european space agency
agence spatiale européenne

Pages 1 to 14

DIODE, RECTIFIER, SCHOTTKY,

BASED ON TYPES 1N5817, 1N5818 AND 1N5819

ESA/SCC Detail Specification No. 5103/028

space components
coordination group

Issue/Rev.	Date	Approved by	
		SCCG Chairman	ESA Director General or his Deputy
Issue 1	March 1993		

DOCUMENTATION CHANGE NOTICE

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.

TABLE OF CONTENTS

Page

TABLES

FIGURES

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 Diode, Rectifier, Schottky, based on Types 1N5817, 1N5818 and 1N5819. 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 of diode 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 diodes specified herein, are as scheduled in Table 1(b).

1.4 PARAMETER DERATING INFORMATION

The parameter derating information applicable to the diodes specified herein, is shown in Figure 1.

1.5 PHYSICAL DIMENSIONS

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

1.6 FUNCTIONAL DIAGRAM

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

1.7 HANDLING PRECAUTIONS

These devices are susceptible to damage by electrostatic discharge. Therefore, suitable precautions shall be employed for protection during all phases of manufacture, testing, packaging, shipment and any handling.

These components are Categorised as Class 1 with a Minimum Critical Path Failure Voltage of V_R Volts as specified in Table 1(a) (column 3).

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 Semiconductors.

(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.

TABLE 1(a) - TYPE VARIANTS

(1) VARIANT	(2) BASED ON TYPE	(3) V_R (V)	(4) I_R (μA)	(5) LEAD MATERIAL AND FINISH
01	1N5817	20	100	L3 or L4
02	1N5818	30	25	L3 or L4
03	1N5819	40	25	L3 or L4

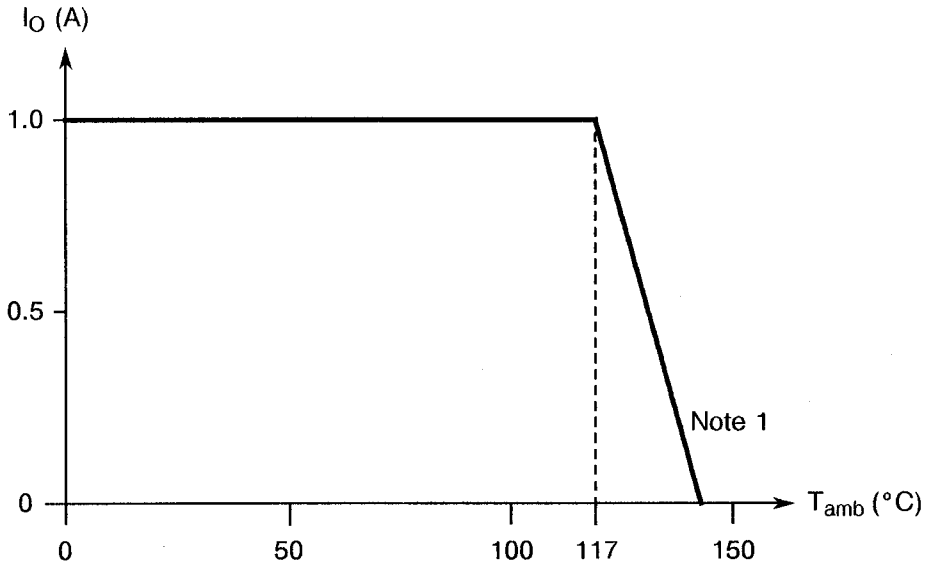
TABLE 1(b) - MAXIMUM RATINGS

No.	CHARACTERISTICS	SYMBOL	MAXIMUM RATING	UNIT	REMARKS
1	Repetitive/Working Peak Reverse Voltage	V_{RM}/V_R	Note 1	V_{pk}	-
2	Peak Reverse Current	I_{RM}	1.0	mA	V_{RM} = Note 1 T_J = +25°C
3	Surge Forward Current	I_{FSM}	50	A	T_J = +150°C 8.3ms half-sine
4	Average Forward Current	I_O	1.0	A	Note 2
5	Operating Temperature Range	T_{op}	−65 to +150	°C	T_{amb}
6	Storage Temperature Range	T_{stg}	−65 to +150	°C	-
7	Soldering Temperature	T_{sol}	+240	°C	Note 3
8	Junction Temperature	T_J	+150	°C	-
9	Thermal Resistance (Junction to Lead)	$R_{TH(J-L)}$	60	°C/W	Note 4

NOTES

1. See column (3) of Table 1(a).
2. At T_{amb} = +117°C. For derating at T_{amb} > +117°C, see Figure 1.
3. Duration 15 seconds maximum, at a distance ≥12.7mm from the case.
4. Diode mounted at L = 9.5mm to infinite heatsink.

