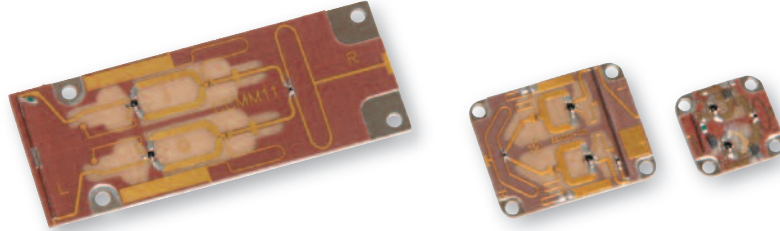




High Performance IQ Modulators and Image Reject Mixers
Typical and Guaranteed Specifications—50 Ω System



Model	Frequency Range			LO Power dBm Nominal	Conversion Loss		Isolation dB				Image Reject dB	
	RF	GHz LO	IF		dB Typ.	dB Max.	L to R Typ.	Min.	L to I/Q Typ.	Min.	Typ.	Min.
Available in Standard Cougar Mixer Carriers												
IQM2811	1.4-2.8	1.4-2.8	DC-0.5	13	10.5	11.5	42	35	40	30	25	20
IQM4221	2.1-4.1	2.1-4.1	DC-0.5	10	9.0	10.0	40	33	42	35	25	20
IQM11621	6.0-10.8	6.0-10.8	DC-0.5	10	8.5	10.0	25	20	40	33	28	23
IQM18621	15.0-18.0	15.0-18.0	DC-0.5	13	10.0	12.0	25	20	30	23	23	18
IQM15101	10.5-14.5	10.5-14.5	DC-0.5	10	6.3	8.0	25	20	28	22	23	18
IQM15103	10.5-14.5	10.5-14.5	DC-0.5	13	6.3	8.0	25	20	28	22	23	18
IQM17131	13.2-16.8	13.2-16.8	DC-0.5	10	6.5	8.0	25	20	30	23	23	18
IQM17133	13.2-16.8	13.2-16.8	DC-0.5	13	6.5	8.0	25	20	30	23	23	18

High Performance IQ (Quadrature) Modulators
Typical and Guaranteed Specifications—50 Ω System

Model	Frequency Range MHz			Carrier Input Power dBm Nominal	Data Signal Levels L to R		Insertion Loss Input to Output		Carrier Isolation Input to Output		Phase Accuracy		Amplitude Balance		VSWR
	Carrier Center Freq. (fo)	Carrier Bandwidth	I/QData Port Bandwidth		Low mA	High Typ.	dB Max.	dB Typ.	dB Max.	dB Typ.	Deg Max.	Deg Typ.	dB Max.	dB Max.	
10% Bandwidth – Available in Cougar Flatpack															
IQF034	30	10 % of fo	DC to 50 Min.	0	-20	20	4	6	55	45	± 2	± 4	0.25	0.5	1.5:1
IQF124	120	10 % of fo	DC to 50 Min.	0	-20	20	4	6	50	40	± 2	± 4	0.25	0.5	1.5:1
IQF504	500	10 % of fo	DC to 50 Min.	0	-20	20	7	9	40	30	± 2	± 5	0.5	1.0	1.5:1
IQF1004	1000	10 % of fo	DC to 50 Min.	0	-20	20	7	9	30	20	± 2	± 5	0.5	1.0	1.5:1
Octave Bandwidth – Available in Cougar Flatpack															
IQ069	60	fo ± 20 MHz	DC to 50 Min.	0	-20	20	4	6	55	45	90 ± 4	90 ± 5	0.25	0.5	1.5:1
IQ150	150	fo ± 50 MHz	DC to 50 Min.	0	-20	20	4	6	50	40	90 ± 4	90 ± 5	0.25	0.5	1.5:1

IQ NETWORKS

Current data sheets available on website. *RF and IQ Bandwidths are typically much greater than specified.



High Performance IQ Demodulators
Typical and Guaranteed Specifications—50 Ω System

Model	Frequency Range MHz			LO Power dBm Nominal	Conversion Loss		Isolation				I to Q Balance				VSWR Max
	RF/LO ¹ Center Freq. (fo)	LO Bandwidth	I/Q Bandwidth ¹		dB Typ.	dB Max.	L to R		L to I/Q		Phase Deg		Amplitude dB		
							dB Typ.	dB Max.	dB Typ.	dB Max.	Deg Typ.	Deg Max.	dB Typ.	dB Max.	
10% Bandwidth – Available in Cougar Flatpack															
IQF030	30	10 % of fo	DC to 50 Min.	+10	9	11	55	45	55	45	90 ± 3	90 ± 5	0.10	0.50	1.5:1
IQF031	30	10 % of fo	DC to 50 Min.	+10	9	11	55	45	55	45	90 ± 1	90 ± 2	0.1	0.2	1.5:1
IQF120	120	10 % of fo	DC to 50 Min.	+10	9	11	50	45	55	45	90 ± 3	90 ± 5	0.15	0.50	1.5:1
IQF121	120	10 % of fo	DC to 50 Min.	+10	9	11	50	40	55	45	90 ± 1	90 ± 2	0.1	0.2	1.5:1
IQF500	500	10 % of fo	DC to 50 Min.	+10	9	11	40	30	40	30	90 ± 3	90 ± 5	0.25	0.75	1.5:1
IQF501	500	10 % of fo	DC to 50 Min.	+10	9	11	40	30	40	30	90 ± 1	90 ± 2	0.1	0.2	1.5:1
IQF1000	1000	10 % of fo	DC to 50 Min.	+10	10	12	40	30	30	20	90 ± 3	90 ± 5	0.35	1.0	1.5:1
IQF1001	1000	10 % of fo	DC to 50 Min.	+10	10	12	40	30	30	20	90 ± 1	90 ± 2	0.1	0.2	1.5:1
IQF1500	1500	10 % of fo	DC to 50 Min.	+10	10	12	30	20	20	15	90 ± 3	90 ± 5	0.5	1.0	1.5:1
IQF1501	1500	10 % of fo	DC to 50 Min.	+10	10	12	30	20	20	15	90 ± 1	90 ± 2	0.1	0.2	1.5:1
Octave Bandwidth – Available in Cougar Flatpack															
IQ068	60	fo ± 20 MHz	DC to 50 Min.	+10	9	11	55	45	55	45	90 ± 4	90 ± 5	0.25	0.50	1.5:1
IQ158	150	fo ± 50 MHz	DC to 50 Min.	+10	9	11	50	45	55	45	90 ± 4	90 ± 5	0.25	0.50	1.5:1

