

To our customers,

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## Old Company Name in Catalogs and Other Documents

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On April 1<sup>st</sup>, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: <http://www.renesas.com>

April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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# SILICON TRANSISTOR

# GA4xxx

## RESISTOR BUILT-IN TYPE NPN TRANSISTOR

### FEATURES

- Compact package
- Resistors built-in type
- Complementary to GN4xxx

### ORDERING INFORMATION

| PART NUMBER | PACKAGE |
|-------------|---------|
| GA4xxx      | SC-70   |

### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25°C)

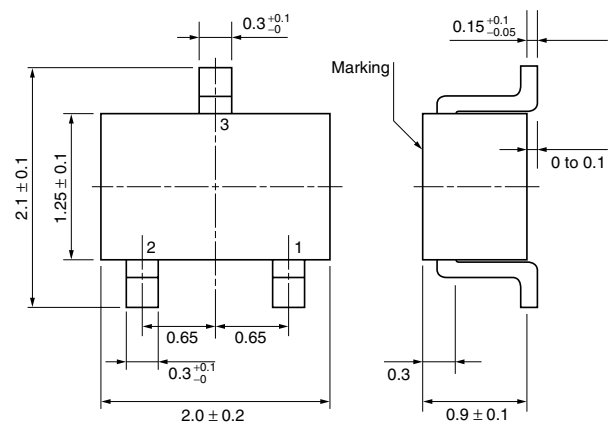
|     |                              |                       |             |    |
|-----|------------------------------|-----------------------|-------------|----|
|     | Collector to Base Voltage    | V <sub>CBO</sub>      | 60          | V  |
|     | Collector to Emitter Voltage | V <sub>CEO</sub>      | 50          | V  |
| <R> | Emitter to Base Voltage      | V <sub>EBO</sub>      | Note1       | V  |
|     | Collector Current (DC)       | I <sub>C</sub>        | 0.1         | A  |
|     | Collector Current (pulse)    | I <sub>C(pulse)</sub> | 0.2         | A  |
| <R> | Total Power Dissipation      | P <sub>T</sub>        | 0.15        | W  |
|     | Junction Temperature         | T <sub>j</sub>        | 150         | °C |
|     | Storage Temperature          | T <sub>stg</sub>      | -55 to +150 | °C |

### Note 1.

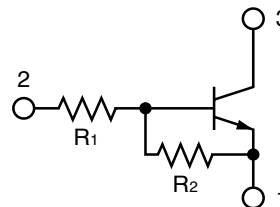
| PART NUMBER | V <sub>EBO</sub><br>(V) | MARK | R <sub>1</sub><br>(kΩ) | R <sub>2</sub><br>(kΩ) |
|-------------|-------------------------|------|------------------------|------------------------|
| GA4A4M      | 10                      | AA1  | 10.0                   | 10.0                   |
| GA4F4M      | 10                      | AB1  | 22.0                   | 22.0                   |
| GA4L4M      | 10                      | AC1  | 47.0                   | 47.0                   |
| GA4L3M      | 10                      | AD1  | 4.7                    | 4.7                    |
| GA4L3N      | 5                       | AE1  | 4.7                    | 10.0                   |
| GA4L3Z      | 5                       | AF1  | 4.7                    |                        |
| GA4A3Q      | 5                       | AG1  | 1.0                    | 10.0                   |
| GA4A4P      | 5                       | AH1  | 10.0                   | 47.0                   |
| GA4F4N      | 5                       | AJ1  | 22.0                   | 47.0                   |

**Note 2.** PW ≤ 10 ms, Duty Cycle ≤ 50%

### PACKAGE DRAWING (Unit: mm)



### EQUIVALENT CIRCUIT



### PIN CONNECTION

- 1: Emitter
- 2: Base
- 3: Collector

| PART NUMBER | V <sub>EBO</sub><br>(V) | MARK | R <sub>1</sub><br>(kΩ) | R <sub>2</sub><br>(kΩ) |
|-------------|-------------------------|------|------------------------|------------------------|
| GA4L4L      | 15                      | AK1  | 47.0                   | 22.0                   |
| GA4A4Z      | 5                       | AL1  | 10.0                   |                        |
| GA4F4Z      | 5                       | AM1  | 22.0                   |                        |
| GA4L4Z      | 5                       | AN1  | 47.0                   |                        |
| GA4F3M      | 10                      | AP1  | 2.2                    | 2.2                    |
| GA4F3P      | 5                       | AQ1  | 2.2                    | 10.0                   |
| GA4F3R      | 5                       | AR1  | 2.2                    | 47.0                   |
| GA4A4L      | 15                      | AS1  | 10.0                   | 4.7                    |
| GA4L4K      | 25                      | AT1  | 47.0                   | 10.0                   |

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**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)**

| CHARACTERISTICS              | SYMBOL               | TEST CONDITIONS                                       | MIN.         | TYP. | MAX. | UNIT       |
|------------------------------|----------------------|-------------------------------------------------------|--------------|------|------|------------|
| Collector Cut-off Current    | I <sub>CBO</sub>     | V <sub>CB</sub> = 50 V, I <sub>E</sub> = 0            |              |      | 100  | nA         |
| DC Current Gain              | h <sub>FE1</sub>     | V <sub>CE</sub> = 5.0 V, I <sub>C</sub> = 5.0 mA      | <b>Note1</b> |      |      | -          |
|                              | h <sub>FE2</sub>     | V <sub>CE</sub> = 5.0 V, I <sub>C</sub> = 50 mA       |              |      |      | -          |
| Collector Saturation Voltage | V <sub>CE(sat)</sub> | I <sub>C</sub> = 5.0 mA, I <sub>B</sub> = 0.25 mA     |              |      | 0.2  | V          |
| Low-level Input Voltage      | V <sub>IL</sub>      | V <sub>CE</sub> = 5.0 V, I <sub>C</sub> = 100 $\mu$ A | <b>Note2</b> |      |      | V          |
| High-level Input Voltage     | V <sub>IH</sub>      | V <sub>CE</sub> = 0.2 V, I <sub>C</sub> = 5.0 mA      |              |      |      | V          |
| Input Resistor               | R <sub>I</sub>       |                                                       | <b>Note3</b> |      |      | k $\Omega$ |
| Emitter to Base Resistor     | R <sub>2</sub>       |                                                       |              |      |      | k $\Omega$ |

**Note 1.**

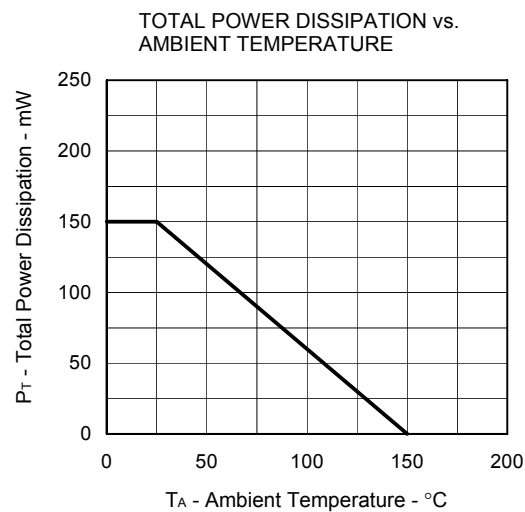
| PART NUMBER | h <sub>FE1</sub> |      |      | h <sub>FE2</sub> |      |      | UNIT |
|-------------|------------------|------|------|------------------|------|------|------|
|             | MIN.             | TYP. | MAX. | MIN.             | TYP. | MAX. |      |
| GA4A4M      | 35               |      | 100  | 80               |      |      | -    |
| GA4F4M      | 60               |      | 195  | 90               |      |      | -    |
| GA4L4M      | 85               |      | 340  | 95               |      |      | -    |
| GA4L3M      | 20               |      | 80   | 80               |      |      | -    |
| GA4L3N      | 35               |      | 100  | 80               |      |      | -    |
| GA4L3Z      | 135              |      | 600  | 100              |      |      | -    |
| GA4A3Q      | 35               |      | 100  | 80               |      |      | -    |
| GA4A4P      | 85               |      | 340  | 95               |      |      | -    |
| GA4F4N      | 85               |      | 340  | 95               |      |      | -    |
| GA4L4L      | 60               |      | 195  | 90               |      |      | -    |
| GA4A4Z      | 135              |      | 600  | 100              |      |      | -    |
| GA4F4Z      | 135              |      | 600  | 100              |      |      | -    |
| GA4L4Z      | 135              |      | 600  | 100              |      |      | -    |
| GA4F3M      | 8                |      | 50   | 50               |      |      | -    |
| GA4F3P      | 35               |      | 100  | 80               |      |      | -    |
| GA4F3R      | 85               |      | 340  | 95               |      |      | -    |
| GA4A4L      | 20               |      | 80   | 80               |      |      | -    |
| GA4L4K      | 35               |      | 100  | 80               |      |      | -    |

**Note 2.**

| PART NUMBER | V <sub>IL</sub> |      |      | V <sub>IH</sub> |      |      | UNIT |
|-------------|-----------------|------|------|-----------------|------|------|------|
|             | MIN.            | TYP. | MAX. | MIN.            | TYP. | MAX. |      |
| GA4A4M      |                 |      | 0.8  | 3.0             |      |      | V    |
| GA4F4M      |                 |      | 0.8  | 4.0             |      |      | V    |
| GA4L4M      |                 |      | 0.8  | 5.0             |      |      | V    |
| GA4L3M      |                 |      | 0.8  | 3.0             |      |      | V    |
| GA4L3N      |                 |      | 0.6  | 3.0             |      |      | V    |
| GA4L3Z      |                 |      | 0.5  | 1.2             |      |      | V    |
| GA4A3Q      |                 |      | 0.5  | 2.0             |      |      | V    |
| GA4A4P      |                 |      | 0.5  | 3.0             |      |      | V    |
| GA4F4N      |                 |      | 0.6  | 3.0             |      |      | V    |
| GA4L4L      |                 |      | 0.9  | 6.0             |      |      | V    |
| GA4A4Z      |                 |      | 0.5  | 2.0             |      |      | V    |
| GA4F4Z      |                 |      | 0.5  | 3.0             |      |      | V    |
| GA4L4Z      |                 |      | 0.5  | 4.0             |      |      | V    |
| GA4F3M      |                 |      | 0.8  | 3.0             |      |      | V    |
| GA4F3P      |                 |      | 0.5  | 2.0             |      |      | V    |
| GA4F3R      |                 |      | 0.5  | 2.0             |      |      | V    |
| GA4A4L      |                 |      | 0.9  | 6.0             |      |      | V    |
| GA4L4K      |                 |      | 2.0  | 8.0             |      |      | V    |

