

## Features

- 30 V/ $\mu$ S Slew Rate
- 10 nA Offset Current
- 330 nS Settling Time To 0.1%
- 500 KHz Full Power Bandwidth
- 12 MHz Typical Gain Bandwidth
- 20 M $\Omega$  Minimum Input Impedance
- Internally Compensated

## Applications

- Video Amplifiers
- Pulse Amplifiers
- Signal Generators
- High Speed Sample-and-Hold Amplifiers

## Description

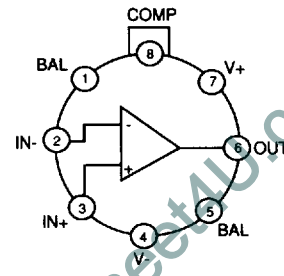
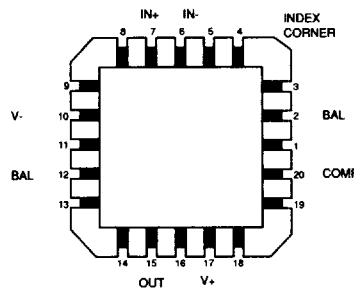
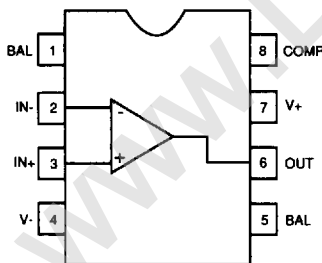
The SP-2500/02/05 operational amplifiers are fast settling, low offset voltage and current, and high slew rate operational amplifiers. Their wide bandwidth and high input impedance combined with internal compensation make them excellent choices in high frequency signal conditioning applications.

These devices are designed to allow additional compensation and offset trimming. A 100K $\Omega$  trim potentiometer is recommended for use between the balance pins (the wiper should be connected to V<sup>+</sup>).

The SP-2502 and SP-2505 are the relaxed specification military temperature range and the commercial temperature range of the SP-2500.

All versions are available in metal can and ceramic mini DIP packages as well as in die form. LCC packaged versions are also available.

## Connection Diagrams



# SP-2500/02/05

Precision, High Slew Rate Operational Amplifiers

## Absolute Maximum Ratings

Voltage Between V <sup>+</sup> and V <sup>-</sup> Terminals	40.0V	Operating Temperature Range	
Differential Input Voltage, V <sub>d</sub>	±15.0V	SP-2500	-55°C ≤ T <sub>A</sub> ≤ 125°C
Internal Power Dissipation, P <sub>d</sub>	300mW	Storage Temperature Range	-65°C ≤ T <sub>A</sub> ≤ 150°C
Peak Output Current, I <sub>p</sub>	50mA		

**Electrical Characteristics:** V<sup>+</sup> = +15V, V<sup>-</sup> = -15V, T<sub>A</sub> = 25°C unless otherwise specified in "Conditions".

### SP-2500

Parameter	Symbol	Conditions	Min	Typ	Max	Units
<b>Input Characteristics</b>						
Offset Voltage	V <sub>os</sub>	-55°C ≤ T <sub>A</sub> ≤ 125°C		2	5	mV
Offset Voltage Drift	ΔV <sub>os</sub> /ΔT	-55°C ≤ T <sub>A</sub> ≤ 125°C; average		20	8	μV/°C
Bias Current	I <sub>b</sub>	-55°C ≤ T <sub>A</sub> ≤ 125°C		100	200	nA
Offset Current	I <sub>os</sub>	-55°C ≤ T <sub>A</sub> ≤ 125°C		10	25	nA
Input Impedance	Z <sub>in</sub>	Guaranteed by Design	25	50		MΩ
Common Mode Range	V <sub>cm</sub>	-55°C ≤ T <sub>A</sub> ≤ 125°C	±10.0			V
<b>Transfer Characteristics</b>						
Large Signal Voltage Gain	A <sub>v,OL</sub>	R <sub>L</sub> = 2KΩ, V <sub>o</sub> = ±10V -55°C ≤ T <sub>A</sub> ≤ 125°C, R <sub>L</sub> = 2KΩ, V <sub>o</sub> = ±10V	20K 15K	30K		V/V V/V
Common Mode Rejection Ratio	CMRR	-55°C ≤ T <sub>A</sub> ≤ 125°C, V <sub>cm</sub> = ±10V	80	90		dB
Unity Gain Bandwidth Product	GBW	A <sub>v</sub> > 10		12		MHz
<b>Output Characteristics</b>						
Output Voltage Swing	V <sub>o</sub>	-55°C ≤ T <sub>A</sub> ≤ 125°C, R <sub>L</sub> = 2KΩ	±10.0	±12.0		V
Output Current	I <sub>OUT</sub>	V <sub>o</sub> = ±10V	±10	±20		mA
Full Power Bandwidth	FPBW	V <sub>o</sub> = ±10V, FPBW = (SR) (2π V <sub>p</sub> ) <sup>-1</sup>	350	500		KHz
<b>Transient Response</b>						
Rise Time	t <sub>r</sub>	R <sub>L</sub> = 2KΩ, C <sub>L</sub> = 50pF, V <sub>o</sub> = ±200mV		25	50	nS
Overshoot	γ	R <sub>L</sub> = 2KΩ, C <sub>L</sub> = 50pF, V <sub>o</sub> = ±200mV		25	40	%
Slew Rate	SR	R <sub>L</sub> = 2KΩ, C <sub>L</sub> = 50pF, V <sub>o</sub> = ±5V	25	30		V/S
Settling Time to 0.1%	t <sub>s</sub>	R <sub>L</sub> = 2KΩ, C <sub>L</sub> = 50pF, V <sub>o</sub> = ±5V		0.33		S
<b>Power Supply</b>						
Supply Current	I <sub>s</sub>			4	6	mA
Power Supply Rejection Ratio	PSRR	-55°C ≤ T <sub>A</sub> ≤ 125°C, ΔV <sub>s</sub> = ±5V	80	90		dB

