Electronic Components

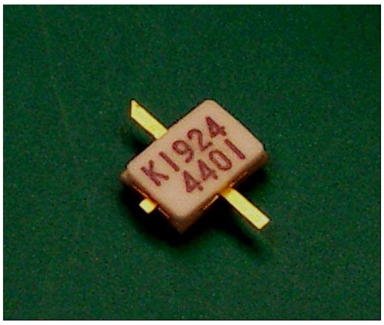
ODRKGF1924-08
Issue Date:Jan 20, 2006

KGF1924

RF Driver HEMT

GENERAL DESCRIPTION

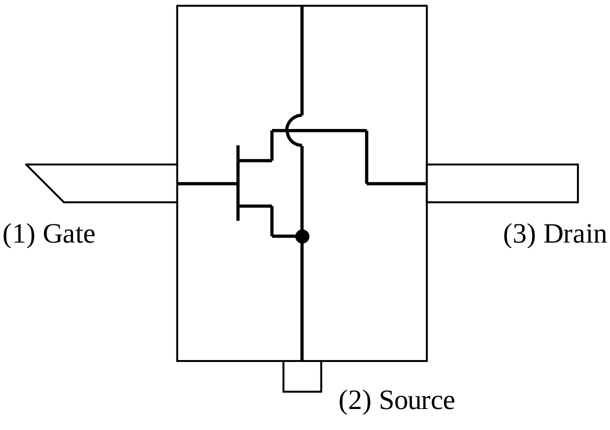
The KGF1924, housed in a ceramic package with integrated heat sink, is a discrete RF power HEMT that features high efficiency, high output power and low current operation. The KGF1924 specifications are guaranteed to a fixed matching circuit for 10V and 1.9GHz; external impedance-matching circuits are also required. Because of its high efficiency, high output power (more than 36.5dBm), and low thermal resistance, the KGF1924 is ideal as a transmitter-driver-stage amplifier for base station of various wireless systems, such as cellular phone.



FEATURES

- Operating frequency from 0.5GHz to 3GHz
- High output power > 36.5dBm @ 1.9GHz(CW)
- High gain = 10.0dB(Typ.) @ 1.9GHz(CW)
- High efficiency > 55% @ 1.9GHz(CW)
- Low ACPR = -47dBc @2.1GHz(Single carrier), 500mW, 5MHz offset, 3.84MHz BW, Peak/Avg.=8.5dB (0.01% Probability on CCDF, 3GPP Test Model 1)
- Package: 3PHTP (Ceramic package with integrated heat sink. SOT-89 plastic package is available)

FUNCTION DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Condition	Min	Max	Unit	Note
Drain - source Voltage	V_{DS}	Ta=25°C	—	16	V	
Gate - source Voltage	V_{GS}	Ta=25°C	- 4	0.7	V	
Drain Current	I_{DS}	Ta=25°C	—	6	A	
Total Power Dissipation	P_{TOT}	Ta=Tc=25°C	—	7	W	
Channel Temperature	T_{CH}	—	—	175	°C	
Storage Temperature	T_{STG}	—	-45	125	°C	

ELECTRICAL CHARACTERISTICS

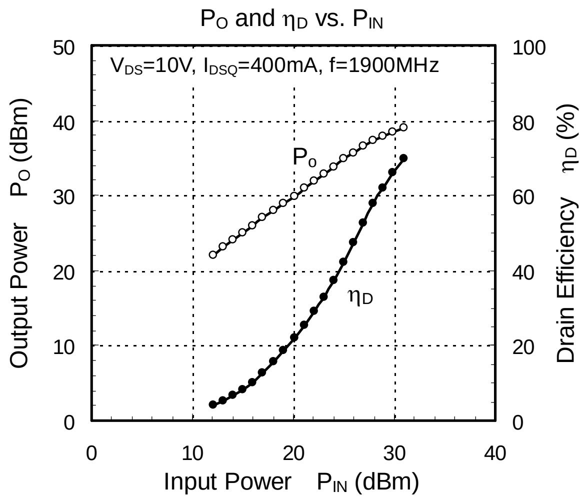
(Ta=25°C)