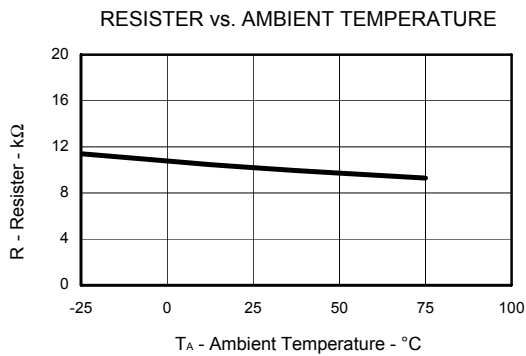
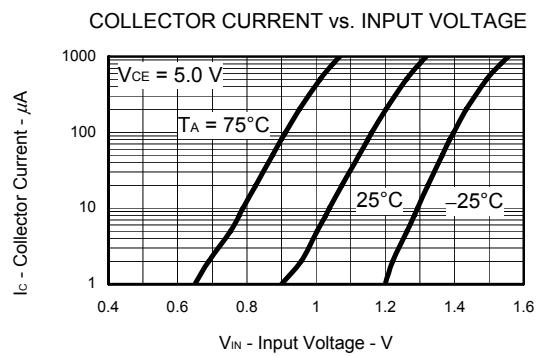
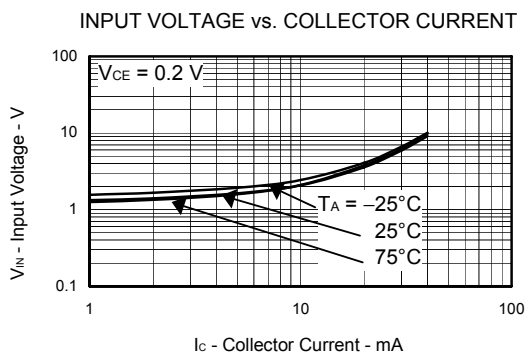
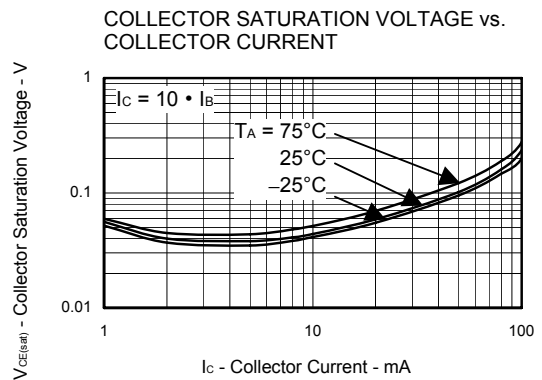
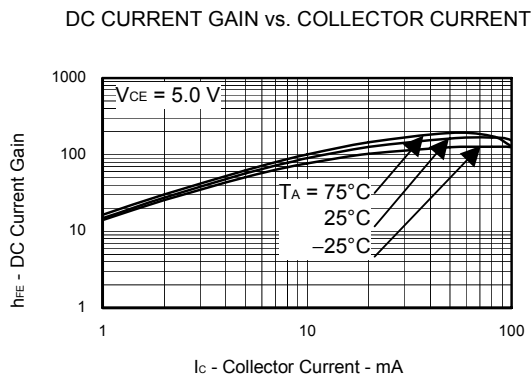
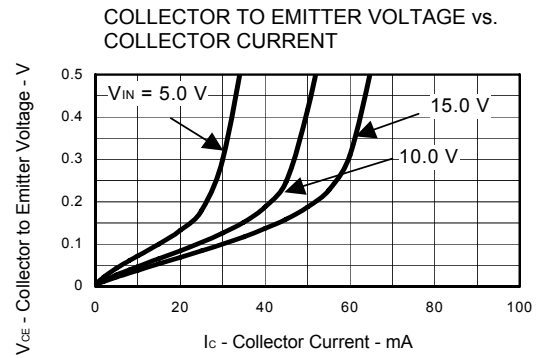
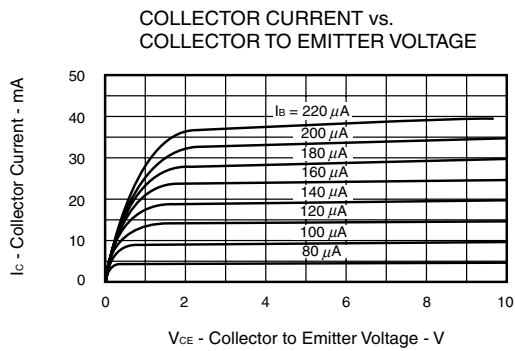
**Note 3.**

| PART NUMBER | R <sub>1</sub> |       |       | R <sub>2</sub> |       |       | UNIT |
|-------------|----------------|-------|-------|----------------|-------|-------|------|
|             | MIN.           | TYP.  | MAX.  | MIN.           | TYP.  | MAX.  |      |
| GA4A4M      | 7.00           | 10.00 | 13.00 | 7.00           | 10.00 | 13.00 | kΩ   |
| GA4F4M      | 15.40          | 22.00 | 28.60 | 15.40          | 22.00 | 28.60 | kΩ   |
| GA4L4M      | 32.90          | 47.00 | 61.10 | 32.90          | 47.00 | 61.10 | kΩ   |
| GA4L3M      | 3.29           | 4.70  | 6.11  | 3.29           | 4.70  | 6.11  | kΩ   |
| GA4L3N      | 3.29           | 4.70  | 6.11  | 7.00           | 10.00 | 13.00 | kΩ   |
| GA4L3Z      | 3.29           | 4.70  | 6.11  |                |       |       | kΩ   |
| GA4A3Q      | 0.70           | 1.00  | 1.30  | 7.00           | 10.00 | 13.00 | kΩ   |
| GA4A4P      | 7.00           | 10.00 | 13.00 | 32.90          | 47.00 | 61.10 | kΩ   |
| GA4F4N      | 15.40          | 22.00 | 28.60 | 32.90          | 47.00 | 61.10 | kΩ   |
| GA4L4L      | 32.90          | 47.00 | 61.10 | 15.40          | 22.00 | 28.60 | kΩ   |
| GA4A4Z      | 7.00           | 10.00 | 13.00 |                |       |       | kΩ   |
| GA4F4Z      | 15.40          | 22.00 | 28.60 |                |       |       | kΩ   |
| GA4L4Z      | 32.90          | 47.00 | 61.10 |                |       |       | kΩ   |
| GA4F3M      | 1.54           | 2.20  | 2.86  | 1.54           | 2.20  | 2.86  | kΩ   |
| GA4F3P      | 1.54           | 2.20  | 2.86  | 7.00           | 10.00 | 13.00 | kΩ   |
| GA4F3R      | 1.54           | 2.20  | 2.86  | 32.90          | 47.00 | 61.10 | kΩ   |
| GA4A4L      | 7.00           | 10.00 | 13.00 | 3.29           | 4.70  | 6.11  | kΩ   |
| GA4L4K      | 32.90          | 47.00 | 61.10 | 7.00           | 10.00 | 13.00 | kΩ   |



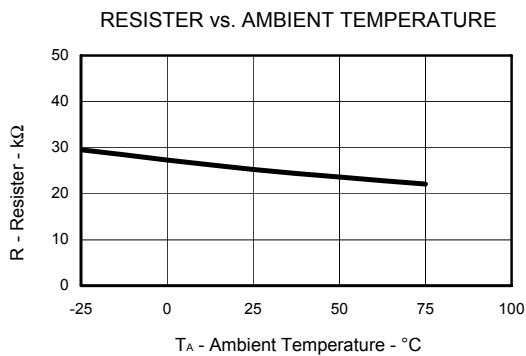
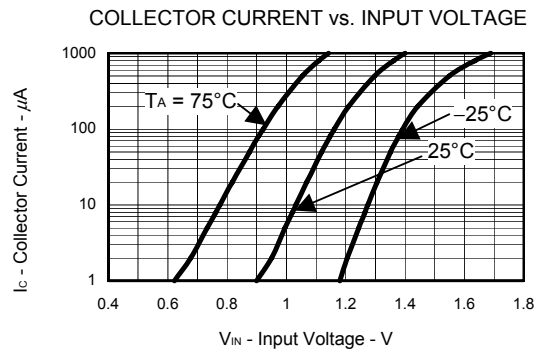
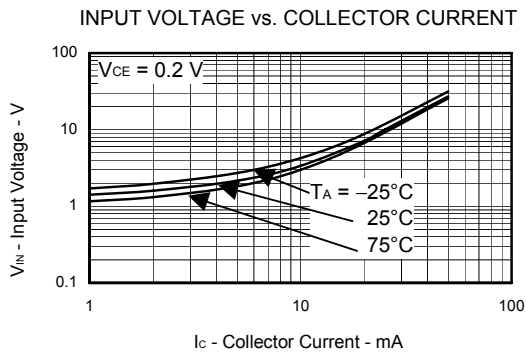
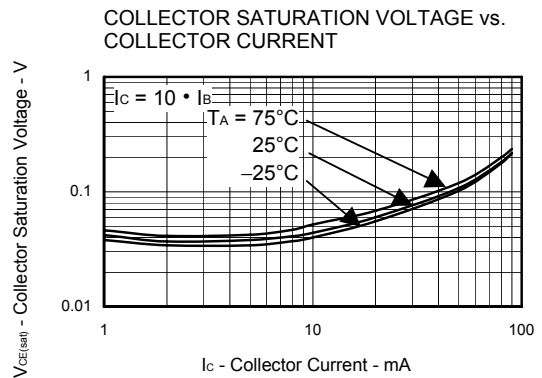
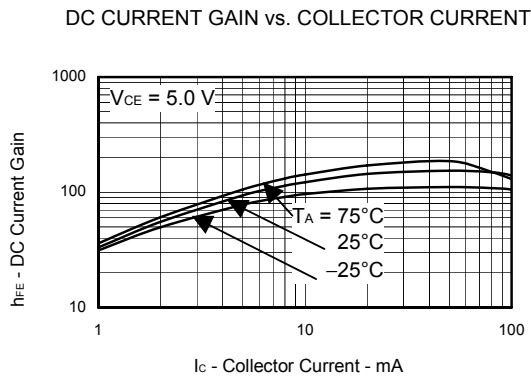
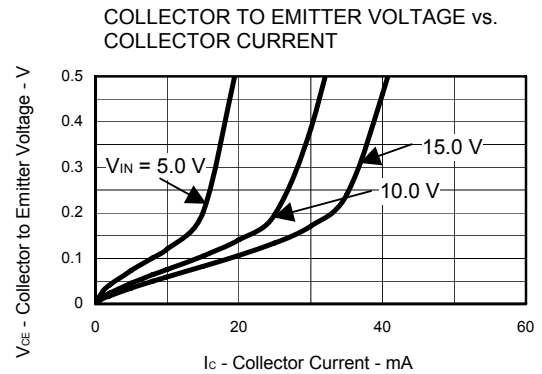
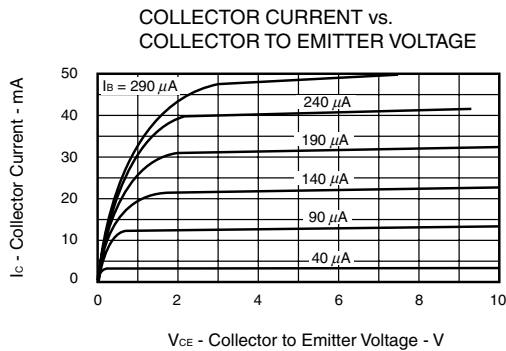
[GA4A4M]

