

1416GN-600V

Datasheet

Class-AB GaN-on-SiC HEMT Transistor



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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.

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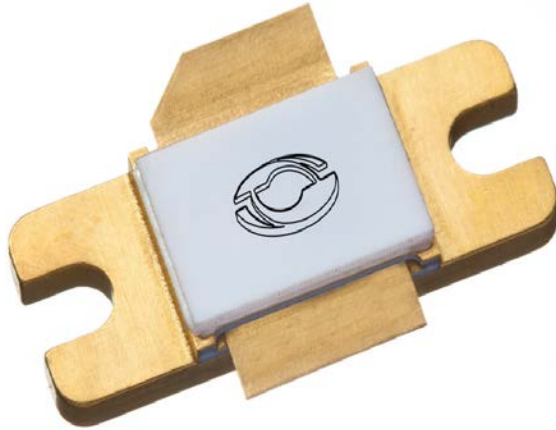
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2 Product Overview

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 μ s 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		%
D_r	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 μ s, 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	$V_{GS} = -8\text{ V}$, $V_D = 50\text{ V}$			64	mA
$I_{G(Off)}$	Gate leakage current	$V_{GS} = -8\text{ V}$, $V_D = 0\text{ V}$			20	mA
BV_{DSS}	Drain-source breakdown voltage	$V_{GS} = -8\text{ V}$, $I_D = 64\text{ mA}$	150			V

3.4 Typical Broadband Performance Data

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

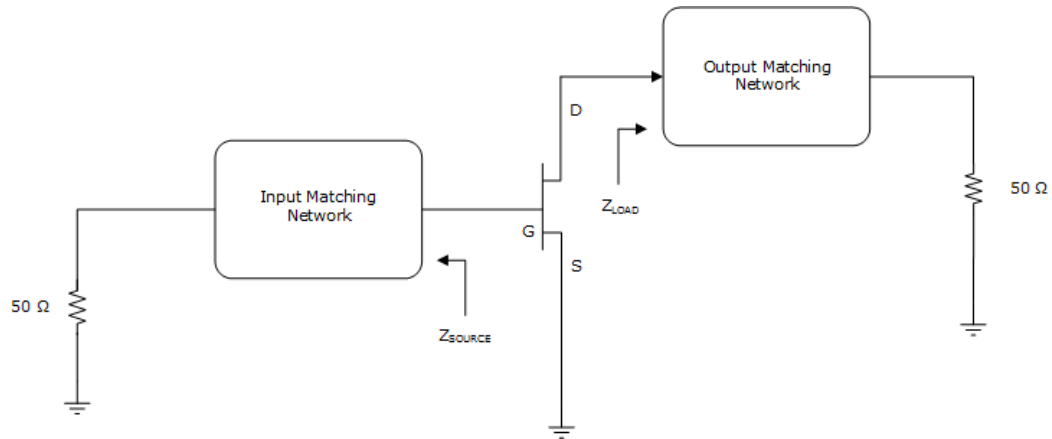
Table 4 Typical Broadband Performance Data

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.

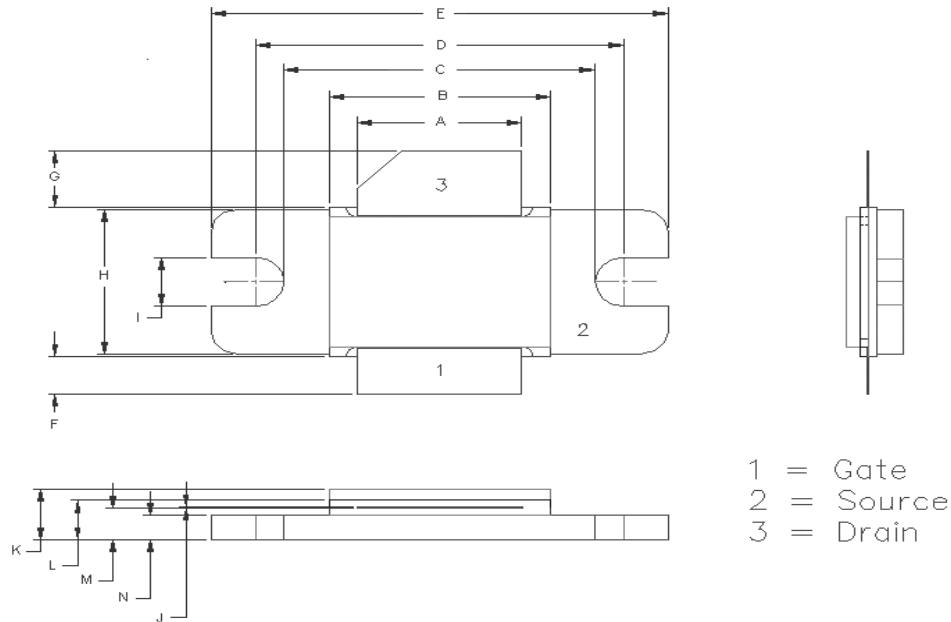
Table 5 Impedance Data

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