

30V Stepper Motor Driver

Description

The SA8550 is a dual-channel low saturation voltage forward/reverse motor driver IC. It is optimal for motor drive in 12V or 24V system products and can drive a stepper motor in Full-step or two DC motor.

The output driver block of each H-bridge consists of N-channel power MOSFETs configured as an H- bridge to drive the motor windings. Each H-bridge includes circuitry to regulate or limit the winding current. Internal shutdown functions are provided for under-voltage lockout, over current protection and over temperature. A low-power sleep mode is also provided.

The SA8550 is available in a compact ESOP8 package.

FEATURES

- VM max=32V, IO max = 1.2A
- $R_{DS(on)}$: 730-m Ω (HS + LS)
- H-Bridge Motor Driver
- Over current protection
- Over temperature protection
- UVLO protection
- Low-Power Sleep Mode
- ESOP8 Package

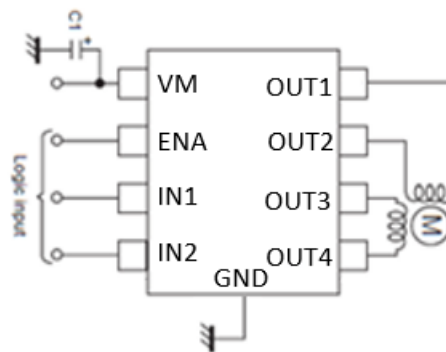
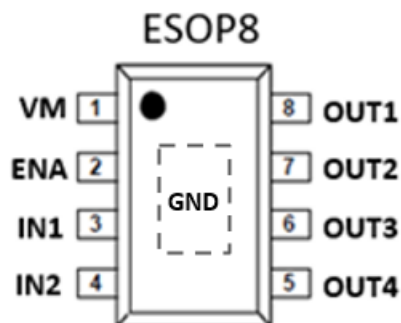
Applications

- Stage Lighting
- Refrigerator
- Vacuum Cleaner
- POS Printer
- Any Relevant Stepper Motor Applications.

Device Information

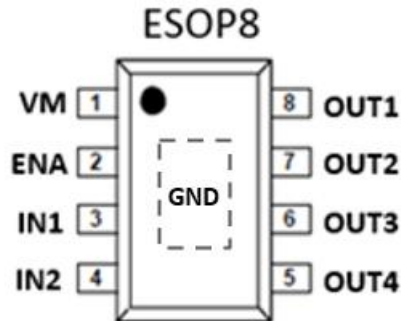
Part No.	Package	Quantity
SA8550	ESOP8	4000/Reel

