

**1214GN-120E/EL/EP Datasheet**  
**120W L-Band Radar GaN Power Transistor and**  
**Pallet Amplifier**



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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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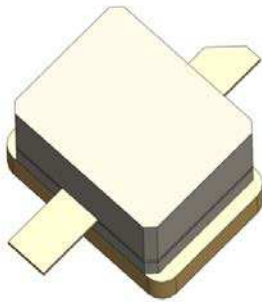
## 2 Product Overview

The 1214GN-120E/EL/EP is an internally matched, common source, Class AB, GaN on SiC HEMT transistor capable of providing over 17 dB typical power gain, 120 W of pulsed RF output power under 300  $\mu$ S pulse width and 10% long term duty cycle pulsing across the 1200 to 1400 MHz band. The transistor has internal pre-match for optimal performance. This hermetically sealed transistor is available in two package types, as well as mounted on a compact footprint 50  $\Omega$  IN/OUT pallet, and is specifically designed for L-band pulsed primary radar applications. It utilizes gold metallization and eutectic die attach to provide the highest reliability and superior ruggedness. Export Classification: EAR-99.

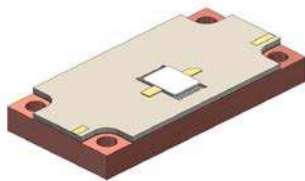
**Figure 1 Case Outline 55-QQ Common Source (0.160"  $\times$  0.550")**



**Figure 2 Case Outline 55-QQP Common Source (0.160"  $\times$  0.230")**



**Figure 3 Pallet Outline 50  $\Omega$  IN/OUT (0.600"  $\times$  1.200"  $\times$  0.150")**



### 2.1 Applications

The 1214GN-120E and 1214GN-120EL transistors and the 1214GN-120EP pallet are specifically designed for L-band pulsed primary radar applications.

### 2.1.1 Key Features

The following are the key features of the 1214GN-120E/EL/EP E-Series Earless/Eared GaN transistor products:

- 1200–1400 MHz, 120 W pulsed output power, 300  $\mu$ S 10% pulsing
- Common source, Class AB, 50 V bias voltage
- High efficiency: >60% typical across the frequency band
- Extremely compact size
- High power gain: >16.8 dB
- Excellent gain flatness
- Ideal for radar, L-Band avionics, communications, and industrial 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

### 3.1 Absolute Maximum Ratings

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

**Table 1 Absolute Maximum Ratings**

Rating		Value	Units
Maximum power dissipation	Device dissipation at 25 °C	265	W
Maximum voltage and current	Drain-Source voltage ( $V_{DS}$ )	125	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	$P_{IN} = 2.5$ W, Freq = 1200, 1300, 1400 MHz	120	130		W
$G_P$	Power gain	$P_{IN} = 2.5$ W, Freq = 1200, 1300, 1400 MHz	16.8	17.16		dB
$\eta_D$	Drain efficiency	$P_{IN} = 2.5$ W, Freq = 1200, 1300, 1400 MHz	57	65		%
$D_r$	Droop	$P_{IN} = 2.5$ W, Freq = 1200, 1300, 1400 MHz		0.15	0.6	dB
VSWR-T	Load mismatch tolerance	$P_{IN} = 2.5$ W, Freq = 1500 MHz, 100 $\mu$ S-10%			5:1	
$\Theta_{JC}$	Junction-Case thermal resistance	300 $\mu$ S, 10% duty cycle			1.25	°C/W

