# APPLICATION NOTE

MITSUBISHI ELECTRIC
Silicon RF Power Semiconductors

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**SUBJECT:** RD01MUS2 & RD07MUS2B RF characteristics data at f=400-470MHz,Vdd=7.2V

**SUMMARY:**

This application note shows the RF wide band characteristics data
(Frequency, Pout vs. Pin, Pout vs. Vgg characteristics) at 400 to 470 MHz band.

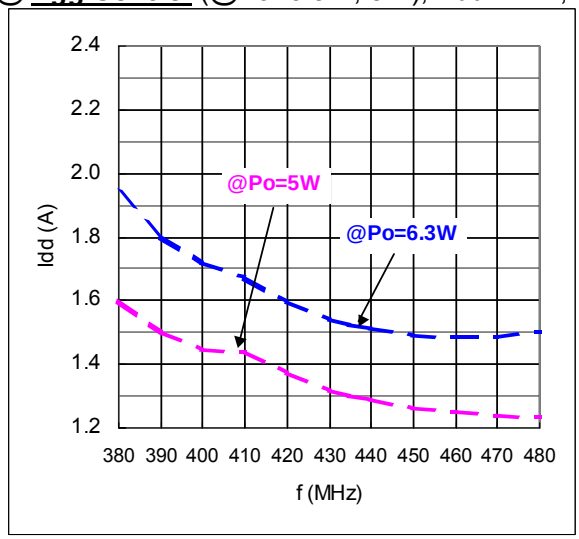
- Sample history :
  RD01MUS2 : Lot number “571”
  RD07MUS2B : Lot number “086ZE-G”

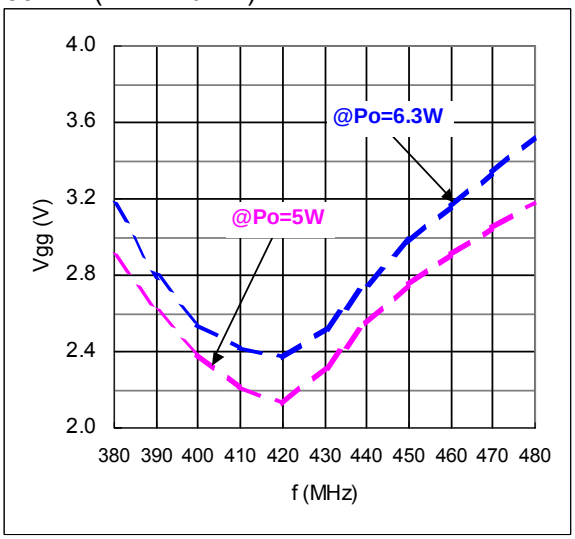
- Evaluate conditions :
  @f=400 to 470MHz : Vdd=7.2V, Vgg=3.5V

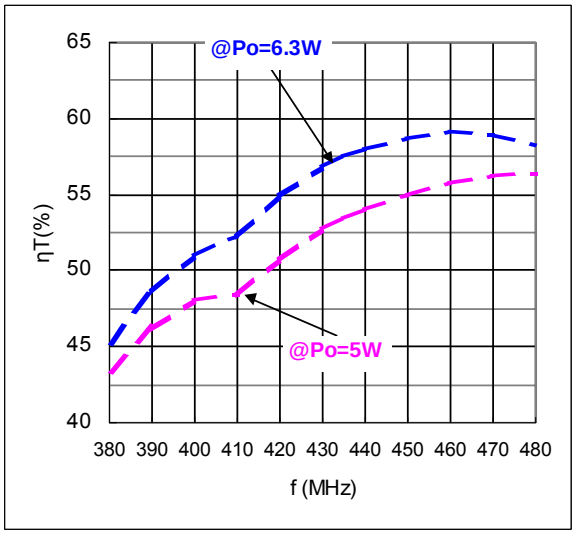
- Results :
  Page 2-5. shows the typical Frequency characteristics data.
  Page 6-9. shows the typical Pout vs. Pin characteristics data.
  Page 10-13. shows the typical Pout vs. Vgg characteristics data.
  Page 14-15. shows the equivalent circuit.

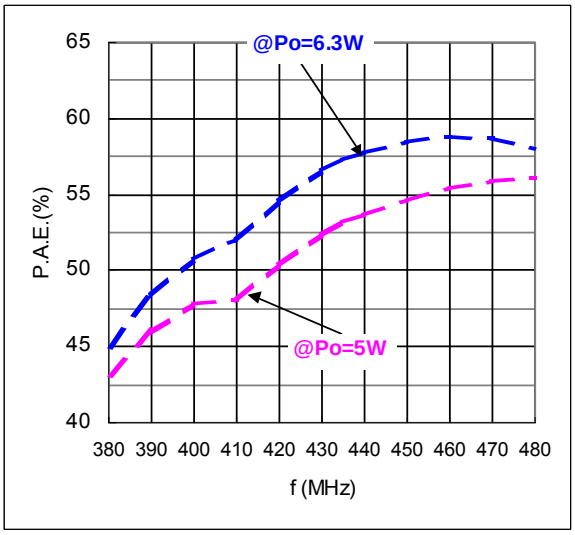
## Frequency characteristics 1

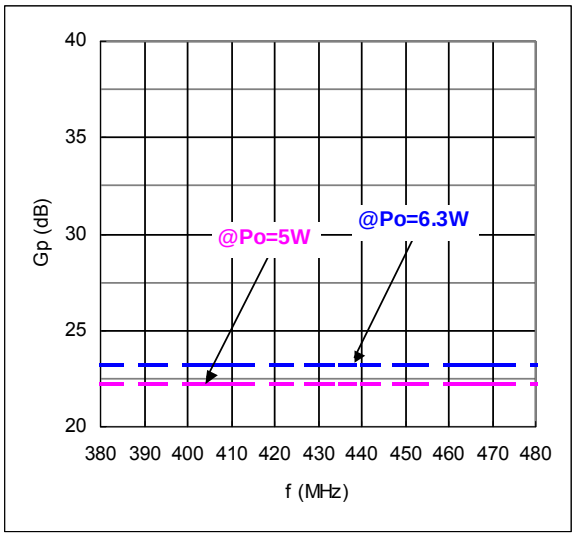
@ **Vgg Control** (@Po=6.3W, 5W), Vdd=7.2V, Pi=30mW (=14.77dBm)



## Frequency characteristics 1 data

@ **Po=6.3W**, Vdd=7.2V, Pi=30mW (=14.77dBm)

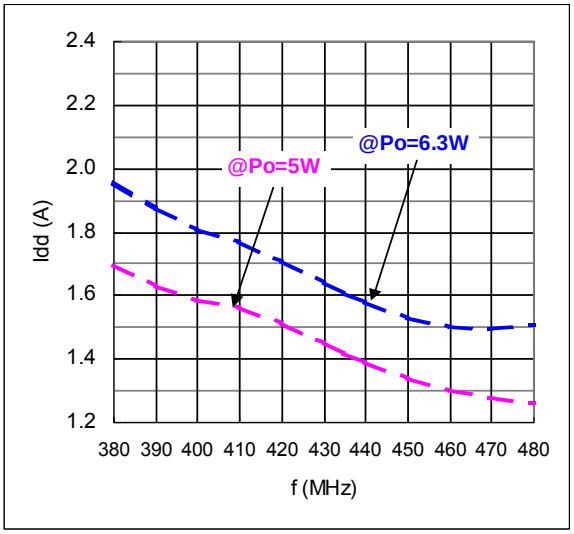
| f (MHz) | Vgg (V) | Gp (dB) | Idd (A) | ηT (%) | P.A.E. (%) | 2fo (dBc) | 3fo (dBc) |
|---|---|---|---|---|---|---|---|
| 380 | 3.17 | 23.2 | 1.94 | 45.2 | 45.0 | -20 | -62 |
| 390 | 2.79 | 23.2 | 1.80 | 48.6 | 48.4 | -19 | -64 |
| 400 | 2.54 | 23.2 | 1.72 | 51.0 | 50.7 | -20 | -65 |
| 410 | 2.42 | 23.2 | 1.68 | 52.2 | 52.0 | -24 | -66 |
| 420 | 2.38 | 23.2 | 1.60 | 54.9 | 54.7 | -30 | -67 |
| 430 | 2.52 | 23.2 | 1.54 | 56.8 | 56.6 | -35 | -65 |
| 435 | 2.64 | 23.2 | 1.52 | 57.5 | 57.3 | -38 | -65 |
| 440 | 2.75 | 23.2 | 1.51 | 58.0 | 57.7 | -40 | -64 |
| 450 | 2.98 | 23.2 | 1.49 | 58.7 | 58.5 | -44 | -63 |
| 460 | 3.16 | 23.2 | 1.48 | 59.1 | 58.9 | -48 | -64 |
| 470 | 3.34 | 23.2 | 1.49 | 59.0 | 58.7 | -50 | -64 |
| 480 | 3.52 | 23.2 | 1.50 | 58.2 | 58.0 | -50 | -69 |

