

Zero-Drift, Single-Supply, Rail-to-Rail Input/ Output Operational Amplifiers

General Description

The LN8581, LN8582 and LN8584 are single, dual and quad amplifiers featuring rail-to-rail input and output swings, which has ultralow offset, drift and bias current. All are guaranteed to operate from +2.7 V to +5 V single supply.

With an offset voltage of only 80 μV and drift of 20 $\text{nV}/^\circ\text{C}$, the LN8581 is perfectly suited for applications where error sources cannot be tolerated. Temperature, position and pressure sensors, medical equipment and strain gage amplifiers benefit greatly from nearly zero drift over their operating temperature range. The rail-to-rail input and output swings provided by the LN858X family make both high-side and low-side sensing easy.

The LN858X series is specified for the extended industrial/automotive (-40°C to $+125^\circ\text{C}$) temperature range. The LN8581 single is available in 5-lead SOT and 8-lead SOP/MSOP packages. The LN8582 dual amplifier is available in 8-lead SOP/MSOP packages. The LN8584 quad is available in narrow 14-lead SOP and 14-lead TSSOP packages.

Applications

- Temperature Measurements
- Pressure Sensors
- Precision Current Sensing
- Electronic Scales
- Strain Gage Amplifiers
- Medical Instrumentation
- Thermocouple Amplifiers
- Handheld Test Equipment

Features

- Low Offset Voltage: 80 μV (TYP)
- Rail-to-Rail Input and Output Swing
- 2.7V to 5.0V Single Supply Operation
- Voltage Gain: 145dB (TYP)
- PSRR: 115dB (TYP)
- CMRR: 110dB (TYP)
- Low Input Bias Currents: 130pA
- Low Supply Current: 450 μA /Channel
- Overload Recovery Time: 0.1ms
- No External Capacitors Required
- -40°C to $+125^\circ\text{C}$ Operating Temperature Range
- Small Packaging:

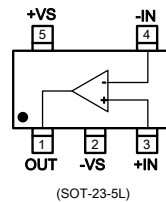
LN8581 Available in Green SOT-23-5L, SOP8 and MSOP8

LN8582 Available in Green SOP8 and MSOP8

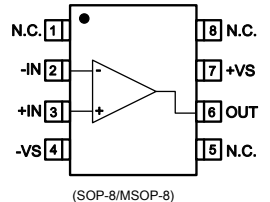
LN8584 Available in Green SOP14

Package

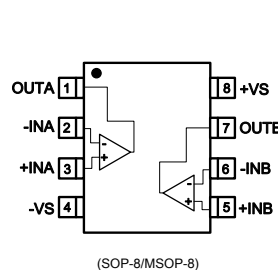
LN8581MR



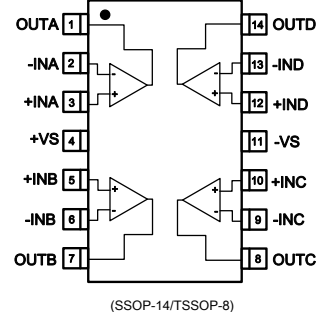
LN8581SR/LN8581MMR



LN8582SR/LN8582MMR



LN8584SSR/LN8584TSR



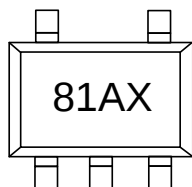
Ordering Information

LN858 ①②③

Designator	Symbol	Description
①		Product No.
	1	LN8581
	2	LN8582
	4	LN8584
②	—	Package
	M	SOT-23-5
	S	SOP-8
	MM	MSOP-8
	SS	SSOP-14
	TS	TSSOP-14
③	—	Device Orientation
	R	Embossed Tape: Standard Feed
	L	Embossed Tape: Reverse Feed

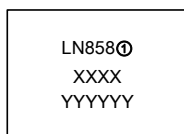
Marking

LN8581MR



81----LN8581MR
A-----die code
X-----process code

LN858①②③



LN858①---LN8581 or LN8582 or LN8584
XXXX-----process code
YYYYYY---lot code

Absolute Maximum Ratings

- ✧ Supply Voltage.....6V
- ✧ Input Voltage.....-VS+0.3V—+VS+0.3V
- ✧ Differential Input Voltage.....-5.0V to +5.0V
- ✧ Package Thermal Resistance @ TA = 25℃
 - SOT-23-5L.....190℃/W
 - MSOP-8.....216℃/W
 - SOP-8.....125℃/W
 - SSOP-14.....120℃/W
 - TSSOP-14.....180℃/W
- ✧ Storage temperature range.....-65℃ to 150℃
- ✧ Operating junction temperature.....-40℃ to 125℃
- ✧ ESD Human Model.....4000V
- ✧ Lead Temperature Range (Soldering 10 sec)
 -260℃

Electrical Characteristics

(VS = +5V, VCM = +2.5V, VO = +2.5V, TA = +25°C, unless otherwise noted.)

