DA14870

Low-Power Dual Mode Bluetooth® v6.0 Compliant Audio SoC

The DA14870 Bluetooth® SIG certified Dual mode Audio ICs combines with Renesas Electronics Smart Codecs and System PMIC devices to form a flexible, powerful chipset optimized for low power consumption, high-performance portable Bluetooth Audio products.

The DA14870 integrates an Arm® Cortex® M33F application processor, a Tensilica® Fusion F1 audio DSP, a BT SIG v6.0 qualified Dual Mode Bluetooth solution, a rich set of peripherals and communication interfaces including USB 2.0 HS/FS.

A dedicated trainable Edge AI Neural Network Processor (NNP) with tools, supports Voice Activity Detector (VAD), Hot-Word detector (HWD), acoustic event detection (for example, glass breaking and so on), and audio scene detection (for example, music) to enable contexture awareness.

The DA14870 development kit; Customer Dev Kit (CDK) hardware, Audio Development Platform (ADP) software and tools; provide a flexible, powerful platform to accelerate time-to-market deployment of a broad range of Bluetooth audio products.

The ADP includes a wide range of audio products reference application software; a comprehensive suite of middleware firmware; a full set of low-drivers and audio DSP firmware; audio framework, libraries and reference audio flows.

The platform is further enhanced by Renesas Electronics; AvTools, desktop application tuning and configuration tool; and Reality AI, ML model generation and training tools to enable rapid deployment of Edge AI-based embedded software solutions.

Key Benefits:

- Best in class, power and performance, radio
- High resolution low-latency audio
- Renesas TWS (True Wireless Stereo) protocol
- Flexible wake-word detection and user commands
- Flexible audio scene and audio event detection
- Edge AI-based embedded software generation

Key Features

- Compliant with Bluetooth® 6.0, ETSI EN 300 328 and EN 300 440 Class 2 (Europe), FCC CFR47 Part 15 (US) and ARIB STD-T66 (Japan)
- Processing Power
  - 40 MHz up to160 MHz 32-bit Arm® Cortex® M33F with 16 kB, four-way associative cache
  - 40/80 MHz Arm Cortex- M0+
  - 40 MHz up to 320 MHz Tensilica Fusion F1 DSP
  - NNP for VAD and HWD
- On-Chip Memory
  - 256 kB CPU RAM
  - 512 kB CMAC RAM
  - 1024 kB DSP RAM
  - 256 kB Shared RAM
  - 4 kB One-Time-Programmable (OTP) memory
- Memory Interfaces
  - 80 MHz Quad/Octa SPI Flash controller with On-the-fly M33 XIP decryption
  - 80 MHz Quad SPI PSRAM/Flash Controller
- Clocks Source
  - 40/80 MHz crystal
  - RCX32 kHz (startup)
  - 32 kHz crystal (optional)
- Radio interface
  - Transmitter power consumption: 7.2 mW TX 0 dBm GFSK
  - Receiver power consumption: 4.95 mW
  - Receiver sensitivity
    - Bluetooth LE 1 Mbit: -99 dBm
    - Bluetooth LE 2 Mbit: -97 dBm
    - BLT BR: -96 dBm
    - BLT EDR 2 Mb: -94 dBm
    - BLT EDR 3 Mb: -87 dBm
  - Internal RX/TX switch
  - 2.4 GHz BT/Wi-Fi® Coexistence support
- Security
  - AES-128/192/256, SHA-224/256 Cryptographic engine
- Timers

