ARF460A/B

Datasheet

RF Power MOSFET

Final

May 2018

Microsemi

Power Matters.™

Contents

1 Revision History

The revision history describes the changes that were implemented in the document. The changes are listed by revision, starting with the most current publication.

1.1 Revision F

Revision F was published in May 2018. The following is a summary of the changes in revision F of this document.

- Updated Product Overview (see page 2) image and features bullet
- Added Thermal and Mechanical Characteristics (see page 3) section
- Updated Maximum Transient Thermal Impedance (see page 5) graph
- Updated Capacitance vs. Drain-to-Source Voltage (see page 6) graph
- Updated Threshold Voltage vs. Temperature (see page 6) graph

1.2 Revision E

Revision E was published in October 2007. The following is a summary of the changes in revision E of this document.

- Updated to Microsemi format
- Changed operating and storage junction temperature range from –55 °C to 175 °C to –55 °C to 150 ° C
- Changed the GFS (VDS) from 15 V to 25 V
- Changed the minimal values in the Functional Characteristics (see page 4) table

1.3 Revision D

Revision D was published in August 2003. The following is a summary of the changes in revision D of this document.

- Updated Maximum Transient Thermal Impedance (see page 5) graph
- Added RC ladder
- Updated patent information

1.4 Revision C

Revision C was published in March 2002. The following is a summary of the changes in revision C of this document.

- Updated to remove preliminary status

1.5 Revision B

Revision B was published in November 2001. The following is a summary of the changes in revision B of this document.

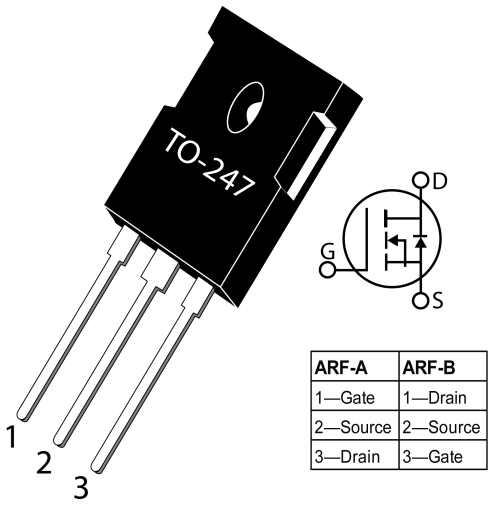
- Updated capacitance values in the Dynamic Electrical Characteristics (see page 4) table

1.6 Revision A

Revision A was published in December 2000. It is the first publication of this document.

2 Product Overview

The ARF460A and ARF460B comprise a symmetric pair of common source RF power transistors designed for push-pull scientific, commercial, medical, and industrial RF power amplifier applications up to 65 MHz. They have been optimized for both linear and high-efficiency classes of operation.



ARF-A	ARF-B
1—Gate	1—Drain
2—Source	2—Source
3—Drain	3—Gate

2.1 Features

The following are key features of the ARF460A/B devices:

- Low-cost common source RF package
- Low Vth thermal coefficient
- Low thermal resistance
- Optimized SOA for superior ruggedness
- RoHS compliant

2.2 Characteristics

The following are characteristics of the ARF460A/B devices at 125 V and 40.68 MHz:

- Output power: 150 W
- Gain: 13 dB (Class AB)
- Efficiency: 75% (Class C)

3 Electrical Specifications

This section details the electrical specifications for the ARF460A/B devices.

3.1 Absolute Maximum Ratings

The following table shows the absolute maximum ratings for the ARF460A/B devices.

All ratings at T_C = 25 °C unless otherwise specified.

Table 1 • Absolute Maximum Ratings

Symbol	Parameter	Ratings	Unit
V_{DSS}	Drain-source voltage	500	V
V_{DGO}	Drain-gate voltage	500	V
I_D	Continuous drain current	14	A
V_{GS}	Gate-source voltage	±30	V
P_D	Total power dissipation	250	W
$R_{\theta JC}$	Junction-to-case thermal resistance	0.40	°C/W
T_J, T_{STG}	Operating and storage junction temperature range	–55 to 150	°C
T_L	Lead temperature 0.063 inches from case for 10 seconds	300	°C

3.2 Thermal and Mechanical Characteristics

The following table shows the thermal and mechanical characteristics of the ARF460A/B device.

