

# UNR221x Series (UN221x Series)

## Silicon NPN epitaxial planar type

For digital circuits

### ■ Features

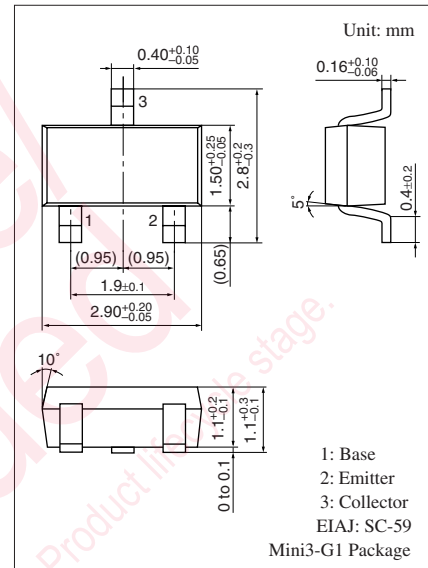
- Costs can be reduced through downsizing of the equipment and reduction of the number of parts.
- Mini type package allowing easy automatic insertion through tape packing and magazine packing

### ■ Resistance by Part Number

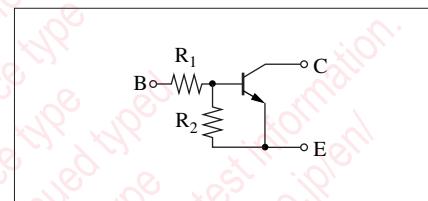
	Marking Symbol (R <sub>1</sub> )	(R <sub>2</sub> )
• UNR2210 (UN2210)	8L	47 kΩ —
• UNR2211 (UN2211)	8A	10 kΩ 10 kΩ
• UNR2212 (UN2212)	8B	22 kΩ 22 kΩ
• UNR2213 (UN2213)	8C	47 kΩ 47 kΩ
• UNR2214 (UN2214)	8D	10 kΩ 47 kΩ
• UNR2215 (UN2215)	8E	10 kΩ —
• UNR2216 (UN2216)	8F	4.7 kΩ —
• UNR2217 (UN2217)	8H	22 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
	UNR221V		$I_C = 10 \text{ mA}, I_B = 1.5 \text{ mA}$				
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	UNR2218	$R_i$		-30%	0.51	+30%	k $\Omega$
	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

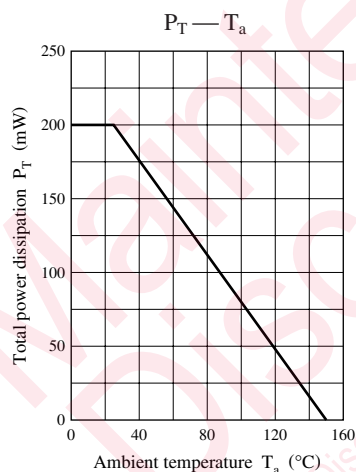
Rank	Q	R	S	No-rank
$h_{FE}$	160 to 260	210 to 340	290 to 460	160 to 460

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

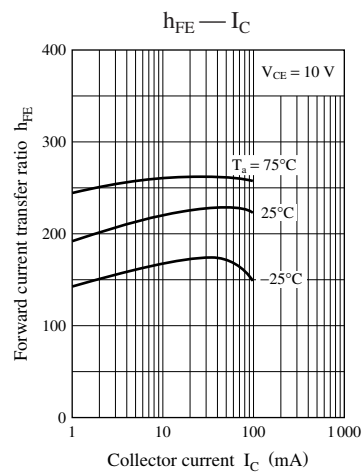
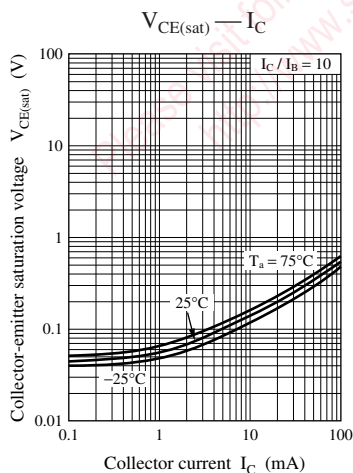
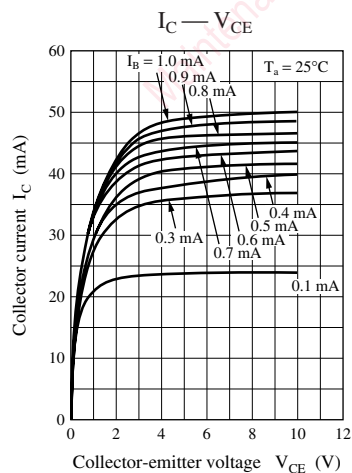
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Resistance ratio	UNR221M	$R_1/R_2$		0.047		—
	UNR221N			0.1		
	UNR2218/2219		0.08	0.10	0.12	
	UNR221Z			0.21		
	UNR2214		0.17	0.21	0.25	
	UNR221T			0.47		
	UNR221F		0.37	0.47	0.57	
	UNR221V			1.0		
	UNR2211/2212/2213/221L		0.8	1.0	1.2	
	UNR221K		1.70	2.13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

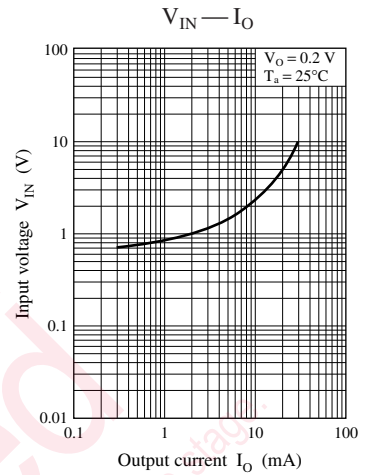
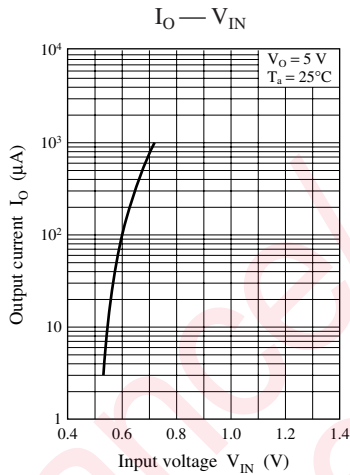
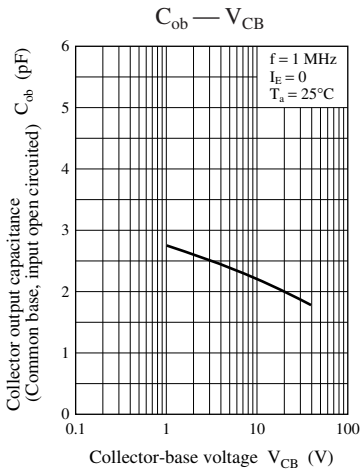
Note) Measuring methods are based on JAPANESE INDUSTRIAL STANDARD JIS C 7030 measuring methods for transistors.

Common characteristics chart

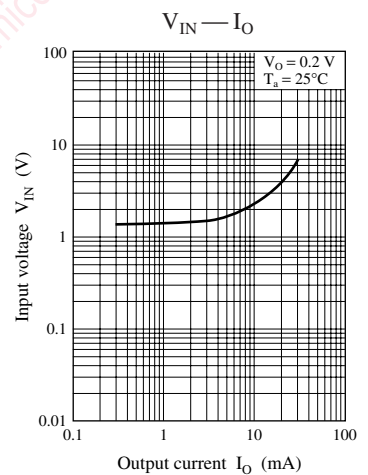
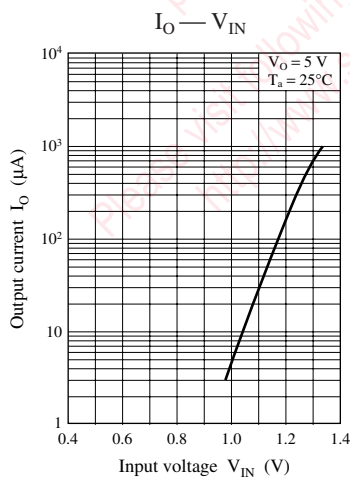
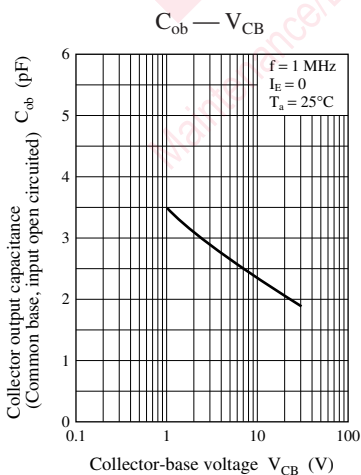
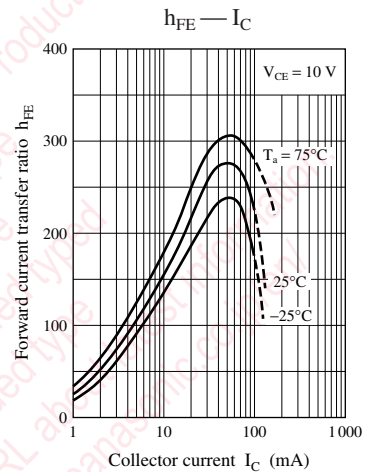
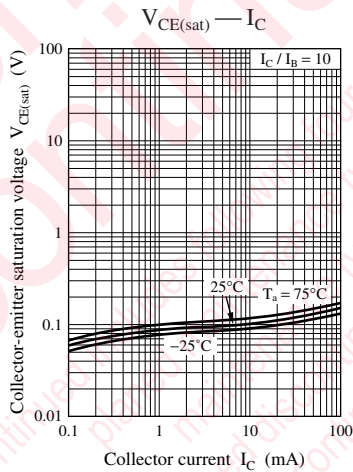
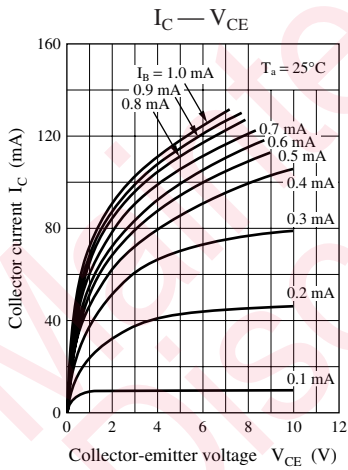


