

# LM, TS, CS, LF, MC, OA, TJM, TL, UA, L

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# Amplifiers and Comparators

## Overview

ST's product portfolio includes and dedicated to the challenging industrial, automotive and consumer markets.

The main features of our growing portfolio are **low power**, **high precision** and **tiny packages**.

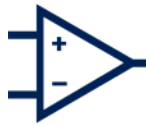
The range of products allows easy and fast integration of analog products inside signal conditioning, monitoring and control solutions.

### Operational amplifiers



High performance, low power, precision, automotive-grade qualified op amps and tiny packages.

### Comparators



High-speed, low-power, automotive-grade qualified comparators, outstanding robustness and tiny packages.

### Current sense amplifiers



Integrated solution, robust devices and automotive-grade qualified current sense amplifiers.

### Video amplifiers



Single and triple video buffers/filters, with or without power-down function, for HD or SD applications.

### Power op amp



High output current, low drop and high gain. Power op amp available in insertion and surface-mount packages.

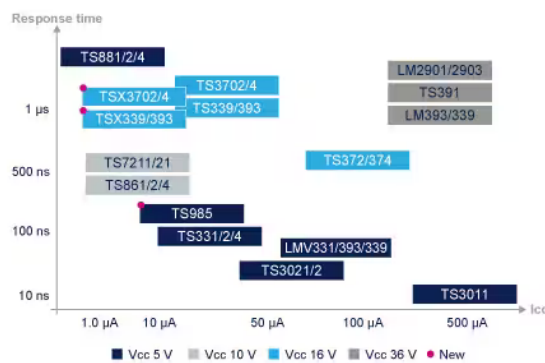
# Comparators

## Overview

A leading supplier of comparators, ST's portfolio offers:

- High-speed comparators, with response times as fast as 8 ns
- Low-power comparators with operating currents as low as 210 nA
- High-temperature (150°C) qualified devices
- Outstanding robustness (ESD tolerance 4 kV HBM)
- Space-saving packages, such as CSP, DFN, QFN, SOT-23 and SC-70

Our are AEC-Q100 qualified and tested with certified high-reliability flow, to meet the very specific, rigorous demands of the automotive market.



## TS3011YCT: New small package for AEC-100 automotive applications



Increased integration of device functionality for **autonomous driving, in-vehicle-networking, infotainment and sensor integration** are key drivers for reduced package sizes in automotive applications.

To facilitate design in space constraint applications, ST introduces its best-seller comparator TS3011YCT in a tiny SC-70 package (2.0 x 2.1 mm).

## Micropower comparators combining very low current consumption and outstanding robustness

The TSX393 and TSX3702 micropower 16 V dual CMOS voltage comparators and the TSX339 and TSX3704 micropower 16 V quad CMOS voltage comparators exhibit a very low current consumption of 5 µA (typical) per comparator.

The TSX comparators help save energy in application that use power-saving design techniques reducing by a factor 3 the current consumption of equivalent existing devices.

The TSX comparators also increase reliability with improved robustness (ESD tolerance 4 Kv HBM).

**Amplifiers and Comparators/Comparators**

Part Number	General Description	Package	Grade	Number of Channels	Operating Temperature (°C) min	Operating Temperature (°C) max	Supply Current per Channel (µA) typ	Supply Voltage (V) min	Supply Voltage (V) max	Response Time (µs) (Small Signal) typ	Input Offset Voltage (mV) max	Rail to Rail Input	Output Configuration
LM139	Low power quad voltage comparators	SO-14	Industrial	4	-55	125	275	2	36	1.3	5	false	Open Collector
LM193	Low power dual voltage comparator	QFN-8L P 0.5 mm,SO-8	Industrial	2	-55	125	200	2	36	1.3	5	false	Open Collector
LM211	Voltage comparator with strobe	SO-8	Industrial	1	-40	105	5100	5	30	0.2	3	false	Open Collector
LM219	Dual high speed comparators	SO-14	Industrial	2	-40	105	8000	5	30	0.08	4	false	Open Collector
LM239	Low power quad voltage comparator	QFN-16L,SO-14,TSSOP-14L	Industrial	4	-40	105	275	2	36	1.3	5	false	Open Collector
LM2901	Low power quad voltage comparator	QFN-16L,SO-14,TSSOP-14L	Automotive,Industrial	4	-40	125	275	2	32	1.3	7	false	Open Collector
LM2901B	Automotive grade, low-power quad voltage comparator	QFN-16L,SO-14,TSSOP-14L	Automotive	4	-40	125	200	2	36	1	4	false	Open Collector
LM2901H	Low power quad voltage comparator	SO-14	Automotive	4	-40	150	275	2	36	1.3	7	false	Open Collector
LM2903	Low power dual voltage comparator	MiniSO-8,QFN-8L P 0.5 mm,QFN-8L WF,SO-8,TSSOP-8L	Automotive,Industrial	2	-40	125	400	2	36	1.3	7	false	Open Collector
LM2903B	Low power dual voltage comparator	MiniSO-8,QFN-8L WF,SO-8,TSSOP-8L	Automotive,Industrial	2	-40	125	400	2	36	1.3	5	false	Open Collector
LM2903H	Low power dual voltage comparator	SO-8,TSSOP-8L	Automotive	2	-40	150	400	2	36	1.3	7	false	Open Collector
LM2903W	Low power dual voltage comparator	MiniSO-8,SO-8,TSSOP-8L	Automotive,Industrial	2	-40	125	400	2	36	1.3	7	false	Open Collector
LM2903WH	Low power dual voltage comparator	MiniSO-8	Automotive	2	-40	150	400	2	36	1.3	7	false	Open Collector
LM293	Low power dual voltage comparator	MiniSO-8,QFN-8L P 0.5 mm,SO-8,TSSOP-8L	Industrial	2	-40	105	200	2	36	1.3	5	false	Open Collector
LM311	Voltage comparator with strobe	SO-8	Industrial	1	0	70	5100	5	30	0.2	7.5	false	Open Collector
LM319	Dual, high speed comparator	SO-14	Industrial	2	0	70	8000	5	30	0.08	8	false	Open Collector
LM339	Low power quad voltage comparator	QFN-16L,SO-14,TSSOP-14L	Industrial	4	0	70	275	2	36	1.3	5	false	Open Collector
LM393	Low power dual voltage comparator	MiniSO-8,QFN-8L P 0.5 mm,SO-8,TSSOP-8L	Industrial	2	0	70	200	2	36	1.3	5	false	Open Collector
LM393W	Low power dual voltage comparators	SO-8	Industrial	2	0	70	400	2	36	1.3	5	false	Open Collector
LMV331	General purpose low voltage comparator	SC70-5,SOT23-5L	Industrial	1	-40	85	20	2.7	5	0.2	7	false	Open Drain
LMV339	General-purpose low voltage comparators	SO-14,TSSOP-14L	Industrial	4	-40	85	20	2.7	5	0.2	7	false	Open Drain
LMV393	General-purpose low voltage comparators	MiniSO-8,SO-8	Industrial	2	-40	85	20	2.7	5	0.2	7	false	Open Drain
TS3011	Rail-to-rail high-speed comparator	QFN-8L WF,SC70-5,SOT23-5L	Automotive,Industrial	1	-40	125	470	2.2	5	0.008	7	true	Push Pull
TS3021	Rail-to-rail 1.8 V high-speed comparator	SC70-5,SOT23-5L	Automotive,Industrial	1	-40	125	73	1.8	5.5	0.038	6	true	Push Pull

TS3021A	Rail-to-rail 1.8 V high-speed comparator, small input offset voltage	SOT23-5L	Industrial	1	-40	125	73	1.8	5.5	0.038	2	true	Push Pull
TS3021H	Rail-to-rail 1.8 V high-speed comparator, 150oC extended temperature range	SOT23-5L	Automotive	1	-40	150	73	1.8	5.5	0.038	6	true	Push Pull
TS3022	Rail-to-Rail 1.8V High-Speed Micropower Comparators	MiniSO-8,SO-8	Automotive,Industrial	2	-40	125	73	1.8	5.5	0.038	6	true	Push Pull
TS331	Micropower low-voltage rail-to-rail comparator	QFN-6L P 0.4 mm,SC70-5,SOT23-5L	Automotive,Industrial	1	-40	125	20	1.6	5	0.2	5	true	Open Drain
TS332	Micropower low-voltage rail-to-rail comparator	MiniSO-8,QFN-8L P 0.5 mm,SO-8	Automotive,Industrial	2	-40	125	20	1.6	5	0.2	5	true	Open Drain
TS334	Micropower low-voltage rail-to-rail comparator	SO-14,TSSOP-14L	Automotive,Industrial	4	-40	125	20	1.6	5	0.2	5	true	Open Drain
TS339	Micropower quad CMOS voltage comparator	SO-14,TSSOP-14L	Industrial	4	-40,0	125,70	9	2.7	16	1.5	5	false	Open Drain
TS3702	Micropower dual CMOS voltage comparator	SO-8,TSSOP-8L	Industrial	2	-40,0	125,70	7	2.7	16	1.5	5	false	Push Pull
TS3704	Micropower quad CMOS voltage comparator	SO-14,TSSOP-14L	Industrial	4	-40,0	125,70	7	2.7	16	1.2	5	false	Push Pull
TS372	Low power dual CMOS voltage comparator	SO-8	Industrial	2	-40,0	125,70	150	3	16	0.6	10	false	Open Drain
TS374	Low power quad CMOS voltage comparator	SO-14	Industrial	4	-55,0	125,70	150	3	16	0.6	10	false	Open Drain
TS391	Low power, single voltage comparator	QFN-8L P 0.5 mm,SOT23-5L	Automotive,Industrial	1	-40	125	200	2	34	1.3	5	false	Open Collector
TS391A	Low power, single voltage comparator	SOT23-5L	Industrial	1	-40	125	200	2	34	1.3	5	false	Open Collector
TS393	Micropower CMOS dual voltage comparator	SO-8,TSSOP-8L	Automotive,Industrial	2	-40,0	125,70	9	2.7	16	1.5	5	false	Open Drain
TS7211	Rail-to-rail micropower BiCMOS comparator	SOT23-5L	Industrial	1	-40	85	6	2.7	10	0.5	7	true	Push Pull
TS7221	Rail-to-rail micropower BiCMOS comparator	SOT23-5L	Industrial	1	-40	85	6	2.7	10	0.5	7	true	Open Drain
TS861	Rail-to-rail micropower BiCMOS comparator	SO-8,SOT23-5L	Industrial	1	-40	85	6	2.7	10	0.5	7	true	Push Pull
TS862	Rail-to-rail micropower BiCMOS dual comparator	SO-8,TSSOP-8L	Industrial	2	-40	85	6	2.7	10	0.5	7	true	Push Pull
TS864	Rail-to-rail micropower BiCMOS quad comparator	SO-14,TSSOP-14L	Industrial	4	-40	85	6	2.7	10	0.5	7	true	Push Pull
TS880	Rail-to-rail 0.9V nanopower, open drain single comparator	SC70-5,SOT23-5L	Industrial	1	-40	125	0.21	0.85	5.5	2.6	6	true	Open Drain
TS881	Rail-to-rail 0.9V nanopower, push-pull single comparator	SC70-5,SOT23-5L	Industrial	1	-40	125	0.21	0.85	5.5	2.6	6	true	Push Pull
TS882	Rail-to-rail 1.1 V nanopower, push-pull dual comparators	MiniSO-8,QFN-8L P 0.5 mm	Automotive,Industrial	2	-40	125	0.21	1.1	5.5	2.6	6	true	Push Pull
TS883	Rail-to-rail 0.9V nanopower, open drain dual comparators	MiniSO-8,QFN-8L P 0.5 mm	Industrial	2	-40	125	0.21	0.85	5.5	2.6	6	true	Open Drain
TS884	Rail-to-rail 1.1 V nanopower, push-pull quad comparators	QFN-16L,SO-14,TSSOP-14L	Industrial	4	-40	125	0.21	1.1	5.5	2.6	6	true	Push Pull
TS985	Micropower low-voltage rail-to-rail comparator	WLCSOP MSL1	Industrial	1	-40	85	14	1.8	5	0.3	8	true	Push Pull
TSX339	Micropower (5uA) 16V CMOS quad comparator, open drain output	QFN-16L,SO-14,TSSOP-14L	Automotive,Industrial	4	-40	125	5	2.7	16	0.9	5	false	Open Drain

TSX3702	Micropower dual CMOS voltage comparators	DFN-8L P 0.5 mm,MiniSO-8,SO-8,TSSOP-8L	Automotive,Industrial	2	-40	125	5	2.7	16	2.5	5	false	Push Pull
TSX3704	Micropower (5uA) 16V quad CMOS comparator, push pull output	QFN-16L,SO-14,TSSOP-14L	Automotive,Industrial	4	-40	125	5	2.7	16	2.5	5	false	Push Pull
TSX393	Micropower dual CMOS voltage comparators	DFN-8L P 0.5 mm,MiniSO-8,SO-8,TSSOP-8L	Automotive,Industrial	2	-40	125	5	2.7	16	0.9	5	false	Open Drain

# Current Sensing

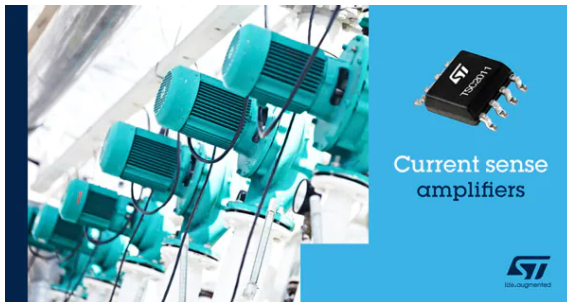
## Overview

### Current sense amplifiers

A current sense amplifier is a **differential amplifier** providing an analog output voltage proportional to the current flowing into a load connected on its input.



ST's current sense amplifier IC portfolio offers a large variety of high-performance devices.



Current sensing solutions add valuable safety and protection features to system designs. They provide information to control current in power systems and avoid overheating and short circuits. Current sensing is also an essential part of energy metering to ensure power-efficiency and minimize environmental impact.

