

# UNR2211/2212/2213/2214/2215/2216/2217/2218/2219/2210/ 221D/221E/221F/221K/221L/221M/221N/221T/221V/221Z

## (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.

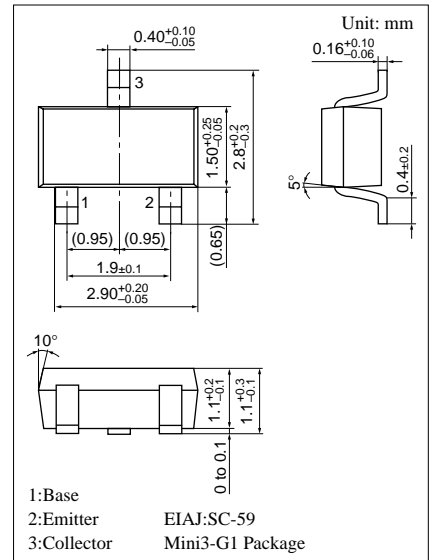
#### Resistance by Part Number

	Marking Symbol	(R <sub>1</sub> )	(R <sub>2</sub> )
• UNR2211	8A	10kΩ	10kΩ
• UNR2212	8B	22kΩ	22kΩ
• UNR2213	8C	47kΩ	47kΩ
• UNR2214	8D	10kΩ	47kΩ
• UNR2215	8E	10kΩ	—
• UNR2216	8F	4.7kΩ	—
• UNR2217	8H	22kΩ	—
• UNR2218	8I	0.51kΩ	5.1kΩ
• UNR2219	8K	1kΩ	10kΩ
• UNR2210	8L	47kΩ	—
• UNR221D	8M	47kΩ	10kΩ
• UNR221E	8N	47kΩ	22kΩ
• UNR221F	8O	4.7kΩ	10kΩ
• UNR221K	8P	10kΩ	4.7kΩ
• UNR221L	8Q	4.7kΩ	4.7kΩ
• UNR221M	EL	2.2kΩ	47kΩ
• UNR221N	EX	4.7kΩ	47kΩ
• UNR221T	EZ	22kΩ	47kΩ
• UNR221V	FD	2.2kΩ	2.2kΩ
• UNR221Z	FF	4.7kΩ	22kΩ

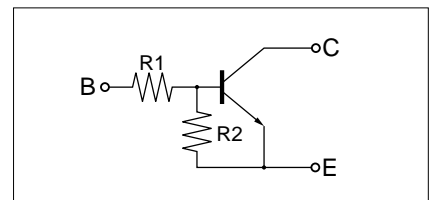
#### Absolute Maximum Ratings (Ta=25°C)

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>stg</sub>	-55 to +150	°C

Note) The part numbers in the parenthesis show conventional part number.



#### Internal Connection



UNR2211/2212/2213/2214/2215/2216/2217/2218/2219/2210/  
**Transistors with built-in Resistor 221D/221E/221F/221K/221L/221M/221N/221T/221V/221Z**

**Electrical Characteristics** (T<sub>a</sub>=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	UNR2211	I <sub>EBO</sub>	V <sub>EB</sub> = 6V, I <sub>C</sub> = 0			0.5	mA	
	UNR2212/2214/221E/221D/221M/221N/221T					0.2		
	UNR2213					0.1		
	UNR2215/2216/2217/2210					0.01		
	UNR221F/221K					1.0		
	UNR2219					1.5		
	UNR2218/221L/221V					2.0		
	UNR221Z					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	UNR2211	h <sub>FE</sub>	V <sub>CE</sub> = 10V, I <sub>C</sub> = 5mA	35			—	
	UNR2212/221E			60				
	UNR2213/2214/221M			80				
	UNR2215*/2216*/2217*/2210*			160		460		
	UNR221F/221D/2219			30				
	UNR2218/221K/221L			20				
	UNR221N/221T			80		400		
	UNR221V			60		200		
Collector to emitter saturation voltage		V <sub>CE(sat)</sub>	I <sub>C</sub> = 10mA, I <sub>B</sub> = 0.3mA			0.25	V	
				UNR221V		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	
				UNR2213/221K				0.2
				UNR221D				0.2
				UNR221E				0.2
Transition frequency		f <sub>T</sub>	V <sub>CB</sub> = 10V, I <sub>E</sub> = -2mA, f = 200MHz		150		MHz	
Input resistance	UNR2211/2214/2215/221K	R <sub>i</sub>		(-30%)		10	(+30%)	kΩ
	UNR2212/2217/221T					22		
	UNR2213/221D/221E/2210					47		
	UNR2216/221F/221L/221N/221Z					4.7		
	UNR2218					0.51		
	UNR2219					1		
	UNR221M/221V					2.2		

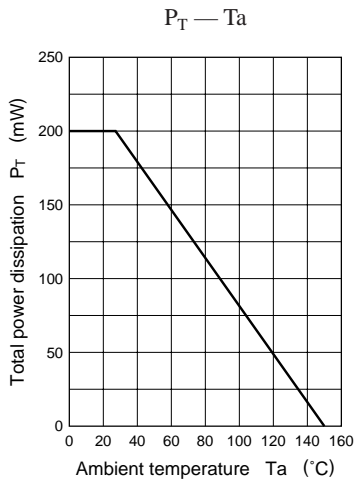
\* h<sub>FE</sub> rank classification (UNR2215/2216/2217/2210)

Rank	Q	R	S
h <sub>FE</sub>	160 to 260	210 to 340	290 to 460

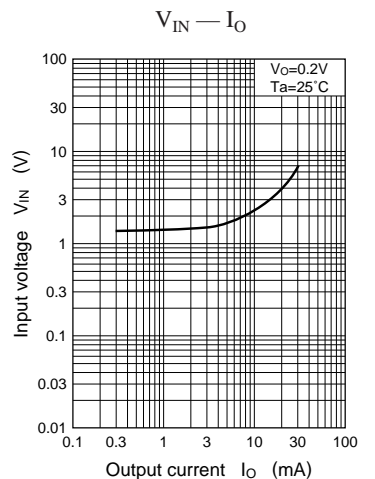
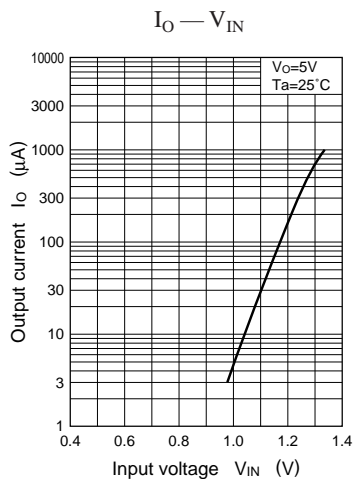
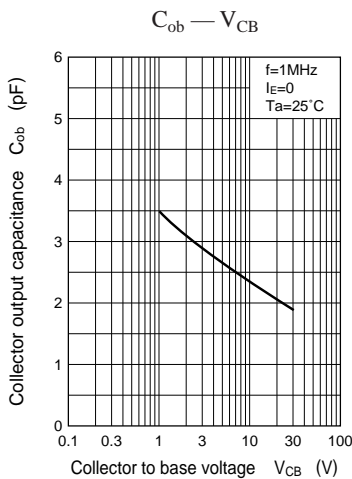
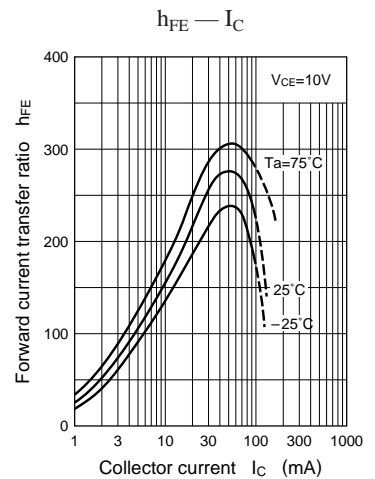
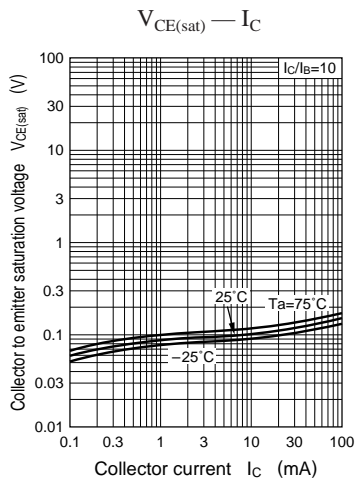
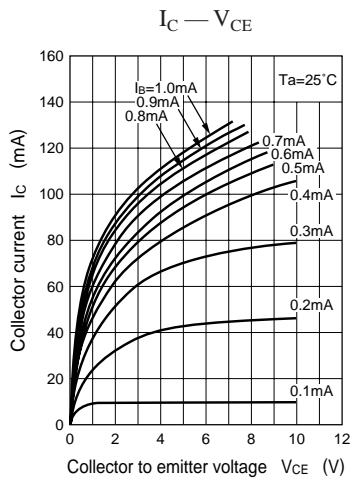
■ Electrical Characteristics (continued) (Ta=25°C)

Parameter		Symbol	Conditions	min	typ	max	Unit
Resis- tance ratio	UNR2211/2212/2213/221L	$R_1/R_2$		0.8	1.0	1.2	
	UNR2214			0.17	0.21	0.25	
	UNR2218/2219			0.08	0.1	0.12	
	UNR221D				4.7		
	UNR221E				2.14		
	UNR221F/221T				0.47		
	UNR221K				2.13		
	UNR221M				0.047		
	UNR211N				0.1		
	UNR211V				1.0		
	UNR211Z				0.21		

