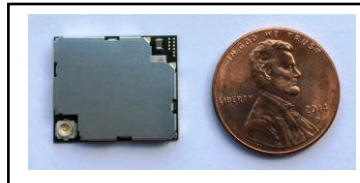


LBAD0ZZ1SE

**LTE CAT
M1/NB-IoT
Module**

Features

- **LTE Cat M1 – Class 3, up to 23dBm**
- **NB-IoT (NB1) Rel. 13 (Rel. 14 – SW Upgrade)**
- **STM32L462RE/Cortex M4 w/512KB Flash and 160 KB SRAM**
- **1MB on-board Serial Flash**
- **GNSS**
- **VoLTE**
- **Dimension: 15.4 x 18.0 x 2.5 mm (max)**
- **Package: LGA**
- **SIM card: internal eSIM (WLCSP)**
- **Antenna configurations: U.FL antenna connection**
- **3GPP eDRX and PSM modes**
- **Power Consumption: enables up to 10 year battery life**
- **Support PSM and eDRX**
- **Operating temperature range: -40 °c to 85 °c**
- **OTA firmware upgrade**
- **Global Carrier Certifications: GCF and PTCRB**



Applications

- **Certified as a host device for ease of integration with several different types of applications**
 - **Quicker time to market (no additional carrier or regulatory certification)**
 - **Less development time and costs for developer/device manufacturer in need of LTE Cat M1/NB-IoT connectivity**
 - **eSIM included in certification**
- **Build/Develop applications with the use of ST's vast set of software modules**
- **Availability of ST's Community and Development Forums**
- **Secure boot architecture and a robust hardware-based security framework**

1 Block Diagram

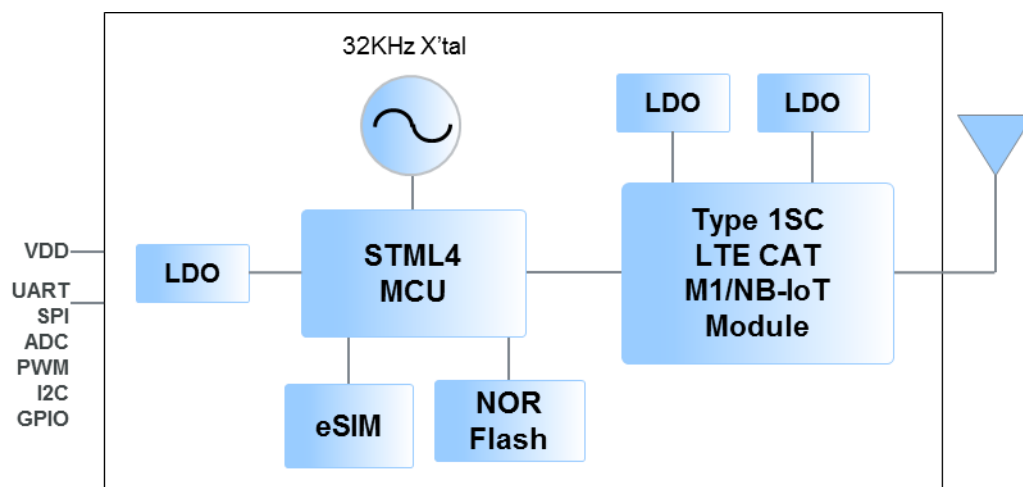


Figure 1 Type 1SE Block Diagram

2 Module Specifications

Part Number	LBAD0ZZ1SE
Connectivity	3GPP Release 13/Optimized for LTE Class 3 output power (+23 dBm)
Universal LTE (LB & MB)	Low-band: B5/B8/B12/B13/B14/B17/B18/B19/B20/B26/B28 Mid-band: B1/B2/B3/B4/B25/B66 (AWS)
GNSS	GPS and GLONASS
Voltage Input	3.3-5V
Antenna	Off board multi-band antenna
Dimension	15.4 x 18.0 x 2.5 mm (max)
Peripheral Interfaces	GPIO, ADC, I2C, PWM, SPI, UART
Operating Temp	-40° to 85° C

