



# 15GN03MA

## RF Transistor

10V, 70mA,  $f_T=1.5\text{GHz}$ , NPN Single MCP

ON Semiconductor®

<http://onsemi.com>

### Applications

- VHF, RF, MIXER, OSC, IF amplifier

### Features

- High cut-off frequency :  $f_T=1.5\text{GHz}$  typ
- High gain :  $|S_{21e}|^2=13\text{dB}$  typ ( $f=0.4\text{GHz}$ )
- Ultrasmall package permitting applied sets to be small and slim

### Specifications

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

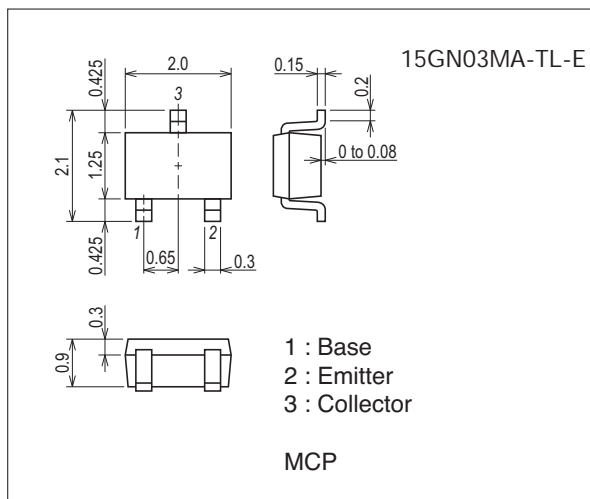
| Parameter                    | Symbol    | Conditions  | Ratings     | Unit             |
|------------------------------|-----------|---|-------------|------------------|
| Collector-to-Base Voltage    | $V_{CBO}$ |   | 20          | V                |
| Collector-to-Emitter Voltage | $V_{CEO}$ |   | 10          | V                |
| Emitter-to-Base Voltage      | $V_{EBO}$ |   | 3           | V                |
| Collector Current            | $I_C$     |   | 70          | mA               |
| Collector Dissipation        | $P_C$     | When mounted on ceramic substrate (250mm <sup>2</sup> x0.8mm) | 400         | mW               |
| Junction Temperature         | $T_j$     |   | 150         | $^\circ\text{C}$ |
| Storage Temperature          | $T_{stg}$ |   | -55 to +150 | $^\circ\text{C}$ |

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)

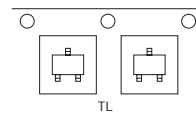
7023A-009



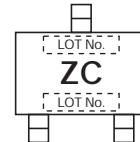
### Product & Package Information

- Package : MCP
- JEITA, JEDEC : SC-70, SOT-323
- Minimum Packing Quantity : 3,000 pcs./reel

