SPEC No.

ISSUE : April 5, 1999

To ;

SPECIFICATION (PRELIMINARY)

Product Type DIGITAL SIGNAL PROCESSOR FOR COLOR CAMERA

Model No **LR38602**

※This specification contains ** pages including the cover and appendix.
If you have any objections, please contact us before issuing purchasing order.

CUSTOMERS ACCEPTANCE

DATE:

BY:

PRESENTED

BY: Nobuo Kubo

N. KUBO
Dept. General Manager

REVIEWED BY:

PREPARED BY:

Image Device Engineering Dept. 3
SYSTEM LSI DEVELOPMENT CENTER
Integrated Circuits Group
SHARP CORPORATION

●When using the products covered herein, please observe the conditions written herein and the precautions outlined in the following paragraphs. In no event shall the company be liable for any damages resulting from failure company be liable for any damages resulting from failure to strictly adhere to these conditions and precautions.

(1) The products covered herein are designed and manufactured for the following applications areas. When using the products covered herein for the equipment listed in Paragraph (2), even for the following application areas, be sure to observe the precautions given in Paragraph (2). Never use the products for the equipment listed in Paragraph (3).

- Office electronics
- Instrumentation and measuring equipment
- Machine tools
- Audiovisual equipment
- Home appliances
- Communication equipment other than for trunk lines

(2) Those contemplating using the products covered herein for the following equipment which demands high reliability, should first contact a sales representative of the company and then accept responsibility for incorporating into the design fail-safe operation, redundancy, and other appropriate measures for ensuring reliability and safety of the equipment and the overall system.

- Control and safety devices for airplanes, trains, automobiles, and other transportation equipment
- Mainframe computers
- Traffic control systems
- Gas leak detectors and automatic cutoff devices
- Rescue and security equipment
- Other safety devices and safety equipment, etc.

(3) Do not use the products covered herein for the following equipment which demands extremely high performance in terms of functionality, reliability, or accuracy.

- Aerospace equipment
- Communications equipment for trunk lines
- Control equipment for the nuclear power industry
- Medical equipment related to life support, etc.

(4) Please direct all queries and comments regarding the interpretation of the above three Paragraphs to a sales representative of the company.

●Please direct all queries regarding the products covered herein to a sales representative of the company.

CONTENTS

1. GENERAL

This is the digital signal processor for color USB camera system of 350K pixels CCD or CMOS imager with the primary color filter. This camera system can transfer images which is 30 frame/sec with VGA resolution through USB interface to PC.

	IMAGER	CDS/AGC/AD	V DRIVER	MICON	DSP
TYPE 1	CCD LZ24BP	IR3Y38M	LR36685	LU831603	LR38602
TYPE 2	CCD LZ24BP	IR3Y48M	LR36685	LU831603	LR38602
TYPE 3	CMOS LZ34B10	-	-	LU831603	LR38602
TYPE 4	CMOS LZ34C10	-	-	LU831603	LR38602

1-1. FEATURES

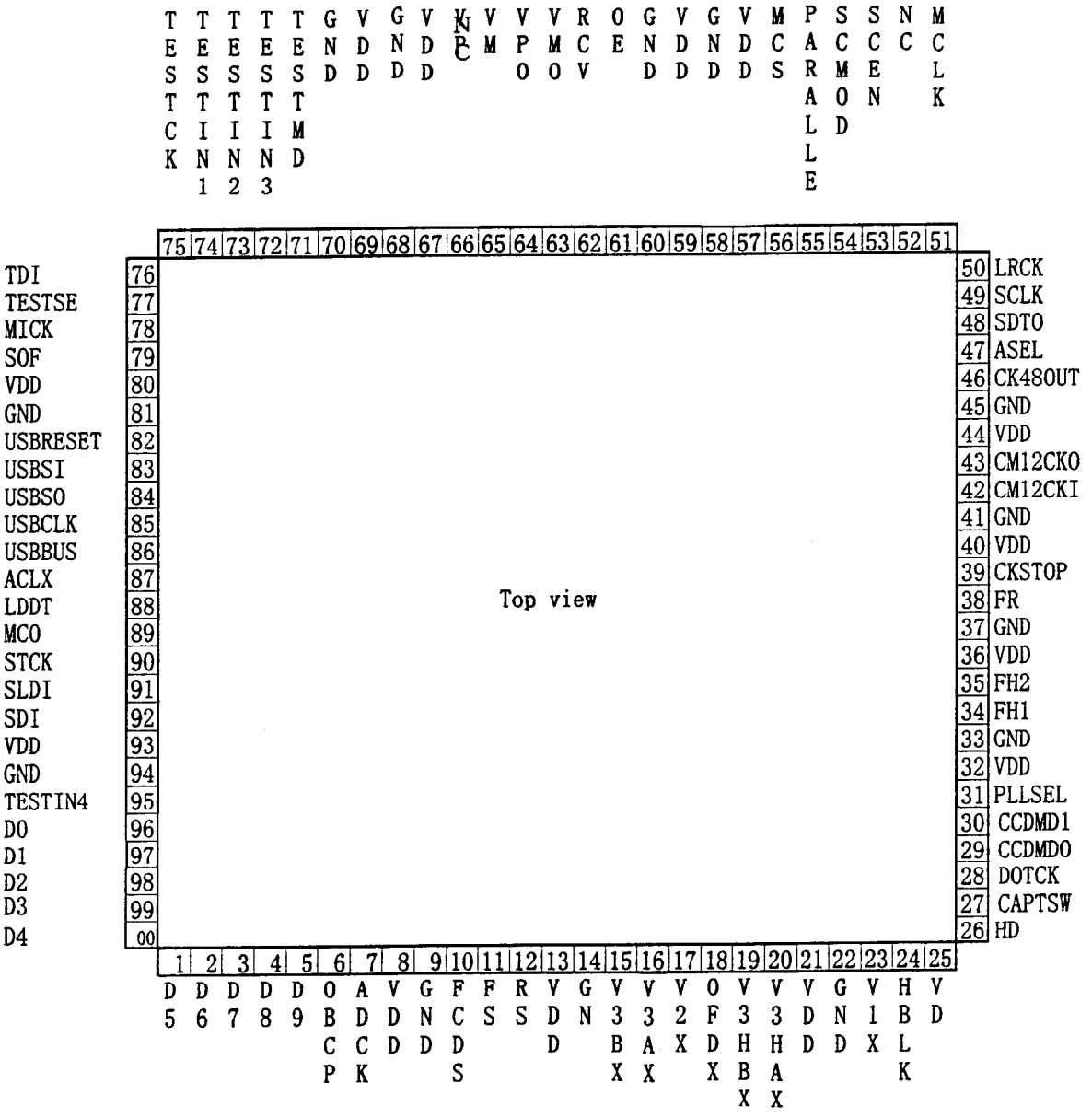
- The process (structure) is CMOS.
- A P-type silicon circuit board is used.
- The package type is 100-pin QFP.
- The package material is plastic.
- Not designed or rated as radiation hardened.

