

FEATURES

Up to 600 MHz high-performance Blackfin processor
 Two 16-bit MACs, two 40-bit ALUs, four 8-bit video ALUs,
 40-bit shifter
 RISC-like register and instruction model for ease of
 programming and compiler-friendly support
 Advanced debug, trace, and performance monitoring
 tbd V to tbd V core V_{DD} with on-chip voltage regulation
 1.8V, 2.5V, or 3.3V I/O operation
 Embedded low power audio CODEC
 289-ball MBGA package

MEMORY

132K bytes of on-chip memory:
 48K bytes of instruction SRAM
 16K bytes of instruction SRAM/cache
 32K bytes of data SRAM
 32K bytes of data SRAM/cache
 4K bytes of scratchpad SRAM
 External memory controller with glueless support for SDRAM
 and asynchronous 8-bit and 16-bit memories
 Nand flash controller
 Flexible booting options from external flash, SPI and TWI
 memory or from SPI, TWI, and UART host devices
 One-time programmable memory for security
 Two dual-channel memory DMA controllers
 Memory management unit providing memory protection

PERIPHERALS

Refer to the published ADSP-BF522/ADSP-BF525/ADSP-
 BF527 Revision PrB datasheet for additional peripherals

CODEC FEATURES

Stereo 24-bit A/D and D/A converters

DAC

100 dB (A-weighted) signal-to-noise ratio at 3.3 V

95 dB (A-weighted) signal-to-noise ratio at 1.8 V

ADC

90 dB (A-weighted) signal-to-noise ratio at 3.3 V

85dB (A-weighted) signal-to-noise ratio at 1.8 V

Audio sample rates

8 kHz, 44.1 kHz or 88.2 kHz—XTI/MCLK frequency 11.2896
 MHz ($256 \times F_S$) or 16.9344 MHz ($384 \times F_S$)

8 kHz, 32 kHz, 48 kHz or 96 kHz—XTI/MCLK frequency
 12.288 MHz ($256 \times F_S$) or 18.432 MHz ($384 \times F_S$)

Highly efficient headphone amplifier

Complete stereo/mono or microphone/line interface

Normal and USB modes programmed under software control

Low power

8 mW stereo playback (1.8 V all power supplies)

20 mW record and playback (1.8 V all power supplies))

Low supply voltages

1.8 V to 3.6 V analog supply range

1.8 V to 3.6 V digital supply range

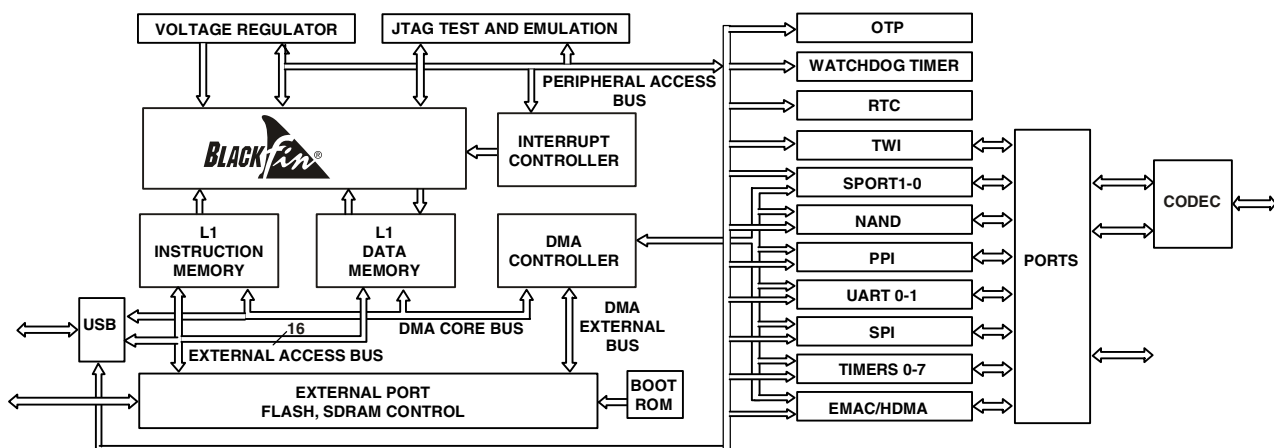


Figure 1. Functional Block Diagram

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Rev. PrB

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REVISION HISTORY

6/07—Revision PrB: Changes from PrA to PrB

Corrects SS/PG and VRSEL 289-Ball Mini-BGA Ball Assignment (Alphabetically by Signal) 7

Corrects SS/PG and VRSEL 289-Ball Mini-BGA Ball Assignment (Numerically by Ball Number) 8

3/07—Revision PrA: Initial Version

GENERAL DESCRIPTION

This document describes the differences between the ADSP-BF522C/ADSP-BF525C/ADSP-BF527C and the ADSP-BF522/ADSP-BF525/ADSP-BF527 standard product. Please refer to the published ADSP-BF522/ADSP-BF525/ADSP-BF527 Revision PrC datasheet for general description and specifications. This document only describes the exceptions to that datasheet.

The ADSP-BF522C/ADSP-BF525C/ADSP-BF527C adds a stereo CODEC to the standard product and changes the package labeling.

STEREO CODEC

The CODEC in the ADSP-BF522C/ADSP-BF525C/ADSP-BF527C is a low power, high quality stereo audio CODEC for portable digital audio application. It features two 24-bit A/D converter channels and two 24-bit D/A converter channels.

