AFM912N

Airfast RF Power LDMOS Transistor

Rev. 0 — November 2022

Data Sheet: Technical Data

Designed for handheld two–way radio applications with frequencies from 136 to 941 MHz. The high gain, ruggedness and wideband performance of this device make it ideal for large–signal, common–source amplifier applications in handheld radio equipment.

Typical Performance (7.5 Vdc, T_A = 25°C, CW)

Frequency (MHz)	Gain Compression	P_{out} (W)	G_{ps} (dB)	η_D (%)
941	P1dB	12.5	13.3	65.2
	P3dB	15.7	11.3	69.5

Load Mismatch/Ruggedness

Frequency (MHz)	Signal Type	VSWR	P_{in} (dBm)	Test Voltage	Result
941	CW	> 10:1 at all Phase Angles	32.9 (3 dB Overdrive)	10.0	No Device Degradation

Features

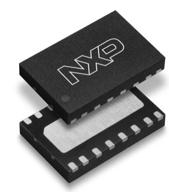
- Characterized for operation from 136 to 941 MHz
- Unmatched input and output allowing wide frequency range utilization
- Device can be used single–ended or in a push–pull configuration
- Integrated ESD protection
- Integrated stability enhancements
- Wideband — full power across each band
- Extreme ruggedness
- High linearity for: TETRA, SSB

Typical Applications

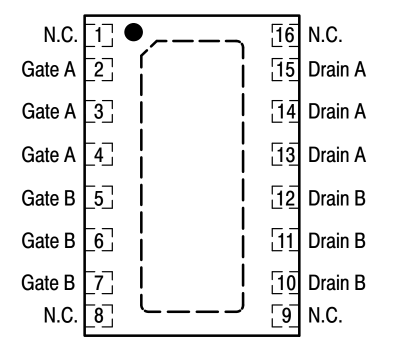
- Output stage VHF band handheld radio
- Output stage UHF band handheld radio
- Output stage for 700–800 MHz handheld radio

AFM912N

136–941 MHz, 12 W, 7.5 V WIDEBAND AIRFAST RF POWER LDMOS TRANSISTOR



DFN 4 × 6



(Top View)

Note: Exposed backside of the package is the source terminal for the transistor.

Figure 1. Pin Connections

NXP reserves the right to change the detail specifications as may be required to permit improvements in the design of its products.

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
Drain–Source Voltage	V_{DSS}	–0.5, +30	Vdc
Gate–Source Voltage	V_{GS}	–6.0, +12	Vdc
Operating Voltage	V_{DD}	0 to 12.5	Vdc
Storage Temperature Range	T_{stg}	–65 to +150	°C
Case Operating Temperature Range	T_C	–40 to +150	°C
Operating Junction Temperature Range (1)	T_J	–40 to +150	°C
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	142 1.14	W W/°C

Table 2. Thermal Characteristics

Characteristic	Symbol	Value (2)	Unit
Thermal Resistance, Junction to Case Case Temperature 78°C, 12.6 W CW, 7.5 Vdc, $I_{DQ(A+B)}$ = 130 mA, 941 MHz	$R_{\theta JC}$	0.88	°C/W

Table 3. ESD Protection Characteristics

Test Methodology	Class
Human Body Model (per JS–001–2017)	Class 1C, passes 1000 V
Charge Device Model (per JS–002–2014)	Class C3, passes 1200 V

Table 4. Moisture Sensitivity Level

Test Methodology	Rating	Package Peak Temperature	Unit
Per JESD22–A113, IPC/JEDEC J–STD–020	3	260	°C

Table 5. Electrical Characteristics (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Off Characteristics (3)					
Zero Gate Voltage Drain Leakage Current (V_{DS} = 30 Vdc, V_{GS} = 0 Vdc)	I_{DSS}	—	—	10	μAdc
Gate–Source Leakage Current (V_{GS} = 5 Vdc, V_{DS} = 0 Vdc)	I_{GSS}	—	—	500	nAdc
On Characteristics (3)					
Gate Threshold Voltage (V_{DS} = 10 Vdc, I_D = 78 μAdc)	$V_{GS(th)}$	1.7	2.1	2.6	Vdc
Drain–Source On–Voltage (V_{GS} = 10 Vdc, I_D = 780 mAdc)	$V_{DS(on)}$	—	0.11	0.15	Vdc
Forward Transconductance (V_{DS} = 7.5 Vdc, I_D = 4.7 Adc)	g_{fs}	—	4.4	—	S

1. Continuous use at maximum temperature will affect MTTF.
2. Refer to AN1955, *Thermal Measurement Methodology of RF Power Amplifiers.* Go to http://www.nxp.com/RF and search for AN1955.
3. Each side of device measured separately.

