



Pages 1 to 12

## **DIODE, SILICON, SWITCHING**

**BASED ON TYPE 1N6640U**

**ESCC Detail Specification No. 5101/027**

Issue 2 Draft C	March 2011
-----------------	------------



Document Custodian: European Space Agency - see <https://escies.org>

**LEGAL DISCLAIMER AND COPYRIGHT**

European Space Agency, Copyright © 2011. 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 the prior permission of the European Space Agency and provided that 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
DCR634	Specification up issued to incorporate editorial and technical changes per DCR.

**TABLE OF CONTENTS**

<b>1.</b>	<b><u>GENERAL</u></b>	<b>5</b>
1.1	Scope	5
1.2	Applicable Documents	5
1.3	Terms, Definitions, Abbreviations, Symbols and Units	5
1.4	The ESCC Component Number and Component Type Variants	5
1.4.1	The ESCC Component Number	5
1.4.2	Component Type Variants	5
1.5	Maximum Ratings	6
1.6	Handling Precautions	6
1.7	Physical Dimensions and Terminal Identification	7
1.7.1	Leadless Chip Carrier Package (LCC2D) - 2 Terminal	7
1.8	Functional Diagram	7
1.9	Materials and Finishes	8
<b>2.</b>	<b><u>REQUIREMENTS</u></b>	<b>8</b>
2.1	General	8
2.1.1	Deviations from the Generic Specification	8
2.2	Marking	8
2.3	Electrical Measurements at Room, High and Low Temperatures	8
2.3.1	Room Temperature Electrical Measurements	8
2.3.2	High and Low Temperatures Electrical Measurements	9
2.3.3	Notes to Electrical Measurement Tables	10
2.4	Parameter Drift Values	10
2.5	Intermediate and End-Point Electrical Measurements	10
2.6	High Temperature Reverse Bias Burn-in Conditions	11
2.7	Power Burn-in Conditions	11
2.8	Operating Life Conditions	11
	APPENDIX 'A'	12

## 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. 5000
- (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: 510102707

- Detail Specification Reference: 5101027
- Component Type Variant Number: 07

#### 1.4.2 Component Type Variants

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

Variant Number	Based on Type	Case	Breakdown Voltage $V_{(BR)}$ (V)	Working Peak Reverse Voltage $V_{RWM}$ (V)	Terminal Finish	Weight max g
07	1N6640U	LCC2D	75	50	2 (Note 1)	0.12
08	1N6640U	LCC2D	75	50	4	0.12

#### **NOTES:**

1. With electrolytic nickel underplating.

The terminal finish shall be in accordance with the requirements of ESCC Basic Specification No. 23500

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
Forward Surge Current	$I_{FSM}$	2	A	Notes 1, 2
Working Peak Reverse Voltage	$V_{RWM}$	Note 3	V	
Average Output Rectified Current	$I_O$	300	mA	Note 4
Operating Temperature Range (Case Temperature)	$T_{op}$	-65 to +175	°C	Note 5
Junction Temperature	$T_j$	+175	°C	
Storage Temperature Range	$T_{stg}$	-65 to +175	°C	Note 5
Soldering Temperature	$T_{sol}$	+245	°C	Note 6
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	60	°C/W	Note 7
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	280	°C/W	

**NOTES:**

1. Sinusoidal pulse of 8.3ms duration.
2. At  $T_{amb} \leq +25^\circ C$ .
3. See Component Type Variants for  $V_{RWM}$  value.
4. At  $T_{case} \geq +155^\circ C$ , derate linearly to 0A at  $+175^\circ C$ .
5. For Variants with hot solder dip lead finish all testing and any handling performed at  $T_{amb} > +125^\circ C$  shall be carried out in a 100% inert atmosphere.
6. Duration 5s maximum and the same package shall not be resoldered until 3 minutes have elapsed.
7. Package mounted on an infinite heat sink.

