



europaean space agency
agence spatiale européenne

Pages 1 to 18

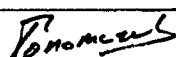
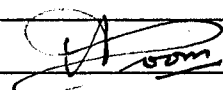
TRANSISTORS, HIGH POWER, NPN

BASED ON TYPE 2N5672

ESA/SCC Detail Specification No. 5203/004



**space components
coordination group**

Issue/Rev.	Date	Approved by	
		SCCG Chairman	ESA Director General or his Deputy
Issue 2	March 1979	-	-
Revision 'A'	February 1982	-	-
Revision 'B'	October 1994		

**ESASCC**

ESA/SCC Detail Specification
No. 5203/004

Rev. 'B'

PAGE 2

ISSUE 2

DOCUMENTATION CHANGE NOTICE

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.		
'A'	Feb. '92	This Issue incorporates all modifications agreed on the basis of Policy DCR 21016 for adaptation to new qualification requirements				
		P1.	Cover page	None		
		P2.	DCN	None		
		P4.	Table of Contents	: Table 1 renumbered to "1(b)"	22885	
				: Table 1(a) added	22885	
				: "Appendices" Title added	21019	
		P5.	Para. 1.2	: Paragraph amended	22885	
				Para. 1.3	: Amended to read "... Table 1(b)"	22885
		P6.	Table 1	: Renumbered to "1(b)"	22885	
				Table 1(a)	: New Table added	22885
		P9.	Para. 2	: MIL-STD-1276 deleted, "ESA/SCC Basic Spec. No. 23500" added	21025	
				Para. 4.1	: Additional text added	21019
				Para. 4.2.2	: PIND deviation deleted	21043
		P10.	Para. 4.4.2	: Paragraph amended	22885	
		P11.	Para. 4.5.3	: "Type Variant" added	22885	
		P15.	Table 3	: Note deleted	21047	
		P17.	Para. 4.8.5	: Amended to read "... Table 1(b)"	22885	
'B'	Oct. '94	P1.	Cover page	None		
		P2.	DCN	None		
		P8.	Figure 2	: Pin identifiers '1 - Emitter' and '2 - Base' reversed	23626	
		This document has been transferred from hardcopy to electronic format. The content is unchanged but minor differences in presentation exist.				

**TABLE OF CONTENTS**

	<u>Page</u>
1. <u>GENERAL</u>	5
1.1 Scope	5
1.2 Component Type Variants	5
1.3 Maximum Ratings	5
1.4 Parameter Derating Information	5
1.5 Physical Dimensions	5
1.6 Functional Diagram	5
2. <u>APPLICABLE DOCUMENTS</u>	9
3. <u>TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS</u>	9
4. <u>REQUIREMENTS</u>	9
4.1 General	9
4.2 Deviations from Generic Specification	9
4.2.1 Deviations from Special In-process Controls	9
4.2.2 Deviations from Final Production Tests (Chart II)	9
4.2.3 Deviations from Burn-in and Electrical Measurements (Chart III)	9
4.2.4 Deviations from Qualification Tests (Chart IV)	9
4.2.5 Deviations from Lot Acceptance Tests (Chart V)	9
4.3 Mechanical Requirements	10
4.3.1 Dimension Check	10
4.3.2 Weight	10
4.3.3 Terminal Strength	10
4.4 Materials and Finishes	10
4.4.1 Case	10
4.4.2 Lead Material and Finish	10
4.5 Marking	11
4.5.1 General	11
4.5.2 Lead Identification	11
4.5.3 The SCC Component Number	11
4.5.4 Traceability Information	11
4.5.5 Marking of Small Components	11



