

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

■ 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.

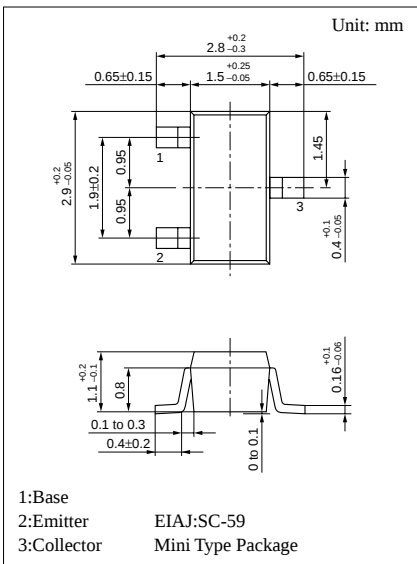
■ Resistance by Part Number

	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

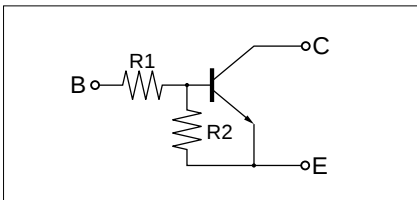
■ Absolute Maximum Ratings (Ta=25°C)

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.



Internal Connection



UNR2211/2212/2213/2214/2215/2216/2217/2218/2219/2210/
Transistors with built-in Resistor 221D/221E/221F/221K/221L/221M/221N/221T/221V/221Z

■ 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		
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 _i		(−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)

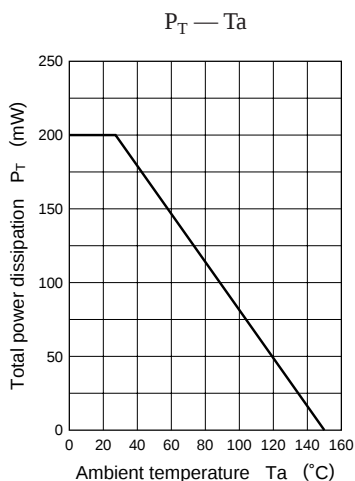
Rank	Q	R	S
h_{FE}	160 to 260	210 to 340	290 to 460

UNR2211/2212/2213/2214/2215/2216/2217/2218/2219/2210/
Transistors with built-in Resistor 221D/221E/221F/221K/221L/221M/221N/221T/221V/221Z

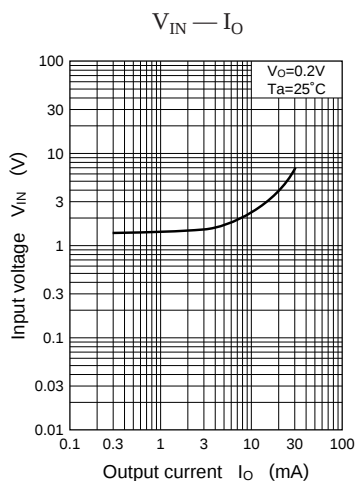
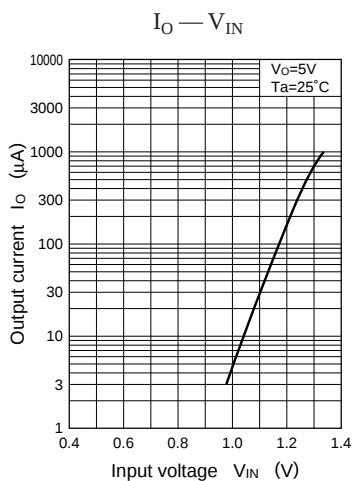
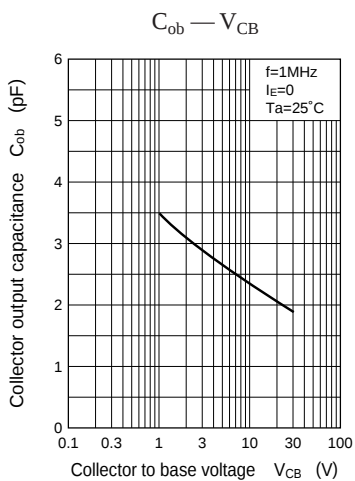
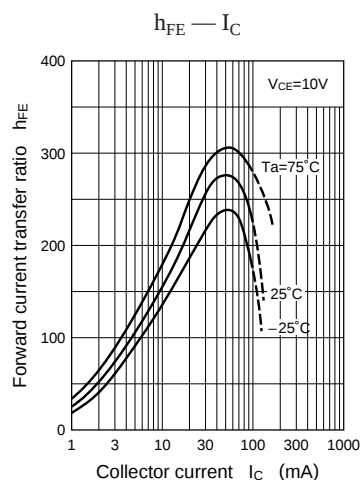
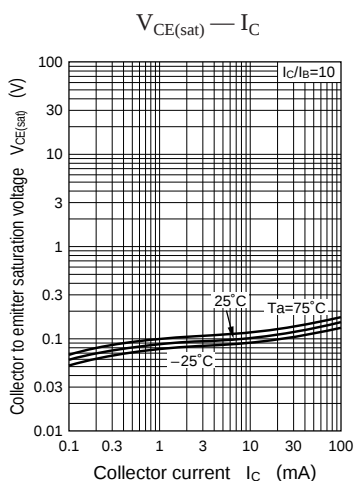
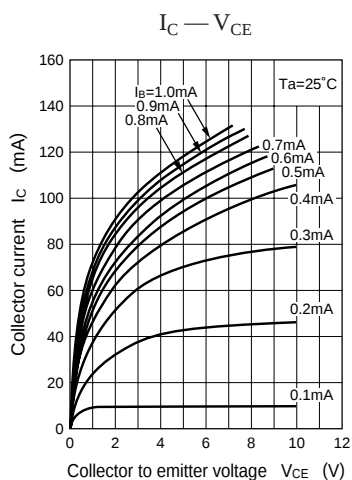
■ Electrical Characteristics (continued) (Ta=25°C)

