

1012GN-1000V

Datasheet

Class-AB GaN-on-SiC HEMT Transistor



**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

©2017 Microsemi Corporation. All rights reserved. Microsemi and the Microsemi logo are registered trademarks of Microsemi Corporation. All other trademarks and service marks are the property of their respective owners.

Microsemi makes no warranty, representation, or guarantee regarding the information contained herein or the suitability of its products and services for any particular purpose, nor does Microsemi assume any liability whatsoever arising out of the application or use of any product or circuit. The products sold hereunder and any other products sold by Microsemi have been subject to limited testing and should not be used in conjunction with mission-critical equipment or applications. Any performance specifications are believed to be reliable but are not verified, and Buyer must conduct and complete all performance and other testing of the products, alone and together with, or installed in, any end-products. Buyer shall not rely on any data and performance specifications or parameters provided by Microsemi. It is the Buyer's responsibility to independently determine suitability of any products and to test and verify the same. The information provided by Microsemi hereunder is provided "as is, where is" and with all faults, and the entire risk associated with such information is entirely with the Buyer. Microsemi does not grant, explicitly or implicitly, to any party any patent rights, licenses, or any other IP rights, whether with regard to such information itself or anything described by such information. Information provided in this document is proprietary to Microsemi, and Microsemi reserves the right to make any changes to the information in this document or to any products and services at any time without notice.

About Microsemi

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.

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 1.0

Revision 1.0 was published in March 2017. It was the first publication of this document.

Contents

- Revision History..... 3
 - 1.1 Revision 1.0..... 3
- 2 Product Overview 7
- 3 Electrical Characteristics 8
 - 3.1 Absolute Maximum Ratings 8
 - 3.2 Electrical Characteristics 8
 - 3.3 Functional Characteristics 8
 - 3.4 Typical Broadband Performance Data 9
- 4 Package Information 11
 - 4.1 55-Q03 Package 11

Figures

Figure 1 55-Q03 Case Outline	7
Figure 2 Typical Broadband Performance Graphs (under 32 μ s, DF = 2%)	9
Figure 3 55-Q03 Package Outline	11

Tables

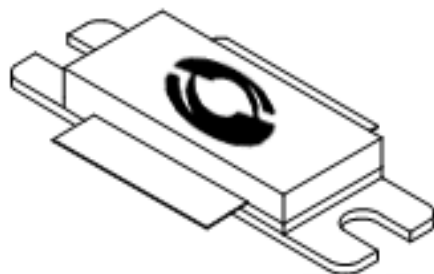
Table 1	Absolute Maximum Ratings	8
Table 2	Electrical Characteristics	8
Table 3	Functional Characteristics	8
Table 4	Typical Broadband Performance Data (under 32 μ s, DF = 2%)	9
Table 5	Typical Broadband Performance Data (under 128 μ s, DF = 10%)	10
Table 6	55-Q03 Package Dimensions	11

2 Product Overview

The 1012GN-1000V is an internally matched, common-source, class-AB, GaN-on-SiC HEMT transistor capable of providing over 19 dB gain, 1000 W of pulsed RF output power at 32 μ s, and 2% duty cycle pulse format across the 1025 MHz to 1150 MHz band. The transistor has internal pre-match for optimal performance. It utilizes gold metallization and eutectic die attach to provide the highest reliability and superior ruggedness.

The export classification is EAR-99.

Figure 1 55-Q03 Case Outline



3 Electrical Characteristics

This section details the electrical characteristics of the 1012GN-1000V device.

3.1 Absolute Maximum Ratings

The following table shows the absolute maximum ratings of the 1012GN-1000V device.

Table 1 Absolute Maximum Ratings

Rating	Parameter	Value	Units
Maximum power dissipation	Device dissipation at 25 °C	1700	W
Maximum voltage and current	Drain-source voltage (V_{DSS})	150	V
	Gate-source voltage (V_{GS})	-8 to 0	V
Maximum temperatures	Storage temperature (T_{STG})	-55 to 125	°C
	Operating junction temperature	200	°C

3.2 Electrical Characteristics

The following table shows the typical electrical characteristics of the 1012GN-1000V device at 25 °C.

