DIODES, MICROWAVE, SILICON, MULTIPLIER VARACTOR

BASED ON TYPES DH252, EH252, DH256, EH256, DH267, EH267, DH292, EH292, DH294 AND EH294

ESCC Detail Specification No. 5512/016

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DOCUMENTATION CHANGE NOTICE

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

DCR No.	CHANGE DESCRIPTION
979	Specification upissued to incorporate changes per DCR.

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1 GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics and test and inspection data for the component type variants and/or the range of components specified below. It supplements the requirements of, and shall be read in conjunction with, the ESCC Generic Specification listed under Applicable Documents.

1.2 APPLICABLE DOCUMENTS

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

(a) ESCC Generic Specification No. 5010
(b) MIL-STD-750, Test Methods and Procedures for Semiconductor Devices

1.3 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.

1.4 THE ESCC COMPONENT NUMBER AND COMPONENT TYPE VARIANTS

1.4.1 The ESCC Component Number

The ESCC Component Number shall be constituted as follows:

Example: 551201610

- Detail Specification Reference: 5512016
- Component Type Variant Number: 10 (as required)

1.4.2 Component Type Variants

The component type variants applicable to this specification are as follows:

Packaged Components

Variant Number	Based On Type	Package Type / Description	Total Capacitance C_T (pF)		Lead/Terminal Material and Finish (Note 1)		Weight Max (g)
			Min	Max	Anode	Cathode	
10	DH267	Ceramic Pill A (2 Leads)	0.28	0.42	E2	E2	0.02
11	DH267	Ceramic Pill B	0.28	0.42	D7	D7	0.02
12	DH267	Ceramic Pill C (Cathode Lead)	0.28	0.42	D7	E2	0.02
13	DH267	Ceramic Pill D (Anode Lead)	0.28	0.42	E2	D7	0.02
14	DH267	Ceramic Pill E (2 Leads)	0.28	0.42	E2	E2	0.02
15	DH267	Ceramic Pill F (Anode Lead)	0.28	0.42	E2	D7	0.02
16	DH267	Ceramic Pill G	0.34	0.5	D7	A7	0.15
20	DH292	Ceramic Pill A (2 Leads)	0.28	0.62	E2	E2	0.02
21	DH292	Ceramic Pill B	0.28	0.62	D7	D7	0.02
22	DH292	Ceramic Pill C (Cathode Lead)	0.28	0.62	D7	E2	0.02

Variant Number	Based On Type	Package Type / Description	Total Capacitance C_T (pF)		Lead/Terminal Material and Finish (Note 1)		Weight Max (g)
			Min	Max	Anode	Cathode	
23	DH292	Ceramic Pill D (Anode Lead)	0.28	0.62	E2	D7	0.02
24	DH292	Ceramic Pill E (2 Leads)	0.28	0.62	E2	E2	0.02
25	DH292	Ceramic Pill F (Anode Lead)	0.28	0.62	E2	D7	0.02
26	DH292	Ceramic Pill G	0.34	0.7	D7	A7	0.15
30	DH256	Ceramic Pill A (2 Leads)	0.58	1.22	E2	E2	0.02
31	DH256	Ceramic Pill B	0.58	1.22	D7	D7	0.02
32	DH256	Ceramic Pill C (Cathode Lead)	0.58	1.22	D7	E2	0.02
33	DH256	Ceramic Pill D (Anode Lead)	0.58	1.22	E2	D7	0.02
34	DH256	Ceramic Pill E (2 Leads)	0.58	1.22	E2	E2	0.02
35	DH256	Ceramic Pill F (Anode Lead)	0.58	1.22	E2	D7	0.02
36	DH256	Ceramic Pill G	0.64	1.3	D7	A7	0.15
40	DH252	Ceramic Pill A (2 Leads)	0.98	2.12	E2	E2	0.02
41	DH252	Ceramic Pill B	0.98	2.12	D7	D7	0.02
42	DH252	Ceramic Pill C (Cathode Lead)	0.98	2.12	D7	E2	0.02
43	DH252	Ceramic Pill D (Anode Lead)	0.98	2.12	E2	D7	0.02
44	DH252	Ceramic Pill E (2 Leads)	0.98	2.12	E2	E2	0.02
45	DH252	Ceramic Pill F (Anode Lead)	0.98	2.12	E2	D7	0.02
46	DH252	Ceramic Pill G	1.04	2.2	D7	A7	0.15
50	DH294	Ceramic Pill A (2 Leads)	4.08	7.12	E2	E2	0.02
51	DH294	Ceramic Pill B	4.08	7.12	D7	D7	0.02
52	DH294	Ceramic Pill C (Cathode Lead)	4.08	7.12	D7	E2	0.02
53	DH294	Ceramic Pill D (Anode Lead)	4.08	7.12	E2	D7	0.02
54	DH294	Ceramic Pill E (2 Leads)	4.08	7.12	E2	E2	0.02
55	DH294	Ceramic Pill F (Anode Lead)	4.08	7.12	E2	D7	0.02
56	DH294	Ceramic Pill G	4.14	7.2	D7	A7	0.15

