

M56733AFP

3-PHASE BRUSHLESS MOTOR CONTROL

DESCRIPTION

The M56733AFP is a semiconductor integrated circuit designed as a single chip controller for the FDD spindle motor. The IC is equipped with a power amplifier, hole amplifier, FG amplifier, oscillator, speed discriminator, and various types of protection circuits.

Equipped with MOD pin that enables 3-speed switching with a single pin, the M56733AFP is very convenient to make system compact.

FEATURES

- Provided with digital servo enabling high precision, high stability and non-adjustment.
- 3-speed switching function with a pin MOD
- Enable two systems $EN \cdot \overline{EN}$
- I_o (peak)=1.0A
- Low capacitance of dumping capacitor

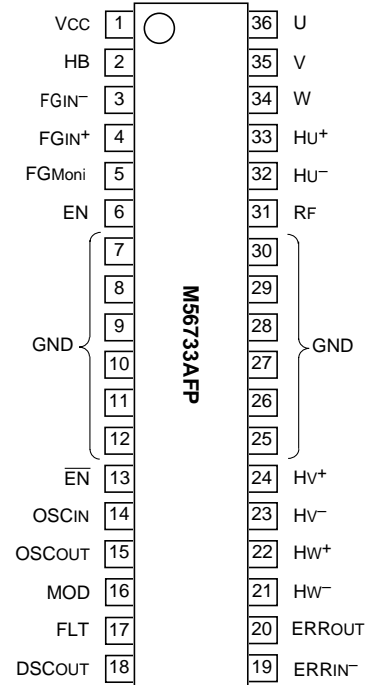
APPLICATION

FDD spindle motor (5")

RECOMMENDED OPERATING CONDITIONS

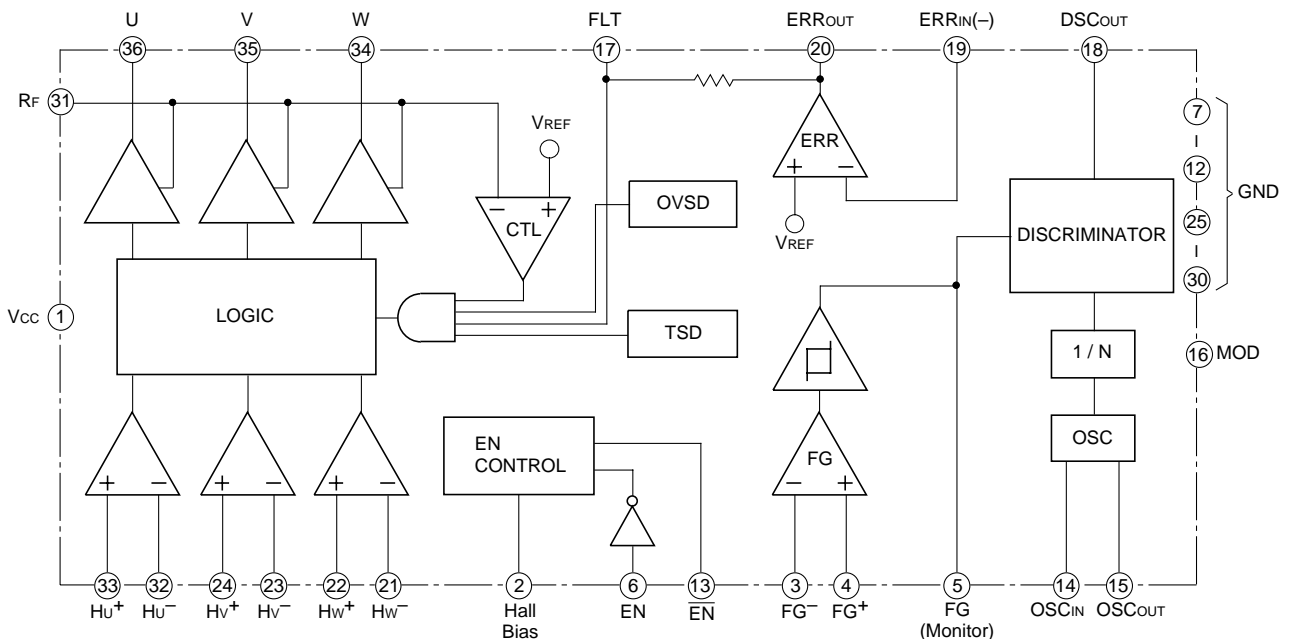
Supply voltage 10.8 – 12.0 – 13.2 V
 Oscillation frequency 492 kHz
 Maximum output current 800 mA
 FG amplifier input signal level 5 mVp-p or more

