

UNR221x Series (UN221x Series)

Silicon NPN epitaxial planar transistor

For digital circuits

■ Features

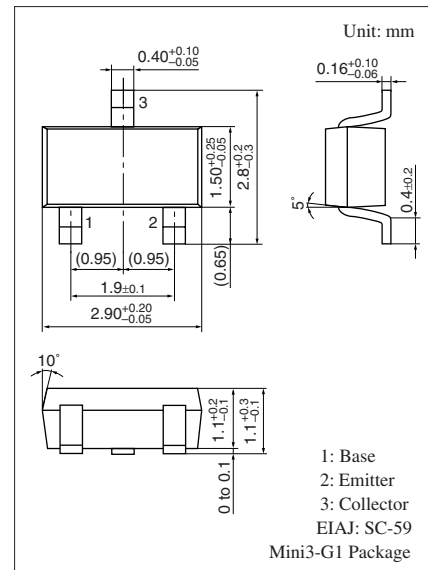
- Costs can be reduced through downsizing of the equipment and reduction of the number of parts.
- Mini type package allowing easy automatic insertion through tape packing and magazine packing

■ Resistance by Part Number

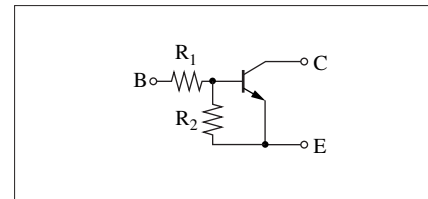
	Marking Symbol (R ₁)	(R ₂)
• UNR2210 (UN2210)	8L	47 kΩ —
• UNR2211 (UN2211)	8A	10 kΩ 10 kΩ
• UNR2212 (UN2212)	8B	22 kΩ 22 kΩ
• UNR2213 (UN2213)	8C	47 kΩ 47 kΩ
• UNR2214 (UN2214)	8D	10 kΩ 47 kΩ
• UNR2215 (UN2215)	8E	10 kΩ —
• UNR2216 (UN2216)	8F	4.7 kΩ —
• UNR2217 (UN2217)	8H	22 kΩ —
• UNR2218 (UN2218)	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	
		$I_C = 10 \text{ mA}, I_B = 1.5 \text{ mA}$					
Output voltage high-level	V_{OH}	$V_{CC} = 5 \text{ V}, V_B = 0.5 \text{ V}, R_L = 1 \text{ k}\Omega$	4.9			V	
Output voltage low-level	V_{OL}	$V_{CC} = 5 \text{ V}, V_B = 2.5 \text{ V}, R_L = 1 \text{ k}\Omega$			0.2	V	
		$V_{CC} = 5 \text{ V}, V_B = 3.5 \text{ V}, R_L = 1 \text{ k}\Omega$					
		$V_{CC} = 5 \text{ V}, V_B = 10 \text{ V}, R_L = 1 \text{ k}\Omega$					
		$V_{CC} = 5 \text{ V}, V_B = 6 \text{ V}, R_L = 1 \text{ k}\Omega$					
Transition frequency	f_T	$V_{CB} = 10 \text{ V}, I_E = -2 \text{ mA}, f = 200 \text{ MHz}$		150		MHz	
Input resistance	R_i		-30%	0.51	+30%	k Ω	
				1.0			
				2.2			
				4.7			
				10			
				22			
				47			

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

2. *: Rank classification

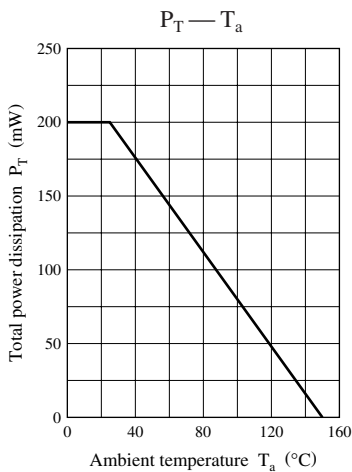
Rank	Q	R	S	No-rank
h_{FE}	160 to 260	210 to 340	290 to 460	160 to 460

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

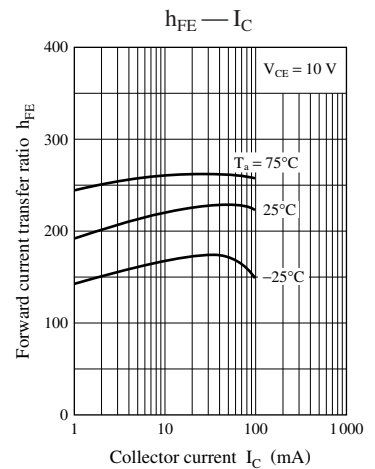
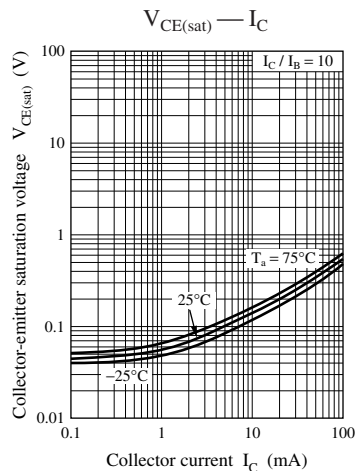
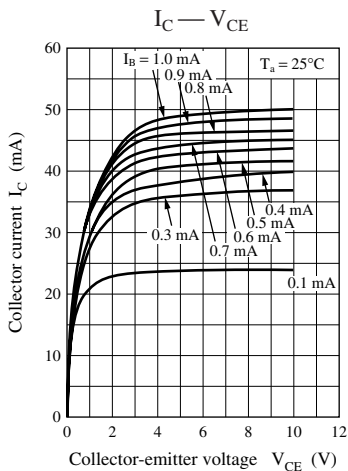
Parameter		Symbol	Conditions	Min	Typ	Max	Unit
Resistance ratio	UNR221M	R_1/R_2			0.047		—
	UNR221N				0.1		
	UNR2218/2219			0.08	0.10	0.12	
	UNR221Z				0.21		
	UNR2214			0.17	0.21	0.25	
	UNR221T				0.47		
	UNR221F			0.37	0.47	0.57	
	UNR221V				1.0		
	UNR2211/2212/2213/221L			0.8	1.0	1.2	
	UNR221K			1.70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

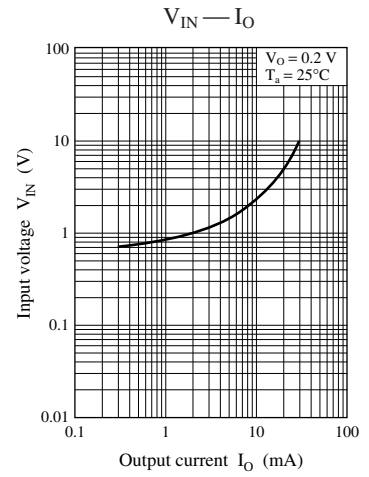
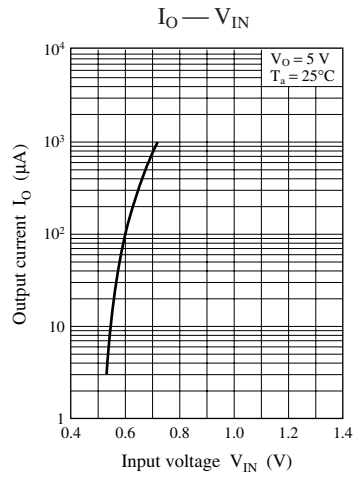
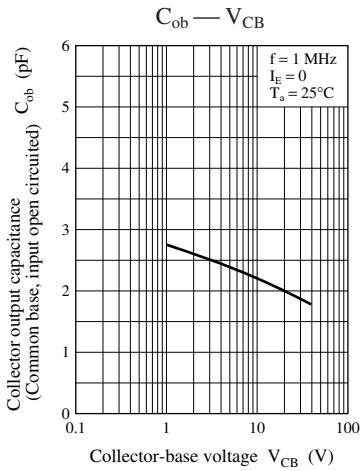
Note) Measuring methods are based on JAPANESE INDUSTRIAL STANDARD JIS C 7030 measuring methods for transistors.

