

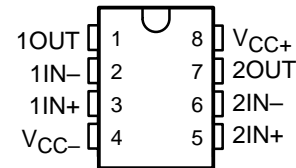
TL4581

DUAL LOW-NOISE HIGH-DRIVE OPERATIONAL AMPLIFIER

SLVS457A – JANUARY 2003 – REVISED MARCH 2003

- **Equivalent Input Noise Voltage**
5 nV/ $\sqrt{\text{Hz}}$ Typ at 1 kHz
- **Unity-Gain Bandwidth . . . 10 MHz Typ**
- **High Slew Rate . . . 9 V/ μs Typ**
- **Peak-to-Peak Output Voltage Swing**
32 V Typ, With $V_{CC\pm} = \pm 18 \text{ V}$ and $R_L = 600 \Omega$
- **Wide Supply-Voltage Range . . . $\pm 3 \text{ V}$ to $\pm 20 \text{ V}$**
- **Common-Mode Rejection Ratio . . . 100 dB Typ**
- **High dc Voltage Gain . . . 100 V/mV Typ**
- **Applications: Audio PreAmps, Active Filters, Headphone Amps**
- **End Equipment: DVD/CD/CDRW Players; Set-Top Boxes**

D, P, OR PS PACKAGE
(TOP VIEW)



description/ordering information

The TL4581 is a dual operational amplifier that has been designed optimally for audio applications, such as improving tone control. It offers low noise, high-gain bandwidth, good slew, and high output current drive for driving capacitive loads. These features make the TL4581 ideally suited for audio applications, such as audio preamps and active filters. When high output current is required, the TL4581 also can be used as a headphone amplifier.

ORDERING INFORMATION

T _A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
	PACKAGE	QUANTITY		
0°C to 70°C	PDIP – P	Tube of 50	TL4581P	TL4581P
	SOIC – D	Tube of 75	TL4581D	T4581
		Reel of 2500	TL4581DR	
	SOP – PS	Reel of 2000	TL4581PSR	T4581

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.



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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.

**TEXAS
INSTRUMENTS**

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TL4581

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absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage (see Note 1): V_{CC+}	22 V
V_{CC-}	-22 V
Input voltage, either input (see Notes 1 and 2)	$V_{CC\pm}$
Input current (see Note 3)	± 10 mA
Duration of output short circuit (see Note 4)	Unlimited
Operating virtual junction temperature, T_J	150°C
Package thermal impedance, θ_{JA} (see Notes 5 and 6): D package	97°C/W
P package	85°C/W
PS package	95°C/W
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260°C
Storage temperature range, T_{stg}	-65°C to 150°C

† 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 or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES:
1. All voltage values, except differential voltages, are with respect to the midpoint between V_{CC+} and V_{CC-} .
 2. The magnitude of the input voltage must never exceed the magnitude of the supply voltage.
 3. Excessive input current will flow if a differential input voltage in excess of approximately 0.6 V is applied between the inputs, unless some limiting resistance is used.
 4. The output may be shorted to ground or either power supply. Temperature and/or supply voltages must be limited to ensure the maximum dissipation rating is not exceeded.
 5. Maximum power dissipation is a function of $T_{J(max)}$, θ_{JA} , and T_A . The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_{J(max)} - T_A) / \theta_{JA}$. Operating at the absolute maximum T_J of 150°C can affect reliability.
 6. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions

	MIN	MAX	UNIT
V_{CC+} Supply voltage	5	15	V
V_{CC-} Supply voltage	-5	-15	V
T_A Operating free-air temperature range	0	70	°C