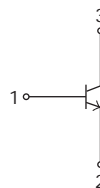
### Packing Type: TL



### Marking



### Electrical Connection



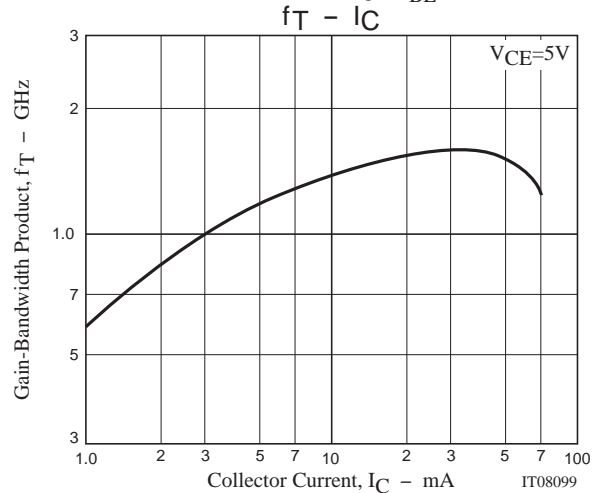
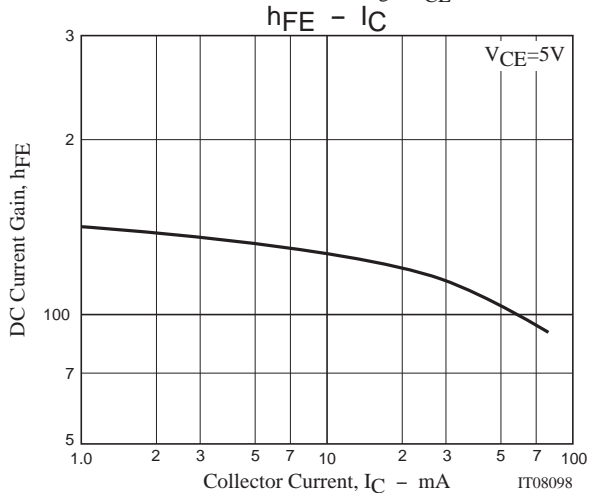
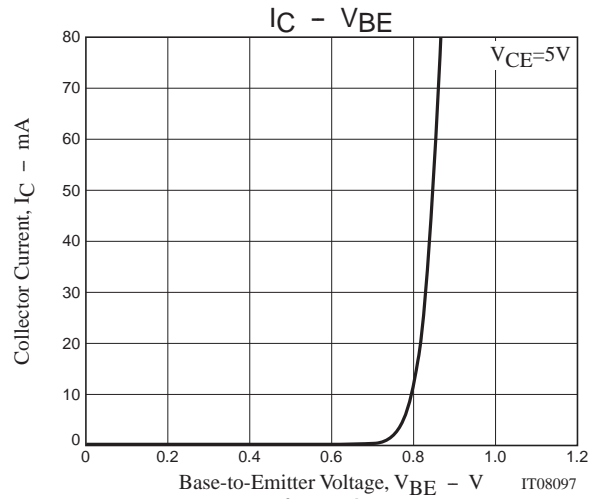
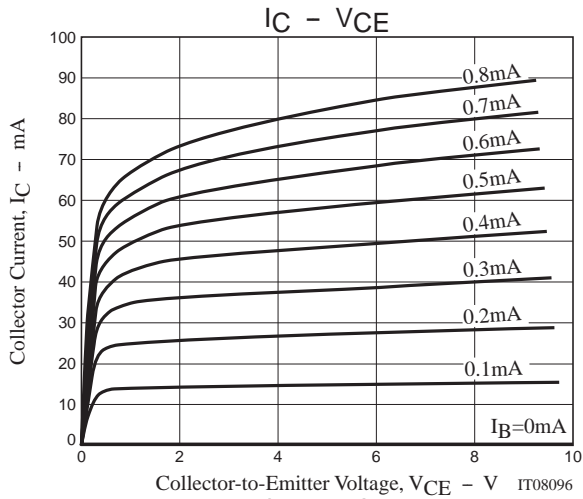
# 15GN03MA

