

Low $V_{CE(sat)}$ Transistor Series

Overview

This series is a low $V_{CE(sat)}$ bipolar transistor housed in compact surface mounting package. Together with a compound type that has a build-in SBD, it helps miniaturize and streamline sets.

Features

- Uses compact surface mounting package(mini-type 3 terminals,mini-type 6 terminals).
- Low $V_{CE(sat)}$.
- Reduces components by build-in SBD.

Specifications

Parameter Product name	I _C /I _F (A)		V _{CEO} /V _R (V)	V _{CE(sat)} /V _F (V)		Package
				Conditions		
2SA2010	-2.5		-15	-0.27(typ)	I _C =-2.5A,I _B =-50mA	mini-type 3 terminals
2SC5592	2.5		15	0.22(typ)	I _C =2.5A,I _B =50mA	mini-type 3 terminals
XN09D57	Tr	-2.5	-15	-0.27(typ)	I _C =-2.5A,I _B =-50mA	mini-type 6 terminals
	SBD	1.0	20	<0.45	I _F =1.0A	
XN09D58	Tr	-2.5	-15	-0.27(typ)	I _C =-2.5A,I _B =-50mA	mini-type 6 terminals
	SBD	0.7	25	<0.45	I _F =0.7A	

Applications

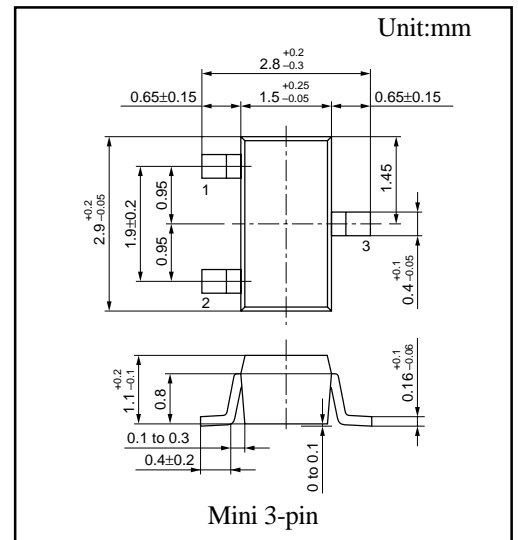
- DVCs ●DSCs ●DC-DC converters for electronic equipment

2SA2010

■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Collector to base voltage	V_{CB0}	-15	V
Collector to emitter voltage	V_{CEO}	-15	V
Emitter to base voltage	V_{EBO}	-5	V
Collector current	I_{CP}	-2.5	A
Peak collector current	I_C	-10	A
Collector power dissipation	P_C	600 *1	mW
Junction temperature	T_j	150	°C
Storage temperature	T_{stg}	-55 to +150	°C

*1) Measuring on Ceramic substrate at 15×15×0.6mm



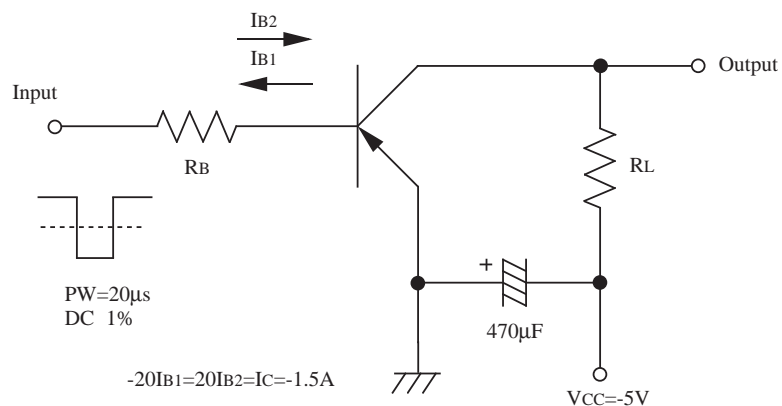
1. Base
2. Emitter
3. Collector

■ Electrical Characteristics($T_a=25^\circ\text{C}\pm 3^\circ\text{C}$)