3 Mechanical Specification

3.1 Module Dimensions

Table 3.1: Module Dimensions

Parameter	Typical	Unit
Dimension (L x W x H)	15.4 ±0.2mm x 18.0 ±0.2mm x 2.5 (max)	mm

3.2 Top and Side View

To Be Added

Figure 3.1 Module Top and Side View (Unit: mm)

3.3 PCB Footprint Top View

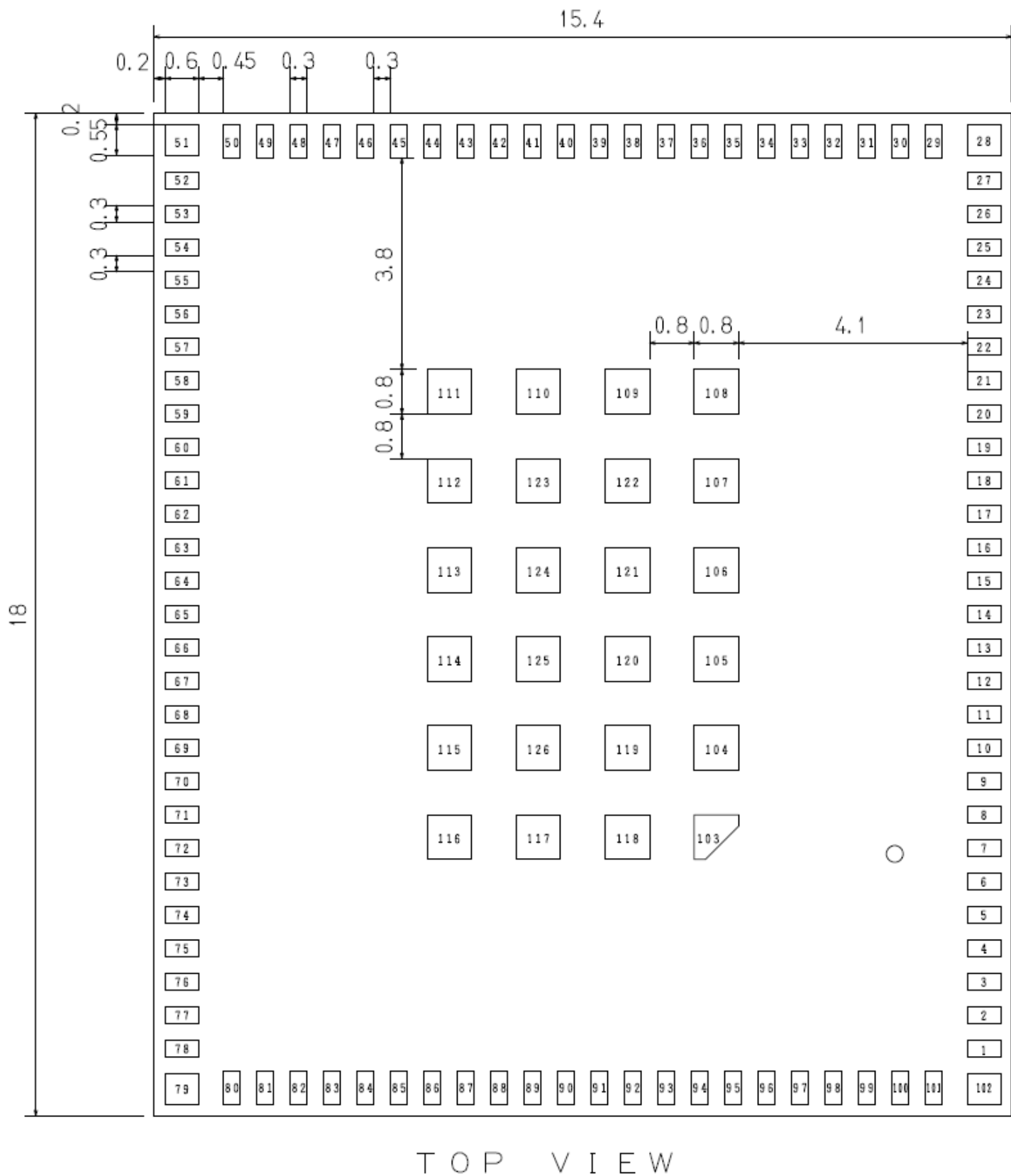


Figure 3.2 Module Footprint Top View (Unit: mm)

3.4 Pin Configuration

To Be Added

Figure 3.3 Pinout Diagram Top View

Table 3.2 Pinouts

Pin #	Pin Name	Type1SC	STM32L462	Type	Description
1	USART2_RTS		E6	I/O	PA1/USART2_RTS
2	USART2_RX		F6	I/O	PA3/USART2_RX
3	USART2_TX		G7	I/O	PA2/USART2_TX
4	USART2_CTS		H8	I/O	PA0/USART2_CTS
5	VDDA		F7	Power	ADC power; connect to VDD_1V8 if not used
6	VSSA		G8	Power	ADC GND
7	NRST		F8	Reset	Reset STM32
8	FFU_RFFE_SCLK	77		I/O	RFFE MIPI SCLK
9	FFU_RFFE_SDATA	78		I/O	RFFE MIPI SDATA
10	GPIO_EXTI7		E1	I/O	PC7/GPIO_EXTI7