Characteristics charts of UNR2210

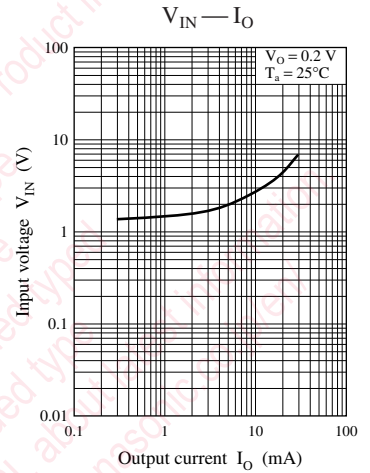
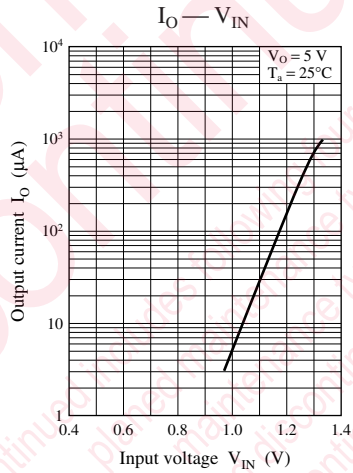
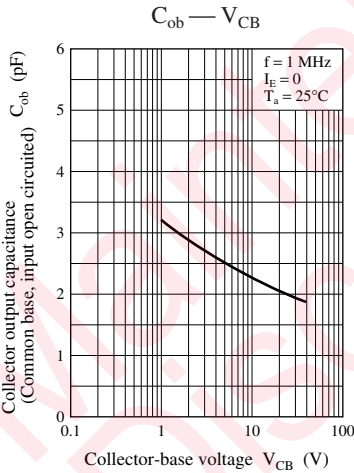
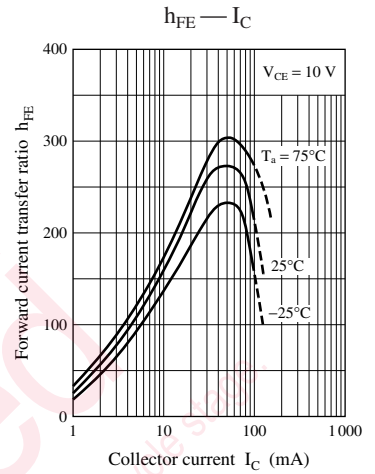
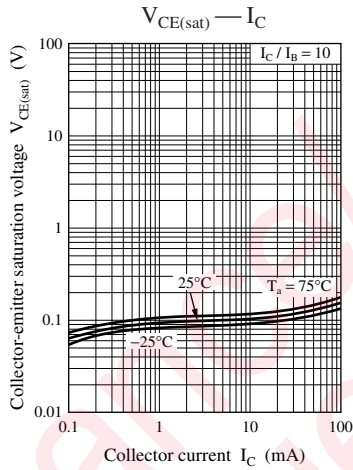
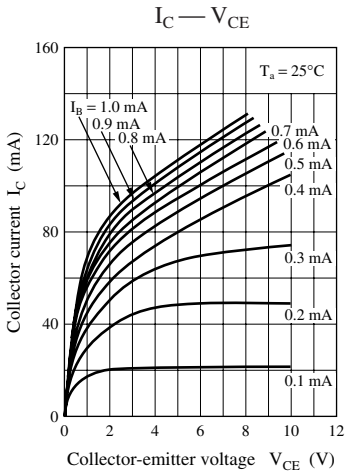




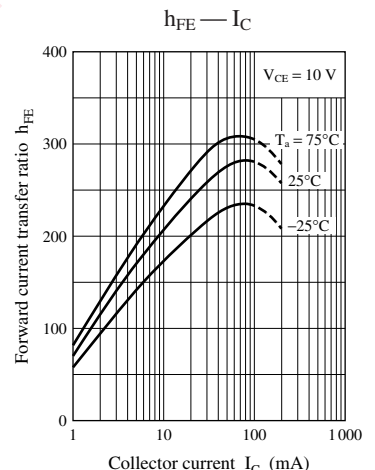
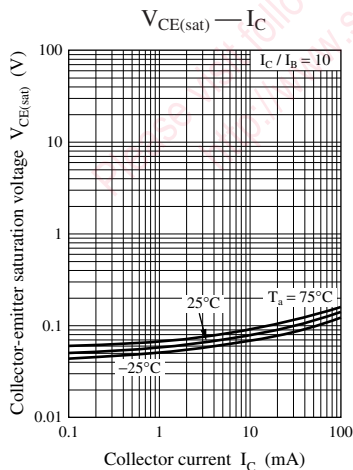
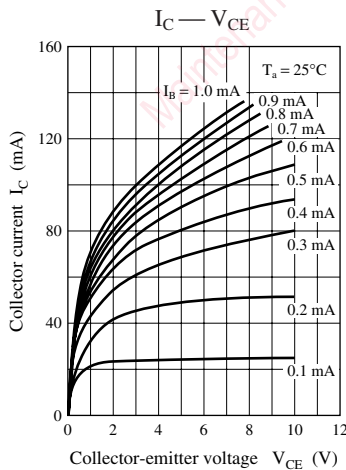
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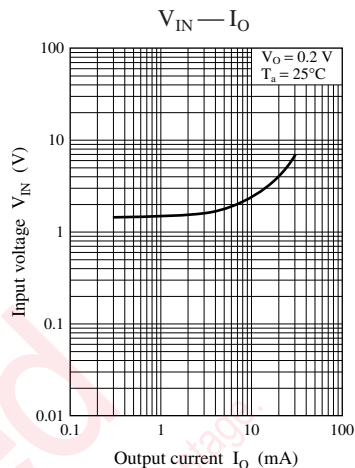
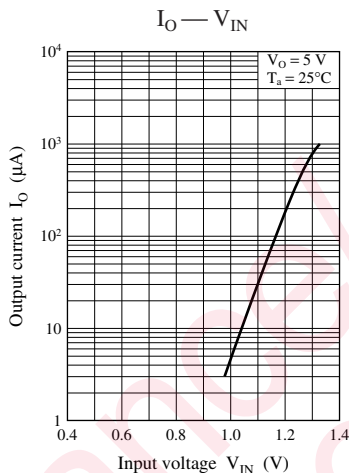
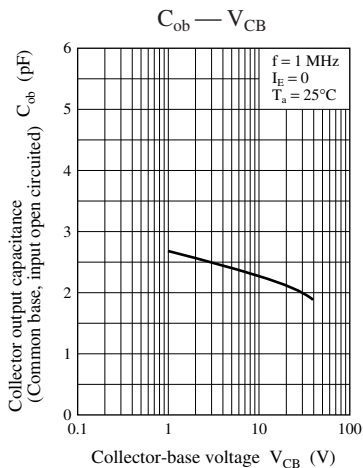


