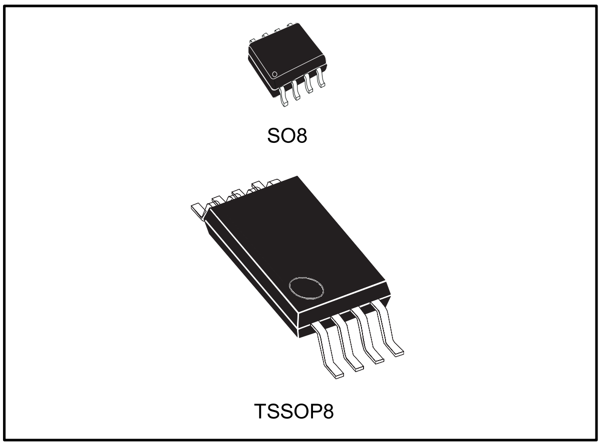
TL082, TL082A, TL082B

General purpose JFET dual operation amplifiers

Datasheet - production data



Features

- Wide common-mode (up to V_{CC}^+) and differential voltage range
- Low input bias and offset current
- Output short-circuit protection
- High input impedance JFET input stage
- Internal frequency compensation
- Latch up free operation
- High slew rate: 16 V/µs (typical)

Description

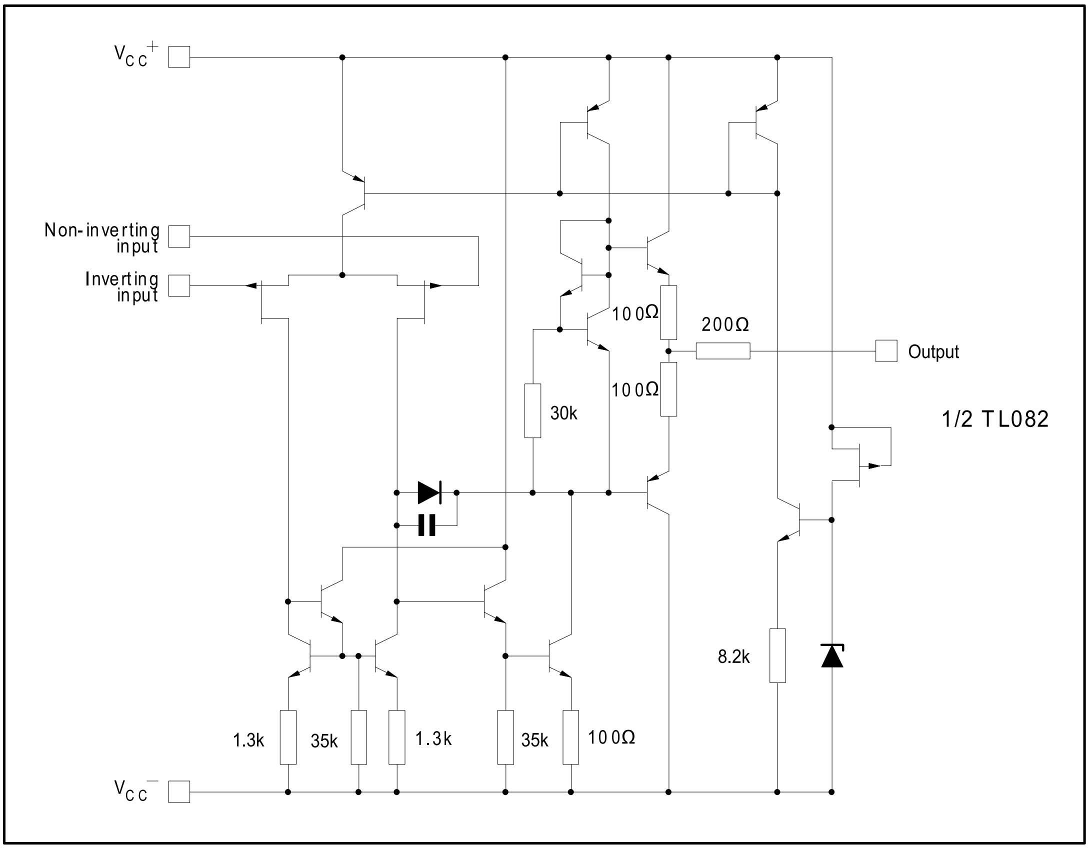
The TL082, TL082A and TL082B are high speed JFET input dual operational amplifiers incorporating well-matched, high voltage JFET and bipolar transistors in a monolithic integrated circuit.

The devices feature high slew rates, low input bias and offset current, and low offset voltage temperature coefficient.

