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Pages 1 to 20

**TRANSISTORS, MATCHED DUAL, NPN,  
BASED ON TYPES 2N2919, 2N2920 AND 2N2920A**

**ESA/SCC Detail Specification No. 5207/002**



**space components  
coordination group**

Issue/Rev.	Date	Approved by	
		SCCG Chairman	ESA Director General or his Deputy
Issue 6	March 1998		
Revision 'A'	July 1999		
Revision 'B'	November 1999		
Revision 'C'	February 2000		



**DOCUMENTATION CHANGE NOTICE**

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.
		This Issue supersedes Issue 5 and incorporates all changes agreed in the following DCR's:-		
		Cover Page		None
		DCN		None
		Para. 1.2	: "See Table 1(a)" deleted and new text added	221436
		Para. 1.7	: New paragraph added	221436
		Para. 2	: Item (c) deleted	221436
		Table 1(a)	: Lead Material column heading amended	221436
			: For Variants 01 to 03, Figure number amended to "2(a)"	221436
			: Variants 04 to 12 added	221436
		Table 1(b)	: No. 5, Characteristics and Symbol amended	221436
			: , Maximum Rating for Variants 10 to 12 added	221436
			: No. 6, Characteristics and Symbol amended	221436
			: No. 9, Characteristics amended	221436
			: , Maximum Rating for Variants 10 to 12 added	221436
			: , Remarks deleted and Note references added	221436
			: Notes 1 and 2 extended	221436
			: Notes 3 to 5 added	221436
		Figure 1	: Deratings added for "600" and "1000" mW	221436
			: Legend clarified and 2 entries added	221436
		Figure 2	: Subtitle added to existing drawing	221436
			: In the Table, Imperial dimensions deleted and Notes amended	221436
		Figure 2(a)	: Figure added	221436
		Figure 3	: Subtitle added to existing drawing	221436
			: New drawing added	221436
		Para. 4.2.3	: Existing text deleted and new text added	221436
		Para. 4.3.2	: Text expanded	221436
		Para. 4.4.1	: Existing text clarified and new text added	221436
		Para. 4.4.2	: Existing text clarified and new text added	221436
		Para. 4.5.1	: Existing text deleted and new text added	221436
		Para. 4.5.5	: Deleted in toto	221436
		Para. 4.6.3	: Title amended and text replaced by "Not applicable"	221436
		Para. 4.7.2	: Renumbered as "4.7.3" and second sentence amended to "5(b)"	221436
			: New Para. 4.7.2 entry added	221436
		Para. 4.7.3	: Renumbered as "4.7.5", Title amended and text replaced by "Not applicable"	221436
		Para. 4.7.4	: New Para. 4.7.4 entry added	221436
		Table 2 d.c.	: No. 7, Variants 04 to 12 added to Conditions	221436
			: No. 11, Variants 04 to 12 added to Conditions	221436
		Table 3	: No. 7, Variants 04 to 12 added to Conditions	221436
			: No. 11, Variants 04 to 12 added to Conditions	221436
		Table 5(a)	: Entry added	221436
		Table 5	: Title amended to "5(b)"	221436
			: No. 3, Characteristics, Symbol and Conditions amended	221436
		Figure 5(a)	: Entry added	221436
		Figure 5	: Title amended to "5(b)"	221436
		Para. 4.8.1	: Text added to the beginning of the second sentence	221436
		Para. 4.8.2	: Second sentence added	221436
		Para. 4.8.3	: In the second sentence, "(b)" added to "5"	221436
		Para. 4.8.4	: In the text, "(b)" added to "5"	221436
		Table 6	: No. 7, Variants 04 to 12 added to Conditions	221436
			: No. 11, for both entries, Variants 04 to 12 added to Conditions	221436

**SEC**

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**DOCUMENTATION CHANGE NOTICE**

