

- ◇ Structure Silicon Monolithic integrated circuit
- ◇ Product name USB host AAC+WMA+MP3 Decoder LSI
- ◇ Type BU9458KV
- ◇ Applications Audio products, etc.
- ◇ Functions BU9458KV is AAC+WMA+MP3 decoder IC which contains USB host and SD card I/F, audio DAC, system controller, regulator for internal CORE power supply.
 - USB2.0 Full Speed host I/F function contained.
 - SD card I/F function contained.
 - I²C I/F function contained.
 - FAT analysis function contained.
 - MP3 decode function contained. (available for MPEG1, 2 and 2.5, Layer 1, 2 and 3)
 - WMA decode function contained. (available for WMA9 standard and not available for DRM)
 - AAC decode function contained. (available for MPEG4 AAC-LC and not available for DRM)
 - Sample Rate Converter contained.
 - System Controller contained.
 - LED Controller contained.
 - KEY matrix Controller contained.
 - Stand Alone mode contained.
 - External processor can control.
 - Audio DAC contained.
 - Sound Effect function contained.
 - Digital Audio Out(I²S, S/PDIF) function contained.
 - File Name, Folder Name Sorting.
 - ID3TAG and WMATAG and AACTAG Analysis.
 - Regulator for internal CORE power supply contained.
 - VQFP64pin(0.5mm pitch)

◇ Absolute maximum ratings (Ta = 25 °C)

| Parameter | Symbol | Limits | Unit | Comment |
|-----------------------------|---------|-------------------|------|-------------------------------|
| Supply voltage(Analog, I/O) | VDD1MAX | -0.3~4.5 | V | DVDDIO, VDD_PLL, DAVDD, AVDDC |
| Input voltage | VIN | -0.3 ~ VDD1 + 0.3 | V | |
| Storage temperature range | TSTG | -55~125 | °C | |
| Operating temperature range | TOPR | -40~85 | °C | |
| Power dissipation *1 | PD | 750 | mW | |

*1 : In the case of use at Ta=25°C or more, 7.5mW should be reduced per 1°C.
Radiation resistance design is not arranged.

◇ Operating conditions (Ta = 25°C)

| Parameter | Symbol | Limits | Unit | Comment |
|-----------------------------|--------|---------|------|-------------------------------|
| Supply voltage(Analog, I/O) | VDD1 | 3.0~3.6 | V | DVDDIO, VDD_PLL, DAVDD, AVDDC |

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◇Electrical characteristics

(Unless specified, Ta=25°C, VDD1=3.3V, DVSS=AVSSC=VSS_PLL=DAVSS=0V, XIN_PLL=16.9344MHz)

| Parameter | Symbol | Limits | | | Unit | Condition |
|--------------------------------|----------|----------|--------|----------|------|-------------------------------|
| | | MIN. | TYP. | MAX. | | |
| <Total > | | | | | | |
| Circuit current (VDD1 USB1) | IDD1USB1 | - | 65 | 80 | mA | *1 When USB memory is played. |
| Circuit current (VDD1 SD1) | IDD1SD1 | - | 35 | 50 | mA | *1 When SD card is played. |
| <Digital block> | | | | | | |
| H-Level input voltage | VIH | VDD1*0.7 | — | VDD1 | V | *3 |
| L-Level input voltage | VIL | DVSS | — | VDD1*0.3 | V | *3 |
| H-Level output voltage1 | VOH1 | VDD1-0.4 | — | VDD1 | V | IOH=-1.6mA, *4 |
| L-Level output voltage1 | VOL1 | 0 | — | 0.4 | V | IOL=1.6mA, *4 |
| H-Level output voltage2 | VOH2 | VDD1-0.4 | — | VDD1 | V | IOH=-3.6mA, *5 |
| L-Level output voltage2 | VOL2 | 0 | — | 0.4 | V | IOL=3.6mA, *5 |
| H-Level output voltage3 | VOH3 | VDD1-0.4 | — | VDD1 | V | IOH=-0.6mA, *6 |
| L-Level output voltage3 | VOL3 | 0 | — | 0.4 | V | IOL=0.6mA, *6 |
| H-Level output voltage4 | VOH4 | VDD1-1.0 | — | VDD1 | V | IOH=-0.6mA, *7 |
| L-Level output voltage4 | VOL4 | 0 | — | 1.0 | V | IOL=0.6mA, *7 |
| <USB-HOST > | | | | | | |
| H-Level input voltage | VIHUSB | VDD1*0.6 | — | VDD1 | V | *8 |
| L-Level input voltage | VILUSB | AVSSC | — | VDD1*0.3 | V | *8 |
| Output impedance(H) | ZOH | 22.0 | 45.0 | 60.0 | Ω | *8 |
| Output impedance(L) | ZOL | 22.0 | 45.0 | 60.0 | Ω | *8 |
| H-Level output voltage | VOHUSB | VDD1-0.5 | — | VDD1 | V | *8 |
| L-Level output voltage | VOLUSB | 0 | — | 0.3 | V | *8 |
| Rise/Fall time | Tr/Tf | — | 11 | — | ns | *8, Output capacity 50pF |
| Voltage of crossing point | VCRS | — | VDD1/2 | — | V | *8, Output capacity 50pF |
| Range of differential input | VDIFF | 0.8 | — | 2.5 | V | *8 |
| Differential input sensitivity | VSENS | 0.2 | — | — | V | *8 |
| Pull-down resistance | RPD | 14.25 | 15.0 | 24.8 | kΩ | *8 |
| <Audio DAC> | | | | | | |
| Distortion rate | THD | — | 0.02 | — | % | 1kHz, 0dB, sine, *9 |
| Dynamic range | DR | — | 88 | — | dB | 1kHz, -60dB, sine, *9 |
| S/N ratio | S/N | — | 96 | — | dB | *9 |
| Max output level | VSMAX | — | 0.92 | — | Vrms | 1kHz, 0dB, sine, *9 |