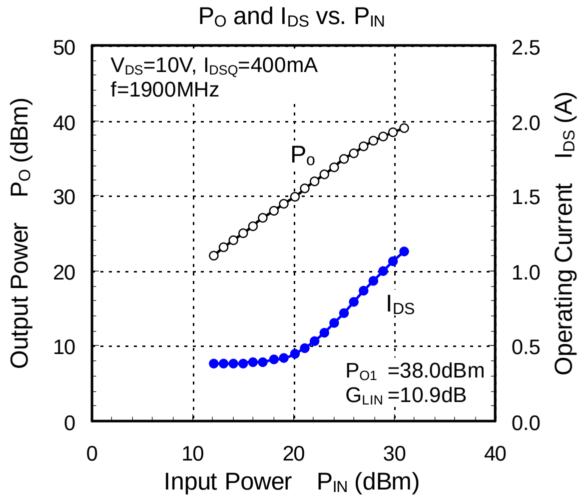
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Gate-source Leakage Current	I_{GSS}	V_{GS}=-4V	—	—	1.0	mA
Gate-drain Leakage Current	I_{GDO}	V_{GD}=-20V	—	—	5.5	mA
Drain-source Leakage Current	$I_{DS(off)}$	V_{DS}=16V, V_{GS}=-4V	—	—	5.5	mA
Drain Current	I_{DSS}	V_{DS}=1.5V, V_{GS}=0.7V	4.0	—	—	A
Gate-source Cut-off Voltage	$V_{GS(off)}$	V_{DS}=3V, I_{DS}=7.0mA	- 0.9	—	- 0.5	V
Output Power	P_O	(*1), P_{IN}=30dBm	36.5	38	—	dBm
Drain Efficiency	η_D	(*1), P_{IN}=30dBm	55	65		%
Linear Gain	G_{LIN}	(*1), P_{IN}=10dBm	—	10	—	dB
Thermal Resistant	R_{TH}	Channel to Case	—	12	—	°C/W

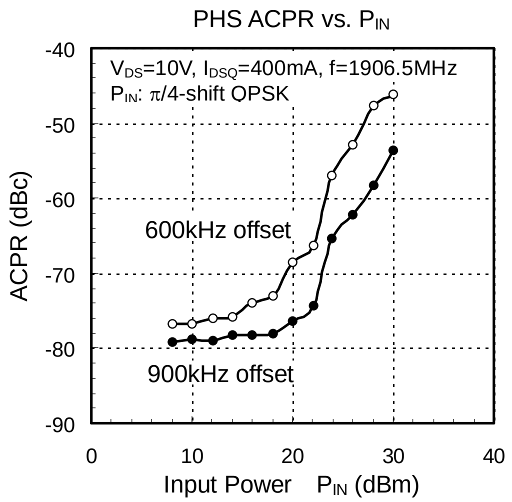
(*1): V_{DS}=10V, I_{DSQ}=400mA, f=1900MHz

TYPICAL CHARACTERISTICS

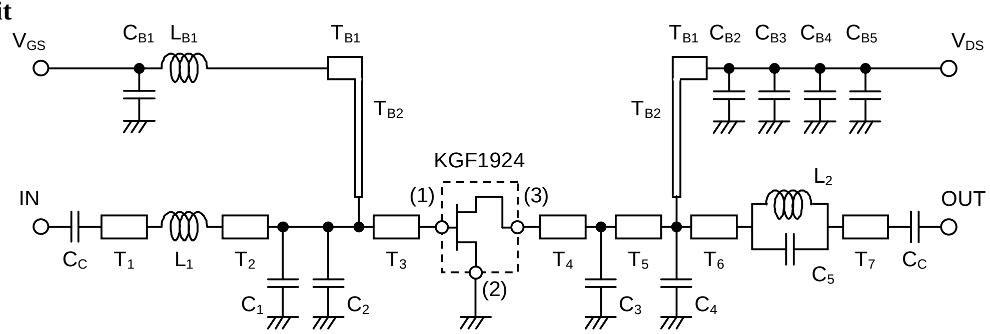
V_{DS}=10V, I_{DSQ}=400mA, f=1900MHz







Test circuit



Substrate: Teflon (t=0.8mm, ε_r= 2.4, 18μm Copper/Solder cladding)

T_1: Z_0=50Ω, E=6.4deg　T_2: Z_0=50Ω, E=58deg　T_3: Z_0=50Ω, E=12.9deg

T_4: Z_0=50Ω, E=6.4deg　T_5: Z_0=50Ω, E=6.4deg　T_6: Z_0=50Ω, E=58deg　T_7: Z_0=50Ω, E=6.4deg