### Key features

The main features of ST's portfolio of current sensing ICs ensure **robustness** and **application safety**:

- -20 to +70 V line monitoring
- Bidirectional or unidirectional current measurement
- Integrated solutions for faster design time and reduced bill of materials
  - Integrated EMI filters
  - Pin selectable gain
  - Shutdown function
- Robust devices that do not require external protection
- Automotive-grade qualified



### High-voltage

Tolerance to high voltage ranges and protection mechanisms to handle negative voltage are essential in high-power systems such as batteries in electric vehicles. Our current sense amplifiers can work in high voltage applications avoiding additional external protections components and simplifying the final schematic.

### Precision / high-accuracy

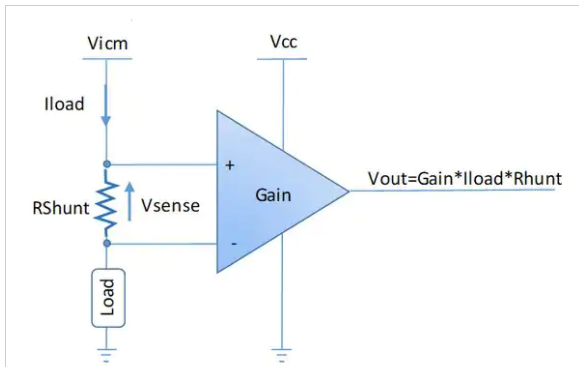
Using a precision current sense amplifier allows designers to **measure small voltage drops** across shunt resistors with minimal error. Small shunt resistors values are necessary to minimize the power dissipation. Thanks to highly accurate current measurements, precision current sense amplifiers offer a **better efficiency** and **thermal performance**.

## WHAT ARE THE MAIN BENEFITS OF A CURRENT SENSE AMPLIFIER?

Current sense amplifiers provide several benefits for designers, including the possibility to:

- measure current ranging from a few milli amperes to several hundreds
- perform real-time current measurement in several topologies
- precisely measure current, thanks to an integrated matched resistive gain network
- reduce PCB size thanks to integrated gain resistance
- sustain extended input common mode voltage, far beyond the power supply rail

## HOW DOES A CURRENT SENSE AMPLIFIER WORK?

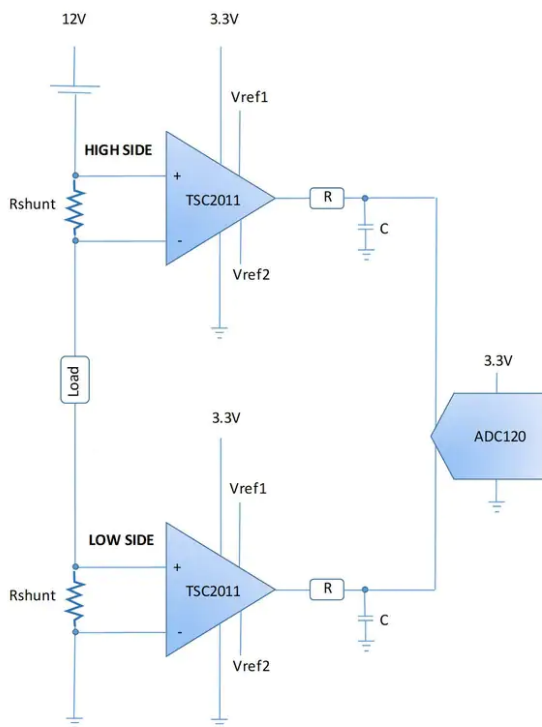


Circuit example

The working principle of a current sensing amplifier is based on **Ohm's law**. When load current flows through a shunt resistor ( $R_{shunt}$ ) present on inputs, it generates a voltage drop called  $V_{SENSE}$ . This voltage is generally small to limit power dissipation losses.

$V_{SENSE}$  is then amplified with an internal instrumentation amplifier. The resulting output voltage ( $V_{OUT}$ ) is a voltage which is proportional to the load current. It can then be processed with an ADC (analog-to-digital converter).

## WHAT ARE THE MAIN TYPES OF CURRENT SENSE AMPLIFIERS?



Circuit example

### High-side amplifiers

The current is measured between the supply rail and the load. The DC voltage applied on the input pins can be much higher than the power supply.

#### Benefits

- Short-to-ground fault detection
- High immunity against ground disturbance
- Current monitored directly from the source

#### Challenges

- High-input common-mode voltages
- Support fast variation of input common mode voltage

### Low-side amplifiers

The current is measured between the load and the ground. The voltage applied on the input pins is close to the ground.

#### Benefits

- Simple implementation
- Cost-effective solution
- $V_{ICM}$  (input common-mode voltage) close to GND (zero-voltage point)

#### Challenges

- Difficult to detect short-cut to ground
- Multiple output power supply (all current are combined in GND line)
- May disturb the ground voltage seen by the load

## Bi-directional VS unidirectional



In some applications, the current can flow into the load in both directions. This is the case for motor control applications used in H-Bridge topologies. In this case, the current sense amplifier must have one additional pin, called  $V_{REF}$ . The  $V_{REF}$  pin allows designers to set the output reference anywhere within the power supply range. A bidirectional amplifiers can be used as a unidirectional current sense amplifier, setting the reference to one voltage rail.

## HOW TO CHOOSE THE RIGHT CURRENT SENSE AMPLIFIER FOR YOUR DESIGN?

### 1. Define the configuration required for your device

**High-side configuration:** Select the current sense amplifier depending of the max common mode voltage ( $V_{ICM}$ ) required by the application and its power supply ( $V_{CC}$ ).

**Low-side configuration:** Select a current sense amplifier that can work with a common mode voltage close to 0 volts.

Operational amplifiers can be also used, adding 4 external resistors to set the gain. However, the size of the PCB will be larger and accuracy can be lower.

### 2. Look into the direction of current flows

After defining the configuration required, ask yourself if the current in your application needs to flow in both directions, in order to choose a bidirectional or unidirectional current sensing.

### 3. If accurate measurements are needed

Several parameters related to the application must be taken into account. Depending on the current range to be measured and the shunt resistor used, the voltage drop into the shunt resistor can be very small (hundreds of  $\mu V$ ). For better accuracy, it is important to consider the error related to offset and accuracy gain.

## New low/high-side bidirectional current sense amplifiers for Industrial and Automotive

Based on a **zero-drift** architecture that delivers high performance for precision **current sensing**, the TSC21x family brings **excellent accuracy** and **robustness** to your design.

TSC21x products are available in six different versions (TSC210 / TSC211 / TSC212 / TSC213 / TSC214 / TSC215), offering different gain. They can operate over a **broad supply voltage range**, from 2.7 to 26 V, and support temperatures ranging from -40 to 125 °C, making them ideal for **industrial and automotive** applications.

**Evaluation board** is also available, to support developers in their designs

**STEVAL-AETKT2V1**

## High-voltage, bidirectional current-sense amplifiers

Able to sense very low drop voltages as low as 10 mV, our TSC2010 (20 V/V Gain), TSC2011 (60 V/V) and TSC2012 (100 V/V) **high-voltage bidirectional current sense amplifiers** (available both as Automotive and Industrial grade) can sense the current thanks to a shunt resistor over a wide range of common mode voltages from -20 to + 70 V, regardless of the supply voltage. Available also with **extended temperature range (-40 to 150 °C)** : TSC2010H, TSC2011H and TSC2012H.

An Evaluation board can be ordered (STEVAL-AETKT1V2), to support developers in their designs.

**Amplifiers and Comparators/Current Sensing**

Part Number	General Description	Package	Grade	Operating Temperature (°C) min	Operating Temperature (°C) max	Supply Current (µA) max	Supply Voltage (V) min	Supply Voltage (V) max	Common Mode Input Voltage (V) min	Common Mode Input Voltage (V) max	Input Offset Voltage (mV) max	Gain Bandwidth Product (MHz) typ	Current Sensing (Bidirectional)	Voltage Gain (V/V)	Automotive Grade
CS30	High side current sense high voltage op amp	SOT23-5L	Industrial	-40	125	300	4	24	2.8	30	1.5	0.67	false	100	-
CS70	High side current sense high voltage op amp	TSSOP-8L	Industrial	-40	125	360	2.7	5.5	2.9	70	0.5	0.7	false	100	-
TSC101	High side current sense amplifier	SOT23-5L	Automotive,Industrial	-40	125	300	4	24	2.8	30	1.5	0.67	false	100,20,50	Yes
TSC102	High side current sense amplifier plus signal conditioning amplifier	SO-8,TSSOP-8L	Automotive,Industrial	-40	125	420	3.5	5.5	2.8	30	1.5	0.8	false	20	Yes
TSC1021	High side current sense amplifier	TSSOP-8L	Automotive,Industrial	-40	125	300	3.5	5.5	2.8	30	1.5	0.8	false	20,50	Yes
TSC103	High voltage, high side current sense amplifier	SO-8,TSSOP-8L	Automotive,Industrial	-40	125	360	2.7	5.5	2.9	70	0.5	0.7	false	100	Yes
TSC1031	High-voltage high side current sense amplifier	SO-8,TSSOP-8L	Automotive,Industrial	-40	125	360	2.7	5.5	2.9	70	0.5	0.7	false	100	Yes
TSC200	High voltage, current sense amplifier with open drain comparator and ref	MiniSO-8,SO-8	Automotive,Industrial	-40	125	1800	2.7	18	-16	80	2.5	1	false	20	Yes
TSC2010	High voltage, precision, bidirectional current sense amplifier	MiniSO-8,SO-8	Automotive,Industrial	-40	125	2300	2.7	5.5	-20	70	0.2	0.75	true	20	Yes
TSC2010H	High temperature, high voltage, precision, bidirectional current sense amplifiers	SO-8	Automotive	-40	150	2300	2.7	5.5	-20	70	0.2	0.75	true	20	Yes
TSC2011	High voltage, precision, bidirectional current sense amplifier	MiniSO-8,SO-8	Automotive,Industrial	-40	125	2300	2.7	5.5	-20	70	0.2	0.62	true	60	Yes
TSC2011H	High voltage, precision, bidirectional current sense amplifier	SO-8	Automotive	-40	150	2300	2.7	5.5	-20	70	0.2	0.62	true	60	Yes
TSC2012	High voltage, precision, bidirectional current sense amplifier	MiniSO-8,SO-8	Automotive,Industrial	-40	125	2300	2.7	5.5	-20	70	0.2	0.415	true	100	Yes
TSC2012H	High voltage, precision, bidirectional current sense amplifier	SO-8	Automotive	-40	150	2300	2.7	5.5	-20	70	0.2	0.415	true	100	Yes
TSC210	Low / High side bidirectional, zero-drift, current sense amplifiers	QFN-10L,SC70-6	Automotive,Industrial	-40	125	100	2.7	26	-0.3	26	0.035	0.025	true	200	Yes
TSC211	Low / High side bidirectional, zero-drift, current sense amplifiers	QFN-10L,SC70-6	Automotive,Industrial	-40	125	100	2.7	26	-0.3	26	0.035	0.008	true	500	Yes
TSC212	Low / High side bidirectional, zero-drift, current sense amplifiers	QFN-10L,SC70-6	Automotive,Industrial	-40	125	100	2.7	26	-0.3	26	0.035	0.006	true	1000	Yes
TSC213	Low / High side bidirectional, zero-drift, current sense amplifiers	QFN-10L,SC70-6	Automotive,Industrial	-40	125	100	2.7	26	-0.3	26	0.1	0.1	true	50	Yes
TSC214	Low / High side bidirectional, zero-drift, current sense amplifiers	QFN-10L,SC70-6	Automotive,Industrial	-40	125	100	2.7	26	-0.3	26	0.06	0.04	true	100	Yes
TSC215	Low / High side bidirectional, zero-drift, current sense amplifiers	QFN-10L,SC70-6	Automotive,Industrial	-40	125	100	2.7	26	-0.3	26	0.06	0.06	true	75	Yes
TSC888	Low cost high-side current sense amplifier	SOT23-5L	Industrial	-40	85	1000	4	24	2.8	24	-	-	false	100,20,50	-
TSC1641	60V, 16-bit, High precision, I3C/I2C, digital current/voltage/power/temperature Monitor	VDFPN 10 3x3x1.0	Industrial	-40	125	1200	2.7	3.6	0	60	0.02	-	true	-	-

# Operational Amplifiers (Op Amps)

## Overview

**Operational amplifiers, known also as op amps**, play a major role in analog signal conditioning applications. Invented by Karl Dale Swartzel Jr. in 1941, these products are largely used in today's electronic devices.

They are **key enablers for industrial applications** towards industry 4.0 and for automotive customers on their transition to electrification.



ST's operational amplifier portfolio provides a **unique choice of high performance**, low-power, precision op amps and tiny packages. It addresses voltages from 1.5 to 44 V and operating temperatures from -40 to 175°C.

## What are op amps used for and why you should choose ST's op amps

Operational amplifiers are **primarily used for**:

- AC and/or DC signal amplification
- Buffering
- Driving signals
- Gain and level shifting
- Filtering
- Performing mathematical operations

But there is more, by choosing our products **you also benefit from**:

- Largest micropower op amp portfolio on the market, with consumption as low as 600 nA
- High volume supplier of highly reliable standard and high-performance op amps
- Space-saving packages including CSP, DFN, QFN, SOT-23 and SC-70

## Types of operational amplifiers

Each application has a suitable operational amplifier: Discover our ever-increasing range of op amps designed for the challenging industrial, automotive and consumer markets.



### Low power op amps

Operational amplifiers with exceptionally low current consumption, enabling longer battery life and designed for a large diversity of applications.

### Low input bias current op amps

Our portfolio is a perfect fit for any transimpedance usage or when dealing with high impedance sensors.

### High voltage op amps

Featuring an extended supply voltage range from 2.7 up to 36 V, our high-voltage series simplify the design of a wide variety of automotive and industrial applications: filters,

### Precision op amps

ST's precision op amp solutions include zero drift amplifiers and amplifiers with a low offset drift over temperature. They are a perfect fit for use with any sensor, including gas, temperature, pressure and position sensors.

