



## DOCUMENT CHANGE REQUEST

DCR number	443	Changes required for:	N/A	Originator:	Benoit Cornanguer
Date:	2008/11/21	Date sent:	2008/11/21	Organisation:	CNES
Status:	IMPLEMENTED				

Title: Diodes Switching, based on types 1N5802, 1N5804, 1N5806, 1N5802US, 1N5804US, 1N5806US and

Number: 5101/014 Issue: 1

Other documents affected:

Page:

Page 6: Table 1(a) - Type Variants  
Page 6: Table 1(b) - Maximun Ratings  
Page 7: Figure 1 - Parameter Derating Information  
Page 9: Figure 2 - Physical Dimensions  
Page 9: Figure 3 - Functional Diagram  
Page 10: paragraph 4.2.2 - Deviations from Final Produ

Paragraph:

Page 6: Table 1(a) - Type Variants  
Page 6: Table 1(b) - Maximun Ratings  
Page 7: Figure 1 - Parameter Derating Information  
Page 9: Figure 2 - Physical Dimensions  
Page 9: Figure 3 - Functional Diagram  
Page 10: paragraph 4.2.2 - Deviations from Final Produ

Original wording:

Proposed wording:

See attached document

Justification:

New variants 13 & 14 introduction with LCC2 A package (gold finish and hot solder dip).

Attachments:

DCR443att.pdf, 5101014.pdf, null

Modifications:

Approved wording if different from 'Proposed Wording' above or reason for rejection

Additional changes as follows are included in this DCR as included in the attached 5101/014 issue 2 Draft E:

a) Rewording and restructure of various sections and paragraphs of the specification plus other editorial changes based on the layout and editorial content of other Detail Specifications already converted to ESCC format, as well as changes to make the Detail specification consistent with the current ESCC Generic Specification No. 5000.

b) Deletion of any redundant paragraphs and information, e.g.: Figure 1, mechanical paragraph, Figure 4, Appendix for Microsemi/I.

c) Table 1(b)

For VRWM, delete remark that rating applies at  $T_{amb} \leq 25C$  (simple correction)

d) Table 1(b), Figure 1

Maximum rating for Average Output Rectified Current IO amended to be 2.5A at  $T_{case}$  (was 1A at  $T_{amb}$ )(to be consistent with new variants 13 & 14 and MIL-PRF-19500/477). Derating of IO amended for  $T_{case} > 75C$  (to be consistent with MIL-PRF-19500/477).

d) Tables 2, 3(b), 4, 6

Amend characteristics for new variants 13 & 14:

IR1

V(BR) (replaced by IR2)

as detailed in the attached 5101/014 issue 2 Draft E.

e) Appendix for ST

Replace ST appendix with the one as detailed in the attached 5101/014 issue 2 Draft E.

Approval signature:



Date signed:

2008-11-21



Pages 1 to 18

## DIODES, SILICON, SWITCHING

**BASED ON TYPES 1N5802, 1N5804, 1N5806, 1N5802US, 1N5804US, 1N5806US AND  
1N5806U**

**ESCC Detail Specification No. 5101/014**

Issue 2 Draft E	March 2009
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DCR No.	CHANGE DESCRIPTION
315, 432, 454, 473, 474	Specification up issued to incorporate editorial and technical 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. 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: 510101401

- Detail Specification Reference: 5101014
- Component Type Variant Number: 01(as required)

**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 Material and/or Finish	Weight max g
01	1N5806	UU	160	150	O1	0.25
02	1N5806	UU	160	150	A3 or A4	0.25
03	1N5804	UU	110	100	O1	0.25
04	1N5804	UU	110	100	A3 or A4	0.25
05	1N5802	UU	60	50	O1	0.25
06	1N5802	UU	60	50	A3 or A4	0.25
07	1N5806	A	160	150	A3 or A4	0.4

Variant Number	Based on Type	Case	Breakdown Voltage $V_{(BR)}$ (V)	Working Peak Reverse Voltage $V_{RWM}$ (V)	Terminal Material and/or Finish	Weight max g
08	1N5804	A	110	100	A3 or A4	0.4
09	1N5802	A	60	50	A3 or A4	0.4
10	1N5806US	MELF	160	150	O4	0.3
11	1N5804US	MELF	110	100	O4	0.3
12	1N5802US	MELF	60	50	O4	0.3
13	1N5806U	LCC2A	160	150	2	0.12
14	1N5806U	LCC2A	160	150	4	0.12

The terminal material and/or 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 Variant 01 to 12 Variants 13, 14	$I_{FSM}$	35 33	A	Notes 1, 2
Working Peak Reverse Voltage	$V_{RWM}$	Note 3	V	
Average Output Rectified Current	$I_O$	2.5	A	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 Variants 01 to 09 Variants 10 to 12 Variants 13, 14	$R_{th(j-c)}$	36 20 13	°C/W	



**NOTES:**

1. Sinusoidal pulse of 8.3ms duration for Variants 01 to 12 and 10ms for Variants 13, 14.
2. At  $T_{amb} \leq +25^{\circ}\text{C}$ .
3. See Component Type Variants for  $V_{RWM}$  value.
4. For Variants 01 to 12: At  $T_{case} \geq +75^{\circ}\text{C}$ , derate linearly to 0A at  $+175^{\circ}\text{C}$ .  
For Variants 13, 14: At  $T_{case} \geq +142^{\circ}\text{C}$ , derate linearly to 0A at  $+175^{\circ}\text{C}$ .
5. For Variants 02, 04, 06, 07, 08, 09, 10, 11, 12, 14 with hot solder dip or tin-lead plating terminal finish all testing performed at  $T_{amb} > +125^{\circ}\text{C}$  shall be carried out in a 100% inert atmosphere.
6. For Variants 01 to 09: Duration 10s maximum at a distance of not less than 1.5mm from the device body and the same package shall not be resoldered until 3 minutes have elapsed.  
For Variants 10 to 12: Duration 10s maximum and the same package shall not be resoldered until 3 minutes have elapsed.  
For Variants 13, 14: Duration 5s maximum and the same package shall not be resoldered until 3 minutes have elapsed.

