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

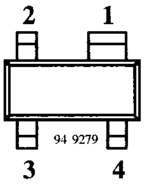
Electrostatic sensitive device.
Observe precautions for handling.

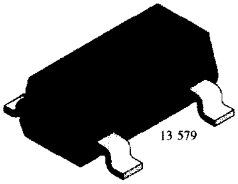
Applications

Input and mixer stages in UHF tuner.

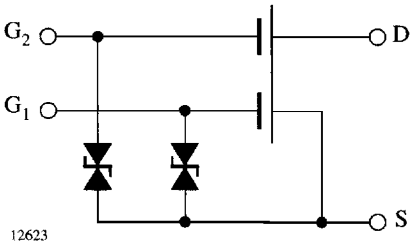
Features

- Integrated gate protection diodes
- Low noise figure
- Low feedback capacitance
- High cross modulation performance
- Low input capacitance
- High AGC-range





BF996S Marking: MH
Plastic case (SOT 143)
1 = Source; 2 = Drain; 3 = Gate 2; 4 = Gate 1



Absolute Maximum Ratings

Parameters	Symbol	Value	Unit
Drain source voltage	V_{DS}	20	V
Drain current	I_D	30	mA
Gate 1/gate 2-source peak current	$\pm I_{G1/G2SM}$	10	mA
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

Maximum Thermal Resistance

Parameters	Symbol	Value	Unit
Channel ambient on glass fibre printed board (25 x 20 x 1.5) mm^3 plated with 35 μm Cu	R_{thChA}	450	K/W

Electrical DC Characteristics

T_{amb} = 25°C

Parameters / Test Conditions	Type	Symbol	Min.	Typ.	Max.	Unit
Drain-source breakdown voltage I_D = 10 µA, $-V_{G1S} = -V_{G2S}$ = 4 V		$V_{(BR)DS}$	20			V
Gate 1-source breakdown voltage $\pm I_{G1S}$ = 10 mA, $V_{G2S} = V_{DS}$ = 0		$\pm V_{(BR)G1SS}$	8		14	V
Gate 2-source breakdown voltage $\pm I_{G2S}$ = 10 mA, $V_{G1S} = V_{DS}$ = 0		$\pm V_{(BR)G2SS}$	8		14	V
Gate 1-source leakage current $\pm V_{G1S}$ = 5 V, $V_{G2S} = V_{DS}$ = 0		$\pm I_{G1SS}$			50	nA
Gate 2-source leakage current $\pm V_{G2S}$ = 5 V, $V_{G1S} = V_{DS}$ = 0		$\pm I_{G2SS}$			50	nA
Drain current V_{DS} = 15 V, V_{G1S} = 0, V_{G2S} = 4 V	BF 996 S BF 996 SA BF 996 SB	I_{DSS} I_{DSS} I_{DSS}	4 4 9.5		18 10.5 18	mA mA mA
Gate 1-source cut-off voltage V_{DS} = 15 V, V_{G2S} = 4 V, I_D = 20 µA		$-V_{G1S(OFF)}$			2.5	V
Gate 2-source cut-off voltage V_{DS} = 15 V, V_{G1S} = 0, I_D = 20 µA		$-V_{G2S(OFF)}$			2.0	V

Electrical AC Characteristics

V_{DS} = 15 V, I_D = 10 mA, V_{G2S} = 4 V, f = 1 MHz, T_{amb} = 25°C

Parameters / Test Conditions	Type	Symbol	Min.	Typ.	Max.	Unit
Forward transadmittance		$\lvert y_{21s} \rvert$	15	18.5		mS
Gate 1 input capacitance		C_{issg1}		2.2	2.6	pF
Gate 2 input capacitance V_{G1S} = 0, V_{G2S} = 4 V		C_{issg2}		1.1		pF
Feedback capacitance		C_{rss}		25	35	fF
Output capacitance		C_{oss}		10.8	1.2	pF
Power gain g_S = 2 mS, g_L = 0.5 mS, f = 200 MHz g_S = 3.3 mS, g_L = 1 mS, f = 800 MHz		G_{ps} G_{ps}		25 18		dB 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 g_S = 3.3 mS, g_L = 1 mS, f = 800 MHz		F F		1.0 1.8		dB dB