### Rail-to-rail op amps

Our rail-to-rail operational amplifier portfolio includes several series covering different voltage ranges, as well as many possible combinations of power consumption and gain bandwidth.

### High speed op amps

ST offers a portfolio of high-end, high-speed operational amplifiers.

power supply and motor control, actuator driving, hall effect sensors and resistive transducers.

## Featured op amps



High-bandwidth, low-offset, rail-to-rail op amp



Ultra-high accuracy, zero drift op amp



6 MHz, precision, rail-to-rail op amp

## ST's op amps series at a glance

	Nano Power	Micro Power	Zero Drift	Precision	Energy Effective	Fast
5 V	TSU	TSV6	TSZ	TSV7	TSV5/V8	TSV9
16 V		TSX6		TSX7	TSX5	TSX9
36 V		TSB6		TSB7	TSB5	TSB9 *

AECQ-100 \* In development

## New 20MHz, low-offset op amp in high-performance 5V family

The TSV771 and TSV772 are a **single and dual operational amplifier** (op amp) ideal for **low-side current measurement**, combining high accuracy and low power consumption.

Enlarging ST's high-performance 5V op amps family, the devices feature also rail-to-rail inputs / outputs, 20MHz gain-bandwidth (GBW), and is unity-gain stable. With a slew rate of 13V/ $\mu$ s, 7nV/ $\sqrt$ Hz input noise density, and 4kV ESD capability (HBM), the TSV772 is a strong all-round performer in a very small 2.0mm x 2.0mm DFN8 package.

**Automotive grade** version is also available.

## High bandwidth and low offset 5 V op amps for Industrial and Automotive

ST enlarges its **5V op amps** portfolio with the new TSV7722 and TSV7723 dual high-performance operational amplifiers.

Boasting a gain bandwidth product of 22MHz, an input offset voltage of 50 $\mu$ V, and a **wide supply voltage range**, the TSV7722 and TSV7723 (feat. **shutdown** option) are the perfect choice for **low-side current sensing** in industrial and automotive contexts.

**Automotive grade** version is also available for TSV7722.

## Questions / Answers

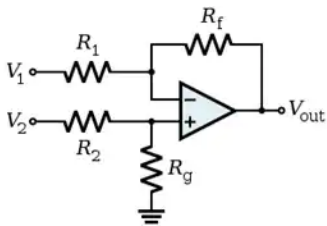
### What are the main characteristics of ideal and real op amps?

Ideal op amp	Real op amp
<b>Infinite bandwidth:</b> all frequency signals are amplified without attenuation.	Each op amp has its specific <b>gain-bandwidth product</b> : input frequency should not exceed this particular frequency range at the desired gain.
<b>Infinite input impedance:</b> in order not to affect upstream circuitry.	Very high, but finite input impedance.
<b>Zero output impedance:</b> in order not to affect downstream circuitry.	Very low, but not zero output impedance.

### What are the main applications for op amps?

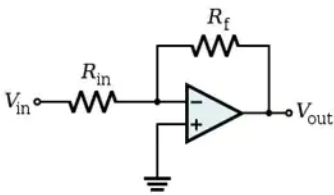
It can be easily said that op amps are present in almost all electrical devices and can be used for various applications, depending on the external components/circuitry or topology.

#### Differential amplifier (difference amplifier)



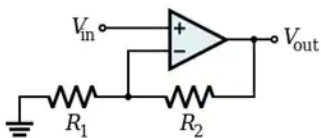
Amplifies the difference in voltage between its inputs.

#### Inverting amplifier



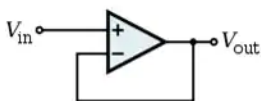
An inverting amplifier is a special case of the differential amplifier producing an output which is 180° out of phase with respect to its input.

#### Non-inverting amplifier



In this case, the output voltage is always in phase with the input voltage, which is why this topology is known as non-inverting.

#### Voltage follower (unity buffer amplifier)



This circuit does not generally require external components, and provides high input impedance and low output impedance, which makes it a useful buffer.

**Amplifiers and Comparators/Operational Amplifiers (Op Amps)**

Part Number	General Description	Package	Grade	Number of Channels	Operating Temperature (°C) min	Operating Temperature (°C) max	Supply Current per Channel (µA) typ	Supply Current per Channel (µA) max	Supply Voltage (V) min	Supply Voltage (V) max	Input Offset Voltage (mV) max	Input Bias Current (pA) max	Gain Bandwidth Product (MHz) typ	Slew Rate (V/µs) typ	Output Current (mA) typ	Rail to Rail Input	Rail to Rail Output	Input Equivalent Noise Voltage (nV/√Hz) typ
LF247	Low input current (200pA), high slew rate (16V/us) 36V JFET Op-Amps, quad	SO-14	Industrial	4	-40	105	1400	2700	6	36	10	200	4	16	40	false	false	15
LF253	JFET inputs, low input bias & offset current, (15nV/VHz & 0.01%)	SO-8	Industrial	2	-40	105	1400	3200	6	36	10	200	4	16	40	false	false	15
LF347	Low input current (200pA), high slew rate (16V/us) 36V JFET Op-Amps, quad	SO-14	Industrial	4	0	70	1400	2700	6	36	10	200	4	16	40	false	false	15
LF351	JFET inputs, low input bias & offset current, (15nV/sqrtHz & 0.01%)	SO-8	Industrial	1	0	70	1400	3400	6	32	10	200	4	16	40	false	false	15
LF353	JFET inputs, low input bias & offset current, (15nV/sqrtHz & 0.01%)	SO-8	Industrial	2	0	70	1400	3200	6	32	10	200	4	16	40	false	false	15
LM124	Low power, low input bias current	SO-14	Industrial	4	-55	125	700	1200	3	30	5	150000	1.3	0.4	40	false	false	40
LM158	Low power dual op-amps with low input bias current	QFN-8L P 0.5 mm,SO-8	Industrial	2	-55	125	350	600	3	32	5	150000	1.1	0.6	40	false	false	55
LM158W	Low power dual operational amplifiers	SO-8	Industrial	2	-55	125	350	600	3	30	2	150000	1.1	0.6	40	false	false	55
LM201A	Input & output overload protection, low input offset current	SO-8	Industrial	1	-40	105	1800	3000	5	40	2	75000	1	0.5	50	false	false	25
LM224	Low power quad op-amps with low input bias current	QFN-16L,SO-14,TSSOP-14L	Industrial	4	-40	105	700	1200	3	30	5	150000	1.3	0.4	40	false	false	40
LM224A	Low power, low input bias current	SO-14,TSSOP-14L	Industrial	4	-40	105	700	1200	3	30	3	100000	1.3	0.4	40	false	false	40
LM248	Quad UA741 bipolar op-amp	SO-14	Industrial	4	-40	105	525	900	3	44	5	100000	1.3	0.5	25	false	false	40
LM258	Low-power dual op-amps with low input bias current	QFN-8L P 0.5 mm,SO-8,TSSOP-8L	Automotive,Industrial	2	-40	105	350	600	3	32	5	150000	1.1	0.6	60	false	false	55
LM258A	Low-power dual operational amplifiers	MiniSO-8,SO-8,TSSOP-8L	Automotive,Industrial	2	-40	105	350	600	3	32	5	150000	1.1	0.6	60	false	false	55
LM258W	Low power dual operational amplifiers	SO-8,TSSOP-8L	Automotive,Industrial	2	-40	105	350	600	3	32	5	150000	1.1	0.6	40	false	false	55
LM2902	Low power, bipolar op-amp	QFN-16L,SO-14,TSSOP-14L	Automotive,Industrial	4	-40	125	375	750	3	30	7	150000	1.3	0.4	40	false	false	40
LM2902B	Automotive-grade, low power, quad, 36 V operational amplifier	QFN-16L,SO-14,TSSOP-14L	Automotive	4	-40	125	350	600	3	36	4	150000	1.3	0.4	40	false	false	40
LM2902W	Low power quad operational amplifier	SO-14,TSSOP-14L	Automotive,Industrial	4	-40	125	700	1200	3	30	7	150000	1.3	0.4	20	false	false	40
LM2904	Low power, bipolar op-amp	MiniSO-8,QFN-8L P 0.5 mm,QFN-8L WF,SO-8,TSSOP-8L	Automotive,Industrial	2	-40	125	350	600	3	30	7	150000	1.1	0.6	40	false	false	55
LM2904A	Low power, bipolar op-amp	SO-8,TSSOP-8L	Automotive	2	-40	125	350	600	3	30	2	150000	1.1	0.6	40	false	false	55
LM2904AH	Low power, bipolar op-amp	QFN-8L WF,TSSOP-8L	Automotive	2	-40	150	350	600	3	30	6	150000	1.1	0.6	40	false	false	55
LM2904AW	Low power dual operational amplifier	TSSOP-8L	Automotive	2	-40	125	350	600	3	30	2	150000	1.1	0.6	40	false	false	55
LM2904B	Automotive-grade, low power, dual, 36 V operational amplifiers	MiniSO-8,QFN-8L WF,SO-8,TSSOP-8L	Automotive,Industrial	2	-40	125	350	600	3	36	4	150000	1.2	0.75	40	false	false	55
LM2904W	Low Power Dual Operational Amplifier	SO-8,TSSOP-8L	Automotive,Industrial	2	-40	125	350	600	3	30	7	150000	1.1	0.6	40	false	false	55
LM2904WH	Dual general purpose operational amplifier	MiniSO-8,SO-8	Automotive,Industrial	2	-40	150	350	600	3	30	7	150000	1.1	0.6	40	false	false	55
LM324	Low power, low input bias current	QFN-16L,SO-14,TSSOP-14L	Industrial	4	0	70	700	1200	3	30	5	150000	1.3	0.4	40	false	false	40
LM324A	Low power, low input bias current	SO-14,TSSOP-14L	Industrial	4	0	70	700	1200	3	30	3	100000	1.3	0.4	40	false	false	40
LM324W	Low power, low input bias current	SO-14,TSSOP-14L	Industrial	4	0	70	700	1200	3	30	3	100000	1.3	0.4	40	false	false	40
LM358	Low-power dual op-amps with low input bias current	MiniSO-8,QFN-8L P 0.5 mm,SO-8,TSSOP-8L	Industrial	2	0	70	350	600	3	32	7	150000	1.1	0.6	60	false	false	55

LM358A	Low input bias current	MiniSO-8,SO-8,TSSOP-8L	Industrial	2	0	70	350	600	3	32	7	150000	1.1	0.6	60	false	false	55
LM358W	Low power dual operational amplifiers	MiniSO-8,SO-8,TSSOP-8L	Industrial	2	0	70	350	600	3	30	7	150000	1.1	0.6	40	false	false	55
LM833	Low-noise dual op-amps amplifier	SO-8	Industrial	2	-40	105	4000	8000	5	30	5	1000000	15	7	30	false	false	4.5
LMC6482	Rail-to-rail 16V CMOS operational amplifier, dual, GBP 2.7MHz	MiniSO-8,SO-8	Industrial	2	-40	125	500	800	2.7	16	2	50	2.7	1.4	50	true	true	22
LMC7101	Micropower (235uA), 16V CMOS Op-Amp, single, GBP 900KHz	SOT23-5L	Industrial	1	-40	125	220	300	3	16	3	100	0.9	1.1	90	true	true	48
LMV321	Low power rail-to-rail input/output op-amp	SOT23-5L	Automotive,Industrial	1	-40	125	145	200	2.7	6	3	50000	1	0.35	48	true	true	40
LMV321L	Low-power, general-purpose operational amplifier	SC70-5,SOT23-5L	Industrial	1	-40	125	130	350	2.7	5.5	7	60000	1.3	0.7	58	false	true	30
LMV324	Low power rail-to-rail input/output op amp	SO-14,TSSOP-14L	Automotive,Industrial	4	-40	125	145	200	2.7	6	3	50000	1	0.35	46	true	true	40
LMV324L	Low-power, general-purpose operational amplifier	SO-14,TSSOP-14L	Industrial	4	-40	125	130	350	2.7	5.5	7	60000	1.3	0.7	58	false	true	30
LMV358	Low power rail-to-rail input/output op-amp	SO-8,TSSOP-8L	Automotive,Industrial	2	-40	125	145	200	2.7	6	3	50000	1	0.35	46	true	true	40
LMV358L	Low-power, general-purpose operational amplifier op-amp	MiniSO-8,SO-8,TSSOP-8L	Industrial	2	-40	125	130	350	2.7	5.5	7	60000	1.3	0.7	58	false	true	30
LMV820	Low power (400uA), general purpose Bipolar 5V Op-Amp, GBP=5.5MHz, single with shutdown feature	SOT23-6L	Industrial	1	-40	125	300	600	2.5	5.5	3.5	120000	5.5	1.9	56	false	true	16
LMV820A	Low power (400uA), general purpose Bipolar 5V Op-Amp, GBP=5.5MHz, small offset, single with shutdown feature	SOT23-6L	Industrial	1	-40	125	300	600	2.5	5.5	0.8	120000	5.5	1.9	56	false	true	16
LMV821	Low power (440uA), general purpose BiPolar 5V Op-Amp, GBP=5.5MHz, single	SC70-5,SOT23-5L	Automotive,Industrial	1	-40	125	300	600	2.5	5.5	3.5	120000	5.5	1.9	56	false	true	16
LMV821A	Low power (400uA), general purpose Bipolar 5V Op-Amp, GBP=5.5MHz, small offset, single	SC70-5,SOT23-5L	Automotive,Industrial	1	-40	125	300	600	2.5	5.5	0.8	120000	5.5	1.9	56	false	true	16
LMV822	Low power (440uA), general purpose Bipolar 5V Op-Amps, GBP=5.5MHz, dual	MiniSO-8,QFN-8L P 0.5 mm,SO8	Automotive,Industrial	2	-40	125	300	600	2.5	5.5	3.5	120000	5.5	1.9	56	false	true	16
LMV822A	Low power (440uA), general purpose Bipolar 5V Op-Amps, GBP=5.5MHz, small offset, dual	MiniSO-8,SO-8	Automotive,Industrial	2	-40	125	300	600	2.5	5.5	0.8	120000	5.5	1.9	56	false	true	16
LMV823	Low power (440uA), general purpose Bipolar 5V Op-Amps, GBP=5.5MHz, dual with shutdown feature	MiniSO-10	Industrial	2	-40	125	300	600	2.5	5.5	3.5	120000	5.5	1.9	56	false	true	16
LMV823A	Low power (440uA), general purpose Bipolar 5V Op Amps, GBP=5.5MHz, small offset, dual with shutdown feature	MiniSO-10	Industrial	2	-40	125	300	600	2.5	5.5	0.8	120000	5.5	1.9	56	false	true	16
LMV824	Low power (440uA), general purpose Bipolar 5V Op-Amps, GBP=5.5MHz, quad	SO-14,TSSOP-14L	Automotive,Industrial	4	-40	125	300	600	2.5	5.5	3.5	120000	5.5	1.9	56	false	true	16
LMV824A	Low power (440uA), general purpose Bipolar 5V Op-Amps, GBP=5.5MHz, small offset, quad	SO-14,TSSOP-14L	Automotive,Industrial	4	-40	125	300	600	2.5	5.5	0.8	120000	5.5	1.9	56	false	true	16
LMX321	Low-power, general-purpose operational amplifier	SC70-5,SOT23-5L	Industrial	1	-40	125	130	180	2.5	5.5	4	60000	1.3	0.7	43	false	true	39
LMX324	Low-power, general-purpose operational amplifier	SO-14,TSSOP-14L	Industrial	4	-40	125	180	180	2.5	5.5	4	60000	1.3	0.7	43	false	true	39
LMX358	Low-power, general-purpose operational amplifier	MiniSO-8,QFN-8L P 0.5 mm,SO8	Industrial	2	-40	125	180	180	2.5	5.5	4	60000	1.3	0.7	43	false	true	39
MC1458	High performance dual op-amps with wide input common mode voltage range	SO-8	Industrial	2	-40	105	1150	2500	5	40	5	500000	1	0.8	20	false	false	45
MC3303	Quad enhanced UA741 version with lower consumption	SO-14,TSSOP-14L	Industrial	4	-40	105	700	1750	3	36	5	500000	1	0.5	45	false	false	43
MC33078	Low-noise op-amps	SO-8	Automotive,Industrial	2	-40	125	2000	2500	5	30	2	750000	15	7	30	false	false	4.5
MC33079	Low-noise op-amps	SO-14	Automotive,Industrial	4	-40	105	2000	2500	5	30	2.5	750000	15	7	30	false	false	4.5
MC33171	Low consumption versus speed	SO-8	Industrial	1	-40	105	200	250	4	44	4.5	100000	2.1	2	15	false	false	29
MC33172	Low consumption versus speed	SO-8	Industrial	2	-40	105	200	250	4	44	4.5	100000	2.1	2	15	false	false	29
MC33174	Low consumption versus speed	SO-14	Industrial	4	-40	105	200	250	4	44	4.5	100000	2.1	2	15	false	false	29
MC3403	Quad enhanced UA741 version with lower consumption	SO-14	Industrial	4	0	70	700	1750	3	36	5	500000	1	0.5	45	false	false	43
MC4558	Widebandwidth dual bipolar op-amps	SO-8,TSSOP-8L	Industrial	2	-40,0	105,70	1150	2250	4	40	5	400000	5.5	2.2	20	false	false	12
OA1MPA	High precision low-power single CMOS op amp	SC70-5	Industrial	1	-40	125	10	14	1.5	5.5	0.2	10	0.12	0.06	45	true	true	100

