Midium Power Transistors (30V / 3A)

QS5W1

● Structure

NPN Silicon epitaxial planar transistor

● Features

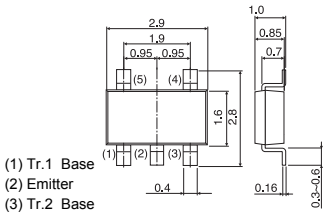
1) Low saturation voltage
   $V_{CE\ (sat)}$ = 0.4V (Max.) (I_C / I_B= 1A / 50mA)
2) High speed switching

● Applications

Low Frequency Amplifier
Driver

● Dimensions (Unit : mm)

TSMT5



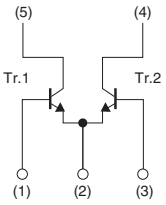
(1) Tr.1 Base
(2) Emitter
(3) Tr.2 Base
(4) Tr.2 Collector
(5) Tr.1 Collector

Abbreviated symbol : W01

● Packaging specifications

Type	Package	TSMT5
	Code	TR
	Quantity (pcs)	3000

● Inner circuit (Unit : mm)



(1) Tr.1 Base
(2) Emitter
(3) Tr.2 Base
(4) Tr.2 Collector
(5) Tr.1 Collector

● 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.

●**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= 1mA
Collector-base breakdown voltage	BV_{CBO}	30	-	-	V	I_C= 100μA
Emitter-base breakdown voltage	BV_{EBO}	6	-	-	V	I_E= 100μA
Collector cut-off current	I_{CBO}	-	-	1	μA	V_{CB}= 30V
Emitter cut-off current	I_{EBO}	-	-	1	μA	V_{EB}= 4V
Collector-emitter staturation voltage	$V_{CE(sat)}$ *1	-	200	400	mV	I_C= 1A, I_B= 50mA
DC current gain	h_{FE}	200	-	500	-	V_{CE}= 2V, I_C= 500mA
Transition frequency	f_T *1	-	270	-	MHz	V_{CE}= 10V I_E=-100mA, f=100MHz
Collector output capacitance	C_{ob}	-	16	-	pF	V_{CB}= 10V, I_E=0A f=1MHz
Turn-on time	t_{on} *2	-	25	-	ns	I_C= 1.5A, I_{B1}= 150mA, I_{B2}=-150mA, V_{CC}≒12V
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

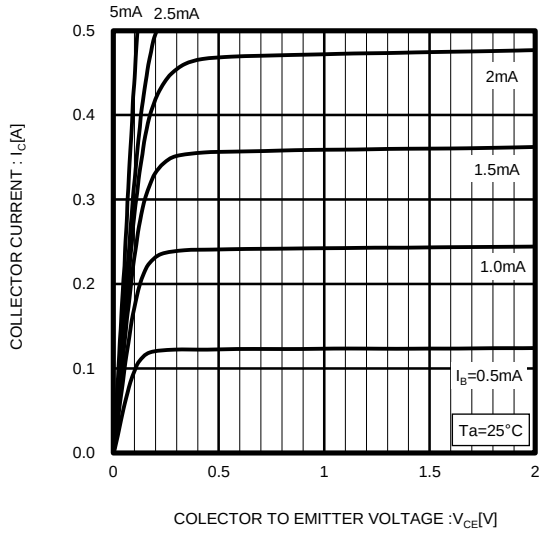


Fig.2 DC Current Gain vs. Collector Current (I)

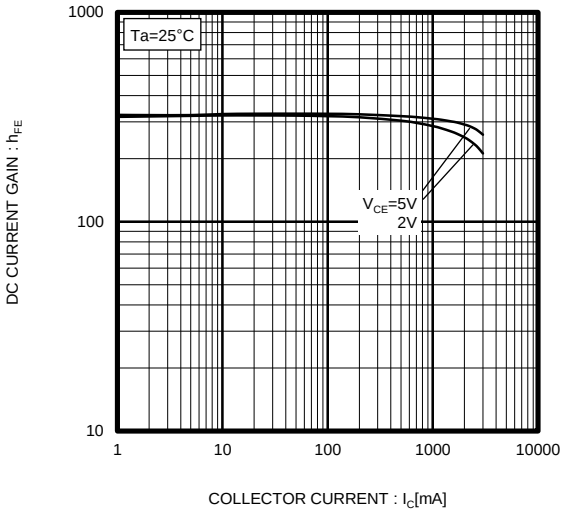


Fig3. DC Current Gain vs. Collector Current (II)

