

GENERAL DESCRIPTION

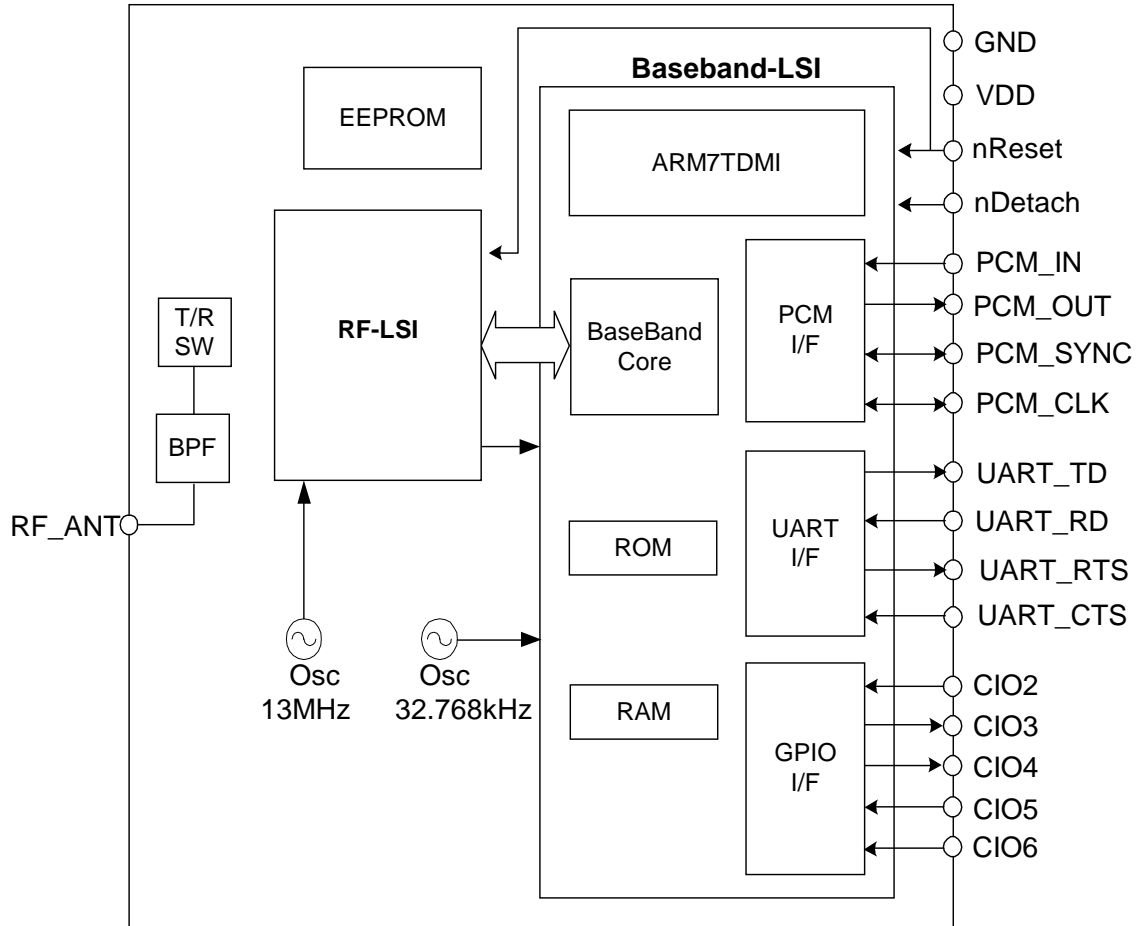
The MK70215 is Bluetooth module operates in the 2.4 GHz ISM band. Embedded baseband /RF transceiver LSI and protocol stacks up to Serial Port Profile(SPP) provide users with Bluetooth Class2 stable wireless connectivity and high performance. Equipped with UART/PCM interface, it is suitable for both data/voice application purposes. This surface-mount type module can be mounted to users' boards easily by soldering. The development TAT for Bluetooth-enabled end products can be shortened very effectively by utilizing MK70215.

