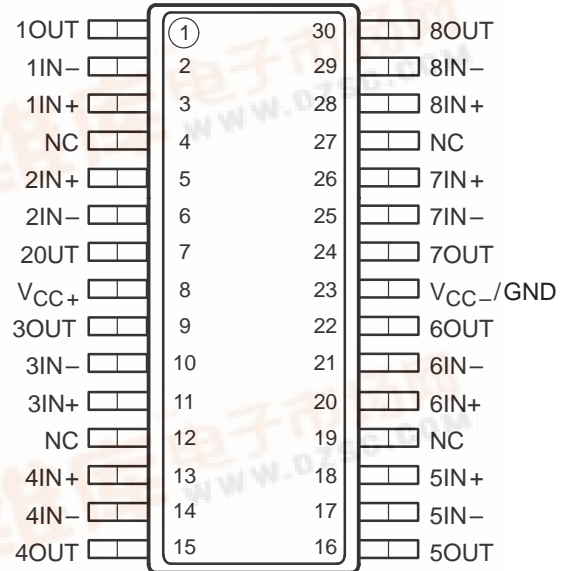


# OCTAL OPERATIONAL AMPLIFIER

SLOS133A – APRIL 1994 – REVISED AUGUST 1996

- **Wide Range of Supply Voltages:**  
Single Supply . . . 3 V to 30 V  
or Dual Supplies
- **Low Supply-Current Drain Independent of Supply Voltage** . . . 1.4 mA Typ
- **Common-Mode Input Voltage Range**  
Includes Ground Allowing Direct Sensing Near Ground
- **Low Input Bias and Offset Parameters:**  
Input Offset Voltage . . . 3 mV Typ  
Input Offset Current . . . 2 nA Typ  
Input Bias Current . . . –20 nA Typ
- **Differential Input Voltage Range Equal to Maximum-Rated Supply Voltage** . . . 32 V
- **Open-Loop Differential Voltage Amplification** . . . 100 V/mV Typ
- **Internal Frequency Compensation**

DB PACKAGE  
(TOP VIEW)



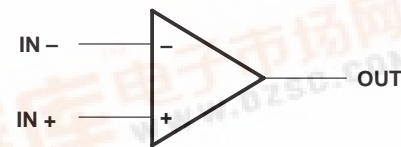
NC – No internal connection

## description

The LM324x2 device consists of eight independent, high-gain frequency-compensated operational amplifiers that are designed specifically to operate from a single supply over a wide range of voltages. Operation from split supplies is also possible when the difference between the two supplies is 3 V to 30 V and  $V_{CC}$  is at least 1.5 V more positive than the input common-mode voltage. The low supply-current drain is independent of the magnitude of the supply voltage.

Applications include transducer amplifiers, dc amplification blocks, and all the conventional operational-amplifier circuits that now can be more easily implemented in single-supply-voltage systems.

## symbol (each amplifier)

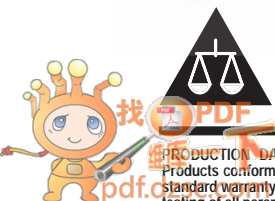


## AVAILABLE OPTION

T <sub>A</sub>	V <sub>IO</sub> max AT 25°C	PACKAGE
		SMALL OUTLINE (DB)†
0°C to 70°C	7 mV	LM324x2DBLE

† The DB package is only available left-end taped and reeled.

Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.



PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

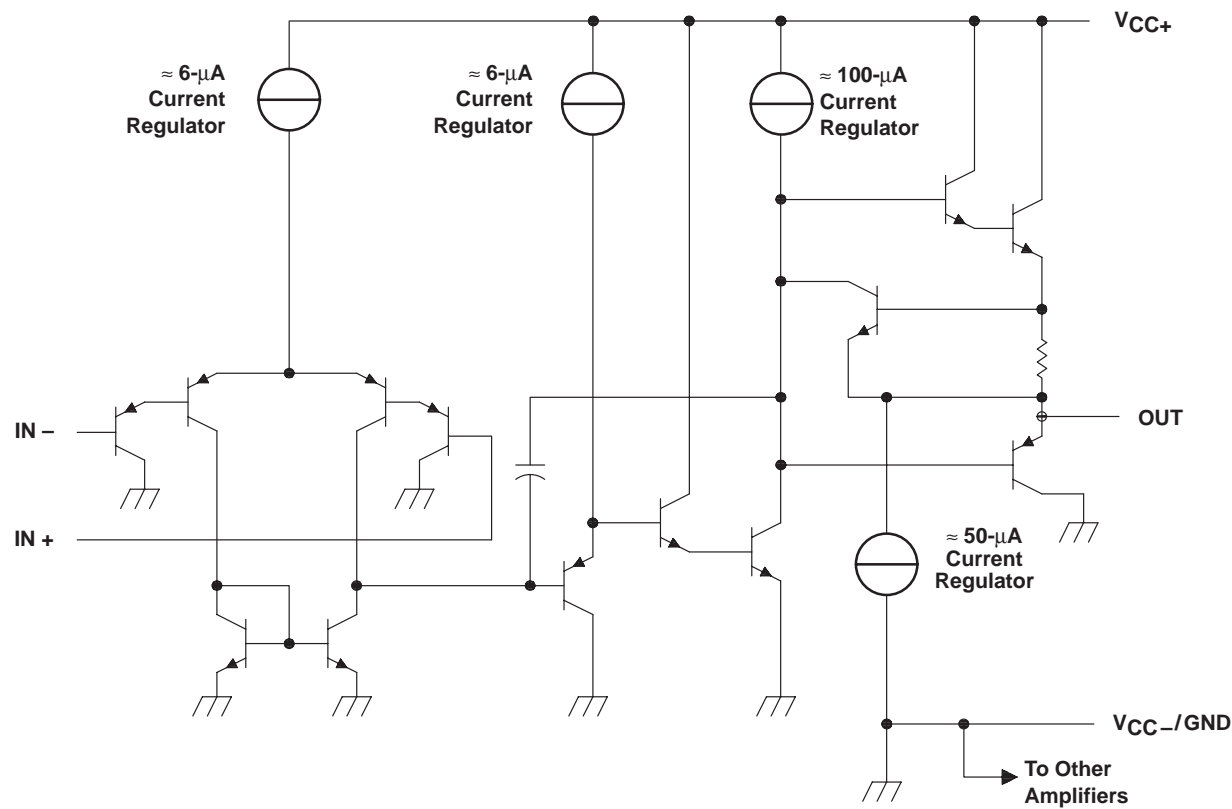


# LM324x2

## OCTAL OPERATIONAL AMPLIFIER

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### schematic (each amplifier)



COMPONENT COUNT (total device)	
Epi-FET	2
Transistors	190
Diodes	8
Resistors	22
Capacitors	8

# LM324x2 OCTAL OPERATIONAL AMPLIFIER

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## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>

Supply voltage, $V_{CC}$ (see Note 1)	32 V
Differential input voltage, $V_{ID}$ (see Note 2)	$\pm 32$ V
Input voltage range, $V_I$ (any input)	–0.3 V to 32 V
Duration of output short circuit to ground (see Note 3)	unlimited
Continuous total power dissipation	See Dissipation Rating Table
Operating free-air temperature range, $T_A$	0°C to 70°C
Storage temperature range	–65°C to 150°C

<sup>†</sup> Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these conditions beyond those indicated is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES:
1. All voltage values, except differential voltages and  $V_{CC}$  specified for the measurement of  $I_{OS}$ , are with respect to GND.
  2. Differential voltages are at  $IN+$  with respect to  $IN-$ .
  3. Short circuits from outputs to  $V_{CC}$  can cause excessive heating and eventual destruction.

DISSIPATION RATING TABLE

PACKAGE	$T_A \leq 25^\circ\text{C}$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25^\circ\text{C}$	$T_A = 70^\circ\text{C}$ POWER RATING
DB	1024 mW	8.2 mW/°C	655 mW

# LM324x2

## OCTAL OPERATIONAL AMPLIFIER

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**electrical characteristics at specified free-air temperature,  $V_{CC} = 5\text{ V}$  (unless otherwise noted)**

PARAMETER	TEST CONDITIONS†	$T_A$ ‡	MIN	TYP§	MAX	UNIT
$V_{IO}$ Input offset voltage	$V_{CC} = 5\text{ V to MAX}, V_O = 1.4\text{ V}$ $V_{IC} = V_{ICRmin},$	25°C		3	7	mV
		Full range			9	
$I_{IO}$ Input offset current	$V_O = 1.4\text{ V}$	25°C		2	50	nA
		Full range			150	
$I_{IB}$ Input bias current	$V_O = 1.4\text{ V}$	25°C		–20	–250	nA
		Full range			–500	
$V_{ICR}$ Common-mode input voltage range	$V_{CC} = 5\text{ V to MAX}$	25°C		0 to $V_{CC}-1.5$		V
		Full range		0 to $V_{CC}-2$		
$V_{OH}$ High-level output voltage	$R_L = 2\text{ k}\Omega$	25°C		$V_{CC}-1.5$		V
	$V_{CC} = \text{MAX}, R_L = 2\text{ k}\Omega$	Full range		26		
	$V_{CC} = \text{MAX}, R_L \geq 10\text{ k}\Omega$	Full range		27	28	
$V_{OL}$ Low-level output voltage	$R_L \leq 10\text{ k}\Omega$	Full range		5	20	mV
$AVD$ Large-signal differential voltage amplification	$V_{CC} = 15\text{ V}, V_O = 1\text{ V to }11\text{ V},$ $R_L \geq 2\text{ k}\Omega$	25°C	25	100		V/mV
		Full range	15			
$CMRR$ Common-mode rejection ratio	$V_{IC} = V_{ICRmin}$	25°C	65	80		dB
$k_{SVR}$ Supply-voltage rejection ratio ( $\Delta V_{CC}/\Delta V_{IO}$ )		25°C	65	100		dB
$V_{O1}/V_{O2}$ Crosstalk attenuation	$f = 1\text{ kHz to }20\text{ kHz}$	25°C		120		dB
$I_O$ Output current	$V_{CC} = 15\text{ V}, V_O = 0$	25°C	–20	–30	–60	mA
		Full range	–10			
	$V_{CC} = 15\text{ V}, V_O = 15\text{ V}$	25°C	10	20		mA
		Full range	5			
$I_{OS}$ Short-circuit output current	$V_O = 0, GND = -5\text{ V}$	25°C		$\pm 40$	$\pm 60$	mA
$I_{CC}$ Supply current (eight amplifiers)	$V_O = 2.5\text{ V},$ No load	Full range		1.4	2.4	mA
	$V_{CC} = \text{MAX}, V_O = 0.5 V_{CC},$ No load	Full range		2.2	6	

† All characteristics are measured under open-loop conditions with zero common-mode input voltage unless otherwise specified. MAX  $V_{CC}$  for testing purposes is 30 V.

‡ Full range is 0°C to 70°C.

§ All typical values are at  $T_A = 25^\circ\text{C}$ .

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