

# **JL7033C Datasheet**

**Zhuhai Jieli Technology Co.,LTD**

**Version 2.1**

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## Revision History

| Date       | Revision | Description                                                                                                                                          |
|------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2024.06.19 | V1.0     | Initial Release                                                                                                                                      |
| 2024.07.12 | V1.1     | Update DSP Audio Processing_Feature(Support Hi-Res Audio)<br>Add PIN PC6 Note(PC6 input can not be Low in power on)<br>Update IC Marking Information |
| 2024.07.26 | V1.2     | Update Pin Description(Update FMIP IO Type)                                                                                                          |
| 2024.08.22 | V1.3     | Update BT characteristics                                                                                                                            |
| 2024.09.27 | V1.4     | Update Pin Description(Update FMIP IO Type)                                                                                                          |
| 2024.11.26 | V2.0     | Update Feature_Audio(Add I <sup>2</sup> S&TDM&SPDIF&PDM Description)<br>Update Feature_Peripherals(Add IR RX)                                        |
| 2025.01.16 | V2.1     | Update Features_Bluetooth<br>Update Block Diagram                                                                                                    |

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# JL7033C Features

## SYSTEM

- Dual Core 32bit DSP 320MHz
- With IEEE754 Single precision FPU
- Support FFT/MATRIX/MATH
- 2 x I-cache and D-cache
- Support SDTAP/EMU
- On-chip SRAM 528kbyte
- Support MMU
- Support MPU
- Support External PSRAM
- Built-In Flash
- 24MHz crystal oscillator
- 32.768kHz crystal oscillator
- Internal RC oscillator,PLL

## DSP Audio Processing

- SBC/AAC/LDAC/LHDC/LC3/CVSD/mSBC codec
- mSBC voice codec supported for BT phone
- PLC for voice processing
- Multi-MIC ENC
- Multi-band DRC
- Multi-band EQ
- Support spatial sound
- Support Hi-Res Audio

## Audio

- 4 x 24bit DAC
  - ❖ SNR 113dB
  - ❖ Noise 3uVrms
  - ❖ Supports differential mode
  - ❖ Supports VCMO mode
  - ❖ Sampling rate 8~96kHz
- 4 x 24bit ADC
  - ❖ SNR 105dB
  - ❖ Sampling rate 8~48kHz
  - ❖ Support AMUX
- 2 x I<sup>2</sup>S AUDIO Master/Slave interface
  - ❖ Sampling rate 8~384kHz
  - ❖ Support TX and RX
  - ❖ Support multi-slot mode(TDM)
- 1 x SPDIF AUDIO Master/Slave interface

- ❖ Sampling rate 8~384kHz

- ❖ Support TX and RX

- 1 x PDM AUDIO Slave interface

- ❖ Sampling rate 8~192kHz

- ❖ 4 x DMIC input

## Bluetooth

- Dual-mode BT6.0 with LE Audio (DN Q332415)
- Support AoA/AoD
- Support LE audio BIS/CIS
- Support long range BLE
- Maximum transmitting power 10dBm
- Receiver sensitivity
  - ❖ -95 dBm @BR
  - ❖ -95 dBm @EDR 1/4 DQPSK
  - ❖ -87 dBm @EDR 8DPSK

## Peripherals

- 1 x High speed USB2.0
- 2 x SD host controller
- 6 x Multi-function 32bit timer
- 3 x UART interface
- 1 x I<sup>2</sup>C Master/Slave interface
- 3 x SPI Master/Slave interface
- 3 x QDEC
- 1 x 10bit ADC(16 Channels)
- 44 x GPIO Support function remapping
- 1 x VLCD driver
- 3 x Light strip controller
- 12 x MCPWM
- 1 x EMI interface
- 10 x LP\_Touch with low power wake up
- 1 x IR RX

## FM

- FM RX sensitivity minimum 4dBuV,Support mono/stereo
- FM TX power maximum 6dBm,Support mono/stereo

## NFC

- NFC with low power wakeup

## PMU

- Integrated battery charger up to 350mA
- Support temperature sensor
- VPWR range 4.5V to 5.5V
- VBAT range 2.7V to 4.5V
- IOVDD range 2.2V to 3.4V

## Packages

- QFN68(7mm\*7mm)

## Temperature

- Operating temperature  
TC = -20°C to +85°C (standard range)  
TC = -40°C to +105°C (extended range)
- Storage temperature -65°C to +150°C

## Applications

- Bluetooth live sound card
- Bluetooth soundbar
- Bluetooth TV Soundbar
- Bluetooth Party Speaker

