

# HSMS-8101, 8202, 8207, 8209

## Surface Mount Microwave Schottky Mixer Diodes



### Data Sheet

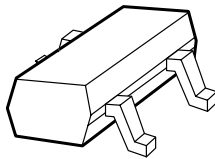


#### Description/Applications

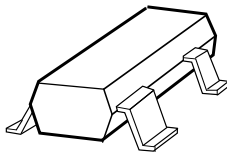
These low cost microwave Schottky diodes are specifically designed for use at X/Ku-bands and are ideal for DBS and VSAT downconverter applications. They are available in SOT-23 and SOT-143 standard package configurations.

Note that Avago's manufacturing techniques assure that dice found in pairs and quads are taken from adjacent sites on the wafer, assuring the highest degree of match.

#### Plastic SOT-23 Package



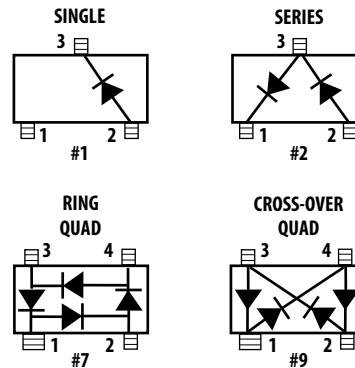
#### Plastic SOT-143 Package



#### Features

- Optimized for use at 10-14 GHz
- Low Capacitance
- Low Conversion Loss
- Low RD
- Low Cost Surface Mount Plastic Package
- Lead-free

#### Package Lead Code Identification (Top View)



#### Absolute Maximum Ratings<sup>[1]</sup>, $T_A = +25^\circ\text{C}$

Symbol	Parameter	Unit	Min.	Max.
$P_T$	Total Device Dissipation <sup>[2]</sup>	mW	—	75
$P_{IV}$	Peak Inverse Voltage	V	—	4
$T_J$	Junction Temperature	$^\circ\text{C}$	—	+150
$T_{STG}, T_{OP}$	Storage and Operating Temperature	$^\circ\text{C}$	-65	+150

#### Notes:

1. Operation in excess of any one of these conditions may result in permanent damage to the device.
2. Measured in an infinite heat sink at  $T_{CASE} = 25^\circ\text{C}$ . Derate linearly to zero at  $150^\circ\text{C}$  per diode.



**Attention: Observe precautions for handling electrostatic sensitive devices.**  
 ESD Machine Model (Class A)  
 ESD Human Body Model (Class 0)  
 Refer to Avago Application Note A004R:  
 Electrostatic Discharge Damage and Control.

### DC Electrical Specifications, $T_A = 25^\circ\text{C}$

Symbol	Parameters and Test Conditions	Units	HSMS-8101		HSMS-8202		HSMS-8207		HSMS-8209	
			Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
$V_{BR}$	Breakdown Voltage $I_R = 10 \mu\text{A}$	V	4		4		4		4	
$C_T$	Total Capacitance $V_R = 0\text{V}, f = 1\text{MHz}$	pF		0.26		0.26		0.26		0.26
$DC_T$	Capacitance Difference $V_R = 0\text{V}, f = 1\text{MHz}$	pF		—		0.04		0.04		0.04
$R_D$	Dynamic Resistance $I_F = 5\text{mA}$	$\Omega$		14		14		14		14
$DR_D$	Dynamic Resistance Difference $I_F = 5\text{mA}$	$\Omega$		—		2		2		2
$V_F$	Forward Voltage $I_F = 1\text{mA}$	mV	250	350	250	350	250	350	250	350
$DV_F$	Forward Voltage Difference $I_F = 1\text{mA}$	mV		—		20		20		20
	Lead Code			1		2		7		9
	Package Marking Code where x is date code			R1x		2Rx		R7x		R9x

### RF Electrical Parameters, $T_A = 25^\circ\text{C}$

Symbol	Parameter	Units	Typical
$L_c$	Conversion Loss at 12 GHz	dB	6.3
$Z_{IF}$	IF Impedance	$\Omega$	150
SWR	SWR at 12 GHz		1.2

