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# Medium Power Transistors (30V / 3A)

## QS5W1

### ● Structure

NPN Silicon epitaxial planar transistor

### ● Features

- 1) Low saturation voltage  
 $V_{CE(sat)} = 0.4V$  (Max.) ( $I_C / I_B = 1A / 50mA$ )
- 2) High speed switching

### ● Applications

Low Frequency Amplifier  
Driver

### ● Packaging specifications

Type	Package	TSMT5
	Code	TR
	Basic ordering unit (pieces)	3000

### ● Absolute maximum ratings (Ta = 25°C)

<It is the same ratings for the Tr.1 and Tr.2>

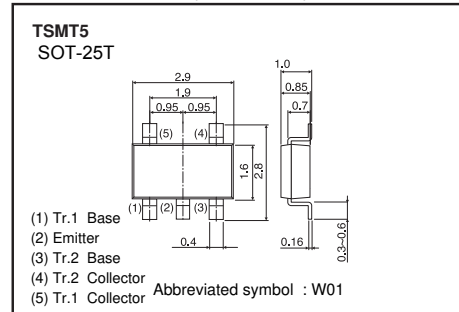
Parameter	Symbol	Limits	Unit
Collector-base voltage	$V_{CBO}$	30	V
Collector-emitter voltage	$V_{CEO}$	30	V
Emitter-base voltage	$V_{EBO}$	6	V
Collector current	DC	$I_C$	3 A
	Pulsed	$I_{CP}^{*1}$	6 A
Power dissipation	$P_D^{*2}$	0.5	W/Total
	$P_D^{*3}$	1.25	W/Total
	$P_D^{*3}$	0.9	W/Element
Junction temperature	$T_j$	150	°C
Range of storage temperature	$T_{stg}$	-55 to 150	°C

\*1  $P_w=10ms$ , Single Pulse

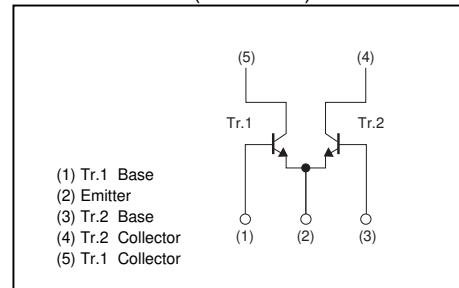
\*2 Mounted on a recommended land.

\*3 Mounted on a 25 x 25 x 0.8[mm] ceramic board.

### ● Dimensions (Unit : mm)



### ● Inner circuit (Unit : mm)



●Electrical characteristics (Ta=25°C)

<It is the same ratings for the Tr.1 and Tr.2>

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-emitter breakdown voltage	$BV_{CEO}$	30	-	-	V	$I_C=1\text{mA}$
Collector-base breakdown voltage	$BV_{CBO}$	30	-	-	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	$\mu\text{A}$	$V_{CB}=30\text{V}$
Emitter cut-off current	$I_{EBO}$	-	-	1	$\mu\text{A}$	$V_{EB}=4\text{V}$
Collector-emitter saturation voltage	$V_{CE(sat)}^{*1}$	-	200	400	mV	$I_C=1\text{A}, I_B=50\text{mA}$
DC current gain	$h_{FE}$	200	-	500	-	$V_{CE}=2\text{V}, I_C=500\text{mA}$
Transition frequency	$f_T^{*1}$	-	270	-	MHz	$V_{CE}=10\text{V}$ $I_E=-100\text{mA}, f=100\text{MHz}$
Collector output capacitance	$C_{ob}$	-	16	-	pF	$V_{CB}=10\text{V}, I_E=0\text{A}$ $f=1\text{MHz}$
Turn-on time	$t_{on}^{*2}$	-	25	-	ns	$I_C=1.5\text{A}, I_{B1}=150\text{mA},$ $I_{B2}=-150\text{mA}, V_{CC}\approx 12\text{V}$
Storage time	$t_{stg}^{*2}$	-	300	-	ns	
Fall time	$t_f^{*2}$	-	20	-	ns	

