

# AN6387

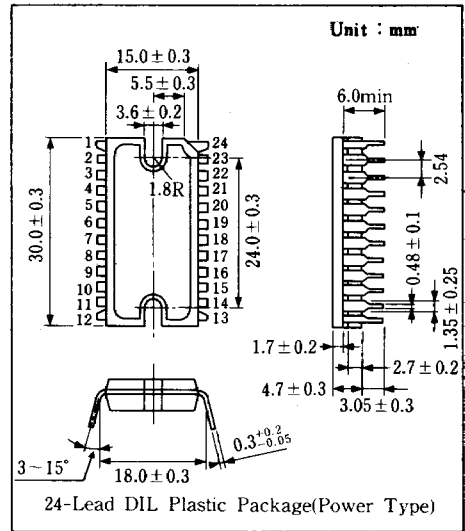
## VCR Cylinder Direct Motor Drive Circuit

### Outline

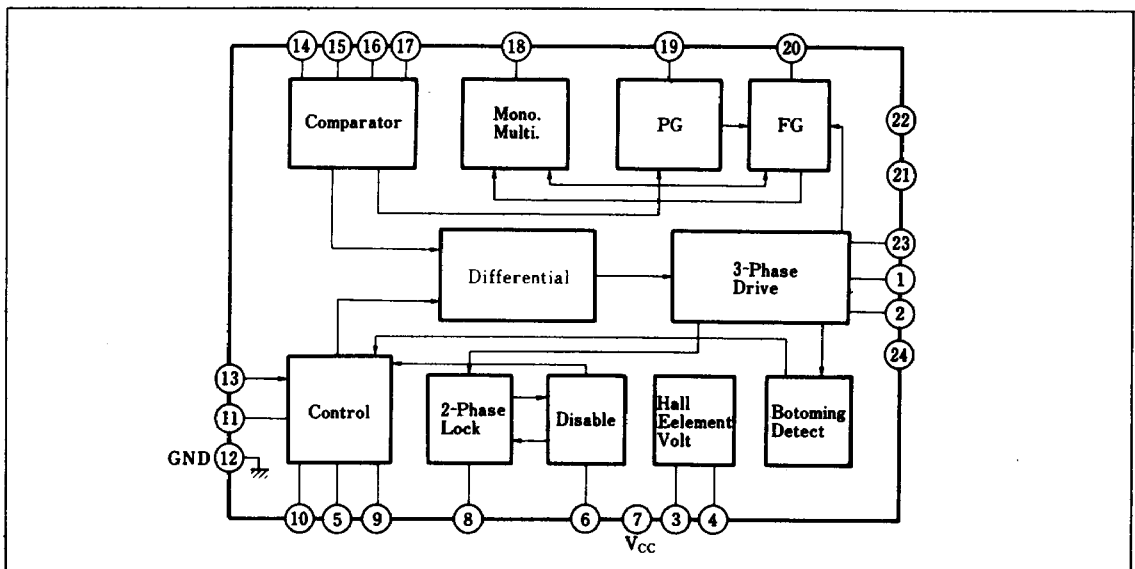
The AN6387 is an integrated circuit designed to drive a VCR cylinder DD motor.

### Features

- The functions consist of :
  - 3-Phase motor drive circuit
  - 2-Phase Hall element input circuit
  - PG, FG, generator circuit
  - Motor lock detector
- Supply voltage : either 9V or 12V



### Block Diagram



### ■ Pin

Pin No.	Pin Name	Pin No.	Pin Name
1	Motor Current (2)	13	Torque Direct Voltage
2	Output (3)	14	(1)
3	Hall Element Ref. Voltage	15	Hall Element (2)
4	Hall Element Voltage	16	Voltage Input (3)
5	Motor Current Detect	17	(4)
6	Disable	18	MM Output
7	V <sub>CC</sub>	19	PG Output
8	Lock Detect	20	FG Output
9	Phase Compensation	21	V <sub>M</sub>
10	Phase Compensation	22	NC
11	Servo Ref. Voltage	23	Motor Current Output(1)
12	GND	24	Motor Current

