

# UNR221x Series (UN221x Series)

## Silicon NPN epitaxial planar transistor

For digital circuits

### ■ Features

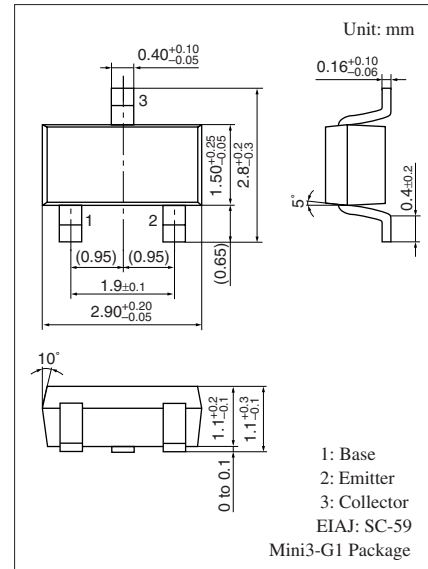
- Costs can be reduced through downsizing of the equipment and reduction of the number of parts.
- Mini type package allowing easy automatic insertion through tape packing and magazine packing

### ■ Resistance by Part Number

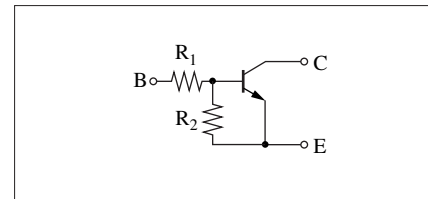
	Marking Symbol (R <sub>1</sub> )	(R <sub>2</sub> )
• UNR2210 (UN2210)	8L	47 kΩ —
• UNR2211 (UN2211)	8A	10 kΩ 10 kΩ
• UNR2212 (UN2212)	8B	22 kΩ 22 kΩ
• UNR2213 (UN2213)	8C	47 kΩ 47 kΩ
• UNR2214 (UN2214)	8D	10 kΩ 47 kΩ
• UNR2215 (UN2215)	8E	10 kΩ —
• UNR2216 (UN2216)	8F	4.7 kΩ —
• UNR2217 (UN2217)	8H	22 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)	$V_{CBO}$	$I_C = 10 \mu\text{A}, I_E = 0$	50			V
Collector-emitter voltage (Base open)	$V_{CEO}$	$I_C = 2 \text{ mA}, I_B = 0$	50			V
Collector-base cutoff current (Emitter open)	$I_{CBO}$	$V_{CB} = 50 \text{ V}, I_E = 0$			0.1	$\mu\text{A}$
Collector-emitter cutoff current (Base open)	$I_{CEO}$	$V_{CE} = 50 \text{ V}, I_B = 0$			0.5	$\mu\text{A}$
Emitter-base cutoff current (Collector open)	UNR2210/2215/2216/2217	$I_{EBO}$	$V_{EB} = -6 \text{ V}, I_C = 0$		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	$h_{FE}$	$V_{CE} = 10 \text{ V}, I_C = 5 \text{ mA}$	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	$V_{CE(sat)}$	$I_C = 10 \text{ mA}, I_B = 0.3 \text{ mA}$			0.25	V
		$I_C = 10 \text{ mA}, I_B = 1.5 \text{ mA}$				
Output voltage high-level	$V_{OH}$	$V_{CC} = 5 \text{ V}, V_B = 0.5 \text{ V}, R_L = 1 \text{ k}\Omega$	4.9			V
Output voltage low-level	$V_{OL}$	$V_{CC} = 5 \text{ V}, V_B = 2.5 \text{ V}, R_L = 1 \text{ k}\Omega$			0.2	V
		$V_{CC} = 5 \text{ V}, V_B = 3.5 \text{ V}, R_L = 1 \text{ k}\Omega$				
		$V_{CC} = 5 \text{ V}, V_B = 10 \text{ V}, R_L = 1 \text{ k}\Omega$				
		$V_{CC} = 5 \text{ V}, V_B = 6 \text{ V}, R_L = 1 \text{ k}\Omega$				
Transition frequency	$f_T$	$V_{CB} = 10 \text{ V}, I_E = -2 \text{ mA}, f = 200 \text{ MHz}$		150		MHz
Input resistance	$R_i$		-30%	0.51	+30%	k $\Omega$
				1.0		
				2.2		
				4.7		
				10		
				22		
				47		

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

2. \*: Rank classification

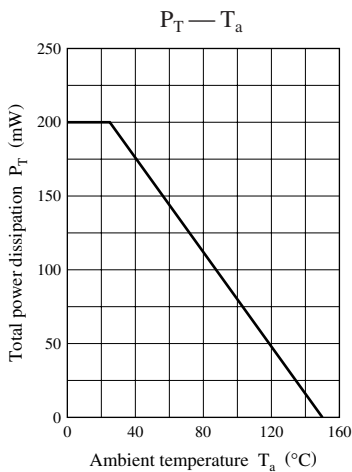
Rank	Q	R	S	No-rank
$h_{FE}$	160 to 260	210 to 340	290 to 460	160 to 460

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

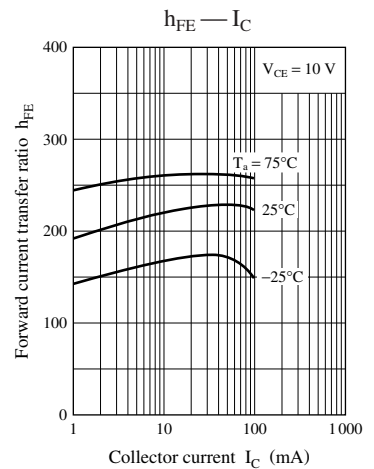
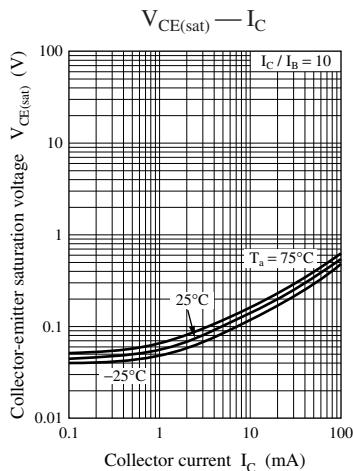
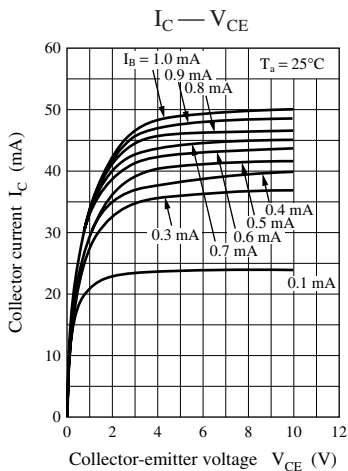
Parameter		Symbol	Conditions	Min	Typ	Max	Unit
Resistance ratio	UNR221M	$R_1/R_2$			0.047		—
	UNR221N				0.1		
	UNR2218/2219			0.08	0.10	0.12	
	UNR221Z				0.21		
	UNR2214			0.17	0.21	0.25	
	UNR221T				0.47		
	UNR221F			0.37	0.47	0.57	
	UNR221V				1.0		
	UNR2211/2212/2213/221L			0.8	1.0	1.2	
	UNR221K	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

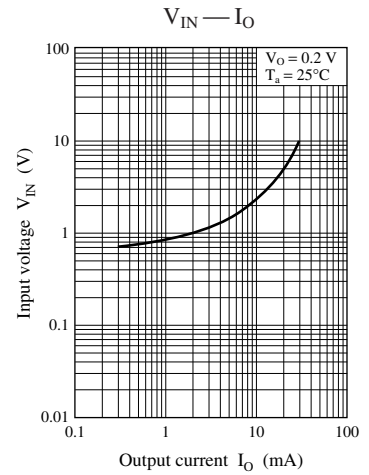
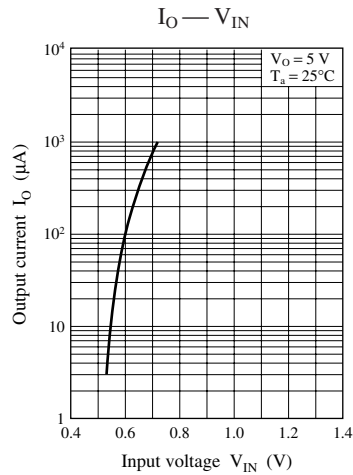
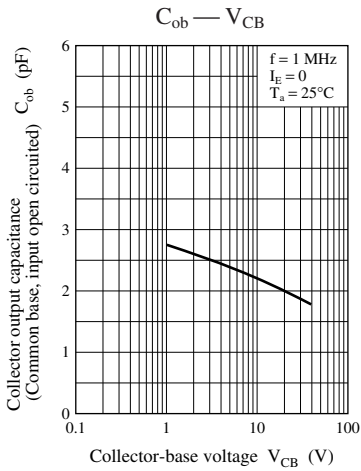
Note) Measuring methods are based on JAPANESE INDUSTRIAL STANDARD JIS C 7030 measuring methods for transistors.

