



2SC5501A

RF Transistor 10V, 70mA, $f_T=7\text{GHz}$, NPN Single MCP4

ON Semiconductor®

<http://onsemi.com>

Features

- Low-noise : NF=1.0dB typ (f=1GHz)
- High gain : $|S_{21e}|^2=13\text{dB}$ typ (f=1GHz)
- High cut-off frequency : $f_T=7\text{GHz}$ typ
- Large allowable collector dissipation : $P_C=500\text{mW}$ max

Specifications

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

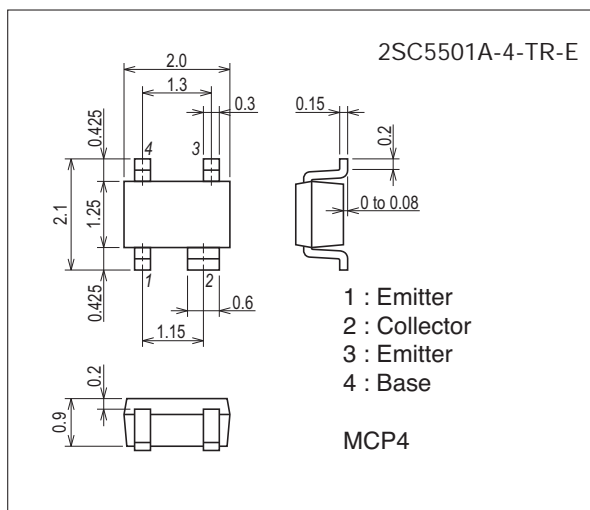
| Parameter | Symbol | Conditions | Ratings | Unit |
|------------------------------|-----------|---|-------------|------|
| Collector-to-Base Voltage | V_{CBO} | | 20 | V |
| Collector-to-Emitter Voltage | V_{CEO} | | 10 | V |
| Emitter-to-Base Voltage | V_{EBO} | | 2 | V |
| Collector Current | I_C | | 70 | mA |
| Collector Dissipation | P_C | When mounted on ceramic substrate (250mm ² ×0.8mm) | 500 | mW |
| Junction Temperature | T_j | | 150 | °C |
| Storage Temperature | T_{stg} | | -55 to +150 | °C |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

Package Dimensions

unit : mm (typ)

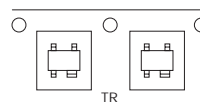
7025A-001



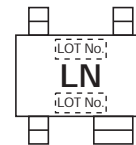
Product & Package Information

- Package : MCP4
- JEITA, JEDEC : SC-82, SC-82AB, SOT-343
- Minimum Packing Quantity : 3,000 pcs./reel

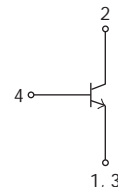
Packing Type: TR



Marking



Electrical Connection



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Electrical Characteristics at Ta=25°C

