

# Midium Power Transistors (30V / 3A)

## QS5W1

### ● Structure

NPN Silicon epitaxial planar transistor

### ● Features

1) Low saturation voltage

$$V_{CE(sat)} = 0.4V \text{ (Max.) } (I_C / I_B = 1A / 50mA)$$

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>

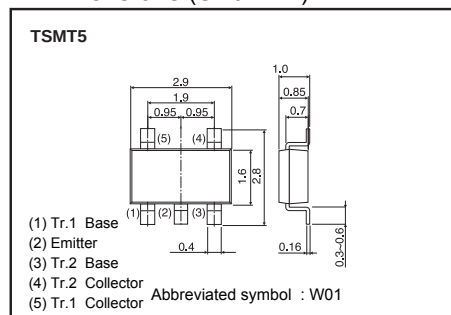
| Parameter                    |        | Symbol        | Limits     | Unit      |
|------------------------------|--------|---------------|------------|-----------|
| Collector-base voltage       |        | $V_{CBO}$     | 30         | V         |
| Collector-emitter voltage    |        | $V_{CEO}$     | 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 Pw=10ms, Single Pulse

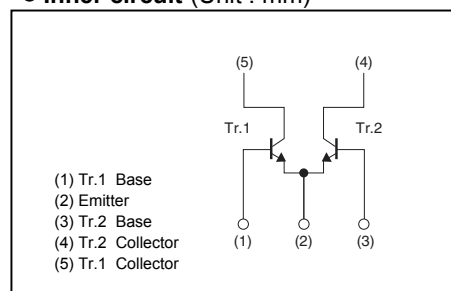
\*2 Mounted on a recommended land.

\*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           | $V_{CE} = 10\text{V}$<br>$I_E = -100\text{mA}, f = 100\text{MHz}$                                 |
| Collector output capacitance         | $C_{ob}$           | -    | 16   | -    | pF            | $V_{CB} = 10\text{V}, I_E = 0\text{A}$<br>$f = 1\text{MHz}$                                       |
| Turn-on time                         | $t_{on}^{*2}$      | -    | 25   | -    | ns            | $I_C = 1.5\text{A}, I_{B1} = 150\text{mA},$<br>$I_{B2} = -150\text{mA}, V_{CC} \simeq 12\text{V}$ |
| 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

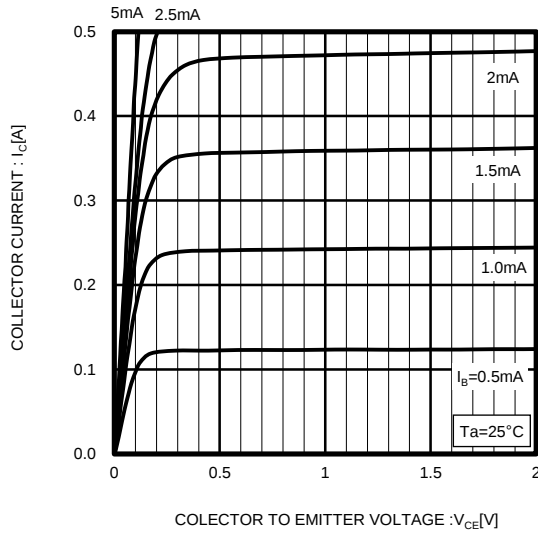


Fig.2 DC Current Gain vs. Collector Current ( I )

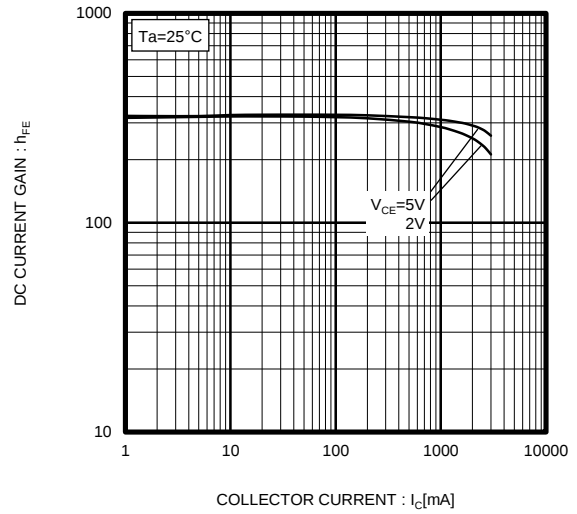


Fig.3 DC Current Gain vs. Collector Current ( II )