Common characteristics chart

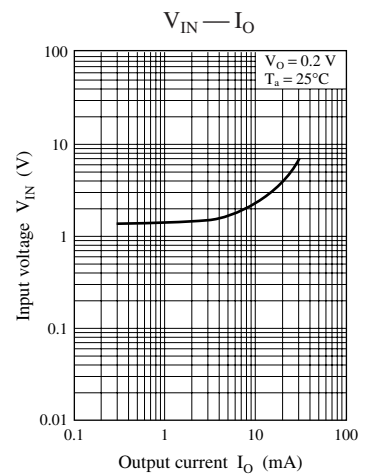
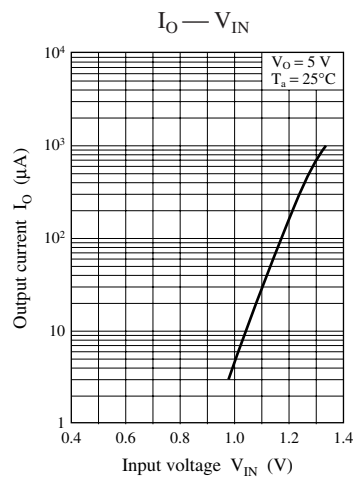
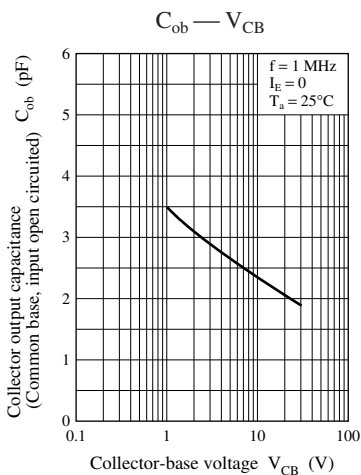
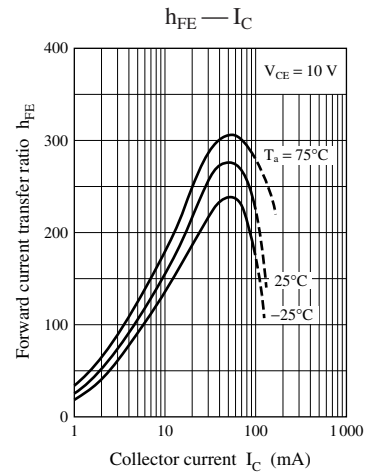
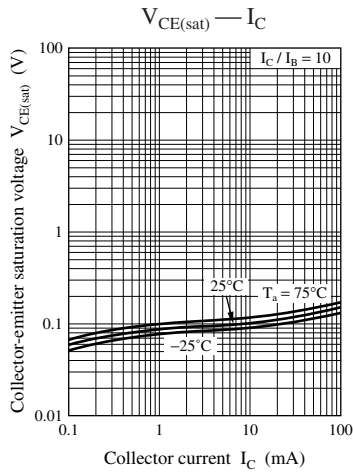
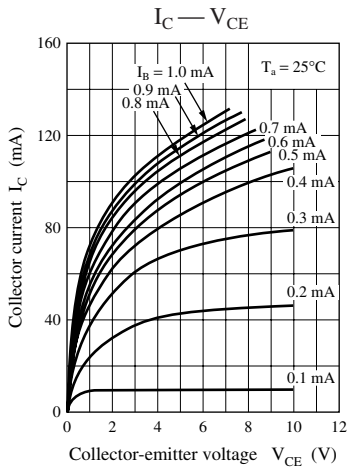


Characteristics charts of UNR2210

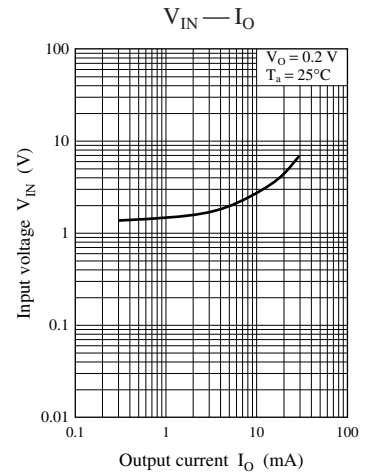
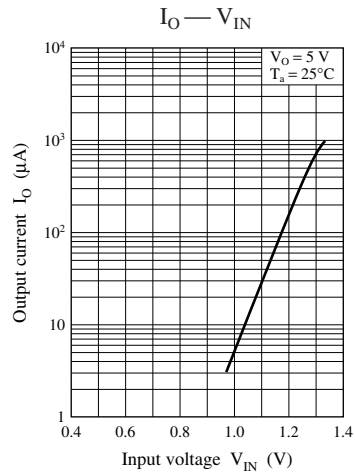
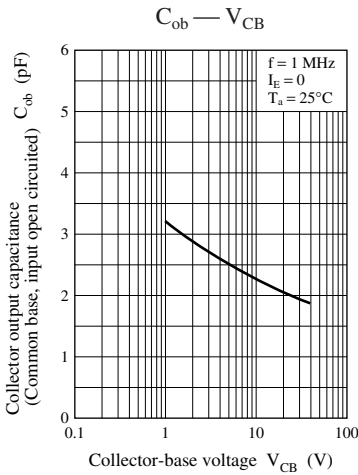
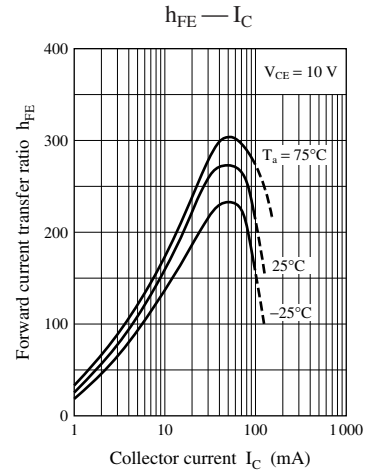
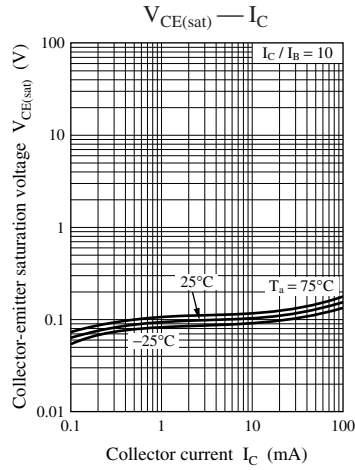
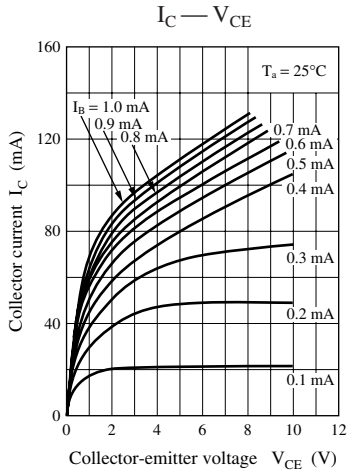




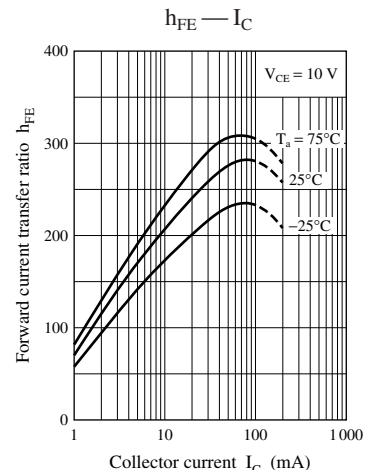
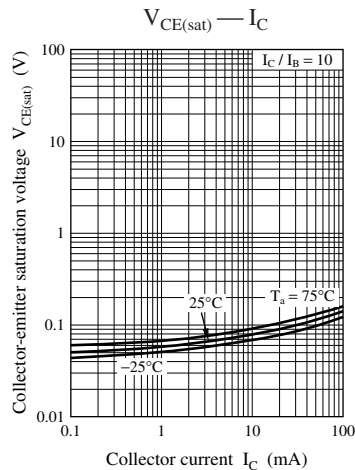
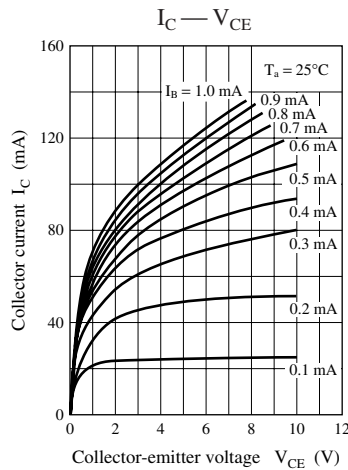
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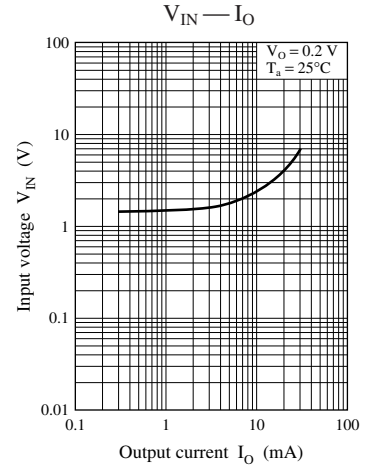
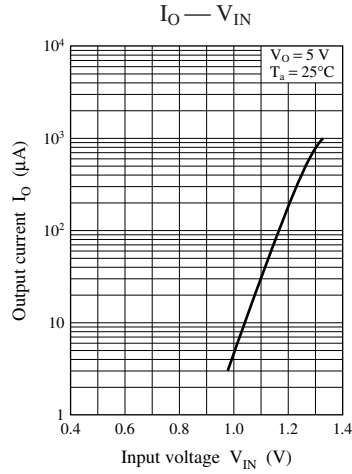
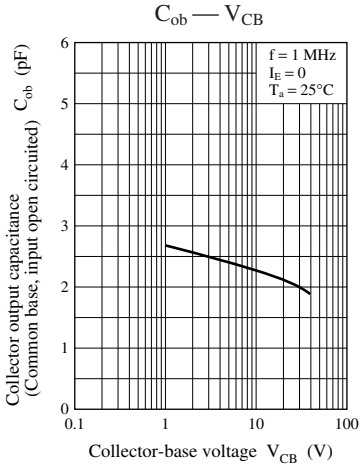


