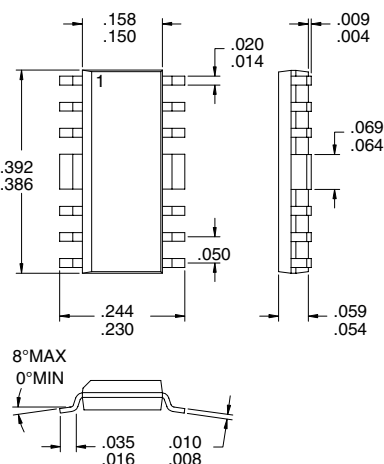


Typical Applications

- Analog Communication Systems
- 900MHz Spread Spectrum Systems
- 400MHz Industrial Radios
- Driver Stage for Higher Power Applications
- 3V Applications

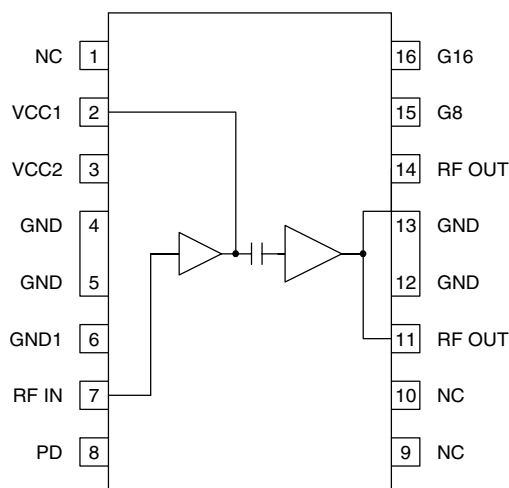
Product Description

The RF2155 is a 3V medium power programmable gain amplifier IC. The device is manufactured on an advanced Gallium Arsenide Heterojunction Bipolar Transistor (HBT) process, and has been designed for use as the final RF amplifier in analog cellular phone transmitters or ISM applications operating at 915MHz. The device is self-contained with the exception of the output matching network and power supply feed line. A two-bit digital control provides 4 levels of power control, in 8dB steps.



Optimum Technology Matching® Applied

- | | | |
|-------------------------------------|--|--------------------------------------|
| <input type="checkbox"/> Si BJT | <input checked="" type="checkbox"/> GaAs HBT | <input type="checkbox"/> GaAs MESFET |
| <input type="checkbox"/> Si Bi-CMOS | <input type="checkbox"/> SiGe HBT | <input type="checkbox"/> Si CMOS |



Functional Block Diagram

Package Style: SOP-16 BW

Features

- Single 3V Supply
- 500mW CW Output Power
- 31dB Small Signal Gain
- Up to 60% Efficiency
- Digitally Controlled Output Power
- 430MHz to 930MHz Frequency Range

Ordering Information

| | |
|-------------|--------------------------------------|
| RF2155 | 3V Programmable Gain Power Amplifier |
| RF2155 PCBA | Fully Assembled Evaluation Board |

RF Micro Devices, Inc.
7625 Thorndike Road
Greensboro, NC 27409, USA

Tel (336) 664 1233
Fax (336) 664 0454
<http://www.rfmd.com>

Absolute Maximum Ratings

| Parameter | Rating | Unit |
|---------------------------------------|--------------|-----------------|
| Supply Voltage | -0.5 to +5.5 | V _{DC} |
| Power Down Voltage (V _{PD}) | -0.5 to +3.3 | V |
| DC Supply Current | 500 | mA |
| Input RF Power | +10 | dBm |
| Output Load VSWR | 10:1 | |
| Ambient Operating Temperature | -30 to +85 | °C |
| Storage Temperature | -40 to +150 | °C |



Caution! ESD sensitive device.