Contents

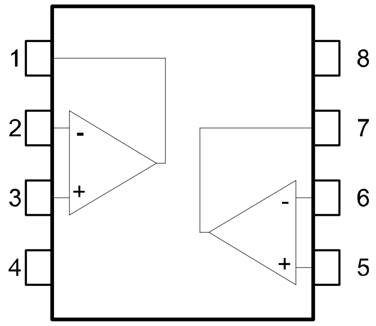
1 Schematic diagram

Figure 1: Schematic diagram



2 Pin connections

Figure 2: Pin connections (top view)



1 = Output 1
2 = Inverting input 1
3 = Non-inverting input 1
4 = V_{CC}^{-}
5 = Non-inverting input 2
6 = Inverting input 2
7 = Output 2
8 = V_{CC}^{+}

3 Absolute maximum ratings and operating conditions

Table 1: Absolute maximum ratings

<table>
<tr><th>Symbol</th><th colspan="2">Parameter</th><th>TL082I, AI, BI</th><th>TL082C, AC, BC</th><th>Unit</th></tr>
<tr><td>V_{CC}</td><td colspan="2">Supply voltage (1)</td><td colspan="2">±18</td><td rowspan="3">V</td></tr>
<tr><td>V_{in}</td><td colspan="2">Input voltage (2)</td><td colspan="2">±15</td></tr>
<tr><td>V_{id}</td><td colspan="2">Differential input voltage (3)</td><td colspan="2">±30</td></tr>
<tr><td>P_{tot}</td><td colspan="2">Power dissipation</td><td colspan="2">680</td><td>mW</td></tr>
<tr><td rowspan="2">R_{thja}</td><td rowspan="2">Thermal resistance junction-to-ambient (4)</td><td>SO8</td><td colspan="2">125</td><td rowspan="4">°C/W</td></tr>
<tr><td>TSSOP8</td><td colspan="2">120</td></tr>
<tr><td rowspan="2">R_{thjc}</td><td rowspan="2">Thermal resistance junction-to-case</td><td>SO8</td><td colspan="2">40</td></tr>
<tr><td>TSSOP8</td><td colspan="2">37</td></tr>
<tr><td></td><td colspan="2">Output short-circuit duration (5)</td><td colspan="2">Infinite</td><td></td></tr>
<tr><td>T_{stg}</td><td colspan="2">Storage temperature range</td><td colspan="2">-65 to 150</td><td>°C</td></tr>
<tr><td rowspan="3">ESD</td><td colspan="2">HBM: human body model (6)</td><td colspan="2">1</td><td>kV</td></tr>
<tr><td colspan="2">MM: machine model (7)</td><td colspan="2">200</td><td rowspan="2">V</td></tr>
<tr><td colspan="2">CDM: charged device model (8)</td><td colspan="2">1500</td></tr>
</table>

Notes:

(1)All voltage values, except differential voltage, are with respect to the zero reference level (ground) of the supply voltages where the zero reference level is the midpoint between V_{CC}^{+} and V_{CC}^{-}.

(2)The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15 volts, whichever is less.

(3)Differential voltages are the non-inverting input terminal with respect to the inverting input terminal.

(4)Short-circuits can cause excessive heating. Destructive dissipation can result from simultaneous short-circuit on all amplifiers.

(5)The output may be shorted to ground or to either supply. Temperature and/or supply voltages must be limited to ensure that the dissipation rating is not exceeded

(6)Human body model: 100 pF discharged through a 1.5 kΩ resistor between two pins of the device, done for all couples of pin combinations with other pins floating.

(7)Machine model: a 200 pF cap is charged to the specified voltage, then discharged directly between two pins of the device with no external series resistor (internal resistor < 5 Ω), done for all couples of pin combinations with other pins floating.

(8)Charged device model: all pins plus package are charged together to the specified voltage and then discharged directly to the ground.

Table 2: Operating conditions

<table>
<tr><th>Symbol</th><th>Parameter</th><th>TL082I, AI, BI</th><th>TL082C, AC, BC</th><th>Unit</th></tr>
<tr><td>V_{CC}</td><td>Supply voltage</td><td colspan="2">6 to 36</td><td>V</td></tr>
<tr><td>T_{oper}</td><td>Operating free-air temperature range</td><td>-40 to 105</td><td>0 to 70</td><td>°C</td></tr>
</table>

4 Electrical characteristics

Table 3: VCC = ±15V, Tamb = +25°C (unless otherwise specified)

