

# UNR22XX Series (UN22XX Series)

## Silicon NPN epitaxial planer transistor

For digital circuits

### ■ Features

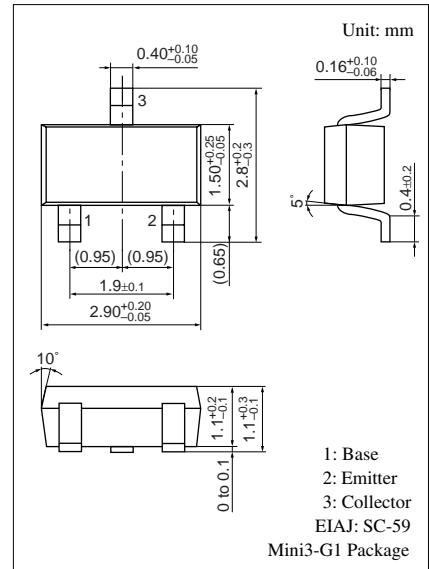
- Costs can be reduced through downsizing of the equipment and reduction of the number of parts.
- Mini type package, allowing downsizing of the equipment and automatic insertion through tape packing and magazine packing.

### ■ Resistance by Part Number

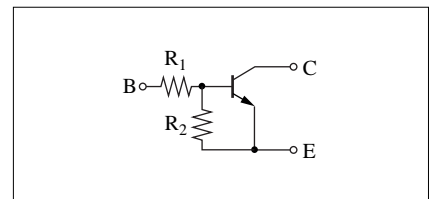
	Marking	Symbol (R <sub>1</sub> )	(R <sub>2</sub> )	
• UNR2210	(UN2210)	8L	47 kΩ	—
• UNR2211	(UN2211)	8A	10 kΩ	10 kΩ
• UNR2212	(UN2212)	8B	22 kΩ	22 kΩ
• UNR2213	(UN2213)	8C	47 kΩ	47 kΩ
• UNR2214	(UN2214)	8D	10 kΩ	47 kΩ
• UNR2215	(UN2215)	8E	10 kΩ	—
• UNR2216	(UN2216)	8F	4.7 kΩ	—
• UNR2217	(UN2117)	8H	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 to base voltage	V <sub>CBO</sub>	50	V
Collector to emitter voltage	V <sub>CEO</sub>	50	V
Collector current	I <sub>C</sub>	100	mA
Total power dissipation	P <sub>T</sub>	200	mW
Junction temperature	T <sub>j</sub>	150	°C
Storage temperature	T <sub>stg</sub>	-55 to +150	°C



### Internal Connection



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

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

Parameter		Symbol	Conditions	Min	Typ	Max	Unit
Collector cutoff current		$I_{\text{CBO}}$	$V_{\text{CB}} = 50 \text{ V}, I_{\text{E}} = 0$			0.1	$\mu\text{A}$
		$I_{\text{CEO}}$	$V_{\text{CE}} = 50 \text{ V}, I_{\text{B}} = 0$			0.5	
Emitter cutoff current	UNR2211	$I_{\text{EBO}}$	$V_{\text{EB}} = 6 \text{ V}, I_{\text{C}} = 0$			0.5	mA
	UNR2212/2214/221D/ 221E/221M/221N/221T					0.2	
	UNR2213					0.1	
	UNR2210/2215/2216/2217					0.01	
	UNR221F/221K					1.0	
	UNR2219					1.5	
	UNR2218/221L/221V					2.0	
	UNR221Z					0.4	
Collector to base voltage		$V_{\text{CBO}}$	$I_{\text{C}} = 10 \mu\text{A}, I_{\text{E}} = 0$	50			V
Collector to emitter voltage		$V_{\text{CEO}}$	$I_{\text{C}} = 2 \text{ mA}, I_{\text{B}} = 0$	50			V
Forward current transfer ratio	UNR2211	$h_{\text{FE}}$	$V_{\text{CE}} = 10 \text{ V}, I_{\text{C}} = 5 \text{ mA}$	35			
	UNR2212/221E			60			
	UNR2213/2214/221M			80			
	UNR2210*/2215*/2216*/2217*			160		460	
	UNR2218/221K/221L			20			
	UNR2219/221D/221F			30			
	UNR221N/221T			80		400	
	UNR221V			6		20	
UNR221Z	60		200				
Collector to emitter saturation voltage		$V_{\text{CE(sat)}}$	$I_{\text{C}} = 10 \text{ mA}, I_{\text{B}} = 0.3 \text{ mA}$			0.25	V
			$I_{\text{C}} = 10 \text{ mA}, I_{\text{B}} = 1.5 \text{ mA}$		0.04	0.25	
Output voltage high level		$V_{\text{OH}}$	$V_{\text{CC}} = 5 \text{ V}, V_{\text{B}} = 0.5 \text{ V}, R_{\text{L}} = 1 \text{ k}\Omega$	4.9			V
Output voltage low level		$V_{\text{OL}}$	$V_{\text{CC}} = 5 \text{ V}, V_{\text{B}} = 2.5 \text{ V}, R_{\text{L}} = 1 \text{ k}\Omega$			0.2	V
			$V_{\text{CC}} = 5 \text{ V}, V_{\text{B}} = 3.5 \text{ V}, R_{\text{L}} = 1 \text{ k}\Omega$				
			$V_{\text{CC}} = 5 \text{ V}, V_{\text{B}} = 10 \text{ V}, R_{\text{L}} = 1 \text{ k}\Omega$				
			$V_{\text{CC}} = 5 \text{ V}, V_{\text{B}} = 6 \text{ V}, R_{\text{L}} = 1 \text{ k}\Omega$				
Transition frequency		$f_{\text{T}}$	$V_{\text{CB}} = 10 \text{ V}, I_{\text{E}} = -2 \text{ mA}, f = 200 \text{ MHz}$		150		MHz
Input resistance	UNR2218	$R_{\text{I}}$		-30%	0.51	+30%	k $\Omega$
	UNR2219				1		
	UNR221M/221V				2.2		
	UNR2216/221F/221L/221N UNR221Z				4.7		
	UNR2211/2214/2215/221K				10		
	UNR2212/2217/221T				22		
	UNR2210/2213/221D/221E				47		

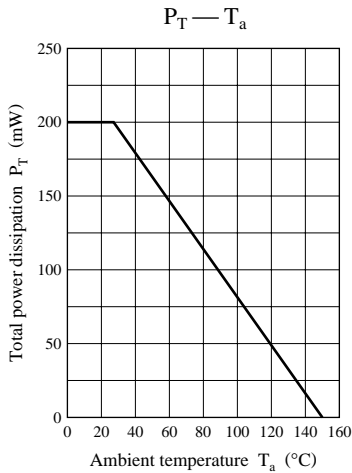
 Note) \*:  $h_{\text{FE}}$  rank classification (UNR2210/2215/2216/2217)

Rank	Q	R	S
$h_{\text{FE}}$	160 to 260	210 to 340	290 to 460

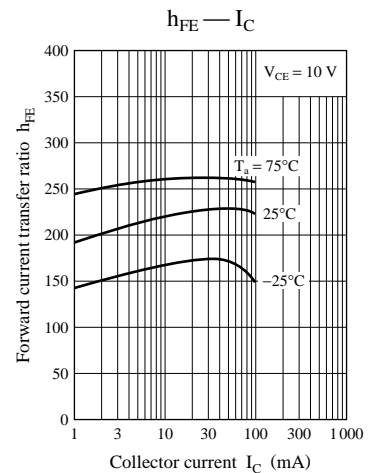
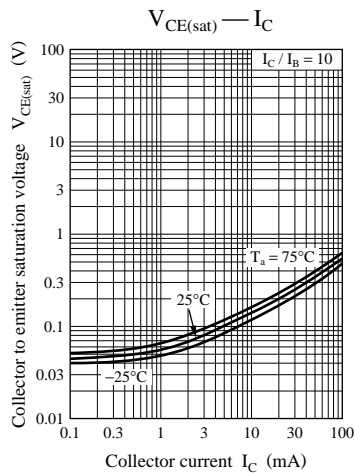
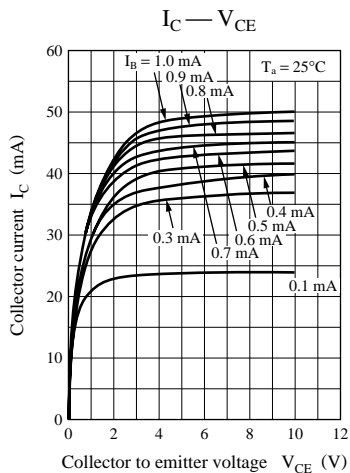
## ■ Electrical Characteristics (continued) $T_a = 25^\circ\text{C}$

