

SHARP



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OPTO-ANALOG DEVICES DIVISION
ELECTRONIC COMPONENTS GROUP
SHARP CORPORATION

SPECIFICATION

DEVICE SPECIFICATION FOR

VOLTAGE REGULATOR

MODEL No.

PQ1DX095MZPQ

Specified for

Enclosed please find copies of the Specifications which consists of 16 pages including cover.
This specification sheets and attached sheets shall be both side copy.
After confirmation of the contents, please be sure to send back copies of the Specifications
with approving signature on each.

CUSTOMER'S APPROVAL

PRESENTED

DATE

DATE

June 13, 2007

BY

BY

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SHARP CORPORATION

Product name : VOLTAGE REGULATOR

Model No. : PQ1DX095MZPO

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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) 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 (2) or (3), please be sure to observe the precautions given in those respective paragraphs.
 - (2) 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
 - (3) 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
 - (4) 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.

1. Application

This specification applies to the outline and characteristics of series regulator (linear type),
Model No. PQ1DX095MZPQ.

Usage

PQ1DX095MZPQ is the sink/source type device stabilizing of the DC positive voltage output with the built-in over current protection function, the over heat protection function and the reference voltage output function , and capable of supplying up to 0.8A as the DDR2-SDRAM termination voltage source.

Block diagram --- (Specified on page 4/15)

2. Outline --- (Specified on page 5/15)

3. Ratings and characteristics --- (Specified on page 6/15 through 7/15)

3-1 Absolute maximum ratings

3-2 Recommended operation input voltage

3-3 Electrical characteristics

3-4 Electrical characteristics measurement circuit

4. Reliability --- (Specified on page 8/15)

5. Outgoing inspection --- (Specified on page 9/15)

6. Supplement --- (Specified on page 9/15 through 12/15)

6-1 Example of usage:

6-2 Taping package

6-3 About Ozone depleting substances

1 This product does not contain the following substances.

2 This product does not use the following substances in the production process.

Restricted substances: CFCs, Halon, Carbon tetrachloride, 1,1,1-Trichloroethane (Methyl chloroform)

6-4 Compliance with each regulation

6-4-1 The RoHS directive(2002/95/EC)

This product complies with the RoHS directive(2002/95/EC).

Object substances: mercury, lead, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE)

6-4-2 Content of six substances specified in Management Methods for Control of Pollution Caused by Electronic formation Products Regulation (Chinese : 电子信息产品污染控制管理办法).

Category	Toxic and hazardous substances					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent chromium (Cr ⁶⁺)	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
Voltage regulator	✓	✓	✓	✓	✓	✓

✓ : 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 standard.

6-5 Specified brominated flame retardants

Specified brominated flame retardants (PBB and PBDE) are not used in this device at all.

6-6 About irradiation

This product is not designed as electromagnetic and ionized-particle radiation resistant.