	<u>Page</u>
4.6 Electrical Measurements	12
4.6.1 Electrical Measurements at Room Temperature	12
4.6.2 Electrical Measurements at High and Low Temperatures	12
4.6.3 Circuits for Electrical Measurements	12
4.7 Burn-in Tests	12
4.7.1 Parameter Drift Values	12
4.7.2 Conditions for Burn-in	12
4.7.3 Electrical Circuits for Burn-in	12
4.8 Environmental and Endurance Tests	17
4.8.1 Electrical Measurements on Completion of Environmental Tests	17
4.8.2 Electrical Measurements at Intermediate Points and on Completion of Endurance Tests	17
4.8.3 Conditions for Operating Life Tests (Part of Endurance Testing)	17
4.8.4 Electrical Circuits for Operating Life Tests	17
4.8.5 Conditions for High Temperature Storage Test (Part of Endurance Testing)	17

TABLES

1(a) Type Variants	6
1(b) Maximum Ratings	6
2 Electrical Measurements at Room Temperature - d.c. Parameters	13
Electrical Measurements at Room Temperature - a.c. Parameters	14
3 Electrical Measurements at High and Low Temperatures	15
4 Parameter Drift Values	15
5 Conditions for Burn-in	16
6 Electrical Measurements at Intermediate Points and on Completion of Endurance Testing	18

FIGURES

1 Parameter Derating Information	7
2 Physical Dimensions	8
3 Functional Diagram	8
4 Test Circuit	14
5 Electrical Circuit for Burn-in	16

APPENDICES (Applicable to specific Manufacturers only)

None.

**1. GENERAL****1.1 SCOPE**

This specification details the ratings, physical and electrical characteristics, test and inspection data for a Transistor, High Power, NPN, based on Type 2N5672.

It shall be read in conjunction with ESA/SCC Generic Specification No. 5000, the requirements of which are supplemented herein.

1.2 COMPONENT TYPE VARIANTS

Variants of the basic transistors specified herein, which are also covered by this specification, are given in Table 1(a).

1.3 MAXIMUM RATINGS

The maximum ratings, which shall not be exceeded at any time during use or storage, applicable to the transistors specified herein, are scheduled in Table 1(b).

1.4 PARAMETER DERATING INFORMATION

The derating information applicable to the transistors specified herein is shown in Figure 1.

1.5 PHYSICAL DIMENSIONS

The physical dimensions of the transistors specified herein are shown in Figure 2.

1.6 FUNCTIONAL DIAGRAM

The functional diagram showing lead identification, of the transistors specified herein, is shown in Figure 3.

**TABLE 1(a) - TYPE VARIANTS**

VARIANT	BASED ON TYPE	FIGURE	LEAD MATERIAL AND FINISH
01	2N5672	2	D2
02	2N5672	2	H7
03	2N5672	2	H9

TABLE 1(b) - MAXIMUM RATINGS

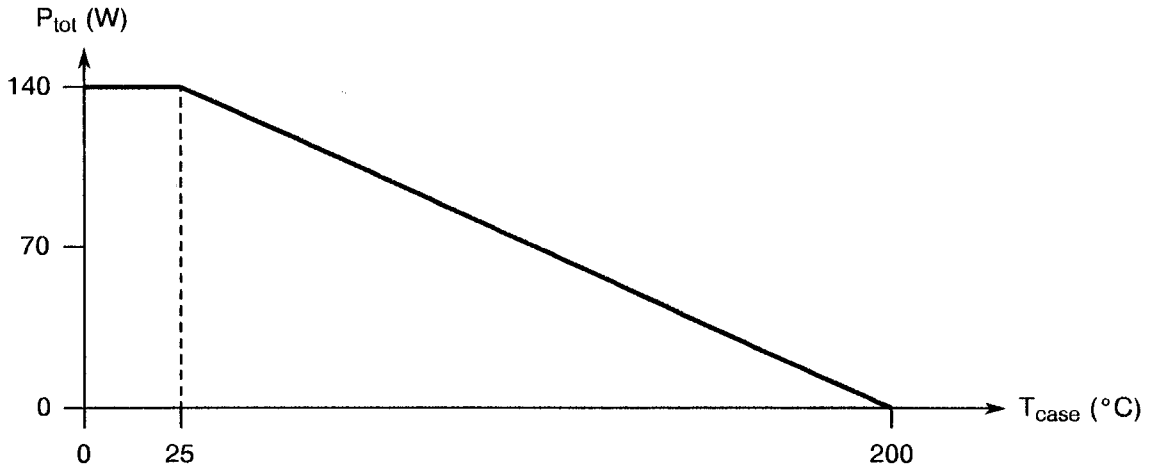
No.	CHARACTERISTICS	SYMBOL	MAXIMUM RATINGS	UNIT	REMARKS
1	Collector - Base Breakdown Voltage	$V_{(BR)CBO}$	150	V	
2	Collector - Emitter Breakdown Voltage	$V_{(BR)CEO}$	120	V	
3	Emitter - Base Breakdown Voltage	$V_{(BR)EBO}$	7.0	V	
4	Collector Current	I_C	30	A	
5	Power Dissipation	P_{tot}	140	W	$T_{case} = +25^{\circ}C$
6	Operating Temperature Range	T_{op}	- 65 to +200	$^{\circ}C$	T_{amb}
7	Storage Temperature Range	T_{stg}	- 65 to +200	$^{\circ}C$	
8	Soldering Temperature	T_{sol}	+260	$^{\circ}C$	Note 1
9	Base Current	I_B	10	A	

