

# Medium power Transistor(-32V, -2A)

## 2SB1188/2SB1182/2SB1240/2SB891F/ 2SB822/2SB1277/2SB911M

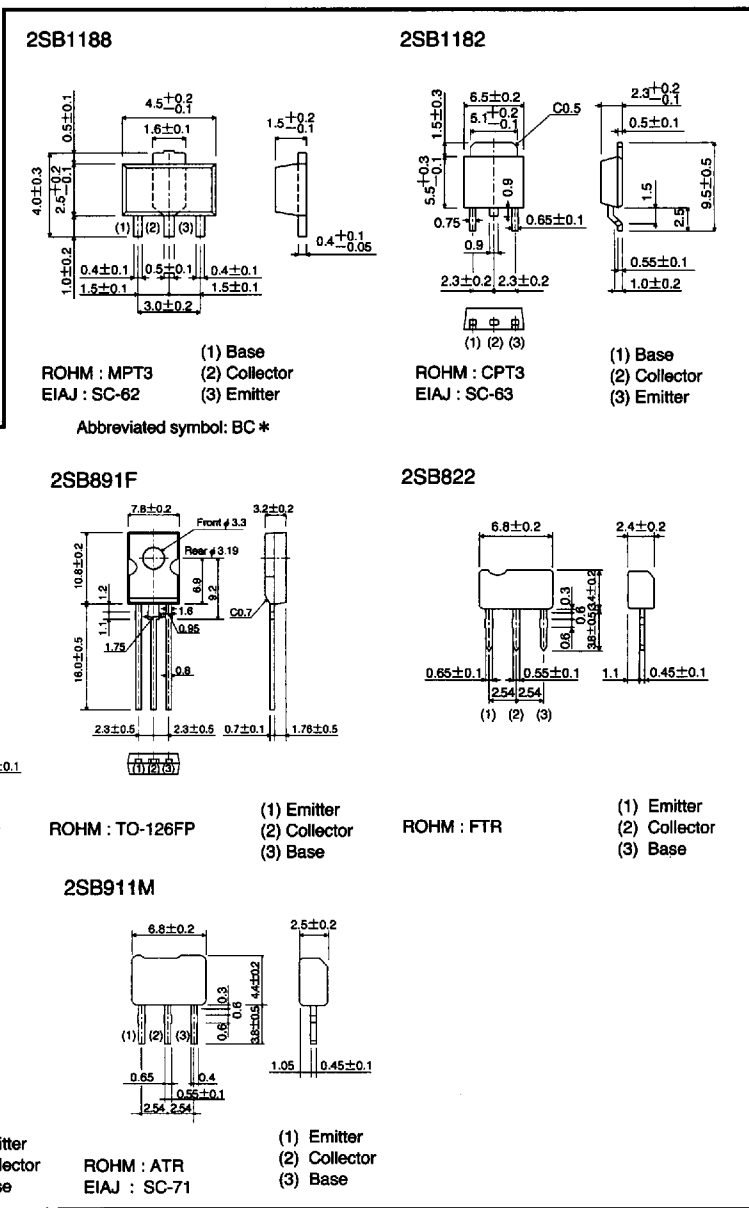
● Features

- 1) Low  $V_{CE(sat)}$ .  
 $V_{CE(sat)} = -0.5V$  (Typ.)  
( $I_C/I_B = -2A/-0.2A$ )
- 2) Complements the 2SD1766/  
2SD1758/2SD1862/2SD1189F/  
2SD1055/2SD19192/SD1227M.

● Structure

Epitaxial planar type  
PNP silicon transistor

● External dimensions (Units: mm)



\*Denotes hFE

● Absolute maximum ratings (Ta = 25°C)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V <sub>CB0</sub>	-40	V
Collector-emitter voltage		V <sub>CE0</sub>	-32	V
Emitter-base voltage		V <sub>EB0</sub>	-5	V
Collector current		I <sub>c</sub>	-2 -3	A (DC) A (Pulse) * 1
Collector power dissipation	2SB1188	P <sub>c</sub>	0.5	W * 2
			2	
	2SB1182		10	W (T <sub>c</sub> =25°C)
	2SB1240,2SB911M		1	W * 3
			1.2	
	2SB891F		5	W (T <sub>c</sub> =25°C)
2SB822,2SB1277	0.75	W		
Junction temperature		T <sub>j</sub>	150	°C
Storage temperature		T <sub>stg</sub>	-55~150	°C

\* 1 Single pulse P<sub>w</sub>=100ms

\* 2 On 40 x 40 x 0.7 mm ceramic board is used.

