

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

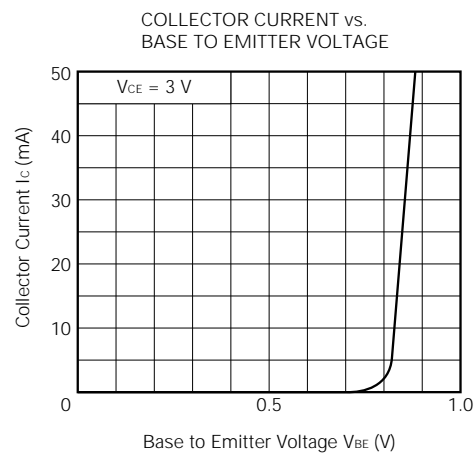
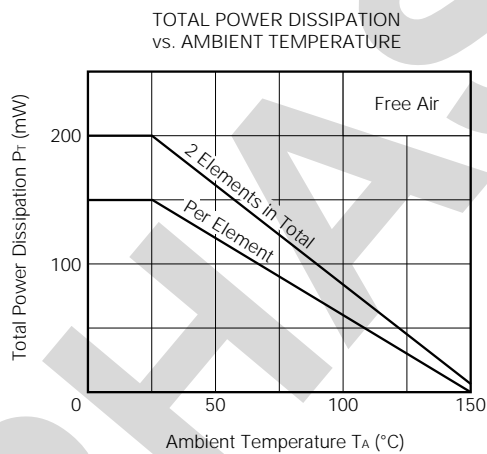
| PARAMETER | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT |
|--------------------------|-------------------|--|------|------|------|---------------|
| Collector Cutoff Current | I_{CBO} | $V_{CB} = 5\text{ V}, I_E = 0$ | | | 0.1 | μA |
| Emitter Cutoff Current | I_{EBO} | $V_{EB} = 1\text{ V}, I_C = 0$ | | | 0.1 | μA |
| DC Current Gain | h_{FE} | $V_{CE} = 3\text{ V}, I_C = 10\text{ mA}$ ^{Note 1} | 75 | | 150 | |
| Gain Bandwidth Product | f_T | $V_{CE} = 3\text{ V}, I_C = 10\text{ mA}, f = 2\text{ GHz}$ | | 12 | | GHz |
| Feed-back Capacitance | C_{re} | $V_{CB} = 3\text{ V}, I_E = 0, f = 1\text{ MHz}$ ^{Note 2} | | 0.4 | 0.7 | pF |
| Insertion Power Gain | $ S_{21} ^2$ | $V_{CE} = 3\text{ V}, I_C = 10\text{ mA}, f = 2\text{ GHz}$ | 7 | 8.5 | | dB |
| Noise Figure | NF | $V_{CE} = 3\text{ V}, I_C = 3\text{ mA}, f = 2\text{ GHz}$ | | 1.5 | 2.5 | dB |
| h_{FE} Ratio | h_{FE1}/h_{FE2} | $V_{CE} = 3\text{ V}, I_C = 10\text{ mA}$ A smaller value among h_{FE} of $h_{FE1} = Q1, Q2$ A larger value among h_{FE} of $h_{FE2} = Q1, Q2$ | 0.85 | | | |