Table 2 • Thermal and Mechanical Characteristics

Symbol	Characteristic	Min	Typ	Max	Unit
$R_{\theta JC}$	Junction-to-case thermal resistance		0.27	0.50	°C/W
T_J	Operating junction temperature	–55		175	°C
T_{stg}	Storage temperature	–55		175	
T_L	Soldering temperature for 10 seconds (1.6 mm from case)			260	
	Mounting torque, 6-32 or M3 screw			10	lbf-in
				1.1	N-m
WT	Package weight		0.22		oz
			6.1		g

3.3 Electrical Performance

The following table shows the static electrical characteristics of the ARF460A/B devices. These devices are sensitive to electrostatic discharge. Proper handling procedures should be followed.

Table 3 • Static Electrical Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
BV_{DSS}	Drain-source breakdown voltage (V_{GS} = 0 V, I_D = 250 µA)	500			V
$V_{DS(ON)}$	On-state drain voltage($I_{D(ON)}$ = 7 A, V_{GS} = 10 V)			4	V
I_{DSS}	Zero gate voltage drain current (V_{DS} = V_{DSS}, V_{GS} = 0 V)			25	µA
	Zero gate voltage drain current (V_{DS} = 0.8 V_{DSS}, V_{GS} = 0 V, T_C = 125 °C)			250	
I_{GSS}	Gate-source leakage current (V_{DS} = ±30 V, V_{DS} = 0 V)			±100	nA
g_{FS}	Forward transconductance (V_{DS} = 25 V, I_D = 7 A)	3.3	5.5	8	mhos
$V_{GS(TH)}$	Gate threshold voltage (V_{DS} = V_{GS}, I_D = 50 mA)	3		5	V

The following table shows the dynamic electrical characteristics of the ARF460A/B devices.

Table 4 • Dynamic Electrical Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
C_{ISS}	Input capacitance	V_{GS} = 0 V V_{DS} = 150 V f = 1 MHz		1200	1400	pF
C_{OSS}	Output capacitance			150	180	
C_{RSS}	Reverse transfer capacitance			60	75	
$t_{D(ON)}$	Turn-on delay time	V_{GS} = 15 V V_{DD} = 0.5 V_{DSS} I_D = $I_{D[Cont.]}$ at 25 °C R_G = 1.6 Ω		7		ns
t_R	Rise time			6		
$t_{D(OFF)}$	Turn-off delay time			20		
t_F	Fall time			4.0	7	

The following table shows the functional characteristics of the ARF460A/B devices.

Table 5 • Functional Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
G_{PS}	Common source amplifier power gain	f = 40.68 MHz I_{DQ} = 50 mA V_{DD} = 125 V P_{OUT} = 150 W	13	15		dB
η	Drain efficiency		70	75		%
Ψ	Electrical ruggedness VSWR 10:1		No degradation in output power			

Note: Pulse test: pulse width < 380 µs; duty cycle < 2%

3.4 Typical Performance Curves

This section shows the typical performance curves for the ARF460A/B devices.