11	NC_RST_IND			I/O	Reserved for internal usage and testing
12	NC_UART0_RTS			I/O	Reserved for internal usage and testing
13	NC_UART0_CTS			I/O	Reserved for internal usage and testing
14	NC_UART0_TX			I/O	Reserved for internal usage and testing
15	NC_UART0_RX			I/O	Reserved for internal usage and testing
16	RFT_UART2_CTS	21		I/O	Recovery UART_CTS
17	RFT_UART2_TX	22		I/O	Recovery UART_RX
18	RFT_UART2_RTS	74		I/O	Recovery UART_RTS
19	RFT_UART2_RX	20		I/O	Recovery UART_TX
20	FFU_TX_IND	31		I/O	Future use
21	FFU_GNSS_COEX_IND	37		I/O	Future use
22	FFU_GNSS_EXT_LNA	44		I/O	Future use
23	RFT_UART1_RTS	43		I/O	Log UART_RTS
24	RFT_UART1_TX	46		I/O	Log UART_TX
25	RFT_UART1_RX	45		I/O	Log UART_RX
26	RFT_UART1_CTS	94		I/O	Log UART_CTS
27	NC_DWU			I/O	Reserved for internal usage and testing
28	GND			GND	GND
29	NC_HWU			I/O	Reserved for internal usage and testing
30	FFU_VREF	49		Power	Future use

