



# SANYO Semiconductors DATA SHEET

## 2SC5488A — NPN Epitaxial Planar Silicon Transistor VHF to UHF Wide-Band Low-Noise Amplifier Applications

### Features

- Low-noise : NF=1.0dB typ (f=1GHz).
- High gain :  $|S_{21e}|^2=12\text{dB}$  typ (f=1GHz).
- High cut-off frequency :  $f_T=7\text{GHz}$  typ.
- Ultrasmall, slim flat-lead package (1.4mm×0.8mm×0.6mm).
- 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 | $V_{CEO}$ |            | 10          | V                |
| Emitter-to-Base Voltage      | $V_{EBO}$ |            | 2           | V                |
| Collector Current            | $I_C$     |            | 70          | mA               |
| Collector Dissipation        | $P_C$     |            | 100         | mW               |
| Junction Temperature         | $T_J$     |            | 150         | $^\circ\text{C}$ |
| Storage Temperature          | $T_{stg}$ |            | -55 to +150 | $^\circ\text{C}$ |

**Electrical Characteristics** at  $T_a=25^\circ\text{C}$

| Parameter                    | Symbol    | Conditions                          | Ratings |      |     | Unit          |
|------------------------------|-----------|-------------------------------------|---------|------|-----|---------------|
|                              |           |                                     | min     | typ  | max |               |
| 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 | $C_{re}$  | $V_{CB}=10\text{V}, f=1\text{MHz}$  |         | 0.45 |     | pF            |

Marking : LN

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**SANYO Semiconductor Co., Ltd.**

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60408AB TI IM TC-00001389 No. A1089-1/4

# 2SC5488A

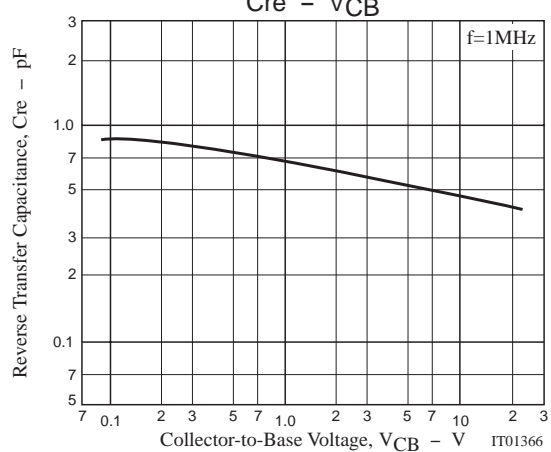
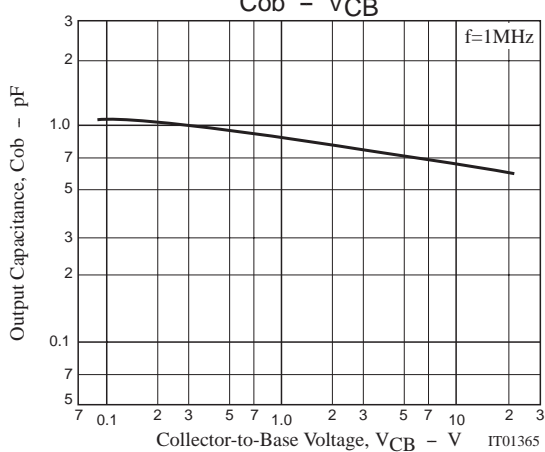
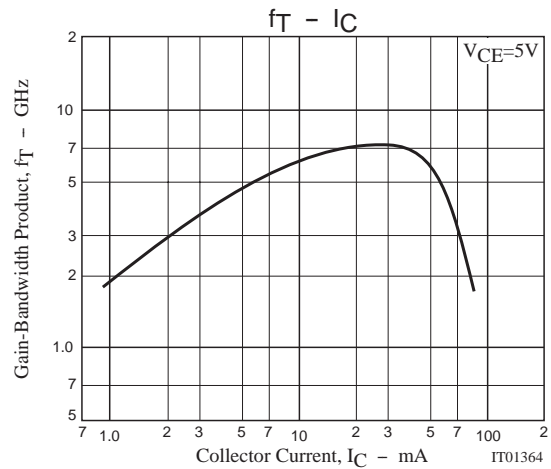
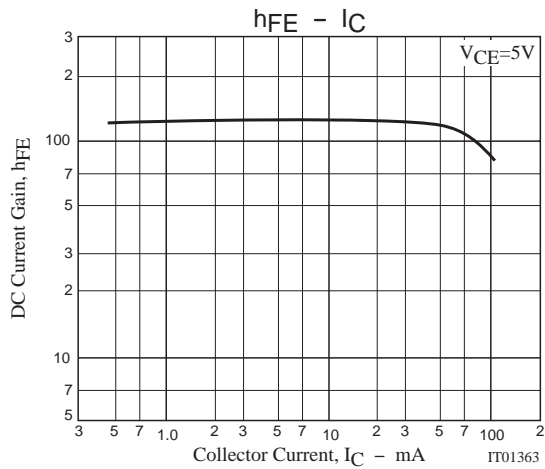
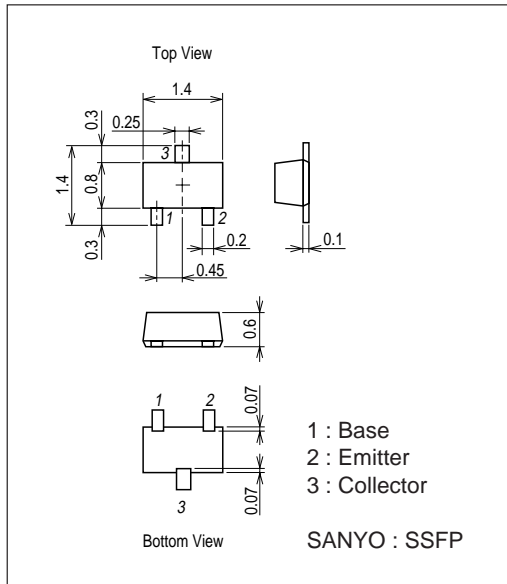
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| Parameter             | Symbol           | Conditions                    | Ratings |     |     | Unit |
|-----------------------|------------------|-------------------------------|---------|-----|-----|------|
|                       |                  |                               | min     | typ | max |      |
| Forward Transfer Gain | $ S_{21e} ^{21}$ | $V_{CE}=5V, I_C=20mA, f=1GHz$ | 9       | 12  |     | dB   |
|                       | $ S_{21e} ^{22}$ | $V_{CE}=2V, I_C=3mA, f=1GHz$  |         | 8.5 |     | dB   |
| Noise Figure          | NF               | $V_{CE}=5V, I_C=7mA, f=1GHz$  |         | 1.0 | 1.8 | dB   |

