DIODES, SWITCHING, FAST RECOVERY,

BASED ON TYPE UTR6420

ESCC Detail Specification No. 5101/018

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ESA/SCC DETAIL SPECIFICATION NO. 5101/018

space components
coordination group

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DOCUMENTATION CHANGE NOTICE

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.
		This Issue supersedes Issue 2 and incorporates all modifications defined in Issue 2 and the following DCR's:-		
		Cover Page		None
		DCN		None
		Para. 1.4	: Text corrected	23476
		Table 1(b)	: No. 4, symbol corrected	23476
		Para. 2	: Reference to ESA/SCC Basic Specification No. 23500 added	21025
		Para. 4.2.2	: PIND deviation standardised	21043
		Para. 4.2.4	: Title corrected	23476
		Para. 4.7.1	: Third sentence standardised	23476
		Para. 4.7.2	: Text standardised	23476
		Table 2 D.C.	: Format, sequence and Note standardised	23476
		Table 2 A.C.	: Title, format and Note standardised	23476
		Table 3	: Title, format and sequence standardised	23476
		Table 4	: Format, numbering and Note standardised	23476
		Para. 4.8.1	: Second sentence standardised	23476
		Table 6	: Format and numbering standardised	23476

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APPENDICES (Applicable to specific Manufacturers only)

1. GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for Diodes, Switching, Fast Recovery based on Type UTR6420. 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 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.

TABLE 1(a) - TYPE VARIANTS

VARIANT	BASED ON TYPE	LEAD MATERIAL AND/OR FINISH
01	UTR6420	A2
02	UTR6420	A3 or A4 (Note 1)

NOTES
1. Stud finish is Type '2'

TABLE 1(b) - MAXIMUM RATINGS

No.	CHARACTERISTICS	SYMBOL	MAXIMUM RATING	UNIT	REMARKS
1	Peak Inverse Voltage	PIV	200	V	
2	Non-repetitive Sinusoidal Surge Current	I_{FSM}	150	A	Note 1
3	Average DC Output Current	I_O	9.0	A	Note 2
4	Operating Temperature Range	T_{op}	−65 to +175	°C	T_{amb}
5	Storage Temperature Range	T_{stg}	−65 to +175	°C	
6	Soldering Temperature	T_{sol}	+260	°C	Note 3

NOTES
1. For 8.3ms maximum duration.
2. For derating of I_O with T_{amb}, see Figure 1.
3. Duration 10 seconds maximum at a distance of not less than 1.5mm from the can; the same lead shall not be resoldered until 3 minutes have elapsed.

