

# UN2211/2212/2213/2214/2215/2216/2217/2218/2219/2210/ 221D/221E/221F/221K/221L/221M/221N/221T/221V/221Z

## Silicon NPN epitaxial planer transistor

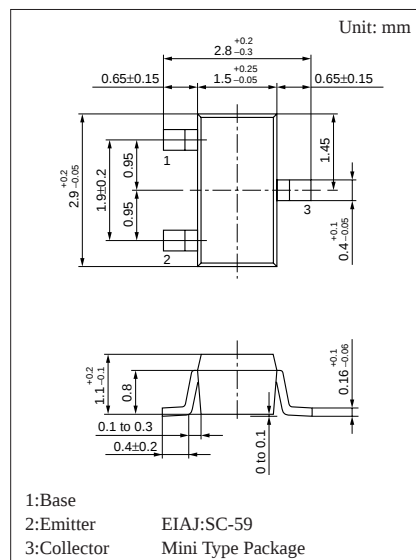
For digital circuits

### Features

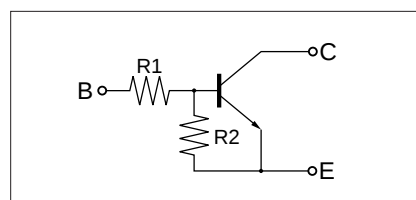
- Costs can be reduced through downsizing of the equipment and reduction of the number of parts.
- Mini type package, allowing downsizing of the equipment and automatic insertion through tape packing and magazine packing.

### Resistance by Part Number

|          | Marking Symbol | (R <sub>1</sub> ) | (R <sub>2</sub> ) |
|----------|----------------|-------------------|-------------------|
| • UN2211 | 8A             | 10kΩ              | 10kΩ              |
| • UN2212 | 8B             | 22kΩ              | 22kΩ              |
| • UN2213 | 8C             | 47kΩ              | 47kΩ              |
| • UN2214 | 8D             | 10kΩ              | 47kΩ              |
| • UN2215 | 8E             | 10kΩ              | —                 |
| • UN2216 | 8F             | 4.7kΩ             | —                 |
| • UN2217 | 8H             | 22kΩ              | —                 |
| • UN2218 | 8I             | 0.51kΩ            | 5.1kΩ             |
| • UN2219 | 8K             | 1kΩ               | 10kΩ              |
| • UN2210 | 8L             | 47kΩ              | —                 |
| • UN221D | 8M             | 47kΩ              | 10kΩ              |
| • UN221E | 8N             | 47kΩ              | 22kΩ              |
| • UN221F | 8O             | 4.7kΩ             | 10kΩ              |
| • UN221K | 8P             | 10kΩ              | 4.7kΩ             |
| • UN221L | 8Q             | 4.7kΩ             | 4.7kΩ             |
| • UN221M | EL             | 2.2kΩ             | 47kΩ              |
| • UN221N | EX             | 4.7kΩ             | 47kΩ              |
| • UN221T | EZ             | 22kΩ              | 47kΩ              |
| • UN221V | FD             | 2.2kΩ             | 2.2kΩ             |
| • UN221Z | FF             | 4.7kΩ             | 22kΩ              |



### Internal Connection



### Absolute Maximum Ratings (Ta=25°C)

| Parameter                    | Symbol           | Ratings     | Unit |
|------------------------------|------------------|-------------|------|
| Collector to base voltage    | V <sub>CBO</sub> | 50          | V    |
| Collector to emitter voltage | V <sub>CEO</sub> | 50          | V    |
| Collector current            | I <sub>C</sub>   | 100         | mA   |
| Total power dissipation      | P <sub>T</sub>   | 200         | mW   |
| Junction temperature         | T <sub>j</sub>   | 150         | °C   |
| Storage temperature          | T <sub>sig</sub> | -55 to +150 | °C   |

UN2211/2212/2213/2214/2215/2216/2217/2218/2219/2210/  
Transistors with built-in Resistor 221D/221E/221F/221K/221L/221M/221N/221T/221V/221Z

■ Electrical Characteristics (Ta=25°C)

| Parameter                                               |                                         | Symbol           | Conditions                                                        | min                  | typ                                           | max    | Unit |
|---------------------------------------------------------|-----------------------------------------|------------------|-------------------------------------------------------------------|----------------------|-----------------------------------------------|--------|------|
| Collector cutoff current                                |                                         | I <sub>CBO</sub> | V <sub>CB</sub> = 50V, I <sub>E</sub> = 0                         |                      |                                               | 0.1    | μA   |
|                                                         |                                         | I <sub>CEO</sub> | V <sub>CE</sub> = 50V, I <sub>B</sub> = 0                         |                      |                                               | 0.5    | μA   |
| Emitter cutoff current                                  | UN2211                                  | I <sub>EBO</sub> | V <sub>EB</sub> = 6V, I <sub>C</sub> = 0                          |                      |                                               | 0.5    | mA   |
|                                                         | UN2212/2214/221E/221D/221M/221N/221T    |                  |                                                                   |                      |                                               | 0.2    |      |
|                                                         | UN2213                                  |                  |                                                                   |                      |                                               | 0.1    |      |
|                                                         | UN2215/2216/2217/2210                   |                  |                                                                   |                      |                                               | 0.01   |      |
|                                                         | UN221F/221K                             |                  |                                                                   |                      |                                               | 1.0    |      |
|                                                         | UN2219                                  |                  |                                                                   |                      |                                               | 1.5    |      |
|                                                         | UN2218/221L/221V                        |                  |                                                                   |                      |                                               | 2.0    |      |
|                                                         | UN221Z                                  |                  |                                                                   |                      |                                               | 0.4    |      |
| Collector to base voltage                               |                                         | V <sub>CBO</sub> | I <sub>C</sub> = 10μA, I <sub>E</sub> = 0                         | 50                   |                                               |        | V    |
| Collector to emitter voltage                            |                                         | V <sub>CEO</sub> | I <sub>C</sub> = 2mA, I <sub>B</sub> = 0                          | 50                   |                                               |        | V    |
| Forward current transfer ratio                          | UN2211                                  | h <sub>FE</sub>  | V <sub>CE</sub> = 10V, I <sub>C</sub> = 5mA                       | 35                   |                                               |        |      |
|                                                         | UN2212/221E                             |                  |                                                                   | 60                   |                                               |        |      |
|                                                         | UN2213/2214/221M                        |                  |                                                                   | 80                   |                                               |        |      |
|                                                         | UN2215*/2216*/2217*/2210*               |                  |                                                                   | 160                  |                                               | 460    |      |
|                                                         | UN221F/221D/2219                        |                  |                                                                   | 30                   |                                               |        |      |
|                                                         | UN2218/221K/221L                        |                  |                                                                   | 20                   |                                               |        |      |
|                                                         | UN221N/221T                             |                  |                                                                   | 80                   |                                               | 400    |      |
|                                                         | UN221V                                  |                  |                                                                   | 60                   |                                               | 200    |      |
|                                                         | Collector to emitter saturation voltage |                  |                                                                   | V <sub>CE(sat)</sub> | I <sub>C</sub> = 10mA, I <sub>B</sub> = 0.3mA |        |      |
| UN221V<br>I <sub>C</sub> = 10mA, I <sub>B</sub> = 1.5mA |                                         |                  |                                                                   |                      | 0.04                                          | 0.25   |      |
| Output voltage high level                               |                                         | V <sub>OH</sub>  | V <sub>CC</sub> = 5V, V <sub>B</sub> = 0.5V, R <sub>L</sub> = 1kΩ | 4.9                  |                                               |        | V    |
| Output voltage low level                                |                                         | V <sub>OL</sub>  | V <sub>CC</sub> = 5V, V <sub>B</sub> = 2.5V, R <sub>L</sub> = 1kΩ |                      |                                               | 0.2    | V    |
|                                                         |                                         |                  | V <sub>CC</sub> = 5V, V <sub>B</sub> = 3.5V, R <sub>L</sub> = 1kΩ |                      |                                               | 0.2    |      |
|                                                         |                                         |                  | V <sub>CC</sub> = 5V, V <sub>B</sub> = 10V, R <sub>L</sub> = 1kΩ  |                      |                                               | 0.2    |      |
|                                                         |                                         |                  | V <sub>CC</sub> = 5V, V <sub>B</sub> = 6V, R <sub>L</sub> = 1kΩ   |                      |                                               | 0.2    |      |
| Transition frequency                                    |                                         | f <sub>T</sub>   | V <sub>CB</sub> = 10V, I <sub>E</sub> = −2mA, f = 200MHz          |                      | 150                                           |        | MHz  |
| Input resistance                                        | UN2211/2214/2215/221K                   | R <sub>1</sub>   |                                                                   | (−30%)               | 10                                            | (÷30%) | kΩ   |
|                                                         | UN2212/2217/221T                        |                  |                                                                   |                      | 22                                            |        |      |
|                                                         | UN2213/221D/221E/2210                   |                  |                                                                   |                      | 47                                            |        |      |
|                                                         | UN2216/221F/221L/221N/221Z              |                  |                                                                   |                      | 4.7                                           |        |      |
|                                                         | UN2218                                  |                  |                                                                   |                      | 0.51                                          |        |      |
|                                                         | UN2219                                  |                  |                                                                   |                      | 1                                             |        |      |
|                                                         | UN221M/221V                             |                  |                                                                   |                      | 2.2                                           |        |      |

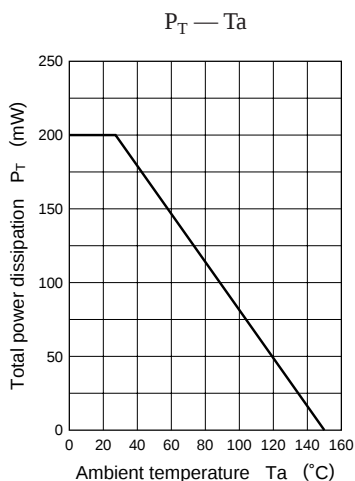
\*  $h_{FE}$  rank classification (UN2215/2216/2217/2210)

| Rank     | Q          | R          | S          |
|----------|------------|------------|------------|
| $h_{FE}$ | 160 to 260 | 210 to 340 | 290 to 460 |

