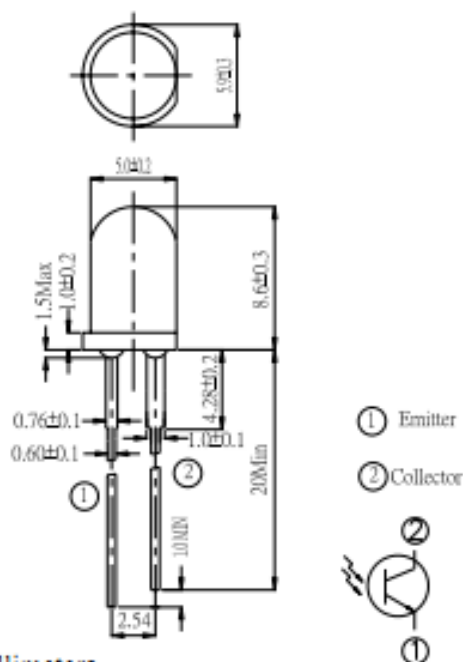


## Hojas de especificaciones de los componentes electrónicos seleccionados.

Fototransistor infrarrojo utilizado en los sensores de distancia.

### Package Dimensions



- Notes:** 1. All dimensions are in millimeters  
2. Tolerances unless dimensions  $\pm 0.25$ mm

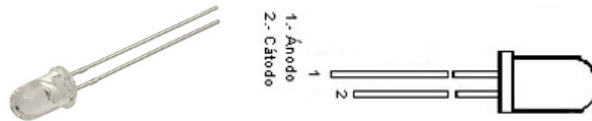
### Absolute Maximum Ratings ( $T_a=25^\circ\text{C}$ )

Parameter	Symbol	Rating	Units
Collector-Emitter Voltage	$V_{CE0}$	30	V
Emitter-Collector-Voltage	$V_{ECO}$	5	V
Collector Current	$I_c$	20	mA
Operating Temperature	$T_{opr}$	$-25 \sim +85^\circ\text{C}$	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	$-40 \sim +85^\circ\text{C}$	$^\circ\text{C}$
Lead Soldering Temperature	$T_{sol}$	260	$^\circ\text{C}$
Power Dissipation at (or below) $25^\circ\text{C}$ Free Air Temperature	$P_c$	75	mW

**Notes:** \*1: Soldering time  $\cong 5$  seconds.

**Led infrarrojo emisor utilizado en los sensores de distancia.**

**IR333C**



**Descripción: Diodo emisor de luz infrarrojo de 5 mm transparente.**

**Rangos Máximos (Ta = 25° C)**

Parámetro	Símbolo	Valores	Unidad
Corriente continua en sentido directo	$I_F$	100	mA
Corriente pico en sentido directo (ancho de pulso= 10 $\mu$ S)	$I_{FP}$	1.0	A
Tensión inversa	$V_R$	5	V
Rango de temperatura de operación	$T_{opr}$	-40 ~ +85	°C
Rango de temperatura almacenaje	$T_{stg}$	-40~ +85	°C
Temperatura de soldeo	$T_{sol}$	260	°C
Potencia de disipación a (o abajo) de 25°C	$P_d$	150	mW

## Motores de corriente directa utilizados

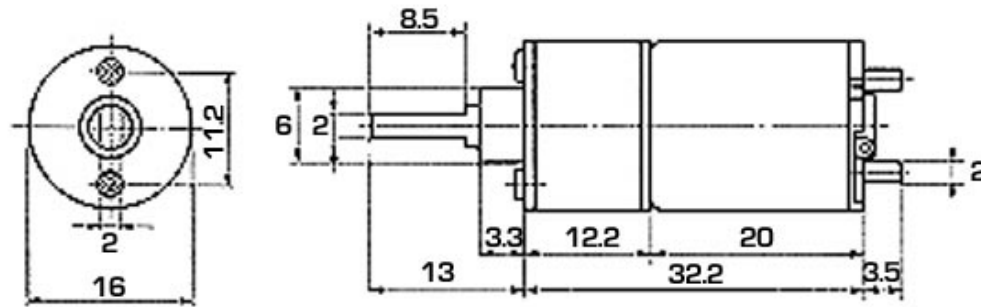
### Low Cost Mini Geared Motor -- LA16G-324VE

#### SPECIFICATIONS

This little motor takes the Copal line another step further with its all-metal gears at a ratio of 50 to 1. We've tested this motor extensively, and were extremely impressed at its performance.

