



SANYO Semiconductors

## DATA SHEET

An ON Semiconductor Company

# CPH6021 — NPN Epitaxial Planar Silicon Transistor

## High-Frequency Low-Noise Amplifier

### Features

- Low-noise use :  $NF=1.2\text{dB}$  typ ( $f=1\text{GHz}$ )
- High cut-off frequency :  $f_T=10\text{GHz}$  typ ( $V_{CE}=5\text{V}$ )
- High gain :  $|S_{21e}|^2=14\text{dB}$  typ ( $f=1\text{GHz}$ )
- Halogen free compliance

### Specifications

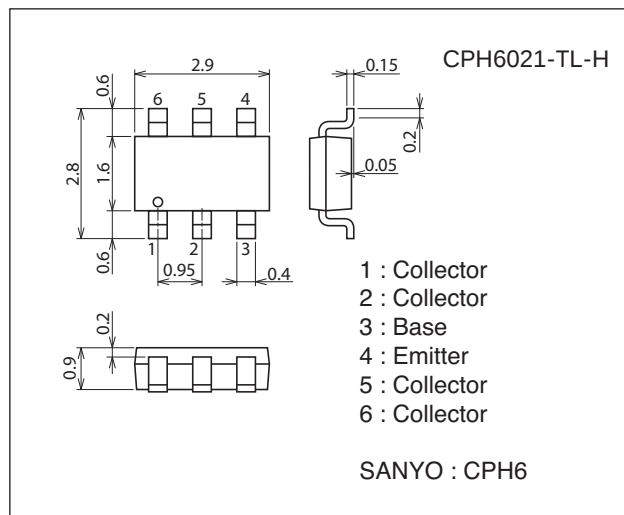
Absolute Maximum Ratings at  $T_a=25^\circ\text{C}$ 

| Parameter                    | Symbol    | Conditions                                                                 | Ratings     | Unit             |
|------------------------------|-----------|----------------------------------------------------------------------------|-------------|------------------|
| Collector-to- Base Voltage   | $V_{CBO}$ |                                                                            | 20          | V                |
| Collector-to-Emitter Voltage | $V_{CEO}$ |                                                                            | 12          | V                |
| Emitter-to-Base Voltage      | $V_{EBO}$ |                                                                            | 2           | V                |
| Collector Current            | $I_C$     |                                                                            | 100         | mA               |
| Collector Dissipation        | $P_C$     | When mounted on ceramic substrate ( $250\text{mm}^2 \times 0.8\text{mm}$ ) | 700         | mW               |
| Junction Temperature         | $T_J$     |                                                                            | 150         | $^\circ\text{C}$ |
| Storage Temperature          | $T_{stg}$ |                                                                            | -55 to +150 | $^\circ\text{C}$ |

### Package Dimensions

unit : mm (typ)

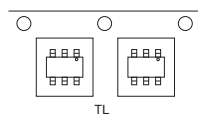
7018A-002



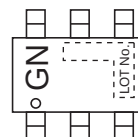
### Product & Package Information

- Package : CPH6
- JEITA, JEDEC : SC-74, SOT-26, SOT-457
- Minimum Packing Quantity : 3,000 pcs./reel

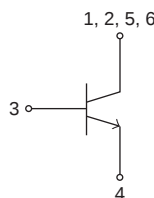
### Packing Type: TL



### Marking



### Electrical Connection



# CPH6021

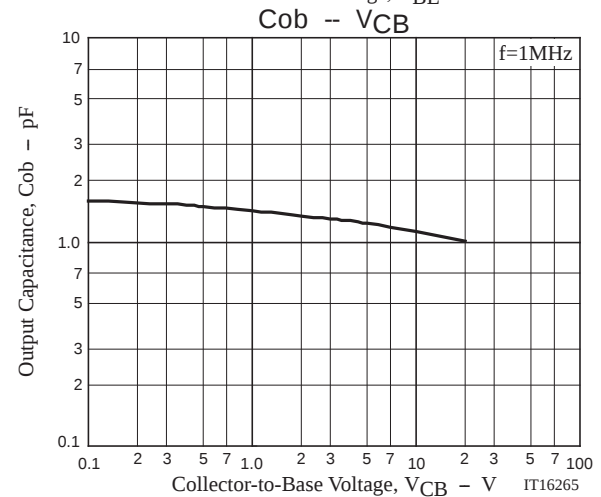
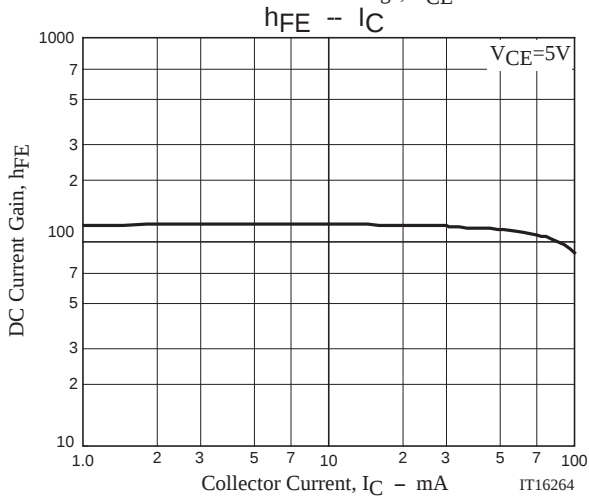
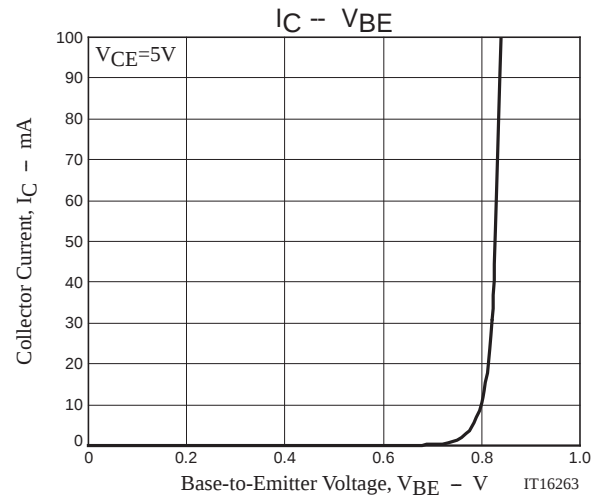
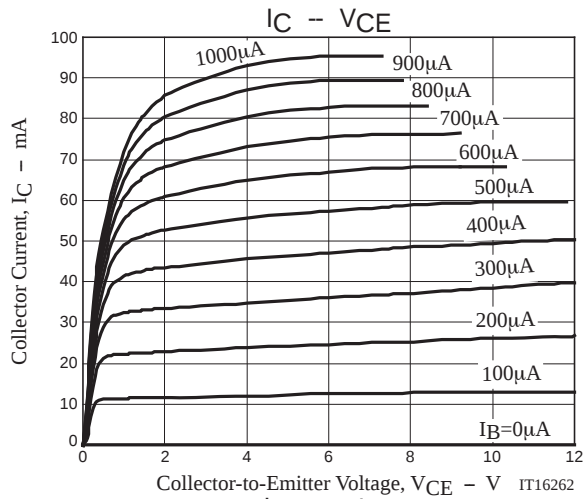
## Electrical Characteristics at Ta=25°C

