

TS187x, TS187xA

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

Datasheet — production data

Features

- Operating range from V_{CC} = 1.8 to 6 V
- Rail-to-rail input and output
- Extended V_{icm} (V_{CC-} 0.2 V to V_{CC+} + 0.2 V)
- Low supply current (400 µA)
- Gain bandwidth product (1.6 MHz)
- High unity gain stability
- ESD tolerance (2 kV)
- Latch-up immunity
- Available in
 - SOT23-5 micropackage
 - MiniSO-8, SO-8, SO-14
 - TSSOP8, TSSOP14 package

Applications

- Battery powered applications (toys)
- Portable communication devices (cell phones)
- Audio drivers (headphone drivers)
- Laptop/notebook computers

Description

The TS187x (single, dual and quad) device can operate with voltages as low as 1.8 V. They feature both input and output rail-to-rail.

The common mode input voltage extends 200 mV beyond the supply voltages at 25 °C, while the output voltage swing is within 100 mV of each rail with a 600 Ω load resistor. The devices consume typically 400 μA per channel while offering 1.6 MHz of gain bandwidth product. The amplifiers provide a high output drive capability at typically 65 mA loads.

These features make the TS187x family ideal for sensor interface, battery supplied and portable applications.

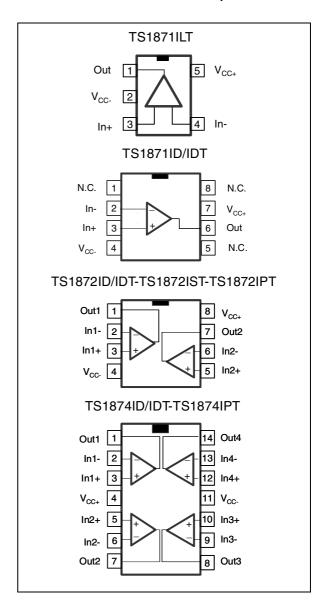


Table 1. Device summary

Reference	Single version	Dual version	Quad version
TS187x	TS1871	TS1872	TS1874
TS187xA	TS1871A	TS1872A	TS1874A

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1 Absolute maximum ratings and operating conditions

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V _{CC}	Supply voltage ⁽¹⁾	7	V
V _{id}	Differential input voltage ⁽²⁾	±1	V
V _{in}	Input voltage	V _{CC-} -0.3 to V _{CC+} +0.3	V
T _{stg}	Storage temperature	-65 to +150	°C
Tj	Maximum junction temperature	150	°C
R _{thja}	Thermal resistance junction-to-ambient ⁽³⁾ SOT23-5 MiniSO-8 SO-8 SO-14 TSSOP8 TSSOP14	250 190 125 103 120 100	°C/W
R _{thjc}	Thermal resistance junction-to-case SOT23-5 MiniSO-8 SO-8 SO-14 TSSOP8 TSSOP14	81 39 40 31 37 32	°C/W
	HBM: human body model ⁽⁴⁾	2	kV
ESD	MM: machine model ⁽⁵⁾	200	V
	CDM: charged device model ⁽⁶⁾	1.5	kV
	Latch-up immunity	200	mA
	Lead temperature (soldering, 10 sec.)	250	°C
	Output short-circuit duration	See ⁽⁷⁾	

- 1. All voltage values, except differential voltage, are with respect to network terminal.
- 2. Differential voltages are the non-inverting input terminal with respect to the inverting input terminal. If $V_{id} > \pm 1 \ V$, the maximum input current must not exceed $\pm 1 \ \text{mA}$. When $V_{id} > \pm 1 \ \text{V}$, add an input series resistor to limit the input current.
- 3. Short-circuits can cause excessive heating. Destructive dissipation can result from simultaneous short-circuits on all amplifiers.
- 4. Human body model: a 100 pF capacitor is charged to the specified voltage, then discharged through a 1.5 k Ω resistor between two pins of the device. This is done for all couples of connected pin combinations while the other pins are floating.
- 5. Machine model: a 200 pF capacitor is charged to the specified voltage, then discharged directly between two pins of the device with no external series resistor (internal resistor < 5 Ω). This is done for all couples of connected pin combinations while the other pins are floating.
- Charged device model: all pins and package are charged together to the specified voltage and then discharged directly to ground through only one pin. This is done for all pins.
- 7. Short-circuits from the output to V_{CC} can cause excessive heating. The maximum output current is approximately 80 mA, independent of the magnitude of V_{CC} . Destructive dissipation can result from simultaneous short-circuits on all amplifiers.



Table 3. Operating conditions

Symbol	Parameter	Value	Unit
V _{CC}	Supply voltage	1.8 to 6	V
V _{icm}	Common-mode input voltage range $T_{oper} = 25 ^{\circ}\text{C}, \ 1.8 \leq V_{CC} \leq 6 \text{V}$ $T_{min} < T_{oper} < T_{max}, \ 1.8 \leq V_{CC} \leq 6 \text{V}$	V_{CC-} - 0.2 to V_{CC+} + 0.2 V_{CC-} to V_{CC+}	V
T _{oper}	Operating free air temperature range	-40 to + 125	°C