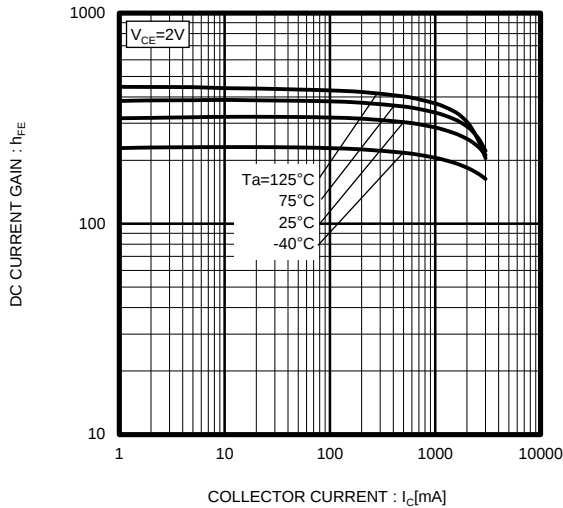


Fig.4 Collector-Emitter Saturation Voltage vs. Collector Current ( I )

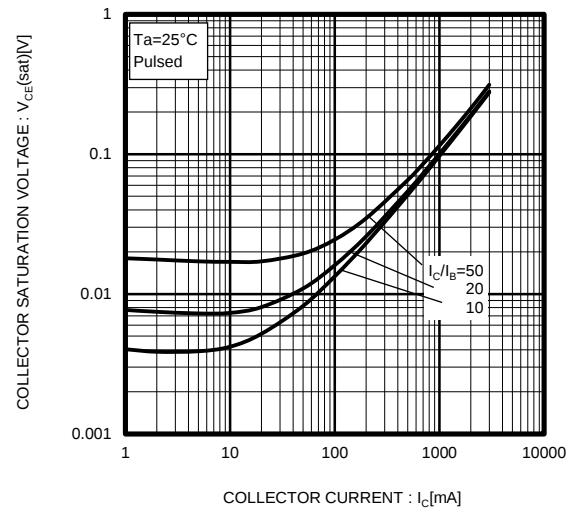


Fig.5 Collector-Emitter Saturation Voltage vs. Collector Current ( II )

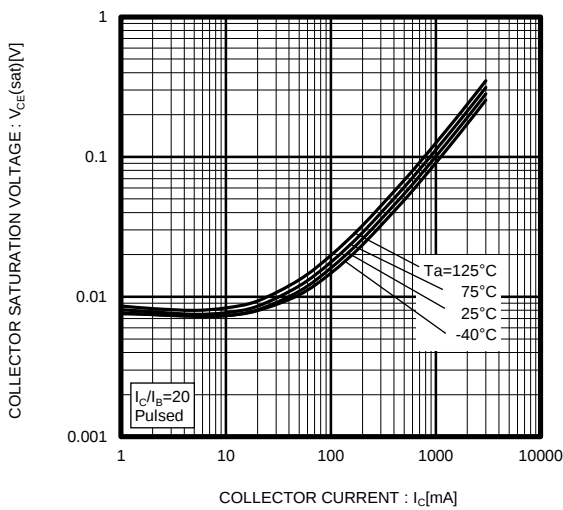


Fig.6 Ground Emitter Propagation Characteristics

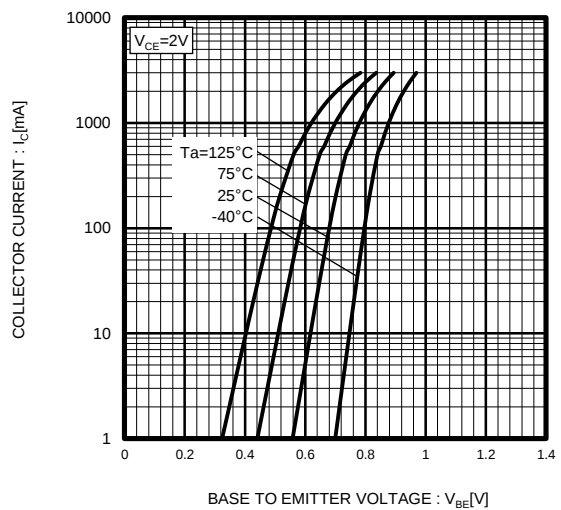


Fig.7 Emitter Input Capacitance vs. Emitter-Base Voltage  
Collector Output Capacitance vs. Collector-Base Voltage