SA8550 Package & Simplified Schematic



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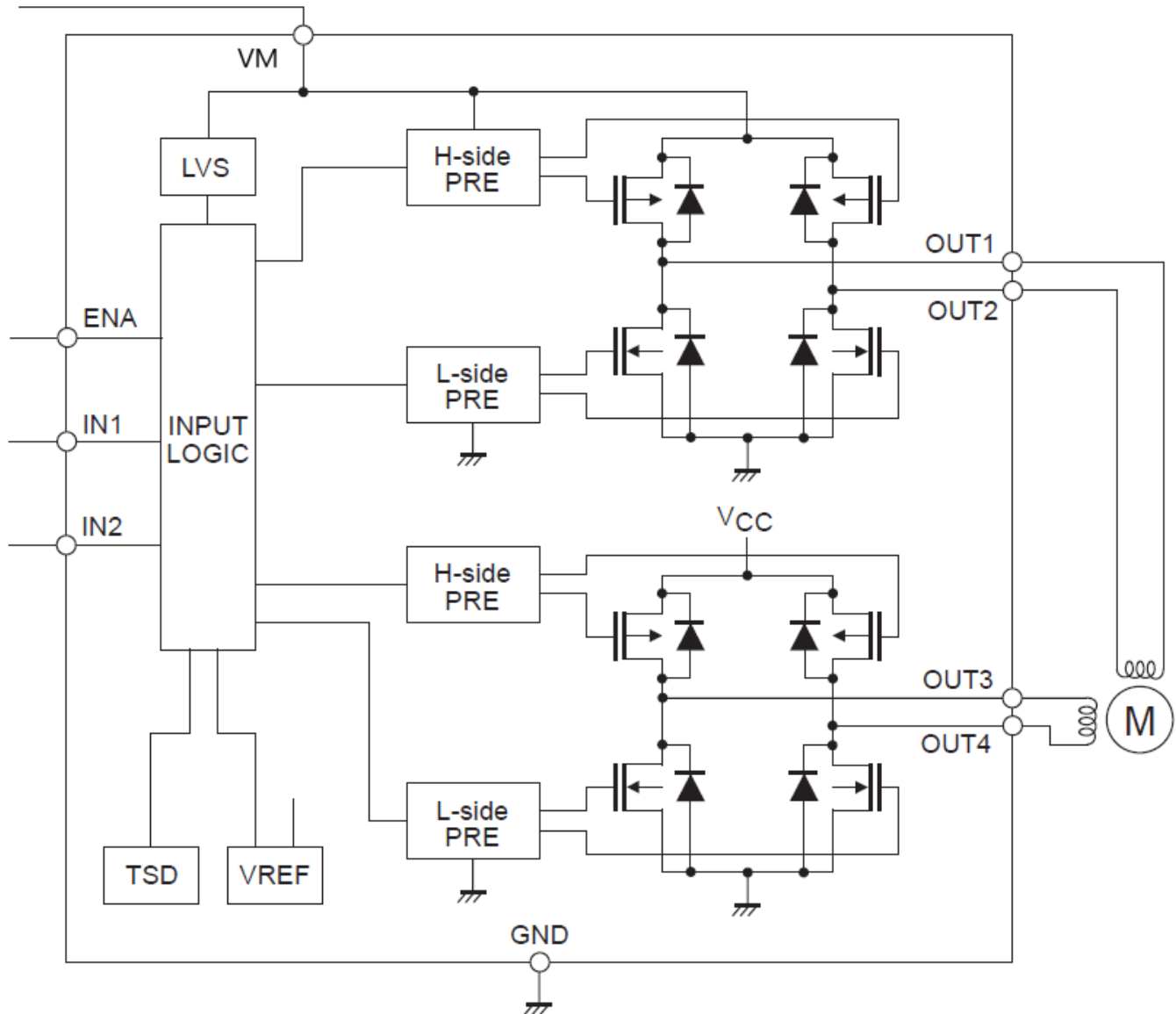
Pin Configuration and Functions



ESOP8	NAME	TYPE	DESCRIPTION
1	VM	P	4.0 to 30.0V power supply. Connect a 22 μ F bypass capacitor to ground, as well as sufficient bulk capacitance, rated for the VM voltage.
2	ENA	I	Motor drive control enable pin. "0" stand-by current when ENA=L. Output is corresponding to input control logic when ENA=H.
3	IN1	I	Logic input pin of OUT1 and OUT2. Internal pull-down.
4	IN2	I	Logic input pin of OUT3 and OUT4. Internal pull-down.
	NC	NC	No connection.
	GND	P	Device ground.
5	OUT4	O	Driving output pin. Motor coil is connected between terminal OUT3
6	OUT3	O	Driving output pin. Motor coil is connected between terminal OUT4
7	OUT2	O	Driving output pin. Motor coil is connected between terminal OUT1
8	OUT1	O	Driving output pin. Motor coil is connected between terminal OUT2
Thermal Pad	GND	P	Device ground.

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Block Diagram



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Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)

		MIN	MAX	UNIT
Power supply voltage	VM	-0.3	36.0	V
Logic input voltage	ENA, IN1, IN2	-0.3	7.0	V
Continuous phase node pin voltage	OUT1, OUT2, OUT3, OUT4	-0.3	VM	V
ESD (HBM)	VM, ENA, IN1, IN2, OUT1, OUT2, OUT3, OUT4	2		kV
Output current (100% duty cycle)	IOUT	0	1.4*	A
Operating junction temperature,	T _J	-40	150	°C
Storage temperature,	T _{stg}	-65	150	°C
Thermal Impedance (ESOP8)	θ _{JA}		80	°C/W

Notes: * Using 25mm² FR4 Signal layer PCB (1 oz) under VM=12.0V test.

Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)

		MIN	MAX	UNIT
Power supply voltage	VM	4.0	32.0	V
Logic input voltage	ENA, IN1, IN2	0	5.5	V
Logic input PWM frequency	f _{PWM}	0	200	kHz
Output current	IOUT	0	1.2**	A

Notes: ** Using 25mm² FR4 Signal layer PCB (1 oz) under VM=12.0V test.

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Electrical Characteristics

VM=24V, T_A = 25°C, over recommended operating conditions (unless otherwise noted)

PARAMETER UNIT		TEST CONDITIONS	MIN	TYP	MAX	UNIT
POWER SUPPLY (VM)						
VM	VM operating voltage		4.0		32.0	V
I _{VM_ON}	VM operating supply current	VM=24V		1.2	2.4	mA
I _{VM_OFF}	VM sleep current	VM=24V		5.5	12.0	uA
MOTOR DRIVER OUTPUTS (OUT1, OUT2, OUT3, OUT4)						
R _{DS(on)}	High-side & Low-side FET on resistance	VM=24V, LS+HS, I _{OUT} =1A		730	950	mΩ
T _{DEAD}	Output dead time			250		ns
V _D	Body diode forward voltage	I _{OUT} =1A		1.0	1.2	V
I _{OFF}	Off-state leakage current		-20		20	uA
LOGIC-LEVEL INPUTS (ENA, IN1, IN2)						
V _{INH}	Input logic high voltage		2.0		5.0	V
V _{INL}	Input logic low voltage		0		0.7	V
V _{IN_HYS}	Input logic hysteresis			0.2		V
I _{INH}	Input logic high current	INx=5.0V		10	20	uA
I _{INL}	Input logic low current	IN=0V		0	1	
R _{PD}	Pulldown resistance	to GND		500	700	KΩ
PROTECTION CIRCUITS						
V _{UVLO_R}	VM rises until operation recovers			2.55	3.00	V
V _{UVLO_F}	VM falls until UVLO triggers			2.40	2.80	
V _{UVLO_H}	VM undervoltage hysteresis			0.15	0.20	
T _{SD}	Thermal shutdown temperature			170		°C
T _{HYS}	Thermal shutdown hysteresis			40		