## 1 Block Diagram

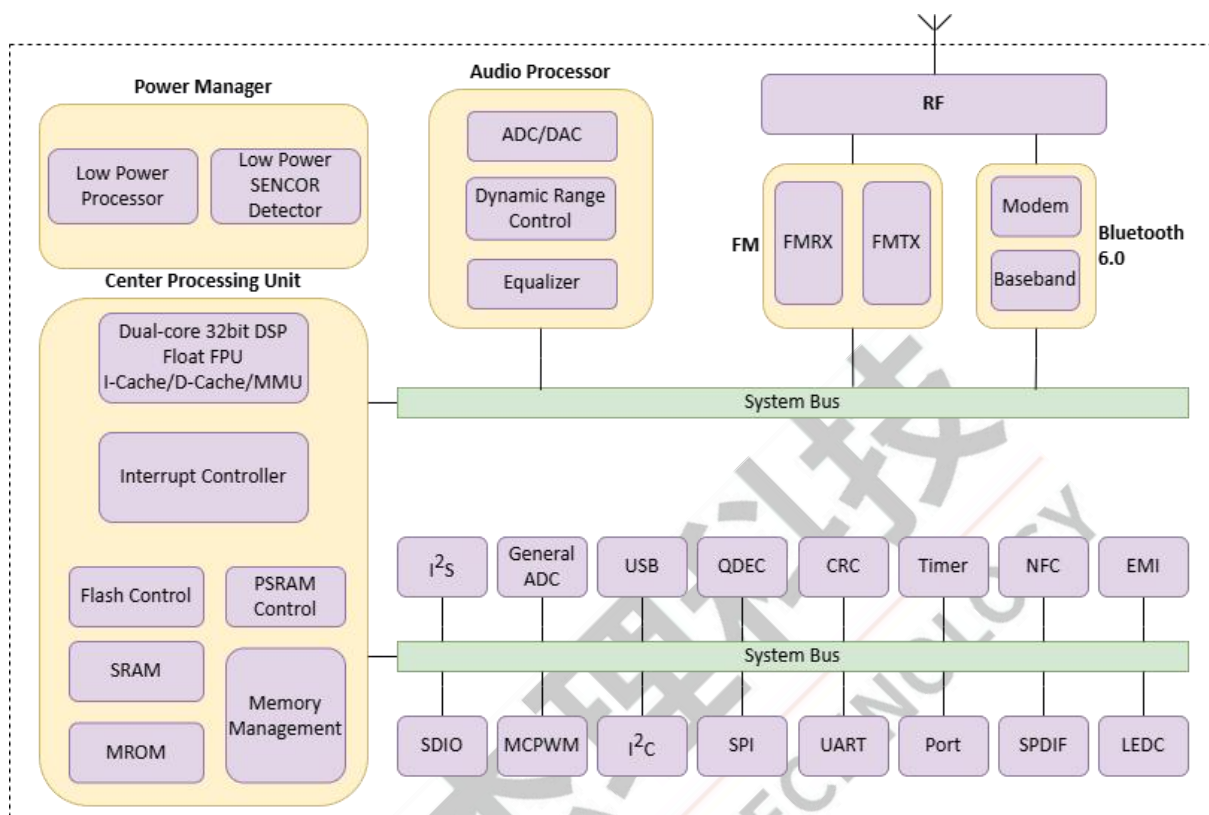
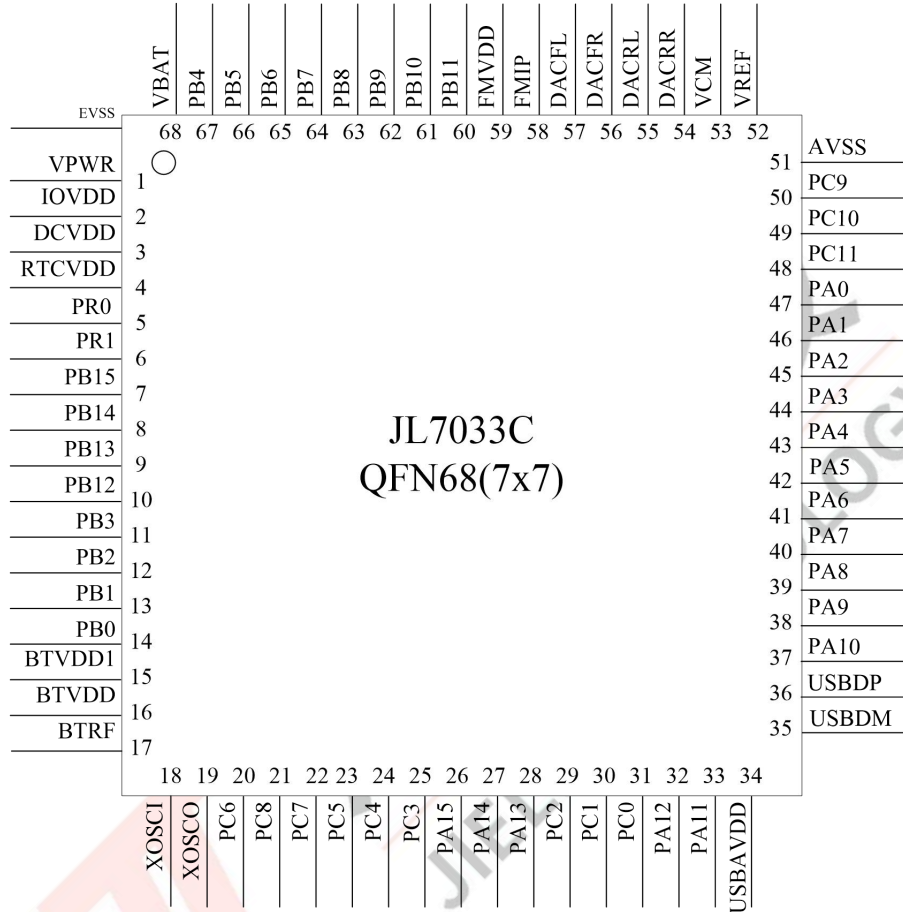


