TriQuint SEMICONDUCTOR

AGR09070EF
70 W, 921 MHz—960 MHz, N-Channel E-Mode, Lateral MOSFET

Introduction

The AGR09070EF is a high-voltage, gold-metalized, laterally diffused metal oxide semiconductor (LDMOS) RF power transistor suitable for global system for mobile communication (GSM), enhanced data for global evolution (EDGE), and multicarrier class AB power amplifier applications. This device is manufactured on an advanced LDMOS technology, offering state-of-the-art performance and reliability. Packaged in an industry-standard package and capable of delivering a minimum output power of 70 W, it is ideally suited for today's wireless base station RF power amplifier applications.

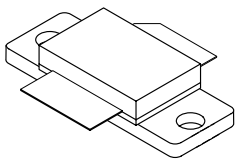


Figure 1. AGR09070EF (flanged) Package

Features

Typical performance ratings for GSM EDGE (f = 941 MHz, P_{OUT} = 21 W):
— Modulation spectrum:
@ ±400 kHz = –60 dBc.
@ ±600 kHz = –72 dBc.

Typical performance over entire GSM band:
— P_{1dB}: 85 W typ.
— Power gain: @ P_{1dB} = 18.25 dB.
— Efficiency @ P_{1dB} = 56% typ.
— Return loss: –12 dB.

High-reliability, gold-metalization process.

Internally matched.

High gain, efficiency, and linearity.

Integrated ESD protection.

70 W minimum output power.

Table 1. Thermal Characteristics

Parameter	Sym	Value	Unit
Thermal Resistance, Junction to Case: AGR09070EF	R_{JC}	0.80	°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: AGR09070EF	P_D	219	W
Derate Above 25 C: AGR09070EF	—	1.25	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*

AGR09070EF	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

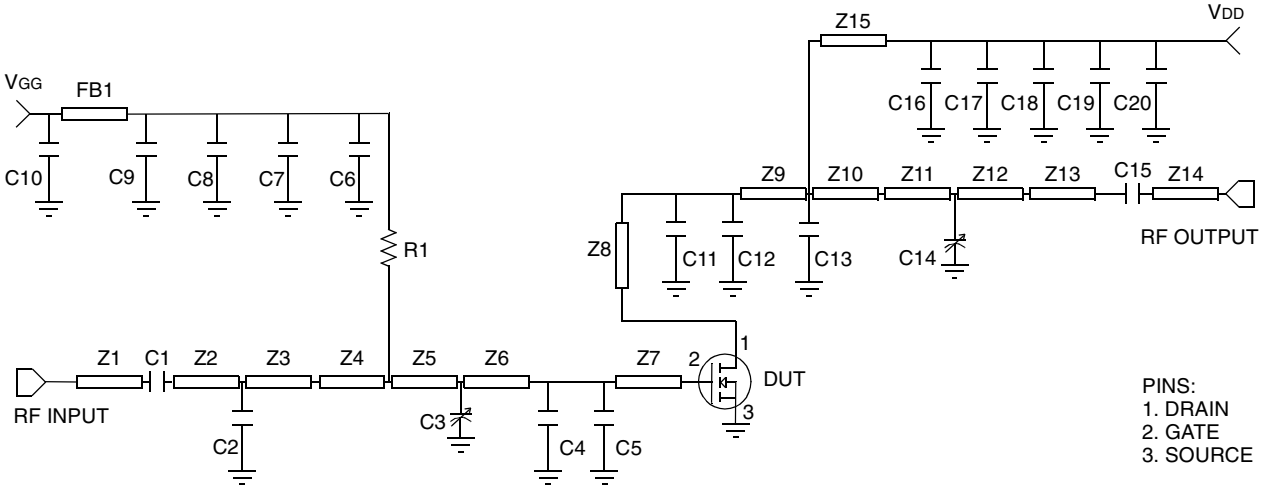
Parameter	Symbol	Min	Typ	Max	Unit
Off Characteristics					
Drain-source Breakdown Voltage (V_{GS} = 0, I_D = 300 µA)	$V_{(BR)DSS}$	65	—	—	Vdc
Gate-source Leakage Current (V_{GS} = 5 V, V_{DS} = 0 V)	I_{GSS}	—	—	2.6	µAdc
Zero Gate Voltage Drain Leakage Current (V_{DS} = 26 V, V_{GS} = 0 V)	I_{DSS}	—	—	100	µAdc
On Characteristics					
Forward Transconductance (V_{DS} = 10 V, I_D = 1.0 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} = 26 V, I_{DQ} = 800 mA)	$V_{GS(Q)}$	—	3.6	—	Vdc
Drain-source On-voltage (V_{GS} = 10 V, I_D = 1.0 A)	$V_{DS(ON)}$	—	0.12	—	Vdc

