

**1214GN-750V Datasheet**  
**L-Band Radar Output Stage GaN Power**  
**Transistor**



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Microsemi Corporate Headquarters  
One Enterprise, Aliso Viejo,  
CA 92656 USA  
Within the USA: +1 (800) 713-4113  
Outside the USA: +1 (949) 380-6100  
Sales: +1 (949) 380-6136  
Fax: +1 (949) 215-4996  
E-mail: [sales.support@microsemi.com](mailto:sales.support@microsemi.com)  
[www.microsemi.com](http://www.microsemi.com)

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## Revision History

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### 1.1 Revision 1.0

Revision 1.0 was the first publication of this document.

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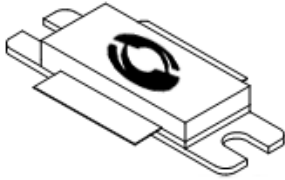
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## 2 Product Overview

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The 1214GN-750V is an internally matched, common source, class AB GaN on SiC HEMT transistor capable of providing a typical power gain of over 17 dB, 750 W minimum of pulsed RF output power at 300  $\mu$ S pulse width, and 10% long term duty cycle across the 1200 to 1400 MHz band. The transistor has internal pre-match for optimal performance and it is specifically designed for L-Band radar applications. It utilizes gold metallization and eutectic die attach to provide the highest reliability and superior ruggedness. Export Classification: EAR-99.

**Figure 1 Case Outline 55-Q03 Common Source**



### 2.1 Applications

The 1214GN-750V transistor is specifically designed for L-Band radar applications.

### 2.2 Key Features

The following are the key features of the 1214GN-750V GaN transistor:

- 1200–1400 MHz, 750 W pulsed output power, 300  $\mu$ S 10% pulsing
- Common source, Class AB, 50 V bias voltage
- High efficiency: >55% across the frequency band
- Extremely compact size
- High power gain: >17 dB
- Excellent gain flatness
- Ideal for L-Band radar applications
- Utilizes all-gold metallization and eutectic die attach for highest reliability
- 50  $\Omega$  IN/OUT lumped element, very small footprint, plug-and-play pallets available

## 3 Electrical Specifications

The following table shows the absolute maximum ratings at 25 °C unless otherwise specified.

### 3.1 Absolute Maximum Ratings

**Table 1 Absolute Maximum Ratings**

Rating		Value	Units
Maximum power dissipation	Device dissipation at 25 °C	1466	W
Maximum voltage and current	Drain-Source voltage ( $V_{DS}$ )	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 at 25 °C

The following table shows the typical electrical characteristics at 25 °C.

**Table 2 Typical Electrical Characteristics at 25 °C**

Symbol	Characteristics	Test Conditions	Min	Typ	Max	Units
$P_{OUT}$	Output power	Freq = 1200, 1300, 1400 MHz	750			W
$G_P$	Power gain	$P_{OUT} = 750$ W, Freq = 1200, 1300, 1400 MHz		17.2		dB
$\eta_D$	Drain efficiency	$P_{OUT} = 750$ W, Freq = 1200, 1300, 1400 MHz	55	62		%
$D_r$	Droop	$P_{OUT} = 750$ W, Freq = 1200, 1300, 1400 MHz			0.8	dB
VSWR-T	Load mismatch tolerance	$P_{OUT} = 750$ W, Freq = 1400 MHz			3:1	
$\Theta_{JC}$	Junction-Case thermal resistance	300 $\mu$ S, 10% duty cycle			1.25	°C/W

**Bias Condition:**  $V_{DD} = 50$  V,  $I_{DQ} = 125$  mA average current ( $V_{GS} = -2.0$  to  $-4.5$  V typical) with constant gate bias

### 3.3 Functional Characteristics at 25 °C

**Table 3 Typical Functional Characteristics at 25 °C**

Symbol	Characteristics	Test Conditions	Min	Typ	Max	Units
$I_{D(off)}$	Drain leakage current	$V_{GS} = -8$ V, $V_D = 150$ V			40	mA
$I_{G(off)}$	Gate leakage current	$V_{GS} = -8$ V, $V_D = 0$ V			10	mA

