

**2SA1963**

High-Frequency Low-Noise Amplifier, Ultrahigh-Speed Switching Applications

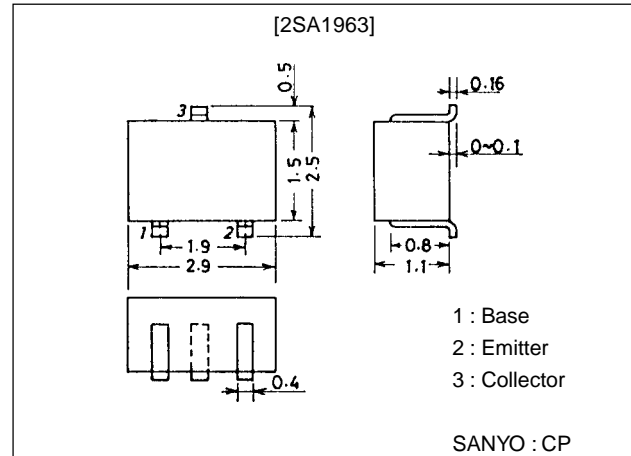
Features

- Low noise : $NF=1.5\text{dB typ (}f=1\text{GHz)}$.
- High gain : $|S_{21e}|^2=9\text{dB typ (}f=1\text{GHz)}$.
- High cutoff frequency : $f_T=5\text{GHz typ}$.

Package Dimensions

unit:mm

2018B



Specifications

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

| Parameter | Symbol | Conditions | Ratings | Unit |
|------------------------------|-----------|------------|-------------|------------------|
| Collector-to-Base Voltage | V_{CB0} | | -12 | V |
| Collector-to-Emitter Voltage | V_{CEO} | | -8 | V |
| Emitter-to-Base Voltage | V_{EBO} | | -2 | V |
| Collector Current | I_C | | -50 | mA |
| Collector Dissipation | P_C | | 200 | 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} | $V_{CB}=-10\text{V}, I_E=0$ | | | -1.0 | μA |
| Emitter Cutoff Current | I_{EBO} | $V_{EB}=-1\text{V}, I_C=0$ | | | -1.0 | μA |
| DC Current Gain | h_{FE} | $V_{CE}=-5\text{V}, I_C=-10\text{mA}$ | 20* | | 120* | |
| Gain-Bandwidth Product | f_T | $V_{CE}=-5\text{V}, I_C=-10\text{mA}$ | 3 | 5 | | GHz |
| Output Capacitance | C_{ob} | $V_{CB}=-10\text{V}, f=1\text{MHz}$ | | 0.8 | 1.3 | pF |
| Reverse Transfer Capacitance | C_{re} | $V_{CB}=-10\text{V}, f=1\text{MHz}$ | | 0.55 | | pF |
| Forward Transfer Gain | $ S_{21e} ^2(1)$ | $V_{CE}=-5\text{V}, I_C=-10\text{mA}, f=1\text{GHz}$ | 7 | 9 | | dB |
| | $ S_{21e} ^2(2)$ | $V_{CE}=-2\text{V}, I_C=-3\text{mA}, f=1\text{GHz}$ | | 6.5 | | dB |
| Noise Figure | NF | $V_{CE}=-5\text{V}, I_C=-5\text{mA}, f=1\text{GHz}$ | | 1.5 | 3.0 | dB |

* : The 2SA1963 is classified by 10mA h_{FE} as follows :

| | | | | | | | | |
|----|---|----|----|---|----|----|---|-----|
| 20 | 1 | 50 | 40 | 2 | 80 | 60 | 3 | 120 |
|----|---|----|----|---|----|----|---|-----|

