

# XP04654 (XP4654)

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

For high-speed switching

■ Features

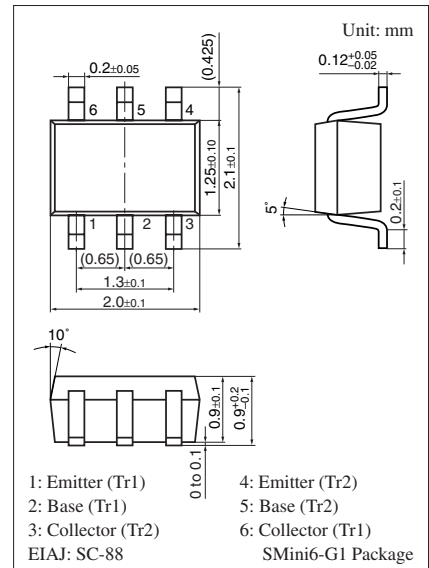
- Two elements incorporated into one package
- Reduction of the mounting area and assembly cost by one half

■ Basic Part Number

- 2SC3757 + 2SA1738

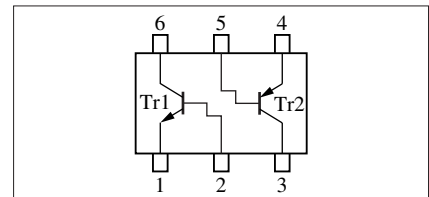
■ Absolute Maximum Ratings  $T_a = 25^\circ\text{C}$

	Parameter	Symbol	Rating	Unit
Tr1	Collector-base voltage (Emitter open)	$V_{\text{CBO}}$	40	V
	Collector-emitter voltage (E-B short)	$V_{\text{CES}}$	40	V
	Emitter-base voltage (Collector open)	$V_{\text{EBO}}$	5	V
	Collector current	$I_{\text{C}}$	100	mA
	Peak collector current	$I_{\text{CP}}$	300	mA
Tr2	Collector-base voltage (Emitter open)	$V_{\text{CBO}}$	-15	V
	Collector-emitter voltage (E-B short)	$V_{\text{CES}}$	-15	V
	Emitter-base voltage (Collector open)	$V_{\text{EBO}}$	-4	V
	Collector current	$I_{\text{C}}$	-50	mA
	Peak collector current	$I_{\text{CP}}$	-100	mA
Overall	Total power dissipation	$P_{\text{T}}$	150	mW
	Junction temperature	$T_{\text{j}}$	150	$^\circ\text{C}$
	Storage temperature	$T_{\text{stg}}$	-55 to +150	$^\circ\text{C}$



Marking Symbol: ED

Internal Connection



Note) The part number in the parenthesis shows conventional part number.

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

#### • Tr1

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Collector-base cutoff current (Emitter open)	$I_{\text{CBO}}$	$V_{\text{CB}} = 40 \text{ V}, I_{\text{E}} = 0$			0.1	$\mu\text{A}$
Emitter-base cutoff current (Collector open)	$I_{\text{EBO}}$	$V_{\text{EB}} = 4 \text{ V}, I_{\text{C}} = 0$			0.1	$\mu\text{A}$
Forward current transfer ratio	$h_{\text{FE}}$	$V_{\text{CE}} = 1 \text{ V}, I_{\text{C}} = 10 \text{ mA}$	60		320	—
Collector-emitter saturation voltage	$V_{\text{CE(sat)}}$	$I_{\text{C}} = 10 \text{ mA}, I_{\text{B}} = 1 \text{ mA}$		0.17	0.25	V
Base-emitter saturation voltage	$V_{\text{BE(sat)}}$	$I_{\text{C}} = 10 \text{ mA}, I_{\text{B}} = 1 \text{ mA}$			1.0	V
Transition frequency	$f_{\text{T}}$	$V_{\text{CB}} = 10 \text{ V}, I_{\text{E}} = -10 \text{ mA}, f = 200 \text{ MHz}$		450		MHz
Collector output capacitance (Common base, input open circuited)	$C_{\text{ob}}$	$V_{\text{CB}} = 10 \text{ V}, I_{\text{E}} = 0, f = 1 \text{ MHz}$		2	6	pF
Turn-on time	$t_{\text{on}}$	Refer to the switching time measurement circuit		17		ns
Turn-off time	$t_{\text{off}}$			17		ns
Storage time	$t_{\text{stg}}$			10		ns