Table 5. RF Characteristics

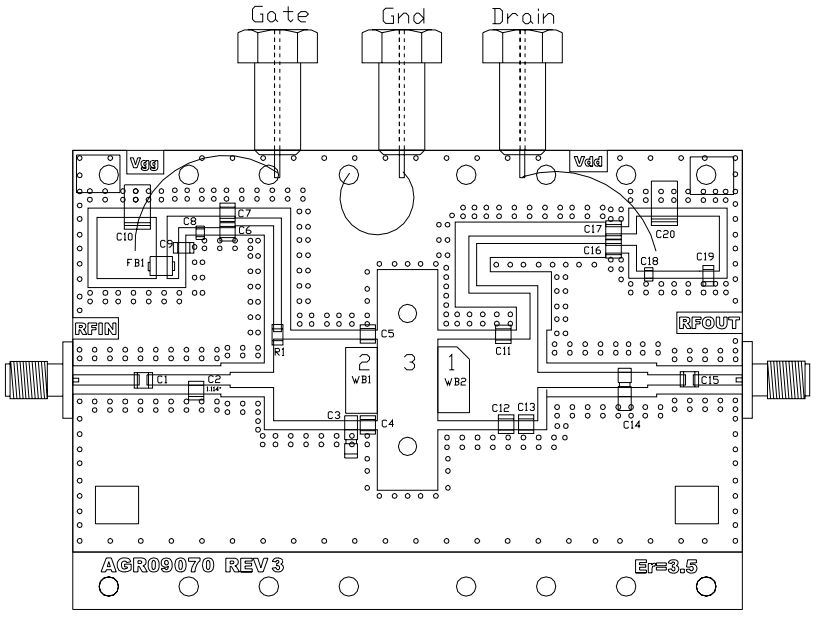
Parameter	Symbol	Min	Typ	Max	Unit
Dynamic Characteristics					
Reverse Capacitance (V_{DS} = 26 Vdc, V_{GS} = 0, f = 1 MHz)	C_{RSS}	—	2.3	—	pF
Output Capacitance (V_{DS} = 26 Vdc, V_{GS} = 0, f = 1 MHz)	C_{OSS}	—	48	—	pF
Functional Tests (in Supplied Test Fixture)					
Power Gain (V_{DS} = 26 V, P_{OUT} = 70 W, I_{DQ} = 800 mA)	G_L	17	18.25	—	dB
Drain Efficiency (V_{DS} = 26 V, P_{OUT} = P_{1dB}, I_{DQ} = 800 mA)		50	56	—	%
EDGE Linearity Characterization[2] (P_{OUT} = 21 W, f = 941 MHz, V_{DS} = 26 V, I_{DQ} = 800 mA)					
Modulation Spectrum @ ±400 kHz	—	—	–60	—	dBc
Modulation Spectrum @ ±600 kHz	—	—	–72	—	dBc
Output Power (V_{DS} = 26 V, 1 dB gain compression, I_{DQ} = 800 mA)	P_{1dB}	70	85	—	W
Input VSWR	$VSWR_I$	—	1:6	—	—
Ruggedness (V_{DS} = 26 V, P_{OUT} = 70 W, I_{DQ} = 800 mA, VSWR = 10:1, all angles)		No degradation in output power.			

