

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 KA4xxx

## RESISTOR BUILT-IN TYPE NPN TRANSISTOR

### FEATURES

- Compact package
- Resistors built-in type
- Complementary to KN4xxx

### ORDERING INFORMATION

PART NUMBER	PACKAGE
KA4xxx	SC-75 (USM)

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

Collector to Base Voltage	V <sub>CB0</sub>	60	V
Collector to Emitter Voltage	V <sub>CEO</sub>	50	V
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
Total Power Dissipation	P <sub>T</sub>	0.2	W
Junction Temperature	T <sub>J</sub>	150	°C
Storage Temperature	T <sub>stg</sub>	-55 to +150	°C

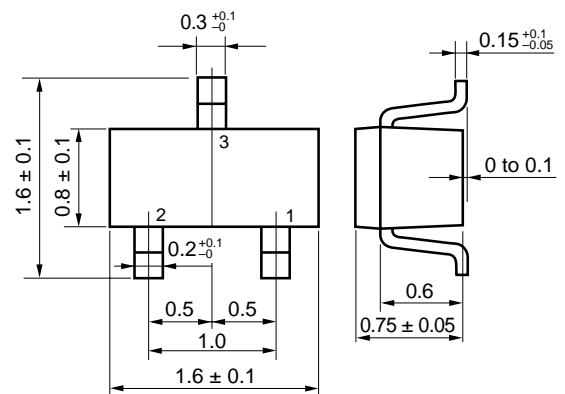
#### Note 1.

PART NUMBER	V <sub>EBO</sub> (V)	MARK	R <sub>1</sub> (kΩ)	R <sub>2</sub> (kΩ)
KA4A4M	10	A4	10.0	10.0
KA4F4M	10	B4	22.0	22.0
KA4L4M	10	C4	47.0	47.0
KA4L3M	10	D4	4.7	4.7
KA4L3N	5	E4	4.7	10.0
KA4L3Z	5	F4	4.7	
KA4A3Q	5	G4	1.0	10.0
KA4A4P	5	H4	10.0	47.0
KA4F4N	5	X4	22.0	47.0

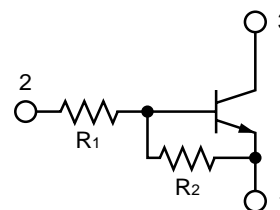
Note 2. PW ≤ 10 ms, Duty Cycle ≤ 50%

<R> Note 3. Mounted on ceramic substrate of 3.0 cm<sup>2</sup> x 0.64 mm

### PACKAGE DRAWING (Unit: mm)



### EQUIVALENT CIRCUIT



### PIN CONNECTION

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

PART NUMBER	V <sub>EBO</sub> (V)	MARK	R <sub>1</sub> (kΩ)	R <sub>2</sub> (kΩ)
KA4L4L	15	K4	47.0	22.0
KA4A4Z	5	Y4	10.0	
KA4F4Z	5	Z4	22.0	
KA4L4Z	5	N4	47.0	
KA4F3M	10	P4	2.2	2.2
KA4F3P	5	Q4	2.2	10.0
KA4F3R	5	R4	2.2	47.0
KA4A4L	15	S4	10.0	4.7
KA4L4K	25	T4	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 μA	<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>1</sub>		<b>Note3</b>			kΩ
Emitter to Base Resistor	R <sub>2</sub>					kΩ

**Note 1.**

PART NUMBER	h <sub>FE1</sub>			h <sub>FE2</sub>			UNIT
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
KA4A4M	35		100	80			-
KA4F4M	60		195	90			-
KA4L4M	85		340	95			-
KA4L3M	20		80	80			-
KA4L3N	35		100	80			-
KA4L3Z	135		600	100			-
KA4A3Q	35		100	80			-
KA4A4P	85		340	95			-
KA4F4N	85		340	95			-
KA4L4L	60		195	90			-
KA4A4Z	135		600	100			-
KA4F4Z	135		600	100			-
KA4L4Z	135		600	100			-
KA4F3M	8		50	50			-
KA4F3P	35		100	80			-
KA4F3R	85		340	95			-
KA4A4L	20		80	80			-
KA4L4K	35		100	80			-

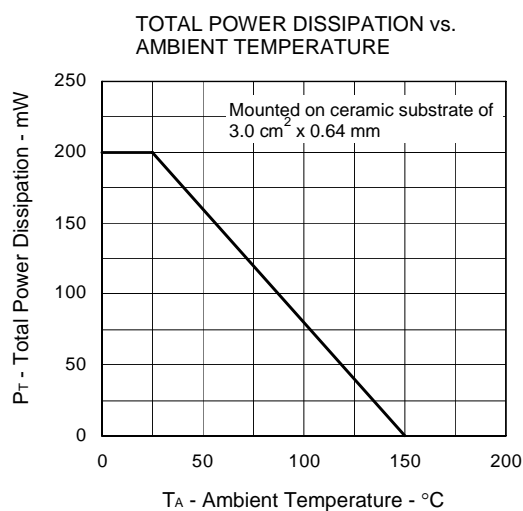
**Note 2.**

PART NUMBER	V <sub>IL</sub>			V <sub>IH</sub>			UNIT
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
KA4A4M			0.8	3.0			V
KA4F4M			0.8	4.0			V
KA4L4M			0.8	5.0			V
KA4L3M			0.8	3.0			V
KA4L3N			0.6	3.0			V
KA4L3Z			0.5	1.2			V
KA4A3Q			0.5	2.0			V
KA4A4P			0.5	3.0			V
KA4F4N			0.6	3.0			V
KA4L4L			0.9	6.0			V
KA4A4Z			0.5	2.0			V
KA4F4Z			0.5	3.0			V
KA4L4Z			0.5	4.0			V
KA4F3M			0.8	3.0			V
KA4F3P			0.5	2.0			V
KA4F3R			0.5	2.0			V
KA4A4L			0.9	6.0			V
KA4L4K			2.0	8.0			V

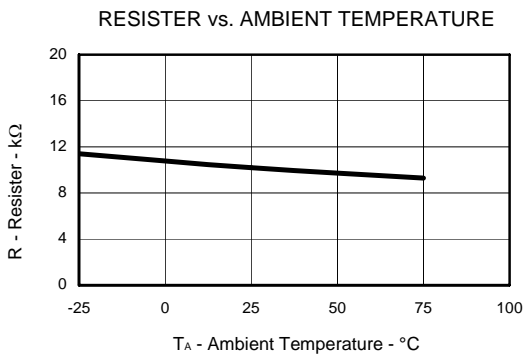
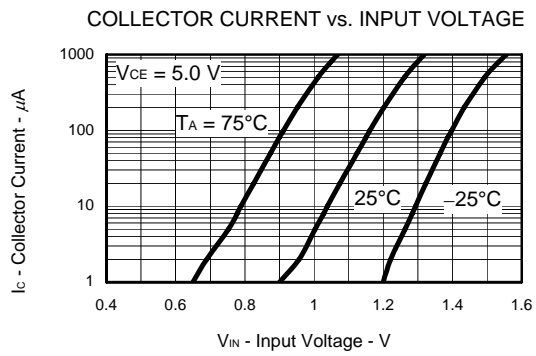
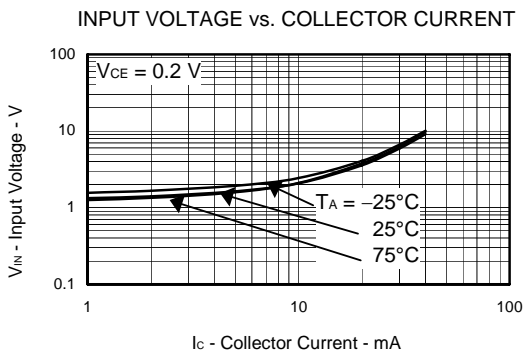
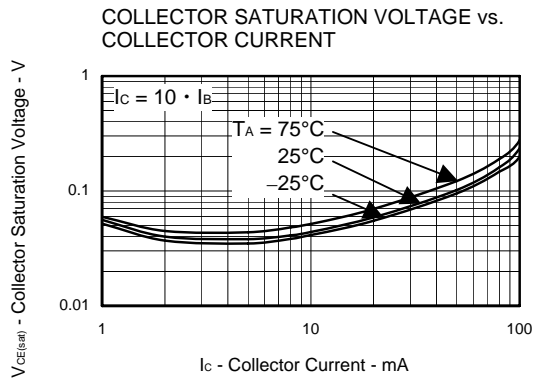
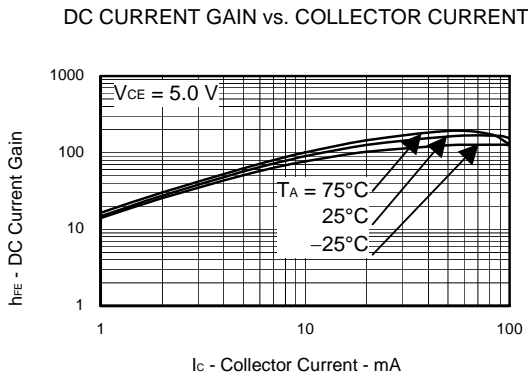
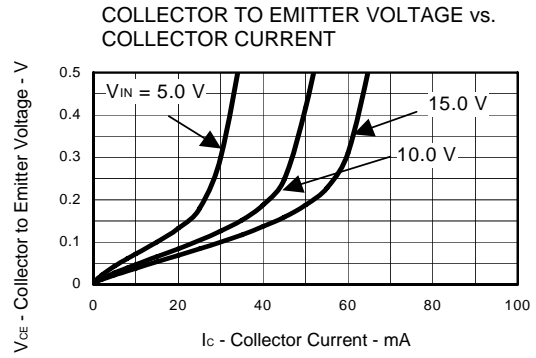
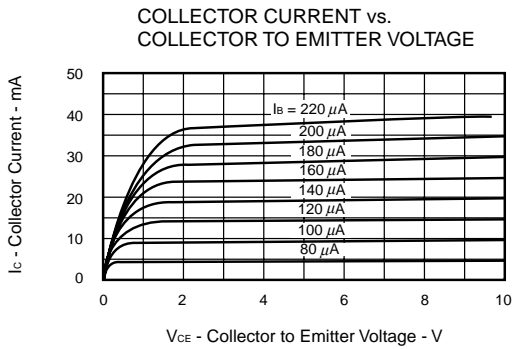
Note 3.

