



## L6219

## LINEAR INTEGRATED CIRCUIT

### DUAL FULL-BRIDGE PWM MOTOR DRIVER

#### DESCRIPTION

The L6219 motor driver is designed to drive both windings of a bipolar stepper motor or bidirectionally control two dc motors. Both bridges are capable of sustaining 45V and include internal pulse-width modulation (PWM) control of the output current to 750mA .The outputs have been optimized for a low output saturation voltage drop (less than 1.8V total source plus sink at 500mA ).

For PWM current control, the maximum output current is determined by the user's selection of a reference voltage and sensing resistor. 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.

The bridges include both ground clamp and flyback diodes for protection against inductive transients. Internally generated delays prevent cross-over currents when switching current direction. Special power-up sequencing is not required. Thermal protection circuitry disables the outputs if the chip temperature exceeds safe operating limits.

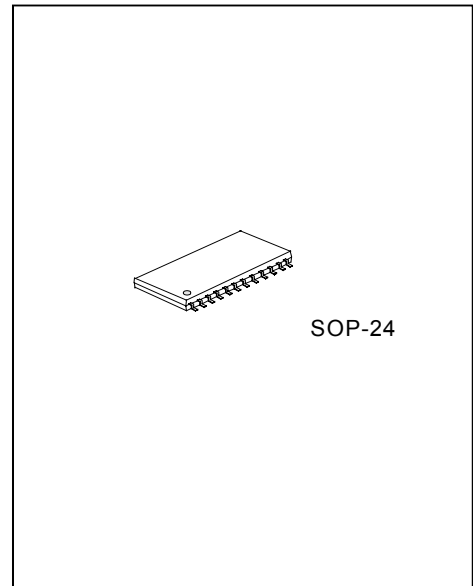
#### FEATURES

- \*Interchangeable with SGS L6219
- \*750mA Continuous Output Current
- \*45V Output Sustaining Voltage
- \*Internal Clamp Diodes
- \*Internal PWM Current Control
- \*low Output Saturation Voltage
- \*Internal Thermal Shutdown Circuitry

#### ORDERING INFORMATION

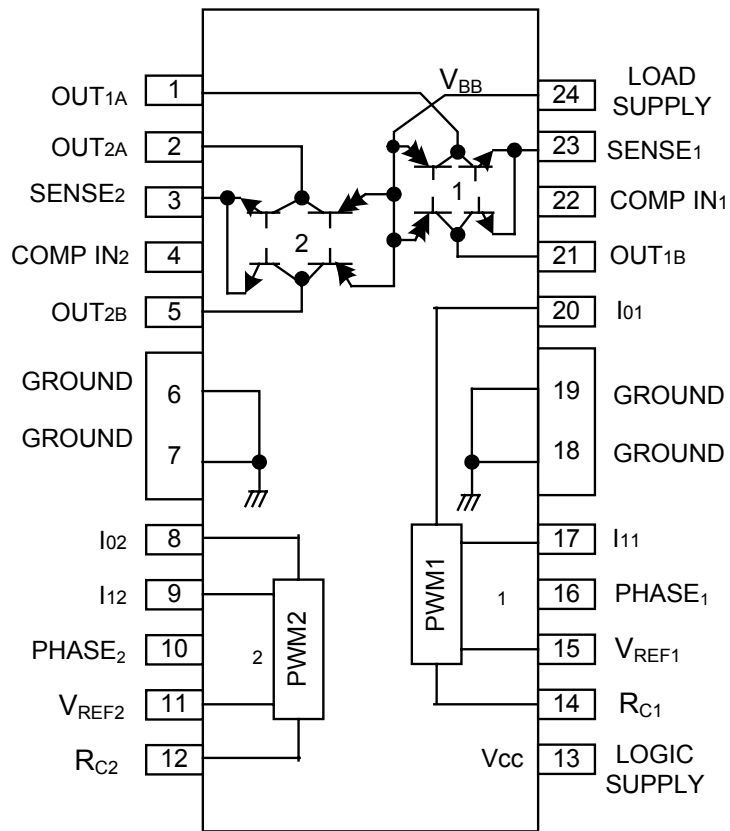
Order Number		Package	Packing
Normal	Lead Free Plating		
L6219-S24-R	L6219L-S24-R	SOP-24	Tape Reel
L6219-S24-T	L6219L-S24-T	SOP-24	Tube

