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CONFIDENTIAL INFORMATION

CUSTOMER : \_\_\_\_\_

DATE : 2021.03.26

SPECIFICATIONS FOR APPROVAL

PRODUCT : EFR32BG22 BLE (Bluetooth Low Energy) Module

MODEL NAME : DBS22-11ST0

CUSTOMER P/N :

| APPROVAL | REMARK |
|----------|--------|
|          |        |

| Revision                                                                                             |
|------------------------------------------------------------------------------------------------------|
| 0.1 (21/01/17) - Initial release.<br>0.2 (21/03/26) – Mechanical Dimensions, Recommended PCB pattern |

| Designed | Checked   | Approved | DeviceDesign Co., Ltd. |                   |
|----------|-----------|----------|------------------------|-------------------|
|          |           |          |                        |                   |
|          |           |          | DOCUMENT No.           | DBS22-1XSTX SA    |
| Lee D.H  | Hwang K.R | Choi Y.L | PAGE                   | REV 0.2 ( 1 / 20) |

|                                                   |                  |
|---------------------------------------------------|------------------|
| TITLE : Specifications for approval (DBS22-1XSTX) | REV 0.2 (2 / 27) |
| (CUSTOMER P/N : )                                 |                  |

1. Introduction

DeviceDesign would like to announce a low-cost and low-power consumption module which has all of the Bluetooth Low Energy functionalities. The highly integrated module makes the possibilities of keyboards, remote controls, Sports and fitness sensors, heating control and lighting control application.

2. Purpose

This specification is applied to “DeviceDesign Bluetooth Low Energy module”.

3. Quality

Quality should meet each condition which mentioned on this specification. However, the items which are not mentioned on this specification follow the inspection agreements and standards which are agree with both companies.

4. Appearance and Characteristics

1) Appearance

Appearance should not contaminated by harmful materials and should not have cracks etc. Mechanical dimensions should meet the contents of clause 9.

2) Characteristics

Electrical characteristics should meet the contents of clause 11.

5. Application

DBS22-1XSTX is a Bluetooth Low Energy (v5.2) Module. But this module is not designed for Life Support Application. Also it is recommended that this module mounted by Reflow soldering.

|                  |     |            |                       |                        |      |      |                |
|------------------|-----|------------|-----------------------|------------------------|------|------|----------------|
| R<br>E<br>V<br>. | 0.1 | 2021.01.17 | Initial Release       | DeviceDesign Co., Ltd. |      |      |                |
|                  | 0.2 | 2021.03.26 | Mechanical Dimensions | DSGD                   | CHKD | APPD | DBS22-1XSTX    |
|                  |     |            |                       |                        |      |      |                |
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|                  |     |            |                       |                        |      |      | DBS22-1XSTX SA |

|                                                   |                  |
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| TITLE : Specifications for approval (DBS22-1XSTX) | REV 0.2 (3 / 27) |
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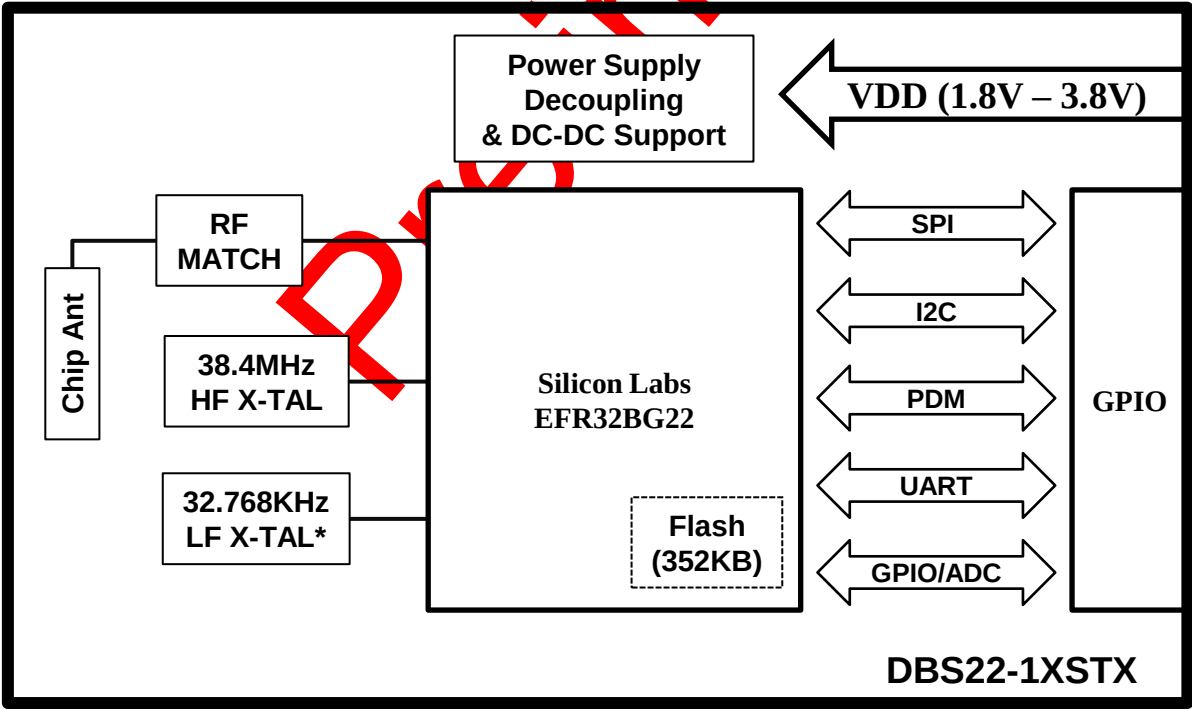
6. Absolute Maximum Rating

| Parameter           |     | Min. | Max. | Unit  |
|---------------------|-----|------|------|-------|
| Storage Temperature |     | -40  | 85   | deg.C |
| Supply Voltage      | VDD | -0.3 | 3.8  | V     |

7. Test

Electrical characteristics are tested for every products. However, if there are any objection in judgment, it should be treated with agreements of both companies.

8. Block Diagram



\* Option : 32kHz can be removed for no critical precise time application.

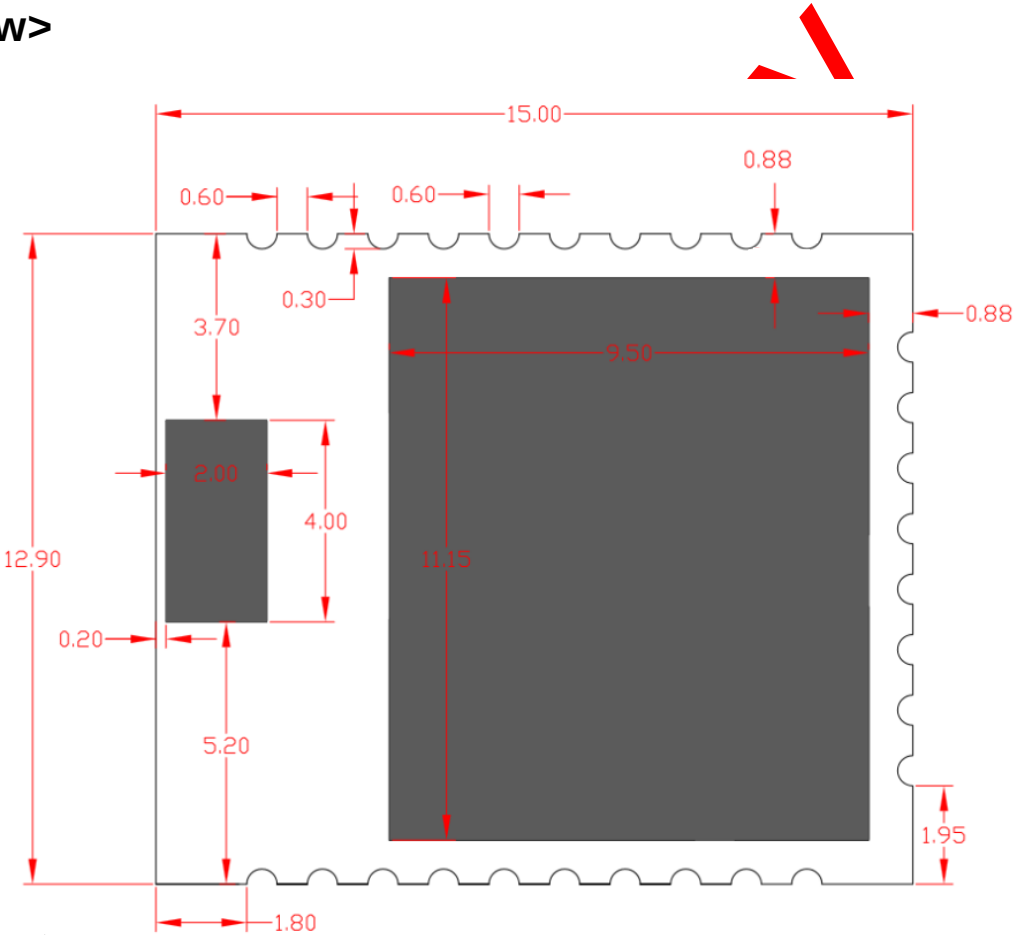
|      |     |            |                       |                        |      |      |                |
|------|-----|------------|-----------------------|------------------------|------|------|----------------|
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|      |     |            |                       |                        |      |      | DBS22-1XSTX SA |
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### 9. Mechanical Dimensions #1

|           |                                |
|-----------|--------------------------------|
| Dimension | 12.9mm × 15.0mm × 2.61mm(Max.) |
|-----------|--------------------------------|

<Top View>



<Side View>



Unit : mm

|      |     |            |                       |                        |      |      |                                |
|------|-----|------------|-----------------------|------------------------|------|------|--------------------------------|
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|      | 0.2 | 2021.03.26 | Mechanical Dimensions | DSGD                   | CHKD | APPD | DBS22-1XSTX                    |
|      |     |            |                       |                        |      |      |                                |
|      |     |            |                       |                        |      |      |                                |
|      |     |            |                       |                        |      |      | DOCUMENT NO.<br>DBS22-1XSTX SA |

