# EMD53

Complex Digital Transistors (Bias Resistor Built-in Transistors) Datasheet

<For DTr1(NPN)>

| Parameter | Value |
|---|---|
| $V_{CC}$ | 50V |
| $I_{C(MAX.)}$ | 100mA |
| $R_1$ | 10kΩ |
| $R_2$ | 10kΩ |

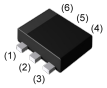
<For DTr2(PNP)>

| Parameter | Value |
|---|---|
| $V_{CC}$ | -50V |
| $I_{C(MAX.)}$ | -100mA |
| $R_1$ | 10kΩ |
| $R_2$ | 10kΩ |

## ●Outline

SOT-563

SC-107C



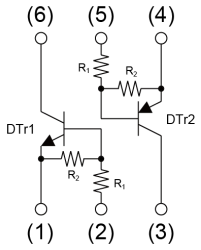

EMT6

## ●Features

1) DTA014E and DTC014E chip in a EMT package.
2)Mounting possible with EMT3 automatic mounting machines.
3)Transistor elements are independent, eliminating interference.
4)Mounting cost and area can be cut in half.

## ●Inner circuit

(1) DTr1 GND(Emitter)
(2) DTr1 IN(Base)
(3) DTr2 OUT(Collector)
(4) DTr2 GND(Emitter)
(5) DTr2 IN(Base)
(6) DTr1 OUT(Collector)




## ●Application

SWITCHING CIRCUIT, INVERTER CIRCUIT, INTERFACE CIRCUIT

## ●Packaging specifications

| Part No. | Package | Package size | Taping code | Reel size (mm) | Tape width (mm) | Basic ordering unit.(pcs) | Marking |
|---|---|---|---|---|---|---|---|
| EMD53 | SOT-563 (EMT6) | 1616 | T2R | 180 | 8 | 8000 | D53 |

## ●Absolute maximum ratings ($T_a$ = 25°C)

| Parameter | Symbol | DTr1(NPN) | DTr2(PNP) | Unit |
|---|---|---|---|---|
| Supply voltage | $V_{CC}$ | 50 | -50 | V |
| Input voltage | $V_{IN}$ | 40 to -10 | -40 to 10 | V |
| Output current | $I_O$ | 50 | -50 | mA |
| Collector current | $I_{C(MAX)}$ *1 | 100 | -100 | mA |
| Power dissipation | $P_D$ *2*3 | 150 | | mW/Total |
| Junction temperature | $T_j$ | 150 | | ℃ |
| Range of storage temperature | $T_{stg}$ | -55 to +150 | | ℃ |

## ●Electrical characteristics ($T_a$ = 25°C) <For DTr1(NPN)>

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Input voltage | $V_{I(off)}$ | $V_{CC}$ = 5V, $I_O$ = 100μA | - | - | 0.8 | V |
| | $V_{I(on)}$ | $V_O$ = 0.3V, $I_O$ = 5mA | 2.6 | - | - | |
| Output voltage | $V_{O(on)}$ | $I_O$ = 5mA, $I_I$ = 0.5mA | - | 50 | 150 | mV |
| Input current | $I_I$ | $V_I$ = 5V | - | - | 880 | μA |
| Output current | $I_{O(off)}$ | $V_{CC}$ = 50V, $V_I$ = 0V | - | - | 500 | nA |
| DC current gain | $G_I$ | $V_O$ = 10V, $I_O$ = 5mA | 35 | - | - | - |
| Input resistance | $R_1$ | - | 7 | 10 | 13 | kΩ |
| Resistance ratio | $R_2/R_1$ | - | 0.8 | 1.0 | 1.2 | - |
| Transition frequency | $f_T$ *1 | $V_{CE}$ = 10V, $I_E$ = -5mA, f = 100MHz | - | 250 | - | MHz |