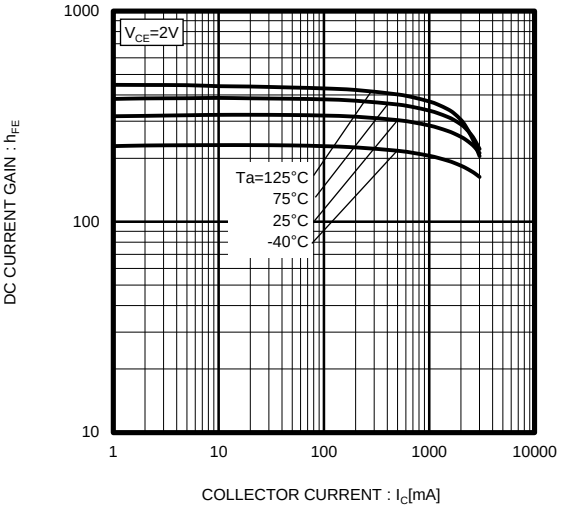


Fig.4 Collector-Emitter Saturation Voltage vs. Collector Current (I)

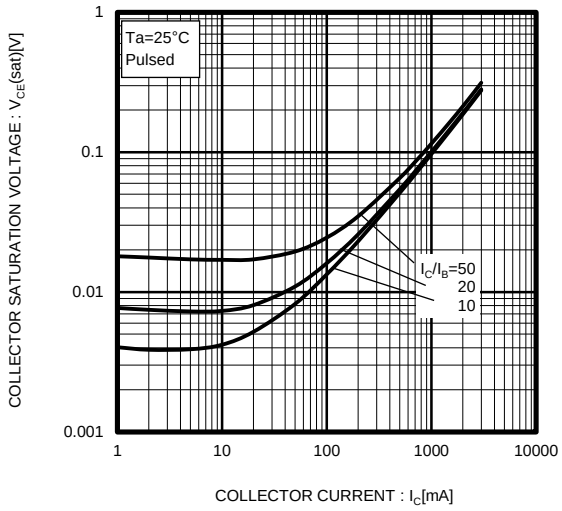


Fig.5 Collector-Emitter Saturation Voltage vs. Collector Current (II)

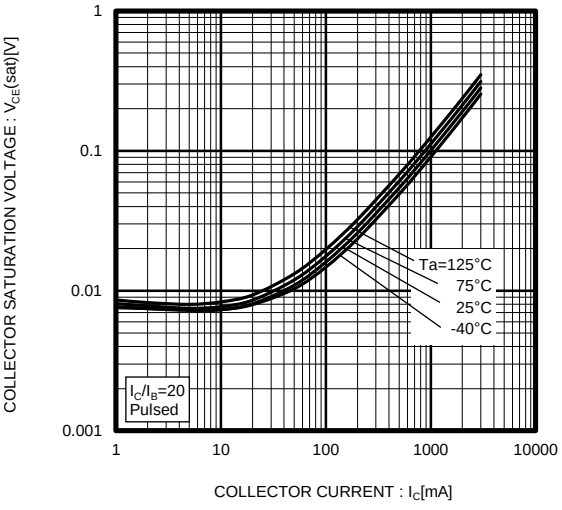


Fig.6 Ground Emitter Propagation Characteristics

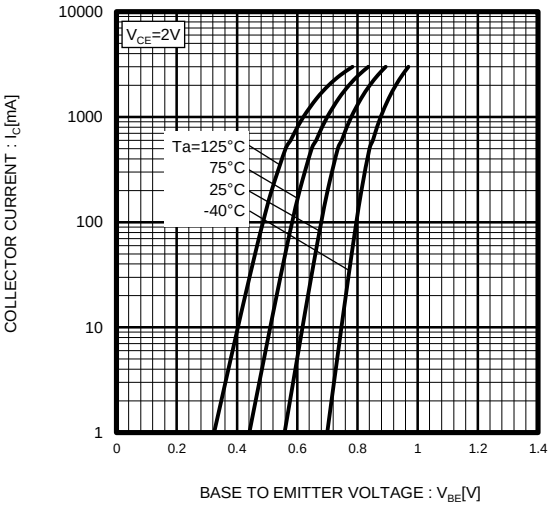


Fig.7 Emitter Input Capacitance vs. Emitter-Base Voltage
Collector Output Capacitance vs. Collector-Base Voltage

