CEL

# SILICON TRANSISTOR
# μPA800T

## HIGH-FREQUENCY LOW NOISE AMPLIFIER
## NPN SILICON EPITAXIAL TRANSISTOR
## (WITH BUILT-IN 2 ELEMENTS) MINI MOLD

The μPA800T has built-in 2 low-voltage transistors which are designed to amplify low noise in the VHF band to the UHF band.

### FEATURES

- Low Noise
  NF = 1.9 dB TYP. @ f = 2 GHz, $V_{CE}$ = 1 V, $I_C$ = 3 mA
- High Gain
  $|S_{21e}|^2$ = 6.5 dB TYP. @ f = 2 GHz, $V_{CE}$ = 1 V, $I_C$ = 3 mA
- A Mini Mold Package Adopted
- Built-in 2 Transistors (2 × 2SC4228)

### ORDERING INFORMATION

| PART NUMBER | QUANTITY | PACKING STYLE |
|---|---|---|
| μPA800T | Loose products (50 PCS) | Embossed tape 8 mm wide. Pin 6 (Q1 Base), Pin 5 (Q2 Base), Pin 4 (Q2 Emitter) face to perforation side of the tape. |
| μPA800T-T1 | Taping products (3 KPCS/Reel) | |

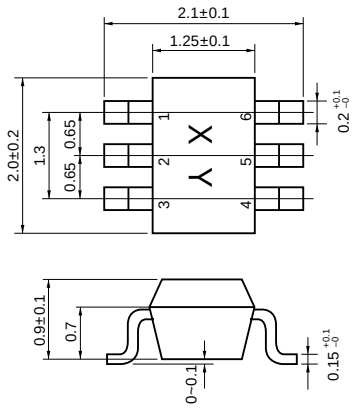
**Remark** To order evaluation samples, please contact your nearby sales office.
Part number for sample order: μPA800T-A (Unit Sample quantity is 50 pcs.)

### ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25 °C)

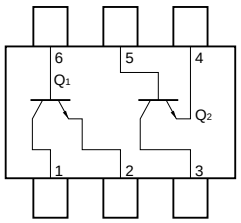
| PARAMETER | SYMBOL | RATING | UNIT |
|---|---|---|---|
| Collector to Base Voltage | $V_{CBO}$ | 20 | V |
| Collector to Emitter Voltage | $V_{CEO}$ | 10 | V |
| Emitter to Base Voltage | $V_{EBO}$ | 1.5 | V |
| Collector Current | $I_C$ | 35 | mA |
| Total Power Dissipation | $P_T$ | 150 in 1 element<br>200 in 2 elements**Note** | mW |
| Junction Temperature | $T_j$ | 150 | °C |
| Storage Temperature | $T_{stg}$ | –65 to +150 | °C |

**Note** 110 mW must not be exceeded in 1 element.

### PACKAGE DRAWINGS
**(Unit: mm)**




### PIN CONFIGURATION (Top View)




**PIN CONNECTIONS**
1. Collector (Q1)
2. Emitter (Q1)
3. Collector (Q2)
4. Emitter (Q2)
5. Base (Q2)
6. Base (Q1)



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## ELECTRICAL CHARACTERISTICS ($T_A$ = 25 °C)