<p>L6219L-S24-R</p>	<p>(1)Packing Type (2)Package Type (3)Lead Plating</p>	<p>(1) R: Tape Reel, T: Tube (2) S24: SOP-24 (3) L: Lead Free Plating, Blank: Pb/Sn</p>
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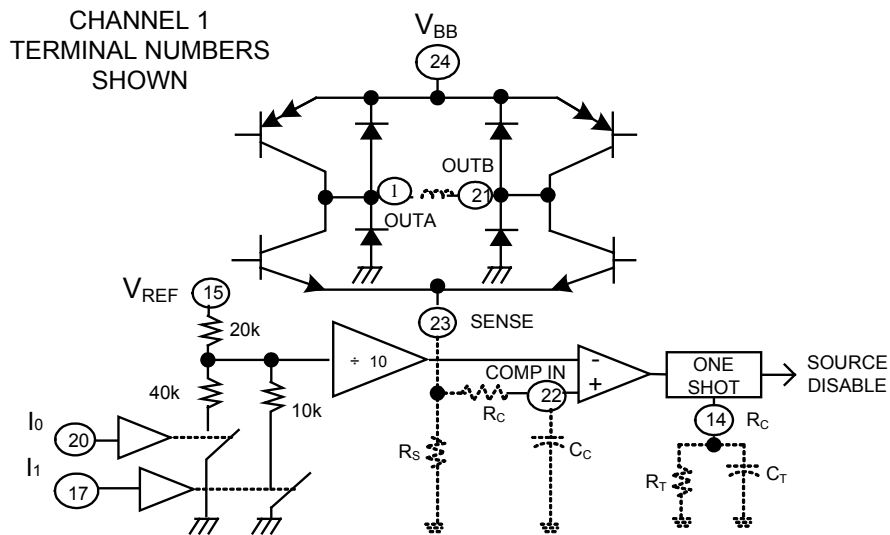