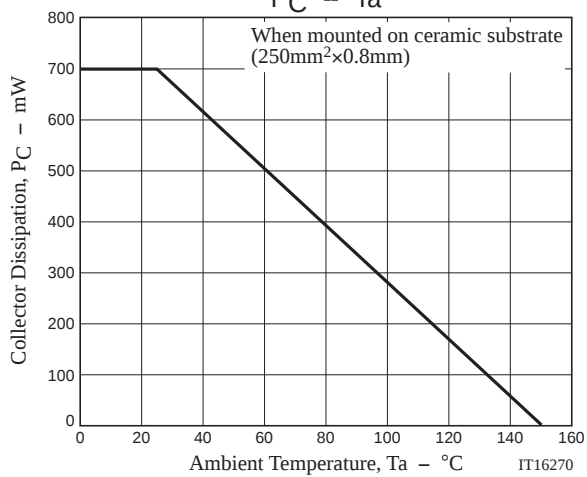
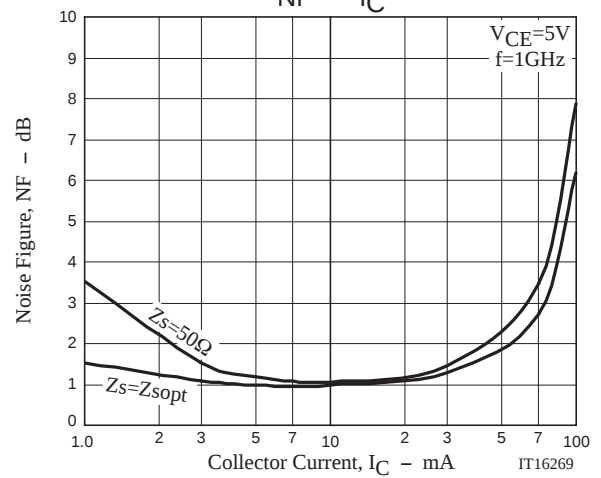
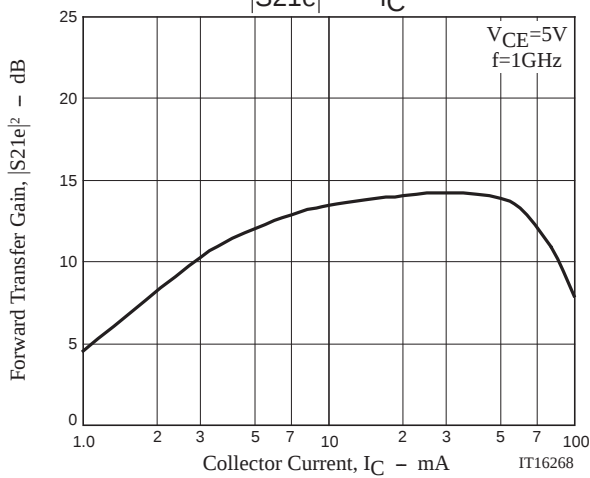
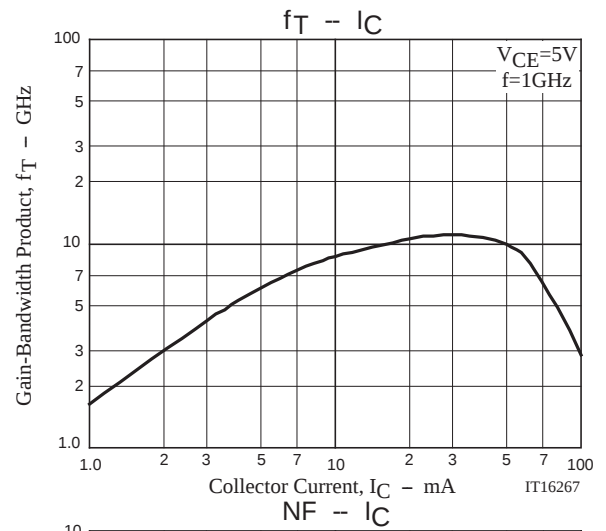
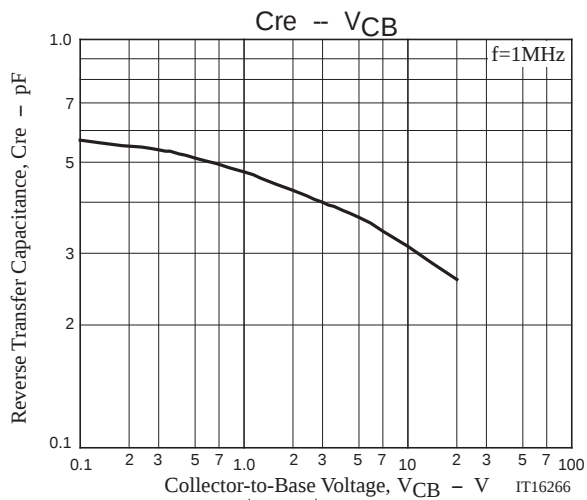
| Parameter                | Symbol        | Conditions                    | Ratings |     |     | Unit    |
|--------------------------|---------------|-------------------------------|---------|-----|-----|---------|
|                          |               |                               | min     | typ | max |         |
| Collector Cutoff Current | $I_{CBO}$     | $V_{CB}=5V, I_E=0A$           |         |     | 1.0 | $\mu A$ |
| Emitter Cutoff Current   | $I_{EBO}$     | $V_{EB}=1V, I_C=0A$           |         |     | 1.0 | $\mu A$ |
| DC Current Gain          | $h_{FE}$      | $V_{CE}=5V, I_C=50mA$         | 60      |     | 150 |         |
| Gain-Bandwidth Product   | $f_T$         | $V_{CE}=5V, I_C=30mA$         | 8       | 10  |     | GHz     |
| Forward Transfer Gain    | $ S_{21e} ^2$ | $V_{CE}=5V, I_C=30mA, f=1GHz$ | 10      | 14  |     | dB      |
| Noise Figure             | NF            | $V_{CE}=5V, I_C=10mA, f=1GHz$ |         | 1.2 | 1.8 | dB      |

Notre) Pay attention to handling since it is liable to be affected by static electricity due to the high-frequency process adopted.

## Ordering Information

| Device       | Package | Shipping       | memo                     |
|--------------|---------|----------------|--------------------------|
| CPH6021-TL-H | CPH6    | 3,000pcs./reel | Pb Free and Halogen Free |





