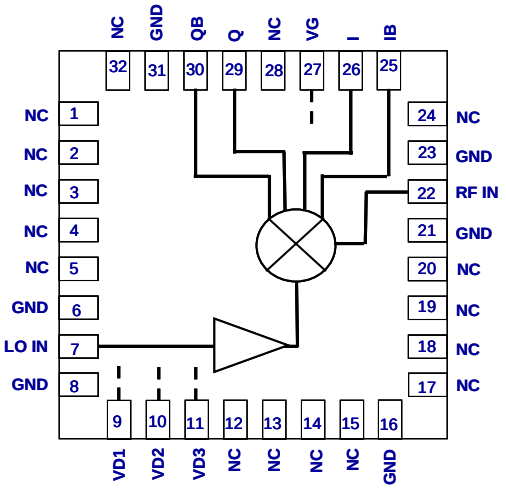
Advance Information: AI1016

QFN Packaged 10-16GHz Direct Modulator

GaAs Monolithic Microwave IC

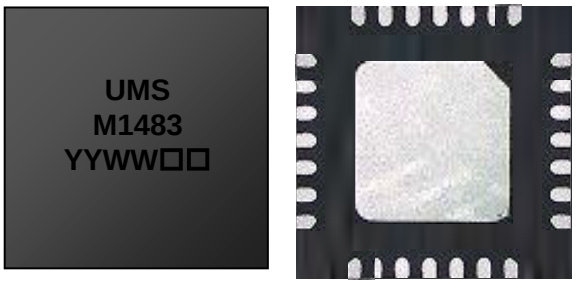


UMS 10-16GHz direct quadrature modulator packaged integrates a double-balanced mixer (LO suppression and Image Rejection) and a LO buffer. It can be used for both LSB and USB configurations. The high carrier suppression, the side band rejection and the very low out-of-band noise density combined with the baseband inputs which supports modulation from DC to 250MHz makes of this circuit a very versatile modulator for high performance systems.

Moreover it is proposed in standard surface mount package (QFN). The overall power supply is as low as 4V / 110mA.

The circuit is mainly dedicated to Point to Point and Point to Multi-Point systems and also well suited for a wide range of microwave and millimetre wave applications and systems.

It is developed on a 0.5µm E/D mode pHEMT process, and will be available in a standard surface mount 32 leads QFN5x5, compliant with the Restriction of Hazardous Substances (RoHS) European Union directive 2002/95/EC.



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Main Characteristics

Tamb.= +25°C, VD1 = VD2 = VD3 = +4V

Symbol	Parameter	Min	Typ	Max	Unit
F_{RF}	RF Frequency range	10		16	GHz
F_{LO}	LO Frequency range	10		16	GHz
F_{IF}	Base band bandwidth	DC		250	MHz
G_c	Conversion Gain (1)		-10		dB
P_{LO}	LO input power		0		dBm
LO	Carrier suppression without Vbb tuning		25		dBc
LO sup	Carrier suppression with Vbb tuning		50		dBc
SDB sup	Side band suppression		18		dBc
OIP3	Output IP3		12		dBm
IMD2	2nd order intermodulation ratio		40		dBc
Spr	Spurious		-55		dBm
$Vbb_{I\&Ib}$	Baseband input DC voltage on I & IB	-0.1		+0.1	V
$Vbb_{Q\&Qb}$	Baseband input DC voltage on Q & QB	-0.1		+0.1	V
VDx	DC supply voltage		4		V
VG	DC mixer supply		-0.7		V
Id	DC supply current		110		mA

(1) Given for V_{IF} = 100mV_{pp} (over 50Ω) on each IF input => Input Power : P_{IF} = -10dBm

These values are representative of on-board measurements.
Electrostatic discharge sensitive device observe handling precautions!

Absolute Maximum Ratings (1)

Tamb.= +25°C

Symbol	Parameter	Values	Unit
Vdx	DC supply voltage	(TBD)	V
Id	DC supply current	(TBD)	mA
VG	DC mixer supply	-2 to +0.4	V
P_{LO}	Maximum P_{LO} peak input power overdrive (2)	(TBD)	dBm
P_{IF}	Maximum P_{IF} peak input power overdrive (2)	(TBD)	dBm
Tj	Junction temperature	(TBD)	°C
Ta	Operating temperature range	-40 to +85	°C
Tstg	Storage temperature range	-55 to +155	°C

(1) Operation of this device above anyone of these parameters may cause permanent damage.
(2) Duration < 1s.

