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Description

The PA2464/PA2464-LF is a Power Amplifier (PA) IC as the final RF amplifier for hand-held applications in the 400MHz to 480MHz band.

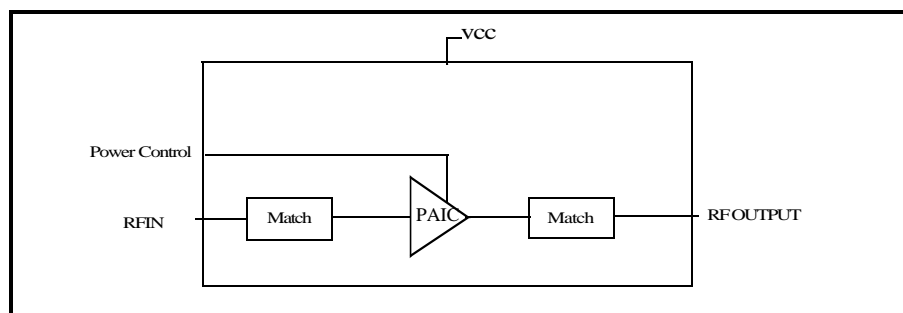
Features

- ◆ Single 3.5V to 6V Supply Voltage
- ◆ +36dBm Output Power
- ◆ 75% Efficiency
- ◆ 8-pin SOP(FD) package (5mm x 4mm)

Applications

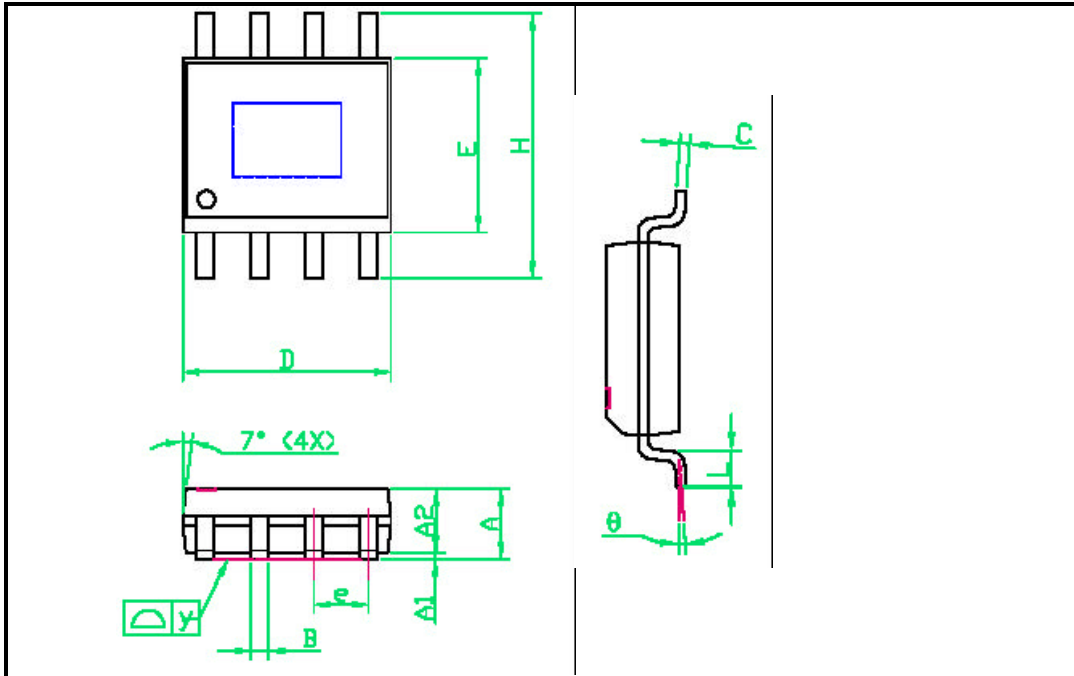
- ◆ FRS, GMRS Handsets
- ◆ Commercial and Consumer Systems
- ◆ Portable Battery-Powered Equipment
- ◆ Long distance Remote Control

