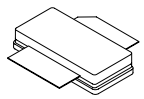
TriQuint SEMICONDUCTOR

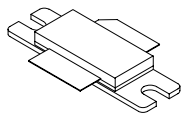
AGR09085E
85 W, 865 MHz—895 MHz, N-Channel E-Mode, Lateral MOSFET

Introduction

The AGR09085E is a high-voltage, 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 best-in-class thermal resistance. Packaged in an industry-standard package incorporating internal matching and capable of delivering a minimum output power of 85 W, it is ideally suited for today's RF power amplifier applications.



AGR09085EU (unflanged)



AGR09085EF (flanged)

Figure 1. Available Packages

Features

Typical performance ratings are for IS-95 CDMA, pilot, sync, paging, and traffic codes 8—13:
- — Output power (P_{OUT}): 20 W.
- — Power gain: 18 dB.
- — Efficiency: 28%.
- — Adjacent channel power ratio (ACPR) for 30 kHz bandwidth (BW):
  (750 kHz offset: –45 dBc).
  1.98 MHz offset: –60 dBc).
- — Return loss: 10 dB.

High-reliability, gold-metalization process.

Best-in-class thermal resistance.

Internally matched.

High gain, efficiency, and linearity.

Integrated ESD protection.

Si LDMOS.

Industry-standard packages.

85 W minimum output power.

Table 1. Thermal Characteristics

Parameter	Sym	Value	Unit
Thermal Resistance, Junction to Case: AGR09085EU AGR09085EF	$R_{\theta JC}$	 0.7 0.7	°C/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
Drain Current—Continuous	I_D	8.5	Adc
Total Dissipation at T_C = 25 °C: AGR09085EU AGR09085EF Derate Above 25 C: AGR09085EU AGR09085EF	P_D	 250 250 1.43 1.43	 W 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*

AGR09085E	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 °C.

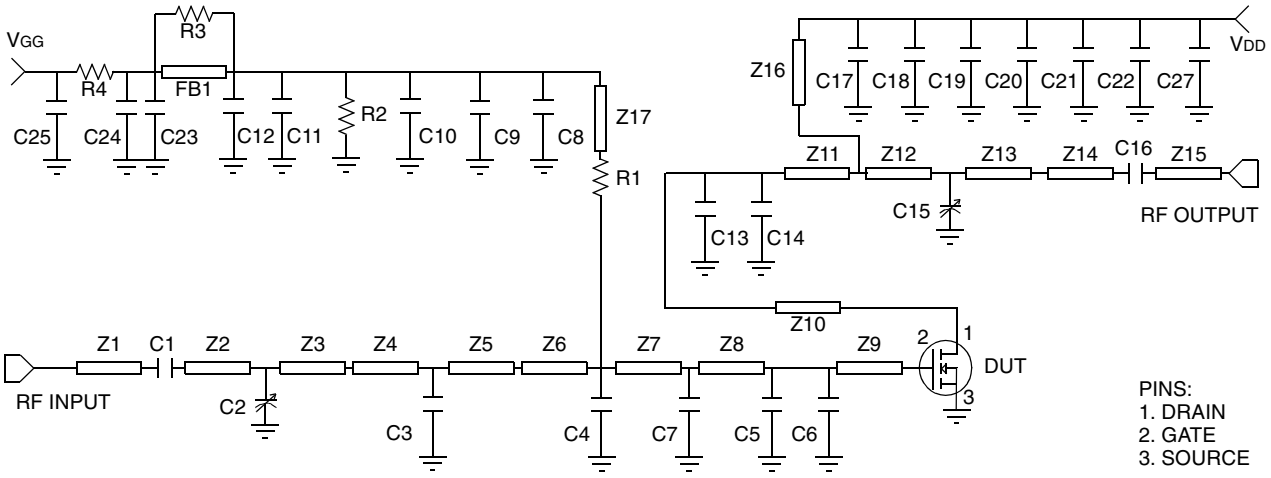
Table 4. dc Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Off Characteristics					
Drain-source Breakdown Voltage (V_{GS} = 0, I_D = 300 µA)	$V_{(BR)DSS}$	65	—	—	Vdc
Gate-source Leakage Current (V_{GS} = 5 V, V_{DS} = 0 V)	I_{GSS}	—	—	2.6	µAdc
Zero Gate Voltage Drain Leakage Current (V_{DS} = 28 V, V_{GS} = 0 V)	I_{DSS}	—	—	100	µAdc
On Characteristics					
Forward Transconductance (V_{DS} = 10 V, I_D = 1 A)	G_{FS}	—	6	—	S
Gate Threshold Voltage (V_{DS} = 10 V, I_D = 400 µA)	$V_{GS(TH)}$	—	—	4.8	Vdc
Gate Quiescent Voltage (V_{DS} = 28 V, I_{DQ} = 800 mA)	$V_{GS(Q)}$	—	3.6	—	Vdc
Drain-source On-voltage (V_{GS} = 10 V, I_D = 1 A)	$V_{DS(ON)}$	—	0.12	—	Vdc