2 Electrical characteristics

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

Symbol	Parameter	Conditions	Min.	Тур.	Max.	Unit
V _{io}	Input offset voltage	$\begin{split} &V_{icm} = V_{out} = V_{CC}/2\\ &TS1871A/2A/4A\\ &T_{min} \leq T_{amb} \ \leq T_{max}\\ &TS1871/2/4\\ &T_{min} \leq T_{amb} \ \leq T_{max} \end{split}$		0.1	1 1.5 3 6	mV
ΔV _{io}	Input offset voltage drift			2		μV/°C
I _{io}	Input offset current	$V_{icm} = V_{out} = V_{CC}/2^{(2)}$ $T_{min} \le T_{amb} \le T_{max}$		3	30 60	nA
I _{ib}	Input bias current	$V_{icm} = V_{out} = V_{CC}/2^{(2)}$ $T_{min} \le T_{amb} \le T_{max}$		40	125 150	nA
CMR	Common mode rejection ratio 20 log $(\Delta V_{io}/\Delta V_{io})$	$0 \le V_{icm} \le V_{CC}, V_{out} = V_{CC}/2$ $T_{min} \le T_{amb} \le T_{max}$	55 52	77		dB
A _{vd}	Large signal voltage gain	V_{out} = 0.5 to 1.3 V R_L = 2 k Ω R_L = 600 Ω	77 70	91 84		dB
V _{OH}	High level output voltage	$\begin{aligned} &V_{id} = 100 \text{ mV} \\ &R_L = 2 \text{ k}\Omega \\ &R_L = 600 \Omega \\ &T_{min} \leq T_{amb} \leq T_{max}, R_L = 2 \text{ k}\Omega \\ &T_{min} \leq T_{amb} \leq T_{max}, R_L = 600 \Omega \end{aligned}$	1.65 1.62 1.65 1.62	1.77 1.74		>
V _{OL}	Low level output voltage	$\begin{split} &V_{id} = \text{-}100 \text{ mV} \\ &R_L = 2 k\Omega \\ &R_L = 600 \Omega \\ &T_{min} \leq T_{amb} \leq T_{max}, R_L = 2 k\Omega \\ &T_{min} \leq T_{amb} \leq T_{max}, R_L = 600 \Omega \end{split}$		30 46	100 150 100 150	mV
	Output source current	V_{id} = 100 mV, V_O = V_{CC} -	20	58		mΛ
I _o	Output sink current	V_{id} = -100 mV, V_O = V_{CC+}	20	68		mA
I _{CC}	Supply current (per amplifier)	$V_{out} = V_{CC}/2$ $A_{VCL} = 1$, no load $T_{min} \le T_{amb} \le T_{max}$		400	560 600	μΑ
GBP	Gain bandwidth product	$R_L = 10 \text{ k}\Omega$, $C_L = 100 \text{ pF}$, $f = 100 \text{ kHz}$	0.9	1.6		MHz
SR	Slew rate	$R_L = 10 \text{ k}\Omega$, $C_L = 100 \text{ pF}$, $A_V = 1$	0.38	0.54		V/µs
φm	Phase margin	C _L = 100 pF		53		Degrees
e _n	Input voltage noise	f = 1 kHz		27		nV/√Hz
THD	Total harmonic distortion			0.01		%

^{1.} All parameter limits at temperatures different from 25 °C are guaranteed by correlation.

^{2.} Maximum values include unavoidable inaccuracies of the industrial tests.

Electrical characteristics TS187x, TS187xA

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

Symbol	Parameter	Conditions	Min.	Тур.	Max.	Unit
V _{io}	Input offset voltage	$\begin{split} &V_{icm} = V_{out} = V_{CC}/2\\ &TS1871A/2A/4A\\ &T_{min} \leq T_{amb} \leq T_{max}\\ &TS1871/2/4\\ &T_{min} \leq T_{amb} \leq T_{max} \end{split}$		0.1	1 1.5 3 6	mV
ΔV _{io}	Input offset voltage drift			2		μV/°C
l _{io}	Input offset current	$\begin{aligned} V_{icm} &= V_{out} = V_{CC}/2^{(2)} \\ T_{min} &\leq T_{amb} \leq T_{max} \end{aligned}$		3	30 60	nA
l _{ib}	Input bias current	$V_{icm} = V_{out} = V_{CC}/2^{(2)}$ $T_{min} \le T_{amb} \le T_{max}$		4	125 150	nA
CMR	Common mode rejection ratio 20 log $(\Delta V_{ic}/\Delta V_{io})$	$0 \le V_{icm} \le V_{CC, V_{out}} = V_{CC}/2$ $T_{min} \le T_{amb} \le T_{max}$	60 57	80		dB
A _{vd}	Large signal voltage gain	V_{out} = 0.5 to 2.5 V R_L = 2 k Ω R_L = 600 Ω	80 74	94 88		dB
V _{OH}	High level output voltage	$\begin{split} &V_{id} = 100 \text{ mV} \\ &R_L = 2 \text{ k}\Omega \\ &R_L = 600 \Omega \\ &T_{min} \leq T_{amb} \leq T_{max}, R_L = 2 \text{ k}\Omega \\ &T_{min} \leq T_{amb} \leq T_{max}, R_L = 600 \Omega \end{split}$	2.82 2.80 2.82 2.80	2.95 2.95		V
V _{OL}	Low level output voltage	$\begin{split} &V_{id} = \text{-}100 \text{ mV} \\ &R_L = 2 \text{ k}\Omega \\ &R_L = 600 \Omega \\ &T_{min} \leq T_{amb} \leq T_{max}, R_L = 2 \text{ k}\Omega \\ &T_{min} \leq T_{amb} \leq T_{max}, R_L = 600 \Omega \end{split}$		39 58	120 160 120 160	mV
	Output source current	V_{id} = 100 mV, $V_O = V_{CC}$	20	60		mΛ
I _o	Output sink current	V_{id} = -100 mV, $V_O = V_{CC+}$	20	70		mA
I _{CC}	Supply current (per amplifier)	$V_{out} = V_{CC}/2$ $A_{VCL} = 1$, no load $T_{min} \le T_{amb} \le T_{max}$		450	650 690	μΑ
GBP	Gain bandwidth product	$R_L = 10 \text{ k}\Omega$, $C_L = 100 \text{ pF}$, $f = 100 \text{ kHz}$	1	1.7		MHz
SR	Slew rate	$R_L = 10 \text{ k}\Omega$, $C_L = 100 \text{ pF}$, $A_V = 1$	0.42	0.6		V/µs
φm	Phase margin	C _L = 100 pF		53		Degrees
e _n	Input voltage noise	f = 1 kHz		27		nV/√Hz
THD	Total harmonic distortion			0.01		%