1. Across full GSM band, 921 MHz—960 MHz.
2. Measured according to 3GPP GSM 05.05.

Test Circuit Illustrations for AGR09070EF



A. Schematic



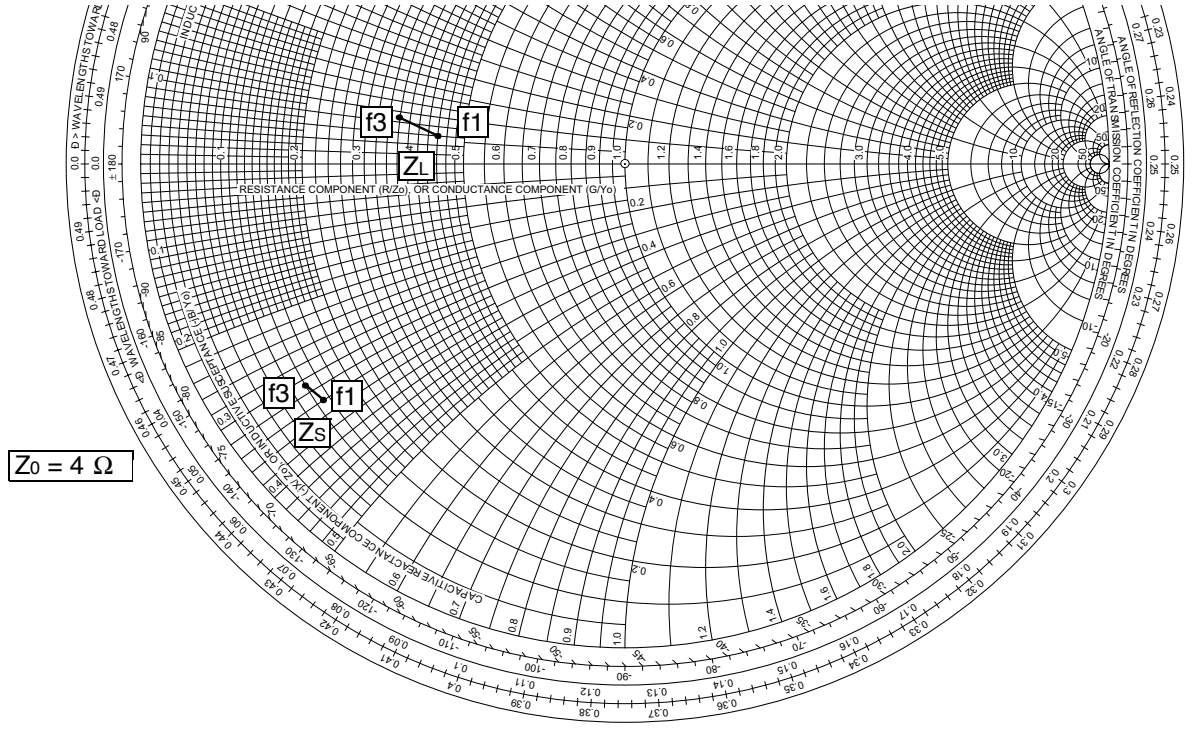
Parts List:

Microstrip line: Z1 0.431 in. x 0.066 in.; Z2 0.327 in. x 0.066 in.; Z3 0.214 in. x 0.066 in.; Z4 0.285 in. x 0.100 in.; Z5 0.510 in. x 0.530 in.; Z6 0.107 in. x 0.530 in.; Z7 0.058 in. x 0.530 in.; Z8 0.455 in. x 0.530 in.; Z9 0.132 in. x 0.530 in.; Z10 0.070 in. x 0.530 in.; Z11 0.535 in. x 0.100 in.; Z12 0.181 in. x 0.100 in.; Z13 0.245 in. x 0.066 in.; Z14 0.315 in. x 0.066 in.; Z15 1.700 in. x 0.050 in.
ATC® chip capacitor: C1, C6, C15, C16: 47 pF 100B470JW500X; C2, 2.2 pF 100B1R2JW500X; C4, C5, C11, C12: 12 pF 100B120JW500X; C7, 22 pF 100B220JW500X; C13, 2.7 pF 100B2R7BW500X; C17, 10 pF 100B100JW500X.
Sprague® tantalum surface-mount chip capacitor: C10, C20 10 µF, 35 V.
Kemet® 1206 size chip capacitor: C9, C19: 0.1 µF C1206104K5RAC7800.
Murata® 0805 size chip capacitor: C8, C18: 0.01 µF GRM40X7R103K100AL.
Johanson Giga-Trim® variable capacitor: C3, C14: 0.8 pF to 8.0 pF 27271SL.
1206 size chip resistor: R1 51 .
Fair-Rite® ferrite bead: FB1 2743019447.
Taconic® ORCER RF-35: board material, 1 oz. copper, 30 mil thickness, r = 3.5.

