DIODE, POWER, SCHOTTKY RECTIFIER, SURFACE MOUNT

BASED ON TYPE STPS80A150, STPS60A150

ESCC Detail Specification No. 5106/023

Issue 2	July 2019

Document Custodian: European Space Agency – see https://escies.org

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DOCUMENTATION CHANGE NOTICE

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

DCR No.	CHANGE DESCRIPTION
1199	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. 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: 510602301

- Detail Specification Reference: 5106023
- Component Type Variant Number: 01

1.4.2 Component Type Variants

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

Variant Number	Based on Type	Case	Average Output Rectified Current per Device (I_O) (A)	Description	Terminal Material and Finish	Weight Max (g)
01	STPS80A150	SMD.5	80	Dual diode, common cathode	Q14	0.92
02	STPS60A150	SMD.5	60	Dual diode, common cathode	Q14	0.92

The terminal material and 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 (per diode)	I_{FSM}	190	A	Notes 1, 2
Working Peak Reverse Voltage	V_{RWM}	150	V	
Average Output Rectified Current Variant 01 (per diode) Variant 01 (per device) Variant 02 (per diode) Variant 02 (per device)	I_O	 40 80 30 60	A	Note 3
Operating Temperature Range (Case Temperature)	T_{op}	-55 to +175	°C	
Junction Temperature	T_j	+175	°C	Note 4
Storage Temperature Range	T_{stg}	-55 to +175	°C	
Soldering Temperature	T_{sol}	+245	°C	Note 5
Thermal Resistance, Junction to Case Per diode Per device	$R_{th(j-c)}$	 3.4 2.2	°C/W	
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	95	°C/W	Note 4

NOTES:

1. Sinusoidal pulse of 10ms duration.
2. At $T_{amb} \leq 25°C$.
3. For Variant 01 per diode: At $T_{case} > +33.5°C$, derate linearly to 0A at +175°C.
   For Variant 01 per device: At $T_{case} > -8°C$, derate linearly to 0A at +175°C.
   For Variant 02 per diode: At $T_{case} > +74°C$, derate linearly to 0A at +175°C.
   For Variant 02 per device: At $T_{case} > +44°C$, derate linearly to 0A at +175°C.
4. To avoid the risk of thermal runaway of a diode, on its own heatsink, the following condition shall be applied: $(dP_{tot}/dT_j) < (1/R_{th(j-a)})$
5. Duration 5s maximum and the same package shall not be resoldered until 3 minutes have elapsed.

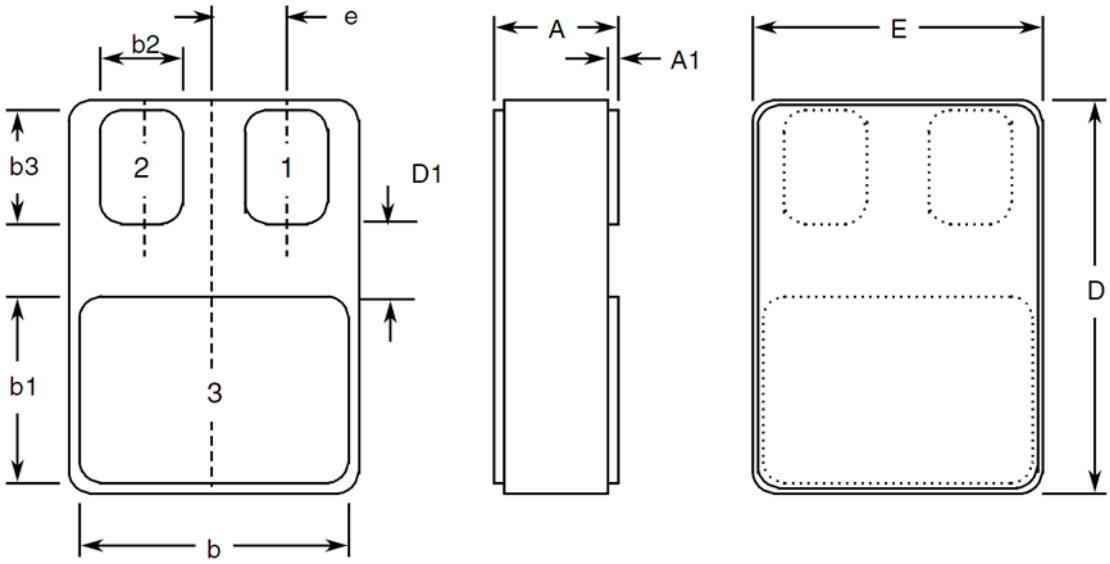
1.6 HANDLING PRECAUTIONS

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 8kV.

