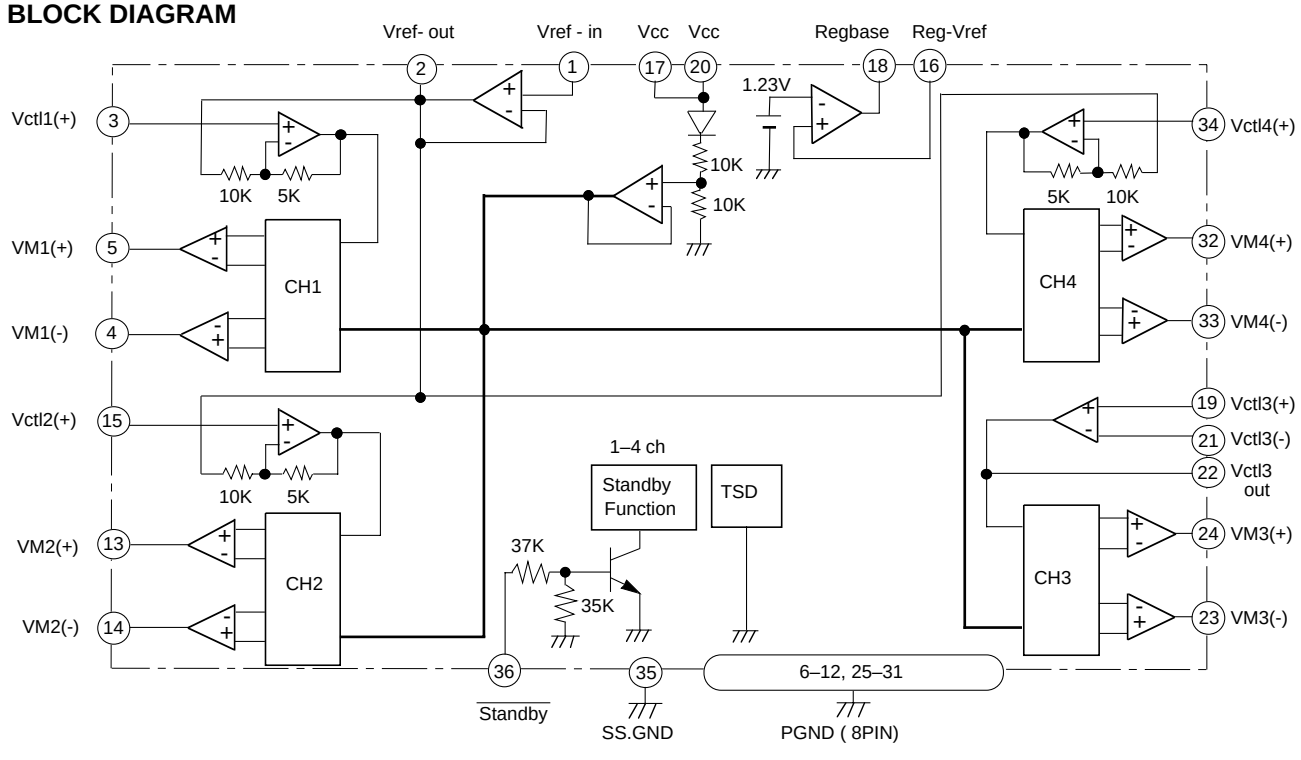
CD Player,CD-ROM,Video-CD

PIN CONFIGURATION (TOP VIEW)