## 1.6

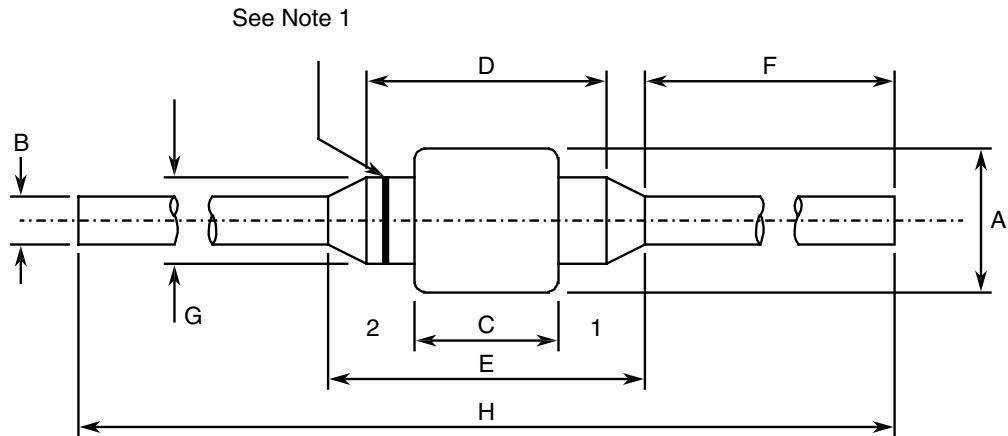
**HANDLING PRECAUTIONS**

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 15000 Volts.

1.7 PHYSICAL DIMENSIONS AND TERMINAL IDENTIFICATION

1.7.1 Axial Lead Package (UU)

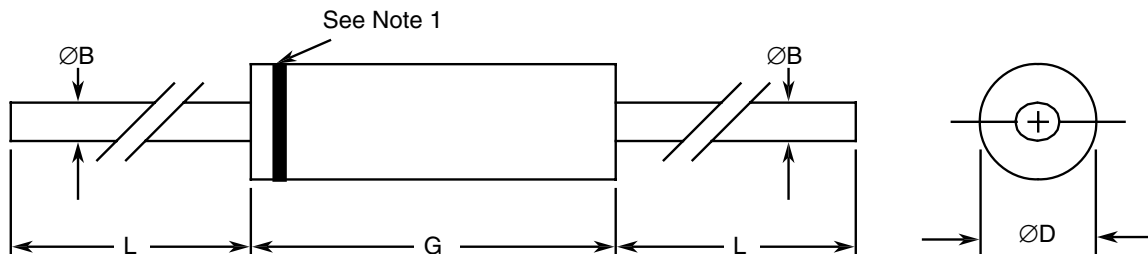


Symbols	Dimensions mm		Notes
	Min	Max	
A	-	2.2	
B	0.68	0.74	
C	-	2.3	
D	-	4	
E	-	6.35	
F	17.8	-	
G	-	1.5	
H	41.3	-	

**NOTES:**

1. Terminal identification: The cathode end shall be marked with a contrasting coloured band.

1.7.2 Axial Lead Package (A)

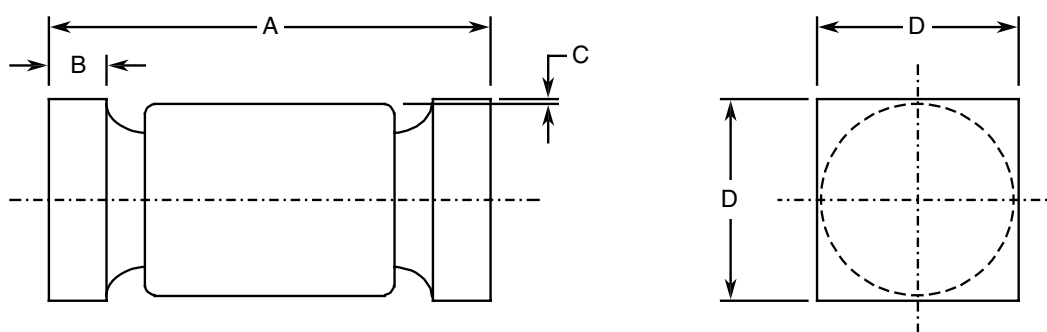


Symbols	Dimensions mm		Notes
	Min	Max	
ØB	0.66	0.84	
ØD	1.65	2.79	2
G	3.18	6.35	3
L	17.78	33.02	

**NOTES:**

1. Terminal identification: The cathode end shall be marked with a contrasting coloured band.
2. Dimension ØD shall be measured at the largest diameter.
3. Dimension G shall include the sections of the lead over which the diameter is uncontrolled. This uncontrolled area is defined as the zone between the edge of the diode body and extending 1.27mm onto the leads.

