钍地半导体
Tudi Semiconductor

Product Specification

TUDI-TS1851/TS1852/TS1854

1.8 V input/output, rail-to-rail, low power operational amplifiers

网址 www.sztdbdt.com

用芯智造·卓越品质

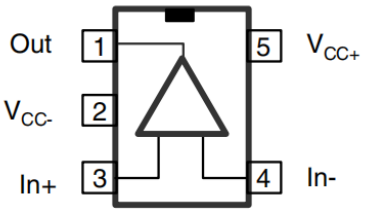
semiconductor device manufacturer

- Design
- research and development
- production
- and sales

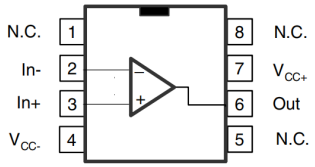
Features

- Operating range from VCC = 1.8 to 6 V
- Rail-to-rail input and output
- Extended Vicm (VCC- - 0.2 V to VCC + + 0.2 V)
- Low supply current (120 A)
- Good accuracy (1 mV max for A version)
- Gain bandwidth product (530 kHz)
- High unity gain stability (able to drive 500 pF)
- ESD tolerance (2 kV)
- Latch-up immunity
- Available in SOT23-5 micropackage

TS1851ILT



TS1851ID/IDT



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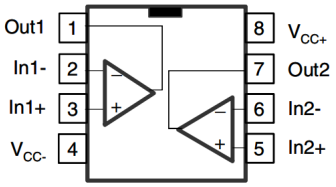

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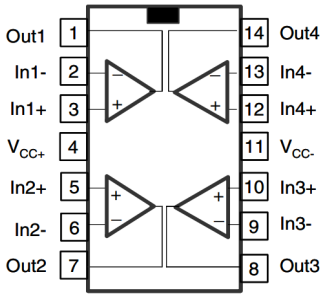


Applications

- Two-cell battery-powered systems
- Battery-powered electronic equipment
- Cordless phones
- Cellular phones
- Laptops
- PDAs

Description

The TS185x (single, dual and quad) can operate with voltages as low as 1.8 V. They feature both input and output rail-to-rail (1.71 at VCC = 1.8 V, RL =2k), 120 A current consumption and 530 kHz gain bandwidth product.
With this low consumption and a sufficient GBP for many applications, these operational amplifiers are well-suited to all kinds of battery supplied and portable applications.
The TS1851 is housed in the space-saving 5-pin SOT23-5 package, which simplifies board design (outside dimensions are 2.8 mm x 2.9 mm).

2 Electrical characteristics

Table 4. Electrical characteristics measured at V_{CC+} = +1.8 V, V_{CC-} = 0 V, with C_L and R_L connected to $V_{CC}/2$, T_{amb} = 25°C (unless otherwise specified) (1)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{io}	Input offset voltage	TS1851/2/4 $T_{min} \le T_{amb} \le T_{max}$ TS1851A/2A/4A $T_{min} \le T_{amb} \le T_{max}$		0.1	3 6 1 1.5	mV
ΔV_{io}	Input offset voltage drift			2		µV/°C
I_{io}	Input offset current	$V_{icm} = V_{out} = V_{CC}/2$ (2) $T_{min} \le T_{amb} \le T_{max}$		1	9 25	nA
I_{ib}	Input bias current	$V_{icm} = V_{out} = V_{CC}/2$ (2) $T_{min} \le T_{amb} \le T_{max}$		10	50 80	nA
CMR	Common mode rejection ratio 20 log ($\Delta V_{ic}/\Delta V_{io}$)	$0 \le V_{icm} \le V_{CC}$ $T_{min} \le T_{amb} \le T_{max}$	55 52	85		dB
A_{vd}	Large signal voltage gain	V_{out} = 0.5 to 1.3 V R_L = 10 kΩ R_L = 2 kΩ	80 70	100 100		dB
V_{OH}	High level output voltage	V_{id} = 100 mV R_L = 10 kΩ R_L = 2 kΩ $T_{min} \le T_{amb} \le T_{max}$, R_L = 10 kΩ $T_{min} \le T_{amb} \le T_{max}$, R_L = 2 kΩ	1.7 1.65 1.7 1.65	1.77 1.7		V
V_{OL}	Low level output voltage	V_{id} = -100 mV R_L = 10 kΩ R_L = 2 kΩ $T_{min} \le T_{amb} \le T_{max}$, R_L = 10 kΩ $T_{min} \le T_{amb} \le T_{max}$, R_L = 2 kΩ		40 62	70 90 100 120	mV
I_o	Output source current	V_{id} = 100 mV, V_O = V_{CC-} at T_{amb}	15	29		mA
		at $T_{min} \le T_{amb} \le T_{max}$	5	5		
	Output sink current	V_{id} = -100 mV, V_O = V_{CC+}, at T_{amb}	15	46		mA
		at $T_{min} \le T_{amb} \le T_{max}$	5			
I_{CC}	Supply current (per amplifier)	$V_{out} = V_{CC}/2$ A_{VCL} = 1, no load $T_{min} \le T_{amb} \le T_{max}$		120	170 200	µA
GBP	Gain bandwidth product	R_L = 10 kΩ, C_L = 100 pF, f = 100 kHz	300	530		kHz
SR	Slew rate	R_L = 10 kΩ, C_L = 100 pF, A_V = 1	0.1	0.18		V/µs
ϕm	Phase margin	C_L = 100 pF		60		Degrees
e_n	Input voltage noise	f = 1 kHz		40		nV/√Hz
THD	Total harmonic distortion			0.01		%

