

Complex Midium Power Transistors ($\pm 50V/\pm 1A$)

QS6Z5

● Structure

NPN/PNP Silicon epitaxial planar transistor

● Features

1) Low saturation voltage

$$V_{CE(sat)} = 0.35V \text{ (Max.) } (I_C / I_B = 500mA / 25mA)$$

$$V_{CE(sat)} = -0.40V \text{ (Max.) } (I_C / I_B = -500mA / -25mA)$$

2) High speed switching

● Applications

Low Frequency Amplifier
Driver

● Packaging specifications

Type	Package	TSM6
	Code	TR
	Basic ordering unit (pieces)	3000

● Absolute maximum ratings (Ta = 25°C)

<Tr.1>

Parameter	Symbol	Limits	Unit	
Collector-base voltage	V_{CBO}	50	V	
Collector-emitter voltage	V_{CEO}	50	V	
Emitter-base voltage	V_{EBO}	6	V	
Collector current	DC	I_C	1	A
	Pulsed	$I_{CP} *1$	2	A

<Tr.2>

Parameter	Symbol	Limits	Unit	
Collector-base voltage	V_{CBO}	-50	V	
Collector-emitter voltage	V_{CEO}	-50	V	
Emitter-base voltage	V_{EBO}	-6	V	
Collector current	DC	I_C	-1	A
	Pulsed	$I_{CP} *1$	-2	A

<Tr.1 and Tr.2>

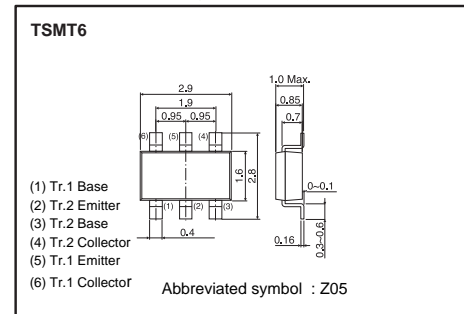
Parameter	Symbol	Limits	Unit
Power dissipation	$P_D *2$	0.5	W/Total
	$P_D *3$	1.25	W/Total
	$P_D *3$	0.9	W/Element
Junction temperature	T_j	150	°C
Range of storage temperature	T_{stg}	-55 to +150	°C

*1 Pw=10ms, Single Pulse

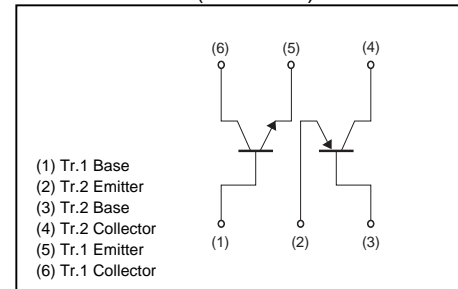
*2 Mounted on a recommended land.

*3 Mounted on a 40 x 40 x 0.7[mm] ceramic board.

● Dimensions (Unit : mm)



● Inner circuit (Unit : mm)



●Electrical characteristics (Ta = 25°C)

<Tr.1>

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-emitter breakdown voltage	BV_{CEO}	50	-	-	V	$I_C = 1\text{mA}$
Collector-base breakdown voltage	BV_{CBO}	50	-	-	V	$I_C = 100\mu\text{A}$
Emitter-base breakdown voltage	BV_{EBO}	6	-	-	V	$I_E = 100\mu\text{A}$
Collector cut-off current	I_{CBO}	-	-	1	μA	$V_{CB} = 50\text{V}$
Emitter cut-off current	I_{EBO}	-	-	1	μA	$V_{EB} = 4\text{V}$
Collector-emitter saturation voltage	$V_{CE(sat)}^{*1}$	-	130	350	mV	$I_C = 500\text{mA}, I_B = 25\text{mA}$
DC current gain	h_{FE}	180	-	450	-	$V_{CE} = 2\text{V}, I_C = 50\text{mA}$
Transition frequency	f_T^{*1}	-	360	-	MHz	$V_{CE} = 10\text{V}$ $I_E = -200\text{mA}, f = 100\text{MHz}$
Collector output capacitance	C_{ob}	-	7	-	pF	$V_{CB} = 10\text{V}, I_E = 0\text{A}$ $f = 1\text{MHz}$
Turn-on time	t_{on}^{*2}	-	40	-	ns	$I_C = 0.5\text{A}, I_{B1} = 50\text{mA},$ $I_{B2} = -50\text{mA}, V_{CC} = 10\text{V}$
Storage time	t_{stg}^{*2}	-	410	-	ns	
Fall time	t_f^{*2}	-	75	-	ns	