Common characteristics chart

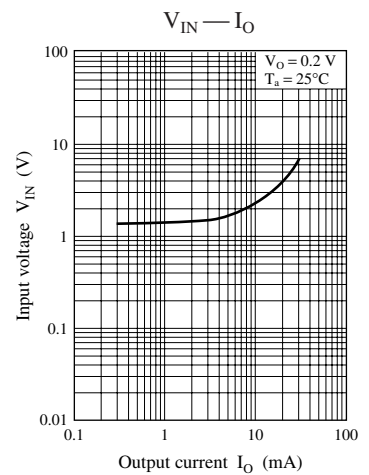
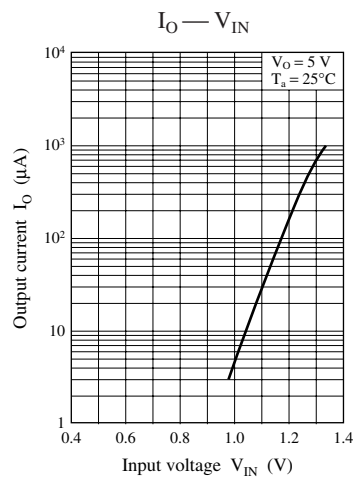
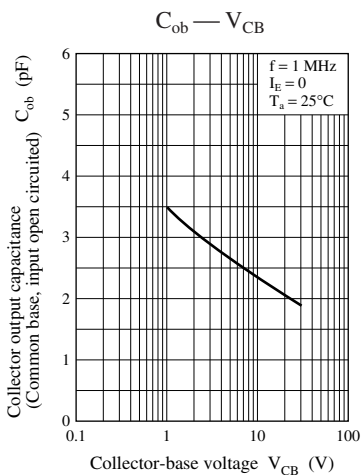
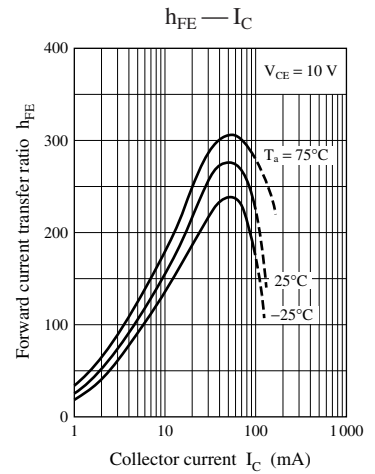
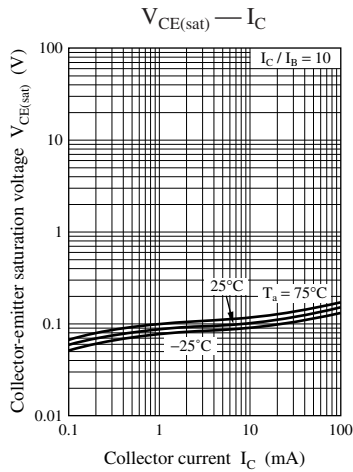
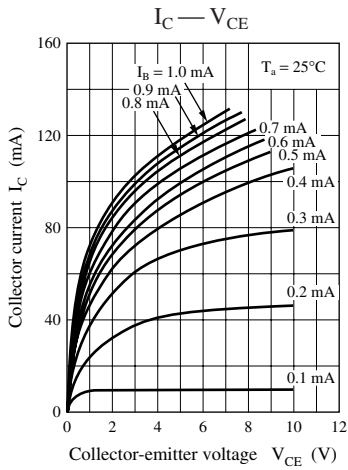


Characteristics charts of UNR2210

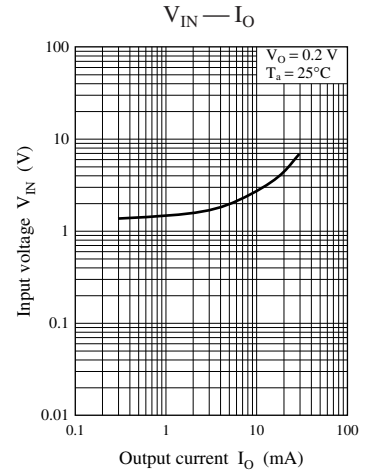
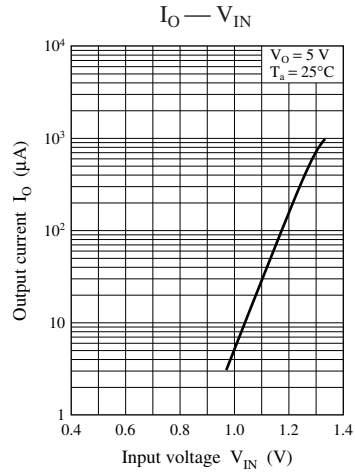
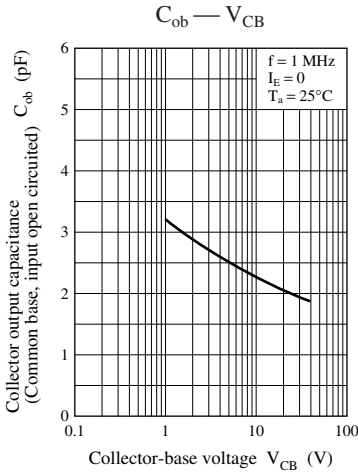
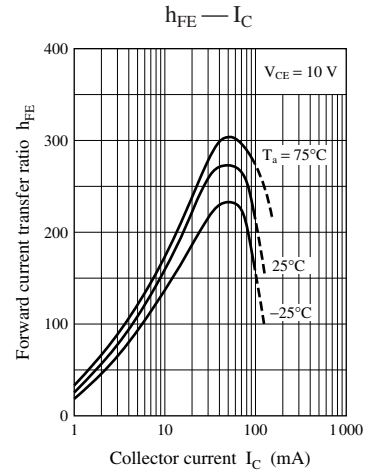
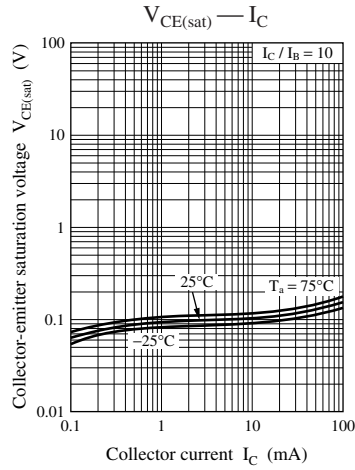
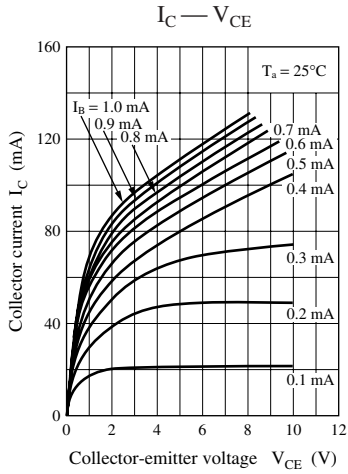




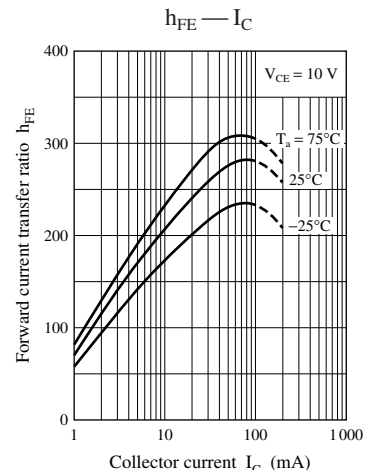
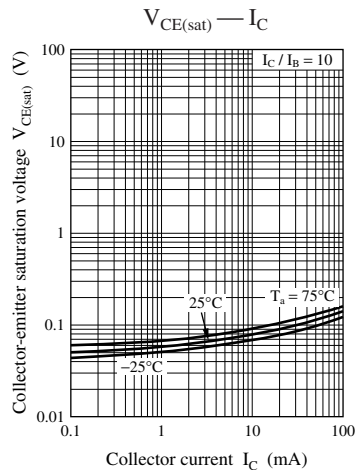
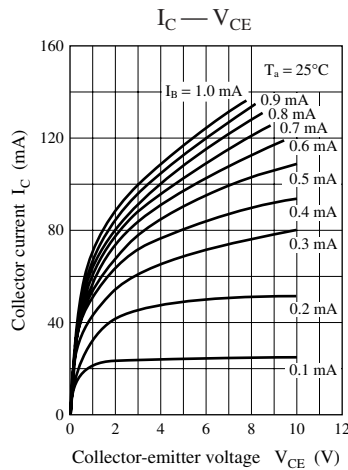
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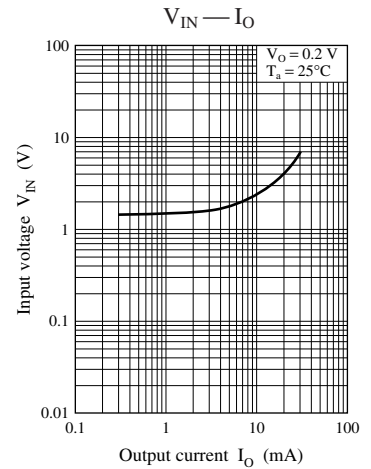
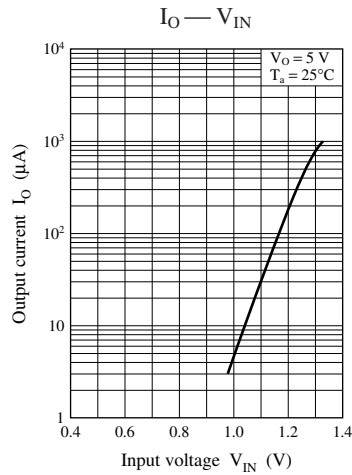
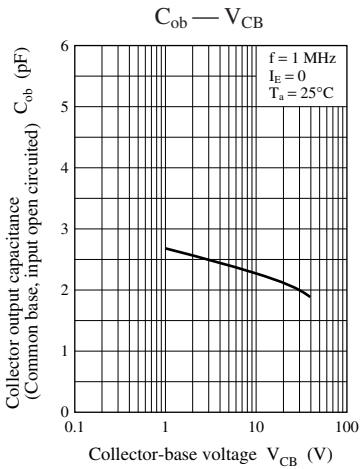


