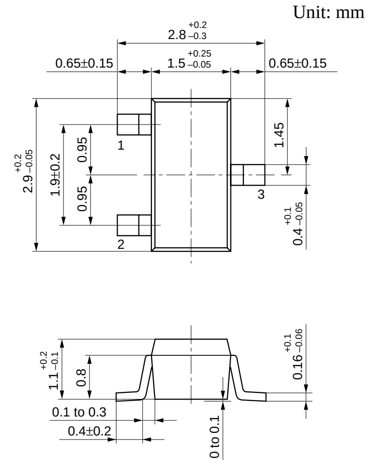
UNR2211/2212/2213/2214/2215/2216/2217/2218/2219/2210/221D/221E/221F/221K/221L/221M/221N/221T/221V/221Z

(UN2211/2212/2213/2214/2215/2216/2217/2218/2219/2210/221D/221E/221F/221K/221L/221M/221N/221T/221V/221Z)

Silicon NPN epitaxial planer transistor

For digital circuits



1:Base
2:Emitter EIAJ:SC-59
3:Collector Mini Type Package

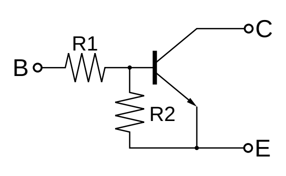
Features

- 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_1)	(R_2)
UNR2211	8A	10kΩ	10kΩ
UNR2212	8B	22kΩ	22kΩ
UNR2213	8C	47kΩ	47kΩ
UNR2214	8D	10kΩ	47kΩ
UNR2215	8E	10kΩ	—
UNR2216	8F	4.7kΩ	—
UNR2217	8H	22kΩ	—
UNR2218	8I	0.51kΩ	5.1kΩ
UNR2219	8K	1kΩ	10kΩ
UNR2210	8L	47kΩ	—
UNR221D	8M	47kΩ	10kΩ
UNR221E	8N	47kΩ	22kΩ
UNR221F	8O	4.7kΩ	10kΩ
UNR221K	8P	10kΩ	4.7kΩ
UNR221L	8Q	4.7kΩ	4.7kΩ
UNR221M	EL	2.2kΩ	47kΩ
UNR221N	EX	4.7kΩ	47kΩ
UNR221T	EZ	22kΩ	47kΩ
UNR221V	FD	2.2kΩ	2.2kΩ
UNR221Z	FF	4.7kΩ	22kΩ

Internal Connection



Absolute Maximum Ratings (Ta=25˚C)

Parameter	Symbol	Ratings	Unit
Collector to base voltage	V_{CBO}	50	V
Collector to emitter voltage	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

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

Electrical Characteristics (Ta=25˚C)

Parameter		Symbol	Conditions	min	typ	max	Unit
Collector cutoff current		I_{CBO}	V_{CB} = 50V, I_E = 0			0.1	μA
		I_{CEO}	V_{CE} = 50V, I_B = 0			0.5	μA
Emitter cutoff current	UNR2211	I_{EBO}	V_{EB} = 6V, I_C = 0			0.5	mA
	UNR2212/2214/221E/221D/221M/221N/221T					0.2	
	UNR2213					0.1	
	UNR2215/2216/2217/2210					0.01	
	UNR221F/221K					1.0	
	UNR2219					1.5	
	UNR2218/221L/221V					2.0	
	UNR221Z					0.4	
Collector to base voltage		V_{CBO}	I_C = 10μA, I_E = 0	50			V
Collector to emitter voltage		V_{CEO}	I_C = 2mA, I_B = 0	50			V
Forward current transfer ratio	UNR2211	h_{FE}	V_{CE} = 10V, I_C = 5mA	35			
	UNR2212/221E			60			
	UNR2213/2214/221M			80			
	UNR2215*/2216*/2217*/2210*			160		460	
	UNR221F/221D/2219			30			
	UNR2218/221K/221L			20			
	UNR221N/221T			80		400	—
	UNR221V			60		200	
Collector to emitter saturation voltage		$V_{CE(sat)}$	I_C = 10mA, I_B = 0.3mA			0.25	V
	UNR221V		I_C = 10mA, I_B = 1.5mA		0.04	0.25	
Output voltage high level		V_{OH}	V_{CC} = 5V, V_B = 0.5V, R_L = 1kΩ	4.9			V
Output voltage low level		V_{OL}	V_{CC} = 5V, V_B = 2.5V, R_L = 1kΩ			0.2	V
	UNR2213/221K		V_{CC} = 5V, V_B = 3.5V, R_L = 1kΩ			0.2	
	UNR221D		V_{CC} = 5V, V_B = 10V, R_L = 1kΩ			0.2	
	UNR221E		V_{CC} = 5V, V_B = 6V, R_L = 1kΩ			0.2	
Transition frequency		f_T	V_{CB} = 10V, I_E = –2mA, f = 200MHz		150		MHz
Input resistance	UNR2211/2214/2215/221K	R_1		(–30%)	10	(+30%)	kΩ
	UNR2212/2217/221T				22		
	UNR2213/221D/221E/2210				47		
	UNR2216/221F/221L/221N/221Z				4.7		
	UNR2218				0.51		
	UNR2219				1		
	UNR221M/221V				2.2		

* h_{FE} rank classification (UNR2215/2216/2217/2210)

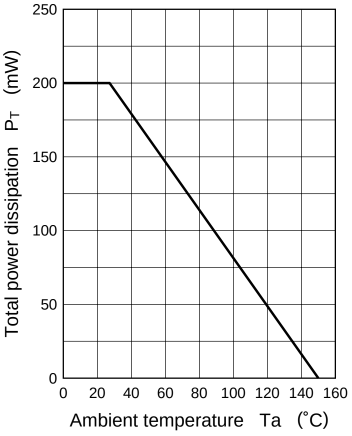
Rank	Q	R	S
h_{FE}	160 to 260	210 to 340	290 to 460

■ Electrical Characteristics (continued) (Ta=25˚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		
	UNR211N				0.1		
	UNR211V				1.0		
	UNR211Z				0.21		