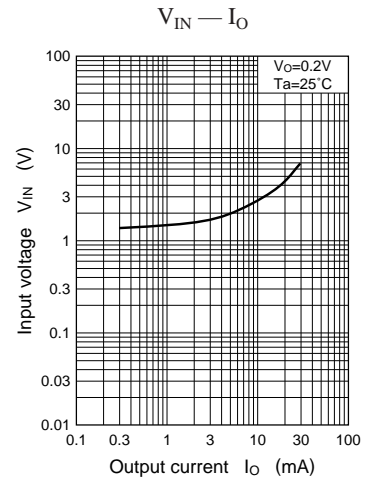
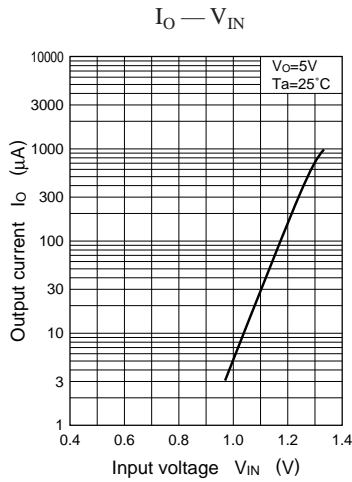
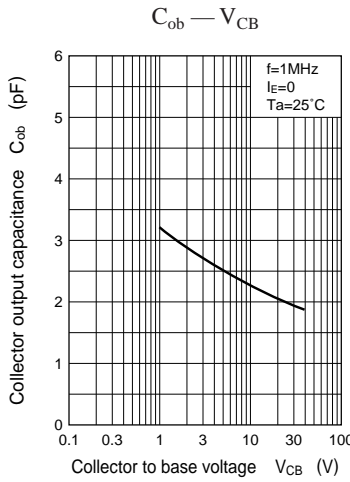
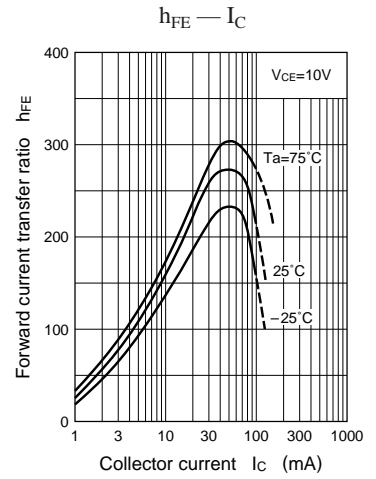
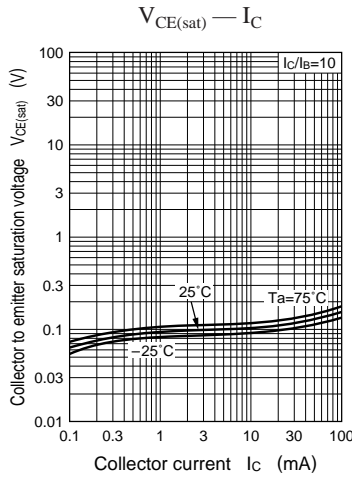
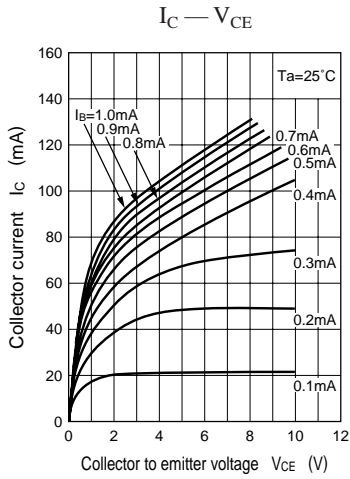
Common characteristics chart



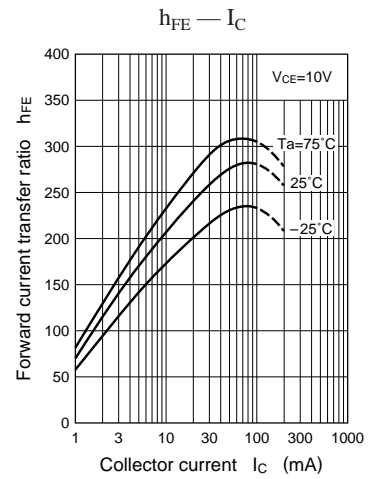
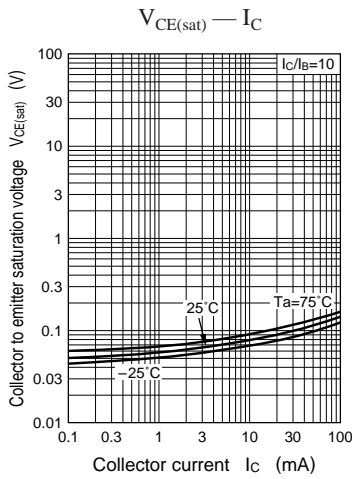
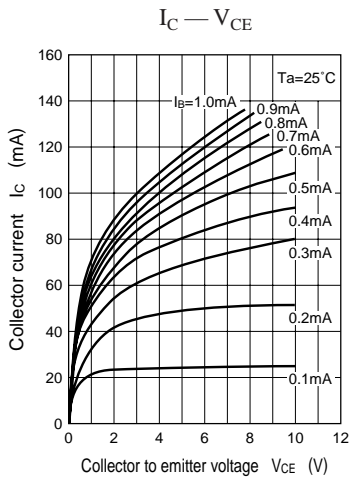
Characteristics charts of UNR2211

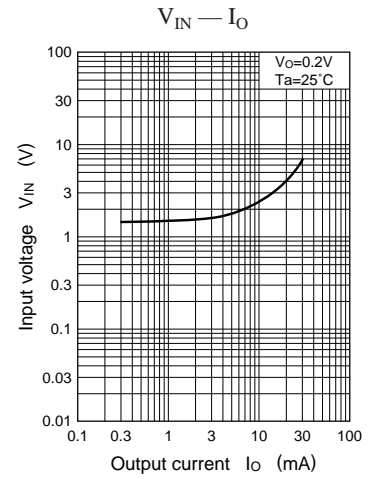
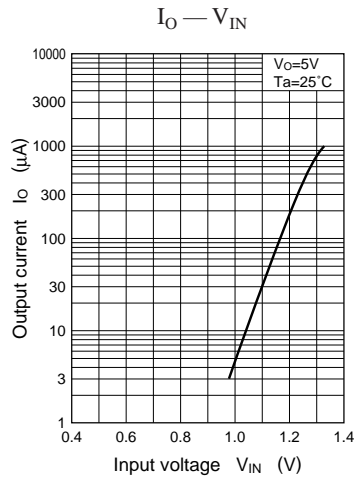
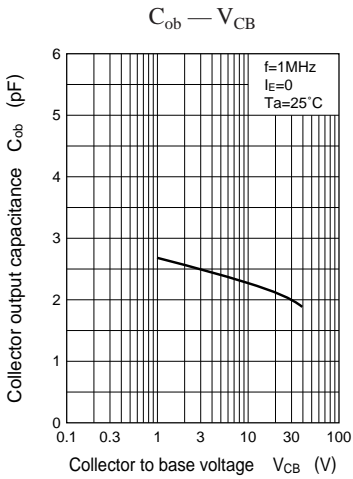


Characteristics charts of UNR2212

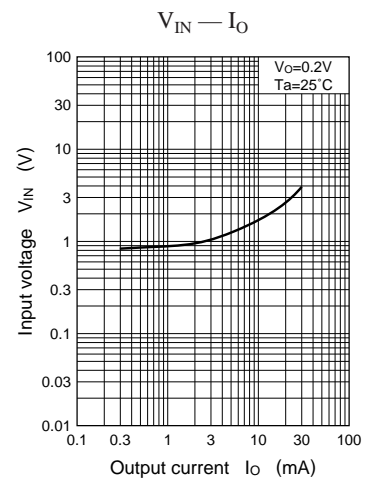
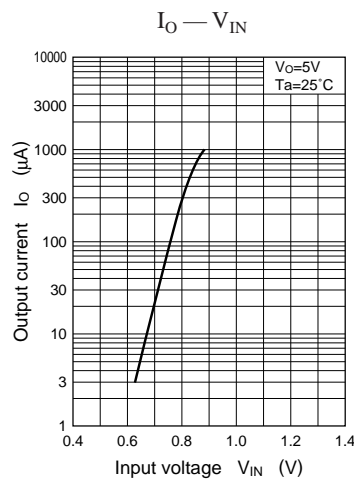
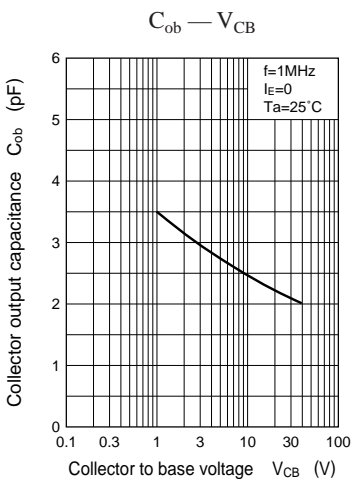
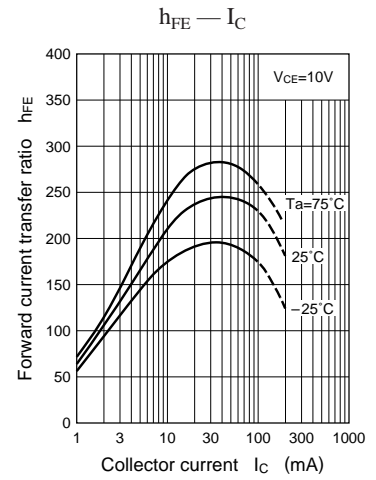
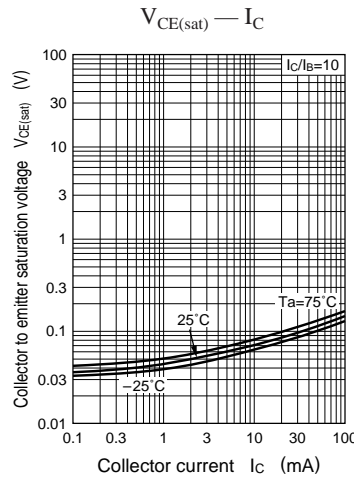
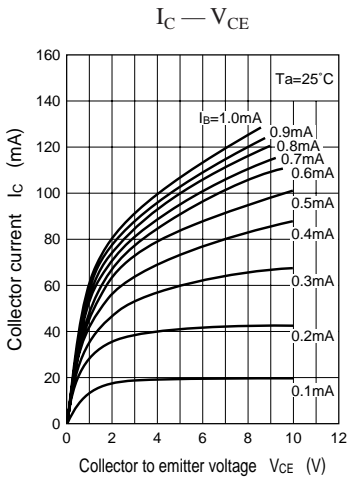