7. Note for use --- (Specified on page 13/15 through 15/15)

7-1 External connection

7-2 Thermal protection designing and termination output current

7-3 VDDQ pin

7-4 V_{ref} pin

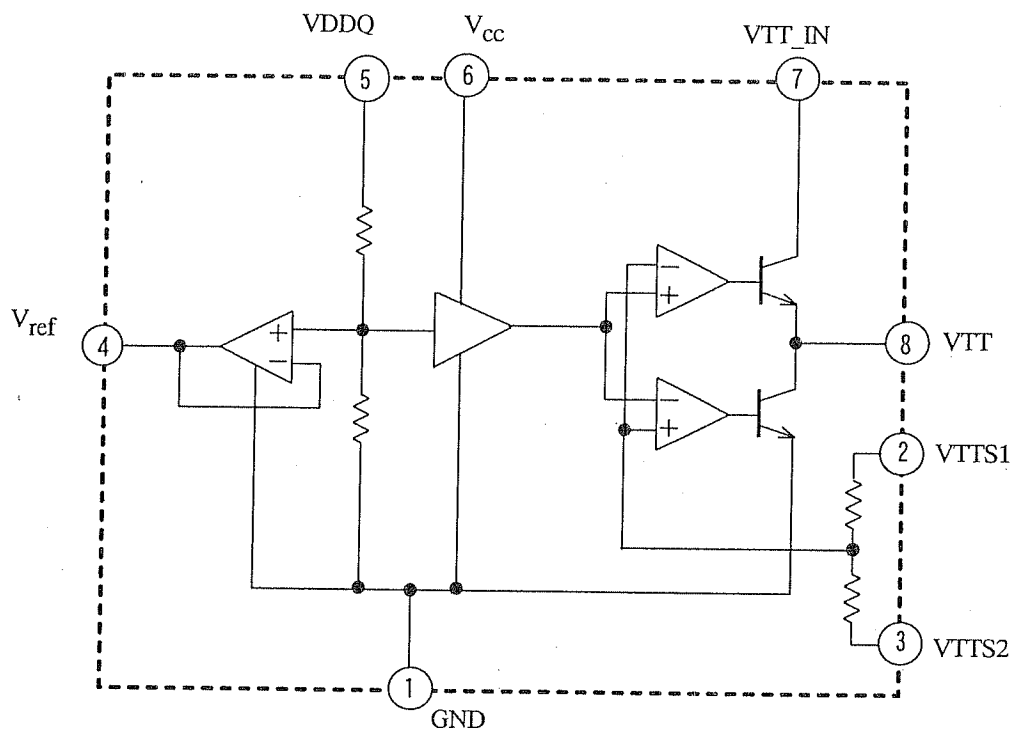
7-5 Sensing pin

7-6 Electro static discharge

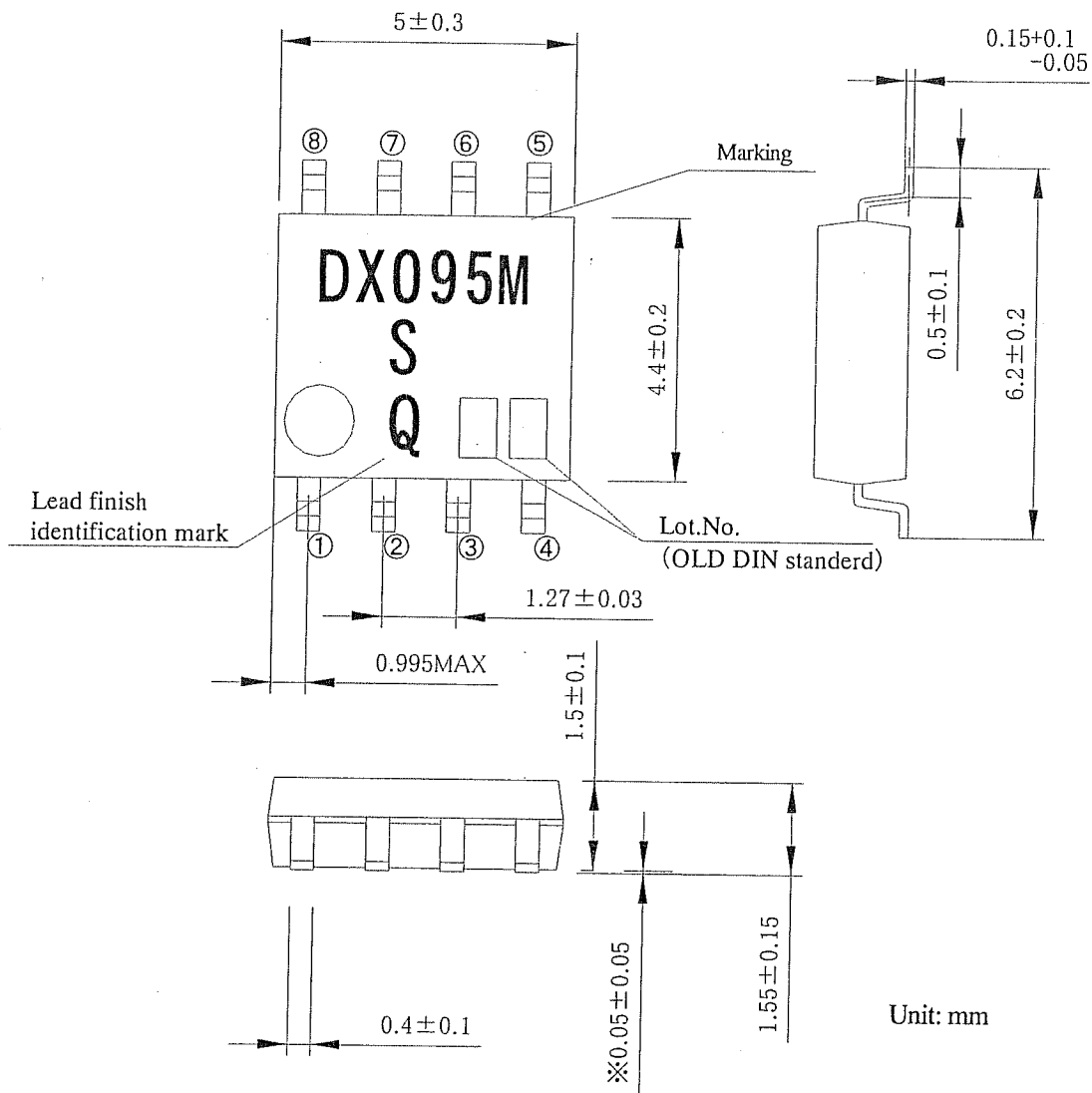
7-7 Soldering

7-8 Cleaning

1. PQ1DX095MZPQ Block diagram



2. Outline



Unit: mm

- ① GND
- ② VTT_S1
- ③ VTT_S2
- ④ V_{ref}
- ⑤ VDDQ
- ⑥ V_{cc}
- ⑦ VTT_IN
- ⑧ VTT

Lead finish : Lead-free solder plating
(Composition: Sn-2Bi)

Lead material : Cu

Product mass : (0.08g)