Characteristics charts of UNR2212

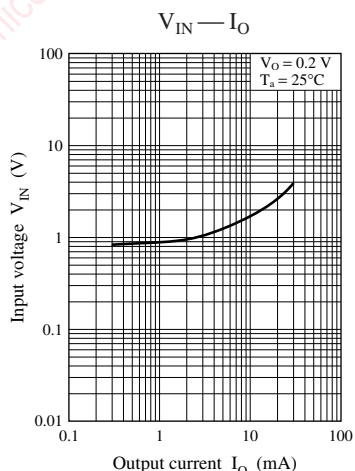
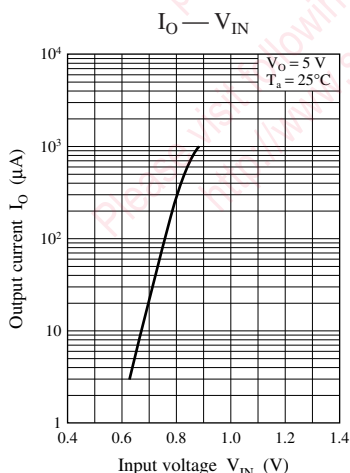
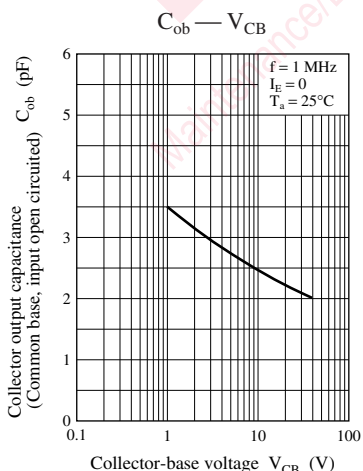
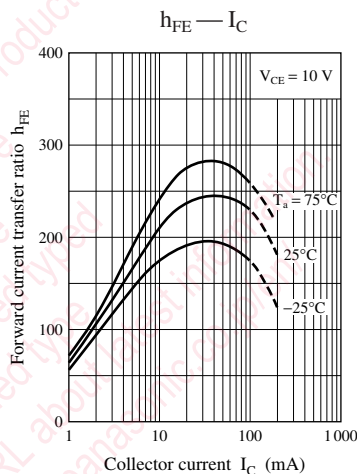
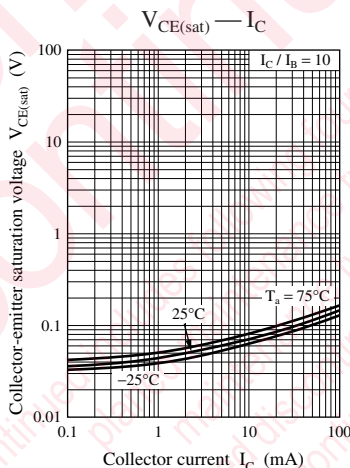
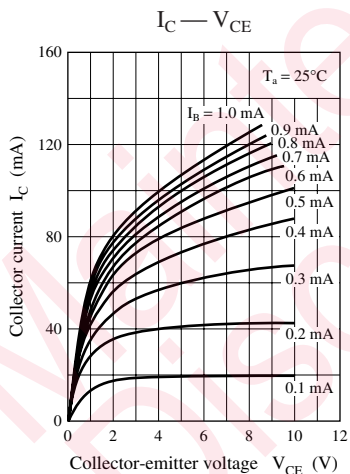


Characteristics charts of UNR2213

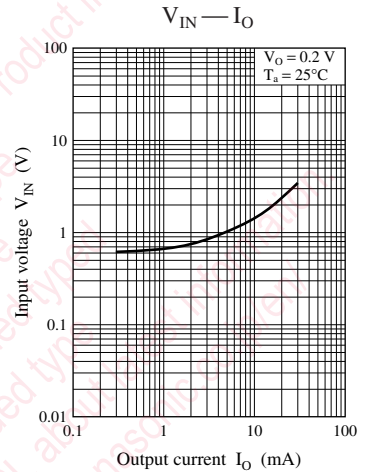
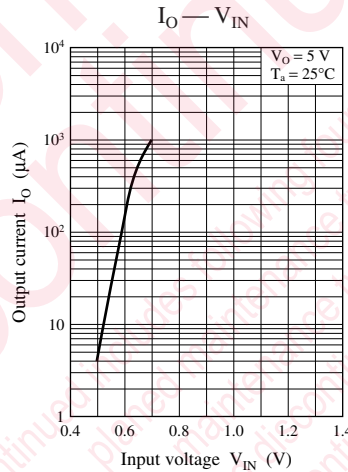
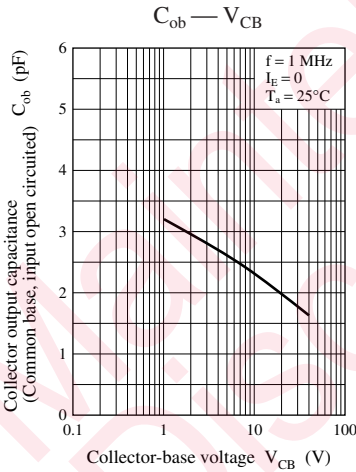
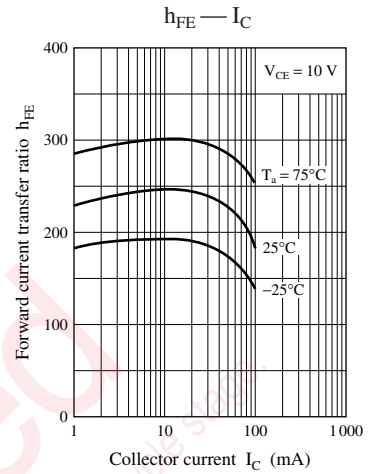
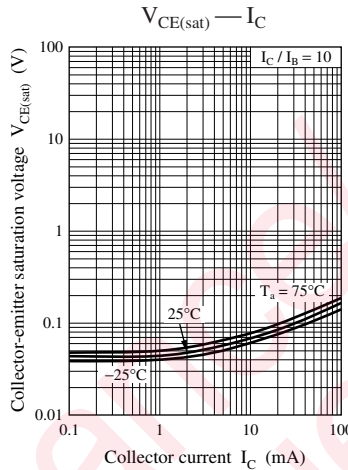
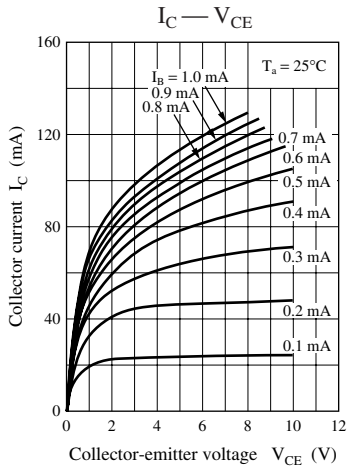




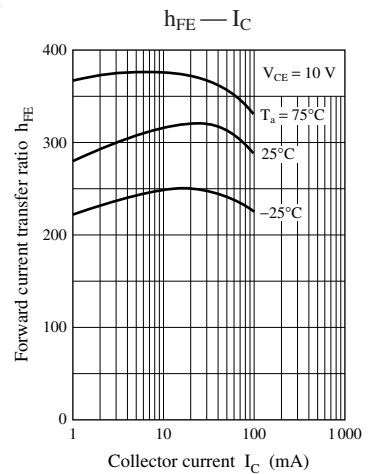
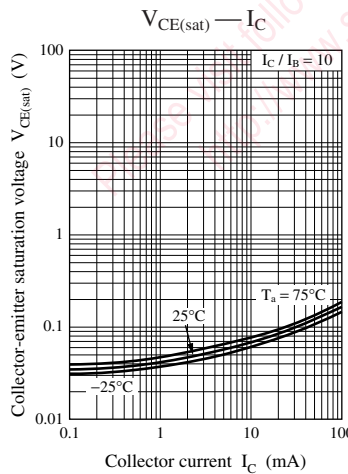
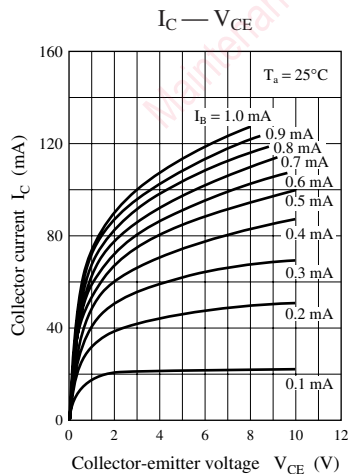
Characteristics charts of UNR2214



