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	SPECIFICATION	SYSTEM DEVICE DIVISION

DEVICE SPECIFICATION FOR

2.4GHz Wireless LAN Front-End IC

MODEL No.

Q M 2 A 1 U B 0 3 2 A

☐ CUSTOMER'S APPROVAL

DATE

BY

PRESENTED

BY

Development Department I
System Device Division
Electronic Components and Devices Group
SHARP CORPORATION

SHARP

RECORD OF REVISION

MODEL No.	SPEC No.
QM2A1UB032A	

DOC. FIRST ISSUE
Mar. 28, 2013

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Mar. 28, 2013			FIRST ISSUE	

Product name : 2.4GHz Wireless LAN Front-End IC

Model No. QM2A1UB032A

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2. When using this product, please observe the absolute maximum ratings and the instructions for use outlined in these specification sheets, as well as the precautions mentioned below. Sharp assumes no responsibility for any damage resulting from use of the product which does not comply with the absolute maximum ratings and the instructions included in these specification sheets, and the precautions mentioned below.

(Precautions)

(1) Please do verify the validity of this part after assembling it in customer's products, when customer wants to make catalogue and instruction manual based on the specification sheet of this part.

(2) This product is designed for use in the following application areas ;
- OA equipment • Audio visual equipment • Home appliances
- Telecommunication equipment (Terminal) • Measuring equipment
- Tooling machines • Computers

If the use of the product in the above application areas is for equipment listed in paragraphs (3) or (4), please be sure to observe the precautions given in those respective paragraphs.

(3) Appropriate measures, such as fail-safe design and redundant design considering the safety design of the overall system and equipment, should be taken to ensure reliability and safety when this product is used for equipment which demands high reliability and safety in function and precision, such as ;
- Transportation control and safety equipment (aircraft, train, automobile etc.)
- Traffic signals • Gas leakage sensor breakers • Rescue and security equipment
- Other safety equipment

(4) Please do not use this product for equipment which require extremely high reliability and safety in function and precision, such as ;
- Space equipment • Telecommunication equipment (for trunk lines)
- Nuclear power control equipment • Medical equipment

(5) Please contact and consult with a Sharp sales representative if there are any questions regarding interpretation of the above three paragraphs.

3. Please contact and consult with a Sharp sales representative for any questions about this product.

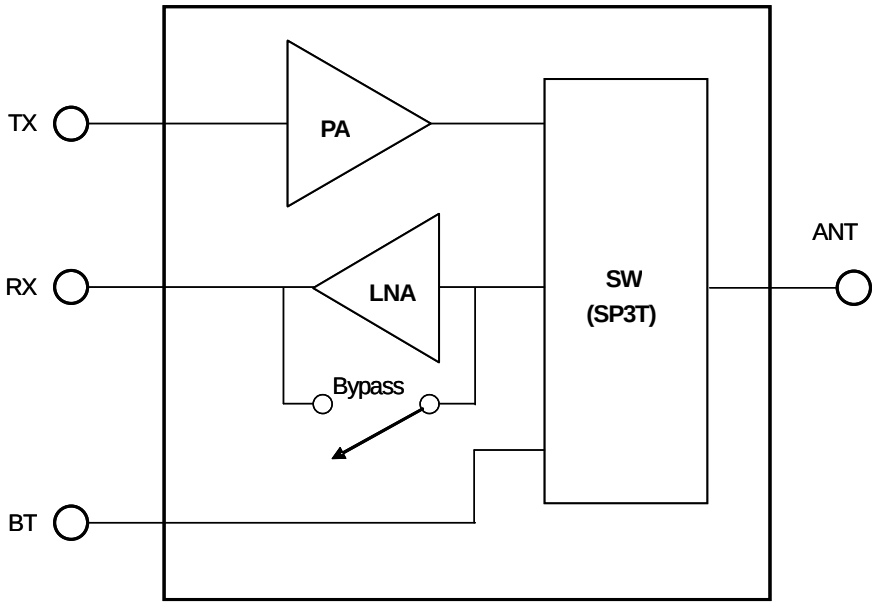
CONTENTS

1. Description

1-1 Functions

The QM2A1UB032A is an integrated Front-end IC in a small and low profile 2.5mmx2.5mmx0.4mm package for 2.4GHz Band WLAN systems.

The QM2A1UB032A integrates two-stage Power Amplifier with a power detector, LNA and SP3T switch with all 50Ω RF ports, which requires minimal external components and provides minimizing PCB foot-print.



1-2 Features

- Integrates matching network, All RF ports are 50Ω
- Integrates the high efficiency and high linearity PA
  Pout=19dBm, 802.11ac (MCS7, BW=20MHz , 64QAM,) at EVM 2%, 2.4-2.5GHz, VDD=3.6V
- Wide dynamic range and load insensitive built-in power detector
- SP3T Switch capable of alternative reception for WLAN and Bluetooth
- The LNA with bypass mode function which allows wide dynamic range Rx operation
- Lead Free / RoHS Compliant / Halogen Free

1-3 Applications

- W-LAN(IEEE 802.11b/g./n/ac)

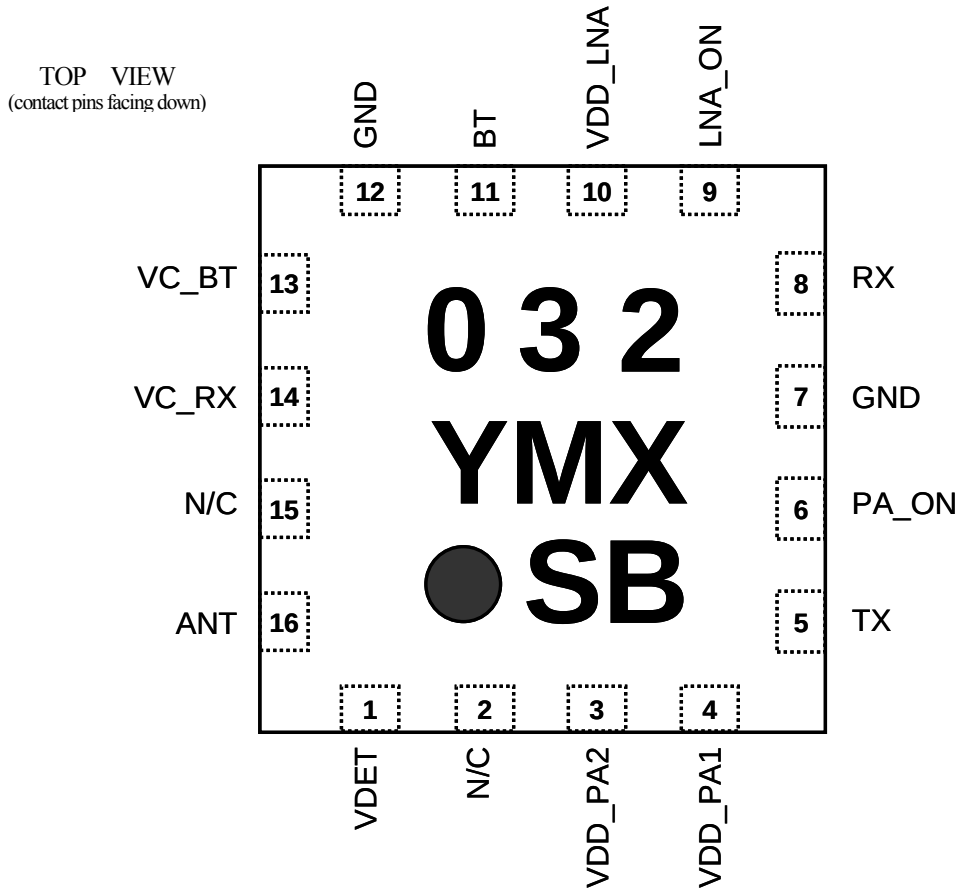
======= Not designed or rated as radiation hardened =======

1-4 Handle with care

- ESD (Electro-Static Discharge) sensitive.
- Gallium (Ga) and Arsenic (As) specified as poisonous chemicals by law. For the prevention of a hazard, do not burn, destroy, or process chemically to make them as gas or powder.
  When the product is disposed, please follow the related regulation and do not mix this with general industrial waste or household waste.