3. Ratings and characteristics

3-1 Absolute maximum ratings

Ta = 25 °C

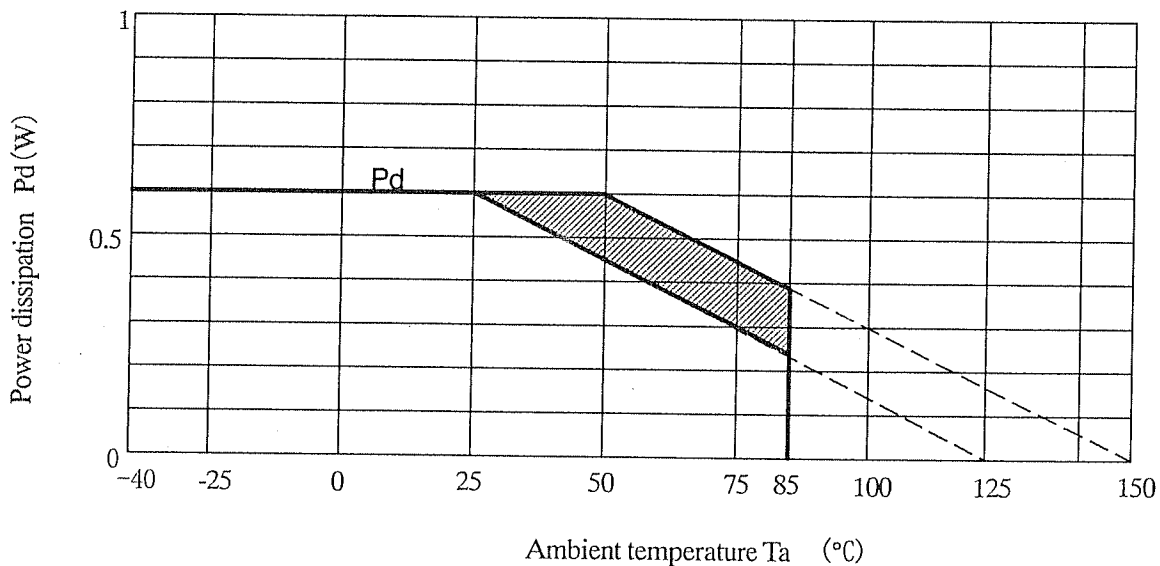
Parameter	Symbol	Rating	Unit	Conditions
Input voltage (*1)	V _{cc}	6	V	
Termination input voltage (*1)	VTT_IN	6	V	
VDDQ input voltage (*1)	VDDQ	6	V	
Reference voltage (*1)	V _{ref}	5	V	
Termination pin voltage (*1)	VTT	5	V	
Source current	I _{TT+}	+0.8	A	
Sink current	I _{TT-}	-0.8	A	
Power dissipation (*2)	P _d	0.6	W	
Junction temperature(*3)	T _j	150	°C	
Operating temperature	T _{opr}	- 40 to + 85	°C	
Storage temperature	T _{stg}	- 55 to + 150	°C	
Soldering temperature	T _{sol}	260	°C	For 10 s

(*1) Other terminals than GND and this terminal are to be opened circuit.

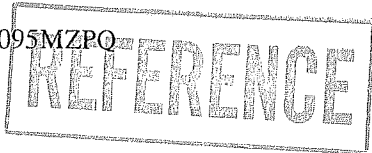
(*2) P_d : While mounted on circuit board

(*3) It is not allowed to use this product at T_j = 125 to 150°C because the over heat protection function may operates.

Fig. 1 Inner derating curve



(Note) The over heat protection function may operate in the oblique lined area.



3-2 Recommended operation input voltage

Ta = 25 °C

Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Conditions
Input voltage	V _{CC}	3.0	-	6.0	V	
Termination input voltage	V _{TT_IN}	1.7	-	6.0	V	
VDDQ voltage	VDDQ	1.7	-	1.9	V	

3-3 Electrical characteristics

Unless otherwise stated, V_{CC} = 3.3V, V_{TT_IN} = 1.8V, VDDQ = 1.8V, I_{TT} = 0A