# CPH6021

## S Parameters (Common emitter)

V<sub>CE</sub>=3V, I<sub>C</sub>=10mA

| Freq(MHz) | S <sub>11</sub> | ∠S <sub>11</sub> | S <sub>21</sub> | ∠S <sub>21</sub> | S <sub>12</sub> | ∠S <sub>12</sub> | S <sub>22</sub> | ∠S <sub>22</sub> |
|-----------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| 100       | 0.758           | -26.8            | 14.284          | 149.0            | 0.021           | 74.1             | 0.878           | -24.0            |
| 200       | 0.630           | -56.2            | 13.720          | 131.4            | 0.033           | 66.6             | 0.711           | -38.2            |
| 300       | 0.503           | -82.5            | 12.164          | 116.0            | 0.044           | 65.4             | 0.593           | -46.0            |
| 400       | 0.414           | -103.1           | 10.315          | 104.5            | 0.053           | 65.8             | 0.512           | -51.3            |
| 500       | 0.368           | -117.9           | 8.649           | 96.7             | 0.062           | 67.0             | 0.457           | -55.3            |
| 600       | 0.341           | -129.4           | 7.360           | 90.8             | 0.072           | 68.0             | 0.419           | -58.7            |
| 700       | 0.326           | -138.7           | 6.370           | 86.0             | 0.081           | 68.6             | 0.391           | -61.8            |
| 800       | 0.313           | -147.1           | 5.629           | 81.7             | 0.091           | 69.2             | 0.370           | -64.6            |
| 900       | 0.307           | -154.2           | 5.036           | 78.0             | 0.101           | 69.2             | 0.353           | -67.3            |
| 1000      | 0.302           | -160.2           | 4.556           | 74.7             | 0.112           | 69.2             | 0.342           | -69.9            |
| 1200      | 0.299           | -170.7           | 3.832           | 68.6             | 0.133           | 68.5             | 0.325           | -75.2            |
| 1400      | 0.298           | -179.6           | 3.316           | 63.1             | 0.155           | 67.4             | 0.316           | -80.5            |
| 1600      | 0.301           | 172.7            | 2.931           | 57.9             | 0.177           | 66.0             | 0.312           | -86.0            |
| 1800      | 0.305           | 165.8            | 2.634           | 53.0             | 0.199           | 64.4             | 0.311           | -91.4            |
| 2000      | 0.309           | 159.4            | 2.398           | 48.3             | 0.222           | 62.7             | 0.312           | -96.9            |
| 2200      | 0.315           | 153.4            | 2.204           | 43.8             | 0.244           | 60.7             | 0.314           | -102.6           |
| 2400      | 0.320           | 147.8            | 2.044           | 39.5             | 0.267           | 58.7             | 0.316           | -108.0           |
| 2600      | 0.326           | 142.7            | 1.911           | 35.4             | 0.290           | 56.6             | 0.321           | -113.1           |
| 2800      | 0.334           | 137.8            | 1.799           | 31.3             | 0.314           | 54.3             | 0.327           | -118.8           |
| 3000      | 0.338           | 133.2            | 1.700           | 27.7             | 0.337           | 52.2             | 0.333           | -123.7           |

V<sub>CE</sub>=3V, I<sub>C</sub>=30mA

| Freq(MHz) | S <sub>11</sub> | ∠S <sub>11</sub> | S <sub>21</sub> | ∠S <sub>21</sub> | S <sub>12</sub> | ∠S <sub>12</sub> | S <sub>22</sub> | ∠S <sub>22</sub> |
|-----------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| 100       | 0.422           | -60.6            | 29.590          | 135.2            | 0.016           | 71.4             | 0.722           | -33.7            |
| 200       | 0.307           | -104.4           | 21.814          | 112.1            | 0.025           | 72.9             | 0.519           | -44.2            |
| 300       | 0.268           | -126.8           | 15.788          | 100.5            | 0.037           | 76.0             | 0.425           | -48.4            |
| 400       | 0.256           | -140.7           | 12.124          | 93.3             | 0.047           | 77.3             | 0.373           | -51.5            |
| 500       | 0.254           | -150.8           | 9.776           | 88.0             | 0.058           | 78.3             | 0.340           | -54.4            |
| 600       | 0.255           | -158.5           | 8.161           | 83.9             | 0.070           | 78.3             | 0.317           | -57.4            |
| 700       | 0.258           | -164.9           | 6.998           | 80.2             | 0.081           | 77.8             | 0.300           | -60.3            |
| 800       | 0.259           | -170.4           | 6.125           | 77.0             | 0.093           | 77.5             | 0.288           | -63.2            |
| 900       | 0.262           | -175.2           | 5.448           | 74.1             | 0.105           | 76.6             | 0.278           | -66.1            |
| 1000      | 0.265           | -179.3           | 4.911           | 71.3             | 0.117           | 75.3             | 0.272           | -68.8            |
| 1200      | 0.270           | 173.0            | 4.110           | 66.2             | 0.141           | 73.4             | 0.263           | -74.5            |
| 1400      | 0.275           | 166.2            | 3.546           | 61.3             | 0.165           | 71.1             | 0.259           | -80.3            |
| 1600      | 0.281           | 160.2            | 3.126           | 56.7             | 0.189           | 68.6             | 0.259           | -86.1            |
| 1800      | 0.287           | 154.6            | 2.804           | 52.3             | 0.212           | 66.2             | 0.260           | -91.9            |
| 2000      | 0.292           | 149.3            | 2.549           | 48.0             | 0.236           | 63.6             | 0.263           | -97.7            |
| 2200      | 0.299           | 144.3            | 2.343           | 43.7             | 0.259           | 61.0             | 0.266           | -103.5           |
| 2400      | 0.305           | 139.4            | 2.170           | 39.7             | 0.282           | 58.5             | 0.269           | -109.0           |
| 2600      | 0.310           | 135.1            | 2.028           | 35.9             | 0.305           | 56.0             | 0.275           | -114.2           |
| 2800      | 0.317           | 130.7            | 1.908           | 32.0             | 0.329           | 53.3             | 0.280           | -119.9           |
| 3000      | 0.320           | 126.7            | 1.803           | 28.5             | 0.352           | 50.9             | 0.287           | -124.7           |

## CPH6021

### S Parameters (Common emitter)

V<sub>CE</sub>=3V, I<sub>C</sub>=50mA

| Freq(MHz) | S <sub>11</sub> | ∠S <sub>11</sub> | S <sub>21</sub> | ∠S <sub>21</sub> | S <sub>12</sub> | ∠S <sub>12</sub> | S <sub>22</sub> | ∠S <sub>22</sub> |
|-----------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| 100       | 0.317           | -109.4           | 31.770          | 125.5            | 0.013           | 75.2             | 0.630           | -35.4            |
| 200       | 0.309           | -140.2           | 20.342          | 105.6            | 0.023           | 76.4             | 0.452           | -42.0            |
| 300       | 0.303           | -153.5           | 14.403          | 96.2             | 0.034           | 78.9             | 0.381           | -44.4            |
| 400       | 0.305           | -161.9           | 10.996          | 89.9             | 0.045           | 79.8             | 0.343           | -46.8            |
| 500       | 0.310           | -168.1           | 8.862           | 85.1             | 0.057           | 80.6             | 0.319           | -49.5            |
| 600       | 0.315           | -172.9           | 7.391           | 81.2             | 0.068           | 80.1             | 0.303           | -52.5            |
| 700       | 0.321           | -177.3           | 6.332           | 77.7             | 0.080           | 80.0             | 0.291           | -55.6            |
| 800       | 0.324           | 178.9            | 5.544           | 74.6             | 0.092           | 79.1             | 0.282           | -58.6            |
| 900       | 0.329           | 175.4            | 4.934           | 71.7             | 0.104           | 78.4             | 0.275           | -61.6            |
| 1000      | 0.332           | 172.3            | 4.448           | 69.0             | 0.116           | 77.4             | 0.271           | -64.6            |
| 1200      | 0.338           | 166.2            | 3.725           | 63.8             | 0.140           | 75.1             | 0.267           | -70.7            |
| 1400      | 0.344           | 160.6            | 3.216           | 58.9             | 0.164           | 72.7             | 0.265           | -77.0            |
| 1600      | 0.351           | 155.5            | 2.838           | 54.1             | 0.188           | 70.3             | 0.267           | -83.3            |
| 1800      | 0.356           | 150.7            | 2.545           | 49.6             | 0.212           | 67.8             | 0.270           | -89.5            |
| 2000      | 0.362           | 146.0            | 2.316           | 45.2             | 0.237           | 65.2             | 0.275           | -95.7            |
| 2200      | 0.369           | 141.3            | 2.128           | 40.9             | 0.260           | 62.5             | 0.279           | -101.9           |
| 2400      | 0.374           | 136.9            | 1.973           | 36.8             | 0.284           | 60.0             | 0.284           | -107.8           |
| 2600      | 0.379           | 132.8            | 1.843           | 32.9             | 0.308           | 57.4             | 0.290           | -113.3           |
| 2800      | 0.387           | 128.7            | 1.735           | 29.0             | 0.332           | 54.6             | 0.297           | -119.4           |
| 3000      | 0.389           | 124.8            | 1.640           | 25.5             | 0.357           | 52.1             | 0.304           | -124.5           |