Common Source S-Parameters
V_{DS} = 15 V, V_{G2S} = 4 V, Z_0 = 50 Ω

V_{DS}/V	I_D/mA	f/MHz	S_{11}		S_{21}		S_{12}		S_{22}	
			LIN MAG	ANG	LIN MAG	ANG	LIN MAG	ANG	LIN MAG	ANG
				deg		deg		deg		deg
15	5	100	0.99	–8.5	1.45	164.9	0.001	82.2	0.99	–3.4
		200	0.98	–17.7	1.52	150.9	0.003	75.6	0.98	–7.1
		300	0.95	–24.6	1.33	134.7	0.004	67.7	0.97	–9.7
		400	0.92	–32.1	1.26	121.3	0.004	62.8	0.95	–12.3
		500	0.89	–39.2	1.18	108.4	0.005	57.8	0.93	–15.1
		600	0.86	–45.8	1.11	96.5	0.005	57.3	0.92	–17.4
		700	0.83	–52.3	1.05	85.0	0.004	58.9	0.90	–19.7
		800	0.80	–58.7	0.99	74.1	0.004	63.3	0.88	–22.0
		900	0.78	–64.7	0.93	63.6	0.004	73.1	0.86	–24.3
		1000	0.75	–70.7	0.88	53.1	0.004	83.5	0.85	–26.2
		1100	0.72	–76.6	0.84	43.7	0.004	102.1	0.83	–28.4
		1200	0.70	–82.5	0.80	33.6	0.004	120.4	0.82	–30.5
		1300	0.68	–88.6	0.76	24.1	0.006	131.7	0.80	–32.7
	10	100	0.99	–9.0	1.82	165.3	0.002	81.9	0.99	–3.5
		200	0.98	–18.7	1.90	151.8	0.003	75.0	0.98	–7.2
		300	0.95	–26.0	1.67	136.3	0.004	67.2	0.96	–9.8
		400	0.92	–33.7	1.58	123.3	0.005	61.8	0.95	–12.6
		500	0.88	–41.2	1.48	110.9	0.005	56.3	0.93	–15.3
		600	0.85	–48.3	1.39	99.5	0.005	55.8	0.91	–17.8
		700	0.82	–55.1	1.32	88.7	0.005	56.7	0.90	–20.0
		800	0.79	–61.6	1.24	78.1	0.004	60.7	0.88	–22.4
		900	0.76	–67.9	1.17	67.9	0.004	69.9	0.86	–24.6
		1000	0.73	–74.2	1.11	57.9	0.004	80.0	0.84	–26.6
		1100	0.71	–80.2	1.06	48.7	0.004	98.9	0.83	–28.8
		1200	0.68	–86.4	1.01	38.9	0.004	118.2	0.81	–31.0
		1300	0.66	–92.3	0.97	29.6	0.006	130.5	0.80	–33.3
	15	100	0.99	–9.4	2.01	165.4	0.002	81.4	0.98	–3.6
		200	0.98	–19.4	2.10	152.0	0.003	74.6	0.97	–7.3
		300	0.94	–27.1	1.84	136.7	0.004	66.4	0.96	–10.0
		400	0.91	–35.0	1.74	123.8	0.005	60.8	0.94	–12.9
		500	0.87	–42.9	1.63	111.5	0.005	55.1	0.92	–15.7
		600	0.84	–50.3	1.53	100.3	0.005	54.4	0.91	–18.0
		700	0.81	–57.2	1.45	89.6	0.005	54.9	0.89	–20.4
		800	0.78	–63.9	1.37	79.4	0.005	58.5	0.87	–22.7
		900	0.75	–70.4	1.29	69.2	0.004	67.3	0.86	–25.0
		1000	0.72	–76.8	1.22	59.4	0.004	76.7	0.84	–27.1
		1100	0.69	–82.9	1.17	50.2	0.004	95.2	0.83	–29.4
		1200	0.67	–89.0	1.12	40.8	0.004	115.3	0.81	–31.6
		1300	0.65	–95.1	1.07	31.5	0.006	128.7	0.79	–33.9

Typical Characteristics (T$_j$ = 25 °C unless otherwise specified)

