

UNR221x Series (UN221x Series)

Silicon NPN epitaxial planar transistor

For digital circuits

■ Features

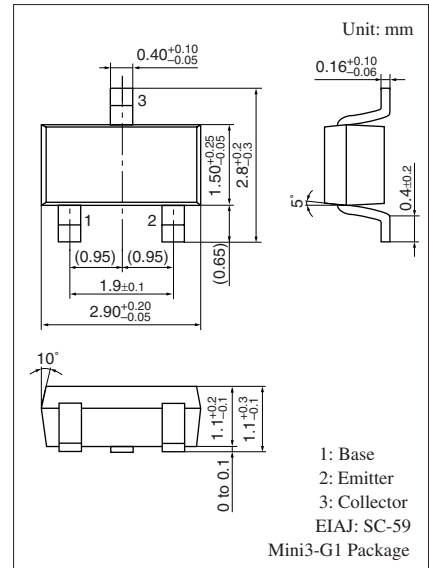
- Costs can be reduced through downsizing of the equipment and reduction of the number of parts.
- Mini type package allowing easy automatic insertion through tape packing and magazine packing

■ Resistance by Part Number

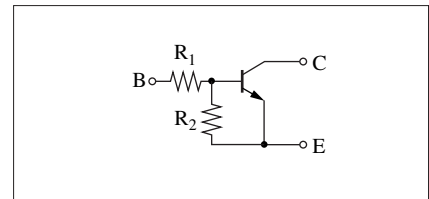
	Marking Symbol (R ₁)	(R ₂)
• UNR2210 (UN2210)	8L	47 kΩ —
• UNR2211 (UN2211)	8A	10 kΩ 10 kΩ
• UNR2212 (UN2212)	8B	22 kΩ 22 kΩ
• UNR2213 (UN2213)	8C	47 kΩ 47 kΩ
• UNR2214 (UN2214)	8D	10 kΩ 47 kΩ
• UNR2215 (UN2215)	8E	10 kΩ —
• UNR2216 (UN2216)	8F	4.7 kΩ —
• UNR2217 (UN2217)	8H	22 kΩ —
• UNR2218 (UN2218)	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_a = 25°C

Parameter	Symbol	Rating	Unit
Collector-base voltage (Emitter open)	V _{CBO}	50	V
Collector-emitter voltage (Base open)	V _{CEO}	50	V
Collector current	I _C	100	mA
Total power dissipation	P _T	200	mW
Junction temperature	T _j	150	°C
Storage temperature	T _{stg}	-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	μA	
Collector-emitter cutoff current (Base open)	I_{CEO}	$V_{CE} = 50 \text{V}, I_B = 0$			0.5	μA	
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	
			UNR2213/221K	$V_{CC} = 5 \text{V}, V_B = 3.5 \text{V}, R_L = 1 \text{k}\Omega$			
			UNR221D	$V_{CC} = 5 \text{V}, V_B = 10 \text{V}, R_L = 1 \text{k}\Omega$			
			UNR221E	$V_{CC} = 5 \text{V}, V_B = 6 \text{V}, R_L = 1 \text{k}\Omega$			
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 Ω
	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

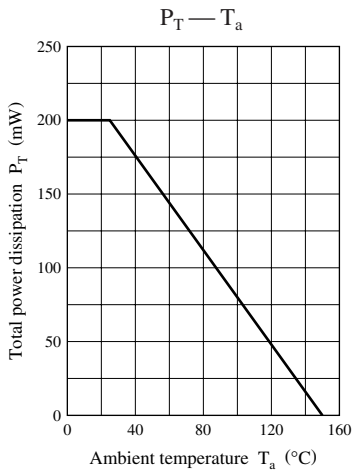
Rank	Q	R	S	No-rank
h_{FE}	160 to 260	210 to 340	290 to 460	160 to 460

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

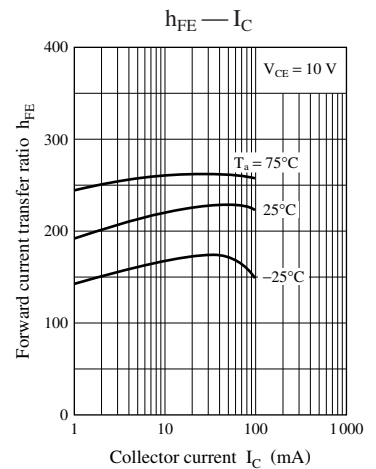
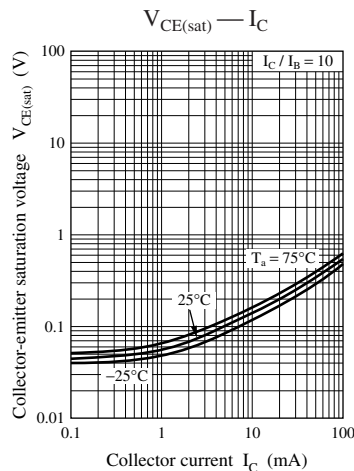
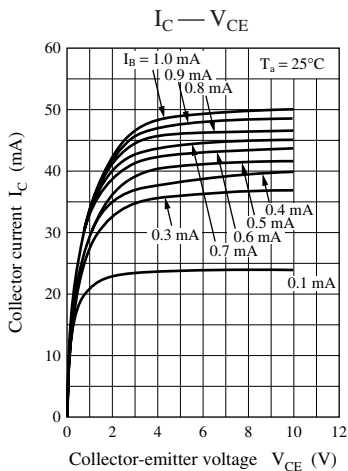
Parameter		Symbol	Conditions	Min	Typ	Max	Unit
Resistance ratio	UNR221M	R_1/R_2			0.047		—
	UNR221N				0.1		
	UNR2218/2219			0.08	0.10	0.12	
	UNR221Z				0.21		
	UNR2214			0.17	0.21	0.25	
	UNR221T				0.47		
	UNR221F			0.37	0.47	0.57	
	UNR221V				1.0		
	UNR2211/2212/2213/221L			0.8	1.0	1.2	
	UNR221K			1.70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

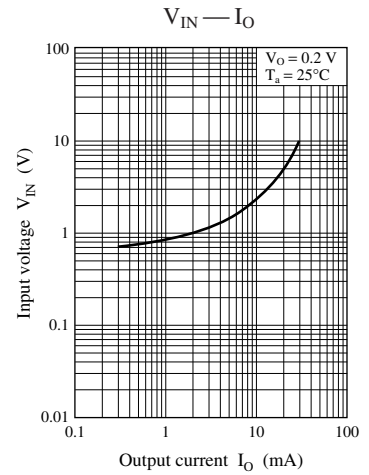
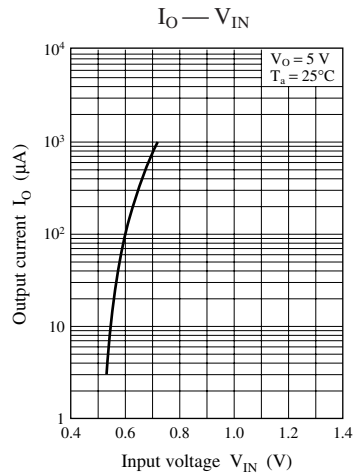
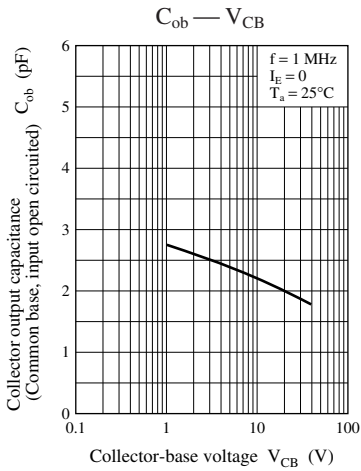
Note) Measuring methods are based on JAPANESE INDUSTRIAL STANDARD JIS C 7030 measuring methods for transistors.

