User's Manual

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RH850/F1K, RH850/F1KM

User's Manual: Hardware

Renesas microcontroller
RH850 Family

Addendum for additional products

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(Rev.4.0-1 November 2017)

Notes for CMOS devices

(1) Voltage application waveform at input pin:

Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between VIL (MAX) and VIH (MIN) due to noise, etc., the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between VIL (MAX) and VIH (MIN).

(2) Handling of unused input pins:

Unconnected CMOS device inputs can be cause of malfunction. If an input pin is unconnected, it is possible that an internal input level may be generated due to noise, etc., causing malfunction. CMOS devices behave differently than Bipolar or NMOS devices. Input levels of CMOS devices must be fixed high or low by using pull-up or pull-down circuitry. Each unused pin should be connected to power supply or GND via a resistor if there is a possibility that it will be an output pin. All handling related to unused pins must be judged separately for each device and according to related specifications governing the device.

(3) Precaution against ESD:

A strong electric field, when exposed to a MOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop generation of static electricity as much as possible, and quickly dissipate it when it has occurred. Environmental control must be adequate. When it is dry, a humidifier should be used. It is recommended to avoid using insulators that easily build up static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors should be grounded. The operator should be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions need to be taken for PW boards with mounted semiconductor devices.

(4) Status before initialization:

Power-on does not necessarily define the initial status of a MOS device. Immediately after the power source is turned ON, devices with reset functions have not yet been initialized. Hence, power-on does not guarantee output pin levels, I/O settings or contents of registers. A device is not initialized until the reset signal is received. A reset operation must be executed immediately after power-on for devices with reset functions.

(5) Power ON/OFF sequence:

In the case of a device that uses different power supplies for the internal operation and external interface, as a rule, switch on the external power supply after switching on the internal power supply. When switching the power supply off, as a rule, switch off the external power supply and then the internal power supply. Use of the reverse power on/off sequences may result in the application of an overvoltage to the internal elements of the device, causing malfunction and degradation of internal elements due to the passage of an abnormal current. The correct power on/off sequence must be judged separately for each device and according to related specifications governing the device.

(6) Input of signal during power off state:

Do not input signals or an I/O pull-up power supply while the device is not powered. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Input of signals during the power off state must be judged separately for each device and according to related specifications governing the device.

How to Use This Manual

Readers This manual is intended for users who wish to understand the functions of the RH850/F1K, RH850/F1KM and design application systems using the following RH850/F1K, RH850/F1KM microcontrollers:

Purpose This manual is intended to give users an understanding of the hardware functions of the RH850/F1K, RH850/F1KM.

How to read this manual It is assumed that the readers of this manual have general knowledge in the fields of electrical engineering, logic circuits, and microcontrollers.

To understand the overall functions of the RH850/F1K, RH850/F1KM.

→ The part names of the additional products are shown in this document including the correspondence table between the general products and the additional products.

The specification of the additional products is the same as the general product except the specification items shown in this document.

Read the following manuals according to its content.

Make sure to refer to the latest versions of these documents.

Document Type	Description	Document Title	Document No.
User's manual for Hardware	Hardware specifications (pin assignments, memory maps, peripheral function specifications, electrical characteristics, timing charts) and operation description	RH850/F1K Group User's Manual: Hardware	R01UH0562EJxxxx
User's manual for Hardware	Hardware specifications (pin assignments, memory maps, peripheral function specifications, electrical characteristics, timing charts) and operation description	RH850/F1KH, RH850/F1KM User's Manual: Hardware	R01UH0684EJxxxx

Conventions

Data significance: Higher digits on the left and lower digits on the right

Active low representation: xxx (overscore over pin or signal name)

Memory map address: Higher addresses on the top and lower addresses on the bottom

Note: Footnote for item marked with Note in the text

Caution: Information requiring particular attention

Remark: Supplementary information

Numeric representation: Binary ... xxxx or $xxxx_B$

Decimal ... xxxx

Hexadecimal ... $xxxx_H$

Prefix indicating power of 2 (address space, memory capacity):

K (kilo): $2^{10} = 1,024$

M (mega): $2^{20} = 1,024^2$

G (giga): $2^{30} = 1,024^3$

Section 1 Overview

The specification of the additional products is the same as the general product.