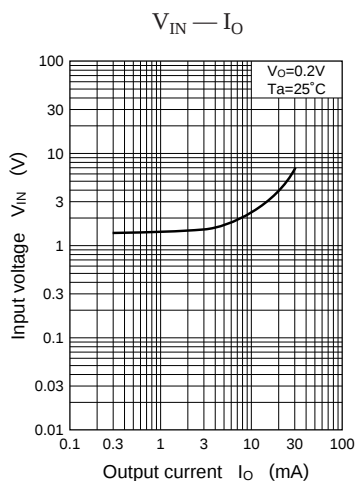
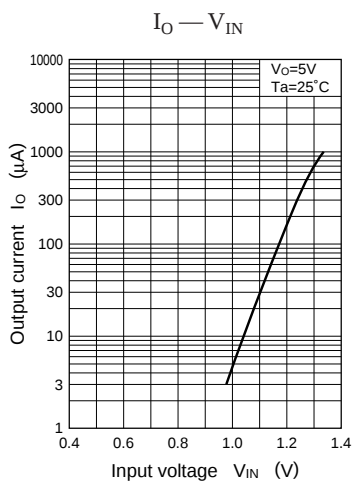
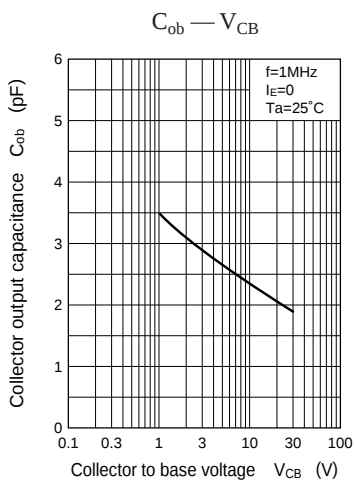
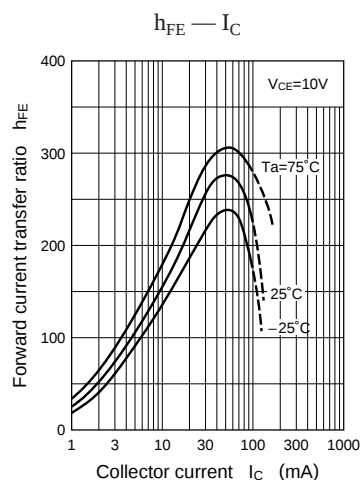
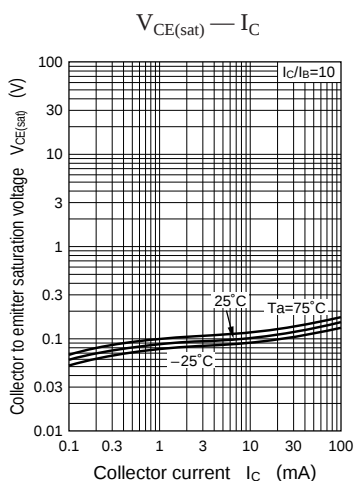
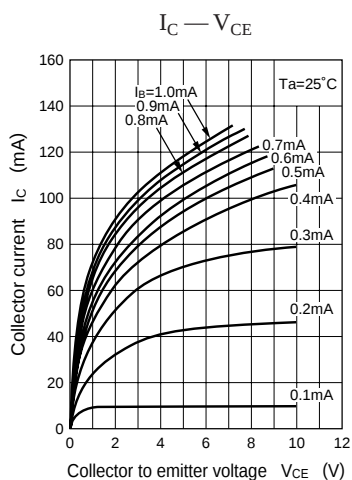
■ Electrical Characteristics (continued) (Ta=25°C)

| Parameter                |                       | Symbol                         | Conditions | min  | typ   | max  | Unit |
|--------------------------|-----------------------|--------------------------------|------------|------|-------|------|------|
| Resis-<br>tance<br>ratio | UN2211/2212/2213/221L | R <sub>1</sub> /R <sub>2</sub> |            | 0.8  | 1.0   | 1.2  |      |
|                          | UN2214                |                                |            | 0.17 | 0.21  | 0.25 |      |
|                          | UN2218/2219           |                                |            | 0.08 | 0.1   | 0.12 |      |
|                          | UN221D                |                                |            |      | 4.7   |      |      |
|                          | UN221E                |                                |            |      | 2.14  |      |      |
|                          | UN221F/221T           |                                |            |      | 0.47  |      |      |
|                          | UN221K                |                                |            |      | 2.13  |      |      |
|                          | UN221M                |                                |            |      | 0.047 |      |      |
|                          | UN211N                |                                |            |      | 0.1   |      |      |
|                          | UN211V                |                                |            |      | 1.0   |      |      |
|                          | UN211Z                |                                |            |      | 0.21  |      |      |

