AN3830K

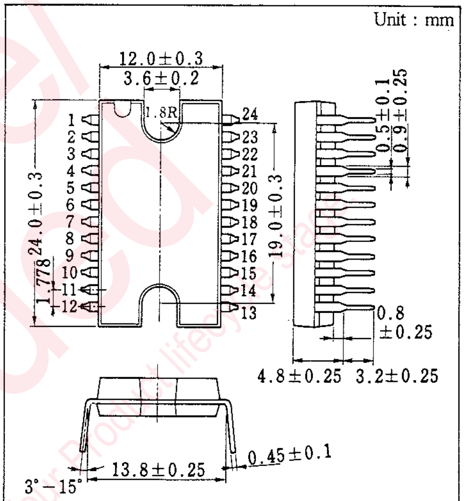
VTR Reel Direct-Drive Motor Drive Circuit

■ Outline

The AN3830K is an integrated circuit designed for a VTR reel direct-drive motor drive.

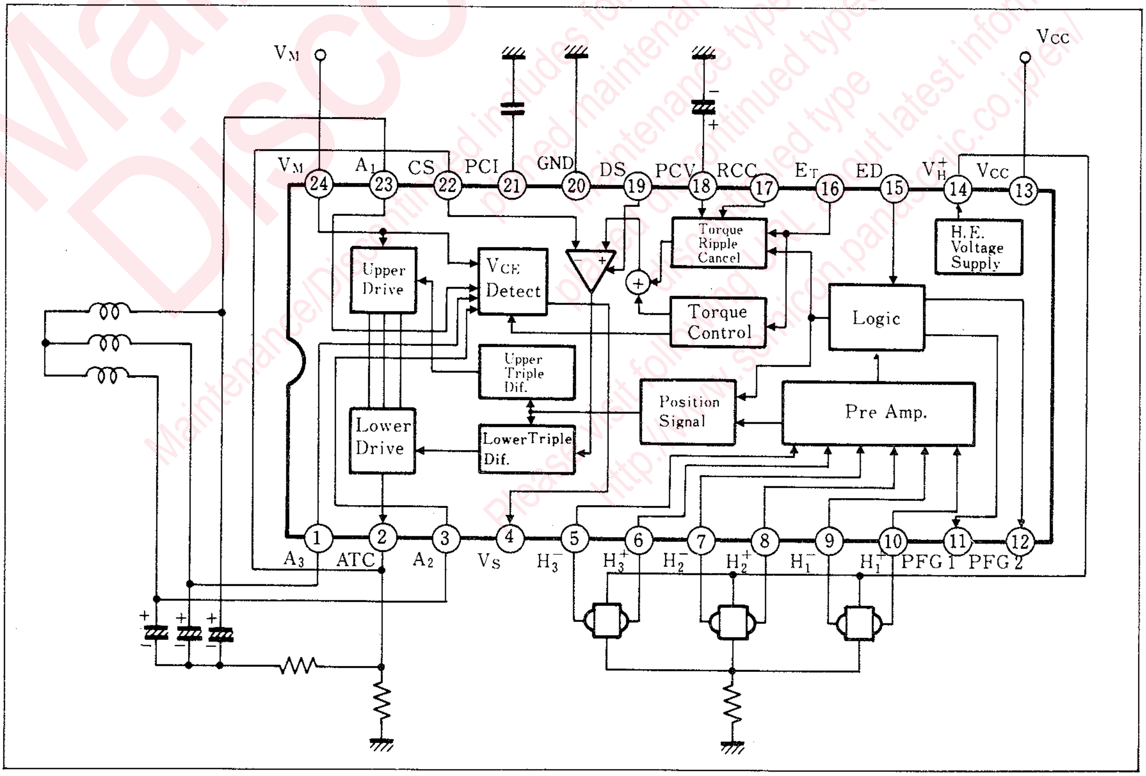
■ Features

- Three-phase full-wave operation
- Built-in torque ripple canceller
- Built-in power transistor
- Forward or reverse motor drive, brake and stop



24-Lead Shrunk DIL Plastic Package (Power Type)

■ Block Diagram



■ Absolute Maximum Ratings (Ta=25℃)

