

# OKI electronic components

## KGF2236

### Dual Monolithic GaAs Power FET

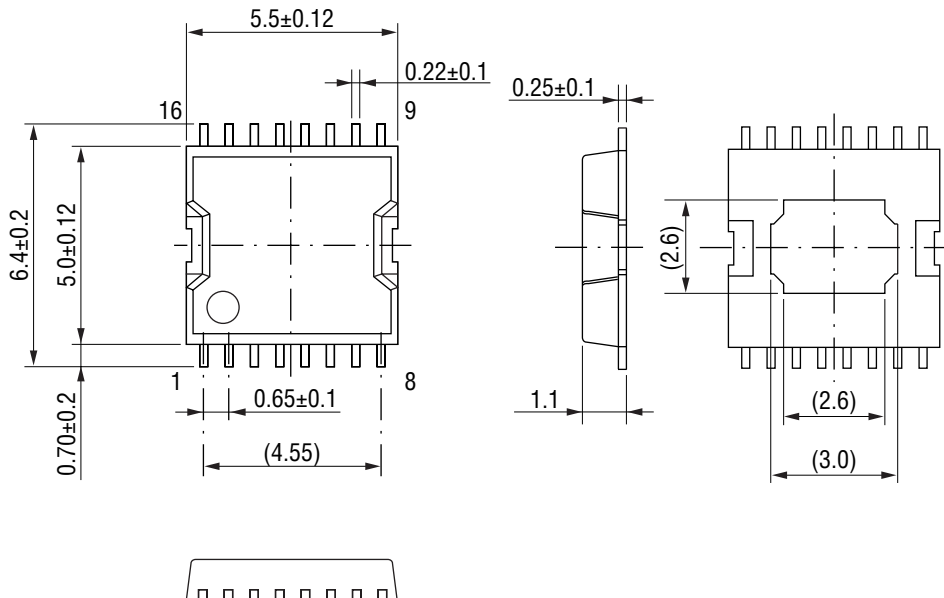
#### GENERAL DESCRIPTION

The KGF2236, housed in a SMD-type plastic package, is a dual monolithic GaAs power FET that features high efficiency at 3 V. Since the KGF2236 is made up of Driver FET and Power FET, that is good to develop smaller and lighter. The KGF2236 specifications are guaranteed to fixed matching circuit of 3.5 V and 835 MHz; external impedance-matching circuit are also required. The KGF2236 provides high efficiency 60% (typical) with a 31.5 dBm (min. @Pin=7 dBm) output at 3.5 V. The device is optimized for transmitter-final-stage amplifiers in Portable Handy Phones (PHPs) and other 3 V analog cellular phone.

#### FEATURES

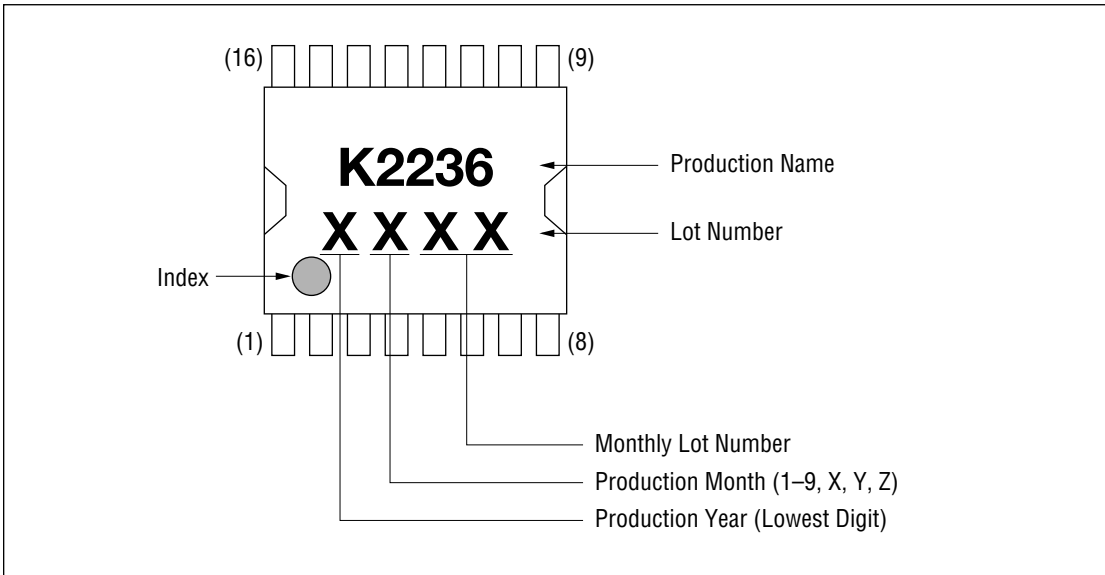
- Dual monolithic GaAs Power FET
- High efficiency: 60% (typ.)
- High gain: 25 dB
- Specifications guaranteed to a fixed matching circuit at 3.5 V, 835 MHz
- Package: 16PSSOP