Symbol	Parameter	TL082I, AC, AI, BC, BI			TL082C			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V_{io}	Input offset voltage, R_s = 50 Ω, T_{amb} = 25 °C, TL082		3	10		3	10	mV
	Input offset voltage, R_s = 50 Ω, T_{amb} = 25 °C, TL082A		3	6				
	Input offset voltage, R_s = 50 Ω, T_{amb} = 25 °C, TL082B		1	3				
	Input offset voltage, R_s = 50 Ω, $T_{min} \leq T_{amb} \leq T_{max}$, TL082			13			13	
	Input offset voltage, R_s = 50 Ω, $T_{min} \leq T_{amb} \leq T_{max}$, TL082A			7				
	Input offset voltage, R_s = 50 Ω, $T_{min} \leq T_{amb} \leq T_{max}$, TL082B			5				
DV_{io}	Input offset voltage drift		10			10		µV/°C
I_{io}	Input offset current, T_{amb} = 25 °C (1)		5	100		5	100	pA
	Input offset current, $T_{min} \leq T_{amb} \leq T_{max}$ (1)			4			10	nA
I_{ib}	Input bias current, T_{amb} = 25 °C		20	200		20	400	pA
	Input bias current, $T_{min} \leq T_{amb} \leq T_{max}$			20			20	nA
A_{vd}	Large signal voltage gain, R_L = 2 kΩ, V_o = ±10 V, T_{amb} = 25 °C	50	200		25	200		V/mV
	Large signal voltage gain, R_L = 2 kΩ, V_o = ±10 V, $T_{min} \leq T_{amb} \leq T_{max}$	25			15			
SVR	Supply voltage rejection ratio, R_S = 50 Ω, T_{amb} = 25 °C	80	86		70	86		dB
	Supply voltage rejection ratio, R_S = 50 Ω, $T_{min} \leq T_{amb} \leq T_{max}$	80			70			
I_{CC}	Supply current, no load, T_{amb} = 25 °C		1.4	2.5		1.4	2.5	mA
	Supply current, no load, $T_{min} \leq T_{amb} \leq T_{max}$			2.5			2.5	
V_{icm}	Input common mode voltage range	±11	15 -12		±11	15 -12		V
CMR	Common mode rejection ratio, R_S = 50 Ω, T_{amb} = 25 °C	80	86		70	86		dB
	Common mode rejection ratio, R_S = 50 Ω, $T_{min} \leq T_{amb} \leq T_{max}$	80			70			
I_{os}	Output short-circuit current, T_{amb} = 25 °C	10	40	60	10	40	60	mA
	Output short-circuit current, $T_{min} \leq T_{amb} \leq T_{max}$	10		60	10		60	

Symbol	Parameter	TL082I, AC, AI, BC, BI			TL082C			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
$\pm V_{opp}$	Output voltage swing, T_{amb} = 25 °C, R_L = 2 kΩ	10	12		10	12		V
	Output voltage swing, T_{amb} = 25 °C, R_L = 10 kΩ	12	13.5		12	13.5		
	Output voltage swing, $T_{min} \leq T_{amb} \leq T_{max}$, R_L = 2 kΩ	10			10			
	Output voltage swing, $T_{min} \leq T_{amb} \leq T_{max}$, R_L = 10 kΩ	12			12			
SR	Slew rate, T_{amb} = 25 °C, V_{in} = 10 V, R_L = 2 kΩ, C_L = 100 pF, unity gain	8	16		8	16		V/µs
t_r	Rise time, T_{amb} = 25 °C, V_{in} = 20 mV, R_L = 2 kΩ, C_L = 100 pF, unity gain		0.1			0.1		µs
K_{ov}	Overshoot, T_{amb} = 25 °C, V_{in} = 20 mV, R_L = 2 kΩ, C_L = 100 pF, unity gain		10			10		%
GBP	Gain bandwidth product, T_{amb} = 25 °C, V_{in} = 10 mV, R_L = 2 kΩ, C_L = 100 pF, F = 100 kHz	2.5	4		2.5	4		MHz
R_i	Input resistance		10^{12}			10^{12}		Ω
THD	Total harmonic distortion, T_{amb} = 25 °C, F = 1 kHz, R_L = 2 kΩ, C_L = 100 pF, A_v = 20 dB, V_o = 2 V_{pp}		0.01			0.01		%
e_n	Equivalent input noise voltage, R_S = 100 Ω, F = 1 kHz		15			15		nV/√Hz
∅m	Phase margin		45			45		degrees
V_{o1}/V_{o2}	Channel separation, A_v = 100		120			120		dB

Notes:

(1)The input bias currents are junction leakage currents which approximately double for every 10° C increase in the junction temperature.

