



**DIODES, MICROWAVE, SILICON,  
PIN, FAST SWITCHING,  
BASED ON TYPES ML4622 TO ML4624  
ESCC Detail Specification No. 5513/014**

Issue 3	June 2013
---------	-----------



### **LEGAL DISCLAIMER AND COPYRIGHT**

European Space Agency, Copyright © 2013. All rights reserved.

The European Space Agency disclaims any liability or responsibility, to any person or entity, with respect to any loss or damage caused, or alleged to be caused, directly or indirectly by the use and application of this ESCC publication.

This publication, without prior permission of the European Space Agency and provided it is not used for a commercial purpose, may be:

- copied in whole, in any medium, without alteration or modification.
- copied in part, in any medium, provided that the ESCC document identification, comprising the ESCC symbol, document number and document issue, is removed.

**DOCUMENTATION CHANGE NOTICE**

(Refer to <https://escies.org> for ESCC DCR content)

DCR No.	CHANGE DESCRIPTION
795	Specification upissued to incorporate editorial changes per DCR.

**TABLE OF CONTENTS**

1	GENERAL	6
1.1	SCOPE	6
1.2	TYPE VARIANTS	6
1.3	MAXIMUM RATINGS	6
1.4	PARAMETER DERATING INFORMATION	6
1.5	PHYSICAL DIMENSIONS	6
1.6	FUNCTIONAL DIAGRAM	6
1.7	HANDLING PRECAUTIONS	6
2	APPLICABLE DOCUMENTS	6
3	TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS	6
4	REQUIREMENTS	37
4.1	GENERAL	37
4.2	DEVIATIONS FROM GENERIC SPECIFICATION	37
4.2.1	Deviations from Special In-process Controls	37
4.2.2	Deviations from Final Production Tests (Chart II (b))	37
4.2.3	Deviations from Burn-in and Electrical Measurements (Chart III (a))	37
4.2.4	Deviations from Qualification Tests (Chart IV)	37
4.2.5	Deviations from Lot Acceptance Tests (Chart V)	37
4.3	MECHANICAL AND ENVIRONMENTAL REQUIREMENTS	37
4.3.1	Dimension Check	37
4.3.2	Weight	37
4.3.3	Terminal Strength	38
4.4	MATERIALS AND FINISHES	39
4.4.1	Case	39
4.4.2	Lead Materials and Finish	39
4.5	MARKING	39
4.5.1	General	39
4.5.2	Cathode Identification	40
4.5.3	ESCC Component Number	40
4.5.4	Traceability Information	40
4.6	ELECTRICAL MEASUREMENTS	40
4.6.1	Electrical Measurements at Room Temperature	40
4.6.2	Electrical Measurements at High and Low Temperatures	40
4.6.3	Circuits for Electrical Measurements	40
4.7	BURN-IN TESTS	40



4.7.1	Parameter Drift Values	40
4.7.2	Conditions for High Temperature Reverse Bias Burn-in	41
4.7.3	Conditions for Power Burn-in	41
4.7.4	Electrical Circuits for High Temperature Reverse Bias and Power Burn-in	41
4.8	ENVIRONMENTAL AND ENDURANCE TESTS (CHARTS IV AND V OF ESCC GENERIC SPECIFICATION NO. 5010)	45
4.8.1	Electrical Measurements on Completion of Environmental Tests	45
4.8.2	Electrical Measurements at Intermediate Points and on Completion of Endurance Tests	45
4.8.3	Conditions for Operating Life Tests (Part of Endurance Testing)	45
4.8.4	Electrical Circuits for Operating Life Tests	45
4.9	TOTAL DOSE IRRADIATION TESTING	45
4.9.1	Application	45
4.9.2	Bias Conditions	45
4.9.3	Electrical Measurements	45
4.10	SPECIAL TESTING	45
	APPENDIX A	48

## 1 GENERAL

### 1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for a Diode, Microwave, Silicon, PIN, Fast Switching, based on Types ML4622 to ML4624. It shall be read in conjunction with ESCC Generic Specification No. 5010, 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 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 HANDLING PRECAUTIONS

These devices are susceptible to damage by electrostatic discharge. Therefore, suitable precautions shall be employed for protection during all phases of manufacture, testing, packaging, shipment and any handling.

These components are Categorised as Class 2 with a Minimum Critical Path Failure Voltage of 4200V.

## 2 APPLICABLE DOCUMENTS

The following documents form part of this specification and shall be read in conjunction with it:

- (a) ESCC Generic Specification No. 5010 for Discrete Microwave Semiconductor Components.
- (b) MIL-STD-750, Test Methods 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 ESCC Basic Specification No. 21300 shall apply.

**TABLE 1(a) - TYPE VARIANTS**

(1) Variant	(2) Based on Type	(3) Figure	(4) Total Capacitance $C_T$ (pF)		(5) Junction Capacitance $C_J$ (pF) (Typical)	(6) Body-Lid and Lead Material and Finish
			Min.	Max.		
01	ML4622 - 30	2(a)	0.25	0.35	0.1	A7-D2
02	ML4622 - 31	2(b)	0.25	0.35	0.1	A7-D2
03	ML4622 - 32	2(c)	0.36	0.46	0.1	A7-D2
04	ML4622 - 34	2(d)	0.45	0.55	0.1	A7-D2
05	ML4622 - 36	2(e)	0.25	0.35	0.1	A7-D2
06	ML4622 - 43	2(f)	0.85	0.95	0.1	A7-D2
07	ML4622 - 56	2(g)	0.58	0.68	0.1	A7-D2
08	ML4622 - 91	2(h)	0.36	0.46	0.1	A7-D2
09	ML4622 - 92	2(i)	0.36	0.46	0.1	A7-D2
10	ML4622 - 94	2(j)	0.23	0.33	0.1	A7-D2
11	ML4622 - 95	2(k)	0.23	0.33	0.1	A7-D2
12	ML4622 - 96	2(l)	0.23	0.33	0.1	A7-D2
13	ML4622 - 97	2(m)	0.23	0.33	0.1	A7-D2
14	ML4622 - 101	2(n)	0.55	0.65	0.1	A7-D2
15	ML4622 - 103	2(o)	0.36	0.46	0.1	A7-D2
16	ML4622 - 118	2(p)	0.3	0.4	0.1	A7
17	ML4622 - 120	2(q)	0.21	0.31	0.1	D2
18	ML4622 - 128	2(r)	0.31	0.41	0.1	A7-D2
19	ML4622 - 138	2(s)	0.26	0.36	0.1	A7
20	ML4622 - 148	2(t)	0.34	0.44	0.1	A7
21	ML4622 - 255	2(u)	0.35	0.45	0.1	A7
22	ML4622 - 275	2(v)	0.43	0.53	0.1	A7
23	ML4622 - 276	2(w)	0.21	0.31	0.1	D2
24	ML4622 - 54	2(x)	0.1	0.2	0.1	C4
25	ML4622 - 186	2(y)	0.2	0.3	0.1	D2
26	ML4623 - 30	2(a)	0.3	0.5	0.2	A7-D2
27	ML4623 - 31	2(b)	0.3	0.5	0.2	A7-D2

(1) Variant	(2) Based on Type	(3) Figure	(4) Total Capacitance $C_T$ (pF)		(5) Junction Capacitance $C_J$ (pF) (Typical)	(6) Body-Lid and Lead Material and Finish
			Min.	Max.		
28	ML4623 - 32	2(c)	0.41	0.61	0.2	A7-D2
29	ML4623 - 34	2(d)	0.5	0.7	0.2	A7-D2
30	ML4623 - 36	2(e)	0.3	0.5	0.2	A7-D2
31	ML4623 - 43	2(f)	0.9	1.1	0.2	A7-D2
32	ML4623 - 56	2(g)	0.63	0.83	0.2	A7-D2
33	ML4623 - 91	2(h)	0.41	0.61	0.2	A7-D2
34	ML4623 - 92	2(i)	0.41	0.61	0.2	A7-D2
35	ML4623 - 94	2(j)	0.28	0.48	0.2	A7-D2
36	ML4623 - 95	2(k)	0.28	0.48	0.2	A7-D2
37	ML4623 - 96	2(l)	0.28	0.48	0.2	A7-D2
38	ML4623 - 97	2(m)	0.28	0.48	0.2	A7-D2
39	ML4623 - 101	2(n)	0.6	0.8	0.2	A7-D2
40	ML4623 - 103	2(o)	0.41	0.61	0.2	A7-D2
41	ML4623 - 118	2(p)	0.35	0.55	0.2	A7
42	ML4623 - 120	2(q)	0.26	0.46	0.2	D2
43	ML4623 - 128	2(r)	0.36	0.56	0.2	A7-D2
44	ML4623 - 148	2(t)	0.39	0.59	0.2	A7
45	ML4623 - 255	2(u)	0.26	0.46	0.2	A7
46	ML4623 - 275	2(v)	0.4	0.6	0.2	A7
47	ML4623 - 276	2(w)	0.48	0.68	0.2	D2
48	ML4623 - 54	2(x)	0.15	0.35	0.2	C4
49	ML4623 - 186	2(y)	0.25	0.45	0.2	D2
50	ML4624 - 30	2(a)	0.4	0.6	0.3	A7-D2
51	ML4624 - 31	2(b)	0.4	0.6	0.3	A7-D2
52	ML4624 - 32	2(c)	0.51	0.71	0.3	A7-D2
53	ML4624 - 34	2(d)	0.6	0.8	0.3	A7-D2
54	ML4624 - 36	2(e)	0.4	0.6	0.3	A7-D2
55	ML4624 - 43	2(f)	1	1.2	0.3	A7-D2
56	ML4624 - 56	2(g)	0.73	0.93	0.3	A7-D2



(1) Variant	(2) Based on Type	(3) Figure	(4) Total Capacitance $C_T$ (pF)		(5) Junction Capacitance $C_J$ (pF) (Typical)	(6) Body-Lid and Lead Material and Finish
			Min.	Max.		
57	ML4624 - 91	2(h)	0.51	0.71	0.3	A7-D2
58	ML4624 - 92	2(i)	0.51	0.71	0.3	A7-D2
59	ML4624 - 101	2(n)	0.7	0.9	0.3	A7-D2
60	ML4624 - 103	2(o)	0.51	0.71	0.3	A7-D2
61	ML4624 - 255	2(u)	0.5	0.7	0.3	A7
62	ML4624 - 54	2(x)	0.25	0.45	0.3	C4
63	ML4624 - 186	2(y)	0.35	0.55	0.3	D2

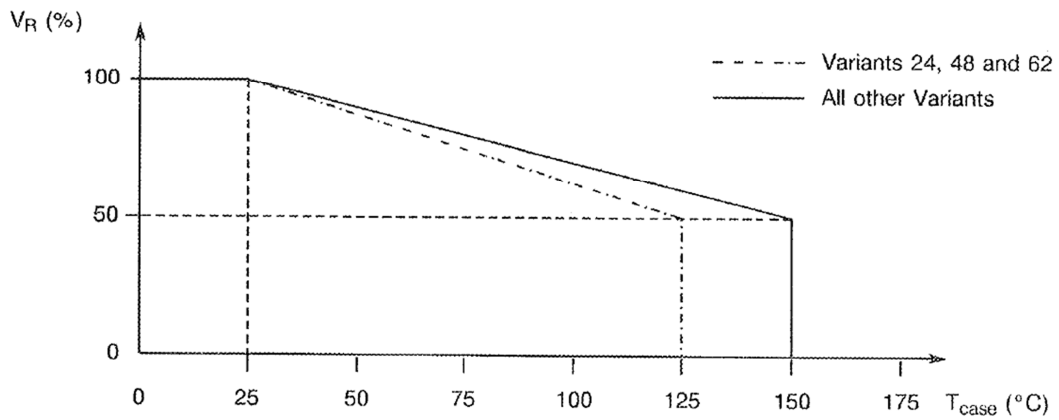
**TABLE 1(b) - MAXIMUM RATINGS**

No.	Characteristic	Symbol	Maximum Ratings	Unit	Remarks
1	DC Reverse Voltage	$V_R$	-150	V	Note 1
2	DC Forward Current (Continuous) Variants 24, 48 and 62 All other Variants	$I_F$	100 200	mA	Note 1 Note 2
3	RF Power Dissipation Variants 01 to 23 Variant 24 Variant 25 Variants 26 to 47 Variant 48 Variant 49 Variants 50 to 61 Variant 62 Variant 63	$P_{tot}$	2.7 0.2 0.6 3.1 0.2 0.6 3.5 0.2 0.6	W	Note 1
4	Operating Temperature Range Variants 24, 48 and 62 All other Variants	$T_{op}$	-65 to +125 -65 to +150	°C	$T_{case}$
5	Storage Temperature Range Variants 24, 48 and 62 All other Variants	$T_{stg}$	-65 to +125 -65 to +150	°C	
6	Soldering Temperature	$T_{sol}$	+230	°C	Note 3

