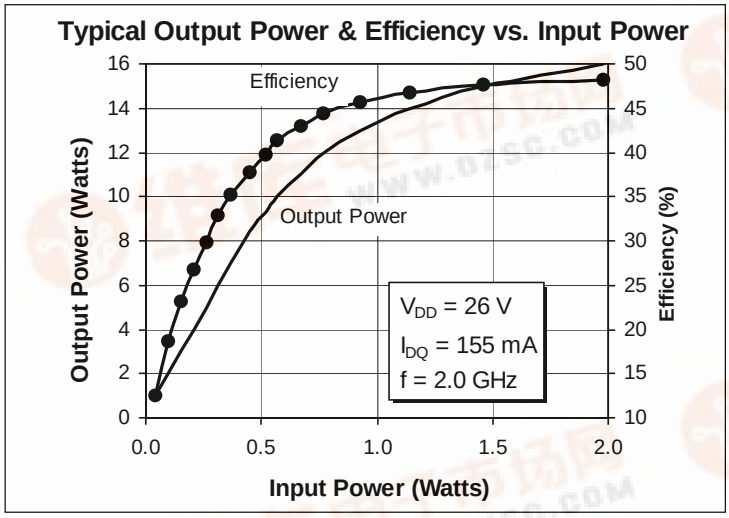
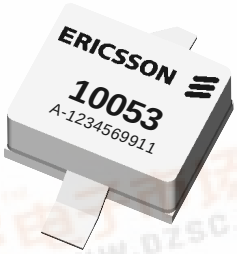
PTF 10053
12 Watts, 2.0 GHz
GOLDMOS® Field Effect Transistor

Description

The PTF 10053 is a 12–watt *GOLDMOS* FET intended for large signal applications from 1.0 to 2.0 GHz. It operates at 40% efficiency with 12 dB typical gain. Nitride surface passivation and full gold metallization ensure excellent device lifetime and reliability.

- **Guaranteed Performance at 1.99 GHz, 26 V**
  - **Output Power = 12 Watts Min**
  - **Power Gain = 12 dB Typ**
- **Full Gold Metallization**
- **Silicon Nitride Passivated**
- **Back Side Common Source**
- **Excellent Thermal Stability**
- **100% Lot Traceability**





Package 20244

RF Specifications (100% Tested)

Characteristic	Symbol	Min	Typ	Max	Units
Gain (V_{DD} = 26 V, P_{OUT} = 3 W, I_{DQ} = 155 mA, f = 1.93, 1.99 GHz)	G_{ps}	10	12	—	dB
Power Output at 1 dB Compression (V_{DD} = 26 V, I_{DQ} = 155 mA, f = 1.99 GHz)	P-1dB	12	—	—	Watts
Drain Efficiency (V_{DD} = 26 V, P_{OUT} = 12 W, I_{DQ} = 155 mA, f = 1.99 GHz)	η_D	40	—	—	%
Load Mismatch Tolerance (V_{DD} = 26 V, P_{OUT} = 12 W, I_{DQ} = 155 mA, f = 1.99 GHz —all phase angles at frequency of test)	Ψ	—	—	10:1	—

All published data at T_{CASE} = 25°C unless otherwise indicated.

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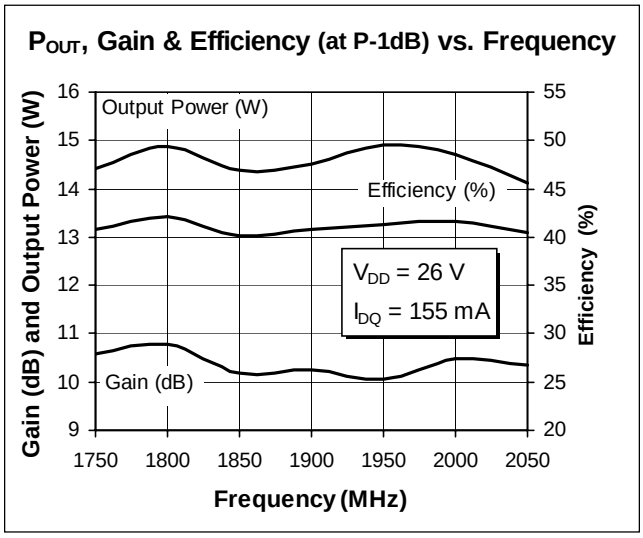
Electrical Characteristics (100% Tested)

