JIANGSU CHANGJING ELECTRONICS TECHNOLOGY CO., LTD.

JFET Input Quadruple Operational Amplifier

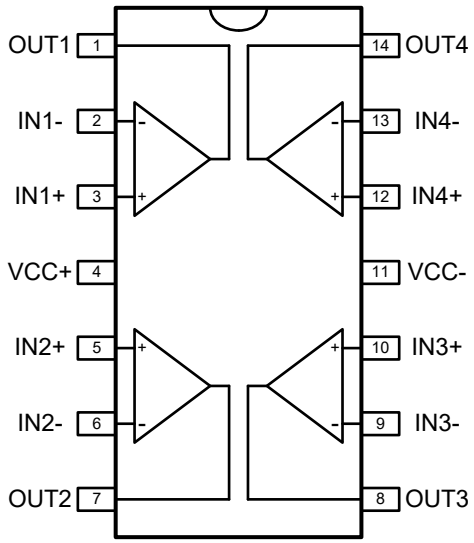
TL084 Operational Amplifier

1 Introduction

The TL084 is an industry standard, four channel, J-FET input operational amplifier. It integrates well matched high-voltage JFET and bipolar transistor in a single chip integrated circuit, and has high conversion rate, low input bias and bias current, and low bias voltage temperature coefficient.

2 Available Package

PART NUMBER	PACKAGE
TL084	SOP14



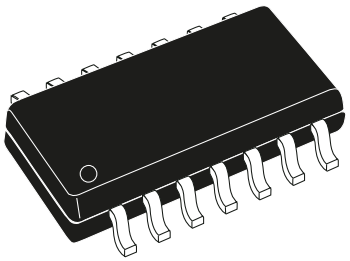
Pin Connections

3 Features

- Dual Power Supply Range: ±5 to ±15V
- Built-in Four Independent Operational Amplifiers
- Quiescent Current: 1.4mA per channel
- Wide Common-mode and Differential Input range
- Low Input Offset Voltage: 3mV (typ.)
- Low Input Bias and Offset Current
- High Input Impedance
- Output Short-circuit Current Protection
- High Voltage Slew Rate: 16 V/μs
- Internal Frequency Compensation

4 Applications

- General-purpose Amplification
- Active Filters
- Data Acquisition
- Industrial / Process Control
- Input Buffering
- Integrators
- Power Control and Monitoring
- Sample and Hold Circuits



SOP14 Package

5 Orderable and Marking Information

5.1 Orderable Information

MODEL	DEVICE	PACKAGE	OP TEMP	ECO PLAN	MSL	PACKING OPTION	SORT
-	TL084	SOP14	0 ~ 70°C	RoHS & Green	Level 3 168 HR	Tape and Reel 2500 Units / Reel	Active
Others	-	-	-	-	-	-	Customized

Note:

ECO PLAN: For the RoHS and Green certification standards of this product, please refer to the official report provided by JSCJ.

MSL: Moisture Sensitivity Level. Determined according to JEDEC industry standard classification.

SORT: Specifically defined as follows:

Active: Recommended for new products;

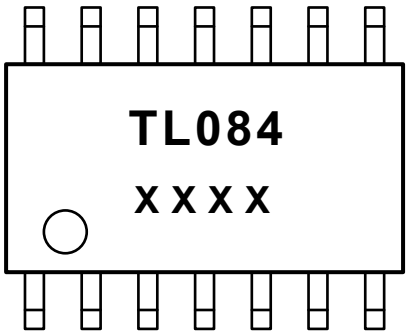
Customized: Products manufactured to meet the specific needs of customers;

Preview: The device has been released and has not been fully mass produced. The sample may or may not be available;

NoRD: It is not recommended to use the device for new design. The device is only produced for the needs of existing customers;

Obsolete: The device has been discontinued.