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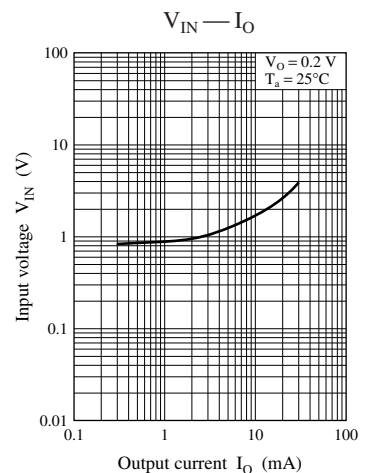
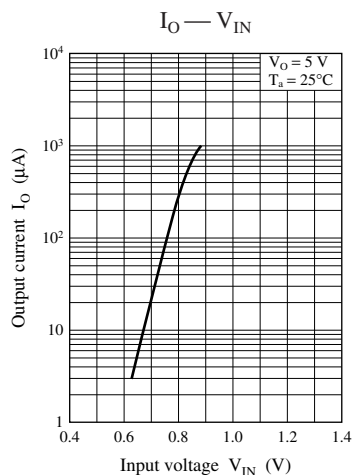
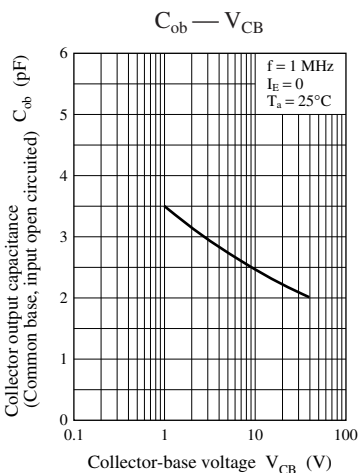
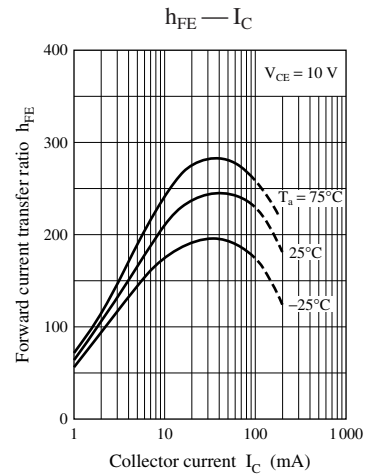
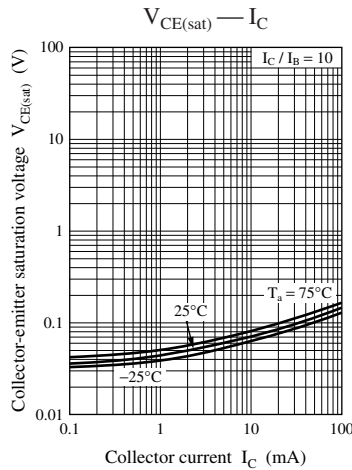
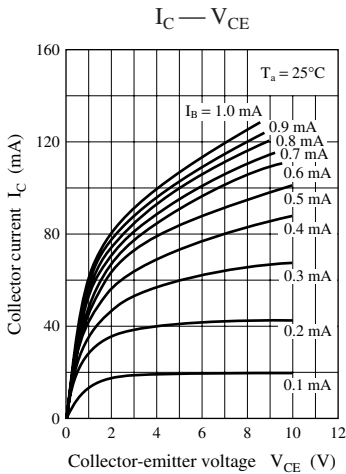


Characteristics charts of UNR2213

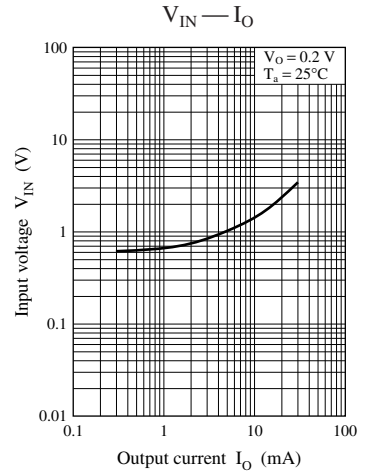
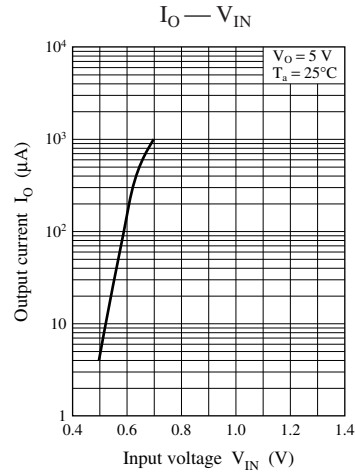
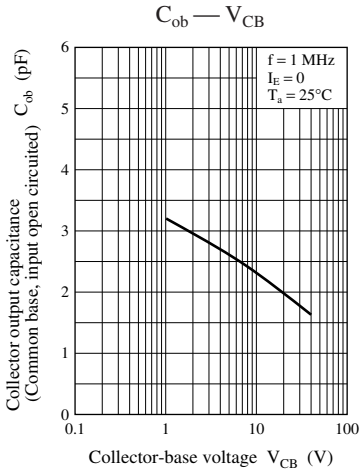
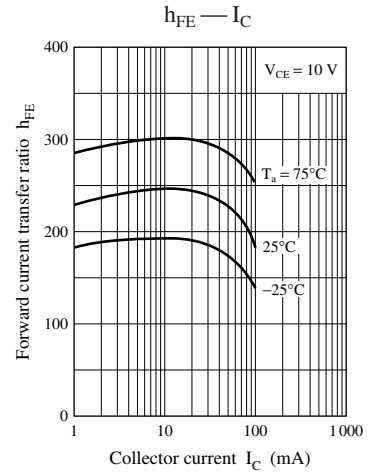
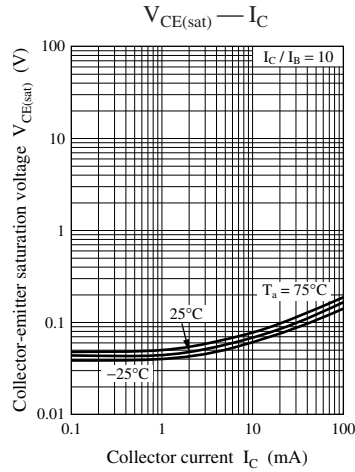
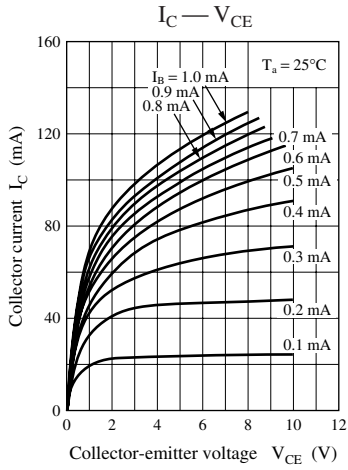




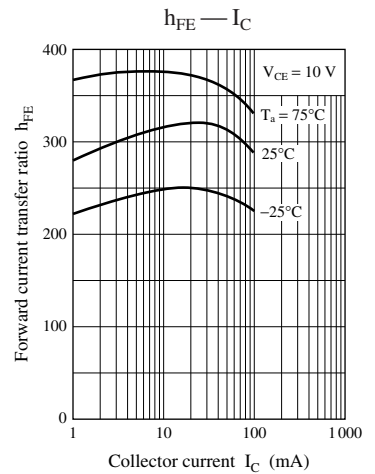
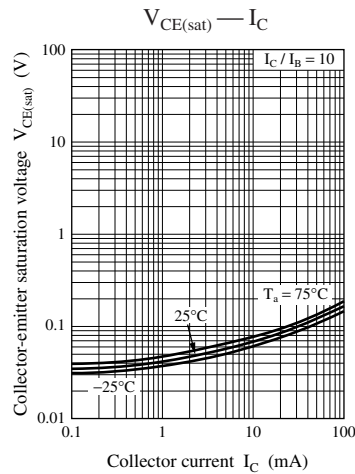
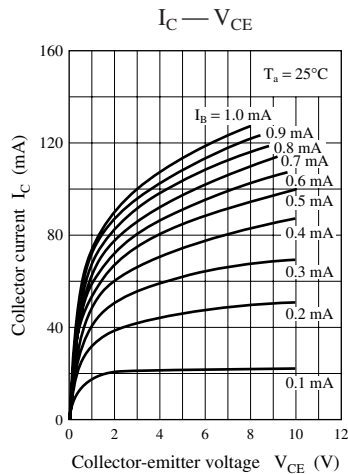
Characteristics charts of UNR2214