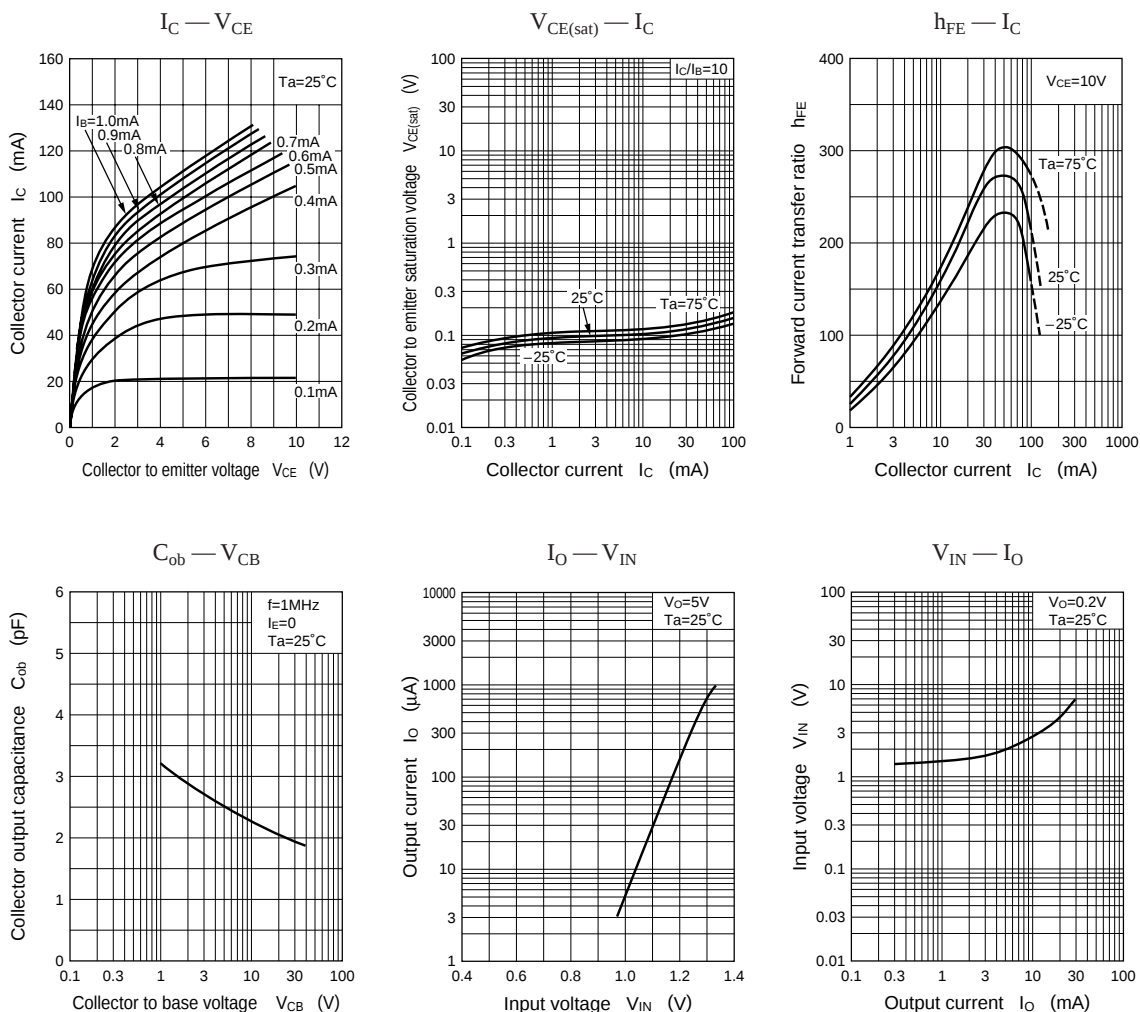
Common characteristics chart



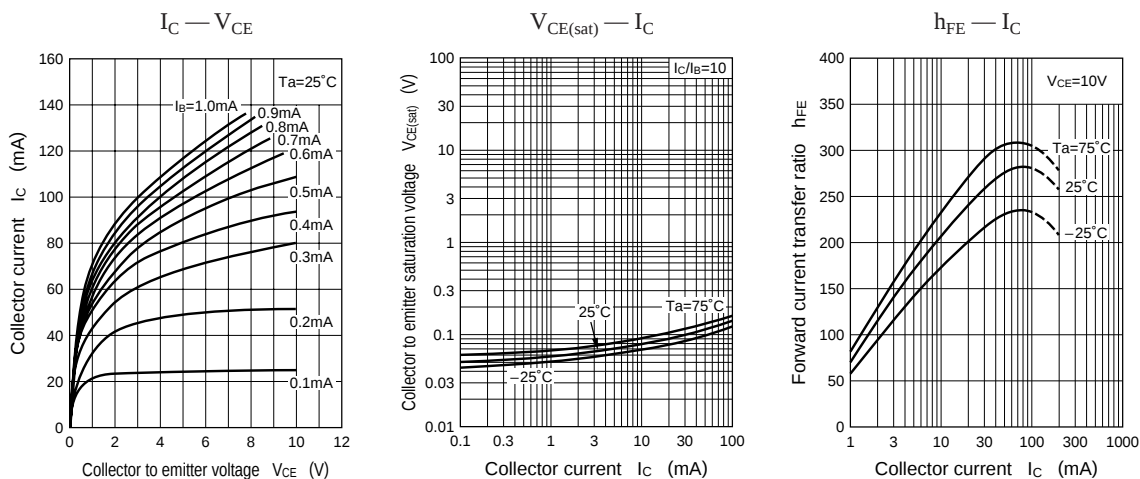
Characteristics charts of UN2211

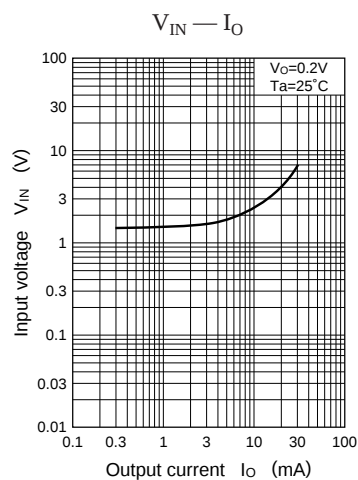
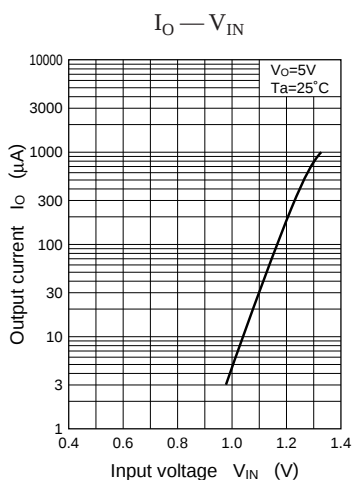
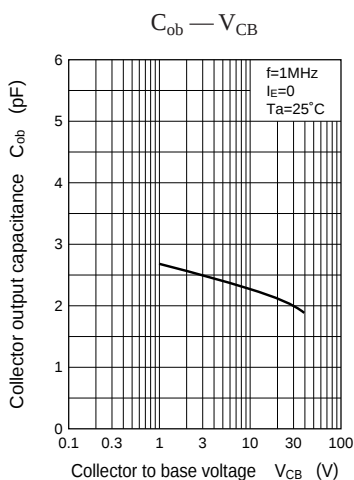


Characteristics charts of UN2212

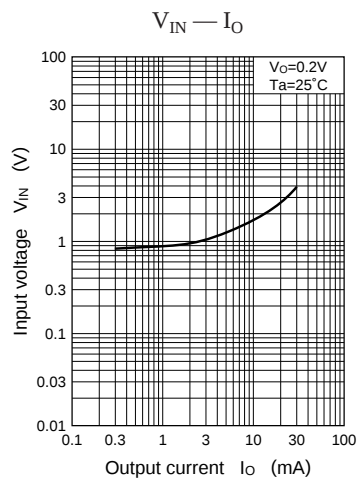
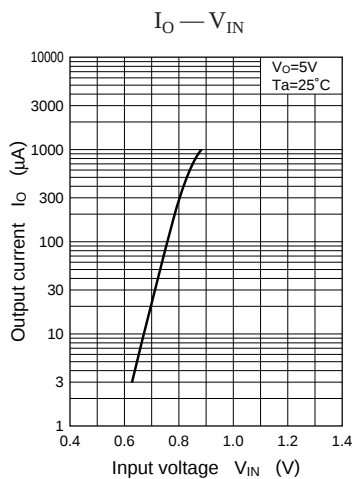
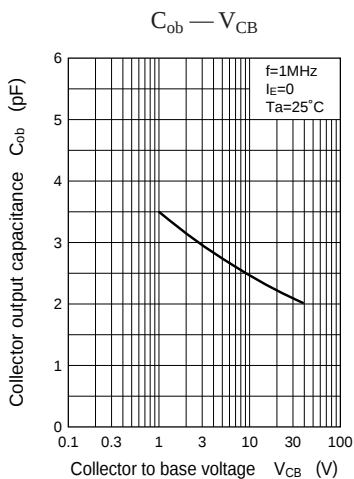
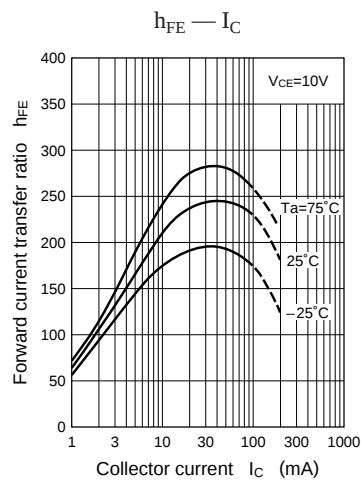
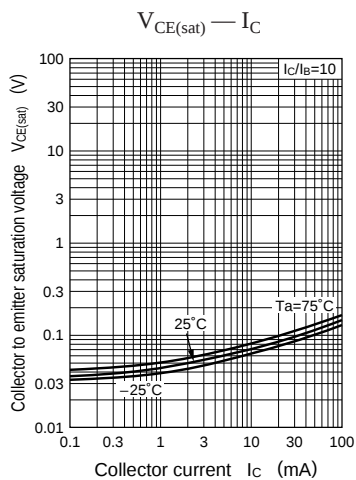
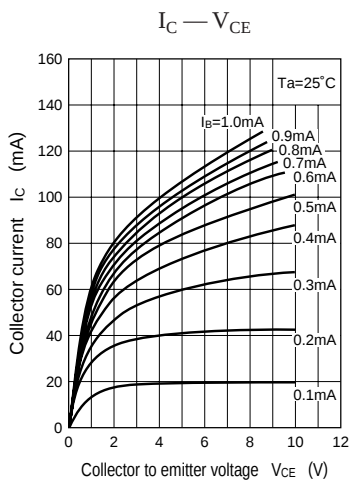


