

# RNB4580 Series

## Dual Low Noise Operational Amplifier

REA03D0004-0100

Rev.1.00

Dec 25, 2006

### Description

RNB4580 is dual bipolar low noise amplifiers designed for audio systems to improve tone control, audio pre-amplifier and industrial measurement tools. It also suitable for head phone amplifier at higher output current.

This product features internal frequency compensation, low noise, low distortion, high gain and high bandwidth. It also can operate under dual power supply voltage up to  $\pm 18$  V or single power supply up to 36 V.

The IC can be applied for the handy type set operational amplifier of general purpose in application of low voltage single supply type, which is properly biased of the input low voltage source.

### Features

- Wide bandwidth: 15 MHz
- High speed: 7 V/ $\mu$ s
- Low input noise voltage: 0.7  $\mu$ Vrms
- Large DC voltage gain: 110 dB
- Operating voltage:  $\pm 2$  V to  $\pm 18$  V
- Package outline available in Pb free lead frame:
  - DP-8
  - SOP-8 (JEITA)
  - SOP-8 (JEDEC)

### Applications

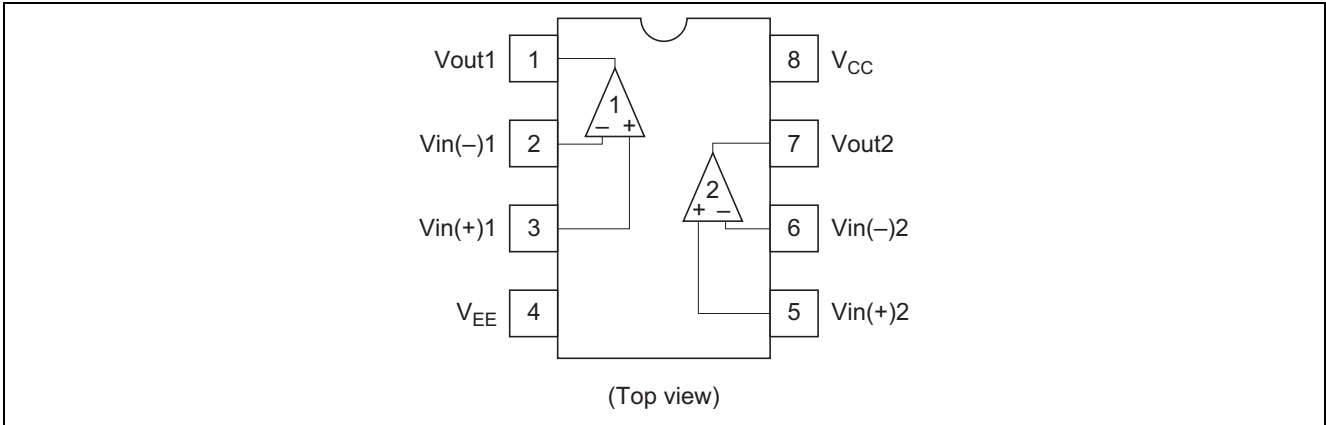
- Audio AC-3 decoder system
- Audio amplifier
- Pre-amp
- Active filter

