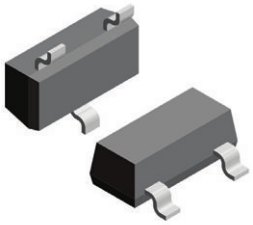
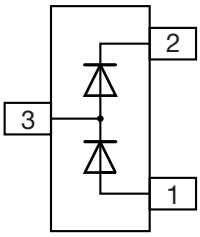
Low Capacitance Rail to Rail Protection Diode in SOT-23



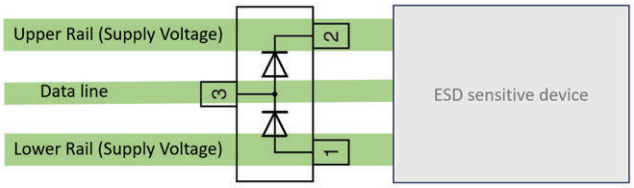
SOT-23



LINKS TO ADDITIONAL RESOURCES

3D Models | Models | Marking | Parametric Search | Order Samples

PRIMARY CHARACTERISTICS	
V_{RRM}	80 V
C_D ; 1 MHz; V_r = 0 V: Pin 31 or 23	0.5 pF
I_{PPM} (8/20 µs)	12 A
ESD immunity (330 pF / 330 Ω)	± 30 kV
T_J max.	150 °C
Package	SOT-23



FEATURES

- Low capacitance ESD-protection for one data line
- Low total capacitance C_{tot} = 1 pF
- Clamps transient overvoltage to positive and negative rail potentials
- High ESD-immunity in forward direction
  - 30 kV acc. ISO10605 (330 pF / 330 Ω)
  - 30 kV acc. IEC61000-4-2 (150 pF / 330 Ω)
- AEC-Q101 qualified available
- Moisture sensitivity level (MSL) 1
- Molding compound meets UL 94 V-0 flammability rating
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e3

RoHS COMPLIANT

HALOGEN FREE GREEN (5-2008)

APPLICATIONS

- Telecommunication network
- Portable electronics
- Video Line Protection
- Microcontroller Input Protection
- I2C Bus Protection

The VR2RA1-03S is a low capacitance ESD-protection device for one data line with a working voltage between the two supply voltage levels (potential of the upper and lower rail) of the application.

As long as the voltage on the data line is within these two rail voltages both protection diodes of the VR2RA1-03S are reverse biased with a low leakage current and capacitance.

Just when the voltage on the data line gets higher than the upper rail voltage or lower than the lower rail voltage one of the protection diodes gets in forward mode and clamps the transient voltage to the upper or lower rail voltage.

The low capacitance protection diode is made to conduct the surge current of a transient voltage spike in forward direction to the upper or lower rail. The maximum reverse voltage the diodes can withstand is 80 V. Higher reverse voltages can destroy the diodes. Therefore the impedance of the rail sources must be low enough to absorb the occurring surge current. Is this not given, the voltage between the two rails can be clamped by an unidirectional TVS diode.

ORDERING INFORMATION

PART NUMBER (EXAMPLE)	ENVIRONMENTAL AND QUALITY CODE			REVISION	PACKAGING CODE		ORDERING CODE (EXAMPLE)
	AEC-Q101 QUALIFIED	RoHS-COMPLIANT + LEAD (Pb)-FREE TERMINATIONS	TIN PLATED		3K PER 7" REEL (8 mm TAPE), 15K/BOX = MOQ	10K PER 13" REEL (8 mm TAPE), 10K/BOX = MOQ	
VR2RA1-03S	-	G	3	-	08		VR2RA1-03S-G3-08
VR2RA1-03S	H	G	3	-	08		VR2RA1-03SHG3-08
VR2RA1-03S	-	G	3	-		18	VR2RA1-03S-G3-18
VR2RA1-03S	H	G	3	-		18	VR2RA1-03SHG3-18

PACKAGE DATA RATINGS						
DEVICE NAME	PACKAGE NAME	TYPE CODE	WEIGHT	MOLDING COMPOUND FLAMMABILITY RATING	MOISTURE SENSITIVITY LEVEL	SOLDERING CONDITIONS
VR2RA1-03S	SOT-23	R2R	9.2 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	Peak temperature max. 260 °C

