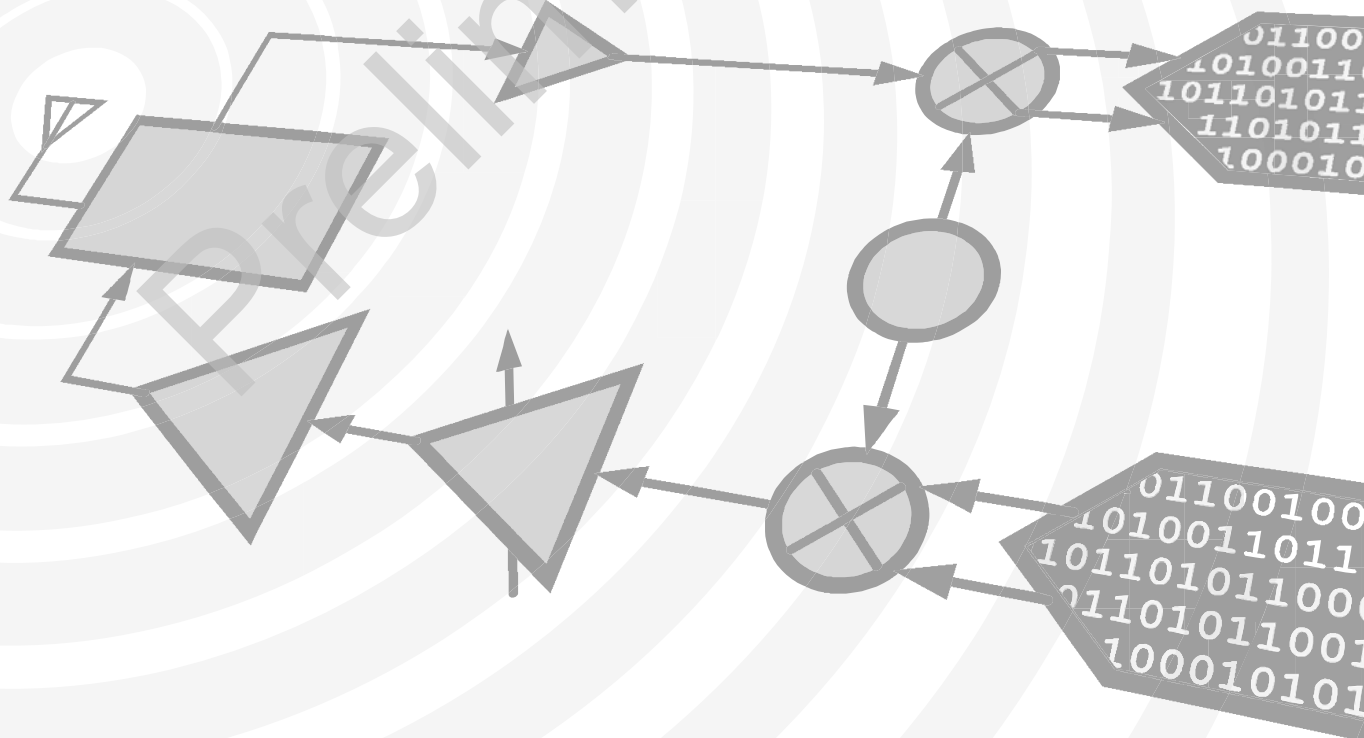


Analog Devices Welcomes Hittite Microwave Corporation



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Preliminary

HMC6505ALC5

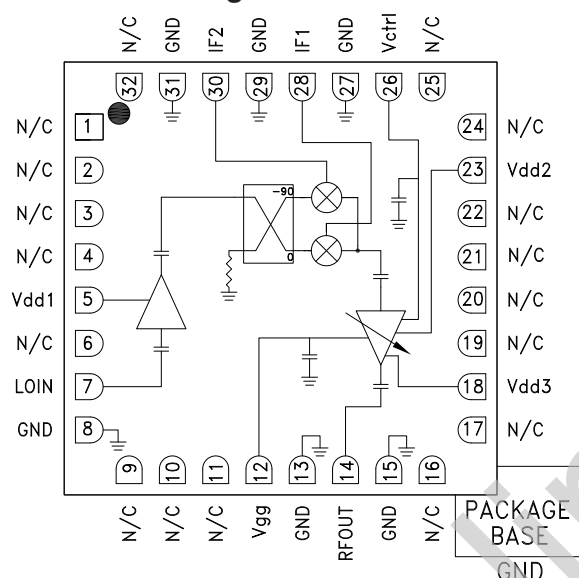
GaAs MMIC I/Q UPCONVERTER 5.5 - 8.6 GHz

Typical Applications

The HMC6505ALC5 is ideal for:

- Point-to-Point and Point-to-Multi-Point Radio
- Military Radar, EW & ELINT
- Satellite Communications
- Sensors

Functional Diagram



Features

- High Conversion Gain: 15 dB
- Sideband Rejection: 22 dBc
- LO / RF Rejection: 14 dBc
- High Output IP3: +35 dBm
- 32 Lead 5x5 mm SMT Ceramic Package: 25 mm²

General Description

The HMC6505ALC5 is a compact GaAs MMIC I/Q upconverter in a leadless RoHS compliant SMT package. This device provides a small signal conversion gain of 15 dB with 22 dBc of sideband rejection. The HMC6505ALC5 utilizes a RF amplifier preceded by an I/Q mixer where the LO is driven by a driver amplifier. IF1 and IF2 mixer inputs are provided and an external 90° hybrid is needed to select the required sideband. The I/Q mixer topology reduces the need for filtering of the unwanted sideband. The HMC6505ALC5 is a much smaller alternative to hybrid style single sideband upconverter assemblies and it eliminates the need for wire bonding by allowing the use of surface mount manufacturing techniques.