\* 3 Printed circuit board 1.7mm thick, collector copper plating 1cm<sup>2</sup> or larger.

● Electrical characteristics (Ta = 25°C)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage		BV <sub>CB0</sub>	-40	—	—	V	I <sub>c</sub> =-50 μA
Collector-emitter breakdown voltage		BV <sub>CE0</sub>	-32	—	—	V	I <sub>c</sub> =-1mA
Emitter-base breakdown voltage		BV <sub>EB0</sub>	-5	—	—	V	I <sub>E</sub> =-50 μA
Collector cutoff current		I <sub>CB0</sub>	—	—	-1	μA	V <sub>CB</sub> =-20V
Emitter cutoff current		I <sub>EB0</sub>	—	—	-1	μA	V <sub>EB</sub> =-4V
Collector-emitter saturation voltage		V <sub>CE(sat)</sub>	—	-0.5	-0.8	V	I <sub>c</sub> /I <sub>B</sub> =-2A/-0.2A *
DC current transfer ratio	2SB1188,2SB1182	h <sub>FE</sub>	82	—	390	—	V <sub>CE</sub> =-3V, I <sub>c</sub> =-0.5A
	2SB1240,2SB891F						
	2SB822,2SB1277		120	—	390		
	2SB891F						
Transition frequency		f <sub>T</sub>	—	100	—	MHz	V <sub>CE</sub> =-5V, I <sub>E</sub> =0.5A, f=30MHz
Output capacitance		C <sub>ob</sub>	—	50	—	pF	V <sub>CB</sub> =-10V, I <sub>E</sub> =0A, f=1MHz

\* Measured using pulse current.

Bi-polar transistors

● Packaging specifications and  $h_{FE}$

Type	h <sub>FE</sub>	Package	Taping				Bulk	
		Code	T100	TL	TU2	TL2	—	—
		Basic ordering unit (pieces)	1000	2500	2500	2500	1000	2000
2SB1188	PQR		○	—	—	—	—	—
2SB1182	PQR		—	○	—	—	—	—
2SB1240	QR		—	—	○	—	—	—
2SB891F	PQR		—	—	—	—	○	—
2SB822	Q		—	—	—	—	—	○
2SB1277	Q		—	—	—	○	—	—
2SB911M	Q		—	—	—	—	—	○

$h_{FE}$  values are classified as follows :

Item	P	Q	R
$h_{FE}$	82~180	120~270	180~390

● Electrical characteristic curves

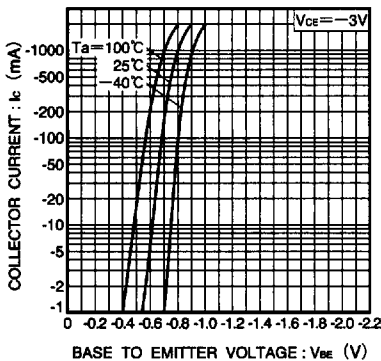


Fig.1 Grounded emitter propagation characteristics

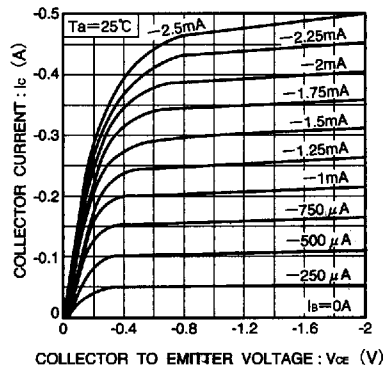


Fig.2 Grounded emitter output characteristics

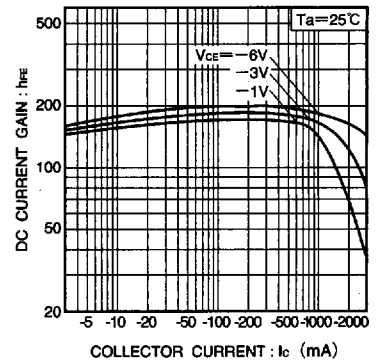


Fig.3 DC current gain vs. collector current (I)

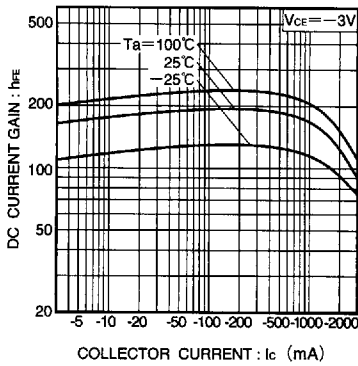


Fig.4 DC current gain vs. collector current ( II )

