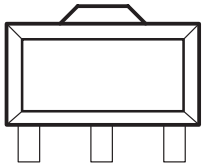
SLWS058B – APRIL 1997 – REVISED MARCH 1998

- **Wide Operating Frequency Range up to 1000 MHz**
- **High Output Power:**
  Typical Value of 32.5 dBm at 4.8 V and 900 MHz
  Typical Value of 29 dBm at 3.6 V and 900 MHz
- **High Gain:**
  Typical Value of 9.5 dB at 4.8 V, and 900 MHz at 32.5-dBm Output Power
- **High Power-Added Efficiency (PAE):**
  Typical Value of 50% at 32.5-dBm Output Power
- **Low Cost**
- **Extremely Rugged:**
  Sustains 20:1 Load Mismatch
- **Suitable for Various Wireless Applications**
- **Low Leakage <1 μA**
- **SOT-89 Plastic Power Package**

PK PACKAGE
(TOP VIEW)



description

The TRF7003 power amplifier is a silicon, metal-oxide semiconductor, field-effect transistor (MOSFET) manufactured using the Texas Instruments RFMOS™ process. It is housed in a SOT-89 (PK) plastic power package. The TRF7003 is intended for global systems for mobile communications (GSM) power amplifier applications. The TRF7003 is a rugged, low-cost device that operates from a single-polarity positive power supply and has low leakage current. Typical power output at 900 MHz is 32.5 dBm, with an associated power gain of 9.5 dB and 50-percent power-added efficiency (PAE).

ADVANCE INFORMATION

These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

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absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Drain-source voltage, V_{DS} . . . . . 20 V
Gate-source voltage, V_{GS} . . . . . 7 V
Continuous drain current, I_D . . . . . 2 A
Junction temperature, $T_{J\ max}$ . . . . . 150°C
Thermal resistance, junction to case, $R_{\Theta JC}$ (See Note 1) . . . . . 10°C/W
Total device power dissipation @ T_C = 25°C . . . . . 12.5 W
Derate above 25 °C . . . . . 100 mW/°C
Operating free-air temperature range,T_A . . . . . –40°C to 85°C
Storage temperature range, T_{stg} . . . . . –65°C to 100°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under ”recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTE 1: With infinite heatsink and no air flow

electrical characteristics over operating free-air temperature range (unless otherwise noted)

dc characteristics

PARAMETER		TEST CONDITIONS‡		LIMITS			UNITS
				MIN	TYP	MAX	
I_D	Saturated drain current	V_{DS} = 4.8 V,	V_{GS} = 1.8 V		0.7		A
g_m	Transconductance	V_{DS} = 4.8 V,	V_{GS} = 1.8 V		1000		mS
$V_{(TO)}$	Threshold voltage	V_{DS} = 100mV,	I_{DS} = 1.5 mA		1.0		V
$V(BR)_{sd}$	Source-drain breakdown voltage	Ids = 40 μA, Source is grounded	V_{GS} = 0 V		23		V
	Leakage current	V_{DS} = 4.8 V	V_{GS} = 0 V		<1		μA

‡ T_A = 25°C

RF characteristics, V_{DS} = 4.8 V, V_{GS} = 1.8 V

PARAMETER		TEST CONDITIONS§	LIMITS			UNITS
			MIN	TYP	MAX	
	Output power	Frequency = 900 MHz, P_I = 23 dBm	31.5	32.5		dBm
	Power gain	Frequency = 900 MHz, P_I = 23 dBm		9.5		dB
η_{add}	Power added efficiency	Frequency = 900 MHz, P_I = 23 dBm	45	50		%
	Ruggedness test	P_I = 23 dBm, Frequency = 900 MHz, Load VSWR = 20:1, All phase angles		¶		

§ T_A = 25°C, fixed matching circuit
¶ No degradation in output power after test.