Outline 36P4E

BLOCK DIAGRAM



PIN DESCRIPTIONS

Pin No.	Symbol	Function	Pin No.	Symbol	Function
①	Vref - in	Reference voltage input terminal	⑲	Vctl3(+)	CH3 amp. non-inverted input terminal
②	Vref - out	Reference voltage output terminal	⑳	Vcc	Power supply
③	Vctl1(+)	CH1 amp. non-inverted input terminal	㉑	Vctl3(-)	CH3 amp. inverted input terminal
④	VM1(-)	CH1 amp. inverted output terminal	㉒	Vctl3(out)	CH3 input amp. output terminal
⑤	VM1(+)	CH1 amp. non-inverted output terminal	㉓	VM3(-)	CH3 amp. inverted output terminal
⑥–⑫	GND	GND	㉔	VM3(+)	CH3 amp. non-inverted output terminal
⑬	VM2(+)	CH2 amp. non-inverted output terminal	㉕–㉛	GND	GND
⑭	VM2(-)	CH2 amp. inverted output terminal	㉜	VM4(+)	CH4 amp. non-inverted output terminal
⑮	Vctl2(+)	CH2 amp. non-inverted input terminal	㉝	VM4(-)	CH4 amp. inverted output terminal
⑯	Reg-Vref	Connect the resistors	㉞	Vctl4(+)	CH4 amp. non-inverted input terminal
⑰	Vcc	Power supply	㉟	SS . GND	Small signal GND
⑱	Reg-base	Connect the base of external PNP	㊱	$\overline{\text{Standby}}$	L standby input terminal

ABSOLUTE MAXIMUM RATING (Ta=25˚C)

Symbol	Parameter	Conditions	Rating	Unit
Vcc	Supply Voltage	⑰, ⑳ pin	15	V
Io	Output Current		500	mA
Vin	Maximum Input Voltage of each Terminals	①,③, ⑮, ⑯, ⑲, ㉑, ㉞, ㊱ pin	0–Vcc	V
Pt	Power Dissipation	With infinite heatsink	5.7	W
Kθ	Thermal derating	With infinite heatsink	22	˚C/W
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	Supply Voltage	4.5	—	13.2	V
Io	Output current	—	—	500	mA

ELECTRICAL CHARACTERISTICS (Ta=25˚C,Vcc=9V unless otherwise noted.)

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
Icc1	Circuit current at standby function	Vref=Vctl=2.5V, $\overline{\text{Standby}}$=0V	—	—	100	μA
Icc2	Circuit current	Vref=Vctl=2.5V, $\overline{\text{Standby}}$=2.0V	—	35	49	mA
Vsat	Output saturation voltage	Top and Bottom saturation voltage of output power Tr. Load Current Io=0.5A	—	1.35	1.90	V
Vofs 1	Output offset voltage – 1	CH1, 2, 4, Vref=Vctl=2.5V (Gain=10times)	-120	—	+120	mV
Vofs 2	Output offset voltage – 2	CH 3 , Vref=Vctl=2.5V (Gain=2.66times)	-100	—	+100	
Gv	Voltage gain between input and output	CH1, 2, 4	19.08	20.00	20.83	dB
		CH 3 uses input amp. as a buffer.	13.62	14.54	15.37	
$\overline{\text{Standby}}$	$\overline{\text{Standby}}$ Function	36 pin input voltage due to all circuit shutting off.	—	—	0.8	V
		36 pin input voltage due to all circuit working.	2.0	—	—	V
Reg5V	Regulator output voltage	Vcc=7.5V 16pin - GND: 3.6k 16pin - collector of PNP transistor: 10.8k	4.70	4.90	5.10	V
Ain	CH1, 2, 3 and 4 input voltage range.	Input Amp. input voltage range of each channel.	0.3V	—	Vcc-1.8V	V
Iin 36	$\overline{\text{Standby}}$ terminal input current	$\overline{\text{Standby}}$ terminal input current at 2.0V input.	—	—	500	μA

ELECTRICAL CHARACTERISTICS (Ta=25˚C,Vcc=9V unless otherwise noted.)

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
IinR	VREF amplifier input current	Vref=2.5V	-1	-0.05	0	µA
IinC	INPUT amplifier input current	Vctl=Vref=2.5V	-1	-0.15	0	µA

CONFIRMED PARAMETER AT ES EVALUATION

These parameters cannot test under Ta=25˚C conditions.
Therefore, these values of these parameters were confirmed by the ES evaluations.