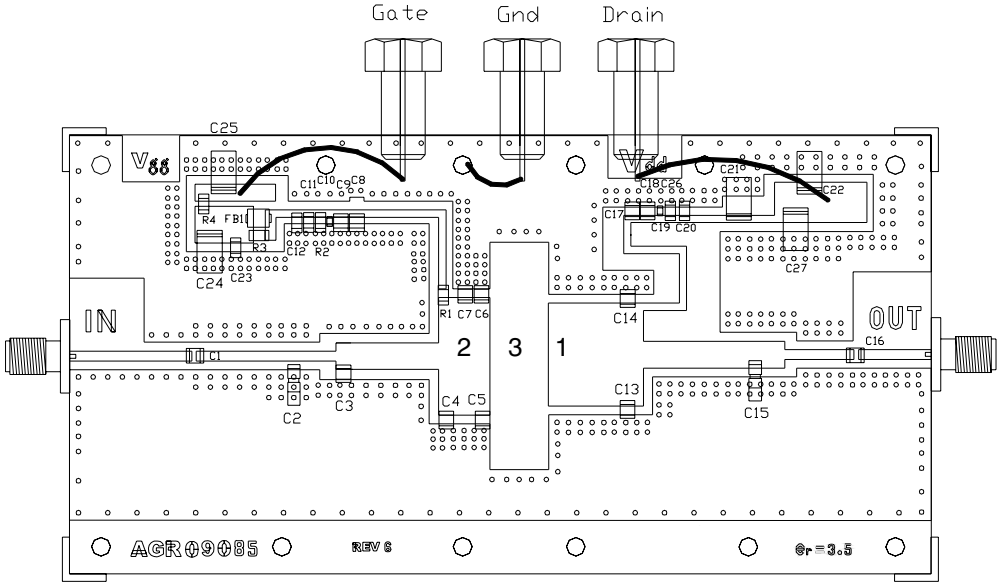
Table 5. RF Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Dynamic Characteristics					
Output Capacitance (V_{DS} = 28 Vdc, V_{GS} = 0, f = 1 MHz)	C_{OSS}	—	48	—	pF
Reverse Transfer Capacitance (V_{DS} = 28 Vdc, V_{GS} = 0, f = 1 MHz)	C_{RSS}	—	2.3	—	pF
Functional Tests (in Supplied Test Fixture) (Test frequencies (f) = 865 MHz, 880 MHz, 895 MHz)					
Linear Power Gain (V_{DS} = 28 V, P_{OUT} = 8 W, I_{DQ} = 800 mA)	G_L	17	18	—	dB
Output Power (V_{DS} = 28 V, 1 dB compression, I_{DQ} = 800 mA)	P_{1dB}	85	105	—	W
Drain Efficiency (V_{DS} = 28 V, P_{OUT} = P_{1dB}, I_{DQ} = 800 mA)		—	55	—	%
Third-order Intermodulation Distortion (100 kHz spacing, V_{DS} = 28 V, P_{OUT} = 90 WPEP, I_{DQ} = 800 mA)	IM3	—	30	—	dBc
Input VSWR	VSWRI	—	2:1	—	—
Ruggedness (V_{DS} = 28 V, P_{OUT} = 85 W, I_{DQ} = 800 mA, f = 880 MHz, VSWR = 10:1, all angles)	—	No degradation in output power.			