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.
'A'	Jul. '99	P1. Cover page P2A. DCN P9. Figure 2(b)	: Page added : In the Table, Dimension 'C' amended	None None 23911
'B'	Nov. '99	P1. Cover page P2A. DCN P6. Table 1(a) Table 1(b) P7. Figure 1 P9. Figure 2(b) P10. Figure 3 P11. Para. 4.3.2 P12. Para. 4.4.1 Para. 4.4.2 P14. Table 2 d.c. P15. Table 2 d.c. P17. Table 3 P20. Table 6	: In Table new variants 13 to 15 added : Nos. 5 and 9, Variant numbers amended : In legend Variant number changed from "12" to "15" : Title amended : Changed from "Variants 10 to 12" to "Variants 10 to 15" : Text amended : Text amended : New sentence added : No. 7, Conditions amended to include Variants 13 to 15 : No. 11, Conditions amended to include Variants 13 to 15 : Nos. 7 and 11, Conditions amended to include Variants 13 to 15 : Nos. 7 and 11, Conditions amended to include Variants 13 to 15	None None 221534 221534 221534 221534 221534 221534 221534 221534 221534 221534 221534
'C'	Feb. '00	P1. Cover page P2A. DCN P20. Table 6	: In first No. 11, $V_{CE}$ and $I_C$ added to Test Conditions	None None 221545

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**APPENDICES (Applicable to specific Manufacturers only)**

None.

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**1. GENERAL**

**1.1 SCOPE**

This specification details the ratings, physical and electrical characteristics, test and inspection data for a Transistor, Matched Dual, NPN, based on Types 2N2919, 2N2920 and 2N2920A. 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 type 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.

**1.7 HIGH TEMPERATURE TEST PRECAUTIONS**

For tin-lead plated or solder-dipped lead finish, all tests to be performed at a temperature that exceeds +125°C shall be carried out in 100% inert atmosphere.

**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.

**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. In addition, the following symbols are used:-

- $|V_{BE1} - V_{BE2}|$  - Absolute value of base-emitter voltage differential between the individual sections.
- $|\Delta(V_{BE1} - V_{BE2})\Delta T_{amb}|$  - Absolute value of the algebraic difference between the base-emitter voltage differentials between the individual sections at two different temperatures.
- $I_{LK}$  - Leakage current between active devices.

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

VARIANT	BASED ON TYPE	CASE	FIGURE	LEAD MATERIAL AND/OR FINISH
01	2N2919	TO77	2(a)	D2
02	2N2920	TO77	2(a)	D2
03	2N2920A	TO77	2(a)	D2
04	2N2919	TO77	2(a)	D3 or D4
05	2N2920	TO77	2(a)	D3 or D4
06	2N2920A	TO77	2(a)	D3 or D4
07	2N2919	TO77	2(a)	D7
08	2N2920	TO77	2(a)	D7
09	2N2920A	TO77	2(a)	D7
10	2N2919	LCCC6	2(b)	2
11	2N2920	LCCC6	2(b)	2
12	2N2920A	LCCC6	2(b)	2
13	2N2919	LCCC6	2(b)	4
14	2N2920	LCCC6	2(b)	4
15	2N2920A	LCCC6	2(b)	4

