

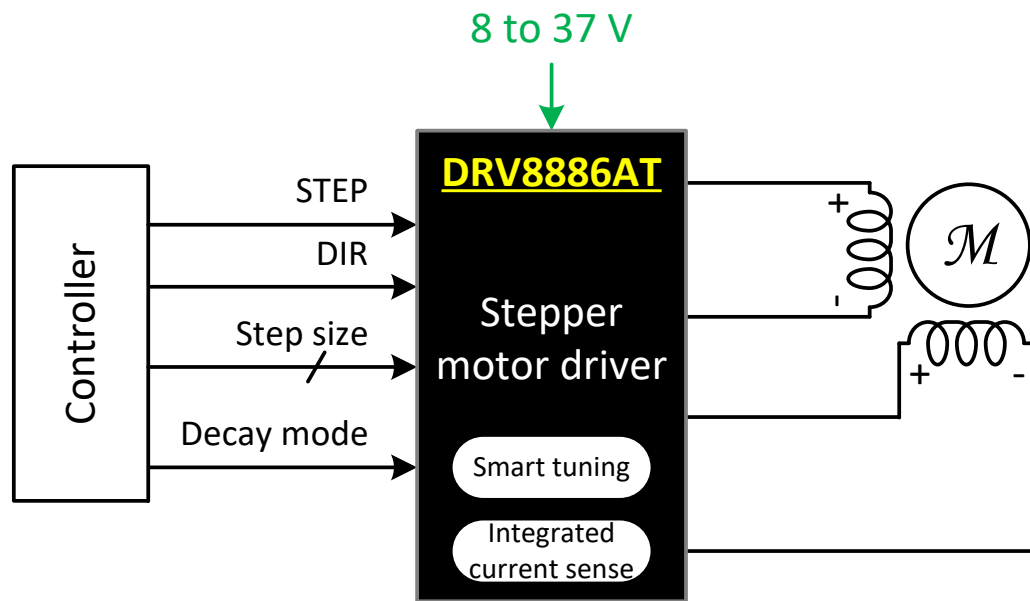
Stepper Motor 4: Integrated Stepper Driver Control Interfaces

TI Precision Labs – Motor Drivers

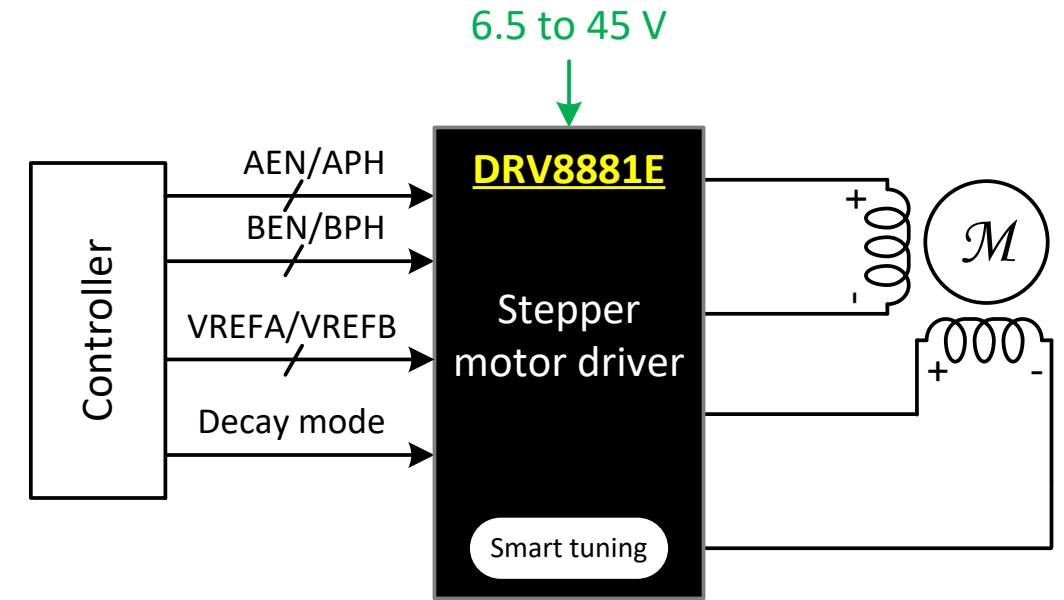
Presented and prepared by James Lockridge