Parameter	Symbol	Conditions	min	typ	max	Unit
Collector to base voltage	V_{CB0}	$I_C=-10\mu\text{A}, I_E=0$	-15	—	—	V
Collector to emitter voltage	V_{CEO}	$I_C=-1\text{mA}, I_B=0$	-15	—	—	V
Emitter to base voltage	V_{EBO}	$I_E=-10\mu\text{A}, I_C=0$	-5	—	—	V
Collector cutoff current	I_{CBO}	$V_{CB}=-10\text{V}, I_E=0$	—	—	-0.1	μA
Forward current transfer ratio	h_{FE1}	$V_{CE}=-2\text{V}, I_C=-100\text{mA}$ *1	200	—	560	—
Forward current transfer ratio	h_{FE2}	$V_{CE}=-2\text{V}, I_C=-2.5\text{A}$ *1	100	—	—	—
Collector to emitter saturation voltage	$V_{CE(sat)}$	$I_C=-1\text{A}, I_B=-10\text{mA}$ *1	—	-140	—	mV
Collector to emitter saturation voltage	$V_{CE(sat)}$	$I_C=-2.5\text{A}, I_B=-50\text{mA}$ *1	—	-270	-320	mV
Collector output capacitance	C_{ob}	$V_{CB}=-10\text{V}, I_E=0, f=1\text{MHz}$	—	40	—	pF
Transition frequency	f_T	$V_{CB}=-10\text{V}, I_E=50\text{mA}, f=200\text{MHz}$	—	180	—	MHz
Turn-on time	t_{on}	2) See test circuit	—	35	—	ns
Storage time	T_{stg}	2) See test circuit	—	110	—	ns
Turn-off time	t_{off}	2) See test circuit	—	10	—	ns

*1) Pulse test

*2) Switching time test circuit.

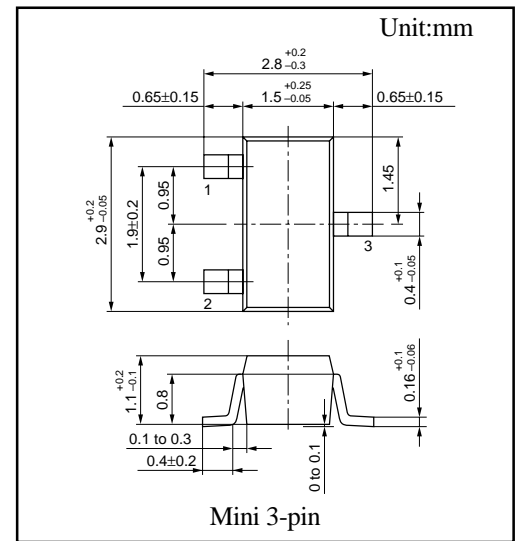


2SC5592

Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Collector to base voltage	V_{CBO}	15	V
Collector to emitter voltage	V_{CEO}	15	V
Emitter to base voltage	V_{EBO}	5	V
Collector current	I_{CP}	2.5	A
Peak collector current	I_C	10	A
Collector power dissipation	P_C	600 *1	mW
Junction temperature	T_j	150	°C
Storage temperature	T_{stg}	-55 to +150	°C

*1) Measuring on Ceramic substrate at 15×15×0.6mm



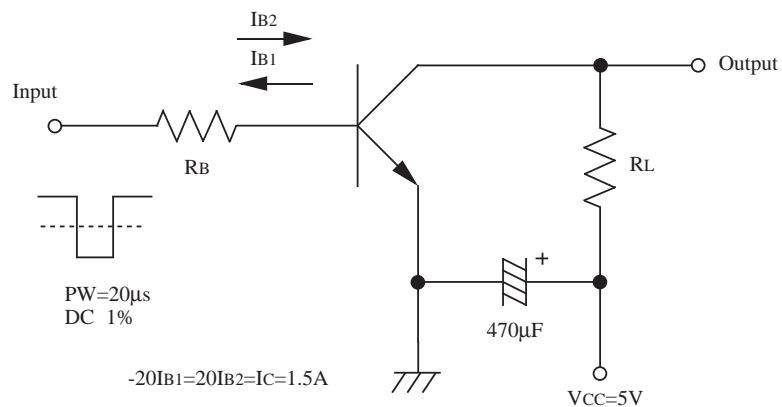
1. Base
2. Emitter
3. Collector

Electrical Characteristics ($T_a=25^\circ\text{C}\pm 3^\circ\text{C}$)