NOTES

1. Duration 10 seconds maximum at a distance of not less than 1.5mm from the case.



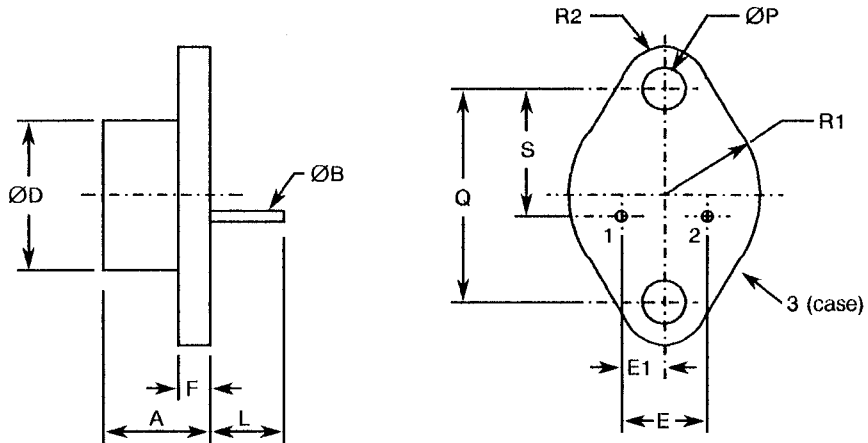
FIGURE 1 - PARAMETER DERATING INFORMATION



Rated Power Dissipation versus Case Temperature

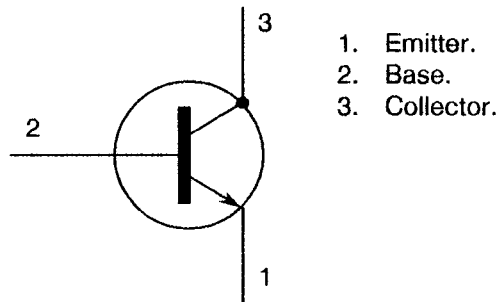


FIGURE 2 - PHYSICAL DIMENSIONS



SYMBOL	MILLIMETRES		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	6.35	11.43	0.250	0.450
ØB	0.97	1.09	0.038	0.043
ØD	-	22.23	-	0.875
E	10.67	11.18	0.420	0.440
E1	5.21	5.72	0.205	0.225
F	-	3.43	-	0.135
L	7.92	-	0.312	-
ØP	3.84	4.09	0.151	0.161
Q	29.90	30.40	1.177	1.197
R1	-	13.34	-	0.525
R2	-	4.78	-	0.188
S	16.54	17.15	0.655	0.675

FIGURE 3 - FUNCTIONAL DIAGRAM



NOTES

1. The collector is internally connected to the case.

**2. APPLICABLE DOCUMENTS**

The following documents form part of this specification and shall be read in conjunction with it:-

- (a) ESA/SCC Generic Specification No. 5000 for Discrete Semiconductor Components.
- (b) MIL-STD-750, Test Methods and Procedures for Semiconductor Devices.
- (c) ESA/SCC Basic Specification No. 23500, Requirements for Lead Materials and Finishes for Components for Space Application.

3. TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS

For the purpose of this specification, the terms, definitions, abbreviations, symbols and units specified in ESA/SCC Basic Specification No. 21300 shall apply.

4. REQUIREMENTS**4.1 GENERAL**

The complete requirements for procurement of the transistors specified herein are stated in this specification and ESA/SCC Generic Specification No. 5000. Deviations from the Generic Specification, applicable to this specification only, are listed in Para. 4.2.

Deviations from the applicable Generic Specification and this Detail Specification, formally agreed with specific Manufacturers on the basis that the alternative requirements are equivalent to the ESA/SCC requirements and do not affect the components' reliability, are listed in the appendices attached to this specification.

4.2 DEVIATIONS FROM GENERIC SPECIFICATION**4.2.1 Deviations from Special In-process Controls**

None.

4.2.2 Deviations from Final Production Tests (Chart II)

None.

4.2.3 Deviations from Burn-in and Electrical Measurements (Chart III)

- (a) Para. 7.1.1(a), High Temperature Reverse Bias Test (H.T.R.B.) is not required.

4.2.4 Deviations from Qualification Tests (Chart IV)

None.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

None.



4.3 MECHANICAL REQUIREMENTS

4.3.1 Dimension Check

The dimensions of the transistors specified herein shall be checked. They shall conform to those shown in Figure 2.

4.3.2 Weight

The maximum weight of the transistors specified herein shall be 18 grammes.

4.3.3 Terminal Strength

The requirements for terminal strength testing are specified in Section 9 of ESA/SCC Generic Specification No. 5000. The test conditions shall be as follows:-

Test Condition: 'A' (Tension).
Applied Force: 10 Newtons.
Duration: 10 seconds.

4.4 MATERIALS AND FINISHES

The materials and finishes shall be as specified herein. Where a definite material is not specified, a material which will enable the transistors specified herein to meet the performance requirements of this specification shall be used. Acceptance or approval of any constituent material does not guarantee acceptance of the finished product.

4.4.1 Case

Metal case, hermetically sealed, similar to JEDEC TO-3.

4.4.2 Lead Material and Finish

The lead material shall be either Type 'D' with Type '2' finish or Type 'H' with either Type '7' or Type '9' finish in accordance with the requirements of ESA/SCC Basic Specification No. 23500. (See Table 1(a) for Type Variants).



4.5 MARKING

4.5.1 General

The marking of all components delivered to this specification shall be in accordance with the requirements of ESA/SCC Basic Specification No. 21700. Each component shall be marked in respect of:-

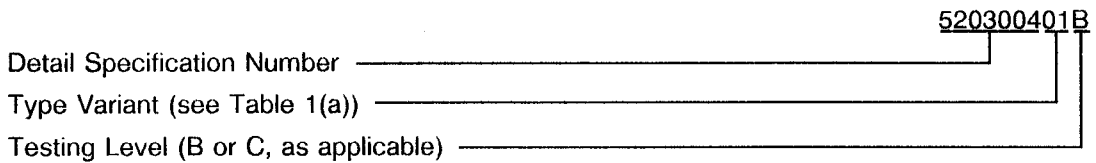
- (a) Lead Identification.
- (b) The SCC Component Number.
- (c) Traceability Information.

4.5.2 Lead Identification

Lead identification shall be as shown in Figures 2 and 3.

4.5.3 The SCC Component Number

Each component shall bear the SCC Component Number which shall be constituted and marked as follows:-



4.5.4 Traceability Information



Each component shall be marked in respect of traceability information in accordance with the requirements of ESA/SCC Basic Specification No. 21700.