Naked Die Components (Note 2)

Variant Number	Based On Type	Junction Capacitance C_J (pF)		Total Capacitance C_T (pF) (Note 3)	
		Min	Max	Min	Max
17	EH267	0.2	0.3	0.34	0.5
27	EH292	0.2	0.5	0.34	0.7
37	EH256	0.5	1.1	0.64	1.3
47	EH252	0.9	2	1.04	2.2
57	EH294	4	7	4.14	7.2

NOTES:
1. The lead/terminal material and finish shall be in accordance with the requirements of ESCC Basic Specification No. 23500.
2. For Naked Die Components, Variants 17, 27, 37, 47, 57, the default package selected for assembly of the Packaged Test Sublot shall be Ceramic Pill G. At the Manufacturer's option, any of the other packages specified herein with a Variant for the same die may be selected. The die applicable to each Variant is indicated by the based on type number.
3. In cases where the default package is not selected for the Packaged Test Sublot, the Total Capacitance limit of the selected package shall apply.

1.5 MAXIMUM RATINGS

The maximum ratings shall not be exceeded at any time during use or storage.

Maximum ratings shall only be exceeded during testing to the extent specified in this specification and when stipulated in Test Methods and Procedures of the ESCC Generic Specification.

Characteristics	Symbols	Maximum Ratings	Unit	Remarks
DC Reverse Voltage Variants 10 to 17: Variants 20 to 27: Variants 30 to 37: Variants 40 to 47: Variants 50 to 57:	V_{Rmax}	 -15 -20 -30 -40 -45	V	
DC Forward Current (Continuous) Variants 10 to 15, 20 to 25, 30 to 35: Variants 16, 26: Variants 36, 46, 56: Variants 40 to 45, 50 to 55:	I_{Fmax}	 250 600 1000 500	mA	Note 1
RF Power Dissipation Variants 10 to 15, 20 to 25, 30 to 35, 40 to 45: Variants 16, 26: Variants 36, 46, 56: Variants 50 to 55:	P_{tot}	 0.5 0.75 1.25 0.6	W	Note 2
Operating Temperature Range	T_{op}	-55 to +150	°C	T_{case}
Storage Temperature Range	T_{stg}	-65 to +175	°C	
Junction Temperature	T_j	+150	°C	
Thermal Resistance, Junction-to-Case Variants 10 to 15, 20 to 25, 30 to 35, 40 to 45: Variants 16, 17, 26, 27: Variants 36, 37, 46, 47, 56, 57: Variants 50 to 55:	$R_{th(j-c)}$	 150 100 60 125	°C/W	Note 3
Soldering Temperature	T_{sol}	+230	°C	Note 4

NOTES:
1. At $T_{case} \leq +75°C$. For $T_{case} > +75°C$, derate linearly to 0A at $T_{case} = +150°C$.
2. At $T_{case} \leq +75°C$. For $T_{case} > +75°C$, derate linearly to 0W at $T_{case} = +150°C$.
3. Thermal Resistance ratings for Naked Die Components, Variants 17, 27, 37, 47, 57, refer to the Packaged Test Sublot assembled in the default Ceramic Pill G package. In cases where the default package is not used, the Thermal Resistance rating associated with the package used and the same die shall apply.

4. Duration 5 seconds maximum and the same terminal shall not be resoldered until 3 minutes have elapsed. Only applicable to Variants 10 to 16, 20 to 26, 30 to 36, 40 to 46, 50 to 56 (Packaged Components).

