

AN3810K

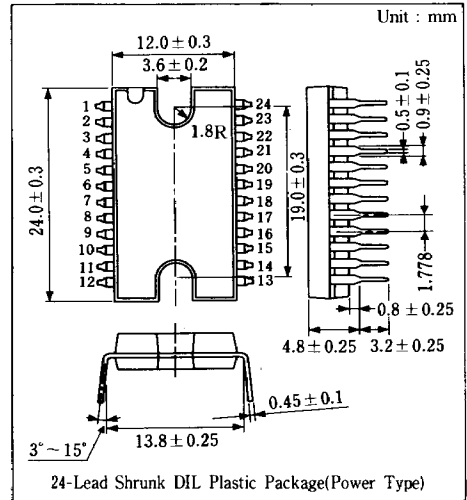
VCR Cylinder Direct Motor Drive Circuit

■ Outline

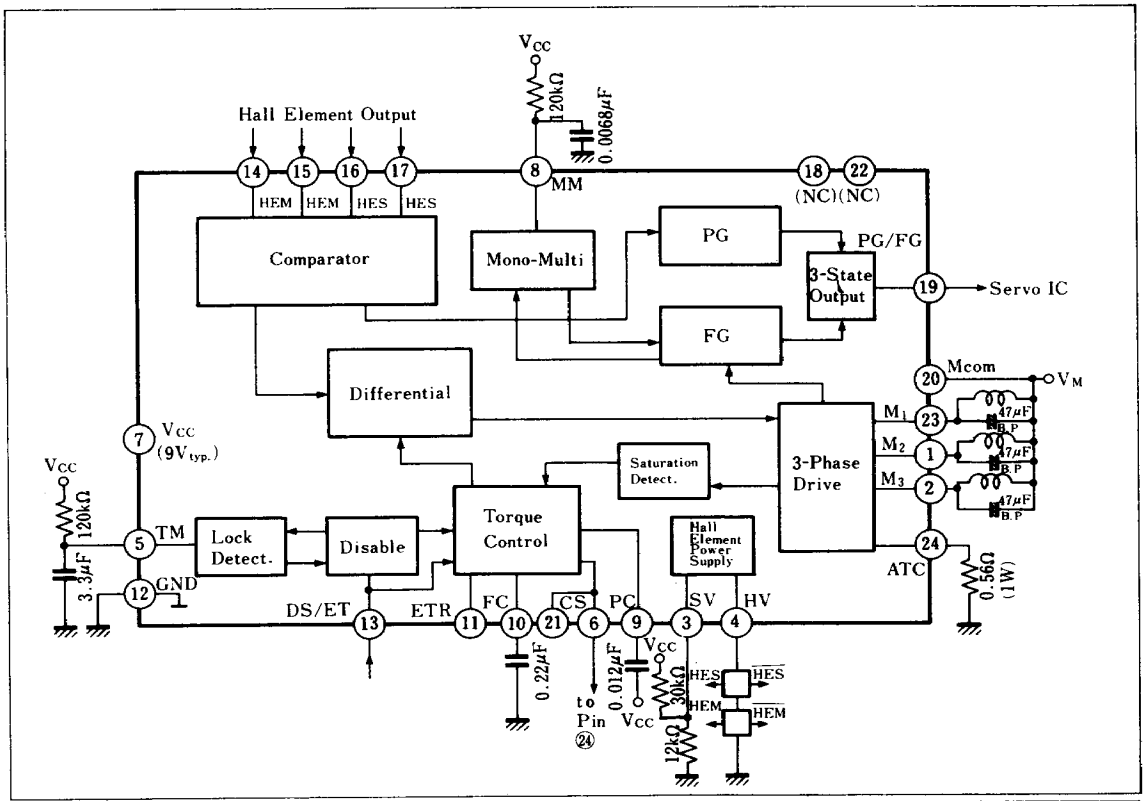
The AN3810K is an integrated circuit designed to drive the VCR cylinder DD motor.