Marking : MS

 h_{FE} ranks : 1, 2, 3

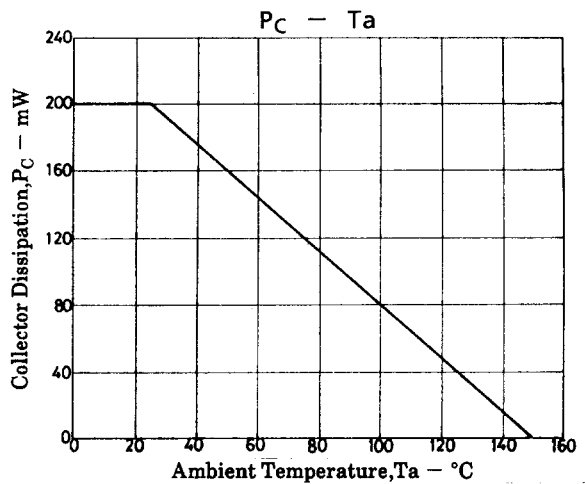
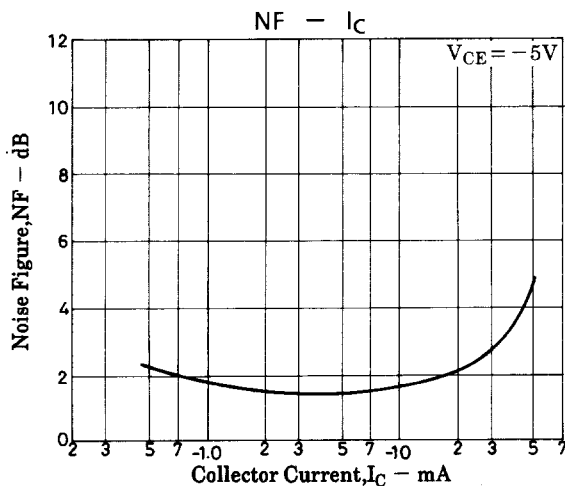
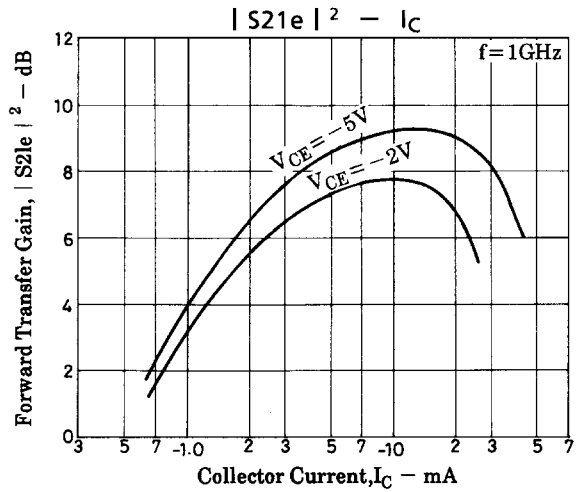
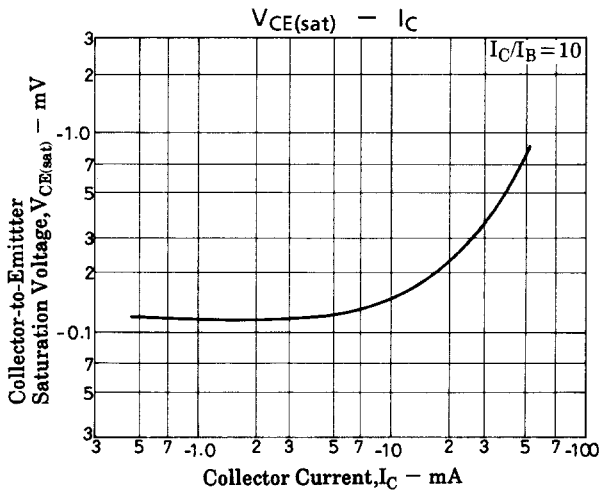
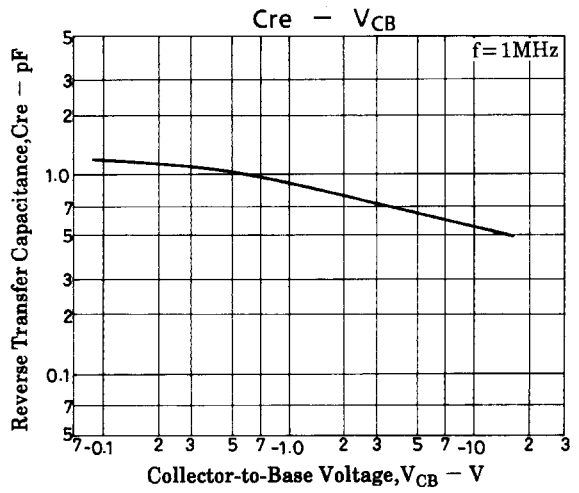
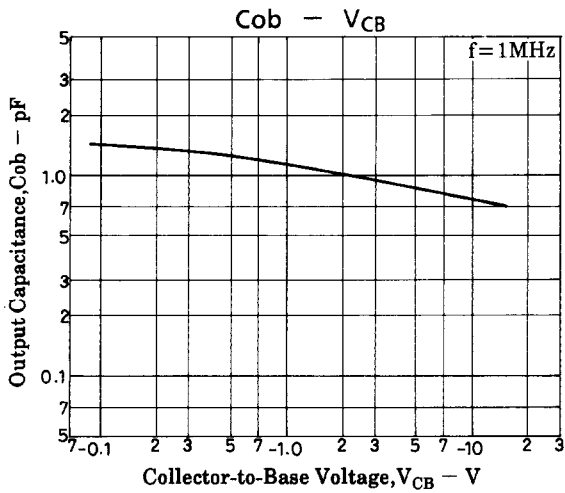