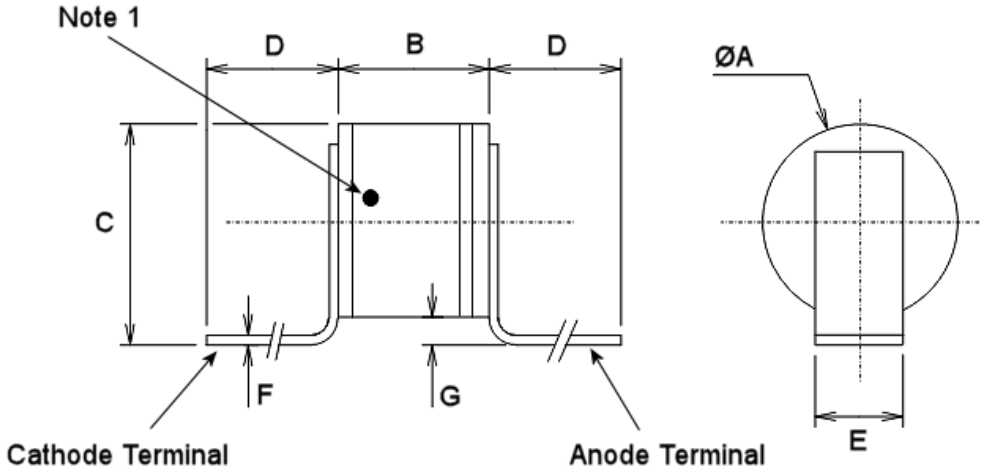
1.6 HANDLING PRECAUTIONS

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 per ESCC Basic Specification No. 23800 with a Minimum Critical Path Failure Voltage of 1550V.

1.7 PHYSICAL DIMENSIONS AND TERMINAL IDENTIFICATION

1.7.1 Ceramic Pill A (2 Leads) - Variants 10, 20, 30, 40, 50

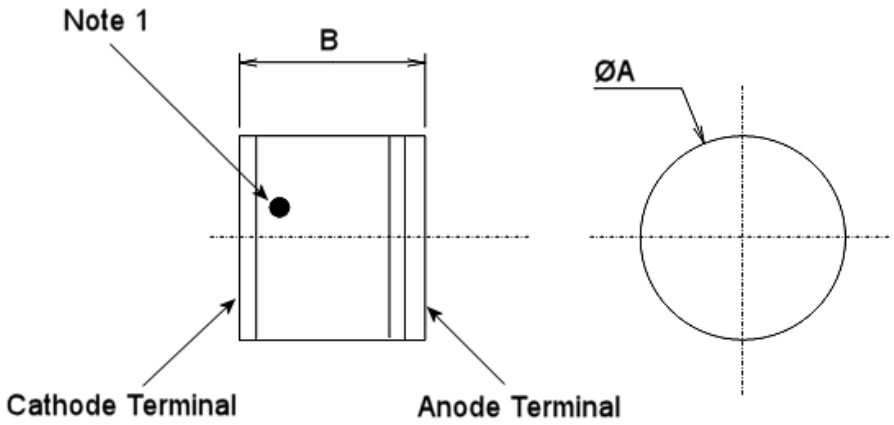


Symbols	Dimensions mm		Remarks
	Min	Max	
ØA	1.07	1.47	
B	0.95	1.35	
C	1.3	1.9	Both terminals
D	2.5	-	
E	0.55	0.65	Both terminals
F	0.06	0.1	Both terminals
G	0.1	0.5	Both terminals

NOTES:

1. Terminal identification: The body shall be marked at a suitable location near the cathode terminal with a black dot.

1.7.2 Ceramic Pill B - Variants 11, 21, 31, 41, 51

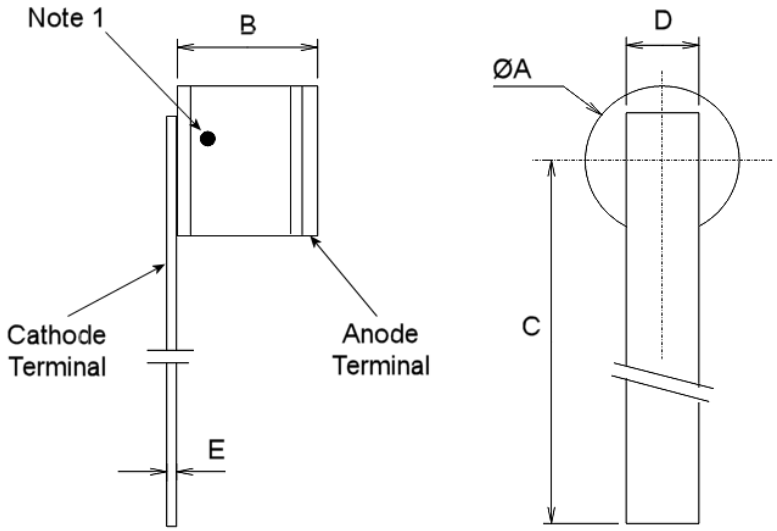


Symbols	Dimensions mm	
	Min	Max
ØA	1.07	1.47
B	0.95	1.35

NOTES:

1. Terminal identification: The body shall be marked at a suitable location near the cathode terminal with a black dot.

1.7.3 Ceramic Pill C (Cathode Lead) - Variants 12, 22, 32, 42, 52

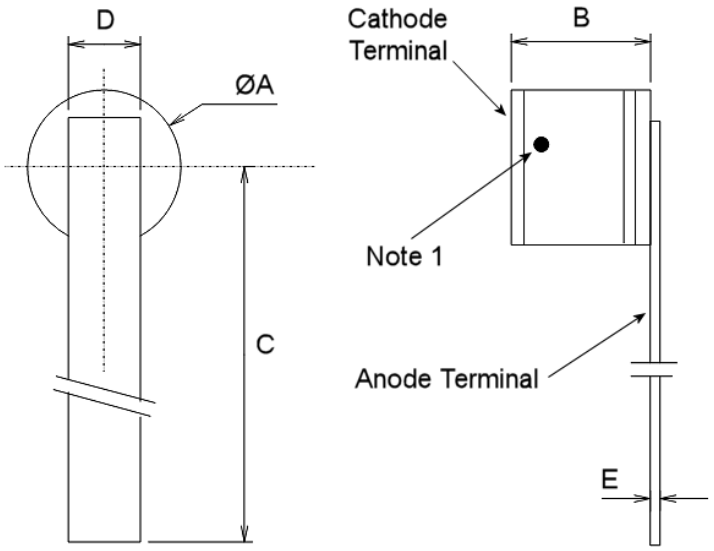


Symbols	Dimensions mm	
	Min	Max
ØA	1.07	1.47
B	0.95	1.35
C	5	-
D	0.55	0.65
E	0.06	0.1

NOTES:

1. Terminal identification: The body shall be marked at a suitable location near the cathode terminal with a black dot.

1.7.4 Ceramic Pill D (Anode Lead) - Variants 13, 23, 33, 43, 53

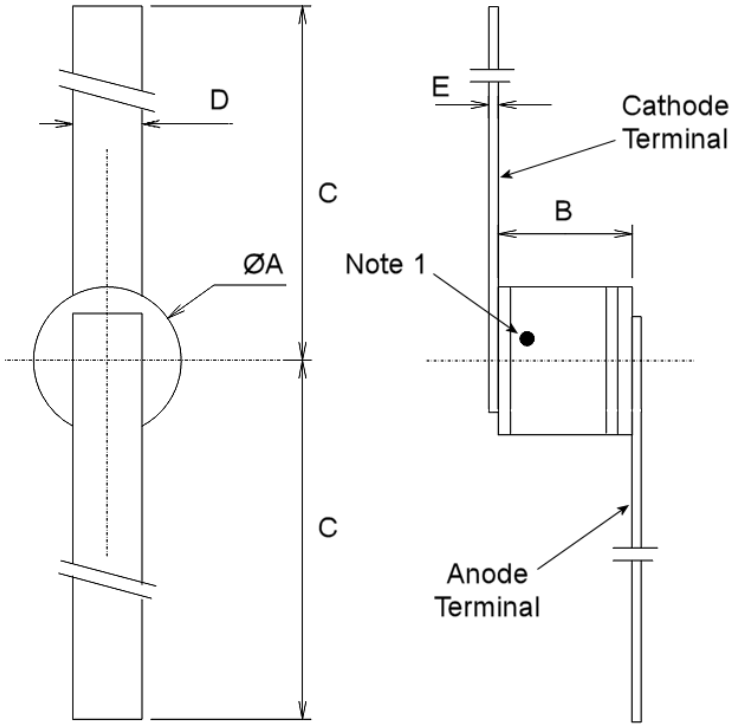


Symbols	Dimensions mm	
	Min	Max
ØA	1.07	1.47
B	0.95	1.35
C	5	-
D	0.55	0.65
E	0.06	0.1

NOTES:

1. Terminal identification: The body shall be marked at a suitable location near the cathode terminal with a black dot.

1.7.5 Ceramic Pill E (2 Leads) - Variants 14, 24, 34, 44, 54

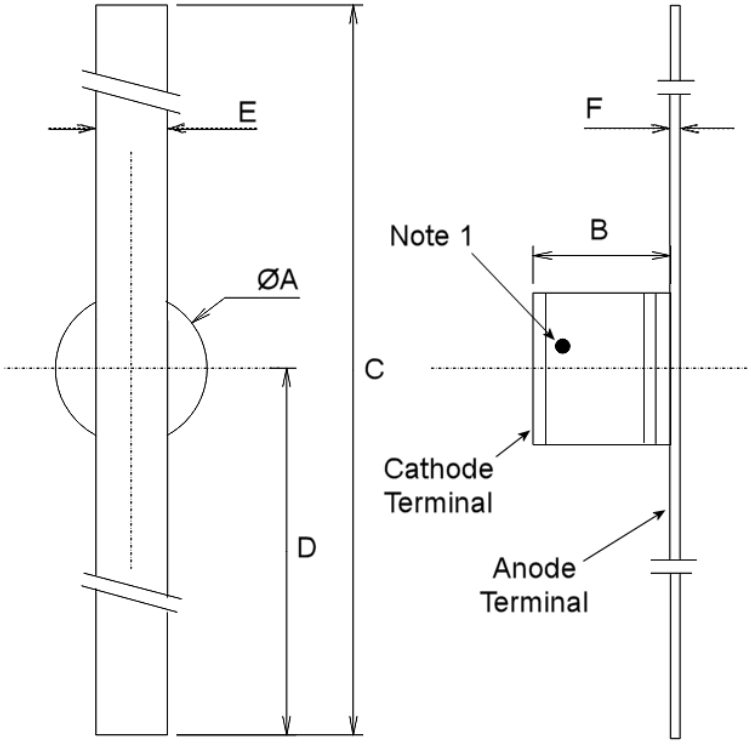


Symbols	Dimensions mm		Remarks
	Min	Max	
ØA	1.07	1.47	
B	0.95	1.35	
C	5	-	
D	0.55	0.65	Both terminals
E	0.06	0.1	Both terminals

NOTES:

1. Terminal identification: The body shall be marked at a suitable location near the cathode terminal with a black dot.

1.7.6 Ceramic Pill F (Anode Lead) - Variants 15, 25, 35, 45, 55

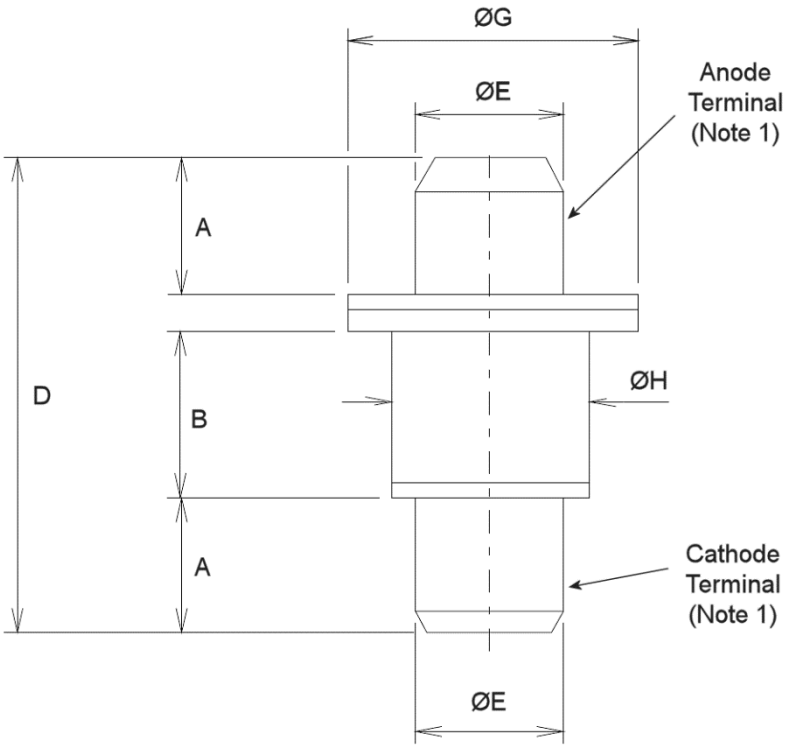


Symbols	Dimensions mm	
	Min	Max
ØA	1.07	1.47
B	0.95	1.35
C	10	10.4
D	5	-
E	0.55	0.65
F	0.06	0.1

NOTES:

1. Terminal identification: The body shall be marked at a suitable location near the cathode terminal with a black dot.

1.7.7 Ceramic Pill G - Variants 16, 26, 36, 46, 56

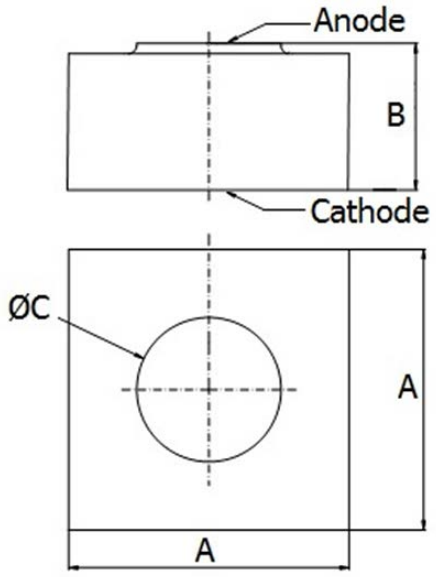


Symbols	Dimensions mm	
	Min	Max
A	1.52	1.63
B	1.75	1.85
D	5.2	5.72
ØE	1.52	1.63
ØG	3	3.23
ØH	1.95	2.11

NOTES:

1. Terminal identification shall be by means of the physical configuration of the package.

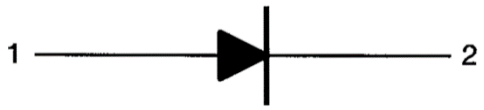
1.7.8 Naked Die – Variants 17, 27, 37, 47, 57



Symbols	Dimensions mm		Remarks
	Min	Max	
A	0.34 0.53	0.4 0.6	Variants 17, 27, 37, 47 Variant 57
B	0.16	0.26	
ØC	0.03 0.05 0.06 0.12 0.3	0.06 0.08 0.1 0.2 0.48	Variant 17 Variant 27 Variant 37 Variant 47 Variant 57

NOTES:
1. Terminal identification shall be by means of the physical configuration.

1.8 FUNCTIONAL DIAGRAM



1. Anode
2. Cathode

1.9 MATERIALS AND FINISHES

1.9.1 Materials and Finishes of Packaged Components

For Variants 10 to 16, 20 to 26, 30 to 36, 40 to 46 and 50 to 56, the materials and finishes shall be as follows:

(a) Case
The case shall be hermetically sealed and have a ceramic body with a metal base and lid.

(b) Leads/Terminals
As specified in Component Type Variants.

1.9.2 Materials and Finishes of Naked Die Components

For Variants 17, 27, 37, 47 and 57, the materials and finishes shall be as follows:

(a) Bond pad
The bond pad metallisation shall be TiPtAu with a layer of vacuum-deposited gold of thickness 0.7µm minimum.

(b) Die backface
The die backface metallisation shall be TiPtAu with a layer of gold of thickness 0.7µm minimum.

2 REQUIREMENTS

2.1 GENERAL

The complete requirements for procurement of the components specified herein are as stated in this specification and the ESCC Generic Specification. Permitted deviations from the Generic Specification, applicable to this specification only, are listed below.

Permitted deviations from the Generic Specification and this Detail Specification, formally agreed with specific Manufacturers on the basis that the alternative requirements are equivalent to the ESCC requirement and do not affect the component's reliability, are listed in the appendices attached to this specification.

2.1.1 Deviations from the Generic Specification

2.1.1.1 Deviations from Qualification and Periodic Tests (Chart F4)

(a) Mechanical Shock: Shall not be performed.
(b) Vibration: Shall not be performed.
(c) Constant Acceleration: Shall not be performed.

2.2 MARKING

The marking shall be in accordance with the requirements of ESCC Basic Specification No. 21700 and as follows.

The information to be marked on the component shall be:

(a) Terminal identification, as specified in Physical Dimensions and Terminal Identification.
(b) The ESCC qualified components symbol (for ESCC qualified components only).
(c) The ESCC Component Number.
(d) Traceability information.

2.3 DIE SHEAR

In those cases where package clearances are such that a die shear test is not practicable, the die shall be pushed away with a suitable tool. The force required to remove the die need not be recorded. The die attachment area shall be inspected and the component shall be considered acceptable if more than 50% of the semiconductor material remains.

2.4 TERMINAL STRENGTH

The test conditions for terminal strength, tested as specified in the ESCC Generic Specification, shall be as follows:

- For Variants 10, 12 to 15, 20, 22 to 25, 30, 32 to 35, 40, 42 to 45, 50, 52 to 55: Test Condition A, tension, with a force of 1.25N for duration 10s.
- For Variants 11, 16, 17, 21, 26, 27, 31, 36, 37, 41, 46, 47, 51, 56, 57: shall not be performed.