^{1.} All parameter limits at temperatures different from 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 with V_{CC} = 0 V, C_L and R_L connected to $V_{CC}/2$, and T_{amb} = 25 °C (unless otherwise specified)⁽¹⁾

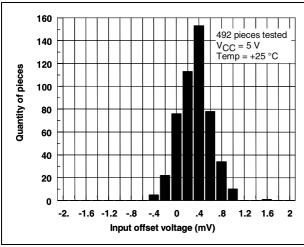
Symbol	Parameter	Conditions	Min.	Тур.	Max.	Unit
V _{io}	Input offset voltage	$\begin{aligned} &V_{icm} = V_{out} = V_{CC}/2\\ &TS1871A/2A/4A\\ &T_{min} \leq T_{amb} \leq T_{max}\\ &TS1871/2/4\\ &T_{min} \leq T_{amb} \leq T_{max} \end{aligned}$		0.1	1 1.5 3 6	mV
ΔV _{io}	Input offset voltage drift			2		μV/°C
I _{io}	Input offset current	$\begin{aligned} V_{icm} &= V_{out} = V_{CC}/2^{(2)} \\ T_{min} &\leq T_{amb} \leq T_{max} \end{aligned}$		3	30 60	nA
l _{ib}	Input bias current	$V_{icm} = V_{out} = V_{CC}/2^{(2)}$ $T_{min} \le T_{amb} \le T_{max}$		70	130 150	nA
CMR	Common mode rejection ratio 20 log ($\Delta V_{ic}/\Delta V_{io}$)	$0 \leq V_{icm} \leq V_{CC,} \ V_{out} \ not \ equal \ to \ V_{CC}/2$ $T_{min} \leq T_{amb} \ \leq T_{max}$	65 62	85		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	$V_{out} = 1 \text{ to } 4 \text{ V}$ $R_L = 2 \text{ k}\Omega$ $R_L = 600 \Omega$	83 77	97 91		dB
V _{OH}	High level output voltage	$\begin{split} &V_{id} = 100 \text{ mV} \\ &R_L = 2 \text{ k}\Omega \\ &R_L = 600 \Omega \\ &T_{min} \leq T_{amb} \leq T_{max}, R_L = 2 \text{ k}\Omega \\ &T_{min} \leq T_{amb} \leq T_{max}, R_L = 600 \Omega \end{split}$	4.80 4.75 4.80 4.75	4.95 4.90		V
V _{OL}	Low level output voltage	$\begin{split} &V_{id} = \text{-}100 \text{ mV} \\ &R_L = 2 \text{ k}\Omega \\ &R_L = 600 \Omega \\ &T_{min} \leq T_{amb} \leq T_{max}, R_L = 2 \text{ k}\Omega \\ &T_{min} \leq T_{amb} \leq T_{max}, R_L = 600 \Omega \end{split}$		52 70	130 188 130 188	mV
1	Output source current	V_{id} = 100 mV, V_O = V_{CC} -	20	65		mA
I _o	Output sink current	$V_{id} = -100 \text{ mV}, V_O = V_{CC+}$	20	80		IIIA
I _{CC}	Supply current (per amplifier)	$V_{out} = V_{CC}/2$ $A_{VCL} = 1, \text{ no load}$ $T_{min} \le T_{amb} \le T_{max}$		500	835 875	μΑ
GBP	Gain bandwidth product	$R_L = 10 \text{ k}\Omega$, $C_L = 100 \text{ pF}$, $f = 100 \text{ kHz}$	1	1.8		MHz
SR	Slew rate	$R_L = 10 \text{ k}\Omega$, $C_L = 100 \text{ pF}$, $A_V = 1$	0.42	0.6		V/µs
φm	Phase margin	C _L = 100 pF		55		Degrees
e _n	Input voltage noise	f = 1 kHz		27		nV/√Hz
THD	Total harmonic distortion			0.01		%

^{1.} All parameter limits at temperatures different from 25 °C are guaranteed by correlation.

^{2.} Maximum values include unavoidable inaccuracies of the industrial tests.

Figure 1. Input offset voltage distribution

Figure 2. Input offset voltage vs. temperature



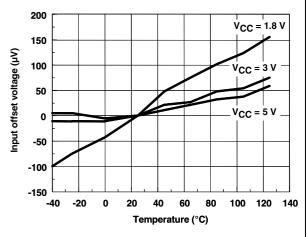
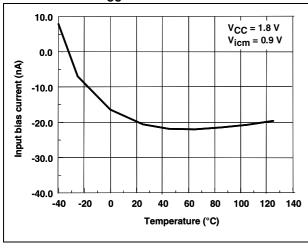


Figure 3. Input bias current vs. temperature at $V_{CC} = 1.8 \text{ V}$

Figure 4. Input bias current vs. temperature at $V_{CC} = 3 \text{ V}$



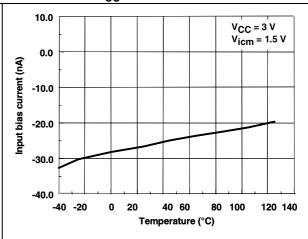


Figure 5. Supply current/amplifier vs. supply voltage

Vs. supply voltage

(eq.)