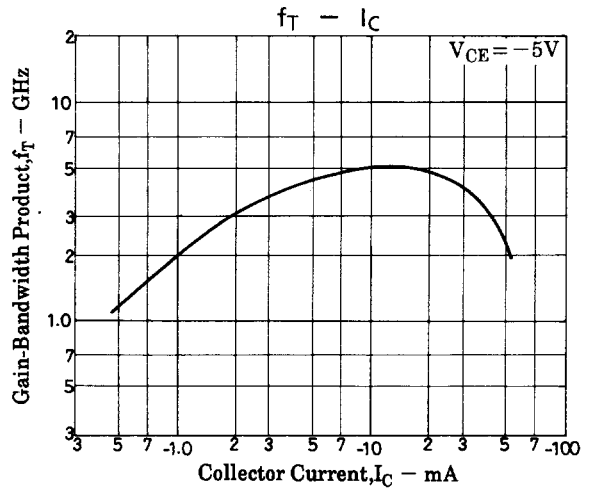
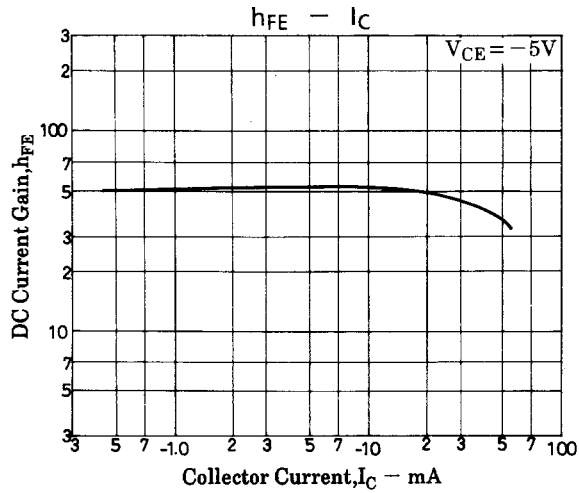
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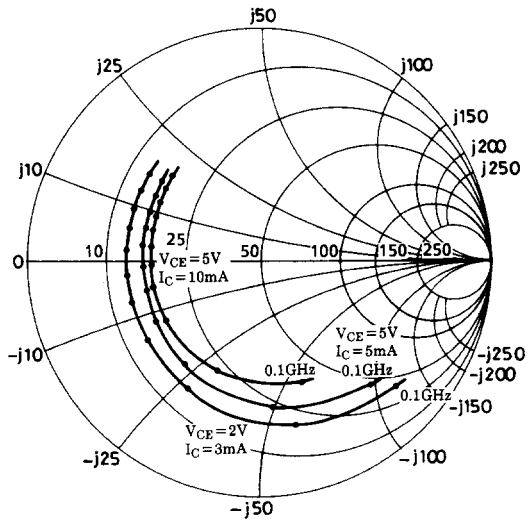
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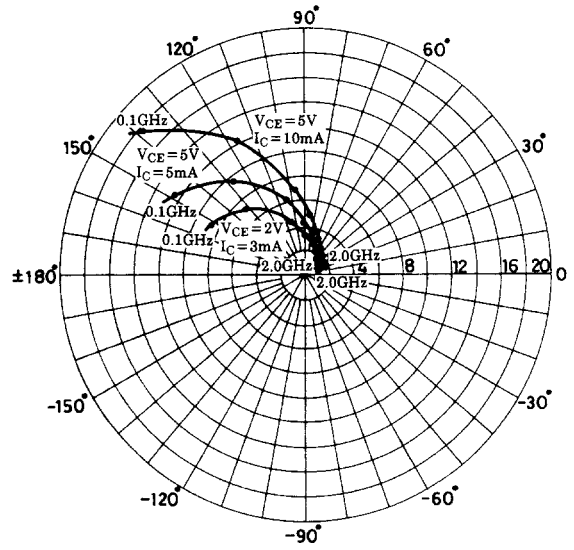