Block Diagram





Package and Pin Assignment: 8-Pin SOP(FD)



| Symbols | Dimensions in mm | | | Dimensions in inch | | |
|---------|------------------|------|------|--------------------|-------|-------|
| | min. | nom. | max. | min. | nom. | max. |
| A | 1.45 | 1.50 | 1.55 | 0.057 | 0.059 | 0.061 |
| A1 | 0.00 | --- | 0.10 | 0.000 | --- | 0.004 |
| A2 | --- | 1.45 | --- | --- | 0.057 | --- |
| B | 0.33 | --- | 0.51 | 0.013 | --- | 0.020 |
| C | 0.19 | --- | 0.25 | 0.007 | --- | 0.010 |
| D | 4.80 | --- | 5.00 | 0.189 | --- | 0.197 |
| E | 3.80 | --- | 4.00 | 0.150 | --- | 0.157 |
| e | --- | 1.27 | --- | --- | 0.050 | --- |
| H | 5.80 | --- | 6.20 | 0.228 | --- | 0.244 |
| L | 0.40 | --- | 1.27 | 0.016 | --- | 0.050 |
| y | --- | --- | 0.10 | --- | --- | 0.004 |
| θ | 0° | --- | 8° | 0° | --- | 8° |



Pin Descriptions

| Number | Name | I/O | Description |
|--------|--------|-------|---|
| 1 | APC1 | I | Analog Power Control |
| 2 | NC | I | No Connection |
| 3 | RF_IN | I | RF Input |
| 4 | VCC | Power | Power supply for PA |
| 5 | L2 | I | Connect to PIN4 through a matching section,do not short to GND or PIN4. |
| 6 | RF_OUT | O | RF Output |
| 7 | RF_OUT | O | RF Output |
| 8 | APC2 | I | Analog Power Control |





Absolute Maximum Ratings

$$V_{SS} = V_{SS1} = 0 \text{ V}$$

| Parameter | Symbol | Rating | Unit |
|-----------------------------|-----------|------------|------|
| Supply Voltage | V_{CC} | 6 | V |
| Supply current | I_{CC} | 1000 | mA |
| Input Power | P_{IN} | 10 | dBm |
| Operating Temperature Range | T_{OPR} | 5 to 100 | °C |
| Storage Temperature Range | T_{STG} | -40 to 125 | °C |
| Soldering Temperature Range | T_{SLD} | 255 | °C |
| Soldering Time Range | t_{SLD} | 10 | s |

Recommended Operating Conditions

$$V_{SS} = V_{SS1} = 0 \text{ V}$$

| Parameter | Symbol | Value | | | Unit |
|-----------------------|----------|-------|------|------|------|
| | | min. | typ. | max. | |
| Supply Voltage Range | V_{CC} | | 3.5 | 6 | V |
| Operating Temperature | T_A | -30 | 25 | 85 | °C |



Electrical Characteristics

($V_{CC} = 6V$, $V_{SS} = 0V$, $T_A = 25^\circ C$, $R_L = 50 \text{ Ohm}$)

| Parameter | Symbol | Condition | Value | | | Unit |
|---------------------------------|-----------|---------------------------------------|-------|-------|------|-----------------|
| | | | min. | typ. | max. | |
| VCC Supply Voltage | V_{CC} | | | 6 | | V |
| Frequency Range | f | | 400 | | 480 | MHz |
| Input Power | P_{IN} | | - | 5 | - | dBm |
| Output Power | P_{OUT} | $P_{IN} = 5\text{dBm}$ | - | 36 | | dBm |
| Efficiency | | $P_{IN} = 5\text{dBm}$ | | 75 | | % |
| Current Consumption | I | $P_{OUT} = 36\text{dBm}, V_{CC} = 6V$ | | 900 | 1000 | mA |
| Control Voltage Range | V_{APC} | | 0.2 | | 1.6 | V |
| Full Power Control Voltage | | $P_{OUT} = 36\text{dBm}$ | | 1.5 | | V |
| Control Current into V_{APC} | I_{APC} | | | 40 | | mA |
| 2nd to 13th Harmonic Distortion | | $P_{OUT} = 36\text{dBm}$ | | -20 | | dBc |
| Input VSWR | | All power level | | 1.5:1 | 2:1 | |
| Rise Time and Fall Time | | $P_{OUT} = 36\text{dBm}$ | | | 2 | μsec |



