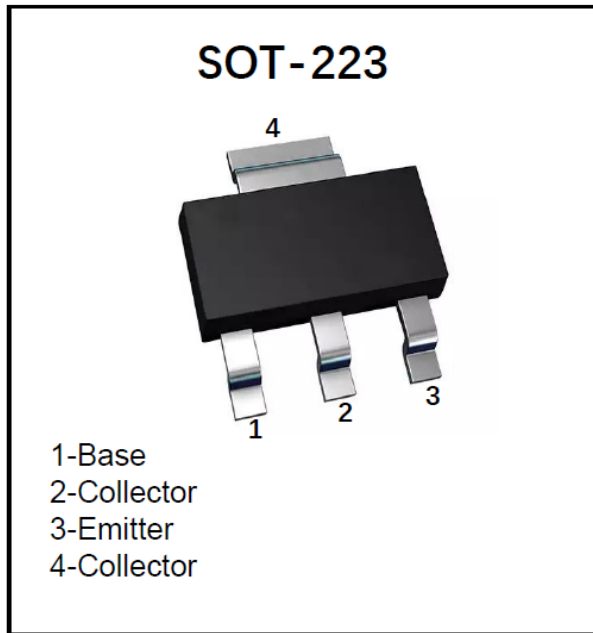


NPN Transistor



Features

- Moisture Sensitivity Level 1
- Low collector-emitter saturation voltage
- Part no. with suffix "Q" means AEC-Q101 qualified

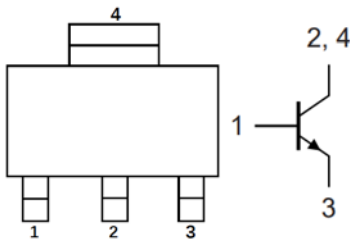
Application

- DC/DC converters; MOSFET gate driving
- Motor control; Power switches

Mechanical Data

- **Package:** SOT-223
- **Terminals:** Tin plated leads, solderable per J-STD-002 and JESD22-B102
- **Marking:** S304NZ

■Equivalent circuit



■Maximum Ratings (Ta=25°C unless otherwise noted)

Item	Symbol	Unit	Conditions	Value
Collector-Emitter Voltage	V_{CEO}	V		60
Collector-Base Voltage	V_{CBO}	V		60
Emitter-Base Voltage	V_{EBO}	V		5
Collector Current	I_C	A		5.2
Power Dissipation (Note1)	P_D	W		0.7
Power Dissipation (Note2)	P_D	W		1
Junction Temperature	T_j	°C		-55 to +150
Storage Temperature	T_{stg}	°C		-55 to +150



■ Thermal Characteristics

Parameter	Symbol	Unit	Value
Thermal resistance, junction-to-ambient	$R_{\theta J-A}^{(1)}$	$^{\circ}\text{C/W}$	179
Thermal resistance, junction-to-ambient	$R_{\theta J-A}^{(2)}$	$^{\circ}\text{C/W}$	125

Note:

- (1) Thermal resistance from junction to ambient, mounted on FR4 P.C.B. with standard footprint.
(2) Thermal resistance from junction to ambient, mounted on FR4 P.C.B. with 1mm² copper collector pad area.

■ Electrical Characteristics (Ta=25 $^{\circ}\text{C}$ unless otherwise noted)