| PARAMETER | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Collector Cutoff Current | $I_{CBO}$ | $V_{CB}$ = 10 V, $I_E$ = 0 | | | 1.0 | μA |
| Emitter Cutoff Current | $I_{EBO}$ | $V_{EB}$ = 1 V, $I_C$ = 0 | | | 1.0 | μA |
| DC Current Gain | $h_{FE}$ | $V_{CE}$ = 3 V, $I_C$ = 5 mA **Note 1** | 80 | | 200 | |
| Gain Bandwidth Product | $f_T$ | $V_{CE}$ = 3 V, $I_C$ = 5 mA | 5.5 | 80 | | GHz |
| Feed-back Capacitance | $C_{re}$ | $V_{CB}$ = 3 V, $I_E$ = 0, f = 1 MHz **Note 2** | | | 0.7 | pF |
| Insertion Power Gain (1) | $\|S_{21e}\|^2$ | $V_{CE}$ = 1 V, $I_C$ = 3 mA, f = 2 GHz | 4.5 | 6.5 | | dB |
| Insertion Power Gain (2) | $\|S_{21e}\|^2$ | $V_{CE}$ = 3 V, $I_C$ = 5 mA, f = 2 GHz | 5.5 | 7.5 | | dB |
| Noise Figure (1) | NF | $V_{CE}$ = 1 V, $I_C$ = 3 mA, f = 2 GHz | | 1.9 | 3.2 | dB |
| Noise Figure (2) | NF | $V_{CE}$ = 3 V, $I_C$ = 5 mA, f = 2 GHz | | 1.9 | 3.2 | dB |

**Notes 1.** Pulse Measurement: Pw ≤ 350 μs, Duty cycle ≤ 2 %

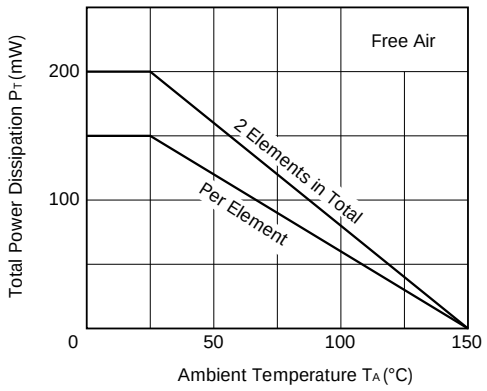
**2.** Measured with 3-pin bridge, emitter and case should be connected to guard pin of bridge.

## $h_{FE}$ CLASSIFICATION

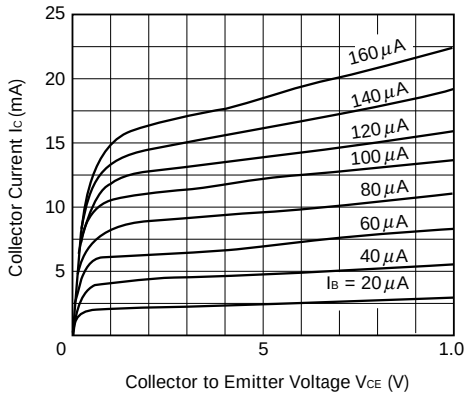
| Rank | KB |
|---|---|
| Marking | RL |
| $h_{FE}$ Value | 80 to 200 |

