DIODES, SILICON, POWER RECTIFIER,

FAST RECOVERY,

BASED ON TYPES 1N5550 THROUGH 1N5554

ESCC Detail Specification No. 5103/027

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Pages 1 to 18

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space components
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'A'	Nov. '87	P1. Cover Page		None
		P2. DCN		None
		P16. Table 3	: Limits column, Note corrected to '3'	23319
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'B'	July '93	P1. Cover Page		None
		P2. DCN		None
		P9. Para. 4.2.2	: PIND deviation amended	21043
		P10. Para. 4.2.3	: Radiographic Inspection deviation deleted, subsequent deviation renumbered	21049
		P16. Table 3	: Note 4 deleted	21047
		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, Silicon, Power Rectifier, Fast Recovery, based on Types 1N55550 through 1N5554.

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

(c) MIL-STD-750, Test Methods and Procedures for Semiconductor Devices.

TABLE 1(a) - TYPE VARIANTS

(1) VARIANT	(2) BASED ON TYPE	(3) V_R (V)	(4) V_{RWM} (V)	(5) t_{rr} (µs)	(6) C (pF)	(7) $V_{(BR)}$ min. at $I_R = 50\mu A$ (V)	(8) Lead Material and Finish	(9) Figure
01	1N5550	200	200	2.0	100	240	A3 or A4	2(a)
02	1N5551	400	400	2.0	100	460	A3 or A4	2(a)
03	1N5552	600	600	2.0	100	660	A3 or A4	2(a)
04	1N5553	800	800	2.0	100	880	A3 or A4	2(a)
05	1N5554	1000	1000	2.0	100	1100	A3 or A4	2(a)
06	1N5550	200	200	2.0	100	240	K3 or K4	2(b)
07	1N5551	400	400	2.0	100	460	K3 or K4	2(b)
08	1N5552	600	600	2.0	100	660	K3 or K4	2(b)
09	1N5553	800	800	2.0	100	880	K3 or K4	2(b)
10	1N5554	1000	1000	2.0	100	1100	K3 or K4	2(b)