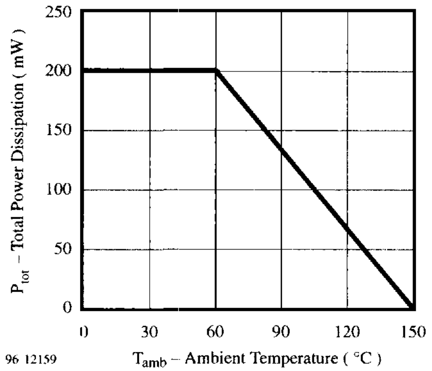


Figure 1. Total Power Dissipation vs. Ambient Temperature

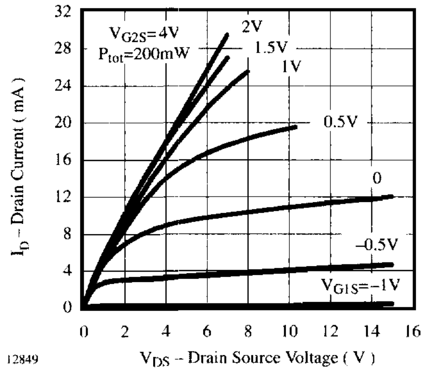


Figure 2. Drain Current vs. Drain Source Voltage

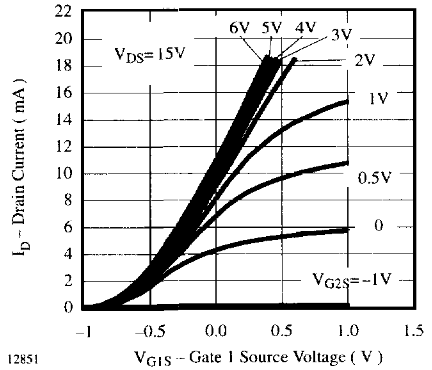


Figure 3. Drain Current vs. Gate 1 Source Voltage

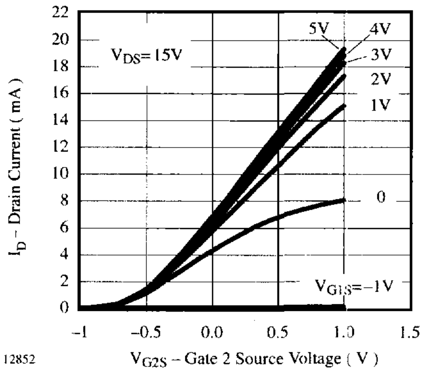


Figure 4. Drain Current vs. Gate 2 Source Voltage

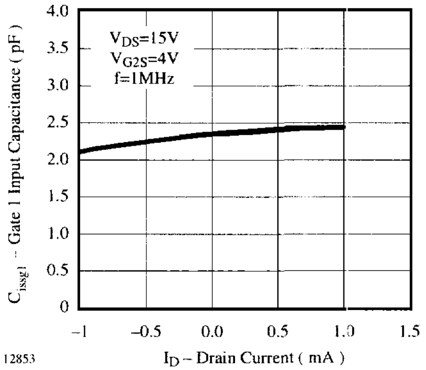


Figure 5. Gate 1 Input Capacitance vs. Drain Current

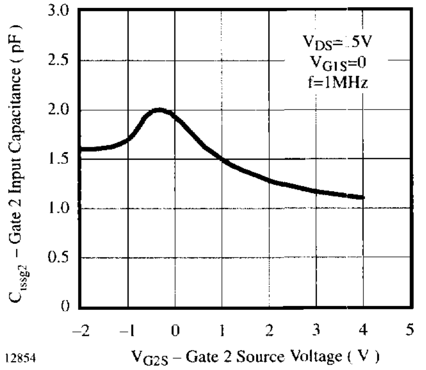


Figure 6. Gate 2 Input Capacitance vs. Gate 2 Source Voltage

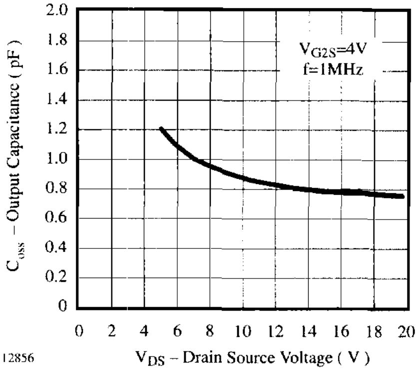


Figure 7. Output Capacitance vs. Drain Source Voltage

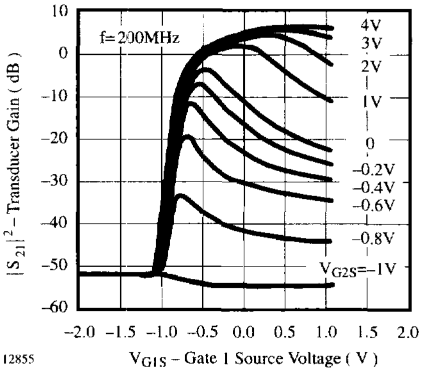


Figure 8. Transducer Gain vs. Gate 1 Source Voltage