**TABLE 1(b) - MAXIMUM RATINGS**

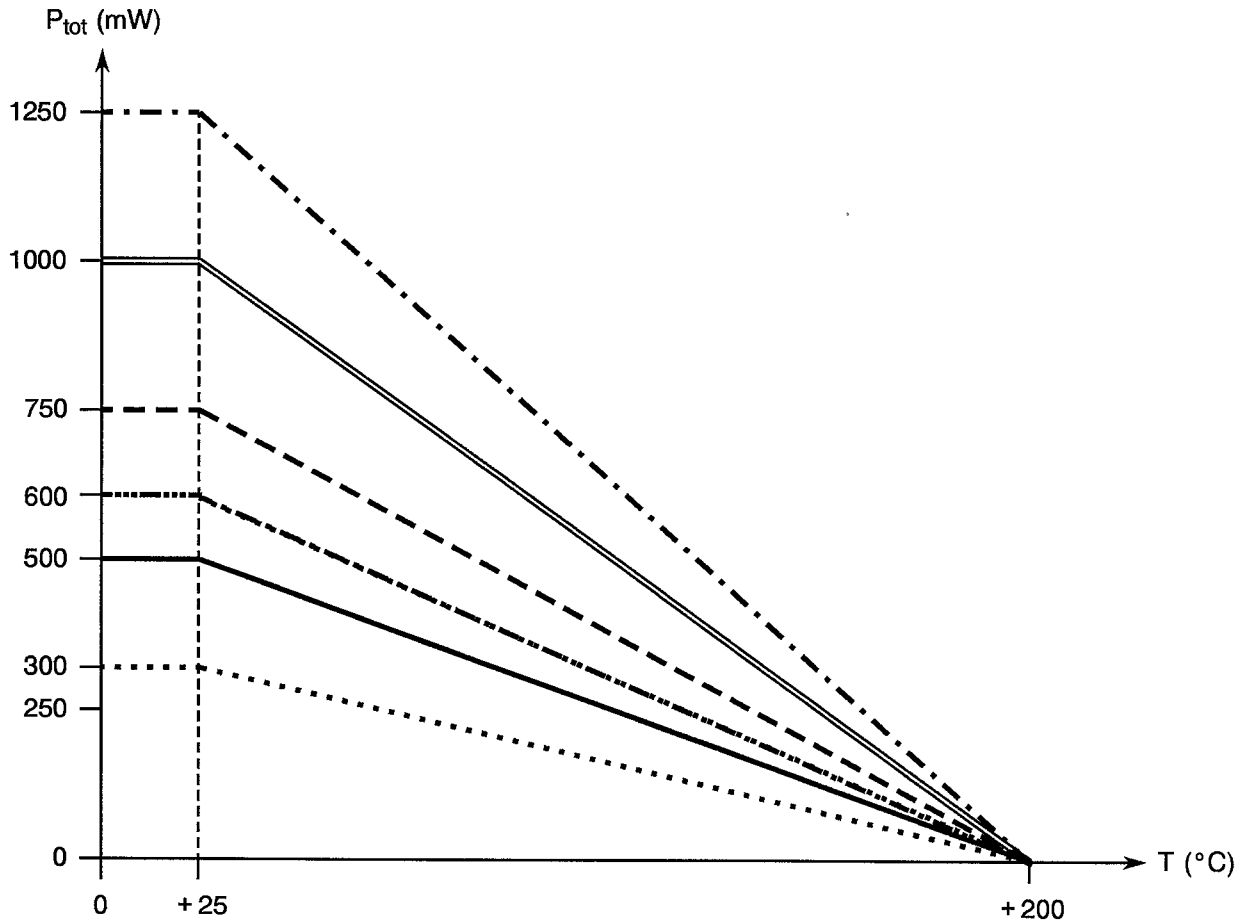
No.	CHARACTERISTICS	SYMBOL	MAXIMUM RATINGS	UNIT	REMARKS
1	Collector-Base Voltage	$V_{CBO}$	60	V	
2	Collector-Emitter Voltage	$V_{CEO}$	60	V	
3	Emitter-Base Voltage	$V_{EBO}$	6.0	V	
4	Collector Current (Continuous)	$I_C$	30	mA	
5	Power Dissipation 1 All Variants	$P_{tot1}$	0.3 (Note 1) 0.5 (Note 2)	W	$T_{amb} = +25^{\circ}C$
	Variants 10 to 15		0.6 (Notes 1 and 3) 1.0 (Notes 2 and 3)		
6	Power Dissipation 2 Variants 01 to 09	$P_{tot2}$	0.75 (Note 1) 1.25 (Note 2)	W	$T_{case} = +25^{\circ}C$
7	Operating Temperature Range	$T_{op}$	-55 to +200	$^{\circ}C$	$T_{amb}$ or $T_{case}$
8	Storage Temperature Range	$T_{stg}$	-65 to +200	$^{\circ}C$	
9	Soldering Temperature Variants 01 to 09	$T_{sol}$	+260	$^{\circ}C$	Note 4 Note 5
	Variants 10 to 15		+245		

**NOTES**

1. One section. For derating at  $T_{amb}$  or  $T_{case} > +25^{\circ}C$ , see Figure 1.
2. Both sections. For derating at  $T_{amb}$  or  $T_{case} > +25^{\circ}C$ , see Figure 1.
3. When mounted on a 15 x 15 x 0.6mm ceramic substrate.
4. Duration 10 seconds maximum at a distance of not less than 1.5mm from the device body and the same lead shall not be resoldered until 3 minutes have elapsed.
5. Duration 5 seconds maximum and the same terminal shall not be resoldered until 3 minutes have elapsed.