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		

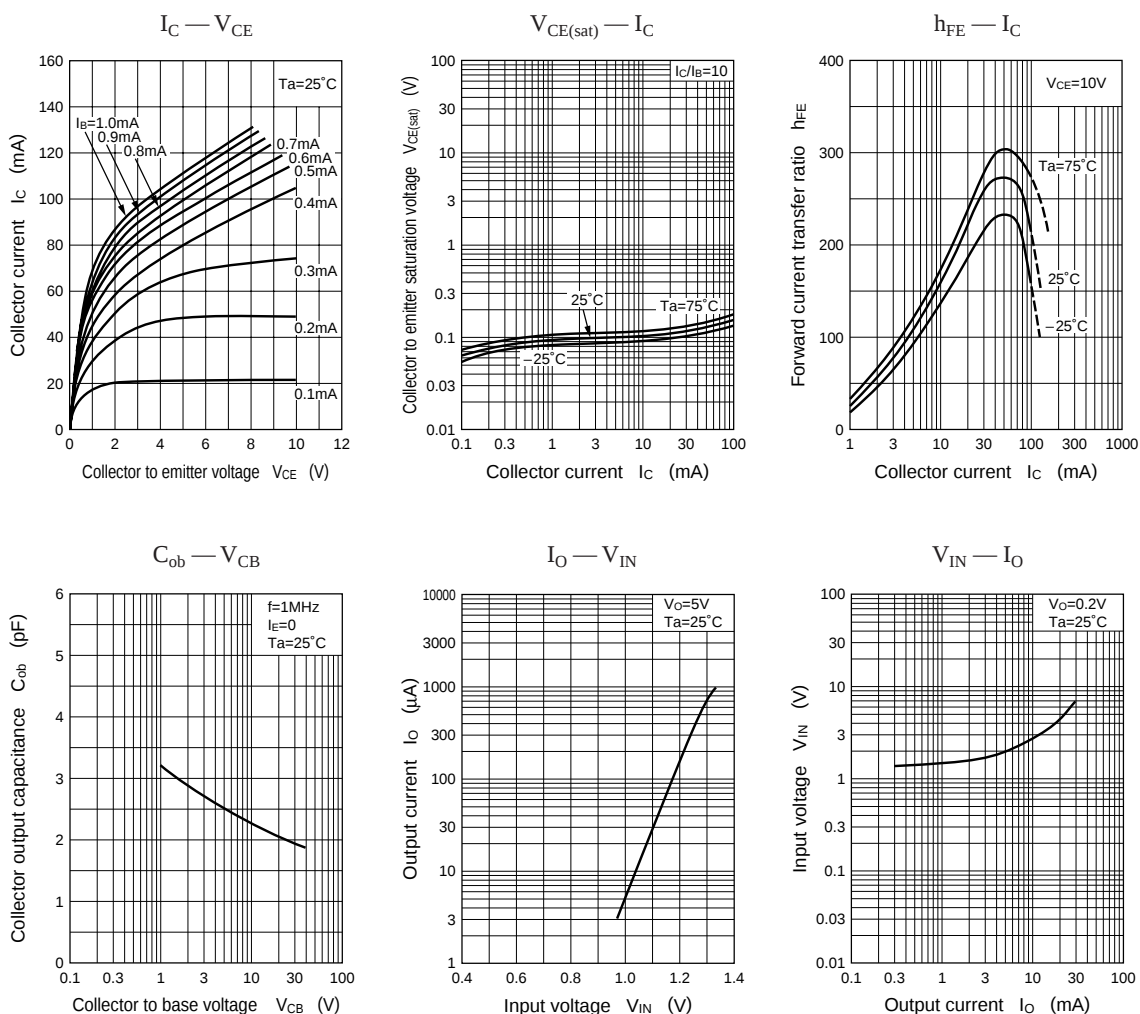
Common characteristics chart



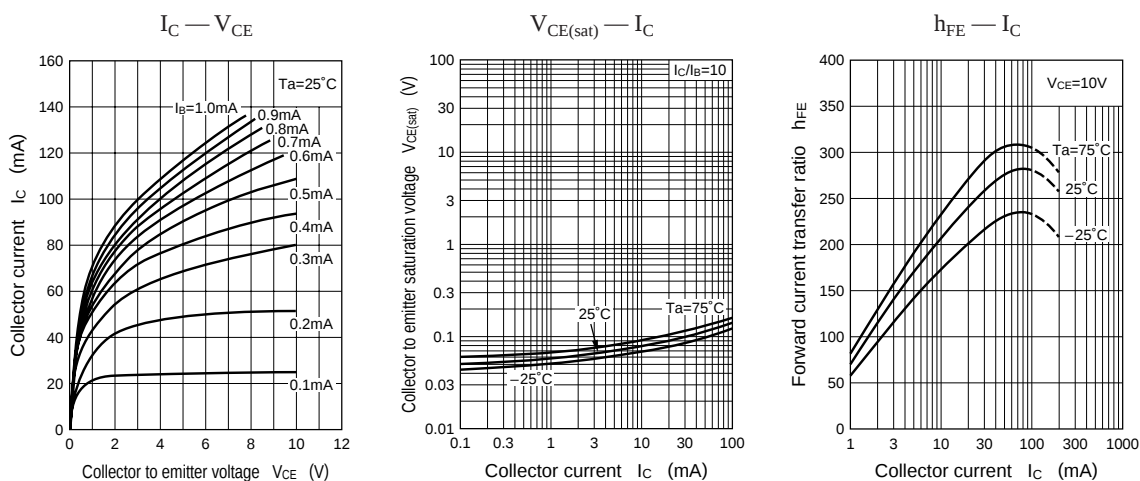
Characteristics charts of UNR2211

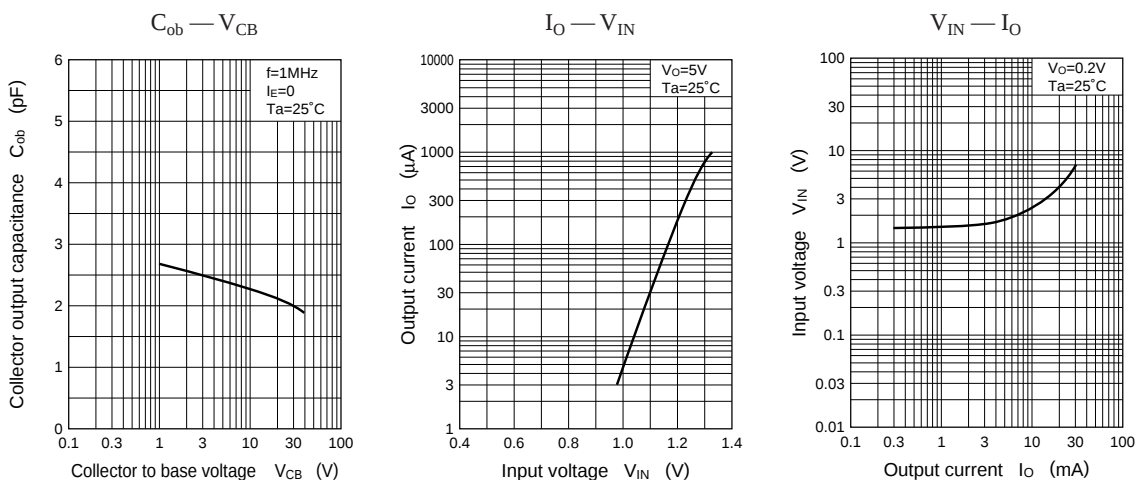


Characteristics charts of UNR2212

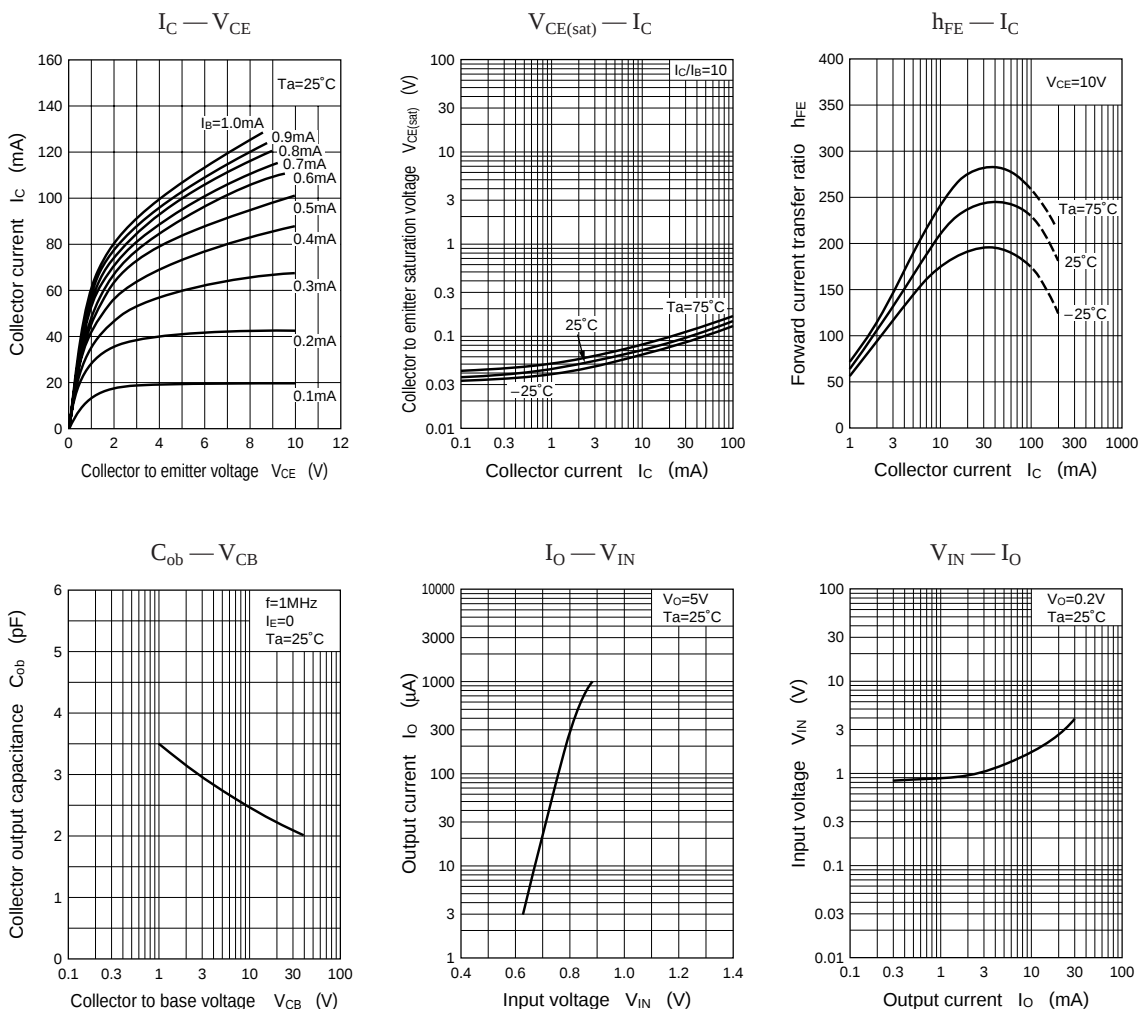


Characteristics charts of UNR2213

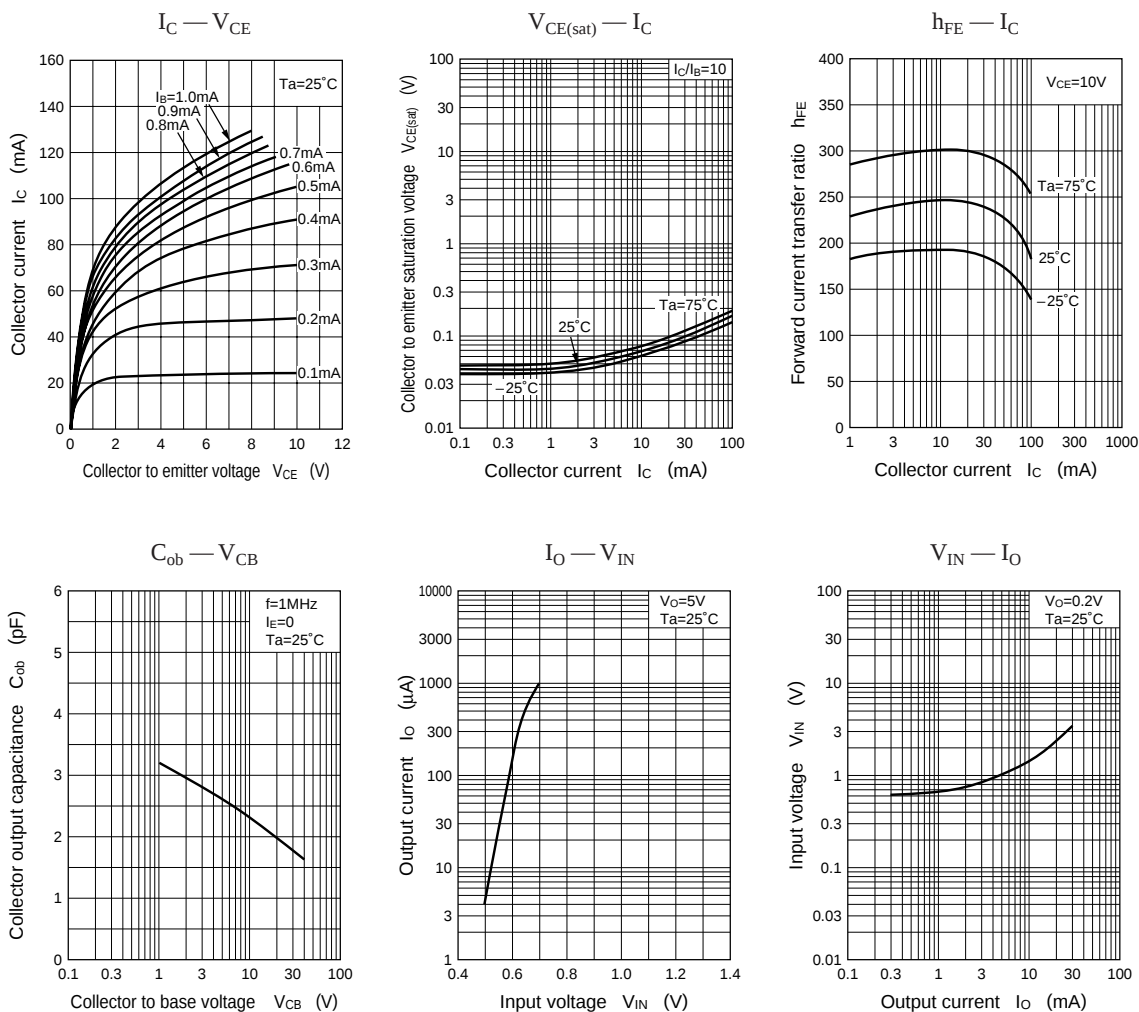




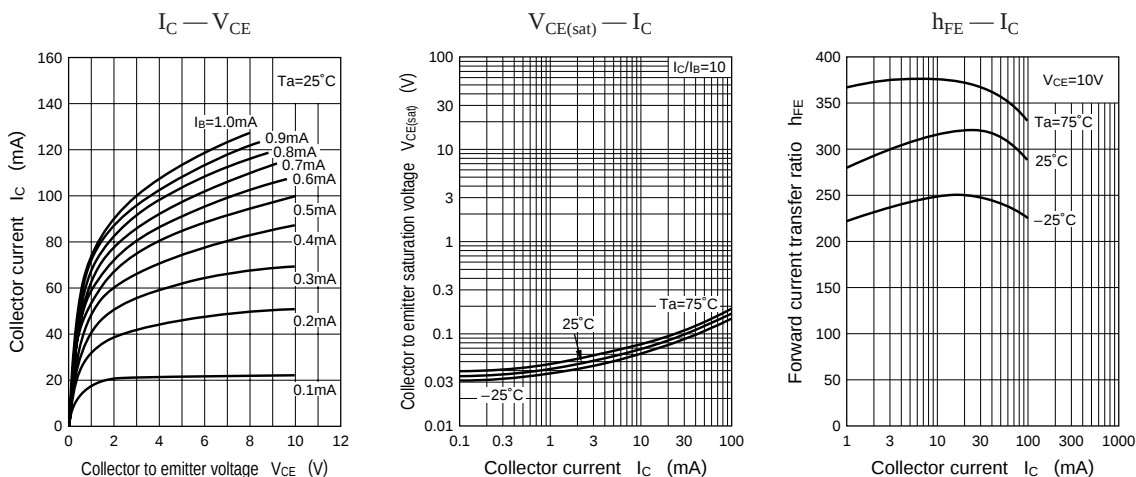