Characteristics charts of UN2213

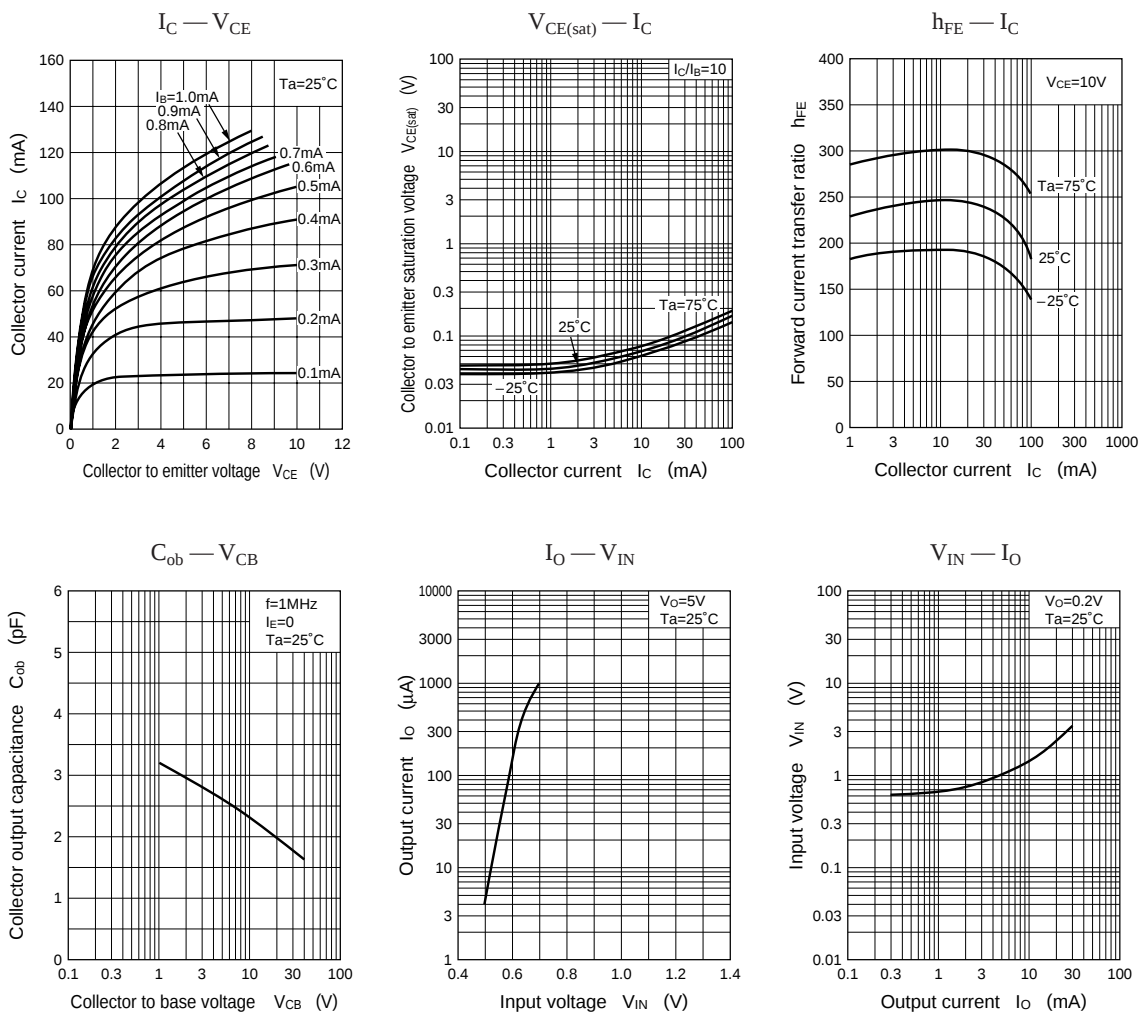




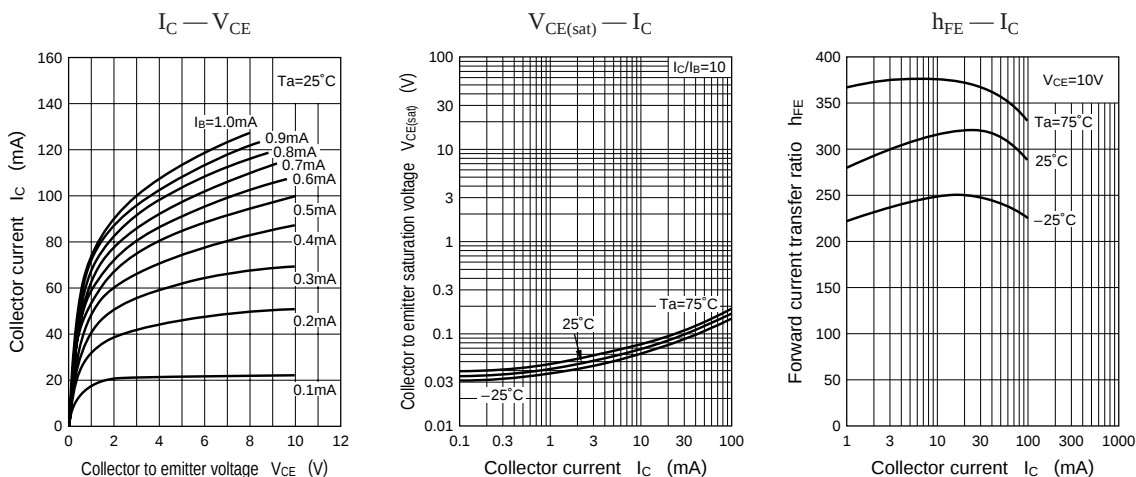
Characteristics charts of UN2214

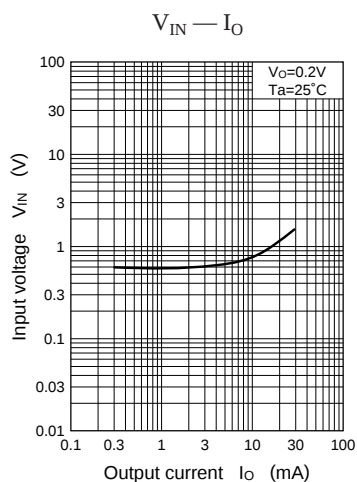
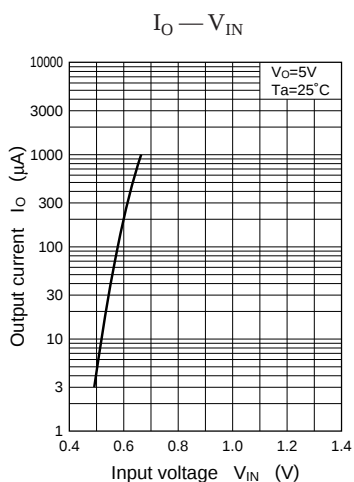
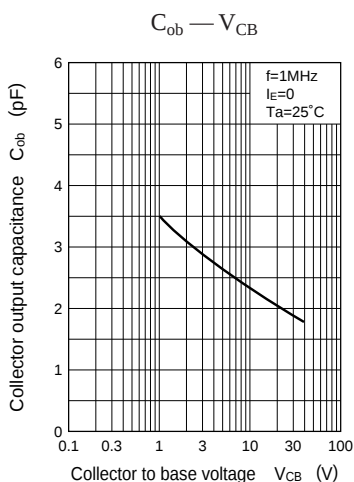


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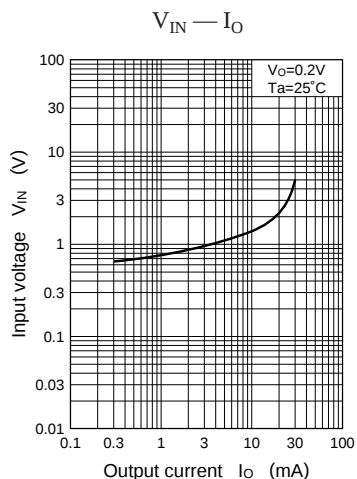
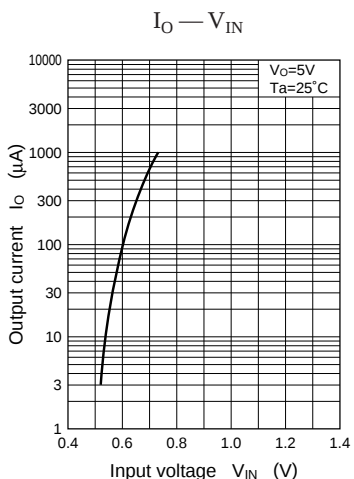
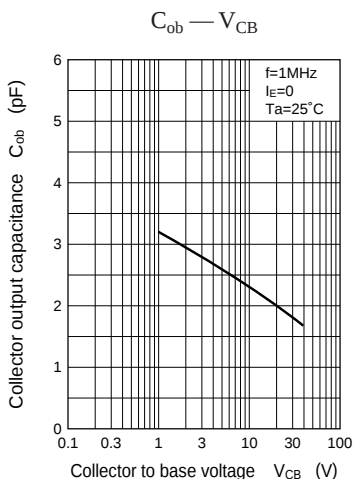
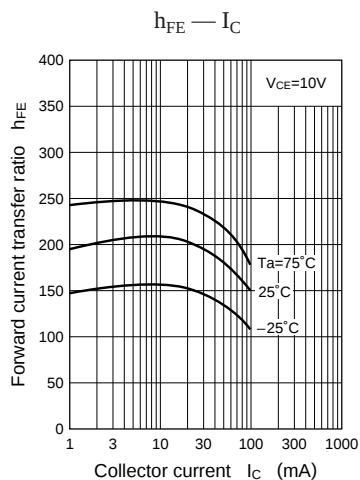
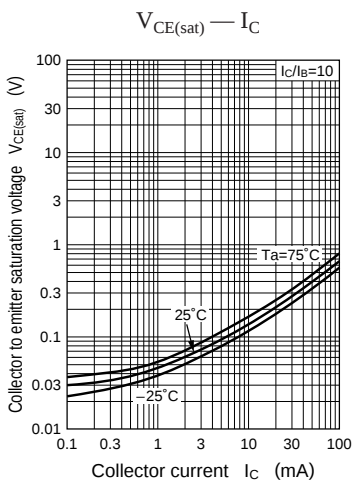
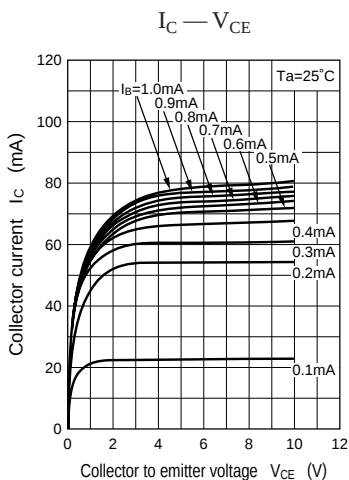