Common characteristics chart

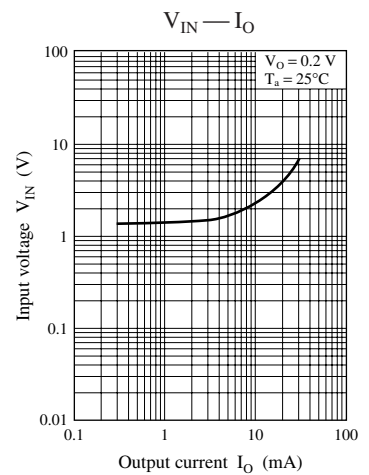
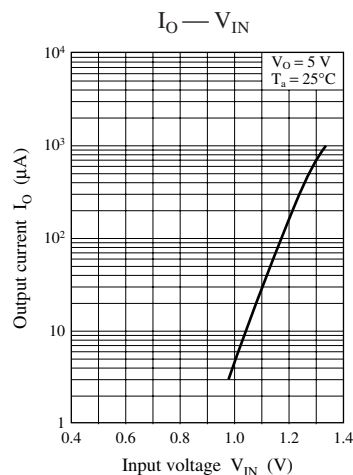
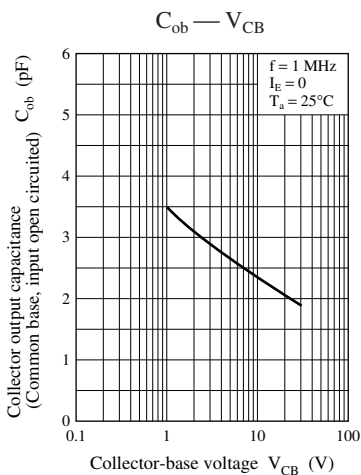
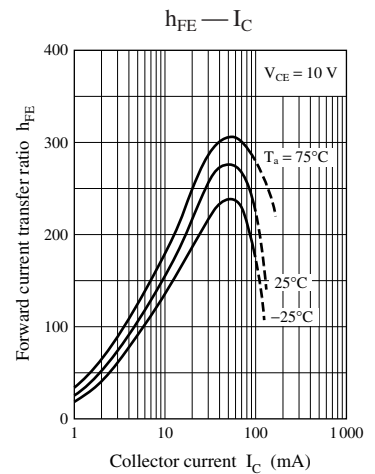
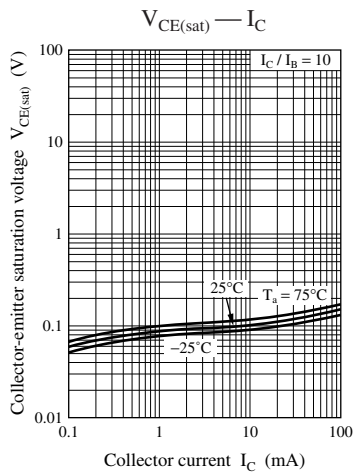
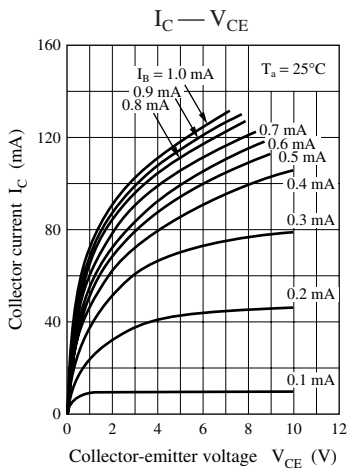


Characteristics charts of UNR2210

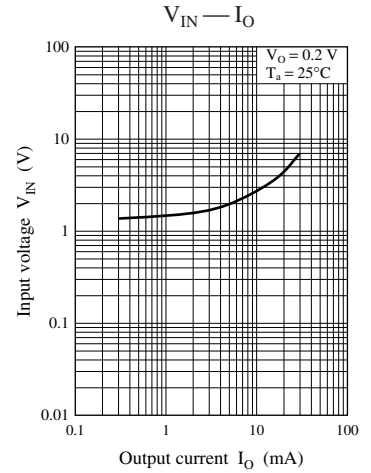
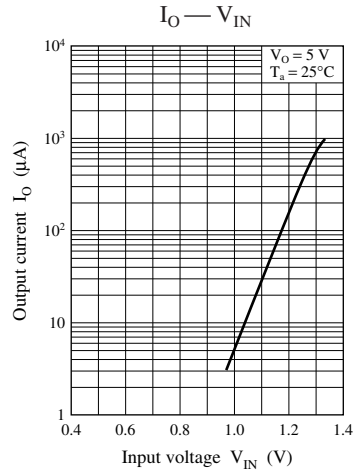
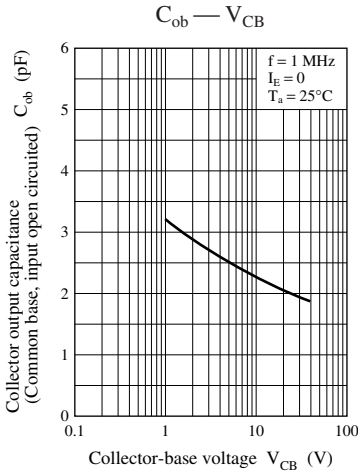
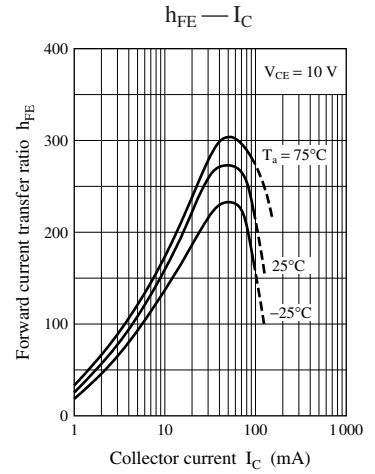
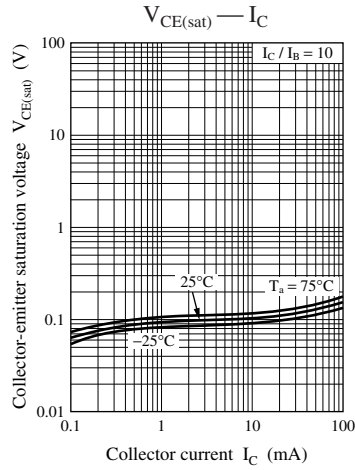
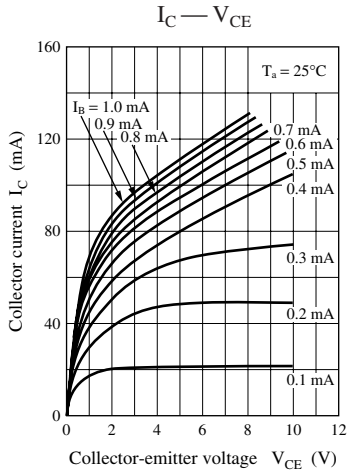




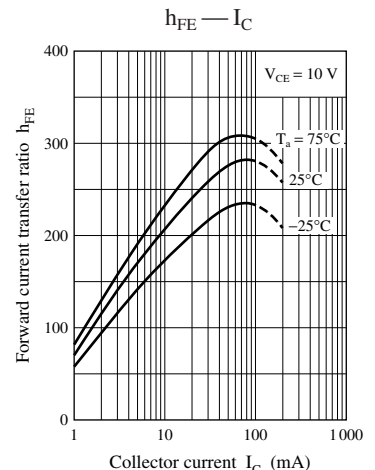
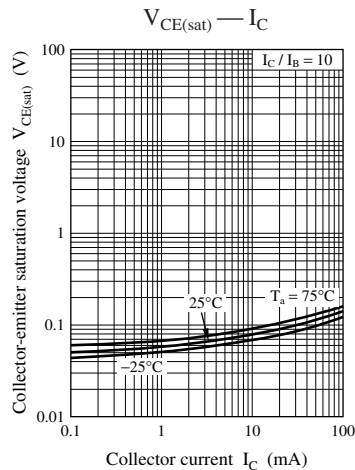
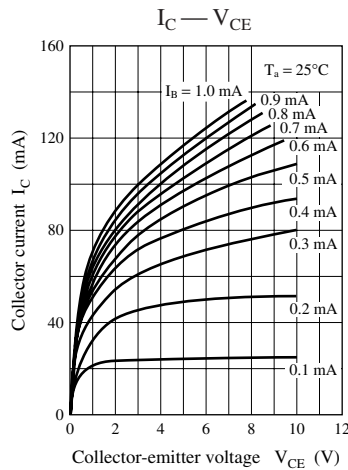
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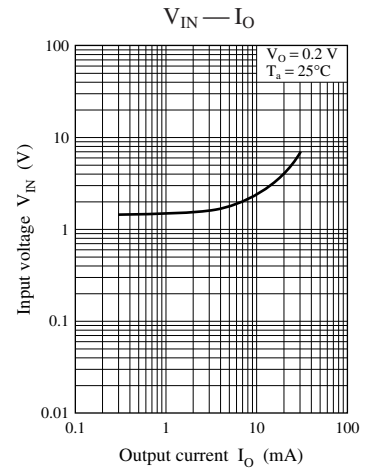
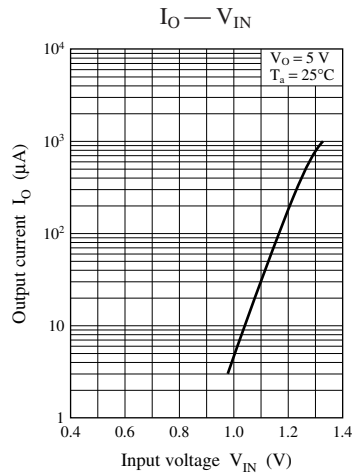
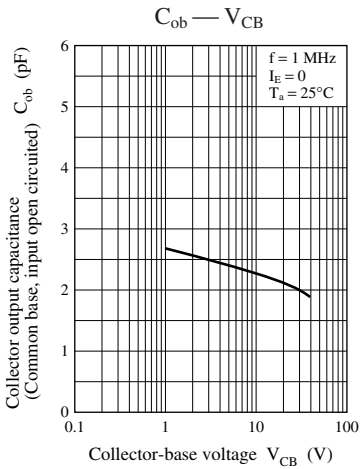