Characteristics charts of UNR2214

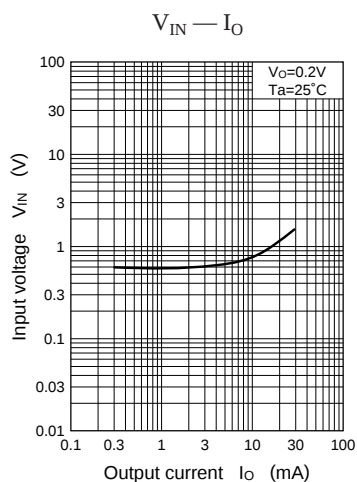
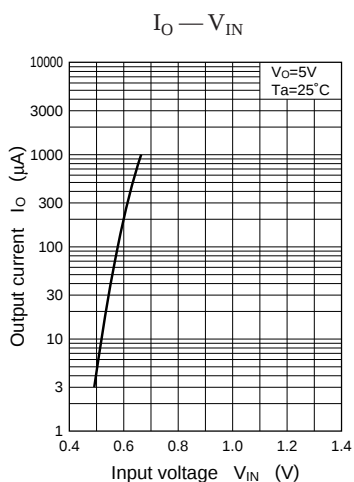
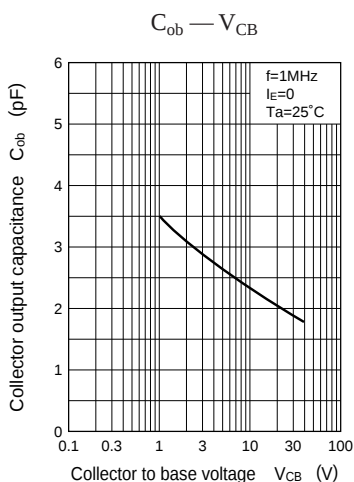


Characteristics charts of UNR2215

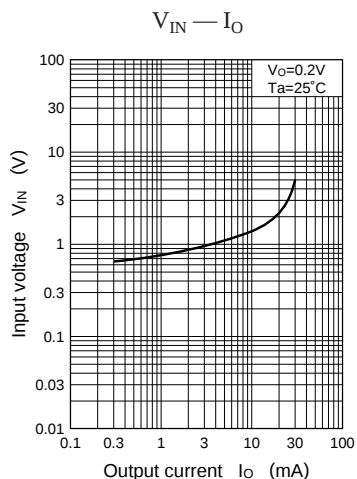
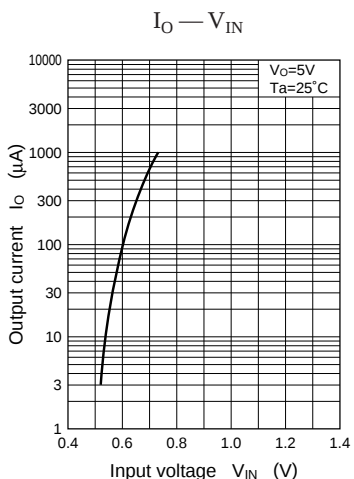
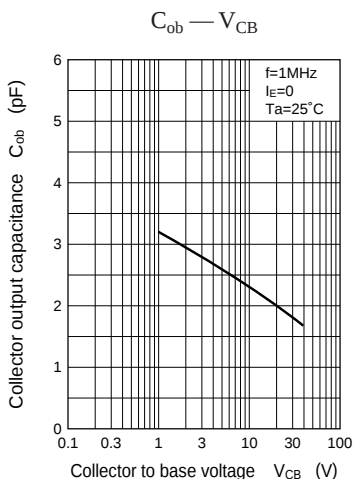
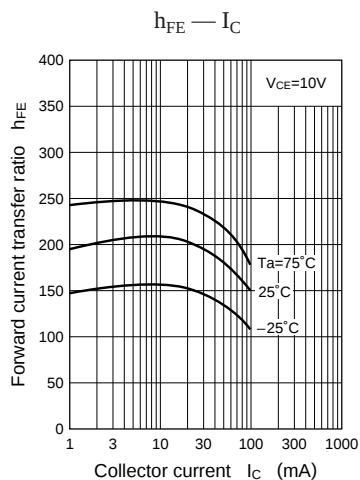
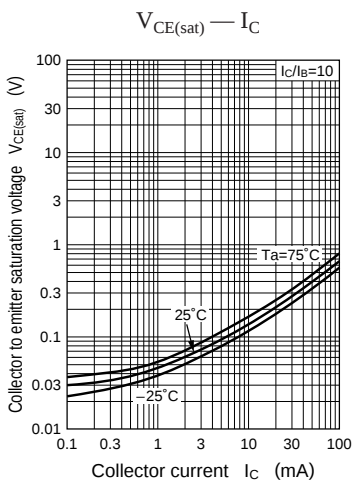
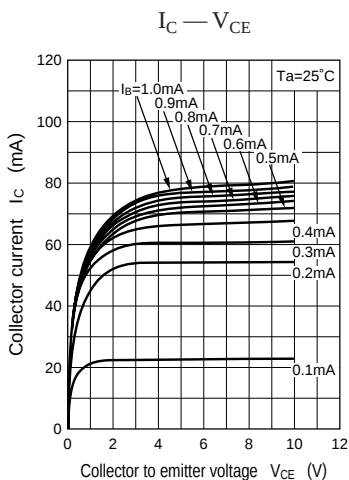