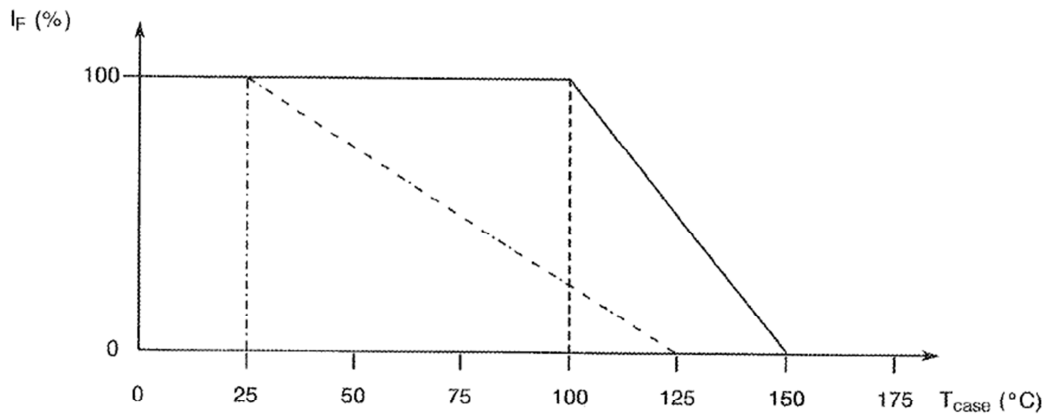
**NOTES**

1. At  $T_{case} = +25^\circ\text{C}$ . For derating at  $T_{case} > +25^\circ\text{C}$ , see Figure 1.
2. At  $T_{case} = +100^\circ\text{C}$ . For derating at  $T_{case} > +100^\circ\text{C}$ , see Figure 1.
3. Duration 5 seconds maximum (at a distance of not less than 1.5mm from the body for Variants 23, 24, 25, 47, 48, 49, 62 and 63) and the same termination shall not be resoldered until 3 minutes have elapsed.

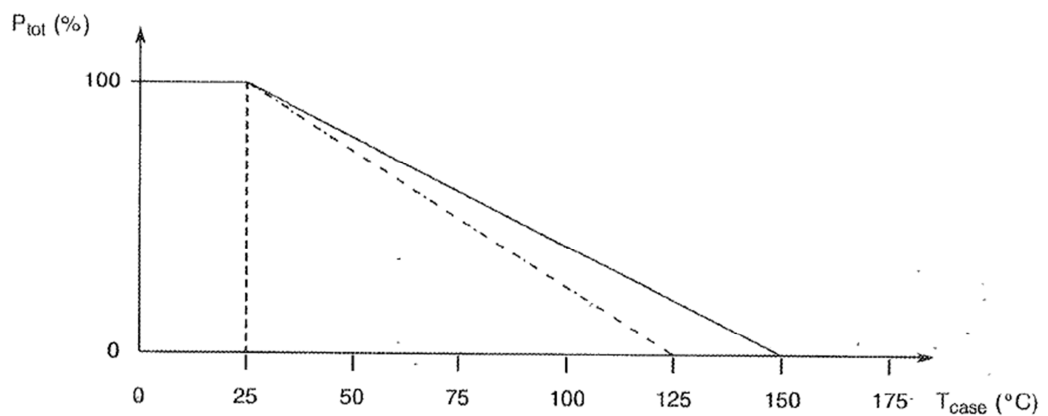
**FIGURE 1 - PARAMETER DERATING INFORMATION**



Reverse Voltage versus Temperature



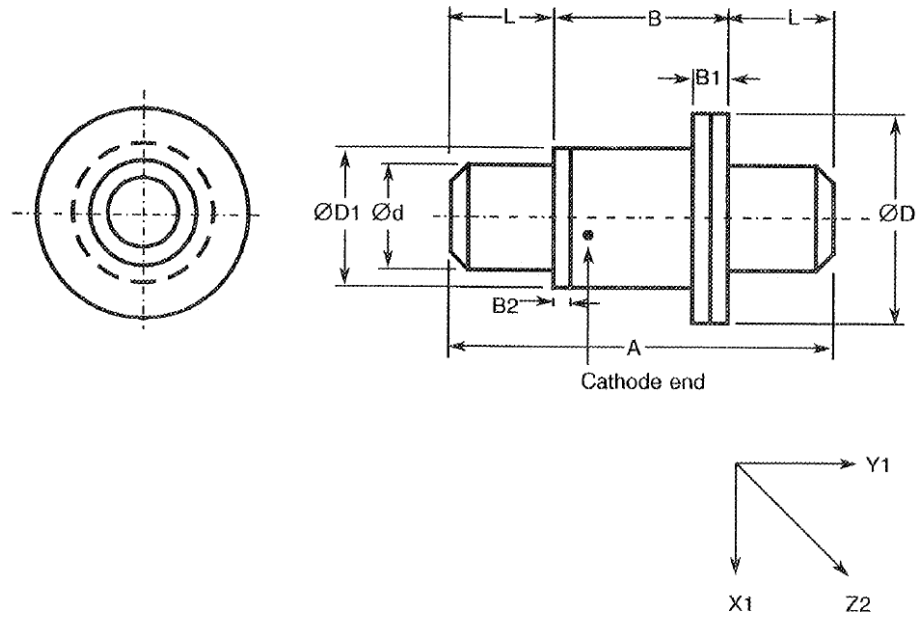
Forward Current versus Temperature



Power Dissipation versus Temperature

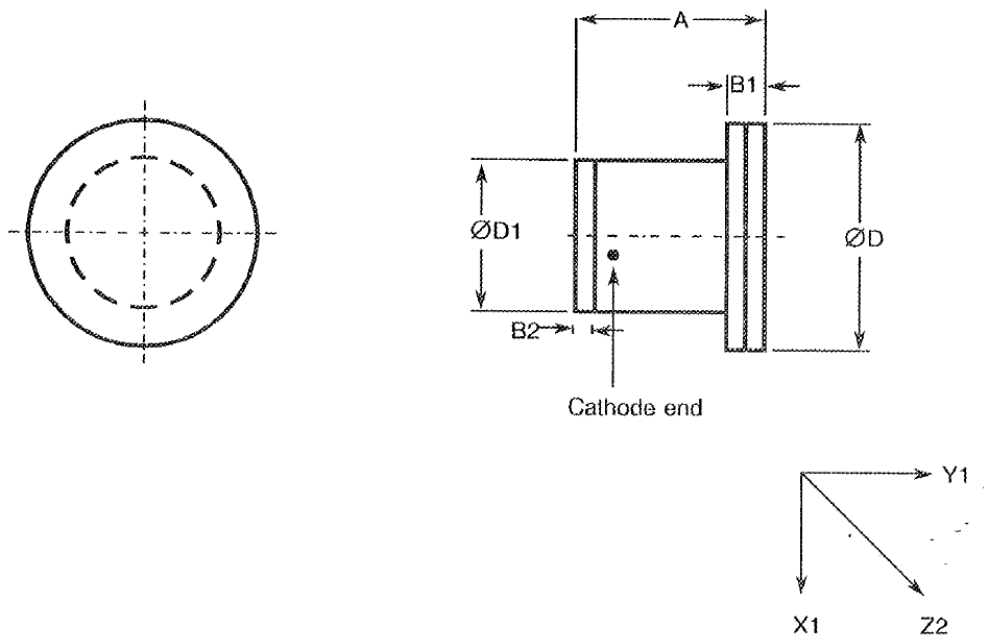
**FIGURE 2 - PHYSICAL DIMENSIONS**

**FIGURE 2(a) - VARIANTS 01, 26, 50**



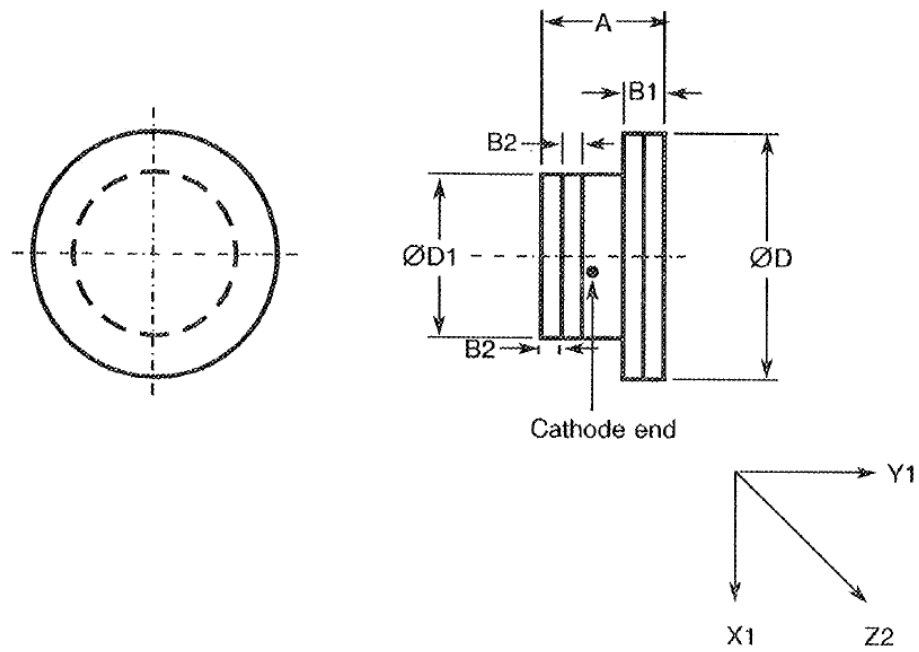
Symbol	Millimetres	
	Min	Max
A	5.2	5.72
B	2.16	2.46
B1	0.41	0.61
B2	0.15	0.25
$\varnothing d$	1.52	1.63
$\varnothing D$	3	3.23
$\varnothing D1$	1.95	2.11
L	1.52	1.63

FIGURE 2(b) VARIANTS 02, 27, 51



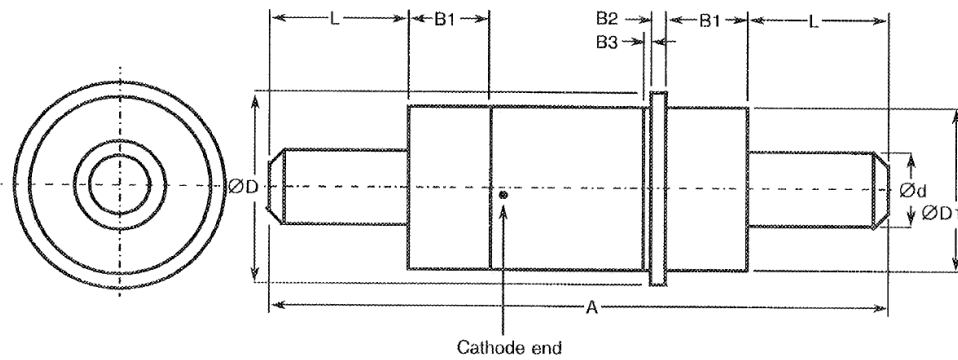
Symbol	Millimetres	
	Min	Max
A	2.16	2.46
B1	0.41	0.61
B2	0.15	0.25
ØD	3	3.23
ØD1	1.95	2.11

