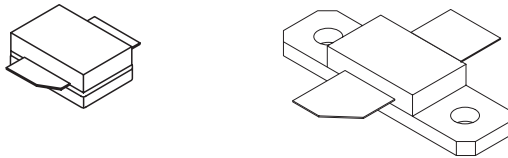


AGR09060G

60 W, 865 MHz—895 MHz, N-Channel E-Mode, Lateral MOSFET

Introduction

The AGR09060G is a high-voltage, gold-metalized, laterally diffused metal oxide semiconductor (LDMOS) RF power transistor suitable for cellular band, code-division multiple access (CDMA), global system for mobile communication (GSM), enhanced data for global evolution (EDGE), and time-division multiple access (TDMA) single and multicarrier class AB wireless base station amplifier applications. This device is manufactured on an advanced LDMOS technology, offering state-of-the-art performance, reliability, and thermal resistance. Packaged in an industry-standard CuW package capable of delivering a minimum output power of 60 W, it is ideally suited for today's RF power amplifier applications.



AGR09060GU (unflanged) AGR09060GF (flanged)

Figure 1. Available Packages

Features

- Typical performance ratings are for IS-95 CDMA, pilot, sync, paging, traffic codes 8—13:
 - Output power (POUT): 14 W.
 - Power gain: 18.5 dB.
 - Efficiency: 27%.
 - Adjacent channel power ratio (ACPR) for 30 kHz bandwidth (BW):
 - (750 kHz offset: -45 dBc)
 - (1.98 MHz offset: -60 dBc).
 - Input return loss: 10 dB.
- High-reliability gold-metalization process.
- High gain, efficiency, and linearity.
- Integrated ESD protection.
- Si LDMOS.
- Industry-standard packages.
- 60 W minimum output power.

Table 1. Thermal Characteristics

Parameter	Sym	Value	Unit
Thermal Resistance, Junction to Case:			
AGR09060GU	R _{θJC}	1.0	°C/W
AGR09060GF	R _{θJC}	1.3	°C/W

Table 2. Absolute Maximum Ratings*

Parameter	Sym	Value	Unit
Drain-source Voltage	V _{DSS}	65	V _{dc}
Gate-source Voltage	V _{GS}	-0.5, +15	V _{dc}
Drain Current—Continuous	I _D	6.0	A _{dc}
Total Dissipation at T _c = 25 °C:			
AGR09060GU	P _D	175	W
AGR09060GF	P _D	135	W
Derate Above 25 °C:			
AGR09060GU	—	1.0	W/°C
AGR09060GF	—	0.77	W/°C
Operating Junction Temperature	T _J	200	°C
Storage Temperature Range	T _{STG}	-65, +150	°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*

AGR09060G	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. Agere 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: $T_c = 30\text{ }^\circ\text{C}$.