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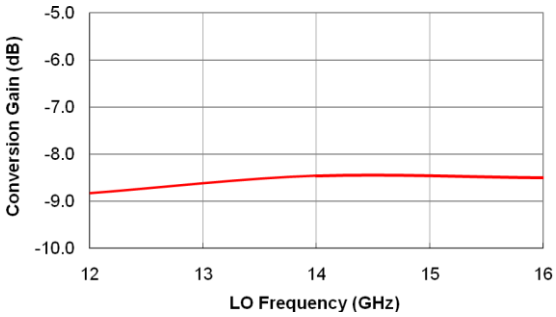
Typical On Wafer Measurements

Tamb.= +25°C, VDx = 4V, Id = 110mA, VG = -0.7V

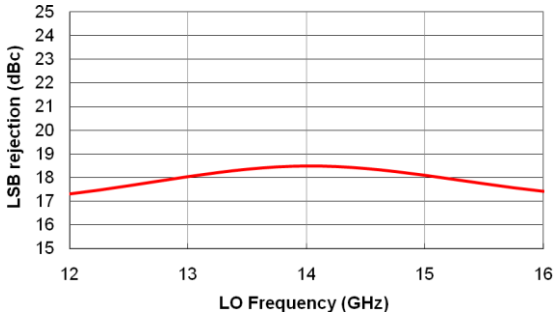
Conversion Gain versus LO frequency

F_{IF} = 9MHz / V_{IF} = 100mVpp
P_{LO} = 0dBm / F_{LO}: 12, 14, 16GHz



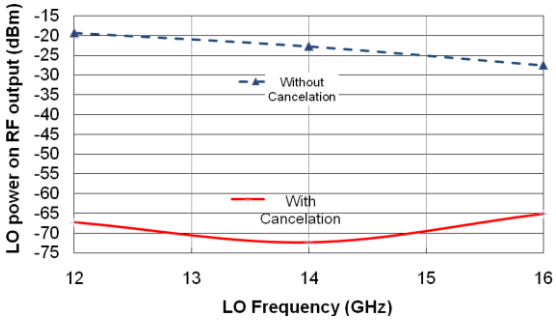
LSB Rejection versus LO frequency

F_{IF} = 9MHz / V_{IF} = 100mVpp
P_{LO} = 0dBm / F_{LO}: 12, 14, 16GHz
$Vbb_{I\&Ib}$ and $Vbb_{Q\&Qb}$ adjusted



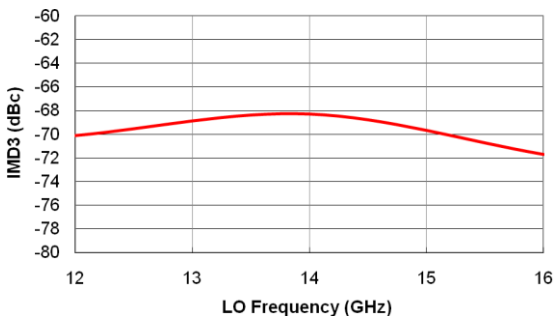
LO Cancelation versus LO frequency

F_{IF} = 9MHz / V_{IF} = 100mVpp
P_{LO} = 0dBm / F_{LO}: 12, 14, 16GHz
$Vbb_{I\&Ib}$ and $Vbb_{Q\&Qb}$ adjusted



IMD3 versus LO frequency

IF_1 = 9 MHz & IF_2 = 11MHz / V_{IF} = 100mVpp
P_{LO} = 0dBm / F_{LO}: 12, 14, 16GHz
P_{RF_DCL} = -18dBm



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Typical On Wafer Measurements

Tamb.= +25°C, VDx = 4V, Id = 110mA, VG = -0.7V

Intermodulation products and Harmonics versus IF frequency

F_{LO} = 14GHz / P_{LO} = 0dBm
VIF1 = VIF2 = 100mVpp
PRF_DCL = -18dBm

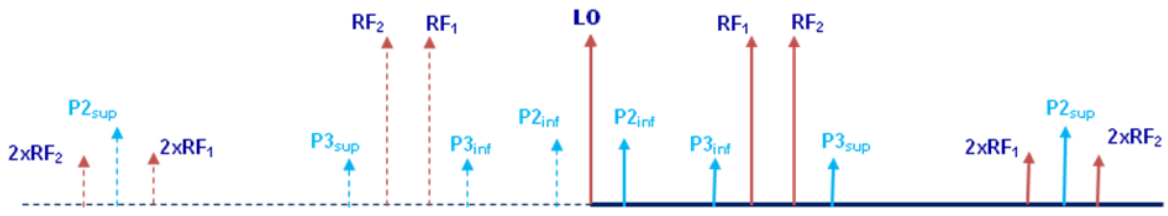
IF1 & IF2 (MHz)	8 - 10	48 - 50	30 - 50
IMD3 (dBc)	70	65	66
$IMD2_{INF}$ (dBc)	44	43	48
$IMD2_{SUP}$ (dBc)	49	41	41
2xRF1 (dBc)	46	35	42
2xRF2 (dBc)	52	35	36