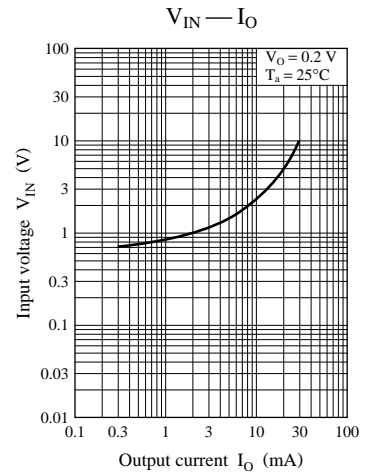
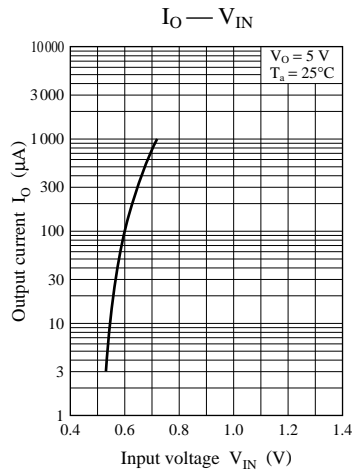
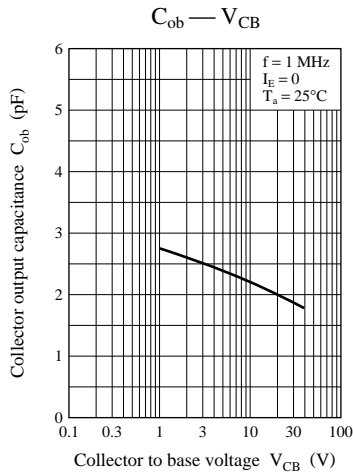
Parameter		Symbol	Conditions	Min	Typ	Max	Unit
Resis- tance ratio	UNR2211/2212/2213/221L	$R_1/R_2$		0.8	1.0	1.2	
	UNR2214			0.17	0.21	0.25	
	UNR2218/2219			0.08	0.1	0.12	
	UNR221D				4.7		
	UNR221E				2.14		
	UNR221F/221T				0.47		
	UNR221K				2.13		
	UNR221M				0.047		
	UNR221N				0.1		
	UNR221V				1.0		
UNR221Z			0.21				

### Common characteristics chart

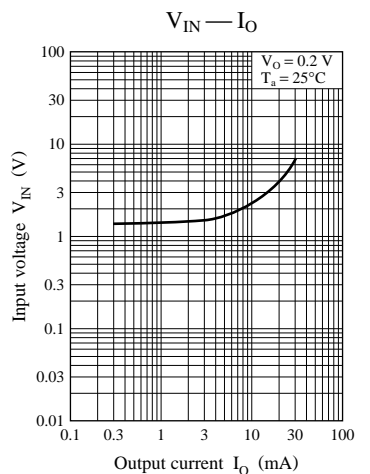
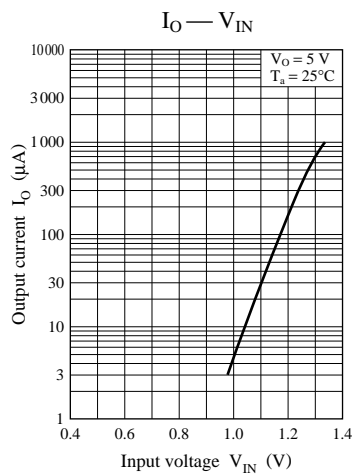
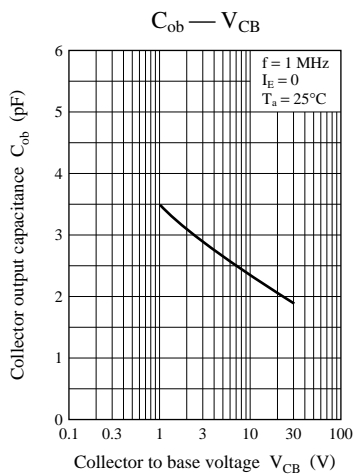
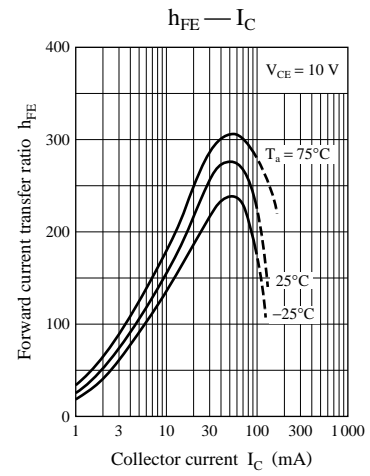
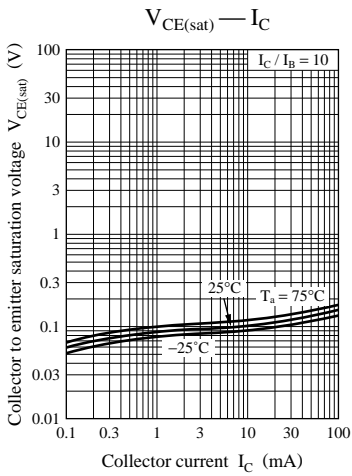
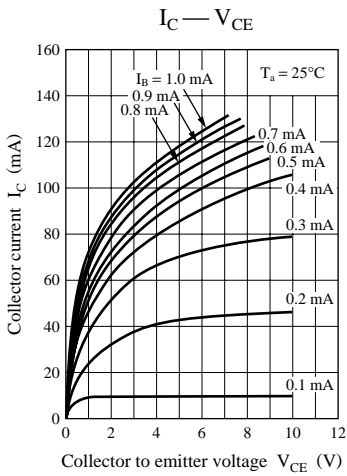


### Characteristics charts of UNR2210

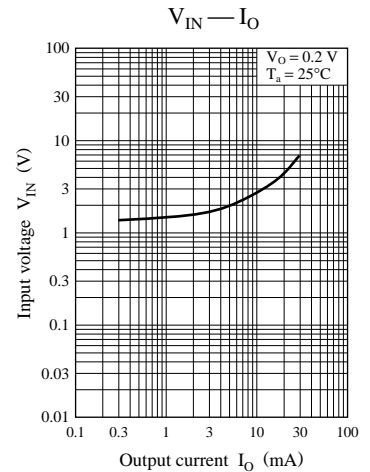
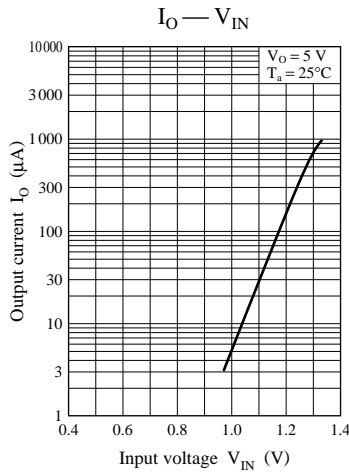
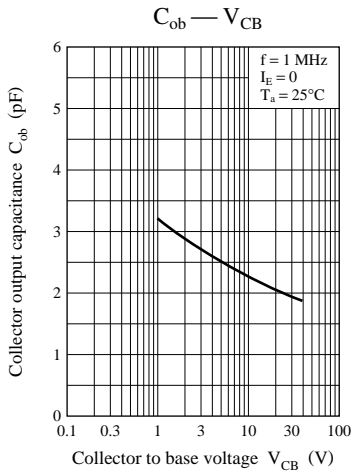
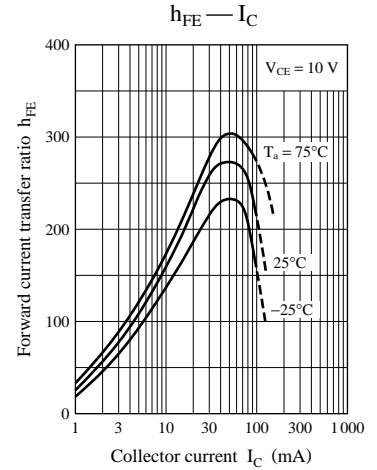
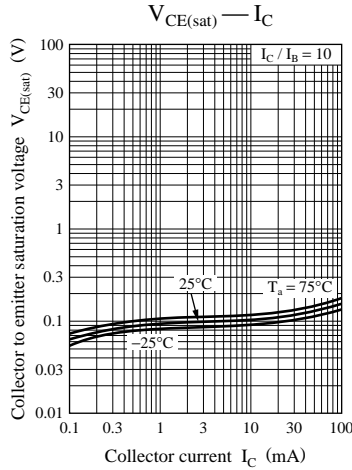
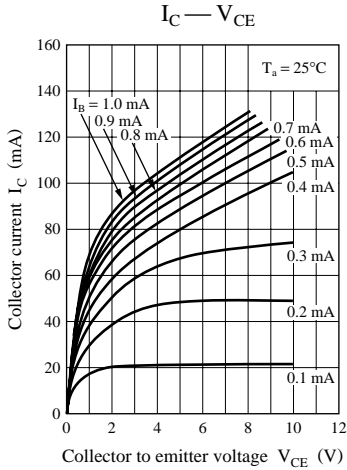




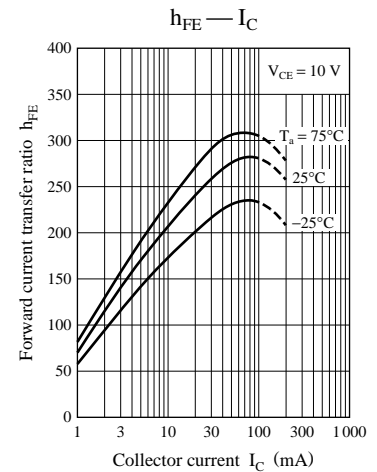
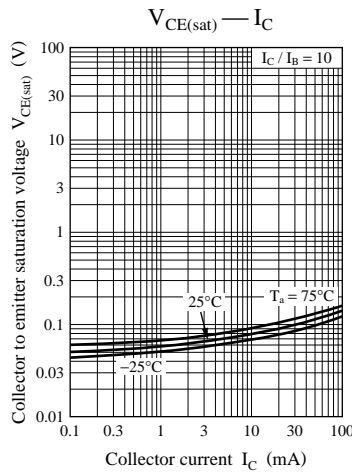
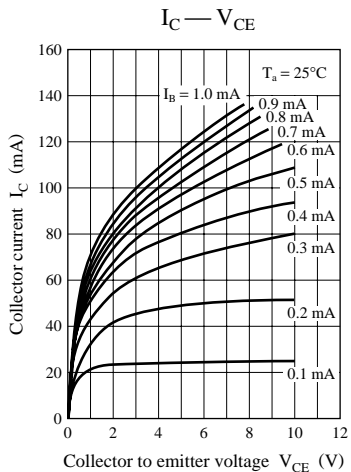
Characteristics charts of UNR2211