Current data sheets available on website. ¹RF and IQ Bandwidths are typically much greater than specified.

IQM2811

1.4 TO 2.8 GHz IQ MIXER MODULATOR/DEMODULATOR

Typical Values	IQM2811
LO & RF	1.4 - 2.8 GHz
IF	DC - 0.5 GHz
Third Order I.P.	+13.0 dBm
Conversion Loss	-9.0 dB
LO Drive (nominal)	+13.0 dBm
High Isolation (LO to RF)	42.0 dB
Standard Mixer Carrier	

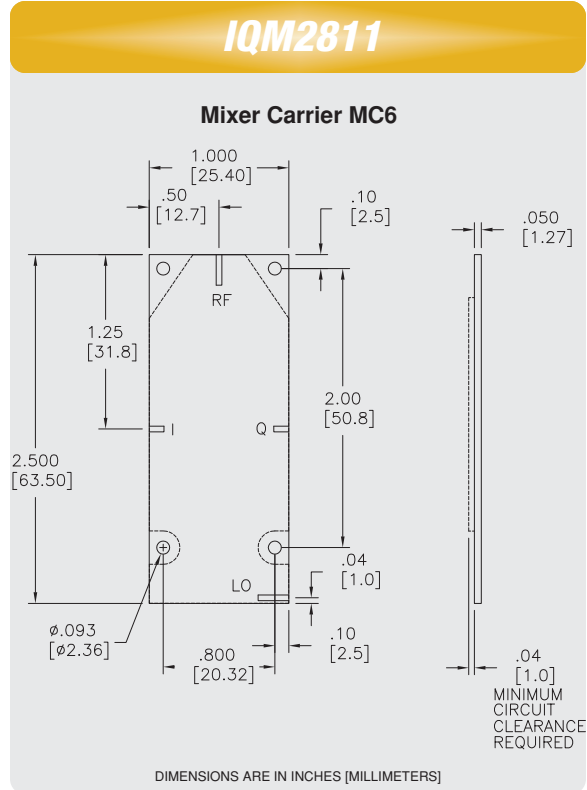
SPECIFICATIONS*

Parameter	Port	Frequency (GHz)	Typ. (dB)	Guaranteed Max. (-55 to +85 °C) (dB)
SSB Conversion Loss and SSB Noise Figure	f_R	1.4 to 2.8	8.5	9.5
	f_L	1.4 to 2.8	8.5	9.5
	f_I	DC to 0.5	8.5	9.5
	f_R	1.6 to 2.8	10.5	11.5
	f_L	1.6 to 2.8	10.5	11.5
Conversion Comp. Desensitization	f_{R2}	Level = +5 dBm	—	1.0
	f_{R2}	Level = +2 dBm	—	1.0
Isolation	f_L at R	1.4 to 2.0	42	35
	f_L at I, Q	1.4 to 2.0	40	30
	f_R at I, Q	1.4 to 2.0	32	25
	f_L at R	2.0 to 2.8	46	36
	f_L at I, Q	2.0 to 2.8	50	42
	f_R at I, Q	2.0 to 2.8	36	30
Third Order Intercept		LO = +13 dBm	+15 dBm	—
		LO = +16 dBm	+16 dBm	—
Image Rejection Side Band Suppression		RF = 6.0 to 10.8 GHz IF = 0.5 GHz	25 dB	20 dB
		RF = 1.4 to 1.8 GHz RF = 1.8 to 2.8 GHz	0.5 dB 0.15 dB	1.0 dB 0.25 dB
Amplitude Match		RF = 1.4 to 1.8 GHz	0.5 dB	1.0 dB
		RF = 1.8 to 2.8 GHz	0.15 dB	0.25 dB
Phase Match (Demodulation)		RF = 6.0 to 10.8 GHz	4.0°	6.0°
		RF = 1.4 to 1.8 GHz RF = 1.8 to 2.8 GHz	±25.0° ±15.0°	±30.0° ±22.0°
Conversion Loss (Modulation)		RF = 1.4 to 1.8 GHz	-9.5 dB	-11.0 dB
		RF = 1.8 to 2.8 GHz	-7.0 dB	-8.5 dB

* Measured in a 50-ohm system with nominal LO drive of +13 dBm as a downconverter.