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electrical characteristics, $V_{CC\pm} = +15\text{ V}$, $T_A = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER		TEST CONDITIONS†		MIN	TYP	MAX	UNIT
V_{IO}	Input offset voltage	$V_O = 0$	$T_A = 25^\circ\text{C}$	0.5	4		mV
			$T_A = 0^\circ\text{C to } 70^\circ\text{C}$			5	
I_{IO}	Input offset current	$T_A = 25^\circ\text{C}$		10	150		nA
		$T_A = 0^\circ\text{C to } 70^\circ\text{C}$				200	
I_{IB}	Input bias current	$T_A = 25^\circ\text{C}$		200	800		nA
		$T_A = 0^\circ\text{C to } 70^\circ\text{C}$				1000	
V_{ICR}	Common-mode input-voltage range			± 12	± 13		V
V_{OPP}	Maximum peak-to-peak output-voltage swing	$R_L \geq 600\ \Omega$	$V_{CC\pm} = \pm 15\text{ V}$	24	26		V
			$V_{CC\pm} = \pm 18\text{ V}$	30	32		
A_{VD}	Large-signal differential-voltage amplification	$R_L \geq 600\ \Omega$, $V_O = \pm 10\text{ V}$	$T_A = 25^\circ\text{C}$	15	50		V/mV
			$T_A = 0^\circ\text{C to } 70^\circ\text{C}$	10			
		$R_L \geq 2\text{ k}\Omega$, $V_O = \pm 10\text{ V}$	$T_A = 25^\circ\text{C}$	25	100		
			$T_A = 0^\circ\text{C to } 70^\circ\text{C}$	15			
A_{vd}	Small-signal differential-voltage amplification	$f = 10\text{ kHz}$		2.2		V/mV	
B_{OM}	Maximum-output-swing bandwidth	$R_L = 600\ \Omega$	$V_O = \pm 10\text{ V}$	140			kHz
			$V_{CC\pm} = \pm 18\text{ V}$, $V_O = \pm 14\text{ V}$	100			
B_1	Unity-gain bandwidth	$R_L = 600\ \Omega$,	$C_L = 100\text{ pF}$	10			MHz
r_i	Input resistance			30	300		k Ω
z_o	Output impedance	$A_{VD} = 30\text{ dB}$, $R_L = 600\ \Omega$, $f = 10\text{ kHz}$		0.3			Ω
CMRR	Common-mode rejection ratio	$V_{IC} = V_{ICR}\text{ min}$		70	100		dB
k_{SVR}	Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$)	$V_{CC\pm} = \pm 9\text{ V to } \pm 15\text{ V}$, $V_O = 0$		80	100		dB
I_{OS}	Output short-circuit current			10	38	60	mA
I_{CC}	Total supply current	$V_O = 0$,	No load	8	16		mA
	Crosstalk attenuation (V_{O1}/V_{O2})	$V_{O1} = 10\text{ V}$ peak,	$f = 1\text{ kHz}$	110			dB

† All characteristics are measured under open-loop conditions with zero common-mode input voltage, unless otherwise specified.

operating characteristics, $V_{CC\pm} = \pm 15\text{ V}$, $T_A = 25^\circ\text{C}$

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
SR	Slew rate at unity gain				9		V/ μs
	Overshoot factor	$V_I = 100\text{ mV}$, $R_L = 600\ \Omega$,	$A_{VD} = 1$, $C_L = 100\text{ pF}$		10		%
V_n	Equivalent input noise voltage	$f = 30\text{ Hz}$			8		nV/ $\sqrt{\text{Hz}}$
		$f = 1\text{ kHz}$			5		
I_n	Equivalent input noise current	$f = 30\text{ Hz}$			2.7		pA/ $\sqrt{\text{Hz}}$
		$f = 1\text{ kHz}$			0.7		



PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
TL4581D	Active	Production	SOIC (D) 8	75 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	T4581
TL4581DR	Active	Production	SOIC (D) 8	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	T4581

(1) **Status:** For more details on status, see our [product life cycle](#).

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

(4) **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TL4581DR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TL4581DR	SOIC	D	8	2500	340.5	338.1	20.6

TUBE


*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
TL4581D	D	SOIC	8	75	507	8	3940	4.32