Control interfaces

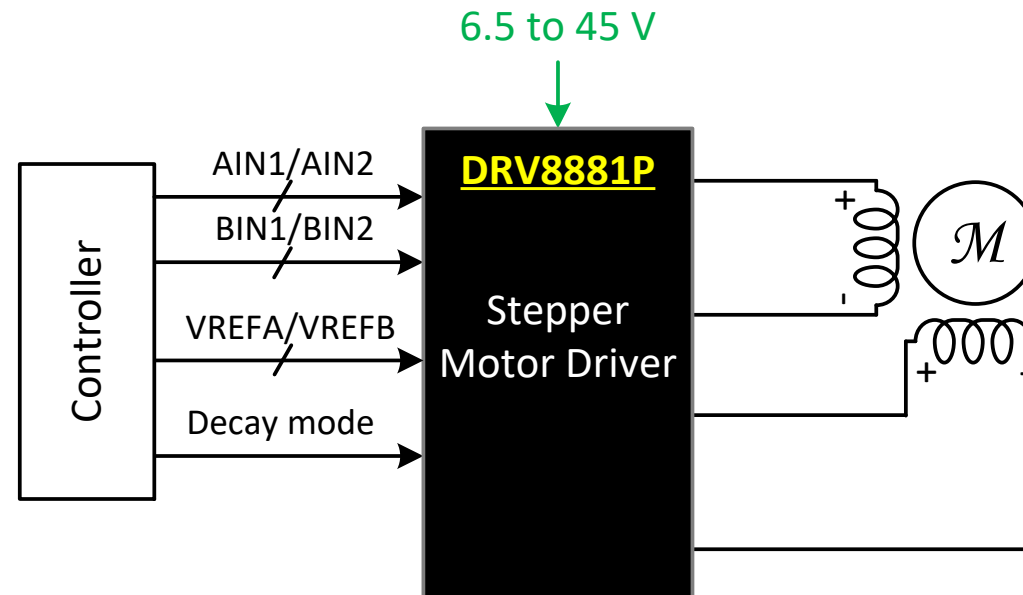
Step-direction (STEP/DIR)



Phase-enable (PH/EN)



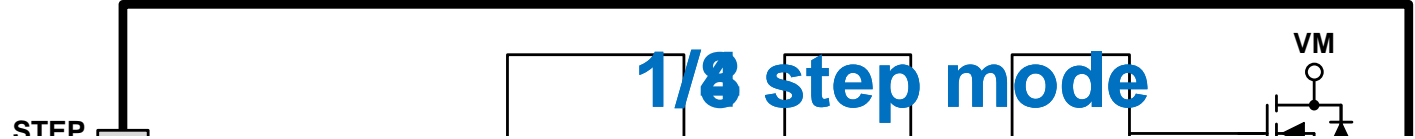
PWM (INx)



STEP/DIR interface

- Driver integrates an **indexer** with adjustable microstepping level
- On each STEP input, the indexer advances one place in the table