4.5.5 Marking of Small Components

When it is considered that the component is too small to accommodate the marking as specified above, as much as space permits shall be marked. The order of precedence shall be as follows:-

- (a) Lead Identification.
- (b) The SCC Component Number.
- (c) Traceability Information.

The marking information in full shall accompany each component in its primary package.

 	<p style="text-align: center;">ESA/SCC Detail Specification No. 5203/004</p>		<p>PAGE 12 ISSUE 2</p>
--	--	--	----------------------------

4.6 ELECTRICAL MEASUREMENTS

4.6.1 Electrical Measurements at Room Temperature

The parameters to be measured at room temperature are scheduled in Table 2. The measurements shall be performed at $T_{amb} = +22 \pm 3$ °C.

4.6.2 Electrical Measurements at High and Low Temperatures

The parameters to be measured at high and low temperatures are scheduled in Table 3.

4.6.3 Circuits for Electrical Measurements

Circuits for use in performing the electrical measurements listed in Tables 2 and 3 of this specification are shown in Figure 4.

4.7 BURN-IN TESTS

4.7.1 Parameter Drift Values

The parameter drift values applicable to burn-in are specified in Table 4 of this specification. Unless otherwise stated, measurements shall be performed at $T_{amb} = +22 \pm 3$ °C. The parameter drift values (Δ) applicable to the parameters scheduled, shall not be exceeded. In addition to these drift value requirements, the appropriate limit value specified for a given parameter in Table 2 shall not be exceeded.

4.7.2 Conditions for Burn-in

The requirements for burn-in are specified in Section 7 of ESA/SCC Generic Specification No. 5000. The conditions for burn-in shall be as specified in Table 5 of this specification.

4.7.3 Electrical Circuits for Burn-in

Circuits for use in performing the burn-in tests are shown in Figure 5 of this specification.

**TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - d.c. PARAMETERS**

No.	CHARACTERISTICS	SYMBOL	MIL-STD-750 TEST METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN	MAX	
1	Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	3011	$I_C = 200mA$ $I_B = 0A$ Note 1	120	-	V
		$V_{(BR)CEX}$	3011	$I_C = 200mA$ $V_{BE} = -1.5V$	150	-	V
		$V_{(BR)CER}$	3011	$I_C = 200mA$ $R_{BE} = 50$	140	-	V
2	Collector-Emitter Cut-off Current	I_{CEX}	3041	$V_{CE} = 135V$ $V_{BE} = -1.5V$	-	10	mA
		I_{CEO}	3041	$V_{CE} = 80V$ $I_B = 0A$	-	10	mA
3	Emitter-Base Cut-off Current	I_{EBO}	3061D	$V_{EB} = 7.0V$ $I_C = 0A$	-	10	mA
4	D.C. Forward Current Transfer Ratio	h_{FE1}	3076	$I_C = 20A$ $V_{CE} = 5.0V$ Note 1	20	-	-
		h_{FE2}	3076	$I_C = 15A$ $V_{CE} = 2.0V$ Note 1	20	100	-
5	Base-Emitter Voltage	V_{BE}	3020	$I_C = 15A$ $V_{CE} = 5.0V$ Note 1	-	1.6	V
6	Collector-Emitter Saturation Voltage	V_{CEsat}	3071	$I_C = 15A$ $I_B = 1.2A$ Note 1	-	0.75	V
7	Base-Emitter Saturation Voltage	V_{BEsat}	3066	$I_C = 15A$ $I_B = 1.2A$ Note 1	-	1.5	V

NOTES1. Pulsed measurement: Pulse Length $\leq 300\mu s$, Duty Cycle $\leq 2.0\%$.

