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Pages 1 to 19

DIODES, RECTIFIER, FAST RECOVERY,

BASED ON TYPES

UES 801, 802, 803 AND UES 801R, 802R, 803R

ESA/SCC Detail Specification No. 5103/017

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 1 and incorporates all modifications agreed on the basis of the following DCR's:-		
		DCR's for Implementation of Policy Decisions		
		- Manufacturer's Appendices		21019
		- Format		21022
		- New "Lead" Specification (ESA/SCC 23500)		21025
		P6. Table 1(a)	: Table extended to include 'R' versions	22273
		P9. Figure 2	: Cathode stud - note amended	22273
		Figure 3	: Note and drawing reference amended	22273
'A'	Jul. '93	P1. Cover Page		None
		P2. DCN		None
		P10. Para. 4.2.2	: Die Shear Test deviation deleted	23499
			: PIND deviation deleted, subsequent deviation renumbered	21043
		P11. Para. 4.2.3	: Radiographic Inspection deviation deleted	21049
		Para. 4.2.4	: Die Shear Test deviation deleted	23499
		P16. Table 3	: Note 3 deleted	21047
		This document has been transferred from hardcopy to electronic format. The content is unchanged but minor differences in presentation exist.		
'B'	Aug. '96	P1. Cover Page		None
		P2. DCN		None
		P5. Para. 1.7	: Text amended	21083

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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 Diodes, Rectifier, Fast Recovery, based on Types UES 801, 802, 803 and UES 801R, 802R, 803R.

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 FUNCTIONAL DIAGRAM

The functional diagram, showing lead identification of the diodes 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 a 100% inert atmosphere.

TABLE 1(a) - TYPE VARIANTS

(1) VARIANT	(2) BASED ON TYPE	(3) LEAD MATERIAL AND FINISH	(4) $V_R = V_{RWM} = V_{RRM}$ (V)
01	UES 801	A5	50
02	UES 801	A3 or A4	50
03	UES 802	A5	100
04	UES 802	A3 or A4	100
05	UES 803	A5	150
06	UES 803	A3 or A4	150
07	UES 801R	A5	50
08	UES 801R	A3 or A4	50
09	UES 802R	A5	100
10	UES 802R	A3 or A4	100
11	UES 803R	A5	150
12	UES 803R	A3 or A4	150

TABLE 1(b) - MAXIMUM RATINGS

No.	CHARACTERISTICS	SYMBOL	MAXIMUM RATINGS	UNIT	REMARKS
1	D.C. Blocking Voltage	V_R	Note 1	V	
2	Working Peak Reverse Voltage	V_{RWM}	Note 1	V	
3	Peak Repetitive Reverse Voltage	V_{RRM}	Note 1	V	
4	Non-repetitive Peak Surge Current	I_{FSM}	800	A	Note 2
5	Average Rectified Forward Current	I_O	70	A	Note 3
6	Operating Temperature	T_{op}	−55 to +175	°C	
7	Storage Temperature	T_{stg}	−55 to +175	°C	
8	Soldering Temperature	T_{sol}	+265	°C	Note 4

NOTES

1. See Column 4 of Table 1(a)
2. Sinusoidal, with period = 8.3ms maximum.
3. Up to T_C = +100°C. For derating of I_O with T_C, see Figure 1.
4. Duration 10 seconds maximum at a distance of not less than 1.5mm from the can and the same lead shall not be resoldered until 3 minutes have elapsed.