There are now TWO different versions of this motor- one with a 6V motor, and one with a 12V motor. Since we know many builders will opt to overvolt these motors anyway to 12+ volts, we had Copal develop a new 6V version of this motor, just for the Robot MarketPlace. Both motor models have wire leads soldered onto the back. Check out the stats below.

Note that this motor's gearbox is exposed, so it's best for use in a bot where it is enclosed. If you need to, you could wrap a layer of thin CF or foil around the gearbox if you're worried about grit getting inside, or better yet, check out our Lexan Mounts made just for this motor, which also keep the gearbox enclosed.



#### Performance Specifications

DC Voltage (VDC) 12.0  
 Shaft Speed (rpm) 270  
 Continuous Current (amps) 0.1000  
 Continuous Torque (In-lbs) 1.47  
 Output Power (HP) 2.24E-4  
 Torque Constant (in-oz/amp)  
 Rotor Inertia (oz-in-sec<sup>2</sup>)

#### Motor Type

DC Construction Permanent Magnet  
 Commutation Brush

Shaft Orientation In-line; Single-ended

### Gearing Options

Gearing Gearmotor  
 Gearhead Model  
 Gear Type  
 Gearbox Ratio (: 1) 49.73  
 Gearing Efficiency (%)

### Housing / Enclosure

Units Metric  
 Motor Shape Cylindrical Body  
 Diameter / Width (inch)  
 Length (inch) 1.27  
 NEMA Frame  
 Options  
 Extreme Environment

### Other Specifications

Feedback  
 Features

### Environment

Operating Temperature (F)  
 Shock Rating (g)  
 Vibration Rating (g)  
 Environment

**Notes** Mini DC geared motor

Voltage:	4.8-14.8V
Output Speed:	500rpm @ 12V 280rpm @ 6V
Stall Torque:	58.9 oz-in (4241 g-cm) @ 12V 48.43 oz-in (3487 g-cm) @ 6V
Size:	1.3" (32.2mm) long, 5/8" (16mm) diameter
Weight:	0.71oz (20.1g)
Gear Ratio:	Metal Spur gear 50:1
Stall Current:	Stall at 1.5a
Shaft Info:	4mm D Shaft with 1 flat

## Driver de potencia para el control de los motores

### L293, L293D QUADRUPLE HALF-H DRIVERS

SLRS008B – SEPTEMBER 1996 – REVISED JUNE 2002

- Featuring Unitrode L293 and L293D Products Now From Texas Instruments
- Wide Supply-Voltage Range: 4.5 V to 36 V
- Separate Input-Logic Supply
- Internal ESD Protection
- Thermal Shutdown
- High-Noise-Immunity Inputs
- Functional Replacements for SGS L293 and SGS L293D
- Output Current 1 A Per Channel (600 mA for L293D)
- Peak Output Current 2 A Per Channel (1.2 A for L293D)
- Output Clamp Diodes for Inductive Transient Suppression (L293D)