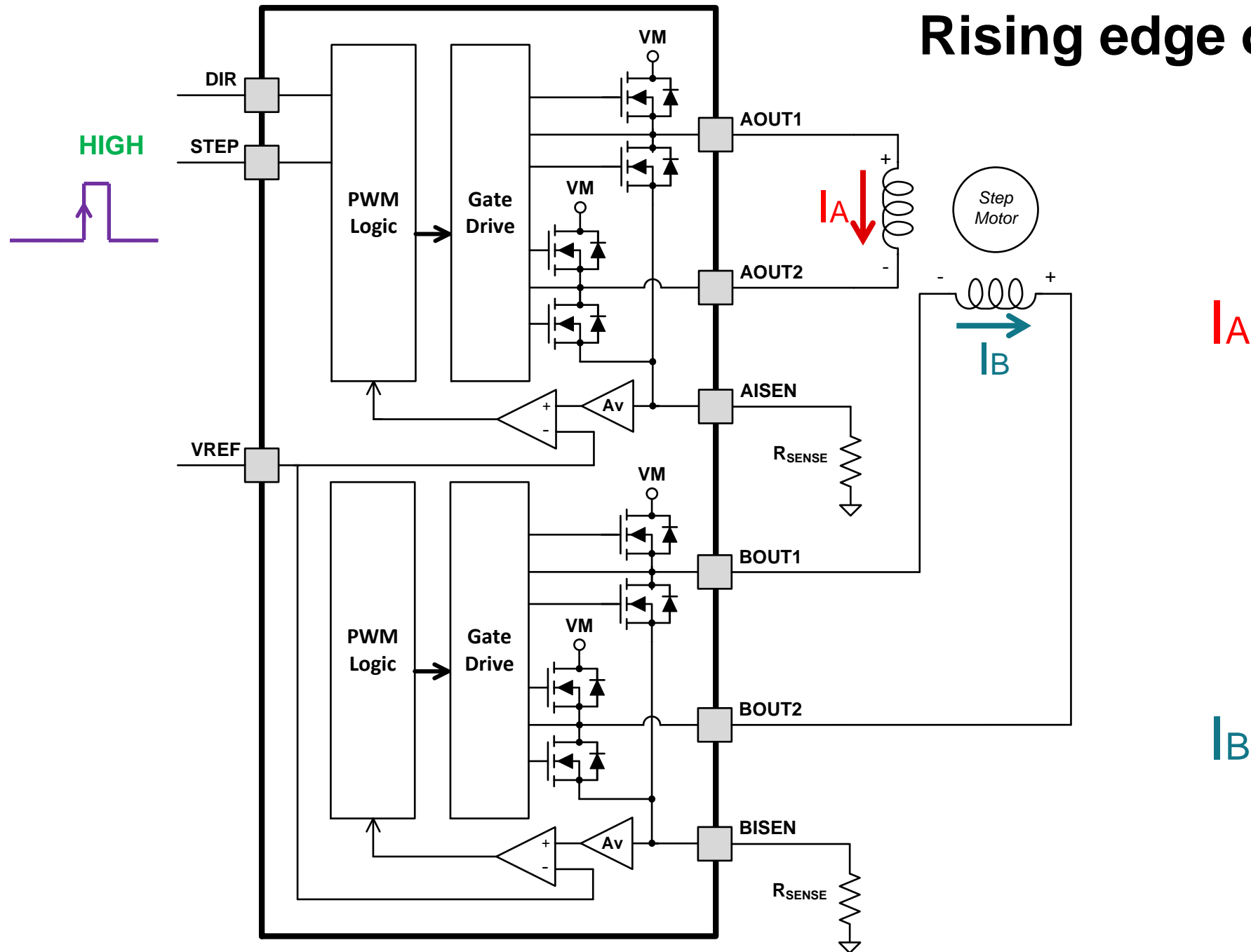
1/8 step mode



FULL STEP	1/2 STEP	1/4 STEP	1/8 STEP	1/16 STEP	ELECTRICAL ANGLE (DEGREES)	AOUT CURRENT (% FULL-SCALE)	BOUT CURRENT (% FULL-SCALE)
	1	1	1	1	0.000°	0 %	100 %
				2	5.625°	10 %	100 %
				3	11.250°	20 %	98 %
				4	16.875°	29 %	96 %
				5	22.500°	38 %	92 %
				6	28.125°	47 %	88 %
				7	33.750°	56 %	83 %
				8	39.375°	63 %	77 %
1	2	3	5	9	45.000°	71 %	71 %
				10	50.625°	77 %	63 %
				11	56.250°	83 %	56 %
				12	61.875°	88 %	47 %
				13	67.500°	92 %	38 %