Characteristics charts of UNR2216

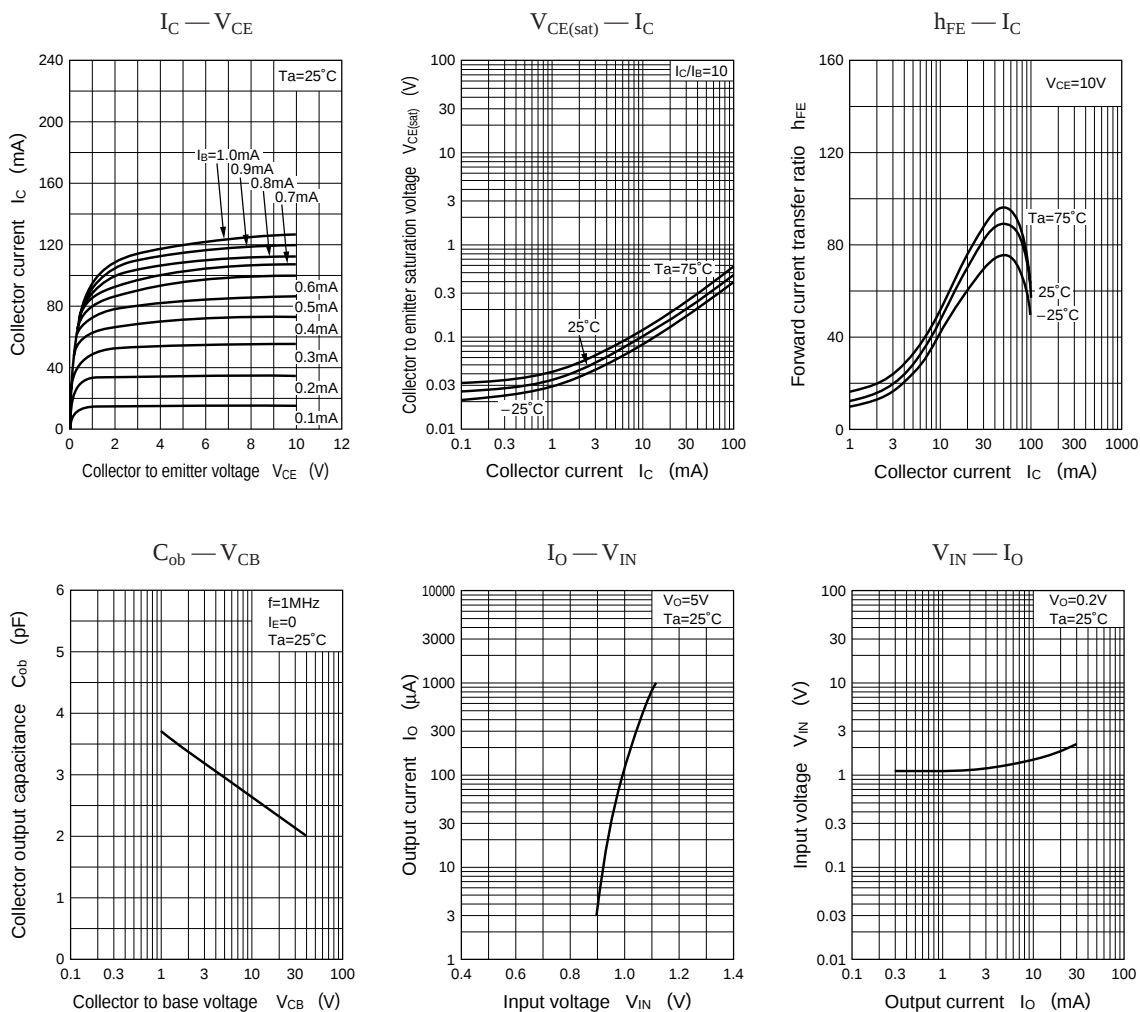




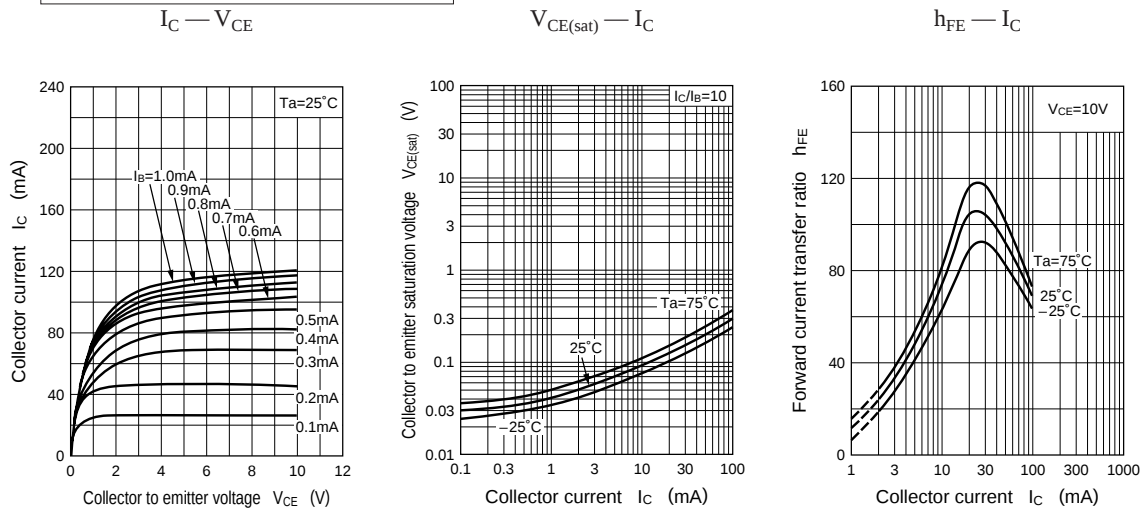
Characteristics charts of UNR2217

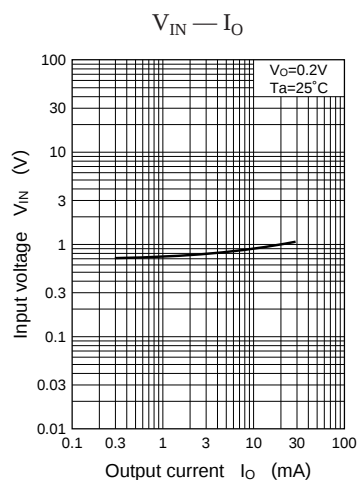
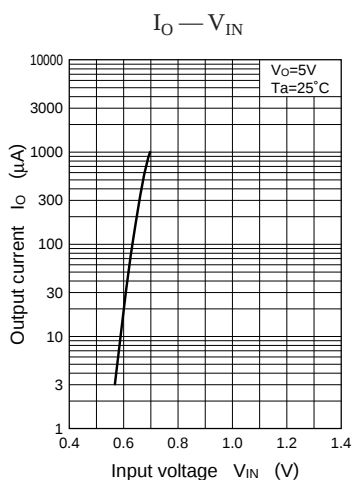
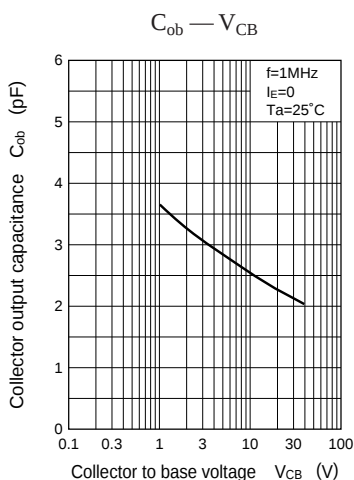


Characteristics charts of UNR2218

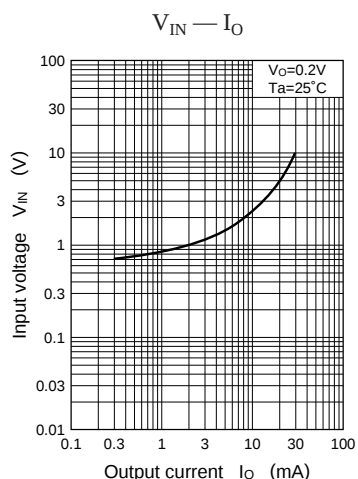
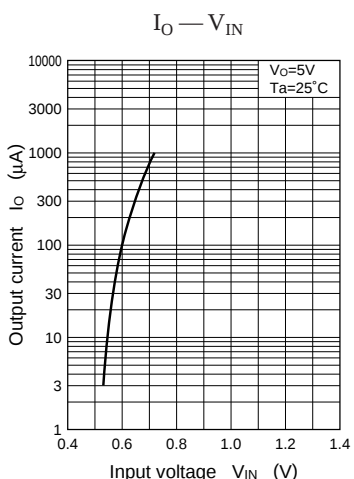
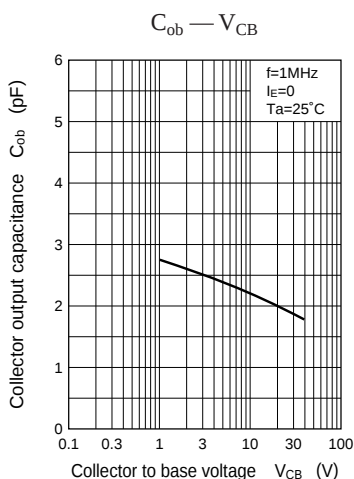
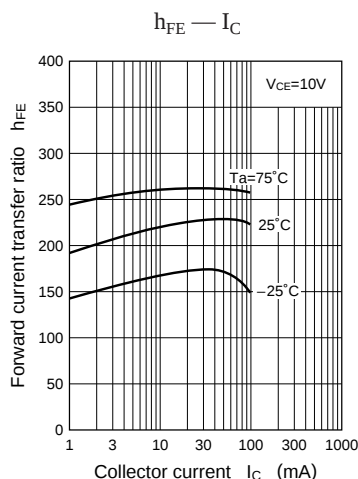
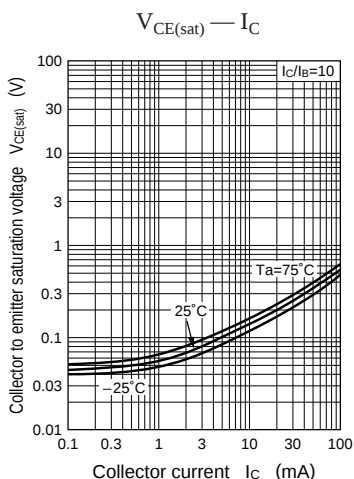
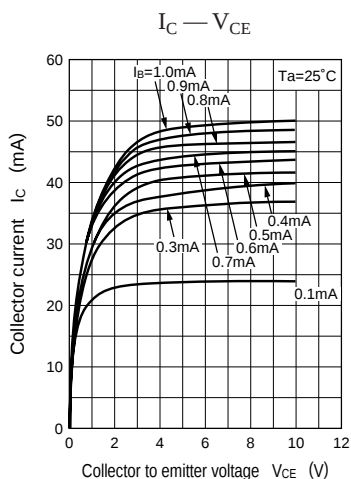


