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DIODES, SILICON, FAST RECOVERY RECTIFIER,

(LOW FORWARD VOLTAGE DROP)

BASED ON SERIES BYW 78

ESA/SCC Detail Specification No. 5103/018

SCC

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	CHANGE		Approved DCR No.
		Reference	Item	
		This issue incorporates all modifications agreed on the basis of Policy DCR's 21019 and 21022		
'A'	Feb. '84	P1. Cover Page		None
		P2. DCN		None
		P9. Para. 4.2.3(a)	HTRB shall be performed	23131
		P11. Para. 4.5.3	Component No. changed to 5103018 02 B	23131
'B'	Nov. '86	P1. Cover Page		None
		P2. DCN		None
		P4. T of C	Appendix A for Thomson-CSF added	24040
		P17. Appendix A	New page	24040
'C'	July '93	P1. Cover Page		None
		P2. DCN		None
		P9. Para. 4.2.2	PIND deviation deleted, subsequent deviation renumbered	21043
		Para. 4.2.3	H.T.R.B. deviation deleted	23499
			Radiographic Inspection deviation deleted	21049
		This document has been transferred from hardcopy to electronic format. The content is unchanged but minor differences in presentation exist.		

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TABLES

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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, Fast Recovery Rectifier, Low Forward Voltage Drop, based on Series BYW78.

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 diodes specified herein, which are also covered by this specification, are listed 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 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.

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) MIL-STD-202, Test Methods for Electronic and Electrical Component Parts.