#### PACKAGE DIMENSIONS

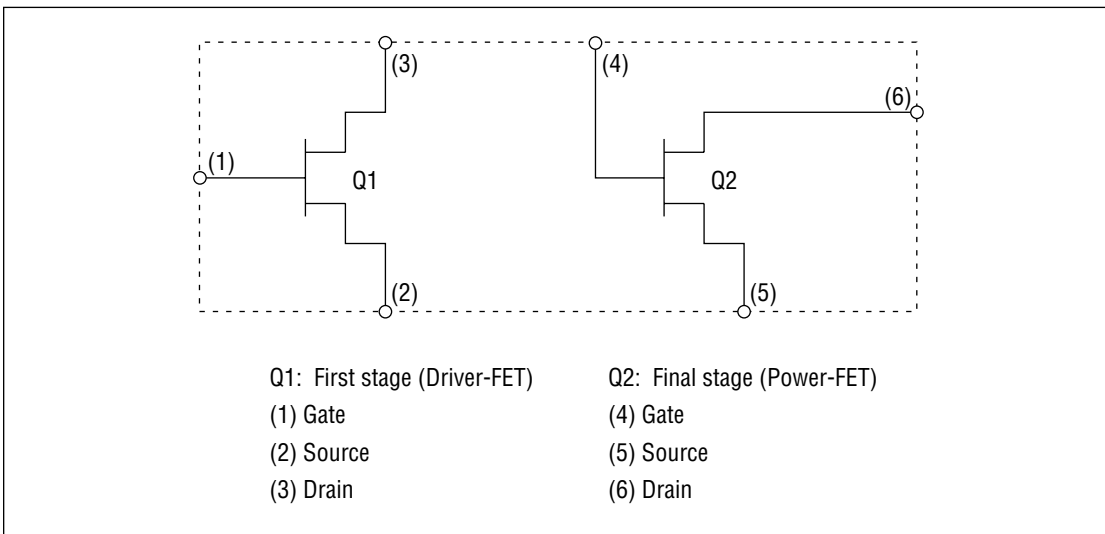


(Unit: mm)

**MARKING**



**CIRCUIT**



**ABSOLUTE MAXIMUM RATINGS**

(Ta=25°C)

Item	Symbol	Conditions	Unit	Min.	Max.	Notes
Drain-source voltage	$V_{DS1}$	Ta = 25°C	V	—	8.0	Q1
Gate-source voltage	$V_{GS1}$	Ta = 25°C	V	-6.0	0.4	Q1
Drain current	$I_{DS1}$	Ta = 25°C	A	—	1.0	Q1
Total power dissipation	$P_{tot1}$	Ta = Tc = 25°C	W	—	2.0	Q1
Channel temperature	$T_{ch1}$	—	°C	—	150	Q1
Drain-source voltage	$V_{DS2}$	Ta = 25°C	V	—	8.0	Q2
Gate-source voltage	$V_{GS2}$	Ta = 25°C	V	-6.0	0.4	Q2
Drain current	$I_{DS2}$	Ta = 25°C	A	—	5.0	Q2
Total power dissipation	$P_{tot2}$	Ta = Tc = 25°C	W	—	5.0	Q2
Channel temperature	$T_{ch2}$	—	°C	—	150	Q2
Storage temperature	$T_{stg}$	—	°C	-45	150	

**ELECTRICAL CHARACTERISTICS**

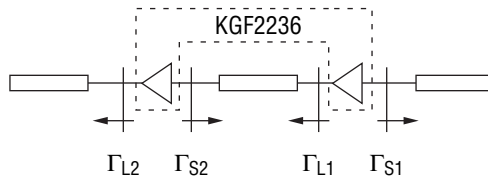
(Ta=25°C)

