life.augmented

TSL6401

Datasheet

High bandwidth 50 MHz, rail-to-rail, 5 V cost-effective op amp

TSL6401
SOT23-5

Features

- Gain bandwidth product 50 MHz, unity gain stable
- Rail-to-rail input and output
- Wide supply voltage range: 2.2 V to 5.5 V
- Input offset voltage: 4.5 mV
- Low input bias current: 1 pA typ.
- Extended temperature range: -40 °C to +125 °C

Applications

- Cost-sensitive applications
- Battery-powered products

Maturity status link	
TSL6401	SOT23-5

Related products	
TSL6201	6 MHz GBW, for power savings
TSL6001	1 MHz GBW, for more power savings

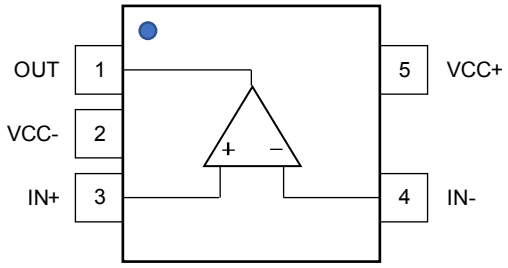
Description

The TSL6401 is a single, 50 MHz-bandwidth unity-gain-stable amplifier. The rail-to-rail input stage and the wide supply range from 2.2 V to 5.5 V make the TSL6401 ideal for low-voltage, high bandwidth signal conditioning.

1 Pin description

1.1 TSL6401 single operational amplifier

Figure 1. Pin connections (top view)



SOT23-5

Table 1. Pin description

Pin n°	Pin name	Description
1	OUT	Output channel
2	VCC-	Negative supply voltage
3	IN+	Non-inverting input channel
4	IN-	Inverting input channel
5	VCC+	Positive supply voltage

2 Absolute maximum ratings and operating conditions

Table 2. Absolute maximum ratings

Symbol	Parameter [1]	Value	Unit
V_{CC}	Supply voltage	6	V
V_{id}	Input voltage differential (V_{IN+} - V_{IN-})	$\pm V_{CC}$	V
V_{in} [2]	Input voltage	(V_{CC-}) -0.2 to (V_{CC+}) +0.2	V
I_{in}	Input current	±10	mA
T_{stg}	Storage temperature	-65 to +150	°C
R_{th-ja} [3]	Thermal resistance junction-to-ambient		°C / W
	SOT23-5	250	
T_j	Maximum junction temperature	150	°C
ESD	HBM: human body model [4]	2	kV
	CDM: charged device model [5]	1	kV

1. *All voltage values are with respect to the VCC- pin, unless otherwise specified.*
2. *The maximum input voltage differential value may be extended to the condition that the input current is limited to ±10 mA.*
3. *R_{th-ja} is a typical value.*
4. *Human body model: HBM test according to the standard ESDA/JEDEC JS-001-2017.*
5. *Charged device model: the test CDM is done according to the standard ESDA/JEDEC JS-002-2018.*

Table 3. Operating conditions

Symbol	Parameter	Value
V_{CC}	Supply voltage	2.2 V to 5.5 V
V_{icm}	Common-mode input voltage range (CMR)	V_{CC-} –0.1 V to V_{CC+} +0.1 V
T_{oper}	Operating free air temperature range	-40 °C to +125 °C

3 Electrical characteristics

Table 4. Electrical characteristics at V_{CC} = 2.2 V to 5.5 V, V_{ICM} = V_{OUT} = V_{CC} / 2, T = 25 °C and OUT connected to V_{CC} / 2 through R_L = 10 kΩ (unless otherwise specified).