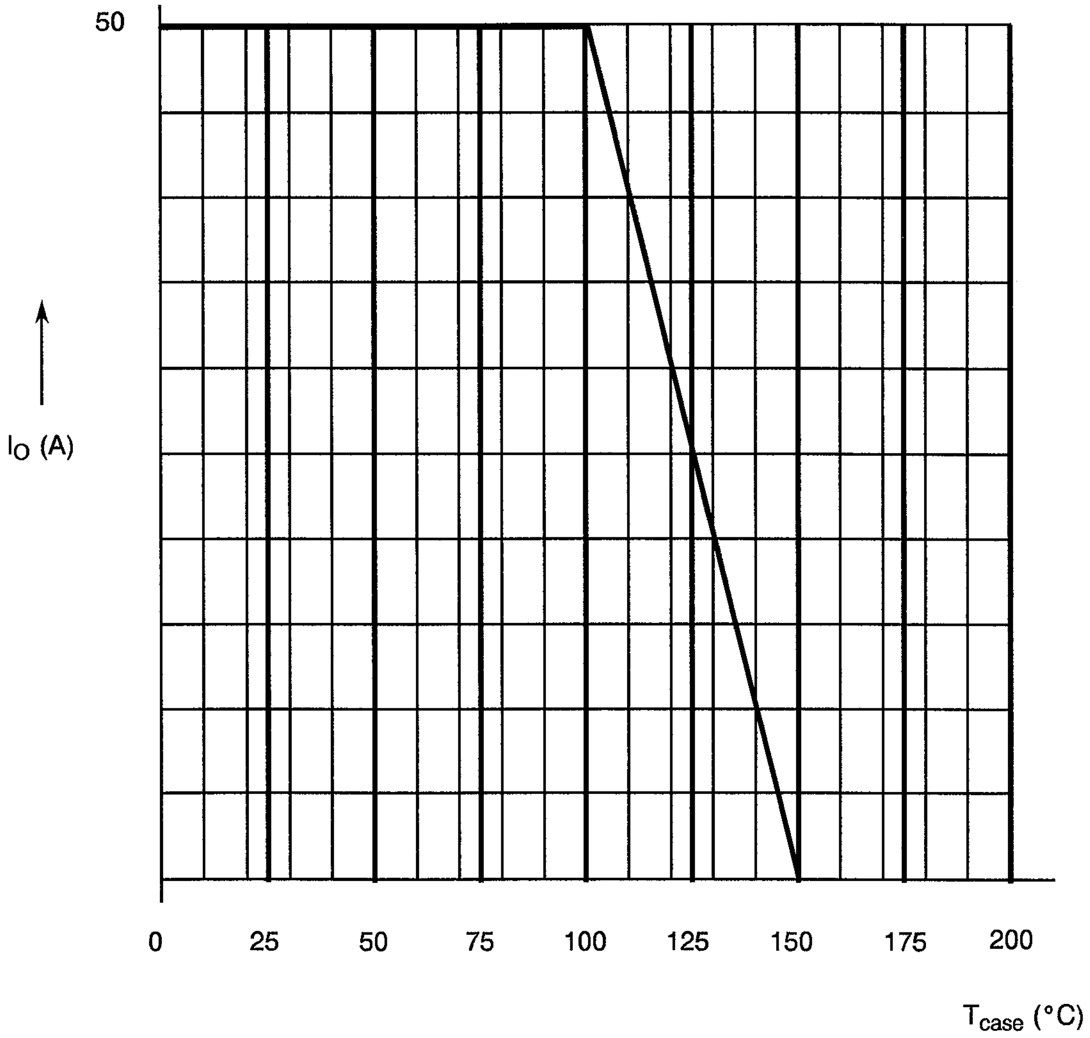
TABLE 1(a) - TYPE VARIANTS

(1) VARIANT	(2) BASED ON TYPE	(3) V_R (V)	(4) V_{RWM} (V)	(5) V_{RRM} (V)	(6) V_{RSM} (V)
01	BYW 78 - 50	50	50	50	55
02	BYW 78 - 100	100	100	100	110
03	BYW 78 - 150	150	150	150	165
04	BYW 78 - 200	200	200	200	220

TABLE 1(b) - MAXIMUM RATINGS

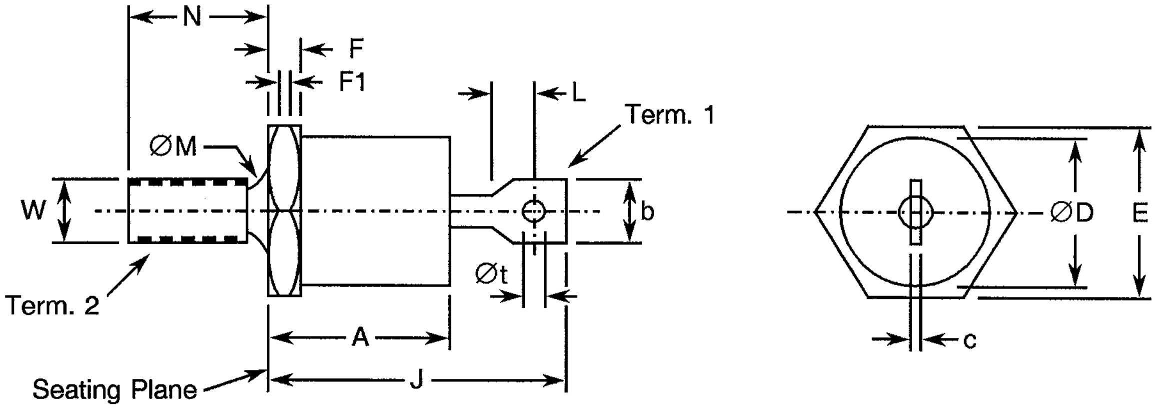
No.	CHARACTERISTIC	SYMBOL	MAXIMUM RATING	UNIT	REMARKS
1	Forward Surge Current	I_{FSM}	1500	A	$T_{(vj)} = +150°C$
2	Operating Temperature Range	T_{op}	−40 to +150	°C	T_{amb}
3	Storage Temperature Range	T_{stg}	−65 to +175	°C	
4	Soldering Temperature	T_{sol}	+260	°C	Time: ≤10s Distance from case: ≥1.5mm
5	Average Forward Current	I_O	50	A	$T_{case} = +100°C$

