1416GN-600V

Datasheet

Class-AB GaN-on-SiC HEMT Transistor

Microsemi
Power Matters.™

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

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 Revision1.0

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

Contents

Figures

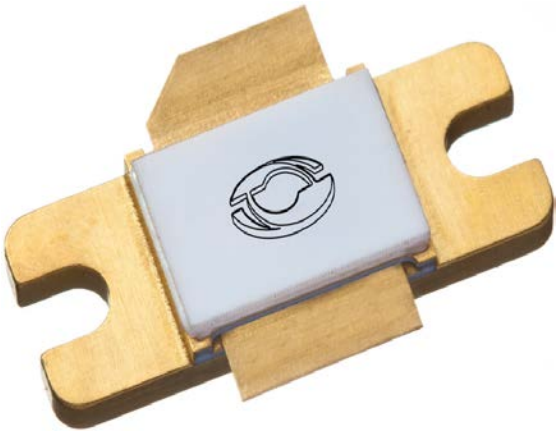
Tables

2 Product Overview

The 1416GN-600V is an internally matched, common-source, class-AB, GaN-on-SiC HEMT transistor capable of providing over 16.8 dB gain, 600 W of pulsed-RF output power at 300 µs pulse width, and 10% duty factor across the 1400 MHz to 1600 MHz band. The transistor has internal pre-match for optimal performance. This hermetically sealed transistor can be used for broadband avionics data-link applications. It utilizes gold metallization and eutectic attach to provide the highest reliability and superior ruggedness.

The export classification is EAR-99.

Figure 1 Case Outline 55-KR Common Source



3 Electrical Specifications

This section details the electrical specifications of the 1416GN-600V device.

3.1 Absolute Maximum Ratings

The following table shows the absolute maximum ratings of the 1416GN-600V device.

Table 1 Absolute Maximum Ratings

Rating	Parameter	Value	Units
Maximum power dissipation	Device dissipation at 25 °C	1200	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	250	°C

3.2 Electrical Characteristics

The following table shows the typical electrical characteristics of the 1416GN-600V device at 25 °C.

Table 2 Electrical Characteristics

Symbol	Characteristics	Test Conditions	Min	Typ	Max	Units
P_{OUT}	Output power	P_{OUT} = 600 W, Freq = 1400 MHz, 1500 MHz, 1600 MHz	600			W
G_P	Power gain	P_{OUT} = 600 W, Freq = 1400 MHz, 1500 MHz, 1600 MHz	16.8	17.4		dB
η_D	Drain efficiency	P_{OUT} = 600 W, Freq = 1400 MHz, 1500 MHz, 1600 MHz	58	62		%
Dr	Droop	P_{OUT} = 600 W, Freq = 1400 MHz, 1500 MHz, 1600 MHz			0.9	dB
VSWR-T	Load mismatch tolerance	P_{OUT} = 600 W, Freq = 1600 MHz			3:1	
θ_{JC}	Thermal resistance	Pulse width = 300 µs, Duty = 10%			0.28	°C/W

Bias Condition: V_{DD} = 50 V, I_{DQ} = 100 mA average current (V_{GS} = –2.0 V to –4.5 V)

3.3 Functional Characteristics

The following table shows the typical functional characteristics of the 1416GN-600V 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 = 50 V			64	mA
$I_{G(Off)}$	Gate leakage current	V_{GS} = –8 V, V_D = 0 V			20	mA
BV_{DSS}	Drain-source breakdown voltage	V_{GS} = –8 V, I_D = 64 mA	150			V

3.4 Typical Broadband Performance Data

The following table shows the typical broadband performance data of the 1416GN-600V device.

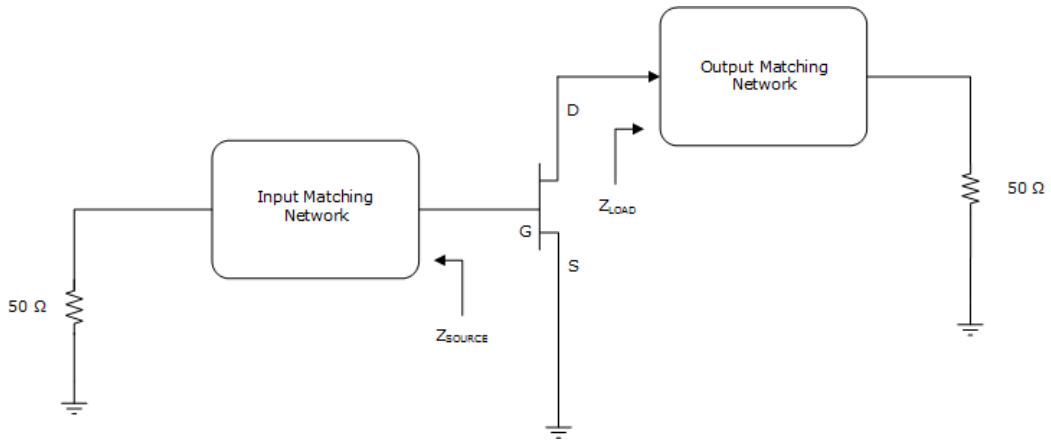
Table 4 Typical Broadband Performance Data