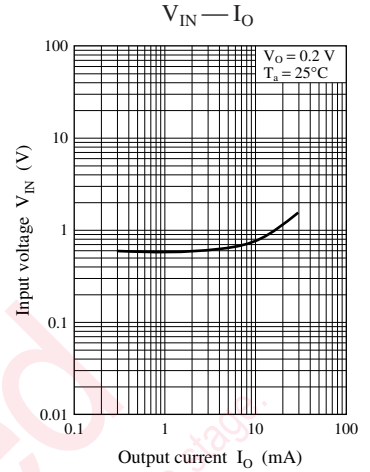
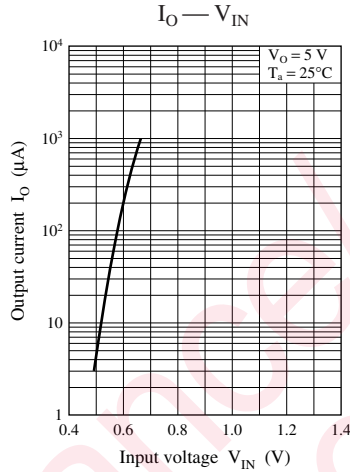
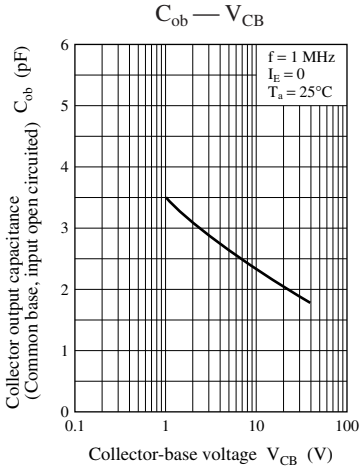
Characteristics charts of UNR2215



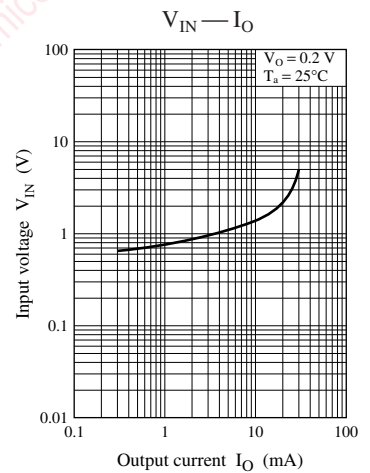
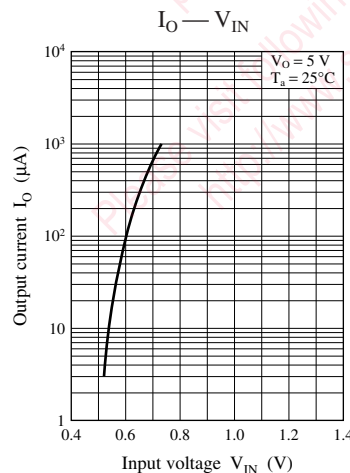
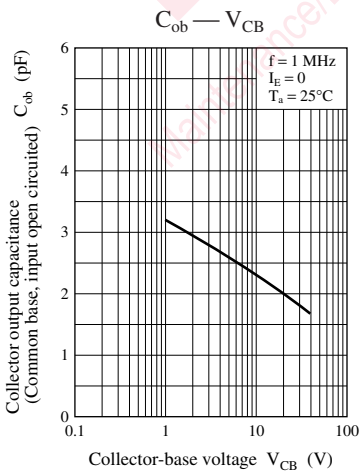
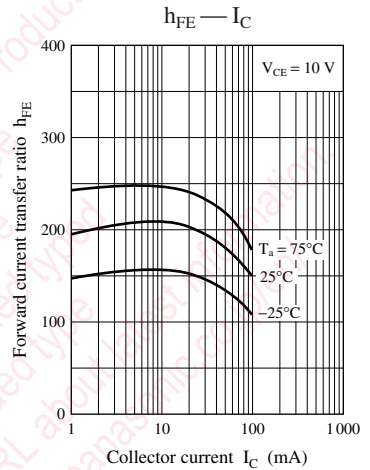
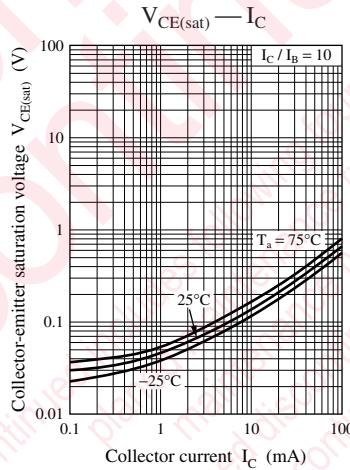
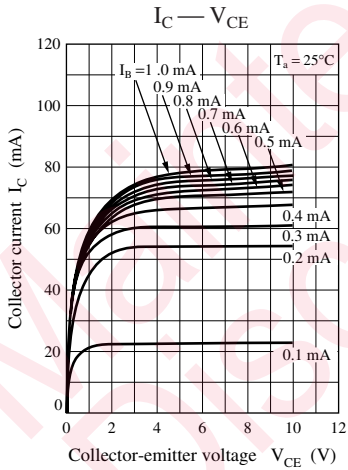
Characteristics charts of UNR2216





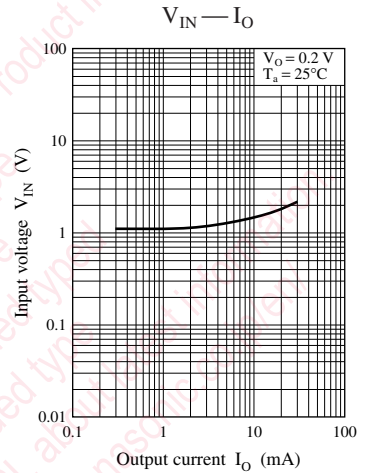
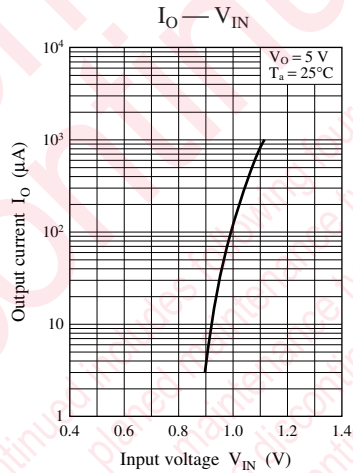
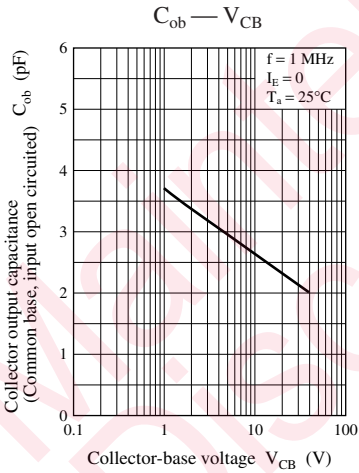
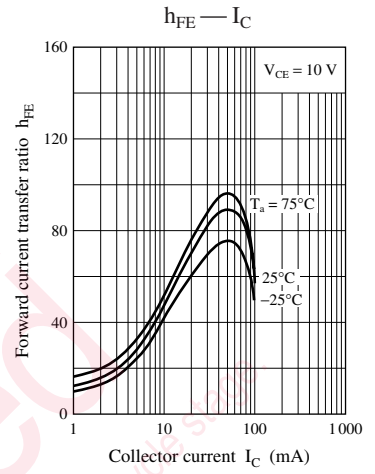
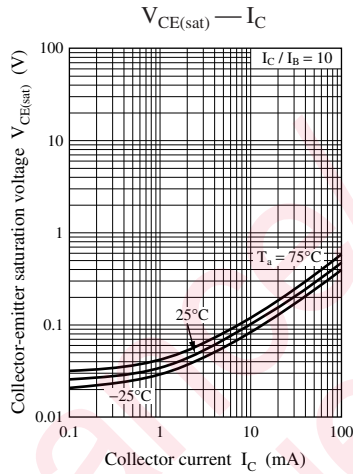
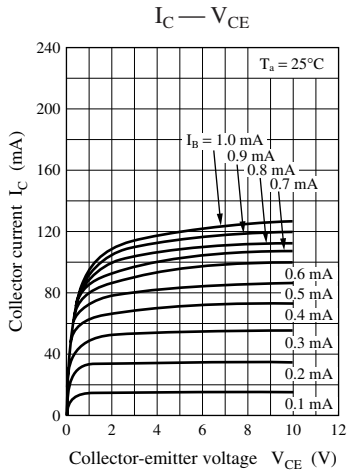


Characteristics charts of UNR2217

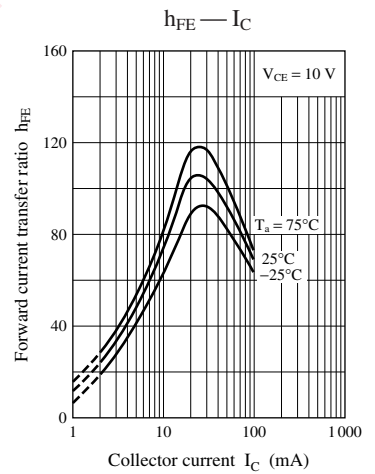
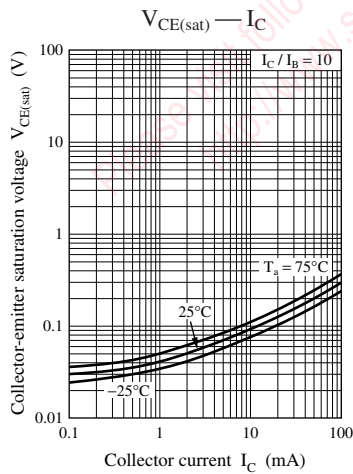
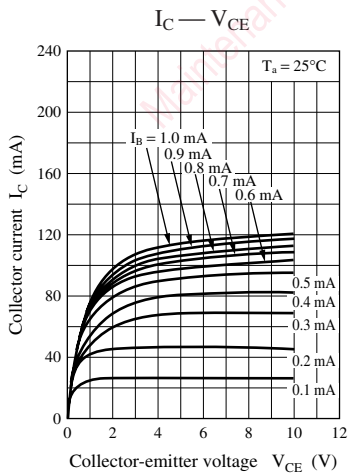


