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DIODES, VOLTAGE VARIABLE CAPACITOR,

BASED ON TYPES 1N5139A THROUGH 1N5148A

ESA/SCC Detail Specification No. 5107/016

space components
coordination group

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DOCUMENTATION CHANGE NOTICE

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.
'A'	July '93	P1. Cover Page		None
		P2. DCN		None
		P6. Table 1(a)	: "Lead Material and/or Finish" column added	21025
		P9. Para. 4.2.2	: PIND deviation amended	21043
		P10. Para. 4.2.3	: H.T.R.B. deviation deleted, subsequent deviations renumbered	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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1. GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for Diodes, Voltage Variable Capacitor, based on Types 1N5139A through 1N5148A.

It shall be read in conjunction with ESA/SCC Generic Specification No. 5000, the requirements of which are supplemented herein.

1.2 TYPE VARIANTS

Variants of the basic 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 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.

TABLE 1(a) - TYPE VARIANTS

(1) Variant	(2) Figure	(3) (4) (5) Total Capacitance (CT) (pF) Min.	(pF) Nom.	(pF) Max.	(6) Tuning Ratio (TR) (Min.)	(7) Q Factor (Min.)	(8) Based on Type	(9) Lead Material and Finish
01	2	6.46	6.8	7.14	2.7	350	1N5139A	C2
02	2	9.50	10	10.50	2.8	300	1N5140A	C2
03	2	11.40	12	12.60	2.8	300	1N5141A	C2
04	2	14.30	15	15.70	2.8	250	1N5142A	C2
05	2	17.10	18	18.90	2.8	250	1N5143A	C2
06	2	20.90	22	23.10	3.2	200	1N5144A	C2
07	2	25.70	27	28.30	3.2	200	1N5145A	C2
08	2	31.40	33	34.60	3.2	200	1N5146A	C2
09	2	37.10	39	40.90	3.2	200	1N5147A	C2
10	2	44.70	47	49.30	3.2	200	1N5148A	C2

