DIODES, POWER RECTIFIER, SCHOTTKY BARRIER

BASED ON TYPE STPS20100

ESCC Detail Specification No. 5106/016

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DOCUMENTATION CHANGE NOTICE

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

DCR No.	CHANGE DESCRIPTION
1218	Specification upissued 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: 510601601

- Detail Specification Reference: 5106016
- 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	Lead/Terminal Material and Finish	Weight max g
01	STPS20100	TO-254	Single diode	H9	10
02	STPS20100	TO-254	Dual diode, common anode	H9	10
03	STPS20100	TO-254	Dual diode, common cathode	H9	10
04	STPS20100	TO-254	Dual diode, series, centre tapped	H9	10
05	STPS20100	SMD.5	Single diode	Q14	2
06	STPS20100	SMD1	Single diode	Q14	3
07	STPS20100	SMD1	Dual diode, common cathode	Q14	3
08	STPS20100	TO-254	Dual diode, common anode	H14	10
09	STPS20100	TO-254	Dual diode, common anode	H4	10

Variant Number	Based on Type	Case	Description	Lead/Terminal Material and Finish	Weight max g
10	STPS20100	TO-254	Dual diode, common cathode	H14	10
11	STPS20100	TO-254	Dual diode, common cathode	H4	10

The lead/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}	250	A	Note 1
Repetitive Peak Reverse Voltage	V_{RRM}	100	V	Note 2
Repetitive Peak Reverse Current	I_{RRM}	1	A	Note 3
Average Output Rectified Current	I_O		A	50% duty cycle Notes 4, 9
All Variants (per Diode)		20		
Variants 02, 03, 07, 08, 09, 10, 11 (per Device)		40		
RMS Forward Current (Per Diode)	$I_{F(rms)}$	30	A	
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}		°C	
For TO-254		+260		Note 6
For SMD.5 and SMD1		+245		Note 7
Critical Rate of Rise of Reverse Voltage	dV/dt	10000	V/µs	
Thermal Resistance, Junction to Case	$R_{th(j-c)}$		°C/W	Notes 8, 9
Variants 01, 05 and 06		1.65		
Variants 02, 03, 04, 07, 08, 09,10, 11 (per Diode)		1.65		
Variants 02, 03, 07, 08, 09, 10, 11 (per Device)		0.85		

NOTES:

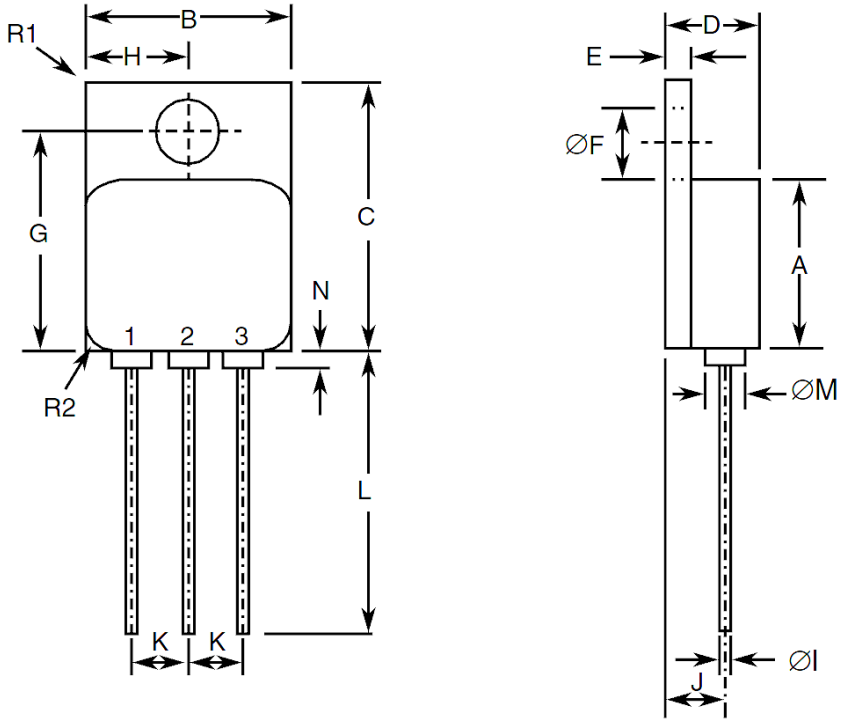
1. Sinusoidal pulse of 10ms duration.
2. Pulsed, duration 5ms, f = 50Hz.
3. Pulsed, duration 2µs, f = 1kHz.
4. For T_{case} > +140ºC, derate linearly to 0A at +175ºC.
5. For Variants with hot solder dip lead finish all testing performed at T_{amb} > +125ºC shall be carried out in a 100% inert atmosphere.
6. Duration 10 seconds maximum at a distance of not less than 1.5mm from the device body and the same lead shall not be resoldered until 3 minutes have elapsed.
7. Duration 5 seconds maximum and the same package shall not be resoldered until 3 minutes have elapsed.
8. Package mounted on infinite heatsink.
9. The "per Device" ratings apply only as follows:
   Variant 02, 08 and 09: when both cathode terminals are tied together.
   Variants 03, 07, 10 and 11: when both anode terminals are tied together.