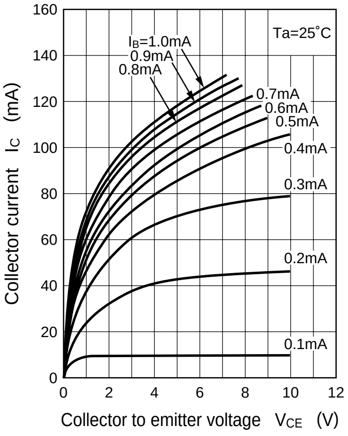
Common characteristics chart

P_T — Ta

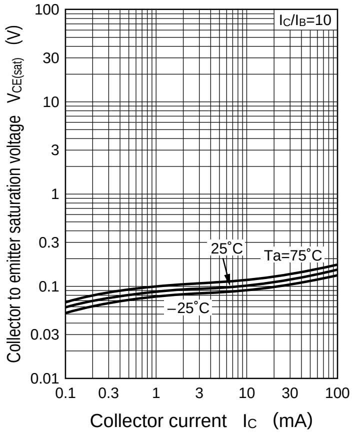


Characteristics charts of UNR2211

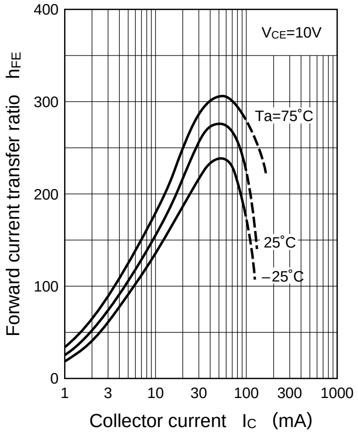
I_C — V_{CE}



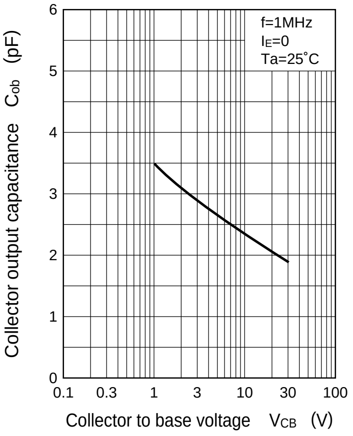
$V_{CE(sat)}$ — I_C



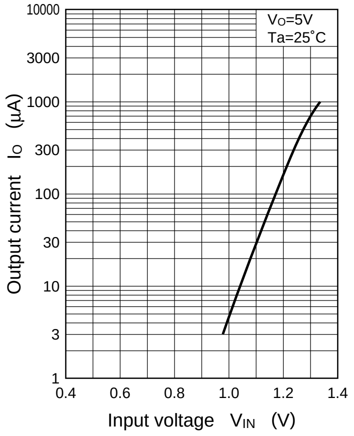
h_{FE} — I_C



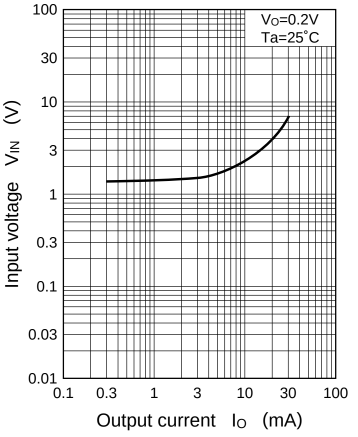
C_{ob} — V_{CB}



I_O — V_{IN}

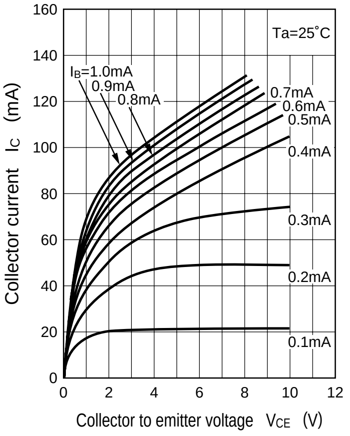


V_{IN} — I_O

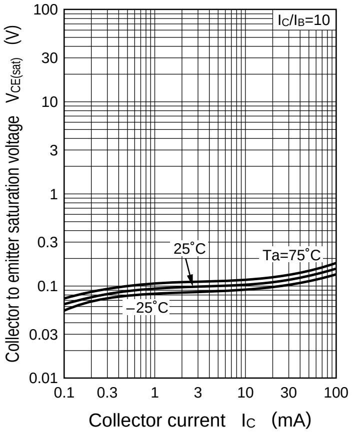


Characteristics charts of UNR2212

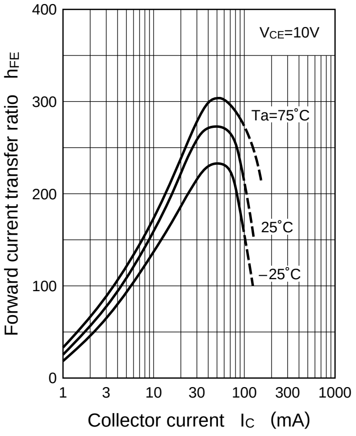
I_C — V_{CE}



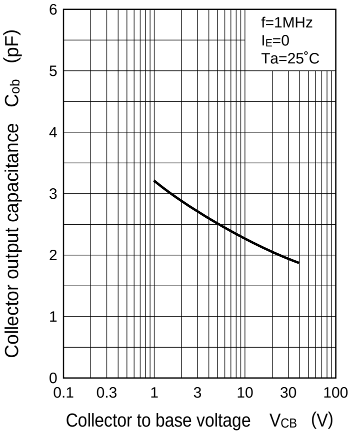
$V_{CE(sat)}$ — I_C



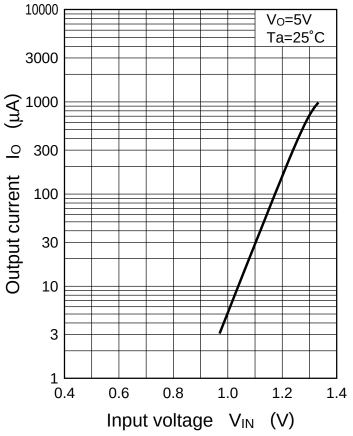
h_{FE} — I_C



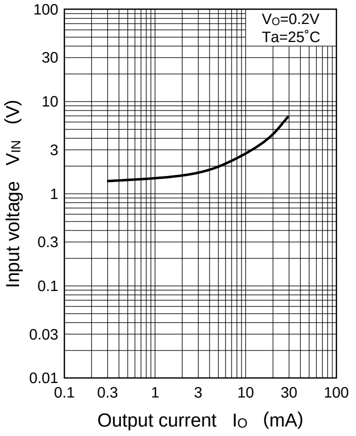
C_{ob} — V_{CB}



I_O — V_{IN}

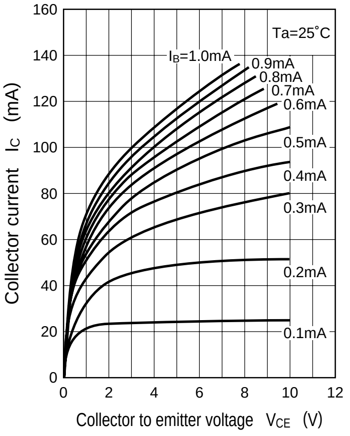


V_{IN} — I_O

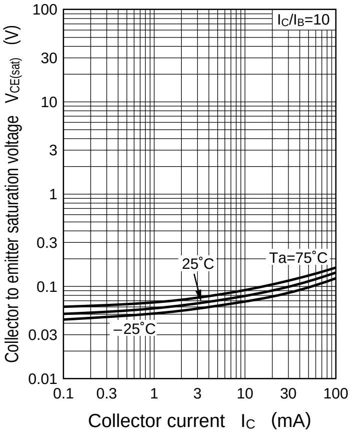


Characteristics charts of UNR2213

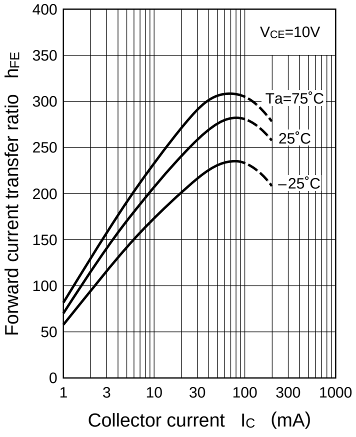
I_C — V_{CE}



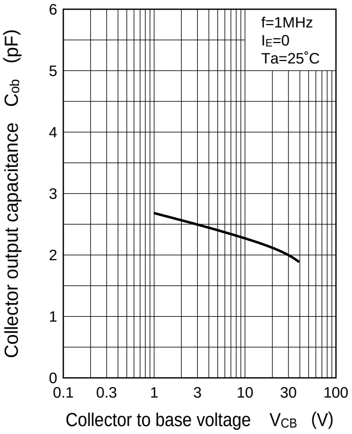
$V_{CE(sat)}$ — I_C



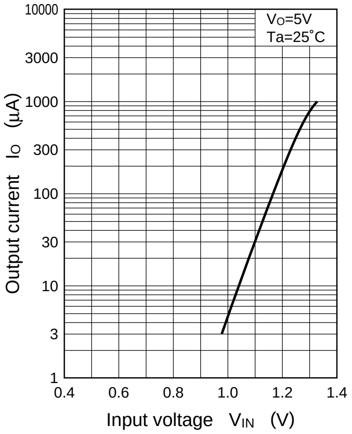
h_{FE} — I_C



