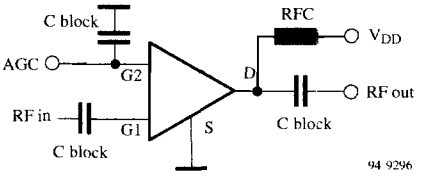
MOSMIC® for TV-Tuner Prestage with 5 V Supply Voltage

MOSMIC – MOS Monolithic Integrated Circuit

Electrostatic sensitive device.
Observe precautions for handling.

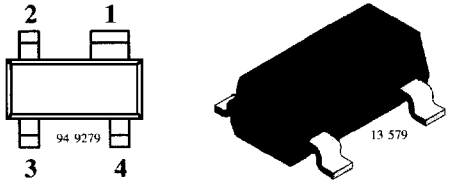
Applications

Low noise gain controlled input stages in UHF- and VHF-tuner with 5 V supply voltage.

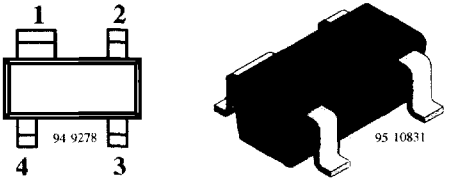


Features

- Integrated gate protection diodes
- Low noise figure
- High gain
- Biasing network on chip
- Improved cross modulation at gain reduction
- High AGC-range
- SMD package



S594T Marking: 594
Plastic case (SOT 143)
1 = Source; 2 = Drain; 3 = Gate 2; 4 = Gate 1



S594TR Marking: 94R
Plastic case (SOT 143R)
1 = Source; 2 = Drain; 3 = Gate 2; 4 = Gate 1

Absolute Maximum Ratings

Parameters	Symbol	Value	Unit
Drain source voltage	V_{DS}	8	V
Drain current	I_D	20	mA
Gate 1/gate 2-source peak current	$\pm I_{G1/G2SM}$	10	mA
Gate 1/gate 2-source voltage	$\pm V_{G1/G2SM}$	6	V
Total power dissipation $T_{amb} \leq 78°C$	P_{tot}	160	mW
Channel temperature	T_{Ch}	150	°C
Storage temperature range	T_{stg}	–55 to +150	°C

Maximum Thermal Resistance

Parameters	Symbol	Maximum	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	Symbol	Min.	Typ.	Max.	Unit
Gate 1-source breakdown voltage $\pm I_{G1S}$ = 10 mA, $V_{G2S} = V_{DS} = 0$	$\pm V_{(BR)G1SS}$	7		10	V
Gate 2-source breakdown voltage $\pm I_{G2S}$ = 10 mA, $V_{G1S} = V_{DS} = 0$	$\pm V_{(BR)G2SS}$	7		10	V
Gate 1-source leakage current $+V_{G1S}$ = 5 V, $V_{G2S} = V_{DS} = 0$	$+I_{G1SS}$			50	µA
Gate 1-source leakage current $-V_{G1S}$ = 5 V, $V_{G2S} = V_{DS} = 0$	$-I_{G1SS}$			100	µA
Gate 2-source leakage current $\pm V_{G2S}$ = 5 V, $V_{G1S} = V_{DS} = 0$	$\pm I_{G2SS}$			20	nA
Drain current V_{DS} = 5 V, V_{G1S} = 0, V_{G2S} = 4 V	I_{DSS}	50		500	µA
Self-biased operating current V_{DS} = 5 V, V_{G1S} =nc, V_{G2S} = 4 V	I_{DSP}	7	10	14	mA
Gate 2-source cut-off voltage V_{DS} = 5 V, V_{G1S} = nc, I_D = 20 µA	$V_{G2S(OFF)}$		1.0		V

Electrical AC Characteristics

V_{DS} = 5 V, V_{G2S} = 4 V, f = 1 MHz, T_{amb} = 25°C

Parameters / Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Forward transadmittance	$\lvert y_{21s} \rvert$	20	24	28	mS
Gate 1 input capacitance	C_{issg1}		2.1	2.5	pF
Feedback capacitance	C_{rss}		20		fF
Output capacitance	C_{oss}		0.9		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}	 16.5	 26 20	 	 dB dB
AGC range V_{DS} = 5 V, V_{G2S} = 1 to 4 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 1.3	 	 dB dB

Caution for Gate 1 switch-off mode:

No external DC-voltage on Gate 1 in active mode!
Switch-off at Gate 1 with $V_{G1S} < 0.7$ V is feasible.
Using open collector switching transistor (inside of PLL), insert 10 kΩ collector resistor.