1. All parameter limits at temperatures other than 25°C are guaranteed by correlation.
2. Maximum values include unavoidable inaccuracies of the industrial tests.

Table 5. Electrical characteristics measured at V_{CC+} = +3 V, V_{CC-} = 0 V, with C_L and R_L connected to $V_{CC}/2$, T_{amb} = 25°C (unless otherwise specified) (1)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{io}	Input offset voltage	$V_{icm} = V_{out} = V_{CC}/2$ TS1851/2/4 $T_{min} \le T_{amb} \le T_{max}$ TS1851A/2A/4A $T_{min} \le T_{amb} \le T_{max}$		0.1	3 6 1 1.5	mV
ΔV_{io}	Input offset voltage drift			2		µV/°C
I_{io}	Input offset current	$V_{icm} = V_{out} = V_{CC}/2$ (2) $T_{min} \le T_{amb} \le T_{max}$		1	9 25	nA
I_{ib}	Input bias current	$V_{icm} = V_{out} = V_{CC}/2$ (2) $T_{min} \le T_{amb} \le T_{max}$		10	55 85	nA
CMR	Common mode rejection ratio 20 log ($\Delta V_{ic}/\Delta V_{io}$)	$0 \le V_{icm} \le V_{CC}$ $T_{min} \le T_{amb} \le T_{max}$	60 57	90		dB
A_{vd}	Large signal voltage gain	V_{out} = 0.5 to 2.5 V R_L = 10 kΩ R_L = 2 kΩ	83 74	102 102		dB
V_{OH}	High level output voltage	V_{id} = 100 mV R_L = 10 kΩ R_L = 2 kΩ $T_{min} \le T_{amb} \le T_{max}$, R_L = 10 kΩ $T_{min} \le T_{amb} \le T_{max}$, R_L = 2 kΩ	2.9 2.85 2.9 2.85	2.96 2.94		V
V_{OL}	Low level output voltage	V_{id} = -100 mV R_L = 10 kΩ R_L = 2 kΩ $T_{min} \le T_{amb} \le T_{max}$, R_L = 10 kΩ $T_{min} \le T_{amb} \le T_{max}$, R_L = 2 kΩ		10 46	90 100 120 130	mV
I_o	Output source current	V_{id} = 100 mV, $V_O = V_{CC-}$, at T_{amb}	15	47		mA
		At $T_{min} \le T_{amb} \le T_{max}$	5			
	Output sink current	V_{id} = -100 mV, $V_O = V_{CC+}$, at T_{amb}	15	47		mA
		At $T_{min} \le T_{amb} \le T_{max}$	5			
I_{CC}	Supply current (per amplifier)	$V_{out} = V_{CC}/2$ A_{VCL} = 1, no load $T_{min} \le T_{amb} \le T_{max}$		150	200 230	µA
GBP	Gain bandwidth product	R_L = 10 kΩ, C_L = 100 pF, f = 100 kHz	370	600		kHz
SR	Slew rate	R_L = 10 kΩ, C_L = 100 pF, A_V = 1	0.12	0.2		V/µs
ϕm	Phase margin	C_L = 100 pF		60		Degrees
e_n	Input voltage noise	f = 1 kHz		40		nV/√Hz
THD	Total harmonic distortion	V_{out} = 2 V_{pk-pk}, A_V = -1, f = 1 kHz		0.005		%

1. All parameter limits at temperatures other than 25°C are guaranteed by correlation.
2. Maximum values include unavoidable inaccuracies of the industrial tests.