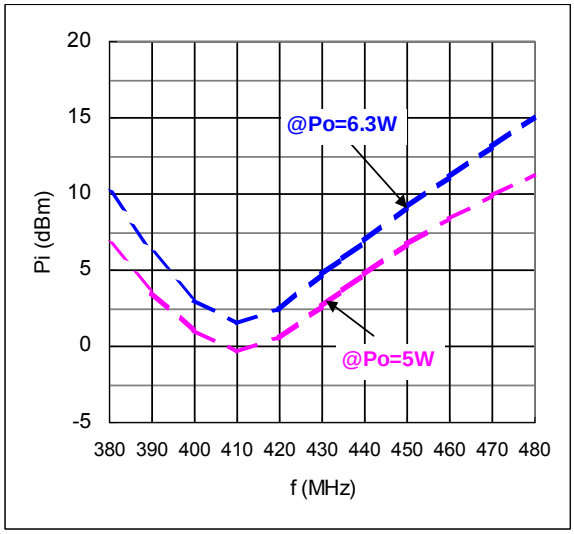
@ **Po=5W**, Vdd=7.2V, Pi=30mW (=14.77dBm)

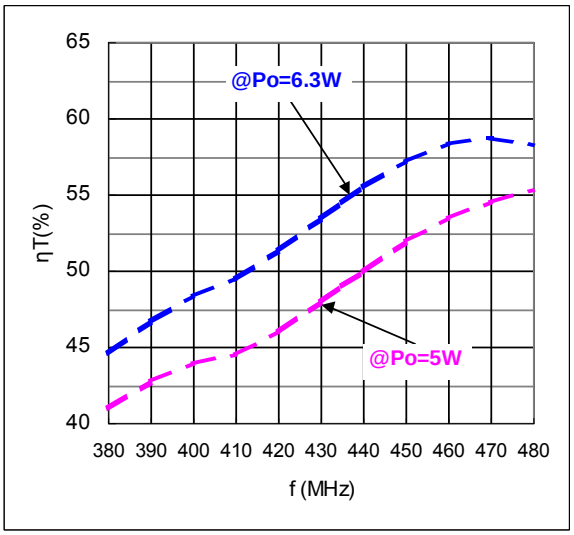
| f (MHz) | Vgg (V) | Gp (dB) | Idd (A) | ηT (%) | P.A.E. (%) | 2fo (dBc) | 3fo (dBc) |
|---|---|---|---|---|---|---|---|
| 380 | 2.90 | 22.2 | 1.60 | 43.4 | 43.2 | -15 | -62 |
| 390 | 2.61 | 22.2 | 1.50 | 46.2 | 45.9 | -15 | -64 |
| 400 | 2.39 | 22.2 | 1.45 | 48.1 | 47.8 | -15 | -64 |
| 410 | 2.21 | 22.2 | 1.44 | 48.4 | 48.1 | -19 | -68 |
| 420 | 2.13 | 22.2 | 1.37 | 50.8 | 50.5 | -25 | -69 |
| 430 | 2.32 | 22.2 | 1.32 | 52.7 | 52.4 | -30 | -66 |
| 435 | 2.43 | 22.2 | 1.30 | 53.5 | 53.2 | -33 | -67 |
| 440 | 2.55 | 22.2 | 1.29 | 54.0 | 53.7 | -35 | -65 |
| 450 | 2.75 | 22.2 | 1.26 | 54.9 | 54.6 | -40 | -64 |
| 460 | 2.92 | 22.2 | 1.25 | 55.8 | 55.4 | -45 | -64 |
| 470 | 3.05 | 22.2 | 1.24 | 56.2 | 55.9 | -50 | -64 |
| 480 | 3.18 | 22.2 | 1.24 | 56.4 | 56.1 | -55 | -68 |

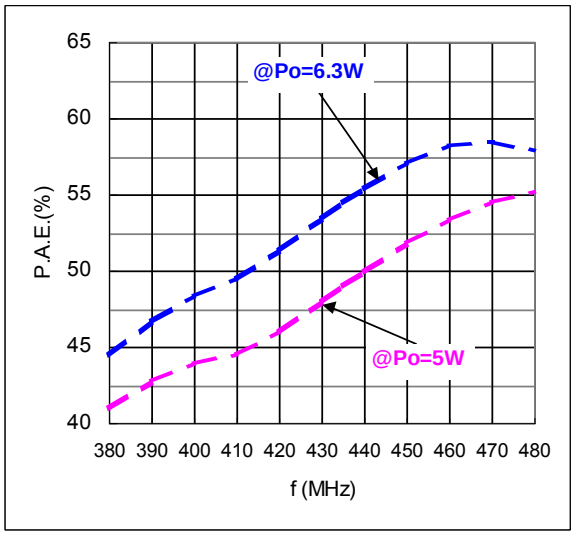
## Frequency characteristics 2

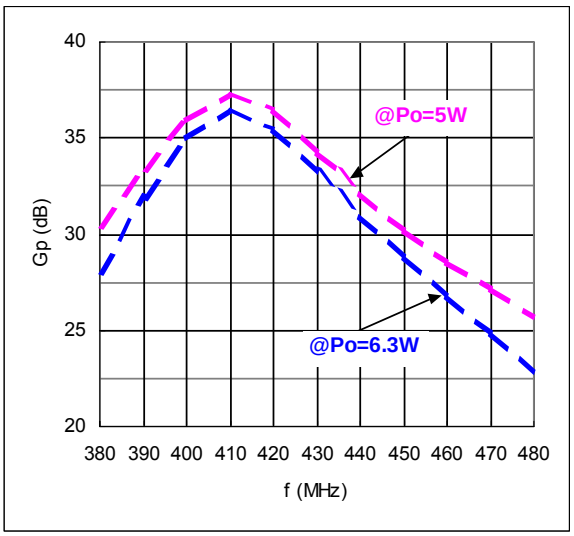
@ **Pin Control** (**@Po=6.3W**, **5W**), Vdd=7.2V, Vgg=3.5V (Idq=404mA)



## Frequency characteristics 2 data

@ **Po=6.3W**, Vdd=7.2V, Vgg=3.5V (Idq=404mA)

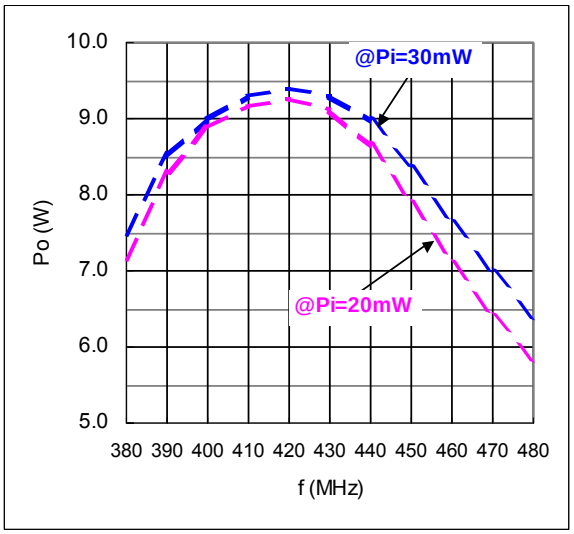
| f (MHz) | Pi (W) | Pi (dBm) | Gp (dB) | Idd (A) | ηT (%) | P.A.E. (%) | 2fo (dBc) | 3fo (dBc) |
|---|---|---|---|---|---|---|---|---|
| 380 | 0.010 | 10.0 | 28.0 | 1.96 | 44.6 | 44.5 | -22 | -64 |
| 390 | 0.004 | 6.07 | 31.9 | 1.87 | 46.7 | 46.7 | -24 | -64 |
| 400 | 0.002 | 3.01 | 35.0 | 1.81 | 48.4 | 48.4 | -26 | -66 |
| 410 | 0.001 | 1.54 | 36.5 | 1.77 | 49.6 | 49.6 | -31 | -67 |
| 420 | 0.002 | 2.49 | 35.5 | 1.71 | 51.4 | 51.4 | -36 | -67 |
| 430 | 0.003 | 4.76 | 33.2 | 1.64 | 53.5 | 53.5 | -40 | -67 |
| 435 | 0.004 | 5.87 | 32.1 | 1.61 | 54.5 | 54.5 | -42 | -66 |
| 440 | 0.005 | 7.02 | 31.0 | 1.58 | 55.5 | 55.5 | -43 | -65 |
| 450 | 0.008 | 9.16 | 28.8 | 1.53 | 57.2 | 57.1 | -46 | -63 |
| 460 | 0.013 | 11.2 | 26.8 | 1.50 | 58.3 | 58.2 | -48 | -64 |
| 470 | 0.020 | 13.1 | 24.9 | 1.49 | 58.7 | 58.5 | -49 | -65 |
| 480 | 0.033 | 15.1 | 22.9 | 1.51 | 58.2 | 57.9 | -50 | -69 |

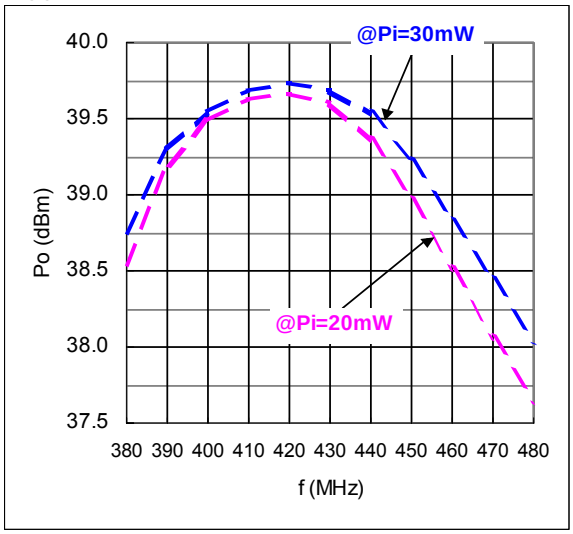
@ **Po=5W**, Vdd=7.2V, Vgg=3.5V (Idq=404mA)