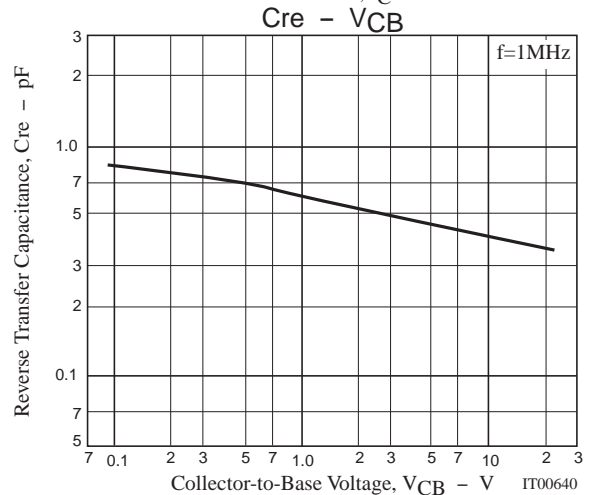
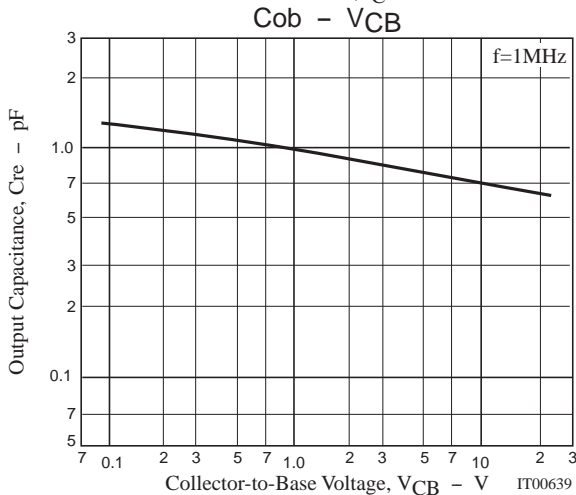
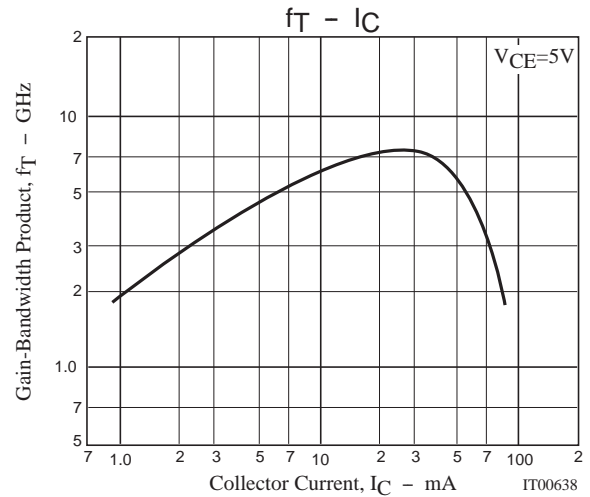
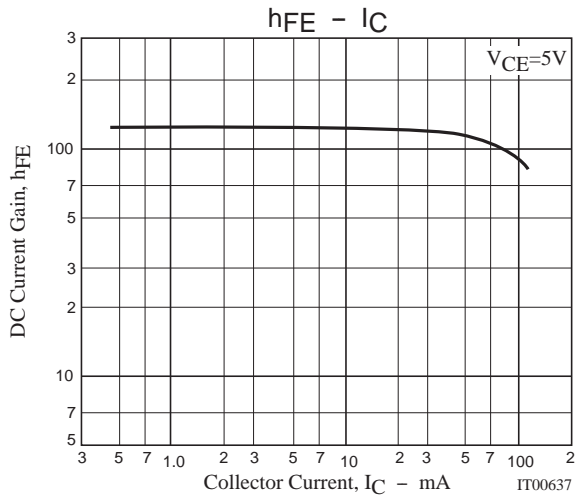
| Parameter | Symbol | Conditions | Ratings | | | Unit |
|------------------------------|-----------------|-------------------------------|---------|------|------|---------|
| | | | min | typ | max | |
| Collector Cutoff Current | I_{CBO} | $V_{CB}=10V, I_E=0A$ | | | 1.0 | μA |
| Emitter Cutoff Current | I_{EBO} | $V_{EB}=1V, I_C=0A$ | | | 10 | μA |
| DC Current Gain | h_{FE} | $V_{CE}=5V, I_C=20mA$ | 90* | | 180* | |
| Gain-Bandwidth Product | f_T | $V_{CE}=5V, I_C=20mA$ | 5 | 7 | | GHz |
| Output Capacitance | C_{ob} | $V_{CB}=10V, f=1MHz$ | | 0.75 | 1.2 | pF |
| Reverse Transfer Capacitance | C_{re} | $V_{CB}=10V, f=1MHz$ | | 0.4 | | pF |
| Forward Transfer Gain | $ S_{21e} ^2_1$ | $V_{CE}=5V, I_C=20mA, f=1GHz$ | 10 | 13 | | dB |
| | $ S_{21e} ^2_2$ | $V_{CE}=2V, I_C=3mA, f=1GHz$ | | 9 | | dB |
| Noise Figure | NF | $V_{CE}=5V, I_C=7mA, f=1GHz$ | | 1.0 | 1.8 | dB |

* : The 2SC5501A is classified by 20mA h_{FE} as follows :

