## FEATURES

- Direct up/down conversion with differential IQ in/out
- Wide IF bandwidth 0 – 12 GHz
- IIP3 typical 24 dBm
- 30 dB LO to RF isolation
- 9 dB conversion loss

## TYPICAL APPLICATIONS

- WiGig
- V-band point to point communication
- Instrumentation
- Fiber over radio

## DESCRIPTION

The gMDR0037 is a highly linear and balanced direct IQ modulator or a demodulator that covers the V and E-band. Baseband inputs are IQ and IQ complementary signals from DC up to 12 GHz. Both LO and image suppression are excellent throughout the E-band. LO-RF isolation features 30 dB and image suppression 25 dB.

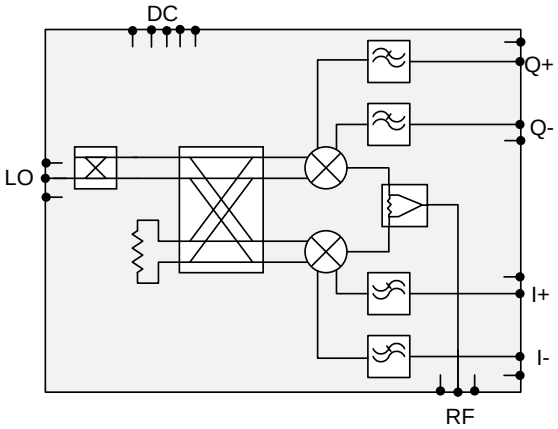


Figure 1. Block diagram of gMDR0037

## ELECTRICAL PERFORMANCE

Table 1. Electrical performance $T_A$=25C

| Parameter | Min | Typ | Max | Unit |
|---|---|---|---|---|
| RF Frequency | 57 (55) | | 66 (75) | GHz |
| LO Frequency | 57 (55) | | 66 (75) | GHz |
| IF Frequency | DC | | 12 | GHz |
| Conversion loss | 11 | 9 | 8 | dB |
| LO power | 7 | 13 | 16 | dBm |
| Power consumption | | 0 | | mW |
| OIP3 | | 15 | | dBm |
| IIP3 | | 24 | | dBm |
| OIP2 | | 45 | | dBm |
| IIP2 | | TBD | | dBm |
| Input referred P1dB | 13 | | | dBm |
| LO to RF suppresion[1] | | 40 | | dBc |
| RF return loss | | 10 | | dB |
| Image Rejection | | 25 | | dB |
| IF return loss | | TBD | | dB |
| LO return loss | | 10 | | dB |

## MEASURED PERFORMANCE

The chip has been measured on-wafer using CW and 2-tone input test signals. The transmitter uses typical bias settings if not specified differently.

Table 2. Test conditions

| Parameter | Setting |
|---|---|
| IF input power | -5 dBm/tone |
| IF input frequency | 1 GHz |
| Frequency separation | 10 MHz |
| Temperature | 25°C |

[1] Apply I+, I-, Q+ and Q- DC offset voltage for LO cancellation.