Table 2 Electrical Characteristics

Symbol	Characteristics	Test Conditions	Min	Typ	Max	Units
P_{OUT}	Output power	$P_{IN} = 12.6$ W, Freq = 1025 MHz, 1090 MHz, 1150 MHz	15	19		W
G_P	Power gain	$P_{IN} = 12.6$ W, Freq = 1025 MHz, 1090 MHz, 1150 MHz	17.5	18.1		dB
η_D	Drain efficiency	$P_{IN} = 12.6$ W, Freq = 1025 MHz, 1090 MHz, 1150 MHz	60	65		%
Dr	Droop	$P_{IN} = 12.6$ W, Freq = 1025 MHz, 1090 MHz, 1150 MHz		0.1	0.5	dB
VSWR-T	Load mismatch tolerance	$P_{OUT} = 1000$ W, Freq = 1025 MHz			5:1	
θ_{JC}	Thermal resistance	32 μ s, 2% duty cycle			0.21	°C/W

Bias Condition: $V_{DD} = 50$ V, $I_{DQ} = 10$ mA constant current ($V_{GS} = -2.0$ V to -4.5 V typical)

3.3 Functional Characteristics

The following table shows the typical functional characteristics of the 1012GN-1000V device at 25 °C.

Table 3 Functional Characteristics

Symbol	Characteristics	Test Conditions	Min	Typ	Max	Units
$I_{D(off)}$	Drain leakage current	$V_{GS} = -8$ V, $V_D = 150$ V			64	mA
$I_{G(off)}$	Gate leakage current	$V_{GS} = -8$ V, $V_D = 0$ V			20	mA

3.4 Typical Broadband Performance Data

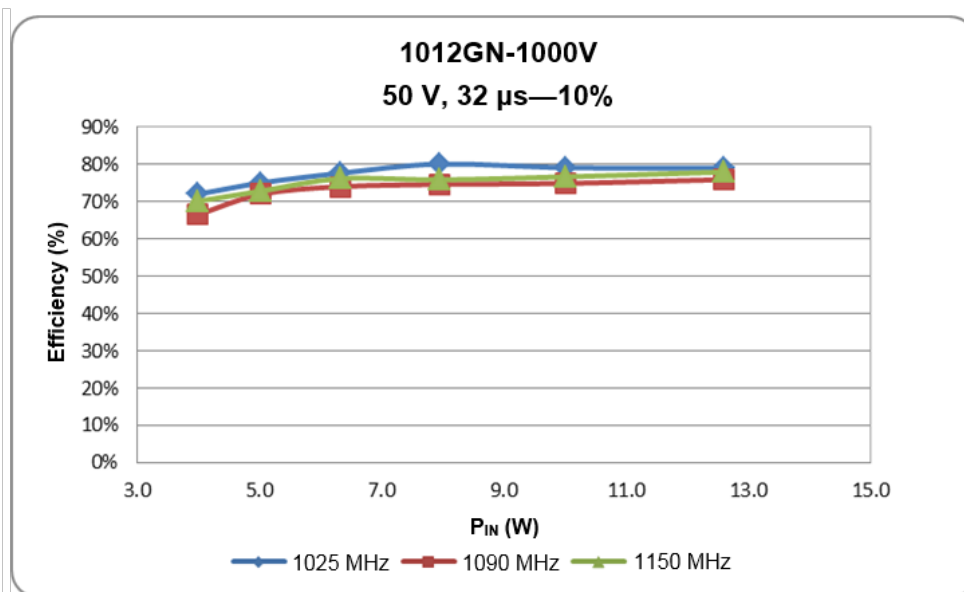
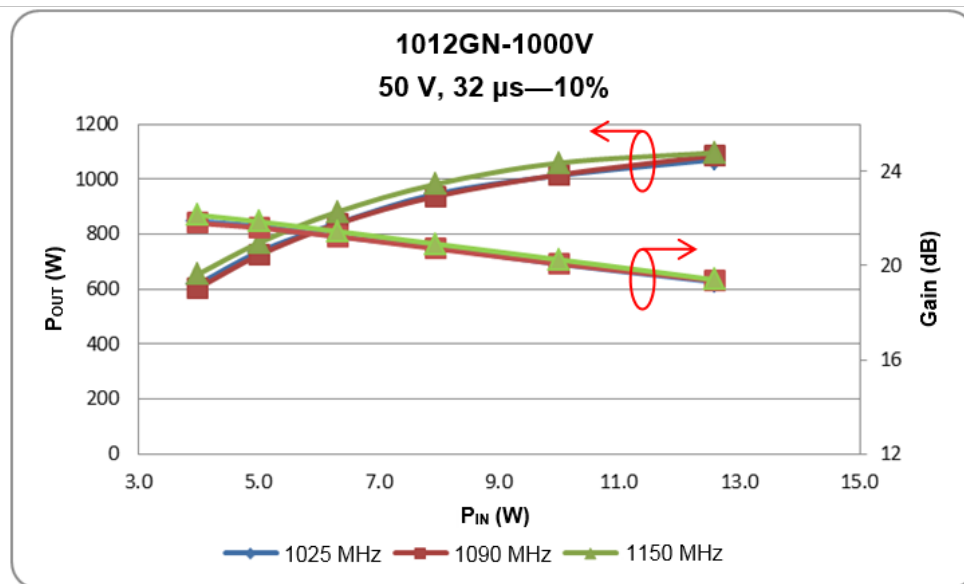
The following table shows the typical broadband performance data of the 1012GN-1000V device under 32 μ s, DF = 2%.

