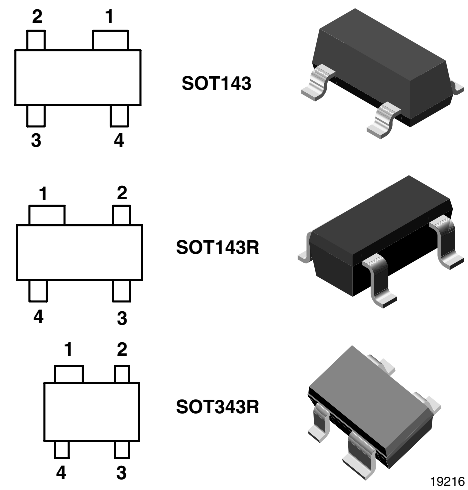
N-Channel Dual Gate MOS-Fieldeffect Tetrode, Depletion Mode

Features
- Integrated gate protection diodes
- Low noise figure
- Low feedback capacitance
- High cross modulation performance
- Low input capacitance
- High AGC-range
- High gain
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC



Electrostatic sensitive device.
Observe precautions for handling.

Applications
- Input and mixer stages in UHF tuners

Mechanical Data
Typ: BF998
Case: SOT143 Plastic case
Weight: approx. 8.0 mg
Marking: MO
Pinning:
1 = Source, 2 = Drain,
3 = Gate 2, 4 = Gate 1
Typ: BF998R
Case: SOT143R Plastic case
Weight: approx. 8.0 mg
Marking: MOR
Pinning:
1 = Source, 2 = Drain,
3 = Gate 2, 4 = Gate 1
Typ: BF998RW
Case: SOT343R Plastic case
Weight: approx. 6.0 mg
Marking: WMO
Pinning:
1 = Source, 2 = Drain,
3 = Gate 2, 4 = Gate 1

Parts Table

Part	Ordering code	Type Marking	Remarks
BF998	BF998A-GS08	MO	SOT143
BF998A	BF998A-GS08	MO	SOT143
BF998R	BF998RA-GS08	MOR	SOT143R
BF998RA	BF998RA-GS08	MOR	SOT143R
BF998RW	BF998RAW-GS08 or BF998RBW-GS08	WMO	SOT343R
BF998RAW	BF998RAW-GS08	WMO	SOT343R
BF998RBW	BF998RBW-GS08	WMO	SOT343R

Absolute Maximum Ratings

T_{amb} = 25 °C, unless otherwise specified

Parameter	Test condition	Symbol	Value	Unit
Drain - source voltage		V_{DS}	12	V
Drain current		I_D	30	mA
Gate 1/Gate 2 - source peak current		± $I_{G1/G2SM}$	10	mA
Gate 1/Gate 2 - source voltage		± $V_{G1S/G2S}$	7	V
Total power dissipation	$T_{amb} \leq 60$ °C	P_{tot}	200	mW
Channel temperature		T_{Ch}	150	°C
Storage temperature range		T_{stg}	- 65 to + 150	°C