OA1NP	Low power, rail-to-rail input and output, CMOS single op amp	SC70-5	Industrial	1	-40	85	0.58	0.75	1.5	5.5	3	5	0.008	0.003	5	true	true	265
OA1ZHA	High precision 5 uV zero drift, low-power single op amp	SC70-5	Industrial	1	-40	125	31	40	1.8	5.5	0.005	200	0.4	0.19	17	true	true	37
OA2NP	Low power, rail-to-rail input and output, CMOS dual op amp	DFN-8L P 0.5 mm, MiniSO-8	Industrial	2	-40	85	0.58	0.75	1.5	5.5	3	5	0.008	0.003	5	true	true	265
OA2ZHA	High precision 5 uV zero drift, low-power dual op amp	MiniSO-8, QFN-8L P 0.5 mm	Industrial	2	-40	125	31	40	1.8	5.5	0.005	200	0.4	0.19	17	true	true	37
OA4MPA	High precision low-power quad CMOS op amp	QFN-16L	Industrial	4	-40	125	10	14	1.5	5.5	0.2	10	0.12	0.06	45	true	true	100
OA4NP	Low power, rail-to-rail input and output, CMOS quad op amp	QFN-16L	Industrial	2	-40	85	0.58	0.75	1.5	5.5	3	5	0.008	0.003	5	true	true	265
OA4ZHA	High precision 5 uV zero drift, low-power quad op amp	QFN-16L	Industrial	4	-40	125	31	40	1.8	5.5	0.005	200	0.4	0.19	17	true	true	37
TJM4558	Wide bandwidth dual bipolar op-amps	SO-8	Industrial	2	0	70	2300	4500	6	44	5	400000	5.5	2.2	20	false	false	22
TL061	Low input current (200pA), low power (200uA) 35V JFET Op-Amp, single	SO-8	Industrial	1	-40	105	200	200	6	36	6	200	1	3.5	40	false	false	42
TL062	Low input current (200pA), low power (200uA) 36V JFET Op-Amps, dual	SO-8	Industrial	2	-40,0	105,70	200	250	6	36	6	200	1	3.5	40	false	false	42
TL062A	Low input current (200pA), low power (200uA) 36V JFET Op-Amps, dual, small offset	SO-8	Industrial	2	-40	105	200	250	6	36	6	200	1	3.5	40	false	false	42
TL062B	Low input current (200pA), low power (200uA) 36V JFET Op-Amps, dual, small offset	SO-8	Industrial	2	-40	105	200	250	6	36	3	200	1	3.5	40	false	false	42
TL064	Low input current (200pA), low power (200uA) 36V JFET Op-Amps, quad	SO-14	Industrial	4	-40,0	105,70	200	250	6	36	6	200	1	3.5	40	false	false	42
TL071	JFET inputs, low input bias current	SO-8	Industrial	1	-40	105	1400	2500	5	36	6	200	4	16	40	false	false	15
TL072	JFET inputs, low input bias current	SO-8	Industrial	2	-40,0	105,70	1400	2500	6	36	6	200	4	16	40	false	false	15
TL072A	JFET inputs, low input bias current	SO-8	Industrial	2	0	70	1400	2500	5	36	3	200	4	16	40	false	false	15
TL072B	JFET inputs, low input bias current	SO-8	Automotive, Industrial	2	-40	125	1400	2500	5	36	3	200	4	16	40	false	false	45
TL074	JFET inputs, low input bias current	SO-14	Automotive, Industrial	4	-40,0	105,70	1400	2500	6	36	6	200	4	16	40	false	false	15
TL081	JFET inputs, low input bias current	SO-8	Industrial	1	-40,0	105,70	1400	2500	6	36	6	200	4	16	40	false	false	15
TL082	JFET inputs, low input bias current	SO-8, TSSOP-8L	Automotive, Industrial	2	-40,0	105,70	1400	2500	6	36	10	200	4	16	40	false	false	15
TL084AC	JFET inputs, low input bias current	SO-14	Industrial	4	-40	70	1400	2500	6	36	6	200	4	16	40	false	false	15
TL084AI	JFET inputs, low input bias current	SO-14	Industrial	4	-40	125	1400	2500	6	36	6	200	4	16	40	false	false	15
TL084BC	JFET inputs, low input bias current	SO-14	Industrial	4	-40	70	1400	2500	6	36	3	200	4	16	40	false	false	15
TL084BI	JFET inputs, low input bias current	SO-14	Automotive, Industrial	4	-40	125	1400	2500	6	36	3	200	4	16	40	false	false	15
TL084C	JFET inputs, low input bias current	SO-14, TSSOP-14L	Industrial	4	0	70	1400	2500	6	36	10	200	4	16	40	false	false	15
TL084I	JFET inputs, low input bias current	SO-14, TSSOP-14L	Automotive, Industrial	4	-40	125	1400	2500	6	36	10	200	4	16	40	false	false	15
TS1851	1.8V min. voltage supply, micropower	SO-8, SOT23-5L	Industrial	1	-40	125	162	250	1.8	6	3	50000	0.65	0.25	48	true	true	40
TS1852	1.8V min. voltage supply, micropower	MiniSO-8, SO-8	Industrial	2	-40	125	165	250	1.8	6	3	50000	0.65	0.25	48	true	true	40
TS1852A	1.8V min. voltage supply, micropower	MiniSO-8	Industrial	2	-40	125	165	250	1.8	6	1	50000	0.65	0.25	48	true	true	40
TS1854	1.8V min. voltage supply, micropower	SO-14, TSSOP-14L	Industrial	4	-40	125	165	250	1.8	6	3	50000	0.65	0.25	48	true	true	40
TS1871	1.8V Input/Output Rail-to-Rail Low Power Operational Amplifiers	SO-8, SOT23-5L	Automotive, Industrial	1	-40	125	400	560	1.8	6	3	125000	1.8	0.6	72	true	true	27
TS1871A	1.8V Input/Output Rail-to-Rail Low Power Operational Amplifiers	SOT23-5L	Automotive, Industrial	1	-40	125	400	560	1.8	6	1	125000	1.8	0.6	72	true	true	27
TS1872	1.8V min. voltage supply, micropower	SO-8, TSSOP-8L	Automotive, Industrial	2	-40	125	400	560	1.8	6	3	125000	1.8	0.6	72	true	true	27
TS1872A	1.8V min. voltage supply, micropower	MiniSO-8, SO-8	Automotive, Industrial	2	-40	125	400	560	1.8	6	1	125000	1.8	0.6	72	true	true	27
TS1874	1.8V min. voltage supply, micropower	SO-14, TSSOP-14L	Automotive, Industrial	4	-40	125	400	560	1.8	6	3	125000	1.8	0.6	72	true	true	27
TS1874A	1.8V min. voltage supply, micropower	SO-14, TSSOP-14L	Automotive, Industrial	4	-40	125	400	560	1.8	6	1	125000	1.8	0.6	72	true	true	27
TS271	Micropower, programmable op-amp	SO-8	Industrial	1	-40,0	125,70	10	15	3	16	10	150	0.1	0.04	60	false	false	30
TS272	Micropower, wide range of input offset voltage	SO-8, TSSOP-8L	Industrial	2	-40,0	125,70	1000	1500	3	16	10	150	3.5	5.5	60	false	false	30