V<sub>CE</sub>=3V, I<sub>C</sub>=80mA

| Freq(MHz) | S <sub>11</sub> | ∠S <sub>11</sub> | S <sub>21</sub> | ∠S <sub>21</sub> | S <sub>12</sub> | ∠S <sub>12</sub> | S <sub>22</sub> | ∠S <sub>22</sub> |
|-----------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| 100       | 0.476           | -152.5           | 23.097          | 116.2            | 0.016           | 68.9             | 0.452           | -34.8            |
| 200       | 0.527           | -167.4           | 12.902          | 98.8             | 0.025           | 72.7             | 0.341           | -36.3            |
| 300       | 0.540           | -174.6           | 8.790           | 90.8             | 0.034           | 76.2             | 0.305           | -37.7            |
| 400       | 0.547           | -179.4           | 6.612           | 85.1             | 0.045           | 78.8             | 0.288           | -40.3            |
| 500       | 0.553           | 176.8            | 5.303           | 80.5             | 0.056           | 79.7             | 0.277           | -43.6            |
| 600       | 0.557           | 173.5            | 4.423           | 76.6             | 0.068           | 79.6             | 0.270           | -47.4            |
| 700       | 0.561           | 170.5            | 3.794           | 72.9             | 0.079           | 79.6             | 0.266           | -51.2            |
| 800       | 0.564           | 167.7            | 3.328           | 69.7             | 0.092           | 79.3             | 0.264           | -55.1            |
| 900       | 0.566           | 165.0            | 2.969           | 66.5             | 0.104           | 78.6             | 0.262           | -59.0            |
| 1000      | 0.569           | 162.4            | 2.683           | 63.4             | 0.116           | 77.8             | 0.261           | -62.7            |
| 1200      | 0.573           | 157.4            | 2.259           | 57.7             | 0.141           | 76.0             | 0.264           | -70.5            |
| 1400      | 0.577           | 152.6            | 1.960           | 52.2             | 0.166           | 73.8             | 0.268           | -78.1            |
| 1600      | 0.581           | 148.0            | 1.739           | 47.0             | 0.191           | 71.5             | 0.274           | -85.7            |
| 1800      | 0.585           | 143.4            | 1.567           | 42.1             | 0.218           | 69.1             | 0.281           | -93.1            |
| 2000      | 0.588           | 138.9            | 1.432           | 37.5             | 0.244           | 66.5             | 0.289           | -100.4           |
| 2200      | 0.591           | 134.4            | 1.321           | 33.1             | 0.270           | 63.7             | 0.296           | -107.6           |
| 2400      | 0.594           | 130.1            | 1.229           | 29.1             | 0.297           | 61.1             | 0.304           | -114.4           |
| 2600      | 0.596           | 125.9            | 1.152           | 25.3             | 0.323           | 58.2             | 0.311           | -120.7           |
| 2800      | 0.600           | 121.6            | 1.087           | 21.7             | 0.350           | 55.2             | 0.319           | -127.6           |
| 3000      | 0.600           | 117.6            | 1.032           | 18.6             | 0.377           | 52.5             | 0.328           | -133.5           |

# CPH6021

## S Parameters (Common emitter)

V<sub>CE</sub>=5V, I<sub>C</sub>=10mA

| Freq(MHz) | S <sub>11</sub> | ∠S <sub>11</sub> | S <sub>21</sub> | ∠S <sub>21</sub> | S <sub>12</sub> | ∠S <sub>12</sub> | S <sub>22</sub> | ∠S <sub>22</sub> |
|-----------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| 100       | 0.766           | -25.4            | 14.421          | 149.8            | 0.020           | 72.1             | 0.889           | -22.0            |
| 200       | 0.640           | -53.7            | 13.939          | 132.3            | 0.031           | 67.6             | 0.734           | -35.1            |
| 300       | 0.512           | -78.9            | 12.421          | 117.0            | 0.041           | 66.8             | 0.620           | -42.4            |
| 400       | 0.418           | -98.6            | 10.572          | 105.3            | 0.049           | 67.1             | 0.541           | -47.2            |
| 500       | 0.366           | -113.3           | 8.897           | 97.5             | 0.058           | 68.5             | 0.488           | -50.9            |
| 600       | 0.335           | -124.8           | 7.581           | 91.4             | 0.067           | 69.8             | 0.450           | -54.1            |
| 700       | 0.318           | -134.3           | 6.565           | 86.6             | 0.076           | 70.4             | 0.423           | -57.0            |
| 800       | 0.302           | -142.8           | 5.808           | 82.3             | 0.086           | 70.7             | 0.401           | -59.6            |
| 900       | 0.294           | -150.2           | 5.196           | 78.6             | 0.096           | 70.9             | 0.385           | -62.1            |
| 1000      | 0.289           | -156.4           | 4.700           | 75.2             | 0.106           | 70.9             | 0.373           | -64.7            |
| 1200      | 0.284           | -167.3           | 3.953           | 69.1             | 0.127           | 70.3             | 0.356           | -69.6            |
| 1400      | 0.282           | -176.6           | 3.421           | 63.5             | 0.148           | 69.3             | 0.347           | -74.8            |
| 1600      | 0.285           | 175.3            | 3.022           | 58.3             | 0.169           | 68.0             | 0.342           | -80.2            |
| 1800      | 0.288           | 168.1            | 2.715           | 53.4             | 0.191           | 66.5             | 0.340           | -85.5            |
| 2000      | 0.292           | 161.5            | 2.470           | 48.7             | 0.213           | 64.8             | 0.341           | -90.9            |
| 2200      | 0.298           | 155.4            | 2.270           | 44.2             | 0.236           | 62.8             | 0.343           | -96.6            |
| 2400      | 0.304           | 149.6            | 2.104           | 39.9             | 0.258           | 60.8             | 0.345           | -102.0           |
| 2600      | 0.310           | 144.4            | 1.966           | 35.8             | 0.281           | 58.8             | 0.350           | -107.1           |
| 2800      | 0.318           | 139.3            | 1.849           | 31.7             | 0.305           | 56.5             | 0.355           | -112.9           |
| 3000      | 0.322           | 134.7            | 1.747           | 28.0             | 0.329           | 54.5             | 0.361           | -117.8           |

