ICs for Motor   **Panasonic**

AN3840NSR

VTR Capstan-Drive IC

■ Overview

The AN3840NSR is an IC for driving the VTR capstan motor.

The reduction of acoustic noise, vibration and torque ripple of motor can be realized.

■ Features

- Output transistor built-in
- Torque ripple cancellation circuit built-in
- Overlap drive
- Output terminal electrolytic capacitor not required
- Thermal protection circuit built-in
- Output maximum current of 1.5 A
- Copper block with good heat radiation built-in

AN3840NSR   Unit : mm

24-pin SOP Package (HSOP024-P-0450)
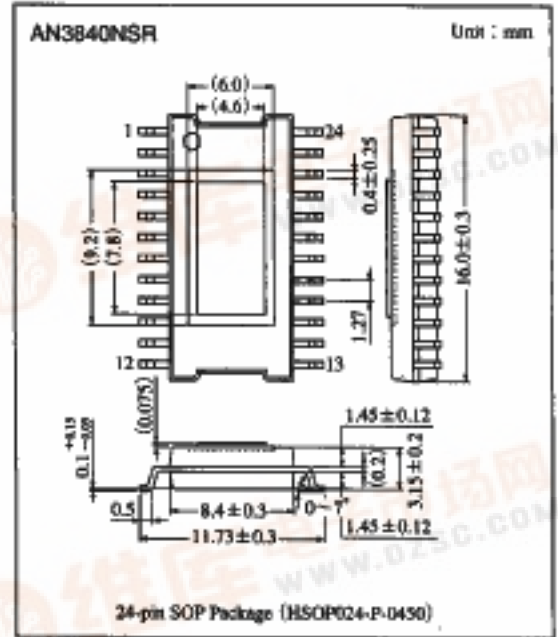
■ Function Block Diagram
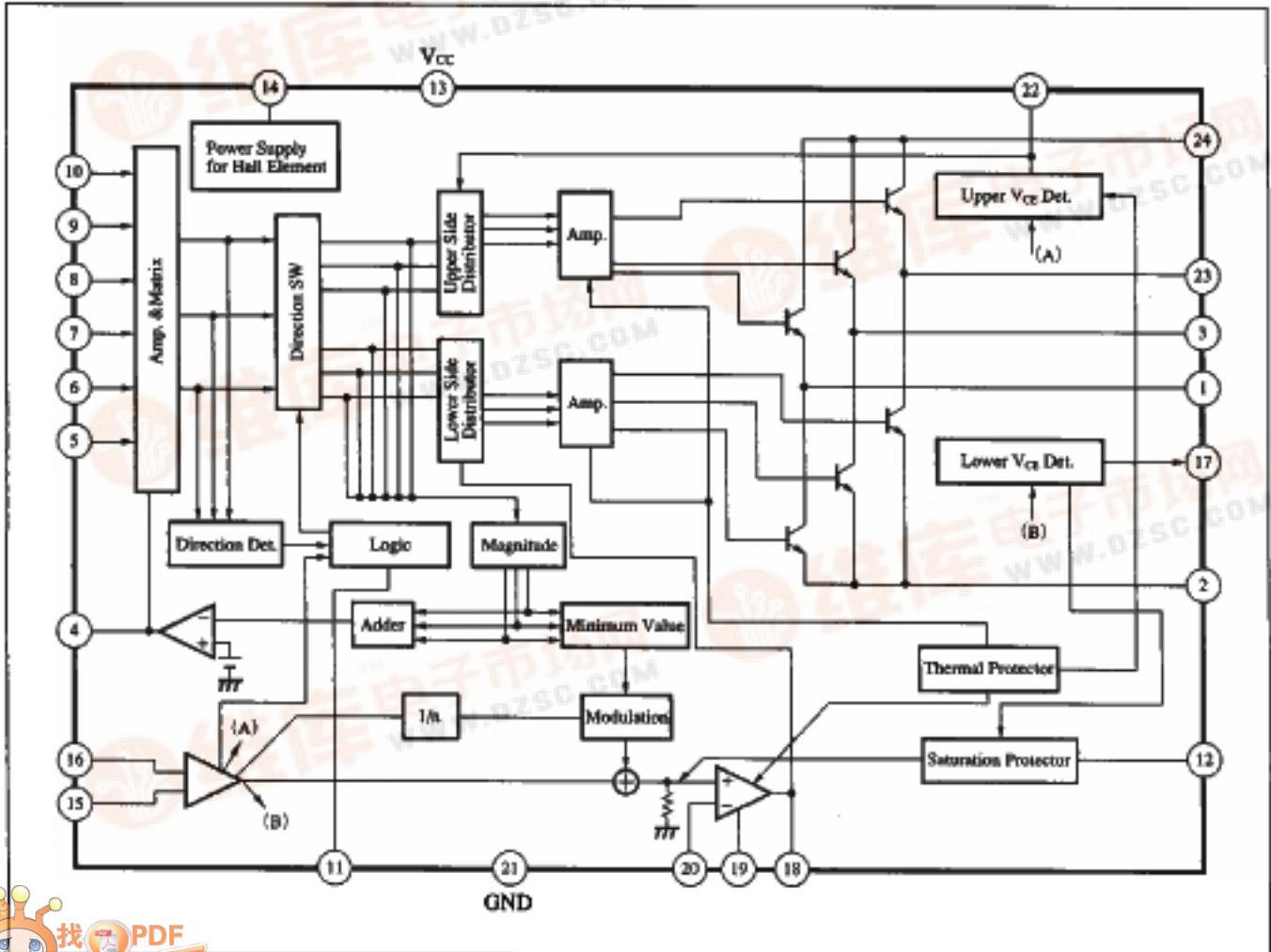
ICs for Motor