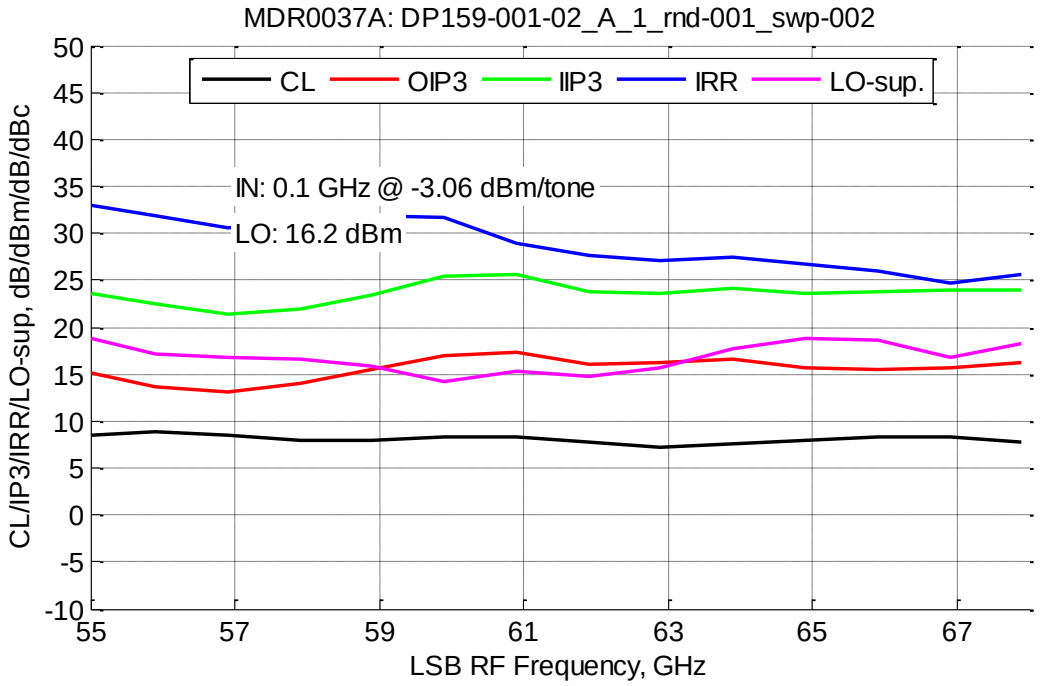


Figure 1. Conver. loss (CL), OIP3, IP3, image rej. (IRR) and LO-suppresion vs RF frequency at 55 – 68 GHz

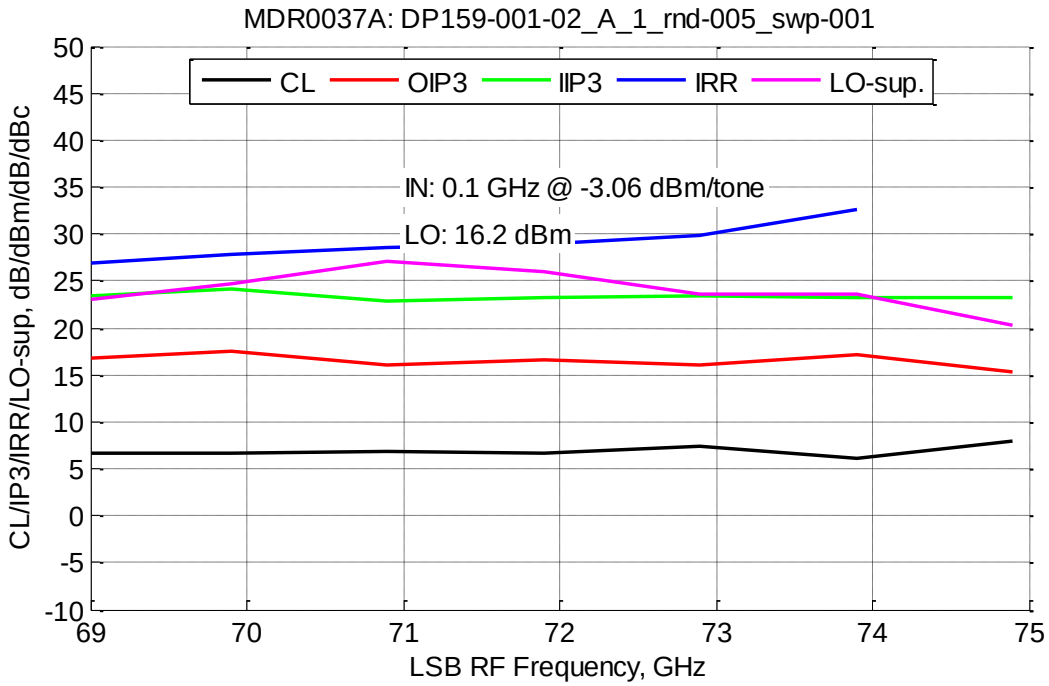


Figure 2. Conver. loss (CL), OIP3, IP3, image rej. (IRR) and LO-suppresion vs RF frequency at 69 – 75 GHz