■ Features

- 3-phase motor drive circuit built-in
- PG and FG generator circuit built-in
- Motor lock detector circuit built-in
- Hall element input circuit built-in



■ Block Diagram and Peripheral Circuit



■ Pin

Pin No.	Pin Name	Pin No.	Pin Name
1	Drive Output 2	13	Torque Control/Disable
2	Drive Output 3	14	H.E. Input
3	H.E. Power Supply Control	15	H.E. Input
4	H.E. Power Supply	16	H.E. Input
5	Mono-Multi Cap.	17	H.E. Input
6	Current Detection	18	NC
7	V _{cc}	19	PG/FG Output
8	Mono-Multi Cap.	20	Voltage Supply for Motor
9	Phase Compensation	21	Current Detection
10	Soft Start	22	NC
11	Reference Voltage Input	23	Drive Output 1
12	GND	24	ATC

■ Absolute Maximum Ratings (Ta = 25°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
	V ₂₀₋₁₂	0 24	V	
Circuit Current	I _n	0 1500	mA	n=1, 2, 23
Power Dissipation	P _d	2000	mW	
Operating Ambient Temperature	T _{opr}	-20 ~ +75	°C	
Storage Temperature	T _{stg}	-55 ~ +150	°C	

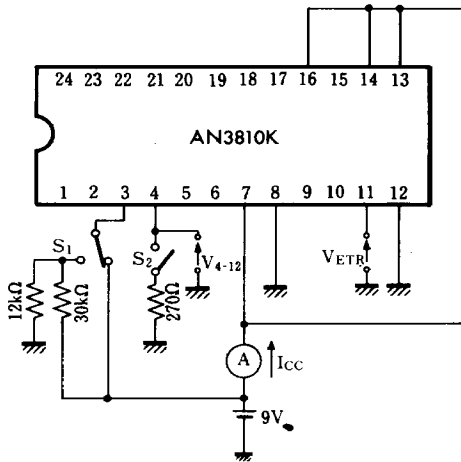
■ Electrical Characteristics (V_{cc} = 9V, Ta = 25°C)

Item	Symbol	Test Circuit	Condition	min.	typ.	max.	Unit
Total Current	I _{cc} *	1		6		16	mA
Output Saturation Voltage	V _{o(set)}	2	I _o = 1A			1	V
ATC Limit Voltage	V _{lim}	2	V _{ET} = 0V (at full torque command)	0.41		0.53	V
Input/Output Transfer Gain	A _v	2	R _a = 0.47Ω	0.9		1.4	
Saturation Detect Gain	A _d	3		0.5		1.5	
HV Output Voltage	V _{HV}	1	V _{sv} = 2.6V, R _{HV} = 270Ω	2.2		2.6	V
HV Protected Voltage	V _{prot}	1	V _{sv} = V _{cc}	3.3		4.3	V
DS Input Level Voltage	V _{DS}	2		3.1		4.1	V
ETR Voltage	V _{ETR}	1		2.1		2.9	V
ET Offset Voltage	V _{offET}	2		-30		30	mV
HEM-HES Comparator Offset Voltage	V _{offm}	4		-6		6	mV
HES-HES Comparator Offset Voltage	V _{offs}	4		-6		6	mV
PG/FG Three-State Output Voltage (1)	V _{OH}	4	I _{is} = ±10μA	4.2			V
PG/FG Three-State Output Voltage (2)	V _{OM}	4	I _{is} = ±10μA	2.1		2.9	V
PG/FG Three-State Output Voltage (3)	V _{OL}		I _{is} = ±10μA			1	V
MM Theshold Voltage	V _{MM}	5		3.8		4.6	V
BFG Fetch Voltage	V _{BFG}	4	V _M = 9V	0.5		1.2	V
TM Threshold Voltage	V _{TM}	5		4.1		4.9	V
ATC Residual Voltage	V _{late}	2		0		5	mV
ET Input Bias Current	I _{ET}					-10	μA
HEM, HEM, HES, HES Input Bias Current	I _B					-10	μA