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
TSD	Thermal shut-down protection temperature		——	152	——	˚C

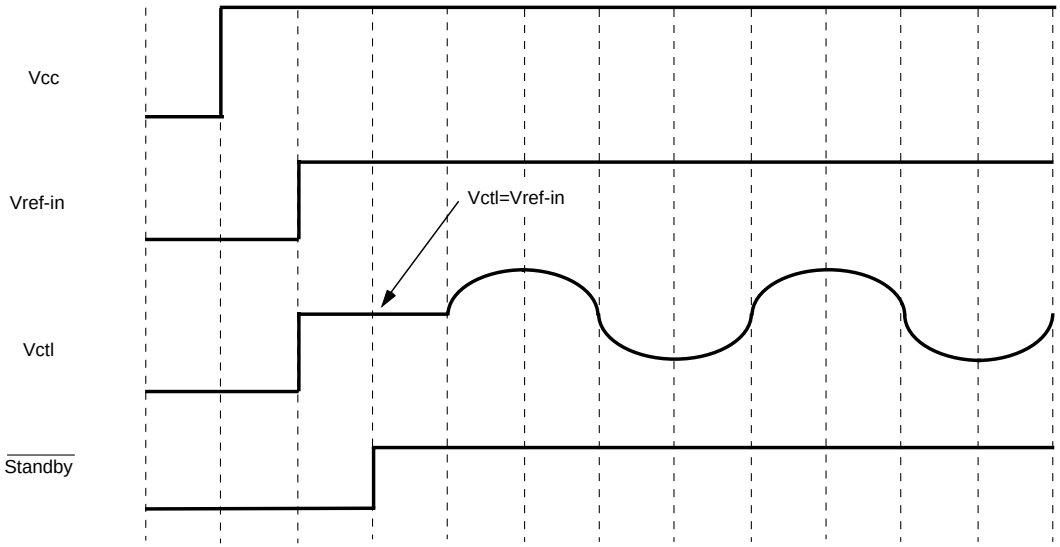
This device does not guarantee the electrical function until above TSD function temperature range.
The function is guaranteed under maximum junction temperature that is regulated in the
Absolute Maximum Rating, so TSD function is a protection circuit for unusual Tj when this device is used over Tj 150˚C.
Therefore, this device must function under Tj maximum 150˚C condition.

SHORT PROTECT

M63000SP has an internal short protect circuit .
It can proof between any output to Vcc or GND and each output to other output with under Vcc 13.2V condition.

THE TIMING CHART

Please start M63000SP with the following timing chart.

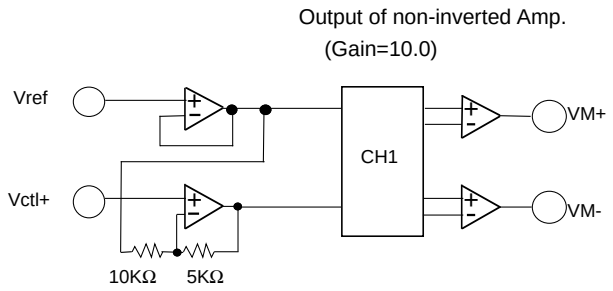


EXPLANATION OF OPERATION

1.The characteristics between Control voltage and Output voltage

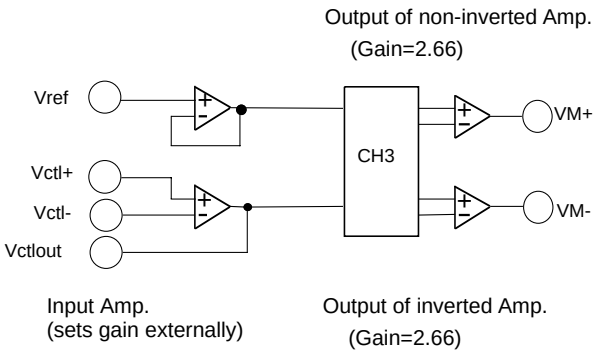
CH1,CH2,CH4 AMP.