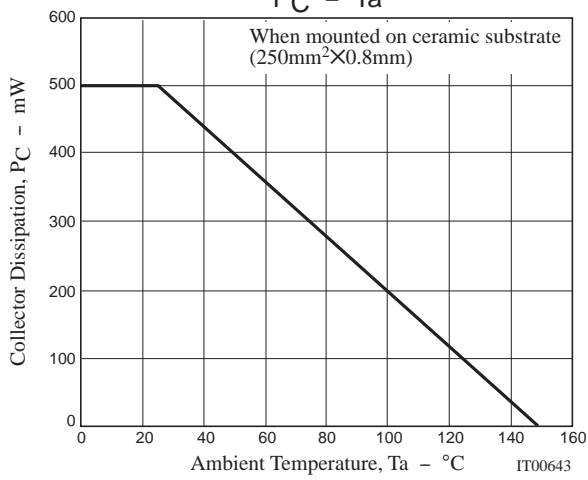
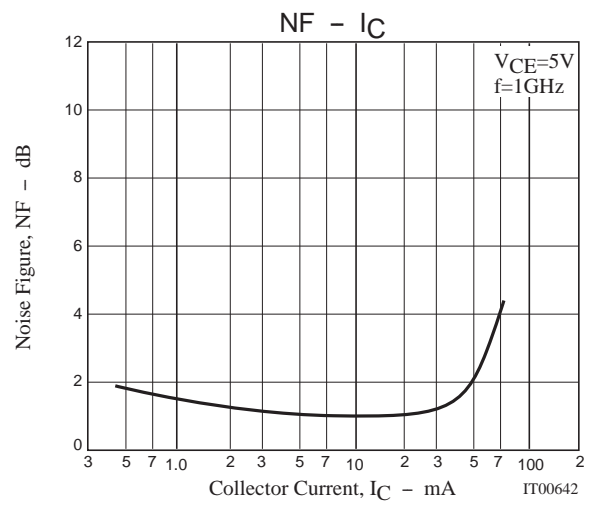
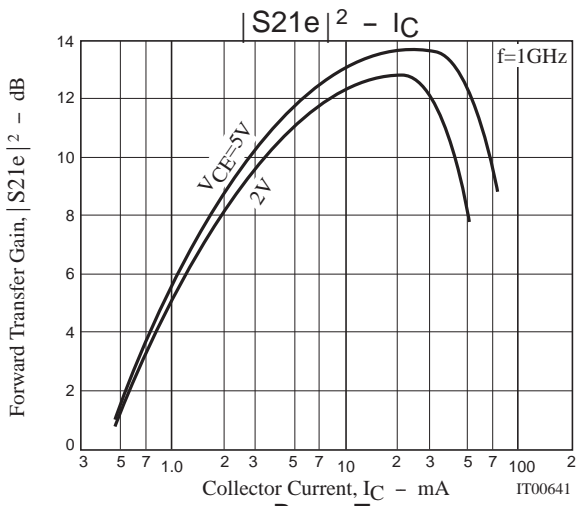
| | |
|----------|-----------|
| Rank | 4 |
| h_{FE} | 90 to 180 |

Ordering Information

| Device | Package | Shipping | memo |
|-----------------|---------|----------------|---------|
| 2SC5501A-4-TR-E | MCP4 | 3,000pcs./reel | Pb Free |



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S Parameters (Common emitter)

$V_{CE}=2V, I_C=1mA, Z_O=50\Omega$

| Freq(MHz) | S11 | $\angle S11$ | S21 | $\angle S21$ | S12 | $\angle S12$ | S22 | $\angle S22$ |
|-----------|-------|--------------|-------|--------------|-------|--------------|-------|--------------|
| 100 | 0.974 | -20.4 | 2.443 | 162.5 | 0.043 | 75.9 | 0.983 | -8.7 |
| 200 | 0.950 | -39.4 | 2.257 | 147.7 | 0.079 | 63.0 | 0.940 | -16.6 |
| 400 | 0.906 | -72.8 | 1.847 | 124.5 | 0.132 | 42.9 | 0.853 | -28.8 |
| 600 | 0.852 | -102.1 | 2.016 | 103.8 | 0.155 | 28.8 | 0.780 | -35.7 |
| 800 | 0.809 | -124.4 | 1.713 | 88.6 | 0.156 | 18.6 | 0.704 | -43.6 |
| 1000 | 0.796 | -139.9 | 1.299 | 74.7 | 0.165 | 11.5 | 0.694 | -48.2 |
| 1200 | 0.764 | -155.0 | 1.287 | 63.6 | 0.152 | 6.8 | 0.653 | -54.7 |
| 1400 | 0.744 | -167.3 | 1.213 | 54.0 | 0.145 | 3.8 | 0.666 | -59.2 |
| 1600 | 0.734 | -177.3 | 1.089 | 45.7 | 0.139 | 0.6 | 0.702 | -63.9 |
| 1800 | 0.722 | 173.3 | 0.929 | 36.6 | 0.131 | -2.1 | 0.709 | -69.2 |
| 2000 | 0.711 | 164.9 | 0.791 | 28.5 | 0.118 | 4.1 | 0.707 | -74.8 |

