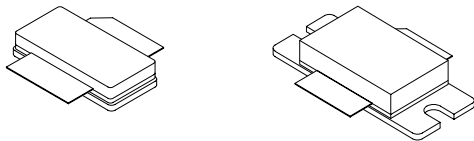


# AGR19125E

## 125 W, 1930 MHz—1990 MHz, PCS LDMOS RF Power Transistor

### Introduction

The AGR19125E is a 125 W, 28 V N-channel laterally diffused metal oxide semiconductor (LDMOS) RF power field effect transistor (FET) suitable for personal communication service (PCS) (1930 MHz—1990 MHz), time-division multiple access (TDMA), and single-carrier or multicarrier class AB power amplifier applications.



AGR19125EU (unflanged)    AGR19125EF (flanged)

Figure 1. Available Packages

### Features

- Typical 2 carrier, N-CDMA performance for  $V_{DD} = 28\text{ V}$ ,  $I_{DQ} = 1250\text{ mA}$ ,  $F_1 = 1958.75\text{ MHz}$ ,  $F_2 = 1961.25\text{ MHz}$ , IS-95 (pilot, paging, sync, traffic channels 8—13) 1.2288 MHz channel bandwidth (BW). Adjacent channels measured over a 30 kHz BW at  $F_1 - 0.885\text{ MHz}$  and  $F_2 + 0.885\text{ MHz}$ . Intermodulation distortion products measured over a 1.2288 MHz BW at  $F_1 - 2.5\text{ MHz}$  and  $F_2 + 2.5\text{ MHz}$ . Peak/Average (P/A) = 9.72 dB at 0.01% probability on CCDF:
  - Output power: 24 W.
  - Power gain: 15 dB.
  - Efficiency: 24%.
  - ACPR: -48 dBc.
  - IMD3: -34 dBc.
  - Return loss: -10 dB.

High-reliability, gold-metalization process.

Low hot carrier injection (HCI) induced bias drift over 20 years.

Internally matched.

High gain, efficiency, and linearity.

Integrated ESD protection.

Device can withstand a 10:1 voltage standing wave ratio (VSWR) at 28 Vdc, 1960 MHz, 125 W continuous wave (CW) output power.

Large signal impedance parameters available.

Table 1. Thermal Characteristics

Parameter	Sym	Value	Unit
Thermal Resistance, Junction to Case:			
AGR19125EU	$R_{\theta JC}$	0.5	$^{\circ}\text{C}/\text{W}$
AGR19125EF	$R_{\theta JC}$	0.5	$^{\circ}\text{C}/\text{W}$

Table 2. Absolute Maximum Ratings\*

Parameter	Sym	Value	Unit
Drain-source Voltage	$V_{DSS}$	65	Vdc
Gate-source Voltage	$V_{GS}$	-0.5, +15	Vdc
Total Dissipation at $T_c = 25\text{ }^{\circ}\text{C}$ :			
AGR19125EU	$P_D$	350	W
AGR19125EF	$P_D$	350	W
Derate Above 25 $^{\circ}\text{C}$ :			
AGR19125EU	—	2.0	$\text{W}/^{\circ}\text{C}$
AGR19125EF	—	2.0	$\text{W}/^{\circ}\text{C}$
Operating Junction Temperature	$T_J$	200	$^{\circ}\text{C}$
Storage Temperature Range	$T_{STG}$	-65, +150	$^{\circ}\text{C}$

\* Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Table 3. ESD Rating\*

AGR19125E	Minimum (V)	Class
HBM	500	1B
MM	50	A
CDM	1500	4

\* Although electrostatic discharge (ESD) protection circuitry has been designed into this device, proper precautions must be taken to avoid exposure to ESD and electrical overstress (EOS) during all handling, assembly, and test operations. PEAK Devices employs a human-body model (HBM), a machine model (MM), and a charged-device model (CDM) qualification requirement in order to determine ESD-susceptibility limits and protection design evaluation. ESD voltage thresholds are dependent on the circuit parameters used in each of the models, as defined by JEDEC's JESD22-A114B (HBM), JESD22-A115A (MM), and JESD22-C101A (CDM) standards.

**Caution: MOS devices are susceptible to damage from electrostatic charge. Reasonable precautions in handling and packaging MOS devices should be observed.**

## Electrical Characteristics

Recommended operating conditions apply unless otherwise specified:  $T_c = 30\text{ }^\circ\text{C}$ .