Test Circuit Illustrations for AGR09085E



A. Schematic



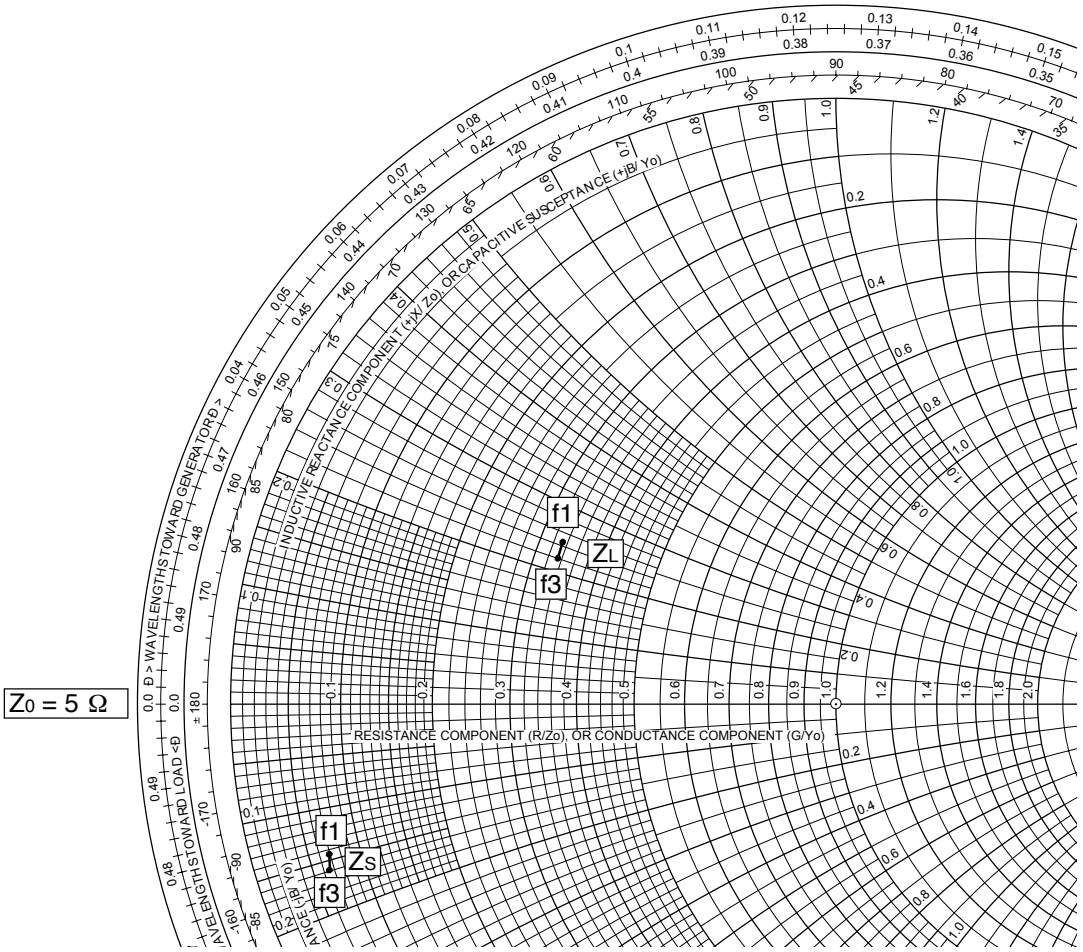
Parts List:

Microstrip line: Z1 0.834 in. x 0.066 in.; Z2 0.665 in. x 0.066 in.; Z3 0.290 in. x 0.066 in.; Z4 0.050 in. x 0.180 in.; Z5 0.650 in. x 0.180 in.; Z6 0.050 in. x 0.800 in.; Z7 0.132 in. x 0.800 in.; Z8 0.105 in. x 0.800 in.; Z9 0.057 in. x 0.800 in.; Z10 0.543 in. x 0.700 in.; Z11 0.108 in. x 0.700 in.; Z12 0.760 in. x 0.180 in.; Z13 0.200 in. x 0.180 in.; Z14 0.470 in. x 0.066 in.; Z15 0.495 in. x 0.066 in.; Z16 1.100 in. x 0.050 in.; Z17 1.100 in. x 0.050 in.
ATC® chip capacitor: C1, C8, C16, C17: 47 pF 100B470JW; C3 2.7 pF 100B2R7BW; C4, C13, C14: 12 pF 100B120JW; C5, C6, C9, C18: 10 pF 100B100JW; C7 5.6 pF 100B5R6BW.
0603 chip capacitor: C10, C19: 220 pF.
Kemet® chip capacitor: C11, C26: 0.01 µF C1206C103KRAC7800; C12, C20, C23: 0.1 µF C1206C104KRAC7800.
Johanson Giga-Trim® variable capacitor, 27291SL: C2, C15: 0.8 pF to 8 pF.
Sprague® tantalum chip capacitor: C21, C24, C25, C27: 10 µF, 35 V; C22 22 µF, 35 V.
1206 size chip resistor (0.25 W): R1 (fixed film RM73B2B510J) 51 ; R2, (fixed film RM73B2B563J) 56 k ; R3 (fixed film RM73B2B120J) 12 ; R4 (fixed film RM73B2B122J) 1.2 k .
Kreger® ferrite bead: FB1 2743D19447.
Taconic® ORCER RF-35: board material, 1 oz. copper, 30 mil thickness, r = 3.5.

B. Component Layout

Figure 2. AGR09085E Test Circuit

Typical Performance Characteristics



MHz (f)	ZS Ω (Complex Source Impedance)	ZL Ω (Complex Optimum Load Impedance)
865 (f1)	0.35 – j0.73	1.66 + j1.22
880 (f2)	0.35 – j0.77	1.67 + j1.18
895 (f3)	0.33 – j0.82	1.69 + j1.14

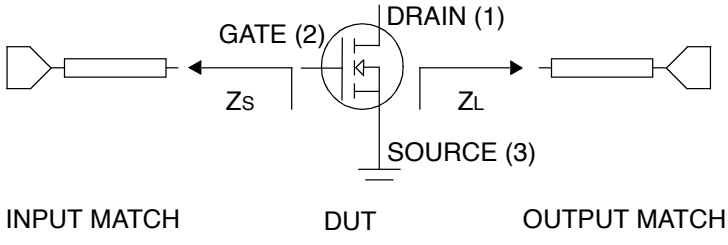
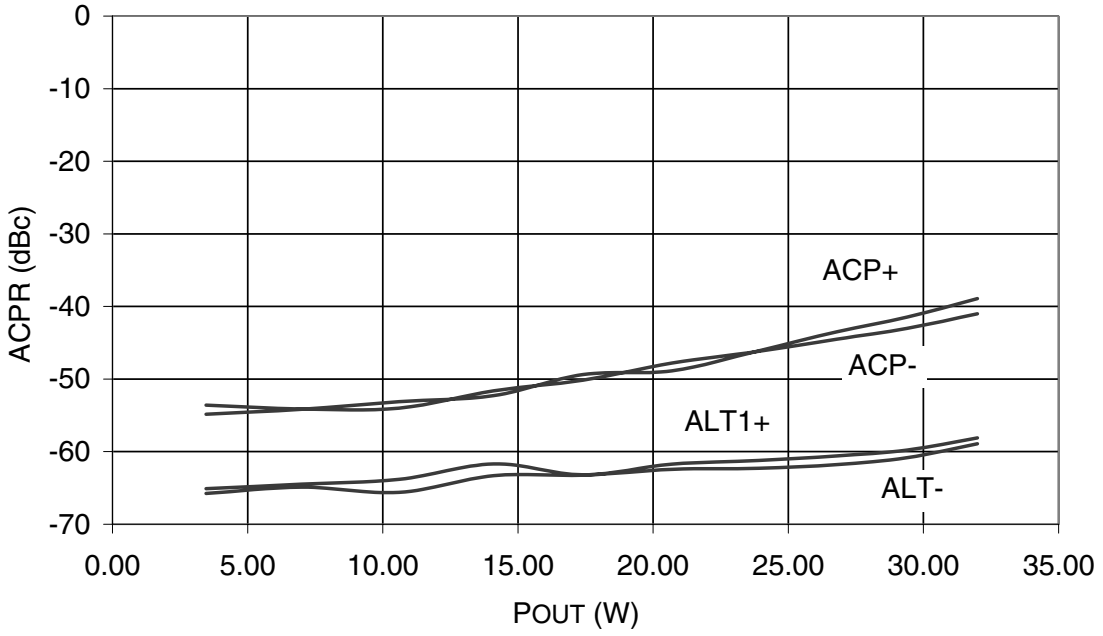