$V_{CE}=2V, I_C=3mA, Z_O=50\Omega$

| Freq(MHz) | S11 | $\angle S11$ | S21 | $\angle S21$ | S12 | $\angle S12$ | S22 | $\angle S22$ |
|-----------|-------|--------------|-------|--------------|-------|--------------|-------|--------------|
| 100 | 0.914 | -30.2 | 6.935 | 155.9 | 0.041 | 71.2 | 0.946 | -16.6 |
| 200 | 0.870 | -54.3 | 5.731 | 139.8 | 0.070 | 55.6 | 0.826 | -29.5 |
| 400 | 0.765 | -100.1 | 5.112 | 113.5 | 0.098 | 36.8 | 0.634 | -44.7 |
| 600 | 0.703 | -129.1 | 4.069 | 95.7 | 0.109 | 28.5 | 0.544 | -50.2 |
| 800 | 0.677 | -147.3 | 3.250 | 83.3 | 0.112 | 24.8 | 0.481 | -55.8 |
| 1000 | 0.645 | -163.5 | 2.768 | 72.4 | 0.114 | 23.8 | 0.447 | -60.1 |
| 1200 | 0.635 | -173.9 | 2.366 | 63.5 | 0.114 | 25.2 | 0.444 | -64.2 |
| 1400 | 0.624 | 176.9 | 2.068 | 55.4 | 0.119 | 25.1 | 0.441 | -68.6 |
| 1600 | 0.623 | 169.5 | 1.794 | 48.5 | 0.122 | 24.9 | 0.462 | -72.3 |
| 1800 | 0.616 | 161.8 | 1.631 | 41.1 | 0.127 | 28.8 | 0.449 | -77.7 |
| 2000 | 0.603 | 154.4 | 1.472 | 34.7 | 0.135 | 30.5 | 0.474 | -81.4 |

$V_{CE}=2V, I_C=7mA, Z_O=50\Omega$

| Freq(MHz) | S11 | $\angle S11$ | S21 | $\angle S21$ | S12 | $\angle S12$ | S22 | $\angle S22$ |
|-----------|-------|--------------|--------|--------------|-------|--------------|-------|--------------|
| 100 | 0.828 | -44.7 | 13.964 | 147.3 | 0.036 | 62.9 | 0.855 | -28.9 |
| 200 | 0.730 | -84.2 | 11.969 | 126.2 | 0.055 | 47.9 | 0.655 | -45.7 |
| 400 | 0.642 | -129.8 | 7.972 | 101.7 | 0.071 | 37.6 | 0.430 | -60.7 |
| 600 | 0.603 | -154.1 | 5.753 | 87.4 | 0.078 | 37.5 | 0.342 | -66.5 |
| 800 | 0.593 | -167.7 | 4.413 | 78.1 | 0.087 | 38.7 | 0.304 | -70.9 |
| 1000 | 0.584 | -177.5 | 3.548 | 69.6 | 0.097 | 39.3 | 0.285 | -74.8 |
| 1200 | 0.577 | 174.2 | 2.983 | 62.4 | 0.106 | 40.8 | 0.282 | -78.8 |
| 1400 | 0.571 | 166.8 | 2.574 | 55.4 | 0.118 | 41.8 | 0.280 | -83.5 |
| 1600 | 0.566 | 159.7 | 2.283 | 49.5 | 0.130 | 42.1 | 0.293 | -86.5 |
| 1800 | 0.566 | 154.0 | 2.027 | 42.8 | 0.141 | 41.9 | 0.301 | -90.5 |
| 2000 | 0.560 | 148.0 | 1.834 | 36.8 | 0.156 | 41.0 | 0.311 | -94.5 |