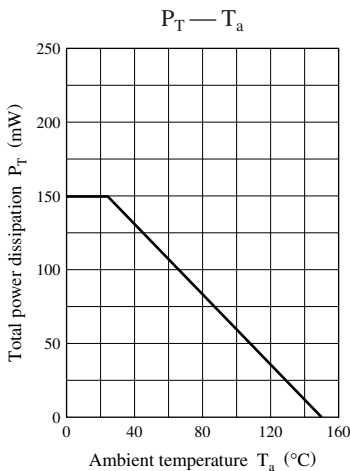
Note) Measuring methods are based on JAPANESE INDUSTRIAL STANDARD JIS C 7030 measuring methods for transistors.

#### • Tr2

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Collector-base cutoff current (Emitter open)	$I_{\text{CBO}}$	$V_{\text{CB}} = -8 \text{ V}, I_{\text{E}} = 0$			-0.1	$\mu\text{A}$
Emitter-base cutoff current (Collector open)	$I_{\text{EBO}}$	$V_{\text{EB}} = -3 \text{ V}, I_{\text{C}} = 0$			-0.1	$\mu\text{A}$
Forward current transfer ratio	$h_{\text{FE1}}$	$V_{\text{CE}} = -1 \text{ V}, I_{\text{C}} = -10 \text{ mA}$	50		150	—
	$h_{\text{FE2}}$	$V_{\text{CE}} = -1 \text{ V}, I_{\text{C}} = -1 \text{ mA}$	30			
Collector-emitter saturation voltage	$V_{\text{CE(sat)}}$	$I_{\text{C}} = -10 \text{ mA}, I_{\text{B}} = -1 \text{ mA}$		-0.1	-0.2	V
Transition frequency	$f_{\text{T}}$	$V_{\text{CB}} = -10 \text{ V}, I_{\text{E}} = 10 \text{ mA}, f = 200 \text{ MHz}$	800	1500		MHz
Collector output capacitance (Common base, input open circuited)	$C_{\text{ob}}$	$V_{\text{CB}} = -5 \text{ V}, I_{\text{E}} = 0, f = 1 \text{ MHz}$		1		pF
Turn-on time	$t_{\text{on}}$	Refer to the switching time measurement circuit		12		ns
Turn-off time	$t_{\text{off}}$			20		ns
Storage time	$t_{\text{stg}}$			19		ns