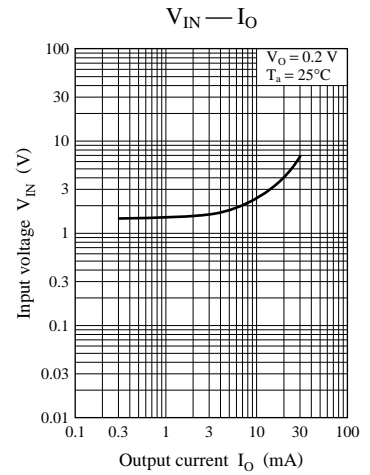
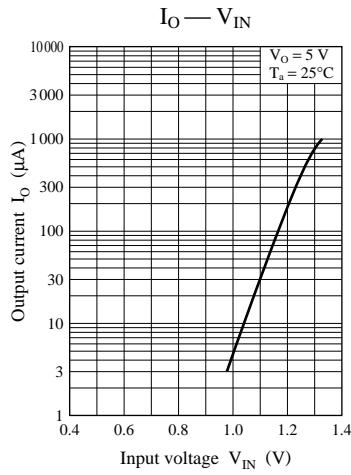
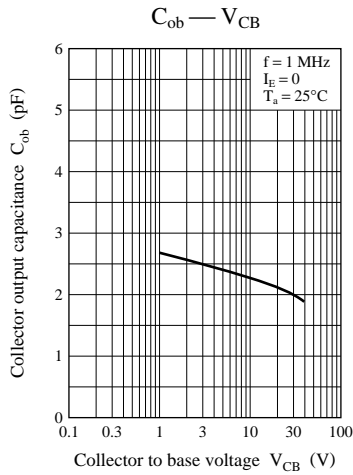


Characteristics charts of UNR2212

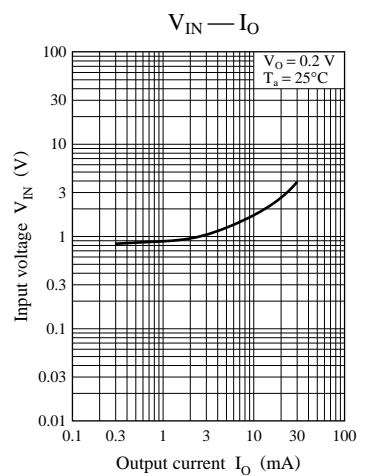
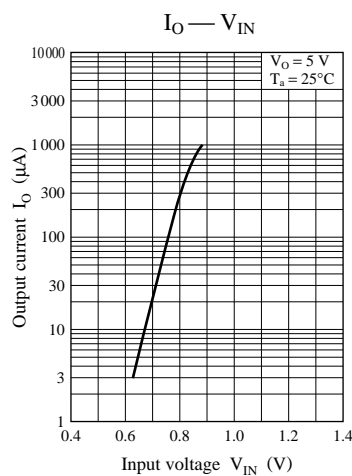
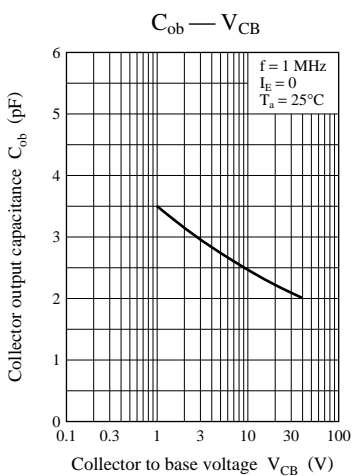
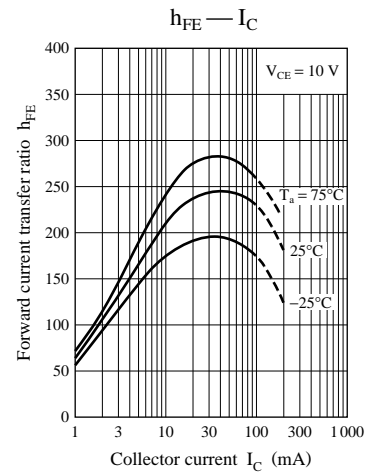
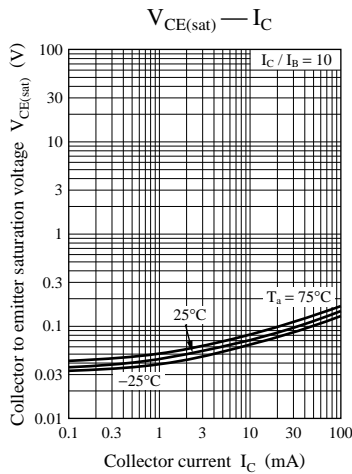
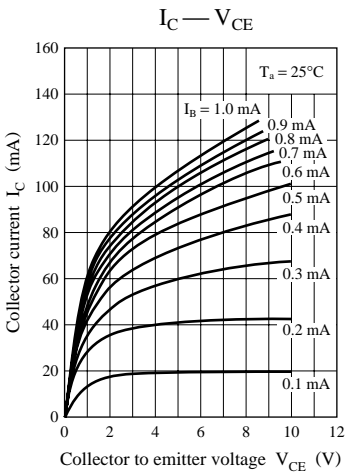


Characteristics charts of UNR2213

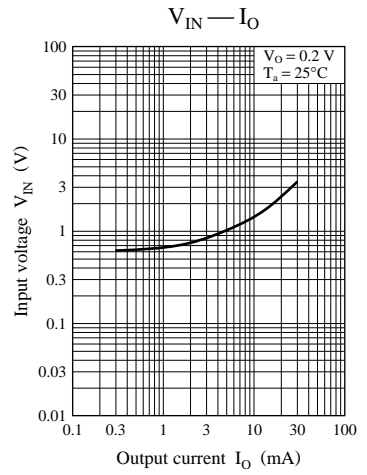
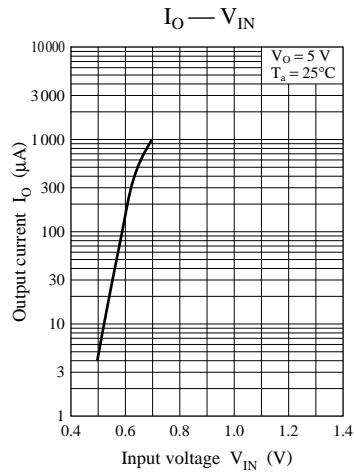
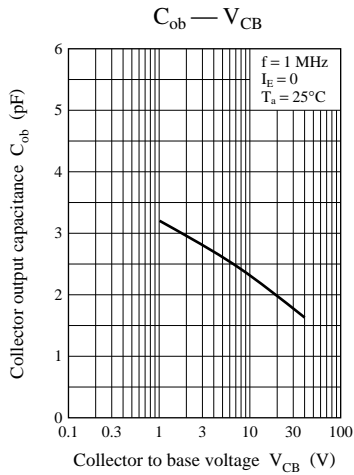
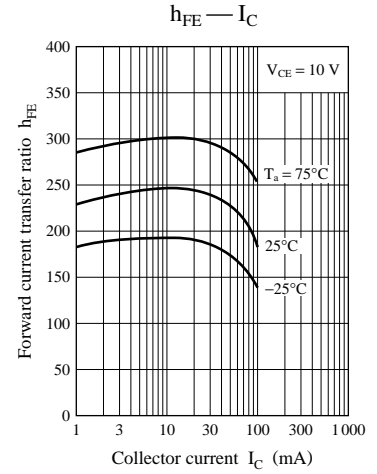
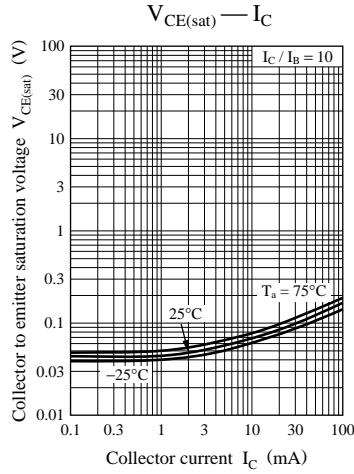
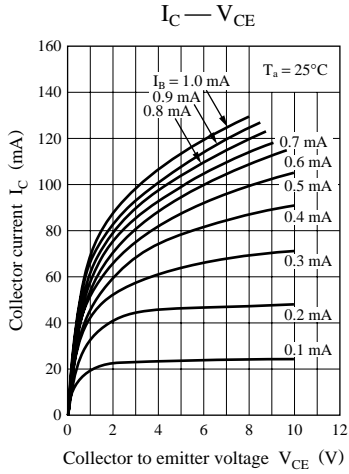