## TYPICAL CHARACTERISTICS ($T_A$ = 25 °C)

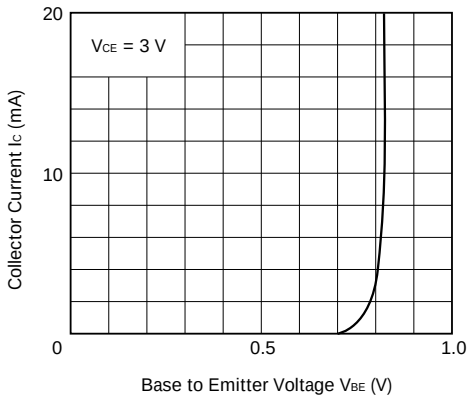
$P_T$ - $T_A$ Characteristics



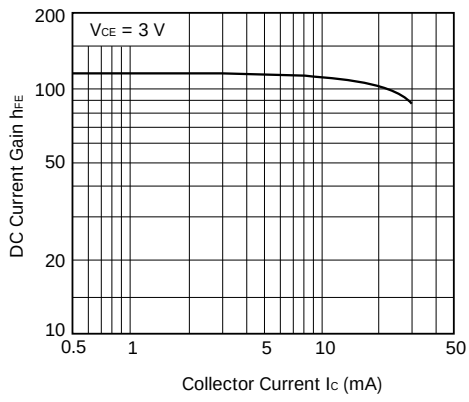

$I_C$ - $V_{CE}$ Characteristics



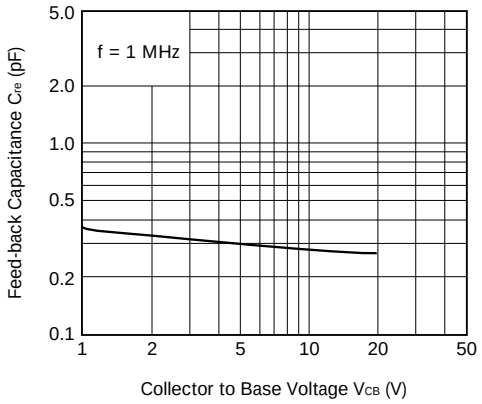

$I_C$ - $V_{BE}$ Characteristics



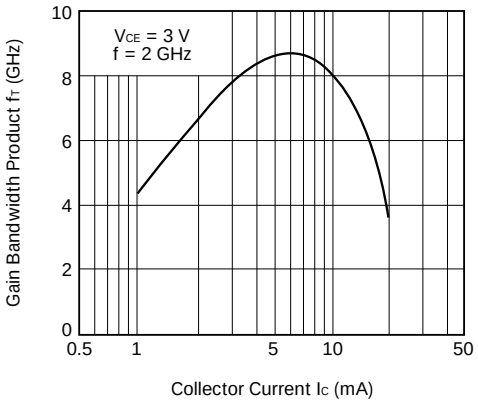

$h_{FE}$ - $I_C$ Characteristics



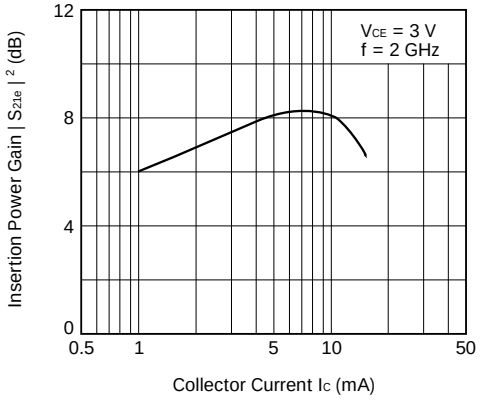
$C_{re}$ - $V_{CB}$ Characteristics



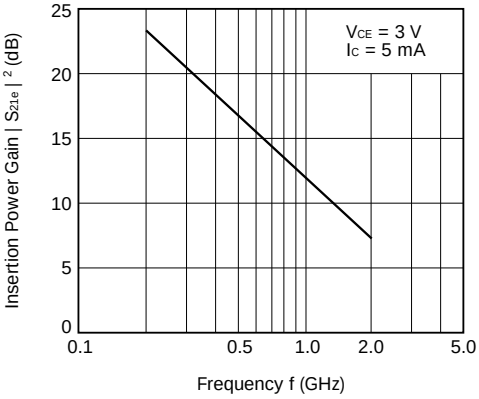

$f_T$ - $I_C$ Characteristics



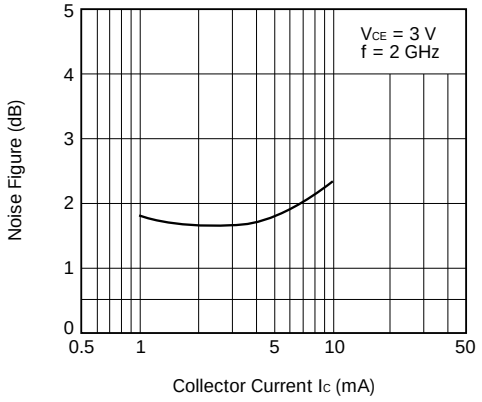

$|S_{21e}|^2$ - $I_C$ Characteristics




$|S_{21e}|^2$ - f Characteristics




NF - $I_C$ Characteristics



## S-PARAMETERS

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

| FREQUENCY | S11 | | S21 | | S12 | | S22 | |
|---|---|---|---|---|---|---|---|---|
| MHz | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 100.00 | .875 | –18.6 | 14.087 | 161.1 | .018 | 78.2 | .958 | –10.1 |
| 200.00 | .762 | –35.0 | 12.290 | 145.1 | .034 | 68.6 | .888 | –17.7 |
| 300.00 | .677 | –47.2 | 10.888 | 133.6 | .048 | 66.6 | .800 | –24.4 |
| 400.00 | .565 | –59.4 | 9.275 | 123.6 | .055 | 65.8 | .719 | –26.7 |
| 500.00 | .495 | –67.5 | 8.300 | 115.7 | .063 | 63.5 | .669 | –28.7 |
| 600.00 | .425 | –76.1 | 7.184 | 108.9 | .074 | 61.1 | .610 | –30.3 |
| 700.00 | .372 | –81.6 | 6.454 | 104.8 | .084 | 63.8 | .600 | –30.6 |
| 800.00 | .327 | –88.5 | 5.818 | 99.5 | .089 | 62.7 | .560 | –31.3 |
| 900.00 | .289 | –93.6 | 5.231 | 95.5 | .092 | 64.6 | .543 | –30.1 |
| 1000.00 | .255 | –100.5 | 4.820 | 92.0 | .104 | 62.8 | .519 | –33.4 |
| 1100.00 | .236 | –105.2 | 4.444 | 88.8 | .105 | 64.2 | .512 | –31.8 |
| 1200.00 | .214 | –112.2 | 4.142 | 85.3 | .113 | 64.2 | .497 | –33.4 |
| 1300.00 | .195 | –117.6 | 3.842 | 83.2 | .122 | 63.6 | .476 | –33.2 |
| 1400.00 | .182 | –123.8 | 3.554 | 79.3 | .127 | 65.0 | .481 | –34.2 |
| 1500.00 | .165 | –129.9 | 3.343 | 77.4 | .139 | 64.1 | .467 | –34.6 |
