Aimtron
圓創科技股份有限公司

AT5519

Preliminary Product Information

Dual Full-Bridge Stepper Motor Driver

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

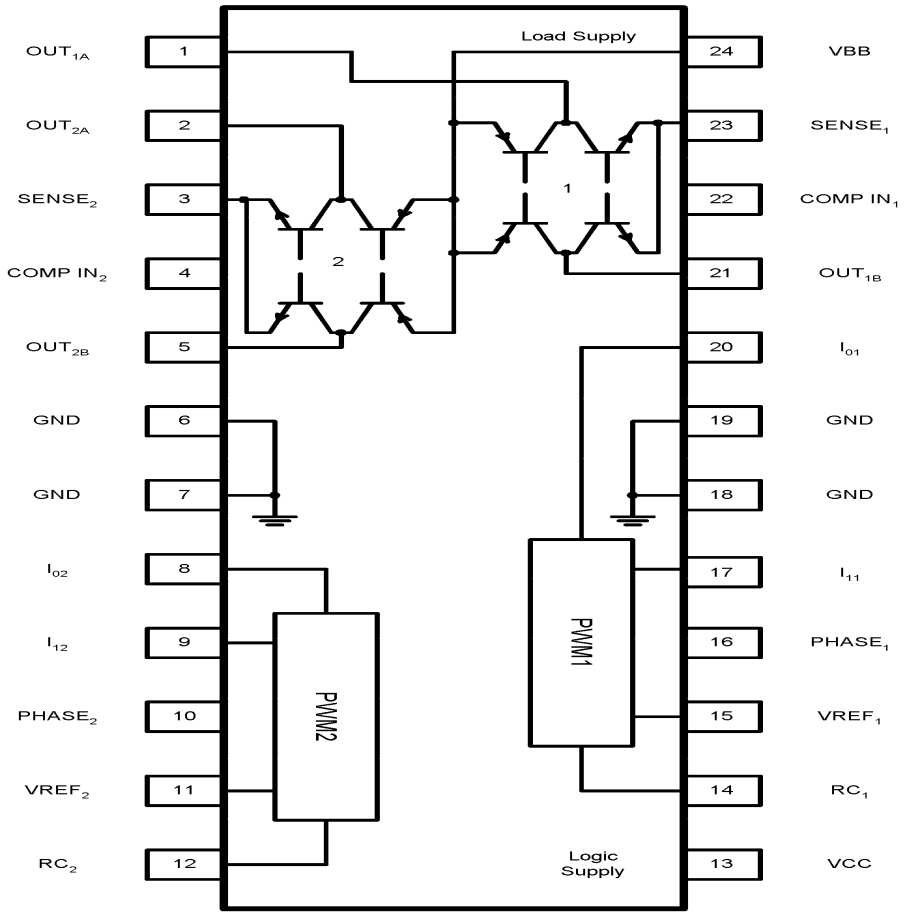
General Description

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.

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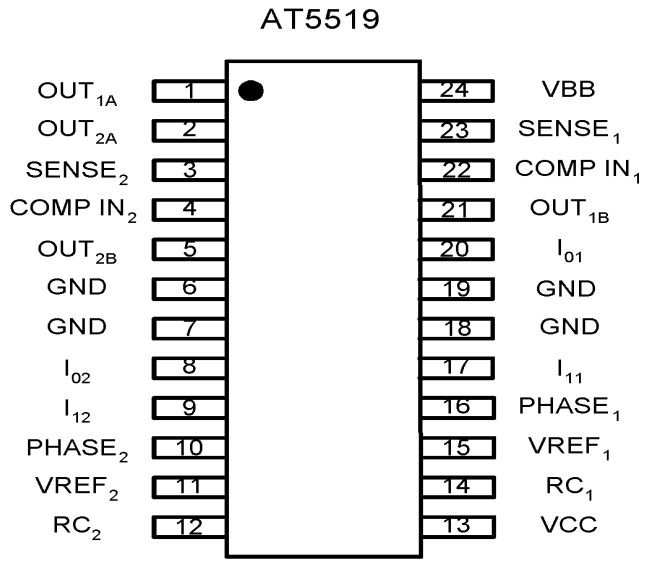
Pin Configuration