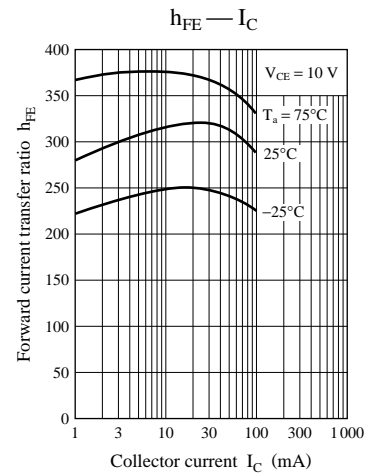
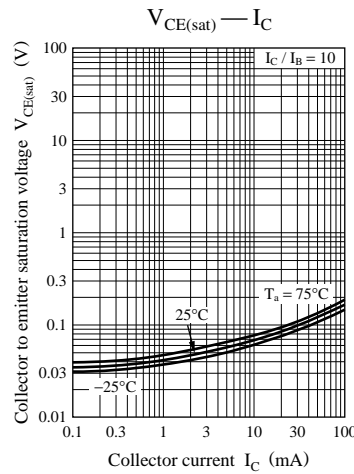
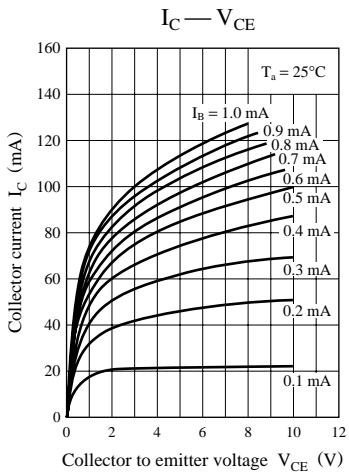
Characteristics charts of UNR2214

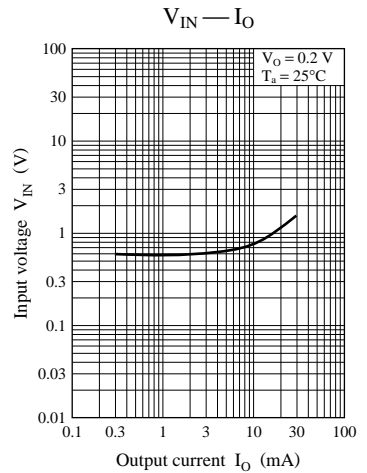
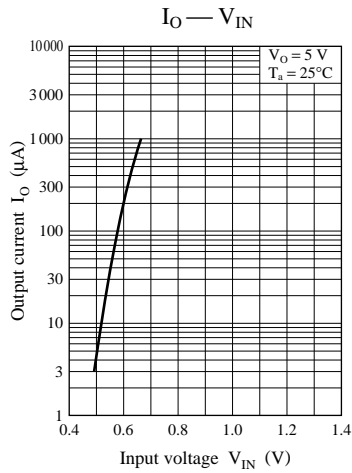
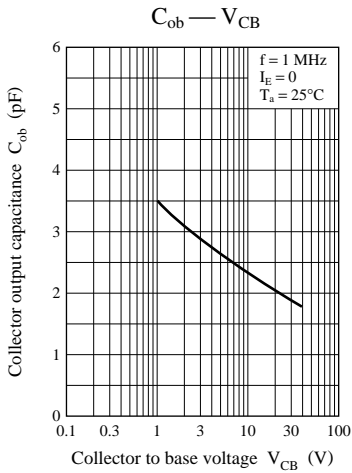


Characteristics charts of UNR2215

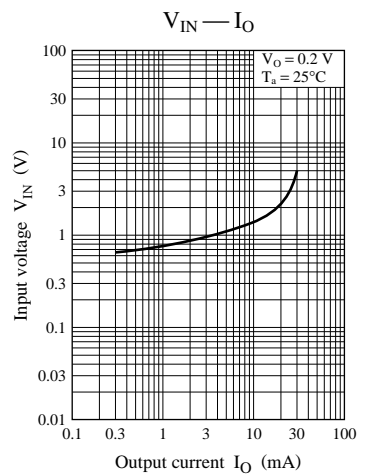
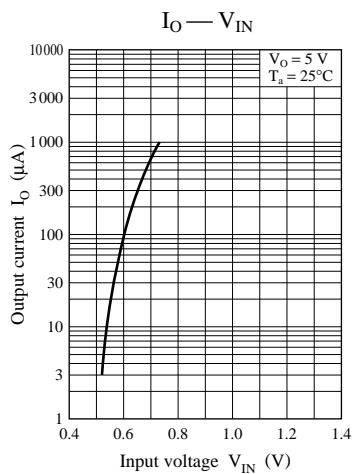
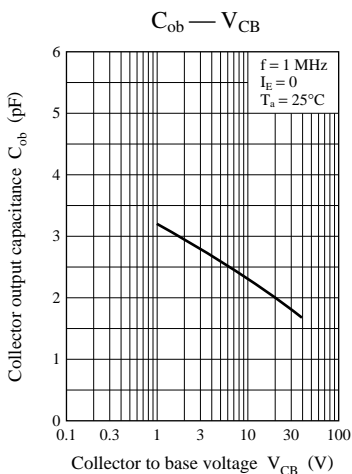
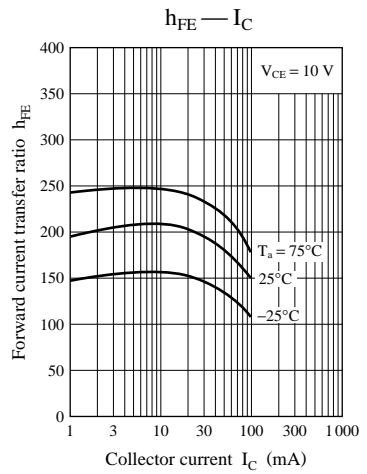
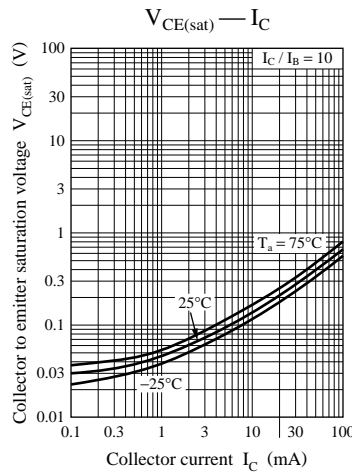
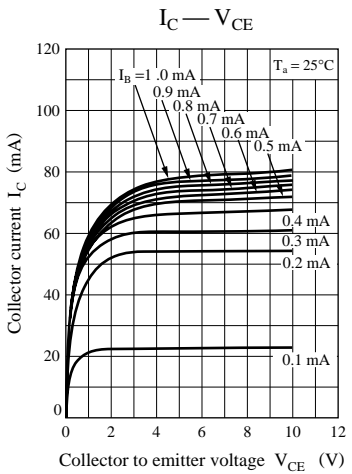


Characteristics charts of UNR2216



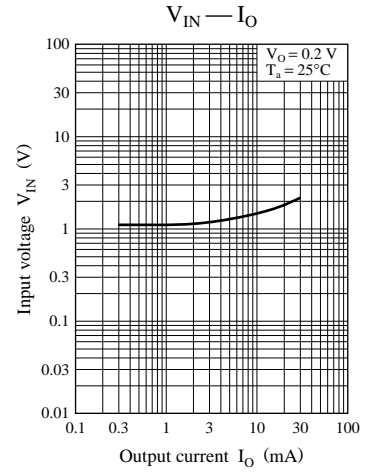
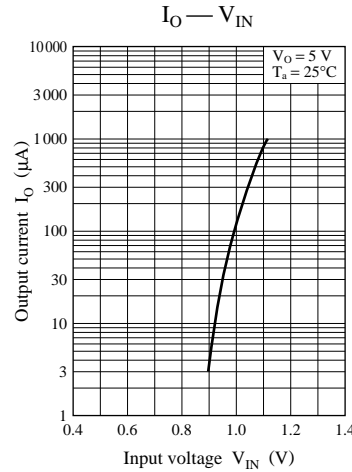
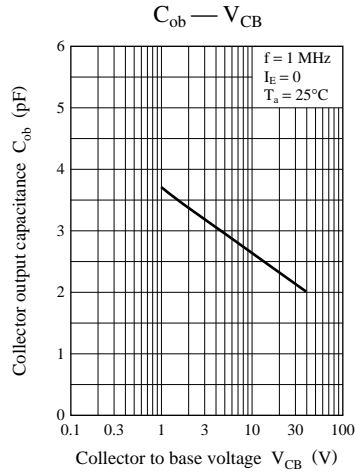
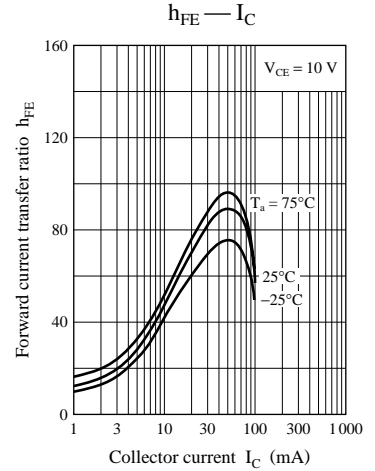
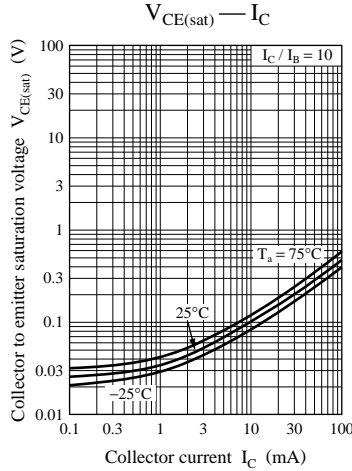
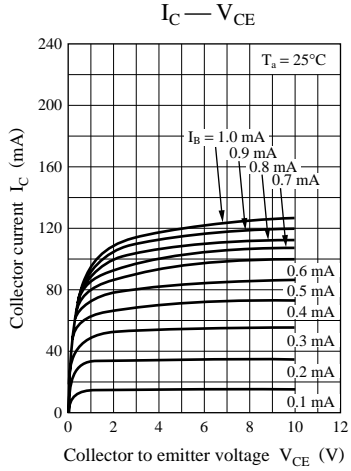