## Electrical Characteristics at Ta=25°C

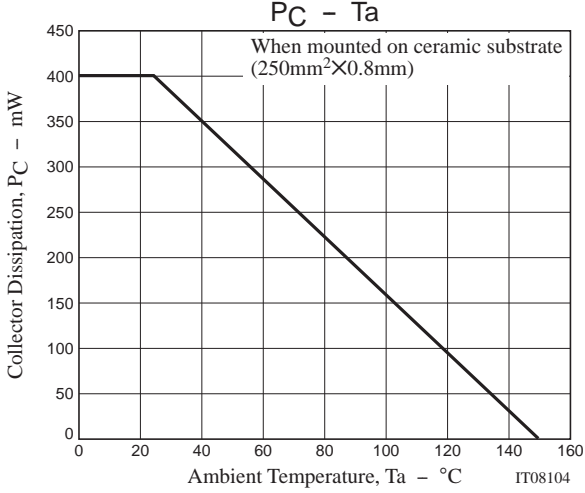
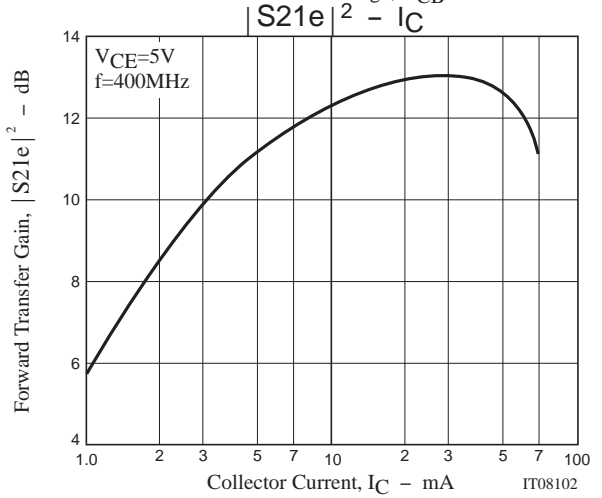
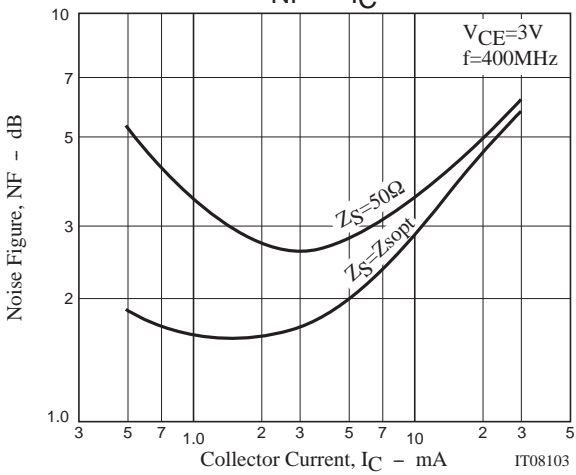
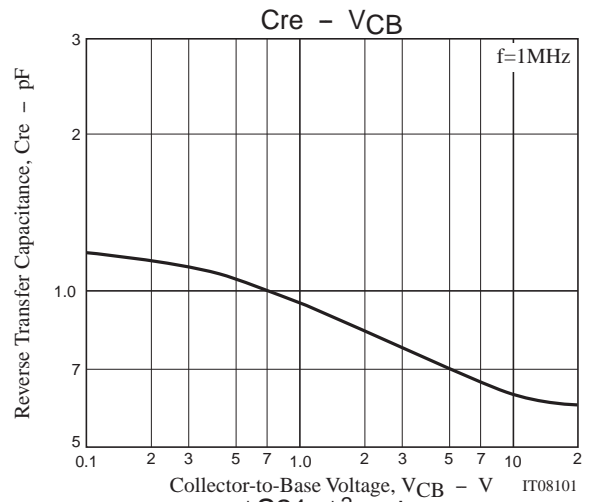
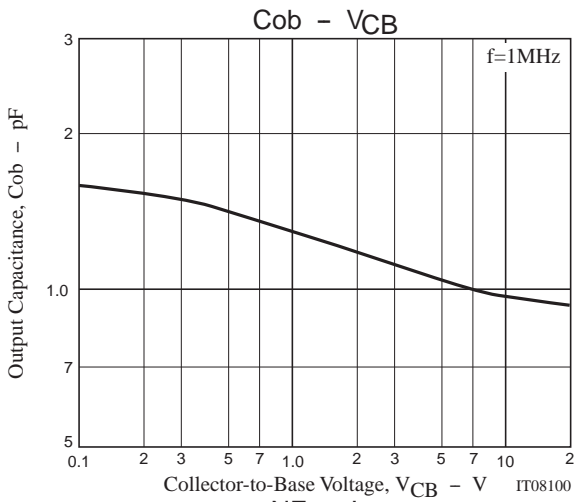
| Parameter                    | Symbol        | Conditions                      | Ratings |      |      | Unit    |
|------------------------------|---------------|---------------------------------|---------|------|------|---------|
|                              |               |                                 | min     | typ  | max  |         |
| Collector Cutoff Current     | $I_{CBO}$     | $V_{CB}=10V, I_E=0A$            |         |      | 0.1  | $\mu A$ |
| Emitter Cutoff Current       | $I_{EBO}$     | $V_{EB}=2V, I_C=0A$             |         |      | 1    | $\mu A$ |
| DC Current Gain              | $h_{FE}$      | $V_{CE}=5V, I_C=10mA$           | 100     |      | 180  |         |
| Gain-Bandwidth Product       | $f_T$         | $V_{CE}=5V, I_C=20mA$           | 1.0     | 1.5  |      | GHz     |
| Output Capacitance           | $C_{ob}$      | $V_{CB}=10V, f=1MHz$            |         | 0.95 | 1.25 | pF      |
| Reverse Transfer Capacitance | $C_{re}$      |                                 |         |      | 0.65 | pF      |
| Forward Transfer Gain        | $ S_{21e} ^2$ | $V_{CE}=5V, I_C=20mA, f=0.4GHz$ | 10      | 13   |      | dB      |
| Noise Figure                 | NF            | $V_{CE}=3V, I_C=2mA, f=0.4GHz$  |         | 1.6  |      | dB      |