PART NUMBER	R <sub>1</sub>			R <sub>2</sub>			UNIT
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
KA4A4M	7.00	10.00	13.00	7.00	10.00	13.00	kΩ
KA4F4M	15.40	22.00	28.60	15.40	22.00	28.60	kΩ
KA4L4M	32.90	47.00	61.10	32.90	47.00	61.10	kΩ
KA4L3M	3.29	4.70	6.11	3.29	4.70	6.11	kΩ
KA4L3N	3.29	4.70	6.11	7.00	10.00	13.00	kΩ
KA4L3Z	3.29	4.70	6.11				kΩ
KA4A3Q	0.70	1.00	1.30	7.00	10.00	13.00	kΩ
KA4A4P	7.00	10.00	13.00	32.90	47.00	61.10	kΩ
KA4F4N	15.40	22.00	28.60	32.90	47.00	61.10	kΩ
KA4L4L	32.90	47.00	61.10	15.40	22.00	28.60	kΩ
KA4A4Z	7.00	10.00	13.00				kΩ
KA4F4Z	15.40	22.00	28.60				kΩ
KA4L4Z	32.90	47.00	61.10				kΩ
KA4F3M	1.54	2.20	2.86	1.54	2.20	2.86	kΩ
KA4F3P	1.54	2.20	2.86	7.00	10.00	13.00	kΩ
KA4F3R	1.54	2.20	2.86	32.90	47.00	61.10	kΩ
KA4A4L	7.00	10.00	13.00	3.29	4.70	6.11	kΩ
KA4L4K	32.90	47.00	61.10	7.00	10.00	13.00	kΩ

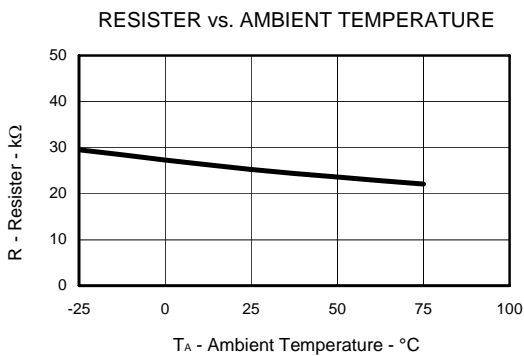
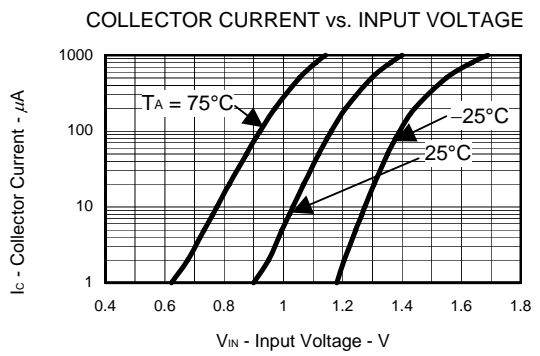
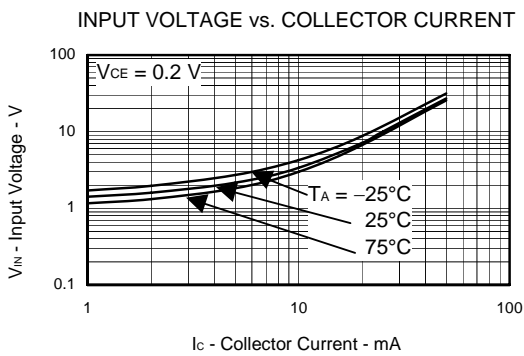
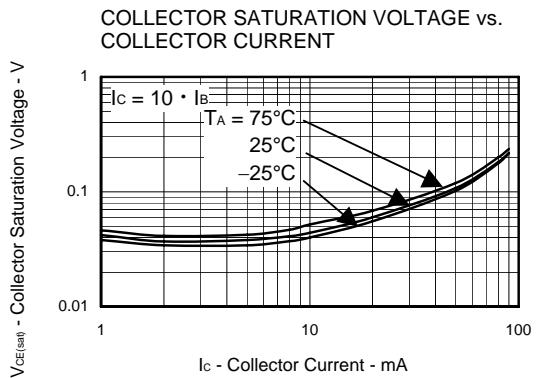
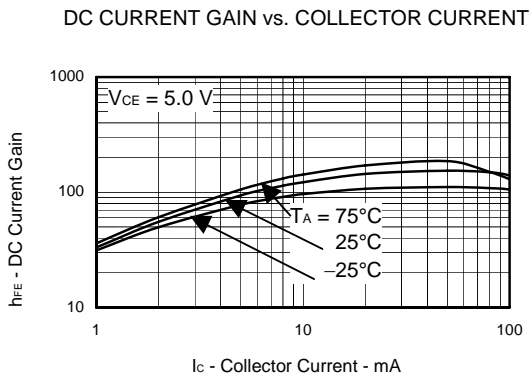
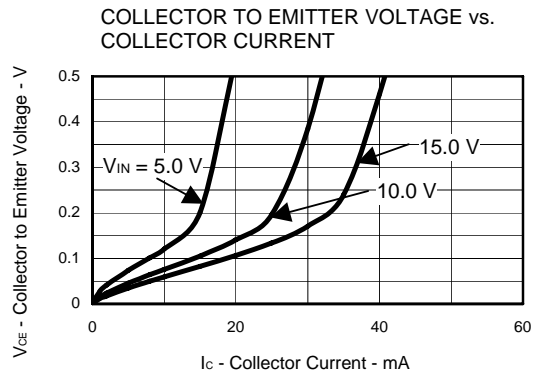
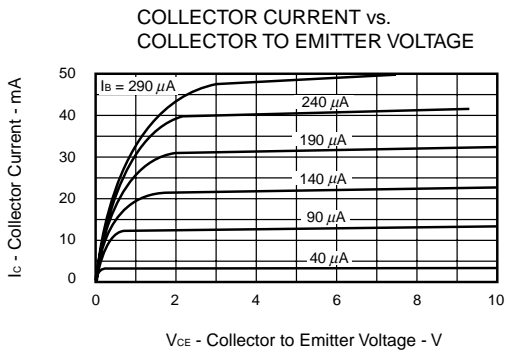
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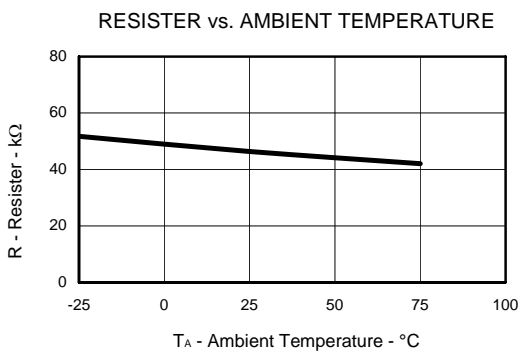
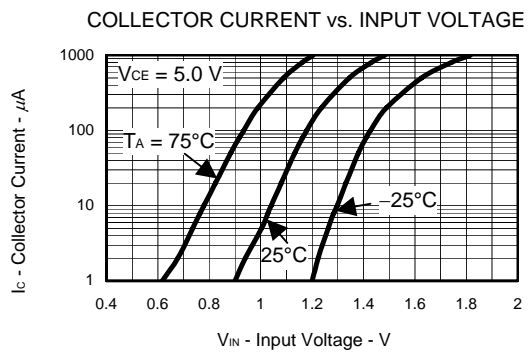
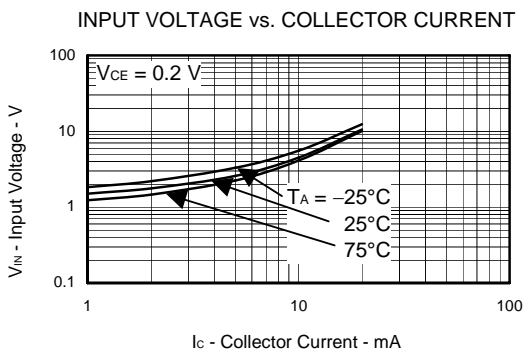
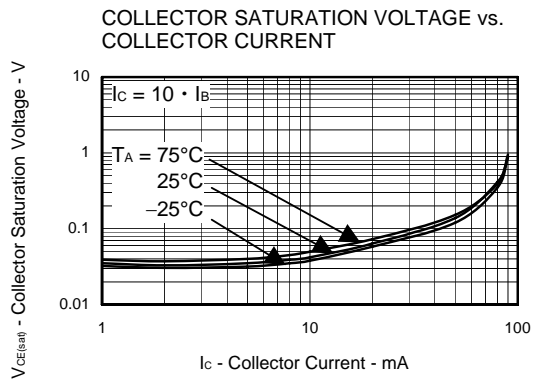
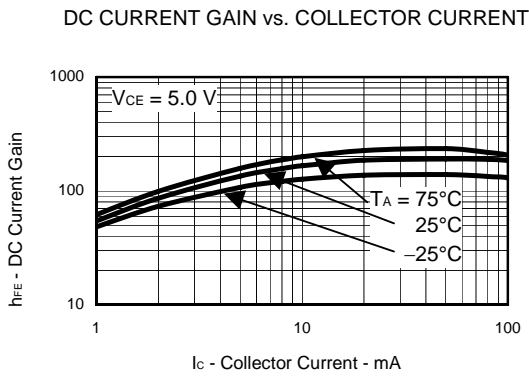
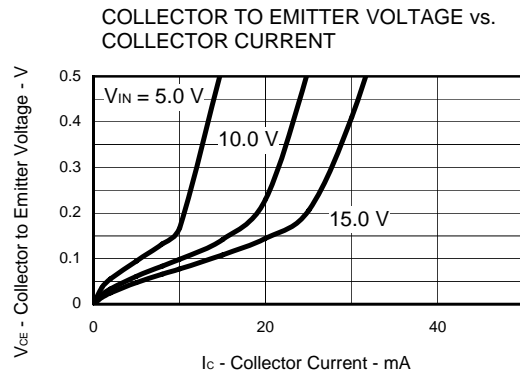
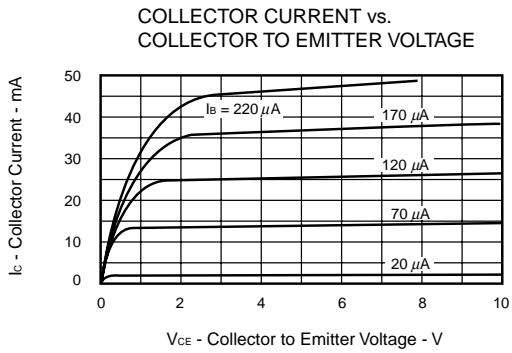
[KA4A4M]  
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)



[KA4F4M]  
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)