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

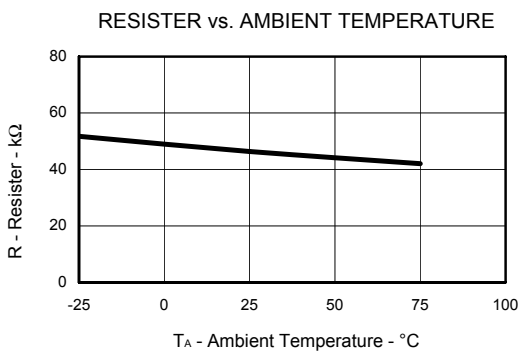
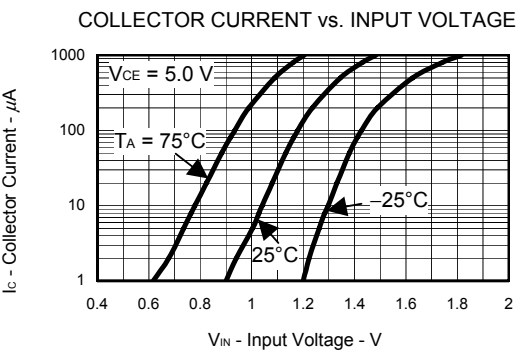
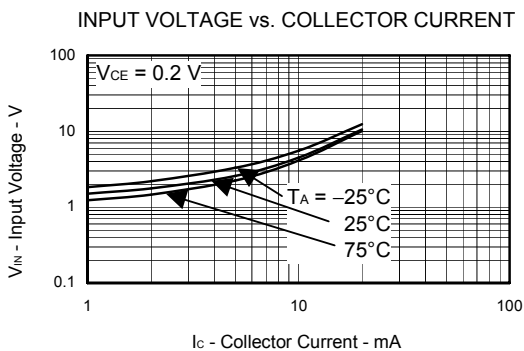
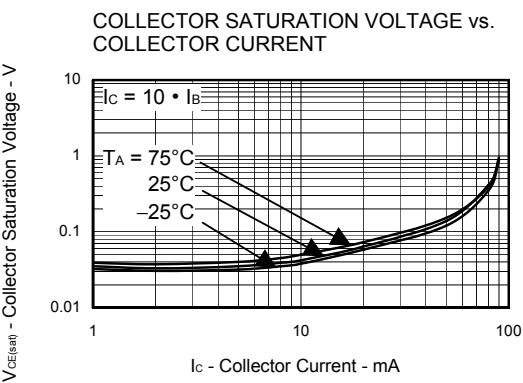
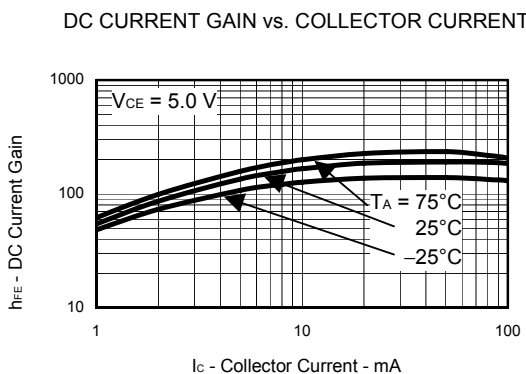
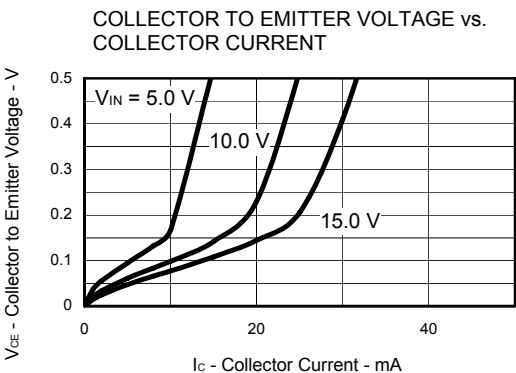
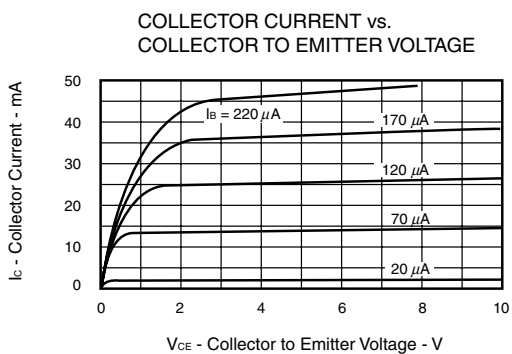


[GA4F4M]

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

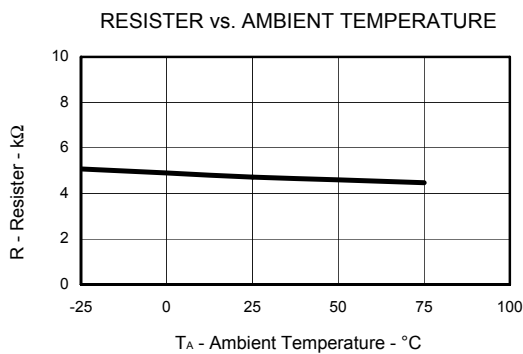
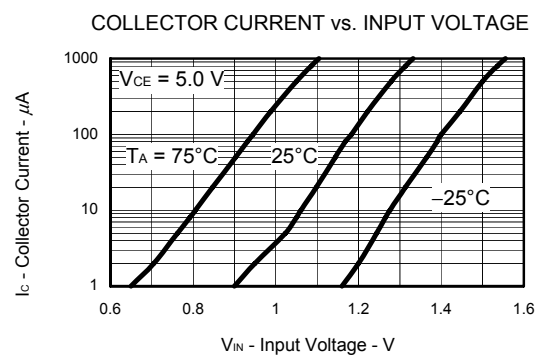
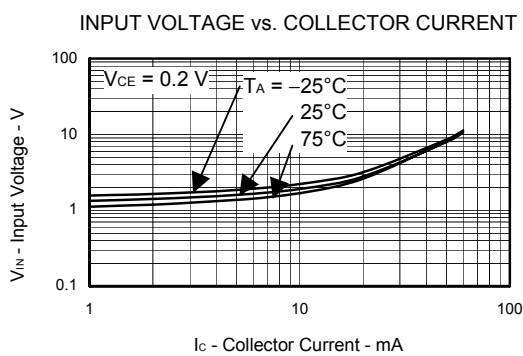
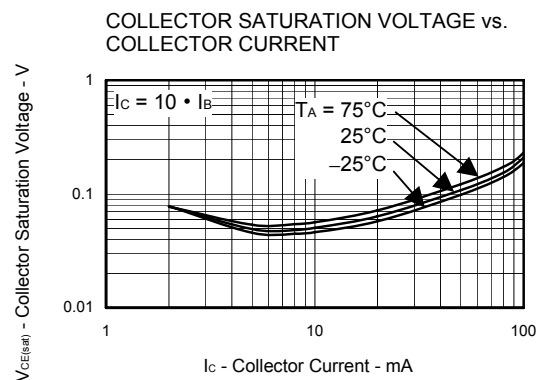
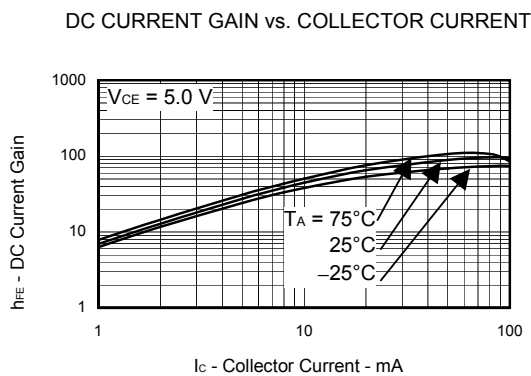
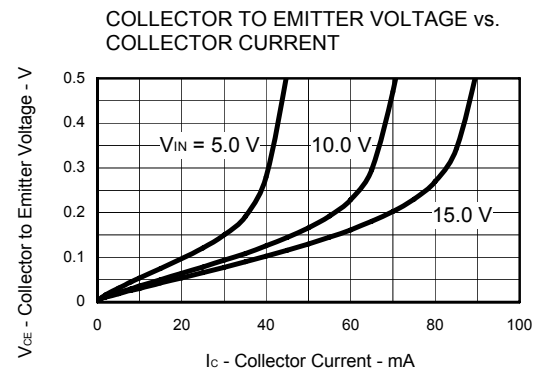
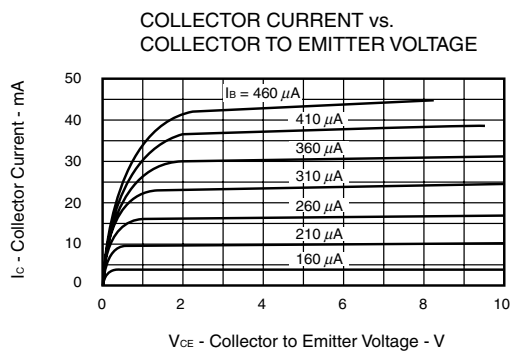


[GA4L4M]  
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)



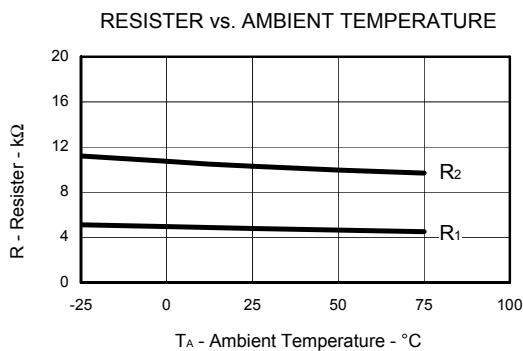
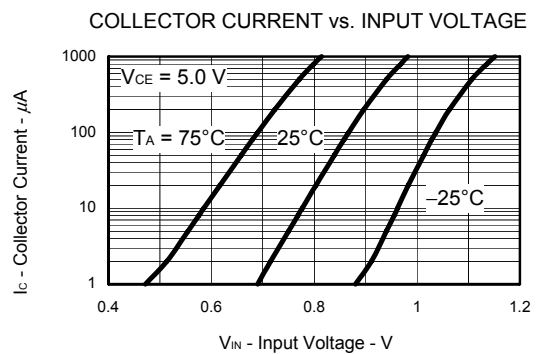
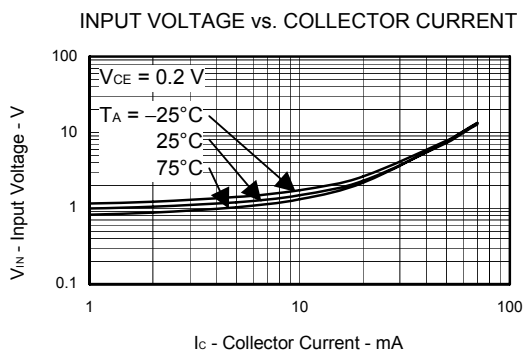
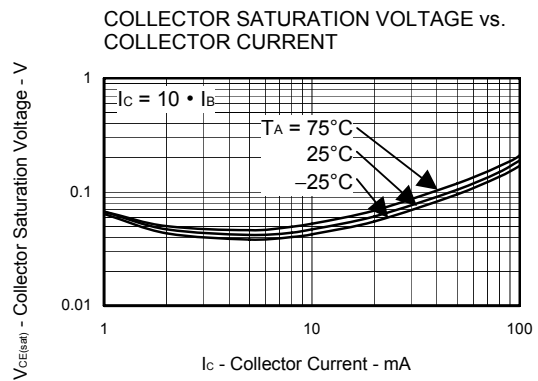
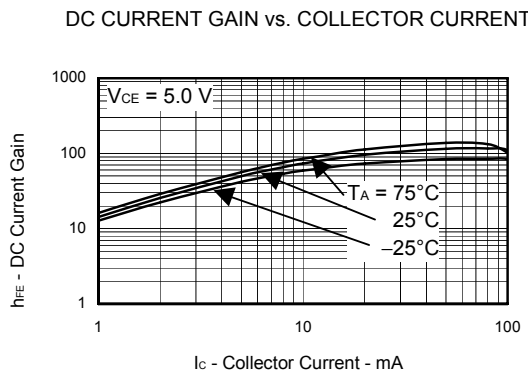
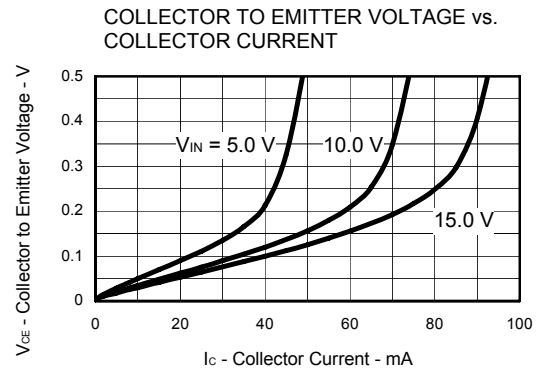
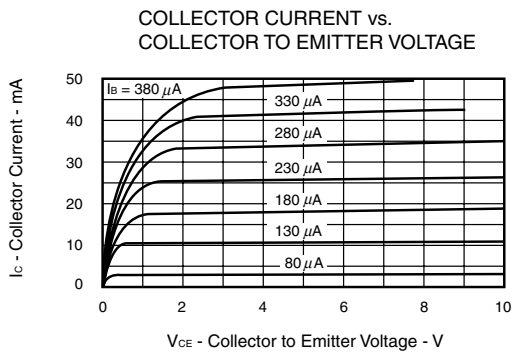
[GA4L3M]