FIGURE 2(c) - VARIANTS 03, 28, 52



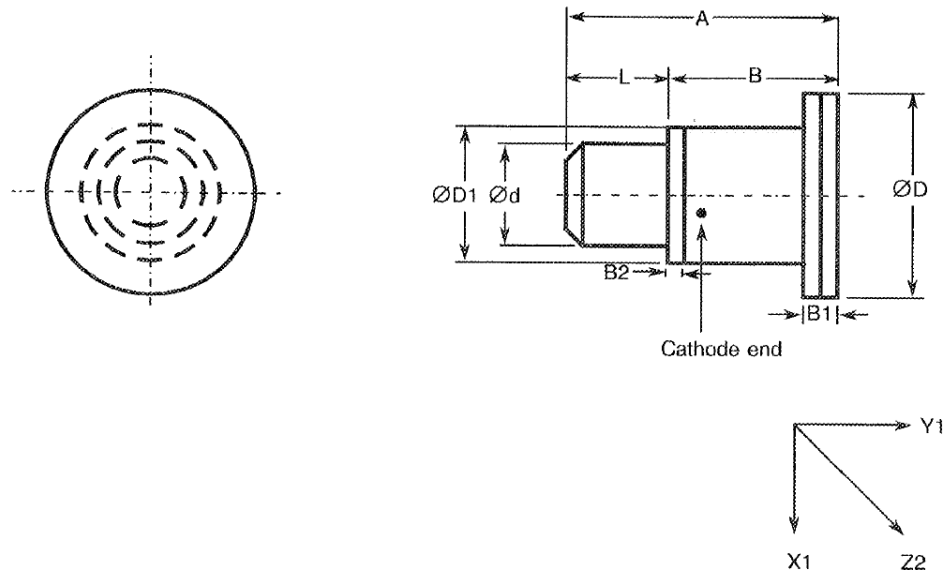
Symbol	Millimetres	
	Min	Max
A	1.37	1.68
B1	0.41	0.61
B2	0.15	0.25
$\varnothing D$	3	3.23
$\varnothing D1$	1.95	2.11

FIGURE 2(d) - VARIANTS 04, 29, 53



Symbol	Millimetres	
	Min	Max
A	19.45	20.12
B1	2.54	-
B2	0.53	0.83
B3	0.19	0.41
$\varnothing d$	2.33	2.44
$\varnothing D$	-	6.1
$\varnothing D1$	5.2	5.46
L	4.57	4.83

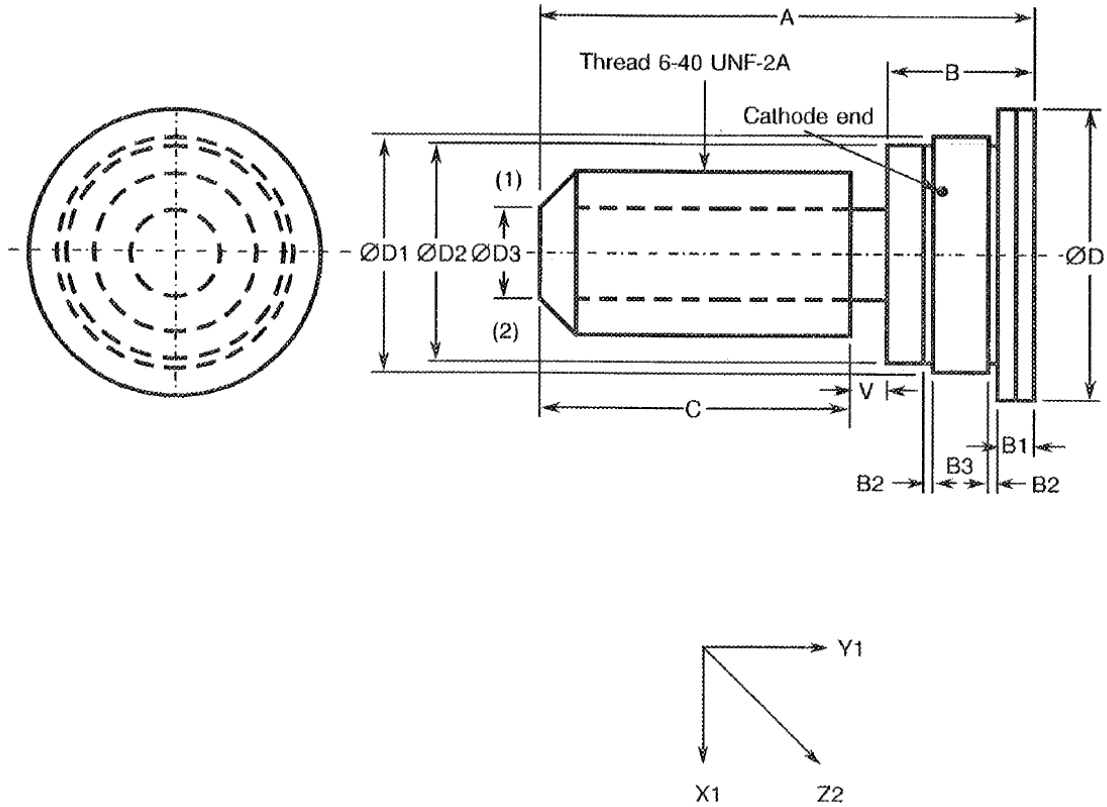
FIGURE 2(e) - VARIANTS 05, 30, 54



Symbol	Millimetres	
	Min	Max
A	3.6	4.18
B	2.16	2.46
B1	0.41	0.61
B2	0.15	0.25
$\varnothing d$	1.52	1.63
$\varnothing D$	3	3.23
$\varnothing D_1$	1.95	2.11
L	1.52	1.63



FIGURE 2(f) - VARIANTS 06, 31, 55

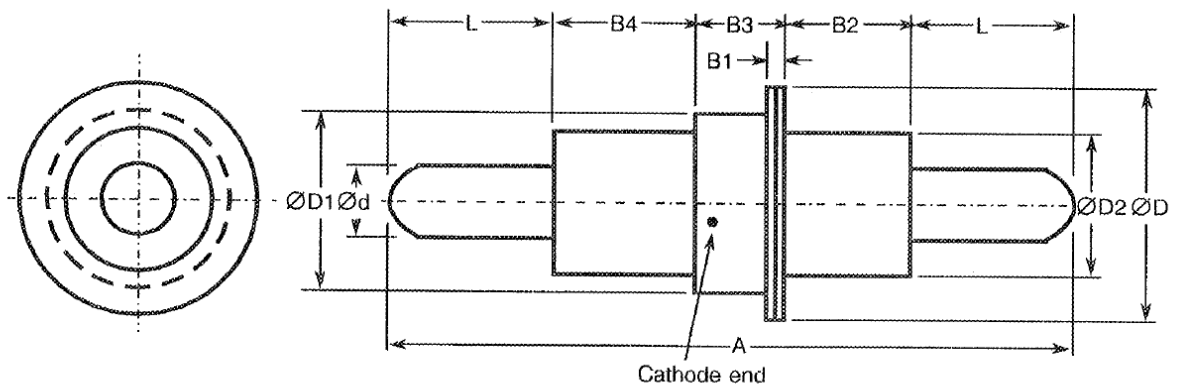


Symbol	Millimetres	
	Min	Max
A	11.18	11.68
B	3.02	3.66
B1	0.64	0.89
B2	0.18	0.23
B3	1.17	1.27
C	6.5	7.9
$\text{ØD}$	6.48	6.73
$\text{ØD1}$	5.2	5.5
$\text{ØD2}$	4.8	5.2
$\text{ØD3}$	2	2.7
V	0.76	1.02

**NOTES**

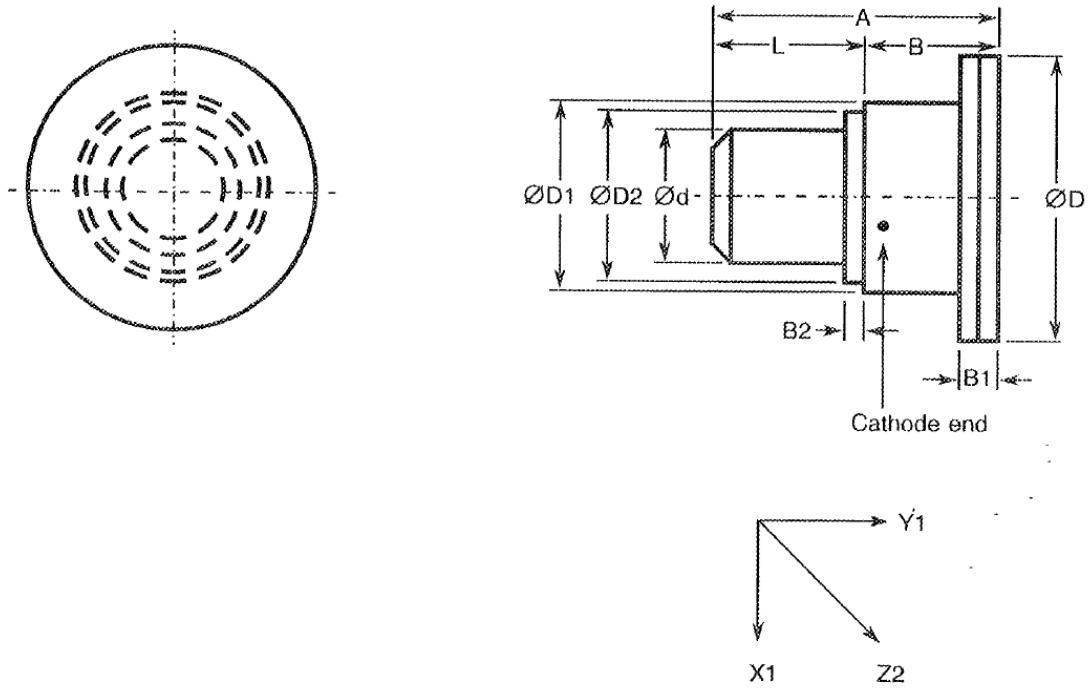
1. Spline socket to fit spline key 1.78mm deep.
2. 0.51mm x 45°.

FIGURE 2(g) - VARIANTS 07, 32, 56



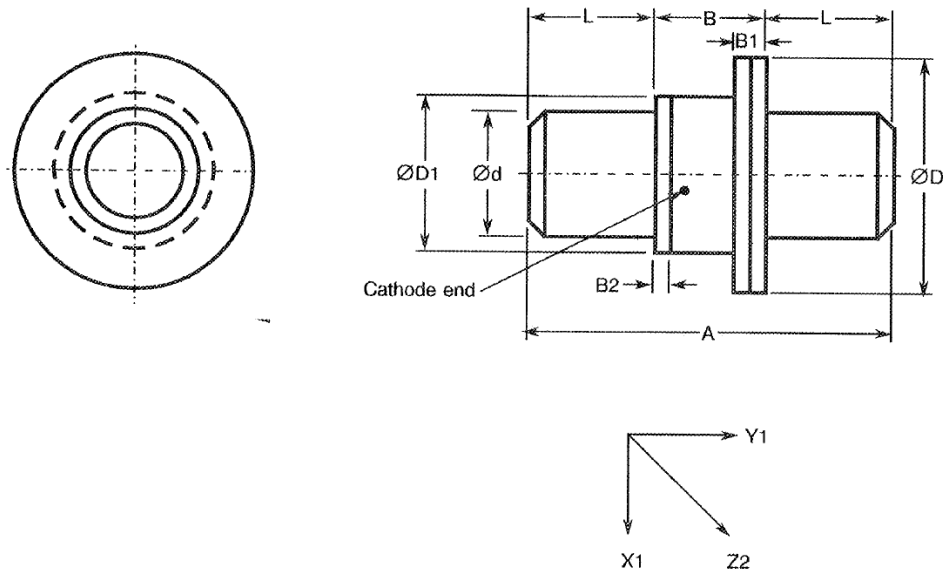
Symbol	Millimetres	
	Min	Max
A	19.46	20.12
B1	-	0.76
B2	3	3.6
B3	2.41	2.67
B4	3.68	3.94
$\text{Ød}$	2.33	2.39
$\text{ØD}$	-	6.1
$\text{ØD1}$	4.72	4.83
$\text{ØD2}$	3.81	4.19
L	4.57	4.83

FIGURE 2(h) -VARIANTS 08, 33, 57



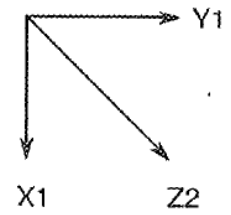
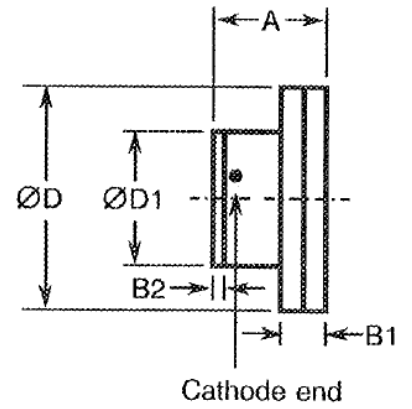
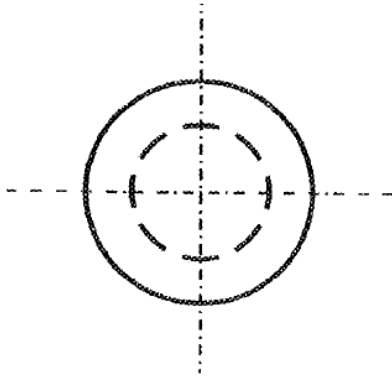
Symbol	Millimetres	
	Min	Max
A	2.92	3.28
B	1.4	1.65
B1	0.41	0.61
B2	0.15	0.2
$\varnothing d$	1.52	1.63
$\varnothing D$	3	3.23
$\varnothing D1$	1.95	2.11
$\varnothing D2$	1.85	2.03
L	1.52	1.63