PIN CONFIGURATION (TOP VIEW)



Outline 36P2R-D

BLOCK DIAGRAM



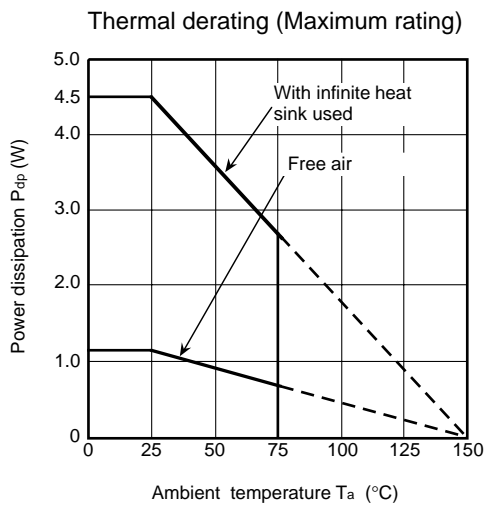
M56733AFP

3-PHASE BRUSHLESS MOTOR CONTROL

ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

Symbol	Parameter	Conditions	Ratings	Unit
V _{CC}	Supply voltage		15	V
I _O	Output current		1.0	A
V _{HD}	Hole amplifier, differential input voltage	Between 21 and 22, between 23 and 24, between 32 and 33 (pin number)	5	V
V _{IN}	Apply voltage at pin	6,13,21 – 24,32,33 (pin number)	0 – V _{CC}	V
f _{IN}	Clock frequency		1000	kHz
P _t	Power dissipation	Use of infinite heat sink	4.5	W
K _θ	Thermal derating	Use of infinite heat sink	27.8	°C/W
T _J	Temperature at junction		150	°C
T _{opr}	Operating temperature		-20 – 75	°C
T _{stg}	Storage temperature		-40 – 125	°C