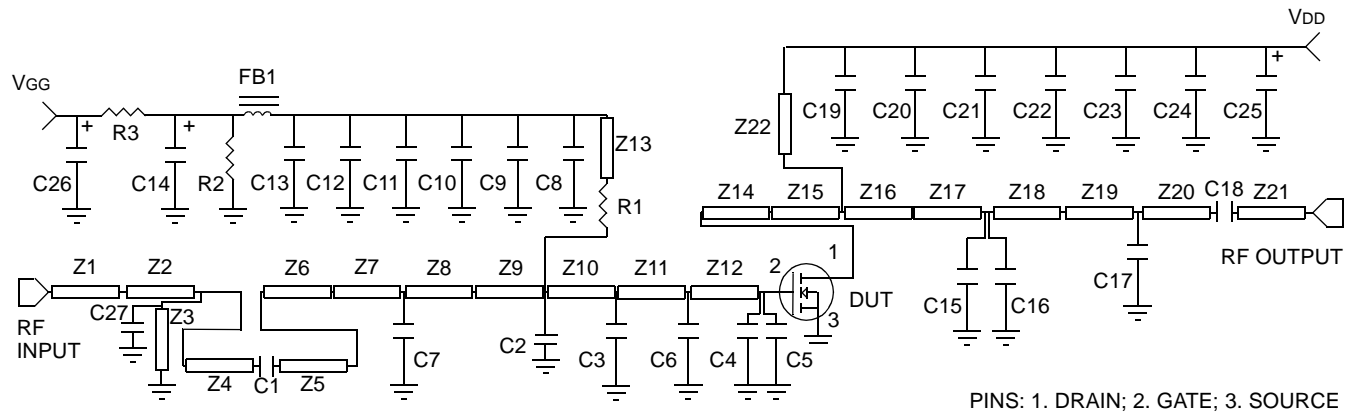
Table 4. dc Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Off Characteristics					
Drain-source Breakdown Voltage ($V_{GS} = 0$, $I_D = 100\ \mu\text{A}$)	$V_{(BR)DSS}$	65	—	—	Vdc
Gate-source Leakage Current ($V_{GS} = 5\ \text{V}$, $V_{DS} = 0\ \text{V}$)	I_{GSS}	—	—	1.3	μA_{dc}
Zero Gate Voltage Drain Leakage Current ($V_{DS} = 28\ \text{V}$, $V_{GS} = 0\ \text{V}$)	I_{DSS}	—	—	4	μA_{dc}
On Characteristics					
Forward Transconductance ($V_{DS} = 10\ \text{V}$, $I_D = 1.0\ \text{A}$)	G_{FS}	—	3	—	S
Gate Threshold Voltage ($V_{DS} = 10\ \text{V}$, $I_D = 400\ \mu\text{A}$)	$V_{GS(TH)}$	—	—	4.8	Vdc
Gate Quiescent Voltage ($V_{DS} = 28\ \text{V}$, $I_{DQ} = 550\ \text{mA}$)	$V_{GS(Q)}$	—	3.5	—	Vdc
Drain-source On-voltage ($V_{GS} = 10\ \text{V}$, $I_D = 1.0\ \text{A}$)	$V_{DS(ON)}$	—	0.17	—	Vdc

Table 5. RF Characteristics

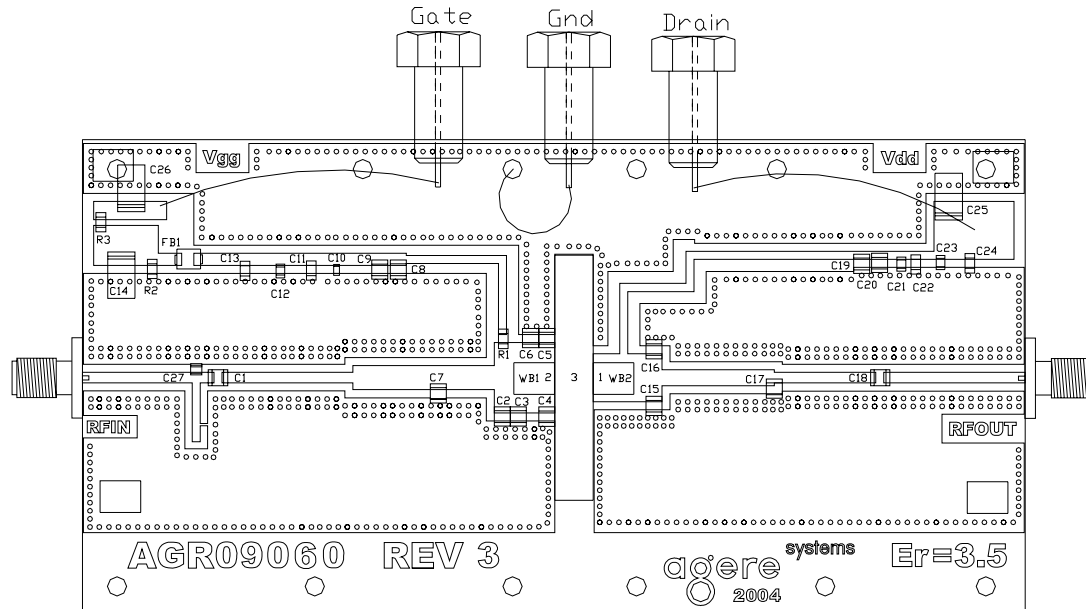
Parameter	Symbol	Min	Typ	Max	Unit
Dynamic Characteristics					
Input Capacitance ($V_{DS} = 28\ \text{V}_{dc}$, $V_{GS} = 0$, $f = 1\ \text{MHz}$)	C_{iss}	—	126	—	pF
Output Capacitance ($V_{DS} = 28\ \text{V}_{dc}$, $V_{GS} = 0$, $f = 1\ \text{MHz}$)	C_{oss}	—	36	—	pF
Reverse Transfer Capacitance ($V_{DS} = 28\ \text{V}_{dc}$, $V_{GS} = 0$, $f = 1\ \text{MHz}$)	C_{rss}	—	1.9	—	pF
Functional Tests (in Agere Systems Supplied Test Fixture) (Test frequencies (f) = 865 MHz, 880 MHz, 895 MHz)					
Linear Power Gain ($V_{DS} = 28\ \text{V}$, $P_{OUT} = 6\ \text{W}$, $I_{DQ} = 550\ \text{mA}$)	G_L	17	18.5	—	dB
Drain Efficiency ($V_{DS} = 28\ \text{V}$, $P_{OUT} = P_{1dB}$, $I_{DQ} = 550\ \text{mA}$)	η	—	57	—	%
Third-order Intermodulation Distortion (100 kHz spacing, $V_{DS} = 28\ \text{V}$, $P_{OUT} = 60\ \text{WPEP}$, $I_{DQ} = 550\ \text{mA}$)	IMD	—	-32	—	dBc
Output Power ($V_{DS} = 28\ \text{V}$, 1 dB compression, $I_{DQ} = 550\ \text{mA}$)	P_{1dB}	60	75	—	W
Input VSWR	V_{SWR_I}	—	2:1	—	—
Ruggedness ($V_{DS} = 28\ \text{V}$, $P_{OUT} = 60\ \text{W}$, $I_{DQ} = 550\ \text{mA}$, $f = 880\ \text{MHz}$, $V_{SWR} = 10:1$, all angles)	—	No degradation in output power.			