*1 Pulsed

*2 See switching time test circuit

<Tr.2>

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-emitter breakdown voltage	BV_{CEO}	-50	-	-	V	$I_C = -1\text{mA}$
Collector-base breakdown voltage	BV_{CBO}	-50	-	-	V	$I_C = -100\mu\text{A}$
Emitter-base breakdown voltage	BV_{EBO}	-6	-	-	V	$I_E = -100\mu\text{A}$
Collector cut-off current	I_{CBO}	-	-	-1	μA	$V_{CB} = -50\text{V}$
Emitter cut-off current	I_{EBO}	-	-	-1	μA	$V_{EB} = -4\text{V}$
Collector-emitter saturation voltage	$V_{CE(sat)}^{*1}$	-	-200	-400	mV	$I_C = -500\text{mA}, I_B = -25\text{mA}$
DC current gain	h_{FE}	180	-	450	-	$V_{CE} = -2\text{V}, I_C = -50\text{mA}$
Transition frequency	f_T^{*1}	-	400	-	MHz	$V_{CE} = -10\text{V}$ $I_E = 200\text{mA}, f = 100\text{MHz}$
Collector output capacitance	C_{ob}	-	12	-	pF	$V_{CB} = -10\text{V}, I_E = 0\text{A}$ $f = 1\text{MHz}$
Turn-on time	t_{on}^{*2}	-	40	-	ns	$I_C = -0.5\text{A}, I_{B1} = -50\text{mA},$ $I_{B2} = 50\text{mA}, V_{CC} = -10\text{V}$
Storage time	t_{stg}^{*2}	-	250	-	ns	
Fall time	t_f^{*2}	-	35	-	ns	

*1 Pulsed

*2 See switching time test circuit

●Electrical characteristic curves (Ta=25°C)

<Tr.1>

Fig.1 Ground Emitter Propagation Characteristics

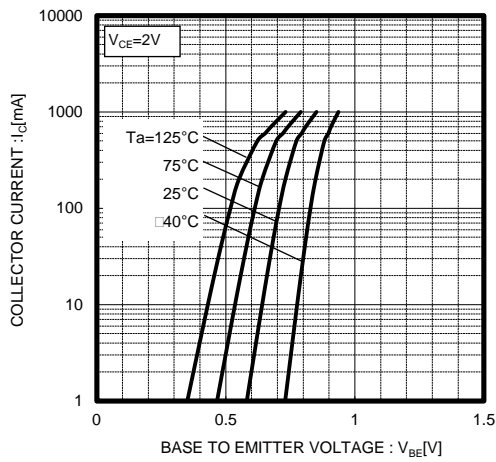


Fig.2 Typical Output Characteristics

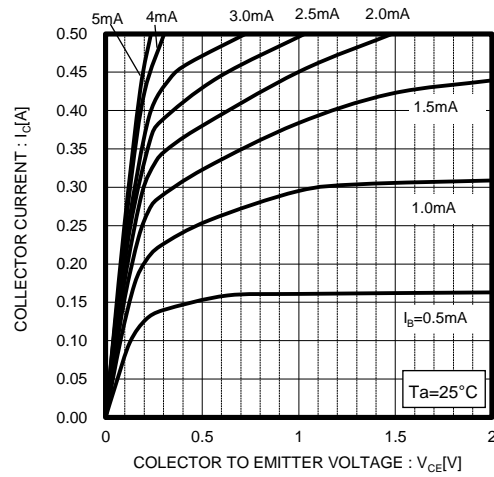


Fig.3 DC Current Gain vs. Collector Current (I)

