

# UNR221x Series (UN221x Series)

## Silicon NPN epitaxial planar transistor

For digital circuits

### ■ Features

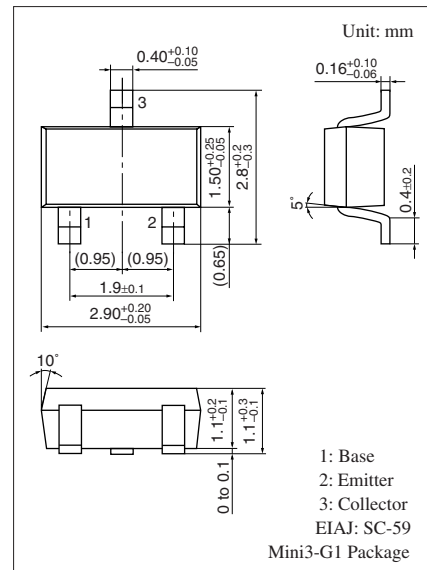
- Costs can be reduced through downsizing of the equipment and reduction of the number of parts.
- Mini type package allowing easy automatic insertion through tape packing and magazine packing

### ■ Resistance by Part Number

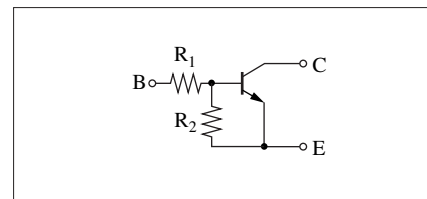
		Marking Symbol (R <sub>1</sub> )		(R <sub>2</sub> )
• UNR2210	(UN2210)	8L	47 kΩ	—
• UNR2211	(UN2211)	8A	10 kΩ	10 kΩ
• UNR2212	(UN2212)	8B	22 kΩ	22 kΩ
• UNR2213	(UN2213)	8C	47 kΩ	47 kΩ
• UNR2214	(UN2214)	8D	10 kΩ	47 kΩ
• UNR2215	(UN2215)	8E	10 kΩ	—
• UNR2216	(UN2216)	8F	4.7 kΩ	—
• UNR2217	(UN2217)	8H	22 kΩ	—
• UNR2218	(UN2218)	8I	0.51 kΩ	5.1 kΩ
• UNR2219	(UN2219)	8K	1 kΩ	10 kΩ
• UNR221D	(UN221D)	8M	47 kΩ	10 kΩ
• UNR221E	(UN221E)	8N	47 kΩ	22 kΩ
• UNR221F	(UN221F)	8O	4.7 kΩ	10 kΩ
• UNR221K	(UN221K)	8P	10 kΩ	4.7 kΩ
• UNR221L	(UN221L)	8Q	4.7 kΩ	4.7 kΩ
• UNR221M	(UN221M)	EL	2.2 kΩ	47 kΩ
• UNR221N	(UN221N)	EX	4.7 kΩ	47 kΩ
• UNR221T	(UN221T)	EZ	22 kΩ	47 kΩ
• UNR221V	(UN221V)	FD	2.2 kΩ	2.2 kΩ
• UNR221Z	(UN221Z)	FF	4.7 kΩ	22 kΩ

### ■ Absolute Maximum Ratings T<sub>a</sub> = 25°C

Parameter	Symbol	Rating	Unit
Collector-base voltage (Emitter open)	V <sub>CBO</sub>	50	V
Collector-emitter voltage (Base open)	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



### Internal Connection



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

■ Electrical Characteristics  $T_a = 25^\circ\text{C} \pm 3^\circ\text{C}$ 

Parameter		Symbol	Conditions	Min	Typ	Max	Unit
Collector-base voltage (Emitter open)		V <sub>CBO</sub>	I <sub>C</sub> = 10 μA, I <sub>E</sub> = 0	50			V
Collector-emitter voltage (Base open)		V <sub>CEO</sub>	I <sub>C</sub> = 2 mA, I <sub>B</sub> = 0	50			V
Collector-base cutoff current (Emitter open)		I <sub>CBO</sub>	V <sub>CB</sub> = 50 V, I <sub>E</sub> = 0			0.1	μA
Collector-emitter cutoff current (Base open)		I <sub>CEO</sub>	V <sub>CE</sub> = 50 V, I <sub>B</sub> = 0			0.5	μA
Emitter-base cutoff current (Collector open)	UNR2210/2215/2216/2217	I <sub>EBO</sub>	V <sub>EB</sub> = −6 V, I <sub>C</sub> = 0			0.01	mA
	UNR2213					0.1	
	UNR2212/2214/221D/ 221E/221M/221N/221T					0.2	
	UNR221Z					0.4	
	UNR2211					0.5	
	UNR221F/221K					1.0	
	UNR2219					1.5	
	UNR2218/221L/221V					2.0	
Forward current transfer ratio	UNR221V	h <sub>FE</sub>	V <sub>CE</sub> = 10 V, I <sub>C</sub> = 5 mA	6		20	—
	UNR2218/221K/221L			20			
	UNR2219/221D/221F			30			
	UNR2211			35			
	UNR2212/221E			60			
	UNR221Z			60		200	
	UNR2213/2214/221M			80			
	UNR221N/221T			80		400	
	UNR2210*/2215*/2216*/2217*			160		460	
Collector-emitter saturation voltage		V <sub>CE(sat)</sub>	I <sub>C</sub> = 10 mA, I <sub>B</sub> = 0.3 mA			0.25	V
UNR221V			I <sub>C</sub> = 10 mA, I <sub>B</sub> = 1.5 mA				
Output voltage high-level		V <sub>OH</sub>	V <sub>CC</sub> = 5 V, V <sub>B</sub> = 0.5 V, R <sub>L</sub> = 1 kΩ	4.9			V
Output voltage low-level		V <sub>OL</sub>	V <sub>CC</sub> = 5 V, V <sub>B</sub> = 2.5 V, R <sub>L</sub> = 1 kΩ			0.2	V
UNR2213/221K			V <sub>CC</sub> = 5 V, V <sub>B</sub> = 3.5 V, R <sub>L</sub> = 1 kΩ				
UNR221D			V <sub>CC</sub> = 5 V, V <sub>B</sub> = 10 V, R <sub>L</sub> = 1 kΩ				
UNR221E			V <sub>CC</sub> = 5 V, V <sub>B</sub> = 6 V, R <sub>L</sub> = 1 kΩ				
Transition frequency		f <sub>T</sub>	V <sub>CB</sub> = 10 V, I <sub>E</sub> = −2 mA, f = 200 MHz		150		MHz
Input resistance	UNR2218	R <sub>i</sub>		−30%	0.51	+30%	kΩ
	UNR2219				1.0		
	UNR221M/211V				2.2		
	UNR2216/221F/221L/ 221N/221Z				4.7		
	UNR2211/2214/2215/221K				10		
	UNR2212/2217/221T				22		
	UNR2210/2213/221D/221E				47		

Note) 1. Measuring methods are based on JAPANESE INDUSTRIAL STANDARD JIS C 7030 measuring methods for transistors.

2. \*: Rank classification

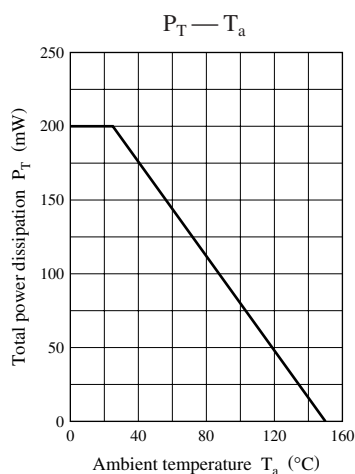
Rank	Q	R	S	No-rank
$h_{FE}$	160 to 260	210 to 340	290 to 460	160 to 460

■ Electrical Characteristics (continued)  $T_a = 25^\circ\text{C} \pm 3^\circ\text{C}$

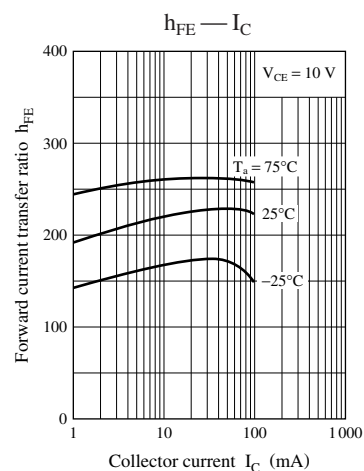
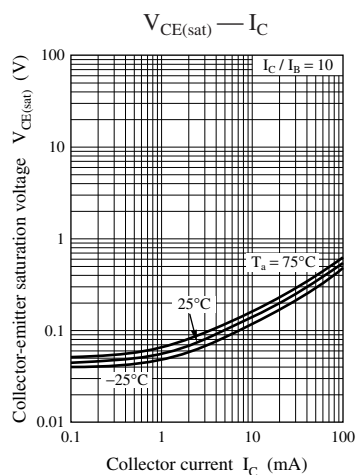
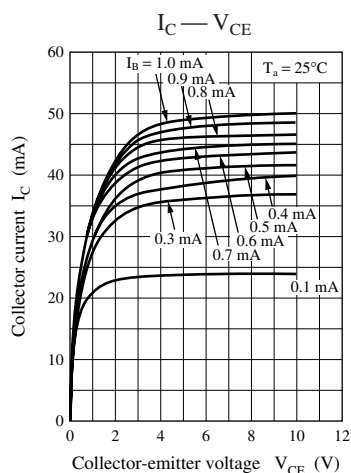
	Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Resistance ratio	UNR221M	$R_1/R_2$			0.047		—
	UNR221N				0.1		
	UNR2218/2219			0.08	0.10	0.12	
	UNR221Z				0.21		
	UNR2214			0.17	0.21	0.25	
	UNR221T				0.47		
	UNR221F			0.37	0.47	0.57	
	UNR221V				1.0		
	UNR2211/2212/2213/221L			0.8	1.0	1.2	
	UNR221K			1.70	2.13	2.60	
	UNR221E			1.70	2.14	2.60	
	UNR221D			3.7	4.7	5.7	