**FIGURE 1 - PARAMETER DERATING INFORMATION**



Power Dissipation versus Temperature

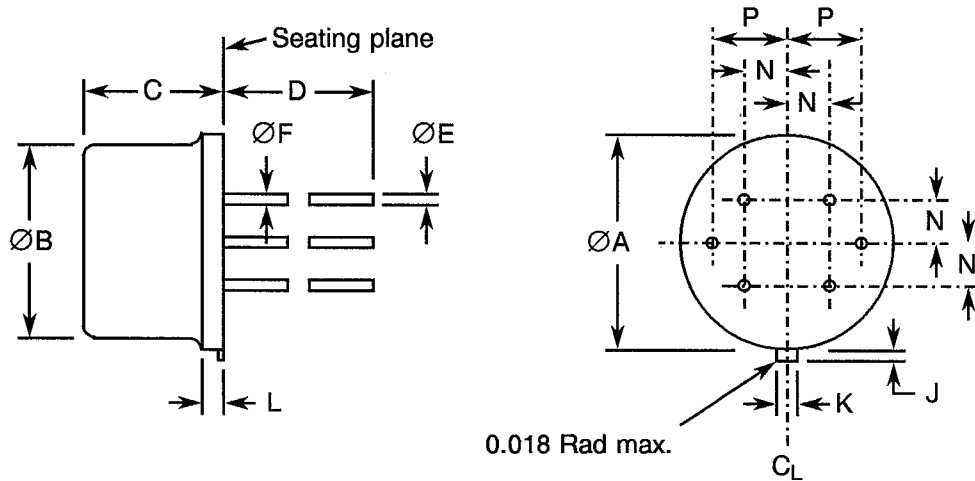
- Case temperature, both sides - Variants 01 to 09.
- - - Case temperature, one side - Variants 01 to 09.
- Ambient temperature, both sides - All Variants.
- ..... Ambient temperature, one side - All Variants.
- ==== Ambient temperature, both sides - Variants 10 to 15.
- Ambient temperature, one side - Variants 10 to 15.





**FIGURE 2 - PHYSICAL DIMENSIONS**

FIGURE 2(a) - VARIANTS 01 to 09



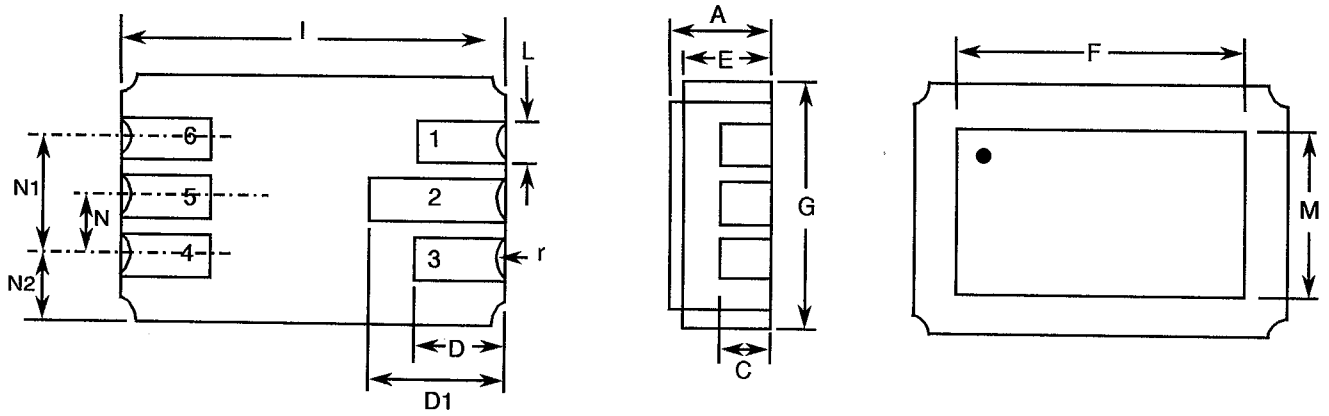
SYMBOL	MILLIMETRES		NOTES
	MIN.	MAX.	
ØA	8.51	9.40	
ØB	7.75	8.51	
C	3.56	6.60	
D	12.70	44.45	6
ØE	0.41	0.53	1, 6
ØF	0.41	0.48	2, 6
J	0.74	1.14	5
K	0.71	0.86	
L	0.23	1.04	
N	1.80 NOM.		3
P	2.54 NOM.		3