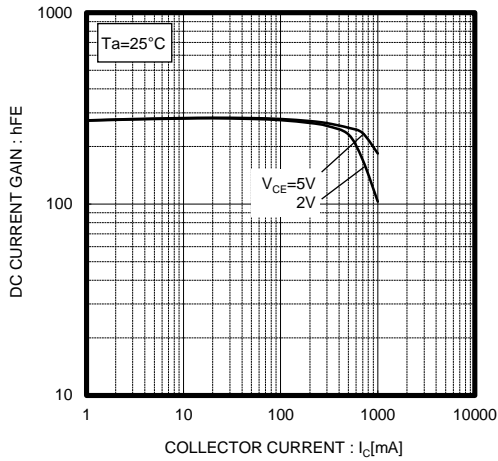


Fig.4 DC Current Gain vs. Collector Current (II)

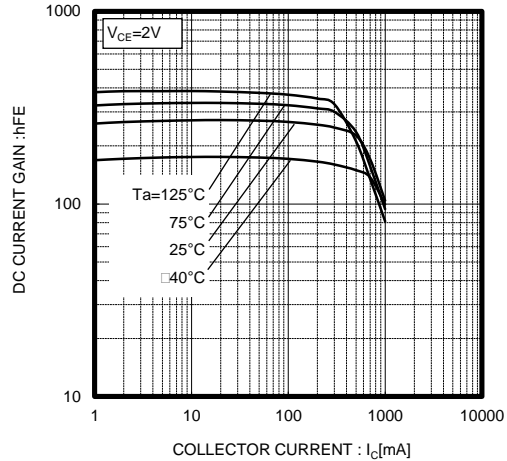


Fig.5 Collector-Emitter Saturation Voltage vs. Collector Current (I)

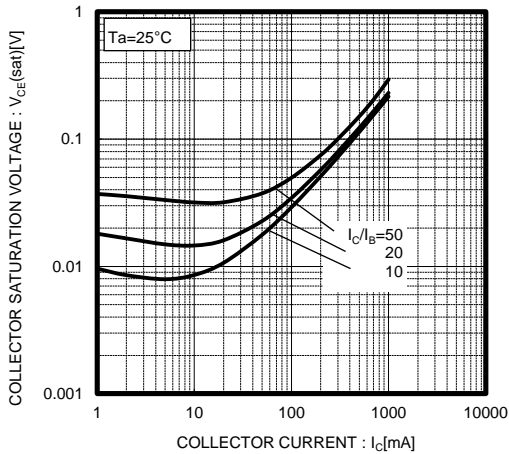


Fig.6 Collector-Emitter Saturation Voltage vs. Collector Current(II)

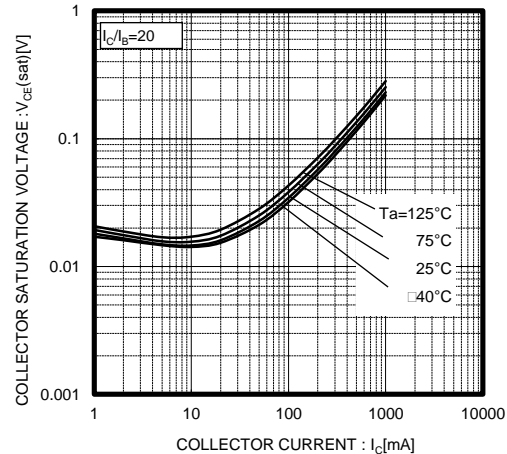


Fig.7 Emitter input capacitance vs. Emitter-Base Voltage
Collector output capacitance vs. Collector-Base