1-2. FUNCTIONS

- Single +3.3V power supply
- Available for either 350K CCD or 350K CMOS imager, with R,G and B color filter
- Available for YUV digital output
- Built-in JPEG encorder
- Built-in USB interface
- Built-in Mirror image function
- Built-in Pan, Tilt function
- Auto Exposure control by external micom.
- Auto White Balance control by external micom.
- Built-in Auto Carrier Balance control
- 10 bits digital input
- External control interface Input / Output

2. PIN ASSIGNMENT

2-1. PIN ASSIGNMENT



2-2. Pin table

PIN	SYMBOL	I/O
1	D5	IBFC
2	D6	IBFC
3	D7	IBFC
4	D8	IBFC
5	D9	IBFC
6	OBCP	OBF2MA
7	ADCK	OBF6MA
8	VDD	-
9	GND	-
10	FCDS	OBF6MA
11	FS	OBF6MA
12	RS	OBF6MA
13	VDD	-
14	GND	-
15	V3BX	OBF2MA
16	V3AX	OBF2MA
17	V2X	OBF2MA
18	OFDX	OBF2MA
19	V3HBX	OBF2MA
20	V3HAX	OBF2MA
21	VDD	-
22	GND	-
23	V1X	OBF2MA
24	HBLK	OBF2MA
25	VD	OBF2MA

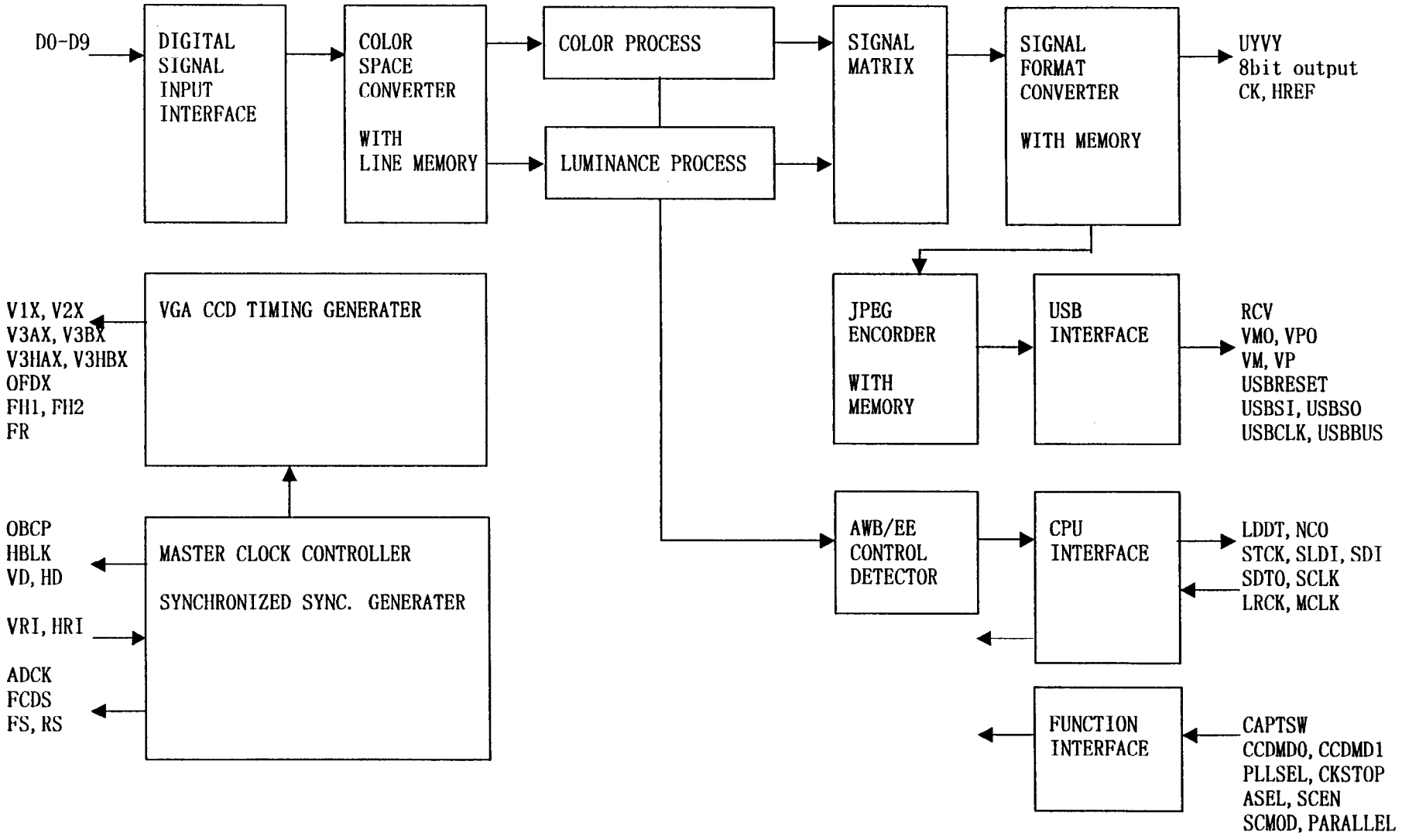
PIN	SYMBOL	I/O
26	HD	OBF2MA
27	CAPTSW	IBFC
28	DOTCK	IBFC
29	CCDMD0	IBFC
30	CCDMD1	IBFC
31	PLLSEL	IBFC
32	VDD	-
33	GND	-
34	FH1	OBF12MA
35	FH2	OBF12MA
36	VDD	-
37	GND	-
38	FR	OBF12MA
39	CKSTOP	IBFC
40	VDD	-
41	GND	-
42	CM12CKI	IBF0A
43	CM12CKO	OSCX
44	VDD	-
45	GND	-
46	CK48OUT	OBF2MA
47	ASEL	IOBFC2MAU1
48	SDTO	IOBFC2MAU1
49	SCLK	OBF2MA
50	LRCK	OBF2MA

