TL072 TL072A TL072B

Low noise JFET dual operational amplifiers

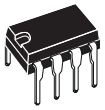
Features

- Wide common-mode (up to V_{CC}^+) and differential voltage range
- Low input bias and offset current
- Low noise e_n = 15 nV/√Hz (typ)
- Output short-circuit protection
- High input impedance JFET input stage
- Low harmonic distortion: 0.01% (typical)
- Internal frequency compensation
- Latch-up free operation
- High slew rate: 16 V/µs (typ)

Description

The TL072, TL072A and TL072B are high speed JFET input dual operational amplifiers incorporating well matched, high voltage JFET and bipolar transistors in a monolithic integrated circuit.

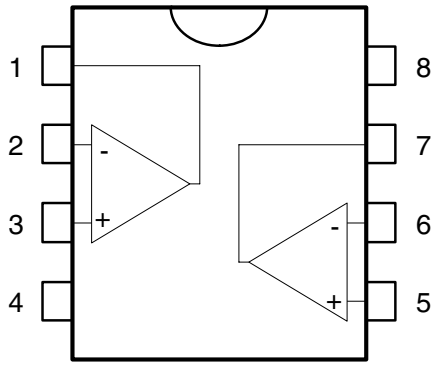
The devices feature high slew rates, low input bias and offset current, and low offset voltage temperature coefficient.



N
DIP8
(Plastic package)

D
SO-8
(Plastic micropackage)

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}^+

2 Absolute maximum ratings and operating conditions

Table 1. Absolute maximum ratings

Symbol	Parameter	TL072I, AI, BI	TL072C, AC, BC	Unit
V_{CC}	Supply voltage (1)	±18		V
V_{in}	Input voltage (2)	±15		V
V_{id}	Differential input voltage (3)	±30		V
R_{thja}	Thermal resistance junction to ambient(4) SO-8 DIP8	 125 85		°C/W
R_{thjc}	Thermal resistance junction to case (4) SO-8 DIP8	 40 41		°C/W
	Output short-circuit duration (5)	Infinite		
T_{stg}	Storage temperature range	-65 to +150		°C
ESD	HBM: human body model(6)	1		kV
	MM: machine model(7)	200		V
	CDM: charged device model(8)	1.5		kV

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-circuits 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). This is 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

Symbol	Parameter	TL072I, AI, BI	TL072C, AC, BC	Unit
V_{CC}	Supply voltage	6 to 36		V
T_{oper}	Operating free-air temperature range	-40 to +105	0 to +70	°C

3 Electrical characteristics

Table 3. Electrical characteristics at V_{CC} = ±15V, T_{amb} = +25°C (unless otherwise specified)

Symbol	Parameter	TL072I,AC,AI BC,BI			TL072C			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V_{io}	Input offset voltage (R_s = 50Ω) T_{amb} = +25°C TL072 TL072A TL072B $T_{min} \le T_{amb} \le T_{max}$ TL072 TL072A TL072B		 3 3 1	 10 6 3 13 7 5		 3	 10 13	 mV
DV_{io}	Input offset voltage drift		10			10		µV/°C
I_{io}	Input offset current (1) T_{amb} = +25°C $T_{min} \le T_{amb} \le T_{max}$		5	100 4		5	100 10	pA nA
I_{ib}	Input bias current (1) T_{amb} = +25°C $T_{min} \le T_{amb} \le T_{max}$		20	200 20		20	200 20	pA nA
A_{vd}	Large signal voltage gain (R_L = 2kΩ, V_o = ±10V) T_{amb} = +25°C $T_{min} \le T_{amb} \le T_{max}$	50 25	200		25 15	200		V/mV
SVR	Supply voltage rejection ratio (R_S = 50Ω) T_{amb} = +25°C $T_{min} \le T_{amb} \le T_{max}$	80 80	86		70 70	86		dB
I_{CC}	Supply current, no load T_{amb} = +25°C $T_{min} \le T_{amb} \le T_{max}$		1.4	2.5 2.5		1.4	2.5 2.5	mA
V_{icm}	Input common mode voltage range	±11	-12 to +15		±11	-12 to +15		V
CMR	Common mode rejection ratio (R_S = 50Ω) T_{amb} = +25°C $T_{min} \le T_{amb} \le T_{max}$	80 80	86		70 70	86		dB
I_{os}	Output short-circuit current T_{amb} = +25°C $T_{min} \le T_{amb} \le T_{max}$	10 10	40	60 60	10 10	40	60 60	mA

Table 3. Electrical characteristics at V_{CC} = ±15V, T_{amb} = +25°C (unless otherwise specified) (continued)

