

FEATURES

- ζ Direct up/down conversion with differential IQ in/out
- ζ Wide IF bandwidth 0 – 12 GHz
- ζ 30 dB LO to RF isolation
- ζ 10 dB conversion loss

TYPICAL APPLICATIONS

- ζ 94 GHz imaging and radars
- ζ E- and W-band point to point communication
- ζ Another bullet
- ζ 77 GHz Automotive radar
- ζ Fiber over radio

DESCRIPTION

The gMDR0013 is a direct IQ modulator or a demodulator that covers the E and W-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. LO drive power is at modest 7 dBm.

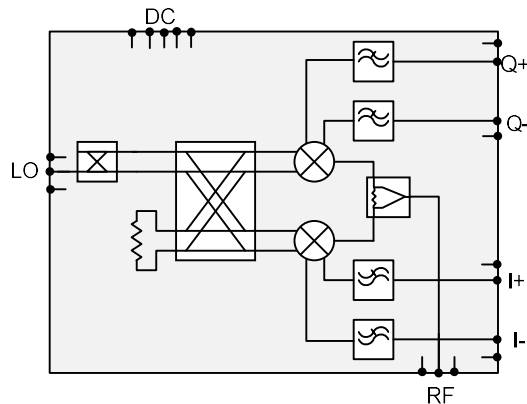


Figure 1. Block diagram of gMDR0013

ELECTRICAL PERFORMANCE

Table 1. Electrical performance $T_A=25^{\circ}\text{C}$

Parameter	Min	Typ	Max	Unit
RF Frequency	70		100	GHz
LO Frequency	69		101	GHz
IF Frequency	DC		12	GHz
Conversion loss		10		dB
LO power	7	7	12	dBm
Power consumption		0		mW
OIP3		10		dBm
IIP3		20		dBm
OIP2		TBD		dBm
IIP2		TBD		dBm
P1dB	>5			dBm
LO to RF suppression ^[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	-10 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.

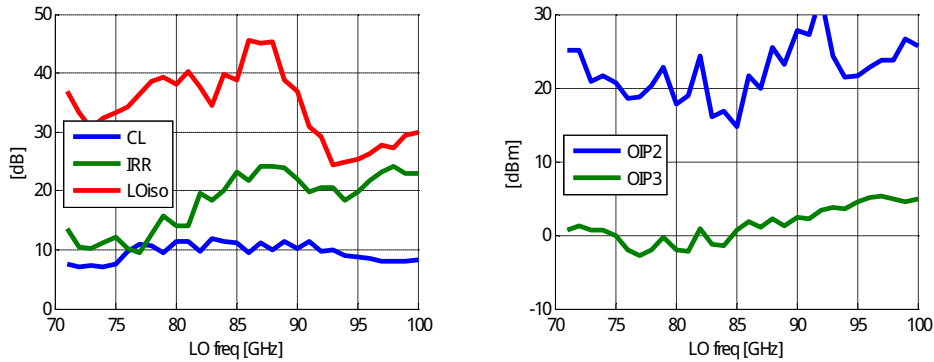


Figure 1. (Left) Conversion loss (CL), Image rejection (IRR) and LO isolation vs LO freq, IF freq = 1 GHz. (Right) OIP2 and OIP3 vs LO freq, IF freq = 1 GHz.

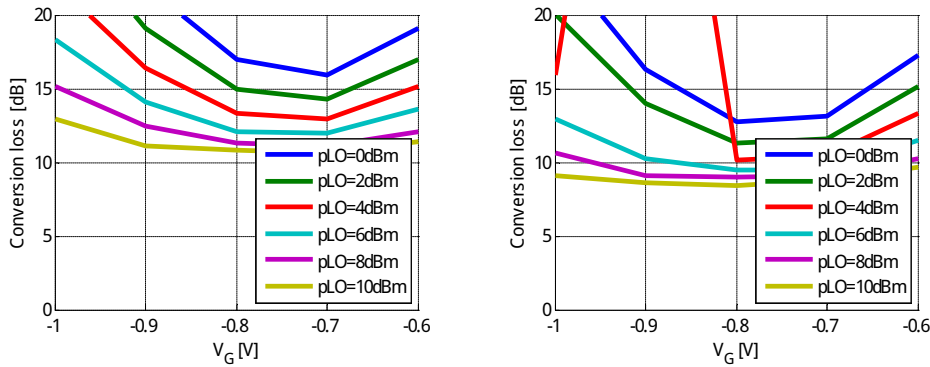


Figure 2. Conversion loss vs VG_MIX at different LO power (Left) 85 GHz, (Right) 95 GHz