FIGURE 1 - RATED AVERAGE OUTPUT CURRENT DERATING WITH AMBIENT TEMPERATURE

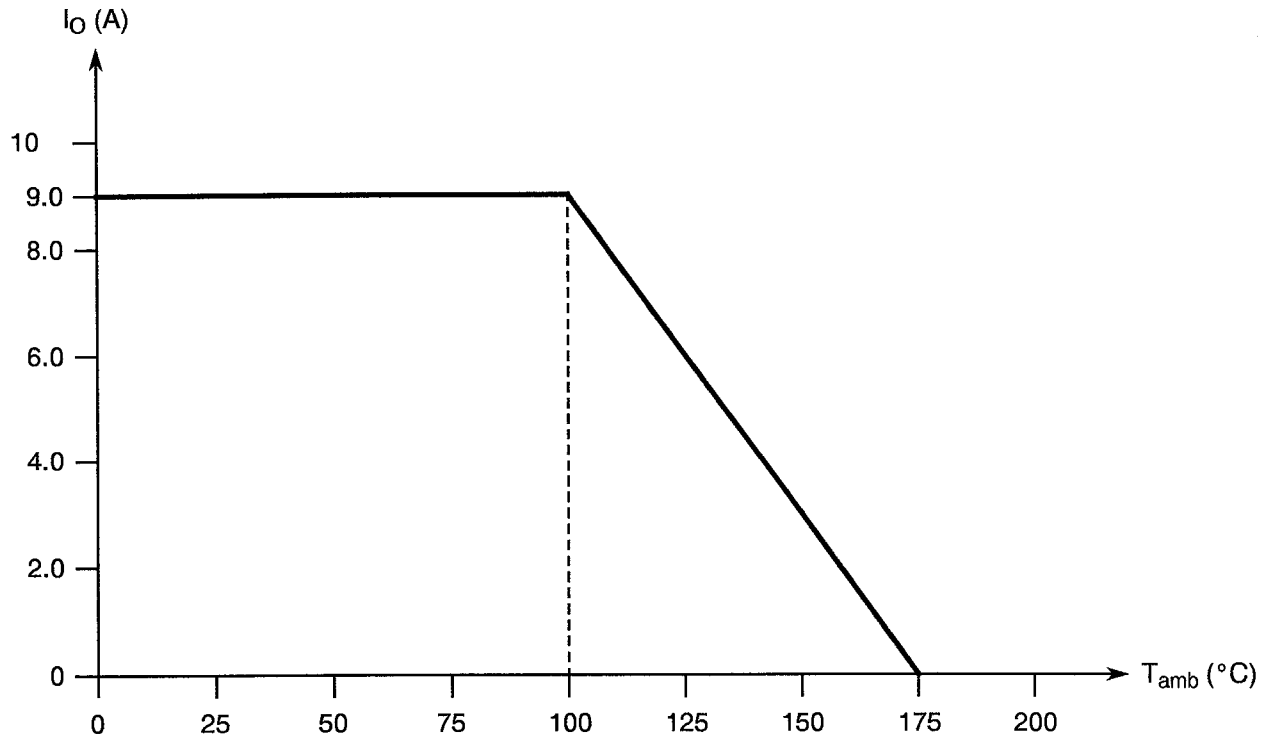
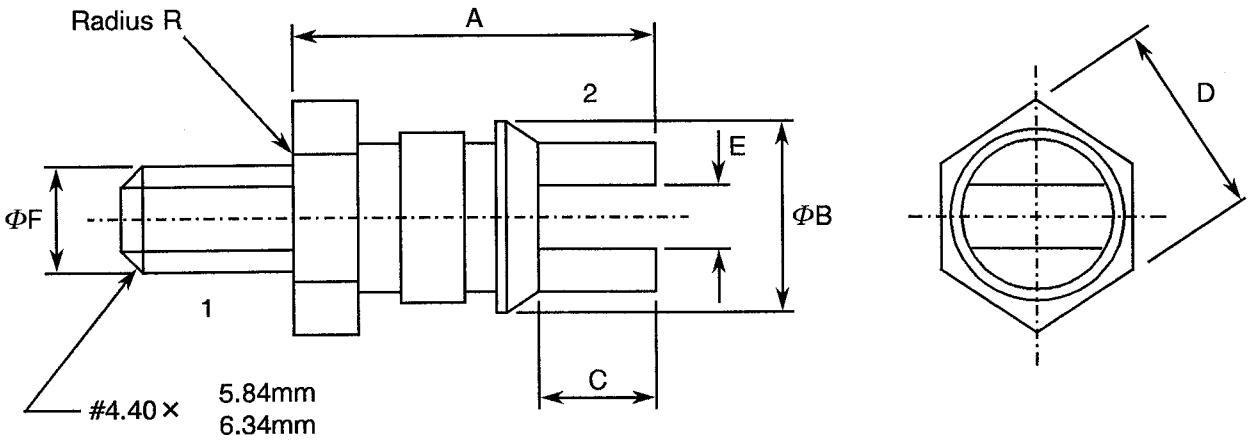