Characteristics charts of UNR2219

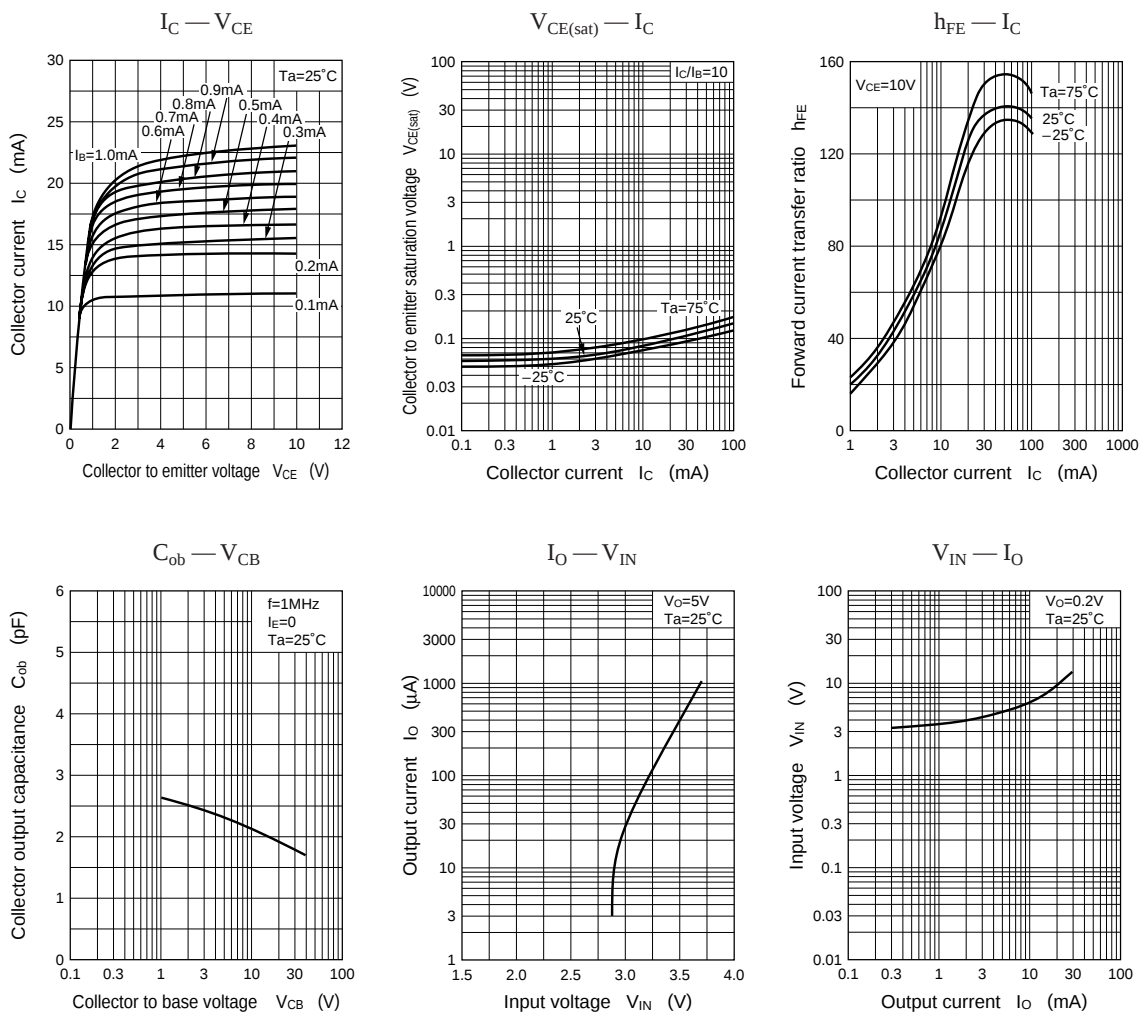




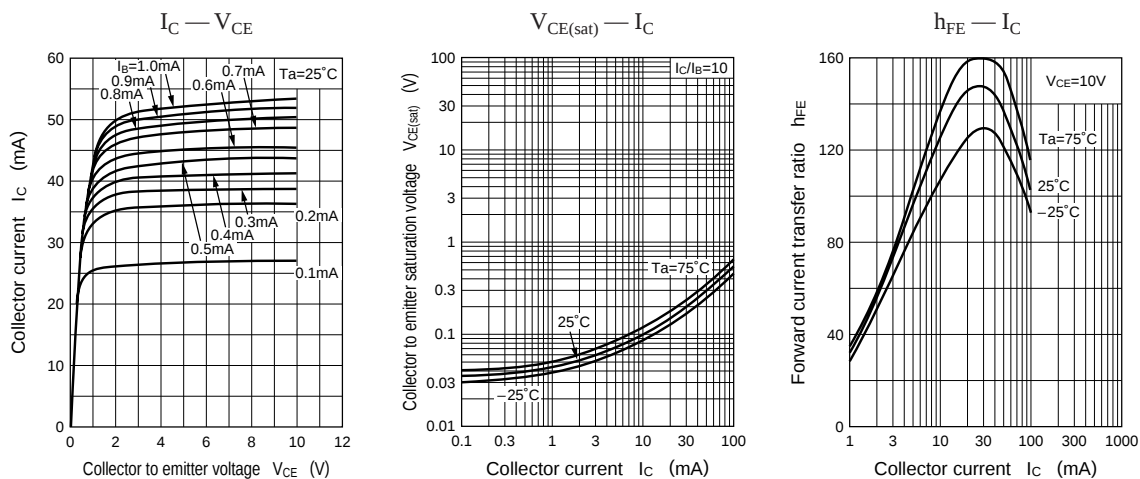
Characteristics charts of UNR2210

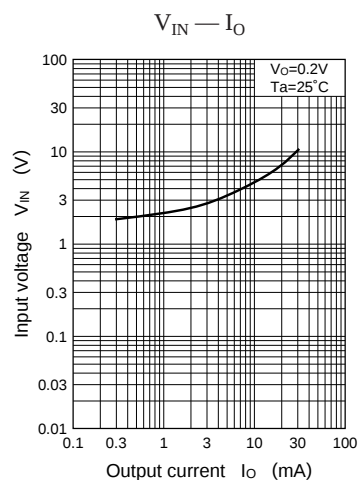
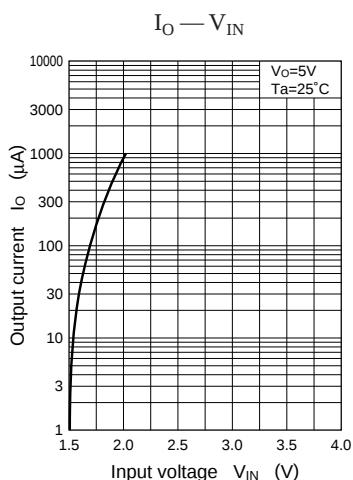
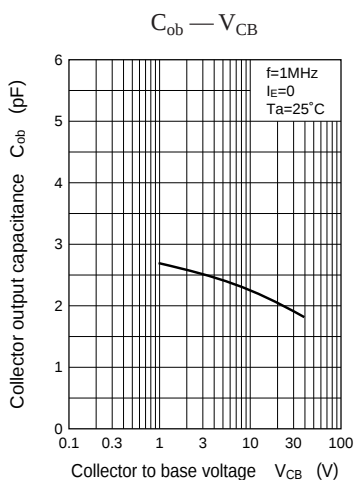


Characteristics charts of UNR221D

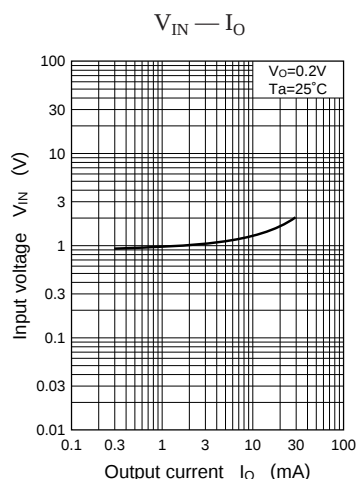
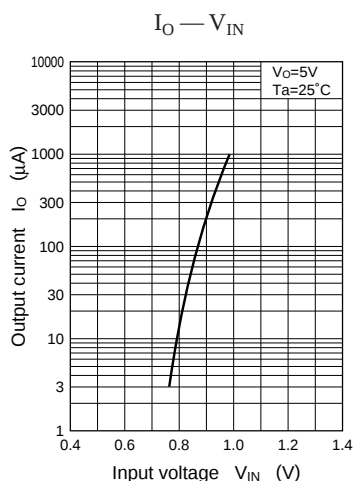
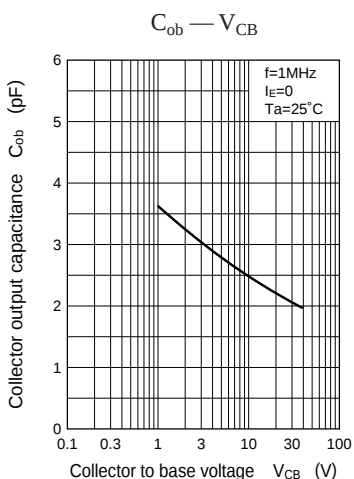
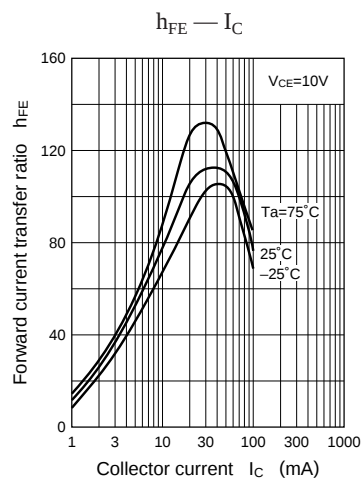
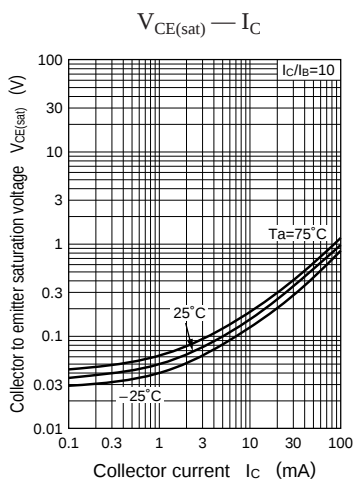
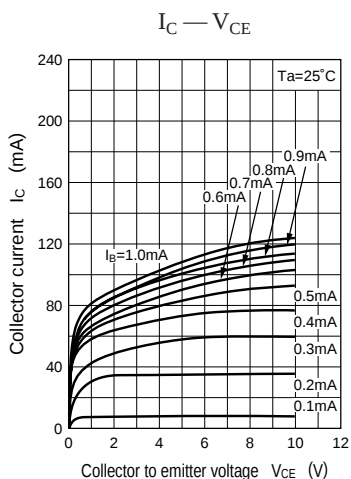


