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Midium Power Transistors ($\pm 50V / \pm 3A$)

MP6Z13

● Structure

NPN/PNP Silicon epitaxial planar transistor

● Features

1) Low saturation voltage, typically

$$V_{CE(sat)} = 0.35V \text{ (Max.) } (I_C / I_B = 1A / 50mA)$$

$$V_{CE(sat)} = -0.40V \text{ (Max.) } (I_C / I_B = -1A / -50mA)$$

2) High speed switching

● Applications

Low Frequency Amplifier
Driver

● Packaging specifications

Type	Package	MPT6
	Code	TR
	Basic ordering unit (pieces)	1000

● 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	3	A
	Pulsed	$I_{CP} *1$	6	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	-3	A
	Pulsed	$I_{CP} *1$	-6	A

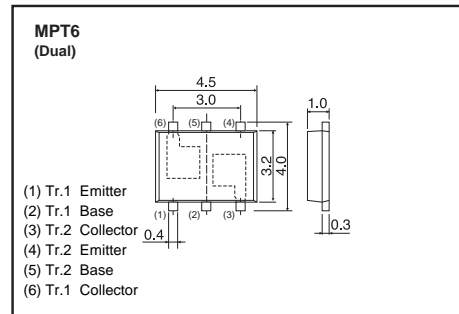
<Tr.1 and Tr.2>

Parameter	Symbol	Limits	Unit
Power dissipation	$P_D *2$	2.0	W/Total
	$P_D *2$	1.4	W/Element
Junction temperature	T_j	150	°C
Range of storage temperature	T_{stg}	-55 to 150	°C

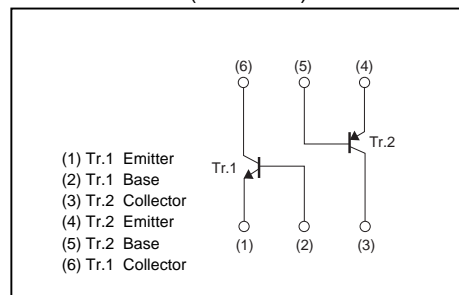
*1 Pw=10ms, Single Pulse

*2 Mounted on a 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	$I_C = 1\text{A}, I_B = 50\text{mA}$
DC current gain	h_{FE}	180	-	450	-	$V_{CE} = 3\text{V}, I_C = 50\text{mA}$
Transition frequency	f_T^{*1}	-	320	-	MHz	$V_{CE} = 10\text{V}$ $I_E = -500\text{mA}, f = 100\text{MHz}$
Collector output capacitance	C_{ob}	-	13	-	pF	$V_{CB} = 10\text{V}, I_E = 0\text{A}$ $f = 1\text{MHz}$
Turn-on time	t_{on}^{*2}	-	50	-	ns	$I_C = 1.5\text{A}, I_{B1} = 150\text{mA},$ $I_{B2} = -150\text{mA}, V_{CC} = 10\text{V}$
Storage time	t_{stg}^{*2}	-	450	-	ns	
Fall time	t_f^{*2}	-	80	-	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	$I_C = -1\text{A}, I_B = -50\text{mA}$
DC current gain	h_{FE}	180	-	450	-	$V_{CE} = -3\text{V}, I_C = -50\text{mA}$
Transition frequency	f_T^{*1}	-	300	-	MHz	$V_{CE} = -10\text{V}$ $I_E = 500\text{mA}, f = 100\text{MHz}$
Collector output capacitance	C_{ob}	-	24	-	pF	$V_{CB} = -10\text{V}, I_E = 0\text{A}$ $f = 1\text{MHz}$
Turn-on time	t_{on}^{*2}	-	45	-	ns	$I_C = -1.5\text{A}, I_{B1} = -150\text{mA},$ $I_{B2} = 150\text{mA}, V_{CC} = -10\text{V}$
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>