**Table 4. dc Characteristics**

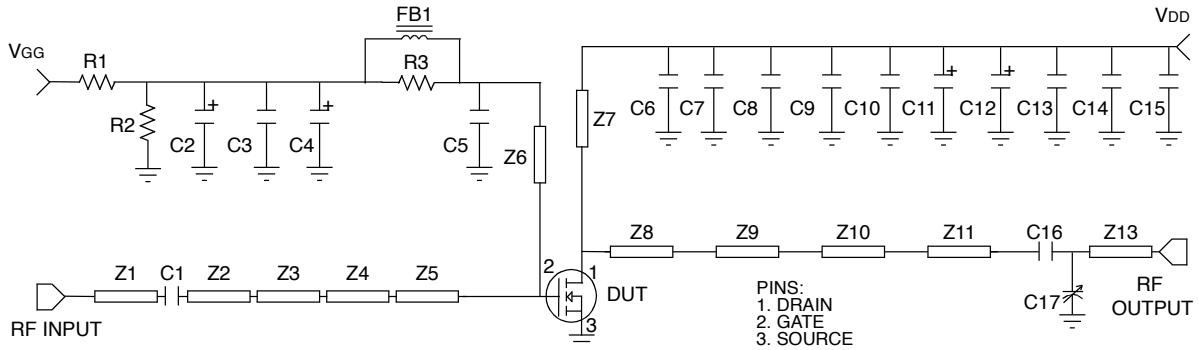
Parameter	Symbol	Min	Typ	Max	Unit
<b>Off Characteristics</b>					
Drain-source Breakdown Voltage ( $V_{GS} = 0$ , $I_D = 400\ \mu\text{A}$ )	$V_{(BR)DSS}$	65	—	—	Vdc
Gate-source Leakage Current ( $V_{GS} = 5\ \text{V}$ , $V_{DS} = 0\ \text{V}$ )	$I_{GSS}$	—	—	4	$\mu\text{A}_{dc}$
Zero Gate Voltage Drain Leakage Current ( $V_{DS} = 28\ \text{V}$ , $V_{GS} = 0\ \text{V}$ )	$I_{DSS}$	—	—	200	$\mu\text{A}_{dc}$
<b>On Characteristics</b>					
Forward Transconductance ( $V_{DS} = 10\ \text{V}$ , $I_D = 1\ \text{A}$ )	$G_{FS}$	—	9	—	S
Gate Threshold Voltage ( $V_{DS} = 10\ \text{V}$ , $I_D = 400\ \mu\text{A}$ )	$V_{GS(TH)}$	—	—	4.8	Vdc
Gate Quiescent Voltage ( $V_{DS} = 28\ \text{V}$ , $I_D = 1200\ \text{mA}$ )	$V_{GS(Q)}$	—	3.8	—	Vdc
Drain-source On-voltage ( $V_{GS} = 10\ \text{V}$ , $I_D = 1\ \text{A}$ )	$V_{DS(ON)}$	—	0.08	—	Vdc

**Table 5. RF Characteristics**

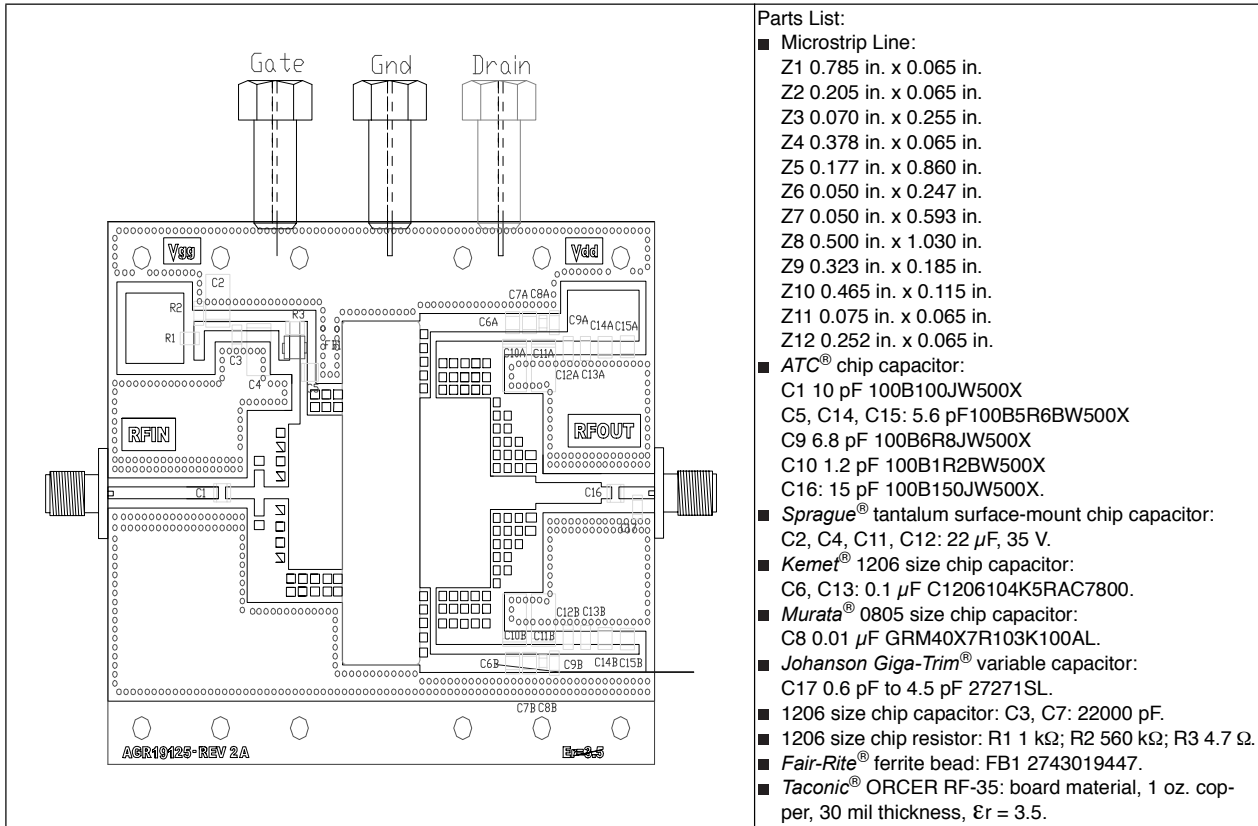
Parameter	Symbol	Min	Typ	Max	Unit
<b>Dynamic Characteristics</b>					
Reverse Transfer Capacitance ( $V_{DS} = 28\ \text{V}$ , $V_{GS} = 0$ , $f = 1.0\ \text{MHz}$ ) (This part is internally matched on both the input and output.)	$C_{RSS}$	—	3.0	—	pF
<b>Functional Tests (in Supplied Test Fixture)</b>					
Common-source Amplifier Power Gain*	$G_{PS}$	14	15	—	dB
Drain Efficiency*	$\eta$	—	24	—	%
Third-order Intermodulation Distortion* (IMD3 measured over 1.2288 MHz BW @ $f_1 - 2.5\ \text{MHz}$ and $f_2 + 2.5\ \text{MHz}$ )	IM3	—	-34	—	dBc
Adjacent Channel Power Ratio* (ACPR measured over BW of 30 kHz @ $f_1 - 0.885\ \text{MHz}$ and $f_2 + 0.885\ \text{MHz}$ )	ACPR	—	-48	—	dBc
Input Return Loss*	IRL	—	-10	—	dB
Power Output, 1 dB Compression Point ( $V_{DD} = 28\ \text{V}$ , $f_c = 1960.0\ \text{MHz}$ )	$P_{1dB}$	—	125	—	W
Output Mismatch Stress ( $V_{DD} = 28\ \text{V}$ , $P_{OUT} = 125\ \text{W}$ (CW), $I_{DQ} = 1250\ \text{mA}$ , $f_c = 1960.0\ \text{MHz}$ $V_{SWR} = 10:1$ ; [all phase angles])	$\psi$	No degradation in output power.			