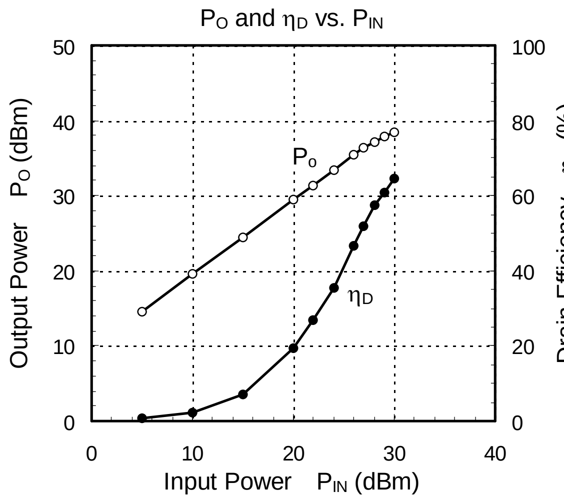
T_{B1}: Z_0=133Ω, E=9.2deg　T_{B2}: Z_0=133Ω, E=76.7deg

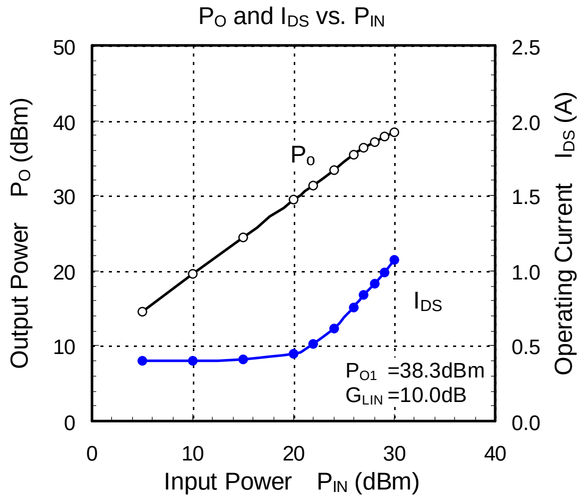
C_1 =1pF	C_2 =0.5pF	C_3 =2pF	C_4 =1pF x2	C_5 =30pF	L_1=4.3nH	L_2=4.3nH
C_C =30pF x2	C_{B1} =1μF	C_{B2}=1μF x4	C_{B3}=6.8μF	C_{B4}=1pF	C_{B5}=100pH	L_{B1}=100nH

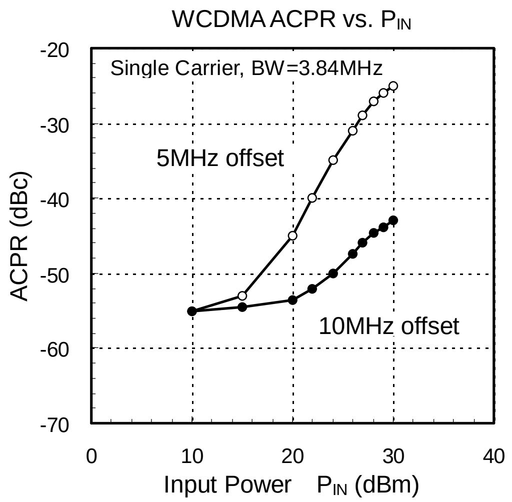
Equivalent circuit

TYPICAL CHARACTERISTICS

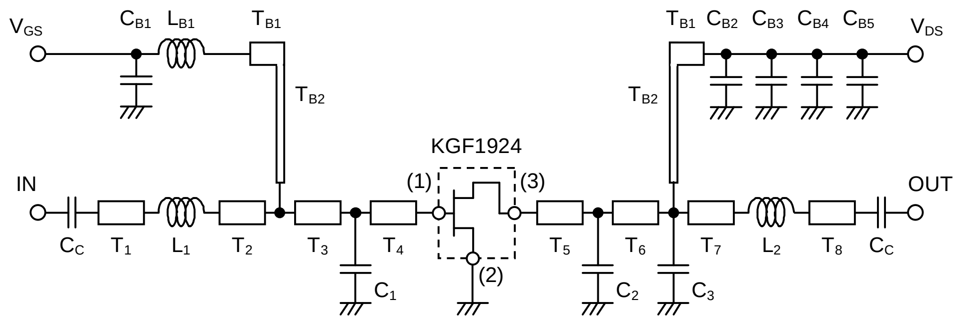
V_{DS}=10V, I_{DSQ}=400mA, f=2100MHz







Test circuit



Substrate: Teflon (t=0.8mm, ε_r= 2.4, 18µm Copper/Solder cladding)