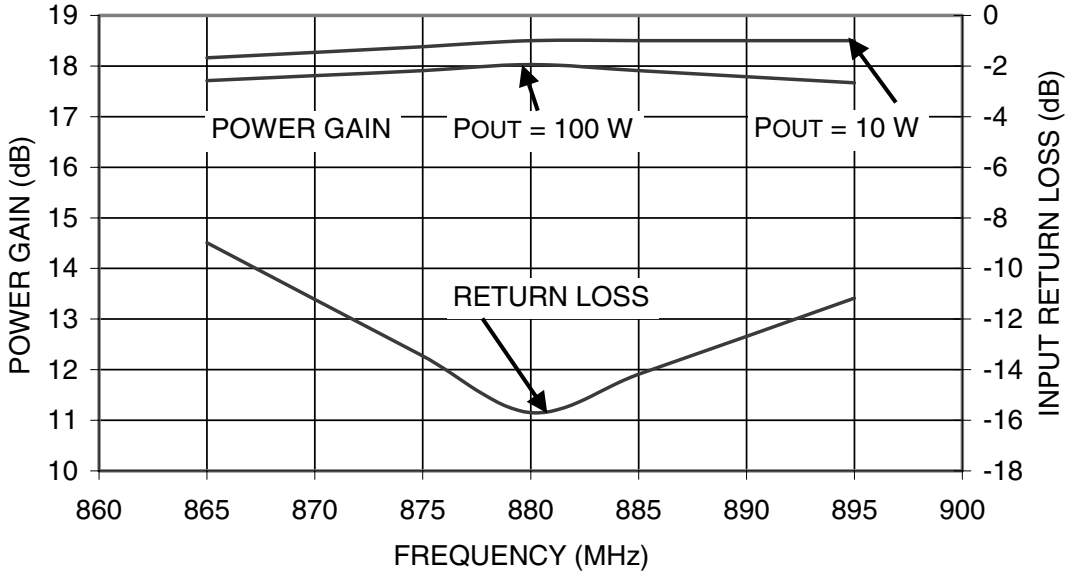
Figure 3. Series Equivalent Input and Output Impedances

Typical Performance Characteristics (continued)



TEST CONDITIONS:
V_{DD} = 28 Vdc, I_{DQ} = 0.8 A, T_C = 30 °C.
FREQUENCY = 880 MHz; IS-95 CDMA PILOT, PAGING, SYNC, TRAFFIC CODES 8 THROUGH 13; OFFSET 1 = 750 kHz; OFFSET 2 = 1.98 MHz; OFFSET 1 AND 2 BW = 30 kHz.

