

## 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 E-band point to point communication
- ζ Another bullet
- ζ 77 GHz Automotive radar
- ζ Fiber over radio

## DESCRIPTION

The gMDR0015 is a direct IQ modulator or a demodulator that covers the full 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. LO drive power is at modest 7 dBm.

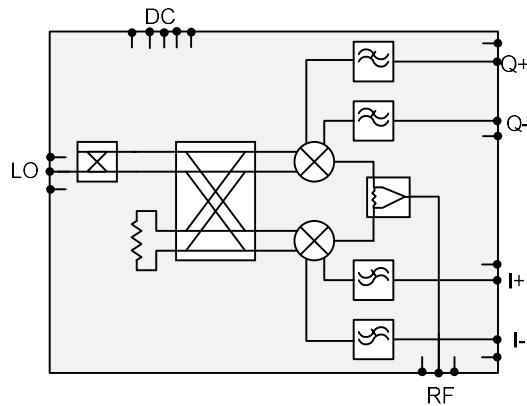


Figure 1. Block diagram of gMDR0015

## ELECTRICAL PERFORMANCE

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

Parameter	Min	Typ	Max	Unit
RF Frequency	71		86	GHz
LO Frequency	70		87	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 <sup>[1]</sup>		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

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

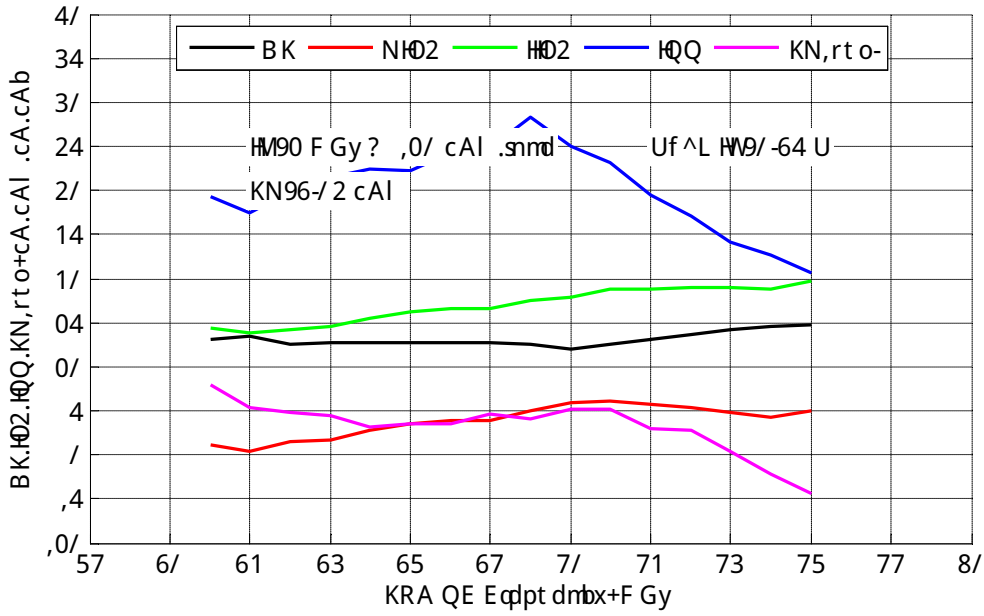


Figure 1. Conversion loss (CL), OIP3, IP3, image rejection (IRR) and LO-suppression vs RF frequency.

## RECOMMENDED OPERATING CONDITIONS

**Table 3. Electrical settings on connector P1**

Connector P1	Pad No.	Bias settings (V/mA)			I/O
		Min	Typ <sup>[2]</sup>	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

<sup>[2]</sup> 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 <sub>pp</sub> /ch.
LO drive	+ 15 dBm
Operating temperature	-40 to + 85 C
Storage temperature	-65 to +150 C

## OUTLINE DRAWING

Distances are in  $\mu\text{m}$ . Drawing is also available in dxf-file format on the web. The substrate thickness is 50  $\mu\text{m}$  (GaAs).

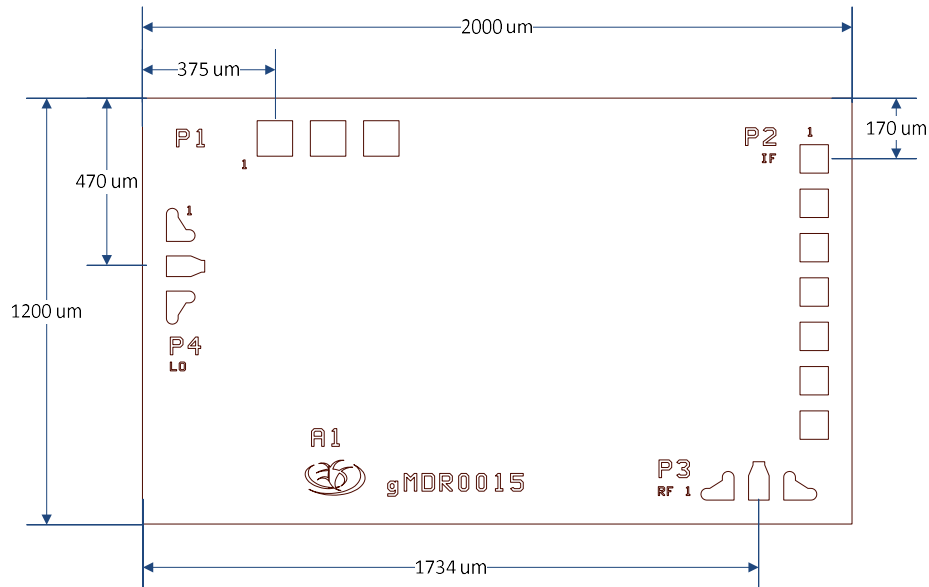


Figure 2. Outline drawing of the gMDR0015 MMIC. Dimensions are in  $\mu\text{m}$ .