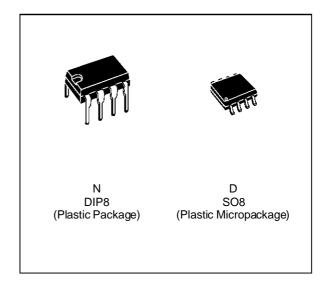


TL081 TL081A - TL081B

GENERAL PURPOSE J-FET SINGLE OPERATIONAL AMPLIFIER

- WIDE COMMON-MODE (UP TO V_{CC}⁺) AND DIFFERENTIAL VOLTAGE RANGE
- LOW INPUT BIAS AND OFFSET CURRENT
- OUTPUT SHORT-CIRCUIT PROTECTION
- HIGH INPUT IMPEDANCE J-FET INPUT STAGE
- INTERNAL FREQUENCY COMPENSATION
- LATCH UP FREE OPERATION
- HIGH SLEW RATE: 16V/µs (typ)



DESCRIPTION

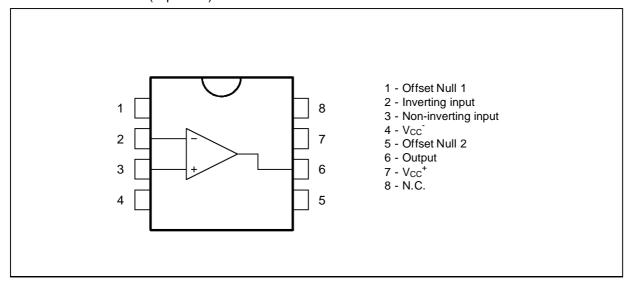
The TL081, TL081A and TL081B are high speed J–FET inputsingle operational amplifiers incorporating well matched, high voltage J–FET and bipolar transistors in a monolithic integrated circuit.

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

ORDER CODES

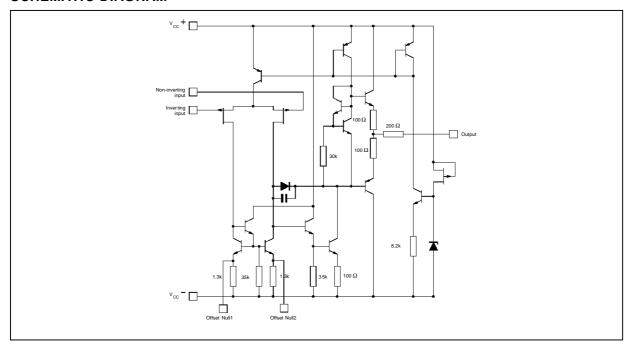
Part Number	Temperature	Package		
Part Number	Range	N	D	
TL081M/AM/BM	–55°C, +125°C	•	•	
TL081I/AI/BI	–40°C, +105°C	•	•	
TL081C/AC/BC	0°C, +70°C	•	•	
Examples : TL081	•	•		

PIN CONNECTIONS (top view)

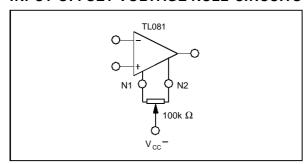


October 1997 1/9

SCHEMATIC DIAGRAM



INPUT OFFSET VOLTAGE NULL CIRCUITS



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter		Value	Unit
Vcc	Supply Voltage - (note 1)		±18	V
Vi	Input Voltage - (note 3)		±15	V
V _{id}	Differential Input Voltage - (note 2)		±30	V
P _{tot}	Power Dissipation		680	mW
	Output Short-circuit Duration - (note 4)		Infinite	
T _{oper}	Operating Free Air Temperature Range	TL081C,AC,BC TL081I,AI,BI TL081M,AM,BM	0 to 70 -40 to 105 -55 to 125	°C
T _{stg}	Storage Temperature Range		-65 to 150	°C

Notes:

- 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}⁻.
 Differential voltages are at the non-inverting input terminal with respect to the inverting input terminal.
 The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15 volts, whichever is less.
 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.



