

# L6219

# LINEAR INTEGRATED CIRCUIT

## STEPPER MOTOR DRIVER

### DESCRIPTION

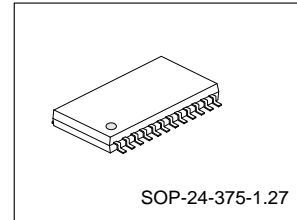
The L6219 is a bipolar monolithic integrated circuits intended to control and drive both winding of a bipolar stepper motor or bidirectionally control two DC motors.

The L6219 with a few external components form a complete control and drive circuit for LS-TTL or microprocessor controlled stepper motor system. The power stage is a dual full bridge capable of sustaining 46V and including four diodes for current recirculation.

A cross conduction protection is provided to avoid simultaneous cross conduction during switching current direction.

An internal pulse-width-modulation (PWM) controls the output current to 750mA with peak start-up current up to 1A.

Wide range of current control from 750mA (each bridge) is permitted by means of two logic inputs and an external voltage reference. A phase input to each bridge determines the load current direction. A thermal protection circuitry disables the outputs if the chip temperature exceeds safe operating limits.



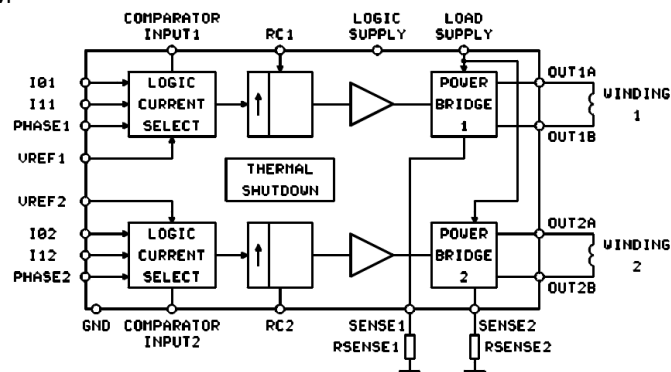
### ORDERING INFORMATION

Device	Package
L6219	SOP-24-375-1.27

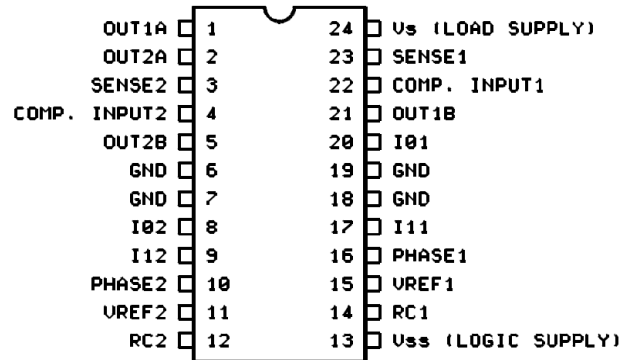
### FEATURES

- ◇ Able to drive both windings of bipolar stepper motor
- ◇ Output current up to 750mA each winding
- ◇ Wide voltage range 10V to 46V
- ◇ Half-step, full-step and micro-stepping mode
- ◇ Built-in protection diodes
- ◇ Internal PWM current control
- ◇ Low output saturation voltage
- ◇ Designed for unstabilized motor supply voltage
- ◇ Internal thermal shutdown

### BLOCK DIAGRAM



## PIN CONFIGURATION



## PIN FUNCTIONS

PDIP & SO	Name	Function
1;2	OUTPUT A	See pins 5;21
3;23	SENSE RESISTOR	Connection to Lower Emitters of Output Stage for Insertion of Current Sense Resistor
4;22	COMPARATOR INPUT	Input connected to the comparators. The voltage across the sense resistor is feedback to this input through the low pass filter RC CC. The higher power transistors are disabled when the sense voltage exceeds the reference voltage of the selected comparator. When this occurs the current decays for a time set by $R_T C_T$ ( $t_{off} = 1.1 R_T C_T$ ). See fig. 1.
5;21	OUTPUT B	Output Connection. The output stage is a "H" bridge formed by four transistors and four diodes suitable for switching applications.
6;19	GROUND	See pins 7;18
7;18	GROUND	Ground Connection. With pins 6 and 19 also conducts heat from die to printed circuit copper.
8;20	INPUT 0	See INPUT 1 (pins 9;17)
9;17	INPUT 1	These pins and pins 8;20 (INPUT 0) are logic inputs which select the outputs of the comparators to set the current level. Current also depends on the sensing resistor and reference voltage. See Functional Description.
10;16	PHASE	This TTL-compatible logic inputs sets the direction of current flow through the load. A high level causes current to flow from OUTPUT A (source) to OUTPUT B (sink). A schmitt trigger on this input provides good noise immunity and a delay circuit prevents output stage short circuits during switching.
11;15	REFERENCE VOLTAGE	A voltage applied to this pin sets the reference voltage of the comparators, this determining the output current (also thus depending on $R_s$ and the two inputs INPUT 0 and INPUT 1).
12;14	RC	A parallel RC network connected to this pin sets the OFF time of the higher power transistors. The pulse generator is a monostable triggered by the output of the comparators ( $t_{off} = 1.1 R_T C_T$ ).
13	$V_{ss}$ - LOGIC SUPPLY	Supply Voltage Input for Logic Circuitry
24	$V_s$ - LOAD SUPPLY	Supply Voltage Input for the Output Stages.