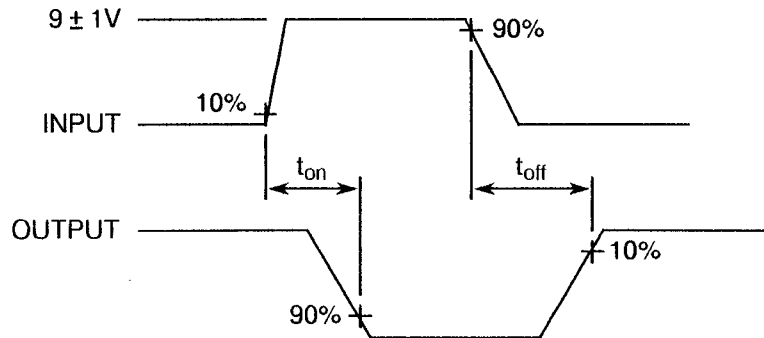
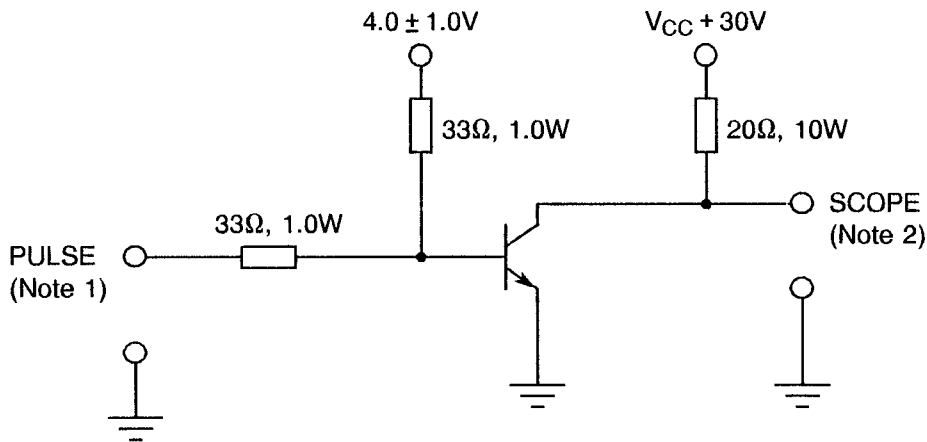


TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - a.c. PARAMETERS

No.	CHARACTERISTICS	SYMBOL	MIL-STD-750 TEST METHOD	TEST FIG.	TEST CONDITIONS	LIMITS		UNIT
						MIN	MAX	
1	A.C. Forward Current Transfer Ratio	h_{FE}	3206	-	$I_C = 2.0A$ $V_{CE} = 10V$ $f = 5.0MHz$	10	-	-
2	Output Capacitance	C_{obo}	3236	-	$V_{CB} = 10V$ $I_C = 0A$ $f = 1.0MHz$	-	900	pF
3	Switching Time	t_{on} t_s t_{off}	3251 Cond. A	4	$I_C = 15A$ $I_{B1} = 1.2A$ $I_{B2} = 1.2A$ $V_{CC} = 30V$	-	0.5 1.5 0.5	μs

FIGURE 4 - TEST CIRCUIT

PULSE RESPONSE TEST CIRCUIT



NOTES

1. The rise time (t_r) and fall time (t_f) of the applied pulse shall each be $\leq 20ns$, duty cycle $\leq 2.0\%$, generator source impedance shall be 50Ω , pulse width = $20\mu s$.
2. Output sampling oscilloscope: $Z_{IN} > 100k\Omega$, $C_{IN} \leq 50pF$, rise time $\leq 20ns$.

**TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES**

No.	CHARACTERISTICS	SYMBOL	MIL-STD-750 TEST METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN	MAX	
1	Collector-Emitter Cut-off Current	I_{CEX}	3041	$T_{case} = +150^{\circ}C$ $V_{CE} = 100V$ $V_{BE} = -1.5V$	-	10	mA

TABLE 4 - PARAMETER DRIFT VALUES

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITIONS	CHANGE LIMITS (Δ)	UNIT
1	Collector-Emitter Cut-off Current	I_{CEO}	MIL-STD-750	$V_{CE} = 80V$ $I_B = 0A$	500 or 100	μA %
2	D.C. Forward Current Transfer Ratio	h_{FE}	MIL-STD-750 Method 3076A	$V_{CE} = 2.0V$ $I_C = 15A$ Note 1	± 15	%
3	Collector-Emitter Saturation Voltage	V_{CEsat}	MIL-STD-750 Method 3071	$I_C = 15A$ $I_B = 1.2A$ Note 1	± 15	%