FIGURE 2(i) - VARIANTS 09, 34, 58



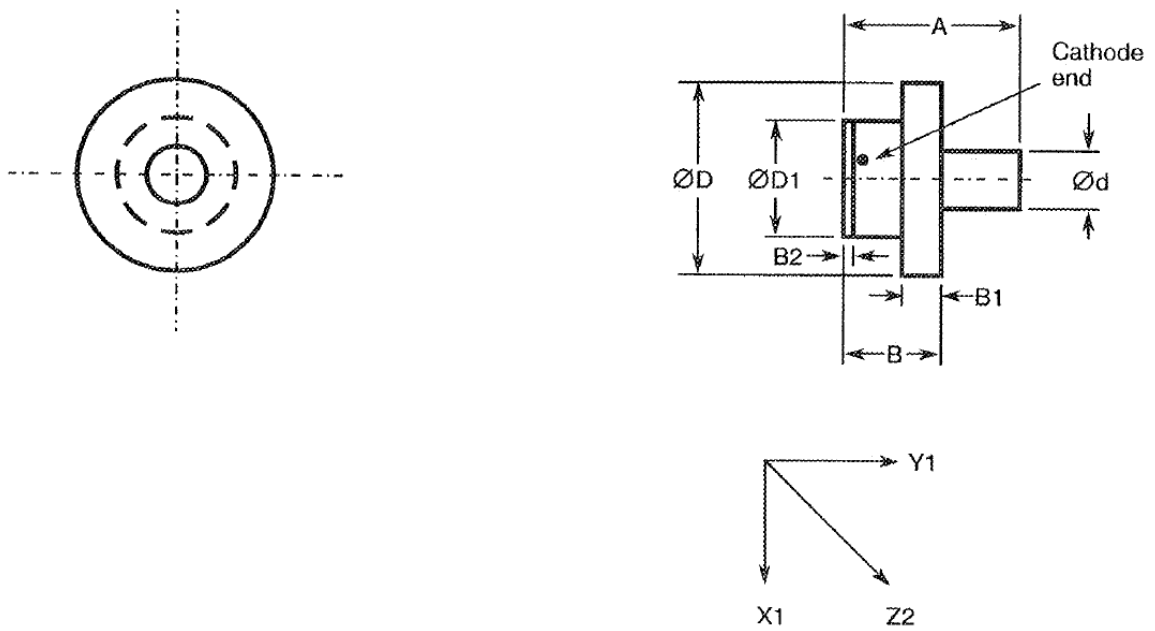
Symbol	Millimetres	
	Min	Max
A	4.42	4.93
B	1.4	1.65
B1	0.41	0.61
B2	0.15	0.2
$\text{Ø}d$	1.52	1.63
$\text{Ø}D$	3	3.23
$\text{Ø}D1$	1.95	2.11
L	1.52	1.63

FIGURE 2(j) - VARIANTS 10, 35



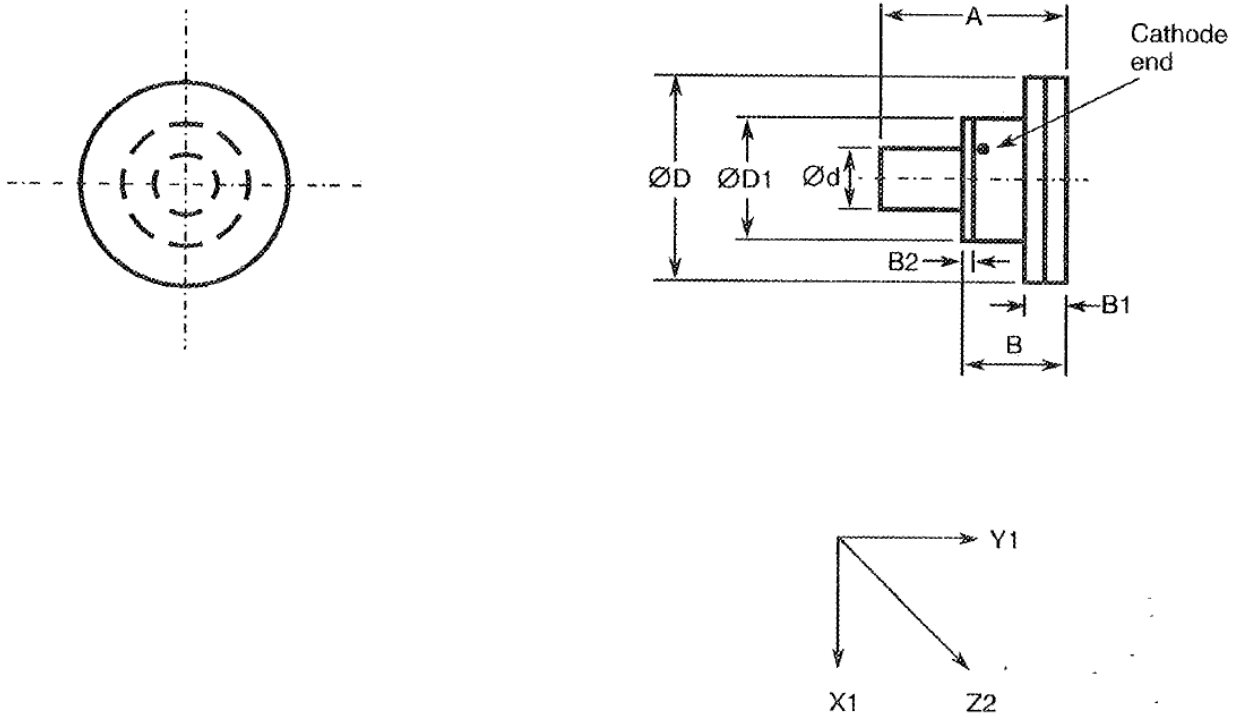
Symbol	Millimetres	
	Min	Max
A	1.02	1.27
B1	-	0.38
B2	0.1	0.25
ØD	1.98	2.18
ØD1	1.19	1.35

FIGURE 2(k) - VARIANTS 11, 36



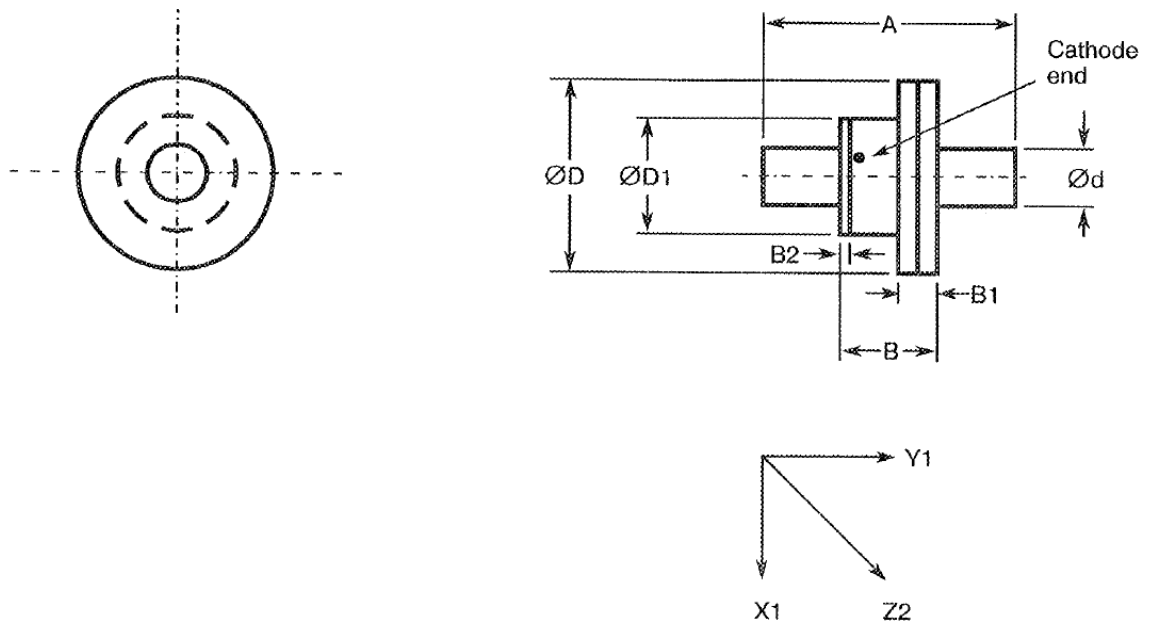
Symbol	Millimetres	
	Min	Max
A	1.78	2.03
B	1.02	1.27
B1	-	0.38
B2	0.1	0.25
Ød	0.61	0.66
ØD	1.98	2.18
ØD1	1.19	1.35

FIGURE 2(I) - VARIANTS 12, 37



Symbol	Millimetres	
	Min	Max
A	1.78	2.03
B	1.02	1.27
B1	-	0.38
B2	0.1	0.25
$\varnothing d$	0.61	0.66
$\varnothing D$	1.98	2.18
$\varnothing D1$	1.19	1.35

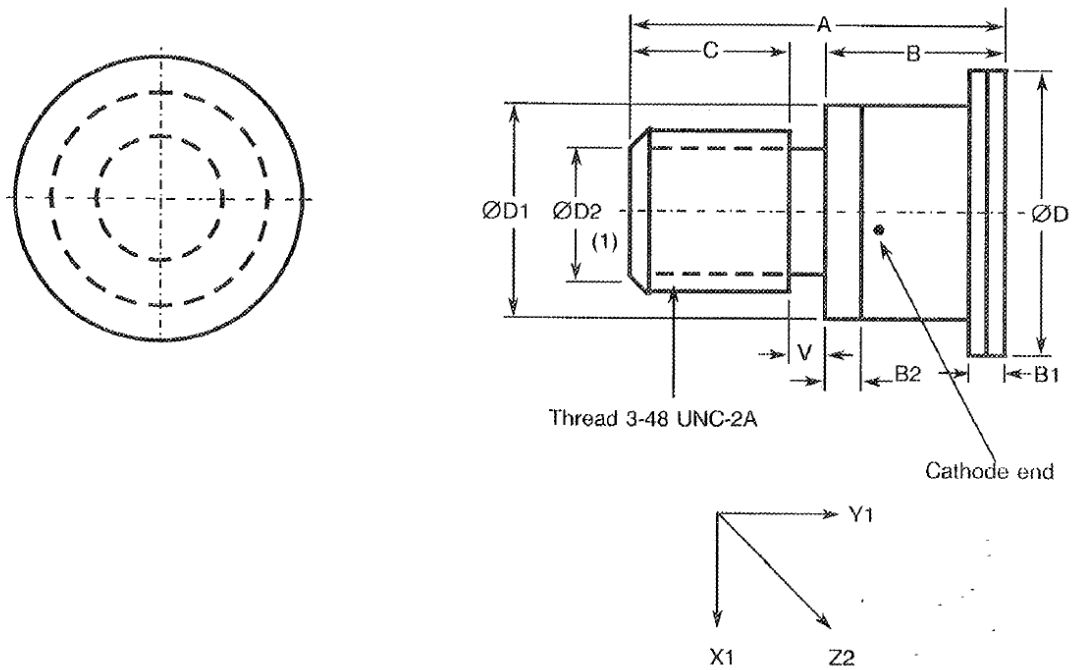
FIGURE 2(m) - VARIANTS 13, 38



Symbol	Millimetres	
	Min	Max
A	2.54	2.79
B	1.02	1.27
B1	-	0.38
B2	0.1	0.25
$\varnothing d$	0.61	0.66
$\varnothing D$	1.98	2.18
$\varnothing D1$	1.19	1.35