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	**RC_1**	14	OFF time setting
$SENSE_2$	3	Current Sense Resistor Connection	**$VREF_1$**	15	Reference voltage of the comparator
COMP IN_2	4	Input Connected to the Comparator	**$PHASE_1$**	16	Current Flow input
OUT_{2B}	5	Output Connection	**I_{11}**	17	Current Level input of PWM1
GND	6	Ground	**GND**	18	Ground
GND	7	Ground	**GND**	19	Ground
I_{02}	8	Current Level input of PWM2	**I_{01}**	20	Current Level input of PWM1
I_{12}	9	Current Level input of PWM2	**OUT_{1B}**	21	Output Connection
$PHASE_2$	10	Current Flow input	**COMP IN_1**	22	Input Connected to the Comparator
$VREF_2$	11	Reference voltage of the comparator	**$SENSE_1$**	23	Current Sense Resistor Connection
RC_2	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

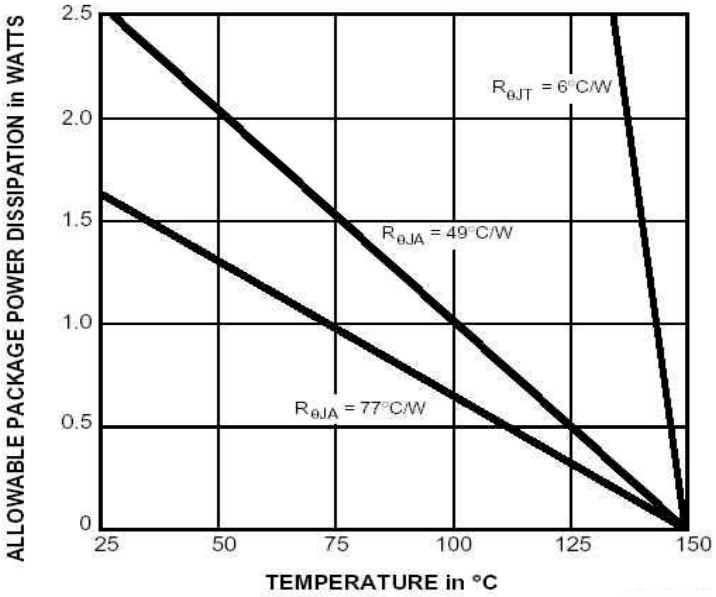
Absolute Maximum Ratings

(T_a=+25°C)

Item	Symbol	Ratings	Units
Storage temperature	T_{STG}	-55～+150	℃
Operating temperature	T_A	-20～+85	℃
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~+7.0	V
Output Emitter Voltage	V_{SENSE}	1.5	V
Power consumption	Pd	55	°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 ragting or a junction temperature of +150°C**