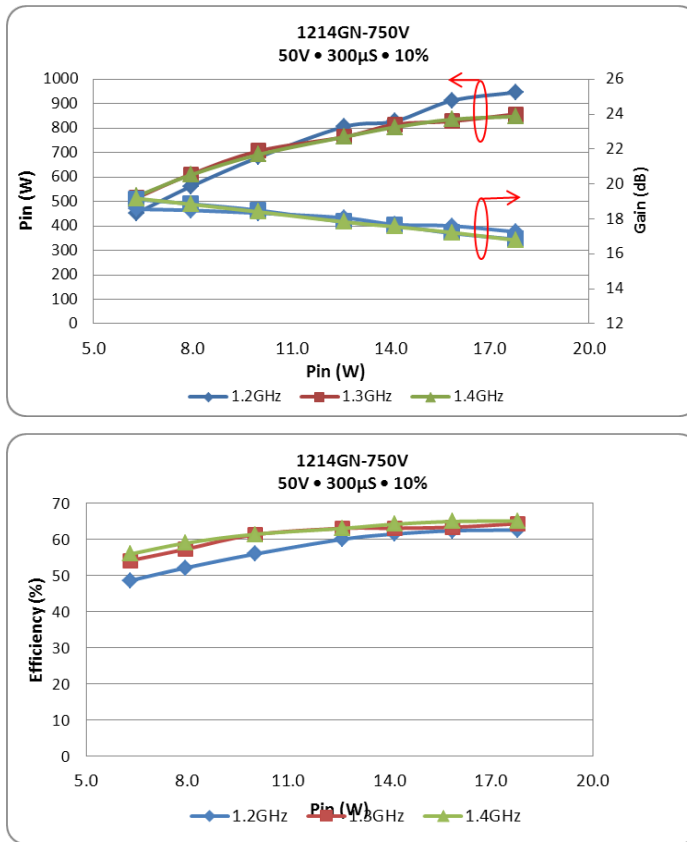


### 3.4 Typical Broadband Performance Data (300 $\mu$ S, 10% Pulsing)

**Table 4 Typical Broadband Performance Data (300  $\mu$ S, 10% Pulsing)**

Frequency	P <sub>IN</sub> (W)	P <sub>OUT</sub> (W)	P <sub>D</sub> (A)	IRL (dB)	$\eta_D$ (%)	G <sub>p</sub> (dB)	Droop (dB)
1200 MHz	14.1	827	2.80	-9.2	61.5	17.68	0.5
1300 MHz	14.1	814	2.69	-9.5	63.1	17.61	0.4
1400 MHz	14.1	803	2.61	-10.7	64.2	17.55	0.3

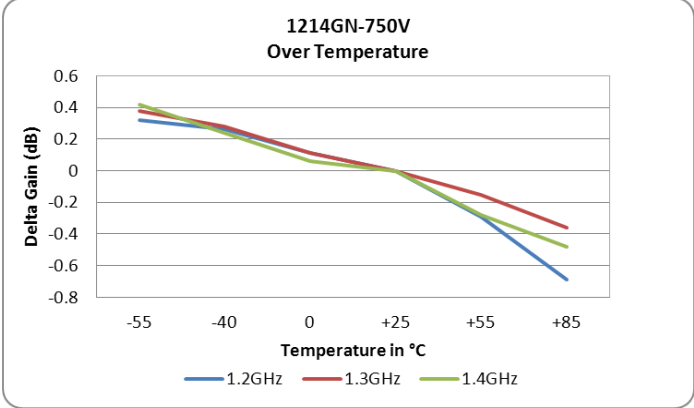
**Figure 2 Typical Broadband Performance Data Graphs**



### 3.5 Typical Transistor Performance Over Temperature

The following figure shows the transistor performance over temperature.

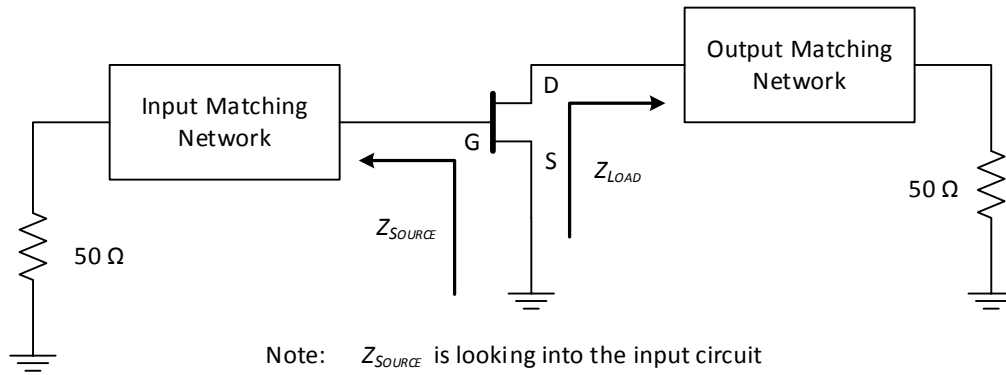
Figure 3 Typical Transistor Performance Over Temperature



## 4 Transistor Impedance Information

The following diagram shows the transistor impedance information for 1214GN-750V.