1.1 Product Lineup

Table 1.1 Product Lineup of F1K

F1K		Memory				Line Name	Part Name (general product)		Part Name (additional product 1)		Part Name (additional product 2)	
Pin Count	CPU frequency	Code Flash	Local RAM	Data Flash	Retention RAM (RRAM)		Operating Temperature (Ta)		Operating Temperature (Ta)		Operating Temperature (Ta)	
							–40°C to +105°C	–40°C to +125°C	–40°C to +105°C	–40°C to +125°C	–40°C to +105°C	–40°C to +125°C
144 pins	80 MHz max.	768 KB	32 KB	64 KB	64 KB	ECO	R7F7016023AFP-C	R7F7016024AFP-C	R7F7016023AFE	R7F7016024AFE	R7F7016023AFD	R7F7016024AFD
		1024 KB	64 KB				R7F7016033AFP-C	R7F7016034AFP-C	R7F7016033AFE	R7F7016034AFE	R7F7016033AFD	R7F7016034AFD
		1536 KB	96 KB				R7F7015423AFP-C	R7F7015424AFP-C	R7F7015423AFE	R7F7015424AFE	R7F7015423AFD	R7F7015424AFD
		2048 KB	128 KB				R7F7015433AFP-C	R7F7015434AFP-C	R7F7015433AFE	R7F7015434AFE	R7F7015433AFD	R7F7015434AFD
176 pins	80 MHz max.	1024 KB	64 KB	64 KB	64 KB		R7F7015573AFP-C	R7F7015574AFP-C	R7F7015573AFE	R7F7015574AFE	R7F7015573AFD	R7F7015574AFD
		1536 KB	96 KB				R7F7015463AFP-C	R7F7015464AFP-C	R7F7015463AFE	R7F7015464AFE	R7F7015463AFD	R7F7015464AFD
		2048 KB	128 KB				R7F7015473AFP-C	R7F7015474AFP-C	R7F7015473AFE	R7F7015474AFE	R7F7015473AFD	R7F7015474AFD
100 pins	120 MHz max.	768 KB	32 KB	64 KB	64 KB	ADVANCED	R7F7016103AFP-C	R7F7016104AFP-C	R7F7016103AFE	R7F7016104AFE	R7F7016103AFD	R7F7016104AFD
		1024 KB	64 KB				R7F7016113AFP-C	R7F7016114AFP-C	R7F7016113AFE	R7F7016114AFE	R7F7016113AFD	R7F7016114AFD
		1536 KB	96 KB				R7F7015603AFP-C	R7F7015604AFP-C	R7F7015603AFE	R7F7015604AFE	R7F7015603AFD	R7F7015604AFD
		2048 KB	128 KB				R7F7015613AFP-C	R7F7015614AFP-C	R7F7015613AFE	R7F7015614AFE	R7F7015613AFD	R7F7015614AFD
144 pins	120 MHz max.	768 KB	32 KB	64 KB	64 KB		R7F7016123AFP-C	R7F7016124AFP-C	R7F7016123AFE	R7F7016124AFE	R7F7016123AFD	R7F7016124AFD
		1024 KB	64 KB				R7F7016133AFP-C	R7F7016134AFP-C	R7F7016133AFE	R7F7016134AFE	R7F7016133AFD	R7F7016134AFD
		1536 KB	96 KB				R7F7015623AFP-C	R7F7015624AFP-C	R7F7015623AFE	R7F7015624AFE	R7F7015623AFD	R7F7015624AFD
		2048 KB	128 KB				R7F7015633AFP-C	R7F7015634AFP-C	R7F7015633AFE	R7F7015634AFE	R7F7015633AFD	R7F7015634AFD
176 pins	120 MHz max.	1024 KB	64 KB	64 KB	64 KB	ADVANCED	R7F7015773AFP-C	R7F7015774AFP-C	R7F7015773AFE	R7F7015774AFE	R7F7015773AFD	R7F7015774AFD
		1536 KB	96 KB				R7F7015663AFP-C	R7F7015664AFP-C	R7F7015663AFE	R7F7015664AFE	R7F7015663AFD	R7F7015664AFD
		2048 KB	128 KB				R7F7015673AFP-C	R7F7015674AFP-C	R7F7015673AFE	R7F7015674AFE	R7F7015673AFD	R7F7015674AFD
100 pins	120 MHz max.	768 KB	32 KB	64 KB	64 KB	PREMIUM	R7F7016203AFP-C	R7F7016204AFP-C	R7F7016203AFE	R7F7016204AFE	R7F7016203AFD	R7F7016204AFD
		1024 KB	64 KB				R7F7016213AFP-C	R7F7016214AFP-C	R7F7016213AFE	R7F7016214AFE	R7F7016213AFD	R7F7016214AFD
		1536 KB	96 KB				R7F7015803AFP-C	R7F7015804AFP-C	R7F7015803AFE	R7F7015804AFE	R7F7015803AFD	R7F7015804AFD
		2048 KB	128 KB				R7F7015813AFP-C	R7F7015814AFP-C	R7F7015813AFE	R7F7015814AFE	R7F7015813AFD	R7F7015814AFD
144pins	120 MHz max.	768 KB	32 KB	64 KB	64 KB		R7F7016223AFP-C	R7F7016224AFP-C	R7F7016223AFE	R7F7016224AFE	R7F7016223AFD	R7F7016224AFD
		1024 KB	64 KB				R7F7016233AFP-C	R7F7016234AFP-C	R7F7016233AFE	R7F7016234AFE	R7F7016233AFD	R7F7016234AFD
		1536 KB	96 KB				R7F7015823AFP-C	R7F7015824AFP-C	R7F7015823AFE	R7F7015824AFE	R7F7015823AFD	R7F7015824AFD
		2048 KB	128 KB				R7F7015833AFP-C	R7F7015834AFP-C	R7F7015833AFE	R7F7015834AFE	R7F7015833AFD	R7F7015834AFD
176pins	120 MHz max.	1024 KB	64 KB	64 KB	64 KB		R7F7015973AFP-C	R7F7015974AFP-C	R7F7015973AFE	R7F7015974AFE	R7F7015973AFD	R7F7015974AFD
		1536 KB	96 KB				R7F7015863AFP-C	R7F7015864AFP-C	R7F7015863AFE	R7F7015864AFE	R7F7015863AFD	R7F7015864AFD
		2048 KB	128 KB				R7F7015873AFP-C	R7F7015874AFP-C	R7F7015873AFE	R7F7015874AFE	R7F7015873AFD	R7F7015874AFD