Microstepping on a STEP/DIR interface

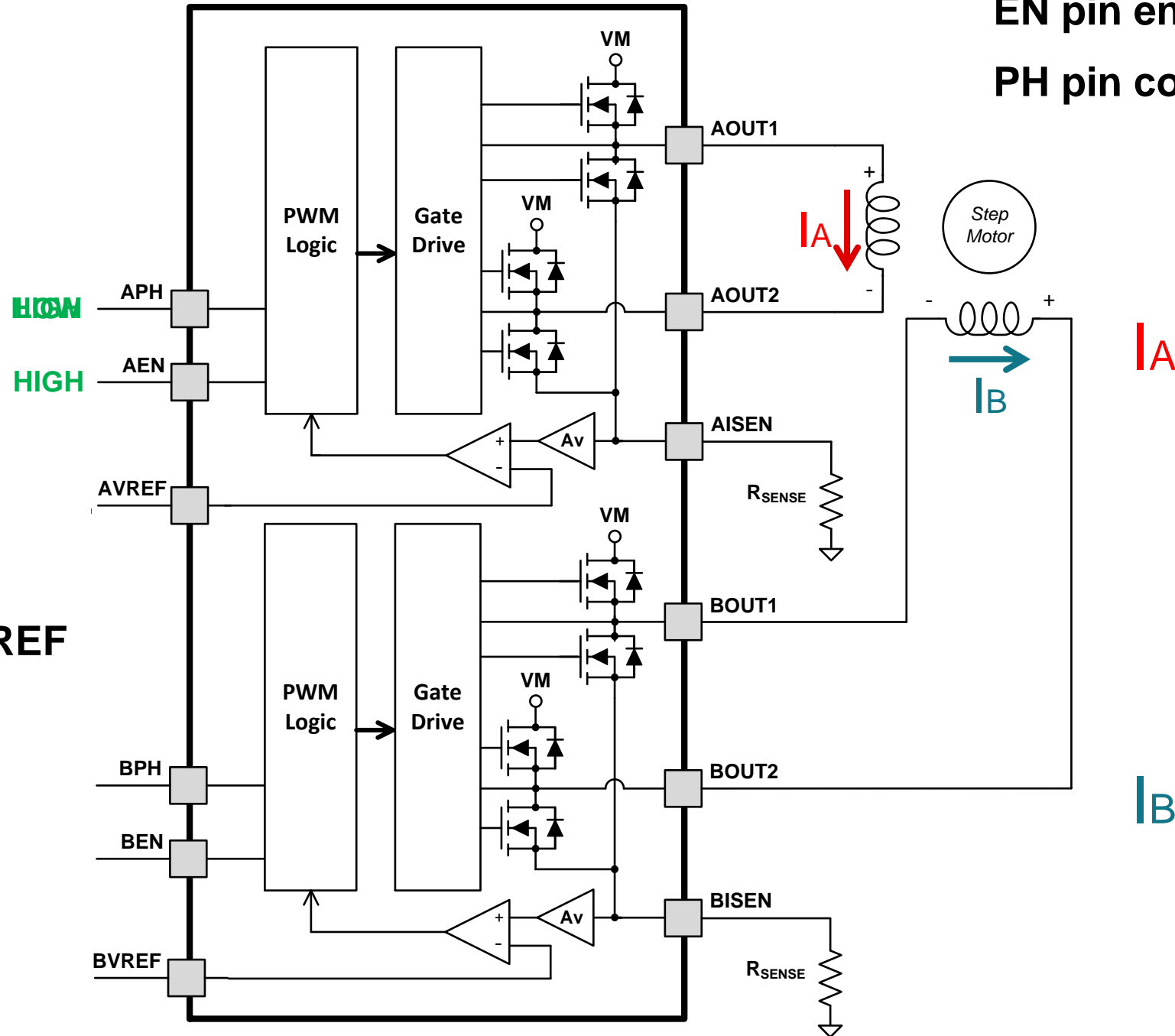
Rising edge on STEP advances the indexer