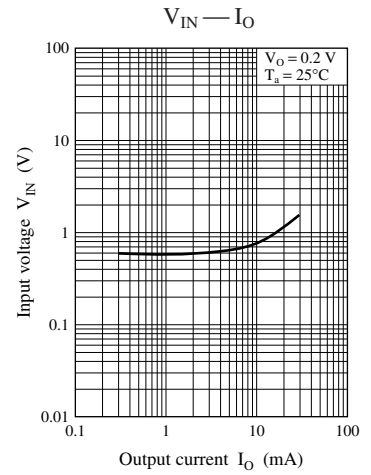
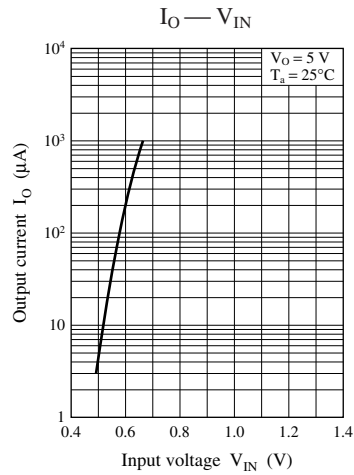
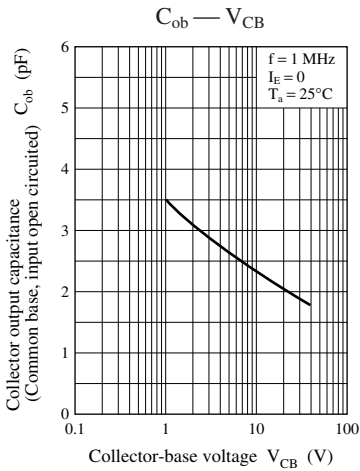


Characteristics charts of UNR2215

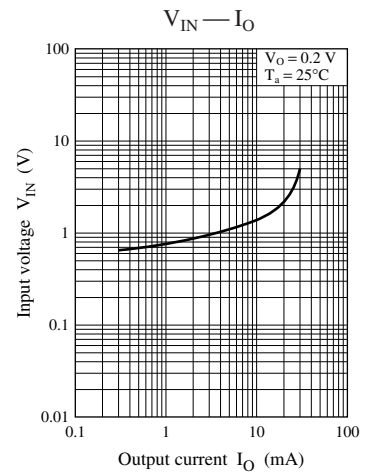
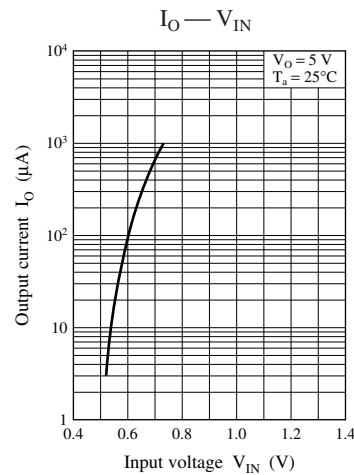
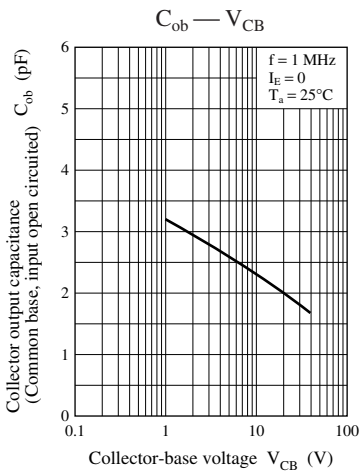
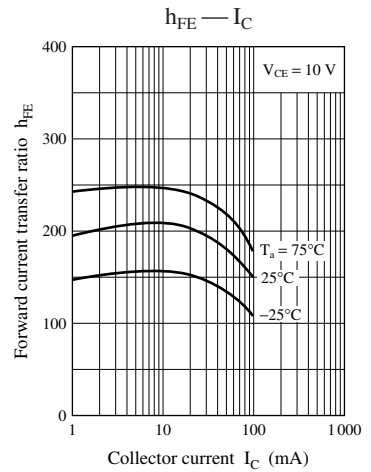
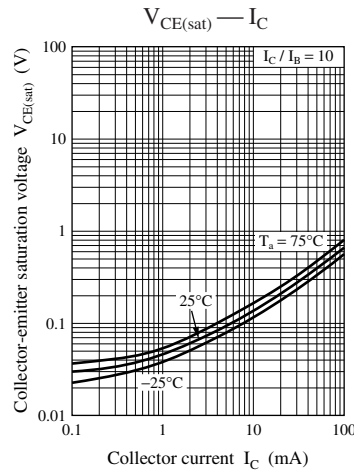
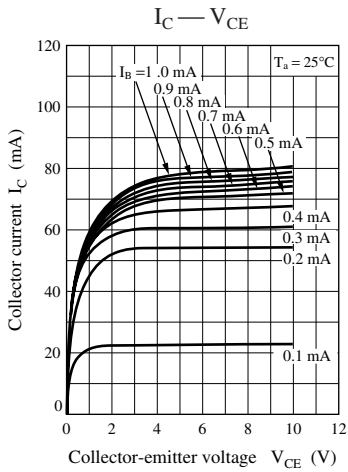


Characteristics charts of UNR2216

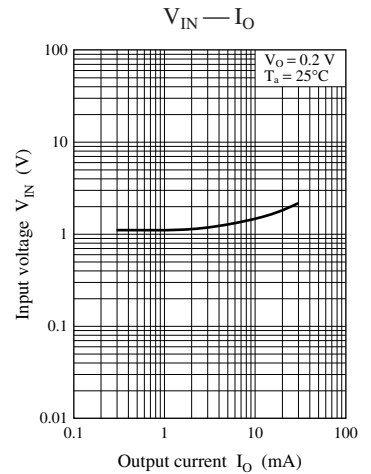
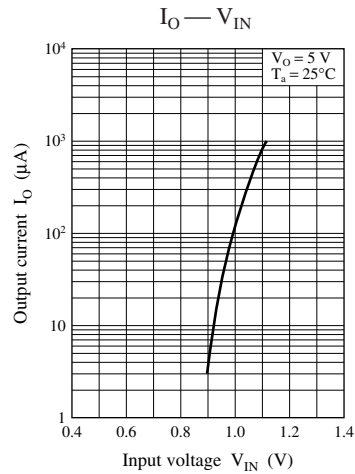
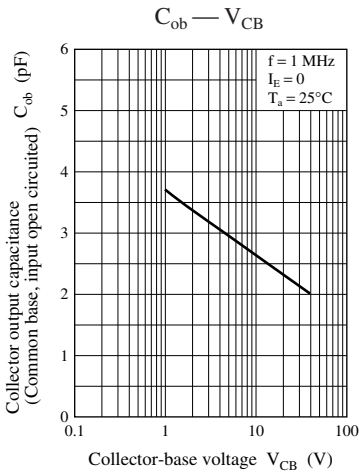
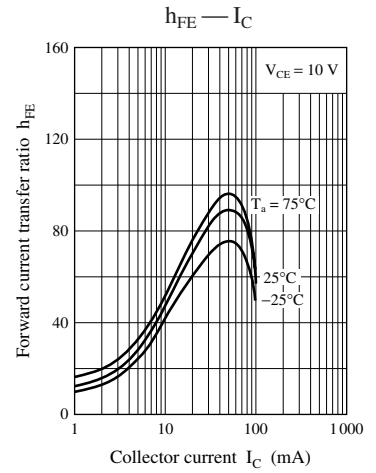
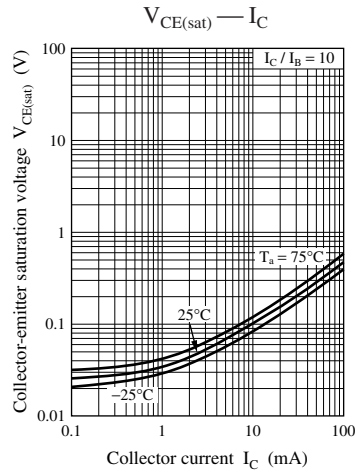
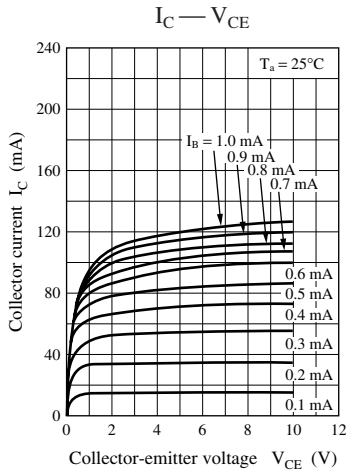