Table 1.2 Product Lineup of F1KM-S4

F1KM-S4		Memory					Part Name (general product)		Part Name (additional product 1)		Part Name (additional product 2)	
Pin Count	CPU Frequency	Code Flash	Data Flash	Local RAM (LRAM)	Global RAM (GRAM)	Retention RAM (RRAM)	Operating Temperature (Ta)		Operating Temperature (Ta)		Operating Temperature (Ta)	
							–40°C to +105°C	–40°C to +125°C	–40°C to +105°C	–40°C to +125°C	–40°C to +105°C	–40°C to +125°C
100 pin	240 MHz max.	3 MB	128 KB	192 KB	128 KB	64 KB	R7F7016443AFP-C	Not provided	R7F7016443AFE	Not provided	R7F7016443AFD	Not provided
		4 MB		256 KB	192KB		R7F7016453AFP-C	Not provided	R7F7016453AFE	Not provided	R7F7016453AFD	Not provided
144 pin	240 MHz max.	3 MB	128 KB	192 KB	128 KB	64 KB	R7F7016463AFP-C	Not provided	R7F7016463AFE	Not provided	R7F7016463AFD	Not provided
		4 MB		256 KB	192KB		R7F7016473AFP-C	Not provided	R7F7016473AFE	Not provided	R7F7016473AFD	Not provided
176 pin	240 MHz max.	3 MB	128 KB	192 KB	128 KB	64 KB	R7F7016483AFP-C	Not provided	R7F7016483AFE	Not provided	R7F7016483AFD	Not provided
		4 MB		256 KB	192KB		R7F7016493AFP-C	Not provided	R7F7016493AFE	Not provided	R7F7016493AFD	Not provided