PIN	SYMBOL	I/O
51	MCLK	OBF2MA
52	NC	-
53	SCEN	IBFC
54	SCMOD	IBFC
55	PARALEL	IBFC
56	MCS	IBFC
57	VDD	-
58	GND	-
59	VDD	-
60	GND	-
61	OE	OBF2MA
62	RCV	IBFC
63	VMO	OBF2MA
64	VPO	OBF2MA
65	VM	OBF2MA
66	VP	OBF2MA
67	VDD	-
68	GND	-
69	VDD	-
70	GND	-
71	TESTMD	IBFC
72	TESTIN3	IBFC
73	TESTIN2	IBFC
74	TESTIN1	IBFC
75	TESTCK	IBFC

PIN	SYMBOL	I/O
76	TDI	IBFC
77	TESTSET	IBFC
78	MICK	OBF2MA
79	SOF	OBF2MA
80	VDD	-
81	GND	-
82	USBRESET	OBF2MA
83	USBSI	OBF2MA
84	USBSO	OBF2MA
85	USBCLK	IOBFC2MA
86	USBBUS	OBF2MA
87	ACLX	IBFC
88	LDDT	OBF2MA
89	MCO	OBF2MA
90	STCK	IOBFC2MA
91	SLDI	IOBFC2MA
92	SDI	IBFC
93	VDD	-
94	GND	-
95	TESTIN4	IBFC
96	D0	IBFC
97	D1	IBFC
98	D2	IBFC
99	D3	IBFC
100	D4	IBFC

IC : Input pin under the condition of CMOS 3.3 V
ICU : Input pin under the condition of CMOS 3.3 V with a pull-up register
ICD : Input pin under the condition of CMOS 3.3 V with a pull-down register
ICS : Input pin under the condition of Schmidt 3.3 V with a pull-down register

O : Output pin with 2 mA 3.3 V
TO : Tri-state output pin with 2 mA 3.3 V
XTO : Tri-state output pin with 2 mA 3.3 V


D0-D9
DIGITAL SIGNAL INPUT INTERFACE
COLOR SPACE CONVERTER
WITH LINE MEMORY
COLOR PROCESS
LUMINANCE PROCESS
SIGNAL MATRIX
SIGNAL FORMAT CONVERTER
WITH MEMORY
UYVY
8bit output
CK, HREF
V1X, V2X
V3AX, V3BX
V3HAX, V3HBX
OFDX
FH1, FH2
FR
VGA CCD TIMING GENERATER
JPEG ENCORDER
WITH MEMORY
USB INTERFACE
RCV
VM0, VP0
VM, VP
USBRESET
USBSI, USBSO
USBCLK, USBBUS
OBCP
HBLK
VD, HD
VRI, HRI
ADCK
FCDS
FS, RS
MASTER CLOCK CONTROLLER
SYNCHRONIZED SYNC. GENERATER
AWB/EE CONTROL DETECTOR
CPU INTERFACE
LDDT, NCO
STCK, SLDI, SDI
SDTO, SCLK
LRCK, MCLK
FUNCTION INTERFACE
CAPTSW
CCDMD0, CCDMD1
PLLSEL, CKSTOP
ASEL, SCEN
SCMOD, PARALLEL

