Design a common-emitter amplifier with the following specifications:

- Minimum gain = 125
- Minimum swing = ±3 Volts
- Nominal lower 3 dB frequency less than 300 Hz.
- Load resistance = 1500 Ohms
- Source resistance = 100 Ohms

Your design must work for the following device tolerances:

- All resistors have ±5% tolerance except R1 and R2 on the base of the transistor.
- $50 \leq \beta \leq 350$ for the 2n3904 BJT
- $0.5V \leq V_{BE} \leq 0.9V$ for the 2n3904 BJT
- Supply voltages have ±5% tolerance

Turn in the following:

1. Printout of Mathcad file used to solve this problem.
2. PSpice simulation of minimum collector current verifying your design.
3. PSpice simulation of maximum collector current verifying your design.
4. PSpice simulation of minimum gain verifying your design.
5. PSpice Bode plot of the gain.
### Panasonic 1% Precision Thick Film Chip Resistors

**Surface Mount Resistors**

**General Specifications:**
- **Power Rating:**
  - 1/16 Watt = 90 mW
  - 1/8 Watt = 250 mW
  - 1/4 Watt = 500 mW
  - 1/2 Watt = 1W
  - 1 Watt = 2W

**Resistances and Values:**
- **1206:**
  - 0.1W ± 1%: 2.5K, 5K, 10K, 15K, 22K, 33K, 47K, 68K, 100K, 220K, 470K, 680K, 1M, 2M, 3M, 4M, 5M, 6.8M, 10M

**Max. Working Voltage:**
- 400V

**Max. Overload Voltage:**
- 510V

**Dimensions (mm):**
- **1206:** 3.175 x 1.5 x 0.76

### YAGEO 1% Metal Film Fixed Resistors

**MFR Series**

**General Specifications:**
- **Power Rating:** 1/4 Watt
- **Max. Working Voltage:** 250V
- **Max. Overload Voltage:** 300V

**Resistance Tolerance:** ±1%

**Ambient Temperature:**
- 20°C

**Max. Temperature:**
- 270°C ± 5°C

**Dimensions:**
- **MFR:** 28 x 21.5 x 5.5 mm

**Description**

<table>
<thead>
<tr>
<th>Value Range</th>
<th>Part No.</th>
<th>Digi-Key Part No.</th>
</tr>
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<tr>
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<td>5420011</td>
<td>100K_R52_R500</td>
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<tr>
<td>1K Ω</td>
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<td>1M Ω</td>
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**Pricing**

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</tr>
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**Packaging:**
- **Bulk Package:** 1000 pieces
- **Order in multiples of 5,000 pieces**

**YAGEO Panasonic**

**General Specifications:**
- **Power Rating:** 1/4 Watt

**Resistances and Values:**
- **0402:**
  - 0.1W ± 1%: 2.5K, 5K, 10K, 15K, 22K, 33K, 47K, 68K, 100K, 220K, 470K, 680K, 1M, 2M, 3M, 4M, 5M, 6.8M, 10M

**Max. Working Voltage:**
- 200V

**Max. Overload Voltage:**
- 250V

**Dimensions:**
- **0402:** 0.16 x 0.09 x 0.026

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**Pricing**

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**Packaging:**
- **Bulk Package:** 1000 pieces
- **Order in multiples of 5,000 pieces**

**YAGEO Panasonic 1% Chip Resistors**

### Digi-Key® 1% Chip Resistors

**Assortment Kits**

- **RS Mix-50 1% Chip Resistors**
  - **RSX5M-ND:** $29.95
  - **RSX5M-ND:** $29.95

**Individual Values:**

- **50 Ω:** $0.50
- **100 Ω:** $0.50
- **220 Ω:** $0.50
- **470 Ω:** $0.50
- **1M Ω:** $0.50

**Order in multiples of 5,000 pieces**

**YAGEO Panasonic 0805 1% Chip Resistors**

**Assortment Kits**

- **RS Mix-50 1% Chip Resistors**
  - **RSX5M-ND:** $29.95

**Individual Values:**

- **50 Ω:** $0.50
- **100 Ω:** $0.50
- **220 Ω:** $0.50
- **470 Ω:** $0.50
- **1M Ω:** $0.50

**Order in multiples of 5,000 pieces**