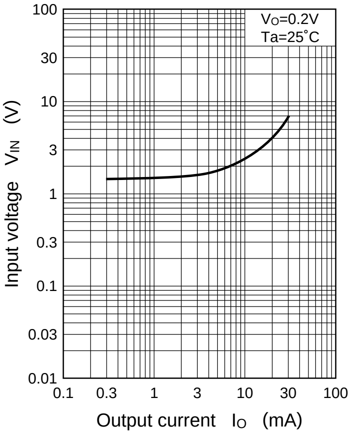
C_{ob} — V_{CB}



I_O — V_{IN}

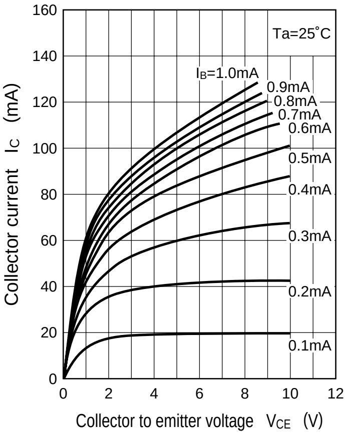


V_{IN} — I_O

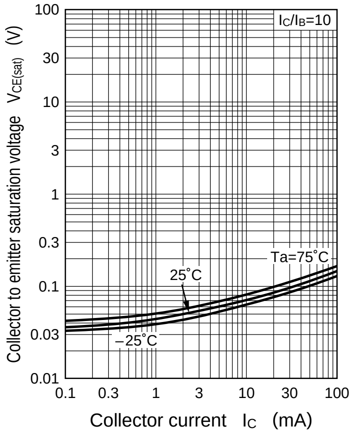


Characteristics charts of UNR2214

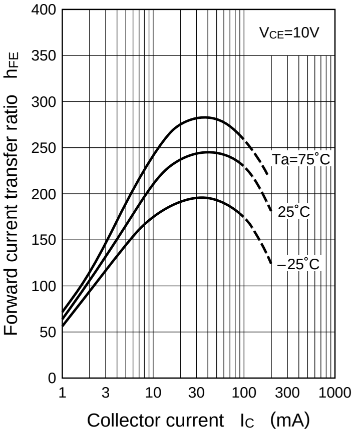
I_C — V_{CE}



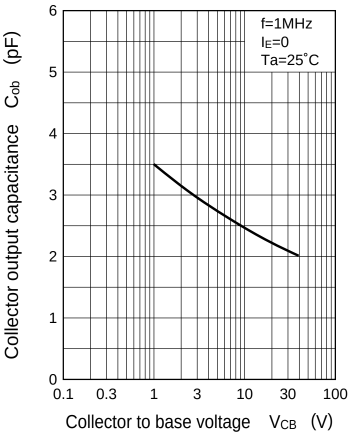
$V_{CE(sat)}$ — I_C



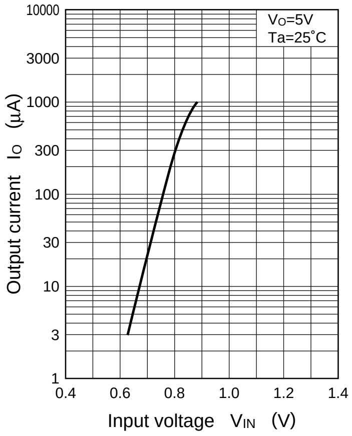
h_{FE} — I_C



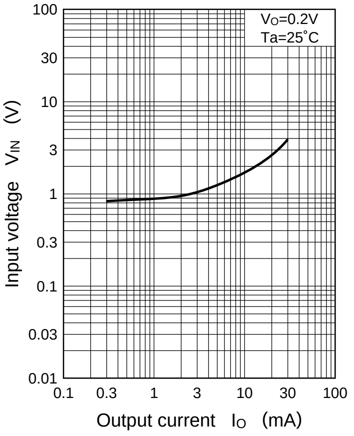
C_{ob} — V_{CB}



I_O — V_{IN}

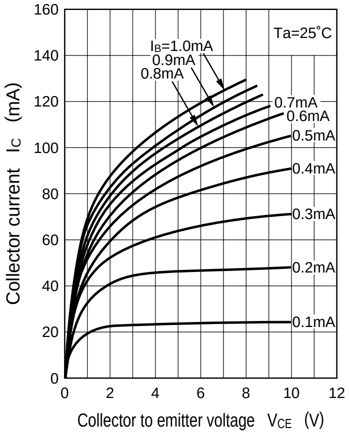


V_{IN} — I_O

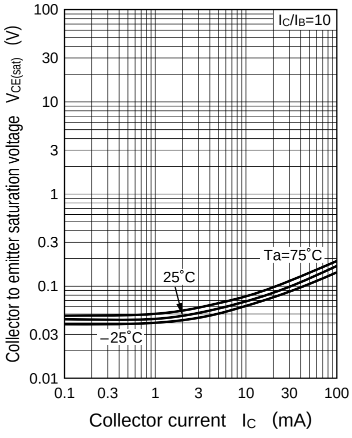


Characteristics charts of UNR2215

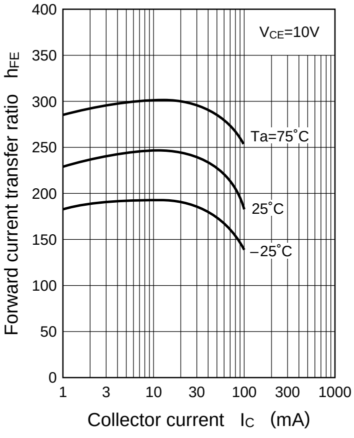
I_C — V_{CE}



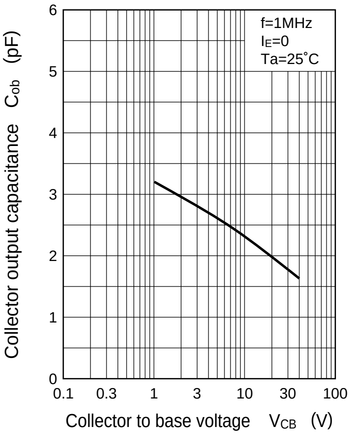
$V_{CE(sat)}$ — I_C



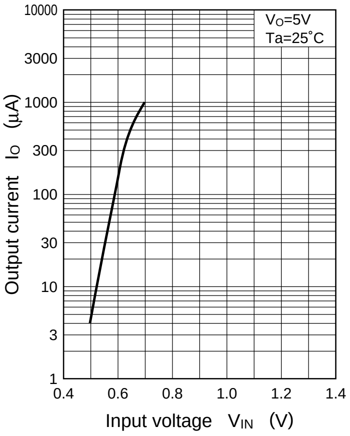
h_{FE} — I_C



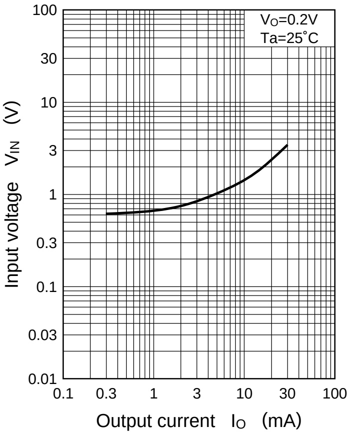
C_{ob} — V_{CB}



I_O — V_{IN}

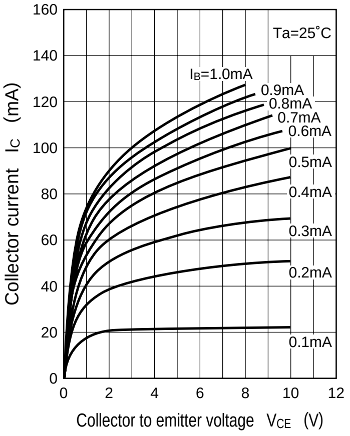


V_{IN} — I_O

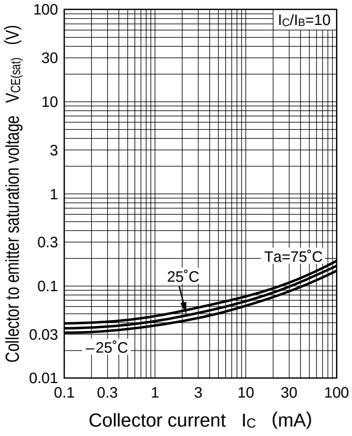


Characteristics charts of UNR2216

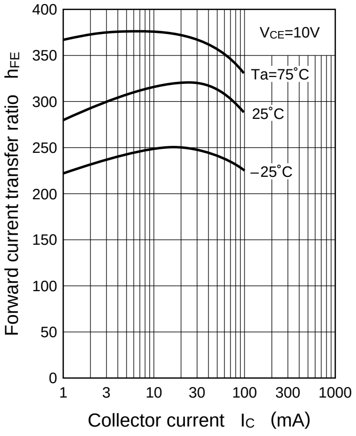
I_C — V_{CE}



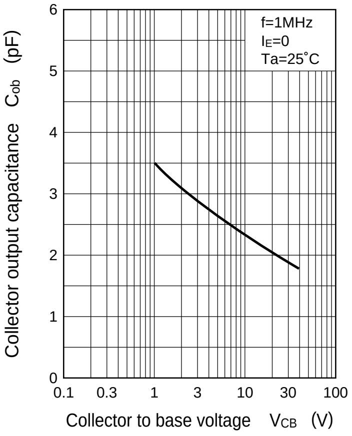
$V_{CE(sat)}$ — I_C