Test Circuit Illustrations for AGR09060G



PINS: 1. DRAIN; 2. GATE; 3. SOURCE

A. Schematic



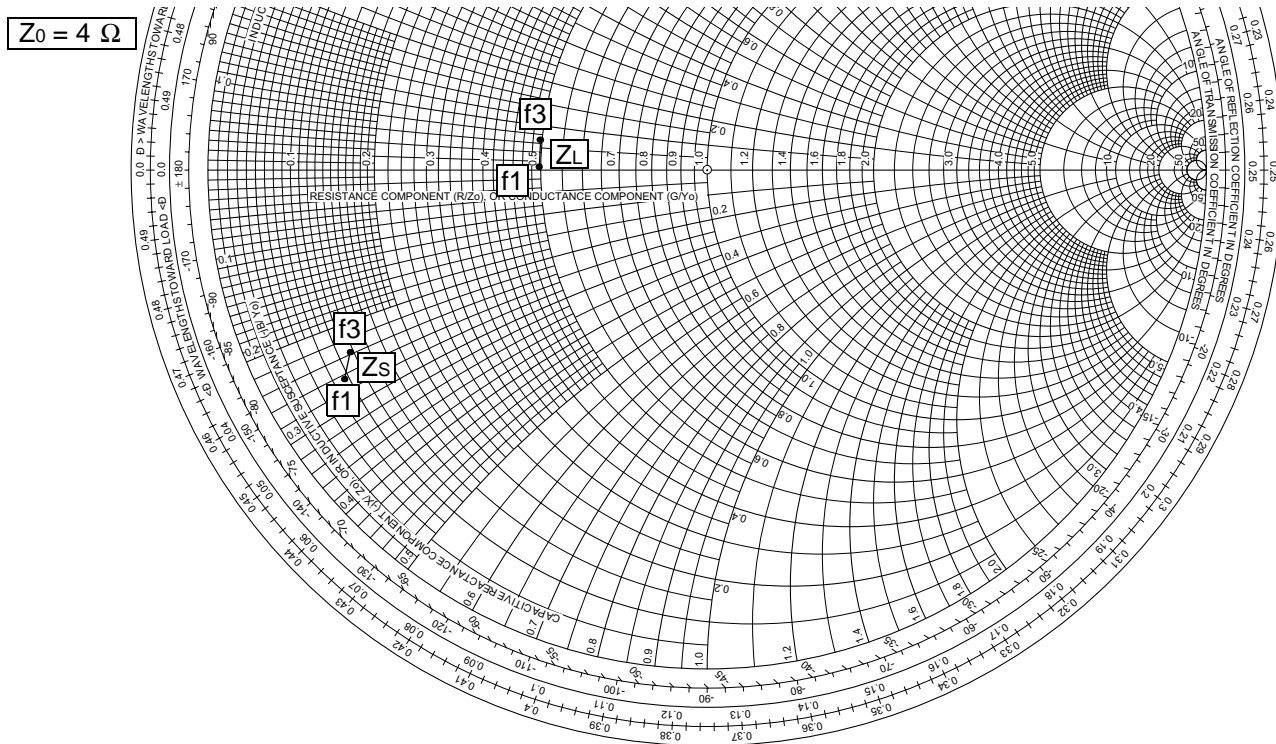
Parts List:

- Microstrip line: Z1 0.675 in. x 0.066 in.; Z2 0.035 in. x 0.066 in.; Z3 0.297 in. x 0.050 in.; Z4 0.075 in. x 0.066 in.; Z5 0.818 in. x 0.066 in.; Z6 0.482 in. x 0.150 in.; Z7 0.050 in. x 0.150 in.; Z8 0.300 in. x 0.150 in.; Z9 0.050 in. x 0.440 in.; Z10 0.050 in. x 0.440 in.; Z11 0.078 in. x 0.440 in.; Z12 0.050 in. x 0.440 in.; Z13 1.024 in. x 0.050 in.; Z14 0.166 in. x 0.300 in.; Z15 0.050 in. x 0.300 in.; Z16 0.114 in. x 0.300 in.; Z17 0.050 in. x 0.300 in.; Z18 0.650 in. x 0.100 in.; Z19 0.050 in. x 0.100 in.; Z20 0.583 in. x 0.066 in.; Z21 0.881 in. x 0.066 in.; Z22 2.048 in. x 0.050 in.
- Murata® 0805 chip capacitor: C12, C23: 0.01 μ F, GRM40X7R103K100AL.
- 0603 chip capacitor: C10, C21: 220 pF.
- Sprague® tantalum chip capacitor: C14, C25, C26: 22 μ F, 35 V.
- Kreger® ferrite bead: FB1: 2743D19447.
- Kemet® 1206 chip capacitor: C13, C24: 0.10 μ F, C1206C104KRAC7800.
- Vitramon® chip capacitor: C11, C22: 2200 pF, VJ1206Y222KXA.
- Taconic® ORCER RF-35: board material, 1 oz. copper, 30 mil thickness, $\epsilon_r = 3.5$.
- ATC® chip capacitor: C1, C8, C18, C19: 47 pF, 100B470JW; C2: 3.9 pF, 100B3R9BW; C3, C6, C9, C20: 10 pF, 100B100JW; C4, C5, C15, C16: 12 pF, 100B120JW; C7: 5.6 pF, 100B5R6BW; C17: 4.7 pF, 100B4R7BW; C27: 8.2 pF, 100A8R2BW.
- 1206 size fixed film chip resistor, 0.25 W: R1: 50 Ω , RM73B2B500J; R2: 47 k Ω , RM73B2B473J; R3: 1 k Ω , RM73B2B103J.

B. Component Layout

Figure 2. AGR09060G Test Circuit

Typical Performance Characteristics



MHz (f)	Zs Ω (Complex Source Impedance)	ZL Ω (Complex Optimum Load Impedance)
865 (f1)	0.393 – j1.07	1.97 + j0.004
880 (f2)	0.431 – j1.02	1.98 + j0.120
895 (f3)	0.471 – j0.985	1.99 + j0.223

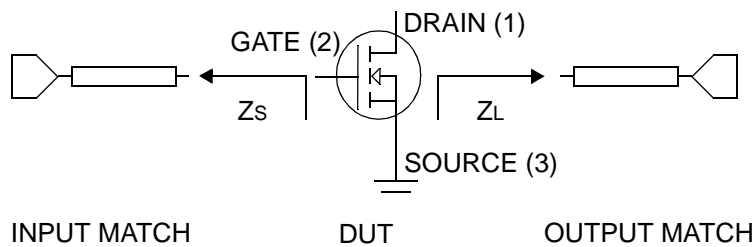


Figure 3. Series Equivalent Input and Output Impedances

Typical Performance Characteristics (continued)