| 1600.00 | .153 | –137.4 | 3.218 | 75.3 | .140 | 64.5 | .466 | –34.8 |
| 1700.00 | .145 | –144.3 | 3.091 | 73.6 | .152 | 65.4 | .458 | –37.2 |
| 1800.00 | .139 | –151.8 | 2.857 | 70.4 | .162 | 64.3 | .456 | –36.1 |
| 1900.00 | .134 | –157.0 | 2.764 | 68.7 | .168 | 62.3 | .451 | –38.4 |
| 2000.00 | .129 | –164.7 | 2.624 | 66.4 | .176 | 64.8 | .445 | –39.0 |

$V_{CE}$ = 3 V, $I_C$ = 3 mA, $Z_O$ = 50 Ω

| FREQUENCY | S11 | | S21 | | S12 | | S22 | |
|---|---|---|---|---|---|---|---|---|
| MHz | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 100.00 | .943 | –13.4 | 9.384 | 165.9 | .020 | 84.1 | .969 | –7.7 |
| 200.00 | .868 | –26.6 | 8.668 | 152.8 | .038 | 77.2 | .936 | –13.8 |
| 300.00 | .815 | –37.7 | 8.165 | 142.9 | .051 | 67.9 | .876 | –20.9 |
| 400.00 | .717 | –48.9 | 7.279 | 132.9 | .062 | 63.9 | .804 | –23.5 |
| 500.00 | .655 | –56.8 | 6.780 | 125.5 | .075 | 63.9 | .764 | –26.7 |
| 600.00 | .577 | –65.5 | 6.061 | 118.0 | .084 | 60.0 | .708 | –29.7 |
| 700.00 | .518 | –71.2 | 5.504 | 112.8 | .091 | 59.7 | .685 | –31.1 |
| 800.00 | .468 | –78.1 | 5.074 | 106.7 | .098 | 57.0 | .639 | –32.0 |
| 900.00 | .420 | –83.7 | 4.632 | 102.8 | .102 | 59.0 | .611 | –32.8 |
| 1000.00 | .380 | –90.6 | 4.340 | 98.3 | .105 | 56.6 | .592 | –35.0 |
| 1100.00 | .344 | –94.8 | 3.951 | 94.8 | .112 | 57.8 | .579 | –34.1 |
| 1200.00 | .321 | –101.6 | 3.717 | 90.5 | .121 | 59.0 | .551 | –35.0 |
| 1300.00 | .291 | –105.9 | 3.485 | 87.6 | .128 | 58.7 | .532 | –35.9 |
| 1400.00 | .273 | –111.7 | 3.306 | 84.3 | .135 | 59.8 | .535 | –36.6 |
| 1500.00 | .250 | –117.2 | 3.134 | 80.7 | .140 | 58.0 | .511 | –37.5 |
| 1600.00 | .228 | –122.4 | 2.959 | 79.0 | .145 | 59.5 | .516 | –37.7 |
| 1700.00 | .219 | –128.5 | 2.819 | 76.0 | .153 | 59.0 | .504 | –39.0 |
| 1800.00 | .199 | –135.3 | 2.699 | 73.9 | .161 | 58.4 | .493 | –39.9 |
| 1900.00 | .193 | –139.6 | 2.572 | 71.9 | .163 | 60.3 | .489 | –41.4 |
| 2000.00 | .182 | –146.9 | 2.474 | 68.3 | .175 | 59.8 | .482 | –41.4 |