Thermal Characteristics

Parameter	Test condition	Symbol	Value	Unit
Channel ambient	1)	R_{thChA}	450	K/W

1) on glass fibre printed board (25 x 20 x 1.5) mm^3 plated with 35 µm Cu

Electrical DC Characteristics

T_{amb} = 25 °C, unless otherwise specified

Parameter	Test condition	Part	Symbol	Min.	Typ.	Max.	Unit
Drain - source breakdown voltage	I_D = 10 µA, - V_{G1S} = - V_{G2S} = 4 V		$V_{(BR)DS}$	12			V
Gate 1 - source breakdown voltage	± I_{G1S} = 10 mA, V_{G2S} = V_{DS} = 0		± $V_{(BR)G1SS}$	7		14	V
Gate 2 - source breakdown voltage	± I_{G2S} = 10 mA, V_{G1S} = V_{DS} = 0		± $V_{(BR)G2SS}$	7		14	V
Gate 1 - source leakage current	± V_{G1S} = 5 V, V_{G2S} = V_{DS} = 0		± I_{G1SS}			50	nA
Gate 2 - source leakage current	± V_{G2S} = 5 V, V_{G1S} = V_{DS} = 0		± I_{G2SS}			50	nA
Drain current	V_{DS} = 8 V, V_{G1S} = 0, V_{G2S} = 4 V	BF998/ BF998R/ BF998RW	I_{DSS}	4		18	mA
		BF998A/ BF998RA/ BF998RAW	I_{DSS}	4		10.5	mA
		BF998RBW	I_{DSS}	9.5		18	mA
Gate 1 - source cut-off voltage	V_{DS} = 8 V, V_{G2S} = 4 V, I_D = 20 µA		- $V_{G1S(OFF)}$		1.0	2.0	V
Gate 2 - source cut-off voltage	V_{DS} = 8 V, V_{G1S} = 0, I_D = 20 µA		- $V_{G2S(OFF)}$		0.6	1.0	V

Electrical AC Characteristics

T_{amb} = 25 °C, unless otherwise specified

V_{DS} = 8 V, I_D = 10 mA, V_{G2S} = 4 V, f = 1 MHz

Parameter	Test condition	Symbol	Min.	Typ.	Max.	Unit
Forward transadmittance		$\lvert y_{21s} \rvert$	21	24		mS
Gate 1 input capacitance		C_{issg1}		2.1	2.5	pF
Gate 2 input capacitance	V_{G1S} = 0, V_{G2S} = 4 V	C_{issg2}		1.1		pF
Feedback capacitance		C_{rss}		25		fF
Output capacitance		C_{oss}		1.05		pF

Parameter	Test condition	Symbol	Min.	Typ.	Max.	Unit
Power gain	G_S = 2 mS, G_L = 0.5 mS, f = 200 MHz	G_{ps}		28		dB
	G_S = 3,3 mS, G_L = 1 mS, f = 800 MHz	G_{ps}	16.5	20		dB
AGC range	V_{G2S} = 4 to -2 V, f = 800 MHz	ΔG_{ps}	40			dB
Noise figure	G_S = 2 mS, G_L = 0.5 mS, f = 200 MHz	F		1.0		dB
	G_S = 3,3 mS, G_L = 1 mS, f = 800 MHz	F		1.5		dB