In normal mode, the XMI/MCLK oscillator is set up according to the desired sample rates of the ADC and DAC. For ADC or DAC sampling rates of 8 kHz, 32 kHz, 48 kHz or 96 kHz, MCLK frequencies of either 12.288 MHz ($256 \times FS$) or 18.432 MHz ($384 \times FS$) can be used. For ADC or DAC sampling rates of 8 kHz, 44.1 kHz or 88.2 kHz, MCLK frequencies of either 11.2896 MHz ($256 \times FS$) or 16.9344 MHz ($384 \times FS$) can be used.

In USB mode, the XTI/MCLK frequency is only 12MHz allowing for ADC and DAC sampling rates of 8 kHz, 44.1 kHz or 88.2 kHz.

The CODEC can operate with power supplies as low as 1.8 V for the analog part and 1.8 V for digital port. The maximum voltage is 3.6 V for all power supplies.

The device is controlled by a 2- or 3-wire serial interface which provides access to all features including volume controls, mutes and extensive power management facilities.

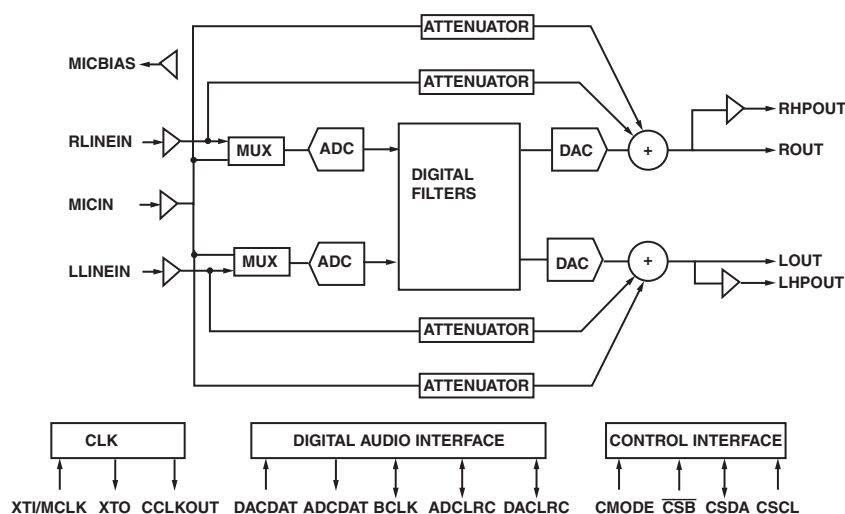


Figure 2. Audio CODEC Block Diagram

PIN DESCRIPTIONS

The ADSP-BF522C/ADSP-BF525C/ADSP-BF527C processor adds CODEC signals as listed in [Table 1](#).

Table 1. Pin Descriptions

| Pin Name | Type | Function | Pull-Up/Down |
|-------------------------|------|---|---------------------------------|
| CCLKOUT | O | CODEC Clock Output | None |
| BCLK | I/O | CODEC Digital Audio Bit Clock | Internal Pull-down ¹ |
| DACDAT | I | CODEC DAC Sample Rate Left/Right Clock | None |
| DACLRC | I/O | CODEC I/O DAC Sample Rate Left/Right Clock | Internal Pull-down ¹ |
| ADCDAT | O | CODEC ADC Digital Audio Data Output | None |
| ADCLRC | I/O | CODEC ADC Sample Rate Left/Right Clock | Internal Pull-down ¹ |
| CMODE | I | CODEC Control Interface Selection | Internal Pull-up ¹ |
| $\overline{\text{CSB}}$ | I | CODEC MPU Chip Select/MPU Interface Address Selection | Internal Pull-up ¹ |
| CSDA | I/O | CODEC MPU Data Input | None |
| CSCL | I | CODEC MPU Clock | None |
| XTI/MCLK | I | CODEC Crystal Input/MPU Clock Input | None |
| XTO | O | CODEC Crystal Output | None |
| LHPOUT | O | CODEC Left Channel Headphone Output (Analog Output) | None |
| RHPOUT | O | CODEC Right Channel Headphone Output (Analog Output) | None |
| LOUT | O | CODEC Left Channel Line Output (Analog Output) | None |
| ROUT | O | CODEC Right Channel Line Output (Analog Output) | None |
| VMID | O | CODEC Mid-rail Reference Decoupling Point (Analog Output) | None |
| MICBIAS | O | CODEC Electret Microphone Bias (Analog Output) | None |
| MICIN | I | CODEC Microphone Input; (Analog Input, AC Coupled) | None |
| RLINEIN | I | CODEC Right Channel Line Input (Analog Input, AC Coupled) | None |
| LLINEIN | I | CODEC Left Channel Line Input (Analog Input, AC Coupled) | None |
| GND | P | CODEC Digital Core Ground | N/A |
| AVDD | P | CODEC Analog V_{DD} | N/A |
| AGND | P | CODEC Analog Ground | N/A |
| HPVDD | P | CODEC Headphone V_{DD} (Analog) | N/A |
| HPGND | P | CODEC Headphone Ground | N/A |

¹ Pull-up/pull-down is only present when the control register interface ACTIVE = 0 to conserve power.

SPECIFICATIONS

Component specifications are subject to change without notice.