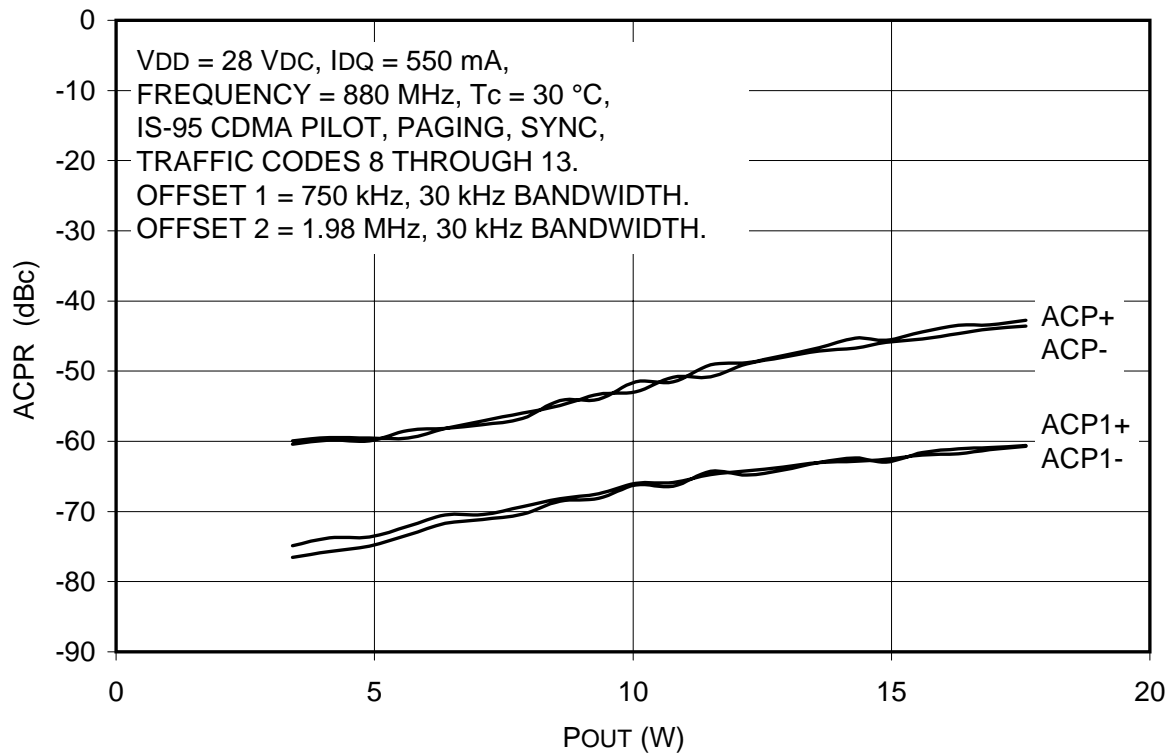


Figure 4. ACPR vs. Pout

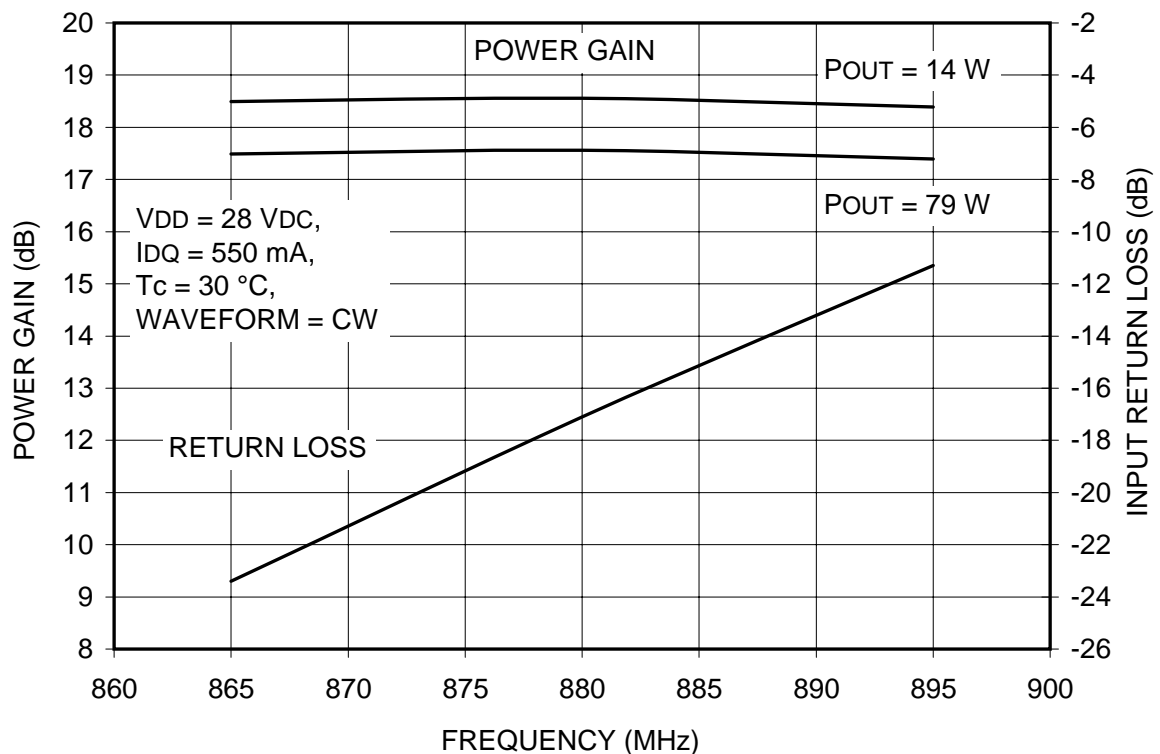


Figure 5. Power Gain and Input Return Loss vs. Frequency

Typical Performance Characteristics (continued)