Electrical Specifications, $T_A = +25^\circ\text{C}$, $IF = 350\text{ MHz}$,

$LO = +4\text{ dBm}$, $V_{dd2}, 3 = +5\text{V}$, $I_{dd2} + I_{dd3} = 120\text{ mA}$, $V_{dd1} = +5\text{V}$, $I_{dd1} = 125\text{ mA}$ [1][2][6]

Parameter	Min.	Typ.	Max.	Min.	Typ.	Max.	Units
Frequency Range, RF		5.5 - 7			7 - 8.6		GHz
Frequency Range, LO		5 - 10			6.5 - 11.6		GHz
Frequency Range, IF		DC - 3			DC - 3		GHz
Conversion Gain [5]	12	15		11	14		dB
Sideband Rejection	18	22		18	22		dBc
1 dB Compression (Output)		21			22		dBm
IP3 (Output)	31	35		31	35		dBm
LO / RF Rejection [3][4]	7	10		11	14		dBc
RF Return Loss		16			17		dB
LO Return Loss		8			9		dB
IF1 Return Loss		10			10		dB
IF2 Return Loss		8			8		dB
Supply Current I_{dd1}		125			125		mA
Supply Current $I_{dd2} + I_{dd3}$ [2]		120			120		mA

[1] Unless otherwise noted all measurements performed with high side LO, $IF = 350\text{ MHz}$ and external $IF\ 90^\circ$ hybrid.

[2] Adjust V_{gg} between -2 to 0V to achieve $I_{dd2} + I_{dd3} = 120\text{ mA}$ Typical.

[3] The LO / RF Rejection is defined as the LO signal level at the RF output port relative to the desired RF output signal level.

[4] The LO / RF Rejection data is with $IF = -6\text{ dBm}$.

[5] Data based on subtracting out board loss and loss of hybrid.

[6] +3V can also be used for V_{dd1} .