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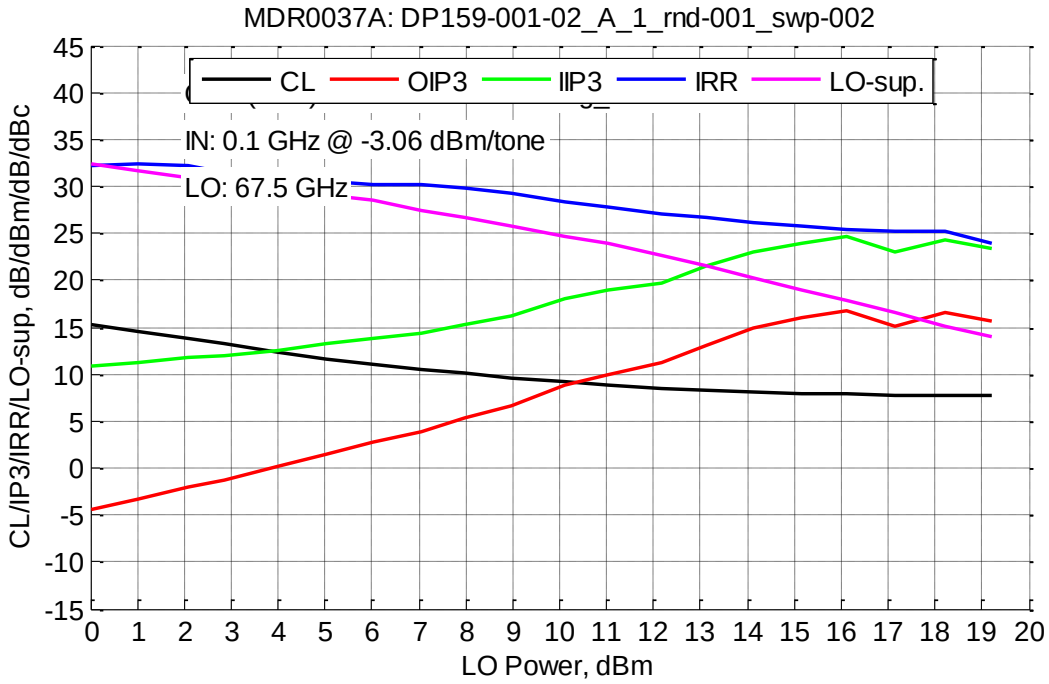


Figure 3. Conver. loss (CL), OIP3, IP3, image rej. (IRR) and LO-suppresion vs RF frequency vs LO power

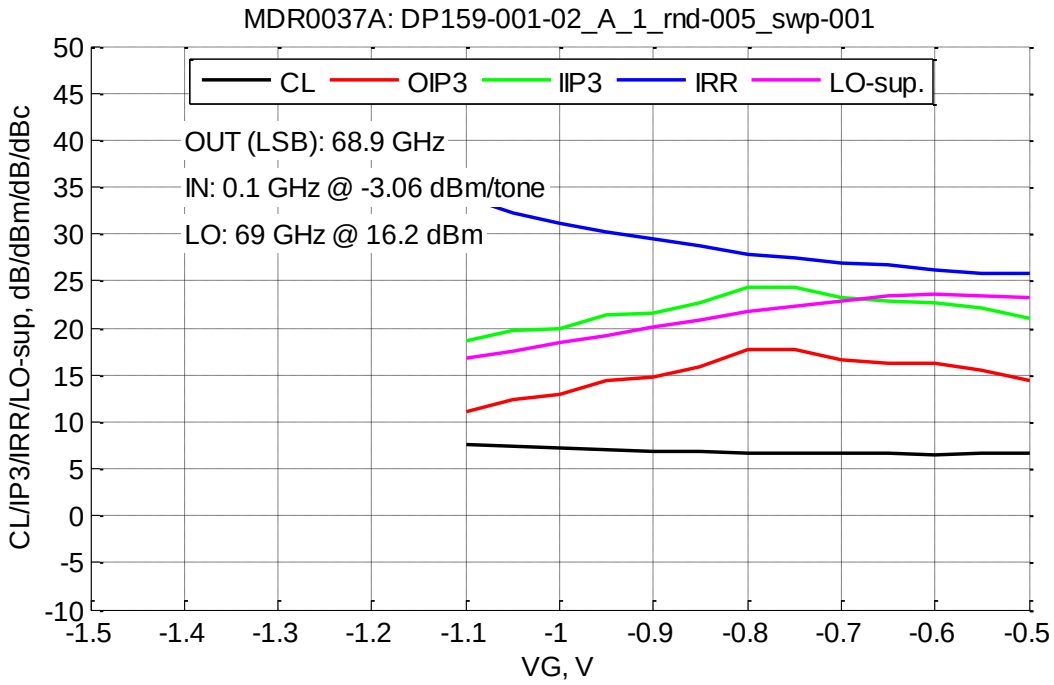


Figure 4. Conver. loss (CL), OIP3, IP3, image rej. (IRR) and LO-suppresion vs RF frequency vs Vg mix bias.