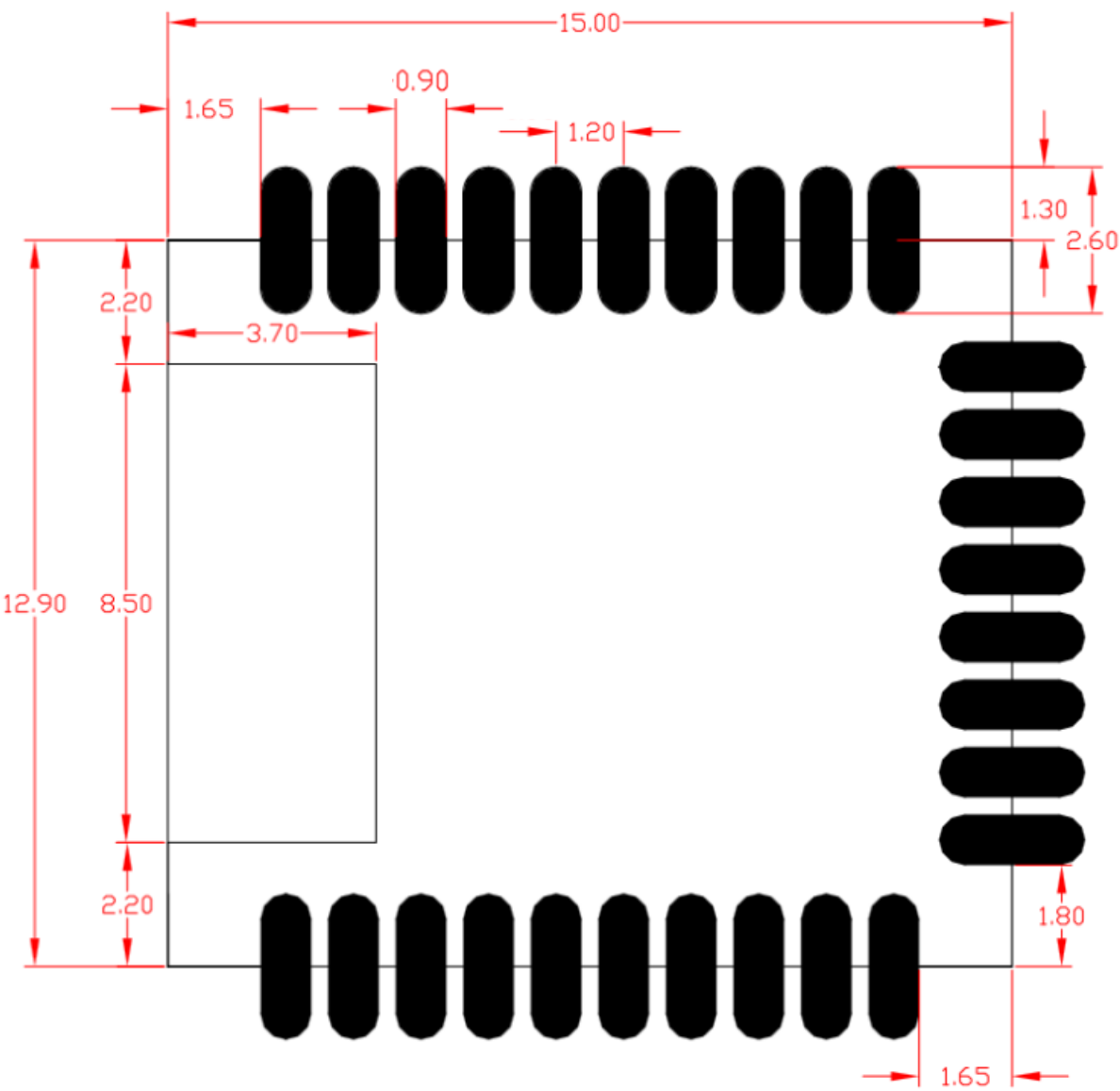
## <Top Through View>



Unit : mm

|                  |     |            |                       |                        |      |      |                                |
|------------------|-----|------------|-----------------------|------------------------|------|------|--------------------------------|
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|                  |     |            |                       |                        |      |      |                                |
|                  |     |            |                       |                        |      |      | DOCUMENT NO.<br>DBS22-1XSTX SA |

10. Recommended PCB pattern



Unit : mm

|      |     |            |                       |                        |      |      |                                |
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|      |     |            |                       |                        |      |      |                                |
|      |     |            |                       |                        |      |      | DOCUMENT NO.<br>DBS22-1XSTX SA |



2) MCU Current Consumption with 3 V Supply

Unless otherwise indicated, typical conditions are: Module supply voltage = 3.0 V. Voltage scaling level = VSCALE1. TA = 25 °C.  
Minimum and maximum values in this table represent the worst conditions across process variation at TA = 25 °C.

| Parameter                                                                            | Symbol               | Test Condition                                                                                      | Min | Typ  | Max | Unit   |
|--------------------------------------------------------------------------------------|----------------------|-----------------------------------------------------------------------------------------------------|-----|------|-----|--------|
| Current consumption in EM0 mode with all peripherals disabled                        | I <sub>ACTIVE</sub>  | 76.8 MHz HFCO w/ DPLL referenced to 38.4 MHz crystal, CPU running while loop from flash, VSCALE2    | -   | 27   | -   | µA/MHz |
|                                                                                      |                      | 76.8 MHz HFCO w/ DPLL referenced to 38.4 MHz crystal, CPU running CoreMark loop from flash, VSCALE2 | -   | 37   | -   | µA/MHz |
|                                                                                      |                      | 38.4 MHz crystal, CPU running Prime from flash                                                      | -   | 28   | -   | µA/MHz |
|                                                                                      |                      | 38.4 MHz crystal, CPU running while loop from flash                                                 | -   | 26   | -   | µA/MHz |
|                                                                                      |                      | 38.4 MHz crystal, CPU running CoreMark loop from flash                                              | -   | 38   | -   | µA/MHz |
|                                                                                      |                      | 38 MHz HFCO, CPU running while loop from flash                                                      | -   | 22   | -   | µA/MHz |
|                                                                                      |                      | 76.8 MHz HFCO w/ DPLL referenced to 38.4 MHz crystal, CPU running Prime from flash, VSCALE2         | -   | 28   | -   | µA/MHz |
| Current consumption in EM1 mode with all peripherals disabled                        | I <sub>EM1</sub>     | 76.8 MHz HFCO w/ DPLL referenced to 38.4 MHz crystal, VSCALE2                                       | -   | 17   | -   | µA/MHz |
|                                                                                      |                      | 38.4 MHz crystal                                                                                    | -   | 17   | -   | µA/MHz |
|                                                                                      |                      | 38 MHz HFCO                                                                                         | -   | 13   | -   | µA/MHz |
| Current consumption in EM2 mode, VSCALE0                                             | I <sub>EM2_VS</sub>  | Full RAM retention and RTC running from LFXO                                                        | -   | 1.4  | -   | µA     |
|                                                                                      |                      | Full RAM retention and RTC running from LFRCO                                                       | -   | 1.4  | -   | µA     |
|                                                                                      |                      | Full RAM retention and RTC running from LFRCO in precision mode                                     | -   | 1.75 | -   | µA     |
|                                                                                      |                      | 24 kB RAM retention and RTC running from LFXO                                                       | -   | 1.32 | -   | µA     |
|                                                                                      |                      | 24 kB RAM retention and RTC running from LFRCO in precision mode                                    | -   | 1.66 | -   | µA     |
|                                                                                      |                      | 8 kB RAM retention and RTC running from LFXO                                                        | -   | 1.21 | -   | µA     |
|                                                                                      |                      | 8 kB RAM retention and RTC running from LFRCO                                                       | -   | 1.2  | -   | µA     |
| Current consumption in EM3 mode, VSCALE0                                             | I <sub>EM3_VS</sub>  | 8 kB RAM retention and RTC running from ULFRCO                                                      | -   | 1.05 | -   | µA     |
| Current consumption in EM4 mode                                                      | I <sub>EM4</sub>     | No BURTC, No LF Oscillator, DCDC bypassed                                                           | -   | 0.17 | -   | µA     |
| Additional current in EM2 or EM3 when any peripheral in PD0B is enabled <sup>1</sup> | I <sub>PD0B_VS</sub> |                                                                                                     | -   | 0.37 | -   | µA     |

Note :

1. Extra current consumed by power domain. Does not include current associated with the enabled peripherals. See for a list of the peripherals in each power domain.

|      |     |            |                       |                        |      |      |                |
|------|-----|------------|-----------------------|------------------------|------|------|----------------|
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|      |     |            |                       |                        |      |      |                |
|      |     |            |                       |                        |      |      | DOCUMENT NO.   |
|      |     |            |                       |                        |      |      | DBS22-1XSTX SA |

3) RF General Characteristics for the 2.4 GHz Band

Unless otherwise indicated, typical conditions are: TA = 25 °C, VDD = 3.0V. RF center frequency 2.45 GHz.

| Parameter                 | Symbol             | Test Condition | Min  | Typ | Max    | Unit |
|---------------------------|--------------------|----------------|------|-----|--------|------|
| RF tuning frequency range | F <sub>RANGE</sub> |                | 2400 | -   | 2483.5 | MHz  |

4) Radio Current Consumption with 3 V Supply

RF current consumption measured with MCU in EM1, HCLK = 38.4 MHz, and all MCU peripherals disabled. Unless otherwise indicated, typical conditions are: VDD = 3.0 V. TA = 25 °C. Minimum and maximum values in this table represent the worst conditions across process variation at TA = 25 °C.