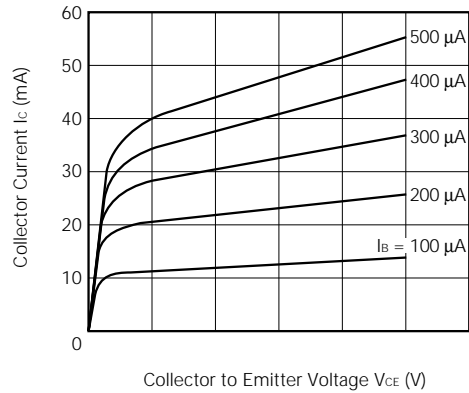
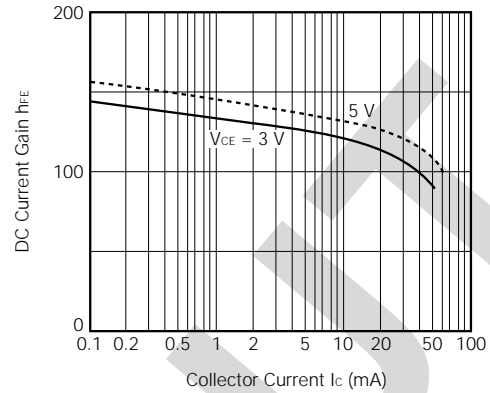
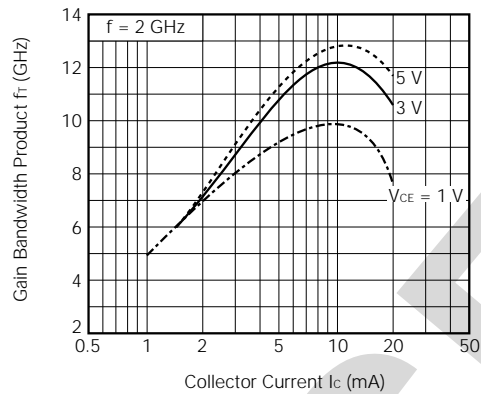
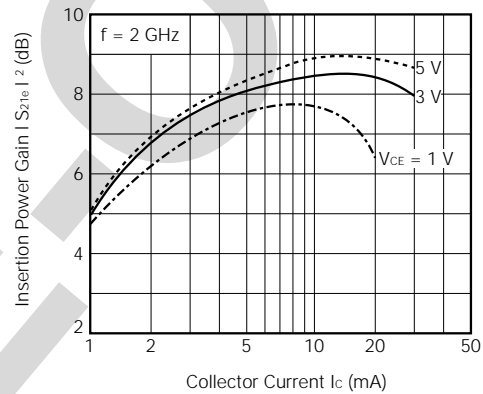
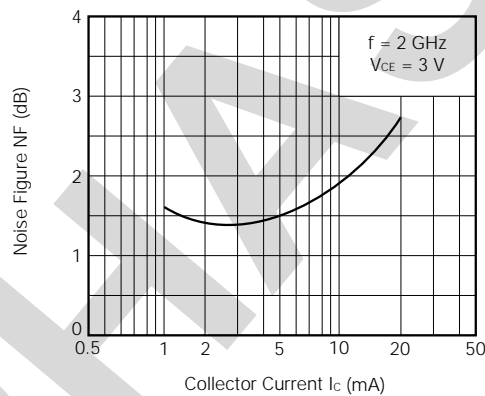
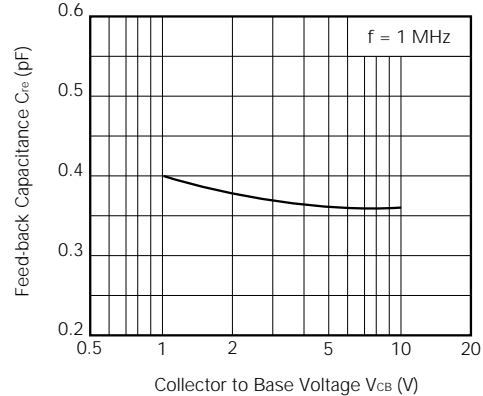
Notes 1. Pulse Measurement: $P_w \leq 350\text{ }\mu\text{s}$, Duty cycle $\leq 2\%$

2. Measured with 3-pin bridge, emitter and case should be connected to guard pin of bridge.

 h_{FE} CLASSIFICATION

| | |
|----------------|-----------|
| Rank | KB |
| Marking | T83 |
| h_{FE} Value | 75 to 150 |

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

COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGEDC CURRENT GAIN vs.
COLLECTOR CURRENTGAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENTINSERTION GAIN vs.
COLLECTOR CURRENTNOISE FIGURE vs.
COLLECTOR CURRENTFEED-BACK CAPACITANCE vs.
COLLECTOR TO BASE VOLTAGE