Figure 1-1 JL7033C Block Diagram

## 2 Pin Definition

### 2.1 Pin Assignment



**Figure 2-1 JL7033C Pin Assignment**

## 2.2 Pin Description

Table 2-2-1 JL7033C Pin Description

| Pin No. | Name   | Type | IO Initial State | Description                                                                 |
|---------|--------|------|------------------|-----------------------------------------------------------------------------|
| 1       | VPWR   | I/O  | Z                | Charge Power Input                                                          |
| 2       | IOVDD  | P    | --               | IO Power                                                                    |
| 3       | DCVDD  | P    | --               | DCDC power                                                                  |
| 4       | RTCVDD | P    | --               | RTC Power                                                                   |
| 5       | PR0    | I/O  | Z                | 32.768k Crystal Oscillator Input<br>LP_TOUCHA3(TOUCH_CHA3)                  |
| 6       | PR1    | I/O  | Z                | 32.768k Crystal Oscillator Output<br>LP_TOUCHA4(TOUCH_CHA4)                 |
| 7       | PB15   | I/O  | Z                | --                                                                          |
| 8       | PB14   | I/O  | 10kΩ Pull-up     | --                                                                          |
| 9       | PB13   | I/O  | Z                | --                                                                          |
| 10      | PB12   | I/O  | Z                | --                                                                          |
| 11      | PB3    | I/O  | Z                | ADC6(ADC Input Channel 6)<br>LP_TOUCHA2(TOUCH_CHA2)<br>NFC_TX               |
| 12      | PB2    | I/O  | Z                | LP_TOUCHA1(TOUCH_CHA1)<br>NFC_RX                                            |
| 13      | PB1    | I/O  | 10kΩ Pull-up     | Hold down 0 to reset<br>ADC5(ADC Input Channel 5)<br>LP_TOUCHA0(TOUCH_CHA0) |
| 14      | PB0    | I/O  | Z                | --                                                                          |
| 15      | BTVDD1 | P    | --               | BT Power                                                                    |
| 16      | BTVDD  | P    | --               | BT Power                                                                    |
| 17      | BTRF   | RF   | --               | Bluetooth RF Antenna                                                        |
| 18      | XOSCI  | I    | --               | Crystal Oscillator Input                                                    |
| 19      | XOSCO  | O    | --               | Crystal Oscillator Output                                                   |
| 20      | PC6    | I/O  | 10kΩ Pull-up     | ADC15(ADC Input Channel 15)<br>LCD SEG19                                    |
| 21      | PC8    | I/O  | Z                | LCD SEG21<br>PSRAM_D0B                                                      |
| 22      | PC7    | I/O  | Z                | LCD SEG20<br>PSRAM_D2B                                                      |
| 23      | PC5    | I/O  | Z                | ADC14(ADC Input Channel 14)<br>LCD COM0<br>PSRAM_D3A                        |



| Pin No. | Name    | Type | IO Initial State | Description                                                                         |
|---------|---------|------|------------------|-------------------------------------------------------------------------------------|
| 24      | PC4     | I/O  | Z                | ADC13(ADC Input Channel 13)<br>LCD COM1<br>PSRAM_CKA                                |
| 25      | PC3     | I/O  | Z                | ADC12(ADC Input Channel 12)<br>LCD COM2<br>PSRAM_CSA                                |
| 26      | PA15    | I/O  | 10kΩ Pull-down   | LCD SEG15<br>PSRAM_D1B                                                              |
| 27      | PA14    | I/O  | 10kΩ Pull-down   | LCD SEG14<br>PSRAM_CSB                                                              |
| 28      | PA13    | I/O  | Z                | LCD SEG13<br>PSRAM_CKB                                                              |
| 29      | PC2     | I/O  | Z                | ADC11(ADC Input Channel 11)<br>LCD COM3<br>LCD SEG18<br>PSRAM_D1A<br>SPDIF_IN_AMP_D |
| 30      | PC1     | I/O  | Z                | LCD COM4<br>LCD SEG17<br>PSRAM_D2A                                                  |
| 31      | PC0     | I/O  | Z                | LCD COM5<br>LCD SEG16<br>PSRAM_D0A<br>SPDIF_IN_AMP_C                                |
| 32      | PA12    | I/O  | Z                | ADC4(ADC Input Channel 4)<br>LCD SEG12<br>PSRAM_D3B                                 |
| 33      | PA11    | I/O  | Z                | LCD SEG11                                                                           |
| 34      | USBAVDD | P    | --               | High Speed USB Power                                                                |
| 35      | USBDM   | I/O  | 15kΩ Pull-down   | USB Negative Data                                                                   |
| 36      | USBDP   | I/O  | 15kΩ Pull-down   | USB Positive Data                                                                   |
| 37      | PA10    | I/O  | Z                | ADC3(ADC Input Channel 3)<br>LCD SEG10<br>PAP_WR<br>LCD_SPI_D3                      |
| 38      | PA9     | I/O  | Z                | LCD SEG9<br>PAP_D7<br>LCD_SPI_D2                                                    |

| Pin No. | Name | Type | IO Initial State | Description                                                                         |
|---------|------|------|------------------|-------------------------------------------------------------------------------------|
| 39      | PA8  | I/O  | Z                | LCD SEG8<br>PAP_D6<br>LCD_SPI_D1<br>SPDIF_IN_AMP_B                                  |
| 40      | PA7  | I/O  | Z                | LCD SEG7<br>PAP_D5<br>LCD_SPI_D0                                                    |
| 41      | PA6  | I/O  | Z                | ADC2(ADC Input Channel 2)<br>LCD SEG6<br>PAP_D4<br>LCD_SPI_CLK<br>SPDIF_IN_AMP_A    |
| 42      | PA5  | I/O  | Z                | ADC1(ADC Input Channel 1)<br>LCD SEG5<br>PAP_D3<br>MICBIASD(MIC Bias Output)        |
| 43      | PA4  | I/O  | Z                | LCD SEG4<br>PAP_D2<br>AIN_DN(Audio ADC Negative Input)                              |
| 44      | PA3  | I/O  | Z                | LCD SEG3<br>PAP_D1<br>AIN_D1(Audio ADC Positive Input)                              |
| 45      | PA2  | I/O  | Z                | ADC0(ADC Input Channel 0)<br>LCD SEG2<br>PAP_D0<br>AIN_D0(Audio ADC Positive Input) |
| 46      | PA1  | I/O  | Z                | LCD SEG1<br>AIN_B2(Audio ADC Positive Input)<br>MICBIASB(MIC Bias Output)           |
| 47      | PA0  | I/O  | Z                | LCD SEG0<br>AIN_A2(Audio ADC Positive Input)<br>MICBIASA(MIC Bias Output)           |
| 48      | PC11 | I/O  | Z                | LCD SEG24<br>AIN_CON(Audio ADC Negative Input)                                      |
| 49      | PC10 | I/O  | Z                | LCD SEG23<br>AIN_C1(Audio ADC Positive Input)<br>MICBIASC(MIC Bias Output)          |
| 50      | PC9  | I/O  | Z                | LCD SEG22<br>AIN_C0(Audio ADC Positive Input)                                       |
| 51      | AVSS | G    | --               | Audio Ground                                                                        |
| 52      | VREF | P    | --               | Audio Power                                                                         |