FIGURE 2(n) - VARIANTS 14, 39, 59

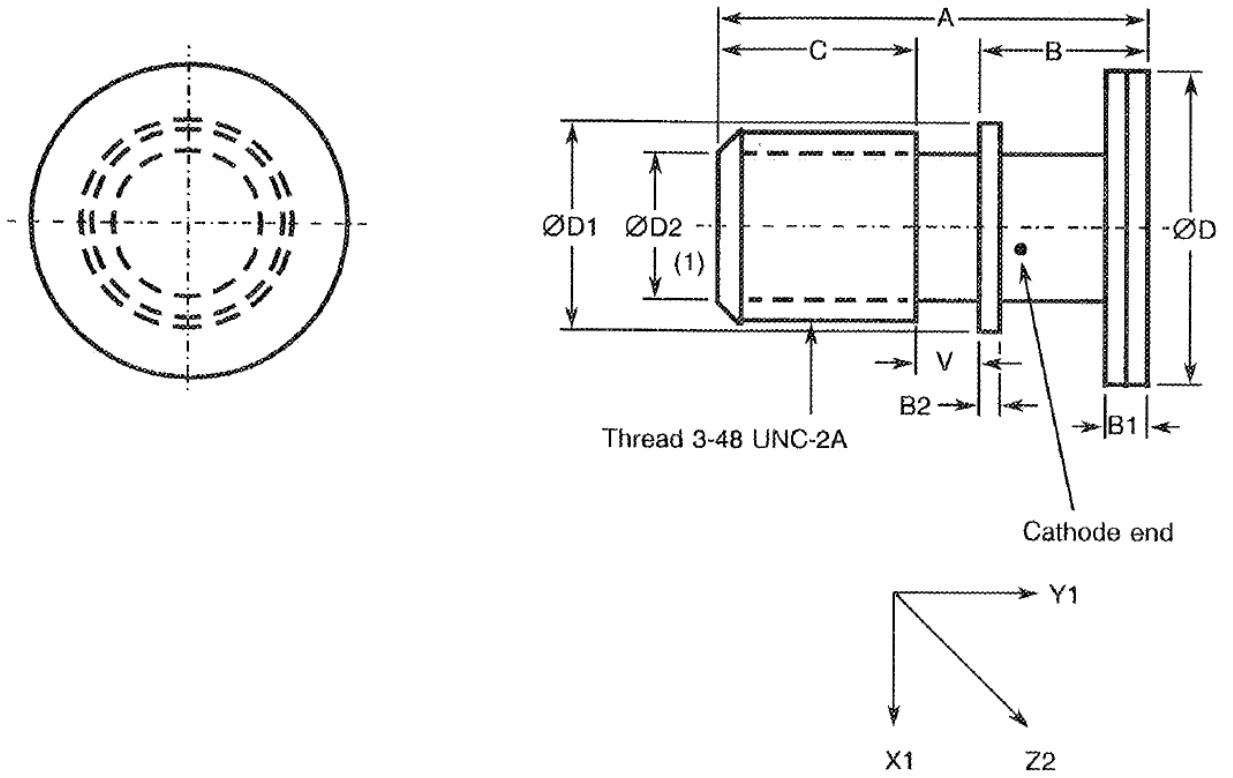


Symbol	Millimetres	
	Min	Max
A	5.34	5.74
B	2.52	2.72
B1	0.61	0.81
B2	0.65	0.85
C	1.68	2.58
ØD	4.03	4.09
ØD1	3.05	3.25
ØD2	1.6	2
V	0.64	0.94

**NOTES**

1. 6 spline socket, 1.39mm deep

FIGURE 2(o) - VARIANTS 15, 40, 60



Thread 3-48 UNC-2A

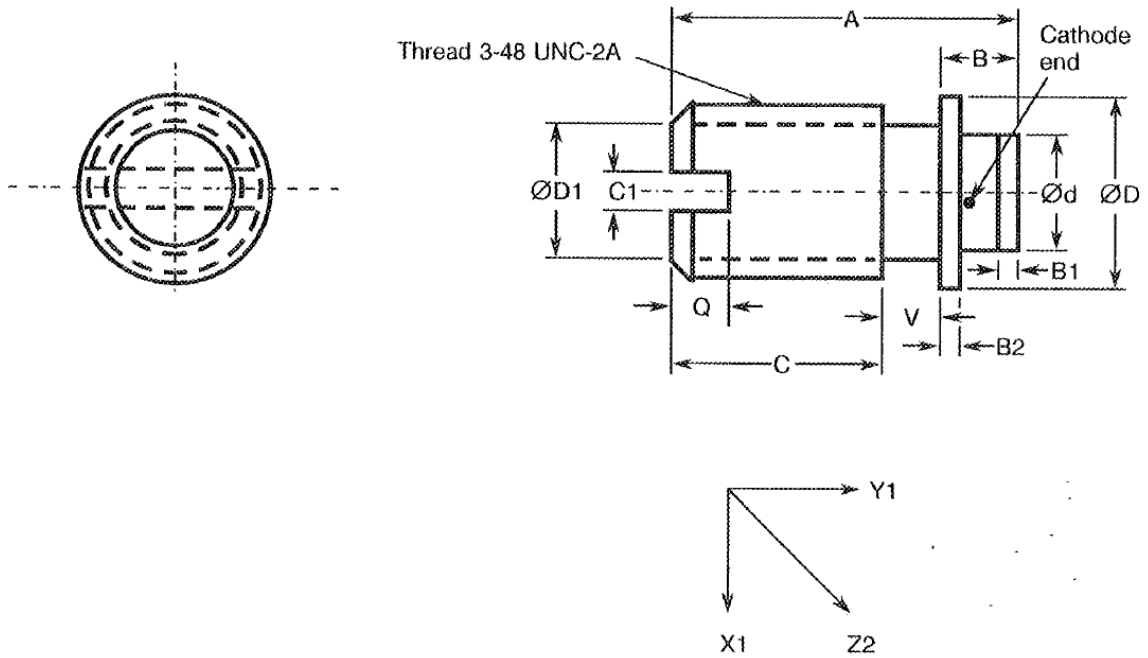
Cathode end

Symbol	Millimetres	
	Min	Max
A	4.71	5.3
B	1.47	1.8
B1	0.41	0.61
B2	0.2	0.3
C	1.97	3.19
ØD	3	3.23
ØD1	2.49	2.59
ØD2	1.6	2
V	0.64	0.94

**NOTES**

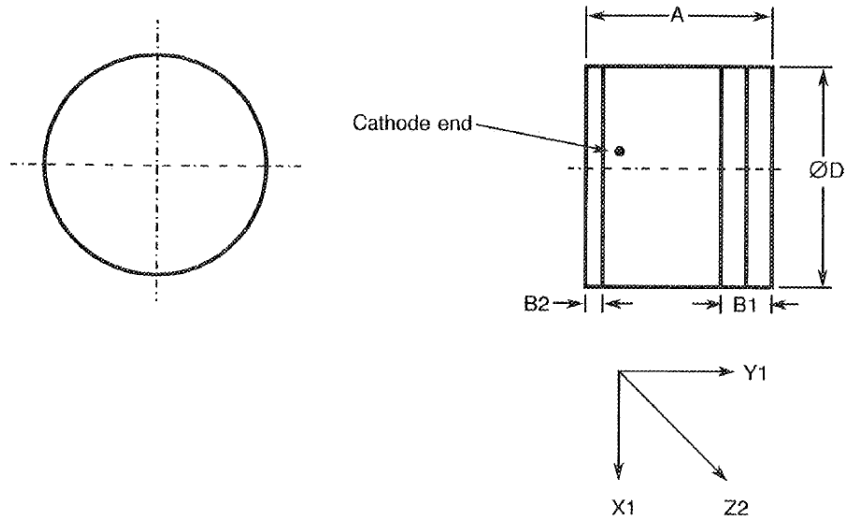
1. 6 spline socket, 1.39mm deep

FIGURE 2(p) - VARIANTS 16, 41



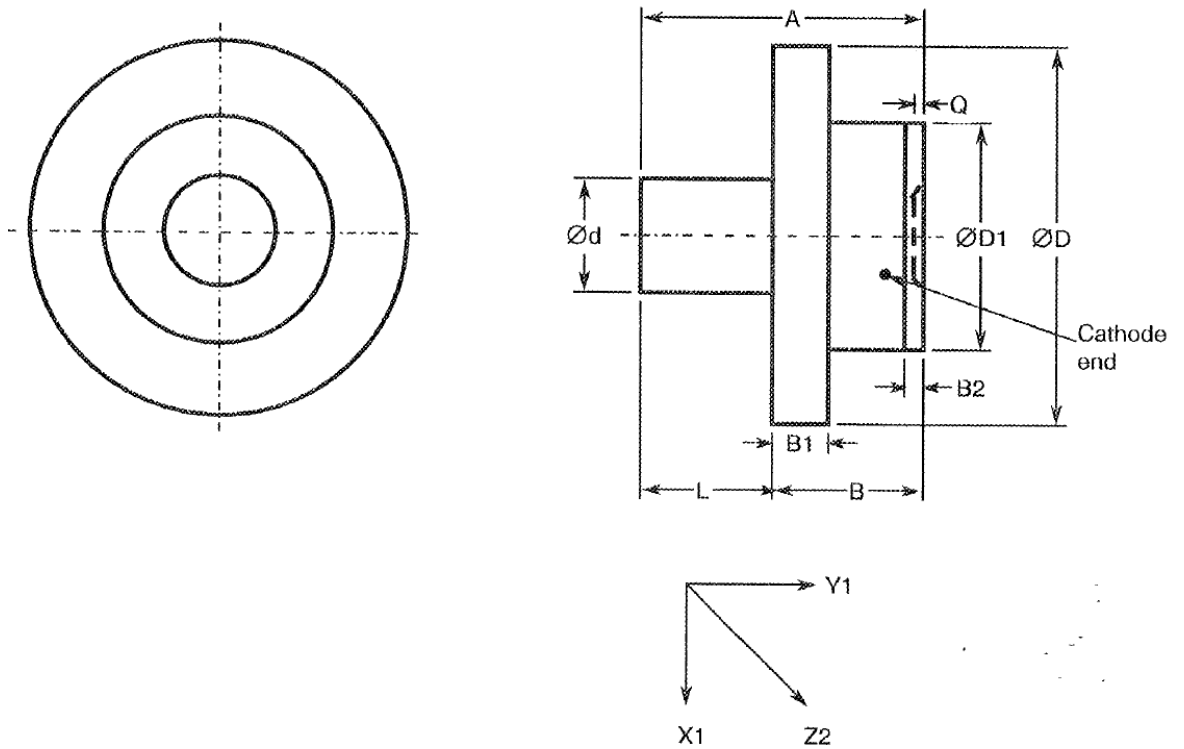
Symbol	Millimetres	
	Min	Max
A	4.19	4.7
B	0.77	1.04
B1	0.2	0.3
B2	0.22	0.28
C	2.21	3.29
C1	0.38	0.64
Ød	1.22	1.32
ØD	2.49	2.59
ØD1	1.6	2
Q	0.64	1.14
V	0.64	0.94

FIGURE 2(q) -VARIANTS 17, 42



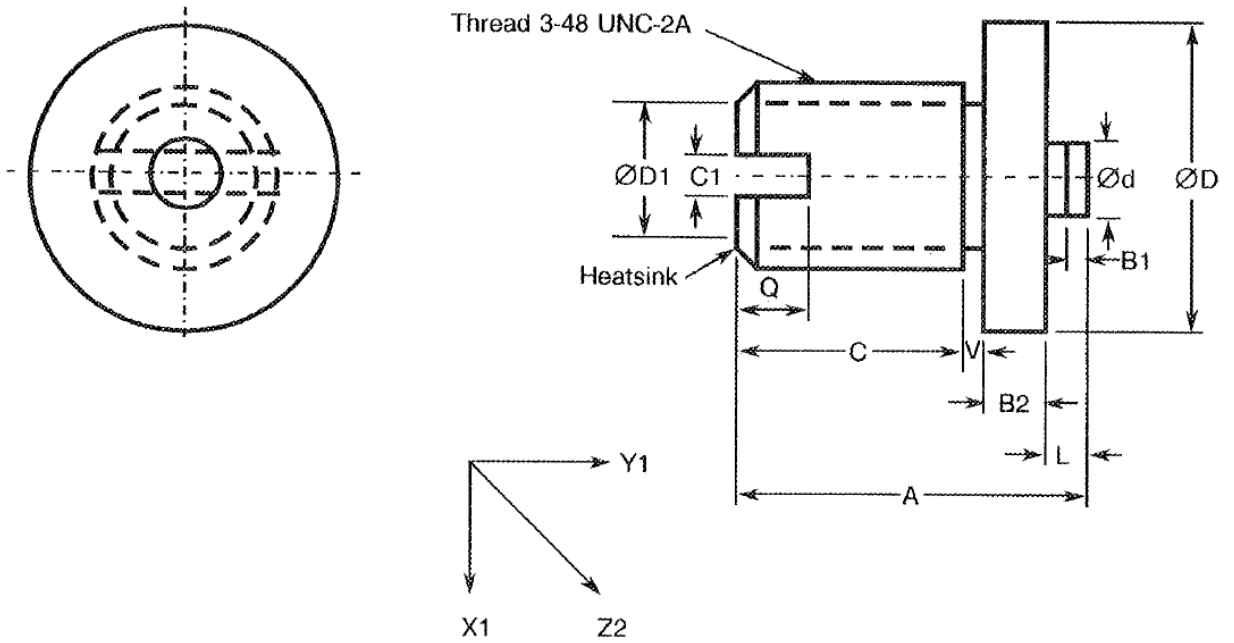
Symbol	Millimetres	
	Min	Max
A	1.02	1.27
B1	0.23	0.33
B2	0.1	0.15
$\varnothing D$	1.29	1.4