T_1: Z_0=50Ω, E=7.1deg T_2: Z_0=50Ω, E=69deg T_3: Z_0=50Ω, E=3.6deg T_4: Z_0=50Ω, E=10.7deg

T_5: Z_0=50Ω, E=7.1deg T_6: Z_0=50Ω, E=7.1deg T_7: Z_0=50Ω, E=64deg T_8: Z_0=50Ω, E=7.1deg

T_{B1}: Z_0=133Ω, E=10deg T_{B2}: Z_0=133Ω, E=84deg

C_1 =2pF C_2 =1pF C_3 =1pF L_1=4.3nH L_2=4.3nH

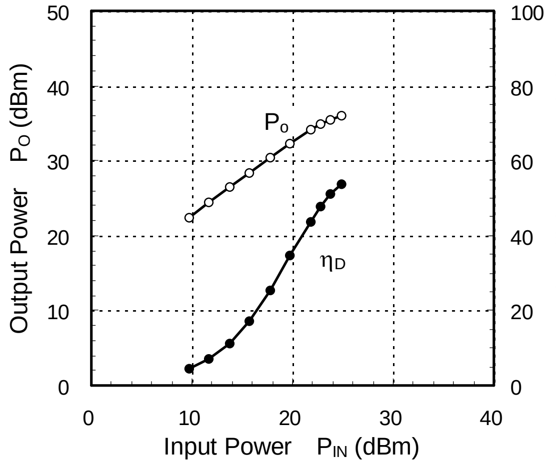
C_C =30pF x2 C_{B1} =1µF x4 C_{B2}=1µF x4 C_{B3}=6.8µF C_{B4}=1pF C_{B5}=100pF L_{B1}=100nH

Equivalent circuit

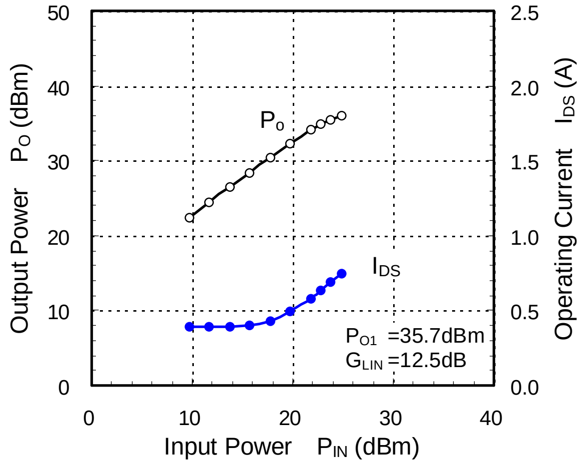
TYPICAL CHARACTERISTICS

V_{DS}=10V, I_{DSQ}=400mA, f=2100MHz, using the optimized matching circuit for lower ACPR