Table 1.3 Product Lineup of F1KM-S1

F1KM-S1		Memory				Part Name (general product)		Part Name (additional product 1)		Part Name (additional product 2)	
Pin Count	CPU Frequency	Code Flash	Data Flash	Local RAM (LRAM)	Retention RAM (RRAM)	Operating Temperature (Ta)		Operating Temperature (Ta)		Operating Temperature (Ta)	
						–40°C to +105°C	–40°C to +125°C	–40°C to +105°C	–40°C to +125°C	–40°C to +105°C	–40°C to +125°C
100 pin	120 MHz max.	1024 KB	64 KB	96 KB	32 KB	R7F7016843AFP-C	R7F7016844AFP-C	R7F7016843AFE	R7F7016844AFE	R7F7016843AFD	R7F7016844AFD
		768 KB		64 KB		R7F7016853AFP-C	R7F7016854AFP-C	R7F7016853AFE	R7F7016854AFE	R7F7016853AFD	R7F7016854AFD
		512 KB		32 KB		R7F7016863AFP-C	R7F7016864AFP-C	R7F7016863AFE	R7F7016864AFE	R7F7016863AFD	R7F7016864AFD

Section 2 Electrical Characteristics

The specification of the additional products is the same as the general product.

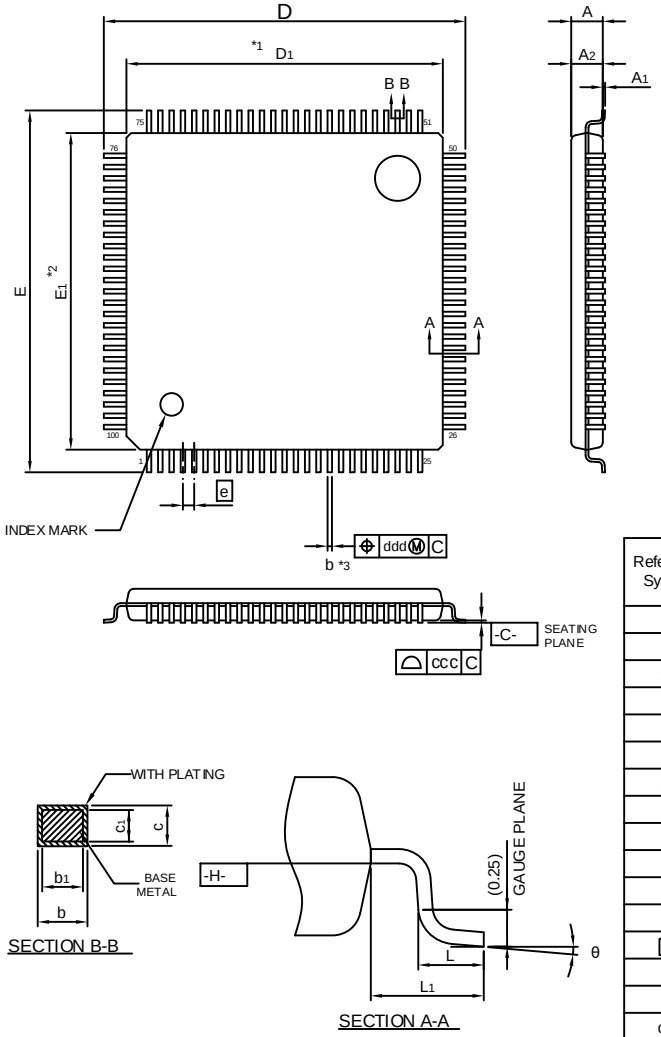
Appendix A Package

A.1 Package Dimensions

A.1.1 100 Pins (R7F7010xxxAFE)

JEITA Package code	RENESAS code	MASS(TYP.)[g]
P-LFQFP100-14x14-0.50	PLQP0100KL-A	0.7