ELECTRICAL CHARACTERISTICS

 $V_{CC} = \pm 15V$, $T_{amb} = 25^{\circ}C$ (unless otherwise specified)

Symbol	Parameter		TL081I,M,AC,AI, AM,BC,BI,BM			TL081C		
		Min.	Тур.	Max.	Min.	Тур.	Max.	
Vio	Input Offset Voltage (Rs = 50Ω) $T_{amb} = 25^{\circ}C$ $T_{min.} \leq T_{amb} \leq T_{max.}$ $TL081BC,BI,BM$ $TL081BC,BI,BM$		3	6 3 7 5		3	10 13	mV
DV _{io}	Input Offset Voltage Drift		10			10		μV/°C
l _{io}	Input Offset Current * $T_{amb} = 25^{\circ}C$ $T_{min.} \le T_{amb} \le T_{max.}$		5	100 4		5	100 4	pA nA
l _{ib}	Input Bias Current * $T_{amb} = 25^{\circ}C$ $T_{min.} \le T_{amb} \le T_{max.}$		20	200 20		20	400 20	pA nA
A _{vd}	Large Signal Voltage Gain ($R_L = 2k\Omega$, $V_O = \pm 10V$) $T_{amb} = 25^{\circ}C$ $T_{min.} \le T_{amb} \le T_{max.}$	50 25	200		25 15	200		V/mV
SVR	Supply Voltage Rejection Ratio (R _S = 50Ω) $T_{amb} = 25^{\circ}C$ $T_{min.} \le T_{amb} \le T_{max.}$	80 80	86		70 70	86		dB
Icc	Supply Current, no Load $T_{amb} = 25^{\circ}C$ $T_{min.} \le T_{amb} \le T_{max.}$		1.4	2.5 2.5		1.4	2.5 2.5	mA
V _{icm}	Input Common Mode Voltage Range	±11	+15 -12		±11	+15 -12		V
CMR	Common Mode Rejection Ratio (R _S = 50Ω) $T_{amb} = 25^{\circ}C$ $T_{min.} \le T_{amb} \le T_{max.}$	80 80	86		70 70	86		dB
los	Output Short-circuit Current $T_{amb} = 25^{\circ}C$ $T_{min.} \le T_{amb} \le T_{max.}$	10 10	40	60 60	10 10	40	60 60	mA
±V _{OPP}	$ \begin{array}{ll} \text{Output Voltage Swing} \\ T_{amb} = 25^{\circ}C & R_L = 2k\Omega \\ R_L = 10k\Omega \\ T_{min.} \leq T_{amb} \leq T_{max.} & R_L = 2k\Omega \\ R_L = 10k\Omega \end{array} $	10 12 10 12	12 13.5		10 12 10 12	12 13.5		V
SR	Slew Rate (V_{in} = 10V, R_L = 2k Ω , C_L = 100pF, T_{amb} = 25°C, unity gain)	8	16		8	16		V/μs
t _r	Rise Time (V_{in} = 20mV, R_L = 2k Ω , C_L = 100pF, T_{amb} = 25°C, unity gain)		0.1			0.1		μs
Kov	Overshoot (V_{in} = 20mV, R_L = 2k Ω , C_L = 100pF, T_{amb} = 25°C, unity gain)		10			10		%
GBP	Gain Bandwidth Product (f = 100kHz, $T_{amb} = 25^{\circ}C$, $V_{in} = 10$ mV, $R_{L} = 2$ k Ω , $C_{L} = 100$ pF)	2.5	4		2.5	4		MHz
R _i	Input Resistance		10 ¹²			10 ¹²		Ω
THD	Total Harmonic Distortion (f = 1kHz, A_V = 20dB, R_L = 2k Ω , C_L = 100pF, T_{amb} = 25°C, V_O = 2V _{PP})		0.01			0.01		%
en	Equivalent Input Noise Voltage (f = 1kHz, R _s = 100Ω)		15			15		$\frac{\text{nV}}{\sqrt{\text{Hz}}}$
Øm	Phase Margin		45			45		Degrees

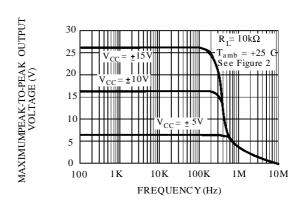
^{*} The input bias currents are junction leakage currents which approximately double for every 10°C increase in the junction temperature.