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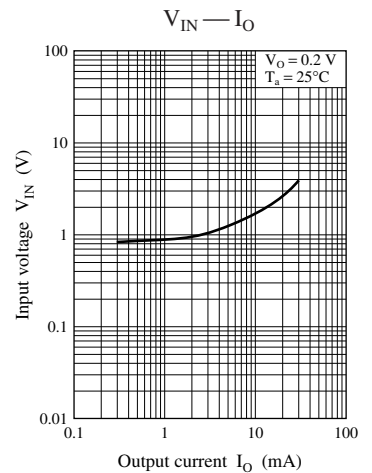
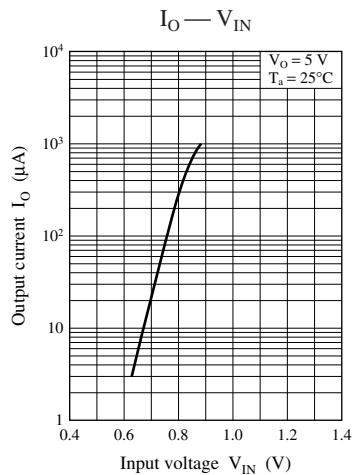
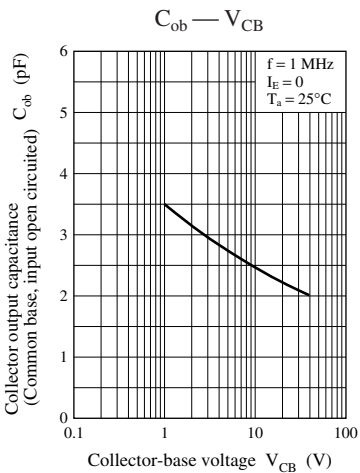
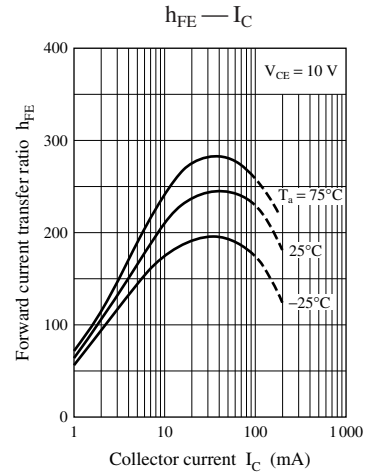
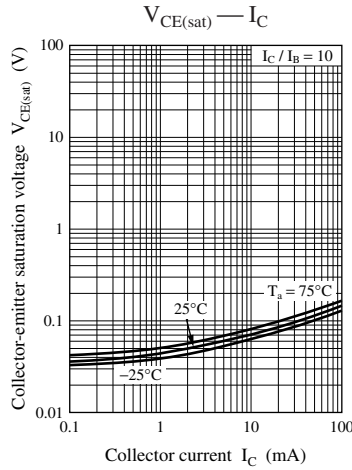
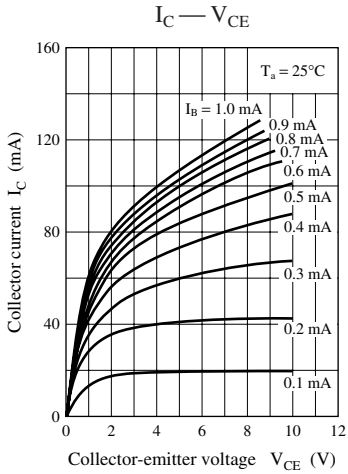


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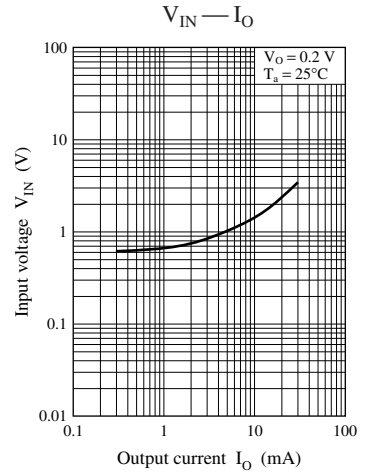
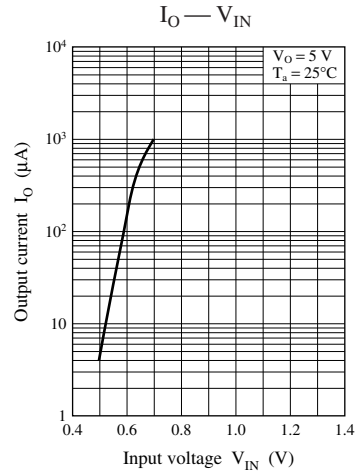
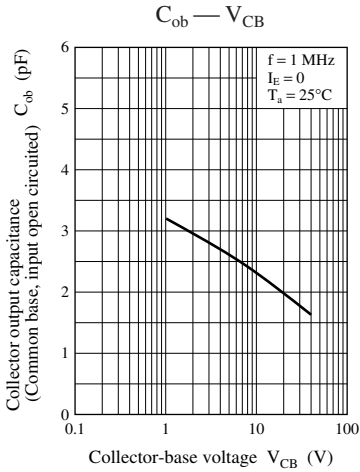
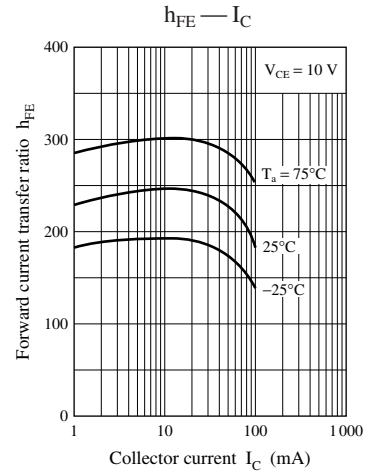
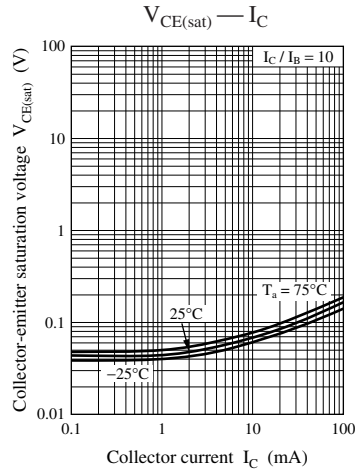
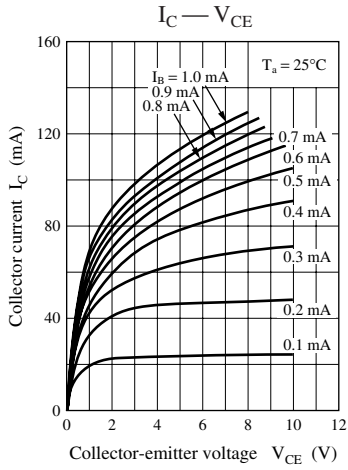