1.7.3 Surface Mount Package (MELF)



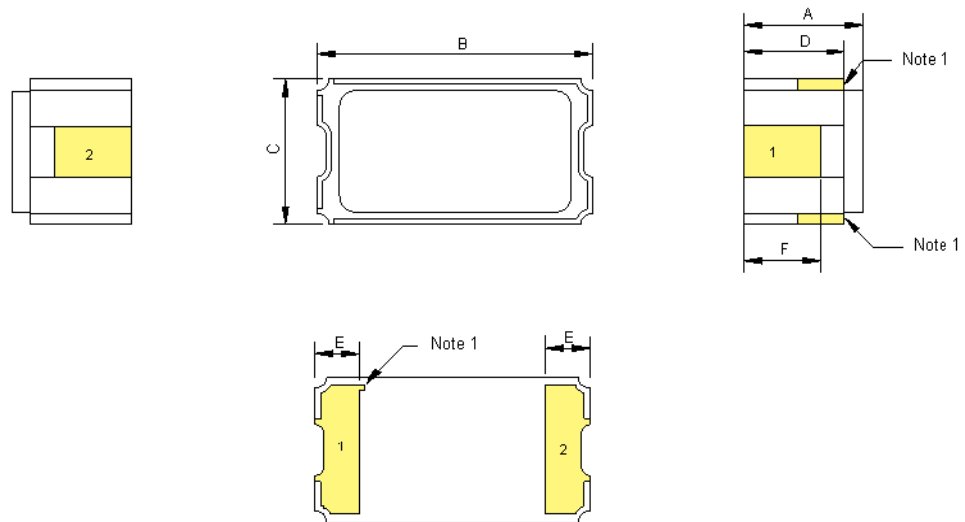
Symbols	Dimensions mm		Notes
	Min	Max	
A	4.27	5.08	
B	0.48	0.71	
C	0.08	-	
D	2.31	2.62	

**NOTES:**

1. Terminal identification: The cathode end shall be marked with a minimum of 3 contrasting coloured

dots or a black band.

1.7.4 Leadless Chip Carrier Package (LCC2A) - 2 Terminal



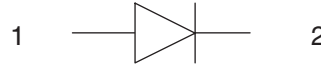
Symbols	Dimensions mm		Notes
	Min	Max	
A	1.86	2.2	2
B	4.54	4.87	
C	2.33	2.59	
D	1.53	1.87	
E	0.48	0.71	

**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 14 dimension limits apply prior to solder coating of terminals.

## 1.8 FUNCTIONAL DIAGRAM

Terminal 1: Anode  
Terminal 2: Cathode



### **NOTES:**

1. For LCC2A, the lid is not connected to any terminal.

## 1.9 MATERIALS AND FINISHES

Materials and finishes shall be as follows:

- a) Case  
For Variants 01 to 12 the case shall be hermetically sealed and have a glass body.  
For Variants 13, 14 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

##### 2.1.1.1 *Deviations from Special In-Process Controls (Chart F2)*

- (a) Bond Strength: Not applicable for Variants 01 to 12.
- (b) Die Shear: Not applicable for Variants 01 to 12.

##### 2.1.1.2 *Deviations from Screening Tests (Chart F3)*

- (a) For Variants 01 to 12 only, following Temperature Cycling, Room Temperature Electrical Measurements shall be performed as specified herein.  
Immediately following Room Temperature Electrical Measurements a Surge Current test shall be performed on a sample of 32 components with 0 failures allowed. The Surge Current test shall be

as follows:

MIL-STD-750, Test Method 4066, condition A

- $I_{FSM} = 35A$  (pk)
- $I_O = 1.0A$
- $V_{RWM} =$  See Component Type Variants for value.
- 10 surges at a rate of 1 per minute maximum and of duration 8.3ms or 10ms.

After the Surge Current test, Parameter Drift Values shall be performed as specified herein referred to the measurements prior to the test.

Immediately following the Surge Current test components shall be subjected to Scope Display analysis of the reverse breakdown characteristic as follows:

MIL-STD-750, Test Method 4023

- Display calibration:  $50\mu A$  to  $100\mu A$  and 20 V to 50V per division
- Reverse current over the knee:  $500\mu A$  minimum.

Any discontinuity or dynamic instability of the trace shall be cause for lot rejection.

- (b) Particle Impact Noise Detection: Not applicable for Variants 01 to 12.
- (c) Seal, Fine Leak: Not applicable for Variants 01 to 12.
- (d) Radiographic Inspection: Not applicable for Variants 01 to 12.

#### 2.1.1.3 *Deviations from Qualification and Periodic Tests (Chart F4)*

- (a) Bond Strength: Not applicable for Variants 01 to 12.
- (b) Die Shear: Not applicbale for Variants 01 to 12.

## 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 TERMINAL STRENGTH

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

- For Variants 01 to 09, Test Condition A with applied force 17.8N and duration 15s.
- For Variants 10 to 14, as specified in the ESCC Generic Specification.

## 2.4 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.

2.4.1 Room Temperature Electrical Measurements

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

Characteristics	Symbols	MIL-STD-750 Test Method	Test Conditions	Limits		Units
				Min	Max	
Forward Voltage	$V_{F1}$	4011	Pulse Method $I_F=1A$ , Note 1 Variants 01 to 12 Variants 13, 14	- -	0.875 0.88	V
	$V_{F2}$	4011	Pulse Method $I_F=2.5A$ , Note 1 Variants 01 to 12 Variants 13, 14	- -	0.975 1	V
Reverse Current 1	$I_{R1}$	4016	DC Method $V_R=V_{RWM}$ , Note 2 Variants 01 to 12 Variants 13, 14	- -	1 0.5	$\mu A$
Reverse Current 2 (Breakdown Voltage)	$I_{R2}$	4021	Variants 13, 14 only DC Method $V_R=V_{(BR)}$ , Note 2	-	10	$\mu A$
Breakdown Voltage	$V_{(BR)}$	4021	Variants 01 to 12 only Pulse Method $I_R=100\mu A$ , Note 1	Note 2	-	V
Capacitance	C	4001	$V_R=10V$ $V_{sig}=50mV$ (p-p)max $f=1MHz$	-	25	pF
Reverse Recovery Time	$t_{rr}$	4031	Variants 01 to 12 Test Condition A $I_F=I_R=500mA$ $I_{rr}=50mA(pk)$ $di/dt=65A/\mu s$ (min) Note 3	-	25	ns
			Variants 13, 14 Test Condition A $I_F=1A$ $V_R=30V$ $dI_F/dt=-50A/\mu s$	-	30	ns
Forward Recovery Time	$t_{fr}$	4026	Variants 01 to 12 $I_F=250mA$ $t_r=8.0ns$ $V_{fr}=1.1V_F$ Note 3	-	15	ns
			Variants 13, 14 $I_F=250mA$ $V_{fr}=1.1V_F$	-	15	ns

