

# RF Transistor

10 V, 70 mA,  $f_T = 7$  GHz, NPN Single SSFP

## 2SC5488A

### Features

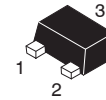
- Low-noise:  $NF = 1.0$  dB Typ ( $f = 1$  GHz)
- High Gain:  $|S_{21e}|^2 = 12$  dB Typ ( $f = 1$  GHz)
- High Cut-off Frequency:  $f_T = 7$  GHz Typ
- Ultrasmall, Slim Flat-lead Package (1.4 mm x 0.8 mm x 0.6 mm)
- This Device is Pb-Free and Halogen Free

### Specifications

#### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )

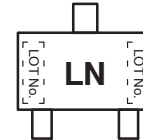
| Symbol    | Parameter                    | Value       | Unit             |
|-----------|------------------------------|-------------|------------------|
| $V_{CBO}$ | Collector-to-Base Voltage    | 20          | V                |
| $V_{CEO}$ | Collector-to-Emitter Voltage | 10          | V                |
| $V_{EBO}$ | Emitter-to-Base Voltage      | 2           | V                |
| $I_C$     | Collector Current            | 70          | mA               |
| $P_C$     | Collector Dissipation        | 100         | mW               |
| $T_J$     | Junction Temperature         | 150         | $^\circ\text{C}$ |
| $T_{stg}$ | Storage Temperature          | -55 to +150 | $^\circ\text{C}$ |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



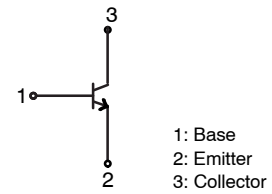
SOT-623 / SSFP  
CASE 631AC

### MARKING DIAGRAM



LN = Specific Device Code

### ELECTRICAL CONNECTION



### ORDERING INFORMATION

| Device        | Package                                     | Shipping <sup>†</sup> |
|---------------|---------------------------------------------|-----------------------|
| 2SC5488A-TL-H | SOT-623 / SSFP<br>(Pb-Free,<br>Halide Free) | 8000 /<br>Tape & Reel |

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, [BRD8011/D](#).

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$ )

| Parameter                    | Symbol           | Test Condition                                              | Min | Typ  | Max | Unit          |
|------------------------------|------------------|-------------------------------------------------------------|-----|------|-----|---------------|
| Collector Cutoff Current     | $I_{CBO}$        | $V_{CB} = 10\text{ V}, I_E = 0\text{ A}$                    | –   | –    | 1.0 | $\mu\text{A}$ |
| Emitter Cutoff Current       | $I_{EBO}$        | $V_{EB} = 1\text{ V}, I_C = 0\text{ A}$                     | –   | –    | 10  | $\mu\text{A}$ |
| DC Current Gain              | $h_{FE}$         | $V_{CE} = 5\text{ V}, I_C = 20\text{ mA}$                   | 90  | –    | 200 |               |
| Gain–Bandwidth Product       | $f_T$            | $V_{CE} = 5\text{ V}, I_C = 20\text{ mA}$                   | 5   | 7    | –   | GHz           |
| Output Capacitance           | $C_{ob}$         | $V_{CB} = 10\text{ V}, f = 1\text{ MHz}$                    | –   | 0.7  | 1.2 | pF            |
| Reverse Transfer Capacitance | $C_{re}$         |                                                             | –   | 0.45 | –   | pF            |
| Forward Transfer Gain        | $ S_{21e} ^{21}$ | $V_{CE} = 5\text{ V}, I_C = 20\text{ mA}, f = 1\text{ GHz}$ | 9   | 12   | –   | dB            |
|                              | $ S_{21e} ^{22}$ | $V_{CE} = 2\text{ V}, I_C = 3\text{ mA}, f = 1\text{ GHz}$  | –   | 8.5  | –   | dB            |
| Noise Figure                 | NF               | $V_{CE} = 5\text{ V}, I_C = 7\text{ mA}, f = 1\text{ GHz}$  | –   | 1.0  | 1.8 | dB            |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

