

AN6387

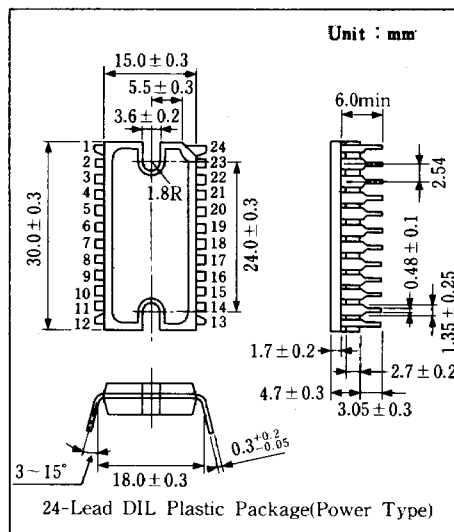
VCR Cylinder Direct Motor Drive Circuit

■ Outline

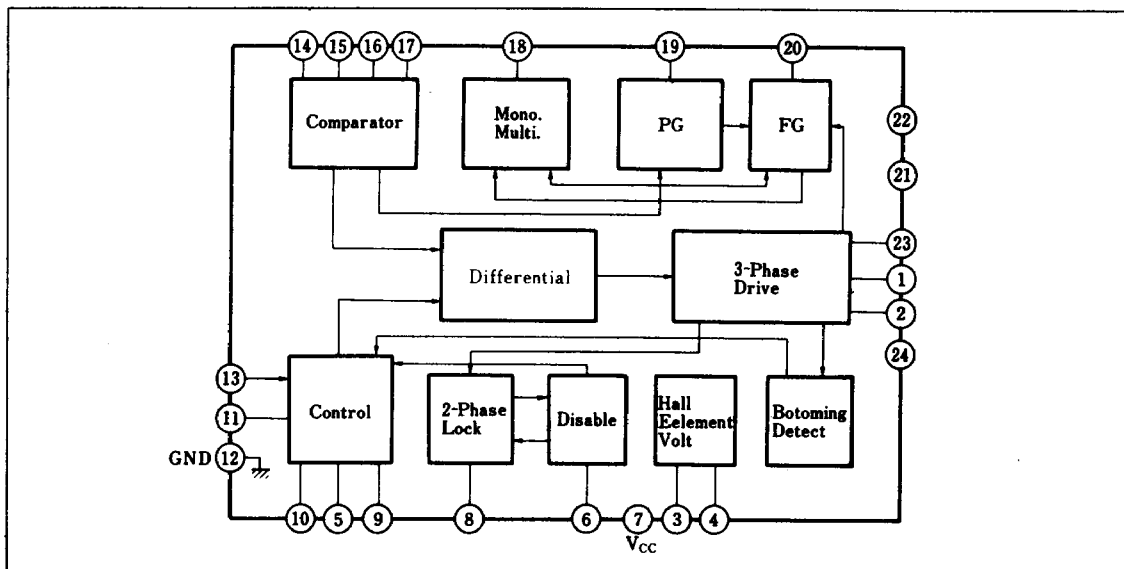
The AN6387 is an integrated circuit designed to drive a VCR cylinder DD motor.

■ 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	Hall Element Voltage Input	(1)
3	Hall Element Ref. Voltage		15		(2)
4	Hall Element Voltage		16		(3)
5	Motor Current Detect		17		(4)
6	Disable		18	MM Output	
7	V_{CC}		19	PG Output	
8	Lock Detect		20	FG Output	
9	Phase Compensation		21	V_M	
10	Phase Compensation		22	NC	
11	Servo Ref. Voltage		23	Motor Current Output(1)	
12	GND		24	Motor Current	

Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

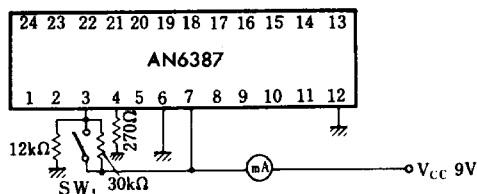
Item	Symbol	Rating		Unit	Note
Supply Voltage	V_{CC}	14.4		V	
Circuit Voltage	V_{n-12}	0	40	V	n = 1,2,23
Circuit Voltage	V_{21-12}	0	24	V	
Circuit Current	I_n	0	1500	mA	n = 1,2,23
Power Dissipation	P_D	10		W	
Operating Ambient Temperature	V_{opr}	$-20 \sim +70$		$^\circ\text{C}$	
Storage Temperature	T_{stg}	$-40 \sim +150$		$^\circ\text{C}$	

Electrical Characteristics ($T_a = 25^\circ\text{C} \pm 2^\circ\text{C}$)