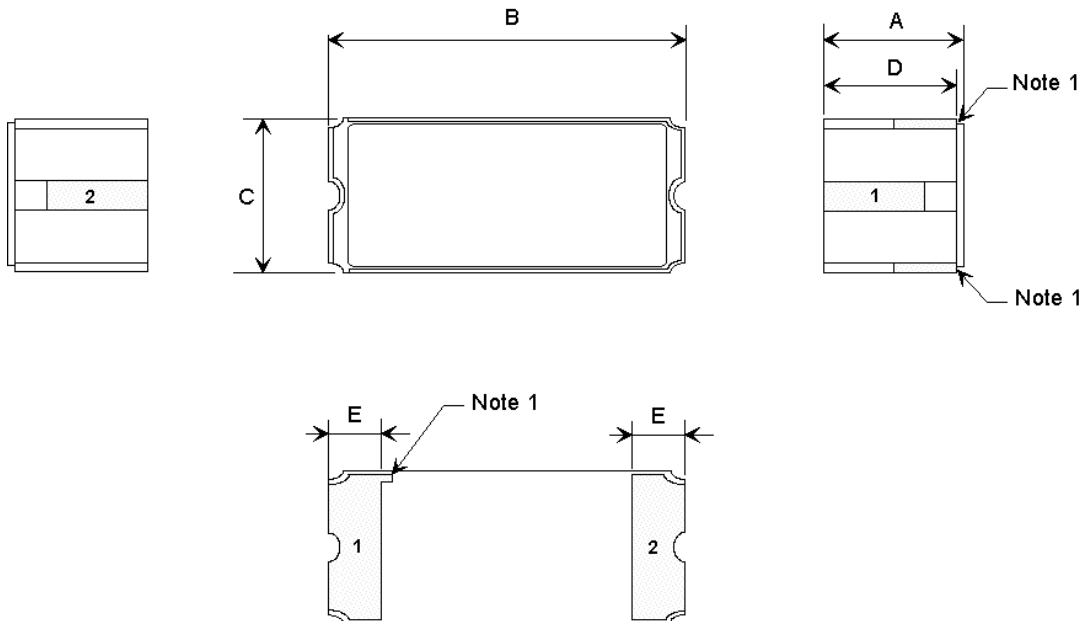
1.6 **HANDLING PRECAUTIONS**

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 3 per ESCC Basic Specification No. 23800 with a Minimum Critical Path Failure Voltage of 5800 Volts.

1.7 PHYSICAL DIMENSIONS AND TERMINAL IDENTIFICATION

1.7.1 Leadless Chip Carrier Package (LCC2D) - 2 Terminal



Symbols	Dimensions mm		Notes
	Min	Max	
A	1.86	2.2	2
B	4.44	4.77	
C	1.84	2.1	
D	1.53	1.87	
E	0.48	0.71	

**NOTES:**

1. Terminal identification: The anode is identified by metallisation in the two castellations and by the index mark on the bottom metallisation.
2. For Variant 08 dimension limits apply prior to solder coating of terminals.

1.8 FUNCTIONAL DIAGRAM

Terminal 1: Anode  
Terminal 2: Cathode



**NOTES:**

1. For LCC2D the lid is not connected to any terminal.

**1.9 MATERIALS AND FINISHES**

Materials and finishes shall be as follows:

- a) Case  
The case shall be hermetically sealed and have an Aluminium Nitride body with a Kovar lid.
- b) Terminal Finish  
As specified in Component Type Variants.

**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**

None

**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.
- (b) The ESCC qualified components symbol (for ESCC qualified components only).
- (c) The ESCC Component Number.
- (d) Traceability information.

**2.3 ELECTRICAL MEASUREMENTS AT ROOM, HIGH AND LOW TEMPERATURES**

Electrical measurements shall be performed at room, high and low temperatures. Consolidated notes are given after the tables.

**2.3.1 Room Temperature Electrical Measurements**

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



Characteristics	Symbols	MIL-STD-750 Test Method	Test Conditions	Limits		Units
				Min	Max	
Forward Voltage 1	$V_{F1}$	4011	Pulse Method $I_F=1mA$ , Note 1	0.54	0.63	V
Forward Voltage 2	$V_{F2}$	4011	Pulse Method $I_F=50mA$ , Note 1	0.76	0.89	V
Forward Voltage 3	$V_{F3}$	4011	Pulse Method $I_F=100mA$ , Note 1	0.82	0.98	V
Forward Voltage 4	$V_{F4}$	4011	Pulse Method $I_F=200mA$ , Note 1	0.87	1.1	V
Reverse Current 1	$I_{R1}$	4016	DC Method $V_R=V_{RWM}$ , Note 2	-	40	nA
Reverse Current 2 (Breakdown Voltage)	$I_{R2}$	4016	DC Method $V_R=V_{(BR)}$ , Note 2	-	50	nA
Capacitance	C	4001	$V_R = 0V$ $V_{sig}=50mV$ (p-p)max $f = 1MHz$ Note 3	-	3	pF
Reverse Recovery Time 1	$t_{rr1}$	4031	Test Condition A $I_F= I_R= 10mA$ $I_{rr}=1mA$ Note 4	-	9	ns
Reverse Recovery Time 2	$t_{rr2}$	4031	Test Condition A $I_F= 1A$ , $V_R = 30V$ $dI/dt= -15A/\mu s$ Note 3	-	20	ns
Forward Recovery Time	$t_{fr}$	4026	$I_F=200mA$ $V_{fr}=1.1V_F$ Note 3	-	20	ns
Forward Recovery Voltage	$V_{fr}$	4026	$I_F=200mA$ $V_{fr}=1.1V_F$ Note 3	-	5	V
Thermal Impedance, Junction to Ambient	$Z_{th(j-a)}$	3101	$I_H=0.1A$ to $0.3A$ $t_H=50ms$ to $10s$ $I_M=10mA$ $t_{MD}=100\mu s$ Note 5	Calculate $\Delta V_F$ see Note 6		$^{\circ}C/W$