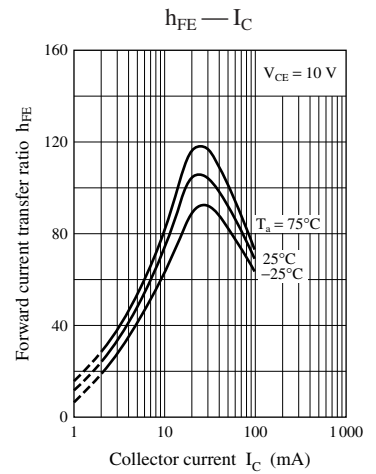
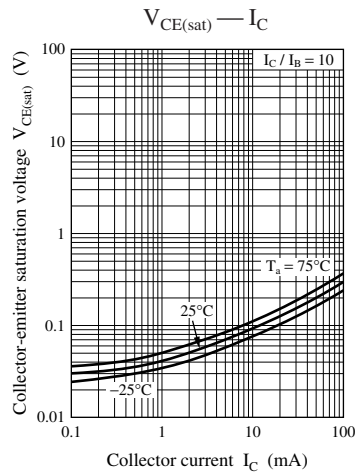
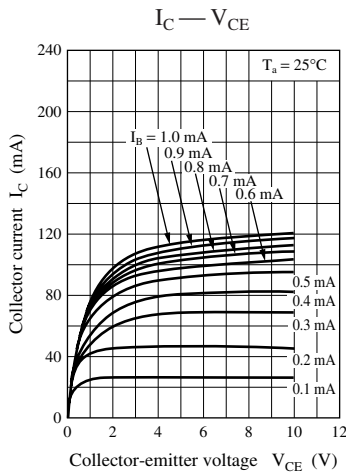
Characteristics charts of UNR2217

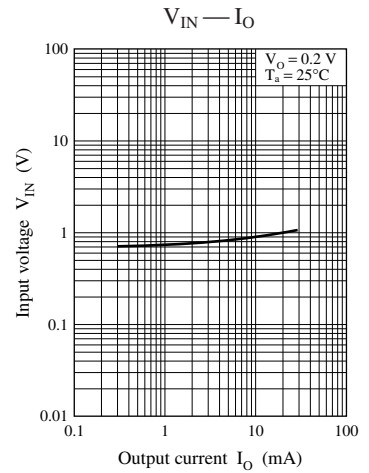
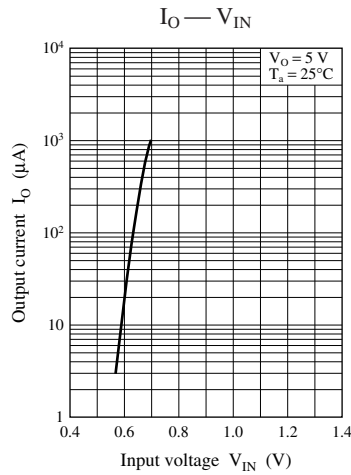
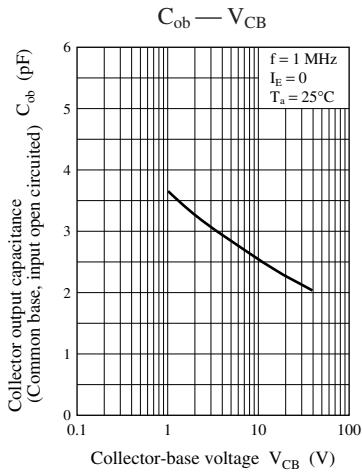


Characteristics charts of UNR2218

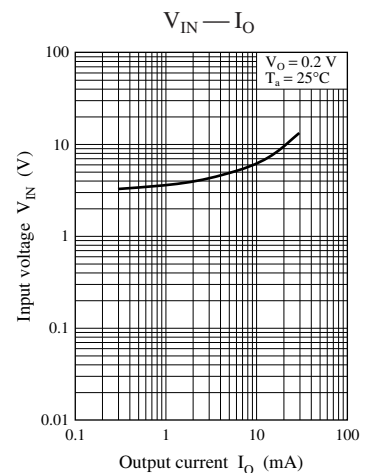
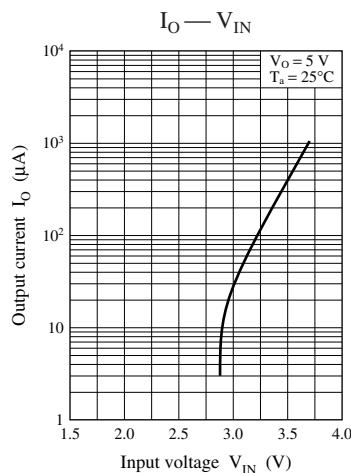
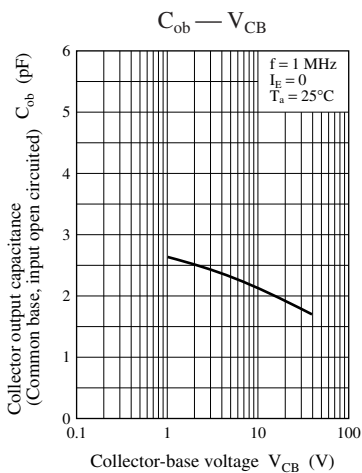
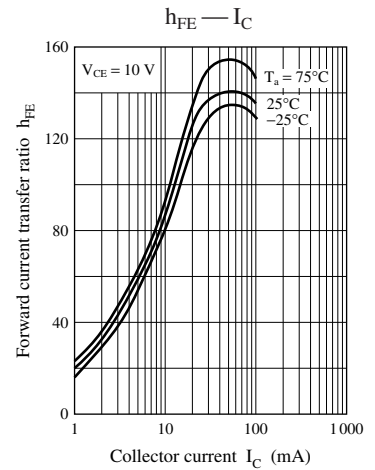
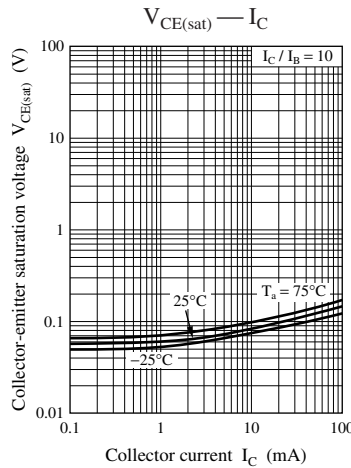
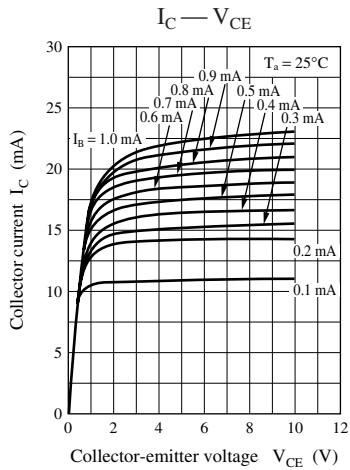


Characteristics charts of UNR2219

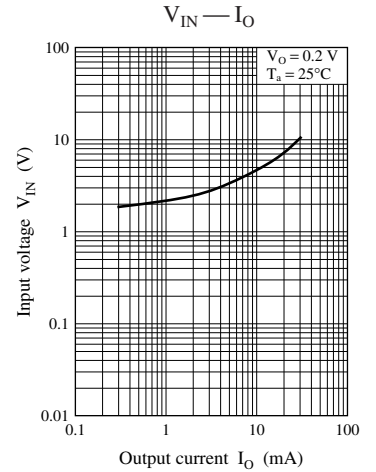
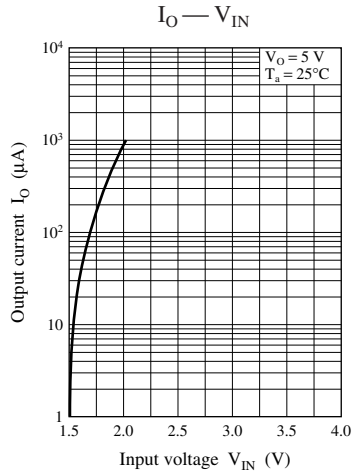
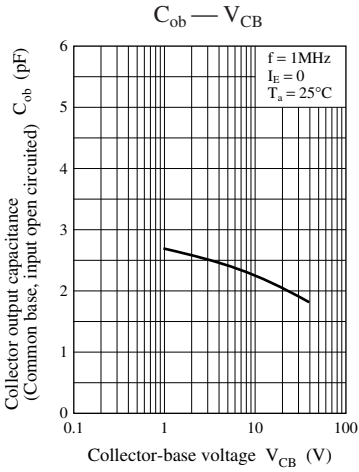
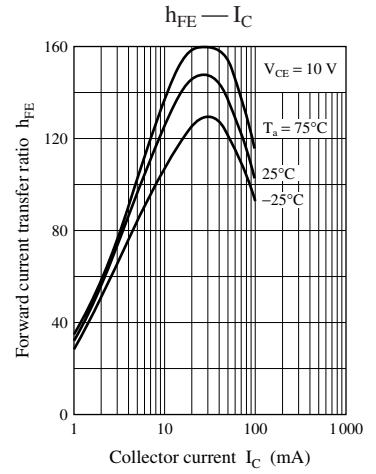
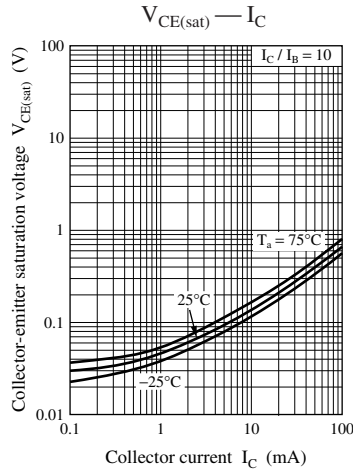
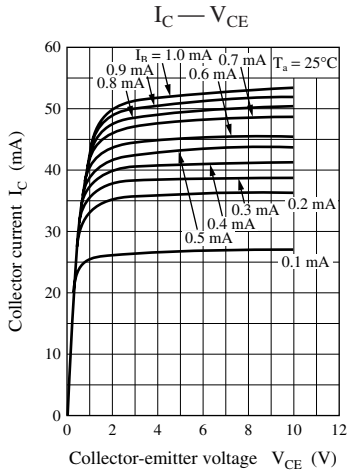