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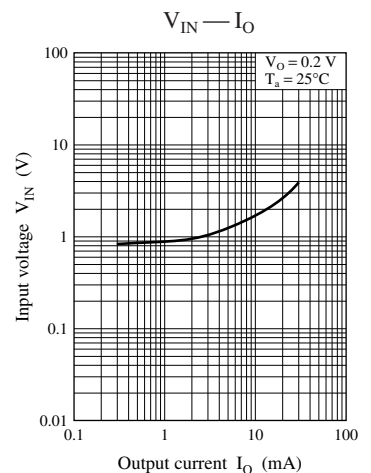
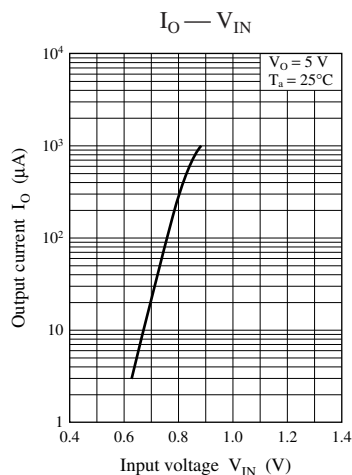
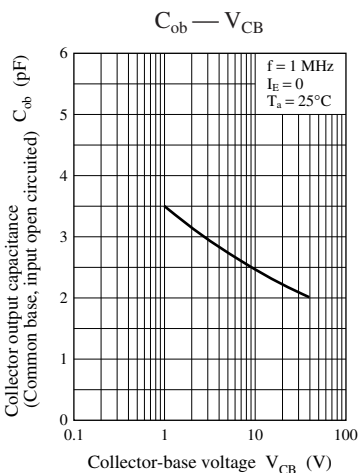
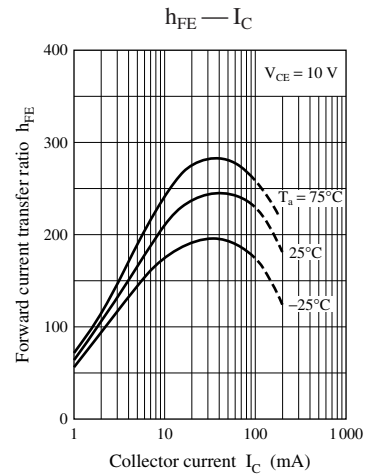
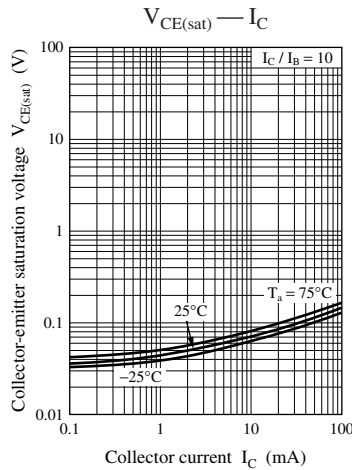
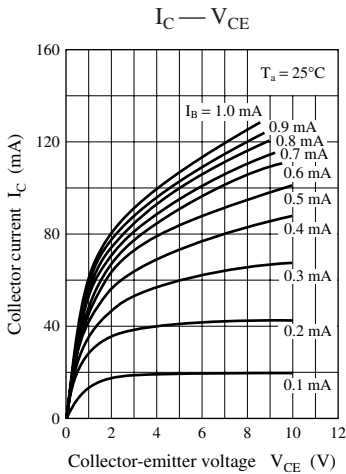


Characteristics charts of UNR2213

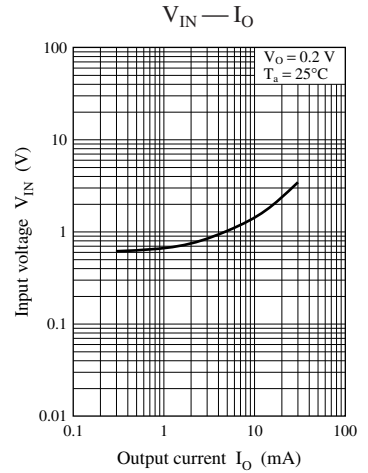
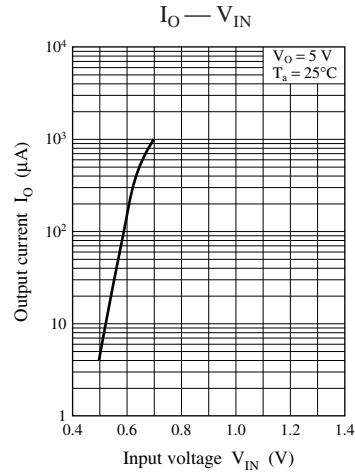
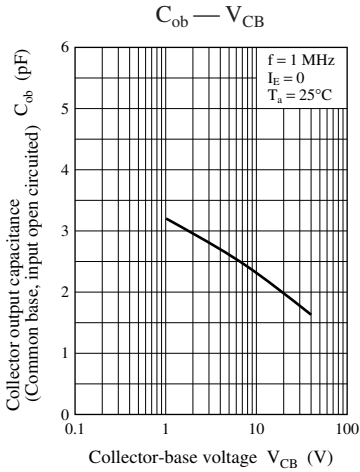
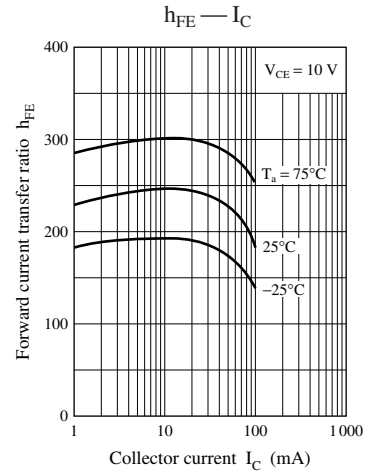
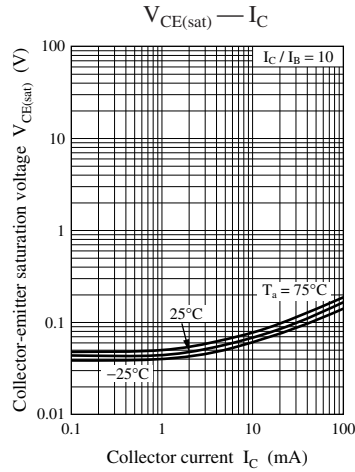
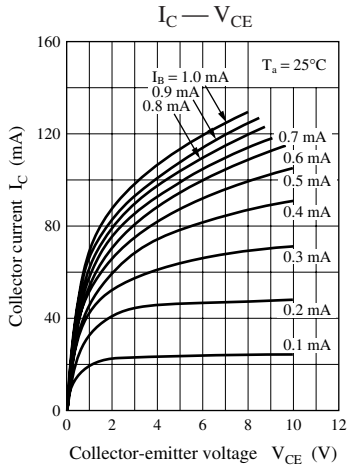




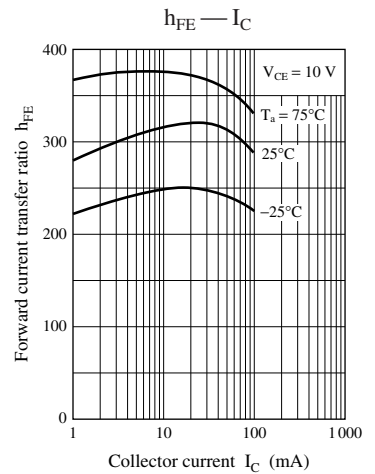
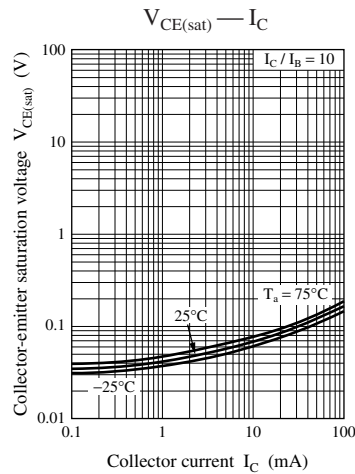
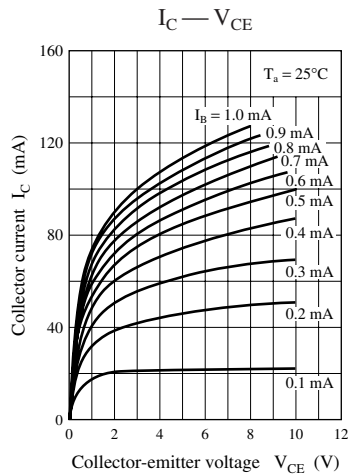
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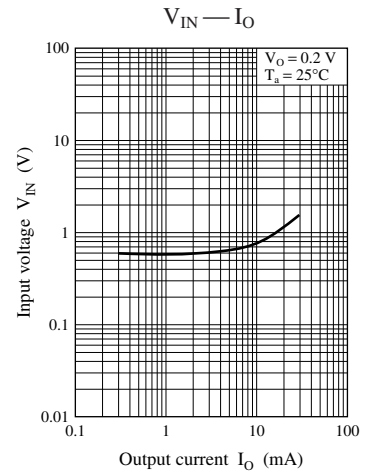
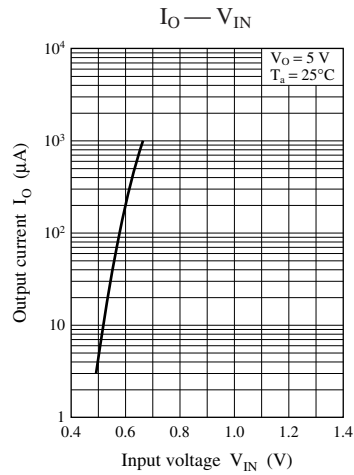
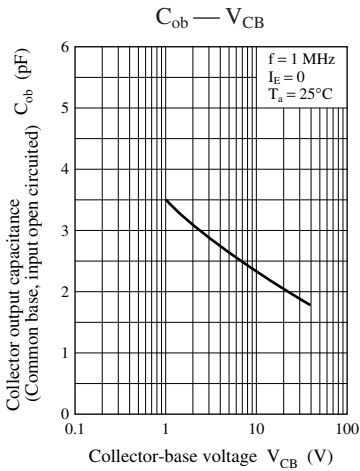