V<sub>CE</sub>=5V, I<sub>C</sub>=30mA

| Freq(MHz) | S <sub>11</sub> | ∠S <sub>11</sub> | S <sub>21</sub> | ∠S <sub>21</sub> | S <sub>12</sub> | ∠S <sub>12</sub> | S <sub>22</sub> | ∠S <sub>22</sub> |
|-----------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| 100       | 0.447           | -51.2            | 31.013          | 137.1            | 0.015           | 72.3             | 0.749           | -30.3            |
| 200       | 0.303           | -94.5            | 22.794          | 113.5            | 0.024           | 74.5             | 0.556           | -39.8            |
| 300       | 0.254           | -118.0           | 16.483          | 101.5            | 0.033           | 76.9             | 0.464           | -43.7            |
| 400       | 0.237           | -133.0           | 12.654          | 94.1             | 0.044           | 78.3             | 0.412           | -46.5            |
| 500       | 0.232           | -144.2           | 10.199          | 88.7             | 0.055           | 79.6             | 0.378           | -49.1            |
| 600       | 0.231           | -152.7           | 8.520           | 84.4             | 0.066           | 79.4             | 0.356           | -51.8            |
| 700       | 0.233           | -159.7           | 7.304           | 80.7             | 0.077           | 79.3             | 0.338           | -54.5            |
| 800       | 0.234           | -165.7           | 6.390           | 77.5             | 0.088           | 78.6             | 0.325           | -57.1            |
| 900       | 0.236           | -171.0           | 5.681           | 74.6             | 0.100           | 77.8             | 0.315           | -59.9            |
| 1000      | 0.239           | -175.6           | 5.120           | 71.8             | 0.111           | 77.1             | 0.308           | -62.5            |
| 1200      | 0.244           | 176.1            | 4.285           | 66.7             | 0.134           | 74.8             | 0.298           | -67.8            |
| 1400      | 0.249           | 168.9            | 3.693           | 61.9             | 0.157           | 72.7             | 0.293           | -73.4            |
| 1600      | 0.255           | 162.5            | 3.255           | 57.2             | 0.180           | 70.2             | 0.292           | -79.0            |
| 1800      | 0.260           | 156.7            | 2.919           | 52.8             | 0.203           | 67.9             | 0.293           | -84.6            |
| 2000      | 0.266           | 151.2            | 2.651           | 48.5             | 0.226           | 65.5             | 0.295           | -90.3            |
| 2200      | 0.274           | 146.0            | 2.435           | 44.3             | 0.249           | 62.9             | 0.297           | -96.1            |
| 2400      | 0.279           | 141.0            | 2.254           | 40.3             | 0.272           | 60.4             | 0.300           | -101.6           |
| 2600      | 0.285           | 136.4            | 2.104           | 36.4             | 0.295           | 58.0             | 0.305           | -106.8           |
| 2800      | 0.293           | 132.0            | 1.979           | 32.6             | 0.318           | 55.4             | 0.310           | -112.6           |
| 3000      | 0.297           | 127.9            | 1.869           | 29.1             | 0.341           | 53.1             | 0.316           | -117.4           |

# CPH6021

## S Parameters (Common emitter)

V<sub>CE</sub>=5V, I<sub>C</sub>=50mA

| Freq(MHz) | S <sub>11</sub> | ∠S <sub>11</sub> | S <sub>21</sub> | ∠S <sub>21</sub> | S <sub>12</sub> | ∠S <sub>12</sub> | S <sub>22</sub> | ∠S <sub>22</sub> |
|-----------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| 100       | 0.286           | -86.2            | 35.792          | 128.9            | 0.013           | 76.8             | 0.686           | -31.3            |
| 200       | 0.249           | -124.8           | 22.813          | 107.7            | 0.022           | 78.3             | 0.508           | -37.7            |
| 300       | 0.242           | -142.0           | 16.061          | 97.7             | 0.032           | 80.1             | 0.435           | -40.2            |
| 400       | 0.242           | -152.3           | 12.234          | 91.2             | 0.042           | 81.7             | 0.394           | -42.4            |
| 500       | 0.247           | -160.1           | 9.830           | 86.3             | 0.053           | 82.4             | 0.368           | -45.0            |
| 600       | 0.252           | -166.1           | 8.194           | 82.3             | 0.064           | 82.1             | 0.350           | -47.8            |
| 700       | 0.258           | -171.3           | 7.020           | 78.9             | 0.075           | 81.6             | 0.336           | -50.6            |
| 800       | 0.262           | -175.7           | 6.139           | 75.8             | 0.087           | 80.9             | 0.326           | -53.4            |
| 900       | 0.266           | -179.8           | 5.460           | 72.9             | 0.098           | 80.1             | 0.318           | -56.1            |
| 1000      | 0.270           | -176.6           | 4.918           | 70.2             | 0.110           | 78.9             | 0.313           | -58.9            |
| 1200      | 0.276           | -169.9           | 4.112           | 65.1             | 0.133           | 76.8             | 0.305           | -64.5            |
| 1400      | 0.283           | -163.8           | 3.545           | 60.3             | 0.156           | 74.3             | 0.303           | -70.4            |
| 1600      | 0.290           | -158.3           | 3.124           | 55.7             | 0.179           | 71.9             | 0.302           | -76.3            |
| 1800      | 0.296           | -153.1           | 2.801           | 51.2             | 0.203           | 69.5             | 0.304           | -82.2            |
| 2000      | 0.303           | -148.2           | 2.545           | 46.9             | 0.226           | 67.0             | 0.307           | -88.1            |
| 2200      | 0.310           | -143.4           | 2.336           | 42.7             | 0.249           | 64.4             | 0.310           | -94.2            |
| 2400      | 0.316           | -138.8           | 2.163           | 38.6             | 0.273           | 61.9             | 0.314           | -99.9            |
| 2600      | 0.322           | -134.6           | 2.019           | 34.8             | 0.296           | 59.4             | 0.319           | -105.2           |
| 2800      | 0.330           | -130.3           | 1.898           | 30.9             | 0.320           | 56.6             | 0.324           | -111.2           |
| 3000      | 0.334           | -126.4           | 1.792           | 27.4             | 0.344           | 54.3             | 0.331           | -116.4           |

V<sub>CE</sub>=5V, I<sub>C</sub>=80mA

| Freq(MHz) | S <sub>11</sub> | ∠S <sub>11</sub> | S <sub>21</sub> | ∠S <sub>21</sub> | S <sub>12</sub> | ∠S <sub>12</sub> | S <sub>22</sub> | ∠S <sub>22</sub> |
|-----------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| 100       | 0.345           | -137.6           | 29.631          | 121.2            | 0.013           | 65.7             | 0.593           | -27.9            |
| 200       | 0.398           | -159.0           | 16.989          | 102.4            | 0.020           | 76.7             | 0.468           | -29.9            |
| 300       | 0.414           | -168.4           | 11.622          | 93.6             | 0.029           | 79.1             | 0.426           | -31.5            |
| 400       | 0.425           | -174.1           | 8.756           | 87.6             | 0.039           | 82.5             | 0.403           | -34.1            |
| 500       | 0.433           | -178.6           | 7.015           | 83.0             | 0.049           | 83.3             | 0.388           | -36.9            |
| 600       | 0.438           | -177.7           | 5.843           | 79.0             | 0.059           | 83.9             | 0.378           | -40.2            |
| 700       | 0.443           | -174.4           | 5.008           | 75.5             | 0.070           | 83.5             | 0.370           | -43.6            |
| 800       | 0.448           | -171.3           | 4.383           | 72.3             | 0.081           | 83.3             | 0.364           | -46.8            |
| 900       | 0.452           | -168.5           | 3.903           | 69.3             | 0.092           | 82.6             | 0.360           | -50.3            |
| 1000      | 0.455           | -165.7           | 3.519           | 66.4             | 0.104           | 81.8             | 0.357           | -53.6            |
| 1200      | 0.460           | -160.5           | 2.952           | 60.9             | 0.127           | 80.1             | 0.354           | -60.4            |
| 1400      | 0.466           | -155.5           | 2.552           | 55.7             | 0.151           | 78.1             | 0.355           | -67.3            |
| 1600      | 0.472           | -150.8           | 2.254           | 50.7             | 0.175           | 75.9             | 0.357           | -74.2            |
| 1800      | 0.477           | -146.2           | 2.025           | 45.9             | 0.200           | 73.5             | 0.361           | -81.1            |
| 2000      | 0.482           | -141.7           | 1.845           | 41.3             | 0.226           | 71.0             | 0.366           | -87.9            |
| 2200      | 0.488           | -137.2           | 1.695           | 36.9             | 0.251           | 68.4             | 0.370           | -94.6            |
| 2400      | 0.493           | -132.9           | 1.572           | 32.8             | 0.278           | 65.7             | 0.375           | -101.3           |
| 2600      | 0.498           | -128.8           | 1.469           | 28.9             | 0.304           | 63.0             | 0.380           | -107.5           |
| 2800      | 0.504           | -124.6           | 1.382           | 25.0             | 0.331           | 60.1             | 0.386           | -114.1           |
| 3000      | 0.506           | -120.6           | 1.307           | 21.6             | 0.359           | 57.4             | 0.392           | -120.1           |