FEATURES

- Conforms to the Bluetooth Specification Version 1.1
- Optimized design where RF/BB LSI chips and authorized OKI software are used
- SPP full module includes Bluetooth baseband IC & RF transceiver IC, EEPROM and XTAL
- RF output power: Class 2
- Interfaces provided
 - UART interface (Supports HCI and SPP commands /up to 921.6 kbps)
 - PCM interface* (selectable between PCM Linear/A-law/ μ -law)
 - * The PCM I/F is only valid in the HCI mode.

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BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Condition	Rating	Unit
Power supply voltage	V_{DD}	$T_a = 25^{\circ}\text{C}$	-0.3 to 4.5	V
Input voltage	V_{IN}	$T_a = 25^{\circ}\text{C}$	-0.3 to 4.5	V
Input RF power	—	$T_a = 25^{\circ}\text{C}$	20	dBm
Storage temperature	T_{stg}	—	-40 to +85	$^{\circ}\text{C}$

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Power supply voltage	V _{DD}	—	3.0	3.3	3.6	V
“H” level input voltage	V _{ih}	—	2.2	—	V _{DD}	V
“L” level input voltage	V _{il}	—	0	—	0.8	V
Operating temperature	T _{OP}	—	-30	25	75	°C

ELECTRICAL CHARACTERISTICS

Following values are valid for V_{DD} = 3.3 V ±0.3 V, Ta = -30 to 75°C.
 Values of the RF characteristics are defined at the RF_ANT pin for the module.

General Specifications

Items	Specification	Note
Conformance Specifications	Bluetooth Specification Version 1.1	—
Power Class	Class 2	—
Frequency range	2,402 to 2,480 MHz	—
Number of channels	79ch	—
Channel separation	1 MHz	—
Modulation method	GFSK	—
RF input-output impedance	Nominal 50 Ω	2,402 to 2,480 MHz
Symbol Rate	1 Mbps	—

DC Characteristics

Output voltage (Applies to digital pins)

Parameter	Symbol	Min.	Typ.	Max.	Unit
“H” level output voltage	V_{oh}	2.4	—	—	V
“L” level output voltage	V_{ol}	—	—	0.4	V

Power consumption

Mode	Symbol	Typ.	Max.	Unit
During operation	I_{DDO}	80	—	mA
During stand-by	I_{DDS}	200	—	μ A

RF Transmission Characteristics

Parameter	Min.	Max.	Unit	Remarks
Output power	-4	+4	dBm	
ICFT	-50	+50	kHz	
Frequency drift				
DH1	-25	+25	kHz	
DH3, DH5	-40	+40	kHz	
Frequency Max drift rate		20	kHz/50 μ s	
Frequency deviation				
$\Delta f_{1_{avg}}$: payload = 11110000	140	175	kHz	
$\Delta f_{2_{max}}$: payload = 1010...	115	—	kHz	
$\Delta f_{2_{avg}}/\Delta f_{1_{avg}}$	80	—	%	
20 dB band width	—	1	MHz	
In-band spurious emission				Measured by peak detection
Freq. offset = ± 2 MHz	—	-20	dBm	
Freq. offset $\geq \pm 3$ MHz	—	-40	dBm	
Out-of-band spurious emission				When operating
30 MHz $\leq f < 1$ GHz	—	-36	dBm	
1 GHz $\leq f \leq 12.75$ GHz	—	-30	dBm	
1.8 GHz $\leq f \leq 1.9$ GHz	—	-47	dBm	
5.15 GHz $\leq f \leq 5.30$ GHz	—	-47	dBm	
				When in standby
30 MHz $\leq f < 1$ GHz	—	-57	dBm	
1 GHz $\leq f \leq 12.75$ GHz	—	-47	dBm	
1.8 GHz $\leq f \leq 1.9$ GHz	—	-47	dBm	
5.15 GHz $\leq f \leq 5.30$ GHz	—	-47	dBm	

