

Stepping Motor Drive IC AN8495SB

■ Overview

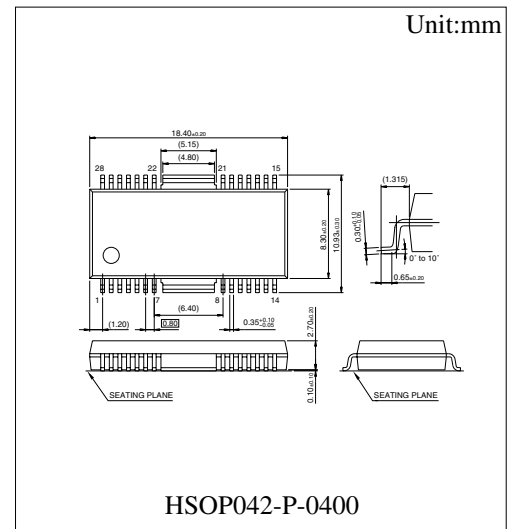
AN8495SB is a stepping-motor-driving IC, created by using a D-MOS process, and provides a maximum output of 30V at 1.5A. By the PWM drive and 2-bit constant-current-chopping-drive method, the winding 1-2 phase drive is possible.

■ Features

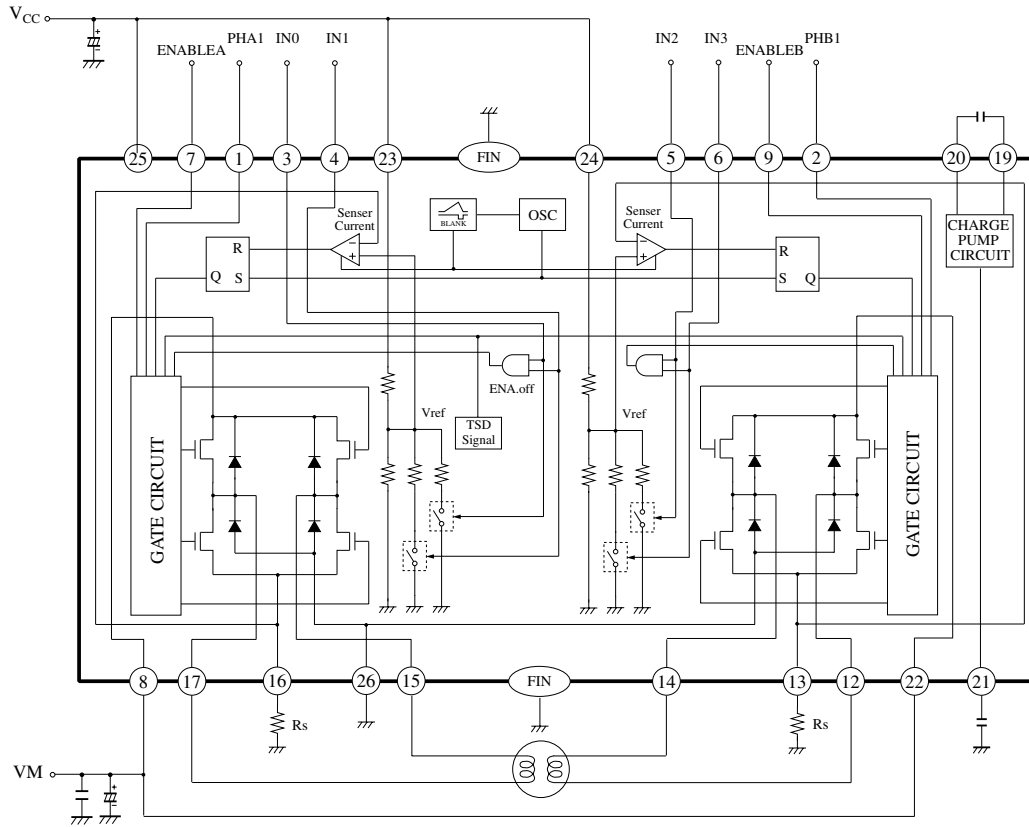
- 4-phase input (W1-2 phase excitation)
- 2-bit current level switching.
- Built-in noise canceler.
- Built-in phase-change thru-current protection function.
- Built-in flywheel diode

■ Applications

- Printer ● FAX ● PPC



■ Block Diagram



* A voltage is applied externally to Terminals PHA1, PHB1, IN0 to 3, ENABLEA, ENABLEB, VREFA and VREFV, and may cause an overcurrent. To protect the device from overcurrent, insert an overcurrent protective resistor (1KΩ or over).