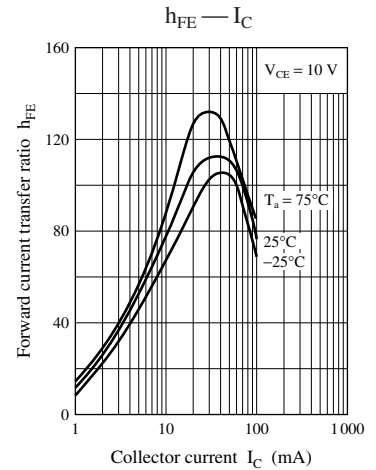
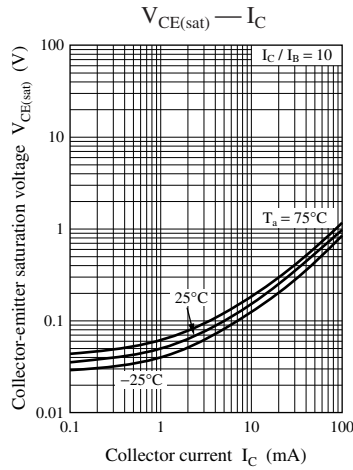
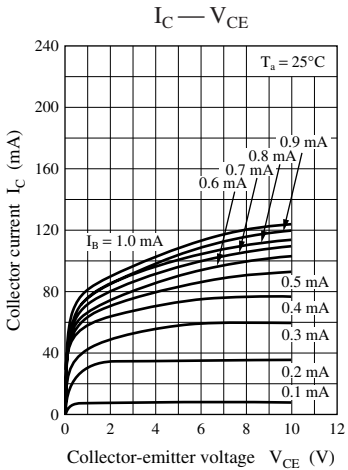
Characteristics charts of UNR221D

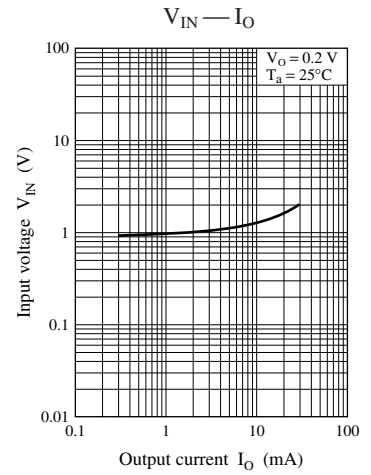
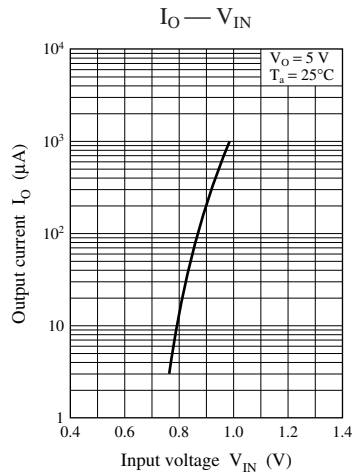
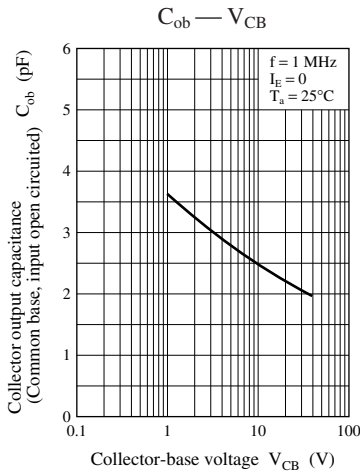


Characteristics charts of UNR221E

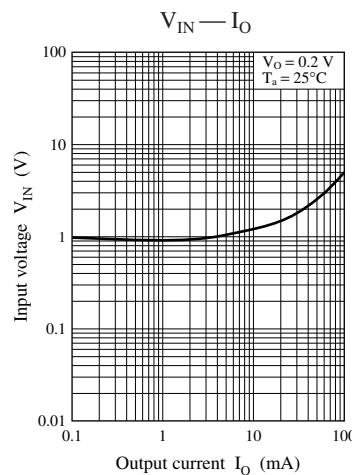
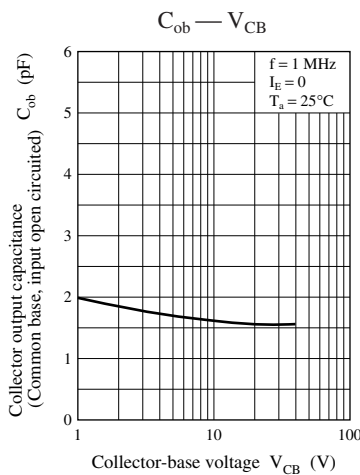
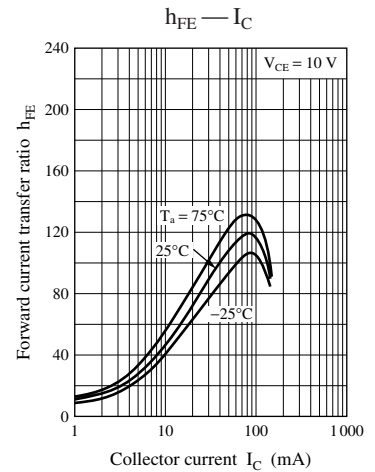
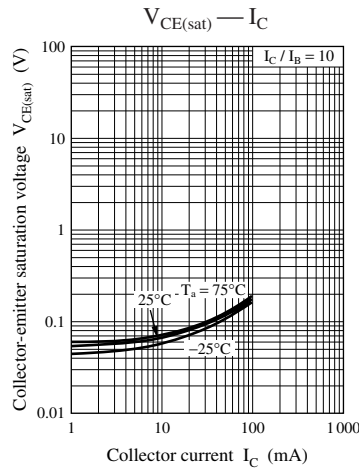
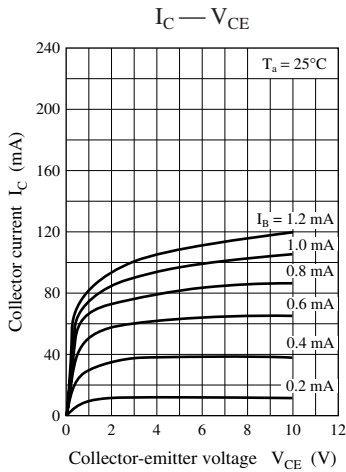


Characteristics charts of UNR221F

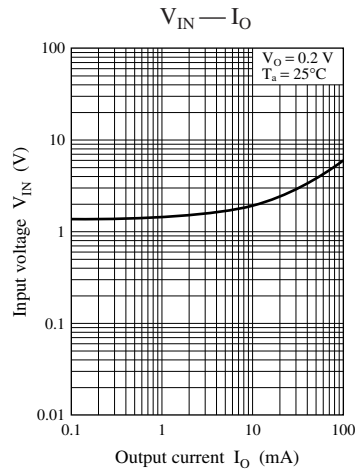
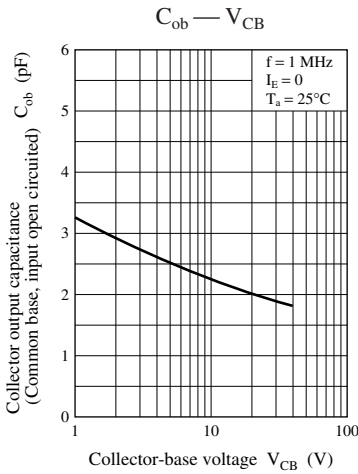
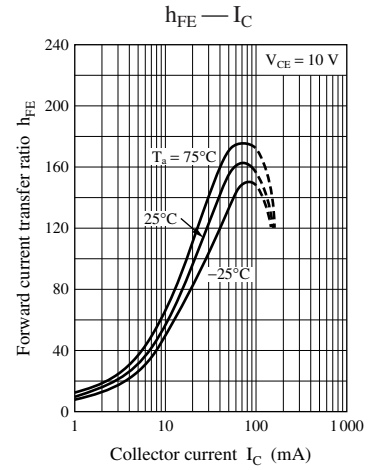
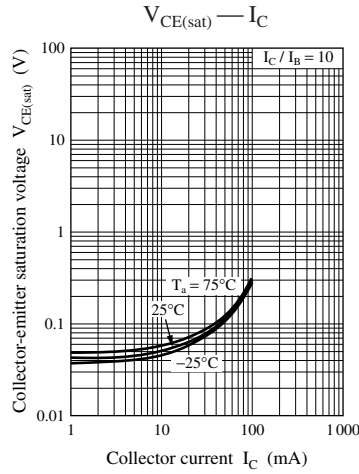
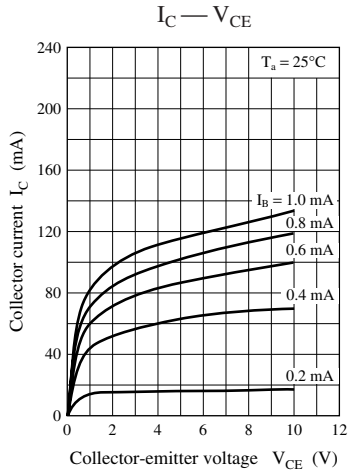