Common Source S-Parameters

T_{amb} = 25 °C, unless otherwise specified

V_{DS} = 8 V, V_{G2S} = 4 V, Z_0 = 50 Ω

ID/mA	f/MHz	S11		S21		S12		S22	
		LOG MAG	ANG	LOG MAG	ANG	LOG MAG	ANG	LOG MAG	ANG
			deg		deg		deg		deg
5	100	- 0.03	- 7.2	5.71	168.8	- 55.94	83.6	- 0.08	- 3.6
	200	- 0.15	- 14.1	5.51	157.3	- 50.26	76.8	- 0.13	- 7.0
	300	- 0.34	- 20.9	5.20	134.7	- 48.51	67.7	- 0.29	- 9.7
	400	- 0.70	- 32.1	2.01	121.3	- 46.98	62.8	- 0.44	- 12.3
	500	- 1.03	- 39.2	1.45	108.4	- 46.40	57.8	- 0.59	- 15.1
	600	- 1.33	- 45.8	0.94	96.5	- 46.40	57.3	- 0.76	- 17.4
	700	- 1.62	- 52.3	0.43	85.0	- 47.02	58.9	- 0.91	- 19.7
	800	- 1.92	- 58.7	- 0.10	74.1	- 47.53	63.3	- 1.08	- 22.0
	900	- 2.21	- 64.7	- 0.59	63.6	- 47.81	73.1	- 1.26	- 24.3
	1000	- 2.49	- 70.7	- 1.12	53.1	- 48.52	83.5	- 1.45	- 26.2
	1100	- 2.80	- 76.6	- 1.52	43.7	- 48.53	102.1	- 1.57	- 28.4
	1200	- 3.07	- 82.5	- 1.93	33.6	- 46.95	120.4	- 1.75	- 30.5
	1300	- 3.31	- 88.6	- 2.35	24.1	- 44.44	131.7	- 1.92	- 32.7
10	100	- 0.05	- 9.0	5.19	165.3	- 56.24	81.9	- 0.11	- 3.5
	200	- 0.16	- 18.7	5.58	151.8	- 49.97	75.0	- 0.21	- 7.2
	300	- 0.48	- 26.0	4.45	136.3	- 47.91	67.2	- 0.33	- 9.8
	400	- 0.76	- 33.7	3.95	123.3	- 46.48	61.8	- 0.47	- 12.6
	500	- 1.11	- 41.2	3.40	110.9	- 45.91	56.3	- 0.65	- 15.3
	600	- 1.43	- 48.3	2.88	99.5	- 45.91	55.8	- 0.81	- 17.8
	700	- 1.75	- 55.1	2.39	88.7	- 46.53	56.7	- 0.96	- 20.0
	800	- 2.07	- 61.6	1.88	78.1	- 47.13	60.7	- 1.12	- 22.4
	900	- 2.40	- 67.9	1.39	67.9	- 47.41	69.9	- 1.32	- 24.6
	1000	- 2.70	- 74.2	0.90	57.9	- 48.21	80.0	- 1.49	- 26.6
	1100	- 3.03	- 80.2	0.50	48.7	- 48.43	98.9	- 1.61	- 28.8
	1200	- 3.32	- 86.4	0.13	38.9	- 47.04	118.2	- 1.79	- 31.0
	1300	- 3.59	- 92.3	- 0.28	29.6	- 44.54	130.5	- 1.96	- 33.3
15	100	- 0.05	- 9.4	6.07	165.4	- 55.74	81.4	- 0.15	- 3.6
	200	- 0.17	- 19.4	6.44	152.0	- 49.47	74.6	- 0.24	- 7.3
	300	- 0.50	- 27.1	5.31	136.7	- 47.41	66.4	- 0.36	- 10.0
	400	- 0.81	- 35.0	4.80	123.8	- 45.98	60.8	- 0.52	- 12.9
	500	- 1.18	- 42.9	4.23	111.5	- 45.41	55.1	- 0.68	- 15.7
	600	- 1.52	- 50.3	3.72	100.3	- 45.41	54.4	- 0.84	- 18.0
	700	- 1.86	- 57.2	3.22	89.6	- 46.13	54.9	- 1.02	- 20.4
	800	- 2.20	- 63.9	2.72	79.4	- 46.63	58.5	- 1.16	- 22.7
	900	- 2.53	- 70.4	2.24	69.2	- 47.00	67.3	- 1.35	- 25.0
	1000	- 2.86	- 76.8	1.74	59.4	- 47.91	76.7	- 1.53	- 27.1
	1100	- 3.21	- 82.9	1.34	50.2	- 48.33	95.2	- 1.66	- 29.4
	1200	- 3.50	- 89.0	0.95	40.8	- 47.04	115.3	- 1.84	- 31.6
	1300	- 3.80	- 95.1	0.56	31.5	- 44.53	128.7	- 2.00	- 33.9