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Repetitive peak reverse voltage		V_{RRM}	80	V
Peak forward surge current	t_p = 8.3 ms, sine half wave	I_{FSM}	2	A
Peak forward surge current	t_p = 100 µs	I_{FSM}	4	A
Peak forward surge current	t_p = 10/1000 µs, acc. Fig.3	I_{FSM}	4	A
Peak forward surge current	t_p = 8/20 µs, acc. Fig.2	I_{FSM}	12	A
Peak forward surge current	t_p = 100 ns, (TLP)	I_{FSM}	60	A
Average forward current	Half wave rectification with resistive load and f ≥ 50 Hz mounted on Infinite heatsink	$I_{F(AV)}$	250	mA
Forward current	mounted on Infinite heatsink	I_F	350	mA
Power dissipation	on FR-4 board with recommended soldering footprint	P_{tot}	270	mW
Thermal resistance junction to ambient air	according to JEDEC® 51-3 on FR-4 board with recommended soldering footprint	R_{thJA}	460	K/W
Thermal resistance junction to lead	mounted on Infinite heatsink	R_{thJL}	320	K/W
Junction temperature		T_j	150	°C
Storage temperature range		T_{stg}	-65 to +150	°C
Operating temperature range		T_{op}	-55 to +150	°C
ESD Immunity	forward direction (pin 1 to 3 or 3 to 2) acc. ISO10605 (330 pF/ 330 Ω) IEC61000-4-2 (150 pF/330 Ω)	V_{ESD}	30	kV

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Forward voltage	I_F = 1 mA	V_F	-	-	0.75	V
Reverse current	V_R = 80 V,	I_R	-	12	30	nA
Reverse current	V_R = 80 V, T_j = 150 °C	I_R	-	-	30	µA
Reverse breakdown voltage	I_R = 20 µA	V_{BR}	100	-	-	V
Diode capacitance	V_R = 0, f = 1 MHz; Pin 1 to 3 or 3 to 2	C_D	-	0.5	0.6	pF
Total capacitance	V_R = 0, f = 1 MHz; Pin 1+2 to 3	C_{tot}	-	1	1.2	pF

TYPICAL CHARACTERISICS (T_{amb} = 25 °C, unless otherwise specified)

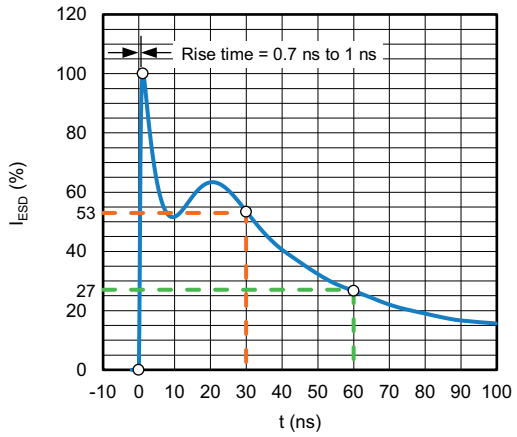


Fig. 1 - ESD Discharge Current Wave Form acc. IEC 61000-4-2 (330 Ω / 150 pF)