■ Pin Description

Pin No.	Function	Pin No.	Function		
1	PHA1	A phase changeover terminal	16	RCSA	A phase current detector
2	PHB1	B phase changeover terminal	17	AOUT1	Motor drive A phase output 1
3	IN0	A phase output torque control 1	18	N.C	—
4	IN1	A phase output torque control 2	19	BC1	Capacitor for charge pump circuit 1
5	IN2	B phase output torque control 1	20	BC2	Capacitor for charge pump circuit 2
6	IN3	B phase output torque control 2	21	VPUMP	Charge pump circuit output
7	ENABLEA	A phase start/stop signal input	22	VM2	Supply terminal for Motor 2
8	VM1	Supply terminal for Motor 1	23	VREFA	A phase torque ref. voltage input
9	ENABLEB	B phase start/stop signal input	24	VREFB	B phase torque ref. voltage input
10	N.C	—	25	VCC	Supply terminal
11	N.C	—	26	GND	Signal GND
12	BOUT2	Motor drive B phase output 2	27	N.C	—
13	RCSB	B phase current detector	28	N.C	—
14	BOUT1	Motor drive B phase output 1	FIN	GND	Signal GND
15	AOUT2	Motor drive A phase output 2			

■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit	Note
Storage temperature	T_{stg}	-55 to +150	°C	1
Operating ambient temperature	T_{opr}	-20 to +70	°C	1
Supply voltage	V_{CC}	7.0	V	
Supply current	I_{CC}	30	mA	
Power dissipation	P_D	1.04	W	2
Motor supply voltage	V_{M1}/V_{M2}	30	V	Pin=8,22
Output voltage	V_{OUT}	30	V	Pin=12,14 15,17
Motor drive current	I_{OUT}	±1.5	A	
Flyhoile diode current	I_f	1.5	A	
Charge pump circuit voltage	V_{PUMP}	40	V	Pin=21

Note 1) $T_a=25^{\circ}\text{C}$ except storage temperature and operating ambient temperature.

Note 2) Power dissipation shows the value of only package at $T_a=70^{\circ}\text{C}$.

■ Recommended Operating Range

Operating supply voltage range	V_{CC}	4.75 V to 5.25 V
	V_M	18.0 V to 28.0 V

■ Electrical Characteristics ($T_a = 25^{\circ}\text{C} \pm 2^{\circ}\text{C}, V_{CC} = 5.0\text{ V}, V_M = 24\text{ V}$)

Parameter	Symbol	Condition	min	typ	max	Unit
Power block						
Output saturation voltage H	V_{OH}	$I = -1.0\text{ A}$	$V_M-0.75$	$V_M-0.5$	—	V
Output saturation voltage L	V_{OL}	$I = 1.0\text{ A}$	—	0.65	0.98	V
Flywheel diode forward voltage	V_{DI}	$I = 1.0\text{ A}$	0.5	1.0	1.5	V
Output leak current 1	I_{LEAK1}	$V_{OUT} = 30\text{ V}, V_{RCS} = 0\text{ V}$	—	10	50	μA
Circuit current						
Supply current (2-circuit ON)	I_{CC}	$\text{ENABLEA}=\text{ENABLEB} = 0\text{ V}$	—	5	9.5	mA
I/O block						
IN “H” input voltage	V_{INH}		2.0	—	V_{CC}	V
IN “L” input voltage	V_{INL}		GND	—	0.6	V
IN “H” input current	I_{INH}	$V_{IN} = 5\text{ V}$	-10	0	10	μA
IN “L” input current	I_{INL}	$V_{IN} = 0\text{ V}$	-80	-40	-20	μA
PHA1,PHB1 “H” input voltage	$V_{PHAH/PHBH}$		2.0	—	V_{CC}	V
PHA1,PHB1 “L” input voltage	$V_{PHAL/PHBL}$		GND	—	0.6	V
PHA1,PHB1 “H” input current	$I_{PHAH/PHBH}$	$\text{PHA1} = \text{PHB1} = 5\text{ V}$	-10	0	10	μA
PHA1,PHB1 “L” input current	$I_{PHAL/PHBL}$	$\text{PHA1} = \text{PHB1} = 0\text{ V}$	-150	-100	-50	μA