TS274	Micropower, wide range of input offset voltage	SO-14,TSSOP-14L	Industrial	4	-40,0	125,70	1000	1500	3	16	10	150	3.5	5.5	60	false	false	30
TS27L2	Micropower, high voltage CMOS op-amp	SO-8,TSSOP-8L	Industrial	2	-40,0	125,70	10	15	3	16	5	150	0.1	0.04	60	false	false	68
TS27L4	Micropower, high voltage CMOS op-amp	SO-14,TSSOP-14L	Industrial	4	-40	125	10	15	3	16	5	150	0.1	0.04	60	false	false	68
TS27M2	Micropower, high voltage CMOS op-amp	SO-8,TSSOP-8L	Industrial	2	-40	125,70	150	200	3	16	10	150	1	0.6	60	false	false	38
TS27M2A	Micropower, high voltage CMOS op-amp	SO-8	Industrial	2	-40	125	150	200	3	16	5	150	1	0.6	60	false	false	38
TS27M2B	Micropower, high voltage CMOS op-amp	SO-8	Industrial	2	-40	125	150	200	3	16	2	150	1	0.6	60	false	false	38
TS27M4	Micropower, high voltage CMOS op-amp	SO-14,TSSOP-14L	Industrial	4	-40,0	125,70	150	200	3	16	10	150	1	0.6	60	false	false	38
TS321	Single LM324, LM358 enhanced version in sot23-5 package	SOT23-5L	Automotive,Industrial	1	-40	125	500	800	3	30	4	150000	0.8	0.4	40	false	false	40
TS461	Output rail-to-rail op-amps	SO-8,SOT23-5L	Industrial	1	-20	70	2000	2800	2.7	10	5	750000	12	4	1.5	false	true	4
TS462	Output rail-to-rail op-amps	MiniSO-8,SO-8,TSSOP-8L	Industrial	2	-20	70	2000	2800	2.7	10	5	750000	12	4	1.5	false	true	4
TS464	Output rail-to-rail op-amps	SO-14,TSSOP-14L	Industrial	4	-20	70	2000	2800	2.7	10	5	750000	12	4	1.5	false	true	4
TS507	High precision single supply rail to rail op-amp	SO-8,SOT23-5L	Automotive,Industrial	1	-40,0	125,85	850	1150	2.7	5.5	0.1	70000	1.9	0.6	115	true	true	12
TS512	Low noise & distortion (8nV/sqrtHz & 0.03%)	SO-8	Automotive,Industrial	2	-40	125	500	750	6	30	2.5	150000	3	1.5	23	false	false	8
TS512A	Low noise & distortion (8nV/sqrtHz & 0.03%)	SO-8	Automotive,Industrial	2	-40	125	500	750	6	30	0.5	150000	3	1.5	23	false	false	8
TS512B	Low noise & distortion (8nV/sqrtHz & 0.03%)	SO-8	Automotive	2	-40	125	500	750	6	30	0.5	150000	3	1.5	23	false	false	8
TS514	Low noise & distortion (8nV/sqrtHz & 0.03%)	SO-14	Industrial	4	-40	125	500	750	6	30	2.5	150000	3	1.5	23	false	false	8
TS522	Very low noise suitable for audio applications (4.5nV/sqrtHz)	SO-8	Industrial	2	-40	125	2000	2500	5	30	0.85	750000	15	7	37	false	false	4.5
TS524	Very low noise suitable for audio applications (4.5nV/sqrtHz)	SO-14	Industrial	4	-40	125	2000	2500	5	30	0.95	750000	15	7	38	false	false	4.5
TS912	Low power with CMOS inputs	SO-8	Automotive,Industrial	2	-40	125	400	600	2.7	16	10	150	1.4	1	70	true	true	30
TS912A	Low power with CMOS inputs	SO-8	Automotive,Industrial	2	-40	125	400	600	2.7	16	5	150	1.4	1	70	true	true	30
TS912B	Low power with CMOS inputs	SO-8	Automotive,Industrial	2	-40	125	400	600	2.7	16	2	150	1.4	1	70	true	true	30
TS914	Low power with CMOS inputs	SO-14	Automotive,Industrial	4	-40	125	400	600	2.7	16	10	150	1.4	1	70	true	true	30
TS914A	Low power with CMOS inputs	SO-14	Automotive,Industrial	4	-40	125	400	600	2.7	16	5	150	1.4	1	70	true	true	30
TS921	Rail-to-rail high output current op-amps	SO-8,TSSOP-8L	Industrial	1	-40	125	1000	1500	2.7	12	3	100000	4	1.3	80	true	true	9
TS922	Excellent audio performance / low distortion (0.005%)	CSP P 0.5 mm,SO-8,TSSOP-8L	Automotive,Industrial	2	-40	125	1000	1500	2.7	12	3	100000	4	1.3	80	true	true	9
TS9222	Precision rail-to-rail high output current op-amps	SO-8,TSSOP-8L	Automotive,Industrial	2	-40	125	900	1200	2.7	12	0.5	55000	4	1.3	80	true	true	9
TS9224	Precision rail-to-rail high output current op-amps	SO-14,TSSOP-14L	Automotive,Industrial	4	-40	125	900	1200	2.7	12	0.5	55000	4	1.3	80	true	true	9
TS922A	Excellent audio performance / low distortion (0.005%)	SO-8,TSSOP-8L	Automotive,Industrial	2	-40	125	1000	1500	2.7	12	0.9	100000	4	1.3	80	true	true	9
TS924	Rail-to-rail high output current op-amps	SO-14,TSSOP-14L	Automotive,Industrial	4	-40	125	1000	1750	2.7	12	3	100000	4	1.3	80	true	true	9
TS924A	Excellent audio performance / low distortion (0.005%)	SO-14,TSSOP-14L	Automotive,Industrial	4	-40	125	1000	1750	2.7	12	0.9	100000	4	1.3	80	true	true	9
TS931	Micropower amplifier with CMOS inputs	SO-8,SOT23-5L	Industrial	1	-40	105	20	33	2.7	10	10	150	0.1	0.05	5	false	true	76
TS931A	Micropower amplifier with CMOS inputs	SOT23-5L	Industrial	1	-40	105	20	33	2.7	10	5	150	0.1	0.05	5	false	true	76
TS931B	Micropower amplifier with CMOS inputs	SOT23-5L	Industrial	1	-40	105	20	33	2.7	10	2	150	0.1	0.05	5	false	true	76
TS932	Micropower amplifier with CMOS inputs	SO-8	Industrial	2	-40	85	20	33	2.7	10	10	150	0.1	0.05	5	false	true	76
TS934	Micropower amplifier with CMOS inputs	SO-14,TSSOP-14L	Automotive,Industrial	4	-40	85	20	33	2.7	10	10	150	0.1	0.05	5	false	true	76
TS934A	Micropower amplifier with CMOS inputs	SO-14	Automotive	4	-40	85	20	33	2.7	10	5	150	0.1	0.05	5	false	true	76
TS941	Ultra-micropower amplifier with CMOS inputs	SOT23-5L	Industrial	1	-40	85	1.2	1.85	2.5	10	10	150	0.01	0.0045	4.5	false	true	330
TS941A	Ultra-micropower amplifier with CMOS inputs	SOT23-5L	Industrial	1	-40	85	1.2	1.85	2.5	10	5	150	0.01	0.0045	4.5	false	true	330

TS942	Ultra-micropower amplifier with CMOS inputs	SO-8	Industrial	2	-40	85	1.2	1.85	2.5	10	10	150	0.01	0.0045	4.5	false	true	330
TS942A	Ultra-micropower amplifier with CMOS inputs	SO-8	Industrial	2	-40	85	1.2	1.85	2.5	10	5	150	0.01	0.0045	4.5	false	true	330
TS944	Ultra-micropower amplifier with CMOS inputs	SO-14,TSSOP-14L	Industrial	4	-40	85	1.2	1.85	2.5	10	10	150	0.01	0.0045	4.5	false	true	330
TS944A	Ultra-micropower amplifier with CMOS inputs	SO-14,TSSOP-14L	Industrial	4	-40	85	1.2	1.85	2.5	10	5	150	0.01	0.0045	4.5	false	true	330
TS951	Real input & output rail to rail / low distortion (0.01%)	SO-8,SOT23-5L	Automotive,Industrial	1	-40	125	900	1300	2.7	12	6	100000	3	1	22	true	true	25
TS9511	Precision rail-to-rail input/output 3 MHz single operational amplifier	SOT23-5L	Automotive,Industrial	1	-40	125	950	1200	2.7	12	0.8	70000	3	1	20	true	true	25
TS952	Real input & output rail to rail / low distortion (0.01%)	SO-8,TSSOP-8L	Automotive,Industrial	2	-40	125	900	1300	2.7	12	6	100000	3	1	22	true	true	25
TS954	Real input & output rail to rail / low distortion (0.01%)	SO-14,TSSOP-14L	Automotive,Industrial	4	-40	125	900	1300	2.7	12	6	100000	3	1	22	true	true	25
TS971	Output rail-to-rail very low-noise op-amps	SO-8,SOT23-5L	Automotive,Industrial	1	-40	125	2000	2800	2.7	10	5	750000	12	4	100	false	true	4
TS972	Output rail-to-rail very low-noise op-amps	MiniSO-8,QFN-8L P 0.5 mm,SO-8,TSSOP-8L	Automotive,Industrial	2	-40	125	2000	2800	2.7	10	5	750000	12	4	100	false	true	4
TS974	Output rail-to-rail very low-noise op-amps	SO-14,TSSOP-14L	Automotive,Industrial	4	-40	125	2000	2800	2.7	10	5	750000	12	4	100	false	true	4
TS982	High output current dual operational amplifier	PowerSO-8	Automotive,Industrial	2	-40	125	5500	7200	2.5	5.5	5	500000	2.2	0.7	200	true	true	17
TSB182	Very high accuracy (20 µV) automotive grade, zero drift, rail to rail output, 3 MHz, 36 V op amp	MiniSO-8,SO-8	Automotive,Industrial	2	-40	125	670	850	4	36	0.02	500	3	1.7	27	false	true	24
TSB511	Rail-to-rail inputs and outputs, 36 V, 6 MHz op amps	SOT23-5L	Automotive,Industrial	1	-40	125	1800	2800	2.7	36	1.5	900000	6	3	50	true	true	12
TSB512	Rail-to-rail inputs and outputs, 36 V, 6 MHz op-amps	MiniSO-8,SO-8	Automotive,Industrial	2	-40	125	1800	2800	2.7	36	1.5	900000	6	3	50	true	true	12
TSB514	Rail-to-rail inputs and outputs, 36 V, 6 MHz op-amps	SO-14,TSSOP-14L	Automotive,Industrial	4	-40	125	1800	2800	2.7	36	1.5	900000	6	3	50	true	true	12
TSB571	Low-power, 2.5 MHz, RR IO, 36 V BiCMOS operational amplifier	SOT23-5L	Automotive,Industrial	1	-40	125	380	470	4	36	1.5	30000	2.5	1	60	true	true	20
TSB572	Low-power, 2.5 MHz, RR IO, 36 V BiCMOS operational amplifier	MiniSO-8,QFN-8L WF,SO-8	Automotive,Industrial	2	-40	125	380	470	4	36	1.5	30000	2.5	1	60	true	true	20
TSB582	200 mA output current with thermal shutdown and output current limiter, 3.1 MHz, 36 V, BiCMOS dual operational amplifier	PowerSO-8,QFN-8L WF	Automotive,Industrial	2	-40	125	2500	3300	4	36	2.4	2000	3.1	2	200	false	true	45
TSB611	Low power, rail-to-rail output, 36V operational amplifier	SOT23-5L	Automotive,Industrial	1	-40	125	103	125	2.7	36	1	10000	0.56	0.18	60	false	true	28
TSB612	Low power, rail-to-rail output, 36V operational amplifier	MiniSO-8,SO-8	Automotive,Industrial	2	-40	125	103	125	2.7	36	1	10000	0.56	0.18	60	false	true	28
TSB621	Low power, 1.7MHz, rail-to-rail output, 36V operational amplifier	SOT23-5L	Automotive,Industrial	1	-40	125	310	375	2.7	36	1	30000	1.7	0.6	45	false	true	25
TSB622	Low power, 1.7MHz, rail-to-rail output, 36V operational amplifier	MiniSO-8,QFN-8L WF,SO-8	Automotive,Industrial	2	-40	125	310	375	2.7	36	1	30000	1.7	0.6	45	false	true	25
TSB624	Low power, 1.7MHz, rail-to-rail output, 36V operational amplifier	SO-14,TSSOP-14L	Automotive,Industrial	4	-40	125	310	375	2.7	36	1	30000	1.7	0.6	45	false	true	25
TSB711	Precision, 6 MHz, RR IO, 36 V BiCMOS operational amplifier	SOT23-5L	Automotive,Industrial	1	-40	125	1800	2800	2.7	36	0.8	900000	6	3	50	true	true	12
TSB711A	Precision, 6 MHz, RR IO, 36 V BiCMOS operational amplifier	SOT23-5L	Automotive,Industrial	1	-40	125	1800	2800	2.7	36	0.3	900000	6	3	50	true	true	12
TSB712	Precision, 6 MHz, RR IO, 36 V BiCMOS operational amplifier	MiniSO-8,SO-8	Automotive,Industrial	2	-40	125	1800	2800	2.7	36	0.8	900000	6	3	50	true	true	12
TSB712A	Precision, 6 MHz, RR IO, 36 V BiCMOS operational amplifier	MiniSO-8,SO-8	Automotive,Industrial	2	-40	125	1800	2800	2.7	36	0.3	900000	6	3	50	true	true	12
TSB7191	Precision, 22 MHz, RR IO, 36 V BiCMOS operational amplifier	SOT23-5L	Automotive,Industrial	1	-40	125	1800	2800	2.7	36	0.8	900000	22	12	50	true	true	12
TSB7191A	Precision, 22 MHz, RR IO, 36 V BiCMOS operational amplifier	SOT23-5L	Automotive,Industrial	1	-40	125	1800	2800	2.7	36	0.3	900000	22	12	50	true	true	12
TSB7192	Precision, 22 MHz, RR IO, 36 V BiCMOS operational amplifier	MiniSO-8,SO-8	Automotive,Industrial	2	-40	125	1800	2800	2.7	36	0.8	900000	22	12	50	true	true	12
TSB7192A	Precision, 22 MHz, RR IO, 36 V BiCMOS operational amplifier	MiniSO-8,SO-8	Automotive,Industrial	2	-40	125	1800	2800	2.7	36	0.3	900000	22	12	50	true	true	12