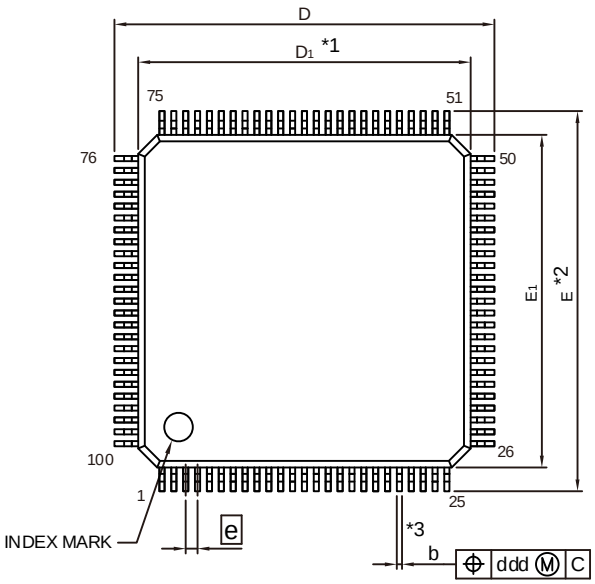
NOTE)
1.DIMENSIONS "*1 "AND "*2 "DO NOT INCLUDE MOLD FLASH.
2.DIMENSION"*3" DOES NOT INCLUDE TRIM OFFSET.



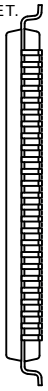
Reference Symbol	Dimension in Millimeters		
	Min.	Nom.	Max.
D_1	13.80	14.00	14.20
E_1	13.80	14.00	14.20
A_2	—	1.40	—
D	15.80	16.00	16.20
E	15.80	16.00	16.20
A	—	—	1.60
A_1	0.05	—	0.15
b	0.17	0.22	0.27
b_1	0.17	0.20	0.23
c	0.09	—	0.20
c_1	0.09	—	0.16
θ	0°	—	7°
e	—	0.50	—
L	0.45	0.60	0.75
L_1	—	1.00	—
ccc	—	—	0.08
ddd	—	—	0.08

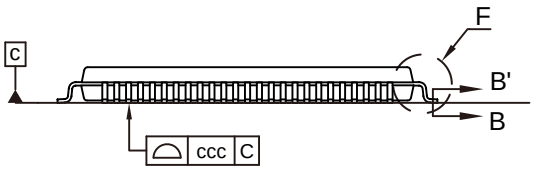
A.1.2 100 Pins (R7F7010xxxAFD)

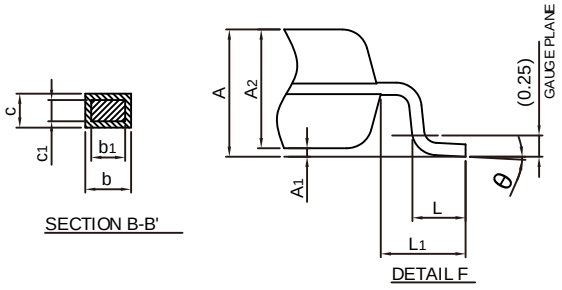
JEITA Package code	RENESAS code	MASS(TYP.)[g]
P-LFQFP100-14x14-0.50	PLQP0100KM-A	0.6



NOTE)
1. DIMENSIONS "*1" AND "*2" DO NOT INCLUDE MOLD FLASH.
2. DIMENSIONS "*3" DO NOT INCLUDE TRIM OFFSET.