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4. PIN DESCRIPTION

NO.	SYMBOL	I/O	FUNCTION
1	D5	I	Digital signal inputs. D9 is MSB.
2	D6	I	
3	D7	I	
4	D8	I	
5	D9	I	
6	OBCP	O	Optical black clamp pulse output
7	ADCK	O	AD converter clock pulse output to IR3Y38M/IR3Y48M
8	VDD	I	+3.3V input
9	GND	-	Ground
10	FCDS	O	Clamping pulse output for CDS of IR3Y38M/IR3Y48M
11	FS	O	Samping pulse output for CDS of IR3Y38M/IR3Y48M
12	RS	O	Samping pulse output for CDS of IR3Y38M/IR3Y48M
13	VDD	I	+3.3V input
14	GND	-	Ground
15	V3BX	O	Vertical transfer pulse output to LR36685
16	V3AX	O	Vertical transfer pulse output to LR36685
17	V2X	O	Vertical transfer pulse output to LR36685
18	OFDX	O	Vertical transfer pulse output to LR36685
19	V3HBX	O	Vertical transfer pulse output to LR36685
20	V3HAX	O	Vertical transfer pulse output to LR36685
21	VDD	I	+3.3V input
22	GND	-	Ground
23	V1X	O	Vertical transfer pulse output to LR36685
24	HBLK	O	Horizontal blanking pulse output.
25	VD	O	Vertical blanking pulse output.
26	HD	O	Horizontal drive pulse output
27	CAPTSW	I	Snap-shot mode control L:Motion image H:Snap-shot (Still image capture)
28	DOTCK	O	Clock input from CMOS imager LZ34B10/LZ34C10 LZ34B10:12MHz LZ34C10:9MHz
29	CCDMD0	I	Imager choice
30	CCDMD1	I	
31	PLLSEL	I	Built-in PLL choice
32	VDD	I	+3.3V input
33	GND	-	Ground

	PIN 29=L	PIN29=H
PIN30=L	LZ24BP	LZ34C10
PIN30=H	PROHIBITED	LZ34B10

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NO.	SYMBOL	I/O	FUNCTION
34	FH1	O	Horizontal transfer pulse output to LZ24BP
35	FH2	O	Horizontal transfer pulse output to LZ24BP
36	VDD	I	+3.3V input
37	GND	-	Ground
38	FR	O	Horizontal reset pulse output to LZ24BP
39	CKSTOP	I	Clock oscillator control for the suspended mode
40	VDD	I	+3.3V input
41	GND	-	Ground
42	CM12CKI	I	Clock input PIN31=L:12MHz PIN31=H:48MHz
43	CM12CKO	O	Clock output PIN31=L:12MHz PIN31=H:48MHz
44	VDD	I	+3.3V input
45	GND	-	Ground
46	CK480UT	O	Not used
47	ASEL	I/O	Audio function L:Available H:Not available
48	SDTO	I/O	Serial audio signal data input
49	SCLK	O	Clock output of serial audio signal data (750KHz)
50	LRCK	O	Audio signal sampling pulse output (11.71KHz)
51	MCLK	O	Audio main clock output (3MHz)
52	NC	-	Non connection
53	SCEN	I	Test input. Connected to Ground
54	SCMOD	I	Test input. Connected to Ground
55	PARALLEL	I	Output mode L:USB H:8bit parallel(See PAGE 8)
56	MCS	I	Hand-shake signal with CPU in USB
57	VDD	I	+3.3V input
58	GND	-	Ground
59	VDD	I	+3.3V input
60	GND	-	Ground
61	OE	O	Output enable pulse output in USB
62	RCV	I	USB data input
63	VMO	O	D- output in USB
64	VPO	O	D+ output in USB
65	VM	I	D- input in USB
66	VP	I	D+ input in USB
67	VDD	I	+3.3 V input
68	GND	-	Ground
69	VDD	I	+3.3 V input
70	GND	-	Ground

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NO.	SYMBOL	I/O	FUNCTION
71	TESTMD	I	Test input. Connected to Ground
72	TESTIN3	I	Test input. Connected to Ground
73	TESTIN2	I	DBURST2 input
74	TESTIN1	I	Test input. Connected to Ground
75	TESTCK	I	Test input. Connected to Ground
76	TDI	I	Test input. Connected to Ground
77	TESTSET	I	Test input. Connected to Ground
78	MICK	O	Clock output to CPU (4.8MHz)
79	SOF	O	Frame start signal in USB
80	VDD	I	+3.3V input
81	GND	-	Ground
82	USBRESET	I	Reset input in USB
83	USBSI	I	Serial control data input in USB
84	USBSO	O	Serial control data output in USB
85	USBCLK	I	Serial clock input in USB
86	USBBUS	O	Busy signal output in USB
87	ACLX	I	Reset input
88	LDDT	O	Serial data output for AWB/EE control
89	MCO	O	Serial data ready output
90	STCK	I/O	Serial clock input for register
91	SLDI	—	Serial strobe input for register
92	SDI	I	Serial data input for register
93	VDD	I	+3.3V input
94	GND	-	Ground
95	TESTIN4	I	Test input. Connected to Ground
96	D0	I	Digital data inputs D0:LSB
97	D1	I	
98	D2	I	
99	D3	I	
100	D4	I	

8 bit parallel output at PIN 55=HIGH

PIN 47	UYVY bit 0	PIN 83	UYVY bit 6
PIN 48	UYVY bit 1	PIN 84	UYVY bit 7
PIN 49	UYVY bit 2	PIN 86	Pixel clock output
PIN 50	UYVY bit 3	PIN 85	ID pulse for effective pixels
PIN 51	UYVY bit 4		
PIN 82	UYVY bit 5		