ADVANCE INFORMATION

TYPICAL CHARACTERISTICS

**OUTPUT POWER AND POWER ADDED EFFICIENCY
vs
INPUT POWER
OVER TEMPERATURE**

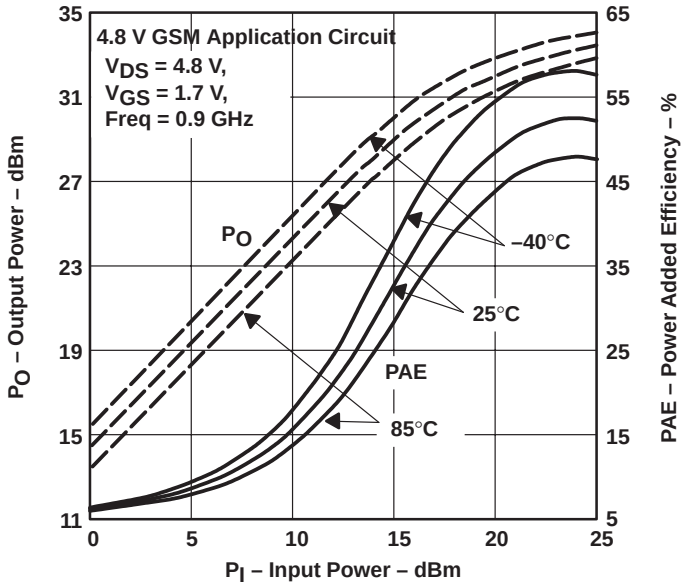


Figure 1

**OUTPUT POWER AND POWER ADDED EFFICIENCY
vs
FREQUENCY
OVER TEMPERATURE**

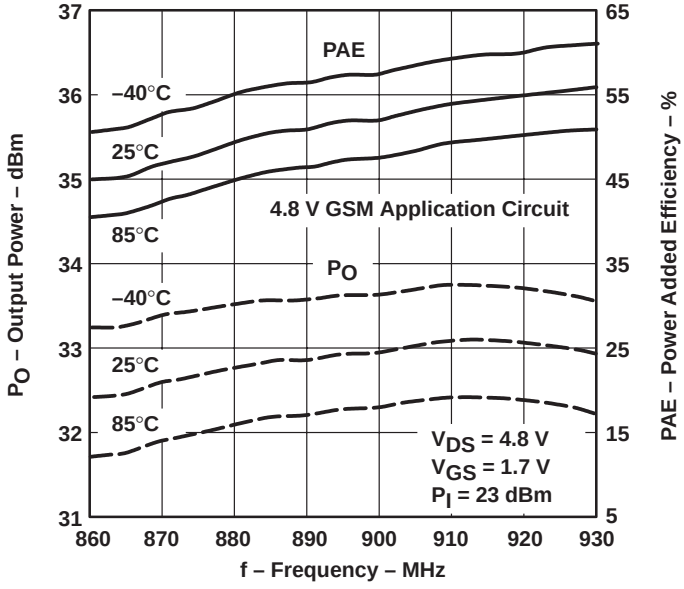


Figure 2