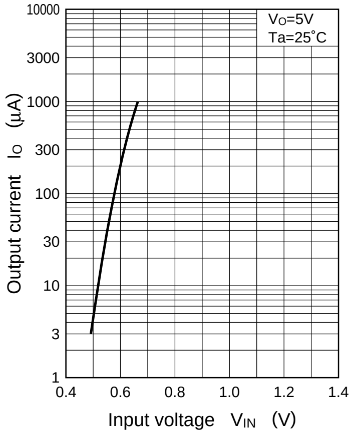
h_{FE} — I_C



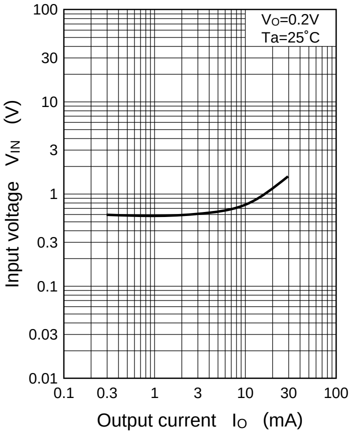
C_{ob} — V_{CB}



I_O — V_{IN}

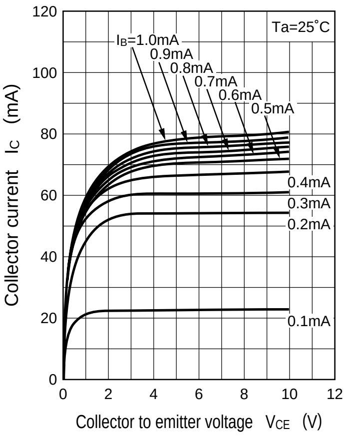


V_{IN} — I_O

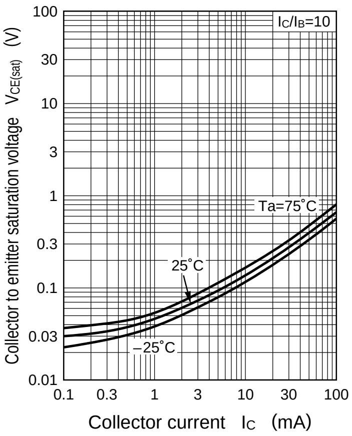


Characteristics charts of UNR2217

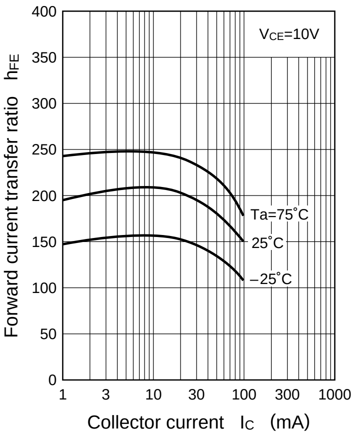
I_C — V_{CE}



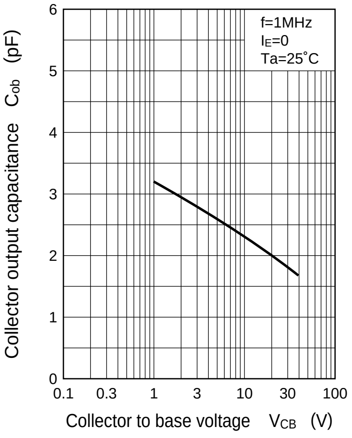
$V_{CE(sat)}$ — I_C



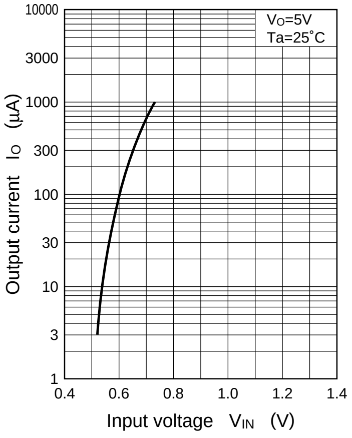
h_{FE} — I_C



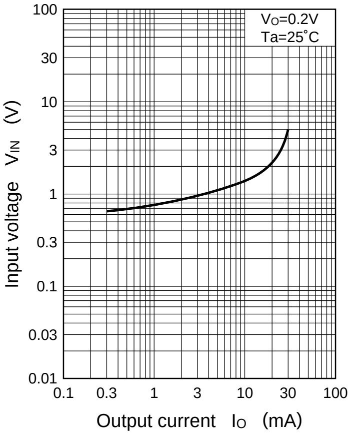
C_{ob} — V_{CB}



I_O — V_{IN}

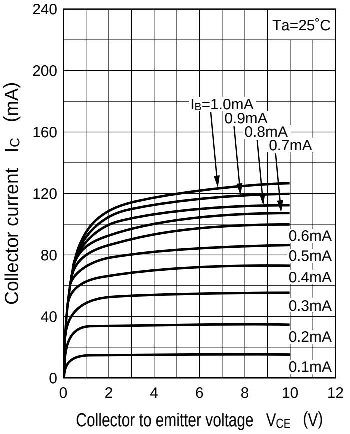


V_{IN} — I_O

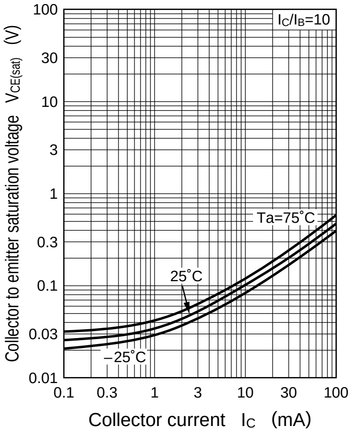


Characteristics charts of UNR2218

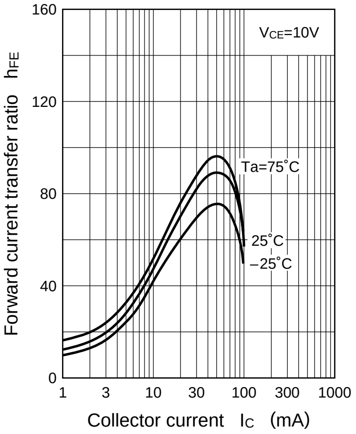
I_C — V_{CE}



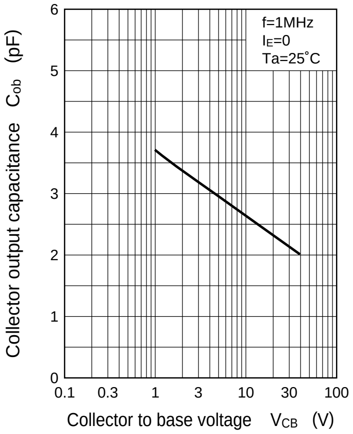
$V_{CE(sat)}$ — I_C



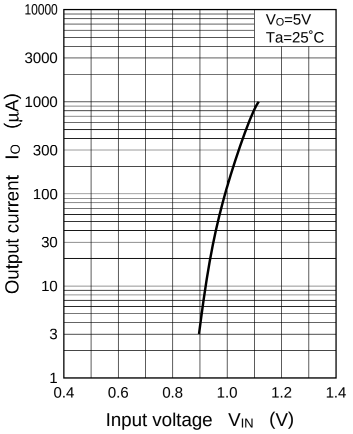
h_{FE} — I_C



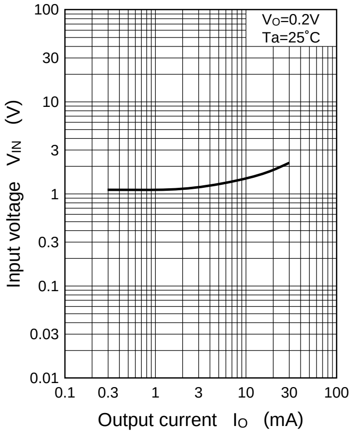
C_{ob} — V_{CB}



I_O — V_{IN}

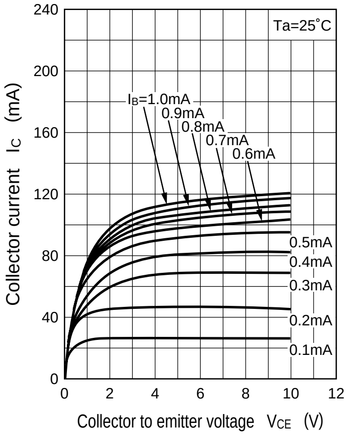


V_{IN} — I_O

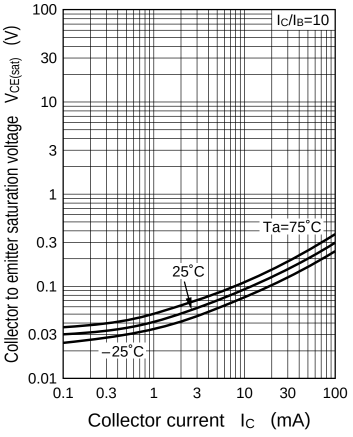


Characteristics charts of UNR2219

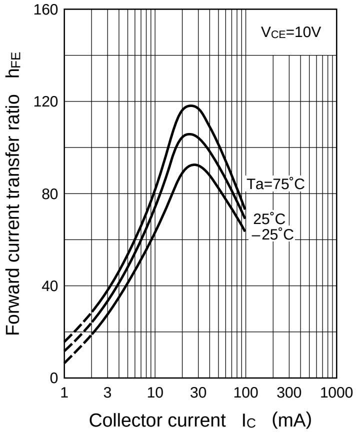
I_C — V_{CE}



