BURR-BROWN®

SHC600BH

Ultra-High Speed SAMPLE/HOLD AMPLIFIER

FEATURES

- CLOSED-LOOP OUTPUT AMPLIFIER
- ±0.01% FSR LINEARITY max
- ACQUISITION TIME (2.5V step):
  1% FSR 17ns typ
  0.1% FSR 27ns typ
  0.02% FSR 40ns typ
- 300V/µs SLEW RATE
- 24-PIN CERAMIC DIP
- VERY LOW DISTORTION

APPLICATIONS

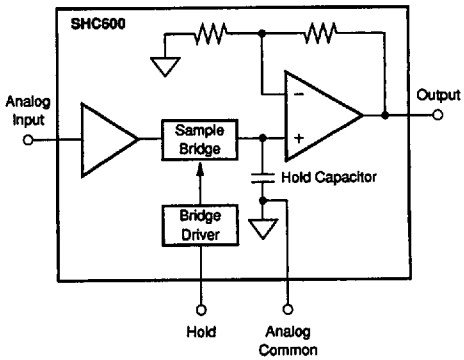
- SUCCESSIVE-APPROXIMATION ADCs
- IMPROVING FLASH ADCs
- WAVEFORM DIGITIZERS
- VIDEO
- PEAK DETECTORS
- BOXCAR INTEGRATORS
- DOWN CONVERTERS

DESCRIPTION

The SHC600 is a high speed S/H amplifier designed for use in ultra-fast, 12-bit data acquisition and signal processing systems. It acquires input step changes of 2.5V to 1% accuracy in 17ns and 0.02% accuracy in 40ns, typically. The closed-loop output amplifier provides a maximum linearity error of ±0.01% with a low output impedance of 0.4Ω. The gain has been optimized to drive 100Ω loads with a gain error of less than ±0.1%.

In the sample mode, the SHC600 operates as a unity-gain buffer with a small signal bandwidth of 70MHz. Input voltage range is ±2V.

The hold command is ECL-compatible.



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SPECIFICATIONS

ELECTRICAL

At +25°C and rated power supplies and 100Ω in parallel with 3pF load unless otherwise specified.