## Note:

ESD on GND,  $V_s$ ,  $V_{ss}$ , OUT 1A and OUT 2A is guaranteed up to 1.5KV (Human Body Model, 1500Ω, 100pF).

## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>s</sub>	Supply Voltage	50	V
I <sub>o</sub>	Output Current (peak)	±1	A
I <sub>o</sub>	Output Current (continuous)	±0.75	A
V <sub>SS</sub>	Logic Supply Voltage	7	V
V <sub>IN</sub>	Logic Input Voltage Range	-0.3 to +7	V
V <sub>sense</sub>	Sense Output Voltage	1.5	V
T <sub>J</sub>	Junction Temperature	+150	°C
T <sub>op</sub>	Operating Temperature Range	-20 to +85	°C
T <sub>stg</sub>	Storage Temperature Range	-55 to +150	°C

## THERMAL DATA

Symbol	Description		PDIP	SO	Unit
R <sub>thj-case</sub>	Thermal Resistance Junction-case	Max.	14	18	°C/W
R <sub>thj-amb</sub>	Thermal Resistance Junction-ambient	Max.	60 (*)	75 (*)	°C/W

(\*) With minimized copper area.

## ELECTRICAL CHARACTERISTICS

(T<sub>j</sub> = 25°C, V<sub>s</sub> = 46V, V<sub>SS</sub> = 4.75V to 5.25V, V<sub>REF</sub> = 5V; unless otherwise specified) See fig. 1.

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
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OUTPUT DRIVERS (OUT<sub>A</sub> or OUT<sub>B</sub>)

V <sub>s</sub>	Motor Supply Range		10		46	V
I <sub>CEX</sub>	Output Leakage Current	V <sub>OUT</sub> = V <sub>s</sub> V <sub>OUT</sub> = 0	- -	<1 <-1	50 -50	μA μA
V <sub>CE(sat)</sub>	Output Saturation Voltage	Sink Driver, I <sub>OUT</sub> = +500mA Sink Driver, I <sub>OUT</sub> = +750mA Source Driver, I <sub>OUT</sub> = -500mA Source Driver, I <sub>OUT</sub> = -750mA	- - - -	0.3 0.7 1.1 1.3	0.6 1 1.4 1.6	V V V V
I <sub>R</sub>	Clamp Diode Leakage Current	V <sub>R</sub> = 50V	-	<1	50	μA
V <sub>F</sub>	Clamp Diode Forward Voltage	Sink Diode Source Diode I <sub>F</sub> = 750mA		1 1	1.5 1.5	V V
I <sub>S(on)</sub>	Driver Supply Current	Both Bridges ON, No Load	-	8	15	mA
I <sub>S(off)</sub>	Driver Supply Current	Both Bridges OFF	-	6	10	mA

## ELECTRICAL CHARACTERISTICS (Continued)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
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### CONTROL LOGIC

V <sub>IN(H)</sub>	Input Voltage	All Inputs	2.4	-	-	V
V <sub>IN(L)</sub>	Input Voltage	All Inputs	-	-	0.8	V
I <sub>IN(H)</sub>	Input Current	V <sub>IN</sub> = 2.4V	-	<1	20	μA
I <sub>IN(L)</sub>	Input Current	V <sub>IN</sub> = 0.84V	-	-3	-200	μA
V <sub>REF</sub>	Reference Voltage	Operating	1.5	-	7.5	V
I <sub>SS(ON)</sub>	Total Logic Supply Current	I <sub>o</sub> = I <sub>1</sub> = 0.8V, No Load	-	64	74	mA
I <sub>SS(OFF)</sub>	Total Logic Supply Current	I <sub>o</sub> = I <sub>1</sub> = 2.4V, No Load	-	10	14	mA