## ●Electrical characteristics ($T_a$ = 25°C) <For DTr2(PNP)>

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Input voltage | $V_{I(off)}$ | $V_{CC}$ = -5V, $I_O$ = -100μA | - | - | -0.8 | V |
| | $V_{I(on)}$ | $V_O$ = -0.3V, $I_O$ = -5mA | -2.6 | - | - | |
| Output voltage | $V_{O(on)}$ | $I_O$ = -5mA, $I_I$ = -0.5mA | - | -70 | -150 | mV |
| Input current | $I_I$ | $V_I$ = -5V | - | - | -880 | μA |
| Output current | $I_{O(off)}$ | $V_{CC}$ = -50V, $V_I$ = 0V | - | - | -500 | nA |
| DC current gain | $G_I$ | $V_O$ = -10V, $I_O$ = -5mA | 35 | - | - | - |
| Input resistance | $R_1$ | - | 7 | 10 | 13 | kΩ |
| Resistance ratio | $R_2/R_1$ | - | 0.8 | 1.0 | 1.2 | - |
| Transition frequency | $f_T$ *1 | $V_{CE}$ = -10V, $I_E$ = 5mA, f = 100MHz | - | 250 | - | MHz |

*1 Characteristics of built-in transistorEach

*2 Each terminal mounted on a reference land.

*3 120mW per element must not be exceeded.

## ●Electrical characteristic curves($T_a$ = 25°C) <For DTR1(NPN)>

Fig.1 Input voltage vs. output current (ON characteristics)

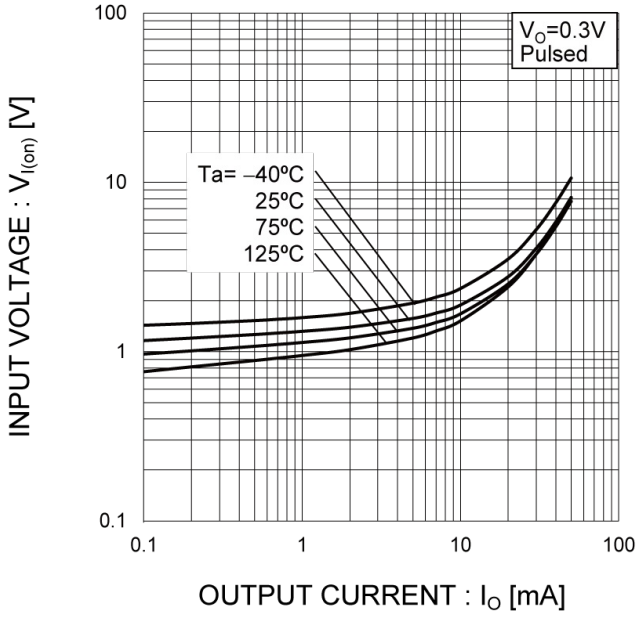



Fig.2 Output current vs. input voltage (OFF characteristics)