\* IS-95 N-CDMA P/A = 9.72 dB at 0.01% CCDF,  $f_1 = 1958.75\ \text{MHz}$ , and  $f_2 = 1961.25\ \text{MHz}$ .  
 $V_{DD} = 28\ \text{Vdc}$ ,  $I_{DQ} = 1250\ \text{mA}$ , and  $P_{OUT} = 24\ \text{W}$  avg.

**Test Circuit Illustrations for AGR19125E**



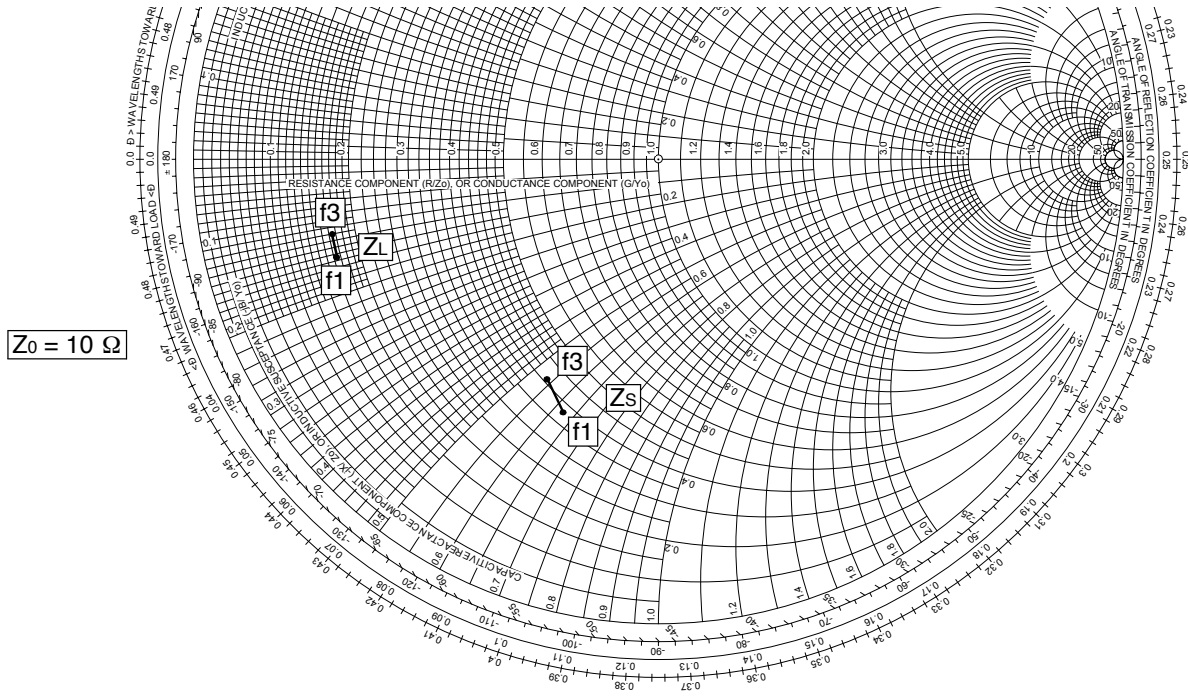
**A. Schematic**



**B. Component Layout**

**Figure 2. AGR19125E Test Circuit**

Typical Performance Characteristics



$Z_0 = 10 \Omega$

MHz (f)	$Z_s \Omega$ (Complex Source Impedance)	$Z_L \Omega$ (Complex Optimum Load Impedance)
1930 (f1)	4.22 – j6.13	1.63 – j1.42
1960 (f2)	4.02 – j5.80	1.60 – j1.19
1990 (f3)	3.91 – j5.55	1.74 – j1.18