### Ordering Information

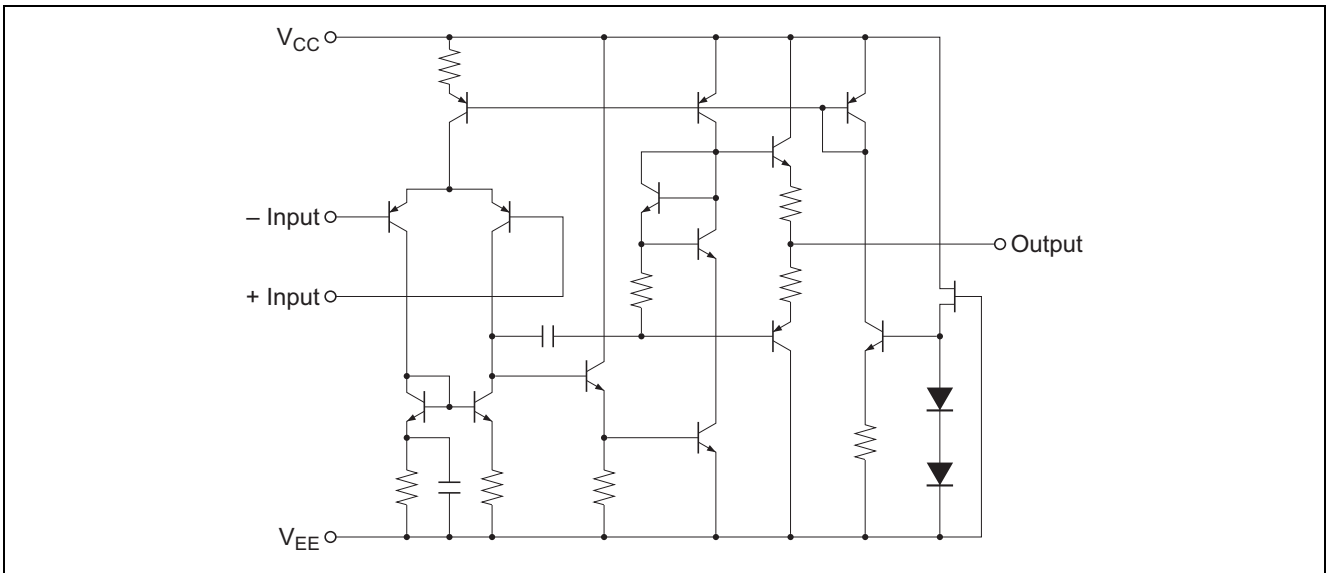
| Type No.  | Application    | Package Code (Package Name) |
|-----------|----------------|-----------------------------|
| RNB4580   | Commercial use | PRDP0008AF-B (DP-8FV)       |
| RNB4580F  |                | PRSP0008DE-B (FP-8DGV)      |
| RNB4580RP |                | PRSP0008DD-C (FP-8DCV)      |

Note: This product is designed for consumer use and not for automotive.

### Pin Arrangement



### Circuit Schematic (1/2)



## Absolute Maximum Ratings

(Ta = 25°C)

| Item                       | Symbol                 | Ratings     |             |             | Unit |
|----------------------------|------------------------|-------------|-------------|-------------|------|
|                            |                        | RNB4580     | RNB4580F    | RNB4580RP   |      |
| Supply Voltage             | V <sub>CC</sub>        | 18          | 18          | 18          | V    |
|                            | V <sub>EE</sub>        | -18         | -18         | -18         | V    |
| Differential input voltage | V <sub>IN</sub> (diff) | ±30         | ±30         | ±30         | V    |
| Common mode input voltage  | V <sub>CM</sub> *3     | ±15         | ±15         | ±15         | V    |
| Power dissipation          | P <sub>T</sub>         | 670 *1      | 385 *2      | 385 *2      | mW   |
| Operating temperature      | Topr                   | -40 to +85  | -40 to +85  | -40 to +85  | °C   |
| Storage temperature        | Tstg                   | -55 to +125 | -55 to +125 | -55 to +125 | °C   |

- Notes: 1. This is the allowable value up to Ta = 45°C. Derate by 8.3 mW/°C above that temperature.  
 2. These are the allowable values up to Ta = 60°C mounting on 40mm × 40mm × 1.6mm (t) 10% wiring density glass epoxy board. Derate by 5.9 mW/°C above that temperature.  
 3. If the supply voltage is less than ±15 V, input voltage should be less than supply voltage.

