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# UP04313

Silicon NPN epitaxial planar type (Tr1)  
Silicon PNP epitaxial planar type (Tr2)

For switching/digital circuits

## ■ Features

- Two elements incorporated into one package  
(Transistors with built-in resistor)
- Reduction of the mounting area and assembly cost by one half

## ■ Basic Part Number

- UNR2213 + UNR2113

## ■ Absolute Maximum Ratings $T_a = 25^\circ\text{C}$

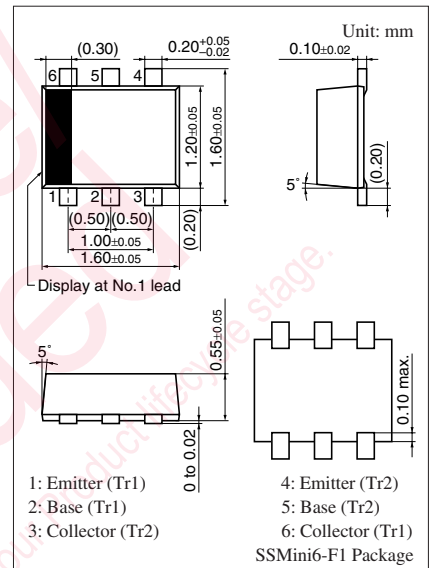
Parameter	Symbol	Rating	Unit	
Tr1	Collector-base voltage (Emitter open)	$V_{\text{CBO}}$	50	V
	Collector-emitter voltage (Base open)	$V_{\text{CEO}}$	50	V
	Collector current	$I_{\text{C}}$	100	mA
Tr2	Collector-base voltage (Emitter open)	$V_{\text{CBO}}$	-50	V
	Collector-emitter voltage (Base open)	$V_{\text{CEO}}$	-50	V
	Collector current	$I_{\text{C}}$	-100	mA
Overall	Total power dissipation	$P_{\text{T}}$	125	mW
	Junction temperature	$T_{\text{j}}$	125	$^\circ\text{C}$
	Storage temperature	$T_{\text{stg}}$	-55 to +125	$^\circ\text{C}$

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

- Tr1

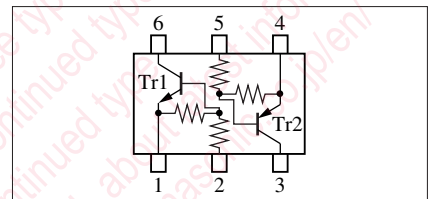
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Collector-base voltage (Emitter open)	$V_{\text{CBO}}$	$I_{\text{C}} = 10 \mu\text{A}, I_{\text{E}} = 0$	50			V
Collector-emitter voltage (Base open)	$V_{\text{CEO}}$	$I_{\text{C}} = 2 \text{ mA}, I_{\text{B}} = 0$	50			V
Collector-base cutoff current (Emitter open)	$I_{\text{CBO}}$	$V_{\text{CB}} = 50 \text{ V}, I_{\text{E}} = 0$			0.1	$\mu\text{A}$
Collector-emitter cutoff current (Base open)	$I_{\text{CEO}}$	$V_{\text{CE}} = 50 \text{ V}, I_{\text{B}} = 0$			0.5	$\mu\text{A}$
Emitter-base cutoff current (Collector open)	$I_{\text{EBO}}$	$V_{\text{EB}} = 6 \text{ V}, I_{\text{C}} = 0$			0.1	mA
Forward current transfer ratio	$h_{\text{FE}}$	$V_{\text{CE}} = 10 \text{ V}, I_{\text{C}} = 5 \text{ mA}$	80			—
Collector-emitter saturation voltage	$V_{\text{CE(sat)}}$	$I_{\text{C}} = 10 \text{ mA}, I_{\text{B}} = 0.3 \text{ mA}$			0.25	V
Output voltage high-level	$V_{\text{OH}}$	$V_{\text{CC}} = 5 \text{ V}, V_{\text{B}} = 0.5 \text{ V}, R_{\text{L}} = 1 \text{ k}\Omega$	4.9			V
Output voltage low-level	$V_{\text{OL}}$	$V_{\text{CC}} = 5 \text{ V}, V_{\text{B}} = 3.5 \text{ V}, R_{\text{L}} = 1 \text{ k}\Omega$			0.2	V
Input resistance	$R_{\text{I}}$		-30%	47	+30%	$\text{k}\Omega$
Resistance ratio	$R_{\text{I}}/R_{\text{2}}$		0.8	1.0	1.2	—
Transition frequency	$f_{\text{T}}$	$V_{\text{CB}} = 10 \text{ V}, I_{\text{E}} = -2 \text{ mA}, f = 200 \text{ MHz}$		150		MHz