Parameter	Symbol	Conditions	min	typ	max	Unit
Collector to base voltage	V_{CBO}	$I_C=10\mu\text{A}, I_E=0$	15	—	—	V
Collector to emitter voltage	V_{CEO}	$I_C=1\text{mA}, I_B=0$	15	—	—	V
Emitter to base voltage	V_{EBO}	$I_E=10\mu\text{A}, I_C=0$	5	—	—	V
Collector cutoff current	I_{CBO}	$V_{CB}=10\text{V}, I_E=0$	—	—	0.1	μA
Forward current transfer ratio	h_{FE1}	$V_{CE}=2\text{V}, I_C=100\text{mA}$ *1	200	—	1000	—
Forward current transfer ratio	h_{FE2}	$V_{CE}=2\text{V}, I_C=2.5\text{A}$ *1	100	—	—	—
Collector to emitter saturation voltage	$V_{CE(sat)}$	$I_C=1\text{A}, I_B=10\text{mA}$ *1	—	110	—	mV
Collector to emitter saturation voltage	$V_{CE(sat)}$	$I_C=2.5\text{A}, I_B=50\text{mA}$ *1	—	220	320	mV
Collector output capacitance	C_{ob}	$V_{CB}=10\text{V}, I_E=0, f=1\text{MHz}$	—	30	—	pF
Transition frequency	f_T	$V_{CB}=10\text{V}, I_E=50\text{mA}, f=200\text{MHz}$	—	180	—	MHz
Turn-on time	t_{on}	2) See test circuit	—	30	—	ns
Storage time	T_{stg}	2) See test circuit	—	100	—	ns
Turn-off time	t_{off}	2) See test circuit	—	10	—	ns

*1) Pulse test

*2) Switching time test circuit.

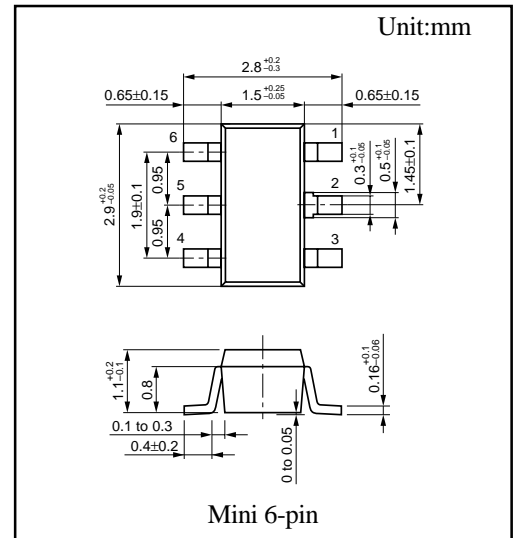


XN09D57 (Part of Transistor)

Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Collector to base voltage	VCBO	-15	V
Collector to emitter voltage	VCEO	-15	V
Emitter to base voltage	VEBO	-5	V
Collector current	ICP	-2.5	A
Peak collector current	IC	-10	A
Collector power dissipation	PC	600 *1	mW
Junction temperature	Tj	150	°C
Storage temperature	Tstg	-55 to +150	°C