Characteristics	Symbols	MIL-STD-750 Test Method	Test Conditions	Limits		Units
				Min	Max	
Forward Recovery Voltage	$V_{fr}$	4026	Variants 01 to 12 $I_F=250mA$ $t_r=8.0ns$ $V_{fr}=1.1V_F$ Note 3	-	2.2	V
			Variants 13, 14 $I_F=250mA$ $V_{fr}=1.1V_F$	-	2.2	V
Thermal Impedance, Junction to Case	$Z_{th(j-c)}$	3101	Variants 01 to 12 $I_H = 5.0A$ $t_H = 10ms$ $I_M = 1mA$ to 10mA $t_{md} = 100\mu s$ (max) Note 4	-	4.5	$^{\circ}C/W$
			Variants 13, 14 $I_H = 1$ to 10A $t_H = 50ms$ $I_M = 50mA$ $t_{md} = 100\mu s$ Note 4	(Calculate $\Delta V_F$ , see Note 5)		$^{\circ}C/W$

2.4.2 High and Low Temperatures Electrical Measurements

Characteristics	Symbols	MIL-STD-750 Test Method	Test Conditions Note 3	Limits		Units
				Min	Max	
Forward Voltage 1	$V_{F1}$	4011	$T_{amb}=+125(+0 -5)^{\circ}C$ Pulse Method $I_F=1A$ , Note 1	-	0.8	V
			$T_{amb}=-65(+5 -0)^{\circ}C$ Pulse Method $I_F=1A$ , Note 1	-	1.075	V
Reverse Current 1	$I_{R1}$	4016	$T_{amb}=+125(+0 -5)^{\circ}C$ DC Method $V_R = V_{RWM}$ , Note 2 Variants 01 to 12 Variants 13, 14	-	50	$\mu A$
			-	20		
Reverse Current 2 (Breakdown Voltage)	$I_{R2}$	4021	Variants 13, 14 only $T_{amb}= -65(+5 -0)^{\circ}C$ DC Method $V_R=V_{(BR)}$ , Note 2	-	10	$\mu A$
Breakdown Voltage	$V_{(BR)}$	4021	Variants 01 to 12 only $T_{amb}= -65(+5 -0)^{\circ}C$ Pulse Method $I_R=100\mu A$ , Note 1	Note 2	-	V



2.4.3 Notes to Electrical Measurement Tables

1. For Variants 01 to 12 Pulse Width  $\leq 8.3\text{ms}$ , Duty Cycle  $\leq 2\%$ . For Variants 13, 14 Pulse Width  $\leq 680\mu\text{s}$ , 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 5 components with 0 failures allowed. Alternatively a 100% inspection may be performed.
4. Performed only during Screening Tests Parameter Drift Values (Initial Measurements), go-no-go.
5. The limits for  $\Delta V_F$  shall be defined by the Manufacturer on every lot in accordance with MIL-STD-750 Method 3101 and shall guarantee the  $R_{th(j-c)}$  limits specified in Maximum Ratings.

2.5 PARAMETER DRIFT VALUES

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

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 1 Variants 01 to 12 Variants 13, 14	$V_{F1}$	$\pm 0.05$	- -	0.875 0.88	V
Reverse Current 1  Variants 01 to 12 Variants 13, 14	$I_{R1}$	$\pm 0.15$ or (1) $\pm 100\%$	- -	1 0.5	$\mu\text{A}$

**NOTES:**

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

2.6 INTERMEDIATE AND END-POINT ELECTRICAL MEASUREMENTS

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

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 $\Delta$ Note 2	Absolute		
			Min		Max
Forward Voltage 1 Variants 01 to 12 Variants 13, 14	$V_{F1}$	$\pm 0.05$	- -	0.875 0.88	V
Reverse Current 1  Variants 01 to 12 Variants 13, 14	$I_{R1}$	$\pm 0.15$ or (1) $\pm 100\%$	- -	1 0.5	$\mu A$

**NOTES:**

1. Whichever is the greater referred to the initial value.
2. Drift values only apply to Variants 01 to 12.

2.7 HIGH TEMPERATURE REVERSE BIAS BURN-IN CONDITIONS

Characteristics	Symbols	Limits	Units
Ambient Temperature	$T_{amb}$	+150 (+0 -5)	$^{\circ}C$
Reverse Voltage	$V_R$	$0.8 \times V_{RWM}$ (Note 1)	V
Duration	t	72 (Variants 01 to 12) $\geq 48$ (Variants 13, 14)	hours

**NOTES:**

1. See Component Type Variants for  $V_{RWM}$  value.

2.8 POWER BURN-IN CONDITIONS

For Variants 01 to 12

Characteristics	Symbols	Test Conditions	Units
Ambient Temperature	$T_{amb}$	$+22 \pm 3$	$^{\circ}C$
Working Peak Reverse Voltage	$V_{RWM}$	Note 1	V
Average Output Rectified Current	$I_O$	1.0 f=50 to 60 Hz	A

For Variants 13, 14

Characteristics	Symbols	Test Conditions	Units
Ambient Temperature	$T_{amb}$	$+22 \pm 3$	$^{\circ}C$
Junction Temperature	$T_j$	+175 (+0 -5)	$^{\circ}C$
Average Output Rectified Current	$I_O$	Note 2	A

**NOTES:**

1. See Component Type Variants for  $V_{RWM}$  value.
2. The output current may be adjusted, within the given limit range, to attain the specified junction temperature.