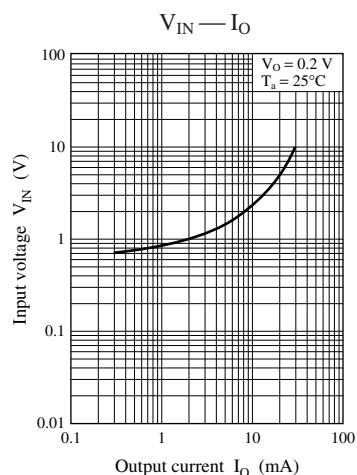
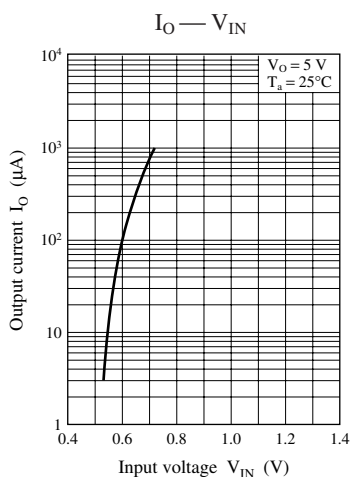
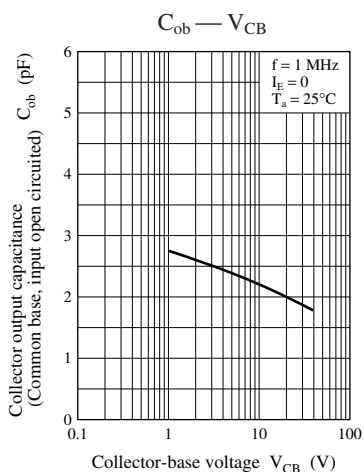
Note) Measuring methods are based on JAPANESE INDUSTRIAL STANDARD JIS C 7030 measuring methods for transistors.

Common characteristics chart

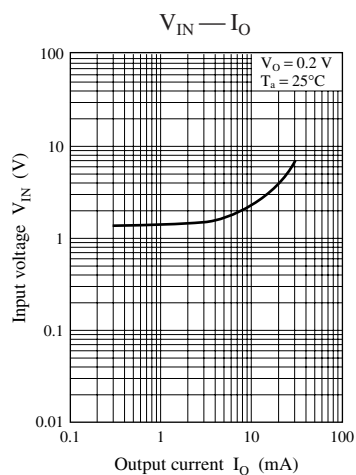
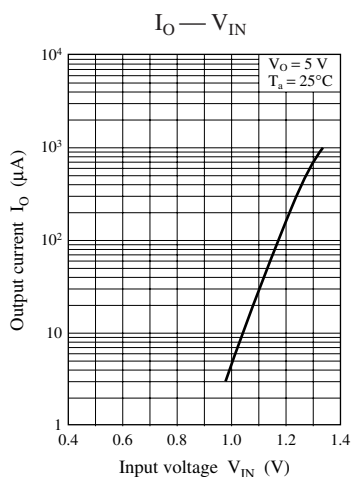
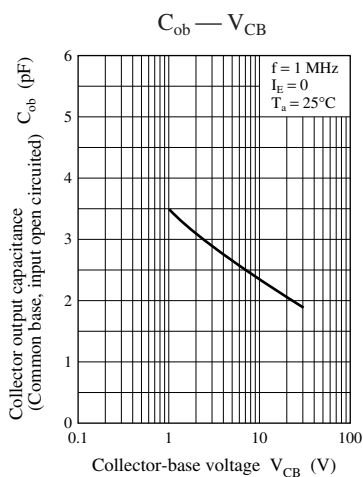
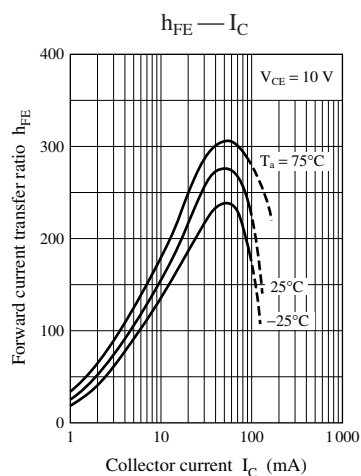
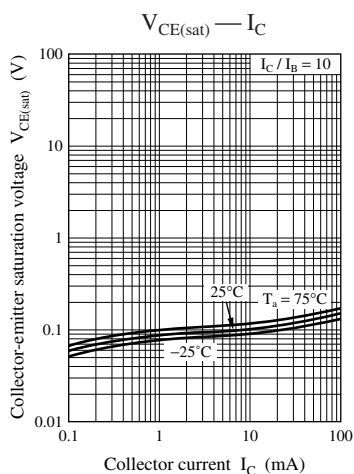
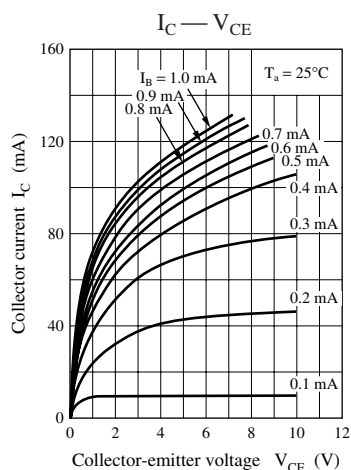


Characteristics charts of UNR2210

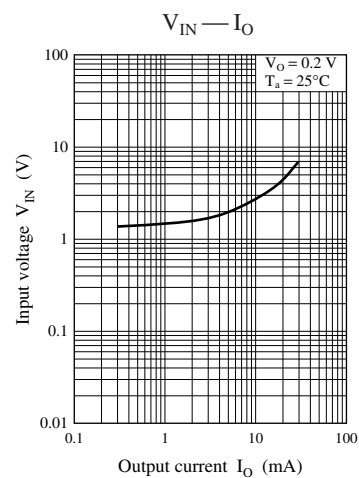
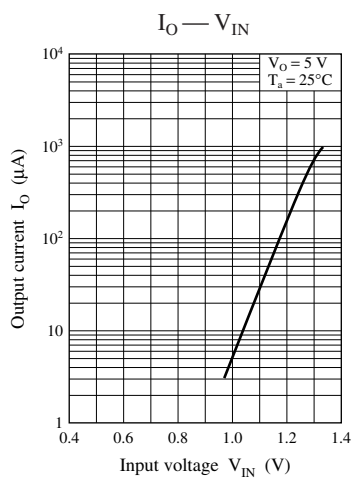
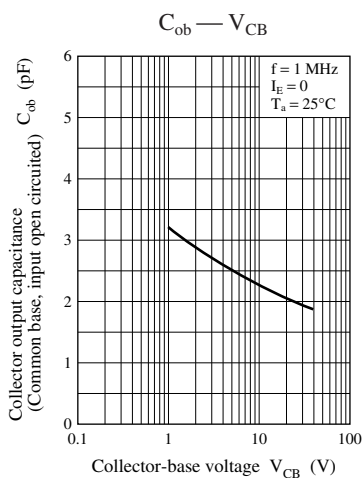
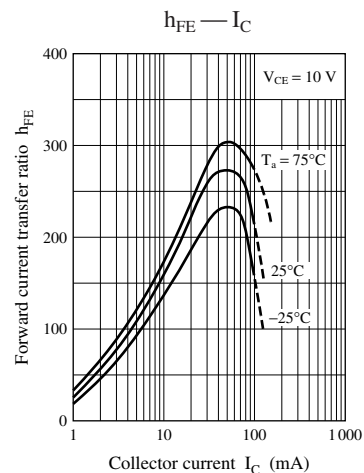
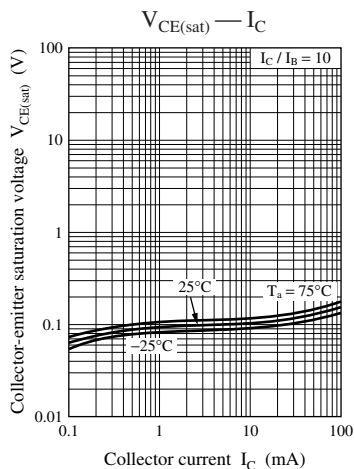
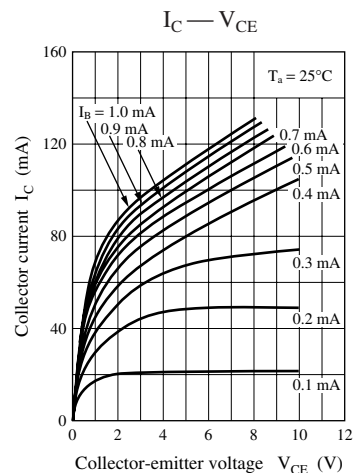