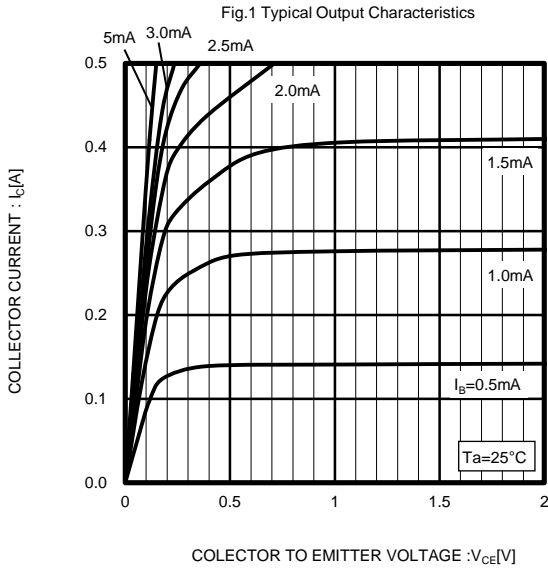


Fig.3. DC Current Gain vs. Collector Current (II)

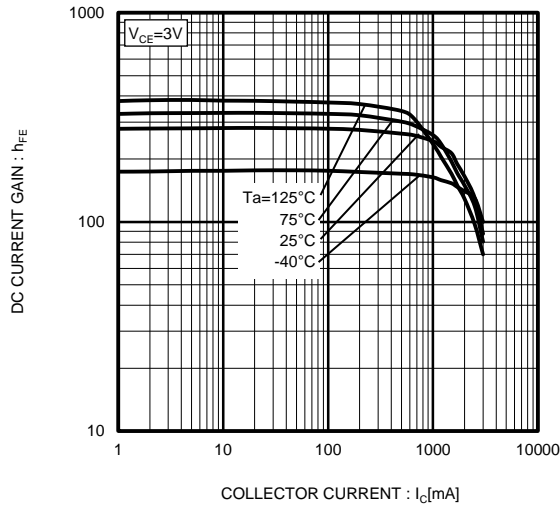


Fig.5 Collector-Emitter Saturation Voltage vs. Collector Current (II)

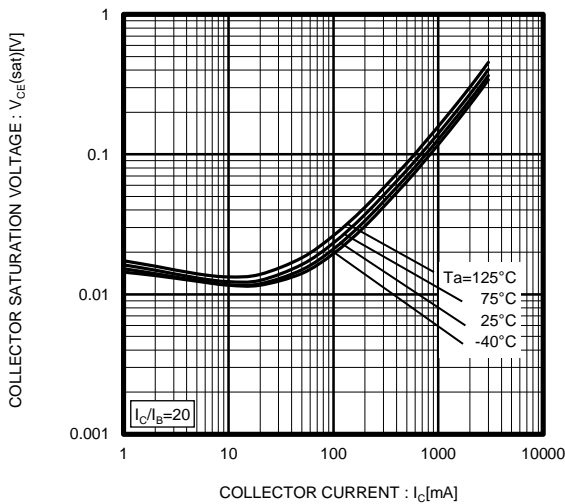


Fig.2 DC Current Gain vs. Collector Current (I)

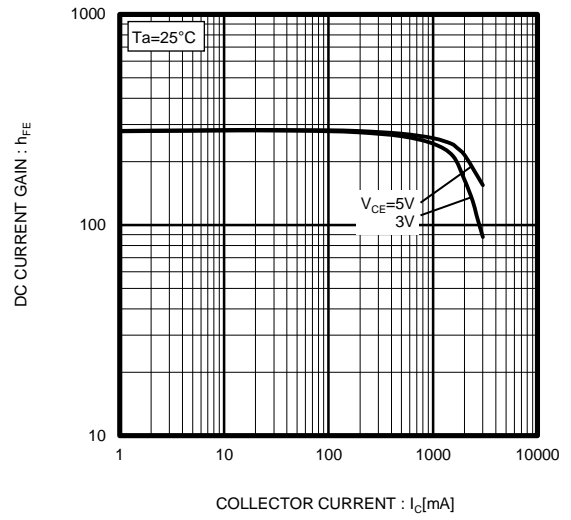


Fig.4 Collector-Emitter Saturation Voltage vs. Collector Current (I)

