MICRF112 Data Sheet

MICRF112

Introduction

The MICRF112 is a high-performance, easy-to-use, true “Data-In, RF-Out”, ASK/FSK, Phase-Locked Loop (PLL)-based, transmitter IC for applications in the 300 MHz to 450 MHz frequency range. These applications include Remote Keyless Entry (RKE) and a Tire Pressure Monitoring System (TPMS). The device needs only a low-cost crystal to precisely set the desired RF frequency and a few external components for matching the power amplifier output to the antenna.

The MICRF112 operates over the 1.8V to 3.6V operating range and delivers +10 dBm (CW) output power into a 50Ω load, while consuming 11.5 mA of supply current from a 3.0V power supply. In ASK mode, the device consumes 6.9 mA of supply current at a data rate of 1 kbps (Manchester 50%). It features a low-power shutdown mode where the device typically consumes 50 nA of supply current. This makes it an ideal solution for battery-powered applications.

The MICRF112 is rated for the -40°C to +125°C temperature range and is available in 10-pin MSOP and 10-pin Ultra-Thin DFN packages. For automotive applications where the AEC-Q100 qualification is required, consider the MAQRF112. For ASK only applications that do not require shutdown, consider the MICRF113 in SOT23-6.

Features

- 1.8V to 3.6V Supply Voltage Range
- Up to +10 dBm Output Power (CW)
- 6.9 mA Supply Current at 1 kbps ASK (50% Manchester)
- 11.5 mA Supply Current at +10 dBm (FSK/CW)
- 1 µA Shutdown Supply Current
- Data Rates Up to 50 kbps ASK, 10 kbps FSK
- Crystal or Ceramic Resonators Sets RF Frequency
- -40°C to +125°C Temperature Range
- 10-Pin MSOP (3.0 mm x 4.9 mm), 10-Pin Ultra-Thin DFN (2 mm x 2 mm x 0.5 mm)

Applications

- Remote Keyless Entry systems (RKE)
- Remote control (STB, HVAC and appliances)
- Garage Door Openers (GDO)
- Tire Pressure Monitor Systems (TPMS)
- Outdoor weather stations
- Security/alarms systems
- Lighting and fan remote controls
- Doorbells
- Irrigation control

Table of Contents

1. Quick References

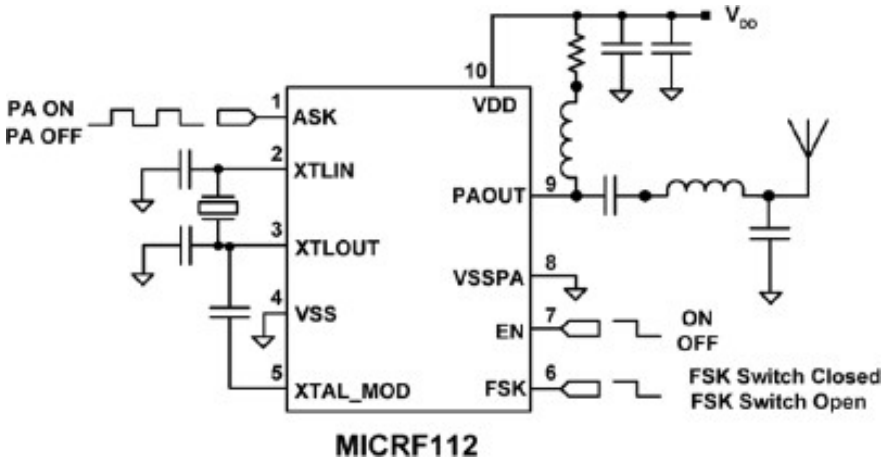
1.1 Acronyms and Abbreviations

Table 1-1. Acronyms and Abbreviations

Acronyms/Abbreviations	Description
GDO	Garage Door Openers
PLL	Phase Locked Loop
RKE	Remote Keyless Entry
T_A	Ambient Operating Temperature
TPMS	Tire Pressure Monitoring System
T_s	Storage Temperature
UVLO	Undervoltage Lock Out

2. System Overview

2.1 Typical Application



2.2 Ordering Information

Table 2-1. Ordering Information

Part Number	Top Mark	Temp. Range	Package
MICRF112YMM	RF112YMM	-40°C to +125°C	10-pin MSOP
MICRF112YMU	12B	-40°C to +125°C	10-pin UTDFN