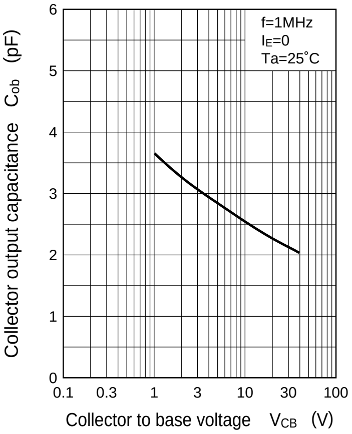
$V_{CE(sat)}$ — I_C



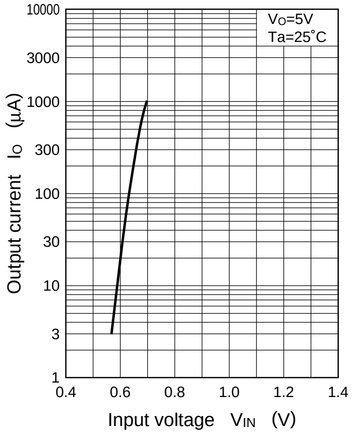
h_{FE} — I_C



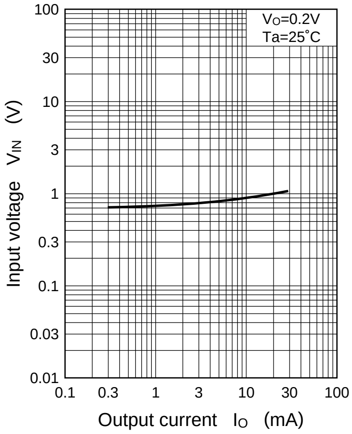
C_{ob} — V_{CB}



I_O — V_{IN}

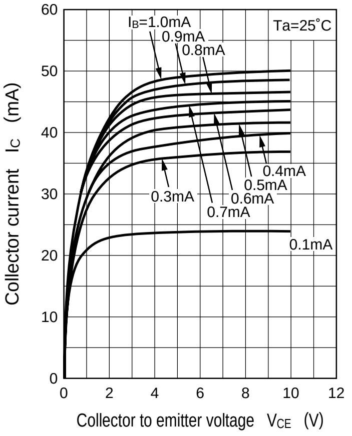


V_{IN} — I_O

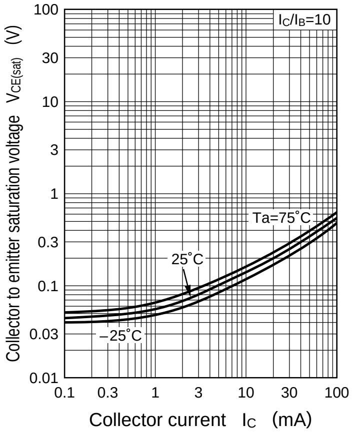


Characteristics charts of UNR2210

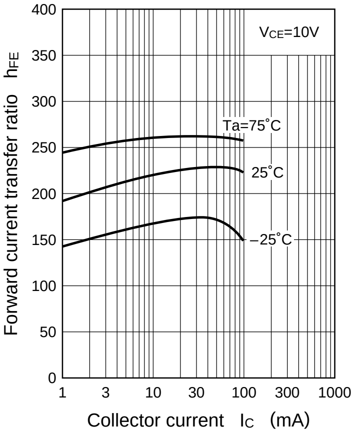
I_C — V_{CE}



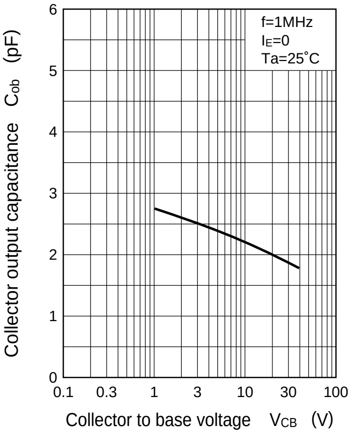
$V_{CE(sat)}$ — I_C



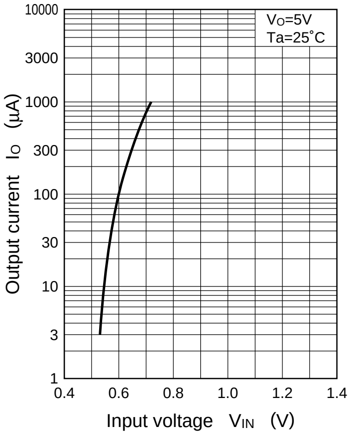
h_{FE} — I_C



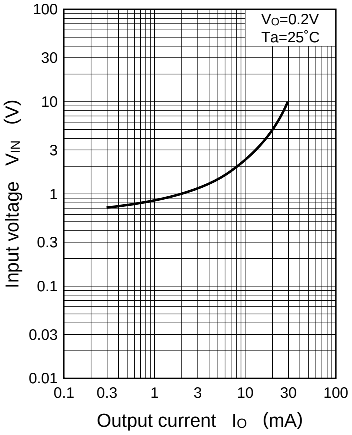
C_{ob} — V_{CB}



I_O — V_{IN}

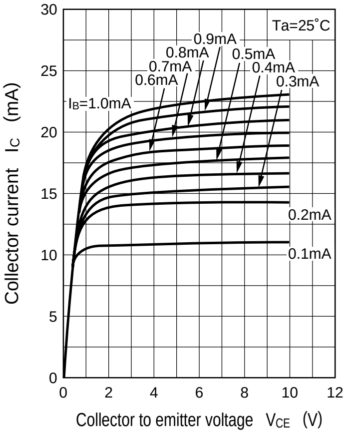


V_{IN} — I_O

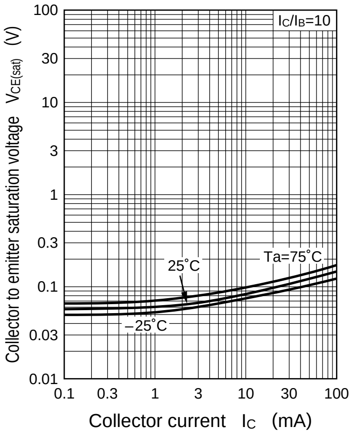


Characteristics charts of UNR221D

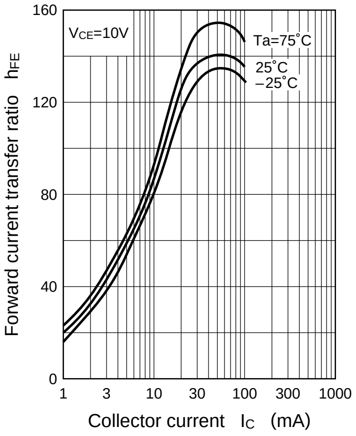
I_C — V_{CE}



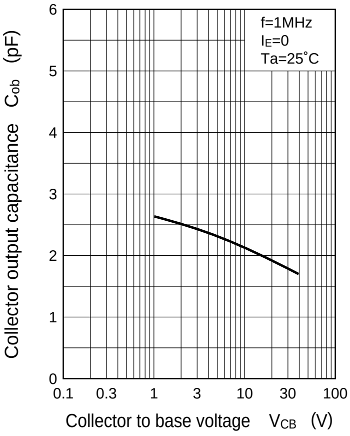
$V_{CE(sat)}$ — I_C



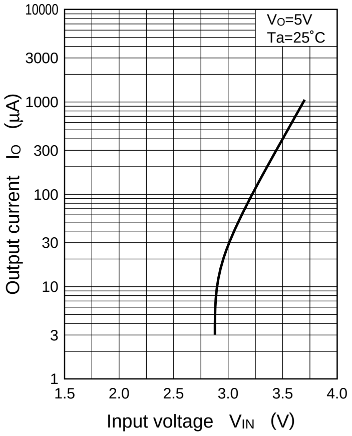
h_{FE} — I_C



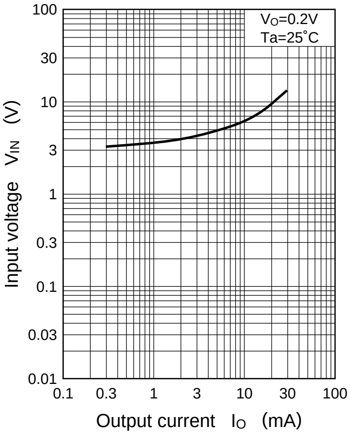
C_{ob} — V_{CB}



I_O — V_{IN}

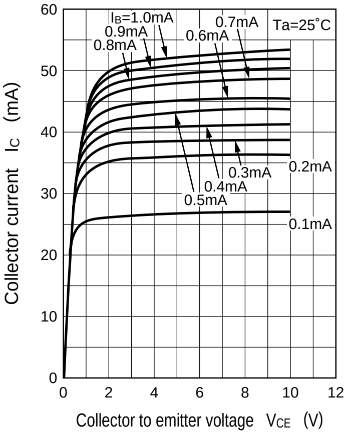


V_{IN} — I_O

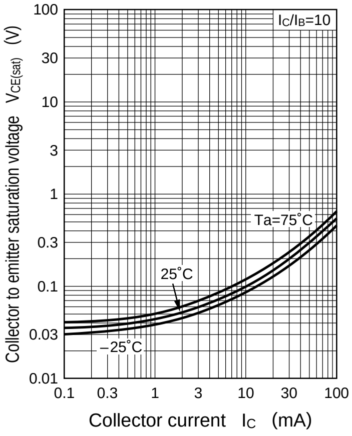


Characteristics charts of UNR221E