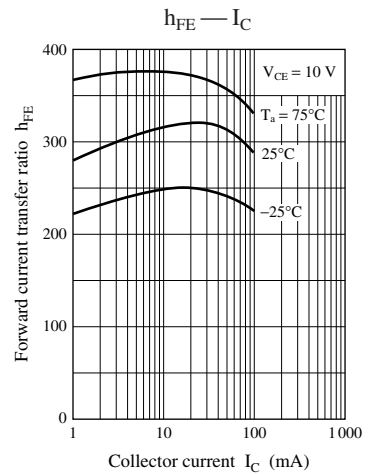
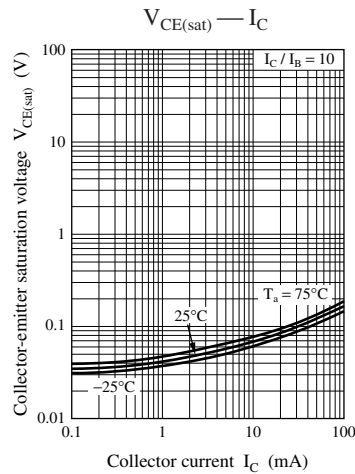
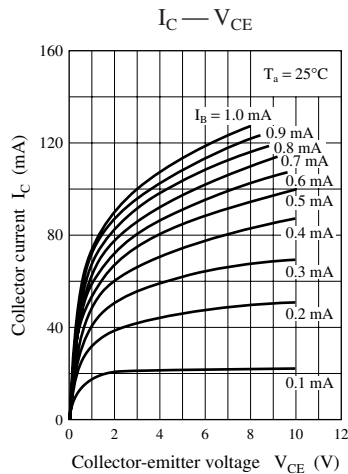
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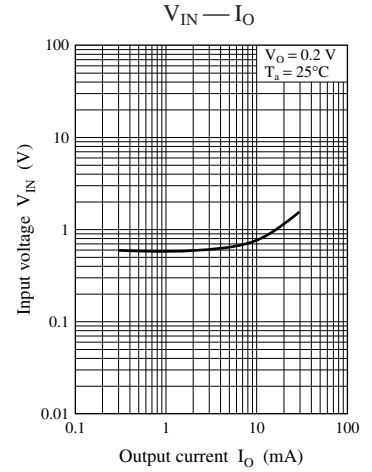
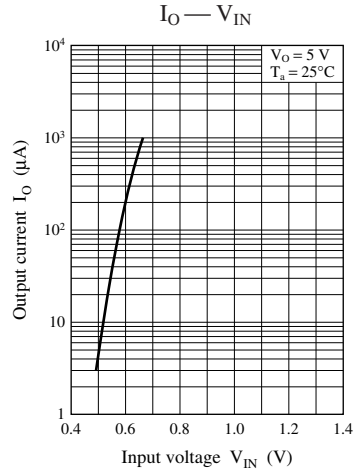
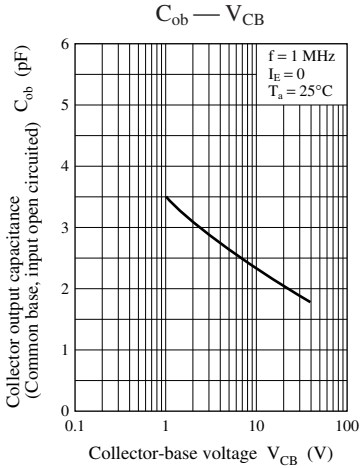


Characteristics charts of UNR2215

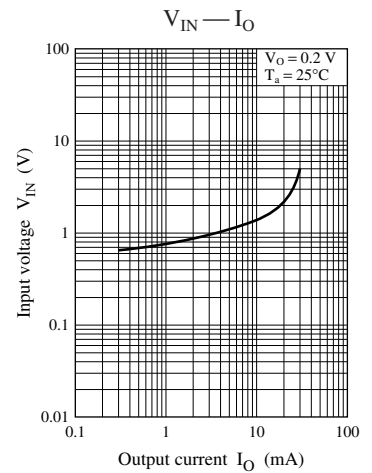
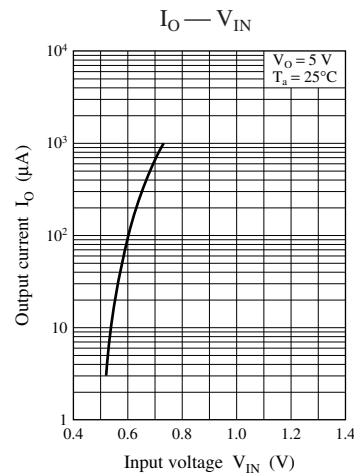
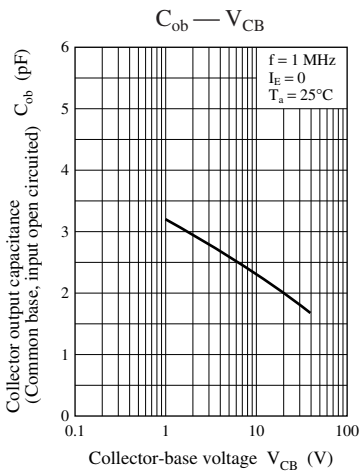
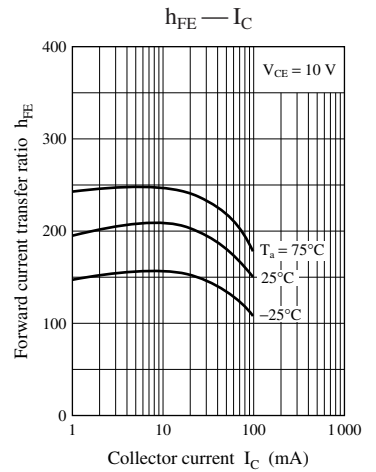
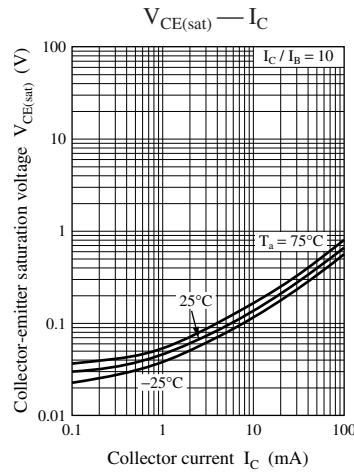
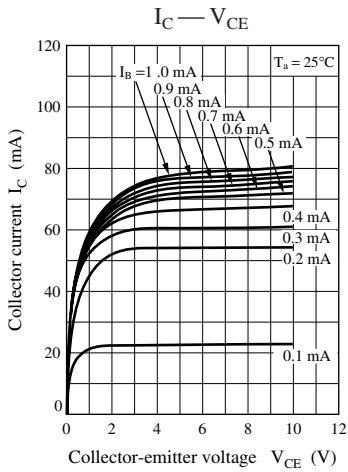


Characteristics charts of UNR2216



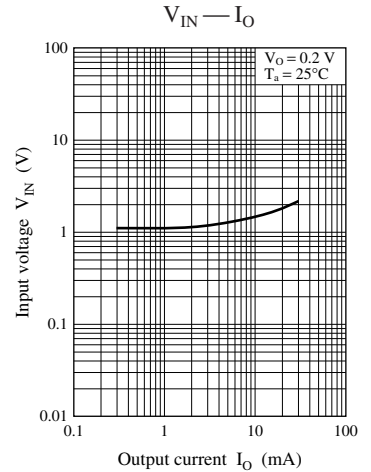
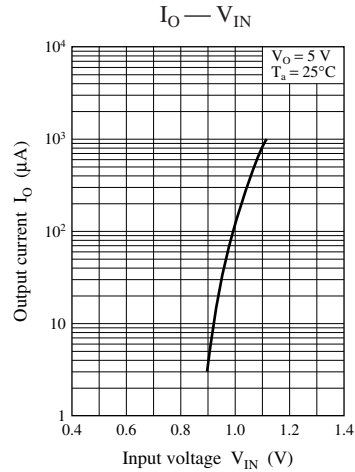
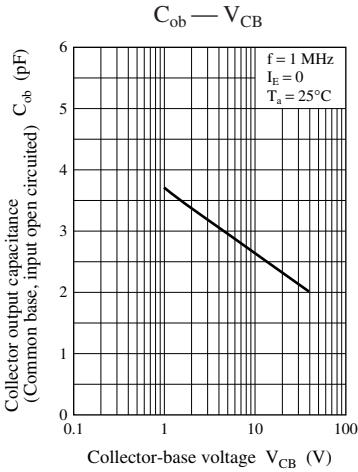
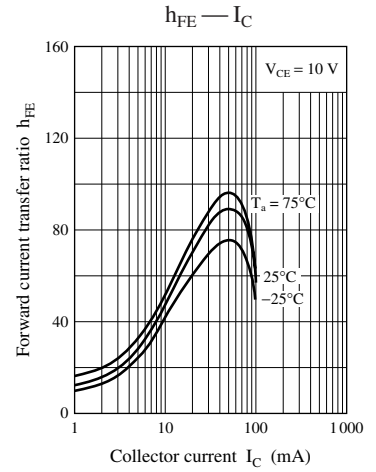
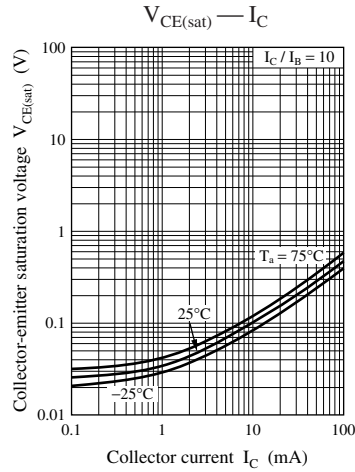
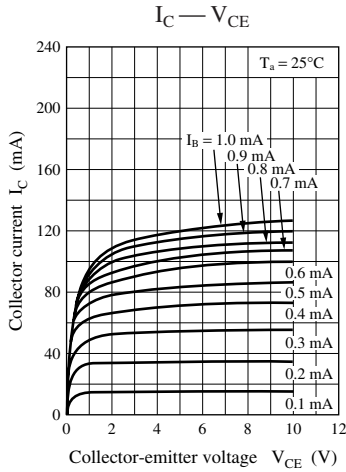


