



**DIODES, POWER RECTIFIER, HIGH EFFICIENCY,  
FAST RECOVERY**

**BASED ON TYPE BYW81-200**

**ESCC Detail Specification No. 5103/029**

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DCR No.	CHANGE DESCRIPTION
879	Specification upissued to incorporate 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: 510302901

- Detail Specification Reference: 5103029
- 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	BYW81-200	TO-254	Single diode	H9	10
02	BYW81-200	TO-254	Dual diode, Common Anode	H9	10
03	BYW81-200	TO-254	Dual diode, Common Cathode	H9	10
04	BYW81-200	TO-254	Dual diode, series, centre tapped	H9	10
05	BYW81-200	SMD.5	Single diode	Q14	2
06	BYW81-200	TO-254	Dual diode, Common Anode	H14	10
07	BYW81-200	TO-254	Dual diode, Common Anode	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 Variant 01, 04 and 05 Variant 02, 03, 06 and 07 (per Diode) Variant 02, 03, 06 and 07 (per Device)	$I_{FSM}$	250 250 500	A	Notes 1, 8
Repetitive Peak Reverse Voltage	$V_{RRM}$	200	V	Note 2
Average Output Rectified Current Variant 01, 04 and 05 Variant 02, 03, 06 and 07 (per Diode) Variant 02, 03, 06 and 07 (per Device)	$I_O$	15 15 30	A	50% Duty Cycle Notes 3, 8
RMS Forward Current Variant 01, 04 and 05 Variant 02, 03, 06 and 07 (per Diode) Variant 02, 03, 06 and 07 (per Device)	$I_{F(rms)}$	30 30 40	A	Note 8
Operating Temperature Range (Case Temperature)	$T_{op}$	-55 to +150	°C	Note 4
Junction Temperature	$T_j$	+150	°C	
Storage Temperature Range	$T_{stg}$	-55 to +150	°C	Note 4
Soldering Temperature For TO-254 For SMD.5	$T_{sol}$	+260 +245	°C	Note 5 Note 6
Thermal Resistance, Junction to Case All variants (per Diode) Variants 02, 03, 06 and 07 (per Device)	$R_{th(j-c)}$	2.3 1.4	°C/W	Notes 7, 8

**NOTES:**

1. Sinusoidal pulse of 10ms duration.
2. Pulsed, duration 5ms,  $f = 50\text{Hz}$ .
3. At  $T_{\text{case}} > +110\text{ }^{\circ}\text{C}$ , derate linearly to 0A at  $+150\text{ }^{\circ}\text{C}$ .
4. For Variants with hot solder dip lead finish all testing performed at  $T_{\text{amb}} > +125\text{ }^{\circ}\text{C}$  shall be carried out in a 100% inert atmosphere.
5. 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.
6. Duration 5 seconds maximum and the same package shall not be resoldered until 3 minutes have elapsed.
7. Package mounted on an infinite heatsink.
8. For Variants 02, 03, 06 and 07 the "per Device" ratings apply only when both anode or cathode terminals are tied together.

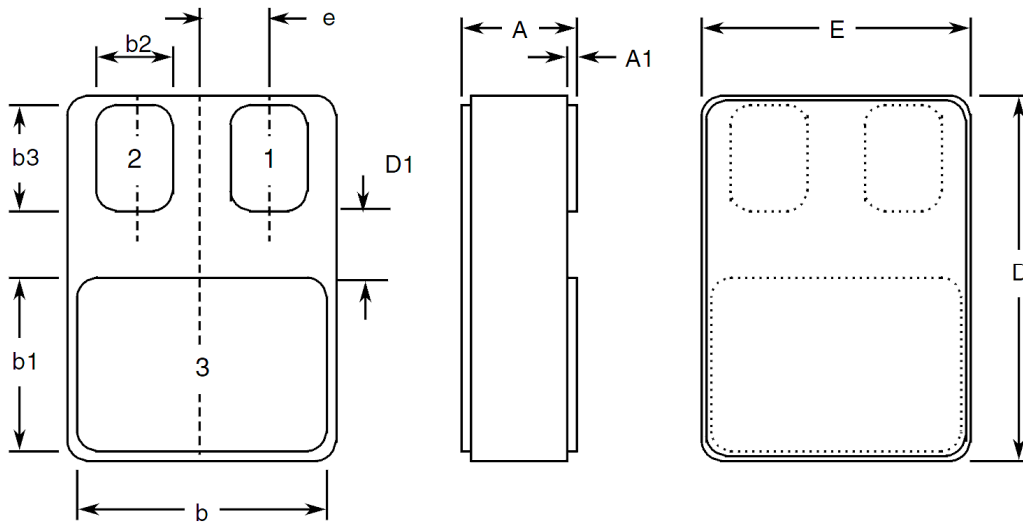
1.6 **HANDLING PRECAUTIONS**

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.