Item	Symbol	Conditions	Unit	Min.	Typ.	Max.	Notes
Gate-source leakage current	$I_{GSS1}$	$V_{GS} = -6\text{ V}$	mA	—	—	0.1	Q1
Gate-drain cut-off voltage	$V_{GDO1}$	$I_{GD} = -0.3\text{ mA}$	V	-15	—	—	Q1
Drain current	$I_{DSS1}$	$V_{DS} = 1.5\text{ V}, V_{GS} = 0\text{ V}$	A	0.4	—	—	Q1
Gate bias Q point	$V_{GSQ1}$	$V_{DS} = 3.5\text{ V}, I_{DS} = 80\text{ mA}$	V	-2.5	—	-1.5	Q1
Thermal resistance	$R_{th1}$	Channel to Case	°C/W	—	—	50	Q1
Gate-source leakage current	$I_{GSS2}$	$V_{GS} = -6\text{ V}$	mA	—	—	0.1	Q2
Gate-drain cut-off voltage	$V_{GDO2}$	$I_{GD} = -2.4\text{ mA}$	V	-15	—	—	Q2
Drain current	$I_{DSS2}$	$V_{DS} = 1.5\text{ V}, V_{GS} = 0\text{ V}$	A	4.0	—	—	Q2
Gate bias Q point	$V_{GSQ2}$	$V_{DS} = 3.5\text{ V}, I_{DS} = 200\text{ mA}$	V	-2.8	—	-1.8	Q2
Thermal resistance	$R_{th2}$	Channel to Case	°C/W	—	—	20	Q2
Output Power	$P_O$	*1	dBm	31.5	—	—	Q1+Q2
Power added efficiency	PAE	*1	%	55	60	—	Q1+Q2

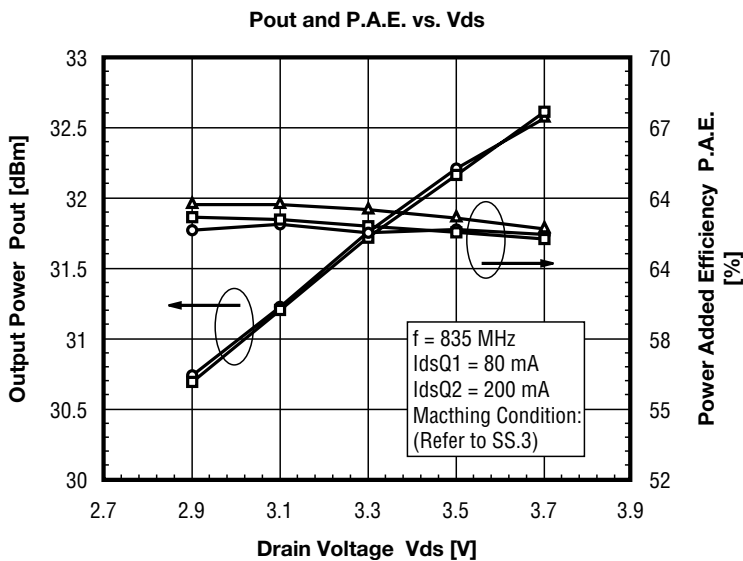
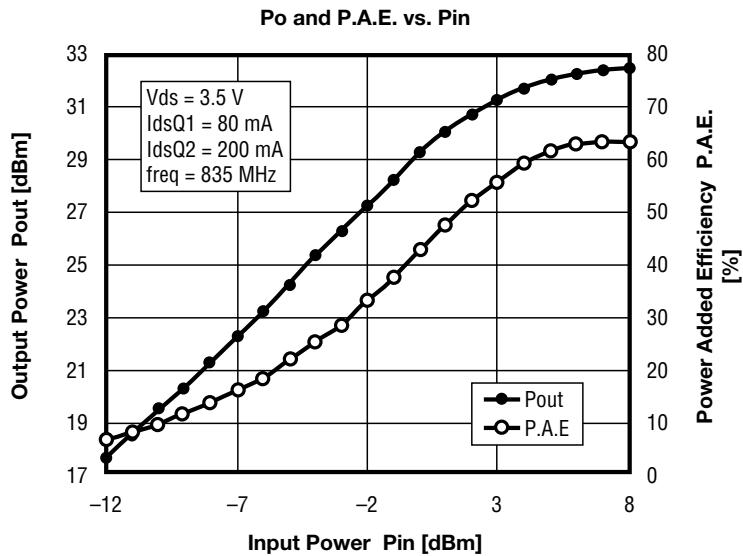
\*1 Condition:  $f = 835\text{ MHz}$ ,  $V_{DS} = 3.5\text{ V}$ ,  $I_{DSQ1} = 80\text{ mA}$ ,  $I_{DSQ2} = 200\text{ mA}$ ,  $P_{IN} = 7\text{ dBm}$