- 5x General purpose timers
- 3x Watchdog timers
- 3x Phase counters

- RTC
- Debug Support
  - Arm® CoreSight SoC-400 with single SWD interface for debugging Fusion F1, M33 and M0+
- Power management
  - Optimum features and performance when paired with DA9098 system PMIC
  - Optimized Power modes (Extended Sleep, Deep Sleep and Hibernation)
  - Power supply pins: 3x Digital, 3x Analog and 2x Digital IO
  - Programmable thresholds brownout detection
- Digital interfaces
  - General Purpose I/Os with programmable pin assignment up to:
    - 25x for WLCSP
    - 50x for VFBGA
  - 3x UARTs up-to 3 Mbps
  - 2x SPI+™ Master/Slave
  - 2x I2C Master/slave
  - MIPI I3C controller
  - 4x PDM DMIC interface
  - Stereo PDM output
  - 3x LED timers with load balancing PWM
  - 2x Digital Audio interface (DAI) with I2S, PCM, TDM format
  - 6x Sample Rate Converters
  - 8x channel DMA for peripherals,16x DSPDMA channels for audio
- USB
  - USB 2.0 HS/FS Device
  - 1x IN/OUT Control Endpoint 0
  - 11x IN/OUT Control, ISOC, Bulk, INT endpoints with Dynamical FIFOs
  - 2x 12 DMA channels
  - LPM L1 (ADC3), LPM L2
- Analog interfaces
  - 12-bit SAR ADC, 1.5 M samples/s
  - On-chip Temperature sensor
  - BC1.2 Battery Charging Detection
- Packages
  - WLCSP64, 2.90x3.42 mm^2
  - VFBGA104, 4.20x4.65 mm^2

Applications

- BT Classic and LE Hearables
- LE Auracast Sink and Source
- Hearing Protection Earwear
- Hearing Assist Earwear
- Low Latency Wireless Mobile Gaming Solution
- Bluetooth Audio Dongle
- Wireless Audio Gateway
- Professional Wireless Microphone

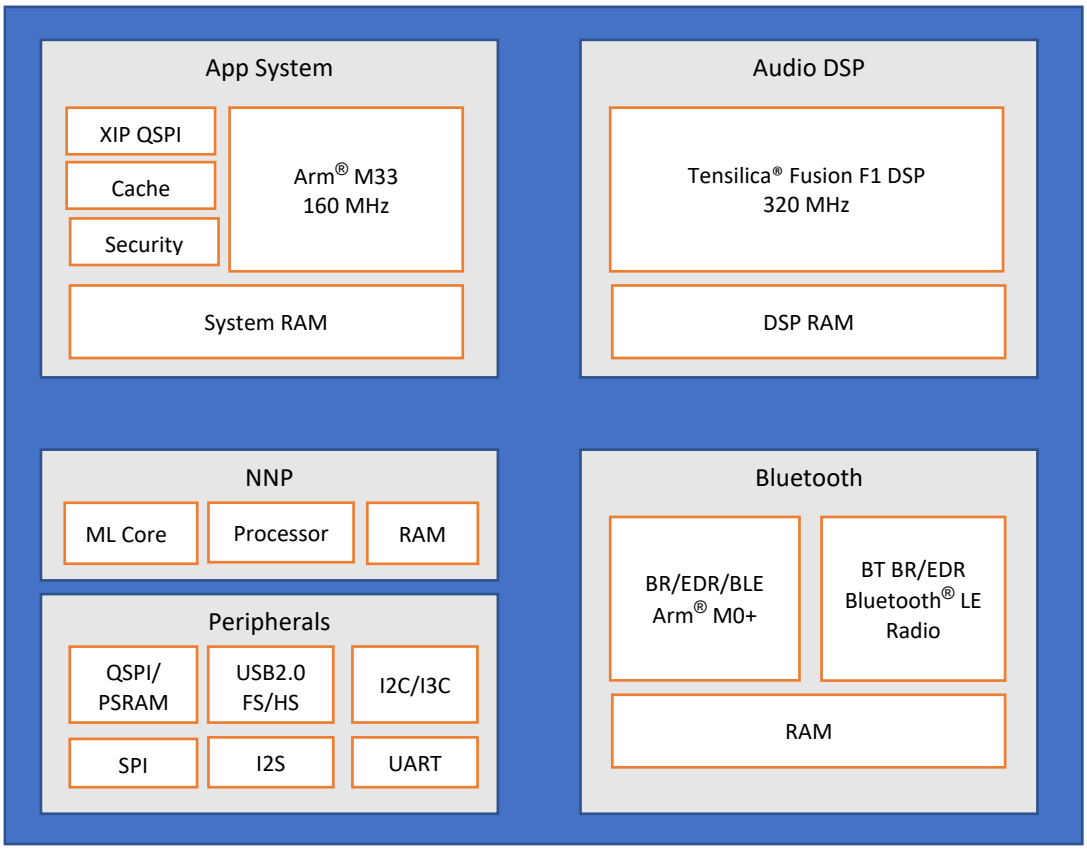

Figure 1. DA14870 block diagram

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1. Moisture Sensitivity Level