■ Absolute Maximum Rating (Ta＝25℃)

Parameter	Symbol	Rating	Unit
Supply voltage	V_{CC}	6	V
Motor supply voltage	V_2	20	V
Motor supply current Note 1)	I_n	±1.5	A
Output terminal voltage Note 1)	V_b	20	V
Terminal voltage Note 2)	V_m	V_{CC}	V
Terminal 14 current	I_{14}	−100	mA
Power dissipation	P_D	1400	mW
Operating ambient temperature	T_{opr}	−20 to +70	℃
Storage temperature	T_{stg}	−55 to +150	℃

Note 1) Pin No.＝1, 3, 23   Note 2) Pin No.＝5, 6, 7, 8, 9, 10, 11, 15, 16, 19

■ Recommended Operating Range (Ta＝25℃)

Parameter	Symbol	Range
Operating supply voltage	V_{CC}	4.5V to 5.5V
Motor supply current	V_M	6V to 18V

■ Electrical Characteristics (Ta＝25℃)

Parameter	Symbol	Condition	min	typ	max	Unit
Supply current	I_{CC}	Current of hall element power supply excluded	—	—	15	mA
Torque command reference voltage	ECR		2	—	3.5	V
Torque command voltage	EC		0.5	—	4	V
Torque command input offset voltage	EC_{offset}		−150	—	150	mV
Torque command dead zone	EC_{DZ}		50	—	150	mV
Output idle voltage	ATC_{idle}		—	—	4	mV
Input/Output gain	G_{io}		0.61	0.68	0.75	multiple