**Bias Condition:**  $V_{DD} = 50$  V,  $I_{DQ} = 30$  mA constant current ( $V_{GS} = -2.0$  to  $-4.5$  V typical)

### 3.3 Functional Characteristics at 25 °C

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

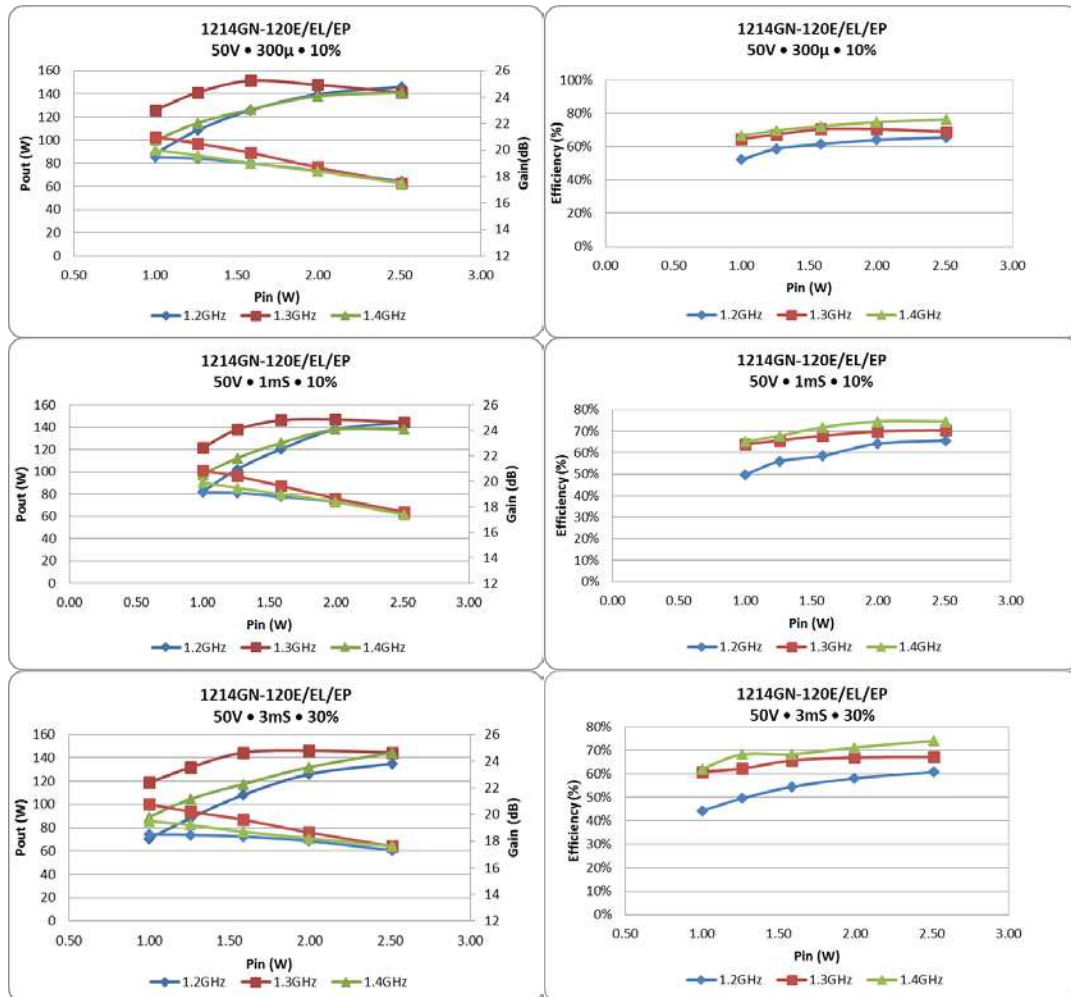
Symbol	Characteristic	Test Conditions	Min	Typ	Max	Units
$I_{D(off)}$	Drain leakage current	$V_{GS} = -8$ V, $V_D = 125$ V			12	mA
$I_{G(off)}$	Gate leakage current	$V_{GS} = -8$ V, $V_D = 0$ V			4	mA

### 3.4 Typical Broadband Performance Data (300 μS, 10% Pulsing)

**Table 4 Typical Broadband Performance Data (300 μS, 10% Pulsing)**

Frequency	P <sub>IN</sub> (W)	P <sub>OUT</sub> (W)	I <sub>D</sub> (mA)	IRL (dB)	η <sub>D</sub> (%)	G <sub>P</sub> (dB)	Drop (dB)
1200 MHz	2.5	146	477	-7.0	65	17.65	0.15
1300 MHz	2.5	141	440	-10.0	69	17.50	0.15
1400 MHz	2.5	141	400	-8.5	76	17.50	0.14