Symbol	Parameter	TL072I,AC,AI BC,BI			TL072C			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
$\pm V_{opp}$	Output voltage swing T_{amb} = +25°C R_L = 2kΩ R_L = 10kΩ $T_{min} \leq T_{amb} \leq T_{max}$ R_L = 2kΩ R_L = 10kΩ	 10 12 10 12	 12 13.5 	 	 10 12 10 12	 12 13.5 	 	V
SR	Slew rate V_{in} = 10V, R_L = 2kΩ, C_L = 100pF, unity gain	8	16		8	16		V/µs
t_r	Rise time V_{in} = 20mV, R_L = 2kΩ, C_L = 100pF, unity gain		0.1			0.1		µs
K_{ov}	Overshoot V_{in} = 20mV, R_L = 2kΩ, C_L = 100pF, unity gain		10			10		%
GBP	Gain bandwidth product V_{in} = 10mV, R_L = 2kΩ, C_L = 100pF, F= 100kHz	2.5	4		2.5	4		MHz
R_i	Input resistance		10^{12}			10^{12}		Ω
THD	Total harmonic distortion F= 1kHz, R_L = 2kΩ,C_L = 100pF, A_v = 20dB, $V_o = 2V_{pp}$		0.01			0.01		%
e_n	Equivalent input noise voltage R_S = 100Ω, F= 1kHz		15			15		$\frac{nV}{\sqrt{Hz}}$
∅m	Phase margin		45			45		degrees
V_{o1}/V_{o2}	Channel separation A_v = 100		120			120		dB

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

6.2 SO-8 package information

Figure 22. SO-8 package mechanical drawing

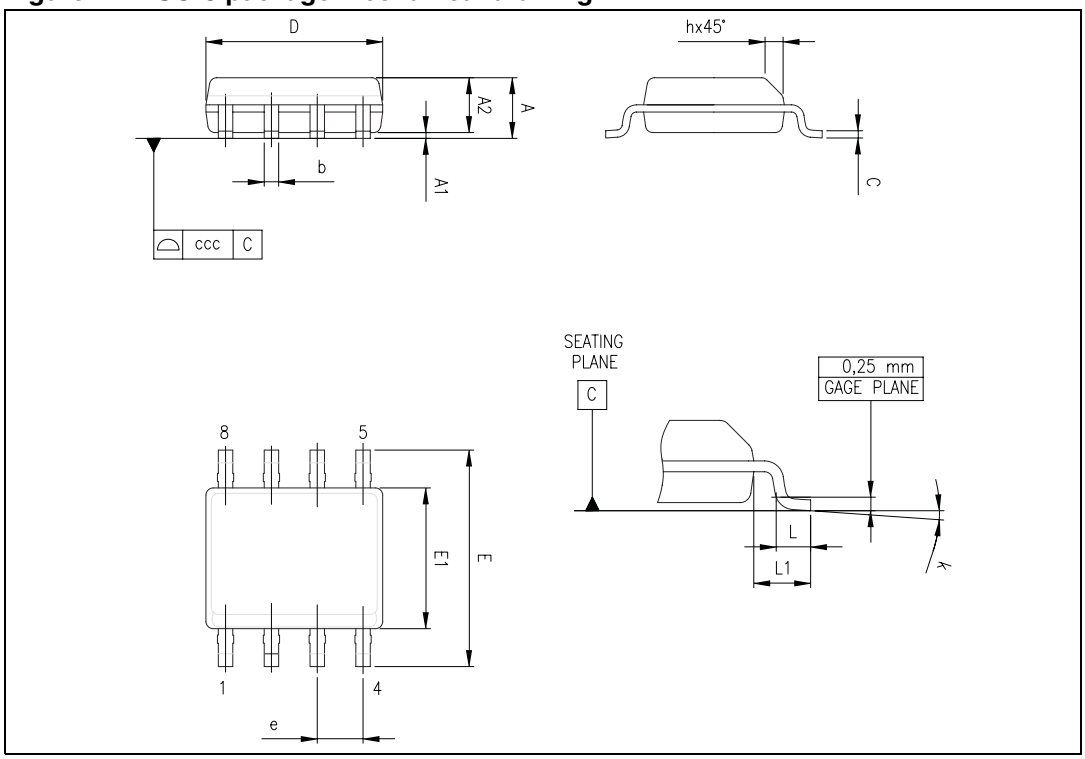


Table 5. SO-8 package mechanical data

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
k	1°		8°	1°		8°
ccc			0.10			0.004

7 Ordering information

Table 6. Order codes

Order code	Temperature range	Package	Packing	Marking
TL072IN	-40°C, +105°C	DIP8	Tube	TL072IN
TL072AIN				TL072AIN
TL072BIN				TL072BIN
TL072ID TL072IDT		SO-8	Tube or tape & reel	072I
TL072AID TL072AIDT				072AI
TL072BID TL072BIDT				072BI
TL072CN	0°C, +70°C	DIP8	Tube	TL072CN
TL072ACN				TL072ACN
TL072BCN				TL072BCN
TL072CD TL072CDT		SO-8	Tube or tape & reel	072C
TL072ACD TL072ACDT				072AC
TL072BCD TL072BCDT				072BC
TL072IYD/DT(1) TL072AIYD/DT(1) TL072BIYD/DT(1)	-40°C, +105°C	SO-8 (Automotive grade)	Tube or tape & reel	072IY 072AIY 072BIY

1. Qualification and characterization according to AEC Q100 and Q003 or equivalent, advanced screening according to AEC Q001 & Q 002 or equivalent.