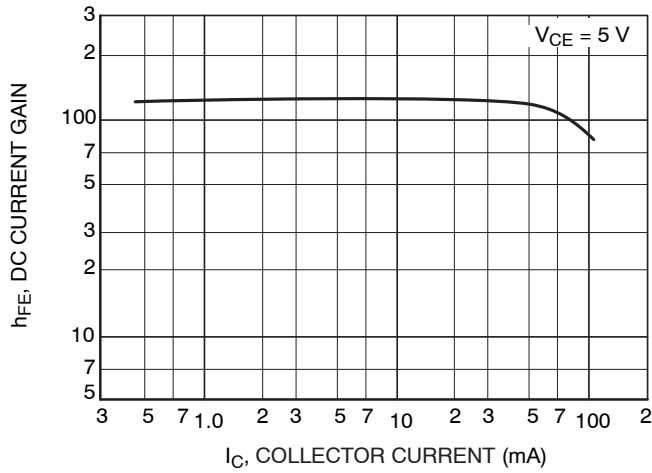


Figure 1.  $h_{FE} - I_C$

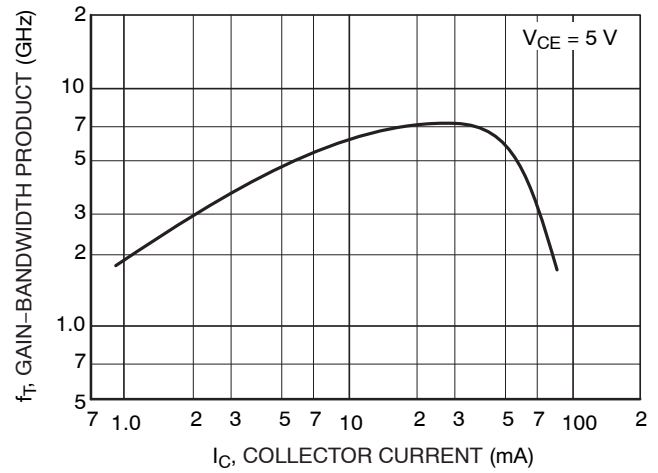


Figure 2.  $f_T - I_C$

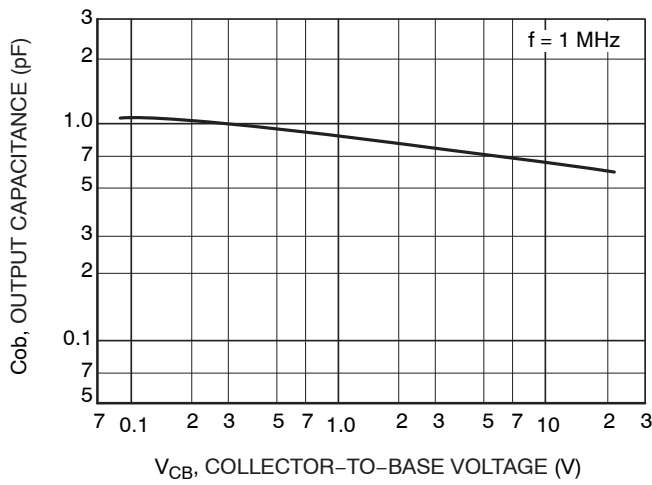


Figure 3.  $C_{ob} - V_{CB}$

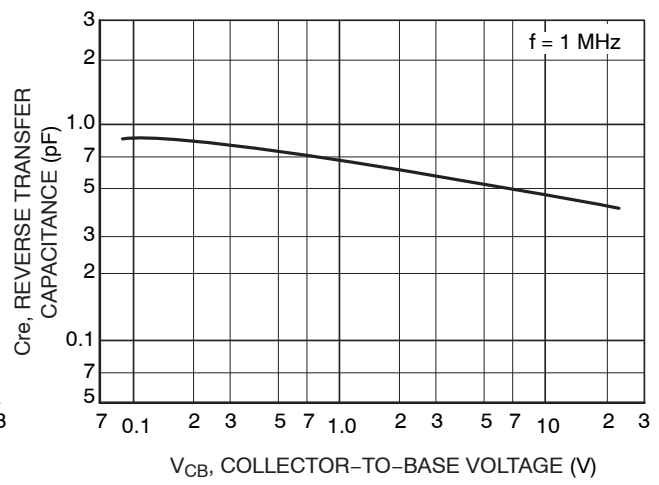


Figure 4.  $C_{re} - V_{CB}$

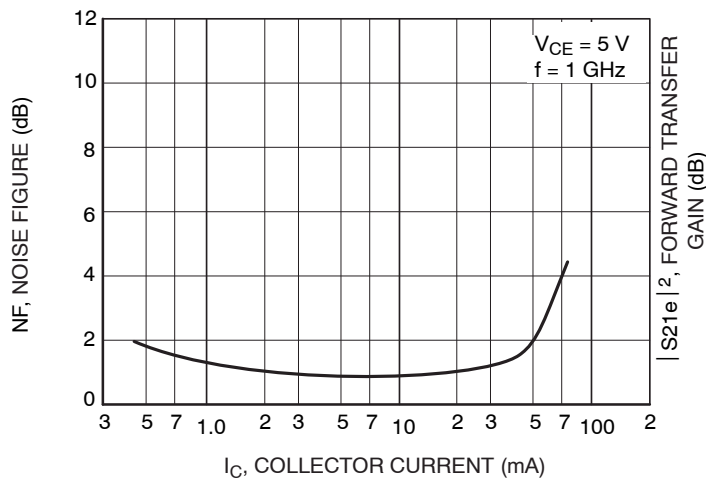


Figure 5.  $NF - I_C$

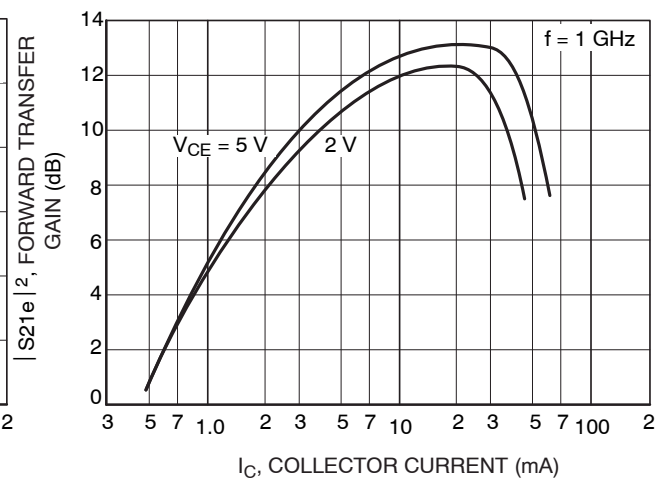
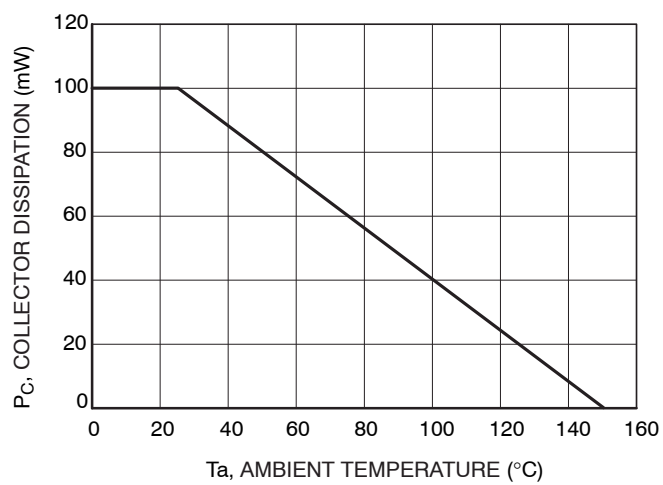


Figure 6.  $|S_{21e}|^2 - I_C$



**Figure 7.  $P_C - T_a$**

## S Parameters (Common Emitter)

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

| Freq(MHz) | S11   | $\angle S11$ | S21    | $\angle S21$ | S12   | $\angle S12$ | S22   | $\angle S22$ |
|-----------|-------|--------------|--------|--------------|-------|--------------|-------|--------------|
| 100       | 0.786 | -40.7        | 17.507 | 151.3        | 0.028 | 70.1         | 0.898 | -20.4        |
| 200       | 0.677 | -72.4        | 13.998 | 131.4        | 0.046 | 58.0         | 0.739 | -33.4        |
| 400       | 0.546 | -112.7       | 9.061  | 108.6        | 0.064 | 49.6         | 0.525 | -43.7        |
| 600       | 0.492 | -135.2       | 6.442  | 96.1         | 0.076 | 49.3         | 0.423 | -46.7        |
| 800       | 0.473 | -150.0       | 5.005  | 87.3         | 0.087 | 50.8         | 0.374 | -44.4        |
| 1000      | 0.465 | -160.0       | 4.073  | 80.4         | 0.099 | 52.6         | 0.346 | -49.7        |
| 1200      | 0.457 | -169.5       | 3.449  | 74.0         | 0.111 | 54.0         | 0.332 | -51.6        |
| 1400      | 0.451 | -176.2       | 2.989  | 68.6         | 0.124 | 55.2         | 0.321 | -54.1        |
| 1600      | 0.449 | 177.8        | 2.658  | 63.8         | 0.138 | 56.6         | 0.319 | -56.2        |
| 1800      | 0.454 | 172.5        | 2.378  | 58.4         | 0.151 | 56.7         | 0.313 | -60.0        |
| 2000      | 0.460 | 167.1        | 2.154  | 54.0         | 0.166 | 56.7         | 0.311 | -63.2        |