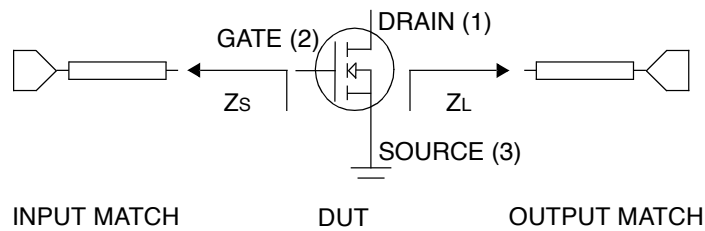
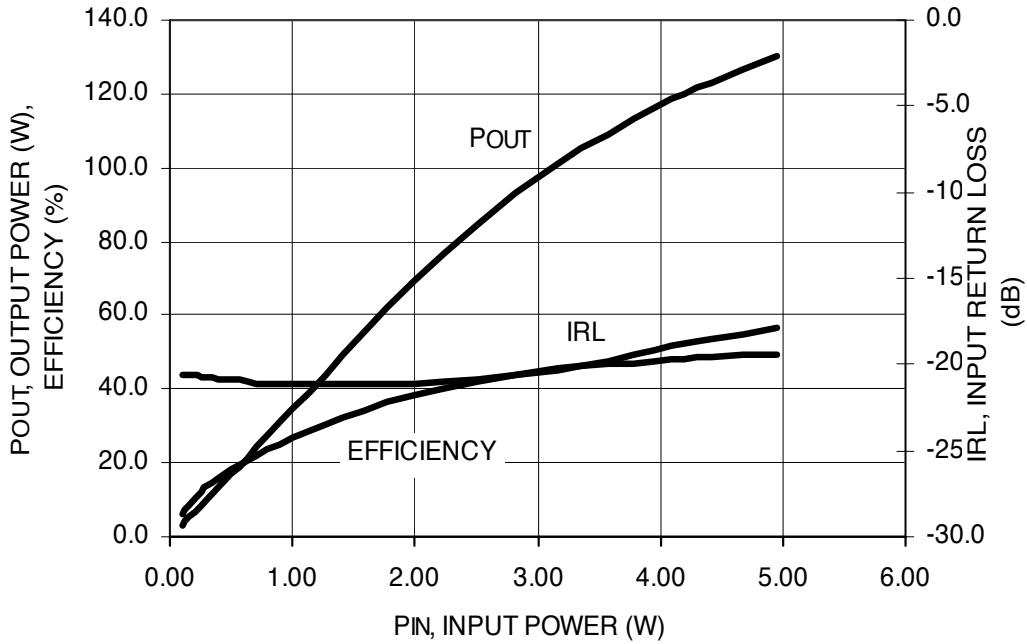


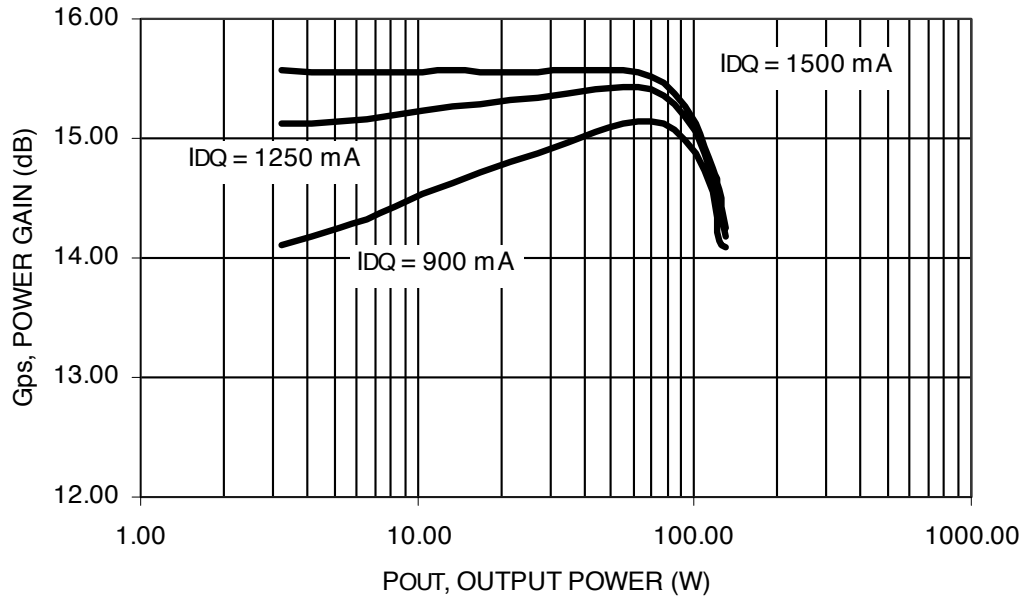
Figure 3. Series Equivalent Input and Output Impedances

Typical Performance Characteristics (continued)



TEST CONDITIONS:  
 $V_{DD} = 28\text{ V}$ ,  $I_{DQ} = 1250\text{ mA}$ ,  $F = 1960\text{ MHz}$ .

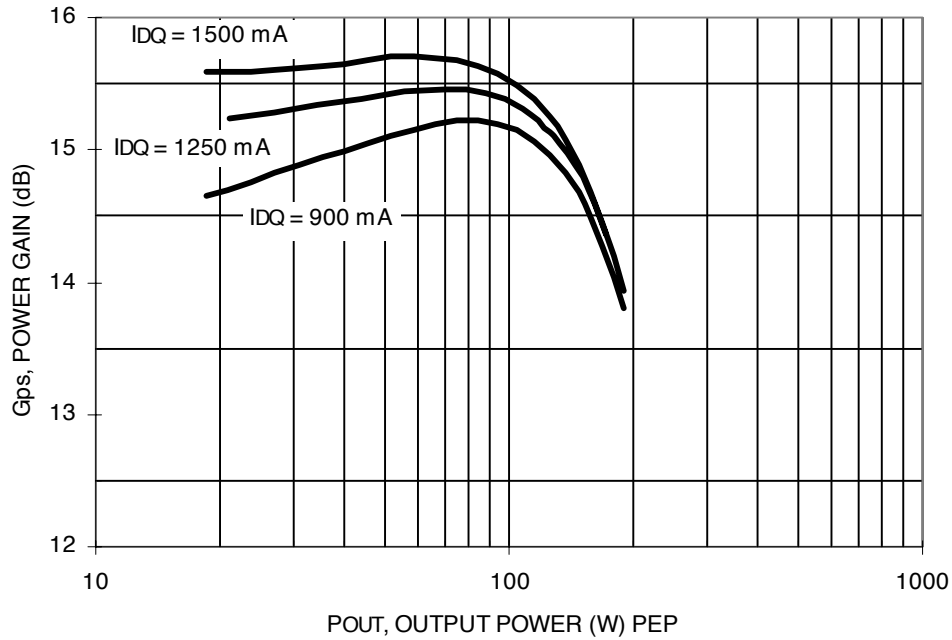
Figure 4. Output Power and Efficiency vs. Input Power