Characteristics charts of UNR2215

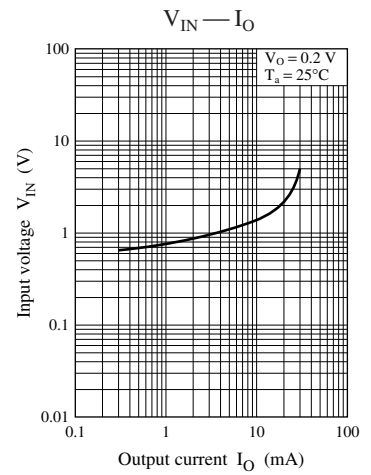
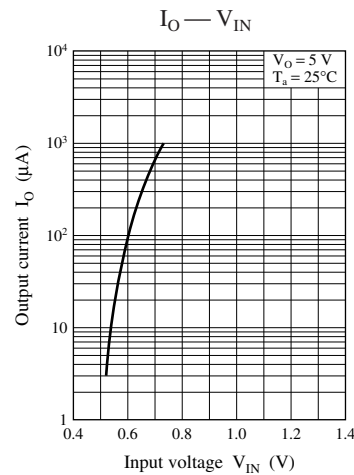
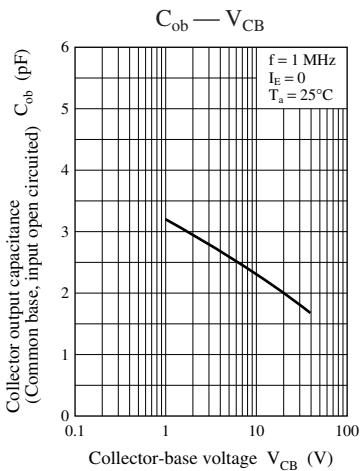
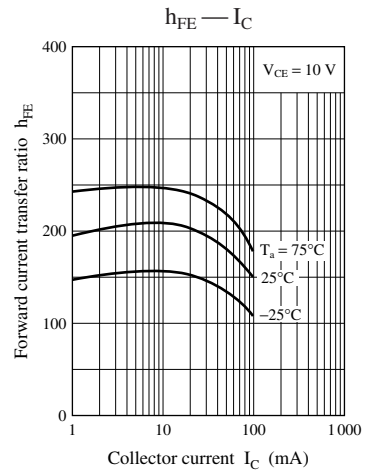
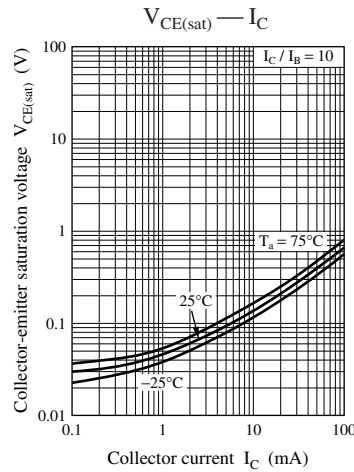
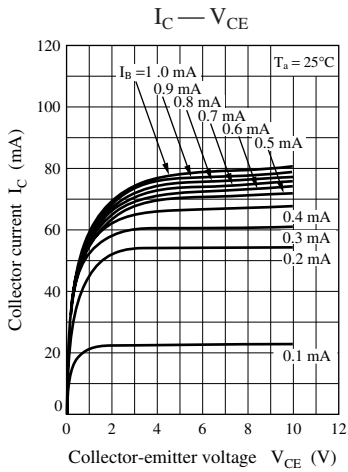


Characteristics charts of UNR2216

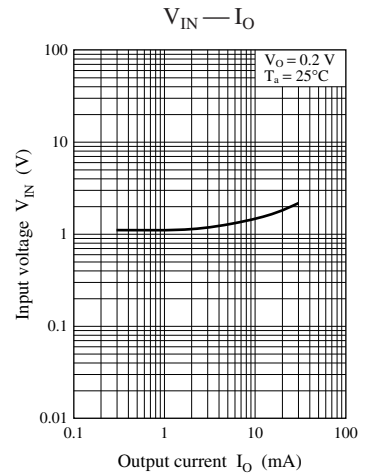
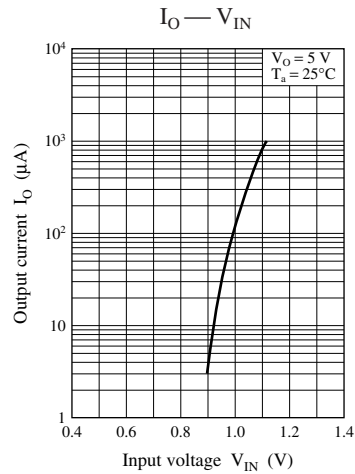
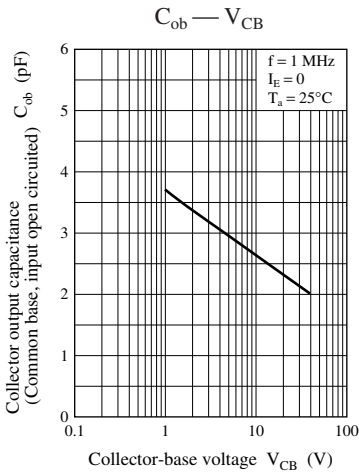
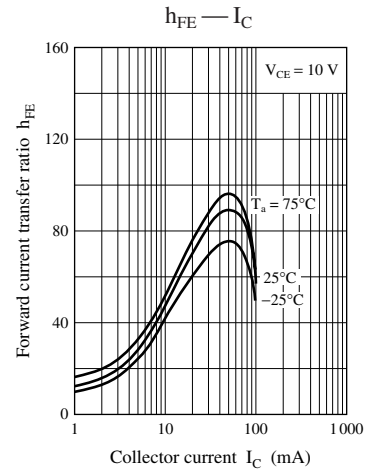
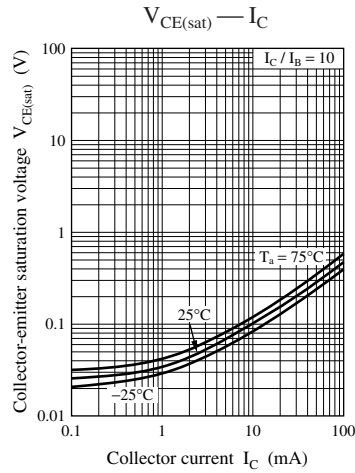
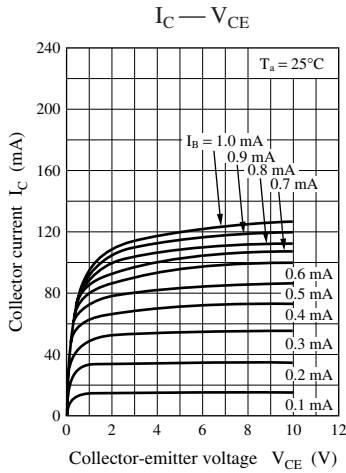