\*1 Pulsed

\*2 See switching time test circuit

●Electrical characteristic curves (Ta=25°C)

Fig.1 Typical Output Characteristics

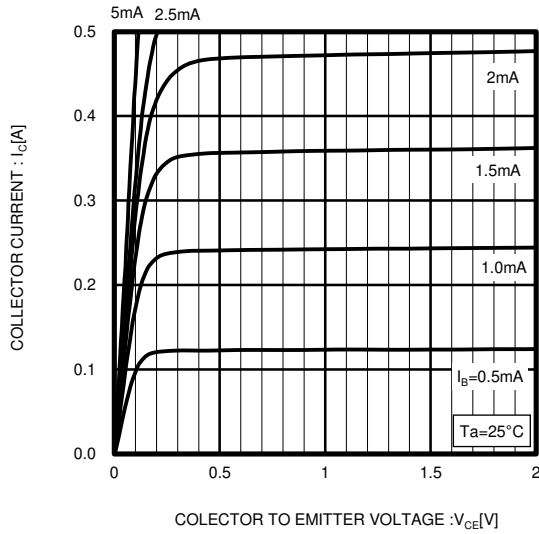


Fig.2 DC Current Gain vs. Collector Current ( I )

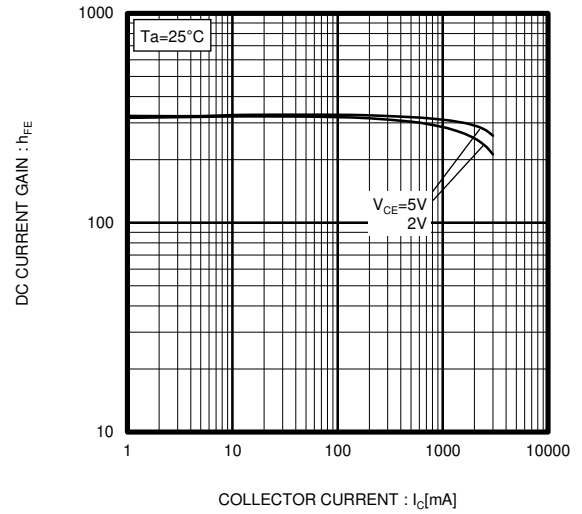


Fig3. DC Current Gain vs. Collector Current ( II )

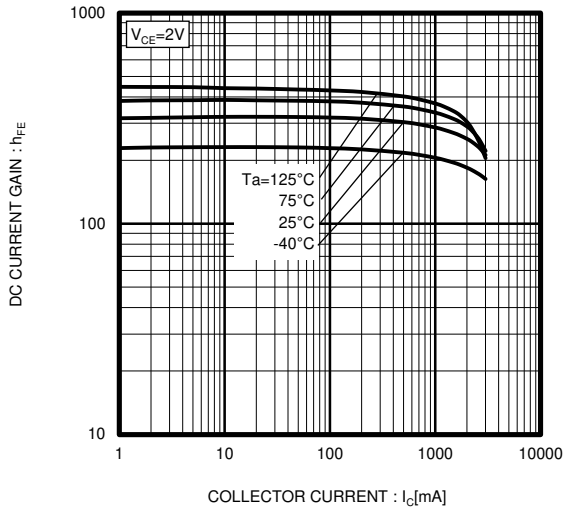


Fig.4 Collector-Emitter Saturation Voltage vs. Collector Current ( I )

