

# FLL21E090IK

## High Voltage - High Power GaAs FET

### FEATURES

- High Voltage Operation :  $V_{DS}=28V$
- High Gain: 15dB(typ.) at  $P_{out}=43dBm(Avg.)$
- Broad Frequency Range : 2100 to 2200MHz
- Proven Reliability

### DESCRIPTION

The FLL21E090IK is a high power GaAs FET that offers high efficiency, ease of matching, greater consistency and broad bandwidth for high power L-band amplifiers. This device is targeted for high voltage, low current operation in digitally modulated base station amplifiers. This product is ideally suited for W-CDMA base station amplifiers while offering high gain, long term reliability and ease of use.



### ABSOLUTE MAXIMUM RATINGS

| Item                    | Symbol    | Condition        | Rating      | Unit       |
|-------------------------|-----------|------------------|-------------|------------|
| Drain-Source Voltage    | $V_{DS}$  | $T_c=25^\circ C$ | 32          | V          |
| Gate-Source Voltage     | $V_{GS}$  |                  | -3          | V          |
| Total Power Dissipation | $P_t$     |                  | 125         | W          |
| Storage Temperature     | $T_{stg}$ |                  | -65 to +175 | $^\circ C$ |
| Channel Temperature     | $T_{ch}$  |                  | 200         | $^\circ C$ |

### RECOMMENDED OPERATING CONDITION (Case Temperature $T_c=25^\circ C$ )

| Item                 | Symbol   | Condition       | Limit | Unit       |
|----------------------|----------|-----------------|-------|------------|
| DC Input Voltage     | $V_{DS}$ | $R_G=2\ \Omega$ | <28   | V          |
| Forward Gate Current | $I_{GF}$ |                 | <352  | mA         |
| Reverse Gate Current | $I_{GR}$ |                 | >-31  | mA         |
| Channel Temperature  | $T_{ch}$ |                 | 155   | $^\circ C$ |

### ELECTRICAL CHARACTERISTICS (Case Temperature $T_c=25^\circ C$ )

| Item                                  | Symbol    | Condition                 | Limit |      |      | Unit         |
|---------------------------------------|-----------|---------------------------|-------|------|------|--------------|
|                                       |           |                           | min.  | Typ. | Max. |              |
| Pinch-Off Voltage                     | $V_p$     | $V_{DS}=5V, I_{DS}=150mA$ | -0.1  | -0.2 | -0.5 | V            |
| Gate-Source Breakdown Voltage         | $V_{GSO}$ | $I_{GS}=-1.5mA$           | -5    |      |      | V            |
| 3rd Order Inter modulation Distortion | $IM_3$    | $V_{DS}=28V$              | -     | -35  | -30  | dBc          |
| Power Gain                            | $G_p$     | $I_{DS}(DC)=700mA$        | 14.0  | 15.0 | -    | dB           |
| Drain Efficiency                      | $\eta_d$  | $P_{out}=43dBm(Avg.)$     | -     | 26   | -    | %            |
| Adjacent Channel Leakage Power Ratio  | $ACL_R$   | note                      | -     | -36  | -    | dBc          |
| Thermal Resistance                    | $R_{th}$  | Channel to Case           | -     | 1.1  | 1.2  | $^\circ C/W$ |

Note 1 :  $IM_3$   $ACL_R$  and Gain test condition as follows:

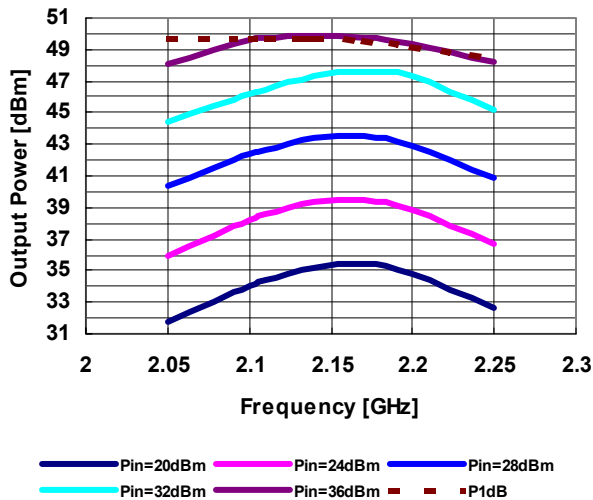
$IM_3$  & Gain :  $f_0=2.1325GHz, f_1=2.1475GHz$  W-CDMA(3GPP3.4 12-00) BS-1 64ch non clipping modulation measured over 3.84MHz at  $f_0-15MHz$  and  $f_1+15MHz$ .