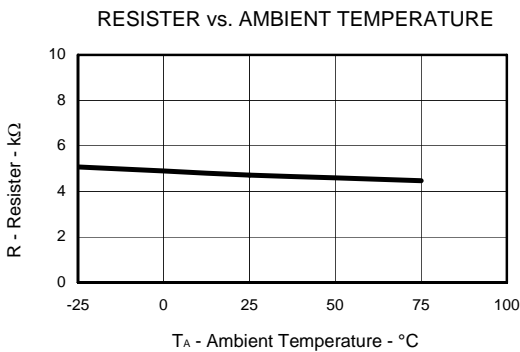
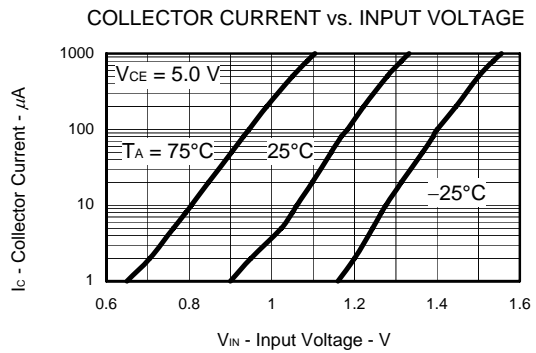
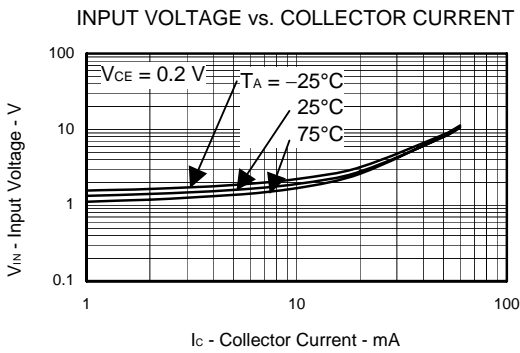
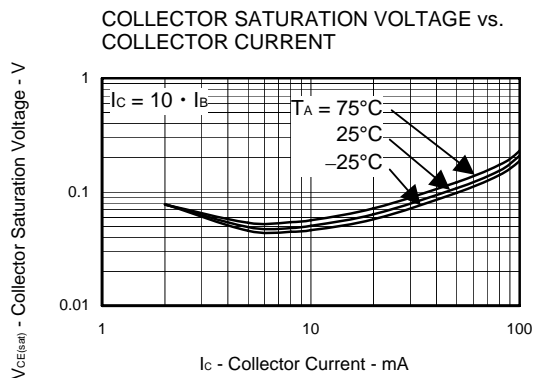
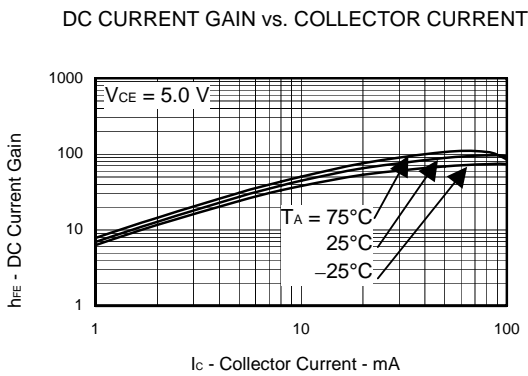
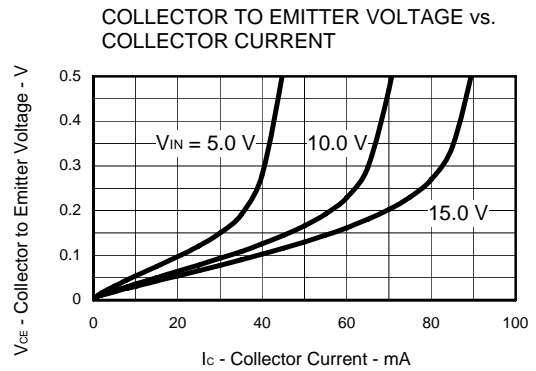
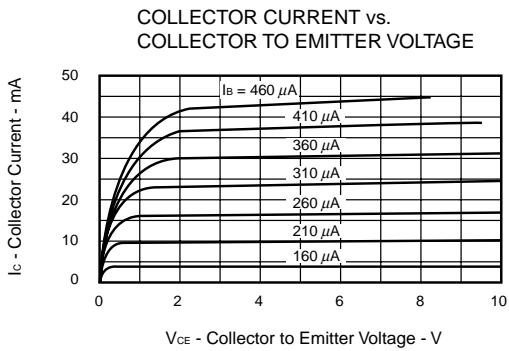


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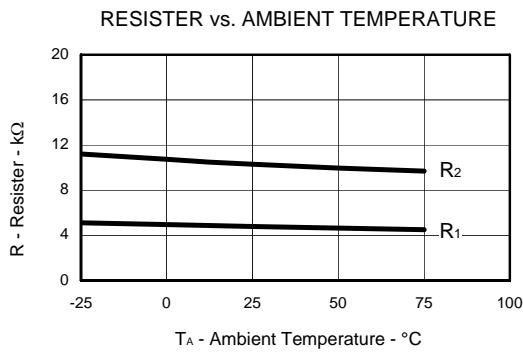
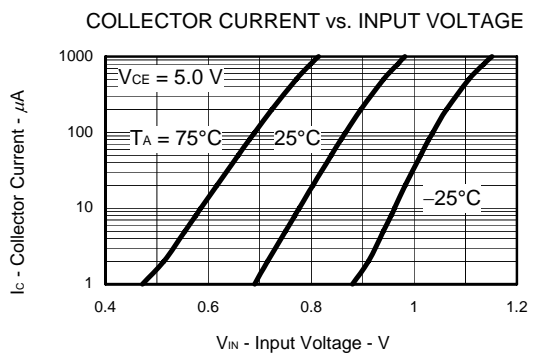
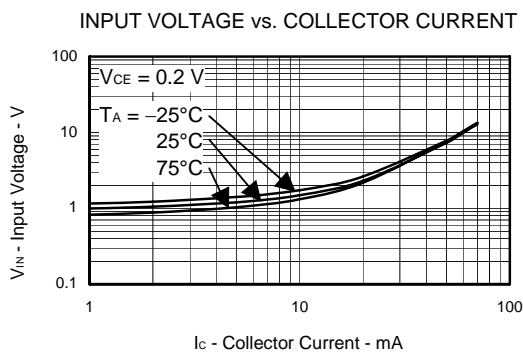
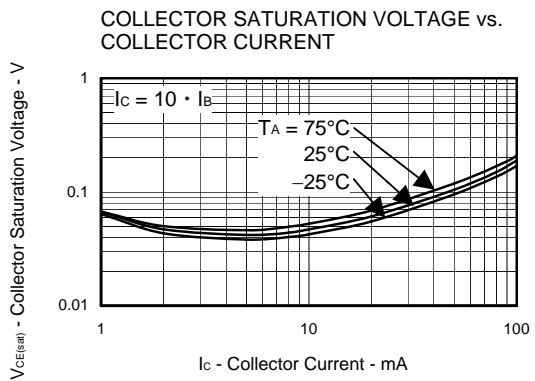
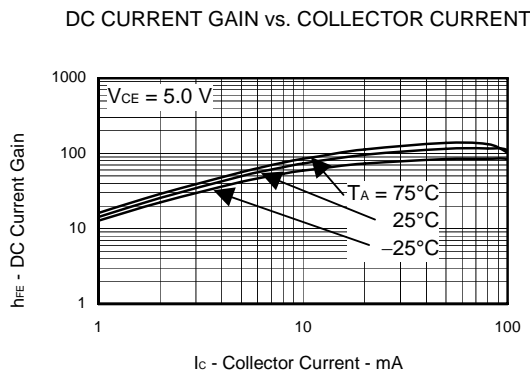
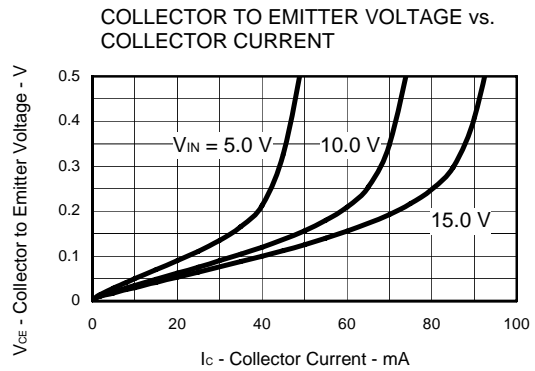
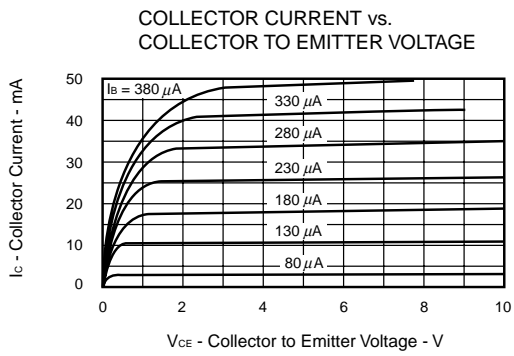




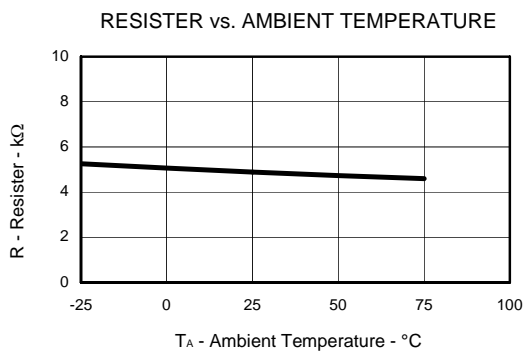
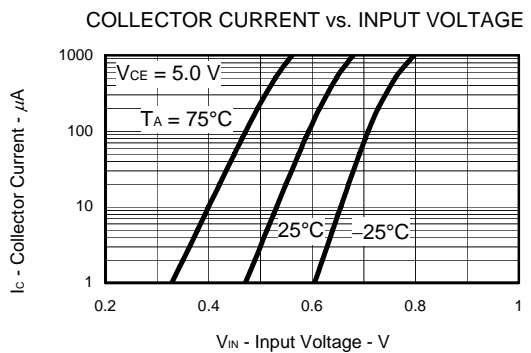
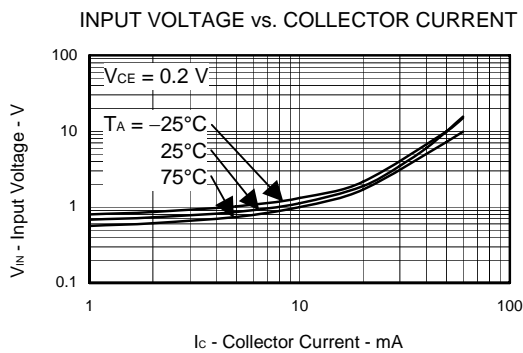
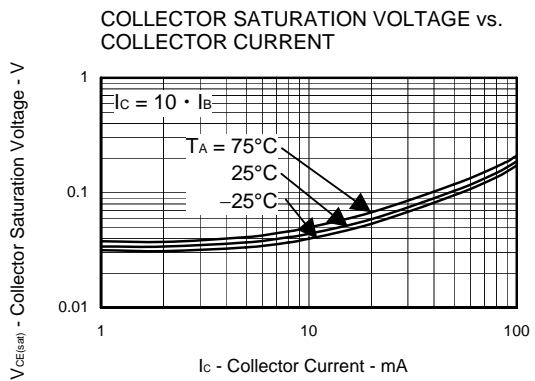
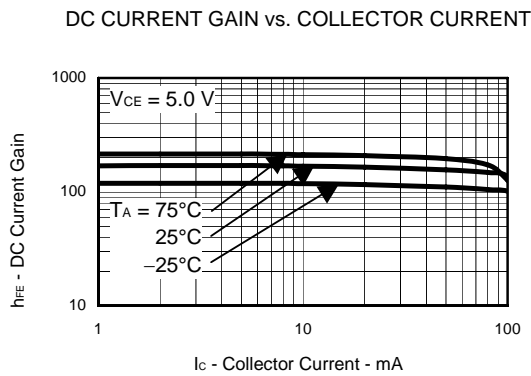
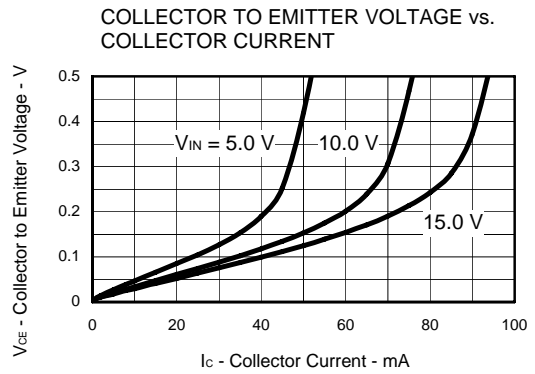
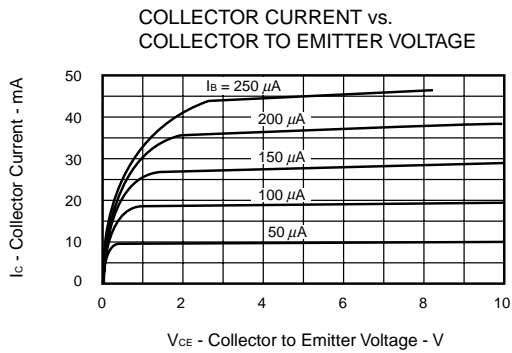
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TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)



