AN3830K

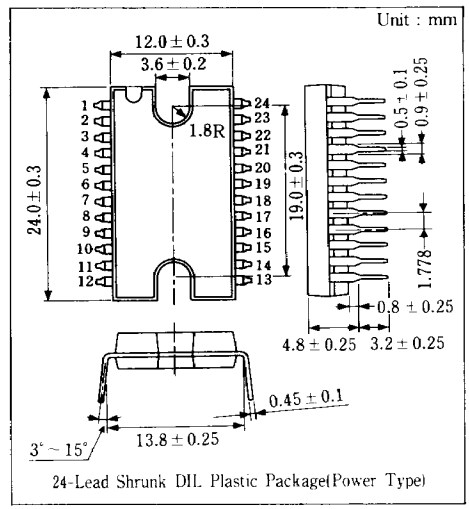
VCR Reel Direct Motor Drive Circuit

■ Outline

The AN3830K is an integrated circuit designed to drive a VCR relay DD motor.

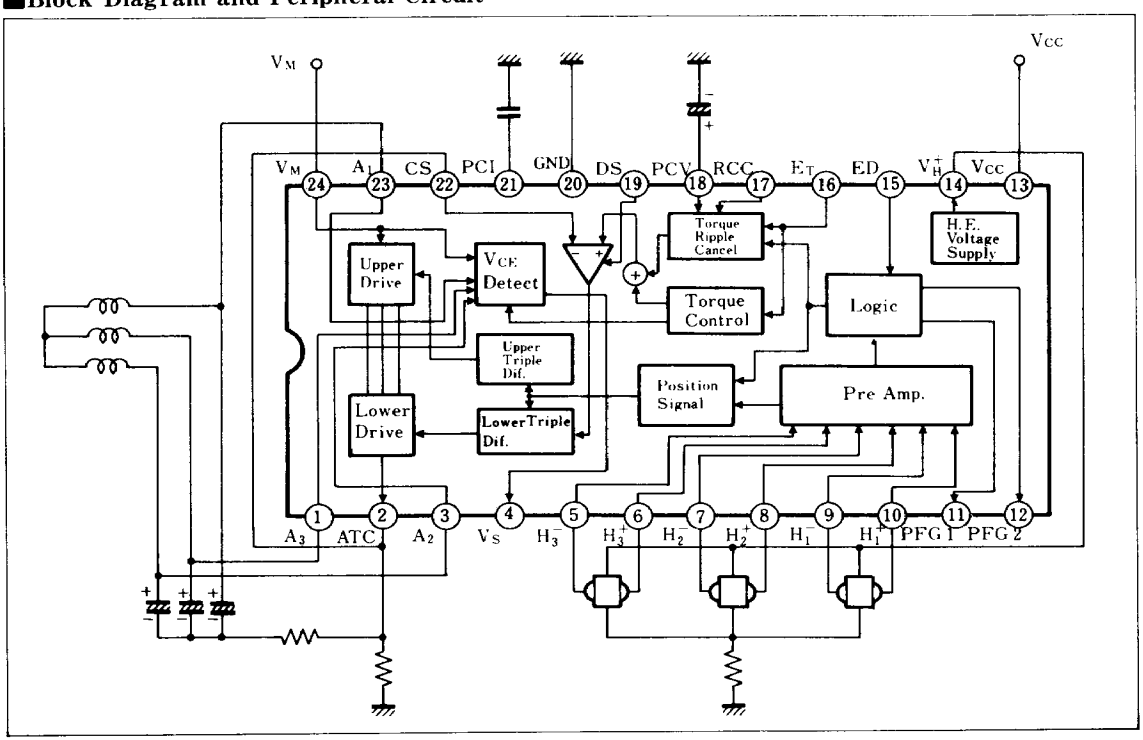
■ Features

- Three-phase full-wave operation
- Torque ripple canceller built-in
- Power transistor built-in
- Forward or reverse motor drive, brake and stop



24-Lead Shrunk DIL Plastic Package(Power Type)