## Ordering Information

| Device        | Package | Shipping       | memo    |
|---------------|---------|----------------|---------|
| 15GN03MA-TL-E | MCP     | 3,000pcs./reel | Pb Free |



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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       | 0.927 | -39.48       | 3.051 | 153.95       | 0.045 | 66.57        | 0.938 | -5.28        |
| 200       | 0.877 | -72.13       | 2.643 | 134.85       | 0.072 | 53.42        | 0.879 | -10.12       |
| 300       | 0.831 | -97.09       | 2.258 | 118.70       | 0.090 | 41.89        | 0.834 | -15.17       |
| 400       | 0.796 | -115.43      | 1.925 | 105.65       | 0.093 | 33.66        | 0.806 | -20.70       |
| 500       | 0.772 | -128.51      | 1.645 | 95.12        | 0.090 | 29.42        | 0.796 | -25.57       |
| 600       | 0.759 | -139.76      | 1.420 | 86.92        | 0.085 | 28.20        | 0.796 | -28.96       |
| 700       | 0.754 | -148.33      | 1.255 | 80.31        | 0.080 | 30.19        | 0.792 | -31.48       |
| 800       | 0.750 | -155.54      | 1.132 | 74.68        | 0.072 | 36.45        | 0.790 | -34.42       |
| 900       | 0.746 | -162.07      | 1.033 | 69.44        | 0.067 | 44.81        | 0.793 | -37.89       |
| 1000      | 0.743 | -167.59      | 0.948 | 65.05        | 0.065 | 55.74        | 0.796 | -41.83       |

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

| Freq(MHz) | S11   | $\angle S11$ | S21   | $\angle S21$ | S12   | $\angle S12$ | S22   | $\angle S22$ |
|-----------|-------|--------------|-------|--------------|-------|--------------|-------|--------------|
| 100       | 0.819 | -66.73       | 7.544 | 137.99       | 0.036 | 55.23        | 0.862 | -14.15       |
| 200       | 0.733 | -107.53      | 5.274 | 115.44       | 0.050 | 43.07        | 0.730 | -17.07       |
| 300       | 0.698 | -130.44      | 3.901 | 102.51       | 0.055 | 40.37        | 0.691 | -20.60       |
| 400       | 0.682 | -144.75      | 3.111 | 93.53        | 0.056 | 41.56        | 0.673 | -22.18       |
| 500       | 0.674 | -154.20      | 2.563 | 85.87        | 0.056 | 46.54        | 0.680 | -25.14       |
| 600       | 0.669 | -161.91      | 2.175 | 79.64        | 0.057 | 53.71        | 0.686 | -28.23       |
| 700       | 0.669 | -167.44      | 1.884 | 74.61        | 0.061 | 62.91        | 0.686 | -30.58       |
| 800       | 0.671 | -172.33      | 1.680 | 70.09        | 0.067 | 70.67        | 0.690 | -33.35       |
| 900       | 0.672 | -176.77      | 1.520 | 65.76        | 0.075 | 78.25        | 0.695 | -36.65       |
| 1000      | 0.672 | -179.40      | 1.386 | 61.98        | 0.086 | 83.86        | 0.700 | -40.53       |