### COMPARATORS

V <sub>REF</sub> / V <sub>sense</sub>	Current Limit Threshold (at trip point)	I <sub>o</sub> = I <sub>1</sub> = 0.8V	9.5	10	10.5	-
		I <sub>o</sub> = 2.4V, I <sub>1</sub> = 0.8V	13.5	15	16.5	-
		I <sub>o</sub> = 0.8V, I <sub>1</sub> = 2.4V	25.5	30	34.5	-
t <sub>off</sub>	Cut off Time	R <sub>t</sub> = 56KΩ C <sub>t</sub> = 820pF	-	50		μs
t <sub>d</sub>	Turn Off Delay		-	1		μs

### PROTECTION

T <sub>J</sub>	Thermal Shutdown Temperature		-	170	-	°C
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### TYPICAL APPLICATION CIRCUIT

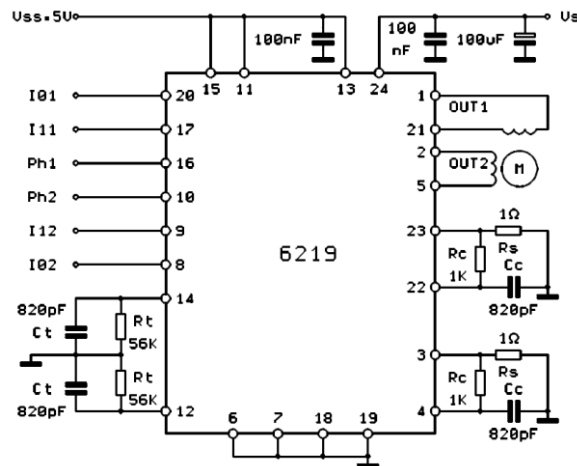
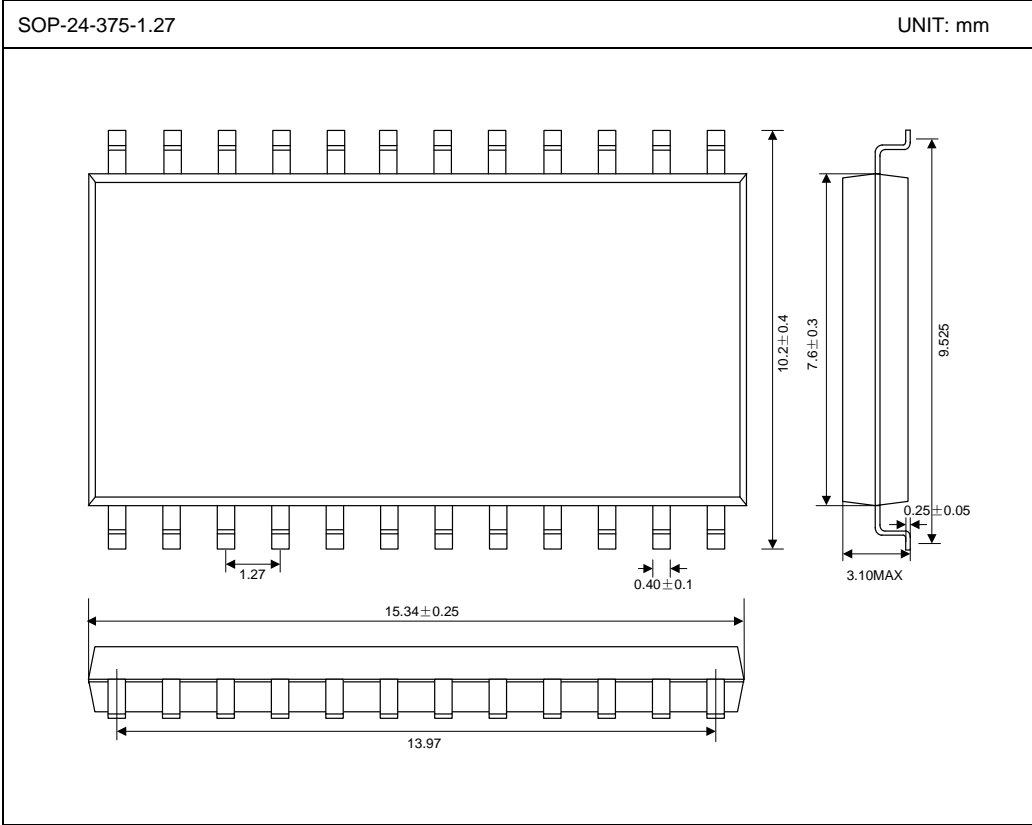


Figure 1: Typical Application Circuit. (Pin out referred to DIP24 package)

# L6219

# LINEAR INTEGRATED CIRCUIT

## PACKAGE OUTLINE



## ELECTROSTATIC DISCHARGE CAUTION



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage handling to prevent electrostatic damage to the device.

## NOTICE

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