

## LOW NOISE QUAD J-FET OPERATIONAL AMPLIFIER

### ■ Description

The TTESEMI TL084 is a high speed J-FET input dual operational amplifier. It incorporates well matched, high voltage J-FET and bipolar transistors in a monolithic integrated circuit. The device features high slew rates, low input bias and offset current, and low offset voltage temperature coefficient.

### ■ Features

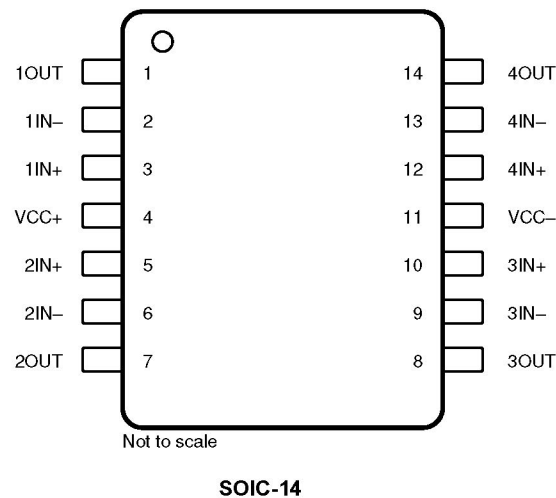
- \* Low Power Consumption
- \* Wide Common-Mode (Up To VCC+) and Differential Voltage Range
- \* Low Input Bias and Offset Current
- \* Low Noise  $eN = 15nV/\sqrt{Hz}$  (typ.)
- \* Output Short-Circuit Protection
- \* High Input Impedance J-FET Input Stage
- \* Low Harmonic Distortion: 0.01% (typ.)
- \* Internal Frequency Compensation
- \* Latch up Free Operation

### ■ Applications

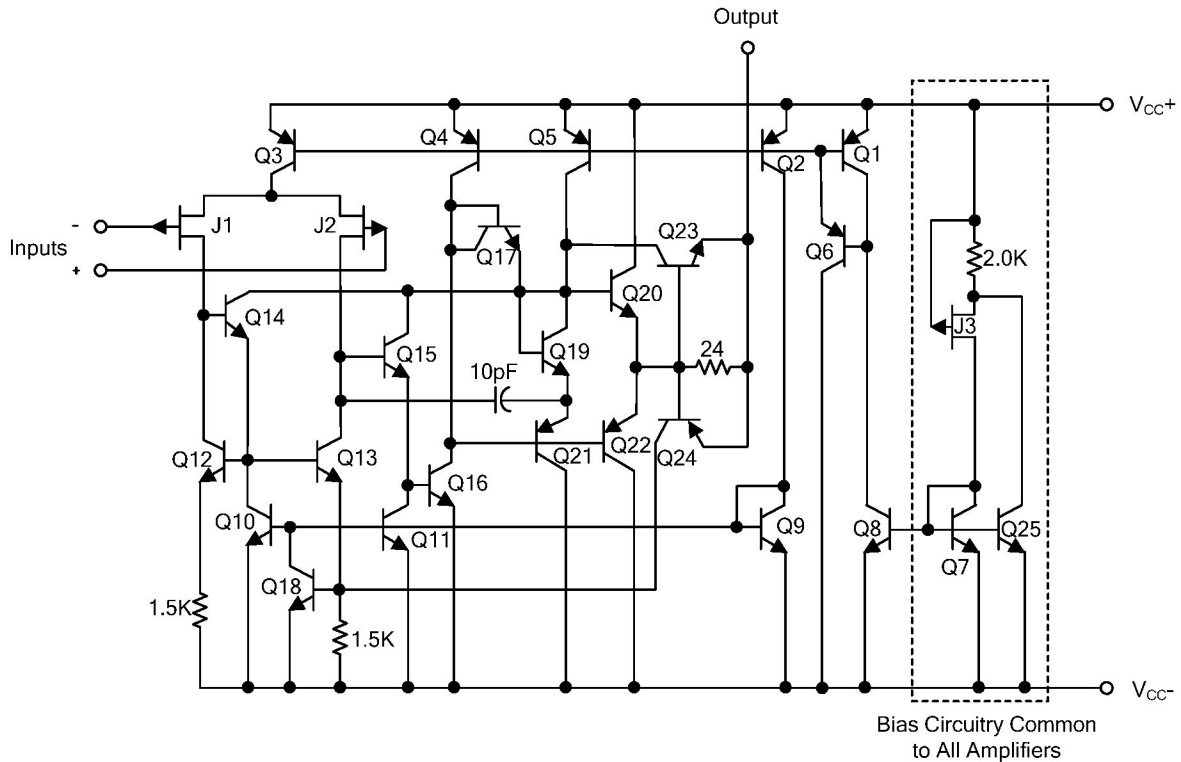
- Solar energy: string and central inverter
- Motor drives: AC and servo drive control and power stage modules
- Single phase online UPS
- Three phase UPS
- Pro audio mixers
- Battery test equipment