## 2.9

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 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.
Room Temperature Electrical Measurements	All AC characteristics ( $C$ , $t_{rr}$ , $t_{fr}$ , $V_{fr}$ ) 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.

**TABLE 1(a)- Type Variants**

Variant	Based on Type	Case	Figure	Breakdown Voltage V(BR) (V)	Working Peak Reverse Voltage VRWM (V)	Lead/Terminal Material and Finish
13	1N5806U	LCC2A	2(d)	150	150	2
14	1N5806U	LCC2A	2(d)	150	150	4

**Justification .**

Variant 13: new ST variant introduction with LCC2A package

Variant 14: new ST variant introduction with LCC2A package

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

N°	Characteristics	Symbols	Maximum Ratings	Unit	Remarks
1	Forward Surge Current (per Diode) Variants 01 to 12 Variants 13 to 14	IFSM	35 33	A(pk) A	At Tamb ≤ +25°C Note 1 Note 7
3	Average Output Rectified Current Variants 01 to 12 Variants 13 to 14	IO	1 2.5	A A	50%Duty Cycle Note 3 Note 8
4	Operating Temperature Range Variants 01 to 12 Variants 13 to 14 (Case Temperature)	Top Top	-65 to +175 -65 to +175	°C °C	Tamb Note 9
added	Junction Temperature Variants 13 to 14	Tj	+175	°C	
5	Storage Temperature Range	Tstg	-65 to +175	°C	Note 9
6	Soldering Temperature Variant 01 to 09 Variant 10 to 12 Variant 13 to 14	Tsol	+245	°C	Note 4 Note 5 Note 10
added	Thermal Resistance, Junction to Case Variant 13 to 14	Rth(j-c)	13	°C/W	Note 11

**NOTES:**

7. Sinusoidal pulse of 10ms duration.

8. For Variants 13 to 14 at Tcase ≥ +142°C per Diode, derate linearly to 0A at +175°C.

9. For Variants with hot solder dip lead finish all testing performed at Tamb > +125°C shall be carried out in a 100% inert atmosphere.

10. Duration 5 seconds maximum. The same package must not be resoldered until 3 minutes have elapsed.

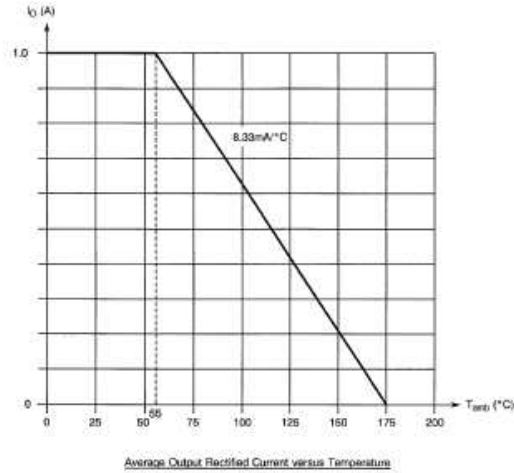
11. Package mounted on infinite heatsink.

**Justification .**

Variant 13: new ST variant introduction with LCC2A package

Variant 14: new ST variant introduction with LCC2A package

**FIGURE 1 – PARAMETER DERATING INFORMATION (Not Applicable for the variants 13 to 14)**



**Justification .**

Variant 13: new ST variant introduction with LCC2A package

Variant 14: new ST variant introduction with LCC2A package

**Figure 2(d)- Variant 13 to 14 - Leadless Chip Carrier 2 (LCC2A) – 2 Terminal**

Ref	Dimensions					
	Millimeters			Inches		
	Min	Typ	Max	Min	Typ	Max
A <sup>(2)</sup>	1.86	2.03	2.20	0.073	0.080	0.087
B	4.54	4.67	4.87	0.179	0.184	0.192
C	2.33	2.46	2.59	0.092	0.097	0.102
D	1.53	1.7	1.87	0.060	0.067	0.074
E	0.48		0.71	0.019		0.031
F		1.3			0.051	
G		2.16			0.085	
H		0.86			0.034	
I		0.15			0.006	
r1		0.15			0.006	
r2		0.20			0.008	

**Notes:**

1. The anode is identified by metallization in two castellation and by the index mark on the bottom metallization n°1.
2. Measurement prior to solder coating the mounting pads on bottom of package.

**Justification .**

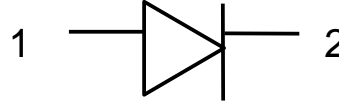
Variant 13: new ST variant introduction with LCC2A package

Variant 14: new ST variant introduction with LCC2A package

**FIGURE 3 - FUNCTIONAL DIAGRAM**

**Variants 13 to 14**

Terminal 1: Anode  
Terminal 2: Cathode



**Notes:**

1. For LCC2, the lid is not connected to any lead.

**Justification .**

Variant 13: new ST variant introduction with LCC2A package  
Variant 14: new ST variant introduction with LCC2A package