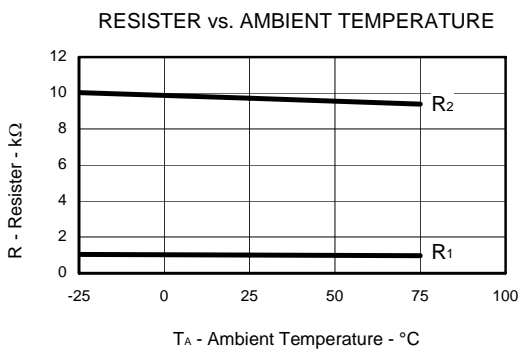
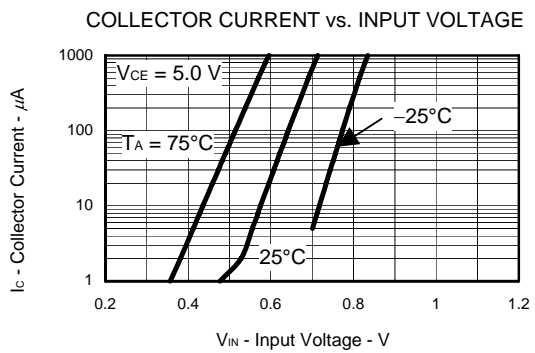
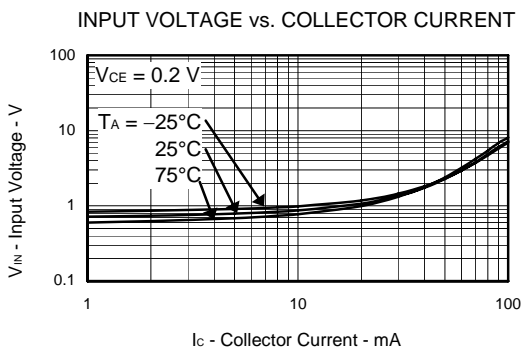
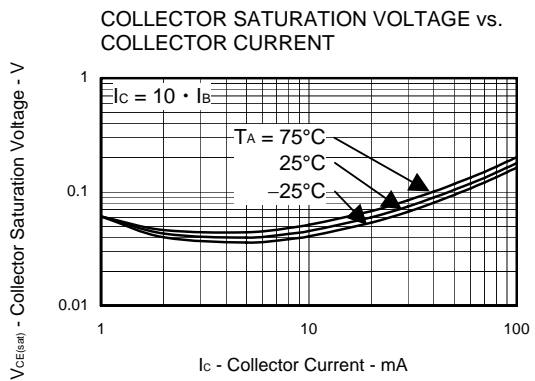
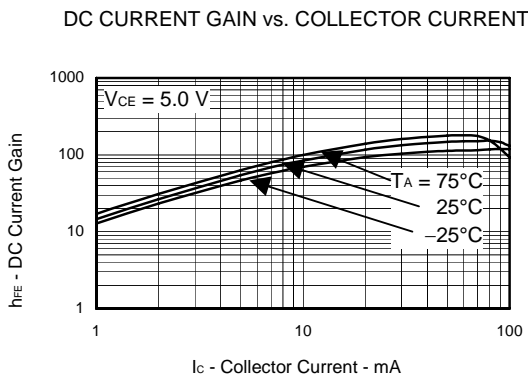
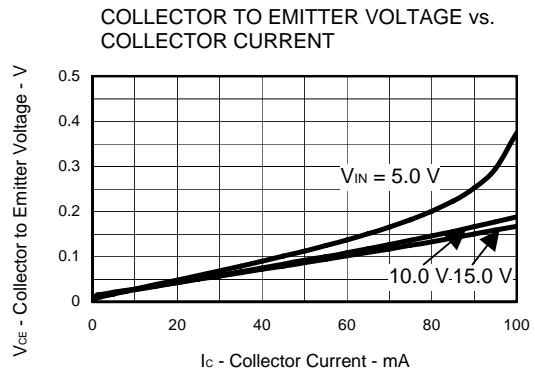
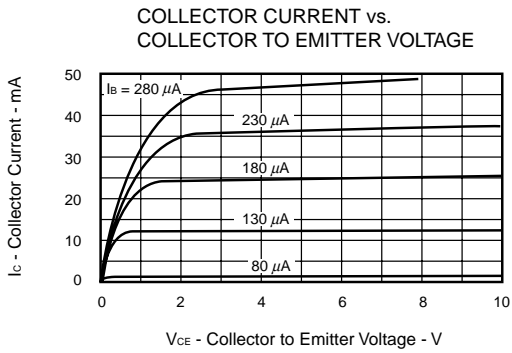
[KA4L3N]  
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)



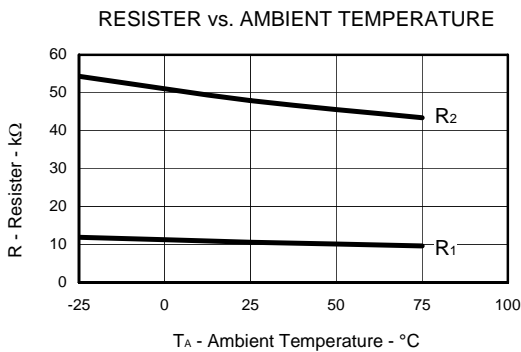
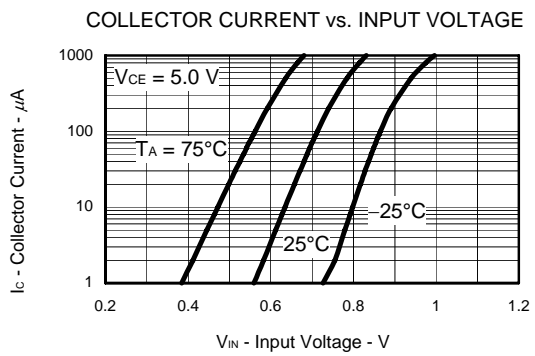
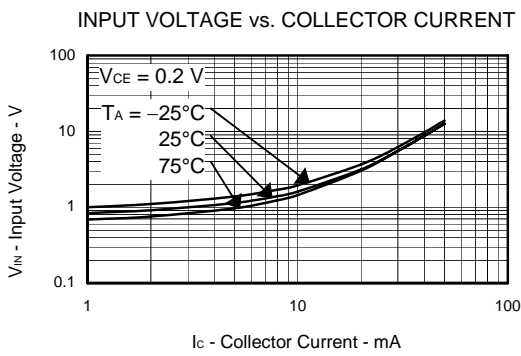
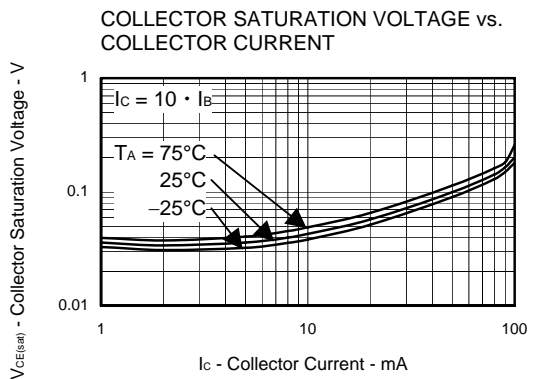
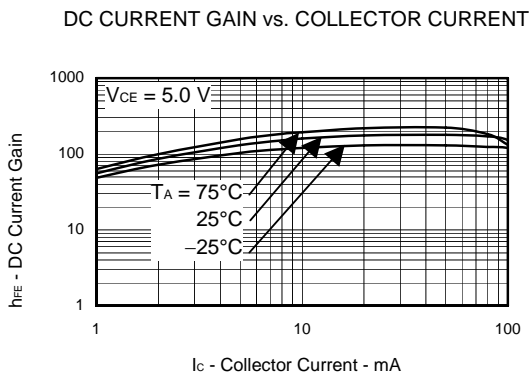
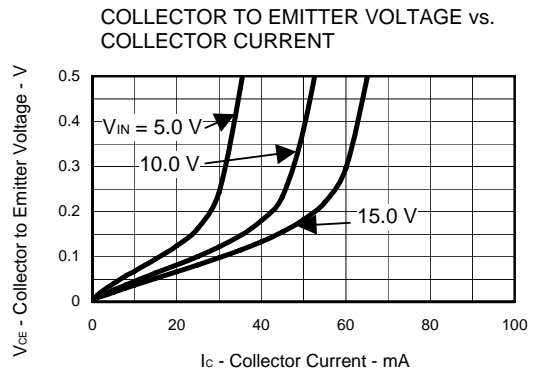
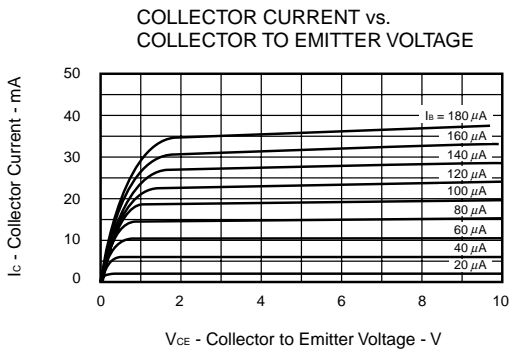
[KA4L3Z]  
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)