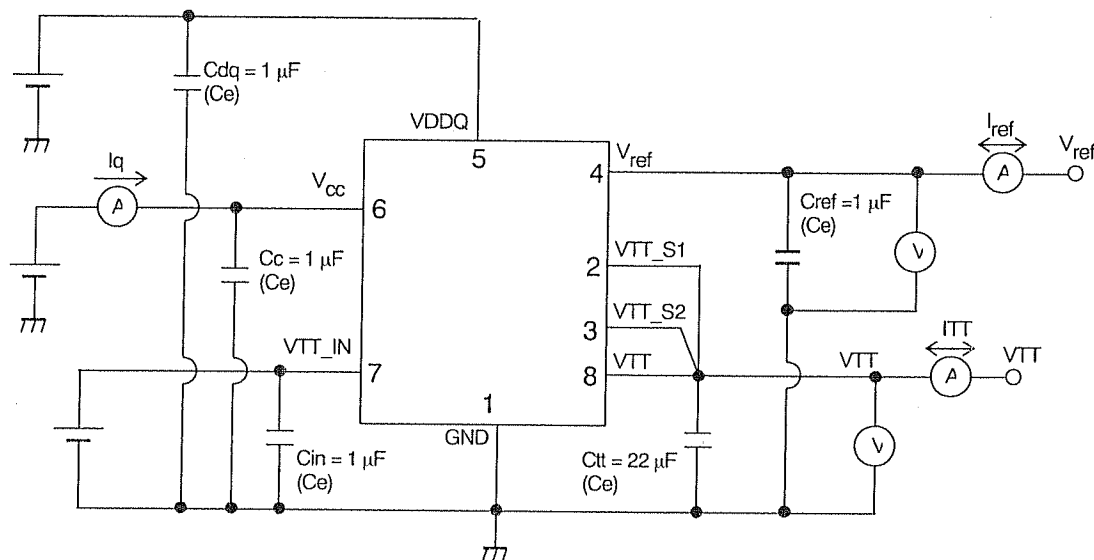
Ta = 25 °C

Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Conditions
Termination pin voltage	V _{TT}	V _{ref} -30 mV	V _{ref}	V _{ref} +30 mV	mV	I _{TT} = -0.8A ~ +0.8A (*1)
Line regulation	Reg _l	-	-	20	mV	V _{CC} = 3 ~ 6 V
Quiescent current	I _q	-	2	4	mA	I _{TT} = 0 mA
VDDQ input impedance	Z _{VDDQ}	-	100	-	kΩ	
Reference voltage 1	V _{ref 1}	VDDQ/2 -18mV	VDDQ/2	VDDQ/2 +18 mV	V	I _{ref} = 0 A
Reference voltage 2	V _{ref 2}	VDDQ/2 -25 mV	VDDQ/2	VDDQ/2 +25 mV	V	I _{ref} = -0.1 mA ~ +1 mA

(*1) V_{TT} load regulation is measured by using 10 ms current pulse.

3-4 Electrical characteristics measurement circuit

Fig. 2 Standard measurement circuit



Ce: Ceramic capacitor

4. Reliability

The reliability of products shall satisfy items listed below.

Confidence level : 90 %
LTPD : 10 or 20

Test Items	Test Conditions	Failure judgment criteria	Samples (n)
			Defective (c)
Temperature cycling	1 cycle: -40°C (30min) to +150°C (30min) 20 cycles	$V_{TT} < L \times 0.8$ $V_{TT} > U \times 1.2$ $V_{ref1} < L \times 0.8$ $V_{ref1} > U \times 1.2$ $RegI > U \times 1.2$	n = 22, c = 0
Temperature humidity bias	+85°C, 85%RH, $V_{CC} = V_{TT_IN} = V_{DDQ} = 6V$, $I_{TT} = I_{ref} = 0A$, 1000h		n = 22, c = 0
Damp Heat cycling	1 cycle : -20°C (2h) to + 70°C (2h) Transient time between high and low temp: 1h., 40 cycles, 90 % RH		n = 22, c = 0
High temp. storage	+150°C, 1000h		n = 22, c = 0
Low temp. storage	-40°C, 1000h		n = 22, c = 0
Operation life	$T_a = 25^\circ C$, $P_d = 0.6 W$, 1000 h		n = 22, c = 0
Mechanical shock	15 km / s ² , 0.5 ms each 3 times / ± X, ± Y, ± Z		n = 11, c = 0
Vibration (Variable frequency)	200 m / s ² 100 to 2000 to 100 Hz/4 min.. each 4 times / X, Y, Z direction		U: Upper specification limit L: Lower specification limit n = 11, c = 0
Soldering heat	260°C, 10s *1		n=11, c = 0
Reflow Soldering heat	Temperature profile as shown in the item 7-7, two times.		n=11, c = 0
Electrostatic discharge	±250 V, 200 pF, 0 Ω Between GND and each terminal / each 3 times		n=11, c = 0
Robustness of Termination (Tensile test)	Weight: 2.5 N 10 s / each terminal *2		Failure if broken or loosened *3 n=11, c = 0
Solderability	245 ± 2°C, 3 s Solder: Sn / 3.0 Ag / 0.5Cu Flux to use: EC19S (made by TAMURA KAKEN) *1		Failure if solder does not cover 95% or more of the dipped portion *4 n= 11, c = 0

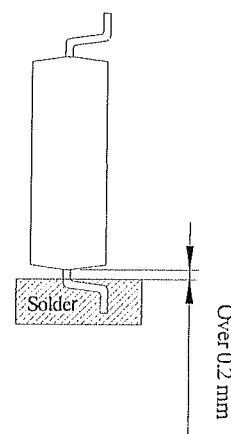
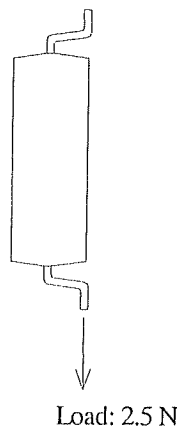
*1 The area to immerse solder is as shown below. *2 Direction to pull terminal is as shown below.

*3 Bending of terminal is excluded.

*4 Top edge surface is excluded.