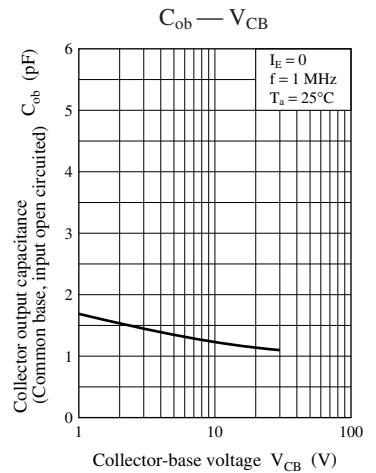
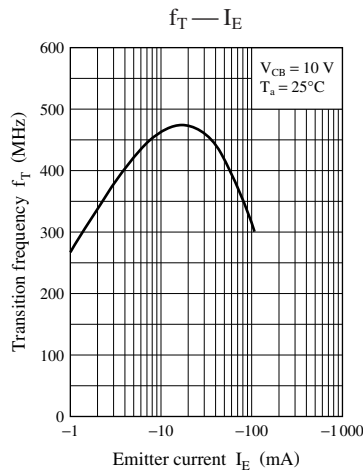
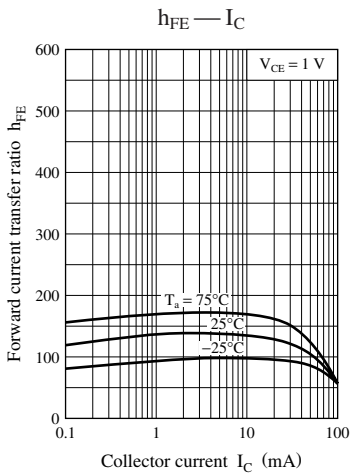
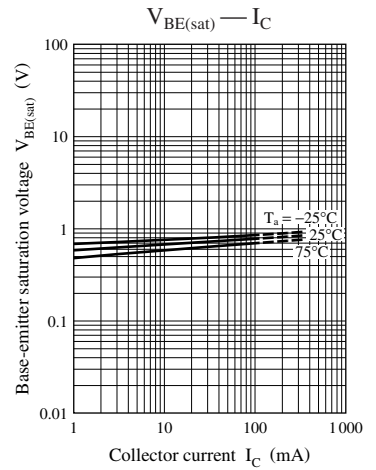
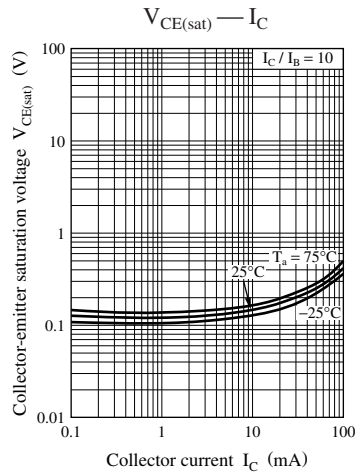
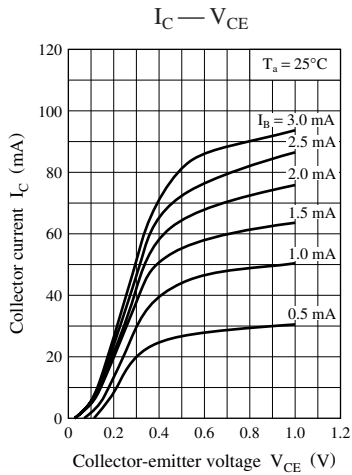
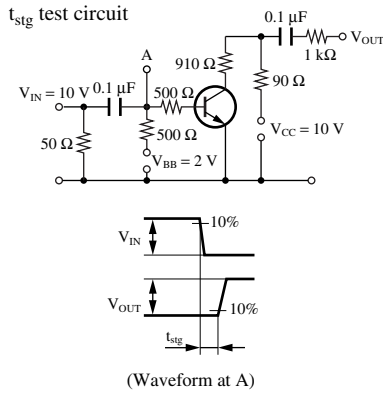
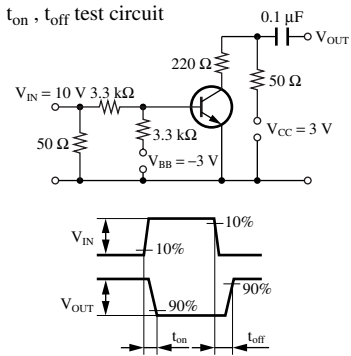
Note) Measuring methods are based on JAPANESE INDUSTRIAL STANDARD JIS C 7030 measuring methods for transistors.

Common characteristics chart



Characteristics charts of Tr1

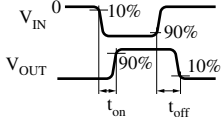
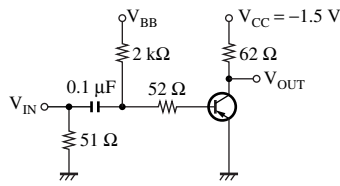
Switching time measurement circuit



Characteristics charts of Tr2

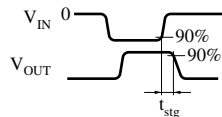
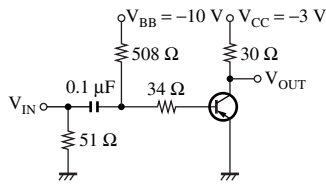
Switching time measurement circuit

