To our customers,

# Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation



Issued by: Renesas Electronics Corporation (http://www.renesas.com)

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# 2SC5631

## Silicon NPN Epitaxial
## UHF / VHF Wide Band Amplifier

REJ03G0128-0300Z
(Previous ADE-208-981A(Z))
Rev.3.00
Oct.20.2003

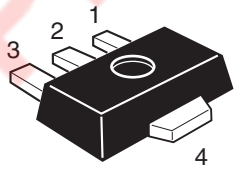


### Features

- High gain bandwidth product
  $f_T$ = 11 GHz typ.
- High power gain and low noise figure ;
  PG = 10 dB typ. , NF = 1.2 dB typ. at f = 900 MHz

### Outline

UPAK




1. Base
2. Collector
3. Emitter
4. Collector

Note: Marking is “JR”.

## Absolute Maximum Ratings

(Ta = 25°C)

| Item | Symbol | Ratings | Unit |
|---|---|---|---|
| Collector to base voltage | $V_{CBO}$ | 15 | V |
| Collector to emitter voltage | $V_{CEO}$ | 6 | V |
| Emitter to base voltage | $V_{EBO}$ | 1.5 | V |
| Collector current | $I_C$ | 80 | mA |
| Collector power dissipation | Pc | 800* | mW |
| Junction temperature | Tj | 150 | °C |
| Storage temperature | Tstg | –55 to +150 | °C |

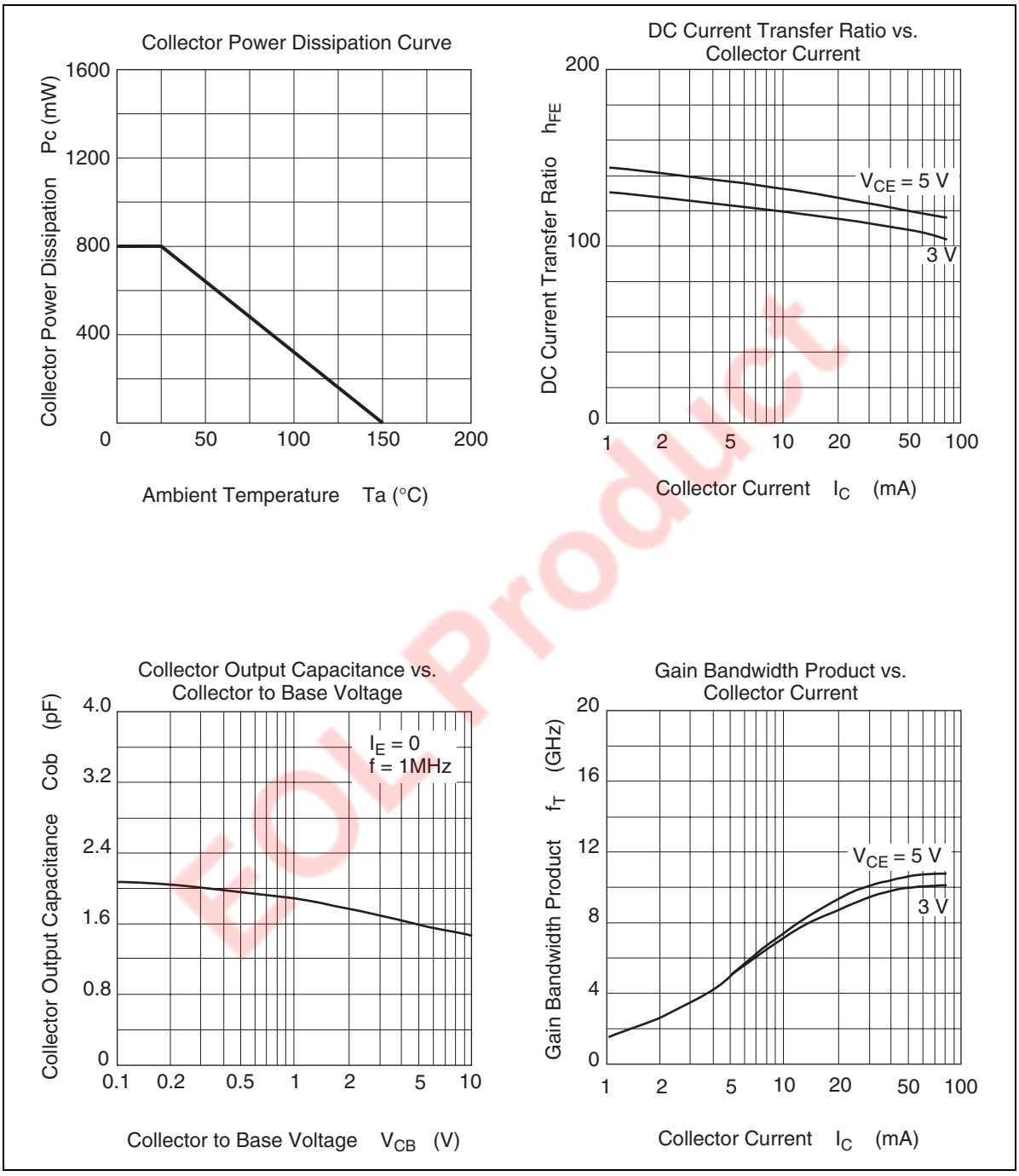
* When using alumina ceramic board (12.5 x 20 x 0.7 mm)