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



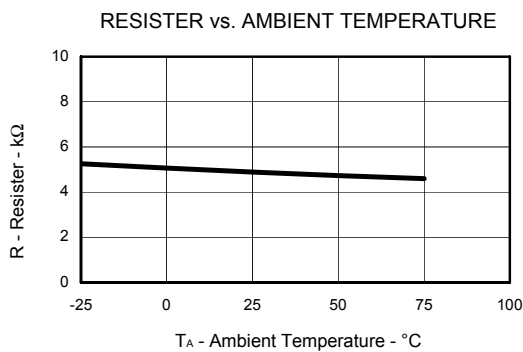
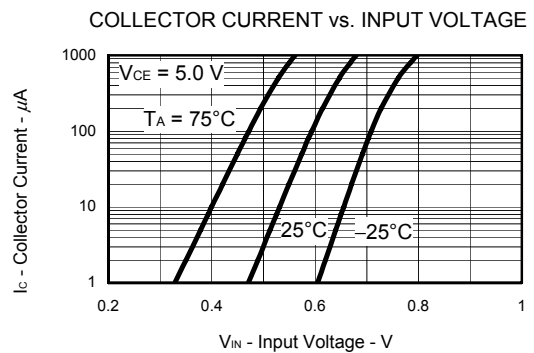
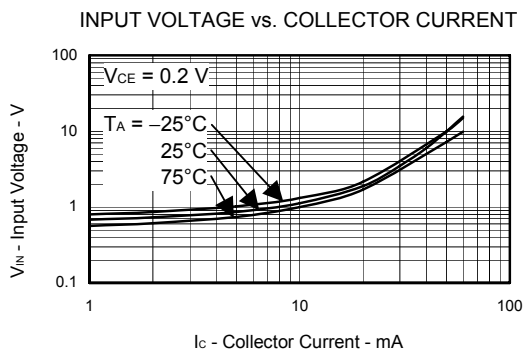
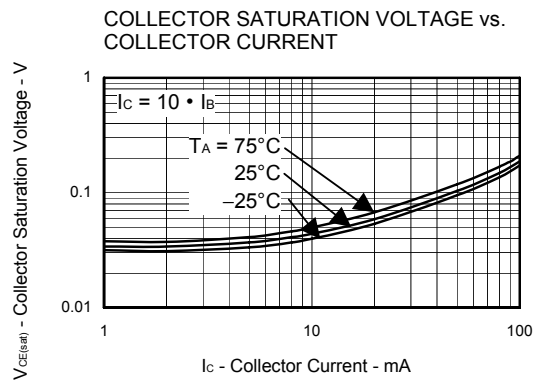
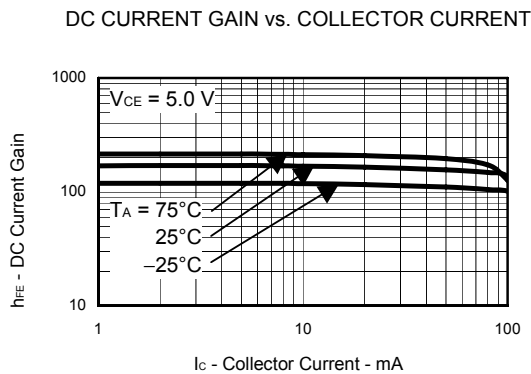
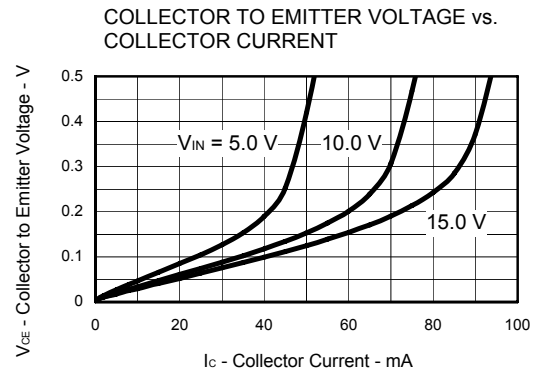
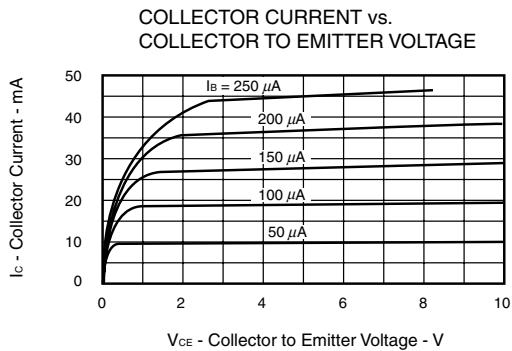
[GA4L3N]

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



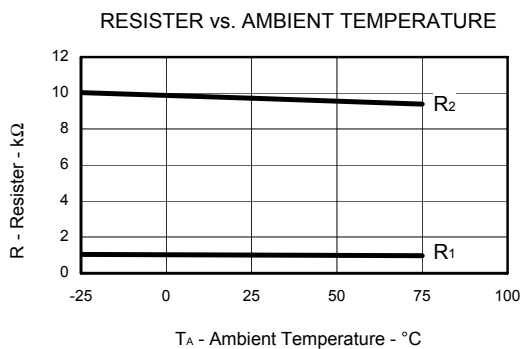
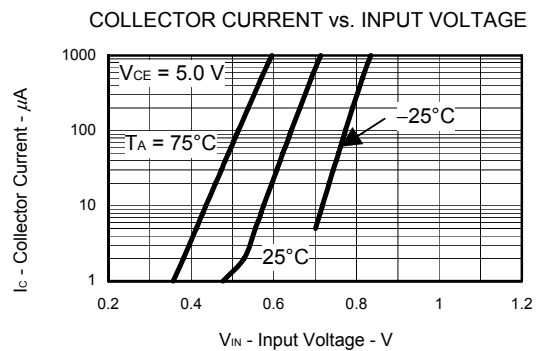
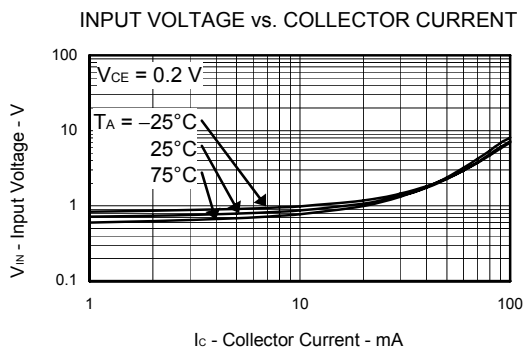
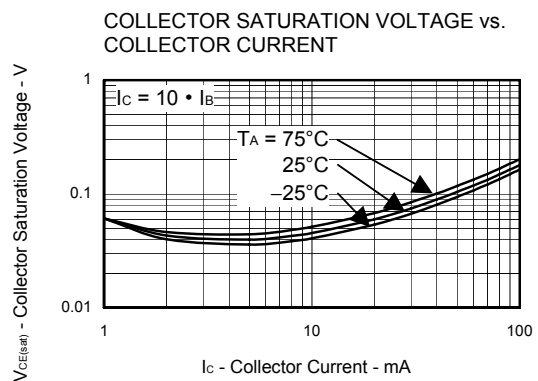
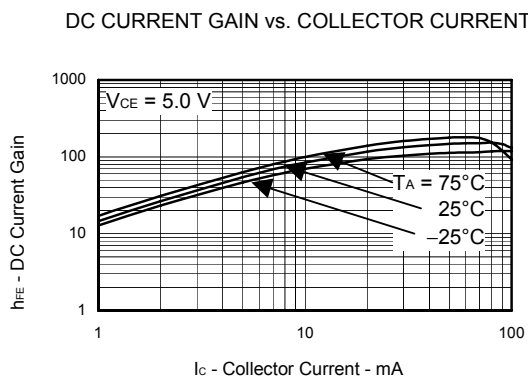
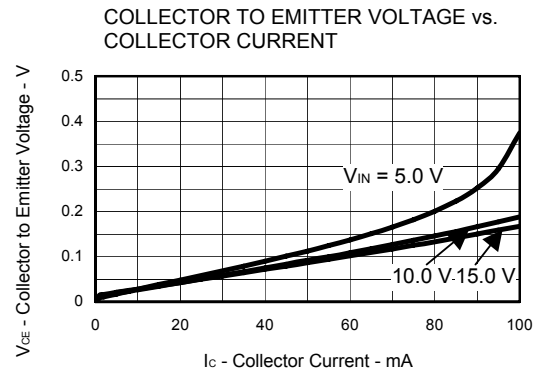
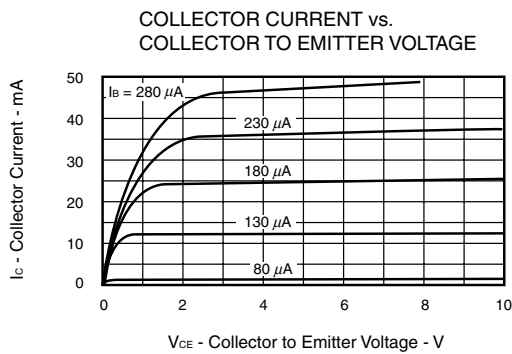
[GA4L3Z]

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



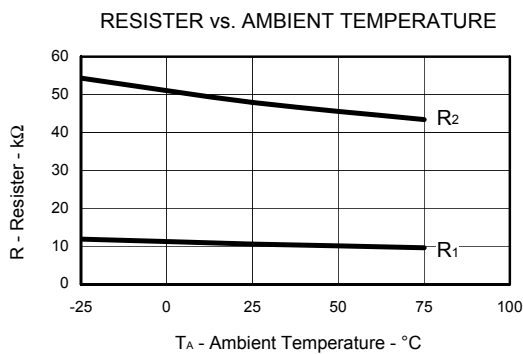
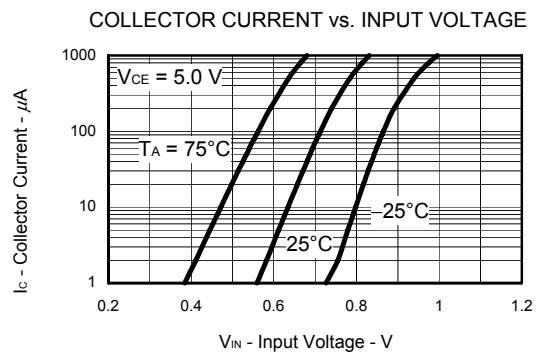
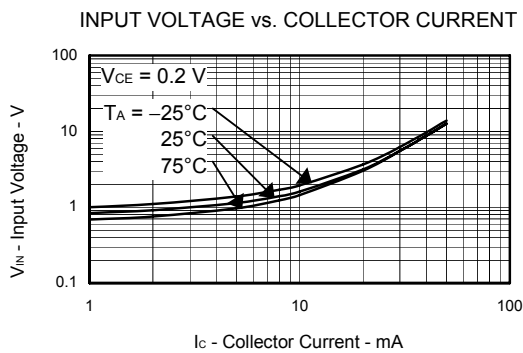
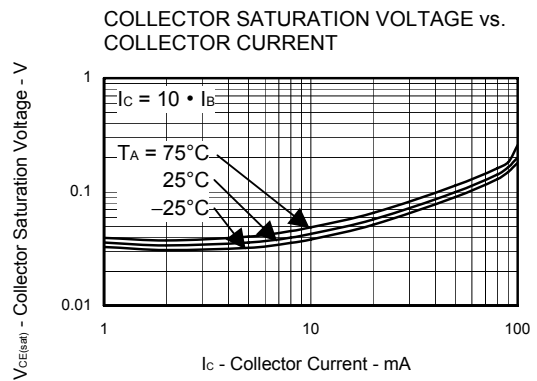
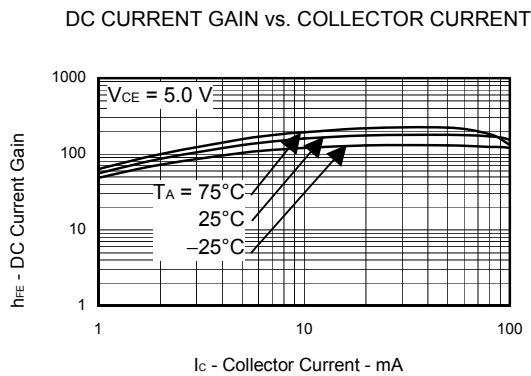
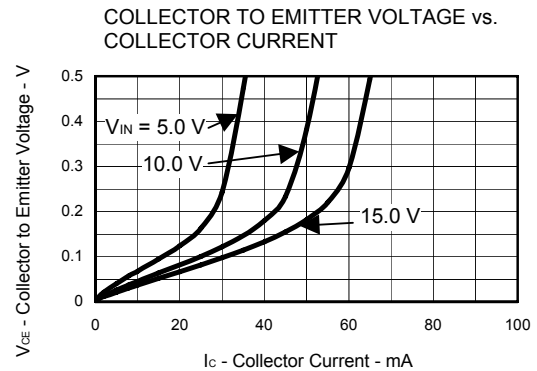
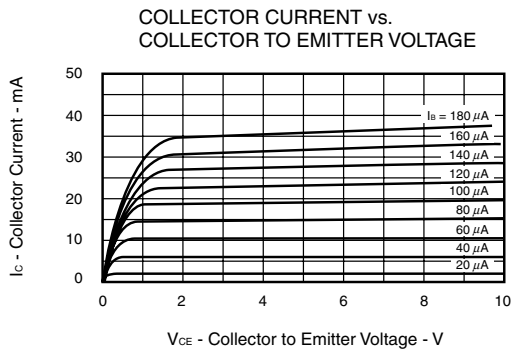
[GA4A3Q]

