

Brushless DC motor controller

NE/SA5570

DESCRIPTION

The NE/SA/SE5570 is a three-phase brushless DC motor controller with a microprocessor-compatible serial input data port; 8-bit monotonic digital-to-analog converter; PWM comparator; oscillator; three Hall sensor inputs and six source/sink phase pre-drivers.

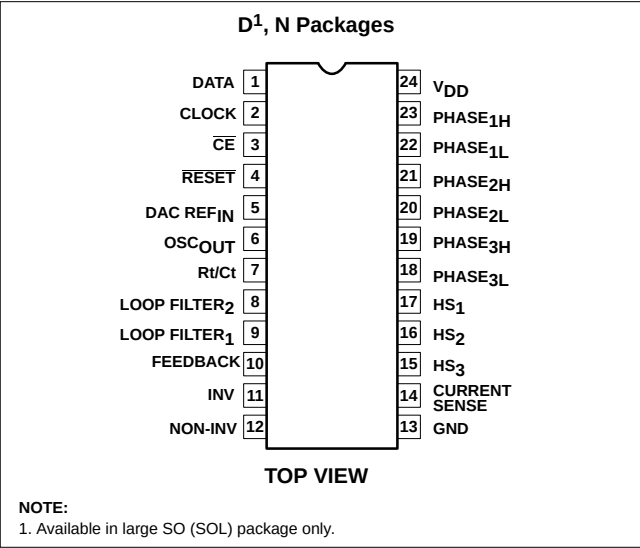
FEATURES

- 8-bit DAC
- Serial-to-parallel converter
- Output pre-drivers
- Entire switch mode conversion
- Adaptable to 60° or 120° commutation
- Overcurrent protection

APPLICATIONS

- Motor controller for three-phase brushless DC motor
- Robotics
- Computer peripherals