$V_{CE}$ = 3 V, $I_C$ = 1 mA, $Z_O$ = 50 Ω

| FREQUENCY | S11 | | S21 | | S12 | | S22 | |
|---|---|---|---|---|---|---|---|---|
| MHz | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 100.00 | 1.023 | –7.6 | 3.505 | 172.1 | .025 | 86.4 | .995 | –4.6 |
| 200.00 | .983 | –16.1 | 3.400 | 163.3 | .039 | 79.3 | .986 | –7.8 |
| 300.00 | .975 | –22.4 | 3.368 | 157.3 | .061 | 74.6 | .976 | –12.8 |
| 400.00 | .922 | –31.8 | 3.219 | 149.1 | .075 | 70.7 | .936 | –15.1 |
| 500.00 | .899 | –36.9 | 3.186 | 143.3 | .093 | 66.4 | .922 | –18.8 |
| 600.00 | .849 | –44.7 | 3.046 | 135.7 | .105 | 62.2 | .885 | –22.5 |
| 700.00 | .812 | –50.6 | 2.905 | 131.1 | .113 | 61.7 | .880 | –24.4 |
| 800.00 | .774 | –57.1 | 2.830 | 124.4 | .128 | 55.7 | .846 | –27.2 |
| 900.00 | .727 | –62.9 | 2.694 | 119.2 | .134 | 55.6 | .808 | –28.8 |
| 1000.00 | .680 | –69.3 | 2.597 | 114.1 | .146 | 53.7 | .790 | –31.8 |
| 1100.00 | .651 | –74.1 | 2.479 | 109.3 | .146 | 50.3 | .766 | –32.8 |
| 1200.00 | .616 | –79.8 | 2.392 | 104.8 | .155 | 49.8 | .741 | –34.9 |
| 1300.00 | .575 | –85.2 | 2.302 | 101.1 | .155 | 46.2 | .714 | –35.9 |
| 1400.00 | .546 | –90.6 | 2.207 | 96.0 | .160 | 46.7 | .708 | –36.8 |
| 1500.00 | .512 | –95.8 | 2.110 | 92.1 | .168 | 43.6 | .685 | –38.4 |
| 1600.00 | .481 | –100.6 | 2.034 | 88.8 | .165 | 45.5 | .676 | –40.1 |
| 1700.00 | .463 | –106.3 | 1.989 | 85.5 | .176 | 45.3 | .667 | –41.8 |
| 1800.00 | .440 | –111.8 | 1.903 | 82.2 | .173 | 43.8 | .649 | –42.3 |
| 1900.00 | .419 | –116.4 | 1.854 | 78.9 | .174 | 43.5 | .633 | –44.2 |
| 2000.00 | .394 | –121.2 | 1.779 | 75.5 | .173 | 43.7 | .630 | –45.2 |

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