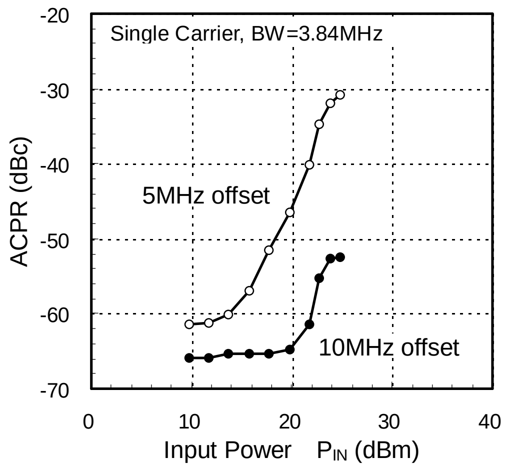
P_O and η_D vs. P_{IN}



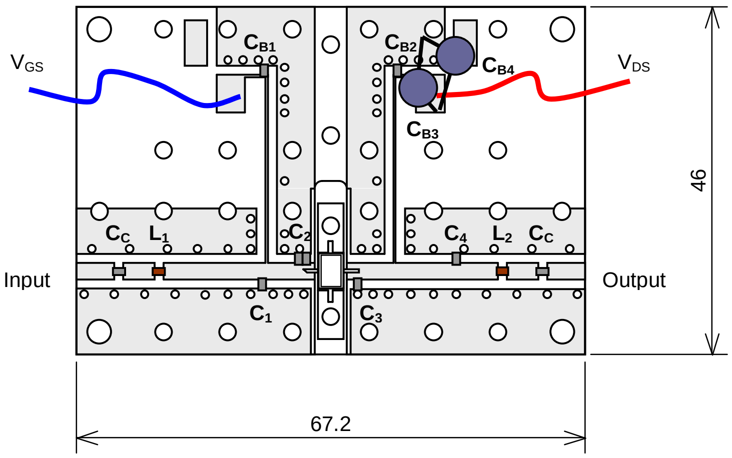
P_O and I_{DS} vs. P_{IN}



WCDMA ACPR vs. P_{IN}

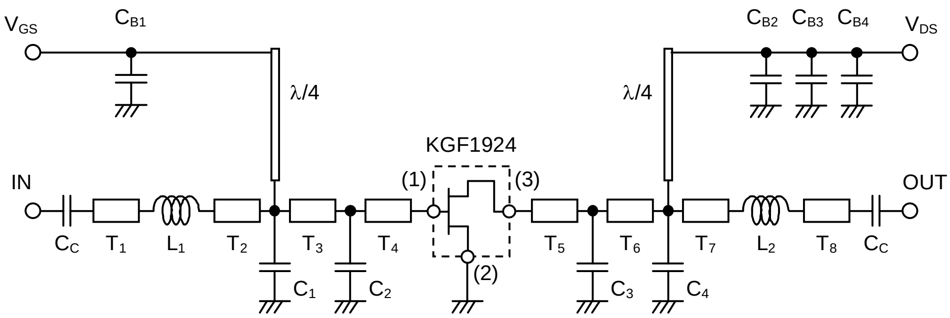


Test circuit for lower ACPR



unit: mm

Layout of evaluation board

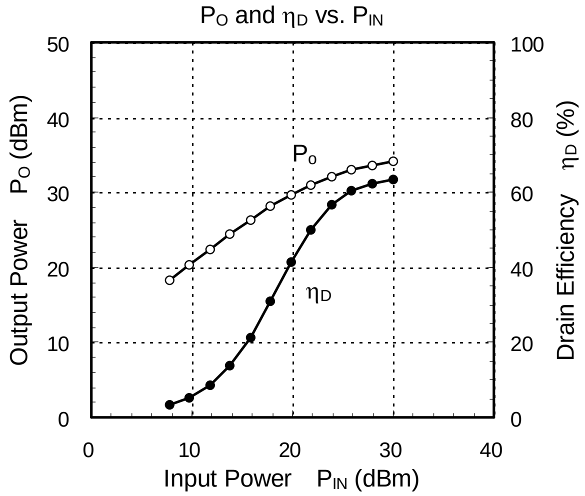


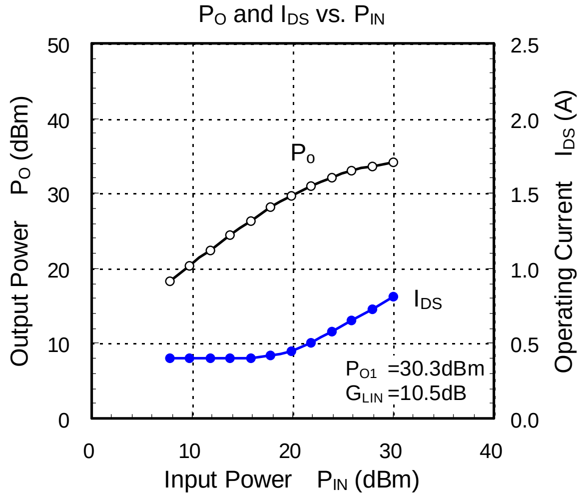
Substrate: Teflon (t=0.8mm, ε_r= 2.4, 18μm Copper/Solder cladding)
T_1: Z_0=50Ω, E=14.6deg T_2: Z_0=50Ω, E=46.2deg T_3: Z_0=50Ω, E=21.2deg T_4: Z_0=50Ω, E=3.6deg
T_5: Z_0=50Ω, E=5.2deg T_6: Z_0=50Ω, E=46.2deg T_7: Z_0=50Ω, E=19.6deg T_8: Z_0=50Ω, E=14.6deg
C_1 =2pF C_2 =2pF x2 C_3 =2pF C_4 =2pF L_1=3.9nH L_2=3.9nH
C_C =2pF C_{B1} =2pF C_{B2}=2pF C_{B3}=33μF C_{B4}=120μF