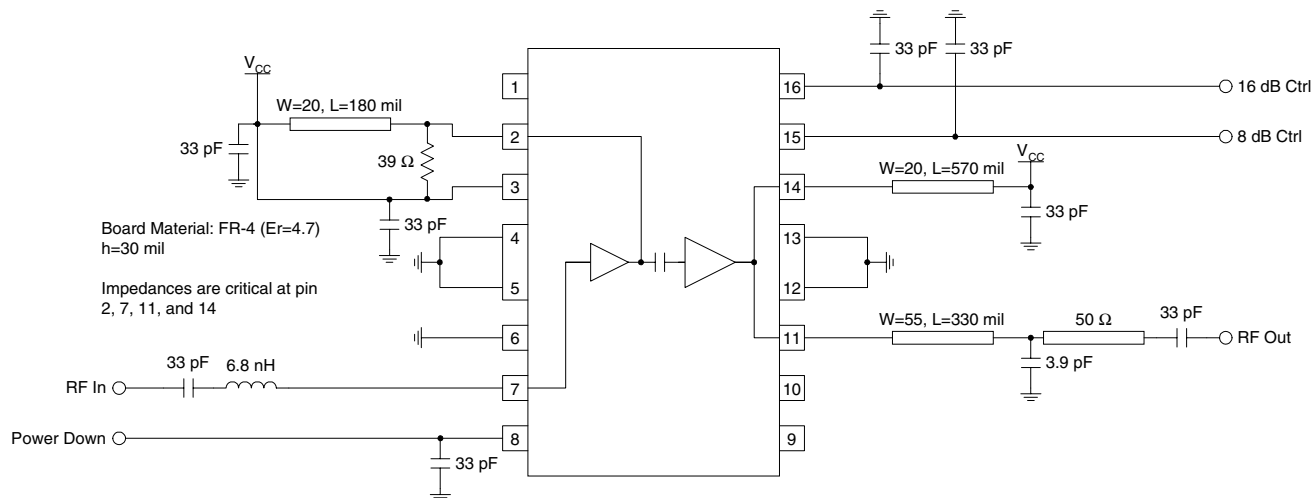
RF Micro Devices believes the furnished information is correct and accurate at the time of this printing. However, RF Micro Devices reserves the right to make changes to its products without notice. RF Micro Devices does not assume responsibility for the use of the described product(s).

| Parameter | Specification | | | Unit | Condition |
|-------------------------|---------------|------------|-------|------|---|
| | Min. | Typ. | Max. | | |
| Overall | | | | | T=25 °C, V _{CC} =3.6V, V _{PD} =3.0V, Z _{LOAD} =13Ω, P _{IN} =0dBm, Freq=915MHz |
| Frequency Range | | 430 to 930 | | MHz | |
| Maximum CW Output Power | | 450 | | mW | V _{CC} =3.6V |
| | | 300 | | mW | V _{CC} =3.0V |
| Small Signal Gain | | 31 | | dB | |
| Second Harmonic | | -30 | | dBc | Without external second harmonic trap |
| Third Harmonic | | -40 | | dBc | |
| Fourth Harmonic | | -36 | | dBc | |
| Input VSWR | | 2:1 | | | All gain settings |
| CW Efficiency | 50 | 56 | | % | G16="high", G8="high", P _{IN} =0dBm |
| Output Load VSWR | 6:1 | | | | Spurious<-60dBc |
| Power Control | | | | | |
| Power Down "ON" | 2.7 | 2.8 | 3.0 | V | Voltage supplied to the input |
| Power Down "OFF" | 0 | 0.5 | 0.8 | V | Voltage supplied to the input |
| PD Input Current | | 3.7 | 5.0 | mA | Only in "ON" state |
| G16, G8 "ON" | 2.2 | 2.5 | 3.0 | V | Voltage supplied to the input |
| G16, G8 "OFF" | 0 | 0.3 | 0.5 | V | Voltage supplied to the input |
| G16, G8 Input Current | 0.8 | 1.0 | 1.6 | mA | Only in "ON" state |
| Output Power | +25.5 | +26.5 | +28.0 | dBm | G16="high", G8="high", P _{IN} =0dBm |
| | +16.0 | +18.5 | +21.0 | dBm | G16="high", G8="low", P _{IN} =0dBm |
| | +8.0 | +10.5 | +13.0 | dBm | G16="low", G8="high", P _{IN} =0dBm |
| | -1.0 | +1.5 | +4.0 | dBm | G16="low", G8="low", P _{IN} =0dBm |
| Turn On/Off Time | | | 100 | ns | |
| Power Supply | | | | | |
| Power Supply Voltage | | 3.6 | | V | Specifications |
| | 3.0 | | 5.0 | V | Operating limits |
| Power Supply Current | | 225 | 300 | mA | G16="high", G8="high", P _{IN} =0dBm |
| | | 90 | 115 | mA | G16="high", G8="low", P _{IN} =0dBm |
| | | 37 | 55 | mA | G16="low", G8="high", P _{IN} =0dBm |
| | | 25 | 35 | mA | G16="low", G8="low", P _{IN} =0dBm |
| | 20 | 50 | 110 | mA | G16="high", G8="high", No RF In |
| | | 1 | 10 | μA | G16="low", G8="low", PD="low" |