## SP-2500/02/05

Precision, High Slew Rate Operational Amplifiers

## Absolute Maximum Ratings

Voltage Between $V^+$ and $V^-$ Terminals	40.0V	Operating Temperature Range	
Differential Input Voltage, $V_d$	$\pm 15.0V$	SP-2502	$-55^\circ C \leq T_A \leq 125^\circ C$
Internal Power Dissipation, $P_d$	300mW	Storage Temperature Range	$-65^\circ C \leq T_A \leq 150^\circ C$
Peak Output Current, $I_p$	50mA		

**Electrical Characteristics:**  $V^+ = +15V$ ,  $V^- = -15V$ ,  $T_A = 25^\circ C$  unless otherwise specified in "Conditions".

## SP-2502

Parameter	Symbol	Conditions	Min	Typ	Max	Units
<b>Input Characteristics</b>						
Offset Voltage	$V_{OS}$	$-55^\circ C \leq T_A \leq 125^\circ C$		4	8	mV
Offset Voltage Drift	$\Delta V_{OS}/\Delta T$	$-55^\circ C \leq T_A \leq 125^\circ C$ ; average		20	10	$\mu V/^\circ C$
Bias Current	$I_b$	$-55^\circ C \leq T_A \leq 125^\circ C$		125	250	nA
Offset Current	$I_{OS}$	$-55^\circ C \leq T_A \leq 125^\circ C$		20	50	nA
Input Impedance	$Z_{in}$	Guaranteed by Design	25	50	100	M $\Omega$
Common Mode Range	$V_{cm}$	$-55^\circ C \leq T_A \leq 125^\circ C$	$\pm 10.0$			V
<b>Transfer Characteristics</b>						
Large Signal Voltage Gain	$A_{vOL}$	$R_L = 2K\Omega$ , $V_o = \pm 10V$ $-55^\circ C \leq T_A \leq 125^\circ C$ , $R_L = 2K\Omega$ , $V_o = \pm 10V$	15K 10K	25K		V/V V/V
Common Mode Rejection Ratio	CMRR	$-55^\circ C \leq T_A \leq 125^\circ C$ , $V_{cm} = \pm 10V$	74	90		dB
Unity Gain Bandwidth Product	GBW	$A_v > 10$		12		MHz
<b>Output Characteristics</b>						
Output Voltage Swing	$V_o$	$-55^\circ C \leq T_A \leq 125^\circ C$ , $R_L = 2K\Omega$	$\pm 10.0$	$\pm 12.0$		V
Output Current	$I_{OUT}$	$V_o = \pm 10V$	$\pm 10$	$\pm 20$		mA
Full Power Bandwidth	FPBW	$V_o = \pm 10V$ , $FPBW = (SR) (2\pi V_p)^{-1}$	300	500		KHz
<b>Transient Response</b>						
Rise Time	$t_r$	$R_L = 2K\Omega$ , $C_L = 50pF$ , $V_o = \pm 200mV$		25	50	nS
Overshoot	$\gamma$	$R_L = 2K\Omega$ , $C_L = 50pF$ , $V_o = \pm 200mV$		25	50	%
Slew Rate	SR	$R_L = 2K\Omega$ , $C_L = 50pF$ , $V_o = \pm 5V$	20	30		V/S
Settling Time to 0.1%	$t_s$	$R_L = 2K\Omega$ , $C_L = 50pF$ , $V_o = \pm 5V$		0.33		S
<b>Power Supply</b>						
Supply Current	$I_s$			4	6	mA
Power Supply Rejection Ratio	PSRR	$-55^\circ C \leq T_A \leq 125^\circ C$ , $\Delta V_s = \pm 5V$	74	90		dB

4

## SP-2500/02/05

Precision, High Slew Rate Operational Amplifiers

## Absolute Maximum Ratings

Voltage Between $V^+$ and $V^-$ Terminals	40.0V	Operating Temperature Range	
Differential Input Voltage, $V_d$	$\pm 15.0V$	SP-2505	$0^\circ C \leq T_A \leq 75^\circ C$
Internal Power Dissipation, $P_d$	300mW	Storage Temperature Range	$-65^\circ C \leq T_A \leq 150^\circ C$
Peak Output Current, $I_p$	50mA		

**Electrical Characteristics:**  $V^+ = +15V$ ,  $V^- = -15V$ ,  $T_A = 25^\circ C$  unless otherwise specified in "Conditions".