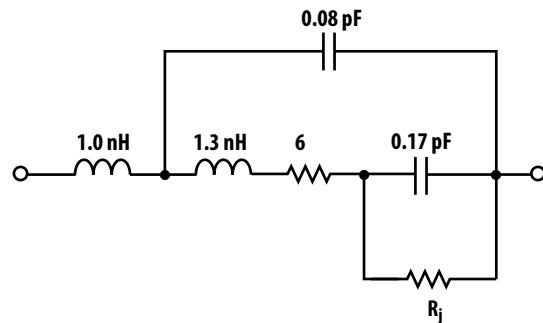
**Note:**

DC Load Resistance = 0  $\Omega$ ; LO Power = 1 mW.

### SPICE Parameters

$I_S = 4.6\text{E-}8$	$E_G = 0.69$	TT = 0
$R_S = 6$	$C_{JO} = 0.18\text{E-}12$	
$N = 1.09$	$P_B (V_J) = 0.5$	
$B_V = 7.3$	$M = 0.5$	
$I_{BV} = 10\text{E-}5$	$FC = 0.5$	

### Linear Equivalent Circuit



### Self Bias

	1 mA	2.5 mA
$R_j$	256	142

## Typical Performance, $T_c = 25^\circ\text{C}$

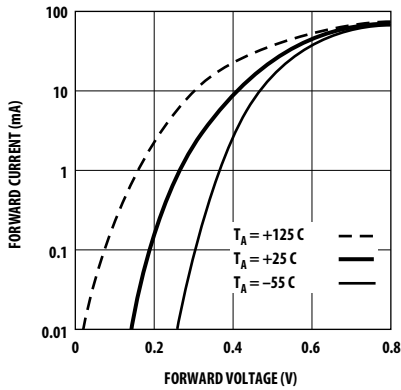


Figure 1. Typical Forward Current vs. Forward Voltage at Three Temperatures.

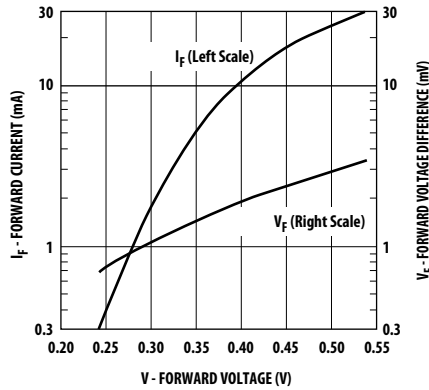


Figure 2. Typical VF Match, HSMS-820X Pairs and Quads.

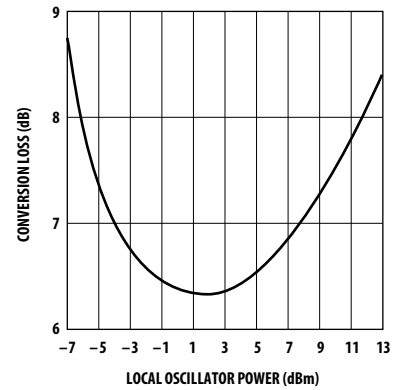
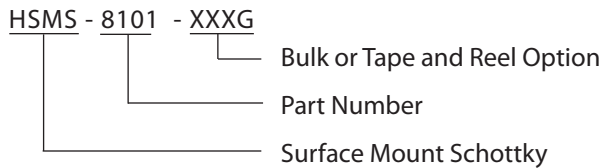


Figure 3. Typical Conversion Loss vs. Local Oscillator Power.