Characteristics charts of UNR2217

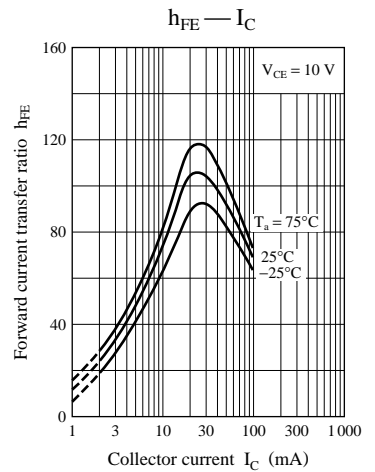
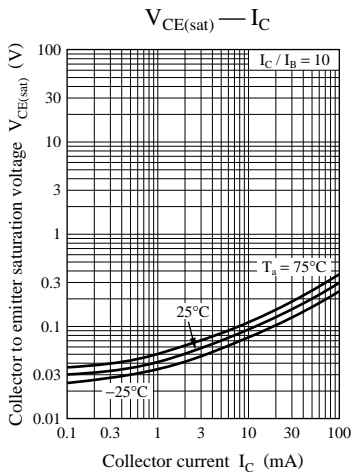
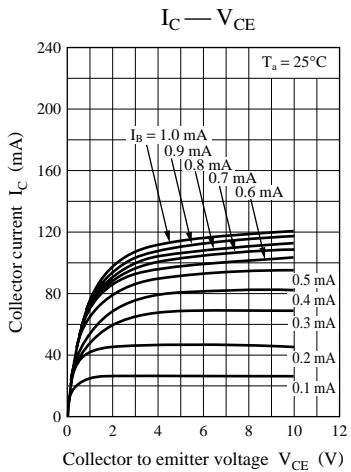


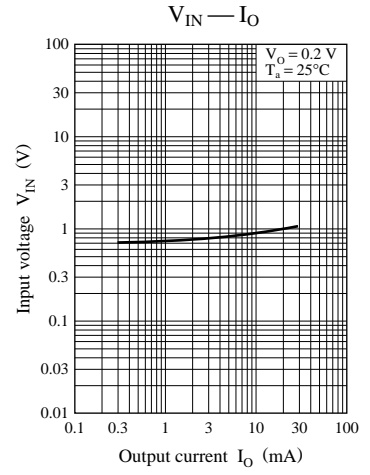
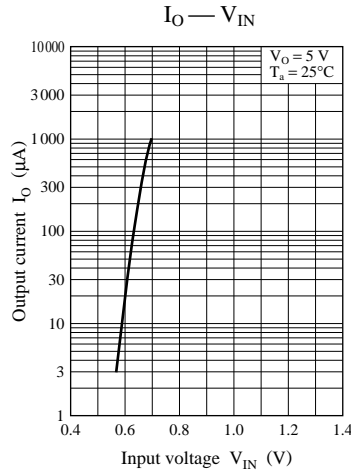
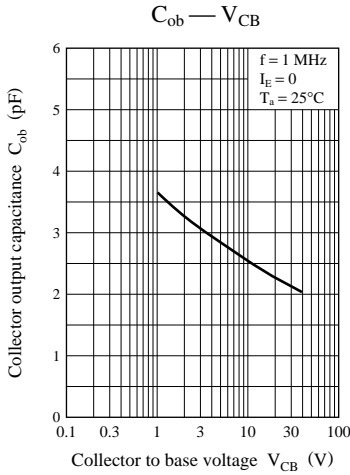


Characteristics charts of UNR2218

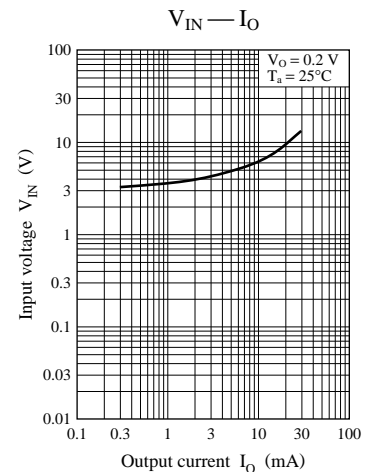
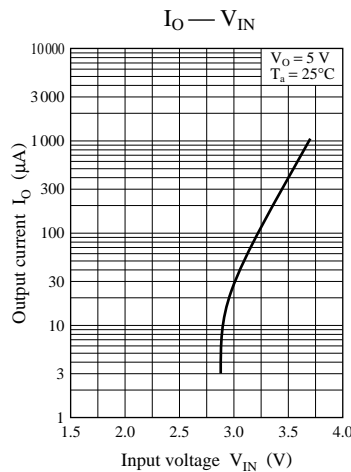
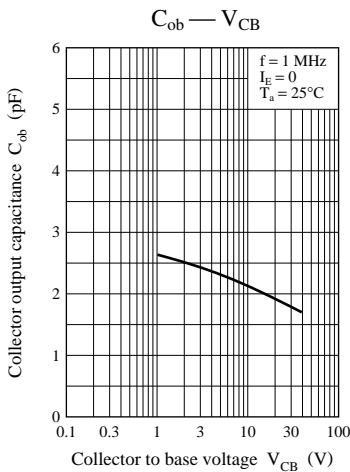
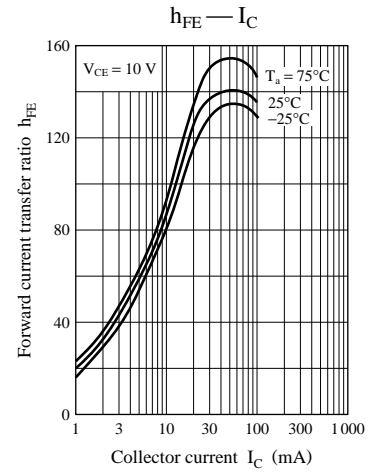
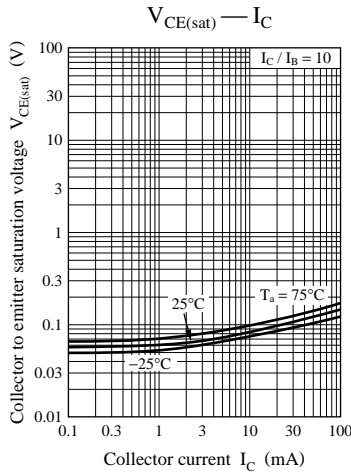
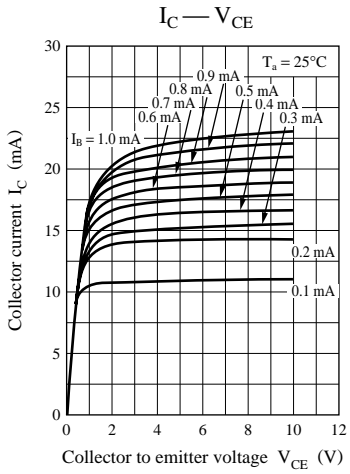