**NOTES**

1. Measured in the zone beyond 6.35mm from the seating plane.
2. Measured in the zone beyond 1.27mm and 6.35mm from the seating plane.
3. When measured in a gauging plane 1.37(+0.03 - 0) below the seating plane of the transistor, maximum diameter leads shall be within 0.18mm of their true location relative to a maximum-width-tab. Smaller diameter leads shall fall within the outline of the maximum diameter lead tolerance.
4. All leads electrically insulated from case and each section electrically isolated from each other.
5. Measured from the maximum diameter of the actual device.
6. All 6 leads.

**FIGURE 2 - PHYSICAL DIMENSIONS (CONTINUED)**

**FIGURE 2(b) - VARIANTS 10 to 15**



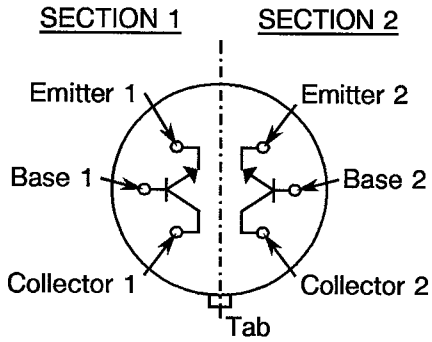
SYMBOL	MILLIMETRES		NOTES	
	MIN.	MAX.		
A	1.53	1.96	1	
C	0.89 TYP.			
D	1.52	1.78		
D1	2.09	2.49		
E	1.25	1.55		
F	5.76	5.91		
G	4.19	4.45		
I	6.09	6.35		
L	0.55	0.71		1
M	3.86	4.01		
N	1.14	1.4		
N1	2.41	2.67		
N2	0.89 TYP.			
r	0.23 TYP.			

**NOTES**

1. Dimensions are the same for the 6 leads.
2. From topside view, pin 1 is indicated by a black ink dot.

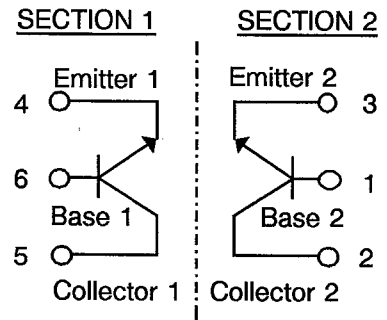
**FIGURE 3 - FUNCTIONAL DIAGRAM**

VARIANTS 01 TO 09





CONNECTION DIAGRAM

VARIANTS 10 TO 15



CONNECTION DIAGRAM

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#### 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 and subsequent electrical measurements related to this test shall be omitted.

###### 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 1.0 grammes for Variants 01 to 09 and 0.2 grammes for Variants 10 to 15.

###### 4.3.3 Terminal Strength

The requirements for terminal strength testing are specified in Section 9 of ESA/SCC Generic Specification No. 5000. For Variants 01 to 09, the test conditions shall be as follows:-

Test Condition: 'E', Lead Fatigue.



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

For Variants 01 to 09, the case shall be hermetically sealed and have a metal body with hard glass seals and the lid shall be welded, brazed, preform soldered or glass frit sealed.

For Variants 10 to 15, the case shall be hermetically sealed and have a ceramic body with kovar lid.

4.4.2 Lead Material and Finish

For Variants 01 to 09, the lead material shall be Type 'D' with either Type '2', Type '3 or 4' or Type '7' finish in accordance with the requirements of ESA/SCC Basic Specification No. 23500. (See Table 1(a) for Type Variants).