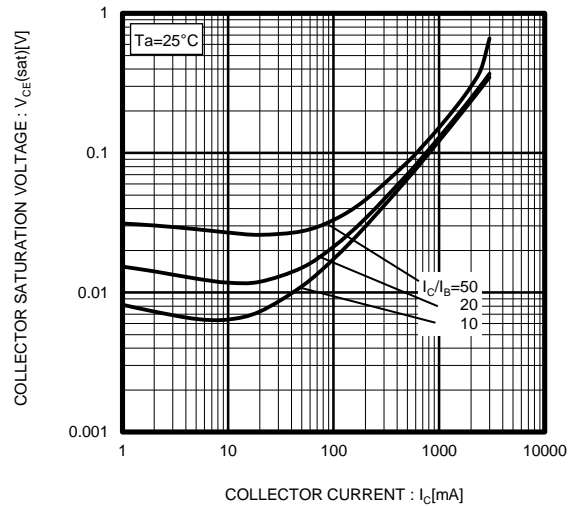


Fig.6 Ground Emitter Propagation Characteristics

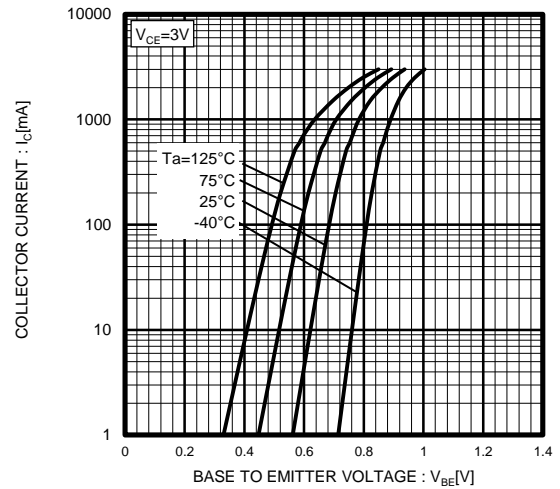


Fig.7 Emitter Input Capacitance vs. Emitter-Base Voltage
Collector Output Capacitance vs. Collector-Base Voltage