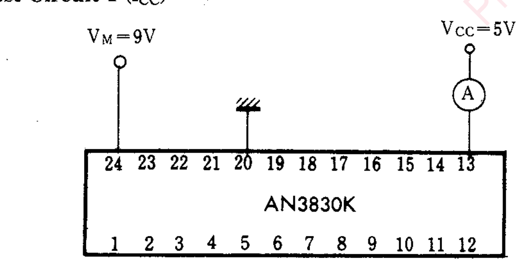
Item	Symbol	Rating	Unit
Supply voltage	V_{CC}	6.0	V
Motor Supply Voltage	V_{24}	24	V
Motor Drive Voltage	I_1, I_3, I_{23}	±1.5	A
Output Terminal Voltage	V_1, V_3, V_{23}	24	V
Power Dissipation	P_D	2000	mW
Operating Ambient Temperature	T_{opr}	−20～+70	℃
Storage Temperature	T_{stg}	−55～+150	℃

■ Electrical Characteristics (Ta=25℃)

Item	Symbol	Test Circuit	Condition	min.	typ.	max.	Unit
Supply Current	I_{CC}	1	V_{CC}=5V, V_M=9V (Hall Element Current Excluded)	5		15	mA
Torque Command Voltage	E_T	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_{limit}	2	V_{CC}=5V	0.65		0.84	V
Forward Command Voltage	ED_F	2	V_{CC}=5V			2.3	V
Reverse 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
PFG 1. PFG 2 Output Voltage(H)	$PFG_{(H)}$	3	V_{CC}=5V, I_{PFG}=−100μA	2.8			V
PFG 1. PFG 2 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 Offset Referred to Input	$V_{H(offset)}$	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
Lower Saturation Voltage	$V_{N(sat)}$	2	V_{CC}=5V, E_T=0.56V, I_O=1A			1.4	V
Upper Saturation Detection Output Gain	G_{VS}	6	V_{CC}=5V	2.2		2.9	times
Upper Saturation Detection Output	V_{SO}	6	V_{CC}=5V, E_T=0.35V, $V_{M\text{-}AI}$=1.55V	2		3	V

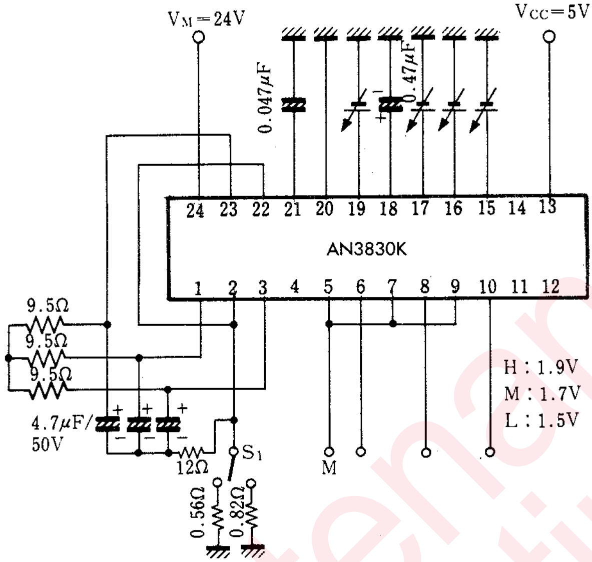
Note) Operating Supply Voltage : $V_{CC(opr)}$=4.5 to 5.5V

Test Circuit 1 (I_{CC})



Icc: Measure the current flowing in from the Vcc terminal.

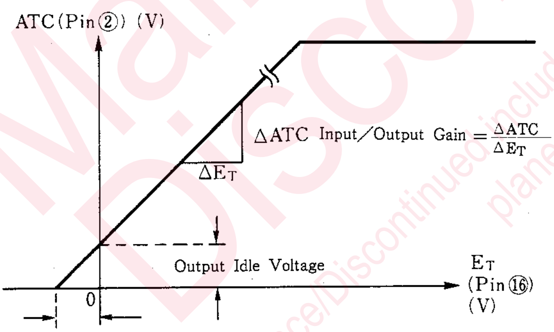
Test Circuit 2 (E_T, $E_{Toffset}$, ATC_{idle}, G_{io}, V_{limit}, ED_F, ED_R, DS_{ON}, DS_{OFF}, RCC_{ON}, RCC_{OFF}, $V_{H(offset)}$, V_{loss}, $V_{H(sat)}$)



• $E_{Toffset}$, ATG_{idle} and Gio:

Measure the input/output characteristic under the following conditions

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

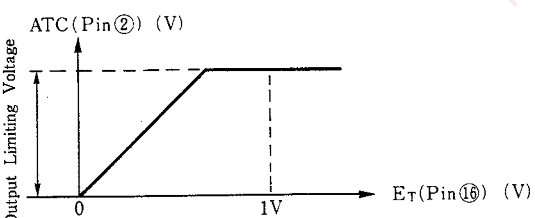


(Fig.1) Input/Output Characteristic

• E_T and V_{limit}

Measure the ATC voltage under the following conditions.