PARAMETER	SHC600BH MIN	SHC600BH TYP	SHC600BH MAX	UNITS
SAMPLE/HOLD INPUTS				
ANALOG				
Voltage Range		±1.25	±2	V
R_{IN}		1.5		MΩ
Input Bias Current		20	35	µA
DIGITAL (ECL Compatible)				
V_{IH} (HOLD)	−1.1		−0.8	V
V_{IL} (SAMPLE)	−1.8		−1.5	V
I_{IH}, V_{IN} = −1.1V			265	µA
I_{IL}, V_{IN} = −1.8V	0.5			µA
SAMPLE/HOLD OUTPUT				
Voltage Range		±1.25	±2	V
Output Current	±40			mA
Short Circuit Protection		Momentary (1s)		
Output Impedance (at DC)		0.4		Ω
Noise in Track Mode (Wideband 200MHz into 50Ω Load)		400		µVrms
SAMPLE/HOLD TRANSFER CHARACTERISTICS				
DC ACCURACY/STABILITY				
Gain		+1		V/V
Gain Error		±0.1		%
Temperature Coefficient		±5	±20	ppm/°C
Linearity Error (±1.25V Input)		±0.002	±0.01	% of FSR[1]
Zero Offset		±2	±5	mV
Temperature Coefficient		±50	±150	µV/°C
Power Supply Sensitivity of Offset: V_{DD1} (+5V)		±1	±3	mV/V
V_{DD2} (−5.2V)		±4	±13	mV/V
$+V_{CC}$ (+15V)		±5	±10	mV/V
$-V_{CC}$ (−15V)		±9	±15	mV/V
HOLD-TO-TRACK (SAMPLE) DYNAMICS				
Acquisition Time (With 2.5V Step)[1]: To Within ±1% of FSR (25mV)		17	25	ns
To Within ±0.1% of FSR (2.5mV)		27	35	ns
To Within ±0.02% of FSR (0.5mV)		40	50	ns
Switch Delay Time		2		ns
TRACK (SAMPLE)-TO-HOLD DYNAMICS				
Aperture Delay Time		4	8	ns
Aperture Uncertainty (Jitter)		5	9	ps (rms)
Offset Step (Pedestal)		±2	±10	mV
Temperature Coefficient		±30	±60	µV/°C
Sensitivity to V_{DD2} (−5.2V)		±2.5	±10	mV/V
Switch Delay Time		2		ns
Switching Transient: Amplitude		7	20	mVpk
Settling to Within ±1mV		10	15	ns
TRACK (SAMPLE) MODE DYNAMICS				
Frequency Response: Full Power Bandwidth		40		MHz
Small Signal Bandwidth		70		MHz
Output Slew Rate	200	300		V/µs
Harmonic Distortion (2.5Vp-p Input at 4MHz): R_L = 200Ω		−78		dB
R_L = 50Ω		−65		dB
HOLD MODE DYNAMICS				
Droop Rate: at +25°C Case Temp		±60	±180	µV/µs
at +85°C Case Temp		±1.5	±4	mV/µs
Feedthrough Rejection: 2.5Vp-p Input at 1MHz	62			dB
at 10MHz	58			dB
POWER SUPPLY REQUIREMENTS				
Supply Voltages: V_{DD1}	+4.75	+5.0	+5.25	V
V_{DD2}	−4.95	−5.2	−5.46	V
$+V_{CC}$	+14.25	+15	+15.75	V
$-V_{CC}$	−14.25	−15	−15.75	V
Quiescent Current: V_{DD1}		40	55	mA
V_{DD2}		−93	−120	mA
$+V_{CC}$		30	45	mA
$-V_{CC}$		−15	−25	mA
Power Dissipation		1.3	2.0	W
TEMPERATURE RANGE				
Specification (Case Temperature)	−25		+85	°C
Storage	−55		+125	°C

NOTE: (1) FSR means Full-Scale Range. For SHC600 FSR = 2.5V.

PIN ASSIGNMENTS

PIN	FUNCTION	PIN	FUNCTION
1	V_{DD1} (+5V)	13	Analog Input
2	V_{DD2} (–5.2V)	14	NIC[1]
3	NIC[1]	15	NIC[1]
4	V_{DD2} (–5.2V)	16	NIC[1]
5	Hold Command	17	NIC[1]
6	Digital Common	18	Analog Common
7	Power Common	19	Analog Common
8	$+V_{CC}$ (+15V)	20	NIC[1]
9	NIC[1]	21	NIC[1]
10	V_{DD2} (–5.2V)	22	$+V_{CC}$ (+15V)
11	Power Common	23	NIC[1]
12	$-V_{CC}$ (–15V)	24	Analog Output

NOTE: (1) NIC = No Internal Connection.

ABSOLUTE MAXIMUM RATINGS

$\pm V_{CC}$	16.5V
V_{DD1}	+7.0V
V_{DD2}	–7.0V
Analog Input	±5.0V
Logic Input	V_{DD2} to +0.5V
Case Temperature	+100°C
Junction Temperature	+150°C
Storage Temperature	–40°C to +100°C

NOTE: Stresses above these ratings may cause permanent damage to the device.