| Pin No. | Name            | Type | IO Initial State | Description                                                                                             |
|---------|-----------------|------|------------------|---------------------------------------------------------------------------------------------------------|
| 53      | VCM             | P    | --               | Audio Reference Voltage                                                                                 |
| 54      | DACRR           | O    | --               | Rear Right Channel DAC Output                                                                           |
| 55      | DACRL<br>(VCMO) | O    | --               | Rear Left Channel DAC Output<br>Audio Common-mode Output voltage                                        |
| 56      | DACFR           | O    | --               | Front Right Channel DAC Output                                                                          |
| 57      | DACFL           | O    | --               | Front Left Channel DAC Output                                                                           |
| 58      | FMIP            | RF   | --               | FM Positive Input                                                                                       |
| 59      | FMVDD           | P    | --               | FM Power                                                                                                |
| 60      | PB11            | I/O  | Z                | ADC10(ADC Input Channel 10)<br>SD Power<br>FM_TX_B                                                      |
| 61      | PB10            | I/O  | Z                | ADC9(ADC Input Channel 9)<br>AIN_B0(Audio ADC Positive Input)<br>FM_TX_A                                |
| 62      | PB9             | I/O  | Z                | AIN_A0(Audio ADC Positive Input)                                                                        |
| 63      | PB8             | I/O  | Z                | ADC8(ADC Input Channel 8)<br>LP_TOUCHB4(TOUCH_CHB4)<br>AIN_B1(Audio ADC Positive Input)                 |
| 64      | PB7             | I/O  | Z                | LP_TOUCHB3(TOUCH_CHB3)<br>AIN_A1(Audio ADC Positive Input)                                              |
| 65      | PB6             | I/O  | Z                | LP_TOUCHB2(TOUCH_CHB2)<br>AIN_BN(Audio ADC Negative Input)                                              |
| 66      | PB5             | I/O  | Z                | LP_TOUCHB1(TOUCH_CHB1)<br>LVD(External Low Voltage Detection Input)<br>AIN_AN(Audio ADC Negative Input) |
| 67      | PB4             | I/O  | Z                | LP_TOUCHB0(TOUCH_CHB0)<br>ADC7(ADC Input Channel 7)                                                     |
| 68      | VBAT            | P    | --               | Battery Input                                                                                           |

**Note**

- 1.IO initial state abbreviations Z--High resistance, H--High level, L--Low level, X--May be changed during power on.
- 2.Timer, MCPWM, QDEC, UART, LEDC, I<sup>2</sup>C, I<sup>2</sup>S, SPI,IR RX and SD functions can be remapped to any I/O.
- 3.PC6 input can not be Low in power on.

**Table 2-2-2 Pin Types Description**

| Pin Type | Description | Pin Type | Description     |
|----------|-------------|----------|-----------------|
| P        | Power       | I/O      | Input or Output |
| G        | Ground      | I        | Input           |
| RF       | RF antenna  | O        | Output          |

## 3 Electrical Characteristics

### 3.1 Absolute Maximum Ratings

Table 3-1 Absolute Maximum Ratings

| Symbol           | Parameter                          | Min  | Max  | Unit |
|------------------|------------------------------------|------|------|------|
| T <sub>opt</sub> | Operating temperature              | -20  | +85  | °C   |
| T <sub>stg</sub> | Storage temperature                | -65  | +150 | °C   |
| VBAT             | Supply Voltage                     | -0.3 | 4.5  | V    |
| VPWR             |                                    | -0.3 | 6    | V    |
| IOVDD            |                                    | -0.3 | 3.6  | V    |
| DCVDD            |                                    | -0.3 | 1.4  | V    |
| RTCVD            |                                    | -0.3 | 3.6  | V    |
| BTVD             |                                    | -0.3 | 3    | V    |
| BTVD1            |                                    | -0.3 | 1.4  | V    |
| USBAVD           |                                    | -0.3 | 3.6  | V    |
| FMVD             |                                    | -0.3 | 3.6  | V    |
| GPIO             | Input voltage of GPIO (except PB0) | -0.3 | 3.6  | V    |
| HVTIO            | Input voltage of HVT-IO (PB0)      | -0.3 | 6    | V    |

**Note**

1. Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device.

### 3.2 ESD Ratings

Table 3-2 ESD Ratings

| Parameter           | Typ   | Test pin | Reference standard          |
|---------------------|-------|----------|-----------------------------|
| Human Body Mode     | ±4kV  | All pins | JEDEC EIA/JESD22-A114       |
| Machine Mode        | ±400V | All pins | JEDEC EIA/JESD22-A115       |
| Charge Device Model | ±1kV  | All pins | ANSI/ESDA/JEDEC JS-002-2022 |

### 3.3 PMU Characteristics

Table 3-3 PMU Characteristics

| Symbol         | Parameter              | Conditions                        | Min | Typ | Max | Unit |
|----------------|------------------------|-----------------------------------|-----|-----|-----|------|
| VBAT           | Voltage Input          | --                                | 2.7 | 3.7 | 4.5 | V    |
| VPWR           | Charger supply Voltage | --                                | 4.5 | 5.0 | 5.5 | V    |
| Operating mode |                        |                                   |     |     |     |      |
| Symbol         | Parameter              | Conditions                        | Min | Typ | Max | Unit |
| IOVDD          | Voltage output         | VBAT = 4.2V, 10mA loading         | --  | 3   | --  | V    |
|                | Loading current        | IOVDD=3.0V@VBAT = 3.7V or VPWR=5V | --  | --  | 300 | mA   |
| DCVDD          | Voltage output         | --                                | --  | 1.2 | --  | V    |

| Symbol         | Parameter       | Conditions                           | Min | Typ | Max | Unit |
|----------------|-----------------|--------------------------------------|-----|-----|-----|------|
|                | Loading current | DCVDD=1.2V@IOVDD=3.0V<br>on LDO mode | --  | --  | 150 | mA   |
|                |                 | DCVDD=1.2V@VBAT=3.7V<br>on DCDC mode | --  | --  | 180 | mA   |
| Low Power mode |                 |                                      |     |     |     |      |
| Symbol         | Parameter       | Conditions                           | Min | Typ | Max | Unit |
| IOVDD          | Loading current | IOVDD=3.0V@VBAT = 3.7V               | --  | --  | 20  | mA   |