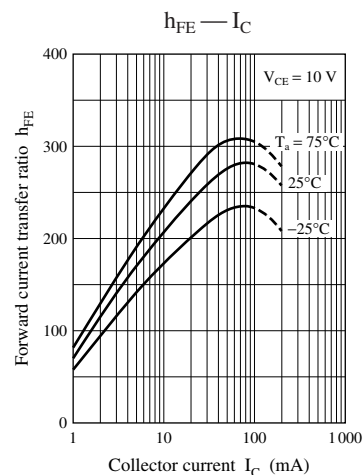
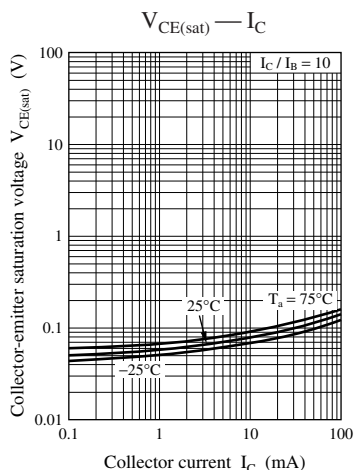
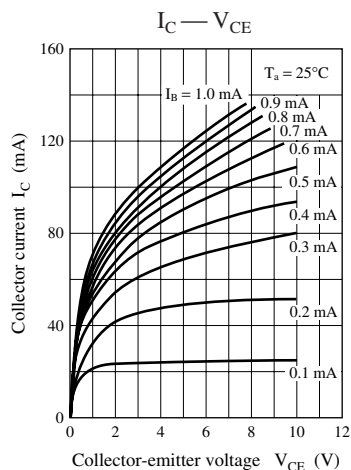
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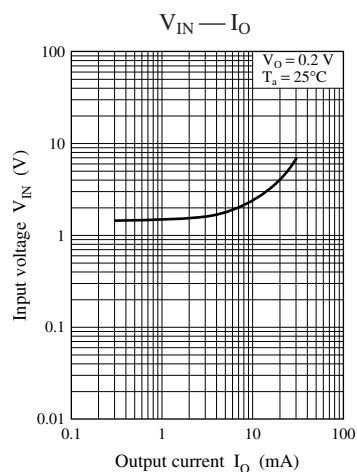
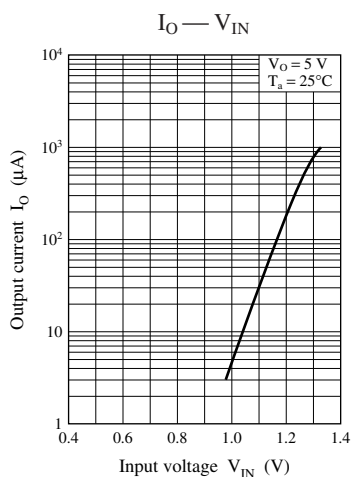
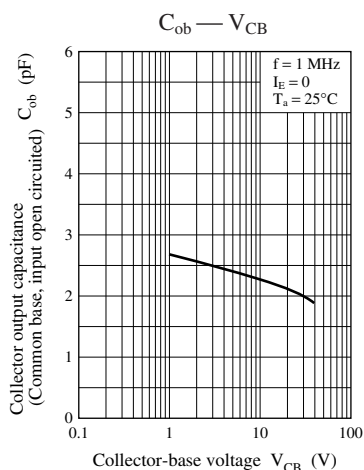


Characteristics charts of UNR2212

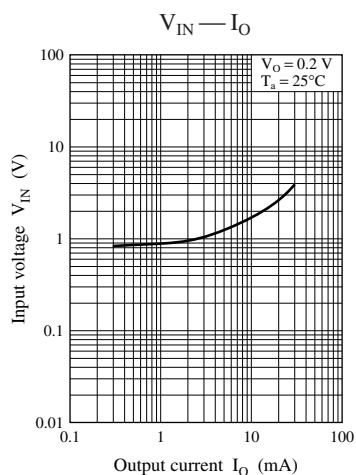
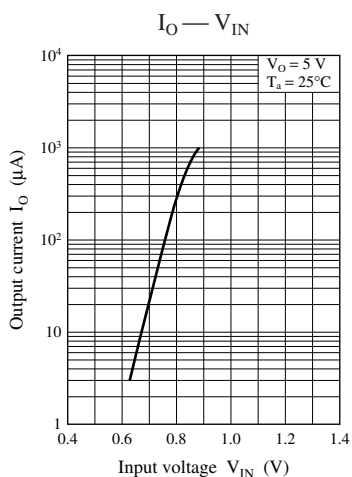
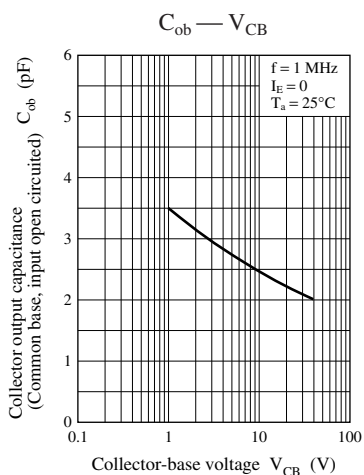
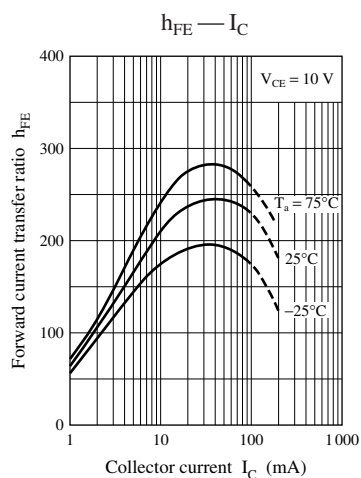
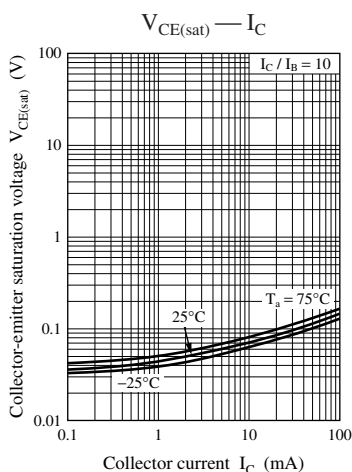
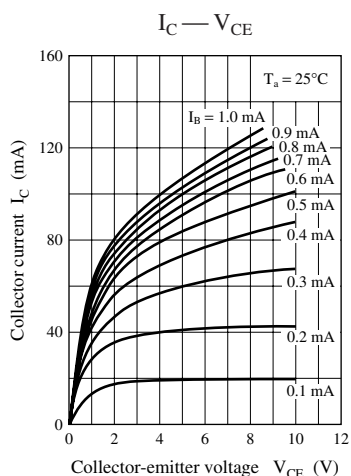


Characteristics charts of UNR2213

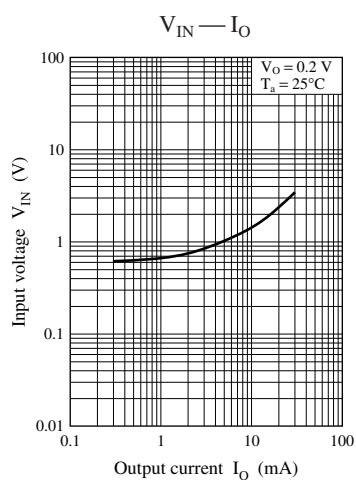
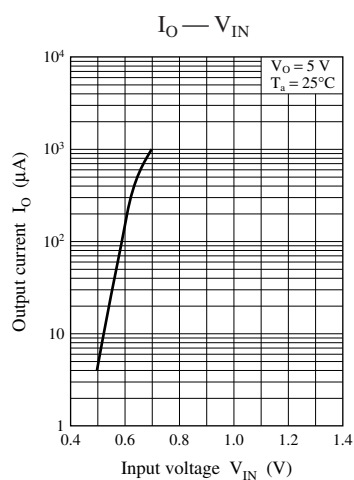
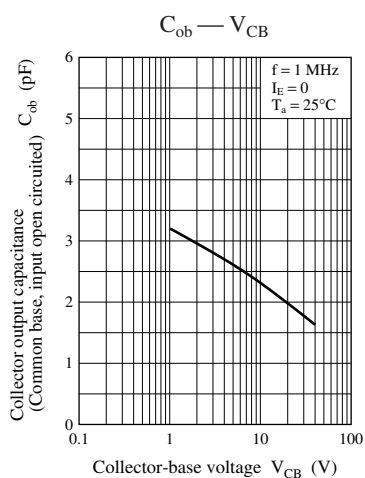
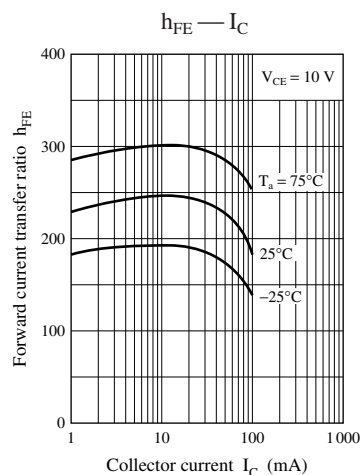
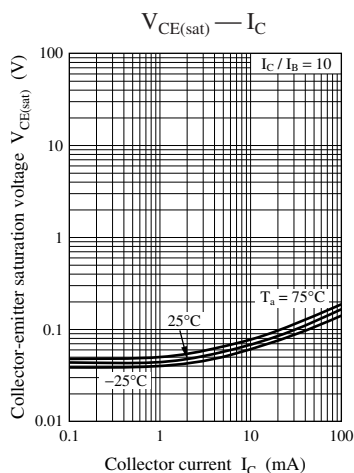
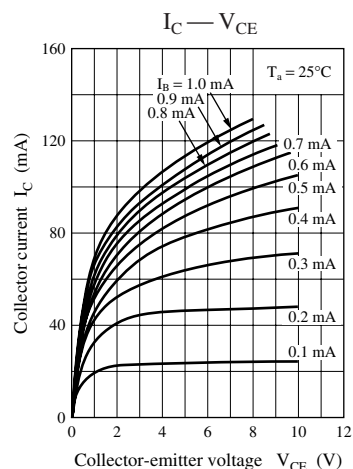




