

Features

- Interchangeable with SGS L6219DS
- 750mA continuous output current
- 28V output sustaining voltage
- Internal clamp diode
- Internal PWM current control
- Low output saturation voltage
- Internal thermal shutdown circuitry
- SOP-24 Package

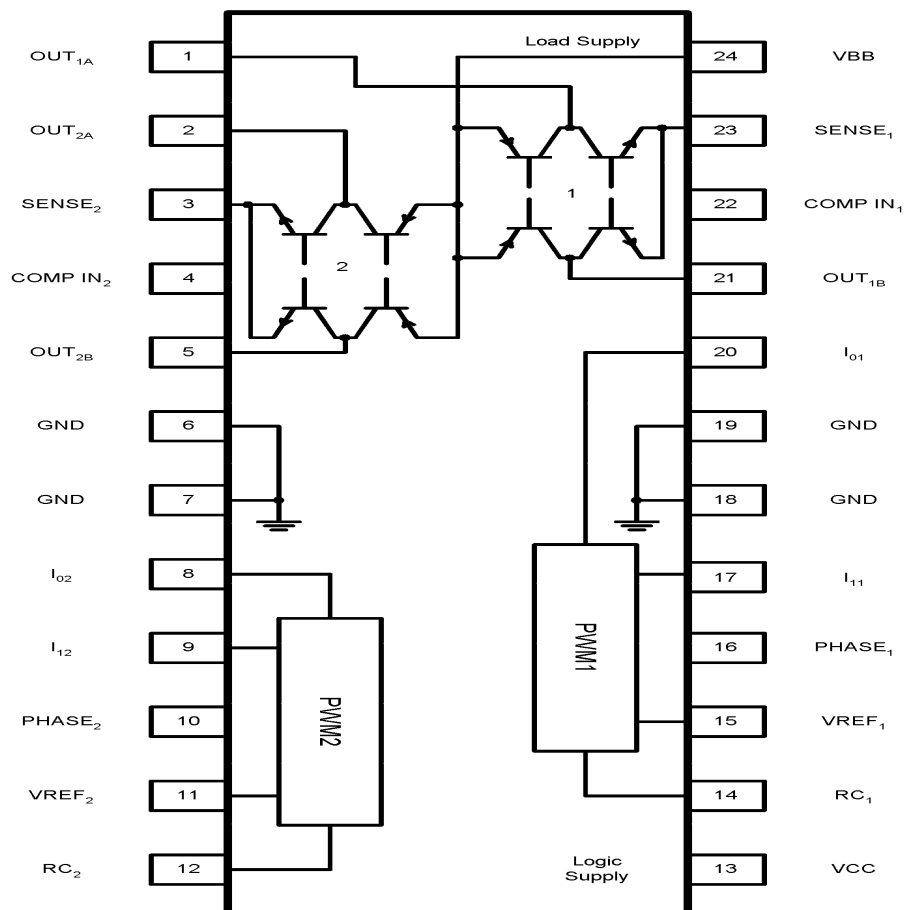
General Description

The AT5519 motor driver is designed to drive both winding of a bipolar stepper motor or bi-directionally control two DC motor. An internal PWM controls the output current to 750mA with peak startup current up to 1A. Two logic-level inputs select output current limits of 0, 33, 67, or 100% of the maximum level. A PHASE input to each bridge determines load current direction. A thermal protection circuitry disables the outputs if the chip temperature exceeds safe operating limits.

Applications

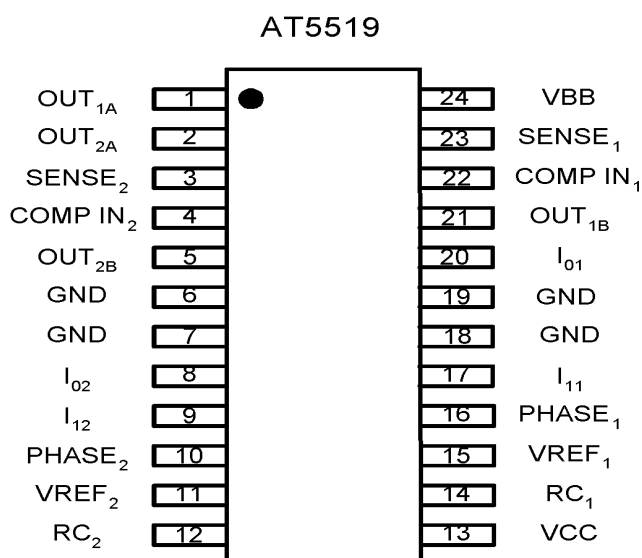
- Scanner

Block Diagram



Aimtron reserves the right without notice to change this circuitry and specifications.