Typical Characteristics

T_{amb} = 25 °C, unless otherwise specified

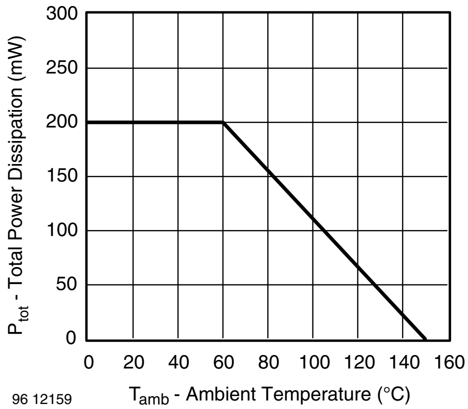


Figure 1. Total Power Dissipation vs. Ambient Temperature

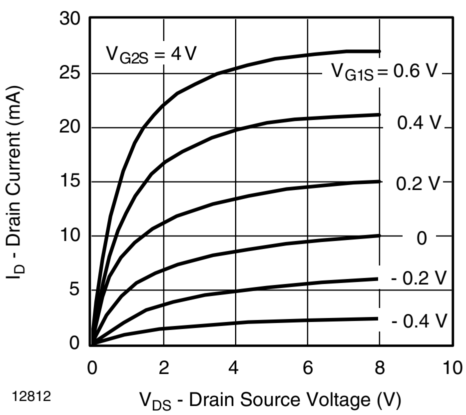


Figure 2. Drain Current vs. Drain Source Voltage

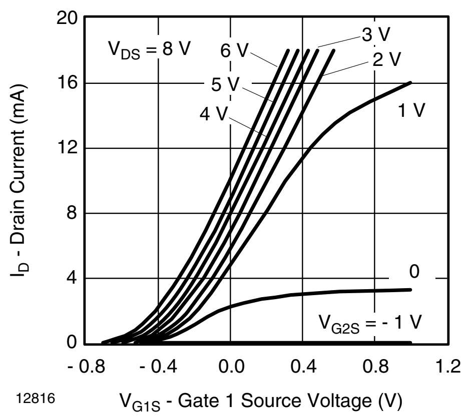


Figure 3. Drain Current vs. Gate 1 Source Voltage

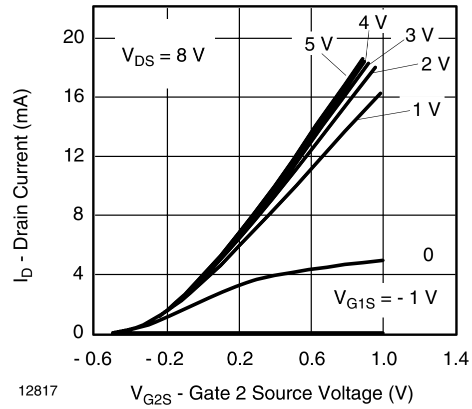


Figure 4. Drain Current vs. Gate 2 Source Voltage

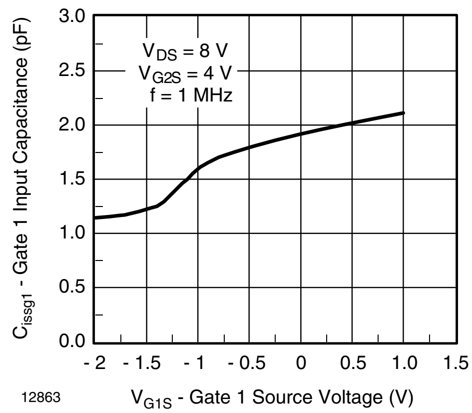


Figure 5. Gate 1 Input Capacitance vs. Gate 1 Source Voltage