Output maximum voltage	ATC_{max}		0.75	—	—	V
Normal rotation command voltage	ED_F		—	—	0.9	V
Stop command voltage	ED_S		1.3	—	3	V
Reverse rotation command voltage	ED_R		3.5	—	—	V
Hall element input offset voltage	H_{offset}		−8	—	8	mV
Lower-side output voltage (1)	$V_{N(1)}$	ATC=68mV	0.44	—	0.88	V
Lower-side output voltage (2)	$V_{N(2)}$	E_{CR}=2.5V E_C=0.5V	2	—	3.5	V
TL-CS offset voltage	ΔTL	TL=600mV	5	—	40	mV
Ripple cancellation ratio	α	ATC=68mV ATC=47mV	4	—	18	%
Hall element supply voltage	VH^+	I_{VH}^+=−20mA	2.6	2.85	3.2	V
Hall element input allowable voltage	H_{in}		1.2	—	3.5	V
Switching supply control output	V_s	EC=ECR, V_M−A1=1.3V	2.1	2.5	2.9	V
Switching supply control output gain	G_{VS}		−3.4	—	−2.3	multiple
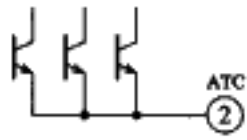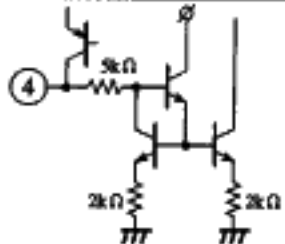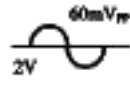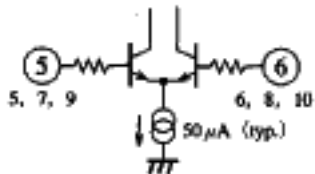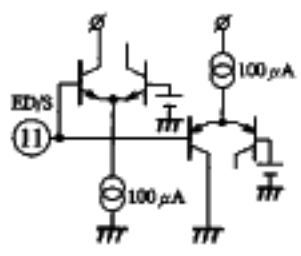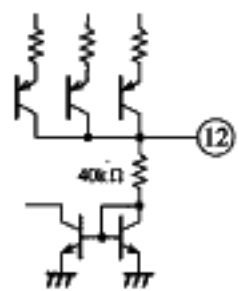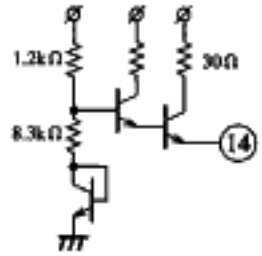
■ Application Diagram
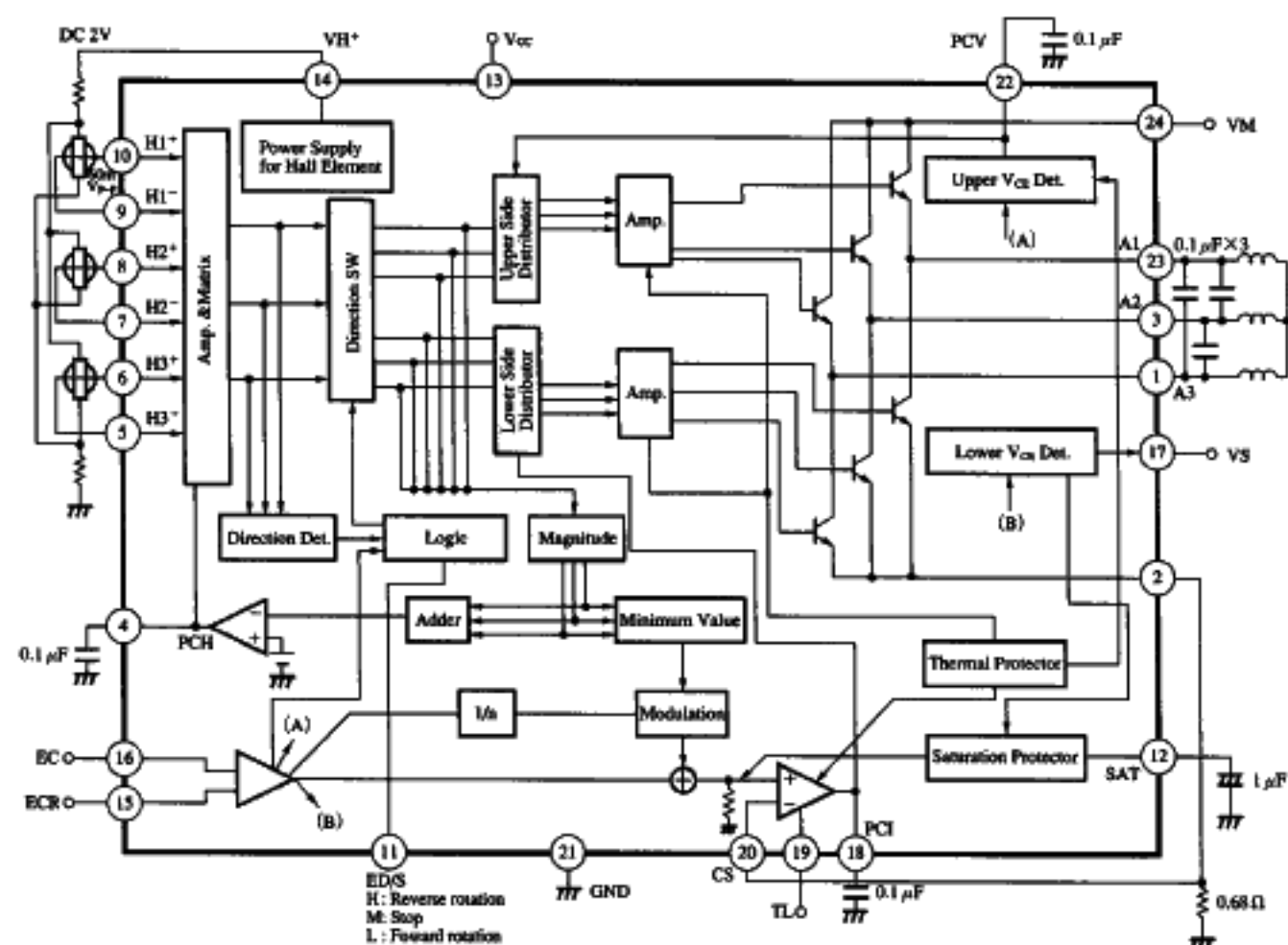
■ Pin Descriptions