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

| Freq(MHz) | S11   | $\angle S11$ | S21    | $\angle S21$ | S12   | $\angle S12$ | S22   | $\angle S22$ |
|-----------|-------|--------------|--------|--------------|-------|--------------|-------|--------------|
| 100       | 0.745 | -85.56       | 10.487 | 129.32       | 0.031 | 52.32        | 0.808 | -17.13       |
| 200       | 0.673 | -125.68      | 6.596  | 107.46       | 0.041 | 43.79        | 0.695 | -19.72       |
| 300       | 0.650 | -144.45      | 4.641  | 95.99        | 0.044 | 45.46        | 0.655 | -20.94       |
| 400       | 0.643 | -155.93      | 3.583  | 88.14        | 0.046 | 51.02        | 0.641 | -22.34       |
| 500       | 0.641 | -163.08      | 2.926  | 81.98        | 0.051 | 57.47        | 0.638 | -24.48       |
| 600       | 0.641 | -169.17      | 2.468  | 76.86        | 0.055 | 65.57        | 0.640 | -27.05       |
| 700       | 0.642 | -173.85      | 2.139  | 72.14        | 0.064 | 72.10        | 0.640 | -29.96       |
| 800       | 0.645 | -177.59      | 1.898  | 68.01        | 0.072 | 78.01        | 0.643 | -32.86       |
| 900       | 0.648 | -179.02      | 1.708  | 64.03        | 0.082 | 84.74        | 0.654 | -36.05       |
| 1000      | 0.649 | -175.69      | 1.565  | 60.67        | 0.096 | 88.35        | 0.663 | -39.64       |

$V_{CE}=5V, I_C=10mA, Z_O=50\Omega$

| Freq(MHz) | S11   | $\angle S11$ | S21    | $\angle S21$ | S12   | $\angle S12$ | S22   | $\angle S22$ |
|-----------|-------|--------------|--------|--------------|-------|--------------|-------|--------------|
| 100       | 0.648 | -111.11      | 13.755 | 118.07       | 0.025 | 49.17        | 0.710 | -18.60       |
| 200       | 0.617 | -144.00      | 7.787  | 99.84        | 0.031 | 50.50        | 0.618 | -18.94       |
| 300       | 0.610 | -157.84      | 5.322  | 90.62        | 0.035 | 55.71        | 0.593 | -19.18       |
| 400       | 0.611 | -165.84      | 4.071  | 84.05        | 0.042 | 63.53        | 0.585 | -20.81       |
| 500       | 0.612 | -171.10      | 3.295  | 78.75        | 0.049 | 72.26        | 0.585 | -23.14       |
| 600       | 0.616 | -175.51      | 2.770  | 74.15        | 0.059 | 76.93        | 0.591 | -25.68       |
| 700       | 0.620 | -179.00      | 2.401  | 69.78        | 0.068 | 81.33        | 0.595 | -28.62       |
| 800       | 0.622 | -178.16      | 2.122  | 65.84        | 0.080 | 85.49        | 0.598 | -31.66       |
| 900       | 0.629 | -175.42      | 1.906  | 62.06        | 0.091 | 88.11        | 0.610 | -34.80       |
| 1000      | 0.632 | -172.79      | 1.741  | 58.71        | 0.104 | 90.16        | 0.619 | -38.30       |

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## S Parameters (Common emitter)

$V_{CE}=5V, I_C=15mA, Z_O=50\Omega$

| Freq(MHz) | S11   | $\angle S11$ | S21    | $\angle S21$ | S12   | $\angle S12$ | S22   | $\angle S22$ |
|-----------|-------|--------------|--------|--------------|-------|--------------|-------|--------------|
| 100       | 0.608 | -124.26      | 15.141 | 112.79       | 0.021 | 49.66        | 0.661 | -18.68       |
| 200       | 0.596 | -152.05      | 8.271  | 96.59        | 0.028 | 56.25        | 0.584 | -17.69       |
| 300       | 0.594 | -163.33      | 5.613  | 88.34        | 0.034 | 63.87        | 0.566 | -18.43       |
| 400       | 0.600 | -169.82      | 4.267  | 82.26        | 0.042 | 71.61        | 0.561 | -19.87       |
| 500       | 0.601 | -173.91      | 3.457  | 77.23        | 0.052 | 77.39        | 0.564 | -22.13       |
| 600       | 0.606 | -177.77      | 2.902  | 72.65        | 0.061 | 81.90        | 0.570 | -24.90       |
| 700       | 0.613 | 179.41       | 2.501  | 68.50        | 0.071 | 84.02        | 0.573 | -27.96       |
| 800       | 0.617 | 176.72       | 2.210  | 64.59        | 0.083 | 86.75        | 0.579 | -30.98       |
| 900       | 0.624 | 174.31       | 1.988  | 60.86        | 0.094 | 88.46        | 0.592 | -34.26       |
| 1000      | 0.628 | 171.96       | 1.808  | 57.39        | 0.108 | 90.57        | 0.599 | -37.51       |