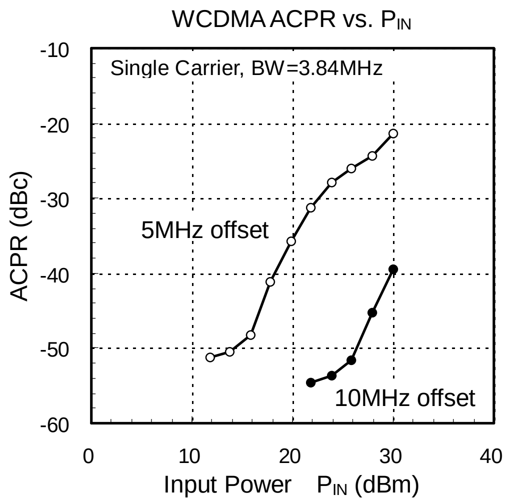
Equivalent circuit

TYPICAL CHARACTERISTICS

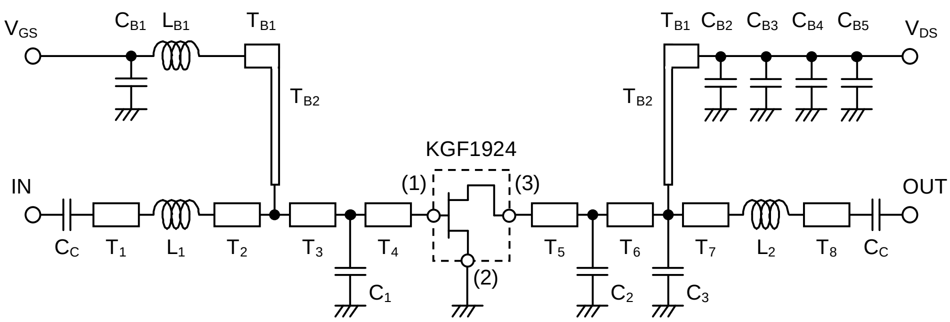
V_{DS}=5V, I_{DSQ}=400mA, f=2100MHz







Test circuit



Substrate: Teflon (t=0.8mm, ε_r= 2.4, 18μm Copper/Solder cladding)

T_1: Z_0=50Ω, E=7.1deg T_2: Z_0=50Ω, E=69deg T_3: Z_0=50Ω, E=3.6deg T_4: Z_0=50Ω, E=10.7deg

T_5: Z_0=50Ω, E=7.1deg T_6: Z_0=50Ω, E=7.1deg T_7: Z_0=50Ω, E=64deg T_8: Z_0=50Ω, E=7.1deg

T_{B1}: Z_0=133Ω, E=10deg T_{B2}: Z_0=133Ω, E=84deg

C_1 =2pF C_2 =1pF C_3 =1pF L_1=4.3nH L_2=4.3nH

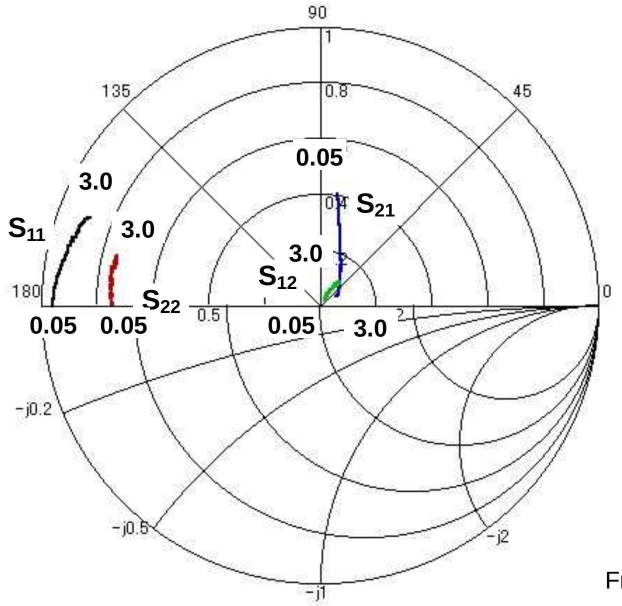
C_C =30pF x2 C_{B1} =1μF x4 C_{B2}=1μF x4 C_{B3}=6.8μF C_{B4}=1pF C_{B5}=100pF L_{B1}=100nH