For Variants 10 to 12, the terminal material shall have Type '2' finish in accordance with the requirements of ESA/SCC Basic Specification No. 23500. (See Table 1(a) for Type Variants).

For Variants 13 to 15, the terminal material shall have Type '4' 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 and the following paragraphs. When the component is too small to accommodate all of the marking specified, as much as space permits shall be marked and the marking information, in full, shall accompany the component in its primary package.

The information to be marked and the order of precedence, shall be as follows:-

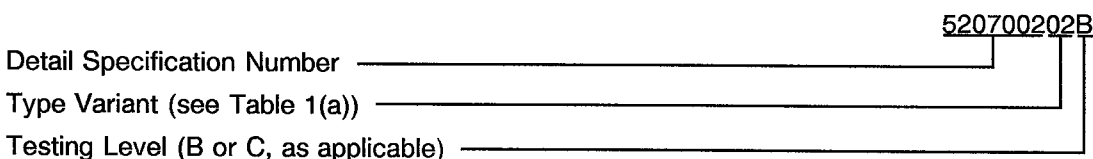
- (a) Lead Identification.
- (b) The SCC Component Number.
- (c) Traceability Information.

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.



#### 4.6 ELECTRICAL MEASUREMENTS

##### 4.6.1 Electrical Measurements at Room Temperature

The parameters to be measured at room temperature are scheduled in Table 2. Unless otherwise specified, 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 (Figure 4)

Not applicable.

#### 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 ( $\Delta$ ) 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 High Temperature Reverse Bias Burn-in (Table 5(a))

Not applicable.

##### 4.7.3 Conditions for Power Burn-in

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

##### 4.7.4 Electrical Circuits for High Temperature Reverse Bias Burn-in (Figure 5(a))

Not applicable.

##### 4.7.5 Electrical Circuits for Power Burn-in (Figure 5(b))

Not applicable.



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**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	$I_C = 10mA$ $I_E = 0A$ Note 1	60	-	V
2	Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	3001	$I_C = 10\mu A$ $I_E = 0A$	60	-	V
3	Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	3026	$I_E = 10\mu A$ $I_C = 0A$	6.0	-	V
4	Collector-Emitter Cut-off Current	$I_{CEO}$	3041	$V_{CE} = 5.0V$ $I_B = 0A$	-	2.0	nA
5	Collector-Base Cut-off Current	$I_{CBO}$	3036	$V_{CB} = 45V$ $I_E = 0A$	-	2.0	nA
6	Emitter-Base Cut-off Current	$I_{EBO}$	3061	$V_{EB} = 5.0V$ $I_C = 0A$	-	2.0	nA
7	D.C. Forward Current Transfer Ratio	$h_{FE1}$	3076	$V_{CE} = 5.0V, I_C = 10\mu A$ Variants 01, 04, 07, 10, 13 Variants 02, 03, 05, 06, 08, 09, 11, 12, 14, 15	60 150	240 600	-
		$h_{FE2}$		$V_{CE} = 5.0V, I_C = 100\mu A$ Variants 01, 04, 07, 10, 13 Variants 02, 03, 05, 06, 08, 09, 11, 12, 14, 15	100 225	- -	
		$h_{FE3}$		$V_{CE} = 5.0V, I_C = 1.0mA$ Variants 01, 04, 07, 10, 13 Variants 02, 03, 05, 06, 08, 09, 11, 12, 14, 15	150 300	- -	
8	Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	3071	$I_C = 1.0mA$ $I_B = 0.1mA$	-	0.35	V
9	Base-Emitter Saturation Voltage	$V_{BE(SAT)}$	3066	$I_C = 1.0mA$ $I_B = 0.1mA$	0.5	1.0	V
10	D.C. Forward Current Transfer Ratio Comparison	$\frac{h_{FE2-1}}{h_{FE2-2}}$	3076	$V_{CE} = 5.0V$ $I_C = 100\mu A$	0.91	1.1	-