FIGURE 1 - AVERAGE OUTPUT RECTIFIED CURRENT DERATING WITH CASE TEMPERATURE

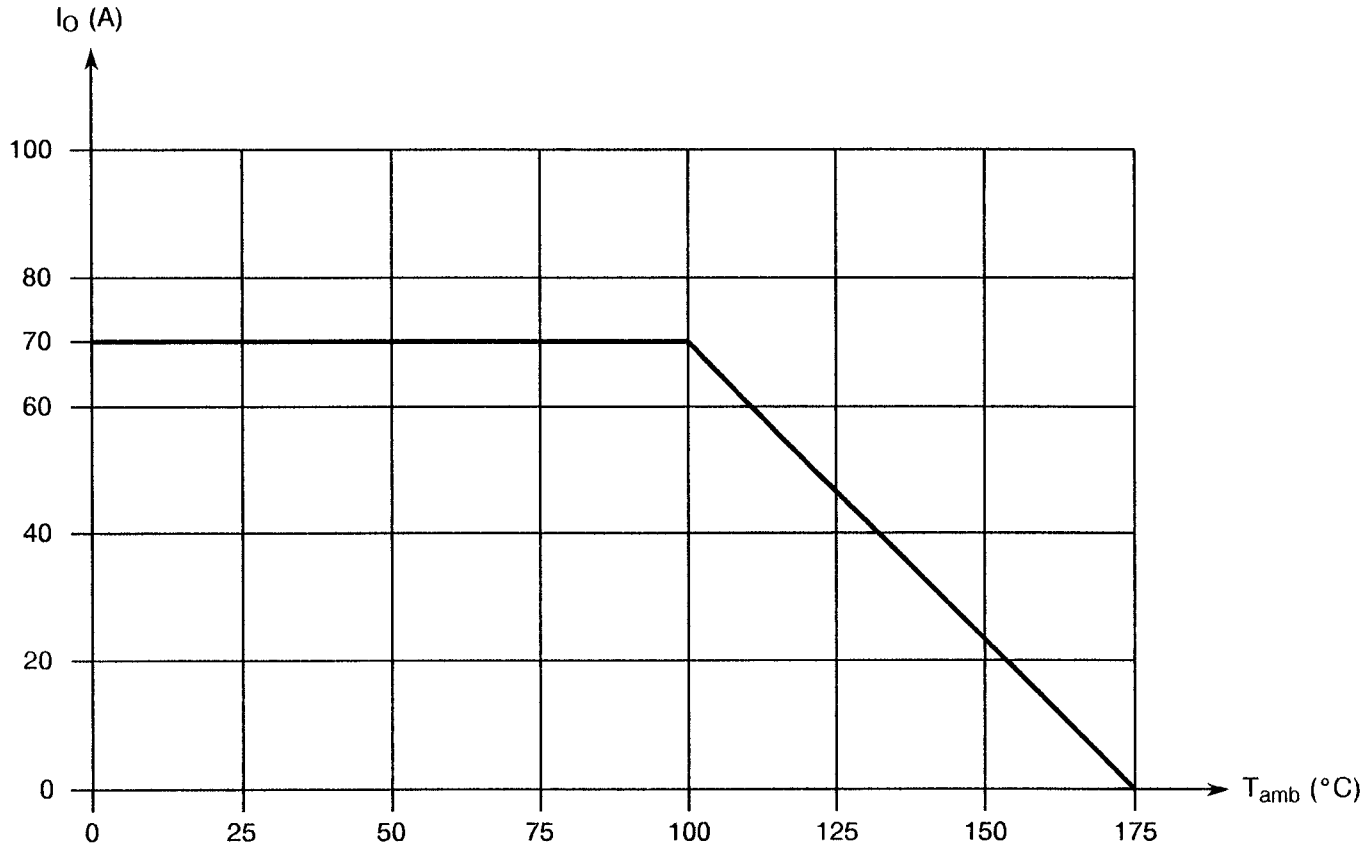
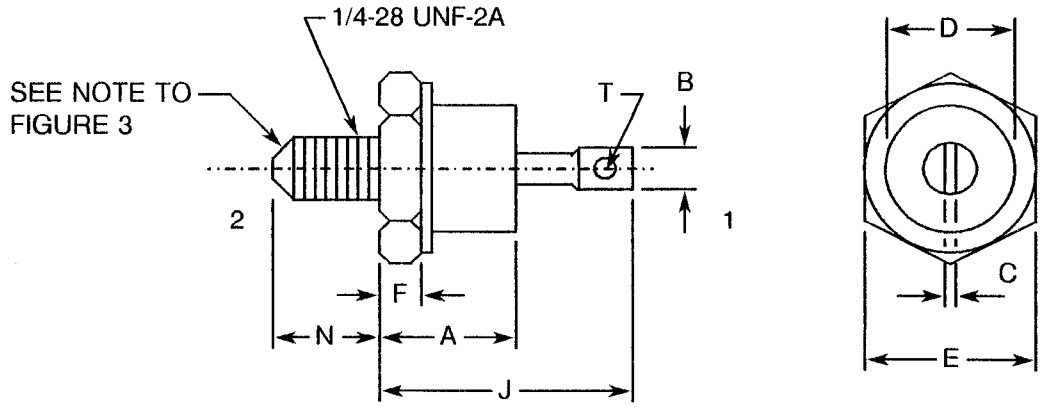
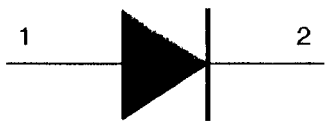