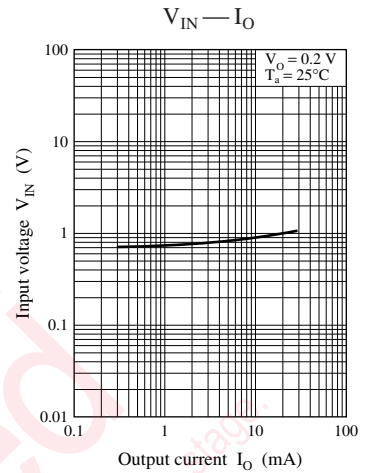
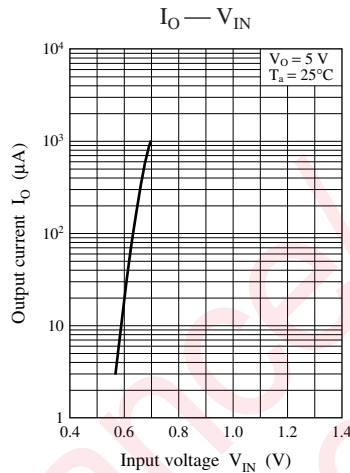
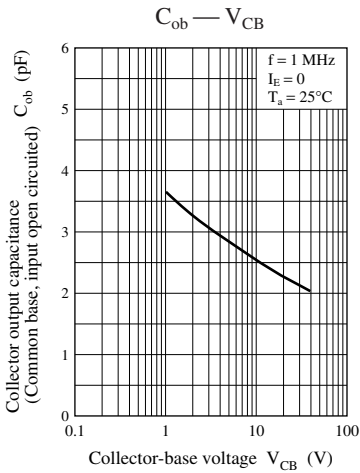


Characteristics charts of UNR2218

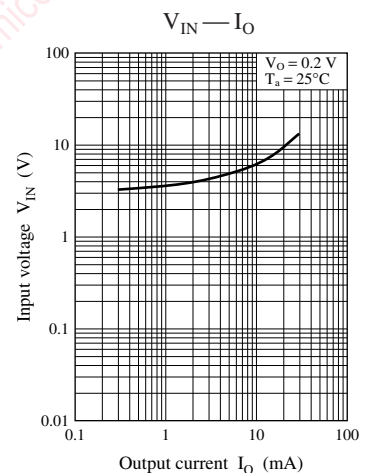
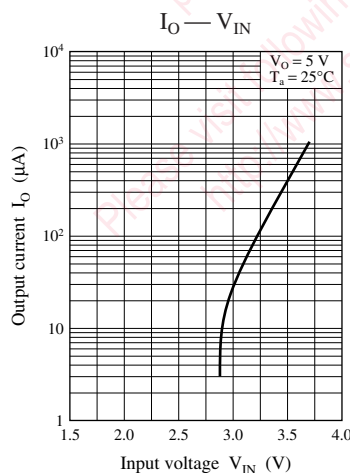
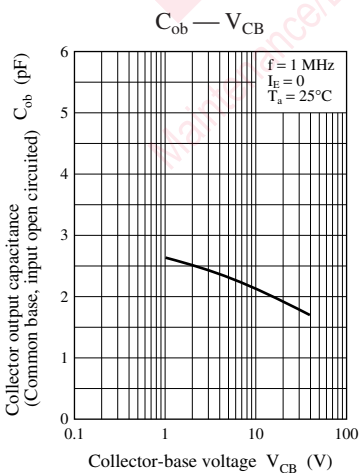
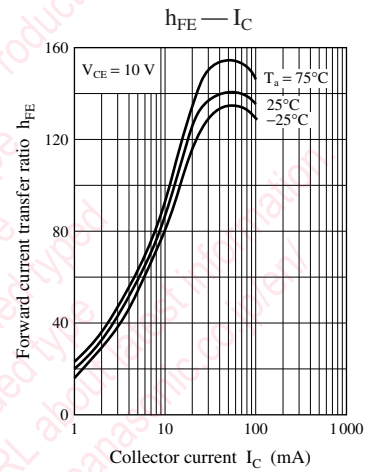
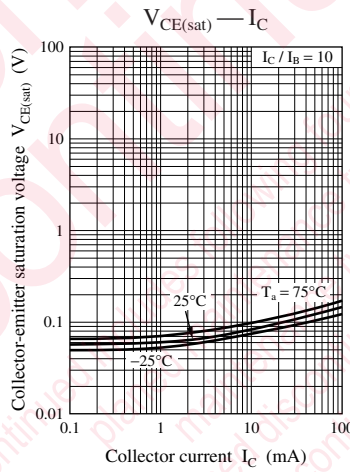
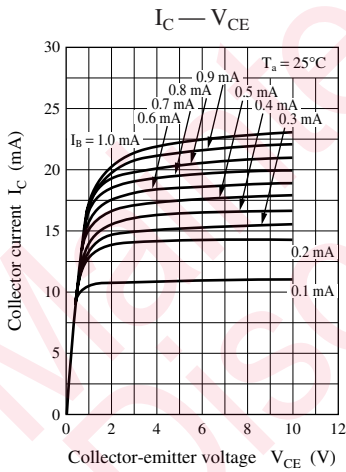


Characteristics charts of UNR2219

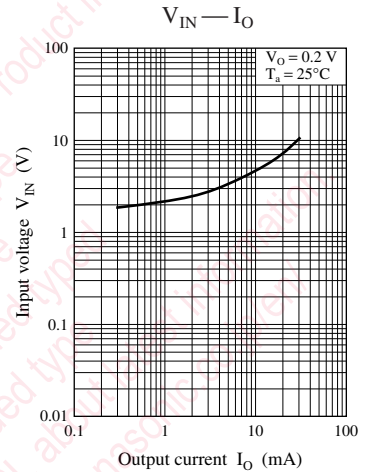
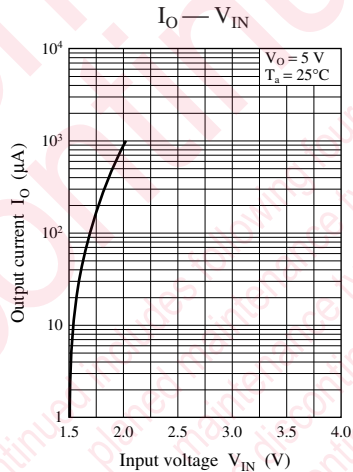
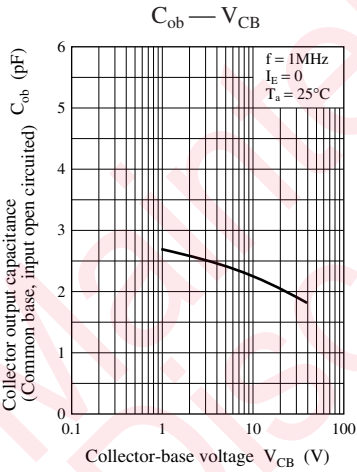
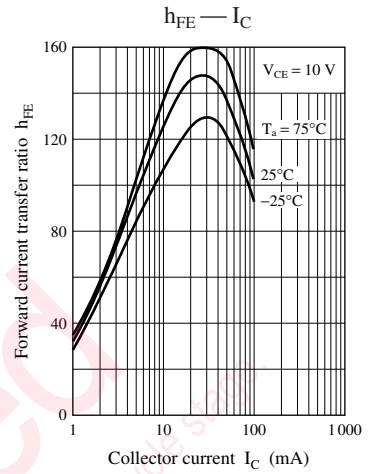
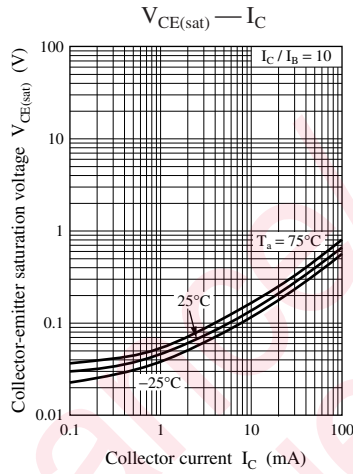
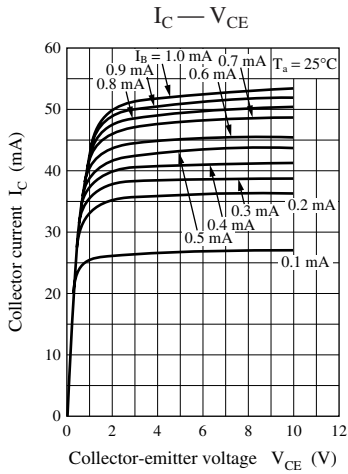