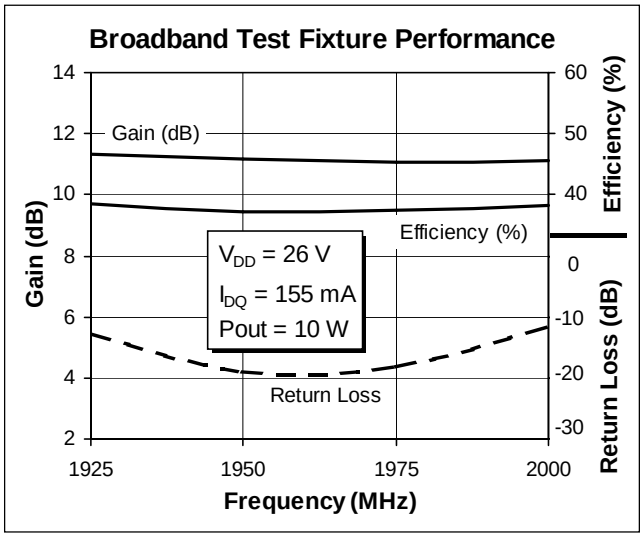
Characteristic	Conditions	Symbol	Min	Typ	Max	Units
Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 50 mA	$V_{(BR)DSS}$	65	—	—	Volts
Zero Gate Voltage Drain Current	V_{DS} = 26 V, V_{GS} = 0 V	I_{DSS}	—	—	1.0	mA
Gate Threshold Voltage	V_{DS} = 10 V, I_D = 75 mA	$V_{GS(th)}$	3.0	—	5.0	Volts
Forward Transconductance	V_{DS} = 10 V, I_D = 2 A	g_{fs}	—	0.8	—	Siemens

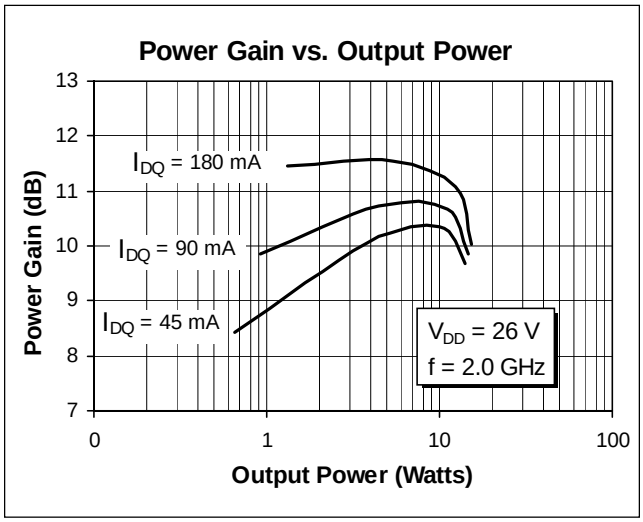
Maximum Ratings

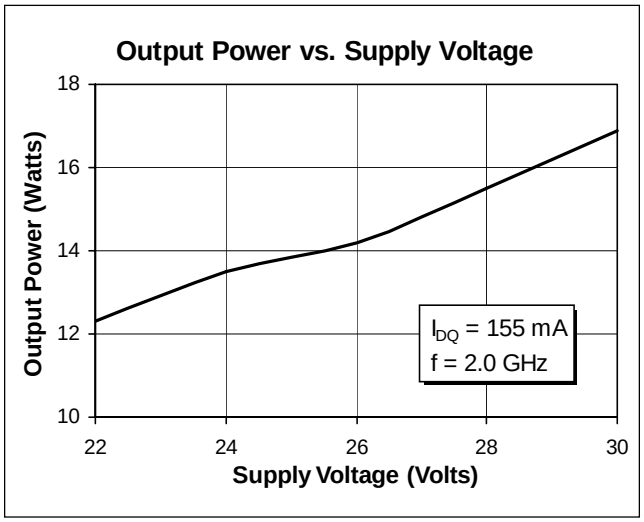
Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	65	Vdc
Gate-Source Voltage	V_{GS}	±20	Vdc
Operating Junction Temperature	T_J	200	°C
Total Device Dissipation Above 25°C derate by	P_D	58 0.33	Watts W/°C
Storage Temperature Range	T_{STG}	–40 to +150	°C
Thermal Resistance (T_{CASE} = 70°C)	$R_{\theta JC}$	3.0	°C/W