FIGURE 2 - PHYSICAL DIMENSIONS



SYMBOL	INCHES		MILLIMETRES		NOTES
	MIN.	MAX.	MIN.	MAX	
A	-	0.450	-	11.4	
B	-	0.375	-	9.5	
C	-	0.080	-	2.0	
D	-	0.667	-	17.0	
E	0.667	0.687	16.9	17.5	
F	0.115	0.200	2.9	5.1	
J	-	1.000	-	25.4	
N	0.422	0.453	10.7	11.5	
T	0.140	0.175	3.5	4.5	

FIGURE 3 - FUNCTIONAL DIAGRAM



1. Anode.
2. Cathode.

NOTES

1. For Variants 01 to 06, the cathode is connected to the mounting stud and for Variants 07 to 12, the anode is connected to the mounting 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.

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:-

$R_{TH(J-C)}$ = Thermal Resistance Junction to Case.

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 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) Bond Strength Test: Shall not be performed.

(b) 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":-

4.2.2 Deviations from Final Production Tests (Chart II) Continued

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

I_{FSM}	=	800A (superimposed on I_O).
Number of pulses	=	5.
Pulse Rate	=	1 pulse/minute.
t_p	=	8.3ms.
V_{RRM}	=	As per Table 1(a), Column 4.
I_O	=	70A.

4.2.3 Deviations from Burn-in Tests (Chart III)

(a) H.T.R.B. Test: Shall not be performed.

4.2.4 Deviations from Qualification Tests (Chart IV)

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

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

None.

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 17 grammes.

4.3.3 Maximum Torque

The maximum torque to be applied to the mounting stud is 17cmN.

4.3.4 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:-

Terminals:	Test Condition:	A, Tension.
	Applied Force:	44.4 Newtons (10 Pounds).
	Duration:	15 seconds.
Stud:	Test Condition:	D_2, Stud Torque.
	Applied Force:	54 Newtons.cm (30 Pounds inch).
	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 metal body.

4.4.2 Lead Material and Finish

The leads shall be Type 'A' with either Type '5' or Type '3 or 4' (with Type '5' underplating) finish in accordance with 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.

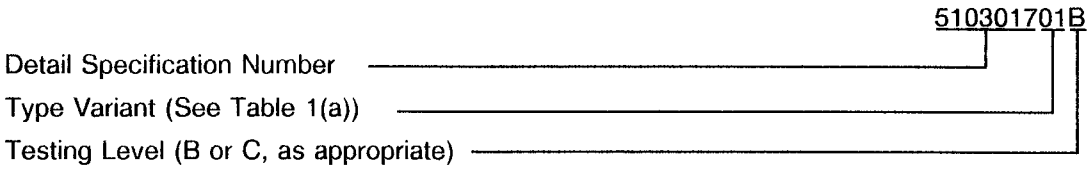
(c) Traceability Information.