2.3 Pin Configuration

Figure 2-1. 10-Pin Ultra-Thin DFN (MU) (2 mm x 2 mm x 0.5 mm) Top View

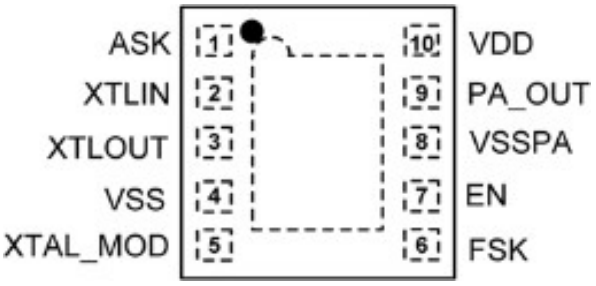
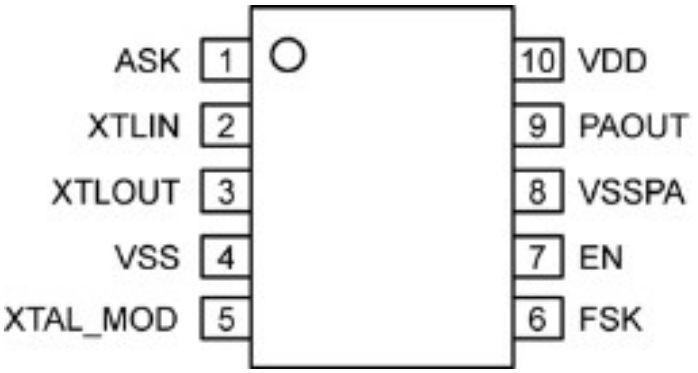


Figure 2-2. 10-Pin MSOP (MM) Top View



Note: The Pin1 marking symbol can be a circle, triangle or other symbol.

2.4 Pin Description

Table 2-2. Pin Description

Pin Number	Pin Name	Pin Function
1	ASK	ASK Data input
2	XTLIN	Reference oscillator input connection
3	XTLOUT	Reference oscillator output connection
4	VSS	Ground
5	XTAL_MOD	Reference oscillation modulation port for FSK operation
6	FSK	FSK Data input
7	EN	Chip enable, active high
8	VSSPA	PA ground
9	PAOUT	PA output
10	VDD	Positive power supply

2.5 Absolute Maximum Ratings(1)

Supply Voltage (VDD)	+4.3V
Voltage on PAOUT	+7.2V
Voltage on I/O Pins	VSS – 0.3 to VDD + 0.3
Lead Temperature (soldering, 10s)	+300°C
Storage Temperature (T_S)	-65°C to +150°C
ESD Rating	Note 3

2.6 Operating Ratings(2)

Supply Voltage (VDD)	1.8V to 3.6V
Ambient Operating Temperature (T_A)	-40°C to +125°C
Transmitter Frequency Range	300 MHz to 450 MHz

2.7 Electrical Characteristics(4)

Specifications apply for VDD = 3.0V, T_A = 25°C, $Freq_{REFOSC}$=13.560 MHz, EN = VDD, 1 Kbps data rate, 50% duty cycle, R_L50Ω load (matched).