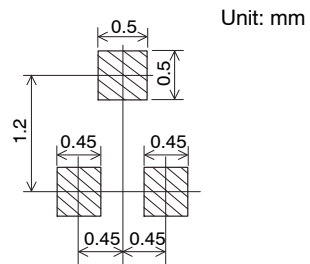
$V_{CE} = 5\text{ V}$ ,  $I_C = 20\text{ mA}$ ,  $Z_O = 50\ \Omega$

| Freq(MHz) | S11   | $\angle S11$ | S21    | $\angle S21$ | S12   | $\angle S12$ | S22   | $\angle S22$ |
|-----------|-------|--------------|--------|--------------|-------|--------------|-------|--------------|
| 100       | 0.601 | -65.8        | 28.967 | 137.1        | 0.023 | 64.1         | 0.757 | -32.9        |
| 200       | 0.497 | -103.7       | 19.309 | 116.6        | 0.035 | 57.0         | 0.534 | -50.3        |
| 400       | 0.435 | -139.6       | 10.891 | 98.6         | 0.050 | 58.7         | 0.345 | -50.3        |
| 600       | 0.419 | -156.6       | 7.461  | 89.3         | 0.065 | 61.3         | 0.280 | -50.7        |
| 800       | 0.414 | -166.6       | 5.695  | 82.5         | 0.081 | 63.1         | 0.251 | -51.3        |
| 1000      | 0.413 | -174.0       | 4.613  | 77.0         | 0.098 | 63.8         | 0.235 | -52.9        |
| 1200      | 0.413 | 178.6        | 3.870  | 71.8         | 0.114 | 63.9         | 0.226 | -55.1        |
| 1400      | 0.411 | 173.8        | 3.345  | 66.9         | 0.131 | 63.6         | 0.221 | -57.7        |
| 1600      | 0.413 | 169.6        | 2.960  | 62.7         | 0.148 | 63.2         | 0.220 | -60.2        |
| 1800      | 0.416 | 165.1        | 2.655  | 58.0         | 0.165 | 61.8         | 0.219 | -64.8        |
| 2000      | 0.422 | 160.3        | 2.406  | 54.0         | 0.182 | 60.6         | 0.218 | -68.3        |

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

| Freq(MHz) | S11   | $\angle S11$ | S21   | $\angle S21$ | S12   | $\angle S12$ | S22   | $\angle S22$ |
|-----------|-------|--------------|-------|--------------|-------|--------------|-------|--------------|
| 100       | 0.888 | -30.2        | 9.280 | 158.6        | 0.038 | 73.6         | 0.949 | -15.1        |
| 200       | 0.815 | -56.4        | 8.218 | 141.3        | 0.067 | 60.5         | 0.849 | -26.9        |
| 400       | 0.690 | -96.0        | 6.074 | 116.7        | 0.098 | 45.1         | 0.657 | -41.1        |
| 600       | 0.616 | -120.7       | 4.517 | 101.4        | 0.112 | 38.4         | 0.539 | -47.6        |
| 800       | 0.584 | -138.0       | 3.610 | 90.4         | 0.120 | 35.8         | 0.475 | -51.2        |
| 1000      | 0.566 | -150.7       | 2.995 | 81.9         | 0.125 | 35.7         | 0.434 | -54.5        |
| 1200      | 0.555 | -161.2       | 2.540 | 74.2         | 0.131 | 36.5         | 0.410 | -57.5        |
| 1400      | 0.546 | -169.3       | 2.213 | 67.5         | 0.137 | 38.4         | 0.393 | -60.7        |
| 1600      | 0.541 | -176.4       | 1.982 | 62.0         | 0.143 | 40.7         | 0.391 | -64.0        |
| 1800      | 0.545 | 177.1        | 1.774 | 55.9         | 0.152 | 42.5         | 0.382 | -67.8        |
| 2000      | 0.547 | 170.9        | 1.614 | 50.9         | 0.163 | 44.7         | 0.381 | -72.1        |