## Electrical Characteristics

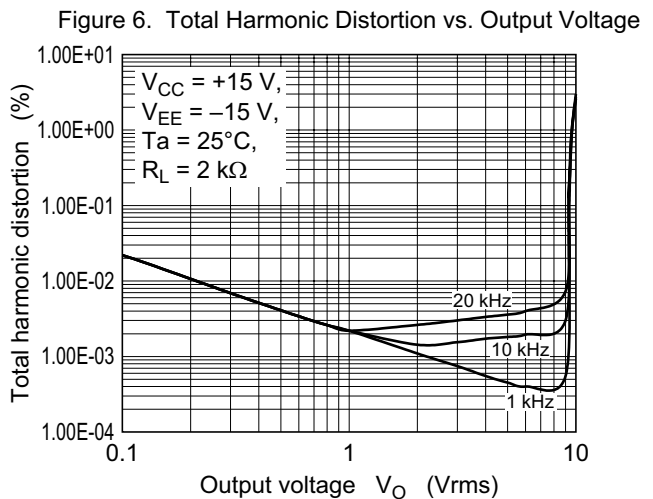
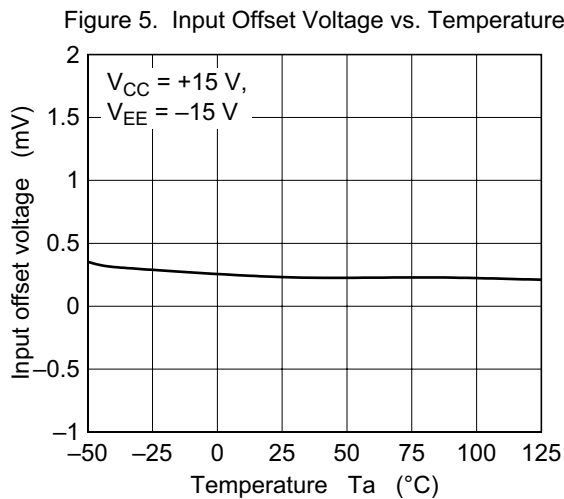
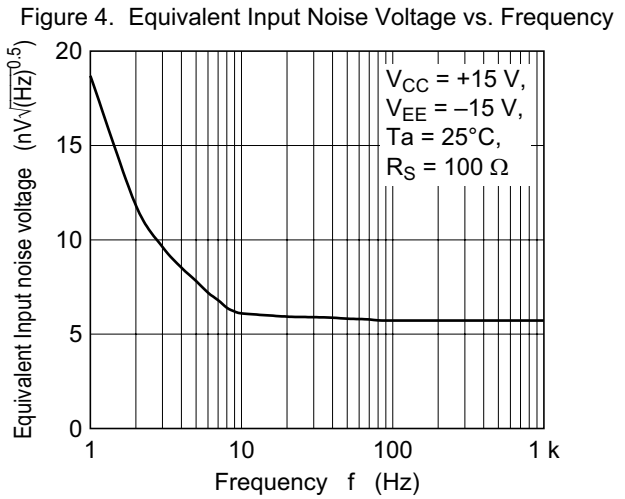
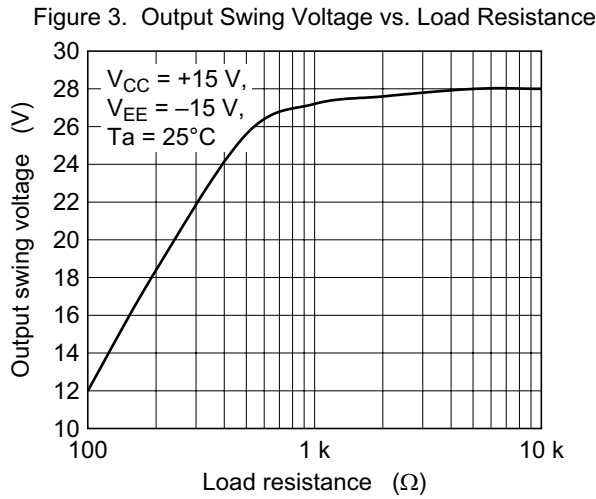
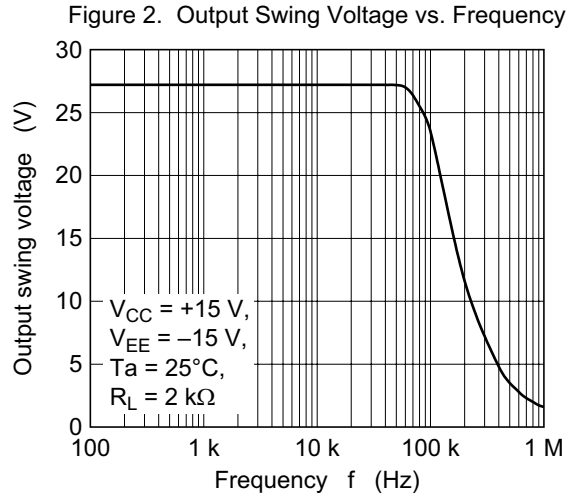
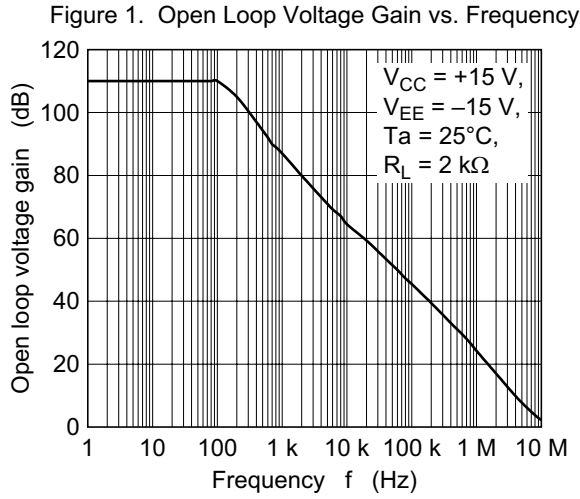
(Ta = 25°C, V<sub>CC</sub> = +15 V, V<sub>EE</sub> = -15 V, unless otherwise specified)