2. Pin Out and Assignment

2-1 Pin Out



2-2 Pin Description

Pin	Symbol	Description	Pin	Symbol	Description
1	VDET	Detector Voltage Output	9	LNA_ON	LNA ON/OFF Control Voltage
2	N/C	No Connect	10	VDD_LNA	LNA Supply Voltage
3	VDD_PA2	PA 2nd Stage Supply Voltage	11	BT	Bluetooth Port
4	VDD_PA1	PA 1stStage Supply Voltage	12	GND	Ground
5	TX	Tx Port Input	13	VC_BT	BT Switch Control Voltage
6	PA_ON	PA ON/OFF Control Voltage	14	VC_RX	Rx Switch Control Voltage
7	GND	Ground	15	N/C	No Connect
8	RX	Rx Port Output	16	ANT	Antenna Port

3. Absolute Maximum Ratings and Recommended Operating Conditions

3-1 Absolute Maximum Ratings

Applied conditions greater than those listed may cause permanent damage to the IC. Functional operation is not implied under these conditions. Exposure to absolute ratings for extended periods of time may adversely affect reliability.

Parameter	Symbol	Unit	Min.	Max.	Note
DC Supply Voltage (VDD)	VDD	V	-	5	No RF Applied, Ta=25℃
DC Supply Current (IDD)	IDD_PA	mA	-	300	While Tx mode, Ta=25℃
Total DC Power Dissipation	PD	W	-	1	Ta=25℃
TX RF Input Level	TX_IN	dBm	-	0	Ta=25℃
RX RF Input Level	RX_IN	dBm	-	5	At ANT Port, Ta=25℃
Storage Temperature	Tstg	℃	-55	+125	
Operating Temperature	Ta_opr	℃	-30	+85	
Maximum Junction Temperature	Tj_max	℃		+150	

3-2 Recommended Operating Conditions

Parameter	Unit	Min.	Typ.	Max.	Note
Frequency	MHz	2400		2500	
DC Supply Voltage	V	3.2	3.6	4.6	VDD_PA,VDD_LNA
Control Voltage (High State)	V	2.95	3.3	3.65	PA_ON (*1)
	V	2.8	3.3	VDD	VC_RX, LNA_ON, VC_BT
Control Voltage (Low State)	V	-	0	0.4	PA_ON, VC_RX, LNA_ON

(*1) with virtual resistor R2 in our evaluation board. (refer to page.9)

3-3 FEIC Control Logic Table

Mode	VC_BT	VC_RX	LNA_ON	PA_ON
Bluetooth	High	Low	Low	Low
WLAN RX (Normal-mode)	Low	High	High	Low
WLAN RX (Bypass-mode)	Low	High	Low	Low
WLAN TX	Low	Low	Low	High

4. Electrical Characteristics

These specifications are obtained with the evaluation board shown in Page 10

Test conditions are Ta = 25 °C, Source impedance: Z_S = 50Ω, load impedance: Z_L = 50 Ω, unless otherwise noted.

Common Parameters

Ta=25℃,VDD_PA=VDD_LNA=3.6V, PA_ON=LNA_ON=VC_BT=VC_RX=0V, no RF input

Parameter	Symbol	Condition	Min.	Typ.	Max	Unit
Stand-by Leakage Current	ILEAK	Measured on VDD leakage current	-	-	20	μA

Tx Parameters

Ta=25℃,Freq=2.4-2.5GHz, VDD_PA=VDD_LNA=3.6V, PA_ON=3.3V, LNA_ON=VC_BT=VC_RX=0V, unless otherwise noted.

Parameter	Symbol	Condition	Min.	Typ.	Max	Unit
Power Gain	GAIN_TX	Pout=19dBm , 802.11ac, MCS7, BW=20MHz, 64QAM, Dynamic-EVM		27		dB
Power Consumption	IDD_PA_			200		mA
PA Control Current	IPA_ON			6		mA
Error Vector Magnitude(*1)	EVM			2		%
Power Detector Voltage Output	VDET_DC	No RF		0.21		V
	VDET	Pout=19dBm, CW		0.8		V
2nd Harmonic	2fo	Pout=21dBm (802.11b, 1Mbps, CCK-1M)		-14		dBm/MHz
3rd Harmonic	3fo			-33		dBm/MHz
Return Loss						
TX Input	RL_TX			12		dB
ANT port	RL_ANT_t			12		dB

RX Parameters

Ta=25℃,Freq=2.4-2.5GHz, VDD_PA=VDD_LNA=3.6V, PA_ON=VC_BT=0V, LNA_ON=3.3V,VC_RX=3.3V, unless otherwise noted.

Parameter	Symbol	Condition	Min.	Typ.	Max	Unit
Normal-mode Gain	GAIN_Rx			13		dB
Bypass-mode Gain	GAIN_BP	LNA_ON=0V		-5.5		dB
Noise Figure	NF	(Includes the SW loss before LNA)		2.0		dB
Input IP3		The tone separation=100kHz, Pin=-20dBm				
Normal-mode	IIP3_NORM			7		dBm
Bypass-mode	IIP3_BP	LNA_ON=0V		15		dBm
LNA Supply Current	IDD_LNA	Measured on VDD_LNA		10		mA
Rx Control Current	IC_RX	Measured on VC_RX		6		μA
LNA Control Current	ILNA_ON	Measured on LNA_EN		6		μA
Return Loss						
RX output	RL_RX			7		dB
ANT port	RL_ANT_r			12		dB

Bluetooth Parameters

Ta=25℃,Freq=2.4-2.5GHz, VDD_PA=VDD_LNA=3.6V, PA_ON=LNA_ON=VC_RX=0V,VC_BT=3.3V, unless otherwise noted.

Parameter	Symbol	Condition	Min.	Typ.	Max	Unit
Insertion Loss	IL_BT			0.6		dB
BT Control Current	IC_BT	Measured on VC_BT		6		μA
BT Port Return Loss	RL_BT			20		dB