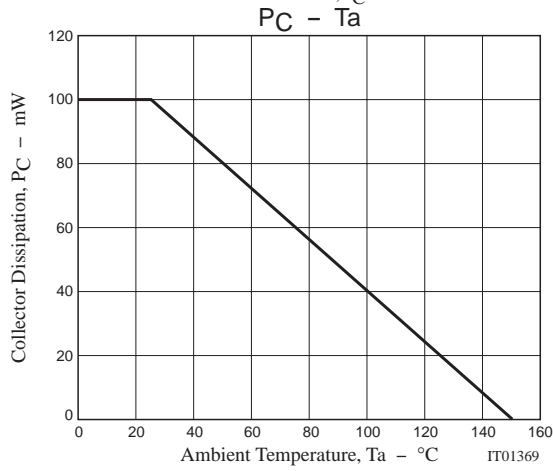
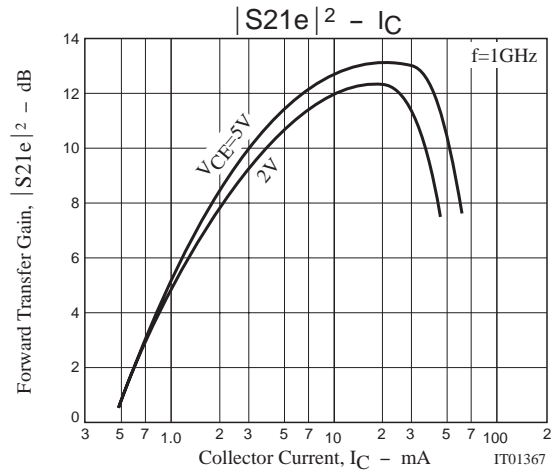
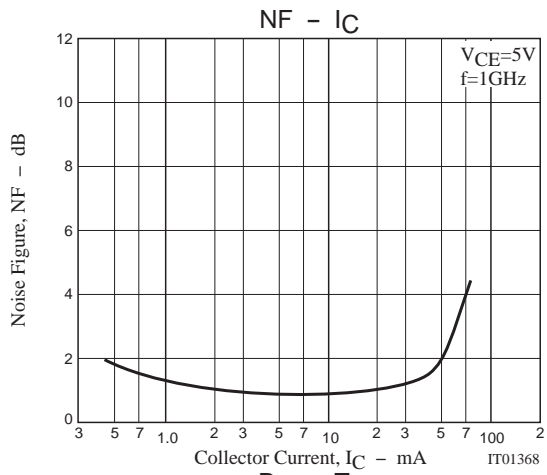
## Package Dimensions

unit : mm (typ)

7029-002



# 2SC5488A



## S Parameters (Common emitter)

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

| Freq(MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|-----------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 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           |

## 2SC5488A

### S Parameters (Common emitter)

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

| Freq(MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|-----------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 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           |

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

| Freq(MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|-----------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 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           |

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