| Item                            | Symbol               | Min | Typ    | Max | Unit              | Test Conditions  |
|---------------------------------|----------------------|-----|--------|-----|-------------------|--|
| Input offset voltage            | V <sub>IO</sub>      | —   | 0.5    | 3   | mV                | R <sub>S</sub> ≤ 10 kΩ   |
| Input offset current            | I <sub>IO</sub>      | —   | 5      | 100 | nA                |  |
| Input bias current              | I <sub>IB</sub>      | —   | 150    | 500 | nA                |  |
| Supply current                  | I <sub>CC</sub>      | —   | 4      | 7   | mA                |  |
| Power supply rejection ratio    | PSRR                 | 80  | 110    | —   | dB                | R <sub>S</sub> ≤ 10 kΩ   |
| Voltage gain                    | A <sub>V</sub>       | 90  | 110    | —   | dB                | R <sub>L</sub> ≥ 2 kΩ, V <sub>O</sub> = ±10 V                                  |
| Common mode rejection ratio     | CMR                  | 80  | 110    | —   | dB                | R <sub>S</sub> ≤ 10 kΩ, V <sub>CM</sub> = 0 V to V <sub>CC</sub> = -1.5 V      |
| Output sink current             | I <sub>OSINK</sub>   | —   | 80     | —   | mA                | V <sub>IN(-)</sub> = 1 V, V <sub>IN(+)</sub> = 0 V, V <sub>O</sub> = 2 V       |
| Output source current           | I <sub>OSOURCE</sub> | —   | 45     | —   | mA                | V <sub>IN(-)</sub> = 0 V, V <sub>IN(+)</sub> = 1 V, V <sub>O</sub> = 2 V       |
| Input common mode voltage range | V <sub>ICM</sub>     | ±12 | ±13.5  | —   | V                 |  |
| Slew rate                       | SR                   | —   | 7      | —   | V/μs              |  |
| Equivalent input noise voltage  | V <sub>NI</sub>      | —   | 0.7    | —   | μV <sub>rms</sub> | RIAA, R <sub>S</sub> = 2.2 kΩ, 30 kHz LPF                                      |
| Gain bandwidth product          | GBP                  | —   | 15     | —   | MHz               | f = 10 kHz, R <sub>L</sub> = 2 kΩ  |
| Total harmonic distortion       | THD                  | —   | 0.0005 | —   | %                 | A <sub>V</sub> = 20 dB, V <sub>O</sub> = 5 V, R <sub>L</sub> = 2 kΩ, f = 1 kHz |