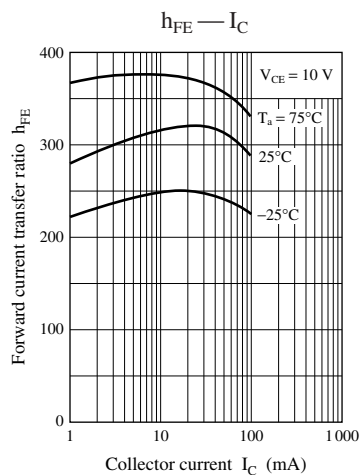
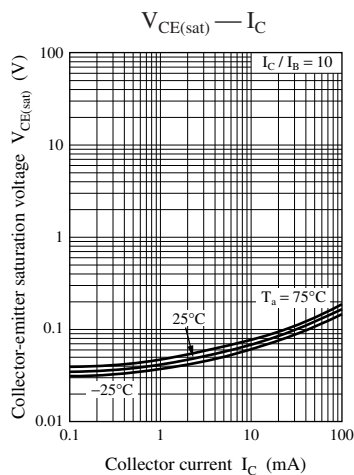
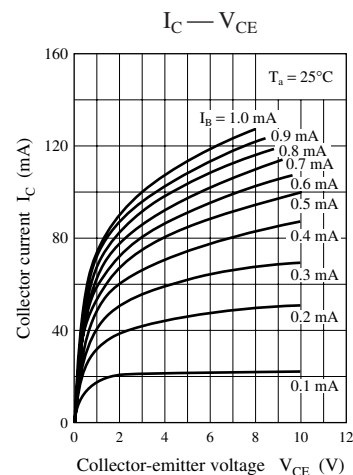
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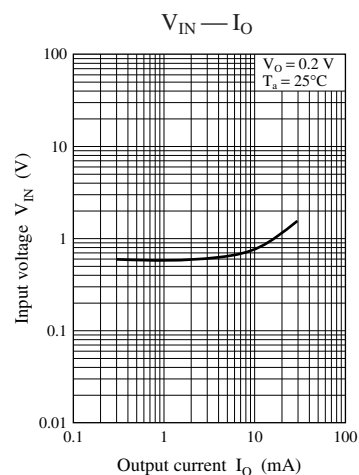
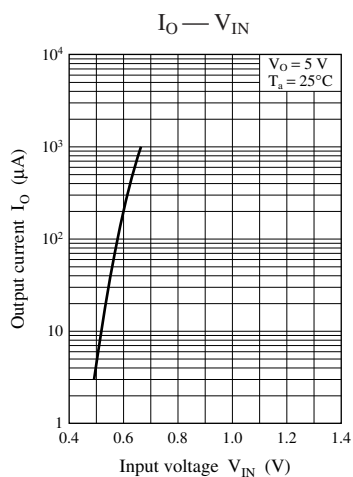
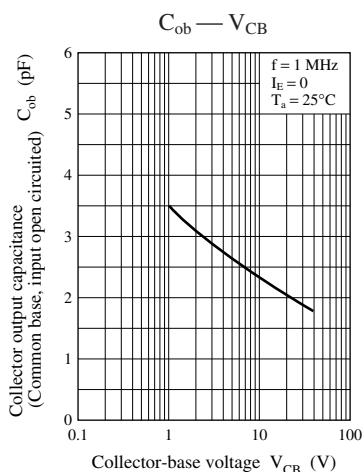


Characteristics charts of UNR2215

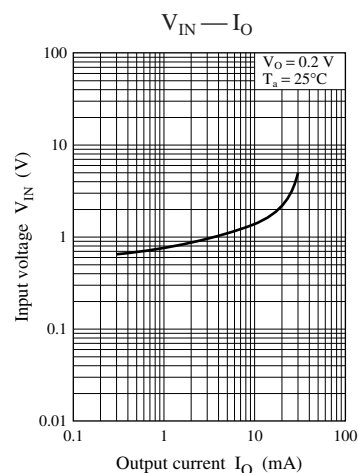
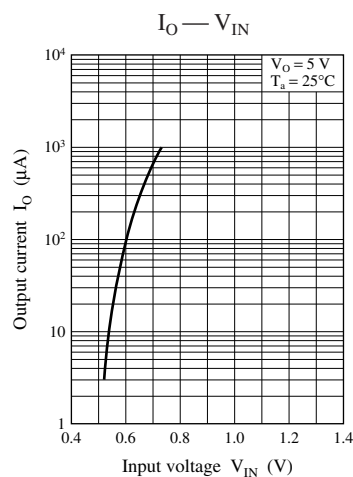
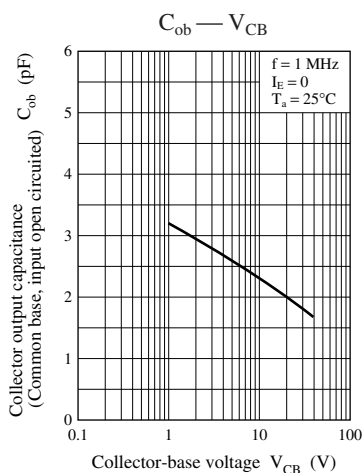
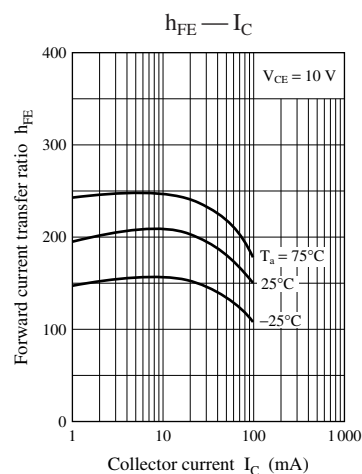
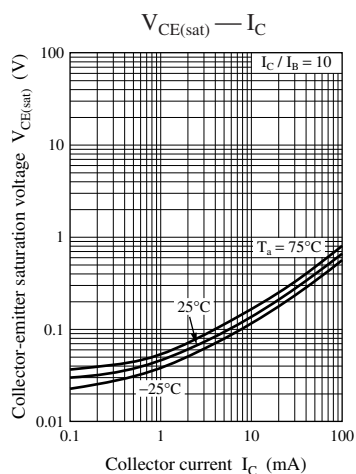
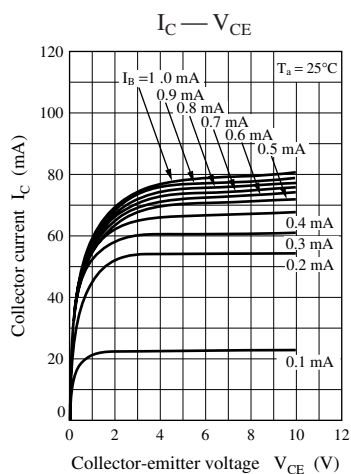