Power Dissipation



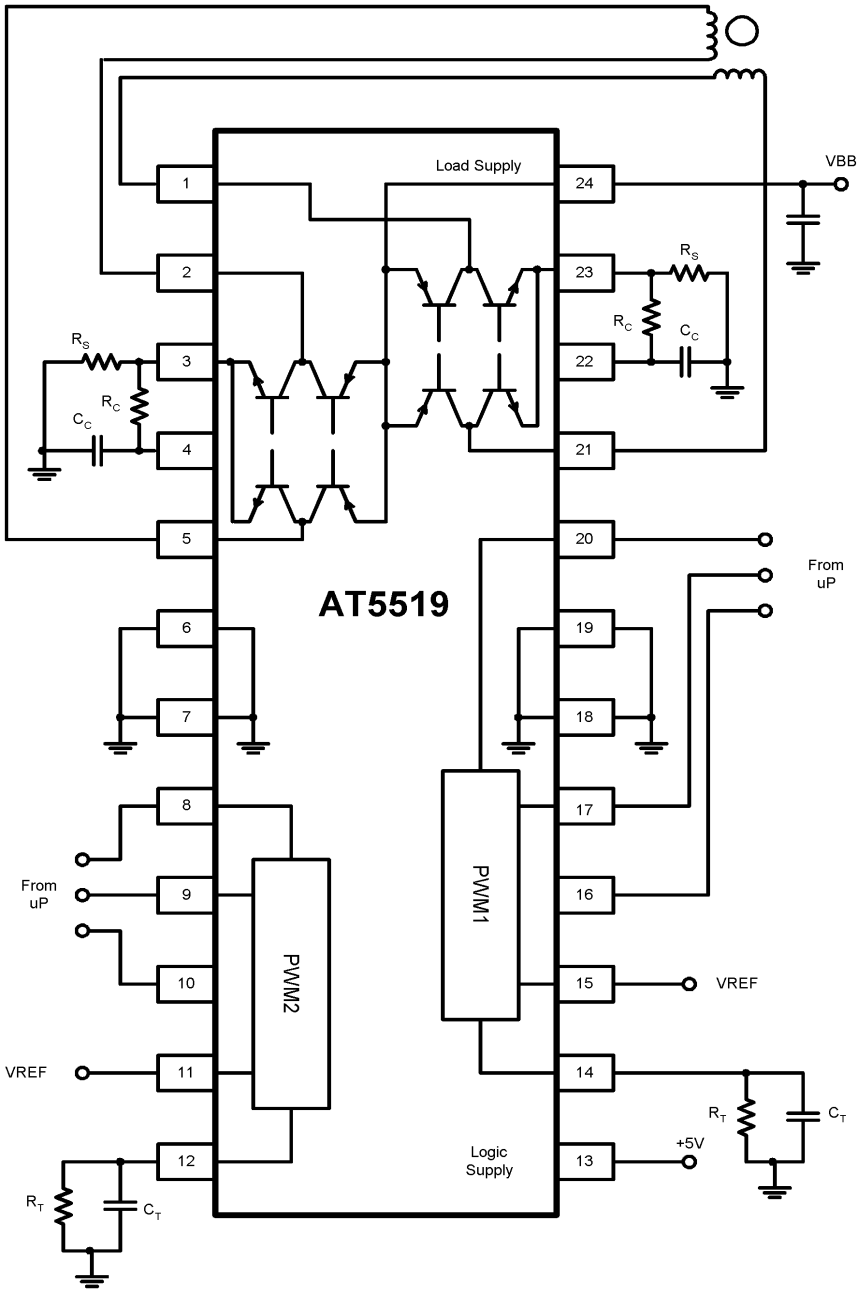
Electrical Characteristics

(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	VBB		10	-	28	V
Output Leakage Current	I_{CEX}	V_{OUT}=VBB	-	-	50	μA
		V_{OUT}=0V	-	-	-50	μA
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	μA
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	μA
		V_{IN}=0.8V	-	-3.0	-200	μA
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

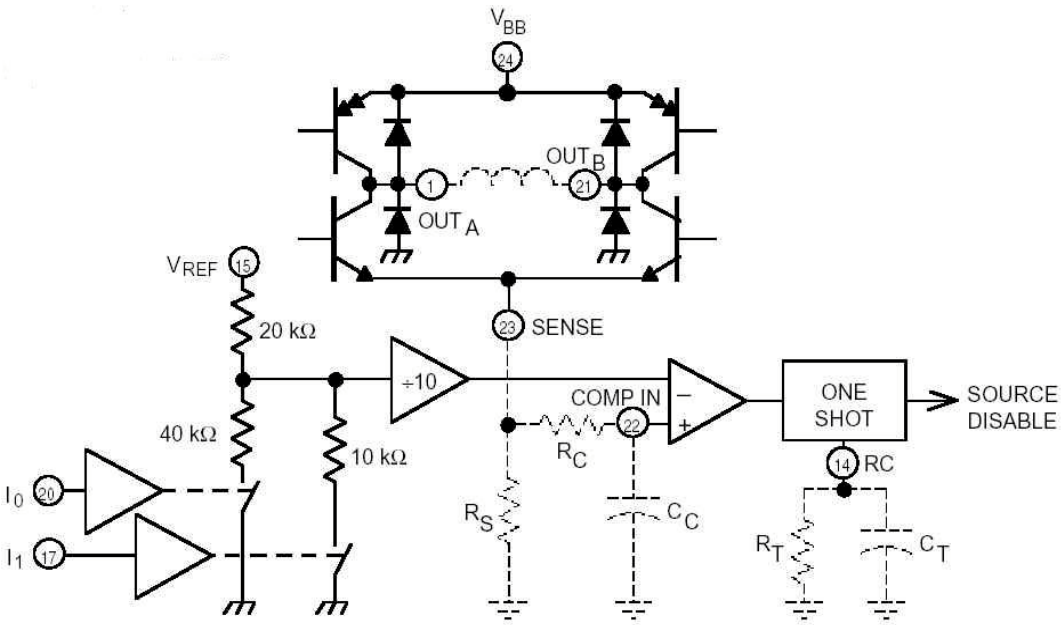
	$I_{CC(OFF)}$	I_0=I_1=2.4V, No Load	-	10	12	mA