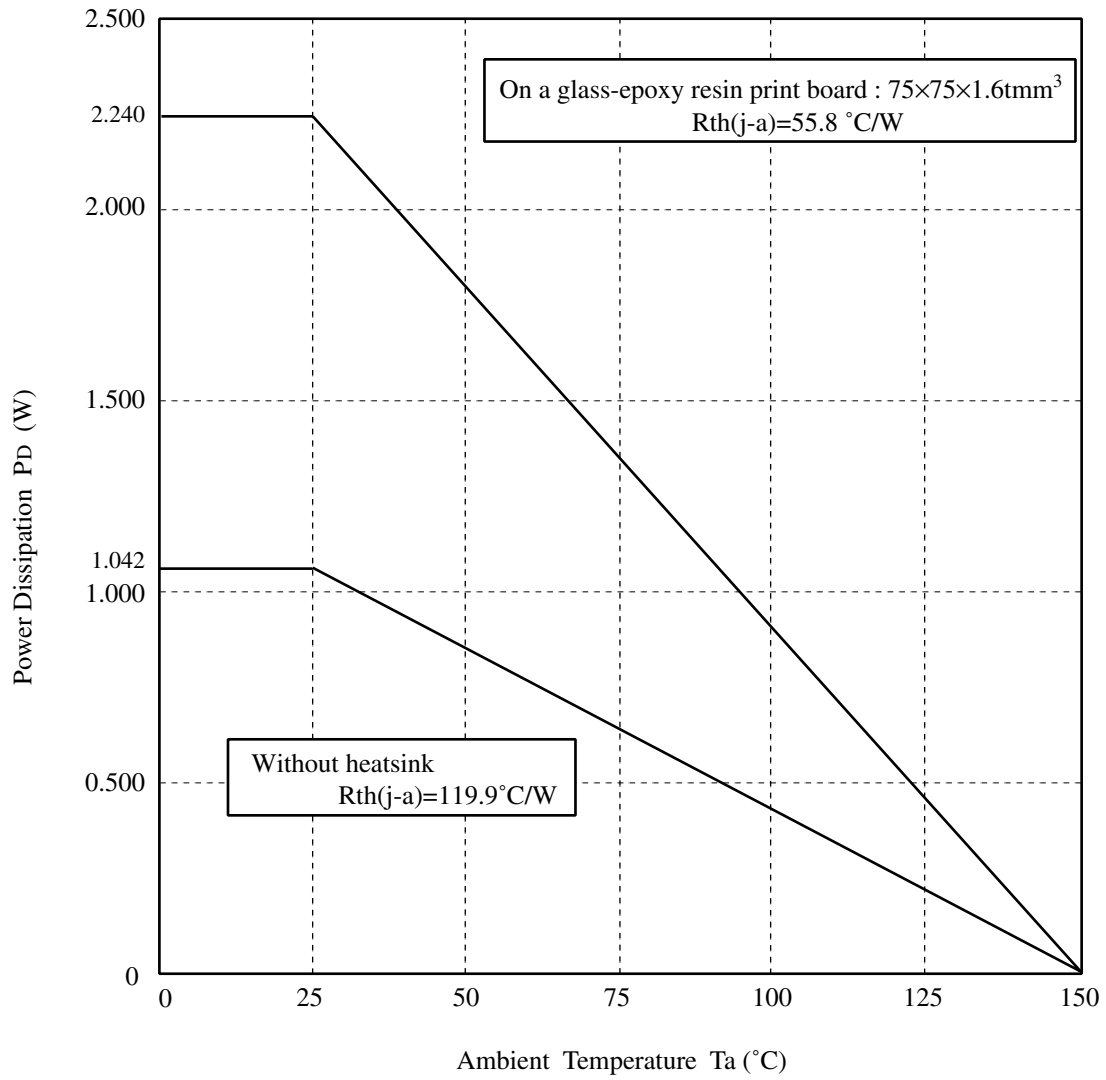
■ Electrical Characteristics (Ta = 25 °C ± 2 °C, V_{CC} = 5.0 V, V_M = 24 V)