$V_{CE}=2V, I_C=10mA, Z_O=50\Omega$

| Freq(MHz) | S11 | $\angle S11$ | S21 | $\angle S21$ | S12 | $\angle S12$ | S22 | $\angle S22$ |
|-----------|-------|--------------|--------|--------------|-------|--------------|-------|--------------|
| 100 | 0.770 | -56.0 | 18.252 | 142.4 | 0.033 | 60.2 | 0.796 | -35.9 |
| 200 | 0.675 | -99.1 | 14.590 | 119.8 | 0.048 | 46.3 | 0.559 | -54.3 |
| 400 | 0.604 | -142.2 | 8.907 | 97.2 | 0.060 | 42.0 | 0.361 | -67.8 |
| 600 | 0.584 | -160.9 | 6.149 | 85.3 | 0.071 | 42.6 | 0.282 | -74.3 |
| 800 | 0.575 | -173.4 | 4.720 | 76.6 | 0.082 | 45.0 | 0.249 | -79.0 |
| 1000 | 0.568 | 177.3 | 3.802 | 68.5 | 0.094 | 46.6 | 0.240 | -82.3 |
| 1200 | 0.562 | 169.7 | 3.203 | 61.8 | 0.106 | 46.8 | 0.239 | -86.3 |
| 1400 | 0.558 | 163.2 | 2.738 | 55.2 | 0.120 | 46.6 | 0.243 | -90.2 |
| 1600 | 0.555 | 157.1 | 2.400 | 49.5 | 0.134 | 46.2 | 0.251 | -93.9 |
| 1800 | 0.551 | 150.6 | 2.171 | 43.4 | 0.148 | 45.5 | 0.264 | -96.9 |
| 2000 | 0.549 | 145.3 | 1.950 | 37.7 | 0.164 | 44.0 | 0.272 | -100.7 |

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S Parameters (Common emitter)

$V_{CE}=5V, I_C=1mA, Z_O=50\Omega$

| Freq(MHz) | S11 | $\angle S11$ | S21 | $\angle S21$ | S12 | $\angle S12$ | S22 | $\angle S22$ |
|-----------|-------|--------------|-------|--------------|-------|--------------|-------|--------------|
| 100 | 0.976 | -19.2 | 2.316 | 164.1 | 0.032 | 77.8 | 0.987 | -7.2 |
| 200 | 0.959 | -37.0 | 2.392 | 149.7 | 0.061 | 65.3 | 0.948 | -14.1 |
| 400 | 0.917 | -69.6 | 2.007 | 127.7 | 0.103 | 46.0 | 0.888 | -22.7 |
| 600 | 0.869 | -97.2 | 1.894 | 108.5 | 0.122 | 32.3 | 0.817 | -30.4 |
| 800 | 0.826 | -120.3 | 1.743 | 92.9 | 0.128 | 22.0 | 0.747 | -36.9 |
| 1000 | 0.806 | -136.9 | 1.422 | 79.5 | 0.131 | 15.4 | 0.763 | -40.2 |
| 1200 | 0.774 | -152.3 | 1.345 | 68.1 | 0.127 | 9.6 | 0.739 | -45.5 |
| 1400 | 0.754 | -164.6 | 1.206 | 58.0 | 0.123 | 5.5 | 0.734 | -50.3 |
| 1600 | 0.745 | -174.8 | 1.056 | 49.4 | 0.111 | 6.4 | 0.747 | -55.0 |
| 1800 | 0.720 | 174.6 | 1.005 | 41.1 | 0.101 | 5.3 | 0.793 | -59.3 |
| 2000 | 0.714 | 166.3 | 0.812 | 32.7 | 0.093 | 11.4 | 0.775 | -64.6 |