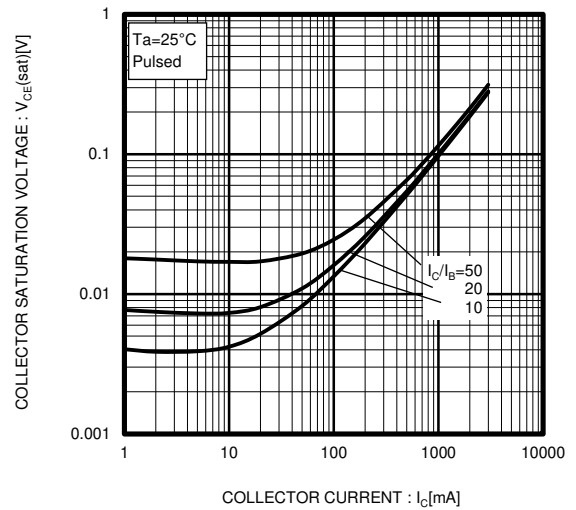


Fig.5 Collector-Emitter Saturation Voltage vs. Collector Current ( II )

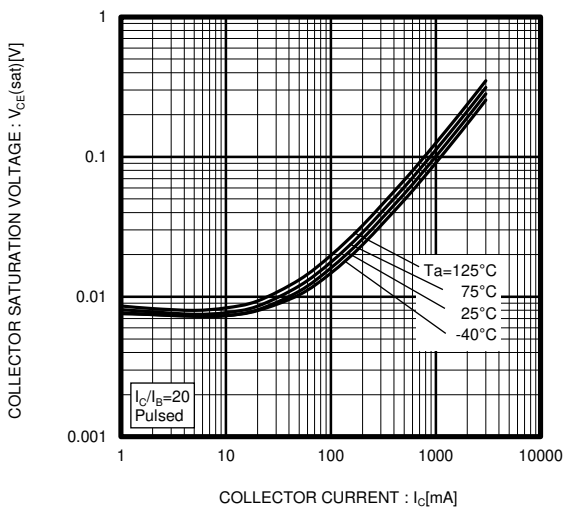


Fig.6 Ground Emitter Propagation Characteristics

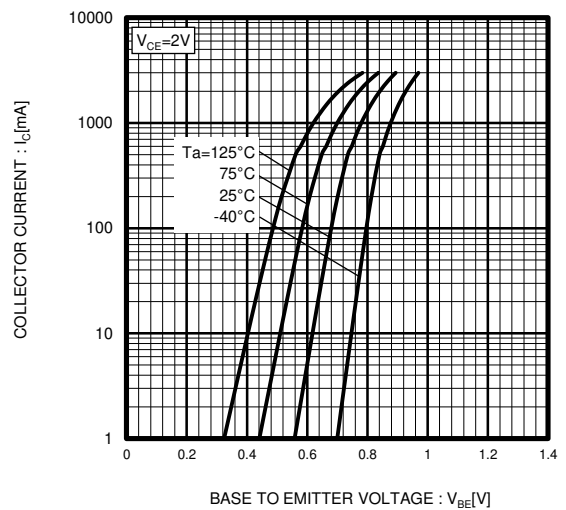


Fig.7 Emitter Input Capacitance vs. Emitter-Base Voltage  
Collector Output Capacitance vs. Collector-Base Voltage