OPERATING CONDITIONS

| Parameter | Conditions | Min | Typical | Max | Unit |
|--------------|---|--|---------|----------------------|------------------|
| V_{DD} | Digital Core V_{DD} | 1.8 | | 3.6 | V |
| $A_{V_{DD}}$ | Analog V_{DD} | 1.8 | | 3.6 | V |
| HPV_{DD} | Headphone V_{DD} (Analog) | 1.8 | | 3.6 | V |
| V_{ILC} | CODEC Low Level Input Voltage ¹ | | | $0.3 \times CV_{DD}$ | V |
| V_{IHC} | CODEC High Level Input Voltage ¹ | $0.7 \times CV_{DD}$ | | | V |
| V_{OLC} | CODEC Low Level Output Voltage ¹ | | | $0.1 \times CV_{DD}$ | V |
| V_{OHC} | CODEC Low Level Output Voltage ¹ | $0.9 \times CV_{DD}$ | | | V |
| T_J | Junction Temperature | 289-Ball Chip Scale Ball Grid Array (Mini-BGA) @ $T_{AMBIENT} = 0^\circ\text{C}$ to $+70^\circ\text{C}$ | | +105 | $^\circ\text{C}$ |

¹ Parameter value applies to digital signal pins (ADC DAT, ADCLRC, BCLK, CSB, CCLKOUT, CMODE, DAC DAT, DACLRC, CSCL, CSDA, XTI/MCLK, XTO).

ELECTRICAL CHARACTERISTICS

| Parameter | Conditions | Min | Typical | Max | Unit |
|--|--|-----|---------|-----|------|
| Line Input to ADC | | | | | |
| SNR | Signal to Noise Ratio A-weighted, 0 dB Gain @ $F_3 = 48$ kHz | tbd | 85 | | dB |
| SNR | Signal to Noise Ratio A-weighted, 0 dB Gain @ $F_3 = 96$ kHz | | 85 | | dB |
| DR | Dynamic Range A-weighted, -60 dB Full Scale Input | tbd | 88 | | dB |
| THD | Total Harmonic Distortion -1 dB Input, 0 dB Gain | | -76 | tbd | dB |
| Microphone Input to ADC | | | | | |
| | 0 dB Gain, $F_3 = 48$ kHz, 40 k Ω Source Impedance | | | | |
| SNR | Signal to Noise Ratio A-weighted, 0 dB Gain | | 80 | | dB |
| DR | Dynamic Range A-weighted, -60 dB Full Scale Input | | 70 | | dB |
| THD | Total Harmonic Distortion 0 dB Input, 0 dB Gain | | -55 | | dB |
| Line Output for DAC Playback Only | | | | | |
| | Load = 10 k Ω , 50 pF | | | | |
| SNR | Signal to Noise Ratio A-weighted, 0 dB Gain @ $F_3 = 48$ kHz | tbd | 95 | | dB |
| SNR | Signal to Noise Ratio A-weighted, 0 dB Gain @ $F_3 = 96$ kHz | | 93 | | dB |
| DR | Dynamic Range A-weighted, -60 dB Full Scale Input | tbd | 90 | | dB |
| THD | Total Harmonic Distortion 1 kHz, 0 dB | | -80 | tbd | dB |
| THD | Total Harmonic Distortion 1 kHz, -3 dB | | -90 | | dB |
| Analog Line Input to Line Output | | | | | |
| | Load = 10 k Ω , 50 pF, No Gain on Input, Bypass Mode | | | | |
| SNR | Signal to Noise Ratio | tbd | 90 | | dB |
| THD | Total Harmonic Distortion 1 kHz, 0 dB | | -83 | tbd | dB |
| THD | Total Harmonic Distortion 1 kHz, -3 dB | | -92 | | dB |
| Stereo Headphone Output | | | | | |
| PO | Maximum Output Power $R_L = 32 \Omega$ | | 9 | | mW |
| PO | Maximum Output Power $R_L = 16 \Omega$ | | 18 | | mW |
| SNR | Signal to Noise Ratio A-weighted | tbd | 95 | | dB |
| THD | Total Harmonic Distortion 1 kHz, -5 dB, $R_L = 32 \Omega$, Full Scale Input | | -62 | tbd | dB |
| THD | Total Harmonic Distortion 1 kHz, -2 dB, $R_L = 32 \Omega$, Full Scale Input | | | tbd | dB |
| Microphone Input to Headphone Output Side Tone Mode | | | | | |
| SNR | Signal to Noise Ratio | tbd | 90 | | dB |

DIGITAL FILTER CHARACTERISTICS

| Parameter | Conditions | Min | Typical | Max | Unit |
|-----------------------------------|-------------------------|------------------|------------------|------------------|------|
| ADC Filter | | | | | |
| Passband | ± 0.05 dB | $tbd \times F_S$ | | $tbd \times F_S$ | |
| Passband | -6 dB | | $0.5 \times F_S$ | | |
| Passband Ripple | | | | tbd | dB |
| Stopband | | $tbd \times F_S$ | | | |
| Stopband Attenuation | $F > 0.5465 \times F_S$ | tbd | | | dB |
| High Pass Filter Corner Frequency | -3 dB | | 3.7 | | Hz |
| High Pass Filter Corner Frequency | -0.5 dB | | 10.4 | | Hz |
| High Pass Filter Corner Frequency | -0.1 dB | | 21.6 | | Hz |
| DAC Filter | | | | | |
| Passband | ± 0.03 dB | $tbd \times F_S$ | | $tbd \times F_S$ | |
| Passband | -6 dB | | $0.5 \times F_S$ | | |
| Passband Ripple | | | | tbd | dB |
| Stopband | | $tbd \times F_S$ | | | |
| Stopband Attenuation | $F > 0.5465 \times F_S$ | tbd | | | dB |

PACKAGE INFORMATION

The information presented in [Figure 3](#) and [Table 2](#) provides details about the package branding for the ADSP-BF522C/ADSP-BF525C/ADSP-BF527C processor. For a complete listing of product availability, see [Ordering Guide on Page 12](#).



