



**DIODE, POWER, SCHOTTKY RECTIFIER,
SURFACE MOUNT**

BASED ON TYPE STPS80A150, STPS60A150

ESCC Detail Specification No. 5106/023

| | |
|---------|---------------|
| Issue 1 | November 2018 |
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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 | I_o | | A | Note 3 |
| Variant 01 (per diode) | | 40 | | |
| Variant 01 (per device) | | 80 | | |
| Variant 02 (per diode) | | 30 | | |
| Variant 02 (per device) | | 60 | | |
| 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 | $R_{th(j-c)}$ | 2.2 | °C/W | |
| Thermal Resistance, Junction to Ambient | $R_{th(j-a)}$ | 95 | °C/W | Note 4 |

NOTES:

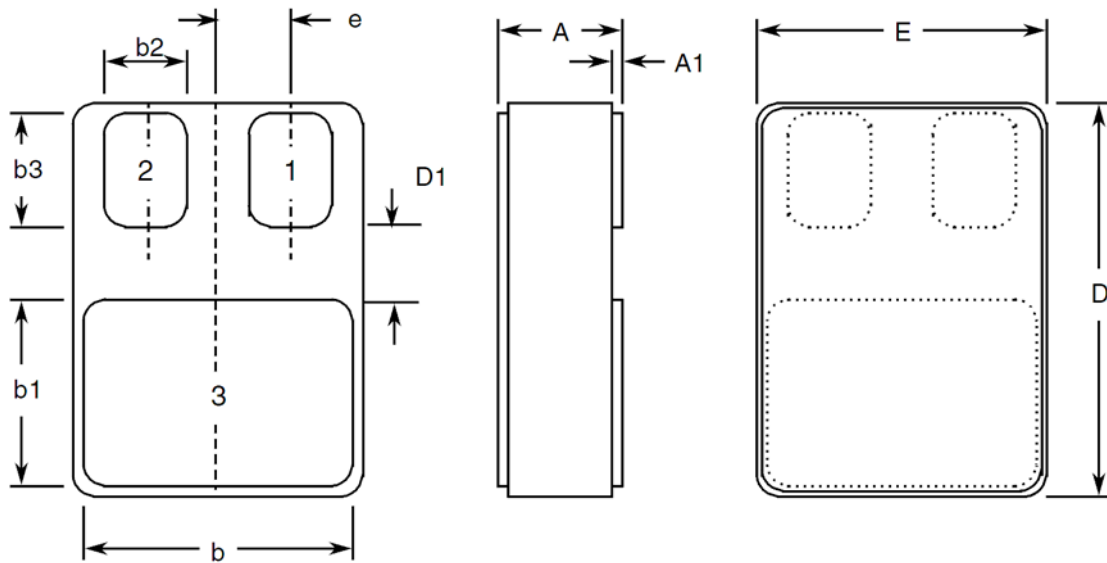
1. Sinusoidal pulse of 10ms duration.
2. At $T_{amb} \leq 25^\circ\text{C}$.
3. For Variant 01: At $T_{case} > +109^\circ\text{C}$, derate linearly to 0A at $+175^\circ\text{C}$.
For Variant 02: At $T_{case} > +83^\circ\text{C}$, derate linearly to 0A at $+175^\circ\text{C}$.
4. To avoid the risk of 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



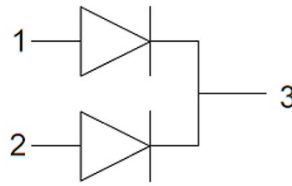
| Symbols | Dimensions mm | | Notes |
|---------|---------------|-------|-------|
| | Min | Max | |
| A | 2.84 | 3.15 | |
| A1 | 0.25 | 0.51 | |
| b | 7.13 | 7.39 | |
| b1 | 5.58 | 5.84 | |
| b2 | 2.28 | 2.54 | 2 |
| b3 | 2.92 | 3.18 | 2 |
| D | 10.03 | 10.28 | |
| D1 | 0.76 | - | 2 |
| E | 7.39 | 7.64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

2.1.1.1 *Deviations from Qualification and Periodic Tests – Chart F4*

- (a) Constant Acceleration is not applicable.
- (b) Terminal Strength is not applicable.

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 after the Tables (see Para. 2.3.3).