Microstepping on a PH/EN interface

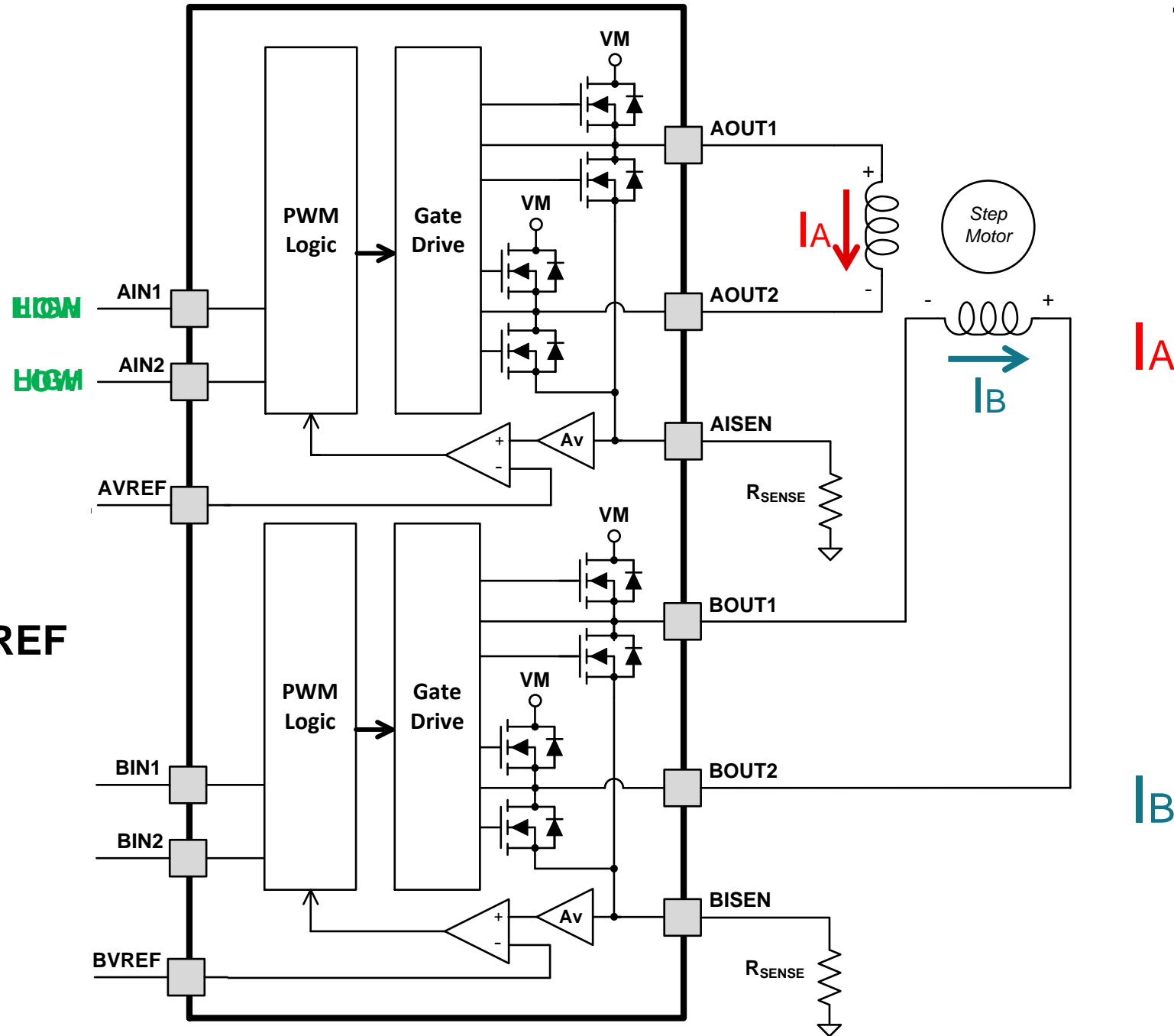
EN pin enables the outputs to drive the motor windings