Characteristics charts of UNR2216



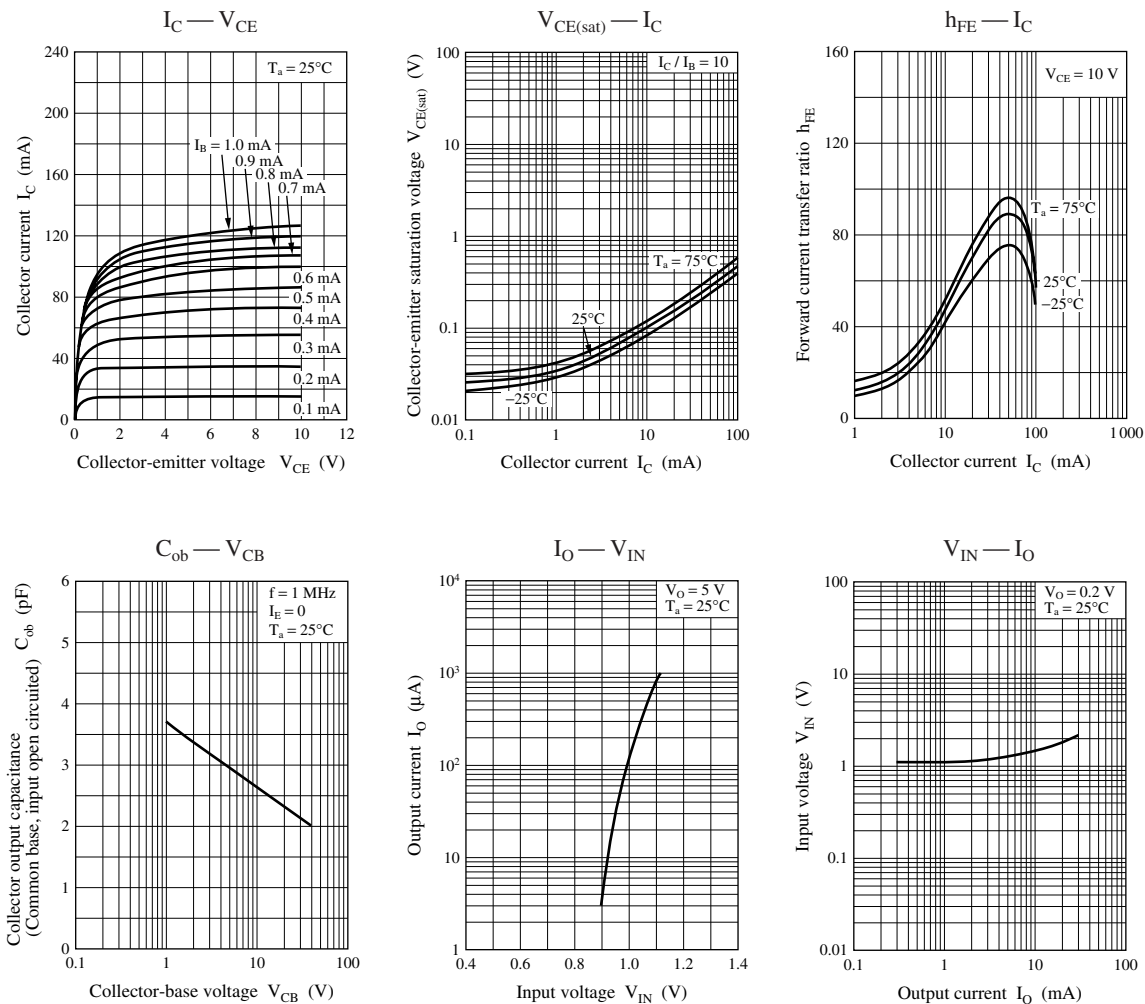


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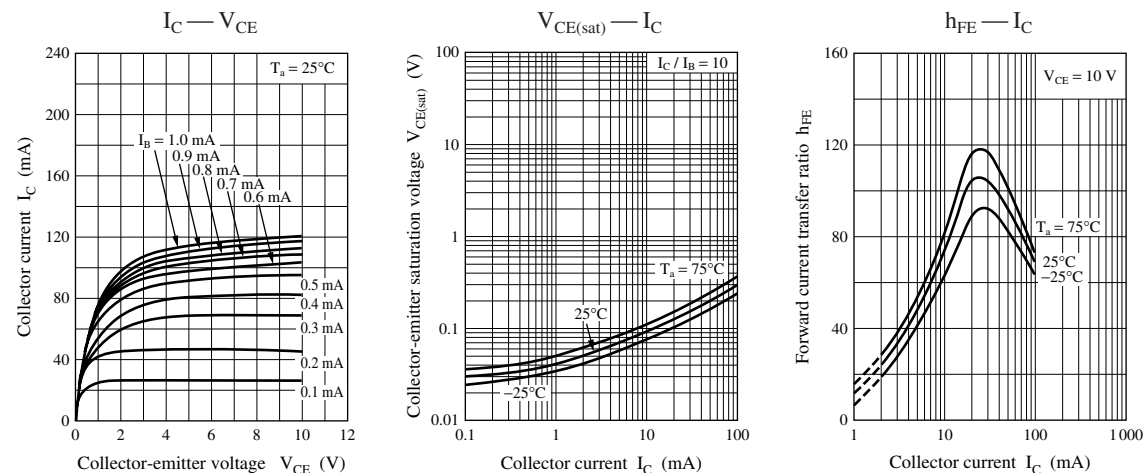


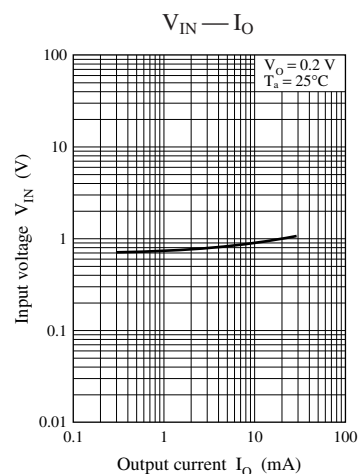
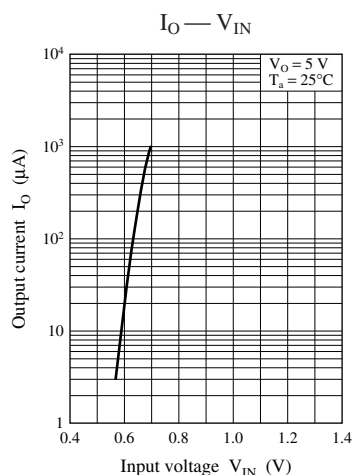
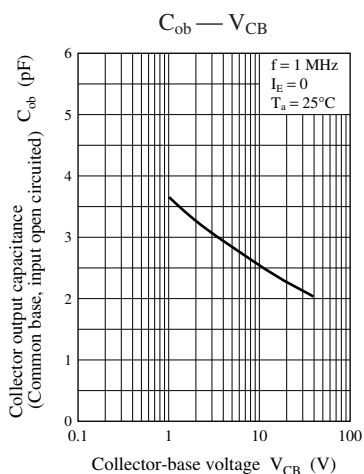


Characteristics charts of UNR2218

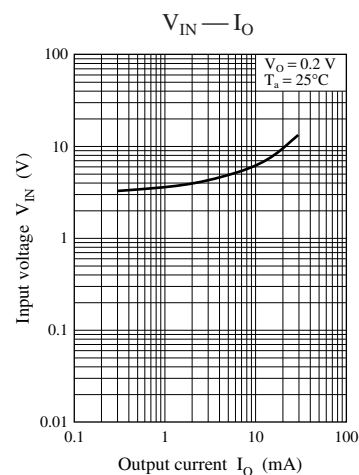
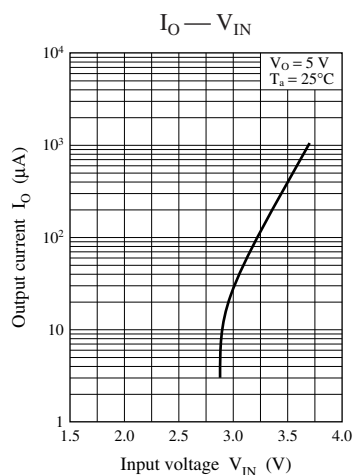
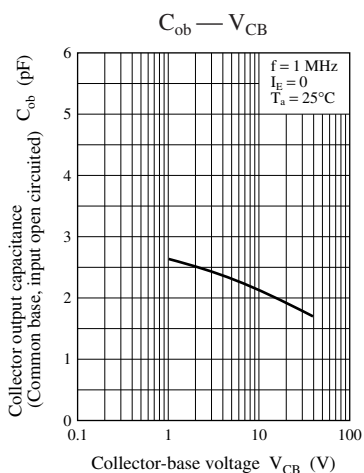
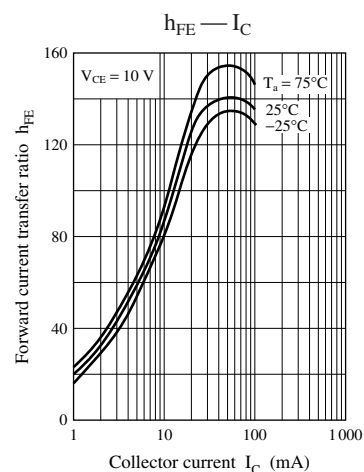
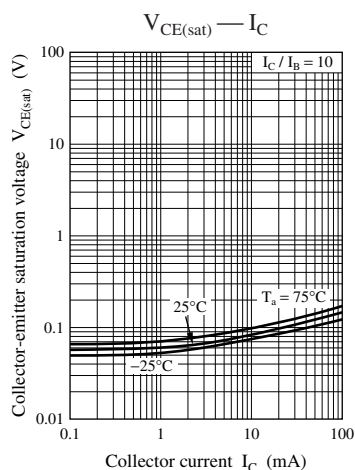
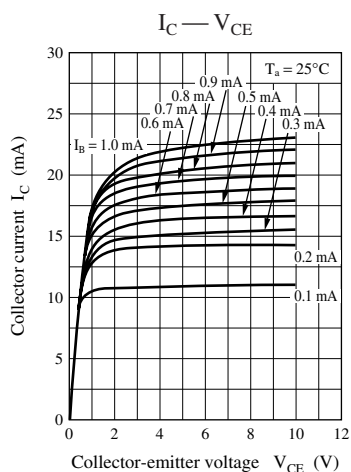