**4.2.2 Deviations from Final Production Tests (Chart II)**

- (a) Para. 9.2.1, Bond Strength Test: Not applicable; **excepted for the variants 13 to 14 (Applicable in the Chart F2 of the ESCC N°5000 Issue 3).**
- (b) Para. 9.2.2, Die Shear Test: Not applicable; **excepted for the variants 13 to 14 (Applicable in the Chart F2 of the ESCC N°5000 Issue 3).**
- (c) At any time following Para. 9.5.1, Thermal Shock Test, Thermal impedance measurements shall be performed in accordance with MIL-STD-750, TEST Method 3101 as specified in Table 2, item 9. **For the variants 13 to 14 (the thermal impedance and the thermal shock applicable in the Chart F3 of the ESCC N°5000 Issue 3).**
- (d) Para. 9.6, Constant Acceleration: Not applicable; **excepted for the variants 13 to 14 (Applicable in the Chart F4 Subgroup 1 of the ESCC N°5000 Issue 3).**
- (e) Para. 9.7 Particle Impact Noise Detection (PIND) test: Not applicable **excepted for the variants 13 to 14 (Applicable in the Chart F3 of the ESCC N°5000 Issue 3).**
- (f) Para. 9.8.1, Seal Test Fine Leak: Not applicable **excepted for the variants 13 to 14 (Applicable in the Chart F3 of the ESCC N°5000 Issue 3).**
- (g) .....**Excepted for the variants 13 to 14: N/A.**
- (h) .....**Excepted for the variants 13 to 14: N/A**

**Justification .**

Variant 13: new ST variant introduction with LCC2A package  
Variant 14: new ST variant introduction with LCC2A package

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

- (b) Para. 9.8.1 Seal Test Fine Leak: Not applicable **excepted for the variants 13 to 14 (Applicable in the Chart F3 of the ESCC N°5000 Issue 3).**
- (c) Para. 9.12, Radiographic Inspection: Not applicable **excepted for the variants 13 to 14 (Applicable in the Chart F3 of the ESCC N°5000 Issue 3).**

**Justification .**

Variant 13: new ST variant introduction with LCC2A package  
Variant 14: new ST variant introduction with LCC2A package

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

- (a) Para. 9.2.3, Bond Strength Test: Not applicable **excepted for the variants 13 to 14 (Applicable in the Chart F4 Subgroup 3 of the ESCC N°5000 Issue 3).**
- (b) Para. 9.2.4, Die Shear Test: Not applicable **excepted for the variants 13 to 14 (Applicable in the Chart F4 Subgroup 3 of the ESCC N°5000 Issue 3).**



(c) Para. 9.8.1, Seal Test Fine Leak: Not applicable excepted for the variants 13 to 14 (Applicable in the Chart F4 Subgroup 1 and 2 of the ESCC N°5000 Issue 3).

(d) Para. 9.15, Constant Acceleration: Not applicable excepted for the variants 13 to 14 (Applicable in the Chart F4 Subgroup 1 of the ESCC N°5000 Issue 3).

**Justification .**

Variant 13: new ST variant introduction with LCC2A package  
Variant 14: new ST variant introduction with LCC2A package

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

(a) Para. 9.8.1, Seal Test Fine Leak: Not applicable excepted for the variants 13 to 14 (Applicable in the Chart F4 Subgroup 1 and 2 of the ESCC N°5000 Issue 3).

(b) Para. 9.15, Constant Acceleration: Not applicable excepted for the variants 13 to 14 (Applicable in the Chart F4 Subgroup 1 of the ESCC N°5000 Issue 3).

**Justification .**

Variant 13: new ST variant introduction with LCC2A package  
Variant 14: new ST variant introduction with LCC2A package

**4.3.2 Weight**

The maximum weight of the diodes specified herein shall be 0.25 grammes for the variants 01 to 06, 0.4 grammes for variant 07 to 09, 0.3 grammes for variant 10 to 12 and 0.12 grammes for the variants 13 to 14.

**Justification .**

Variant 13: new ST variant introduction with LCC2A package  
Variant 14: new ST variant introduction with LCC2A package

**4.3.3 Terminal Strength**

For the variants 13 to 14: MIL-STD-883 test method 2004 Cond D (Applicable in the Chart F4 Subgroup 3 of the ESCC N°5000 Issue 3).

**4.4.1 Case**

The case shall be hermetically sealed and have an Aln body with kovar lid for the variants 13 to 14.

**Justification .**

Variant 13: new ST variant introduction with LCC2A package  
Variant 14: new ST variant introduction with LCC2A package

**4.4.2 Lead Material and Finish**

For the variants 13 to 14 leads/terminals as specified in the Table 1a.

**Justification .**


Variant 13: new ST variant introduction with LCC2A package  
Variant 14: new ST variant introduction with LCC2A package

**4.5.1 General**

For the variants 13 to 14 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:



	<p align="center"><b>Detail specification</b> BE/SS/0707901.ce</p>	<p align="center"><b>Issue : 4 Rev.</b></p>
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(a) The ESCC qualified components symbol (for ESCC qualified components only).

(b) The ESCC Component Number.

(c) Traceability information.

**Justification .**

Variant 13: new ST variant introduction with LCC2A package

Variant 14: new ST variant introduction with LCC2A package

**4.6.2 Electrical Measurements at high an Low Temperatures**

The parameters to be measured at high and low temperatures are scheduled in Table 3(a) and 3(b).

For the variants 01 to 12, the measured shall be performed at Tamb = +100 (+0-5) and tamb = 65 (+5-0) °C respectively.

For the variants 13 to 14, the measured shall be performed at Tamb = +125 (+0-5) and tamb = -65 (+5-0) °C respectively.

**Justification .**

Variant 13: new ST variant introduction with LCC2A package

Variant 14: new ST variant introduction with LCC2A package

**4.6.3 Circuits for Electrical Measurements**

For the variants 13 to 14: Not Applicable.

**Justification .**

Variant 13: new ST variant introduction with LCC2A package

Variant 14: new ST variant introduction with LCC2A package

**4.7.3 Conditions for Power Burn-in**

The requirements for power burn-in are specified in Section 7 of ESA/SCC Generic Specification No. 5000.