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:

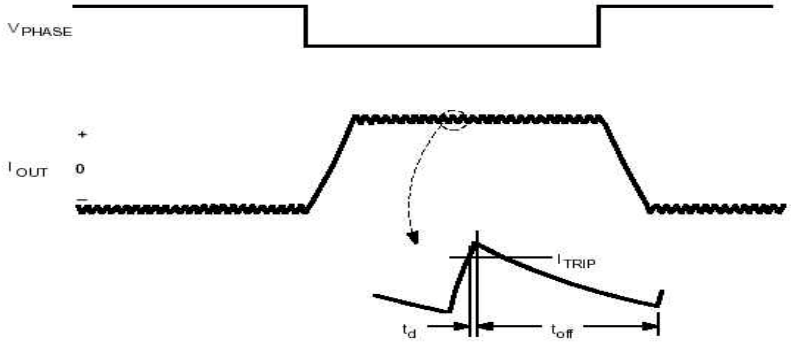
$$I_{TRIP} = \frac{V_{REF}}{10 \times R_S}$$

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 2μs. 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 $R_C C_C$ 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).

Logic control of output current

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

Current Control Truth Table

I_0	I_1	Output Current
L	L	$V_{REF}/10*R_S = I_{Trip}$
H	L	$V_{REF}/15*R_S=2/3\ I_{Trip}$
L	H	$V_{REF}/30*R_S=1/3\ I_{trip}$
H	H	0

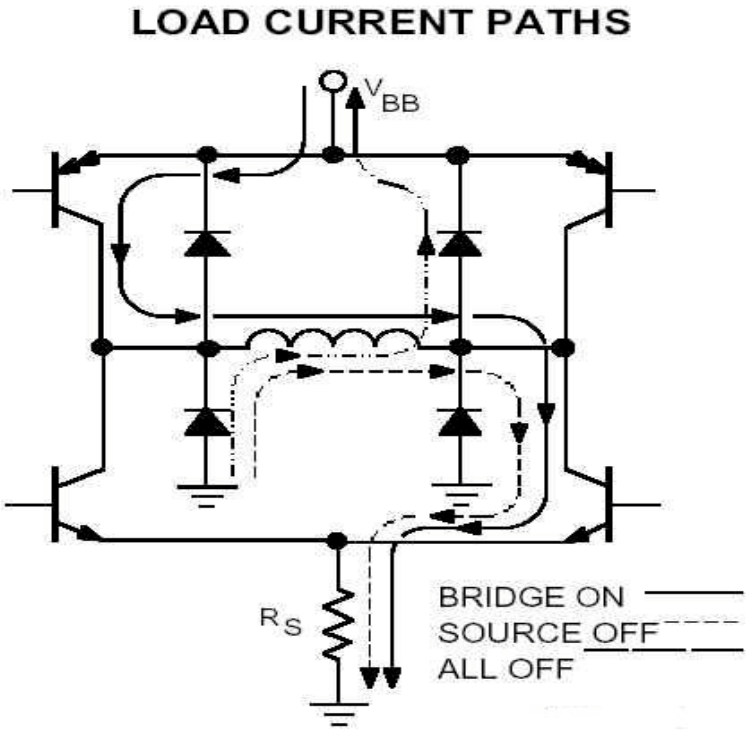
Phase control

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 2μs) 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