RF CHARACTERISTICS

Matching condition



Normalized source impedance of 1st-stage	$GS1 = 0.323 + j0.940$
Normalized load impedance of 1st-stage	$GL1 = 0.046 + j0.487$
Normalized source impedance of final-stage	$GS2 = 0.032 + j0.124$
Normalized load impedance of final-stage	$GL2 = 0.088 + j0.035$



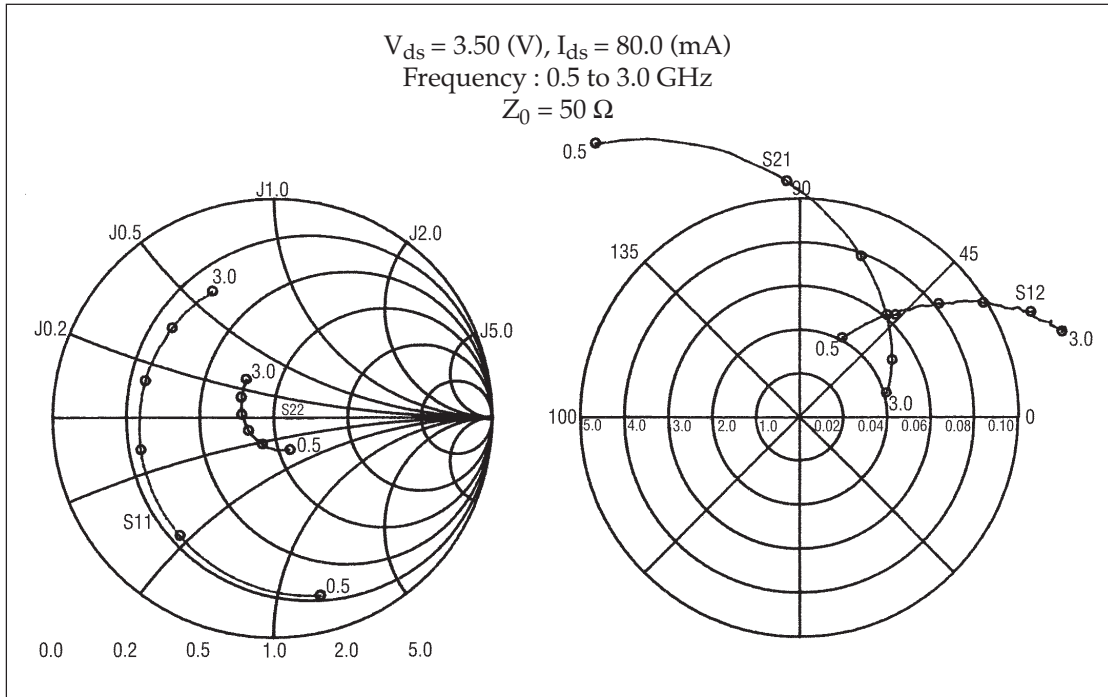
## Typical S Parameters

a) 1st-stage

 $V_{ds} = 3.5 \text{ V}$ ,  $I_{dsq} = 80 \text{ mA}$ 

Freq(MHz)	MAG(S <sub>11</sub> )	ANG(S <sub>11</sub> )	MAG(S <sub>21</sub> )	ANG(S <sub>21</sub> )	MAG(S <sub>12</sub> )	ANG(S <sub>12</sub> )	MAG(S <sub>22</sub> )	ANG(S <sub>22</sub> )
500.0	0.803	-79.65	7.551	121.80	0.046	57.85	0.161	-65.54
550.0	0.777	-86.44	7.283	116.97	0.049	55.44	0.155	-70.86
600.0	0.754	-93.06	6.995	112.87	0.052	52.83	0.150	-77.12
650.0	0.732	-99.64	6.747	108.50	0.055	50.71	0.146	-82.97
700.0	0.710	-105.83	6.478	104.68	0.058	48.67	0.141	-88.49
750.0	0.691	-111.89	6.264	100.72	0.061	46.84	0.137	-94.20
800.0	0.674	-117.77	6.014	97.15	0.063	45.03	0.133	-99.73
850.0	0.655	-123.68	5.775	93.37	0.066	43.36	0.129	-105.03
900.0	0.640	-129.02	5.581	90.29	0.068	41.84	0.127	-110.72
950.0	0.626	-134.49	5.377	86.80	0.071	40.27	0.124	-115.88
1000.0	0.611	-139.49	5.205	84.01	0.073	38.66	0.123	-121.70
1050.0	0.602	-143.59	5.067	80.87	0.075	37.29	0.121	-126.59
1100.0	0.607	-148.59	4.916	77.49	0.077	35.94	0.120	-131.98
1150.0	0.598	-153.79	4.748	74.25	0.080	34.55	0.120	-136.85
1200.0	0.598	-158.09	4.602	71.33	0.082	33.12	0.120	-142.33
1250.0	0.598	-163.18	4.461	68.12	0.084	31.80	0.121	-147.08
1300.0	0.594	-168.09	4.314	65.39	0.086	30.33	0.122	-152.73
1350.0	0.592	-172.47	4.201	62.23	0.088	29.00	0.123	-157.16
1400.0	0.592	-176.86	4.051	59.76	0.089	27.66	0.125	-162.68
1450.0	0.592	178.45	3.939	56.99	0.091	26.33	0.126	-166.83