Characteristics charts of UNR2217

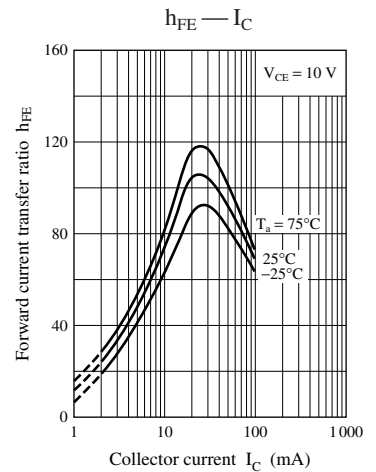
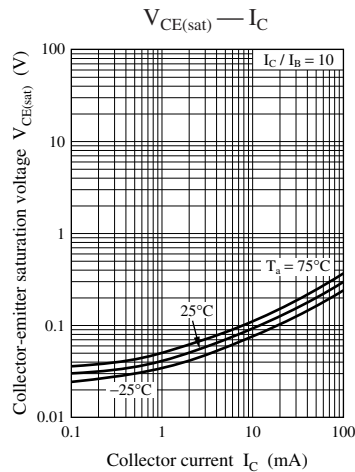
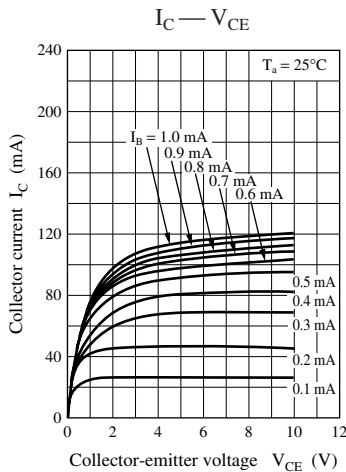


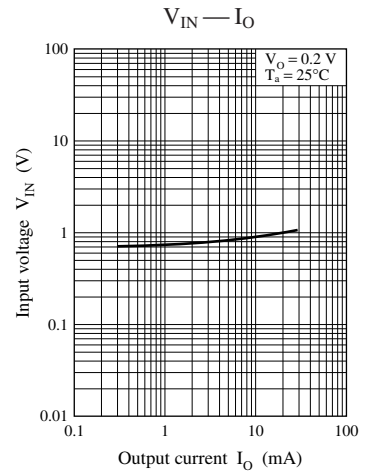
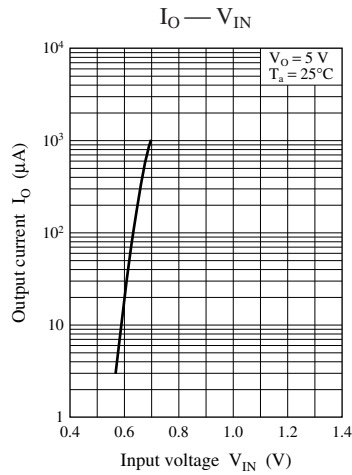
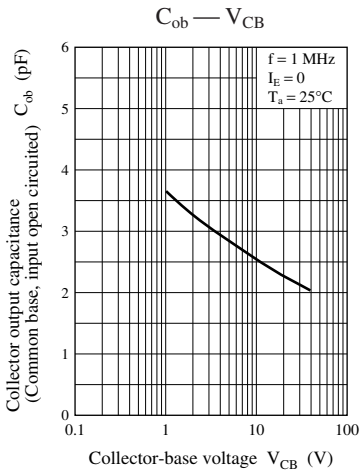


Characteristics charts of UNR2218

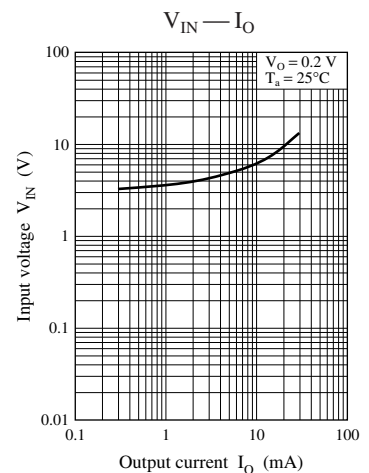
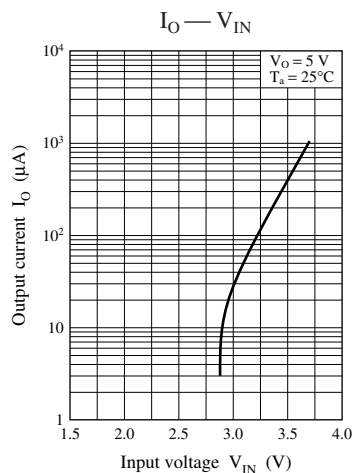
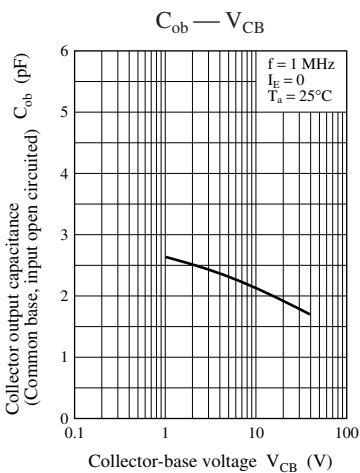
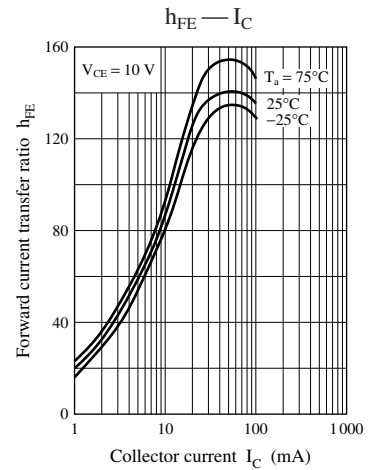
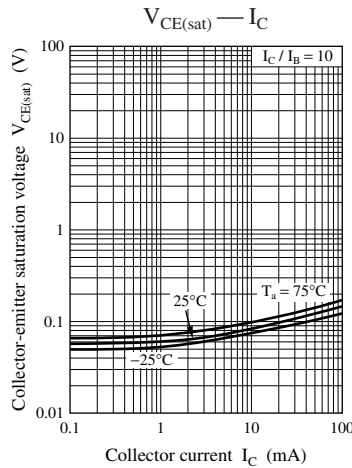
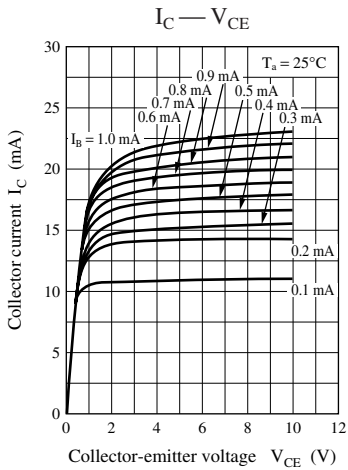


Characteristics charts of UNR2219

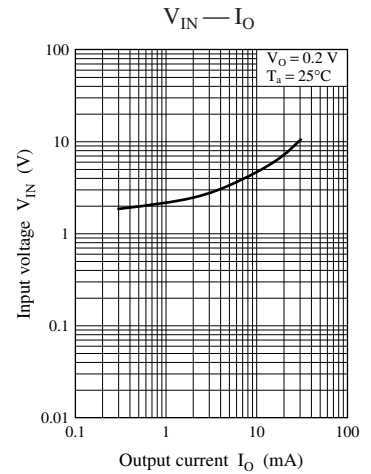
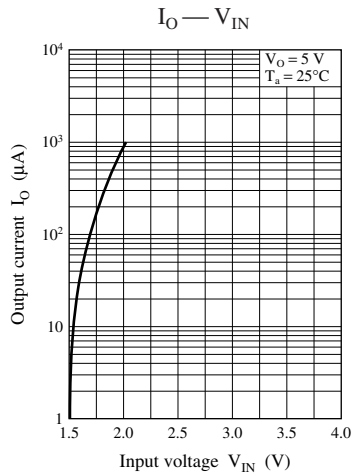
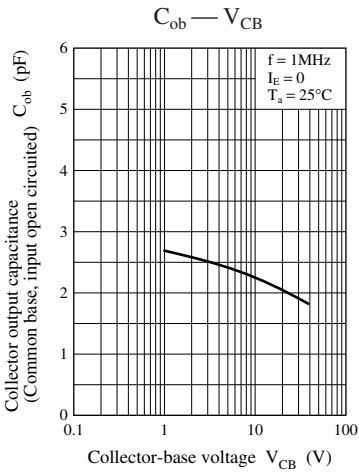
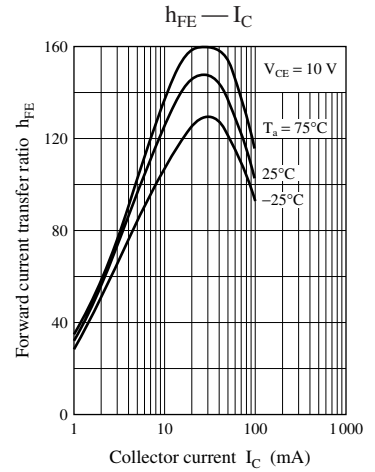
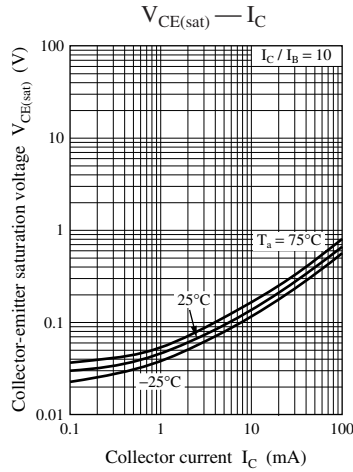
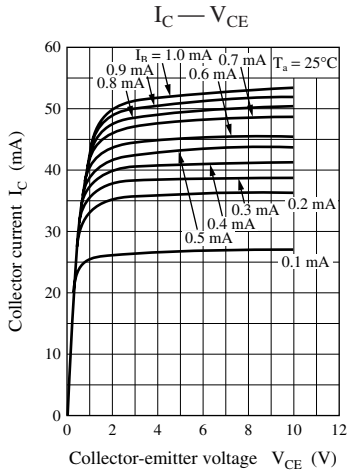