PIN CONFIGURATION



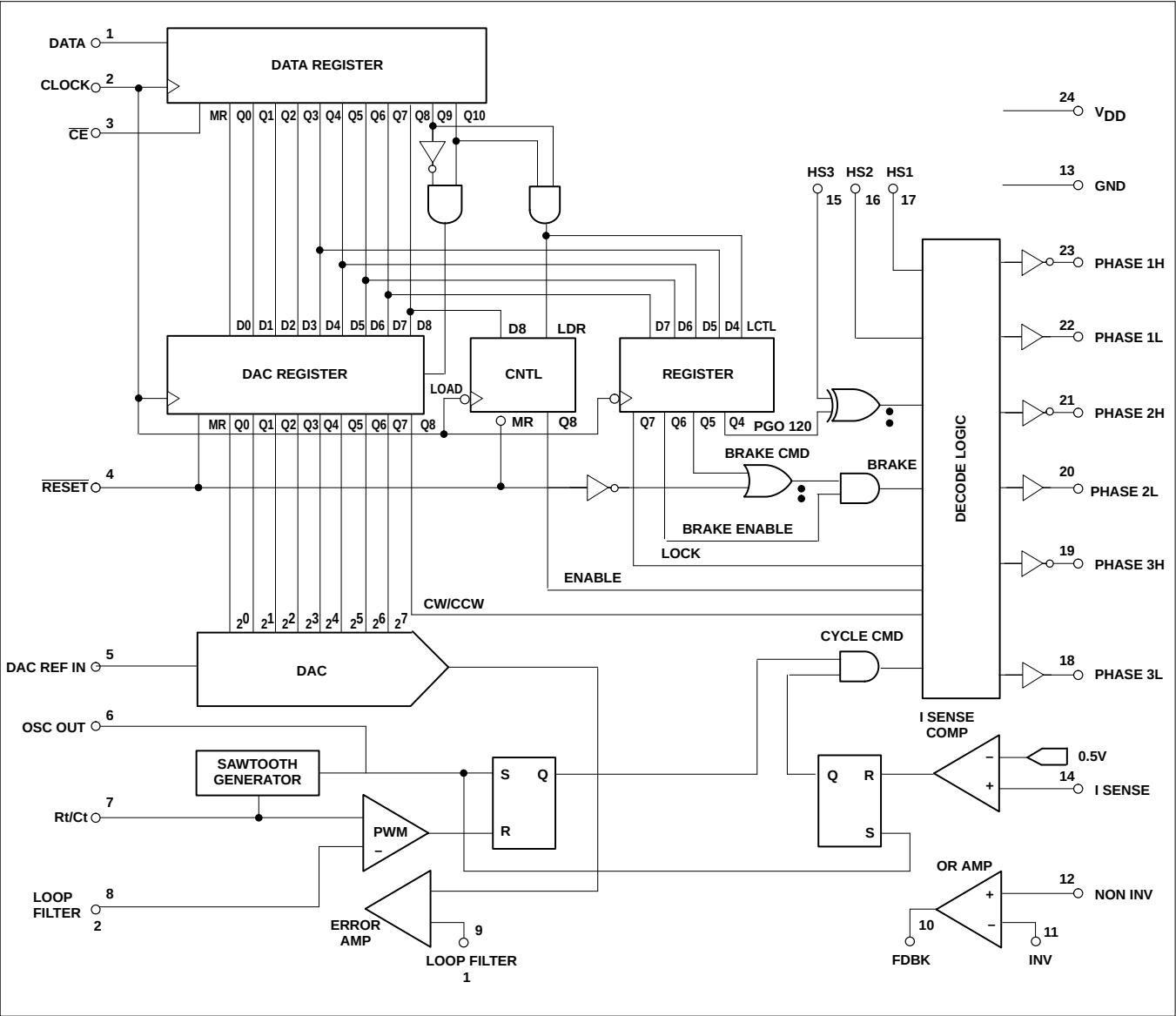
ORDERING INFORMATION

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE	DWG #
24-Pin Plastic Dual In-Line Package (DIP)	0 to +70°C	NE5570N	0412A
24-Pin Small Outline Large Package (SOL)	0 to +70°C	NE5570D	0173D
24-Pin Plastic Dual In-Line Package (DIP)	-40°C to +85°C	SA5570N	0412A
24-Pin Small Outline Large Package (SOL)	-40°C to +85°C	SA5570D	0173D
24-Pin Plastic Dual In-Line Package (DIP)	-55°C to +125°C	SE5570N	0412A

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BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	RATING			UNIT
		NE5570	SA5570	SE5570	
T_A	Temperature range				
T_J	Operating ambient	0 to 70	-40 to 85	-55 to 125	°C
T_{STG}	Operating junction	-55 to 150	-55 to 150	-55 to 150	°C
	Storage	-65 to 150	-65 to 150	-65 to 150	°C
V_{DD}	Power supply	16	16	16	V
	Logic inputs, all	-0.3 to 15	-0.3 to 15	-0.3 to 15	V

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RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	RATING	UNIT
T _A	Ambient temperature range		
	NE Grade	0 to 70	°C
	SA Grade	-40 to 85	°C
	SE Grade	-55 to 125	°C
T _J	Junction temperature range		
	NE Grade	0 to 90	°C
	SA Grade	-40 to 105	°C
	SE Grade	-55 to 145	°C
V _{DD}	Supply voltage	9.6 to 14.4	V

DC ELECTRICAL CHARACTERISTICS

Limits apply at V_{DD}=12V ±10%, V_{REF}=5V and over operating temperature range unless otherwise specified. Typical data applies at T_A=25°C