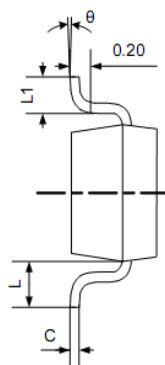
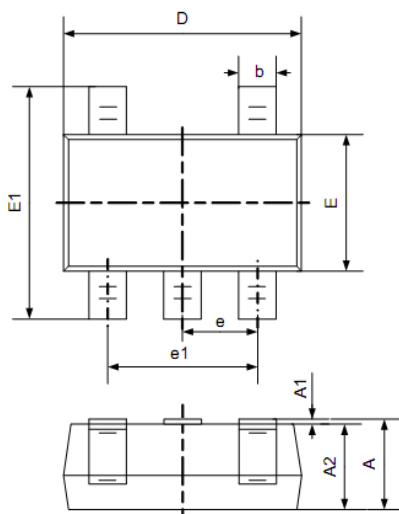
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
INPUT CHARACTERISTICS						
V _{OS}	Input Offset Voltage		—	80	100	μV
I _B	Input Bias Current			100		pA
I _{OS}	Input Offset Current			10		pA
CMRR	Common-Mode Rejection Ratio	V _{CM} = 0V to 5V		110		dB
A _{VO}	Large Signal Voltage Gain	R _L = 10kΩ V _O = 0.3V~4.7V		145		dB
ΔV _{OS} /ΔT	Input Offset Voltage Drift			20		nV/°C
OUTPUT CHARACTERISTICS						
V _{OH}	Output Voltage High	RL = 100kΩ to -VS		4.998		V
		RL = 10kΩ to -VS		4.994		V
V _{OL}	Output Voltage Low	RL = 100kΩ to +VS		2		mV
		RL = 10kΩ to +VS		5		mV
I _{SC}	Short Circuit Limit	RL = 10Ω to -VS		43		mA
I _O	Output Current			30		mA
POWER SUPPLY						
PSRR	Power Supply Rejection Ratio	VS = 2.7V to 5.5V		115		dB
I _Q	Quiescent Current	VO = 0V, RL = 0Ω		450		μA
DYNAMIC PERFORMANCE						
GBP	Gain-Bandwidth Product	G = +100		1.44		MHz
SR	Slew Rate	RL = 10kΩ		0.84		V/μs
T _{OR}	Overload Recovery Time			0.10		ms
NOISE PERFORMANCE						
e _n p-p	Voltage Noise	0Hz to 10Hz		0.81		μVp-p
e _n	Voltage Noise Density	f = 1kHz		49		nV/√Hz

(VS = +2.7V, VCM = +1.35V, VO = +1.35V, TA = +25°C, unless otherwise noted.)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
INPUT CHARACTERISTICS						
V _{OS}	Input Offset Voltage		—	80	100	μV
I _B	Input Bias Current			75		pA
I _{OS}	Input Offset Current			5		pA
CMRR	Common-Mode Rejection Ratio	V _{CM} = 0V to 2.7V		110		dB
A _{VO}	Large Signal Voltage Gain	R _L = 10kΩ V _O =0.3V~2.4V		140		dB
ΔV _{OS} /ΔT	Input Offset Voltage Drift			20		nV/°C
OUTPUT CHARACTERISTICS						
V _{OH}	Output Voltage High	RL = 100kΩ to -VS		2.699		V
		RL = 10kΩ to -VS		2.697		V
V _{OL}	Output Voltage Low	RL = 100kΩ to +VS		1		mV
		RL = 10kΩ to +VS		2		mV
I _{SC}	Short Circuit Limit	RL = 10Ω to -VS		26		mA
I _O	Output Current			10		mA
POWER SUPPLY						
PSRR	Power Supply Rejection Ratio	VS = 2.7V to 5.5V		115		dB
I _Q	Quiescent Current	VO = 0V, RL = 0Ω		450		μA
DYNAMIC PERFORMANCE						
GBP	Gain-Bandwidth Product	G = +100		1.43		MHz
SR	Slew Rate	RL = 10kΩ		0.84		V/μs
T _{OR}	Overload Recovery Time			0.04		ms
NOISE PERFORMANCE						
e _n p-p	Voltage Noise	0Hz to 10Hz		0.90		μVp-p
e _n	Voltage Noise Density	f = 1kHz		53		nV/√Hz