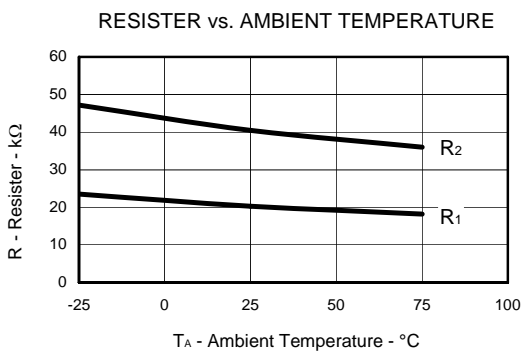
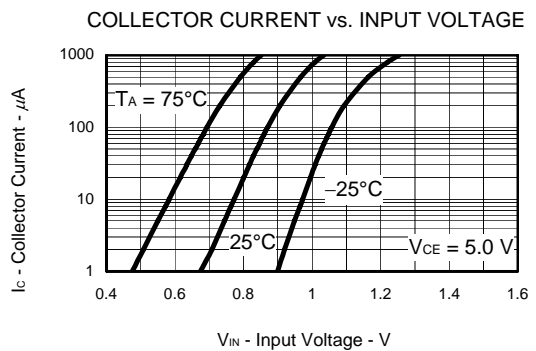
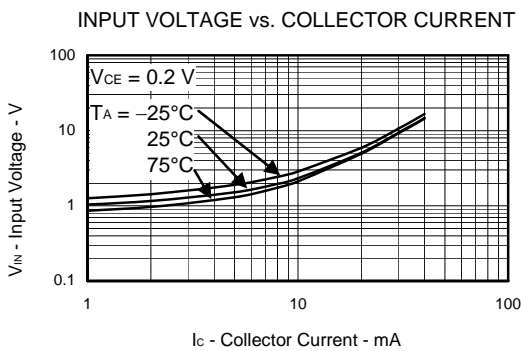
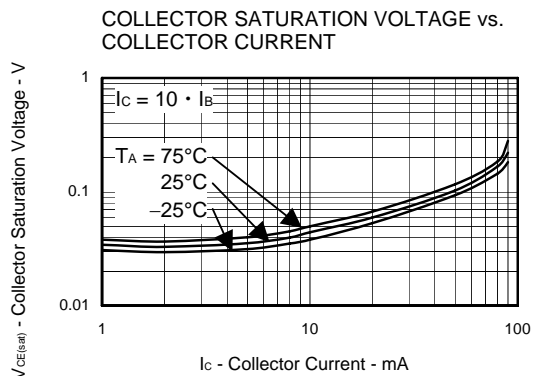
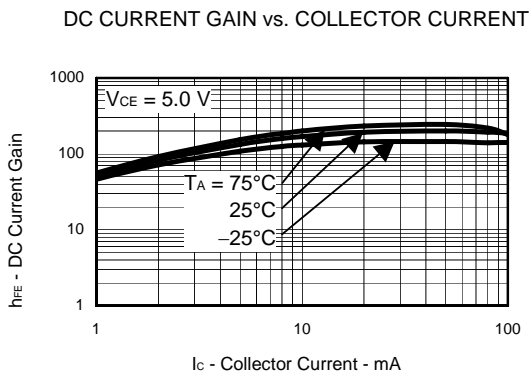
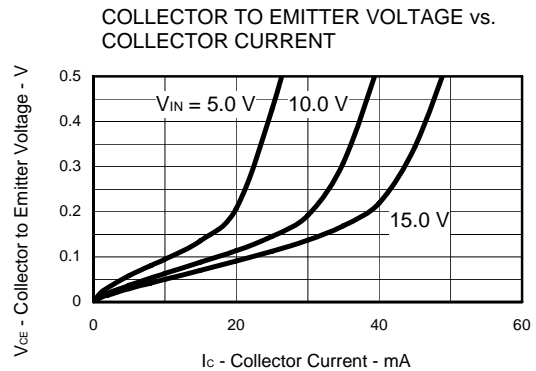
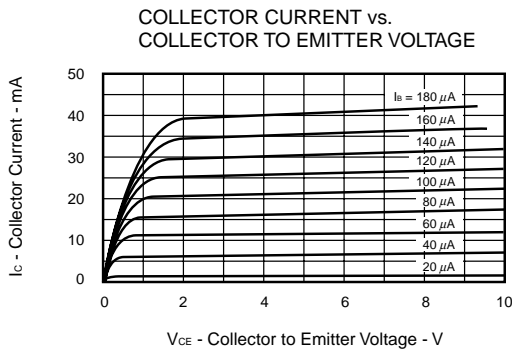
[KA4A3Q]  
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)



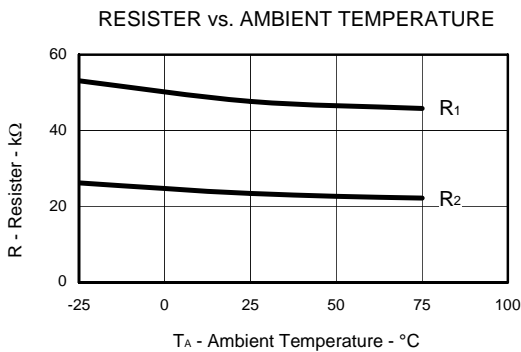
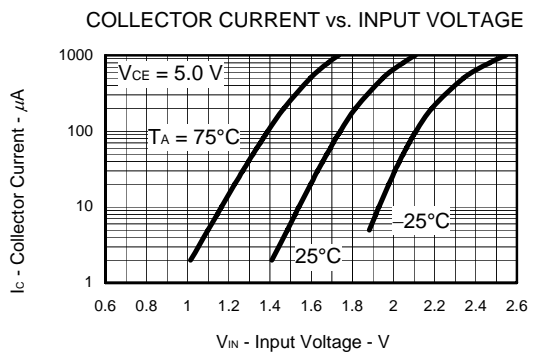
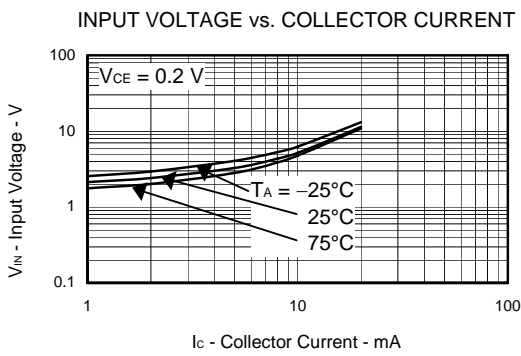
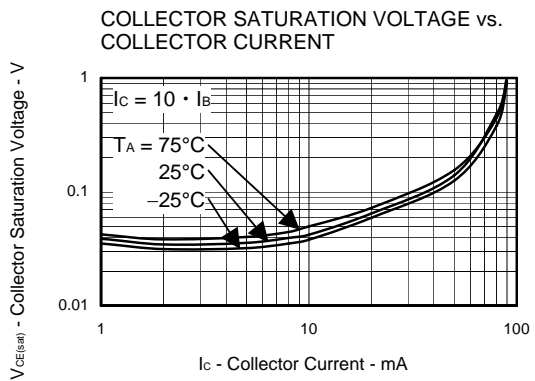
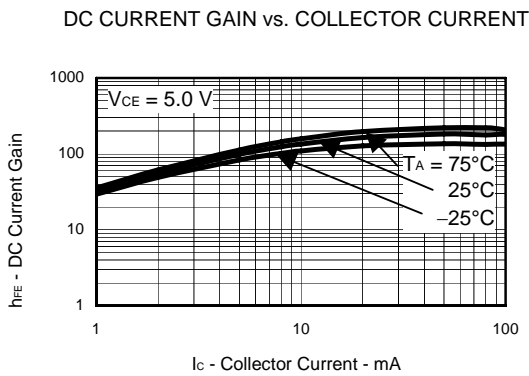
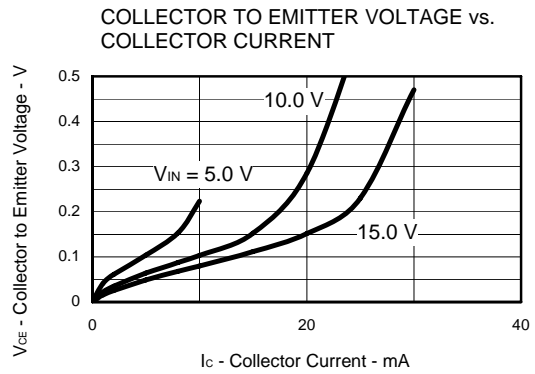
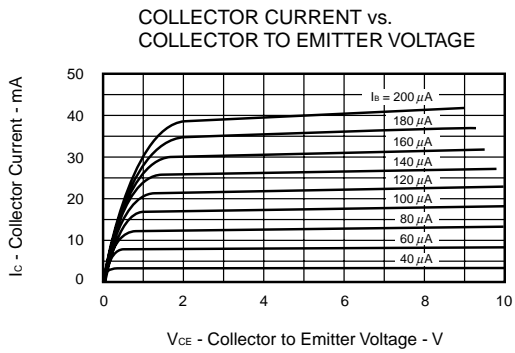
[KA4A4P]  
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)



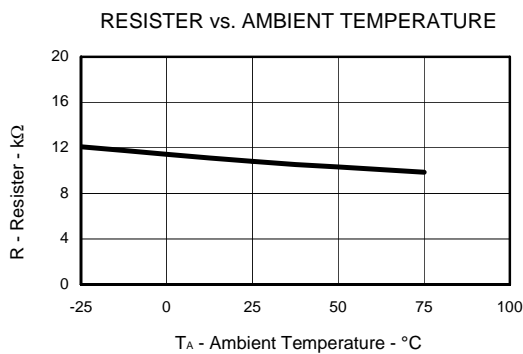
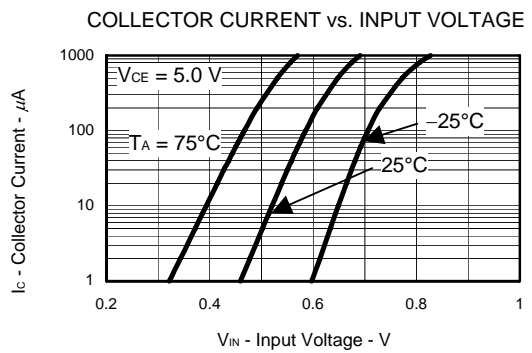
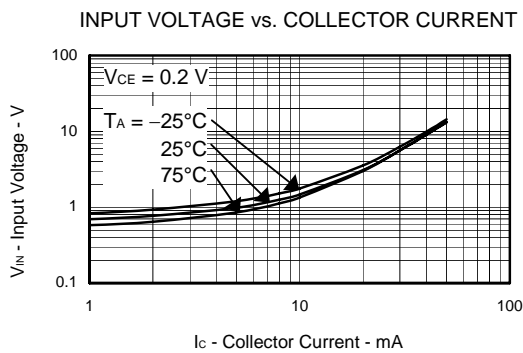
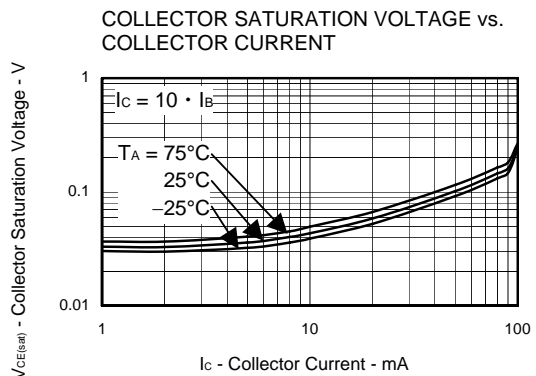
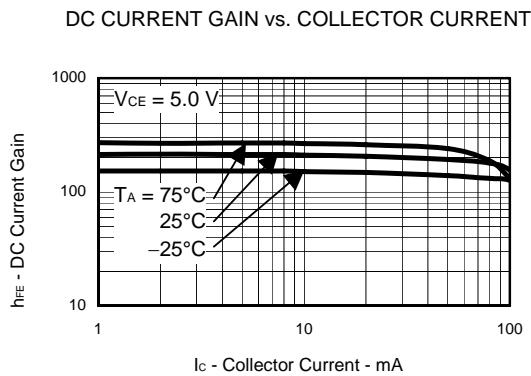
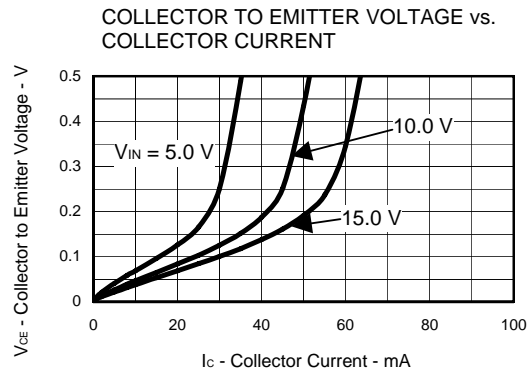
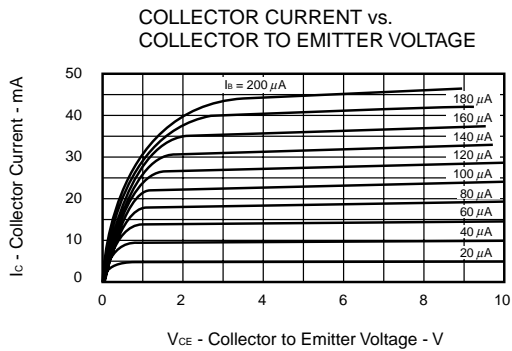
[KA4F4N]  
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)