Characteristics charts of UNR2219

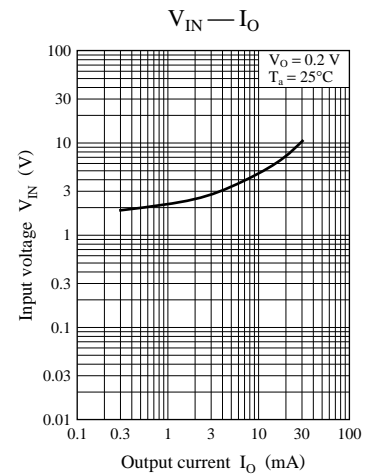
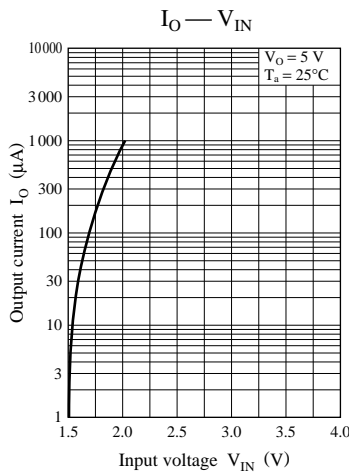
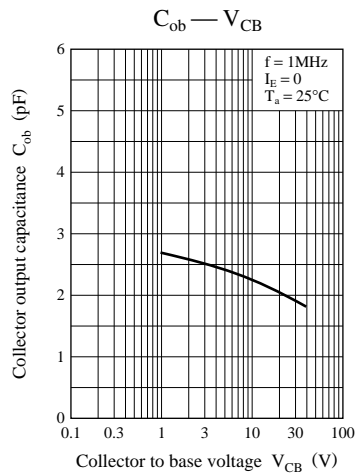
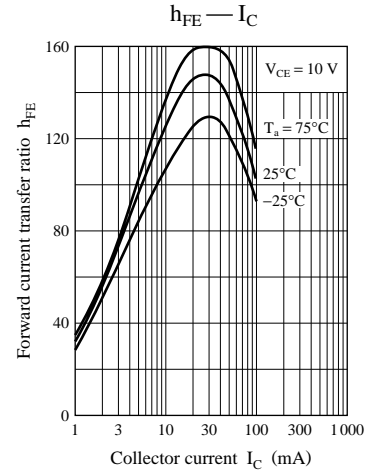
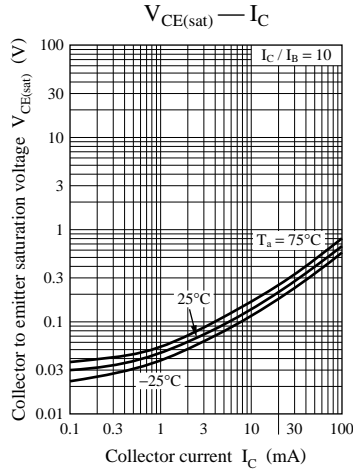
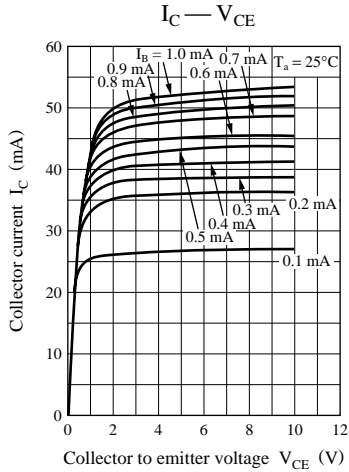




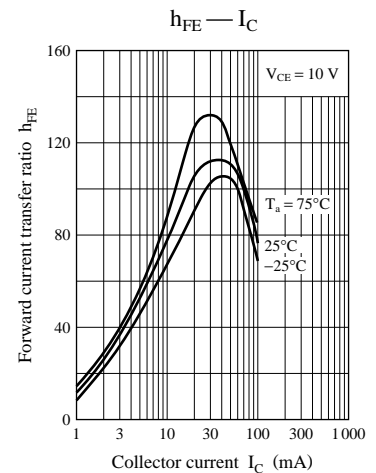
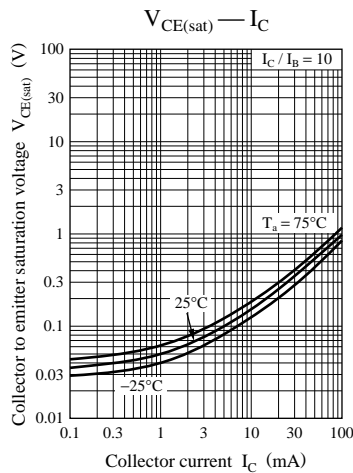
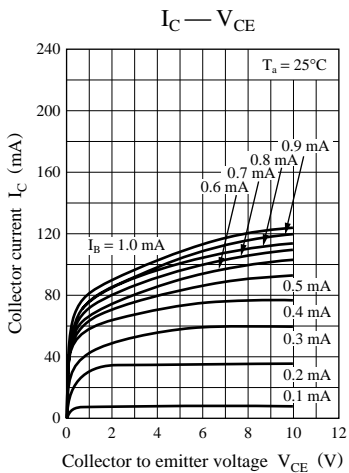
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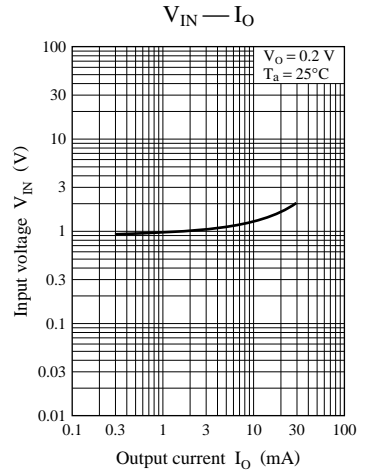
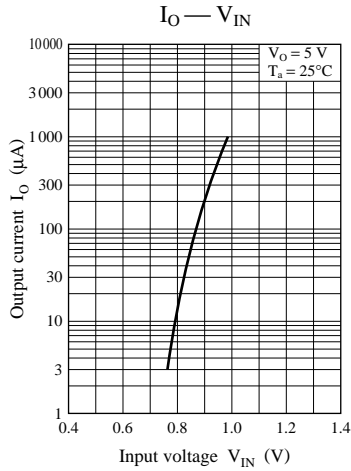
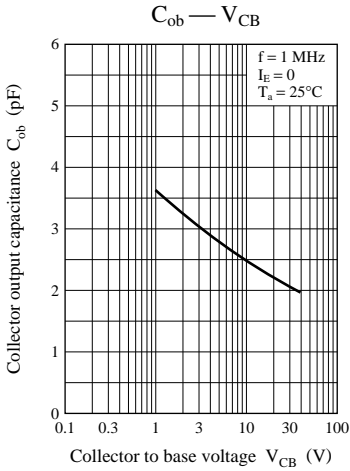


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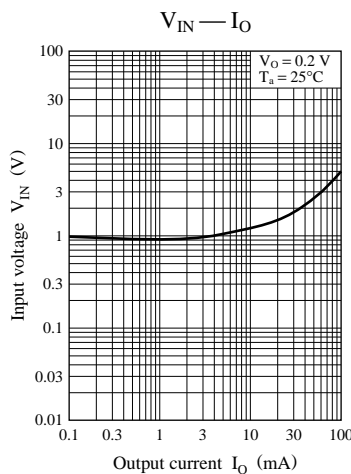
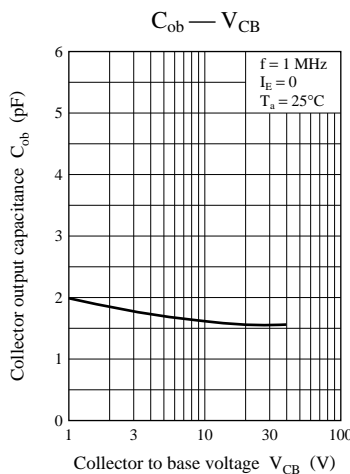
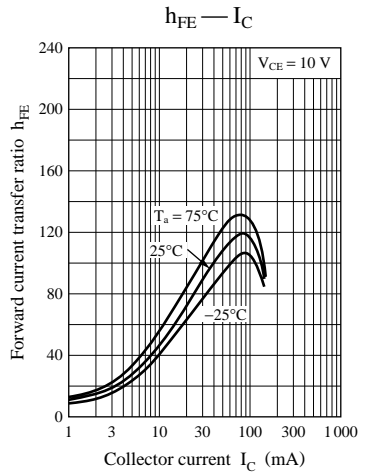
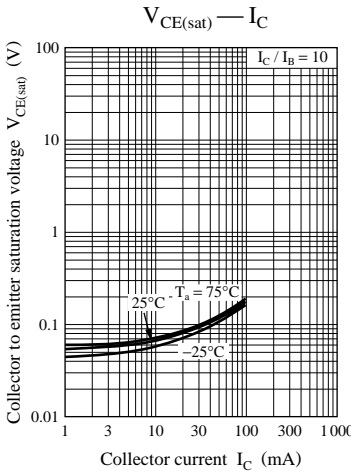
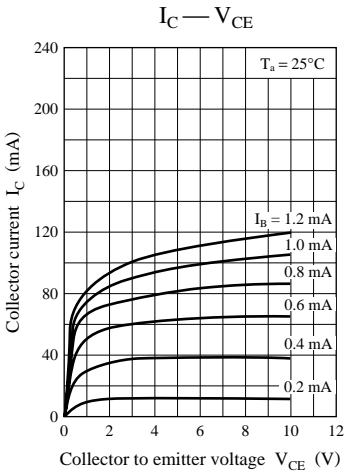