\*Pb-free plating product number: L6219L

## PIN CONFIGURATION



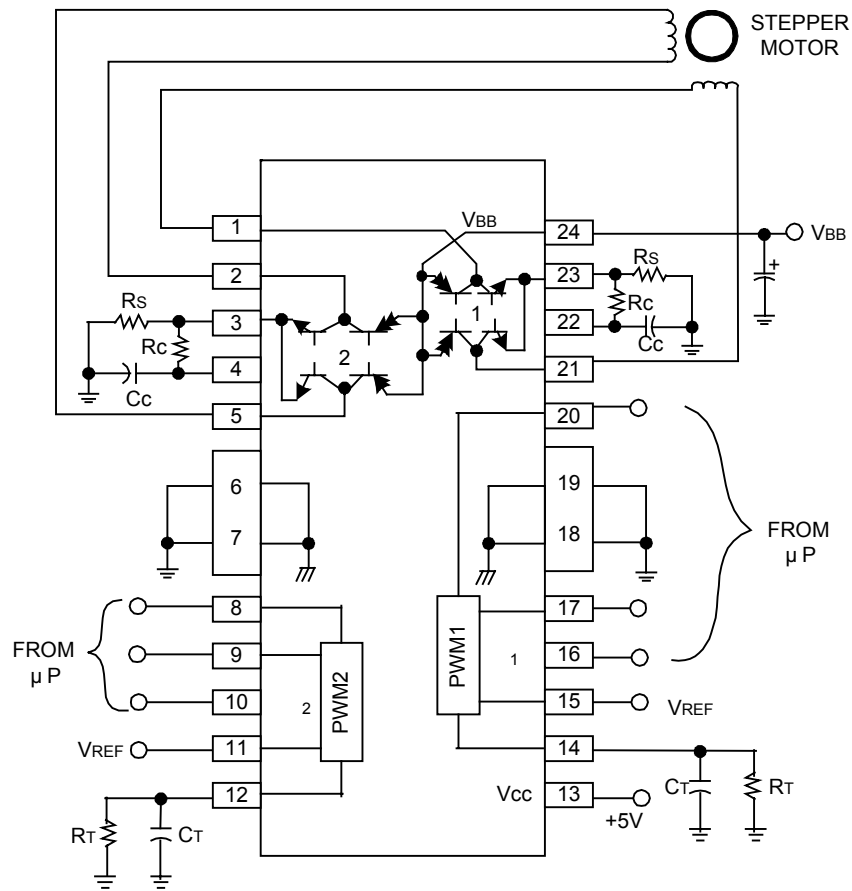
## PWM CURRENT-CONTROL CIRCUITRY



## TRUTH TABLE

PHASE	OUTA	OUTB
H	H	L
L	L	H

## ■ TYPICAL APPLICATION



■ ABSOLUTE MAXIMUM RATINGS (Ta = 25 °C)

PARAMETER	SYMBOL	RATINGS	UNIT
Motor Supply Voltage	V <sub>BB</sub>	45	V
Output Current	I <sub>OUT</sub>	Peak	1.0
		Continuous	750
Logic Supply Voltage	V <sub>CC</sub>	7.0	V
Logic Input Voltage Range	V <sub>IN</sub>	-0.3 ~ +7.0	V
Output Emitter Voltage	V <sub>SENSE</sub>	1.5	V
Package Power Dissipation	P <sub>D</sub>	See graph	
Junction Temperature	T <sub>J</sub>	125	°C
Operating Temperature	T <sub>OPR</sub>	-20~+85	°C
Storage Temperature	T <sub>STG</sub>	-40 ~ +150	°C

Note 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. The device is guaranteed to meet performance specification within 0 ~ +70°C operating temperature range and assured by design from -20 ~ +85°C.

3. Output current rating may be limited by duty cycle, ambient temperature, and heat sinking. Under any set of conditions, do not exceed the specified peak current rating or a junction temperature of +150°C

■ ELECTRICAL CHARACTERISTICS (Ta=25°C, V<sub>CC</sub>=4.75V to 5.25V, V<sub>BB</sub>=45V, T<sub>J</sub>≤150°C, V<sub>REF</sub>=5.0V)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>Output Drivers(OUTA or OUTB)</b>						
Motor Supply Range	V <sub>BB</sub>		10	-	45	V
Output Leakage Current	I <sub>LEAK</sub>	V <sub>OUT</sub> =V <sub>BB</sub>	-	<1.0	50	μA
		V <sub>OUT</sub> =0	-	<-1.0	-50	μA
Output Sustaining Voltage	V <sub>CE(SUS)</sub>	I <sub>OUT</sub> = ± 750mA, L=3.0mH	45	-	-	V
Output Saturation Voltage	V <sub>CE(SAT)</sub>	Sink Driver, I <sub>OUT</sub> =+500mA	-	0.4	0.6	V
		Sink Driver, I <sub>OUT</sub> =+750mA	-	1.0	1.2	V
		Source Driver, I <sub>OUT</sub> = -500mA	-	1.0	1.2	V
		Source Driver, I <sub>OUT</sub> = -750mA	-	1.3	1.5	V
Clamp Diode Leakage Current	I <sub>R</sub>	V <sub>R</sub> =45V	-	<1.0	50	μA
Clamp Diode Forward Voltage	V <sub>F</sub>	I <sub>F</sub> =750mA	-	1.6	2.0	V
Driver Supply Current	I <sub>BB(ON)</sub>	Both Bridges On, No Load	-	20	25	mA
	I <sub>BB(OFF)</sub>	Both Bridge Off	-	5.0	10	mA
<b>Control Logic</b>						
Input Voltage	V <sub>IN(1)</sub>	All Inputs	2.4	-	-	V
	V <sub>IN(0)</sub>	All Inputs	-	-	0.8	V
Input Current	I <sub>IN(1)</sub>	V <sub>IN</sub> =2.4V	-	<1.0	20	μA
		V <sub>IN</sub> =0.8V	-	-3.0	-200	μA
Reference Voltage Range	V <sub>REF</sub>	Operating	1.5	-	7.5	V
Current Limit Threshold (at trip point)	V <sub>REF</sub> /V <sub>COMPIN</sub>	I <sub>0</sub> =I <sub>1</sub> =0.8V	9.5	10	10.5	-
		I <sub>0</sub> =2.4V, I <sub>1</sub> =0.8V	13.5	15	16.5	-
		I <sub>0</sub> =0.8V, I <sub>1</sub> =2.4V	25.5	30	34.5	-
Total Logic Supply Current	I <sub>CC(ON)</sub>	I <sub>0</sub> =I <sub>1</sub> =0.8V, No Load	-	40	50	mA
	I <sub>CC(OFF)</sub>	I <sub>0</sub> =I <sub>1</sub> =2.4V, No Load	-	10	12	
Thermal Shutdown Temperature	T <sub>SHDN</sub>		-	170	-	°C