## Electrical Characteristics

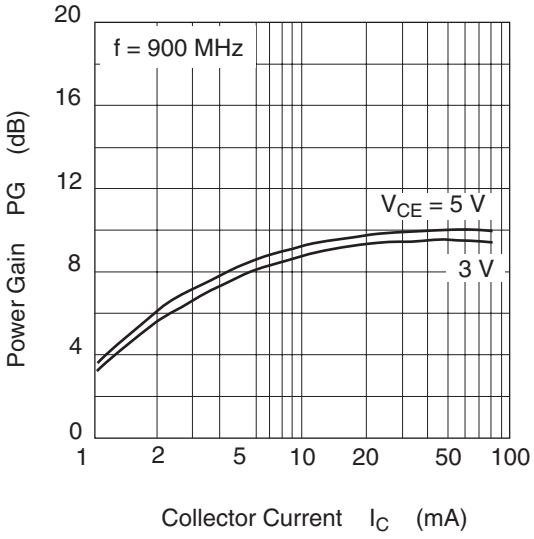
(Ta = 25°C)

| Item | Symbol | Min | Typ | Max | Unit | Test Conditions |
|---|---|---|---|---|---|---|
| Collector to base breakdown voltage | $V_{(BR)CBO}$ | 15 | — | — | V | $I_C$ = 10 µA , $I_E$ = 0 |
| Collector cutoff current | $I_{CBO}$ | — | — | 1 | µA | $V_{CB}$ = 12 V , $I_E$ = 0 |
| Collector cutoff current | $I_{CEO}$ | — | — | 1 | mA | $V_{CE}$ = 6 V , $R_{BE}$ = ∞ |
| Emitter cutoff current | $I_{EBO}$ | — | — | 10 | µA | $V_{EB}$ = 1.5 V , $I_C$ = 0 |
| DC current transfer ratio | $h_{FE}$ | 80 | 120 | 160 | V | $V_{CE}$ = 5 V , $I_C$ = 50 mA |
| Collector output capacitance | Cob | — | 1.6 | 2.2 | pF | $V_{CB}$ = 5 V , $I_E$ = 0<br>f = 1 MHz |
| Gain bandwidth product | $f_T$ | 8 | 11 | — | GHz | $V_{CE}$ = 5 V , $I_C$ = 50 mA<br>f = 1 GHz |
| Power gain | PG | 7 | 10 | — | dB | $V_{CE}$ = 5 V , $I_C$ = 50 mA<br>f = 900 MHz |
| Noise figure | NF | — | 1.2 | 1.9 | dB | $V_{CE}$ = 5 V , $I_C$ = 5 mA<br>f = 900 MHz |