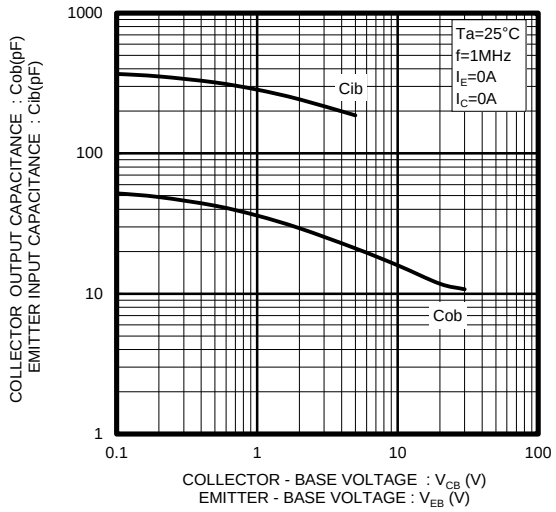


Fig.8 Gain Bandwidth Product vs. Emitter Current

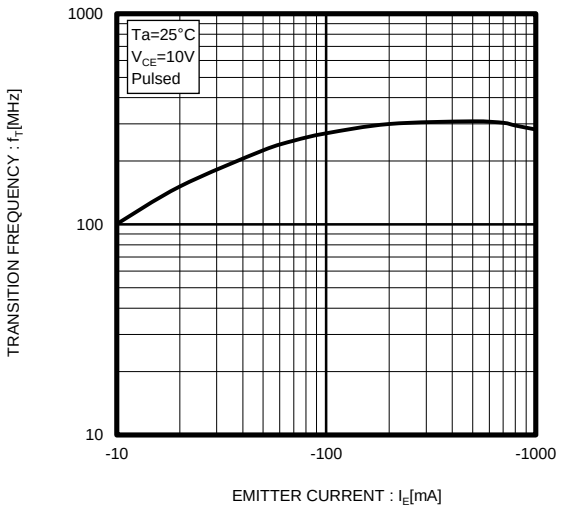
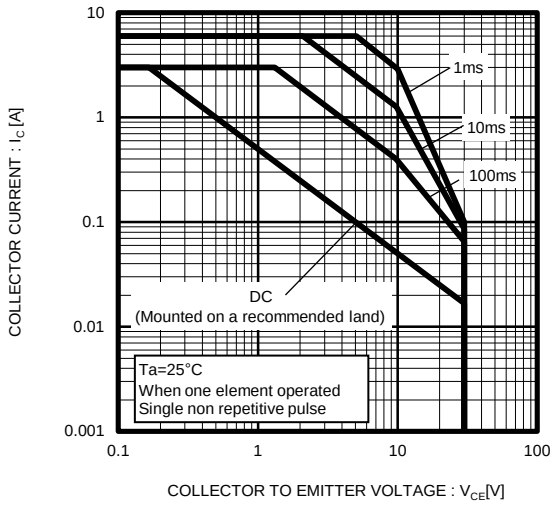
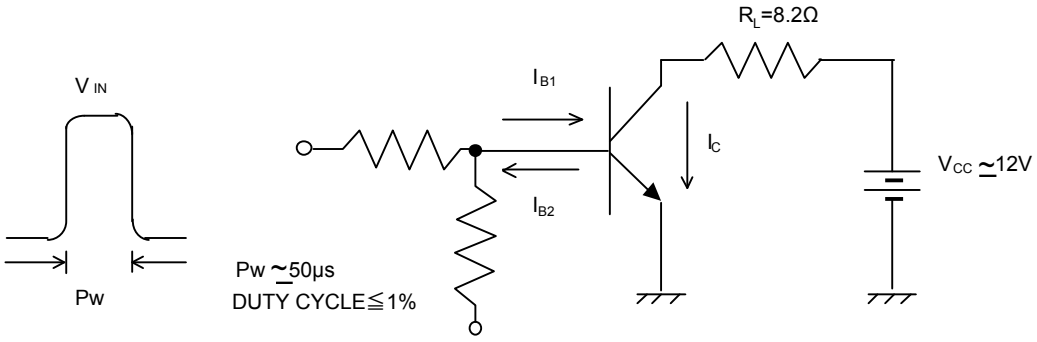


Fig.9 Safe Operating Area

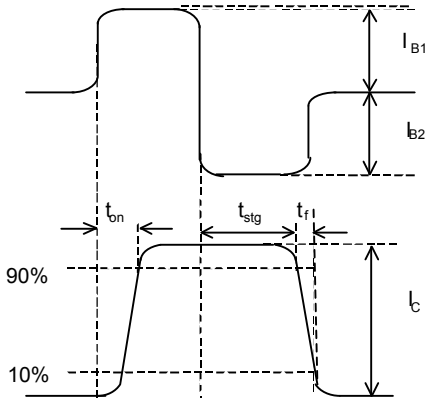


● **Switching time test circuit**



BASE CURENT WAVEFORM

COLLECTOR CURRENT WAVEFORM



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(Note1) Medical Equipment Classification of the Specific Applications