5 Electrical characteristic curves

Figure 3: Maximum peak-to-peak output voltage versus frequency

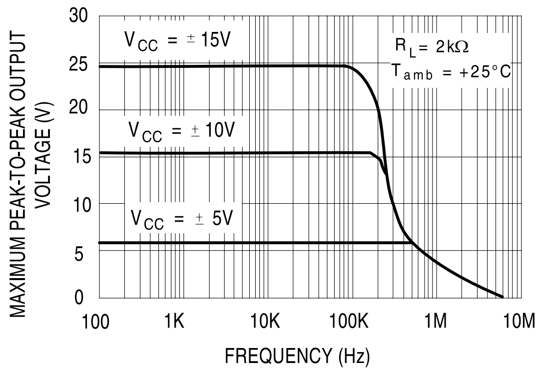


Figure 4: Maximum peak-to-peak output voltage versus frequency

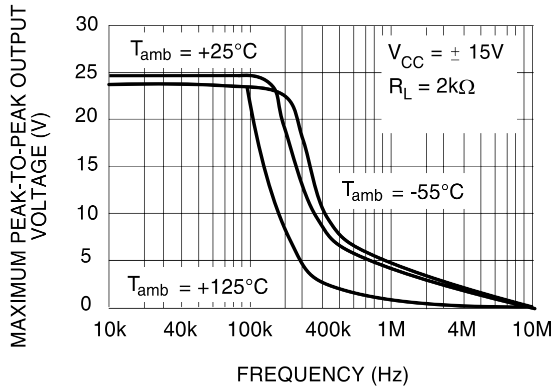


Figure 5: Maximum peak-to-peak output voltage versus load resistance

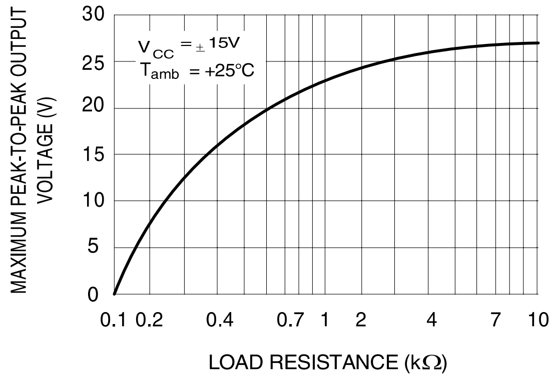


Figure 6: Maximum peak-to-peak output voltage versus frequency

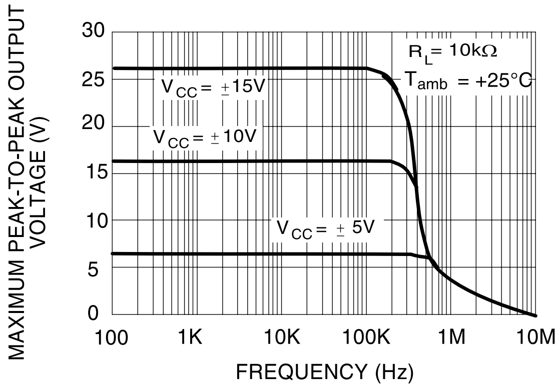


Figure 7: Maximum peak-to-peak output voltage versus free air temperature

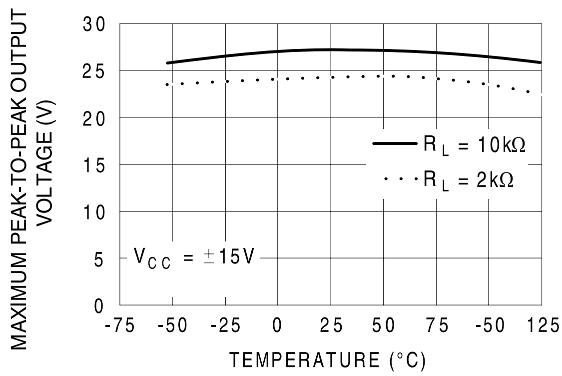


Figure 8: Maximum peak-to-peak output voltage versus supply voltage

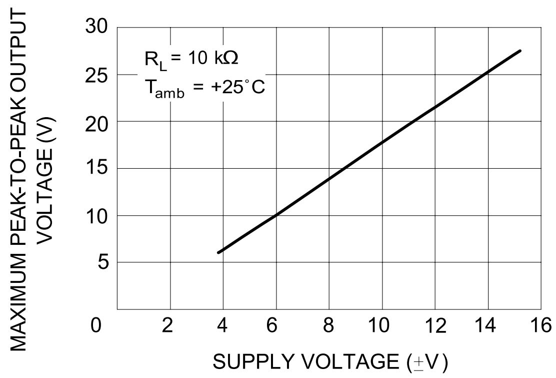


Figure 9: Input bias current versus free air temperature

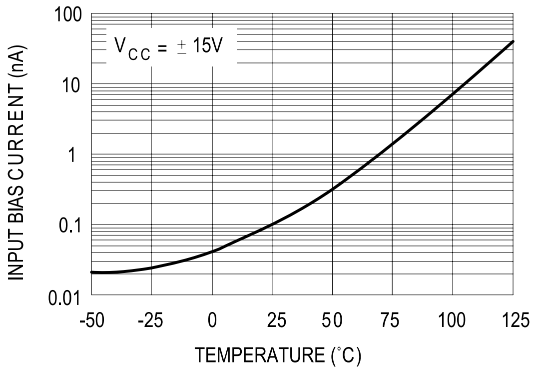


Figure 10: Large signal differential voltage amplification and phase shift versus frequency