TSH22	High gain bandwidth product bipolar op-amp	SO-8	Industrial	2	-40	125	2150	2750	3	30	2.5	650000	25	15	37	false	false	14
TSH24	High gain bandwidth product bipolar op-amp	SO-14	Industrial	4	-40	125	2150	2750	3	30	2.5	650000	25	15	37	false	false	14
TSH80	Rail-to-rail video op-amp with standby	SOT23-5L	Automotive	1	-40	85	8200	10500	4.5	12	10	15000000	65	115	55	false	true	11
TSH82	Rail-to-rail video op-amp	SO-8	Automotive,Industrial	2	-40	85	8200	10500	4.5	12	10	15000000	65	115	55	false	true	11
TSL6001	Low-power, 1MHz, rail-to-rail, 5V cost-effective Op amp	SC70-5,SOT23-5L	Industrial	1	-40	125	75	100	1.8	5.5	4.5	-	1	0.4	30	true	true	45
TSL6002	Low-power, 1MHz, rail-to-rail, 5V cost-effective Op amp	MiniSO-8,SO-8	Industrial	2	-40	125	75	100	1.8	5.5	4.5	-	1	0.4	30	true	true	45
TSL6004	Low-power, 1MHz, rail-to-rail, 5V cost-effective Op amp	TSSOP-14L	Industrial	4	-40	125	75	100	1.8	5.5	4.5	-	1	0.4	30	true	true	45
TSL6201	High bandwidth 6 MHz, rail-to-rail, 5 V cost-effective Op Amp	SOT23-5L	Industrial	1	-40	125	750	1400	2.5	5.5	4.5	-	6	4.5	30	true	true	21
TSL6202	High bandwidth 6 MHz, rail-to-rail, 5 V cost-effective Op Amp	MiniSO-8	Industrial	2	-40	125	750	1400	2.5	5.5	4.5	-	6	4.5	30	true	true	21
TSL6204	High bandwidth 6 MHz, rail-to-rail, 5 V cost-effective Op Amp	TSSOP-14L	Industrial	4	-40	125	750	1400	2.5	5.5	4.5	-	6	4.5	30	true	true	21
TSL6401	High-bandwidth, 50MHz, rail-to-rail, 5V cost-effective Opamp	SOT23-5L	Industrial	1	-40	125	5500	7200	2.2	5.5	4.5	1	50	30	60	true	true	15
TSU101	Nanopower (580nA) rail-to-rail I/O 5V CMOS Op-Amp	SC70-5,SOT23-5L	Industrial	1	-40	85	0.58	0.75	1.5	5.5	3	5	0.008	0.003	11	true	true	265
TSU102	Nanopower (580nA) rail-to-rail I/O 5V CMOS Op-Amp	DFN-8L P 0.5 mm,MiniSO-8	Industrial	2	-40	85	0.58	0.75	1.5	5.5	3	5	0.008	0.003	11	true	true	265
TSU104	Nanopower (580nA) rail-to-rail I/O 5V CMOS Op-Amp	QFN-16L,TSSOP-14L	Industrial	4	-40	85	0.58	0.75	1.5	5.5	3	5	0.008	0.003	11	true	true	265
TSU111	Nanopower (900 nA) high accuracy (150 μV) 5V CMOS Op Amp	QFN-6L P 0.4 mm,SC70-5	Industrial	1	-40	85	0.9	1.35	1.5	5.5	0.15	5	0.0115	0.0027	41	true	true	265
TSU111H	High temperature (150°C) & long mission profile automotive grade, high accuracy (250 μV) 5 V CMOS operational amplifier	SOT23-5L	Automotive	1	-40	150	1.7	2.4	1.5	5.5	0.25	1	0.023	5.5	5	true	true	200
TSU111Y	Nanopower (900 nA) high accuracy (150 μV) 5V CMOS Auto Op Amp	SC70-5,SOT23-5L	Automotive,Industrial	1	-40	125	0.84	1.3	1.5	5.5	0.15	10	0.009	0.0024	4	true	true	220
TSU112	Nanopower (900 nA) high accuracy (150 μV) 5V CMOS Op-Amp	MiniSO-8,QFN-8L P 0.5 mm	Industrial	2	-40	85	0.9	1.35	1.5	5.5	0.15	5	0.0115	0.0027	41	true	true	265
TSU112Y	Nanopower (900 nA) high accuracy (150 μV) 5V CMOS Auto Op-Amp	MiniSO-8,QFN-8L WF	Automotive	2	-40	125	0.9	1.35	1.5	5.5	0.15	5	0.0115	0.0027	41	true	true	265
TSU114	Nanopower (900 nA) high accuracy (150 μV) 5V CMOS Op-Amp	QFN-16L,TSSOP-14L	Industrial	4	-40	85	0.9	1.35	1.5	5.5	0.15	5	0.0115	0.0027	41	true	true	265
TSV321	General purpose low voltage rail to rail input/output op-amp	SOT23-5L	Automotive,Industrial	1	-40	125	500	835	2.5	6	3	125000	1.4	0.6	80	true	true	27
TSV321A	General purpose low voltage rail to rail input/output op-amp	SOT23-5L	Automotive,Industrial	1	-40	125	500	835	2.5	6	1	125000	1.4	0.6	80	true	true	27
TSV324	General purpose low voltage rail to rail input/output op-amp	SO-14,TSSOP-14L	Automotive,Industrial	4	-40	125	500	835	2.5	6	3	125000	1.4	0.6	80	true	true	27
TSV324A	General purpose low voltage rail to rail input/output op-amp	SO-14,TSSOP-14L	Automotive	4	-40	125	500	835	2.5	6	3	125000	1.4	0.6	80	true	true	27
TSV358	General purpose low voltage rail to rail input/output op-amp	MiniSO-8,SO-8,TSSOP-8L	Automotive,Industrial	2	-40	125	500	835	2.5	6	3	125000	1.4	0.6	80	true	true	27
TSV358A	General purpose low voltage rail to rail input/output op-amp	MiniSO-8,SO-8,TSSOP-8L	Automotive,Industrial	2	-40	125	500	835	2.5	6	1	125000	1.4	0.6	80	true	true	27
TSV521	High merit factor (1.15 MHz for 45 uA) CMOS op-amps	SC70-5	Industrial	1	-40	125	45	60	2.7	5.5	1	10	1.15	0.89	55	true	true	57
TSV521A	High merit factor (1.15 MHz for 45 uA) CMOS op-amps	SC70-5	Industrial	1	-40	125	45	60	2.7	5.5	0.6	10	1.15	0.89	55	true	true	57
TSV522	High merit factor (1.15 MHz for 45 uA) CMOS op-amps	MiniSO-8,QFN-8L P 0.5 mm	Automotive,Industrial	2	-40	125	45	60	2.7	5.5	1	10	1.15	0.89	55	true	true	57
TSV522A	High merit factor (1.15 MHz for 45 uA) CMOS op-amps	MiniSO-8,QFN-8L P 0.5 mm	Automotive,Industrial	2	-40	125	45	60	2.7	5.5	0.6	10	1.15	0.89	55	true	true	57
TSV524	High merit factor (1.15 MHz for 45 uA) CMOS op-amps	QFN-16L,TSSOP-14L	Automotive,Industrial	4	-40	125	45	60	2.7	5.5	1	10	1.15	0.89	55	true	true	57

TSV524A	High merit factor (1.15 MHz for 45 uA) CMOS op-amps	TSSOP-14L	Automotive, Industrial	4	-40	125	45	60	2.7	5.5	0.6	10	1.15	0.89	55	true	true	57
TSV611	Rail to rail input/output 5V CMOS Op-Amp, micro-power (10uA), GBP = 120kHz, single	SC70-5,SOT23-5L	Industrial	1	-40	85	10.5	12.5	1.5	5.5	4.5	10	0.12	0.04	60	true	true	105
TSV611A	Rail to rail input/output 5V CMOS Op-Amp, micro-power (10uA), GBP = 120kHz, small offset, single	SC70-5,SOT23-5L	Industrial	1	-40	85	10.5	12	1.5	5.5	0.8	10	0.12	0.04	60	true	true	105
TSV612	Rail to rail input/output 5V CMOS Op-Amps, micro-power (10uA), GBP=120kHz, dual	MiniSO-8,SO-8	Industrial	2	-40	85	10.5	12	1.5	5.5	4	10	0.12	0.04	60	true	true	105
TSV612A	Rail to rail input/output 5V CMOS Op-Amps, micro-power (10uA), GBP=120kHz, small offset, dual	MiniSO-8,SO-8	Industrial	2	-40	85	10.5	12	1.5	5.5	0.8	10	0.12	0.04	60	true	true	105
TSV6191	Rail to rail input/output 5V CMOS Op-Amp, micro-power (10uA), GBP = 450kHz, single	SC70-5,SOT23-5L	Industrial	1	-40	85	10.5	12.5	1.5	5.5	4.5	10	0.45	0.08	60	true	true	105
TSV6191A	Rail to rail input/output 5V CMOS Op-Amp, micro-power (10uA), GBP=450kHz, small offset, single	SC70-5,SOT23-5L	Industrial	1	-40	85	10.5	12	1.5	5.5	0.8	10	0.45	0.08	60	true	true	105
TSV6192	Rail to rail input/output 5V CMOS Op-Amps, micro-power(10uA), GBP=450kHz, dual	MiniSO-8,SO-8	Industrial	2	-40	85	10.5	12	1.5	5.5	4	10	0.45	0.08	60	true	true	105
TSV6192A	Rail to rail input/output 5V CMOS Op-Amps, micro-power (10uA), GBP=450kHz, small offset, dual	MiniSO-8,SO-8	Industrial	2	-40	85	10.5	12	1.5	5.5	0.8	10	0.45	0.08	60	true	true	105
TSV620	Rail-to-rail Input/output 5V CMOS Op-Amp, micro-power (29uA), GBP=420kHz, single with standby	SC70-6,SOT23-6L	Industrial	1	-40	125	29	36	1.5	5.5	4	10	0.42	0.14	69	true	true	70
TSV620A	Rail-to-rail input/output 5V CMOS Op-Amp, micro-power (29uA), GBP=420kHz, small offset, single, with standby	SC70-6,SOT23-6L	Industrial	1	-40	125	29	36	1.5	5.5	0.8	10	0.42	0.14	69	true	true	70
TSV621	Rail-to-rail input/output 5V CMOS Op-Amp, micro-power (29uA), GBP=420kHz, single	SC70-5,SOT23-5L	Industrial	1	-40	125	29	36	1.5	5.5	4	10	0.42	0.14	69	true	true	70
TSV621A	Rail-to-rail input/output 5V CMOS Op-Amp, micro-power (29uA), GBP=420kHz, small offset, single	SC70-5,SOT23-5L	Industrial	1	-40	125	29	36	1.5	5.5	0.8	10	0.42	0.14	69	true	true	70
TSV622	Rail-to-rail input/output 5V CMOS Op-Amps, micro-power (29uA), GBP=420kHz, dual	MiniSO-8,SO-8	Industrial	2	-40	125	29	36	1.5	5.5	4	10	0.42	0.19	69	true	true	77
TSV622A	Rail-to-rail input/output 5V CMOS Op-Amps, micro-power (29uA), GBP=420kHz, small offset, dual	MiniSO-8,SO-8	Industrial	2	-40	125	29	36	1.5	5.5	0.8	10	0.42	0.19	69	true	true	77
TSV623	Rail-to-rail input/output 5V CMOS Op-Amps, micro-power (29uA), GBP=420kHz, dual with standby	MiniSO-10	Industrial	2	-40	125	29	36	1.5	5.5	4	10	0.42	0.19	69	true	true	77
TSV623A	Rail-to-rail input/output 5V CMOS Op-Amps, micro-power (29uA), GBP=420kHz, small offset, dual with standby	MiniSO-10	Industrial	2	-40	125	29	36	1.5	5.5	0.8	10	0.42	0.19	69	true	true	77
TSV624	Rail-to-rail input/output 5V CMOS Op-Amps, micro-power (29uA), GBP=420kHz, quad	TSSOP-14L	Industrial	4	-40	125	29	36	1.5	5.5	4	10	0.42	0.19	69	true	true	77
TSV624A	Rail-to-rail input/output 5V CMOS Op-Amps, micro-power (29uA), GBP=420kHz, small offset, quad	TSSOP-14L	Industrial	4	-40	125	29	36	1.5	5.5	0.8	10	0.42	0.19	69	true	true	77
TSV625	Rail-to-rail input/output 5V CMOS Op-Amps, micro-power (29uA), GBP=420kHz, quad with standby	TSSOP-16L	Industrial	4	-40	125	29	36	1.5	5.5	4	10	0.42	0.19	69	true	true	77
TSV6290	Rail-to-rail input/output 5V CMOS Op-Amp, micro-power (29uA), GBP=1.3MHz, single with standby	SC70-6,SOT23-6L	Industrial	1	-40	125	29	36	1.5	5.5	4	10	1.3	0.5	69	true	true	70
TSV6290A	Rail-to-rail input/output 5V CMOS Op-Amp, micro-power (29uA), GBP=1.3MHz, small offset, single with standby	SC70-6,SOT23-6L	Industrial	1	-40	125	29	36	1.5	5.5	0.8	10	1.3	0.5	69	true	true	70
TSV6291	Rail-to-rail input/output 5V CMOS Op-Amp, micro-power (29uA), GBP=1.3MHz, single	SC70-5,SOT23-5L	Industrial	1	-40	125	29	36	1.5	5.5	4	10	1.3	0.5	69	true	true	70
TSV6291A	Rail-to-rail input/output 5V CMOS Op-Amp, micro-power (29uA), GBP=1.3MHz, small offset, single	SC70-5,SOT23-5L	Industrial	1	-40	125	29	36	1.5	5.5	0.8	10	1.3	0.5	69	true	true	70
TSV6292	Rail-to-rail input/output 5V CMOS Op-Amps, micro-power (29uA), GBP=1.3MHz, dual	MiniSO-8,SO-8	Industrial	2	-40	125	29	35	1.5	5.5	4	10	1.3	0.5	69	true	true	77
TSV6292A	Rail-to-rail input/output 5V CMOS Op-Amps, micro-power (29uA), GBP=1.3MHz, small offset, dual	MiniSO-8,SO-8	Industrial	2	-40	125	29	35	1.5	5.5	0.8	10	1.3	0.5	69	true	true	77
TSV6293	Rail-to-rail input/output 5V CMOS Op-Amps, micro-power (29uA), GBP=1.3MHz, dual with standby	MiniSO-10	Industrial	2	-40	125	29	35	1.5	5.5	4	10	1.3	0.5	69	true	true	77
TSV6293A	Rail-to-rail input/output 5V CMOS Op-Amps, micro-power (29uA), GBP=1.3MHz, small offset, dual with standby	MiniSO-10	Industrial	2	-40	125	29	35	1.5	5.5	0.8	10	1.3	0.5	69	true	true	77
TSV6294	Rail-to-rail input/output 5V CMOS Op-Amps, micro-power (29uA), GBP=1.3MHz, quad	TSSOP-14L	Industrial	4	-40	125	29	35	1.5	5.5	4	10	1.3	0.5	69	true	true	77
TSV6294A	Rail-to-rail input/output 5V CMOS Op-Amps, micro-power (29uA), GBP=1.3MHz, small offset, quad	TSSOP-14L	Industrial	4	-40	125	29	35	1.5	5.5	0.8	10	1.3	0.5	69	true	true	77