Lead pull direction

Solder immersing portion





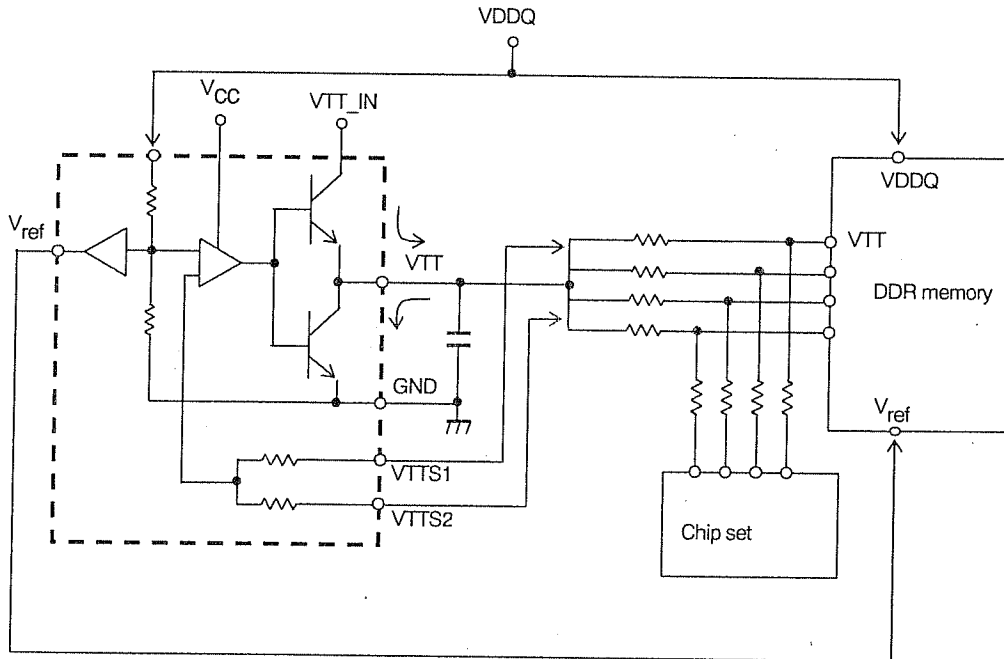
5. Outgoing inspection

A single sampling plan, normal inspection level II based on ISO 2859 is applied.
 The AQL according to the inspection items is shown in table below.

Defect	Inspection items	AQL(%)	Judgment criteria
Major defect	Electrical characteristics	0.1	Depend on the specification
	Marking		To be recognizable
Minor defect	Dimensions	0.4	Depend on the specification
	Appearance		No chipped resin and no bent lead

6. Supplement

6-1 Example of application




 A rectangular stamp with the word "REFERENCE" in a bold, sans-serif font, centered within a double-line border.

6-2 Taping package

6-2-1 Packing form

- (1) The carrier tape structure and dimensions (Refer Fig. A.)

The structure is that the carrier tape (Material: PS + Carbon) is heat compressed with the cover tape (Material: PET and PS), and the dimensions are shown in Fig. A.

- (2) Reel structure and dimensions (Refer Fig. B.)

The reel (material : PS) is made from plastic, and the dimensions are shown in Fig. B.

- (3) Direction of product insertion (Refer Fig. C.)

Product direction in carrier tape follows Fig. C.

- (4) Joint of tape

The cover tape and the carrier tape in one reel shall be of no joint.

- (5) Method to repair taped failure product

Cutting a bottom of carrier tape with a cutter, and after replacing to good devices, the cut portion shall be sealed with adhesive tape..

6-2-2 Tape strength

- (1) Peel off strength of cover tape

The peel-back force between carrier tape and cover tape shall be 0.1N to 1N for the angle 160° to 180°. (Tape speed: 5 mm/s)

- (2) Tape bending strength

In case to bend the tape that the products are sealed in, please bend at over 30 cm radii. If the tape is bent below 30 cm radii, the cover tape may be peeled off.

6-2-3 Winding method and product quantity contained

- (1) Winding method

The tape is wound on the reel as the cover tape to be outside.

At the beginning of winding, more than 10 pitches of empty cavities (trailer) are wound, and at the end of winding more than 20 pitches of empty cavities (leader) of the tape are wound and the end is fixed with an adhesive tape.

- (2) Quantity contained

Basically one reel contains 1000 products.

6-2-4 Indication

- (1) Reel

The label with below contents shall be pasted on the reel.

* Model No. * Quantity * Packing date

- (2) Packing carton

The label with below contents shall be pasted on the outer packaging case.

* Model No. * Quantity * Packing date

6-2-5 Storage environment

Please store the taped products at the temperature from 5°C to 30°C and the humidity below 70 %RH avoiding the direct sunlight.

If not going to use for more than 10 days, please store after rewinding the tape to the reel for sure.

The devices stored for a long time are considered to have a possibility of deterioration of lead color and solderability. Therefore please use the devices after sufficiently checking the solderability in advance.