$ACL_R$  :  $f_0=2.1325GHz$  W-CDMA(3GPP3.4 12-00) BS-1 64ch non clipping modulation, measured over 3.84MHz at  $f_0+5MHz$ .

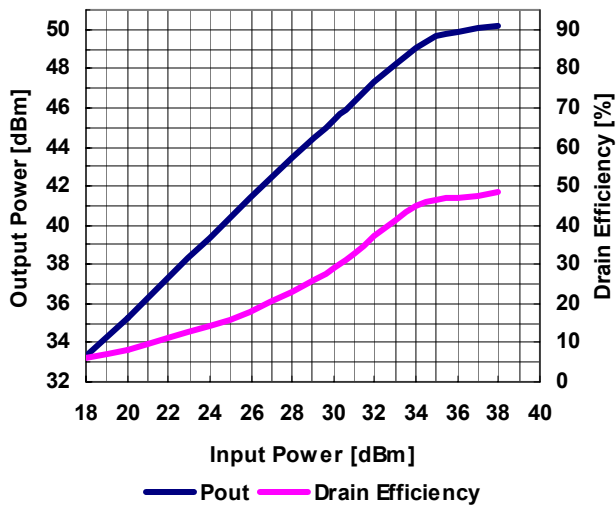
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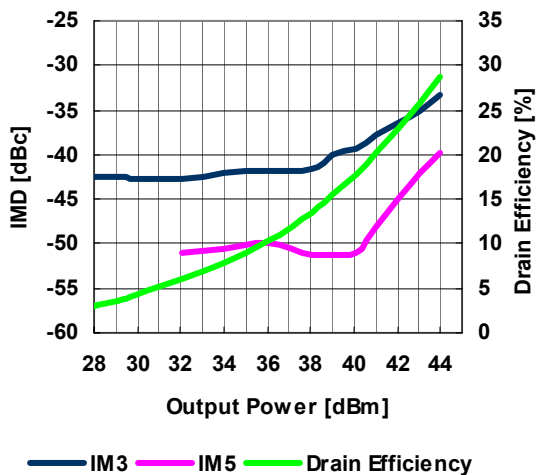
Output Power vs. Frequency  
@VDS=28V, IDS=700mA



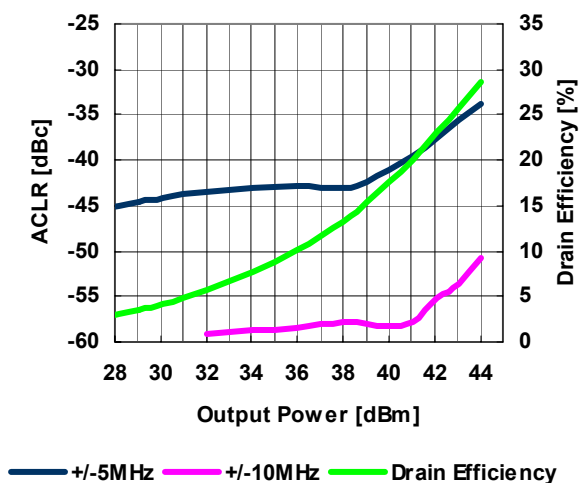
Output Power, Drain Efficiency vs. Input Power  
@VDS=28V, IDS=700mA, f=2.14GHz