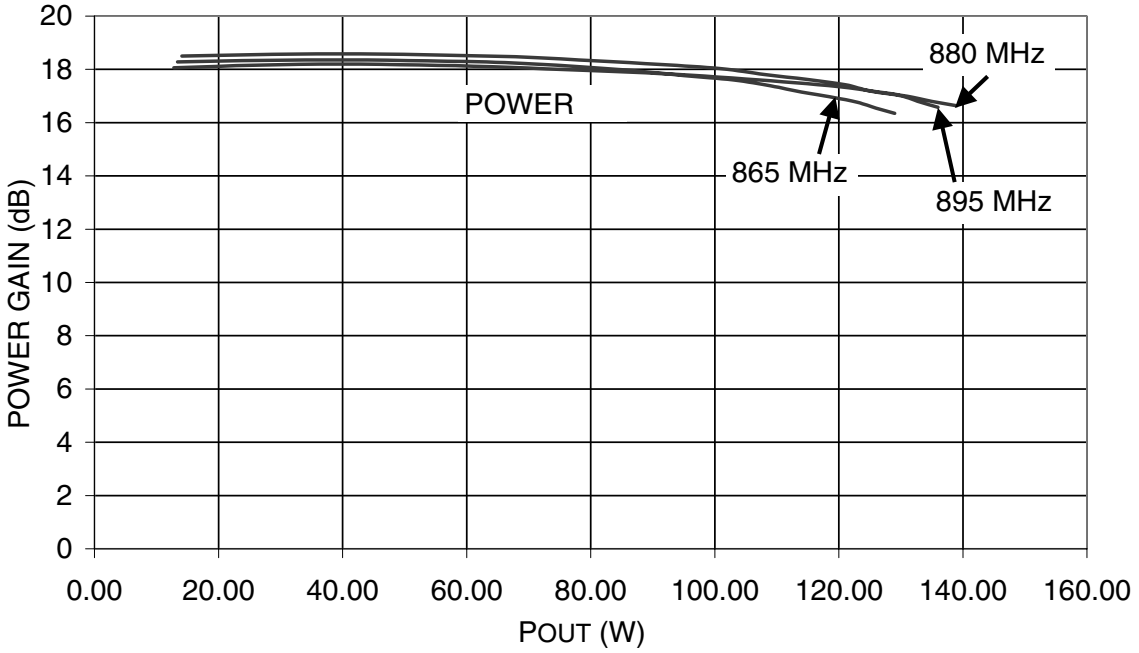
Figure 4. ACPR vs. POUT



TEST CONDITIONS:
V_{DD} = 28 Vdc, I_{DQ} = 0.8 A, T_C = 30 °C, WAVEFORM = CW.