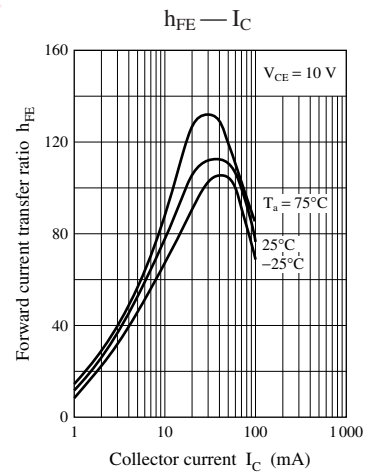
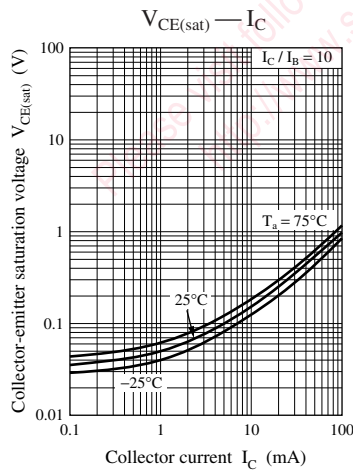
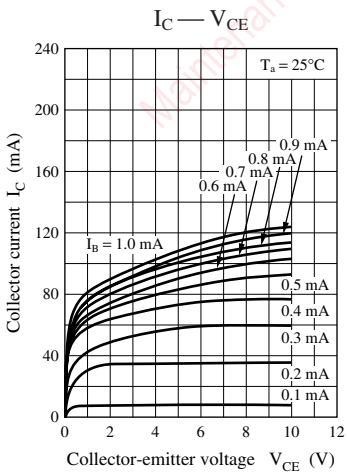
Characteristics charts of UNR221D

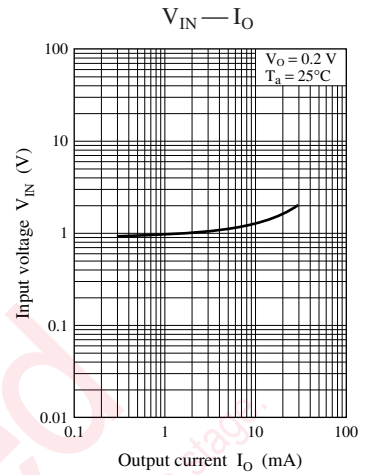
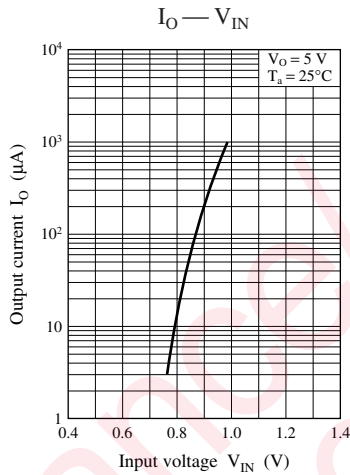
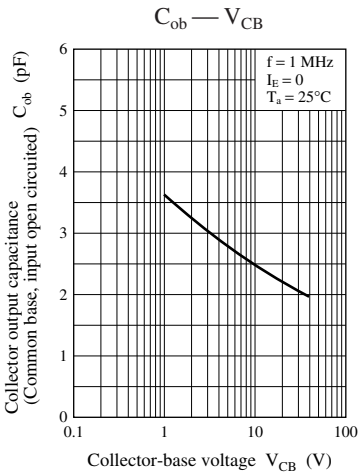


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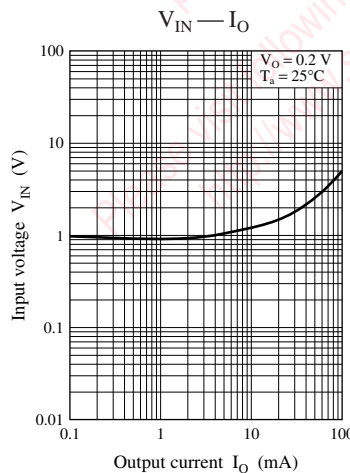
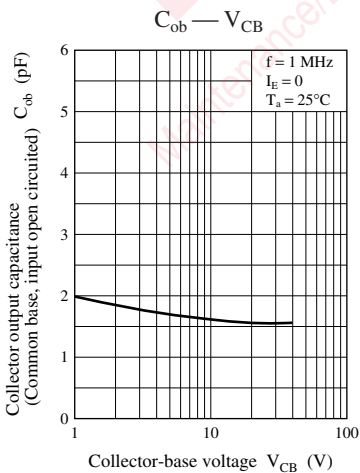
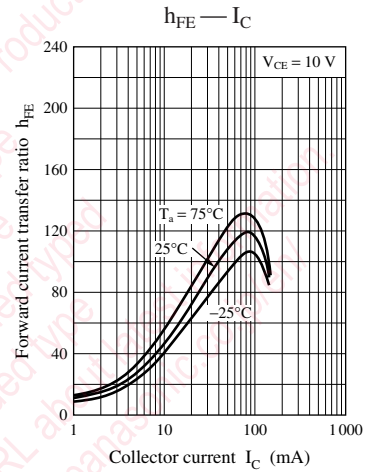
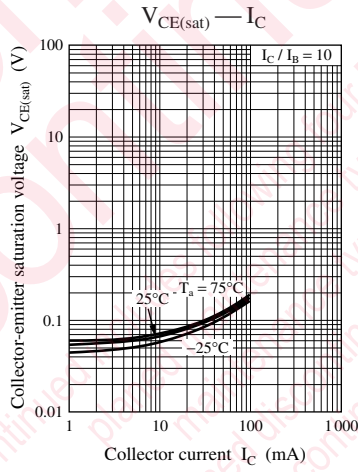
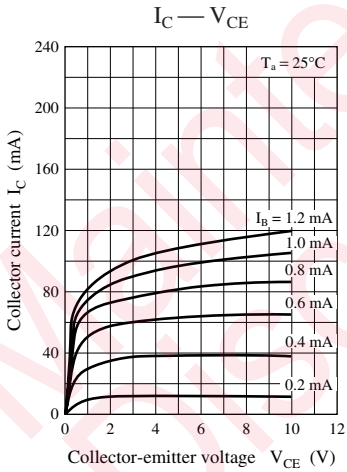


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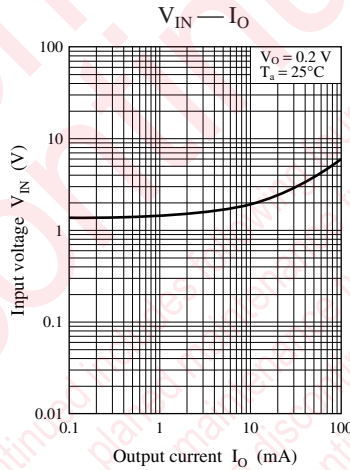
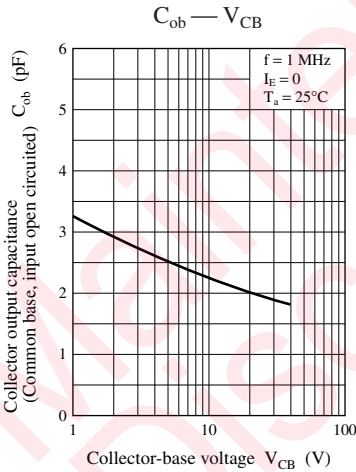
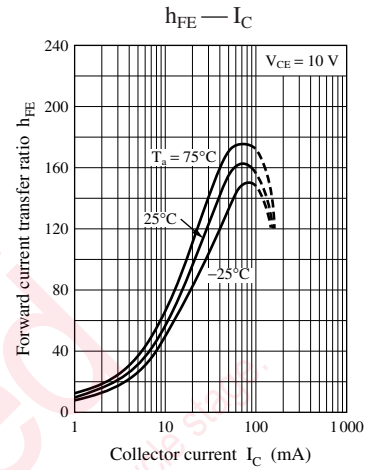
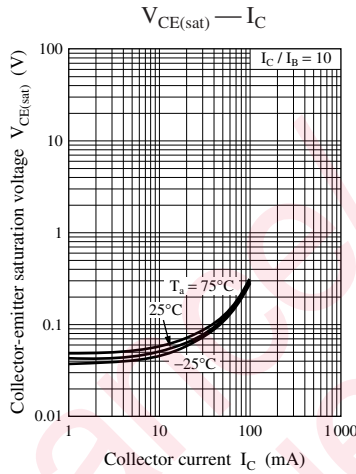
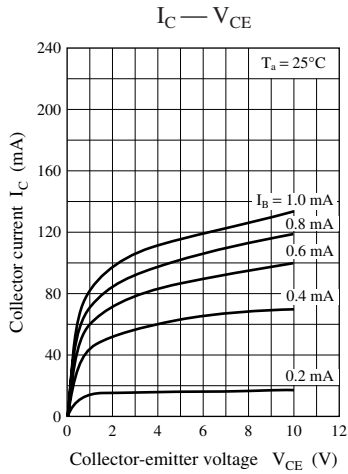