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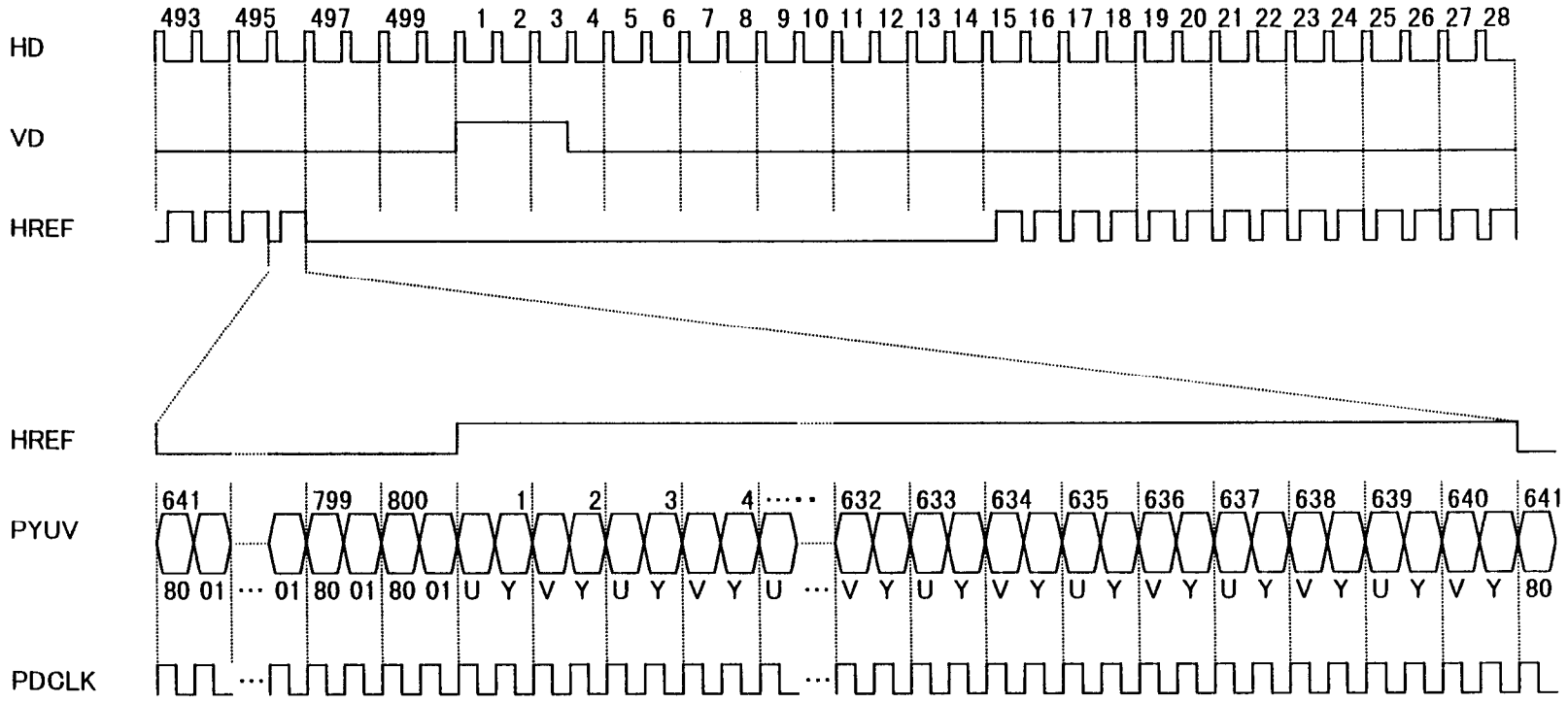
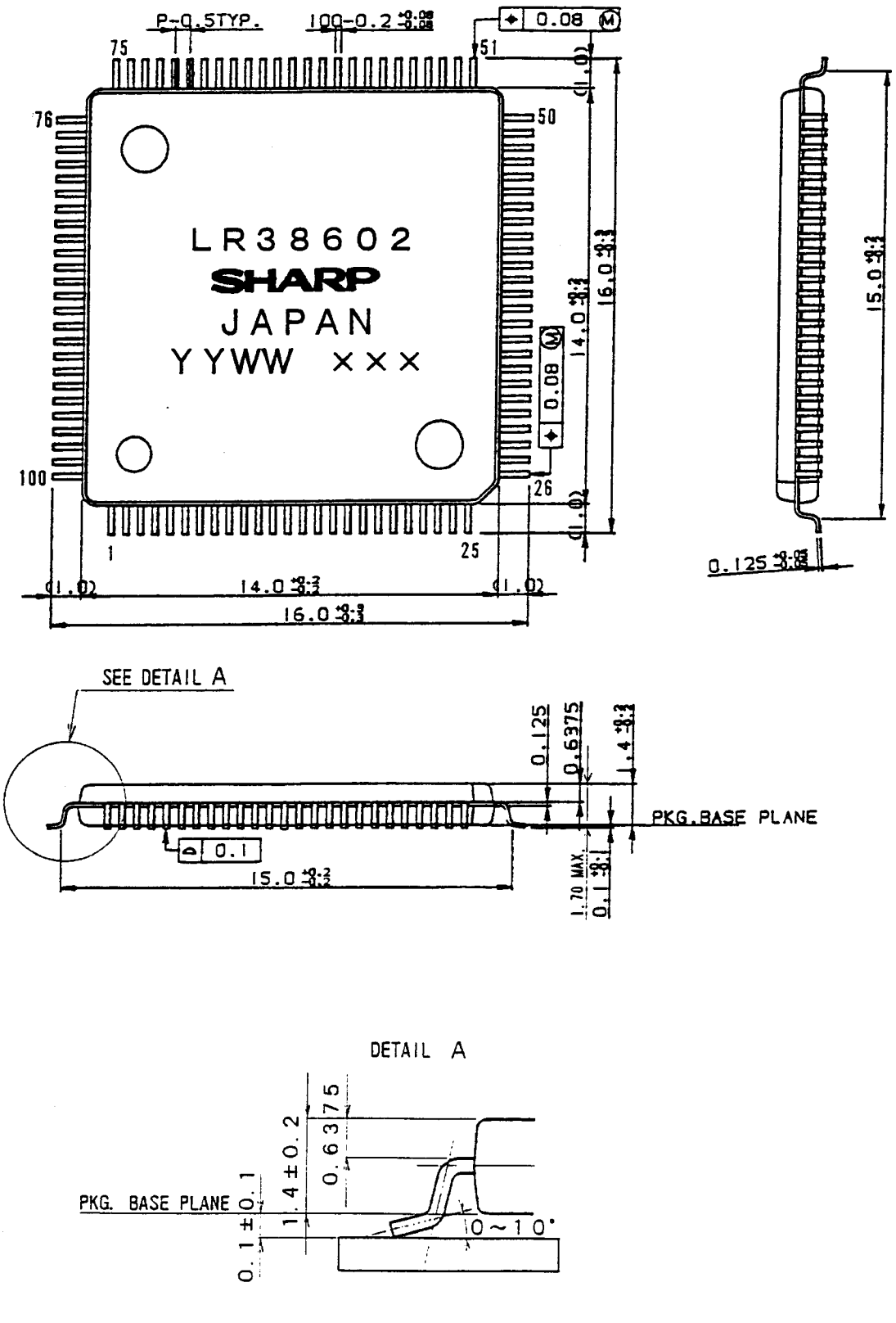
Digital Output Format