TSV630	Rail-to-rail input/output 5V CMOS Op-Amp, micro-power (60uA), GBP=880kHz, single with standby	QFN-6L P 0.4 mm,QFN-8L P 0.5 mm,SC70-6,SOT23-6L	Industrial	1	-40	125	60	69	1.5	5.5	3	10	0.88	0.34	69	true	true	60
TSV630A	Rail-to-rail input/output 5V CMOS Op-Amp, micro-power (60uA), GBP=880kHz, small offset, single with standby	SC70-6,SOT23-6L	Industrial	1	-40	125	60	69	1.5	5.5	0.5	10	0.88	0.34	69	true	true	60
TSV631	Rail-to-rail input/output 5V CMOS Op-Amp, micro-power (60uA), GBP=880kHz, single	SC70-5,SOT23-5L	Automotive,Industrial	1	-40	125	60	69	1.5	5.5	3	10	0.88	0.34	69	true	true	60
TSV631A	Rail-to-rail input/output 5V CMOS Op-Amp, micro-power (60uA), GBP=880kHz, small offset, single	SC70-5,SOT23-5L	Industrial	1	-40	125	60	69	1.5	5.5	0.5	10	0.88	0.34	69	true	true	60
TSV632	Rail-to-rail input/output 5V CMOS Op-Amps, micro-power (60uA), GBP=880kHz, dual	MiniSO-8,QFN-8L P 0.5 mm,SO-8	Automotive,Industrial	2	-40	125	60	69	1.5	5.5	3	10	0.88	0.34	69	true	true	60
TSV632A	Rail-to-rail input/output 5V CMOS Op-Amps, micro-power (60uA), GBP=880kHz, small offset, dual	MiniSO-8,QFN-8L P 0.5 mm,SO-8	Industrial	2	-40	125	60	69	1.5	5.5	0.8	10	0.88	0.34	69	true	true	60
TSV633	Rail-to-rail input/output 5V CMOS Op-Amps, micro-power (60uA), GBP=880kHz, dual with standby	MiniSO-10	Industrial	2	-40	125	60	69	1.5	5.5	3	10	0.88	0.34	69	true	true	60
TSV633A	Rail-to-rail input/output 5V CMOS Op-Amps, micro-power (60uA), GBP=880kHz, small offset, dual with standby	MiniSO-10	Industrial	2	-40	125	60	69	1.5	5.5	0.8	10	0.88	0.34	69	true	true	60
TSV634	Rail-to-rail input/output 5V CMOS Op-Amps, micro-power (60uA), GBP=880kHz, quad	QFN-16L,TSSOP-14L	Automotive,Industrial	4	-40	125	60	69	1.5	5.5	3	10	0.88	0.34	69	true	true	60
TSV634A	Rail-to-rail input/output 5V CMOS Op-Amps, micro-power (60uA), GBP=880kHz, small offset, quad	TSSOP-14L	Industrial	4	-40	125	60	69	1.5	5.5	0.8	10	0.88	0.34	69	true	true	60
TSV635	Rail-to-rail input/offset 5V CMOS Op-Amps, micro-power (60uA), GBP=880kHz, quad with standby	TSSOP-16L	Industrial	4	-40	125	60	69	1.5	5.5	3	10	0.88	0.34	69	true	true	60
TSV635A	Rail-to-rail input/output 5V CMOS Op-Amps, micro-power (60uA), GBP=880kHz, small offset, quad with standby	TSSOP-16L	Industrial	4	-40	125	60	69	1.5	5.5	0.8	10	0.88	0.34	69	true	true	60
TSV6390	Rail-to-rail input/output 5V CMOS Op-Amp, micro-power (60uA), GBP=2.4MHz, single with standby	SC70-6,SOT23-6L	Industrial	1	-40	125	60	69	1.5	5.5	3	10	2.4	1.1	69	true	true	60
TSV6390A	Rail-to-rail input/output 5V CMOS Op-Amp, micro-power (60uA), GBP=2.4MHz, small offset, single with standby	SC70-6,SOT23-6L	Industrial	1	-40	125	60	69	1.5	5.5	0.5	10	2.4	1.1	69	true	true	60
TSV6391	Rail-to-rail input/output 5V CMOS Op-Amp, micro-power (60uA), GBP=2.4MHz, single	SC70-5,SOT23-5L	Industrial	1	-40	125	60	69	1.5	5.5	3	10	2.4	1.1	69	true	true	60
TSV6391A	Rail-to-rail input/output 5V CMOS Op-Amp, micro-power (60uA), GBP=2.4MHz, small offset, single	SC70-5,SOT23-5L	Industrial	1	-40	125	60	69	1.5	5.5	0.5	10	2.4	1.1	69	true	true	60
TSV6392	Rail-to-rail input/output 5V CMOS Op-Amps, micro-power (60uA), GBP=2.4MHz, dual	MiniSO-8,SO-8	Industrial	2	-40	125	60	69	1.5	5.5	3	10	2.4	1.1	69	true	true	60
TSV6392A	Rail-to-rail input/output 5V CMOS Op-Amps, micro-power (60uA), GBP=2.4MHz, small offset, dual	MiniSO-8,SO-8	Industrial	2	-40	125	60	69	1.5	5.5	0.8	10	2.4	1.1	69	true	true	60
TSV6393	Rail-to-rail input/output 5V CMOS Op-Amps, micro-power (60uA), GBP=2.4MHz, dual with standby	MiniSO-10	Industrial	2	-40	125	60	69	1.5	5.5	3	10	2.4	1.1	69	true	true	60
TSV6393A	Rail-to-rail input/output 5V CMOS Op-Amps, micro-power (60uA), GBP=2.4MHz, small offset, dual with standby	MiniSO-10	Industrial	2	-40	125	60	69	1.5	5.5	0.8	10	2.4	1.1	69	true	true	60
TSV6394	Rail-to-rail input/output 5V CMOS Op-Amps, micro-power (60uA), GBP=2.4MHz, quad	TSSOP-14L	Industrial	4	-40	125	60	69	1.5	5.5	3	10	2.4	1.1	69	true	true	60
TSV6394A	Rail-to-rail input/output 5V CMOS Op-Amps, micro-power (60uA), GBP=2.4MHz, small offset, quad	TSSOP-14L	Industrial	4	-40	125	60	69	1.5	5.5	0.8	10	2.4	1.1	69	true	true	60
TSV6395	Rail-to-rail input/output 5V CMOS Op-Amps, micro-power (60uA), GBP=2.4MHz, quad with standby	TSSOP-16L	Industrial	4	-40	125	60	69	1.5	5.5	3	10	2.4	1.1	69	true	true	60
TSV711	High accuracy (Vio below 200uV) Micropower (10uA) 5V CMOS Op Amp, single, GBP 150kHz	SC70-5	Industrial	1	-40	125	10	14	1.5	5.5	0.2	10	0.12	0.06	45	true	true	100
TSV712	High accuracy (Vio below 200uV) Micropower (10uA) 5V CMOS Op Amp, dual, GBP 150kHz	DFN-8L P 0.5 mm,MiniSO-8	Industrial	2	-40	125	10	14	1.5	5.5	0.2	10	0.12	0.06	45	true	true	100
TSV714	High accuracy (Vio below 200uV) Micropower (10uA) 5V CMOS Op Amp, quad, GBP 150kHz	QFN-16L,TSSOP-14L	Industrial	4	-40	125	10	14	1.5	5.5	0.2	10	0.12	0.06	45	true	true	100
TSV731	High accuracy (Vio below 200uV) Micropower (60uA) 5V CMOS Op Amp, single, GBP 900kHz	SC70-5	Industrial	1	-40	125	60	70	1.5	5.5	0.2	10	0.9	0.35	52	true	true	35
TSV732	High accuracy (Vio below 200uV) Micropower (60uA) 5V CMOS Op Amp, dual, GBP 900kHz	DFN-8L P 0.5 mm,MiniSO-8	Industrial	2	-40	125	60	70	1.5	5.5	0.2	10	0.9	0.35	52	true	true	35

TSV734	High accuracy (Vio below 200uV) Micropower (60uA) 5V CMOS Op Amp, quad, GBP 900kHz	QFN-16L,TSSOP-14L	Industrial	4	-40	125	60	70	1.5	5.5	0.2	10	0.9	0.35	52	true	true	35
TSV771	High bandwidth (20 MHz) low offset (200 uV) rail-to-rail 5V Op amp	SOT23-5L	Automotive,Industrial	1	-40	125	1900	2100	2	5.5	0.2	100	20	13	65	true	true	10
TSV772	High bandwidth (20 MHz) low offset (200 uV) rail-to-rail 5V op amp	MiniSO-8,QFN-8L P 0.5 mm,SO-8	Automotive,Industrial	2	-40	125	1900	2100	2	5.5	0.2	100	20	13	65	true	true	10
TSV7721	High bandwidth (22MHz) Low offset (200 uV) low-rail 5V op amp	SOT23-5L	Automotive,Industrial	1	-40	125	1700	2200	1.8	5.5	0.2	100	20	11	65	false	true	7
TSV7722	High bandwidth (22MHz) Low offset (200 uV) low-rail 5V op amp	MiniSO-8,QFN-8L P 0.5 mm,SO-8	Automotive,Industrial	2	-40	125	1700	2200	1.8	5.5	0.2	100	22	11	65	false	true	7
TSV7723	High bandwidth (22MHz) Low offset (200 uV) low-rail 5V op amp	MiniSO-10	Industrial	2	-40	125	1700	2200	1.8	5.5	0.2	100	20	11	65	false	true	7
TSV782	High bandwidth (30MHz) Low offset (200uV) Rail-to-rail 5V op amp	MiniSO-8,QFN-8L P 0.5 mm,SO-8	Automotive,Industrial	2	-40	125	3300	4000	2	5.5	0.2	300	30	19	60	true	true	14
TSV791	High bandwidth (50MHz) Low offset (200uV) Rail-to-rail 5V Op amp	SOT23-5L	Automotive,Industrial	1	-40	125	5000	6000	2.2	5.5	0.2	10	50	30	60	true	true	6.5
TSV792	High bandwidth (50MHz) Low offset (200uV) Rail-to-rail 5V Op amp	MiniSO-8,QFN-8L P 0.5 mm,SO-8	Automotive,Industrial	2	-40	125	5000	6000	2.2	5.5	0.2	10	50	30	60	true	true	6.5
TSV850	Low power (180uA), general purpose 5V Bipolar Op-Amp, GBP=1.3MHz, single with shutdown feature	SOT23-6L	Industrial	1	-40	125	180	180	2.3	5.5	4	60000	1.3	0.7	56	false	true	39
TSV850A	Low-power (180uA), general-purpose 5V Bipolar Op-Amp, GBP=1.3MHz, small offset, single with shutdown feature	SOT23-6L	Industrial	1	-40	125	180	180	2.3	5.5	0.8	60000	1.3	0.7	56	false	true	39
TSV851	Low-power (180uA), general-purpose 5V Bipolar Op-Amp, GBP=1.3MHz, single	SC70-5,SOT23-5L	Automotive,Industrial	1	-40	125	180	180	2.3	5.5	4	60000	1.3	0.7	56	false	true	39
TSV851A	Low-power (180uA), general-purpose 5V Bipolar Op-Amp, GBP=1.3MHz, small offset, single	SC70-5,SOT23-5L	Automotive,Industrial	1	-40	125	180	180	2.3	5.5	0.8	60000	1.3	0.7	56	false	true	39
TSV852	Low-power (180uA), general-purpose 5V Bipolar Op Amps, GBP=1.3MHz, dual	MiniSO-8,QFN-8L P 0.5 mm,SO-8	Automotive,Industrial	2	-40	125	180	180	2.3	5.5	4	60000	1.3	0.7	56	false	true	39
TSV852A	Low-power (180uA), general-purpose 5V Bipolar Op Amps, GBP=1.3MHz, small offset, dual	MiniSO-8,SO-8	Automotive,Industrial	2	-40	125	180	180	2.3	5.5	0.8	60000	1.3	0.7	56	false	true	39
TSV853	Low-power (180uA), general-purpose 5V Bipolar Op-Amps, GBP=1.3MHz, dual with shutdown feature	MiniSO-10	Industrial	2	-40	125	180	180	2.3	5.5	4	60000	1.3	0.7	56	false	true	39
TSV853A	Low-power (180uA), general-purpose 5V Bipolar Op-Amps, GBP=1.3MHz, small offset, dual with shutdown feature	MiniSO-10	Industrial	2	-40	125	180	180	2.3	5.5	0.8	60000	1.3	0.7	56	false	true	39
TSV854	Low-power (180uA), general-purpose 5V Bipolar Op-Amps, GBP=1.3MHz, quad	QFN-16L,SO-14,TSSOP-14L	Automotive,Industrial	4	-40	125	180	180	2.3	5.5	4	60000	1.3	0.7	56	false	true	39
TSV854A	Low-power (180uA), general-purpose 5V Bipolar Op Amps, GBP=1.3MHz, small offset, quad	SO-14,TSSOP-14L	Automotive,Industrial	4	-40	125	180	180	2.3	5.5	0.8	60000	1.3	0.7	56	false	true	39
TSV911	Wide-bandwidth (8MHz) rail to rail input/output 5V CMOS Op-Amp, single	SO-8,SOT23-5L	Automotive,Industrial	1	-40	125	780	1100	2.5	5.5	4.5	10	8	4.5	35	true	true	27
TSV911A	Wide-bandwidth (8MHz) rail to rail input/output 5V CMOS Op-Amp, small offset, single	SO-8,SOT23-5L	Automotive,Industrial	1	-40	125	780	1100	2.5	5.5	1.5	10	8	4.5	35	true	true	27
TSV912	Wide-bandwidth (8MHz) rail to rail input/output 5V CMOS Op-Amps, dual	MiniSO-8,QFN-8L P 0.5 mm,SO-8	Automotive,Industrial	2	-40	125	780	1100	2.5	5.5	4.5	10	8	4.5	35	true	true	27
TSV912A	Wide-bandwidth (8MHz) rail to rail input/output 5V CMOS Op-Amps, small offset, dual	MiniSO-8,SO-8	Automotive,Industrial	2	-40	125	780	1100	2.5	5.5	1.5	10	8	4.5	35	true	true	27
TSV912H	Wide-bandwidth (8MHz), high temperature range (150oC) rail to rail input/output 5V CMOS Op-Amps, dual	SO-8	Automotive	2	-40	150	780	1100	2.5	5.5	4.5	10	8	4.5	35	true	true	27
TSV914	Wide-bandwidth (8MHz) rail to rail input/output 5V CMOS Op-Amps, quad	SO-14,TSSOP-14L	Automotive,Industrial	4	-40	125	780	1100	2.5	5.5	4.5	10	8	4.5	35	true	true	27
TSV914A	Wide-bandwidth (8MHz) rail to rail input/output 5V CMOS Op-Amps, small offset, quad	SO-14,TSSOP-14L	Automotive,Industrial	4	-40	125	780	1100	2.5	5.5	1.5	10	8	4.5	35	true	true	27
TSV991	Wide-bandwidth (20MHz) rail to rail input/output 5V CMOS Op-Amp, single	QFN-8L P 0.5 mm,SO-8,SOT23-5L	Automotive,Industrial	1	-40	125	820	1100	2.5	5.5	4.5	10	20	10	35	true	true	27