ABSOLUTE MAXIMUM RATINGS

Storage Temperature	-65 to +150 °C
Peak RF Input Power All Ports	+22 dBm @ 25 °C derate to +17 dBm @ 100 °C



Harmonic Intermodulation Products (single tone)

HARMONICS OF f_R	0	1	2	3	4	5
5	94	93	95	94	96	96
4	93	93	94	95	96	94
3	93	95	94	96	95	97
2	93	91	95	96	90	96
1	78	95	95	64	94	95
0	74	95	96	56	94	95
	83	78	61	81	88	56
	83	82	59	78	82	55
	27	0	65	53	35	36
	27	0	59	53	36	39
	9	35	7	26	40	40
	15	37	9	31	40	40

HARMONICS OF f_L

$F_R = 2000$ MHz @ -10 dBm $F_L = 2030$ MHz
 $F_L @ +13$ dBm $F_L @ +16$ dBm

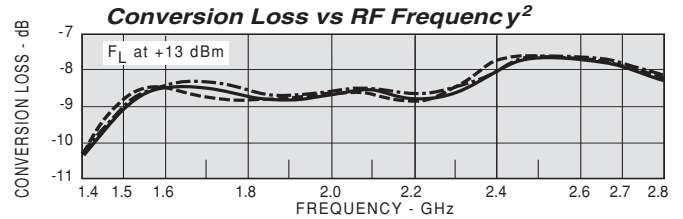
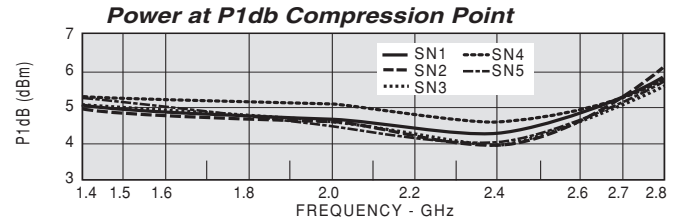
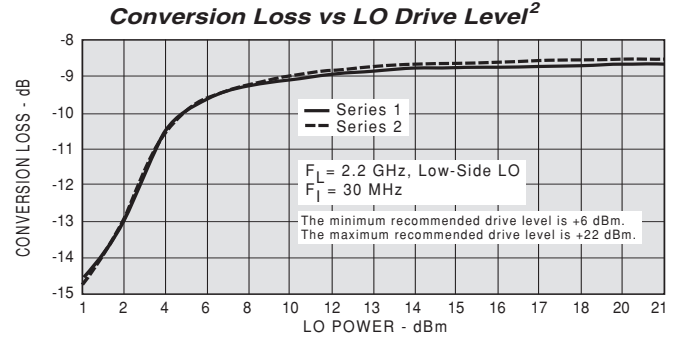
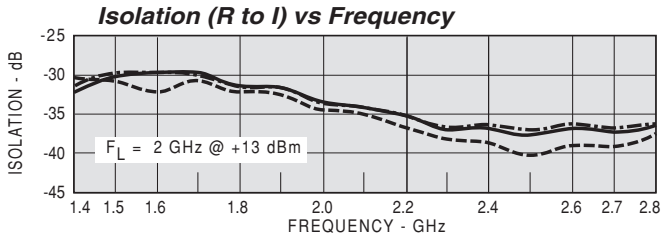
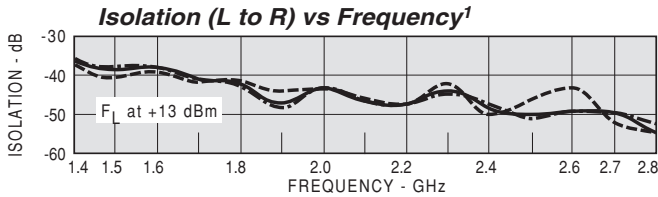
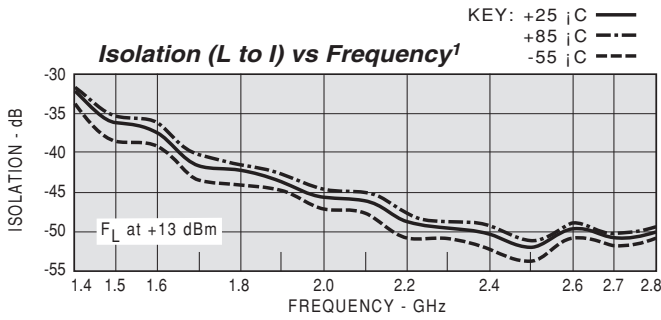
Harmonic Intermodulation Products (single tone)

HARMONICS OF f_R	0	1	2	3	4	5
5	88	92	93	95	96	98
4	90	93	93	96	96	98
3	92	94	96	96	97	96
2	92	94	95	96	95	95
1	93	92	94	61	96	80
0	93	89	93	59	95	74
	67	82	65	81	76	76
	65	82	67	82	79	74
	30	0	48	31	50	53
	30	0	52	33	49	59
	13	12	31	33	30	30
	19	16	31	37	31	31