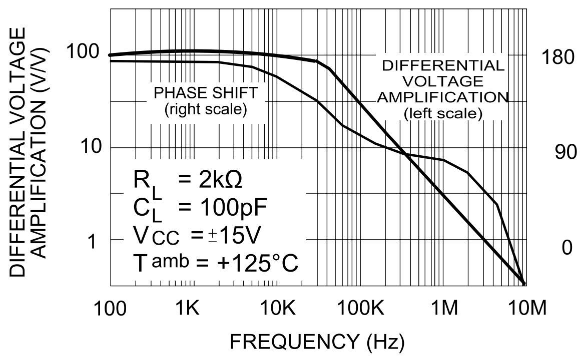


Figure 11: Supply current per amplifier versus free air temperature

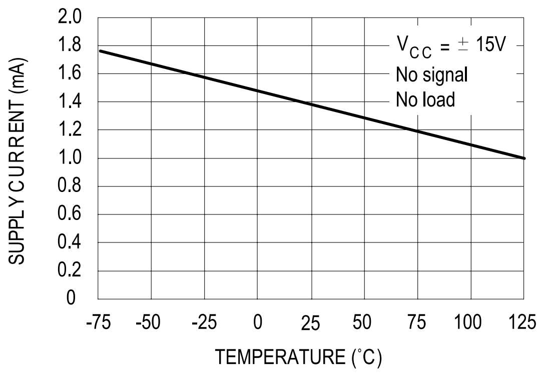


Figure 12: Large signal differential voltage amplification versus free air temperature