ORDERING INFORMATION

SHC600 B H Q

- Basic Model Number
- Performance Grade Code
  - B: –25°C to +85°C
- Package Code
  - H: Ceramic DIP
- Reliability Screening
  - Q: Q-Screened

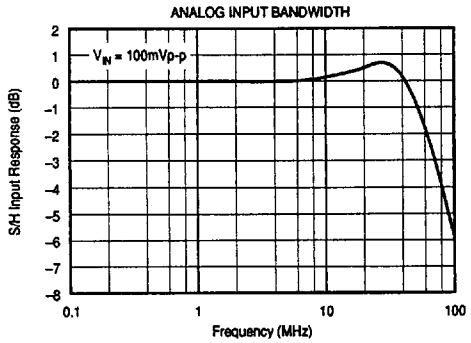
PACKAGE INFORMATION[1]

MODEL	PACKAGE	PACKAGE DRAWING NUMBER
SHC600BH	24-LD Bottombraze	143

NOTE: (1) For detailed drawing and dimension table, please see end of data sheet, or Appendix D of Burr-Brown IC Data Book.

TYPICAL PERFORMANCE CURVE

At +25°C and rated power supplies and 100Ω in parallel with 3pF load unless otherwise specified.



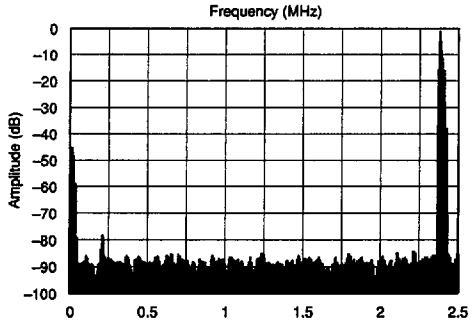
THEORY OF OPERATION

The SHC600 is a high-speed S/H amplifier with low distortion, fast acquisition time and very low aperture uncertainty (jitter). A diode bridge sampling switch is used to achieve an acceptable compromise between speed and accuracy. The diode bridge switching transients are buffered from the analog input by a high input impedance buffer amplifier. Since the hold capacitor does not appear in the feedback of the diode bridge output buffer, the capacitor can acquire the signal in 25ns. The low-bias-current output buffer droop appears as only an offset error and does not affect linearity.

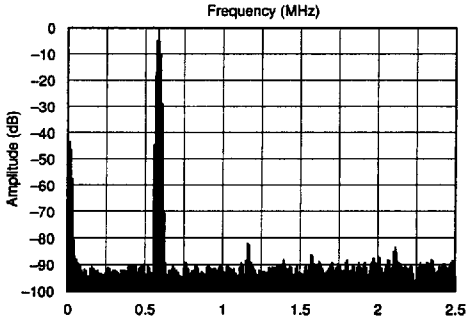
TYPICAL FFT SPECTRAL PERFORMANCE

All FFT data: 512-point FFT, 10-sample average; minimum 4-sample Blackman-Harris Window. Tested in ADC600K high speed ADC.

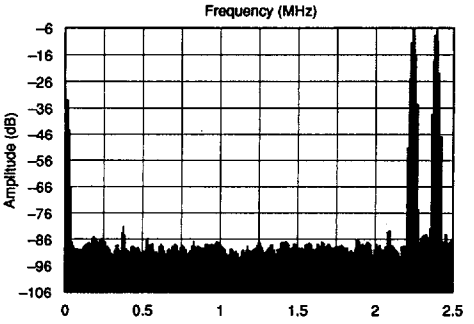
Sample Rate = 5MHz, Input Voltage = Full-Scale (0dB)



	Level re: Full-Scale (dB)
2.4121MHz Fundamental	= –0.6
Harmonics: 2f	= –77.9
3f	= –83.1
4f	= –85.3
SINAD	= 67.3dB
TND	= –68.5dBc
THD	= –73.3dBc



	Level re: Full-Scale (dB)
0.5859MHz Fundamental	= –0.7
Harmonics: 2f	= –81.4
3f	= –87.2
4f	= –87.0
SINAD	= 69.6dB
TND	= –70.7dBc
THD	= –76.1dBc



	Level re: Full-Scale (dB)
F_1: 2.2461MHz	= –6.3
F_2: 2.4023MHz	= –6.4
Peak Envelope	= –0.7
IMD: 0.3809MHz	= –81.2
2.0996MHz	= –82.9
2.4707MHz	= –83.9