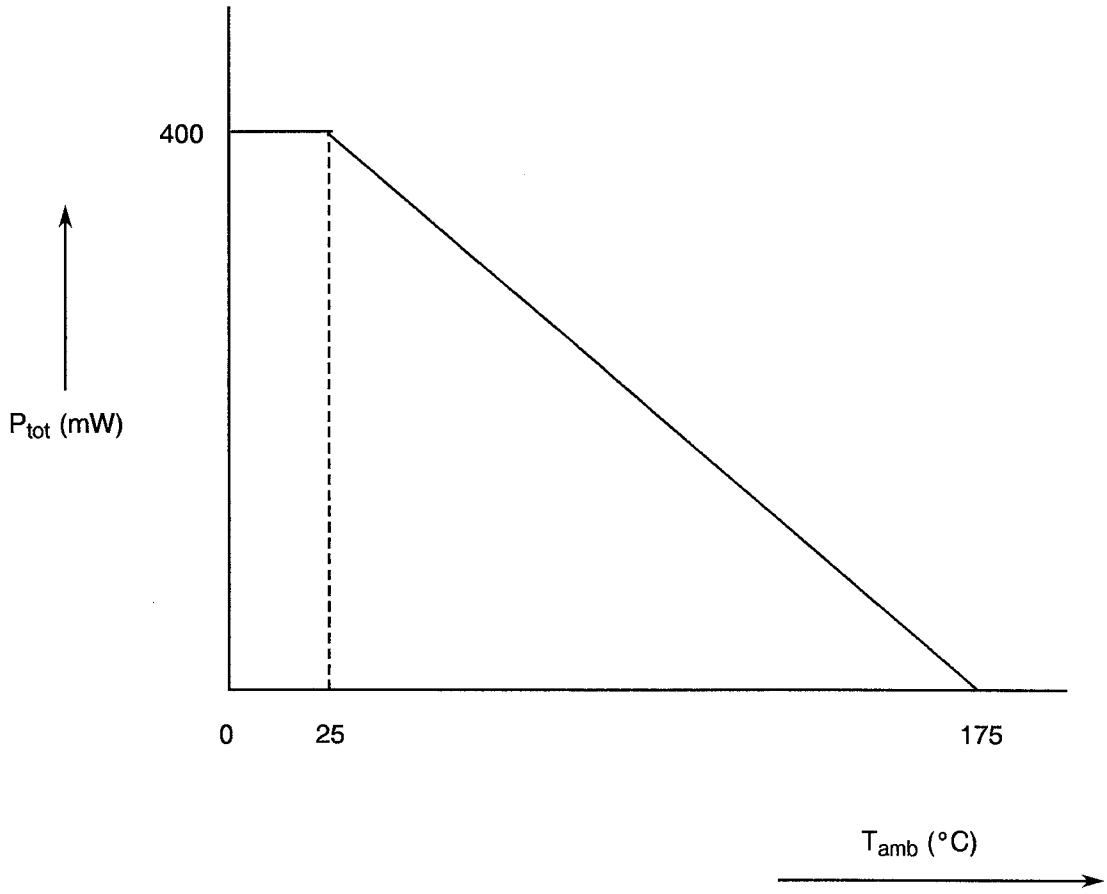
TABLE 1(b) - MAXIMUM RATINGS

No.	CHARACTERISTIC	SYMBOL	MAXIMUM RATING	UNIT	REMARKS
1	Reverse Voltage	V_R	60	Vdc	
2	Forward Current	I_F	250	mAdc	
3	RF Power Input	P_{IN}	5.0	W	See Note 1
4	Power Dissipation	P_{tot}	400	mW	See Note 2
5	Operating Temperature Range	T_{op}	−65 to +175	°C	T_{amb}
6	Storage Temperature Range	T_{stg}	−65 to +200	°C	
7	Soldering Temperature	T_s	+260	°C	See Note 3

NOTES

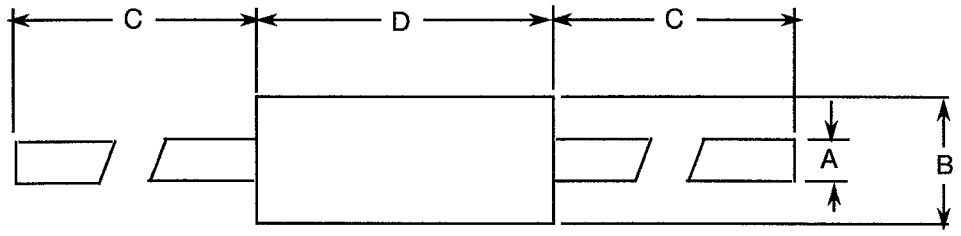
1. Heat sinking must be provided.
2. At T_{amb} = +25°C. For derating at T_{amb} > +25°C, see Figure 1.
3. Duration 5 seconds and the same termination shall not be resoldered until 3 minutes have elapsed.

FIGURE 1 - PARAMETER DERATING INFORMATION



Power Dissipation Versus Temperature

FIGURE 2 - PHYSICAL DIMENSIONS



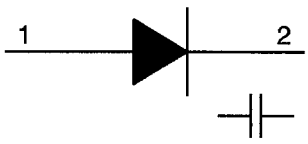
SYMBOL	MILLIMETRES		INCHES		REMARKS
	MIN.	MAX.	MIN.	MAX.	
A	0.46	0.56	0.018	0.022	Diameter: (1) (2)
B	2.16	2.72	0.085	0.107	Diameter: (3)
C	25.40	38.10	1.000	1.500	
D	5.84	7.62	0.230	0.300	

NOTES

1. The specified lead diameter applies in the zone between 1.27mm (0.050 inch) and 25.40mm (1.000 inch) from the diode body. Outside this zone, the lead diameter is not controlled.
2. Both leads shall be within the specified dimensions.
3. The minimum body diameter shall be maintained over 0.38mm (0.150 inch) of body length.

FIGURE 3 - FUNCTIONAL DIAGRAM

1. Anode
2. Cathode



NOTES

1. The cathode end shall be marked with a black dot or band.

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 abbrevations are used:-

C_T = Total Capacitance.
T_R = Tuning Ratio.
Q = Figure of Merit (Q Factor).
TC = Temperature Coefficient of Capacitance.

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 Test: Shall not be performed.

(b) Para. 9.2.2, Die Shear Test: Shall not be performed.

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

(d) Para. 9.10, External Visual Inspection: Shall be performed on a 100% basis.

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

(a) Para. 7.1.1(a), Burn-in (Steady State Power) tests and subsequent electrical measurements related to this test shall be omitted.