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Application Information

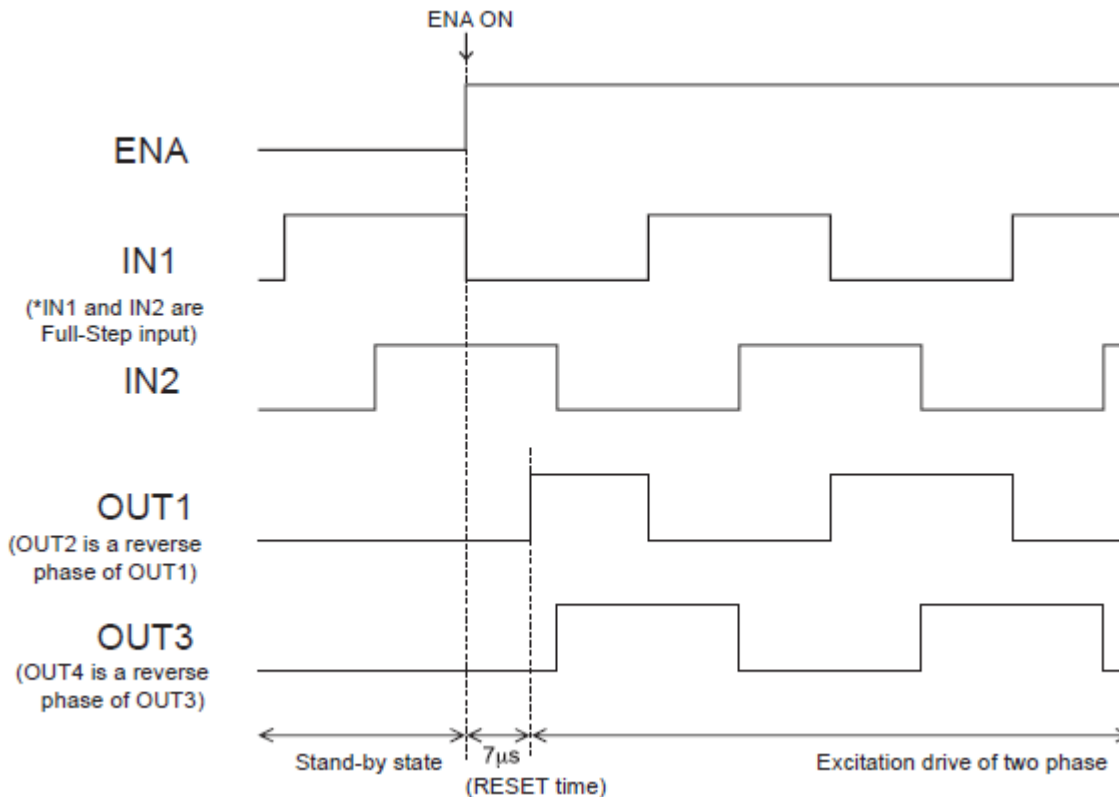
1. STM Output Control Logic

Input			Output				State
ENA	IN1	IN2	OUT1	OUT2	OUT3	OUT4	
L	-	-	OFF	OFF	OFF	OFF	Stand-by
H	L	L	H	L	H	L	Step 1
	H	L	L	H	H	L	Step2
	H	H	L	H	L	H	Step3
	L	H	H	L	L	H	Step4

2. Timing

About the switch time from the stand-by state to the state of operation, this IC has completely stopped operating when ENA pin is logic “0”. After the time of reset of about $7\mu\text{s}$ of and internal setting, it shifts to a prescribed output status corresponding to the state of the input when ENA pin is logic “1”.

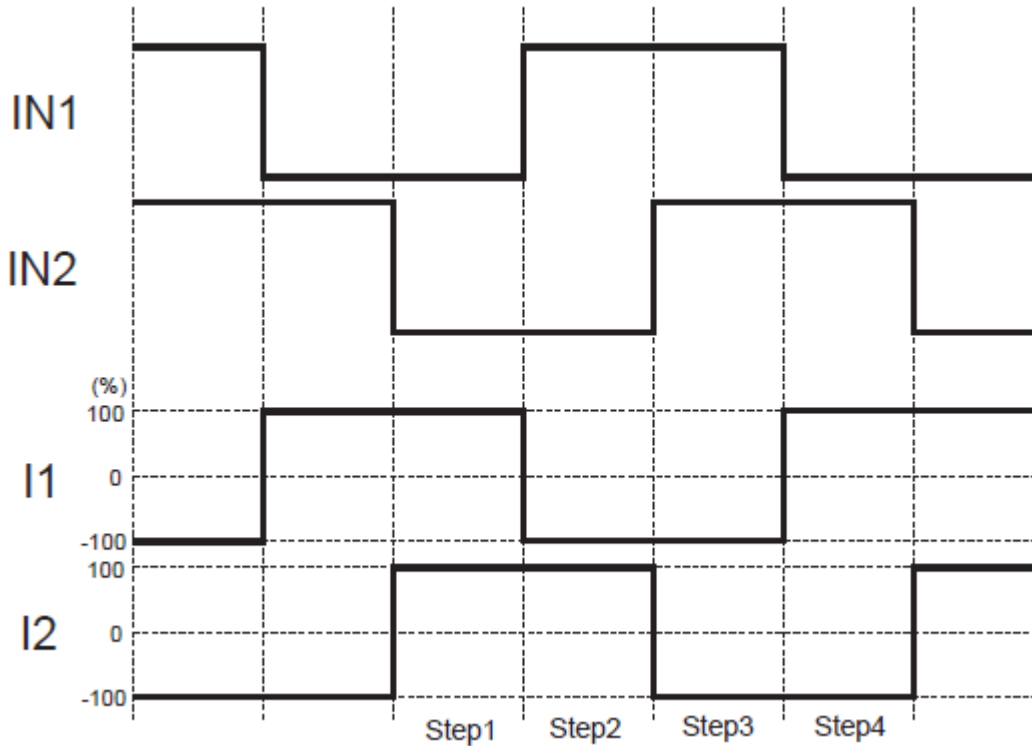
During reset time, all output TR OFF is maintained.



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3. Example of current waveform at full-step mode.



4. Thermal Shutdown

The thermal shutdown circuit is incorporated and the output is turned off when junction temperature exceeds 170°C. As the temperature falls by hysteresis, the output turned on again.