| Parameter                                                           | Symbol                 | Test Condition                                          | Min | Typ  | Max | Unit |
|---------------------------------------------------------------------|------------------------|---------------------------------------------------------|-----|------|-----|------|
| System current consumption in receive mode, active packet reception | I <sub>RX_ACTIVE</sub> | 125 kbit/s, 2GFSK, f = 2.4 GHz, Bluetooth stack running | -   | 4.5  | -   | mA   |
|                                                                     |                        | 500 kbit/s, 2GFSK, f = 2.4 GHz, Bluetooth stack running | -   | 4.5  | -   | mA   |
|                                                                     |                        | 1 Mbit/s, 2GFSK, f = 2.4 GHz, Bluetooth stack running   | -   | 4.3  | -   | mA   |
|                                                                     |                        | 2 Mbit/s, 2GFSK, f = 2.4 GHz, Bluetooth stack running   | -   | 4.8  | -   | mA   |
| System current consumption in receive mode, listening for packet    | I <sub>RX_LISTEN</sub> | 125 kbit/s, 2GFSK, f = 2.4 GHz, Bluetooth stack running | -   | 4.4  | -   | mA   |
|                                                                     |                        | 500 kbit/s, 2GFSK, f = 2.4 GHz, Bluetooth stack running | -   | 4.4  | -   | mA   |
|                                                                     |                        | 1 Mbit/s, 2GFSK, f = 2.4 GHz, Bluetooth stack running   | -   | 4.2  | -   | mA   |
|                                                                     |                        | 2 Mbit/s, 2GFSK, f = 2.4 GHz, Bluetooth stack running   | -   | 4.7  | -   | mA   |
| System current consumption in transmit mode                         | I <sub>TX</sub>        | f = 2.4 GHz, CW, 0 dBm output power                     | -   | 4.8  | -   | mA   |
|                                                                     |                        | f = 2.4 GHz, CW, 6 dBm output power                     | -   | 8.8  | -   | mA   |
|                                                                     |                        | f = 2.4 GHz, CW, 8 dBm output power                     | -   | 10.6 | -   | mA   |

Note :

1. Extra current consumed by power domain. Does not include current associated with the enabled peripherals. See for a list of the peripherals in each power domain.

|                  |     |            |                       |                        |      |      |                                |
|------------------|-----|------------|-----------------------|------------------------|------|------|--------------------------------|
| R<br>E<br>V<br>. | 0.1 | 2021.01.17 | Initial Release       | DeviceDesign Co., Ltd. |      |      |                                |
|                  | 0.2 | 2021.03.26 | Mechanical Dimensions | DSGD                   | CHKD | APPD | DBS22-1XSTX                    |
|                  |     |            |                       |                        |      |      |                                |
|                  |     |            |                       |                        |      |      |                                |
|                  |     |            |                       |                        |      |      | DOCUMENT NO.<br>DBS22-1XSTX SA |

5) RF Transmitter General Characteristics for the 2.4 GHz Band

Unless otherwise indicated, typical conditions are: TA = 25 °C, VDD = 3.0V. RF center frequency 2.45 GHz.

| Parameter                     | Symbol              | Test Condition     | Min  | Typ | Max    | Unit |
|-------------------------------|---------------------|--------------------|------|-----|--------|------|
| RF tuning frequency range     | F <sub>RANGE</sub>  |                    | 2400 | -   | 2483.5 | MHz  |
| Maximum TX power <sup>1</sup> | P <sub>OUTMAX</sub> | 8 dBm output power | -    | 8   | -      | dBm  |
|                               |                     | 6 dBm output power | -    | 6   | -      | dBm  |
|                               |                     | 0 dBm output power | -    | 0   | -      | dBm  |

6) RF Receiver Characteristics for Bluetooth Low Energy in the 2.4 GHz Band

Unless otherwise indicated, typical conditions are: TA = 25 °C, VDD = 3.0V. RF center frequency 2.45 GHz.

| Parameter                       | Symbol | Test Condition                                           | Min | Typ   | Max | Unit |
|---------------------------------|--------|----------------------------------------------------------|-----|-------|-----|------|
| Max usable receiver input level | SAT    | Signal is reference signal <sup>1</sup>                  | -   | 10    | -   | dBm  |
| Sensitivity (1Mbps Data Rate)   | SENS   | Signal is reference signal, 37 byte payload <sup>2</sup> | -   | -98.9 | -   | dBm  |
| Sensitivity (2Mbps Data Rate)   | SENS   | Signal is reference signal, 37 byte payload <sup>2</sup> | -   | -96.2 | -   | dBm  |

Note :  
1. 0.017% Bit Error Rate.  
2. 0.1% Bit Error Rate.

Preliminary

|      |     |            |                       |                        |      |      |                                |
|------|-----|------------|-----------------------|------------------------|------|------|--------------------------------|
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|      | 0.2 | 2021.03.26 | Mechanical Dimensions | DSGD                   | CHKD | APPD | DBS22-1XSTX                    |
|      |     |            |                       |                        |      |      |                                |
|      |     |            |                       |                        |      |      |                                |
|      |     |            |                       |                        |      |      | DOCUMENT NO.<br>DBS22-1XSTX SA |

7) High-Frequency Crystal

| Parameter                   | Symbol                   | Test Condition                     | Min | Typ  | Max | Unit |
|-----------------------------|--------------------------|------------------------------------|-----|------|-----|------|
| Crystal frequency           | f <sub>HFX TAL</sub>     |                                    |     | 38.4 |     | MHz  |
| Initial calibrated accuracy | ACC <sub>HFX TAL</sub>   |                                    | -10 | -    | 10  | ppm  |
| Temperature drift           | DRIFT <sub>HFX TAL</sub> | Across specified temperature range | -20 | -    | 20  | ppm  |

8) Low-Frequency Crystal

| Parameter                      | Symbol                  | Test Condition   | Min  | Typ    | Max | Unit |
|--------------------------------|-------------------------|------------------|------|--------|-----|------|
| Crystal frequency <sup>1</sup> | f <sub>LFXTAL</sub>     |                  | -    | 32.768 | -   | kHz  |
| Temperature drift              | DRIFT <sub>LFXTAL</sub> | -40 °C to +85 °C | -200 | -      | 200 | ppm  |

Note :  
1. Nominal frequency tolerance of the crystal is ± 20 ppm.

9) Precision Low Frequency RC Oscillator (LFRCO)

| Parameter                     | Symbol                 | Test Condition                                                                | Min  | Typ    | Max | Unit |
|-------------------------------|------------------------|-------------------------------------------------------------------------------|------|--------|-----|------|
| Nominal oscillation frequency | F <sub>LFRCO</sub>     |                                                                               | -    | 32.768 | -   | kHz  |
| Frequency accuracy            | F <sub>LFRCO_ACC</sub> | Normal mode                                                                   | -3   | -      | 3   | %    |
|                               |                        | Precision mode <sup>1</sup> , across operating temperature range <sup>2</sup> | -500 | -      | 500 | ppm  |
| Startup time                  | t <sub>STARTUP</sub>   | Normal mode                                                                   | -    | 204    | -   | µs   |
|                               |                        | Precision mode <sup>1</sup>                                                   | -    | 11.7   | -   | ms   |
| Current consumption           | I <sub>LFRCO</sub>     | Normal mode                                                                   | -    | 175    | -   | nA   |
|                               |                        | Precision mode <sup>1</sup> , T = stable at 25°C <sup>3</sup>                 | -    | 655    | -   | nA   |

Note :  
1. The LFRCO operates in high-precision mode when CFG\_HIGHPRECEN is set to 1.  
High-precision mode is not available in EM4.  
2. Includes ± 40 ppm frequency tolerance of the HFXO crystal.  
3. Includes periodic re-calibration against HFXO crystal oscillator.

|                  |     |            |                       |                        |      |      |                |
|------------------|-----|------------|-----------------------|------------------------|------|------|----------------|
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|                  |     |            |                       |                        |      |      | DOCUMENT NO.   |
|                  |     |            |                       |                        |      |      | DBS22-1XSTX SA |

## 10) GPIO Pins

Unless otherwise indicated, typical conditions are: VDD = 3.0 V.

| Parameter                       | Symbol           | Test Condition                                                                                                                                                                | Min         | Typ  | Max        | Unit |
|---------------------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------|------------|------|
| Leakage current                 | $I_{LEAK\_IO}$   | MODEx = DISABLED, VDD = 3.0 V                                                                                                                                                 | -           | 2.5  | -          | nA   |
| Input low voltage <sup>1</sup>  | $V_{IL}$         | Any GPIO pin                                                                                                                                                                  | -           | -    | 0.3 * VDD  | V    |
|                                 |                  | RESETE <sub>n</sub>                                                                                                                                                           | -           | -    | 0.3 * DVDD | V    |
| Input high voltage <sup>1</sup> | $V_{IH}$         | Any GPIO pin                                                                                                                                                                  | 0.7 * VDD   | -    | -          | V    |
|                                 |                  | RESETE <sub>n</sub>                                                                                                                                                           | 0.7 * DVDD  | -    | -          | V    |
| Hysteresis of input voltage     | $V_{HYS}$        | Any GPIO pin                                                                                                                                                                  | 0.05 * VDD  | -    | -          | V    |
|                                 |                  | RESETE <sub>n</sub>                                                                                                                                                           | 0.05 * DVDD | -    | -          | V    |
| Output low voltage              | $V_{OL}$         | Sinking 20mA, VDD = 3.0 V                                                                                                                                                     | -           | -    | 0.2 * VDD  | V    |
|                                 |                  | Sinking 8mA, VDD = 1.62 V                                                                                                                                                     | -           | -    | 0.4 * VDD  | V    |
| Output high voltage             | $V_{OH}$         | Sourcing 20mA, VDD = 3.0 V                                                                                                                                                    | 0.8 * VDD   | -    | -          | V    |
|                                 |                  | Sourcing 8mA, VDD = 1.62 V                                                                                                                                                    | 0.6 * VDD   | -    | -          | V    |
| GPIO rise time                  | $T_{GPIO\_RISE}$ | VDD = 3.0V, Cload = 50pF, SLEWRATE = 4, 10% to 90%                                                                                                                            | -           | 8.4  | -          | ns   |
|                                 |                  | VDD = 1.7V, Cload = 50pF, SLEWRATE = 4, 10% to 90%                                                                                                                            | -           | 13   | -          | ns   |
| GPIO fall time                  | $T_{GPIO\_FALL}$ | VDD = 3.0V, Cload = 50pF, SLEWRATE = 4, 90% to 10%                                                                                                                            | -           | 7.1  | -          | ns   |
|                                 |                  | VDD = 1.7V, Cload = 50pF, SLEWRATE = 4, 90% to 10%                                                                                                                            | -           | 11.9 | -          | ns   |
| Pull up/down resistance         | $R_{PULL}$       | GPIO pull-up to VDD: MODE <sub>n</sub> = DISABLE, DOUT=1.<br>GPIO pulldown to VSS: MODE <sub>n</sub> = WIREDORPULLDOWN, DOUT = 0.<br>RESETE <sub>n</sub> pin pull-up to DVDD. | 35          | 44   | 55         | kΩ   |
| Maximum filtered glitch width   | $T_{GF}$         | MODE = INPUT, DOUT = 1                                                                                                                                                        | -           | 27   | -          | ns   |

|                  |     |            |                       |                        |      |      |                                |
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13. Microcontroller Peripherals