Characteristics charts of UNR2213

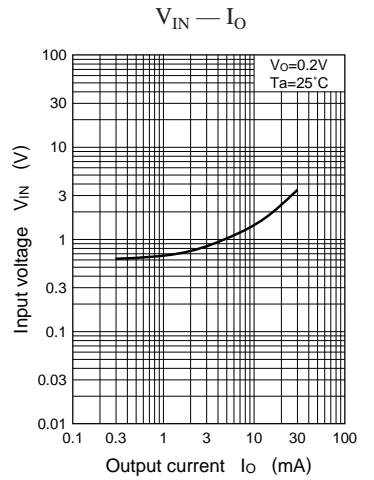
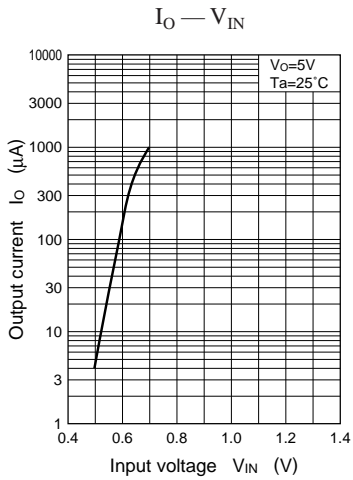
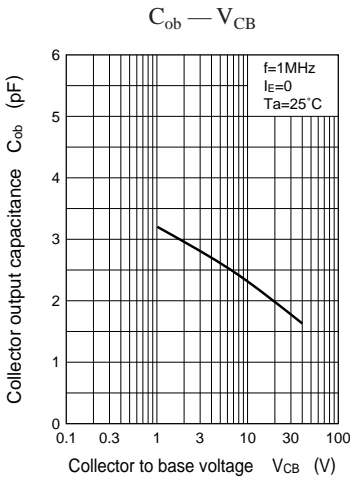
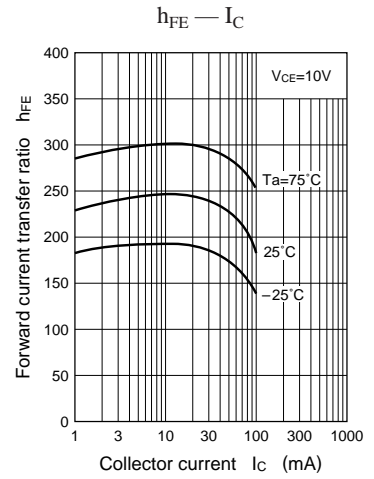
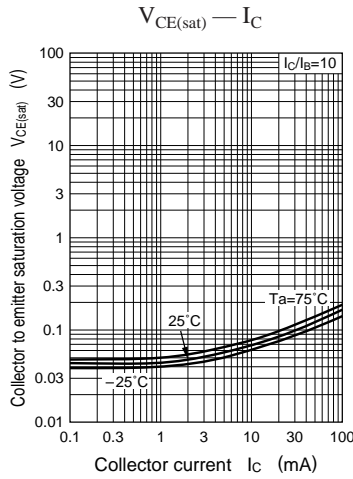
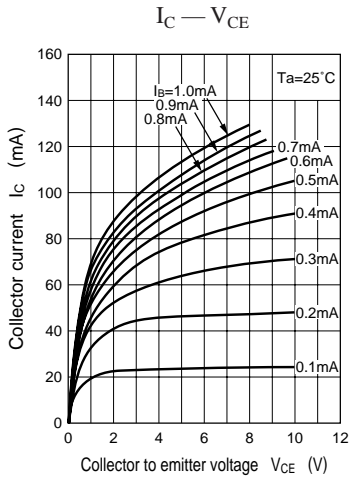




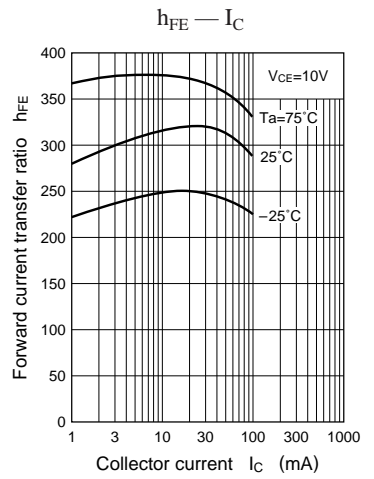
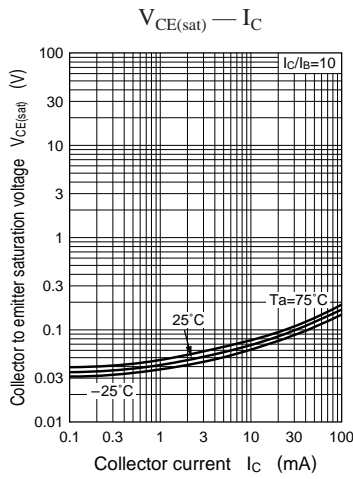
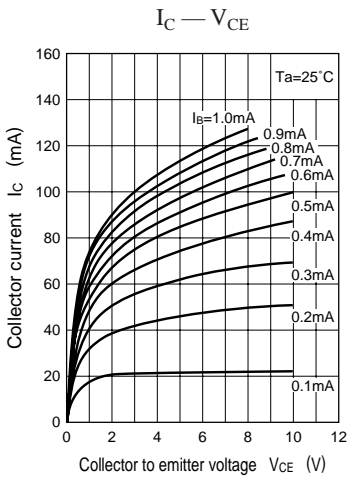
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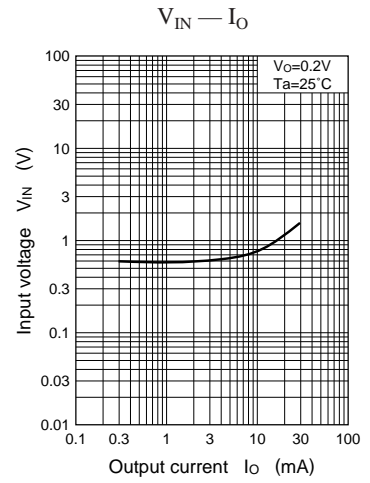
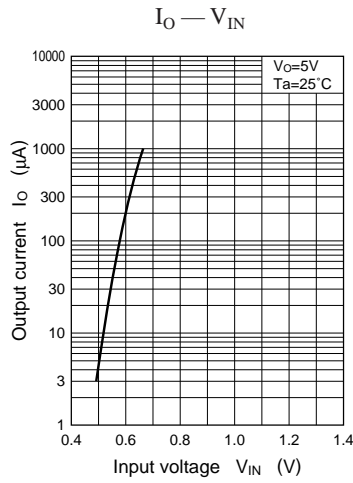
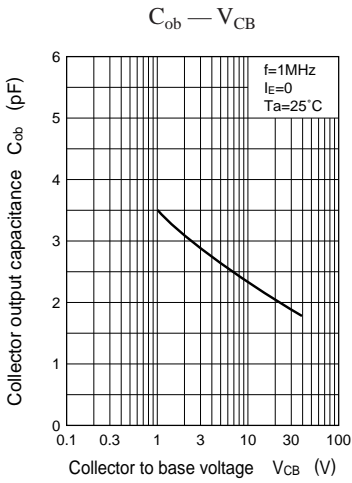