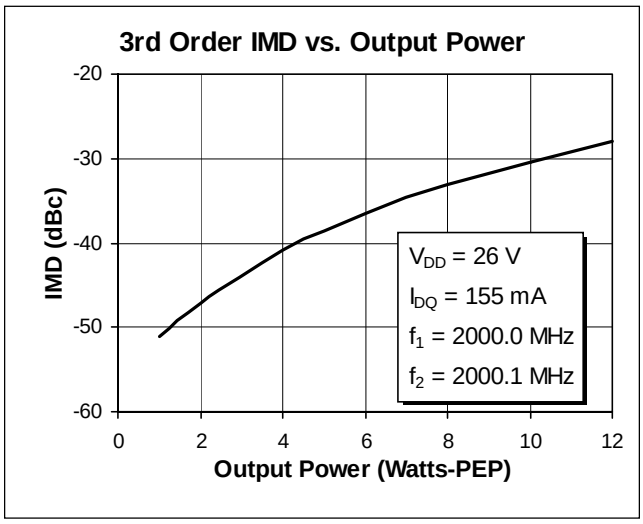
Typical Performance

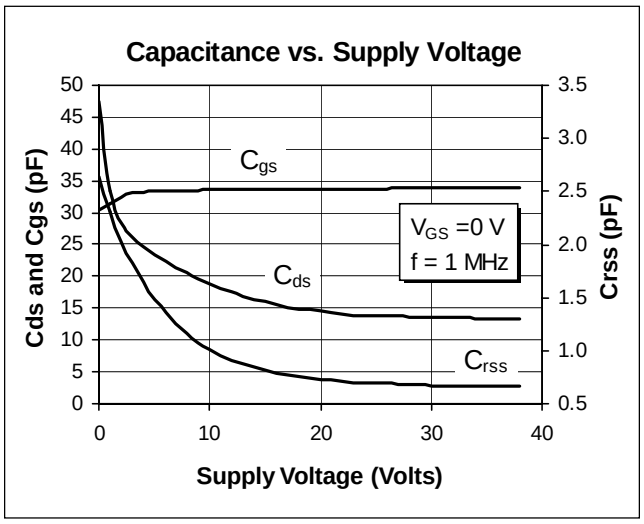


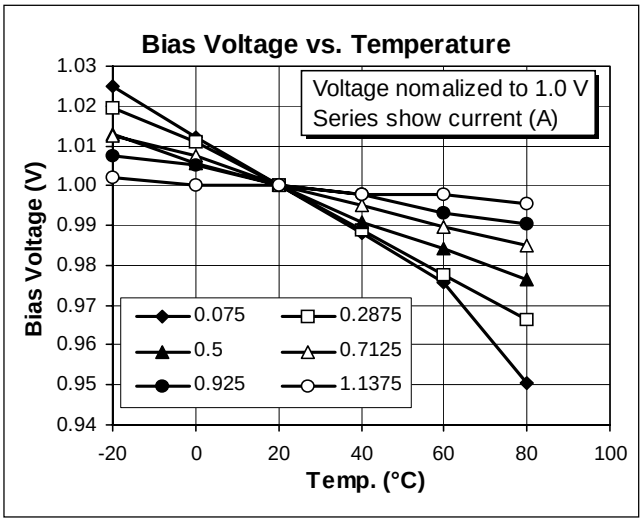



Power Gain vs. Output Power
Power Gain (dB)
Output Power (Watts)
I_{DQ} = 180 mA
I_{DQ} = 90 mA
I_{DQ} = 45 mA
V_{DD} = 26 V
f = 2.0 GHz
13
12
11
10
9
8
7
0
1
10
100