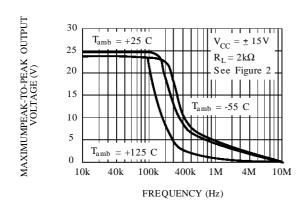
MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS FREQUENCY

30 V_{CC} = ± 15V $R_1 = 2k\Omega$ MAXIMUM PEAK-TO-PEAKOUTPUT 25 T_{amb} = +25°C See Figure 2 20 15 10 $= \pm 5V$ 5 0 100 10M 1K 100K 1M 10K FREQUENCY (Hz)

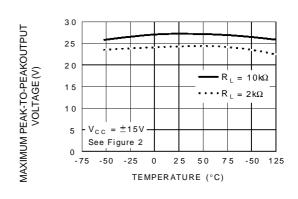
MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS FREQUENCY



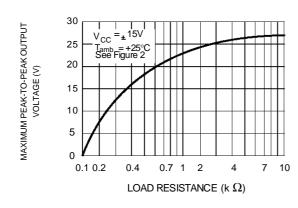
MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS FREQUENCY



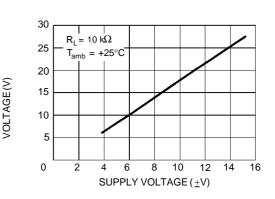
MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS FREE AIR TEMP.



MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS LOAD RESISTANCE



MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS SUPPLY VOLTAGE

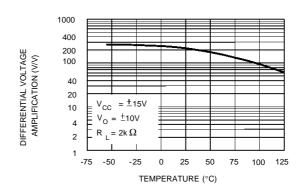


MAXIMUM PEAK-TO-PEAKOUTPUT

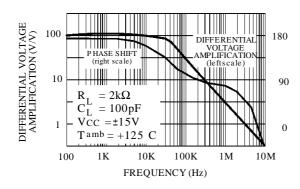
INPUT BIAS CURRENT VERSUS FREE AIR TEMPERATURE

100 V_{CC} = ±15V 10 0.01 -50 -25 0 25 50 75 100 125 TEMPERATURE (°C)

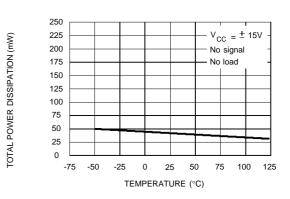
LARGE SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION VERSUS FREE AIR TEMPERATURE



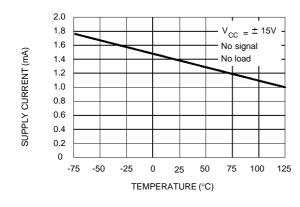
LARGE SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION AND PHASE SHIFT VERSUS FREQUENCY



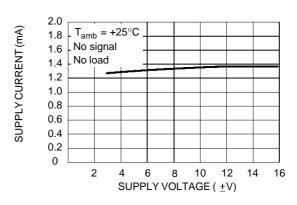
TOTAL POWER DISSIPATION VERSUS FREE AIR TEMPERATURE



SUPPLY CURRENT PER AMPLIFIER VERSUS FREE AIR TEMPERATURE



SUPPLY CURRENT PER AMPLIFIER VERSUS SUPPLY VOLTAGE



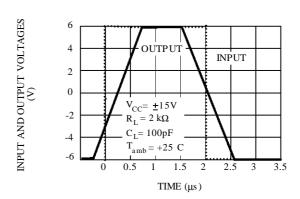


COMMON MODE REJECTION RATIO

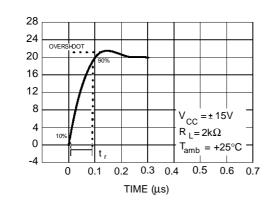
VERSUS FREE AIR TEMPERATURE

89 = 10 kΩ COMMON MODE MODE REJECTION 88 $V_{CC} = \pm 15V$ 87 RATIO (dB) 86 85 84 83 -75 100 -50 -25 0 25 50 75 125 TEMPERATURE (°C)

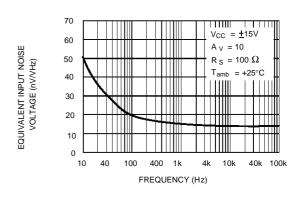
VOLTAGE FOLLOWER LARGE SIGNAL PULSE RESPONSE



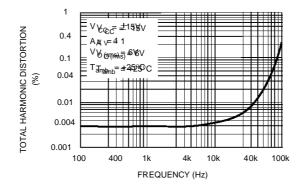
OUTPUT VOLTAGE VERSUS ELAPSED TIME



EQUIVALENT INPUT NOISE VOLTAGE VERSUS FREQUENCY



TOTAL HARMONIC DISTORTION VERSUS FREQUENCY



OUTPUT VOLTAGE (mV)