5. Application Information

5-1 Typical Evaluation Circuit

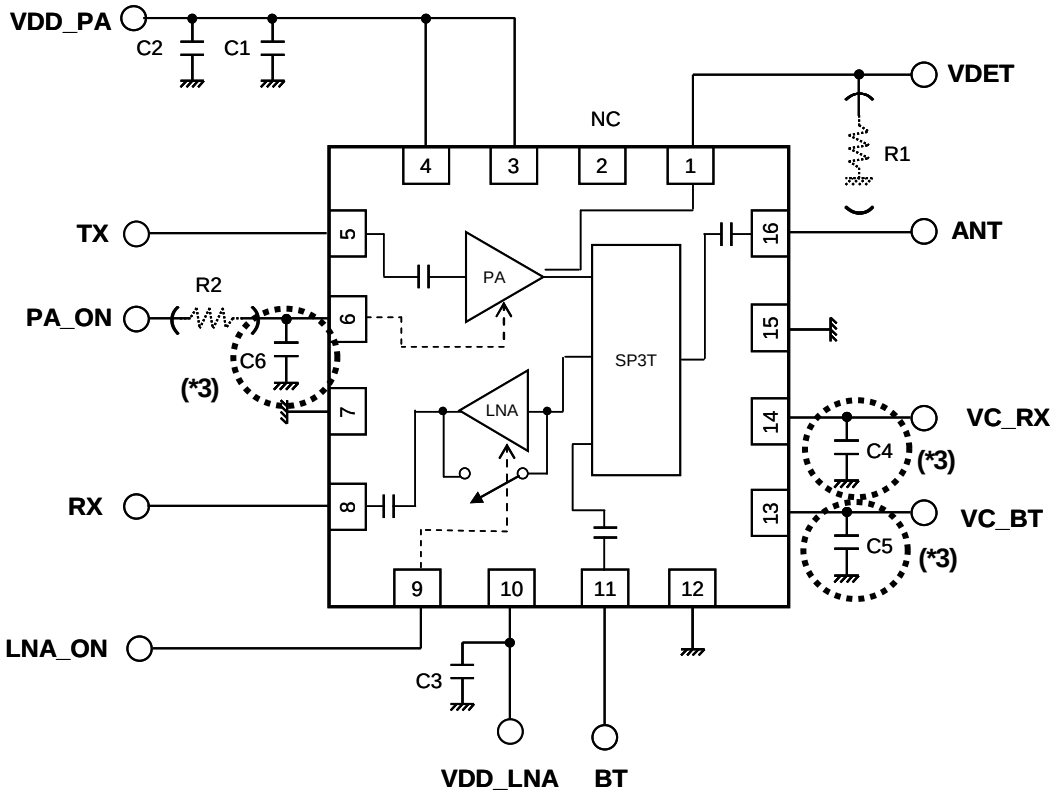


Figure 1. Schematic of Evaluation Circuit

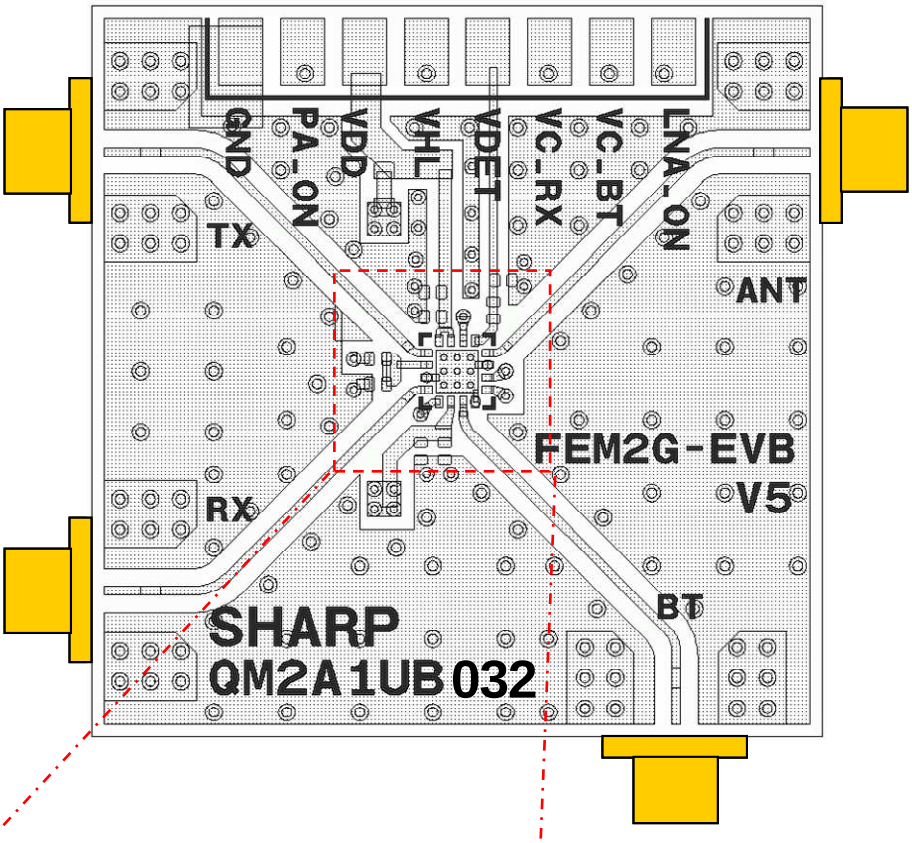
Table 1. Parts List of Evaluation Circuit

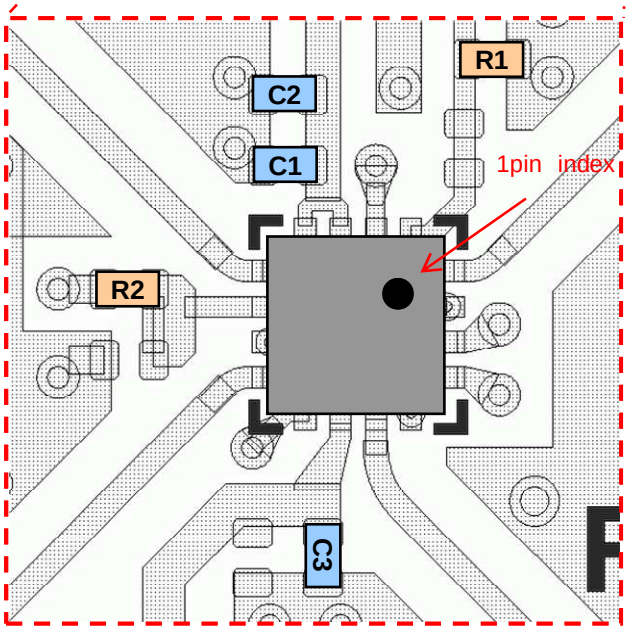
Symbol	Value	Vendor	Part Number
C1	10 pF	KYOCERA	CM05CH100B50AB
C2	1 μF	Murata	GRM155F11C105Z
C3	1 μF	Murata	GRM155F11C105Z
C4 (*3)	10 pF	Kyocera	CM05CH100J50AB
C5 (*3)	10 pF	Kyocera	CM05CH100J50AB
C6 (*3)	10 pF	Kyocera	CM05CH100J50AB
R1(*2)	27k ohm	ROHM	MCR MZSJ 273
R2 (*2)	24 ohm	ROHM	MCR01 MRTJ240

(*2) These resistors do not need in the real circuit because they are put to simulate the output series resistor and input impedance of the chip set.

(*3) These components are for external noise reduction. Please confirm the system performance on your board, if you want to remove or change them.

5-2 Evaluation Board





Layer Structure.

Material: FR4 (ε=4.7) Unit: um

SR	20
Cu	18
PP	200
Cu	35
Core	400
Cu	35
PP	200
Cu	18
SR	20

6. Package and packing specification

6-1 Storage Conditions

6-1-1 Storage conditions required before opening the dry packing

- Normal temperature : 5 ~ 40 °C
- Normal humidity : 80 % (Relative humidity) or less
- Storage period : One year or less

* " Humidity " means " Relative humidity "

6-1-2 Storage conditions required after opening the dry packing

In order to prevent moisture absorption after opening, ensure the following storage conditions apply:

(1) Storage conditions for one-time soldering (Convection reflow**, IR / Convection reflow**)

- Temperature : 5 ~ 25 °C
- Humidity : 60 % or less
- Period : 96 hours or less after opening

(2) Storage conditions for two-time soldering (Convection reflow**, IR / Convection reflow**)

a. Storage conditions following opening and prior to performing the 1st reflow

- Temperature : 5 ~ 25 °C
- Humidity : 60 % or less
- Period : 96 hours or less after opening

b. Storage conditions following completion of the 1st reflow and prior to performing the 2nd reflow

- Temperature : 5 ~ 25 °C
- Humidity : 60 % or less
- Period : 96 hours or less after completion of the 1st reflow

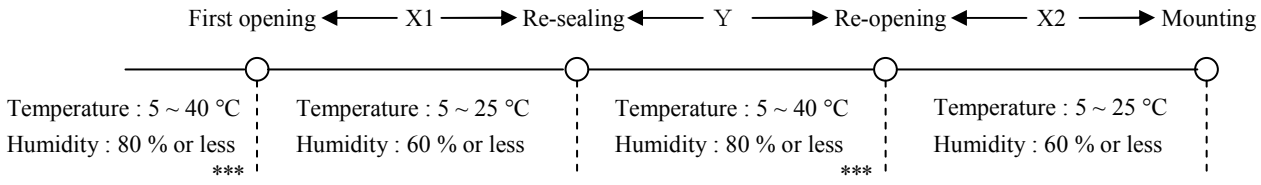
** : Air or nitrogen environment

6-1-3 Temporary storage after opening

To re-store the devices before soldering, do so only once and use a dry box or place desiccant (with a blue humidity indicator) with the devices and perform dry packing again using heat-sealing.