ADVANCE INFORMATION

TYPICAL CHARACTERISTICS

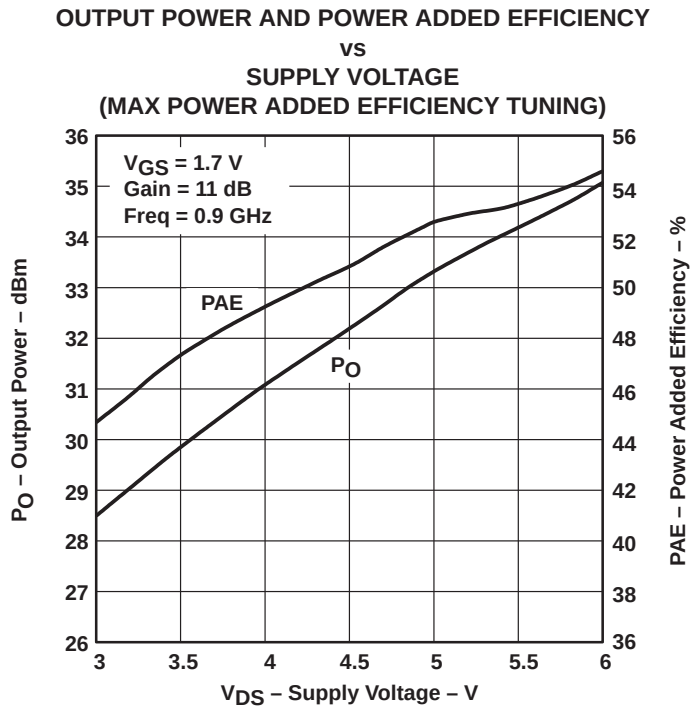


Figure 3

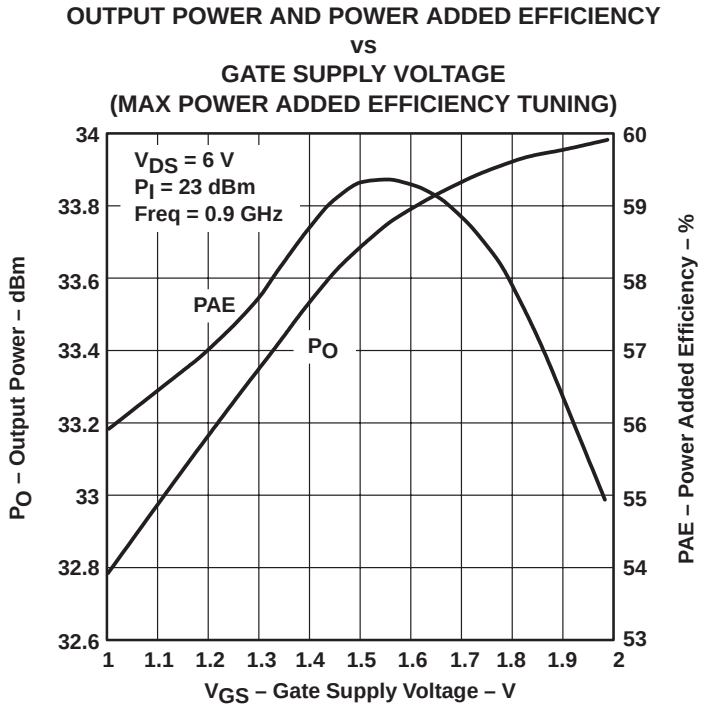


Figure 4

TYPICAL CHARACTERISTICS

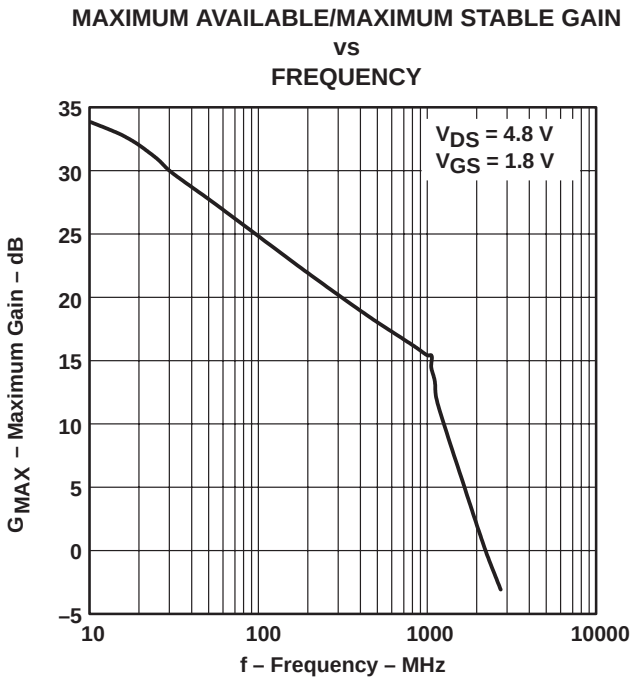


Figure 5

Table 1 lists the small signal scattering parameters of the TRF7003.