Electrical Characteristics

($V_{CC} = 4.5V$, $V_{SS} = 0V$, $T_A = 25^\circ C$, $R_L = 50 \text{ Ohm}$)

| Parameter | Symbol | Condition | Value | | | Unit |
|---------------------------------|-----------|---|-------|-------|------|-----------------|
| | | | min. | typ. | max. | |
| VCC Supply Voltage | V_{CC} | | | 4.5 | | V |
| Frequency Range | f | | 400 | | 480 | MHz |
| Input Power | P_{IN} | | - | 5 | - | dBm |
| Output Power | P_{OUT} | $P_{IN} = 5\text{dBm}$ | - | 35 | | dBm |
| Efficiency | | $P_{IN} = 5\text{dBm}$ | | 65 | | % |
| Current Consumption | I | $P_{OUT} = 35\text{dBm}, V_{CC} = 4.5V$ | | 1070 | 1200 | mA |
| Control Voltage Range | V_{APC} | | 0.2 | | 1.4 | V |
| Full Power Control Voltage | | $P_{OUT} = 35\text{dBm}$ | | 1.3 | | V |
| Control Current into V_{APC} | I_{APC} | | | 40 | | mA |
| 2nd to 13th Harmonic Distortion | | $P_{OUT} = 35\text{dBm}$ | | -20 | | dBc |
| Input VSWR | | All power level | | 1.5:1 | 2:1 | |
| Rise Time and Fall Time | | $P_{OUT} = 35\text{dBm}$ | | | 2 | μsec |



Electrical Characteristics

($V_{CC} = 3.5V$, $V_{SS} = 0V$, $T_A = 25^\circ C$, $R_L = 50 \text{ Ohm}$)

| Parameter | Symbol | Condition | Value | | | Unit |
|---------------------------------|-----------|---|-------|-------|------|-----------------|
| | | | min. | typ. | max. | |
| VCC Supply Voltage | V_{CC} | | | 3.5 | | V |
| Frequency Range | f | | 400 | | 480 | MHz |
| Input Power | P_{IN} | | - | 5 | - | dBm |
| Output Power | P_{OUT} | $P_{IN} = 5\text{dBm}$ | - | 34 | | dBm |
| Efficiency | | $P_{IN} = 5\text{dBm}$ | | 60 | | % |
| Current Consumption | I | $P_{OUT} = 34\text{dBm}, V_{CC} = 3.5V$ | | 1180 | 1300 | mA |
| Control Voltage Range | V_{APC} | | 0.2 | | 1.5 | V |
| Full Power Control Voltage | | $P_{OUT} = 34\text{dBm}$ | | 1.4 | | V |
| Control Current into V_{APC} | I_{APC} | | | 40 | | mA |
| 2nd to 13th Harmonic Distortion | | $P_{OUT} = 34\text{dBm}$ | | -20 | | dBc |
| Input VSWR | | All power level | | 1.5:1 | 2:1 | |
| Rise Time and Fall Time | | $P_{OUT} = 34\text{dBm}$ | | | 2 | μsec |