The storage period, temperature and humidity must be as follows :

(1) Storage temperature and humidity



*** : External atmosphere temperature and humidity of the dry packing

(2) Storage period

- X1＋X2 : Refer to Section 6-1-2 (1) and (2) a , depending on the mounting method.
- Y : Two weeks or less

6-2 Baking Condition

(1) Situations requiring baking before mounting

- Storage conditions exceed the limits specified in Section 6-1-2 or 6-1-3.
- Humidity indicator in the desiccant was already red (pink) when opened.

(Also for re-opening.)

(2) Recommended baking conditions

- Baking temperature and period : 120 + 10 / -0 °C for 2 ~ 3 hours
- The above baking conditions do not apply since the embossed carrier tape is not heat-resistant. Replace the devices on heat-resistant carrier.

(3) Storage after baking

- After baking, store the devices in the environment specified in Section 6-1-2 and mount immediately.

6-3 Surface Mount Conditions

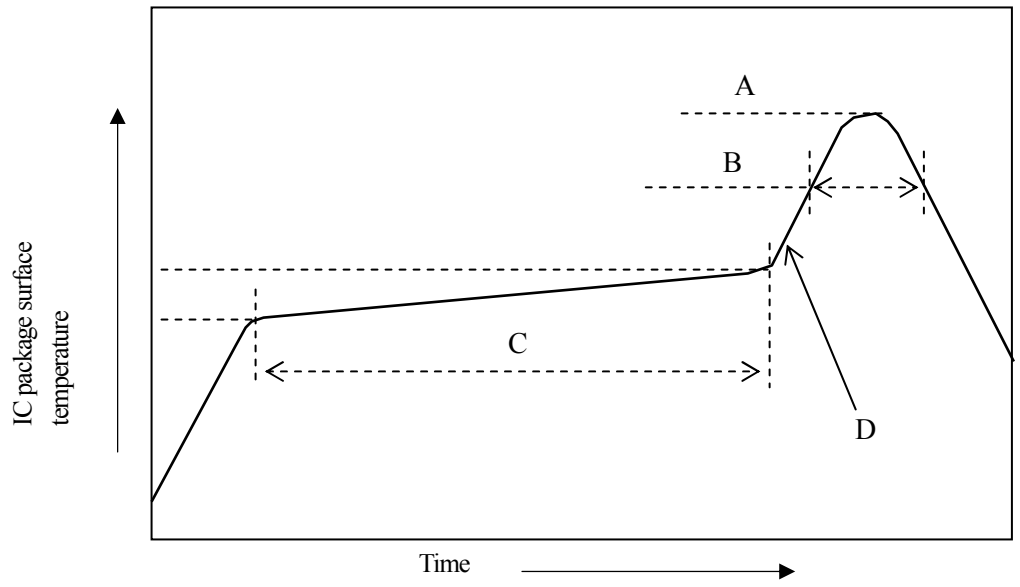
The following soldering conditions are recommended to ensure device quality.

6-3-1 Soldering

(1) Convection reflow or IR/Convection reflow

(one-time soldering or two-time soldering in air or nitrogen environment)

- Temperature and period :
  - A) Peak temperature 260℃ max
  - B) Heating temperature 40 to 60 seconds as 230℃
  - C) Preheat temperature It is 150 to 200℃, and is 120±30 seconds
  - D) Temperature increase rate It is 1 to 3℃/seconds
- Measuring point : IC package surface
- Temperature profile :



6-4 Condition for removal of residual flux

(1) Ultrasonic washing power : 25 watts / liter or less

(2) Washing time : Total 1 minute or less

(3) Solvent temperature : 15 ~ 40 °C

6-5 Package outline specification

6-5-1 Package outline

Refer to the attached drawing.

6-5-2 LEAD FINISH or BALL TYPE

LEAD FREE TYPE (Ni / Pd / Au)

6-6. Markings

6-6-1 Marking details (The information on the package should be given as follows.)

(1) Product name : 032

(2) Date code : YMX

Y → Denotes the production year. (Last one digit of the year.)

M → Denotes the production month. (1・2・～・8・9・0・N・D)

X → Denotes the production ref. code (1 digit).

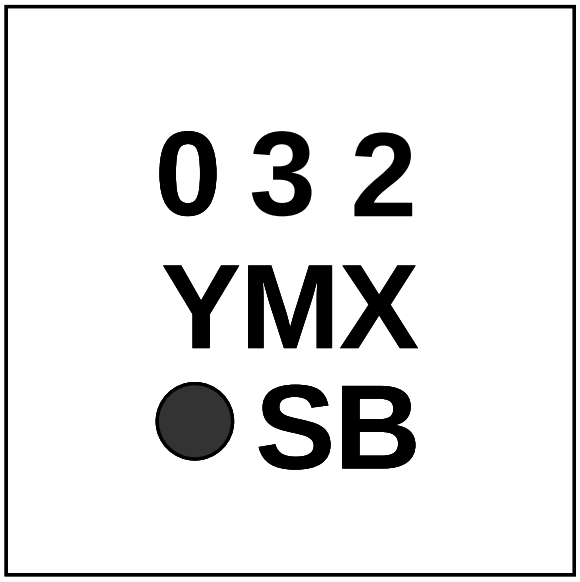
(3) Company name : S

(4) Factory Code : (1 digit, Example "B")

6-6-2 Marking layout

The layout is shown in the attached drawing.

(The layout does not specify the size of the marking character and marking position.)



・Date code:

Y ⋯ Denotes the production year.
(Last one digit of the year.)

M ⋯ Denotes the production month.
(1 ・2 ・3 ⋯8 ・9 ・0 ・N ・D)

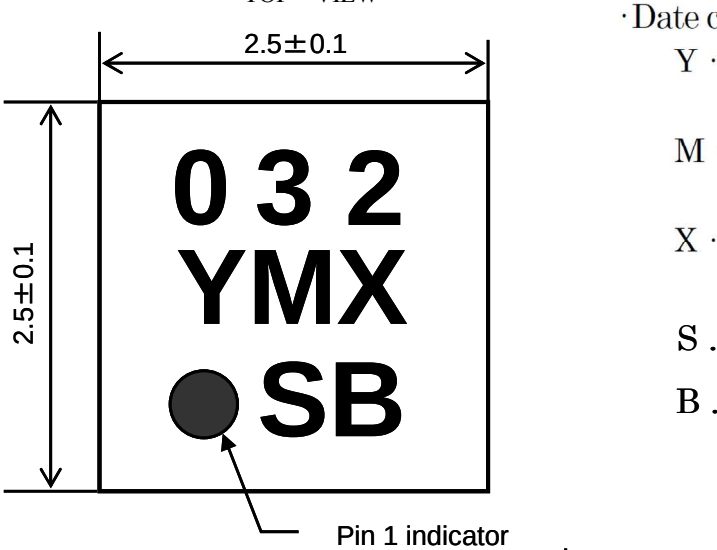
X ⋯ Denotes the production reference code
(Alphanumeric)

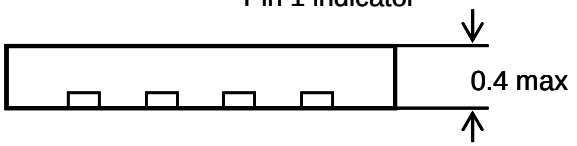
S … Brand name "S"