4.2.4 Deviations from Qualification Tests (Chart IV)

(a) Para. 9.2.3, Bond Strength Test: Shall not be performed.

(b) Para. 9.2.4, 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 0.2 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 : 18.8 Newtons.
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 heremetically sealed and have a glass body.

4.4.2 Lead Material and Finish

The lead material shall be Type 'C' with Type '2' finish in accordance with the requirements of ESA/SCC Basic Specification No. 23500.

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.

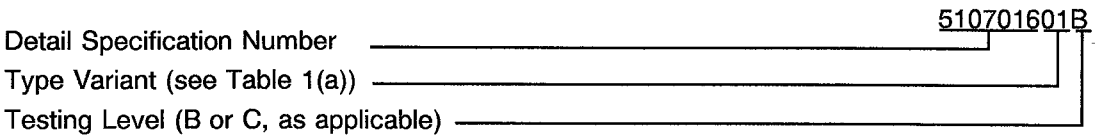
(c) Traceability Information.

4.5.2 Lead Identification

Lead identification shall be as shown in Figures 2 and 3 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 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. Unless otherwise specified, 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 (Figure 4)

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

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 of this specification.

4.7.3 Conditions for Power Burn-in

Not applicable.

4.7.4 Electrical Circuits for High Temperature Reverse Bias and Power Burn-in (Figure 5)

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	Breakdown Voltage	$V_{(BR)}$	4021	I_R = 10mA	65	-	Vdc
2	Reverse Current	I_R	4016	V_R = 55Vdc	-	20	nA

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

No.	CHARACTERISTICS	SYMBOL	TEST METHOD MIL-STD-750	TEST CONDITIONS	LIMITS		UNIT
					MIN.	MAX.	
3	Total Capacitance	C_T	4001	f = 1.0MHz V_R = 4.0Vdc	(1)	(2)	pF
4	Tuning Ratio	T_R	4001	f = 1.0MHz V_R = 4.0 and 60 Vdc	(3)	-	
5	Q Factor	Q	4036	f = 50MHz V_R = 4.0Vdc	(4)		

NOTES

1. See Table 1(a), Column 3.
2. See Table 1(a), Column 5.
3. See Table 1(a), Column 6.
4. See Table 1(a), Column 7.

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES

No.	CHARACTERISTICS	SYMBOL	TEST METHOD MIL-STD-750	TEST CONDITION	LIMITS		UNIT
					MIN.	MAX.	
2	Reverse Current	I_R	4016	V_R = 55Vdc T_{amb} = +150°C	-	20	µA
6	Temperature Coefficient of Capacitance	TC	4001	f = 1.0MHz V_R = 4.0Vdc Tamb = -40 to +85 °C	-	0.03	%/°C (1)

NOTES

1. Relative to the capacitance value measured at T_{amb} = +25 ±3 °C.

TABLE 4 - PARAMETER DRIFT VALUES

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITION	CHANGE LIMITS (Δ)	UNIT
2	Reverse Current	I_R	As per Table 2	As per Table 2	±100 % or (1) ±5.0 nA	%
3	Total Capacitance	C_T	As per Table 2	As per Table 2	±5.0	pF
5	Q Factor	Q	As per Table 2	As per Table 2	±10	%

NOTES

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

FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS

Not applicable.

TABLE 5 - CONDITIONS FOR HIGH TEMPERATURE REVERSE BIAS AND OPERATING LIFE TEST

No.	CHARACTERISTIC	SYMBOL	CONDITION	UNIT
1	Ambient Temperature	T_{amb}	+ 175	°C
2	Reverse Voltage	V_R	-60	Vdc
3	Duration	t	168	Hrs

FIGURE 5 - ELECTRICAL CIRCUIT FOR H.T.R.B 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 2. 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 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 High Temperature Reverse Bias test.

4.8.4 Electrical Circuits for Operating Life Tests (Figure 5)

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 CONDITION	LIMITS		UNIT
					MIN.	MAX.	
1	Breakdown Voltage	$V_{(BR)}$	As per Table 2	As per Table 2	65	-	Vdc
2	Reverse Current	I_R	As per Table 2	As per Table 2	-	20	nA
3	Total Capacitance	C_T	As per Table 2	As per Table 2	(1)	(2)	pF

NOTES

1. See Table 1(a), Column 3.
2. See Table 1(a), Column 5.