■Block Diagram and Peripheral Circuit



■ Absolute Maximum Ratings (Ta=25℃)

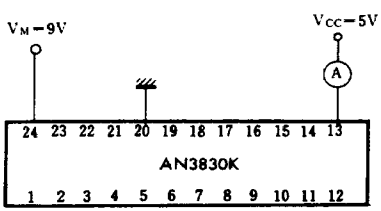
Item	Symbol	Rating	Unit
Power Supply Voltage	V_{CC}	6.0	V
Motor Supply Voltage	V_{24}	24	V
Motor Drive Current	I_1, I_3, I_{23}	±1.5	A
Output Pin Voltage	V_1, V_3, V_{23}	24	V
Power Dissipation	P_D	2000	mW
Operating Ambient Temperature	T_{opr}	−20～+70	℃
Storage Temperature	T_{stg}	−55～+150	℃

■ Electrical Characteristics (Ta=25℃)

Item	Symbol	Test Circuit	Condition	min.	typ.	max.	Unit
Supply Current	I_{CC}	1	V_{CC}=5V, V_M=9V (excluding current of Hall element)	5		15	mA
Torque Command Voltage	E_r	2	V_{CC}=5V	0		1	V
Torque Command Voltage Offset	$E_{Toffset}$	2	V_{CC}=5V			5	mV
Output Idle Voltage	ATC_{Idle}	2	V_{CC}=5V			5	mV
Input/Output Gain	G_{Io}	2	V_{CC}=5V	0.95		1.05	times
Output Limit Voltage	V_{Ilmit}	2	V_{CC}=5V	0.65		0.84	V
Forward Motor Drive Command Voltage	ED_F	2	V_{CC}=5V			2.3	V
Reverse Motor Drive Command Voltage	ED_R	2	V_{CC}=5V	2.7			V
DS ON Voltage	DS_{ON}	2	V_{CC}=5V	2.7			V
DS OFF Voltage	DS_{OFF}	2	V_{CC}=5V			2.3	V
Ripple Cancel ON Voltage	RCC_{ON}	2	V_{CC}=5V			0.9	V
Ripple Cancel OFF Voltage	RCC_{OFF}	2	V_{CC}=5V	1.3			V
PFG1/PFG2 Output Voltage (H)	$PFG_{(H)}$	3	V_{CC}=5V, I_{PFG}=−100μA	2.8			V
PFG1/PFG2 Output Voltage (L)	$PFG_{(L)}$	3	V_{CC}=5V, I_{PFG}=1mA			0.5	V
Hall Element Supply Voltage	V_H^+	4	V_{CC}=5V, I_H=−200mA	2.6		3.2	V
Hall Element Input Allowable Voltage	$V_{H(IN)}$	5	V_{CC}=5V	1.2		2.35	V
Hall Element Input Conversion Offset	$V_{Hoffset}$	2	V_{CC}=5V	−5		5	mV
Output Stage Loss Voltage	V_{loss}	2	V_{CC}=5V, E_T=0.56V, I_O=1A			2.6	V
Saturation Voltage on Ground Side	$V_{N(sat)}$	2	V_{CC}=5V, E_T=0.56V, I_O=1A			1.4	V
Detect Output Gain for Saturation on V_{CC} Side	G_{VS}	6	V_{CC}=5V	2.2		2.9	times
Detect Output for Saturation on V_{CC} Side	V_{SO}	6	V_{CC}=5V, E_T=0.35V, V_{M-AI}=1.55V	2		3	V

Note) Operating Supply Voltage Range $V_{CC(opr)}$=4.5～5.5V

Test Circuit 1 (I_{CC})



I_{CC} : Measure current which flows in from V_{CC} pin.

