

Bipolar Transistors Silicon PNP/NPN Epitaxial Type (PCT Process)(Bias Resistor built-in Transistor)

RN4909FE

1. Applications

- · Switching
- · Inverter Circuits
- · Interfacing
- · Driver Circuits

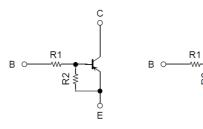
2. Features

- (1) AEC-Q101 qualified (Please see the orderable part number list)
- (2) Small package (Dual type)
- (3) The integrated bias resistor reduces the number of external parts required, making it possible to reduce system size and assembly time.

3. Equivalent Circuit

Q1

Q2

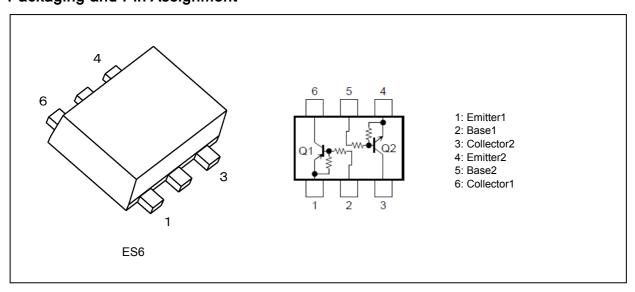


R1: 47 kΩ

R2: 22 kΩ

(Q1, Q2 common)

4. Packaging and Pin Assignment



Start of commercial production

2000-05



5. Orderable part number

Orderable part number	AEC-Q101		Note		
RN4909FE,LF	— General Use				
RN4909FE,LXGF	YES	(Note 1)	Unintended Use (Note		
RN4909FE,LXHF	YES		Automotive Use		

Note 1: For more information, please contact our sales or use the inquiry form on our website.

6. Q1 Absolute Maximum Ratings (Note) (Unless otherwise specified, T_a = 25 °C)

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V _{CBO}	-50	V
Collector-emitter voltage	V _{CEO}	-50	
Emitter-base voltage	V _{EBO}	-15	
Collector current	I _C	-100	mA

7. Q2 Absolute Maximum Ratings (Note) (Unless otherwise specified, Ta = 25 °C)

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V _{CBO}	50	V
Collector-emitter voltage	V _{CEO}	50	
Emitter-base voltage	V _{EBO}	15	
Collector current	I _C	100	mA

8. Q1, Q2 Common Absolute Maximum Ratings (Note) (Unless otherwise specified, T_a = 25 °C)

Characteristics	Symbol	Rating	Unit	
Collector power dissipation	(Note 1)	P _C	100	mW
Junction temperature		T _j	150	°C
Storage temperature		T_{stg}	-55 to 150	

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 1: Total rating

9. Q1 Electrical Characteristics (Unless otherwise specified, T_a = 25 °C)

Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Collector cut-off current	I _{CBO}	$V_{CB} = -50 \text{ V}, I_{E} = 0 \text{ mA}$	_	_	-100	nA
Collector cut-off current	I _{CEO}	V _{CE} = -50 V, I _B = 0 mA	_	_	-500	
Emitter cut-off current	I _{EBO}	V _{EB} = -15 V, I _C = 0 mA	-0.167	_	-0.311	mA
DC current gain	h _{FE}	V _{CE} = -5 V, I _C = -10 mA	70	-	_	_
Collector-emitter saturation voltage	V _{CE(sat)}	I _C = -5 mA, I _B = -0.25 mA	_	-0.1	-0.3	V
Input voltage (ON)	V _{I(ON)}	V _{CE} = -0.2 V, I _C = -5 mA	-2.2	_	-5.8	
Input voltage (off)	$V_{I(off)}$	V _{CE} = -5 V, I _C = -0.1 mA	-1.5	-	-2.6	
Transition frequency	f _T	V _{CE} = -10 V, I _C = -5 mA	_	200	_	MHz
Collector output capacitance	C _{ob}	$V_{CB} = -10 \text{ V}, I_{E} = 0 \text{ mA}, f = 1 \text{ MHz}$	_	3	6	pF



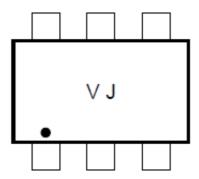
10. Q2 Electrical Characteristics (Unless otherwise specified, T_a = 25 °C)

Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Collector cut-off current	I _{CBO}	V _{CB} = 50 V, I _E = 0 mA	_	_	100	nA
Collector cut-off current	I _{CEO}	V _{CE} = 50 V, I _B = 0 mA	_	_	500	
Emitter cut-off current	I _{EBO}	V _{EB} = 15 V, I _C = 0 mA	0.167	_	0.311	mA
DC current gain	h _{FE}	V _{CE} = 5 V, I _C = 10 mA	70	_	_	_
Collector-emitter saturation voltage	V _{CE(sat)}	I _C = 5 mA, I _B = 0.25 mA	_	0.1	0.3	V
Input voltage (ON)	V _{I(ON)}	V _{CE} = 0.2 V, I _C = 5 mA	2.2	_	5.8	
Input voltage (off)	V _{I(off)}	V _{CE} = 5 V, I _C = 0.1 mA	1.5	_	2.6	
Transition frequency	f _T	V _{CE} = 10 V, I _C = 5 mA	_	250	_	MHz
Collector output capacitance	C _{ob}	V _{CB} = 10 V, I _E = 0 mA, f = 1 MHz	_	3	6	pF