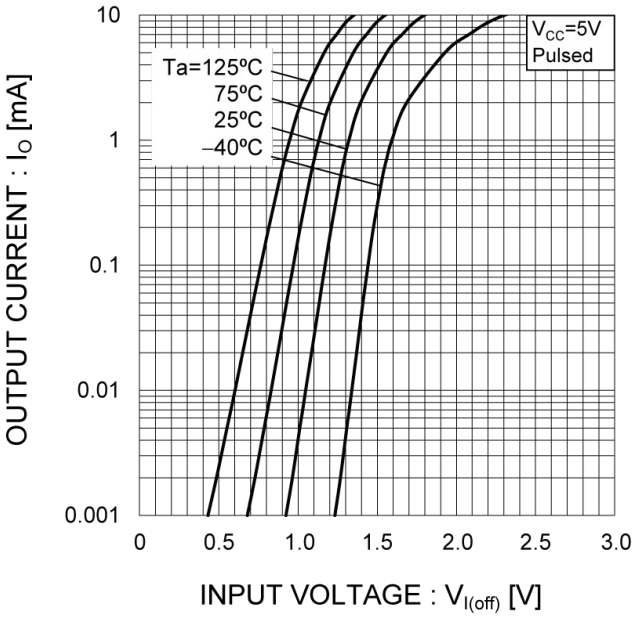



Fig.3 Output current vs. output voltage

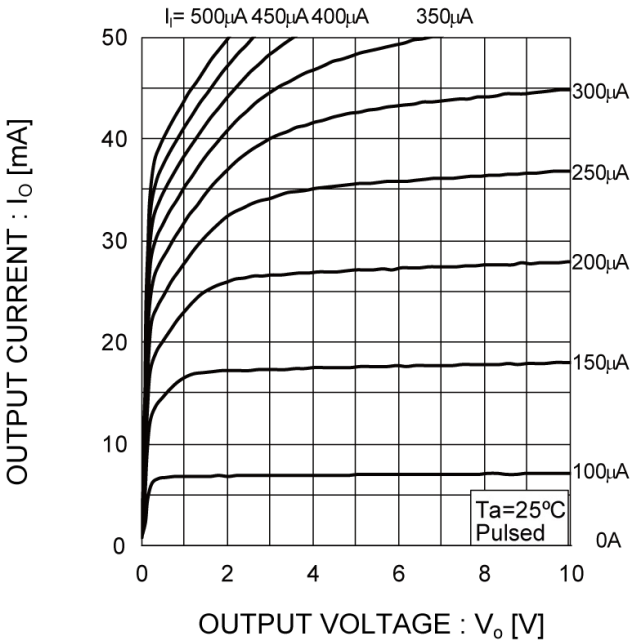
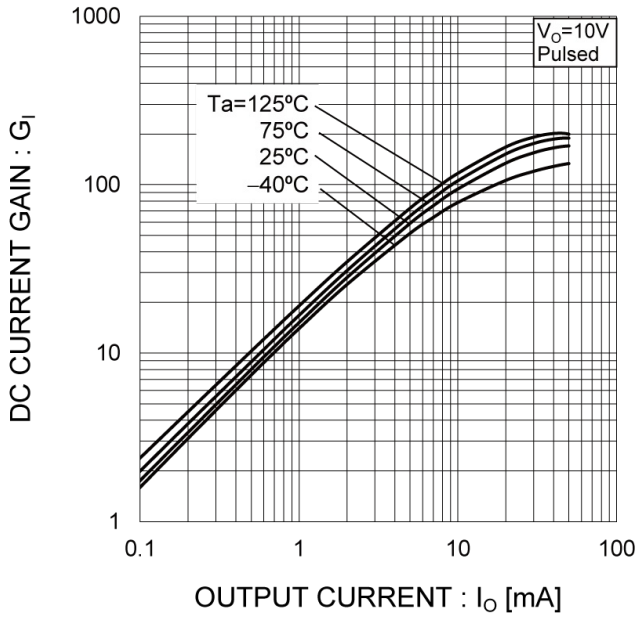
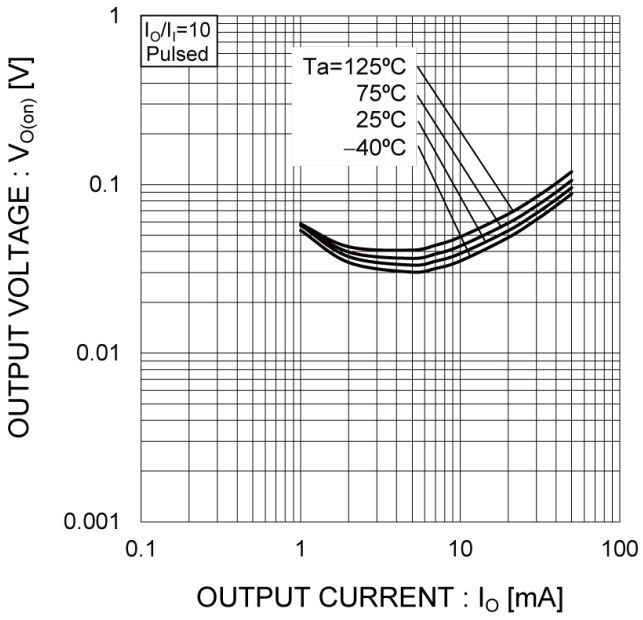