PQ1DX095MZPQ

REFERENCE

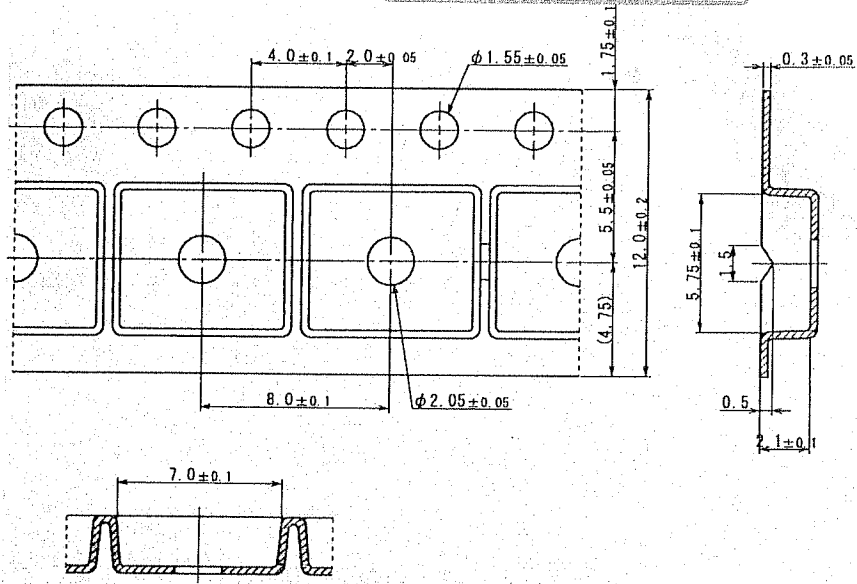


Fig. A Tape structure and dimensions

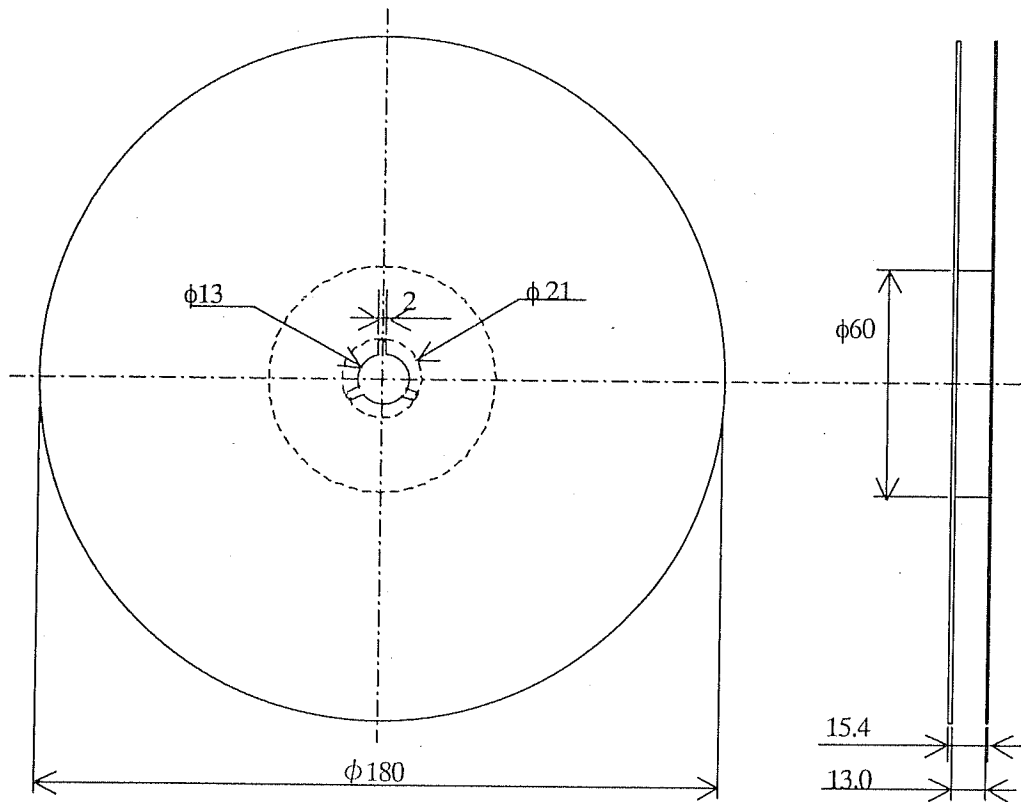
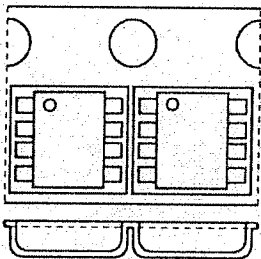
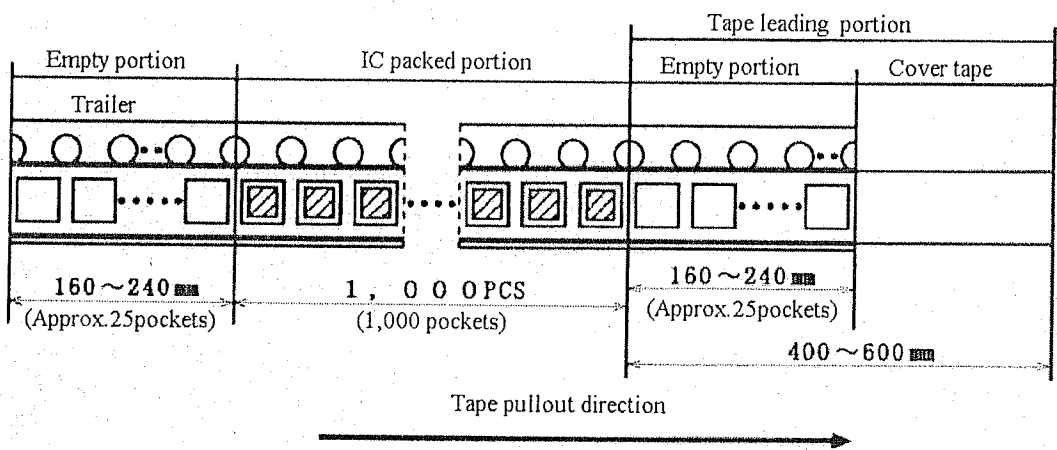