*1) Measuring on Ceramic substrate at 15×15×0.6mm



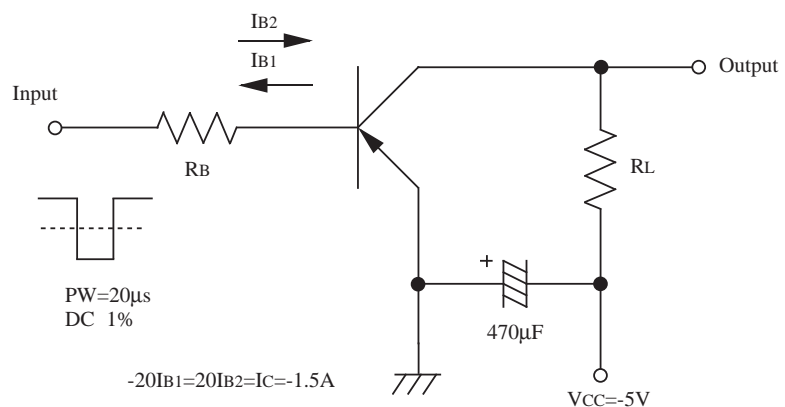
1. Collector/Cathode
2. Collector/Cathode
3. Collector/Cathode
4. Anode
5. Base
6. Emitter

Electrical Characteristics (Ta=25°C±3°C)

Parameter	Symbol	Conditions	min	typ	max	Unit
Collector to base voltage	VCBO	IC=-10μA, IE=0	-15	—	—	V
Collector to emitter voltage	VCEO	IC=-1mA, IB=0	-15	—	—	V
Emitter to base voltage	VEBO	IE=-10μA, IC=0	-5	—	—	V
Collector cutoff current	ICBO	VCB=-10V, IE=0	—	—	-0.1	μA
Forward current transfer ratio	hFE1	VCE=-2V, IC=-100mA *1	200	—	560	—
Forward current transfer ratio	hFE2	VCE=-2V, IC=-2.5A *1	100	—	—	—
Collector to emitter saturation voltage	VCE(sat)	IC=-1A, IB=-10mA *1	—	-140	—	mV
Collector to emitter saturation voltage	VCE(sat)	IC=-2.5A, IB=-50mA *1	—	-270	-320	mV
Collector output capacitance	Cob	VCB=-10V, IE=0, f=1MHz	—	40	—	pF
Transition frequency	fT	VCB=-10V, IE=50mA, f=200MHz	—	180	—	MHz
Turn-on time	ton	2) See test circuit	—	35	—	ns
Storage time	Tstg	2) See test circuit	—	110	—	ns
Turn-off time	toff	2) See test circuit	—	10	—	ns

*1) Pulse test

*2) Switching time test circuit.



XN09D57 (Part of Diode)

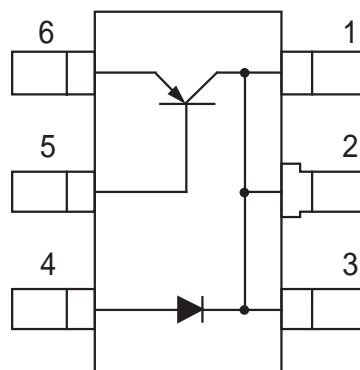
■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Average forward current	$I_{F(AV)}$	1	A
Non-repetitive peak forward surge current	I_{FSM}	2	A
Reverse voltage	V_R	20	V
Repetitive peak reverse voltage	V_{RRM}	25	V

■ Electrical Characteristics($T_a=25^{\circ}C\pm 3^{\circ}C$)

Parameter	Symbol	Conditions	min	typ	max	Unit
Forward voltage	V_F	$I_F=1.0A$	—	—	0.45	V
Reverse current	I_R	$V_R=20V$	—	—	200	μA
Terminal capacitance	C_t	$V_R=0V, f=1MHz$	—	100	—	pF

■ Internal Connection

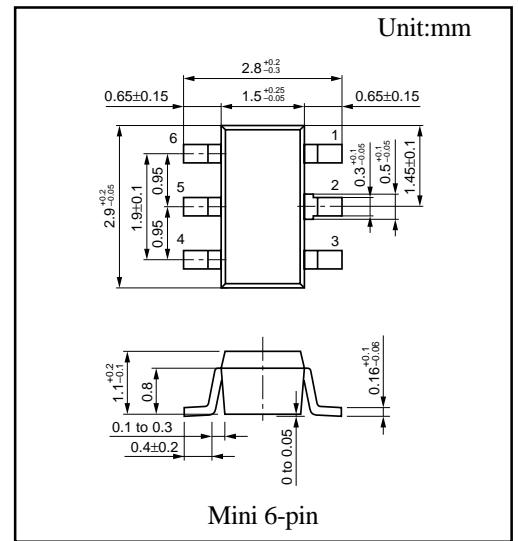


XN09D58 (Part of Transistor)

Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Collector to base voltage	VCBO	-15	V
Collector to emitter voltage	VCEO	-15	V
Emitter to base voltage	VEBO	-5	V
Collector current	ICP	-2.5	A
Peak collector current	IC	-10	A
Collector power dissipation	PC	600 *1	mW
Junction temperature	Tj	125	°C
Storage temperature	Tstg	-55 to +125	°C

*1) Measuring on Ceramic substrate at 15×15×0.6mm



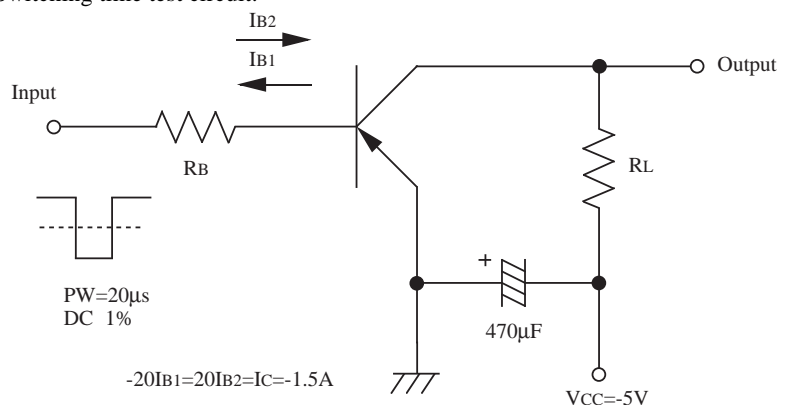
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|----------------------|------------|
| 1. Collector/Cathode | 4. Anode |
| 2. Collector/Cathode | 5. Base |
| 3. Collector/Cathode | 6. Emitter |

Electrical Characteristics (Ta=25°C±3°C)

Parameter	Symbol	Conditions	min	typ	max	Unit
Collector to base voltage	VCBO	IC=-10μA, IE=0	-15	—	—	V
Collector to emitter voltage	VCEO	IC=-1mA, IB=0	-15	—	—	V
Emitter to base voltage	VEBO	IE=-10μA, IC=0	-5	—	—	V
Collector cutoff current	ICBO	VCB=-10V, IE=0	—	—	-0.1	μA
Forward current transfer ratio	hFE1	VCE=-2V, IC=-100mA *1	200	—	560	—
Forward current transfer ratio	hFE2	VCE=-2V, IC=-2.5A *1	100	—	—	—
Collector to emitter saturation voltage	VCE(sat)	IC=-1A, IB=-10mA *1	—	-140	—	mV
Collector to emitter saturation voltage	VCE(sat)	IC=-2.5A, IB=-50mA *1	—	-270	-320	mV
Collector output capacitance	Cob	VCB=-10V, IE=0, f=1MHz	—	40	—	pF
Transition frequency	fT	VCB=-10V, IE=50mA, f=200MHz	—	180	—	MHz
Turn-on time	ton	2) See test circuit	—	35	—	ns
Storage time	Tstg	2) See test circuit	—	110	—	ns
Turn-off time	toff	2) See test circuit	—	10	—	ns

*1) Pulse test

*2) Switching time test circuit.



XN09D58 (Part of Diode)

■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Average forward current	$I_{F(AV)}$	700	mA
Non-repetitive peak forward surge current	I_{FSM}	2	A
Reverse voltage	V_R	20	V
Repetitive peak reverse voltage	V_{RRM}	25	V

■ Electrical Characteristics ($T_a=25^{\circ}\text{C}\pm 3^{\circ}\text{C}$)

Parameter	Symbol	Conditions	min	typ	max	Unit
Forward voltage	V_F	$I_F=700\text{mA}$	—	—	0.45	V
Reverse current	I_R	$V_R=20\text{V}$	—	—	200	μA
Terminal capacitance	C_t	$V_R=0\text{V}, f=1\text{MHz}$	—	100	—	pF

■ Internal Connection