### 3.4 Battery Charge

Table 3-4 Charger Characteristics

| Symbol             | Parameter                | Min   | Typ  | Max   | Unit |
|--------------------|--------------------------|-------|------|-------|------|
| VPWR               | Charge Input Voltage     | 4.5   | 5    | 5.5   | V    |
| CV                 | CV Mode Voltage Accuracy | 4.175 | 4.2  | 4.225 | V    |
|                    |                          | 4.325 | 4.35 | 4.375 | V    |
| CC                 | CC Mode Current          | 15    | --   | 350   | mA   |
| I <sub>end</sub>   | End Of Charge Current    | 1.5   | --   | 35    | mA   |
| V <sub>Trikl</sub> | Trickle Charge Voltage   | --    | 3    | --    | V    |

### 3.5 IO Characteristics

Table 3-5 IO Characteristics

| Input Characteristics  |                          |              |                                                                       |      |      |      |
|------------------------|--------------------------|--------------|-----------------------------------------------------------------------|------|------|------|
| Symbol                 | Parameter                | Conditions   | IO                                                                    | Min  | Max  | Unit |
| V <sub>IL</sub>        | Low-Level Input Voltage  | IOVDD = 3.0V | PA0~PA15<br>PB0~PB15<br>PC0~PC11<br>PR0~PR1<br>USBDP<br>USBDM<br>VPWR | -0.3 | 1.4  | V    |
| V <sub>IH</sub>        | High-Level Input Voltage | IOVDD = 3.0V | PA0~PA15<br>PB1~PB15<br>PC0~PC11<br>PR0~PR1<br>USBDP<br>USBDM         | 1.7  | 3.3  | V    |
|                        |                          | IOVDD = 3.0V | PB0<br>VPWR                                                           | 1.7  | 5.5  | V    |
| Output Characteristics |                          |              |                                                                       |      |      |      |
| Symbol                 | Parameter                | Conditions   | IO                                                                    | Typ  | Unit |      |

| I <sub>OL</sub>                     | Output Current       | IOVDD = 3.0V<br>Voutput = 0.3V | PA0~PA15<br>PB1~PB15<br>PC0~PC11<br>PR0~PR1         | 2(HD=0)<br>8(HD=1)<br>26(HD=2)<br>50(HD=3) | mA   |
|-------------------------------------|----------------------|--------------------------------|-----------------------------------------------------|--------------------------------------------|------|
|                                     |                      |                                | PB0<br>USBDP<br>USBDM                               | 8                                          | mA   |
|                                     |                      |                                | VPWR                                                | 2                                          | mA   |
| I <sub>OH</sub>                     | Output Current       | IOVDD = 3.0V<br>Voutput = 2.7V | PA0~PA15<br>PB1~PB15<br>PC0~PC11<br>PR0~PR1         | 2(HD=0)<br>8(HD=1)<br>26(HD=2)<br>50(HD=3) | mA   |
|                                     |                      |                                | PB0<br>USBDP<br>USBDM                               | 8                                          | mA   |
|                                     |                      |                                | VPWR                                                | 2                                          | mA   |
| Internal Resistance Characteristics |                      |                                |                                                     |                                            |      |
| Symbol                              | Parameter            | Conditions                     | IO                                                  | Typ                                        | Unit |
| R <sub>pu</sub>                     | Pull-up Resistance   | IOVDD = 3.0V                   | PA0~PA15<br>PB0~PB15<br>PC0~PC11<br>VPWR<br>PR0~PR1 | 10k(PU=1)<br>100k(PU=2)<br>1M(PU=3)        | Ω    |
|                                     |                      |                                | USBDP<br>USBDM                                      | 1.5k(PU=1)<br>1k(PU=3)                     | Ω    |
| R <sub>pd</sub>                     | Pull-down Resistance | IOVDD = 3.0V                   | PA0~PA15<br>PB0~PB15<br>PC0~PC11<br>VPWR<br>PR0~PR1 | 10k(PD=1)<br>100k(PD=2)<br>1M(PD=3)        | Ω    |
|                                     |                      |                                | USBDP<br>USBDM                                      | 15k(PD=1)                                  | Ω    |

**Note**

1.Internal pull-up/pull-down resistance accuracy ±20%.

### 3.6 Audio DAC Characteristics

Table 3-6 Stereo DAC Characteristics

| Parameter          | Conditions                                                                                    | Min | Typ | Max | Unit |
|--------------------|-----------------------------------------------------------------------------------------------|-----|-----|-----|------|
| Resolution         | --                                                                                            | --  | --  | 24  | bit  |
| Output Sample Rate | --                                                                                            | 8   | --  | 96  | kHz  |
| SNR <sup>①</sup>   | Differential Mode<br>Fin=1kHz@0dBFS<br>Fs=44.1kHz<br>B/W=20Hz~20kHz A-Weighted<br>load=10kΩ   | --  | 113 | --  | dB   |
|                    | VCMO Mode<br>Fin=1kHz@0dBFS<br>Fs=44.1kHz<br>B/W=20Hz~20kHz A-Weighted<br>load=10kΩ           | --  | 107 | --  | dB   |
|                    | Single-ended Mode<br>Fin=1kHz@0dBFS<br>Fs=44.1kHz<br>B/W=20Hz~20kHz A-Weighted<br>load=10kΩ   | --  | 110 | --  | dB   |
| Dynamic Range      | Differential Mode<br>Fin=1kHz@-60dBFS<br>Fs=44.1kHz<br>B/W=20Hz~20kHz A-Weighted<br>load=10kΩ | --  | 109 | --  | dB   |
|                    | VCMO Mode<br>Fin=1kHz@-60dBFS<br>Fs=44.1kHz<br>B/W=20Hz~20kHz A-Weighted<br>load=10kΩ         | --  | 104 | --  | dB   |
|                    | Single-ended Mode<br>Fin=1kHz@-60dBFS<br>Fs=44.1kHz<br>B/W=20Hz~20kHz A-Weighted<br>load=10kΩ | --  | 106 | --  | dB   |
| THD+N              | Differential Mode<br>Fin=1kHz@0dBFS<br>Fs=44.1kHz<br>B/W=20Hz~20kHz A-Weighted<br>load=32Ω    | --  | -86 | --  | dB   |
|                    | VCMO Mode<br>Fin=1kHz@0dBFS                                                                   | --  | -85 | --  | dB   |