NOTES

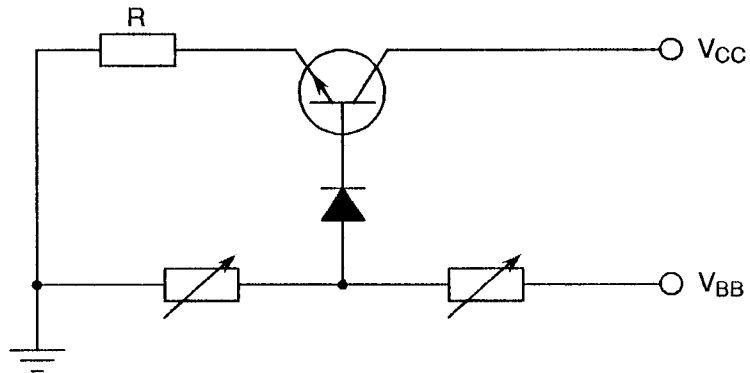
1. Pulsed measurement: Pulse Length $\leq 300\mu s$, Duty Cycle $\leq 2.0\%$.



TABLE 5 - CONDITIONS FOR BURN-IN

No.	CHARACTERISTICS	SYMBOL	CONDITIONS	UNIT
1	Case Temperature	T_{case}	+ 100	°C
2	Collector-Base Voltage	V_{CB}	20	V
3	Power Dissipation	P_{lot}	80	W

FIGURE 5 - ELECTRICAL CIRCUIT FOR BURN-IN



NOTES

1. V_{CC} adjusted for $V_{CE} = 20V$.
 V_{BB} adjusted so that $I_C = 4.0A$.



- 4.8 ENVIRONMENTAL AND ENDURANCE TESTS (CHARTS IV AND V OF ESA/SCC GENERIC SPECIFICATION NO. 5000)
- 4.8.1 Electrical Measurements on Completion of Environmental Tests
The parameters to be measured on completion of environmental tests are scheduled in Table 2. The measurements shall be performed at $T_{amb} = +22 \pm 3$ °C.
- 4.8.2 Electrical Measurements at Intermediate Points and on Completion of Endurance Tests
The parameters to be measured at intermediate points and on completion of endurance testing are scheduled in Table 6.
- 4.8.3 Conditions for Operating Life Tests (Part of Endurance Testing)
The requirements for operating life testing are specified in Section 9 of ESA/SCC Generic Specification No. 5000. The conditions for operating life testing shall be the same as specified in Table 5 for the burn-in test.
- 4.8.4 Electrical Circuits for Operating Life Tests
The circuit to be used for performance of the operating life test is the same as shown in Figure 5 for burn-in.
- 4.8.5 Conditions for High Temperature Storage Test (Part of Endurance Testing)
The requirements for the high temperature storage test are specified in ESA/SCC Generic Specification No. 5000. The temperature to be applied shall be the maximum storage temperature specified in Table 1(b) of this specification.

TABLE 6 - ELECTRICAL MEASUREMENTS AT INTERMEDIATE POINTS AND ON COMPLETION OF ENDURANCE TESTING

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN.	MAX.	
1	D.C. Forward Current Transfer Ratio	h_{FE}	MIL-STD-750 Method 3076	$I_C = 15A$ $V_{CE} = 2.0V$	20	100	-
2	Collector-Emitter Saturation Voltage	V_{CEsat}	MIL-STD-750 Method 3071	$I_C = 15A$ $I_B = 1.2A$ Note 1	-	0.75	V
3	Collector-Emitter Cut-off Current	I_{CEO}	MIL-STD-750 Method 3041	$V_{CE} = 80V$ $I_B = 0A$	-	10	mA

NOTES

1. Pulsed measurement: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2.0\%$.