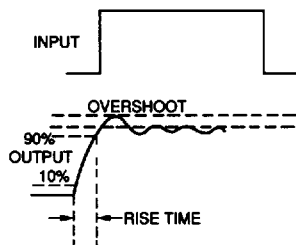
## SP-2505

Parameter	Symbol	Conditions	Min	Typ	Max	Units
<b>Input Characteristics</b>						
Offset Voltage	$V_{OS}$	$0^\circ C \leq T_A \leq 75^\circ C$		4	8	mV
Offset Voltage Drift	$\Delta V_{OS}/\Delta T$	$0^\circ C \leq T_A \leq 75^\circ C$ ; average		20	10	$\mu V/^\circ C$
Bias Current	$I_B$	$0^\circ C \leq T_A \leq 75^\circ C$		125	250	nA
Offset Current	$I_{OS}$	$0^\circ C \leq T_A \leq 75^\circ C$		20	50	nA
Input Impedance	$Z_{in}$	Guaranteed by Design	25	50	100	M $\Omega$
Common Mode Range	$V_{cm}$	$0^\circ C \leq T_A \leq 75^\circ C$	$\pm 10.0$			V
<b>Transfer Characteristics</b>						
Large Signal Voltage Gain	$A_{VOL}$	$R_L = 2K\Omega$ , $V_o = \pm 10V$ $0^\circ C \leq T_A \leq 75^\circ C$ , $R_L = 2K\Omega$ , $V_o = \pm 10V$	15K 10K	25K		V/V V/V
Common Mode Rejection Ratio	CMRR	$0^\circ C \leq T_A \leq 75^\circ C$ , $V_{cm} = \pm 10V$	74	90		dB
Unity Gain Bandwidth Product	GBW	$A_v > 10$		12		MHz
<b>Output Characteristics</b>						
Output Voltage Swing	$V_o$	$0^\circ C \leq T_A \leq 75^\circ C$ , $R_L = 2K\Omega$	$\pm 10.0$	$\pm 12.0$		V
Output Current	$I_{OUT}$	$V_o = \pm 10V$	$\pm 10$	$\pm 20$		mA
Full Power Bandwidth	FPBW	$V_o = \pm 10V$ , $FPBW = (SR) (2\pi V_o)^{-1}$	300	500		KHz
<b>Transient Response</b>						
Rise Time	$t_r$	$R_L = 2K\Omega$ , $C_L = 50pF$ , $V_o = \pm 200mV$		25	50	nS
Overshoot	$\gamma$	$R_L = 2K\Omega$ , $C_L = 50pF$ , $V_o = \pm 200mV$		25	50	%
Slew Rate	SR	$R_L = 2K\Omega$ , $C_L = 50pF$ , $V_o = \pm 5V$	20	30		V/S
Settling Time to 0.1%	$t_s$	$R_L = 2K\Omega$ , $C_L = 50pF$ , $V_o = \pm 5V$		0.33		S
<b>Power Supply</b>						
Supply Current	$I_s$			4	6	mA
Power Supply Rejection Ratio	PSRR	$0^\circ C \leq T_A \leq 75^\circ C$ , $\Delta V_s = \pm 5V$	74	90		dB

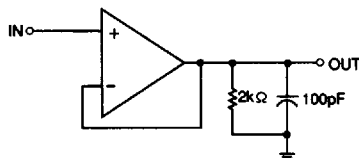
# SP-2500/02/05

Precision, High Slew Rate Operational Amplifiers

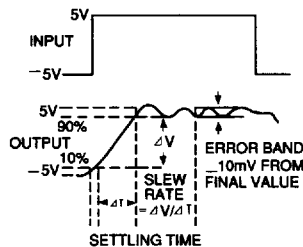
## A.C. Performance



Transient Response



A.C. Test Circuit



Slew Rate/Settling Time

4

## Ordering Information

When ordering the SP-2500/02/05, specify the package and screening according to the following :

<b>SP 2 - 2500 - 2</b>	
Prefix: _____	Generic Part # _____
SP (SIPEX)	
PACKAGE : _____	SCREENING _____
1 - 14 pin ceramic DIP	-2 : -55 °C to 125 °C
2 - Metal Can	-4 : -25 °C to 85 °C
3 - 8 Pin Plastic DIP	-5 : 0 °C to 75 °C
4 - 20 Pin LCC	-6 : 25 °C 100% D.C. Probe (Dice Only)
7 - 8-Pin CERDIP	/883 : -55 °C to 125 °C Full Mil Processing
0 - DICE	

NOTES: 1. Not all package types and screening option combinations are available. Consult local sales office or factory for availability information.

2. Consult factory for special package or screening requirements.

3. Consult factory for 883 revision C compliant data sheet.

4. Consult factory for package mechanical dimensions.