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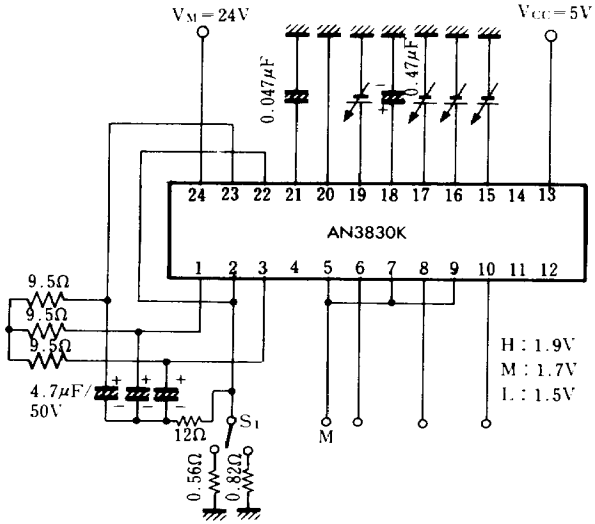
Test Circuit 2 (E_T, $E_{Toffset}$, ATC_{idle}, G_{io}, V_{limit}, ED_F, ED_R, DS_{ON}, DS_{OFF}, RCC_{ON}, RCC_{OFF}, $V_{H(offset)}$, V_{loss}, $V_{H(sat)}$)



● **$E_{Toffset}$, ATG_{Idle}, Gio :**
Set the following conditions and measure the input/output characteristics.

S_1	H_1^+	H_2^+	H_3^-	ED	RCC	DS
0.56Ω	H	L	L	5V	0V	0V

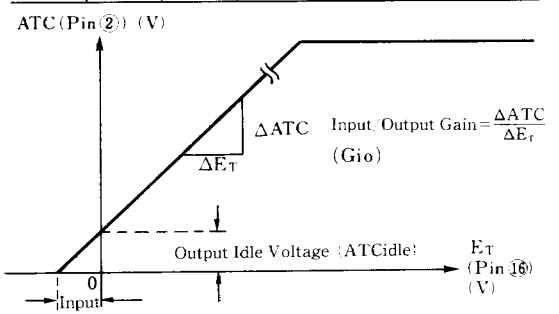


Fig.1 Input/Output Characteristics

● **E_T, V_{limit} :**
Set the following conditions and measure ATC voltage.

S_1	H_1^+	H_2^+	H_2^+	ED	E_T	RCC	DS
0.82Ω	H	L	L	0V	1V	0V	0V

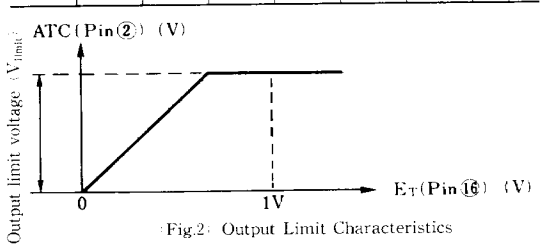


Fig.2 Output Limit Characteristics

● **ED_F, ED_R :**
Measure the ED threshold according to the following conditions.

S_1	H_1^+	H_2^+	H_3^+	E_T	RCC	DS
0.56Ω	H	L	L	0.56V	0V	0V

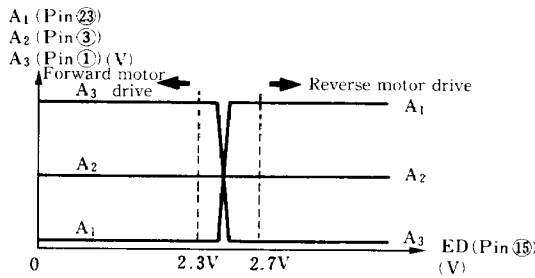


Fig.3 ED Threshold

● **DS_{on}, DS_{OFF} :**
Measure DS threshold according to the following condtions.

S_1	H_1^+	H_2^+	H_3^+	E_T	ED	R_{CC}
0.56Ω	H	L	L	0.56V	5V	0V

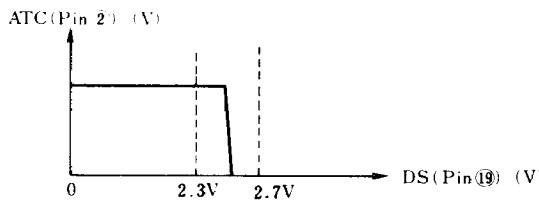


Fig.4 DS Threshold

● **RCC_{ON}, RCC_{OFF} :**
Set the following conditions and measure RCC threshold.