The Moisture Sensitivity Level (MSL) is an indicator for the maximum allowable time period (floor lifetime) in which a moisture sensitive plastic device, when removed from the dry bag, can be exposed to an environment with a maximum temperature of 30 °C and a maximum relative humidity of 60% RH before the solder reflow process.

WLCSP64 is qualified for MSL 1.

VFBGA104 package is qualified for MSL 3.

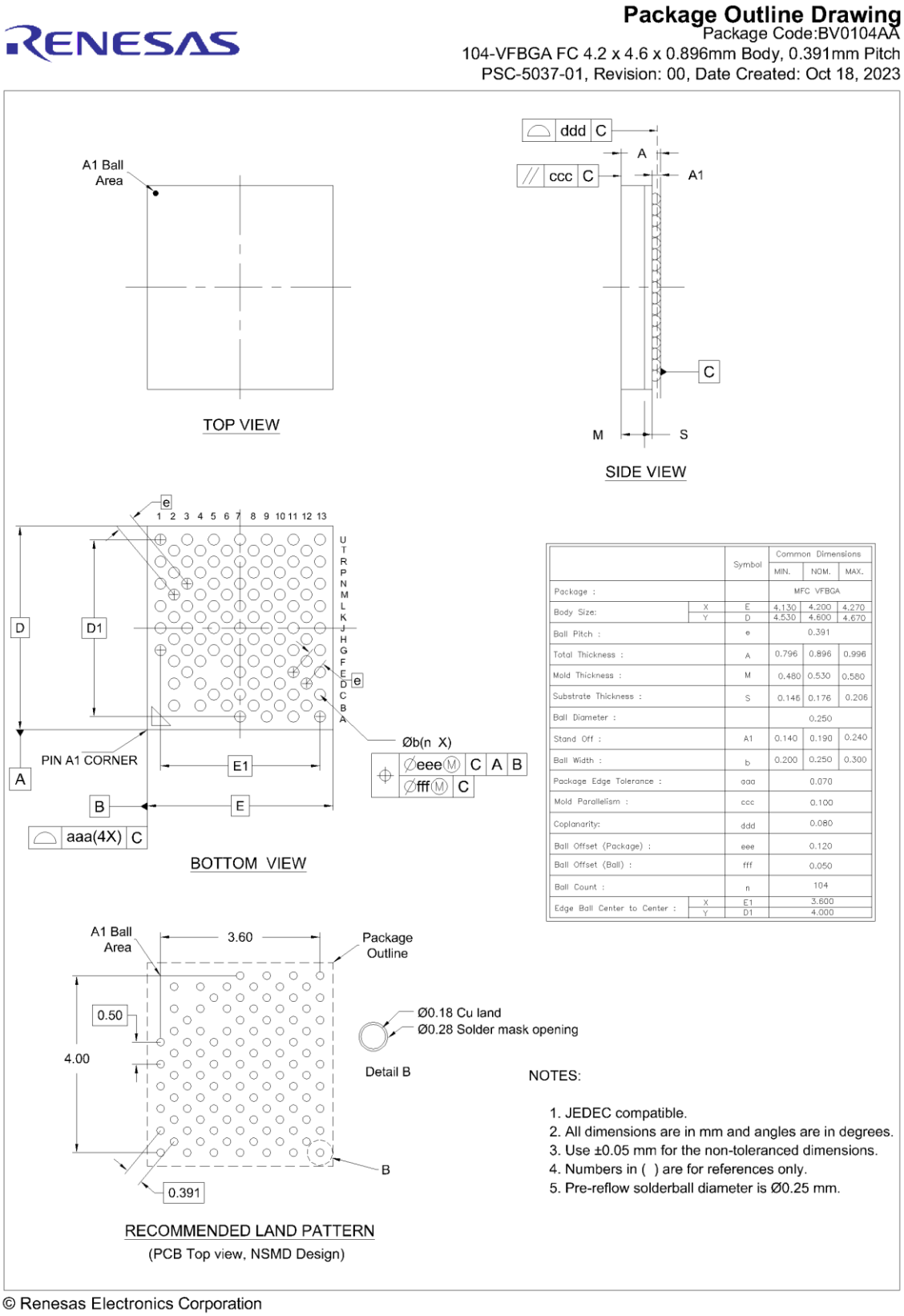
Table 1. MSL definitions

MSL level	Floor lifetime
MSL 4	72 hours
MSL 3	168 hours
MSL 2A	4 weeks
MSL 2	1 year
MSL 1	Unlimited at 30 °C/85%RH

2. Soldering Information

Refer to the IPC/JEDEC standard J-STD-020 for relevant soldering information. This document can be downloaded from http://www.jedec.org.

3. Package Outline Drawings



		Symbol	Common Dimensions		
			MIN.	NOM.	MAX.
Package :			MFC VFBGA		
Body Size:	X	E	4.130	4.200	4.270
	Y	D	4.530	4.600	4.670
Ball Pitch :		e		0.391	
Total Thickness :		A	0.796	0.896	0.996
Mold Thickness :		M	0.480	0.530	0.580
Substrate Thickness :		S	0.146	0.176	0.206
Ball Diameter :				0.250	
Stand Off :		A1	0.140	0.190	0.240
Ball Width :		b	0.200	0.250	0.300
Package Edge Tolerance :		aaa		0.070	
Mold Parallelism :		ccc		0.100	
Coplanarity:		ddd		0.080	
Ball Offset (Package) :		eee		0.120	
Ball Offset (Ball) :		fff		0.050	
Ball Count :		n		104	
Edge Ball Center to Center :	X	E1		3.600	
	Y	D1		4.000	