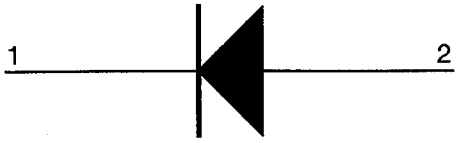
FIGURE 2 - PHYSICAL DIMENSIONS



SYMBOL	MILLIMETRES	
	MIN.	MAX.
A	-	11.68
ΦB	-	4.75
C	-	3.05
D	-	4.75
E	-	1.14
ΦF	-	2.84
R	-	0.13

FIGURE 3 - FUNCTIONAL DIAGRAM

1 Cathode
2 Anode



NOTES

1. The cathode is connected to the stud.

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) ESA/SCC Basic Specification No. 23500, Requirements for Lead Materials and Finishes 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. In addition, the following abbreviation is used:-

C_J - Junction Capacitance.

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 Semiconductors. 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: Not applicable.

(b) Para. 9.2.2, Die Shear Test: Not applicable.

(c) Para. 9.7, Particle Impact Noise Detection (PIND) Test: Not applicable.

(d) The following test shall be added after Para. 9.8.2, "Seal Test, Fine and Gross Leak (Optional)" and before Para. 9.9.3, "Electrical Measurements at Room Temperature":-

Surge current in accordance with MIL-STD-750, Test Method 4066. The following test conditions shall apply:-

T_{amb}	= $+25 \pm 3°C$.
I_{FSM}	= 150A.
Number of pulses	= 5.
Pulse rate	= 1 pulse/minute.
t_p	= 8.3ms, sinusoidal pulse form.
V_R	= 200V.

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

(a) Para 9.22, H.T.R.B. Test: Not applicable.

(b) Para. 9.12, Radiographic Inspection: Shall be performed if the body is not clear glass.

4.2.4 Deviations from Qualification Tests (Chart IV)

(a) Para. 9.2.3, Bond Strength Test: Not applicable.

(b) Para. 9.2.4, Die Shear Test: Not applicable.

(c) The electrical measurements specified at the end of Subgroup I and II tests shall be carried out as stated in Table 6 of this specification.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

The electrical measurements referenced 9.9.3 shall be performed as stated in 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 1.5 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:-

Terminal

Test Condition : 'A' (tension).

Applied Force : 66.7 N.

Duration : 15 seconds.

Stud

Test Condition : D_2 (stud torque).

Applied Torque : 0.20 N.m

Duration : 15 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 hermetically sealed and have a glass body.

4.4.2 Lead Material and Finish

The lead material shall be Type 'A' in accordance with ESA/SCC Basic Specification No. 23500. The stud finish shall be Type '2' and the terminal finish shall be either Type '2' or Type '3 or 4' all in accordance with ESA/SCC Basic Specifcation 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.

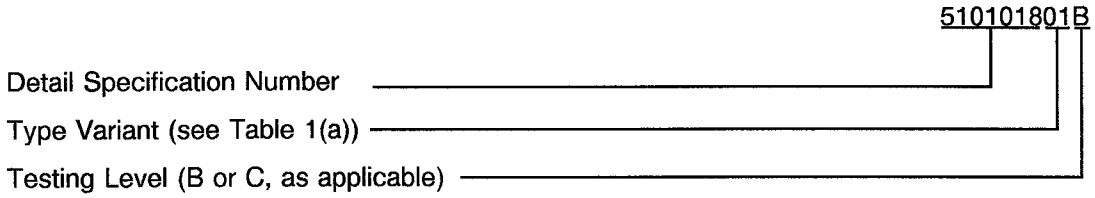
(c) Traceability Information.

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 as defined in 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.

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 $T_{amb} = +25 \pm 3$ °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 electrical measurements listed in Tables 2 and 3 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 $T_{amb} = +25 \pm 3$ °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 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 of this specification.