#### description

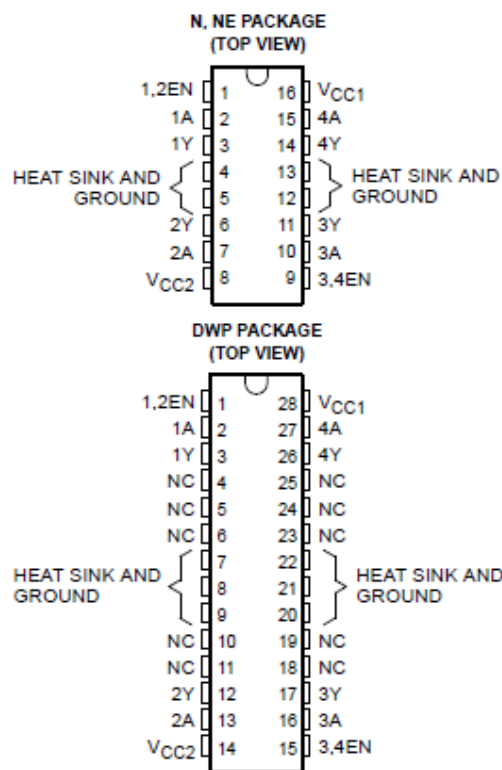
The L293 and L293D are quadruple high-current half-H drivers. The L293 is designed to provide bidirectional drive currents of up to 1 A at voltages from 4.5 V to 36 V. The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. Both devices are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications.

All inputs are TTL compatible. Each output is a complete totem-pole drive circuit, with a Darlington transistor sink and a pseudo-Darlington source. Drivers are enabled in pairs, with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN. When an enable input is high, the associated drivers are enabled and their outputs are active and in phase with their inputs. When the enable input is low, those drivers are disabled and their outputs are off and in the high-impedance state. With the proper data inputs, each pair of drivers forms a full-H (or bridge) reversible drive suitable for solenoid or motor applications.

On the L293, external high-speed output clamp diodes should be used for inductive transient suppression.

A  $V_{CC1}$  terminal, separate from  $V_{CC2}$ , is provided for the logic inputs to minimize device power dissipation.

The L293 and L293D are characterized for operation from 0°C to 70°C.



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS  
INSTRUMENTS**

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Amplificadores operacionales LM324 empleados en la etapa de acondicionamiento de la señal se lo sensores de distancia.



August 2000

## LM124/LM224/LM324/LM2902

### Low Power Quad Operational Amplifiers

#### General Description

The LM124 series consists of four independent, high gain, internally frequency compensated operational amplifiers which were designed specifically to operate from a single power supply over a wide range of voltages. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage.

Application areas include transducer amplifiers, DC gain blocks and all the conventional op amp circuits which now can be more easily implemented in single power supply systems. For example, the LM124 series can be directly operated off of the standard +5V power supply voltage which is used in digital systems and will easily provide the required interface electronics without requiring the additional  $\pm 15V$  power supplies.

#### Unique Characteristics

- In the linear mode the input common-mode voltage range includes ground and the output voltage can also swing to ground, even though operated from only a single power supply voltage
- The unity gain cross frequency is temperature compensated
- The input bias current is also temperature compensated

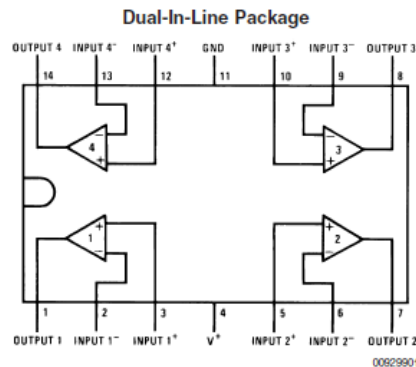
#### Advantages

- Eliminates need for dual supplies
- Four internally compensated op amps in a single package
- Allows directly sensing near GND and  $V_{OUT}$  also goes to GND
- Compatible with all forms of logic
- Power drain suitable for battery operation

#### Features

- Internally frequency compensated for unity gain
- Large DC voltage gain 100 dB
- Wide bandwidth (unity gain) 1 MHz (temperature compensated)
- Wide power supply range:  
Single supply 3V to 32V  
or dual supplies  $\pm 1.5V$  to  $\pm 16V$
- Very low supply current drain (700  $\mu A$ )—essentially independent of supply voltage
- Low input biasing current 45 nA (temperature compensated)
- Low input offset voltage 2 mV and offset current: 5 nA
- Input common-mode voltage range includes ground
- Differential input voltage range equal to the power supply voltage
- Large output voltage swing 0V to  $V^+ - 1.5V$