## ■ PWM CURRENT CONTROL

The L6219 dual bridge is designed to drive both windings of a bipolar stepper motor. Output current is sensed and controlled independently in each bridge by an external sense resistor ( $R_s$ ), internal comparator, and monostable multivibrator.

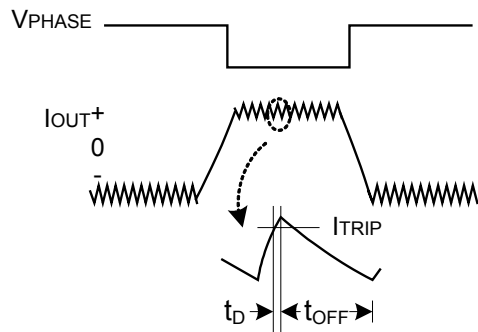
When the bridge is turned on, current increases in the motor winding and it is sensed by the external sense resistor until the sense voltage ( $V_{COMPIN}$ ) reaches the level set at the comparator's input:  $I_{TRIP} = V_{REF} / 10R_s$

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 (especially for low-inductance loads) because of the internal logic and switching delays. This delay ( $t_d$ ) is typically  $2\mu s$ . After turn-off, the motor current decays, circulating through the ground-clamp diode and sink transistor. The source driver's off time (and therefore the magnitude of the current decrease) is determined by the monostable's external  $R_C$  timing components, where  $t_{OFF} = R_T C_T$  within the range of  $20k\Omega$  to  $100k\Omega$  and  $100pF$  to  $1000pF$

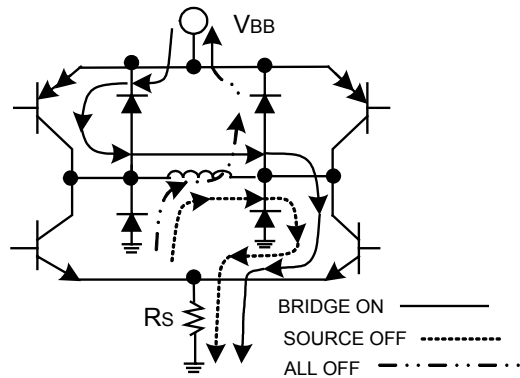
When the source driver is re-enabled, the winding current (the sense voltage) is again allowed to rise to the comparator's threshold. This cycle repeats itself, maintaining the average motor winding current at the desired level.

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).

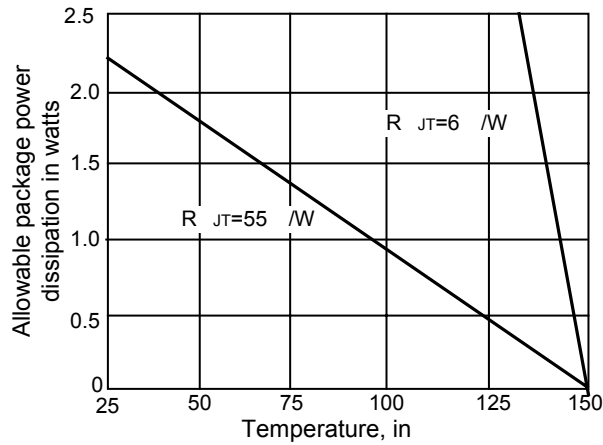
PWM OUTPUT CURRENT WAVE FORM



LOAD CURRENT PATHS



## ■ TYPICAL CHARACTERISTIC



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