B. Component Layout

Figure 2. AGR09070EF Test Circuit

Typical Performance Characteristics



MHz (f)	ZS Ω (Complex Source Impedance)	ZL Ω (Complex Optimum Load Impedance)
921 (f1)	0.530 – j1.527	1.774 + j0.257
940	0.547 – j1.394	1.640 + j0.275
960 (f3)	0.508 – j1.240	1.457 + j0.351

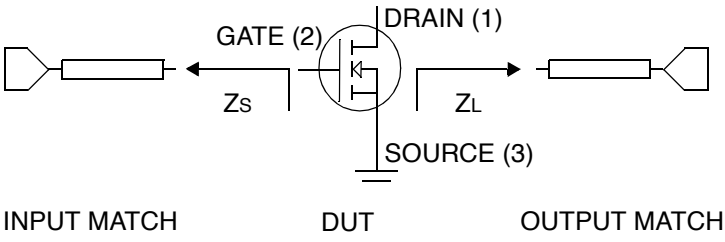


Figure 3. Series Equivalent Input and Output Impedances

Typical Performance Characteristics (continued)

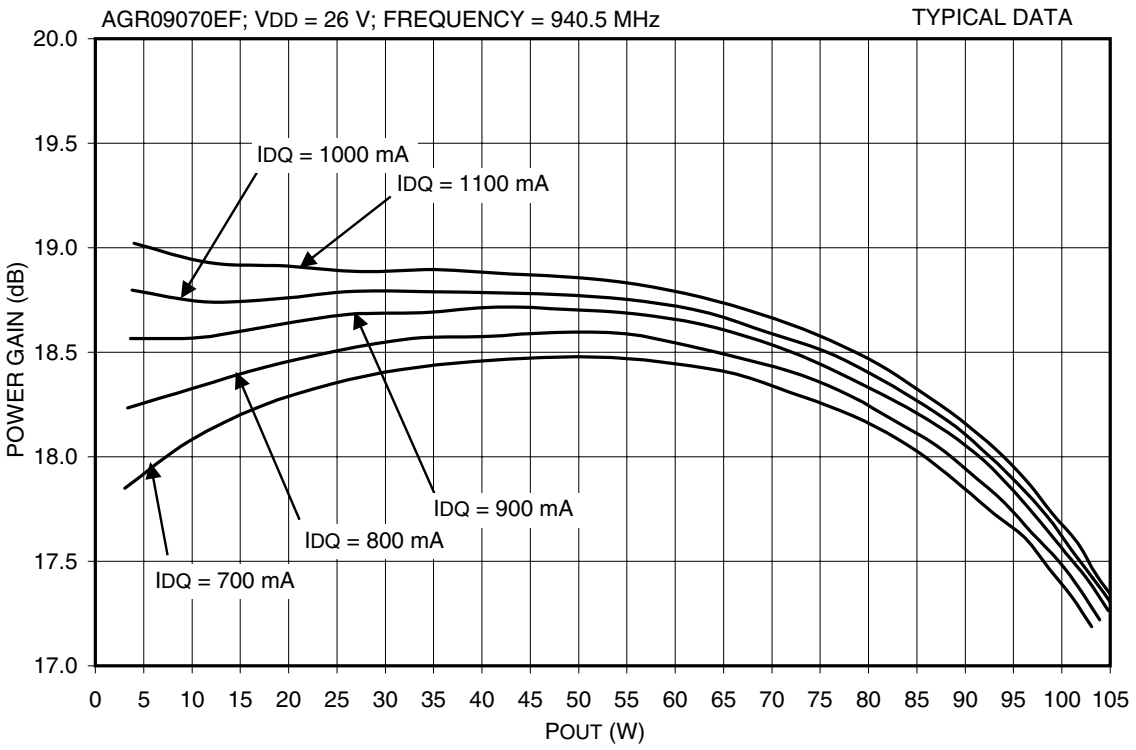


Figure 4. Power Gain vs. POUT

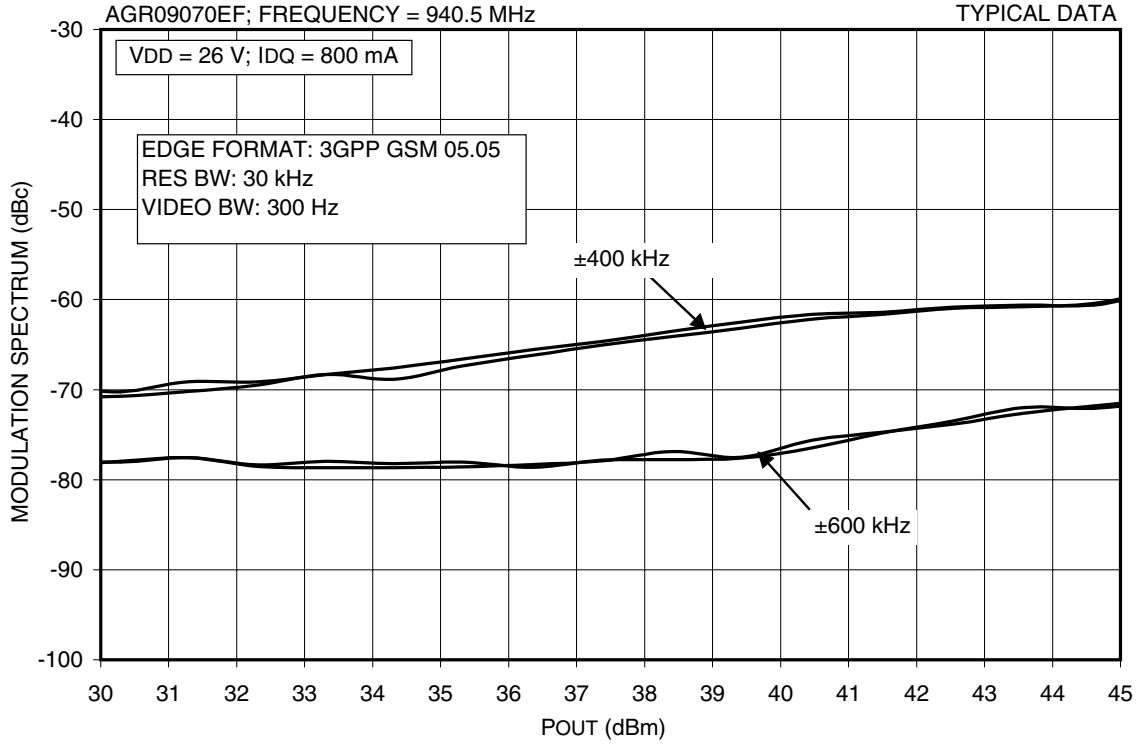


Figure 5. Modulation Spectrum vs. POUT

Typical Performance Characteristics (continued)