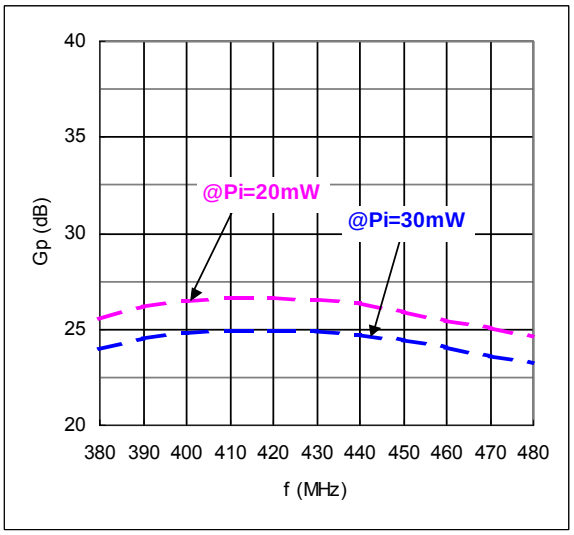
| f (MHz) | Pi (W) | Pi (dBm) | Gp (dB) | Idd (A) | ηT (%) | P.A.E. (%) | 2fo (dBc) | 3fo (dBc) |
|---|---|---|---|---|---|---|---|---|
| 380 | 0.005 | 6.58 | 30.4 | 1.69 | 41.1 | 41.1 | -19 | -64 |
| 390 | 0.002 | 3.60 | 33.4 | 1.63 | 42.8 | 42.7 | -20 | -65 |
| 400 | 0.001 | 1.01 | 36.0 | 1.58 | 43.9 | 43.9 | -20 | -66 |
| 410 | 0.001 | -0.36 | 37.4 | 1.56 | 44.5 | 44.5 | -25 | -68 |
| 420 | 0.001 | 0.53 | 36.5 | 1.51 | 46.1 | 46.1 | -30 | -69 |
| 430 | 0.002 | 2.71 | 34.3 | 1.45 | 48.0 | 48.0 | -35 | -67 |
| 435 | 0.002 | 3.74 | 33.3 | 1.42 | 49.1 | 49.1 | -37 | -67 |
| 440 | 0.003 | 4.81 | 32.2 | 1.39 | 50.1 | 50.0 | -40 | -66 |
| 450 | 0.005 | 6.73 | 30.3 | 1.34 | 52.0 | 51.9 | -44 | -64 |
| 460 | 0.007 | 8.40 | 28.6 | 1.30 | 53.5 | 53.4 | -48 | -64 |
| 470 | 0.010 | 9.86 | 27.1 | 1.28 | 54.6 | 54.5 | -52 | -66 |
| 480 | 0.013 | 11.3 | 25.8 | 1.26 | 55.3 | 55.2 | -55 | -67 |

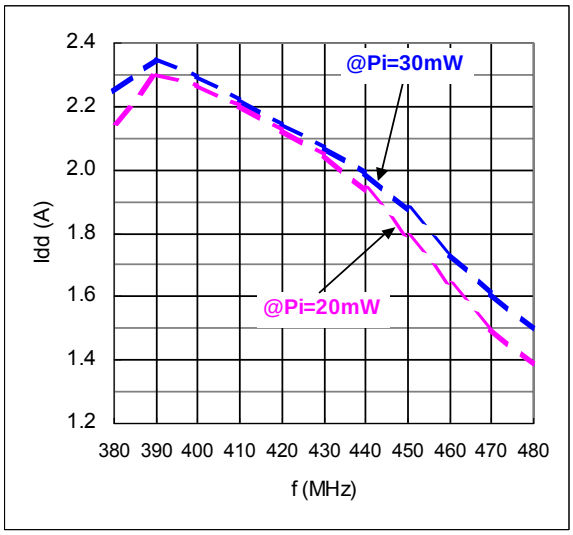
## Frequency characteristics 3

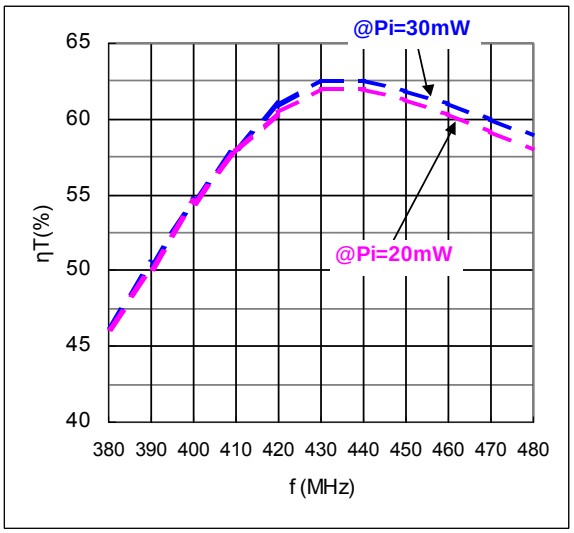
@ **Pin Control** (**@Pi=30mW**, **20mW**), Vdd=7.2V, Vgg=3.5V (Idq=404mA)

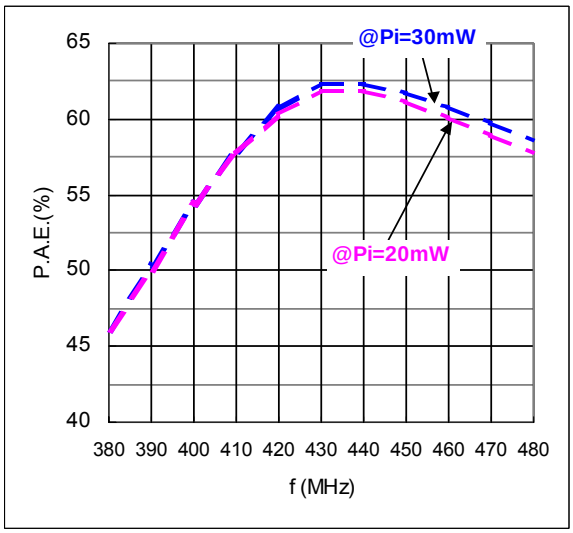


## Frequency characteristics 3 data

**@ Pi=30mW**, Vdd=7.2V, Vgg=3.5V (Idq=404mA)

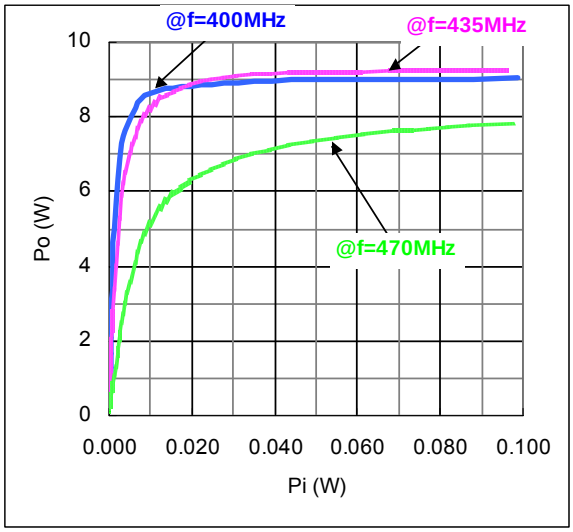
| f (MHz) | Po (W) | Po (dBm) | Gp (dB) | Idd (A) | ηT (%) | P.A.E. (%) | 2fo (dBc) | 3fo (dBc) |
|---|---|---|---|---|---|---|---|---|
| 380 | 7.49 | 38.7 | 24.0 | 2.25 | 46.3 | 46.1 | -22 | -62 |
| 390 | 8.52 | 39.3 | 24.5 | 2.35 | 50.4 | 50.3 | -24 | -63 |
| 400 | 9.01 | 39.5 | 24.8 | 2.29 | 54.6 | 54.4 | -26 | -63 |
| 410 | 9.29 | 39.7 | 24.9 | 2.22 | 58.1 | 57.9 | -31 | -63 |
| 420 | 9.39 | 39.7 | 24.9 | 2.14 | 60.9 | 60.7 | -35 | <-65 |
| 430 | 9.31 | 39.7 | 24.9 | 2.07 | 62.5 | 62.3 | -38 | -64 |
| 440 | 8.98 | 39.5 | 24.7 | 1.99 | 62.6 | 62.3 | -40 | -64 |
| 450 | 8.36 | 39.2 | 24.4 | 1.88 | 61.9 | 61.7 | -43 | -63 |
| 460 | 7.63 | 38.8 | 24.1 | 1.74 | 61.1 | 60.8 | -46 | <-65 |
| 470 | 6.98 | 38.4 | 23.6 | 1.62 | 60.0 | 59.7 | -48 | <-65 |
| 480 | 6.37 | 38.0 | 23.3 | 1.50 | 58.9 | 58.6 | -51 | <-65 |