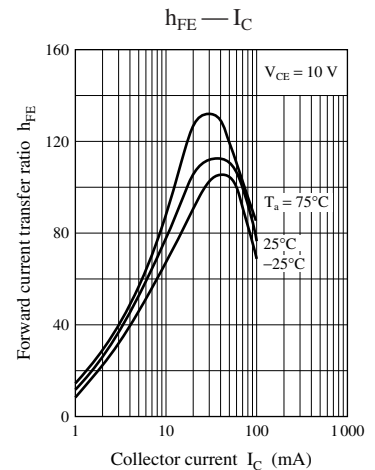
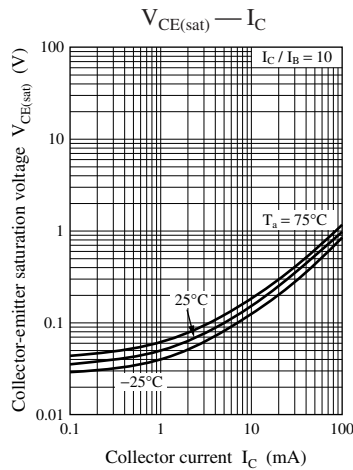
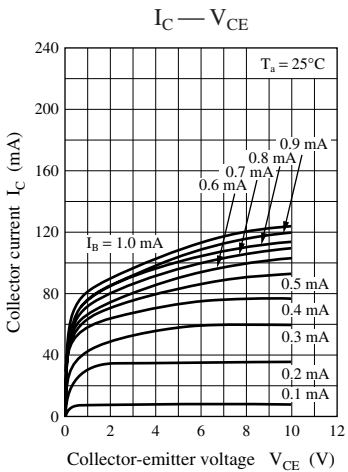
Characteristics charts of UNR221D

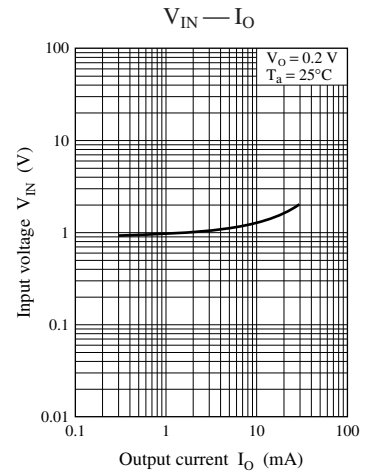
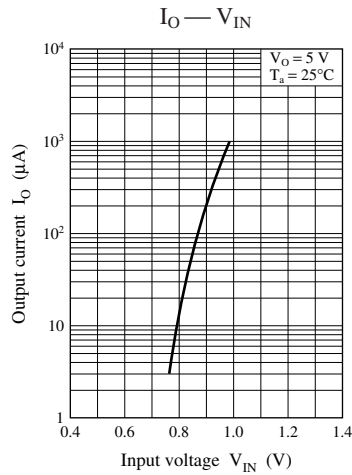
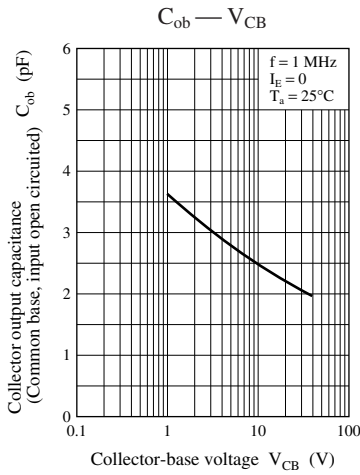


Characteristics charts of UNR221E

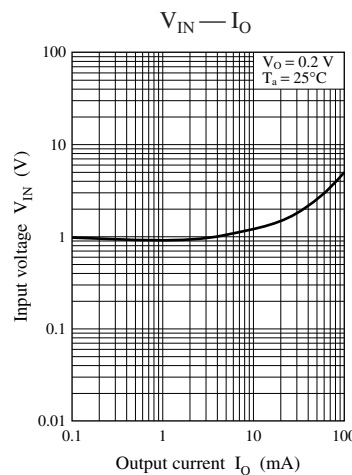
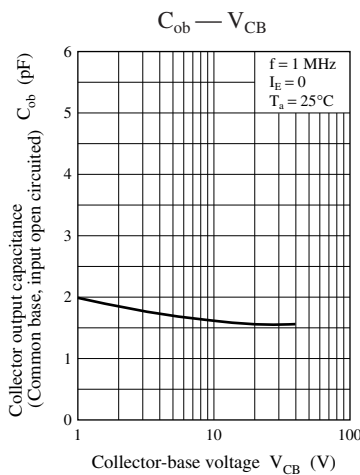
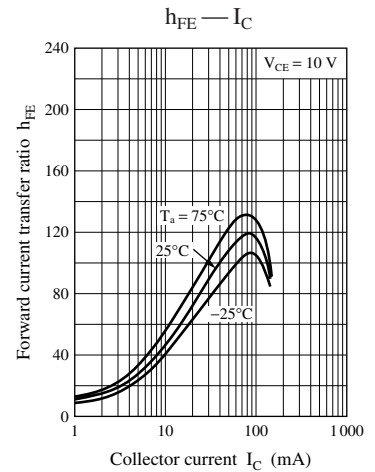
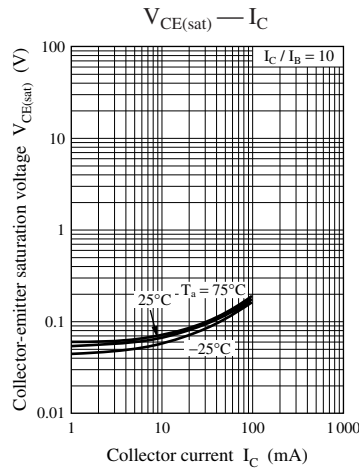
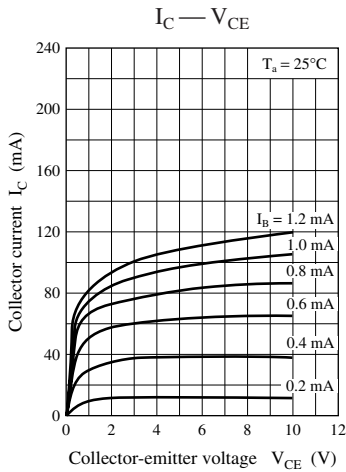


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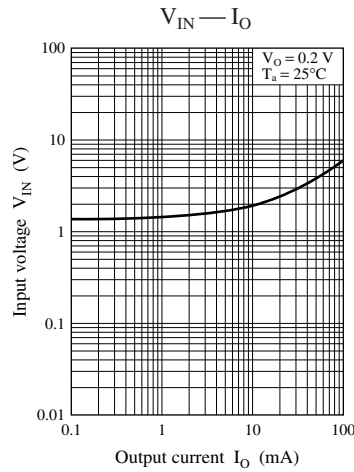
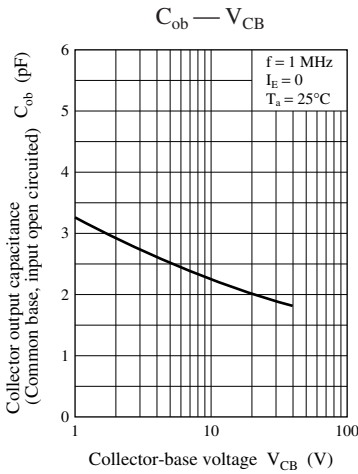
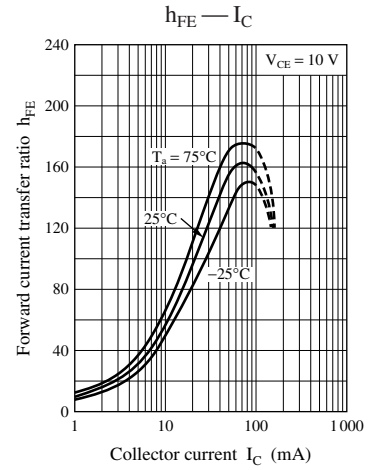
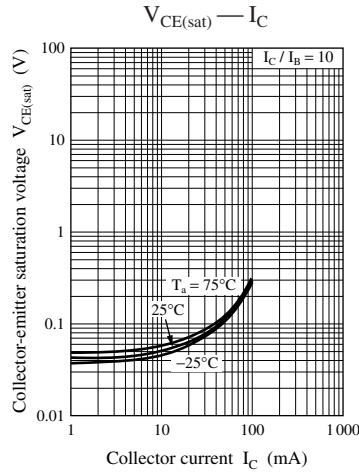
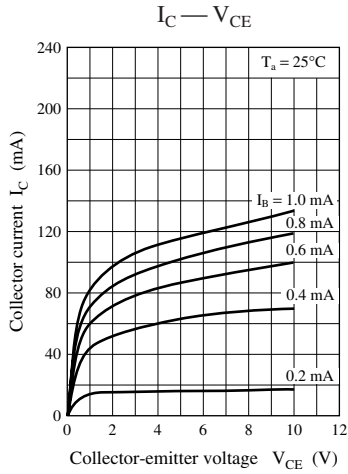