S_1	H_1^+	H_2^+	H_3^+	E_T	ED	DS
0.56Ω	H	M	L	0.056V	5V	0V

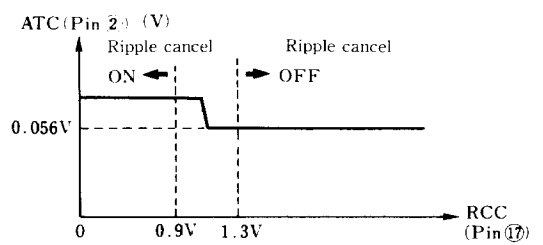
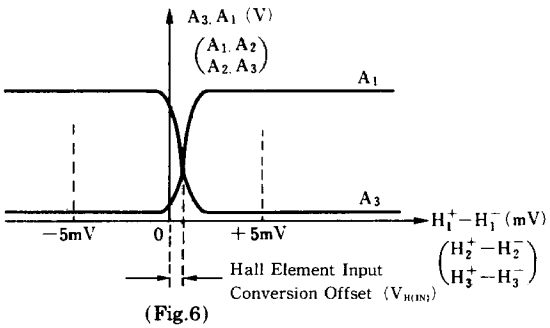


Fig.5 RCC Threshold

● $V_{H(IN)}$:
Set the following conditions and measure the Hall element input conversion offset.

S_1	H_1^+	H_2^+	H_2^+	E_T	ED	DS	RCC	Test Point
	H→L	H	L					A3,A1
0.56Ω	L	L→H	H	0.056V	5V	0V	0V	A1,A2
	H	L	L→H					A2,A3



(Fig.6)

● V_{loss} :
(1) Set the following conditions.

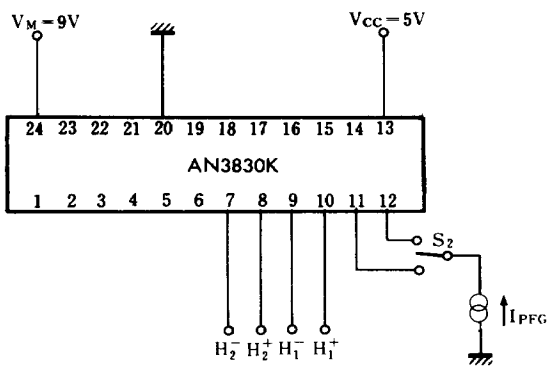
S_1	H_1	H_2	H_3	E_T	ED	DS	RCC
0.56Ω	H	L	L	0.56V	0V	0V	0V

(2) Adjust V_M value so as to be $V_{N(sat)}+V_{P(sat)}=2.6V$.
$V_{N(sat)}=V_{A1}-V_{ATC}$
$V_{P(sat)}=V_M-V_{A3}$
$V_{loss}=V_{N(sat)}+V_{p(sat)}$
(3) Measure the voltage between middle point and A_2 to check that the output transistor of A_2 is not turned ON.

● $V_{N(sat)}$:
Measure the voltage between collector and emitter of output transistor on ground side.

S_1	H_1^+	H_2^+	H_3^+	E_T	ED	DS	RCC	Test Point
	H	L	L					A_1−ATC
0.56Ω	L	H	L	0.56V	0V	0V	0V	A_2−ATC
	L	L	H					A_3−ATC

Test Circuit 3 ($PFG_{(H)}$, $PFG_{(L)}$)

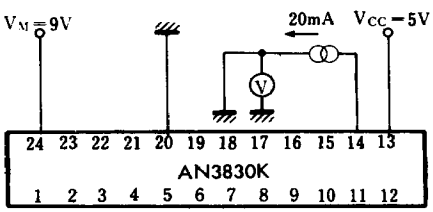


● $PFG_{(H)}$,$PFG_{(L)}$:
Set the following conditions and measure High Level and Low Level of PFG 1 and PFG 2 respectively.