HARMONICS OF f_L

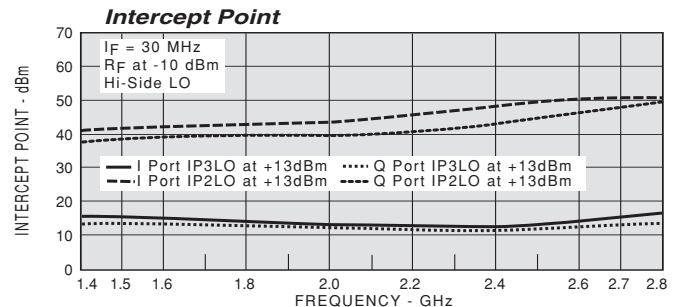
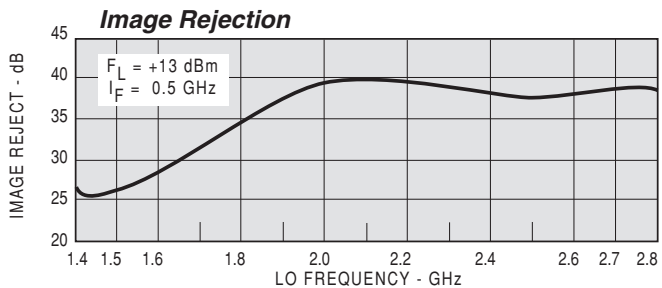
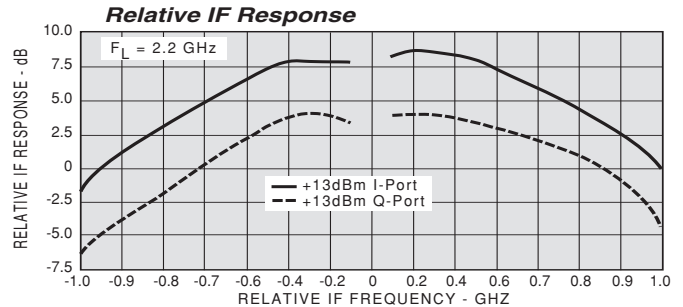
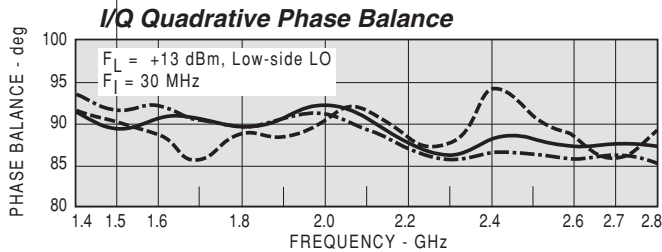
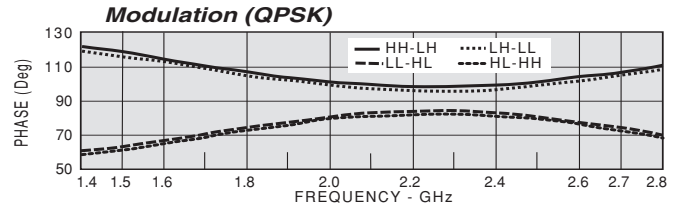
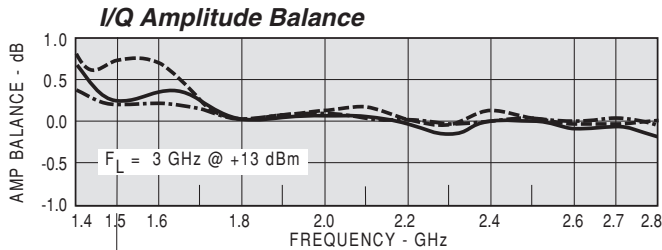
$F_R = 2800$ MHz @ -10 dBm $F_L = 2830$ MHz
 $F_L @ +13$ dBm $F_L @ +16$ dBm

TYPICAL PERFORMANCE



¹Level of the f_L signal fed through to the R- and I-ports with respect to the level of the f_L signal at the L-port.

²Conversion loss of the mixer when used in an SSB system. The frequency ordinate refers to the R-port (f_R) with f_I at 30 MHz.



IQM4221

1.9 TO 4.2 GHz IQ MIXER MODULATOR/DEMODULATOR

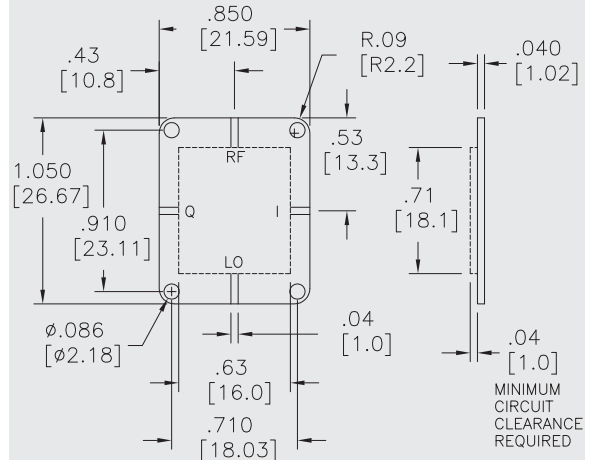
Typical Values

LO & RF	1.9 - 4.2 GHz
IF	DC - 1.1 GHz
Third Order I.P.	+13.0 dBm
Conversion Loss	-10.0 dB
LO Drive (nominal)	+10.0 dBm
High Isolation (LO to RF)	42.0 dB
Standard Mixer Carrier	

IQM4221

IQM4221

Mixer Carrier MC4



DIMENSIONS ARE IN INCHES (MILLIMETERS)