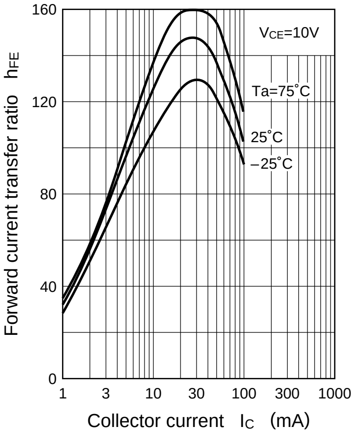
I_C — V_{CE}

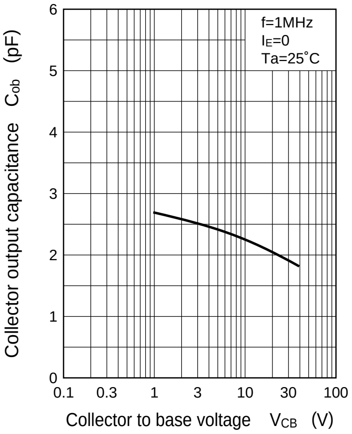


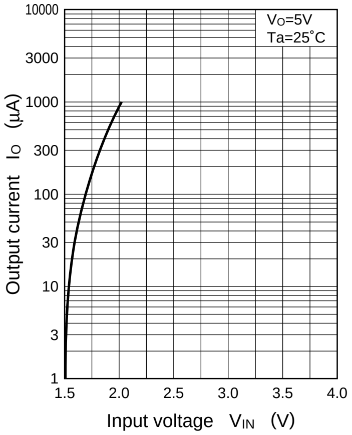
$V_{CE(sat)}$ — I_C

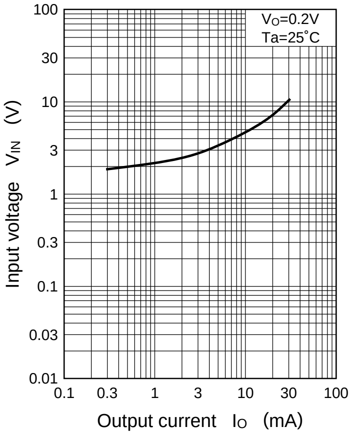


h_{FE} — I_C

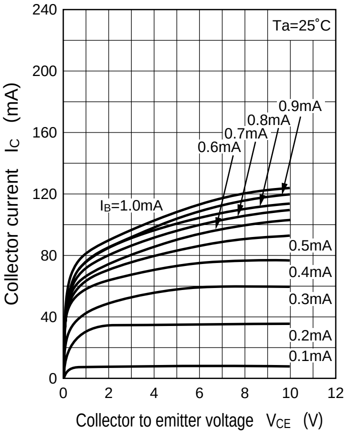


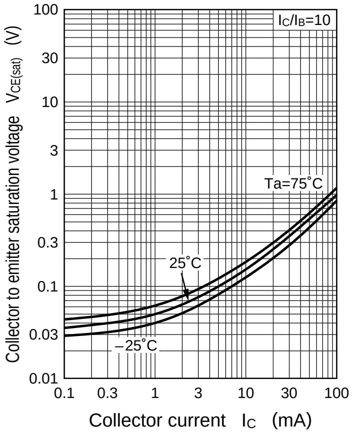

C_{ob} — V_{CB}

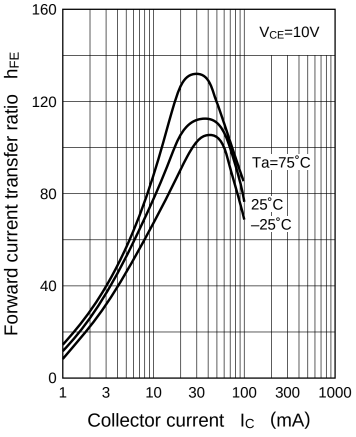

I_O — V_{IN}

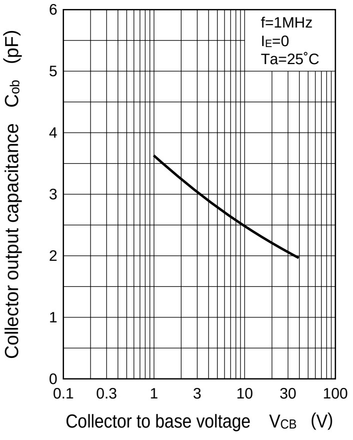

V_{IN} — I_O

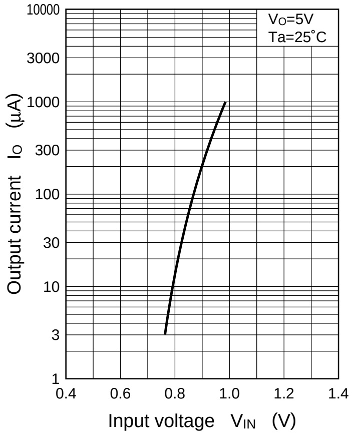
Characteristics charts of UNR221F

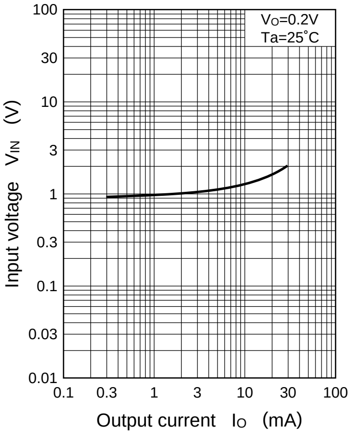

I_C — V_{CE}


$V_{CE(sat)}$ — I_C


h_{FE} — I_C

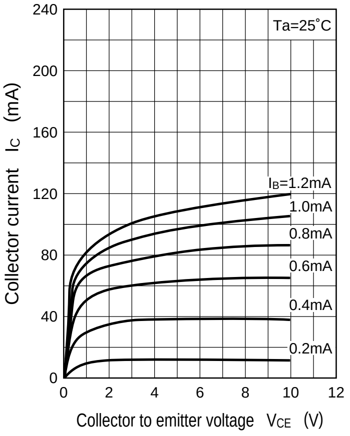

C_{ob} — V_{CB}


I_O — V_{IN}

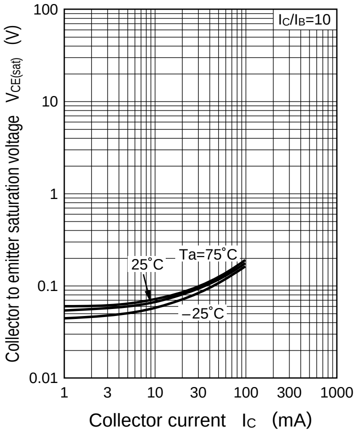

V_{IN} — I_O

Characteristics charts of UNR221K

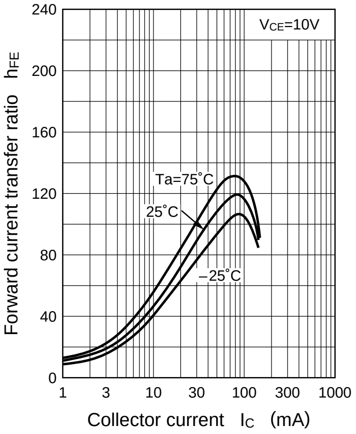
I_C — V_{CE}



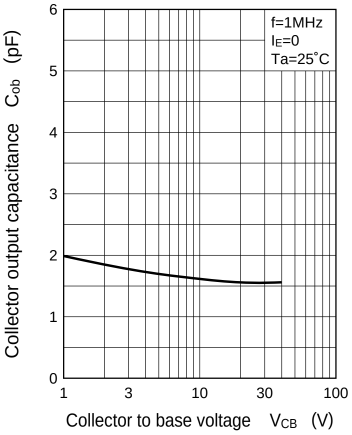
$V_{CE(sat)}$ — I_C



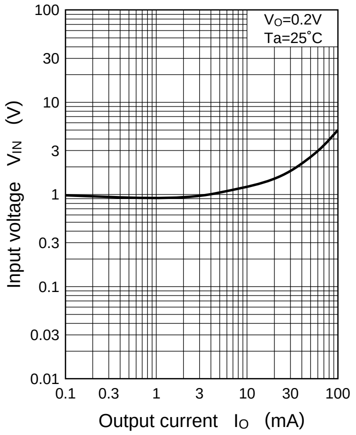
h_{FE} — I_C



C_{ob} — V_{CB}

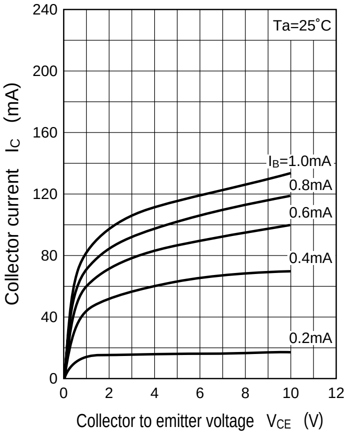


V_{IN} — I_O

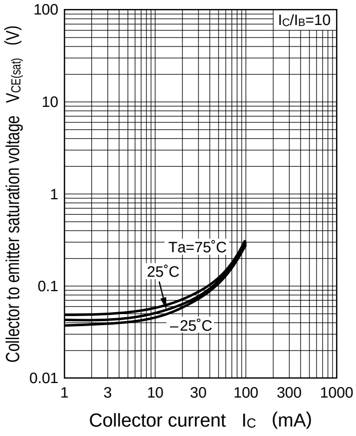


Characteristics charts of UNR221L