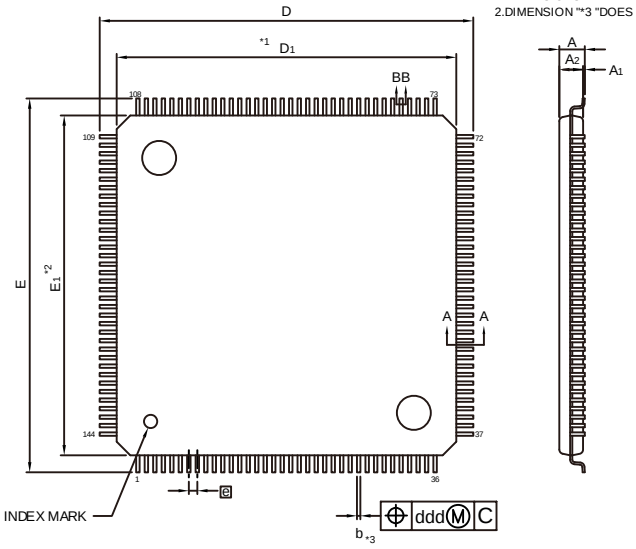


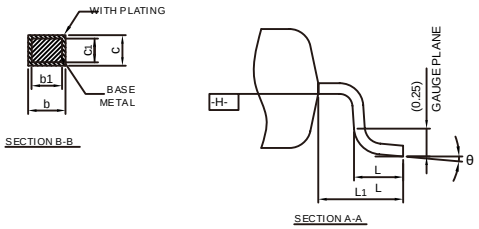
Reference Symbol	Dimension in Millimeters		
	Min.	Nom.	Max.
D_1	13.80	14.00	14.20
E_1	13.80	14.00	14.20
A_2	—	1.40	—
D	15.80	16.00	16.20
E	15.80	16.00	16.20
A	—	—	1.60
A_1	0.05	—	0.15
b	0.17	0.22	0.27
b_1	0.17	0.20	0.23
c	0.09	—	0.20
c_1	0.09	—	0.16
θ	0°	—	7°
e	—	0.50	—
L	0.45	0.60	0.75
L_1	—	1.00	—
ccc	—	—	0.08
ddd	—	—	0.08

A.1.3 144 Pins (R7F7010xxxAFE)

JEITA Package code	RENESAS code	MASS(TYP.)[g]
P-LFQFP144-20x20-0.50	PLQP0144KF-A	1.4

NOTE)
1.DIMENSIONS "*1" AND "*2" DO NOT INCLUDE MOLD FLASH.
2.DIMENSION "*3 "DOES NOT INCLUDE TRIM OFFSET.



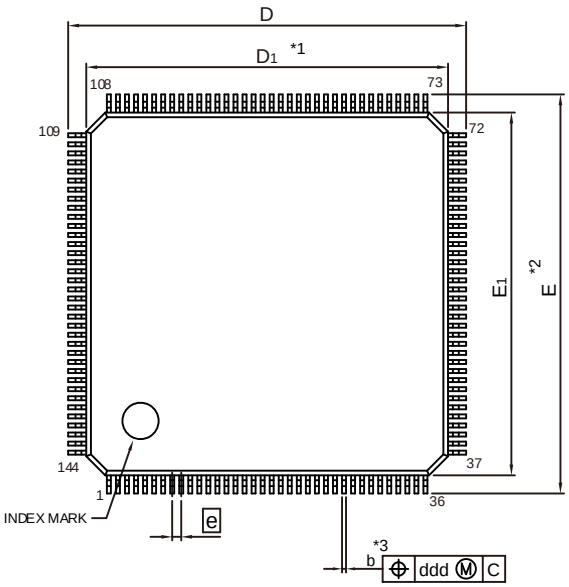


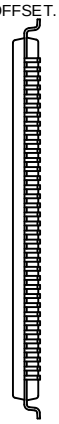
Reference Symbol	Dimension in Millimeters		
	Min.	Nom.	Max.
D_1	19.80	20.00	20.20
E_1	19.80	20.00	20.20
A_2	—	1.40	—
D	21.80	22.00	22.20
E	21.80	22.00	22.20
A	—	—	1.60
A_1	0.05	—	0.15
b	0.17	0.22	0.27
b_1	0.17	0.20	0.23
c	0.09	—	0.20
c_1	0.09	—	0.16
θ	0°	—	7°
e	—	0.50	—
L	0.45	0.60	0.75
L_1	—	1.00	—
ccc	—	—	0.08
ddd	—	—	0.08

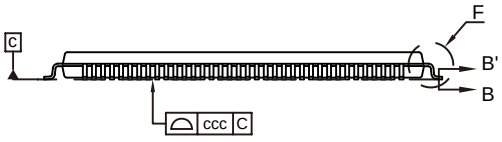
A.1.4 144 Pins (R7F7010xxxAFD)