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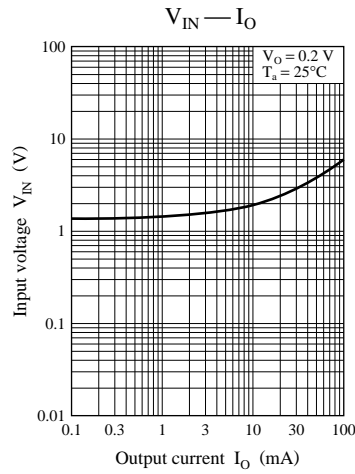
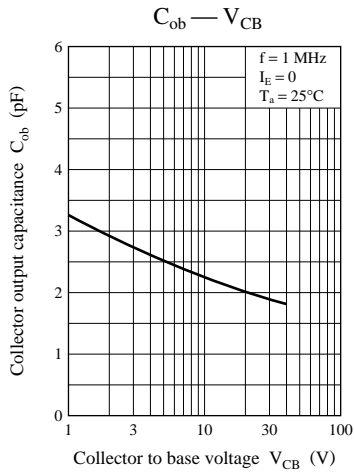
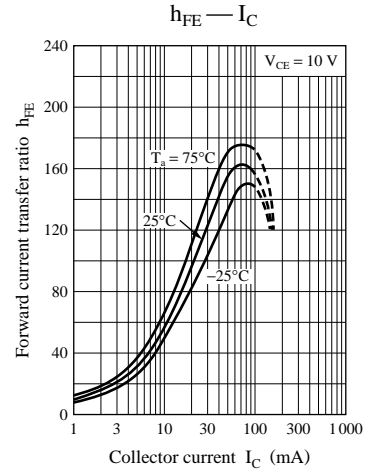
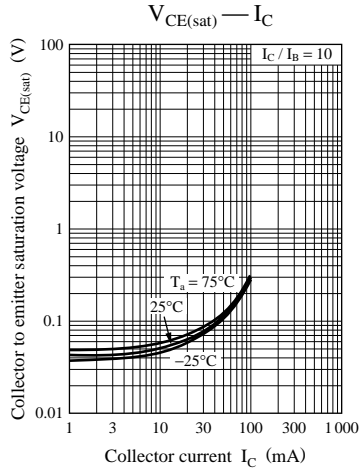
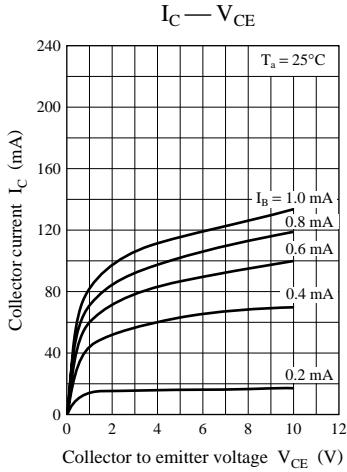




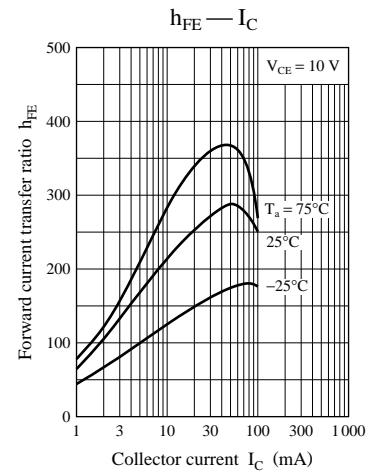
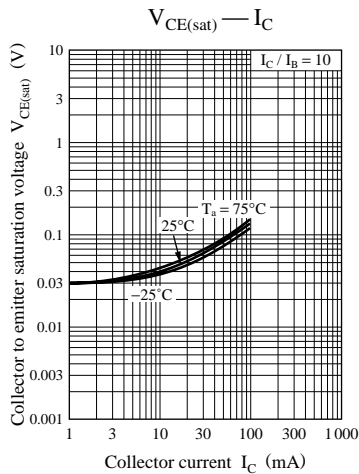
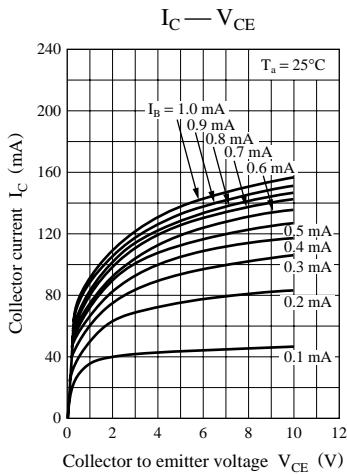
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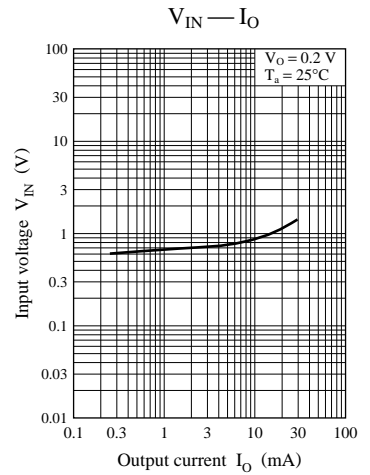
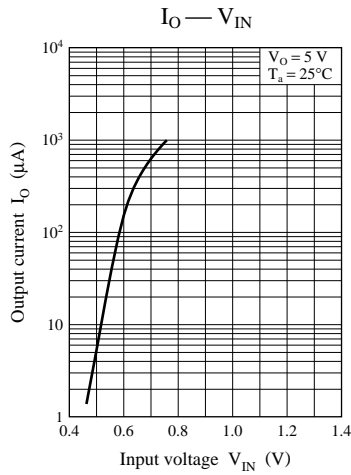
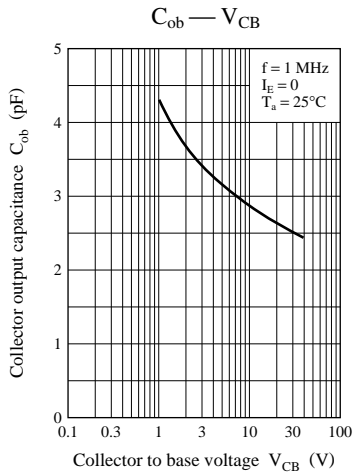


Characteristics charts of UNR221L

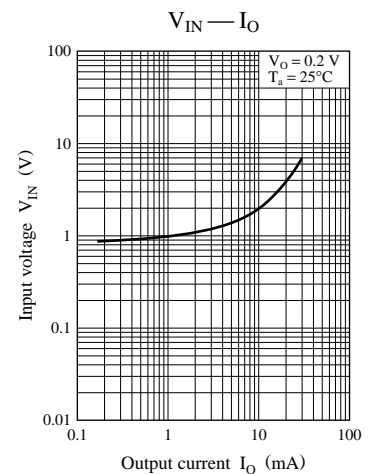
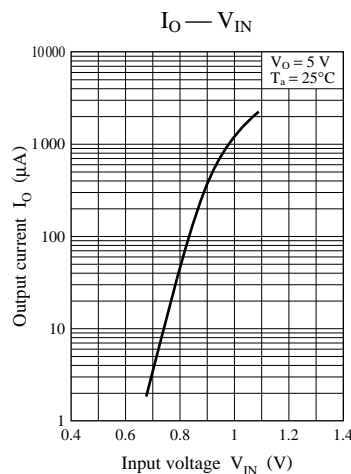
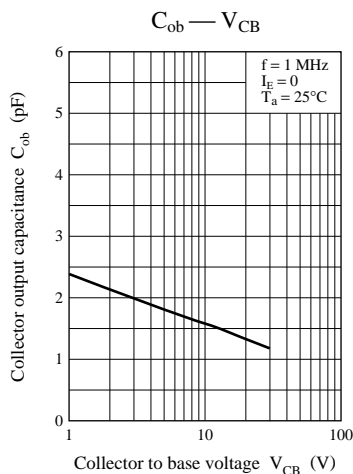
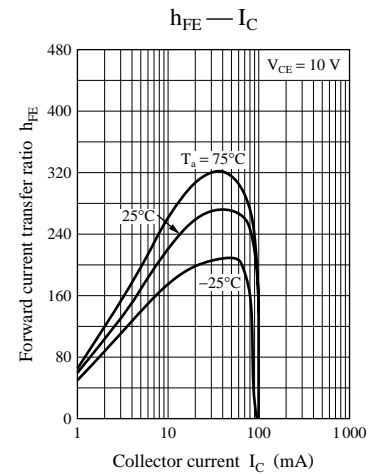
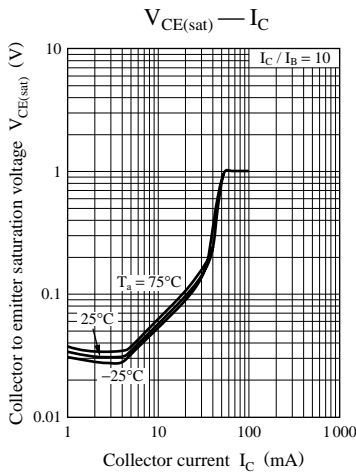
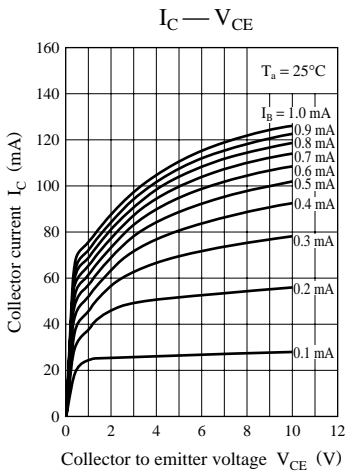