|                       |                                                                                                          |    |      |    |       |
|-----------------------|----------------------------------------------------------------------------------------------------------|----|------|----|-------|
|                       | Fs=44.1kHz<br>B/W=20Hz~20kHz A-Weighted<br>load=32Ω                                                      |    |      |    |       |
|                       | Single-ended Mode<br>Fin=1kHz@0dBFS<br>Fs=44.1kHz<br>B/W=20Hz~20kHz A-Weighted<br>load=32Ω               | -- | -86  | -- | dB    |
| Noise Floor           | Differential Mode<br>B/W=20Hz~20kHz A-Weighted<br>load=10kΩ                                              | -- | 7    | -- | uVrms |
|                       | VCMO Mode<br>B/W=20Hz~20kHz A-Weighted<br>load=10kΩ                                                      | -- | 6    | -- | uVrms |
|                       | Single-ended Mode<br>B/W=20Hz~20kHz A-Weighted<br>load=10kΩ                                              | -- | 5    | -- | uVrms |
| Noise Floor with MUTE | Differential Mode<br>B/W=20Hz~20kHz A-Weighted<br>load=10kΩ                                              | -- | 4    | -- | uVrms |
|                       | VCMO Mode<br>B/W=20Hz~20kHz A-Weighted<br>load=10kΩ                                                      | -- | 4    | -- | uVrms |
|                       | Single-ended Mode<br>B/W=20Hz~20kHz A-Weighted<br>load=10kΩ                                              | -- | 3    | -- | uVrms |
| Stereo Crosstalk      | VCMO Mode<br>Fin=1kHz@0dBFS<br>Fs=44.1kHz<br>B/W=20Hz~20kHz A-Weighted<br>load=10kΩ                      | -- | -108 | -- | dB    |
|                       | Single-ended Mode<br>Fin=1kHz@0dBFS<br>Fs=44.1kHz<br>B/W=20Hz~20kHz A-Weighted<br>load=10kΩ              | -- | -108 | -- | dB    |
| Max Output Power      | Differential Mode<br>Fin=1kHz@0dBFS<br>Fs=44.1kHz<br>B/W=20Hz~20kHz A-Weighted<br>load=16Ω<br>THD+N<0.1% | -- | 30   | 85 | mW    |
|                       | VCMO Mode                                                                                                | -- | 30   | 38 | mW    |



|  |                                                                                                          |    |    |    |    |
|--|----------------------------------------------------------------------------------------------------------|----|----|----|----|
|  | Fin=1kHz@0dBFS<br>Fs=44.1kHz<br>B/W=20Hz~20kHz A-Weighted<br>load=16Ω<br>THD+N<0.1%                      |    |    |    |    |
|  | Single-ended Mode<br>Fin=1kHz@0dBFS<br>Fs=44.1kHz<br>B/W=20Hz~20kHz A-Weighted<br>load=16Ω<br>THD+N<0.1% | -- | 30 | 38 | mW |

**Note**

1. <sup>①</sup>SNR is the ratio of output level with a 1kHz full-scale input to output level with MUTE on.

### 3.7 Audio ADC Characteristics

**Table 3-7 Audio ADC Characteristics**

| Parameter         | Conditions                                                                                             | Min | Typ | Max | Unit |
|-------------------|--------------------------------------------------------------------------------------------------------|-----|-----|-----|------|
| Resolution        | --                                                                                                     | --  | --  | 24  | bits |
| Input Sample Rate | --                                                                                                     | 8   | --  | 48  | kHz  |
| SNR               | Differential input Mode<br>Fin=1kHz@0dBFS<br>Fs=44.1kHz<br>B/W=20Hz~20kHz A-Weighted<br>ADC gain=0dB   | --  | 105 | --  | dB   |
|                   | Single-ended input Mode<br>Fin=1kHz@0dBFS<br>Fs=44.1kHz<br>B/W=20Hz~20kHz A-Weighted<br>ADC gain=0dB   | --  | 102 | --  | dB   |
| Dynamic Range     | Differential input Mode<br>Fin=1kHz@-60dBFS<br>Fs=44.1kHz<br>B/W=20Hz~20kHz A-Weighted<br>ADC gain=0dB | --  | 105 | --  | dB   |
|                   | Single-ended input Mode<br>Fin=1kHz@-60dBFS<br>Fs=44.1kHz<br>B/W=20Hz~20kHz A-Weighted<br>ADC gain=0dB | --  | 102 | --  | dB   |
| THD+N             | Differential input Mode<br>Fin=1kHz@0dBFS<br>Fs=44.1kHz                                                | --  | -90 | --  | dB   |

| Parameter       | Conditions                                                                                           | Min | Typ | Max | Unit |
|-----------------|------------------------------------------------------------------------------------------------------|-----|-----|-----|------|
|                 | B/W=20Hz~20kHz A-Weighted<br>ADC gain=0dB                                                            |     |     |     |      |
|                 | Single-ended input Mode<br>Fin=1kHz@0dBFS<br>Fs=44.1kHz<br>B/W=20Hz~20kHz A-Weighted<br>ADC gain=0dB | --  | -90 | --  | dB   |
| Analogue Gain   | --                                                                                                   | -6  | --  | 28  | dB   |
| Max Input Level | Differential input Mode<br>ADC gain=0dB                                                              | --  | 2   | --  | Vrms |
|                 | Single-ended input Mode<br>ADC gain=0dB                                                              | --  | 1   | --  | Vrms |