11. Q1, Q2 Common Electrical Characteristics (Unless otherwise specified, Ta = 25 °C)

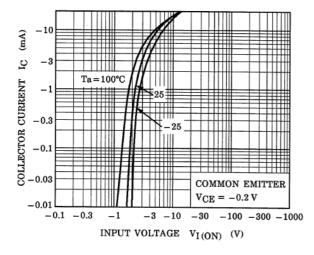
Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Input resistance	R ₁	-	32.9	47	61.1	kΩ
Resistor ratio	R1/R2	-	1.92	2.14	2.35	_

12. Marking





13. Characteristics Curves (Note)



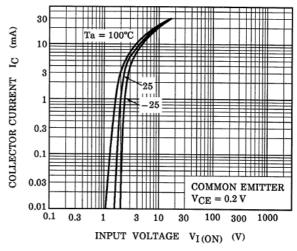
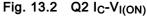
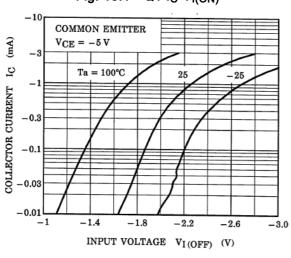


Fig. 13.1 Q1 I_C-V_{I(ON)}





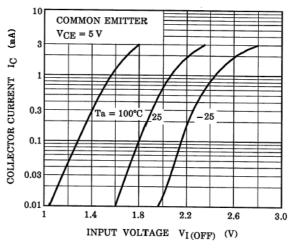
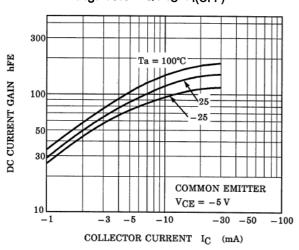


Fig. 13.3 Q1 I_C-V_{I(OFF)}

Fig. 13.4 Q2 I_C-V_{I(OFF)}



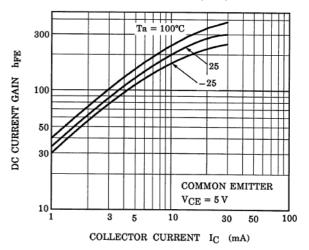


Fig. 13.5 Q1 h_{FE}-I_C

Fig. 13.6 Q2 h_{FE}-I_C

Rev.1.0



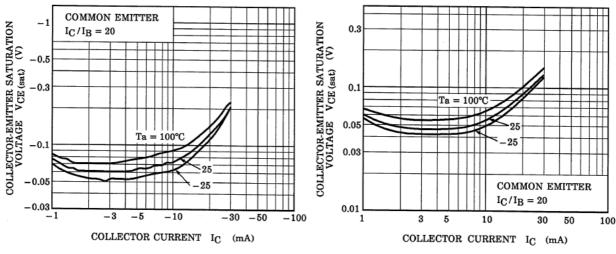


Fig. 13.7 Q1 V_{CE(sat)}-I_C

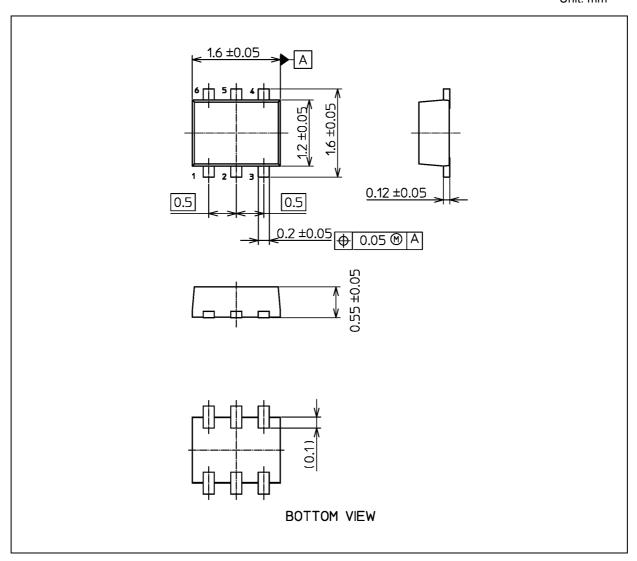
Fig. 13.8 Q2 V_{CE(sat)}-I_C

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.



Package Dimensions

Unit: mm



Weight: 3.0 mg (typ.)

	Package Name(s)
TOSHIBA: 1-2X1S	
Nickname: ES6	



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