1500.0	0.592	174.30	3.811	54.54	0.093	25.17	0.128	-171.69
1550.0	0.592	170.06	3.726	51.72	0.095	23.91	0.131	-175.90
1600.0	0.593	166.28	3.607	49.47	0.097	22.90	0.133	179.98
1650.0	0.594	162.20	3.522	46.92	0.098	21.69	0.135	176.35
1700.0	0.593	158.65	3.418	44.71	0.101	20.74	0.137	172.09
1750.0	0.596	154.86	3.351	42.10	0.103	19.56	0.140	168.92
1800.0	0.600	151.68	3.253	39.97	0.105	18.35	0.144	165.25
1850.0	0.606	147.99	3.181	37.21	0.106	16.97	0.149	162.39
1900.0	0.609	144.76	3.097	35.04	0.108	15.80	0.153	158.55
1950.0	0.614	141.40	3.033	32.51	0.110	14.40	0.158	155.75
2000.0	0.620	137.98	2.955	30.37	0.112	12.96	0.162	152.56
2050.0	0.626	134.71	2.893	27.94	0.114	11.70	0.167	148.91
2100.0	0.627	131.47	2.840	25.92	0.115	10.45	0.171	145.65
2150.0	0.631	128.46	2.767	23.48	0.116	9.53	0.175	142.86
2200.0	0.639	125.40	2.728	21.30	0.118	8.31	0.180	139.92
2250.0	0.643	122.49	2.647	19.14	0.119	7.45	0.183	137.25
2300.0	0.647	119.51	2.605	16.82	0.120	6.18	0.187	134.67
2350.0	0.648	116.88	2.545	14.68	0.122	5.37	0.190	132.42
2400.0	0.653	114.19	2.495	12.24	0.124	4.30	0.196	130.47
2450.0	0.658	111.77	2.442	10.22	0.126	3.24	0.199	128.17
2500.0	0.663	108.94	2.392	7.97	0.127	2.27	0.207	126.08
2550.0	0.670	106.67	2.358	5.94	0.130	0.90	0.210	123.59
2600.0	0.675	103.73	2.315	3.78	0.131	-0.17	0.219	121.43
2650.0	0.681	101.35	2.262	1.54	0.133	-1.51	0.221	119.29
2700.0	0.684	98.90	2.221	-0.49	0.133	-2.57	0.228	117.30
2750.0	0.691	96.57	2.176	-2.76	0.136	-3.64	0.232	115.04
2800.0	0.692	93.89	2.139	-4.80	0.136	-4.83	0.238	113.31
2850.0	0.699	91.72	2.094	-7.13	0.140	-5.96	0.242	110.89
2900.0	0.697	89.29	2.046	-9.00	0.139	-7.10	0.247	109.43
2950.0	0.703	87.18	2.014	-11.13	0.142	-7.83	0.252	106.83
3000.0	0.704	85.20	1.979	-12.55	0.142	-9.30	0.257	105.71