Fig.4 DC current gain vs. output current



## ●Electrical characteristic curves($T_a$ = 25°C) <For DTR1(NPN)>

Fig.5 Output voltage vs. output current



## ●Electrical characteristic curves($T_a$=25°C) <For DTr2(PNP)>

Fig.1 Input voltage vs. output current (ON characteristics)

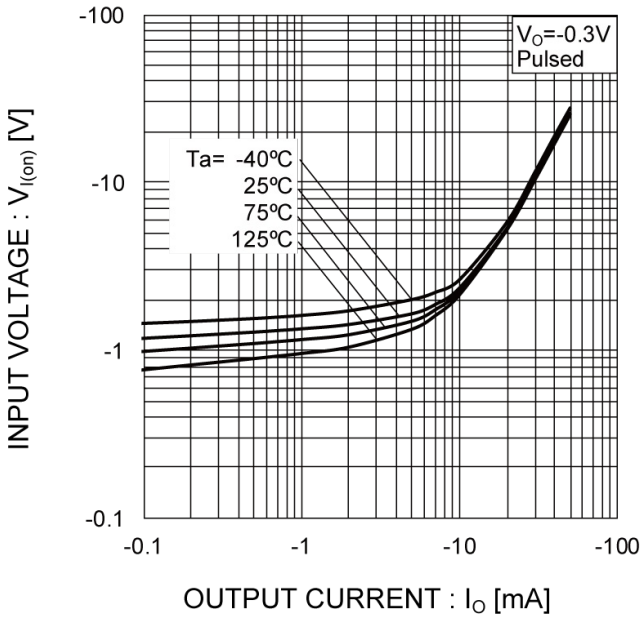



Fig.2 Output current vs. input voltage (OFF characteristics)