S-PARAMETERS

 $V_{CE} = 3 \text{ V}$, $I_C = 1 \text{ mA}$, $Z_O = 50 \Omega$

| f GHz | S11 | | S21 | | S12 | | S22 | |
|----------|--------|--------|--------|-------|--------|------|--------|-------|
| | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 0.200 | 0.9340 | -15.7 | 3.5100 | 164.8 | 0.0450 | 82.6 | 0.9850 | -8.7 |
| 0.400 | 0.9040 | -29.4 | 3.3520 | 150.7 | 0.0780 | 68.0 | 0.9410 | -17.1 |
| 0.600 | 0.8150 | -43.4 | 3.1060 | 138.0 | 0.1140 | 62.8 | 0.8960 | -23.6 |
| 0.800 | 0.7530 | -56.6 | 2.8840 | 126.3 | 0.1370 | 58.0 | 0.8260 | -29.9 |
| 1.000 | 0.6540 | -68.9 | 2.6050 | 115.1 | 0.1490 | 55.2 | 0.7830 | -34.7 |
| 1.200 | 0.5900 | -79.8 | 2.4490 | 105.4 | 0.1660 | 45.4 | 0.7220 | -38.0 |
| 1.400 | 0.5160 | -90.1 | 2.2610 | 96.8 | 0.1770 | 44.8 | 0.6790 | -42.0 |
| 1.600 | 0.4590 | -101.5 | 2.0780 | 89.4 | 0.1780 | 45.1 | 0.6430 | -45.2 |
| 1.800 | 0.4230 | -110.8 | 1.9250 | 83.7 | 0.1880 | 42.5 | 0.6290 | -46.8 |
| 2.000 | 0.3670 | -123.9 | 1.8700 | 76.3 | 0.1900 | 41.9 | 0.5880 | -51.4 |
| 2.200 | 0.3370 | -136.7 | 1.7790 | 69.9 | 0.2110 | 43.9 | 0.5630 | -54.3 |
| 2.400 | 0.3150 | -145.5 | 1.6600 | 64.1 | 0.2140 | 41.9 | 0.5520 | -57.0 |
| 2.600 | 0.3080 | -159.1 | 1.5690 | 59.4 | 0.2070 | 42.8 | 0.5450 | -59.2 |
| 2.800 | 0.2930 | -164.8 | 1.5190 | 55.3 | 0.2140 | 45.8 | 0.5220 | -64.5 |
| 3.000 | 0.2950 | -179.6 | 1.4610 | 50.7 | 0.2260 | 45.4 | 0.4960 | -61.3 |

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

| f GHz | S11 | | S21 | | S12 | | S22 | |
|----------|--------|--------|--------|-------|--------|------|--------|-------|
| | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 0.200 | 0.8020 | -25.9 | 8.8990 | 154.2 | 0.0370 | 67.2 | 0.9420 | -15.7 |
| 0.400 | 0.6780 | -45.8 | 7.4880 | 134.4 | 0.0760 | 65.6 | 0.8040 | -26.6 |
| 0.600 | 0.5440 | -62.8 | 6.1260 | 119.6 | 0.0860 | 60.9 | 0.7060 | -33.2 |
| 0.800 | 0.4430 | -75.7 | 5.1230 | 108.1 | 0.1050 | 58.4 | 0.6250 | -36.6 |
| 1.000 | 0.3540 | -87.3 | 4.3050 | 99.1 | 0.1210 | 55.9 | 0.5660 | -38.3 |
| 1.200 | 0.2930 | -99.7 | 3.7880 | 91.3 | 0.1330 | 61.2 | 0.5190 | -41.4 |
| 1.400 | 0.2360 | -108.4 | 3.3560 | 84.8 | 0.1440 | 55.4 | 0.4950 | -43.9 |
| 1.600 | 0.2000 | -121.0 | 3.0100 | 79.1 | 0.1570 | 56.2 | 0.4660 | -44.5 |
| 1.800 | 0.1820 | -129.5 | 2.6960 | 74.4 | 0.1760 | 58.0 | 0.4560 | -44.5 |
| 2.000 | 0.1480 | -151.7 | 2.5340 | 69.4 | 0.1940 | 56.1 | 0.4310 | -48.8 |
| 2.200 | 0.1370 | -166.1 | 2.3820 | 64.0 | 0.2150 | 56.3 | 0.4050 | -51.9 |
| 2.400 | 0.1340 | 175.2 | 2.1870 | 60.0 | 0.2130 | 57.8 | 0.3990 | -52.8 |
| 2.600 | 0.1640 | 169.7 | 2.0530 | 55.8 | 0.2410 | 57.6 | 0.3950 | -52.9 |
| 2.800 | 0.1500 | 170.9 | 1.9660 | 53.0 | 0.2490 | 55.2 | 0.3750 | -59.2 |
| 3.000 | 0.1780 | 147.7 | 1.8710 | 49.6 | 0.2750 | 56.6 | 0.3740 | -60.8 |