Table 6. Electrical characteristics measured at V_{CC+} = +5 V, V_{CC-} = 0 V, with C_L and R_L connected to $V_{CC}/2$, T_{amb} = 25°C (unless otherwise specified) (1)

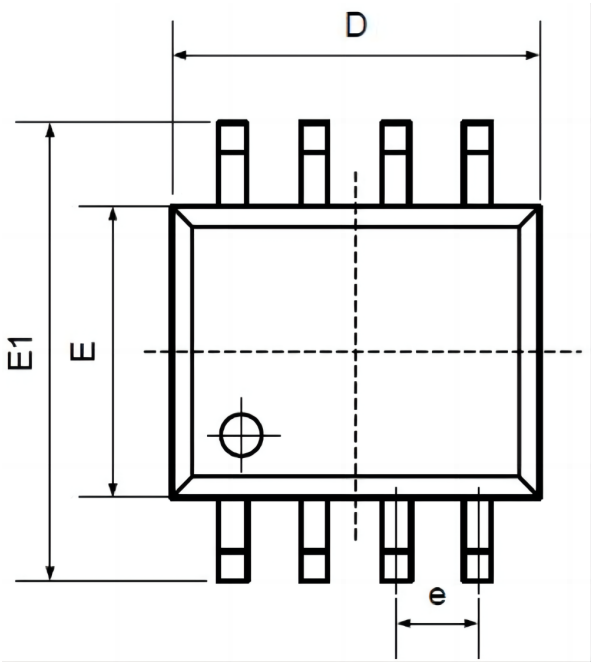
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{io}	Input offset voltage	$V_{icm} = V_{out} = V_{CC}/2$ TS1851/2/4 $T_{min} \le T_{amb} \le T_{max}$ TS1851A/2A/4A $T_{min} \le T_{amb} \le T_{max}$		0.1	3 6 1 1.5	mV
ΔV_{io}	Input offset voltage drift			2		µV/°C
I_{io}	Input offset current	$V_{icm} = V_{out} = V_{CC}/2$ (2) $T_{min} \le T_{amb} \le T_{max}$		1	9 25	nA
I_{ib}	Input bias current	$V_{icm} = V_{out} = V_{CC}/2$ (2) $T_{min} \le T_{amb} \le T_{max}$		16	63 93	nA
CMR	Common mode rejection ratio 20 log ($\Delta V_{ic}/\Delta V_{io}$)	$0 \le V_{icm} \le V_{CC}$ $T_{min} \le T_{amb} \le T_{max}$	65 62	95		dB
SVR	Supply voltage rejection ratio 20 log ($\Delta V_{cc}/\Delta V_{io}$)	V_{CC} = 1.8 to 5 V	70	90		dB
A_{vd}	Large signal voltage gain	V_{out} = 0.5 to 4 V R_L = 10 kΩ R_L = 2 kΩ	85 77	104 104		dB
V_{OH}	High level output voltage	V_{id} = 100 mV R_L = 10 kΩ R_L = 2 kΩ $T_{min} \le T_{amb} \le T_{max}$, R_L = 10 kΩ $T_{min} \le T_{amb} \le T_{max}$, R_L = 2 kΩ	4.85 4.8 4.85 4.8	4.95 4.91		V
V_{OL}	Low level output voltage	V_{id} = -100 mV R_L = 10 kΩ R_L = 2 kΩ $T_{min} \le T_{amb} \le T_{max}$, R_L = 10 kΩ $T_{min} \le T_{amb} \le T_{max}$, R_L = 2 kΩ		40 80	180 200 180 200	mV
I_o	Output source current	V_{id} = 100 mV, $V_O = V_{CC-}$, at T_{amb}	15	48		mA
		at $T_{min} \le T_{amb} \le T_{max}$	5			
	Output sink current	V_{id} = -100 mV, $V_O = V_{CC+}$, at T_{amb}	15	48		mA
		at $T_{min} \le T_{amb} \le T_{max}$	5			
I_{CC}	Supply current (per amplifier)	$V_{out} = V_{CC}/2$ A_{VCL} = 1, no load $T_{min} \le T_{amb} \le T_{max}$		162	220 250	µA
GBP	Gain bandwidth product	R_L = 10 kΩ, C_L = 100 pF, f = 100 kHz	380	656		kHz
SR	Slew rate	R_L = 10 kΩ, C_L = 100 pF, A_V = 1	0.13	0.25		V/µs
ϕm	Phase margin	C_L = 100 pF		60		Degrees
e_n	Input voltage noise	f = 1 kHz		40		nV/√Hz
THD	Total harmonic distortion	V_{out} = 2 V_{pk-pk}, A_V = -1, f = 1 kHz		0.01		%

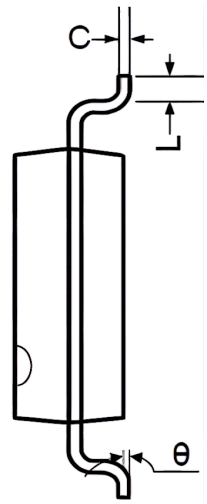
1. All parameter limits at temperatures other than 25°C are guaranteed by correlation.
2. Maximum values include unavoidable inaccuracies of the industrial tests.