The input Amp.(Vctl terminal)consists of the non-inverted Amp. and the output(VM+,VM-) is amplified by the different voltage between Vref and Vctl. The voltage gain of this input Amp. is 1 time.
Also,the output Amp. is the Master-Slave constitution.Each of Master Amp.(VM+) and Slave Amp. (VM-)have the gain of 10 times and the output voltage is about (Vcc-0.7)/2.

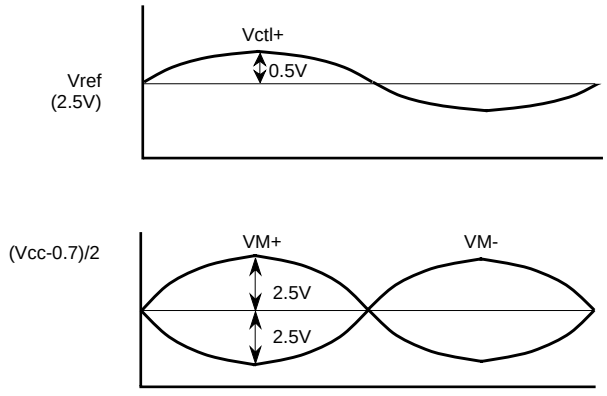


CH3 AMP.

The three terminals(Inverted,non-inverted and output)of Input Amp. go to external pins. So,the Amp. constitution (for example, Buffer Amp.) and the Gain can be adjusted by the external resistors.
The output Amp., the same with CH1, 2 and 4, consist of the Master-Slave Amp.
Each of the Master-Amp.(VM+) and Slave Amp.(VM-) have the gain of 2.66 and the output voltage is about (Vcc-0.7)/2.



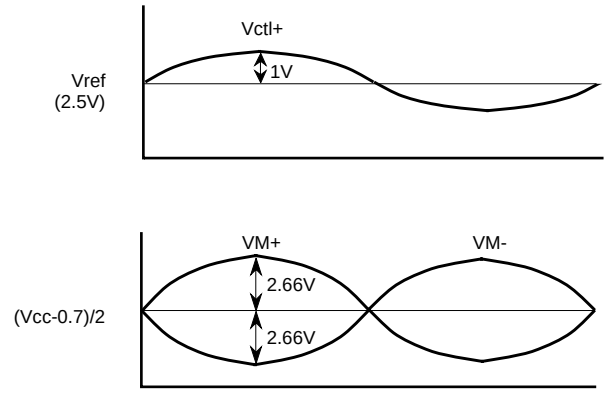
CH1,2,4Amp.



$$\text{Gain} = \frac{5.0\text{V}}{0.5\text{V}}$$

= 10.0 Times
= 20 dB

CH3Amp.(uses input Amp.as a Buffer Amp.)