Pin #	Pin Name	Type1SC	STM32L462	Type	Description
31	FFU_PCM_OUT	97		O	Future use
32	FFU_PCM_FS	95		I/O	Future use
33	FFU_PCM_IN	96		I	Future use
34	FFU_PCM_CLK	98		I/O	Future use
35	PMU_AT_OUT	63		O	Anti-tamper
36	PMU_VBACKUP	56		Power	Modem backup battery @2.2-4.35V (NC if not used)
37	PMU_AT_IN	5		I	Anti-tamper
38	FFU_CLKOUT	100		O	Future use
39	NC_RST			I	Reserved for internal usage and testing
40	FFU_GNSS_SFN_IND	51		I/O	Future use
41	NC_PWR_BUTTON			I	Reserved for internal usage and testing
42	GND			GND	
43	VDD			Power	Power supply for Type1SE
44	VDD			Power	Power supply for Type1SE
45	VDD			Power	Power supply for Type1SE
46	GND			GND	GND
47	FFU_PSM_IND	65		O	Power save mode indicator
48	NC_PWR_EN			I/O	Reserved for internal usage and testing
49	NC_SIM_CLK	69		I/O	SIM clock
50	NC_VSIM	8		O	SIM power supply
51	GND			GND	GND
52	NC_SIM_DETECT	70		I/O	SIM detect
53	NC_SIM_RST	68		I/O	SIM reset
54	PH1_OSC_OUT		E8	I/O	PH1/RCC_OSC_OUT
55	PH0_OSC_IN		D8	I/O	PH0/RCC_OSC_IN
56	FFU_RFFE_VDDIO	7		O	RFFE MIPI VIO
57	NC_SIM_IO	11		I/O	SIM data
58	ADC1_IN1		D7	I/O	PC0/ADC1_IN1
59	ADC1_IN3		D6	I/O	PC2/ADC1_IN3
60	ADC1_IN2		D5	I/O	PC1/ADC1_IN2
61	ADC1_IN4		E7	I/O	PC3/ADC1_IN4
62	RTC_TAMP1		B8	I/O	PC13/RTC_TAMP1
63	BOOT0		B6	I/O	PH3/BOOT0
64	SF_EN		B5	I/O	PB6/SF_EN
65	RCC_MCO		E3	I/O	PA8/RCC_MCO
66	FFU_I2C0_SCL	14		I/O	Future use
67	FFU_I2C0_SDA	15		I/O	Future use
68	VDD_1V8			Power	Reserved for codec supply/MCU VBAT/MCU VDDA
69	I2C1_SDA		C6	I/O	PB9/I2C1_SDA
70	I2C1_SCL		A6	I/O	PB8/I2C1_SCL

Pin #	Pin Name	Type1SC	STM32L462	Type	Description
71	VBAT		B7	Power	Backup supply; connect to VDD_1V8 if not used
72	SPI1_SCK		F5	I/O	PA5/SPI1_SCK
73	SPI1_MOSI		C5	I/O	PB5/SPI1_MOSI
74	SPI1_MISO		A4	I/O	PB4/SPI1_MISO/NJTRST
75	SPI1_NSS		A2	I/O	PA15/SPI1_NSS/JTDI
76	TIM2_CH2		B4	I/O	PB3/TIM2_CH2/JTDO/TRACESWO
77	SPI3_MISO			I/O	Reserved for internal usage and testing
78	SPI3_MOSI			I/O	Reserved for internal usage and testing
79	GND			GND	GND
80	SPI3_SCK			I/O	Reserved for internal usage and testing
81	eSIM_SWP			I/O	SWP for NFC to ST33
82	SPI3_NSS			I/O	Reserved for internal usage and testing
83	eSIM_CTRL			I/O	Reserved for internal usage and testing
84	VDDUSB		A1	Power	3.0 to 3.6 V supply for USB; connect to VDD_1V8 if not used
85	SWCLK		C3	I/O	PA14/JTCK/SWCLK
86	SWDIO		C2	I/O	PA13/JTMS/SWDIO
87	USB_DP		D3	I/O	PA12/USB_DP
88	USB_DM		D2	I/O	PA11/USB_DM
89	USART1_RX		C1	I/O	PA10/USART1_RX
90	USART1_TX		D1	I/O	PA9/USART1_TX
91	TIM15_CH2		F1	I/O	PB15/TIM15_CH2
92	TIM15_CH1		G1	I/O	PB14/TIM15_CH1
93	TIM3_CH4		E2	I/O	PC9/TIM3_CH4
94	TIM3_CH1		F2	I/O	PC6/TIM3_CH1
95	QUADSPI_IO0		F4	I/O	PB1/QUADSPI_BK1_IO0
96	QUADSPI_CLK		H4	I/O	PB10/QUADSPI_CLK
97	QUADSPI_nCS		H3	I/O	PB11/QUADSPI_BK1_NCS; connect to 98 to use internal serial flash
98	SF_nCS			I/O	Internal serial flash chip select
99	QUADSPI_IO1		H5	I/O	PB0/QUADSPI_BK1_IO1
100	QUADSPI_IO3		H6	I/O	PA6/QUADSPI_BK1_IO3
101	QUADSPI_IO2		E5	I/O	PA7/QUADSPI_BK1_IO2
102-126	GND			GND	Ground

