DIODES, POWER RECTIFIER, SCHOTTKY BARRIER

BASED ON TYPE STPS1045

ESCC Detail Specification No. 5106/017

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DOCUMENTATION CHANGE NOTICE

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DCR No.	CHANGE DESCRIPTION
1365	Specification updated to incorporate changes per DCR.

TABLE OF CONTENTS

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: 510601701

- Detail Specification Reference: 5106017
- 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	Description	Terminal Material and Finish	Weight max g
01	STPS1045	SMD.5	Single diode	Q14	2
02	STPS1045	SMD.5	Dual diode, common cathode	Q14	2

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.

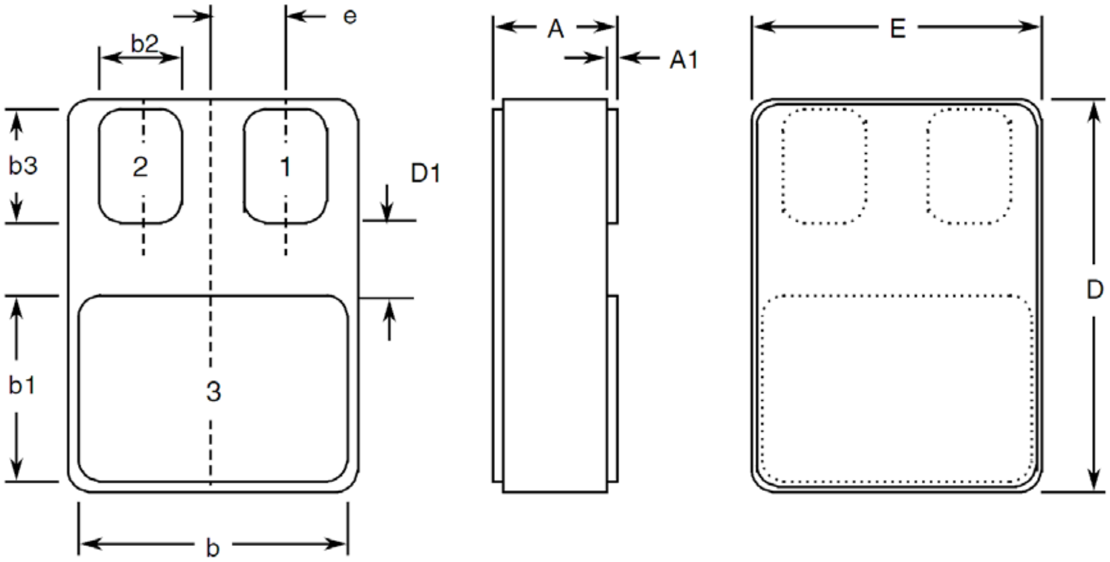
Characteristics	Symbols	Maximum Ratings	Unit	Remarks
Forward Surge Current (per Diode)	I_{FSM}	200	A	Note 1
Repetitive Peak Reverse Voltage	V_{RRM}	45	V	Note 2
Repetitive Peak Reverse Current	I_{RRM}	1	A	Note 3
Average Output Rectified Current Variants 01 and 02 (per Diode) Variant 02 (per Device)	I_O	 10 20	A	50% Duty Cycle Notes 4, 7
RMS Forward Current (per Diode)	$I_{F(rms)}$	15	A	
Operating Temperature Range (Case Temperature)	T_{op}	-65 to +175	°C	
Junction Temperature	T_J	+175	°C	
Storage Temperature Range	T_{stg}	-65 to +175	°C	
Soldering Temperature	T_{sol}	+245	°C	Note 5
Critical Rate of Rise of Reverse Voltage	dV/dt	10000	V/µs	
Thermal Resistance, Junction to Case Variant 01 and 02 (per Diode) Variant 02 (per Device)	$R_{th(j-c)}$	 2.8 1.6	°C/W	Notes 6, 7

NOTES:

1. Sinusoidal pulse of 10ms duration.
2. Pulsed, duration 5ms, f = 50Hz.
3. Pulsed, duration 2µs, f = 1kHz.
4. For Variants 01 and 02 per Diode at T_{case} > +154°C, or Variant 02 per Device at T_{case} > +151°C, derate linearly to 0A at +175°C.
5. Duration 5 seconds maximum and the same package shall not be resoldered until 3 minutes have elapsed.
6. Package mounted on infinite heatsink.
7. For Variant 02 the “per Device” ratings apply only when both anode terminals are tied together.