Item	Symbol	Test Circuit	Condition	min.	typ.	max.	Unit
Total Current	I_{tot}	1	$V_{CC} = 9\text{V}$, disable	4.0		20	mA
ET-ATC Transfer Gain	$G_{(TO)}$	2	$V_{CC} = 9\text{V}$	0.86		1.06	
ATC Limit Voltage	$V_{(lim)}$	2	$V_{CC} = 9\text{V}$, at full-torque command	0.44		0.50	V
Saturation Detect Gain	$G_{(S)}$	3	$V_{CC} = 9\text{V}$, $R_d = 0.47\Omega$	0.5		1.5	
Saturation Detect Start Voltage	$V_{(Det1)}$	3	$V_{CC} = 9\text{V}$, $R_d = 0.47\Omega$	1.0		1.8	V
Saturation Detect End Voltage	$V_{(Det2)}$	3	$V_{CC} = 9\text{V}$, $R_d = 0.47\Omega$	0.5		1.0	V
HV Output Voltage	V_{HV}	1	$V_{CC} = 9\text{V}$, $V_{SV} = 2.6\text{V}$, $R_{HV} = 270\Omega$	2.1			V
HV Protect Voltage	$V_{(Protect)}$	1	$V_{CC} = 9\text{V}$, $V_{SV} = V_{CC}$	3.5		4.3	V
DS Level Voltage	V_{DS}	2	$V_{CC} = 9\text{V}$			1.2	V
ETR Voltage	V_{ETR}	2	$V_{CC} = 9\text{V}$	4.3		4.7	V
HEM, HEM, HES, HES Bias Current	I_{Bias}	2	$V_{CC} = 9\text{V}$	-6			μA
HES-HES Comparator Offset Voltage	$V_{I(offset)S}$	2	$V_{CC} = 9\text{V}$	-6		6	mV
HEM-HEM Comparator Offset Voltage	$V_{I(offset)M}$	2	$V_{CC} = 9\text{V}$	-6		6	mV
PG Lowest Voltage	V_{OL19}	2	$V_{CC} = 9\text{V}$, $47\text{k}\Omega$ applied to Pin⑱→5V			0.5	V
FG Lowest Voltage	V_{OL29}	4	$V_{CC} = 9\text{V}$, $47\text{k}\Omega$ applied to Pin⑳→5V			0.5	V
BEF Fetch Voltage	V_{BFG}	4	$V_{CC} = V_M = 9\text{V}$	0.6		1.0	V

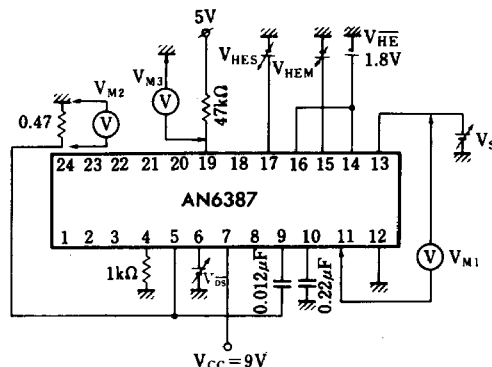
Note: Operating Supply Voltage Range : $V_{CC(opr)} = 8 \sim 13\text{V}$ (V_{7-12})

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



SW₁: Open, Current Value I_{CC}
 SW₁: Open, Pin ③ Voltage 2.6V...
 Pin④ Voltage V_{HV}
 SW₁: Short, Pin ④ Voltage... $V_{(Protect)}$

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})

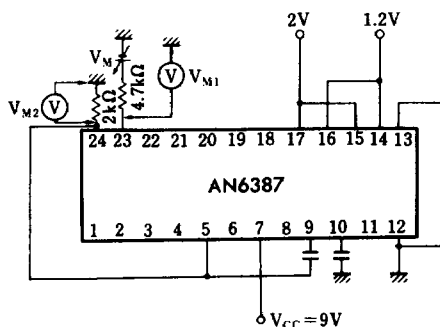
Read V_{M1} when $V_S = 0V$ V_{ETR}

$V_{HES} = V_{HEM} = 2V$, $V_{DS} = 2V$

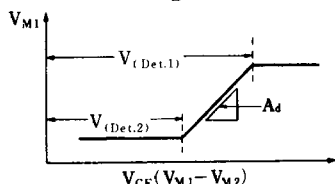
Continuously lowering V_{HES} from 2V, the voltage of $V_{MES} - V_{HF}$ when V_{M3} went down : $V_{I(offset)S}$

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}

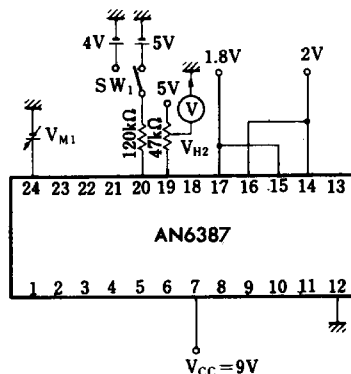
Test Circuit 3 ($G_{(S)}$, $V_{(Det.1)}$, $V_{(Det.2)}$)



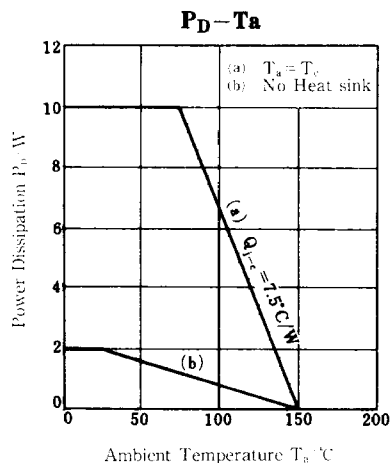
Set V_M at 2V. Continuously increase V_M until it is as shown in the figure below.



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