Pin Configuration



Pin Description

Symbol	Pin No.	Descript	Symbol	Pin No.	Descript
OUT_{1A}	1	Output Connection	VCC	13	Power supply input for Logic circuitry
OUT_{2A}	2	Output Connection	RC₁	14	OFF time setting
SENSE₂	3	Current Sense Resistor Connection	VREF₁	15	Reference voltage of the comparator
COMP IN₂	4	Input Connected to the Comparator	PHASE₁	16	Current Flow input
OUT_{2B}	5	Output Connection	I₁₁	17	Current Level input of PWM1
GND	6	Ground	GND	18	Ground
GND	7	Ground	GND	19	Ground
I₀₂	8	Current Level input of PWM2	I₀₁	20	Current Level input of PWM1
I₁₂	9	Current Level input of PWM2	OUT_{1B}	21	Output Connection
PHASE₂	10	Current Flow input	COMP IN₁	22	Input Connected to the Comparator
VREF₂	11	Reference voltage of the comparator	SENSE₁	23	Current Sense Resistor Connection
RC₂	12	OFF time setting	VBB	24	Power supply input for Load circuitry

Ordering Information

Part number	Package	Marking
AT5519S	SOP24	AT5519S
AT5519S_GRE	SOP24, Green	AT5519S, date code with one bottom line

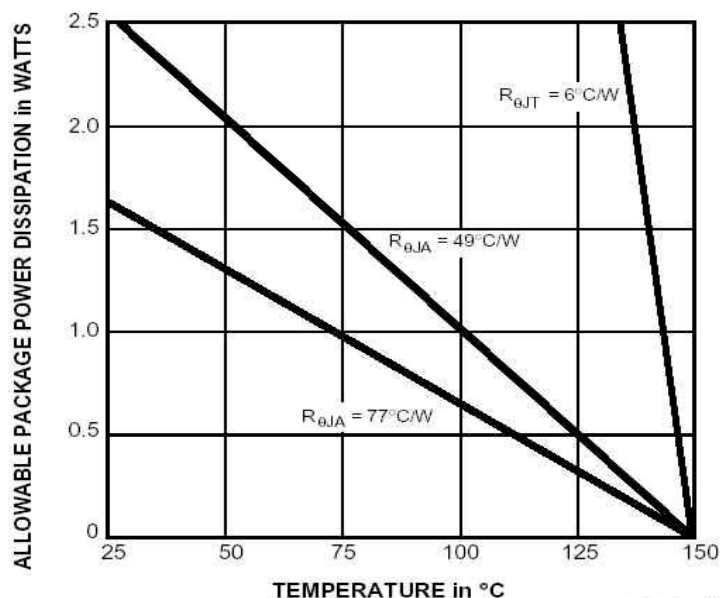
Absolute Maximum Ratings

($T_a = +25^{\circ}\text{C}$)

Item	Symbol	Ratings	Units
Storage temperature	T_{STG}	$-55 \sim +150$	$^{\circ}\text{C}$
Operating temperature	T_A	$-20 \sim +85$	$^{\circ}\text{C}$
Motor Supply Voltage	VBB	30	V
Output Peak Current	I_{OUT}	1.0	A
Output Continuous Current	I_{OUT}	750	mA
Logic Supply Voltage	VCC	7	V
Logic Input Range	VIN	$-0.3 \sim +7.0$	V
Output Emitter Voltage	V_{SENSE}	1.5	V
Power consumption	P_d	55	$^{\circ}\text{C/W}$

*Output current rating may be limited by duty cycle, ambient temperature, and heat sinking. Under any set of condition, do not exceed the specified peak current rating or a junction temperature of $+150^{\circ}\text{C}$

