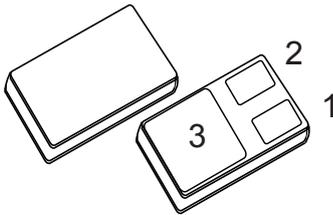
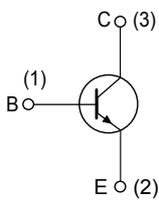


Rad-Hard 300 V, 5 A NPN bipolar transistor



SMD.5



DS10450

Features

V_{CB0}	$I_C(\text{max.})$	H_{FE} at 0.6 V, 250 mA	$T_j(\text{max.})$
300 V	5 A	> 55	200 °C

- 100 krad
- Linear gain characteristics

Description

The 2ST15300 is a silicon planar NPN power transistor in hermetic SMD.5 package and specifically designed for satellite application. Suitable for motor control, inductive load switch and power supply, it offers linear gain characteristic up to 100 krad. Qualified as per 5201/020 ESCC specification, in case of discrepancies between this data-sheet and the relevant agency specification, the latter takes precedence.

Product status link

[2ST15300](#)

1 Electrical ratings

Table 1. Absolute maximum ratings (pre-irradiation)

Symbol	Parameter	Value	Unit
V_{CBO}	Collector-base cut-off current ($I_E = 0$)	300	V
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	100	V
V_{EBO}	Emitter-base current ($I_C = 0$)	6	V
I_C	Drain current (pulsed)	5	A
P_{TOT}	Total power dissipation at $T_{case} \leq 25\text{ °C}$	40	W
	Total power dissipation at $T_{ambient} \leq 25\text{ °C}$	2.2	
T_{op}	Operating temperature range	-65 to 200	°C
T_j	Max. operating junction temperature range	200	°C

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance junction-case max.	4.38	°C/W
R_{thJ-a}	Thermal resistance junction-ambient max.	80	°C/W

2 Electrical characteristics

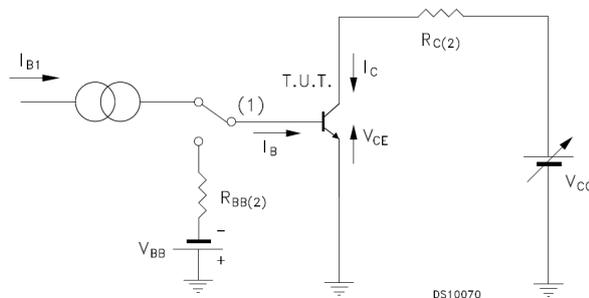
$T_C = 25\text{ }^\circ\text{C}$ unless otherwise specified

Table 3. Electrical characteristics

Symbol	Parameter	Test conditions	Min.	Max.	Unit
I_{CBO}	Collector-base cut-off current ($I_E = 0$)	$V_{CB} = 300\text{ V}$		10	μA
		$V_{CB} = 300\text{ V}, T_C = 150\text{ }^\circ\text{C}$		100	
I_{EBO}	Emitter-base cut-off current ($I_C = 0$)	$V_{EB} = 6\text{ V}$		50	μA
$V_{(BR)CBO}$	Collector-base breakdown voltage ($I_E = 0$)	$I_C = 10\text{ mA}$	300		V
$V_{(BR)CEO}$	Collector-emitter breakdown voltage ($I_B = 0$)	$I_C = 10\text{ mA}$	100		V
$V_{(BR)EBO}$	Emitter-base breakdown voltage ($I_C = 0$)	$I_E = 10\text{ }\mu\text{A}$	6		V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$I_C = 5\text{ A}, I_B = 1\text{ A}$		0.7	V
$V_{BE(sat)}$	Base-emitter saturation voltage	$I_C = 5\text{ A}, I_B = 1\text{ A}$		1.4	V
h_{FE}	DC current gain	$I_C = 50\text{ mA}, V_{CE} = 0.6\text{ V}$	50		
		$I_C = 250\text{ mA}, V_{CE} = 0.6\text{ V}$	55		
		$I_C = 1\text{ A}, V_{CE} = 5\text{ V}$	55		
		$I_C = 5\text{ A}, V_{CE} = 5\text{ V}$	35		
t_{ON}	Turn-on time	$V_{CC} = 30\text{ V}, I_C = 3\text{ A}, I_{B1} = 0.3\text{ A},$		0.4	μs
t_{OFF}	Turn-off time	$I_{B2} = 0.3\text{ A},$ resistive load		3.5	μs
C_{OB}	Output-base	$V_{CB} = 10\text{ V}, f = 1\text{ MHz}$		120	pF