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

| Freq(MHz) | S11   | $\angle S11$ | S21    | $\angle S21$ | S12   | $\angle S12$ | S22   | $\angle S22$ |
|-----------|-------|--------------|--------|--------------|-------|--------------|-------|--------------|
| 100       | 0.587 | -132.33      | 15.887 | 109.73       | 0.018 | 50.98        | 0.630 | -18.23       |
| 200       | 0.589 | -156.83      | 8.517  | 94.77        | 0.026 | 60.57        | 0.563 | -17.10       |
| 300       | 0.590 | -166.31      | 5.751  | 86.97        | 0.034 | 66.88        | 0.549 | -17.73       |
| 400       | 0.593 | -171.88      | 4.373  | 80.95        | 0.043 | 73.76        | 0.547 | -19.30       |
| 500       | 0.598 | -175.61      | 3.529  | 76.08        | 0.052 | 79.21        | 0.552 | -21.55       |
| 600       | 0.604 | -178.89      | 2.958  | 71.70        | 0.063 | 82.86        | 0.558 | -24.41       |
| 700       | 0.611 | 178.36       | 2.550  | 67.43        | 0.073 | 85.71        | 0.560 | -27.19       |
| 800       | 0.616 | 176.07       | 2.257  | 63.56        | 0.085 | 87.76        | 0.569 | -30.31       |
| 900       | 0.624 | 173.75       | 2.026  | 59.99        | 0.097 | 89.02        | 0.581 | -33.63       |
| 1000      | 0.628 | 171.39       | 1.838  | 56.47        | 0.109 | 90.88        | 0.590 | -36.92       |

$V_{CE}=5V, I_C=30mA, Z_O=50\Omega$

| Freq(MHz) | S11   | $\angle S11$ | S21    | $\angle S21$ | S12   | $\angle S12$ | S22   | $\angle S22$ |
|-----------|-------|--------------|--------|--------------|-------|--------------|-------|--------------|
| 100       | 0.574 | -141.90      | 16.518 | 106.28       | 0.017 | 56.75        | 0.594 | -17.60       |
| 200       | 0.584 | -161.69      | 8.702  | 92.68        | 0.024 | 65.21        | 0.541 | -16.13       |
| 300       | 0.587 | -169.42      | 5.851  | 85.19        | 0.033 | 71.56        | 0.531 | -16.69       |
| 400       | 0.596 | -174.12      | 4.433  | 79.42        | 0.042 | 77.01        | 0.532 | -18.41       |
| 500       | 0.599 | -177.29      | 3.570  | 74.54        | 0.053 | 82.34        | 0.536 | -20.78       |
| 600       | 0.609 | 179.93       | 2.987  | 70.07        | 0.063 | 84.47        | 0.545 | -23.60       |
| 700       | 0.616 | 177.48       | 2.574  | 65.88        | 0.073 | 86.83        | 0.550 | -26.54       |
| 800       | 0.621 | 175.27       | 2.268  | 61.99        | 0.085 | 88.18        | 0.559 | -29.78       |
| 900       | 0.631 | 173.12       | 2.033  | 58.20        | 0.096 | 90.72        | 0.571 | -33.08       |
| 1000      | 0.638 | 170.96       | 1.845  | 54.81        | 0.111 | 91.80        | 0.582 | -36.46       |