(continued)

Table 5. Electrical Characteristics (T_A = 25°C unless otherwise noted) **(continued)**

Characteristic	Symbol	Min	Typ	Max	Unit
Dynamic Characteristics [1]					
Reverse Transfer Capacitance (V_{DS} = 7.5 Vdc ± 30 mV(rms)ac @ 1 MHz, V_{GS} = 0 Vdc)	C_{rss}	—	1.7	—	pF
Output Capacitance (V_{DS} = 7.5 Vdc ± 30 mV(rms)ac @ 1 MHz, V_{GS} = 0 Vdc)	C_{oss}	—	39.8	—	pF
Input Capacitance (V_{DS} = 7.5 Vdc, V_{GS} = 0 Vdc ± 30 mV(rms)ac @ 1 MHz)	C_{iss}	—	68.9	—	pF
Typical Performance (In NXP Test Fixture, 50 ohm system) V_{DD} = 7.5 Vdc, $I_{DQ(A+B)}$ = 130 mA, P_{out} = 12 W, f = 941 MHz					
Power Gain	G_{ps}	—	13.3	—	dB
Drain Efficiency	η_D	—	65.2	—	%
Input Return Loss	IRL	—	–17	—	dB

Load Mismatch/Ruggedness (In NXP Test Fixture, 50 ohm system) $I_{DQ(A+B)}$ = 130 mA

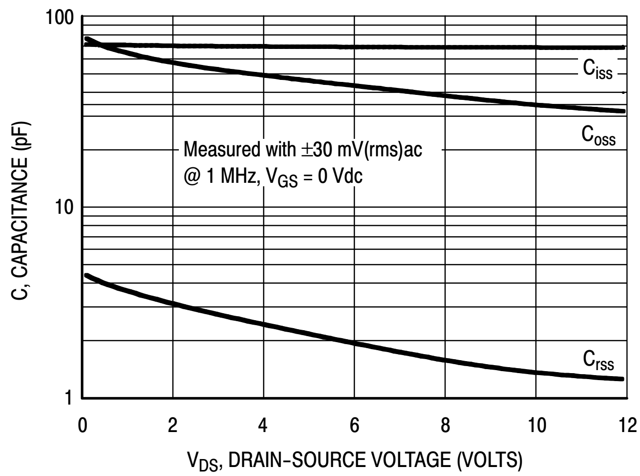
Frequency (MHz)	Signal Type	VSWR	P_{in} (dBm)	Test Voltage, V_{DD}	Result
941	CW	> 10:1 at all Phase Angles	32.9 (3 dB Overdrive)	10.0	No Device Degradation

Table 6. Ordering Information

Device	Tape and Reel Information	Package
AFM912NT1	T1 Suffix = 1,000 Units, 16 mm Tape Width, 7–inch Reel	DFN 4 × 6

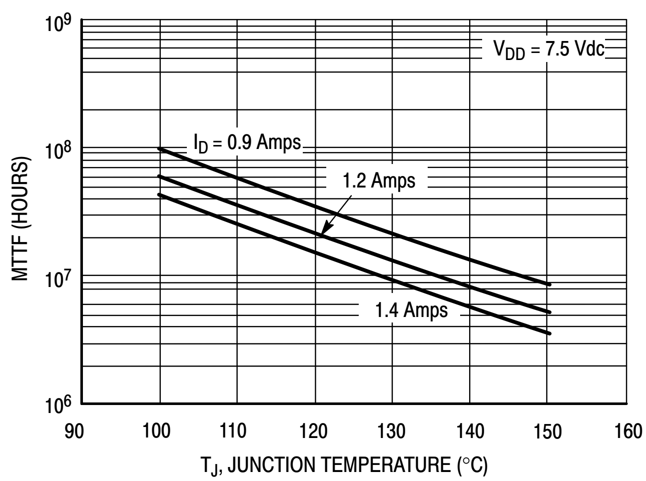
1. Each side of device measured separately.

Typical Characteristics



Note: Each side of device measured separately.

Figure 2. Capacitance versus Drain-Source Voltage



Note 1: Each side of device measured separately.
Note 2: MTTF value represents the total cumulative operating time under indicated test conditions.