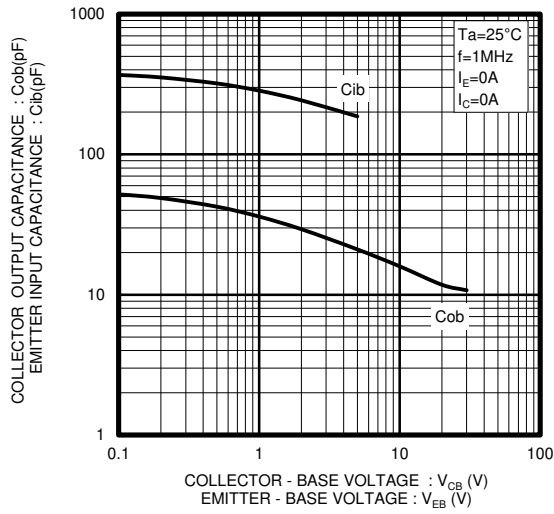


Fig.8 Gain Bandwidth Product vs. Emitter Current

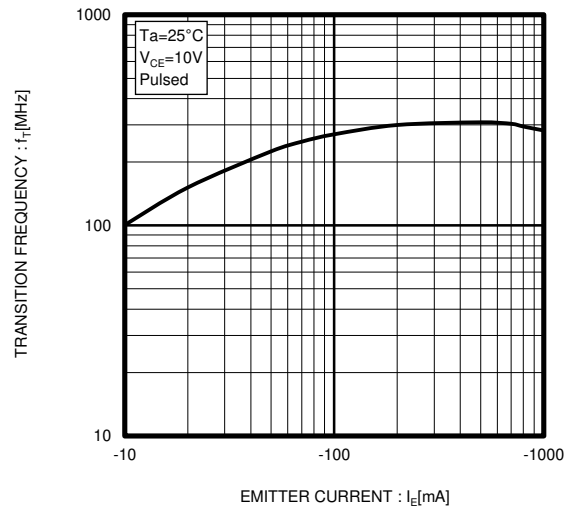
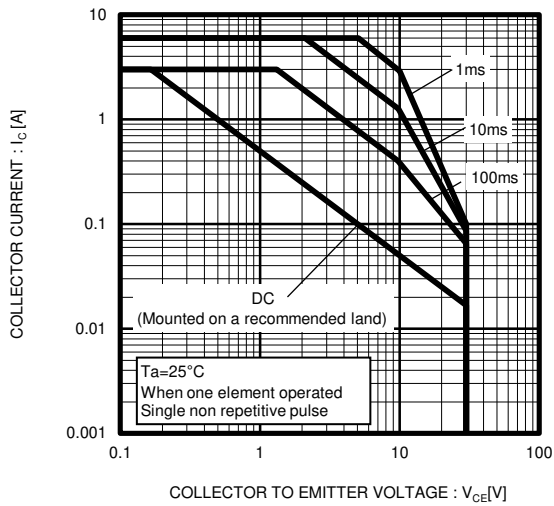
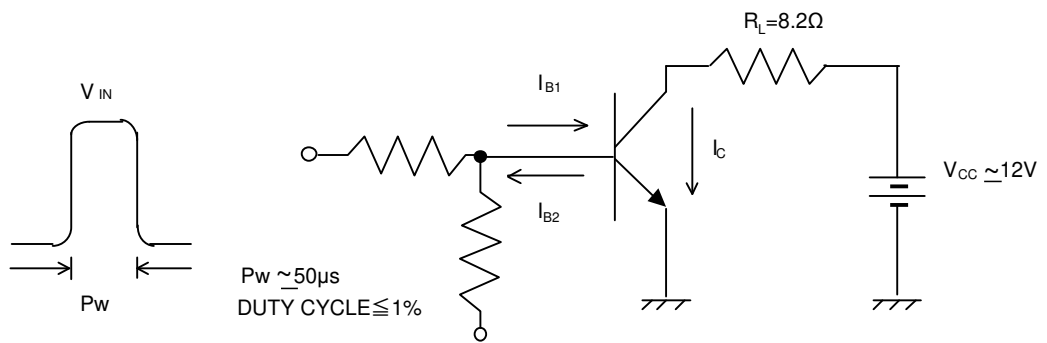


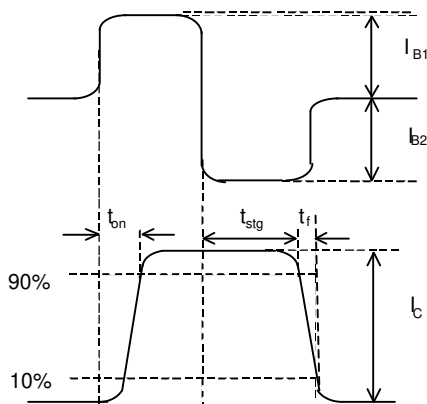
Fig.9 Safe Operating Area



● Switching time test circuit



BASE CURRENT WAVEFORM



COLLECTOR CURRENT WAVEFORM

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