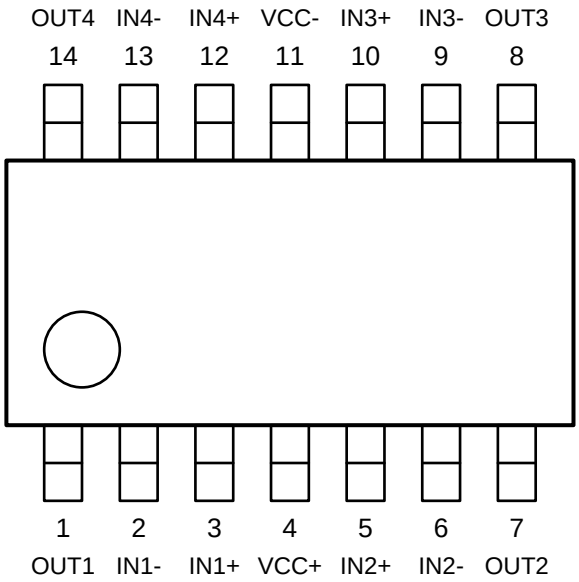
5.2 Marking Information



"**TL084**": Device serial number.

"**XXXX**": Code of production.

6 Pin Configuration and Function



PIN NAME	TL084 SOP14	I / O	DESCRIPTION
OUT1	1	O	Output of the operational amplifier 1.
IN1-	2	I	Negative input of the operational amplifier 1.
IN1+	3	I	Positive input of the operational amplifier 1.
VCC+	4	-	Positive (highest) supply.
IN2+	5	I	Positive input of the operational amplifier 2.
IN2-	6	I	Negative input of the operational amplifier 2.
OUT2	7	O	Output of the operational amplifier 2.
OUT3	8	O	Output of the operational amplifier 3.
IN3-	9	I	Negative input of the operational amplifier 3.
IN3+	10	I	Positive input of the operational amplifier 3.
VCC-	11	-	Negative (lowest) supply.
IN4+	12	I	Positive input of the operational amplifier 4.
IN4-	13	I	Negative input of the operational amplifier 4.
OUT4	14	O	Output of the operational amplifier 4.

7 Specifications

7.1 Absolute Maximum Rating

(T_A = 25°C, unless otherwise specified)(1)

CHARACTERISTIC		SYMBOL	VALUE	UNIT
Power supply	Dual supplies	V_{CC}	±18	V
Differential input range(2)		V_{ID}	-30 ~ 30	V
Input range (either input)		V_{IN}	-15 ~ 15	V
Duration of output short circuit (one amplifier) to ground (or below) at T_A = 25°C, V_S ≤ 15V		t_{SC}	Continuous(3)	s
Maximum junction temperature		$T_{J\ Max}$	150	°C
Storage temperature		T_{stg}	-65 ~ 150	°C
Soldering temperature & time		T_{solder}	260°C, 10s	-

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*. Exposure to absolute-maximum rated conditions for extended periods may affect device reliability.

(2) Differential voltages are at IN+, with respect to IN−.

(3) Short circuits from outputs to V_{CC} can cause excessive heating and eventual destruction. A heat sink may be required to keep the junction temperature below the absolute maximum. This depends on the power supply voltage and how many amplifiers are shorted. Thermal resistance varies with the amount of PC board metal connected to the package. The specified values are for short traces connected to the leads.

7.2 Recommend Operating Conditions

PARAMETER		SYMBOL	MIN.	NOM.	MAX.	UNIT
Power supply range	Positive (highest)	V_{CC+}	5	-	15	V
	Negative (lowest)	V_{CC-}	-5	-	-15	
Common-mode voltage range		V_{CM}	V_{CC-} + 4	-	V_{CC+} - 4	V
Operating ambient temperature		T_A	0	-	70	°C

7 Specifications

7.3 ESD Ratings

ESD RATINGS		SYMBOL	VALUE	UNIT
Electrostatic discharge(4)	Human body model	$V_{ESD-HBM}$	1000	V

(5) ESD testing is conducted in accordance with the relevant specifications formulated by the Joint Electronic Equipment Engineering Commission (JEDEC). The human body model (HBM) electrostatic discharge test is based on the JESD22-114D test standard, using a 100pF capacitor and discharging to each pin of the device through a resistance of 1.5kΩ.