FIGURE 1 - PARAMETER DERATING INFORMATION



Average Output Current versus Temperature

FIGURE 2 - PHYSICAL DIMENSIONS

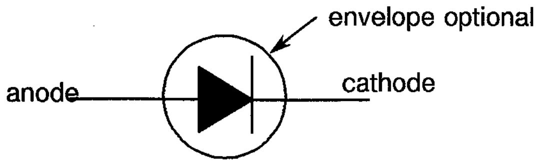


SYMBOL	INCHES		MILLIMETRES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	-	0.450	-	11.43	
b	-	0.375	-	9.53	2
c	-	0.80	-	2.03	
ØD	-	0.667	-	16.94	
E	0.667	0.687	16.94	17.45	
F	0.115	0.200	2.92	5.08	
F1	0.060	-	1.52	-	
J	-	1.000	-	25.40	
L	0.156	-	3.96	-	4
ØM	0.220	0.249	5.59	6.32	1
N	0.422	0.453	10.72	11.51	
Øt	0.140	0.175	3.56	4.45	
W	-	-	-	-	1, 3

NOTES

1. Complete threads to extend to within 2-1/2 thread of seating plane.
2. Angular orientation of this terminal is undefined.
3. M6 or 1/4-28 UNF-2A. Maximum pitch diameter of plated threads shall be basic pitch diameter (0.2268", 5.74mm) ref. (Screw thread standards for Federal Services 1957) Handbook M28 1957 F1.
4. Minimum flat.

FIGURE 3 - FUNCTIONAL DIAGRAM



NOTES

1. The cathode is connected to the stud.

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.

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) Bond Strength Test: Shall not be performed.
(b) Die-shear Test: Shall not be performed.
(c) Thermal Shock: Shall be performed in accordance with MIL-STD-202, Test method 107, Test Condition 'B'.

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

None.

4.2.4 Deviations from Qualification Tests (Chart IV)

(a) Bond Strength Test: Shall not be performed.
(b) Die-shear 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 15 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'.
Applied Force : 20 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

Metal case, welded, hermetically sealed. All metal surfaces are nickel-plated.

4.4.2 Lead Material and Finish

Not applicable.

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. 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:

510301802B

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.

4.5.5 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 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, the 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(b) of this specification.

4.7.3 Electrical Circuits for Burn-in

Circuits for use in performing the burn-in tests are shown in Figure 5 of this specification.

4.7.4 Conditions and Electrical Circuits for High Temperature Reverse Bias

The requirements for the High Temperature Reverse Bias test are specified in Section 7 of ESA/SCC Generic Specification No. 5000. The conditions shall be as specified in Table 5(a), the electrical circuits to be used are shown in Figure 5 of this specification.

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

No.	CHARACTERISTICS	SYMBOL	TEST METHOD MIL-STD-750	TEST CONDITION	LIMITS		UNIT
					MIN.	MAX.	
1	Reverse Current	I_R	4016	$V_R = (1)$	-	50	µA
2	Forward Voltage	V_{F1}	4011	$I_{F1} = 12.5A$ (2)	-	0.8	V
		V_{F2}		$I_{F2} = 50A$ (2)	-	0.95	

NOTES

1. See Column 3 of Table 1(a).
2. Pulse Measurement: Pulse length $\leq 300\mu s$; Duty Cycle $\leq 2\%$.

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

No.	CHARACTERISTICS	SYMBOL	TEST METHOD MIL-STD-750	TEST CONDITION	LIMITS		UNIT
					MIN.	MAX.	
3	Reverse Recovery Time	t_{rr}	4031, Cond. 'B'	$I_F = 1.0A$ $d_{IF}/dt = -50A/\mu s$ $I_{RR} = 0.2I_{RM}$ $V_R = 30V$ See Figure 4	-	60	ns