100

100

2 4 6 8

Supply voltage (V)

Figure 6. Supply current/amplifier vs. temperature

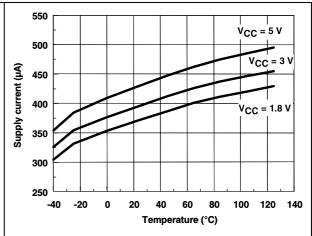


Figure 7. Common mode rejection vs. temperature

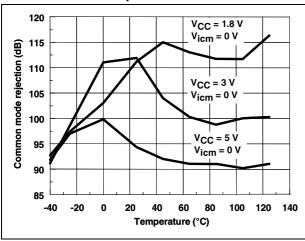


Figure 8. Supply voltage rejection vs. temperature at $V_{CC} = 1.8 \text{ V}$

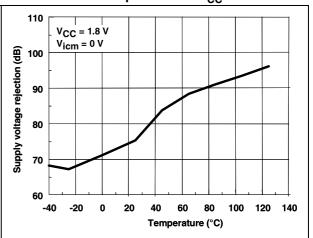


Figure 9. Supply voltage rejection vs. temperature at $V_{CC} = 3 \text{ V}$

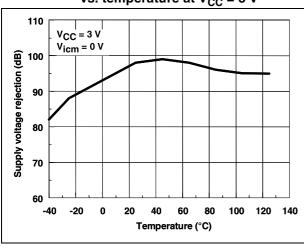


Figure 10. Supply voltage rejection vs. temperature at $V_{CC} = 5 \text{ V}$

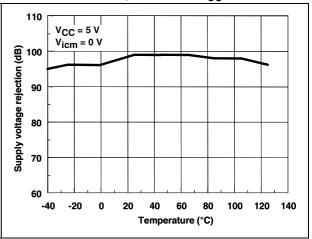


Figure 11. Power supply voltage rejection vs. frequency

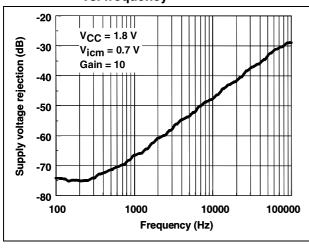


Figure 12. Open loop gain vs. temperature at $V_{CC} = 1.8 \text{ V}$

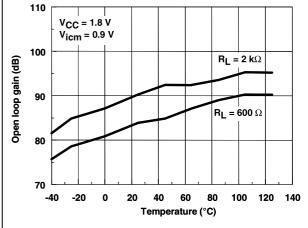


Figure 13. Open loop gain vs. temperature at $V_{CC} = 3 \text{ V}$

110 $V_{CC} = 3 V$ V_{icm} = 1.5 V $R_L = 2 k\Omega$ 100 Open loop gain (dB) 90 $R_L = 600 \Omega$ 80 70 0 100 120 140 -40 -20 20 40 60 80 Temperature (°C)

Figure 14. Open loop gain vs. temperature at $V_{CC} = 5 \text{ V}$

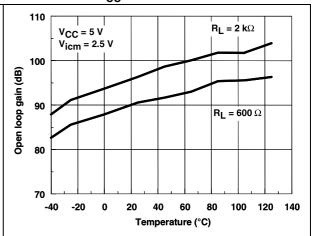


Figure 15. High level output voltage vs. temperature, $R_1 = 600 \Omega$

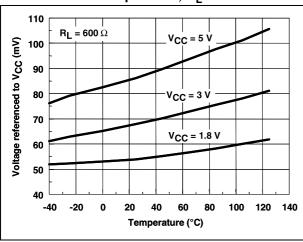


Figure 16. Low level output voltage vs. temperature, $R_1 = 600 \Omega$

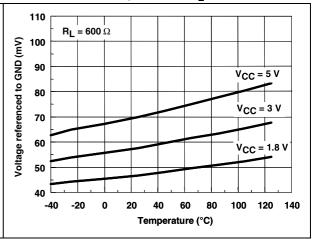


Figure 17. High level output voltage vs. temperature, $R_L = 2 k\Omega$

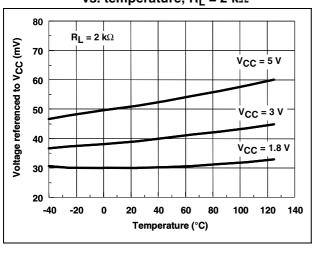
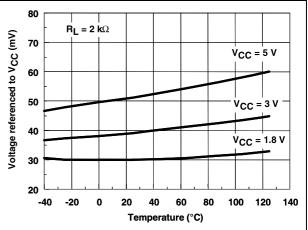


Figure 18. Low level output voltage vs. temperature, $R_L = 2 k\Omega$



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Figure 19. Output current vs. temperature at $V_{CC} = 1.8 \text{ V}$

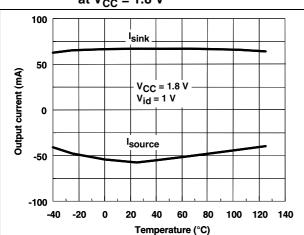


Figure 20. Output current vs. temperature at $V_{CC} = 3 \text{ V}$

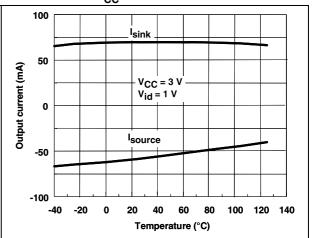


Figure 21. Output current vs. temperature at $V_{CC} = 5 \text{ V}$

100 l_{sink} 50 Output current (mA) V_{CC} = 5 V V_{id} = 1 V 0 . Isource -50 -40 -20 0 20 40 60 80 100 120 140 Temperature (°C)