Figure 3. Product Information on Package

Table 2. Package Brand Information

| Brand Key | Field Description |
|-----------|--------------------|
| t | Temperature Range |
| pp | Package Type |
| Z | Lead Free Option |
| ccc | See Ordering Guide |
| vvvvv.x | Assembly Lot Code |
| n.n | Silicon Revision |
| yyww | Date Code |

289-BALL MINI-BGA PINOUT

Table 3 lists the mini-BGA pinout by signal mnemonic. Table 4 on Page 8 lists the mini-BGA pinout by ball number.

Table 3. 289-Ball Mini-BGA Ball Assignment (Alphabetically by Signal)

| Signal | Ball No. | Signal | Ball No. | Signal | Ball No. | Signal | Ball No. | Signal | Ball No. | Signal | Ball No. | Signal | Ball No. |
|------------|----------|----------|----------|---------|----------|---------------|----------|-------------|----------|--------|----------|----------|----------|
| ABE0/SDQM0 | AB9 | CSB | D23 | GND | L14 | PF5 | B10 | RESET | V22 | VDDEXT | R17 | VDDMEM | U8 |
| ABE1/SDQM1 | AC9 | CSCL | B23 | GND | L15 | PF6 | B12 | RHPOUT | B21 | VDDEXT | T17 | VDDMEM | U9 |
| ADCDAT | A16 | CSDA | C23 | GND | M9 | PF7 | B13 | RLINEIN | F23 | VDDEXT | U17 | VDDMEM | U10 |
| ADCLRC | A15 | DACDAT | A18 | GND | M10 | PF8 | B16 | ROUT | G22 | VDDINT | B5 | VDDMEM | U11 |
| ADDR1 | AB8 | DACLRC | A17 | GND | M11 | PF9 | A20 | RTXI | U23 | VDDINT | H8 | VDDMEM | U12 |
| ADDR2 | AC8 | DATA0 | Y1 | GND | M12 | PF10 | B15 | RTXO | V23 | VDDINT | H9 | VDDMEM | U13 |
| ADDR3 | AB7 | DATA1 | V2 | GND | M13 | PF11 | B17 | SA10 | AC10 | VDDINT | H10 | VDDMEM | U14 |
| ADDR4 | AC7 | DATA2 | W1 | GND | M14 | PF12 | B18 | SCAS | AC11 | VDDINT | H11 | VDDMEM | U15 |
| ADDR5 | AC6 | DATA3 | U2 | GND | M15 | PF13 | B19 | SCKE | AB13 | VDDINT | H12 | VDDMEM | U16 |
| ADDR6 | AB6 | DATA4 | V1 | GND | N9 | PF14 | A9 | SCL | B22 | VDDINT | H13 | VDDOTP | AC12 |
| ADDR7 | AB4 | DATA5 | U1 | GND | N10 | PF15 | A10 | SDA | C22 | VDDINT | H14 | VDDRTC | W23 |
| ADDR8 | AB5 | DATA6 | T2 | GND | N11 | PG0 | H2 | SMS | AC13 | VDDINT | H15 | VDDUSB | W22 |
| ADDR9 | AC5 | DATA7 | T1 | GND | N12 | PG1 | G1 | SRAS | AB12 | VDDINT | H16 | VDDUSB | Y23 |
| ADDR10 | AC4 | DATA8 | R1 | GND | N13 | PG2 | H1 | SS/PG | AC20 | VDDINT | J8 | VMID | G23 |
| ADDR11 | AB3 | DATA9 | P1 | GND | N14 | PG3 | F1 | SWE | AB10 | VDDINT | J16 | VROUT | AC18 |
| ADDR12 | AC3 | DATA10 | P2 | GND | N15 | PG4 | D1 | TCK | L1 | VDDINT | K8 | VRSEL | AB22 |
| ADDR13 | AB2 | DATA11 | R2 | GND | P9 | PG5 | D2 | TDI | J1 | VDDINT | K16 | XTAL | P23 |
| ADDR14 | AC2 | DATA12 | N1 | GND | P10 | PG6 | C2 | TDO | K1 | VDDINT | L8 | XTI/MCLK | A22 |
| ADDR15 | AA2 | DATA13 | N2 | GND | P11 | PG7 | B1 | TMS | L2 | VDDINT | L16 | XTO | A21 |
| ADDR16 | W2 | DATA14 | M2 | GND | P12 | PG8 | C1 | TRST | K2 | VDDINT | M8 | | |
| ADDR17 | Y2 | DATA15 | M1 | GND | P13 | PG9 | B2 | USB_DM | AB21 | VDDINT | M16 | | |
| ADDR18 | AA1 | EMU | J2 | GND | P14 | PG10 | B4 | USB_DP | AA22 | VDDINT | N8 | | |
| ADDR19 | AB1 | EXT_WAKE | AC19 | GND | P15 | PG11 | B3 | USB_ID | Y22 | VDDINT | N16 | | |
| AGND | G17 | GND | A1 | GND | R9 | PG12 | A2 | USB_RSET | AC21 | VDDINT | P8 | | |
| AGND | H22 | GND | A23 | GND | R10 | PG13 | A3 | USB_VBUS | AB20 | VDDINT | P16 | | |
| AMS0 | AC17 | GND | B6 | GND | R11 | PG14 | A4 | USB_VREF | AC22 | VDDINT | R8 | | |
| AMS1 | AB16 | GND | J9 | GND | R12 | PG15 | A5 | USB_XTALIN | AB23 | VDDINT | R16 | | |
| AMS2 | AC16 | GND | J10 | GND | R13 | PH0 | A11 | USB_XTALOUT | AA23 | VDDINT | T8 | | |
| AMS3 | AB15 | GND | J11 | GND | R14 | PH1 | A12 | VDDEXT | G7 | VDDINT | T9 | | |
| AOE | AC15 | GND | J12 | GND | R15 | PH2 | A13 | VDDEXT | G8 | VDDINT | T10 | | |
| ARDY | AC14 | GND | J13 | GND | T22 | PH3 | B14 | VDDEXT | G9 | VDDINT | T11 | | |
| ARE | AB17 | GND | J14 | GND | AC1 | PH4 | A14 | VDDEXT | G10 | VDDINT | T12 | | |
| AVDD | G16 | GND | J15 | GND | AC23 | PH5 | K23 | VDDEXT | G11 | VDDINT | T13 | | |
| AVDD | J22 | GND | K9 | LHPOUT | B20 | PH6 | K22 | VDDEXT | G12 | VDDINT | T14 | | |
| AWE | AB14 | GND | K10 | LLINEIN | E23 | PH7 | L23 | VDDEXT | G13 | VDDINT | T15 | | |
| BCLK | A19 | GND | K11 | LOUT | F22 | PH8 | L22 | VDDEXT | G14 | VDDINT | T16 | | |
| BMODE0 | G2 | GND | K12 | MICBIAS | H23 | PH9 | T23 | VDDEXT | G15 | VDDMEM | J7 | | |
| BMODE1 | F2 | GND | K13 | MICIN | J23 | PH10 | M22 | VDDEXT | H7 | VDDMEM | K7 | | |
| BMODE2 | E1 | GND | K14 | NMI | U22 | PH11 | R22 | VDDEXT | H17 | VDDMEM | L7 | | |
| BMODE3 | E2 | GND | K15 | OTPVPP | AB11 | PH12 | M23 | VDDEXT | J17 | VDDMEM | M7 | | |
| CCLKOUT | D22 | GND | L9 | PF0 | A7 | PH13 | N22 | VDDEXT | K17 | VDDMEM | N7 | | |
| CLKBUF | AB19 | GND | L10 | PF1 | B8 | PH14 | N23 | VDDEXT | L17 | VDDMEM | P7 | | |
| CLKIN | R23 | GND | L11 | PF2 | A8 | PH15 | P22 | VDDEXT | M17 | VDDMEM | R7 | | |
| CLKOUT | AB18 | GND | L12 | PF3 | B9 | PPICLK/TMRCLK | A6 | VDDEXT | N17 | VDDMEM | T7 | | |
| CMODE | E22 | GND | L13 | PF4 | B11 | PPIFS1/TMRO | B7 | VDDEXT | P17 | VDDMEM | U7 | | |