[KA4L4L]  
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)

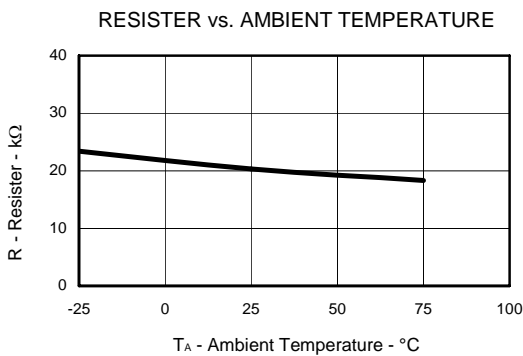
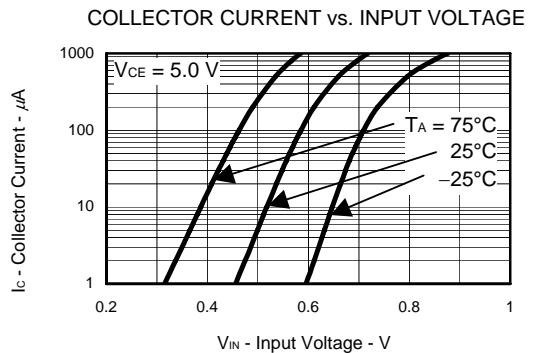
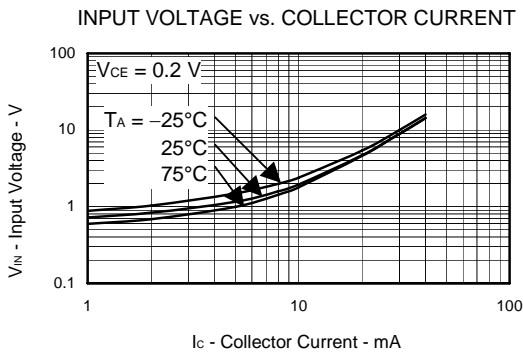
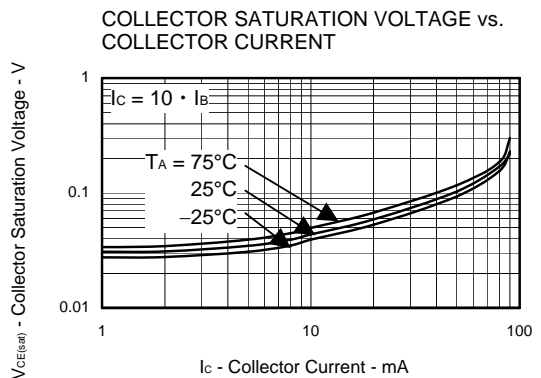
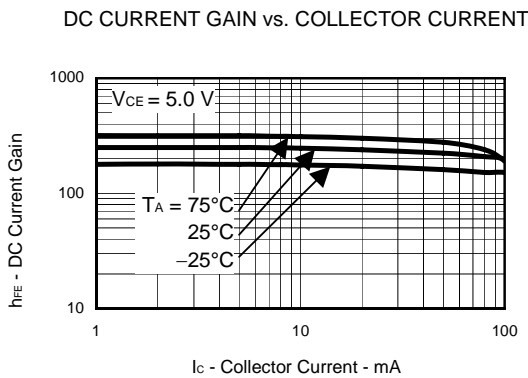
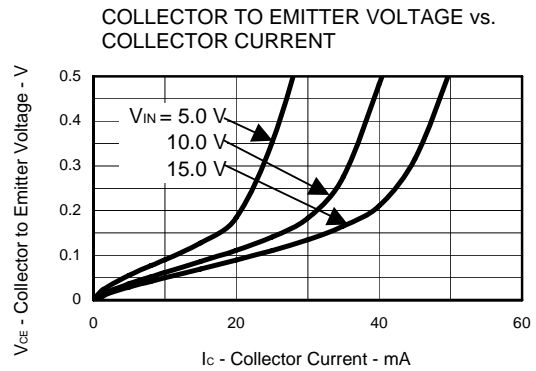
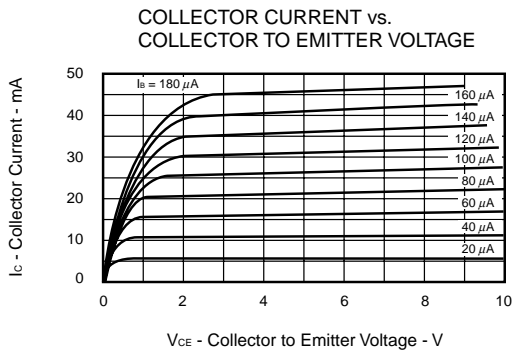


[KA4A4Z]  
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)

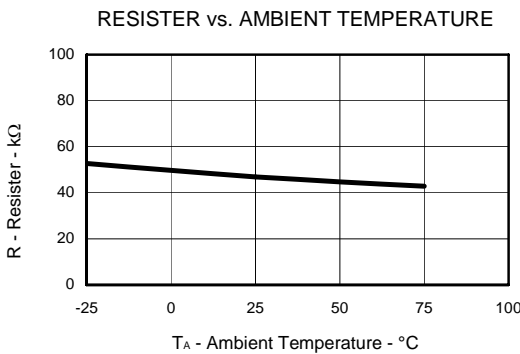
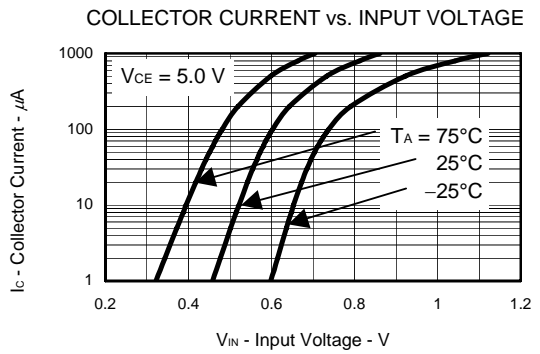
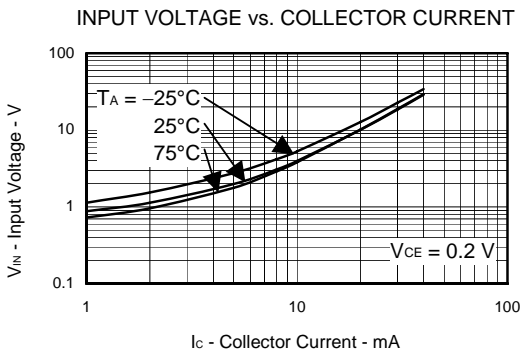
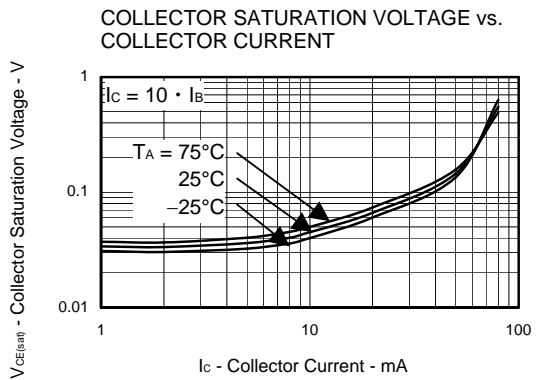
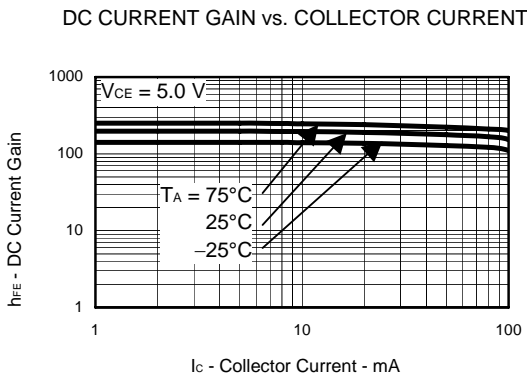
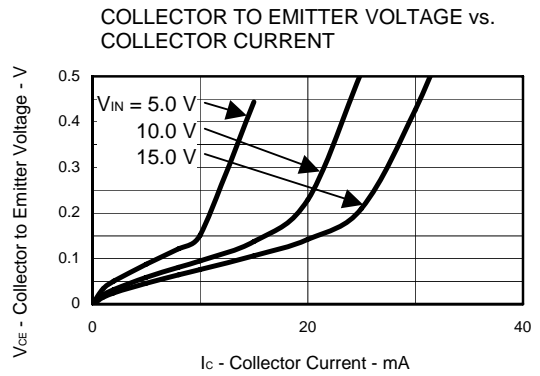
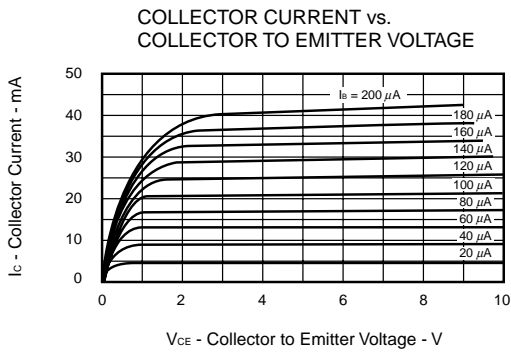




