INTERSIL

HA2600, HA2605, HA2622, HA2602, HA2620, HA2625

High Impedance Operational Amplifiers

FEATURES

- Input Impedance – 500MΩ
- Offset Current – 1nA
- Bias Current – 1nA
- Gain Bandwidth Product – 100MHz
- High Gain – 150K
- Output Short Circuit Protection
- Meets MIL-STD-883

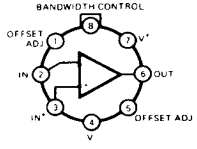
GENERAL DESCRIPTION

The 2600 series of high impedance operational amplifiers are monolithic integrated circuits fabricated using dielectric isolation. These internally compensated amplifiers feature excellent input parameters, low input bias and wide bandwidth. They are ideally suited for general purpose use in instrumentation and signal processing applications.

2600 through 2605 are compensated for unity gain. 2620 through 2625 are intended for closed loop gains of 5 or greater and feature increased slew rated and gain-bandwidth products.

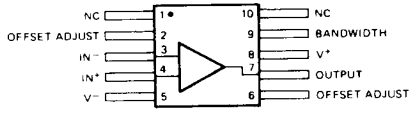
PIN CONFIGURATIONS, TOP VIEWS

(outline dwg TY)

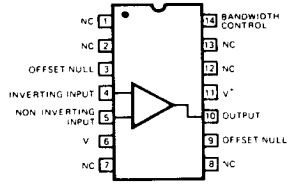


Pin 4 Connected to case

(outline dwg FB)



(outline dwg JD)



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ORDERING INFORMATION

PART NUMBER	TEMPERATURE RANGE	PACKAGE TYPE	ORDER NUMBER
HA2600	−55°C to +125°C	TO-99 TO-91 Flat Pack 14 Pin CerDIP	HA2-2600-2 * HA9-2600-2 * HA1-2600-2 *
HA2602	−55°C to +125°C	TO-99 TO-91 Flat Pack 14 Pin CerDIP	HA2-2602-2 * HA9-2602-2 * HA1-2602-2 *
HA2605	0°C to +75°C	TO-99 TO-91 Flat Pack 14 Pin CerDIP	HA2-2605-5 HA9-2605-5 HA1-2605-5
HA2620	−55°C to +125°C	TO-99 TO-91 Flat Pack 14 Pin CerDIP	HA2-2620-2 * HA9-2620-2 * HA1-2620-2 *
HA2622	−55°C to +125°C	TO-99 TO-91 Flat Pack 14 Pin CerDIP	HA2-2622-2 * HA9-2622-2 * HA1-2622-2 *
HA2625	0°C to +75°C	TO-99 TO-91 Flat Pack 14 Pin CerDIP	HA2-2625-5 HA9-2625-5 HA1-2625-5

*883B processing is available for these devices. Order -8 instead of -2.

ABSOLUTE MAXIMUM RATINGS

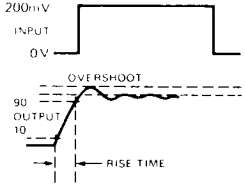
Supply Voltage . . . . . ±22.5V
Input Voltage (Note 1) . . . . . ±15V
Differential Input Voltage . . . . . ±12V
Peak Output Current . . . . . Full Short Circuit Protection
Internal Power Dissipation (Note 2) 300mW
Lead Temperature (Soldering, 60 sec.) . . . . . +300°C
Storage Temperature Range . . . . . −65°C to +150°C
Operating Temperature Range . . . . . −55°C to +125°C (2600, 2602)
0°C to +75°C (2605)

ELECTRICAL CHARACTERISTICS (T_A = 25°C, V_S = ±15V, unless otherwise specified)

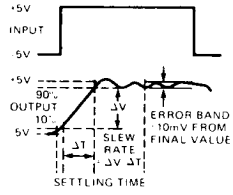
PARAMETER	CONDITIONS	2600			2602			2605			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
Input Offset Voltage	R_S ≤ 10kΩ		0.5	4		3	5		3	5	mV
Input Offset Current			1	10		5	25		5	25	nA
Input Bias Current			1	10		5	25		5	25	nA
Input Resistance		100	500		40	300		40	300		MΩ
Large Signal Voltage Gain	R_L = 2kΩ, V_O = ±10V	100K	150K		80K	150K		80K	150K		V/V
Unity Gain Bandwidth	V_O ≤ 90mV		12			12			12		MHz
Full Power Bandwidth	R_L = 2kΩ, C_L = 50pF, V_O = $20V_{p-p}$	50	75		50	75		50	75		KHz
Rise Time (Note 3)	R_L = 2kΩ, C_L = 100pF		30	60		30	60		30	60	ns
Overshoot (Note 4)	R_L = 2kΩ, C_L = 100pF		25	40		25	50		25	50	%
Slew Rate	R_L = 2kΩ, C_L = 100pF, V_O = ±5V	4	7		4	7		4	7		V/μs
Setting Time (to ±10mV of Final Value)	R_L = 2kΩ, C_L = 100pF, V_O = ±5V		1.5			1.5			1.5		ns
Output Current	V_O = ±10V	±15	±22		±10	±18		±10	±18		mA
Supply Current			3	3.7		3	4		3	4	mA
THE FOLLOWING SPECIFICATIONS APPLY FOR OPERATING TEMPERATURE RANGE											
Input Offset Voltage	R_S ≤ 10kΩ		2	6			7			7	mV
Input Offset Current			5	30			60			40	nA
Input Bias Current			10	30			60			40	nA
Offset Voltage Average Drift	R_S ≤ 10kΩ		5								μV/°C
Common Mode Rejection Ratio	V_{CM} ±5V	80	100		74	100		74	100		dB
Common Mode Range		±11			±11			±11			V
Supply Voltage Rejection Ratio	V_S ±9V To ±15V	80	90		74	90		74	90		dB
Large Signal Voltage Gain	R_L = 2kΩ, V_O = ±10V	70k			60k			70k			V/V
Output Voltage Swing	R_L = 2kΩ	±10	±12		±10	±12		±10	±12		V