Note) Operating Supply Voltage Range: V_{cc(opp)} = 8~13V

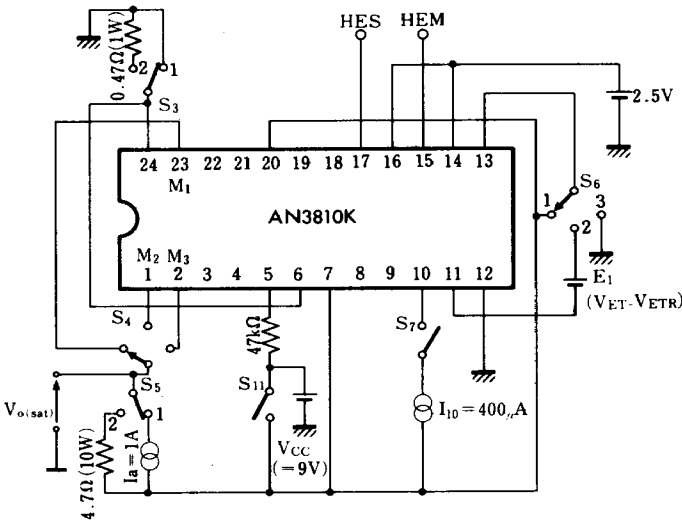
*Supply current to hall elements is not included.

Test Circuit 1 (I_{CC})



- Total current (I_{CC}) : S_1 ① side, S_2 open, measure I_{CC} .
- HV output voltage (V_{HV}) : S_1 ② side, S_2 short, measure V_{4-12} .
- HV protected voltage (V_{prot}) : S_1 ① side, S_2 open, measure V_{4-12} .
- ETR voltage (V_{ETR}): Measure V_{ETR} .

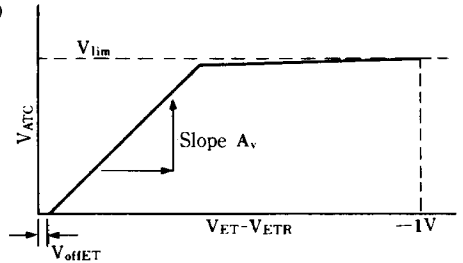
Test Circuit 2 ($V_{O(sat)}$, V_{lim} , A_v , V_{DS} , V_{OFFET} , V_{idle})



- Output saturation voltage ($V_{O(sat)}$) :
 S_3 ① side, S_5 ① side,
 S_6 ① side, S_7 ON
 Set the three-phase mode with Pins ⑭, ⑮ and ⑰ and switch the measuring pin with S_4 .

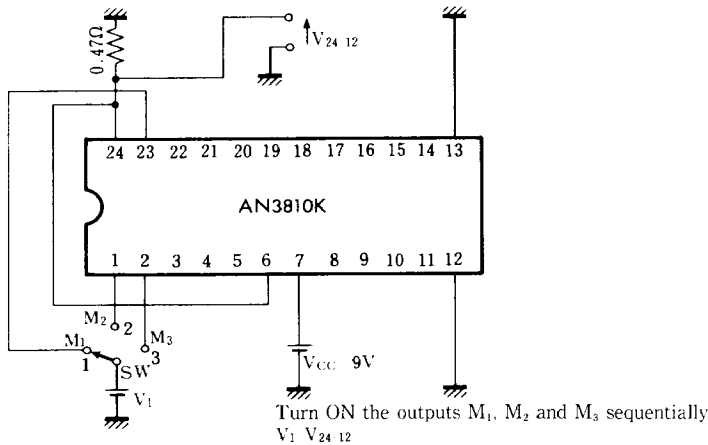
Measuring Pin	Mode Setting		HES (Pin⑰)	H:3V L:2V
	HEM (Pin⑬)	HES (Pin⑰)		
M1 (Pin⑲)	H	H, L		
M2 (Pin⑰)	L	H		
M3 (Pin⑱)	L	L		

- ATC limit voltage (V_{lim}) : S_3 ② side, S_5 ② side
- Input/output transfer gain (A_v) : S_7 open, S_6 ② side
- ET offset voltage (V_{offET}) : S_7 open, S_6 ② side