Figure 1 • Maximum Transient Thermal Impedance

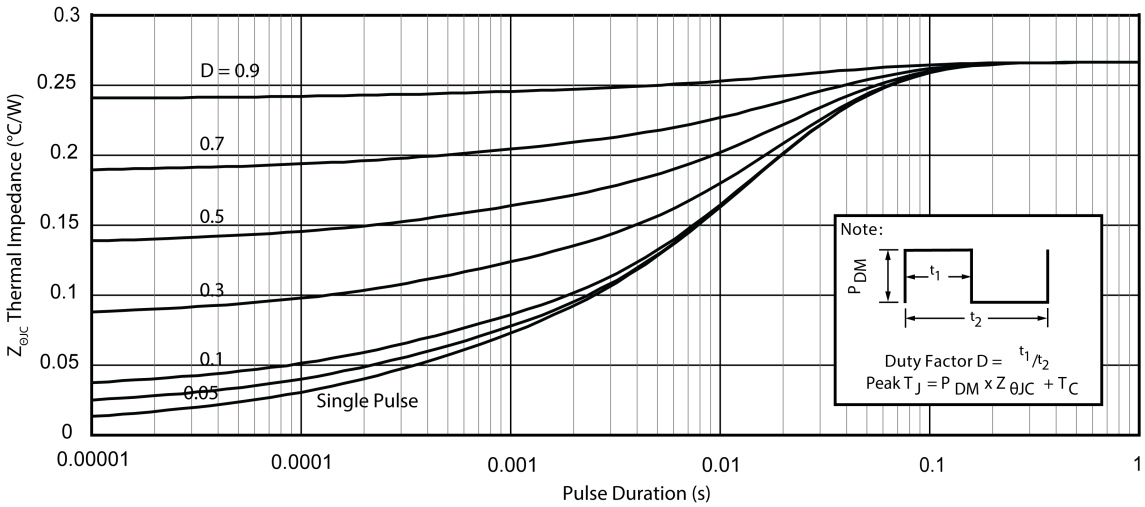


Figure 2 • Transient Thermal Impedance Model

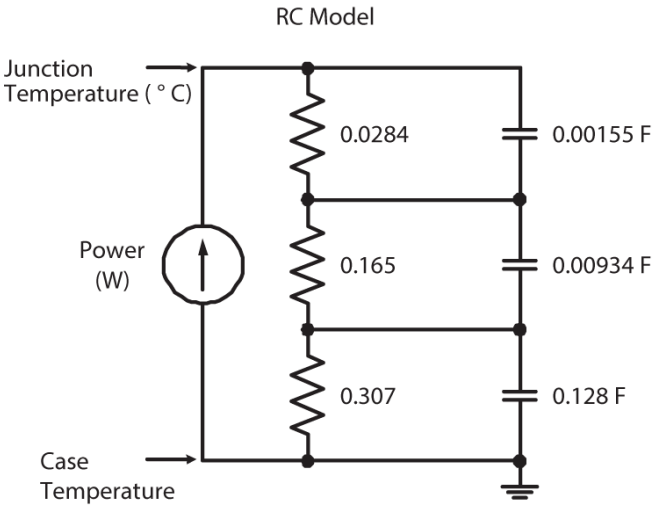


Figure 3 • Capacitance vs. Drain-to-Source Voltage

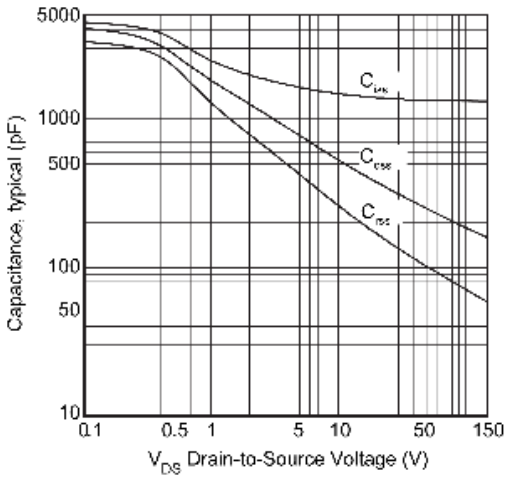


Figure 4 • Drain Current vs. Gate-to-Source Voltage

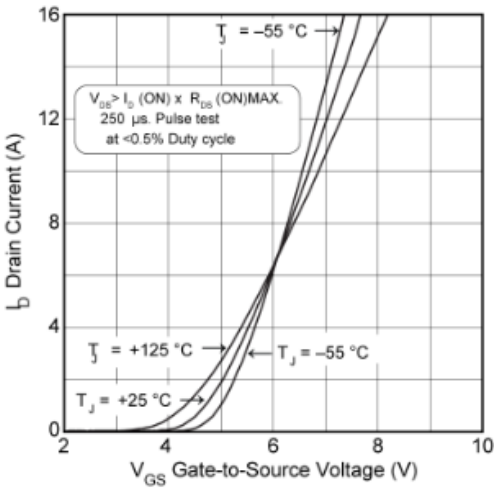


Figure 5 • Drain Current vs. Drain-to-Source Voltage

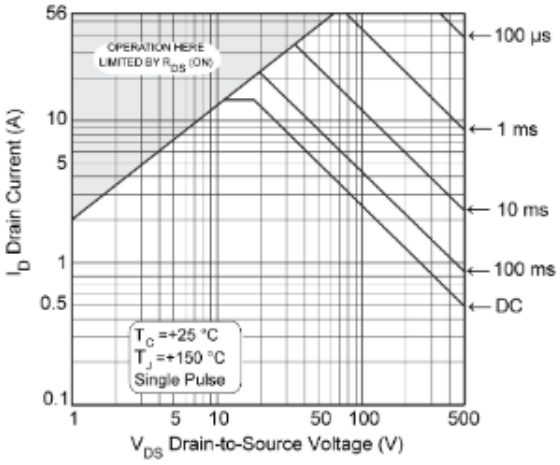


Figure 6 • Threshold Voltage vs. Temperature

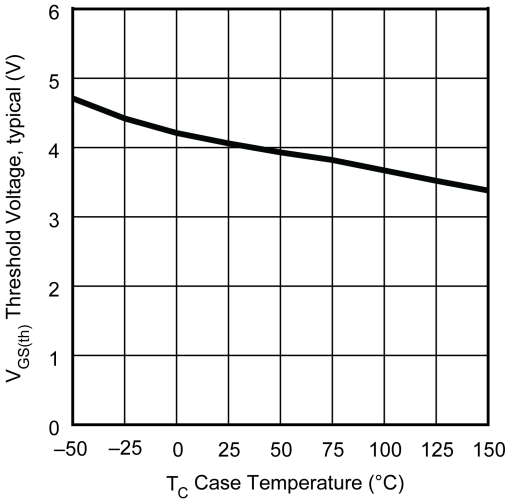
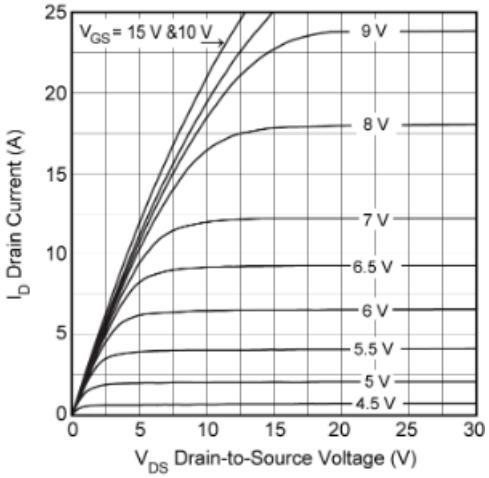


Figure 7 • Typical Output Characteristics



