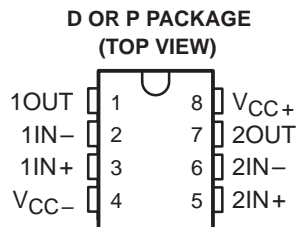


- Low Input Bias Current . . . 50 pA Typ
- Low Input Noise Current  
0.01 pA/√Hz Typ
- Low Input Noise Voltage . . . 18 nV/√Hz Typ
- Low Supply Current . . . 3.6 mA Typ
- High Input Impedance . . . 10<sup>12</sup> Ω Typ
- Internally Trimmed Offset Voltage
- Gain Bandwidth . . . 3 MHz Typ
- High Slew Rate . . . 13 V/μs Typ



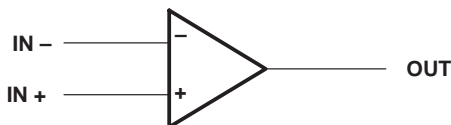
## description

This device is a low-cost, high-speed, JFET-input operational amplifier with very low input offset voltage. It requires low supply current yet maintains a large gain-bandwidth product and a fast slew rate. In addition, the matched high-voltage JFET input provides very low input bias and offset currents.

The LF353 can be used in applications such as high-speed integrators, digital-to-analog converters, sample-and-hold circuits, and many other circuits.

The LF353 is characterized for operation from 0°C to 70°C.

## symbol (each amplifier)



## AVAILABLE OPTIONS

T <sub>A</sub>	V <sub>IO</sub> max AT 25°C	PACKAGE	
		SMALL OUTLINE (D)	PLASTIC DIP (P)
0°C to 70°C	10 mV	LF353D	LF353P

The D packages are available taped and reeled. Add the suffix R to the device type (ie., LF353DR).

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

Supply voltage, V <sub>CC</sub> +	18 V
Supply voltage, V <sub>CC</sub> -	-18 V
Differential input voltage, V <sub>ID</sub>	±30 V
Input voltage, V <sub>I</sub> (see Note 1)	±15 V
Duration of output short circuit	unlimited
Continuous total power dissipation	500 mW
Operating temperature range	0°C to 70°C
Storage temperature range	-65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260°C

NOTE 1: Unless otherwise specified, the absolute maximum negative input voltage is equal to the negative power supply voltage.

**LF353**  
**JFET-INPUT**  
**DUAL OPERATIONAL AMPLIFIER**  
SLOS012B – MARCH 1987 – REVISED AUGUST 1994

**recommended operating conditions**

	MIN	MAX	UNIT
Supply voltage, $V_{CC+}$	3.5	18	V
Supply voltage, $V_{CC-}$	-3.5	-18	V

**electrical characteristics over operating free-air temperature range,  $V_{CC\pm} = \pm 15$  V (unless otherwise specified)**

PARAMETER	TEST CONDITIONS	$T_A^\dagger$	MIN	TYP	MAX	UNIT
$V_{IO}$ Input offset voltage	$V_{IC} = 0, R_S = 10 \text{ k}\Omega$	25°C		5	10	mV
		Full range			13	
$\alpha_{VIO}$ Average temperature coefficient of input offset voltage	$V_{IC} = 0, R_S = 10 \text{ k}\Omega$			10		$\mu\text{V}/^\circ\text{C}$
$I_{IO}$ Input offset current $^\ddagger$	$V_{IC} = 0$	25°C		25	100	pA
		70°C			4	nA
$I_{IB}$ Input bias current $^\ddagger$	$V_{IC} = 0$	25°C		50	200	pA
		70°C			8	nA
$V_{ICR}$ Common-mode input voltage range			$\pm 11$	-12 to 15		V
$V_{OM}$ Maximum peak output voltage swing	$R_L = 10 \text{ k}\Omega$		$\pm 12$	$\pm 13.5$		V
$A_{VD}$ Large-signal differential voltage	$V_O = \pm 10 \text{ V}, R_L = 2 \text{ k}\Omega$	25°C		25	100	V/mV
		Full range		15		
$r_i$ Input resistance	$T_J = 25^\circ\text{C}$			$10^{12}$		$\Omega$
CMRR Common-mode rejection ratio	$R_S \leq 10 \text{ k}\Omega$		70	100		dB
$k_{SVR}$ Supply-voltage rejection ratio	See Note 2		70	100		dB
$I_{CC}$ Supply current				3.6	6.5	mA

$^\dagger$  Full range is 0°C to 70°C.