FIGURE 2(r) - VARIANTS 18, 43



Symbol	Millimetres	
	Min	Max
A	1.384	1.715
B	0.749	0.826
B1	0.025	0.038
B2	0.05	0.18
$\varnothing d$	0.56	0.71
$\varnothing D$	1.96	2.11
$\varnothing D1$	1.19	1.35
Q	0.038	0.076
L	0.558	0.996

FIGURE 2(s) - VARIANT 19

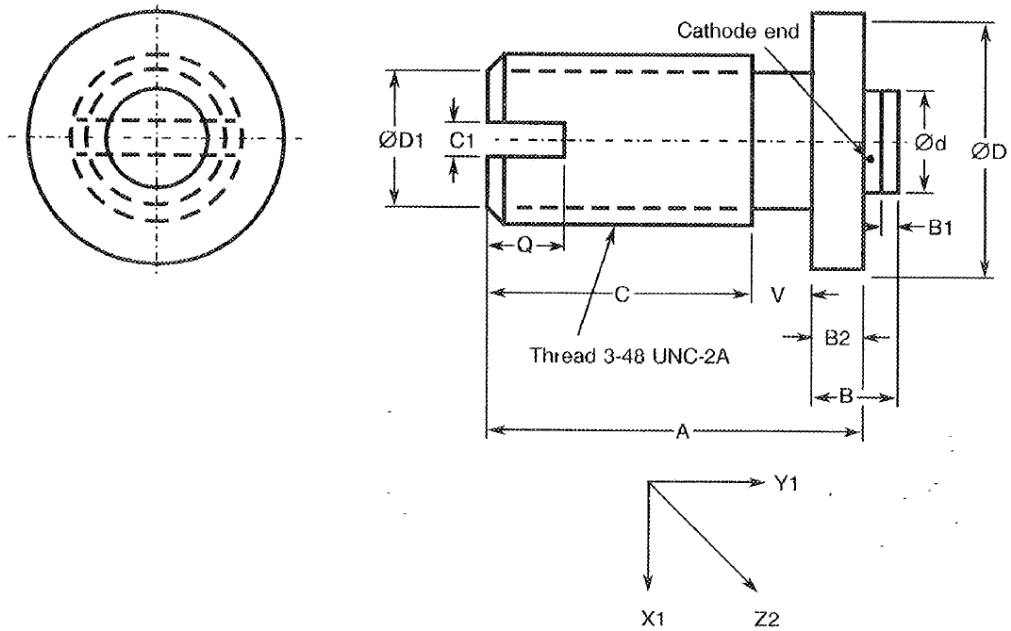


Symbol	Millimetres	
	Min	Max
A	3.56	3.68
B1	0.2	0.3
B2	0.46	0.56
C	2.36	3.02
C1	0.38	0.64
Ød	0.69	0.86
ØD	2.87	3
ØD1	1.6	2
L	0.41	0.48
Q	0.64	1.14
V	0.2	0.64

**NOTES**

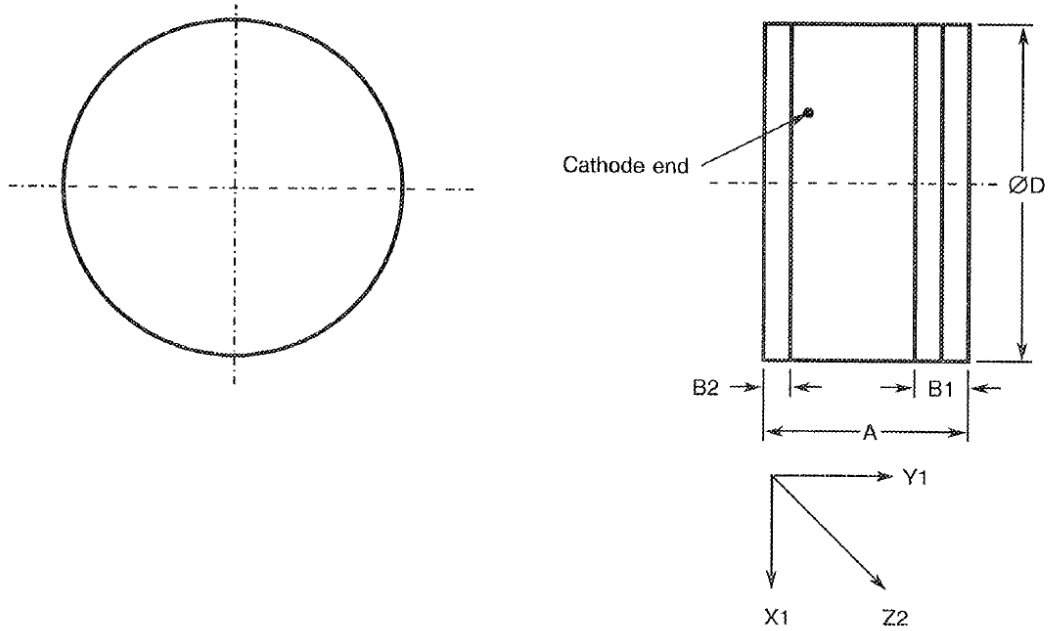
1. Due to its very small size, not even the cathode identification will be marked on this package (see Para. 4.5.1).

FIGURE 2(t) - VARIANTS 20, 44



Symbol	Millimetres	
	Min	Max
A	4.24	4.75
B	1.02	1.32
B1	0.2	0.3
B2	0.46	0.56
C	2.74	3.65
C1	0.38	0.64
Ød	1.22	1.32
ØD	2.87	3
ØD1	1.6	2
Q	0.89	1.14
V	0.64	0.89

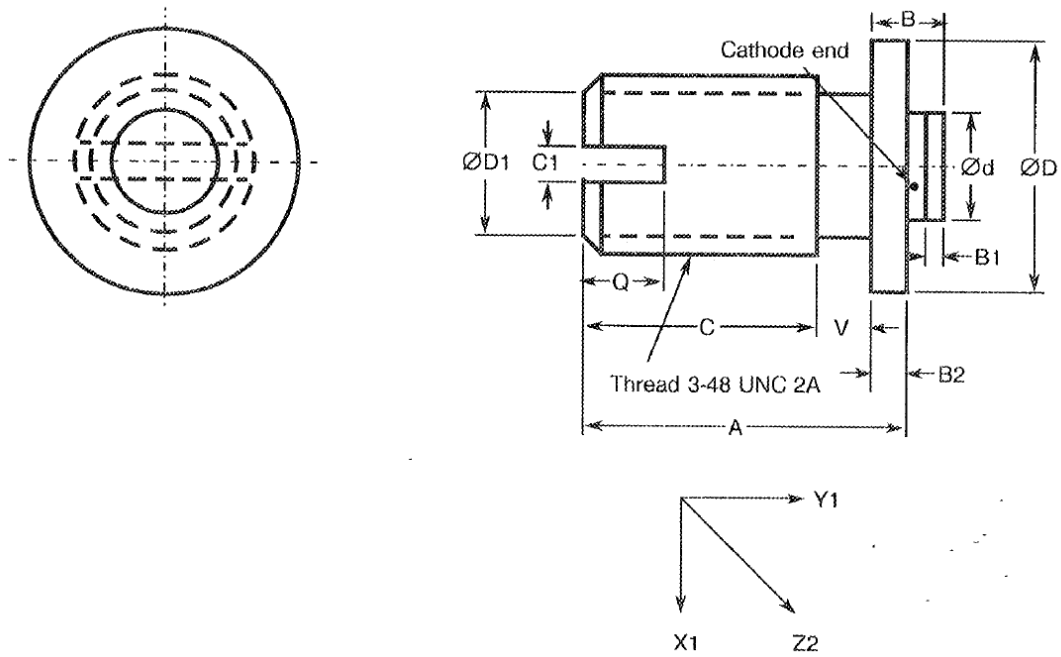
FIGURE 2(u) - VARIANTS 21.45, 61



Symbol	Millimetres	
	Min	Max
A	1.14	1.4
B1	0.23	0.33
B2	0.15	0.2
$\varnothing D$	1.9	2.16

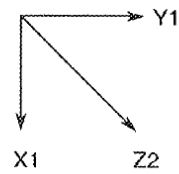
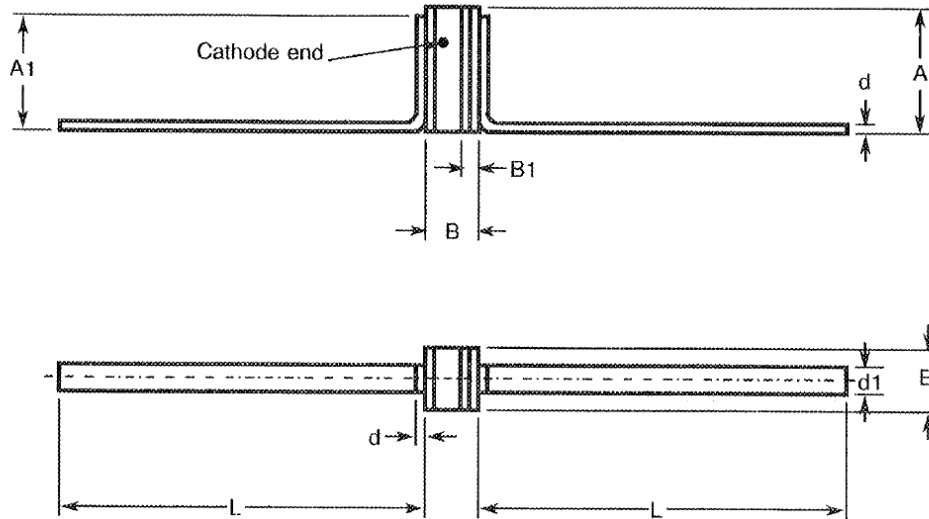


FIGURE 2(v) - VARIANTS 22, 46



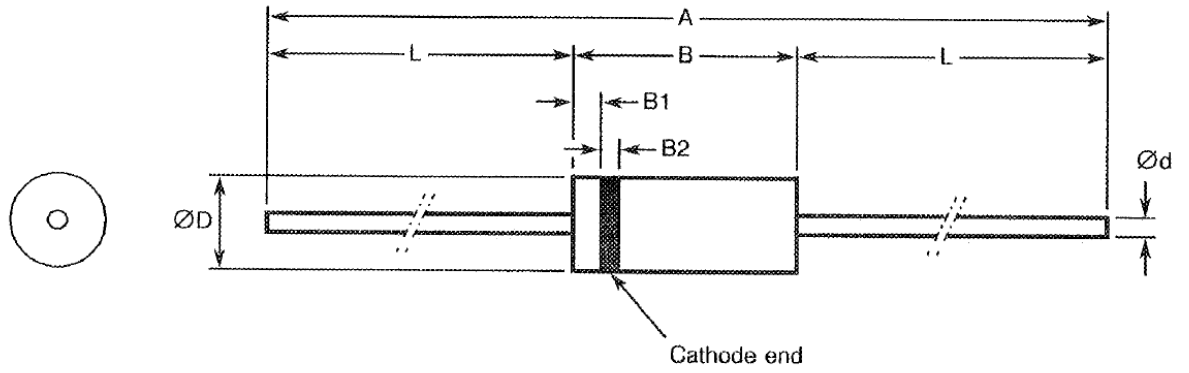
Symbol	Millimetres	
	Min	Max
A	4.04	4.55
B	0.84	1.12
B1	0.2	0.3
B2	0.46	0.56
C	2.54	3.45
C1	0.38	0.64
Ød	1.22	1.32
ØD	2.87	3
ØD1	1.6	2
Q	0.89	1.14
V	0.64	0.94