# CPH6021

## S Parameters (Common emitter)

V<sub>CE</sub>=8V, I<sub>C</sub>=10mA

| Freq(MHz) | S <sub>11</sub> | ∠S <sub>11</sub> | S <sub>21</sub> | ∠S <sub>21</sub> | S <sub>12</sub> | ∠S <sub>12</sub> | S <sub>22</sub> | ∠S <sub>22</sub> |
|-----------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| 100       | 0.779           | -24.4            | 14.321          | 150.5            | 0.018           | 70.1             | 0.899           | -20.2            |
| 200       | 0.654           | -51.5            | 13.927          | 133.2            | 0.029           | 68.6             | 0.755           | -32.2            |
| 300       | 0.527           | -75.6            | 12.487          | 118.0            | 0.038           | 67.5             | 0.647           | -39.1            |
| 400       | 0.427           | -94.7            | 10.692          | 106.3            | 0.047           | 68.6             | 0.571           | -43.6            |
| 500       | 0.371           | -109.3           | 9.024           | 98.3             | 0.055           | 69.6             | 0.518           | -47.3            |
| 600       | 0.337           | -120.7           | 7.706           | 92.1             | 0.063           | 70.6             | 0.482           | -50.3            |
| 700       | 0.316           | -130.2           | 6.683           | 87.2             | 0.072           | 71.5             | 0.454           | -52.9            |
| 800       | 0.298           | -139.0           | 5.917           | 82.8             | 0.082           | 72.0             | 0.433           | -55.5            |
| 900       | 0.288           | -146.5           | 5.295           | 79.0             | 0.091           | 72.2             | 0.416           | -58.0            |
| 1000      | 0.282           | -152.8           | 4.792           | 75.6             | 0.101           | 72.4             | 0.404           | -60.4            |
| 1200      | 0.275           | -164.1           | 4.032           | 69.5             | 0.121           | 72.0             | 0.387           | -65.2            |
| 1400      | 0.273           | -173.8           | 3.486           | 63.8             | 0.141           | 71.0             | 0.378           | -70.3            |
| 1600      | 0.274           | 177.9            | 3.080           | 58.6             | 0.162           | 69.9             | 0.373           | -75.5            |
| 1800      | 0.277           | 170.5            | 2.765           | 53.7             | 0.183           | 68.4             | 0.371           | -80.8            |
| 2000      | 0.282           | 163.6            | 2.518           | 49.0             | 0.205           | 66.8             | 0.372           | -86.2            |
| 2200      | 0.288           | 157.4            | 2.312           | 44.4             | 0.227           | 64.9             | 0.373           | -91.8            |
| 2400      | 0.293           | 151.4            | 2.142           | 40.1             | 0.250           | 63.0             | 0.375           | -97.2            |
| 2600      | 0.299           | 146.0            | 2.001           | 36.0             | 0.273           | 61.1             | 0.380           | -102.4           |
| 2800      | 0.308           | 140.8            | 1.881           | 31.8             | 0.297           | 58.8             | 0.385           | -108.1           |
| 3000      | 0.313           | 136.1            | 1.775           | 28.1             | 0.321           | 56.8             | 0.391           | -113.1           |

V<sub>CE</sub>=8V, I<sub>C</sub>=30mA

| Freq(MHz) | S <sub>11</sub> | ∠S <sub>11</sub> | S <sub>21</sub> | ∠S <sub>21</sub> | S <sub>12</sub> | ∠S <sub>12</sub> | S <sub>22</sub> | ∠S <sub>22</sub> |
|-----------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| 100       | 0.474           | -47.3            | 31.092          | 138.3            | 0.014           | 73.7             | 0.770           | -27.4            |
| 200       | 0.315           | -88.1            | 23.124          | 114.6            | 0.023           | 74.9             | 0.588           | -36.2            |
| 300       | 0.256           | -111.3           | 16.805          | 102.3            | 0.032           | 77.7             | 0.499           | -39.7            |
| 400       | 0.232           | -126.8           | 12.923          | 94.7             | 0.041           | 79.9             | 0.449           | -42.3            |
| 500       | 0.224           | -138.4           | 10.426          | 89.2             | 0.052           | 80.5             | 0.416           | -44.8            |
| 600       | 0.221           | -147.5           | 8.709           | 84.8             | 0.062           | 80.5             | 0.393           | -47.4            |
| 700       | 0.221           | -155.2           | 7.470           | 81.1             | 0.072           | 80.4             | 0.376           | -50.0            |
| 800       | 0.222           | -161.5           | 6.535           | 77.9             | 0.083           | 79.9             | 0.362           | -52.5            |
| 900       | 0.223           | -167.2           | 5.812           | 74.9             | 0.094           | 79.0             | 0.351           | -55.1            |
| 1000      | 0.225           | -172.0           | 5.238           | 72.1             | 0.106           | 78.3             | 0.344           | -57.6            |
| 1200      | 0.229           | 179.1            | 4.379           | 67.0             | 0.128           | 76.4             | 0.334           | -62.8            |
| 1400      | 0.234           | 171.6            | 3.774           | 62.1             | 0.150           | 74.2             | 0.329           | -68.2            |
| 1600      | 0.240           | 164.8            | 3.324           | 57.4             | 0.173           | 72.0             | 0.327           | -73.7            |
| 1800      | 0.246           | 158.8            | 2.980           | 53.0             | 0.195           | 69.7             | 0.327           | -79.2            |
| 2000      | 0.252           | 153.1            | 2.706           | 48.7             | 0.218           | 67.4             | 0.329           | -84.8            |
| 2200      | 0.259           | 147.7            | 2.484           | 44.4             | 0.240           | 64.9             | 0.330           | -90.5            |
| 2400      | 0.266           | 142.5            | 2.299           | 40.4             | 0.263           | 62.5             | 0.333           | -96.0            |
| 2600      | 0.272           | 137.9            | 2.145           | 36.6             | 0.285           | 60.2             | 0.338           | -101.2           |
| 2800      | 0.280           | 133.4            | 2.017           | 32.7             | 0.309           | 57.5             | 0.343           | -107.0           |
| 3000      | 0.284           | 129.2            | 1.903           | 29.1             | 0.332           | 55.3             | 0.349           | -112.0           |