# RECOMMENDED OPERATING CONDITIONS

Table 3. Electrical settings on connector P1

| Connector P1 | Pad No. | Bias settings (V/mA) | | | I/O |
|---|---|---|---|---|---|
| | | Min | Typ | Max | |
| NC | 1 | | | | |
| GND | 2 | | | | |
| VG_MIX | 3 | -1.2 | -0.8 | -0.6 | Input |

Table 4. Electrical settings on connector P2

| Connector P2 | Pad No. | Interface | I/O |
|---|---|---|---|
| GND | 4 | | Ground |
| RF | 5 | $Z_0$ = 50 Ohm, AC coupled | Input/ Output |
| GND | 6 | | Ground |

Table 5. Electrical settings on connector P3

| Connector P3 | Pad No. | Interface | I/O |
|---|---|---|---|
| GND | 7 | | Ground |
| LO | 8 | $Z_0$ = 50 Ohm, AC coupled | Input |
| GND | 9 | | Ground |

Table 6. Electrical settings on connector P4

| Connector P4 | Pad No. | Interface | I/O |
|---|---|---|---|
| GND | 10 | | Ground |
| I+ | 11 | $Z_0$ = 100 Ohm differential impedance, DC coupled | Input |
| I- | 12 | | Input |
| GND | 13 | | Ground |
| Q+ | 14 | $Z_0$ = 100 Ohm differential impedance, DC coupled | Input |
| Q- | 15 | | Input |
| GND | 16 | | Ground |

Table 7. Absolute Maximum Ratings

| | |
|---|---|
| Gate bias voltage | -2 to + 0.7 V |
| Gate-drain breakdown | 8 V |
| IF in (I/I_/Q/Q_) | +13 dBm/ch. |
| IF in (I/I_/Q/Q_) | 5 Vpp/ch. |
| LO drive | +23 dBm |
| Operating temperature | -40 to + 85 C |
| Storage temperature | -65 to +150 C |

## OUTLINE DRAWING

Distances are in µm. Drawing is also available in dxf-file format on the web. The substrate thickness is 50 µm (GaAs).

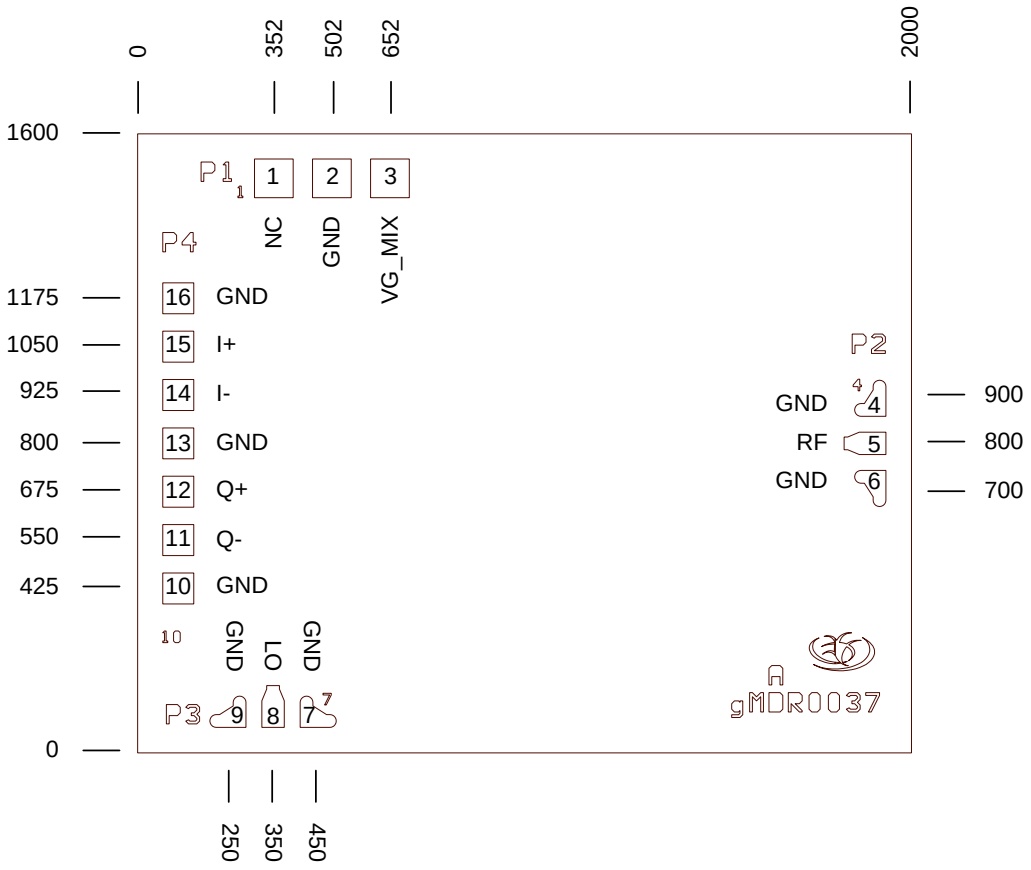


Figure 5. Outline drawing of the chip. Dimensions are in um.