Common Source S-Parameters
V_{DS} = 5 V; V_{G2S} = 4 V

f/MHz	S_{11}		S_{21}		S_{12}		S_{22}	
	LOG MAG	ANG	LOG MAG	ANG	LOG MAG	ANG	LOG MAG	ANG
	dB	deg	dB	deg	dB	deg	dB	deg
50	–0.02	–4.1	7.63	174.7	–63.74	88.0	–0.07	–1.8
100	–0.04	–7.9	7.56	169.0	–57.38	85.8	–0.09	–3.4
150	–0.11	–11.6	7.47	162.5	–53.95	82.9	–0.12	–5.3
200	–0.19	–15.5	7.36	156.7	–51.68	80.5	–0.15	–6.9
250	–0.30	–19.6	7.20	150.3	–50.05	78.0	–0.17	–8.8
300	–0.39	–22.9	7.06	145.2	–48.69	76.6	–0.22	–10.4
350	–0.54	–26.6	6.84	139.3	–47.82	74.8	–0.27	–11.8
400	–0.67	–30.0	6.67	133.9	–47.15	73.6	–0.29	–13.6
450	–0.82	–33.3	6.44	128.7	–46.66	72.8	–0.37	–15.1
500	–0.98	–36.7	6.26	123.5	–46.39	72.1	–0.44	–16.8
550	–1.14	–39.8	6.07	118.7	–46.33	72.0	–0.48	–18.3
600	–1.30	–43.2	5.81	113.4	–46.34	74.4	–0.55	–19.8
650	–1.44	–46.1	5.62	109.3	–46.14	76.3	–0.61	–21.1
700	–1.58	–49.2	5.43	104.4	–46.17	78.6	–0.66	–22.5
750	–1.74	–52.0	5.22	100.0	–46.48	81.7	–0.72	–24.2
800	–1.91	–54.9	5.01	95.5	–46.65	87.0	–0.78	–25.5
850	–2.02	–58.0	4.86	91.2	–46.62	93.4	–0.82	–27.0
900	–2.16	–61.0	4.68	86.8	–46.43	102.1	–0.86	–28.7
950	–2.28	–63.8	4.53	82.6	–45.77	110.0	–0.93	–30.0
1000	–2.43	–66.6	4.29	78.4	–45.10	114.9	–1.01	–31.4
1050	–2.57	–69.4	4.12	73.8	–44.59	119.4	–1.12	–32.7
1100	–2.74	–72.4	3.93	69.9	–44.05	126.3	–1.18	–34.2
1150	–2.81	–75.3	3.85	65.7	–43.14	132.1	–1.20	–35.8
1200	–2.93	–78.0	3.74	62.0	–42.24	138.1	–1.23	–37.3
1250	–3.06	–80.8	3.63	57.8	–41.21	143.1	–1.27	–38.7
1300	–3.16	–83.8	3.47	53.4	–40.03	146.5	–1.39	–40.1

Typical Characteristics (T_j = 25°C unless otherwise specified)