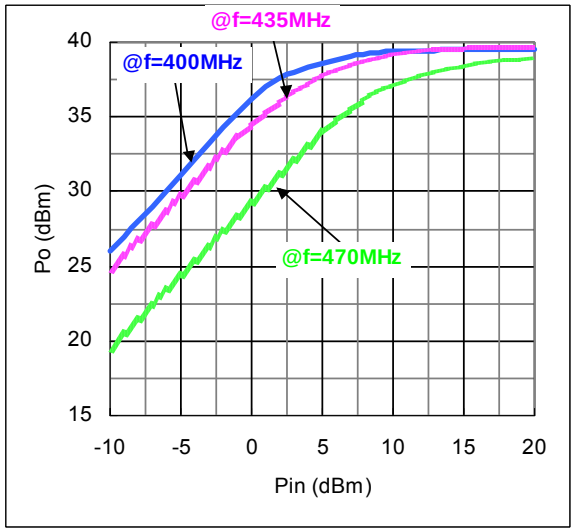
**@ Pi=20mW**, Vdd=7.2V, Vgg=3.5V (Idq=404mA)

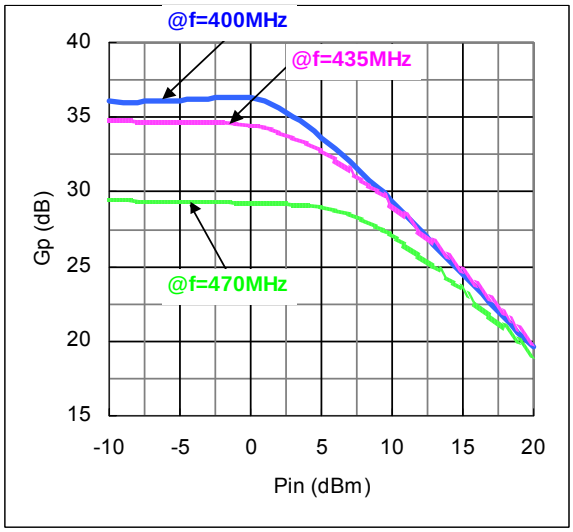
| f (MHz) | Po (W) | Po (dBm) | Gp (dB) | Idd (A) | ηT (%) | P.A.E. (%) | 2fo (dBc) | 3fo (dBc) |
|---|---|---|---|---|---|---|---|---|
| 380 | 7.13 | 38.5 | 25.5 | 2.15 | 46.2 | 46.0 | -22 | <-65 |
| 390 | 8.31 | 39.2 | 26.2 | 2.30 | 50.2 | 50.1 | -24 | -63 |
| 400 | 8.89 | 39.5 | 26.5 | 2.27 | 54.4 | 54.3 | -27 | -64 |
| 410 | 9.17 | 39.6 | 26.6 | 2.20 | 57.8 | 57.7 | -31 | <-65 |
| 420 | 9.26 | 39.7 | 26.7 | 2.13 | 60.5 | 60.3 | -35 | <-65 |
| 430 | 9.13 | 39.6 | 26.6 | 2.05 | 62.0 | 61.8 | -38 | <-65 |
| 440 | 8.64 | 39.4 | 26.3 | 1.94 | 62.0 | 61.9 | -41 | -64 |
| 450 | 7.87 | 39.0 | 25.9 | 1.78 | 61.3 | 61.1 | -44 | -63 |
| 460 | 7.09 | 38.5 | 25.5 | 1.63 | 60.3 | 60.1 | -47 | <-65 |
| 470 | 6.40 | 38.1 | 25.0 | 1.50 | 59.2 | 59.0 | -50 | <-65 |
| 480 | 5.81 | 37.6 | 24.6 | 1.39 | 57.9 | 57.7 | -53 | <-65 |

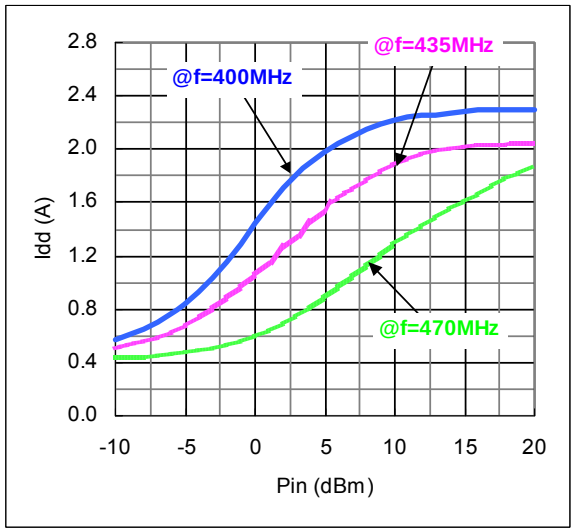
## Pout vs. Pin characteristics

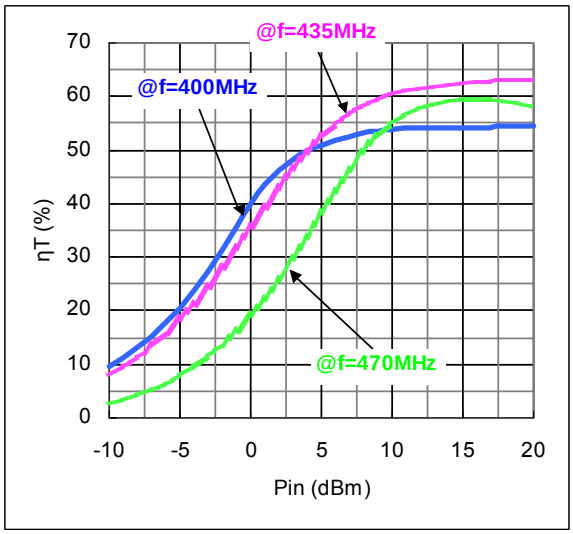
@ Vdd=7.2V, Vgg=3.5V (Idq=404mA), **f=400MHz, 435MHz, 470MHz**

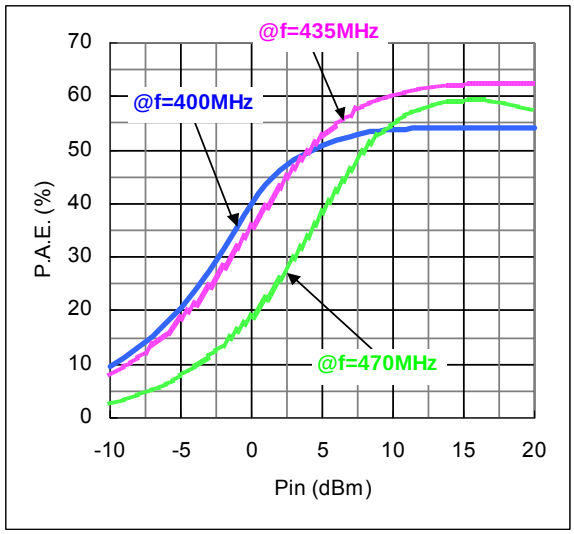


## Pout vs. Pin characteristics data

@ **f=400MHz,** Vgg=3.5V (Idq=404mA)