| Pin | Function | Description | Interface Schematic |
|-----|----------|---|---------------------|
| 1 | NC | Not internally connected. | |
| 2 | VCC1 | Positive supply for the first stage (driver) amplifier. This is an unmatched transistor collector output. This pin should see an inductive path to AC ground (V_{CC} with a UHF bypassing capacitor). This inductance can be achieved with a short, thin microstrip line (approximately equivalent to 0.4 nH). At lower frequencies, the inductance value should be larger (longer microstrip line) and V_{CC} should be bypassed with a larger bypass capacitor. This inductance forms a matching network with the amplifier stages, setting the amplifier's frequency of maximum gain. An additional 1 μ F bypass capacitor in parallel with the UHF bypass capacitor is also recommended, but placement of this component is not as critical. A resistor of 39 Ω from this pin to pin 3 is necessary to ensure stability under extreme output VSWR conditions. | |
| 3 | VCC2 | Positive supply for the bias circuits. This pin should be bypassed with a single UHF capacitor, placed as close as possible to the package. | |
| 4 | GND | Ground connection. Keep traces physically short and connect immediately to the ground plane for best performance. | |
| 5 | GND | Same as pin 4. | |
| 6 | GND1 | Ground return for the first stage; this should be connected to a via very close to the device. | |
| 7 | RF IN | Amplifier RF input. This is a 50 Ω RF input port to the amplifier. To improve the input match over all four gain control settings, an input inductor of 6.8 nH should be added. The amplifier does not contain internal DC blocking and, therefore, should be externally DC blocked before connecting to any device which has DC present or which contains a DC path to ground. A series UHF capacitor is recommended for the DC blocking. | See pin 2. |
| 8 | PD | Power down control voltage. When this pin is at 0V, the device will be in power down mode, dissipating minimum DC power. When this pin is at 3V the device will be in full power mode delivering maximum available gain and output power capability. This pin should not, in any circumstance, be higher than 3.3V. This pin should also have an external UHF and HF bypassing capacitor. | |
| 9 | NC | Not internally connected. | |
| 10 | NC | Not internally connected. | |
| 11 | RF OUT | Amplifier RF output. This is an unmatched collector output of the final amplifier transistor. It is internally connected to pins 11 and 14 to provide low series inductance and flexibility in output matching. Bias for the final power amplifier output transistor must also be provided through one of these pins. Typically, pin 14 is used to supply bias. A transmission line of approximately 500 mils length, followed by a bypass capacitor, is adequate. This pin can also be used to create a second harmonic trap. A UHF and large tantalum (1 μ F) capacitor should be placed on the power supply side of the bias inductor. Pin 11 should be used for the RF output with a matching network that presents the optimum load impedance to the PA for maximum power and efficiency, as well as providing DC blocking at the output. | |
| 12 | GND | Same as pin 4. | |
| 13 | GND | Same as pin 4. | |
| 14 | RF OUT | Same as pin 11. | |
| 15 | G8 | RF output power gain control 8dB bit (see specification table for logic). The control voltage at this pin should never exceed 3.3V and a logic high should be at least 2.7V. This pin should also have an external UHF bypassing capacitor. | |