**Ordering Information**

Part Number	Package	Packing	Temperature(TA)	Package Qty	Remark
TLC084CDR	SOIC-14	Reel	0°C~70°C	2500	
TLC084IDR	SOIC-14	Reel	-40°C~85°C	2500	

**Pin Assignment**

**Pin Description**

PIN		I/O	DESCRIPTION
NAME	NO.		
1IN-	2	I	Inverting input
1IN+	3	I	Noninverting input
1OUT	1	O	Output
2IN-	6	I	Inverting input
2IN+	5	I	Noninverting input
2OUT	7	O	Output
3IN-	9	I	Inverting input
3IN+	10	I	Noninverting input
3OUT	8	O	Output
4IN-	13	I	Inverting input
4IN+	12	I	Noninverting input
4OUT	14	O	Output
V <sub>CC-</sub>	11	—	Power supply
V <sub>CC+</sub>	4	—	Power supply

**■ SCHEMATIC DIAGRAM**

**■ ABSOLUTE MAXIMUM RATINGS**

(TA=25°C, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage (Note 2)	$V_{CC}$	$\pm 18$	V
Input Voltage (Note 3)	$V_{IN}$	$\pm 15$	V
Differential Input Voltage (Note 4)	$V_{ID}$	$\pm 30$	V
Power Dissipation	SOP-8 $P_D$	440	mW
Output Short-Circuit Duration (Note 5)		Infinite	
Operating Temperature	$T_{OPR}$	-40 ~ +125 (Note 6)	°C
Storage Temperature Range	$T_{STG}$	-65 ~ +150	°C

- Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.
2. 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  $V_{CC+}$ .
3. The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15 volts, whichever is less.
4. Differential voltages are at the non-inverting input terminal with respect to the inverting input terminal.
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. It is guarantee by design, not 100% be tested.

**■ Electrical Characteristics**

(VCC=±15V, TA=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Offset Voltage	$V_{I(OFF)}$	$R_S \leq 10k\Omega$ , $V_{CM}=0V$		5	15	mV
Temperature Coefficient of Input Offset Voltage	$\Delta V_{I(OFF)}$	$R_S=50\Omega$		10		$\mu V/^\circ C$
Input Offset Current (Note)	$I_{I(OFF)}$	$V_{CM}=0V$		5	200	pA
Input Bias Current (Note1)	$I_{I(BIAS)}$	$V_{CM}=0V$		30	400	pA
Input Common Mode Voltage	$V_{I(CM)}$		±10	-12~+15		V
Output Voltage Swing	$V_{O(SW)}$	$T_A=25^\circ C$ , $R_L=2k\Omega$ ,	±10	±12		V
		$T_A=25^\circ C$ , $R_L=10k\Omega$	±12	±13.5		V
		$T_{MIN} \leq T_A \leq T_{MAX}$ , $R_L=2k\Omega$	±10			V
		$T_{MIN} \leq T_A \leq T_{MAX}$ , $R_L=10k\Omega$	±12			V
Large Signal Voltage Gain	$G_V$	$R_L \geq 2k\Omega$ , $V_{OUT}=\pm 10V$	25	150		V/mV
Gain Bandwidth Product	$GB_W$			1		MHz
Input Resistance	$R_{IN}$			$10^{12}$		$\Omega$
Common Mode Rejection Ratio	CMR	$R_S \leq 10k\Omega$	70	100		dB
Supply Voltage Rejection Ratio	SVR	$R_S \leq 10k\Omega$	70	100		dB
Supply Current	$I_{CC}$	No Load		1.4	2.8	mA
Channel Separation	V01/V02	$G_V=100$		120		dB
Slew Rate	SR	$V_{IN}=10V$ , $R_L=2k\Omega$ , $C_L=100pF$ , unity gain	2.0			V/ $\mu s$
Rise Time	$t_R$			0.1		$\mu s$
Overshoot Factor	$K_{OV}$	$V_{IN}=20mV$ , $R_L=2k\Omega$ , $C_L=100pF$ , unity gain		10		%
Equivalent Input Noise Voltage	eN	$R_S=100\Omega$ , $f=1KHz$		25		$nV/\sqrt{Hz}$

Note: The Input bias currents are junction leakage currents, which approximately double for every 10°C increase in the junction temperature.