Figure 2. VFBGA104L package outline drawing

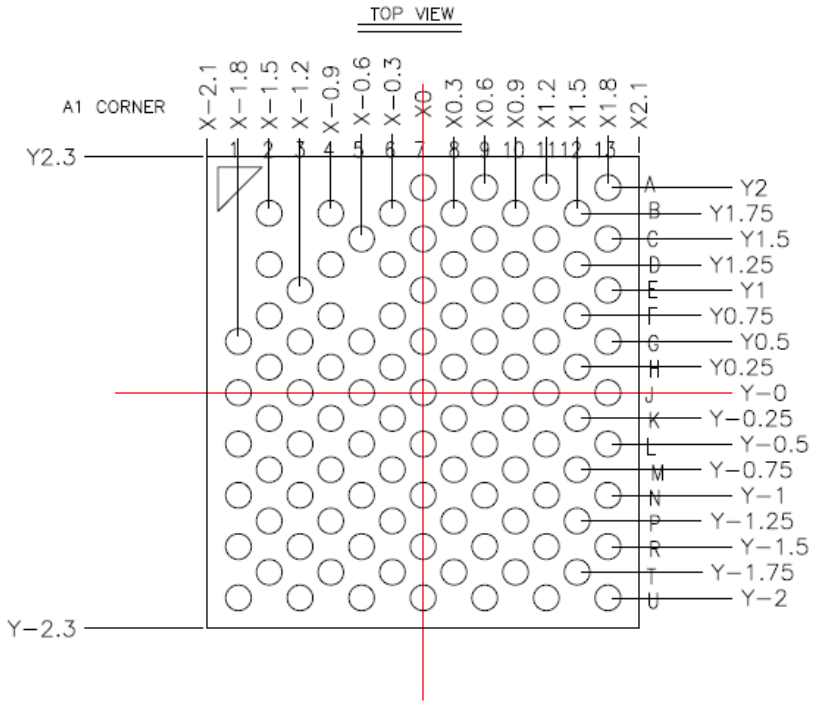