7.4 Thermal Information

THERMAL METRIC(5)		SYMBOL	TL084	UNIT
			SOP14	
Thermal resistance	Junction-to-ambient	$R_{\Theta JA}$	153.6	°C/W
	Junction-to-case	$R_{\Theta JC}$	40.1	
Reference maximum power dissipation for continuous operation		$P_{D\ Ref}$	0.65	W

(5) Thermal metric is measured in still air with T_A = 25°C and installed on a 1 in^2 FR-4 board covered with 2 ounces of copper.

7 Specifications

7.5 Electrical Characteristics

TL084 (V_{CC} = ±15V, T_A = 25°C, unless otherwise specified)

CHARACTERISTIC	SYMBOL	TEST CONDITIONS(6)		MIN.	TYP.	MAX.	UNIT
Offset Voltage							
Input offset voltage	V_{IO}	R_S = 50Ω, V_O = 0V		-	3	13	mV
Supply voltage rejection ratio	SVR	R_S = 50Ω		65	75	-	dB
Common-mode Input							
Common-mode input voltage	V_{ICR}	-		±11	15 -12	-	V
Common-mode rejection ratio	CMRR	R_S = 50Ω, V_O = 0V		65	75	-	dB
Input Current							
Input offset current(7)	I_{IO}	V_O = 0V		-	-	4	nA
Input bias current(7)	I_B	V_O = 0V		-	-	20	nA
Power Supply							
Supply current	I_{CC}	No load, per channel		-	1.5	3.0	mA
Frequency Response							
Gain bandwidth product	GBP	V_{in} = 10mV, R_L = 2kΩ, C_L = 100pF, f = 100 kHz		2.5	4.0	-	MHz
Slew rate	SR	V_{in} = 10V, R_L = 2kΩ, C_L = 100pF, unity gain		8	16	-	V / μs
Output							
Output voltage swing	V_{opp}	R_L = 10kΩ		12	13.5	-	V
		R_L = 2kΩ		10	12	-	
Output current	I_O	V_O = 2V	Source	35	40	60	mA
			Sink	30	40	55	
Nosie							
Equivalent input noise voltage	e_N	R_S = 1kΩ, f = 1kHz		-	18	-	nV/√Hz
Gain							
Large signal voltage gain	A_{VD}	V_O = ±10V, R_L = 2kΩ		-	25	-	V / mV
Rise time	t_{rise}	V_{in} = 200mV, R_L = 2kΩ, C_L = 100pF,		-	0.1	-	μs

Note:

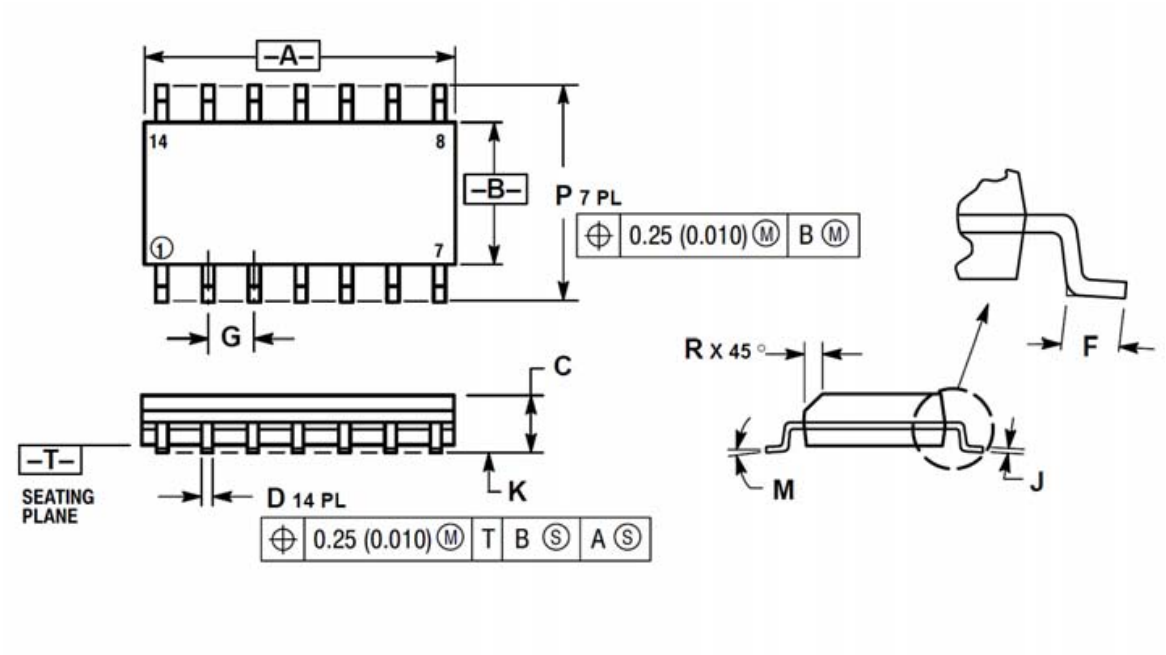
(6) All characteristics are measured under open-loop conditions, with zero common-mode input voltage, unless otherwise specified.

(7) Input bias currents of a FET input operational amplifier are normal junction reverse currents, which are temperature sensitive. Pulse techniques must be used that maintain the junction temperatures as close to the ambient temperature as possible.

8 Mechanical Information

SOP14 Mechanical Information

Outline Dimensions



SYMBOL	DISMENSIONS IN MILLIMETERS			DISMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	8.550	-	8.750	0.337	-	0.344
B	3.800	-	4.000	0.150	-	0.157
C	1.350	-	1.750	0.053	-	0.069
D	0.350	-	0.490	0.014	-	0.019
F	0.400	-	1.250	0.016	-	0.049
G	1.270 BSC.			0.050 BSC.		
J	0.190	-	0.250	0.007	-	0.010
K	0.100	-	0.250	0.004	-	0.010
M	0°	-	7°	0°	-	7°
P	5.800	-	6.200	0.228	-	0.244
R	0.250	-	0.500	0.010	-	0.020

9 Notes and Revision History

9.1 Associated Product Family and Others

To view other products of the same type or IC products of other types, click the official website of JSCJ -- https: ***www.jscj-elec.com*** for more details.

9.2 Notes

Electrostatic Discharge Caution

This IC may be damaged by ESD. Relevant personnel shall comply with correct installation and use specifications to avoid ESD damage to the IC. If appropriate measures are not taken to prevent ESD damage, the hazards caused by ESD include but are not limited to degradation of integrated circuit performance or complete damage of integrated circuit. For some precision integrated circuits, a very small parameter change may cause the whole device to be inconsistent with its published specifications.

9.3 Revision History

November, 2023: released TL084 rev - 1.0.

DISCLAIMER

IMPORTANT NOTICE, PLEASE READ CAREFULLY

The information in this data sheet is intended to describe the operation and characteristics of our products. JSCJ has the right to make any modification, enhancement, improvement, correction or other changes to any content in this data sheet, including but not limited to specification parameters, circuit design and application information, without prior notice.

Any person who purchases or uses JSCJ products for design shall: 1. Select products suitable for circuit application and design; 2. Design, verify and test the rationality of circuit design; 3. Procedures to ensure that the design complies with relevant laws and regulations and the requirements of such laws and regulations. JSCJ makes no warranty or representation as to the accuracy or completeness of the information contained in this data sheet and assumes no responsibility for the application or use of any of the products described in this data sheet.

Without the written consent of JSCJ, this product shall not be used in occasions requiring high quality or high reliability, including but not limited to the following occasions: medical equipment, military facilities and aerospace. JSCJ shall not be responsible for casualties or property losses caused by abnormal use or application of this product.

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