Table 1. Small Signal Scattering Parameters, V_{DS} = 4.8 V, V_{GS} = 1.8 V

FREQ MHz	S11 (MAG)	S11 (ANG)	S21 (MAG)	S21 (ANG)	S12 (MAG)	S12 (ANG)	S22 (MAG)	S22 (ANG)
100	0.88	–153	9.21	96	0.027	7	0.80	–169
200	0.87	–167	4.61	83	0.027	–6	0.81	–175
300	0.88	–171	3.05	73	0.026	–13	0.82	–176
400	0.88	–174	2.20	65	0.025	–20	0.83	–178
500	0.89	–176	1.76	59	0.024	–25	0.84	–179
600	0.89	–178	1.40	52	0.022	–29	0.84	180
700	0.90	–180	1.15	46	0.022	–33	0.86	178
800	0.90	179	0.99	41	0.021	–38	0.86	177
900	0.91	177	0.84	36	0.019	–40	0.87	176
1000	0.91	175	0.73	31	0.018	–42	0.87	174

ADVANCE INFORMATION

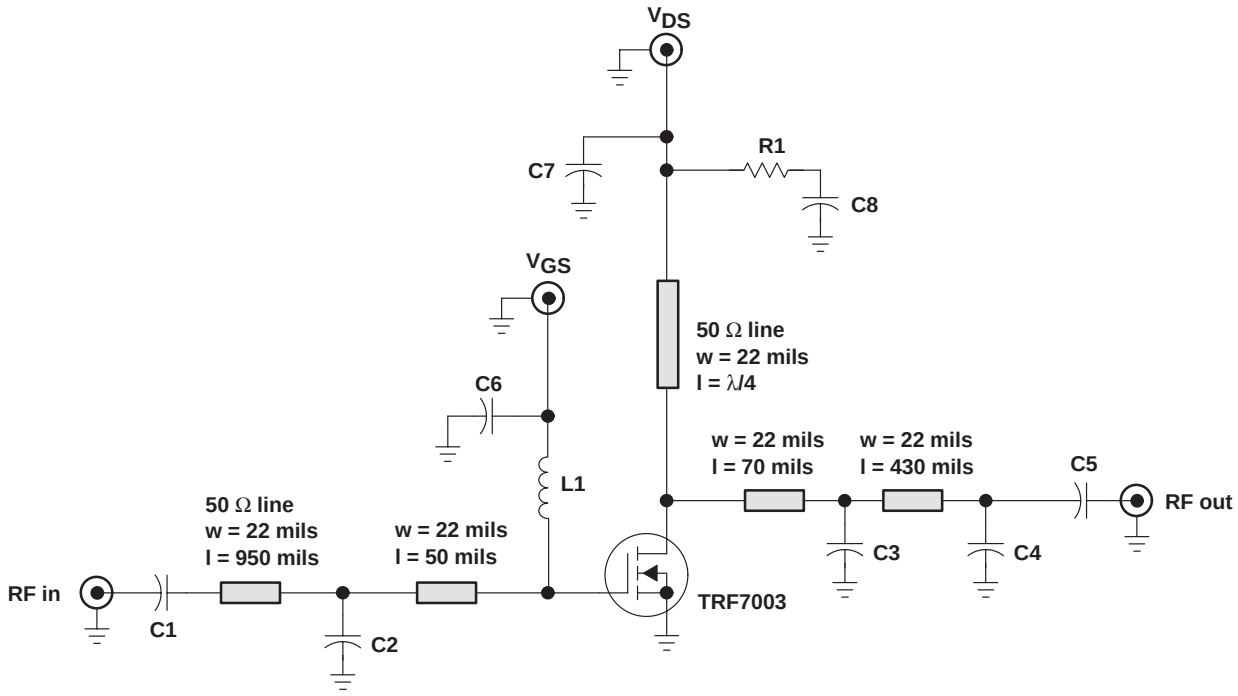
TYPICAL CHARACTERISTICS

Table 2 lists the input and output matching for maximum power-added efficiency (PAE) versus frequency.