Characteristics charts of UN2216

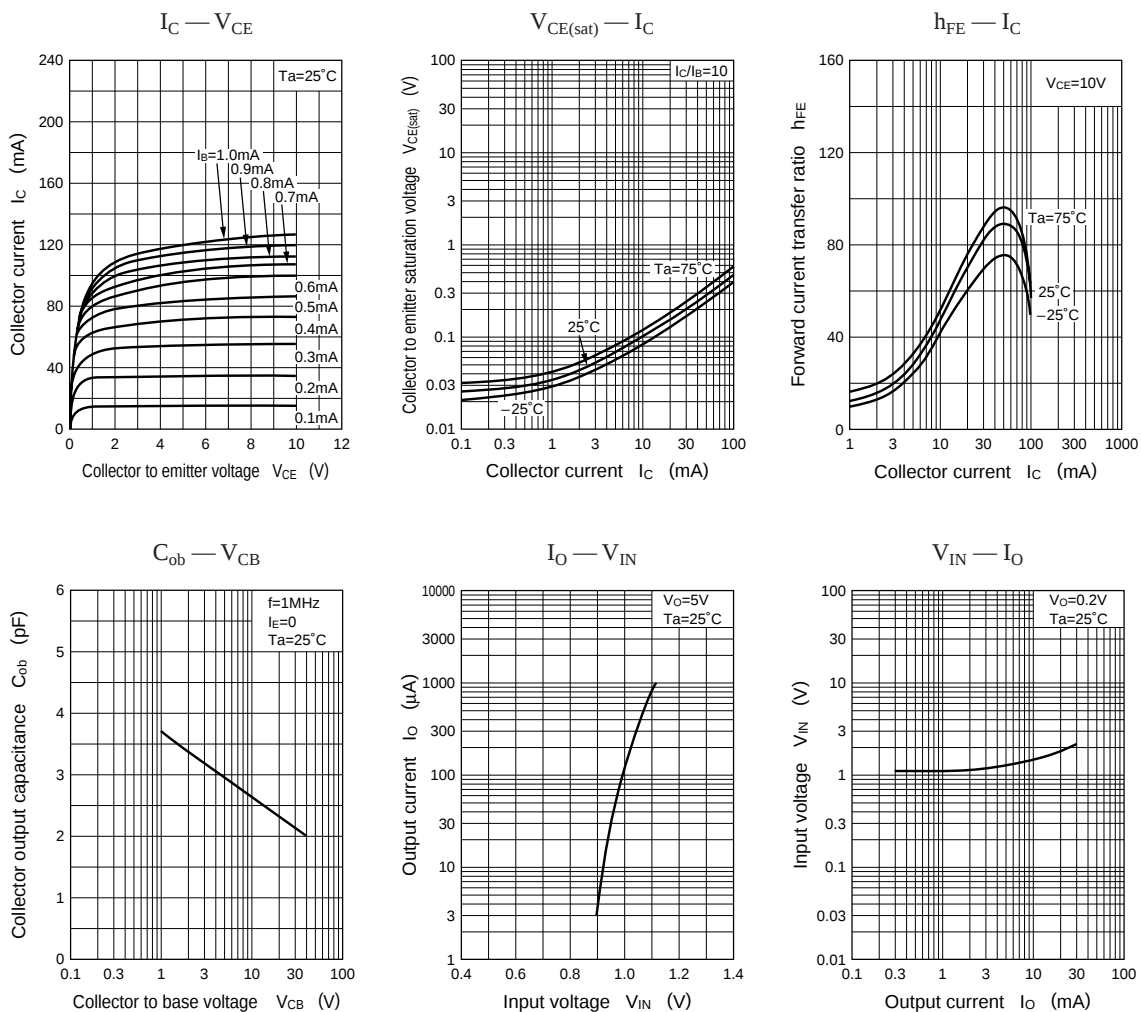




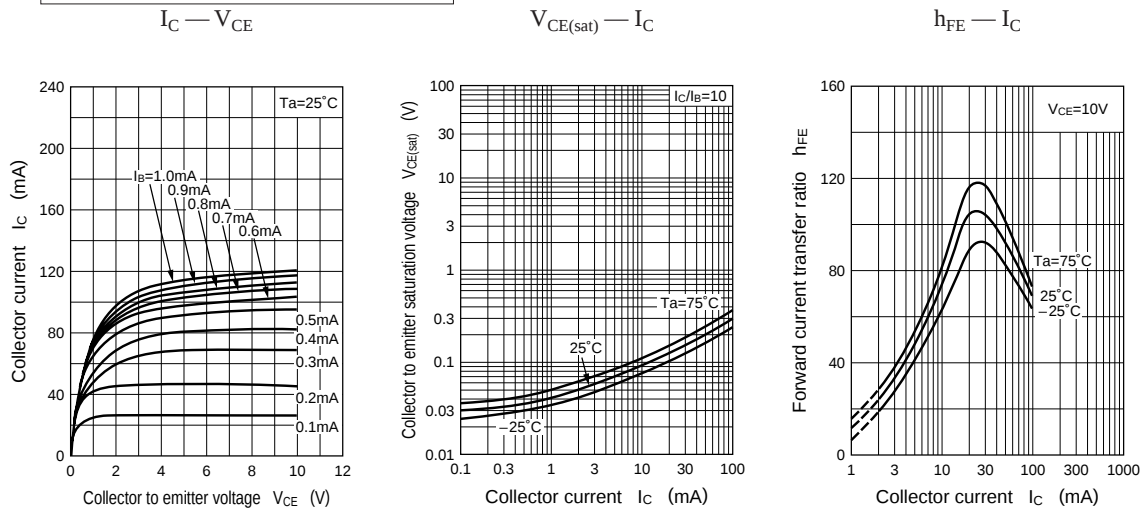
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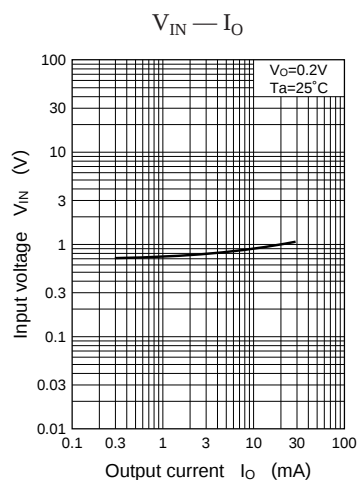
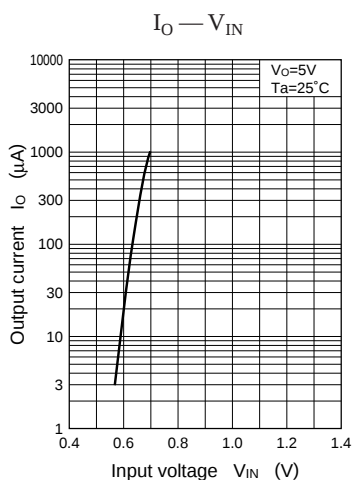
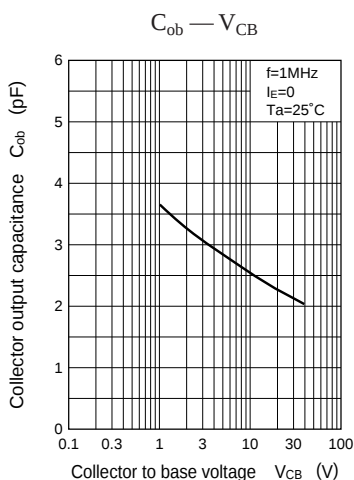


Characteristics charts of UN2218

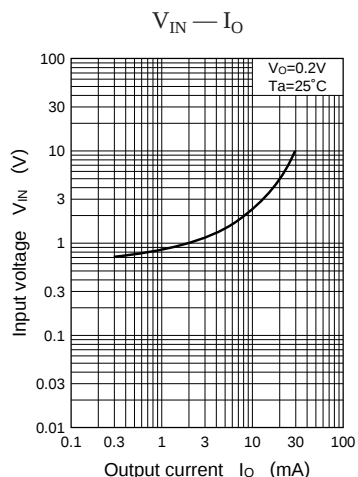
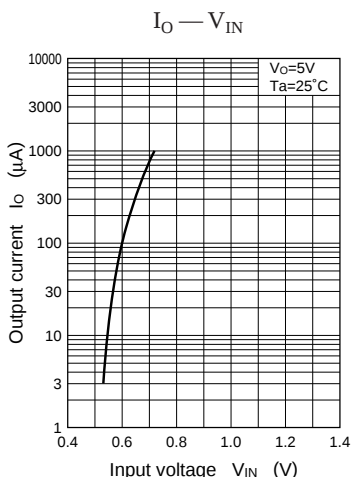
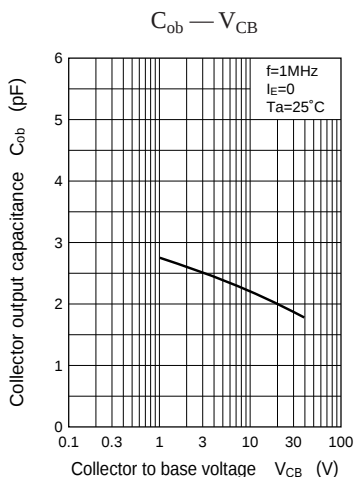
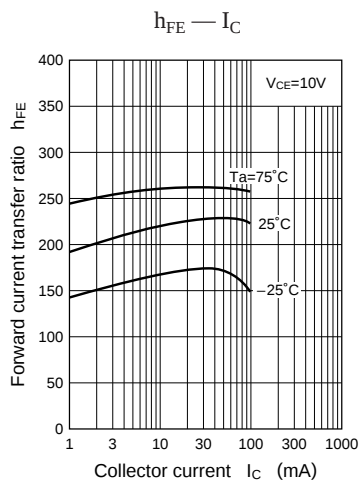
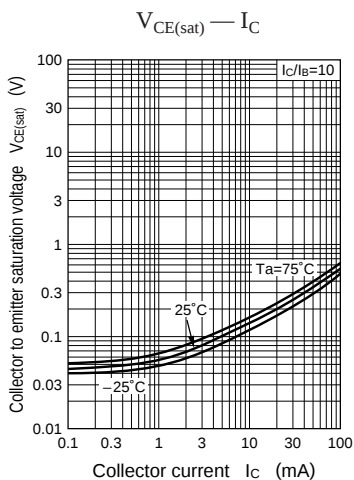
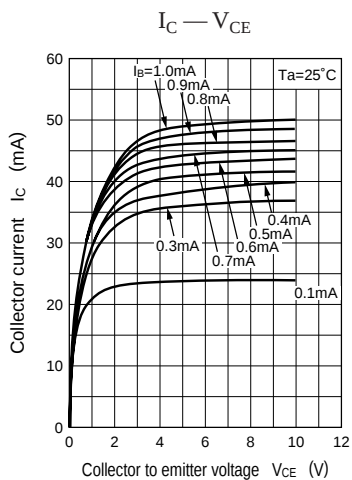