RF Reception Characteristics

Parameter	Min.	Typ.	Max.	Unit	Remarks
Sensitivity*1	—	-77	-72	dBm	
C/I characteristics					Specification at ordinary temperature (Bluetooth Ver.1.1 Test Specification)
Co-channel	—	12	14	dB	
Adjacent channel C/I = 1 MHz	—		4	dB	
Adjacent channel C/I = 2 MHz	—		-30	dB	
Adjacent channel C/I ≥ 3 MHz	—		-40	dB	
Image frequency	—		-9	dB	
Image frequency ±1 MHz	—		-20	dB	
Out-of-band blocking					Specification at ordinary temperature
30 MHz ≤ f < 2,000 MHz	-10	—	—	dBm	
2,000 MHz ≤ f ≤ 2,399 MHz	-27	—	—	dBm	
2,498 MHz ≤ f < 3,000 MHz	-27	—	—	dBm	
3,000 MHz ≤ f ≤ 12.75 GHz	-10	—	—	dBm	
Intermodulation characteristic	-25	—	—	dB	Specification at ordinary temperature
Maximum input level	—		0.1	%	Specification at ordinary temperature, at -20 dBm input
Limit of collateral radio waves					Spurious emission during inquiry scan operation
30 MHz ≤ f < 1 GHz	—		-57	dBm	
1 GHz ≤ f ≤ 12.75 GHz	—		-47	dBm	

*1 The receiver sensitivity is measured at BER 0.1% by Dirty transmitter Signal (According to Bluetooth Ver.1.1 Test Specification)

Others Characteristics

Conducted Emission and Radiation Emission level : Satisfied with FCC, TELEC, ETSI specification.

MECHANICAL CHARACTERISTICS**Marking Specifications**

Company name : OKI (Refer to Module Outline)
 Model name:MK70215 (Refer to Module Outline)
 Lot. No:XXXXXXXX\ (Refer to Module Outline)
 1 pin mark (Refer to Module Outline)

Weight Specifications

Model Name	Weight
MK70215	1.5 g (Max.)

CONNECTOR PIN DESCRIPTIONS

TERMINAL NAME	I/O TYPE	MK70215 INSIDE PULL UP/DOWN	FUNCTION
RF_ANT (*1)	I/O	—	Z0=50Ω
UART_TD	O	—	UART Data Output
UART_RD	I	Schmitt	UART Data Input
UART_RTS	O	—	UART Ready to Send
UART_CTS	I	—	UART Clear to Send
PCM_IN (*2)	I	Pull up	Synchronous 8kss-1 Data Input
PCM_OUT	O	—	Synchronous 8kss-1 Data Output
PCM_SYNC (*3)	I/O	Pull down	Synchronous Data Strobe
PCM_CLK (*3)	I/O	Pull down	Synchronous Data Clock
nRESET(*4)	I	Pull up	Active low reset (L:Reset)
nDetach	I	Pull up	Active low sleep signal (L:Sleep)
CIO2	I	Pull up	—
CIO3	O	—	—
CIO4	O	—	—
CIO5	I	Pull up	—
CIO6	I	Pull up	—
Vdd (*5)	—	—	Power Supply Voltage
GND	—	—	—
AGND	—	—	—

*1 Terminated to a 50Ω load or connected to ANT.

*2 The PCM_IN pins are pulled-up internally.

*3 The PCM_CLK, and PCM_SYNC pins are pulled-down internally.

*4 Setting the reset signal input pin RESET to a “L” level can reset the LSI. The reset state of the LSI is held for a duration of 10 msec even after the reset signal is switched to a “H” level.

*5 Mount an approximately 10μF tantalum or electrolytic capacitor to the power supply input pin.

The capacitor should be mounted as close to the power supply pin of the module as possible.

* The PCM I/F is only valid in the HCI mode.