Output Power vs. Supply Voltage
Output Power (Watts)
Supply Voltage (Volts)
I_{DQ} = 155 mA
f = 2.0 GHz
18
16
14
12
10
22
24
26
28
30


3rd Order IMD vs. Output Power
IMD (dBc)
Output Power (Watts-PEP)
V_{DD} = 26 V
I_{DQ} = 155 mA
f_1 = 2000.0 MHz
f_2 = 2000.1 MHz
-20
-30
-40
-50
-60
0
2
4
6
8
10
12


Capacitance vs. Supply Voltage
Cds and Cgs (pF)
Crss (pF)
Supply Voltage (Volts)
C_{gs}
C_{ds}
C_{rss}
V_{GS} =0 V
f = 1 MHz
50
45
40
35
30
25
20
15
10
5
0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0
10
20
30
40


Bias Voltage vs. Temperature
Bias Voltage (V)
Temp. (°C)
Voltage nomalized to 1.0 V
Series show current (A)
0.075
0.2875
0.5
0.7125
0.925
1.1375
1.03
1.02
1.01
1.00
0.99
0.98
0.97
0.96
0.95
0.94
-20
0
20
40
60
80
100

PTF 10053

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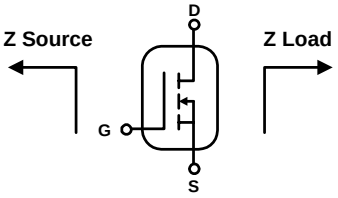
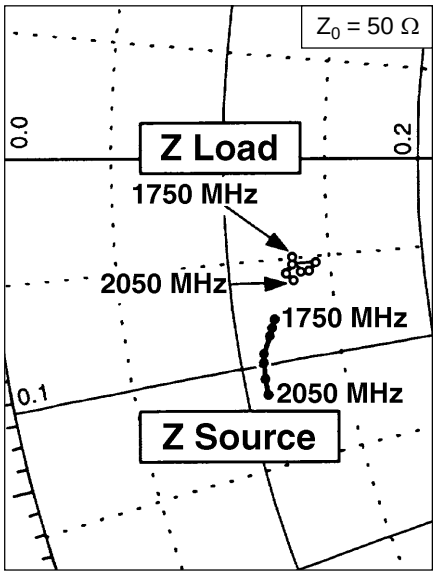
Impedance Data