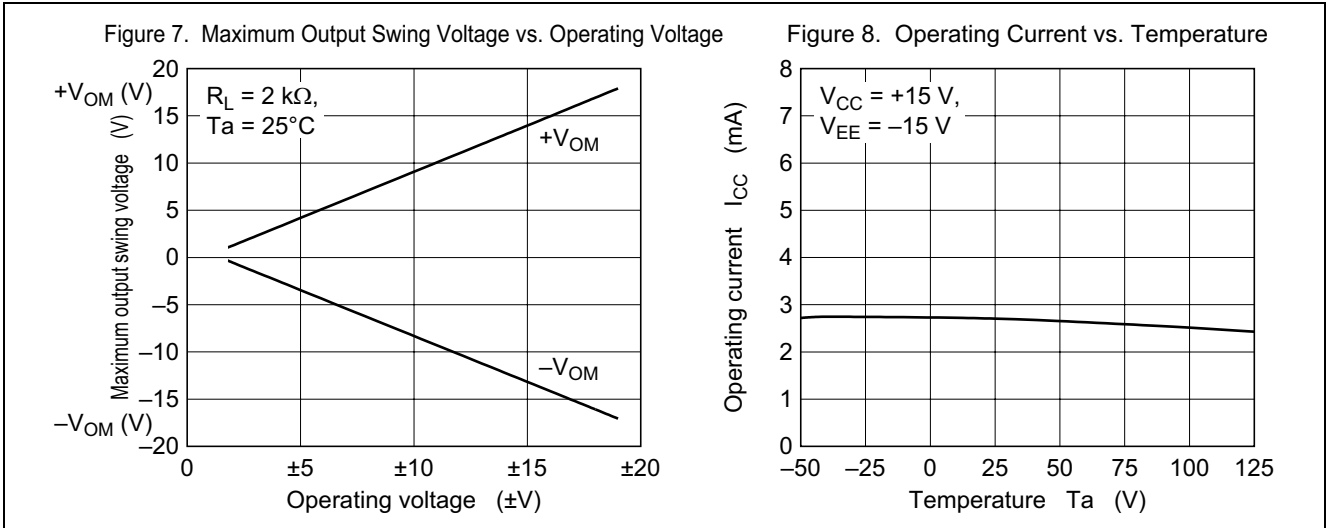
**Table of Graphs**

| <b>Electrical Characteristics</b> |                           | <b>Figure</b> |
|-----------------------------------|---------------------------|---------------|
| Open loop voltage gain            | vs. Frequency $f$         | 1             |
| Output swing voltage              | vs. Frequency $f$         | 2             |
| Output swing voltage              | vs. Load resistance $R_L$ | 3             |
| Equivalent input noise voltage    | vs. Frequency $f$         | 4             |
| Input offset voltage              | vs. Temperature $T_a$     | 5             |
| Total harmonic distortion         | vs. Output Voltage $V_o$  | 6             |
| Maximum output voltage swing      | vs. Operating voltage $V$ | 7             |
| Operating current                 | vs. Temperature $T_a$     | 8             |