$V_{CE}=5V, I_C=3mA, Z_O=50\Omega$

| Freq(MHz) | S11 | $\angle S11$ | S21 | $\angle S21$ | S12 | $\angle S12$ | S22 | $\angle S22$ |
|-----------|-------|--------------|-------|--------------|-------|--------------|-------|--------------|
| 100 | 0.935 | -25.8 | 7.126 | 157.7 | 0.031 | 72.3 | 0.959 | -12.4 |
| 200 | 0.864 | -52.5 | 6.521 | 141.2 | 0.054 | 58.0 | 0.864 | -23.1 |
| 400 | 0.790 | -91.4 | 5.128 | 117.8 | 0.080 | 40.8 | 0.690 | -35.7 |
| 600 | 0.705 | -123.6 | 4.426 | 98.9 | 0.086 | 33.0 | 0.609 | -40.1 |
| 800 | 0.658 | -145.1 | 3.730 | 85.6 | 0.091 | 28.7 | 0.558 | -44.2 |
| 1000 | 0.646 | -157.6 | 2.953 | 75.4 | 0.095 | 27.1 | 0.521 | -48.0 |
| 1200 | 0.628 | -169.6 | 2.542 | 66.4 | 0.097 | 26.5 | 0.516 | -51.6 |
| 1400 | 0.613 | -179.5 | 2.221 | 57.9 | 0.098 | 29.5 | 0.516 | -55.5 |
| 1600 | 0.607 | 172.2 | 1.974 | 51.2 | 0.102 | 32.8 | 0.528 | -59.4 |
| 1800 | 0.607 | 164.8 | 1.697 | 43.6 | 0.105 | 33.7 | 0.534 | -63.7 |
| 2000 | 0.599 | 157.5 | 1.578 | 36.9 | 0.113 | 36.4 | 0.527 | -68.2 |

$V_{CE}=5V, I_C=7mA, Z_O=50\Omega$

| Freq(MHz) | S11 | $\angle S11$ | S21 | $\angle S21$ | S12 | $\angle S12$ | S22 | $\angle S22$ |
|-----------|-------|--------------|--------|--------------|-------|--------------|-------|--------------|
| 100 | 0.844 | -39.2 | 14.003 | 150.3 | 0.028 | 65.9 | 0.886 | -22.4 |
| 200 | 0.748 | -74.3 | 12.502 | 129.9 | 0.044 | 50.9 | 0.712 | -35.2 |
| 400 | 0.637 | -120.9 | 8.689 | 105.1 | 0.059 | 41.2 | 0.515 | -45.0 |
| 600 | 0.586 | -146.5 | 6.395 | 90.2 | 0.066 | 40.3 | 0.423 | -48.3 |
| 800 | 0.569 | -161.6 | 4.930 | 80.2 | 0.073 | 41.5 | 0.387 | -50.9 |
| 1000 | 0.556 | -172.8 | 3.990 | 71.7 | 0.082 | 42.2 | 0.373 | -53.7 |
| 1200 | 0.551 | 178.3 | 3.338 | 64.2 | 0.090 | 44.5 | 0.367 | -57.2 |
| 1400 | 0.543 | 170.4 | 2.882 | 57.2 | 0.100 | 45.9 | 0.363 | -61.2 |
| 1600 | 0.539 | 163.2 | 2.554 | 51.2 | 0.111 | 46.8 | 0.374 | -64.7 |
| 1800 | 0.537 | 156.7 | 2.275 | 44.9 | 0.122 | 46.8 | 0.384 | -68.6 |
| 2000 | 0.532 | 150.5 | 2.055 | 38.6 | 0.134 | 46.1 | 0.390 | -72.6 |