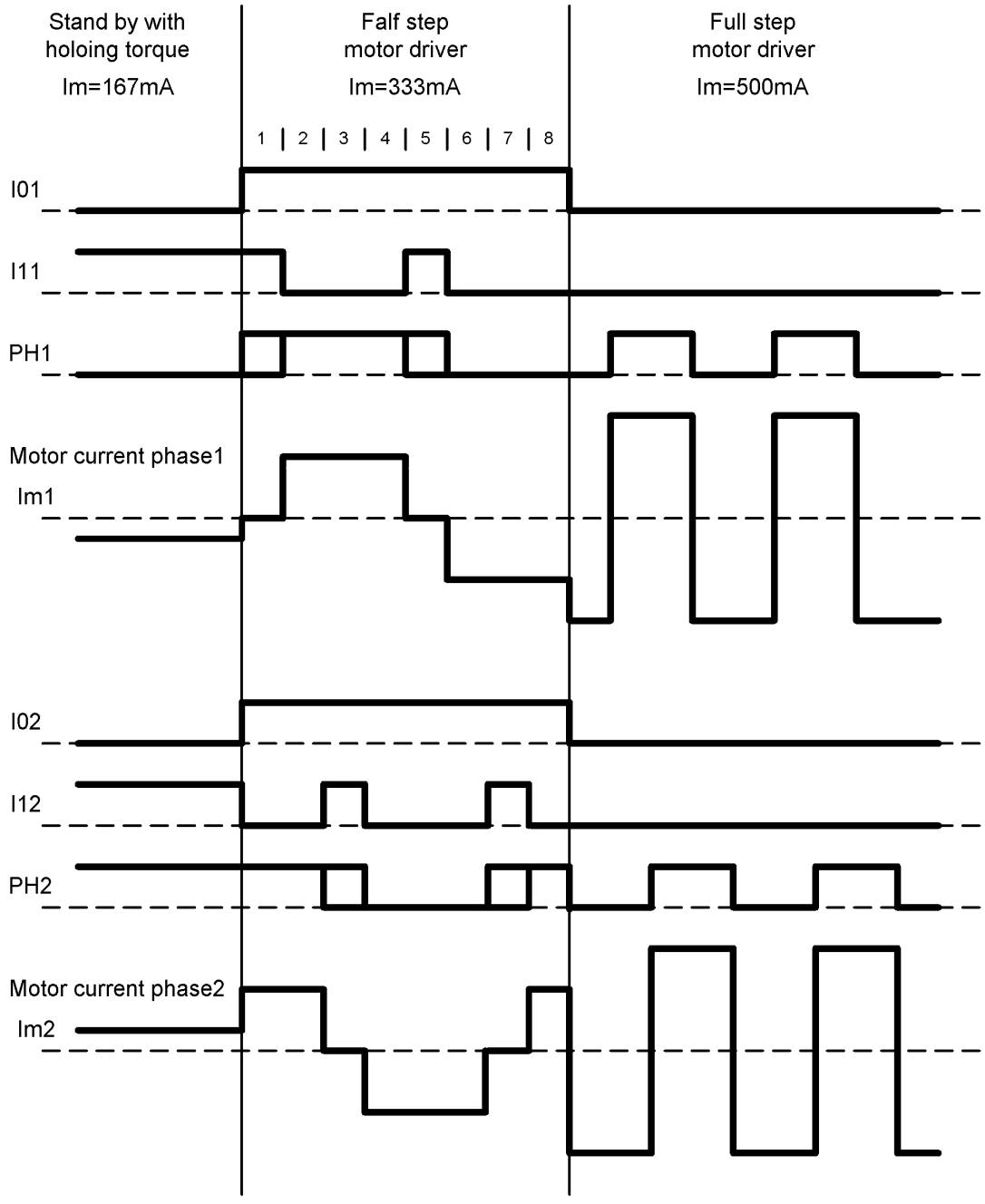
Loads with high distributed capacitances may result in high turn-on current peaks. This peak (appearing across R_S) will attempt to trip the comparator, resulting in erroneous current control or high-frequency oscillations. An external R_CC_C time delay should be used to further delay the action of the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



