

# 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•EN
- I<sub>o</sub> (peak)=1.0A
- Low capacitance of dumping capacitor

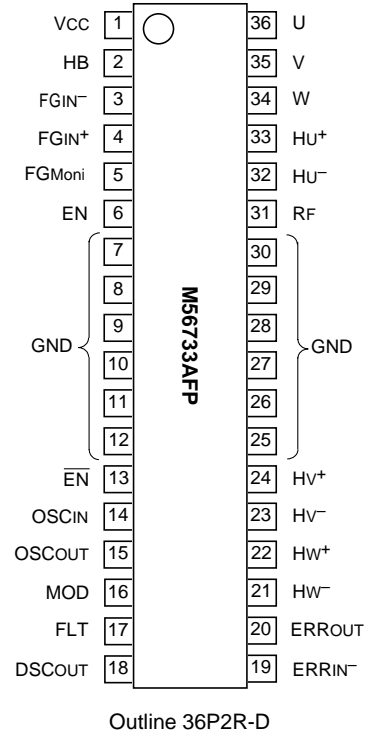
### APPLICATION

FDD spindle motor (5")

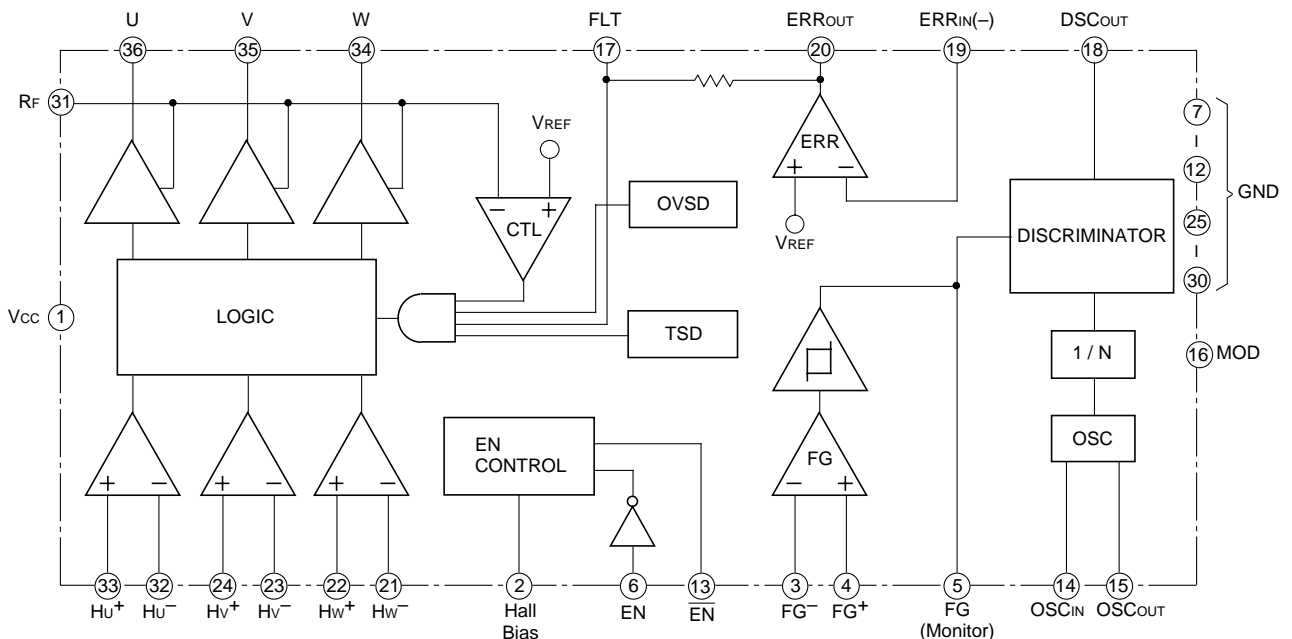
### RECOMMENDED OPERATING CONDITIONS

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)



### BLOCK DIAGRAM



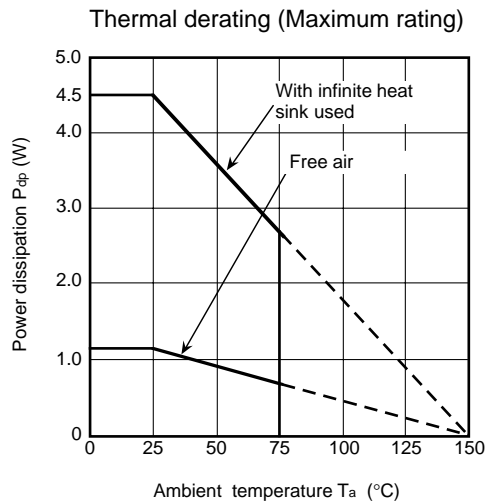
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### ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

