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DIODES, SWITCHING, SCHOTTKY BARRIER

BASED ON TYPE 1N5712

ESA/SCC Detail Specification No. 5106/002

space components
coordination group

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		SCCG Chairman	ESA Director General or his Deputy
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DOCUMENTATION CHANGE NOTICE

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.
		This Issue supersedes Issue 1 and incorporates all modifications defined in Revision 'A' to Issue 1 and the following DCR's:-		
		Cover Page	: Title corrected	23722
		DCN		None
		Para. 1.1	: First sentence corrected	23722
		Para. 1.4	: Existing text deleted and new text added	23722
		Para. 2	: Items (c) and (e) deleted and (d) renumbered as "(c)"	23722
		Table 1(b)	: Note 1 amended	23722
		Figure 1	: Title standardised	23722
			: Undertitle added and "2.0mW/°C" added to slope	23722
		Figure 2	: Imperial dimensions deleted	23722
		Para. 4.2.3	: Title standardised	23722
		Para. 4.2.4	: Deviation added	23722
		Para. 4.2.5	: Deviation added	23722
		Para. 4.5.1	: Existing text deleted and new text added	23722
		Para. 4.5.3	: "Type Variant" and "Testing Level" amended	23722
		Para. 4.5.5	: Deleted in toto	23722
		Para. 4.6.2	: Second sentence amended	23722
		Para. 4.7.2	: Title and text standardised	23722
		Para's. 4.7.2, 4.7.3	: Reversed in sequence	23722
		Para's. 4.7.4, 4.7.5	: Para's added	23722
		Table 2 a.c.	: No. 6, Characteristics amended	23722
		Table 3	: No. 4 deleted and No. 3 added	221182
		Figure 4(b)	: Title amended	23722
		Tables 5(a), 5(b)	: Titles amended	23722
			: Reversed in sequence	23722
		Figures 5(a), 5(b)	: References added	23722
		Para. 4.8	: Title completed	23722
		Para's. 4.8.2, 4.8.3	: Combined as 4.8.2	23722
			: All subsequent paragraphs renumbered	23722
		Para. 4.8.3	: Old Para. 4.8.4, Table corrected to "5(b)"	23722
		Para. 4.8.5	: Old Para. 4.8.6, in second sentence, text deleted and new text added	23722
		Table 6	: No. 6, Characteristics amended	23722

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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, Switching, Schottky Barrier, based on Type 1N5712. 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 diodes 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 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 PIN ASSIGNMENT

Not applicable.

1.7 FUNCTIONAL DIAGRAM

As per Figure 3.

1.8 HANDLING PRECAUTIONS

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

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.

(c) DESC Drawing C680001.