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.

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 are shown, where applicable, in MIL-STD-750.

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

Not applicable.

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

No.	CHARACTERISTICS	SYMBOL	TEST METHOD MIL-STD-750	TEST CONDITIONS	LIMITS		UNIT
					MIN.	MAX.	
1	Reverse Current	I_R	4016	$V_R = V_{RWM}$ Note 1	-	25	µA
2	Forward Voltage	V_F	4011	$I_F = 70A$ Note 2	-	0.975	V
3	Thermal Resistance	$R_{TH(J-C)}$	4081	Note 3	-	1.0	°C/W

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

No.	CHARACTERISTICS	SYMBOL	TEST METHOD MIL-STD-750	TEST CONDITIONS	LIMITS		UNIT
					MIN.	MAX.	
4	Reverse Recovery Time	t_{rr1}	4031	$I_F = 0.5A$ $I_R = 1.0A$ $I_{RR} = 0.25A$	-	50	ns

NOTES

1. V_{RWM} per Column 4 of Table 1(a).
2. Pulse measurement $t_p \leq 300\mu s$, Duty Cycle $\leq 2.0\%$.
3. Test performed on a sample basis, LTPD7 or less.

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES

No.	CHARACTERISTICS	SYMBOL	TEST METHOD MIL-STD-750	TEST CONDITIONS	LIMITS		UNIT
					MIN.	MAX.	
1	Reverse Current	I_R	4016	$V_R = V_{RWM}$ Note 1 $T_{amb} = +100(+0-5)°C$	-	1.0	mA
2	Forward Voltage	V_F	4011	$I_F = 70A$ $T_{amb} = -55(+5-0)°C$ Note 2	-	1.15	V

NOTES

1. V_{RWM} per Column 4 of Table 1(a).
2. Pulse measurement $t_p \leq 300\mu s$, Duty Cycle $\leq 2.0\%$.

TABLE 4 - PARAMETER DRIFT VALUES

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITIONS	CHANGE LIMIT (Δ)	UNIT
1	Reverse Current	I_R	As per Table 2	As per Table 2	±5.0 or (1) ±100	µA %
2	Forward Voltage	V_F	As per Table 2	As per Table 2	±100 or (1) ±10	mV %

NOTES

1. Whichever is greater in respect of the initial value.

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

No.	CHARACTERISTICS	SYMBOL	CONDITION	UNIT
1	Case Temperature	T_C	+100(+0−3)	°C
2	Working Voltage	V_R	V_R (Note 1)	V_{RWM}
3	Frequency	f	60	Hz
4	Average Output Rectified Current	I_O	70	A

NOTES

1. See Table 1(a), Column 4.

4.8 ENVIRONMENTAL AND ENDURANCE TESTS

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 during Endurance Tests

The parameters to be measured on intermediate points during endurance tests are scheduled in Table 6.

4.8.3 Electrical Measurements on Completion of Endurance Tests

The parameters to be measured on completion of endurance tests are scheduled in Table 6. The measurements shall be performed at $T_{amb} = +22 \pm 3$ °C.

4.8.4 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 of this specification.

4.8.5 Electrical Circuits for Operating Life Tests

Not applicable.

4.8.6 Conditions for High Temperature Storage Test (Part of Endurance Testing)

The requirements for the high temperature storage test are specified in Section 9 of ESA/SCC Generic Specification No. 5000. The conditions for high temperature storage test shall be $T_{amb} = +175(+0-5)$°C.

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	Reverse Current	I_R	As per Table 2	As per Table 2	-	25	µA
2	Forward Voltage	V_F	As per Table 2	As per Table 2	-	0.975	V
4	Reverse Recovery Time	t_{rr}	As per Table 2	As per Table 2	-	50	ns