Characteristics charts of UNR2215

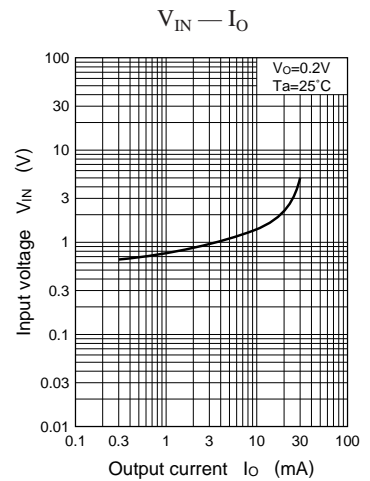
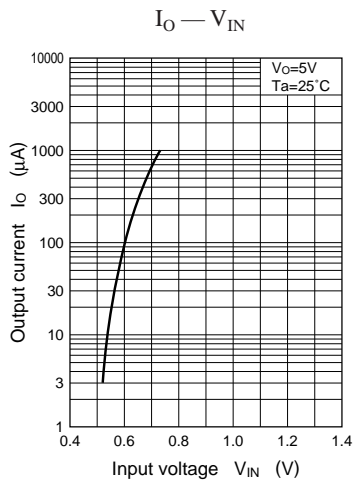
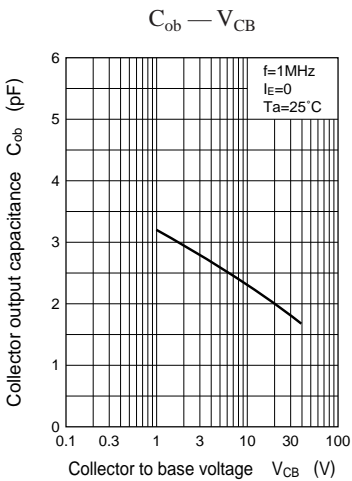
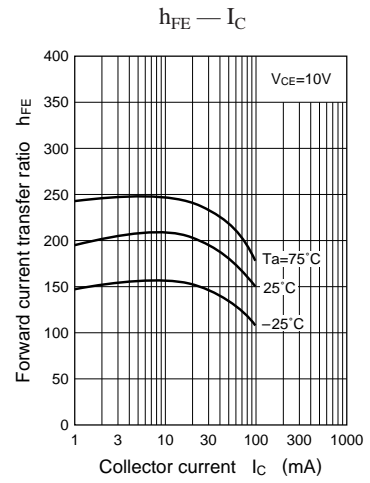
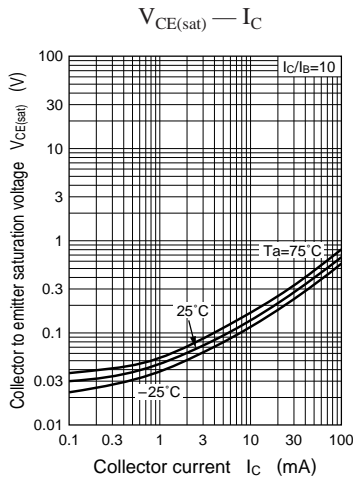
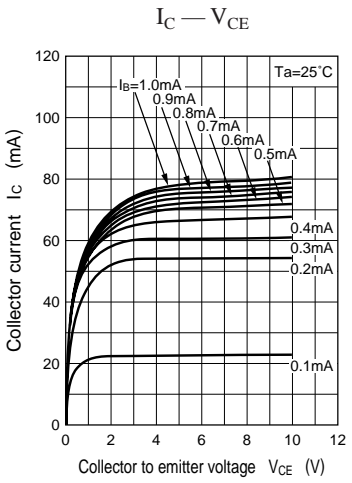


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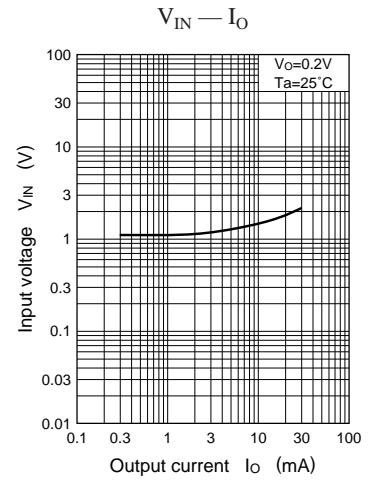
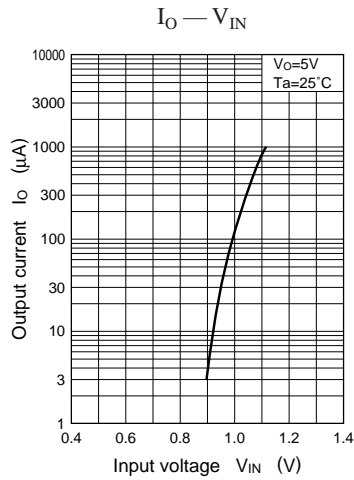
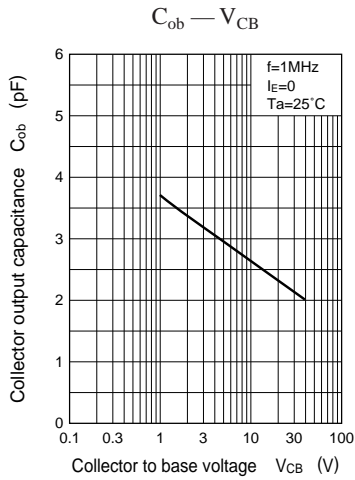
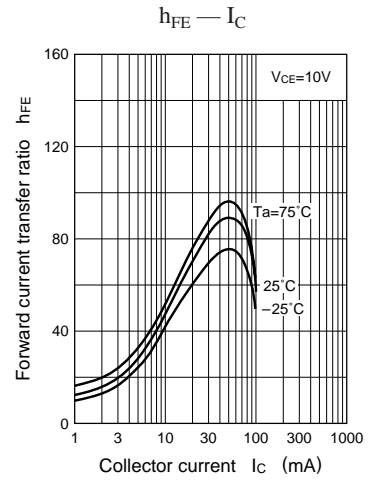
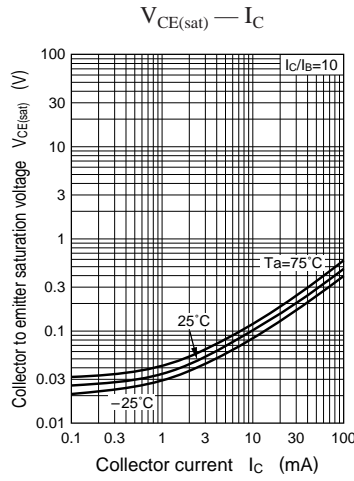
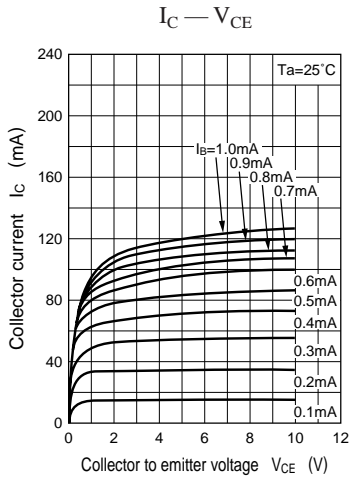




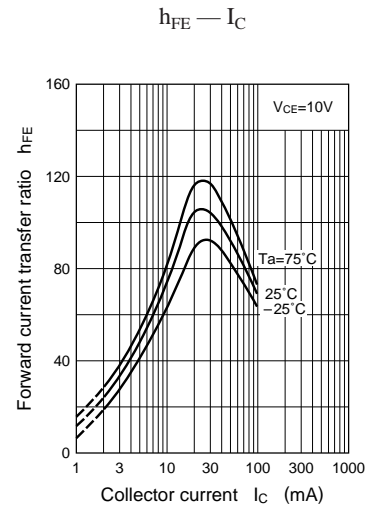
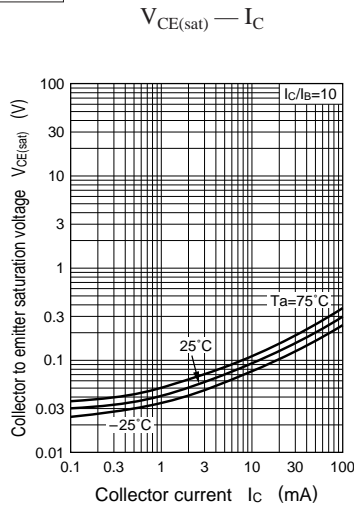
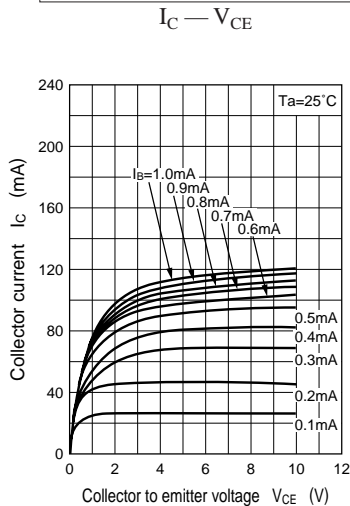
Characteristics charts of UNR2217

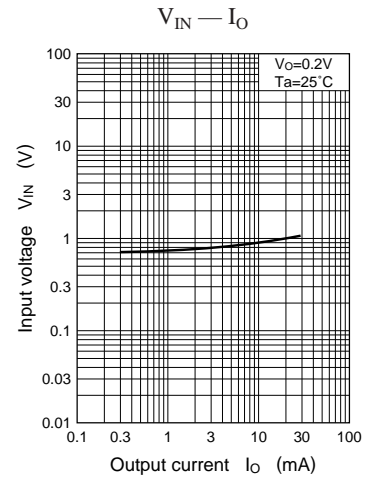
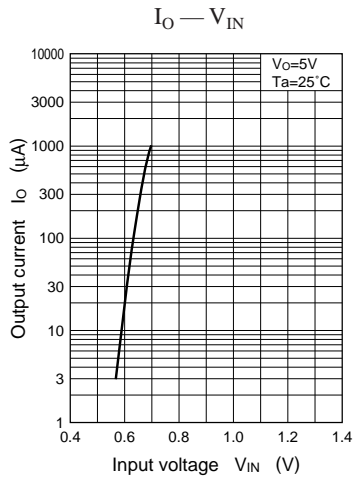
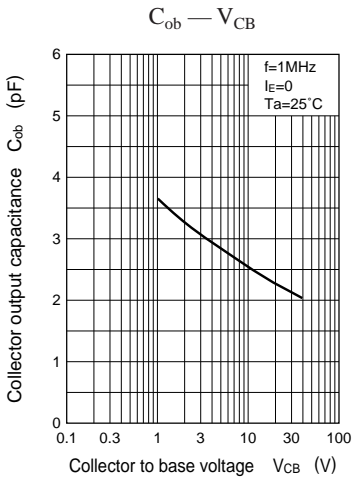