1.6 HANDLING PRECAUTIONS

The TO-254 package contains Beryllium Oxide (BeO) and therefore it must not be ground, machined, sandblasted or subjected to any mechanical operation which will produce dust. The case must not be subjected to any chemical process (e.g. etching) which will produce fumes.

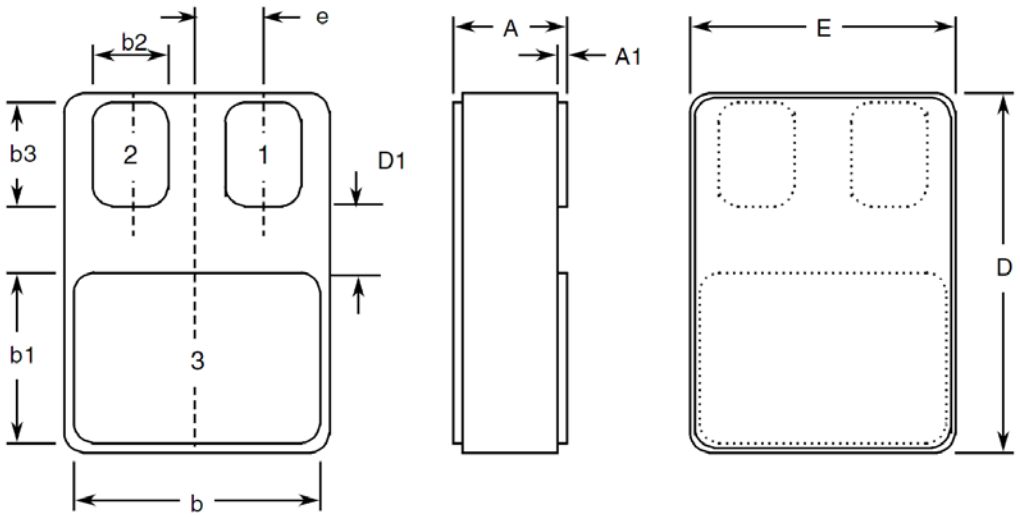
1.7 PHYSICAL DIMENSIONS AND TERMINAL IDENTIFICATION
Consolidated Notes are given in Para. 1.7.4.

1.7.1 Metal Flange Mount Package (TO-254) - 3 lead



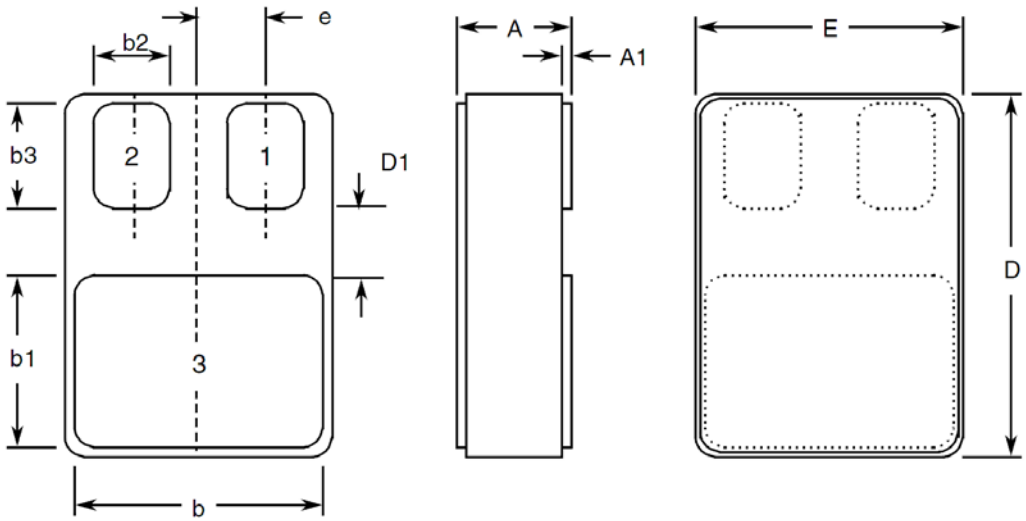
Symbols	Dimensions mm		Notes
	Min	Max	
A	13.59	13.84	
B	13.59	13.84	
C	20.07	20.32	
D	6.3	6.7	
E	1	1.35	
ØF	3.5	3.9	
G	16.89	17.4	
H	6.86 BSC		
ØI	0.89	1.14	2
J	3.81 BSC		
K	3.81 BSC		
L	12.95	14.5	
ØM	3.05 Typical		2
N	-	0.71	2
R1	-	1	3
R2	1.65 Typical		4

1.7.2 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

1.7.3 Surface Mount Package (SMD1) - 3 terminal



Symbols	Dimensions mm		Notes
	Min	Max	
A	3.3	3.61	
A1	0.25	0.51	
b	9.4	9.65	
b1	10.41	10.67	
b2	3.43	3.68	5
b3	3.86	4.11	5
D	15.75	16	
D1	0.76	-	5
E	11.3	11.56	
e	2.67 BSC		5

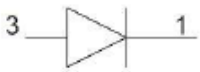
1.7.4 Notes to Physical Dimensions and Terminal Identification

1. The terminal identification is specified by the component's geometry. See Para. 1.8 Functional Diagram for the terminal connections.
2. 3 places.
3. Radius of heatsink flange corner, 4 places.
4. Radius of body corner, 4 places.
5. 2 places.