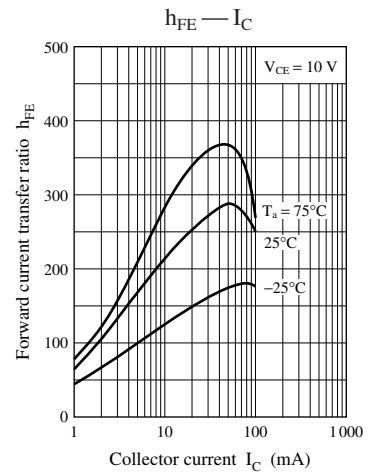
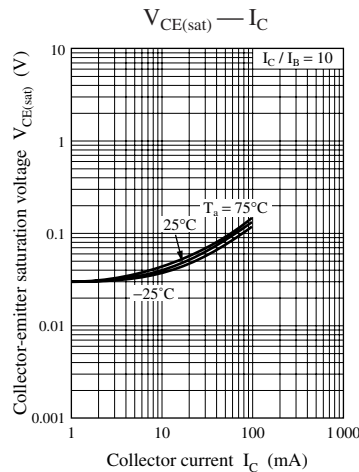
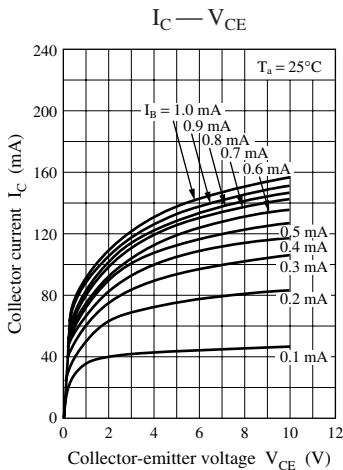
Characteristics charts of UNR221K

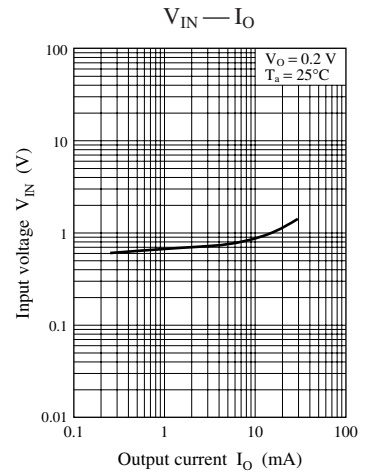
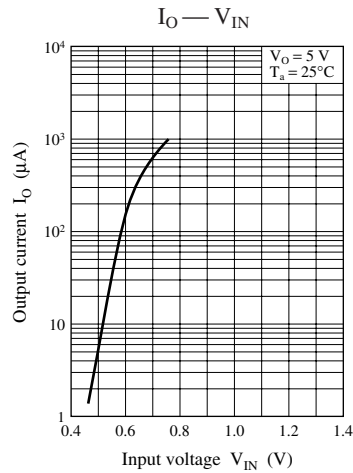
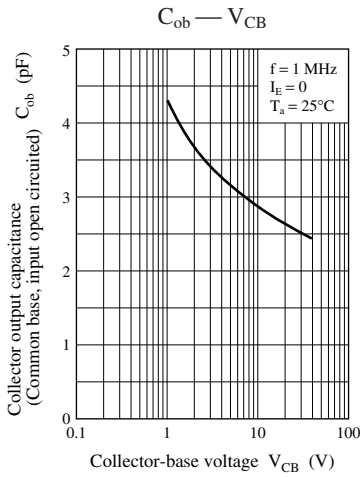


Characteristics charts of UNR221L

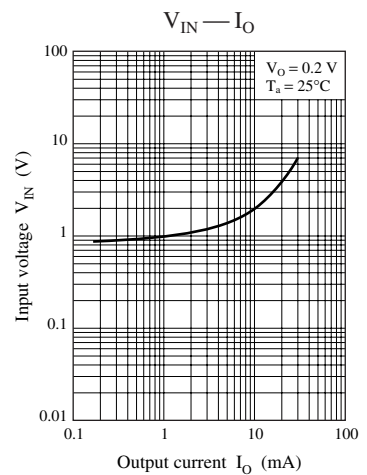
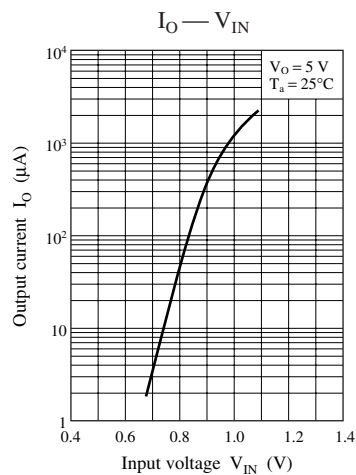
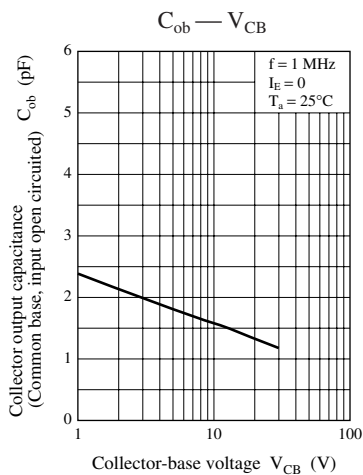
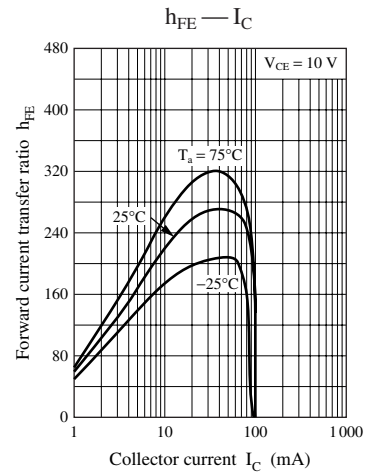
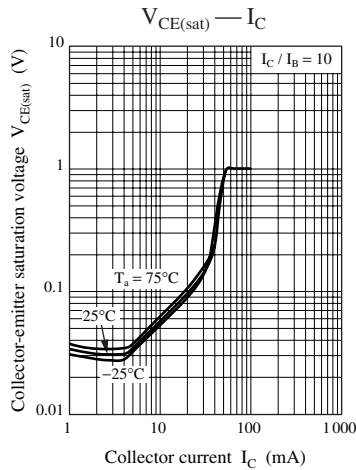
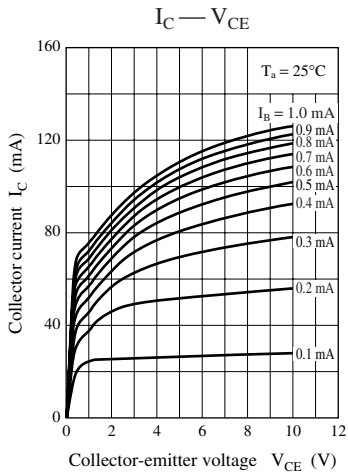