Figure 22. Output current vs. output voltage at $V_{CC} = 1.8 \text{ V}$

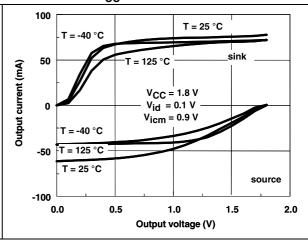


Figure 23. Output current vs. output voltage at $V_{CC} = 3 \text{ V}$

T = -40 °C

 $V_{CC} = 3 V$ $V_{id} = 0.1 V$

V_{icm} = 1.5 V

= 125 °C

T = 125 °C

T = 25 °C

T = -40 °C

0.5

1.0

1.5

2.0

Output voltage (V)

2.5

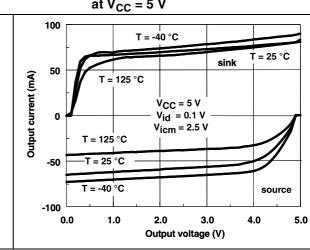


Figure 24. Output current vs. output voltage at $V_{CC} = 5 \text{ V}$

100

50

-50

-100

0.0

Output current (mA)

T = 25 °C

source

3.5

3.0

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Figure 25. Gain and phase vs. frequency at $V_{CC} = 1.8 \text{ V}$

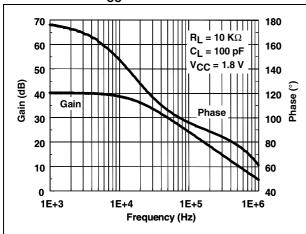


Figure 26. Gain and phase vs. frequency at $V_{CC} = 3 \text{ V}$

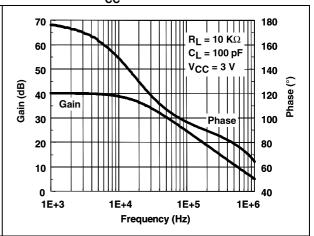


Figure 27. Gain and phase vs. frequency at $V_{CC} = 5 \text{ V}$

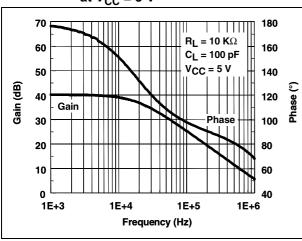


Figure 28. Gain bandwidth product vs. temperature

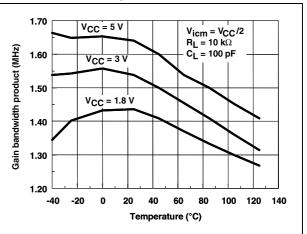
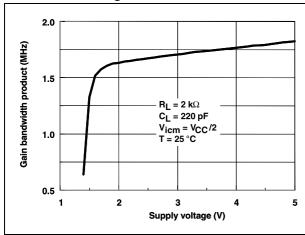
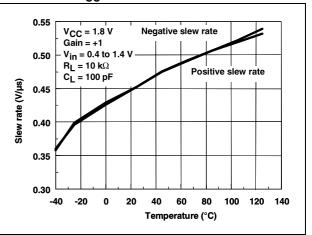


Figure 29. Gain bandwidth product vs. supply Figure 30. Slew rate vs. temperature at voltage $V_{CC} = 1.8 \text{ V}$





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Figure 31. Slew rate vs. temperature at $V_{CC} = 3 \text{ V}$

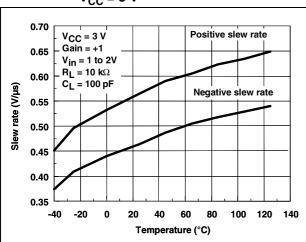


Figure 32. Slew rate vs. temperature at $V_{CC} = 5 \text{ V}$

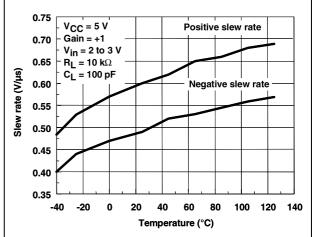


Figure 33. Phase margin vs. load capacitor

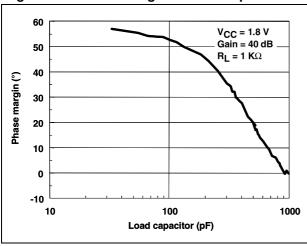


Figure 34. Phase margin vs. output current

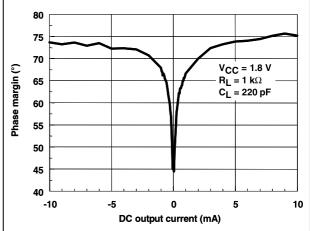
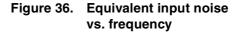
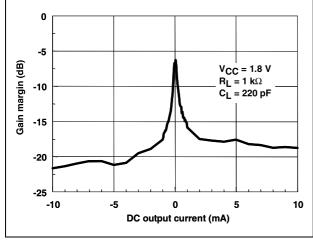