Typical Characteristics Curves

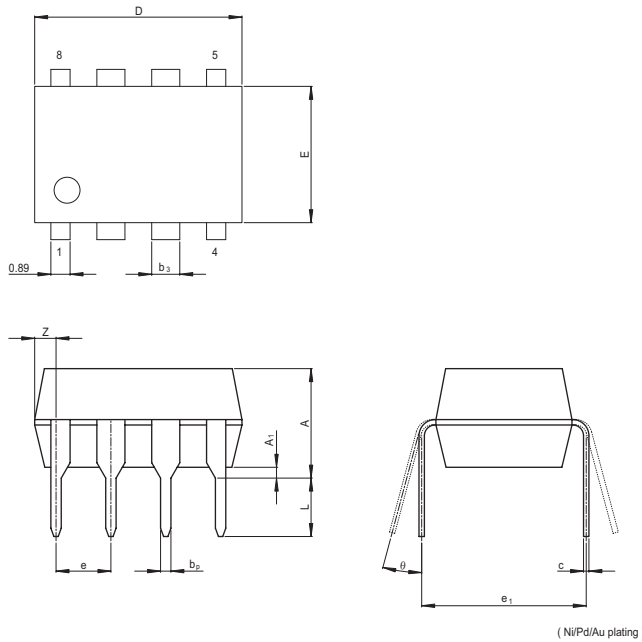


Typical Characteristics Curves (cont.)



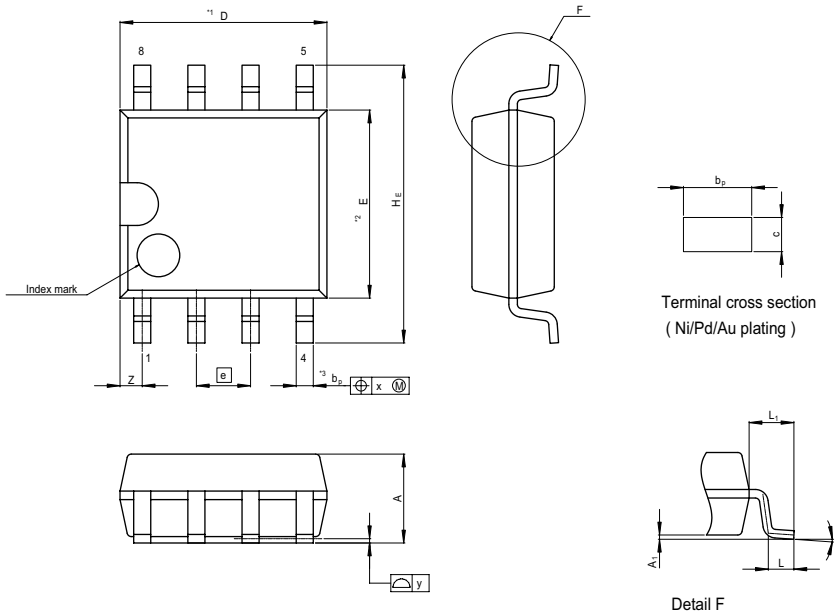
### Package Dimensions

|                     |              |               |            |
|---------------------|--------------|---------------|------------|
| JEITA Package Code  | RENESAS Code | Previous Code | MASS[Typ.] |
| P-DIP8-6.3x9.6-2.54 | PRDP0008AF-B | DP-8FV        | 0.54g      |



| Reference Symbol | Dimension in Millimeters |      |      |
|------------------|--------------------------|------|------|
|                  | Min                      | Nom  | Max  |
| e <sub>1</sub>   | —                        | 7.62 | —    |
| D                | —                        | 9.60 | 10.6 |
| E                | —                        | 6.30 | 7.4  |
| A                | —                        | —    | 5.06 |
| A <sub>1</sub>   | 0.5                      | —    | —    |
| b <sub>p</sub>   | 0.40                     | 0.48 | 0.56 |
| b <sub>3</sub>   | —                        | 1.30 | —    |
| c                | 0.19                     | 0.25 | 0.31 |
| θ                | 0°                       | —    | 15°  |
| e                | 2.29                     | 2.54 | 2.79 |
| Z                | —                        | —    | 1.27 |
| L                | 2.54                     | —    | —    |

|                      |              |               |            |
|----------------------|--------------|---------------|------------|
| JEITA Package Code   | RENESAS Code | Previous Code | MASS[Typ.] |
| P-SOP8-4.4x4.85-1.27 | PRSP0008DE-B | FP-8DGV       | 0.1g       |

