**Bipolar Junction Transistor Characteristics**

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**Proposal**

The purpose of this experiment is to study the characteristics of Bipolar Junction Transistors, also known as BJTs, and then the input and output will be graphed on a semi-log graph. The amplification characteristics of a BJT will be tested, specifically for its current amplification characteristics. The influence and value of current gain, input and output resistance, and voltage feedback will all be studied in this lab.

**Experimental**

In this experiment. we will build multiple circuits, with two different BJTs. The saturation region, the breakdown region, and the forward active region will all be verified and plotted. As well, a curve tracer will be used to obtain the input characteristics of the BJT in its common base setup. Values for the characteristics of this setup will also be recorded.

**Expected Results**

I expect the results of this experiment to be consistent with the standard definitions and standard curves that are consistent with normal/standard BJTs for their emitter current versus emitter voltage and the collector current versus collector voltage.

**Actual Results**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **N** | **IB** | **Your value** | **VBE** | **IC1** | **IC2** | **∆IC2** | **∆IB** | **∆VBE** | **hFE** | **h**fe |
| **of** | @ | @ | = | = | = | @5V |
| **IB** | VCE= 2.5V | VCE= 5.0V | IC2(N)–IC2(N-1) | IB(N)–IB(N-1) | VBE(N)–VBE(N-1) |  |
| **0** | 0.5µA | 0.0000007 | 0.6 | 0.00012 | 0.00013 |  |  |  |  |
| **1** | 5µA | 0.0000052 | 0.65 | 0.00096 | 0.00097 | 0.000845 | 0.0000045 | 0.05 | 186.53846 | 187.777778 |
| **2** | 10µA | 0.0000098 | 0.67 | 0.00174 | 0.00175 | 0.00078 | 0.0000046 | 0.0000046 | 178.57143 | 169.565217 |
| **3** | 50µA | 0.000052 | 0.7 | 0.0091 | 0.0094 | 0.00765 | 0.0000422 | 0.0000422 | 180.76923 | 181.279621 |
| **4** | 75µA | 0.000075 | 0.71 | 0.0137 | 0.0139 | 0.0045 | 0.000023 | 0.000023 | 185.33333 | 195.652174 |
| **5** | 100µA | 0.000098 | 0.71 | 0.0183 | 0.0186 | 0.0047 | 0.000023 | 0.000023 | 189.79592 | 204.347826 |
| **6** | 150µA | 0.00015 | 0.72 | 0.0284 | 0.0288 | 0.0102 | 0.000052 | 0.000052 | 192 | 196.153846 |
| **7** | 200µA | 0.000196 | 0.73 | 0.0372 | 0.0374 | 0.0086 | 0.000046 | 0.000046 | 190.81633 | 186.956522 |

Table 1a: Measured Output Characteristics

|  |  |  |  |
| --- | --- | --- | --- |
| **N** | **∆IC=IC2 - IC1** | **∆VCE = VCE2 – VCE1** | **hoe** |
| **0** | 1E-06 | 2.51 | 3.9841E-07 |
| **1** | 0.00001 | 2.51 | 3.9841E-06 |
| **2** | 0.00001 | 2.51 | 3.9841E-06 |
| **3** | 0.0003 | 2.51 | 0.00011952 |
| **4** | 0.0002 | 2.51 | 7.9681E-05 |
| **5** | 0.0003 | 2.51 | 0.00011952 |
| **6** | 0.0004 | 2.51 | 0.00015936 |
| **7** | 0.0002 | 2.51 | 7.9681E-05 |

Table 1b: Hoe Calculations

|  |  |
| --- | --- |
| N | hFE @5V |
| 0 | 8 |
| 1 | 4 |
| 2 | 4 |
| 3 | 4 |
| 4 | 4 |
| 5 | 5 |
| 6 | 7 |
| 7 | 8 |

Table 2: Inverse active values of hFE