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



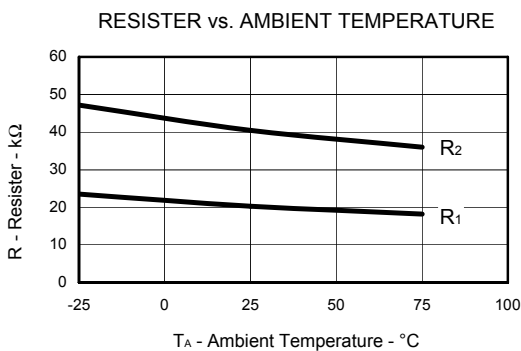
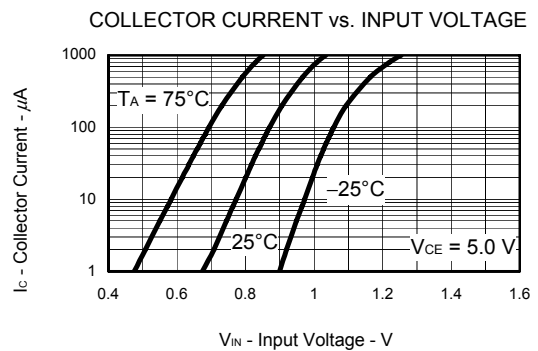
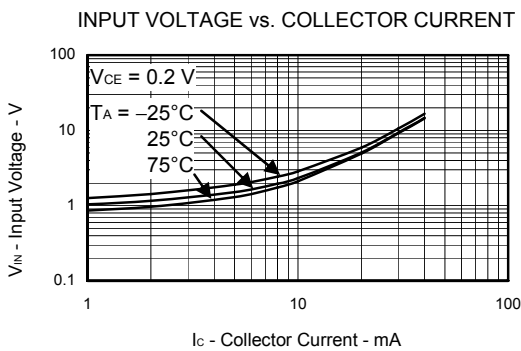
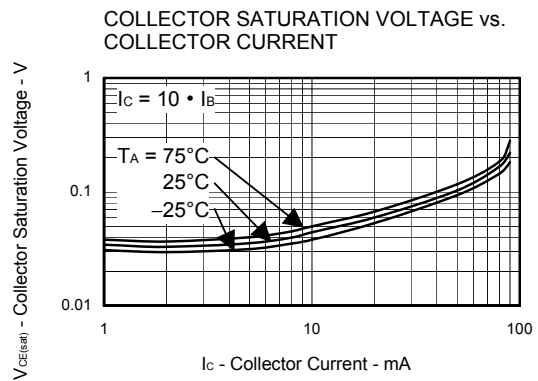
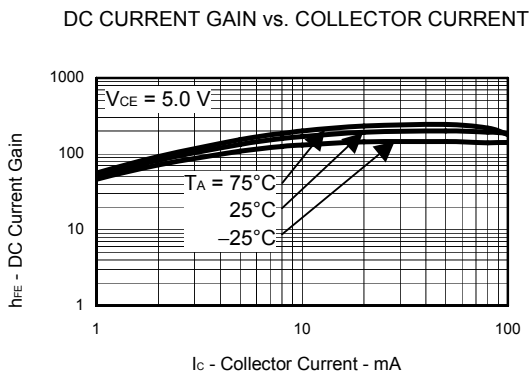
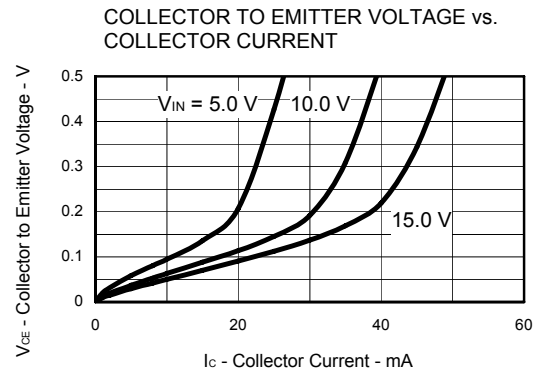
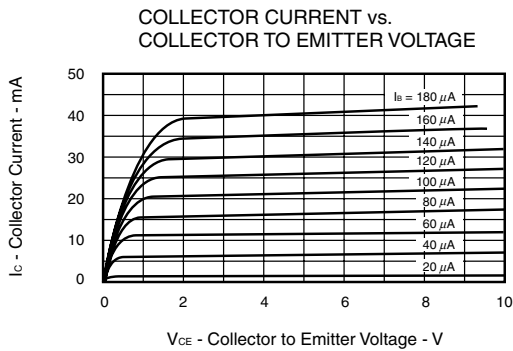
[GA4A4P]

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



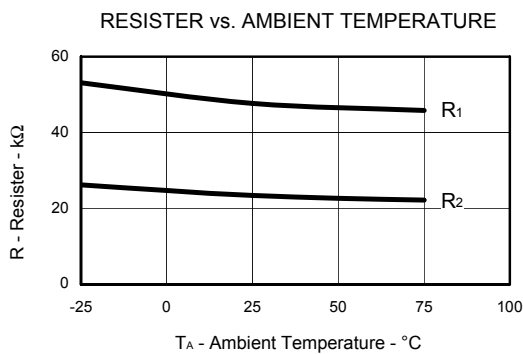
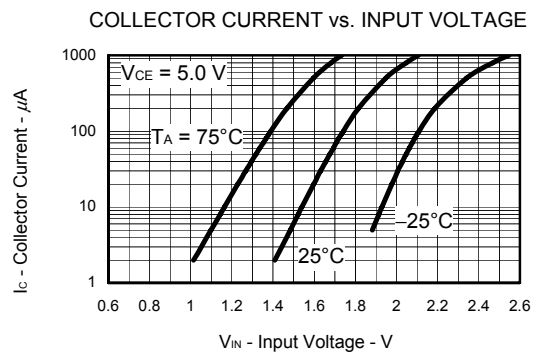
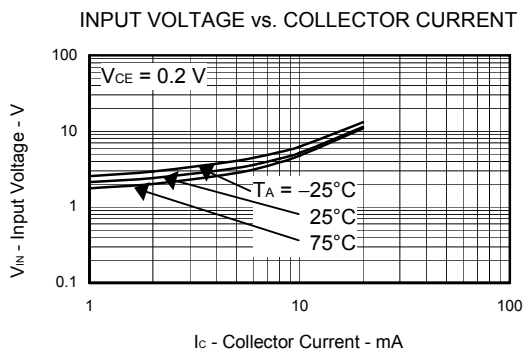
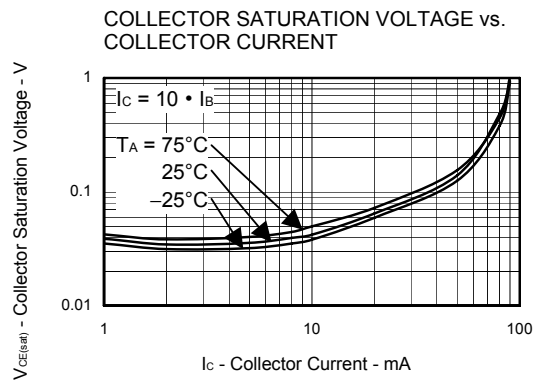
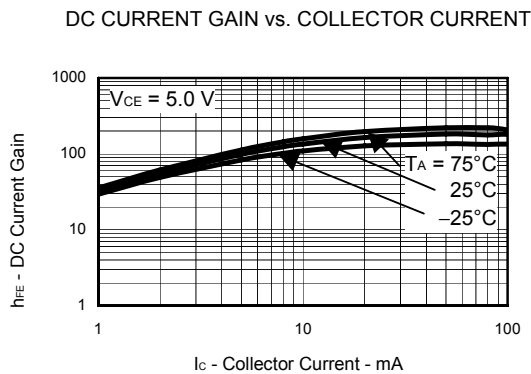
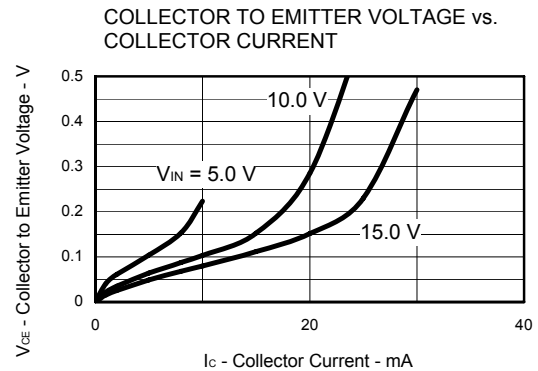
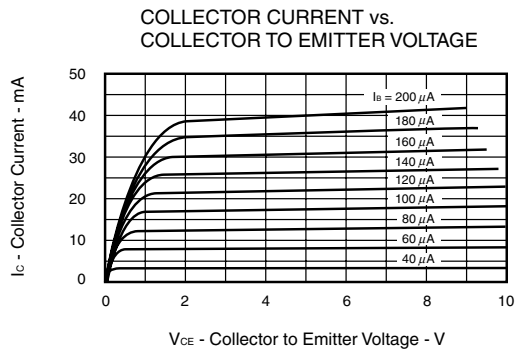
[GA4F4N]