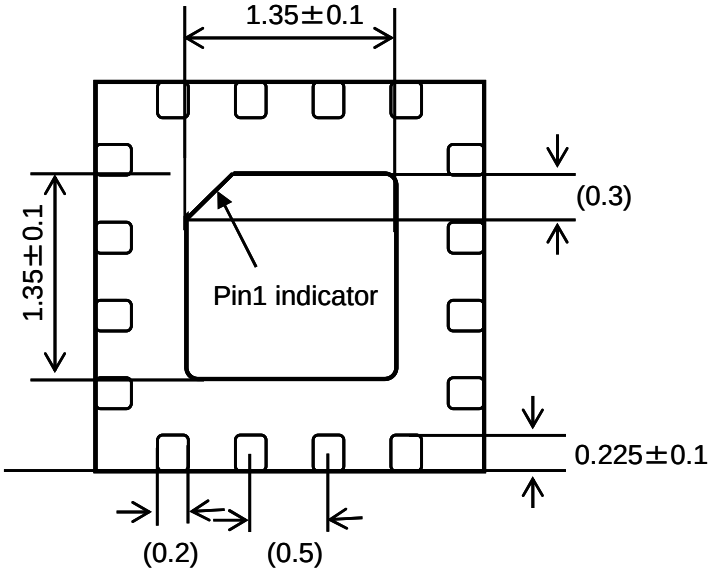
B … Factory code

Package specifications(Final Design)

TOP VIEW







BOTTOM VIEW

·Date code:

Y ···Denotes the production year.
(Last one digit of the year.)

M ···Denotes the production month.
(1 ·2 ·3 ···8 ·9 ·0 ·N ·D)

X ···Denotes the production reference code
(Alphanumeric)

S ... Brand name "S"

B ... Factory code

UNIT : mm

NOTE :

LEAD FREE product.

LEAD FINISH : Ni/Pd/Au PLATING

LEAD MATERIAL : Cu Alloy

6-7 Packing specifications (Embossed carrier tape specifications)

This standard applies to the embossed carrier tape specifications for ICs supplied by SHARP CORPORATION. SHARP's embossed carrier tape specifications are generally based on those described in JIS C 0806 (Japanese Industrial Standard) and EIA481A.

6-7-1 Tape structure

The embossed carrier tape is made of conductive plastic. The embossed portions of the carrier tape are filled with IC packages and a top covering tape is used to enclose them.

6-7-2 Taping reel and embossed carrier tape size

For the taping reel and embossed carrier tape sizes, refer to the attached drawing.

6-7-3 IC package enclosure direction in embossed carrier tape

The IC package enclosure direction in the embossed portion relative to the direction in which the tape is pulled is indicated by an index mark on the package (indicating the No. 1 pin) shown in the attached drawing.

6-7-4 Missing IC packages in embossed carrier tape

The number of missing IC packages in the embossed carrier tape per reel should not exceed either 1 or 0.1 % of the total contained on the tape per reel, whichever is larger. There should never be more than two consecutive missing IC packages.

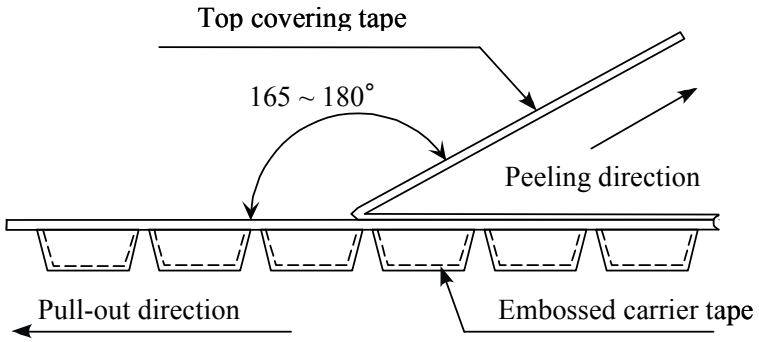
6-7-5 Tape joints

There is no joint in an embossed carrier tape.

6-7-6 Peeling strength of the top covering tape

Peeling strength must meet the following conditions.

(1) Peeling angle : 165 ~ 180 °
(2) Peeling speed : 300 mm / min
(3) Peeling strength : 0.2 ~ 0.7 N (20 ~ 70 gf)



6-7-7 Packing

(1) The top covering tape (leader side) at the leading edge of the embossed carrier tape, and the trailing edge of the embossed carrier tape, should both be held in place with paper adhesive tape at least 30 mm in length.

(2) The leading and trailing edges of the embossed carrier tape should be left empty (with embossed portions not filled with IC packages) in the attached drawing.

(3) The number of IC packages enclosed in the embossed carrier tape per reel should generally comply with the list given below.

Number of IC Packages / Reel	Number of IC Packages / Inner carton	Number of IC Packages / Outer carton
5,000 devices / Reel	5,000devices / Inner carton	25,000 devices / Outer carton

6-7-8 Indications

The following should be indicated on the taping reel and the packing carton.

- Part Number (Product Name)
- Storage Quantity
- Packed Date
- Manufacture's Name (SHARP)

Note : The IC taping direction is indicated by " EL " suffixed to the part number.

EL : Equivalent to " L " of the JIS C 0806 standard.

6-7-9 Protection during transportation

The IC packages should have no deformation and deterioration of their electrical characteristics resulting from transportation.

6-8 Precautions for use

(1) Opening must be done on an anti-ESD treated workbench.
All workers must also have undergone anti-ESD treatment.

(2) The devices should be mounted within one year of the date of delivery.

6-9 Chemical substance information in the product

Product Information Notification based on Chinese law, Management Methods for Controlling Pollution by Electronic Information Products.

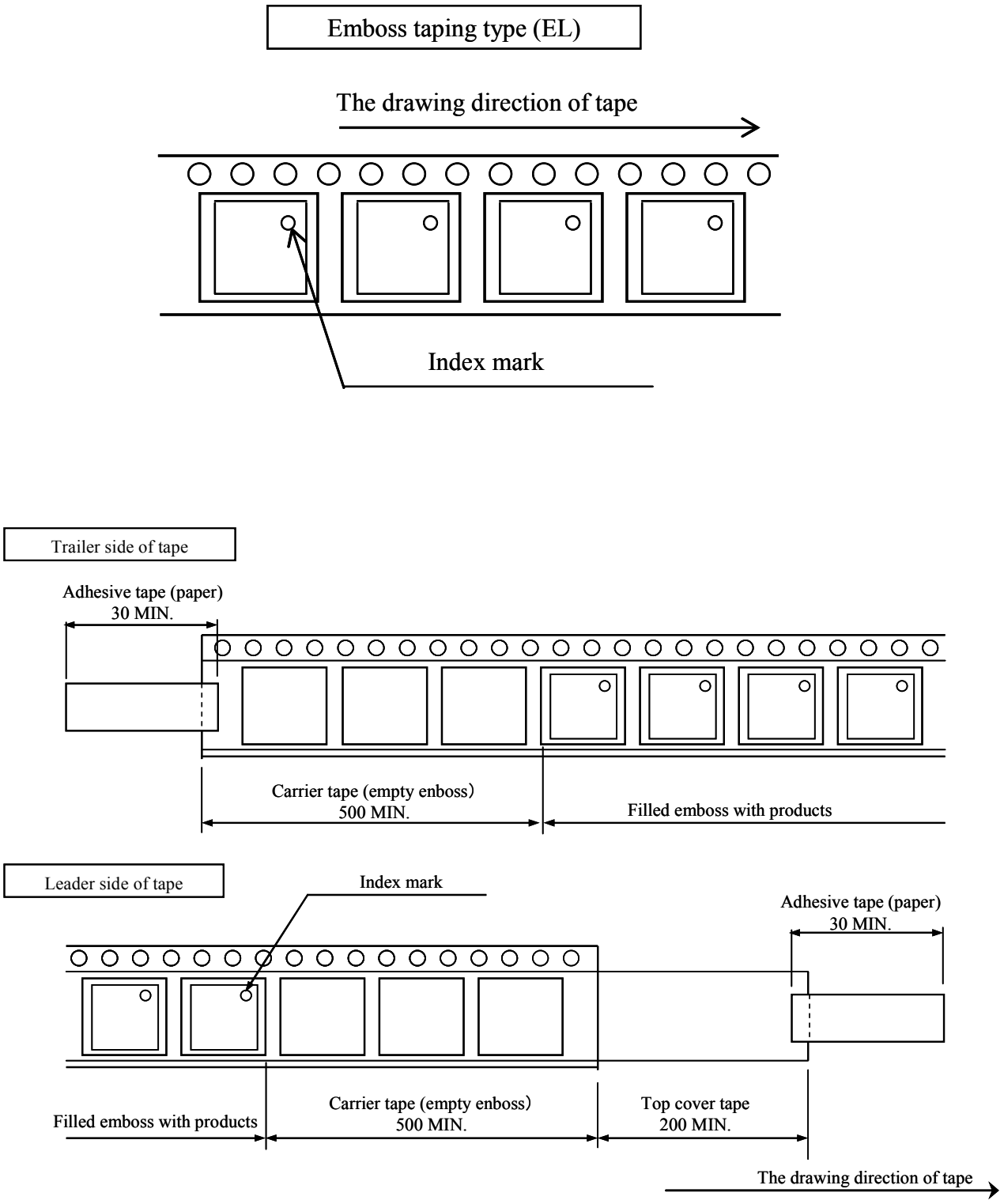
Names and Contents of the Toxic and Hazardous Substances or Elements in the Product

Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr (VI))	Polybrominated Biphenyl (PBB)	Polybrominated Diphenyl Ethers (PBDE)
○	○	○	○	○	○

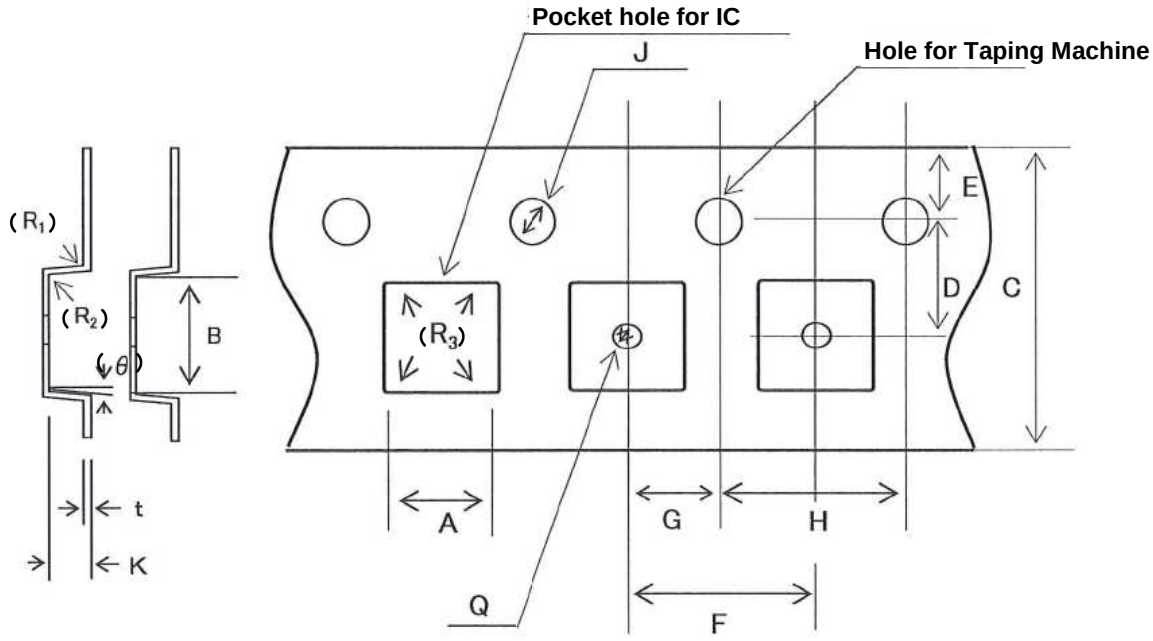
○ : indicates that the content of the toxic and hazardous substance in all the homogeneous materials of the part is below the concentration limit requirement as described in SJ / T 11363 - 2006.

X : indicates that the content of the toxic and hazardous substance in at least one homogeneous material of the part exceeds the concentration limit requirement as described in SJ / T 11363 - 2006 standard.

Product Orientation



Tape structure and dimensions



Unit: mm

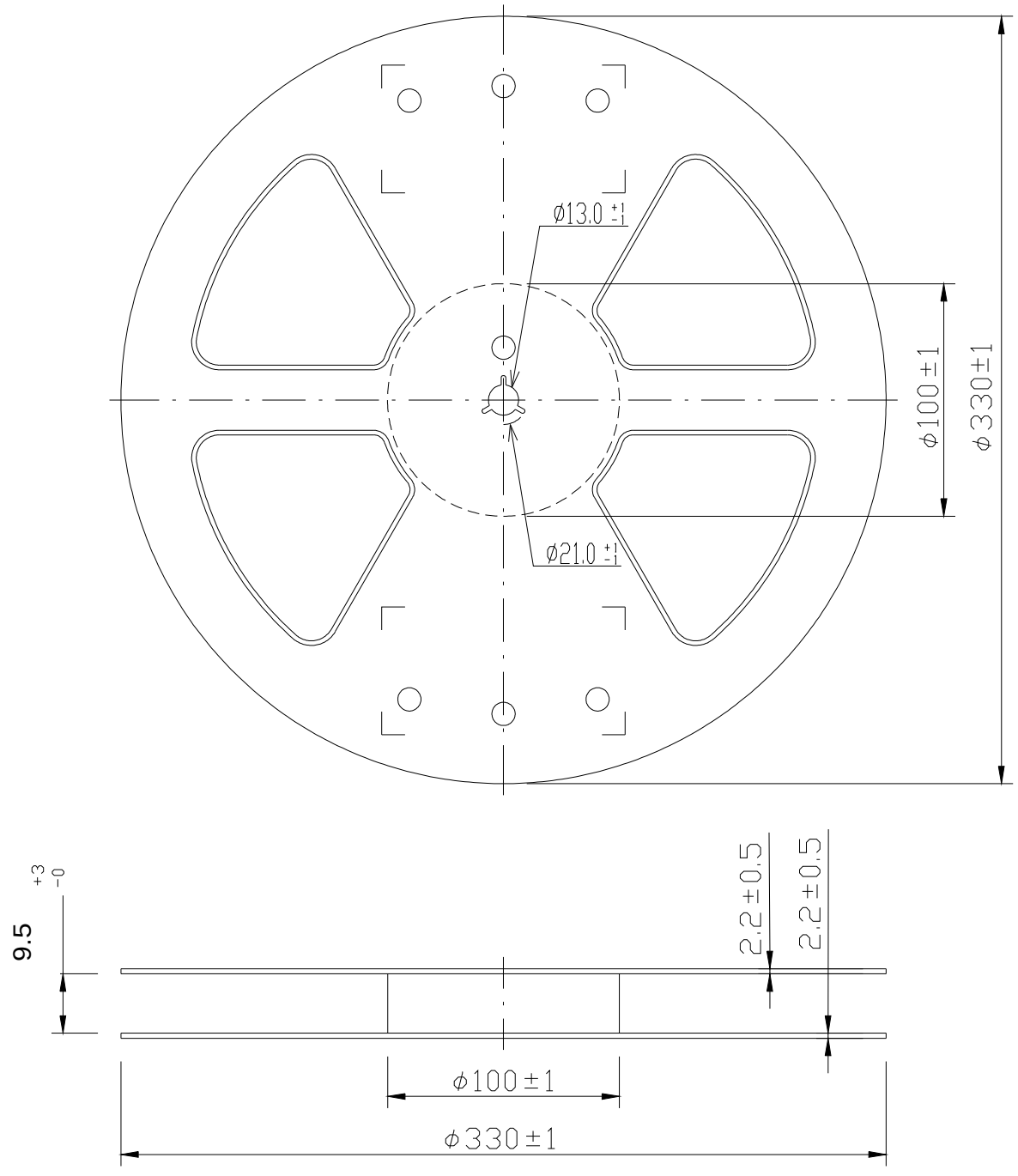
Symbol	A	B	C	D	E	F
Size	2.75±0.1	2.75±0.1	8.0±0.2	3.5±0.05	1.75±0.1	4.0±0.1