Power Dissipation



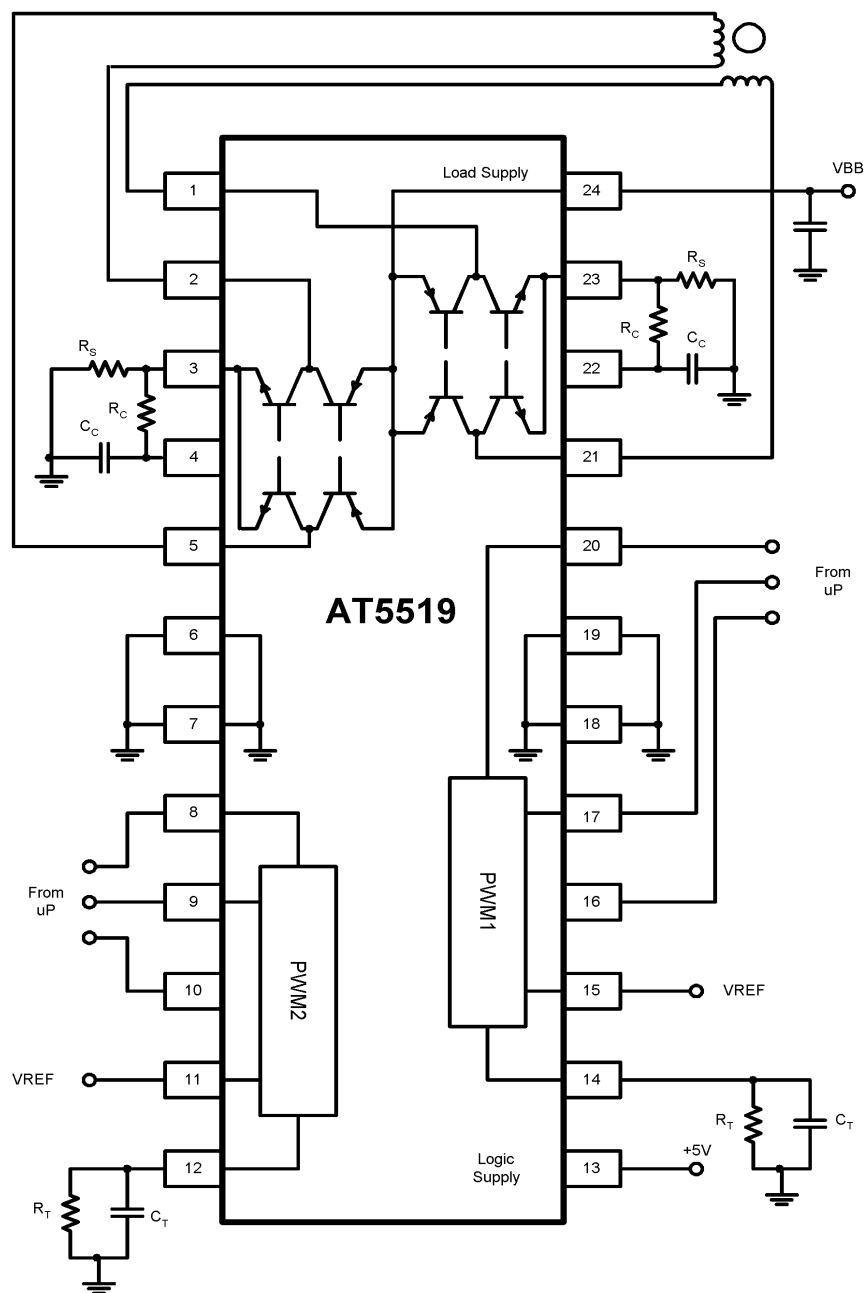
Electrical Characteristics

(VCC=4.75~5.25V, VBB=28V, VREF=5.0V, T_A=+25°C, T_J≤+150°C)