Fig. B Reel structure and dimensions

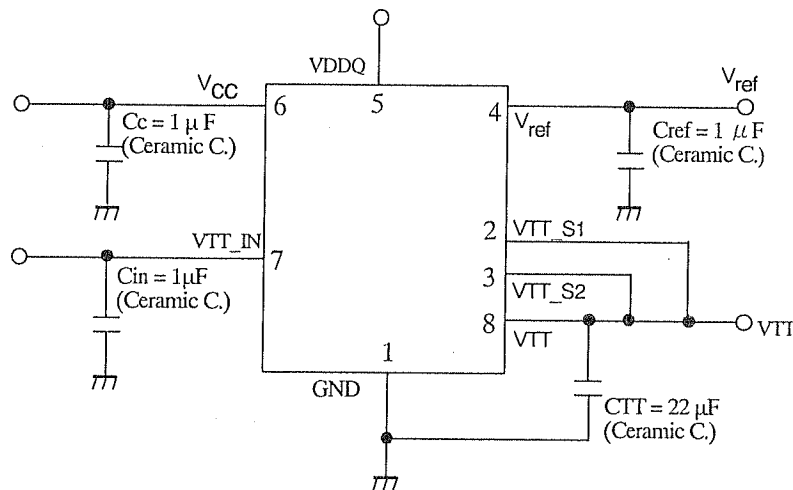
Dimensions: TYP. value
Unit : mm

REFERENCE



7. Notes

7-1 External connection



- (1) Please use this product with CTT and Cref connected.

About CTT please use a ceramic capacitor that has the capacitance bigger than 22 μF and the B (X5R) or R (X7R) characteristics. About Cref please use a ceramic capacitor that has the capacitance bigger than 1 μF and the B (X5R) or R (X7R) characteristics.

To connect Cin, Cc, Cref and CTT with each terminal please use the possible shortest wire.

The possibility of circuit oscillation depends on the kind and the capacitance value of the capacitor and the wiring method. Please use after checking the VTT voltage and the reference voltage.

Especially please locate CTT close to (VTT) 8 terminal and (GND) 1 terminal.

- (2) Please surely avoid applying voltage while the terminal pins are dislocated or the products is faulty mounted.

7-2 Thermal protection designing

The internal power consumption (P) of the device is approximately obtained by the following formula.

$$P_d = I_{TT+} \times (V_{TT_IN} - V_{TT}) + I_{TT-} \times V_{TT} + I_{CC} \times V_{CC}$$

Although this product can handle up to 0.8A of variation peak current as the voltage source for DDR-SDRAM termination, please use the continuous current value to calculate the internal dissipation.

If the ambient operating temperature T_a and the internal consumption P_d is determined, please design the sufficient thermal radiation to operate within the safety operation area specified by the derating curve in Fig. 1.

If the thermal radiation is not enough or to use above the internal power dissipation curve, the normal operation and the reliability of the device is badly affected.

In case of operating at out of the safety operational area shown by the derating curve, the overheat protection circuit operates and the VTT output shuts down. But please avoid operating in such a condition for a long time.

7-3 VDDQ terminal

Two resistors are built in between VDDQ terminal and GND terminal. The voltage divided ($V_{DDQ}/2$) is generated as the internal reference voltage and the VTT output voltage depends on the internal reference voltage.

7-4 V_{ref} terminal

V_{ref} is the buffered output of the internal reference voltage $V_{DDQ}/2$ and can be used for the reference voltage of the memory. And the V_{ref} operates even when the overheat protection function or the over current protection function operates.



7-5 Sensing terminal

This device equips the multi-sensing function and composes the circuit to feedback the average voltage of VTTS_1, between VTTS_1 (terminal 2) and GND (terminal 1) and VTTS_2, between VTTS_2 (terminal 3) and GND (terminal 1) to the control circuit.

When the sensing portion is set to one portion, please connect both the VTTS_1 terminal and the VTTS_2 terminal close to the capacitor CTT.

7-6 Electro static discharge

Because this device consists of a bipolar IC please take care to avoid applying the electro-static discharge to prevent the damage.

Some examples of countermeasure to the electro-static discharge or the excessive voltage are shown below.