TEST CONDITIONS:  
 $V_{DD} = 28\text{ V}$ ,  $F = 1960\text{ MHz}$ , CW MEASUREMENT.

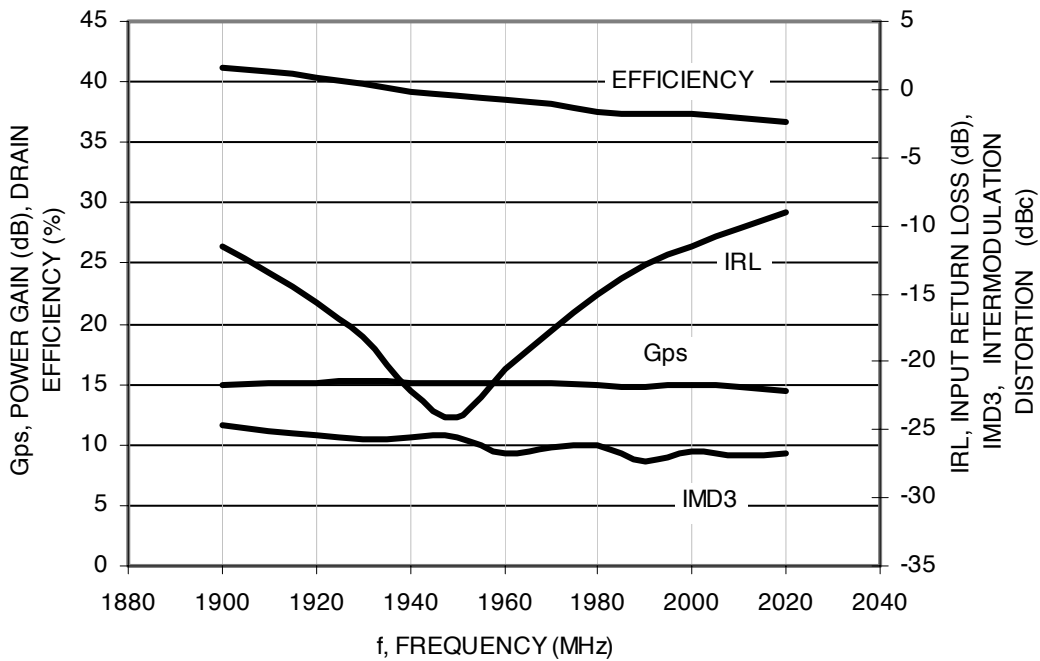
Figure 5. Power Gain vs. Output Power

**Typical Performance Characteristics** (continued)



TEST CONDITIONS:  
 $V_{DD} = 28\text{ V}$ ,  $F = 1960\text{ MHz}$ , 100 kHz TONE SPACING.

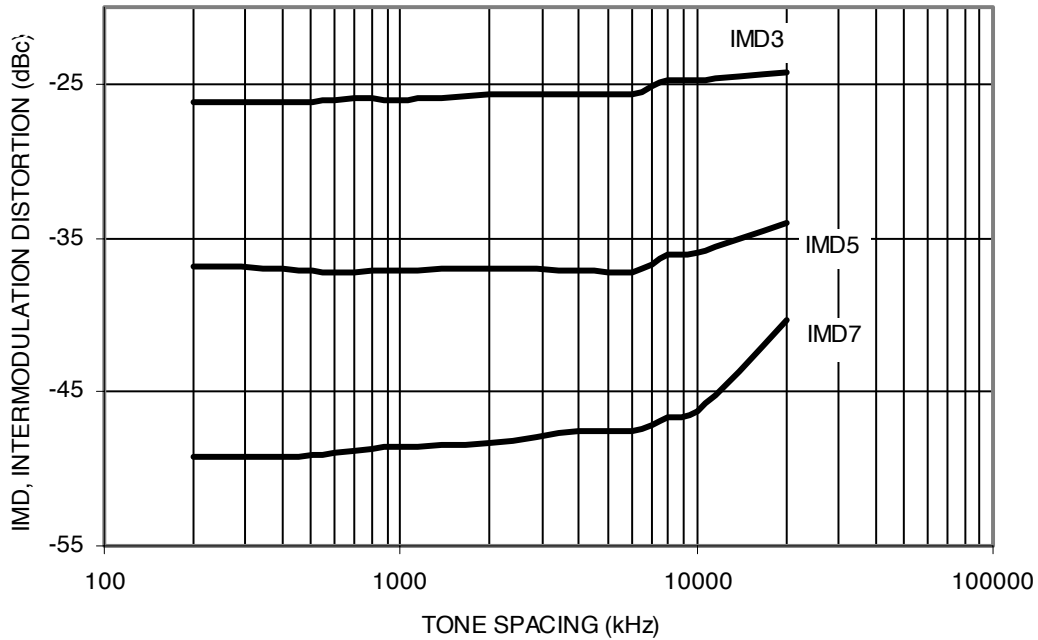
**Figure 6. Two-Tone Gain vs. Output Power**



TEST CONDITIONS:  
 $V_{DD} = 28\text{ V}$ ,  $I_{DQ} = 1250\text{ mA}$ ,  $P_{OUT} = 125\text{ W}$  (PEP), 100 kHz TONE SPACING.