Characteristics charts of UNR2218

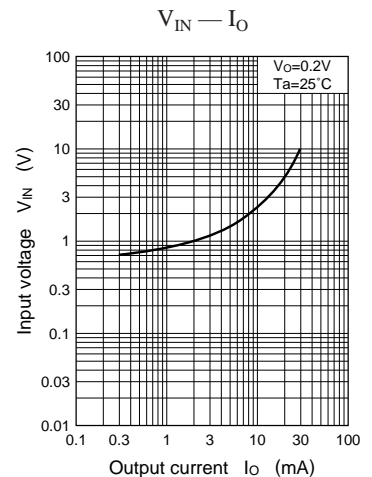
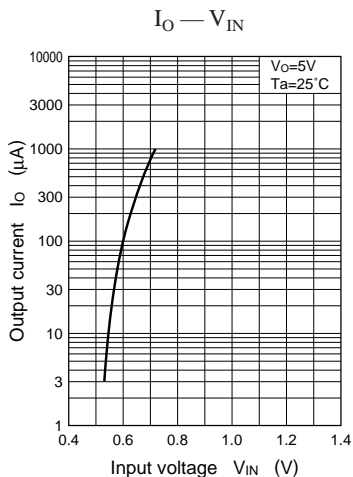
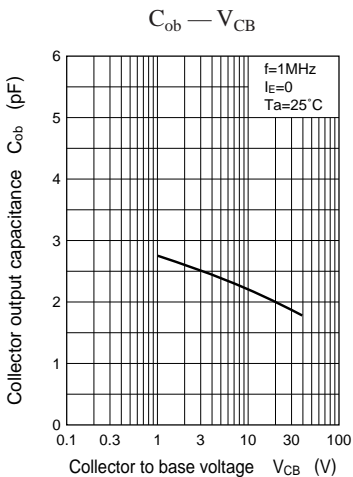
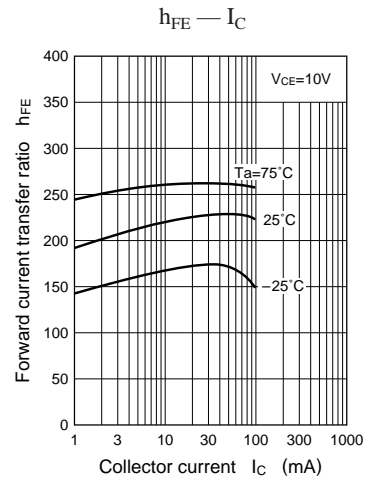
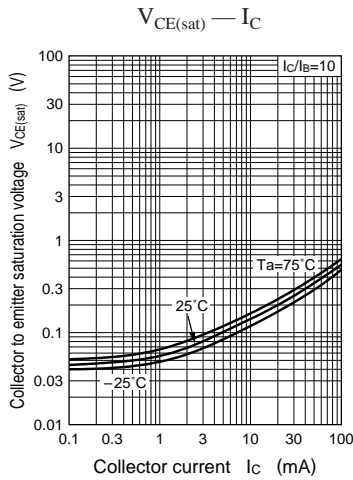
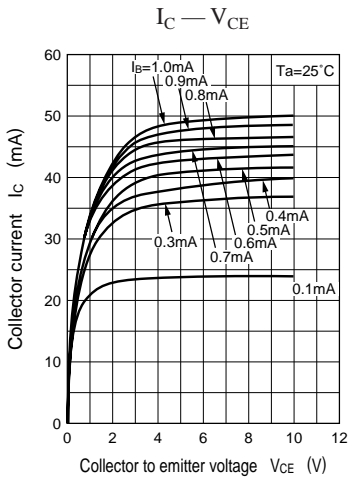


Characteristics charts of UNR2219

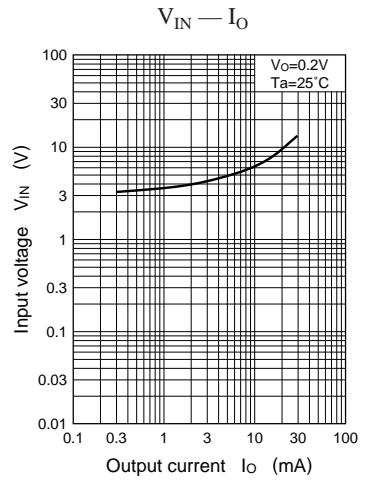
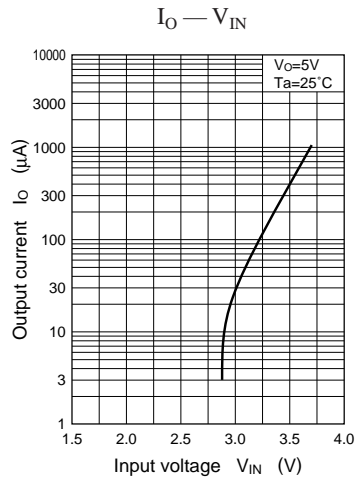
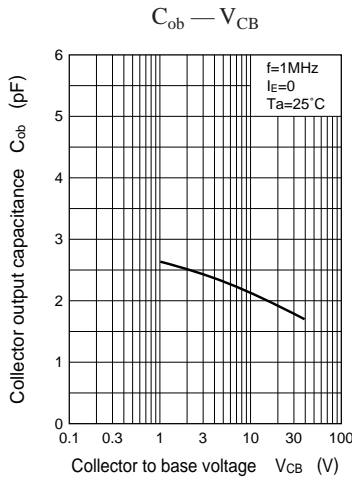
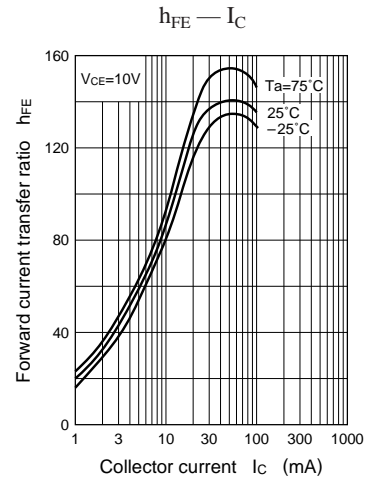
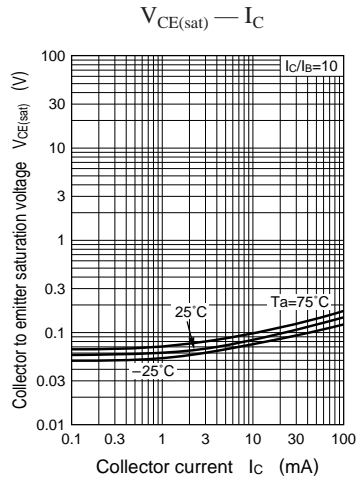
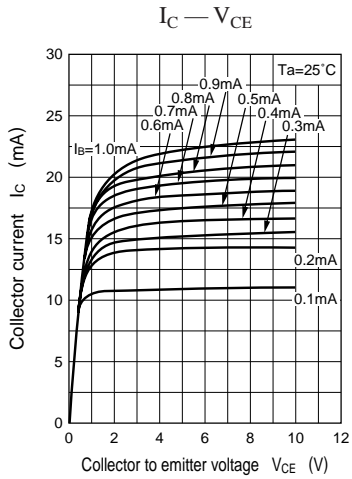




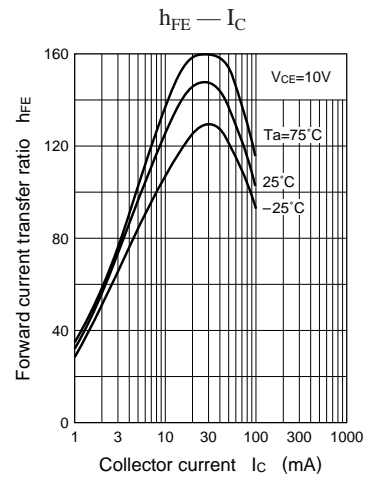
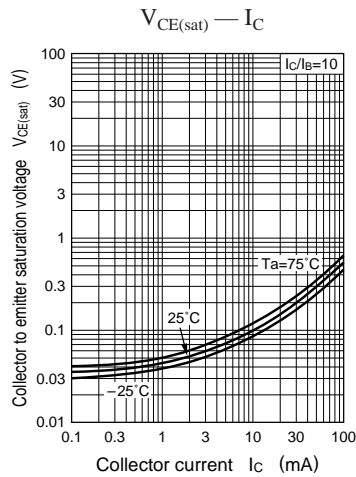
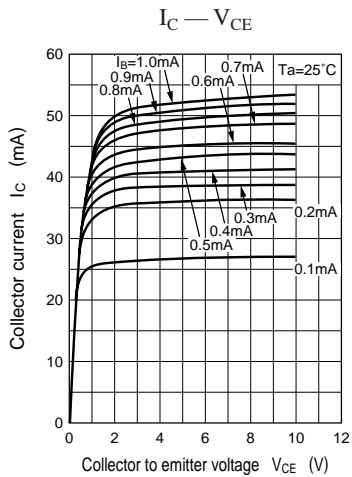
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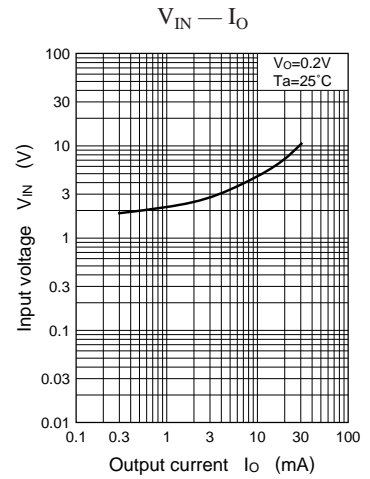
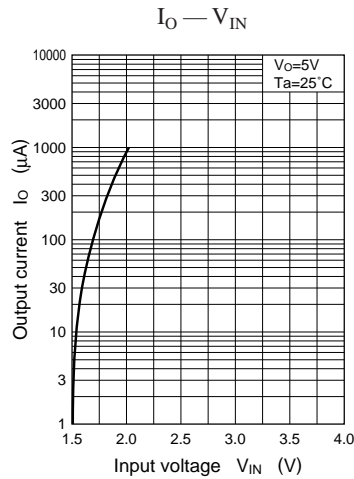
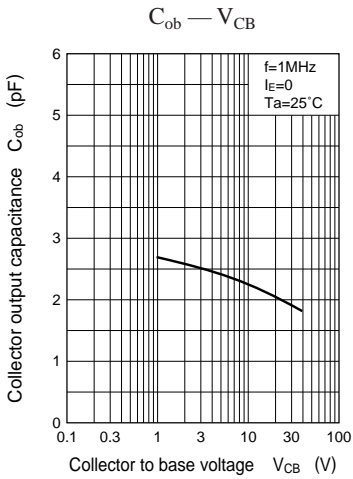