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**GaAs MMIC I/Q UPCONVERTER
5.5 - 8.6 GHz**
Electrical Specifications, (continued) [1]

Parameter	Min.	Typ.	Max.	Min.	Typ.	Max.	Units
Frequency Range, RF	5.5 - 7			7 - 8.6			GHz
Frequency Range, LO	5 - 10			6.5 - 11.6			GHz
Frequency Range, IF	DC - 3			DC - 3			GHz
Dynamic Range	18	20		18	20		dB
V Control	-4		0	-4		0	V
LO Power	-2	3	10	-2	3	10	dBm
Gain Flatness (150 MHz Segments)			0.5			0.5	dB
Noise Figure (Min Attenuation) [7]		11.5			12		dB

[1] Unless otherwise noted all measurements performed with high side LO, IF = 350 MHz and external IF 90° hybrid.

[7] Noise Figure measurement performed with high side LO, IF = 2500 MHz and external IF 90° hybrid.

MxN Spurious Outputs [1][2]

	nLO				
mIF	0	1	2	3	4
0	x	17.3	35.1	57.5	62.6
+1	80.6	0	39.6	66.4	93.3
+2	49.9	64.3	40.6	72.3	91.5
+3	96.7	57.8	87.4	78.5	89.8
+4	88.5	100.8	89.3	94.2	91.7

IF = 0.35 GHz @ -6 dBm

LO = 8.5 GHz @ 0 dBm

	nLO				
mIF	0	1	2	3	4
0	x	15.1	36.4	50.4	61.5
+1	66.7	0	42.9	56.5	83.2
+2	49.2	47.1	39.9	76.5	84.6
+3	95.2	58.9	79.4	76	94.2
+4	86.9	102.5	86.5	96.8	96.1

IF = 0.35 GHz @ -6 dBm

LO = 7.7 GHz @ 0 dBm

	nLO				
mIF	0	1	2	3	4
0	x	11.6	23.6	38.4	60.1
+1	59.8	0	42.9	45.4	70.9
+2	48.5	50.4	39.4	79.9	76.7
+3	86.9	61	87.5	76.2	94.3
+4	85.2	82.4	86.2	97	95.7

IF = 0.35 GHz @ -6 dBm

LO = 7.0 GHz @ 0 dBm

MxN Spurious Outputs [1][3]

	nLO				
mIF	0	1	2	3	4
0	x	17.3	35.1	56.5	62.7
-1	80.6	0	42.8	62.9	93
-2	49.9	53.3	39.3	72.9	90.3
-3	96.9	56	90	75	93
-4	88.2	101.9	89.4	96.1	91.1

IF = 0.35 GHz @ -6 dBm

LO = 8.5 GHz @ 0 dBm

	nLO				
mIF	0	1	2	3	4
0	x	15	36.4	50.6	60.1
-1	66.6	0	48.2	51.4	82.8
-2	49.2	47	38.1	79.7	79.9
-3	95.9	56.7	86.7	75.4	93.1
-4	86.9	94	88.3	97.4	93.8

IF = 0.35 GHz @ -6 dBm

LO = 7.7 GHz @ 0 dBm

	nLO				
mIF	0	1	2	3	4
0	x	11.6	23.5	38.3	58.7
-1	59.7	0	46.7	36.9	73.4
-2	48.6	53	37.7	75.2	69.1
-3	87	58	75	70.9	91.1
-4	84.8	87	83.6	99.5	93.1

IF = 0.35 GHz @ -6 dBm

LO = 7.0 GHz @ 0 dBm

[1] Data taken without external IF 90° hybrid

[2] All values in dBc below RF power level (LO + IF) USB

[3] All values in dBc below RF power level (LO - IF) LSB

GaAs MMIC I/Q UPCONVERTER
5.5 - 8.6 GHz
Absolute Maximum Ratings

IF Input	+20 dBm
LO Input	+10 dBm
Vctrl	-5V to +0.3V
Vdd1	+5.5V
Vdd2 and Vdd3	+5.5V
Vgg	-3V to 0V
Channel Temperature	175 °C
Continuous P _{diss} (T = 85°C) (derate 18.3 mW/°C above 85°C)	1.65 W
Thermal Resistance (channel to ground paddle)	54.6 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C
ESD Sensitivity (HBM)	Class1A



ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

Outline Drawing