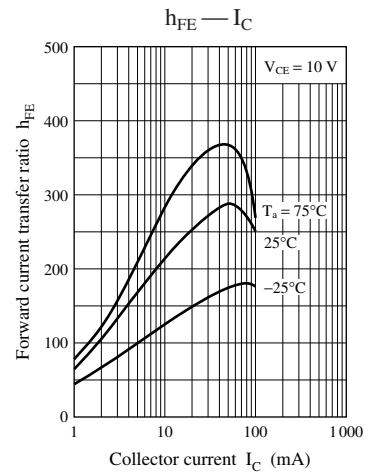
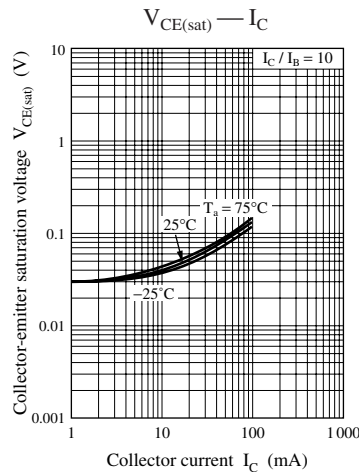
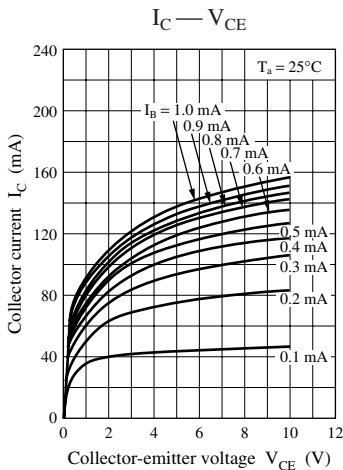
Characteristics charts of UNR221K

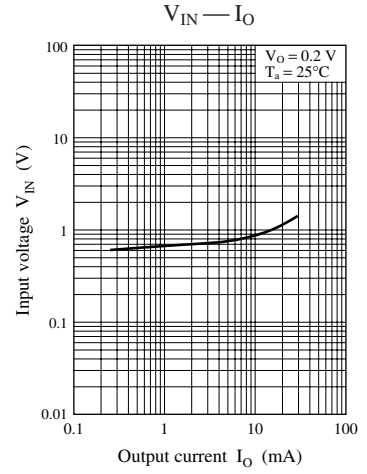
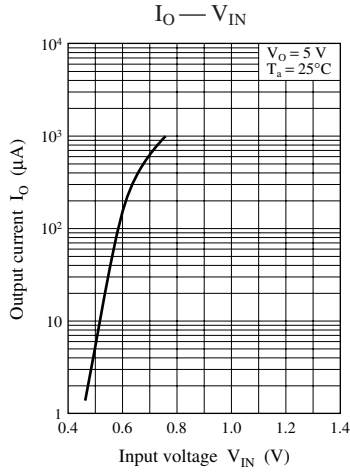
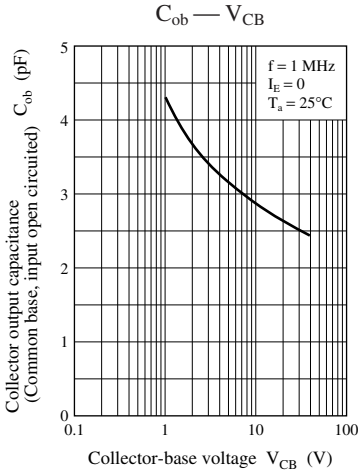


Characteristics charts of UNR221L

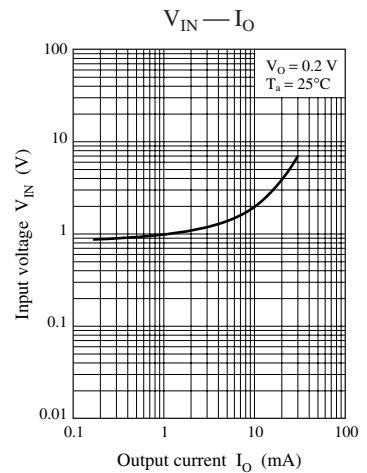
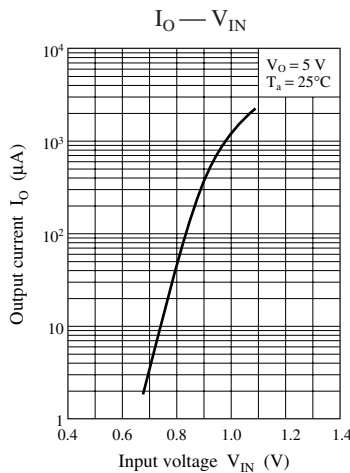
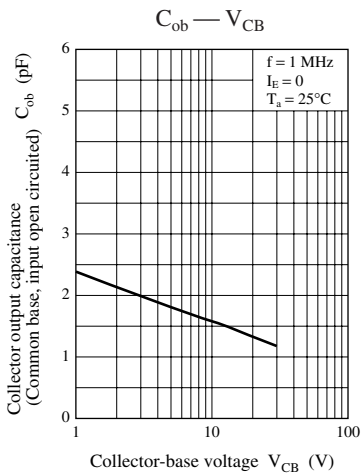
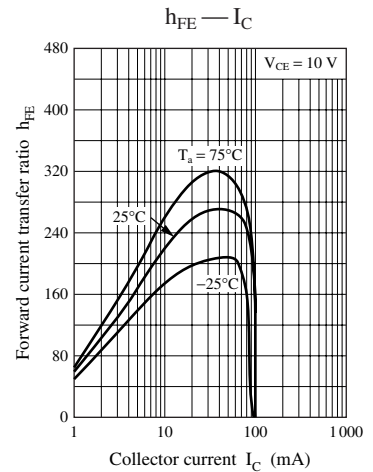
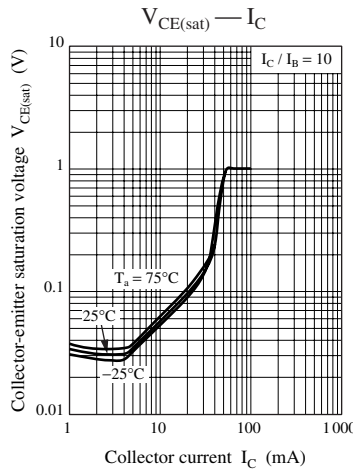
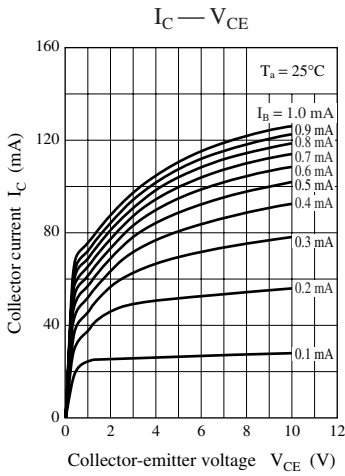