**NOTES:** See Page 16.

**TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - d.c. PARAMETERS (CONT'D)**

No.	CHARACTERISTICS	SYMBOL	MIL-STD-750 TEST METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN	MAX	
11	Base-Emitter Voltage Differential	$V_{BE1} - V_{BE2}$	3066 Condition 'B'	$V_{CE} = 5.0V$ $I_C = 10\mu A$ Variants 01, 02, 04, 05, 07, 08, 10, 11, 13, 14 Variants 03, 06, 09, 12, 15 Note 2	-	5.0	mV
				$V_{CE} = 5.0V$ $I_C = 1.0mA$ Variants 01, 02, 04, 05, 07, 08, 10, 11, 13, 14 Variants 03, 06, 09, 12, 15 Note 2	-	5.0	
				$V_{CE} = 5.0V$ $I_C = 100\mu A$ Variants 01, 02, 04, 05, 07, 08, 10, 11, 13, 14 Variants 03, 06, 09, 12, 15 Note 2	-	3.0	
12	Leakage Current between Active Devices	$I_{LK}$	-	$V = 50V$ to E2, B2, C2 $V = 0V$ to E1, B1, C1	-	5.0	$\mu A$

**NOTES:** See Page 16.



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

No.	CHARACTERISTICS	SYMBOL	MIL-STD-750 TEST METHOD	TEST CONDITIONS (NOTE 3)	LIMITS		UNIT
					MIN	MAX	
13	Current Gain Bandwidth Product	$f_T$	3206	$V_{CE} = 5.0V$ $I_C = 0.5mA$ $f = 20MHz$	60	-	MHz
14	Output Admittance	$h_{ob}$	3216	$V_{CE} = 5.0V$ $I_C = 1.0mA$ $f = 1.0kHz$	-	1.0	$\mu mho$
15	Noise Figure	$N_F$	3246	$V_{CE} = 5.0V$ $I_C = 10\mu A$ $R_S = 10k\Omega$ $f = 1.0kHz$ $BW = 200Hz$	-	3.0	dB
				$V_{CE} = 5.0V$ $I_C = 10\mu A$ $R_S = 10k\Omega$ $f = 10Hz$ to $15.7kHz$ $BW = 10kHz$	-	3.0	
16	Output Capacitance	$C_{obo}$	3236	$V_{CB} = 5.0V$ $I_E = 0A$ $100kHz < f < 1.0MHz$	-	6.0	pF
17	Input Impedance	$h_{ib}$	3201	$V_{CB} = 5.0V$ $I_C = 1.0mA$ $f = 1.0kHz$	25	32	$\Omega$

**NOTES**

1. Pulsed measurement: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2.0\%$ .
2. Any device whose measurement values exceed the specified limits shall be removed from the lot, but only count for PDA when such values exceed twice the specified limits (i.e. 10mV and 6.0mV respectively).
3. Measurements shall be performed on a sample basis, LTPD7 or less.

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

No.	CHARACTERISTICS	SYMBOL	MIL-STD-750 TEST METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN	MAX	
5	Collector-Base Cut-off Current	$I_{CBO}$	3036	$T_{amb} = +150^{\circ}C$ $V_{CB} = 45V$ $I_E = 0A$	-	10	$\mu A$
7	D.C. Forward Current Transfer Ratio	$h_{FE1}$	3076	$T_{amb} = -55^{\circ}C$ $V_{CE} = 5.0V, I_C = 10\mu A$ Variants 01, 04, 07, 10, 13 Variants 02, 03, 05, 06, 08, 09, 11, 12, 14, 15	20 50	- -	-
10	D.C. Forward Current Transfer Ratio Comparison	$\frac{h_{FE2-1}}{h_{FE2-2}}$	3076	$T_{amb} = -55 \text{ to } +125^{\circ}C$ $V_{CE} = 5.0V$ $I_C = 100\mu A$	0.85	1.18	-
11	Base-Emitter Voltage Differential Change	$ \Delta(V_{BE1} - V_{BE2}) $ $ \Delta T_{amb} $	3066 Condition 'B'	$T_{amb} = -55 \text{ to } +25^{\circ}C$ $V_{CE} = 5.0V$ $I_C = 100\mu A$ Variants 01, 02, 04, 05, 07, 08, 10, 11, 13, 14 Variants 03, 06, 09, 12, 15	-	0.8	mV
				$T_{amb} = +25 \text{ to } +125^{\circ}C$ $V_{CE} = 5.0V$ $I_C = 100\mu A$ Variants 01, 02, 04, 05, 07, 08, 10, 11, 13, 14 Variants 03, 06, 09, 12, 15	-	1.0	
					-	0.5	

**FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS**

Not applicable.