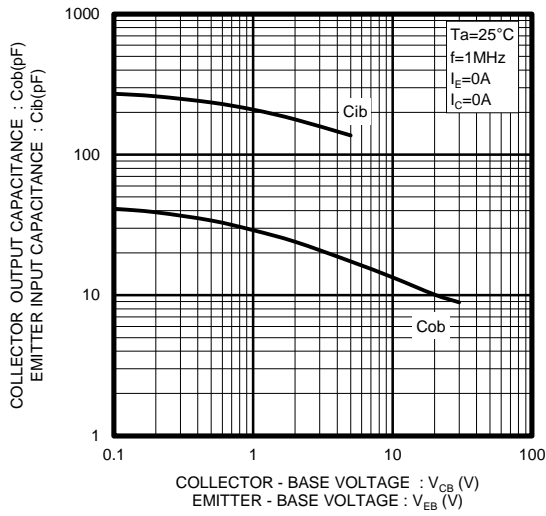


Fig.9 Safe Operating Area

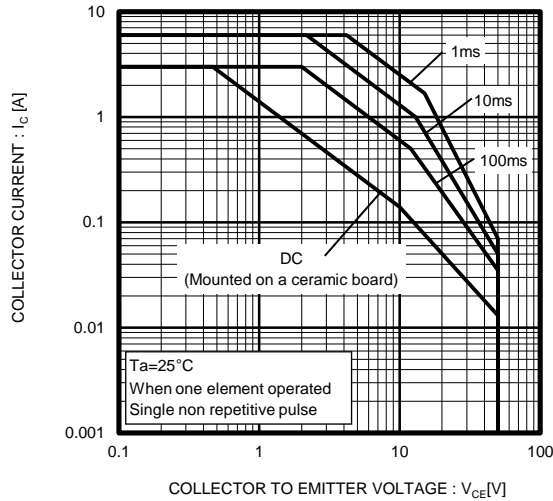
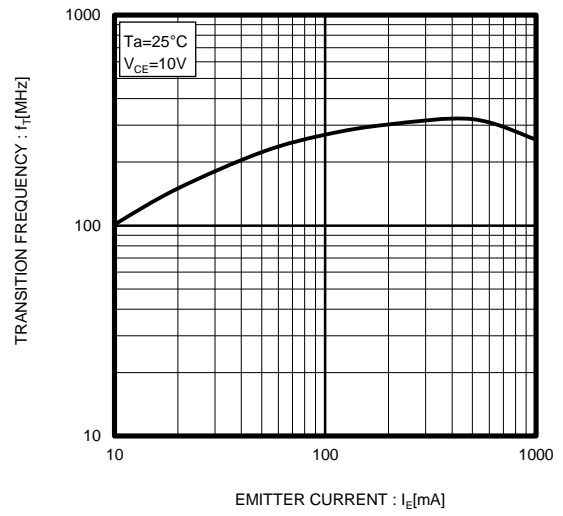