JAPAN	USA	EU	CHINA
CLASSⅢ	CLASSⅢ	CLASSⅡb	CLASSⅢ
CLASSⅣ		CLASSⅢ	

2. ROHM designs and manufactures its Products subject to strict quality control system. However, semiconductor products can fail or malfunction at a certain rate. Please be sure to implement, at your own responsibilities, adequate safety measures including but not limited to fail-safe design against the physical injury, damage to any property, which a failure or malfunction of our Products may cause. The following are examples of safety measures:
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   [b] Installation of redundant circuits to reduce the impact of single or multiple circuit failure

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   [a] Use of our Products in any types of liquid, including water, oils, chemicals, and organic solvents
   [b] Use of our Products outdoors or in places where the Products are exposed to direct sunlight or dust
   [c] Use of our Products in places where the Products are exposed to sea wind or corrosive gases, including Cl_2, H_2S, NH_3, SO_2, and NO_2
   [d] Use of our Products in places where the Products are exposed to static electricity or electromagnetic waves
   [e] Use of our Products in proximity to heat-producing components, plastic cords, or other flammable items
   [f] Sealing or coating our Products with resin or other coating materials
   [g] Use of our Products without cleaning residue of flux (Exclude cases where no-clean type fluxes is used. However, recommend sufficiently about the residue.) ; or Washing our Products by using water or water-soluble cleaning agents for cleaning residue after soldering
   [h] Use of the Products in places subject to dew condensation

4. The Products are not subject to radiation-proof design.

5. Please verify and confirm characteristics of the final or mounted products in using the Products.

6. In particular, if a transient load (a large amount of load applied in a short period of time, such as pulse, is applied, confirmation of performance characteristics after on-board mounting is strongly recommended. Avoid applying power exceeding normal rated power; exceeding the power rating under steady-state loading condition may negatively affect product performance and reliability.

7. De-rate Power Dissipation depending on ambient temperature. When used in sealed area, confirm that it is the use in the range that does not exceed the maximum junction temperature.

8. Confirm that operation temperature is within the specified range described in the product specification.

9. ROHM shall not be in any way responsible or liable for failure induced under deviant condition from what is defined in this document.

Precaution for Mounting / Circuit board design

1. When a highly active halogenous (chlorine, bromine, etc.) flux is used, the residue of flux may negatively affect product performance and reliability.

2. In principle, the reflow soldering method must be used on a surface-mount products, the flow soldering method must be used on a through hole mount products. If the flow soldering method is preferred on a surface-mount products, please consult with the ROHM representative in advance.

For details, please refer to ROHM Mounting specification

Precautions Regarding Application Examples and External Circuits

1. If change is made to the constant of an external circuit, please allow a sufficient margin considering variations of the characteristics of the Products and external components, including transient characteristics, as well as static characteristics.

2. You agree that application notes, reference designs, and associated data and information contained in this document are presented only as guidance for Products use. Therefore, in case you use such information, you are solely responsible for it and you must exercise your own independent verification and judgment in the use of such information contained in this document. ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of such information.

Precaution for Electrostatic

This Product is electrostatic sensitive product, which may be damaged due to electrostatic discharge. Please take proper caution in your manufacturing process and storage so that voltage exceeding the Products maximum rating will not be applied to Products. Please take special care under dry condition (e.g. Grounding of human body / equipment / solder iron, isolation from charged objects, setting of Ionizer, friction prevention and temperature / humidity control).

Precaution for Storage / Transportation

1. Product performance and soldered connections may deteriorate if the Products are stored in the places where:
   [a] the Products are exposed to sea winds or corrosive gases, including Cl_2, H_2S, NH_3, SO_2, and NO_2
   [b] the temperature or humidity exceeds those recommended by ROHM
   [c] the Products are exposed to direct sunshine or condensation
   [d] the Products are exposed to high Electrostatic

2. Even under ROHM recommended storage condition, solderability of products out of recommended storage time period may be degraded. It is strongly recommended to confirm solderability before using Products of which storage time is exceeding the recommended storage time period.

3. Store / transport cartons in the correct direction, which is indicated on a carton with a symbol. Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.

4. Use Products within the specified time after opening a humidity barrier bag. Baking is required before using Products of which storage time is exceeding the recommended storage time period.

Precaution for Product Label

A two-dimensional barcode printed on ROHM Products label is for ROHM's internal use only.

Precaution for Disposition

When disposing Products please dispose them properly using an authorized industry waste company.

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