Parameter	Symbol	Condition	Values			Unit
			Min.	Typ.	Max.	
Output Drivers (OUT _A or OUT _B)						
Motor Supply Voltage	V _{BB}		10	-	28	V
Output Leakage Current	I _{CEX}	V _{OUT} =V _{BB}	-	-	50	μ A
		V _{OUT} =0V	-	-	-50	μ A
Output Sustaining Voltage	V _{CE(SUS)}	I _{OUT} =±750mA,L=3.0mH	28	-	-	V
Output Saturation Voltage	V _{CE(SAT)}	Sink Driver, I _{OUT} =±500mA	-	0.4	0.6	V
		Sink Driver, I _{OUT} =±750mA	-	1.0	1.2	V
		Source Driver, I _{OUT} =-500mA	-	1.1	1.4	V
		Source Driver, I _{OUT} =-750mA	-	1.3	1.6	V
Clamp Diode Leakage Current	I _R	V _R =28V	-	-	50	μ A
Clamp Diode Forward Voltage	V _F	I _F =750mA	-	1.6	2.0	V
Driver Supply Current	I _{BB(ON)}	Both Bridges ON, no load	-	20	25	mA
	I _{BB(OFF)}	Both Bridges OFF	-	5.0	10	mA
Control Logic						
Input Voltage	V _{IN(1)}	All Input	2.4	-	-	V
	V _{IN(O)}	All Input	-	-	0.8	V
Input Current	I _{IN(1)}	V _{IN} =2.4V	-	-	20	μ A
		V _{IN} =0.8V	-	-3.0	-200	μ A
Reference Voltage Range	V _{REF}	Operating	1.5	-	7.5	V
Current Limit Threshold(at trip point)	V _{REF} / V _{COMPIN}	I ₀ =I ₁ =0.8V	9.5	10	10.5	
		I ₀ =2.4V, I ₁ =0.8V	13.5	15	16.5	
		I ₀ =0.8V, I ₁ =2.4V	25.5	30	34.5	
Thermal Shutdown Temperature	T _J		-	170	-	°C
Total Logic Supply Current	I _{CC(ON)}	I ₀ =I ₁ =0.8V, No Load	-	40	50	mA

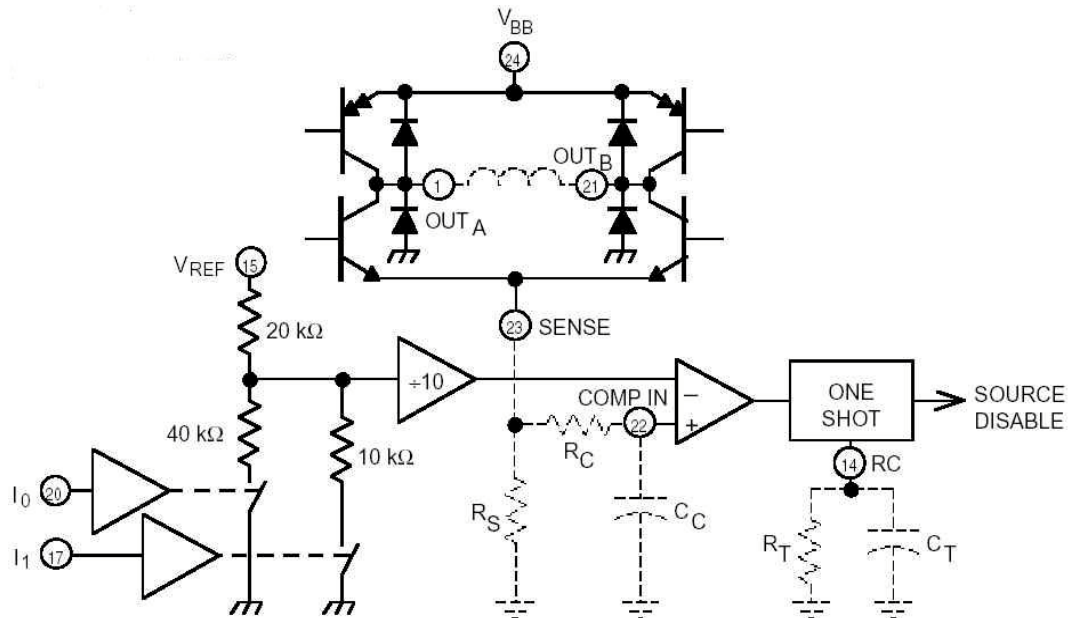
	$I_{CC(OFF)}$	$I_0=I_1=2.4V, \text{ No Load}$	-	10	12	mA
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Typical Application Circuit



Typical Application Information

PWM Current-Control Circuitry



Channel 1 Terminal Number Shown

PWM Current Control

The AT5519 output current is sensed and controlled independently in each bridge by an external sense resistor (R_S), Internal comparator, and monostable multivibrator. When the bridge is turned on, current increases in the motor winding and it is sensed by the external sense resistor until the sense voltage (V_{COMPIN}) reaches the level set at the comparator input:

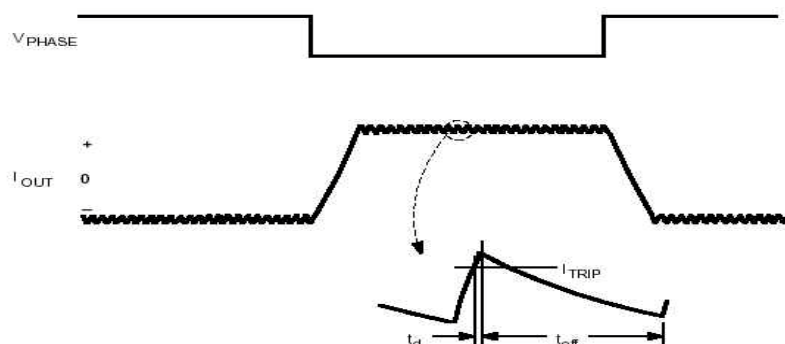
$$I_{TRIP} = \frac{V_{REF}}{10 \times R_S}$$

The comparator then triggers the monostable which turns off the source driver of the bridge. The actual load current peak will be slightly higher than the trip point because of the internal logic and switching delays. The delay (t_d) is typically $2\mu s$. The source driver's off time is determined by the monostable's external R_T and C_T timing components.

$$t_{off} = R_T \times C_T$$

When the source driver is re-enabled, the winding current (the sense voltage) is again allowed to rise to the comparator's threshold. This cycle repeats itself, maintaining the average motor winding current at the desired level.

PWM OUTPUT CURRENT WAVE FORM



An external RC time delay should be used to further delay the action of the comparator. Depending on load type, many applications will not require these external components (SENSE connected to COMP IN).

Logic control of output current

The current level in the motor winding is selected with these inputs. If any of the logic inputs is left open, the circuit will treat it as a high level input.

Current Control Truth Table

I ₀	I ₁	Output Current
L	L	$V_{REF}/10 \cdot R_S = I_{Trip}$
H	L	$V_{REF}/15 \cdot R_S = 2/3 I_{Trip}$
L	H	$V_{REF}/30 \cdot R_S = 1/3 I_{trip}$
H	H	0

Phase control

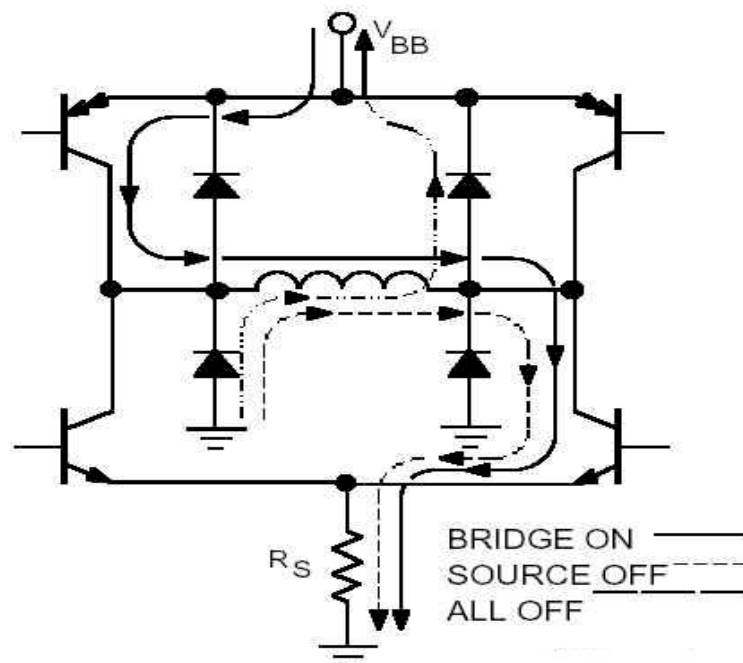
The PHASE control input determines the direction of current flow in the windings, depending on the motor connections. The signal is fed through a schmidt-trigger for noise immunity, and through a time delay (approximately $2\mu\text{s}$) in order to guarantee that no short-circuit occurs in the output stage during phase-shift.