*1 3.3V system I/O, Analog Power supply(VDD1), 1kHz, 0dB, sine-wave playing

*3 1-17, 19-20, 25-26, 40, 49-52, 56, 58-61, 63 pin

*4 10-11, 14-16, 48-55 pin

*5 13 pin

*6 21-23, 26 pin

*7 41 pin

*8 33, 34 pin

*9 44, 46 pin

◇Description of Terminals

| No. | Name | I/O | Description of terminals |
|-----|-------------------|-----|--|
| 1 | RESETX | I | System reset terminal |
| 2 | SEL_SLAVE | I | Slave mode selection (H : Stand Alone mode, L : Slave mode) |
| 3 | SEL_MP3 | I | MPEG Audio Layer selection (H : Only MP3 is playback, L : MP1, MP2 and MP3 can be playback) |
| 4 | SEL_DOUT | I | Digital Audio out selection (H : Disable, L : Enable) |
| 5 | SEL_VOL | I | Volume operation selection (H : Volume++ Effective, L : VOL+-Invalidity) |
| 6 | SEL_APLAY | I | At device(USB,SD) connection, Auto Play mode selection(H:It stop, L:It playback) |
| 7 | SEL_UTPKT | I | USB test packet output selection (H : Normal operation, L : Test packet output) |
| 8 | TEST1 | I | Pull-up to VDD1 system power supply terminal(TEST PIN) |
| 9 | TEST2 | I | Pull-up to VDD1 system power supply terminal(TEST PIN) |
| 10 | KEY_ROW1/MCHNG | I/O | [KEY_ROW1]KEY Matrix terminal, [MCHNG]Music change flag terminal |
| 11 | KEY_ROW2/BUSY | I/O | [KEY_ROW2]KEY Matrix terminal, [BUSY]Busy flag terminal |
| 12 | KEY_ROW3/SCL | I | [KEY_ROW3]KEY Matrix terminal, [SCL] ² C I/F clock terminal |
| 13 | KEY_ROW4/SDA | I/O | [KEY_ROW4]KEY Matrix terminal, [SDA] ² C I/F data terminal |
| 14 | KEY_COL1/A0 | I/O | [KEY_COL1]KEY Matrix terminal, [A0] ² C Slave address selection |
| 15 | KEY_COL2/A1 | I/O | [KEY_COL2]KEY Matrix terminal, [A1] ² C Slave address selection |
| 16 | KEY_COL3/SEL_SMAN | I/O | [KEY_COL3] KEY Matrix terminal, [SEL_SMAN]Manual mode selection (H : Auto, L : Manual) |
| 17 | TEST3 | I | Pull-up to VDD1 system power supply terminal(TEST PIN) |
| 18 | DVDDIO | — | IO Power supply(VDD1) terminal |
| 19 | SD_CON | I | SD card Connect terminal |
| 20 | SD_DO | I | SD card Data In terminal |
| 21 | SD_CLK | O | SD card Clock terminal |
| 22 | SD_DI | O | SD card Data Out terminal |
| 23 | SD_CS | O | SD card Chip select terminal |
| 24 | DVSS | — | GND terminal |
| 25 | TEST4 | I | Pull-up to VDD1 system power supply terminal(TEST PIN) |
| 26 | TEST5/CLKTOU12 | O | [TEST5]Pull-up to VDD1 system power supply terminal(TEST PIN),[CLKOUT12]12MHz clock output terminal |
| 27 | DVDD_M2 | — | CORE Power supply(VDD2) monitor terminal. Connect to 57PIN. |
| 28 | TEST6 | I | Pull-up to VDD1 system power supply terminal(TEST PIN) |
| 29 | TEST7 | I | Pull-up to VDD1 system power supply terminal(TEST PIN) |