Table 4. 289-Ball Mini-BGA Ball Assignment (Numerically by Ball Number)

| Ball No. | Signal | Ball No. | Signal | Ball No. | Signal | Ball No. | Signal | Ball No. | Signal | Ball No. | Signal | | |
|----------|---------------|----------|---------|----------|---------|----------|--------|----------|--------|----------|-------------|------|------------|
| A1 | GND | B23 | CSCL | H22 | AGND | L22 | PH8 | P22 | PH15 | U22 | NMI | AC5 | ADDR9 |
| A2 | PG12 | C1 | PG8 | H23 | MICBIAS | L23 | PH7 | P23 | XTAL | U23 | RTXI | AC6 | ADDR5 |
| A3 | PG13 | C2 | PG6 | J1 | TDI | M1 | DATA15 | R1 | DATA8 | V1 | DATA4 | AC7 | ADDR4 |
| A4 | PG14 | C22 | SDA | J2 | EMU | M2 | DATA14 | R2 | DATA11 | V2 | DATA1 | AC8 | ADDR2 |
| A5 | PG15 | C23 | CSDA | J7 | VDDMEM | M7 | VDDMEM | R7 | VDDMEM | V22 | RESET | AC9 | ABE1/SDQM1 |
| A6 | PPICLK/TMRCLK | D1 | PG4 | J8 | VDDINT | M8 | VDDINT | R8 | VDDINT | V23 | RTXO | AC10 | SA10 |
| A7 | PF0 | D2 | PG5 | J9 | GND | M9 | GND | R9 | GND | W1 | DATA2 | AC11 | SCAS |
| A8 | PF2 | D22 | CCLKOUT | J10 | GND | M10 | GND | R10 | GND | W2 | ADDR16 | AC12 | VDDOTP |
| A9 | PF14 | D23 | CSB | J11 | GND | M11 | GND | R11 | GND | W22 | VDDUSB | AC13 | SMS |
| A10 | PF15 | E1 | BMODE2 | J12 | GND | M12 | GND | R12 | GND | W23 | VDDRTC | AC14 | ARDY |
| A11 | PH0 | E2 | BMODE3 | J13 | GND | M13 | GND | R13 | GND | Y1 | DATA0 | AC15 | AOE |
| A12 | PH1 | E22 | CMODE | J14 | GND | M14 | GND | R14 | GND | Y2 | ADDR17 | AC16 | AMS2 |
| A13 | PH2 | E23 | LLINEIN | J15 | GND | M15 | GND | R15 | GND | Y22 | USB_ID | AC17 | AMS0 |
| A14 | PH4 | F1 | PG3 | J16 | VDDINT | M16 | VDDINT | R16 | VDDINT | Y23 | VDDUSB | AC18 | VROUT |
| A15 | ADCLRC | F2 | BMODE1 | J17 | VDDEXT | M17 | VDDEXT | R17 | VDDEXT | AA1 | ADDR18 | AC19 | EXT_WAKE |
| A16 | ADCDAT | F22 | LOUT | J22 | AVDD | M22 | PH10 | R22 | PH11 | AA2 | ADDR15 | AC20 | SS/PG |
| A17 | DACLRC | F23 | RLINEIN | J23 | MICIN | M23 | PH12 | R23 | CLKIN | AA22 | USB_DP | AC21 | USB_RSET |
| A18 | DACDAT | G1 | PG1 | K1 | TDO | N1 | DATA12 | T1 | DATA7 | AA23 | USB_XTALOUT | AC22 | USB_VREF |
| A19 | BCLK | G2 | BMODE0 | K2 | TRST | N2 | DATA13 | T2 | DATA6 | AB1 | ADDR19 | AC23 | GND |
| A20 | PF9 | G7 | VDDEXT | K7 | VDDMEM | N7 | VDDMEM | T7 | VDDMEM | AB2 | ADDR13 | | |
| A21 | XTO | G8 | VDDEXT | K8 | VDDINT | N8 | VDDINT | T8 | VDDINT | AB3 | ADDR11 | | |
| A22 | XTI/MCLK | G9 | VDDEXT | K9 | GND | N9 | GND | T9 | VDDINT | AB4 | ADDR7 | | |