Characteristics charts of UN2219

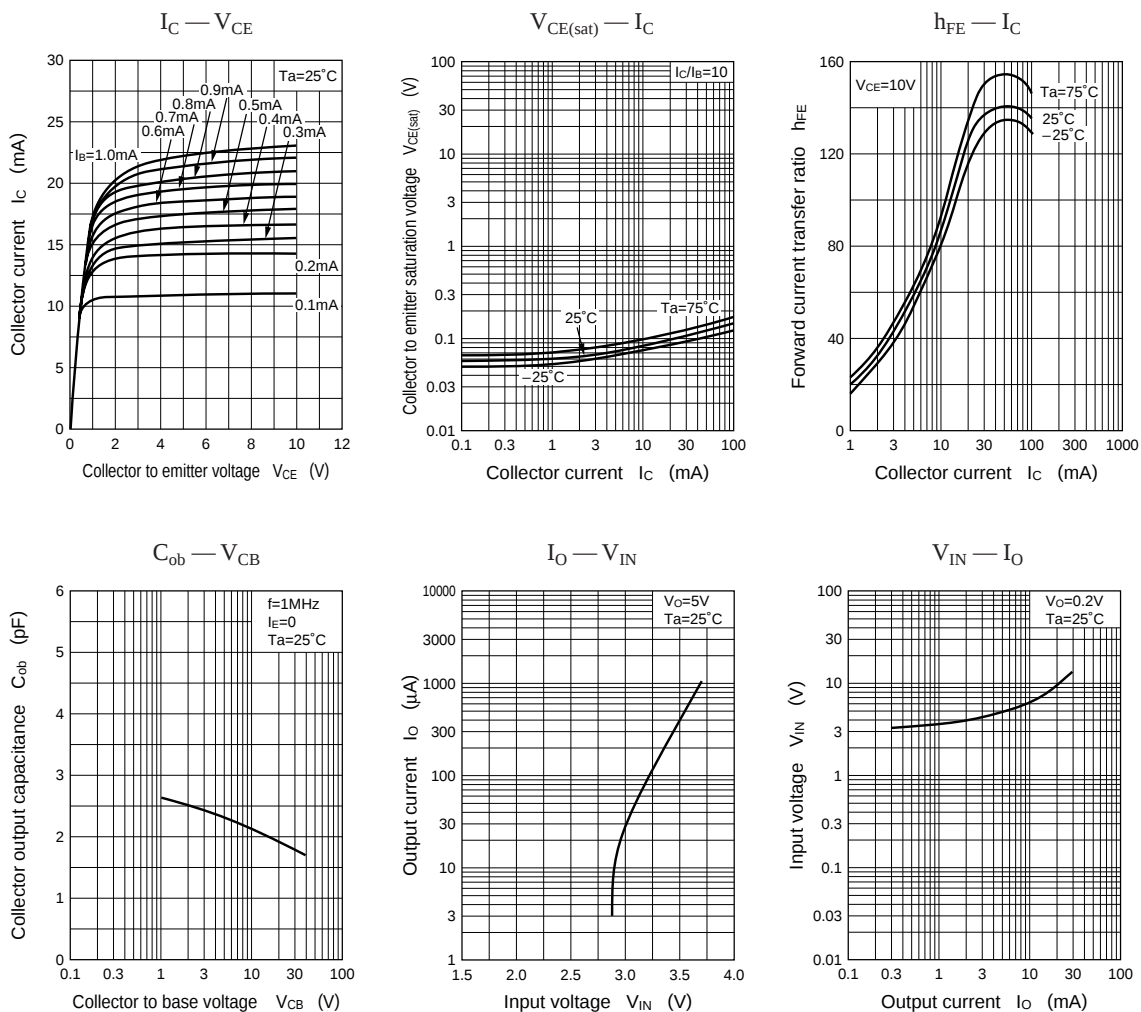




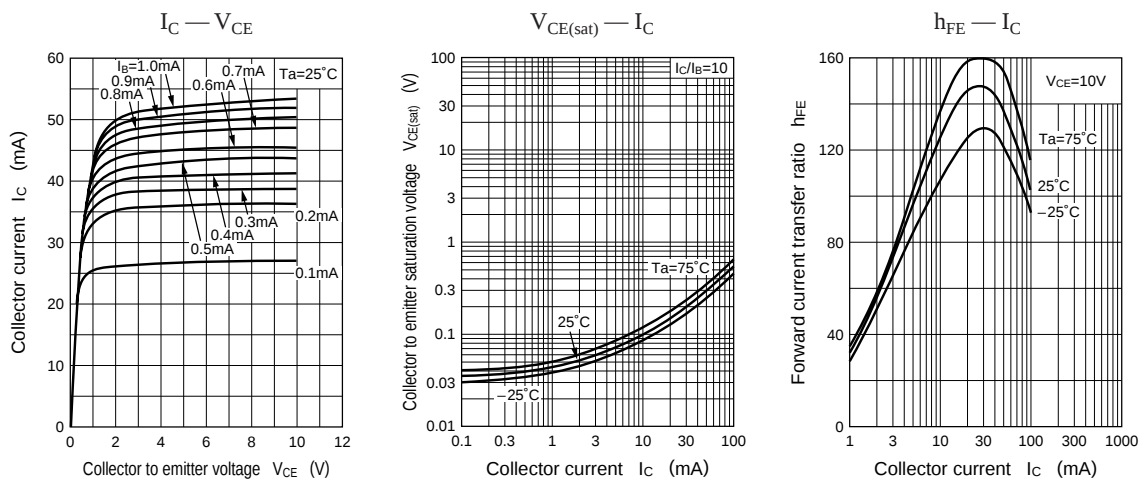
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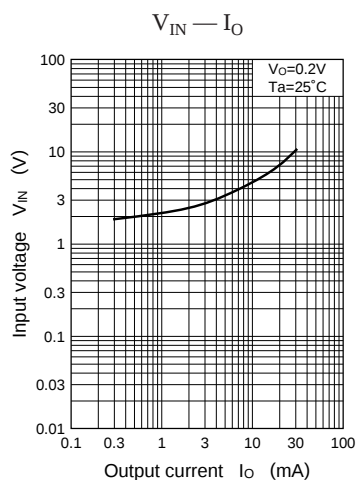
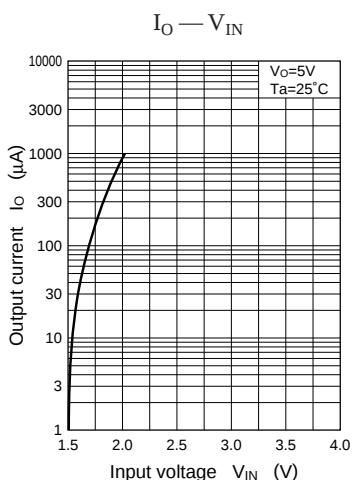
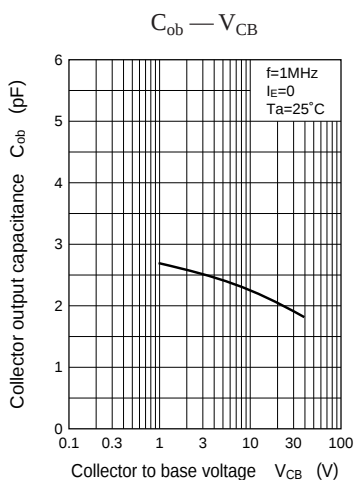


Characteristics charts of UN221D

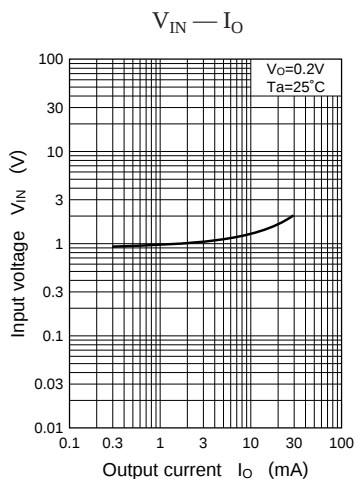
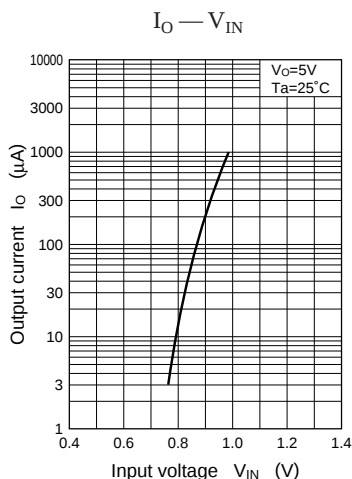
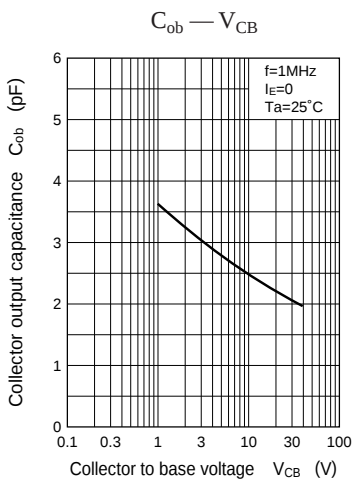
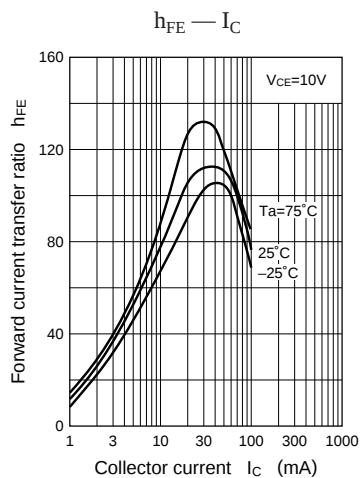
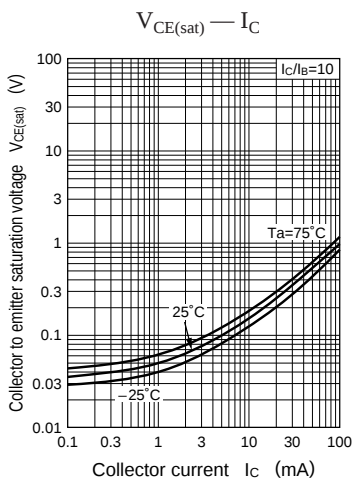
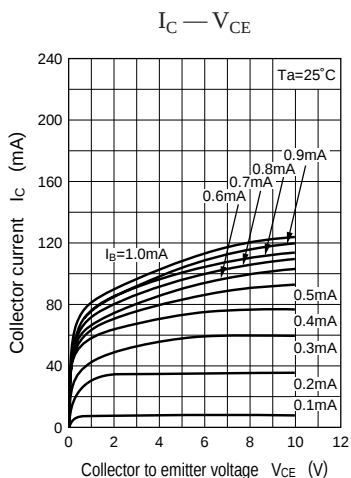