| 30 | TEST8 | I | Pull-up to VDD1 system power supply terminal(TEST PIN) |
| 31 | AATEST1 | O | USB TEST terminal(TEST PIN) |
| 32 | AVDDC | — | USB Power supply(VDD1)terminal |
| 33 | USB_DM | I/O | USB D—I/O terminal |
| 34 | USB_DP | I/O | USB D+ I/Oterminal |
| 35 | AVSSC | — | USB GND terminal |
| 36 | REXTI | O | USB bias resistor(12kΩ) connecting terminal |
| 37 | VOREFI | O | USB TEST terminal(TEST PIN) |
| 38 | VDD_PLL | — | PLL Power supply(VDD1) terminal |
| 39 | TEST_PLL | I | PLL TEST terminal(TEST PIN) |
| 40 | XIN_PLL | I | X'tal(16.9344MHz) connecting input terminal |
| 41 | XOUT_PLL | O | X'tal(16.9344MHz) connecting output terminal |
| 42 | VSS_PLL | — | PLL GND terminal |
| 43 | DAVSS | — | Audio DAC GND terminal |
| 44 | RDACO | O | Audio DAC Rch Line output terminal |
| 45 | VCDACO | O | Audio DAC Reference voltage output terminal |
| 46 | LDACO | O | Audio DAC Lch Line output terminal |
| 47 | DAVDD | — | Audio DAC Power supply(VDD1) terminal |
| 48 | AMUTE | O | Audio Mute output terminal (H : MUTE OFF, L : MUTE ON) |
| 49 | LED_ERROR/TEST9 | O | [LED]Lighting output terminal at ERROR, [TEST9]Pull-up to VDD1 system power supply terminal(TEST PIN) |
| 50 | LED_PLAY/TEST10 | O | [LED]Lighting output terminal at PLAY, [TEST10]Pull-up to VDD1 system power supply terminal(TEST PIN) |
| 51 | LED_PSD/TEST11 | O | [LED]Lighting output terminal at PLAY for SD card, [TEST11]Pull-up to VDD1 system power supply terminal(TEST PIN) |
| 52 | LED_PUSB/TEST12 | O | [LED]Lighting output terminal at PLAY for USB memory, [TEST12] Pull-up to VDD1 system power supply terminal(TEST PIN) |
| 53 | LED_ACCESS | O | [LED]Lighting output terminal when memory is being accessed,[LRCK]Digital Audio channel clock or SPDIF output terminal |
| 54 | LED_RANDOM | O | [LED]Lighting output terminal at PLAY for RANDOM, [BCK]Digital Audio bit clock output terminal |
| 55 | LED_REPEAT | O | [LED]Lighting output terminal at PLAY for REPEAT, [DATA]Digital Audio data output terminal |
| 56 | TEST13 | I | Pull-up to VDD1 system power supply terminal(TEST PIN) |
| 57 | DVDD_M1 | — | CORE Power supply(VDD2) monitor terminal, Connect to bypass condenser |
| 58 | TEST14 | I | Connect to GND(TEST PIN) |
| 59 | TEST15 | I | Pull-up to VDD1 system power supply terminal(TEST PIN) |
| 60 | TEST16 | I | Pull-up to VDD1 system power supply terminal(TEST PIN) |
| 61 | TEST17 | I | Pull-up to VDD1 system power supply terminal(TEST PIN) |
| 62 | DVSS | — | GND terminal |
| 63 | TMODE | I | Connect to GND(TEST PIN) |
| 64 | DVDDIO | — | IO Power supply(VDD1) terminal |