H_1^+	H_1^-	H_2^+	H_2^-	S_2	I_{PFG}	Test Point
H	M	L	M	PFG1	−100μA	PFG1
L	M	L	M	PFG1	1mA	PFG1
L	M	H	M	PFG2	−100μA	PFG2
L	M	L	M	PFG2	1mA	PFG2

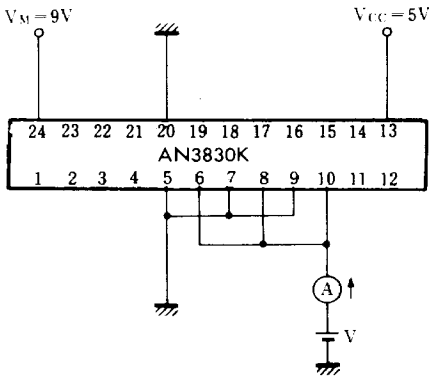
Provided, H : 1.9V M : 1.7V L : 1.5V

Test Circuit 4 (V_H^+)

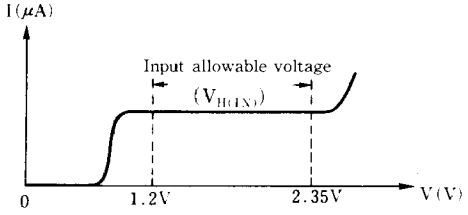


V_H^+ : Measure an electric potential of Pin⑲ from which 20mA is drawn out.

Test Circuit 5 ($V_{H(IN)}$)

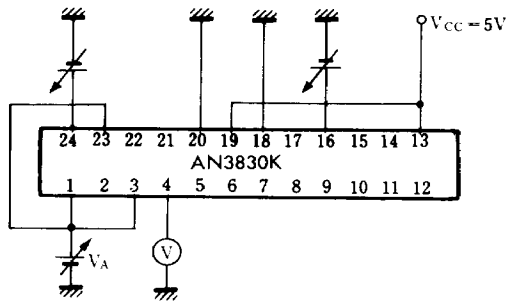


● $V_{H(IN)}$:
Measure the Hall element input allowable voltage at the circuit above.

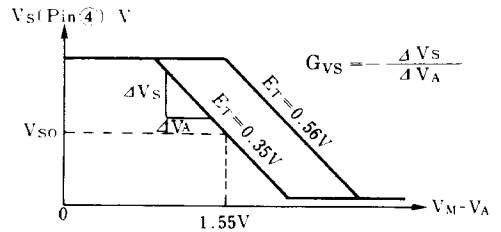


(Fig.7) Hall Element Input Allowable Voltage

Test Circuit 6 (G_{VS}, V_{SO})



● G_{VS}, V_{SO} :
Measure the values of gain ($G_{VS} = \Delta V_S / \Delta V_A$) for V_M = 9V and V_S for E_T = 0.35V and $V_M - V_A$ = 1.55V



(Fig.8) Output Characteristics for Saturation Detect on V_{CC} Side

■ Pin

Pin No.	Pin Name	Pin No.	Pin Name
1	(A3) Drive Output 3	13	(V_{CC}) Power Source
2	(ATC) Current Output	14	(V_H+) H.E. Power Supply
3	(A2) Drive Output 2	15	(ED) Direction Control
4	(V_S) V_{CC} Detect	16	(E_T) Torque Control
5	(H_3−) H.E. Input	17	(RCC) Torque Ripple Cancel Control
6	(H_3+) H.E. Input	14	(PCV) Voltage Feedback Phase Compensation
7	(H_2−) H.E. Input	19	(DS) Disable
8	(H_2+) H.E.Input	20	GND
9	(H_1−) H.E. Input	21	(PCI) Current Feedback Phase Compensation
10	(H_1+) H.E. Input	22	(CS) Current Detection
11	(PFG1) PFG Output 1	23	(A1) Drive Output 1
12	(PFG2) PFG Output 2	24	(V_M) Motor Power