Characteristics charts of UNR221M

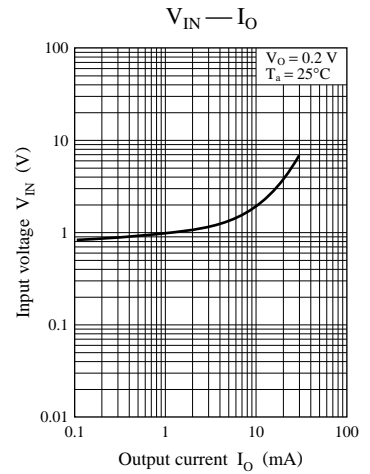
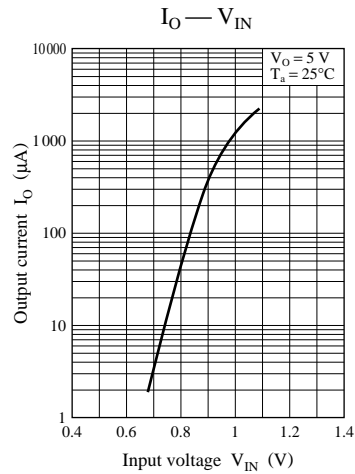
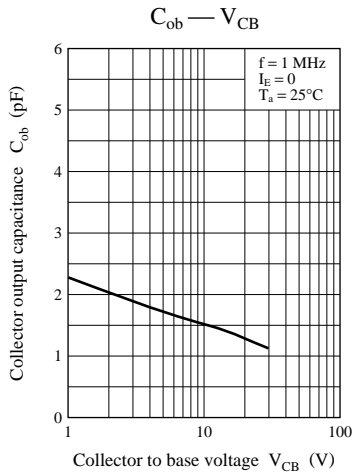
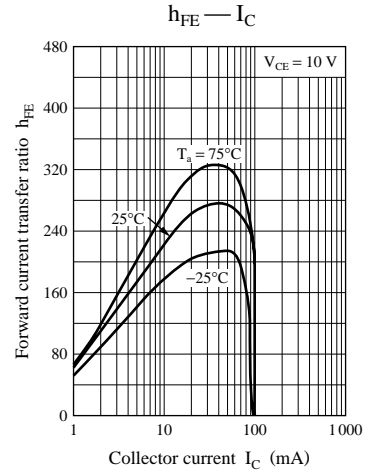
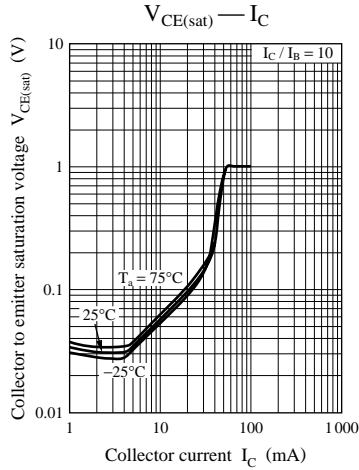
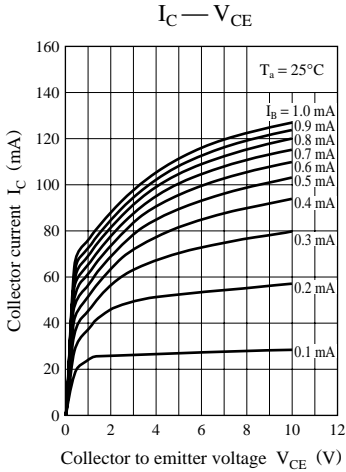




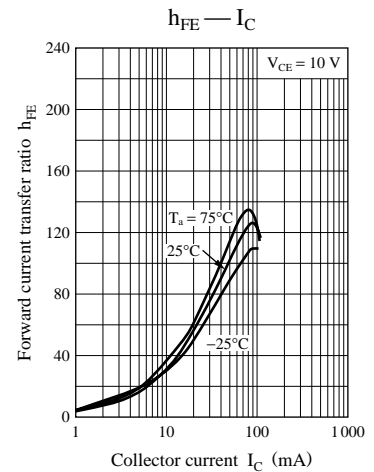
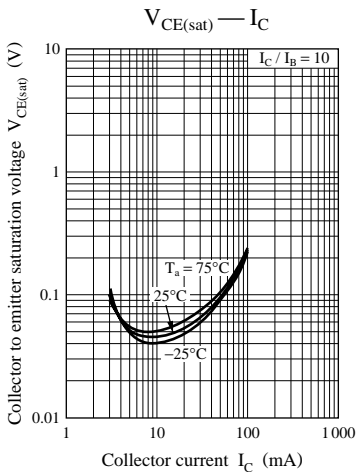
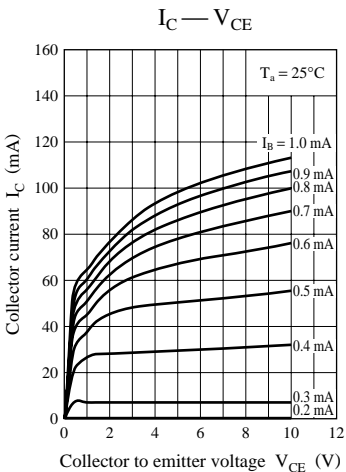
Characteristics charts of UNR221N

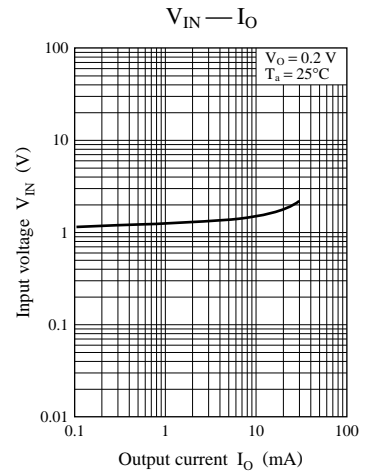
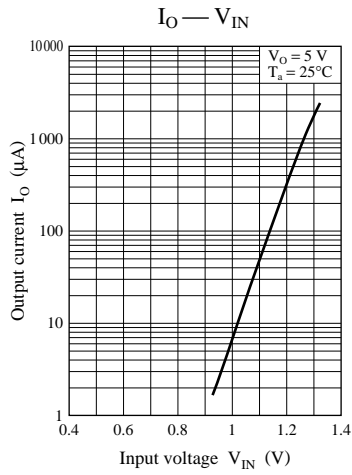
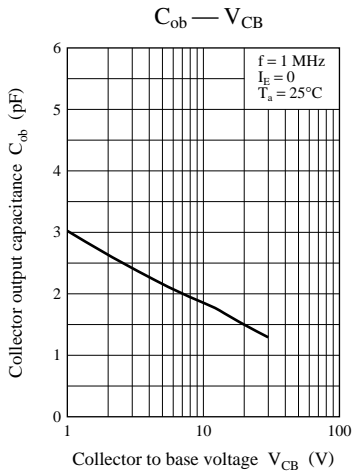


Characteristics charts of UNR221T

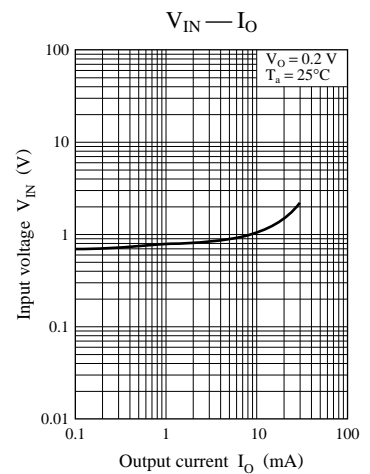
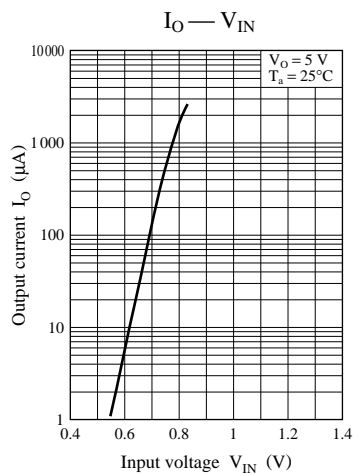
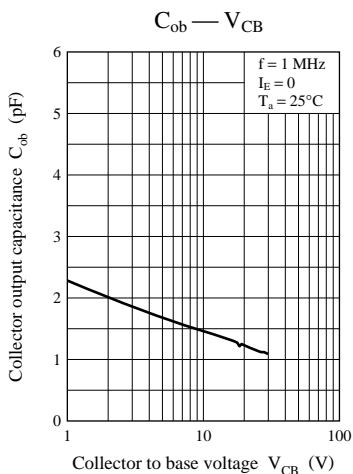
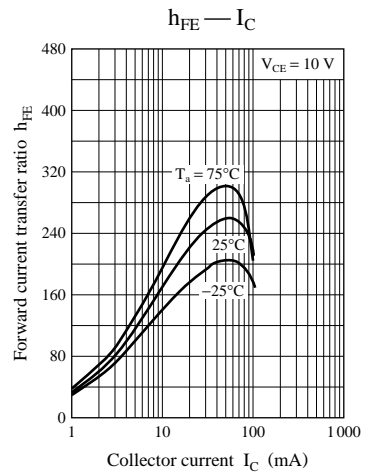
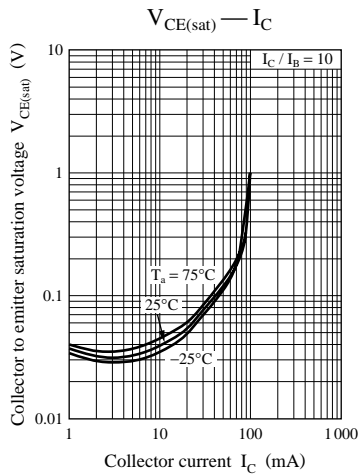
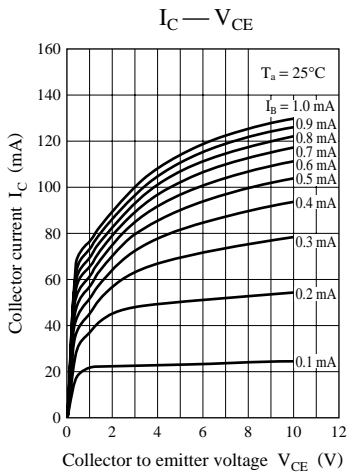


Characteristics charts of UNR221V





Characteristics charts of UNR221Z





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