Item	Symbol	Unit	Conditions	Min	Typ	Max
Collector-Base Breakdown Voltage	V_{CBO}	V	$I_C=100\mu\text{A}, I_E=0$	60		
Collector-Emitter Breakdown Voltage	V_{CEO^*}	V	$I_C=10\text{mA}, I_B=0$	60		
Emitter-Base Breakdown Voltage	V_{EBO}	V	$I_E=100\mu\text{A}, I_C=0$	5		
Collector-Base Cut-Off Current	I_{CBO}	nA	$V_{CB}=60\text{V}, I_E=0$			100
Emitter-Base Cut-Off Current	I_{EBO}	nA	$V_{EB}=5\text{V}, I_C=0$			100
DC Current Gain	h_{FE}		$V_{CE}=2\text{V}, I_C=0.5\text{A}$	300		
	h_{FE}		$V_{CE}=2\text{V}, I_C=1\text{A}$	300		
	h_{FE}		$V_{CE}=2\text{V}, I_C=2\text{A}$	250		
	h_{FE}		$V_{CE}=2\text{V}, I_C=4\text{A}$	150		
	h_{FE}		$V_{CE}=2\text{V}, I_C=6\text{A}$	80		
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	mV	$I_C=0.5\text{A}, I_B=50\text{mA}$			35
			$I_C=1\text{A}, I_B=50\text{mA}$			70
			$I_C=1\text{A}, I_B=10\text{mA}$			120
			$I_C=2\text{A}, I_B=40\text{mA}$			150
			$I_C=4\text{A}, I_B=200\text{mA}$			220
			$I_C=4\text{A}, I_B=400\text{mA}$			210
			$I_C=4\text{A}, I_B=80\text{mA}$			305
			$I_C=5.2\text{A}, I_B=260\text{mA}$			280
Collector-Emitter Saturation Resistance	$R_{CE(sat)}$	m Ω	$I_C=4\text{A}, I_B=200\text{mA}$			55
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	V	$I_C=1\text{A}, I_B=100\text{mA}$			0.9
			$I_C=4\text{A}, I_B=400\text{mA}$			1.05
Base-Emitter Turn-On Voltage	$V_{BE(on)}$	V	$V_{CE}=2\text{V}, I_C=2\text{A}$			0.85
Output Capacitance	C_{ob}	pF	$V_{CB}=10\text{V}, I_E=0, f=1\text{MHz}$		40	
Transition Frequency	f_T	MHz	$V_{CE}=10\text{V}, I_C=100\text{mA}, f=100\text{MHz}$	100		



■Ordering Information (Example)

PREFERRED P/N	PACKING CODE	UNIT WEIGHT(g)	MINIMUM PACKAGE(pcs)	INNER BOX QUANTITY(pcs)	OUTER CARTON QUANTITY(pcs)	DELIVERY MODE
PBSS304NZQ	F2	Approximate 0.11	2500	5000	25000	13" reel

■Characteristics (Typical)