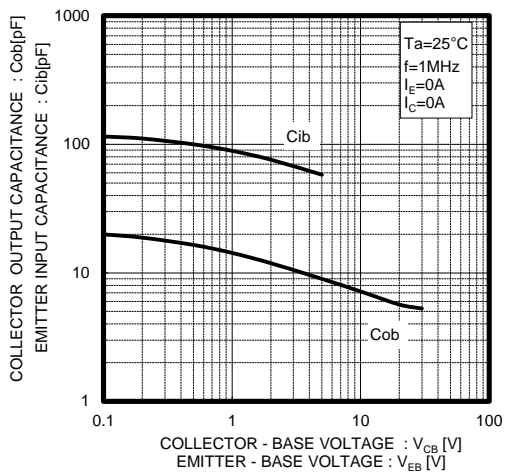


Fig.8 Gain Bandwidth Product vs. Emitter

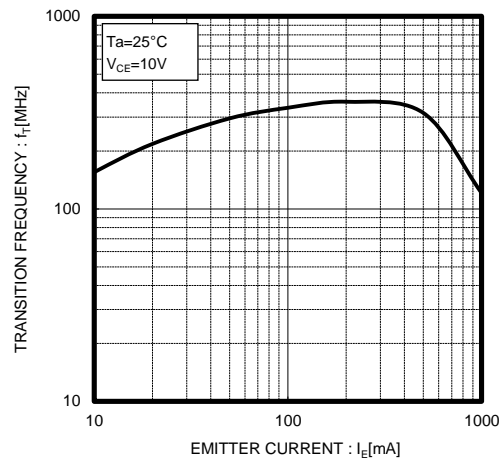
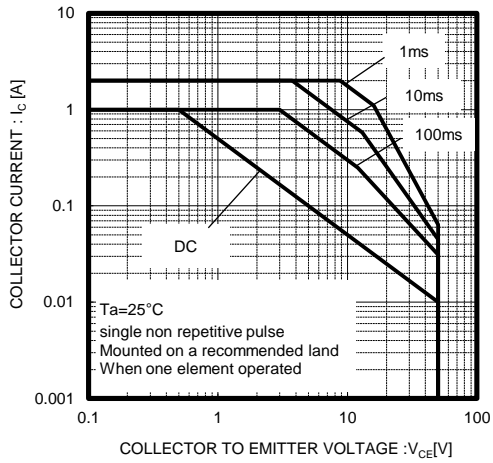


Fig.9 Safe Operating Area



<Tr.2>

Fig.1 Ground Emitter Propagation Characteristics

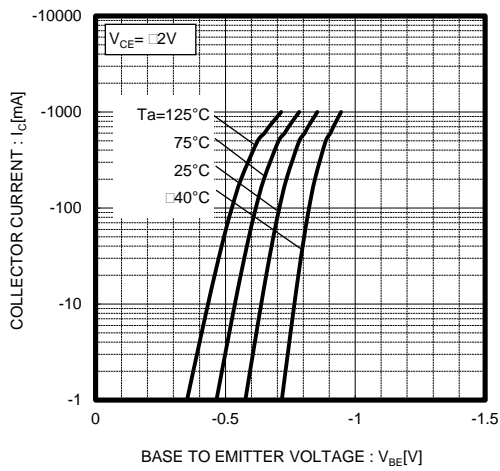


Fig.3 DC Current Gain vs. Collector Current (I)

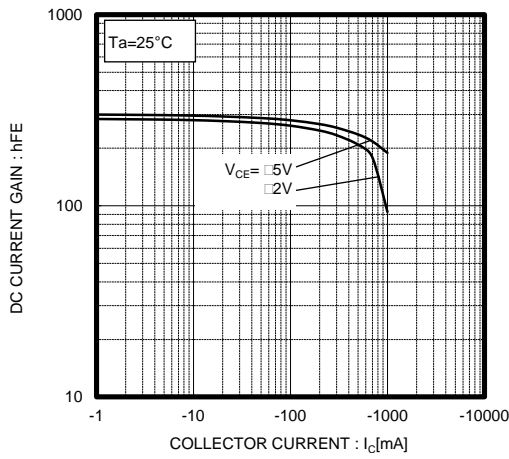


Fig.5 Collector-Emitter Saturation Voltage vs. Collector Current (I)