The following table shows the typical class AB large signal input and output impedance of the ARF460A/B devices, where I_{DQ} = 100 mA.

Table 6 • Typical Class AB Large Signal Input—Output Impedance

Frequency (MHz)	Z_{IN}[1] (Ω)	Z_{OL}[2] (Ω)
2.0	20.9 - j 9.2	38 - j 2.6
13.5	2.4 - j 6.8	31 - j 14
27	0.57 - j 2.6	19.6 - j 17.6
40	0.31 - j 0.5	12.5 - j 15.8
65	0.44 - j 1.9	6.0 - j 10.5

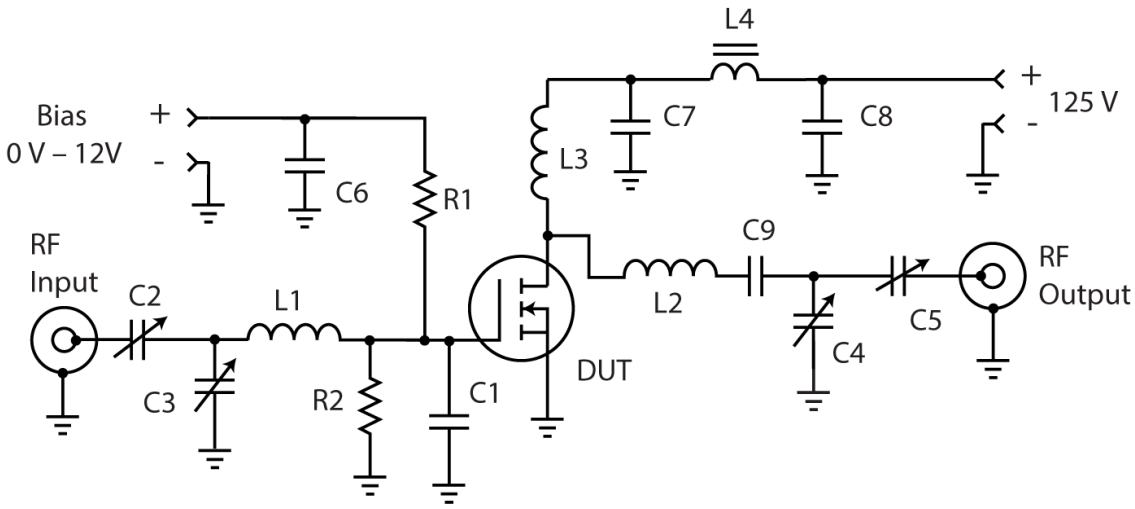
Note:

1. Gate shunted with 25 Ω
2. I_{DQ} = 100 mA
3. Conjugate of optimum load for 150 W output at V_{DD} = 125 V

3.5 Typical Test Circuit

The following drawing shows the test circuit of the ARF460A/B devices.

Figure 8 • 40.68 MHz Test Circuit



The following table shows the test circuit characteristics of the ARF460A/B devices.