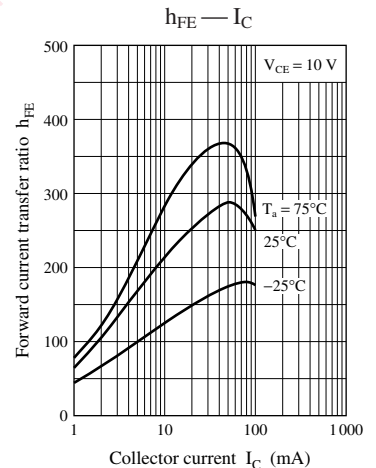
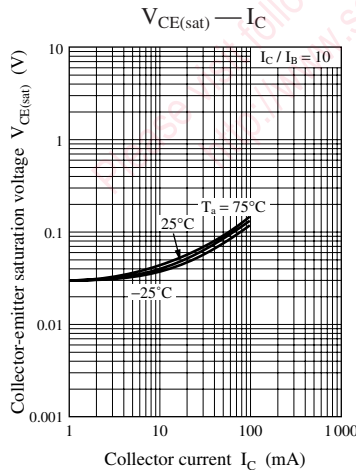
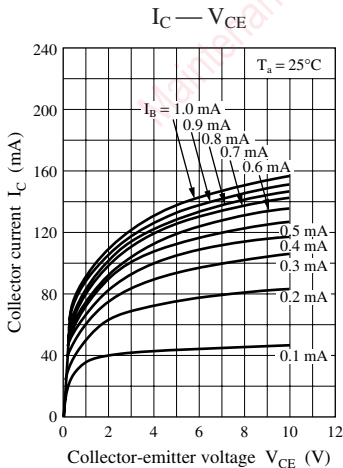
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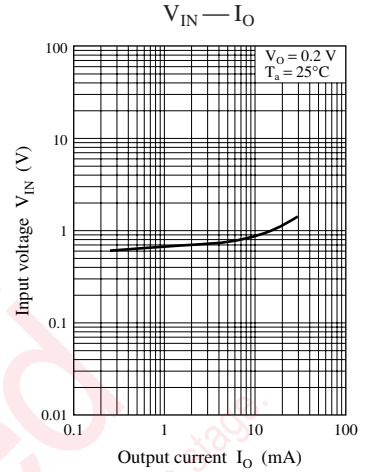
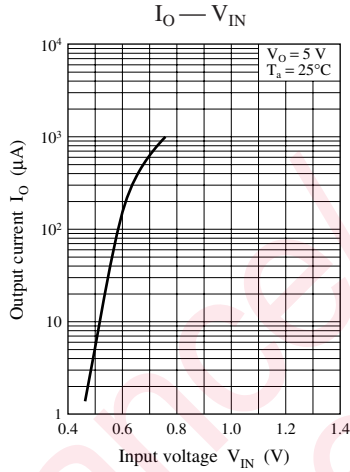
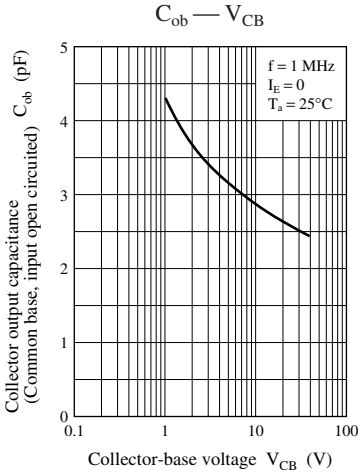


Characteristics charts of UNR221L

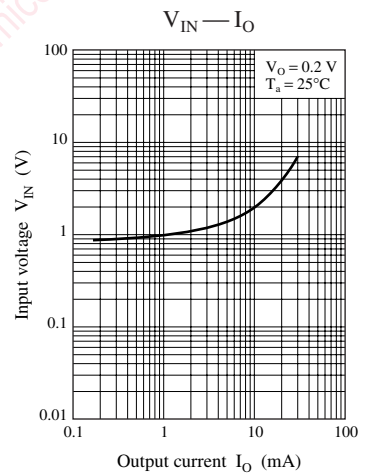
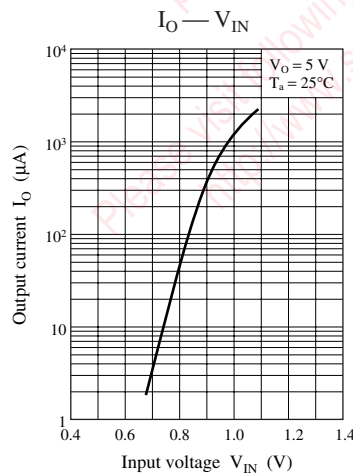
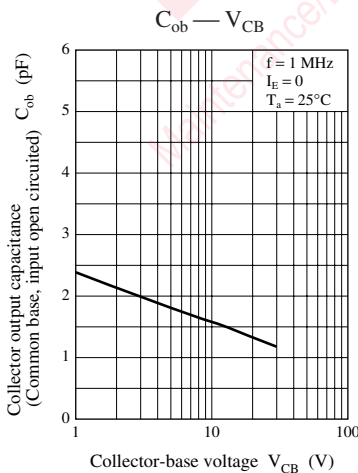
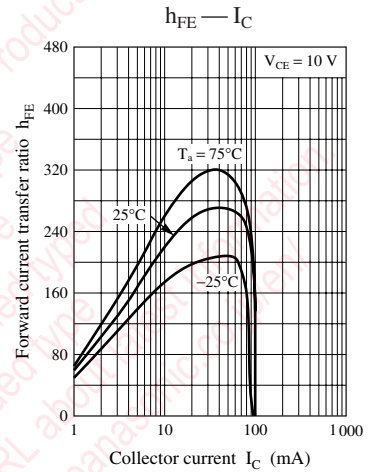
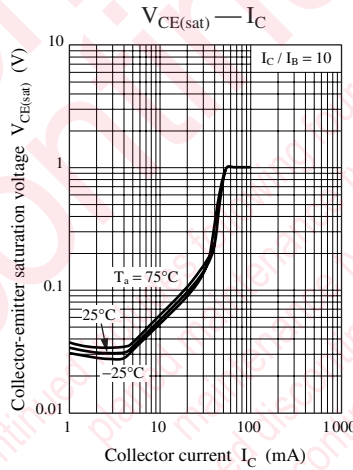
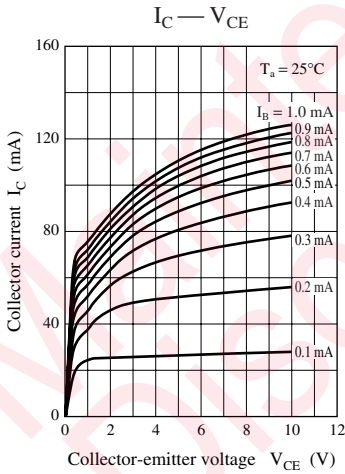