### ■ Absolute Maximum Ratings (Ta = 25°C)

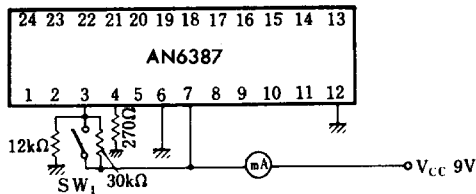
Item	Symbol	Rating	Unit	Note
Supply Voltage	V <sub>CC</sub>	14.4	V	
Circuit Voltage	V <sub>n-12</sub>	0   40	V	n=1,2,23
Circuit Voltage	V <sub>21-12</sub>	0   24	V	
Circuit Current	I <sub>n</sub>	0   1500	mA	n=1,2,23
Power Dissipation	P <sub>D</sub>	10	W	
Operating Ambient Temperature	V <sub>OPR</sub>	-20 ~ +70	°C	
Storage Temperature	T <sub>stg</sub>	-40 ~ +150	°C	

### ■ Electrical Characteristics (Ta = 25°C ± 2°C)

Item	Symbol	Test Circuit	Condition	min.	typ.	max.	Unit
Total Current	I <sub>tot</sub>	1	V <sub>CC</sub> = 9V, disable	4.0		20	mA
ET-ATC Transfer Gain	G <sub>(TO)</sub>	2	V <sub>CC</sub> = 9V	0.86		1.06	
ATC Limit Voltage	V <sub>(lim)</sub>	2	V <sub>CC</sub> = 9V, at full-torque command	0.44		0.50	V
Saturation Detect Gain	G <sub>(S)</sub>	3	V <sub>CC</sub> = 9V, R <sub>d</sub> = 0.47Ω	0.5		1.5	
Saturation Detect Start Voltage	V <sub>(Det 1)</sub>	3	V <sub>CC</sub> = 9V, R <sub>d</sub> = 0.47Ω	1.0		1.8	V
Saturation Detect End Voltage	V <sub>(Det 2)</sub>	3	V <sub>CC</sub> = 9V, R <sub>d</sub> = 0.47Ω	0.5		1.0	V
HV Output Voltage	V <sub>HV</sub>	1	V <sub>CC</sub> = 9V, V <sub>SV</sub> = 2.6V, R <sub>HV</sub> = 270Ω	2.1			V
HV Protect Voltage	V <sub>(Protect)</sub>	1	V <sub>CC</sub> = 9V, V <sub>SV</sub> = V <sub>CC</sub>	3.5		4.3	V
DS Level Voltage	V <sub>DS</sub>	2	V <sub>CC</sub> = 9V			1.2	V
ETR Voltage	V <sub>ETR</sub>	2	V <sub>CC</sub> = 9V	4.3		4.7	V
HEM, HEM, HES, HES Bias Current	I <sub>Bias</sub>	2	V <sub>CC</sub> = 9V	-6			μA
HES-HES Comparator Offset Voltage	V <sub>I(offset)S</sub>	2	V <sub>CC</sub> = 9V	-6		6	mV
HEM-HEM Comparator Offset Voltage	V <sub>I(offset)M</sub>	2	V <sub>CC</sub> = 9V	-6		6	mV
PG Lowest Voltage	V <sub>OL19</sub>	2	V <sub>CC</sub> = 9V, 47kΩ applied to Pin⑱ → 5V			0.5	V
FG Lowest Voltage	V <sub>OL29</sub>	4	V <sub>CC</sub> = 9V, 47kΩ applied to Pin⑳ → 5V			0.5	V
BEF Fetch Voltage	V <sub>BFG</sub>	4	V <sub>CC</sub> = V <sub>M</sub> = 9V	0.6		1.0	V