NOTE 1: For supply voltages less than ±15V, the absolute maximum input voltage is equal to the supply voltage.
NOTE 2: Derate TO-91 at 4.5 mW/°C above 84°C; derate TO-99 at 6.6 mW/°C above 105°C.
NOTE 3: V_O = 400 mV_{p-p}
NOTE 4: V_O = 800 mV_{p-p}

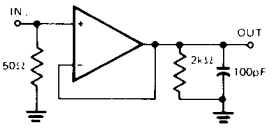
TRANSIENT RESPONSE



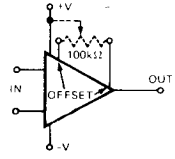
SLEW RATE AND SETTLING TIME



SLEW RATE AND TRANSIENT RESPONSE



SUGGESTED OFFSET ZERO ADJUST HOOK-UP



NOTE: MEASURED ON BOTH POSITIVE AND NEGATIVE TRANSITIONS.

ABSOLUTE MAXIMUM RATINGS

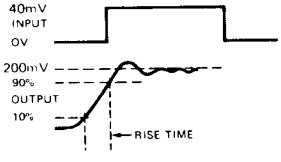
Supply Voltage . . . . . ±22.5V
Input Voltage (Note 1) . . . . . ±15V
Differential Input Voltage . . . . . ±12V
Peak Output Current . . . . . Full Short Circuit Protection
Internal Power Dissipation (Note 2) 300mW
Lead Temperature (Soldering, 60 sec.) . . . . . 300°C
Storage Temperature Range . . . . . −65°C to +150°C
Operating Temperature Range. . . . . −55°C to +125°C (2620, 2622)
0°C to +75°C (2625)

ELECTRICAL CHARACTERISTICS (T_A = 25°C, V_S = ±15V, unless otherwise specified)

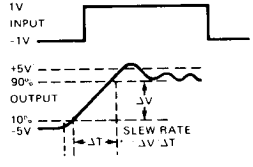
PARAMETER	CONDITIONS	2620			2622			2625			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
Input Offset Voltage (Note 3)	$R_S \leq 10k\Omega$		0.5	4		3	5		3	5	mV
Input Offset Current			1	15		5	25		5	25	nA
Input Bias Current			1	15		5	25		5	25	nA
Input Resistance		65	500		40	300		40	300		MΩ
Large Signal Voltage Gain	R_L = 2kΩ, V_O = ±10V, C_L = 50pF	100K	150K		80K	150K		80K	150K		V/V
Gain Bandwidth (Notes 4 and 5)	R_L = 2kΩ, C_L = 50pF		100			100			100		MHz
Full Power Bandwidth	R_L = 2kΩ, C_L = 50pF, V_O = $20V_{p-p}$	400	600		320	600		320	600		KHz
Rise Time (Note 6)	R_L = 2kΩ, C_L = 50pF		17	45		17	45		17	45	ns
Slew Rate (Note 6)	R_L = 2kΩ, C_L = 50pF, V_O = ±5.0V	±25	±35		±20	±35		±20	±35		V/μs
Output Current	V_O = ±10V	±15	±22		±10	±18		±10	±18		mA
Supply Current			3	3.7		3	4		3	4	mA
FOLLOWING SPECIFICATIONS APPLY FOR OPERATING TEMPERATURE RANGE											
Input Offset Voltage	$R_S \leq 10k\Omega$			6			7			7	mV
Input Offset Current			5	35			60			40	nA
Input Bias Current			10	35			60			40	nA
Common Mode Rejection Ratio	V_{CM} = ±5V	80	100		74	100		74	100		dB
Common Mode Range		±11			±11			±11			V
Supply Voltage Rejection Ratio	V_{Supply} = ±9V To ±15V	80	90		74	90		74	90		dB
Large Signal Voltage Gain	R_L = 2kΩ, V_O = ±10V, C_L = 50pF	70k			60k			70k			V/V
Output Voltage Swing	R_L = 2kΩ, C_L = 50pF	±10	±12		±10	±12		±10	±12		V

NOTE 1: For supply voltages less than ±15V, the absolute maximum input voltage is equal to the supply voltage.
NOTE 2: Derate TO-91 at 4.5 mW/°C above 84°C; derate TO-99 at 6.6 mW/°C above 105°C.
NOTE 3: May be externally adjusted to zero.
NOTE 4: V_O < 90mV.
NOTE 5: 40dB gain.
NOTE 6: A_V = 5.0V.

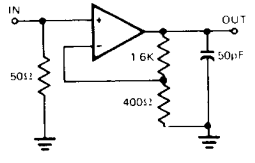
TRANSIENT RESPONSE



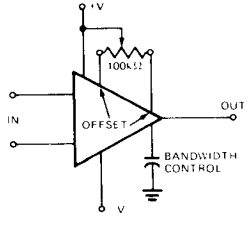
SLEW RATE



SLEW RATE AND TRANSIENT RESPONSE



SUGGESTED OFFSET ZERO ADJUST AND BANDWIDTH CONTROL HOOK-UP



NOTE: MEASURED ON BOTH POSITIVE AND NEGATIVE TRANSITIONS.