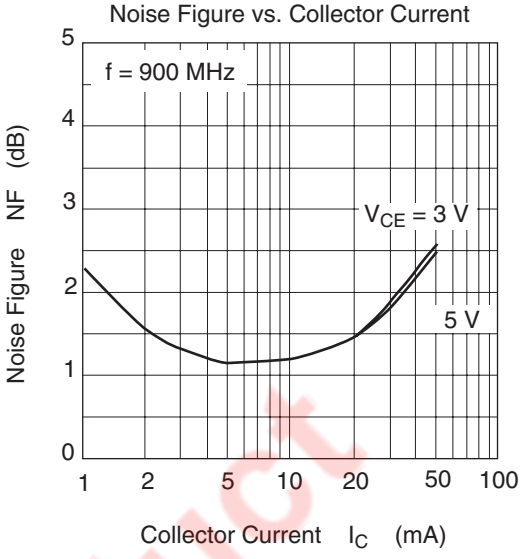
## Main Characteristics



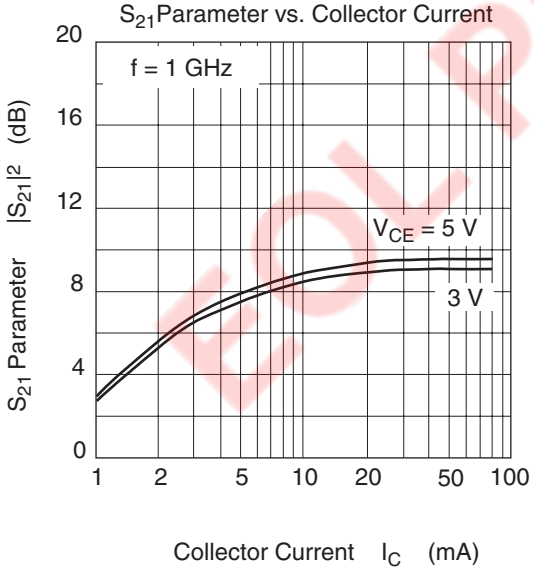
Power Gain vs. Collector Current



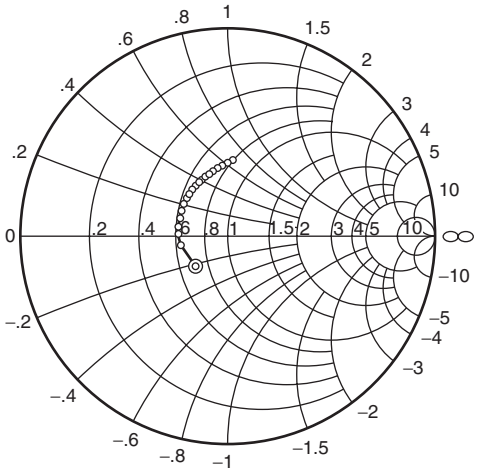

Noise Figure vs. Collector Current




$S_{21}$Parameter vs. Collector Current



S11 Parameter vs. Frequency

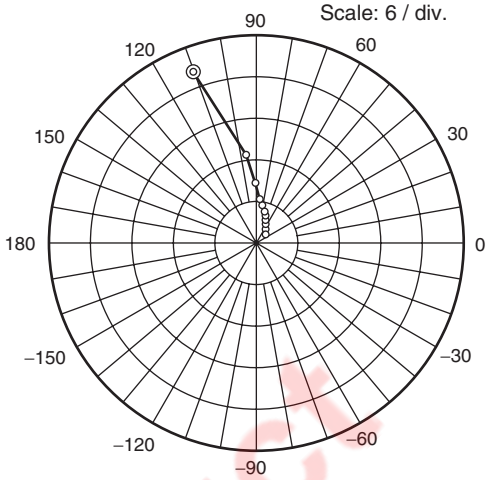



Condition : $V_{CE}$ = 3 V , $I_C$ = 50 mA

100 to 2000 MHz (100 MHz step)

S21 Paramter vs. Frequency

Scale: 6 / div.

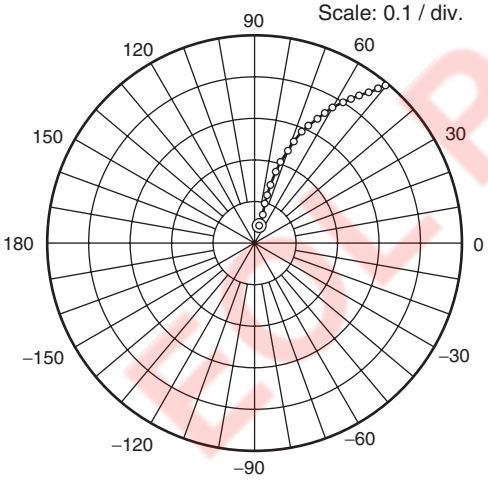



Condition : $V_{CE}$ = 3 V , $I_C$ = 50 mA

100 to 2000 MHz (100 MHz step)