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

| Freq(MHz) | S11   | $\angle S11$ | S21    | $\angle S21$ | S12   | $\angle S12$ | S22   | $\angle S22$ |
|-----------|-------|--------------|--------|--------------|-------|--------------|-------|--------------|
| 100       | 0.578 | -151.54      | 16.222 | 102.78       | 0.015 | 58.15        | 0.564 | -16.24       |
| 200       | 0.596 | -166.79      | 8.428  | 90.13        | 0.023 | 71.59        | 0.524 | -14.78       |
| 300       | 0.603 | -172.63      | 5.641  | 82.89        | 0.033 | 76.27        | 0.520 | -15.94       |
| 400       | 0.611 | -176.28      | 4.254  | 77.21        | 0.043 | 79.95        | 0.521 | -17.71       |
| 500       | 0.618 | -178.98      | 3.421  | 72.11        | 0.052 | 83.78        | 0.530 | -20.31       |
| 600       | 0.629 | 178.44       | 2.851  | 67.60        | 0.064 | 86.83        | 0.538 | -23.39       |
| 700       | 0.639 | 176.23       | 2.452  | 63.15        | 0.074 | 88.24        | 0.546 | -26.40       |
| 800       | 0.647 | 174.01       | 2.155  | 59.33        | 0.087 | 89.54        | 0.555 | -29.74       |
| 900       | 0.657 | 171.87       | 1.921  | 55.44        | 0.099 | 92.59        | 0.568 | -33.37       |
| 1000      | 0.664 | 169.65       | 1.740  | 51.95        | 0.113 | 94.10        | 0.581 | -36.94       |

# 15GN03MA

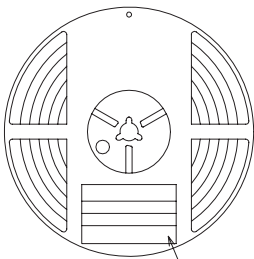
## Embossed Taping Specification

### 15GN03MA-TL-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)  |
| MCP          | MCP               | 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 |

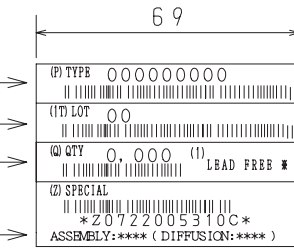
#### Packing method



Reel label

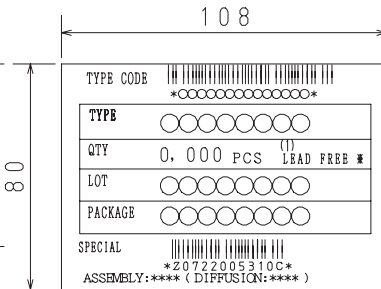
Type No.  
LOT No.  
Quantity  
Origin

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.



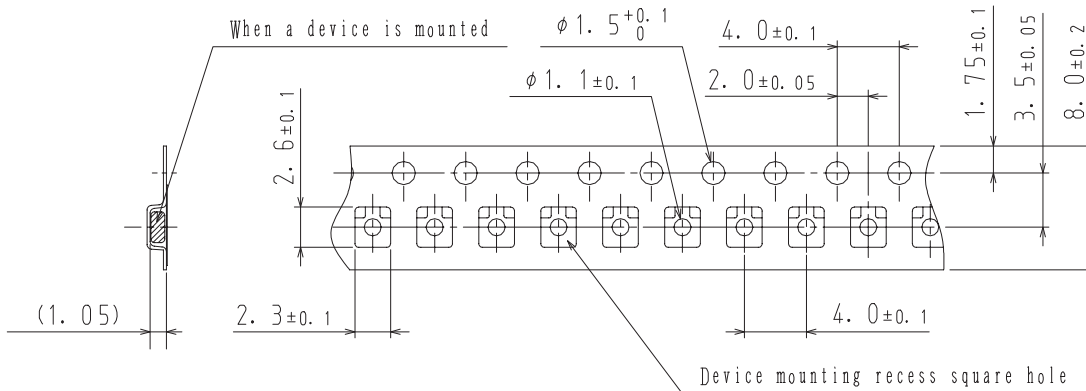
#### NOTE (1)