V_{DD} = 26 V, P_{OUT} = 12 W, I_{DQ} = 155 mA





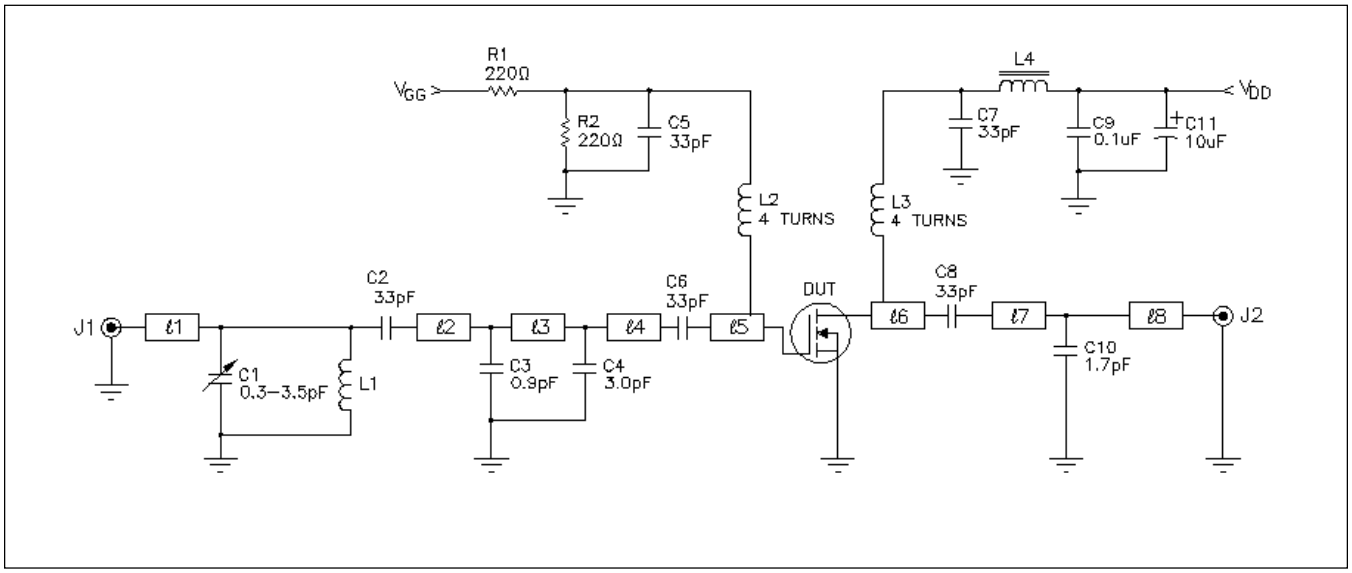
Frequency	Z Source Ω		Z Load Ω	
GHz	R	jX	R	jX
1.75	2.70	-4.0	3.3	-2.5
1.80	2.60	-4.2	3.5	-2.9
1.85	2.50	-4.4	3.7	-2.9
1.90	2.30	-4.8	3.9	-2.7
1.95	2.25	-5.0	3.3	-2.7
2.00	2.20	-5.4	3.1	-2.9
2.05	2.20	-5.8	3.3	-3.1

Typical Scattering Parameters

(V_{DS} = 26 V, I_D = 500 mA)

f	S11		S21		S12		S22	
(MHz)	Mag	Ang	Mag	Ang	Mag	Ang	Mag	Ang
100	0.806	-117	25.9	103	0.012	12	0.578	-80
200	0.800	-127	21.1	96	0.012	4	0.577	-90
300	0.850	-149	12.1	69	0.011	-15	0.650	-113
400	0.878	-158	8.19	54	0.010	-25	0.729	-125
500	0.900	-163	5.94	43	0.008	-31	0.791	-134
600	0.914	-168	4.49	33	0.006	-35	0.851	-142
700	0.925	-171	3.46	25	0.004	-31	0.888	-150
800	0.932	-174	2.73	18	0.003	-16	0.896	-156
900	0.941	-177	2.20	12	0.002	16	0.909	-160
1000	0.947	-180	1.81	6	0.003	52	0.915	-164
1100	0.957	178	1.52	1	0.004	66	0.933	-167
1200	0.961	176	1.29	-4	0.005	73	0.944	-170
1300	0.963	173	1.11	-9	0.006	74	0.953	-173
1400	0.963	171	0.957	-14	0.007	75	0.959	-176
1500	0.963	170	0.839	-19	0.008	75	0.963	-178
1600	0.964	168	0.741	-23	0.009	75	0.964	179
1700	0.968	166	0.664	-27	0.010	75	0.968	177
1800	0.972	165	0.600	-31	0.011	74	0.972	175
1900	0.976	163	0.546	-36	0.012	72	0.974	173
2000	0.978	161	0.499	-40	0.013	71	0.976	171
2100	0.976	159	0.460	-44	0.014	69	0.975	169
2200	0.975	157	0.427	-48	0.015	67	0.977	167