Table 4 Typical Broadband Performance Data (under 32 μ s, DF = 2%)

Freq (MHz)	P _{IN} (W)	P _{OUT} (W)	I _D (A)	RL (dB)	η_D (%)	G _P (dB)	Droop (dB)
1025	12.6	1071	0.66	-14	79	19.30	0.1
1090	12.6	1086	0.69	-8	76	19.36	0.1
1150	12.6	1096	0.68	-7	78	19.42	0.1

The following graphs show the typical broadband performance of the 1012GN-1000V device.

Figure 2 Typical Broadband Performance Graphs (under 32 μ s, DF = 2%)



The following table shows the typical broadband performance data of the 1012GN-1000V device under 128 μ s, DF = 10%.

Table 5 Typical Broadband Performance Data (under 128 μ s, DF = 10%)

Freq (MHz)	P _{IN} (W)	P _{OUT} (W)	I _D (A)	IRL (dB)	η_D (%)	G _P (dB)	Droop (dB)
1025	12.6	1047	3.25	-14	67	19.20	0.15
1090	12.6	1047	3.36	-8	65	19.20	0.15
1150	12.6	1071	3.42	-7	65	19.30	0.15

4 Package Information

This section details the package information of the 1012GN-1000V device.

4.1 55-Q03 Package

The following illustration shows the 55-Q03 package outline of the 1012GN-1000V device. PIN 1 is the drain, PIN 2 is the source, and PIN 3 is the gate.

Figure 3 55-Q03 Package Outline

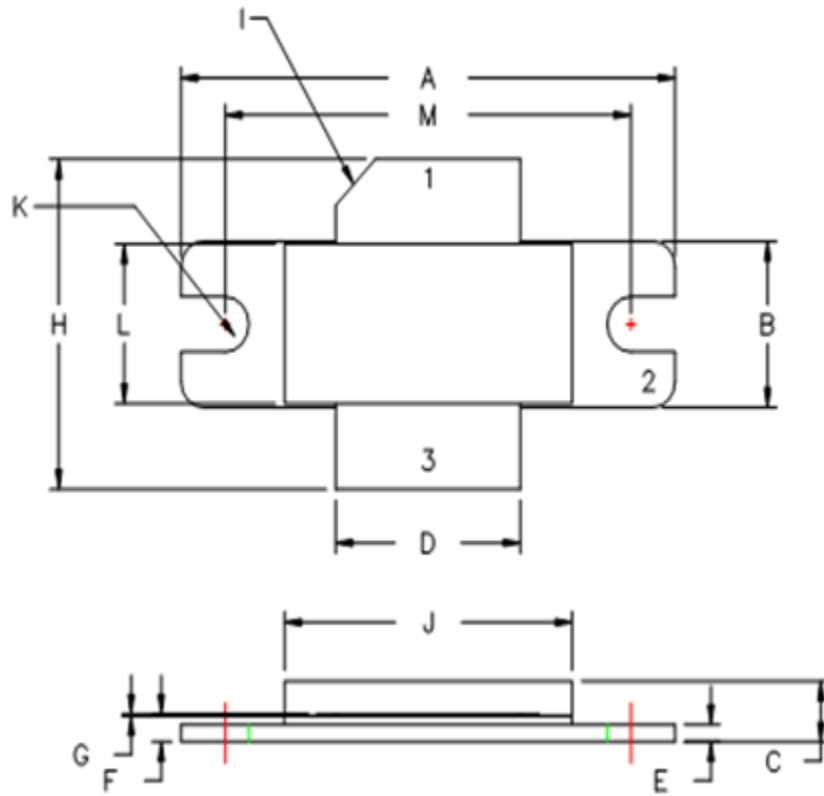


Table 6 55-Q03 Package Dimensions

Dimension	Millimeters	Tol (mm)	Inches	Tol (in.)
A	34.03	0.25	1.340	0.010
B	9.78	0.25	0.385	0.010
C	3.55	0.19	0.140	0.007
D	12.70	0.13	0.500	0.005
E	1.02	0.13	0.040	0.005
F	1.65	0.13	0.065	0.005
G	0.13	0.03	0.005	0.001

Dimension	Millimeters	Tol (mm)	Inches	Tol (in.)
H	19.43	0.76	0.765	0.030
I	45°	5°	45°	5°
J	19.81	0.25	0.780	0.030
K	3.30 DIA	0.13	0.130 DIA	0.005
L	9.40	0.13	0.370	0.005
M	27.94	MAX	1.100	MAX