1.7.2 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

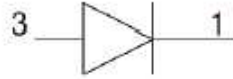
1.7.3 Notes to Physical Dimensions and Terminal Identification

1. The terminal identification is specified by the components geometry. See 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

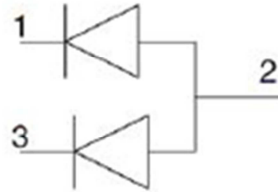
Terminal 1: Cathode  
Terminal 2: No connection  
Terminal 3: Anode

Variant 01



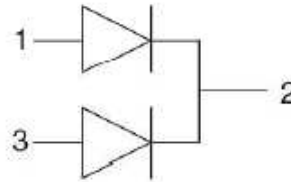
Terminal 1: Cathode a  
Terminal 2: Common Anode  
Terminal 3: Cathode b

Variant 02, 06 and 07



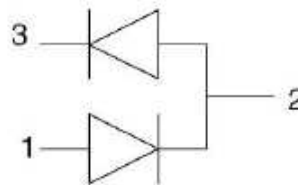
Terminal 1: Anode a  
Terminal 2: Common Cathode  
Terminal 3: Anode b

Variant 03



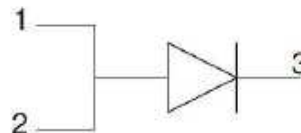
Terminal 1: Anode a  
Terminal 2: Centre Tap  
Terminal 3: Cathode b

Variant 04



Terminals 1 and 2: Anode  
Terminal 3: Cathode

Variant 05



**NOTES:**

1. For TO-254, the case is not connected to any lead.
2. For SMD.5, 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 package the case shall be hermetically sealed and have a ceramic body with a Kovar lid.

### (b) Leads/Terminals

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 Qualification and Periodic Tests - Chart F4*

- (a) Constant Acceleration is not applicable.
- (b) For SMD.5, 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.
- (c) Traceability information.
- (d) Warning sign for Beryllium Oxide (TO-254 only).

### 2.3 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 for a duration of 10s.

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  $T_{amb} = +22 \pm 3 \text{ }^\circ\text{C}$ .

Characteristics	Symbols	MIL-STD-750 Test Method	Test Conditions Note 1	Limits		Units
				Min	Max	
Reverse Current	$I_R$	4016	DC Method $V_R = 200V$	-	20	$\mu A$
Forward Voltage	$V_{F1}$	4011	Pulse Method $I_F = 10A$ , Note 2	-	1	V
	$V_{F2}$	4011	Pulse Method $I_F = 20A$ , Note 2	-	1.2	V
Breakdown Voltage	$V_{(BR)}$	4021	$I_R = 100\mu A$	200	-	V
Capacitance	C	4001	$V_R = 10V$ $f = 1MHz$	-	220	pF
Reverse Recovery Time	$t_{rr}$	4031	Test Condition A $I_F = 1A$ $V_R = 30V$ $dI_F/dt = -50A/\mu s$	-	40	ns
Thermal Impedance, Junction to Case	$Z_{th(j-c)}$	3101	$I_H = 15$ to $40A$ $t_H = 50ms$ $I_M = 50mA$ $t_{md} = 100\mu s$ Note 3	(Calculate $\Delta V_F$ , see Note 4)		$^\circ C/W$

2.4.2 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	$T_{case} = +125 (+0 -5) \text{ }^\circ\text{C}$ DC Method $V_R = 200V$	-	10	mA
Forward Voltage 1	$V_{F1}$	4011	$T_{case} = +125 (+0 -5) \text{ }^\circ\text{C}$ Pulse Method $I_F = 10A$ , Note 2	-	0.85	V
			$T_{case} = -55 (+5 -0) \text{ }^\circ\text{C}$ Pulse Method $I_F = 10A$ , Note 2	-	1.15	V

2.4.3 Notes to Electrical Measurement Tables

1. Measurements per each diode.
2. 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  $\Delta V_F$  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.
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.

2.5 PARAMETER DRIFT VALUES

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

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
Reverse Current	$I_R$	$\pm 2$ or (1) $\pm 100\%$	-	20	$\mu\text{A}$
Forward Voltage 1	$V_{F1}$	$\pm 0.05$	-	1	V

**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  $T_{amb} = +22 \pm 3 \text{ }^\circ\text{C}$ .

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

The limit values for each characteristic shall not be exceeded.

Characteristics	Symbols	Limits		Units
		Min	Max	
Reverse Current	$I_R$	-	20	$\mu\text{A}$
Forward Voltage 1	$V_{F1}$	-	1	V

2.7 HIGH TEMPERATURE REVERSE BIAS BURN-IN CONDITIONS

Characteristics	Symbols	Limits	Units
Ambient Temperature	$T_{amb}$	+150 (+0 -5)	°C
Reverse Voltage	$V_R$	160	V
Duration	t	≥ 48	hours

2.8 POWER BURN-IN CONDITIONS

Characteristics	Symbols	Test Conditions	Units
Case Temperature	$T_{case}$	+125 ±15 Note 1	°C
Junction Temperature	$T_j$	+150 (+0 -5)	°C
Average Output Rectified Current	$I_o$	Notes 1, 2	A

**NOTES:**

1. The case temperature and/or output current may be adjusted, within their given limit ranges, to attain the specified junction temperature.
2. Both diodes shall be tied together for common anode and common cathode variants:  
 $I_o \geq 3.75A$  for each leg of Variants 02, 03, 06 and 07.  
 $I_o \geq 3.75A$  for Variants 01, 04 and 05.

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 Controls - Internal Visual Inspection. Wedge bonds equal to 1.1 wire diameters are acceptable for bonding with a V-Groove tool.
Deviations from Screening Tests - Chart F3	Solderability is not applicable unless specifically stipulated in the Purchase Order.