# CPH6021

## S Parameters (Common emitter)

V<sub>CE</sub>=8V, I<sub>C</sub>=50mA

| Freq(MHz) | S <sub>11</sub> | ∠S <sub>11</sub> | S <sub>21</sub> | ∠S <sub>21</sub> | S <sub>12</sub> | ∠S <sub>12</sub> | S <sub>22</sub> | ∠S <sub>22</sub> |
|-----------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| 100       | 0.306           | -72.7            | 36.956          | 130.9            | 0.011           | 71.4             | 0.720           | -28.3            |
| 200       | 0.240           | -113.2           | 23.684          | 109.1            | 0.020           | 79.6             | 0.548           | -34.3            |
| 300       | 0.225           | -133.1           | 16.651          | 98.7             | 0.030           | 81.1             | 0.476           | -36.5            |
| 400       | 0.223           | -145.1           | 12.680          | 92.0             | 0.039           | 83.0             | 0.437           | -38.8            |
| 500       | 0.226           | -154.0           | 10.188          | 86.9             | 0.050           | 83.4             | 0.410           | -41.3            |
| 600       | 0.230           | -160.9           | 8.491           | 82.9             | 0.060           | 83.2             | 0.392           | -44.0            |
| 700       | 0.235           | -166.7           | 7.273           | 79.3             | 0.071           | 82.8             | 0.377           | -46.7            |
| 800       | 0.239           | -171.6           | 6.356           | 76.2             | 0.082           | 82.1             | 0.367           | -49.3            |
| 900       | 0.243           | -176.1           | 5.651           | 73.4             | 0.093           | 81.0             | 0.357           | -52.1            |
| 1000      | 0.246           | -180.0           | 5.089           | 70.6             | 0.104           | 80.5             | 0.352           | -54.7            |
| 1200      | 0.253           | -172.7           | 4.254           | 65.6             | 0.126           | 78.2             | 0.344           | -60.2            |
| 1400      | 0.259           | -166.2           | 3.665           | 60.7             | 0.149           | 76.0             | 0.340           | -65.8            |
| 1600      | 0.267           | -160.5           | 3.229           | 56.1             | 0.171           | 73.6             | 0.339           | -71.6            |
| 1800      | 0.273           | -155.1           | 2.892           | 51.7             | 0.194           | 71.3             | 0.340           | -77.2            |
| 2000      | 0.280           | -149.9           | 2.627           | 47.4             | 0.217           | 68.8             | 0.342           | -83.0            |
| 2200      | 0.288           | -145.0           | 2.411           | 43.1             | 0.240           | 66.3             | 0.345           | -89.0            |
| 2400      | 0.295           | -140.2           | 2.230           | 39.1             | 0.264           | 63.9             | 0.348           | -94.6            |
| 2600      | 0.301           | -135.8           | 2.080           | 35.2             | 0.286           | 61.5             | 0.353           | -100.0           |
| 2800      | 0.310           | -131.6           | 1.954           | 31.3             | 0.310           | 58.8             | 0.358           | -106.0           |
| 3000      | 0.314           | -127.6           | 1.844           | 27.8             | 0.334           | 56.5             | 0.364           | -111.1           |

V<sub>CE</sub>=8V, I<sub>C</sub>=80mA

| Freq(MHz) | S <sub>11</sub> | ∠S <sub>11</sub> | S <sub>21</sub> | ∠S <sub>21</sub> | S <sub>12</sub> | ∠S <sub>12</sub> | S <sub>22</sub> | ∠S <sub>22</sub> |
|-----------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| 100       | 0.308           | -126.7           | 31.174          | 123.7            | 0.011           | 65.2             | 0.658           | -24.0            |
| 200       | 0.360           | -153.8           | 18.003          | 104.2            | 0.019           | 78.8             | 0.537           | -26.2            |
| 300       | 0.378           | -164.8           | 12.329          | 95.1             | 0.027           | 81.1             | 0.495           | -28.2            |
| 400       | 0.388           | -171.5           | 9.301           | 89.0             | 0.035           | 83.9             | 0.472           | -30.9            |
| 500       | 0.395           | -176.6           | 7.456           | 84.3             | 0.045           | 85.8             | 0.456           | -33.9            |
| 600       | 0.401           | -179.3           | 6.212           | 80.4             | 0.054           | 86.0             | 0.445           | -37.1            |
| 700       | 0.407           | -175.7           | 5.328           | 76.9             | 0.065           | 86.1             | 0.436           | -40.4            |
| 800       | 0.411           | -172.4           | 4.665           | 73.8             | 0.075           | 85.9             | 0.429           | -43.7            |
| 900       | 0.414           | -169.4           | 4.154           | 70.8             | 0.086           | 85.4             | 0.423           | -47.0            |
| 1000      | 0.417           | -166.4           | 3.748           | 68.0             | 0.097           | 84.7             | 0.419           | -50.3            |
| 1200      | 0.423           | -160.9           | 3.144           | 62.7             | 0.120           | 83.0             | 0.415           | -56.9            |
| 1400      | 0.428           | -155.7           | 2.718           | 57.6             | 0.143           | 81.1             | 0.413           | -63.6            |
| 1600      | 0.434           | -150.9           | 2.403           | 52.7             | 0.167           | 78.9             | 0.413           | -70.3            |
| 1800      | 0.438           | -146.2           | 2.158           | 48.1             | 0.192           | 76.5             | 0.414           | -77.0            |
| 2000      | 0.443           | -141.7           | 1.966           | 43.6             | 0.217           | 74.0             | 0.417           | -83.6            |
| 2200      | 0.449           | -137.2           | 1.808           | 39.2             | 0.243           | 71.3             | 0.419           | -90.3            |
| 2400      | 0.454           | -132.8           | 1.676           | 35.1             | 0.269           | 68.7             | 0.422           | -96.7            |
| 2600      | 0.459           | -128.7           | 1.567           | 31.2             | 0.296           | 65.8             | 0.426           | -102.9           |
| 2800      | 0.465           | -124.5           | 1.474           | 27.3             | 0.323           | 62.9             | 0.430           | -109.3           |
| 3000      | 0.467           | -120.6           | 1.394           | 23.9             | 0.350           | 60.1             | 0.435           | -115.2           |

## Embossed Taping Specification

CPH6021-TL-H

## 1. Packing Format

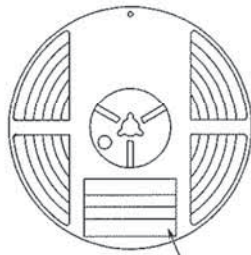
| Package Name | Carrier Tape Type | Maximum Number of devices contained (pcs) |           |           | Packing format                                              |                                                                    |
|--------------|-------------------|-------------------------------------------|-----------|-----------|-------------------------------------------------------------|--------------------------------------------------------------------|
|              |                   | Reel                                      | Inner box | Outer box | Inner BOX (C-1)                                             | Outer BOX (A-7)                                                    |
| CPH6         | CPH6              | 3,000                                     | 15,000    | 90,000    | 5 reels contained<br>Dimensions:mm (external)<br>183×72×185 | 6 inner boxes contained<br>Dimensions:mm (external)<br>440×195×210 |

Reel label, Inner box label  
(unit:mm)

Outer box label

It is a label at the time of factory shipments.  
The form of a label may change in physical distribution process.