■ PARAMETER MEASUREMENT INFORMATION

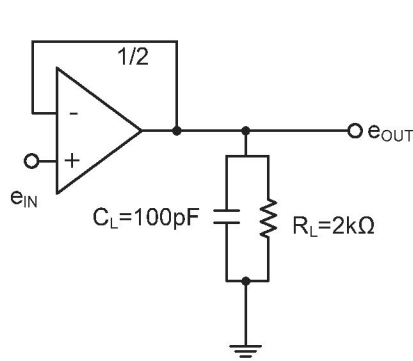


Figure 1. Voltage Follower

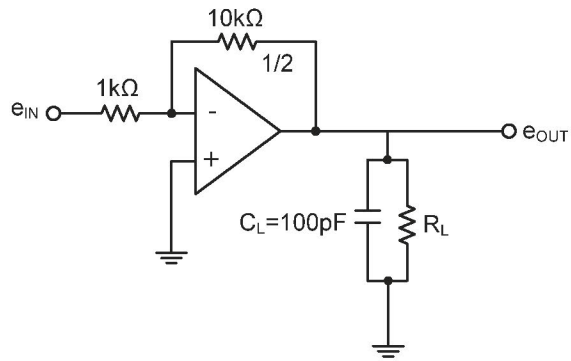
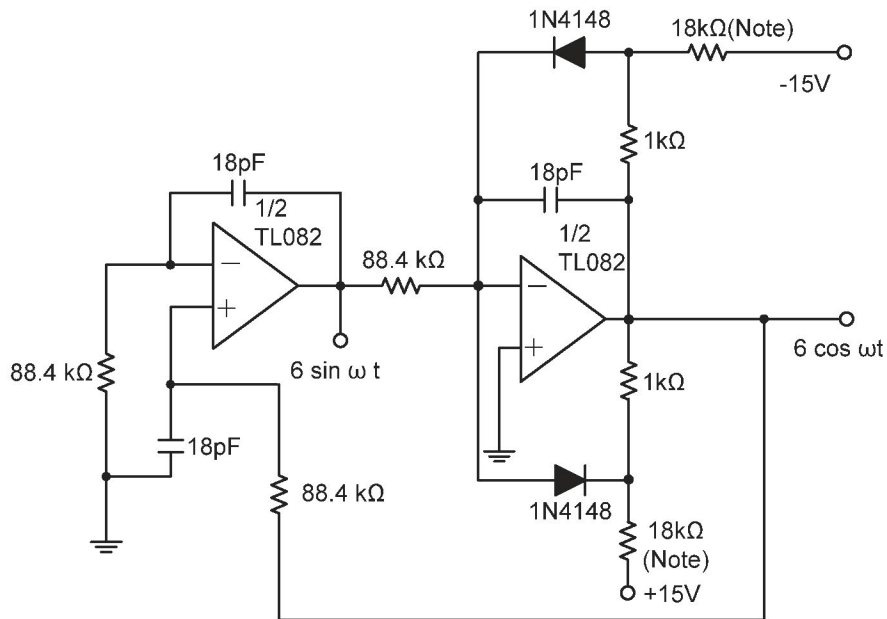