FIGURE 1 - PARAMETER DERATING INFORMATION

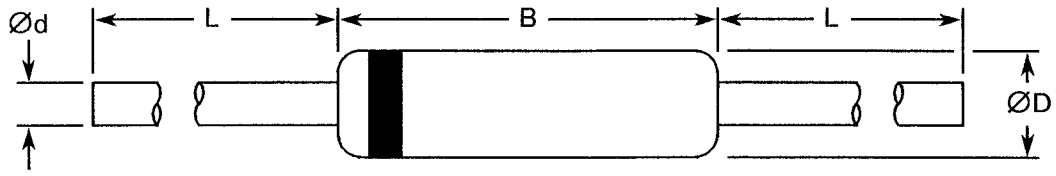


Average Forward Current versus Ambient Temperature

NOTES

1. Because of the Reverse Power Dissipation, the derating curve ends below 150°C, but the operating temperature range (between −65°C and +150°C) remains valid.

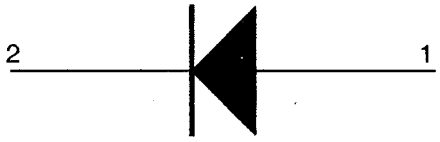
FIGURE 2 - PHYSICAL DIMENSIONS



SYMBOL	MILLIMETRES	
	MIN.	MAX.
B	4.06	5.21
Ød	0.71	0.86
ØD	2.06	2.72
L	27.94	-

FIGURE 3 - FUNCTIONAL DIAGRAM

1 Anode
2 Cathode



NOTES

1. The cathode end shall be marked with a coloured ring.

4. REQUIREMENTS

4.1 GENERAL

The complete requirements for procurement of the diodes specified herein shall be as stated in this specification and ESA/SCC Generic Specification No. 5000 for Discrete Semiconductor Components. Deviations from the Generic Specification, applicable to this Detail 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)

(a) Para. 9.2.1, Bond Strength Test: Shall not be performed.

(b) Para. 9.2.2, Die Shear Test: Shall be replaced by "Decap Internal Visual (Design Verification)" per MIL-STD-750, Method 2075, to be performed after encapsulation on 6 samples randomly selected from the lot. Testing shall be as follows:-
Scratch the glass at die location with a diamond scribe and carefully snap open. Using 30× magnification examine the areas where die was in contact with the plugs. Verify footprints for a minimum of 10% metallurgical bonding area. In the case of footprints less than 10%, the lot shall be rejected.

(c) Para. 9.6, Constant Acceleration: Shall not be performed.

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

(a) Para. 9.8.1, Seal Test, Fine Leak: Shall not be performed.

(b) Diodes shall be painted on completion of Para. 9.8.2, Seal Test (Gross Leak).

(c) Para. 9.9.5, Verification of Safe Operating Area: Shall not be performed.

4.2.4 Deviations from Qualification Tests (Chart IV)

(a) Para. 9.2.1, Bond Strength Test: Shall not be performed.

(b) Para. 9.2.2, Die Shear Test: Shall be replaced by "Decap Internal Visual (Design Verification)" per MIL-STD-750, Method 2075. Testing shall be as follows:-
Scratch the glass at die location with a diamond scribe and carefully snap open. Using 30× magnification examine the areas where die was in contact with the plugs. Verify footprints for a minimum of 10% metallurgical bonding area. In the case of footprints less than 10%, the lot shall be rejected.

(c) Para. 9.8.1, Seal Test, Fine Leak: Shall not be performed.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

(a) Para. 9.8.1, Seal Test, Fine Leak: Shall not be performed.

4.3 MECHANICAL REQUIREMENTS

4.3.1 Dimension Check

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

4.3.2 Weight

The maximum weight of the diodes specified herein shall be 0.4 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 diodes 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

The case shall be transparent painted glass, hermetically sealed, employing a void free, metallurgically bonded, double plug diode construction.

4.4.2 Lead Material and Finish

The lead material shall be Type 'L' with Type '3 or 4' finish in accordance with the requirements of ESA/SCC Basic Specification No. 23500.

4.5 MARKING

4.5.1 General

The marking of 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) Cathode Identification.

(b) The SCC Component Number.

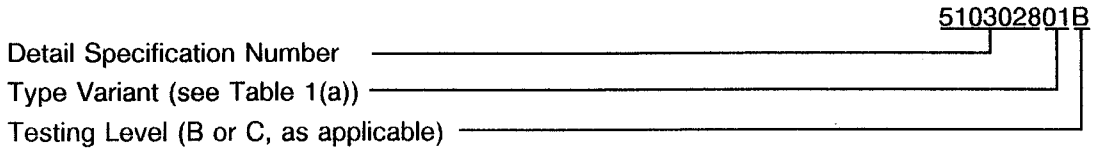
(c) Traceability Information.