2.1 Test circuits

Figure 1. ESCC resistive load switching test circuit



Note: (1) Fast electronic switch

Note: (2) Non-inductive resistor

3 Radiation hardness assurance

This products is guaranteed in radiation as per ESCC 22900 and in compliance with ESCC 5201/020 specification

Each lot is tested in radiation according to the following procedure:

- Radiation condition of 0.1 rad (Si)/s
- Test of 11 samples by wafer, 5 biased at 80% of V(BR)CEO, 5 unbiased and for reference
- Acceptance criteria of each wafer at 100 krad if all 10 samples comply with the post radiation electrical characteristics as per Table 4.

Table 4. ESCC 5201/020 post radiation electrical characteristics (T_{amb} = 25 °C unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Max.	Unit
I _{CBO}	Collector-base cut-off current (I _E = 0)	V _{CB} = 240 V		10	μA
I _{EBO}	Emitter-base cut-off current (I _C = 0)	V _{EB} = 6 V		50	μA
V _{(BR)CBO}	Collector-base breakdown voltage (I _E = 0)	I _C = 10 mA	240		V
V _{(BR)CEO} ⁽¹⁾	Collector-emitter breakdown voltage (I _B = 0)	I _C = 10 mA	100		V
V _{(BR)EBO}	Emitter-base breakdown voltage (I _C = 0)	I _E = 10 μA	6		V
V _{CE(sat)} ⁽¹⁾	Collector-emitter saturation voltage	I _C = 5 A, I _B = 1 A		0.7	V
V _{BE(sat)} ⁽¹⁾	Base-emitter saturation voltage	I _C = 5 A, I _B = 1 A		1.4	V
[h _{FE}]	Post irradiation gain calculation ⁽²⁾	I _C = 50 mA, V _{CE} = 0.6 V	[25]		
		I _C = 250 mA, V _{CE} = 0.6 V	[27.5]		
		I _C = 5 A, V _{CE} = 5 V	[27.5]		
		I _C = 5 A, V _{CE} = 5 V	[17.5]		

1. Pulse test: pulse duration ≤ 300 μs, duty cycle ≤ 2%.

2. The post-irradiation gain calculation [h_{FE}] is made according to MILSTD-750 test method 1019.

4 Package information

In order to meet environmental requirements, ST offers these devices in different grades of **ECOPACK** packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions and product status are available at: www.st.com. ECOPACK is an ST trademark.

4.1 SMD.5 package information

Figure 2. Surface mount SMD.5 package outline (3-terminal)