Two-Carrier IMD(ACLR)& Drain Efficiency vs. Output Power  
@VDS=28V IDS=700mA fo=2.1325, f1=2.1475GHz  
W-CDMA 3-GPP BS-1 64ch Modulation



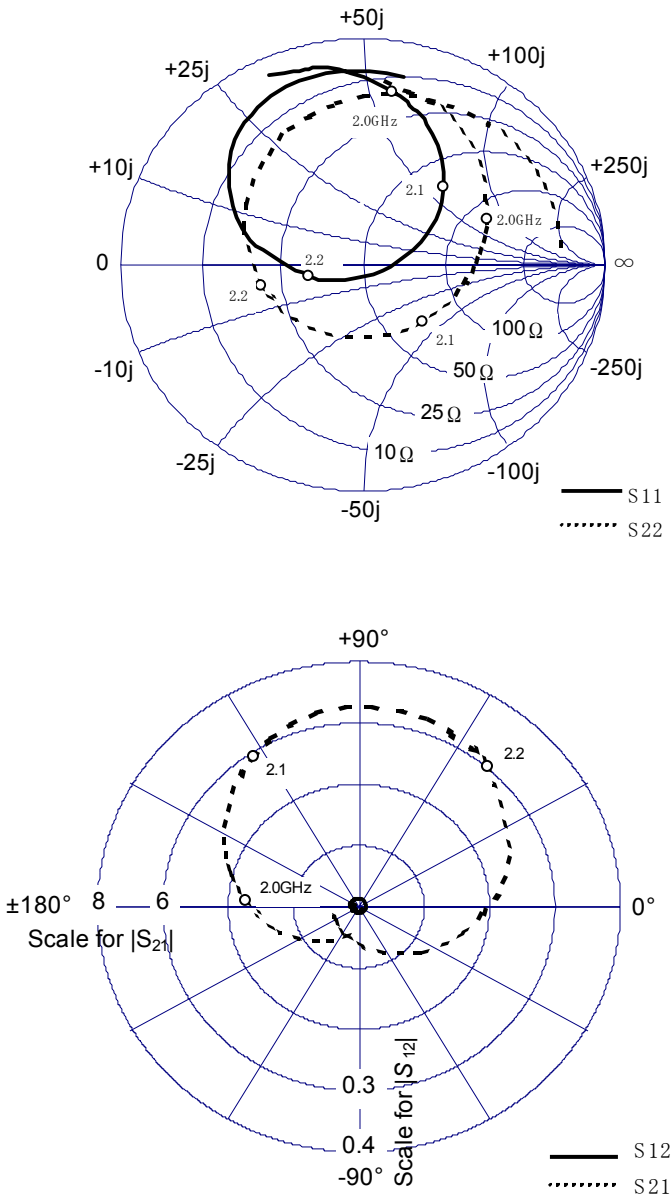
Single-Carrier ACLR & Drain Efficiency vs. Output Power  
@VDS=28V IDS=700mA fo=2.1325GHz  
W-CDMA 3GPP BS-1 64ch Modulation



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## High Voltage - High Power GaAs FET