The MCU peripherals set available in DBS22-1XSTX modules includes:

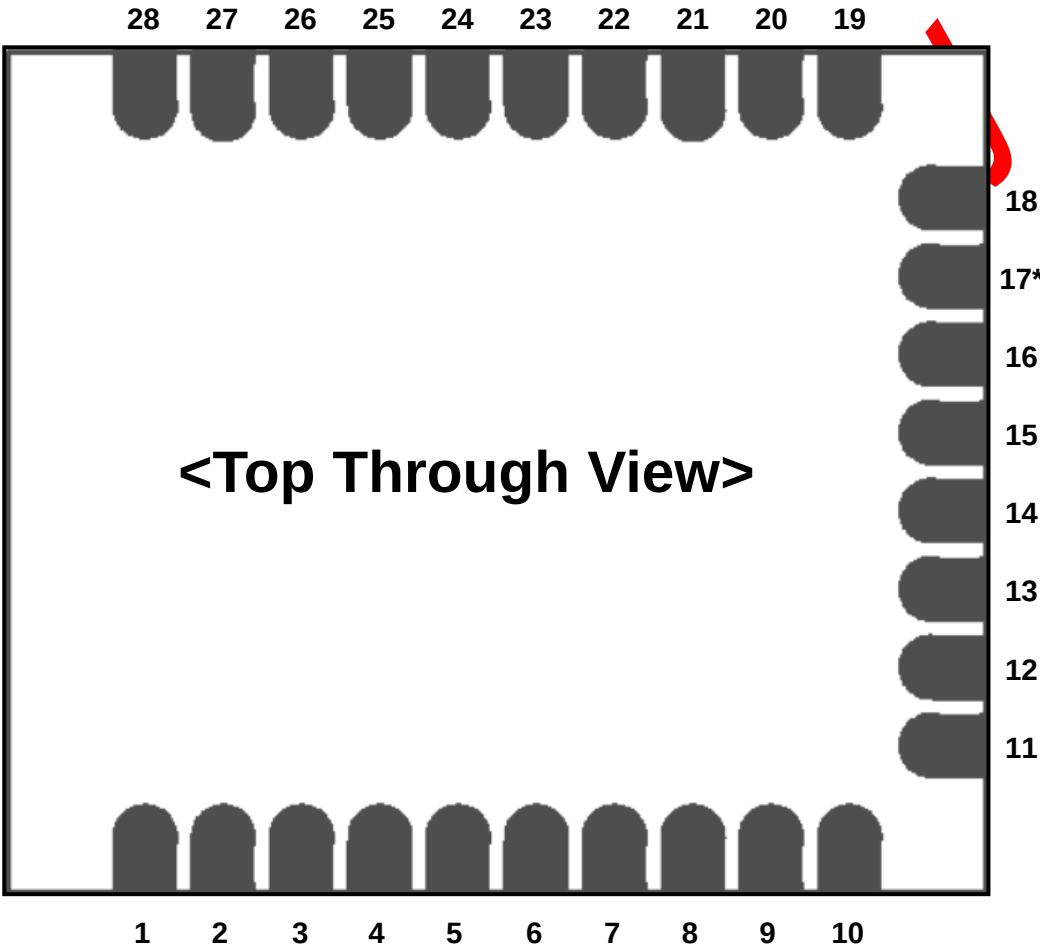
- ADC: 12-bit at 1 Msps, 16-bit at 76.9 ksps
- 16-bit and 32-bit Timers/Counters
- 24-bit Low Energy Timer for waveform generation
- 32-bit Real Time Counter
- USART (UART/SPI/SmartCards/IrDA/I2S)
- EUART (UART/IrDA)
- I2C peripheral interfaces
- PDM interface
- 12 Channel Peripheral Reflex System

For details on their electrical performance, consult the relevant portions of Section 4 in the SoC datasheet. To learn which GPIO ports provide access to every peripheral, consult Analog Peripheral Connectivity and Digital Peripheral Connectivity.

Preliminary

|      |     |            |                       |                        |      |      |                |
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14. Pin Assignment (Top Through View, Bottom Layout)



\* Pin 17 is only available on module with Precision LFRCO Device (Not embedded 32kHz xtal Module)  
\* Pin 17 should be N.C for module with LF Crystal Device (Embedded 32kHz xtal Module)

|                  |     |            |                       |                        |      |      |                |
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|                  |     |            |                       |                        |      |      |                |

15. Pin Description

| Pin | Pin Name | Description                                                                                                                                                                                                                                                                                                                                                                              |
|-----|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | GND      | Ground                                                                                                                                                                                                                                                                                                                                                                                   |
| 2   | PB01     | GPIO                                                                                                                                                                                                                                                                                                                                                                                     |
| 3   | PB00     | GPIO                                                                                                                                                                                                                                                                                                                                                                                     |
| 4   | PA00     | GPIO                                                                                                                                                                                                                                                                                                                                                                                     |
| 5   | PA01     | GPIO                                                                                                                                                                                                                                                                                                                                                                                     |
| 6   | PA02     | GPIO                                                                                                                                                                                                                                                                                                                                                                                     |
| 7   | PA03     | GPIO                                                                                                                                                                                                                                                                                                                                                                                     |
| 8   | PA04     | GPIO                                                                                                                                                                                                                                                                                                                                                                                     |
| 9   | PA05     | GPIO                                                                                                                                                                                                                                                                                                                                                                                     |
| 10  | GND      | Ground                                                                                                                                                                                                                                                                                                                                                                                   |
| 11  | PA06     | GPIO                                                                                                                                                                                                                                                                                                                                                                                     |
| 12  | PA07     | GPIO                                                                                                                                                                                                                                                                                                                                                                                     |
| 13  | PA08     | GPIO                                                                                                                                                                                                                                                                                                                                                                                     |
| 14  | VDD      | Power Supply                                                                                                                                                                                                                                                                                                                                                                             |
| 15  | PD02     | GPIO                                                                                                                                                                                                                                                                                                                                                                                     |
| 16  | PD03     | GPIO                                                                                                                                                                                                                                                                                                                                                                                     |
| 17  | PD01*    | GPIO (*Available only on not embedded 32khz xtal model)                                                                                                                                                                                                                                                                                                                                  |
| 18  | PC00     | GPIO                                                                                                                                                                                                                                                                                                                                                                                     |
| 19  | GND      | Ground                                                                                                                                                                                                                                                                                                                                                                                   |
| 20  | PC01     | GPIO                                                                                                                                                                                                                                                                                                                                                                                     |
| 21  | PC02     | GPIO                                                                                                                                                                                                                                                                                                                                                                                     |
| 22  | PC03     | GPIO                                                                                                                                                                                                                                                                                                                                                                                     |
| 23  | PC04     | GPIO                                                                                                                                                                                                                                                                                                                                                                                     |
| 24  | PC05     | GPIO                                                                                                                                                                                                                                                                                                                                                                                     |
| 25  | PC06     | GPIO                                                                                                                                                                                                                                                                                                                                                                                     |
| 26  | PC07     | GPIO                                                                                                                                                                                                                                                                                                                                                                                     |
| 27  | RESETN   | <p>Reset Pin. The RESETn pin is pulled up to an internal DVDD supply. An external pull-up is not recommended.</p> <p>To apply an external reset source to this pin, it is required to only drive this pin low during reset, and let the internal pull-up ensure that reset is released.</p> <p>The RESETn pin can be left unconnected if no external reset switch or source is used.</p> |
| 28  | GND      | Ground                                                                                                                                                                                                                                                                                                                                                                                   |

|                  |     |            |                       |                        |      |      |                |
|------------------|-----|------------|-----------------------|------------------------|------|------|----------------|
| R<br>E<br>V<br>. | 0.1 | 2021.01.17 | Initial Release       | DeviceDesign Co., Ltd. |      |      |                |
|                  | 0.2 | 2021.03.26 | Mechanical Dimensions | DSGD                   | CHKD | APPD | DBS22-1XSTX    |
|                  |     |            |                       |                        |      |      | DOCUMENT NO.   |
|                  |     |            |                       |                        |      |      | DBS22-1XSTX SA |
|                  |     |            |                       |                        |      |      |                |

16. Alternate Function Table

A wide selection of alternate functionality is available for multiplexing to various pins.  
The following table shows what functions are available on each device pin.

| GPIO | Alternate Function |               |                 |
|------|--------------------|---------------|-----------------|
| PB01 | GPIO.EM4WU3        |               |                 |
| PB00 | IADC0.VREFN        |               |                 |
| PA00 | IADC0.VREFP        |               |                 |
| PA01 | GPIO.SWCLK         |               |                 |
| PA02 | GPIO.SWDIO         |               |                 |
| PA03 | GPIO.SWV           | GPIO.TDO      | GPIO.TRACEDATA0 |
| PA04 | GPIO.TDI           | GPIO.TRACECLK |                 |
| PA05 | GPIO.EM4WU0        |               |                 |
| PD02 | GPIO.EM4WU9        |               |                 |
| PC00 | GPIO.EM4WU6        | GPIO.THMSW_EN |                 |
| PC05 | GPIO.EM4WU7        |               |                 |
| PC07 | GPIO.EM4WU8        |               |                 |