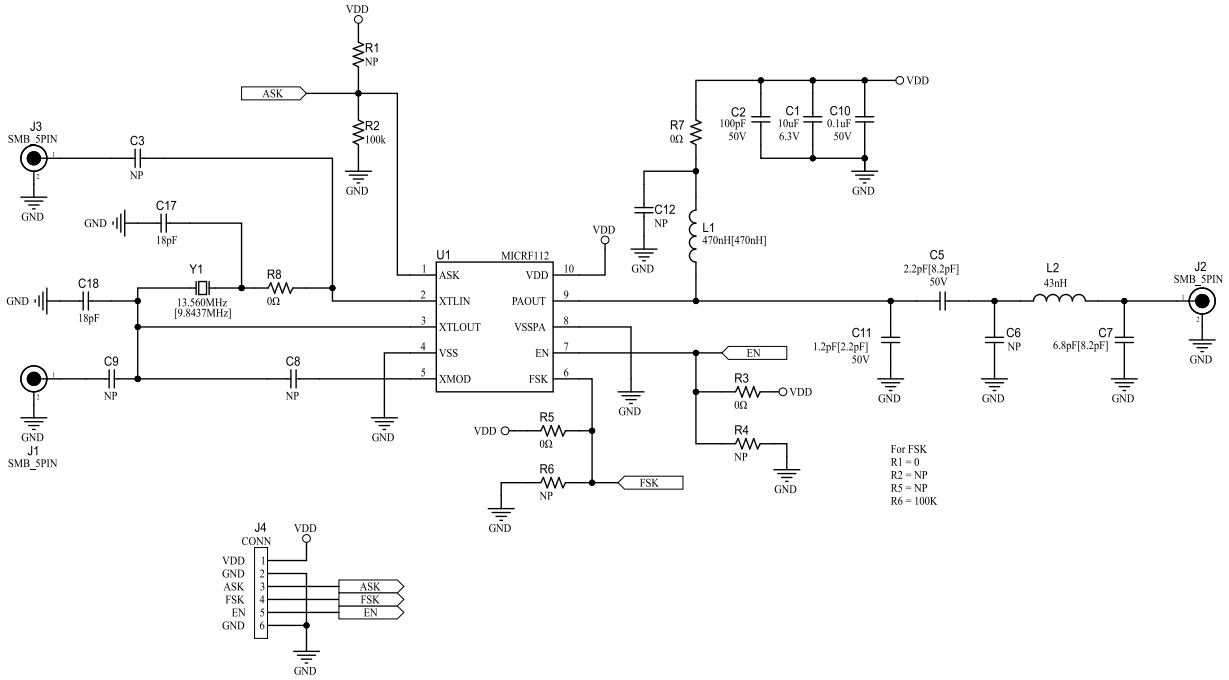
Parameter	Condition	Min.	Typ.	Max.	Units
Power Supply					
Standby Supply Current, Iq	EN= VSS	—	0.05	1	µA
Mark Supply Current ION	@315 MHz, P_{OUT} = +10 dBm	—	11.5	—	mA
	@433.92 MHz, P_{OUT} = +10 dBm	—	11.6	—	mA
SPACE Supply Current, IOFF	@ 315 MHz	—	2.4	—	mA
	@ 433.92 MHz	—	2.7	—	mA
RF Output Section and Modulation Limits:					
Output Power Level, POUTFSK or ASK "Mark"	@ 315 MHz(4)	—	10	—	dBm
	@ 433.92 MHz(4)	—	10	—	dBm
Harmonics output for 315 MHz	@630 MHz(4) 2nd harm	—	-53	—	dBc
	@945 MHz(4) 3rd harm	—	-53	—	dBc
Harmonics Output for 433.92 MHz	@867.84 MHz(4) 2nd harm	—	-51	—	dBc
	@1301.76 MHz(4) 3rd harm	—	-65	—	dBc
Extinction Ratio for ASK	—	—	80	—	dBc
FSK Modulation					
Frequency Deviation	Load capacitor = 10 pF, crystal type = HC49/U	—	22	—	kHz
Data Rate	—	—	—	10	Kbps
ASK Modulation					
Data Rate	—	—	—	50	Kbps
Occupied Bandwidth	@ 315 MHz(5)	—	<700	—	kHz
	@ 433.92 MHz(5)	—	<1000	—	kHz
VCO Section					
315 MHz Single Side Band Phase Noise	@100 kHz from Carrier	—	-76	—	dBc/Hz
	@1000 kHz from Carrier	—	-79	—	dBc/Hz
433.92 MHz Single Side Band Phase Noise	@100 kHz from Carrier	—	-72	—	dBc/Hz
	@1000 kHz from Carrier	—	-81	—	dBc/Hz
Reference Oscillator Section					
XTLIN, XTLOUT, XTLMOD	Pin capacitance	—	2	—	pF
External Capacitance	See Schematic C17 and C18	—	18	—	pF
Oscillator Start-Up Time(6)	Crystal:HC49S	—	400	—	µs
Digital/Control Section					
Output Blanking	STDBY transition from low to high	—	500	—	µs
Digital Input (EN, ASK and FSK)	High (V_{IH})	0.8 x V_{DD}	—	—	V
	Low (V_{IL})	—	—	0.2xV_{DD}	V
Digital Input Leakage Current (EN, ASK and FSK Pins)	High (V_{IH})	—	0.05	—	µA
	Low (V_{IL})	—	0.05	—	µA
Undervoltage Lock Out (UVLO)	—	—	1.6	—	V

Notes:

1. Exceeding the absolute maximum rating may damage the device.
2. The device is not guaranteed to function outside its operating ratings.
3. Devices are ESD sensitive. Handling precautions are recommended. Human body model, 1.5k in series with 100 pF.
4. Measured using the circuit shown in the Test Circuit
5. RBW = 100 kHz, OBW measured at -20 dBc
6. Dependent on crystal

3. Test Circuit

Figure 3-1. MICRF112 Test Circuit with 50Ω Output (MSOP)



Notes:

1. Values without parenthesis are for 433.92 MHz, and values in parenthesis are for 315 MHz.
2. C9 = 100 pF for external REF-OSC
3. For FSK, R1 = 0Ω, R2 = NP, R6 = 100k and R5 = NP.