Table 2. Input/Output Matching for Maximum PAE Versus Frequency, V_{DS} = 4.8 V, V_{GS} = 1.8 V

FREQUENCY MHz	S11 (MAG)	S11 (ANG)	S22 (MAG)	S22 (ANG)
800	.94	165	0.84	164
850	.94	164.5	0.87	163.5
900	.94	164.5	0.88	163
950	.94	164	0.88	162
1000	.94	164	0.88	161

APPLICATION INFORMATION



Board Material Specifications:
Type FR4 ; ε_r = 4.3 ; h = 12 mils

Figure 6. Recommended Application Circuit for 4.8-V GSM

Table 3 lists the TRF7003 components for the recommended 4.8-V GSM application circuit.

Table 3. Component List

DESIGNATORS	DESCRIPTION	VALUE	MANUFACTURER	MANUFACTURER P/N
C1	Capacitor	20 pF	ATC™	ATC100A200JP150X
C2	Capacitor	18 pF	ATC	ATC100A180JP150X
C3	Capacitor	16 pF	ATC	ATC100A160JP150X
C4	Capacitor	2.7 pF	ATC	ATC100A2R7CP150X
C5	Capacitor	100 pF	ATC	ATC100A101JP150X
C6	Capacitor	1 μF	MURATA	GRM220Y5V105Z010
C7	Capacitor	100 pF	ATC	ATC100A101JP150X
C8	Capacitor	1 μF	MURATA	GRM220Y5V105Z010
R1	Resistor	30 Ω	International Manufacturing Services	RCI–0402–30ROJ
L1	Inductor	15 nH	TOKO	LL2012–F15NK

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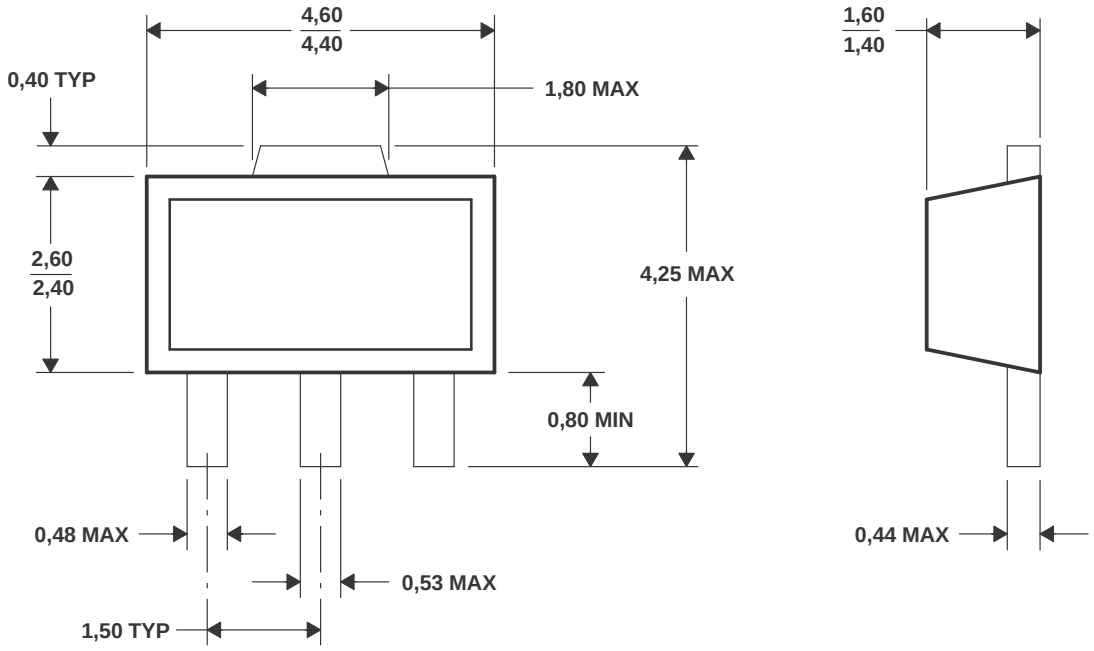
ADVANCE INFORMATION

MECHANICAL DATA

PK (R-PSSO-F3) **PLASTIC SINGLE-IN-LINE PACKAGE**



NOTES: A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. The center lead is in electrical contact with the tab.

ADVANCE INFORMATION

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