Characteristics charts of UNR221M

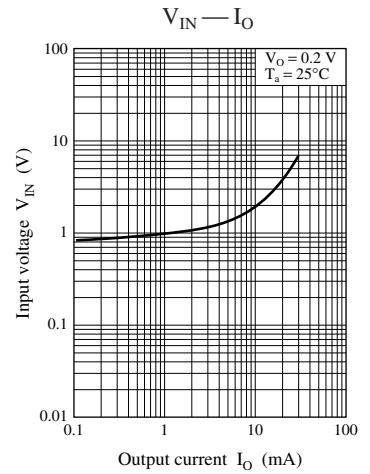
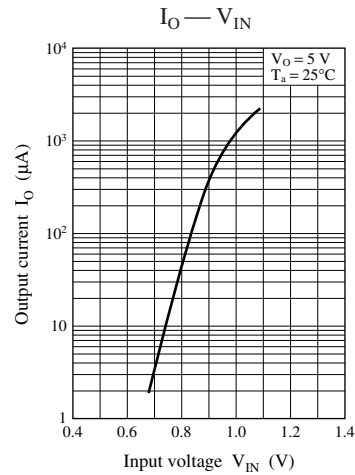
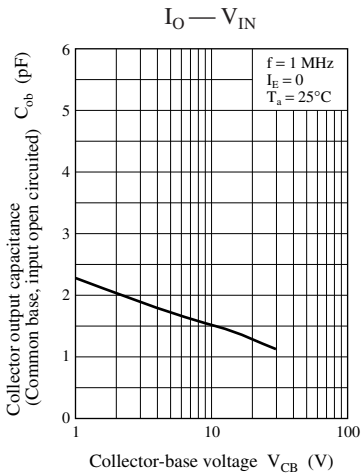
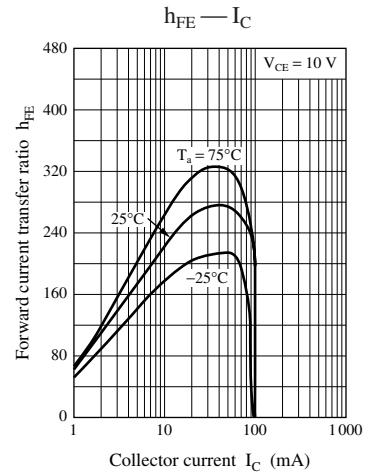
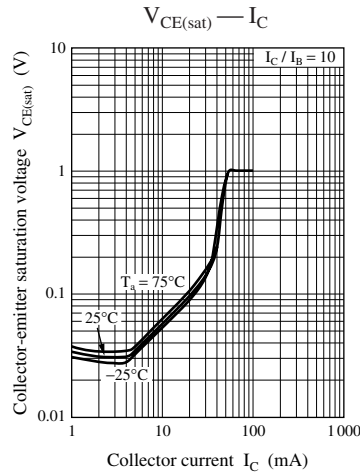
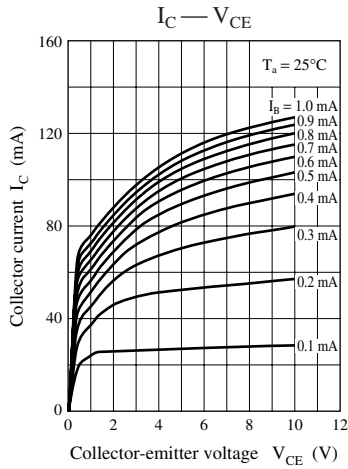




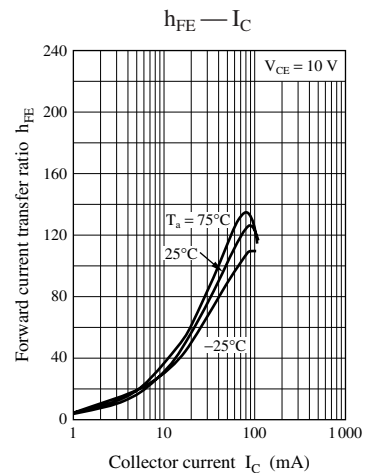
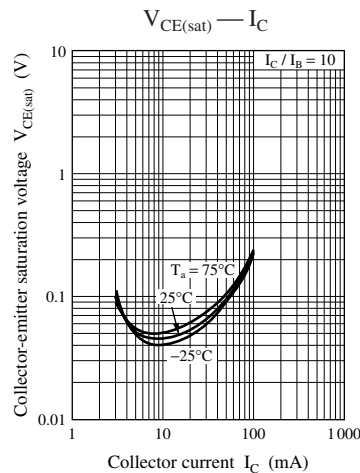
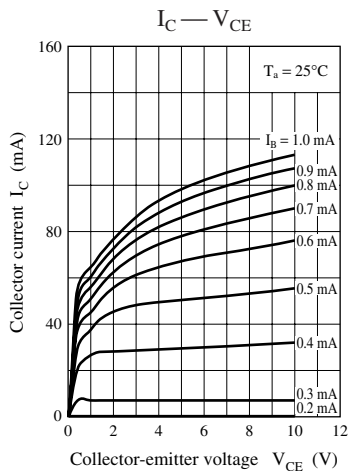
Characteristics charts of UNR221N

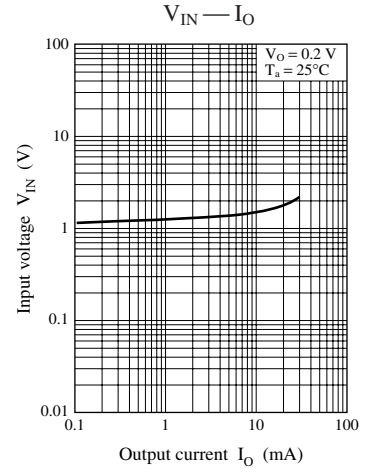
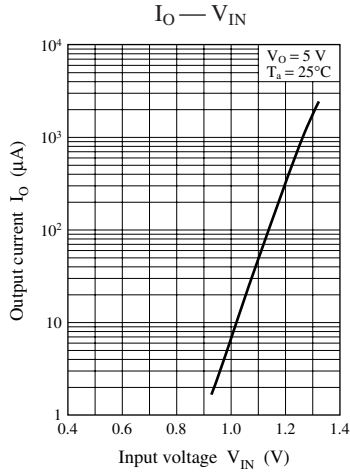
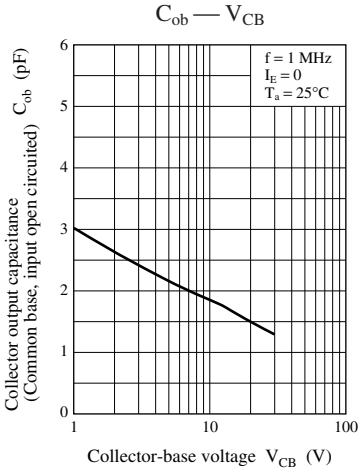


Characteristics charts of UNR221T

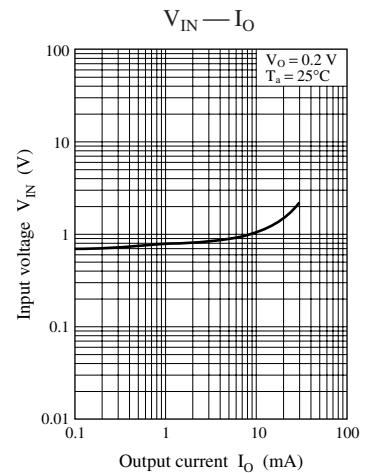
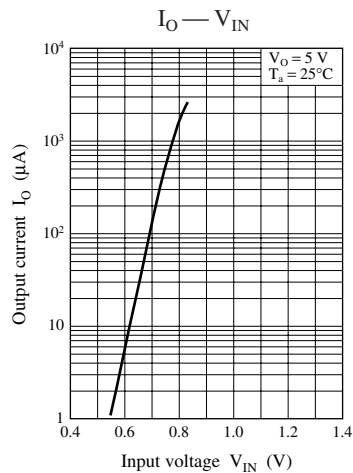
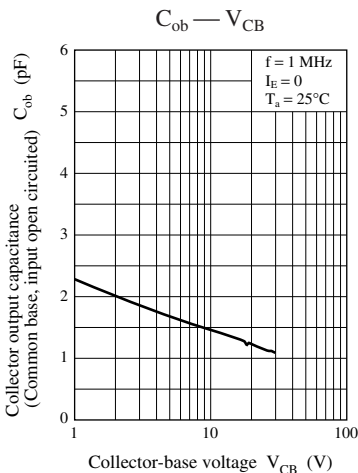
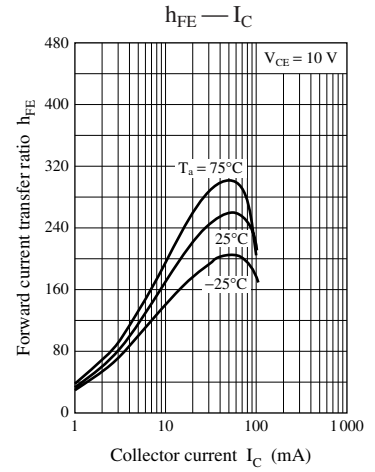
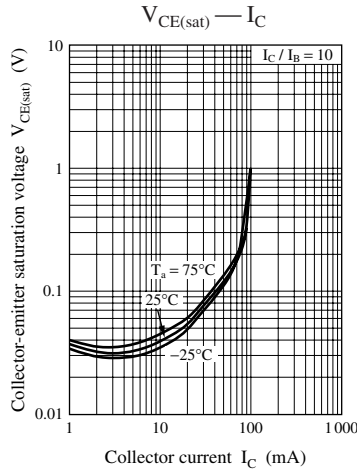
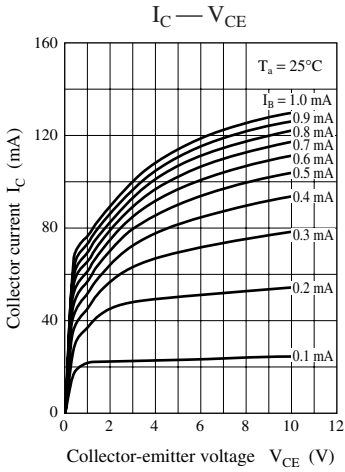


Characteristics charts of UNR221V





Characteristics charts of UNR221Z



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