Characteristics charts of UNR2219

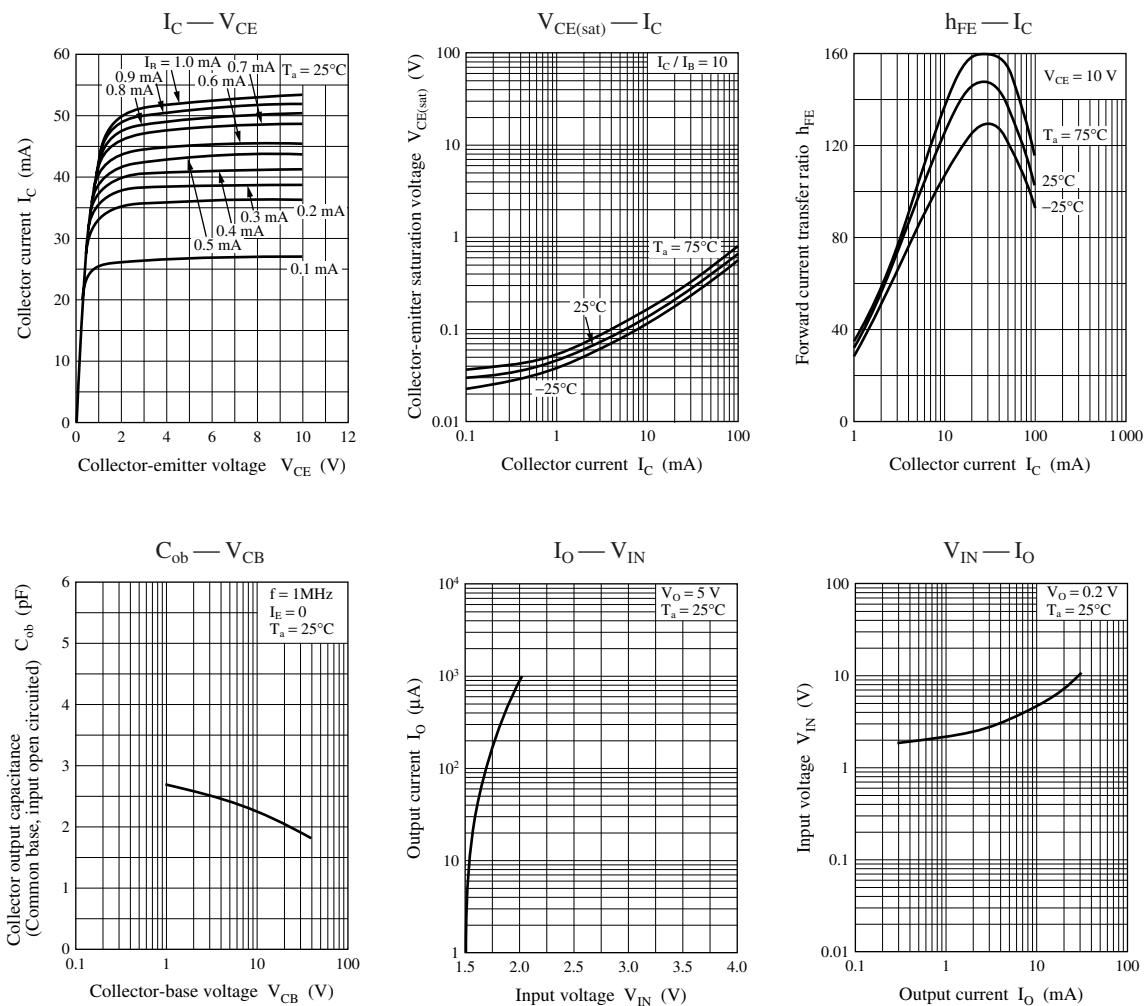




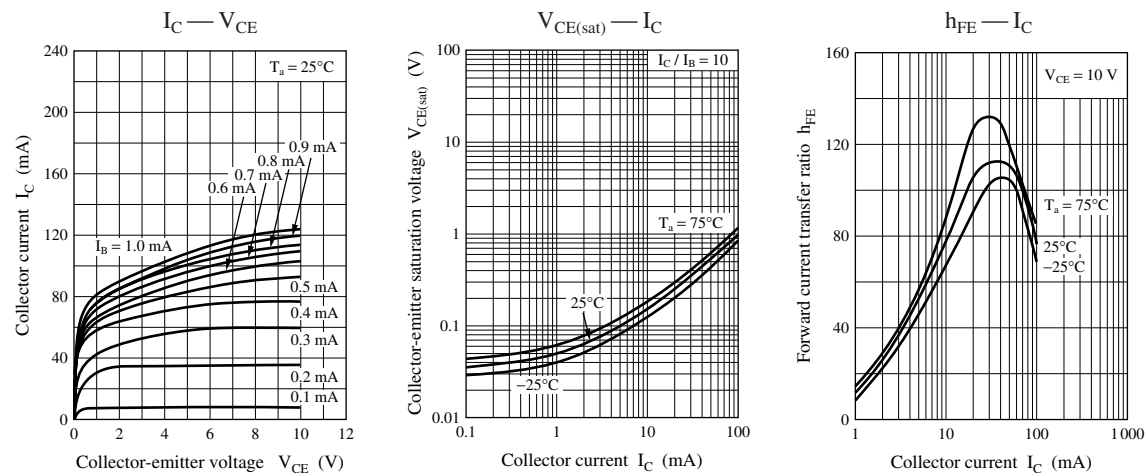
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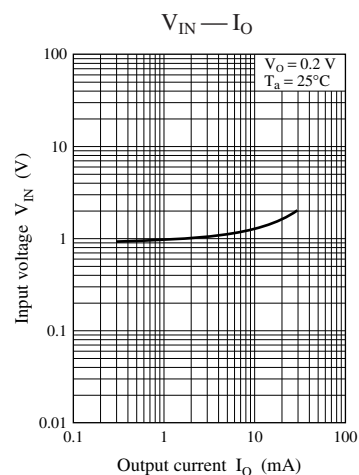
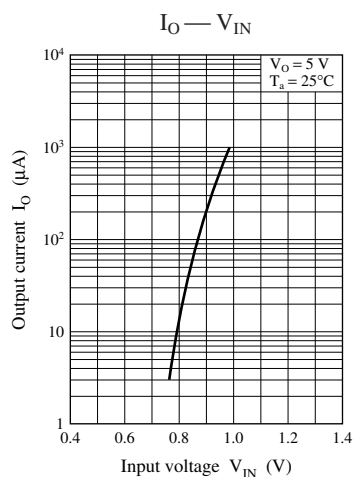
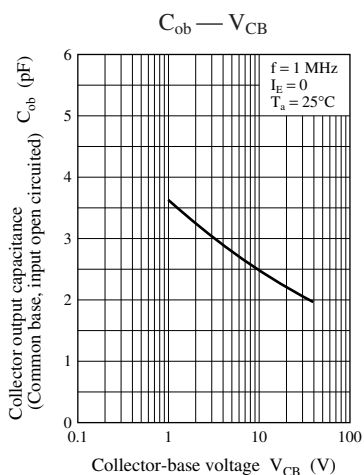


Characteristics charts of UNR221E

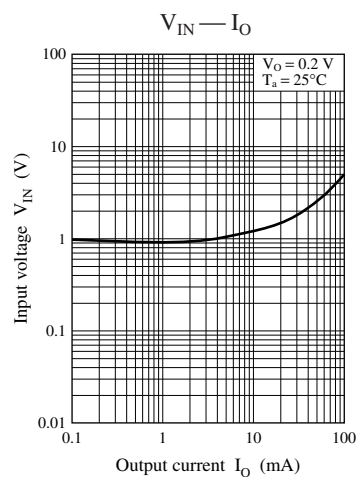
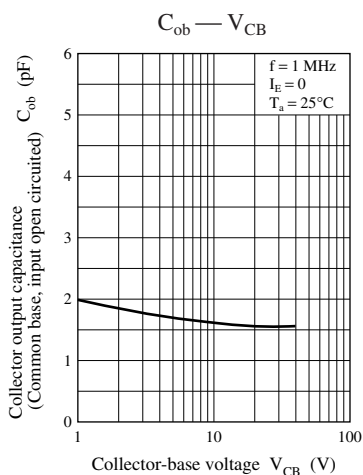
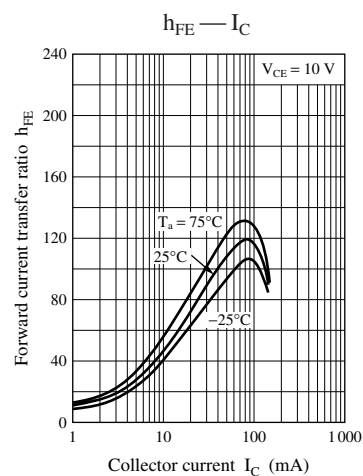
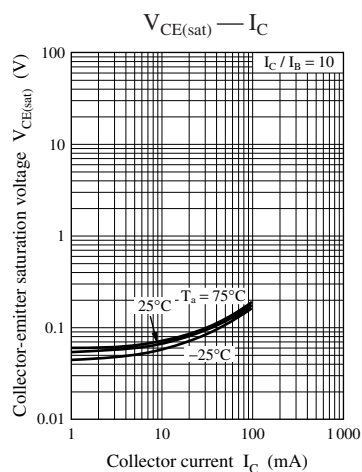
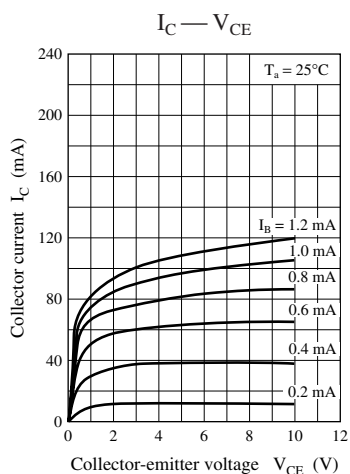