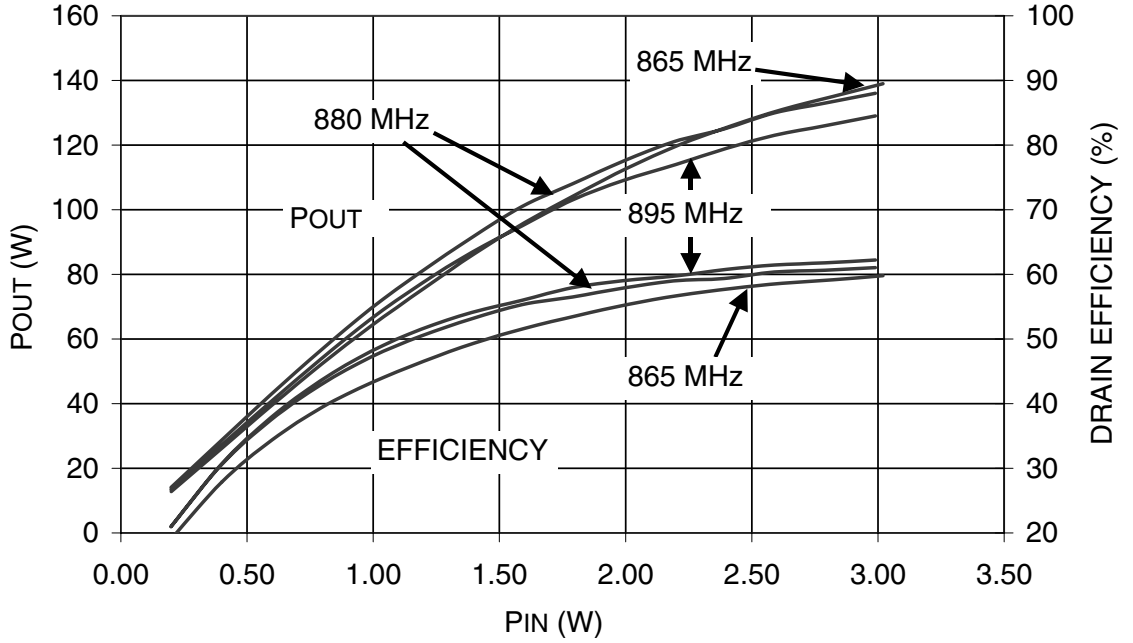
Figure 5. Power Gain and Return Loss vs. Frequency

Typical Performance Characteristics (continued)



TEST CONDITIONS:
V_{DD} = 28 Vdc, I_{DQ} = 0.8 A, T_C = 30 °C, WAVEFORM = CW.

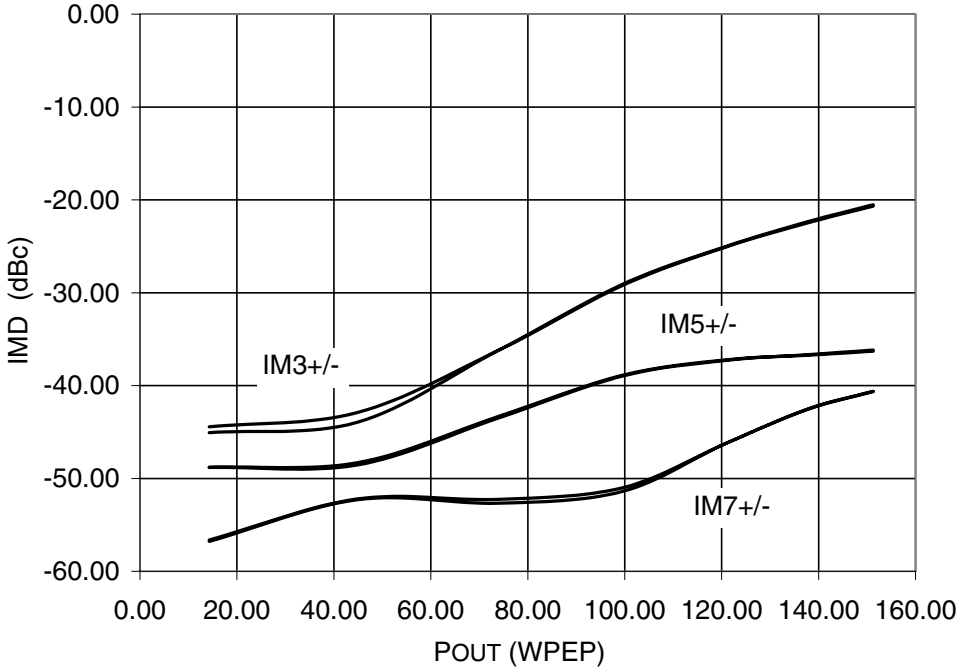
Figure 6. Power Gain vs. Power Out



TEST CONDITIONS:
V_{DD} = 28 Vdc, I_{DQ} = 0.8 A, T_C = 30 °C, WAVEFORM = CW.