Characteristics charts of UNR221E

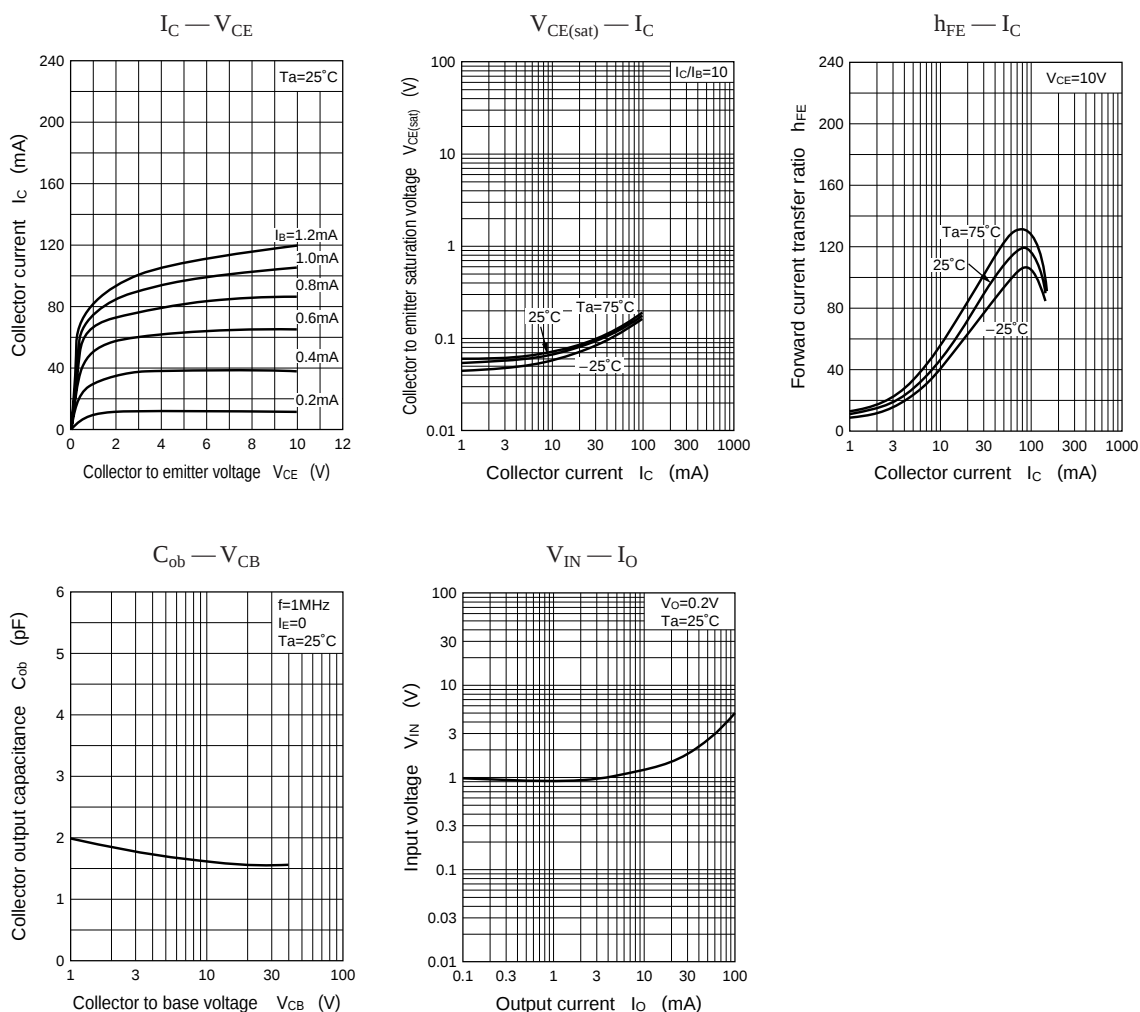




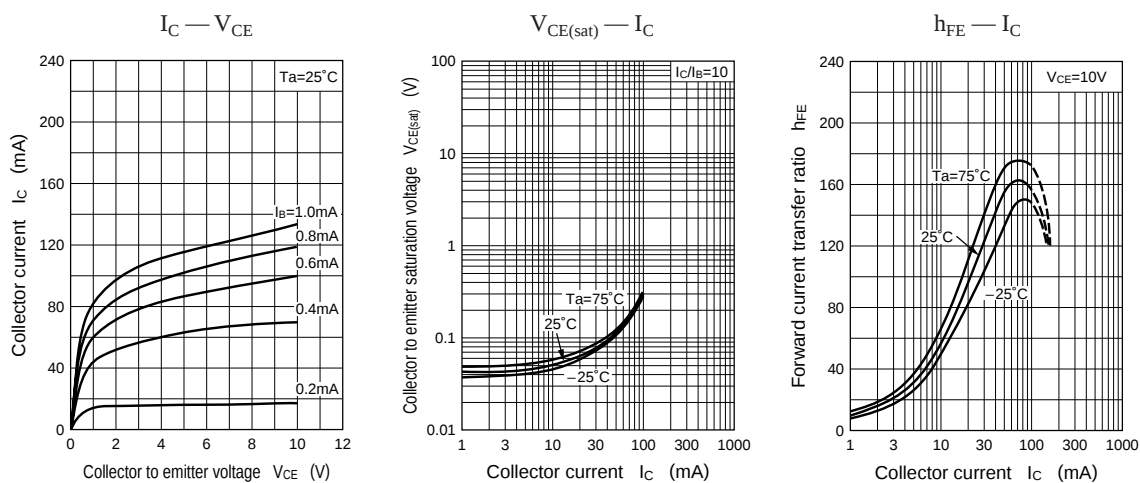
Characteristics charts of UNR221F

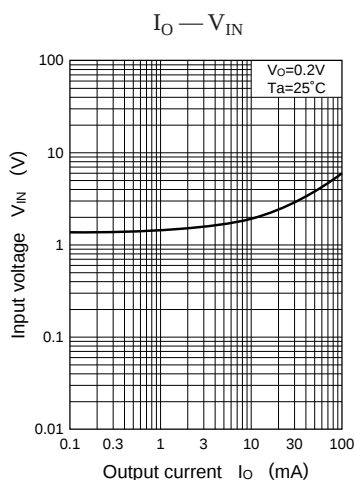
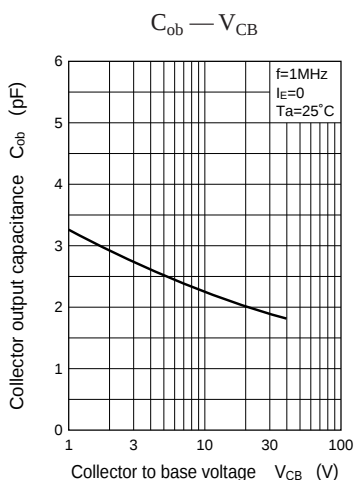