4.7.3 Electrical Circuits 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	DC Forward Voltage	V_F	4011	$I_F = 6.0A$	-	1.1	V
2	DC Reverse Current	I_R	4016	$V_R = 200V$	-	10	µA
3	DC Reverse Voltage	V_R	4021	$I_R = 100\mu A$	200	-	V

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	$V_R = 0V$ $f = 1.0MHz$	-	650	pF
5	Reverse Recovery Time	t_{rr}	4031 and Figure 4	$I_F = 10mA$ $I_R = 10mA$ $I_{RR} = 5.0mA$	-	400	ns

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES

No.	CHARACTERISTICS	SYMBOL	MIL-STD-750 TEST METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN.	MAX.	
2	DC Reverse Current	I_R	4016	$V_R = 200V$ $T_{amb} = +100(+0-5)°C$	-	300	µA

FIGURE 4 - TEST CIRCUIT FOR REVERSE RECOVERY MEASUREMENT

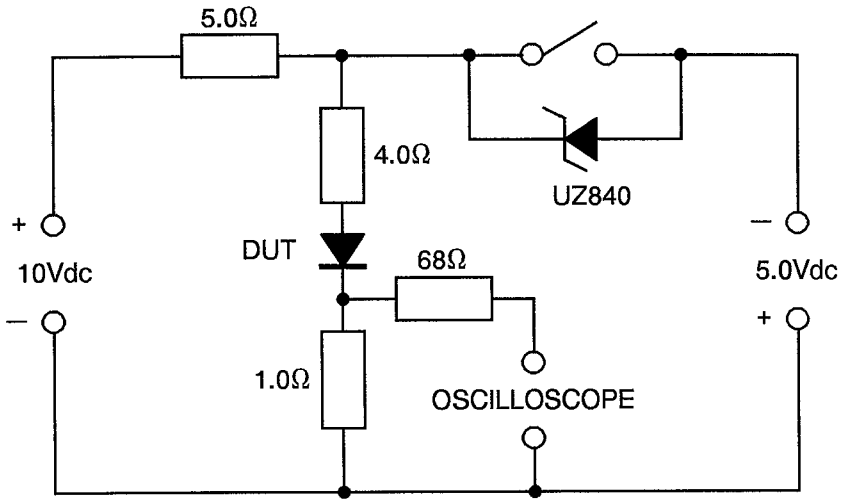


TABLE 4 - PARAMETER DRIFT VALUES

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITIONS	CHANGE LIMITS	UNIT
1	DC Forward Voltage	V_F	As per Table 2	As per Table 2	±50	mV
2	DC Reverse Current	I_R	As per Table 2	As per Table 2	+2.0	µA

TABLE 5 - CONDITIONS FOR POWER BURN-IN AND OPERATING LIFE TEST

No.	CHARACTERISTICS	SYMBOL	CONDITION	UNIT
1	Ambient Temperature	T_{amb}	$+25 \pm 3$	°C
2	Working Voltage	V_{WK}	200	Vrms
3	Frequency	f	60	Hz
4	Average Output Rectified Current	I_O	3.0	A

FIGURE 5 - ELECTRICAL CIRCUIT FOR POWER BURN-IN AND OPERATING LIFE TEST

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 during endurance tests are scheduled in Table 6. 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 the same as specified in Table 5 for the burn-in test.

4.8.4 Electrical Circuits 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 conditions for high temperature storage 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 TESTS

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN.	MAX.	
1	DC Forward Voltage	V_F	As per Table 2	As per Table 2	-	1.1	V
2	DC Reverse Current	I_R	As per Table 2	As per Table 2	-	10	µA

APPENDIX 'A'

AGREED DEVIATIONS FOR UNITRODE (USA)

ITEMS AFFECTED	DESCRIPTION OF DEVIATIONS
Para. 4.2.2 Para. 4.2.4	Internal (pre-encapsulation) Visual Inspection may be performed to MIL-STD-750, Test Method 2074.
Para. 4.2.2 Para. 4.2.3 Para. 4.2.4 Para. 4.2.5	External Visual Inspection may be performed to MIL-STD-750, Test Method 2071.
Para. 4.2.3	Radiographic Inspection may be performed to MIL-STD-750, Test Method 2076.