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



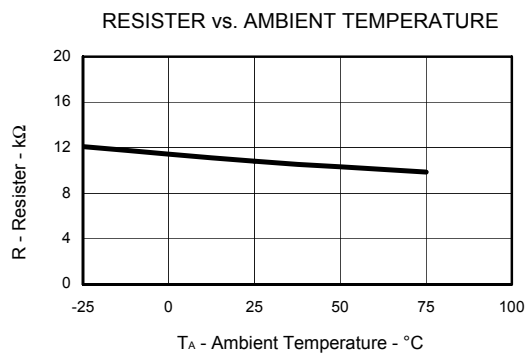
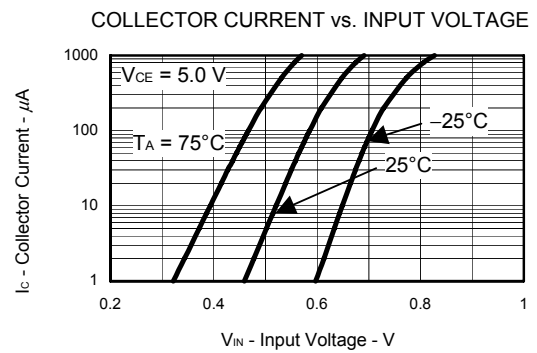
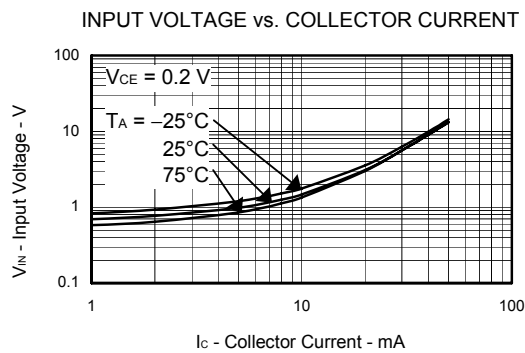
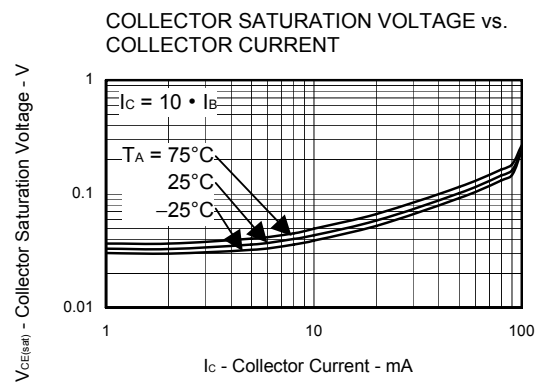
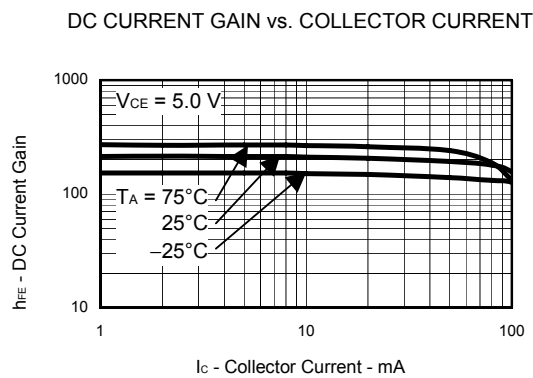
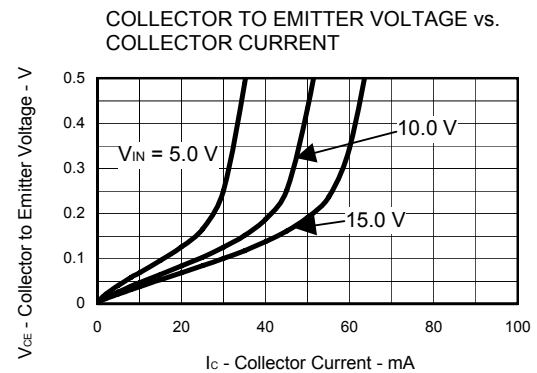
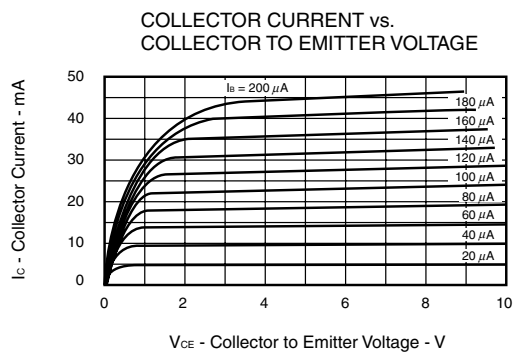
[GA4L4L]

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



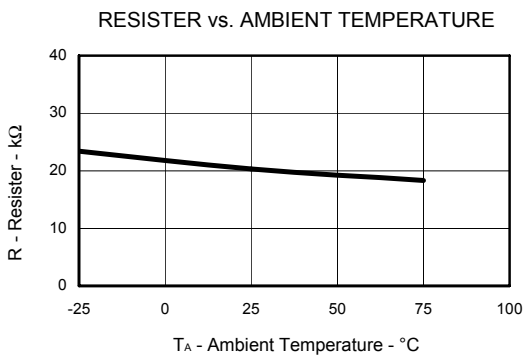
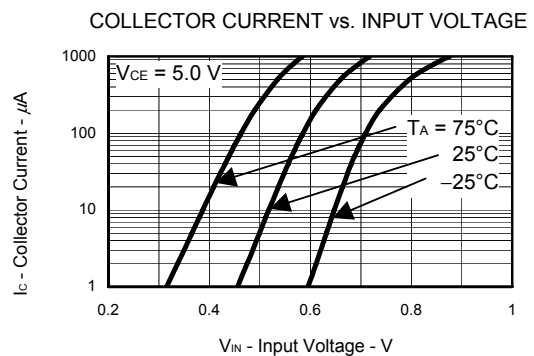
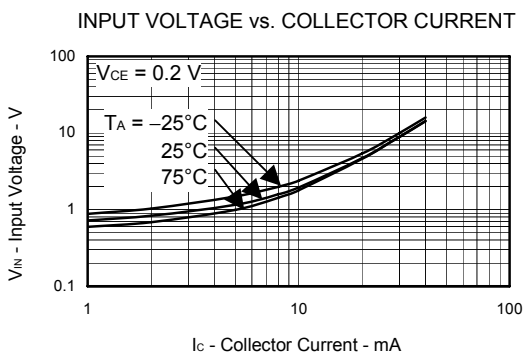
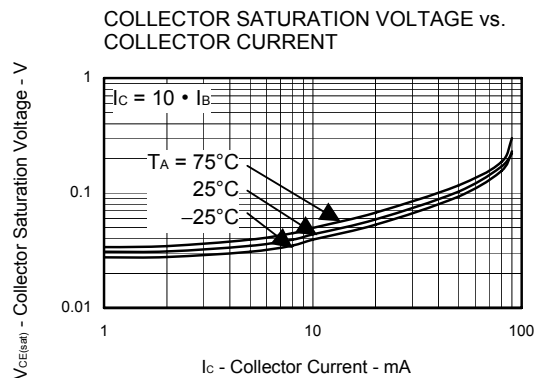
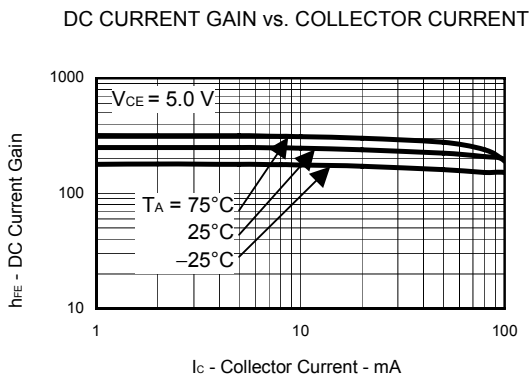
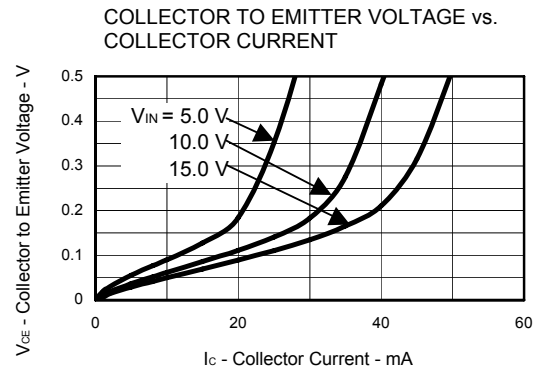
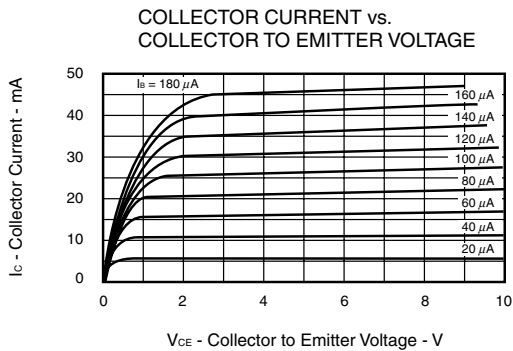
[GA4A4Z]

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



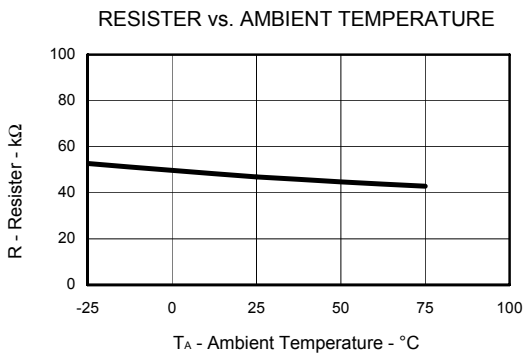
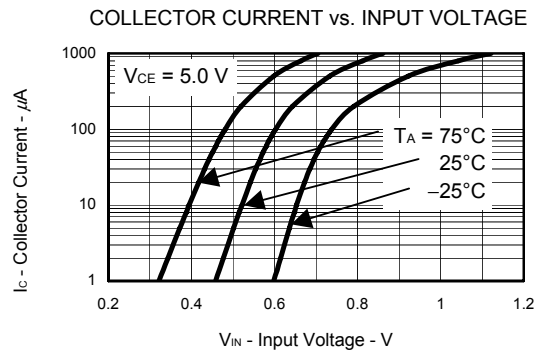
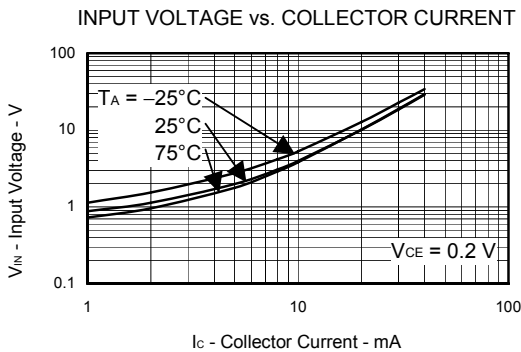
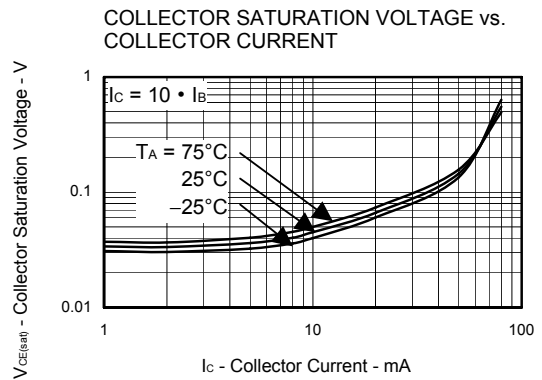
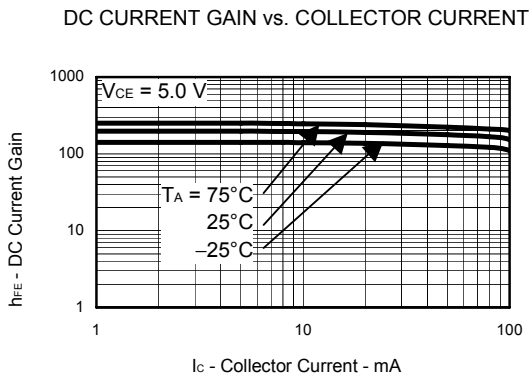
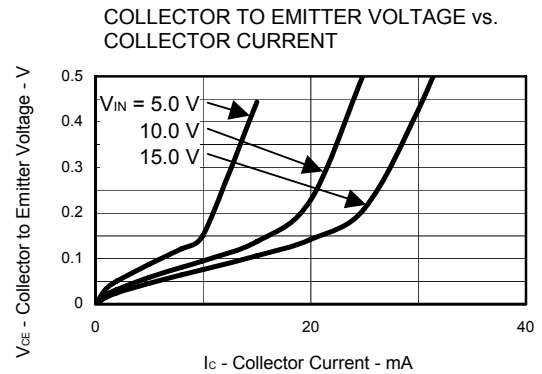
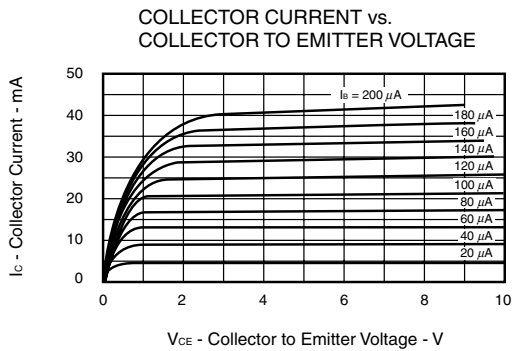
[GA4F4Z]