**TABLE 4 - PARAMETER DRIFT VALUES**

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITIONS	CHANGE LIMITS ( $\Delta$ )	UNIT
5	Collector-Base Cut-off Current	$I_{CBO}$	As per Table 2	As per Table 2	$\pm 0.5$ or (1) $\pm 100$	nA %
7	D.C. Forward Current Transfer Ratio	$h_{FE2}$	As per Table 2	As per Table 2	$\pm 15$	%
8	Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	As per Table 2	As per Table 2	$\pm 15$ or (1) $\pm 10$	mV %

**NOTES**

1. Whichever is greater, referred to the initial value.

**TABLE 5(a) - CONDITIONS FOR HIGH TEMPERATURE REVERSE BIAS BURN-IN**

Not applicable.

**TABLE 5(b) - CONDITIONS FOR POWER BURN-IN AND OPERATING LIFE TESTS**

No.	CHARACTERISTICS	SYMBOL	CONDITIONS	UNIT
1	Ambient Temperature	$T_{amb}$	$+25 \pm 3$	$^{\circ}C$
2	Collector-Base Voltage	$V_{CB}$	40	V
3	Power Dissipation 1	$P_{tot1}$	Maximum rating at $T_{amb}$ according to derating curve (Note 1)	W

**NOTES**


1. See Item 5 of Table 1(b) and Figure 1.

**FIGURE 5(a) - ELECTRICAL CIRCUIT FOR HIGH TEMPERATURE REVERSE BIAS BURN-IN**

Not applicable.

**FIGURE 5(b) - ELECTRICAL CIRCUIT FOR POWER BURN-IN AND OPERATING LIFE TESTS**

Not applicable.

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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. Unless otherwise stated, 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 of this specification. Unless otherwise stated, the measurements shall be performed at  $T_{amb} = +22 \pm 3$  °C.

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(b) for the power burn-in test.

4.8.4 Electrical Circuits for Operating Life Tests

The circuit to be used for performance of the operating life tests shall be the same as shown in Figure 5(b) for power 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.	
5	Collector-Base Cut-off Current	$I_{CBO}$	As per Table 2	As per Table 2	-	2.0	nA
7	D.C. Forward Current Transfer Ratio	$h_{FE2}$	As per Table 2	As per Table 2 Variants 01, 04, 07, 10, 13 Variants 02, 03, 05, 06, 08, 09, 11, 12, 14, 15	100 225	- -	-
8	Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	As per Table 2	As per Table 2	-	0.35	V
10	D.C. Forward Current Transfer Ratio Comparison	$\frac{h_{FE2-1}}{h_{FE2-2}}$	As per Table 2	As per Table 2	0.85	1.18	-
11	Base-Emitter Voltage Differential	$ V_{BE1} - V_{BE2} $	As per Table 2	As per Table 2 $V_{CE} = 5.0V, I_C = 100\mu A$ Variants 01, 02, 04, 05, 07, 08, 10, 11, 13, 14 Variants 03, 06, 09, 12, 15	- -	3.0 1.5	mV
11	Base-Emitter Voltage Differential Change	$ \Delta(V_{BE1} - V_{BE2}) $ $\Delta T_{amb}$	As per Table 3	As per Table 3 Variants 01, 02, 04, 05, 07, 08, 10, 11, 13, 14 Variants 03, 06, 09, 12, 15 Note 1	- -	0.96 0.48	mV
				As per Table 3 Variants 01, 02, 04, 05, 07, 08, 10, 11, 13, 14 Variants 03, 06, 09, 12, 15 Note 1	- -	1.2 0.6	

**NOTES**

1. To be measured once, at completion of endurance tests.