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
DC performance						
V_{io}	Input offset voltage			0.75	4.5	mV
$\Delta V_{io}/\Delta T$	Input offset voltage temperature drift	-40 °C ≤ T ≤ 125 °C		2		µV/°C
I_{ib}	Input bias current			1		pA
I_{io}	Input offset current			1		pA
A_{VD}	Open loop gain	V_{CC-} + 500 mV ≤ V_{OUT} ≤ V_{CC+} - 500 mV	80	95		dB
CMR	Common-mode rejection ratio 20.log ($\Delta V_{io}/\Delta V_{icm}$)	V_{CC-} ≤ V_{icm} ≤ V_{CC+}	54	90		dB
SVR	Supply-voltage rejection ratio 20.log ($\Delta V_{io}/\Delta_{CC}V_{CC}$)	2.2 V ≤ V_{CC} ≤ 5.5 V		100		dB
V_{OH}	High level output voltage drop (V_{OH} = V_{CC+} - V_{OUT})				35	mV
V_{OL}	Low level output voltage drop (V_{OL} = V_{OUT})				35	mV
I_{OUT}	Short-circuit current			±60		mA
I_{CC}	Supply current (by operational amplifier)	No load		5.5	7.2	mA
AC performance						
GBP	Gain bandwidth product			50		MHz
SR	Slew rate	A_V = 1 V/V, 10% to 90%		30		V/µs
Φm	Phase margin	C_L = 60 pF		50		Degrees
en	Input voltage noise density	f = 10 kHz		15		nV/√Hz

4 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions and product status are available at: www.st.com. ECOPACK is an ST trademark.

4.1 SOT23-5 package information

Figure 2. SOT23-5 package outline

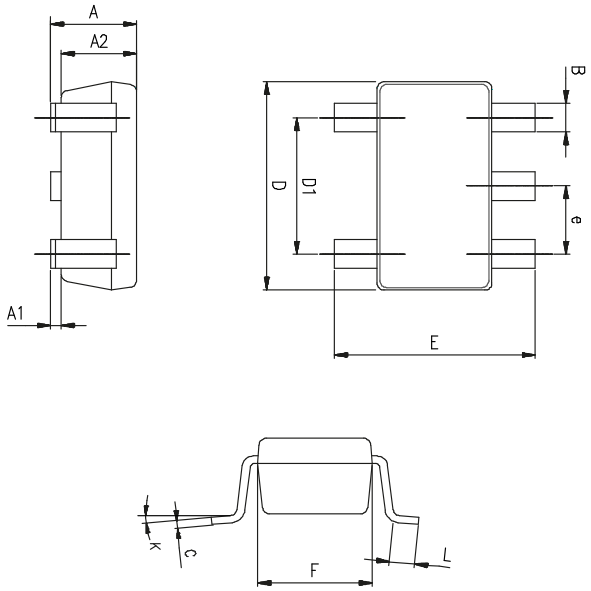


Table 5. SOT23-5 mechanical data

Dimensions						
Symbol	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.90	1.20	1.45	0.035	0.047	0.057
A1			0.15			0.006
A2	0.90	1.05	1.30	0.035	0.041	0.051
B	0.35	0.40	0.50	0.014	0.016	0.020
C	0.09	0.15	0.20	0.004	0.006	0.008
D	2.80	2.90	3.00	0.110	0.114	0.118
D1		1.90			0.075	
e		0.95			0.037	
E	2.60	2.80	3.00	0.102	0.110	0.118
F	1.50	1.60	1.75	0.059	0.063	0.069
L	0.10	0.35	0.60	0.004	0.014	0.024
K	0°		0°	0°		0°

5 Ordering information

Table 6. **Order code**

Order code	Temperature range	Channel	Package	Marking
TSL6401ILT	-40 °C to 125 °C	1	SOT23-5	K242

Revision history

Table 7. **Document revision history**

Date	Revision	Changes
21-Jun-2023	1	Initial release.

Contents

List of tables

List of figures

IMPORTANT NOTICE – READ CAREFULLY

STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST’s terms and conditions of sale in place at the time of order acknowledgment.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of purchasers’ products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. For additional information about ST trademarks, refer to www.st.com/trademarks. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.