PH pin controls the polarity of the voltage on the winding

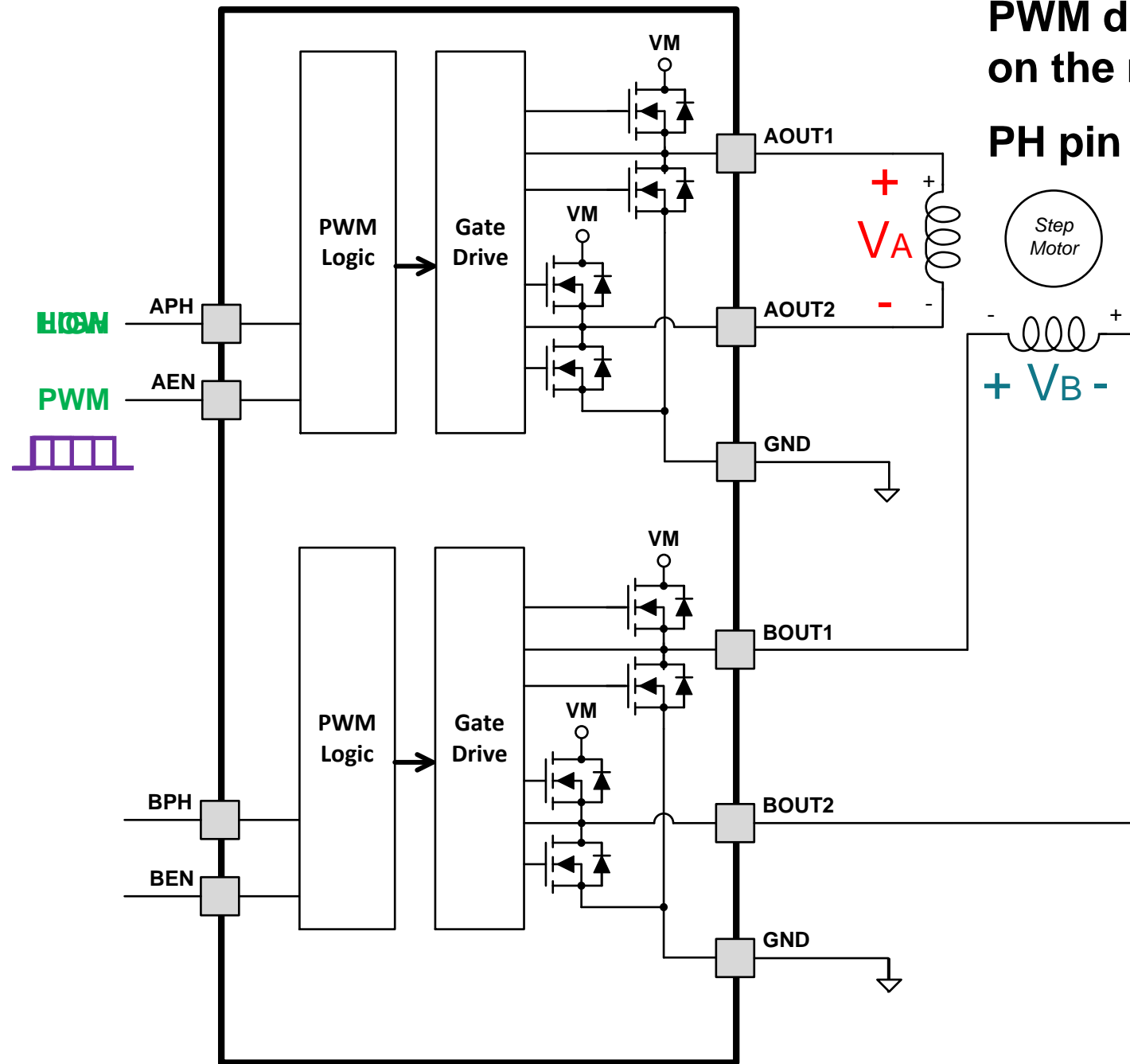


Microstepping on a PWM interface

The signals on the INx pins select the direction for driving the motor.