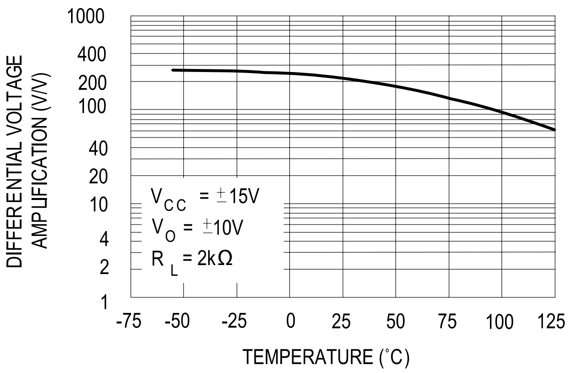


Figure 13: Total power dissipation versus free air temperature

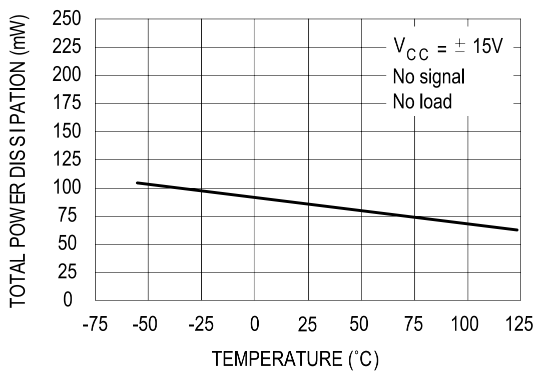


Figure 14: Supply current per amplifier versus supply voltage

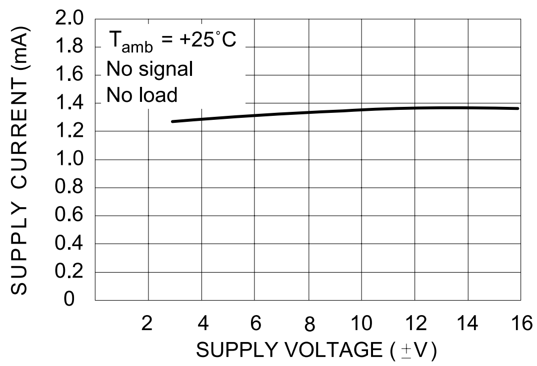


Figure 15: Common-mode rejection ratio versus free air temperature

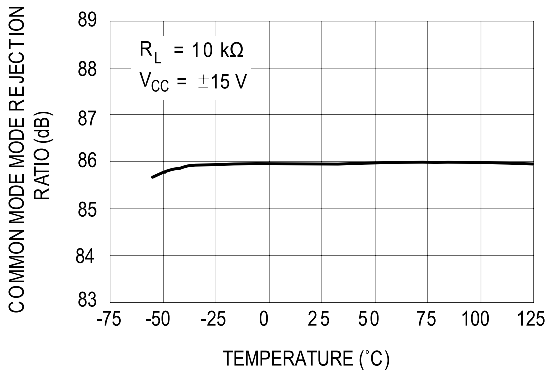


Figure 16: Output voltage versus elapsed time

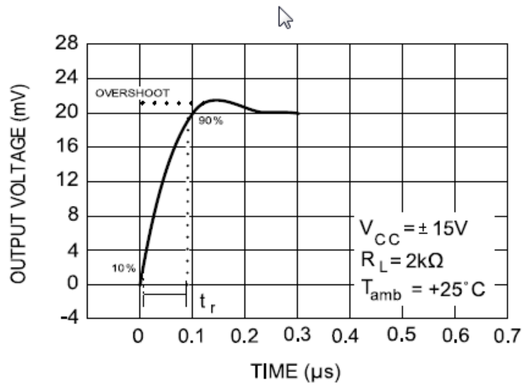


Figure 17: Voltage follower large signal pulse response

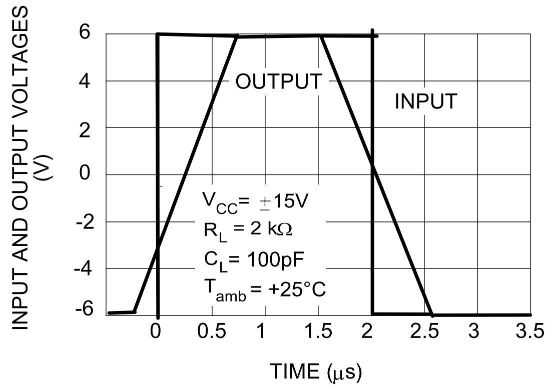


Figure 18: Equivalent input noise voltage versus frequency

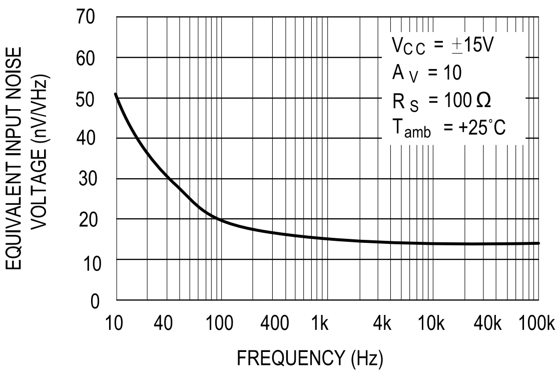
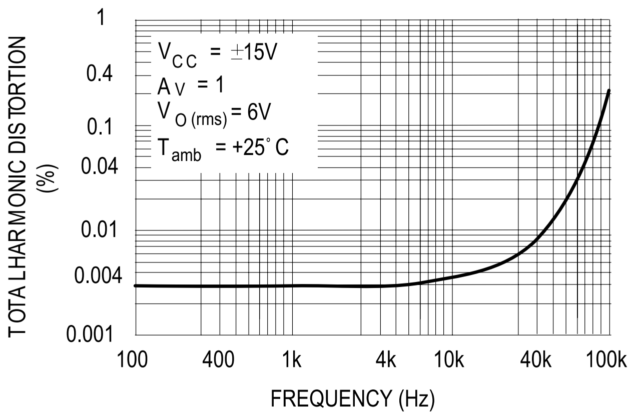