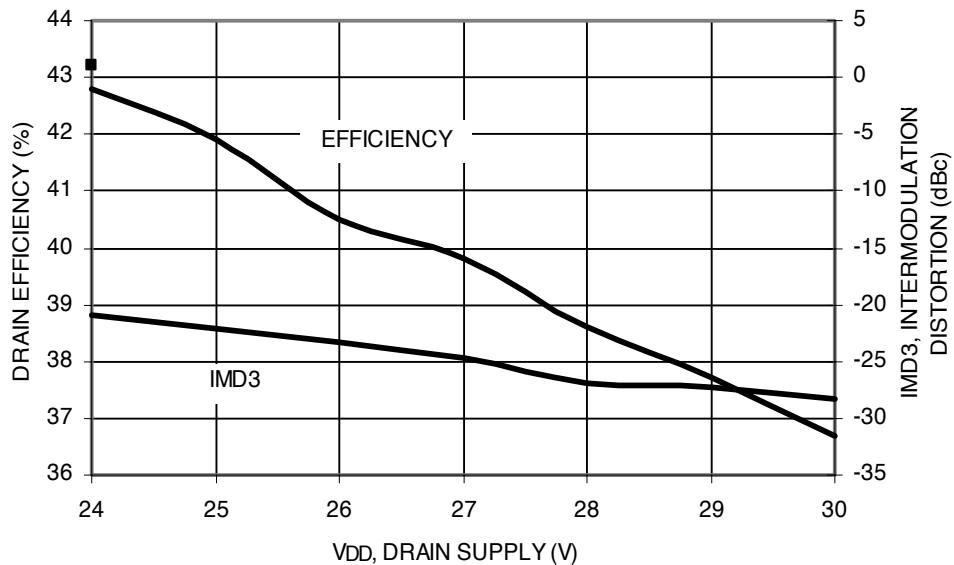
**Figure 7. Two-Tone Broadband Performance**

Typical Performance Characteristics (continued)



TEST CONDITIONS:  
 $V_{DD} = 28\text{ V}$ ,  $F = 1960\text{ MHz}$ ,  $I_{DQ} = 1250\text{ mA}$ ,  $P_{OUT} = 125\text{ W (PEP)}$ .

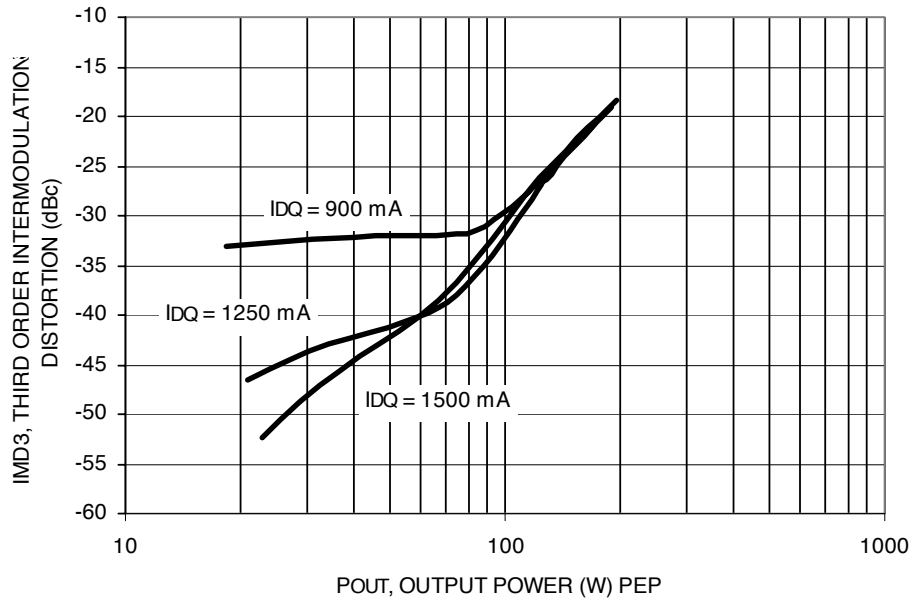
Figure 8. Two-Tone Intermodulation Products vs. Tone Spacing



TEST CONDITIONS:  
 $F = 1960\text{ MHz}$ ,  $I_{DQ} = 1250\text{ mA}$ ,  $P_{OUT} = 125\text{ W (PEP)}$ ,  $100\text{ kHz TONE SPACING}$ .