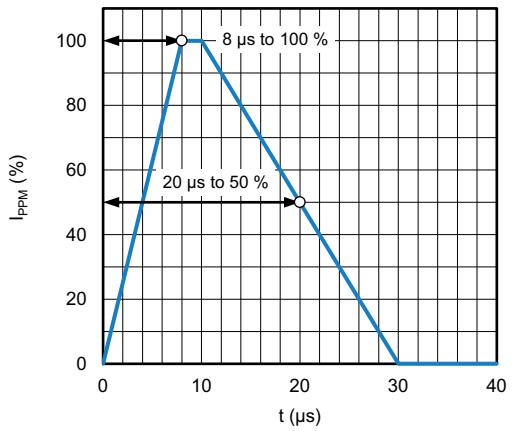


Fig. 2 - 8/20 µs Peak Pulse Current Wave Form acc. IEC 61000-4-5

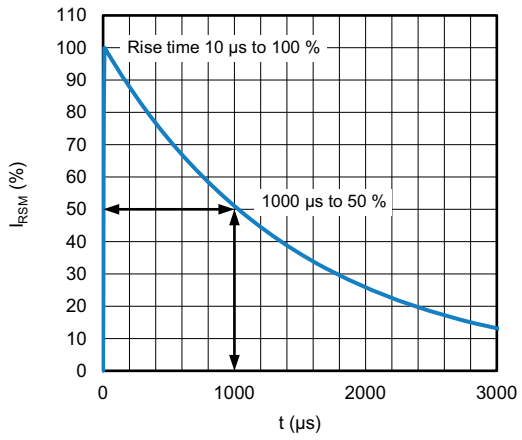


Fig. 3 - 10/1000 µs Peak Pulse Current Wave Form

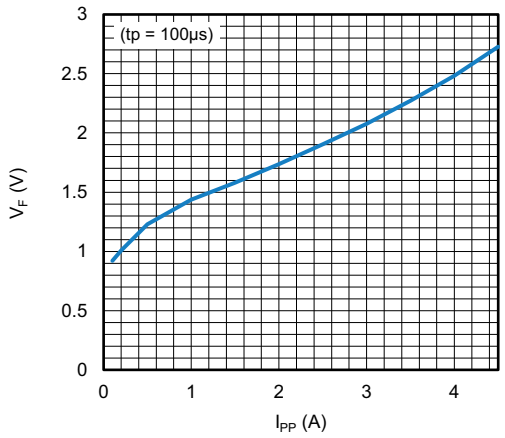


Fig. 4 - Typical Peak Forward Clamping Voltage vs. Peak Pulse Current; t_p = 100 µs

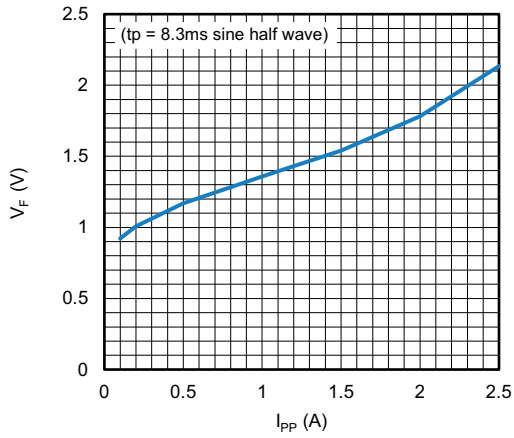


Fig. 5 - Typical Peak Forward Clamping Voltage vs. Peak Pulse Current; t_p = 8.3 ms

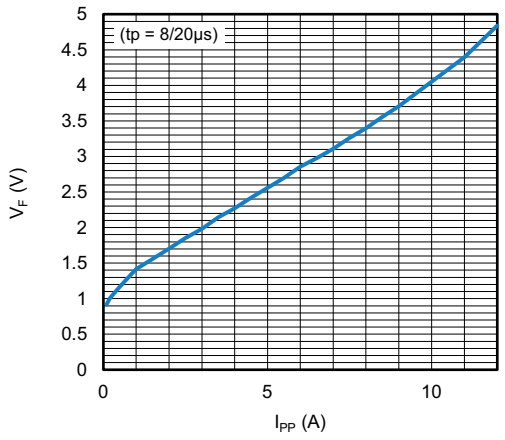


Fig. 6 - Typical Peak Forward Clamping Voltage vs. Peak Pulse Current; t_p = 8/20 µs

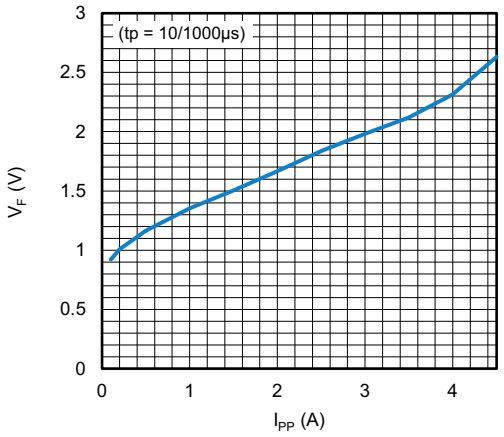


Fig. 7 - Typical Peak Forward Clamping Voltage vs. Peak Pulse Current; t_p = 10/1000 µs