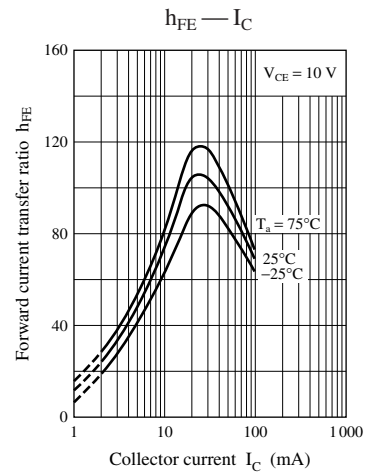
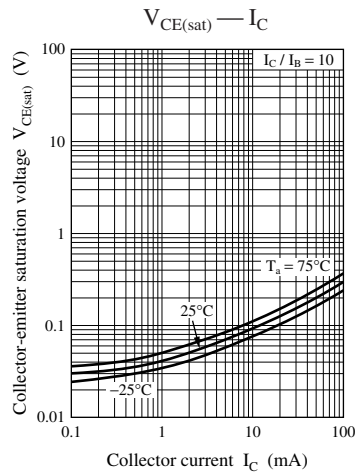
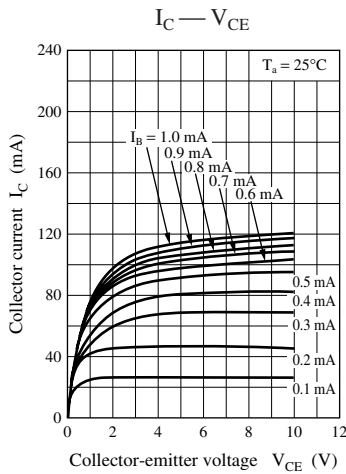
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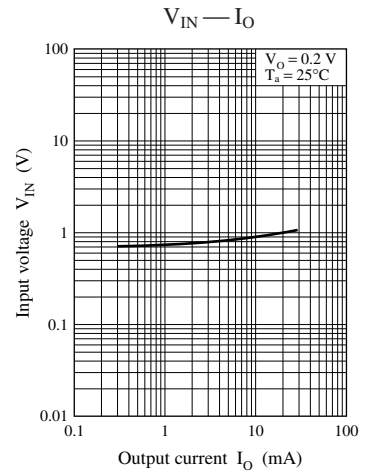
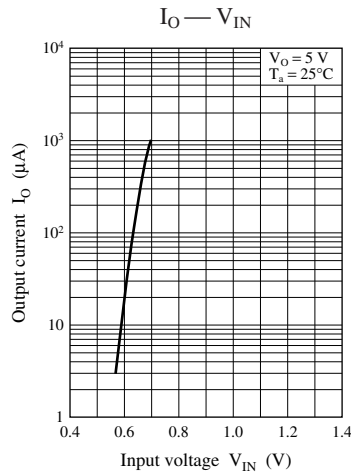
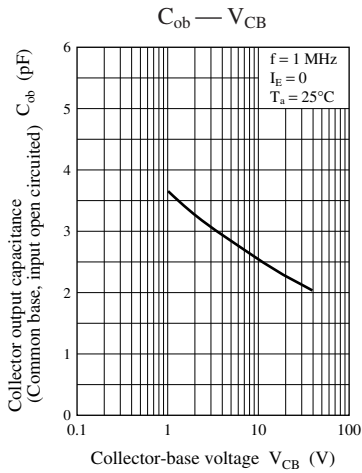


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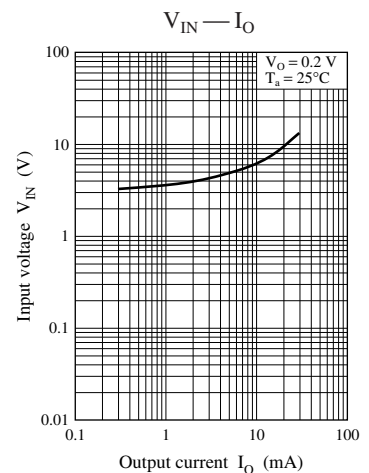
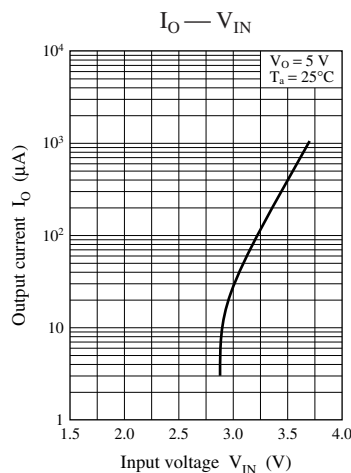
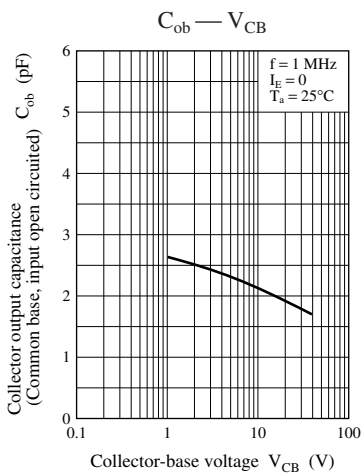
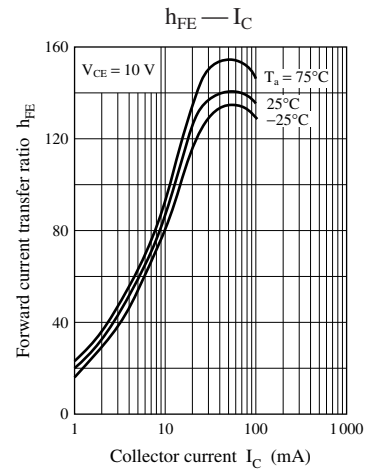
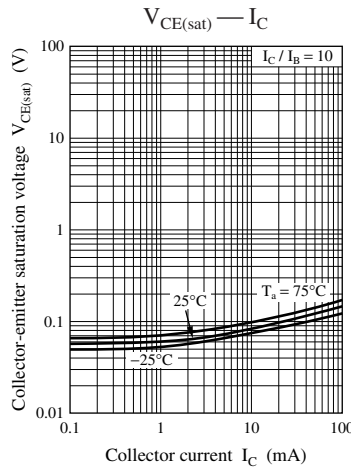
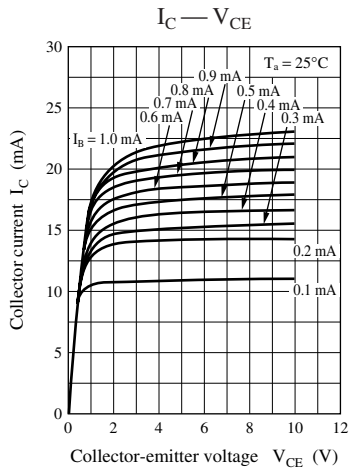


Characteristics charts of UNR2219

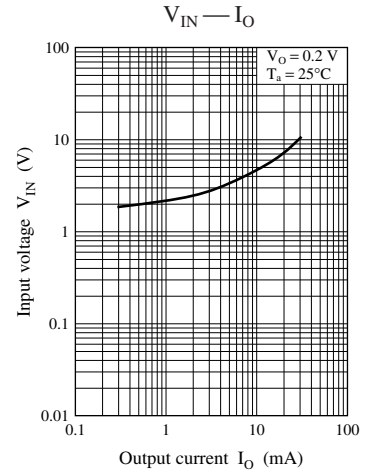
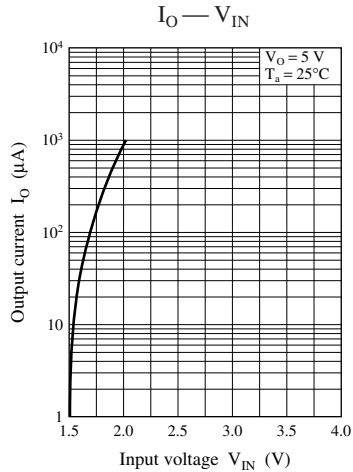
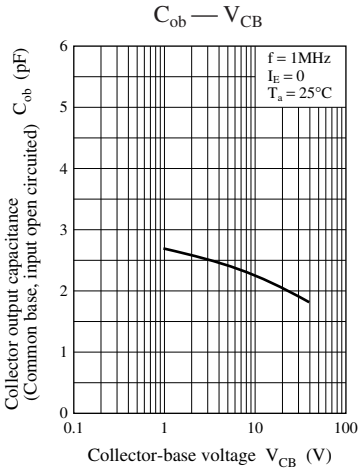
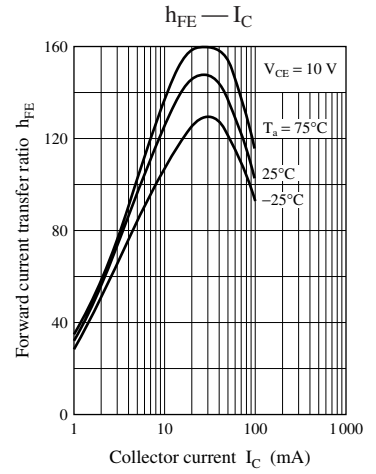
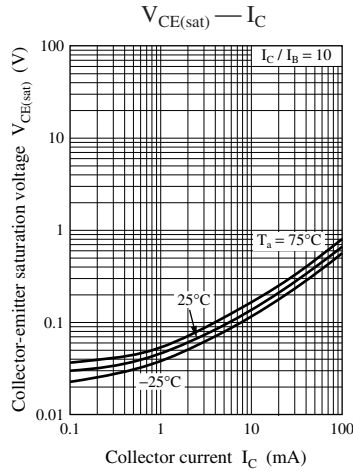
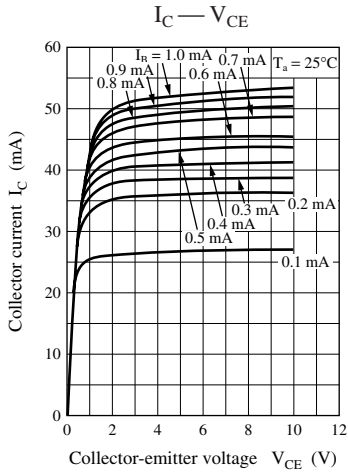