2.3.1 Room Temperature Electrical Measurements

The measurements shall be performed at $T_{amb} = +25 \pm 3^{\circ}\text{C}$.

| Characteristics | Symbols | MIL-STD-750 Test Method | Test Conditions | Limits | | Units |
|---|---------------|----------------------------|--|-----------------------|-------|----------------------|
| | | | | Min | Max | |
| Reverse Current | I_R | 4016 | DC Method $V_R = 150\text{V}$ | - | 14 | μA |
| Forward Voltage | V_{F1} | 4011 | $I_F = 5\text{A}$, Note 2 | - | 0.78 | V |
| | V_{F2} | 4011 | $I_F = 10\text{A}$, Note 2 | - | 0.85 | V |
| | V_{F3} | 4011 | $I_F = 20\text{A}$, Note 2 | - | 0.93 | V |
| | V_{F4} | 4011 | $I_F = 30\text{A}$, Note 2 | - | 0.99 | V |
| Forward Voltage 5 (Variant 01 only) | V_{F5} | 4011 | $I_F = 40\text{A}$, Note 2 | - | 1.04 | V |
| Capacitance | C | 4001 | $V_R = 10\text{V}$ $V_{sig} = 30\text{mV}$ (p-p) max $f = 1\text{MHz}$ | - | 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 | | $^{\circ}\text{C/W}$ |

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 | $T_{amb} = +125 (+0 -5)^{\circ}\text{C}$ DC Method $V_R = 150\text{V}$ | - | 8 | μA |
| Forward Voltage | V_{F1} | 4011 | $T_{amb} = +125 (+0 -5)^{\circ}\text{C}$ $I_F = 5\text{A}$, Note 2 | - | 0.62 | V |
| | | | $T_{amb} = -55 (+5 -0)^{\circ}\text{C}$ $I_F = 5\text{A}$, Note 2 | - | 0.84 | V |
| | V_{F2} | 4011 | $T_{amb} = +125 (+0 -5)^{\circ}\text{C}$ $I_F = 10\text{A}$, Note 2 | - | 0.69 | V |
| | | | $T_{amb} = -55 (+5 -0)^{\circ}\text{C}$ $I_F = 10\text{A}$, Note 2 | - | 1.03 | V |
| | V_{F3} | 4011 | $T_{amb} = +125 (+0 -5)^{\circ}\text{C}$ $I_F = 20\text{A}$, Note 2 | - | 0.78 | V |
| | | | $T_{amb} = -55 (+5 -0)^{\circ}\text{C}$ $I_F = 20\text{A}$, Note 2 | - | 1.435 | V |
| | V_{F4} | 4011 | $T_{amb} = +125 (+0 -5)^{\circ}\text{C}$ $I_F = 30\text{A}$, Note 2 | - | 0.83 | V |
| | | | $T_{amb} = -55 (+5 -0)^{\circ}\text{C}$ $I_F = 30\text{A}$, Note 2 | - | 1.87 | V |
| Forward Voltage 5 (Variant 01 only) | V_{F5} | 4011 | $T_{amb} = +125 (+0 -5)^{\circ}\text{C}$ $I_F = 40\text{A}$, Note 2 | - | 0.88 | V |
| | | | $T_{amb} = -55 (+5 -0)^{\circ}\text{C}$ $I_F = 40\text{A}$, Note 2 | - | 2.33 | V |

2.3.3 Notes to Electrical Measurements Tables

1. Measurement per each diode.
2. Pulsed measurement: Pulse Width $\leq 680\mu\text{s}$, Duty Cycle $\leq 2\%$.
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 $T_{amb} = +25 \pm 3^\circ\text{C}$.

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) $\pm 100\%$ | - | 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 $T_{amb} = +25 \pm 3^{\circ}\text{C}$.

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) | $^{\circ}\text{C}$ |
| 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) | $^{\circ}\text{C}$ |
| Junction Temperature | T_J | +150 (+0 -5) | $^{\circ}\text{C}$ |
| Average Output Rectified Current | I_o | Note 1 | A |
| Duration | t | ≥ 168 | Hours |

NOTES:

- 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 | <p>Solderability: Solderability is not applicable unless specifically stipulated in the Purchase Order.</p> <p>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.</p> <p>A summary of the pilot lot testing shall be provided if required by the Purchase Order.</p> |

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) | 150 | 127.5 | 85 |
| LET (MeV.cm ² /mg) | OK | | |
| 32.4 | SEB | PIST * | OK |

* Test samples found to be out-of-spec for Reverse Leakage Current parameter during Post-Irradiation **ST**ress testing.