$^\ddagger$  Input bias currents of a FET-input operational amplifier are normal junction reverse currents, which are temperature sensitive. Pulse techniques must be used that will maintain the junction temperatures as close to the ambient temperature as possible.

NOTE 2: Supply-voltage rejection ratio is measured for both supply magnitudes increasing or decreasing simultaneously.

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

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$V_{O1}/V_{O2}$ Crosstalk attenuation	$f = 1 \text{ kHz}$		120		dB
SR Slew rate		8	13		V/ $\mu\text{s}$
$B_1$ Unity-gain bandwidth			3		MHz
$V_n$ Equivalent input noise voltage	$f = 1 \text{ kHz}, R_S = 20 \Omega$		18		$\text{nV}/\sqrt{\text{Hz}}$
$I_n$ Equivalent input noise current	$f = 1 \text{ kHz}$		0.01		$\text{pA}/\sqrt{\text{Hz}}$

## PACKAGING INFORMATION

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
LF353D	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LF353DE4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LF353DG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LF353DR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LF353DRE4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LF353DRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LF353P	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
LF353PE4	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type

<sup>(1)</sup> The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSELETE:** TI has discontinued the production of the device.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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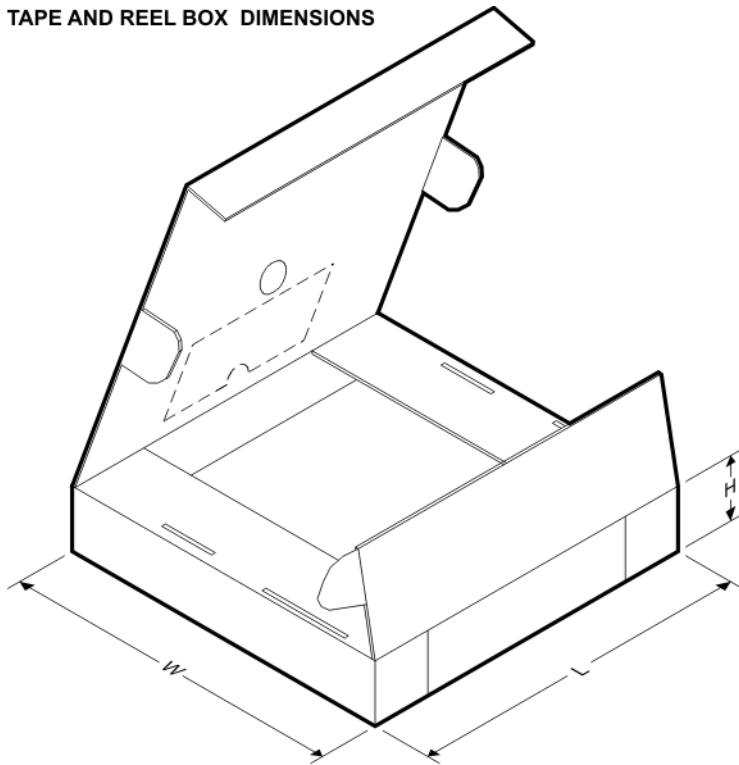
**TAPE AND REEL INFORMATION**



\*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
LF353DR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
LF353DR	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)
LF353DR	SOIC	D	8	2500	346.0	346.0	29.0
LF353DR	SOIC	D	8	2500	340.5	338.1	20.6

P (R-PDIP-T8)

