

# High-speed Switching Transistor

2SA1952 / 2SA1906 / 2SA1757

●Features

- 1) High speed switching (tf : Typ. 0.15 μs at Ic = -3A)
- 2) Low VCE(sat). (Typ. -0.2V at Ic/Ie = -3/-0.15A)
- 3) Wide SOA (safe operating area)
- 4) Complements the 2SC5103/2SC4596.

●Packaging specifications and hfe

Type	2SA1952	2SA1906	2SA1757
Package	CPT3	PSD3	TO-220FP
hfe	Q	DEF	F
Code	TL	TL	—
Basic ordering unit (pieces)	3000	1000	500

●Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits	Unit
Collector-base voltage	Vcbo	-100	V
Collector-emitter voltage	Vceo	-60	V
Emitter-base voltage	Vebo	-5	V
Collector current	Ic	-5	A
		-10	A (Pulse)
Collector power dissipation	Pc	2	W
		10	W (Tc=25°C)
		25	
Junction temperature	Tj	150	°C
Storage temperature	Tstg	-55~150	°C

●Electrical characteristics (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BVcbo	-100	—	—	V	Ic = -50 μA
Collector-emitter voltage	BVceo(sus)	-60	—	—	V	Ic/Ie = -3A/-0.3A, L=1mH
Collector-emitter breakdown voltage	BVceo	-60	—	—	V	Ic = -1mA
Emitter-base breakdown voltage	BVebo	-5	—	—	V	Ie = -50 μA
Collector cutoff current	Icbo	—	—	-10	μA	Vce = -100V
Emitter cutoff current	Iebo	—	—	-10	μA	Veb = -5V
Collector-emitter saturation voltage	VCE(sat)	—	—	-0.3	V	Ic/Ie = -3A/-0.15A
		—	—	-0.5	V	Ic/Ie = -4A/-0.2A
Base-emitter saturation voltage	VBE(sat)	—	—	-1.2	V	Ic/Ie = -3A/-0.15A
		—	—	-1.5	V	Ic/Ie = -4A/-0.2A
DC current transfer ratio	hFE	2SA1952	120	—	270	Vce = -2V, Ic = -1A
		2SA1906	60	—	320	
		2SA1757	160	—	320	
Transition frequency	fr	—	80	—	MHz	Vce = -10V, Ie = 0.5A, f = 30MHz
Output capacitance	Cob	—	130	—	pF	Vce = -10V, Ie = 0A, f = 1MHz
Turn-on time	ton	—	—	0.3	μs	Ic = -3A, Rl = 10 Ω
Storage time	tsg	—	—	1.5	μs	Ia1 = -Ia2 = -0.15A
Fall time	tr	—	—	0.3	μs	Vcc = -30V

(96-603-A314)

# High-speed Switching Transistor

2SC5103 / 2SC4596

●Features

- 1) Low VCE(sat). (Typ. 0.15V at Ic/Ie = 3/0.15A)
- 2) High speed switching (tf : Typ. 0.1 μs at Ic = 3A)
- 3) Wide SOA (safe operating area)
- 4) Complements the 2SA1952/2SA1757.

●Packaging specifications and hfe

Type	2SC5103	2SC4596
Package	CPT3	TO-220FP
hfe	PQ	EF
Code	TL	—
Basic ordering unit (pieces)	2500	500

●Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits	Unit
Collector-base voltage	Vcbo	100	V
Collector-emitter voltage	Vceo	60	V
Emitter-base voltage	Vebo	5	V
Collector current	Ic	5	A (DC)
		10	A (Pulse) *
Collector power dissipation	Pc	1	W
		2	
		10	W (Tc=25°C)
25			
Junction temperature	Tj	150	°C
Storage temperature	Tstg	-55~150	°C