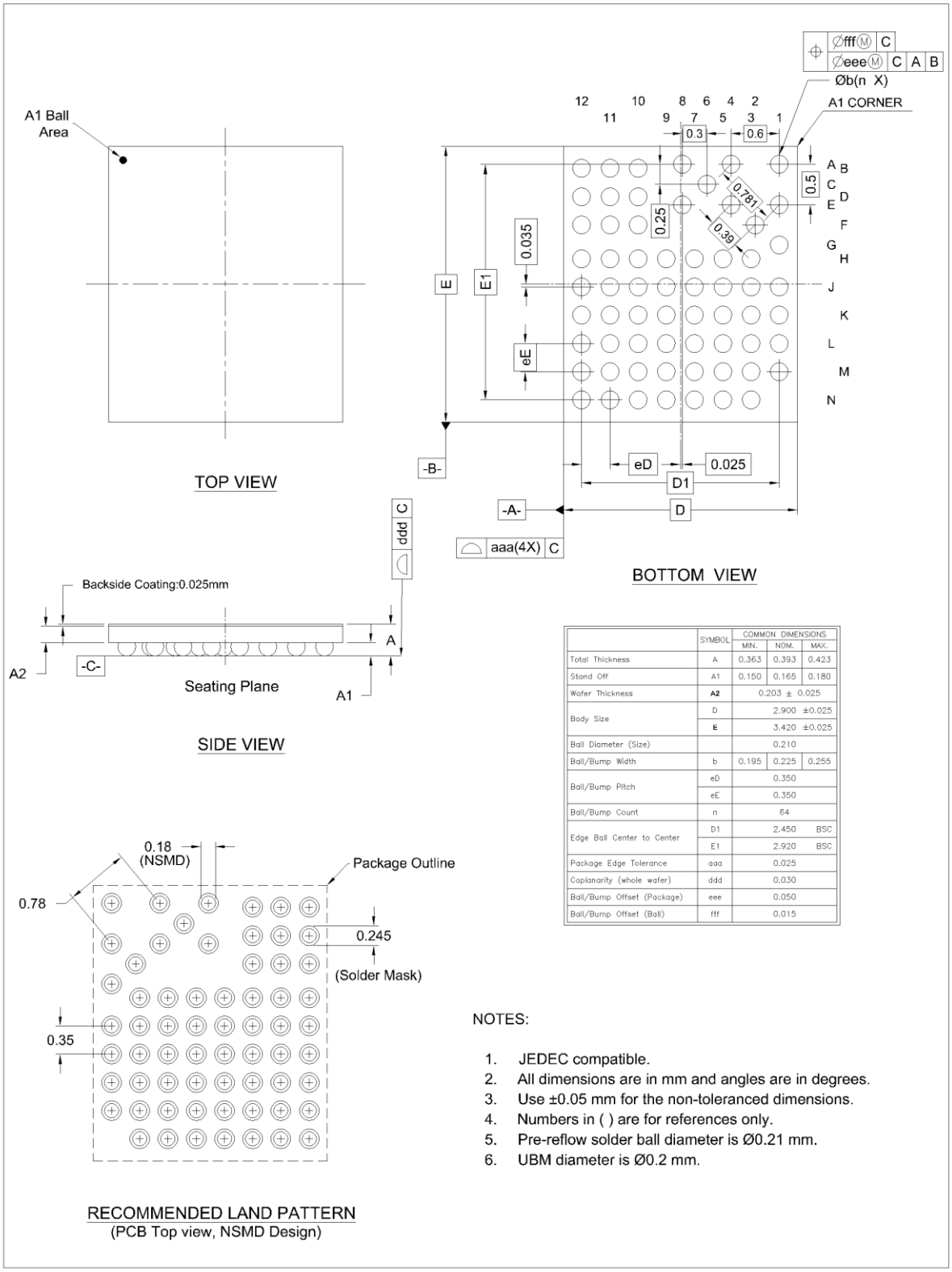


Figure 3. VFBGA104L ball coordinates (top view)