Characteristics charts of UNR221F

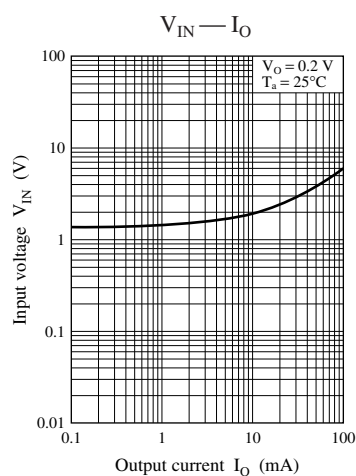
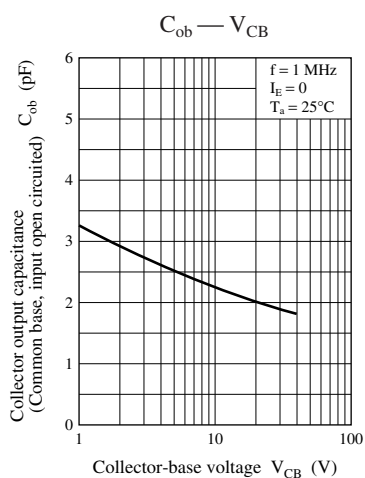
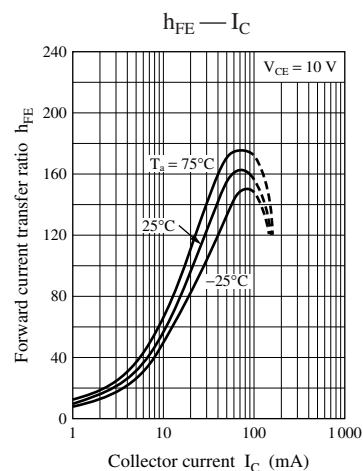
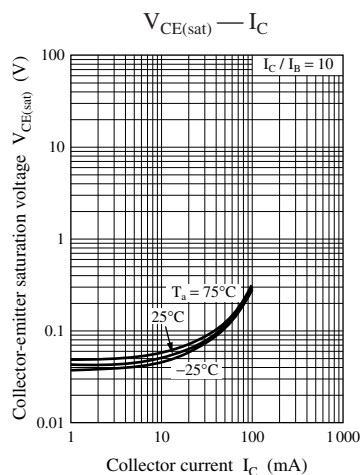
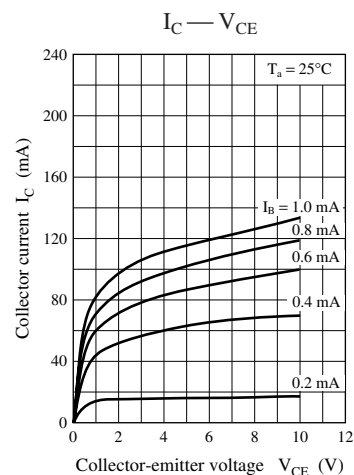




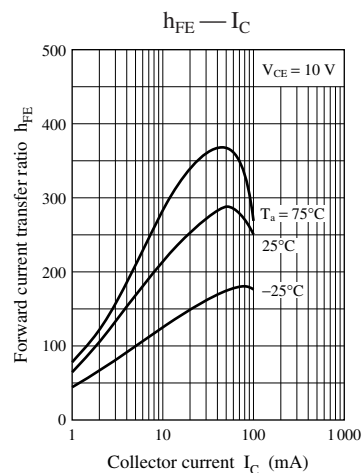
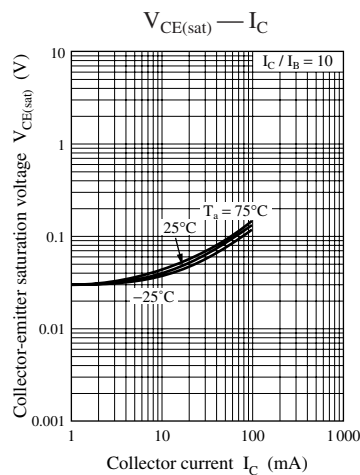
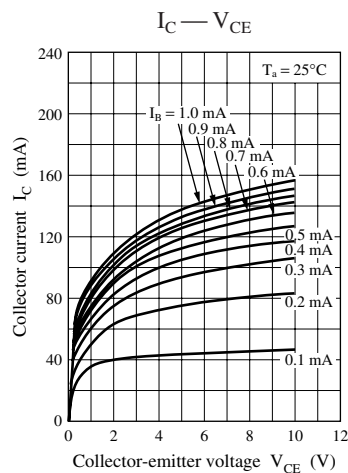
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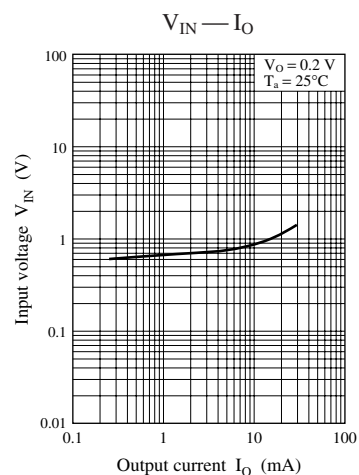
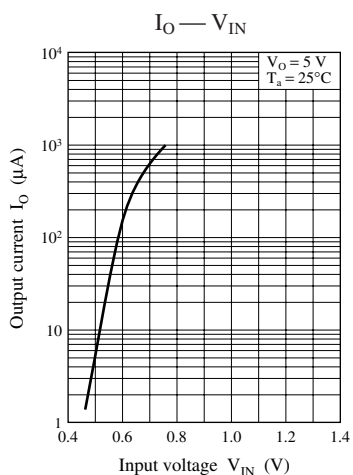
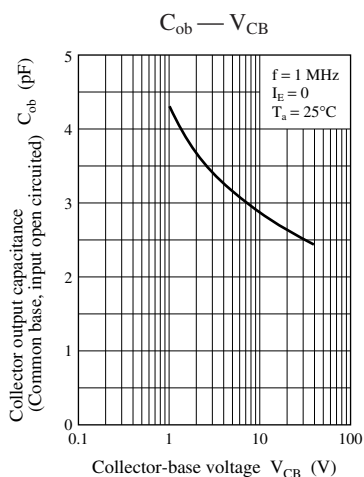


Characteristics charts of UNR221L

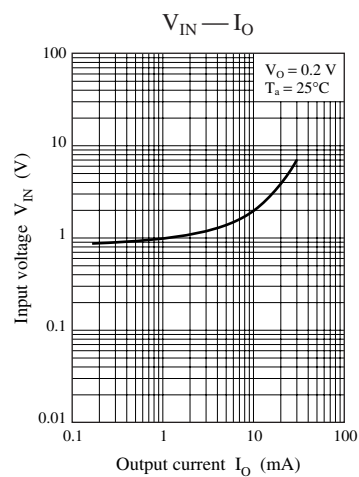
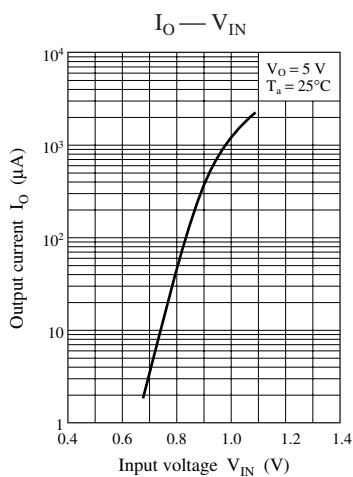
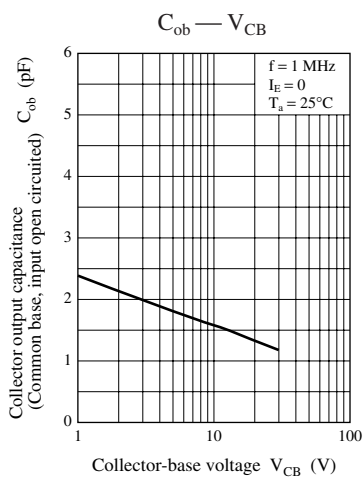
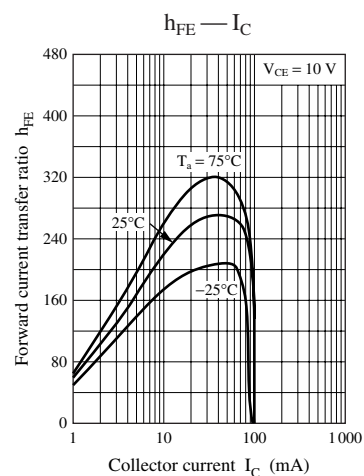
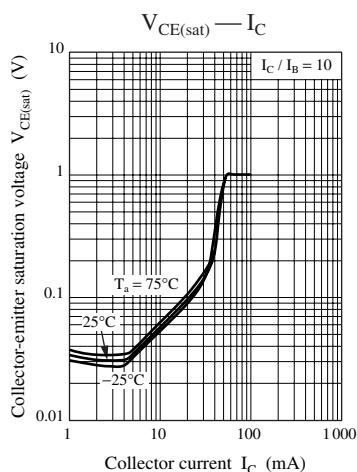
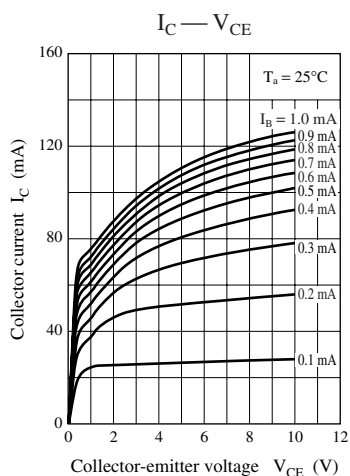