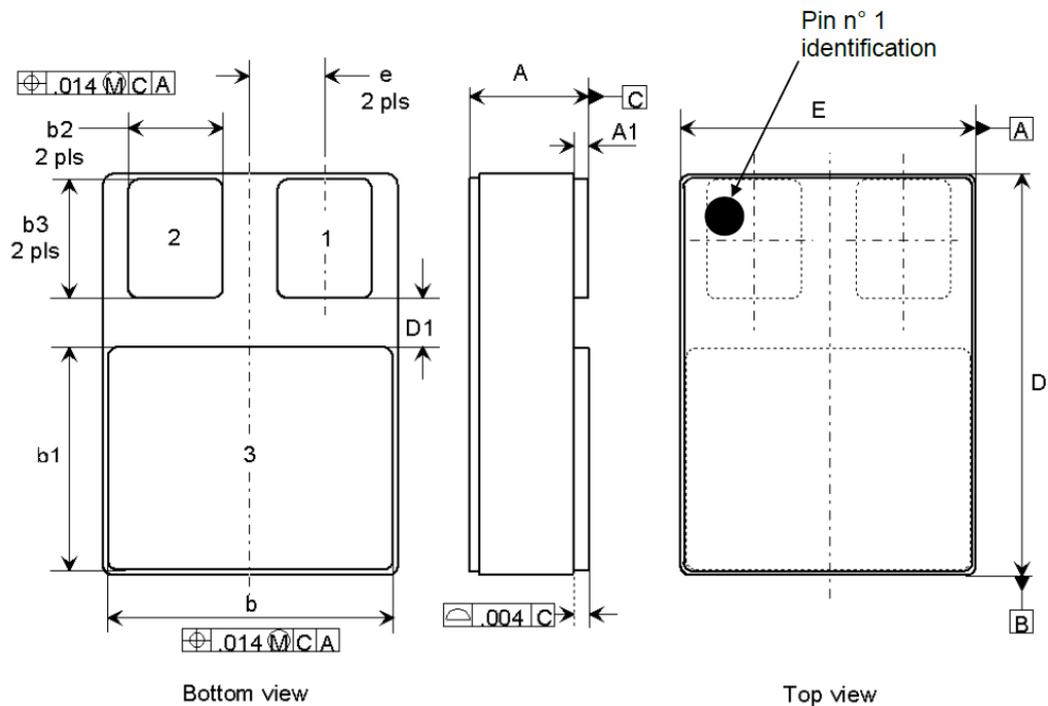


Table 5. SMD.5 package mechanical data

Symbols	Dimensions (mm)			Dimensions (inches)		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.84		3.30	0.112		0.130
A1	0.25	0.38	0.51	0.010	0.015	0.020
b	7.13	7.26	7.39	0.281	0.286	0.291
b1	5.58	5.72	5.84	0.220	0.225	0.230
b2	2.28	2.41	2.54	0.090	0.095	0.100
b3	2.92	3.05	3.18	0.115	0.120	0.125
D	10.03	10.16	10.28	0.395	0.400	0.405
D1	0.76			0.030		
E	7.39	7.52	7.64	0.291	0.296	0.301
e		1.91			0.075	

5 Order codes

Table 6. Ordering information

Part number	Agency specification	Quality level	Radiation level	Package	Mass	Lead finish	Marking	Packing
2ST15300SR1	-	Engineer model	-	SMD.5	2 g	Gold	2ST15300SR1	Strip pack
2ST15300RSRHRG	5201/020	Flight model	100 krad				520102001R	Tape and reel
2ST15300RSRHRGW								

Contact ST sales office for information about the specific conditions for products in die form and for other packages.

6 Other information

6.1 Traceability information

Date code information is described in the table below.

Table 7. Date codes

Quality level	Date codes ⁽¹⁾
Engineer model	3yywwN
ESCC flight model	yywwN

1. yy = year, ww = week, N = lot index in the week.

6.2 Documentation

The table below list the documentation provided for each type of products.

Table 8. Documentation provided for each type of product

Quality level	Radiation level	Documentation
Engineering model	-	Certificate of conformance
ESCC	100 krad	Certificate of conformance ESCC qualification maintenance lot reference Radiation verification test (RVT) report at 25 / 50 / 70 / 100 krad at 0.1 rad / s

Revision history

Table 9. Document revision history

Date	Version	Changes
07-Aug-2019	1	First release.
12-Oct-2020	2	Updated Section Description, Table 3. Electrical characteristics. Added Section 2.1 Test circuits. Minor text changed.
19-Jan-2021	3	Updated Table 1, Figure 2 and Table 5.
11-Mar-2021	4	Updated Table 6 and Table 8.

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