### 3.8 BT Characteristics

#### 3.8.1 Transmitter

Table 3-8-1 Transmitter characteristics

| Parameter                 | Conditions                     | Min | Typ | Max | Unit |
|---------------------------|--------------------------------|-----|-----|-----|------|
| Maximum RF Transmit Power | BR                             | --  | 10  | --  | dBm  |
| Maximum RF Transmit Power | EDR $\pi/4$ DQPSK<br>EDR 8DPSK | --  | 10  | --  | dBm  |
| Relative Transmit Power   | EDR $\pi/4$ DQPSK<br>EDR 8DPSK | --  | -3  | --  | dB   |
| Maximum RF Transmit Power | BLE-1Mbps                      | --  | 10  | --  | dBm  |

#### 3.8.2 Receiver

Table 3-8-2 Receiver characteristics

| Parameter   | Conditions        | Min | Typ   | Max | Unit |
|-------------|-------------------|-----|-------|-----|------|
| Sensitivity | BR                | --  | -95   | --  | dBm  |
|             | EDR $\pi/4$ DQPSK | --  | -95   | --  | dBm  |
|             | EDR 8DPSK         | --  | -87   | --  | dBm  |
|             | BLE-1Mbps         | --  | -98.5 | --  | dBm  |
|             | BLE-2Mbps         | --  | -95.5 | --  | dBm  |
|             | BLE-S2            | --  | -101  | --  | dBm  |
|             | BLE-S8            | --  | -106  | --  | dBm  |

### 3.9 FM Characteristics

Table 3-9-1 FM Transmitter Characteristics

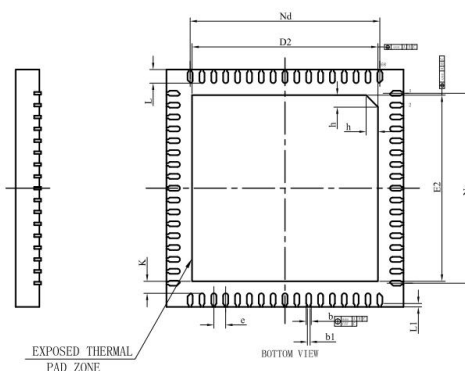
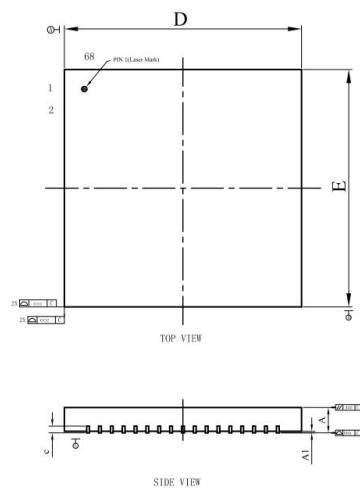
| Parameter         | Conditions | Min | Typ | Max | Unit |
|-------------------|------------|-----|-----|-----|------|
| Frequency range   | --         | 64  | --  | 108 | MHz  |
| RF Transmit Power | --         | --  | 6   | --  | dBm  |

Table 3-9-2 FM Receiver Characteristics

| Parameter                 | Conditions   | Min | Typ | Max | Unit |
|---------------------------|--------------|-----|-----|-----|------|
| Frequency range           | --           | 64  | --  | 108 | MHz  |
| RF Mono sensitivity       | (S+N)/N=26dB | --  | 4   | --  | dBuV |
| Mono Audio SNDR           | --           | --  | 75  | --  | dB   |
| Stereo Audio SNDR         | --           | --  | 64  | --  | dB   |
| Stereo channel separation | --           | --  | 54  | --  | dB   |

## 4 Package Information

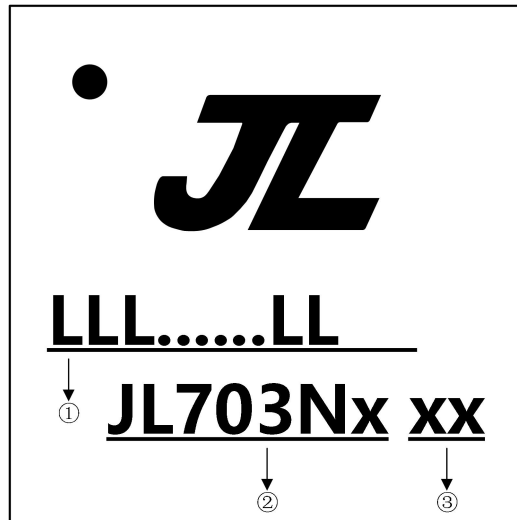
### 4.1 QFN68\_7x7mm



| SYMBOL       | MILLIMETER |      |      |
|--------------|------------|------|------|
|              | MIN        | NOM  | MAX  |
| A            | 0.70       | 0.75 | 0.80 |
| A1           | —          | 0.02 | 0.05 |
| b            | 0.10       | 0.15 | 0.20 |
| b1           | 0.08REF    |      |      |
| c            | 0.18       | 0.20 | 0.25 |
| D            | 6.90       | 7.00 | 7.10 |
| D2           | 5.39       | 5.49 | 5.59 |
| e            | 0.35BSC    |      |      |
| Nd           | 5.60BSC    |      |      |
| E            | 6.90       | 7.00 | 7.10 |
| E2           | 5.39       | 5.49 | 5.59 |
| Ne           | 5.60BSC    |      |      |
| L            | 0.35       | 0.40 | 0.45 |
| L1           | 0.10REF    |      |      |
| K            | 0.20       | —    | —    |
| h            | 0.30       | 0.35 | 0.40 |
| aaa          | 0.07       |      |      |
| bbb          | 0.08       |      |      |
| ccc          | 0.10       |      |      |
| ddd          | 0.10       |      |      |
| eee          | 0.10       |      |      |
| fff          | 0.05       |      |      |
| L1 载体尺寸 (mm) | 232*232    |      |      |