TYPICAL CHARACTERISTICS



M56733AFP

3-PHASE BRUSHLESS MOTOR CONTROL

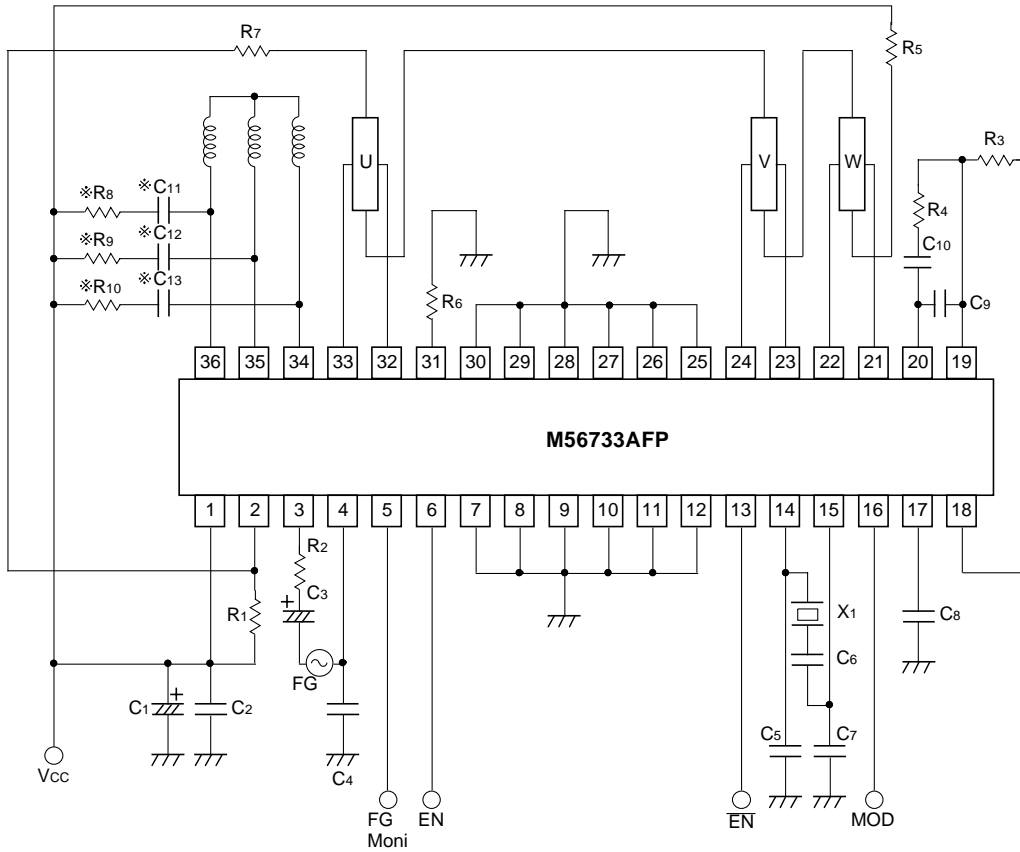
ELECTRICAL CHARACTERISTICS (Ta=25°C, VCC=12V unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Type.	Max.	
I _{CC} H	Circuit current	Except for injector current with circuit turned ON	9	18	28	mA
I _{CC} L	Circuit current	With circuit turned OFF	–	–	300	μA
I _{IN} HA	Hole amplifier input current		–	0.4	4.0	μA
V _N	Phase output center voltage		5.1	6.3	7.1	V
ΔV _N	Center voltage difference between phases		–	–	0.2	V
V _{sat}	Output saturation voltage	I _o =0.7A, sum of upper and lower voltage	–	2.8	3.2	V
V _{TH}	Control input reference voltage	Voltage at FLT pin when output starts	1.05	1.20	1.35	V
G _V	Voltage gain between control input and output	Source side	16.65	18.05	25.10	dB
		Sink side	20.82	23.80	26.81	
		Source + Sink	26.00	28.00	30.00	
ΔG _V	Difference in voltage gain between phases		–	–	2	dB
V _{ref}	Error amplifier reference voltage	Measurement of mean level of discriminator output	2.0	2.2	2.4	V
I _{IN} •E	Error amplifier input current		-0.2	-0.02	–	μA
V _o •E	Error amplifier output level	Hi	2.2	2.5	3.1	V
		Lo	0.6	0.8	1.05	
V _{CL}	Current limit reference voltage	Voltage at RF pin when the voltage at FLT pin is lower than 1.5V.	0.36	0.40	0.44	V
V _{IN}	Function input threshold voltage	Hi	2.5	–	–	V
		Lo	–	–	1.0	
I _{IN}	Input current at function input pin	V _{IN} =12V 6pin	500	700	1000	μA
		V _{IN} =0V 13pin	-150	-100	-70	
V _{inj}	Voltage at injector pin	I _{inj} =6mA	0.6	0.9	1.5	V
V _o DSC	Discriminator output level	Hi	4.1	4.8	5.3	V
		Lo	0.5	0.8	1.2	
ΔT	Discriminator count error	+ for deceleration side, - for acceleration side fosc=492kHz	-6	1	6	μs
fosc	Oscillation frequency	fosc=492kHz	-0.2	–	0.2	%
I _{inj} MAX	Maximum operating current of injector	fosc=492kHz	25	–	–	mA
I _{inj} MIN	Minimum operating current of injector	fosc=492kHz	–	–	4	mA
VOLFG	FG amplifier output low level (monitor)	I _L =200μA	–	0.1	0.2	V
I1FG	Leak current at FG amplifier output pin (monitor)	12V applied	–	–	1.0	μA
I _{IN} MOD	Input current at MOD pin	12V applied	435	565	800	μA
		0V applied	-75	-98	-140	

M56733AFP

3-PHASE BRUSHLESS MOTOR CONTROL

APPLICATION CIRCUIT EXAMPLE



<Constants>

- C1=33μF
- C2=0.47μF
- C3=10μF
- C4=0.01μF
- C5=165pF
- C6=56pF
- C7=165pF
- C8=1μF
- C9=0.01μF
- C10=0.1μF
- C11=0.1μF
- C12=0.1μF
- C13=0.1μF
- R1=5.1kΩ
- R2=510Ω
- R3=47kΩ
- R4=180kΩ
- R5=1.2kΩ
- R6=0.5Ω
- R7=1.2kΩ
- R8=4.7Ω
- R9=4.7Ω
- R10=4.7Ω
- X1=492kHz (Oscillator)

Notes: 1. Sets items with * when measures for such as oscillation require to be taken.
 2. R1 is to be used for injection current boost. Set R1, if necessary.
 3. Set R2 when gain adjustments are required.

4. Enable function

	EN	LO	Hi
EN			
Lo		DISABLE	ENABLE
Hi		DISABLE	DISABLE

5. Mode function

Mode pin	FG synchronous frequency
Lo (MOD ≤ 0.8V)	fosc/1640Hz
M (Open status)	fosc/820Hz
Hi (MOD ≥ 2.6V)	fosc/(4100/3) Hz