Voltage control on a PH/EN interface



PWM duty cycle on EN controls the magnitude of the voltage on the motor winding

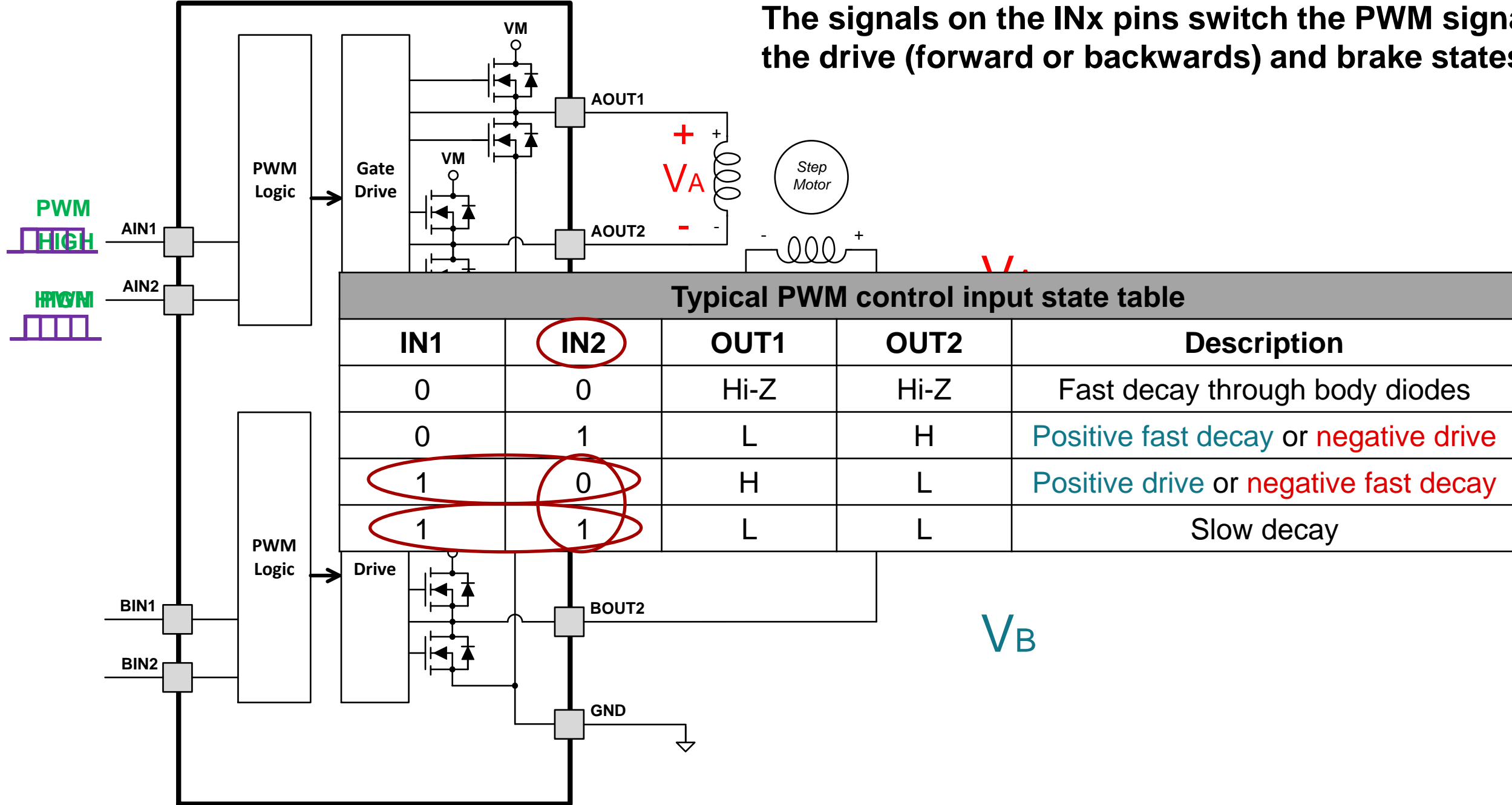
PH pin controls the polarity of the voltage on the winding