Characteristics charts of UNR221M

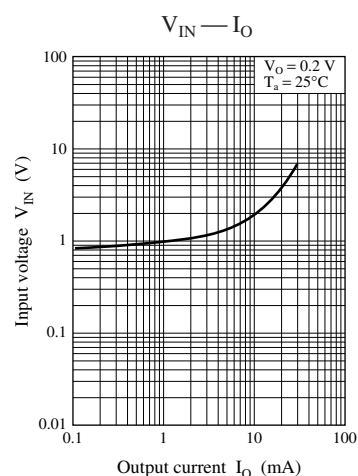
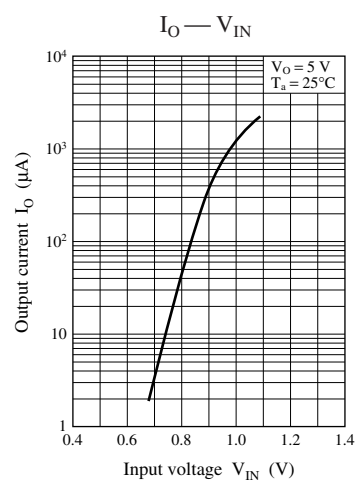
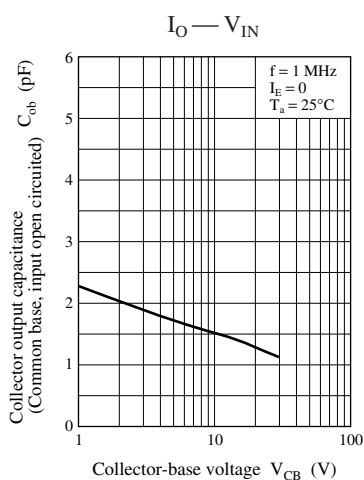
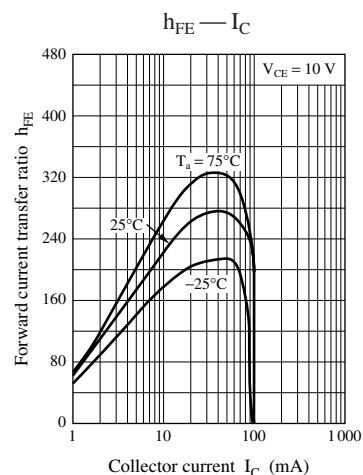
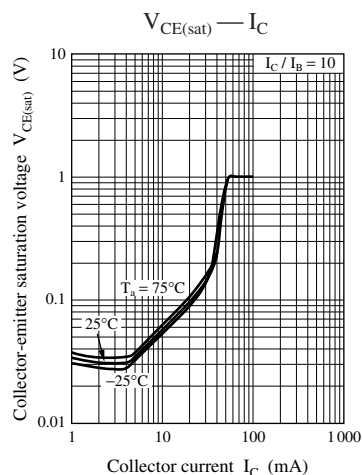
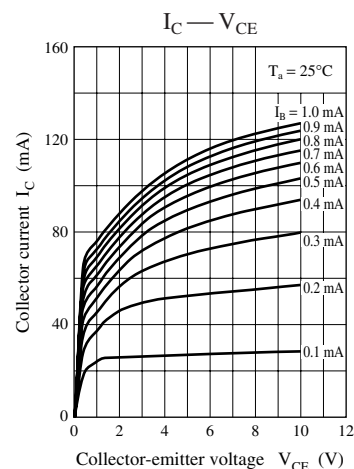




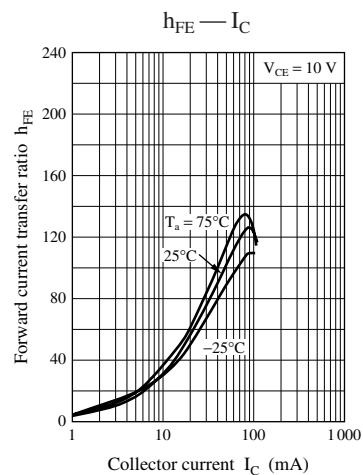
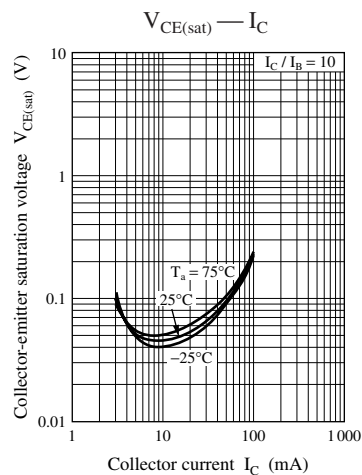
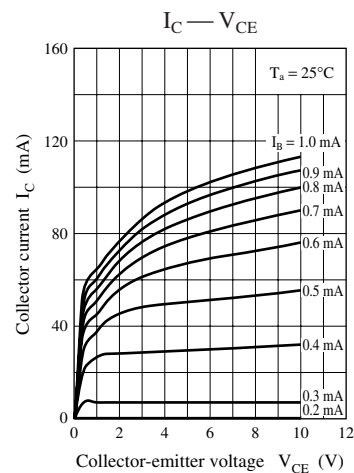
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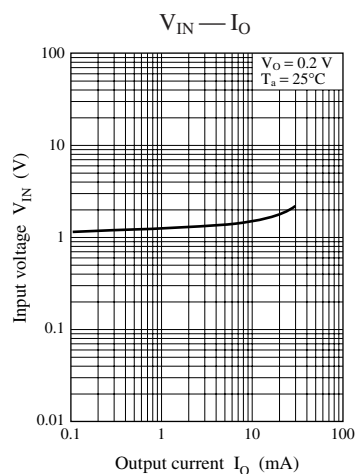
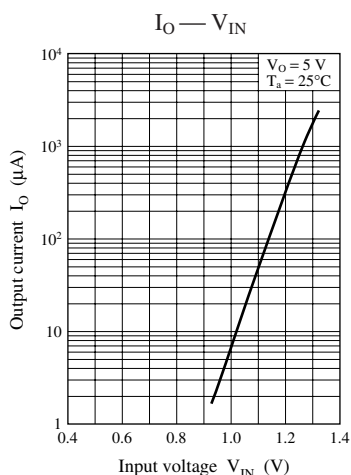
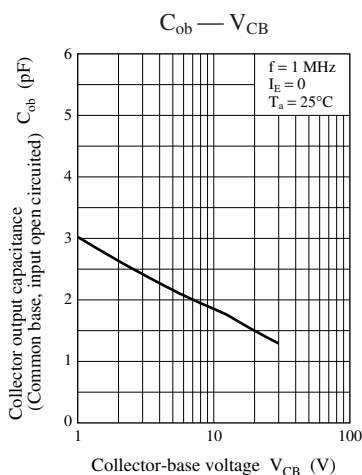


Characteristics charts of UNR221T

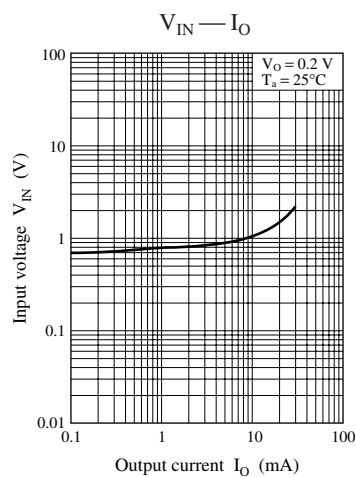
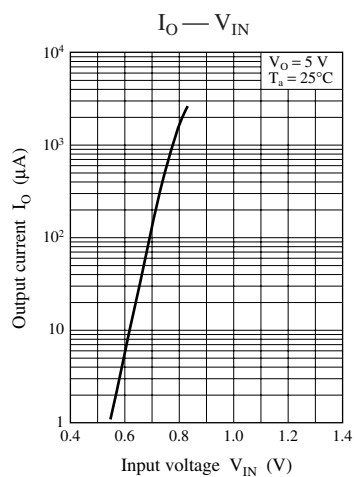
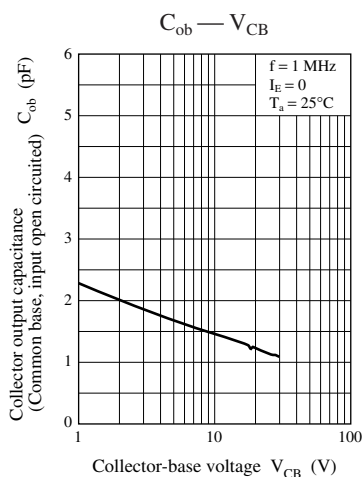
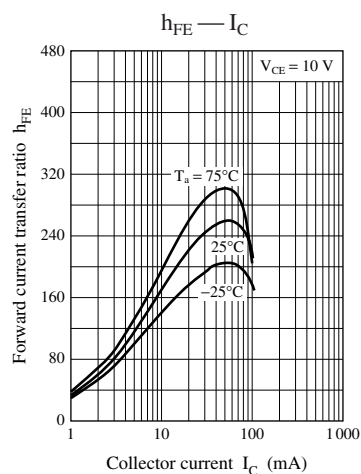
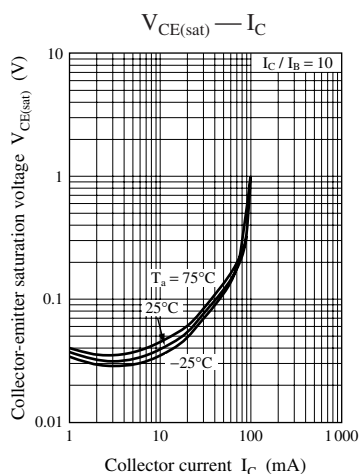
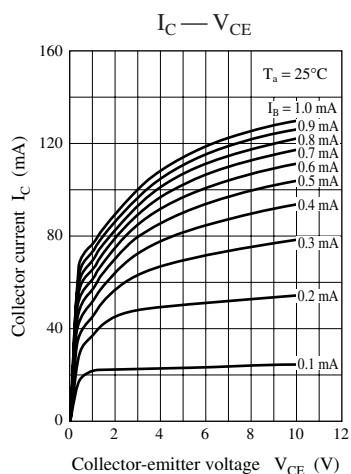


Characteristics charts of UNR221V





## Characteristics charts of UNR221Z





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