Figure 19: Total harmonic distortion versus frequency



6 Parameter measurement information

Figure 20: Voltage follower

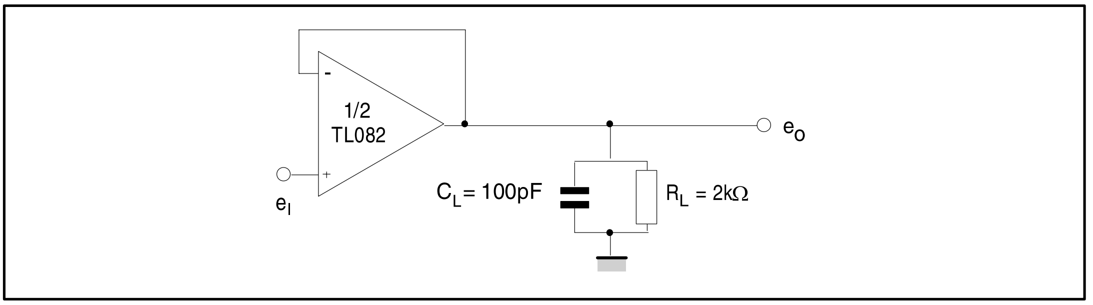
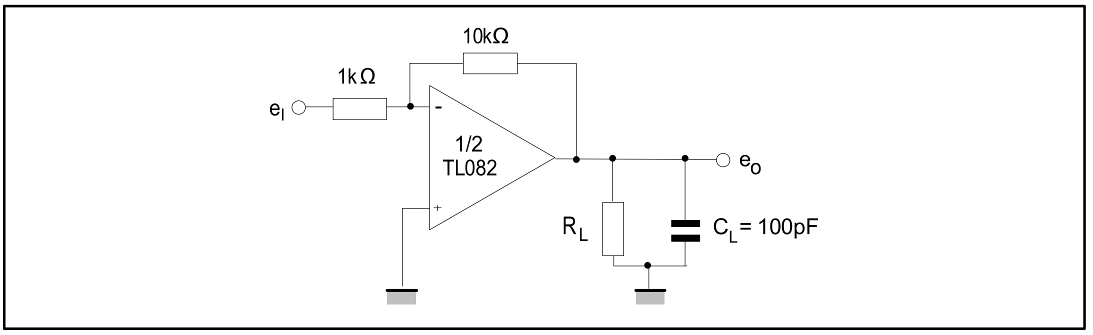
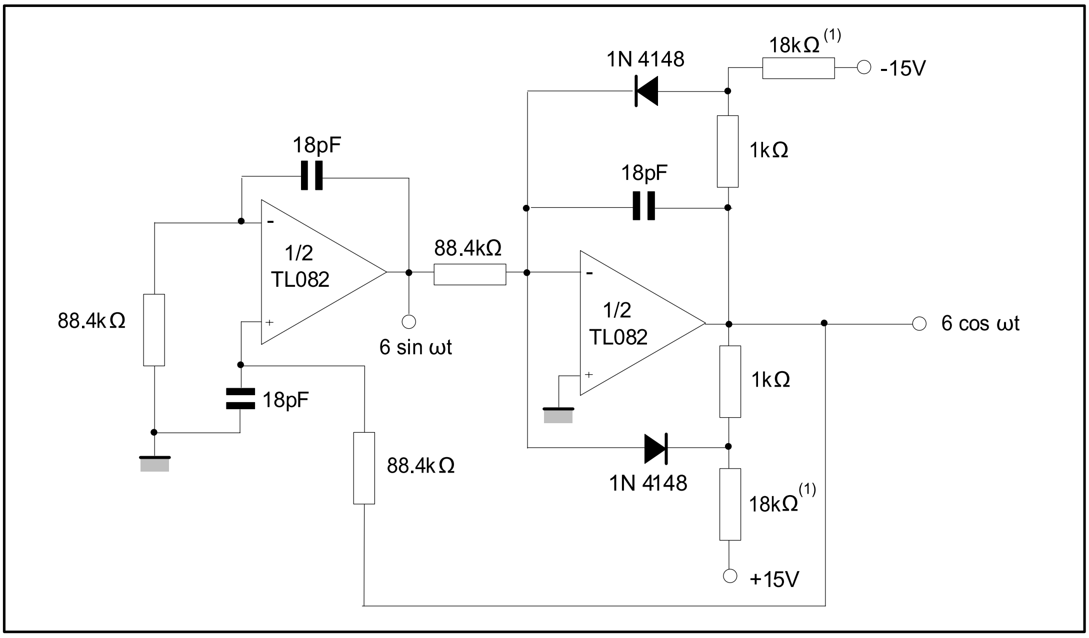


Figure 21: Gain-of-10 inverting amplifier



7 Typical applications

Figure 22: 100 kHz quadruple oscillator



1. These resistor values may be adjusted for a symmetrical output

8 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.