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

VARIANT	FIGURE	LEAD MATERIAL AND FINISH
01	2	C2
02	2	C3 or C4

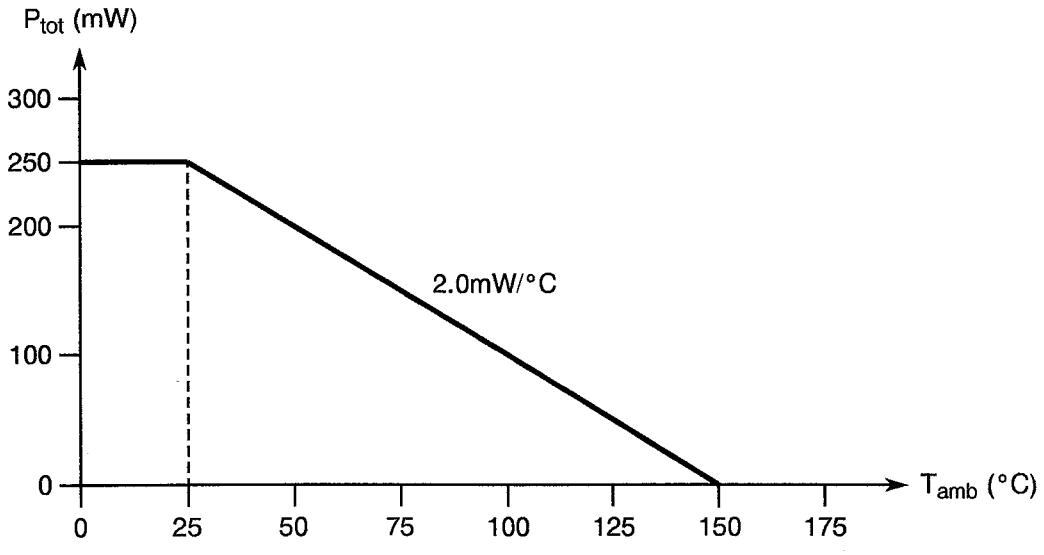
TABLE 1(b) - MAXIMUM RATINGS

No.	CHARACTERISTICS	SYMBOL	MAXIMUM RATINGS	UNIT	REMARKS
1	Reverse Voltage	V_{RM}	16	V	-
2	Power Dissipation	P_{DISS}	250	mW	Note 1
3	Operating Temperature Range	T_{op}	−65 to +150	°C	-
4	Storage Temperature Range	T_{stg}	−65 to +200	°C	-
5	Soldering Temperature	T_{sol}	+230	°C	Note 2

NOTES

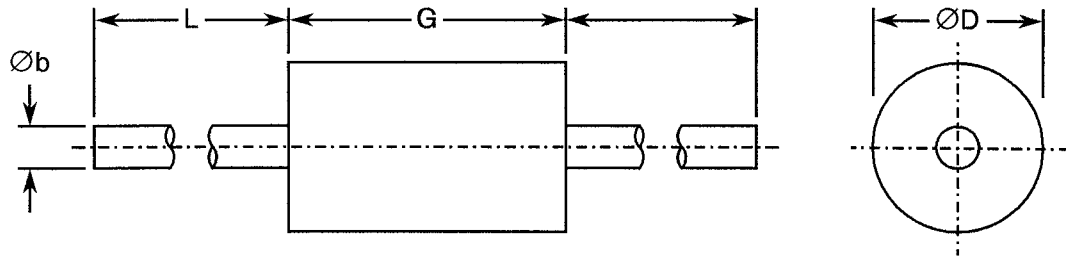
1. At $T_{amb} \leq +25°C$. For derating at $T_{amb} > +25°C$, see Figure 1.
2. Duration 5 seconds maximum at a distance of not less than 1.5mm from the device body and the same lead shall not be resoldered until 3 minutes have elapsed.

FIGURE 1 - PARAMETER DERATING INFORMATION



Power Dissipation versus Temperature

FIGURE 2 - PHYSICAL DIMENSIONS

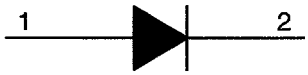


SYMBOL	MILLIMETRES		NOTES
	MIN.	MAX.	
G	3.81	4.32	1
ØD	1.73	1.93	1, 2
L	25.40	38.10	
Øb	0.36	0.51	

NOTES

1. Includes all components of the diode periphery except the sections of leads over which the diameter is controlled.
2. Measured at the largest diameter.

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 are stated in this specification and ESA/SCC Generic Specification No. 5000 for Discrete Semiconductors. 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)

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

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

None.

4.2.4 Deviations from Qualification Tests (Chart IV)

(a) Para. 9.2.2, "Bond Strength": Shall not be performed.

(b) Para. 9.9.3, "Electrical Measurements at Room Temperature" shall be performed in accordance with Table 6 of this specification.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

(a) Para. 9.9.3, "Electrical Measurements at Room Temperature" shall be performed in accordance with Table 6 of this specification.

4.3 MECHANICAL REQUIREMENTS

4.3.1 Dimension Check

The dimensions of the diodes 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 0.2 grammes.

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 hermetically sealed glass.

4.4.2 Lead Material and Finish

The lead material shall be Type 'C' with Type '2' or Type '3 or 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 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 as 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.

(d) Traceability Information.

4.5.2 Lead Identification

The cathode shall be identified by a painted band.

4.5.3 The SCC Component Number

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

510600201B

Detail Specification Number

Type Variant (see Table 1(a))

Testing Level (B or C, as applicable)

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, the measurements shall be performed at $T_{amb} = +25 \pm 3$ °C.