V_A

V_B

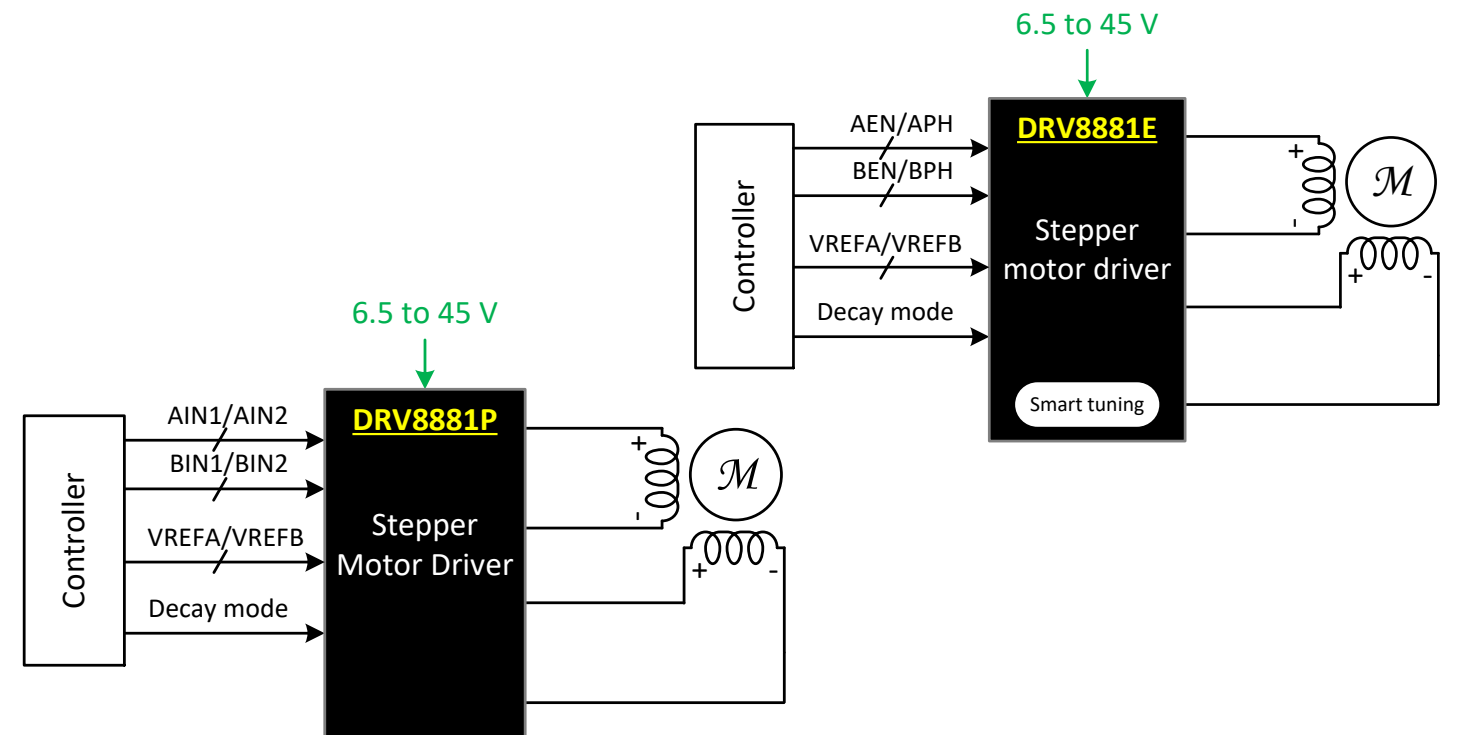
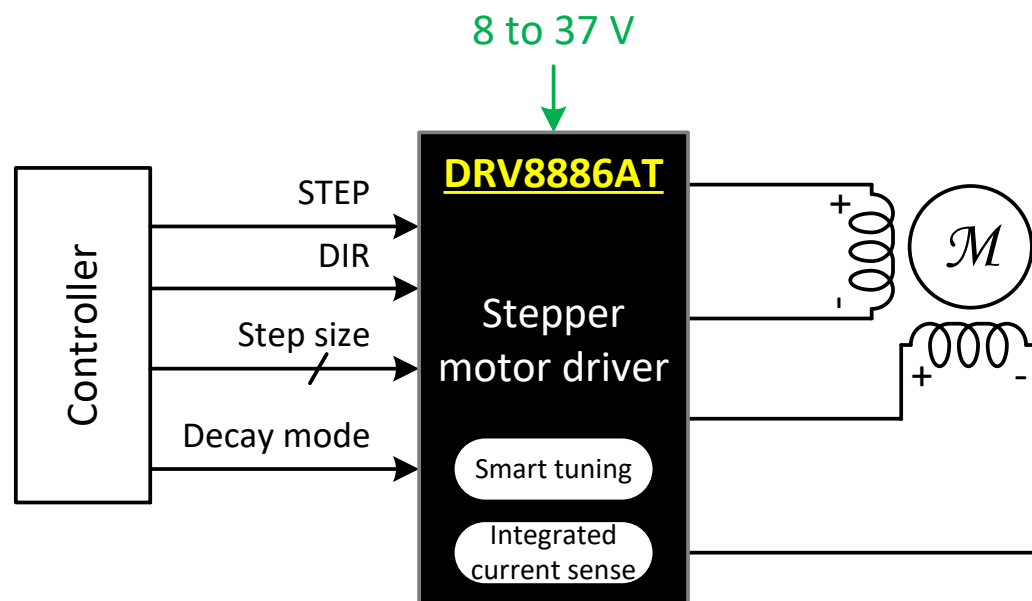
Voltage control on a PWM (INx) interface

The signals on the INx pins switch the PWM signal between the drive (forward or backwards) and brake states



Control interfaces

STEP/DIR	Parallel (PWM or PH/EN)
Less control pins required	More control pins required
Easier control	More complex control
Only one voltage reference required	May need two independent VREFs
Indexer sets current waveform	MCU can control wave shaping
Max microstepping set by driver	Max microstepping controlled by MCU



To find more stepper driver technical resources and search products, visit <http://www.ti.com/motor-drivers/stepper-driver/overview.html>



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