Typical S Parameters



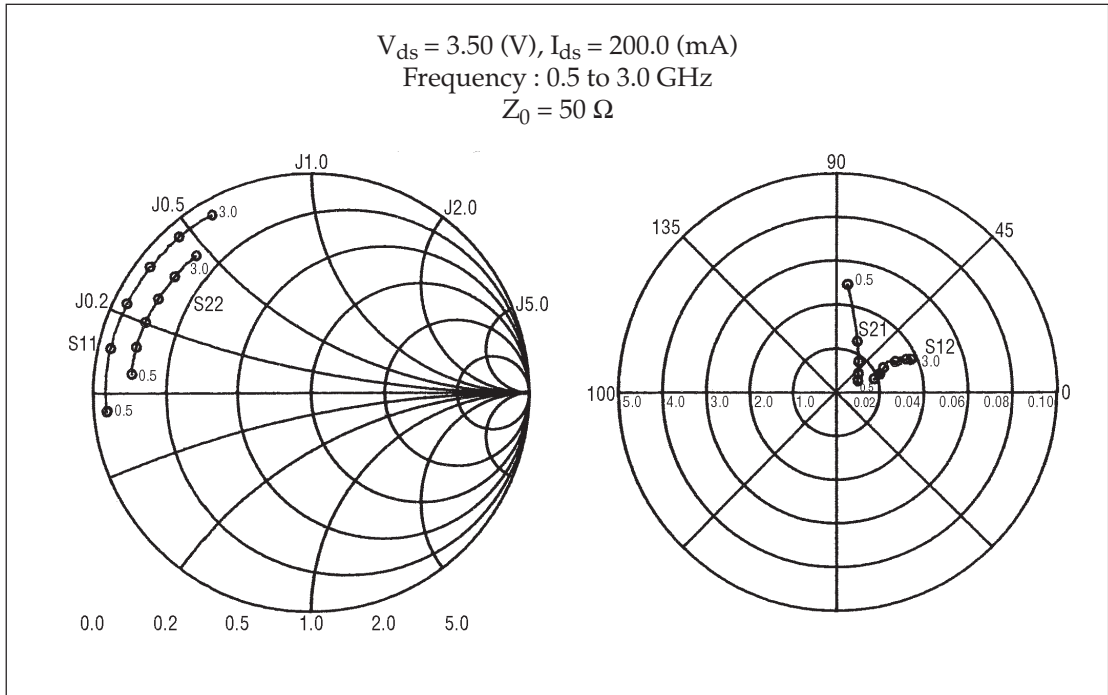
## Typical S Parameters

b) final-stage

 $V_{ds} = 3.5 \text{ V}$ ,  $I_{dsq} = 200 \text{ mA}$ 

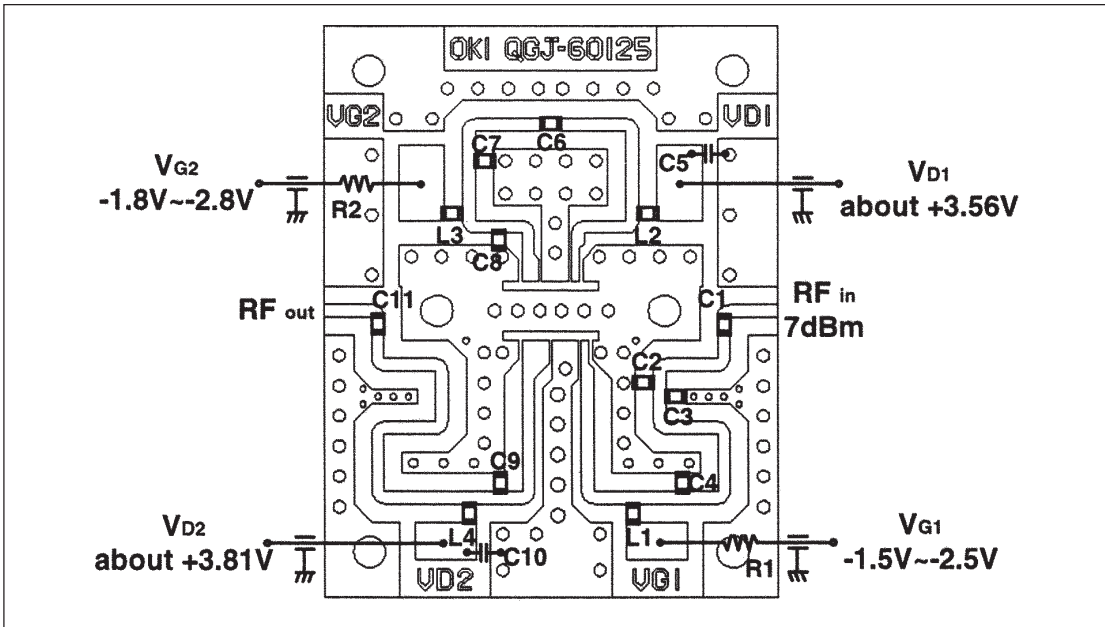
Freq(MHz)	MAG(S <sub>11</sub> )	ANG(S <sub>11</sub> )	MAG(S <sub>21</sub> )	ANG(S <sub>21</sub> )	MAG(S <sub>12</sub> )	ANG(S <sub>12</sub> )	MAG(S <sub>22</sub> )	ANG(S <sub>22</sub> )
500.0	0.935	-176.65	2.455	81.67	0.022	7.83	0.822	172.25
550.0	0.937	-179.20	2.237	79.34	0.022	8.18	0.819	171.09
600.0	0.937	178.60	2.055	77.42	0.022	8.56	0.817	170.05
650.0	0.940	176.23	1.899	75.32	0.022	7.49	0.819	168.82
700.0	0.938	174.29	1.772	73.37	0.023	7.58	0.819	167.93
750.0	0.941	172.33	1.658	71.64	0.023	6.45	0.820	166.84
800.0	0.943	170.53	1.560	69.69	0.023	6.59	0.818	165.89
850.0	0.945	168.81	1.467	68.06	0.023	6.25	0.819	164.70
900.0	0.947	166.92	1.402	66.37	0.023	6.01	0.821	163.80
950.0	0.950	165.31	1.330	64.65	0.023	6.05	0.820	162.61
1000.0	0.953	163.44	1.279	62.95	0.023	6.16	0.819	161.59
1050.0	0.952	161.67	1.240	60.83	0.024	5.69	0.821	160.67
1100.0	0.949	160.21	1.177	57.95	0.024	5.59	0.820	159.87
1150.0	0.952	158.74	1.125	56.33	0.024	5.87	0.819	158.52
1200.0	0.951	157.35	1.081	53.90	0.024	5.61	0.820	157.56
1250.0	0.948	155.83	1.025	52.12	0.025	4.89	0.819	156.47
1300.0	0.953	154.54	0.991	50.63	0.025	5.15	0.819	155.72
1350.0	0.951	153.00	0.955	48.50	0.025	3.90	0.819	154.52
1400.0	0.952	151.80	0.919	46.93	0.025	3.53	0.821	153.49
1450.0	0.954	150.48	0.881	45.41	0.025	3.15	0.822	152.42
1500.0	0.957	149.14	0.856	43.84	0.025	2.82	0.820	151.50
1550.0	0.961	147.76	0.829	42.24	0.025	3.65	0.822	150.42