PARAMETER MEASUREMENT INFORMATION

Figure 1: Voltage Follower

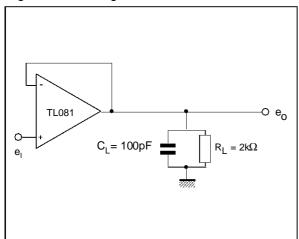
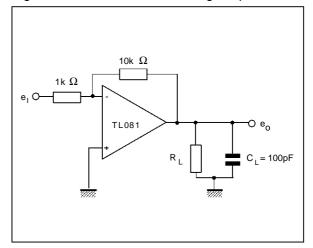
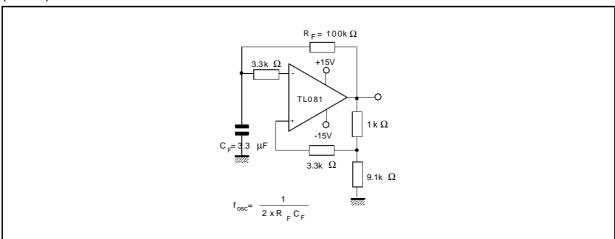


Figure 2: Gain-of-10 Inverting Amplifier

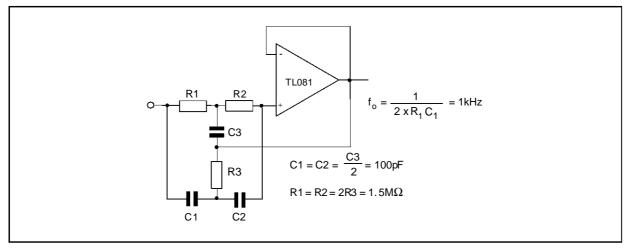


TYPICAL APPLICATIONS

(0.5Hz) SQUARE WAVE OSCILLATOR

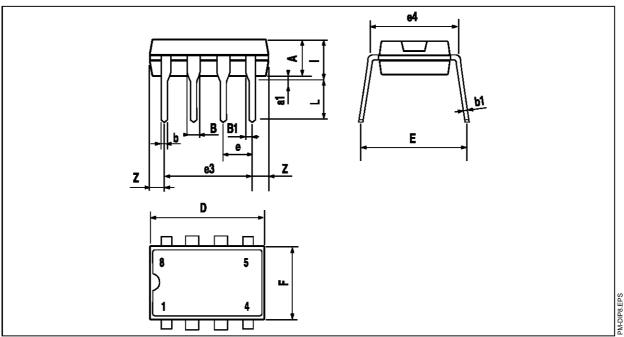


HIGH Q NOTCH FILTER



PACKAGE MECHANICAL DATA

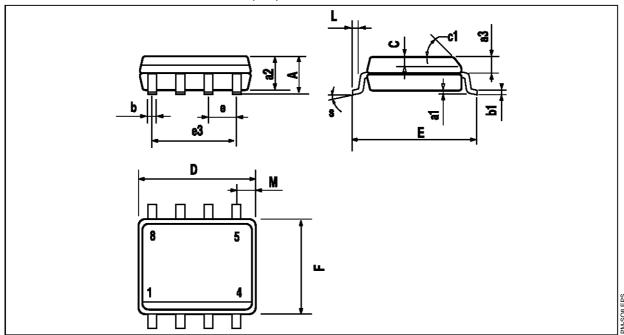
8 PINS - PLASTIC DIP



Dimensions		Millimeters			Inches	
Difficitsions	Min.	Тур.	Max.	Min.	Тур.	Max.
Α		3.32			0.131	
a1	0.51			0.020		
В	1.15		1.65	0.045		0.065
b	0.356		0.55	0.014		0.022
b1	0.204		0.304	0.008		0.012
D			10.92			0.430
Е	7.95		9.75	0.313		0.384
е		2.54			0.100	
e3		7.62			0.300	
e4		7.62			0.300	
F			6.6			0260
i			5.08			0.200
L	3.18		3.81	0.125		0.150
Z			1.52			0.150 0.060

PACKAGE MECHANICAL DATA

8 PINS - PLASTIC MICROPACKAGE (SO)



Dimensions		Millimeters			Inches	
	Min.	Тур.	Max.	Min.	Тур.	Max.
А			1.75			0.069
a1	0.1		0.25	0.004		0.010
a2			1.65			0.065
a3	0.65		0.85	0.026		0.033
b	0.35		0.48	0.014		0.019
b1	0.19		0.25	0.007		0.010
С	0.25		0.5	0.010		0.020
c1			45°	(typ.)		
D	4.8		5.0	0.189		0.197
E	5.8		6.2	0.228		0.244
е		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.150		0.157
L	0.4		1.27	0.016		0.050
М			0.6			0.024
S	8° (max.)					

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