## Ordering Information

Specify part number followed by option. For example:

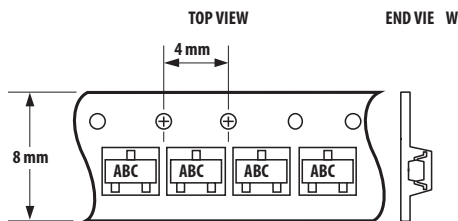
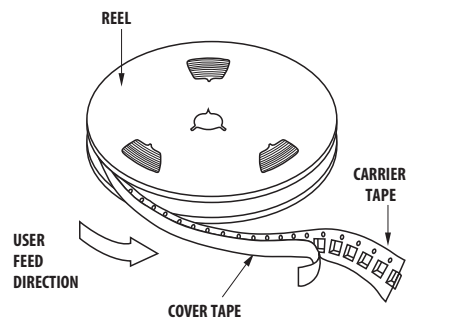


## Profile Option Descriptions

- BLKG = Bulk
- TR1G = 3K pc. Tape and Reel, Device Orientation Figures 4, 5
- TR2G = 10K pc. Tape and Reel, Device Orientation Figures 4, 5

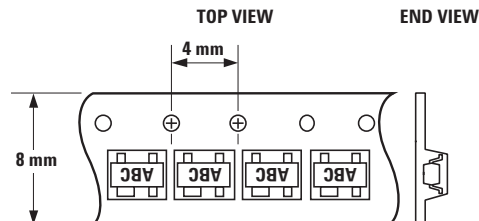
Tape and Reeling conforms to Electronic Industries RS-481, "Taping of Surface Mounted Components for Automated Placement."

## Device Orientation



Note: "AB" represents package marking code.  
"C" represents date code.

Figure 4. Option -TR1G/-TR2G for SOT-23 Packages.



Note: "AB" represents package marking code.  
"C" represents date code.

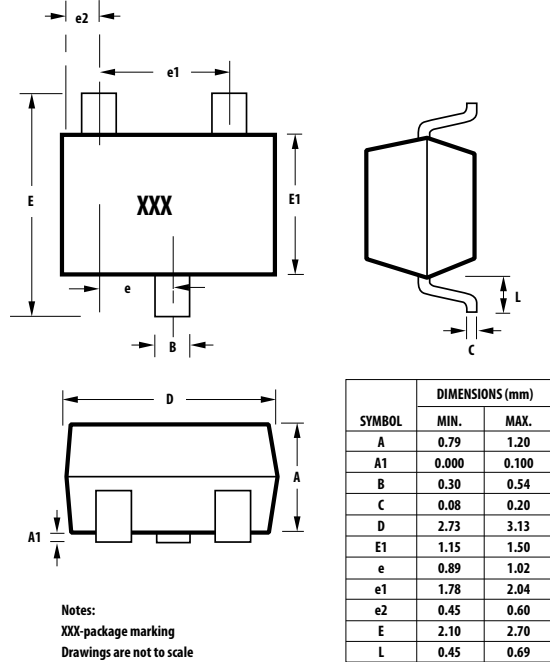
Figure 5. Option -TR1G/-TR2G for SOT-143 Packages.

## Package Characteristics

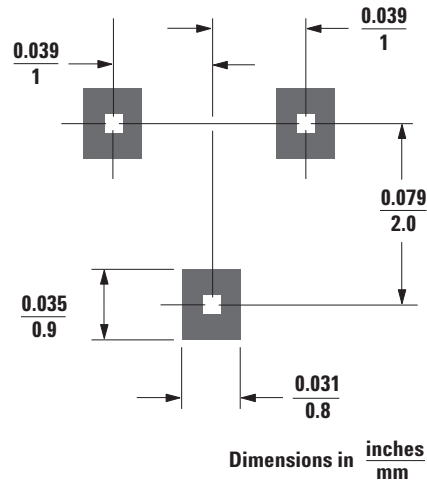
Lead Material	Alloy 42
Lead Finish	Tin 100% (Lead-free option)
Maximum Soldering Temperature	260°C for 5 seconds
Minimum Lead Strength	2 pounds pull
Typical Package Inductance	2 nH
Typical Package Capacitance	0.08 pF (opposite leads)