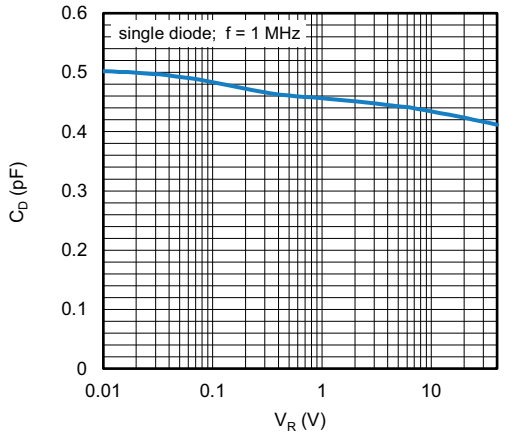


Fig. 10 - Typical Capacitance vs. Reverse Voltage

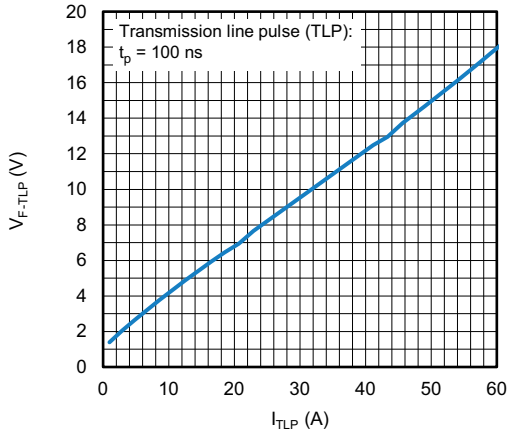


Fig. 8 - Typical Peak Forward Clamping Voltage vs. Peak Pulse Current; t_p = 100 ns (TLP)