Fig.8 Gain Bandwidth Product vs. Emitter Current



<Tr.2>

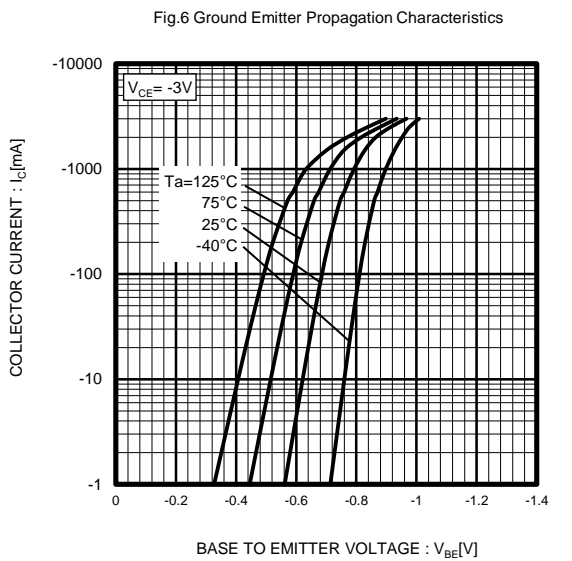
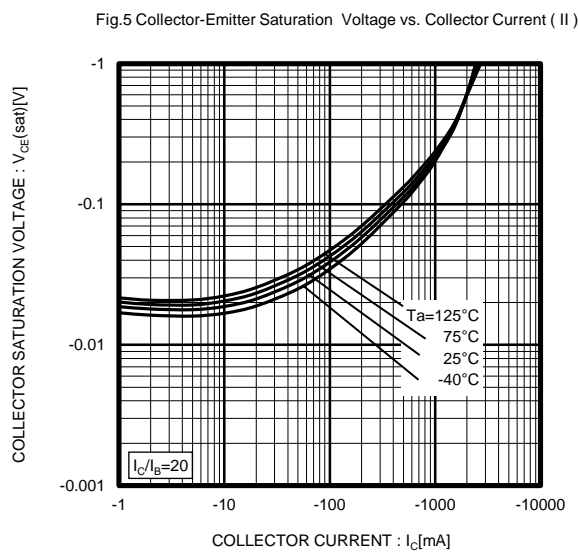
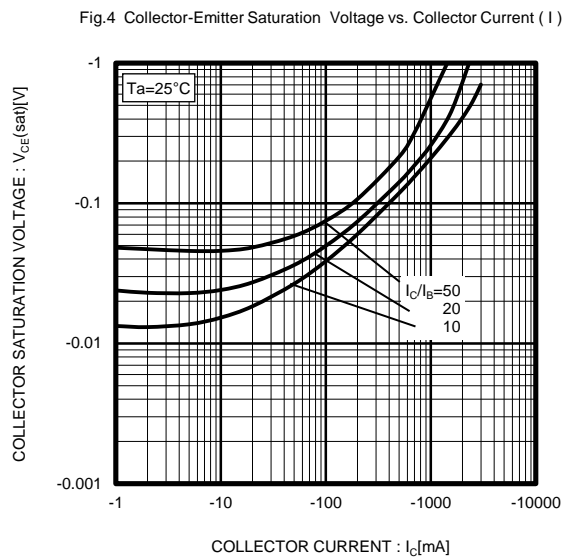
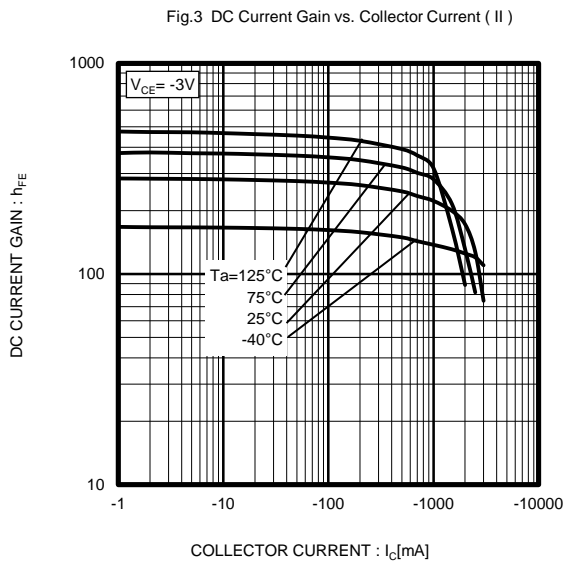
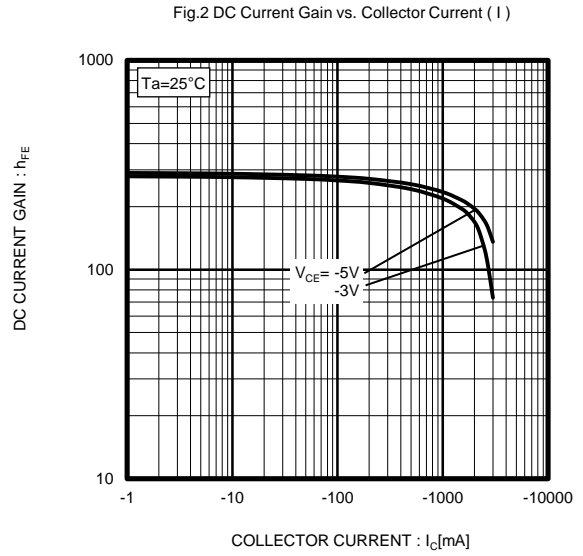
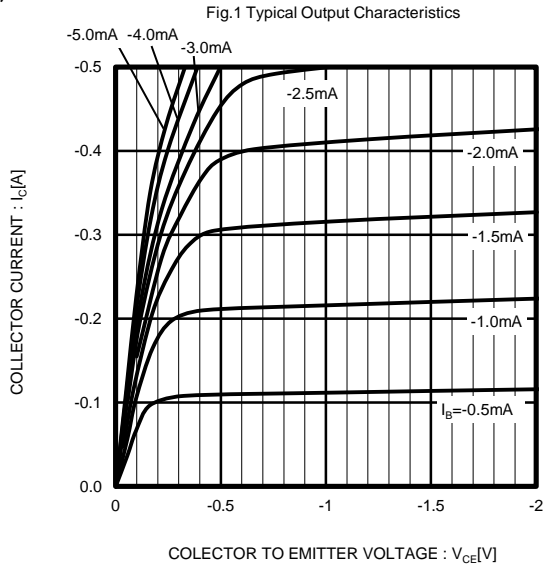