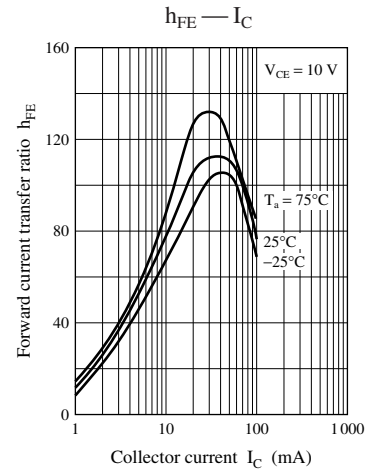
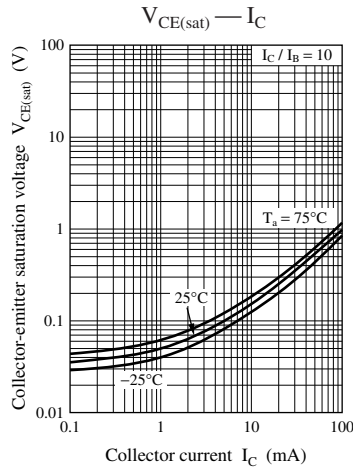
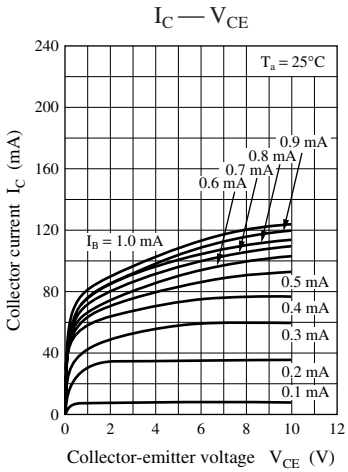
Characteristics charts of UNR221D

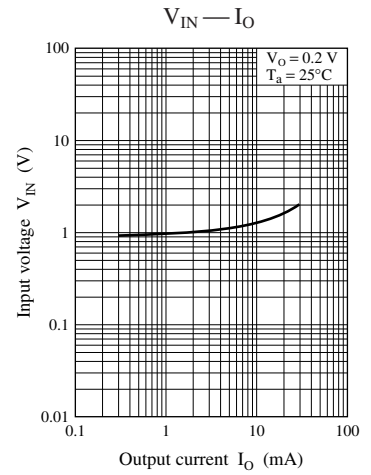
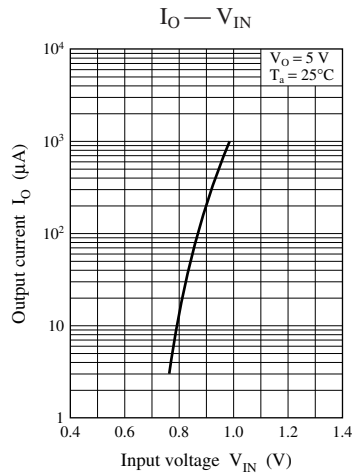
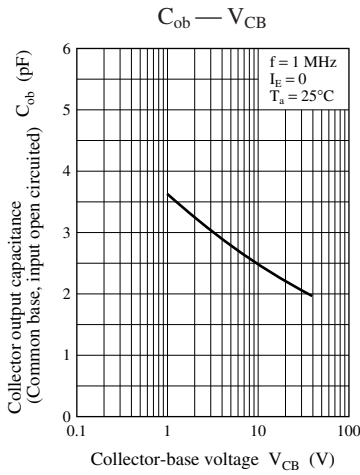


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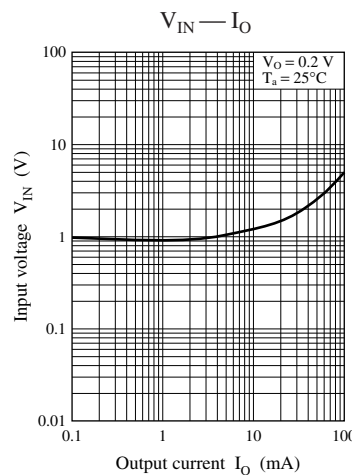
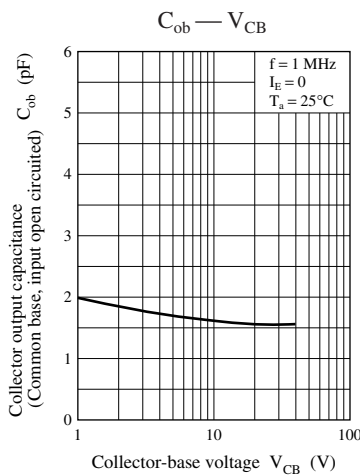
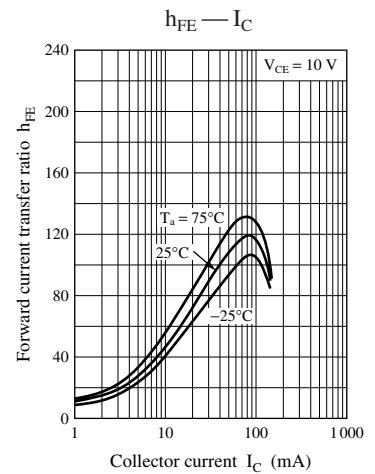
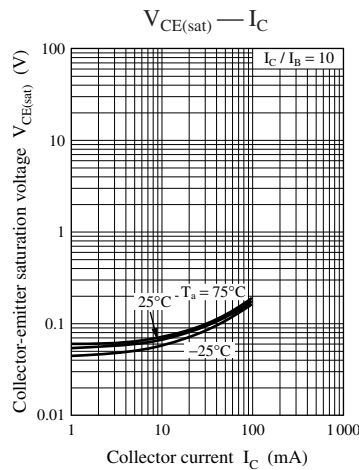
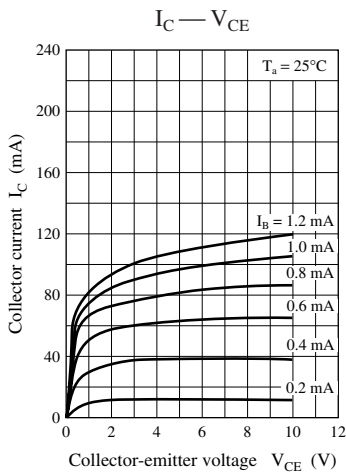


Characteristics charts of UNR221F

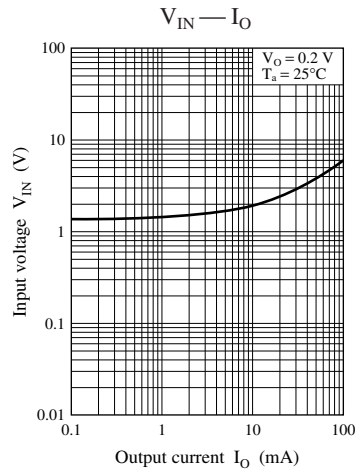
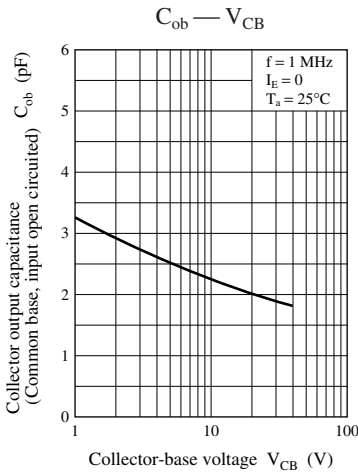
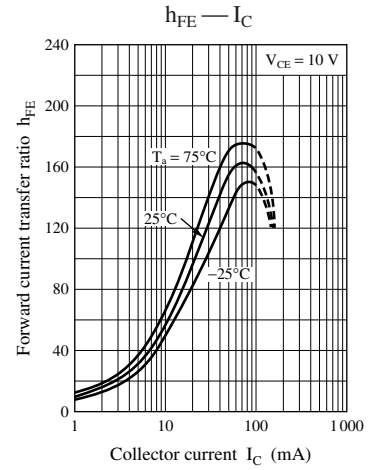
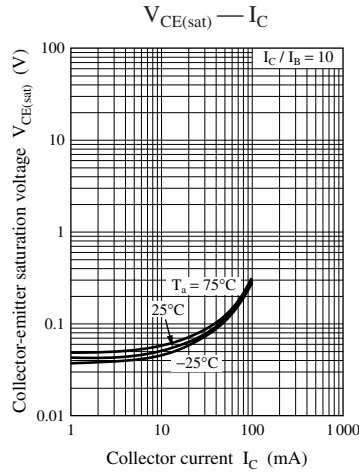
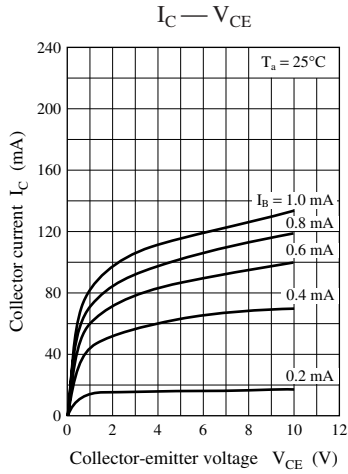