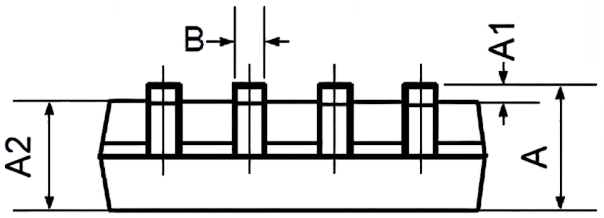
Order information

Order Number	Package	Package Quantity	Marking On The park
TS1851AILT-TUDI	SOT23	Tape,Reel,3000	TS1851AILT
TS1851IDT-TUDI	SOP8	Tape,Reel,2500	TS1851IDT
TS1851ILT-TUDI	SOT23	Tape,Reel,3000	TS1851ILT
TS1852AIDT-TUDI	SOP8	Tape,Reel,2500	TS1852AIDT
TS1852IDT-TUDI	SOP8	Tape,Reel,2500	TS1852IDT
TS1852IST-TUDI	MSOP8	Tape,Reel,2500	TS1852IST
TS1854AIDT-TUDI	SOP8	Tape,Reel,2500	TS1854AIDT
TS1854IDT-TUDI	SOP14	Tape,Reel,2500	TS1854IDT

Package SOP8

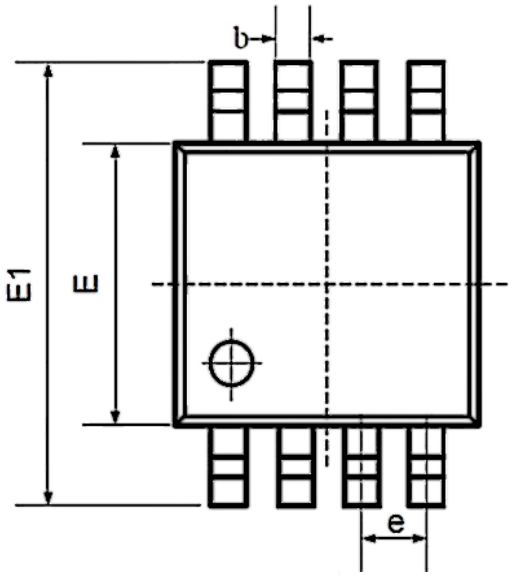


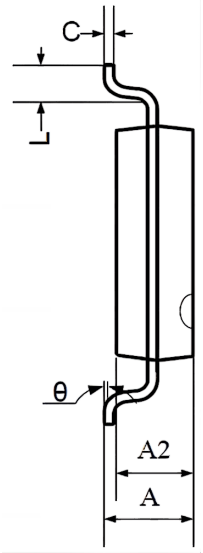


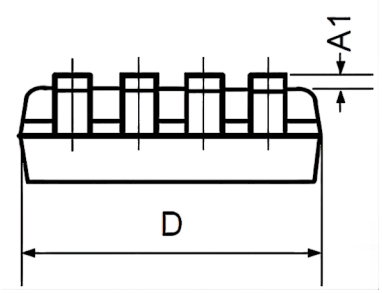


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
B	0.330	0.510	0.013	0.020
C	0.190	0.250	0.007	0.010
D	4.780	5.000	0.188	0.197
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.248
e	1.270TYP		0.050TYP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