4. 50Ω Evaluation Board PCB Layout

Figure 4-1. Assembly Drawing MICRF112 50Ω Evaluation Board (MSOP)

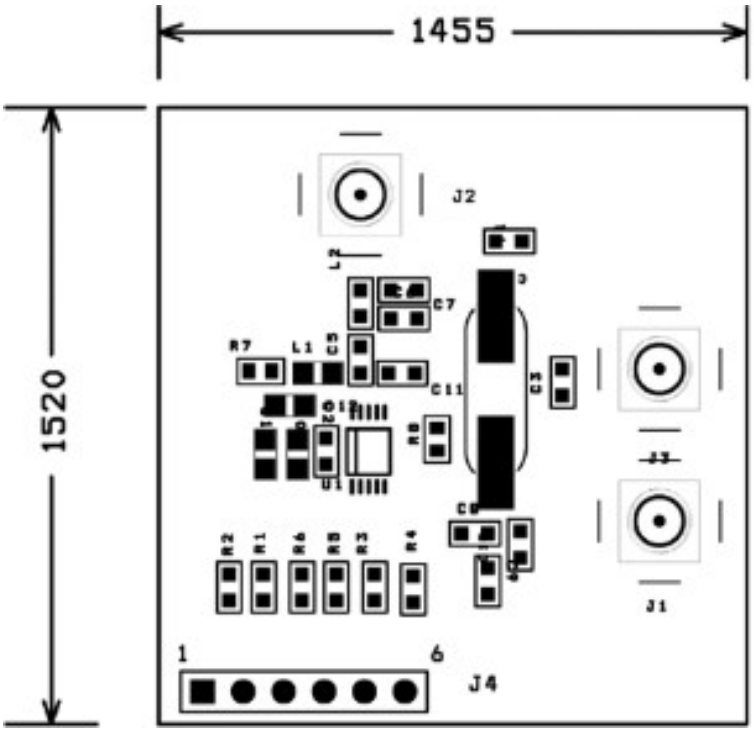


Figure 4-2. Top Layer MICRF112 50Ω Evaluation Board (MSOP)

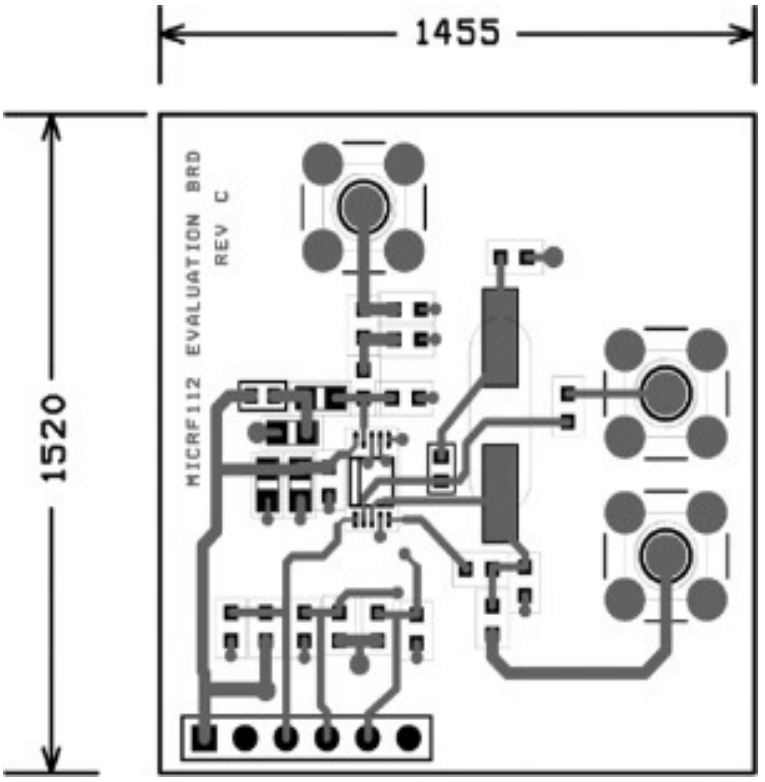
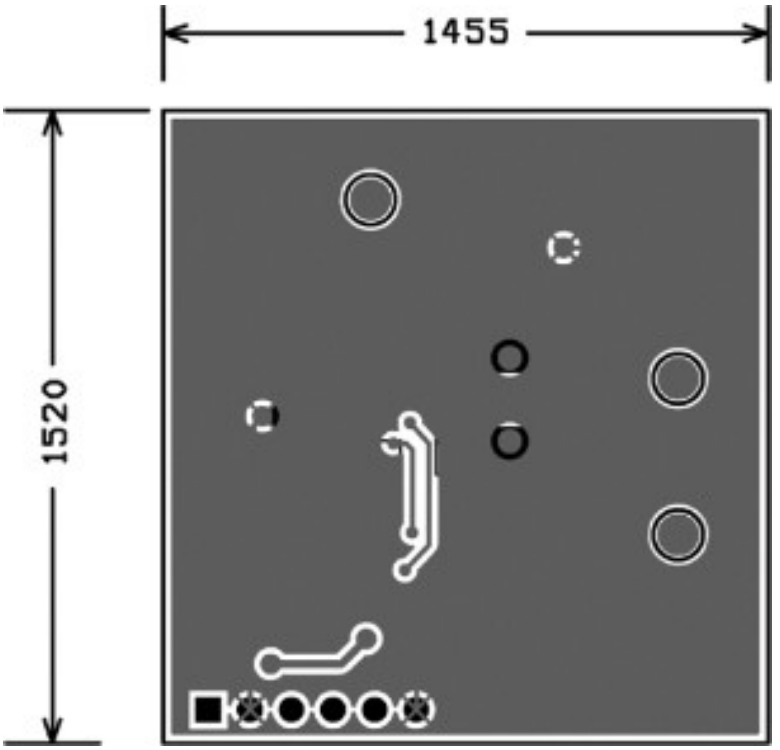