SPECIFICATIONS*

Parameter	Port	Frequency (GHz)	Typ. (dB)	Guaranteed -55 to +85 °C Max. (dB)
SSB Conversion Loss and SSB Noise Figure	f_R	2.1 to 4.1	9.0	10.0
	f_L	2.1 to 4.1	9.0	10.0
	f_I	DC to 0.5	9.0	10.0
	f_R	1.9 to 4.1	11.0	13.0
	f_L	1.9 to 4.1	11.0	13.0
	f_I	0.6 to 1.1	11.0	13.0
Conversion Comp. Desensitization	f_R	Level = +3 dBm	—	1.0
	f_{R2}	Level = +2 dBm	—	1.0
Isolation			Typ. (dB)	Min. (dB)
	f_L at R	1.9 to 3.0	40	33
	f_L at I	1.9 to 3.0	25	18
	f_R	1.9 to 2.7	32	28
	f_L	3.0 to 4.2	45	40
	f_L	3.0 to 4.2	42	35
	f_R	2.7 to 4.2	35	33
Third Order Intercept		LO = +10 dBm	+12 dBm	—
		LO = +13 dBm	+12 dBm	—
Image Rejection Side Band Suppression		RF = 1.9 to 4.2 GHz	25 dB	20 dB
		IF = 0.5 GHz		
Amplitude Match		RF = 1.9 to 4.2 GHz	0.2 dB	0.3 dB
Phase Match (Demodulation)		RF = 1.9 to 4.2 GHz	2.0°	4.0°
Phase Match (Modulation)		RF = 2.5 to 3.5 GHz	±5.0°	±8.0°
		RF = 1.9 to 4.2 GHz	±10.0°	±15.0°
Conversion Loss (Modulation)		RF = 2.5 to 4.2 GHz	-7 dB	-8 dB
		RF = 1.9 to 4.2 GHz	-10 dB	-11.5 dB

* Measured in a 50-ohm system with nominal LO drive of +10 dBm as a downconverter.

ABSOLUTE MAXIMUM RATINGS

Storage Temperature	-65 to +150 °C
Peak RF Input Power All Ports	+22 dBm @ 25 °C derate to +17 dBm @ 100 °C

Harmonic Intermodulation Products (single tone)

HARMONICS OF f_R	5	93	93	94	94	92	82
	4	93	93	94	95	91	78
	3	93	94	94	73	77	78
	2	93	95	94	69	78	72
	1	93	94	94	73	77	78
	0	65	90	67	47	73	93
HARMONICS OF f_L	5	76	37	50	40	71	66
	4	72	38	47	41	71	67
	3	19	0	31	53	36	56
	2	19	0	31	56	41	55
	1						
	0						

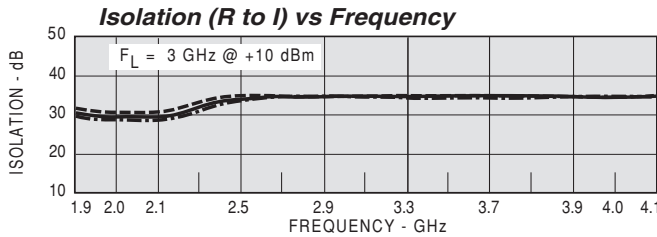
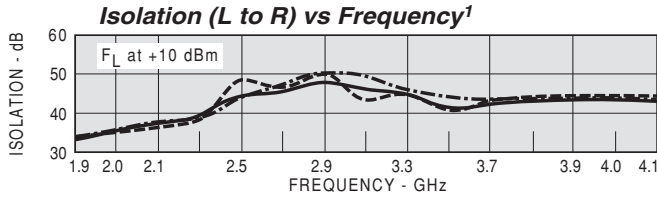
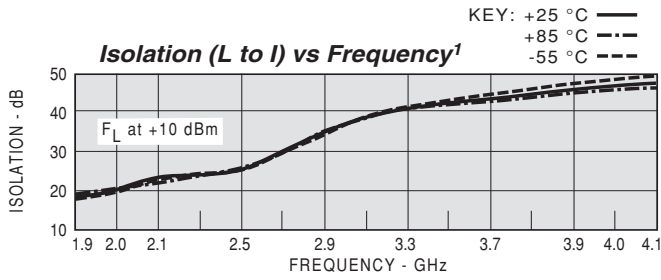
$F_R = 2000$ MHz @ -10 dBm $F_L = 2030$ MHz
 F_L @ +10 dBm F_L @ +13 dBm

Harmonic Intermodulation Products (single tone)

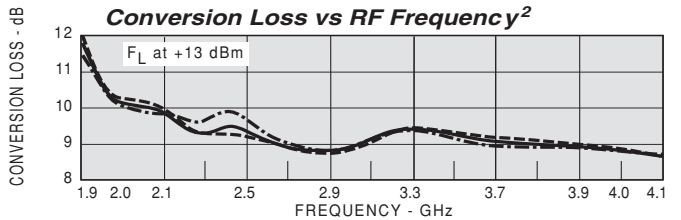
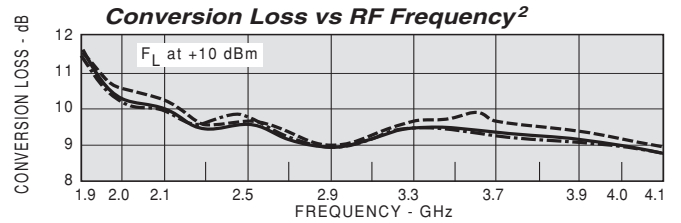
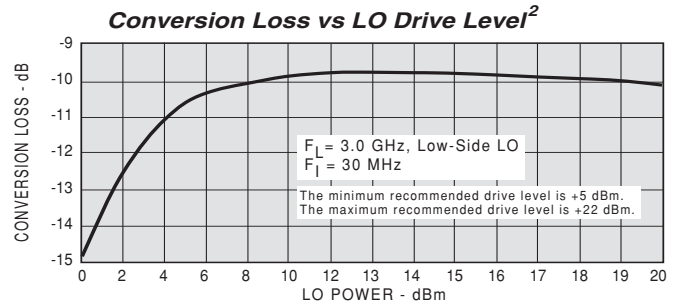
HARMONICS OF f_R	5	90	92	93	93	96	96
	4	90	92	93	93	95	97
	3	92	93	95	96	96	96
	2	91	92	94	95	92	96
	1	91	94	93	61	94	95
	0	90	94	92	59	92	94
HARMONICS OF f_L	5	78	80	66	80	79	65
	4	76	78	65	79	75	69
	3	26	0	48	49	61	50
	2	26	0	52	49	63	50
	1						
	0						