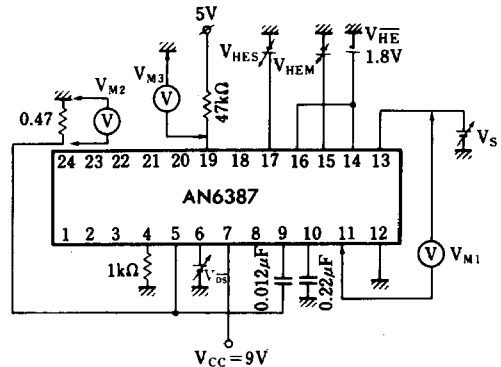
Note: Operating Supply Voltage Range : V<sub>CC(OPR)</sub> = 8 ~ 13V (V<sub>7-12</sub>)

**Test Circuit 1** ( $I_{tot}$ ,  $V_{HV}$ ,  $V_{Protect}$ )



SW<sub>1</sub>: Open, Current Value I<sub>CC</sub>  
 SW<sub>1</sub>: Open, Pin ③ Voltage 2.6V...  
 Pin④ Voltage V<sub>HV</sub>  
 SW<sub>1</sub>: Short, Pin ④ Voltage...V<sub>(Protect)</sub>

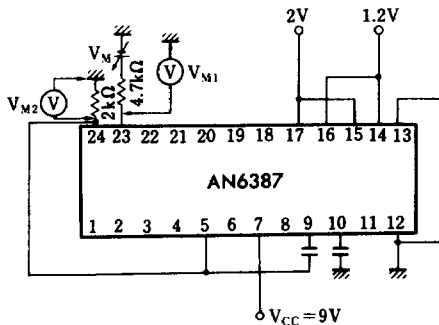
**Test Circuit 2** ( $G_{IO}$ ,  $V_{(lim)}$ ,  $V_{DS}$ ,  $V_{ETR}$ ,  $I_{Bias}$ ,  $V_{I(offset)S}$ ,  $V_{I(offset)M}$ ,  $V_{OL19}$ )



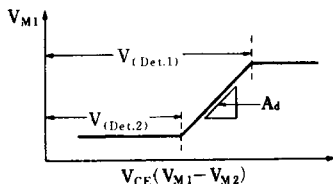
Read  $V_{M1}$  and  $V_{M2}$  when  $V_{HES} = V_{HEM} = 2V$ ,  $V_{DS} = 2V$  and  $V_s = 0 \sim 6V$ .

$G_{IO}$ ,  $V_{(lim)}$   
 ( $V_{HES}$ ,  $V_{HEM}$ ,  $V_{HF}$  current... $I_{Bias}$ )  
 Read  $V_{M1}$  when  $V_s = 0V$ . ... $V_{ETR}$   
 $V_{HES} = V_{HEM} = 2V$ ,  $V_{DS} = 2V$   
 Continuously lowering  $V_{HES}$  from 2V, the voltage of  $V_{MES} - V_{HF}$  when  $V_{M3}$  went down :  $V_{I(offset)S}$   
 Next, continuously lowering  $V_{HEM}$  from 2V, the voltage of  $V_{HEM} - V_{HF}$  when  $V_{M3}$  went down :  $V_{I(offset)M}$ , and lowest voltage of  $V_{M3}$ ... $V_{OL19}$

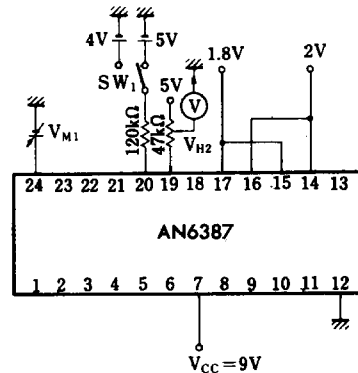
**Test Circuit 3** ( $G_{S}$ ,  $V_{(Det.1)}$ ,  $V_{(Det.2)}$ )



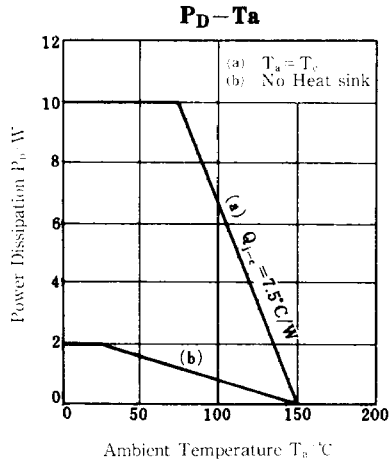
Set  $V_M$  at 2V. Continuously increase  $V_M$  until it is as shown in the figure below.