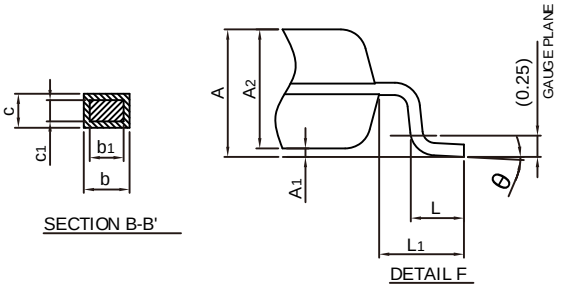
JEITA Package code	RENESAS code	MASS(TYP.)[g]
P-LFQFP144-20x20-0.50	PLQP0144KG-A	1.3

NOTE)
1. DIMENSIONS "*1" AND "*2" DO NOT INCLUDE MOLD FLASH.
2. DIMENSIONS "*3" DO NOT INCLUDE TRIM OFFSET.







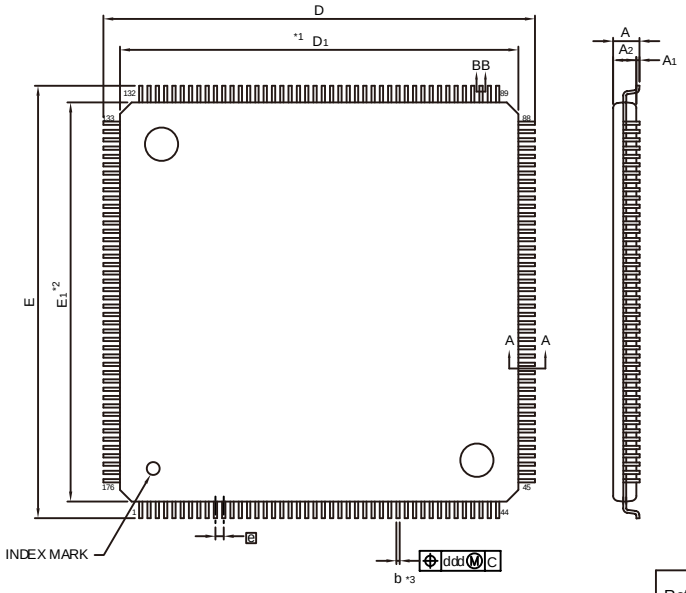


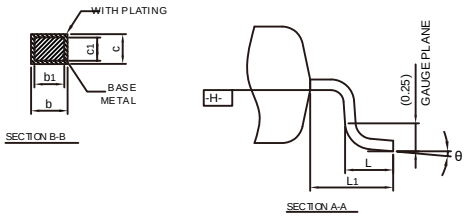
Reference Symbol	Dimension in Millimeters		
	Min.	Nom.	Max.
D_1	19.80	20.00	20.20
E_1	19.80	20.00	20.20
A_2	—	1.40	—
D	21.80	22.00	22.20
E	21.80	22.00	22.20
A	—	—	1.60
A_1	0.05	—	0.15
b	0.17	0.22	0.27
b_1	0.17	0.20	0.23
c	0.09	—	0.20
c_1	0.09	—	0.16
θ	0°	—	7°
e	—	0.50	—
L	0.45	0.60	0.75
L_1	—	1.00	—
ccc	—	—	0.08
ddd	—	—	0.08

A.1.5 176 Pins (R7F7010xxxAFE)

JEITA Package code	RENESAS code	MASS(TYP.)[g]
P-LFQFP176-24x24-0.50	PLQP0176KG-A	1.9

NOTE)
1.DIMENSIONS "*1" AND "*2" DO NOT INCLUDE MOLD FLASH.
2.DIMENSION "*3" DOES NOT INCLUDE TRIM OFFSET.