Characteristics charts of UN221E

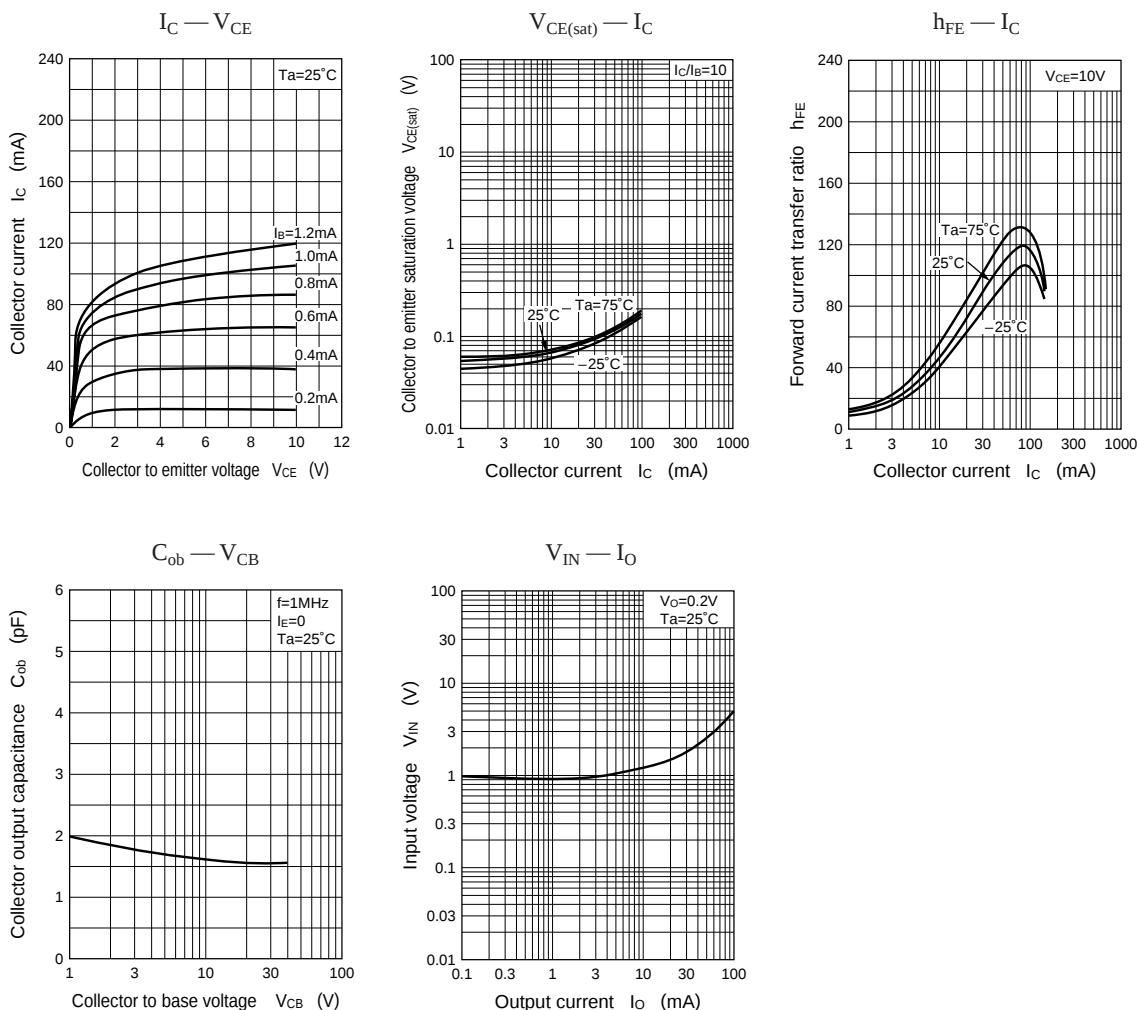




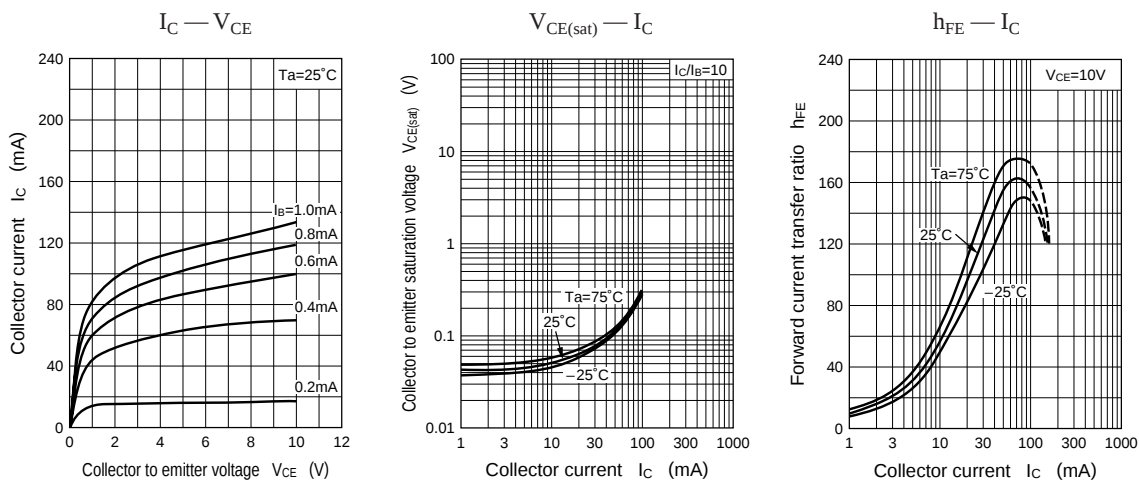
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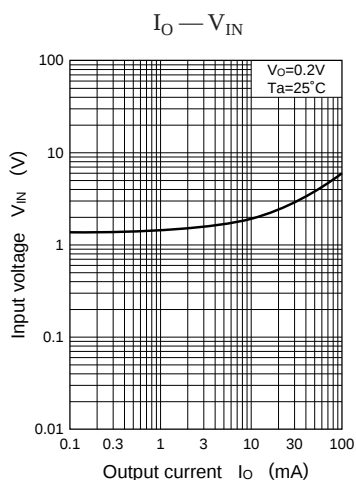
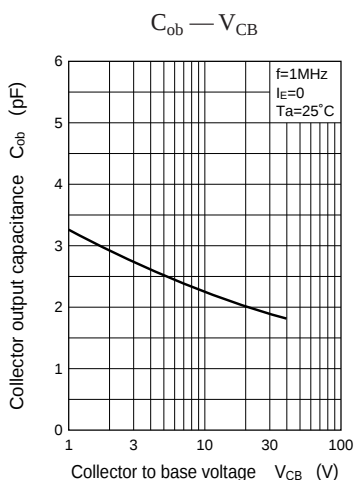


Characteristics charts of UN221K

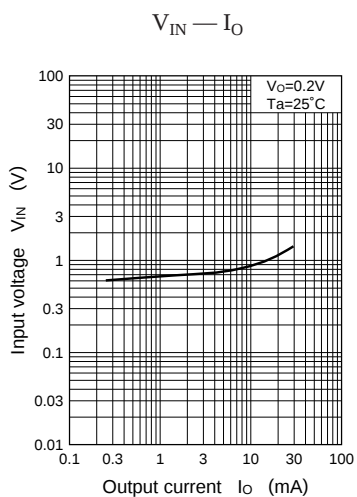
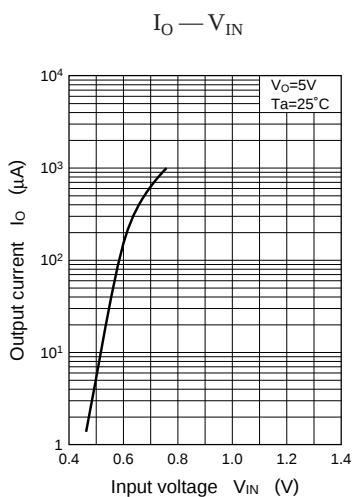
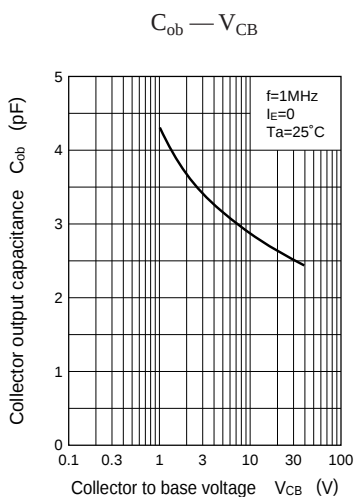
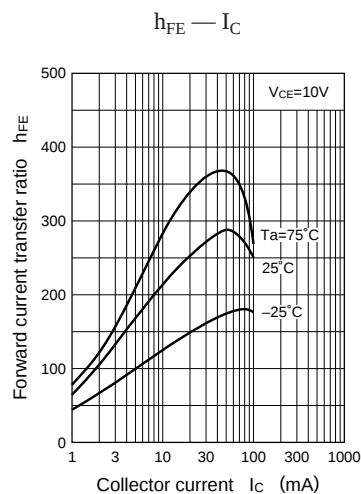
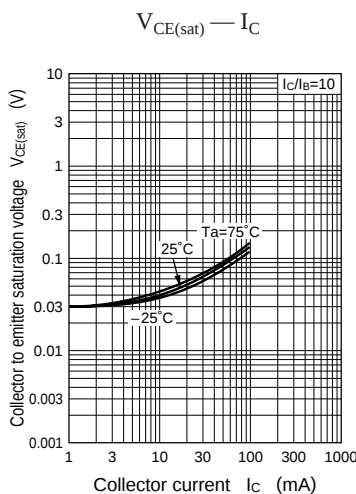
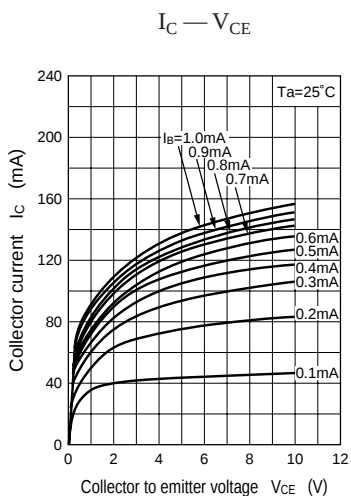