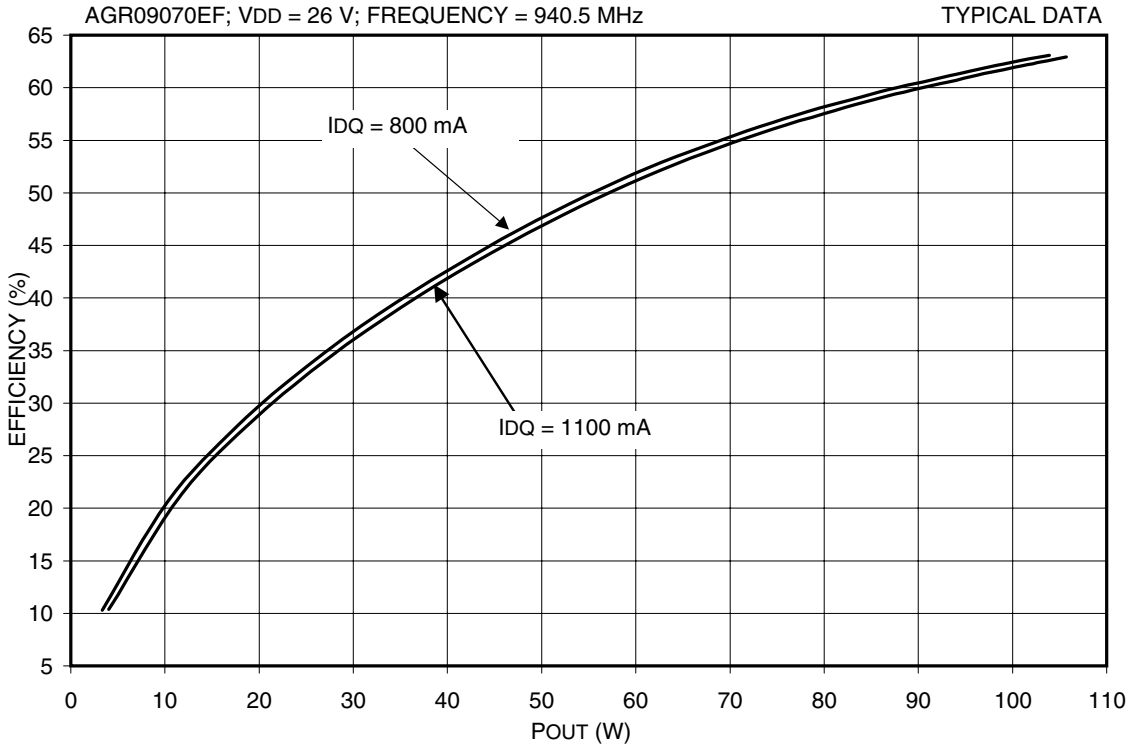


Figure 6. Efficiency vs. POUT

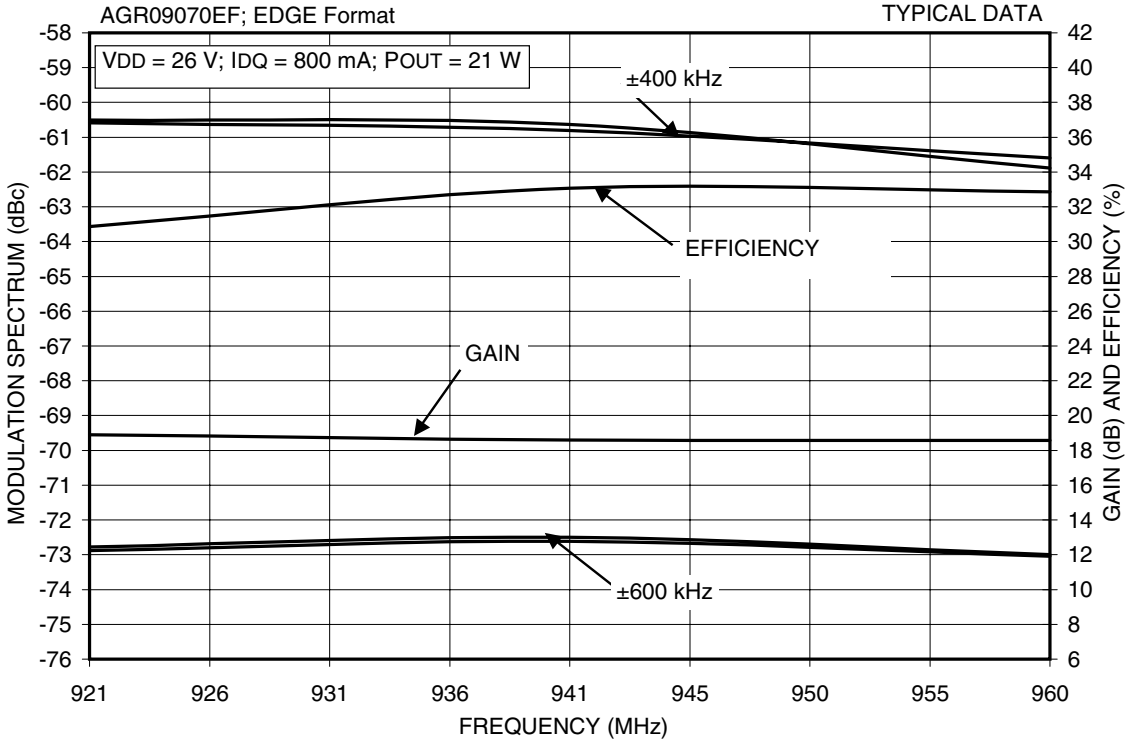


Figure 7. Modulation Spectrum, Gain, and Efficiency vs. Frequency

Typical Performance Characteristics (continued)