Figure 4-3. Bottom Layer MICRF112 50Ω Evaluation Board (MSOP)



5. Typical Characteristics Using MICRF112, 50 Ω Evaluation Board (MSOP)

Figure 5-1. 315 MHz OBW, ASK = 1 kHz

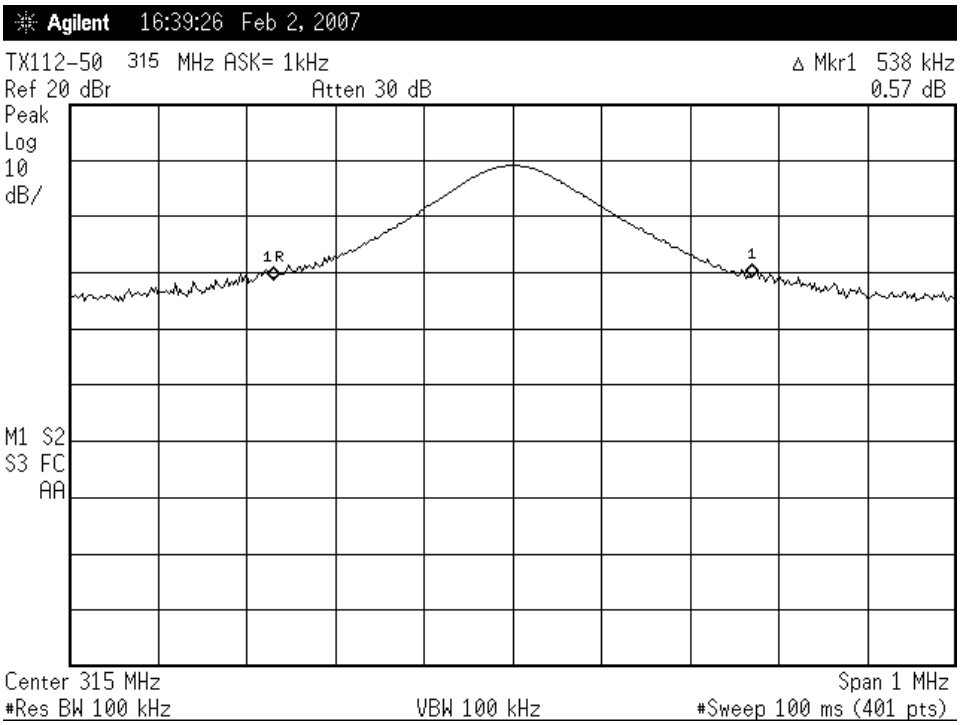


Figure 5-2. 315 MHz OBW, ASK = 50 kHz

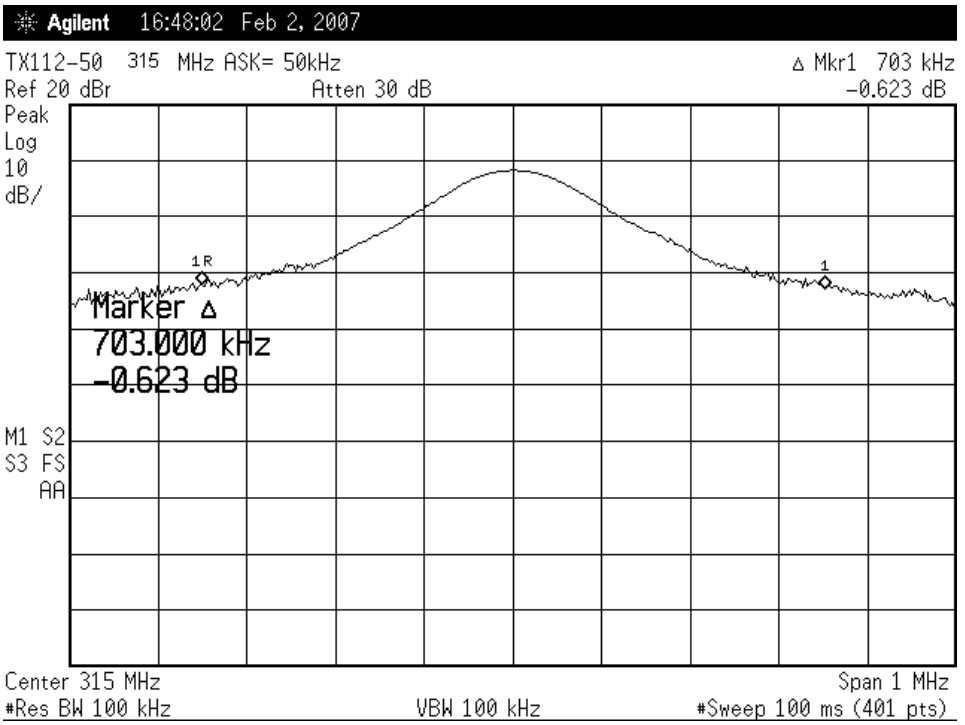
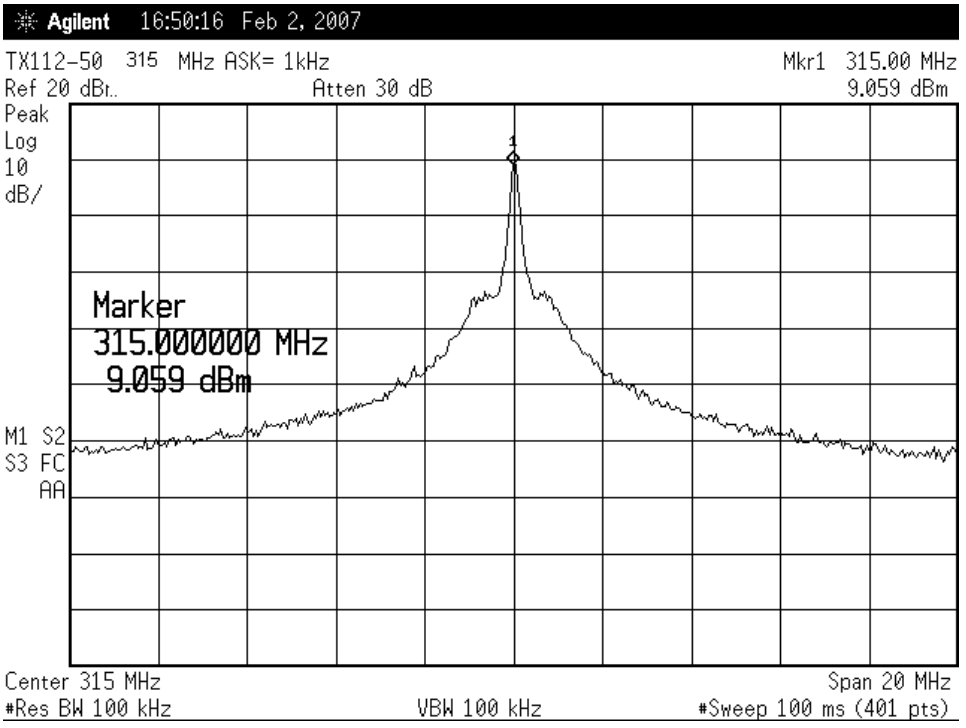