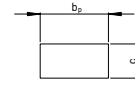
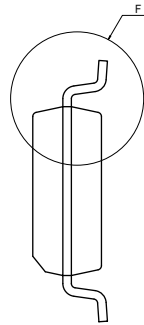
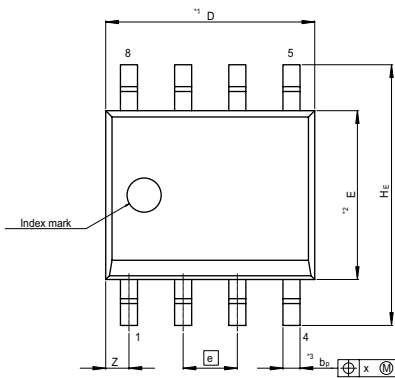


NOTE  
 1. DIMENSIONS\*\*1 (Nom) AND\*\*2\* DO NOT INCLUDE MOLD FLASH.  
 2. DIMENSION\*\*3\* DOES NOT INCLUDE TRIM OFFSET.

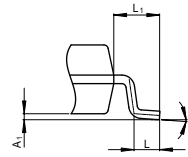
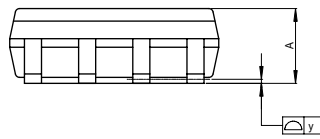
| Reference Symbol | Dimension in Millimeters |      |      |
|------------------|--------------------------|------|------|
|                  | Min                      | Nom  | Max  |
| D                | —                        | 4.85 | 5.25 |
| E                | —                        | 4.4  | —    |
| A <sub>2</sub>   | —                        | —    | —    |
| A <sub>1</sub>   | 0.00                     | 0.1  | 0.20 |
| A                | —                        | —    | 2.03 |
| b <sub>p</sub>   | 0.35                     | 0.4  | 0.45 |
| b <sub>1</sub>   | —                        | —    | —    |
| c                | 0.15                     | 0.20 | 0.25 |
| c <sub>1</sub>   | —                        | —    | —    |
| θ                | 0°                       | —    | 8°   |
| H <sub>E</sub>   | 6.35                     | 6.5  | 6.75 |
| Ⓧ                | —                        | 1.27 | —    |
| x                | —                        | —    | 0.12 |
| y                | —                        | —    | 0.15 |
| Z                | —                        | —    | 0.75 |
| L                | 0.42                     | 0.60 | 0.85 |
| L <sub>1</sub>   | —                        | 1.05 | —    |

# RNB4580 Series

|                      |              |               |            |
|----------------------|--------------|---------------|------------|
| JEITA Package Code   | RENESAS Code | Previous Code | MASS[Typ.] |
| P-SOP8-3.95x4.9-1.27 | PRSP0008DD-C | FP-8DCV       | 0.085g     |



Terminal cross section  
( Ni/Pd/Au plating )



Detail F

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

| Reference Symbol | Dimension in Millimeters |      |      |
|------------------|--------------------------|------|------|
|                  | Min                      | Nom  | Max  |
| D                | —                        | 4.90 | 5.30 |
| E                | —                        | 3.95 | —    |
| A <sub>2</sub>   | —                        | —    | —    |
| A <sub>1</sub>   | 0.10                     | 0.14 | 0.25 |
| A                | —                        | —    | 1.75 |
| $b_p$            | 0.34                     | 0.40 | 0.46 |
| $b_1$            | —                        | —    | —    |
| c                | 0.15                     | 0.20 | 0.25 |
| $c_1$            | —                        | —    | —    |
| $\theta$         | 0°                       | —    | 8°   |
| H <sub>E</sub>   | 5.80                     | 6.10 | 6.20 |
| $\text{Ⓜ}$       | —                        | 1.27 | —    |
| x                | —                        | —    | 0.25 |
| y                | —                        | —    | 0.10 |
| Z                | —                        | —    | 0.75 |
| L                | 0.40                     | 0.60 | 1.27 |
| L <sub>1</sub>   | —                        | 1.08 | —    |



Notes:

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