Characteristics charts of UNR221K

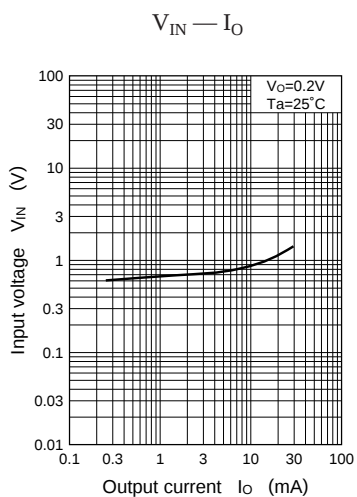
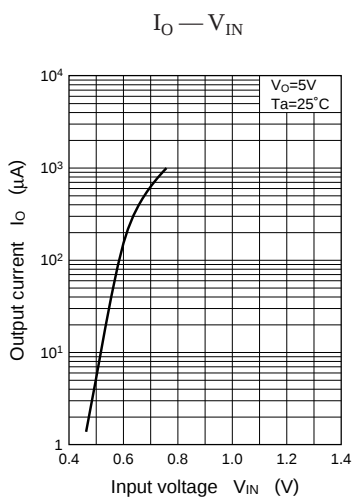
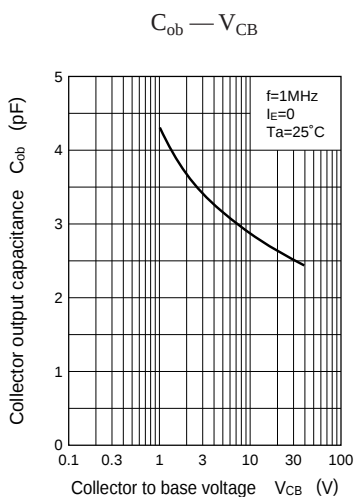
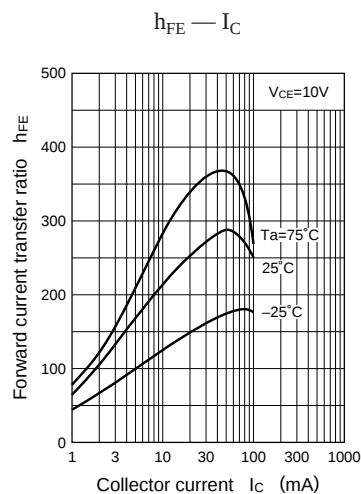
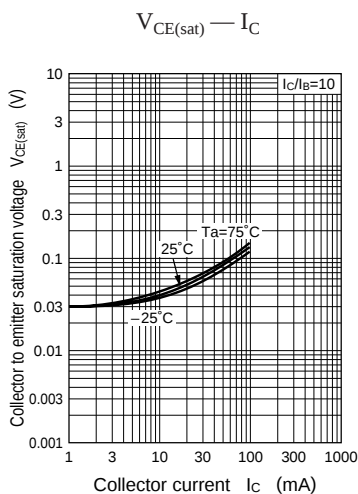
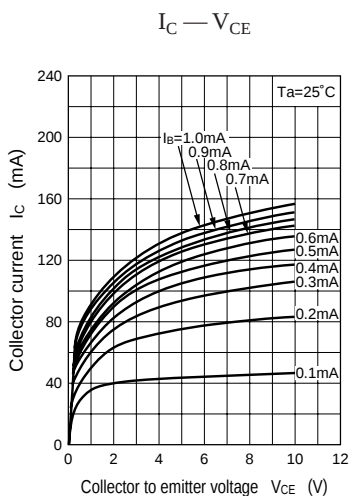


Characteristics charts of UNR221L

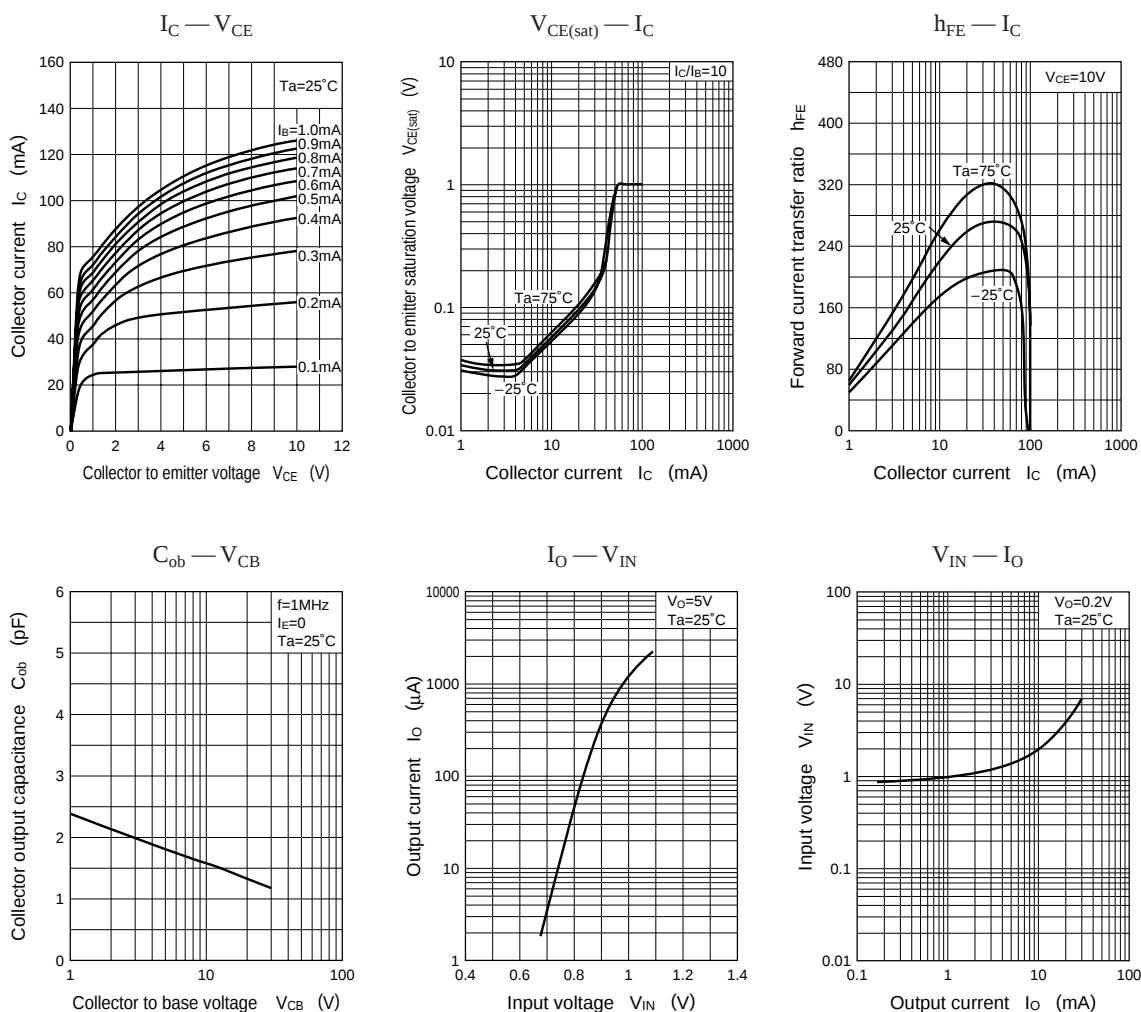




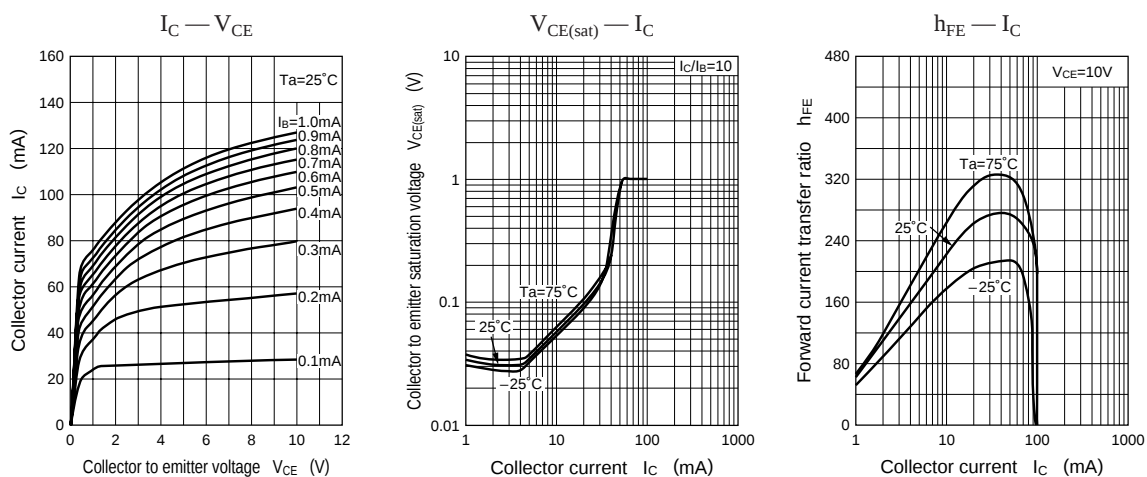
Characteristics charts of UNR221M

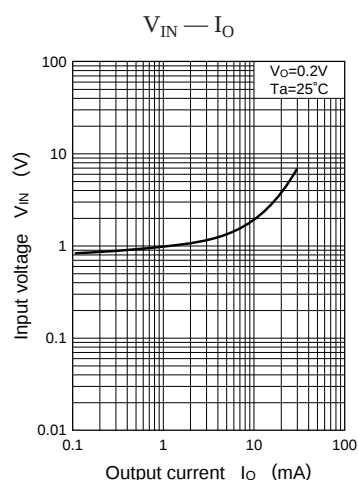
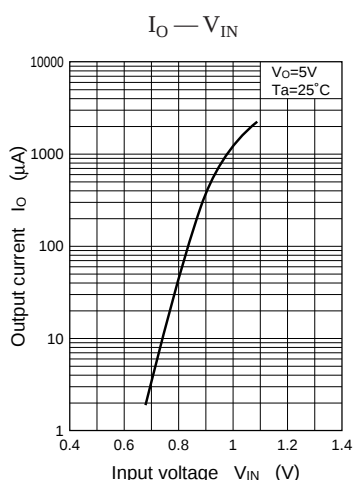
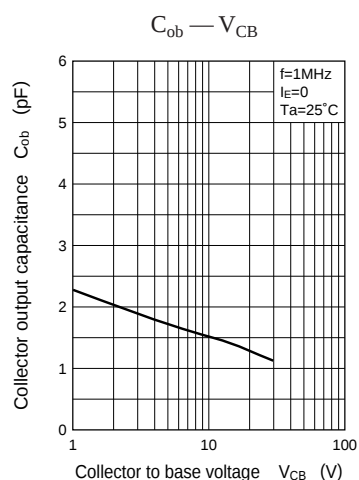