2.5 ELECTRICAL MEASUREMENTS AT ROOM, HIGH AND LOW TEMPERATURES

2.5.1 Room Temperature Electrical Measurements

The measurements shall be performed at T_{amb} = +22 ±3°C.

Characteristics	Symbols	MIL-STD-750 Test Method	Test Conditions	Limits		Units
				Min	Max	
Breakdown Voltage (Note 1)	V_{BR}	4021	I_R = 10µA			V
Variants 10 to 17:				-15	-	
Variants 20 to 27:				-20	-	
Variants 30 to 37:				-30	-	
Variants 40 to 47:				-40	-	
Variants 50 to 57:				-45	-	
Reverse Current (Note 1)	I_R	4016	V_R = -10V	-	20	nA
Forward Voltage (Note 1)	V_F	4011	I_F = 10mA	-	1.1	V
Total Capacitance (Note 2)	C_T	4001	V_R = -6V, f = 1MHz	Note 4	Note 4	pF
Junction Capacitance (Note 3)	C_J	4001	V_R = -6V, f = 1MHz	Note 4	Note 4	pF
Minority Carrier Lifetime (Note 5)	τ_L	4031	I_F = 10mA, I_R = 6mA			ns
Variants 10 to 17:				6	-	
Variants 20 to 27:				10	-	
Variants 30 to 37:				20	-	
Variants 40 to 47:				35	-	
Variants 50 to 57:				125	-	
Snap-off Time (Note 6)	t_{SO}	4031	I_F = 10mA, V_R = 10V Note 7			ps
Variants 10 to 17:				-	60	
Variants 20 to 27:				-	75	
Variants 30 to 37:				-	120	
Variants 40 to 47:				-	200	
Variants 50 to 57:				-	400	

NOTES:

1. This characteristic applies to all Variants tested during Charts F2 and F3 of the Generic Specification.
2. This characteristic applies to Variants 10 to 16, 20 to 26, 30 to 36, 40 to 46, 50 to 56 (Packaged Components) and Variants 17, 27, 37, 47, 57 (Packaged Test Sublot samples for Naked Die Components), tested only during Chart F3 of the Generic Specification.
3. This characteristic applies only to Variants 17, 27, 37, 47, 57 (Naked Die Components), tested only during Chart F2 of the Generic Specification.
4. See Component Type Variants for the applicable limits.

5. Only performed during Chart F2 of the Generic Specification, on a sample of 27 dice per wafer. In the event of any failure, a 100% inspection shall be performed and all failures shall be clearly identified.
6. Unless otherwise specified, only performed during Chart F2 of the Generic Specification, on a sample of 20 dice per wafer assembled into suitable packages.
   For Variants 10 to 16, 20 to 26, 30 to 36, 40 to 46, 50 to 56 (Packaged Components), in the event of any failure, a 100% inspection shall be performed during Room Temperature Electrical Measurements in Chart F3 of the Generic Specification.
   For Variants 17, 27, 37, 47, 57 (Packaged Test Sublot samples for Naked Die Components), in the event of any failure, the wafer shall be rejected.
7. Measured between 20% and 80% of the output voltage transition.

2.5.2 High and Low Temperatures Electrical Measurements

The measurements shall be performed only at T_{amb} = +150 (+0 -3)°C.

Characteristics	Symbols	MIL-STD-750 Test Method	Test Conditions Note 1	Limits		Units
				Min	Max	
Reverse Current (Note 2)	I_R	4016	V_R = -10V	-	1	µA

NOTES:
1. Measurements shall be performed on a sample basis as specified in the Generic Specification.
2. This characteristic applies to all Variants tested during Charts F2 and F3 of the Generic Specification.

2.6 PARAMETER DRIFT VALUES

Unless otherwise specified, the measurements shall be performed at T_{amb} = +22 ±3°C.

The test methods and test conditions shall be as per the corresponding test defined in Room Temperature Electrical Measurements.

The drift values (Δ) shall not be exceeded for each characteristic specified. The corresponding absolute limit values for each characteristic shall not be exceeded.

Characteristics	Symbols	Limits			Units
		Drift Value (1) Δ	Absolute		
			Min	Max	
Reverse Current	I_R	±5 or (2) ±100%	-	20	nA
Forward Voltage	V_F	±5%	-	1.1	V
Total Capacitance (Note 3)	C_T	±5% (4) or ±10% (5)	Note 6	Note 6	pF

NOTES:
1. Δ1 = Δ2.
2. Whichever is the greater referred to the initial value.