## Packing method



Reel label

Type No.  
LOT No.  
Quantity  
Origin

|          |                       |
|----------|-----------------------|
| TYPE     | 000000000             |
| LOT      | 00                    |
| QTY      | 0,000 (1) LEAD FREE # |
| SPECIAL  | *20722005310C*        |
| ASSEMBLY | **** (DIFFUSION:****) |

NOTE (1)

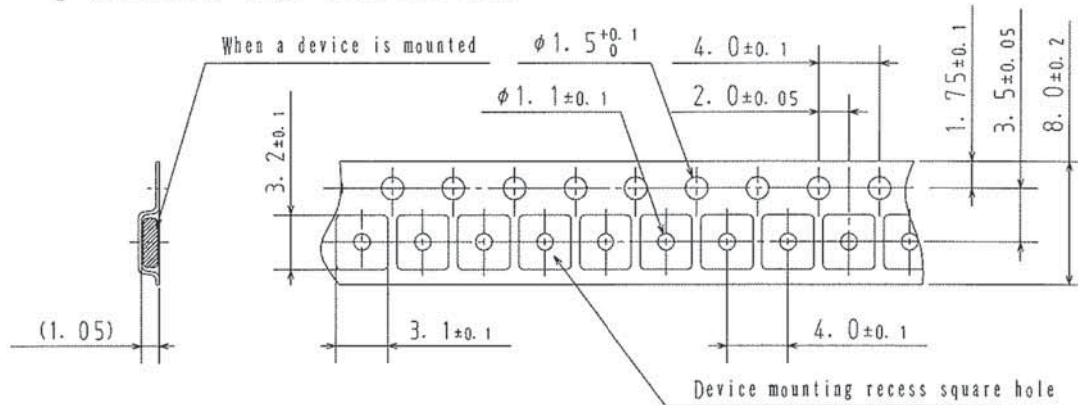
The LEAD FREE # description shows that the surface treatment of the terminal is lead free.

| Label       | JEITA Phase    |
|-------------|----------------|
| LEAD FREE 3 | JEITA Phase 3A |
| LEAD FREE 4 | JEITA Phase 3  |

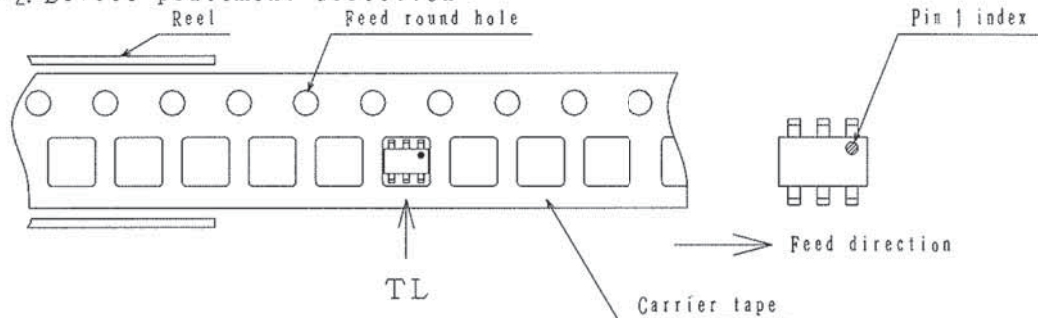
|           |                           |
|-----------|---------------------------|
| TYPE CODE | *****0*****               |
| TYPE      | *****                     |
| QTY       | 0,000 PCS (1) LEAD FREE # |
| LOT       | *****                     |
| PACKAGE   | *****                     |
| SPECIAL   | *20722005310C*            |
| ASSEMBLY  | **** (DIFFUSION:****)     |

## 2. Taping configuration

## 2-1. Carrier tape size (unit:mm)

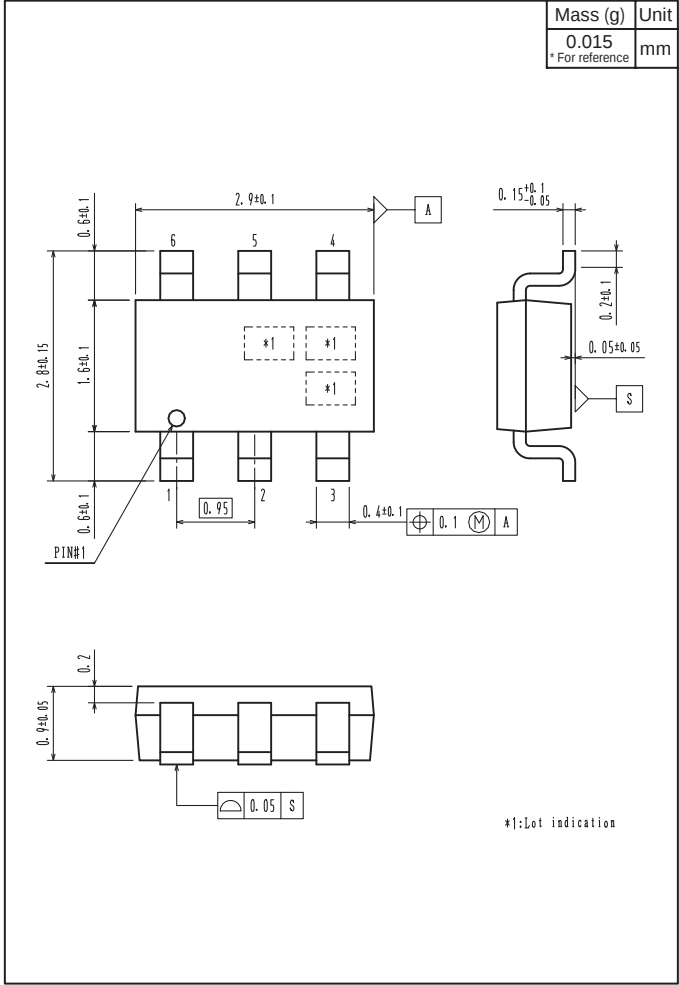


## 2-2. Device placement direction

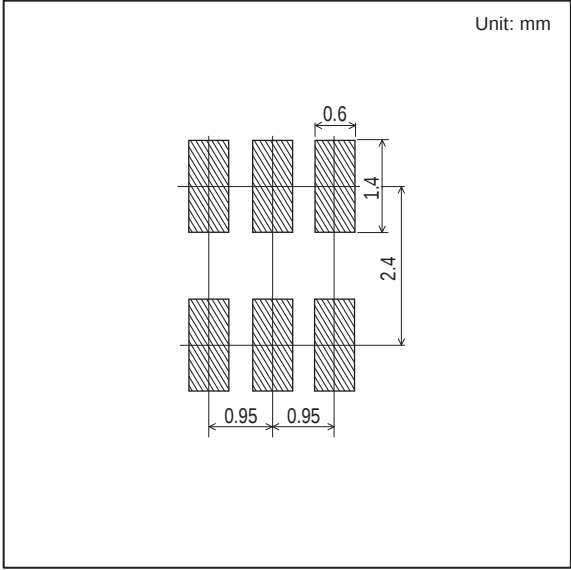


Those with pin 1 index on the feed hole side.....TL

Outline Drawing  
CPH6021-TL-H



Land Pattern Example



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