17. Analog Peripheral Connectivity

Many analog resources are routable and can be connected to numerous GPIO's.  
The table below indicates which peripherals are available on each GPIO port.  
When a differential connection is being used Positive inputs are restricted to the EVEN pins and Negative inputs are restricted to the ODD pins.  
When a single ended connection is being used positive input is available on all pins.  
See the device Reference Manual for more details on the ABUS and analog peripherals.

| Peripheral | Signal  | PA   |     | PB   |     | PC   |     | PD   |     |
|------------|---------|------|-----|------|-----|------|-----|------|-----|
|            |         | EVEN | ODD | EVEN | ODD | EVEN | ODD | EVEN | ODD |
| IADC0      | ana_neg | Yes  | Yes | Yes  | Yes | Yes  | Yes | Yes  | Yes |
|            | ana_pos | Yes  | Yes | Yes  | Yes | Yes  | Yes | Yes  | Yes |

|                  |     |            |                       |                        |      |      |                |
|------------------|-----|------------|-----------------------|------------------------|------|------|----------------|
| R<br>E<br>V<br>. | 0.1 | 2021.01.17 | Initial Release       | DeviceDesign Co., Ltd. |      |      |                |
|                  | 0.2 | 2021.03.26 | Mechanical Dimensions | DSGD                   | CHKD | APPD | DBS22-1XSTX    |
|                  |     |            |                       |                        |      |      | DOCUMENT NO.   |
|                  |     |            |                       |                        |      |      | DBS22-1XSTX SA |
|                  |     |            |                       |                        |      |      |                |

18. Digital Peripheral Connectivity #1

Many digital resources are routable and can be connected to numerous GPIO's.  
The table below indicates which peripherals are available on each GPIO port.

| Peripheral.Resource | PORT      |           |           |           |
|---------------------|-----------|-----------|-----------|-----------|
|                     | PA        | PB        | PC        | PD        |
| CMU.CLKIN0          |           |           | Available | Available |
| CMU.CLKOUT0         |           |           | Available | Available |
| CMU.CLKOUT1         |           |           | Available | Available |
| CMU.CLKOUT2         | Available | Available |           |           |
| EUART0.CTS          | Available | Available | Available | Available |
| EUART0.RTS          | Available | Available | Available | Available |
| EUART0.RX           | Available | Available | Available | Available |
| EUART0.TX           | Available | Available | Available | Available |
| FRC.DCLK            |           |           | Available | Available |
| FRC.DFRAME          |           |           | Available | Available |
| FRC.DOUT            |           |           | Available | Available |
| I2C0.SCL            | Available | Available | Available | Available |
| I2C0.SDA            | Available | Available | Available | Available |
| I2C1.SCL            |           |           | Available | Available |
| I2C1.SDA            |           |           | Available | Available |
| LETIMER0.OUT0       | Available | Available |           |           |
| LETIMER0.OUT1       | Available | Available |           |           |
| MODEM.ANT0          | Available | Available | Available | Available |
| MODEM.ANT1          | Available | Available | Available | Available |
| MODEM.ANT_ROLL_OVER |           |           | Available | Available |
| MODEM.ANT_RR0       |           |           | Available | Available |
| MODEM.ANT_RR1       |           |           | Available | Available |
| MODEM.ANT_RR2       |           |           | Available | Available |
| MODEM.ANT_RR3       |           |           | Available | Available |
| MODEM.ANT_RR4       |           |           | Available | Available |
| MODEM.ANT_RR5       |           |           | Available | Available |
| MODEM.ANT_SW_EN     |           |           | Available | Available |
| MODEM.ANT_SW_US     |           |           | Available | Available |
| MODEM.ANT_TRIG      |           |           | Available | Available |
| MODEM.ANT_TRIG_STOP |           |           | Available | Available |
| MODEM.DCLK          | Available | Available |           |           |

|                  |     |            |                       |                        |      |      |                                |
|------------------|-----|------------|-----------------------|------------------------|------|------|--------------------------------|
| R<br>E<br>V<br>. | 0.1 | 2021.01.17 | Initial Release       | DeviceDesign Co., Ltd. |      |      |                                |
|                  | 0.2 | 2021.03.26 | Mechanical Dimensions | DSGD                   | CHKD | APPD | DBS22-1XSTX                    |
|                  |     |            |                       |                        |      |      |                                |
|                  |     |            |                       |                        |      |      |                                |
|                  |     |            |                       |                        |      |      | DOCUMENT NO.<br>DBS22-1XSTX SA |

18. Digital Peripheral Connectivity #2

| Peripheral.Resource | PORT      |           |           |           |
|---------------------|-----------|-----------|-----------|-----------|
|                     | PA        | PB        | PC        | PD        |
| MODEM.DIN           | Available | Available |           |           |
| MODEM.DOUT          | Available | Available |           |           |
| PDM.CLK             | Available | Available | Available | Available |
| PDM.DAT0            | Available | Available | Available | Available |
| PDM.DAT1            | Available | Available | Available | Available |
| PRS.ASYNCH0         | Available | Available |           |           |
| PRS.ASYNCH1         | Available | Available |           |           |
| PRS.ASYNCH10        |           |           | Available | Available |
| PRS.ASYNCH11        |           |           | Available | Available |
| PRS.ASYNCH2         | Available | Available |           |           |
| PRS.ASYNCH3         | Available | Available |           |           |
| PRS.ASYNCH4         | Available | Available |           |           |
| PRS.ASYNCH5         | Available | Available |           |           |
| PRS.ASYNCH6         |           |           | Available | Available |
| PRS.ASYNCH7         |           |           | Available | Available |
| PRS.ASYNCH8         |           |           | Available | Available |
| PRS.ASYNCH9         |           |           | Available | Available |
| PRS.SYNCH0          | Available | Available | Available | Available |
| PRS.SYNCH1          | Available | Available | Available | Available |
| PRS.SYNCH2          | Available | Available | Available | Available |
| PRS.SYNCH3          | Available | Available | Available | Available |
| TIMER0.CC0          | Available | Available | Available | Available |
| TIMER0.CC1          | Available | Available | Available | Available |
| TIMER0.CC2          | Available | Available | Available | Available |
| TIMER0.CDTI0        | Available | Available | Available | Available |
| TIMER0.CDTI1        | Available | Available | Available | Available |
| TIMER0.CDTI2        | Available | Available | Available | Available |
| TIMER1.CC0          | Available | Available | Available | Available |
| TIMER1.CC1          | Available | Available | Available | Available |
| TIMER1.CC2          | Available | Available | Available | Available |
| TIMER1.CDTI0        | Available | Available | Available | Available |
| TIMER1.CDTI1        | Available | Available | Available | Available |
| TIMER1.CDTI2        | Available | Available | Available | Available |
| TIMER2.CC0          | Available | Available |           |           |
| TIMER2.CC1          | Available | Available |           |           |
| TIMER2.CC2          | Available | Available |           |           |

|                  |     |            |                       |                        |      |      |                                |
|------------------|-----|------------|-----------------------|------------------------|------|------|--------------------------------|
| R<br>E<br>V<br>. | 0.1 | 2021.01.17 | Initial Release       | DeviceDesign Co., Ltd. |      |      |                                |
|                  | 0.2 | 2021.03.26 | Mechanical Dimensions | DSGD                   | CHKD | APPD | DBS22-1XSTX                    |
|                  |     |            |                       |                        |      |      |                                |
|                  |     |            |                       |                        |      |      |                                |
|                  |     |            |                       |                        |      |      | DOCUMENT NO.<br>DBS22-1XSTX SA |

18. Digital Peripheral Connectivity #3

| Peripheral.Resource | PORT      |           |           |           |
|---------------------|-----------|-----------|-----------|-----------|
|                     | PA        | PB        | PC        | PD        |
| TIMER2.CDTI0        | Available | Available |           |           |
| TIMER2.CDTI1        | Available | Available |           |           |
| TIMER2.CDTI2        | Available | Available |           |           |
| TIMER3.CC0          |           |           | Available | Available |
| TIMER3.CC1          |           |           | Available | Available |
| TIMER3.CC2          |           |           | Available | Available |
| TIMER3.CDTI0        |           |           | Available | Available |
| TIMER3.CDTI1        |           |           | Available | Available |
| TIMER3.CDTI2        |           |           | Available | Available |
| TIMER4.CC0          | Available | Available |           |           |
| TIMER4.CC1          | Available | Available |           |           |
| TIMER4.CC2          | Available | Available |           |           |
| TIMER4.CDTI0        | Available | Available |           |           |
| TIMER4.CDTI1        | Available | Available |           |           |
| TIMER4.CDTI2        | Available | Available |           |           |
| USART0.CLK          | Available | Available | Available | Available |
| USART0.CS           | Available | Available | Available | Available |
| USART0.CTS          | Available | Available | Available | Available |
| USART0.RTS          | Available | Available | Available | Available |
| USART0.RX           | Available | Available | Available | Available |
| USART0.TX           | Available | Available | Available | Available |
| USART1.CLK          | Available | Available |           |           |
| USART1.CS           | Available | Available |           |           |
| USART1.CTS          | Available | Available |           |           |
| USART1.RTS          | Available | Available |           |           |
| USART1.RX           | Available | Available |           |           |
| USART1.TX           | Available | Available |           |           |

|                  |     |            |                       |                        |      |      |                                |
|------------------|-----|------------|-----------------------|------------------------|------|------|--------------------------------|
| R<br>E<br>V<br>. | 0.1 | 2021.01.17 | Initial Release       | DeviceDesign Co., Ltd. |      |      |                                |
|                  | 0.2 | 2021.03.26 | Mechanical Dimensions | DSGD                   | CHKD | APPD | DBS22-1XSTX                    |
|                  |     |            |                       |                        |      |      |                                |
|                  |     |            |                       |                        |      |      |                                |
|                  |     |            |                       |                        |      |      | DOCUMENT NO.<br>DBS22-1XSTX SA |