Figure 35. Gain margin vs. output current





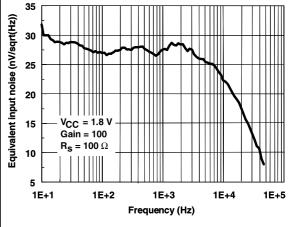


Figure 37. Distortion vs. output voltage at $V_{CC} = 1.8 \text{ V}$

Figure 38. Distortion vs. output voltage at $V_{CC} = 3 \text{ V}$

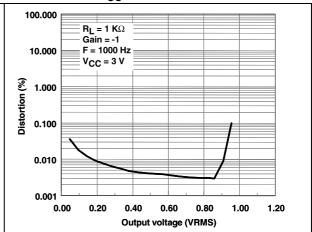


Figure 39. Distortion vs. output voltage at $V_{CC} = 5 \text{ V}$

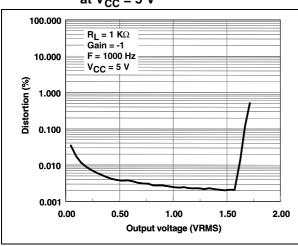


Figure 40. Distortion vs. output voltage at V_{CC} = 2.7 V, R_L = 150 Ω

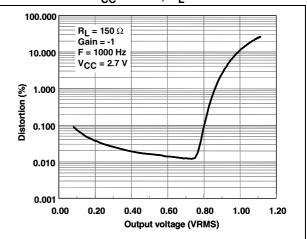


Figure 41. Distortion vs. output voltage at V_{CC} = 2.7 V, R_L = 1500 Ω

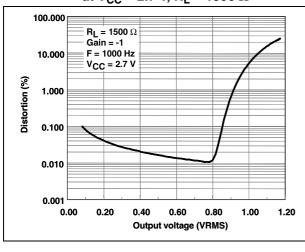


Figure 42. Distortion vs. output voltage at V_{CC} = 2.7 V, R_L = 4700 Ω

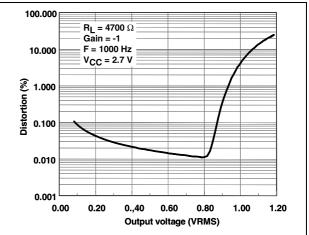


Figure 43. Distortion vs. frequency at $V_{CC} = 1.8 \text{ V}$

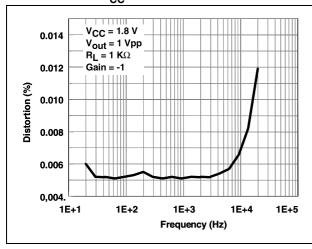


Figure 44. Distortion vs. frequency at $V_{CC} = 3 \text{ V}$

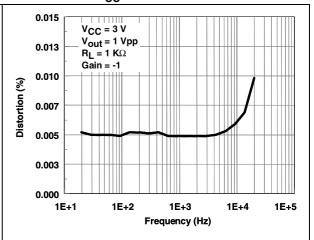


Figure 45. Distortion vs. frequency at V_{CC} = 1.8 V, R_L = 32 Ω

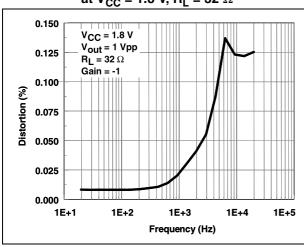


Figure 46. Distortion vs. frequency at V_{CC} = 3 V, R_L = 32 Ω

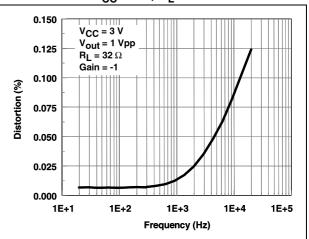


Figure 47. Output power vs. supply voltage

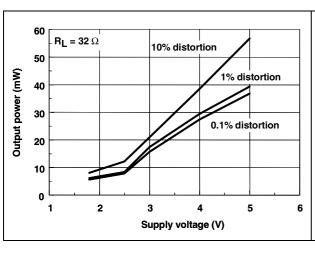
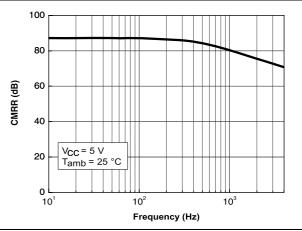


Figure 48. Common mode rejection ratio vs. frequency at $V_{CC} = 5 \text{ V}$



Package information TS187x, TS187xA

3 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.



3.1 SO-8 package information

Figure 49. SO-8 package outline

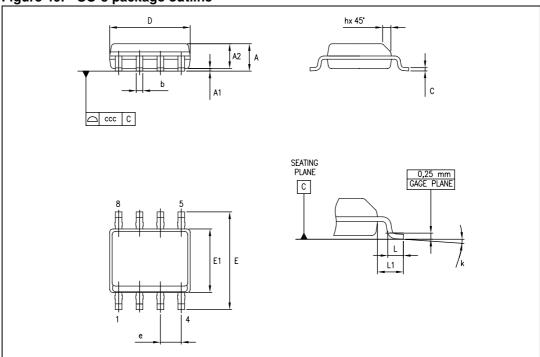


Table 7. SO-8 package mechanical data

		Dimensions							
Symbol		Millimeters		Inches					
	Min.	Тур.	Max.	Min.	Тур.	Max.			
Α			1.75			0.069			
A1	0.10		0.25	0.004		0.010			
A2	1.25			0.049					
b	0.28		0.48	0.011		0.019			
С	0.17		0.23	0.007		0.010			
D	4.80	4.90	5.00	0.189	0.193	0.197			
Е	5.80	6.00	6.20	0.228	0.236	0.244			
E1	3.80	3.90	4.00	0.150	0.154	0.157			
е		1.27			0.050				
h	0.25		0.50	0.010		0.020			
L	0.40		1.27	0.016		0.050			
L1		1.04			0.040				
k	1°		8°	1°		8°			
ccc			0.10			0.004			