| Vdd (V) | Pi (W) | Pi (dBm) | Po (W) | Po (dBm) | Gp (dB) | Idd (A) | ηT (%) | P.A.E. (%) |
|---|---|---|---|---|---|---|---|---|
| 7.47 | 0.000 | -10.0 | 0.40 | 26.0 | 36.0 | 0.57 | 9.4 | 9.4 |
| 7.47 | 0.000 | -9.0 | 0.50 | 27.0 | 36.0 | 0.61 | 11.1 | 11.1 |
| 7.46 | 0.000 | -8.0 | 0.63 | 28.0 | 36.0 | 0.65 | 13.1 | 13.1 |
| 7.45 | 0.000 | -7.0 | 0.80 | 29.0 | 36.0 | 0.70 | 15.3 | 15.3 |
| 7.44 | 0.000 | -6.0 | 1.02 | 30.1 | 36.1 | 0.77 | 17.8 | 17.8 |
| 7.43 | 0.000 | -5.0 | 1.29 | 31.1 | 36.1 | 0.84 | 20.6 | 20.6 |
| 7.42 | 0.000 | -4.0 | 1.64 | 32.1 | 36.2 | 0.93 | 23.8 | 23.7 |
| 7.40 | 0.001 | -3.0 | 2.09 | 33.2 | 36.2 | 1.03 | 27.4 | 27.4 |
| 7.38 | 0.001 | -2.0 | 2.68 | 34.3 | 36.3 | 1.15 | 31.5 | 31.5 |
| 7.36 | 0.001 | -1.0 | 3.38 | 35.3 | 36.3 | 1.29 | 35.7 | 35.7 |
| 7.34 | 0.001 | 0.0 | 4.22 | 36.3 | 36.3 | 1.44 | 39.9 | 39.9 |
| 7.31 | 0.001 | 1.0 | 5.03 | 37.0 | 36.0 | 1.58 | 43.5 | 43.4 |
| 7.29 | 0.002 | 2.0 | 5.76 | 37.6 | 35.6 | 1.71 | 46.2 | 46.2 |
| 7.28 | 0.002 | 3.0 | 6.36 | 38.0 | 35.1 | 1.81 | 48.2 | 48.2 |
| 7.26 | 0.002 | 4.0 | 6.86 | 38.4 | 34.4 | 1.90 | 49.7 | 49.7 |
| 7.25 | 0.003 | 5.0 | 7.29 | 38.6 | 33.7 | 1.98 | 50.9 | 50.9 |
| 7.24 | 0.004 | 6.0 | 7.65 | 38.8 | 32.9 | 2.04 | 51.8 | 51.8 |
| 7.23 | 0.005 | 6.9 | 7.96 | 39.0 | 32.1 | 2.10 | 52.5 | 52.5 |
| 7.23 | 0.006 | 7.9 | 8.24 | 39.2 | 31.2 | 2.15 | 53.1 | 53.1 |
| 7.22 | 0.008 | 8.9 | 8.47 | 39.3 | 30.3 | 2.19 | 53.6 | 53.5 |
| 7.21 | 0.010 | 9.9 | 8.63 | 39.4 | 29.4 | 2.22 | 53.8 | 53.8 |
| 7.21 | 0.012 | 10.9 | 8.72 | 39.4 | 28.5 | 2.24 | 54.0 | 54.0 |
| 7.21 | 0.016 | 11.9 | 8.78 | 39.4 | 27.5 | 2.25 | 54.1 | 54.0 |
| 7.21 | 0.020 | 12.9 | 8.83 | 39.5 | 26.6 | 2.26 | 54.2 | 54.0 |
| 7.21 | 0.025 | 13.9 | 8.88 | 39.5 | 25.6 | 2.27 | 54.2 | 54.1 |
| 7.21 | 0.031 | 14.9 | 8.92 | 39.5 | 24.6 | 2.28 | 54.2 | 54.0 |
| 7.21 | 0.039 | 15.9 | 8.95 | 39.5 | 23.6 | 2.29 | 54.2 | 54.0 |
| 7.21 | 0.049 | 16.9 | 8.98 | 39.5 | 22.6 | 2.30 | 54.3 | 54.0 |
| 7.21 | 0.062 | 17.9 | 9.01 | 39.5 | 21.6 | 2.30 | 54.4 | 54.0 |
| 7.21 | 0.078 | 18.9 | 9.03 | 39.6 | 20.6 | 2.30 | 54.5 | 54.0 |
| 7.21 | 0.099 | 19.9 | 9.04 | 39.6 | 19.6 | 2.30 | 54.6 | 54.0 |

@ **f=435MHz**, Vgg=3.5V (Idq=404mA)

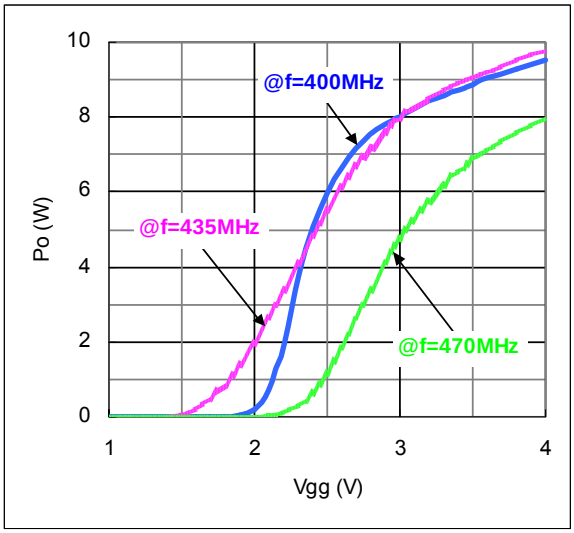
| Vdd (V) | Pi (W) | Pi (dBm) | Po (W) | Po (dBm) | Gp (dB) | Idd (A) | ηT (%) | P.A.E. (%) |
|---|---|---|---|---|---|---|---|---|
| 7.44 | 0.000 | -10.0 | 0.30 | 24.7 | 34.7 | 0.50 | 8.0 | 8.0 |
| 7.44 | 0.000 | -9.1 | 0.37 | 25.7 | 34.8 | 0.53 | 9.5 | 9.5 |
| 7.43 | 0.000 | -8.0 | 0.47 | 26.7 | 34.7 | 0.55 | 11.4 | 11.4 |
| 7.43 | 0.000 | -7.0 | 0.59 | 27.7 | 34.7 | 0.59 | 13.5 | 13.4 |
| 7.42 | 0.000 | -6.0 | 0.74 | 28.7 | 34.7 | 0.63 | 15.8 | 15.7 |
| 7.41 | 0.000 | -5.0 | 0.93 | 29.7 | 34.6 | 0.68 | 18.4 | 18.4 |
| 7.40 | 0.000 | -4.0 | 1.16 | 30.6 | 34.6 | 0.74 | 21.2 | 21.2 |
| 7.39 | 0.001 | -3.0 | 1.46 | 31.6 | 34.6 | 0.81 | 24.4 | 24.4 |
| 7.38 | 0.001 | -2.0 | 1.82 | 32.6 | 34.6 | 0.88 | 27.9 | 27.9 |
| 7.37 | 0.001 | -1.0 | 2.27 | 33.6 | 34.6 | 0.97 | 31.8 | 31.7 |
| 7.35 | 0.001 | 0.0 | 2.78 | 34.4 | 34.5 | 1.06 | 35.6 | 35.6 |
| 7.34 | 0.001 | 1.0 | 3.35 | 35.3 | 34.3 | 1.16 | 39.4 | 39.4 |
| 7.32 | 0.002 | 2.0 | 3.96 | 36.0 | 34.0 | 1.26 | 43.0 | 43.0 |
| 7.31 | 0.002 | 3.0 | 4.62 | 36.6 | 33.7 | 1.36 | 46.6 | 46.5 |
| 7.29 | 0.002 | 4.0 | 5.26 | 37.2 | 33.2 | 1.45 | 49.7 | 49.6 |
| 7.28 | 0.003 | 5.0 | 5.88 | 37.7 | 32.7 | 1.54 | 52.4 | 52.4 |
| 7.26 | 0.004 | 6.0 | 6.47 | 38.1 | 32.1 | 1.63 | 54.8 | 54.7 |
| 7.25 | 0.005 | 6.9 | 6.99 | 38.4 | 31.5 | 1.70 | 56.6 | 56.6 |
| 7.24 | 0.006 | 7.9 | 7.45 | 38.7 | 30.8 | 1.77 | 58.1 | 58.1 |
| 7.23 | 0.008 | 9.0 | 7.87 | 39.0 | 30.0 | 1.83 | 59.4 | 59.3 |
| 7.22 | 0.010 | 9.9 | 8.20 | 39.1 | 29.2 | 1.88 | 60.3 | 60.2 |
| 7.22 | 0.012 | 10.9 | 8.48 | 39.3 | 28.4 | 1.93 | 61.0 | 60.9 |
| 7.21 | 0.016 | 11.9 | 8.70 | 39.4 | 27.5 | 1.96 | 61.5 | 61.4 |
| 7.21 | 0.020 | 12.9 | 8.86 | 39.5 | 26.6 | 1.99 | 61.8 | 61.7 |
| 7.20 | 0.025 | 13.9 | 8.99 | 39.5 | 25.6 | 2.01 | 62.2 | 62.0 |
| 7.20 | 0.031 | 14.9 | 9.08 | 39.6 | 24.7 | 2.02 | 62.4 | 62.2 |
| 7.20 | 0.039 | 15.9 | 9.15 | 39.6 | 23.7 | 2.03 | 62.7 | 62.4 |
| 7.20 | 0.049 | 16.9 | 9.19 | 39.6 | 22.8 | 2.03 | 62.8 | 62.5 |
| 7.20 | 0.061 | 17.8 | 9.22 | 39.6 | 21.8 | 2.04 | 62.9 | 62.5 |
| 7.20 | 0.076 | 18.8 | 9.24 | 39.7 | 20.8 | 2.04 | 63.0 | 62.5 |
| 7.20 | 0.096 | 19.8 | 9.25 | 39.7 | 19.8 | 2.04 | 63.0 | 62.4 |

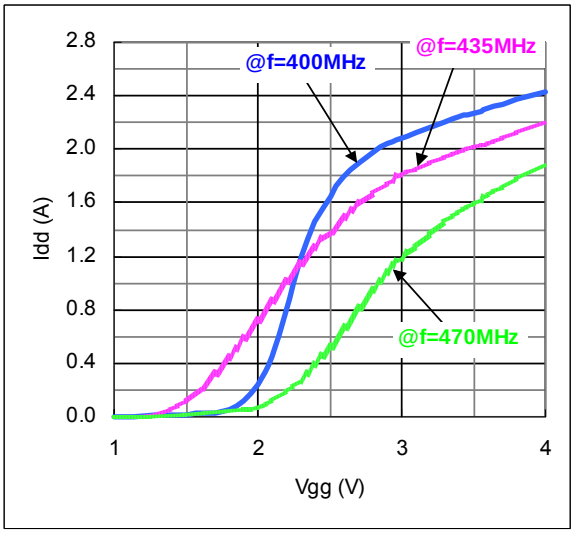
@ **f=470MHz**, Vgg=3.5V (Idq=404mA)