| A23 | GND | G10 | VDDEXT | K10 | GND | N10 | GND | T10 | VDDINT | AB5 | ADDR8 | | |
| B1 | PG7 | G11 | VDDEXT | K11 | GND | N11 | GND | T11 | VDDINT | AB6 | ADDR6 | | |
| B2 | PG9 | G12 | VDDEXT | K12 | GND | N12 | GND | T12 | VDDINT | AB7 | ADDR3 | | |
| B3 | PG11 | G13 | VDDEXT | K13 | GND | N13 | GND | T13 | VDDINT | AB8 | ADDR1 | | |
| B4 | PG10 | G14 | VDDEXT | K14 | GND | N14 | GND | T14 | VDDINT | AB9 | ABE0/SDQM0 | | |
| B5 | VDDINT | G15 | VDDEXT | K15 | GND | N15 | GND | T15 | VDDINT | AB10 | SWE | | |
| B6 | GND | G16 | AVDD | K16 | VDDINT | N16 | VDDINT | T16 | VDDINT | AB11 | OTPVPP | | |
| B7 | PPIFS1/TMR0 | G17 | AGND | K17 | VDDEXT | N17 | VDDEXT | T17 | VDDEXT | AB12 | SRAS | | |
| B8 | PF1 | G22 | ROUT | K22 | PH6 | N22 | PH13 | T22 | GND | AB13 | SCKE | | |
| B9 | PF3 | G23 | VMID | K23 | PH5 | N23 | PH14 | T23 | PH9 | AB14 | AWE | | |
| B10 | PF5 | H1 | PG2 | L1 | TCK | P1 | DATA9 | U1 | DATA5 | AB15 | AMS3 | | |
| B11 | PF4 | H2 | PG0 | L2 | TMS | P2 | DATA10 | U2 | DATA3 | AB16 | AMS1 | | |
| B12 | PF6 | H7 | VDDEXT | L7 | VDDMEM | P7 | VDDMEM | U7 | VDDMEM | AB17 | ARE | | |
| B13 | PF7 | H8 | VDDINT | L8 | VDDINT | P8 | VDDINT | U8 | VDDMEM | AB18 | CLKOUT | | |
| B14 | PH3 | H9 | VDDINT | L9 | GND | P9 | GND | U9 | VDDMEM | AB19 | CLKBUF | | |
| B15 | PF10 | H10 | VDDINT | L10 | GND | P10 | GND | U10 | VDDMEM | AB20 | USB_VBUS | | |
| B16 | PF8 | H11 | VDDINT | L11 | GND | P11 | GND | U11 | VDDMEM | AB21 | USB_DM | | |
| B17 | PF11 | H12 | VDDINT | L12 | GND | P12 | GND | U12 | VDDMEM | AB22 | VRSEL | | |
| B18 | PF12 | H13 | VDDINT | L13 | GND | P13 | GND | U13 | VDDMEM | AB23 | USB_XTALIN | | |
| B19 | PF13 | H14 | VDDINT | L14 | GND | P14 | GND | U14 | VDDMEM | AC1 | GND | | |
| B20 | LHPOUT | H15 | VDDINT | L15 | GND | P15 | GND | U15 | VDDMEM | AC2 | ADDR14 | | |
| B21 | RHPOUT | H16 | VDDINT | L16 | VDDINT | P16 | VDDINT | U16 | VDDMEM | AC3 | ADDR12 | | |
| B22 | SCL | H17 | VDDEXT | L17 | VDDEXT | P17 | VDDEXT | U17 | VDDEXT | AC4 | ADDR10 | | |

Table 5. Thermal Characteristics (BC-289)

| Parameter | Condition | Typical | Unit |
|----------------|-----------------------|---------|------|
| θ_{JA} | 0 linear m/s air flow | tbd | °C/W |
| θ_{JMA} | 1 linear m/s air flow | tbd | °C/W |
| θ_{JMA} | 2 linear m/s air flow | tbd | °C/W |
| θ_{JB} | | tbd | °C/W |
| θ_{JC} | | tbd | °C/W |

Figure 5 shows the top view of the mini-BGA ball configuration.
 Figure 4 shows the bottom view of the mini-BGA ball configuration.