Figure 3. MTTF versus Junction Temperature – CW

941 MHz Test Fixture — 3″ × 5″ (7.8 cm × 12.7 cm)

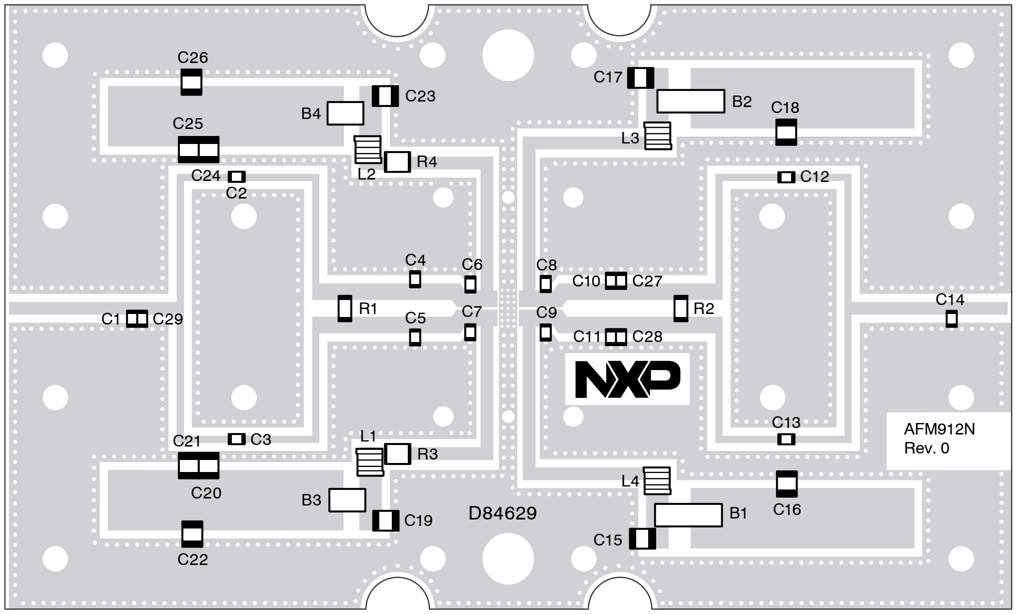


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Figure 4. AFM912N Test Fixture Component Layout — 941 MHz

Table 7. AFM912N Test Fixture Component Designations and Values — 941 MHz

Part	Description	Part Number	Manufacturer
B1, B2	Long RF Bead	2743021447	Fair−Rite
B3, B4	Short RF Bead	2743019447	Fair−Rite
C1	2 pF Chip Capacitor	600F2R0BT250XT	ATC
C2, C3	8.2 pF Chip Capacitor	600F8R2BT250XT	ATC
C4, C5	6.8 pF Chip Capacitor	600F6R8BT250XT	ATC
C6, C7, C8, C9	9.1 pF Chip Capacitor	600F9R1BT250XT	ATC
C10, C11	5.6 pF Chip Capacitor	600F5R6BT250XT	ATC
C12, C13	150 pF Chip Capacitor	600F151JT250XT	ATC
C14	3 pF Chip Capacitor	600F3R0BT250XT	ATC
C15, C17, C19, C23	1 μF Chip Capacitor	GRM32CR72A105KA35L	Murata
C16, C18, C22, C26	10 μF Chip Capacitor	C3225X7S1H106M250AB	TDK
C20, C21, C24, C25	0.1 μF Chip Capacitor	GRM32MR71H104JA01L	Murata
C27, C28	0.2 pF Chip Capacitor	600F0R2BT250XT	ATC
C29	5.1 pF Chip Capacitor	600F5R1BT250XT	ATC
L1, L2	8 nH Inductor, 3 Turns	A03TKLC	Coilcraft
L3, L4	5 nH Inductor, 2 Turns	A02TJLC	Coilcraft
R1, R2	100 Ω, 1/4 W Chip Resistor	CRCW1206100RFKEA	Vishay
R3, R4	3.3 Ω, 1/2 W Chip Resistor	ERJ−14YJ3R3U	Panasonic
PCB	Rogers RO4350B, 0.030″, e_r = 3.66	D84629	MTL