$F_R = 4000$ MHz @ -10 dBm $F_L = 4030$ MHz
 F_L @ +10 dBm F_L @ +13 dBm

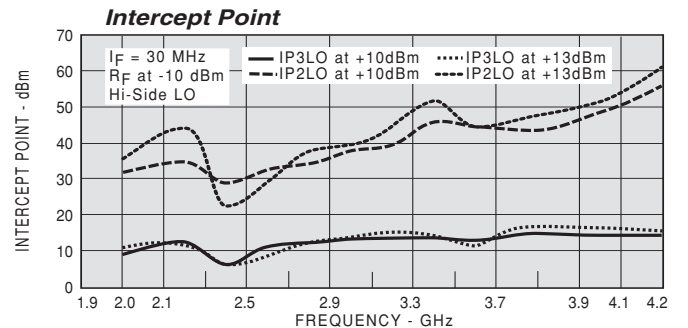
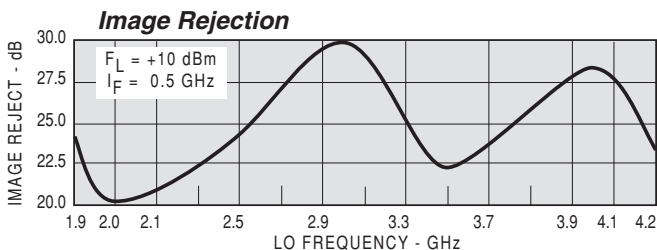
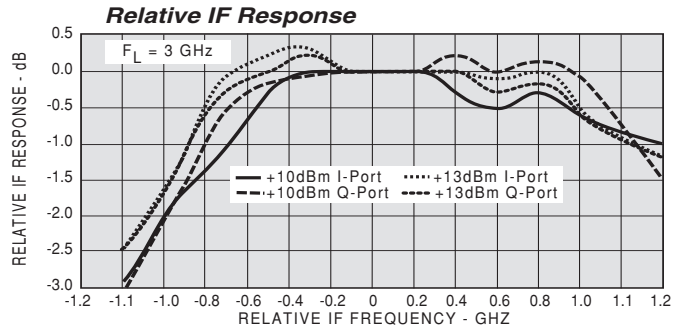
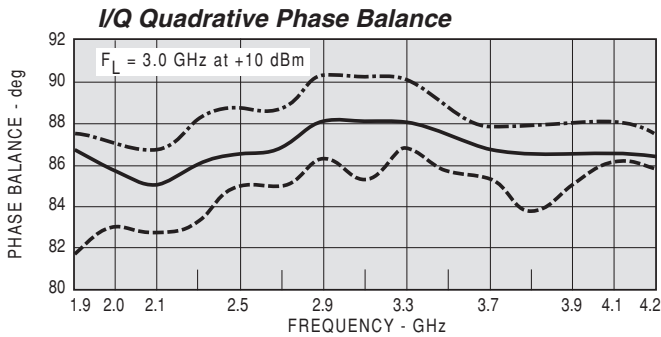
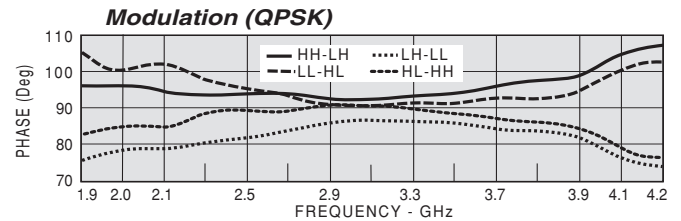
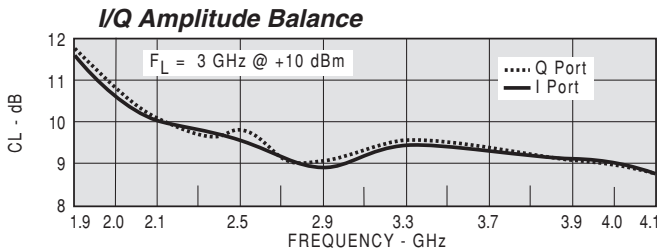
TYPICAL PERFORMANCE



¹Level of the f_L signal fed through to the R- and I-ports with respect to the level of the f_L signal at the L-port.



²Conversion loss of the mixer when used in an SSB system. The frequency ordinate refers to the R-port (f_R) with f_I at 30 MHz.



IQM11621

6.0 TO 10.8 GHz IQ MIXER MODULATOR/DEMODULATOR

Typical Values	IQM11621
LO & RF	6.0 - 10.8GHz
IF	DC - 0.5 GHz
Third Order I.P.	+15.0 dBm
Conversion Loss	-9.0 dB
LO Drive (nominal)	+10.0 dBm
High Isolation (LO to RF)	30.0 dB
Standard Mixer Carrier	