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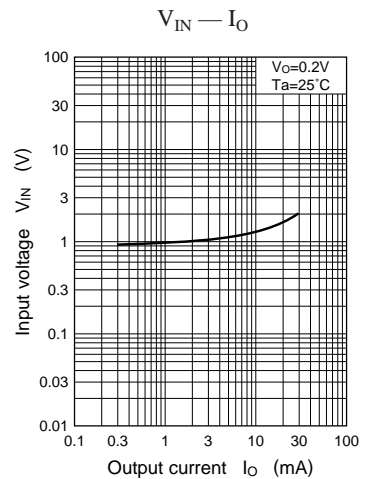
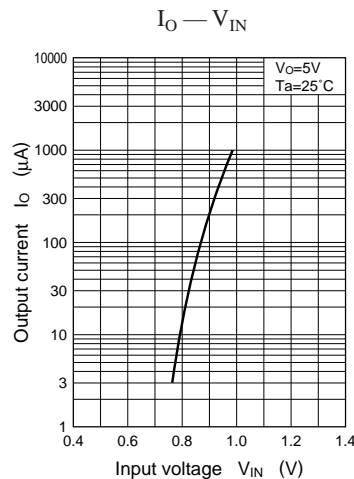
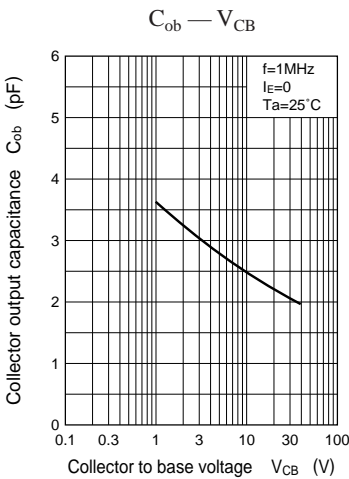
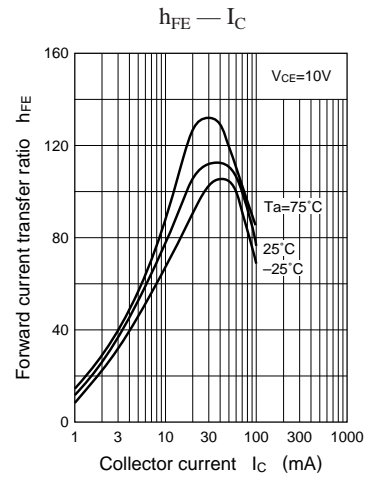
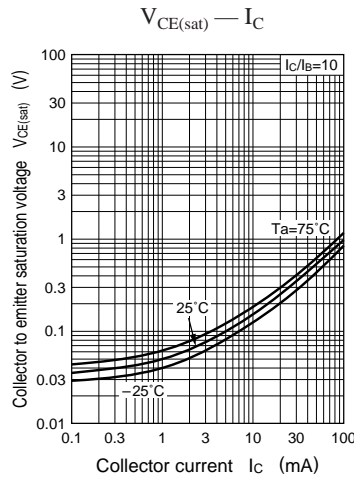
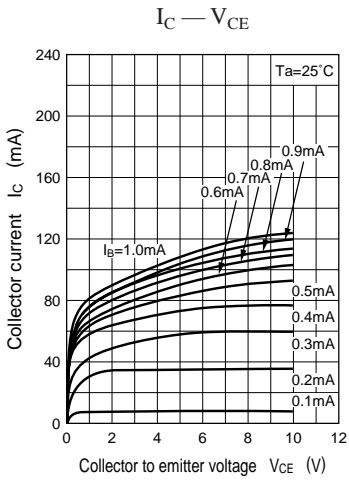


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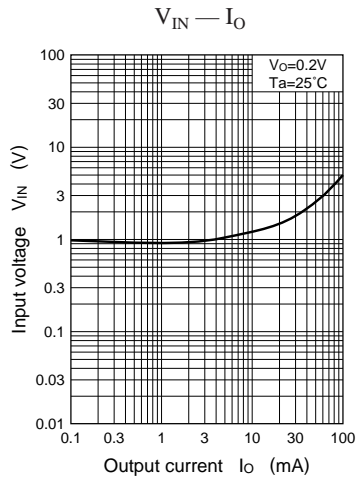
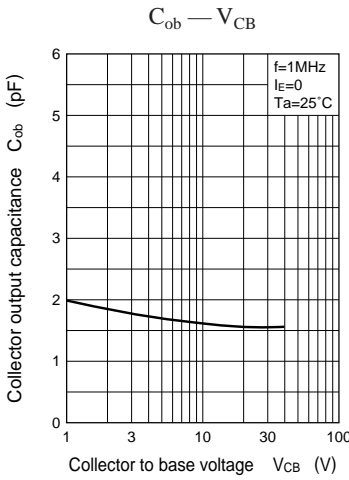
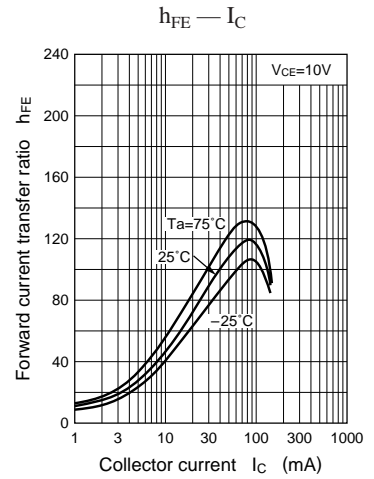
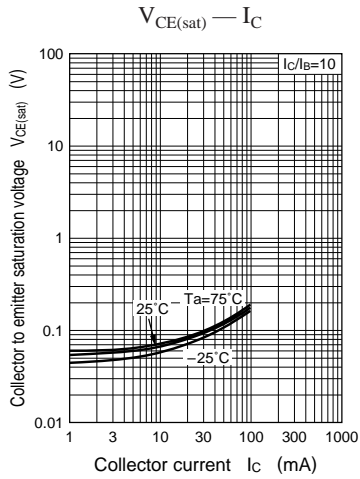
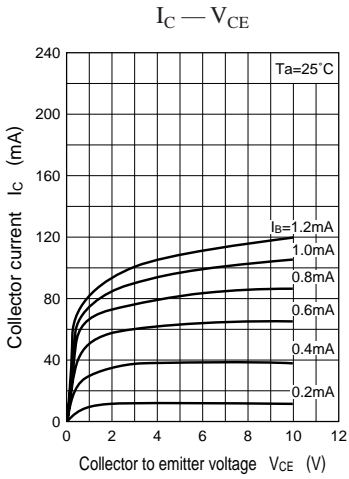




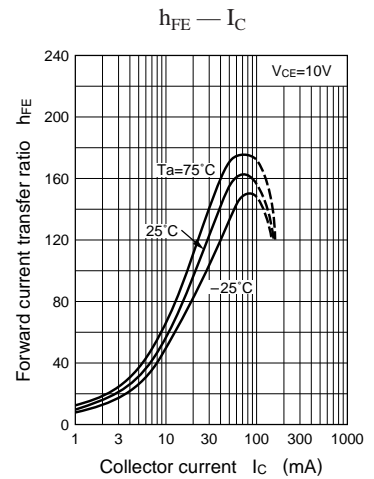
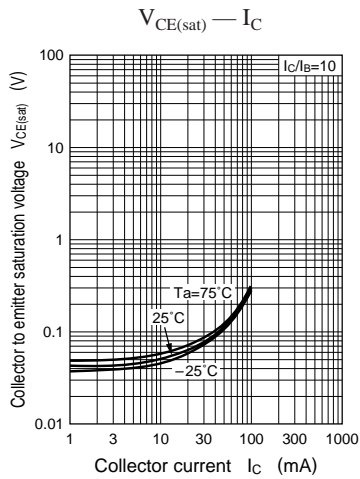
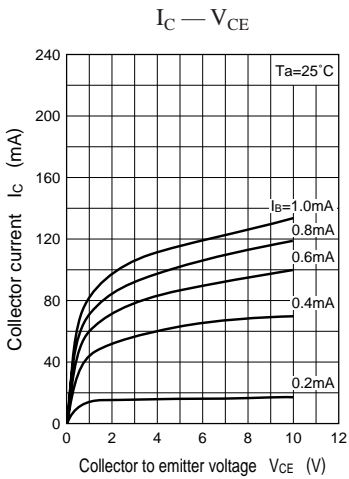
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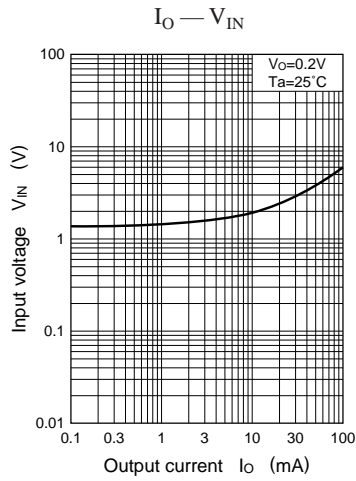
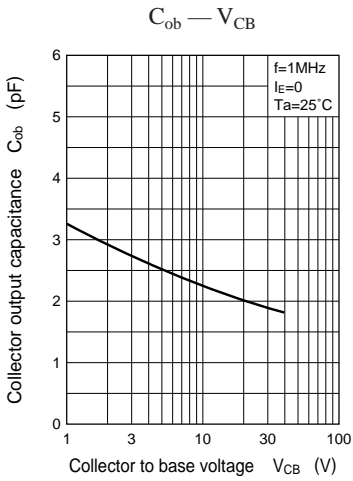