- (a) To ground the human body to release the static charge on the human body or the clothes
- (b) To ground the equipment like the workbench, the inserting machine and the measuring instrument that directly contacts the device
- (c) To use the solder dipping basin with the minimum leakage current (isolation resistance 10 M Ω or more) from the commercial power line, and also to ground the solder dipping basin

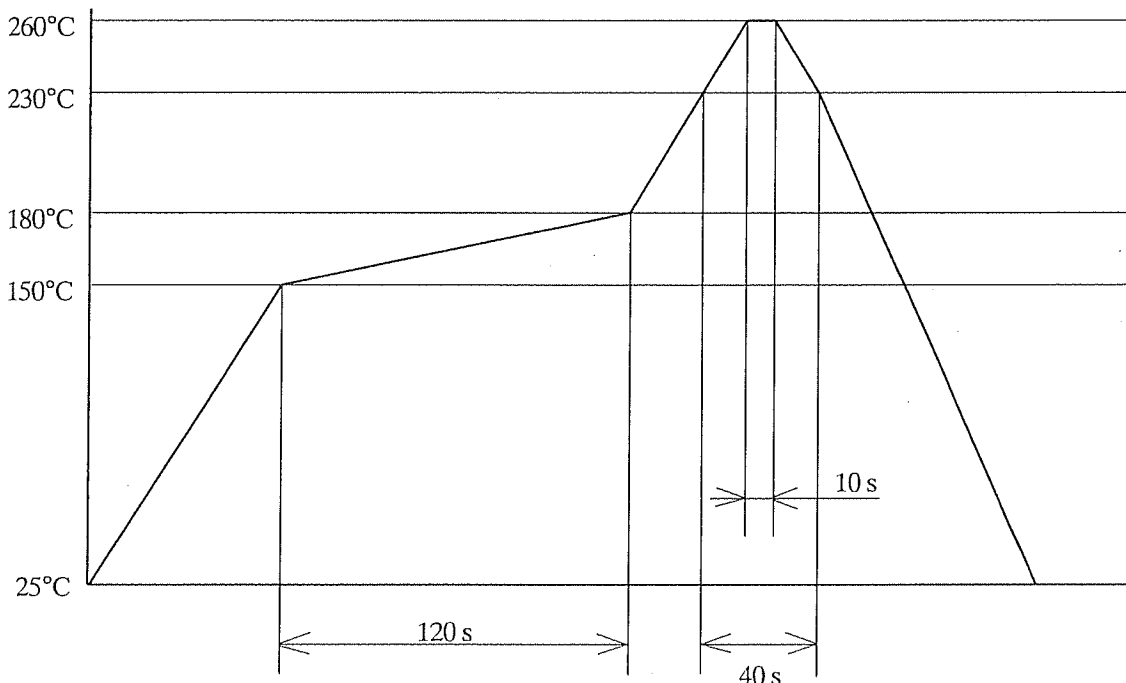
7-7 Soldering

- (1) In case of reflow soldering

Please solder below the temperature and the time profiled as shown below within tow times. It is recommended that the second reflow is to be conducted after the device is completely cooled down to the room temperature. And please obey the notes for solder reflow.

Notes for solder reflow:

- (a) Please avoid mounting on the ceramic circuit board.
- (b) During heating up with an infrared lamp for soldering, the resin portion may be locally heated up but please keep the temperature of the resin to be below the temperature profile as shown below.
- (c) Please keep the temperature slope during reflow to be 4°C / s or less.



(2) In case of soldering dipping

We recommended that solder dip should be 260°C or less (Solder temp.) within 10 s and one time only.

In advance, please confirm fully the dip soldering conditions etc. in the actual application in order to avoid any soldering bridge.

Please obey the notes items below concerning solder dip.

Notes for solder dipping:

- (a) After solder dipping please avoid rapid forced cooling but please cool naturally.
- (b) Please do not give the mechanical force or the impact stress to the device during cooling.
not to result the solder bridge by using the actual usage conditions.

(3) Hand soldering

This device is basically designed for reflow soldering, if it is necessary to do hand soldering for modification, please use a soldering iron which is countermeasures for static electricity.

Temperature of soldering iron tip should be less than 350°C.

Time for soldering should be within 3 seconds each terminals. Number of times should be only one time.

Please be careful not to give any external force on terminals by soldering iron.

Soldering iron should not touch terminals directly.

Even if the above conditions regarding solder reflow, solder dip or hand soldering there is the possibility that the force given to the terminals by the deformation of PCB may cause the electric properties change and wire breaking in the device package. In advance, please confirm fully at the actual application.

7-8 Cleaning

Please consider following items when cleaning.

- (1) Solvent immersion cleaning: Solvent temperature 45°C or less, Immersion for 3 min or less
- (2) Ultrasonic cleaning: The effect to the device bigly depends on the cleaning bath size, the ultrasonic output power, the cleaning time, the board size or the device mounting condition etc.

In advance please perform with the actual using conditions and confirm no occurrence of any defect to start cleaning by ultrasonic cleaning differs by cleaning bath size, ultrasonic power output, cleaning time, PCB size or device mounting condition etc.

Please test it in actual using condition and confirm that doesn't occur any defect before starting the ultrasonic cleaning.

- (3) Solvent recommended: Methyl alcohol, Ethyl alcohol, Isopropyl alcohol

When the other solvent is to be used, there are cases that the packaging resin is eroded. Please use after the sufficient confirmation with the actual using conditions.