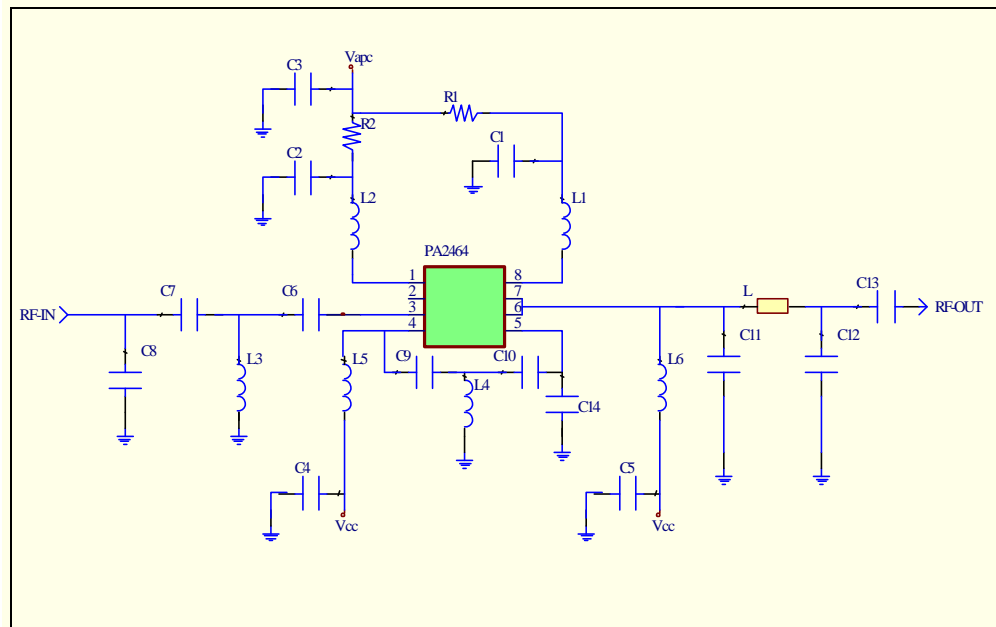
Electrical Characteristics

($V_{CC} = 3.0V$, $V_{SS} = 0V$, $T_A = 25^\circ C$, $R_L = 50 \text{ Ohm}$)

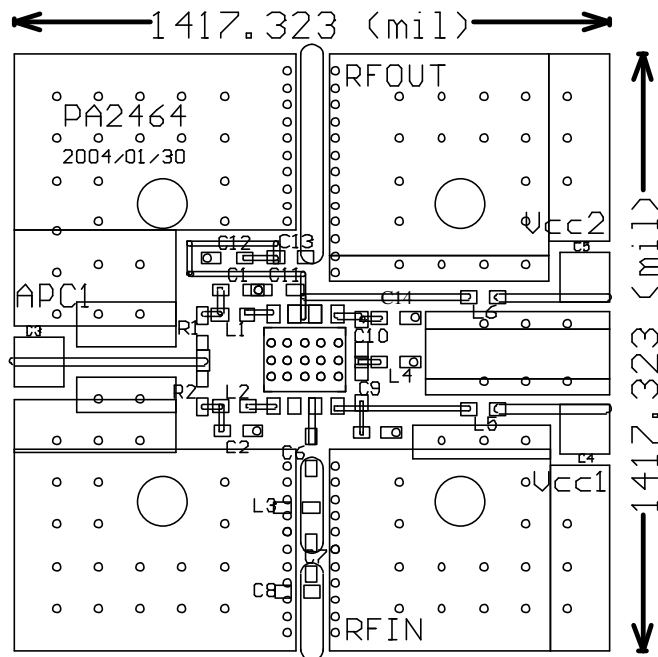
| Parameter | Symbol | Condition | Value | | | Unit |
|---------------------------------|-----------|---------------------------------------|-------|-------|------|-----------------|
| | | | min. | typ. | max. | |
| VCC Supply Voltage | V_{CC} | | | 3 | | V |
| Frequency Range | f | | 400 | | 480 | MHz |
| Input Power | P_{IN} | | - | 5 | - | dBm |
| Output Power | P_{OUT} | $P_{IN} = 5\text{dBm}$ | - | 33 | | dBm |
| Efficiency | | $P_{IN} = 5\text{dBm}$ | | 55 | | % |
| Current Consumption | I | $P_{OUT} = 33\text{dBm}, V_{CC} = 3V$ | | 1190 | 1300 | mA |
| Control Voltage Range | V_{APC} | | 0.2 | | 1.5 | V |
| Full Power Control Voltage | | $P_{OUT} = 33\text{dBm}$ | | 1.4 | | V |
| Control Current into V_{APC} | I_{APC} | | | 40 | | mA |
| 2nd to 13th Harmonic Distortion | | $P_{OUT} = 33\text{dBm}$ | | -20 | | dBc |
| Input VSWR | | All power level | | 1.5:1 | 2:1 | |
| Rise Time and Fall Time | | $P_{OUT} = 33\text{dBm}$ | | | 2 | μsec |