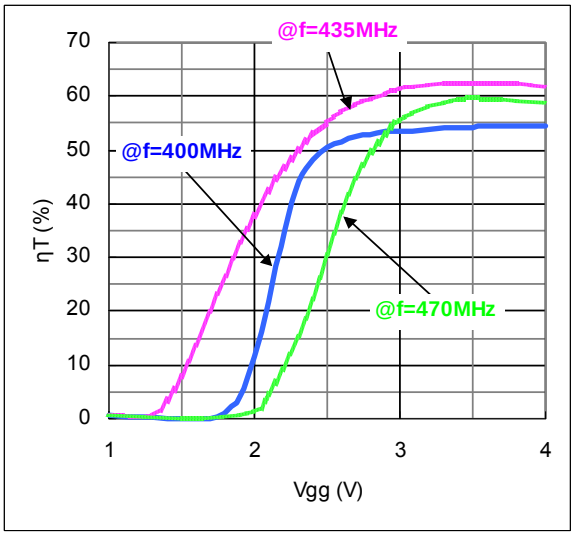
| Vdd (V) | Pi (W) | Pi (dBm) | Po (W) | Po (dBm) | Gp (dB) | Idd (A) | ηT (%) | P.A.E. (%) |
|---|---|---|---|---|---|---|---|---|
| 7.39 | 0.000 | -10.0 | 0.09 | 19.4 | 29.4 | 0.43 | 2.7 | 2.7 |
| 7.39 | 0.000 | -9.0 | 0.11 | 20.4 | 29.4 | 0.44 | 3.4 | 3.4 |
| 7.39 | 0.000 | -8.0 | 0.14 | 21.4 | 29.4 | 0.44 | 4.2 | 4.2 |
| 7.39 | 0.000 | -7.0 | 0.17 | 22.4 | 29.4 | 0.45 | 5.2 | 5.2 |
| 7.38 | 0.000 | -6.0 | 0.22 | 23.4 | 29.4 | 0.46 | 6.4 | 6.4 |
| 7.38 | 0.000 | -5.0 | 0.27 | 24.3 | 29.3 | 0.47 | 7.8 | 7.8 |
| 7.38 | 0.000 | -4.0 | 0.34 | 25.3 | 29.3 | 0.49 | 9.4 | 9.4 |
| 7.38 | 0.001 | -3.0 | 0.43 | 26.3 | 29.3 | 0.51 | 11.4 | 11.4 |
| 7.37 | 0.001 | -2.0 | 0.53 | 27.3 | 29.3 | 0.53 | 13.6 | 13.6 |
| 7.37 | 0.001 | -1.0 | 0.67 | 28.2 | 29.3 | 0.56 | 16.2 | 16.2 |
| 7.36 | 0.001 | 0.0 | 0.83 | 29.2 | 29.2 | 0.60 | 19.0 | 19.0 |
| 7.36 | 0.001 | 1.0 | 1.04 | 30.2 | 29.2 | 0.64 | 22.2 | 22.2 |
| 7.35 | 0.002 | 2.0 | 1.30 | 31.1 | 29.2 | 0.69 | 25.8 | 25.8 |
| 7.34 | 0.002 | 3.0 | 1.62 | 32.1 | 29.1 | 0.75 | 29.6 | 29.6 |
| 7.33 | 0.002 | 4.0 | 2.02 | 33.0 | 29.1 | 0.81 | 33.8 | 33.8 |
| 7.32 | 0.003 | 5.0 | 2.48 | 33.9 | 29.0 | 0.89 | 38.2 | 38.2 |
| 7.31 | 0.004 | 6.0 | 2.99 | 34.8 | 28.8 | 0.97 | 42.4 | 42.3 |
| 7.29 | 0.005 | 7.0 | 3.55 | 35.5 | 28.5 | 1.05 | 46.3 | 46.2 |
| 7.28 | 0.006 | 7.9 | 4.10 | 36.1 | 28.2 | 1.13 | 49.6 | 49.5 |
| 7.27 | 0.008 | 8.9 | 4.63 | 36.7 | 27.7 | 1.21 | 52.5 | 52.4 |
| 7.25 | 0.010 | 9.9 | 5.11 | 37.1 | 27.2 | 1.29 | 54.7 | 54.6 |
| 7.24 | 0.012 | 10.9 | 5.55 | 37.4 | 26.5 | 1.36 | 56.5 | 56.3 |
| 7.23 | 0.016 | 11.9 | 5.94 | 37.7 | 25.8 | 1.42 | 57.7 | 57.6 |
| 7.22 | 0.020 | 12.9 | 6.29 | 38.0 | 25.1 | 1.49 | 58.6 | 58.4 |
| 7.21 | 0.025 | 13.9 | 6.61 | 38.2 | 24.3 | 1.55 | 59.2 | 59.0 |
| 7.20 | 0.031 | 14.9 | 6.88 | 38.4 | 23.5 | 1.61 | 59.5 | 59.2 |
| 7.19 | 0.039 | 15.9 | 7.13 | 38.5 | 22.6 | 1.66 | 59.6 | 59.3 |
| 7.19 | 0.049 | 16.9 | 7.34 | 38.7 | 21.8 | 1.72 | 59.5 | 59.1 |
| 7.18 | 0.061 | 17.9 | 7.52 | 38.8 | 20.9 | 1.77 | 59.2 | 58.7 |
| 7.17 | 0.077 | 18.9 | 7.68 | 38.9 | 20.0 | 1.82 | 58.7 | 58.2 |
| 7.16 | 0.098 | 19.9 | 7.80 | 38.9 | 19.0 | 1.87 | 58.2 | 57.5 |

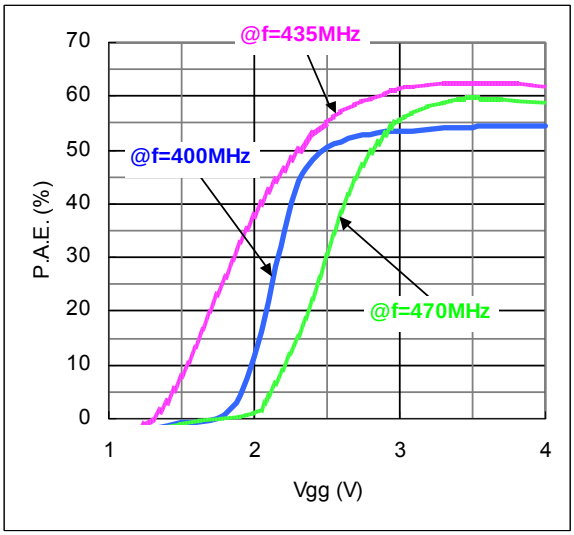
## Pout vs. Vgg characteristics

@ Vdd=7.2V, Pi=30mW (=14.77dBm), **f=400MHz, 435MHz, 470MHz**



## Pout vs. Vgg characteristics data

@ **f=400MHz,** Pi=30mW (=14.77dBm)

| Vgg (V) | Idq (A) | Po (W) | Po (dBm) | Idd (A) | ηT (%) | P.A.E. (%) |
|---|---|---|---|---|---|---|
| 1.8 | 0.000 | 0.00 | 5.0 | 0.05 | 0.9 | 0.6 |
| 1.9 | 0.000 | 0.04 | 15.5 | 0.11 | 4.3 | 4.2 |
| 2.0 | 0.000 | 0.20 | 23.0 | 0.24 | 11.5 | 11.4 |
| 2.1 | 0.000 | 0.71 | 28.5 | 0.45 | 21.9 | 21.9 |
| 2.2 | 0.000 | 2.00 | 33.0 | 0.79 | 35.0 | 35.0 |
| 2.3 | 0.000 | 3.78 | 35.8 | 1.19 | 44.2 | 44.2 |
| 2.4 | 0.001 | 5.06 | 37.0 | 1.46 | 48.3 | 48.3 |
| 2.5 | 0.003 | 5.98 | 37.8 | 1.65 | 50.4 | 50.4 |
| 2.6 | 0.006 | 6.63 | 38.2 | 1.79 | 51.5 | 51.5 |
| 2.7 | 0.012 | 7.16 | 38.5 | 1.90 | 52.4 | 52.4 |
| 2.8 | 0.022 | 7.53 | 38.8 | 1.98 | 52.9 | 52.9 |
| 2.9 | 0.038 | 7.83 | 38.9 | 2.04 | 53.4 | 53.3 |
| 3.0 | 0.063 | 8.03 | 39.0 | 2.09 | 53.5 | 53.5 |
| 3.2 | 0.148 | 8.41 | 39.2 | 2.17 | 53.9 | 53.9 |
| 3.4 | 0.300 | 8.74 | 39.4 | 2.24 | 54.2 | 54.2 |
| 3.5 | 0.408 | 8.87 | 39.5 | 2.27 | 54.2 | 54.2 |
| 3.6 | 0.530 | 9.03 | 39.6 | 2.31 | 54.4 | 54.4 |
| 3.8 | 0.850 | 9.29 | 39.7 | 2.37 | 54.5 | 54.5 |
| 4.0 | 1.225 | 9.52 | 39.8 | 2.43 | 54.4 | 54.3 |