FIGURE 4 - TEST CIRCUITS

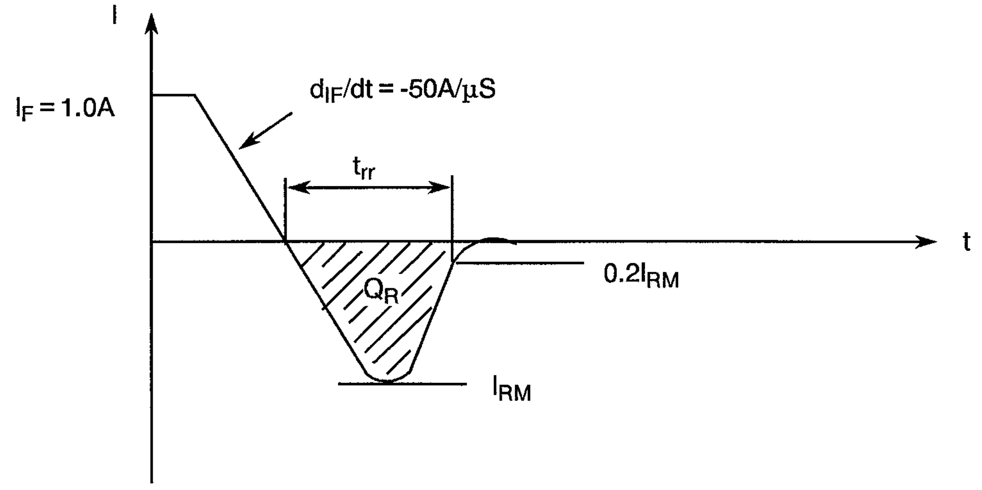


TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES

No.	CHARACTERISTICS	SYMBOL	TEST METHOD MIL-STD-750	TEST CONDITIONS	LIMITS		UNIT
					MIN.	MAX.	
1	Reverse Current	I_R	4016	$V_R = (1)$ V $T_{amb} = +100$ °C	-	5.0	mA

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

TABLE 4 - PARAMETER DRIFT VALUES

No.	CHARACTERISTICS	SYMBOL	TEST METHOD MIL-STD-750	TEST CONDITION	CHANGE LIMITS (Δ)	UNIT
1	Forward Voltage	V_F	4011	$I_F = I_O = 50$A	± 100	mV
2	Reverse Current	I_R	4016	$V_R = (1)$ V	100 or 2.0	% µA

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

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

No.	CHARACTERISTICS	SYMBOL	CONDITION	UNIT
1	Case Temperature	T_{case}	+ 125	°C
2	Reverse Voltage	V_R	$0.8V_R$ (1)	V
3	Duration	-	72	Hrs

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

TABLE 5(b) - CONDITIONS FOR OPERATING BURN-IN

No.	CHARACTERISTICS	SYMBOL	CONDITION	UNIT
1	Case Temperature	T_{case}	+ 100	°C
2	Forward Current	I_F	50	A

FIGURE 5 - ELECTRICAL CIRCUIT FOR HTRB AND BURN-IN

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. 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.

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 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 for 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 temperatrue specified in Table 1(b) of this specification.

TABLE 6 - ELECTRICAL MEASUREMENTS AT INTERMEDIATE POINTS AND ON COMPLETION OF ENDURANCE TESTING

No.	CHARACTERISTICS	SYMBOL	TEST METHOD MIL-STD-750	TEST CONDITION	LIMITS		UNIT
					MIN.	MAX.	
1	Reverse Current	I_R	4016	$V_R = (1)$ V	-	50	μA
2	Forward Voltage	V_{F2}	4011	$I_{F2} = 50A$ See Note 2	-	0.95	V

NOTES

1. See Column 3 of Table 1(a).
2. Pulse Measurement: Pulse length $\leq 300\mu s$; Duty Cycle $\leq 2\%$.

APPENDIX 'A'

AGREED DEVIATIONS FOR THOMSON-CSF (F)

ITEMS AFFECTED	DESCRIPTION OF DEVIATIONS
Para. 4.2.4) Para. 4.2.5)	Deviations from Envrionmental and Endurance Tests (Chart IV) and from Lot Acceptance Tests (Chart V). "Moisture Resistance", para. 9.16, according to MIL-STD-750, Method 1021, shall be replaced by:- "Climatic Sequence" according to IEC Publication No. 68-1; Applicable condition: Phase 'D': Option 2, 5 cycles. Phase 'F' (Low Air Pressure): Not applicable.