Evaluation Board Circuit



Evaluation Board Layout





BOM

| | | | | | | |
|-------------------|--------------|--------------|--------------|--------------|--------------|--------------|
| VCC | 3V | 3.5V | 4.5V | 6V | 6V | 6V |
| Freq.(MHz) | 465 | 465 | 465 | 465 | 465 | 465 |
| Pout | 33dBm | 34dBm | 35dBm | 36dBm | 3W | 2W |
| EFF(%) | 55 | 60 | 65 | 75 | 65 | 55 |
| Vapc | 1.42V | 1.39V | 1.28V | 1.5V | 1.36V | 1.09V |
| C1/C2 | 1nF | 1nF | 1nF | 1nF | 1nF | 1nF |
| C3/C4/C5 | 1uF | 1uF | 1uF | 1uF | 1uF | 1uF |
| C6 | 100pF | 100pF | 100pF | 100pF | 100pF | 100pF |
| C7 | 6pF | 6pF | 6pF | 6pF | 7pF | 4.7pF |
| C8 | 6pF | 6pF | 6pF | 18pF | 12pF | 10pF |
| C9 | 18pF | 18pF | 18pF | 100pF | 100pF | 100pF |
| C10 | 100pF | 100pF | 100pF | 11pF | 7pF | 7pF |
| C11 | 6pF | 6pF | 6pF | 5pF | 5pF | 5pF |
| C12 | 7pF | 7pF | 7pF | 8pF | 7pF | 7pF |
| C13 | 4pF | 5pF | 6pF | 15pF | 15pF | 15pF |
| C14 | 6pF | 6pF | 6pF | - | - | - |
| L1/L2 | 100nH | 100nH | 100nH | 100nH | 100nH | 100nH |
| L3 | 15nH | 15nH | 15nH | 15nH | 12nH | 15nH |
| L4 | - | - | - | 10nH | 22nH | 22nH |
| *L5/L6 | 25nH | 25nH | 25nH | 25nH | 25nH | 25nH |
| R1/R2 | 0 ohm | 0 ohm | 0 ohm | 0 ohm | 0 ohm | 0 ohm |