$V_{CE}=5V, I_C=20mA, Z_O=50\Omega$

| Freq(MHz) | S11 | $\angle S11$ | S21 | $\angle S21$ | S12 | $\angle S12$ | S22 | $\angle S22$ |
|-----------|-------|--------------|--------|--------------|-------|--------------|-------|--------------|
| 100 | 0.668 | -72.1 | 29.572 | 134.7 | 0.022 | 56.8 | 0.729 | -36.1 |
| 200 | 0.572 | -116.7 | 20.212 | 112.4 | 0.031 | 49.1 | 0.496 | -48.2 |
| 400 | 0.527 | -151.7 | 11.297 | 93.7 | 0.042 | 52.5 | 0.325 | -52.4 |
| 600 | 0.514 | -167.7 | 7.718 | 83.3 | 0.054 | 55.4 | 0.273 | -53.6 |
| 800 | 0.511 | -177.8 | 5.834 | 75.9 | 0.066 | 57.4 | 0.258 | -55.7 |
| 1000 | 0.506 | 174.1 | 4.677 | 68.7 | 0.080 | 58.1 | 0.250 | -58.7 |
| 1200 | 0.504 | 167.1 | 3.940 | 62.5 | 0.093 | 57.3 | 0.253 | -62.5 |
| 1400 | 0.501 | 161.0 | 3.357 | 56.2 | 0.107 | 56.5 | 0.258 | -66.5 |
| 1600 | 0.497 | 155.2 | 2.957 | 51.1 | 0.122 | 55.5 | 0.269 | -70.6 |
| 1800 | 0.497 | 149.4 | 2.652 | 45.3 | 0.136 | 54.0 | 0.276 | -74.5 |
| 2000 | 0.495 | 144.1 | 2.384 | 39.7 | 0.151 | 51.6 | 0.288 | -78.5 |

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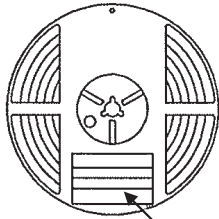
Embossed Taping Specification

2SC5501A-4-TR-E

1. Packing Format

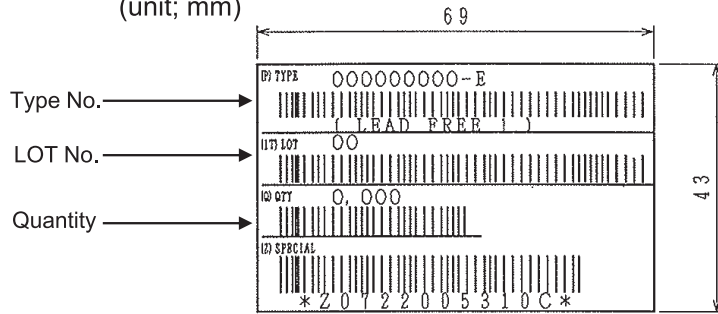
| Package Name | Carrier Tape Type | Maximum Number of devices contained (pcs) | | | Packing format | |
|--------------|-------------------|---|-----------|-----------|---|--|
| | | Reel | Inner box | Outer box | Inner BOX (C-1) | Outer BOX (A-7) |
| MC P4 | MCP4 | 3,000 | 15,001 | 90,000 | 5 reels contained Dimensions :mm(external) 183x72x185 | 6 inner boxes contained Dimensions :mm(external) 440x195x210 |

Packing method



Bar cord label

Bar cord label (unit; mm)

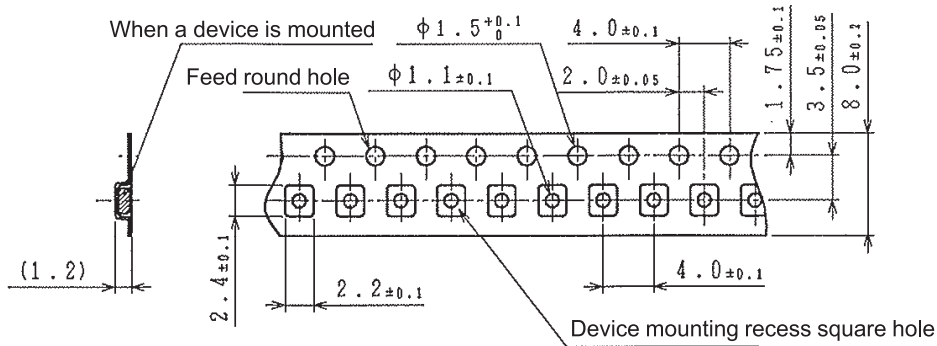


NOTE(1)