Current Flow control Truth Table

PHASE	OUT _A	OUT _B
H	H	L
L	L	H

Loads with high distributed capacitances may result in high turn-on current peaks. This peak (appearing across R_S) will attempt to trip the comparator, resulting in erroneous current control or high-frequency oscillations. An external $R_C C_C$ time delay should be used to further delay the action of the comparator. Depending on load type, many applications will not require these external components(SENSE connected to COMP IN).

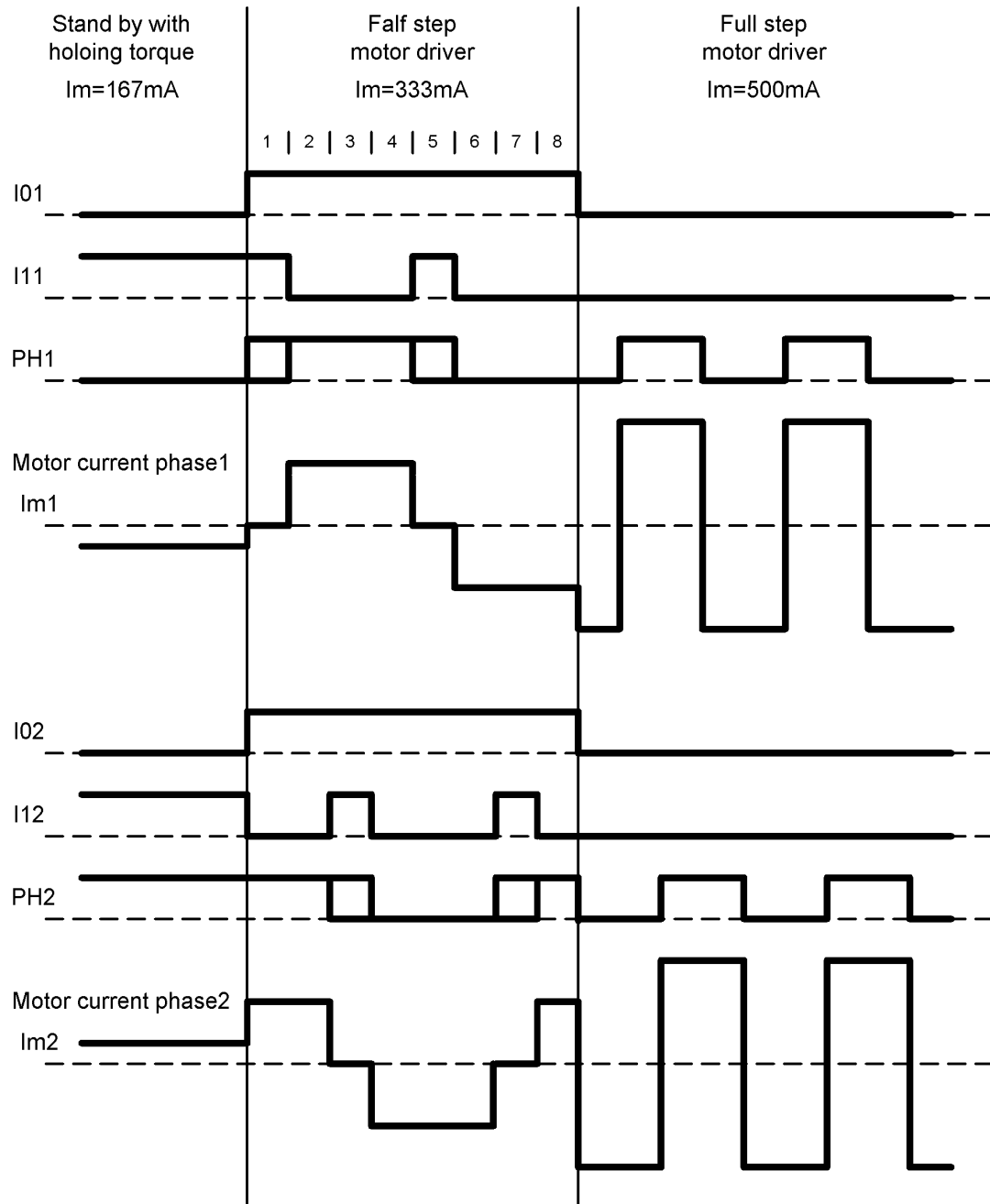
LOAD CURRENT PATHS



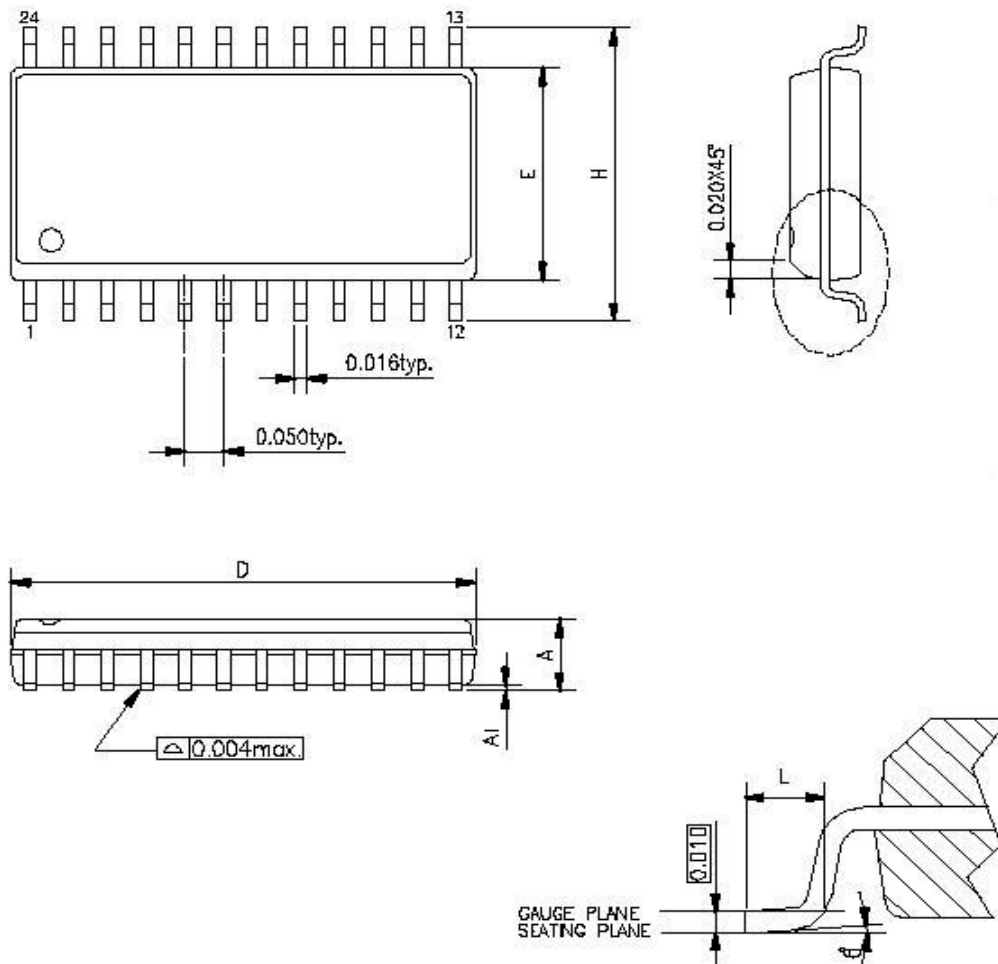
All four drivers in the bridge output can be turned off between steps ($I_0=I_1\geq 2.4V$) resulting in a fast current decay path. The fast current decay is desirable in half-step and high-speed applications. The PHASE, I_0 , and I_1 inputs float high. Varying the reference voltage (V_{REF}) provides continuous control of the peak load current for microstepping applications.

Thermal protection circuitry turns off all drivers when the junction temperature reaches $+170^{\circ}C$. It is only intended to protect the device from failures due to excessive junction temperature and should not imply that output short circuits are permitted. The output drivers are re-enabled when the junction temperature cools to $+145^{\circ}C$.

Operating waveform



Small Outline 24-pin Plastic SOP



SYMBOLS	MIN.	NOM	MAX.
A	0.093	0.099	0.104
A1	0.004	—	0.012
D	0.599	0.600	0.614
E	0.291	0.295	0.299
H	0.394	0.406	0.419
L	0.016	0.035	0.050
θ°	0	—	8

UNIT : INCH