1600.0	0.963	146.50	0.807	40.73	0.025	3.25	0.820	149.33
1650.0	0.967	145.17	0.780	39.28	0.025	3.78	0.819	148.04
1700.0	0.967	143.78	0.766	37.55	0.026	4.32	0.818	147.19
1750.0	0.967	142.22	0.745	35.85	0.027	3.88	0.815	146.40
1800.0	0.969	141.10	0.724	34.14	0.027	4.24	0.817	145.28
1850.0	0.972	139.76	0.703	32.47	0.027	4.11	0.818	144.31
1900.0	0.975	138.43	0.685	30.83	0.028	4.12	0.819	143.21
1950.0	0.974	137.14	0.671	29.25	0.029	1.93	0.819	142.17
2000.0	0.980	135.81	0.656	27.87	0.029	0.40	0.814	140.99
2050.0	0.984	134.56	0.642	26.22	0.029	-2.41	0.819	139.85
2100.0	0.985	133.22	0.631	24.64	0.028	-3.07	0.817	138.84
2150.0	0.983	131.84	0.615	22.99	0.028	-1.81	0.817	137.56
2200.0	0.990	130.51	0.603	21.33	0.028	-2.53	0.818	136.51
2250.0	0.990	129.43	0.591	20.03	0.027	-2.33	0.814	135.35
2300.0	0.989	127.82	0.578	18.51	0.027	-1.71	0.808	134.29
2350.0	0.992	126.66	0.570	16.64	0.027	2.70	0.810	133.62
2400.0	0.992	125.26	0.559	15.34	0.029	4.08	0.810	132.58
2450.0	0.997	124.30	0.554	13.50	0.031	2.75	0.814	131.47
2500.0	0.997	122.90	0.542	11.91	0.031	0.37	0.813	130.45
2550.0	1.001	121.62	0.536	10.21	0.032	-2.00	0.812	129.12
2600.0	1.005	120.23	0.526	8.64	0.031	-3.24	0.813	128.21
2650.0	1.004	119.10	0.517	6.84	0.032	-3.49	0.814	126.97
2700.0	1.006	117.76	0.508	5.39	0.032	-3.90	0.816	125.91
2750.0	1.010	116.36	0.503	3.18	0.033	-4.74	0.814	124.68
2800.0	1.007	114.93	0.492	1.89	0.032	-5.58	0.814	123.64
2850.0	1.009	113.64	0.486	-0.12	0.032	-5.23	0.813	122.24
2900.0	1.004	112.58	0.474	-1.35	0.032	-5.65	0.810	121.19
2950.0	1.008	111.30	0.469	-3.25	0.033	-4.77	0.815	119.99
3000.0	1.009	110.46	0.460	-3.75	0.032	-5.26	0.813	119.20