Symbol	G	H	J	K	Q	t
Size	2.0±0.05	4.0±0.1	$1.5^{+0.1}_{0}$	0.8±0.1	$1.0^{+0.1}_{0}$	0.25±0.1

Symbol	(R_1)	(R_2)	(R_3)	(θ)
Size	0.3MAX	0.3MAX	0.3MAX	5° MAX

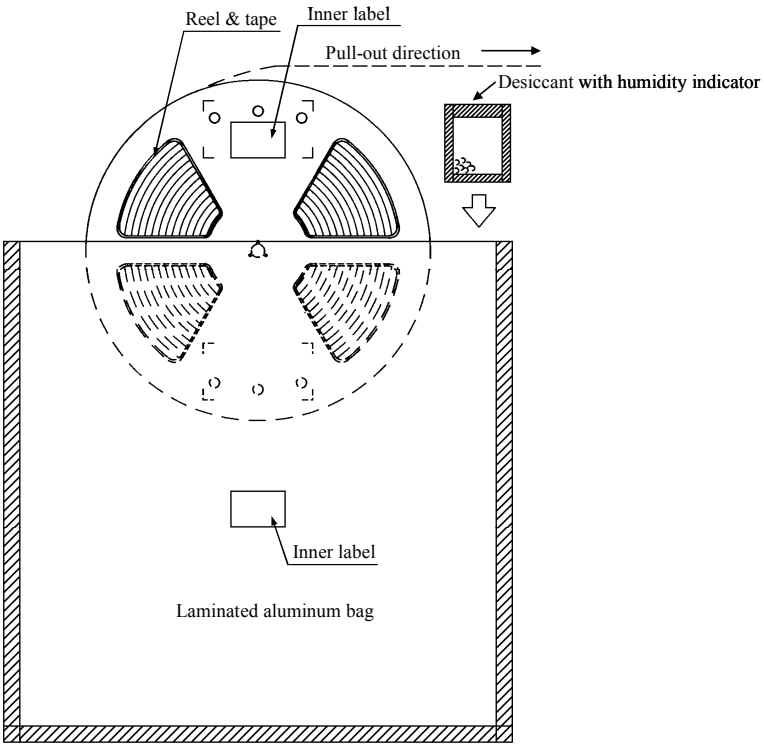
◎ R1,R2,R3, and θ are reference value

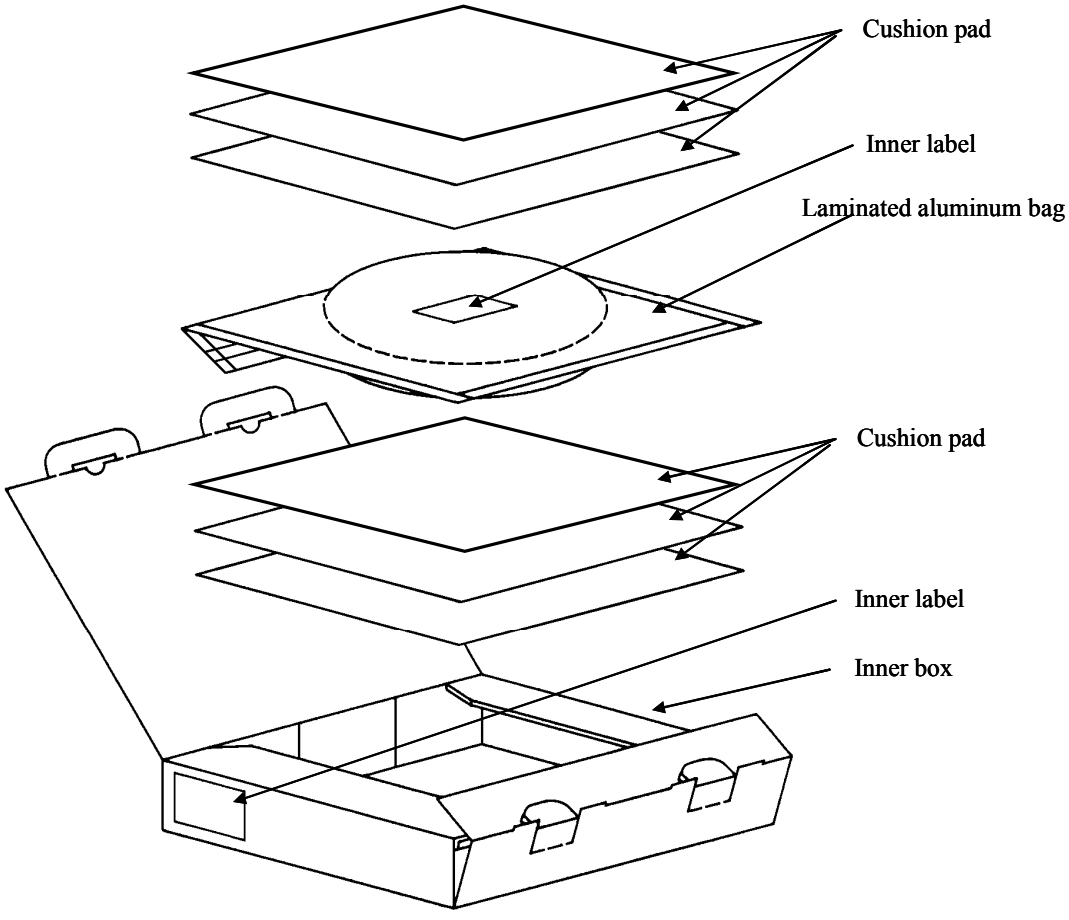
Reel structure and dimensions



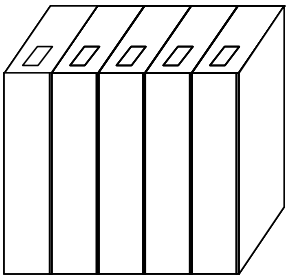
UNIT : mm

Inner packing appearance

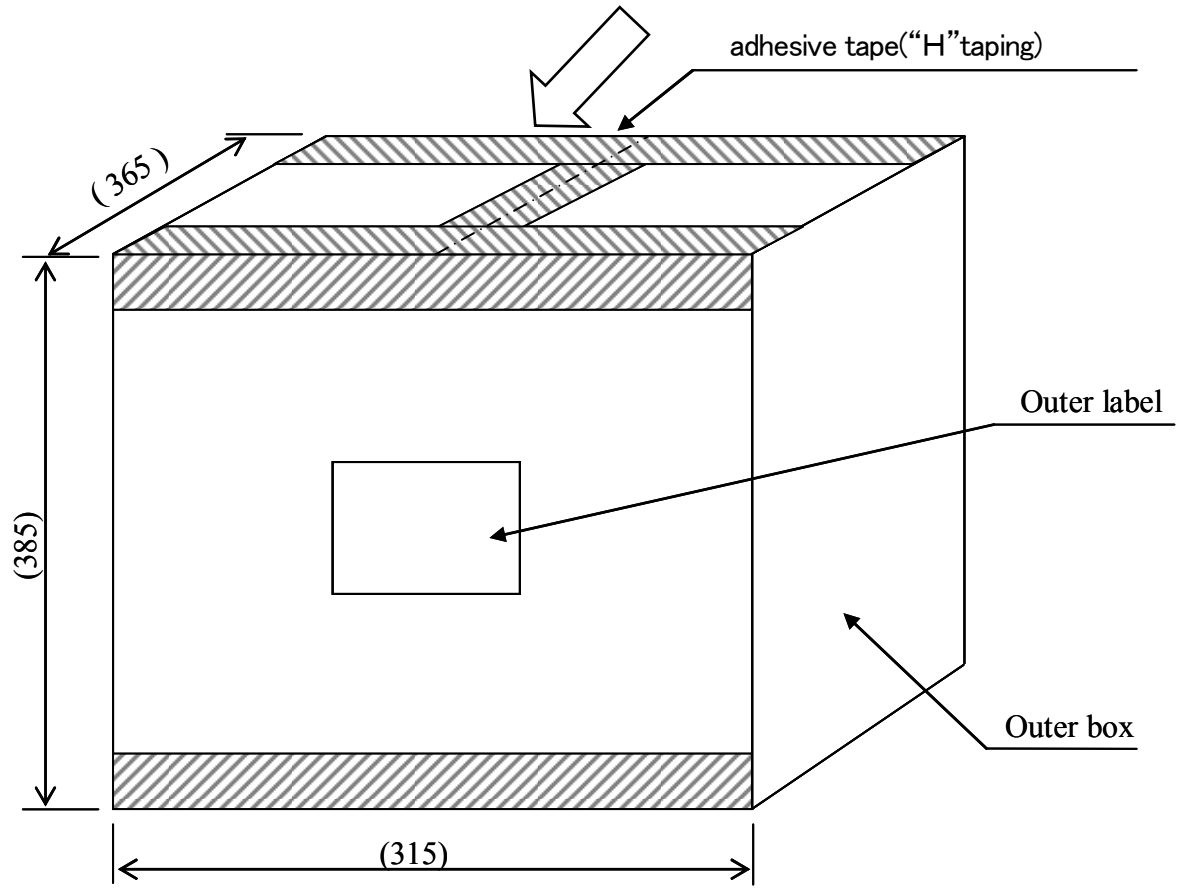




Outer packing appearance



5 rows

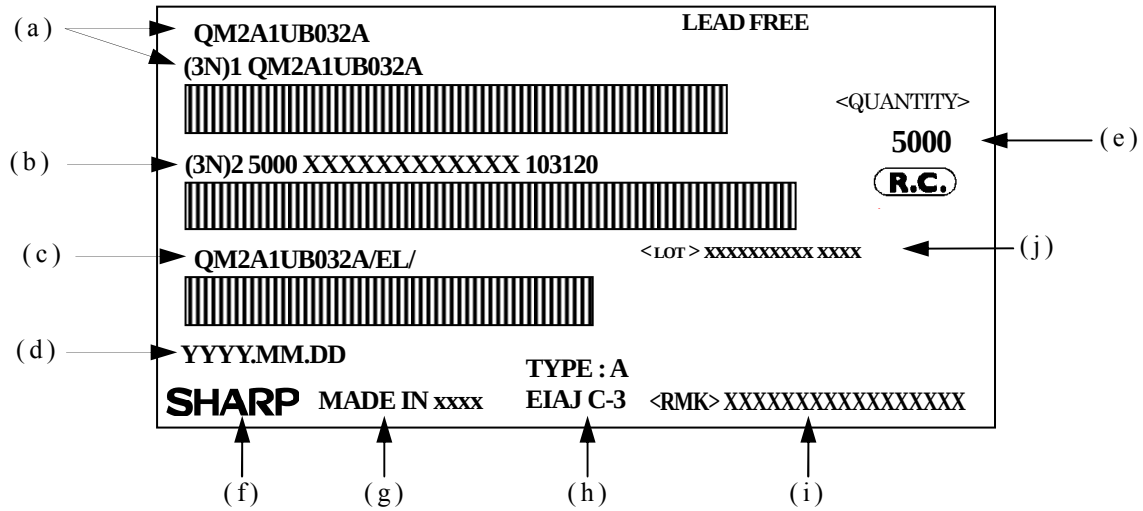


UNIT: mm
( ) : Reference value