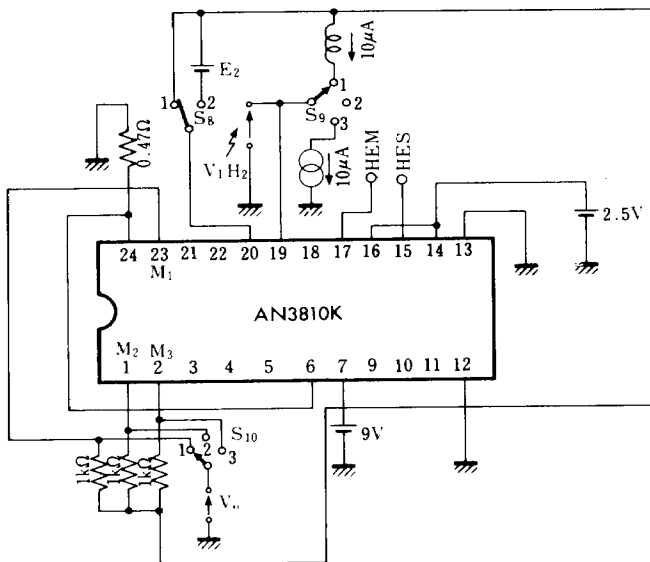


- DS input level voltage (V_{DC}) : HEM (Pin⑬) "H", one-phase (M1) ON STEP1. V_{CC} S_{11} , OFF-ON
 When V_{13-12} increases from 0F, it becomes from "H" to "L" and then measure it.
- ATC residual voltage (V_{idcc}) : S_3 ② side, S_5 ② side
 S_7 open, S_6 ① side
 Measure V_{24-12} when V_{ET} is in disable state.

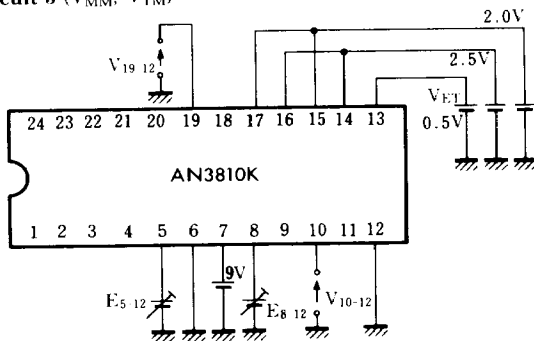
Test Circuit 3 (A_d)



Test Circuit 4 (V_{offM}, V_{offS}, V_{offH}, V_{offM}, V_{offL}, V_{BFG})



Test Circuit 5 (V_{MM}, V_{TM})



- HEM-HEM
Comparator offset voltage (V_{offM}): S₈ ① side
 - MES-MES
Comparator offset voltage (V_{offS}): S₈ ① side HEM: L(2V)
- Check V_o to be switched by changing HES and HEM pin voltage by ±5mV.

V _{offM}	HEM	H 2.5+5mV	↔	L 2.5V-5mV
	S ₈ ① side M1	L	↔	H
V _{offS}	HES	H 2.5V+5mV	↔	L 2.5V-5mV
	S ₈ ② side M2	L	↔	H

- V_{offH}, V_{offM}, V_{offL}
- | | | |
|--|-----------------------|------------|
| PG/FG three-phase output voltage(l) V _{off} | S ₈ ① side | HES HEM MM |
| | | H H H |
| | | L L L |
| V _{offM} | (2) | L L H |
| V _{offL} | (3) | L L L |
- Measure V₁₉₋₁₂, provided that S₈ is at ① side, ② side and ③ side. HES, HEM H : 3V, L : 2V MM H : 5.2V, L : 3.2V

- V_{BFG}
- | | | |
|------------------------------------|-----------------------|------------|
| BFG fetch voltage V _{BFG} | S ₈ ② side | HES HEM MM |
| | | L L L |
| | | H |
- Increase E₂ from 0V, when V₁₉₋₁₂ change from "L" to "M", measure E₂.

- MM threshold Voltage (V_{MM}) : Gradually increase E₈₋₁₂. When V₁₉₋₁₂ changed from L to M, measure E₈₋₁₂.
- TM threshold Voltage (V_{TM}) : Gradually increase E₅₋₁₂. When V₁₀₋₁₂ changed from H to L, measure E₈₋₁₂.