Fig.7 Emitter Input Capacitance vs. Emitter-Base Voltage
Collector Output Capacitance vs. Collector-Base Voltage

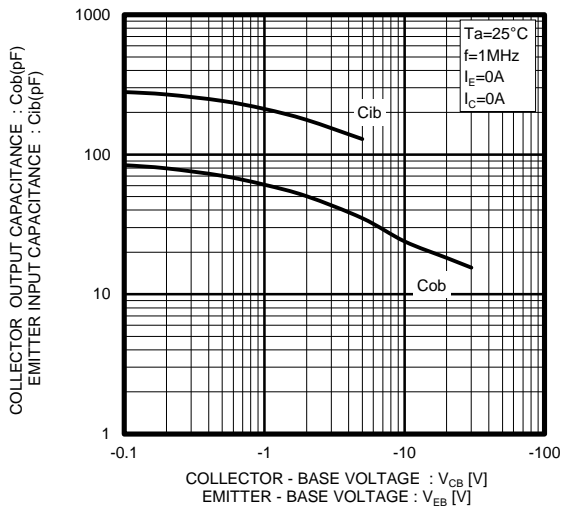


Fig.8 Gain Bandwidth Product vs. Emitter Current

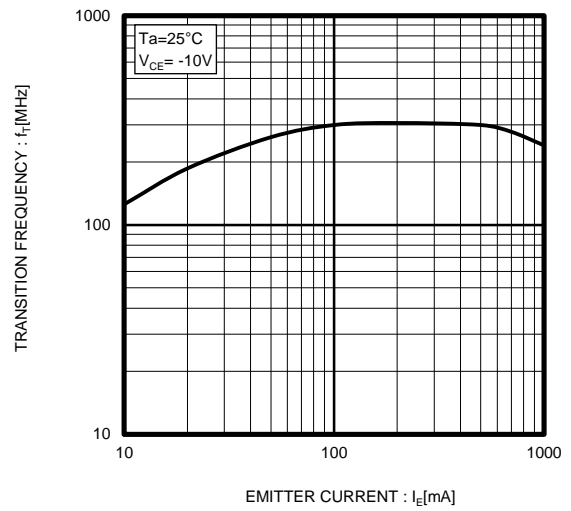
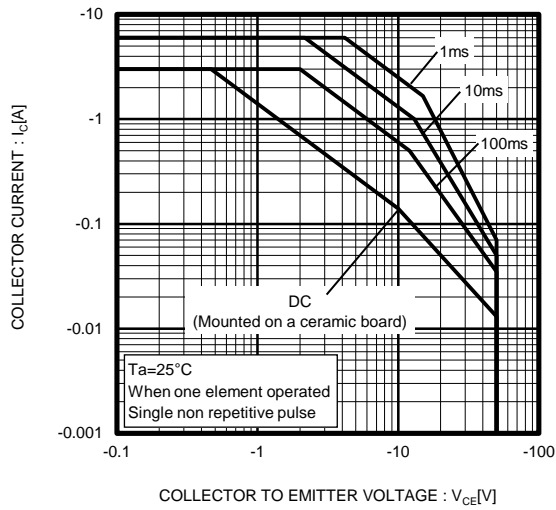
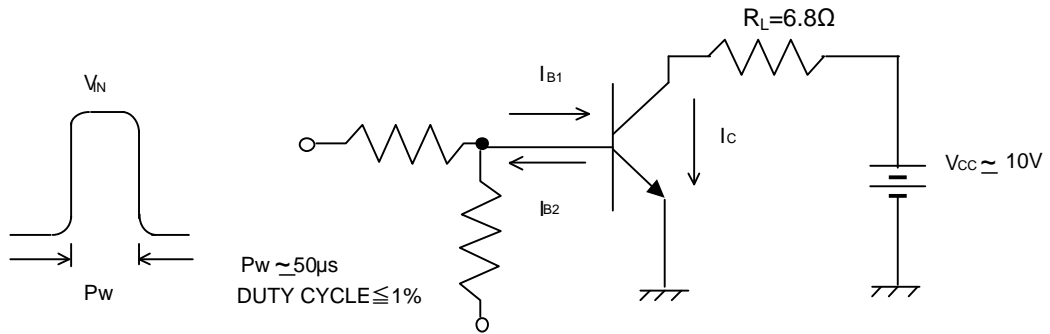