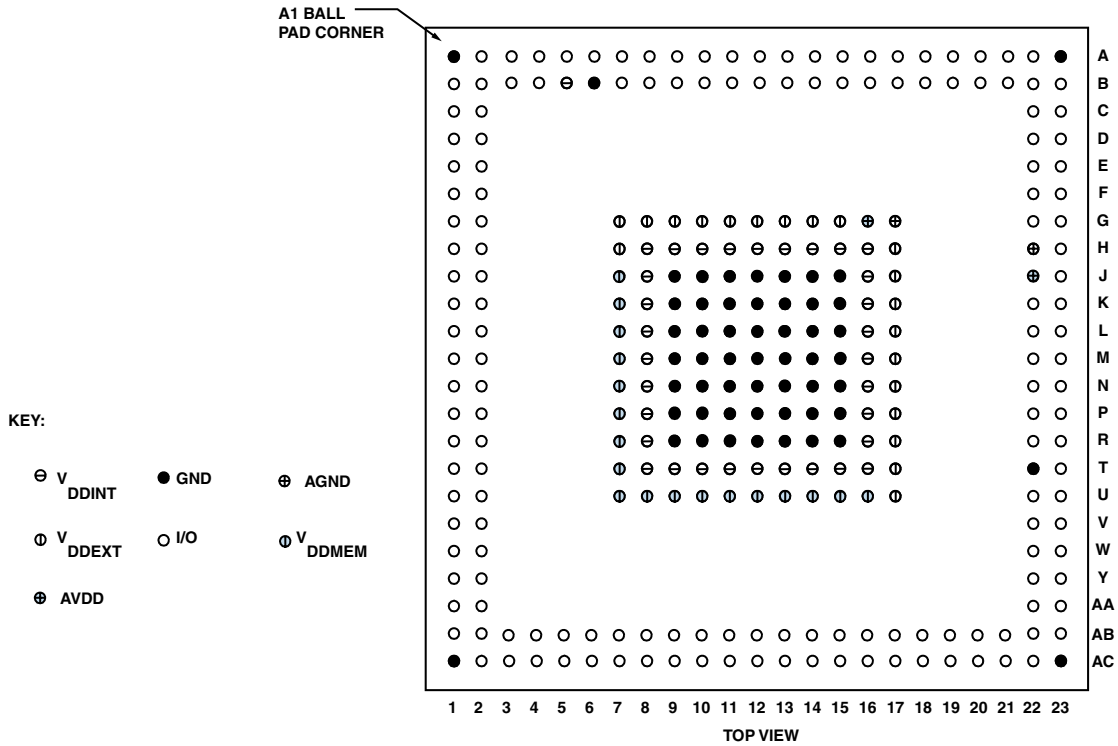


Figure 4. 289-Ball Mini-BGA Ball Configuration (Top View)

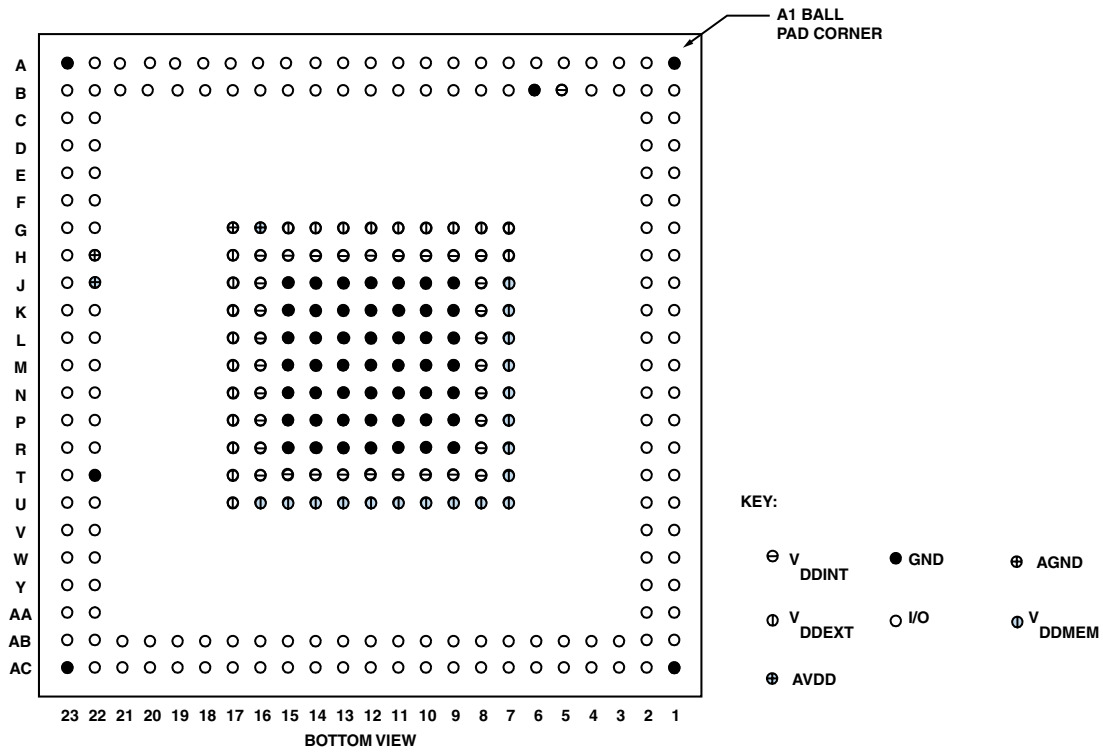


Figure 5. 289-Ball Mini-BGA Ball Configuration (Bottom View)

OUTLINE DIMENSIONS

Dimensions in the outline dimension figures are shown in millimeters.