Characteristics charts of UNR221M

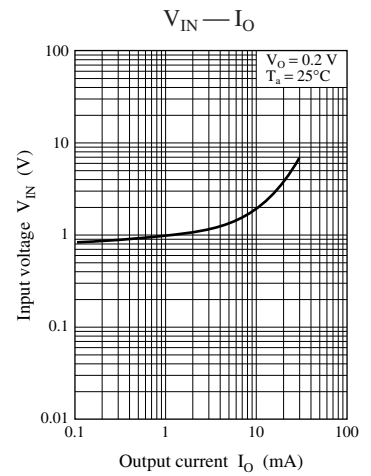
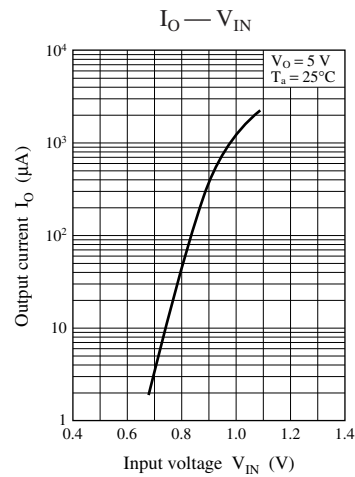
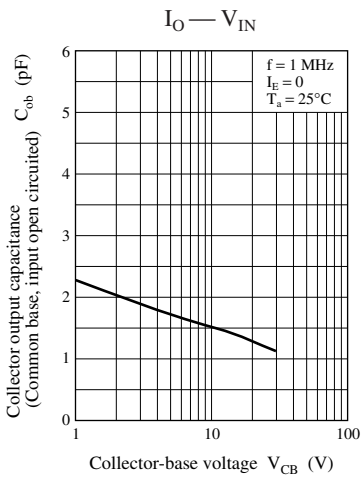
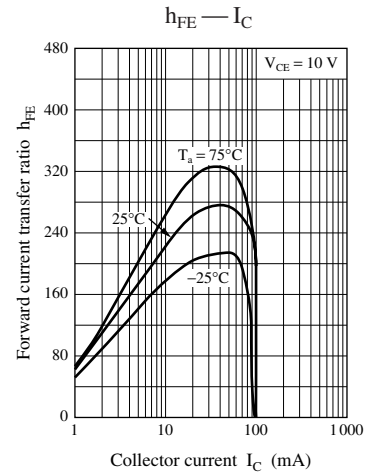
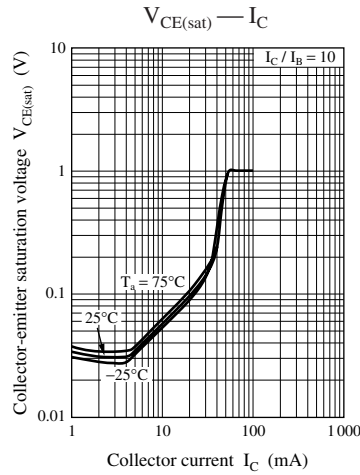
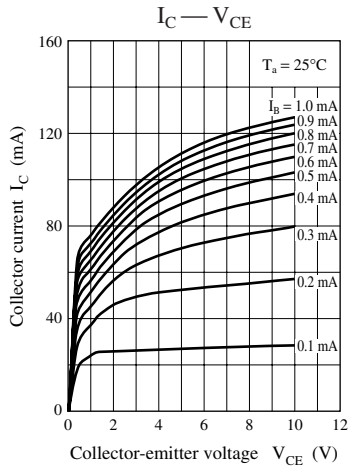




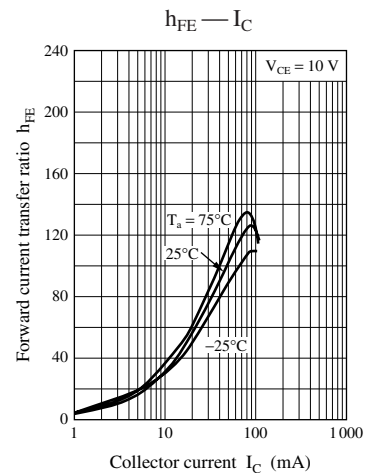
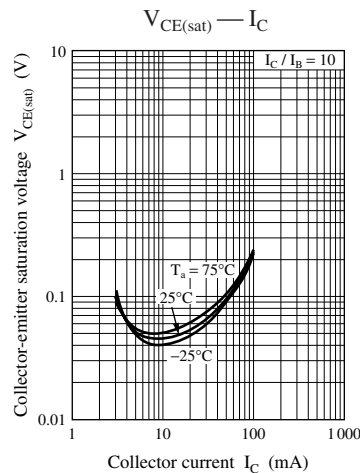
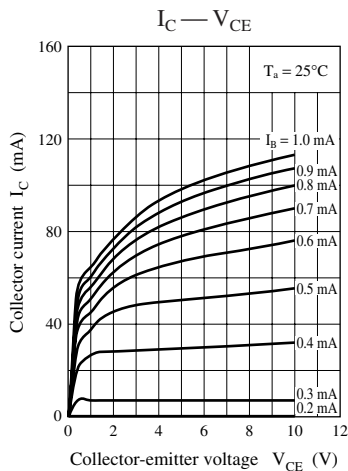
Characteristics charts of UNR221N

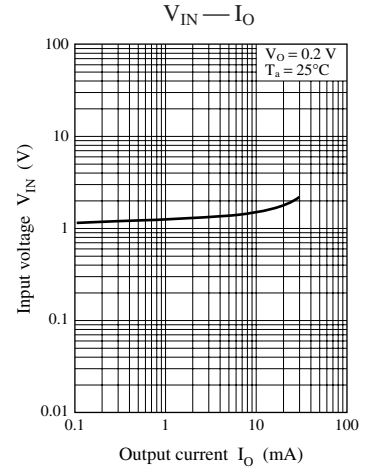
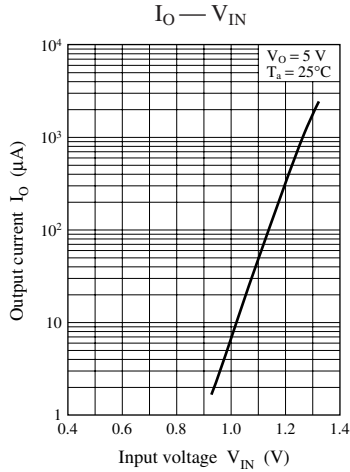
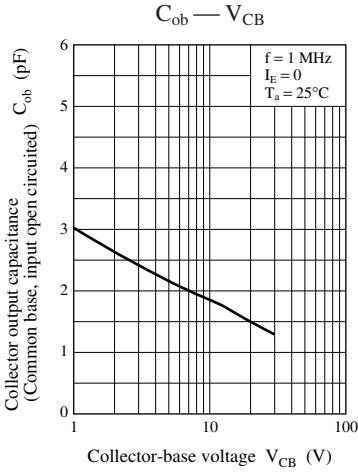


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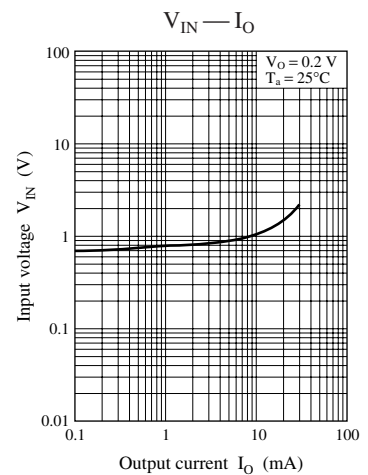
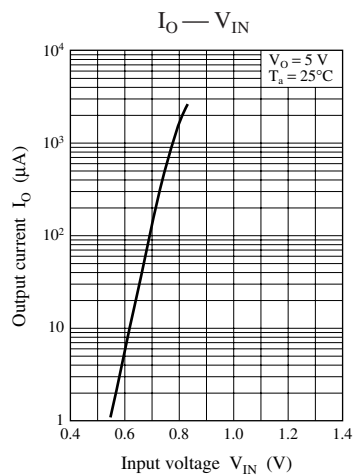
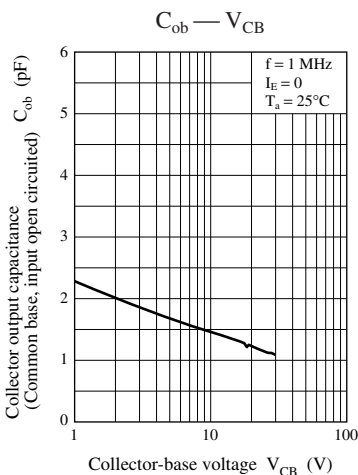
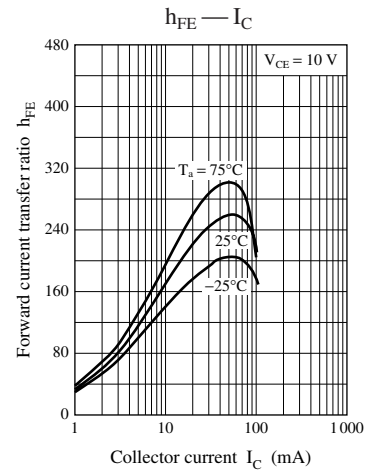
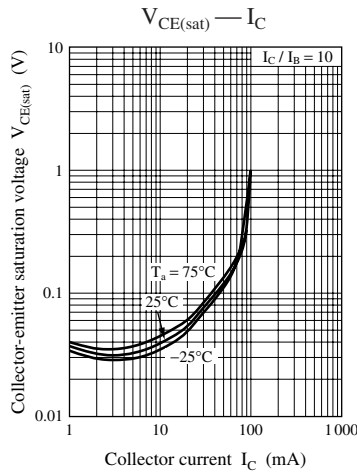
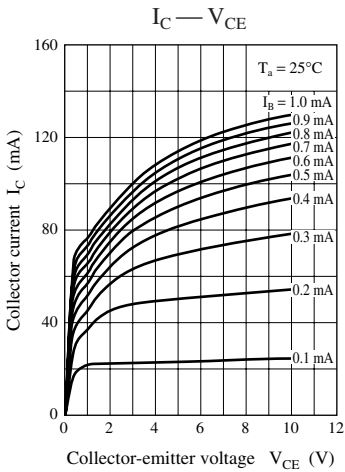


## Characteristics charts of UNR221V





Characteristics charts of UNR221Z





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