* air coil inductor



Typical Characteristics

465MHz, $V_{cc}=6V$, $P_{in}=5dBm$, $V_{apc}=1.5V$

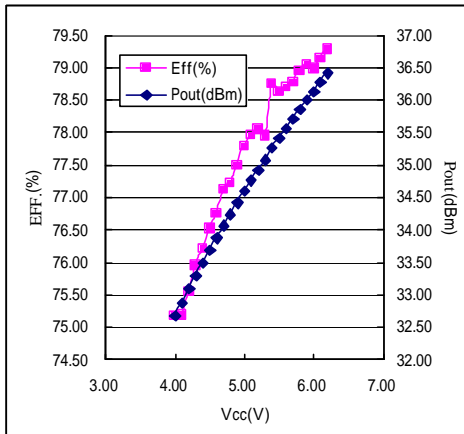


Fig 1.1 Output Power vs. Vcc

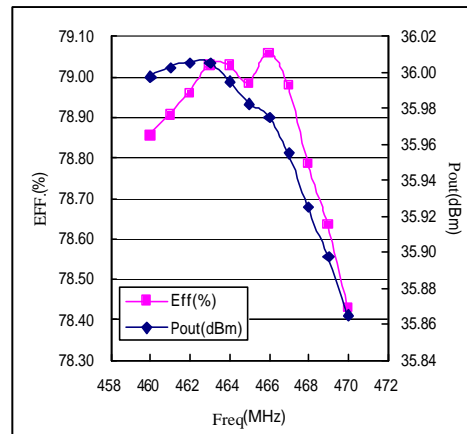


Fig 1.2 Output Power vs. Frequency

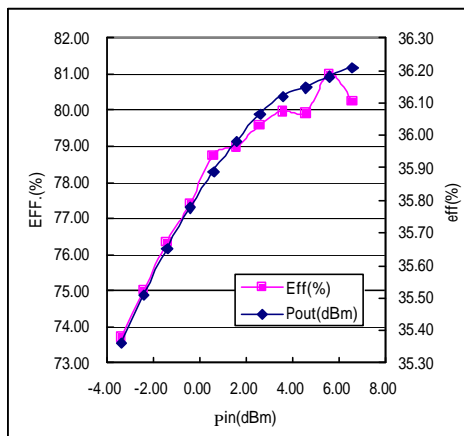


Fig 1.3 Output Power vs. Input Power

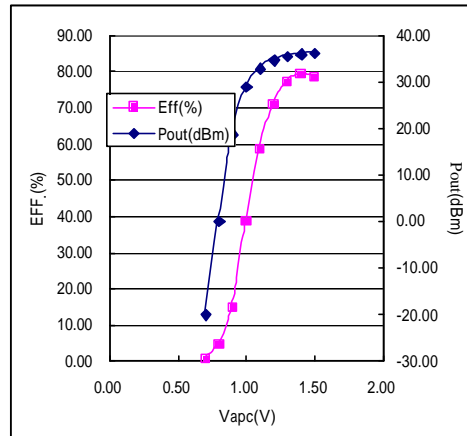


Fig 1.4 Output Power vs. Control Voltage



Typical Characteristics

465MHz, $V_{cc}=4.5V$, $P_{in}=5dBm$, $V_{apc}=1.28V$

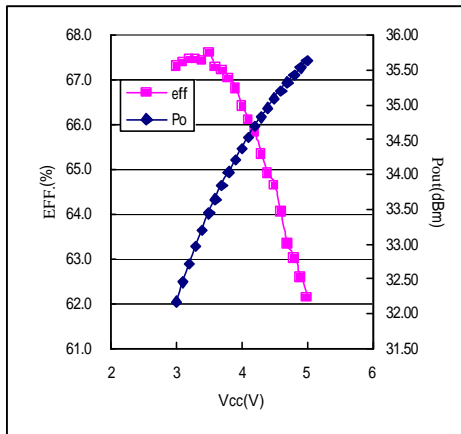


Fig 2.1 Output Power vs. Vcc