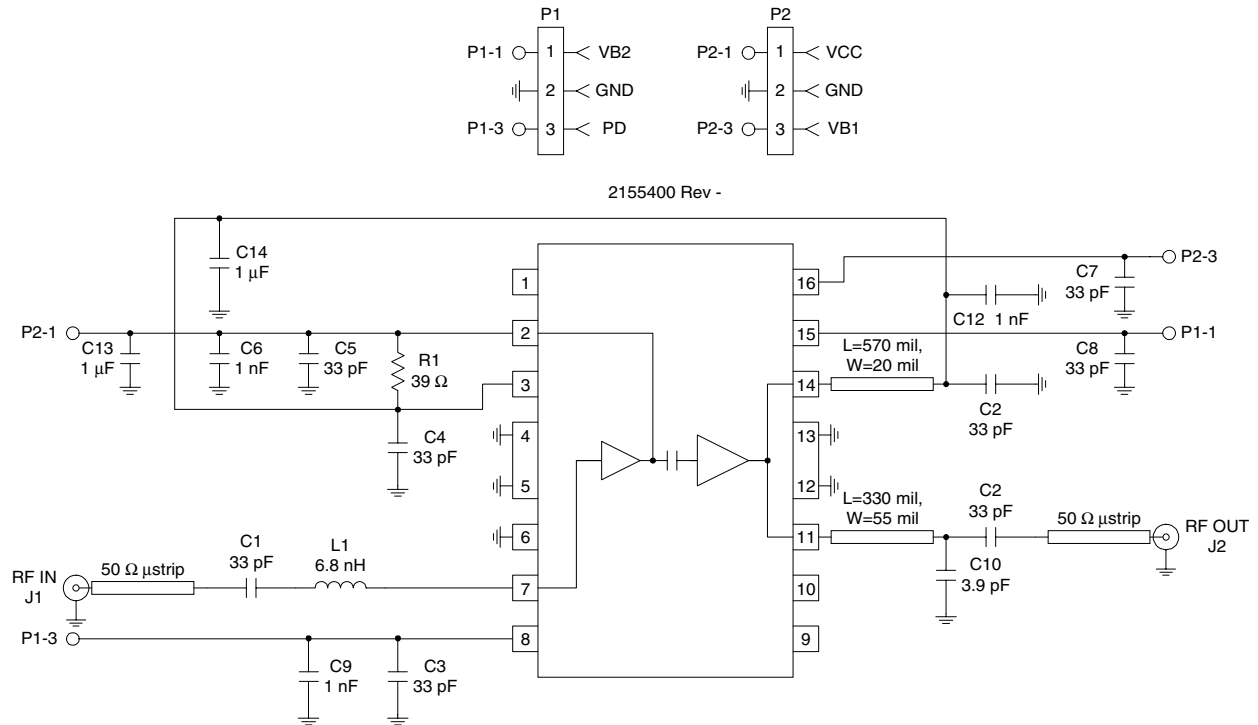
| Pin | Function | Description | Interface Schematic |
|-----|----------|--|---------------------|
| 16 | G16 | RF output power gain control 16dB bit (see specification table for logic). The control voltage at this pin should never exceed 3.3V and a logic high should be at least 2.7V. This pin should also have an external UHF bypassing capacitor. | Same as pin 15. |

Application Schematic 915 MHz

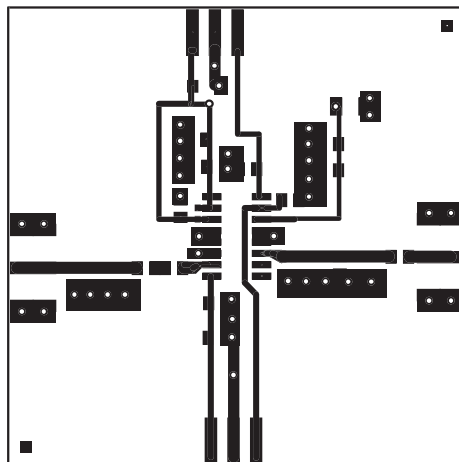
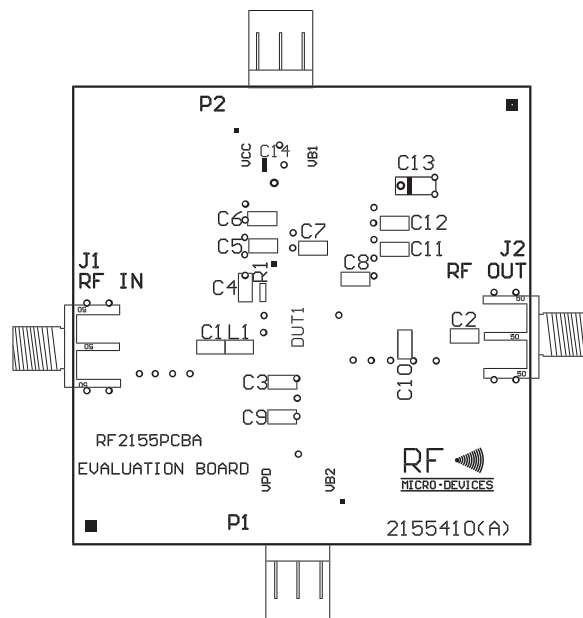