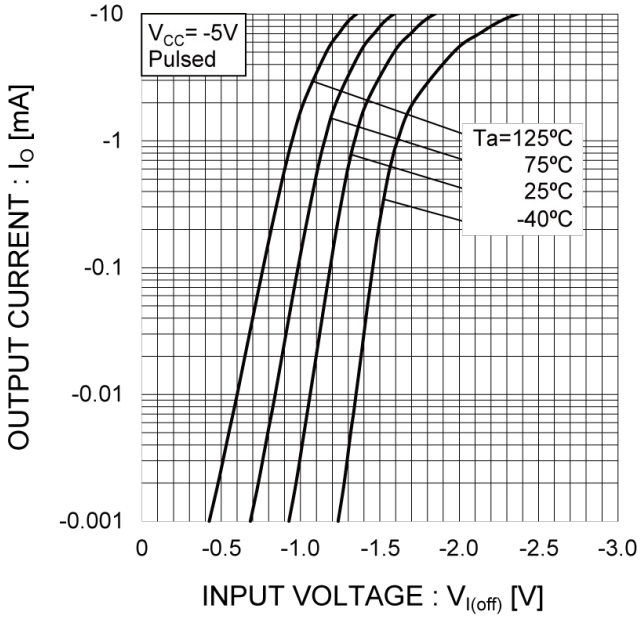



Fig.3 Output current vs. output voltage

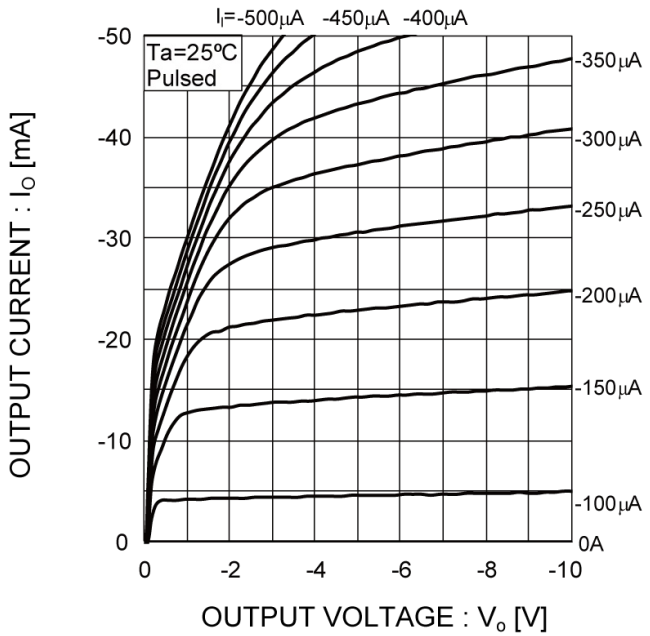
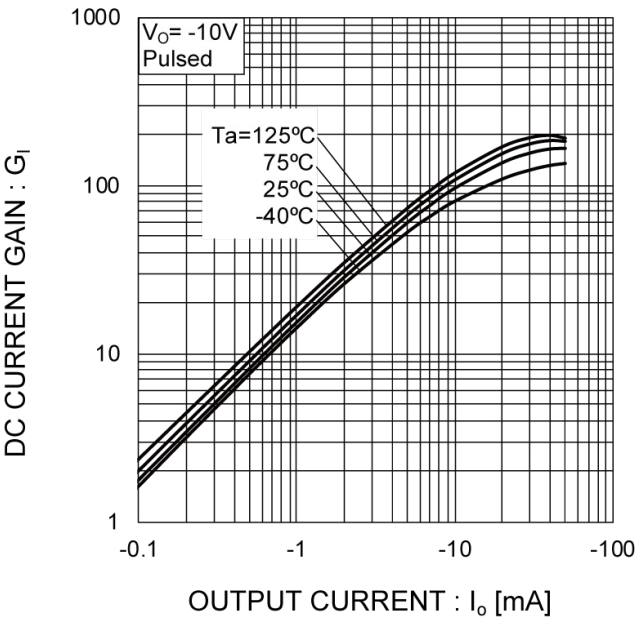
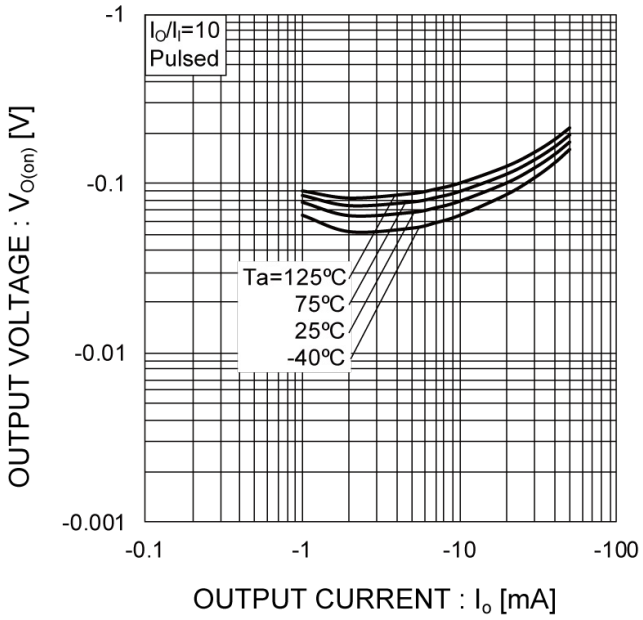