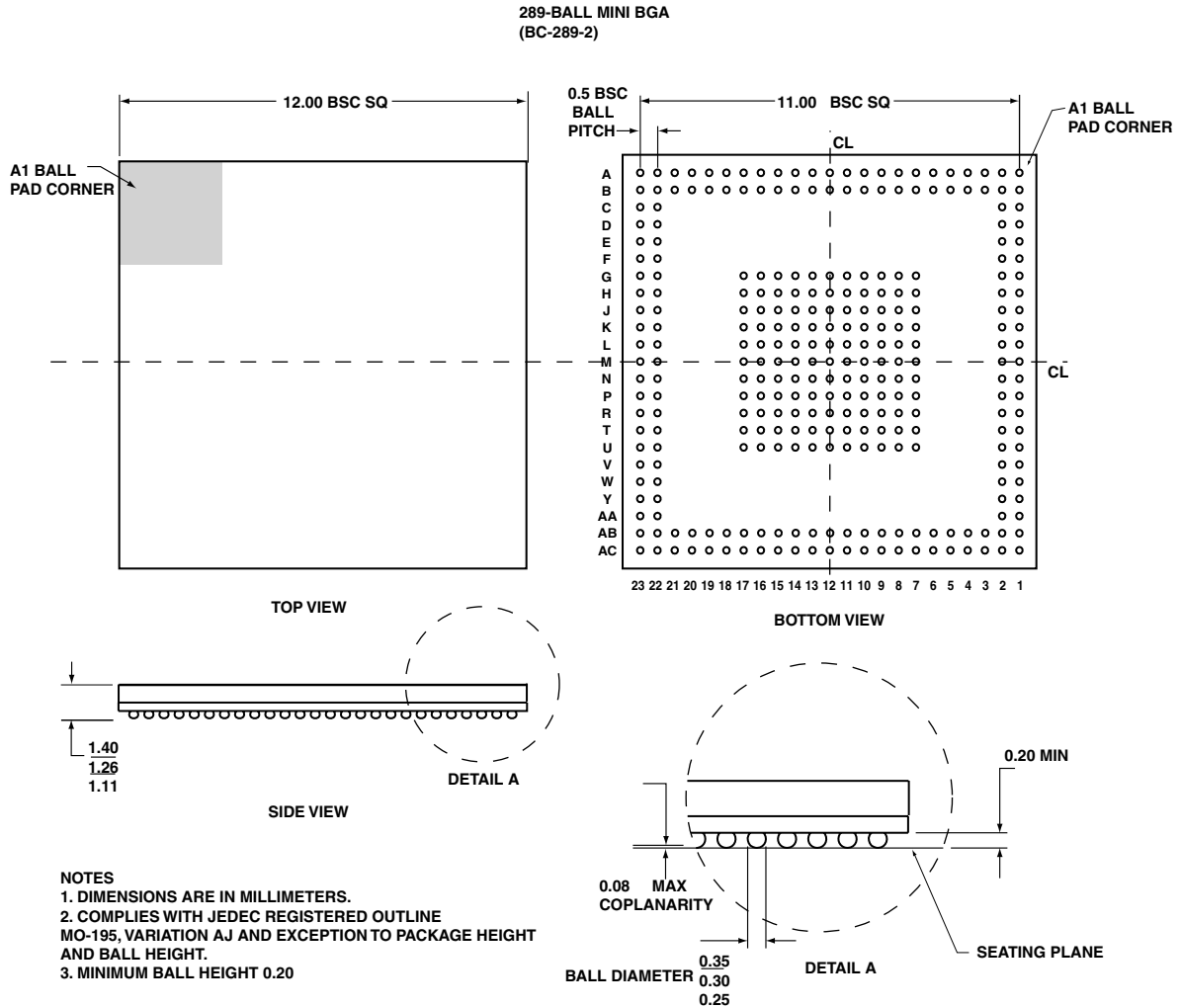


Figure 6. 289-Ball Chip Scale Package Ball Grid Array (Mini-BGA)

SURFACE MOUNT DESIGN

Table 6 is provided as an aid to PCB design. For industry-standard design recommendations, refer to IPC-7351, *Generic Requirements for Surface Mount Design and Land Pattern Standard*.

Table 6. BGA Data for Use with Surface Mount Design

| Package | Ball Attach Type | Solder Mask Opening | Ball Pad Size |
|--|---------------------|---------------------|------------------|
| 289-Ball Chip Scale Package Ball Grid Array (Mini-BGA) | Solder Mask Defined | 0.26 mm diameter | 0.35 mm diameter |

ORDERING GUIDE

| Model | Temperature Range¹ | Package Description | Package Option | Instruction Rate (Max) | Operating Voltage (Nom) |
|-------------------|--------------------------------------|--|-----------------------|-------------------------------|------------------------------------|
| ADSPBF527KBCZENG1 | 0°C to +70°C | 289-Ball Chip Scale Package Ball Grid Array (Mini-BGA) | BC-289 | 600 MHz | tbd V internal, 1.8 V or 3.3 V I/O |

¹ Referenced temperature is ambient temperature.