1.8 FUNCTIONAL DIAGRAM

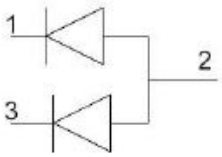
Variant 01

Terminal 1: Cathode
Terminal 2: No connection
Terminal 3: Anode



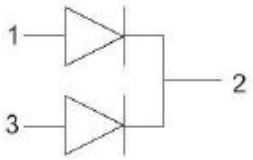
Variants 02, 08 and 09

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



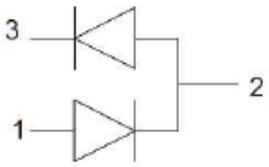
Variants 03, 10 and 11

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



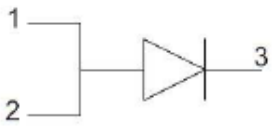
Variant 04

Terminal 1: Anode a
Terminal 2: Centre Tap
Terminal 3: Cathode b



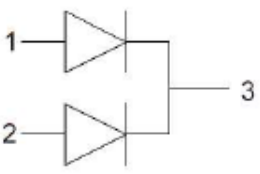
Variants 05 and 06

Terminals 1 and 2: Anode
Terminal 3: Cathode



Variant 07

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



NOTES:

1. For TO-254, the case is not connected to any lead.
2. For SMD.5 and SMD1, the lid is not connected to any terminal.

1.9 MATERIALS AND FINISHES

Materials and finishes shall be as follows:

(a) Case
For the metal flange mount package the case shall be hermetically sealed and have a metal body. The leads pass through ceramic eyelets brazed into the frame and the lid shall be welded.

For the surface mount packages the case shall be hermetically sealed and have a ceramic body with a Kovar lid.

(b) Leads/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.
(d) Warning sign for Beryllium Oxide (TO-254 only).

2.3 CASE ISOLATION

For Variants 01, 02, 03, 04, 08, 09, 10 and 11, Case Isolation shall be performed as specified in the ESCC Generic Specification and as follows:

- Test Conditions:
  - Test voltage: 500Vdc
  - Duration of application of test voltage: 1s
  - Points of application of test voltage: between case metal tab and all terminals connected together.
  - Maximum leakage current: 10nA

2.4 TERMINAL STRENGTH

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

For TO-254, Test Condition: A, tension, with an applied force of 10N and a duration of 10s.

2.5 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. 2.5.3.

2.5.1 Room Temperature Electrical Measurements

The measurements shall be performed at T_{amb} = +22 ±3ºC.

Characteristics	Symbols	MIL-STD-750 Test Method	Test Conditions Note 1	Limits		Units
				Min	Max	
Reverse Current	I_R	4016	DC Method V_R = 100V	-	30	µA
Forward Voltage	V_{F1}	4011	Pulse Method I_F = 10A Note 2	-	780	mV
	V_{F2}	4011	Pulse Method I_F = 20A Note 2	-	1	V
Capacitance	C	4001	V_R = 10V f = 1MHz	-	700	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

2.5.2 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 = 100V	-	20	mA
Forward Voltage 2	V_{F2}	4011	T_{case} = +125 (+0 -5)°C Pulse Method I_F = 20A Note 2	-	900	mV
			T_{case} =-55 (+5 -0)°C Pulse Method I_F = 20A Note 2	-	1.1	V

2.5.3 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.

2.6 PARAMETER DRIFT VALUES

Unless otherwise specified, the measurements shall be performed at T_{amb} = +22 ±3ºC.

The test methods and test conditions shall be as per the corresponding test defined in Para. 2.5.1, 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	±4 or (1) ±100%	-	30	µA
Forward Voltage 1	V_{F1}	±10	-	780	mV

NOTES:

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

2.7 INTERMEDIATE AND END-POINT ELECTRICAL MEASUREMENTS

Unless otherwise specified, the measurements shall be performed at T_{amb} = +22 ±3ºC.

The test methods and test conditions shall be as per the corresponding test defined in Para. 2.5.1, Room Temperature Electrical Measurements.

The limit values for each characteristic shall not be exceeded.

Characteristics	Symbols	Limits		Units
		Min	Max	
Reverse Current	I_R	-	30	µA
Forward Voltage 1	V_{F1}	-	780	mV

2.8 POWER BURN-IN CONDITIONS

Characteristics	Symbols	Test Conditions	Units
Case Temperature	T_{case}	+125	°C
Reverse Voltage	V_R	80	V

2.9 OPERATING LIFE CONDITIONS

The conditions shall be as specified in Para. 2.8 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. 2.1.1.1, Deviations from the Generic Specification: Deviations from Screening Tests - Chart F3	Solderability is not applicable unless specifically stipulated in the Purchase Order.