Intermodulation products and Harmonics versus LO frequency

IF1 = 8MHz & IF2 = 10MHz / VIF1 = VIF2 = 100mVpp
PRF_DCL = -18dBm

FLO (GHz)	13.0	15.0
IMD3 (dBc)	65	66
$IMD2_{INF}$ (dBc)	39	42
$IMD2_{SUP}$ (dBc)	39	38
2xRF1 (dBc)	34	34
2xRF2 (dBc)	39	34

Spectral view of Output Intermodulation products and Harmonics



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Typical On Wafer Measurements

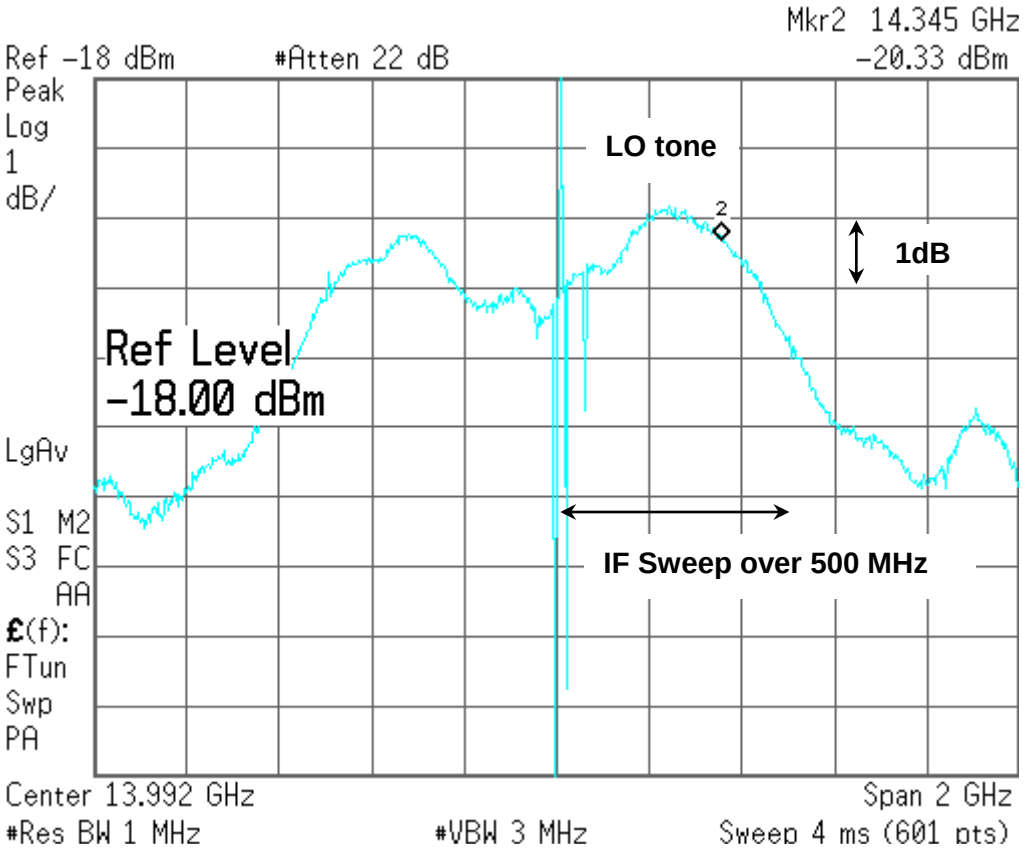
Tamb.= +25°C, VDx = 4V, Id = 110mA, VG = -0.7V

Base band bandwith (until cut off @1dB)