Package MSOP8

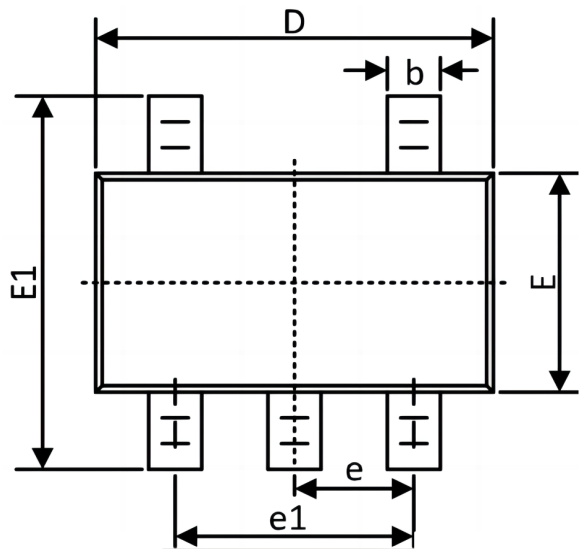


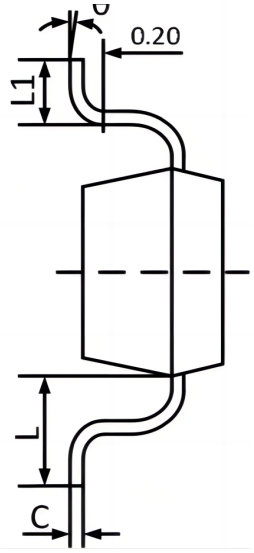


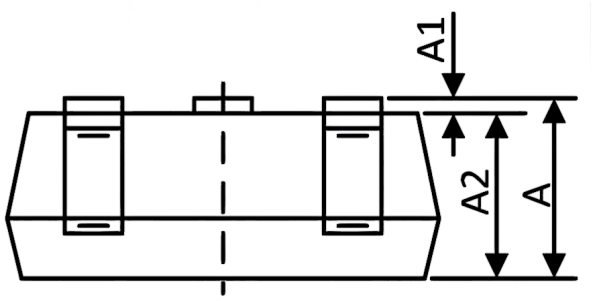


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.800	1.200	0.031	0.047
A1	0.000	0.200	0.000	0.008
A2	0.760	0.970	0.030	0.038
b	0.30 TYP		0.012 TYP	
C	0.15 TYP		0.006 TYP	
D	2.900	3.100	0.114	0.122
e	0.65 TYP		0.026 TYP	
E	2.900	3.100	0.114	0.122
E1	4.700	5.100	0.185	0.201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

Package SOT23-5

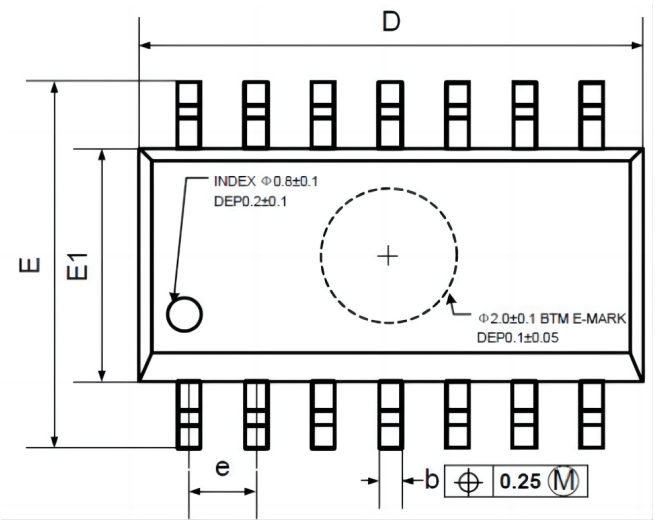


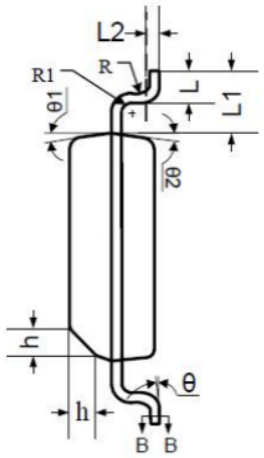


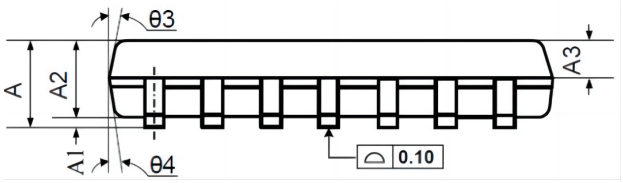


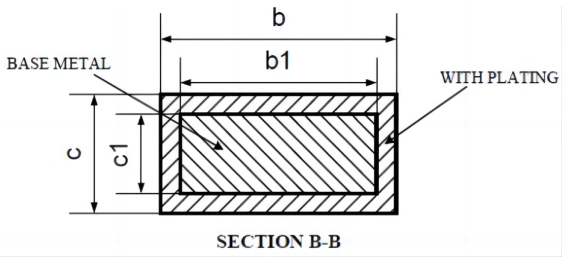
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.400	0.012	0.016
C	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950TYP		0.037TYP	
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°

Package 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°

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