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



Marking Symbol: BZ

Internal Connection





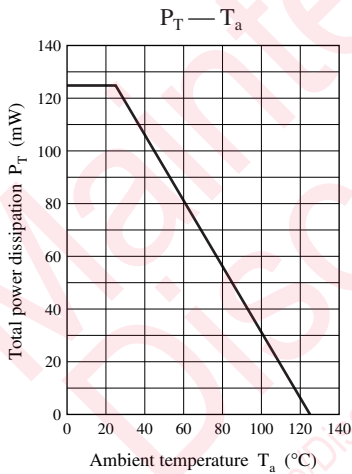
■ Electrical Characteristics (continued)  $T_a = 25^\circ\text{C} \pm 3^\circ\text{C}$

• Tr2

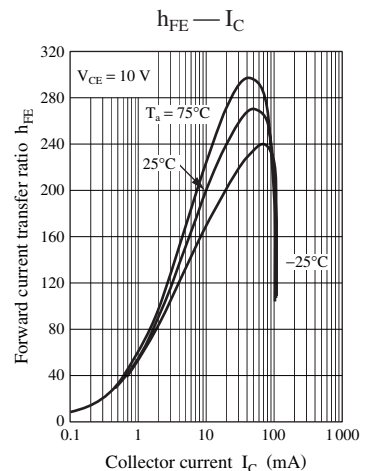
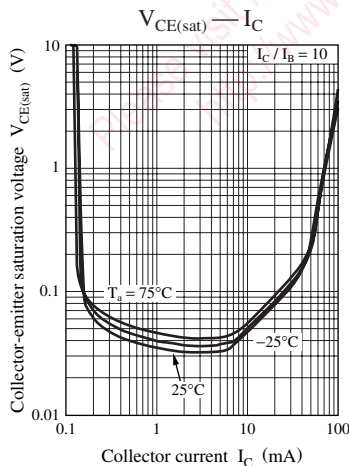
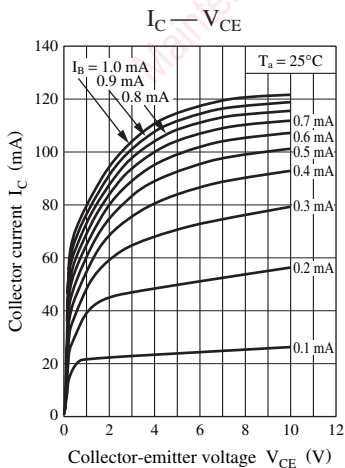
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Collector-base voltage (Emitter open)	$V_{CBO}$	$I_C = -10 \mu\text{A}, I_E = 0$	-50			V
Collector-emitter voltage (Base open)	$V_{CEO}$	$I_C = -2 \text{ mA}, I_B = 0$	-50			V
Collector-base cutoff current (Emitter open)	$I_{CBO}$	$V_{CB} = -50 \text{ V}, I_E = 0$			-0.1	$\mu\text{A}$
Collector-emitter cutoff current (Base open)	$I_{CEO}$	$V_{CE} = -50 \text{ V}, I_B = 0$			-0.5	$\mu\text{A}$
Emitter-base cutoff current (Collector open)	$I_{EBO}$	$V_{EB} = -6 \text{ V}, I_C = 0$			-0.1	mA
Forward current transfer ratio	$h_{FE}$	$V_{CE} = -10 \text{ V}, I_C = -5 \text{ mA}$	80			—
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C = -10 \text{ mA}, I_B = -0.3 \text{ mA}$			-0.25	V
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	$V_{OL}$	$V_{CC} = -5 \text{ V}, V_B = -3.5 \text{ V}, R_L = 1 \text{ k}\Omega$			-0.2	V
Input resistance	$R_1$		-30%	47	+30%	$\text{k}\Omega$
Resistance ratio	$R_1/R_2$		0.8	1.0	1.2	—
Transition frequency	$f_T$	$V_{CB} = -10 \text{ V}, I_E = 1 \text{ mA}, f = 200 \text{ MHz}$		80		MHz