Fig.9 Safe Operating Area

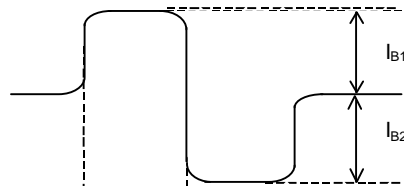


●Switching time test circuit

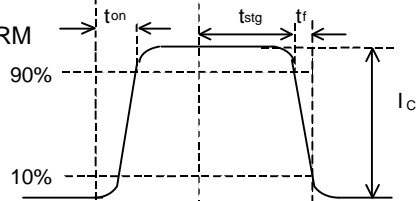
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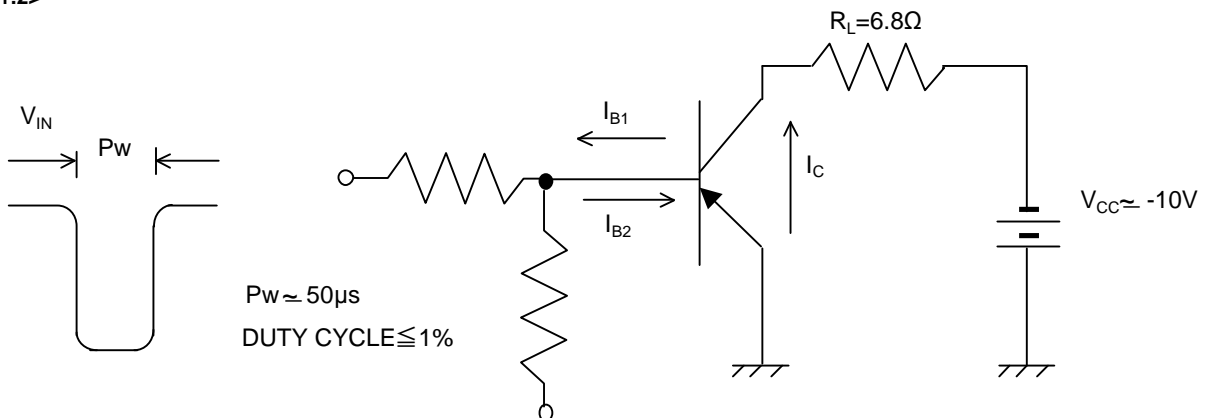
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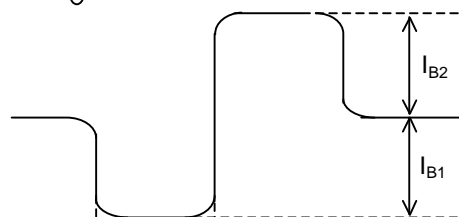
COLLECTOR CURRENT WAVEFORM



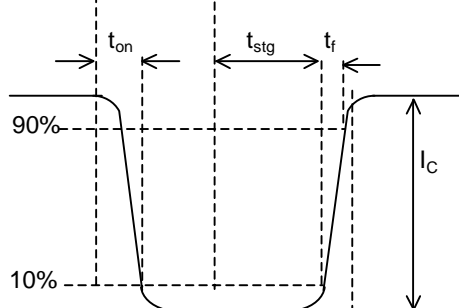
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BASE CURRENT WAVEFORM



COLLECTOR CURRENT WAVEFORM



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