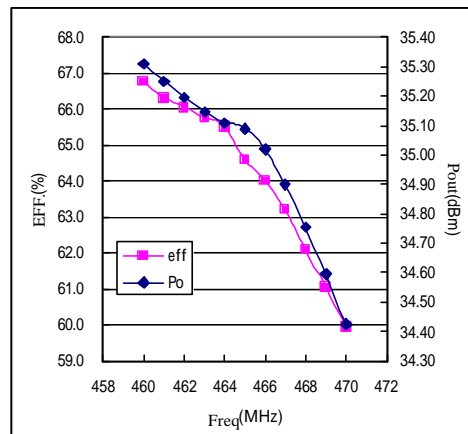


Fig 2.2 Output Power vs. Frequency

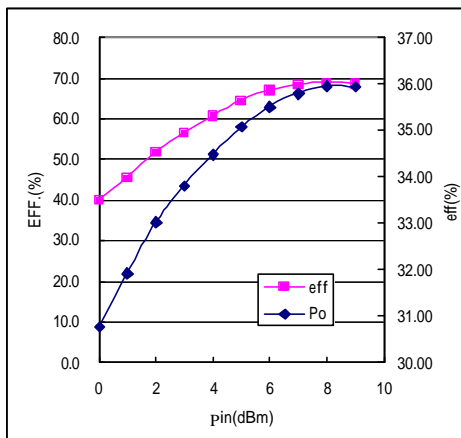


Fig 2.3 Output Power vs. Input Power

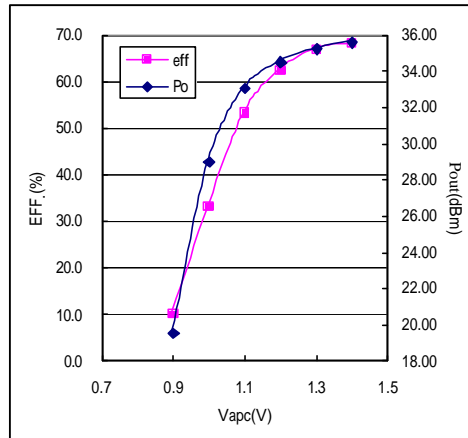


Fig 2.4 Output Power vs. Control Voltage



Typical Characteristics

465MHz, $V_{cc}=3.5V$, $P_{in}=5dBm$, $V_{apc}=1.39V$

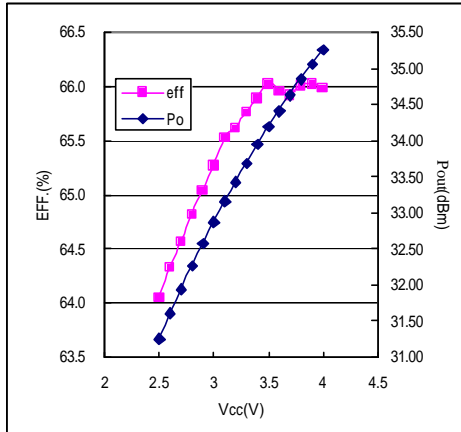


Fig 3.1 Output Power vs. Vcc

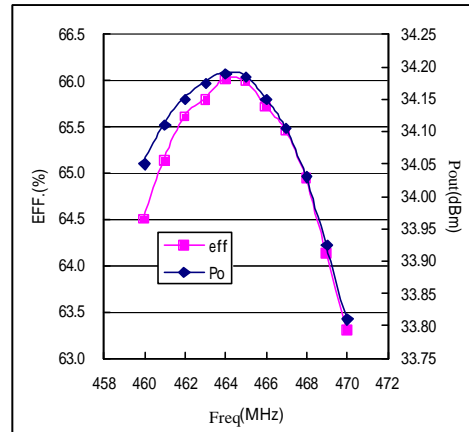


Fig 3.2 Output Power vs. Frequency

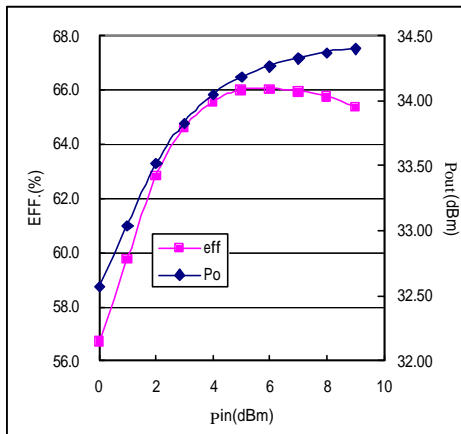


Fig 3.3 Output Power vs. Input Power