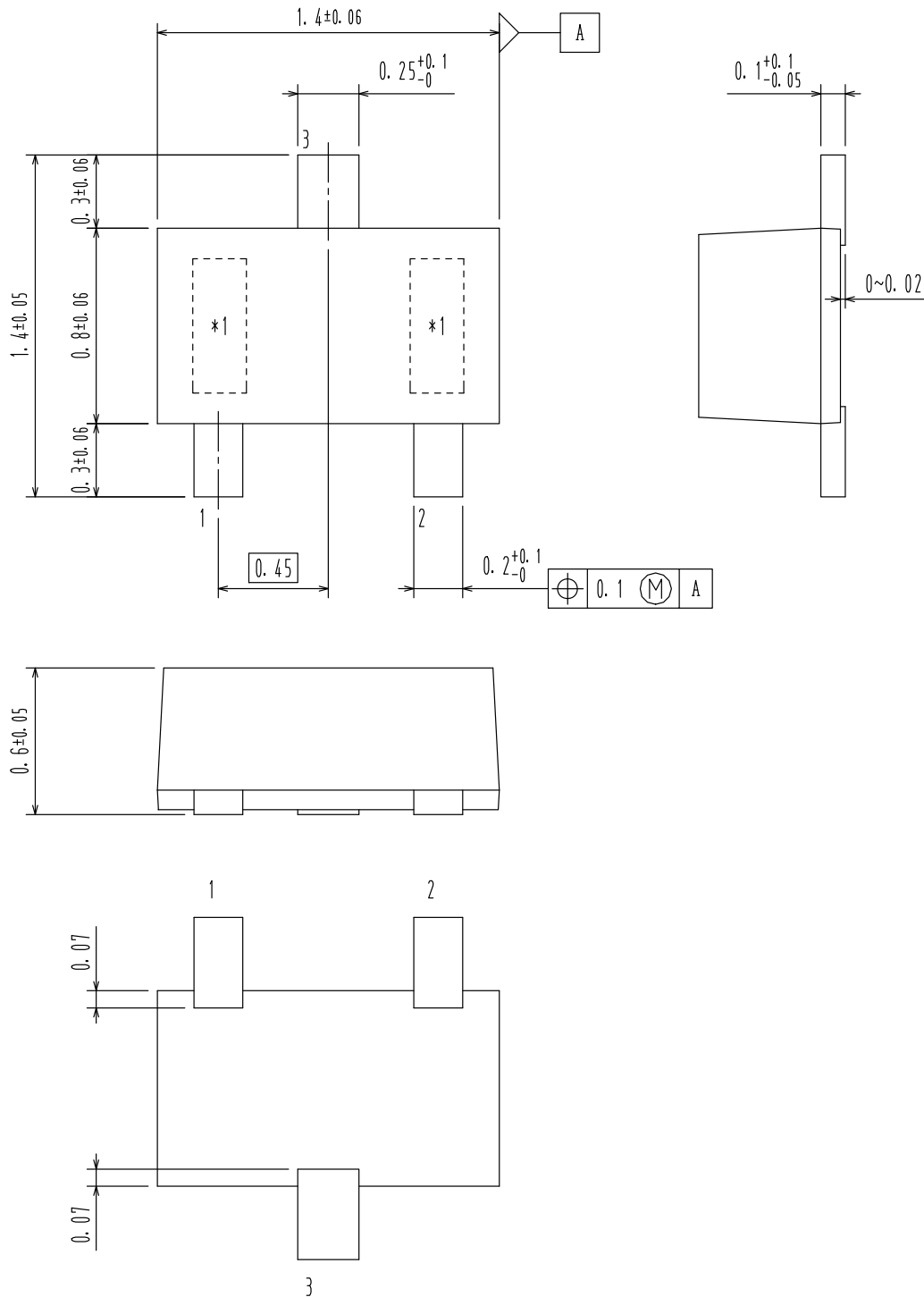
## Land Pattern Example



**Figure 8. Land Pattern Example**

**SOT-623 / SSFP**  
CASE 631AC  
ISSUE O

DATE 29 FEB 2012



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