Figure 4-1 JL7033C Package

## 5 IC Marking Information



**Figure 5-1 JL7033C Package Outline**

- ① LLL.....LL LOT No. , It contains 7 to 18 alphanumerics
  - ② JL703Nx Chip Model
  - ③ xx Built-in Memory
    - 0 No Flash Memory
    - 2 2Mbit Flash
    - 4 4Mbit Flash
    - 8 8Mbit Flash
    - 6 16Mbit Flash
    - 3 32Mbit Flash
- nS memory is flash plus PSRAM, n represents the flash capacity, S represents 16Mbit PSRAM  
nT memory is flash plus PSRAM, n represents the flash capacity, T represents 64Mbit PSRAM

## 6 Solder-Reflow Condition

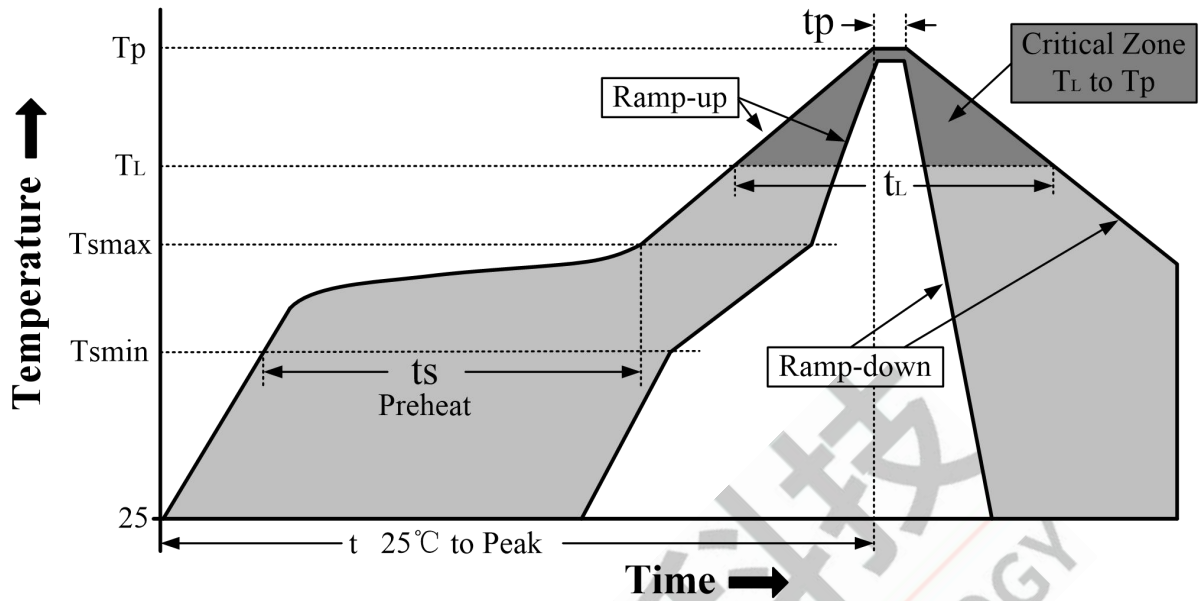


Figure 6-1 Classification Reflow Profile

Table 6-1 Classification Profiles

| Profile Feature                                                   |                                                  | Sn-Pb Eutectic Assembly | Pb-Free Assembly |
|-------------------------------------------------------------------|--------------------------------------------------|-------------------------|------------------|
| Preheat/Soak                                                      | Temperature Min ( $T_{smin}$ )                   | 100°C                   | 150°C            |
|                                                                   | Temperature Max ( $T_{smax}$ )                   | 150°C                   | 200°C            |
|                                                                   | Time ( $t_s$ ) from ( $T_{smin}$ to $T_{smax}$ ) | 60-120 seconds          | 60-180 seconds   |
| Average ramp-up rate ( $T_{smax}$ to $T_p$ )                      |                                                  | 3°C/second max          | 3°C/second max   |
| Liquidous temperature ( $T_l$ )                                   |                                                  | 183°C                   | 217°C            |
| Time ( $t_L$ ) maintained above $T_l$                             |                                                  | 60-150 seconds          | 60-150 seconds   |
| Peak package body temperature ( $T_p$ )                           |                                                  | See Table 6-2           | See Table 6-3    |
| Time within 5°C of actual Peak Temperature ( $t_p$ ) <sup>2</sup> |                                                  | 10-30 seconds           | 20-40 seconds    |
| Ramp-down rate ( $T_p$ to $T_l$ )                                 |                                                  | 6°C/second max          | 6°C/second max   |
| Time 25°C to peak temperature                                     |                                                  | 6 minutes max           | 8 minutes max    |

**Note**

- 1.All temperatures refer to topside of the package, measured on the package body surface
- 2.Time within 5°C of actual peak temperature ( $t_p$ ) specified for the reflow profiles is a "supplier" and "user" maximum.

Table 6-2 SnPb Classification Temperature

| Package Thickness | Volume mm <sup>3</sup><br>< 350 | Volume mm <sup>3</sup><br>≥ 350 |
|-------------------|---------------------------------|---------------------------------|
| <2.5 mm           | 240 +0/-5°C                     | 225 +0/-5°C                     |
| ≥2.5 mm           | 225 +0/-5°C                     | 225 +0/-5°C                     |

**Table 6-3 Pb-free - Classification Temperature**

| Package Thickness | Volume mm <sup>3</sup><br>< 350 | Volume mm <sup>3</sup><br>350 - 2000 | Volume mm <sup>3</sup><br>> 2000 |
|-------------------|---------------------------------|--------------------------------------|----------------------------------|
| < 1.6mm           | 260°C                           | 260°C                                | 260°C                            |
| 1.6 mm - 2.5mm    | 260°C                           | 250°C                                | 245°C                            |
| > 2.5mm           | 250°C                           | 245°C                                | 245°C                            |

**Note**

1.\*Tolerance The device manufacturer/supplier shall assure process compatibility up to and including the stated classification temperature (this means Peak reflow temperature +0°C.For example 260°C+0°C)at the rated MSL level.