Parameter	Symbol	Condition	min	typ	max	Unit
I/O block (continue)						
ENABLEA,ENABLEB “H” input voltage	V _{ENABLEAH} V _{ENABLEBH}		2.0	—	V _{CC}	V
ENABLEA,ENABLEB “L” input voltage	V _{ENABLEAL} V _{ENABLEBL}		GND	—	0.6	V
ENABLEA,ENABLEB “H” input current	I _{ENABLEAH} I _{ENABLEBH}	ENABLEA = ENABLEB = 5 V	-10	0	10	μA
ENABLEA,ENABLEB “L” input current	I _{ENABLEAL} I _{ENABLEBL}	ENABLEA = ENABLEB = 0 V	-15	-2	15	μA
Control block						
Input bias current	I _{REFA/REFB}	V _{REFA} = V _{REFB} = 5 V	67	90	150	μA
PWM frequency	f _{PWM}		50.2	67	83.8	kHz
Pulse blanking time	T _B	V _{REFA} = V _{REFB} = 0 V	1.0	2.0	3.0	μs
Comparator threshold H(100%)	V _{T_H}	IN0=IN1=0 V,IN2=IN3=0 V	0.479	0.503	0.528	V
Comparator threshold C(67%)	V _{T_C}	IN0=5V,IN1=0V,IN2=5V,IN3=0V	0.305	0.330	0.356	V
Comparator threshold L(33%)	V _{T_L}	IN0=0V,IN1=5V,IN2=0V,IN3=5V	0.151	0.167	0.185	V

■ Electrical Characteristics (Reference Data for Designing)

Parameter	Symbol	Condition	min	typ	max	Unit
Output block						
Output slew rate 1	V _{T_r}	Rise time	—	240	—	V/μs
Output slew rate 2	V _{T_f}	Fall time	—	-240	—	V/μs
Dead time	T _D		—	1.5	—	μs
Thermal shutdown						
Thermal shutdown temperature	TSD _{on}		—	150	—	°C
Thermal shutdown hysteresis	ΔTSD		—	36	—	°C

■ Package Dissipation



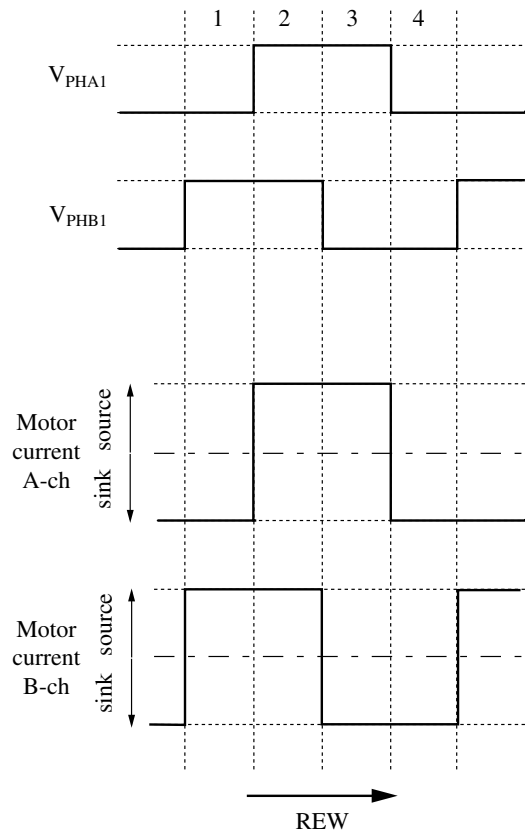
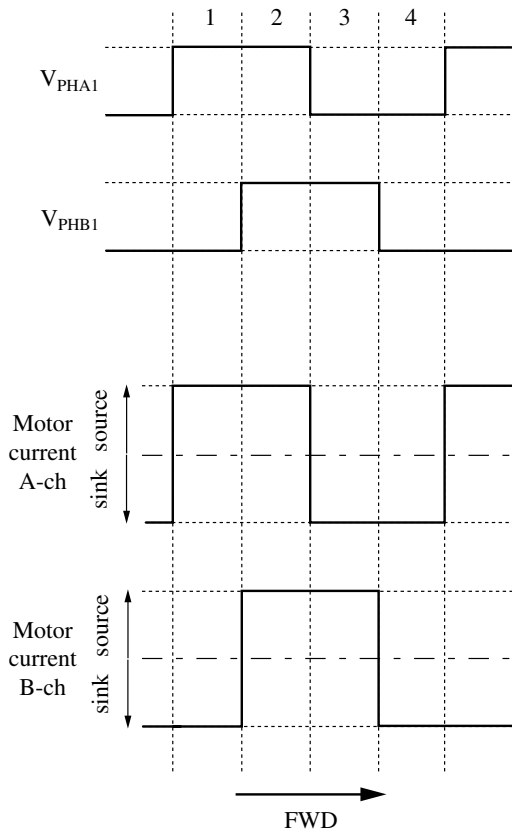
■ Logic Table