S12 Parameter vs. Frequency

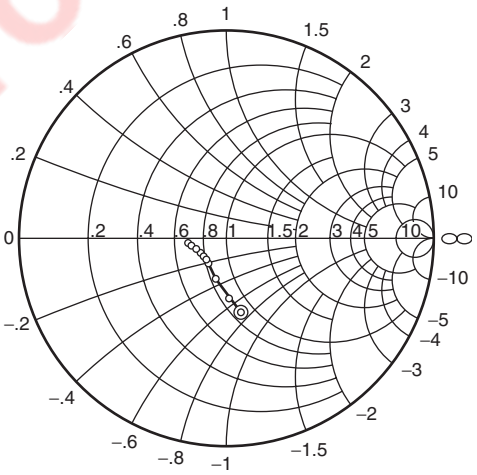
Scale: 0.1 / div.




Condition : $V_{CE}$ = 3 V , $I_C$ = 50 mA

100 to 2000 MHz (100 MHz step)

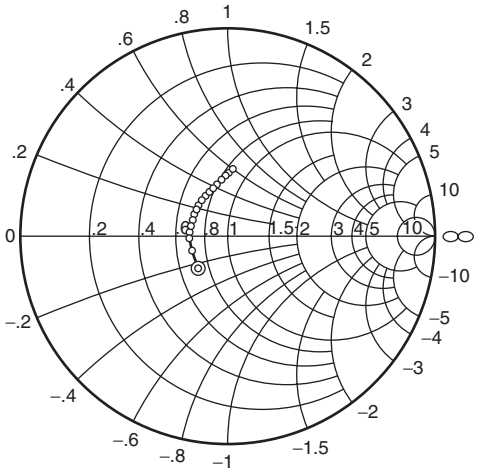
S22 Parameter vs. Frequency




Condition : $V_{CE}$ = 3 V , $I_C$ = 50 mA

100 to 2000 MHz (100 MHz step)

S11 Parameter vs. Frequency

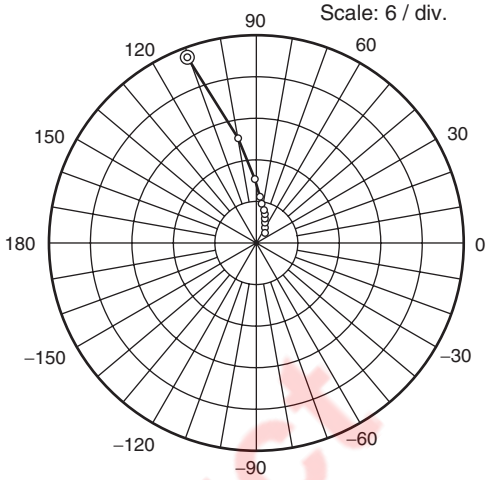



Condition : $V_{CE}$ = 5 V , $I_C$ = 50 mA

100 to 2000 MHz (100 MHz step)

S21 Paramter vs. Frequency

Scale: 6 / div.

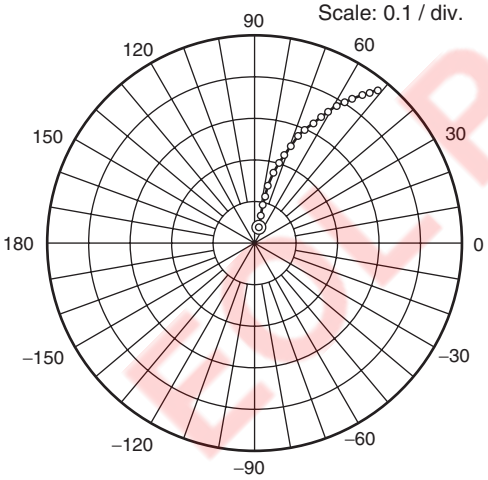



Condition : $V_{CE}$ = 5 V , $I_C$ = 50 mA

100 to 2000 MHz (100 MHz step)