## Package Dimensions

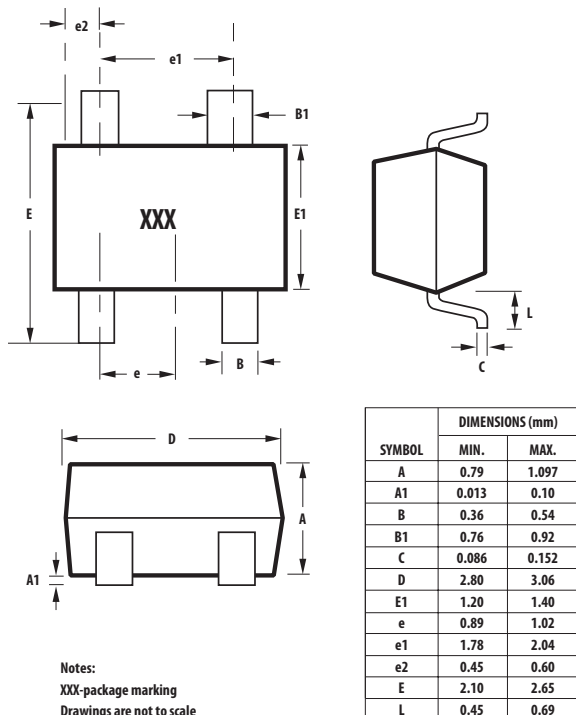
### Outline 23 (SOT-23)



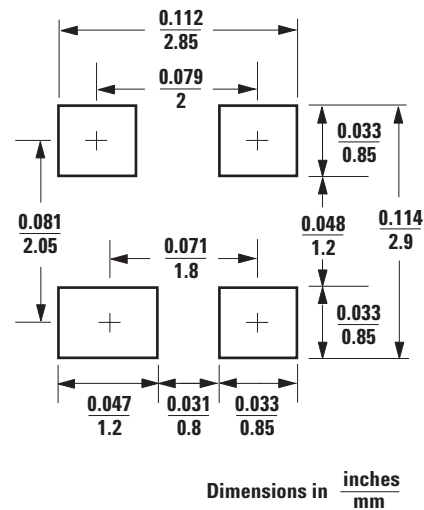
### Recommended PCB Pad Layout for Avago's SOT-23 Products



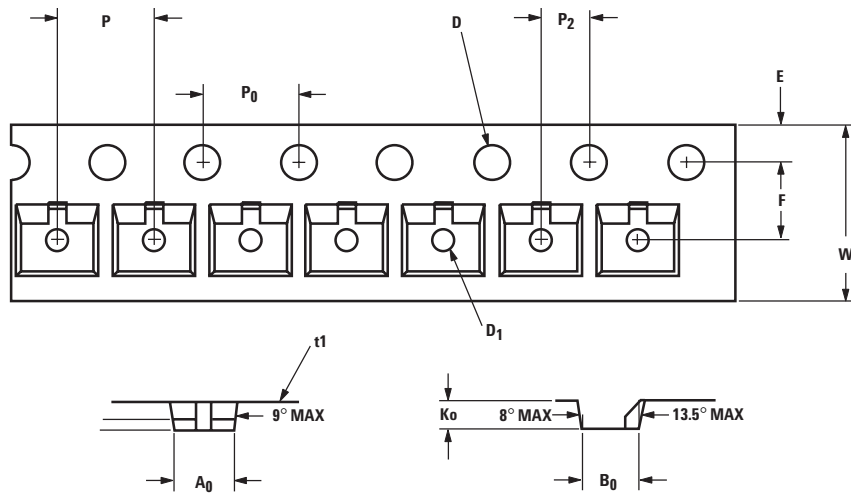
### Outline 143 (SOT-143)