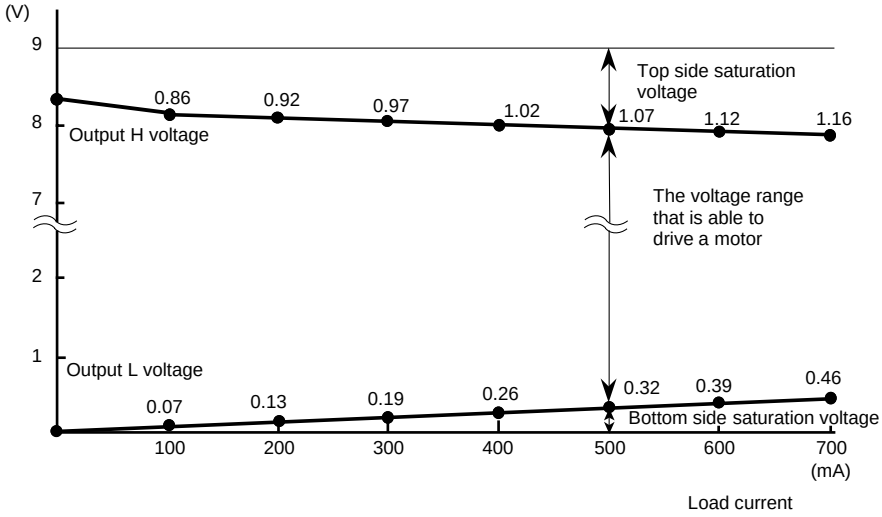


$$\text{Gain} = \frac{5.32\text{V}}{1.0\text{V}}$$

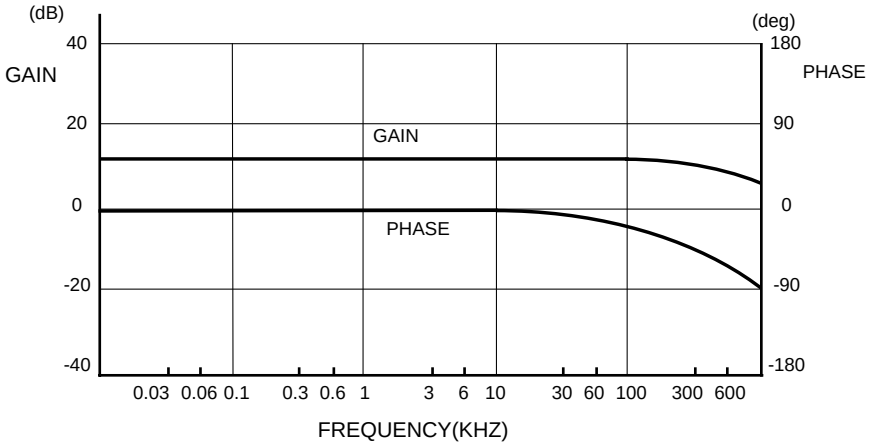
= 5.32 Times
= 14.5dB

TYPICAL CHARACTERISTICS

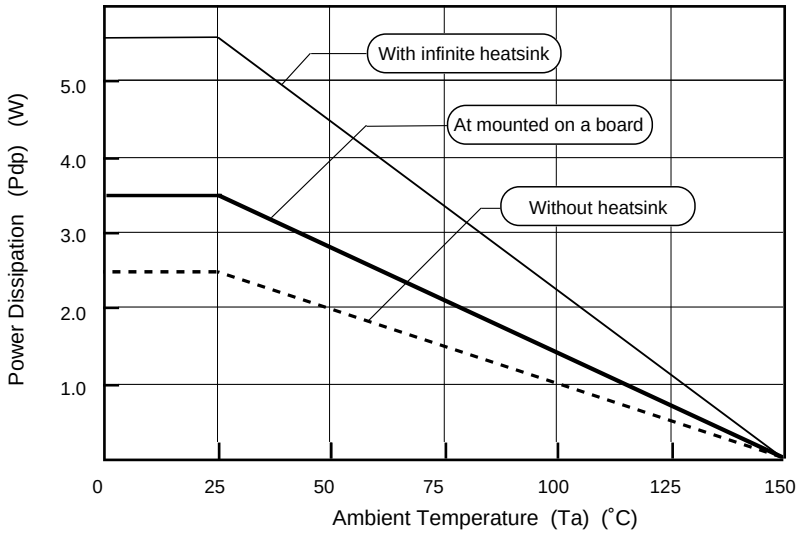
Output saturation voltage-Load current characteristics(Vcc=9V)



Frequency characteristics



Thermal derating curve



Used board
Size:174 X 140mm
Thickness:1.5mm
Paper Phenol on both sides

APPLICATION EXAMPLE