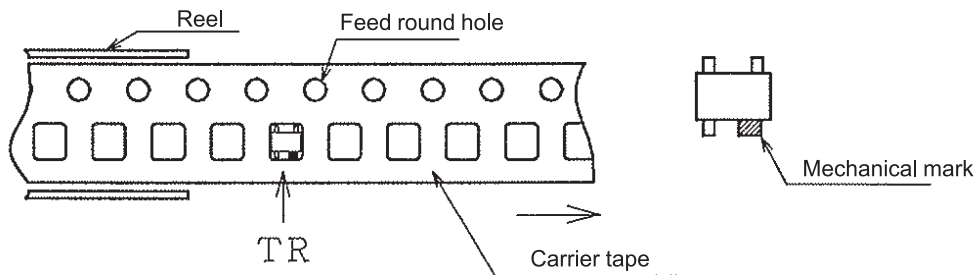
LEAD FREE: description shows that the surface treatment of the terminal is lead free.

2. Taping configuration

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



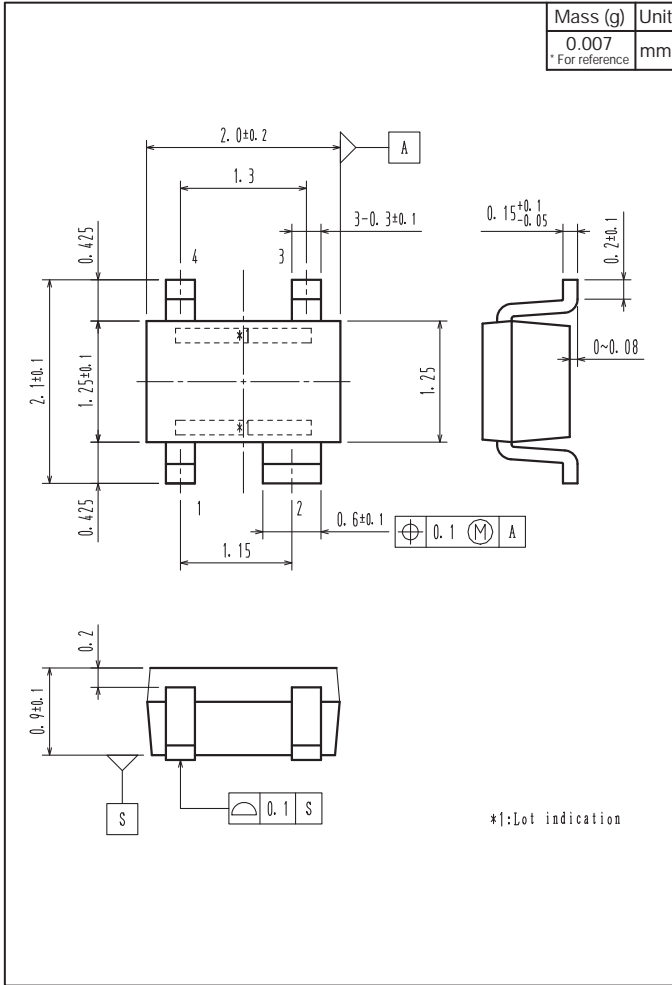
2-2. Device placement direction



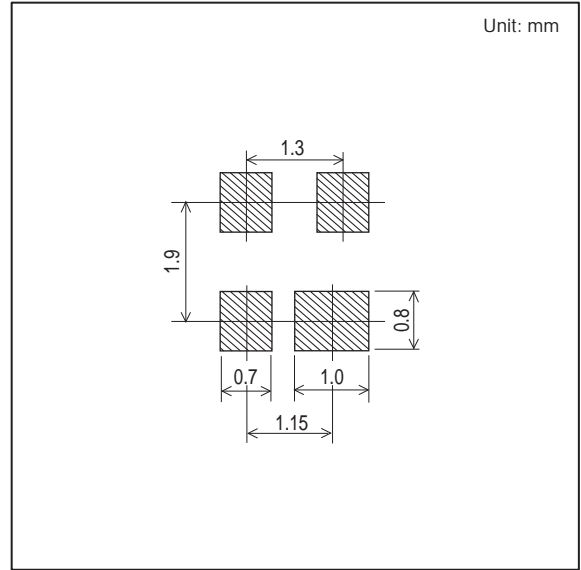
Devices with mechanical mark on the opposite side of the feed round hole → TR

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Outline Drawing 2SC5501A-4-TR-E





Land Pattern Example



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