Pin No.	Pin name	Standard waveform	Description	Equivalent circuit
1 3 23	A3:Drive output 3 A2:Drive output 2 A1:Drive output 1		Motor coil connected	

■ Pin Descriptions

Pin No.	Pin name	Standard waveform	Description	Equivalent circuit
2	ATC : Total current output		The total current of the output transistor is outputted.	
4	PCH : Hall amp. phase compensation		Terminal for phase compensation of AGC loop of Hall amp.	
5 6 7 8 9 10	H_3^- : Hall element input H_3^+ : Hall element input H_2^- : Hall element input H_2^+ : Hall element input H_1^- : Hall element input H_1^+ : Hall element input	60mV$_{pp}$ 2V	Hall Element output of motor is inputted.	
11	ED/S : Direction command input terminal		Terminal for directing the rotation direction and stop of the motor with 3-value input.	
12	SAT : Saturation prevention phase compensation		Terminal for phase compensation of the loop preventing the saturation of output transistor.	
13	V_{CC} : Power supply terminal		The terminal for inputting the supply voltage.	
14	V_H^+ : Hall element power supply		The terminal for outputting the supply voltage for Hall element.	

■ Pin Description (cont.)

Pin No.	Pin name	Standard waveform	Description	Equivalent circuit
15	ECR : Torque command reference input terminal		Terminal for inputting the reference voltage of torque command.	
16	EC : Torque command input terminal		Terminal for inputting the torque command voltage.	
17	V_S : Switching power supply control output		Terminal outputting the voltage proportional to V_{CE} of source side output transistor to control the switching power supply.	
18	PCI : Current feedback system phase compensation		Terminal for phase compensation of the system which controls the current of the sink side output transistor.	
19	TL : Torque limit terminal		Terminal setting the maximum voltage of the ATC terminal.	
20	CS : Current detection terminal		Terminal connected to the ATC terminal, for inputting the value which is current-detected by the resistor.	
21	GND :		Ground terminal	
22	PCV : Voltage feedback system phase compensation		Terminal for phase compensation of the system which controls the source side output transistor.	
24	V_M : Motor power supply terminal		Terminal inputting the motor power supply.	