19. Reliability Test

1) Environment Test

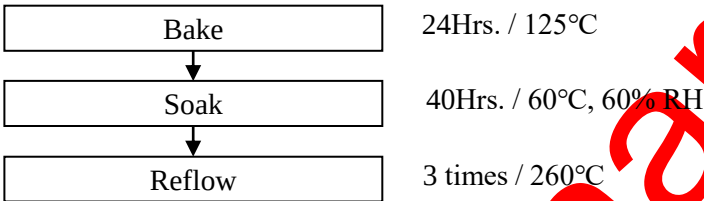
| NO | ITEM                                    | Condition                                                                                                                                                                                                                                                                 | Characteristics                                   |
|----|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| 1  | High Temperature and Humidity Load Test | Initial value measured at standard test condition.<br><b>Test Conditions:</b> 35℃, 90%RH, 50hr<br><b>Supply Voltage Condition:</b> standard ± 5%<br>In standard test condition, take measurements within 3hr.                                                             | - No electrical problem                           |
| 2  | High Temp. Load Test                    | Initial value measured at standard test condition.<br><b>Test Conditions:</b> 85℃, 50hr<br><b>Supply Voltage Condition:</b> standard ± 5%<br>In standard test condition, take measurements within 3hr.                                                                    | - No electrical problem                           |
| 3  | Low Temp. Load Test                     | Initial value measured at standard test condition.<br><b>Test Conditions:</b> -30℃, 50hr<br><b>Supply Voltage Condition:</b> standard ± 5%<br>In standard test condition, take measurements within 3hr.                                                                   | - No electrical problem                           |
| 4  | High Temp. Storage Test                 | Initial value measured at standard test condition.<br><b>Test Conditions:</b> 85℃, 100hr<br>In standard test condition, take measurements within 3hr.                                                                                                                     | - No electrical problem                           |
| 5  | Low Temp. Storage Test                  | Initial value measured at standard test condition.<br><b>Test Conditions:</b> -30, 100hr<br>In standard test condition, take measurements within 3hr.                                                                                                                     | - No electrical problem                           |
| 6  | Temperature Cycling                     | Initial value measured at standard test condition.<br><b>Test Conditions:</b><br>20℃ → 85℃ (1hr)<br>85℃ → 20℃ (1hr)<br>20℃ → -30℃ (1hr)<br>-30℃ → 20℃ (1hr)<br>- Test cycle : 25 cycles, Test Times : 100 Hr<br>In standard test condition, take measurements within 3hr. | - No electrical problem                           |
| 7  | Drop Test                               | Initial value measured at standard test condition.<br><b>Test Conditions:</b><br>- Test height: 100 cm<br>- Test times: 10 times<br>Drop the module onto a 2mm metal plate.<br>In standard test condition, take measurements within 3hr.                                  | - No mechanical damage<br>- No electrical problem |

|             |     |            |                       |                        |      |      |                                |
|-------------|-----|------------|-----------------------|------------------------|------|------|--------------------------------|
| R<br>E<br>V | 0.1 | 2021.01.17 | Initial Release       | DeviceDesign Co., Ltd. |      |      |                                |
|             | 0.2 | 2021.03.26 | Mechanical Dimensions | DSGD                   | CHKD | APPD | DBS22-1XSTX                    |
|             |     |            |                       |                        |      |      |                                |
|             |     |            |                       |                        |      |      |                                |
|             |     |            |                       |                        |      |      | DOCUMENT NO.<br>DBS22-1XSTX SA |

|                                                   |                   |
|---------------------------------------------------|-------------------|
| TITLE : Specifications for approval (DBS22-1XSTX) | REV 0.2 (21 / 27) |
| (CUSTOMER P/N : )                                 |                   |

2) JEDEC MSL(Moisture Sensitivity Level) Test

- MSL 3 Level (Floor Life Time : 168Hrs. / Condition : ≤30℃, 60% RH)
- Standard : IPC / JEDEC J-STD-020C

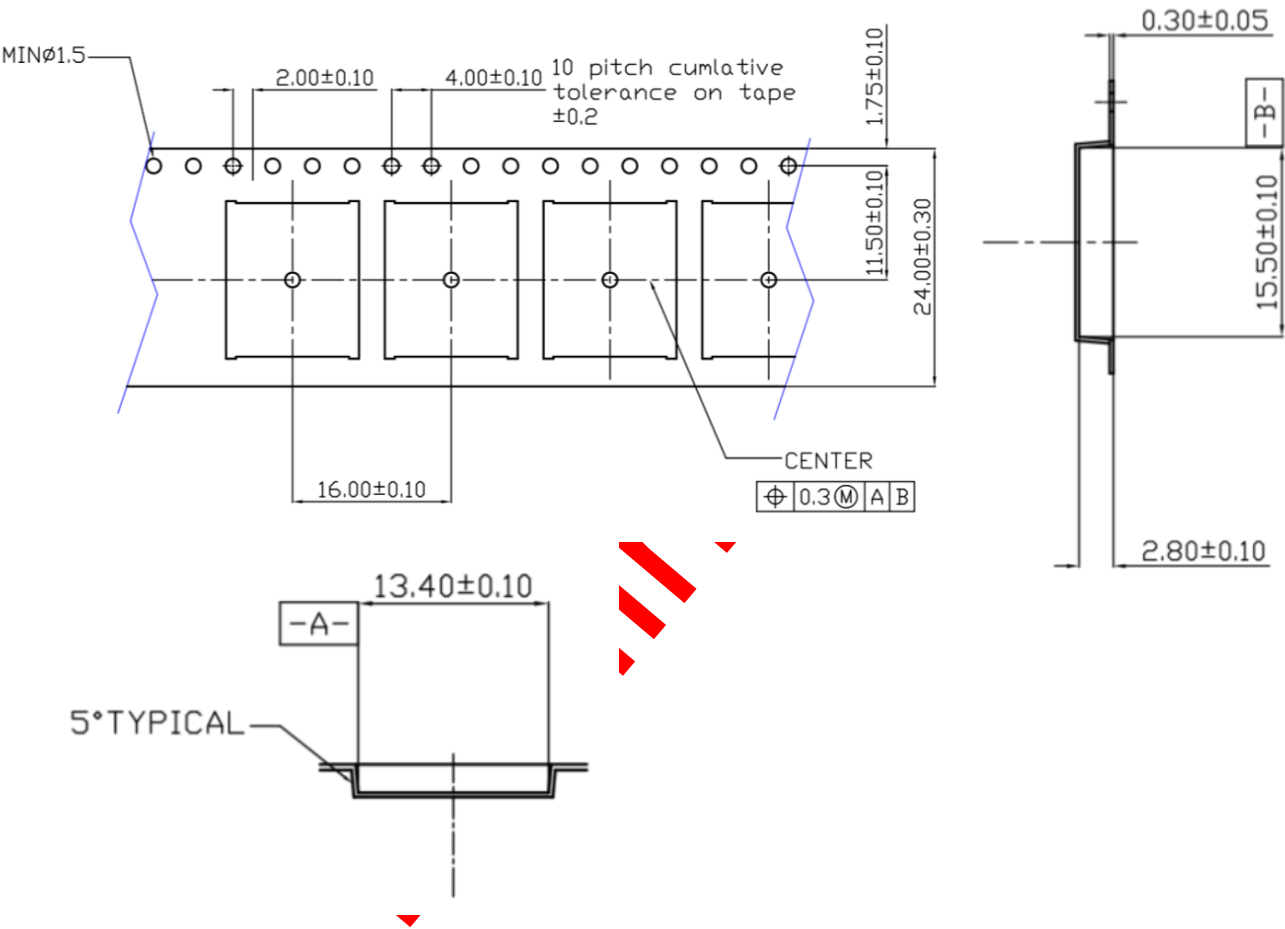


Preliminary

|      |     |            |                       |                        |      |      |                                |
|------|-----|------------|-----------------------|------------------------|------|------|--------------------------------|
| REV. | 0.1 | 2021.01.17 | Initial Release       | DeviceDesign Co., Ltd. |      |      |                                |
|      | 0.2 | 2021.03.26 | Mechanical Dimensions | DSGD                   | CHKD | APPD | DBS22-1XSTX                    |
|      |     |            |                       |                        |      |      |                                |
|      |     |            |                       |                        |      |      |                                |
|      |     |            |                       |                        |      |      | DOCUMENT NO.<br>DBS22-1XSTX SA |

20. Packing Information

1) Carrier Tape Dimension



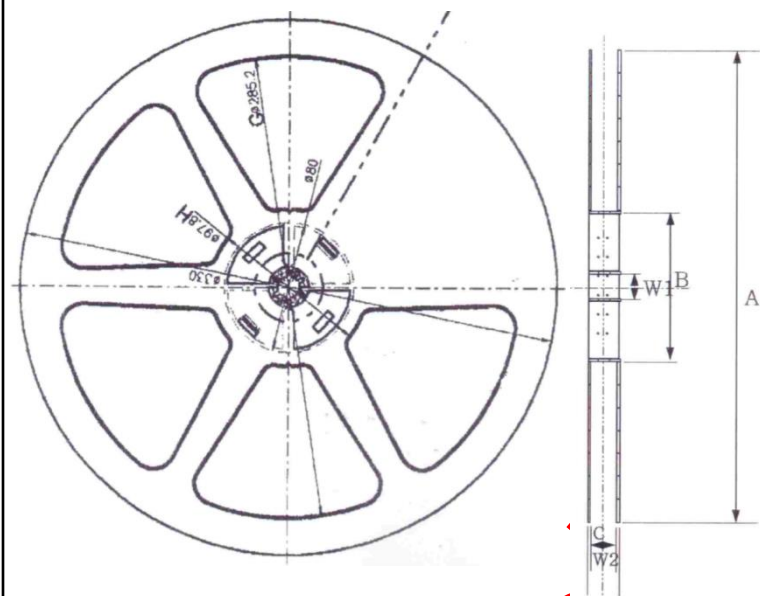
Unit : mm

|    |            |   |            |
|----|------------|---|------------|
| A0 | 15.40±0.20 | E | 1.75±0.10  |
| B0 | 18.40±0.20 | F | 14.20±0.10 |
| K0 | 3.50±0.20  | t | 0.30±0.05  |
| S  | 28.40±0.10 | w | 32.00±0.30 |

|     |     |            |                       |                        |      |      |                |
|-----|-----|------------|-----------------------|------------------------|------|------|----------------|
| REV | 0.1 | 2021.01.17 | Initial Release       | DeviceDesign Co., Ltd. |      |      |                |
|     | 0.2 | 2021.03.26 | Mechanical Dimensions | DSGD                   | CHKD | APPD | DBS22-1XSTX    |
|     |     |            |                       |                        |      |      | DOCUMENT NO.   |
|     |     |            |                       |                        |      |      | DBS22-1XSTX SA |
|     |     |            |                       |                        |      |      |                |