Typical Characteristics — 941 MHz Test Fixture

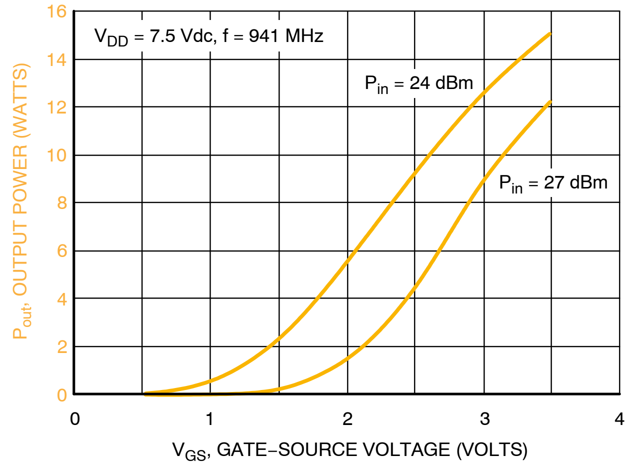


Figure 5. Output Power versus Gate–Source Voltage

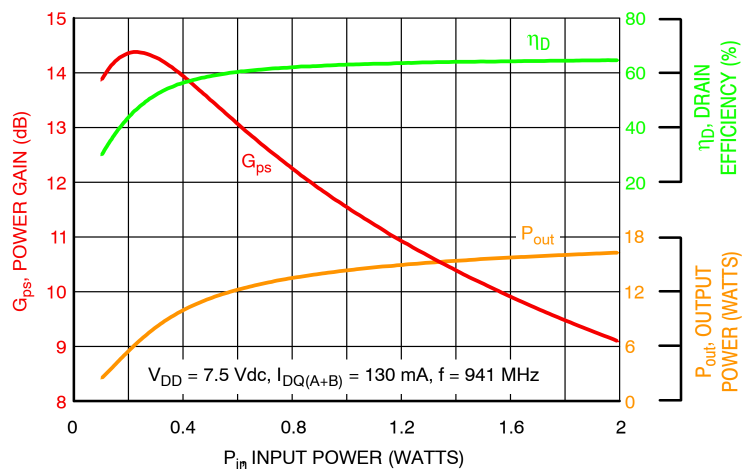


Figure 6. Power Gain, Drain Efficiency and Output Power versus Input Power

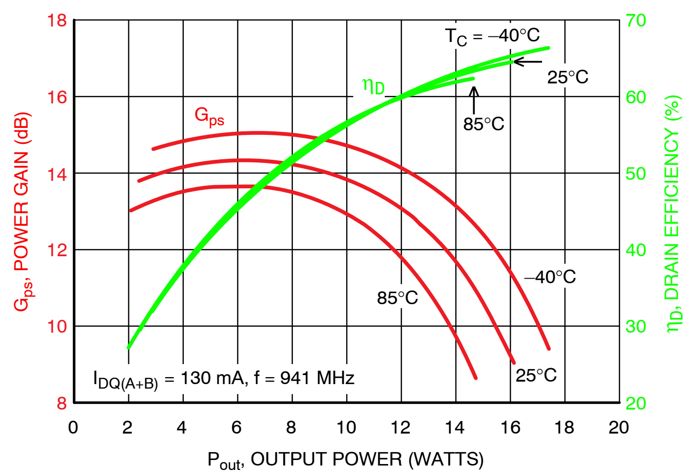


Figure 7. Power Gain and Drain Efficiency versus Output Power over Temperature

941 MHz Test Fixture

f (MHz)	Z_{source} [1] (Ω)	Z_{load} [1] (Ω)
941	0.4 – j1.7	0.9 – j1.2

1. Simulated data.

Z_{source} = Test circuit impedance as measured from gate to ground.

Z_{load} = Test circuit impedance as measured from drain to ground.