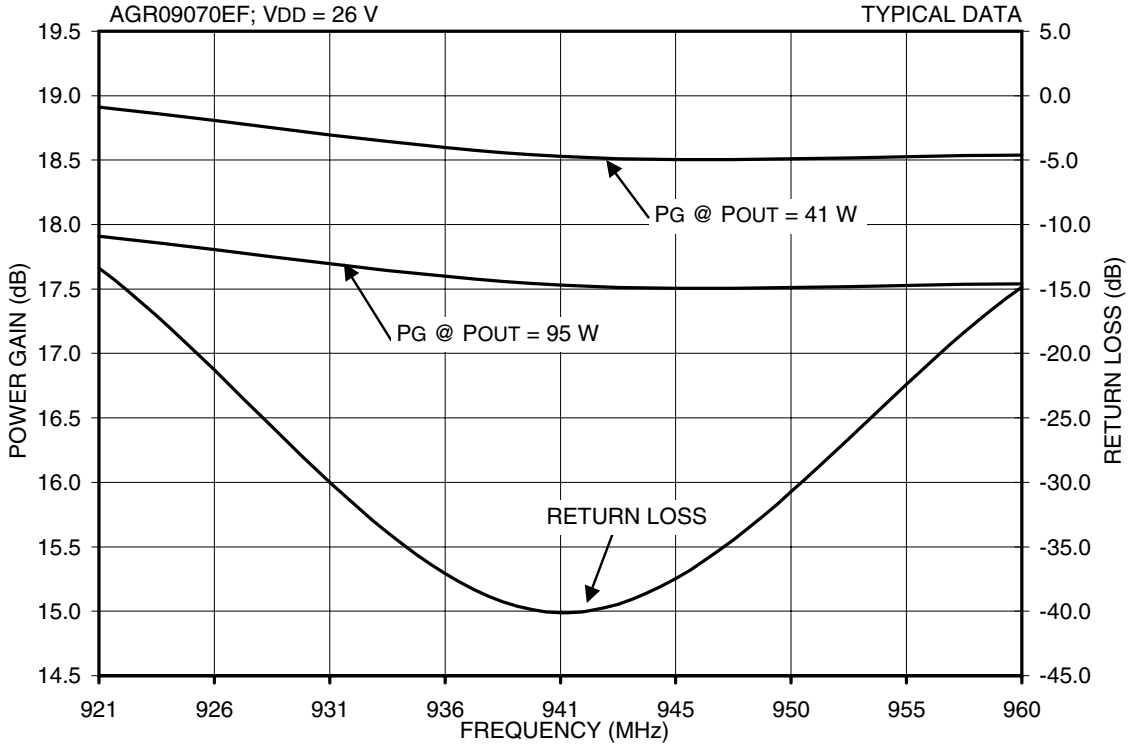


Figure 8. Power Gain and Return Loss vs. Frequency

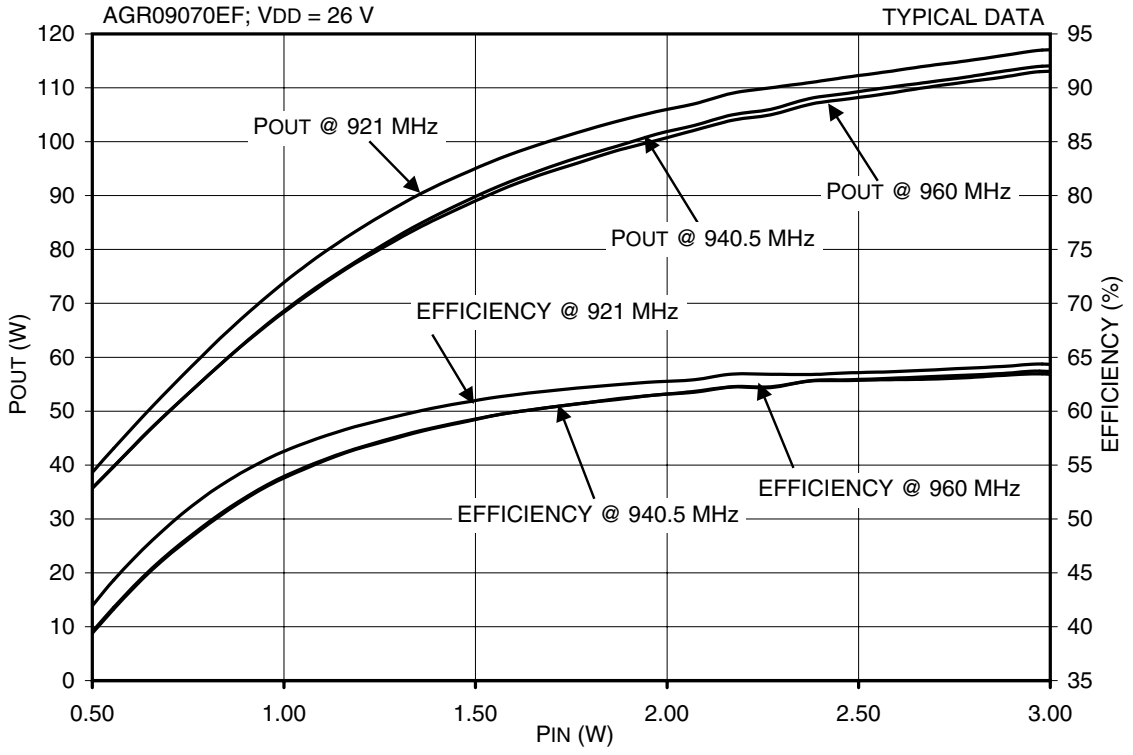
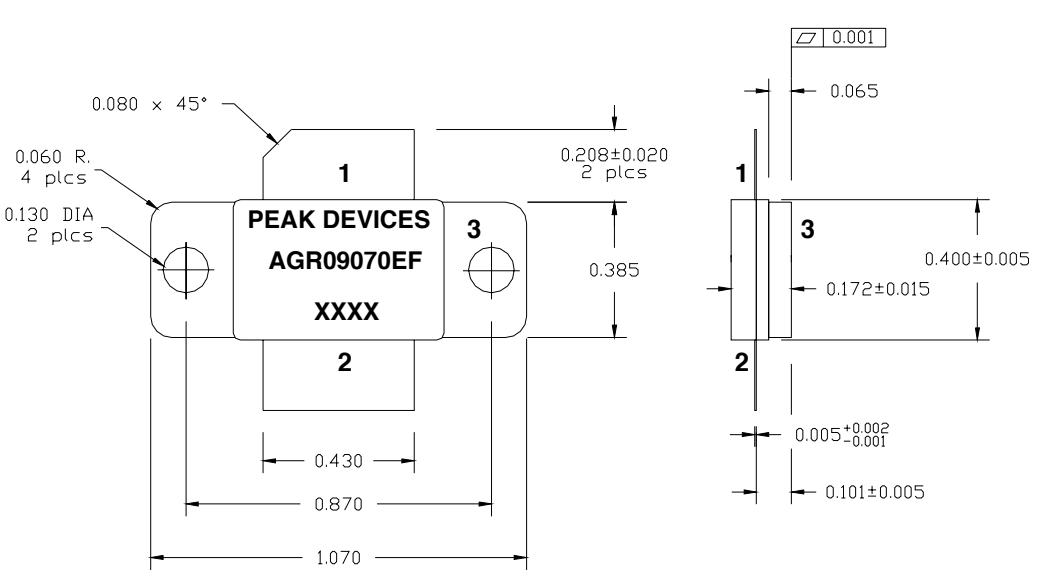


Figure 9. Power Out and Efficiency vs. Input Power

Package Dimensions

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

AGR09070EF



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2. GATE
3. SOURCE

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