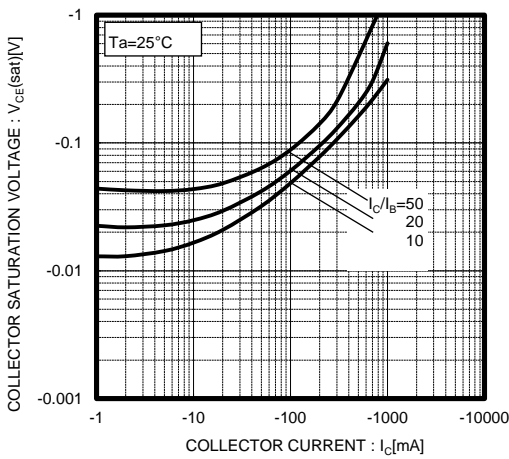


Fig.2 Typical Output Characteristics

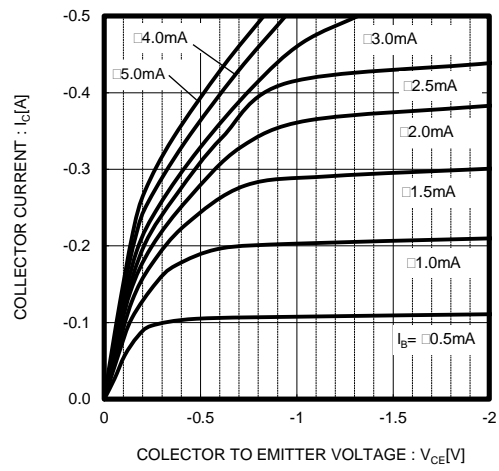


Fig.4 DC Current Gain vs. Collector Current (II)

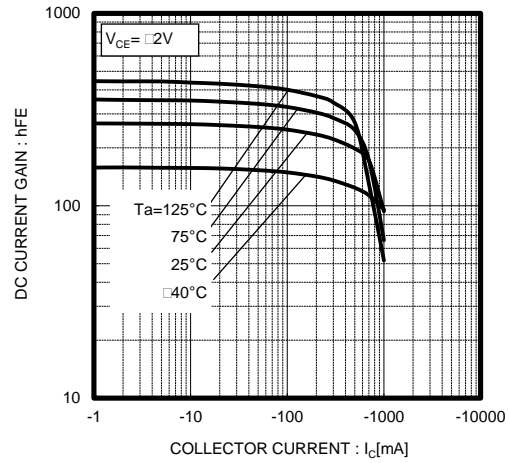


Fig.6 Collector-Emitter Saturation Voltage vs. Collector Current (II)

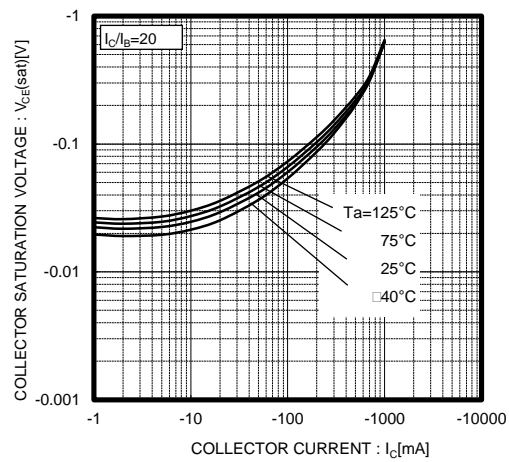


Fig.7 Emitter Input Capacitance vs. Emitter-Base Voltage
Collector Output Capacitance vs. Collector-Base Voltage