名称 NAME	LQFP100-P-1414	リード仕上 LEAD FINISH	TIN-LEAD PLATING	備考 プラスチックパッケージ外形寸法は、バリを含まないものとする。 NOTE Plastic body dimensions do not include burr of resin.
DRAWING NO.	AA1058	単位 UNIT	mm	

9 Package and packing specification

1. Package Outline Specification

Refer to drawing No.AA1058

2. Markings

2－1. Marking contents

(1) Product name : LR38602

(2) Company name : SHARP

(3) Date code

(Example) YY WW ×××

- YY → Denotes the production year. (Lower two digits of the year.)
- WW → Denotes the production week. (01,02,03,・・・・・52,53)
- ××× → Denotes the production ref.code (1-3)

Indicates the product was manufactured in the WWth week of 19YY.

(4) The marking of "JAPAN" indicates the country of origin.

2－2. Marking layout

Refer to drawing No.AA1058

(This layout does not define the dimensions of marking character and marking position.)

3. Packing Specification (Dry packing for surface mount packages)

Dry packing is used for the purpose of maintaining IC quality after mounting packages on the PCB (Printed Circuit Board).

When the epoxy resin which is used for plastic packages is stored at high humidity, it may absorb 0.15% or more of its weight in moisture. If the surface mount type package for a relatively large chip absorbs a large amount of moisture between the epoxy resin and insert material (e.g. chip, lead frame) this moisture may suddenly vaporize into steam when the entire package is heated during the soldering process (e.g. VPS). This causes expansion and results in separation between the resin and insert material, and sometimes cracking of the package. This dry packing is designed to prevent the above problem from occurring in surface mount packages.

3－1. Packing Materials

Material Name	Material Specificaiton	Purpose
Tray	Conductive plastic (60devices/tray)	Fixing of device
Upper cover tray	Conductive plastic (1tray/case)	Fixing of device
Laminated aluminum bag	Aluminum polyethylene (1bag/case)	Drying of device
Desiccant	Silica gel	Drying of device
P P band	Polypropylene (3pcs/case)	Fixing of tray
Inner case	Card board (600devices/case)	Packaging of device
Label	Paper	Indicates part number, quantity and date of manufacture
Outer case	Card board	Outer packing of tray

(Devices shall be placed into a tray in the same direction.)

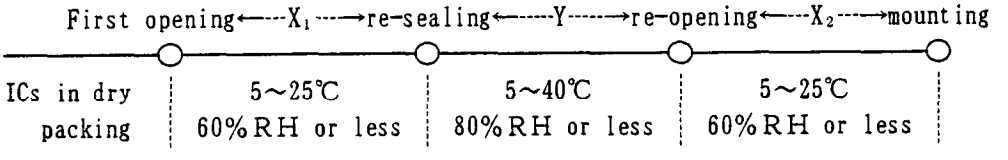
3－2. Outline dimension of tray
Refer to attached drawing.

4. Storage and Opening of Dry Packing

4－1. Store under conditions shown below before opening the dry packing
(1) Temperature range : 5～40℃
(2) Humidity : 80% RH or less

4－2. Notes on opening the dry packing
(1) Before opening the dry packing, prepare a working table which is grounded against ESD and use a grounding strap.
(2) The tray has been treated to be conductive or anti-static. If the device is transferred to another tray, use a equivalent tray.

4－3. Storage after opening the dry packing
Perform the following to prevent absorption of moisture after opening.
(1) After opening the dry packing, store the ICs in an environment with a temperature of 5～25℃ and a relative humidity of 60% or less and mount ICs within 4 days after opening dry packing.
(2) To re-store the ICs for an extended period of time within 4 days after opening the dry packing, use a dry box or re-seal the ICs in the dry packing with desiccant (whoes indicater is blue), and store in an environment with a temperature of 5～40℃ and a relative humidity of 80% or less, and mount ICs within 2 weeks.
(3) Total period of storage after first opening and re-opening is within 4 days, and store the ICs in the same environment as section 4-3.(1).