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

### TYPICAL CHARACTERISTICS



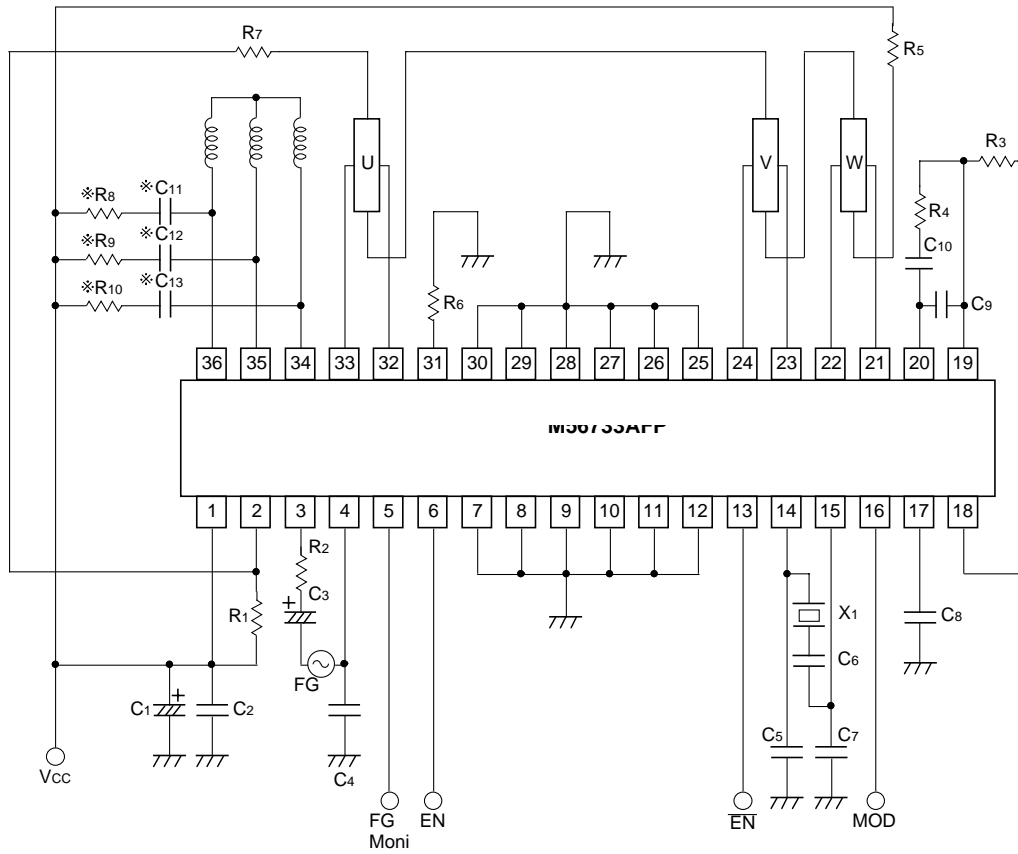
**ELECTRICAL CHARACTERISTICS** (Ta=25°C, Vcc=12V unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Type.	Max.	
IccH	Circuit current	Except for injector current with circuit turned ON	9	18	28	mA
IccL	Circuit current	With circuit turned OFF	–	–	300	μA
IINHA	Hole amplifier input current		–	0.4	4.0	μA
VN	Phase output center voltage		5.1	6.3	7.1	V
ΔVN	Center voltage difference between phases		–	–	0.2	V
Vsat	Output saturation voltage	Io=0.7A, sum of upper and lower voltage	–	2.8	3.2	V
VTH	Control input reference voltage	Voltage at FLT pin when output starts	1.05	1.20	1.35	V
GV	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	
ΔGV	Difference in voltage gain between phases		–	–	2	dB
Vref	Error amplifier reference voltage	Measurement of mean level of discriminator output	2.0	2.2	2.4	V
IIN•E	Error amplifier input current		-0.2	-0.02	–	μA
Vo•E	Error amplifier output level	Hi	2.2	2.5	3.1	V
		Lo	0.6	0.8	1.05	
VCL	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
VIN	Function input threshold voltage	Hi	2.5	–	–	V
		Lo	–	–	1.0	
IIN	Input current at function input pin	VIN=12V 6pin	500	700	1000	μA
		VIN=0V 13pin	-150	-100	-70	
Vinj	Voltage at injector pin	Iinj=6mA	0.6	0.9	1.5	V
VoDSC	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	%
IinjMAX	Maximum operating current of injector	fosc=492kHz	25	–	–	mA
IinjMIN	Minimum operating current of injector	fosc=492kHz	–	–	4	mA
VOLFG	FG amplifier output low level (monitor)	IL=200μA	–	0.1	0.2	V
I1FG	Leak current at FG amplifier output pin (monitor)	12V applied	–	–	1.0	μA
IINMOD	Input current at MOD pin	12V applied	435	565	800	μA
		0V applied	-75	-98	-140	

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### APPLICATION CIRCUIT EXAMPLE



<Constants>

- C1=33 $\mu$ F
- C2=0.47 $\mu$ F
- C3=10 $\mu$ F
- C4=0.01 $\mu$ F
- C5=165pF
- C6=56pF
- C7=165pF
- C8=1 $\mu$ F
- C9=0.01 $\mu$ F
- C10=0.1 $\mu$ F
- C11=0.1 $\mu$ F
- C12=0.1 $\mu$ F
- C13=0.1 $\mu$ F
- R1=5.1k $\Omega$
- R2=510 $\Omega$
- R3=47k $\Omega$
- R4=180k $\Omega$
- R5=1.2k $\Omega$
- R6=0.5 $\Omega$
- R7=1.2k $\Omega$
- R8=4.7 $\Omega$
- R9=4.7 $\Omega$
- R10=4.7 $\Omega$

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	oscillatory frequency
Lo (MOD $\leq$ 0.8V)	fosc/1640Hz
M (Open status)	fosc/820Hz
Hi (MOD $\geq$ 2.6V)	fosc/(4100/3) Hz