2.3.2 High and Low Temperatures Electrical Measurements

Characteristics	Symbols	MIL-STD-750 Test Method	Test Conditions Note 7	Limits		Units
				Min	Max	
Forward Voltage 4	$V_{F4}$	4011	$T_{amb}=-55(+5 -0)^{\circ}C$ Pulse Method $I_F=200mA$ , Note 1	-	1.2	V

Characteristics	Symbols	MIL-STD-750 Test Method	Test Conditions Note 7	Limits		Units
				Min	Max	
Reverse Current 1	$I_{R1}$	4016	$T_{amb}=+150(+0 -5)^{\circ}C$ DC Method $V_R=V_{RWM}$ , Note 2	-	30	$\mu A$
Reverse Current 2 (Breakdown Voltage)	$I_{R2}$	4016	$T_{amb}=-55(+5 -0)^{\circ}C$ DC Method $V_R=V_{(BR)}$ , Note 2	-	40	$\mu A$

2.3.3 Notes to Electrical Measurement Tables

1. Pulse Width  $\leq 680\mu s$ , Duty Cycle  $\leq 2\%$ .
2. See Component Type Variants for  $V_{RWM}$  and  $V_{(BR)}$  values.
3. Read and record measurements shall be performed on a sample of 32 components with 0 failures allowed. Alternatively a 100% inspection may be performed.
4. Guaranteed by  $t_{rr2}$  but not tested.
5. Performed only during Screening Tests Parameter Drift Values (Initial Measurements), go-no-go.
6. The limits for  $\Delta VF$  shall be defined by the Manufacturer on every lot in accordance with MIL-STD-750 Method 3101 and shall guarantee the Rth limits specified in Maximum Ratings.
7. Read and record measurements shall be performed on a sample of 5 components with 0 failures allowed. Alternatively a 100% inspection may be performed.

2.4 PARAMETER DRIFT VALUES

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

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

The drift values ( $\Delta$ ) 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 $\Delta$	Absolute		
			Min	Max	
Forward Voltage 4	$V_{F4}$	$\pm 0.03$	0.87	1.1	V
Reverse Current 1	$I_{R1}$	$\pm 10$ or (1) $\pm 100\%$	-	40	nA

**NOTES:**

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

2.5 INTERMEDIATE AND END-POINT ELECTRICAL MEASUREMENTS

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

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

Characteristics	Symbols	Limits		Units
		Min	Max	
Forward Voltage 4	$V_{F4}$	0.87	1.1	V
Reverse Current 1	$I_{R1}$	-	40	nA
Reverse Current 2 (Breakdown Voltage)	$I_{R2}$	-	50	nA

2.6 HIGH TEMPERATURE REVERSE BIAS BURN-IN CONDITIONS

Characteristics	Symbols	Limits	Units
Ambient Temperature	$T_{amb}$	+150 (+0 -5)	°C
Reverse Voltage	$V_R$	0.8 x $V_{(BR)}$ (Note 1)	V
Duration	t	≥ 48	hours

**NOTES:**

1. See Component Type Variants for  $V_{(BR)}$  value.

2.7 POWER BURN-IN CONDITIONS

Characteristics	Symbols	Test Conditions	Units
Ambient Temperature	$T_{amb}$	+125 (+0 -5)	°C
Junction Temperature	$T_J$	+175 (+0 -5)	°C
Average Output Rectified Current	$I_O$	Note 1	mA

**NOTES:**

1. The output current may be adjusted, within the given limit range, to attain the specified junction temperature.

2.8 OPERATING LIFE CONDITIONS

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

**APPENDIX 'A'**

**AGREED DEVIATIONS FOR STMICROELECTRONICS (F)**

ITEMS AFFECTED	DESCRIPTION OF DEVIATIONS
Deviations from the Generic Specification: Production Control-Chart F2	Special In-process Control Internal Visual Inspection. Wedge bonds equal to 1.1 wire diameters are acceptable for bonding with a V-Groove tool.
	Special In-process Control Internal Visual Inspection. For CCP packages the criteria specified for voids in the fillet and minimum die mounting material around the visible die perimeter for die mounting defects may be omitted providing that a radiographic inspection to verify the die-attach process is performed on a sample basis in accordance with STMICROELECTRONICS procedure 7050651.
Deviations from the Generic Specification: Screening Tests - Chart F3	Solderability is not applicable unless otherwise stipulated in the Purchase Order.
Room Temperature Electrical Measurements	All AC characteristics ( $C$ , $t_{r2}$ , $t_{fr}$ , $V_{fr}$ ) may be considered guaranteed but not tested if successful pilot lot testing has been performed in accordance with STMICROELECTRONICS procedure 7188211 on the wafer lot, which includes AC characteristic measurements per the Detail Specification.  A summary of the pilot lot testing shall be provided if required by the Purchase Order.
High and Low Temperatures Electrical Measurements	Low temperature characteristic $I_{R2}$ may be considered guaranteed but not tested if successful pilot lot testing has been performed in accordance with STMICROELECTRONICS procedure 7188211 on the wafer lot, which includes low temperature characteristic measurements per the Detail Specification.  A summary of the pilot lot testing shall be provided if required by the Purchase Order.