4 DC Electrical Specification

5 Environmental Specification

5.1 Absolute Maximum Rating

Table 5.1 Absolute Maximum Rating

Description	Min	Max	Unit

5.2 Recommended Operating Condition

Table 5.2 Recommended Operating Condition

Parameter	Min	Max	Unit
Operating Temperature Range	-40	85	°C
VDD	3.3	5.0	V

6 Packaging and Marking Information

6.1 Module Marking Information

Figure 6.1 shows the module marking. Dimensions are nominal, not absolute.

To Be Added

Figure 6.1 Module Marking Diagram

6.2 Moisture Sensitivity Level

The LBAD0ZZ1SE is planned to be qualified to moisture sensitivity level 4 in accordance with JEDEC J-STD-020.

7 Regulatory Information

8 RoHS Information

The LBAD0ZZ1SE module is conformed to RoHS requirement.

9 Ordering Information

Product	Model Name	Murata Ordering Part Number	Standard Order Increment
Sample Module	Type 1SE	LBAD0ZZ1SE-TEMP	TBD
Production Module	Type 1SE	TBD	TBD

10 Notice

10.1 Storage Conditions

Please use this product within 6month after receipt.

- The product shall be stored without opening the packing under the ambient temperature from 5 to 35deg.C and humidity from 20 to 70%RH.

(Packing materials, in particular, may be deformed at the temperature over 40deg.C.)

- The product left more than 6months after reception, it needs to be confirmed the solderbility before used.
- The product shall be stored in non-corrosive gas (Cl₂, NH₃, SO₂, Nox, etc.).
- Any excess mechanical shock including, but not limited to, sticking the packing materials by sharp object and dropping the product, shall not be applied in order not to damage the packing materials.

This product is applicable to MSL4 (Based on JEDEC Standard J-STD-020)

- After the packing opened, the product shall be stored at <30deg.C / <60%RH and the product shall be used within 72 hours.
- When the color of the indicator in the packing changed, the product shall be baked before soldering.

Baking condition: 125+5/-0deg.C, 24hours, 1time

The products shall be baked on the heat-resistant tray because the material (Base Tape, Reel Tape and Cover Tape) are not heat-resistant.

10.2 Handling Conditions

Be careful in handling or transporting products because excessive stress or mechanical shock may break products.

Handle with care if products may have cracks or damages on their terminals, the characteristics of products may change. Do not touch products with bare hands that may result in poor solder ability and destroy by static electrical charge.

10.3 Standard PCB Design (Land Pattern and Dimensions)

All the ground terminals should be connected to the ground patterns. Furthermore, the ground pattern should be provided between IN and OUT terminals. Please refer to the specifications for the standard land dimensions.

The recommended land pattern and dimensions is as Murata's standard. The characteristics of products may vary depending on the pattern drawing method, grounding method, land dimensions, land forming method of the NC terminals and the PCB material and thickness. Therefore, be sure to verify the characteristics in the actual set. If use non-standard lands, contact Murata beforehand.

10.4 Notice for Chip Placer

When placing products on the PCB, products may be stressed and broken by uneven forces from a worn-out chucking locating claw or a suction nozzle. To prevent products from damages, be sure to follow the specifications for the maintenance of the chip placer being used. For the positioning of products on the PCB, be aware that mechanical chucking may damage products.