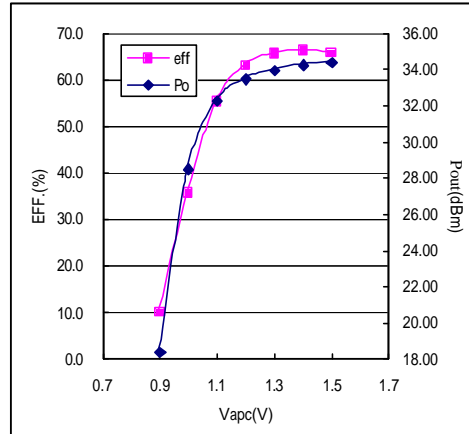


Fig 3.4 Output Power vs. Control Voltage



Typical Characteristics

465MHz, Vcc=3V, Pin=5dBm, Vapc=1.42V

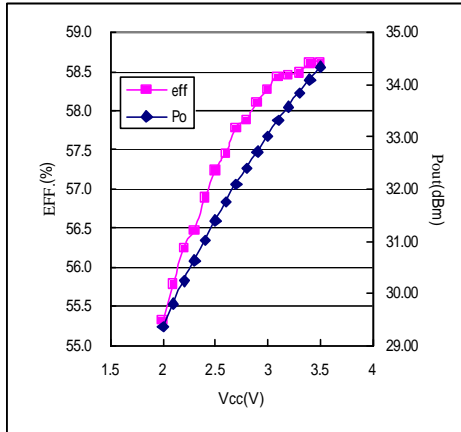


Fig 4.1 Output Power vs. Vcc

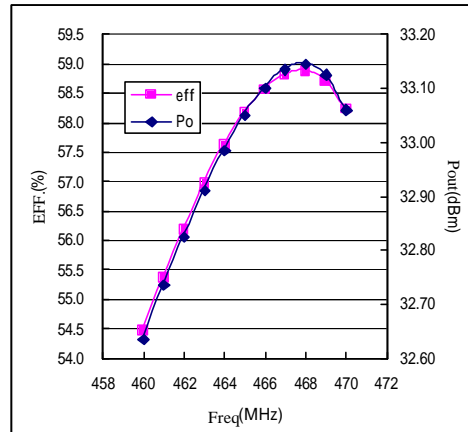


Fig 4.2 Output Power vs. Frequency

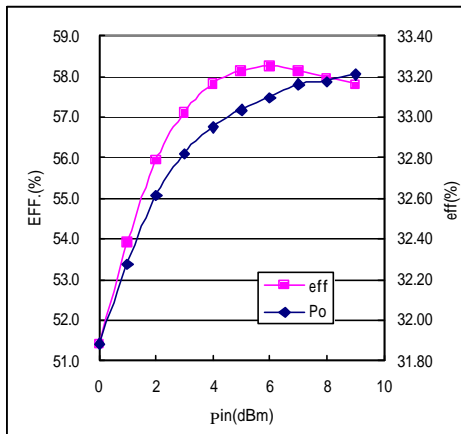


Fig 4.3 Output Power vs. Input Power

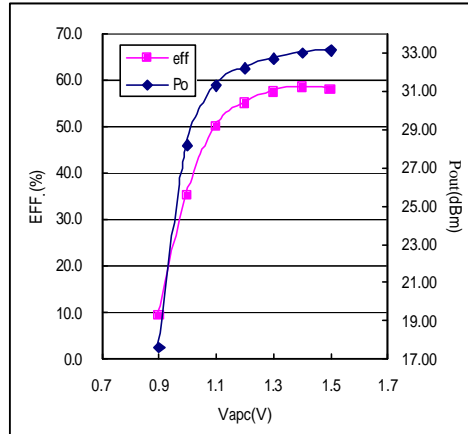
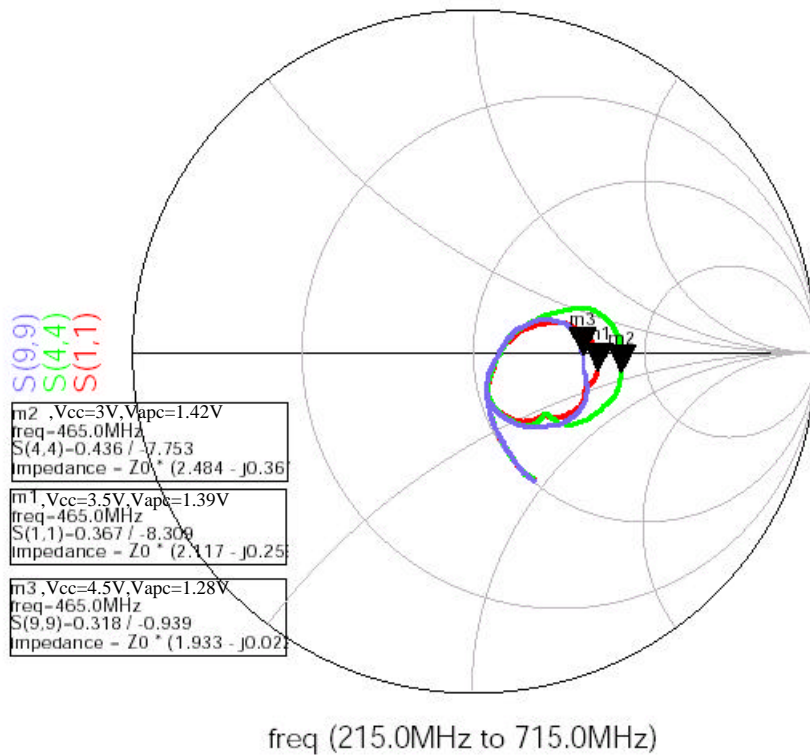


Fig 4.4 Output Power vs. Control Voltage



Input Impedance

465MHz, Pin=5dBm



NOTE:1. C7=C6=100pF,C8=X,L3=X

2. Z0=50 ohm