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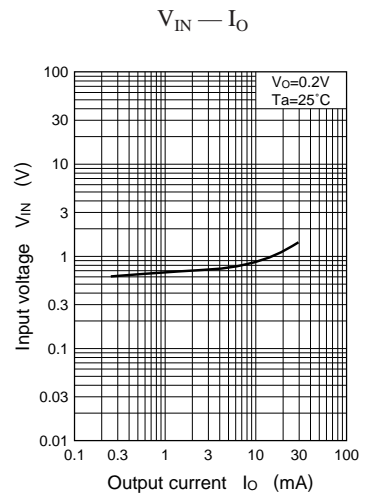
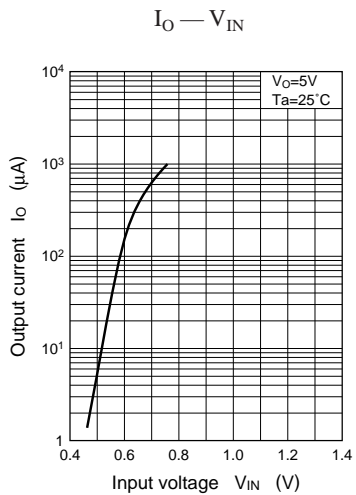
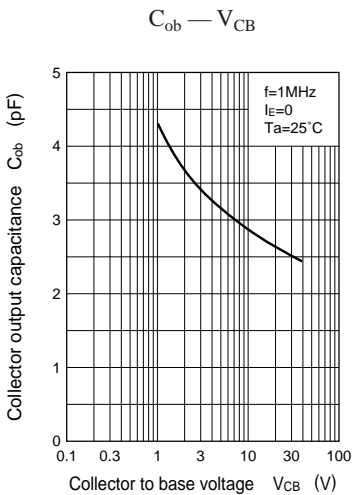
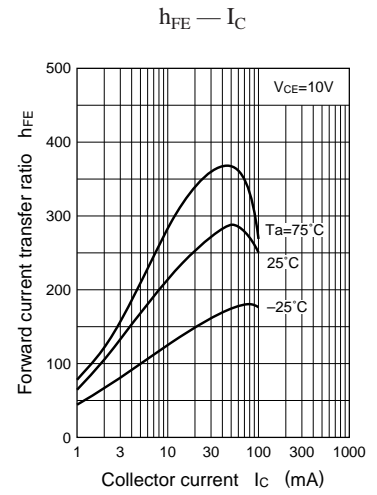
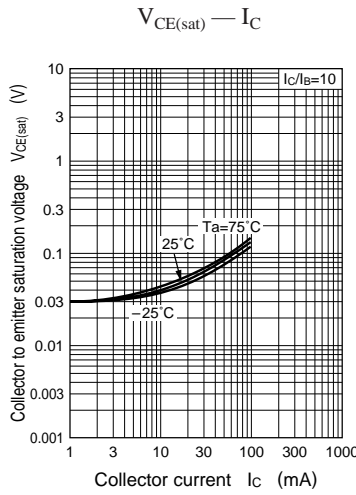
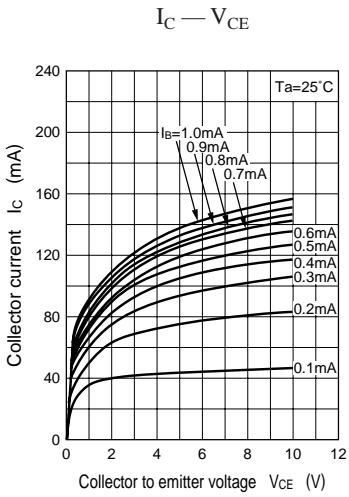


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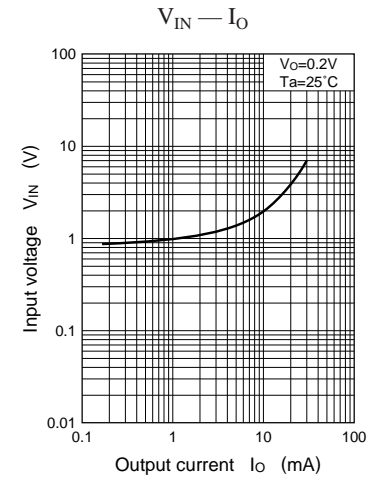
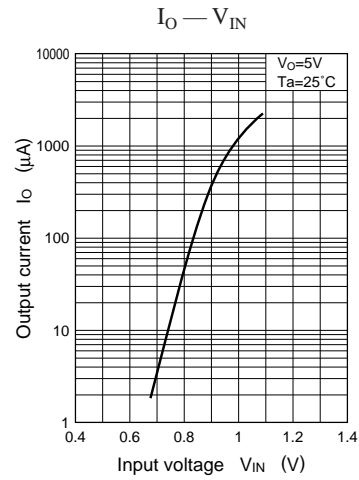
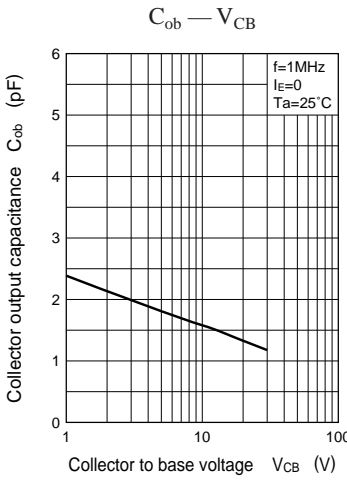
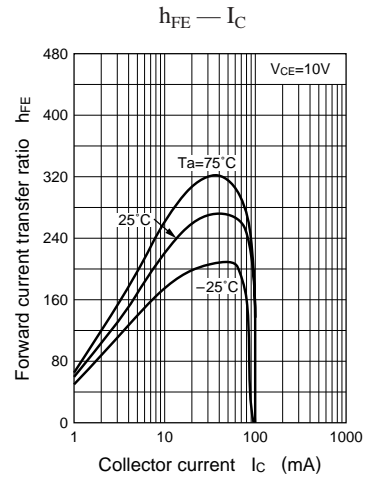
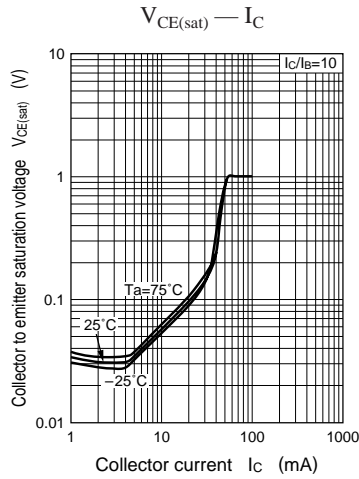
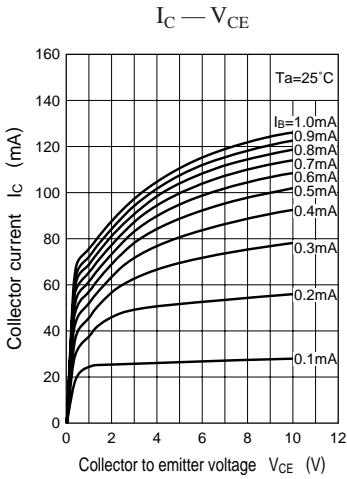