SPECIFICATIONS*

Parameter	Port	Frequency (GHz)	Typ. (dB)	Guaranteed Max. (-55 to +85 °C) (dB)
SSB Conversion Loss and SSB Noise Figure	f_R	6.0 to 9.0	8.5	9.5
	f_L	6.0 to 9.0	8.5	9.5
	f_I	DC to 0.5	8.5	9.5
	f_R	9.0 to 10.8	9.0	10.0
	f_L	9.0 to 10.8	9.0	10.0
	f_I	DC to 0.5	9.0	10.0
Conversion Comp. Desensitization	f_R	Level = +3 dBm	—	1.0
	f_{R2}	Level = +2 dBm	—	1.0
Isolation	f_L at R	6.0 to 8.0	Typ. 25	Min. 20
	f_L at I	6.0 to 8.0	40	33
	f_R at I	6.0 to 8.0	27	23
	f_L at R	8.0 to 10.8	32	26
	f_L at I	8.0 to 10.8	45	38
	f_R at I	8.0 to 10.8	33	27
Third Order Intercept		LO = +10 dBm	+15 dBm	—
		LO = +13 dBm	+15 dBm	—
Image Rejection Side Band Suppression		RF = 6.0 to 10.8 GHz IF = 0.5 GHz	28 dB	23 dB
Amplitude Match		RF = 6.0 to 10.8 GHz	0.5 dB	0.8 dB
Phase Match (Demodulation)		RF = 6.0 to 10.8 GHz	5.0°	8.0°
Phase Match (Modulation)		RF = 6.0 to 7.5 GHz	±8.0°	±12.0°
		RF = 7.5 to 10.8 GHz	±15.0°	±22.0°
Conversion Loss (Modulation)		RF = 6.0 to 10.8 GHz	-13 dB	-14.5 dB

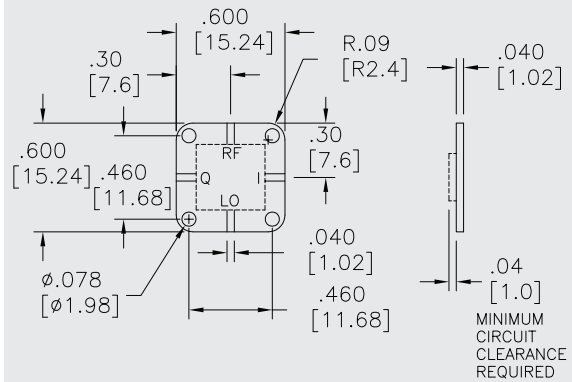
* Measured in a 50-ohm system with nominal LO drive of +10 dBm as a downconverter.

ABSOLUTE MAXIMUM RATINGS

Storage Temperature	-65 to +150 °C
Peak RF Input Power All Ports	+22 dBm @ 25 °C derate to +17 dBm @ 100 °C

IQM11621

Mixer Carrier MC5



DIMENSIONS ARE IN INCHES (MILLIMETERS)

Harmonic Intermodulation Products (single tone)

HARMONICS OF f_R	HARMONICS OF f_L				
	0	1	2	3	4
5	86	83	89	90	92
4	86	84	89	90	93
3	84	89	89	90	90
2	83	89	89	87	84
1	86	75	68	63	77
0	86	73	65	61	74
	71	67	47	61	65
	68	67	43	58	63
	17	0	28	31	56
	18	0	29	33	62
	2	8	30	41	26
	5	10	30	42	31

$F_R = 6000$ MHz @ -10 dBm
 $F_L @ +10$ dBm

$F_L = 6000$ MHz
 $F_L @ +13$ dBm

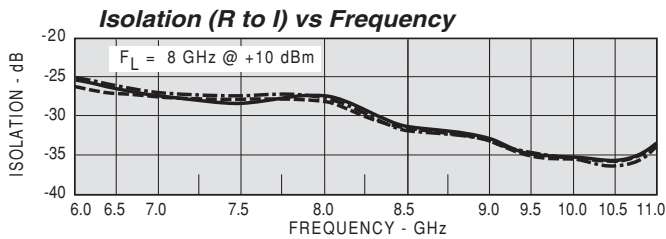
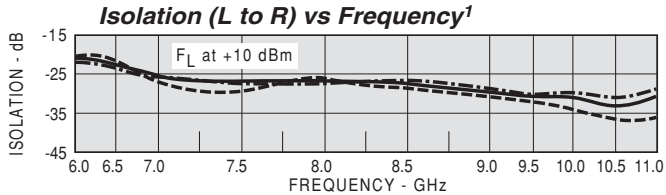
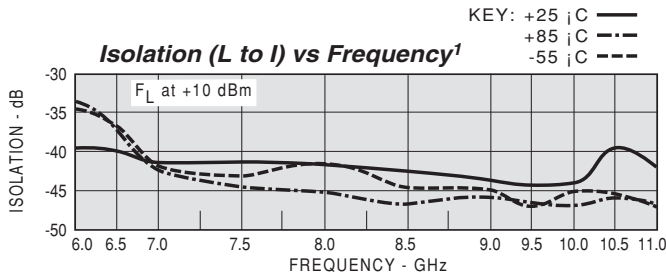
Harmonic Intermodulation Products (single tone)

HARMONICS OF f_R	HARMONICS OF f_L				
	0	1	2	3	4
5	N/A	76	89	90	92
4	N/A	77	89	90	92
3	76	88	90	92	90
2	76	88	90	93	87
1	87	90	92	72	99
0	89	89	90	71	92
	82	79	55	76	76
	80	74	52	71	78
	24	0	42	45	56
	23	0	46	46	53
	24	40	26	31	N/A
	32	42	29	37	N/A