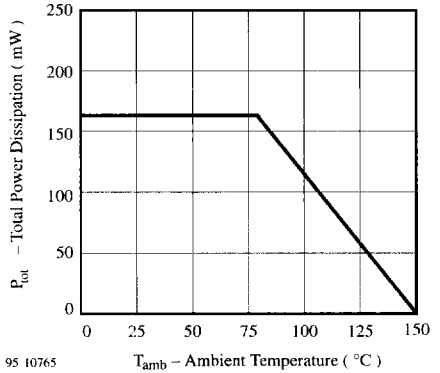


Figure 1. Total Power Dissipation vs. Ambient Temperature

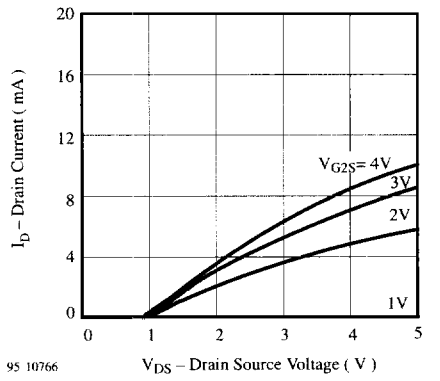


Figure 2. Drain Current vs. Drain Source Voltage

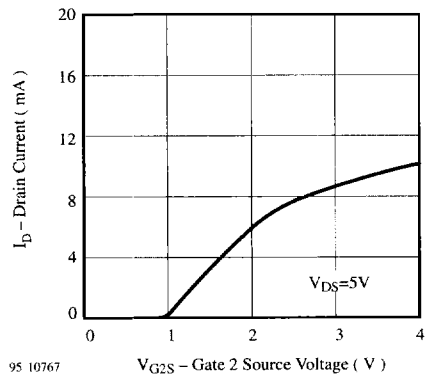


Figure 3. Drain Current vs. Gate 2 Source Voltage

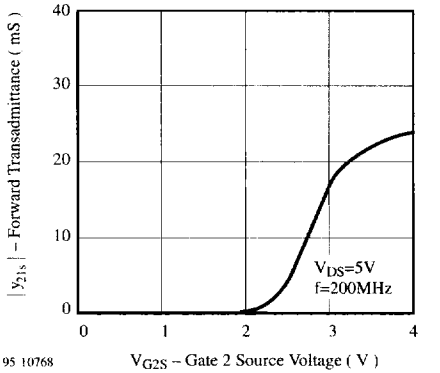


Figure 4. Forward Transadmittance vs. Gate 2 Source Voltage

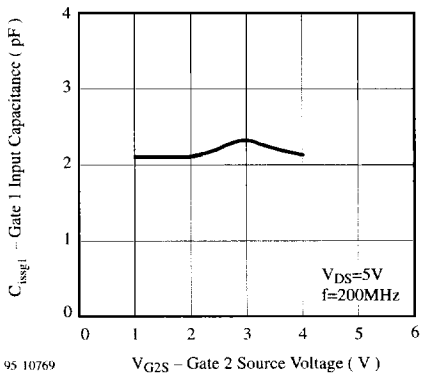


Figure 5. Gate 1 Input Capacitance vs. Gate 2 Source Voltage

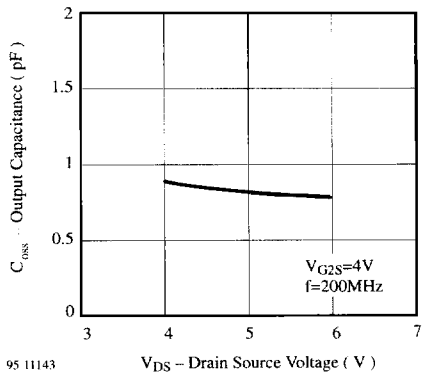


Figure 6. Output Capacitance vs. Drain Source Voltage

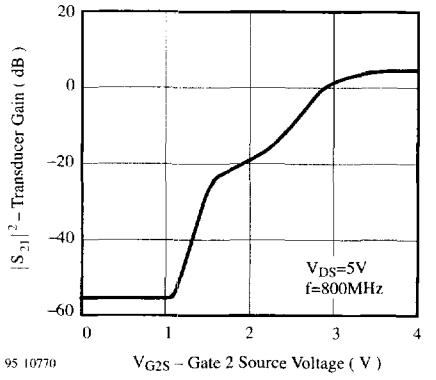