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

Typical Performance Characteristics (continued)



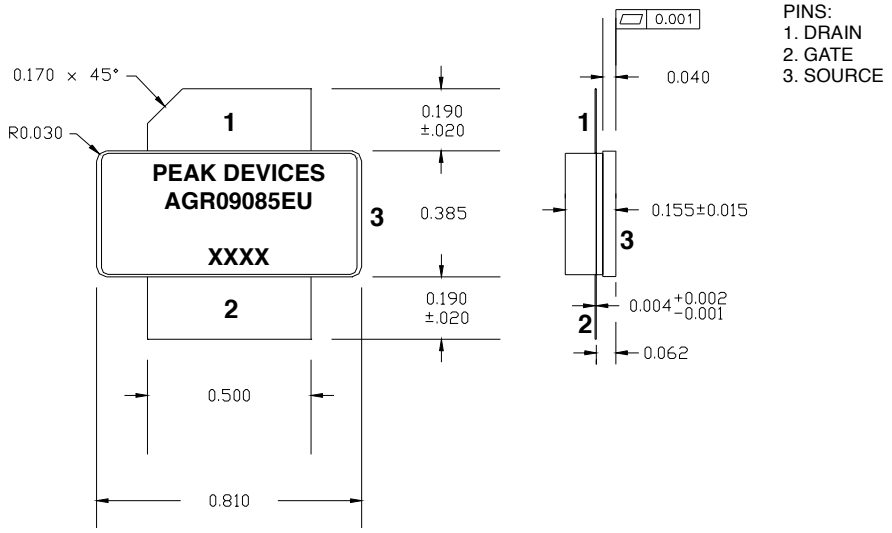
TEST CONDITIONS:
V_{DD} = 28 Vdc, I_{DQ} = 0.8 A, T_C = 30 °C.
FREQUENCY 1 = 880.0 MHz; FREQUENCY 2 = 880.1 MHz.

Figure 8. 2-Tone IMD vs. POUT

Package Dimensions

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

AGR09085EU



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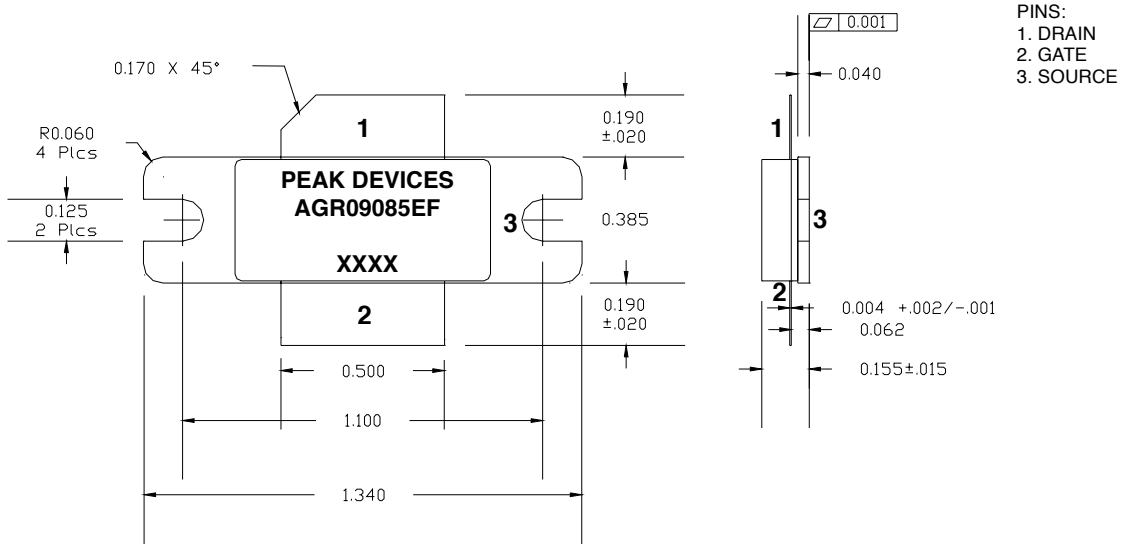

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