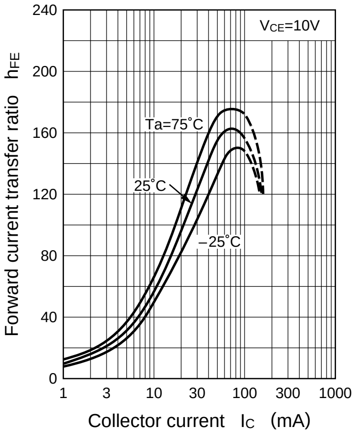
I_C — V_{CE}



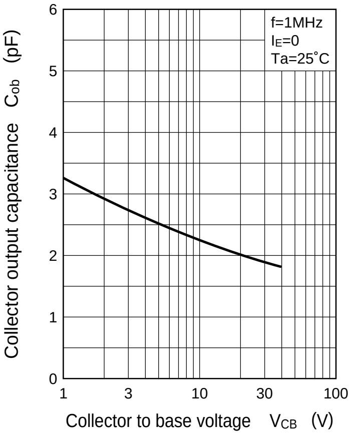
$V_{CE(sat)}$ — I_C



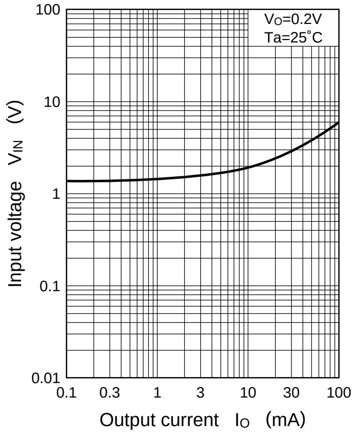
h_{FE} — I_C



C_{ob} — V_{CB}

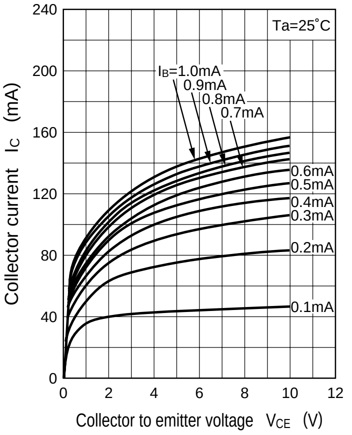


I_O — V_{IN}

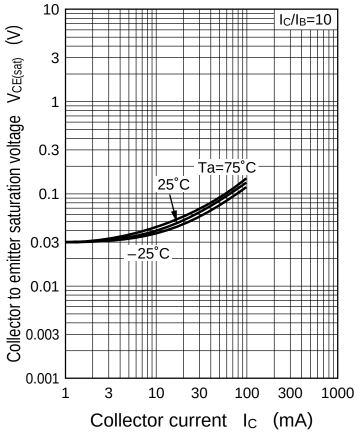


Characteristics charts of UNR221M

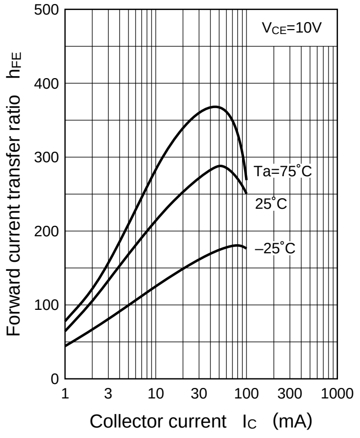
I_C — V_{CE}



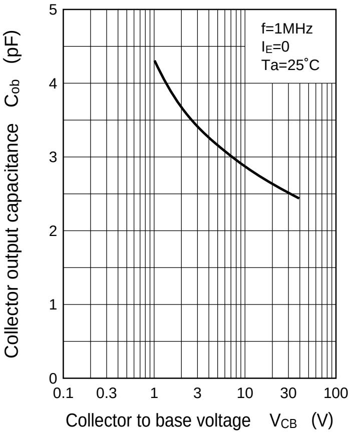
$V_{CE(sat)}$ — I_C



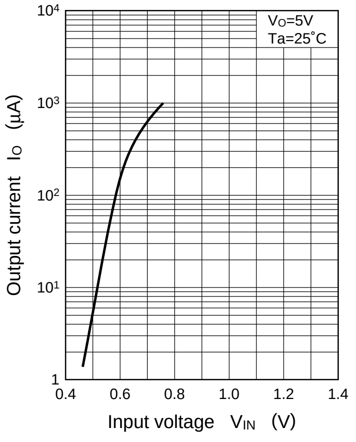
h_{FE} — I_C



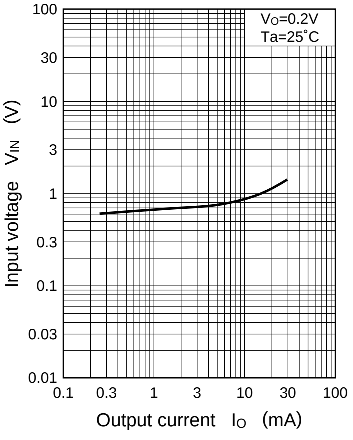
C_{ob} — V_{CB}



I_O — V_{IN}

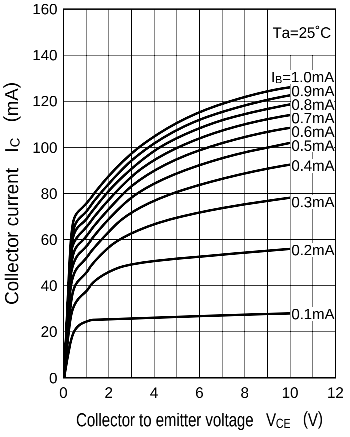


V_{IN} — I_O

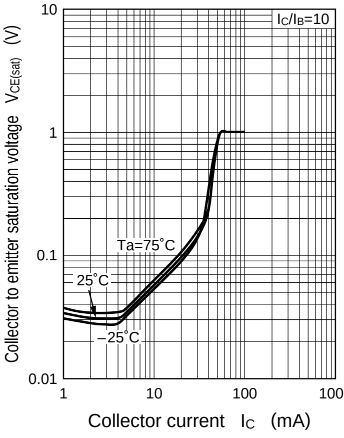


Characteristics charts of UNR221N

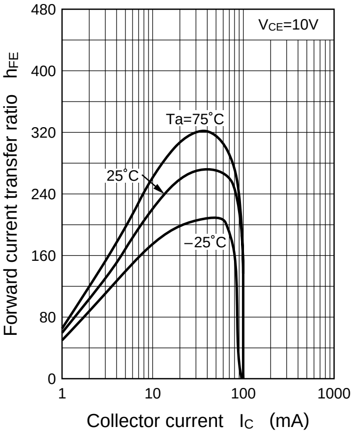
$I_C — V_{CE}$



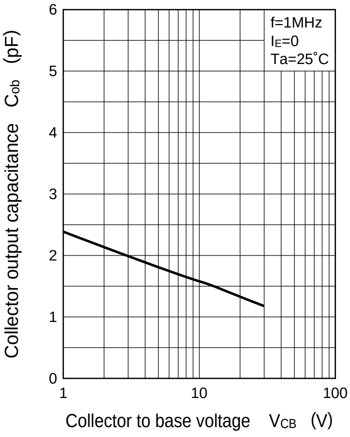
$V_{CE(sat)} — I_C$



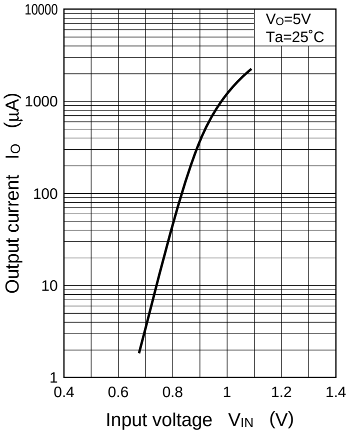
$h_{FE} — I_C$



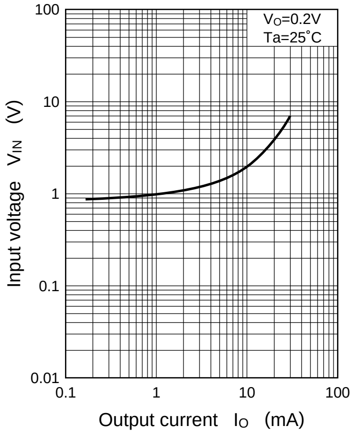
$C_{ob} — V_{CB}$



$I_O — V_{IN}$

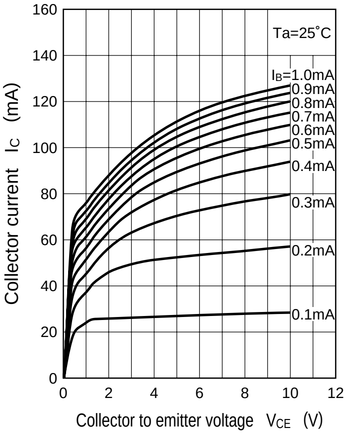


$V_{IN} — I_O$

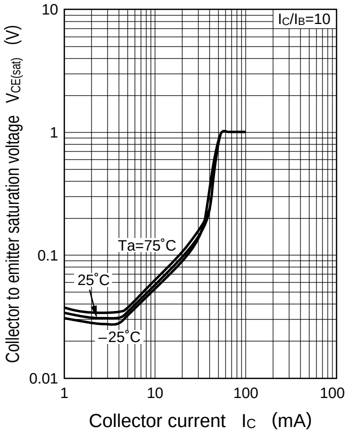


Characteristics charts of UNR221T