Characteristics charts of UNR221M

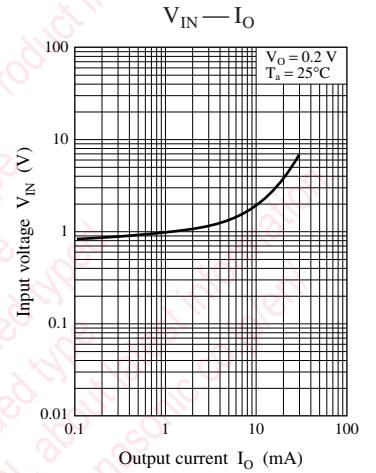
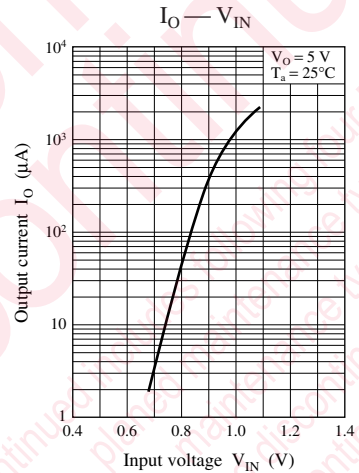
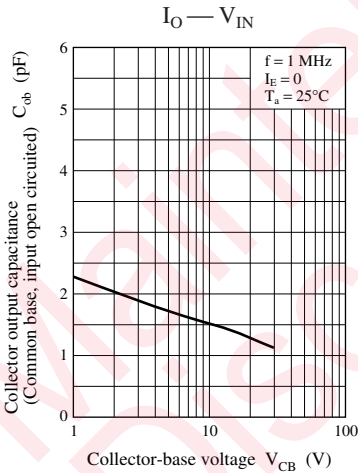
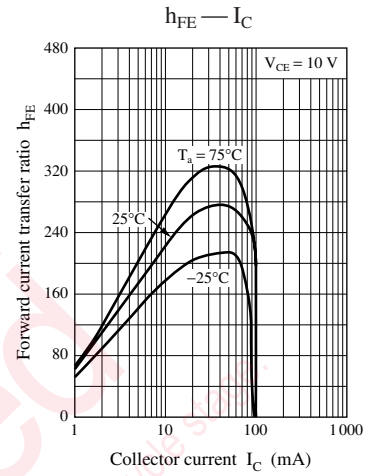
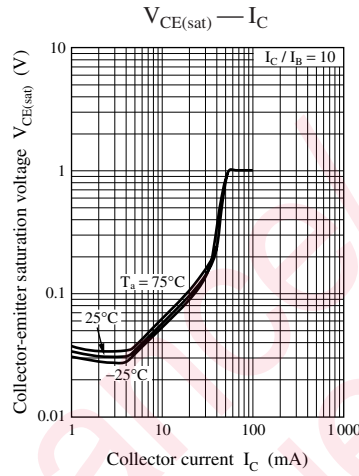
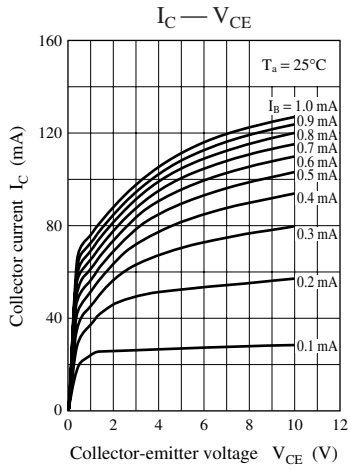




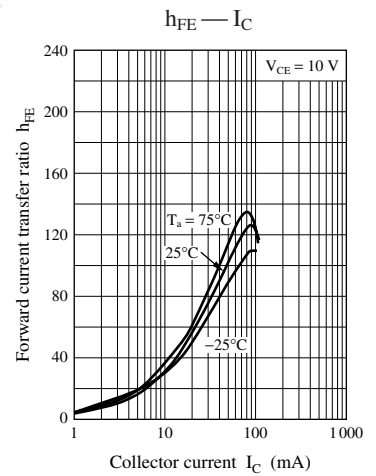
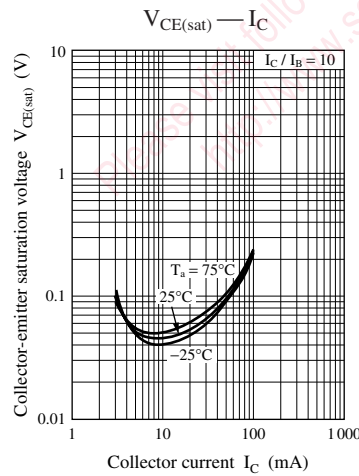
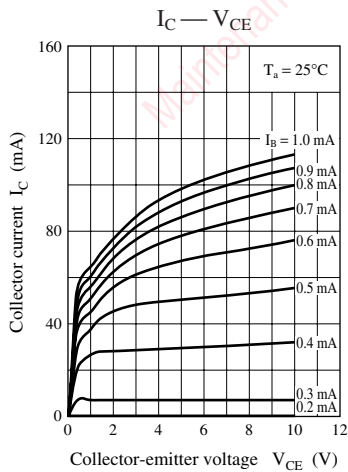
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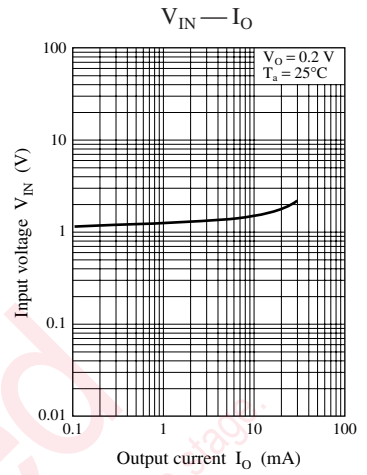
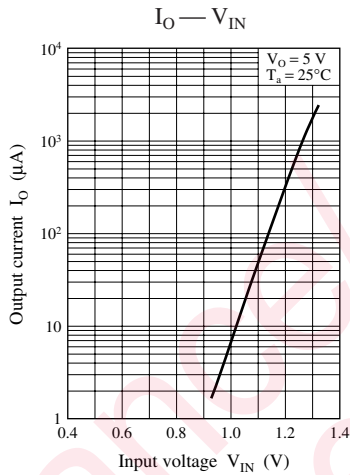
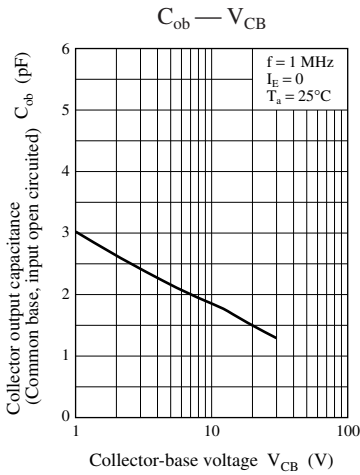
Characteristics charts of UNR221T



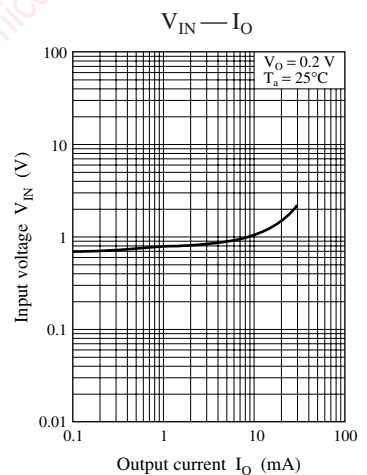
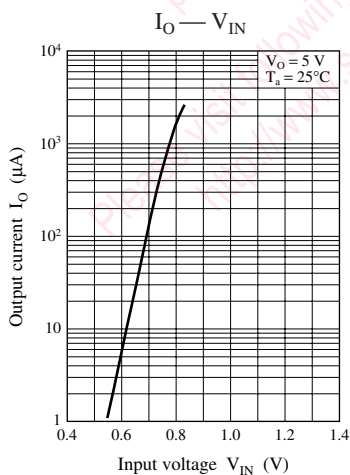
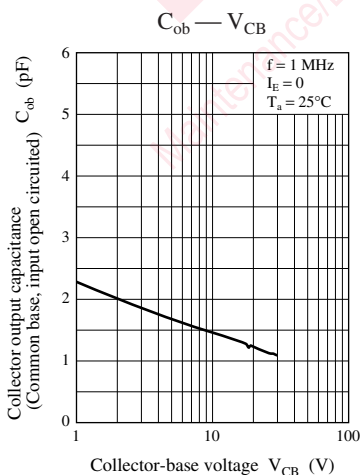
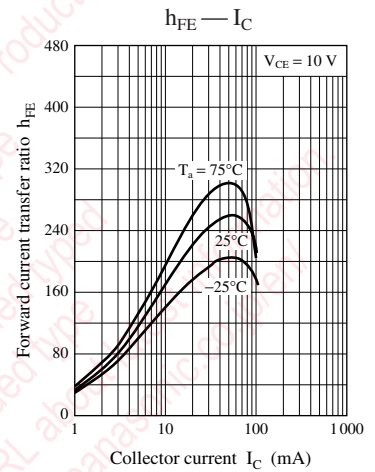
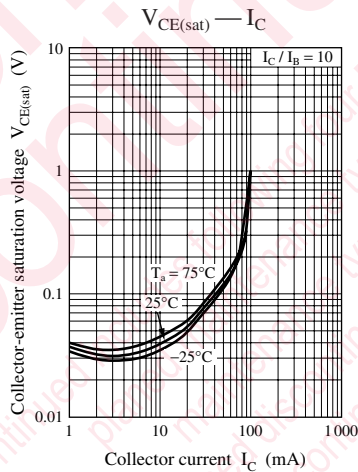
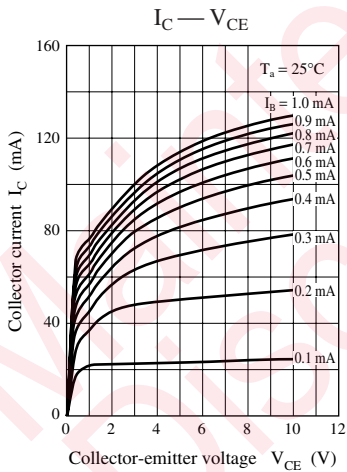
Characteristics charts of UNR221V







Characteristics charts of UNR221Z



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