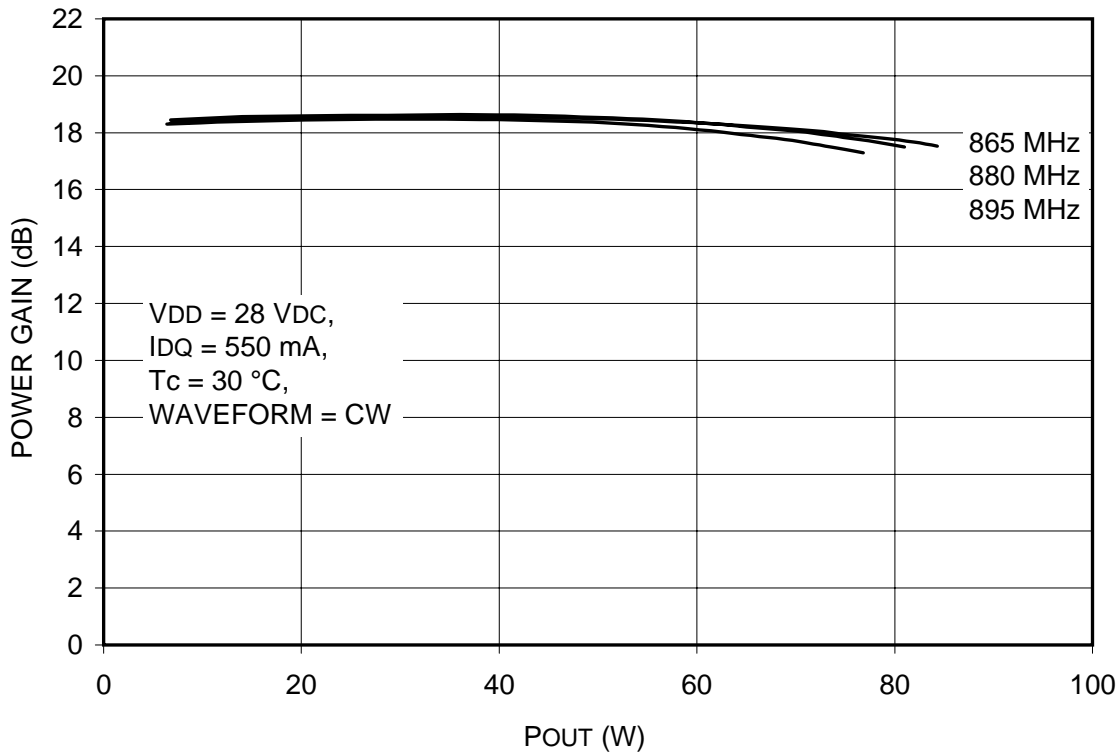


Figure 6. Power Gain vs. Power Out