**Figure 4 Impedance Definition**



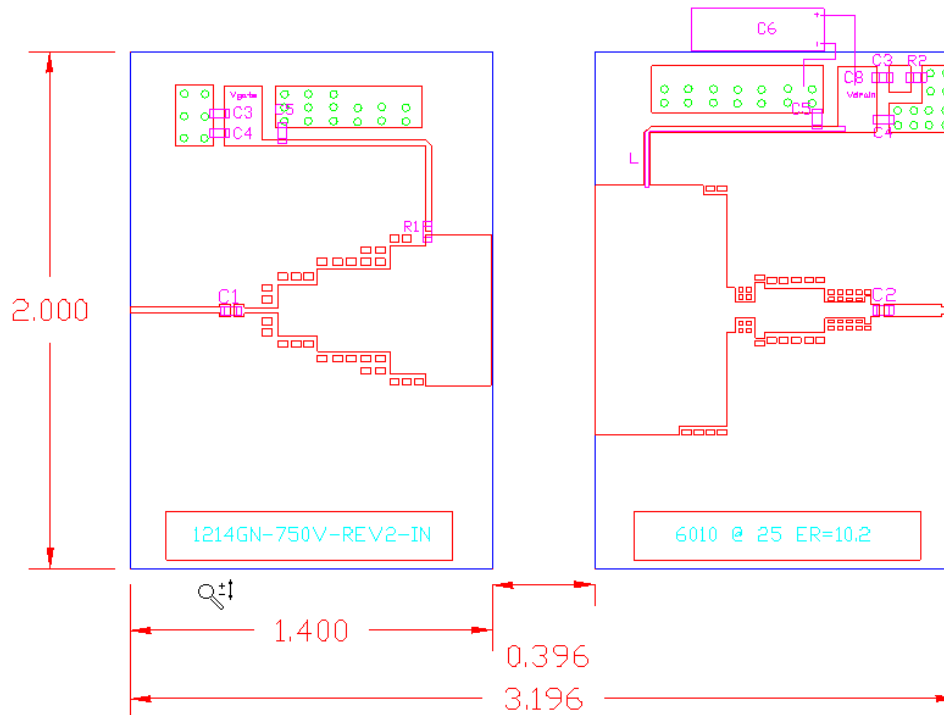
Note:  $Z_{SOURCE}$  is looking into the input circuit  
 $Z_{LOAD}$  is looking into the output circuit

For information about source and load impedances for 1214GN-750V, contact your Microsemi representative.

## 5 Transistor Test Information

### 5.1 Transistor Test Circuit Diagram

Figure 5 Transistor Test Circuit



The board material is Roger Duroid 6010LM at 25 mil thick;  $\epsilon_r = 10.2$ .

The following table lists the components for 1214GN-750V.

Table 5 1214GN-750V Component List

Item	Description	Value
C1	ATC, 100A size	100 pF
C2	ATC, 800B size	82 pF
C3 <sup>1</sup>	ATC, 200B size	100,000 pF
C4 <sup>1</sup>	CER Cap 200 V X7R 1206 size	1000 pf
C5 <sup>1</sup>	ATC, 800B size	100 pF
C6	Electrolytic Cap (63 V)	12,000 $\mu$ F
R1	Chip resistor size 0805	40.5 $\Omega$
R2	Chip resistor size 0805	5.1 $\Omega$
L	RF choke, 20 AWG copper wire solder on top	L = 1350 mil

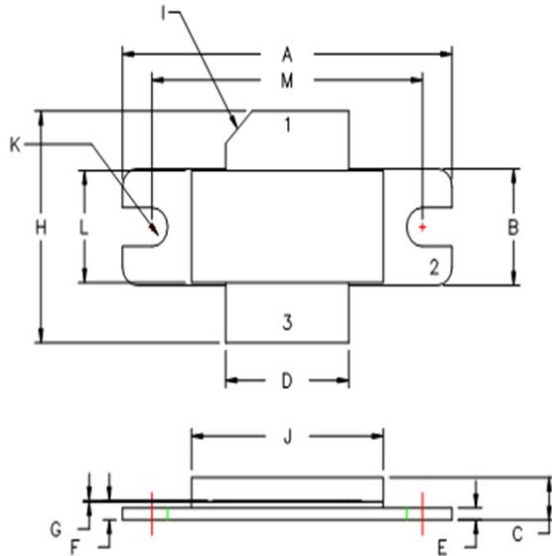
1. Two of these are needed

## 6 Package Outline and Pin Information

The 1214GN-750V transistor is available in the 55-Q03 Common Source Outline.

### 6.1 55-Q03 Common Source Package Dimensions and Pin Information

Figure 6 55-Q03 Package Dimension and Pin Information



Pin 1 = Drain, Pin 2 = Source, Pin 3 = Gate

Table 6 55-Q03 Package Dimensions

Dim	Millimeters	Tol (mm)	Inches	Tol (in.)
A	34.030	0.250	1.340	0.010
B	9.780	0.250	0.385	0.010
C	3.550	0.190	0.140	0.007
D	12.700	0.130	0.500	0.005
E	1.020	0.130	0.040	0.005
F	1.650	0.130	0.065	0.005
G	0.130	0.030	0.005	0.001
H	19.430	0.760	0.765	0.030
I	45°	5°	45°	5°
J	19.810	0.250	0.780	0.030
K	3.300 DIA	0.130	0.130 DIA	0.005
L	9.400	0.130	0.370	0.005
M	27.940	MAX	1.100	MAX