3.2 TSSOP8 package information

Figure 50. TSSOP8 package outline

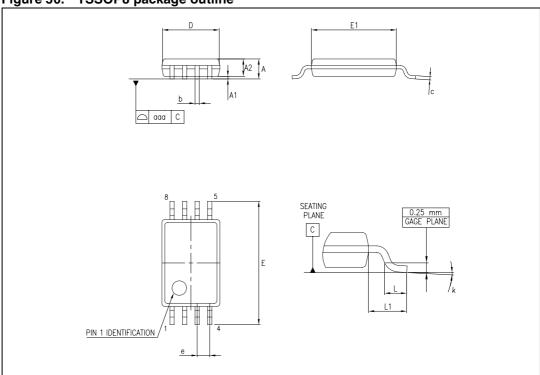


Table 8. TSSOP8 package mechanical data

	Dimensions								
Symbol		Millimeters		Inches					
	Min.	Тур.	Max.	Min.	Тур.	Max.			
Α			1.20			0.047			
A1	0.05		0.15	0.002		0.006			
A2	0.80	1.00	1.05	0.031	0.039	0.041			
b	0.19		0.30	0.007		0.012			
С	0.09		0.20	0.004		0.008			
D	2.90	3.00	3.10	0.114	0.118	0.122			
E	6.20	6.40	6.60	0.244	0.252	0.260			
E1	4.30	4.40	4.50	0.169	0.173	0.177			
е		0.65			0.0256				
k	0°		8°	0°		8°			
L	0.45	0.60	0.75	0.018	0.024	0.030			
L1		1			0.039				
aaa			0.10			0.004			

3.3 MiniSO-8 package information

Figure 51. MiniSO-8 package outline

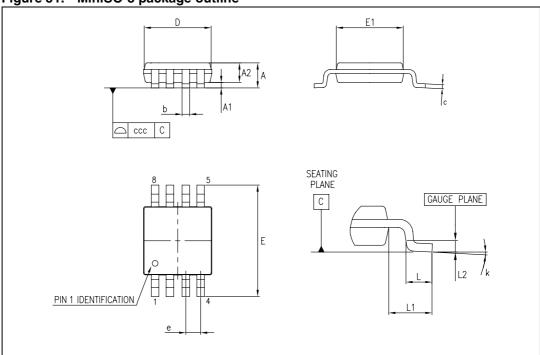


Table 9. MiniSO-8 package mechanical data

	Dimensions								
Symbol		Millimeters Inches		Inches					
	Min.	Тур.	Max.	Min.	Тур.	Max.			
Α			1.1			0.043			
A1	0		0.15	0		0.006			
A2	0.75	0.85	0.95	0.030	0.033	0.037			
b	0.22		0.40	0.009		0.016			
С	0.08		0.23	0.003		0.009			
D	2.80	3.00	3.20	0.11	0.118	0.126			
E	4.65	4.90	5.15	0.183	0.193	0.203			
E1	2.80	3.00	3.10	0.11	0.118	0.122			
е		0.65			0.026				
L	0.40	0.60	0.80	0.016	0.024	0.031			
L1		0.95			0.037				
L2		0.25			0.010				
k	0°		8°	0°		8°			
ccc	_		0.10			0.004			

3.4 SO-14 package information

Figure 52. SO-14 package outline

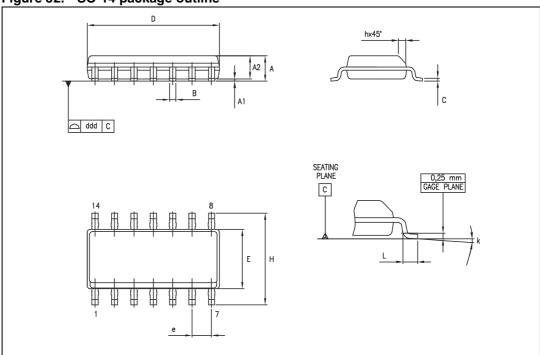


Table 10. SO-14 package mechanical data

Dimensions							
Symbol		Millimeters			Inches		
	Min.	Тур.	Max.	Min.	Тур.	Max.	
Α	1.35		1.75	0.05		0.068	
A1	0.10		0.25	0.004		0.009	
A2	1.10		1.65	0.04		0.06	
В	0.33		0.51	0.01		0.02	
С	0.19		0.25	0.007		0.009	
D	8.55		8.75	0.33		0.34	
Е	3.80		4.0	0.15		0.15	
е		1.27			0.05		
Н	5.80		6.20	0.22		0.24	
h	0.25		0.50	0.009		0.02	
L	0.40		1.27	0.015		0.05	
k			8° (r	nax.)	•	•	
ddd			0.10			0.004	

3.5 TSSOP14 package information

Figure 53. TSSOP14 package outline

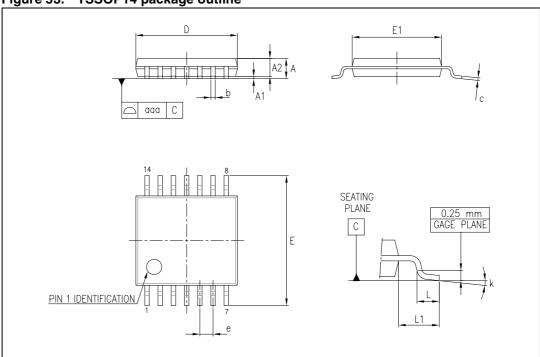


Table 11. TSSOP14 package mechanical data

	Dimensions								
Symbol		Millimeters			Inches				
	Min.	Тур.	Max.	Min.	Тур.	Max.			
А			1.20			0.047			
A1	0.05		0.15	0.002	0.004	0.006			
A2	0.80	1.00	1.05	0.031	0.039	0.041			
b	0.19		0.30	0.007		0.012			
С	0.09		0.20	0.004		0.0089			
D	4.90	5.00	5.10	0.193	0.197	0.201			
E	6.20	6.40	6.60	0.244	0.252	0.260			
E1	4.30	4.40	4.50	0.169	0.173	0.176			
е		0.65			0.0256				
L	0.45	0.60	0.75	0.018	0.024	0.030			
L1		1.00			0.039				
k	0°		8°	0°		8°			
aaa			0.10			0.004			