Fig.4 DC current gain vs. output current



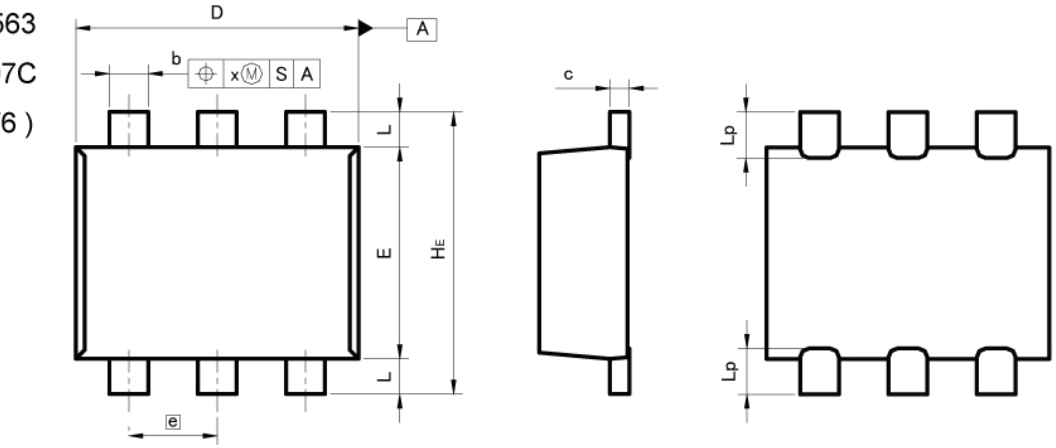
## ●Electrical characteristic curves($T_a$=25°C) <For DTr2(PNP)>

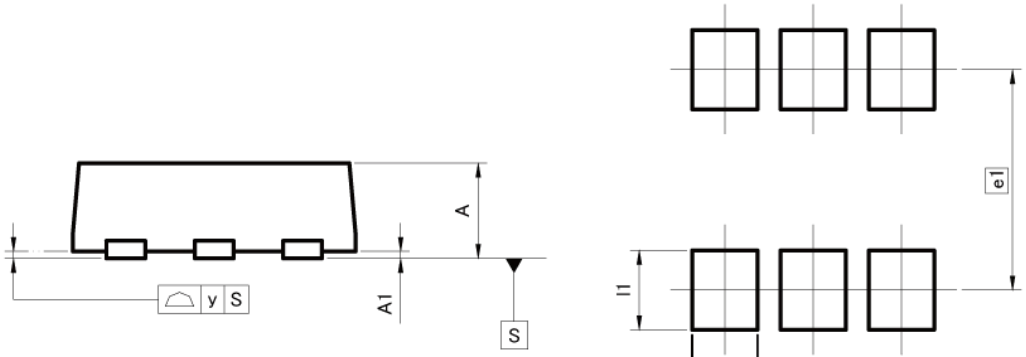
Fig.5 Output voltage vs. output current



## ●Dimensions

SOT-563
SC-107C
( EMT6 )




Pattern of terminal position areas
[Not a pattern of soldering pads]

| DIM | MILIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 0.45 | 0.55 | 0.018 | 0.022 |
| A1 | 0.00 | 0.10 | 0.000 | 0.004 |
| b | 0.17 | 0.27 | 0.007 | 0.011 |
| c | 0.08 | 0.18 | 0.003 | 0.007 |
| D | 1.50 | 1.70 | 0.059 | 0.067 |
| E | 1.10 | 1.30 | 0.043 | 0.051 |
| e | 0.50 | | 0.020 | |
| HE | 1.50 | 1.70 | 0.059 | 0.067 |
| L | 0.10 | 0.30 | 0.004 | 0.012 |
| Lp | – | 0.35 | – | 0.014 |
| x | – | 0.10 | – | 0.004 |
| y | – | 0.10 | – | 0.004 |

| DIM | MILIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| b2 | – | 0.37 | – | 0.015 |
| e1 | 1.25 | | 0.049 | |
| l1 | – | 0.45 | – | 0.018 |