For the variants 01 to 12 the conditions for power burn-in are specified in Table 5(b) of this specification.

For the variants 13 to 14 the conditions for power burn-in are specified in Table 5(c) of this specification.

**Justification .**

Variant 13: new ST variant introduction with LCC2A package

Variant 14: new ST variant introduction with LCC2A package

**TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE**  
**D.C.PARAMETERS**

N°	Characteristics	Symbols	MIL-STD-750 Test Method	Test Conditions	Limits			Units
					Min	Typ	Max	
1	Forward Voltage	$V_{F1}$	4011	Pulse Method $I_F=1A$ , Variants 01 to 12 (Note 1)	-	-	0.875	V
				Pulse Method $I_F=1A$ , Variants 13 to 14 (Note 4)	-	-	0.880	V
2	Forward Voltage	$V_{F2}$	4011	Pulse Method $I_F=2.5A$ , Variants 01 to 12 (Note 1)	-	-	0.975	V
				Pulse Method $I_F=2.5A$ , Variants 13 to 14 (Note 4)	-	-	1	V
3	Reverse Current	$I_{R1}$	4016	DC Method Variant 01 to 12 $V_R=V_{RWM}$ (Note 2)	-	-	1	$\mu A$
				DC Method Variants 13 to 14 $V_R=V_{RWM}=150V$	-	-	1	$\mu A$
4	Breakdown Voltage	$V_{(BR)}$	4021	$I_R=-100\mu A$ Variants 01 to 12	Note 3	-	-	V
				$I_R=-100\mu A$ Variants 13 to 14	150	-	-	V

Notes

1. Pulse measurement:  $t_p = 8.3ms$  maximum.
2. See Column 6 of (Table1 (a))Pulse test:  $t_p \leq 680\mu s$ ; Duty Cycle  $\leq 2\%$
3. See Column 6 of (Table1 (a))
4. Pulse Width  $\leq 680\mu s$ ; Duty Cycle  $\leq 2\%$


Justification.

Variant 13: new ST variant introduction with LCC2A package

Variant 14: new ST variant introduction with LCC2A package

**TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - A.C. PARAMETERS**

N°	Characteristics	Symbols	MIL-STD-750 Test Method	Test Conditions	Limits			Units
					Min	Typ	Max	
5	Junction Capacitance	C <sub>J</sub>	4001	Variant 01 to 12 V <sub>R</sub> =10Vdc; f=1MHz Vsig=50mV(p-p)max (Note 1)	-	-	25	pF
				Variant 13 to 14 V <sub>R</sub> =10Vdc; f=1MHz Vsig=50mV(p-p)max (Note 4)	-	-	25	pF
6	Reverse Recovery Time	T <sub>rr1</sub>	4031 Cond. 'A'	Variants 01 to 12 I <sub>F</sub> =I <sub>R</sub> =0.5A; I <sub>RR</sub> =50mA(pk) DI/dt=-65A/μS (Note 1)	-	-	25	nS
		T <sub>rr2</sub>	4031 Cond. 'A'	Variants 13 to 14 I <sub>F</sub> = 1A; V <sub>R</sub> =30V DI/dt=-50A/μS (Note 4)	-	-	30	nS
7	Forward Recovery Time	T <sub>FR</sub>	4026	Variants 01 to 12 I <sub>F</sub> = 250mA(pk) tr=8.0ns (Note 1 and 2)	-	-	15	nS
				Variants 13 to 14 I <sub>FM</sub> = 250mA, V <sub>RF</sub> = 1.1 x V <sub>F</sub> (Note 4)	-	-	15	nS
8	Forward Recovery Voltage	V <sub>FR</sub>	4026	Variants 01 to 12 I <sub>FM</sub> = 250mA(pk) tr=8.0ns (Note 1 and 2)	-	-	2.2	V
				Variants 13 to 14 I <sub>FM</sub> = 250mA (Note 4)	-	-	2.2	V

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9	Thermal Impedance	$Z_{TH(J-C)}$	3101	<b>Variants 01 to 12</b> $I_H=5A$ ; $t_H=10ms$ $I_M=1mA$ to $10mA$ $t_{md}=100\mu s$ (Note 3)			4.5	$^{\circ}C/W$
added	Thermal Impedance	$Z_{TH(J-C)}$	3101	<b>Variants 13 to 14</b> $I_H=1$ to $10A$ ; $t_H=50ms$ $I_M=50mA$ ; $t_{md}=100\mu s$ <b>(Note 5)</b>	Calculate $\Delta VF$ , <b>(see Note 6)</b>			$^{\circ}C/W$

NOTES

1. Measurements shall be performed on a sample basic, LTPD = 7 or lower.
2. Forward Recovery Time (tfr) shall be measured as the interval between zero time and the point where the pulse has decreased to 110% of the steady value of VF when  $I_F=250mA$ . The maximum rise time of the response detector shall be 1.0ns. The maximum Forward Recovery Voltage (Vfr) shall be measured during the forward recovery interval.
3. During Chart II only.
- 4. See appendix B [Agreed Deviations for STMicroelectronics (F)]**
- 5. Performed only during Screening Tests after reliability test, 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  $R_{th(j-c)}$  limits specified in Maximum Ratings, go no go.**

**Justification .**

Variant 13: new ST variant introduction with LCC2A package  
Variant 14: new ST variant introduction with LCC2A package