Spectrum: output RF power on each side of the LO

F_{LO} = 14GHz / V_{IF} = 100mV_{pp}

F_{IF} = DC to 1.0GHz



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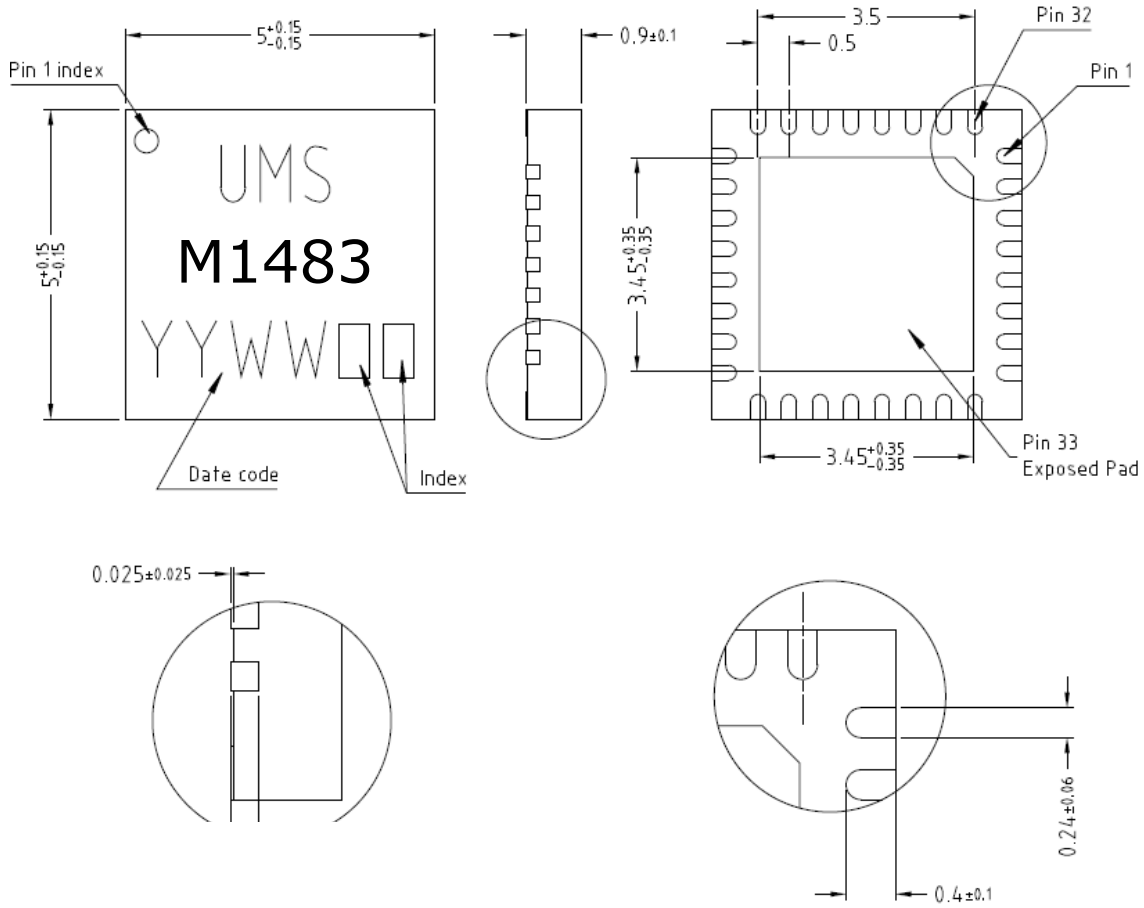
Package outline (1)



Matt tin, Lead Free	(Green)	1- Nc	12- Nc	23- Gnd(2)
Units :	mm	2- Nc	13- Nc	24- Nc
From the standard :	JEDEC MO-220	3- Nc	14- Nc	25- Ib
	(VHHD)	4- Nc	15- Nc	26- I
33-	GND	5- Nc	16- Gnd(2)	27- Vg
		6- Gnd(2)	17- Nc	28- Nc
		7- LO in	18- Nc	29- Q
		8- Gnd(2)	19- Nc	30- Qb
		9- VD1	20- Nc	31- Gnd(2)
		10- VD2	21- Gnd(2)	32- Nc
		11- VD3	22- RF in	

(1) The package outline drawing included to this data-sheet is given for indication. Refer to the application note AN0017 (http://www.ums-gaas.com) for exact package dimensions.

(2) It is strongly recommended to ground all pins marked “Gnd” through the PCB board. Ensure that the PCB board is designed to provide the best possible ground to the package.

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Notes

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Recommended package footprint

Refer to the application note AN0017 available at http://www.ums-gaas.com for package foot print recommendations and exact package dimensions.

SMD mounting procedure

For the mounting process standard techniques involving solder paste and a suitable reflow process can be used. For further details, see application note AN0017 available at http://www.ums-gaas.com.

Recommended environmental management

Refer to the application note AN0019 available at http://www.ums-gaas.com for environmental data on UMS package products.

Recommended ESD management

Refer to the application note AN0020 available at http://www.ums-gaas.com for ESD sensitivity and handling recommendations for the UMS package products.

Sampling request reference

Package: ES-CHM1483-QFG

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