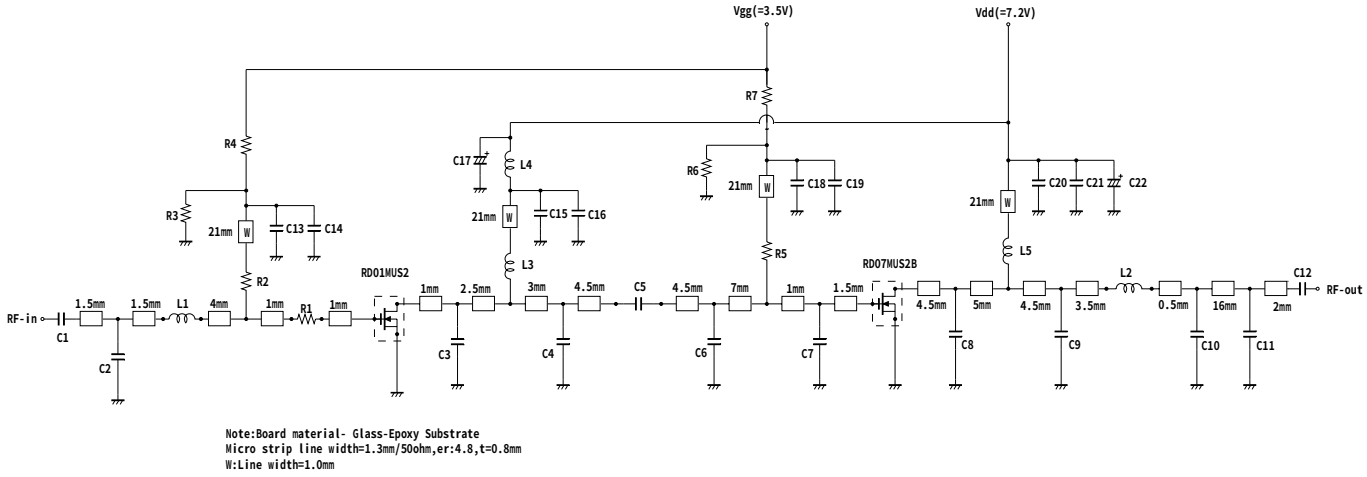
@ **f=435MHz**, Pi=30mW (=14.77dBm)

| Vgg (V) | Idq (A) | Po (W) | Po (dBm) | Idd (A) | ηT (%) | P.A.E. (%) |
|---|---|---|---|---|---|---|
| 1.4 | 0.000 | 0.01 | 10.9 | 0.05 | 3.2 | 2.9 |
| 1.5 | 0.000 | 0.07 | 18.3 | 0.12 | 7.7 | 7.6 |
| 1.6 | 0.000 | 0.20 | 23.0 | 0.21 | 13.4 | 13.3 |
| 1.7 | 0.000 | 0.45 | 26.6 | 0.32 | 19.8 | 19.8 |
| 1.8 | 0.000 | 0.83 | 29.2 | 0.44 | 26.3 | 26.2 |
| 1.9 | 0.000 | 1.36 | 31.3 | 0.58 | 32.5 | 32.5 |
| 2.0 | 0.000 | 1.92 | 32.8 | 0.71 | 37.5 | 37.5 |
| 2.1 | 0.000 | 2.62 | 34.2 | 0.86 | 42.3 | 42.3 |
| 2.2 | 0.000 | 3.35 | 35.3 | 1.00 | 46.4 | 46.4 |
| 2.3 | 0.000 | 4.10 | 36.1 | 1.14 | 49.8 | 49.8 |
| 2.4 | 0.001 | 4.80 | 36.8 | 1.26 | 52.7 | 52.7 |
| 2.5 | 0.003 | 5.50 | 37.4 | 1.39 | 55.2 | 55.2 |
| 2.6 | 0.006 | 6.13 | 37.9 | 1.49 | 57.0 | 57.0 |
| 2.7 | 0.012 | 6.70 | 38.3 | 1.59 | 58.5 | 58.5 |
| 2.8 | 0.022 | 7.15 | 38.5 | 1.67 | 59.6 | 59.6 |
| 2.9 | 0.038 | 7.58 | 38.8 | 1.74 | 60.5 | 60.4 |
| 3.0 | 0.063 | 7.95 | 39.0 | 1.80 | 61.3 | 61.3 |
| 3.2 | 0.148 | 8.50 | 39.3 | 1.90 | 62.0 | 62.0 |
| 3.4 | 0.300 | 8.91 | 39.5 | 1.98 | 62.4 | 62.4 |
| 3.5 | 0.408 | 9.07 | 39.6 | 2.02 | 62.5 | 62.5 |
| 3.6 | 0.530 | 9.21 | 39.6 | 2.05 | 62.4 | 62.4 |
| 3.8 | 0.850 | 9.51 | 39.8 | 2.12 | 62.3 | 62.3 |
| 4.0 | 1.225 | 9.78 | 39.9 | 2.20 | 61.9 | 61.9 |

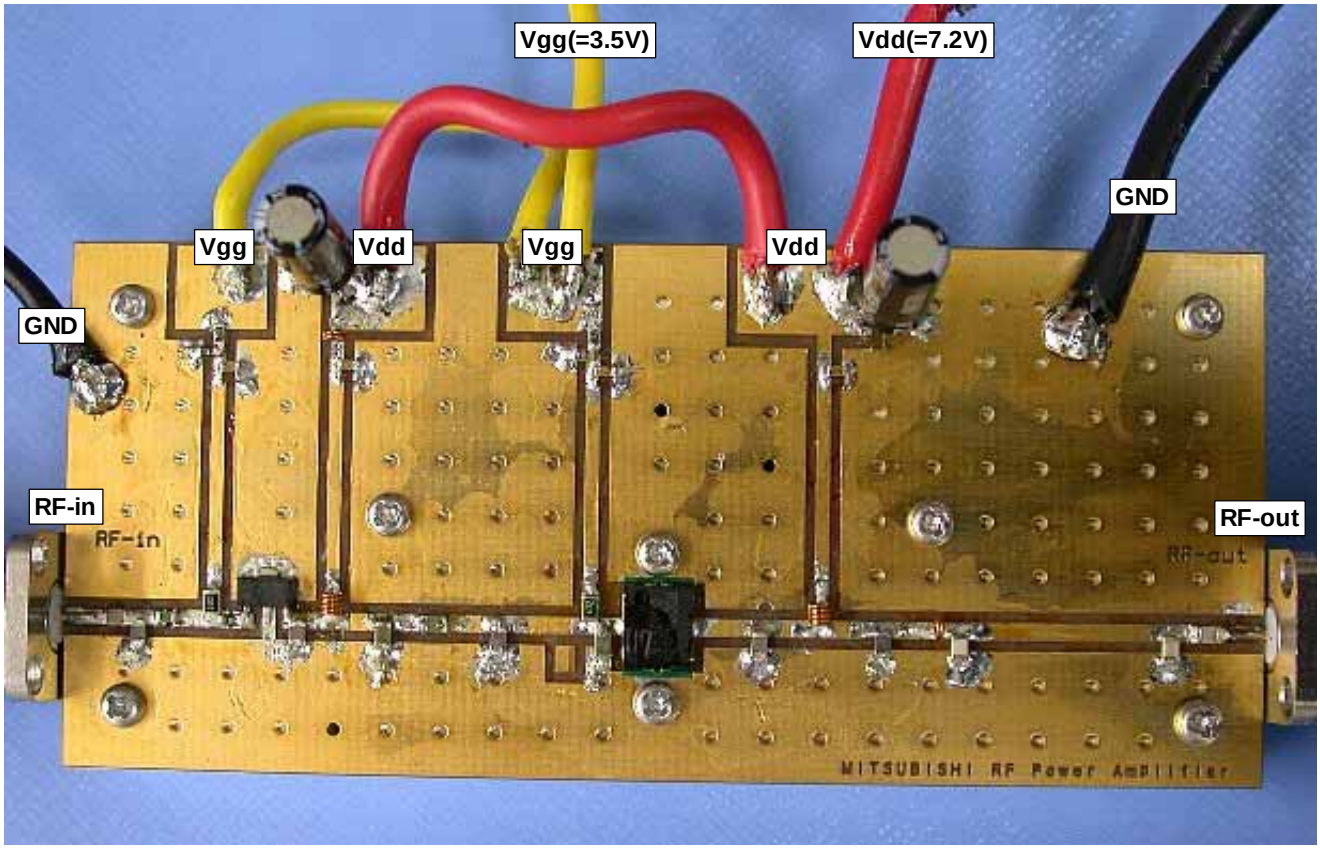
@ **f=470MHz**, Pi=30mW (=14.77dBm)