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



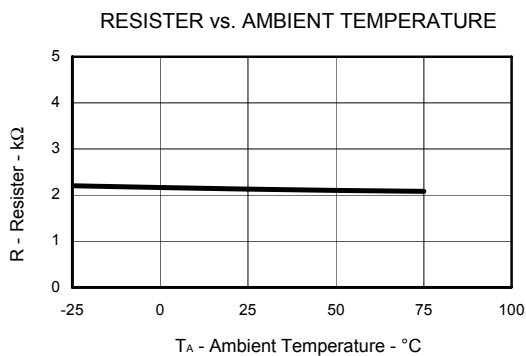
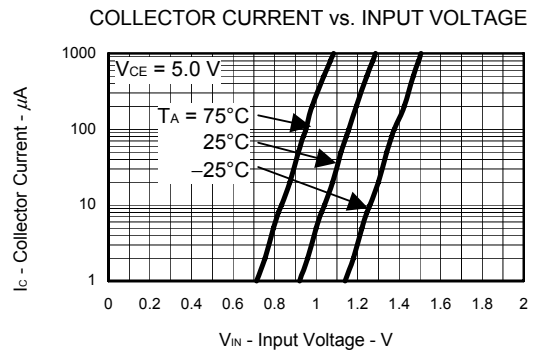
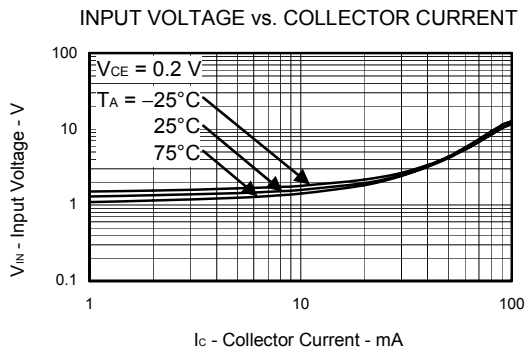
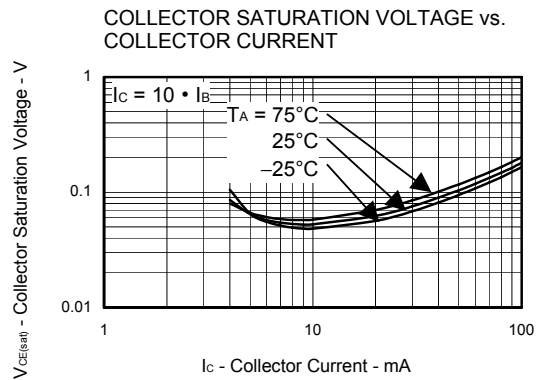
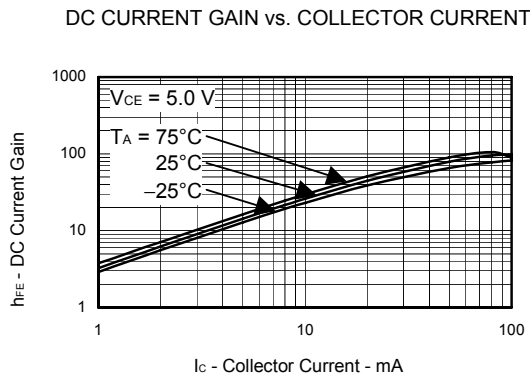
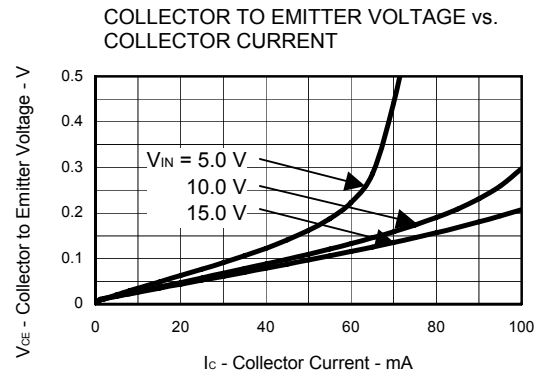
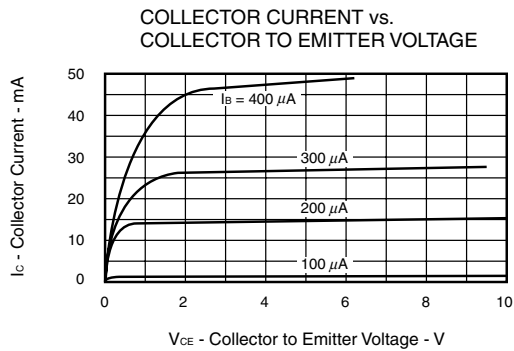
[GA4L4Z]

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



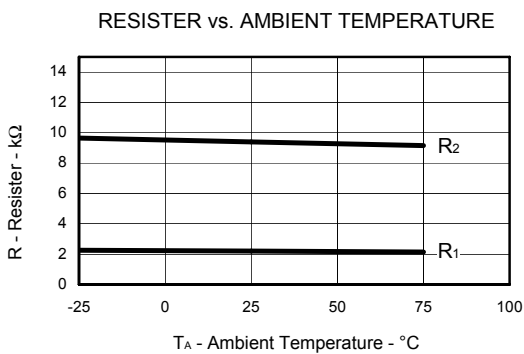
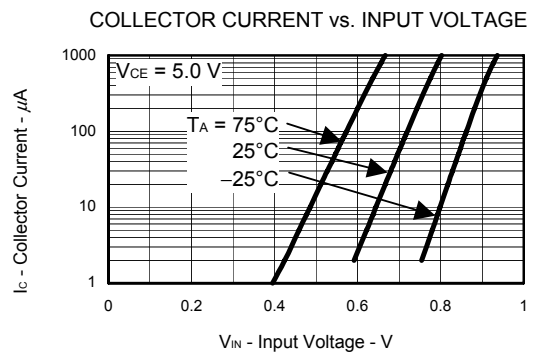
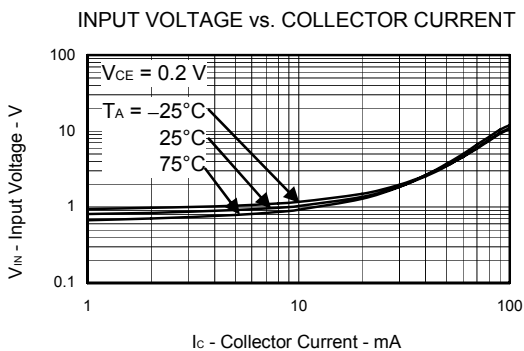
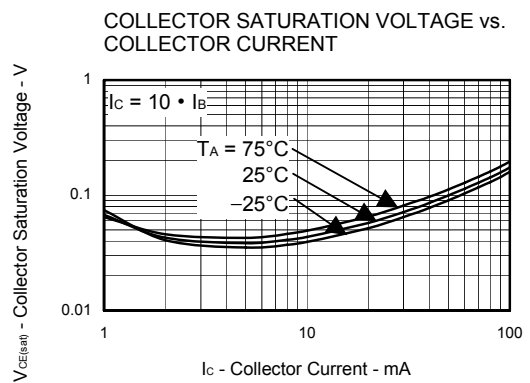
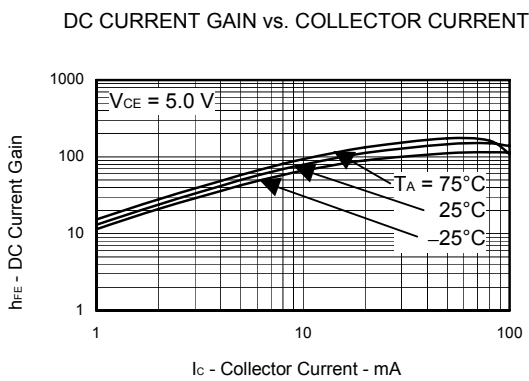
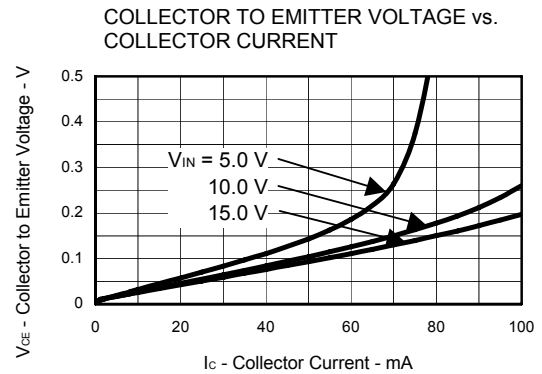
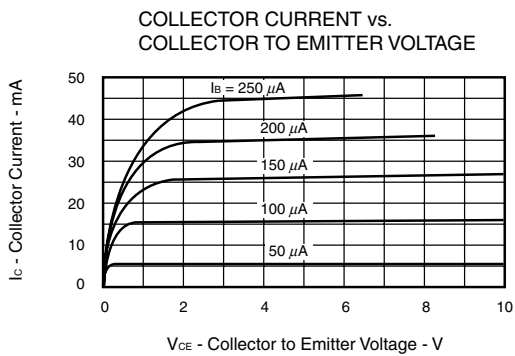
[GA4F3M]