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

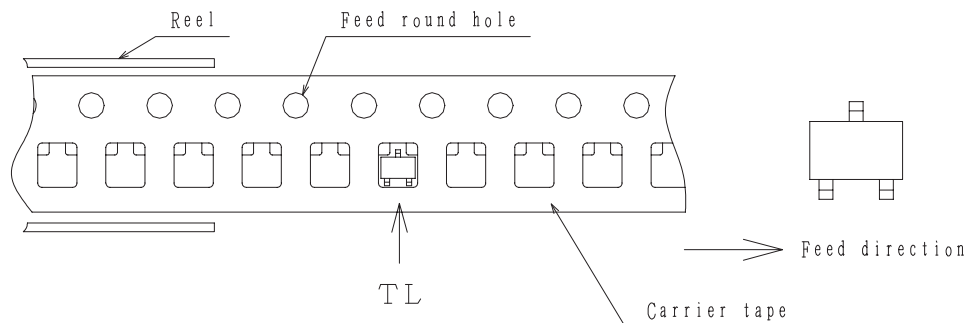
| Label       | JEITA Phase    |
|-------------|----------------|
| LEAD FREE 3 | JEITA Phase 3A |
| LEAD FREE 4 | JEITA Phase 3  |

#### 2. Taping configuration

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



##### 2-2. Device placement direction

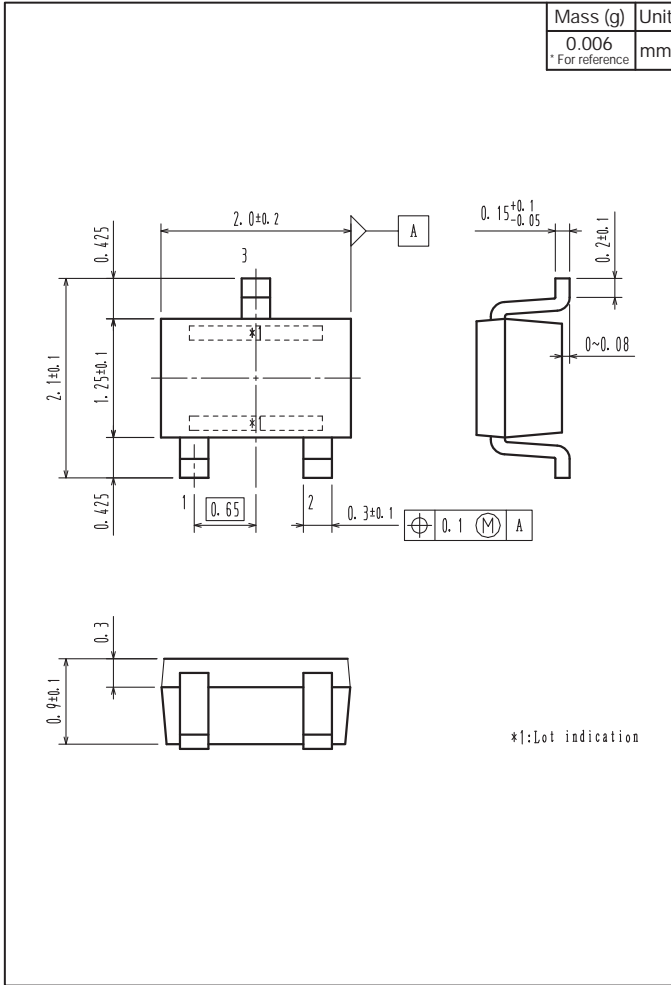


Those with oen electrode terminal on the feed hole side.....TL

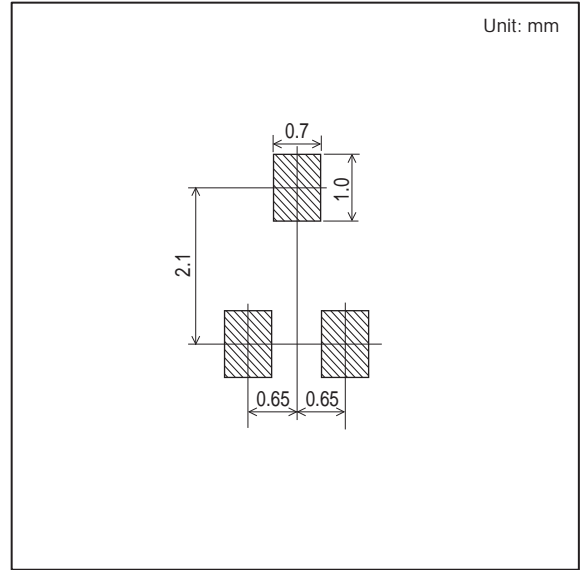
# 15GN03MA

## Outline Drawing

15GN03MA-TL-E



## Land Pattern Example



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