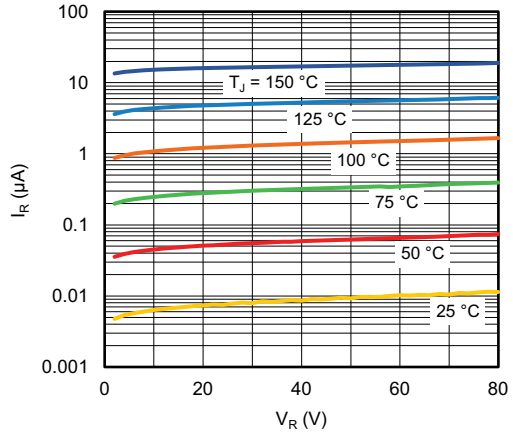


Fig. 11 - Typical Reverse Leakage Current vs. Reverse Voltage

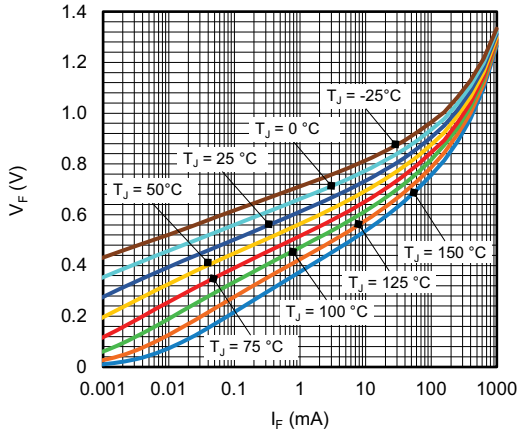


Fig. 9 - Typical Forward Voltage vs. Forward Current

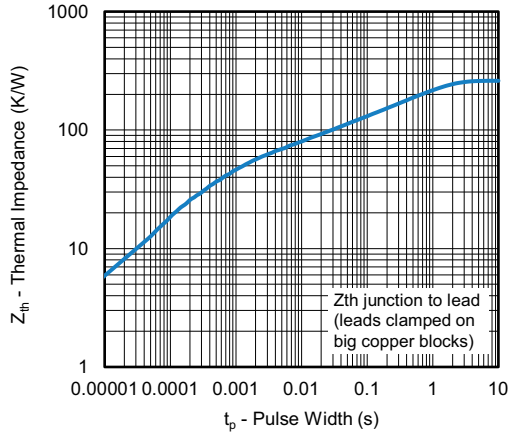
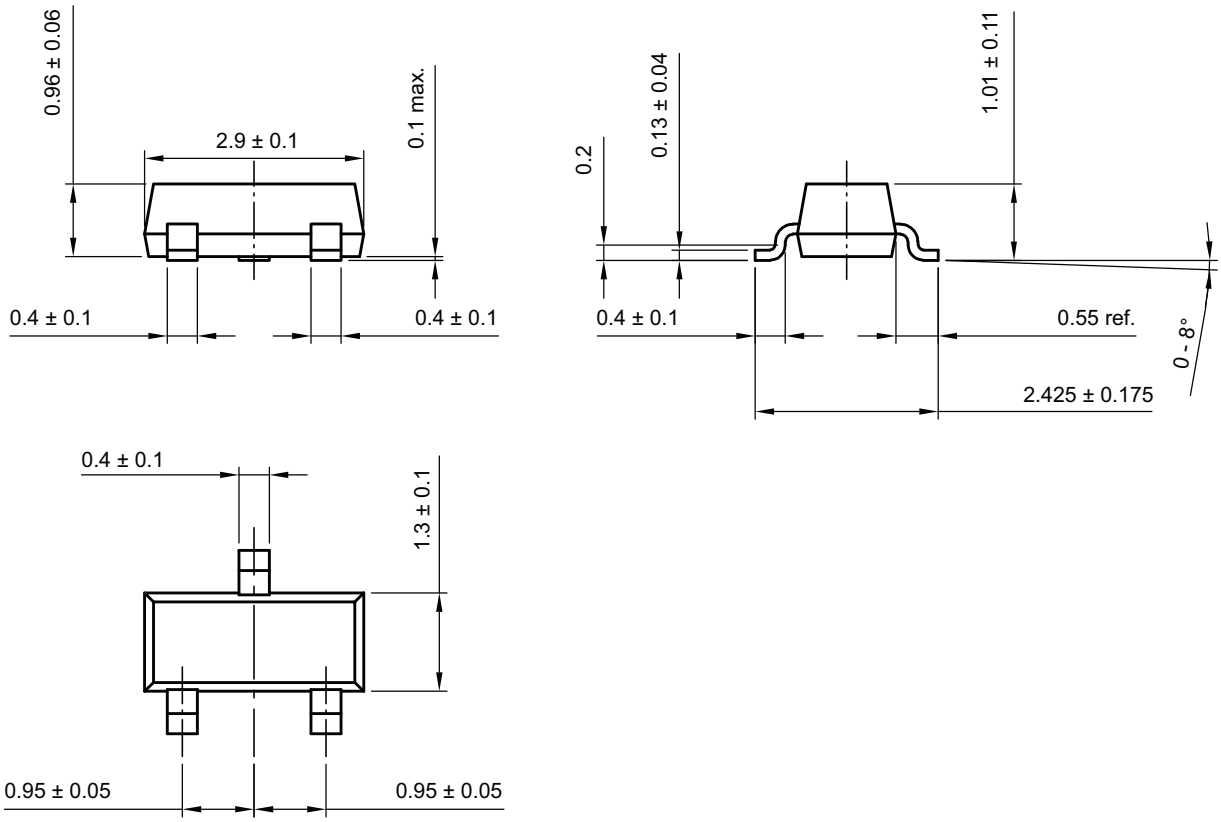
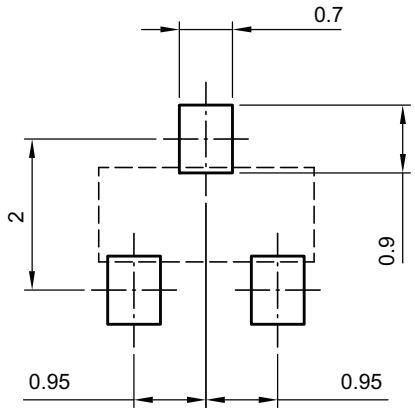