1.6 PHYSICAL DIMENSIONS AND TERMINAL IDENTIFICATION

1.6.1 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	5
b3	2.92	3.18	5
D	10.03	10.28	
D1	0.76	-	5
E	7.39	7.64	
e	1.91 BSC		5

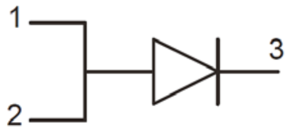
NOTES:

1. The terminal identification is specified by the component’s geometry. See Para. 1.7 Functional Diagram for the terminal connections.
2. 2 places.

1.7 FUNCTIONAL DIAGRAM

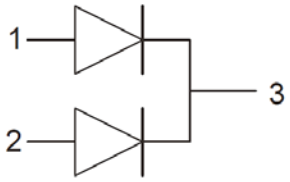
Variant 01

Terminal 1 and 2: Anode
Terminal 3: Cathode



Variant 02

Terminal 1: Anode a
Terminal 2: Anode b
Terminal 3: Common Cathode



NOTES:

1. The lid is not connected to any terminal.

1.8 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) Terminals
As specified in Para. 1.4.2.

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 Deviation from Screening Tests - Chart F3

(a) High Temperature Reverse Bias Burn-in and the subsequent Final Measurements for HTRB shall be omitted.

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 $T_{amb} = +22 \pm 3°C$.

Characteristics	Symbols	MIL-STD-750 Test Method	Test Conditions Note 1	Limits		Units
				Min	Max	
Reverse Current	I_R	4016	DC Method $V_R = 45V$	-	100	µA
Forward Voltage	V_{F1}	4011	Pulse Method $I_F = 3A$, Note 2	-	620	mV
	V_{F2}	4011	Pulse Method $I_F = 10A$, Note 2	-	750	mV
	V_{F3}	4011	Pulse Method $I_F = 20A$, Note 2	-	880	mV
Capacitance	C	4001	$V_R = 5V$ f = 1MHz	-	500	pF
Thermal Impedance, Junction to Case	$Z_{th(j-c)}$	3101	$I_H = 15$ to 40A $t_H = 50ms$ $I_M = 50mA$ $t_{md} = 100µs$ Note 3	(Calculate ΔV_F, see Note 4)		°C/W

2.3.2 High and Low Temperatures Electrical Measurements

Characteristics	Symbols	MIL-STD-750 Test Method	Test Conditions Notes 1 and 5	Limits		Units
				Min	Max	
Reverse Current	I_R	4016	T_{case} = +125 (+0 -5)°C DC Method V_R = 45V	-	15	mA
Forward Voltage	V_{F1}	4011	T_{case} = +125 (+0 -5)°C Pulse Method I_F = 3A, Note 3	-	570	mV
	V_{F2}	4011	T_{case} = +125 (+0 -5)°C Pulse Method I_F = 10A, Note 3	-	700	mV
			T_{case} = -55 (+5 -0)°C Pulse Method I_F = 10A, Note 3	-	850	
	V_{F3}	4011	T_{case} = +125 (+0 -5)°C Pulse Method I_F = 20A, Note 3	-	800	mV

2.3.3 Notes to Electrical Measurement Tables

1. Measurement per each diode.
2. 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} = +22 ±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	±25 or (1) ±100%	-	100	µA
Forward Voltage	V_{F1}	±50	-	620	mV
	V_{F3}	±50	-	880	mV

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 ±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 limit values for each characteristic shall not be exceeded.

Characteristics	Symbols	Limits		Units
		Min	Max	
Reverse Current	I_R	-	100	µA
Forward Voltage	V_{F1}	-	620	mV
	V_{F2}	-	750	mV
	V_{F3}	-	880	mV

2.6 POWER BURN-IN CONDITIONS

Characteristics	Symbols	Test Conditions	Units
Case Temperature	T_{case}	+125	°C
Reverse Voltage	V_R	36	V

2.7 OPERATING LIFE CONDITIONS

The conditions shall be as specified in Para. 2.6 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: Para. 8, Test Methods and Procedures	For qualification and qualification maintenance, or procurement of qualified or unqualified components, the following replacement test method specifications shall be used instead of the following ESCC Basic Specifications: • No. 20400, Internal Visual Inspection: replaced by MIL-STD-750 Test Method 2078. • No. 20500, External Visual Inspection: replaced by MIL-STD-750 Test Method 2071. • No. 20900, Radiographic Inspection of Electronic Components: replaced by MIL-STD-750 Test Method 2076.
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. 2.1.1.1, Deviations from the Generic Specification: Deviations from Screening Tests - Chart F3	Solderability is not applicable unless specifically stipulated in the Purchase Order.