Typical S Parameters

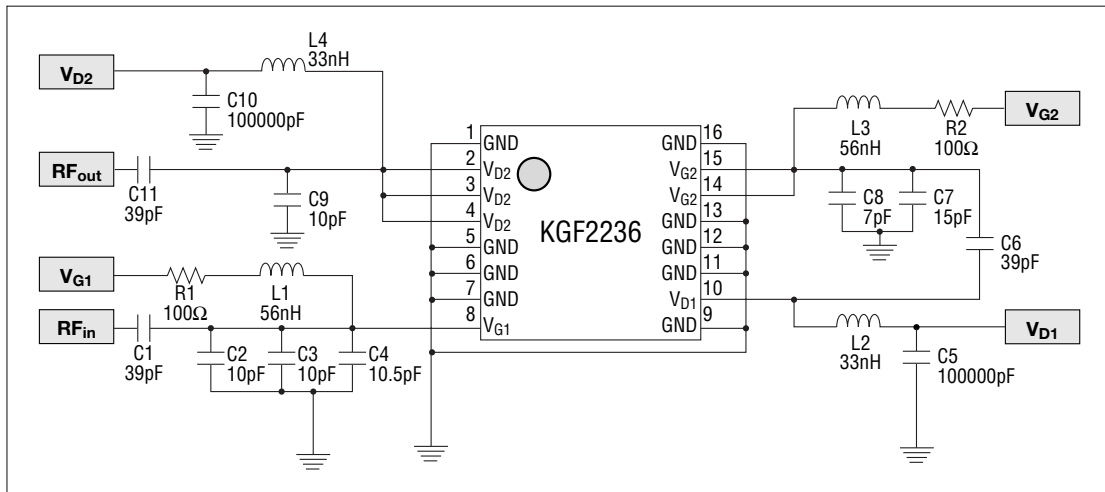




Test Circuit Board for KGF2236



Test Circuit



Remarkable

Power Up

- 1) Begin by setting all power supplies to zero volts, and input power to  $-30$  dBm.
- 2) Make sure that the RF input power is turned off.
- 3) Turn on  $V_{G1}$  (Pin 8) and  $V_{G2}$  (Pin 14 and 15) to  $(-)$  3.3 V.
- 4) Adjust  $V_{D1}$  (Pin 10) and  $V_{D2}$  (Pin 2, 3 and 4) to  $V_{DS1} = V_{DS2} = 3.5$  V, respectively.
- 5) Adjust  $V_{G1}$  and  $V_{G2}$  to  $I_{DSQ1} = 80$  mA and  $I_{DSQ2} = 200$  mA, respectively.
- 6) Turn RF on and adjust input power (Pin = 7 dBm) to get  $P_{out} = 31.5$  dBm.

Power down

To power down the device follow the above procedure in reverse order.