1.7 PHYSICAL DIMENSIONS AND TERMINAL IDENTIFICATION

Surface Mount Package (SMD.5) - 3 Terminal



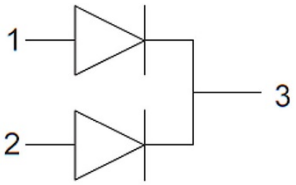
Symbols	Dimensions mm		Notes
	Min	Max	
A	2.84	3.15	
A1	0.25	0.51	
b	7.13	7.39	
b1	5.58	5.84	
b2	2.28	2.54	2
b3	2.92	3.18	2
D	10.03	10.28	
D1	0.76	-	2
E	7.39	7.64	
e	1.91 BSC		2

NOTES:

1. Terminal identification is specified by the component's geometry. See Para. 1.8 Functional Diagram for the terminal connections.
2. 2 places.

1.8 FUNCTIONAL DIAGRAM

Terminal 1: Anode 1
Terminal 2: Anode 2
Terminal 3: Common cathode



NOTES:
1. 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 a ceramic body with a Kovar lid.

(b) Terminal Finish
As specified in Para. 1.4.2 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) The ESCC qualified components symbol (for ESCC qualified components only).
(b) The ESCC Component Number (see Para. 1.4.1).
(c) 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 in Para. 2.3.3.

2.3.1 Room Temperature Electrical Measurements

The measurements shall be performed at T_{amb} = +25 ±3°C.

Characteristics	Symbols	MIL-STD-750 Test Method	Test Conditions	Limits		Units
				Min	Max	
Reverse Current	I_R	4016	DC Method V_R = 150V	-	14	µA
Forward Voltage	V_{F1}	4011	I_F = 5A, Note 2	-	0.78	V
	V_{F2}	4011	I_F = 10A, Note 2	-	0.85	V
	V_{F3}	4011	I_F = 20A, Note 2	-	0.93	V
	V_{F4}	4011	I_F = 30A, Note 2	-	0.99	V
Forward Voltage 5 (Variant 01 only)	V_{F5}	4011	I_F = 40A, Note 2	-	1.04	V
Capacitance	C	4001	V_R = 10V V_{sig} = 30mV (p-p) max f = 1MHz	-	310	pF
Critical Rate of Rise of Reverse Voltage	dV/dt	-	-	-	10000	V/µs
Thermal Impedance, Junction to Case	$Z_{th(j-c)}$	3101	Note 3	ΔV_F, Note 4		°C/W

2.3.2 High and Low Temperatures Electrical Measurements

Characteristics	Symbols	MIL-STD-750 Test Method	Test Conditions Note 4	Limits		Units
				Min	Max	
Reverse Current	I_R	4016	T_{amb} = +125 (+0 -5) °C DC Method V_R = 150V	-	8	mA
Forward Voltage	V_{F1}	4011	T_{amb} = +125 (+0 -5) °C I_F = 5A, Note 2	-	0.62	V
			T_{amb} = -55 (+5 -0) °C I_F = 5A, Note 2	-	0.84	V
	V_{F2}	4011	T_{amb} = +125 (+0 -5) °C I_F = 10A, Note 2	-	0.69	V
			T_{amb} = -55 (+5 -0) °C I_F = 10A, Note 2	-	1.03	V
	V_{F3}	4011	T_{amb} = +125 (+0 -5) °C I_F = 20A, Note 2	-	0.78	V
			T_{amb} = -55 (+5 -0) °C I_F = 20A, Note 2	-	1.435	V
	V_{F4}	4011	T_{amb} = +125 (+0 -5) °C I_F = 30A, Note 2	-	0.83	V
			T_{amb} = -55 (+5 -0) °C I_F = 30A, Note 2	-	1.87	V
Forward Voltage 5 (Variant 01 only)	V_{F5}	4011	T_{amb} = +125 (+0 -5) °C I_F = 40A, Note 2	-	0.88	V
			T_{amb} = -55 (+5 -0) °C I_F = 40A, Note 2	-	2.33	V