3. This characteristic applies to Variants 10 to 16, 20 to 26, 30 to 36, 40 to 46, 50 to 56 (Packaged Components) and Variants 17, 27, 37, 47, 57 (Packaged Test Sublot samples for Naked Die Components).
4. Applicable drift value for C_T > 0.5pF and rounded upwards to the nearest 0.01pF.
5. Applicable drift value for C_T ≤ 0.5pF and rounded upwards to the nearest 0.01pF.
6. See Component Type Variants for the applicable limits.

2.7 INTERMEDIATE AND END-POINT ELECTRICAL MEASUREMENTS

Unless otherwise specified, the measurements shall be performed at T_{amb} = +22 ±3°C.

The test methods and test conditions shall be as per the corresponding test defined in Room Temperature Electrical Measurements.

The limit values for each characteristic shall not be exceeded.

Characteristics	Symbols	Limits		Units
		Min	Max	
Breakdown Voltage	V_{BR}	Note 1	-	V
Reverse Current	I_R	-	20	nA
Forward Voltage	V_F	-	1.1	V
Total Capacitance (Note 2)	C_T	Note 3	Note 3	pF

NOTES:
1. See Room Temperature Electrical Measurements for the applicable limits.
2. This characteristic applies to Variants 10 to 16, 20 to 26, 30 to 36, 40 to 46, 50 to 56 (Packaged Components) and Variants 17, 27, 37, 47, 57 (Packaged Test Sublot samples for Naked Die Components).
3. See Component Type Variants for the applicable limits.

2.8 BURN-IN 1 CONDITIONS

Characteristics	Symbols	Test Conditions	Units
Ambient Temperature	T_{amb}	+150 (+0 -3)	°C
Reverse Voltage (Note 1)	V_R		V
Variants 10 to 17:		-12	
Variants 20 to 27:		-16	
Variants 30 to 37:		-24	
Variants 40 to 47:		-32	
Variants 50 to 57:		-36	

NOTES:
1. Upon completion of Burn-in 1, the test voltage shall be maintained until T_{amb} < +35°C.

2.9 BURN-IN 2 CONDITIONS

Characteristics	Symbols	Test Conditions	Units
Case Temperature	T_{case}	+125 (+0 -3)	°C
Forward Current	I_F		mA
Variants 10 to 17, 20 to 27, 30 to 35, 40 to 45, 50 to 55:		50	
Variants 36, 37, 46, 47:		120	
Variants 56, 57:		130	

2.10 OPERATING LIFE CONDITIONS

The conditions shall be as specified for Burn-in 2.

APPENDIX 'A'

AGREED DEVIATIONS FOR COBHAM MICROWAVE (F)

Items Affected	Description of Deviations
Deviations from Generic Specification: Special In-Process Controls (Chart F2)	SEM Inspection: From each wafer selected for SEM Inspection, the sample of three dice shall be selected after die separation.
	Bond Strength: The following pre-seal bond strength shall apply: • 0.03N minimum
Deviations from Generic Specification: Screening Tests (Chart F3)	Radiographic Inspection: • Shall not be performed on Packaged Test Sublot samples for Naked Die Components. • May be performed without serialisation and at any point during Chart F3. Any components found to fail Radiographic Inspection shall be removed from the lot. • May be performed in the X and Z axes only.

Deviations from Generic Specification: Qualification and Periodic Tests for Packaged Components and Naked Die Components (Charts F4A and F4B)	For the De-encapsulation Subgroup, the Internal Visual Inspection, Bond Strength and Die Shear tests may be replaced by measurements verifying the die solder integrity and wire integrity, as follows:
	• Thermal Impedance test in accordance with MIL-STD-750, Test Method 3101.
	  • For Variants 10 to 15, 20 to 25, 30 to 35, 40 to 45: P_D = 0.25W.
	  • For Variants 16, 17, 26, 27, 50 to 55: P_D = 0.5W.
	  • For Variants 36, 37, 46, 47, 56, 57: P_D = 1W.
	  The Thermal Impedance shall be measured and shall not exceed the applicable value of Thermal Resistance, Junction-to-Case specified in Maximum Ratings.
	• Forward Voltage test in accordance with MIL-STD-750, Test Method 4011.
	  • I_F = 100mA.
	  The Forward Voltage shall be measured and shall not exceed 1.2V.