S-Parameters @VDS=28V, IDS=700mA, f=1.7 to 3 GHz



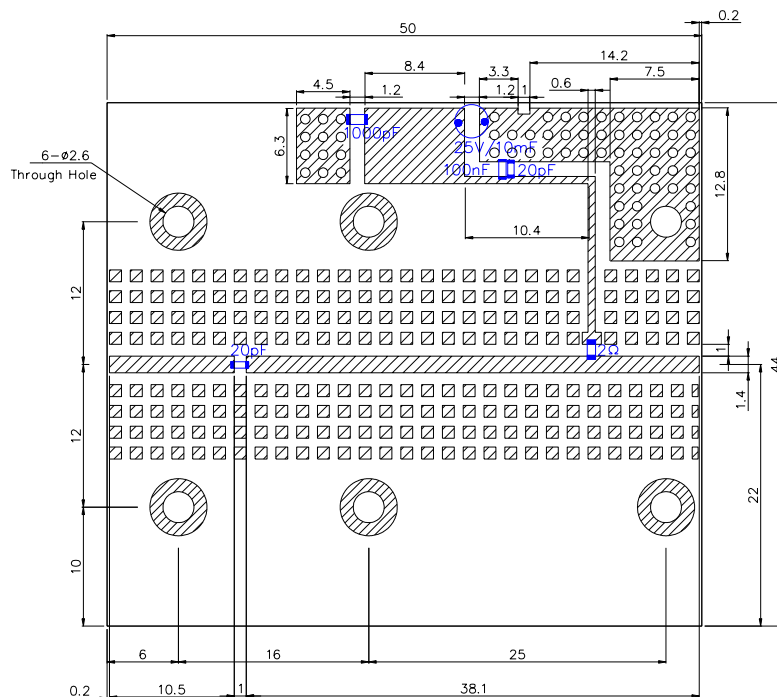
| f(freq)(GHz) | S11(mag) | S11(ang) | S21(mag) | S21(ang) | S12(mag) | S12(ang) | S22(mag) | S22(ang) |
|--------------|----------|----------|----------|----------|----------|----------|----------|----------|
| 0.1          | 0.973    | 175.6    | 0.958    | 161.9    | 0.000    | 34.8     | 0.711    | -168.4   |
| 0.2          | 0.953    | 171.7    | 1.370    | 136.9    | 0.001    | 94.1     | 0.876    | -175.4   |
| 0.3          | 0.934    | 169.7    | 1.433    | 95.6     | 0.003    | 50.0     | 0.931    | 174.7    |
| 0.4          | 0.932    | 167.0    | 1.182    | 61.6     | 0.003    | 12.2     | 0.922    | 167.3    |
| 0.5          | 0.940    | 164.2    | 0.890    | 33.5     | 0.002    | 3.7      | 0.908    | 162.4    |
| 1            | 0.947    | 147.8    | 0.390    | -31.8    | 0.003    | 18.2     | 0.928    | 137.9    |
| 1.1          | 0.952    | 143.8    | 0.381    | -41.2    | 0.003    | 14.1     | 0.921    | 132.4    |
| 1.2          | 0.958    | 139.8    | 0.394    | -50.1    | 0.004    | 7.2      | 0.922    | 126.4    |
| 1.3          | 0.948    | 135.8    | 0.423    | -59.3    | 0.004    | 7.5      | 0.921    | 120.0    |
| 1.4          | 0.951    | 131.5    | 0.480    | -69.3    | 0.004    | 13.5     | 0.910    | 112.6    |
| 1.5          | 0.952    | 126.7    | 0.571    | -80.6    | 0.005    | -1.2     | 0.893    | 104.1    |
| 1.6          | 0.935    | 121.3    | 0.715    | -93.2    | 0.007    | -19.0    | 0.857    | 94.5     |
| 1.7          | 0.924    | 114.9    | 0.952    | -108.0   | 0.008    | -35.4    | 0.820    | 83.3     |
| 1.8          | 0.896    | 107.1    | 1.356    | -126.3   | 0.010    | -48.1    | 0.776    | 69.2     |
| 1.9          | 0.866    | 96.5     | 2.101    | -150.4   | 0.012    | -78.7    | 0.692    | 50.7     |
| 1.95         | 0.832    | 89.8     | 2.692    | -165.2   | 0.014    | -102.2   | 0.631    | 38.1     |
| 2            | 0.775    | 80.9     | 3.492    | -176.7   | 0.016    | -121.5   | 0.553    | 21.5     |
| 2.05         | 0.675    | 67.3     | 4.599    | -153.2   | 0.017    | -152.8   | 0.454    | -3.0     |
| 2.1          | 0.478    | 46.0     | 5.845    | 123.1    | 0.020    | 161.6    | 0.352    | -45.7    |
| 2.11         | 0.422    | 40.4     | 6.094    | 115.8    | 0.020    | 151.9    | 0.338    | -57.6    |
| 2.12         | 0.360    | 34.3     | 6.273    | 108.9    | 0.020    | 141.1    | 0.327    | -70.7    |
| 2.13         | 0.293    | 27.1     | 6.451    | 101.3    | 0.020    | 130.2    | 0.323    | -84.5    |
| 2.14         | 0.222    | 18.7     | 6.549    | 93.5     | 0.020    | 123.6    | 0.325    | -98.7    |
| 2.15         | 0.149    | 6.2      | 6.559    | 85.9     | 0.021    | 111.2    | 0.333    | -112.3   |
| 2.16         | 0.083    | -18.5    | 6.563    | 78.2     | 0.020    | 97.2     | 0.347    | -125.6   |
| 2.17         | 0.052    | -87.3    | 6.512    | 70.6     | 0.020    | 88.0     | 0.364    | -137.7   |
| 2.18         | 0.100    | -139.9   | 6.332    | 63.2     | 0.019    | 72.8     | 0.385    | -148.7   |
| 2.19         | 0.166    | -156.8   | 6.214    | 56.0     | 0.020    | 69.5     | 0.403    | -158.2   |
| 2.2          | 0.228    | -166.8   | 6.005    | 49.2     | 0.019    | 53.5     | 0.425    | -167.4   |
| 2.25         | 0.479    | 166.4    | 4.860    | 18.9     | 0.016    | 8.9      | 0.513    | 160.9    |
| 2.3          | 0.624    | 151.2    | 3.765    | -4.5     | 0.015    | -20.0    | 0.577    | 141.9    |
| 2.35         | 0.710    | 141.0    | 2.960    | -22.9    | 0.015    | -45.9    | 0.626    | 127.9    |
| 2.4          | 0.764    | 133.4    | 2.395    | -38.2    | 0.014    | -65.6    | 0.665    | 116.9    |
| 2.5          | 0.822    | 121.6    | 1.673    | -62.5    | 0.013    | -95.6    | 0.723    | 98.1     |
| 2.6          | 0.848    | 112.1    | 1.293    | -83.3    | 0.011    | -118.3   | 0.767    | 80.6     |
| 2.7          | 0.858    | 103.8    | 1.066    | -101.3   | 0.011    | -142.2   | 0.790    | 63.4     |
| 2.8          | 0.860    | 96.0     | 0.936    | -119.0   | 0.011    | -154.2   | 0.818    | 45.2     |
| 2.9          | 0.856    | 88.1     | 0.866    | -137.8   | 0.012    | -174.4   | 0.825    | 25.3     |
| 3            | 0.846    | 78.8     | 0.849    | -157.1   | 0.012    | 168.1    | 0.829    | 3.5      |