**Figure 4 Typical Broadband Performance Data Graphs**



### 3.5 Critical Performance at $P_{IN} = 4\text{ W}$ (34 dBm)

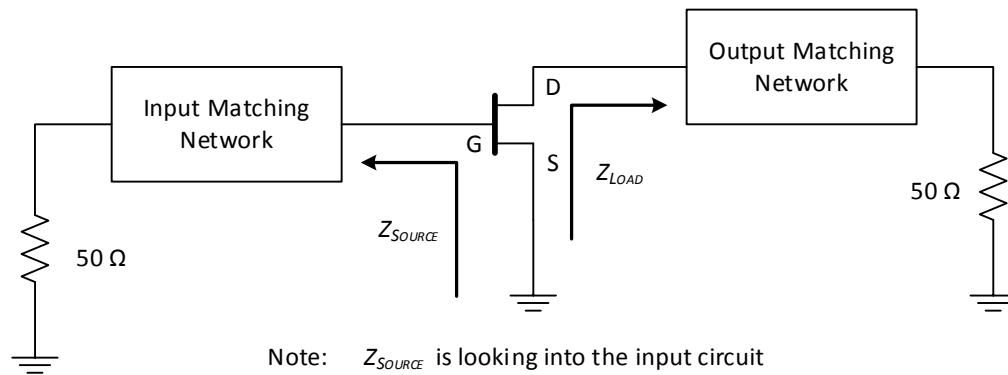
**Table 5 Critical Performance at  $P_{IN} = 4\text{ W}$  (34 dBm)**

Freq (GHz)	Test Condition	$P_{OUT}$ (W)	$G_P$ (dB)	$\eta_D$ (%)	Droop (dB)
1.2	300 $\mu$ S – 10%	146	17.65	65	0.15
1.2	1 mS – 10%	144	17.60	66	0.25
1.2	3 mS – 30%	135	17.30	61	0.60
1.3	300 $\mu$ S – 10%	141	17.50	69	0.15
1.3	1 mS – 10%	144	17.60	70	0.25
1.3	3 mS – 30%	143	17.60	67	0.40
1.4	300 $\mu$ S – 10%	141	17.50	76	0.15
1.4	1 mS – 10%	138	17.40	75	0.25
1.4	3 mS – 30%	144	17.60	74	0.40

## 4 Transistor Impedance Information

The following diagram shows the transistor impedance information for 1214GN-120E/EL/EP.

**Figure 5 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-120E/EL/EP, contact your Microsemi representative.

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## 5 Transistor Test Information

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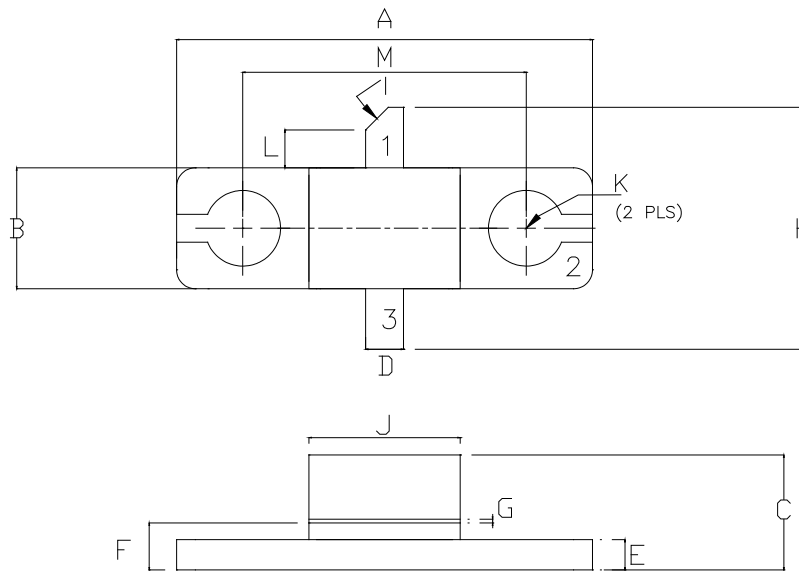
For the latest transistor test information for 1214GN-120E/EL/EP, contact your Microsemi representative.

## 6 Package Outline and Pin Information

The 1214GN-120E transistor is available in the 55-QQP case outline and the 1214GN-120EL transistor is available in the 55-QQP case outline. The 1214GN-120EP is available in the 90-1214GN-120EP pallet outline. All three products are configured for common source operation.