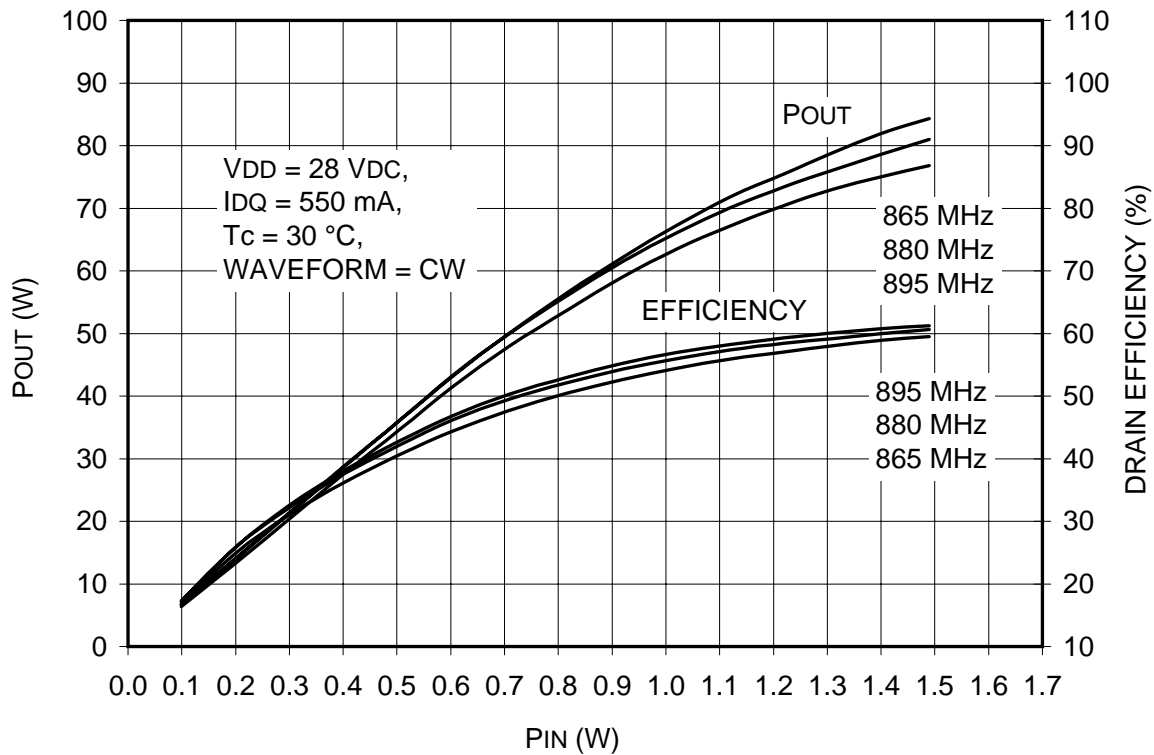
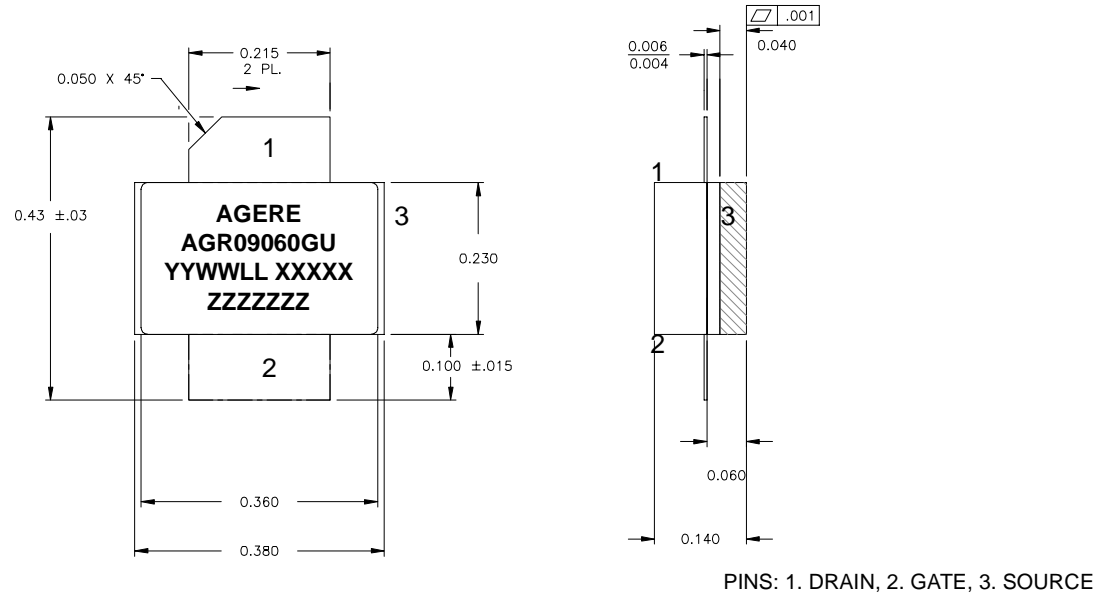