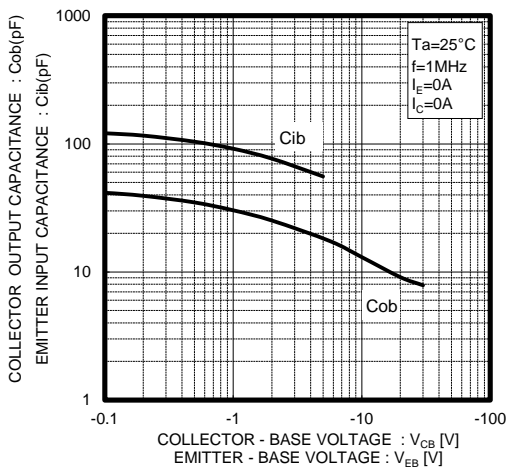


Fig.8 Gain Bandwidth Product vs. Emitter

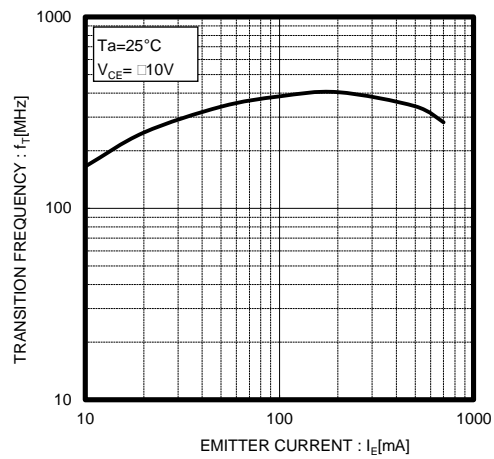
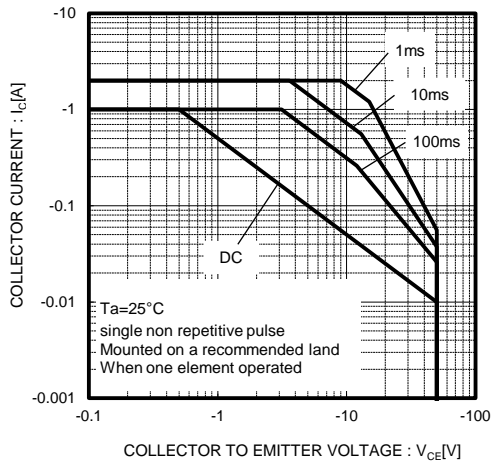
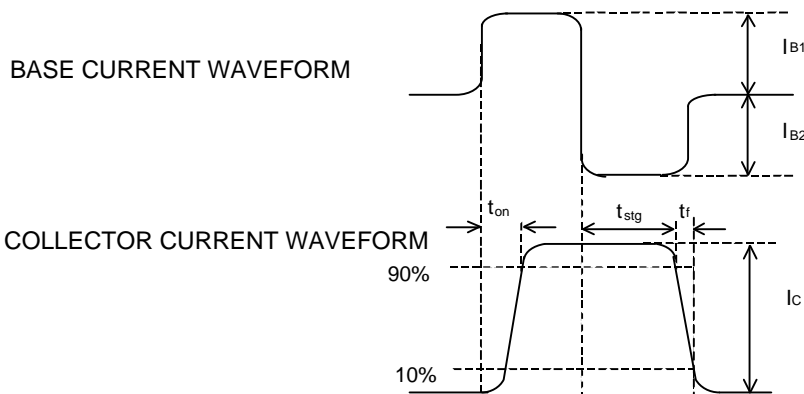
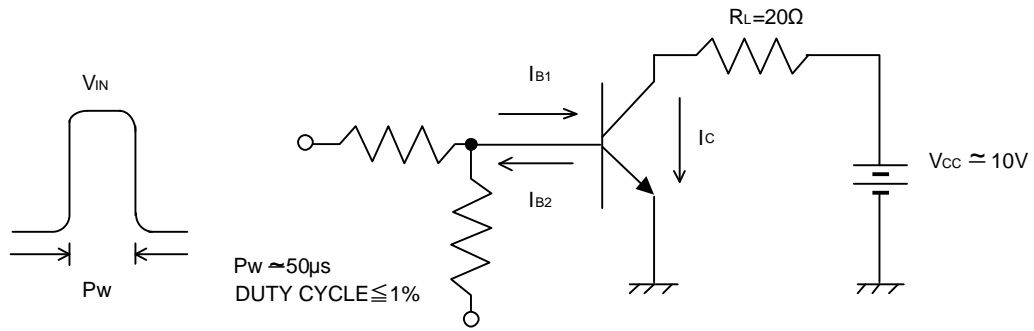