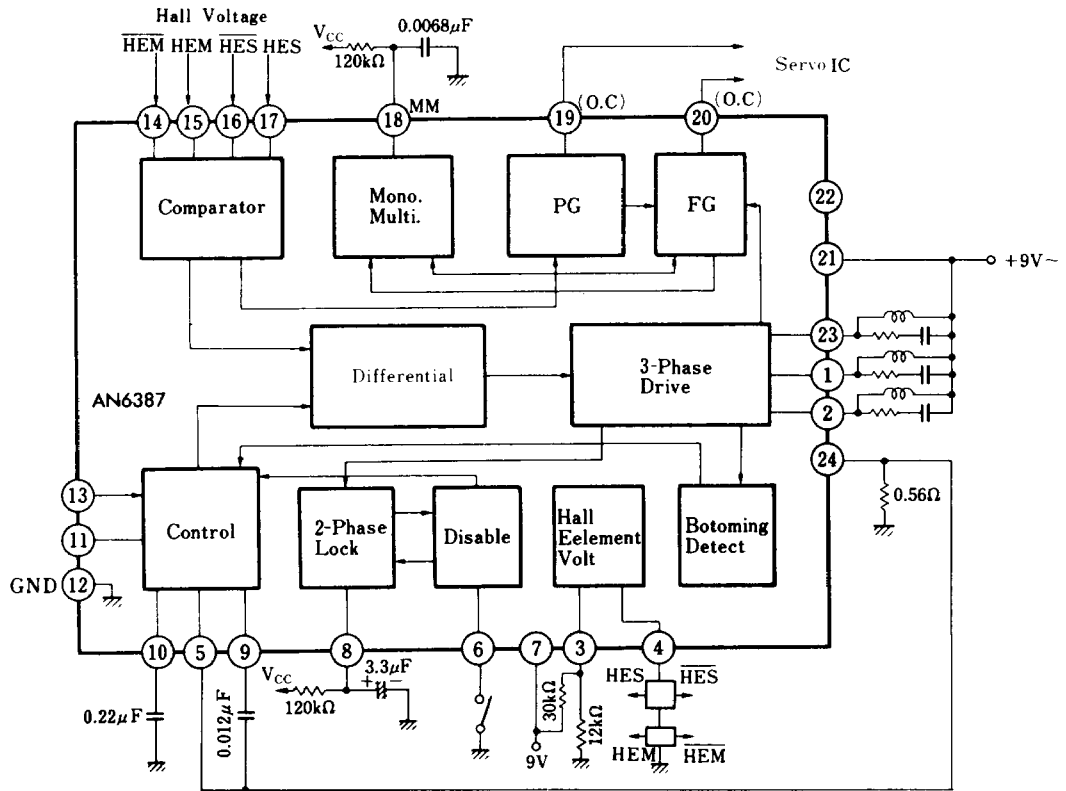
**Test Circuit 4** ( $V_{OL20}$ ,  $V_{BFG}$ )



When  $S_1 = 5V$  and  $V_{M1} = 9V$ ,  $V_{M2}$ ...High voltage  
 When  $S_1 = 4V$  and  $V_{M1} = 9V$ ,  $V_{M2}$ ...Low voltage...  
 $V_{OL20}$ . At this time, continuously increase  $V_{M1}$  up to 10V.  
 Next, when  $V_{M1}$  continuously lowering for  $S_1 = 5V$ , the voltage of  $V_{M1}$  when  $V_{M2}$  became High voltage ... $V_{BFG}$



■ Application Circuit





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