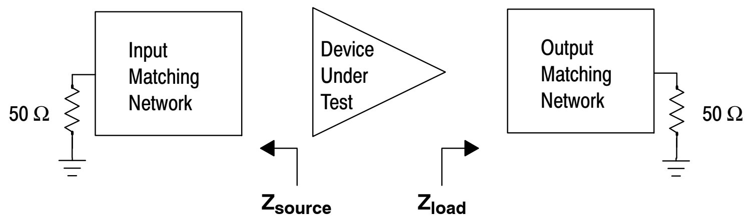
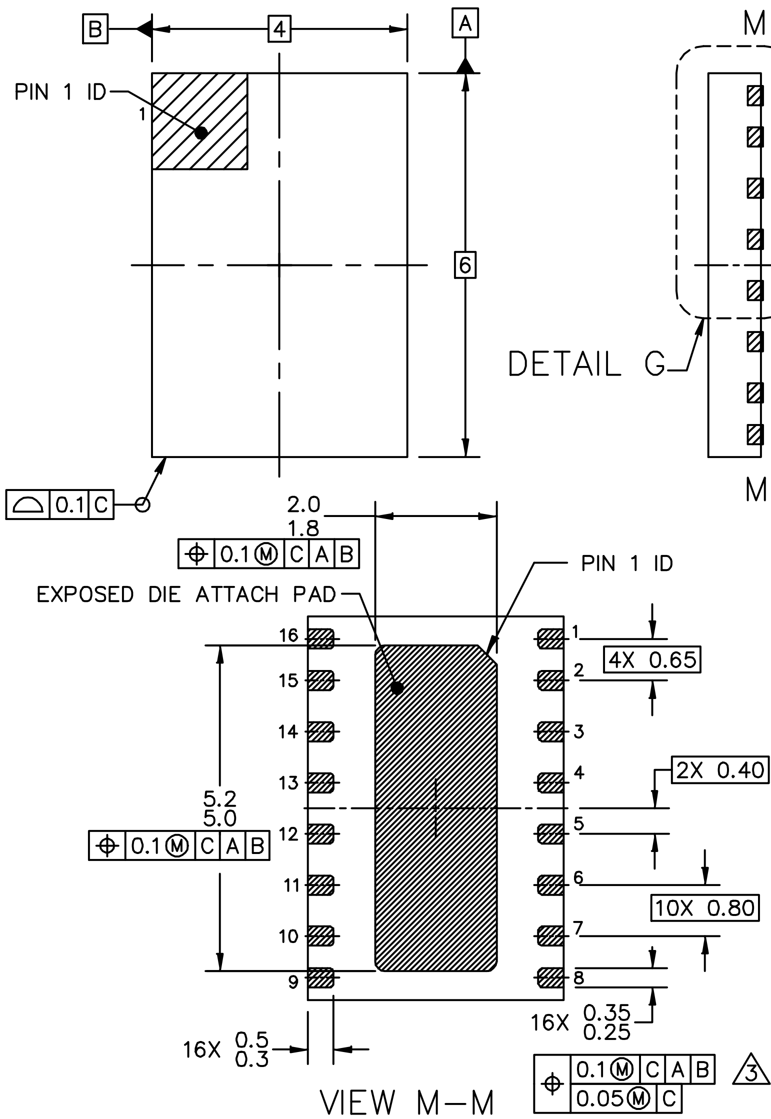


Figure 8. Series Equivalent Source and Load Impedance — 941 MHz

Figure 9. Product Marking

Package Information



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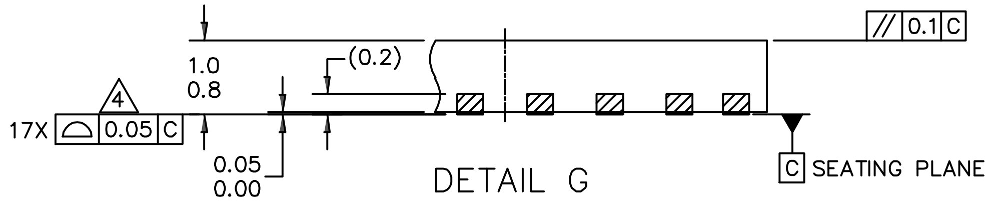

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VIEW ROTATED 90° CLOCKWISE

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	SOT1862-1	27 JUL 2016

NOTES:

1. DIMENSIONING & TOLERANCING CONFIRM TO ASME Y14.5M—1994.
2. ALL DIMENSIONS ARE IN MILLIMETERS. ANGLES ARE IN DEGREES.
3. THIS DIMENSION APPLIES TO METALLIZED TERMINAL AND IS MEASURED BETWEEN 0.25 MM AND 0.30 MM FROM TERMINAL TIP.
4. COPLANARITY APPLIES TO THE EXPOSED HEAT SLUG AS WELL AS THE TERMINALS.

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	SOT1862—1	27 JUL 2016

Product Documentation, Software and Tools

Refer to the following resources to aid your design process.

Application Notes

- AN1907: Solder Reflow Attach Method for High Power RF Devices in Over–Molded Plastic Packages
- AN1955: Thermal Measurement Methodology of RF Power Amplifiers

Engineering Bulletins

- EB212: Using Data Sheet Impedances for RF LDMOS Devices

Software

- Electromigration MTTF Calculator

Development Tools

- Printed Circuit Boards

Revision History

The following table summarizes revisions to this document.

Revision	Date	Description
0	Nov. 2022	• Initial release of data sheet

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