Fig.9 Safe Operating Area

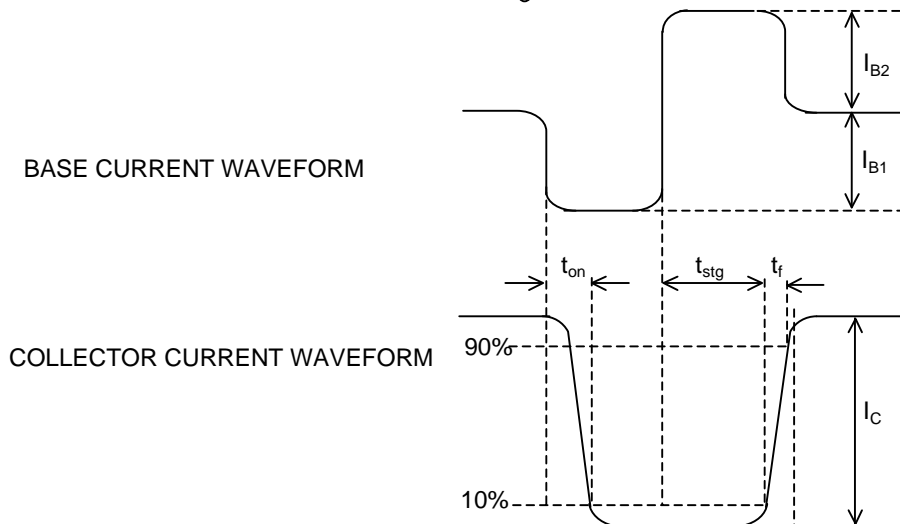
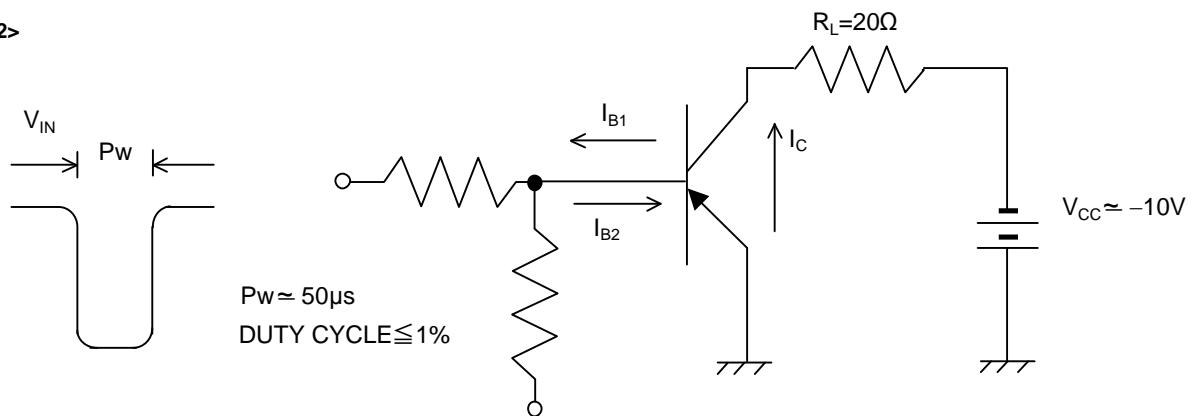


● Switching time test circuit

<Tr.1>



<Tr.2>



Notes

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