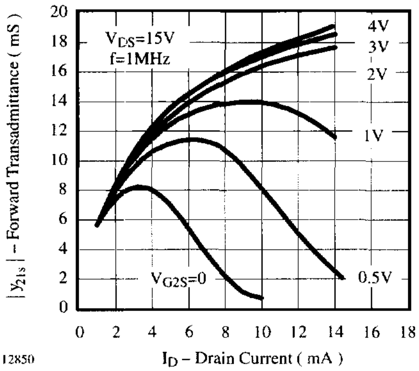


Figure 9. Forward Transadmittance vs. Drain Current

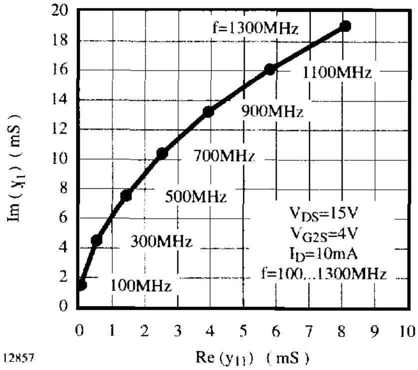


Figure 10. Short Circuit Input Admittance

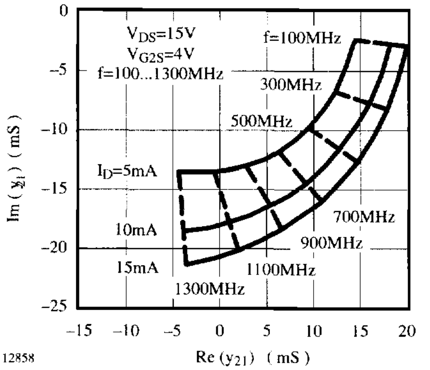


Figure 11. Short Circuit Forward Transfer Admittance

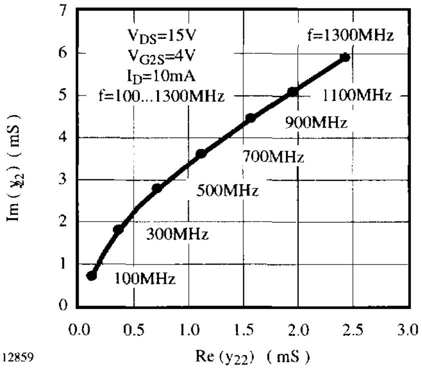


Figure 12. Short Circuit Output Admittance

V_{DS} = 15 V; I_D = 10 mA; V_{G2S} = 4 V; Z_0 = 50 Ω

S_{11}

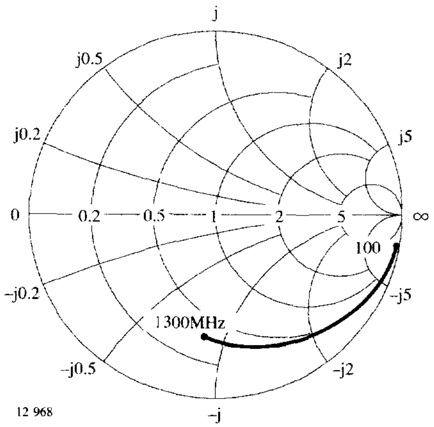


Figure 13. Input reflection coefficient

S_{12}

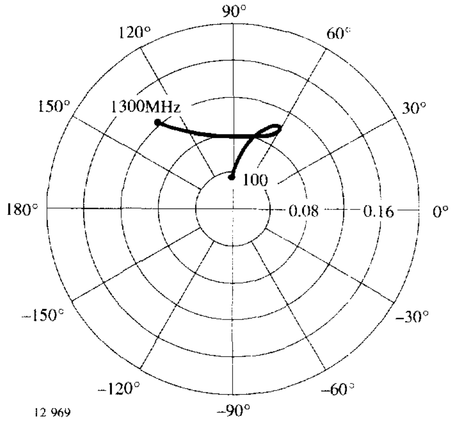


Figure 15. Reverse transmission coefficient

S_{21}

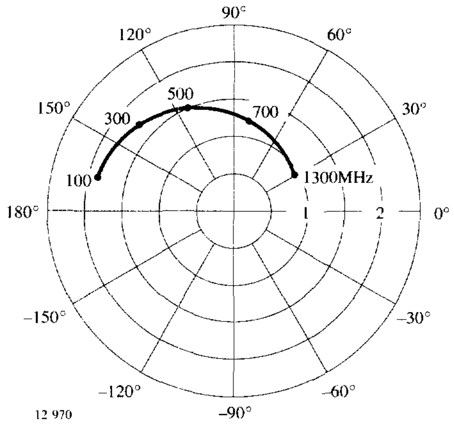


Figure 14. Forward transmission coefficient

S_{22}

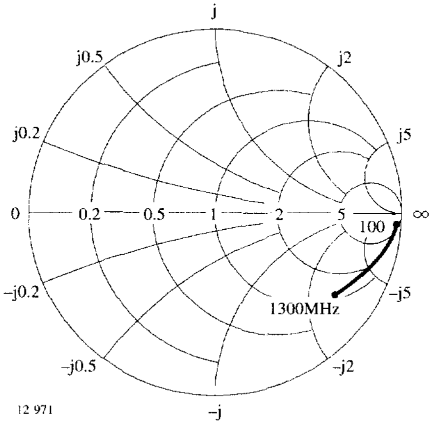


Figure 16. Output reflection coefficient

Dimensions in mm