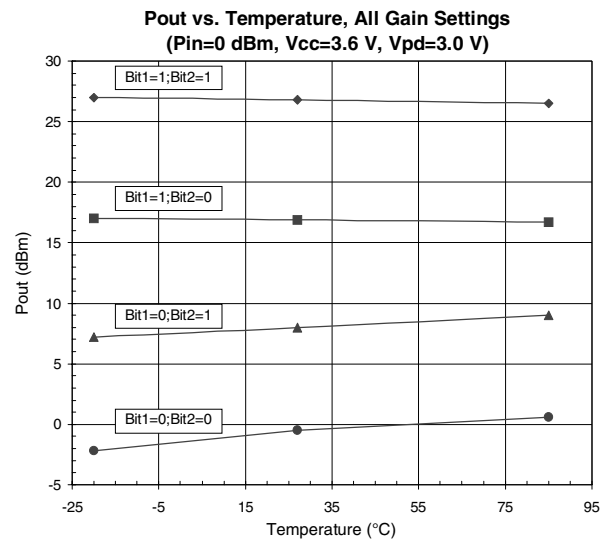
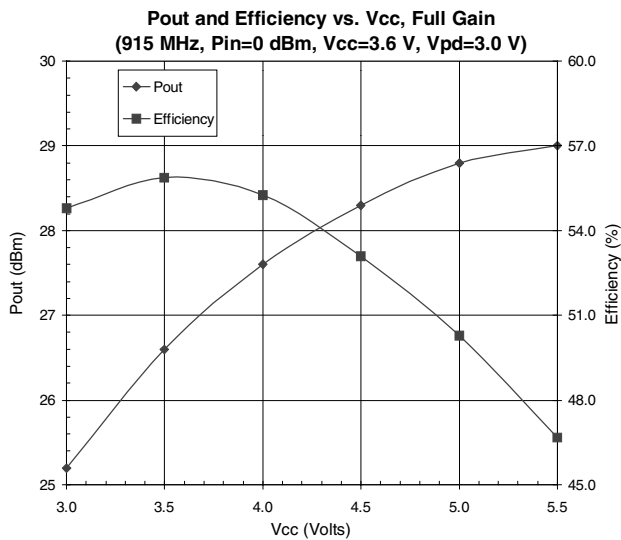
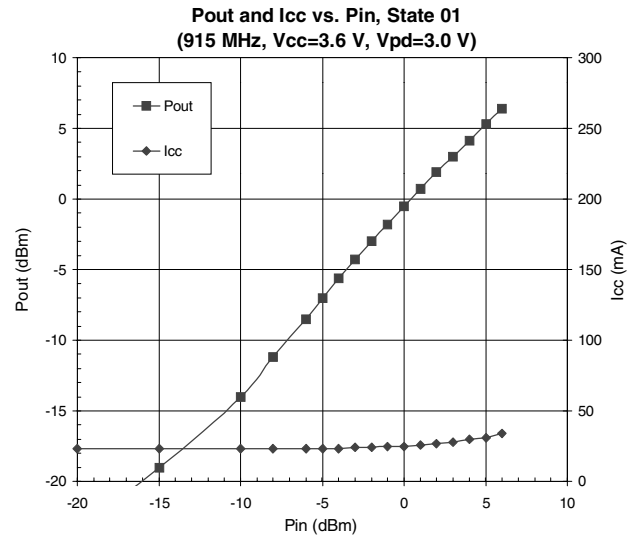
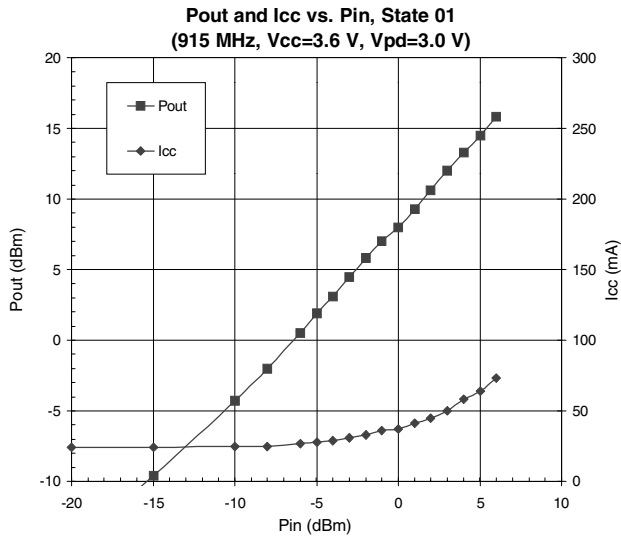
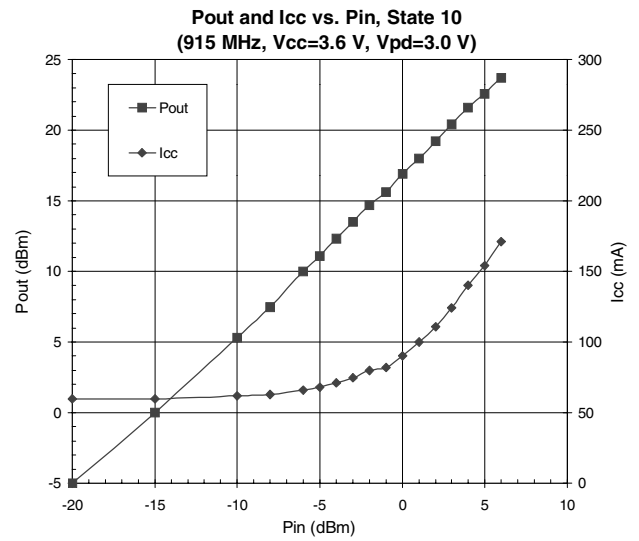
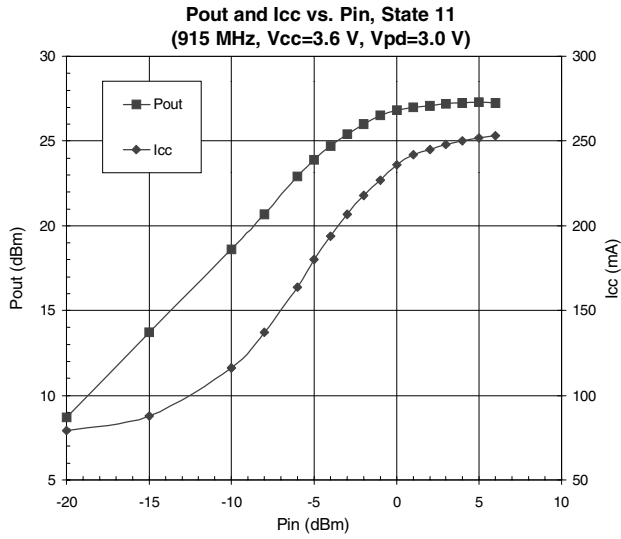
Evaluation Board Schematic