S12 Parameter vs. Frequency

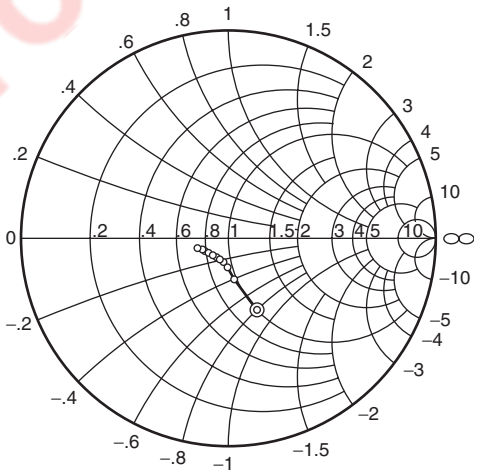
Scale: 0.1 / div.




Condition : $V_{CE}$ = 5 V , $I_C$ = 50 mA

100 to 2000 MHz (100 MHz step)

S22 Parameter vs. Frequency




Condition : $V_{CE}$ = 5 V , $I_C$ = 50 mA

100 to 2000 MHz (100 MHz step)

## S parameter

($V_{CE}$ = 3V, $I_C$ = 50 mA, Zo = 50 Ω )

| | S11 | | S21 | | S12 | | S22 | |
|---|---|---|---|---|---|---|---|---|
| f (MHz) | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 100 | 0.234 | –135.7 | 26.57 | 109.9 | 0.0299 | 75.5 | 0.353 | –77.7 |
| 200 | 0.233 | –165.2 | 13.47 | 96.1 | 0.0575 | 78.0 | 0.199 | –99.6 |
| 300 | 0.234 | 179.3 | 8.92 | 89.7 | 0.0863 | 77.8 | 0.153 | –112.5 |
| 400 | 0.238 | 170.1 | 6.70 | 84.9 | 0.114 | 76.9 | 0.135 | –121.8 |
| 500 | 0.242 | 161.2 | 5.37 | 81.2 | 0.142 | 75.4 | 0.127 | –128.3 |
| 600 | 0.249 | 153.9 | 4.52 | 77.8 | 0.169 | 73.9 | 0.124 | –133.5 |
| 700 | 0.250 | 145.9 | 3.89 | 74.5 | 0.196 | 72.2 | 0.125 | –138.0 |
| 800 | 0.259 | 140.4 | 3.43 | 71.4 | 0.223 | 70.4 | 0.126 | –141.3 |
| 900 | 0.267 | 134.2 | 3.08 | 68.6 | 0.249 | 68.4 | 0.128 | –145.0 |
| 1000 | 0.274 | 128.0 | 2.80 | 65.8 | 0.275 | 66.9 | 0.131 | –147.7 |
| 1100 | 0.282 | 123.5 | 2.58 | 63.2 | 0.299 | 65.0 | 0.136 | –150.3 |
| 1200 | 0.290 | 119.2 | 2.40 | 60.3 | 0.323 | 63.2 | 0.140 | –153.0 |
| 1300 | 0.297 | 114.2 | 2.25 | 57.9 | 0.346 | 61.3 | 0.144 | –155.6 |
| 1400 | 0.307 | 109.6 | 2.12 | 55.9 | 0.367 | 59.7 | 0.149 | –158.1 |
| 1500 | 0.318 | 105.3 | 2.01 | 53.4 | 0.389 | 57.8 | 0.153 | –160.5 |
| 1600 | 0.324 | 101.7 | 1.92 | 51.3 | 0.409 | 56.2 | 0.159 | –162.7 |
| 1700 | 0.334 | 97.7 | 1.83 | 48.6 | 0.430 | 54.4 | 0.163 | –165.1 |
| 1800 | 0.345 | 93.9 | 1.77 | 46.8 | 0.448 | 52.8 | 0.170 | –167.9 |
| 1900 | 0.357 | 91.6 | 1.72 | 44.6 | 0.468 | 50.9 | 0.174 | –170.2 |
| 2000 | 0.366 | 87.9 | 1.65 | 42.6 | 0.485 | 49.5 | 0.180 | –172.6 |