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

Figure 6 55-QQ Package Dimensions and Pin Information



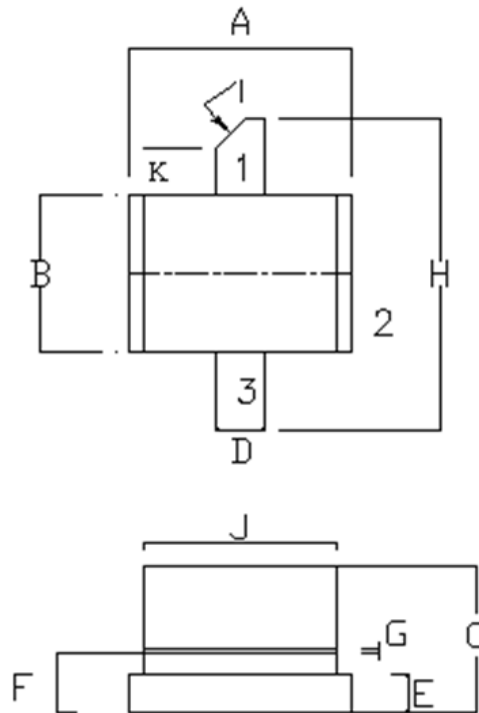
Pin 1: Drain, Pin 2: Source, Pin 3: Gate

Table 6 55-QQ Package Dimensions

Dim	Millimeters	Tol (mm)	Inches	Tol (in.)
A	13.970	0.250	0.550	0.010
B	4.570	0.250	0.160	0.010
C	3.860	0.330	0.152	0.013
D	1.270	0.130	0.050	0.005
E	1.020	0.130	0.040	0.005
F	1.700	0.130	0.067	0.005
G	0.130	0.025	0.005	0.001
H	8.130	0.250	0.320	0.010
I	45°	5°	45°	5°
J	5.080	0.250	0.200	0.010
K	2.54 DIA	0.130	0.100 DIA	0.005
L	1.270	0.130	0.050	0.005
M	9.530	0.130	0.375	0.005

## 6.2 55-QQP Common Source Package Dimensions and Pin Information

Figure 7 55-QQP Package Dimensions and Pin Information



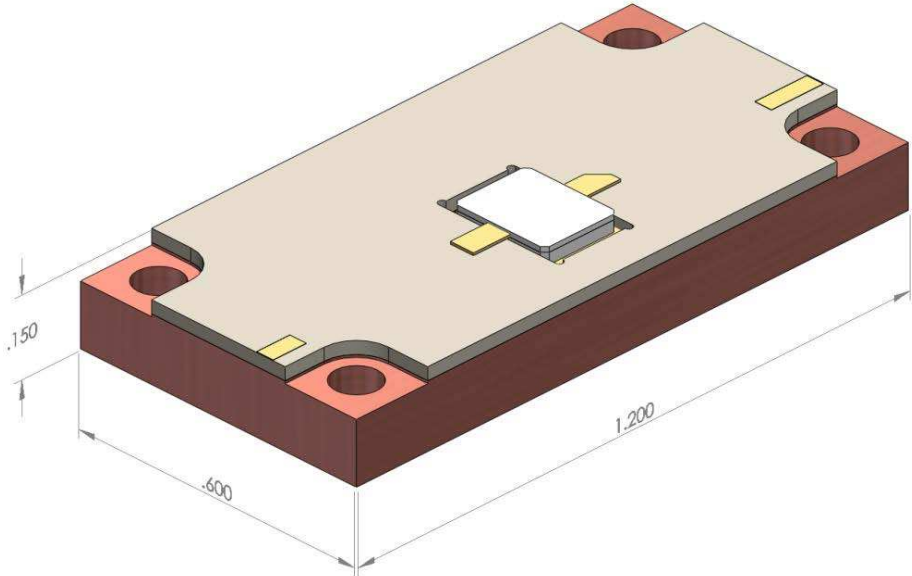
Pin 1: Drain, Pin 2: Source, Pin 3: Gate

Table 7 55-QQP Package Dimensions

Dim	Millimeters	Tol (mm)	Inches	Tol (in.)
A	5.840	0.250	0.230	0.010
B	4.060	0.250	0.160	0.010
C	3.170	0.050	0.125	0.002
D	1.270	0.130	0.050	0.005
E	1.020	0.130	0.040	0.005
F	1.570	0.130	0.062	0.005
G	0.130	0.020	0.005	0.001
H	8.120	0.250	0.320	0.010
I	45°	5°	45°	5°
J	5.080	0.250	0.200	0.010
K	1.400	0.130	0.055	0.005

### 6.3 Overall Pallet Dimensions

Figure 8 Pallet Package Dimensions



Dimensions 1.200" × 0.600" × 0.150"