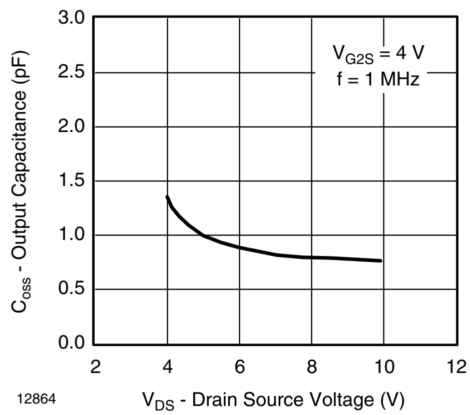


Figure 6. Output Capacitance vs. Drain Source Voltage

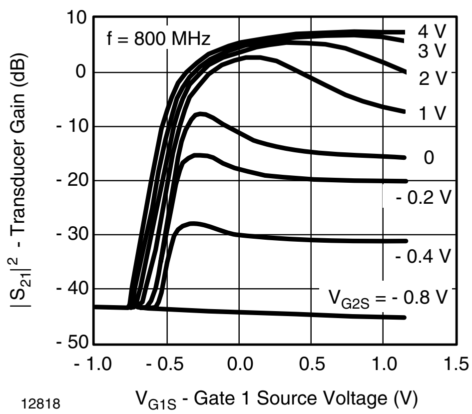


Figure 7. Transducer Gain vs. Gate 1 Source Voltage

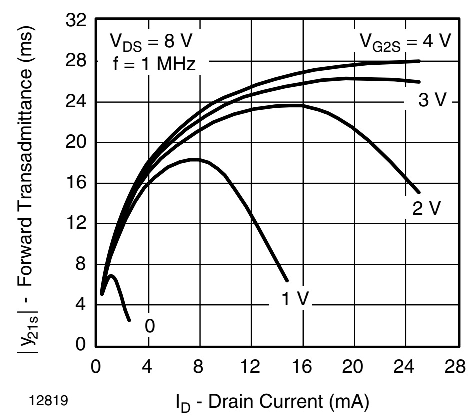


Figure 8. Forward Transadmittance vs. Drain Current

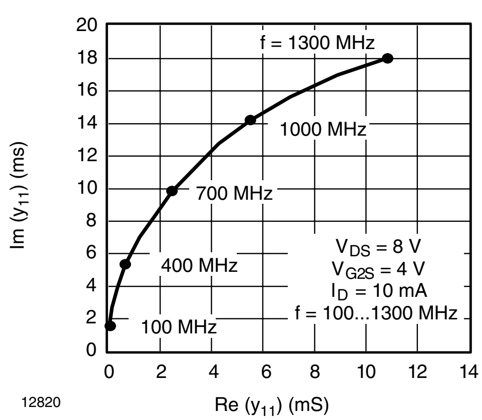


Figure 9. Short Circuit Input Admittance

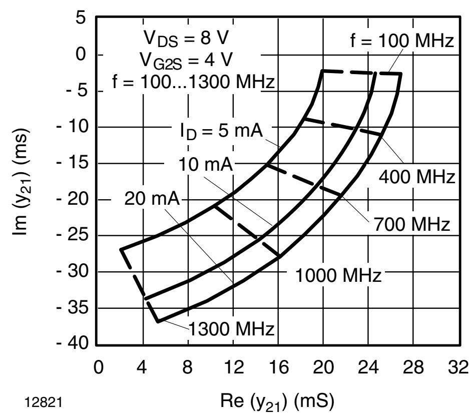


Figure 10. Short Circuit Forward Transfer Admittance

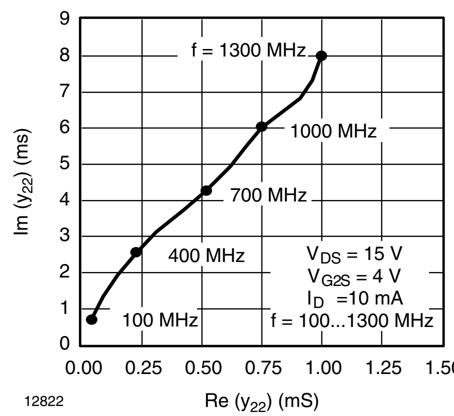