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



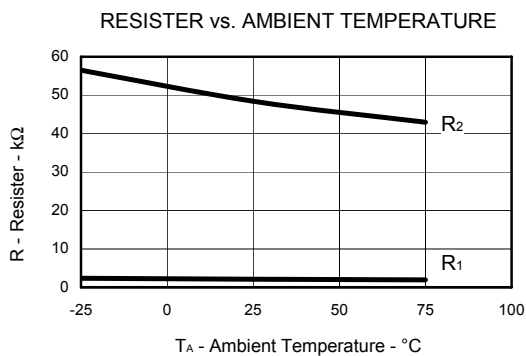
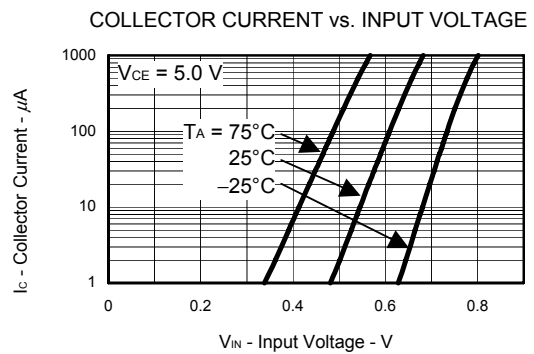
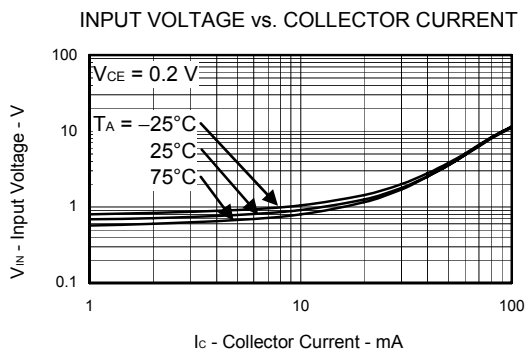
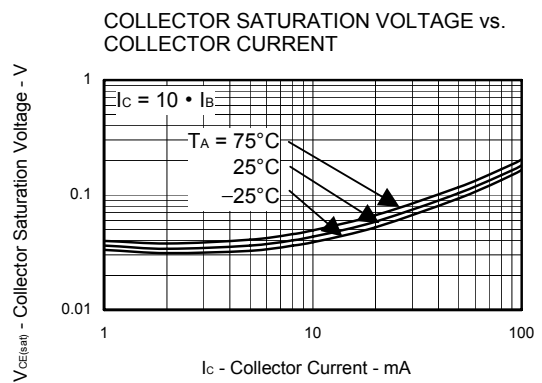
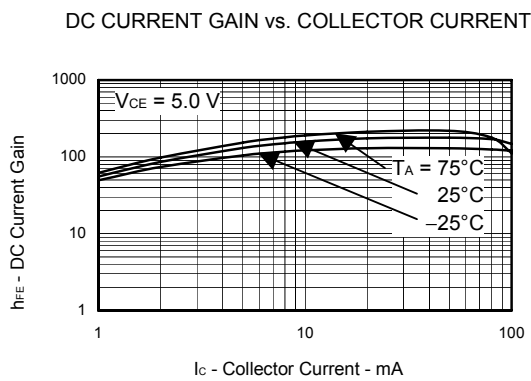
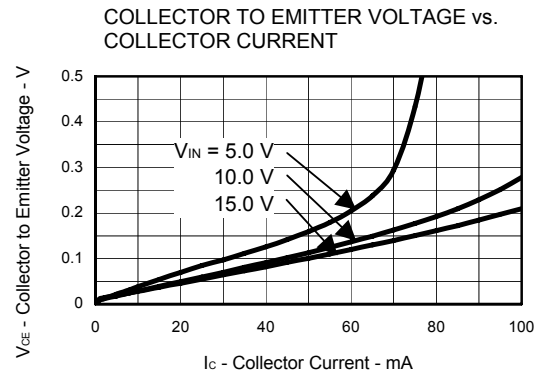
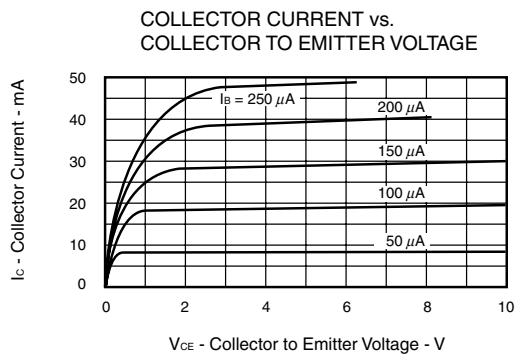
[GA4F3P]

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



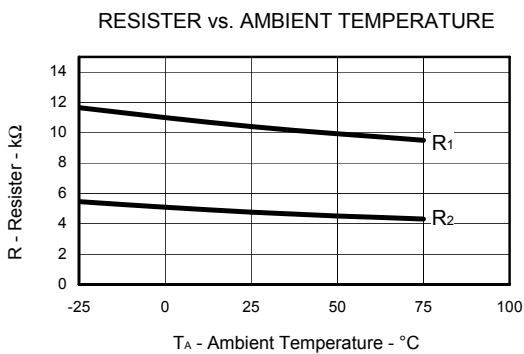
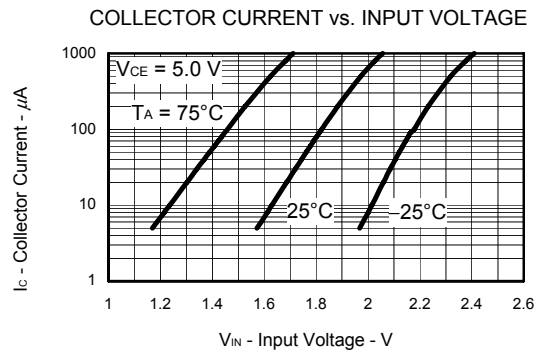
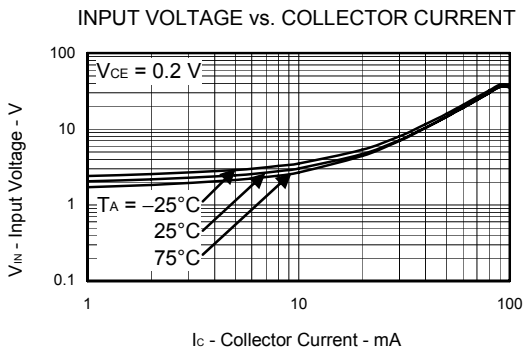
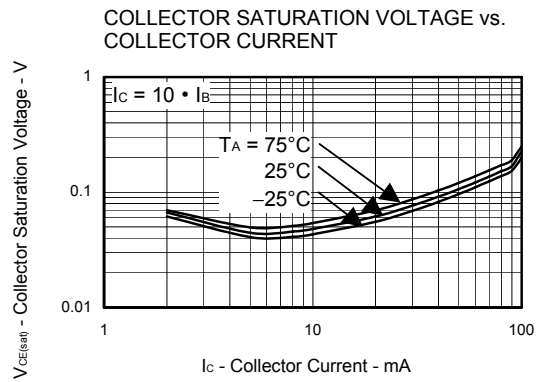
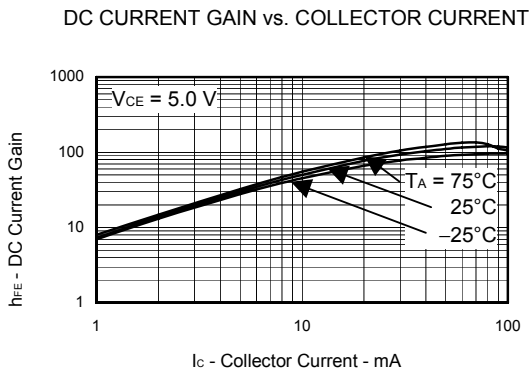
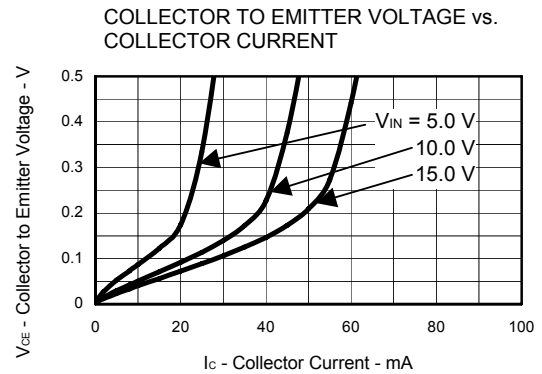
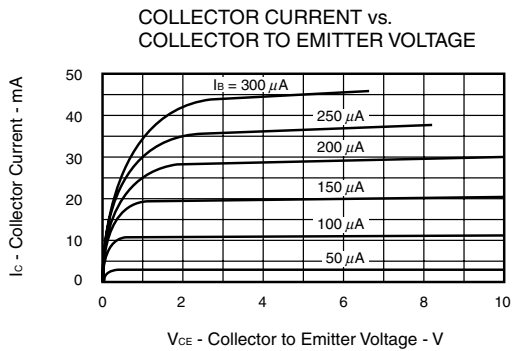
[GA4F3R]

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



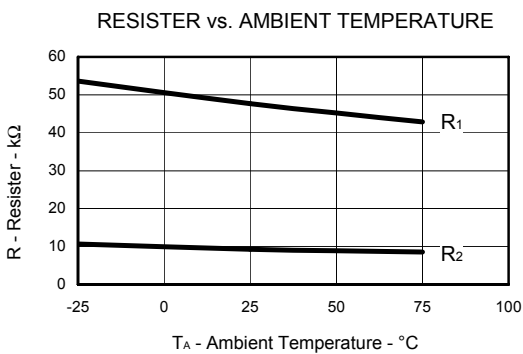
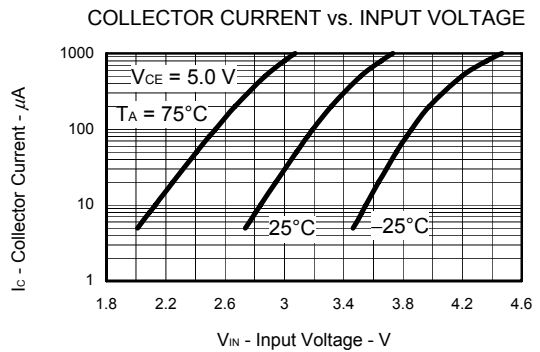
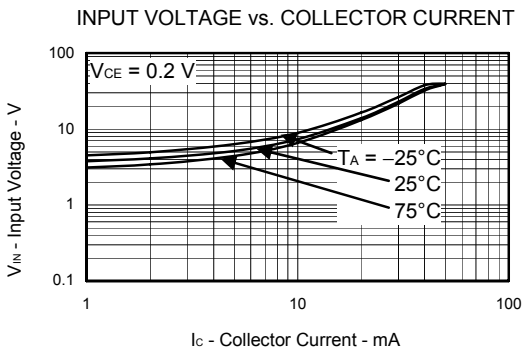
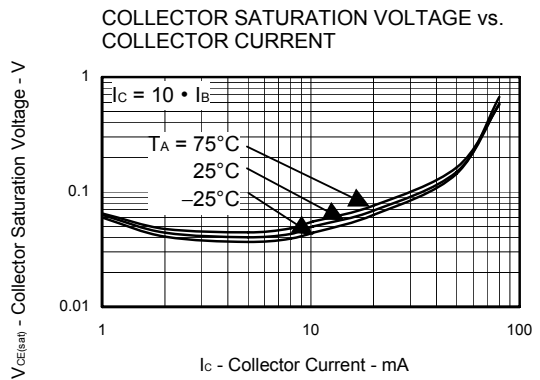
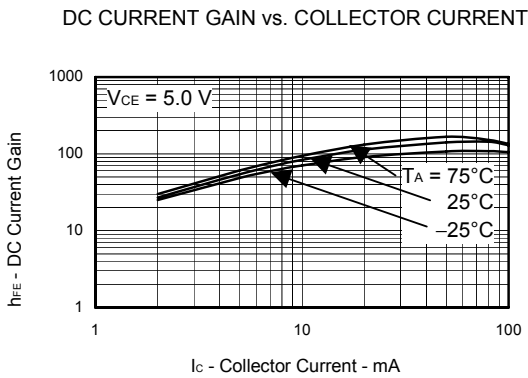
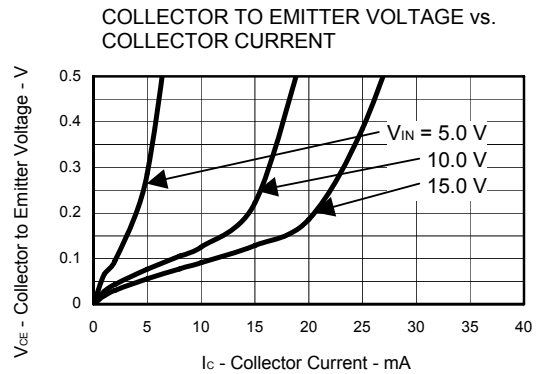
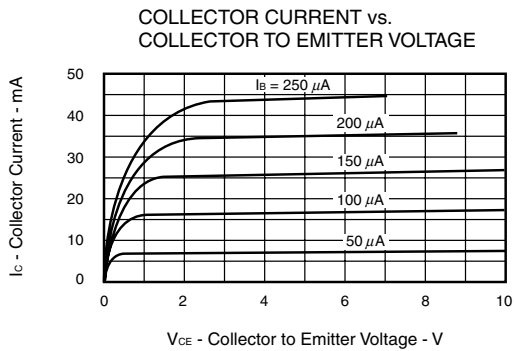
[GA4A4L]

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



[GA4L4K]

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



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