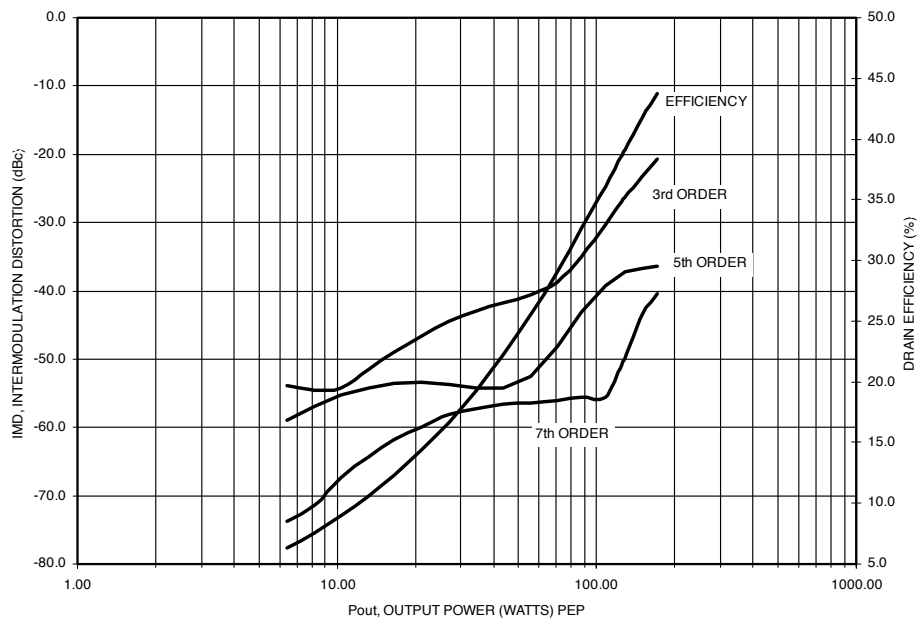
Figure 9. Two-Tone Intermodulation Distortion and Efficiency vs. Drain Supply

**Typical Performance Characteristics** (continued)



TEST CONDITIONS:  
 $V_{DD} = 28\text{ V}$ ,  $F = 1960\text{ MHz}$ , 100 kHz TONE SPACING.

**Figure 10. Third Order Intermodulation Distortion vs. Output Power**

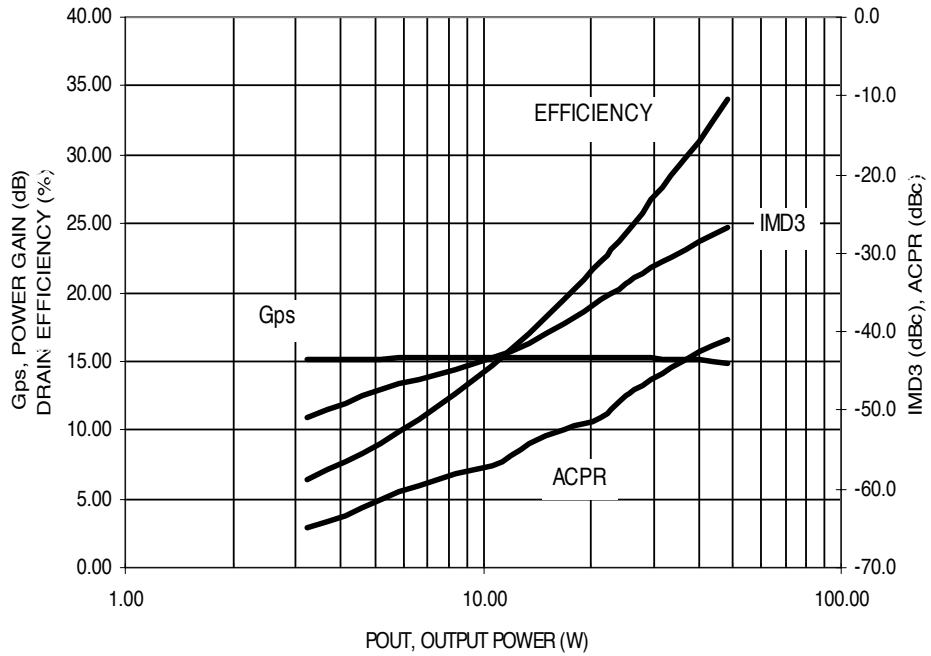


TEST CONDITIONS:  
 $V_{DD} = 28\text{ V}$ ,  $I_{DQ} = 1250\text{ mA}$ ,  $F = 1960\text{ MHz}$ , 100 kHz TONE SPACING.

**Figure 11. Intermodulation Distortion Products vs. Output Power**

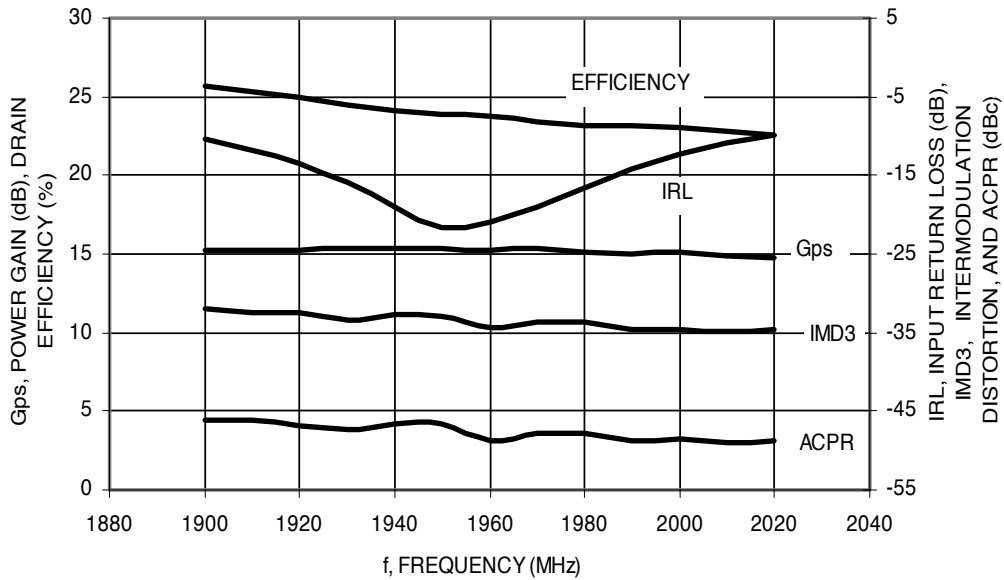


Typical Performance Characteristics (continued)



TEST CONDITIONS:  
 VDD = 28 V, IDQ = 1250 mA, F1 = 1960 MHz, F2 = 1962.5 MHz.  
 9 IS-95 CHANNELS/CARRIER, P/A RATIO = 9.72 dB AT 0.01% PROBABILITY.