SYMBOL	PARAMETER	TEST CONDITIONS	SA/NE5570			SE5570			UNIT
			Min	Typ	Max	Min	Typ	Max	
Oscillator									
f _O	Frequency initial accuracy	T _A =25°C, R _T =2.49kΩ, C _T =22nF	18.5	20	21	18.5	20	21	kHz
f _C	Frequency drift over temp	R _T =2.49kΩ, C _T =22nF	18		22	18		22	kHz
	Supply voltage sensitivity	T _A =25°C		±2			±2		%/V
	Output pulse width	T _A =25°C, R _T =2.49kΩ, C _T =22nF		500	1000		500	1000	ns
Motor Phase Pre-Drivers									
t _R	Rise time	R _L =2kΩ to Gnd, C _L =2nF [1V to 11V]			500			500	ns
t _F	Fall time	R _L =2kΩ to V _{CC} , C _L =2nF [1V to 11V]			500			500	ns
I _{OUT}	I _{SOURCE}	V _{OH} =8V	80			80			mA
	I _{SINK}	V _{OL} =3.1V	80			80			
V _{OUT}	V _{OH}	I _{SOURCE} =5mA	11	11.8		11	11.8		V
		I _{SOURCE} =80mA (over temp)	8	10		8	10		
	V _{OL}	I _{SINK} =5mA		0.4	1		0.4	1	
		I _{SINK} =80mA (over temp)		2	3.1		2	3.1	
PWM Comparator									
I _{BIAS}	Input bias current				1			1	μA
Current Sense Comparator									
I _{BIAS}	Input bias current				1			1	μA
V _{TH}	Current sense trip level		350	500	600	350	500	600	mV
t _{PD}	Propagation delay to output drivers	C _L =2nF		250			250		ns
Error Amplifier									
I _{BIAS}	Input bias current				1			1	μA
V _{CM}	Input common-mode voltage range		0		5	0		5	V
V _{OL}	Large-signal voltage gain	V _{OUT} =1V to 11V	70	90		70	90		dB
PSRR	Power supply rejection ratio		60			60			dB
V _O	Output voltage swing	V _{IN} =+50mV, I _L =-150μA	11.5	11.7		11.5	11.7		V
		V _{IN} =-50mV, I _L =+150μA		0.2	0.5		0.2	0.5	V

DC ELECTRICAL CHARACTERISTICS

(Continued) Limits apply at V_{DD}=12V +10%, V_{REF}=5V and over operating temperature range unless otherwise specified. Typical data applies at T_A=25°C.

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SYMBOL	PARAMETER	TEST CONDITIONS	SA/NE5570			SE5570			UNIT
			Min	Typ	Max	Min	Typ	Max	
Operational Amplifier									
V _{OS}	Offset voltage		-20	3	+20	-20	3	+20	mV
I _{BIAS}	Input bias current				1			1	μA
V _{CM}	Input common-mode voltage range	T _A =25°C Over temp.	-0.3 0		5 5	-0.3 0		5 5	V
V _{OL}	Large signal voltage gain	V _{OUT} =1V to 11V	70	90		70	90		dB
PSRR	Power supply rejection ratio		60	90		60	90		dB
V _O	Output voltage swing	V _{IN} =+50mV, I _L =-150μA V _{IN} =-50mV, I _L =+150μA	11.5	11.7 0.2	0.5	11.5	11.7 0.2	0.5	V V
CMRR	Common-mode rejection ratio	R _S =10kΩ	60	80		60	80		dB
GBW	Gain bandwidth	R _F =100kΩ		250			250		kHz
V _{NN}	Input noise voltage	F=1kHz		300			300		nV/√Hz
Digital-to-Analog Converter									
	Resolution				8			8	bits
INL	Integral non-linearity error			±1	±2		±1	±2	LSB
DNL	Differential non-linearity error ¹			±0.5	±1		±0.5	±1	LSB
V _{FS}	Full-scale gain error	Error amp. A _V =1		±0.2	±0.8		±0.2	±0.8	%FS
	Full-scale temperature drift	V _{REF} T _C =0ppm/°C		20			20		ppm/°C
V _{ZS}	Zero-scale offset error	Error amp. A _V =1		±1	±2		±1	±2	LSB
Z _{IN}	Input impedance (DAC ref. in)		30	45	60	30	45	60	kΩ
t _S	Settling time to ±0.5 LSB			5			5		μs
t _{PLH}	Propagation delay time (high)	Through DAC		200			200		ns
t _{PHL}	Propagation delay time (low)	Through DAC		200			200		ns
Logic Inputs									
V _{IH}	Input voltage: TTL high		2.0		12	2.0		12	V
V _{IL}	Input voltage: TTL low		0		0.8	0		0.8	V
I _{IH}	Input current: TTL high				±1			±1	μA
I _{IL}	Input current: TTL low				±1			±1	μA
Supply Current									
I _{DD}				1.8	5.0		1.8	5.0	mA

NOTES:

1. Monotonicity guaranteed over operating temperature range.

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TYPICAL PERFORMANCE CHARACTERISTICS