Fig.1 - Static characteristic

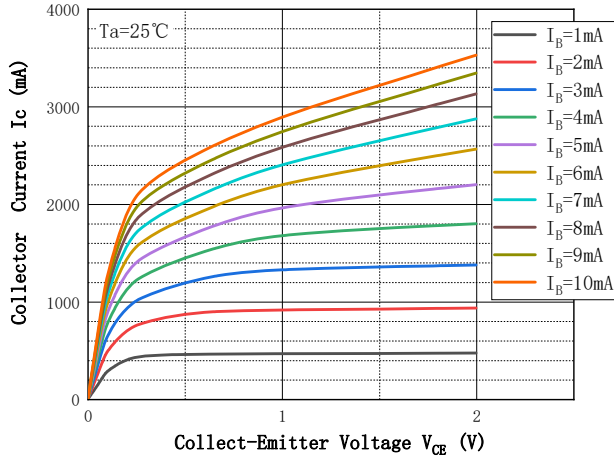


Fig.2 - DC Current Gain

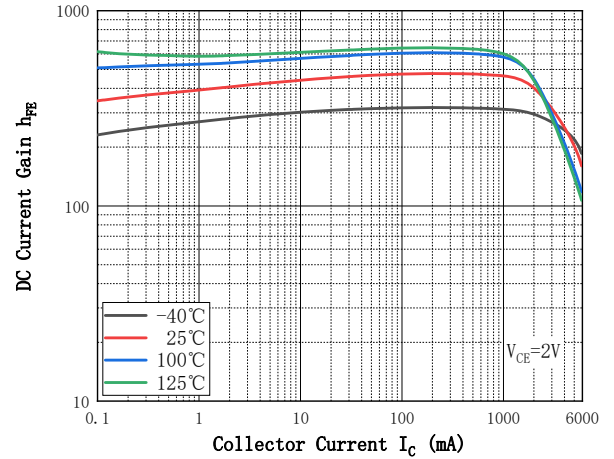


Fig.3 - Collect-Emittor Saturation Voltage

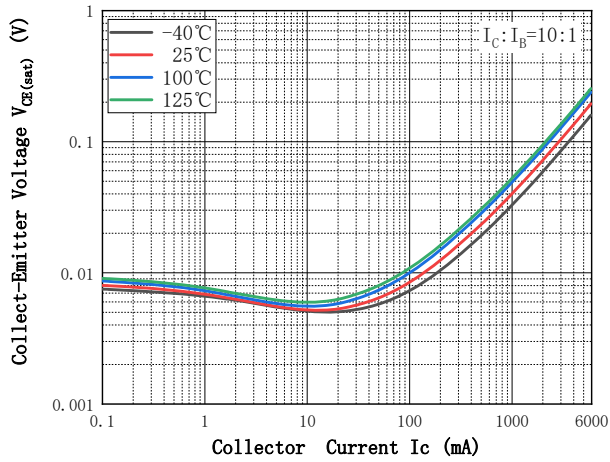


Fig.4 - Collect-Emittor Saturation Voltage

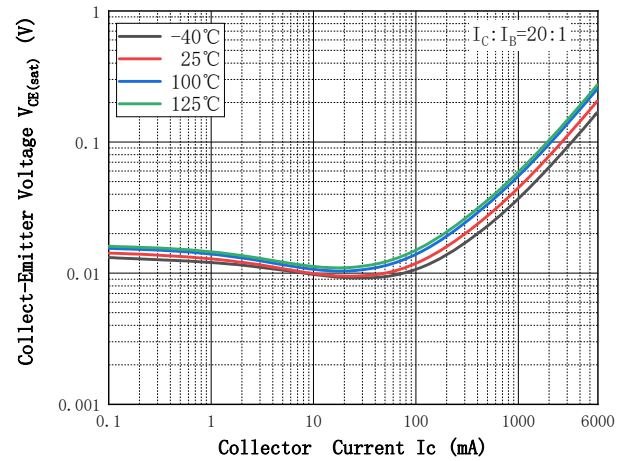


Fig.5 - Base-Emitter Voltage

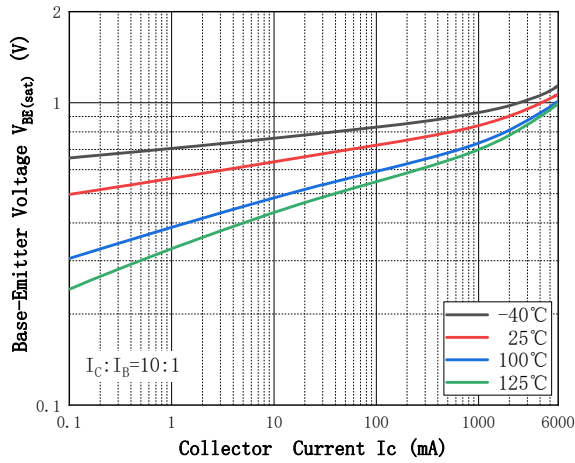


Fig.6 - Base-Emitter Voltage

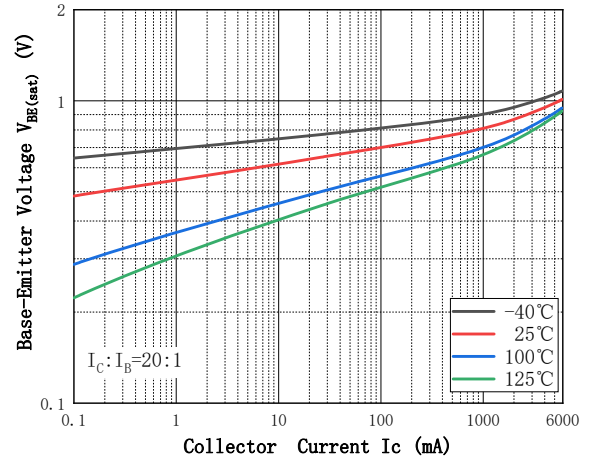


Fig.7 - Base-Emitter On Voltage

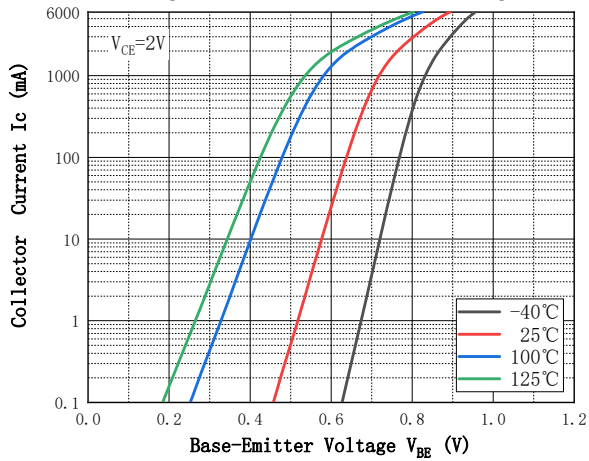


Fig.8 - Cob/Cib—VCB/VEB

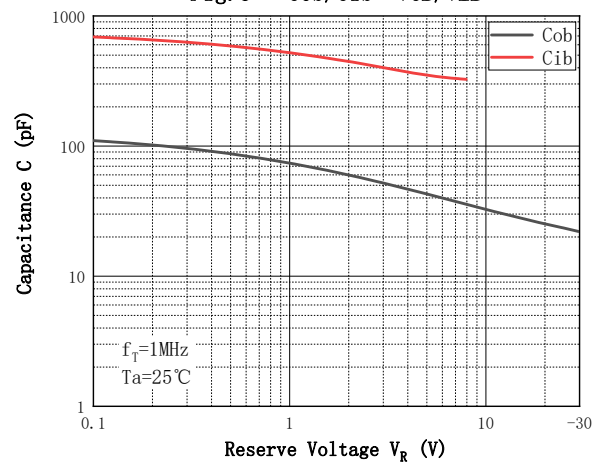
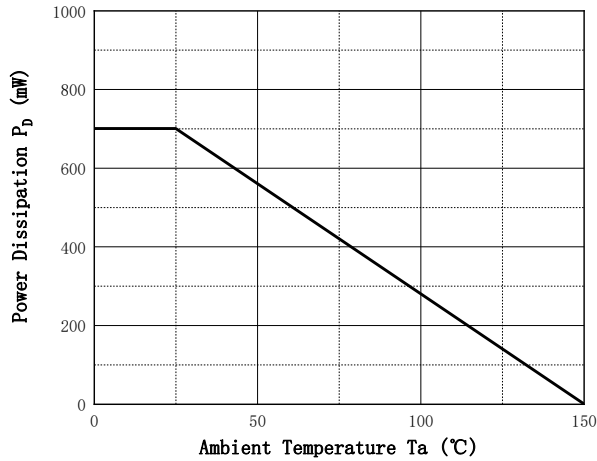