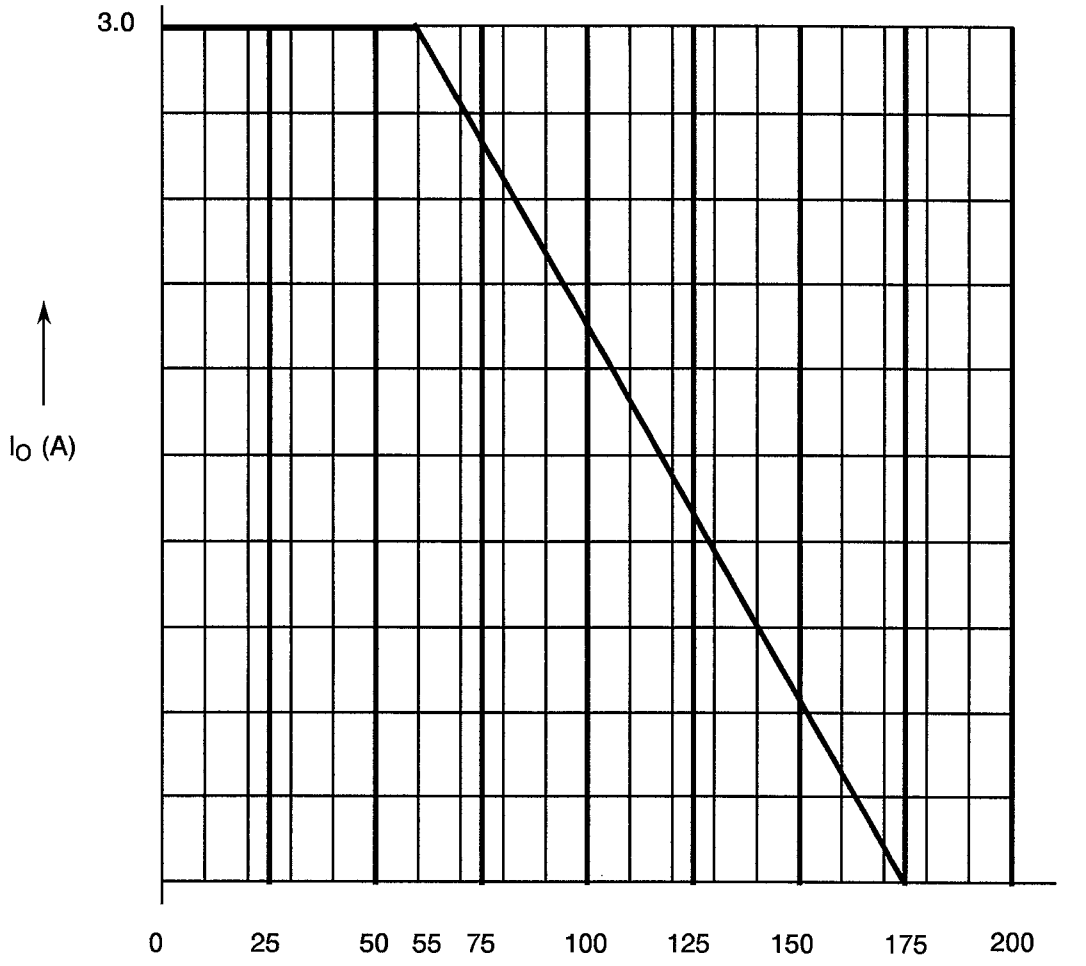
TABLE 1(b) - MAXIMUM RATINGS

No.	CHARACTERISTIC	SYMBOL	MAXIMUM RATING	UNIT	REMARKS
1	Surge Forward Current	I_{FSM}	30	A(pk)	$T_{amb} = +55°C$ $I_O = 2.0A$ $t_p = 8.3ms$
2	Average Forward Current	I_O	3.0 (1)	Adc	$T_{amb} = +55°C$ (2)
3	Operating Temperature Range	T_{op}	−65 to +175	°C	T_{amb}
4	Storage Temperature Range	T_{stg}	−65 to +200	°C	
5	Soldering Temperature	T_{sol}	+260	°C	Time: ≤ 10s Distance from case: ≥ 1.5mm

NOTES

1. No special mounting, heat-sinking or forced-air flow across exposed areas of the device is necessary.
2. For Derating, see Figure 1.

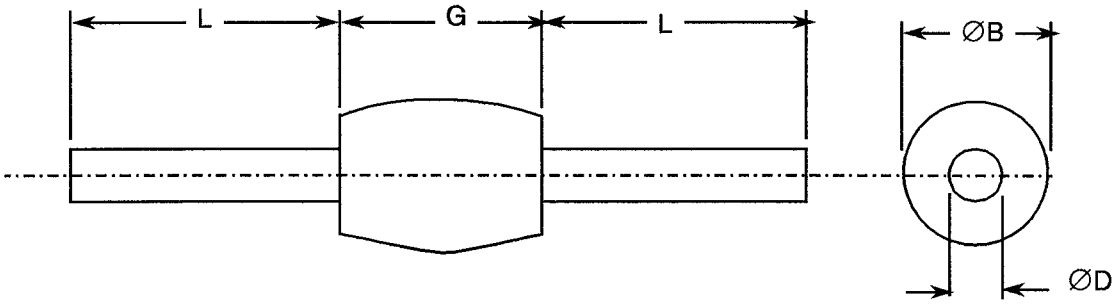
FIGURE 1 - PARAMETER DERATING CHARACTERISTICS



Average Forward Current versus Temperature (T_{amb})

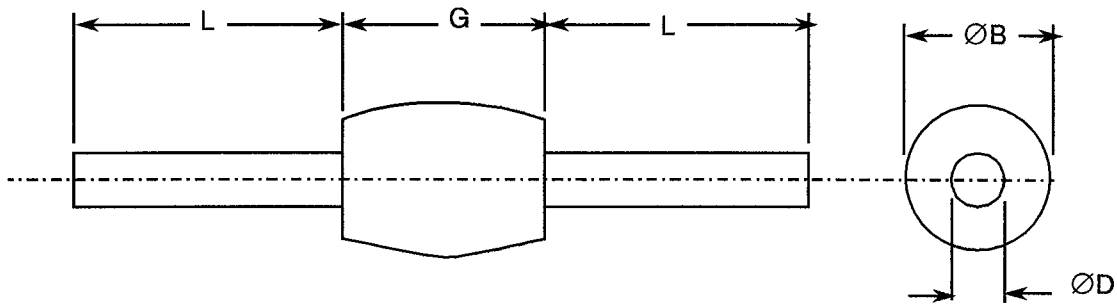
FIGURE 2 - PHYSICAL DIMENSIONS

FIGURE 2(a) - VARIANTS 01- 05



SYMBOL	MILLIMETRES		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
ØB	2.92	4.56	0.115	0.180	1
ØD	0.94	1.07	0.037	0.042	
G	3.30	7.62	0.130	0.300	2
L	22.86	33.02	0.900	1.300	