Table 7 • Test Circuit Characteristics

Component	Characteristic
C1	2000 pF 100 V NPO chip mounted at gate lead
C2–C5	Arco 463 Mica trimmer
C6–C8	0.1 µF 500 V ceramic chip
C9	2200 pF 500 V chip
L1	4t #20 AWG 0.25" ID 0.3" L approximately 80 nH
L2	6t #16 AWG 0.312" ID 0.4" L approximately 185 nH
L3	15t #24 AWG 0.25" ID approximately 0.85 µH
L4	VK200-4B ferrite choke 3 µH
R1–R2	51 Ω 0.5 W carbon
DUT	ARF460A/B

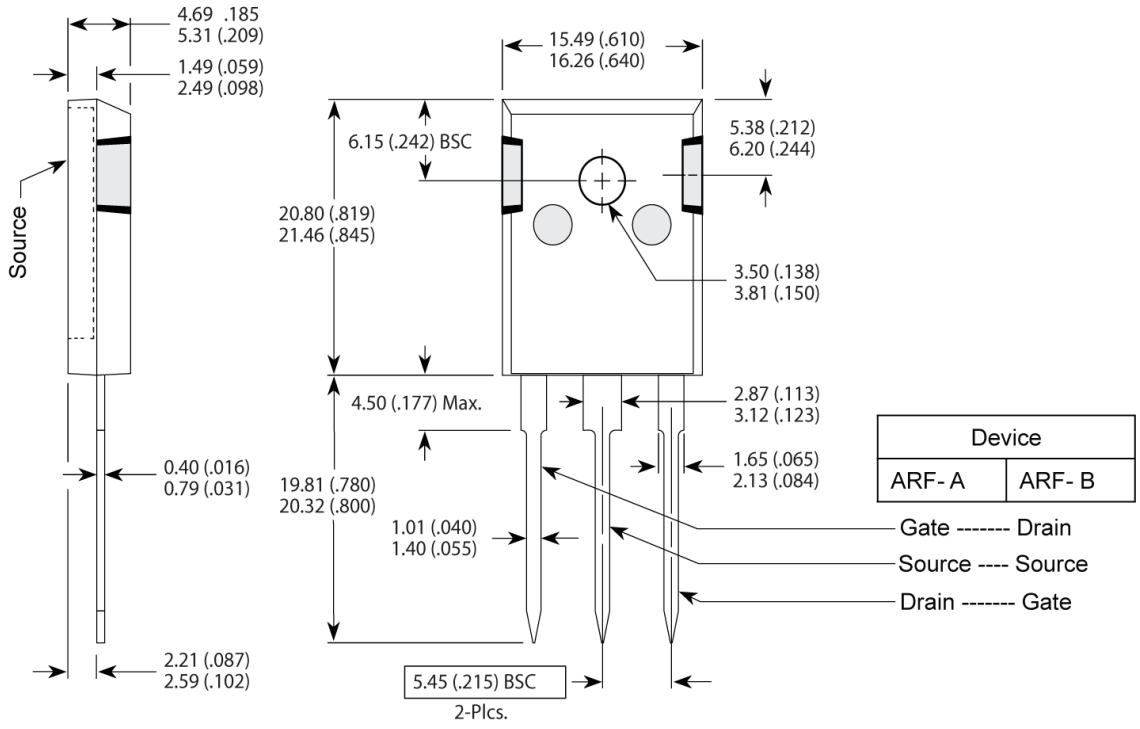
4 Package Specification

This section outlines the package specification for the ARF460A/B device.

4.1 Package Outline Drawing

This section details the TO-247 package drawing of the ARF460A/B device. Dimensions are in millimeters and (inches).

Figure 9 • Package Outline Drawing



Microsemi Corporate Headquarters
One Enterprise, Aliso Viejo,
CA 92656 USA
Within the USA: +1 (800) 713-4113
Outside the USA: +1 (949) 380-6100
Fax: +1 (949) 215-4996
Email: sales.support@microsemi.com
www.microsemi.com

Microsemi Corporation (Nasdaq: MSCC) offers a comprehensive portfolio of semiconductor and system solutions for aerospace & defense, communications, data center and industrial markets. Products include high-performance and radiation-hardened analog mixed-signal integrated circuits, FPGAs, SoCs and ASICs; power management products; timing and synchronization devices and precise time solutions, setting the world's standard for time; voice processing devices; RF solutions; discrete components; enterprise storage and communication solutions; security technologies and scalable anti-tamper products; Ethernet solutions; Power-over-Ethernet ICs and midspans; as well as custom design capabilities and services. Microsemi is headquartered in Aliso Viejo, California, and has approximately 4,800 employees globally. Learn more at www.microsemi.com.

050-5966