8.1 SO8 package information

Figure 23: SO8 package outline

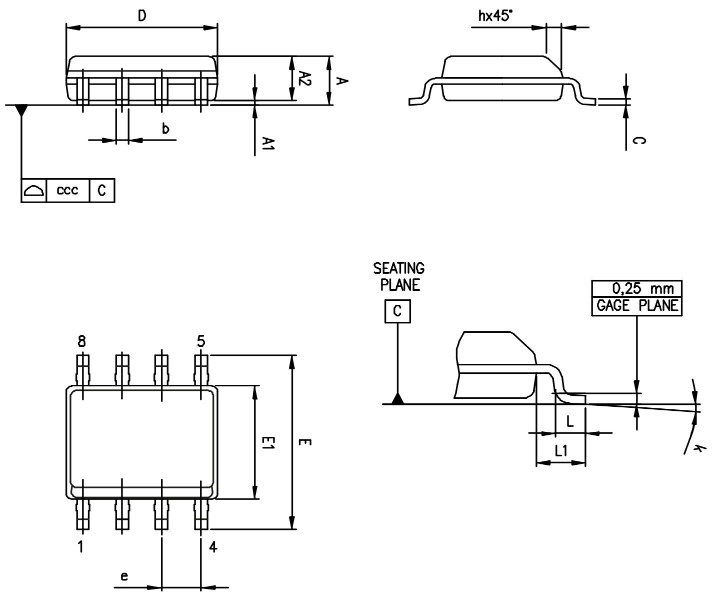


Table 4: SO8 mechanical data

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max
A			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
c	0.17		0.23	0.007		0.010
D	4.80	4.90	5.00	0.189	0.193	0.197
E	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
e		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

8.2 TSSOP8 package information

Figure 24: TSSOP8 package outline

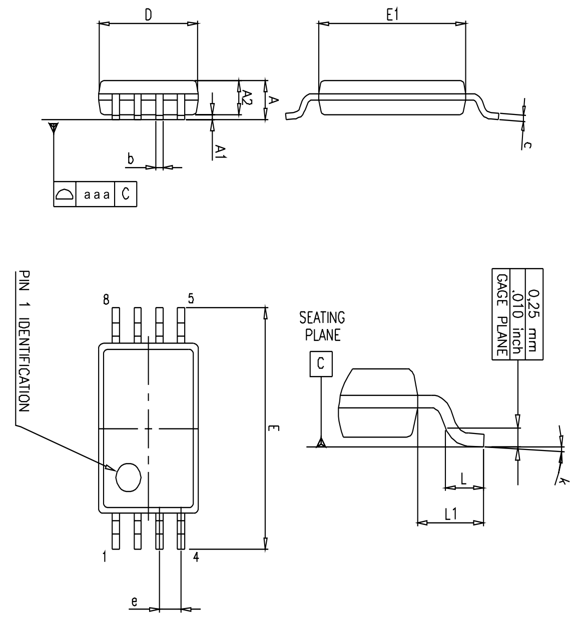


Table 5: TSSOP8 mechanical data

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.2			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
c	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
e		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		0.1			0.004	

9 Ordering information

Table 6: Order codes

<table>
<tr><th>Order code</th><th>Temperature range</th><th>Package</th><th>Packing</th><th>Marking</th></tr>
<tr><td>TL082ID</td><td rowspan="3">-40 °C to 105 °C</td><td rowspan="2">SO8</td><td rowspan="2">Tube or tape and reel</td><td rowspan="3">082I</td></tr>
<tr><td>TL082IDT</td></tr>
<tr><td>TL082IPT</td><td>TSSOP8</td><td>Tape and reel</td></tr>
<tr><td>TL082CD</td><td rowspan="5">0 °C to 70 °C</td><td rowspan="2">SO8</td><td rowspan="2">Tube or tape and reel</td><td rowspan="3">082C</td></tr>
<tr><td>TL082CDT</td></tr>
<tr><td>TL082CPT</td><td>TSSOP8</td><td>Tape and reel</td></tr>
<tr><td>TL082ACDT</td><td rowspan="2">SO8</td><td rowspan="5">Tube or tape and reel</td><td>082AC</td></tr>
<tr><td>TL082BCDT</td><td>082BC</td></tr>
<tr><td>TL082IYDT [(1)]</td><td rowspan="3">-40 °C to 105 °C</td><td rowspan="3">SO8 (automotive grade)</td><td>082IY</td></tr>
<tr><td>TL082AIYDT [(1)]</td><td>82AIY</td></tr>
<tr><td>TL082BIYDT [(1)]</td><td>82BIY</td></tr>
</table>

Notes:

[(1)]Qualified and characterized according to AEC Q100 and Q003 or equivalent, advanced screening according to AEC Q001 and Q 002 or equivalent.

10 Revision history

Table 7: Document revision history

Date	Revision	Changes
02-Apr-2001	1	Initial release.
2002-2003	2-7	Internal revisions.
30-Apr-2004	8	Format update.
06-Mar-2007	9	Added ESD information in Table 1 on page 4. Expanded order codes table and added automotive grade order codes. See Table 7 on page 16. Added Table 2: Operating conditions on page 4. Updated package information to make it compliant with the latest JEDEC standards.
12-Jun-2008	10	Removed information concerning military temperature range (TL082M*, TL082AM*, TL082BM*).
10-Jun-2016	11	Removed DIP8 package and all obsolete order codes Updated document layout *Table 4*: added L1 dimension *Figure 24*: removed silhouette and added package outline

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Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.

Как с нами связаться

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