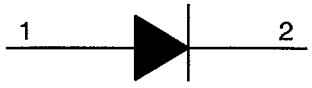
FIGURE 2(b) - VARIANTS 06-10



SYMBOL	MILLIMETRES		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
ØB	3.15	4.20	0.124	0.165	1
ØD	1.20	1.35	0.047	0.053	
G	3.90	4.60	0.154	0.181	2
L	26.00	31.70	1.023	1.248	

NOTES (Applicable to both Figures 2(a) and 2(b)):-
1. Dimension ØB shall be measured at the largest diameter.
2. The 'G' dimension shall include all uncontrolled areas of the device leads.

FIGURE 3 - FUNCTIONAL DIAGRAM



1. Anode
2. Cathode

NOTES
1. The cathode end shall be marked with a contrasting coloured ring.

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) 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. 9.5, Thermal Shock Test: Shall be performed in accordance with MIL-STD-202, Test Method 107, Test Condition 'B'.

(d) Para. 9.6, Constant Acceleration: Shall not be performed.

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

(f) Para's. 9.8.1 and 9.8.2, Seal Test: Shall not be performed.

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

(a) Para. 9.22, H.T.R.B. Test: Shall not be performed.

(b) Para's. 9.8.1 and 9.8.2, Seal Test: Shall not be performed.

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.

(c) Para. 9.15, Constant Acceleration: Shall not be performed.

(d) Para's. 9.8.1 and 9.8.2, Seal Test: Shall not be performed.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

(a) Para. 9.15, Constant Acceleration: Shall not be performed.

(b) Para's. 9.8.1 and 9.8.2, Seal Test: Shall not be performed.

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 1.0 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 : 12.5 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 sintered glass body.

4.4.2 Lead Material and Finish

The lead material shall be either Type 'A' or Type 'K' with 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. Each component shall be marked in respect of:-

(a) Lead Identification.

(b) The SCC Component Number.

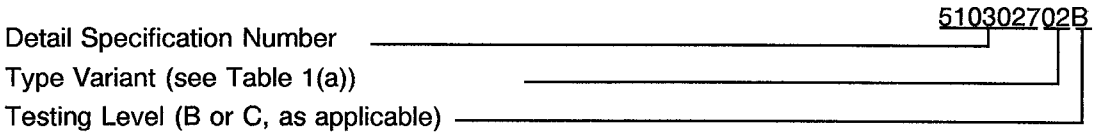
(c) Traceability Information.

4.5.2 Lead Identification

Lead identification shall be as shown in Figure 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. Unless otherwise specififed, 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 Table 2 are shown in Figure 4 of this specification

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 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 shown in Table 5 of this specification.

4.7.3 Electrical Circuits for 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 CONDITION	LIMITS		UNIT
					MIN.	MAX.	
1	Reverse Current	I_R	4016	V_R = (1)	-	1.0	µA
2	Forward Voltage	V_F	4011	I_F = 9.0A See Note 2	0.6	1.2	Vdc
3	Breakdown Voltage	$V_{(BR)}$	4021	I_R = 50µA	(3)	-	Vdc

NOTES
1. See Column 3 of Table 1(a).
2. Pulsed Measurement: Pulse length ≤300µs; Duty Cycle≤2%.
3. See Column 7 of Table 1(a).