Figure 5-3. CW Max Power @ 3V, 315 MHz, ASK = 1 kHz



Note: 1.2 dB cable loss

Figure 5-4. RF Spectrum 2nd Harmonic; Fundamental at 315 MHz

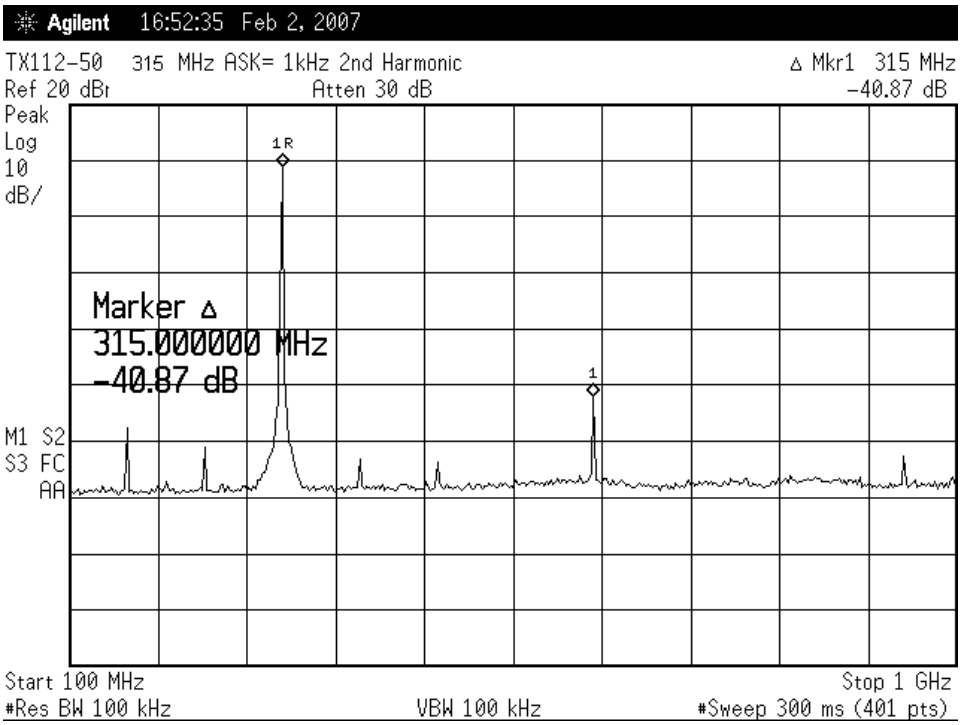


Figure 5-5. RF Spectrum 3rd Harmonic; Fundamental at 315 MHz