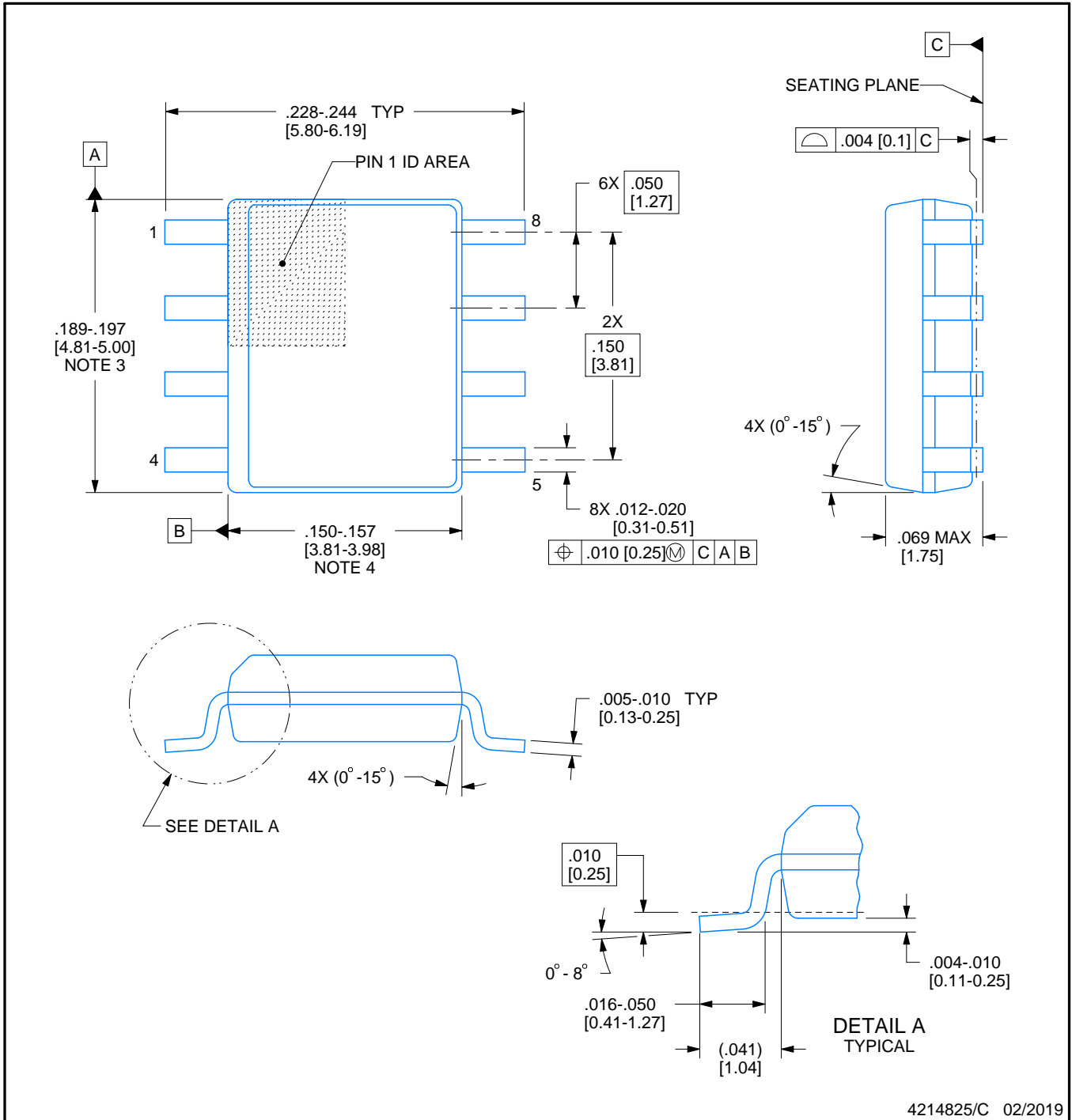
D0008A



PACKAGE OUTLINE

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



4214825/C 02/2019

NOTES:

1. Linear dimensions are in inches [millimeters]. Dimensions in parenthesis are for reference only. Controlling dimensions are in inches. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 [0.15] per side.
4. This dimension does not include interlead flash.
5. Reference JEDEC registration MS-012, variation AA.

EXAMPLE BOARD LAYOUT

D0008A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:8X



SOLDER MASK DETAILS

4214825/C 02/2019

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

D0008A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



SOLDER PASTE EXAMPLE
BASED ON .005 INCH [0.125 MM] THICK STENCIL
SCALE:8X

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NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

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