Figure 7. Transducer Gain vs. Gate 2 Source Voltage

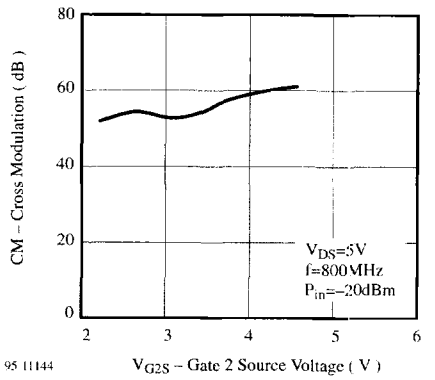


Figure 8. Gate 1 Cross Modulation vs. Gate 2 Source Voltage

V_{DS} = 5 V; V_{G2S} = 4 V; Z_0 = 50 Ω

S_{11}

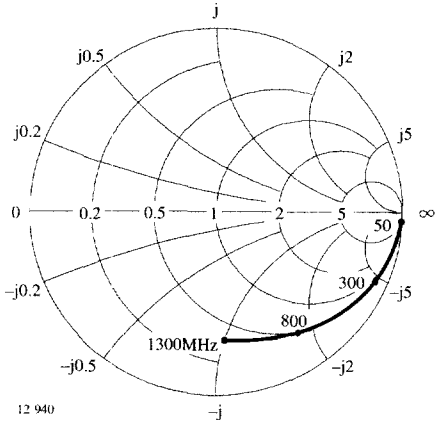


Figure 9. Input reflection coefficient

S_{12}

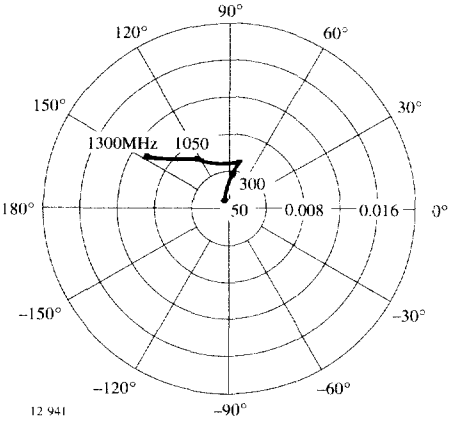


Figure 11. Reverse transmission coefficient

S_{21}

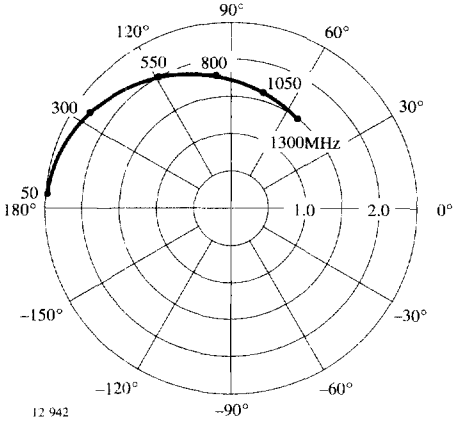


Figure 10. Forward transmission coefficient

S_{22}

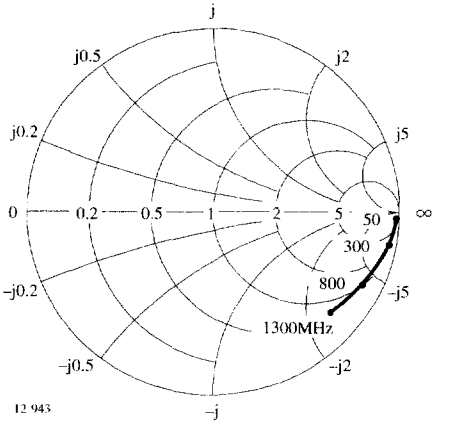
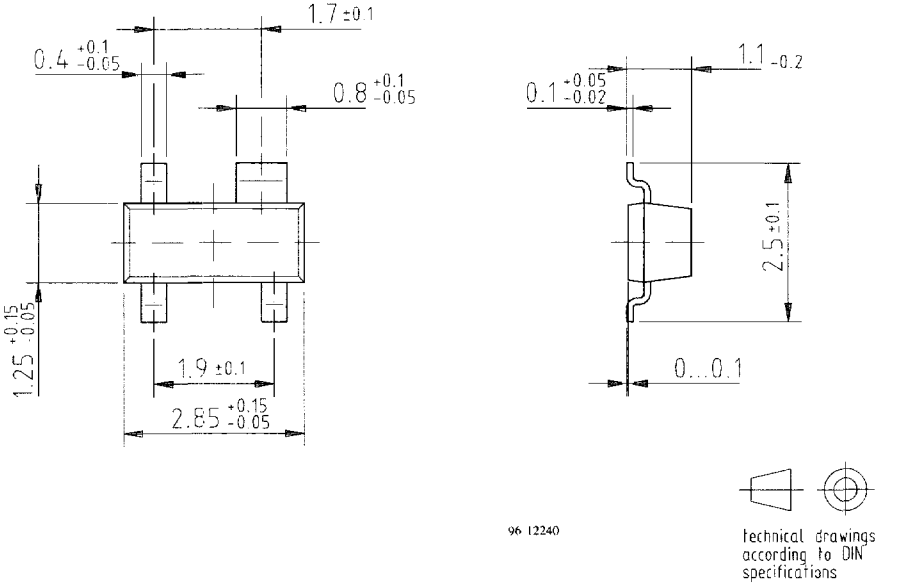


Figure 12. Output reflection coefficient

Dimensions of S594T in mm



Dimensions of S594TR in mm