TSV991A	Wide bandwidth (20MHz) rail to rail input/output 5V CMOS Op-Amp, small offset, single	QFN-6L P 0.4 mm,QFN-8L P 0.5 mm,SOT23-5L	Automotive,Industrial	1	-40	125	820	1100	2.5	5.5	1.5	10	20	10	35	true	true	27
TSV992	Wide bandwidth (20MHz) rail to rail input/output 5V CMOS Op-Amps, dual	MiniSO-8,QFN-8L P 0.5 mm,SOT23-5L	Automotive,Industrial	2	-40	125	820	1100	2.5	5.5	4.5	10	20	10	35	true	true	27
TSV992A	Wide bandwidth (20MHz) rail to rail input/output 5V CMOS Op-Amps, small offset, dual	MiniSO-8,SOT23-5L	Automotive,Industrial	2	-40	125	820	1100	2.5	5.5	1.5	10	20	10	35	true	true	27
TSV994	Wide bandwidth (20MHz) rail to rail input/output 5V CMOS Op-Amps, quad	SO-14,TSSOP-14L	Automotive,Industrial	4	-40	125	820	1100	2.5	5.5	4.5	10	20	10	35	true	true	27
TSV994A	Wide bandwidth (20MHz), rail to rail input/output 5V CMOS Op-Amps, small offset, quad	SO-14,TSSOP-14L	Automotive,Industrial	4	-40	125	820	1100	2.5	5.5	1.5	10	20	10	35	true	true	27
TSX561	Micropower (235uA), 16V CMOS Op-Amp, single, GBP 900kHz	SOT23-5L	Automotive,Industrial	1	-40	125	250	360	3	16	1	100	0.9	1.1	90	true	true	48
TSX561A	Micropower (235uA), 16V CMOS Op-Amp, single, GBP 900kHz, low offset voltage version	SOT23-5L	Automotive,Industrial	1	-40	125	250	360	3	16	0.6	100	0.9	1.1	90	true	true	48
TSX562	Micropower (235uA), 16V CMOS Op-Amps, dual, GBP 900kHz	DFN-8L P 0.5 mm,MiniSO-8	Automotive,Industrial	2	-40	125	250	360	3	16	1	100	0.9	1.1	90	true	true	48
TSX562A	Micropower (235uA), 16V CMOS Op-Amps, dual, GBP 900kHz, low offset voltage version	MiniSO-8	Automotive,Industrial	2	-40	125	250	360	3	16	0.6	100	0.9	1.1	90	true	true	48
TSX564	Micropower (235uA), 16V CMOS Op-Amps, quad, GBP 900kHz	QFN-16L,TSSOP-14L	Automotive,Industrial	4	-40	125	250	360	3	16	1	100	0.9	1.1	90	true	true	48
TSX564A	Micropower (235uA), 16V CMOS Op-Amps, quad, low offset voltage version	TSSOP-14L	Automotive,Industrial	4	-40	125	250	360	3	16	0.6	100	0.9	1.1	90	true	true	48
TSX631	Micropower (60uA), rail-to-rail 16V CMOS Op-Amp, single, GBP 200kHz	SOT23-5L	Automotive,Industrial	1	-40	125	45	60	3.3	16	1	100	0.2	0.12	90	true	true	60
TSX631A	Micropower (60uA), rail-to-rail 16V CMOS Op-Amp, single, GBP 200kHz, low offset voltage version	SOT23-5L	Automotive,Industrial	1	-40	125	45	60	3.3	16	0.5	100	0.2	0.12	90	true	true	60
TSX632	Micropower (60uA), rail-to-rail 16V CMOS Op-Amps, dual, GBP 200kHz	DFN-8L P 0.5 mm,MiniSO-8	Automotive,Industrial	2	-40	125	45	60	3.3	16	1	100	0.2	0.12	90	true	true	60
TSX632A	Micropower (60uA), rail-to-rail 16V CMOS Op-Amps, dual, GBP 200kHz, low offset voltage version	MiniSO-8	Automotive,Industrial	2	-40	125	45	60	3.3	16	0.5	100	0.2	0.12	90	true	true	60
TSX634	Micropower (60uA), rail-to-rail 16V CMOS Op-Amps, quad, GBP 200kHz	QFN-16L,TSSOP-14L	Automotive,Industrial	4	-40	125	45	60	3.3	16	1	100	0.2	0.12	90	true	true	60
TSX634A	Micropower (60uA), rail-to-rail 16V CMOS Op-Amps, quad, GBP 200kHz, low offset voltage version	TSSOP-14L	Automotive,Industrial	4	-40	125	45	60	3.3	16	0.5	100	0.2	0.12	90	true	true	60
TSX711	Precision (200uV), rail-to-rail 16V CMOS Op-Amp, single, GBP 2.7MHz	SOT23-5L	Automotive,Industrial	1	-40	125	660	900	2.7	16	0.2	50	2.7	1.3	50	true	true	22
TSX711A	Precision, rail-to-rail 16V CMOS op-amps	SOT23-5L	Automotive,Industrial	1	-40	125	660	900	2.7	16	0.1	50	2.5	1.5	50	true	true	20
TSX712	Precision (200uV), rail-to-rail 16V CMOS Op-Amps, dual, GBP 2.7MHz	MiniSO-8,SOT23-5L	Automotive,Industrial	2	-40	125	660	900	2.7	16	0.2	50	2.7	1.3	50	true	true	22
TSX7191	Precision (200uV), rail-to-rail, 16 V CMOS Op-Amp, single, GBP 9MHz	SOT23-5L	Automotive,Industrial	1	-40	125	660	900	2.7	16	0.2	50	9	2.3	50	true	true	22
TSX7191A	Low-power, precision, rail-to-rail, 9.0 MHz, 16 V operational amplifiers	SOT23-5L	Automotive,Industrial	1	-40	125	660	900	2.7	16	0.1	50	9	2.3	50	true	true	22
TSX7192	Precision (200uV), rail-to-rail 16 V CMOS Op-Amps, dual, GBP 9MHz	MiniSO-8,SOT23-5L	Automotive,Industrial	2	-40	125	660	900	2.7	16	0.2	50	9	2.3	50	true	true	22
TSX920	Large bandwidth (10MHz), rail-to-rail 16V CMOS Op-Amp with standby, single	SOT23-6L	Industrial	1	-40	125	2800	3400	4	16	4	100	10	17.2	62	true	true	16.5
TSX921	Large bandwidth (10MHz), rail-to-rail 16V CMOS Op-Amp, single	SOT23-5L	Automotive,Industrial	1	-40	125	2800	3400	4	16	4	100	10	17.2	62	true	true	16.5
TSX922	Large bandwidth (10MHz), rail-to-rail 16V CMOS Op-Amps, dual	DFN-8L P 0.5 mm,MiniSO-8,SOT23-5L	Automotive,Industrial	2	-40	125	2800	3400	4	16	4	100	10	17.2	62	true	true	16.5
TSX923	Large bandwidth (10MHz), rail-to-rail 16V CMOS Op-Amps with standby, dual	MiniSO-10	Industrial	2	-40	125	2800	3400	4	16	4	100	10	17.2	62	true	true	16.5
TSX9291	Large bandwidth (16MHz), rail-to-rail 16V CMOS Op-Amp, single	SOT23-5L	Automotive,Industrial	1	-40	125	2800	3400	4	16	4	100	16	26	62	true	true	16.5
TSX9292	Large bandwidth (16MHz), rail-to-rail 16V CMOS Op-Amps, dual	DFN-8L P 0.5 mm,MiniSO-8,SOT23-5L	Automotive,Industrial	2	-40	125	2800	3400	4	16	4	100	16	26	62	true	true	16.5

TSZ121	Very high accuracy (5 uV) zero drift 5 V CMOS Op-Amp, single, GBP=400kHz	SC70-5,SOT23-5L	Automotive,Industrial	1	-40	125	31	40	1.8	5.5	0.005	200	0.4	0.19	17	true	true	37
TSZ122	Very high accuracy (5 uV) zero drift 5 V CMOS Op-Amps, dual, GBP=400kHz	MiniSO-8,QFN-8L P 0.5 mm,SOT8	Automotive,Industrial	2	-40	125	31	40	1.8	5.5	0.005	200	0.4	0.19	17	true	true	37
TSZ124	Very high accuracy (5 uV) zero drift 5 V CMOS Op-Amps, quad, GBP=400kHz	QFN-16L,TSSOP14L	Automotive,Industrial	4	-40	125	31	40	1.8	5.5	0.005	200	0.4	0.19	17	true	true	37
TSZ181	Very high accuracy (25 uV) zero drift 5V CMOS Op-Amps	QFN-6L P 0.4 mm,SOT23-5L	Automotive,Industrial	1	-40	125	800	1000	2.2	5.5	0.025	200	3	4.7	25	true	true	37
TSZ181H	Automotive-grade, very high accuracy (25 uV), high bandwidth (3 MHz), high temperature (150 °C), zero-drift operational amplifiers	SOT23-5L	Automotive	1	-40	150	800	1000	2.2	5.5	0.025	200	3	4.7	25	true	true	37
TSZ181H1	Automotive-grade, very high accuracy (70 uV), high bandwidth (3 MHz), high temperature (175 °C), zero-drift operational amplifiers	SOT23-5L	Automotive	1	-40	175	800	1000	2.2	5.5	0.07	200	3	4.7	25	true	true	37
TSZ182	Very high accuracy (25 uV) zero drift 5V CMOS Op-Amps	MiniSO-8,QFN-8L P 0.5 mm,SOT8	Automotive,Industrial	2	-40	125	800	1000	2.2	5.5	0.025	200	3	4.7	25	true	true	37
TSZ182H	Automotive-grade, very high accuracy (25 uV), high bandwidth (3 MHz), high temperature (150 °C), zero-drift operational amplifiers	SO-8	Automotive	2	-40	150	800	1000	2.2	5.5	0.025	200	3	4.7	25	true	true	37
TSZ182H1	Automotive-grade, very high accuracy (70 uV), high bandwidth (3 MHz), high temperature (175 °C), zero-drift operational amplifiers	SO-8	Automotive	2	-40	175	800	1000	2.2	5.5	0.07	200	3	4.7	25	true	true	37
UA741	Wide applications range	SO-8	Industrial	1	-40,0	105,70	1700	2800	5	44	5	100000	1	0.5	25	false	false	23
TSV774	High bandwidth (20 MHz) low offset (200 uV) rail-to-rail 5V quad op amp	TSSOP-14L,VFQFPN 3X3X0.9 16L PITCH 0.50	Automotive,Industrial	4	-40	125	1900	2100	2	5.5	0.2	100	20	13	65	true	true	10
TSV794	High bandwidth (50MHz) Low offset (200uV) Rail-to-rail 5V Op amp	SO-14,TSSOP14,TSSOP-14L	Automotive,Industrial	4	-40	125	5000	6000	2.2	5.5	0.2	10	50	30	60	true	true	6.5
TSL6801	Nanopower 600nA, rail-to-rail, 5V cost-effective Op amp	-	Industrial	1	-40	85	0.6	1	1.5	5.5	3	-	0.008	0.003	30	true	true	800
TSL6802	Nanopower 600nA, rail-to-rail, 5V cost-effective Op amp	-	Industrial	2	-40	85	0.6	1	1.5	5.5	3	-	0.008	0.003	30	true	true	800
TSL6804	Nanopower 600nA, rail-to-rail, 5V cost-effective Op amp	-	Industrial	4	-40	85	0.6	1	1.5	5.5	3	-	0.008	0.003	30	true	true	800



Amplifiers and Comparators/Power Operational Amplifiers

Part Number	General Description	Package	Number of Channels	Supply Voltage (V) min	Supply Voltage (V) max	Input Offset Voltage (mV) max	Gain Bandwidth Product (MHz) typ	Slew Rate (V/μs) typ	Input Equivalent Noise Voltage (nV/√Hz) typ	Output Current (A) typ	Supply Voltage Rejection Ratio (dB) (@ 100Hz)	Operating Temperature (°C) min	Operating Temperature (°C) max	Supply Current per Channel (μA) max	Supply Current per Channel (μA) typ	Input Bias Current (μA) max	Rail to Rail Input	Rail to Rail Output	Grade
L272	Dual power operational amplifier	SO-16	2	4	28	60	0.35	1	10	1	70	-40	85	12000	8000	2.5	false	true	Industrial
L2720W	Low drop dual power operational amplifiers	SO-16W	2	4	28	10	1.2	2	10	1	70	-40	125	15000	10000	1	false	true	Industrial
TS982	High output current dual operational amplifier	PowerSO-8	2	2.5	5.5	5	2.2	0.7	17	-	-	-40	125	7200	5500	-	true	true	Automotive, Industrial
TSB582	200 mA output current with thermal shutdown and output current limiter, 3.1 MHz, 36 V, BiCMOS dual operational amplifier	PowerSO-8, QFN-8L WF	2	4	36	2.4	3.1	2	45	0.2	-	-40	125	3300	2500	-	false	true	Automotive, Industrial

Power Operational Amplifiers

ST offers a portfolio of power op-amps characterized for high output current, low drop and high gain. This makes them suitable for a wide range of applications and, in particular, for driving inductive loads such as motors and lamps, as well as in automotive applications offering superior performances. Our op-amps are available in insertion and surface-mount packages to meet different environmental requirements.

**Amplifiers and Comparators/Video Amplifiers**

Part Number	General Description	Inputs	Number of Outputs	Bandwidth (MHz) (@ -3dB) typ	Gain (dB) (Selectable) min	Gain (dB) (Selectable) max	Package	Operating Temperature (°C) min	Operating Temperature (°C) max
TSH122	Ultra low power video buffer/filter with power-down	DC-shift and SAG correction	1	6	5	6	SC70-6	-40	85
TSH345	Single supply triple video buffer and selectable filter for HD and SD video applications	RGB x 2	3	30	6	6	SO-14	-40	85

**Video Amplifiers**

ST's video driver class includes single and triple video buffers/filters with low power and a single supply, with or without power-down function, for HD or SD video applications. These devices present low input and output rails, as well as very low harmonic distortions.

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