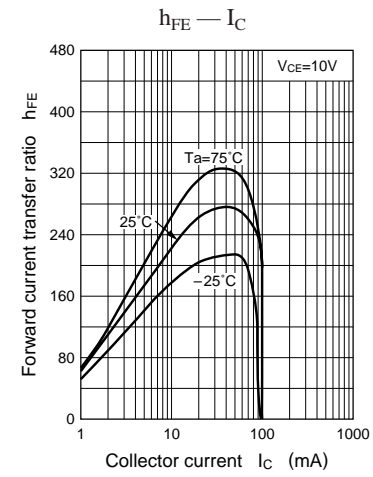
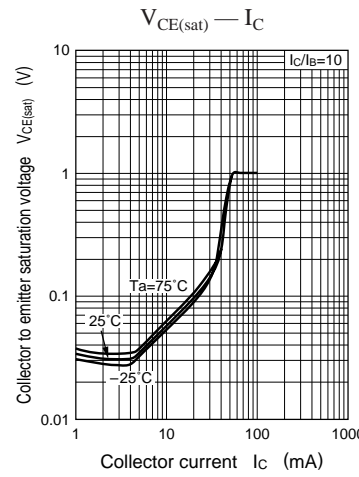
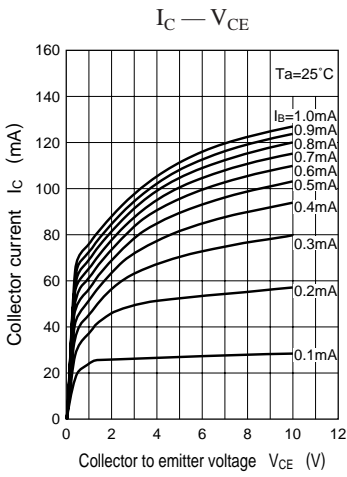
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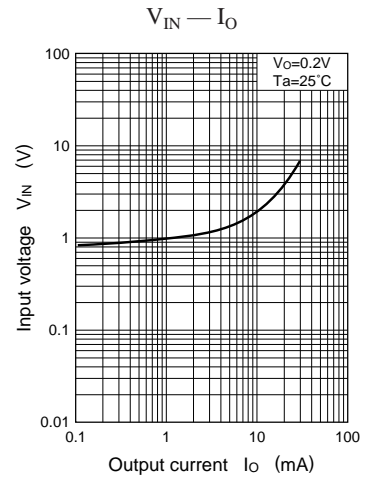
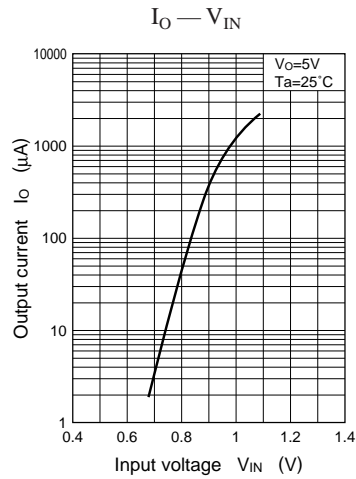
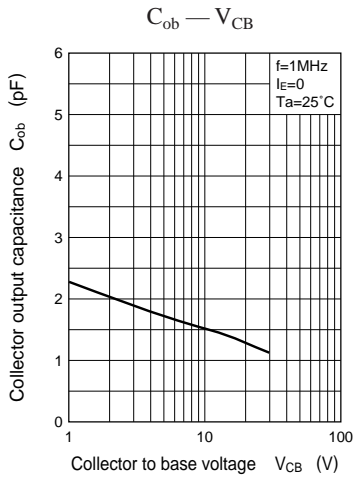


Characteristics charts of UNR221N

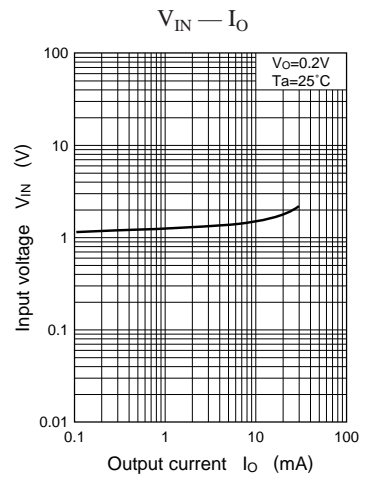
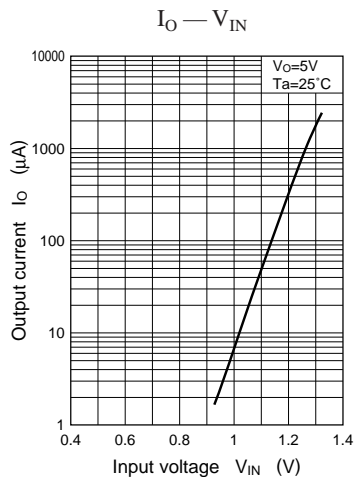
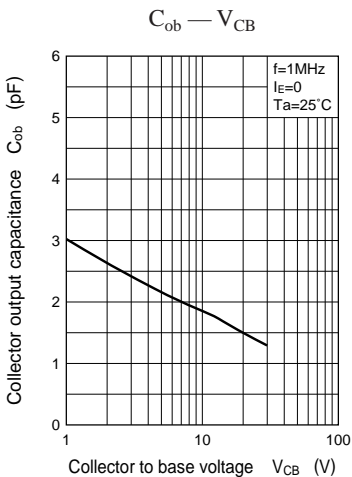
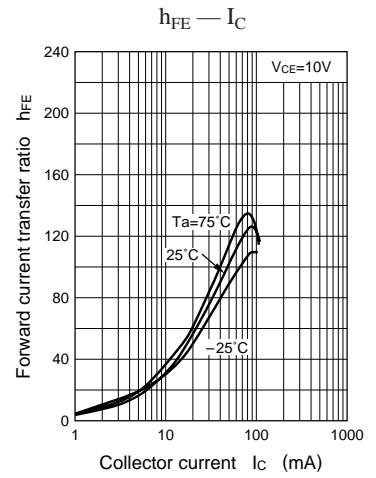
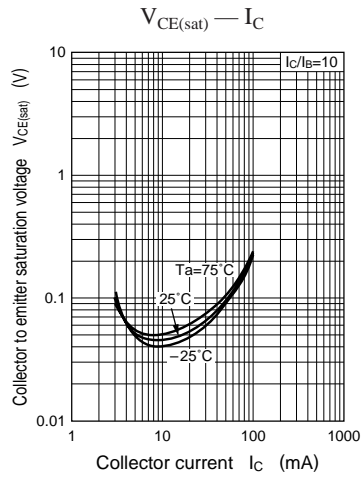
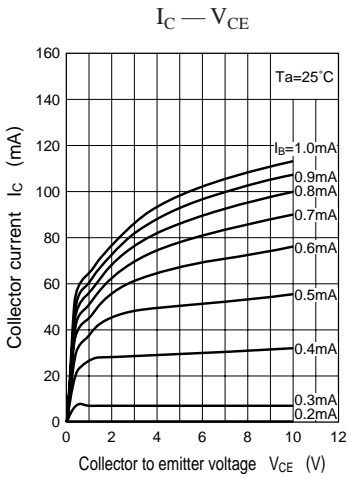


Characteristics charts of UNR221T



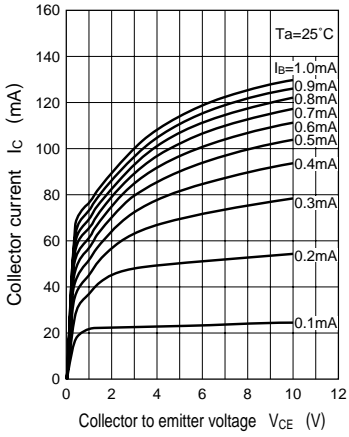


Characteristics charts of UNR221V

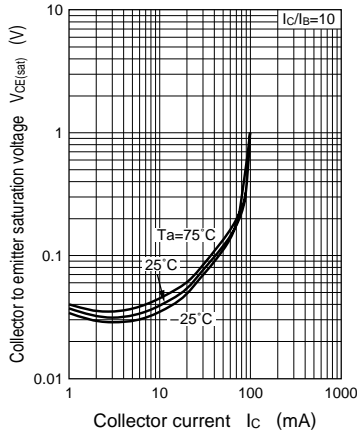


Characteristics charts of UNR221Z

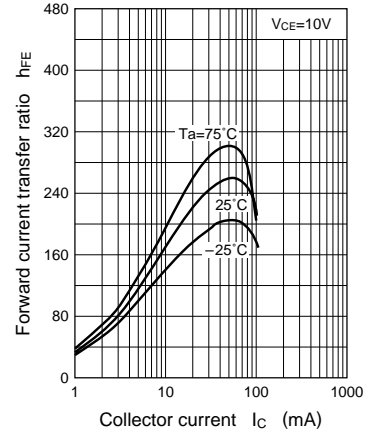
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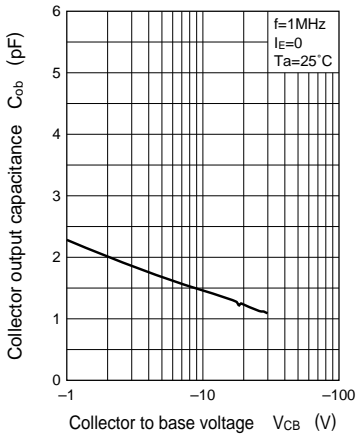
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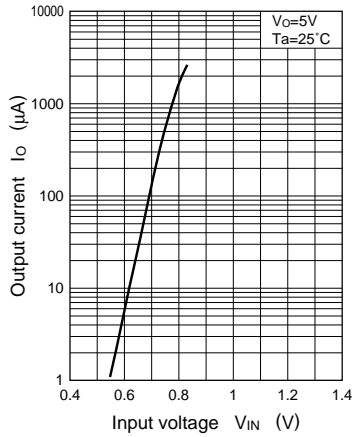
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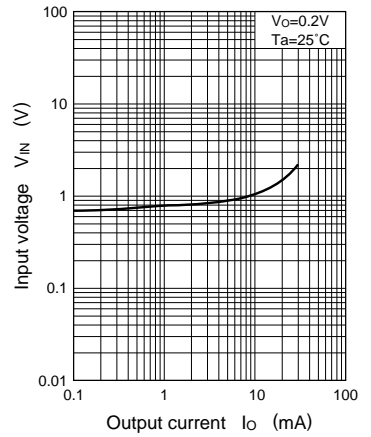
$C_{ob} - V_{CB}$



$I_O - V_{IN}$



$V_{IN} - I_O$



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