Figure 2. Gain-of-10 Inverting Amplifier

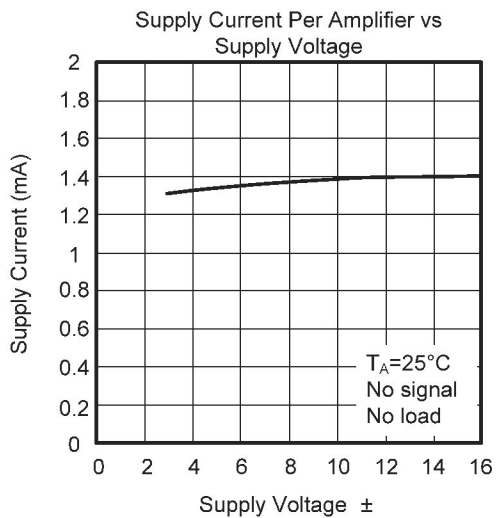
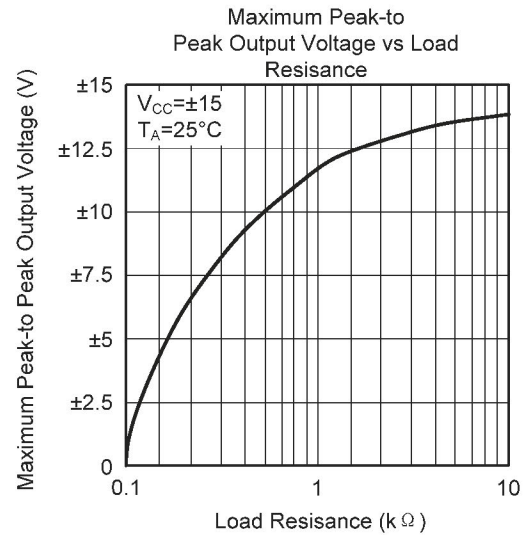
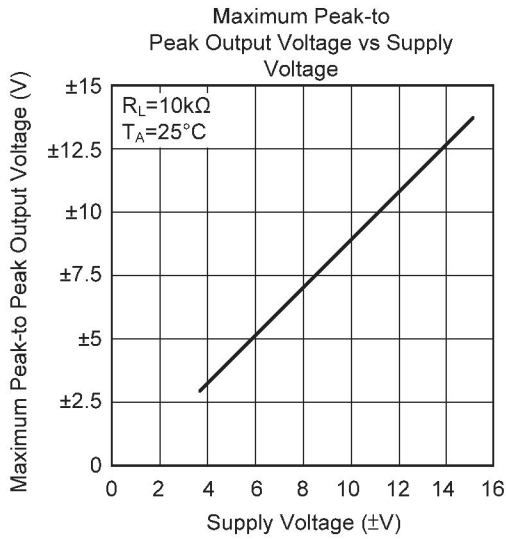
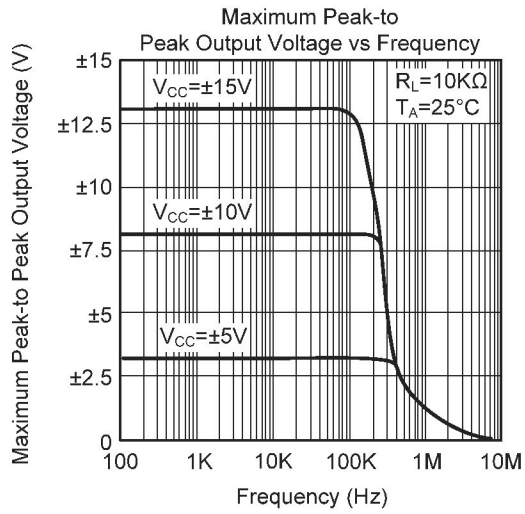
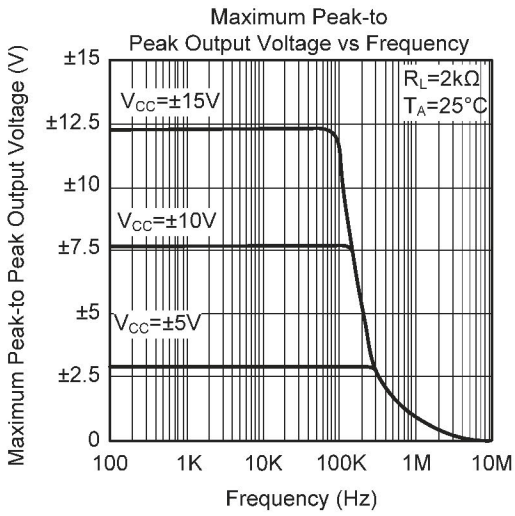
■ TYPICAL APPLICATION CIRCUIT

100 KHz Quadruple Oscillators



Note: These resistors values may be adjusted for a symmetrical output

■ **TYPICAL CHARACTERISTICS**



## Package diagram

SOIC14: plastic small outline package; 14 leads; body width 3.9 mm