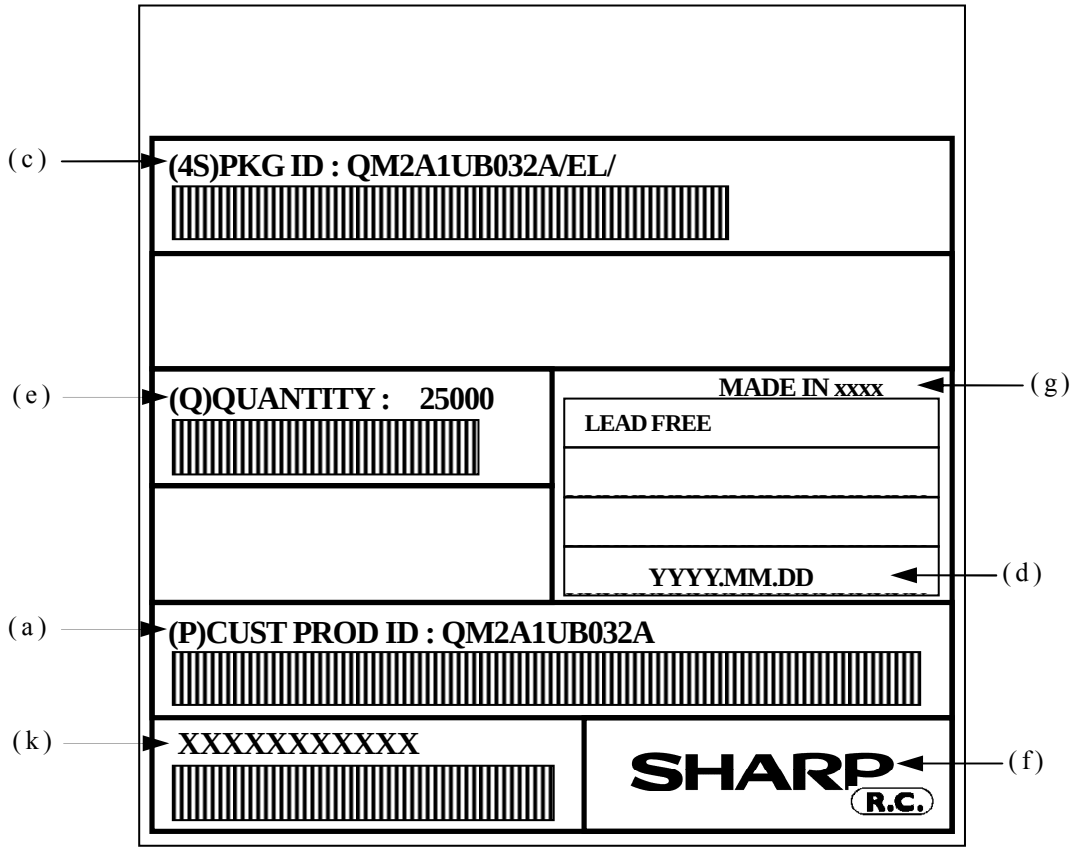
0.23 ± 0.1

Inner label and Outer label

Inner carton label



Outer carton label



NOTE : The « LEAD FREE » indicates this product is lead free articles.
"R.C." is SHARP's corporate logo which indicates RoHS compliant

(a) Model No.
(b) Quantity / PD lot / Company code
(c) SHARP internal Model No.
(d) Packed date
(e) Quantity
(f) " SHARP " Logo
(g) The country of origin
(h) Type name / Former
(i) Assemble management No.
(j) Assemble lot No. / Date code / Quantity
(k) Shipment lot No.