Figure 11. Short Circuit Output Admittance

V_{DS} = 8 V, I_D = 10 mA, V_{G2S} = 4 V, Z_0 = 50 Ω

S_{11}

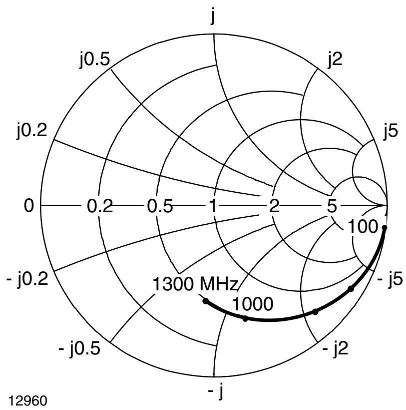


Figure 12. Input Reflection Coefficient

S_{21}

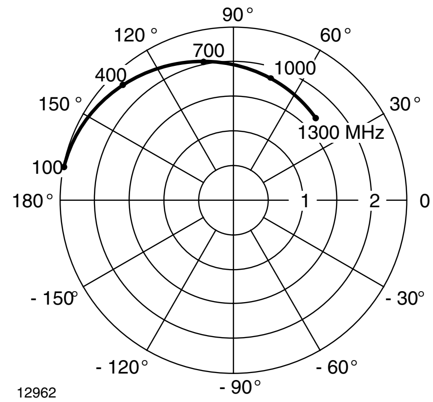


Figure 14. Forward Transmission Coefficient

S_{12}

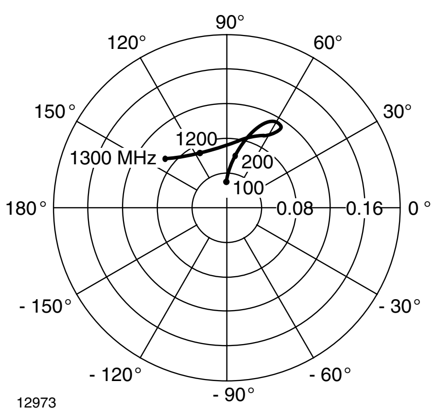


Figure 13. Reverse Transmission Coefficient

S_{22}

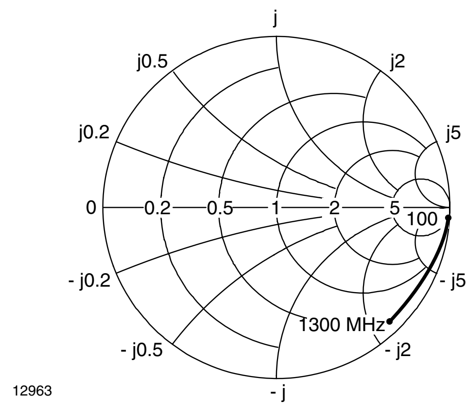
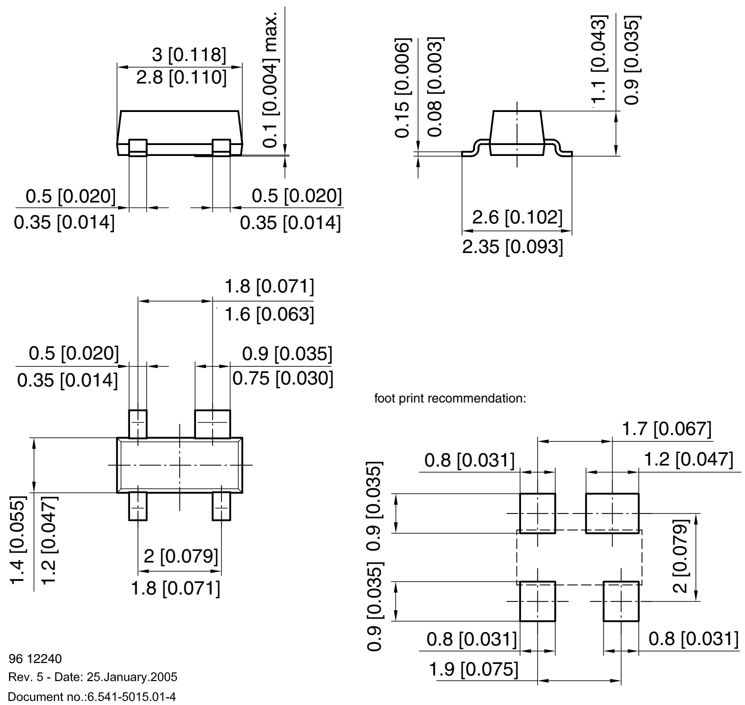
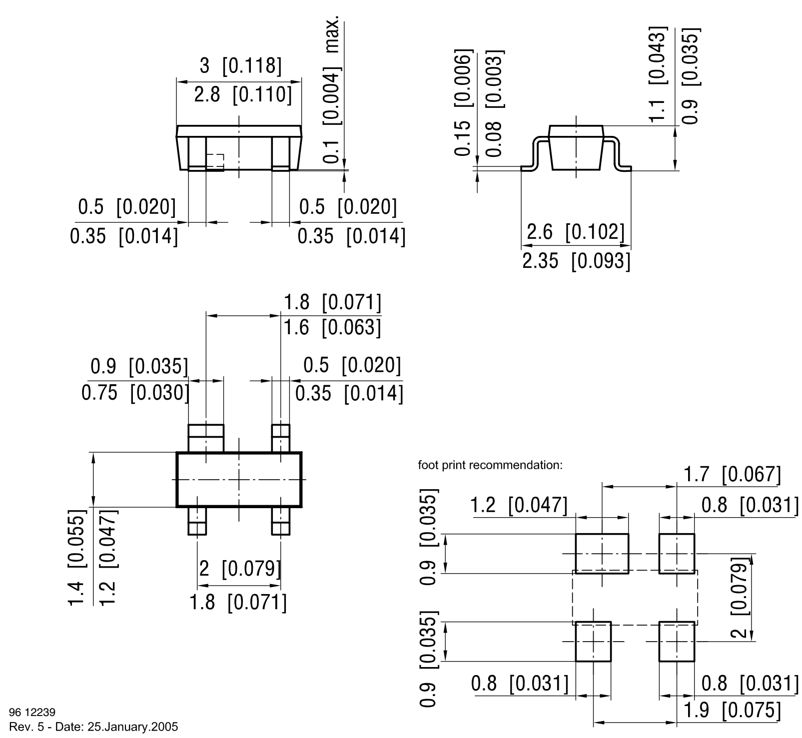