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

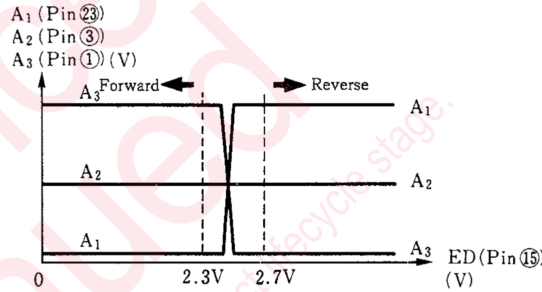


(Fig.2) Output Limit Voltage

• ED_F and ED_R

Measure the ED threshold under the following conditions.

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

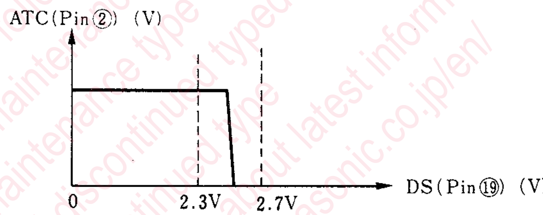


(Fig.3) ED Threshold

• DS_{on} and DS_{OFF}:

Measure the DS Threshold under the following conditions.

S_1	H_1^+	H_2^+	H_3^+	E_T	ED	Rcc
0.56Ω	H	L	L	0.56V	5V	0V

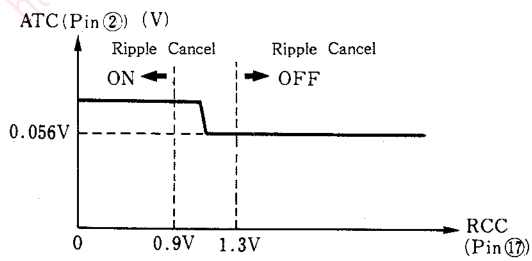


(Fig.4) Ds Threshold

• RCC_{ON} and RCC_{OFF}:

Measure the RCC threshold under the following conditions.

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

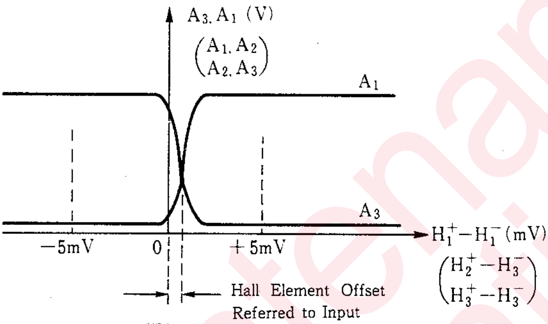


(Fig.5) RCC Threshold

• $V_{H(IN)}$:

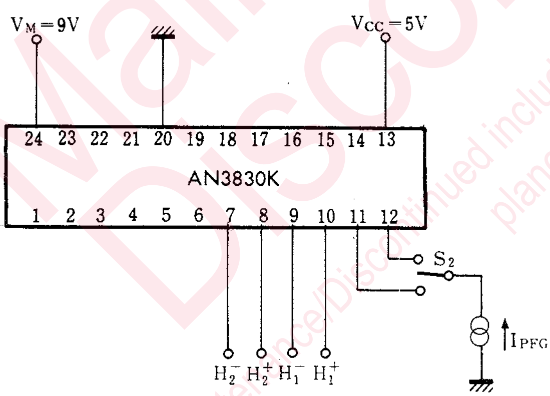
Measure the Hall element offset referred to input under the following conditions.

S_1	H_1^+	H_2^+	H_3^+	E_T	ED	DS	RCC	Mesuring Points
0.56Ω	H→L	H	L	0.056V	5V	0V	0V	A3, A1
	L	L→H	H					A1, A2
	H	L	L→H					A2, A3



(Fig.6)

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



• $PFG_{(H)}$ and $PFG_{(L)}$:

Measure the High levels and the Low Levels of PFG1 and PFG2 under the following conditions.

H_1^+	H_1^-	H_2^+	H_2^-	S_2	I_{PFG}	Measuring Points
H	M	L	M	PF	-100μA	PFG1
L	M	L	M	PFG1	1mA	PF
L	M	H	M	PFG2	-100μA	PFG2
L	M	L	M	PFG2	1mA	PFG2

Where H=1.9V. M=1.7V and L=1.5V.