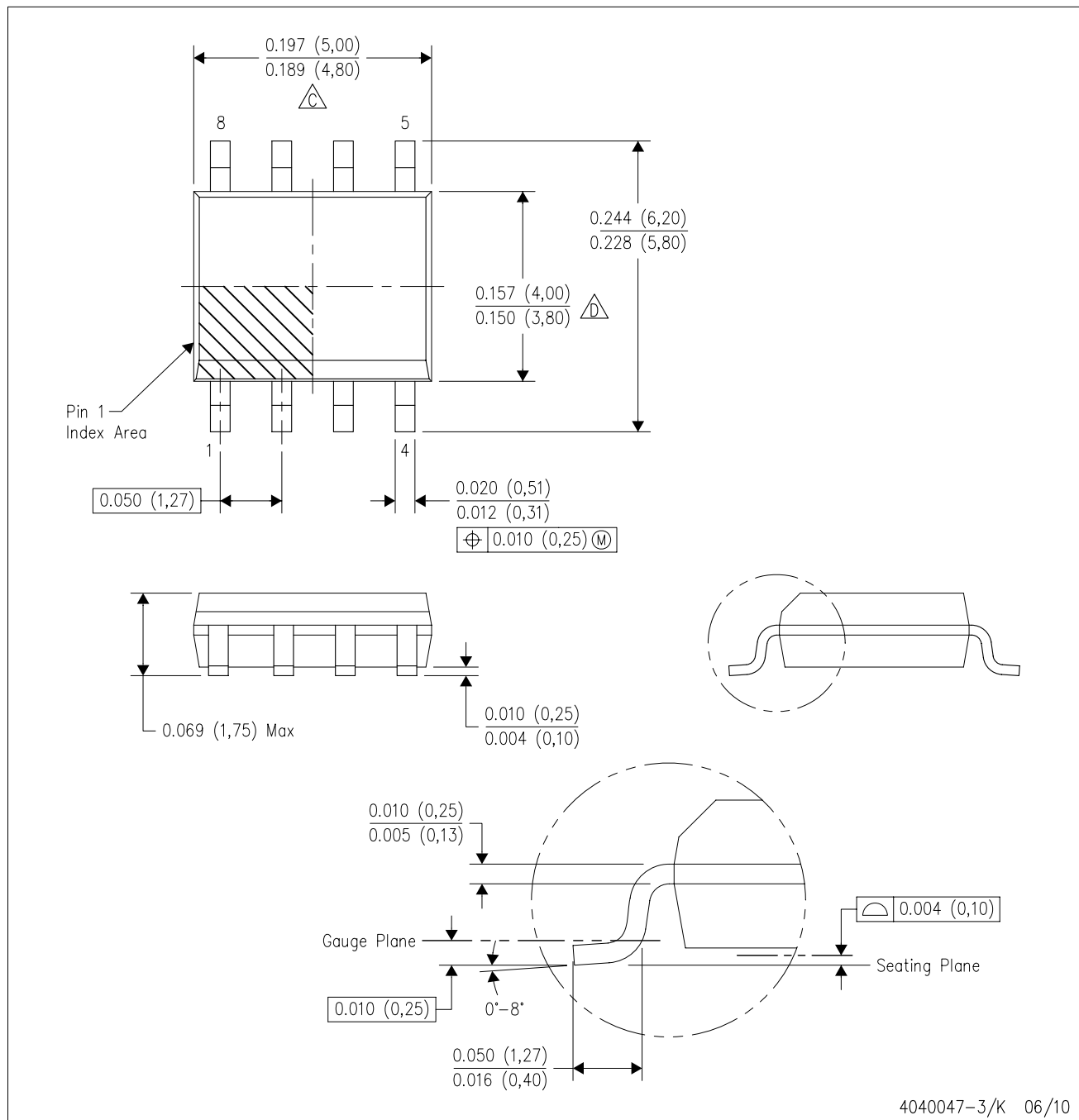
PLASTIC DUAL-IN-LINE PACKAGE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. Falls within JEDEC MS-001 variation BA.