Figure 12. Two Carrier IS-95 CDMA Performance vs. Output Power



TEST CONDITIONS:  
 VDD = 28 V, IDQ = 1250 mA, POUT = 24 W, 2 CARRIERS.  
 2.5 MHz SPACING, P/A RATIO = 9.72 dB AT 0.01%.

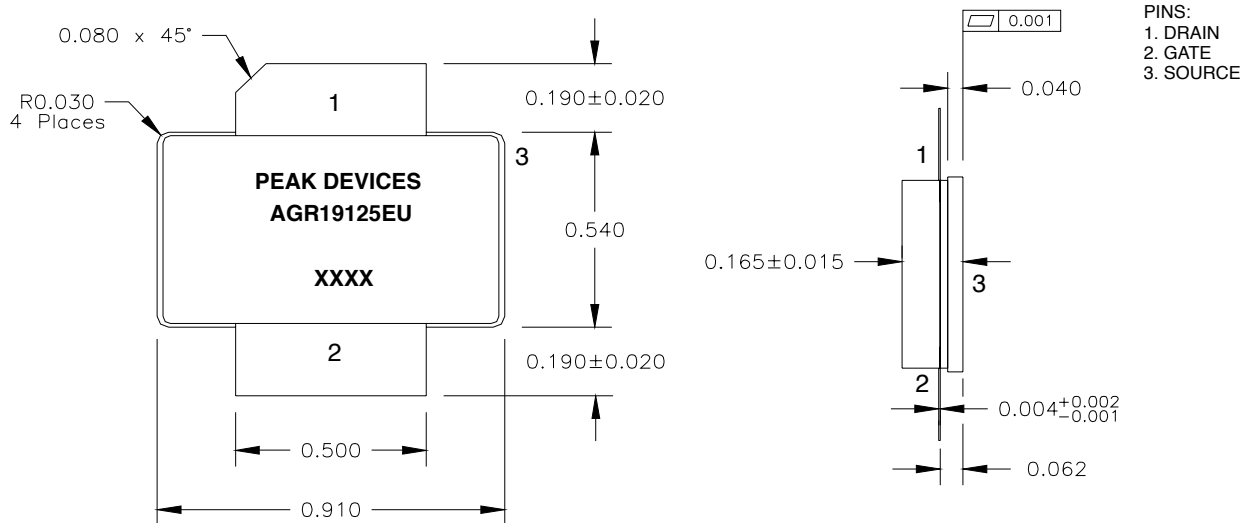
Figure 13. Two Carrier CDMA (IS-95) Broadband Performance

**AGR19125E**  
**125 W, 1930 MHz—1990 MHz, PCS LDMOS RF Power Transistor**

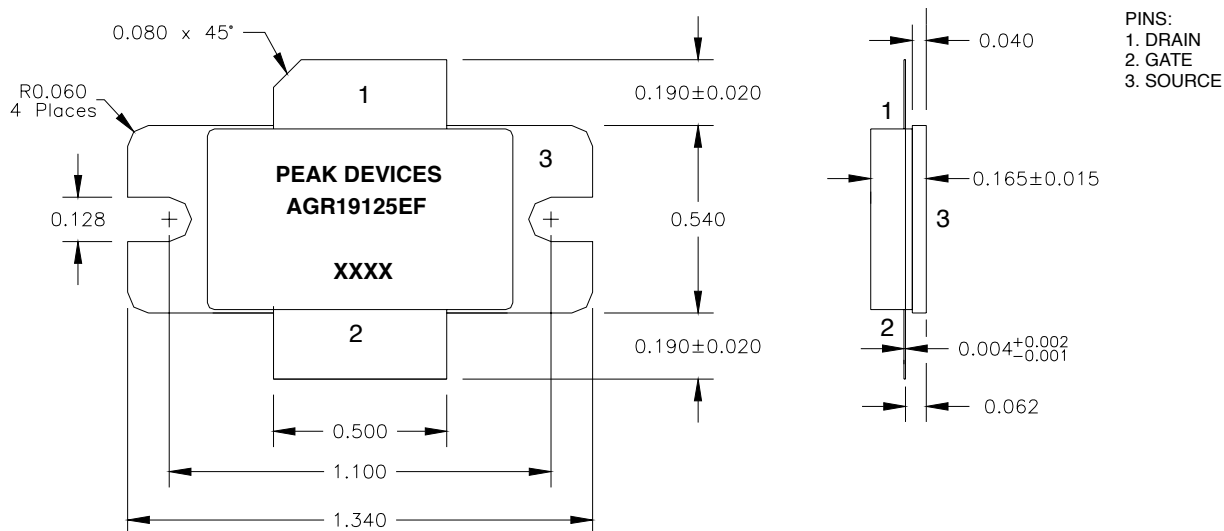
**Package Dimensions**

All dimensions are in inches. Tolerances are  $\pm 0.005$  in. unless specified. Cut lead indicates drain.

**AGR19125EU**



**AGR19125EF**



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