\* Single pulse Pw=100ms

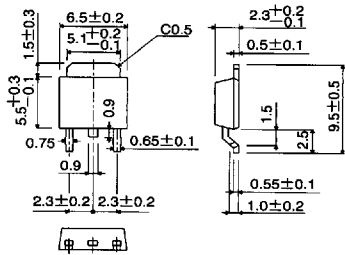
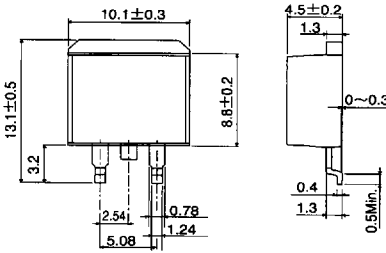
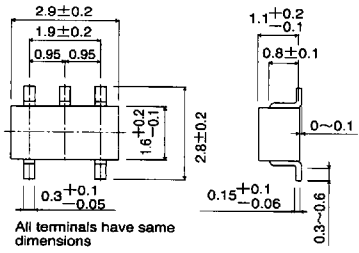
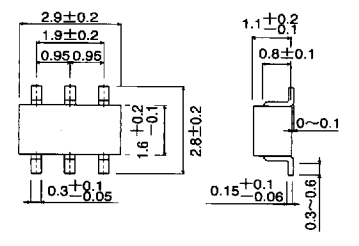
●Electrical characteristics (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BVcbo	100	—	—	V	Ic = 60 μA
Collector-emitter voltage	BVceo(sus)	60	—	—	V	Ic/Ie = 3A/0.3A, L=1mH
Collector-emitter breakdown voltage	BVceo	60	—	—	V	Ic = 1mA
Emitter-base breakdown voltage	BVebo	5	—	—	V	Ie = 50 μA
Collector cutoff current	Icbo	—	—	10	μA	Vce = 100V
Emitter cutoff current	Iebo	—	—	10	μA	Veb = 5V
Collector-emitter saturation voltage	VCE(sat)	—	0.15	0.3	V	Ic/Ie = 3A/0.15A *
		—	—	0.5	V	Ic/Ie = 4A/0.2A *
Base-emitter saturation voltage	VBE(sat)	—	—	1.2	V	Ic/Ie = 3A/0.15A *
		—	—	1.5	V	Ic/Ie = 4A/0.2A *
DC current transfer ratio	hFE	2SC5103	82	—	270	Vce/Ic = 2V/1A
		2SC4596	100	—	320	
Transition frequency	fr	—	120	—	MHz	Vce = 10V, Ie = 0.5A, f = 30MHz *
Output capacitance	Cob	—	80	—	pF	Vce = 10V, Ic = 0A, f = 1MHz
Turn-on time	ton	—	—	0.3	μs	Ic = 3A, Rl = 10 Ω
Storage time	tsg	—	—	1.5	μs	Ia1 = -Ia2 = 0.15A
Fall time	tr	—	—	0.1	μs	Vcc = 30V

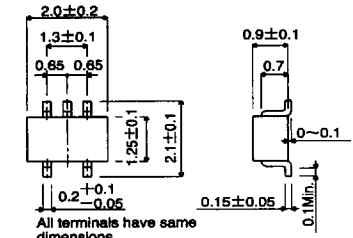
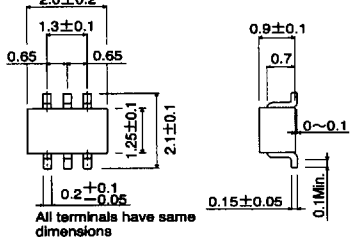
\* Measured using pulse current.

Bi-polar transistors



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>

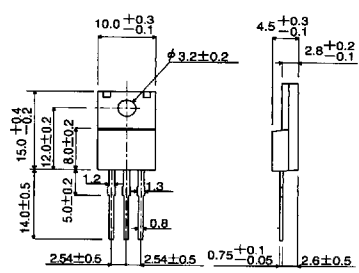
●Types and features of leaded packages

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>

7828999 0016713 7T7

Type	External dimensions (Units : mm)	Features
TO-220FN	 <p>Technical drawing of the TO-220FN transistor showing front and side views with dimensions in mm. The front view shows a top diameter of <math>10.0^{+0.3}_{-0.1}</math> mm, a hole diameter of <math>\phi 3.2 \pm 0.2</math> mm, and a total height of <math>15.0^{+0.4}_{-0.2}</math> mm. The side view shows a total height of <math>14.0 \pm 0.5</math> mm, a base diameter of <math>2.54 \pm 0.5</math> mm, and a lead diameter of <math>0.75^{+0.1}_{-0.05}</math> mm. Other dimensions include <math>12.0 \pm 0.2</math>, <math>8.0 \pm 0.2</math>, <math>5.0 \pm 0.2</math>, <math>1.2</math>, <math>1.3</math>, <math>0.8</math>, <math>4.5^{+0.3}_{-0.1}</math>, <math>2.8^{+0.2}_{-0.1}</math>, and <math>2.6 \pm 0.5</math> mm.</p>	<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

7828999 0016714 633