INTERFACE SPECIFICATIONS

UART Interface

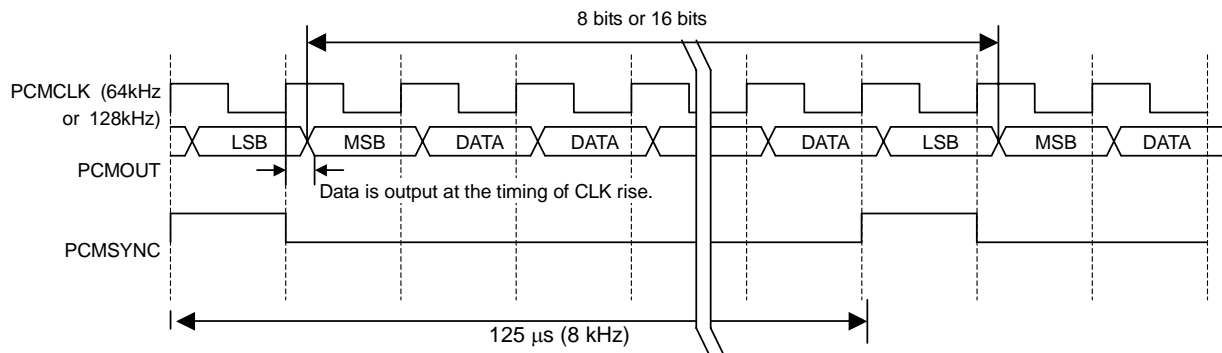
Various settings can be made for the UART interface by using the Vendor specific command (refer to the ML70512 Software Manual).

The default values are as follows:

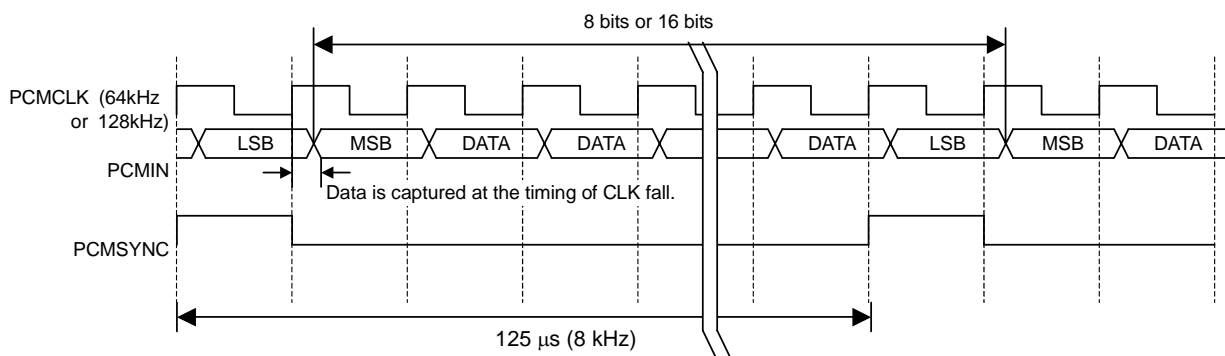
- Baud rate: 115.2 kbps
- Parity: Non-parity
- Data length: 8 bits
- Stop bit: 1 bit
- Flow control: off

PCM Interface

- Application format
PCM linear (8, 16 bits/sample, 64 kHz sampling frequency)/A-law/ μ -law
- Bluetooth format
CVSD/A-law/ μ -law