2) Carrier Tape Dimension

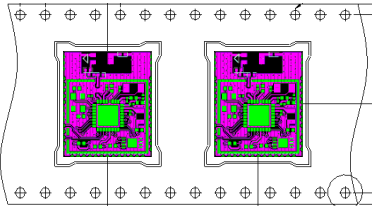
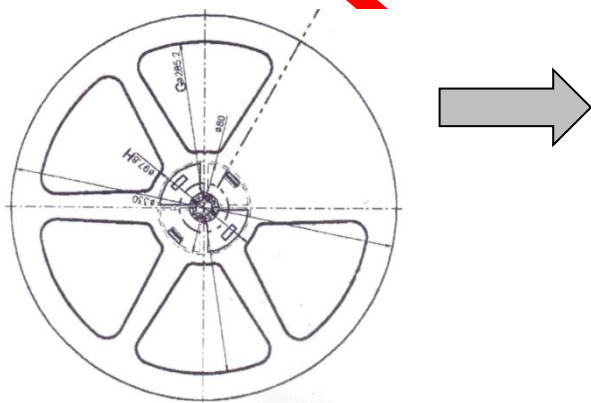
Unit : mm



| 항 목  | A     | B    | C      |
|------|-------|------|--------|
| SPEC | 330±1 | 80±1 | 13±0.5 |

| EIAJ - RRM Ø330 |     |      |     |     |     |      |     |
|-----------------|-----|------|-----|-----|-----|------|-----|
| RRM08D - 56D    |     |      |     |     |     |      |     |
| 품명              | 08D | 12D  | 16D | 24D | 32D | 44D  | 56D |
| 규격              | 08  | 12   | 16  | 24  | 32  | 44   | 56  |
| c(±0.5)         | 9   | 13   | 17  | 25  | 33  | 44.8 | 57  |
| W2(±1)          | 13  | 17.5 | 21  | 29  | 37  | 49   | 61  |

3) User direction of feed



|     |     |            |                       |                        |      |      |                |
|-----|-----|------------|-----------------------|------------------------|------|------|----------------|
| REV | 0.1 | 2021.01.17 | Initial Release       | DeviceDesign Co., Ltd. |      |      |                |
|     | 0.2 | 2021.03.26 | Mechanical Dimensions | DSGD                   | CHKD | APPD | DBS22-1XSTX    |
|     |     |            |                       |                        |      |      | DOCUMENT NO.   |
|     |     |            |                       |                        |      |      | DBS22-1XSTX SA |
|     |     |            |                       |                        |      |      |                |

|                                                   |                   |
|---------------------------------------------------|-------------------|
| TITLE : Specifications for approval (DBS22-1XSTX) | REV 0.2 (24 / 27) |
| (CUSTOMER P/N : )                                 |                   |

21. Packing Box information

1) Inner Box

|           |                     |                                                                                    |
|-----------|---------------------|------------------------------------------------------------------------------------|
| Inner Box |                     |  |
| Spec.     | 350 x 335 x 65 (mm) |                                                                                    |
| 1Box (S)  | 1,480 EA            |                                                                                    |

2) Out Box

|          |                      |                                                                                      |
|----------|----------------------|--------------------------------------------------------------------------------------|
| Out Box  |                      |  |
| Spec.    | 365 x 340 x 350 (mm) |                                                                                      |
| 1Box (S) | 5Box(S) = 7,400 EA   |                                                                                      |

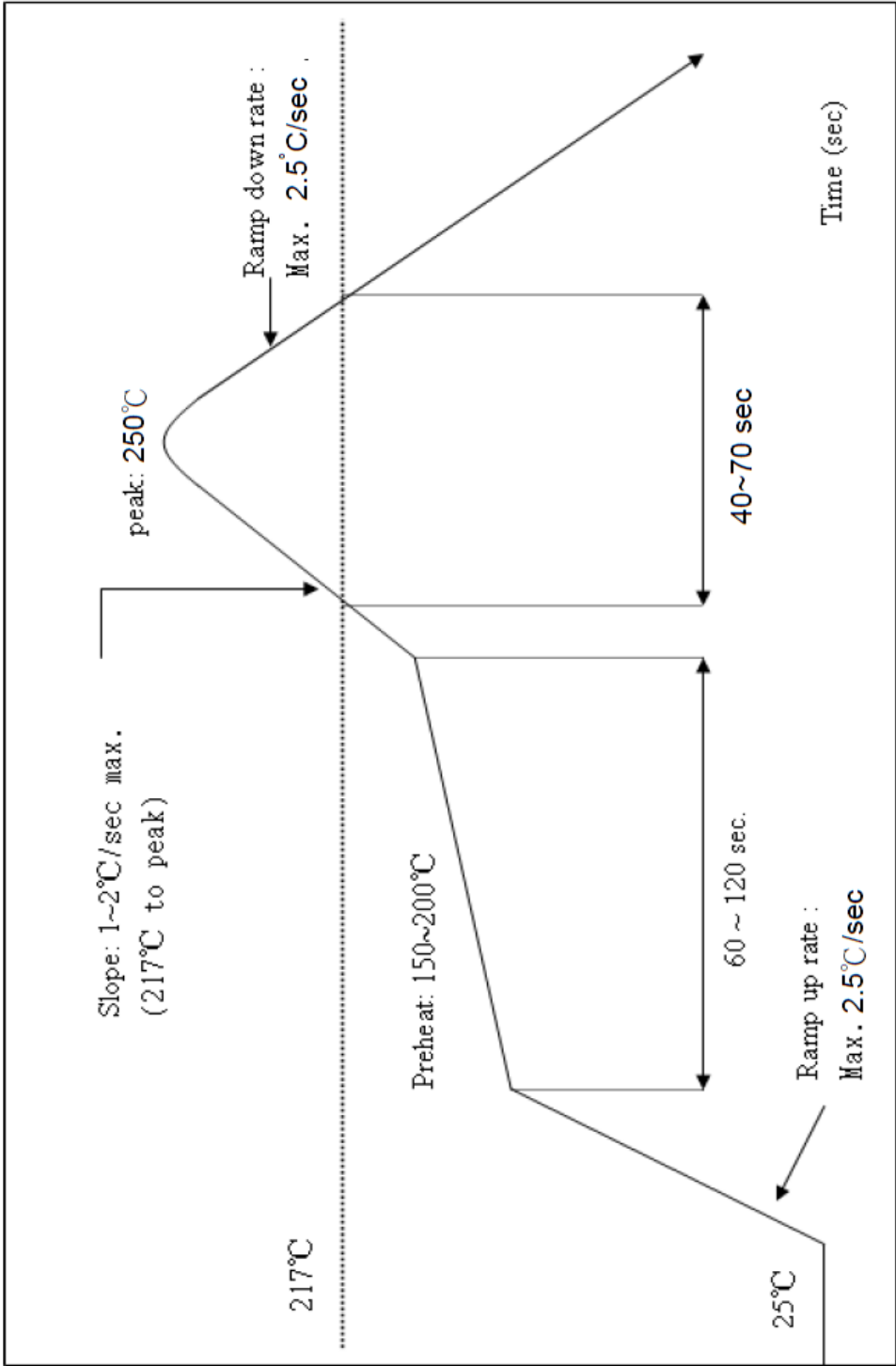
Note1) Recommendation : 72 hours floor time (≤ 30℃ / 60% RH)

Note2) Recommendation: The time between opening and Chip Mount should be within 72 hours.

|                  |     |            |                       |                        |      |      |                                |
|------------------|-----|------------|-----------------------|------------------------|------|------|--------------------------------|
| R<br>E<br>V<br>. | 0.1 | 2021.01.17 | Initial Release       | DeviceDesign Co., Ltd. |      |      |                                |
|                  | 0.2 | 2021.03.26 | Mechanical Dimensions | DSGD                   | CHKD | APPD | DBS22-1XSTX                    |
|                  |     |            |                       |                        |      |      |                                |
|                  |     |            |                       |                        |      |      |                                |
|                  |     |            |                       |                        |      |      | DOCUMENT NO.<br>DBS22-1XSTX SA |