Dimension in mm/inches

# Notice

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|---|---|---|---|
| CLASSⅢ | CLASSⅢ | CLASSⅡb | CLASSⅢ |
| CLASSⅣ | | CLASSⅢ | |

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   [c] Use of our Products in places where the Products are exposed to sea wind or corrosive gases, including $Cl_2$, $H_2S$, $NH_3$, $SO_2$, and $NO_2$
   [d] Use of our Products in places where the Products are exposed to static electricity or electromagnetic waves
   [e] Use of our Products in proximity to heat-producing components, plastic cords, or other flammable items
   [f] Sealing or coating our Products with resin or other coating materials
   [g] Use of our Products without cleaning residue of flux (even if you use no-clean type fluxes, cleaning residue of flux is recommended); or Washing our Products by using water or water-soluble cleaning agents for cleaning residue after soldering
   [h] Use of the Products in places subject to dew condensation

4. The Products are not subject to radiation-proof design.

5. Please verify and confirm characteristics of the final or mounted products in using the Products.

6. In particular, if a transient load (a large amount of load applied in a short period of time, such as pulse. is applied, confirmation of performance characteristics after on-board mounting is strongly recommended. Avoid applying power exceeding normal rated power; exceeding the power rating under steady-state loading condition may negatively affect product performance and reliability.

7. De-rate Power Dissipation depending on ambient temperature. When used in sealed area, confirm that it is the use in the range that does not exceed the maximum junction temperature.

8. Confirm that operation temperature is within the specified range described in the product specification.

9. ROHM shall not be in any way responsible or liable for failure induced under deviant condition from what is defined in this document.

## Precaution for Mounting / Circuit board design

1. When a highly active halogenous (chlorine, bromine, etc.) flux is used, the residue of flux may negatively affect product performance and reliability.

2. In principle, the reflow soldering method must be used on a surface-mount products, the flow soldering method must be used on a through hole mount products. If the flow soldering method is preferred on a surface-mount products, please consult with the ROHM representative in advance.

For details, please refer to ROHM Mounting specification

### Precautions Regarding Application Examples and External Circuits

1. If change is made to the constant of an external circuit, please allow a sufficient margin considering variations of the characteristics of the Products and external components, including transient characteristics, as well as static characteristics.

2. You agree that application notes, reference designs, and associated data and information contained in this document are presented only as guidance for Products use. Therefore, in case you use such information, you are solely responsible for it and you must exercise your own independent verification and judgment in the use of such information contained in this document. ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of such information.

### Precaution for Electrostatic

This Product is electrostatic sensitive product, which may be damaged due to electrostatic discharge. Please take proper caution in your manufacturing process and storage so that voltage exceeding the Products maximum rating will not be applied to Products. Please take special care under dry condition (e.g. Grounding of human body / equipment / solder iron, isolation from charged objects, setting of Ionizer, friction prevention and temperature / humidity control).

### Precaution for Storage / Transportation

1. Product performance and soldered connections may deteriorate if the Products are stored in the places where:
   - [a] the Products are exposed to sea winds or corrosive gases, including Cl2, H2S, NH3, SO2, and NO2
   - [b] the temperature or humidity exceeds those recommended by ROHM
   - [c] the Products are exposed to direct sunshine or condensation
   - [d] the Products are exposed to high Electrostatic

2. Even under ROHM recommended storage condition, solderability of products out of recommended storage time period may be degraded. It is strongly recommended to confirm solderability before using Products of which storage time is exceeding the recommended storage time period.

3. Store / transport cartons in the correct direction, which is indicated on a carton with a symbol. Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.

4. Use Products within the specified time after opening a humidity barrier bag. Baking is required before using Products of which storage time is exceeding the recommended storage time period.

### Precaution for Product Label

A two-dimensional barcode printed on ROHM Products label is for ROHM's internal use only.

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