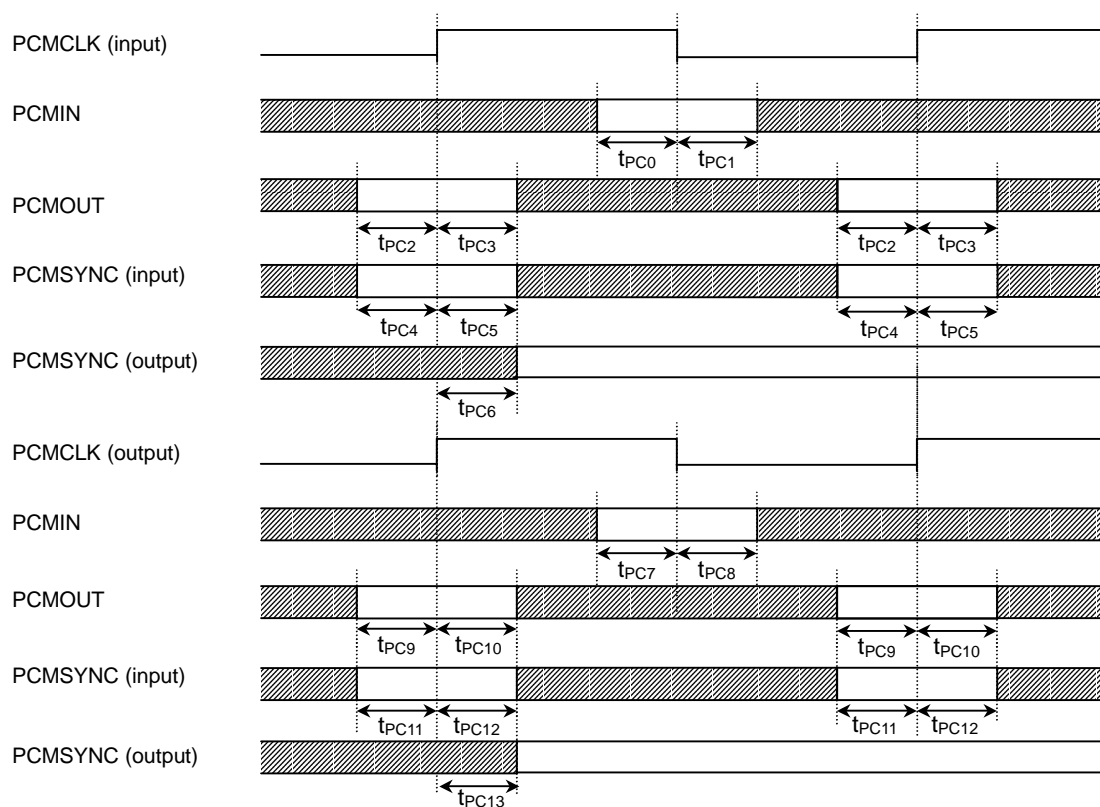
PCM Output Timing



PCM Input Timing

PCM Timing Specifications

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
PCMIN setup time to PCMCLK (input) fall	t_{PC0}	$C_L = 50 \text{ pF}$	500	-	-	ns
PCMIN hold time to PCMCLK (input) fall	t_{PC1}		500	-	-	
PCMOUT setup time to PCMCLK (input) rise	t_{PC2}		500	-	-	
PCMOUT hold time to PCMCLK (input) rise	t_{PC3}		500	-	-	
PCMSYNC (input) setup time to PCMCLK (input) rise	t_{PC4}		500	-	-	
PCMSYNC (input) hold time to PCMCLK (input) rise	t_{PC5}		500	-	-	
PCMIN setup time to PCMCLK (output) fall	t_{PC7}		500	-	-	
PCMIN hold time to PCMCLK (output) fall	t_{PC8}		500	-	-	
PCMOUT setup time to PCMCLK (output) rise	t_{PC9}		500	-	-	
PCMOUT hold time to PCMCLK (output) rise	t_{PC10}		500	-	-	
Delay time from PCMCLK (output) rise to PCMSYNC (output)	t_{PC13}		-	-	500	