10.5 Operational Environment Conditions

Products are designed to work for electronic products under normal environmental conditions (ambient temperature, humidity and pressure). Therefore, products have no problems to be used under the similar conditions to the above-mentioned. However, if products are used under the following circumstances, it may damage products and leakage of electricity and abnormal temperature may occur.

- In an atmosphere containing corrosive gas (Cl₂, NH₃, SO_x, NO_x etc.).
- In an atmosphere containing combustible and volatile gases.
- Dusty place.
- Direct sunlight place.
- Water splashing place.
- Humid place where water condenses.
- Freezing place.

If there are possibilities for products to be used under the preceding clause, consult with Murata before actual use.

As it might be a cause of degradation or destruction to apply static electricity to products, do not apply static electricity or excessive voltage while assembling and measuring.

10.6 Input Power Capacity

Products shall be used in the input power capacity as specified in this specification.
Inform Murata beforehand, in case that the components are used beyond such input power capacity range.

11 PRECONDITIONS TO USE MURATA PRODUCTS

PLEASE READ THIS NOTICE BEFORE USING OUR PRODUCTS.

Please make sure that your product has been evaluated and confirmed from the aspect of the fitness for the specifications of our product when our product is mounted to your product.

All the items and parameters in this product specification/datasheet/catalog have been prescribed on the premise that our product is used for the purpose, under the condition and in the environment specified in this specification. You are requested not to use our product deviating from the condition and the environment specified in this specification.

Please note that the only warranty that we provide regarding the products is its conformance to the specifications provided herein. Accordingly, we shall not be responsible for any defects in products or equipment incorporating such products, which are caused under the conditions other than those specified in this specification.

WE HEREBY DISCLAIMS ALL OTHER WARRANTIES REGARDING THE PRODUCTS, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, THAT THEY ARE DEFECT-FREE, OR AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS.

The product shall not be used in any application listed below which requires especially high reliability for the prevention of such defect as may directly cause damage to the third party's life, body or property. You acknowledge and agree that, if you use our products in such applications, we will not be responsible for any failure to meet such requirements. Furthermore, YOU AGREE TO INDEMNIFY AND DEFEND US AND OUR AFFILIATES AGAINST ALL CLAIMS, DAMAGES, COSTS, AND EXPENSES THAT MAY BE INCURRED, INCLUDING WITHOUT LIMITATION, ATTORNEY FEES AND COSTS, DUE TO THE USE OF OUR PRODUCTS IN SUCH APPLICATIONS.

- Aircraft equipment.
- Aerospace equipment
- Undersea equipment.
- Power plant control equipment
- Medical equipment.
- Transportation equipment (vehicles, trains, ships, elevator, etc.).
- Traffic signal equipment.
- Disaster prevention / crime prevention equipment.
- Burning / explosion control equipment
- Application of similar complexity and/ or reliability requirements to the applications listed in the above.

We expressly prohibit you from analyzing, breaking, reverse-engineering, remodeling altering, and reproducing our product. Our product cannot be used for the product which is prohibited from being manufactured, used, and sold by the regulations and laws in the world.

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Please do not use our products, our technical information and other data provided by us for the purpose of developing of mass-destruction weapons and the purpose of military use.

Moreover, you must comply with "foreign exchange and foreign trade law", the "U.S. export administration regulations", etc. Please note that we may discontinue the manufacture of our products, due to reasons such as end of supply of materials and/or components from our suppliers.

By signing on specification sheet or approval sheet, you acknowledge that you are the legal representative for your company and that you understand and accept the validity of the contents herein. When you are not able to return the signed version of specification sheet or approval sheet within 30 days from receiving date of specification sheet or approval sheet, it shall be deemed to be your consent on the content of specification sheet or approval sheet. Customer acknowledges that engineering samples may deviate from specifications and may contain defects due to their development status. We reject any liability or product warranty for engineering samples. In particular we disclaim liability for damages caused by

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