ENABLEA/B	PHA1/PHB1	AOUT1/BOUT1	AOUT2/BOUT2
L	H	H	L
L	L	L	H
H	-	OFF	OFF

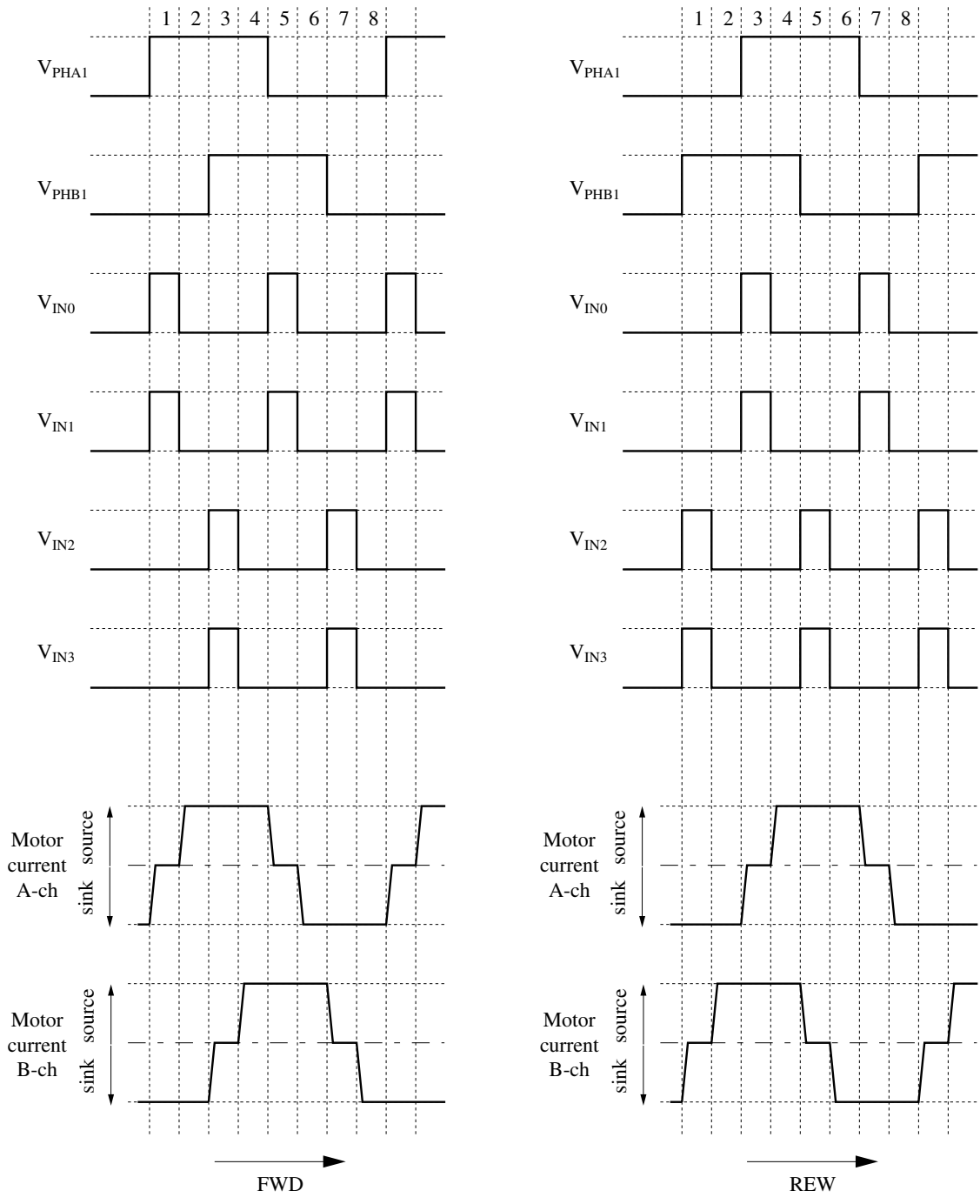
IN0/IN2	IN1/IN3	Output current
L	L	$V_{ref}/(10 \times R_s) = I_{out}$
H	L	$V_{ref}/(15 \times R_s) = I_{out} \times 2/3$
L	H	$V_{ref}/(30 \times R_s) = I_{out} \times 1/3$
H	H	0