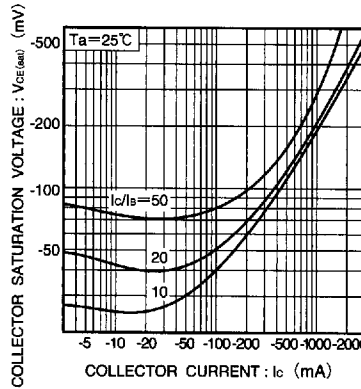


Fig.5 Collector-emitter saturation voltage vs. collector current ( I )

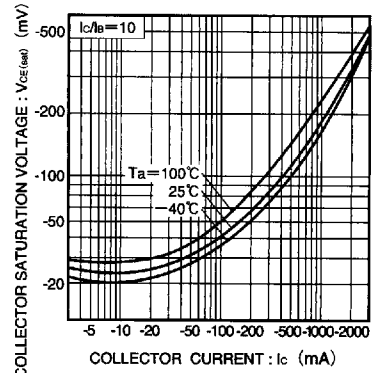


Fig.6 Collector-emitter saturation voltage vs. collector current ( II )

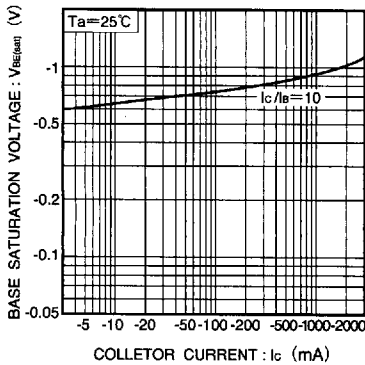


Fig.7 Base-emitter saturation voltage vs. collector current

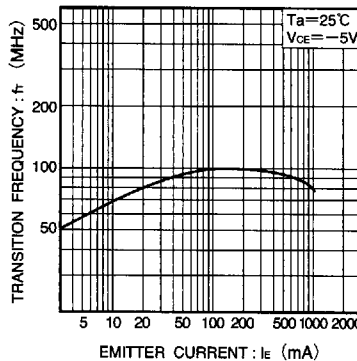


Fig.8 Gain bandwidth product vs. emitter current

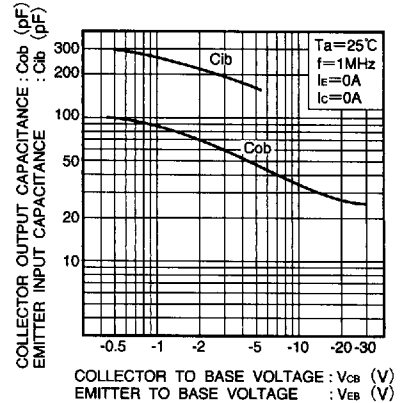


Fig.9 Collector output capacitance vs. collector-base voltage  
Emitter input capacitance vs. emitter-base voltage

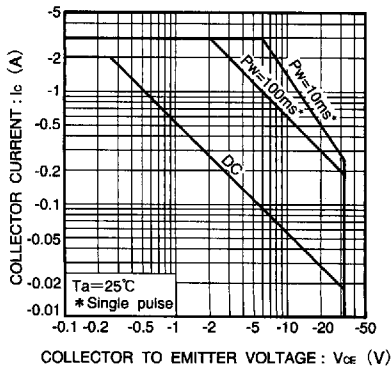


Fig.10 Safe operation area (2SB1188)

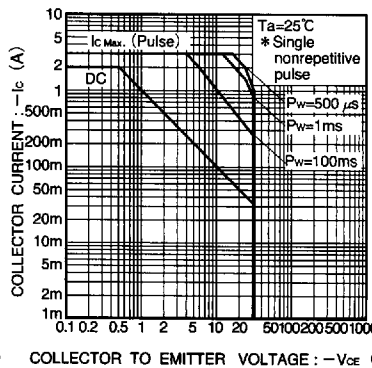


Fig.11 Safe operation area (2SB1182)

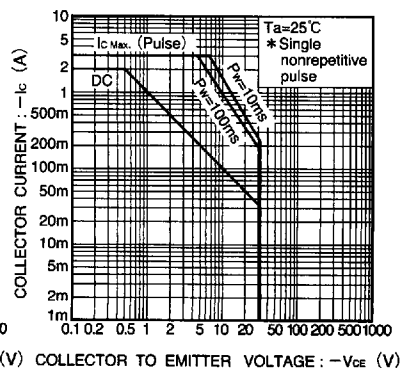


Fig.12 Safe operation area (2SB891)