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3.6 SOT23-5 package information

Figure 54. SOT23-5L package outline

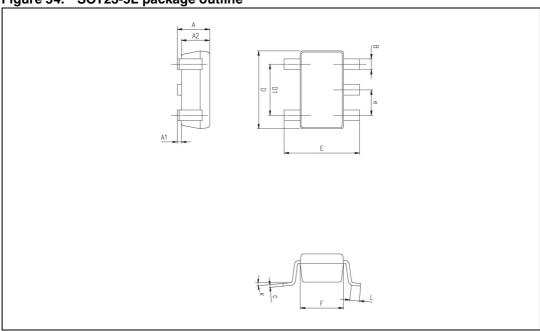


Table 12. SOT23-5L package mechanical data

	Dimensions							
Symbol	Millimeters			Inches				
	Min.	Тур.	Max.	Min.	Тур.	Max.		
Α	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		
В	0.35	0.40	0.50	0.013	0.015	0.019		
С	0.09	0.15	0.20	0.003	0.006	0.008		
D	2.80	2.90	3.00	0.110	0.114	0.118		
D1		1.90			0.075			
е		0.95			0.037			
Е	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	0.013	0.023		
K	0°		10°					

4 Ordering information

Table 13. Order codes

Order code	Temperature range	Package	Packaging	Marking
TS1871ID/IDT		00.0	Tube or tape and reel	18711
TS1871IAID/AIDT		SO-8		1871AI
TS1871ILT		SOT23-5L	Tape and reel	K171
TS1871AILT				K172
TS1871IYLT ⁽¹⁾		SOT23-5L (automotive grade)	Tape and reel	K182
TS1871AIYLT ⁽¹⁾	-40 °C to +125 °C			K183
TS1872ID/IDT		SO-8	Tube or tape and reel	18721
TS1872AID/AIDT				1872AI
TS1872IYDT ⁽¹⁾		SO-8	Tube or	1872Y
TS1872AIYDT ⁽¹⁾		(automotive grade)	tape and reel	1872AY
TS1872IPT		TSSOP8	Tape and reel	18721
TS1872AIPT				1872A
TS1872IYPT ⁽¹⁾		TSSOP8 (automotive grade)	Tape and reel	1872Y
TS1872AIYPT ⁽¹⁾				872AY
TS1872IST		MiniSO-8	Tape and reel	K171
TS1872AIST				K172
TS1874ID/IDT		CO 14	Tube or tape and reel	18741
TS1874AID/AIDT		SO-14		1874AI
TS1874IYDT ⁽¹⁾		SO-14 (automotive grade)	Tape and reel	TS1874Y
TS1874AIYDT ⁽¹⁾				TS1874AY
TS1874IPT			Tape and reel	18741
TS1874AIPT		TSSOP14		1874AI
TS1874IYPT ⁽¹⁾		TSSOP14	Tape and reel	TS1874Y
TS1874AIYPT ⁽¹⁾		(automotive grade)		TS1874AY

Qualified and characterized according to AEC Q100 and Q003 or equivalent, advanced screening according to AEC Q001 and Q 002 or equivalent.

Revision history TS187x, TS187xA

5 Revision history

Table 14. Document revision history

Date	Revision	Changes	
01-Apr-2002	1	First release.	
02-Jan-2005	2	Modifications on AMR Table 2 on page 3 (explanation of V_{id} and V_i limits).	
21-May-2007	3	Added limits over temperature range in <i>Table 4 on page 5</i> , <i>Table 5 on page 6</i> , <i>Table 6 on page 7</i> . Added SVR in <i>Table 6</i> (SVR parameter removed from <i>Table 4</i> and <i>Table 5</i>). Added equivalent input voltage noise in <i>Table 4</i> , <i>Table 5</i> , and <i>Table 6</i> . Added R _{thjc} values in <i>Table 2</i> . Added automotive grade part numbers to order codes table. Moved order codes table to <i>Section 4 on page 23</i> . Updated format of package information.	
17-Jan-2008	4	Updated footnote for automotive grade order codes in <i>Table 13</i> .	
12-Mar-2010	5	Updated document format. Modified headings, added root part number TS187xA and added <i>Table 1: Device summary</i> on cover page. Corrected typical values for A _{Vd} , Isource, Isink and Vol in <i>Table 4, Table 5</i> and <i>Table 6</i> . Added <i>Figure 48: Common mode rejection ratio vs. frequency at V_{CC} = 5 V</i> . Updated package information in <i>Chapter 3</i> . Removed order codes for SO-8 automotive grade packages (TS1871IYDT and TS1871AIYDT) from <i>Table 13</i> . Removed order codes for DIP package from <i>Table 13</i> .	
06-Jul-2012	6	Updated Table 13: Order codes.	
19-Nov-2012	7	Updated <i>Features</i> (added MiniSO-8, SO-8, SO-14, TSSOP8, and TSSOP14 package). Updated titles of <i>Table 5</i> and <i>Table 6</i> (replaced V _{DD} by V _{CC-}). Updated TS1871IYLT, TS1871AIYLT, TS1872IYDT, TS1872AIYDT, TS1874AIYDT, TS1874AIYPT, TS1872IYPT, TS1872IYPT, and TS1874AIYPT order code in <i>Table 13</i> (status qualified). Updated packaging for TS1874IYDT and TS1874AIYDT order code (indicated only tape and reel) in <i>Table 13</i> . Added note <i>1</i> . below <i>Table 13</i> . Minor corrections throughout document.	

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