FIGURE 2(w) - VARIANTS 23, 47



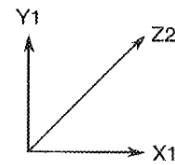
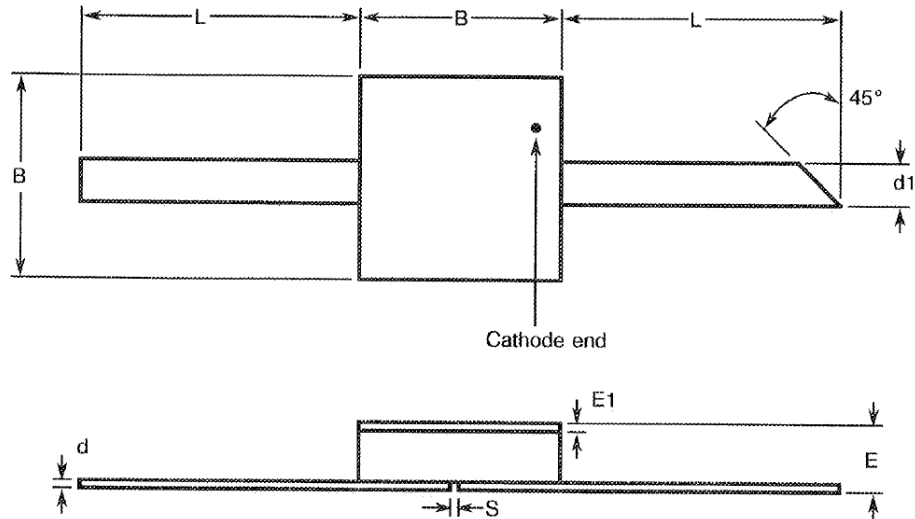
Symbol	Millimetres	
	Min	Max
A	1.35	2.54
A1	-	2.46
B	1.02	1.27
B1	-	0.38
d	0.07	0.15
d1	0.38	0.64
E	1.29	1.4
L	6.1	12.4

FIGURE 2(x) - VARIANTS 24, 48, 62



Symbol	Millimetres	
	Min	Max
A	54.48	80.39
B	3.68	4.19
B1	0.1	1.04
B2	0.3	0.8
Ød	0.35	0.41
ØD	1.73	1.91
L	25.4	38.1

FIGURE 2(y) - VARIANTS 25, 49, 63



Symbol	Millimetres	
	Min	Max
B	2.39	2.62
d	0.07	0.15
d1	0.48	0.56
E	0.79	1.12
E1	0.1	0.18
L	3.3	5.84
S	0.1	-

FIGURE 3 - FUNCTIONAL DIAGRAM



1. Anode
2. Cathode

**NOTES**

1. The cathode end shall be marked with a black dot or band. The marking will not be on the cathode connection but adjacent to it.
2. The heatsink end shall be the same as the cathode end.

## 4 REQUIREMENTS

### 4.1 GENERAL

The complete requirements for procurement of the diodes specified herein shall be as stated in this specification and ESCC Generic Specification No. 5010 for Discrete Microwave Semiconductor Components. 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 ESCC 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

- (a) Para. 5.2.3, Total Dose Irradiation Testing: Shall be performed during qualification and extension of qualification.
- (b) Para. 5.2.3, Total Dose Irradiation Testing: Shall be performed during procurement on a lot acceptance basis at the total dose irradiation level specified in the purchase order.
- (c) Para. 5.3, Wafer Lot Acceptance: Shall be performed as an SEM Inspection only.

#### 4.2.2 Deviations from Final Production Tests (Chart II (b))

- (a) Para. 6.3, Pre-burn-in: Shall be performed in accordance with Para. 9.21(a).
- (b) Para. 9.1, Internal Visual Inspection: For Variant 19, the 3 devices prepared for the Bond Strength Test shall be exempt from the maximum height of bond wire above die requirement.
- (c) Para. 9.2.1, Bond Strength: For Variant 19, 3 devices shall have bonds which are long enough to permit this test to be performed. This test shall not be performed for Variants 24, 48 and 62.
- (d) Para. 9.2.2, Die Shear: Shall not be performed for Variants 19, 24, 48 and 62 and no additional thermal tests shall be performed to replace this test.

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

- (a) Para. 9.2, High Temperature Reverse Bias Burn-in: Shall be performed at 50% of rated  $V_R$ .

#### 4.2.4 Deviations from Qualification Tests (Chart IV)

- (a) Para. 9.2.3, Bond Strength: Shall not be performed for Variants 19, 24, 48 and 62.
- (b) Para. 9.2.4, Die Shear: Shall not be performed for Variants 19, 24, 48 and 62 for which thermal resistance measurements shall be made in accordance with Table 2 of this specification.
- (c) Para. 9.23, Special Testing: Shall not be performed.

#### 4.2.5 Deviations from Lot Acceptance Tests (Chart V)

- (a) Para. 9.23, Special Testing: Shall not be performed.

### 4.3 MECHANICAL AND ENVIRONMENTAL 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:

Variant No.	Weight (g)
01, 26, 50	0.12
02, 27, 51	0.06
03, 28, 52	0.08
04, 29, 53	2.14
05, 30, 54	0.1
06, 31, 55	1.1
07, 32, 56	1.8
08, 33, 57	0.11
09, 34, 58	0.13
10, 35	0.013
11, 36	0.015
12, 37	0.015
13, 38	0.022
14, 39, 59	0.24
15, 40, 60	0.14
16, 41	0.14
17, 42	0.014
18, 43	0.12
19	0.15
20, 44	0.15
21, 45, 61	0.08
22, 46	0.15
23, 47	0.025
24, 48, 62	0.1
25, 49, 63	0.06

#### 4.3.3 Terminal Strength

The requirements for terminal strength testing are specified in Section 9 of ESCC Generic Specification No. 5010. The test conditions shall be as follows:

- (a) Condition: 'A' (Tension)
  - Variants 23 and 47:
    - Force: 1.22N.
    - Duration: 5 seconds.
  - Variants 24, 25, 48, 49, 62 and 63:
    - Force: 5.1N.
    - Duration: 5 seconds.
- (b) Condition: 'D2' (Stud Torque)
  - Variants 06, 31 and 55:
    - Torque: 70mNm.
    - Duration: 5 seconds.
  - Variants 14, 15, 39, 40, 59 and 60:
    - Torque: 56mNm.
    - Duration: 5 seconds.

Variants 16, 19, 20, 22, 41, 44 and 46:

- Torque: 42mNm.
- Duration: 5 seconds.

(c) Condition: Compression

Variants 01, 02, 03, 04, 05, 06, 07, 08, 09, 14, 15, 18, 21, 26, 27, 28, 29, 30, 31, 32, 33, 34, 39, 40, 43, 45, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60 and 61:

- Force: 50N.
- Duration: 5 seconds.

Variants 10, 11, 12, 13, 16, 17, 20, 22, 35, 36, 37, 38, 41, 42, 44 and 46:

- Force: 10N.
- Duration: 5 seconds.

Variant 19:

- Force: 5N.
- Duration: 5 seconds.

The compression test shall be performed by applying the specified force to the end-cap by means of a suitable weight applied for the specified time. On completion of the test, a visual examination shall be performed to check for damage to the end-cap or the ceramic body.

#### 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 shall not guarantee acceptance of the finished product.

##### 4.4.1 Case

The case shall be hermetically sealed and have a ceramic body. The lid shall be welded or preform soldered. For Variants 24, 48 and 62, the case shall be hermetically sealed and have a glass body.

##### 4.4.2 Lead Materials and Finish

- (a) For Variants 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 18, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 43, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59 and 60, the body material shall be Type 'A' with Type '7' finish and the lid material shall be Type 'D' with Type '2' finish, in accordance with the requirements of ESCC Basic Specification No. 23500.
- (b) For Variants 16, 19, 20, 21, 22, 41, 44, 45, 46 and 61, the lead material shall be Type 'A' with Type '7' finish in accordance with the requirements of ESCC Basic Specification No. 23500.
- (c) For Variants 17, 23, 25, 42, 47, 49, and 63, the lead material shall be Type 'D' with Type '2' finish in accordance with the requirements of ESCC Basic Specification No. 23500.
- (d) For Variants 24, 48 and 62, the lead material shall be Type 'C' with Type '4' finish in accordance with the requirements of ESCC Basic Specification No. 23500

#### 4.5 MARKING

##### 4.5.1 General

The marking of components delivered to this specification shall be in accordance with the requirements of ESCC Basic Specification No. 21700 and the following paragraphs. When the component is too small to accommodate all of the marking specified, as much as space permits shall be marked and the marking information, in full, shall accompany the component in its primary package.

The information to be marked and the order of precedence, shall be as follows:-

- (a) Cathode Identification.
- (b) The ESCC Component Number.

(c) Traceability Information.

#### 4.5.2 Cathode Identification

Cathode identification shall be as shown in Figures 2 and 3 of this specification.

#### 4.5.3 ESCC Component Number

Each component shall bear the ESCC Component Number which shall be constituted and marked as follows:

Example: 551301401BF

- Detail Specification Number: 5513014
- Type Variant (see Table 1(a)): 01
- Testing Level (B or C, as applicable): B
- Total Dose Irradiation Level (if applicable): F

The Total Dose Irradiation Level designation shall be added for those devices for which a sample has been successfully tested to the level in question. For these devices, a code letter shall be added in accordance with the requirements of ESCC Basic Specification No. 22900.

#### 4.5.4 Traceability Information

Each component shall be marked in respect of traceability information in accordance with the requirements of ESCC Basic Specification No. 21700.

### 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, measurements shall be performed at  $T_{amb} = +22 \pm 3^{\circ}\text{C}$ .

#### 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. Unless otherwise specified, the measurements shall be performed at  $T_{amb} = +125 (+0 -3)^{\circ}\text{C}$  for Variants 24, 48 and 62 and  $T_{amb} = +150 (+0 - 3)^{\circ}\text{C}$  for all other Variants.

#### 4.6.3 Circuits for Electrical Measurements

Circuits for use in performing electrical measurements listed in Table 2 of this specification are shown in Figure 4.

### 4.7 BURN-IN TESTS

Burn-in shall be Category 2 of Chart III(a)

#### 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  $T_{amb} = +22 \pm 3^{\circ}\text{C}$ . The parameter drift values ( $\Delta$ ) 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 High Temperature Reverse Bias Burn-in

The requirements for the high temperature reverse bias burn-in are specified in Section 7 of ESCC Generic Specification No. 5010. The conditions for high temperature reverse bias burn-in shall be as specified in Table 5(a) of this specification.

4.7.3 Conditions for Power Burn-in

The requirements for power burn-in are specified in Section 7 of ESCC Generic Specification No. 5010. The conditions for power burn-in shall be as specified in Table 5(b) of this specification.

4.7.4 Electrical Circuits for High Temperature Reverse Bias and Power Burn-in

Circuits for use in performing the H.T.R.B and power burn-in tests are shown in Figure 5(a) and 5(b) of this specification.

**TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - DC PARAMETERS**

No.	Characteristics	Symbol	MIL-STD-750 Test Method	Test Conditions	Limits		Unit
					Min.	Max.	
1	Reverse Current 1	$I_{R1}$	4016	$V_R = -150V$	-	10	$\mu A$
2	Reverse Current 2	$I_{R2}$	4016	$V_R = -75V$	-	50	nA
3	Forward Voltage	$V_F$	4011	$I_F = 100mA$	-	1.3	V
4	Thermal Resistance	$R_{TH(J-C)}$	3101	$I_F = 1.0A$ Note 1 Variants 01 to 23 Variant 24 Variant 25 Variants 26 to 47 Variant 48 Variant 49 Variants 50 to 61 Variant 62 Variant 63	- - - - - - - - -	45 500 205 40 500 200 35 500 195	$^{\circ}C/W$

**NOTES**

1. Pulsed measurement, pulse width = 4.0 $\mu s$ , p.r.f. = 1.0kHz.

**TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - AC PARAMETERS**

No.	Characteristics	Symbol	MIL-STD-750 Test Method	Test Fig.	Test Conditions (Note 1)	Limits		Unit
						Min.	Max.	
5	Total Capacitance	$C_T$	4001	-	$V_R = -10V$ $f = 1.0MHz$	Note 1		pF
6	Minority Carrier Lifetime	$\tau_L$	-	4(a)	$I_F = 4.5mA$	-	700	ns
7	Forward Slope Resistance	$R_{FS}$	-	4(b)	$I_F = 40mA$ $f_o = 500MHz$ Variants 01 to 25 Variants 26 to 49 Variants 50 to 63	- - -	1.3 1 0.8	$\Omega$

**NOTES**

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

**TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES**

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN.	MAX.	
2	Reverse Current 2	$I_{R2}$	As per Table 2	As per Table 2	-	10	$\mu A$

**TABLE 4 - PARAMETER DRIFT VALUES**

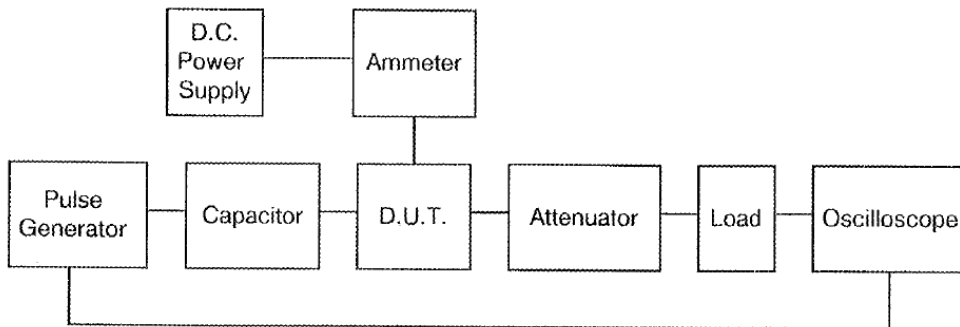
No.	Characteristics	Symbol	Spec. And/Or Test Method	Test Conditions	Change Limits ( $\Delta$ )	Unit
2	Reverse Current 2	$I_{R2}$	As per Table 2	As per Table 2	$\pm 10$ (1) or (2) $+100$ (1)	nA %
3	Forward Voltage	$V_F$	As per Table 2	As per Table 2	$\pm 100$	mV

**NOTES**

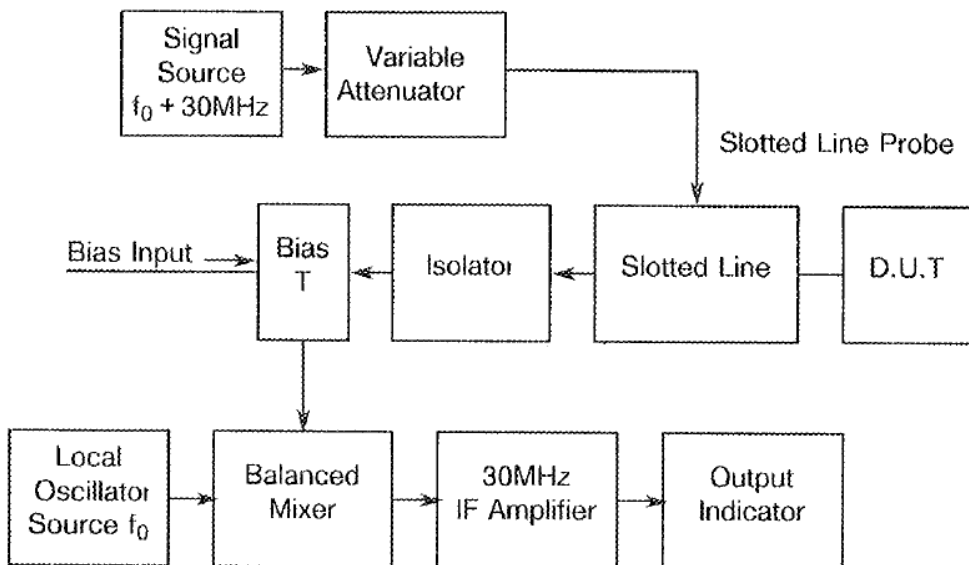
- $\Delta 1 = \Delta 2$ .
- Whichever is the greater, referred to the initial measurement.

**FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS**

**FIGURE 4(a) - MINORITY CARRIER LIFETIME**



**FIGURE 4(b) - FORWARD SLOPE RESISTANCE**



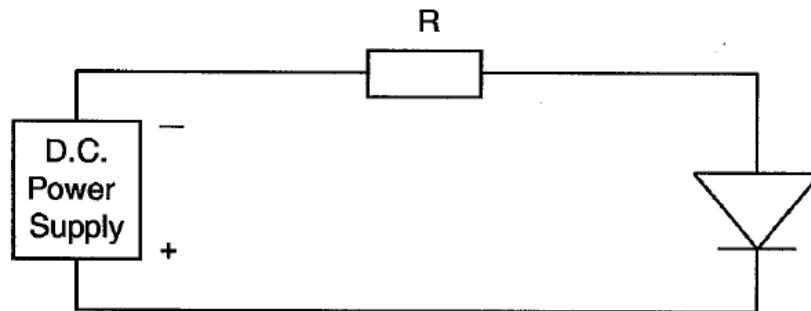
**TABLE 5(a) - CONDITIONS FOR HIGH TEMPERATURE REVERSE BIAS BURN-IN**

No.	Characteristics	Symbol	Conditions	Unit
1	Ambient Temperature	$T_{amb}$	Variants 24, 48 and 62: +125 (+0 -3) All other Variants: +150 (+0 -3)	°C
2	Reverse Voltage	$V_R$	-75	V

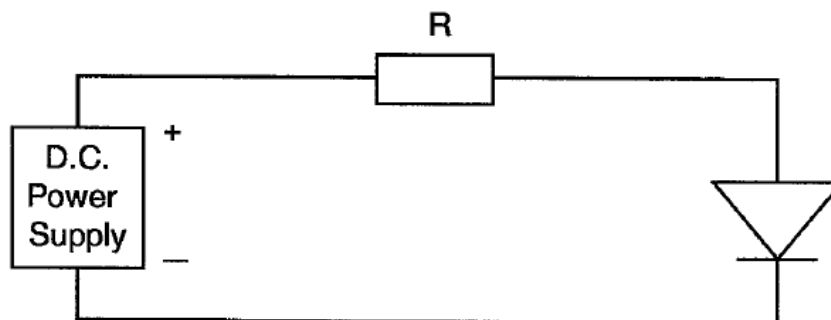
**TABLE 5(b) - CONDITIONS FOR POWER BURN-IN AND OPERATING LIFE TESTS**

No.	Characteristics	Symbol	Conditions	Unit
1	Ambient Temperature	$T_{amb}$	Variants 24, 48 and 62 : +115 (+0 -3) All other Variants: +125 (+0 -3)	°C
2	Forward Current	$I_F$	Variants 24, 48 and 62 : 10 All other Variants: 100	mA

**FIGURE 5(a) - ELECTRICAL CIRCUIT FOR HIGH TEMPERATURE REVERSE BIAS BURN-IN**



**FIGURE 5(B) - ELECTRICAL CIRCUIT FOR POWER BURN-IN AND OPERATING LIFE TESTS**



#### 4.8 ENVIRONMENTAL AND ENDURANCE TESTS (CHARTS IV AND V OF ESCC GENERIC SPECIFICATION NO. 5010)

##### 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. Unless otherwise stated, the measurements shall be performed at  $T_{amb} = +22 \pm 3^{\circ}\text{C}$ .

##### 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 tests are scheduled in Table 6. Unless otherwise stated, the measurements shall be performed at  $T_{amb} = +22 \pm 3^{\circ}\text{C}$ .

##### 4.8.3 Conditions for Operating Life Tests (Part of Endurance Testing)

The requirements for operating life testing are specified in Section 9 of ESCC Generic Specification No. 5010. The conditions for operating life testing are specified in Table 5(b) of this specification.

##### 4.8.4 Electrical Circuits for Operating Life Tests

The circuit to be used for performance of the operating life test shall be the same as shown in Figure 5(b) for Power Burn-in.

#### 4.9 TOTAL DOSE IRRADIATION TESTING

##### 4.9.1 Application

If specified in Para. 4.2.1 of this specification, total dose irradiation testing shall be performed in accordance with the requirements of ESCC Basic Specification No. 22900.

##### 4.9.2 Bias Conditions

Continuous bias shall be applied during irradiation testing as shown in Figure 6 of this specification.

##### 4.9.3 Electrical Measurements

The parameters to be measured prior to irradiation exposure are scheduled in Table 2 of this specification. Only devices which meet the requirements of Table 2 shall be included in the test sample.

The parameters to be measured during and on completion of irradiation testing are scheduled in Table 7 of this specification.

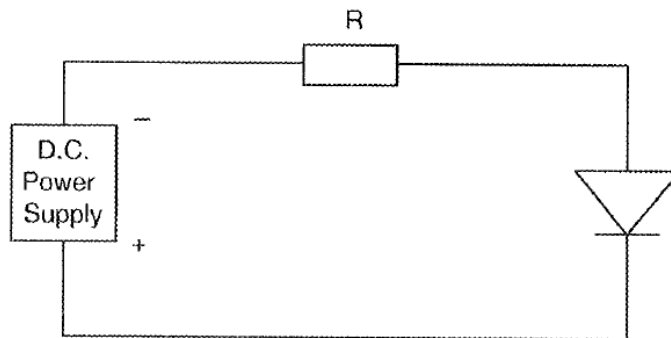
#### 4.10 SPECIAL TESTING

Not applicable.

**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 1	$I_{R1}$	As per Table 2	As per Table 2	As per Table 2		$\mu\text{A}$
2	Reverse Current 2	$I_{R2}$	As per Table 2	As per Table 2	As per Table 2		nA
3	Forward Voltage	$V_F$	As per Table 2	As per Table 2	As per Table 2		V
5	Total Capacitance	$C_T$	As per Table 2	As per Table 2	As per Table 2		pF
7	Forward Slope Resistance	$R_{FS}$	As per Table 2	As per Table 2	As per Table 2		$\Omega$

**FIGURE 6 - BIAS CONDITIONS FOR IRRADIATION TESTING**



**NOTES**

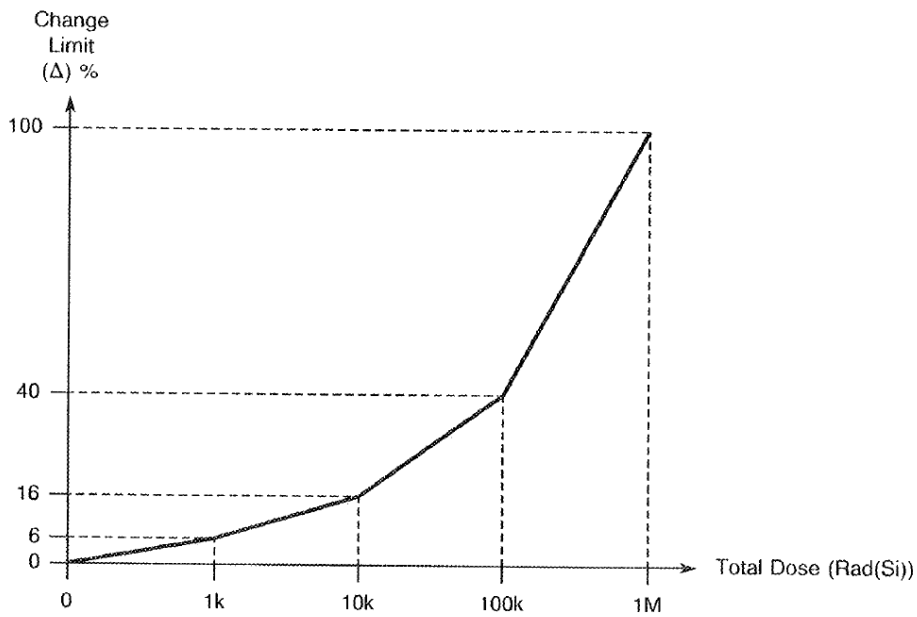
1. A reverse bias of  $V_R = -75\text{V}$  shall be applied.

**TABLE 7 - ELECTRICAL MEASUREMENTS DURING AND ON COMPLETION OF IRRADIATION TESTING**

No.	Characteristics	Symbol	Spec. And/Or Test Method	Test Conditions	Change Limits ( $\Delta$ )	Unit
6	Minority Carrier Lifetime	$\tau_L$	As per Table 2	As per Table 2	Note 1	%

**NOTES**

- The graph given below shall be used to determine the maximum permitted change.



**APPENDIX A**

**AGREED DEVIATIONS FOR M/A-COM LTD. (GB)**

ITEMS AFFECTED	DESCRIPTION OF DEVIATIONS
Para. 4.2.2	Para. 9.4, "High Temperature Stabilisation Bake": May be performed at +125 (+0 -3)°C for Variants 24, 48 and 62.