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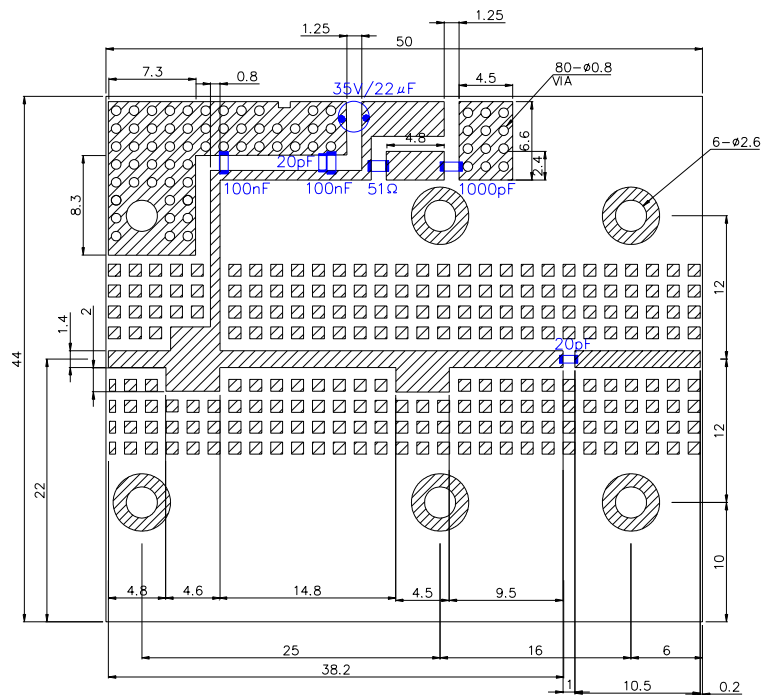
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## BOARD LAYOUT