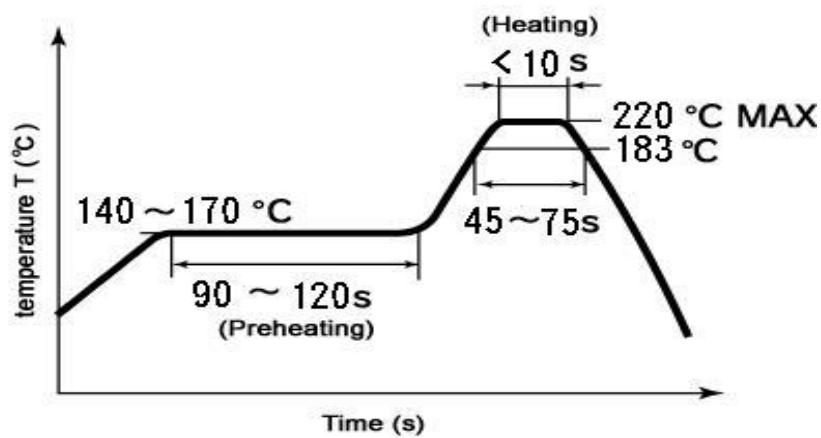
PCM Timing

MOUNTING MODULE

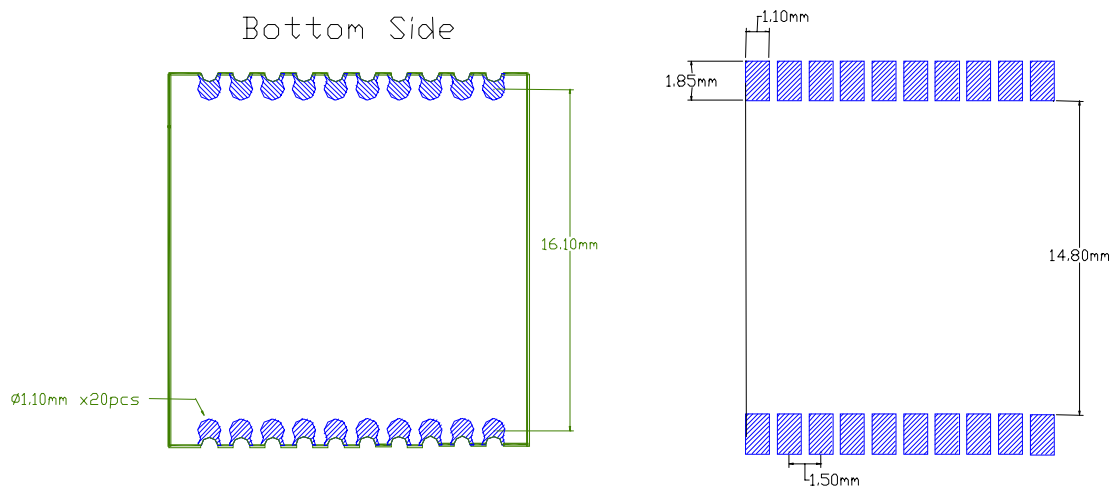
Recommended Module Fixing Method

- This module corresponds to Reflow-soldering.
- This module corresponds to Pb-free

Recommended Reflow Conditions



Recommended PCB Pattern



The accuracy of each size is $\pm 0.05\text{mm}$.

Notes on Mounting the Module

1. The shielding case is connected to GND in the module. For mounting the module, when pattern wiring that touches the shielding case is carried out on the product board, do not cause a short-circuit between the shielding case and the pattern. For example, apply resist on the entire surface that touches the shielding case.
2. The effects of noise on a product board depend on the connection of GND/NC to the fixation pads. Select the connection with better electrical characteristics in the module mounted state.