Package Outline Drawing

Package Code:WD0064AA
64-WLCSP 2.9 x 3.42 x 0.393mm Body, 0.35mm Pitch
PSC-5033-01, Revision: 00, Date Created: Oct 18, 2023



	SYMBOL	COMMON DIMENSIONS MIN.	NOM.	MAX.
Total Thickness	A	0.363	0.393	0.423
Stand Off	A1	0.150	0.165	0.180
Wafer Thickness	A2		0.203 ± 0.025	
Body Size	D		2.900 ±0.025	
	E		3.420 ±0.025	
Ball Diameter (Size)			0.210	
Ball/Bump Width	b	0.195	0.225	0.255
Ball/Bump Pitch	eD		0.350	
	eE		0.350	
Ball/Bump Count	n		64	
Edge Ball Center to Center	D1		2.450 BSC	
	E1		2.920 BSC	
Package Edge Tolerance	aaa		0.025	
Coplanarity (whole wafer)	ddd		0.030	
Ball/Bump Offset (Package)	eee		0.050	
Ball/Bump Offset (Ball)	fff		0.015	

NOTES:

1. JEDEC compatible.
2. All dimensions are in mm and angles are in degrees.
3. Use ±0.05 mm for the non-toleranced dimensions.
4. Numbers in ( ) are for references only.
5. Pre-reflow solder ball diameter is Ø0.21 mm.
6. UBM diameter is Ø0.2 mm.

Figure 4. WLCSP64L outline drawing

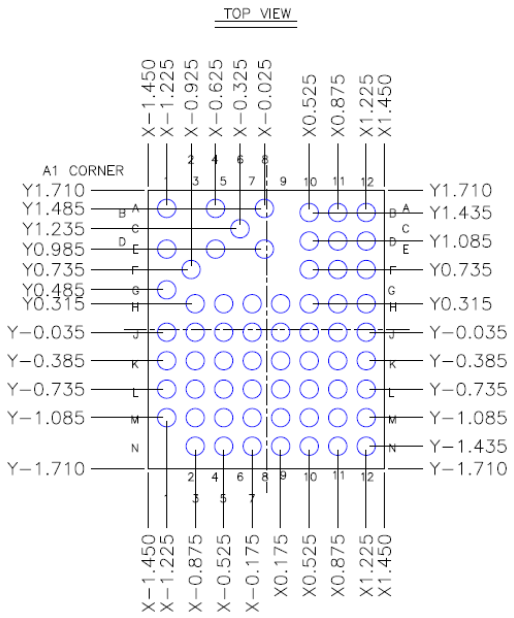


Figure 5. WLCSP64L ball coordinates (top view)

4. Ordering Information.

Table 2. Ordering information

Device	Package	NNP	PYOUR AUDIO	CPU memory	DSP memory	Size (mm)	Shipment form	Pack quantity production Note 1
DA14870-10D00GH2	WLCSP64	No	No	256 kB	1024 kB	2.90 x 3.42	Reel	6000
DA14870-10N00GH2	WLCSP64	Yes	No	256 kB	1024 kB	2.90 x 3.42	Reel	6000
DA14870-10N01GH2	WLCSP64	Yes	Yes	256 kB	1024 kB	2.90 x 3.42	Reel	6000
DA14870-11D00H22	VFBGA104	No	No	256 kB	1024 kB	4.20 x 4.60	Reel	5000
DA14870-11N00H22	VFBGA104	Yes	No	256 kB	1024 kB	4.20 x 4.60	Reel	5000
DA14870-11N01H22	VFBGA104	Yes	Yes	256 kB	1024 kB	4.20 x 4.60	Reel	5000

Note 1 Contact marketing for sample delivery.

5. Revision History

Revision	Date	Description
1.01	Sept 11, 2025	Updated the version of Bluetooth® from 5.4 to 6.0.
1.00	Mar 17, 2025	Initial version.

ROHS Compliance

Renesas Electronics' suppliers certify that its products are in compliance with the requirements of Directive 2011/65/EU of the European Parliament on the restriction of the use of certain hazardous substances in electrical and electronic equipment. RoHS certificates from our suppliers are available on request.

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