4.6.1.1 Test Method for Effective Carrier Lifetime (τ)

This test shall be measured with the device installed in the test fixture, drawing C680001, using the test set up shown in Figure 4(b). Adjust the signal generator to 54MHz and a maximum output in order to obtain a sufficient trigger signal for the oscilloscope. Adjust the sensitivity of the oscilloscope to 20mV/cm. With the device in the the test fixture, adjust the output amplifier until the peak amplitude of the forward current is 20mA or 5.0cm as seen on the oscilloscope. Change sensitivity of scope to 2.0mV/cm. Under these conditions, the effective carrier lifetime is related to the amplitude designated as "τ" shown on Figure 4(b). This amplitude has the calibration of 50ps/cm.

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. Unless otherwise specified, the measurements in shall be performed at $T_{case} = +125(+0-5)$ °C and $-65(+5-0)$ °C respectively.

4.6.3 Circuits for Electrical Measurements

Circuits for use in performing electrical measurements listed in Table 2 of this specification are shown in Figure 4 and are for reference only.

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 $T_{amb} = +25 \pm 3$ °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 High Temperature Reverse Bias Burn-in

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

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.

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	Forward Voltage 1	V_{F1}	4011	$I_F = 1.0mA$	-	0.55	V
2	Forward Voltage 2	V_{F2}	4011	$I_F = 35mA$	-	1.0	V
3	Reverse Current	I_R	4016	$V_R = 16V$	-	150	nA
4	Breakdown Voltage	$V_{(BR)}$	4021	$I_R = 10\mu A$	20	-	V

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.	
5	Total Capacitance	C	4021	4(a)	$V_R = 0V$ $f = 1.0MHz$ $V_{SIG} = 50mV(p\text{-}p)$	-	1.2	pF
6	Effective Carrier Lifetime	τ	Para. 4.6.1.1 of this spec.	4(b)	-	-	100	pS

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES

No.	CHARACTERISTICS	SYMBOL	MIL-STD-750 TEST METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN.	MAX.	
1	Forward Voltage 1	V_{F1}	4011	$I_F = 1.0mA$	-	0.55	V
2	Forward Voltage 2	V_{F2}	4011	$I_F = 35mA$	-	1.0	V
3	Reverse Current	I_R	4016	$V_R = 16V$	-	30	μA

FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS

FIGURE 4(a) - CAPACITANCE

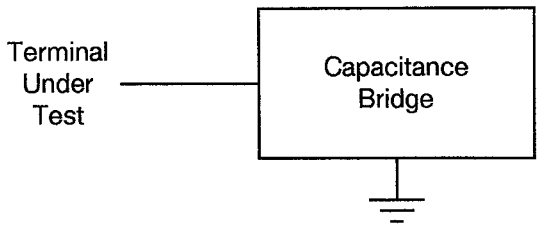
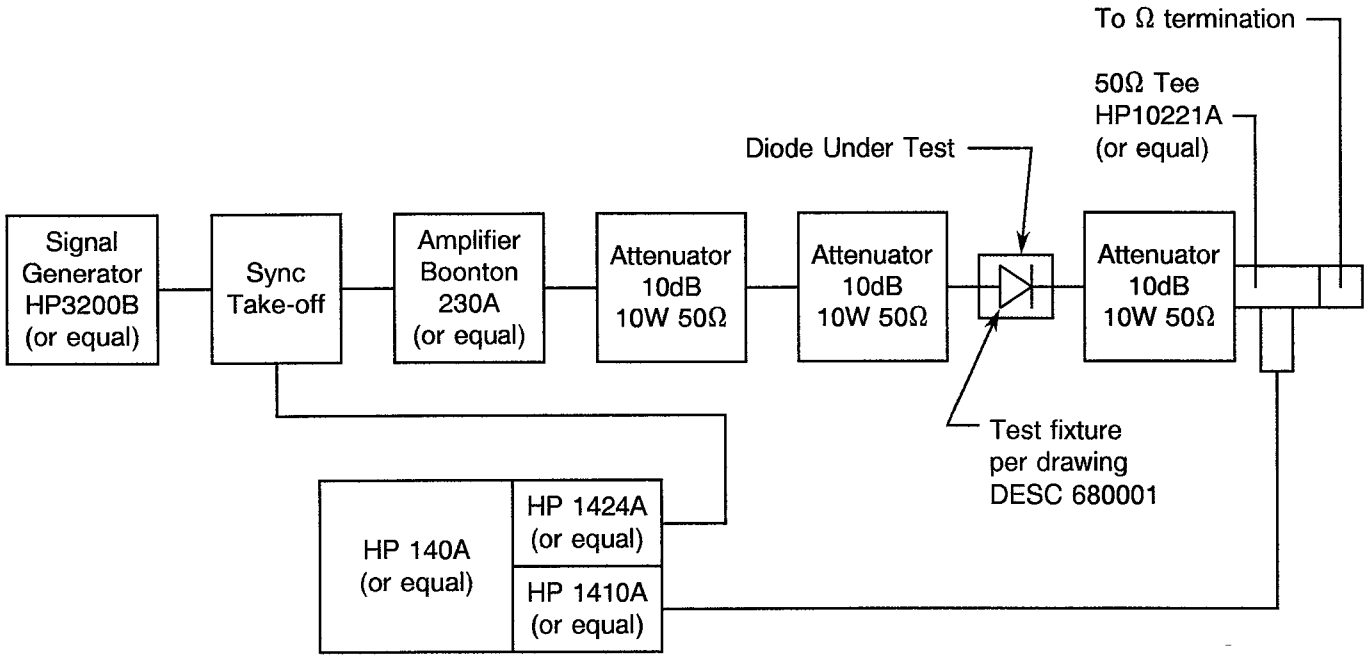
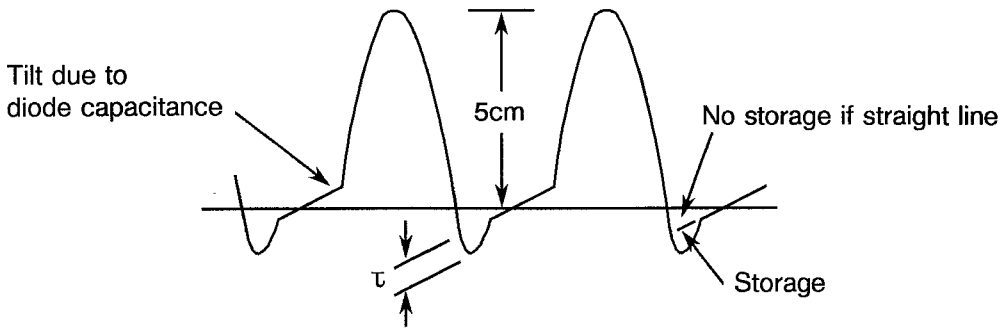


FIGURE 4(b) - EFFECTIVE CARRIER LIFETIME



TEST CIRCUIT



OSCILLOSCOPE DISPLAY FOR MEASUREMENT

TABLE 4 - PARAMETER DRIFT VALUES

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITIONS	CHANGE LIMITS (Δ)	UNIT
1	Forward Voltage 1	V_{F1}	As per Table 2	As per Table 2	±55	mV
3	Reverse Current	I_R	As per Table 2	As per Table 2	±100 or (1) ±30	% nA

NOTES

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

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

No.	CHARACTERISTICS	SYMBOL	CONDITIONS	UNIT
1	Ambient Temperature	T_{amb}	+125(+0−5)	°C
2	Reverse Voltage	V_R	16	V
3	Duration	t	48	Hrs

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

No.	CHARACTERISTICS	SYMBOL	CONDITIONS	UNIT
1	Ambient Temperature	T_{amb}	+25(+5−0)	°C
2	Forward Current	I_F	33	mA
3	Peak Reverse Voltage	V_R	16	Vpk
4	Frequency	f	60	Hz

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 6. Unless otherwise stated, the measurements shall be performed at $T_{amb} = +25 \pm 3$ °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 as scheduled in Table 6 of this specification. Unless otherwise stated, the measurements shall be performed at $T_{amb} = +25 \pm 3$ °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 Circuits for Operating Life Tests (Figure 5(b))

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	LIMITS		UNIT
					MIN.	MAX.	
1	Forward Voltage 1	V_{F1}	As per Table 2	As per Table 2	-	0.55	V
2	Forward Voltage 2	V_{F2}	As per Table 2	As per Table 2	-	1.0	V
3	Reverse Current	I_R	As per Table 2	As per Table 2	-	150	nA
4	Breakdown Voltage	$V_{(BR)}$	As per Table 2	As per Table 2	20	-	V
6	Effective Carrier Lifetime	τ	As per Table 2	As per Table 2	-	100	pS