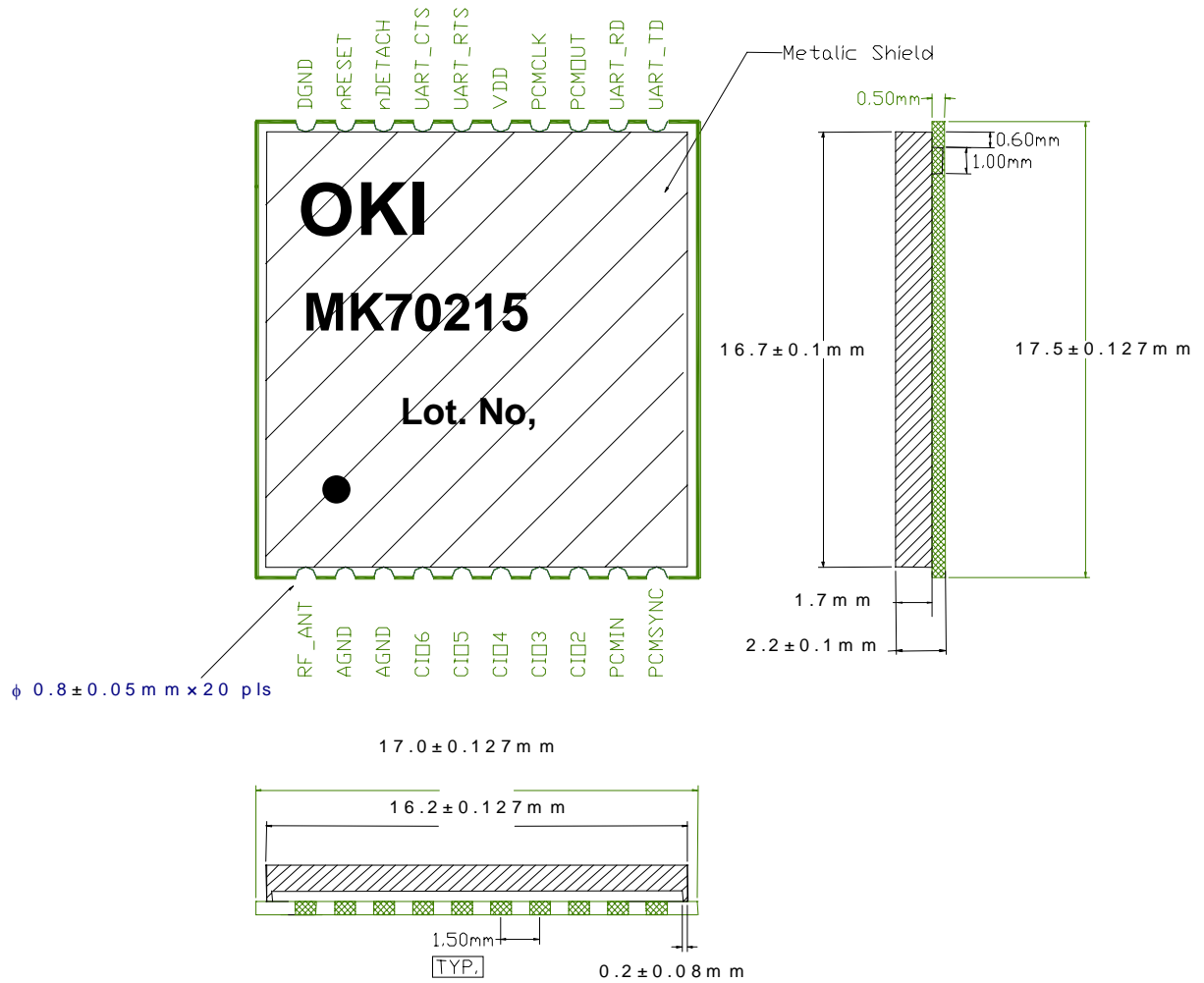
CAUTIONS IN USE

This module consists of precision electronic components. Therefore, note the following when handling the module:

1. In a case of decomposition or recomposition of this module, the operations in these specifications are not assured.
2. This module is not waterproof or drip-proof. Do not use the module in wet locations.
3. Do not use this module under high temperature or high humidity conditions, in direct sunlight, or in dusty places.

MODULE OUTLINE

Outline of MK70215



REVISION HISTORY

Document No.	Date	Page		Description
		Previous Edition	Current Edition	
PEDL70215-01	July 30,2003	—	—	Preliminary edition 1
		—	—	

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