$X_1 + X_2$: within 4 days
Y : within 2 weeks

4－4. Baking (drying) before mounting
(1) Baking is necessary
(A) If the humidity indicator in the desiccant becomes pink
(B) If the procedure in section 4－3 could not be performed
(2) Recommended baking conditions
If the above conditions (A) and (B) are applicable, bake it before mounting. The recommended conditions are 16～24 hours at 120℃.
Heat resistance tray is used for shipping tray.
(3) Storage after baking
After baking ICs, store the ICs in the same environment as section 4-3.(1).

5. Surface Mount Conditions

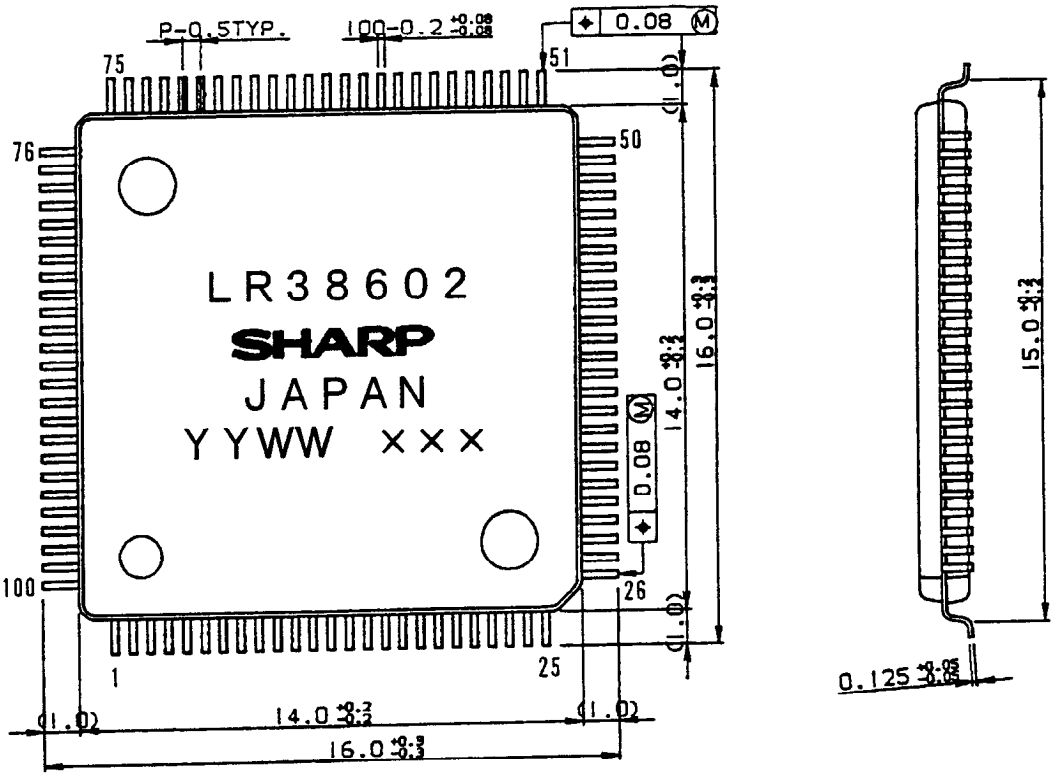
Please perform the following conditions when mounting ICs not to deteriorate IC quality.

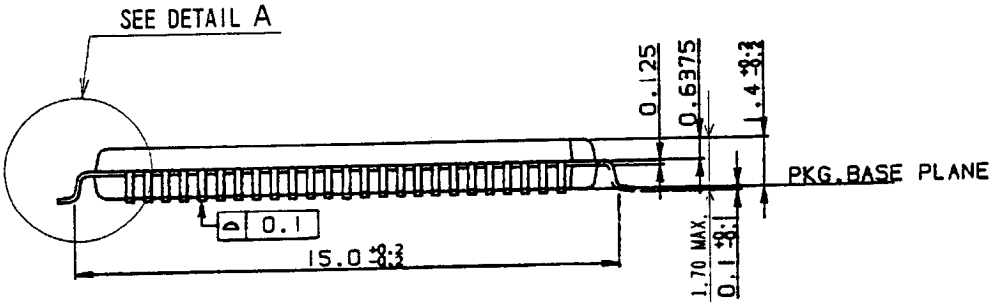
5－1.Soldering conditions(The following conditions are valid only for one time soldering.)

Mounting Method	Temperature and Duration	Measurement Point
Reflow soldering (air)	Peak temperature of 230℃ or less, duration of less than 15 seconds. 200℃ or over,duration of less than 40 seconds. Temperature increase rate of 1～4℃/second.	IC package surface
Vapor phase soldering	215℃ or less, duration of less than 40 seconds above 200℃	Steam
Manual soldering (soldering iron)	260℃ or less, duration of less than 10 seconds	IC outer lead surface

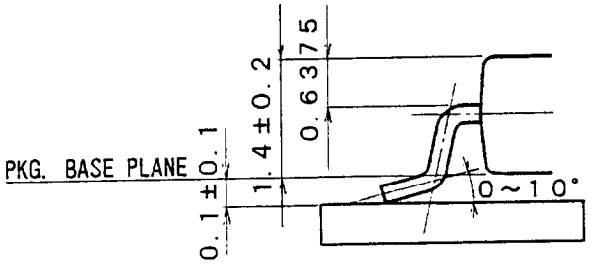
5－2. Conditions for removal of residual flux