Equivalent circuit

TYPICAL S PARAMETERS

V_{DS}=10V, I_{DS}=400mA

Freq(MHz)	MAG(S11)	ANG(S11)	MAG(S21)	ANG(S21)	MAG(S12)	ANG(S12)	MAG(S22)	ANG(S22)
500	0.959	-179.596	4.033	81.021	0.013	42.659	0.748	179.840
600	0.956	178.858	3.362	78.507	0.014	42.463	0.747	179.119
700	0.957	177.495	2.887	75.179	0.014	44.098	0.747	178.493
800	0.955	176.187	2.535	73.157	0.017	49.631	0.747	177.851
900	0.949	175.242	2.263	70.860	0.018	51.864	0.747	177.516
1000	0.946	174.121	2.036	68.368	0.020	52.326	0.752	177.174
1100	0.945	173.117	1.855	66.152	0.022	53.505	0.752	176.842
1200	0.941	172.128	1.696	63.482	0.024	58.705	0.751	176.100
1300	0.940	171.182	1.580	61.629	0.025	57.933	0.751	175.884
1400	0.935	170.166	1.460	59.293	0.026	55.649	0.754	175.198
1500	0.932	169.279	1.371	57.219	0.029	58.696	0.751	174.973
1600	0.928	168.516	1.289	54.968	0.029	53.769	0.755	174.274
1700	0.925	167.552	1.218	52.276	0.032	54.905	0.747	173.624
1800	0.926	166.815	1.149	50.594	0.031	56.449	0.758	173.036
1900	0.922	166.008	1.100	49.002	0.034	55.937	0.750	173.032
2000	0.913	165.049	1.040	46.650	0.036	55.918	0.757	172.339
2100	0.911	164.309	0.991	44.306	0.039	54.515	0.754	171.755
2200	0.909	163.449	0.948	42.279	0.041	54.086	0.756	171.225
2300	0.904	162.656	0.907	41.201	0.042	52.068	0.754	170.719
2400	0.904	162.190	0.879	39.597	0.043	54.843	0.758	169.657
2500	0.905	161.343	0.850	37.300	0.045	54.269	0.747	169.221
2600	0.896	160.584	0.812	34.935	0.045	53.020	0.753	168.671
2700	0.892	159.867	0.785	31.968	0.048	55.009	0.745	167.792
2800	0.888	159.173	0.752	30.917	0.049	53.076	0.751	167.448
2900	0.885	159.094	0.713	27.759	0.052	51.965	0.746	166.578
3000	0.878	159.033	0.674	27.105	0.052	50.130	0.747	166.268

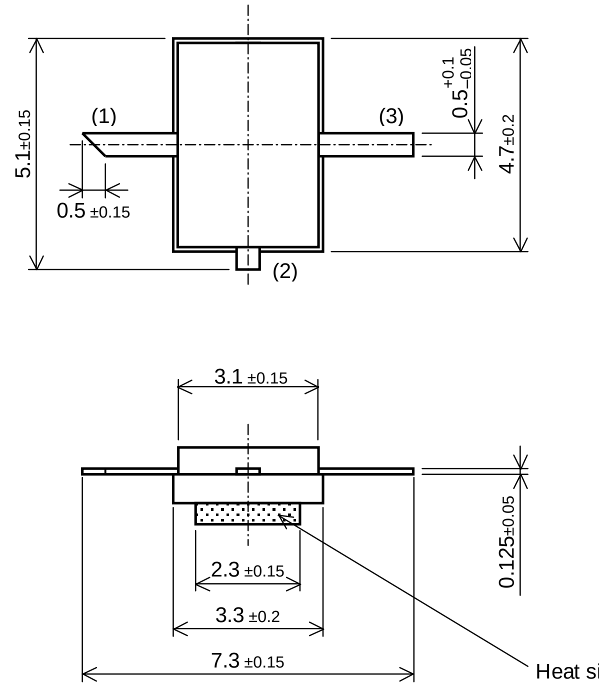


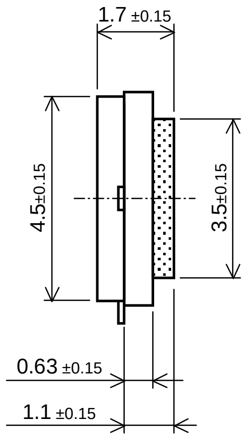
V_{DS}=10V, I_{DS}=400mA
Frequency: 0.5 to 3.0GHz
Z_0=50Ω