2.3.3 Notes to Electrical Measurements Tables

1. Measurement per each diode.
2. Pulsed measurement: Pulse Width ≤ 680µs, Duty Cycle ≤ 2%.
3. Performed only during Screening Tests Parameter Drift Values (Initial Measurements), go-no-go.
4. The limits for ΔV_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 Para. 1.5 Maximum Ratings.
5. 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} = +25 ±3°C.

The test methods and test conditions shall be as per the corresponding test defined in Para. 2.3.1, 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 Δ	Absolute		
			Min	Max	
Reverse Current	I_R	±5 or (1) ±100%	-	14	µA
Forward Voltage	V_{F1}	±0.05	-	0.78	V
	V_{F2}	±0.05	-	0.85	V
	V_{F3}	±0.05	-	0.93	V
	V_{F4}	±0.05	-	0.99	V
Forward Voltage 5 (Variant 01 only)	V_{F5}	±0.05	-	1.04	V

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} = +25 ±3°C.

The test methods and test conditions shall be as per the corresponding test defined in Para. 2.3.1, 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
		Min	Max	
Reverse Current	I_R	-	14	µA
Forward Voltage	V_{F1}	-	0.78	V
	V_{F2}	-	0.85	V
	V_{F3}	-	0.93	V
	V_{F4}	-	0.99	V
Forward Voltage 5 (Variant 01 only)	V_{F5}	-	1.04	V

2.6 HIGH TEMPERATURE REVERSE BIAS BURN-IN CONDITIONS

Characteristics	Symbols	Test Conditions	Units
Ambient Temperature	T_{amb}	+80 (+0 -5)	°C
Reverse Voltage	V_R	120	V
Duration	t	≥ 48	Hours

2.7 POWER BURN-IN CONDITIONS

Characteristics	Symbols	Test Conditions	Units
Ambient Temperature	T_{amb}	+25 (+0 -5)	°C
Junction Temperature	T_J	+175 (+0 -5)	°C
Average Output Rectified Current	I_O	Note 1	A
Duration	t	≥ 168	Hours

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 in Para. 2.7 Power Burn-in Conditions.

APPENDIX 'A'

AGREED DEVIATIONS FOR STMICROELECTRONICS (F)

ITEMS AFFECTED	DESCRIPTION OF DEVIATIONS
Para. 2.1.1, Deviations from the Generic Specification: Deviations from Production Control – Chart F2	Special In-Process Controls - Internal Visual Inspection: Wedge bonds equal to 1.1 wire diameter are acceptable for bonding with a V-Groove tool.
Para. 2.1.1, Deviations from the Generic Specification: Deviations from Screening Tests for Packaged Components – Chart F3A	Solderability: Solderability is not applicable unless specifically stipulated in the Purchase Order.
	Room Temperature Electrical Measurements: Capacitance and Critical Rate of Rise of Reverse Voltage may be considered guaranteed but not tested if successful pilot lot testing has been performed in accordance with STMicroelectronics "Acceptation wafers" internal procedure as specified in the PID, 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.

APPENDIX 'B'

ADDITIONAL DATA – STMICROELECTRONICS (F)

(a) Derating for Space Application

The derating for space applications was originally obtained on STPS60A150 devices under the following test conditions. A Post-Irradiation Gate Stress (PIGS) test has been done after irradiation. The testing was performed in a vacuum at UCL (Louvain-la-Neuve, Belgium):

Ions used: Xe and Kr
LET = 62.5 and 32.4MeV/(mg/cm²) resp.
Energy = 995 and 769MeV resp.
Range = 73.1 and 94.2 µm(Si) resp.

These components are susceptible to Single Event Burn-out (SEB) if operated in a space environment unless the following derating is applied:

V_R (V) / LET (MeV.cm²/mg)	150	127.5	85
32.4	OK		
62.5	**SEB**	**PIST ***	OK

* Test samples found to be out-of-spec for Reverse Leakage Current parameter during **P**ost-**I**rradiation **ST**ress testing.