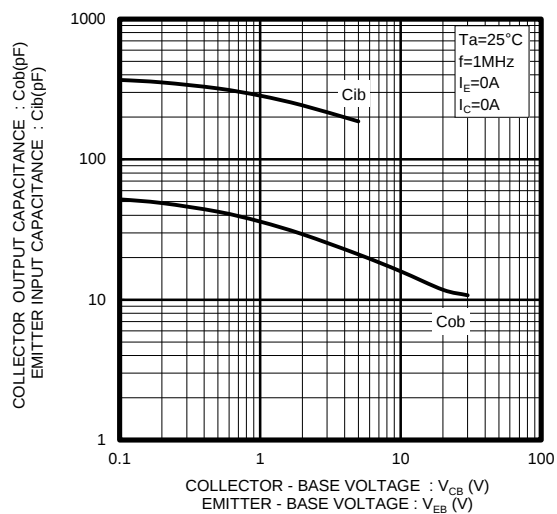


Fig.8 Gain Bandwidth Product vs. Emitter Current

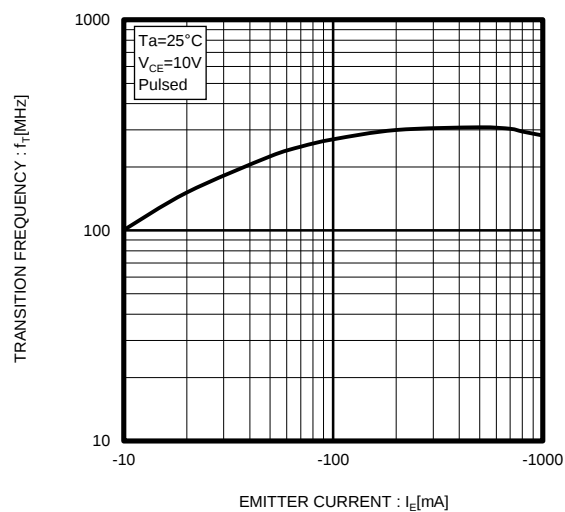
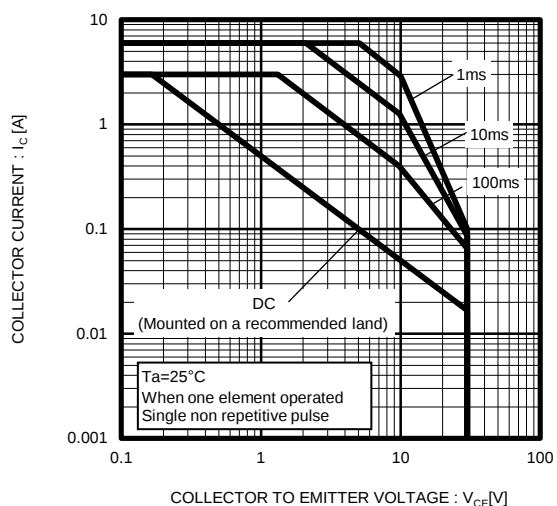
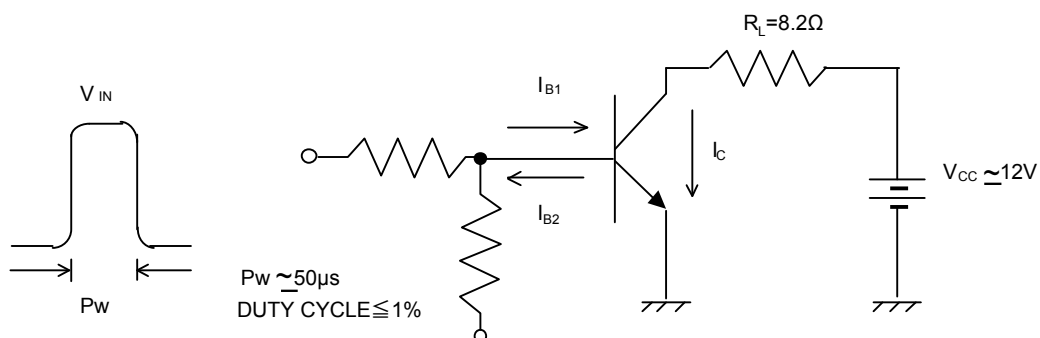


Fig.9 Safe Operating Area

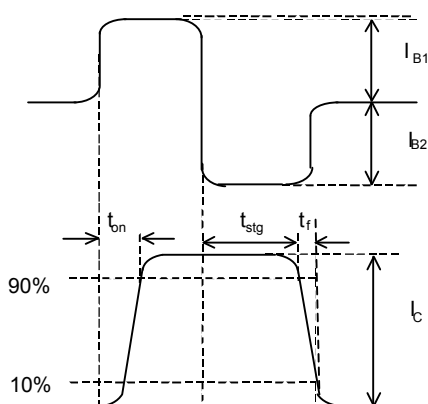


● Switching time test circuit



BASE CURENT WAVEFORM

COLLECTOR CURRENT WAVEFORM



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