Bi-polar transistors

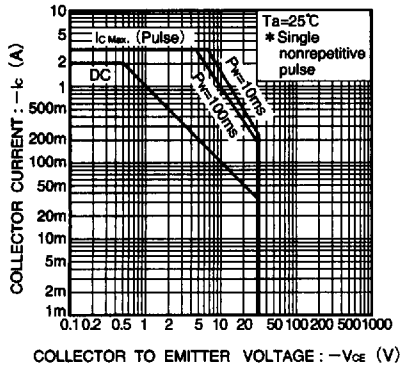
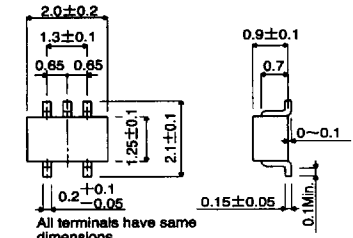
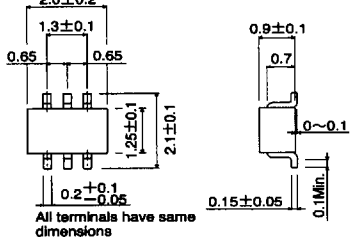


Fig.13 Safe operation area  
(2SB891 (TO-126M))



Type	External dimensions (Units : mm)	Features
<p>CPT 3 SC-63 type</p>	<p>Technical drawing of CPT 3 SC-63 type transistor. Top view dimensions: 6.5±0.2, 5.1±0.2, 0.9, 0.65±0.1, 2.3±0.2, 2.3±0.2. Side view dimensions: 2.3±0.2, 0.5±0.1, 1.5, 2.5, 9.5±0.5, 0.55±0.1, 1.0±0.2. Lead diameter: C0.5. Lead length: 5.5+0.3/-0.1, 1.5±0.3, 0.75, 0.9.</p>	<p>By itself the CPT3 has a <math>P_c</math> of 1 W (<math>T_a = 25^\circ\text{C}</math>), but a large <math>P_c</math> of several watts can be obtained with an appropriate mounting surface. At the same time the CPT3 is compact, making it suitable for high density mounting and hybrid ICs. Available on tape for automatic mounting. For vertical high density mounting, the leaded CPT (SC-64) type with the same mold size is also available.</p>
<p>PSD3</p>	<p>Technical drawing of PSD3 transistor. Top view dimensions: 10.1±0.3, 13.1±0.5, 3.2, 2.54, 5.08, 0.78, 1.24, 8.6±0.2. Side view dimensions: 4.5±0.2, 1.3, 0~0.3, 0.4, 1.3, 0.5Min.</p>	<p>The PSD3 is a TO-220 class surface-mount package. A high <math>P_c</math> can be obtained with an appropriate mounting surface. Surface mounting allows a high vertical density, enabling the design of slim and compact devices. The PSD3 is available on tape for automatic mounting, and it helps improve mounting efficiency and reduce mounting cost.</p>
<p>SMT5 SC-74A type</p>	<p>Technical drawing of SMT5 SC-74A type transistor. Top view dimensions: 2.9±0.2, 1.9±0.2, 0.95, 0.95, 1.6+0.2/-0.1, 2.8±0.2, 0.3+0.1/-0.05. Side view dimensions: 1.1+0.2/-0.1, 0.8±0.1, 0~0.1, 0.15+0.1/-0.06, 0.3~0.6.</p> <p>All terminals have same dimensions</p>	<p>The SMT5 consists of two connected transistors or digital transistors in an SMT3 (SC-59) package. The mounting area can be reduced by 50% compared to the SMT3 and the internal circuitry is complete, making this package ideal for high density mounting at half the assembly cost.</p>
<p>SMT6 SC-74 type</p>	<p>Technical drawing of SMT6 SC-74 type transistor. Top view dimensions: 2.9±0.2, 1.9±0.2, 0.95, 0.95, 1.6+0.2/-0.1, 2.8±0.2, 0.3+0.1/-0.05. Side view dimensions: 1.1+0.2/-0.1, 0.8±0.1, 0~0.1, 0.15+0.1/-0.06, 0.3~0.6.</p>	<p>The SMT6 consists of two independent transistors or two independent digital transistors in an SMT3 (SC-59) package. The mounting area and mounting cost can be reduced by 50% compared to the SMT3, and the two transistors are independent to allow free configuration of a high density circuit.</p>