(1) Ultrasonic washing power : 25 Watts/liter or less
(2) Washing time : Total 1 minute maximum
(3) Solvent temperature : 15～40℃

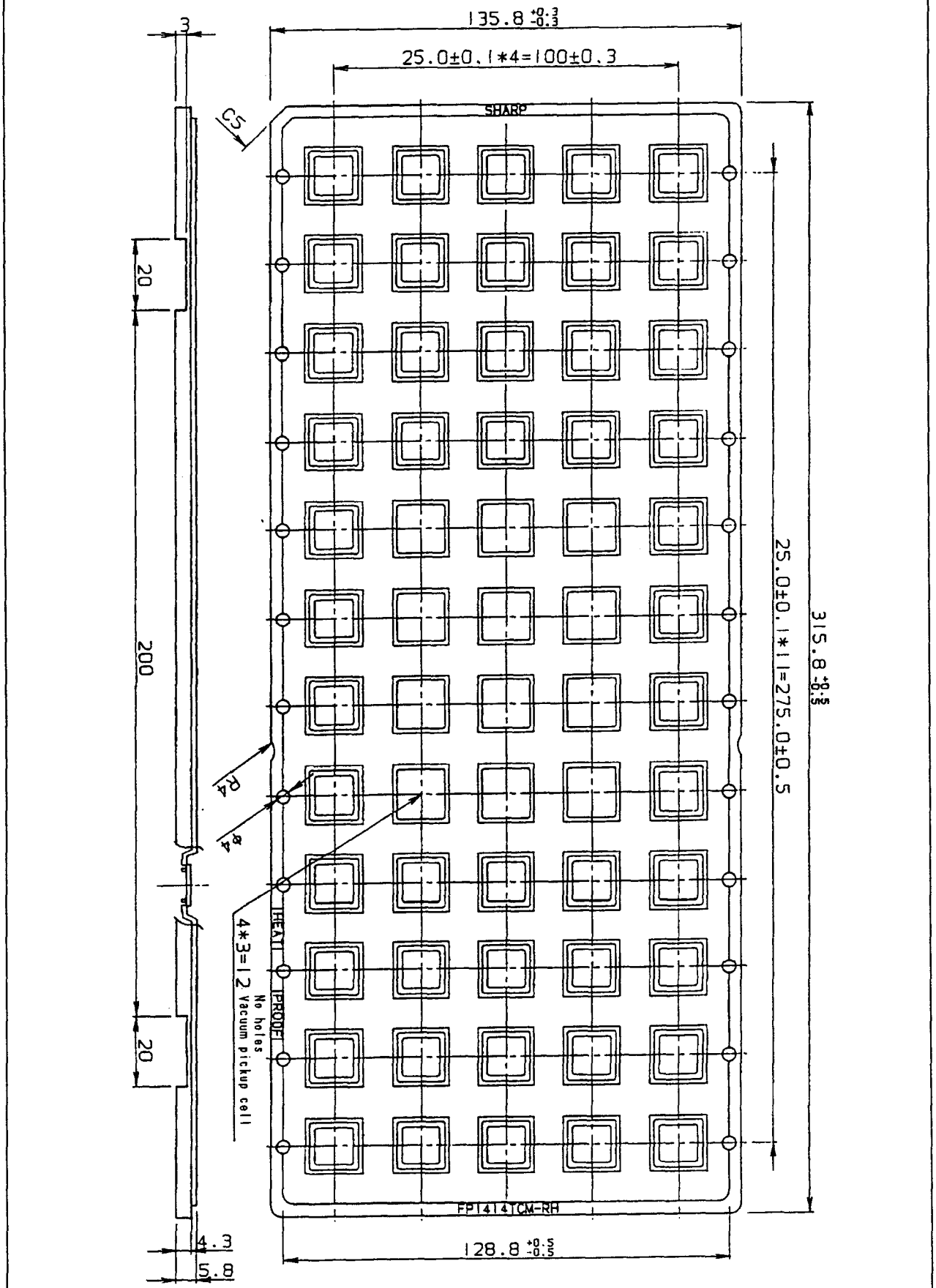




DETAIL A



名称 NAME	LQFP100-P-1414	リード仕上 LEAD FINISH	TIN-LEAD PLATING	備考 NOTE プラスチックパッケージ外形寸法は、バリを含まないものとする。 Plastic body dimensions do not include burr of resin.
DRAWING NO.	AA1058	単位 UNIT	mm	



名称 NAME	FP1414TCM−RH	備考 NOTE
DRAWING NO.	CV557	
単位 UNIT	mm	

《Supplementary data》

LR38602 Recommended mounting conditions for two time reflow soldering .	
Product name(Package)	LR38602(LQFP100-P-1414)
Packing specification	Tray (Dry packing)
Mounting method	Reflow soldering (Air)
Reflow soldering conditions	Peak temperature of 230℃ or less. 200℃ or over, duration of less than 40 seconds. Preheat temperature of 125～150℃, duration of less than 180 seconds. Temperature increase rate of 1～4℃/second.
Measurement point	IC package surface
Storage conditions	After opening the dry packing, store the ICs in an environment with a temperature of 5～25℃ and a relative humidity of 60% or less. If doing reflow soldering twice, do the first reflow soldering within 36 hours after opening dry packing and do the second reflow soldering within 36 hours after the first reflow soldering.
Note	If the above storage conditions are not applicable, bake it before reflow soldering. The recommended conditions are 16~24 hours at 120℃. (Heat resistance tray is used for shipping tray.)

Recommended Reflow Soldering(Air) Temperature Profile