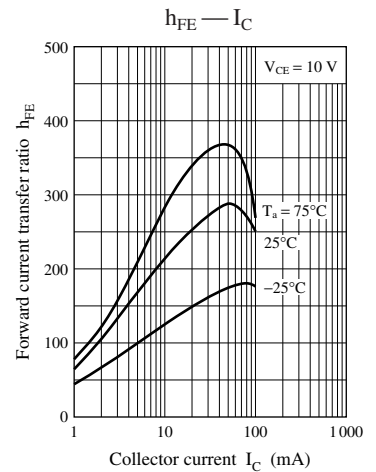
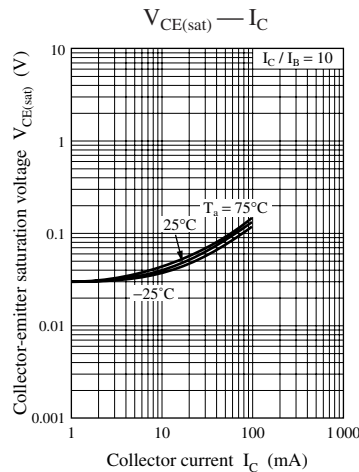
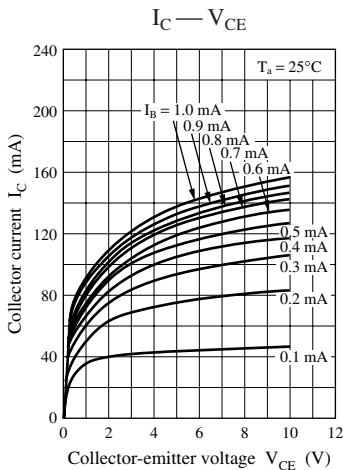
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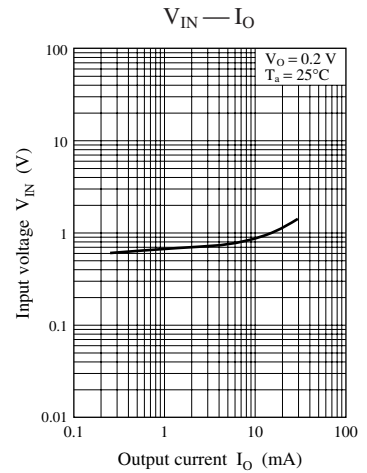
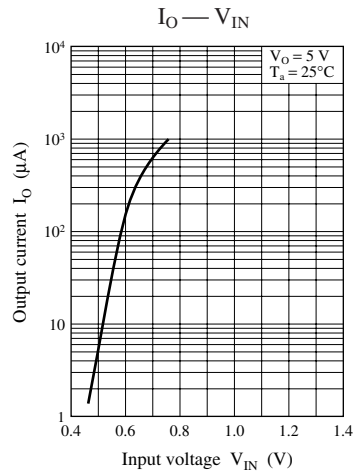
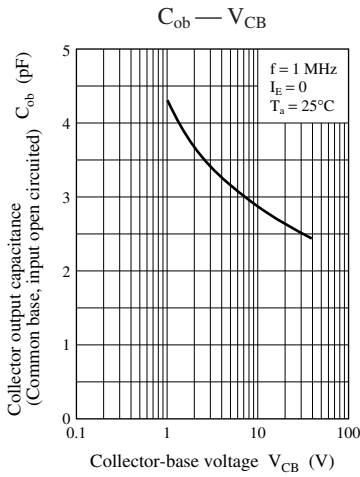


Characteristics charts of UNR221L

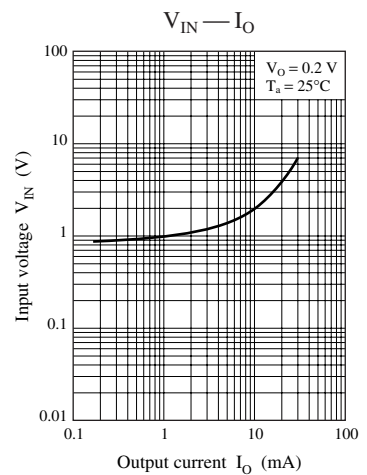
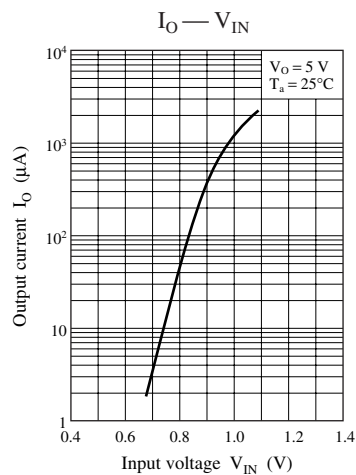
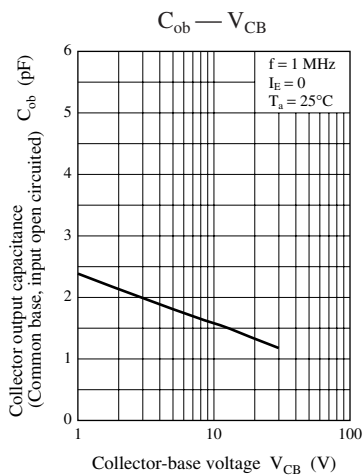
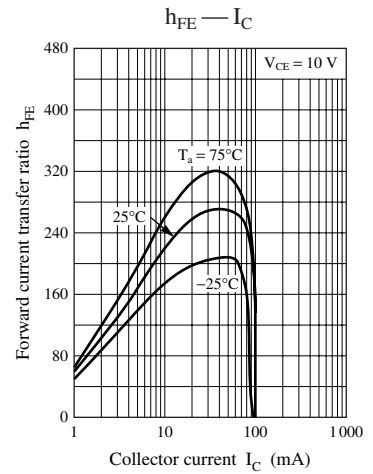
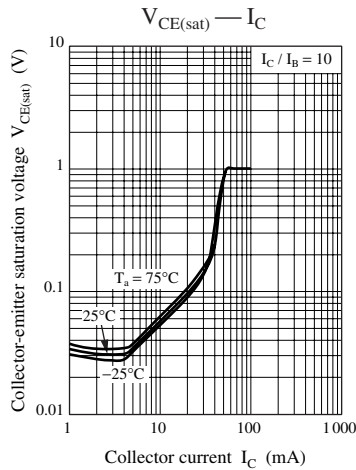
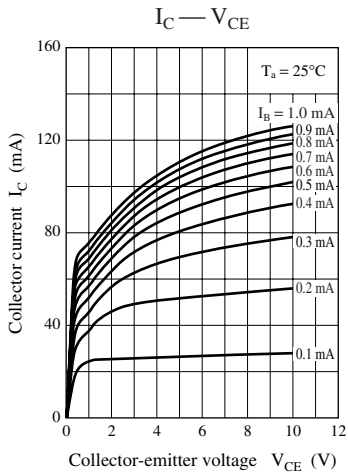