Characteristics charts of UN221L

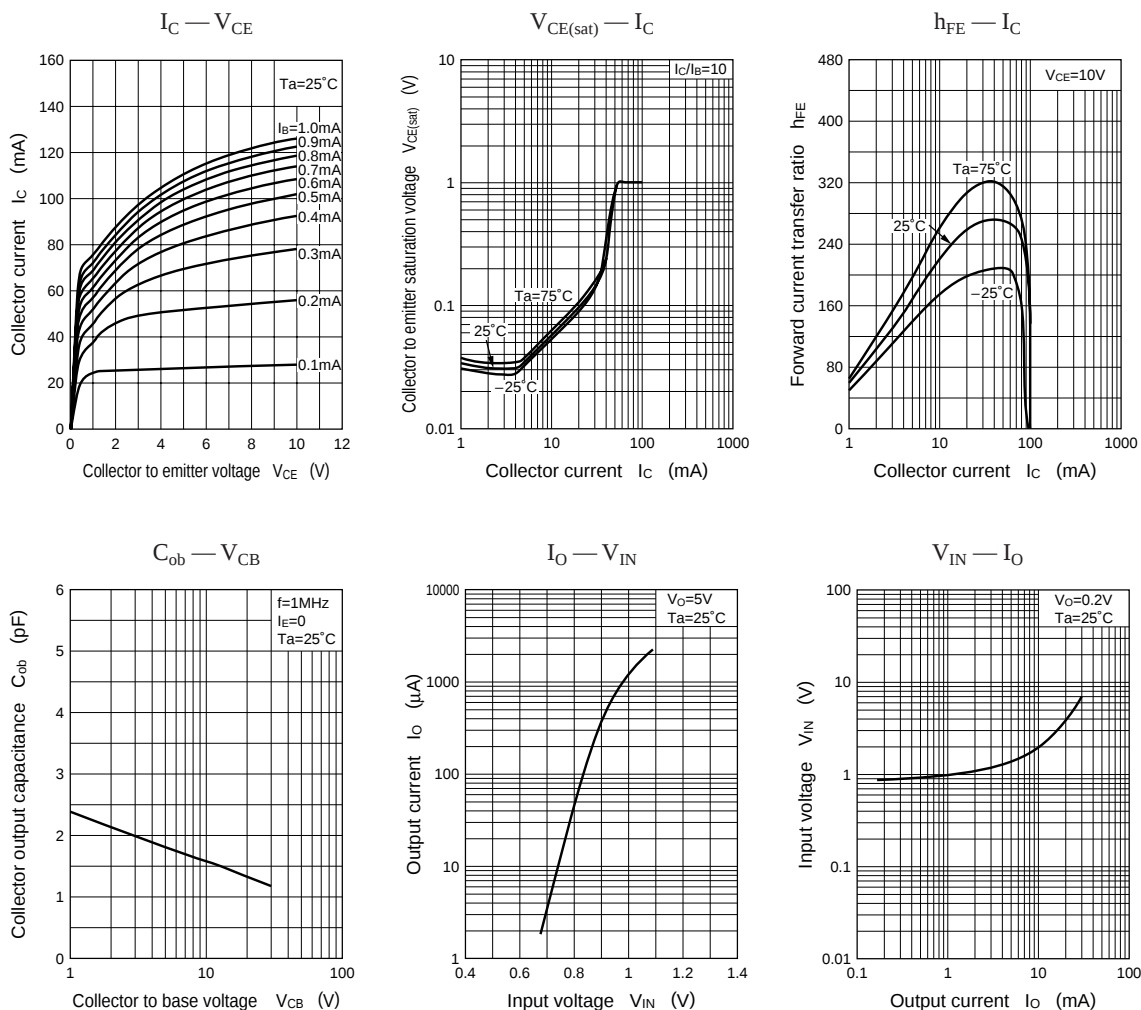




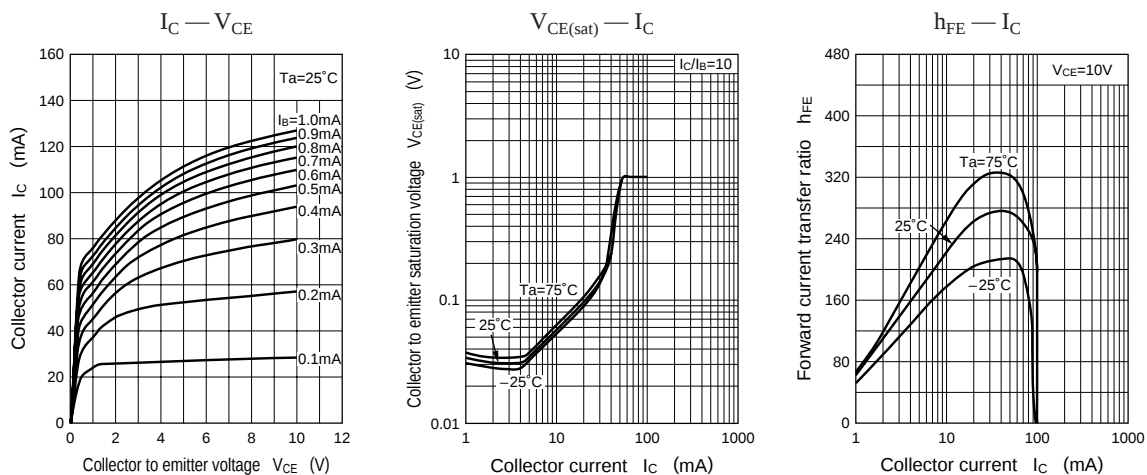
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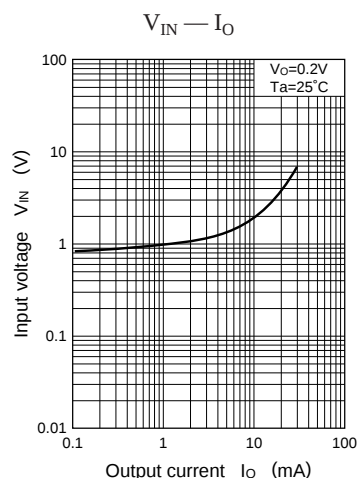
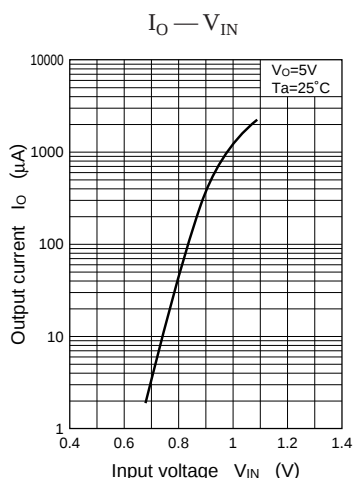
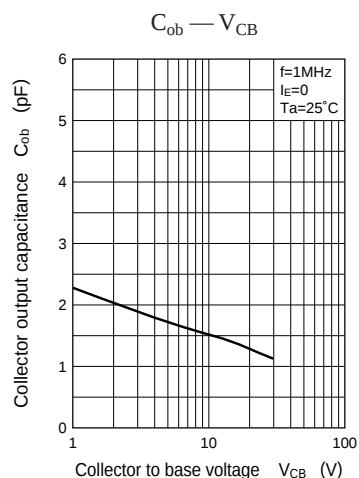


Characteristics charts of UN221N

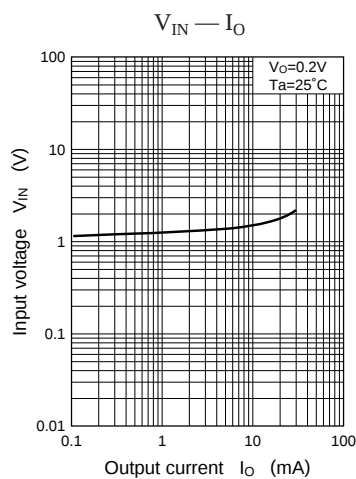
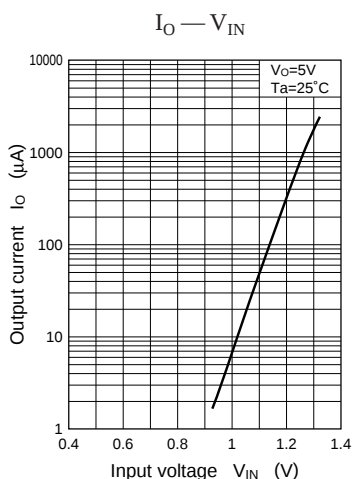
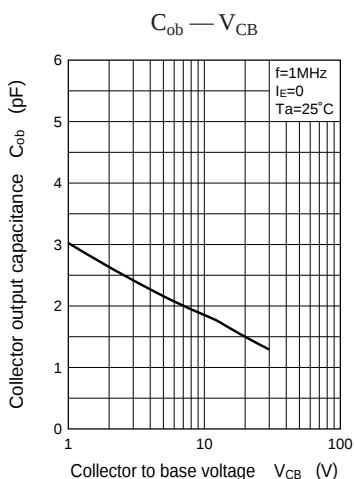
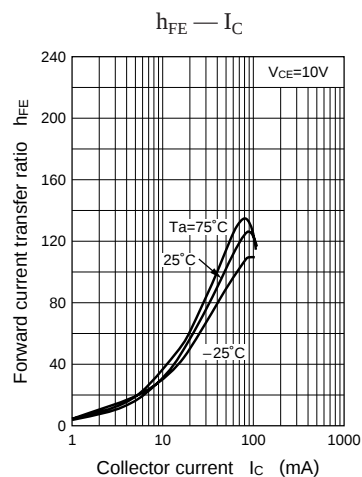
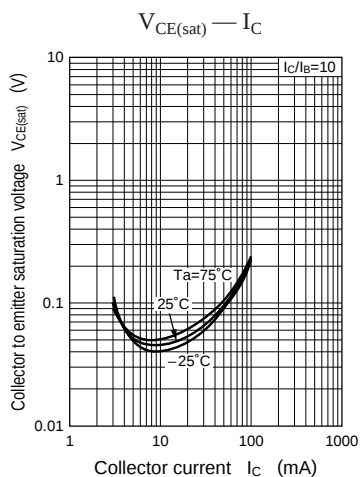
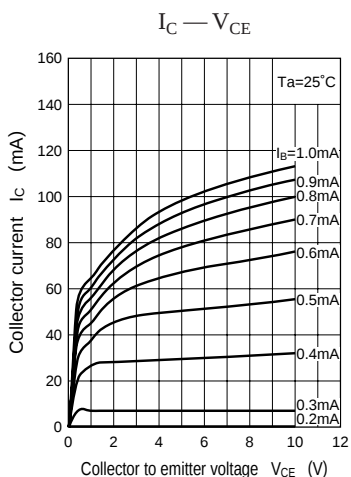


Characteristics charts of UN221T





Characteristics charts of UN221V



Characteristics charts of UN221Z