(Download [Bill of Materials](http://www.rfmd.com) from www.rfmd.com.)

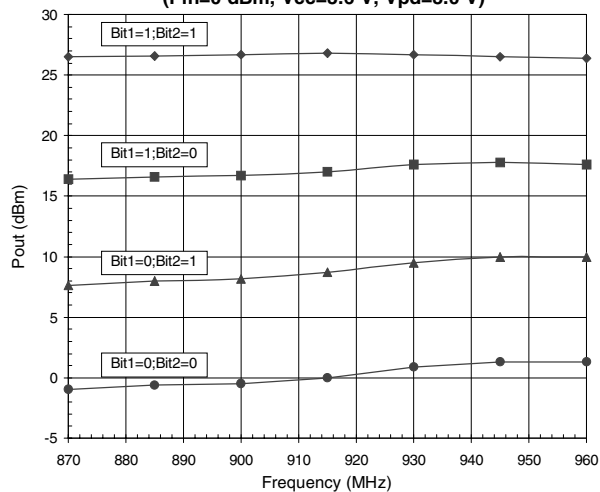


Evaluation Board Layout Board Size 2.0" x 2.0"





Pout vs. Frequency, All Gain Settings
(Pin=0 dBm, Vcc=3.6 V, Vpd=3.0 V)



Icc vs. Frequency, All Gain Settings
(Pin=0 dBm, Vcc=3.6 V, Vpd=3.0 V)