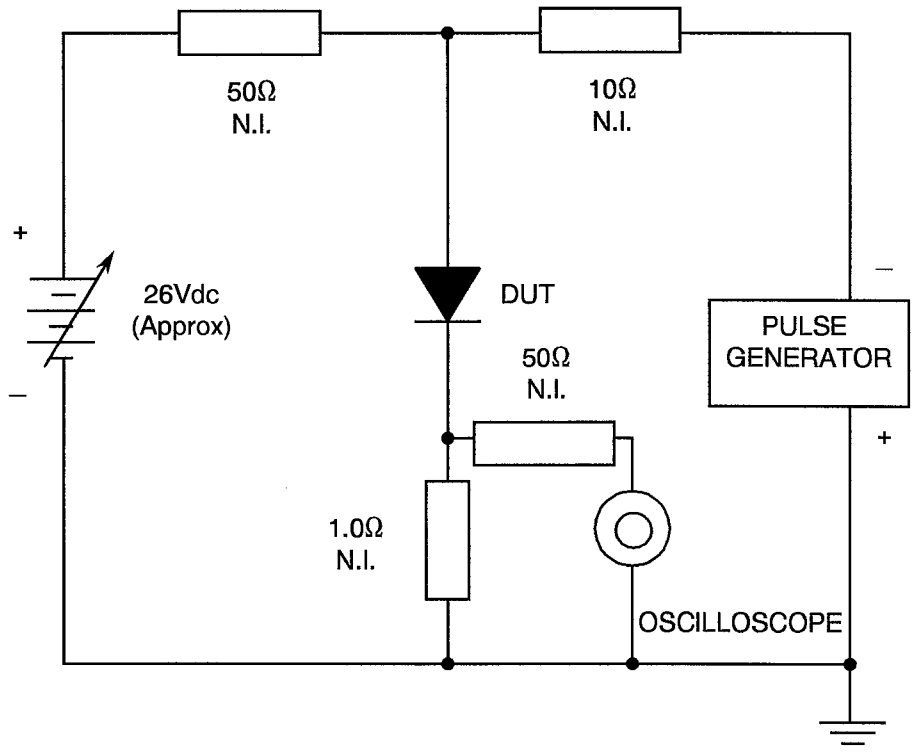
TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - a.c. PARAMETERS

No.	CHARACTERISTICS	SYMBOL	TEST METHOD MIL-STD-750	TEST CONDITION (Note 1)	LIMITS		UNIT
					MIN.	MAX.	
4	Reverse Recovery Time	t_{rr}	4031 Cond. 'B'	I_F = 0.5A I_R = 1.0A I_{RR} = 0.25A See Figure 4	-	2.0	µs
5	Capacitance	C	4001	V_R = 12V 0.1MHz≤f<1.0MHz	-	100	pF

NOTES
1. Measurements performed on a sample basis, LTPD = 7 or less .

FIGURE 4 - TEST CIRCUIT

REVERSE RECOVERY TIME (OR EQUIVALENT)



NOTES

1. Oscilloscope : $t_r \leq 7.0$ns; $Z_{IN} = 1.0$MΩ, 22pF.
2. Pulse Generator : $t_r \leq 10$ns; $Z_S = 50$Ω.

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

Not applicable.

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) T_{amb} = +100 (+0-5) °C	-	75	µA
2	Forward Voltage	V_F	4011	I_F = 9.0A (2) T_{amb} = +100 (+0-5) °C T_{amb} = -55 (+5-0) °C	0.4 -	1.2 1.5	Vdc
3	Breakdown Voltage	$V_{(BR)}$	4021	I_R = 50µA T_{amb} = -55 (+5-0) °C	(3)	-	Vdc

NOTES
1. See Column 3 of Table 1(a).
2. Pulsed Measurement: Pulse length ≤ 300µs; Duty Cycle: ≤ 2%.
3. See Column 7 of Table 1(a).

TABLE 4 - PARAMETER DRIFT VALUES

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITION	CHANGE LIMITS (Δ)	UNIT
1	Reverse Current	I_R	As per Table 2	As per Table 2	±100 or (1) ±250	% nA
2	Forward Voltage	V_F	As per Table 2	As per Table 2	±100	mV

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

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

No.	CHARACTERISTICS	SYMBOL	CONDITION	UNIT
1	Ambient Temperature	T_{amb}	25 ± 3	°C
2	Peak Reverse Working Voltage	V_{RWM}	See Column 4 of Table 1(a)	V
3	Average Forward Current	I_O	3.0 (1)	Adc
4	Frequency	f	50	Hz

NOTES
1. I_O is adjusted to maintain T_J at T_{amb} plus 120°C minimum.

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. The measurements shall be performed at $T_{amb} = +22 \pm 3$ °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 for the burn-in 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 conditions for high temperature storage 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	SPEC. AND/OR TEST METHOD	TEST CONDITION	LIMITS		UNIT
					MIN.	MAX.	
1	Reverse Current	I_R	As per Table 2	As per Table 2	-	1.0	µA
2	Forward Voltage	V_F	As per Table 2	As per Table 2	0.6	1.2	Vdc

APPENDIX 'A'

AGREED DEVIATIONS FOR TELEFUNKEN ELECTRONIC (GERMANY)

ITEMS AFFECTED	DESCRIPTION OF DEVIATIONS
Table 2 (d.c. Parameters) Table 3	) The following Note 2 may be substituted:-) "Pulsed measurement: Pulse length ≤500μs; Duty Cycle ≤2.5%."
Figure 4	For Variants 06 to 10 inclusive, the following Figure 4 may be used.