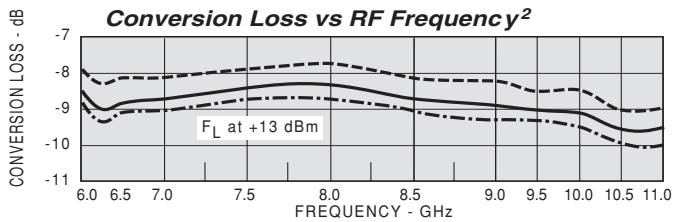
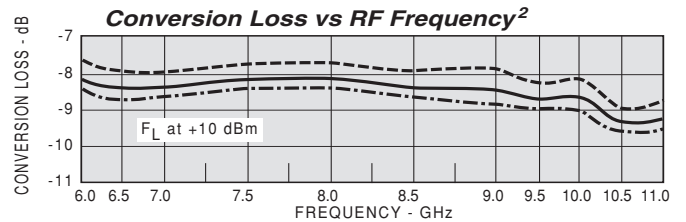
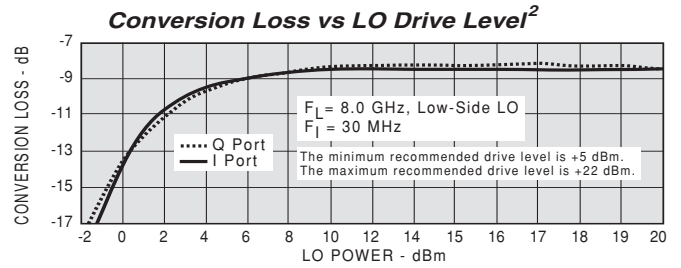
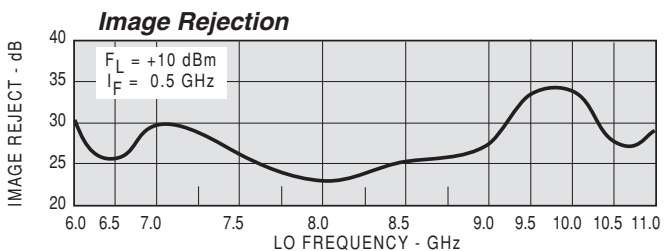
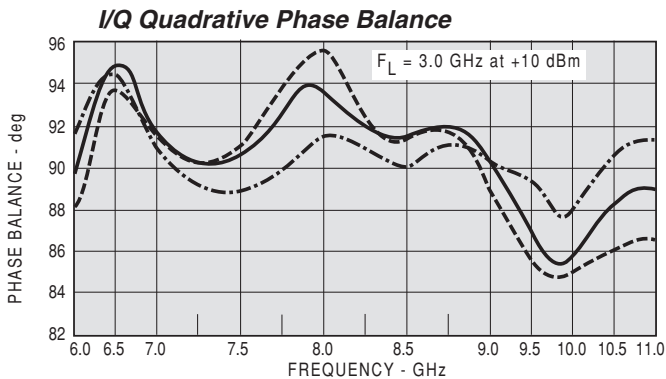
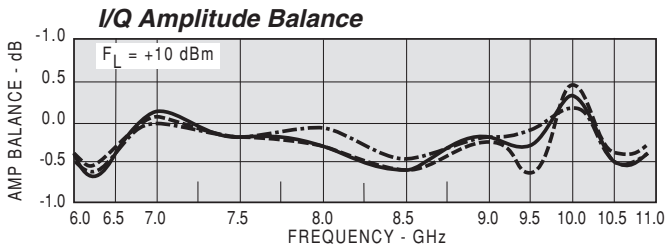
$F_R = 9000$ MHz @ -10 dBm
 $F_L @ +10$ dBm

$F_L = 9000$ MHz
 $F_L @ +13$ dBm

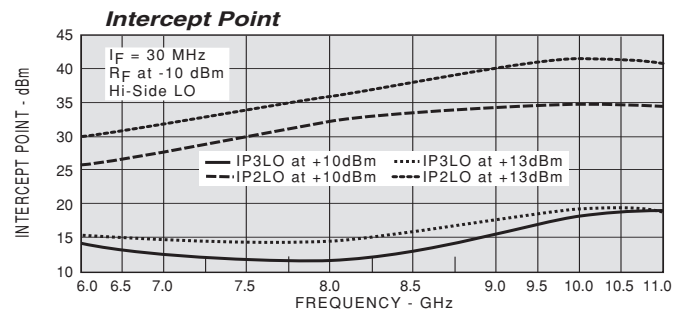
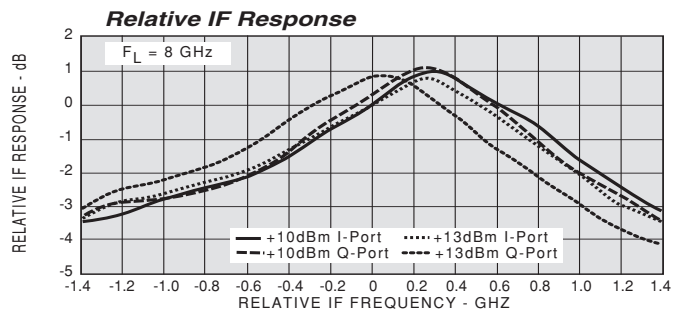
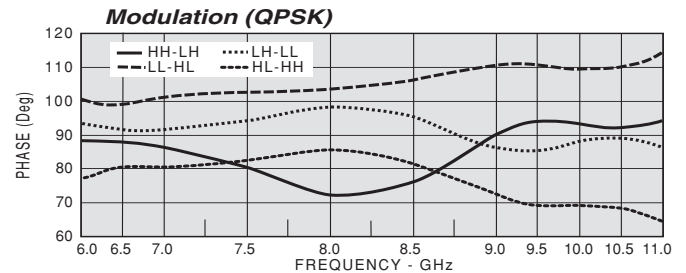
TYPICAL PERFORMANCE



¹Level of the f_L signal fed through to the R- and I-ports with respect to the level of the f_L signal at the L-port.



²Conversion loss of the mixer when used in an SSB system. The frequency ordinate refers to the R-port (f_R) with f_I at 30 MHz.



P1dB data is available upon request.