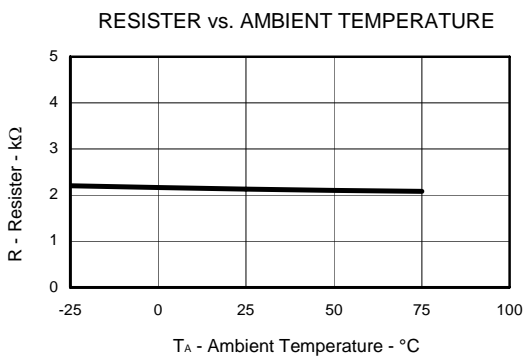
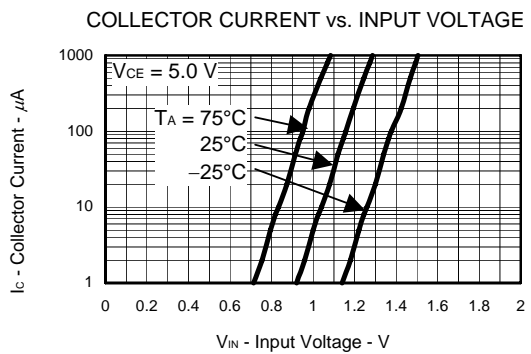
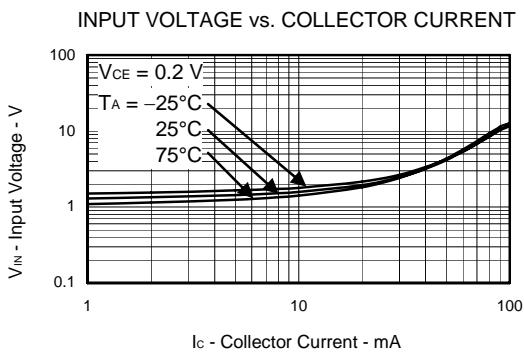
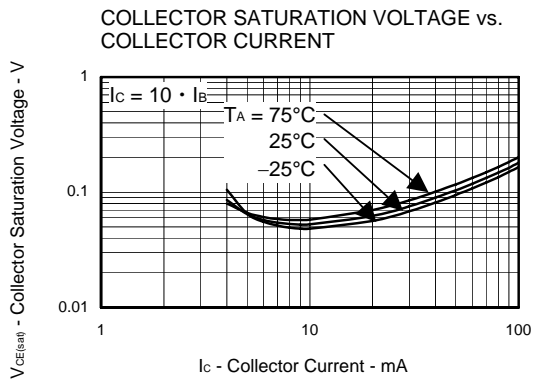
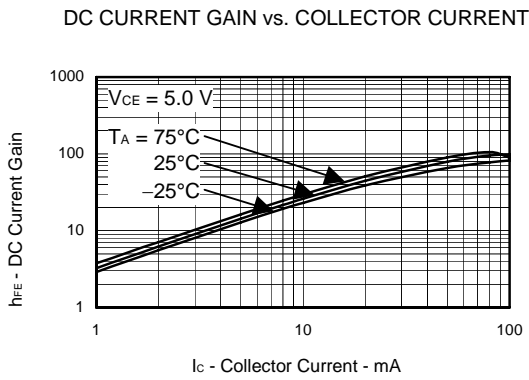
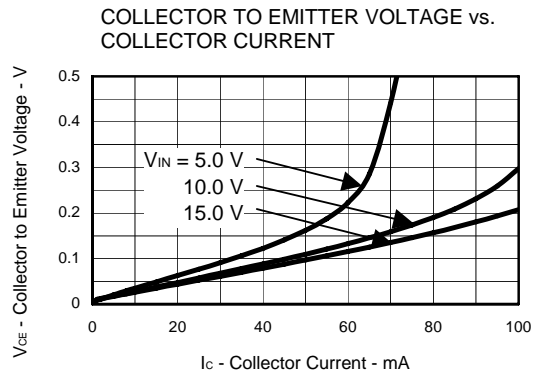
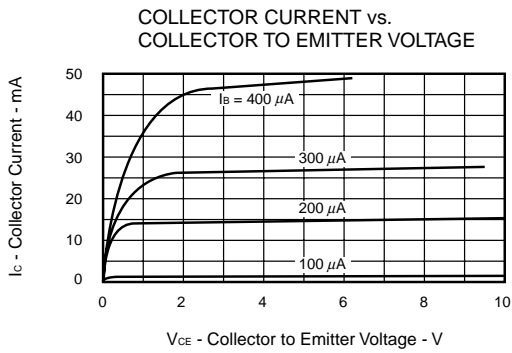
[KA4F4Z]  
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)



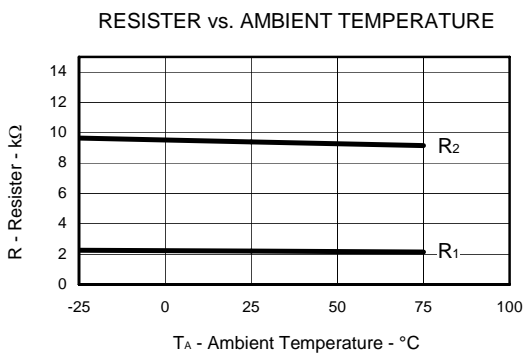
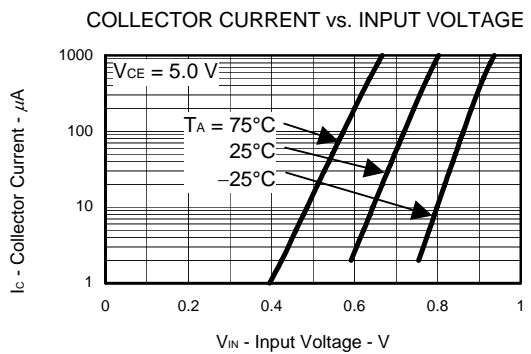
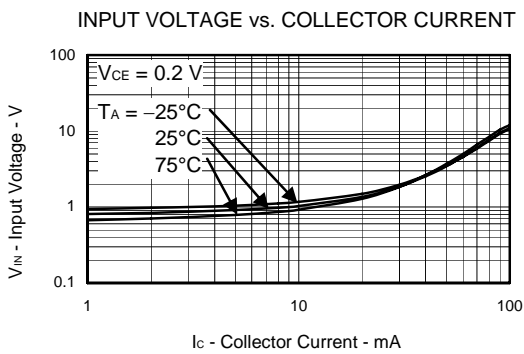
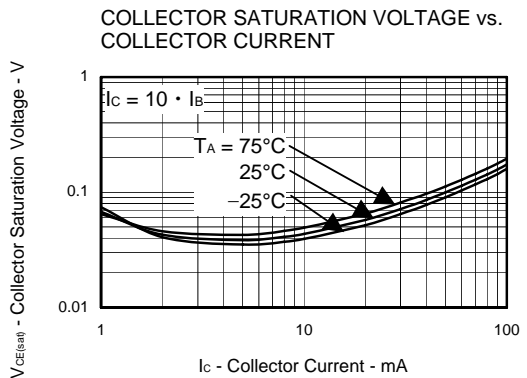
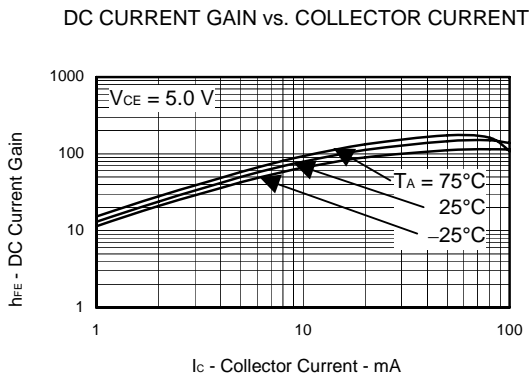
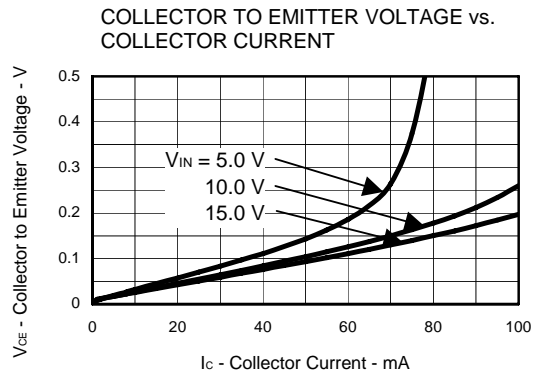
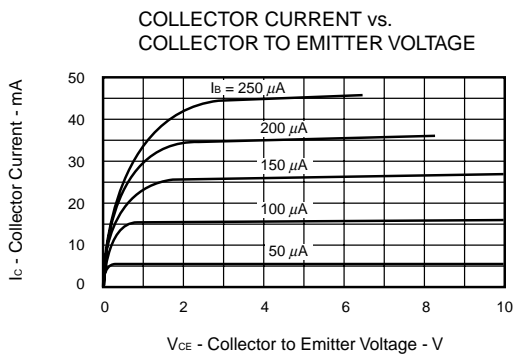
[KA4L4Z]  
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)



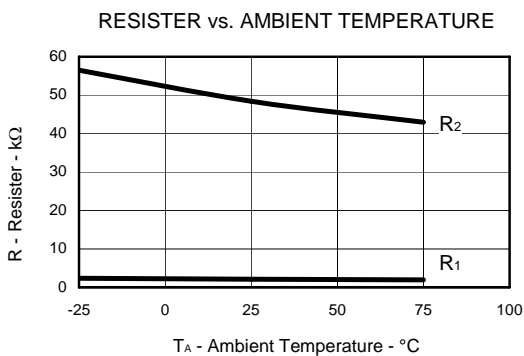
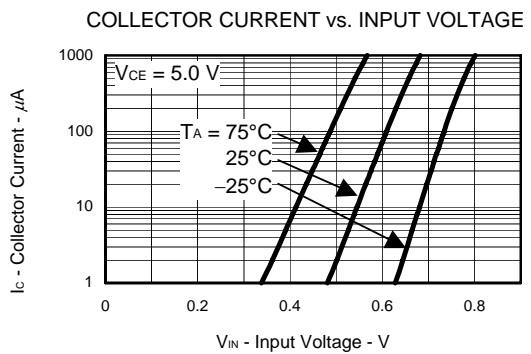
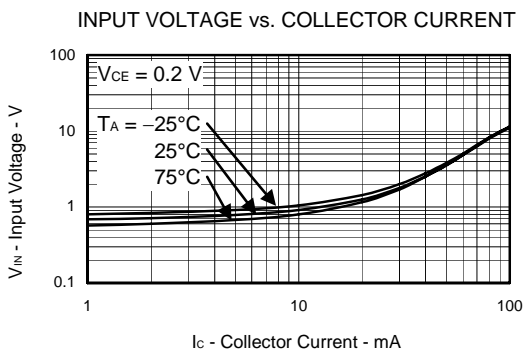
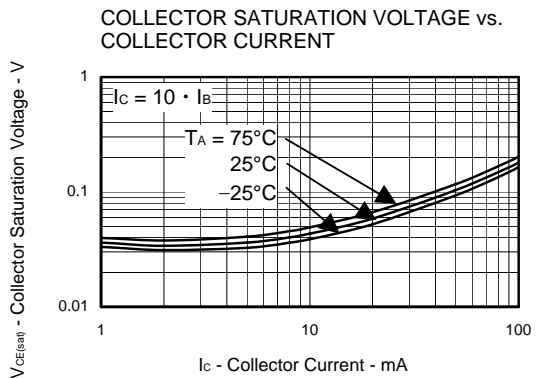
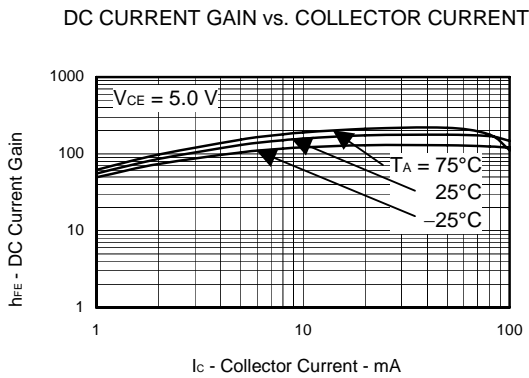
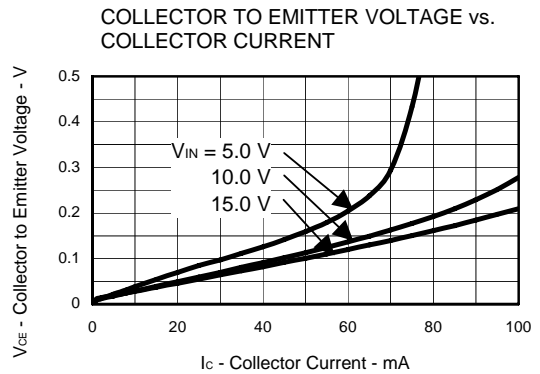
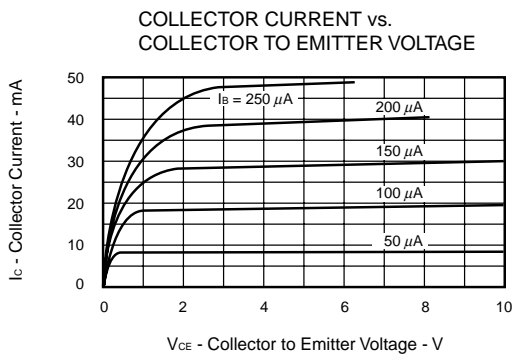
[KA4F3M]  
 TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)