■ Full Step (4 step sequence)

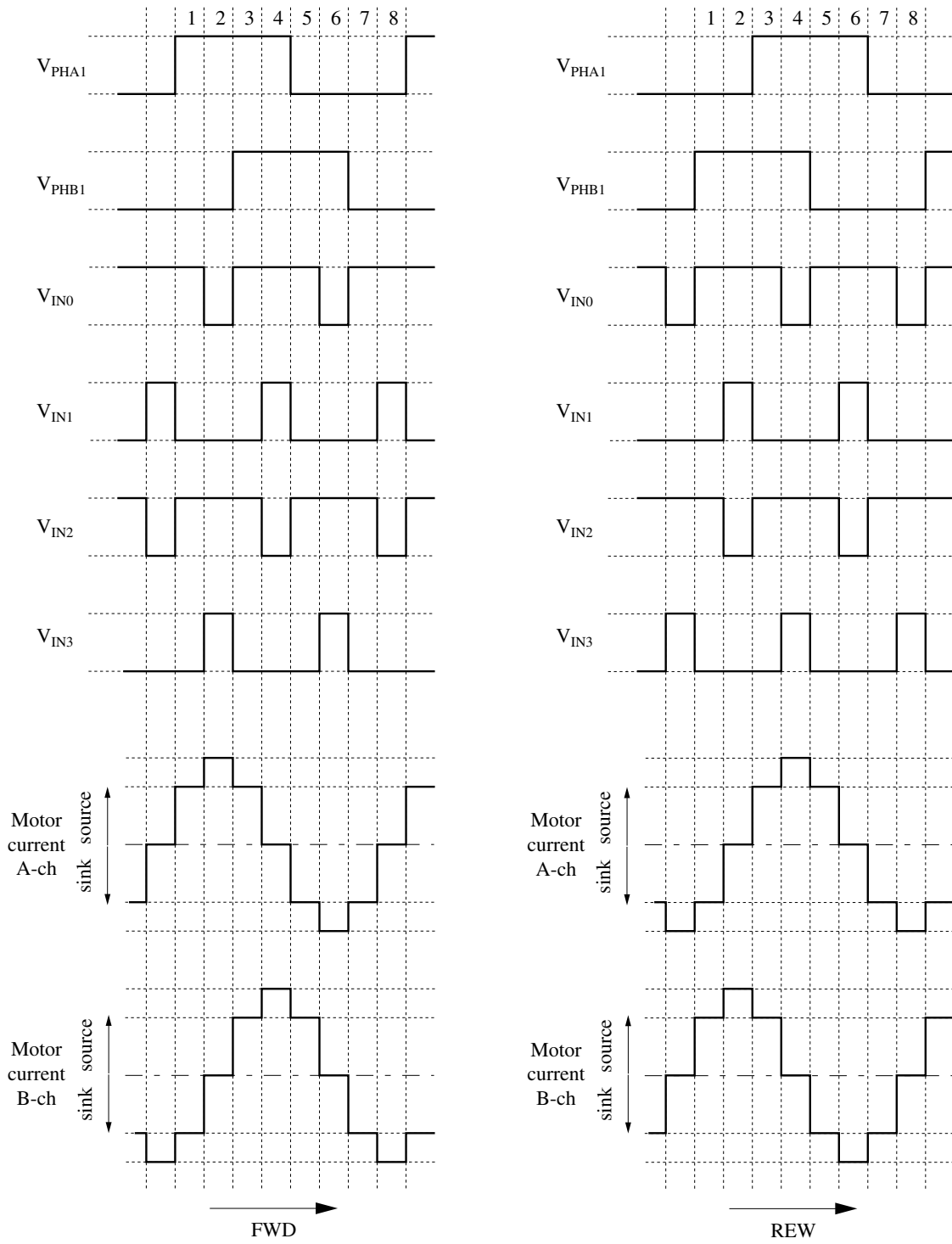
(IN0 to IN3 = const.)