• 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)Regulate the V_M value is regulated so that

$V_{N(sat)} + V_{p(sat)} = 2.6V$.

$V_{N(sat)} = V_{A1} - V_{ATC}$

$V_{p(sat)} = V_M - V_{A3}$

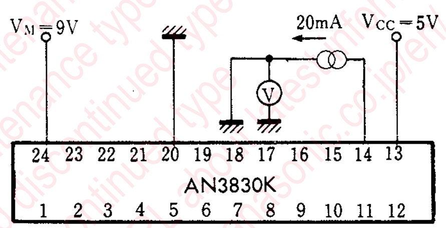
$V_{loss} = V_{N(sat)} + V_{p(sat)}$

(3)Measure the voltage between the middle point and A_2 and confirm that the A_2 output transistor is not ON.

• $V_{N(sat)}$: Measure the collector to emitter voltage of the lower output transistor under the following conditions.

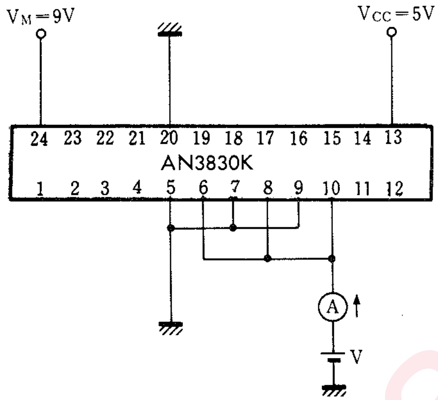
S_1	H_1^+	H_2^+	H_3^+	E_T	ED	DS	RCC	Measuring Point
0.56Ω	H	L	L	0.56V	0V	0V	0V	A_1-ATC
	L	H	L					A_2-ATC
	L	L	H					A_3-ATC

Test Circuit 4 (V_H^+)

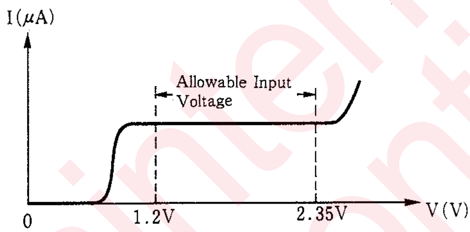


V_H^+: Measure the Pin⑭ electric potential when Pin⑭ is connected at 20mA.

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

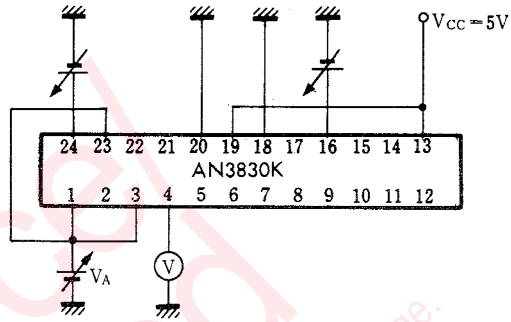


• $V_{H(IN)}$: Measure the Hall element allowable input voltage in the above circuit.



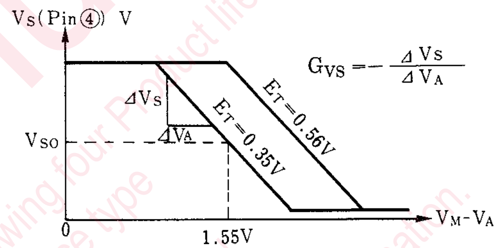
(Fig.7) Hall Element Input Allowable Voltage