PACKAGE

3PHTP (Ceramic package with integrated heat sink)

unit: mm

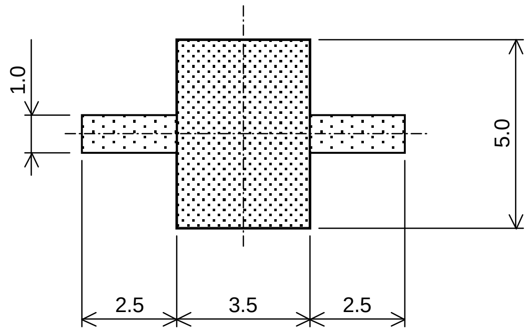


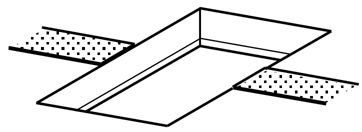


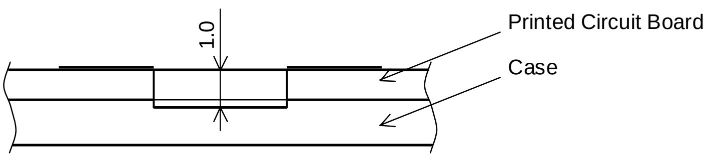
Pin Configuration	
(1)	Gate
(2)	Source
(3)	Drain

Footprint

unit: mm

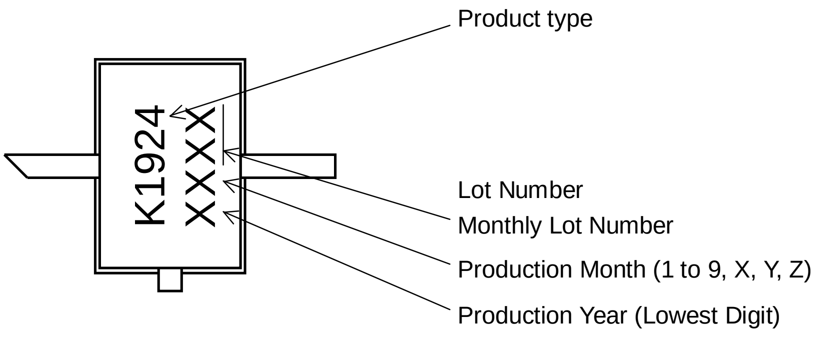






notes:
1) This footprint is an example. The size of footprint depends on accuracyof your mounter.
2) The mounting design should fully be considered in RF grounding and heat dissipation for the better RF performance of the product.
3) Vias are effective in a RF grounding and heat dissipation.

MARKING


Product type
K1924
XXXX
Lot Number
Monthly Lot Number
Production Month (1 to 9, X, Y, Z)
Production Year (Lowest Digit)

SAFETY AND HANDLING INFORMATION ON GAAS DEVICES

Arsenic Compound (GaAs Devices)
The product contains arsenic (As) as a compound.
This material is stable for normal use, however, its dust or vapor may be potentially hazardous to the human body.
Avoid ingestion, fracture, burning or chemical treatment to the product.

- Do not put the product in your mouth.
- Do not burn or destroy the product.
- Do not perform chemical treatment for the product.

Keep laws and ordinances related to the disposal of the products.

NOTICE

1. The information contained herein can change without notice owing to product and/or technical improvements. Before using the product, please make sure that the information being referred to is up-to-date.

2. The outline of action and examples for application circuits described herein have been chosen as an explanation for the standard action and performance of the product. When planning to use the product, please ensure that the external conditions are reflected in the actual circuit, assembly, and program designs.

3. When designing your product, please use our product below the specified maximum ratings and within the specified operating ranges including, but not limited to, operating voltage, power dissipation, and operating temperature.

4. Oki assumes no responsibility or liability whatsoever for any failure or unusual or unexpected operation resulting from misuse, neglect, improper installation, repair, alteration or accident, improper handling, or unusual physical or electrical stress including, but not limited to, exposure to parameters beyond the specified maximum ratings or operation outside the specified operating range.

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