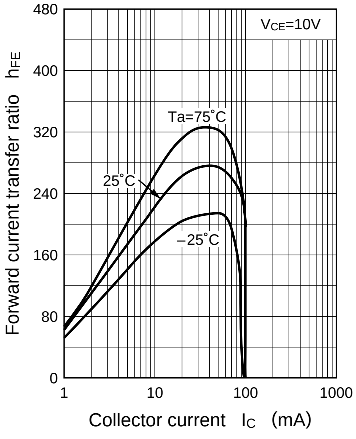
$I_C — V_{CE}$



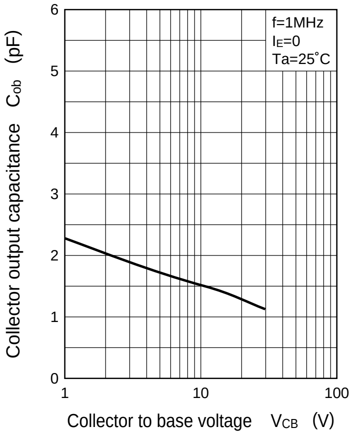
$V_{CE(sat)} — I_C$



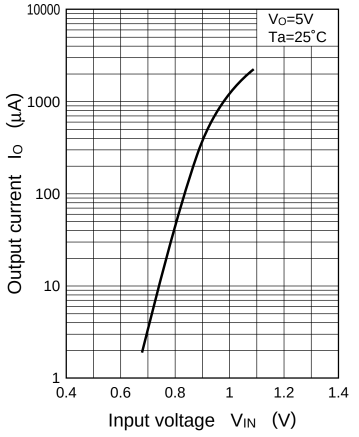
$h_{FE} — I_C$



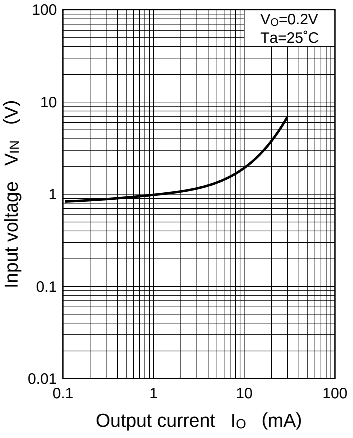
C_{ob} — V_{CB}



I_O — V_{IN}

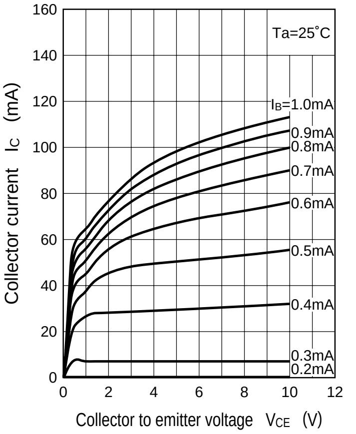


V_{IN} — I_O

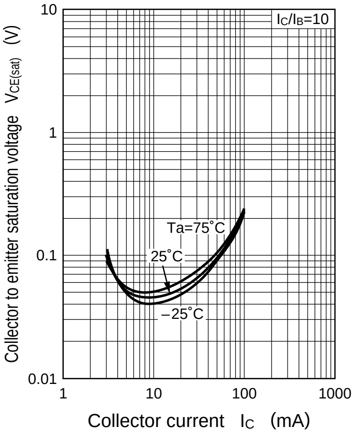


Characteristics charts of UNR221V

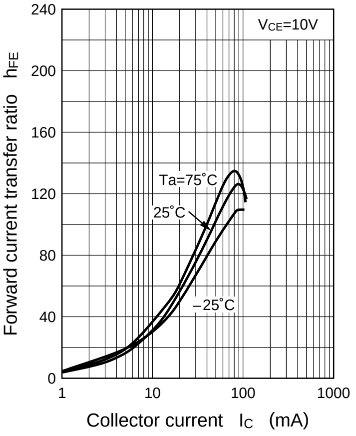
I_C — V_{CE}



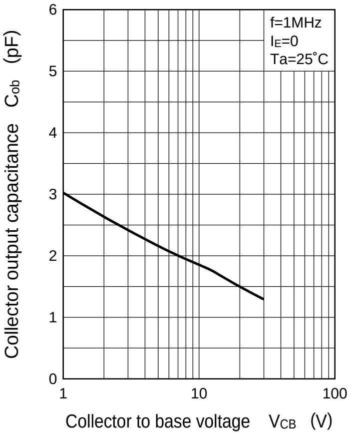
$V_{CE(sat)}$ — I_C



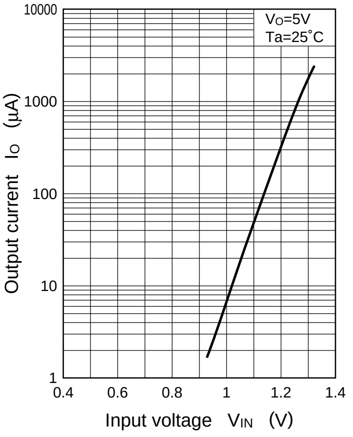
h_{FE} — I_C



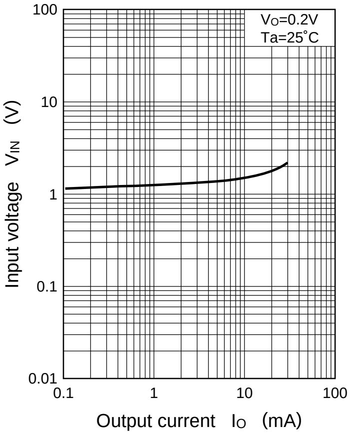
C_{ob} — V_{CB}



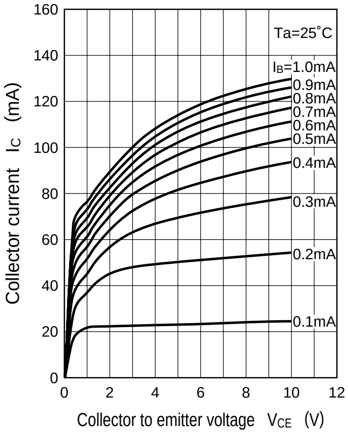
I_O — V_{IN}



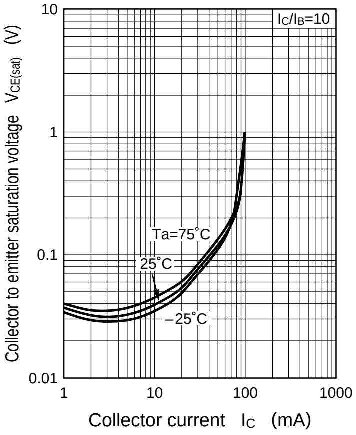
V_{IN} — I_O



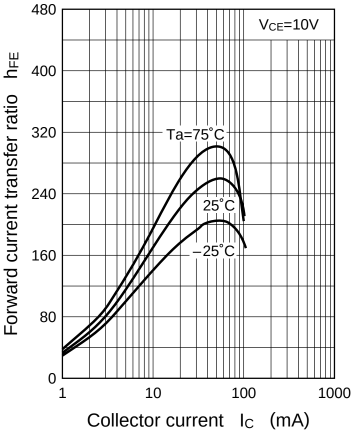
Characteristics charts of UNR221Z



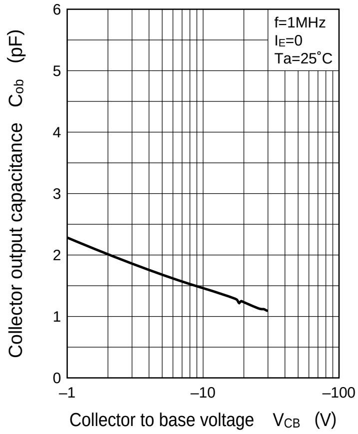
I_C — V_{CE}



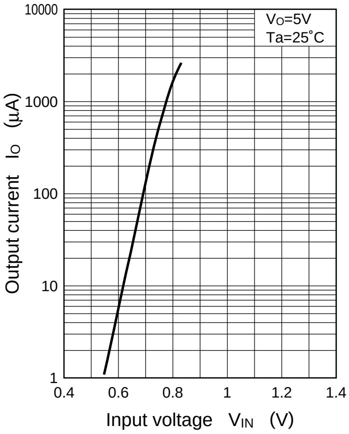
$V_{CE(sat)}$ — I_C



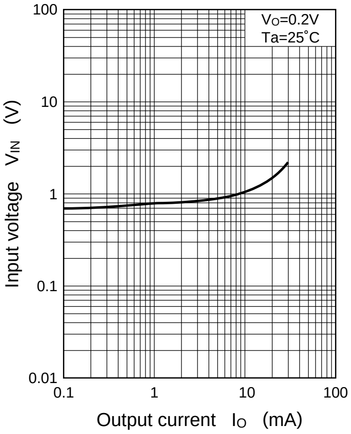
h_{FE} — I_C



C_{ob} — V_{CB}



I_O — V_{IN}



V_{IN} — I_O

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