4.5.2 Cathode Identification

Cathode identification shall be as shown in Figures 2 and 3 of this specification.

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 as defined in 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, 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

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 (Δ) applicable to the scheduled parameters shall not be exceeded. In addition to these drift value requirements for a given parameter, the appropriate limit value specified in Table 2 shall not be exceeded.

4.7.2 Conditions for High Temperature Reverse Bias Burn-in

The requirements for H.T.R.B. burn-in are specified in Section 7 of ESA/SCC Generic Specification No. 5000. The conditions for H.T.R.B. burn-in are specified in Table 5(a) of this specification.

4.7.3 Electrical Circuit for High Temperature Reverse Bias Burn-in

Not applicable.

4.7.4 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 are specified in Table 5(b) of this specification.

4.7.5 Electrical Circuit for Power Burn-in

Not applicable.

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	Reverse Current	I_R	4016	V_R = Note 1	-	(2)	µA
2	Peak Forward Voltage 1	V_{FM1}	4011	I_{FM1} = 0.1A Note 3 Variant 01 Variants 02 and 03	 - -	 0.36 0.39	V
3	Peak Forward Voltage 2	V_{FM2}	4011	I_{FM2} = 1.0A Note 3 Variant 01 Variants 02 and 03	 - -	 0.45 0.55	V

NOTES
1. See column (3) of Table 1(a).
2. See column (4) of Table 1(a).
3. Pulsed measurement, Pulse Width ≤ 300µs, Duty Cycle = 2%.

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - A.C. PARAMETERS

No.	CHARACTERISTICS	SYMBOL	MIL-STD-750 TEST METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN.	MAX.	
4	Junction Capacitance	C_J	4001	V_R = 5.0V f = 1.0MHz Variant 01 Variants 02 and 03	 - -	 125 60	pF

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES (3)

No.	CHARACTERISTICS	SYMBOL	MIL-STD-750 TEST METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN.	MAX.	
1	Reverse Current	I_R	4016	V_R = Note 1 T_{amb} = +100°C Variant 01 Variants 02 and 03	 - -	 10 1.0	mA
3	Peak Forward Voltage 2	V_{FM2}	4011	I_{FM2} = 1.0A T_{amb} = +100°C Note 2 Variant 01 Variants 02 and 03	 - -	 0.42 0.52	V

NOTES
1. See column (3) of Table 1(a).
2. Pulsed measurement, Pulse Width ≤ 300µs, Duty Cycle = 2%.
3. Low temperature measurements are not required.

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	UNIT
1	Reverse Current	I_R	As per Table 2	As per Table 2	+5.0 or (1) ±100	µA %
3	Peak Forward Voltage 2	V_{FM2}	As per Table 2	As per Table 2	±100	mV

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

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

No.	CHARACTERISTICS	SYMBOL	CONDITION	UNIT
1	Ambient Temperature	T_{amb}	+125(+0−3)	°C
2	Reverse Voltage	V_R	$V_R = 0.8 \times$ Note 1	V

NOTES
1. See column (3) of Table 1(a).

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

No.	CHARACTERISTICS	SYMBOL	CONDITION	UNIT
1	Ambient Temperature	T_{amb}	+125(+0−3)	°C
2	Reverse Voltage	V_R	Note 1	Vac
3	Average Forward Current	I_O	1.0 (2)	A
4	Frequency	f	50 to 60	Hz

NOTES
1. See column (3) of Table 1(a).
2. I_O = Average of half-sine rectified current (where nominal $I_{FM} = 3.14 \times I_O$).

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.

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 tests are scheduled in Table 6. 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 as specified in Table 5(b) of this specification.

4.8.4 Electrical Circuit for Operating Life Tests

Not applicable.

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	CHANGE LIMITS (Δ)	ABSOLUTE		UNIT
						MIN.	MAX.	
1	Reverse Current	I_R	As per Table 2	As per Table 2	±5.0 or (1) ±100	-	(2)	µA %
2	Peak Forward Voltage 1	V_{FM1}	As per Table 2	As per Table 2 Variant 01 Variants 02 and 03	 - -	 - -	 0.36 0.39	V
3	Peak Forward Voltage 2	V_{FM2}	As per Table 2	As per Table 2 Variant 01 Variants 02 and 03	 ±0.1 ±0.1	 - -	 0.45 0.55	V
4	Junction Capacitance	C_J	As per Table 2	As per Table 2 Variant 01 Variants 02 and 03	 - -	 - -	 125 60	pF

NOTES

1. Whichever is greater, referred to the initial value.
2. See column (4) of Table 1(a).