Figure 7. Power Out and Drain Efficiency vs. Input Power

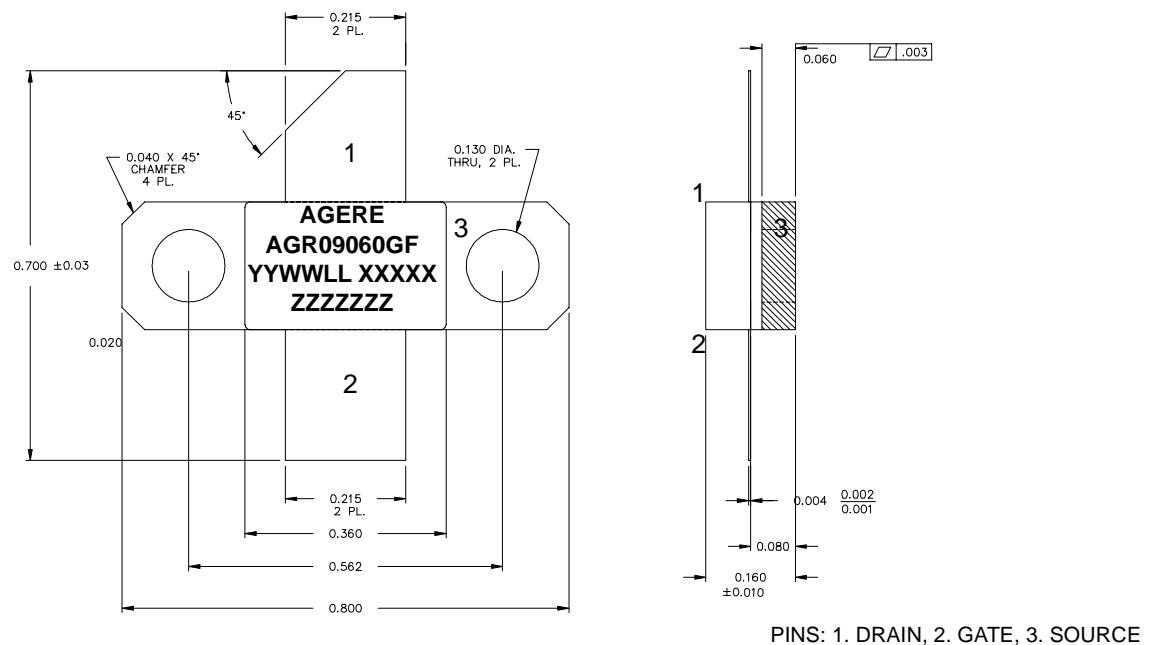
Package Dimensions

All dimensions are in inches. Tolerances are ± 0.005 in. unless specified.

AGR09060GU



AGR09060GF



Label Notes:

- M before the part number denotes model program. X before the part number denotes engineering prototype.
- The last two letters of the part number denote wafer technology and package type.
- YYWWLL is the date code including place of manufacture: year year work week (YYWW), LL = location (AL = Allentown, PA; T = Thailand). XXXXX = five-digit wafer lot number.
- ZZZZZZZ = seven-digit assembly lot number on production parts.
- ZZZZZZZZZZZZ = 12-digit (five-digit lot, two-digit wafer, and five-digit serial number) on models and engineering prototypes.

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For additional information, contact your Agere Systems Account Manager or the following:

INTERNET: <http://www.agere.com>

E-MAIL: docmaster@agere.com

N. AMERICA: Agere Systems Inc., Lehigh Valley Central Campus, Room 10A-301C, 1110 American Parkway NE, Allentown, PA 18109-9138
1-800-372-2447, FAX 610-712-4106 (In CANADA: **1-800-553-2448**, FAX 610-712-4106)

ASIA: CHINA: **(86) 21-54614688** (Shanghai), **(86) 755-25881122** (Shenzhen)

JAPAN: **(81) 3-5421-1600** (Tokyo), KOREA: **(82) 2-767-1850** (Seoul), SINGAPORE: (65) **6741-9855**, TAIWAN: **(886) 2-2725-5858** (Taipei)

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