Figure 15. Output Reflection Coefficient

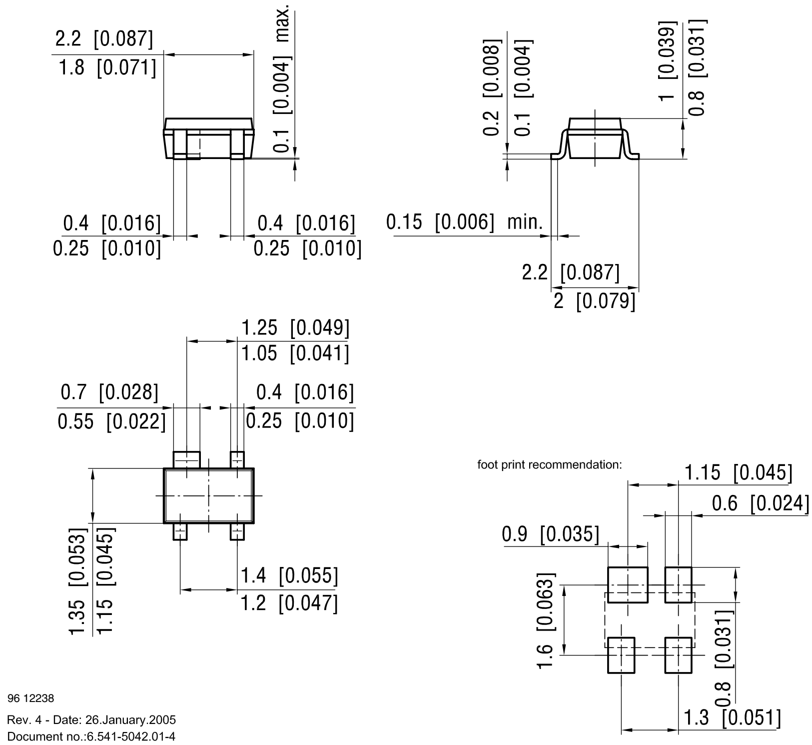
Package Dimensions in millimeters (inches): **SOT143**



Package Dimensions in millimeters (inches): **SOT143R**



Package Dimensions in millimeters (inches): **SOT343R**



Ozone Depleting Substances Policy Statement

It is the policy of Vishay Semiconductor GmbH to

1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Vishay Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Vishay Semiconductor GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

Vishay Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany

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