RECOMMENDED OPERATING CONDITIONS

Table 3. Electrical settings on connector P1

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

Table 4. Electrical settings on connector P2

Connector P5	Pad No.	Interface	I/O
GND	1		Ground
I+	2	Z ₀ = 100 Ohm differential impedance, DC coupled	Input
I-	3		Input
GND	4		Ground
Q+	5	Z ₀ = 100 Ohm differential impedance, DC coupled	Input
Q-	6		Input
GND	7		Ground

Table 5. Electrical settings on connector P3

Connector P3	Pad No.	Interface	I/O
GND	1		Ground
RF	2	Z ₀ = 50 Ohm, AC coupled	Input/ Output
GND	3		Ground

Table 6. Electrical settings on connector P4

Connector P4	Pad No.	Interface	I/O
GND	1		Ground
LO	2	Z ₀ = 50 Ohm, AC coupled	Input
GND	3		Ground

^[2] The gain is typically 12 dB when biasing the VGA at 15 mA.

ABSOLUTE MAXIMUM RATINGS

Table 7. Absolute Maximum Ratings

Gate bias voltage	-2 to + 0.7 V
Gate-drain breakdown	8 V
IF in (I/I_/Q/Q_)	+ 7 dBm/ch.
IF in (I/I_/Q/Q_)	3 V _{pp} /ch.
LO drive	+ 15 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).

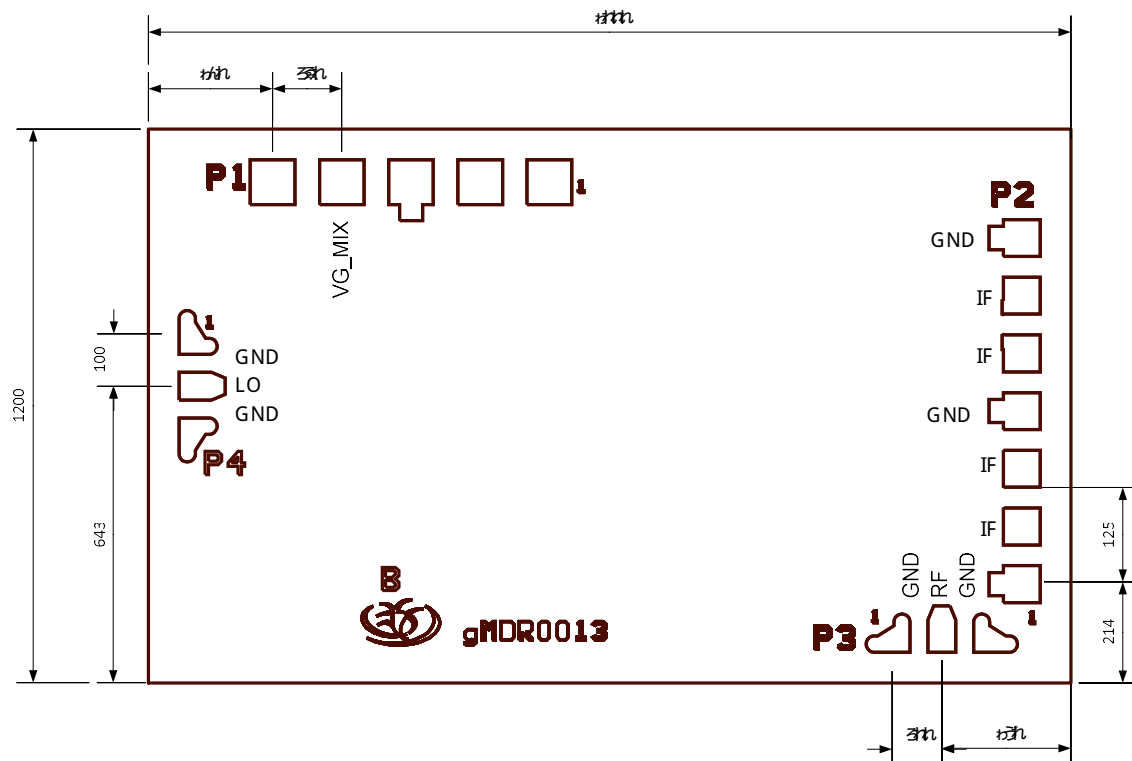


Figure 3. Outline drawing of the chip. Dimensions are in μm .