### Recommended PCB Pad Layout for Avago's SOT-143 Products

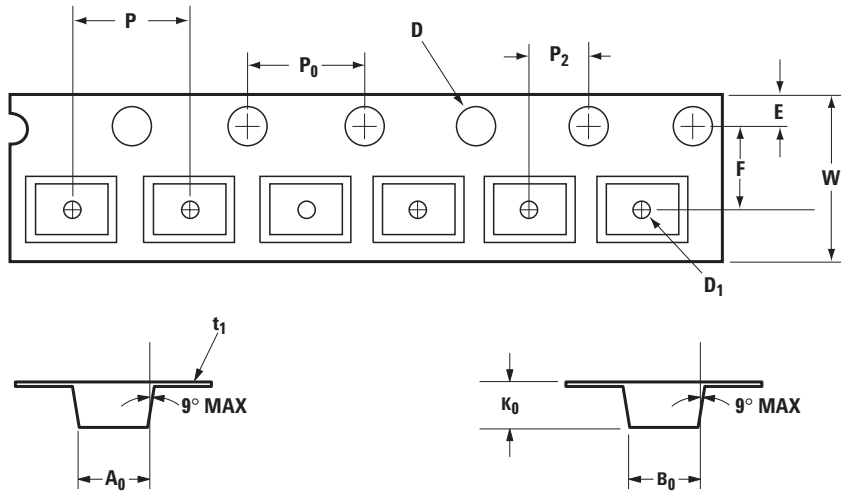


## Tape Dimensions and Product Orientation For Outline SOT-23



DESCRIPTION		SYMBOL	SIZE (mm)	SIZE (INCHES)
CAVITY	LENGTH	A <sub>0</sub>	3.15 ± 0.10	0.124 ± 0.004
	WIDTH	B <sub>0</sub>	2.77 ± 0.10	0.109 ± 0.004
	DEPTH	K <sub>0</sub>	1.22 ± 0.10	0.048 ± 0.004
	PITCH	P	4.00 ± 0.10	0.157 ± 0.004
	BOTTOM HOLE DIAMETER	D <sub>1</sub>	1.00 + 0.05	0.039 ± 0.002
PERFORATION	DIAMETER	D	1.50 + 0.10	0.059 + 0.004
	PITCH	P <sub>0</sub>	4.00 ± 0.10	0.157 ± 0.004
	POSITION	E	1.75 ± 0.10	0.069 ± 0.004
CARRIER TAPE	WIDTH	W	8.00 + 0.30 - 0.10	0.315 + 0.012 - 0.004
	THICKNESS	t <sub>1</sub>	0.229 ± 0.013	0.009 0.0005
DISTANCE BETWEEN CENTERLINE	CAVITY TO PERFORATION (WIDTH DIRECTION)	F	3.50 ± 0.05	0.138 ± 0.002
	CAVITY TO PERFORATION (LENGTH DIRECTION)	P <sub>2</sub>	2.00 ± 0.05	0.079 ± 0.002

**Tape Dimensions and Product Orientation  
For Outline SOT-143**



DESCRIPTION		SYMBOL	SIZE (mm)	SIZE (INCHES)
CAVITY	LENGTH	A <sub>0</sub>	3.19 ± 0.10	0.126 ± 0.004
	WIDTH	B <sub>0</sub>	2.80 ± 0.10	0.110 ± 0.004
	DEPTH	K <sub>0</sub>	1.31 ± 0.10	0.052 ± 0.004
	PITCH	P	4.00 ± 0.10	0.157 ± 0.004
	BOTTOM HOLE DIAMETER	D <sub>1</sub>	1.00 + 0.25	0.039 + 0.010
PERFORATION	DIAMETER	D	1.50 + 0.10	0.059 + 0.004
	PITCH	P <sub>0</sub>	4.00 ± 0.10	0.157 ± 0.004
	POSITION	E	1.75 ± 0.10	0.069 ± 0.004
CARRIER TAPE	WIDTH	W	8.00 + 0.30 - 0.10	0.315 + 0.012 - 0.004
	THICKNESS	t <sub>1</sub>	0.254 ± 0.013	0.0100 ± 0.0005
DISTANCE	CAVITY TO PERFORATION (WIDTH DIRECTION)	F	3.50 ± 0.05	0.138 ± 0.002
	CAVITY TO PERFORATION (LENGTH DIRECTION)	P <sub>2</sub>	2.00 ± 0.05	0.079 ± 0.002

For product information and a complete list of distributors, please go to our web site: [www.avagotech.com](http://www.avagotech.com)

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