EXPLANATION

Type	External dimensions (Units : mm)	Features
<p>UMT5 SC-88A type</p>	 <p>All terminals have same dimensions</p>	<p>The UMT5 consists of two connected transistors or digital transistors in a UMT3 (SC-70) package. The mounting area can be reduced by 50% compared to the UMT3 and the internal circuitry is completed, making this package ideal for high density mounting at half the assembly cost.</p>
<p>UMT6 SC-88 type</p>	 <p>All terminals have same dimensions</p>	<p>The UMT6 consists of two independent transistors or two independent digital transistors in a UMT (SC-70) package. The mounting area and mounting cost can be reduced by 50% compared to the UMT3, and the two transistors are independent to allow free configuration of a high density circuit.</p>



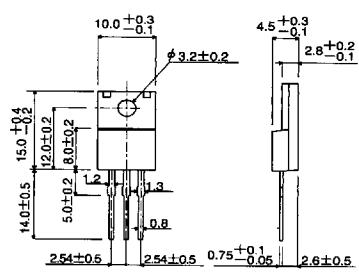
●Types and features of leaded packages

Type	External dimensions (Units : mm)	Features
<p>SPT (SC-72 type)</p>		<p>The SPT is a smaller version of the conventional TO-92 type. The body size (3×4×2 mm<sup>3</sup>) has been reduced to 1/4 that of the TO-92 (5×5×4 mm<sup>3</sup>). The SPT is available on tape for automatic insertion, and less space is occupied on the printed circuit board than the TO-92. Reliability is the same as the TO-92.</p>
<p>FTR</p>		<p>SIL type with a height of 3.4 mm and a lead pitch of 2.54 mm.</p>
<p>FTL</p>		<p>The FTL is a radial taping version of the highly popular FTR. This enables automatic high-density mounting with a radial insertion machine.</p>
<p>ATR (SC-71 type)</p>		<p>SC-71 type with a height of 4.4 mm and a P<sub>c</sub>=1W type.</p>

EXPLANATION

Type	External dimensions (Units : mm)	Features
<p>ATV</p>		<p>The ATV is a radial tapping version of the highly popular ATR. This enables automatic high-density mounting with a radial insertion machine.</p>
<p>TO-92 (SC-43 type)</p>		<p>The SC-43 is for general purpose small signals.</p>
<p>TO-126FP</p>		<p>The TO-126FP is an isolation type package based on a TO-126 full mold. In addition to the features of the TO-126, molded heat sink fins allow easy isolation of the heat sink.</p>
<p>TO-220FP (SC-67 type)</p>		<p>The TO-220FP is an isolation type package based on a TO-220 full mold. In addition to the features of the TO-126 and TO-220, molded heat sink fins allow easy isolation of the heat sink.</p>

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Type	External dimensions (Units : mm)	Features
TO-220FN	 <p>Technical drawing of the TO-220FN transistor showing front and side views with dimensions in millimeters:</p> <ul style="list-style-type: none"> <li>Front view dimensions: <ul style="list-style-type: none"> <li>Top width: <math>10.0^{+0.3}_{-0.1}</math></li> <li>Top diameter: <math>\phi 3.2 \pm 0.2</math></li> <li>Top thickness: <math>15.0^{+0.4}_{-0.2}</math></li> <li>Top to mounting hole: <math>12.0 \pm 0.2</math></li> <li>Mounting hole diameter: <math>8.0 \pm 0.2</math></li> <li>Mounting hole to base: <math>5.0 \pm 0.2</math></li> <li>Base width: <math>14.0 \pm 0.5</math></li> <li>Base to mounting hole: <math>2.54 \pm 0.5</math></li> <li>Base to base: <math>2.54 \pm 0.5</math></li> <li>Base to base: <math>0.75^{+0.1}_{-0.05}</math></li> <li>Base to base: <math>2.6 \pm 0.5</math></li> <li>Base to base: <math>1.2</math></li> <li>Base to base: <math>1.3</math></li> <li>Base to base: <math>0.8</math></li> </ul> </li> <li>Side view dimensions: <ul style="list-style-type: none"> <li>Top thickness: <math>4.5^{+0.3}_{-0.1}</math></li> <li>Top to mounting hole: <math>2.8^{+0.2}_{-0.1}</math></li> </ul> </li> </ul>	<p>The TO-220FN features the same performance as the TO-220FP with approximately 2 mm less height, allowing the design of slimmer devices. Furthermore, the elimination of support pins in the fin (collector electrode) solves short-circuiting problems with neighboring components and the chassis.</p> <p>To make the height to the installation hole the same as the TO-220FP, it can be replaced as is from the TO-220FP.</p>

EXPLANATION

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