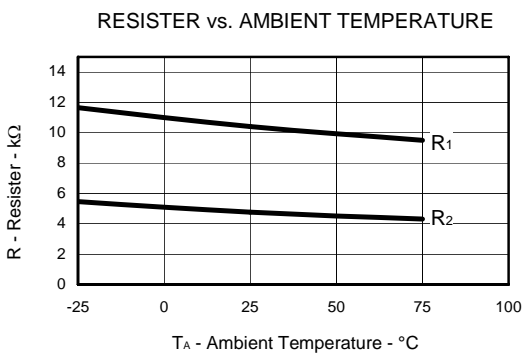
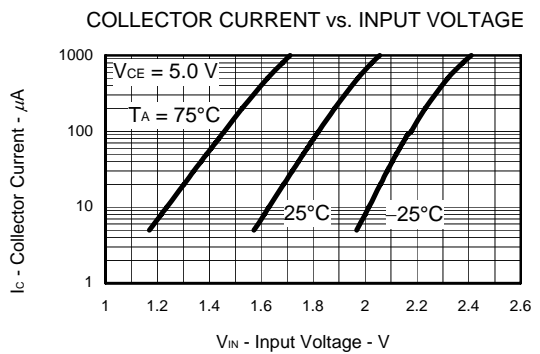
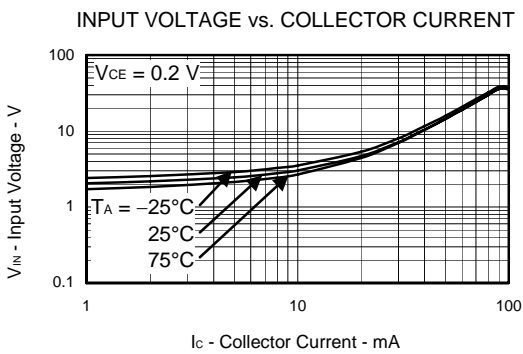
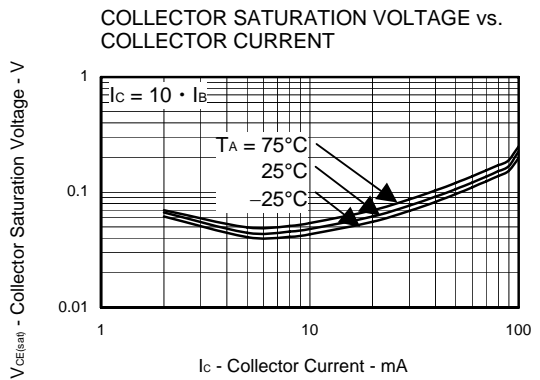
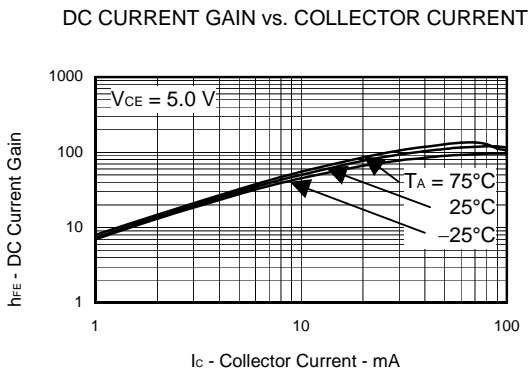
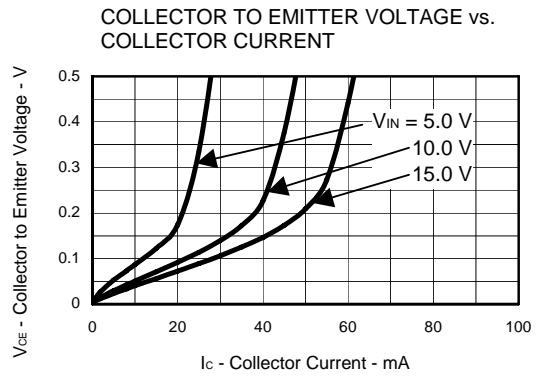
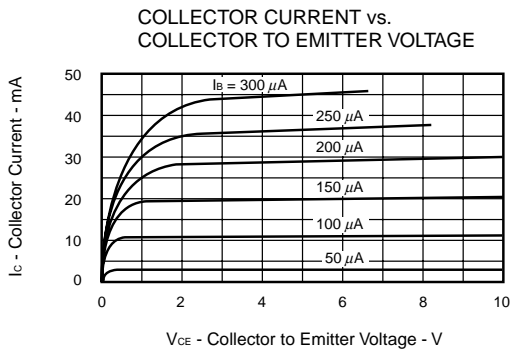
[KA4F3P]  
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)



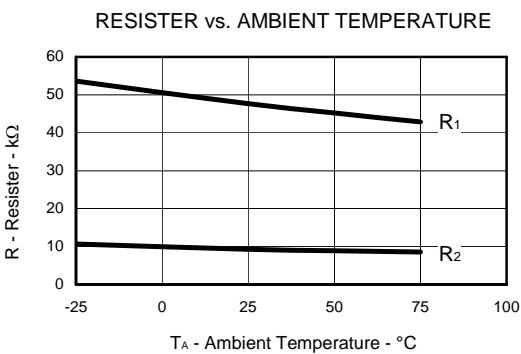
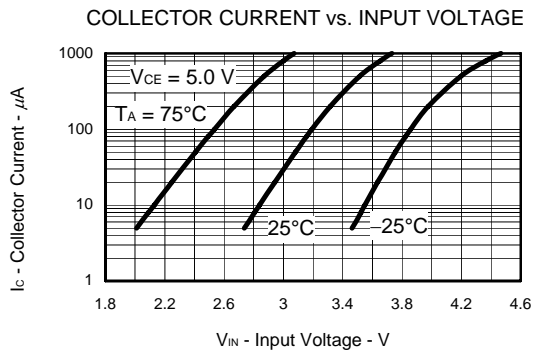
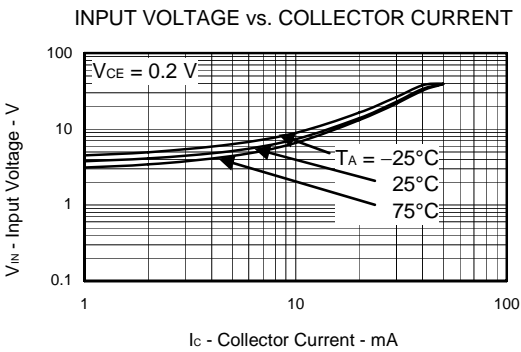
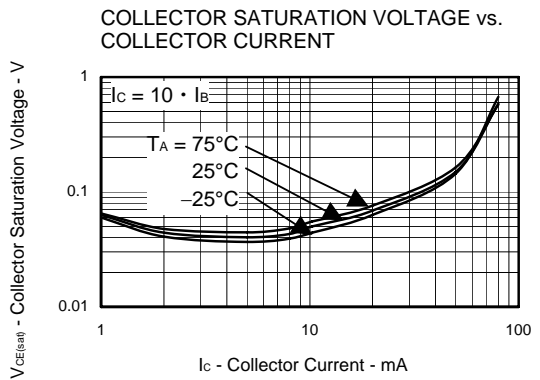
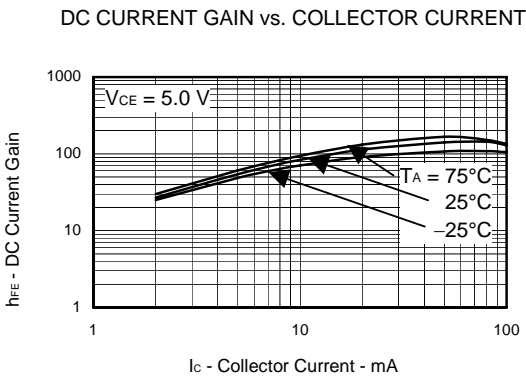
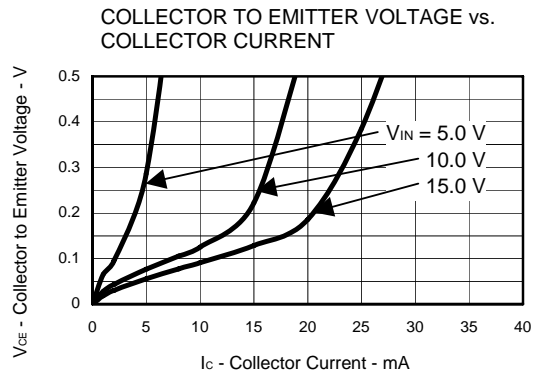
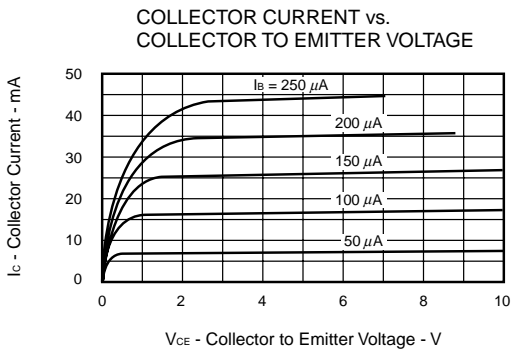
[KA4F3R]  
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)



[KA4A4L]  
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)



[KA4L4K]  
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)



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The "Specific" quality grade applies only to NEC Electronics products developed based on a customer-designated "quality assurance program" for a specific application. The recommended applications of an NEC Electronics product depend on its quality grade, as indicated below. Customers must check the quality grade of each NEC Electronics product before using it in a particular application.

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"Special": Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support).

"Specific": Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems and medical equipment for life support, etc.

The quality grade of NEC Electronics products is "Standard" unless otherwise expressly specified in NEC Electronics data sheets or data books, etc. If customers wish to use NEC Electronics products in applications not intended by NEC Electronics, they must contact an NEC Electronics sales representative in advance to determine NEC Electronics' willingness to support a given application.

(Note)

- (1) "NEC Electronics" as used in this statement means NEC Electronics Corporation and also includes its majority-owned subsidiaries.
- (2) "NEC Electronics products" means any product developed or manufactured by or for NEC Electronics (as defined above).