#### Connection Diagrams



Order Number LM124J, LM124AJ, LM124J/883 (Note 2), LM124AJ/883 (Note 1), LM224J, LM224AJ, LM324J, LM324M, LM324MX, LM324AM, LM324AMX, LM2902M, LM2902MX, LM324N, LM324AN, LM324MT, LM324MTX or LM2902N LM124AJRQML and LM124AJRQMLV (Note 3)  
See NS Package Number J14A, M14A or N14A

LM124/LM224/LM324/LM2902 Low Power Quad Operational Amplifiers

Amplificadores operacionales LM339 utilizados en el acondicionamiento de la señal proveniente de los encoders.



March 2004

## LM139/LM239/LM339/LM2901/LM3302 Low Power Low Offset Voltage Quad Comparators

### General Description

The LM139 series consists of four independent precision voltage comparators with an offset voltage specification as low as 2 mV max for all four comparators. These were designed specifically to operate from a single power supply over a wide range of voltages. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage. These comparators also have a unique characteristic in that the input common-mode voltage range includes ground, even though operated from a single power supply voltage.

Application areas include limit comparators, simple analog to digital converters; pulse, squarewave and time delay generators; wide range VCO; MOS clock timers; multivibrators and high voltage digital logic gates. The LM139 series was designed to directly interface with TTL and CMOS. When operated from both plus and minus power supplies, they will directly interface with MOS logic— where the low power drain of the LM339 is a distinct advantage over standard comparators.

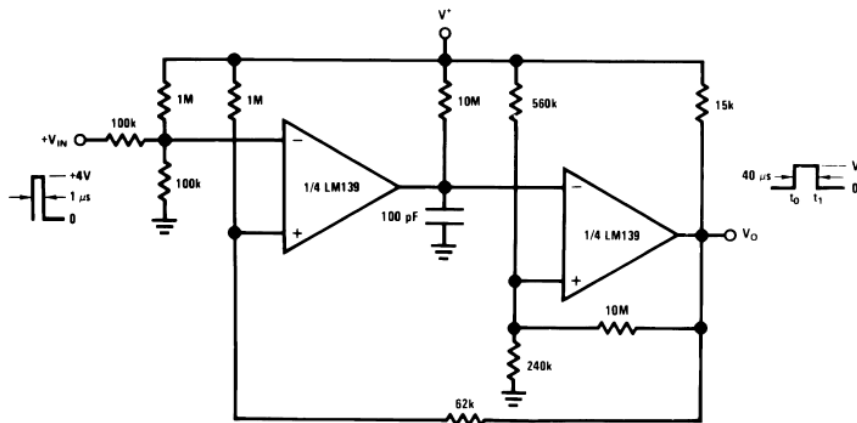
### Features

- Wide supply voltage range
- LM139/139A Series 2 to 36  $V_{DC}$  or  $\pm 1$  to  $\pm 18 V_{DC}$
- LM2901: 2 to 36  $V_{DC}$  or  $\pm 1$  to  $\pm 18 V_{DC}$
- LM3302: 2 to 28  $V_{DC}$  or  $\pm 1$  to  $\pm 14 V_{DC}$
- Very low supply current drain (0.8 mA) — independent of supply voltage
- Low input biasing current: 25 nA
- Low input offset current:  $\pm 5$  nA
- Offset voltage:  $\pm 3$  mV
- Input common-mode voltage range includes GND
- Differential input voltage range equal to the power supply voltage
- Low output saturation voltage: 250 mV at 4 mA
- Output voltage compatible with TTL, DTL, ECL, MOS and CMOS logic systems

### Advantages

- High precision comparators
- Reduced  $V_{OS}$  drift over temperature
- Eliminates need for dual supplies
- Allows sensing near GND
- Compatible with all forms of logic
- Power drain suitable for battery operation