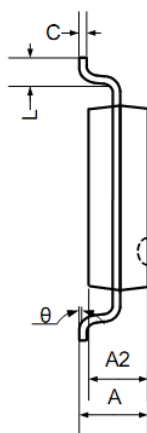
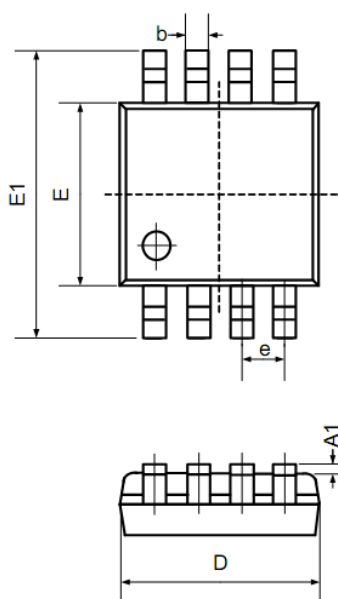
Package Information

SOT-23-5L



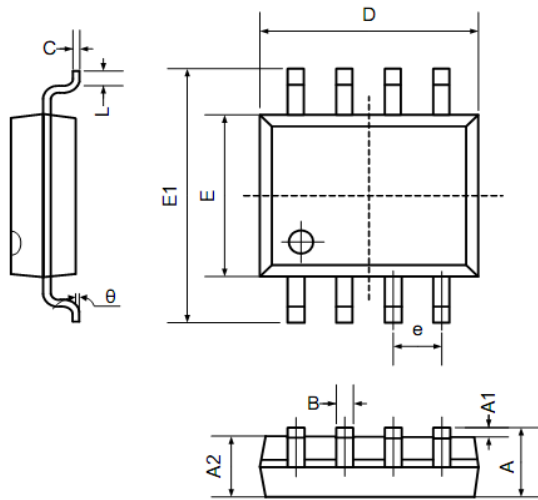
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.400	0.012	0.016
C	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950TYP		0.037TYP	
e1	1.800	2.000	0.071	0.079
L	0.700REF		0.028REF	
L1	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

MSOP8



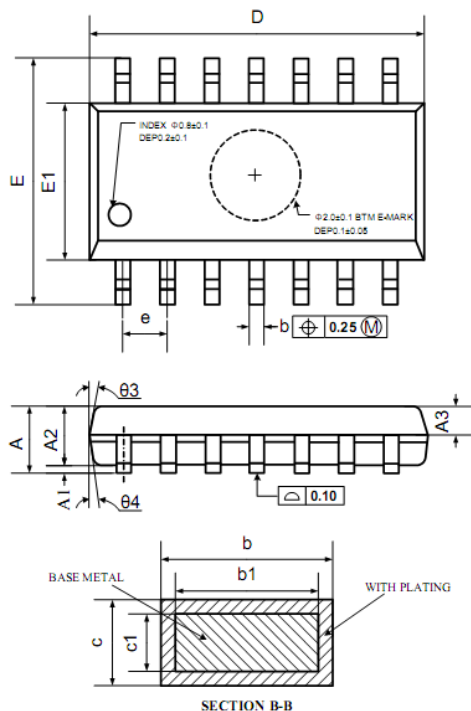
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.800	1.200	0.031	0.047
A1	0.000	0.200	0.000	0.008
A2	0.760	0.970	0.030	0.038
b	0.30 TYP		0.012 TYP	
C	0.15 TYP		0.006 TYP	
D	2.900	3.100	0.114	0.122
e	0.65 TYP		0.026 TYP	
E	2.900	3.100	0.114	0.122
E1	4.700	5.100	0.185	0.201
L	0.410	0.650	0.016	0.026
θ	0°	6°	0°	6°

SOP8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
B	0.330	0.510	0.013	0.020
C	0.190	0.250	0.007	0.010
D	4.780	5.000	0.188	0.197
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.248
e	1.270TYP		0.050TYP	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

SOP14



Symbol	Dimensions In Millimeters		
	MIN	NOM	MAX
A	1.35	1.60	1.75
A1	0.10	0.15	0.25
A2	1.25	1.45	1.65
A3	0.55	0.65	0.75
b	0.36		0.49
b1	0.35	0.40	0.45
c	0.16		0.25
c1	0.15	0.20	0.25
D	8.53	8.63	8.73
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27 BSC		
L	0.45	0.60	0.80
L1	1.04 REF		
L2	0.25 BSC		
R	0.07		
R1	0.07		
h	0.30	0.40	0.50
θ	0°		8°
θ1	6°	8°	10°
θ2	6°	8°	10°
θ3	5°	7°	9°
θ4	5°	7°	9°