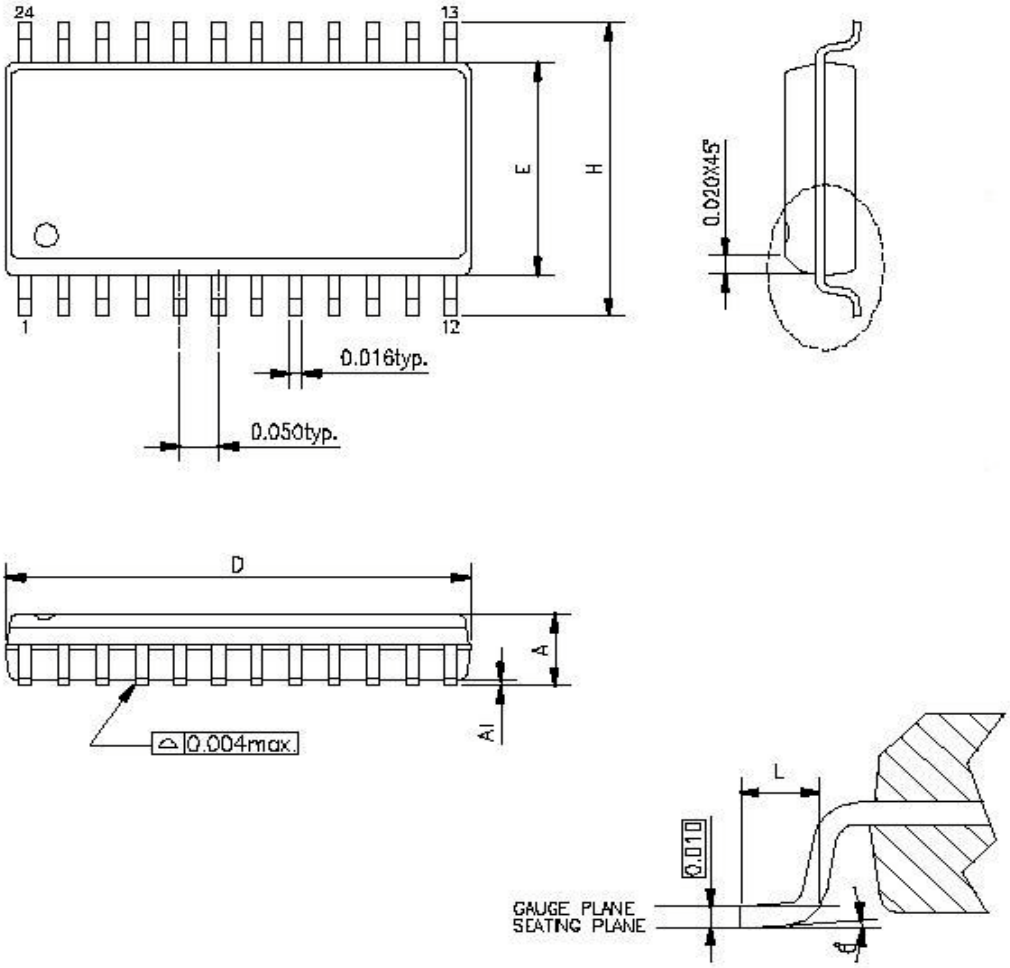
All four drivers in the bridge output can be turned off between steps (I_0=I_1≥2.4V) resulting in a fast current decay path. The fast current decay is desirable in half-step and high-speed applications. The PHASE, I_0, and I_1 inputs float high. Varying the reference voltage (V_{REF}) provides continuous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

Thermal protection circuitry turns off all drivers when the junction temperature reaches +170°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°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