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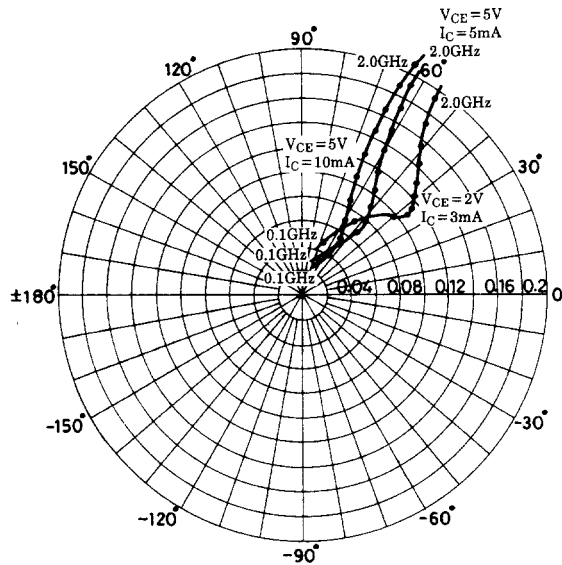
S11e : $f = 100\text{MHz}$, 200 to 2000MHz (200MHz step)



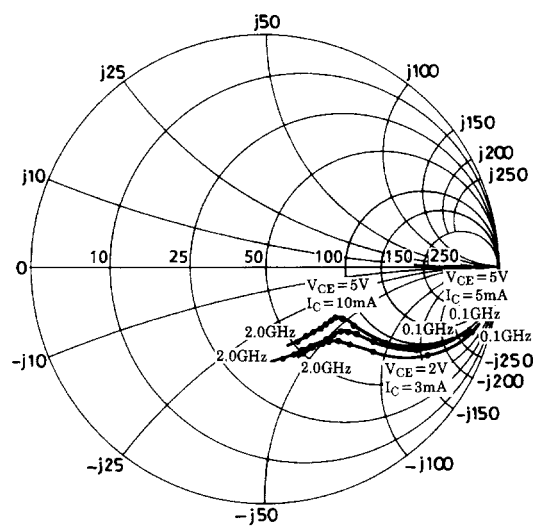
S21e : $f = 100\text{MHz}$, 200 to 2000MHz (200MHz step)



S12e : $f = 100\text{MHz}$, 200 to 2000MHz (200MHz step)



S22e : $f = 100\text{MHz}$, 200 to 2000MHz (200MHz step)



2SA1963

S Parameters (Common Emitter)