The thermal shutdown circuit doesn't guarantee the protection of the final product because it operates when the temperature exceeds the junction temperature of $T_{j_max}=150^{\circ}\text{C}$.

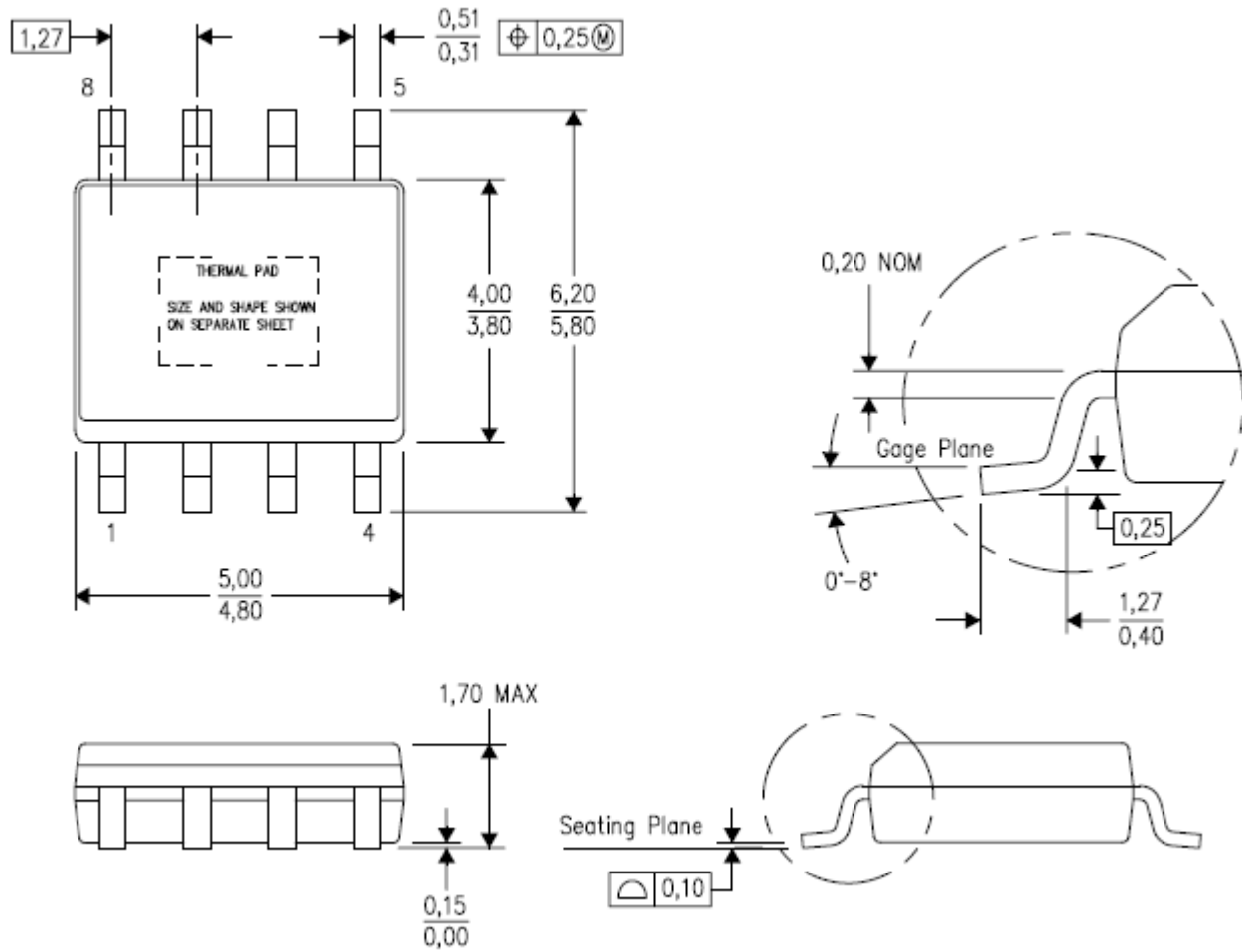
TSD = 170°C (TYP)

TSD_HYS = 40°C (TYP)

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Package Information

ESOP8



30V Stepper Motor Driver**IMPORTANT NOTICE**

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