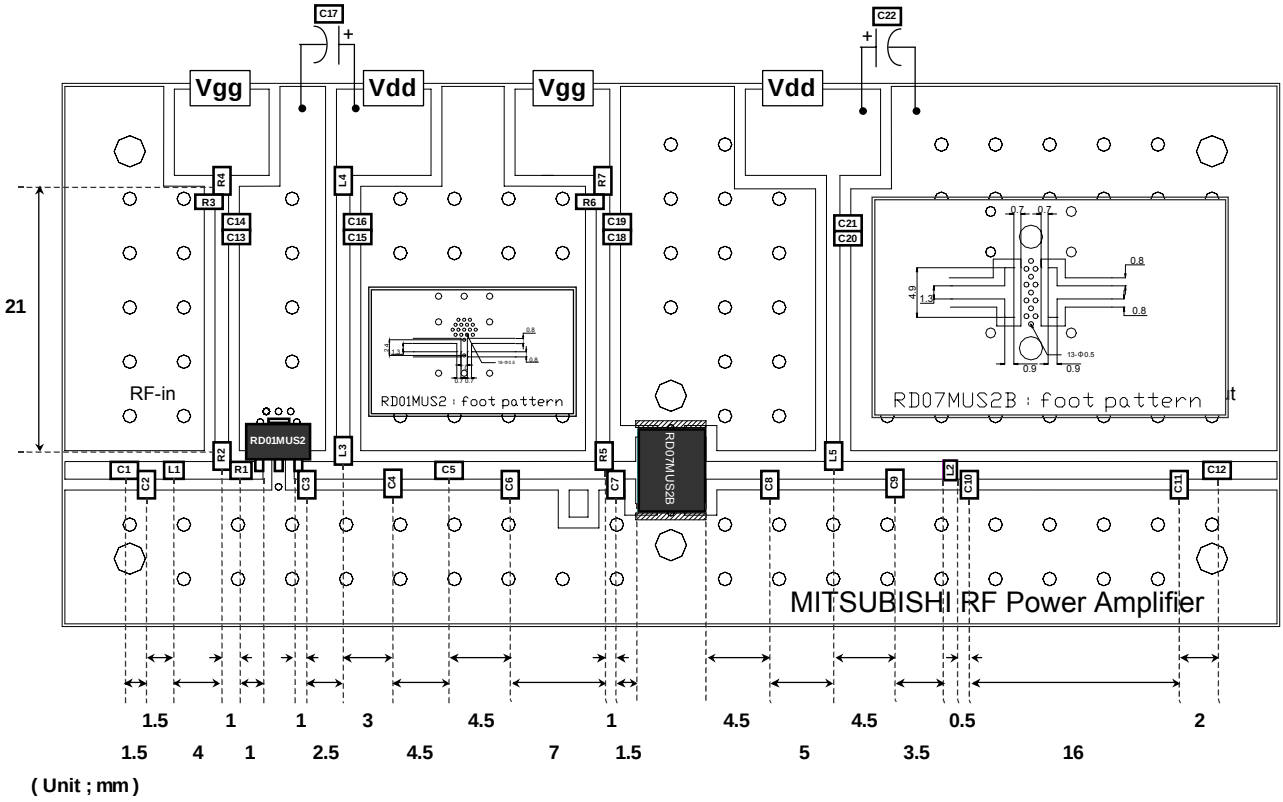
| Vgg (V) | Idq (A) | Po (W) | Po (dBm) | Idd (A) | ηT (%) | P.A.E. (%) |
|---|---|---|---|---|---|---|
| 2.0 | 0.000 | 0.01 | 7.8 | 0.06 | 1.3 | 1.1 |
| 2.1 | 0.000 | 0.04 | 15.7 | 0.11 | 4.6 | 4.4 |
| 2.2 | 0.000 | 0.12 | 20.7 | 0.18 | 9.0 | 9.0 |
| 2.3 | 0.000 | 0.30 | 24.7 | 0.27 | 15.2 | 15.2 |
| 2.4 | 0.001 | 0.61 | 27.8 | 0.38 | 22.2 | 22.2 |
| 2.5 | 0.003 | 1.13 | 30.5 | 0.51 | 30.5 | 30.4 |
| 2.6 | 0.006 | 1.82 | 32.6 | 0.66 | 38.3 | 38.3 |
| 2.7 | 0.012 | 2.60 | 34.2 | 0.81 | 44.7 | 44.7 |
| 2.8 | 0.022 | 3.37 | 35.3 | 0.95 | 49.4 | 49.4 |
| 2.9 | 0.038 | 4.09 | 36.1 | 1.07 | 52.9 | 52.9 |
| 3.0 | 0.063 | 4.73 | 36.8 | 1.19 | 55.5 | 55.5 |
| 3.2 | 0.148 | 5.74 | 37.6 | 1.37 | 58.0 | 58.0 |
| 3.4 | 0.300 | 6.53 | 38.2 | 1.53 | 59.3 | 59.3 |
| 3.5 | 0.408 | 6.85 | 38.4 | 1.60 | 59.6 | 59.6 |
| 3.6 | 0.530 | 7.12 | 38.5 | 1.66 | 59.5 | 59.5 |
| 3.8 | 0.850 | 7.58 | 38.8 | 1.78 | 59.1 | 59.1 |
| 4.0 | 1.225 | 7.97 | 39.0 | 1.89 | 58.7 | 58.7 |

## Equivalent circuit (@f=400 to 470MHz)




| Parts Type | | Value | Type name | Vender |
|---|---|---|---|---|
| Capacitor | C1 | 100pF | GRM2162C1H101GD01E | Murata Manufacturing Co., Ltd. |
| | C2 | 12pF | GRM2162C1H120GD01E | Murata Manufacturing Co., Ltd. |
| | C3 | 22pF | GRM2162C1H220GD01E | Murata Manufacturing Co., Ltd. |
| | C4 | 8pF | GRM2162C1H8R0DD01E | Murata Manufacturing Co., Ltd. |
| | C5 | 39pF | GRM2162C1H390GD01E | Murata Manufacturing Co., Ltd. |
| | C6 | 20pF | GRM2162C1H200GD01E | Murata Manufacturing Co., Ltd. |
| | C7 | 54pF | GRM2162C1H540GD01E | Murata Manufacturing Co., Ltd. |
| | C8 | 24pF | GRM2162C1H240GD01E | Murata Manufacturing Co., Ltd. |
| | C9 | 20pF | GRM2162C1H200GD01E | Murata Manufacturing Co., Ltd. |
| | C10 | 3pF | GRM2163C1H3R0CD01E | Murata Manufacturing Co., Ltd. |
| | C11 | 3pF | GRM2163C1H3R0CD01E | Murata Manufacturing Co., Ltd. |
| | C12 | 100pF | GRM2162C1H101GD01E | Murata Manufacturing Co., Ltd. |
| | C13 | 1000pF | GRM216R11H102KA01E | Murata Manufacturing Co., Ltd. |
| | C14 | 10000pF | GRM216R11H103KA01E | Murata Manufacturing Co., Ltd. |
| | C15 | 1000pF | GRM216R11H102KA01E | Murata Manufacturing Co., Ltd. |
| | C16 | 10000pF | GRM216R11H103KA01E | Murata Manufacturing Co., Ltd. |
| | C17 | 22µF | A0603 | NICHICON CORPORATION |
| | C18 | 1000pF | GRM216R11H102KA01E | Murata Manufacturing Co., Ltd. |
| | C19 | 10000pF | GRM216R11H103KA01E | Murata Manufacturing Co., Ltd. |
| | C20 | 1000pF | GRM216R11H102KA01E | Murata Manufacturing Co., Ltd. |
| | C21 | 10000pF | GRM216R11H103KA01E | Murata Manufacturing Co., Ltd. |
| | C22 | 22µF | A0603 | NICHICON CORPORATION |
| Resistance | R1 | 12 OHM | RPC05-120 | Taiyosha Electric Co.,Ltd. |
| | R2 | 1K OHM | RPC10-102 | Taiyosha Electric Co.,Ltd. |
| | R3 | 56K OHM | RPC05-563 | Taiyosha Electric Co.,Ltd. |
| | R4 | 20K OHM | RPC05-203 | Taiyosha Electric Co.,Ltd. |
| | R5 | 4.7K OHM | CR1/10-472JB | Hokuriku Electric Industry Co.,Ltd. |
| | R6 | 15K OHM | RPC05-153 | Taiyosha Electric Co.,Ltd. |
| | R7 | 20K OHM | RPC05-203 | Taiyosha Electric Co.,Ltd. |
| Inductance | L1 | 8.2nH(Chip Inductor) | LQG11A8N2S00 | Murata Manufacturing Co., Ltd. |
| | L2 | 6.6nH Enameled wire 2Turns, Diameter:0.23mm,φ1.66mm (the out side diameter) | 2302S | Yoneda Processing Place Co.,Ltd. |
| | L3 | 31.0nH Enameled wire 6Turns, Diameter:0.23mm,φ1.66mm (the out side diameter) | 2306C | Yoneda Processing Place Co.,Ltd. |
| | L4 | 6.6nH Enameled wire 2Turns, Diameter:0.23mm,φ1.66mm (the out side diameter) | 2302S | Yoneda Processing Place Co.,Ltd. |
| | L5 | 31.0nH Enameled wire 6Turns, Diameter:0.23mm,φ1.66mm (the out side diameter) | 2306C | Yoneda Processing Place Co.,Ltd. |


Vgg(=3.5V)
Vdd(=7.2V)
GND
Vgg
Vdd
Vgg
Vdd
GND
RF-in
RF-in
RF-out
RF-out
MITSUBISHI RF Power Amplifier


C17
C22
Vgg
Vdd
Vgg
Vdd
21
RF-in
RD01MUS2 : foot pattern
RD07MUS2B : foot pattern
RD01MUS2
RD07MUS2B
MITSUBISHI RF Power Amplifier
1.5
1
1
3
4.5
1
4.5
4.5
0.5
2
1.5
4
1
2.5
4.5
7
1.5
5
3.5
16
( Unit ; mm )