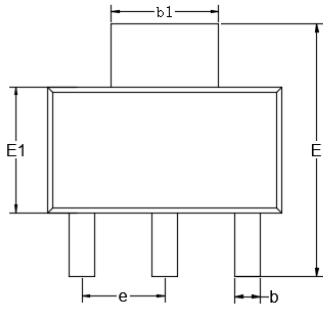
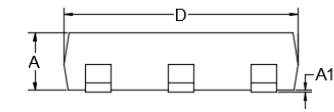


Fig.9 - Power Derating Curve



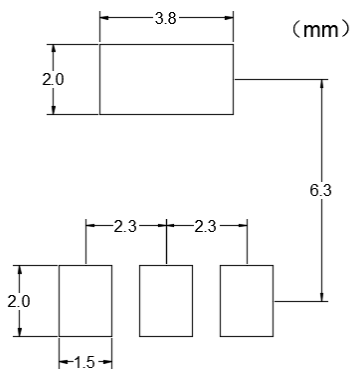


■SOT-223 Package Outline Dimensions



DIM	DIMENSIONS			
	INCHES		MM	
	MIN	MAX	MIN	MAX
A	0.0591	0.0670	1.5000	1.7000
A1	0.0008	0.0039	0.0200	0.1000
b	0.0259	0.0330	0.6600	0.8400
b1	0.1140	0.1220	2.9000	3.1000
c	0.0090	0.0138	0.2300	0.3500
D	0.2480	0.2640	6.3000	6.7000
E	0.2637	0.2874	6.7000	7.3000
E1	0.1290	0.1460	3.3000	3.7000
e	0.0866	0.0945	2.2000	2.4000
L	0.0295	0.0492	0.7500	1.2500
θ	0°	10°	0°	10°

■SOT-223 Suggested Pad Layout





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