### One-Shot Multivibrator with Input Lock Out



00570612

LM139/LM239/LM339/LM2901/LM3302 Low Power Low Offset Voltage Quad Comparators

## Microcontrolador de 8 bits



# PIC16F87XA

## 28/40/44-Pin Enhanced Flash Microcontrollers

### Devices Included in this Data Sheet:

- PIC16F873A
- PIC16F874A
- PIC16F876A
- PIC16F877A

### High-Performance RISC CPU:

- Only 35 single-word instructions to learn
- All single-cycle instructions except for program branches, which are two-cycle
- Operating speed: DC – 20 MHz clock input  
DC – 200 ns instruction cycle
- Up to 8K x 14 words of Flash Program Memory,  
Up to 368 x 8 bytes of Data Memory (RAM),  
Up to 256 x 8 bytes of EEPROM Data Memory
- Pinout compatible to other 28-pin or 40/44-pin  
PIC16CXXX and PIC16FXXX microcontrollers

### Peripheral Features:

- Timer0: 8-bit timer/counter with 8-bit prescaler
- Timer1: 16-bit timer/counter with prescaler, can be incremented during Sleep via external crystal/clock
- Timer2: 8-bit timer/counter with 8-bit period register, prescaler and postscaler
- Two Capture, Compare, PWM modules
  - Capture is 16-bit, max. resolution is 12.5 ns
  - Compare is 16-bit, max. resolution is 200 ns
  - PWM max. resolution is 10-bit
- Synchronous Serial Port (SSP) with SPI™ (Master mode) and I<sup>2</sup>C™ (Master/Slave)
- Universal Synchronous Asynchronous Receiver Transmitter (USART/SCI) with 9-bit address detection
- Parallel Slave Port (PSP) – 8 bits wide with external  $\overline{RD}$ ,  $\overline{WR}$  and  $\overline{CS}$  controls (40/44-pin only)
- Brown-out detection circuitry for Brown-out Reset (BOR)

### Analog Features:

- 10-bit, up to 8-channel Analog-to-Digital Converter (A/D)
- Brown-out Reset (BOR)
- Analog Comparator module with:
  - Two analog comparators
  - Programmable on-chip voltage reference (VREF) module
  - Programmable input multiplexing from device inputs and internal voltage reference
  - Comparator outputs are externally accessible

### Special Microcontroller Features:

- 100,000 erase/write cycle Enhanced Flash program memory typical
- 1,000,000 erase/write cycle Data EEPROM memory typical
- Data EEPROM Retention > 40 years
- Self-reprogrammable under software control
- In-Circuit Serial Programming™ (ICSP™) via two pins
- Single-supply 5V In-Circuit Serial Programming
- Watchdog Timer (WDT) with its own on-chip RC oscillator for reliable operation
- Programmable code protection
- Power saving Sleep mode
- Selectable oscillator options
- In-Circuit Debug (ICD) via two pins

### CMOS Technology:

- Low-power, high-speed Flash/EEPROM technology
- Fully static design
- Wide operating voltage range (2.0V to 5.5V)
- Commercial and Industrial temperature ranges
- Low-power consumption

Device	Program Memory		Data SRAM (Bytes)	EEPROM (Bytes)	I/O	10-bit A/D (ch)	CCP (PWM)	MSSP		USART	Timers 8/16-bit	Comparators
	Bytes	# Single Word Instructions						SPI	Master I <sup>2</sup> C			
PIC16F873A	7.2K	4096	192	128	22	5	2	Yes	Yes	Yes	2/1	2
PIC16F874A	7.2K	4096	192	128	33	8	2	Yes	Yes	Yes	2/1	2
PIC16F876A	14.3K	8192	368	256	22	5	2	Yes	Yes	Yes	2/1	2
PIC16F877A	14.3K	8192	368	256	33	8	2	Yes	Yes	Yes	2/1	2



## Circuito integrado para fuente conmutada elevadora de voltaje



April 200

# LM1577/LM2577 SIMPLE SWITCHER® Step-Up Voltage Regulator

## General Description

The LM1577/LM2577 are monolithic integrated circuits that provide all of the power and control functions for step-up (boost), flyback, and forward converter switching regulators. The device is available in three different output voltage versions: 12V, 15V, and adjustable.