Freq (GHz)	P_{IN} (W)	P_{OUT} (W)	I_D (A)	RL (dB)	Eff (%)	G_P (dB)	Droop (dB)
1.4	12	667	2.25	−24.8	62%	17.44	0.5
1.5	12	658	2.22	−13.6	62%	17.38	0.5
1.6	12	664	2.09	−11.1	66%	17.42	0.3

4 Transistor Impedance Information

The following illustration shows the transistor impedance information for the 1416GN-600V device. Z_{SOURCE} is looking into the input circuit; Z_{LOAD} is looking into the output circuit.

Figure 2 Transistor Impedance Diagram



The following table shows the impedance data for the 1416GN-600V device.

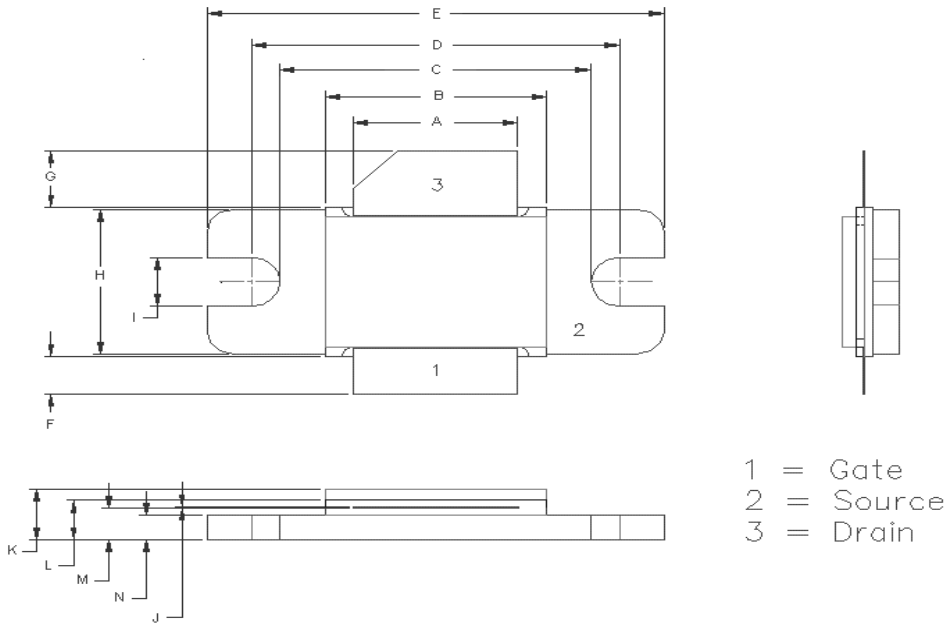
Table 5 Impedance Data

Freq (GHz)	Z_{SOURCE}	Z_{LOAD}
1.4	1.1-j2.1	1.8-j1.1
1.5	1.1-j1.6	1.76-j1.5
1.6	1.1-j1.1	1.3-j1.7

5 Package Information

The following illustration shows the package outline of the 1416GN-600V device.

Figure 3 55-KR Package Outline



The following table shows the dimensions of the 1416GN-600V device, and it corresponds to Figure 3 above.

Table 6 55-KR Package Dimensions

Dimension	Min (mil)	Min (mm)	Max (mil)	Max (mm)
A	370	9.40	372	9.44
B	498	12.65	500	12.7
C	700	17.78	702	17.83
D	830	21.08	832	21.13
E	1030	26.16	1032	26.21
F	86	2.18	116	2.946
G	136	3.45	166	4.22
H	385	9.78	387	9.83
I	130	3.30	132	3.35
J	003	0.076	004	0.10
K	120	3.04	144	3.66
L	100	2.54	114	2.90
M	080	2.03	90	2.29
N	065	1.65	66	1.68