<INPUT SIDE>



<OUTPUT SIDE>

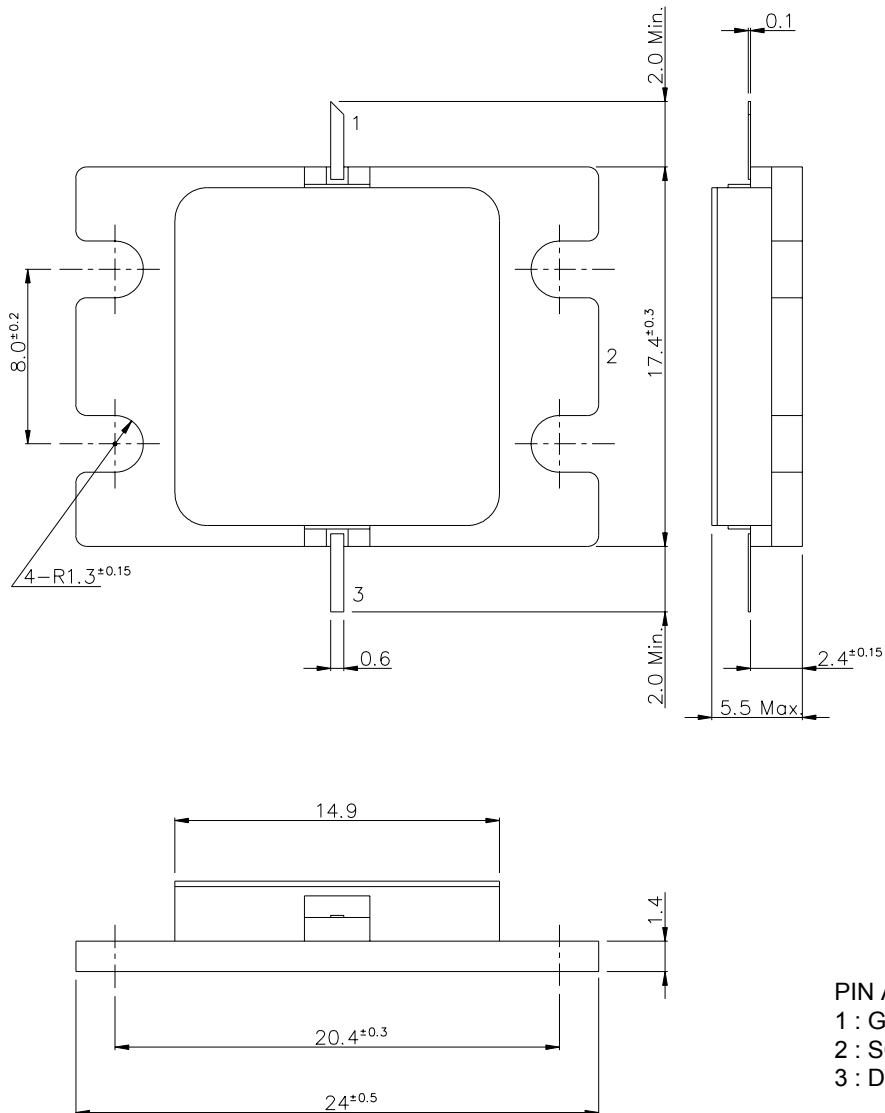


εr=3.5 t=0.6mm

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## IK Package Outline Metal-Ceramic Hermetic Package



PIN ASSIGNMENT  
1 : GATE  
2 : SOURCE(Flange)  
3 : DRAIN

Unit:mm

# **FLL21E090IK**

## **High Voltage - High Power GaAs FET**

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