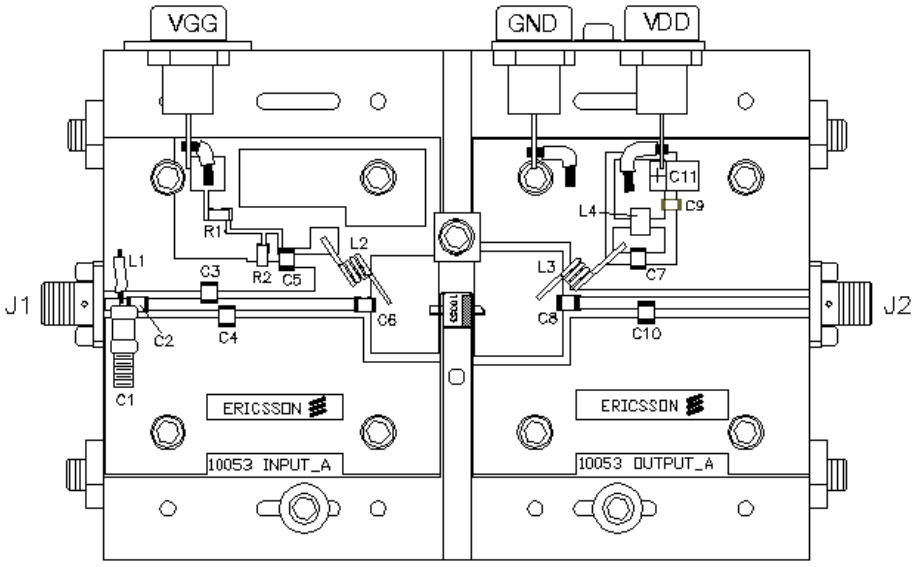
Test Circuit



Schematic for f = 1.990 GHz

DUT	PTF 10053	RF Transistor
ℓ1	0.312 l 1.990 GHz	Microstrip 46.6 Ω
ℓ2	0.161 l 1.990 GHz	Microstrip 46.6 Ω
ℓ3	0.312 l 1.990 GHz	Microstrip 46.6 Ω
ℓ4	0.248 l 1.990 GHz	Microstrip 46.6 Ω
ℓ5	0.118 l 1.990 GHz	Microstrip 9.42 Ω
ℓ6	0.177 λ 1.990 GHz	Microstrip 8.92 Ω
ℓ7	0.129 λ 1.990 GHz	Microstrip 46.6 Ω
ℓ8	0.312 l 1.990 GHz	Microstrip 46.6 Ω
C1	Capacitor, Variable, .3-3.5 pF	
	JACO JMC5701	
C2, C5, C6, C7, C8	Capacitor, 33 pF	100B 330
C3	Capacitor, 0.9 pF	100B R9
C4	Capacitor, 3.0 pF	100B 3R0

C9	Capacitor, 0.1 µF	Digi-Key
	P4525-ND	
C10	Capacitor, 1.7 pF	100B 2R0
C11	Capacitor, 10 µF, 35V	Digi-Key
	PCS6106-ND	
J1, J2	Connector, SMA, Female, Panel Mount	
	Ericsson, #RPM 513 412/53	
L4	Ferrite, 6 mm	
	Phillips 53/3/4.6-452	
L2, L3	4 Turns, 22 AWG, .120 DIA I.D.	
L1	Inductor, 22 AWG Buss Wire	
R1, R2	Resistor, 220 Ω, 1/4W	
	Digi-Key 220QBK-ND	
Circuit Board	TMM4, .030" Dielectric Thickness, 2 oz. copper, ε_r = 4.5, Rogers	



Assembly Diagram (not to scale)

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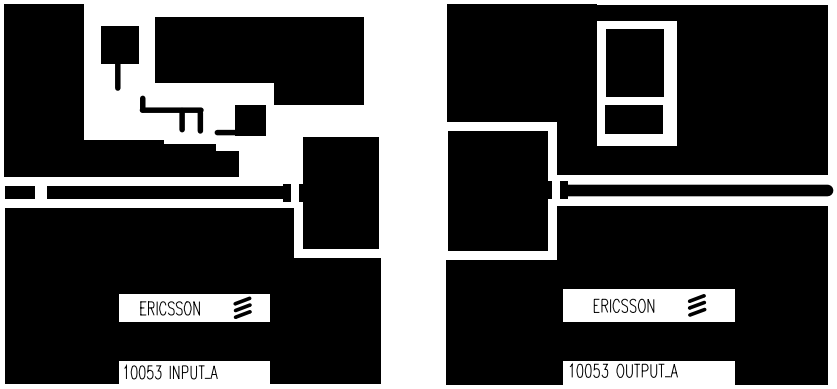

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EUS/KR 1522-PTF 10053 Uen Rev. B 12-13-00