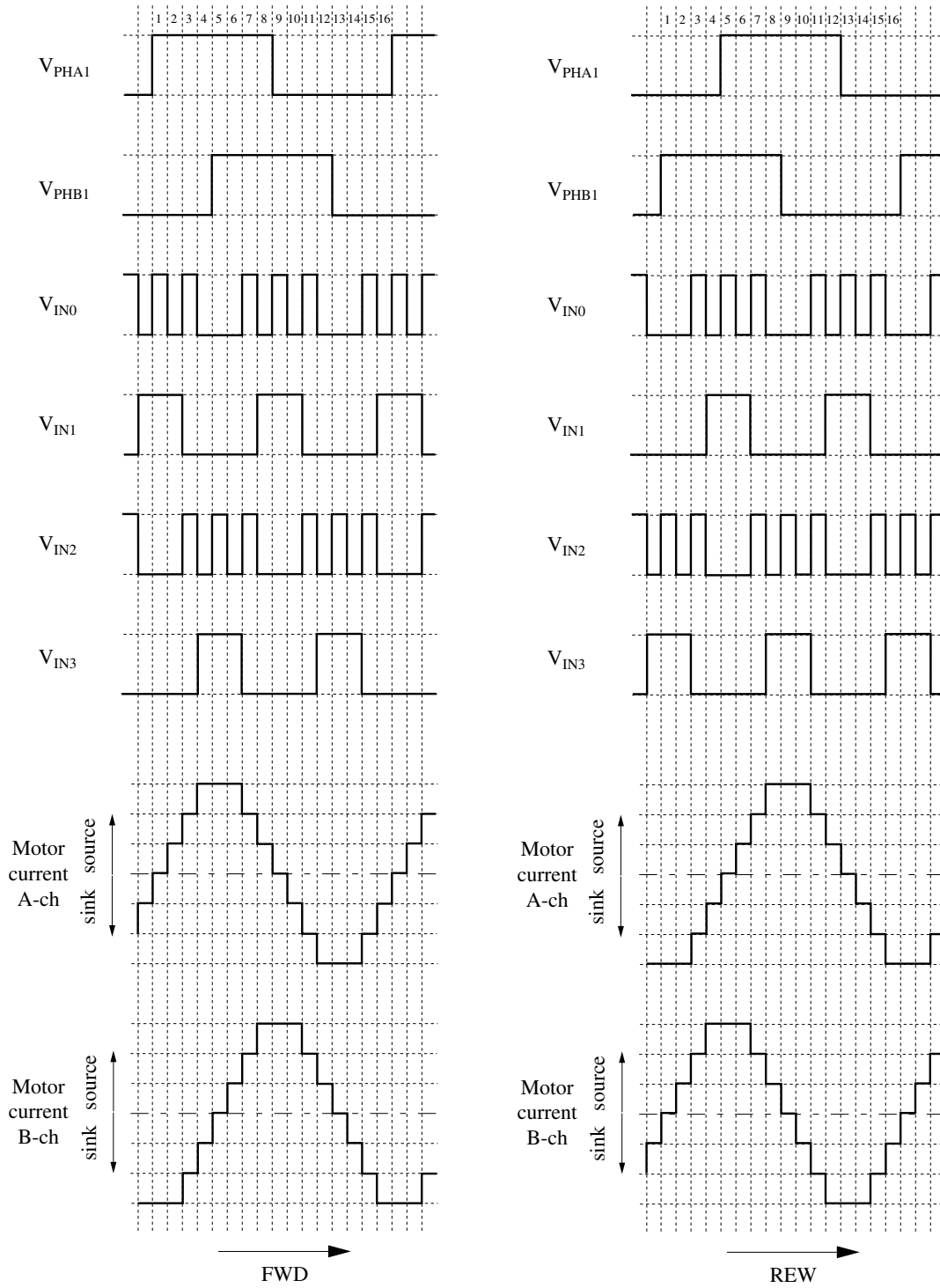
■ Half Step (8 step sequence)
(EX.)



■ 1-2 Phase Excitation (8 step sequence)



■ W1-2 Phase Excitation (16 step sequence)



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