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



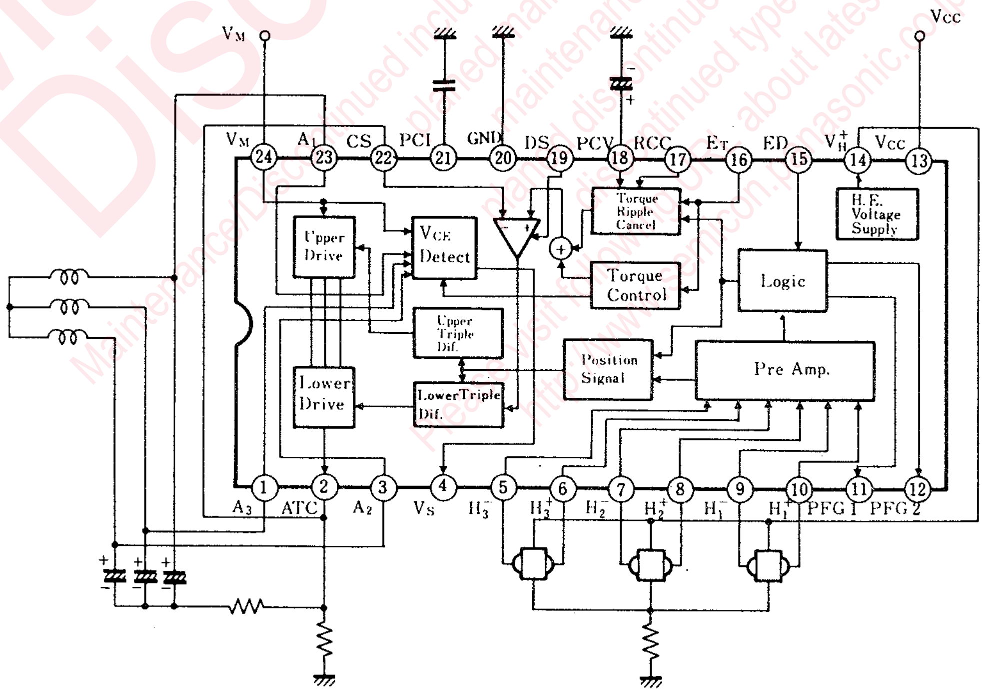
• G_{VS} and V_{so}:

Measure the V_s value when V_M=9V, Gain $G_{vs}=\Delta V_s/\Delta V_A$, E_T=0.35V, and V_M-V_A=1.55 V.



(Fig.8) Upper Saturation Detection Output Characteristic

■ Application Circuit



■ 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) Control
5	(H_3^-) H.E. Input	17	(RCC) Torque Ripple Cancel Control
6	(H_3^+) H.E. Input	18	(PCV) Voltage Loop Phase Compensation
7	(H_2^-) H.E. Input	19	(DS) Disable
8	(H_2^+) H.E. Input	20	(GND) GND
9	(H_1^-) H.E. Input	21	(PCI) Current Loop Phase Compensation
10	(H_1^+) H.E. Input	22	(CS) Current Detection
11	(PFG1) PFG Output 1	23	(AI) Drive Output 1
12	(PFG1) PFG Output 1	24	(V_M) Motor Power

Request for your special attention and precautions in using the technical information and semiconductors described in this book

(1) If any of the products or technical information described in this book is to be exported or provided to non-residents, the laws and regulations of the exporting country, especially, those with regard to security export control, must be observed.

(2) The technical information described in this book is intended only to show the main characteristics and application circuit examples of the products. No license is granted in and to any intellectual property right or other right owned by Panasonic Corporation or any other company. Therefore, no responsibility is assumed by our company as to the infringement upon any such right owned by any other company which may arise as a result of the use of technical information described in this book.

(3) The products described in this book are intended to be used for standard applications or general electronic equipment (such as office equipment, communications equipment, measuring instruments and household appliances).
Consult our sales staff in advance for information on the following applications:
- Special applications (such as for airplanes, aerospace, automobiles, traffic control equipment, combustion equipment, life support systems and safety devices) in which exceptional quality and reliability are required, or if the failure or malfunction of the products may directly jeopardize life or harm the human body.
- Any applications other than the standard applications intended.

(4) The products and product specifications described in this book are subject to change without notice for modification and/or improvement. At the final stage of your design, purchasing, or use of the products, therefore, ask for the most up-to-date Product Standards in advance to make sure that the latest specifications satisfy your requirements.

(5) When designing your equipment, comply with the range of absolute maximum rating and the guaranteed operating conditions (operating power supply voltage and operating environment etc.). Especially, please be careful not to exceed the range of absolute maximum rating on the transient state, such as power-on, power-off and mode-switching. Otherwise, we will not be liable for any defect which may arise later in your equipment.
Even when the products are used within the guaranteed values, take into the consideration of incidence of break down and failure mode, possible to occur to semiconductor products. Measures on the systems such as redundant design, arresting the spread of fire or preventing glitch are recommended in order to prevent physical injury, fire, social damages, for example, by using the products.

(6) Comply with the instructions for use in order to prevent breakdown and characteristics change due to external factors (ESD, EOS, thermal stress and mechanical stress) at the time of handling, mounting or at customer's process. When using products for which damp-proof packing is required, satisfy the conditions, such as shelf life and the elapsed time since first opening the packages.

(7) This book may be not reprinted or reproduced whether wholly or partially, without the prior written permission of our company.

20080805