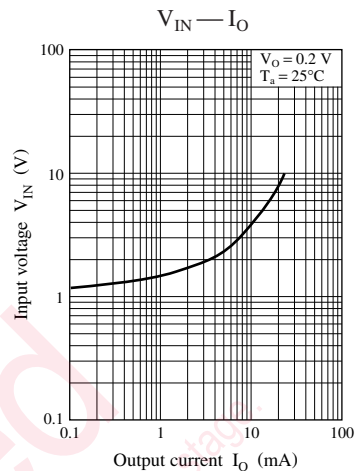
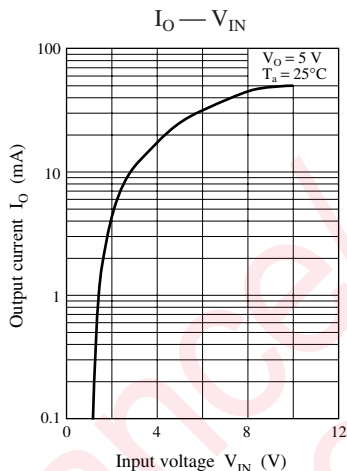
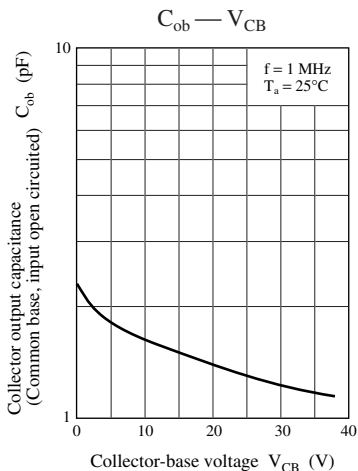
Note) Measuring methods are based on JAPANESE INDUSTRIAL STANDARD JIS C 7030 measuring methods for transistors.

Common characteristics chart

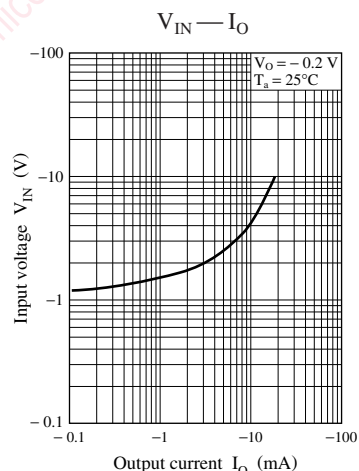
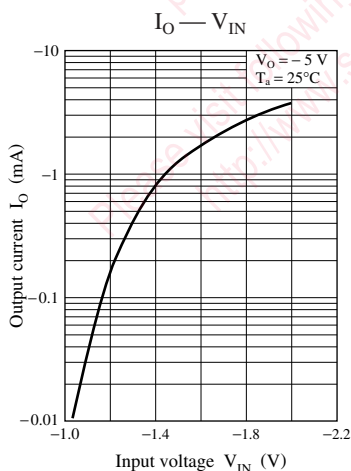
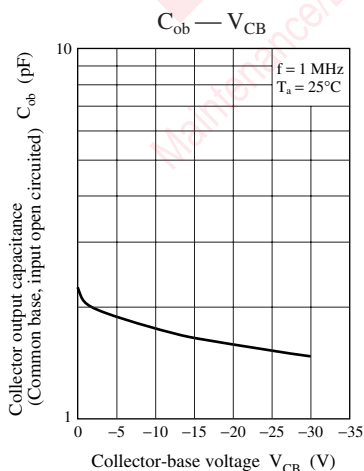
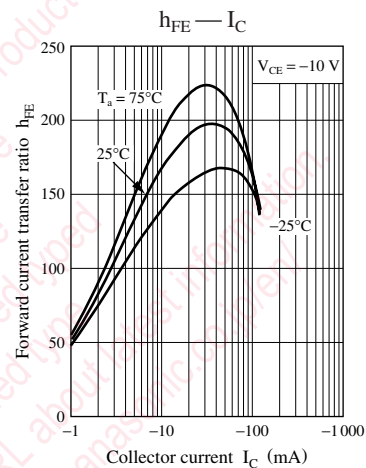
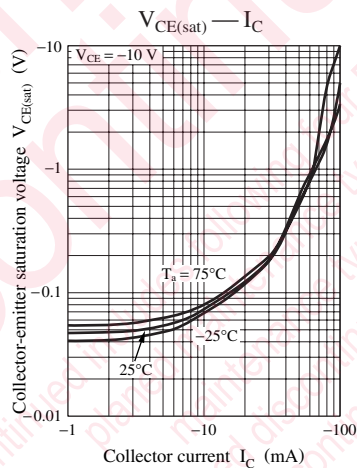
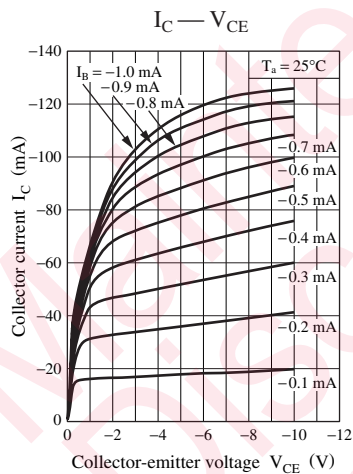


Characteristics charts of Tr1





Characteristics charts of Tr2



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