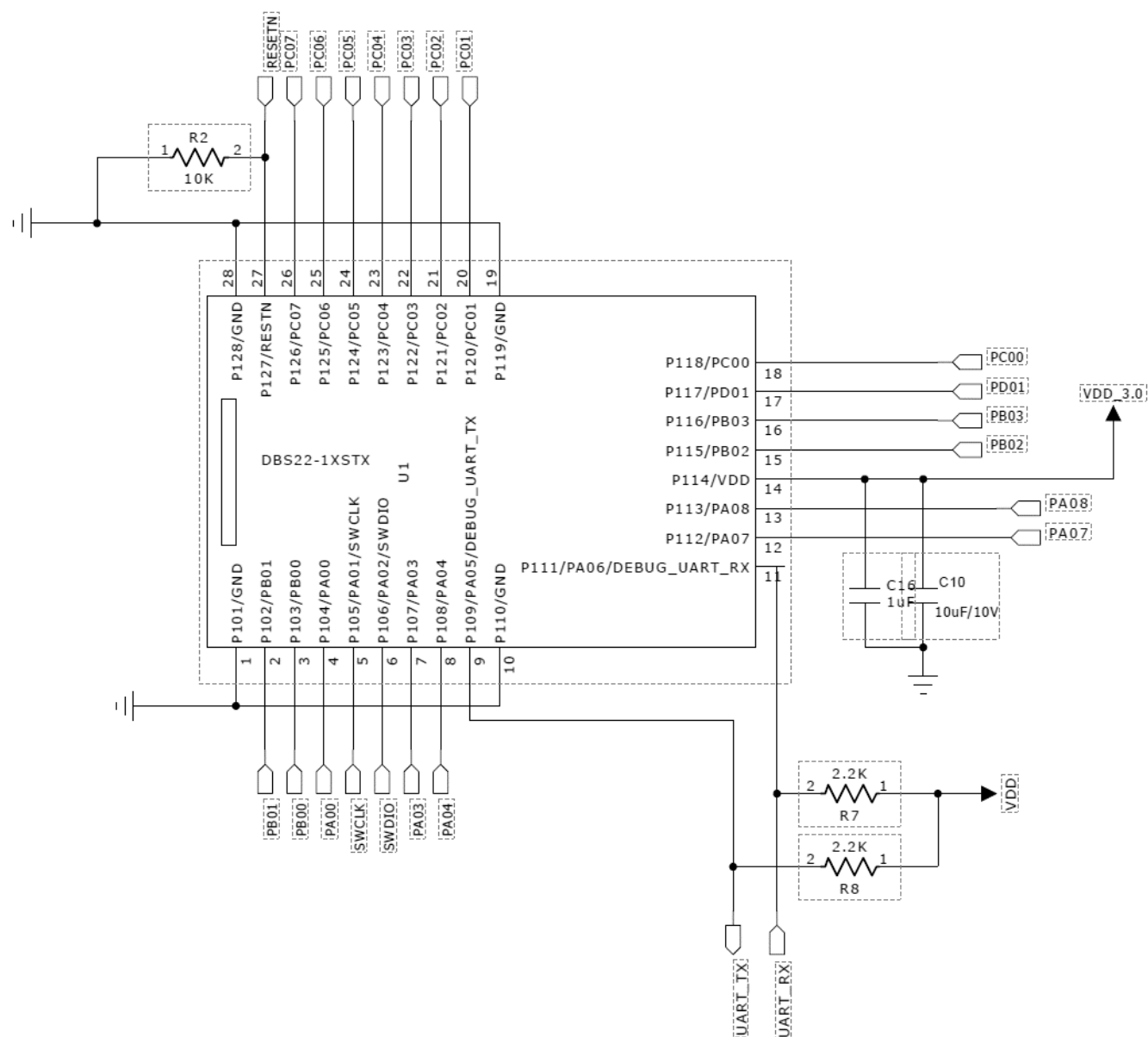
22. Reflow Profile

Referred to IPC/JEDEC standard.  
Peak Temperature : <250°C  
Number of Times : ≤2 times



|      |     |            |                       |                        |      |      |                |
|------|-----|------------|-----------------------|------------------------|------|------|----------------|
| REV. | 0.1 | 2021.01.17 | Initial Release       | DeviceDesign Co., Ltd. |      |      |                |
|      | 0.2 | 2021.03.26 | Mechanical Dimensions | DSGD                   | CHKD | APPD | DBS22-1XSTX    |
|      |     |            |                       |                        |      |      | DOCUMENT NO.   |
|      |     |            |                       |                        |      |      | DBS22-1XSTX SA |

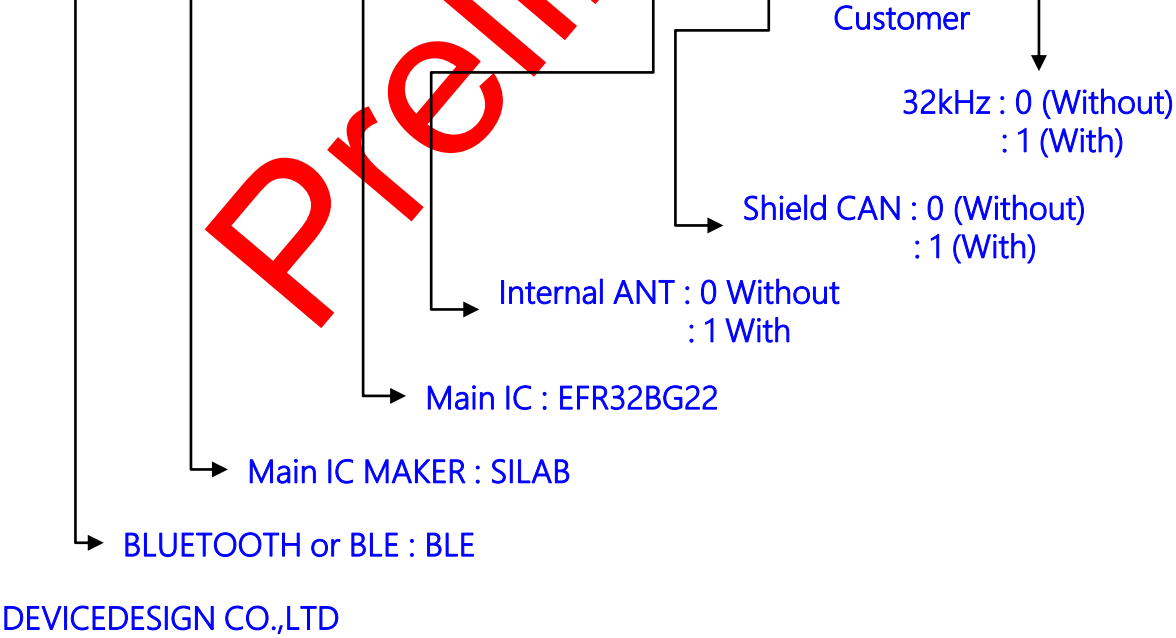
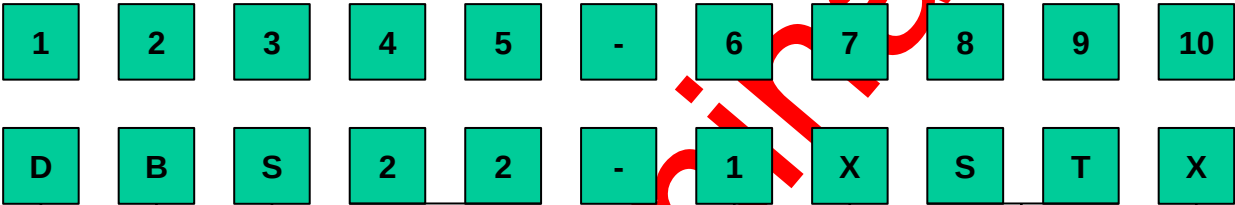
## 23. Application Circuit



|                  |     |            |                       |                        |      |      |                                |
|------------------|-----|------------|-----------------------|------------------------|------|------|--------------------------------|
| R<br>E<br>V<br>. | 0.1 | 2021.01.17 | Initial Release       | DeviceDesign Co., Ltd. |      |      |                                |
|                  | 0.2 | 2021.03.26 | Mechanical Dimensions | DSGD                   | CHKD | APPD | DBS22-1XSTX                    |
|                  |     |            |                       |                        |      |      |                                |
|                  |     |            |                       |                        |      |      |                                |
|                  |     |            |                       |                        |      |      | DOCUMENT NO.<br>DBS22-1XSTX SA |

24.Odering Information

| MODEL       | Shield CASE | 32kHz Xtal |
|-------------|-------------|------------|
| DBS22-10ST0 | X           | X          |
| DBS22-11ST0 | O           | X          |
| DBS22-10ST1 | X           | O          |
| DBS22-11ST1 | O           | O          |



|      |     |            |                       |                        |      |      |                                |
|------|-----|------------|-----------------------|------------------------|------|------|--------------------------------|
| REV. | 0.1 | 2021.01.17 | Initial Release       | DeviceDesign Co., Ltd. |      |      |                                |
|      | 0.2 | 2021.03.26 | Mechanical Dimensions | DSGD                   | CHKD | APPD | DBS22-1XSTX                    |
|      |     |            |                       |                        |      |      |                                |
|      |     |            |                       |                        |      |      |                                |
|      |     |            |                       |                        |      |      | DOCUMENT NO.<br>DBS22-1XSTX SA |

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## **FCC MODULAR APPROVAL INFORMATION EXAMPLES for Manual**

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference.
- (2) This device must accept any interference received, including interference that may cause undesired operation.

**CAUTION:** Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

**NOTE:** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

### **FCC Radiation Exposure Statement:**

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

### **OEM INTEGRATION INSTRUCTIONS:**

This device is intended only for OEM integrators under the following conditions:

The module must be installed in the host equipment such that 20 cm is maintained between the antenna and users, and the transmitter module may not be co-located with any other transmitter or antenna. The module shall be only used with the internal on-board antenna that has been originally tested and certified with this module. External antennas are not supported. As long as these 3 conditions above are met, further transmitter test will not be required.

However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.). The end-product may need Verification testing, Declaration of Conformity testing, a Permissive Class II Change or new Certification. Please involve a FCC certification specialist in order to determine what will be exactly applicable for the end-product.

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**Validity of using the module certification:**

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID of the module cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization. In such cases, please involve a FCC certification specialist in order to determine if a Permissive Class II Change or new Certification is required.

**Upgrade Firmware:**

The software provided for firmware upgrade will not be capable to affect any RF parameters as certified for the FCC for this module, in order to prevent compliance issues.

**End product labeling:**

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains FCC ID: 2APDI-BCM-DA100-AS" .

**Information that must be placed in the end user manual:**

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.