D (R-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE

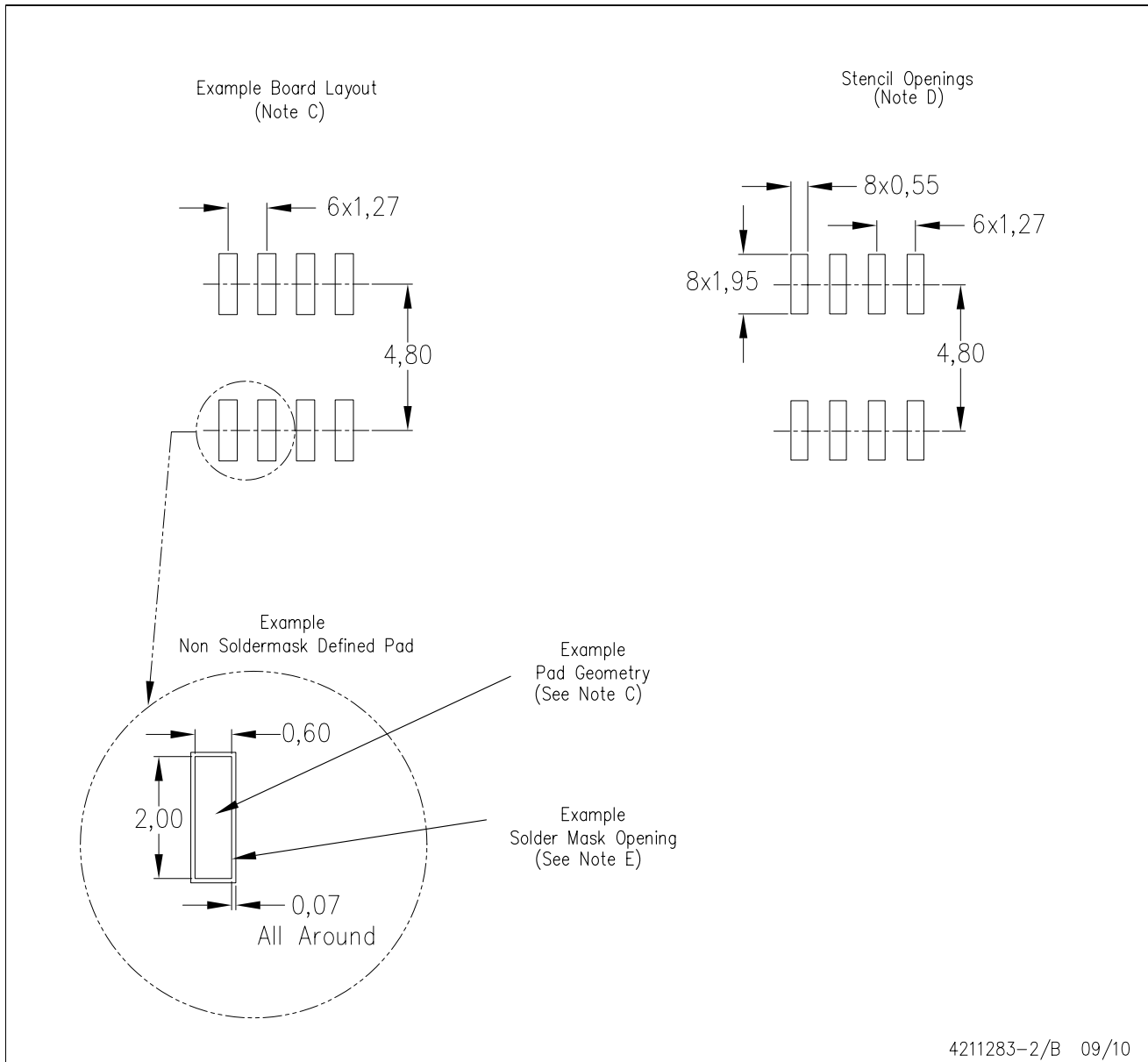


4040047-3/K 06/10

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
  - D. Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
  - E. Reference JEDEC MS-012 variation AA.

D (R-PDSO-G8)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Publication IPC-7351 is recommended for alternate designs.
  - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
  - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.



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