Characteristics charts of UNR221M

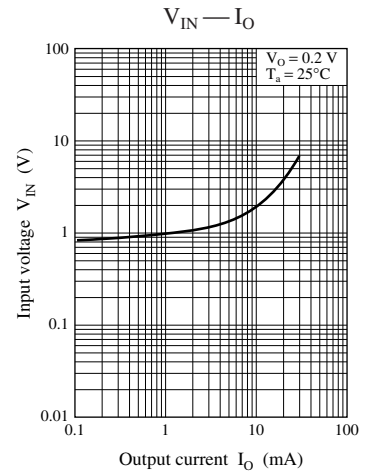
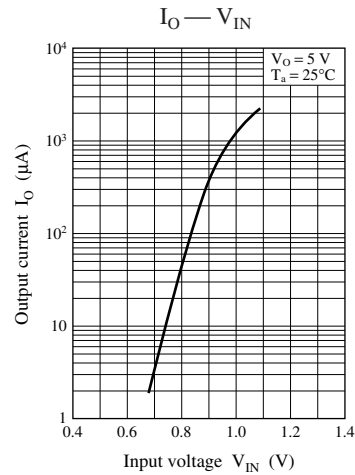
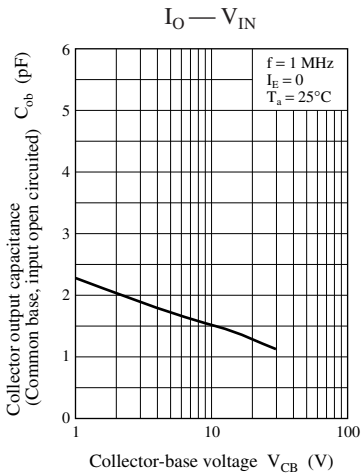
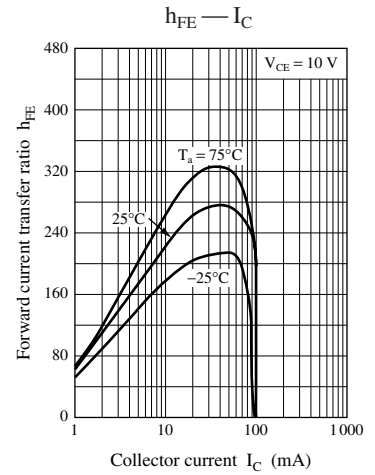
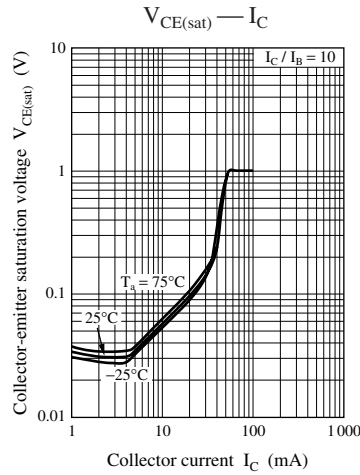
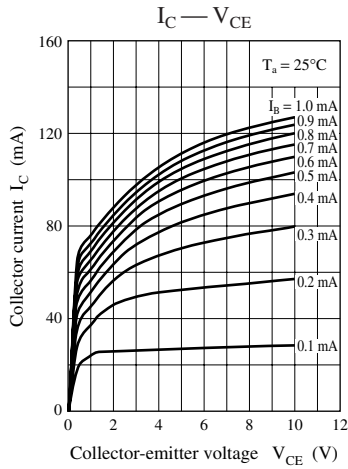




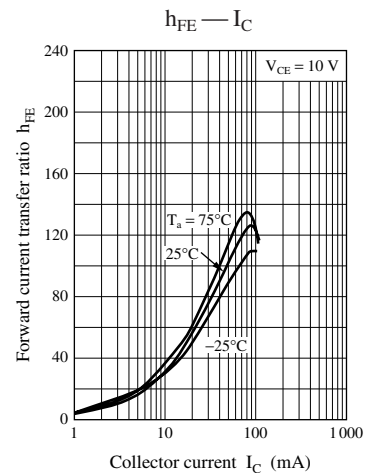
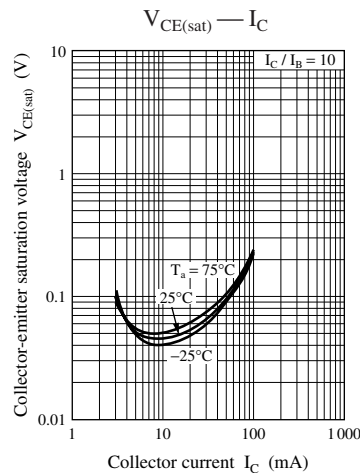
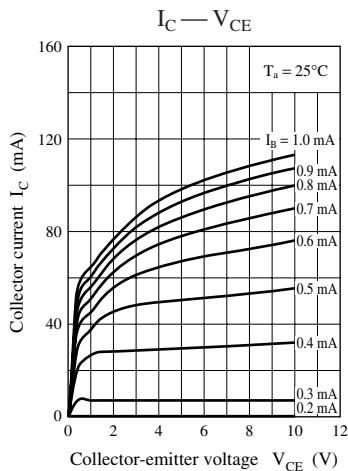
Characteristics charts of UNR221N

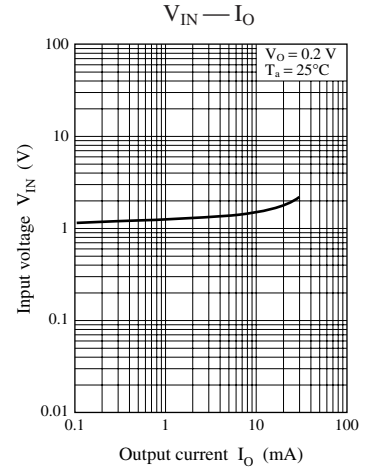
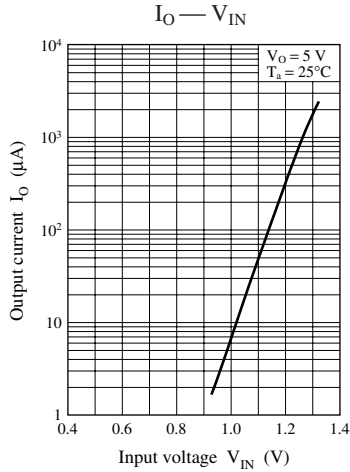
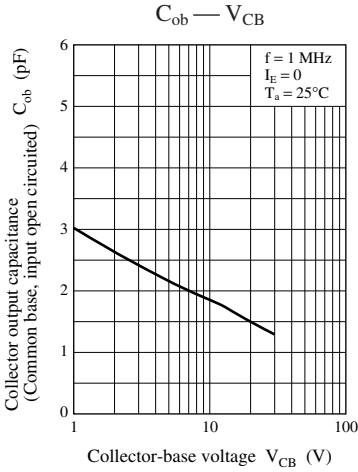


Characteristics charts of UNR221T

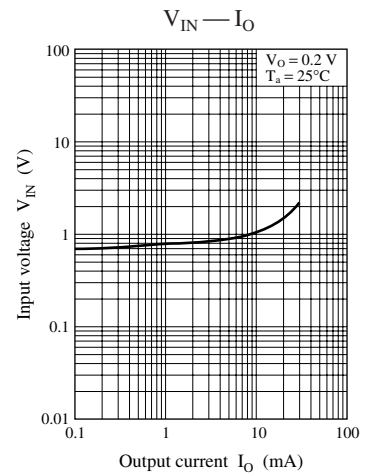
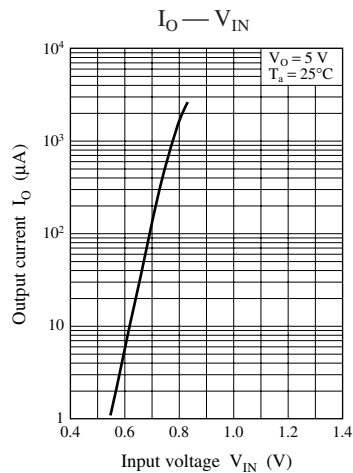
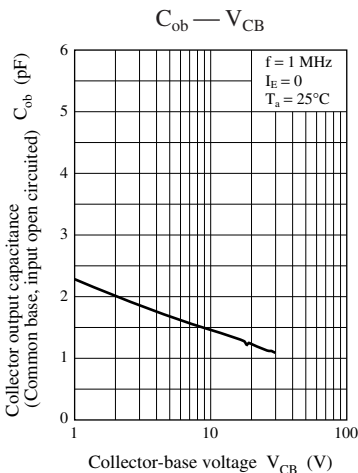
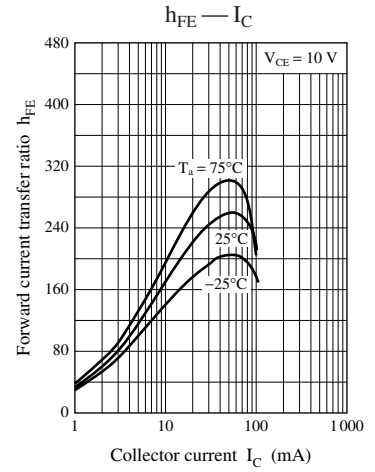
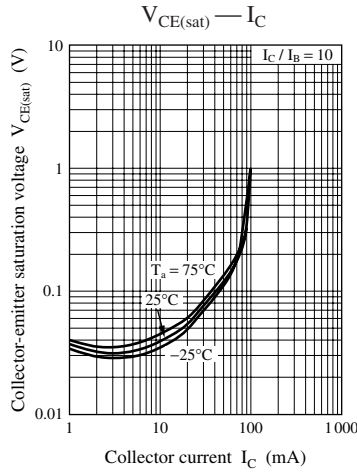
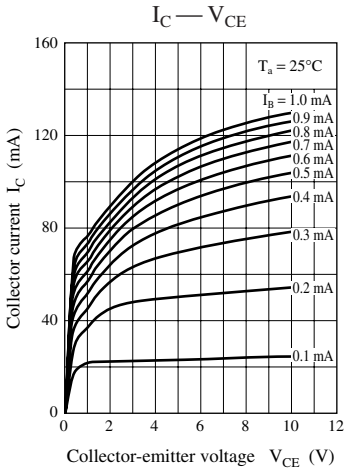


Characteristics charts of UNR221V





Characteristics charts of UNR221Z



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