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

| f GHz | S11 | | S21 | | S12 | | S22 | |
|----------|--------|--------|---------|-------|--------|------|--------|-------|
| | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 0.200 | 0.6900 | -33.3 | 12.2960 | 147.1 | 0.0320 | 74.8 | 0.8850 | -19.7 |
| 0.400 | 0.5360 | -54.7 | 9.4300 | 125.5 | 0.0610 | 66.3 | 0.7210 | -30.3 |
| 0.600 | 0.4010 | -70.0 | 7.2390 | 111.3 | 0.0700 | 59.6 | 0.6030 | -34.5 |
| 0.800 | 0.3150 | -82.4 | 5.8220 | 101.1 | 0.0950 | 63.8 | 0.5230 | -36.7 |
| 1.000 | 0.2360 | -93.8 | 4.7830 | 93.4 | 0.1090 | 62.3 | 0.4870 | -38.0 |
| 1.200 | 0.1850 | -105.4 | 4.1700 | 86.4 | 0.1260 | 61.9 | 0.4600 | -38.8 |
| 1.400 | 0.1440 | -115.8 | 3.6410 | 80.7 | 0.1350 | 65.9 | 0.4360 | -40.4 |
| 1.600 | 0.1230 | -134.4 | 3.2380 | 76.1 | 0.1560 | 61.2 | 0.4170 | -42.6 |
| 1.800 | 0.1040 | -144.6 | 2.8910 | 71.4 | 0.1770 | 62.4 | 0.4020 | -43.9 |
| 2.000 | 0.1000 | -170.6 | 2.7040 | 67.3 | 0.1930 | 60.7 | 0.3940 | -45.8 |
| 2.200 | 0.1110 | 167.4 | 2.5330 | 62.6 | 0.2080 | 60.6 | 0.3710 | -50.3 |
| 2.400 | 0.1040 | 158.2 | 2.3270 | 58.7 | 0.2260 | 61.6 | 0.3500 | -50.2 |
| 2.600 | 0.1180 | 156.3 | 2.1850 | 54.9 | 0.2560 | 58.2 | 0.3560 | -51.2 |
| 2.800 | 0.1190 | 150.0 | 2.0910 | 52.6 | 0.2560 | 56.8 | 0.3520 | -58.1 |
| 3.000 | 0.1490 | 142.4 | 1.9760 | 49.0 | 0.2860 | 56.6 | 0.3410 | -56.9 |

 $V_{CE} = 3\text{ V}$, $I_C = 10\text{ mA}$, $Z_O = 50\ \Omega$

| f GHz | S11 | | S21 | | S12 | | S22 | |
|----------|--------|--------|---------|-------|--------|------|--------|-------|
| | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 0.200 | 0.5080 | -43.6 | 17.0900 | 135.9 | 0.0330 | 63.8 | 0.7930 | -26.2 |
| 0.400 | 0.3410 | -65.3 | 11.3980 | 114.2 | 0.0520 | 68.5 | 0.5910 | -32.9 |
| 0.600 | 0.2320 | -80.7 | 8.2250 | 102.0 | 0.0690 | 69.0 | 0.5130 | -32.9 |
| 0.800 | 0.1770 | -90.8 | 6.3950 | 93.8 | 0.0880 | 71.6 | 0.4480 | -32.8 |
| 1.000 | 0.1220 | -108.2 | 5.1870 | 87.2 | 0.1060 | 69.3 | 0.4180 | -35.9 |
| 1.200 | 0.1010 | -121.8 | 4.4390 | 81.6 | 0.1260 | 70.1 | 0.4030 | -33.3 |
| 1.400 | 0.0670 | -138.2 | 3.8770 | 76.9 | 0.1450 | 70.5 | 0.3930 | -36.5 |
| 1.600 | 0.0620 | -167.6 | 3.4350 | 72.4 | 0.1590 | 65.5 | 0.3680 | -36.2 |
| 1.800 | 0.0660 | -171.3 | 3.0650 | 68.8 | 0.1790 | 65.0 | 0.3610 | -39.5 |
| 2.000 | 0.0770 | 146.7 | 2.8540 | 65.0 | 0.2060 | 63.9 | 0.3480 | -42.3 |
| 2.200 | 0.0990 | 146.5 | 2.6590 | 60.5 | 0.2220 | 62.8 | 0.3360 | -46.6 |
| 2.400 | 0.1140 | 128.1 | 2.4400 | 57.0 | 0.2420 | 60.9 | 0.3370 | -48.8 |
| 2.600 | 0.1260 | 136.8 | 2.2790 | 53.5 | 0.2660 | 59.9 | 0.3170 | -47.2 |
| 2.800 | 0.1020 | 129.6 | 2.1950 | 50.9 | 0.2770 | 59.6 | 0.3280 | -55.1 |
| 3.000 | 0.1370 | 123.5 | 2.0800 | 47.9 | 0.2860 | 58.3 | 0.3100 | -51.2 |

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