$t_{on}, t_{off}$  test circuit

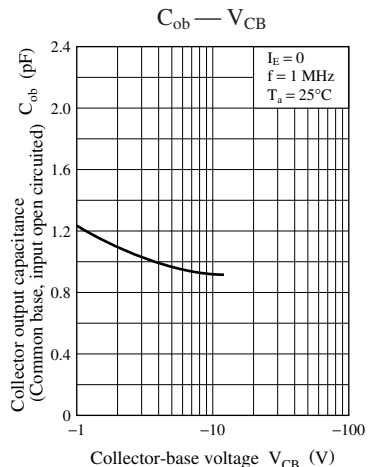
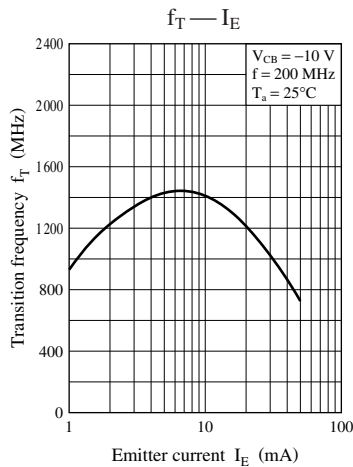
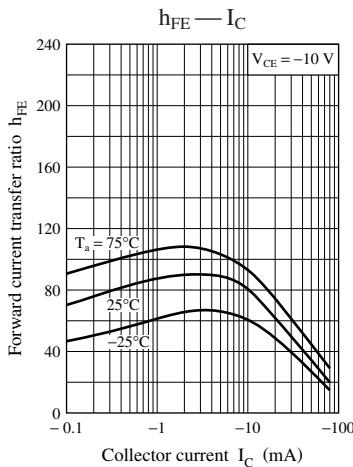
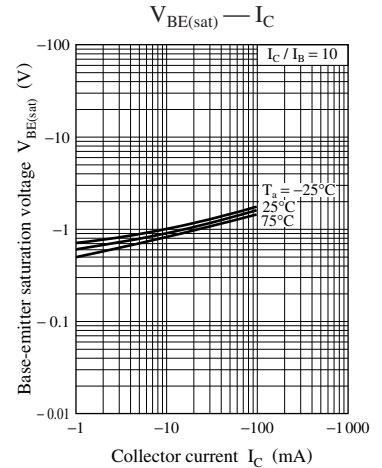
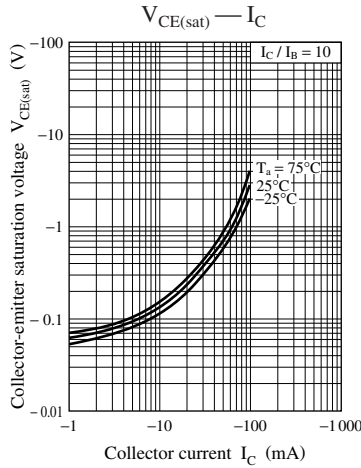
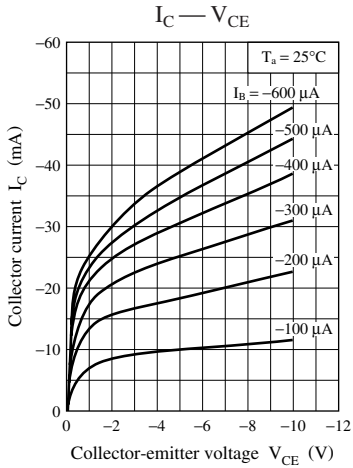


$V_{IN} = -5.8\text{ V}$     $V_{IN} = 9.8\text{ V}$   
 $V_{BB} = \text{Ground}$     $V_{BB} = -8.0\text{ V}$

$t_{stg}$  test circuit



$V_{IN} = 9.0\text{ V}$



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