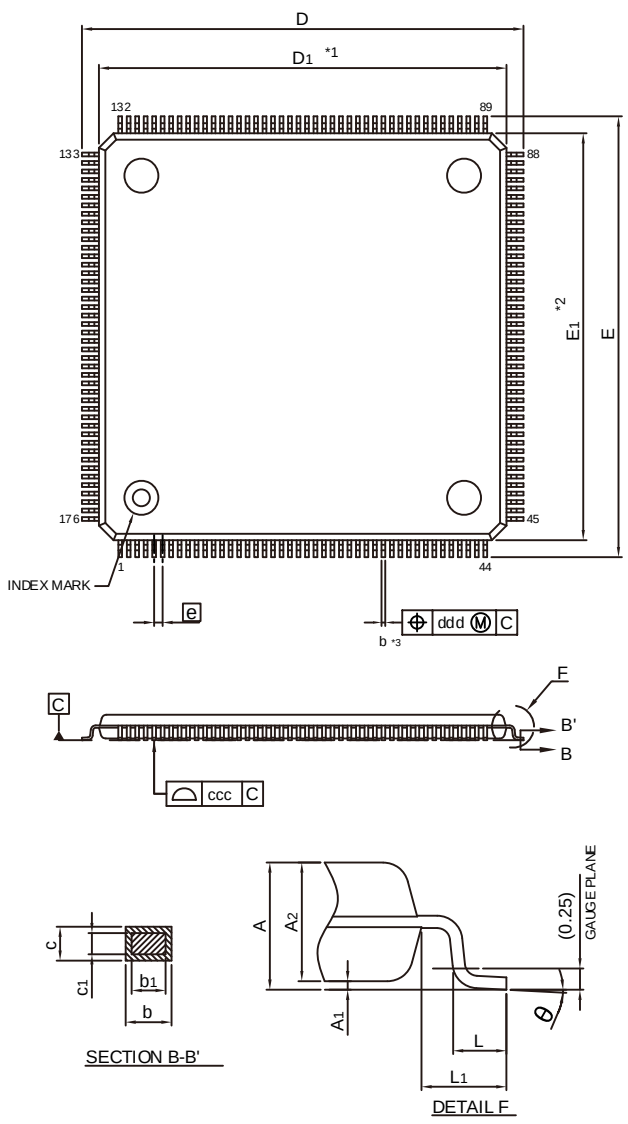


Reference Symbol	Dimension in Millimeters		
	Min.	Nom.	Max.
D_1	23.80	24.00	24.20
E_1	23.80	24.00	24.20
A_2	—	1.40	—
D	25.80	26.00	26.20
E	25.80	26.00	26.20
A	—	—	1.60
A_1	0.05	—	0.15
b	0.17	0.22	0.27
b_1	0.17	0.20	0.23
c	0.09	—	0.20
c_1	0.09	—	0.16
θ	0°	—	7°
e	—	0.50	—
L	0.45	0.60	0.75
L_1	—	1.00	—
ccc	—	—	0.08
ddd	—	—	0.08

A.1.6 176 Pins (R7F7010xxxAFD)

JEITA Package code	RENESAS code	MASS(TYP.)[g]
P-LFQFP176-24x24-0.50	PLQP0176KH-A	1.9

NOTE)
1. DIMENSIONS "*1"AND "*2" DO NOT INCLUDE MOLD FLASH.
2. DIMENSIONS "*3" DO NOT INCLUDE TRIM OFFSET.



Reference Symbol	Dimension in Millimeters		
	Min.	Nom.	Max.
D_1	23.80	24.00	24.20
E_1	23.80	24.00	24.20
A_2	—	1.40	—
D	25.80	26.00	26.20
E	25.80	26.00	26.20
A	—	—	1.60
A_1	0.05	—	0.15
b	0.17	0.22	0.27
b_1	0.17	0.20	0.23
c	0.09	—	0.20
c_1	0.09	—	0.16
θ	0°	—	7°
e	—	0.50	—
L	0.45	0.60	0.75
L_1	—	1.00	—
ccc	—	—	0.08
ddd	—	—	0.08

Revision History

Rev.	Date	Description	
		Section	Summary
1.00	Jan 31, 2019	-	Initial release

RH850/F1K, RH850/F1KM User’s Manual: Hardware

Publication Date: Rev.1.00 Jan 31, 2019

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