Fig. 12 - Thermal Impedance vs. Time

PACKAGE DIMENSIONS in millimeters: **SOT-23**

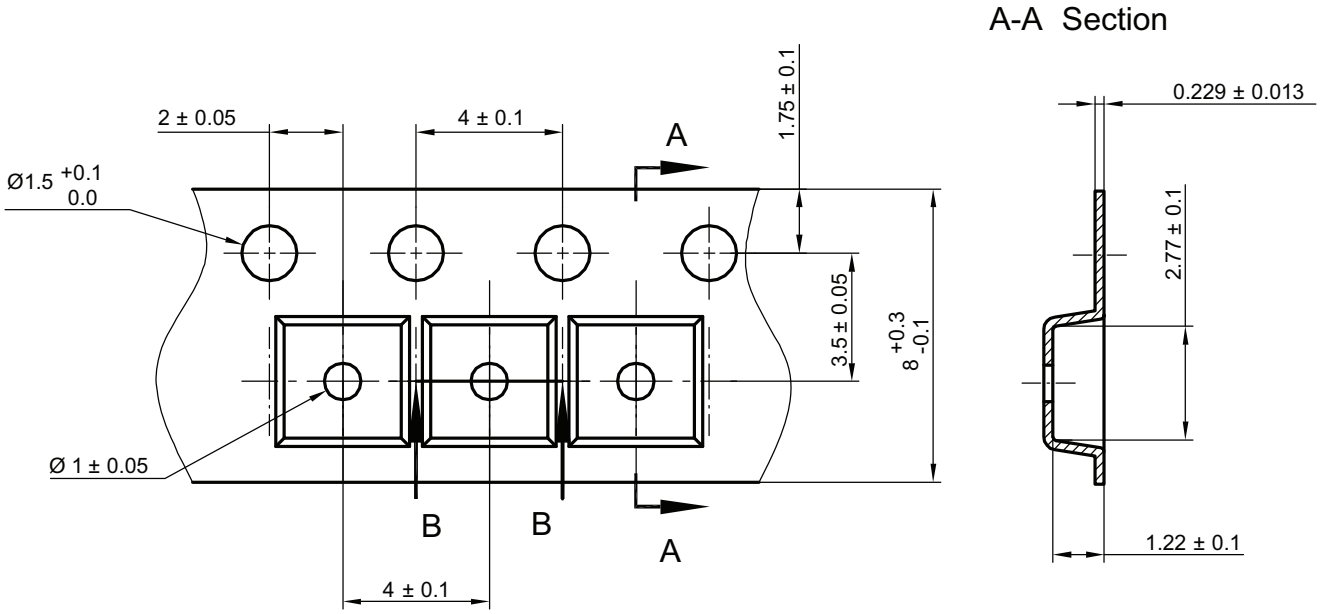


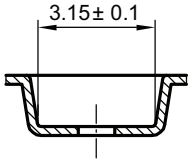
footprint recommendation:



Created - Date: 18-Oct-2021
Rev. 01 - Date: 18-Jan-2022
S8-V-3929.01-009 (4)

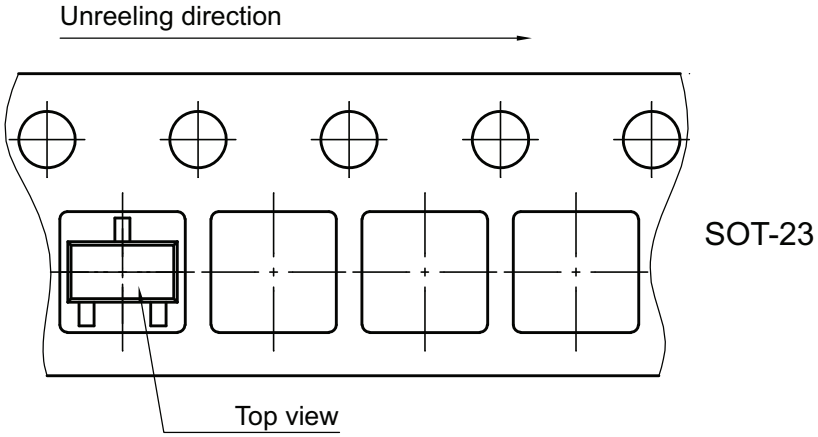
CARRIER TAPE SOT-23





Created Date: 04-Feb-2010
Rev. Date: 07-Feb-2022
S8-V-3929.01-005 (4)

ORIENTATION IN CARRIER TAPE SOT-23



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Rev. Date: 07-Nov-2022
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