Requiring a minimum number of external components, these regulators are cost effective, and simple to use. Listed in this data sheet are a family of standard inductors and flyback transformers designed to work with these switching regulators.

Included on the chip is a 3.0A NPN switch and its associated protection circuitry, consisting of current and thermal limiting, and undervoltage lockout. Other features include a 52 kHz fixed-frequency oscillator that requires no external components, a soft start mode to reduce in-rush current during start-up, and current mode control for improved rejection of input voltage and output load transients.

## Features

- Requires few external components
- NPN output switches 3.0A, can stand off 65V
- Wide input voltage range: 3.5V to 40V
- Current-mode operation for improved transient response, line regulation, and current limit
- 52 kHz internal oscillator
- Soft-start function reduces in-rush current during start-up
- Output switch protected by current limit, under-voltage lockout, and thermal shutdown

## Typical Applications

- Simple boost regulator
- Flyback and forward regulators
- Multiple-output regulator

## Connection Diagrams

Straight Leads  
5-Lead TO-220 (T)

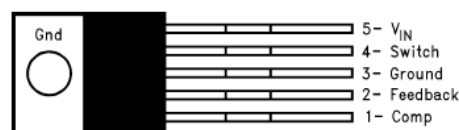


01146804

Top View

Order Number LM2577T-12, LM2577T-15,  
or LM2577T-ADJ  
See NS Package Number T05A

Bent, Staggered Leads  
5-Lead TO-220 (T)



01146805

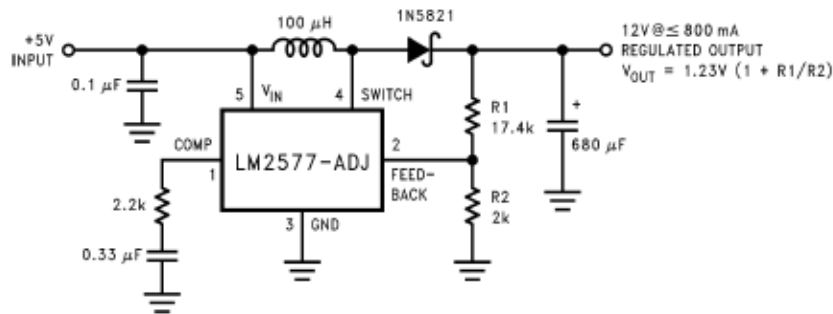
Top View

Order Number LM2577T-12 Flow LB03, LM2577T-15  
Flow LB03, or LM2577T-ADJ Flow LB03  
See NS Package Number T05D

### Ordering Information

Temperature Range	Package Type	Output Voltage			NSC Package Drawing	Package
		12V	15V	ADJ		
-40°C ≤ T <sub>A</sub> ≤ +125°C	24-Pin Surface Mount	LM2577M-12	LM2577M-15	LM2577M-ADJ	M24B	SO
	16-Pin Molded DIP	LM2577N-12	LM2577N-15	LM2577N-ADJ	N16A	N
	5-Lead Surface Mount	LM2577S-12	LM2577S-15	LM2577S-ADJ	TS5B	TO-263
	5-Straight Leads	LM2577T-12	LM2577T-15	LM2577T-ADJ	T05A	TO-220
	5-Bent Staggered Leads	LM2577T-12 Flow LB03	LM2577T-15 Flow LB03	LM2577T-ADJ Flow LB03	T05D	TO-220
-55°C ≤ T <sub>A</sub> ≤ +150°C	4-Pin TO-3	LM1577K-12/883	LM1577K-15/883	LM1577K-ADJ/883	K04A	TO-3

### Typical Application



Note: Pin numbers shown are for TO-220 (T) package.

01140201