$V_{CE}=5V, I_C=5mA, Z_0=50\Omega$

| Freq (MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|------------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 100 | 0.711 | -47.7 | 12.330 | 149.2 | 0.033 | 68.0 | 0.893 | -18.2 |
| 200 | 0.628 | -83.9 | 9.680 | 127.8 | 0.052 | 55.1 | 0.740 | -28.5 |
| 400 | 0.542 | -126.7 | 6.113 | 104.1 | 0.069 | 47.5 | 0.559 | -34.7 |
| 600 | 0.513 | -150.7 | 4.337 | 90.6 | 0.080 | 48.5 | 0.479 | -36.5 |
| 800 | 0.502 | -166.1 | 3.375 | 80.7 | 0.091 | 52.0 | 0.442 | -38.4 |
| 1000 | 0.504 | -177.9 | 2.772 | 72.7 | 0.104 | 55.0 | 0.424 | -41.5 |
| 1200 | 0.506 | 172.3 | 2.378 | 65.5 | 0.119 | 57.6 | 0.416 | -45.2 |
| 1400 | 0.509 | 163.8 | 2.069 | 58.5 | 0.136 | 59.6 | 0.409 | -49.6 |
| 1600 | 0.516 | 155.3 | 1.825 | 52.1 | 0.153 | 61.1 | 0.403 | -55.0 |
| 1800 | 0.527 | 147.7 | 1.645 | 46.4 | 0.173 | 61.9 | 0.403 | -60.5 |
| 2000 | 0.541 | 140.6 | 1.515 | 41.3 | 0.193 | 62.2 | 0.406 | -66.5 |

$V_{CE}=5V, I_C=10mA, Z_0=50\Omega$

| Freq (MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|------------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 100 | 0.547 | -70.6 | 17.652 | 139.1 | 0.027 | 64.1 | 0.801 | -24.4 |
| 200 | 0.501 | -112.1 | 12.156 | 117.0 | 0.040 | 55.5 | 0.610 | -32.8 |
| 400 | 0.479 | -148.5 | 6.937 | 97.2 | 0.056 | 55.7 | 0.457 | -34.5 |
| 600 | 0.473 | -166.7 | 4.783 | 85.8 | 0.071 | 60.0 | 0.398 | -34.6 |
| 800 | 0.473 | -178.8 | 3.677 | 77.6 | 0.088 | 63.2 | 0.374 | -36.5 |
| 1000 | 0.478 | 172.1 | 3.005 | 70.5 | 0.107 | 65.0 | 0.366 | -39.7 |
| 1200 | 0.486 | 163.7 | 2.570 | 63.7 | 0.126 | 65.6 | 0.358 | -43.8 |
| 1400 | 0.492 | 156.4 | 2.228 | 57.3 | 0.147 | 65.8 | 0.353 | -48.5 |
| 1600 | 0.502 | 149.2 | 1.967 | 51.4 | 0.166 | 65.5 | 0.349 | -54.0 |
| 1800 | 0.514 | 142.4 | 1.765 | 45.9 | 0.188 | 64.6 | 0.348 | -59.9 |
| 2000 | 0.526 | 135.6 | 1.626 | 42.1 | 0.209 | 63.6 | 0.351 | -66.1 |

$V_{CE}=2V, I_C=3mA, Z_0=50\Omega$

| Freq (MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|------------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 100 | 0.788 | -42.7 | 8.469 | 152.2 | 0.045 | 68.4 | 0.913 | -17.6 |
| 200 | 0.714 | -77.5 | 6.984 | 131.1 | 0.074 | 53.9 | 0.780 | -29.2 |
| 400 | 0.626 | -120.3 | 4.613 | 106.0 | 0.099 | 40.2 | 0.586 | -38.9 |
| 600 | 0.587 | -145.9 | 3.338 | 90.6 | 0.108 | 36.9 | 0.491 | -42.9 |
| 800 | 0.577 | -162.3 | 2.612 | 79.5 | 0.114 | 38.0 | 0.443 | -46.0 |
| 1000 | 0.574 | -174.9 | 2.173 | 70.6 | 0.122 | 40.9 | 0.422 | -50.2 |
| 1200 | 0.577 | 174.5 | 1.872 | 62.2 | 0.131 | 44.2 | 0.410 | -54.7 |
| 1400 | 0.578 | 165.4 | 1.637 | 54.5 | 0.142 | 47.9 | 0.400 | -59.8 |
| 1600 | 0.587 | 157.0 | 1.447 | 47.5 | 0.155 | 51.1 | 0.398 | -65.9 |
| 1800 | 0.598 | 149.0 | 1.303 | 41.6 | 0.173 | 53.7 | 0.398 | -72.0 |
| 2000 | 0.608 | 141.3 | 1.203 | 36.3 | 0.194 | 55.6 | 0.403 | -78.8 |

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