■ Phase of Hall Input and Output Current

ED/S=0V, EC<ECR
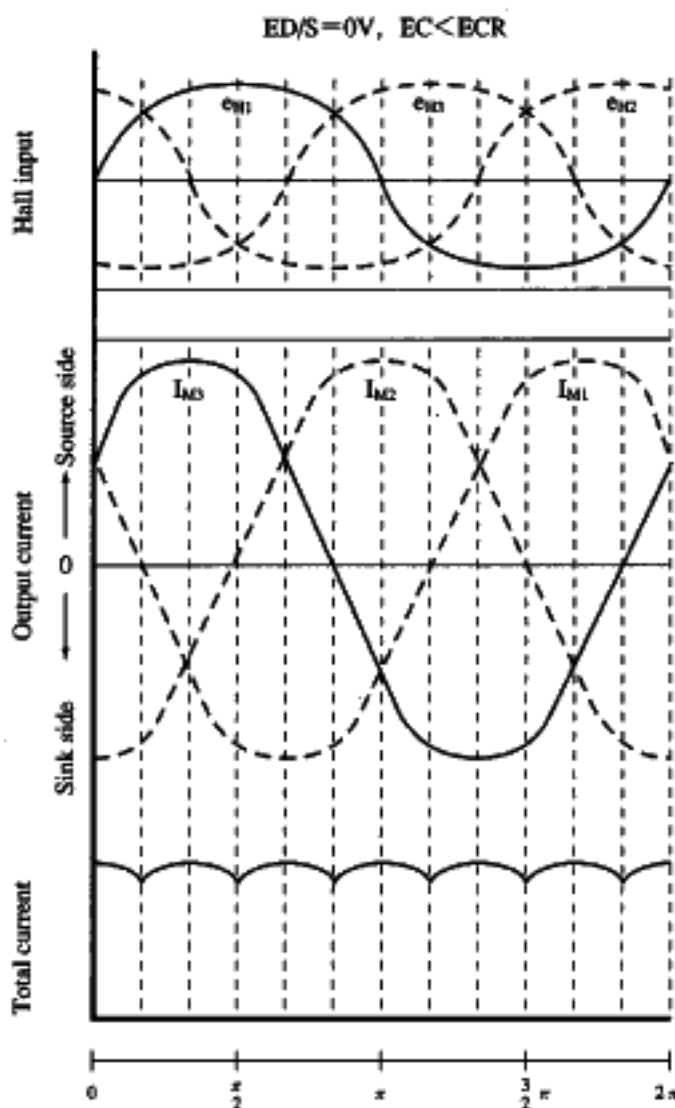
■ Torque Direction Setting Logic

The direction of generated torque is determined according to the following information.

· Information from the rotation direction detection circuit : $\overline{ER}$

High : $H_1 \rightarrow H_3 \rightarrow H_2$

· Brake information from the torque command circuit : $\overline{EA}$

High : BCR>EC

· Rotation direction command : $\overline{ED}$

High : $H_1 \rightarrow H_3 \rightarrow H_2$

∴ ED/S = 0V is set for $H_1 \rightarrow H_3 \rightarrow H_2$ (normal rotation)

· Direction of generated torque : $\overline{EP}$

Generated torque rotating in the direction : High : $H_1 \rightarrow H_3 \rightarrow H_2$

EP is determined by ER, EA and ED as follows :

$EP = ED \cdot EA + \overline{ER} \cdot \overline{EA}$

	$\overline{EA}$	EA		$\overline{EA}$
ED	H	H	H	L
$\overline{ED}$	H	L	L	L
	$\overline{ER}$		ER	

Carnot map of torque direction setting logic