Characteristics charts of UNR221N

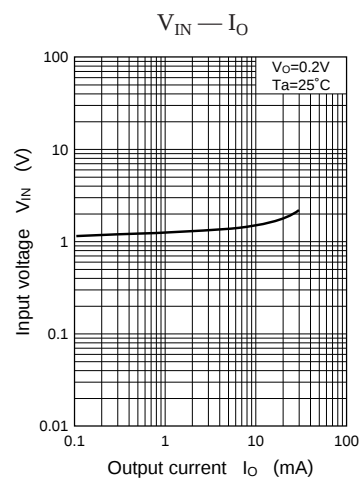
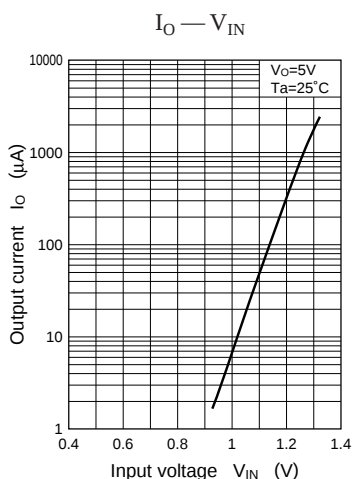
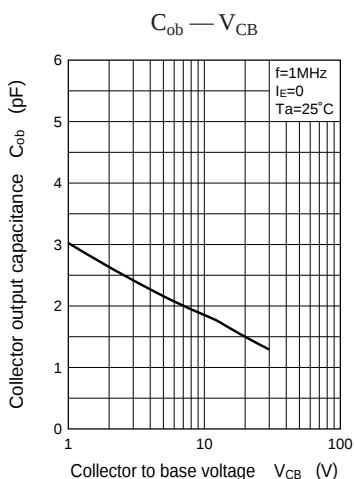
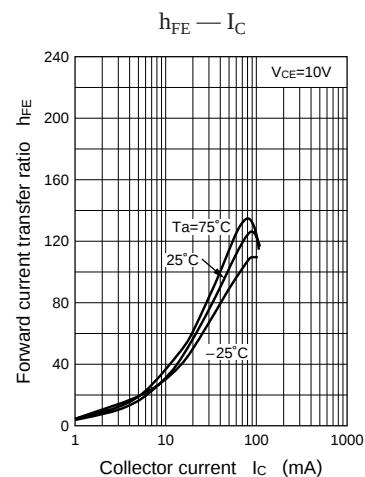
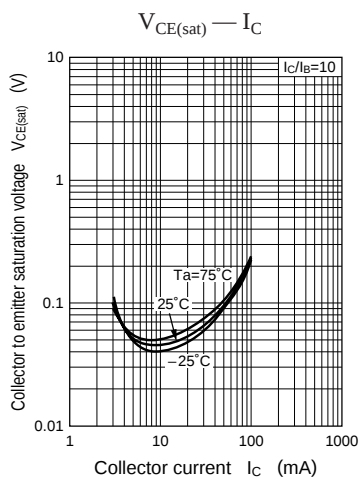
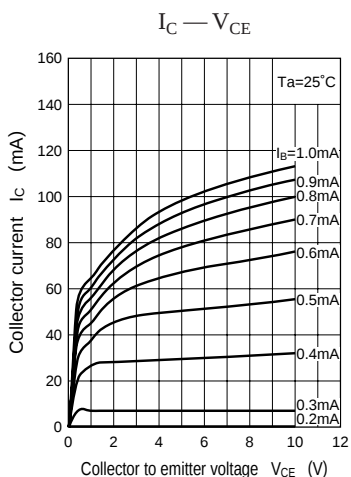


Characteristics charts of UNR221T

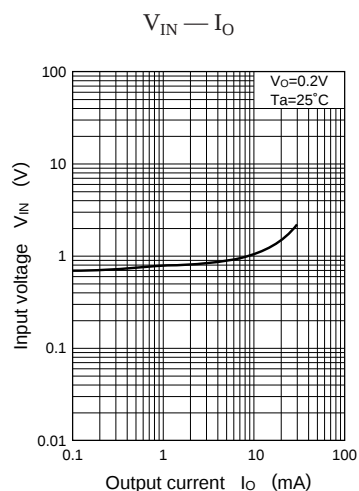
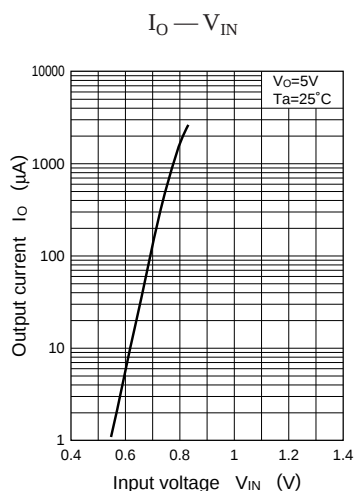
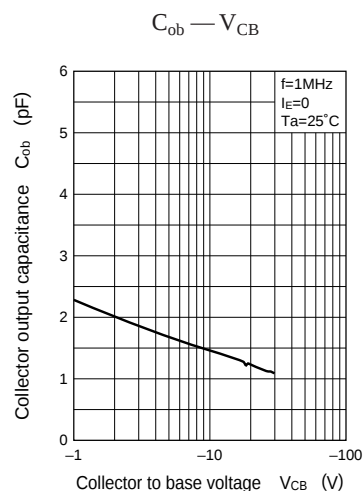
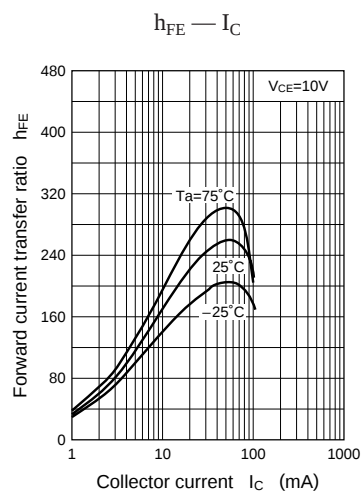
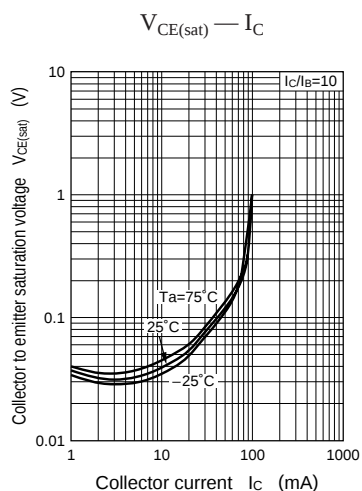
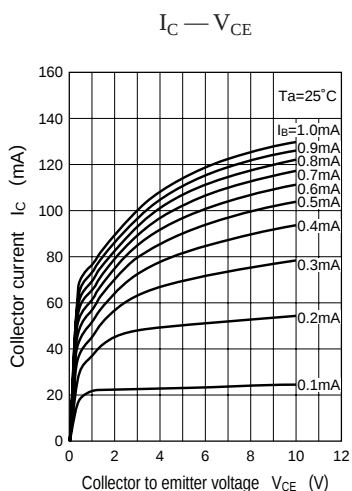




Characteristics charts of UNR221V



Characteristics charts of UNR221Z



Request for your special attention and precautions in using the technical information and semiconductors described in this material

- (1) An export permit needs to be obtained from the competent authorities of the Japanese Government if any of the products or technologies described in this material and controlled under the "Foreign Exchange and Foreign Trade Law" is to be exported or taken out of Japan.
- (2) The technical information described in this material is limited to showing representative characteristics and applied circuit examples of the products. It does not constitute the warranting of industrial property, the granting of relative rights, or the granting of any license.
- (3) The products described in this material are intended to be used for standard applications or general electronic equipment (such as office equipment, communications equipment, measuring instruments and household appliances).
Consult our sales staff in advance for information on the following applications:
 - Special applications (such as for airplanes, aerospace, automobiles, traffic control equipment, combustion equipment, life support systems and safety devices) in which exceptional quality and reliability are required, or if the failure or malfunction of the products may directly jeopardize life or harm the human body.
 - Any applications other than the standard applications intended.
- (4) The products and product specifications described in this material are subject to change without notice for reasons of modification and/or improvement. At the final stage of your design, purchasing, or use of the products, therefore, ask for the most up-to-date Product Standards in advance to make sure that the latest specifications satisfy your requirements.
- (5) When designing your equipment, comply with the guaranteed values, in particular those of maximum rating, the range of operating power supply voltage and heat radiation characteristics. Otherwise, we will not be liable for any defect which may arise later in your equipment.
Even when the products are used within the guaranteed values, redundant design is recommended, so that such equipment may not violate relevant laws or regulations because of the function of our products.
- (6) When using products for which dry packing is required, observe the conditions (including shelf life and after-unpacking standby time) agreed upon when specification sheets are individually exchanged.
- (7) No part of this material may be reprinted or reproduced by any means without written permission from our company.

Please read the following notes before using the datasheets

- A. These materials are intended as a reference to assist customers with the selection of Panasonic semiconductor products best suited to their applications.
Due to modification or other reasons, any information contained in this material, such as available product types, technical data, and so on, is subject to change without notice.
Customers are advised to contact our semiconductor sales office and obtain the latest information before starting precise technical research and/or purchasing activities.
- B. Panasonic is endeavoring to continually improve the quality and reliability of these materials but there is always the possibility that further rectifications will be required in the future. Therefore, Panasonic will not assume any liability for any damages arising from any errors etc. that may appear in this material.
- C. These materials are solely intended for a customer's individual use.
Therefore, without the prior written approval of Panasonic, any other use such as reproducing, selling, or distributing this material to a third party, via the Internet or in any other way, is prohibited.