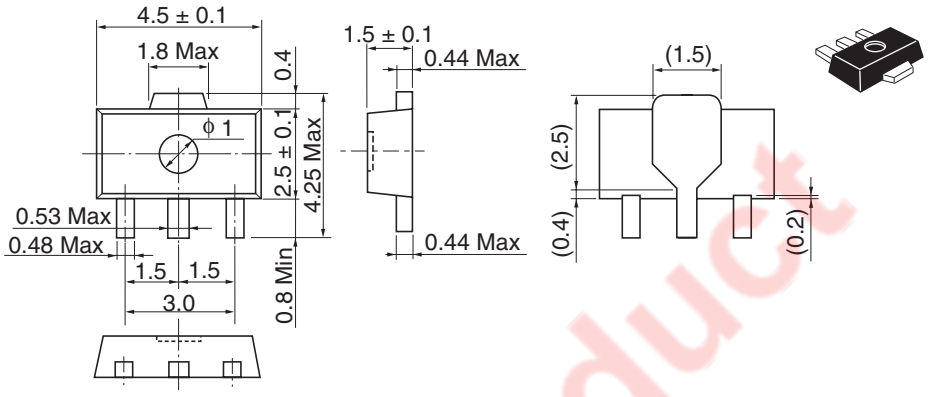
## S parameter

($V_{CE}$ = 5V, $I_C$ = 50 mA, Zo = 50 Ω )

| | S11 | | S21 | | S12 | | S22 | |
|---|---|---|---|---|---|---|---|---|
| f (MHz) | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 100 | 0.205 | –123.9 | 28.04 | 110.8 | 0.0284 | 74.9 | 0.360 | –69.1 |
| 200 | 0.193 | –159.6 | 14.24 | 96.9 | 0.0547 | 78.2 | 0.197 | –84.5 |
| 300 | 0.190 | –177.1 | 9.44 | 90.2 | 0.0820 | 78.3 | 0.145 | –92.5 |
| 400 | 0.193 | 169.9 | 7.09 | 85.3 | 0.109 | 77.5 | 0.123 | –99.0 |
| 500 | 0.201 | 162.0 | 5.68 | 81.8 | 0.135 | 76.3 | 0.112 | –104.1 |
| 600 | 0.206 | 153.7 | 4.76 | 78.4 | 0.162 | 74.6 | 0.107 | –109.5 |
| 700 | 0.206 | 145.4 | 4.11 | 75.1 | 0.188 | 72.9 | 0.105 | –113.7 |
| 800 | 0.221 | 139.0 | 3.62 | 72.2 | 0.213 | 71.3 | 0.105 | –117.6 |
| 900 | 0.224 | 132.6 | 3.25 | 69.4 | 0.238 | 69.4 | 0.106 | –121.8 |
| 1000 | 0.234 | 126.8 | 2.94 | 66.6 | 0.262 | 67.8 | 0.110 | –125.4 |
| 1100 | 0.243 | 120.8 | 2.72 | 64.0 | 0.286 | 66.0 | 0.113 | –128.7 |
| 1200 | 0.249 | 116.8 | 2.53 | 61.3 | 0.309 | 64.3 | 0.117 | –132.0 |
| 1300 | 0.261 | 111.3 | 2.36 | 59.0 | 0.331 | 62.5 | 0.120 | –135.5 |
| 1400 | 0.270 | 107.4 | 2.23 | 56.9 | 0.353 | 60.9 | 0.125 | –138.7 |
| 1500 | 0.280 | 103.5 | 2.10 | 54.5 | 0.373 | 59.1 | 0.129 | –142.0 |
| 1600 | 0.285 | 99.1 | 2.01 | 52.1 | 0.393 | 57.6 | 0.135 | –144.9 |
| 1700 | 0.298 | 95.4 | 1.92 | 50.3 | 0.414 | 56.0 | 0.139 | –148.1 |
| 1800 | 0.312 | 91.8 | 1.84 | 47.6 | 0.431 | 54.3 | 0.145 | –151.3 |
| 1900 | 0.321 | 87.9 | 1.79 | 45.7 | 0.450 | 52.5 | 0.148 | –154.5 |
| 2000 | 0.330 | 85.6 | 1.71 | 43.8 | 0.467 | 51.4 | 0.155 | –157.5 |

## Package Dimensions

As of January, 2003
Unit: mm




| | |
|---|---|
| Package Code | UPAK |
| JEDEC | — |
| JEITA | Conforms |
| Mass (reference value) | 0.050 g |

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