**TABLE 3(a) - ELECTRICAL MEASUREMENTS AT HIGH TEMPERATURES**

N°	Characteristics	Symbols	MIL-STD-750 Test Method	Test Conditions	Limits			Units
					Min	Typ	Max	
1	Forward Voltage	V <sub>F1</sub>	4011	Pulse Method I <sub>F</sub> =1A, Note 1 Variants 01 to 12 <b>T<sub>amb</sub>= +100°C</b>	-	-	0.8	V
				<b>Variants 13 to 14 (Note 3 &amp; 4)</b> <b>T<sub>amb</sub>=+125°C</b>	-	-	<b>0.8</b>	<b>V</b>
3	Reverse Current	I <sub>R1</sub>	4016	Variant 01 to 12 DC Method V <sub>R</sub> =V <sub>RWM</sub> =Note2 <b>T<sub>amb</sub>=+100°C</b>	-	-	50	μA
				<b>Variant 13 to 14 (Note 4)</b> <b>DC Method</b> <b>V<sub>R</sub>=V<sub>RWM</sub>=150V</b> <b>T<sub>amb</sub>=+125°C</b>	-	-	<b>20</b>	<b>μA</b>

**NOTES**

1. Pulsed measurement: tp=8.3ms maximum.
2. See column 6 of Table 1(a)
3. Pulse Width ≤ 680μs; Duty Cycle ≤ 2%
4. Read and record measurements shall be performed on a sample of 5 components with 0 failures allowed. Alternatively a 100% inspection may be performed.

**Justification.**

Variant 13: new ST variant introduction with LCC2A package  
Variant 14: new ST variant introduction with LCC2A package

**TABLE 3(b) - ELECTRICAL MEASUREMENTS AT LOW TEMPERATURES**

N°	Characteristics	Symbols	MIL-STD-750 Test Method	Test Conditions	Limits			Units
					Min	Typ	Max	
1	Forward Voltage	V <sub>F1</sub>	4011	Pulse Method I <sub>F</sub> =1A, T <sub>amb</sub> =-65°C Variants 01 to 12 (Note 1)	-	-	1.075	V
				Pulse Method I <sub>F</sub> =1A, T <sub>amb</sub> =-65°C Variants 13 to 14 (Note 3 & 4)	-	-	1.075	V
4	Breakdown Voltage	V <sub>(BR)</sub>	4021	I <sub>R</sub> =-100µA T <sub>amb</sub> =-65°C Variants 01 to 12	Note 3	-	-	V
				I <sub>R</sub> =-100µA T <sub>amb</sub> =-65°C Variant 13 to 14 (Note 4)	150	-	-	V

**NOTES**

1. Pulsed measurement: tp=8.3ms maximum.
2. See column 6 of Table 1(a)
3. Pulse Width ≤ 680µs; Duty Cycle ≤ 2%
4. Read and record measurements shall be performed on a sample of 5 components with 0 failures allowed. Alternatively a 100% inspection may be performed.

**FIGURE 4 – CIRCUITS FOR ELECTRICAL MEASUREMENTS (Not Applicable for the variants 13 to 14)**

**Justification .**


Variant 13: new ST variant introduction with LCC2A package  
Variant 14: new ST variant introduction with LCC2A package

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

N°	Characteristics	Symbols	Conditions	Units
3	Duration			
	Variants 01 to 12	t	72	Hours
	Variants 13 to 14	t	≥48	Hours

**Justification .**

Variant 13: new ST variant introduction with LCC2A package  
Variant 14: new ST variant introduction with LCC2A package

	<b>Detail specification</b> BE/SS/0707901.ce	<b>Issue : 4 Rev.</b>
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**TABLE 5(c) - CONDITIONS FOR POWER BURN-IN AND OPERATING LIFE TESTS**

For the variants 13 to 14

N°	Characteristics	Symbols	Test Conditions	Units
1	Ambient Temperature	Tamb	+22 (+/-3)	°C
2	Junction Temperature	Tj	+175 (+0 -5)	°C
3	Average Output Rectified Current	IO	Note 2	A

**NOTES:**

2. The output current may be adjusted, within their given limit ranges, to attain the specified junction temperature.

**Justification .**

Variant 13: new ST variant introduction with LCC2A package

Variant 14: new ST variant introduction with LCC2A package

**TABLE 6 - ELECTRICAL MEASUREMENTS AT INTERMEDIATE POINTS AND ONCOMPLETION OF ENDURANCE TESTING**

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITIONS (Note1 and 2)	CHANGE LIMITS (Δ)	ABSOLUTE		UNIT
						MIN.	MAX.	
1	Forward Voltage Drop 1	V <sub>F1</sub>	As per Table 2	As per Table 2 Variant 01 to 12 Variant 13 to 14	+/- 50mV -	- -	0.875 0.880	V V
2	Reverse Current	I <sub>R</sub>	As per Table 2	As per Table 2 Variant 01 to 12 Variant 13 to 14	+/- 150nA -	- -	1.0	μA

**NOTES**

2. Changes limits is not applicable for the variants 13 to 14.

**Justification .**

Variant 13: new ST variant introduction with LCC2A package

Variant 14: new ST variant introduction with LCC2A package

**APPENDIX 'B'**

**AGREED DEVIATIONS FOR STMICROELECTRONICS (F)**

ITEMS AFFECTED	DESCRIPTION OF DEVIATIONS
Deviations from Production Control-Chart F2	Internal Visual Inspection: Wedge bonds equal to 1.1 wire diameter are acceptable for bonding with a V-Groove tool.
Deviations from Production Control-Chart F2	Special In-process Control Internal Visual Inspection. For CCP packages the criteria specified for voids in the filet 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 Room Temperature Electrical Measurements	All AC characteristic (Electrical Measurements at Room Temperature Note 4), may be considered guaranteed but not tested if successful pilot lot testing has been performed on the diffusion 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.

**Justification .**

Variant 13: new ST variant introduction with LCC2A package  
Variant 14: new ST variant introduction with LCC2A package