◇ External dimensions • Block diagram

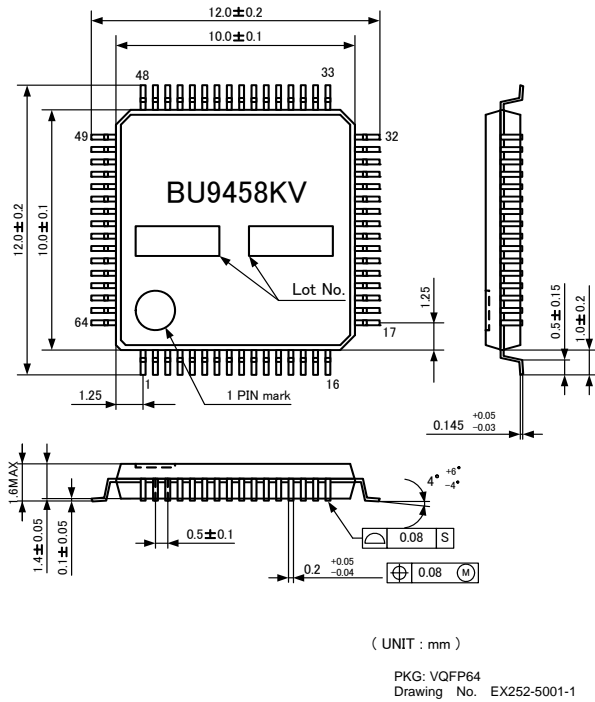


Figure 1. External dimension

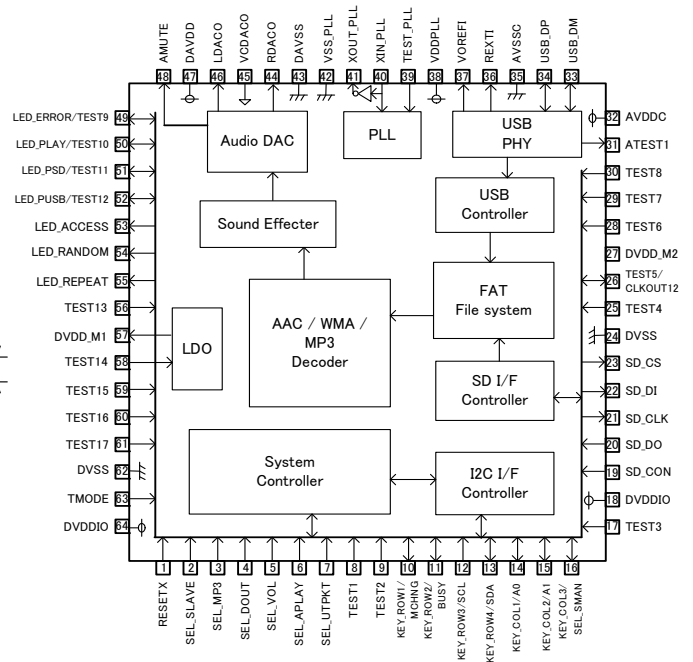


Figure 2. Block diagram

◇ Caution

(1) Power on Reset

Please keep the terminal RESETX at the Low level when the power supply starts. After completely starting up 3.3V system power supply, afterwards, please make the terminal RESETX High level after 5us after the oscillation of the system clock is steady. Moreover, please make the terminal RESETX Low level during 5us or more when resetting it while operating..

(2) About compatibility in USB memory device and SD memory card

According to the file structure and communication speed of an USB memory, SD memory card, this LSI might not play back correctly.

(3) About turning on the power supply

Current rush might flow momentarily by the order of turning on the power supply and the delay in IC with two or more power supplies, and note the capacity of the power supply coupling, the power supply, and width and drawing the GND pattern wiring.

(4) About absolute maximum rating

When the absolute maximum rating such as the applied voltage and the ranges of the operating temperature is exceeded, LSI might be destroyed. Please apply neither voltage nor the temperature that exceeds the absolute maximum rating. Please execute physical measures for safety such as fuse when it is thought to exceed the absolute maximum rating, and examine it so that the condition to exceed the absolute maximum rating is not applied to LSI.

(5) About GND Voltage

In any state of operation must be the lowest voltage about the voltage of the terminal GND. Please actually confirm the voltage of each terminal is not a voltage that is lower than the terminal GND including excessive phenomenon.

(6) About design of overheating malfunction preventive circuit

Please design overheating malfunction preventive circuit with an enough margin in consideration of a permissible loss in the state of using actually.

(7) About the short between terminals and the mounting by mistake

Please note the direction and the gap of position of LSI enough about LSI when you mount on the substrate. LSI might be destroyed when mounting by mistake and energizing. Moreover, LSI might be destroyed when short-circuited by entering of the foreign substances between the terminal and GND, between terminals, between the terminal and the power supply of LSI.

(8) About operation in strong electromagnetic field

Use in strong electromagnetic field has the possibility of malfunctioning and evaluate it enough, please.

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