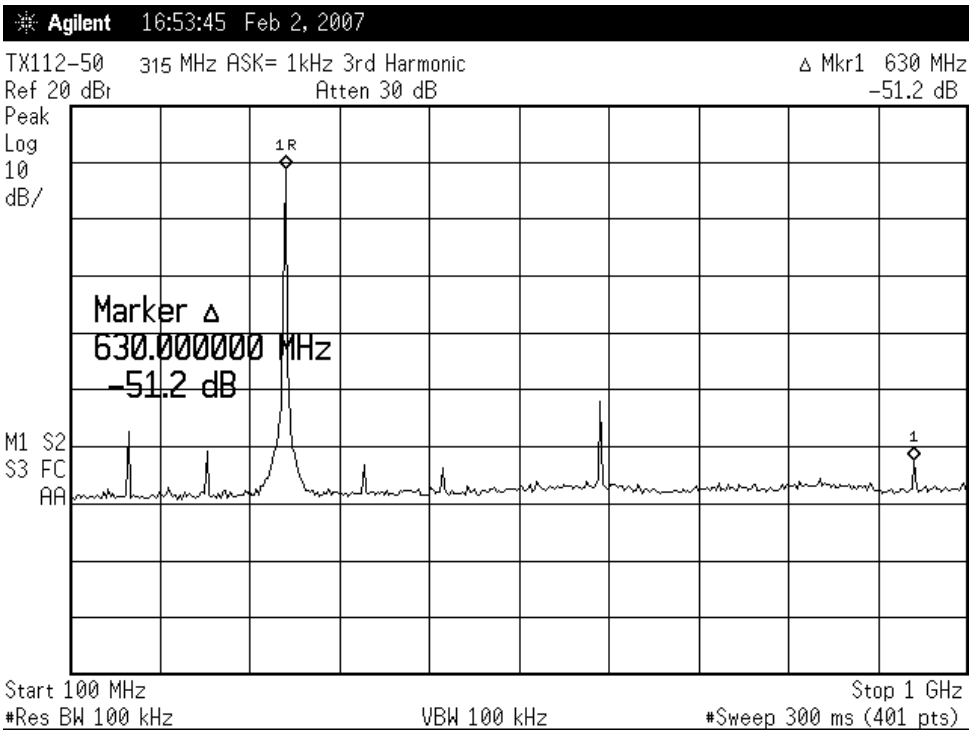


Figure 5-6. 315 MHz, Power Level at Space, VDD = 3.0V, ASK = 1 kHz

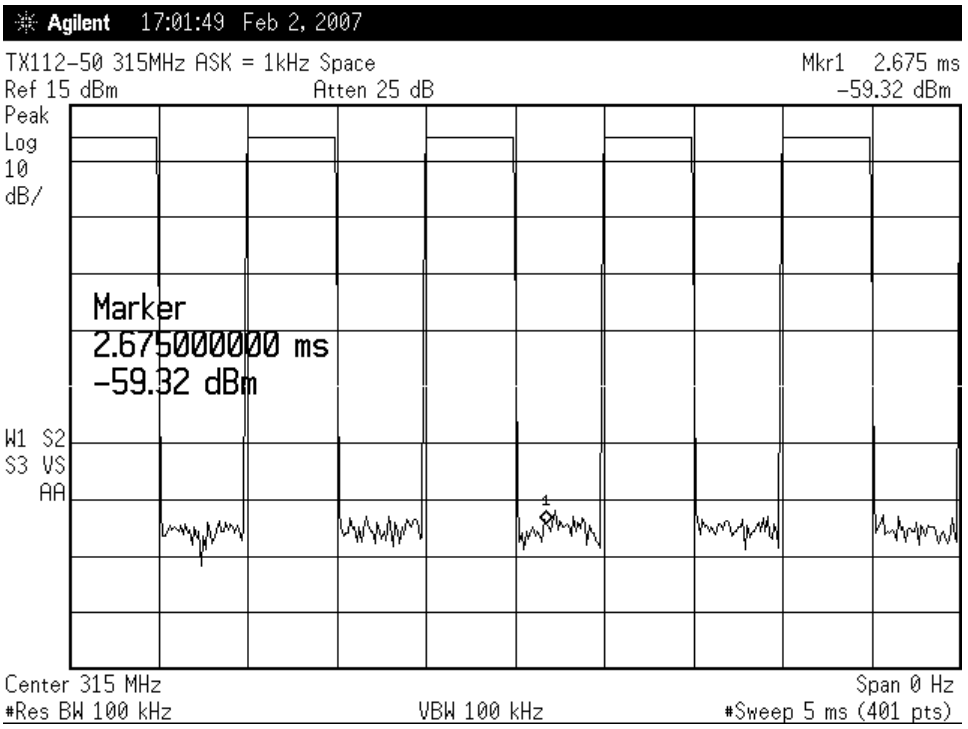


Figure 5-7. 315 MHz, Zero Span, ASK = 1 kHz

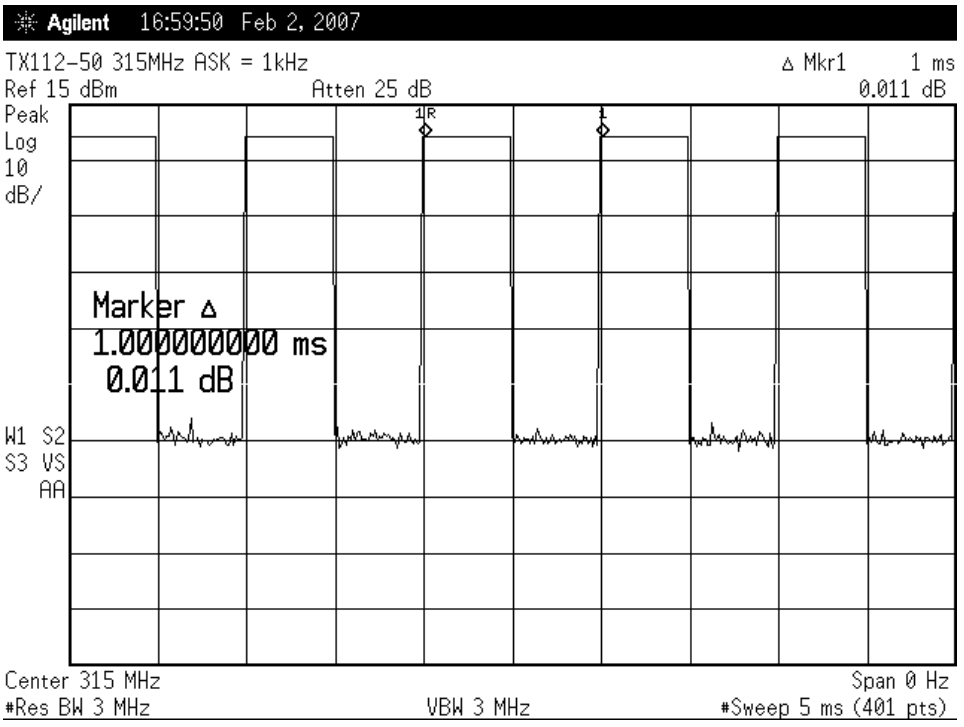


Figure 5-8. 315 MHz, Zero Span, ASK = 50 kHz

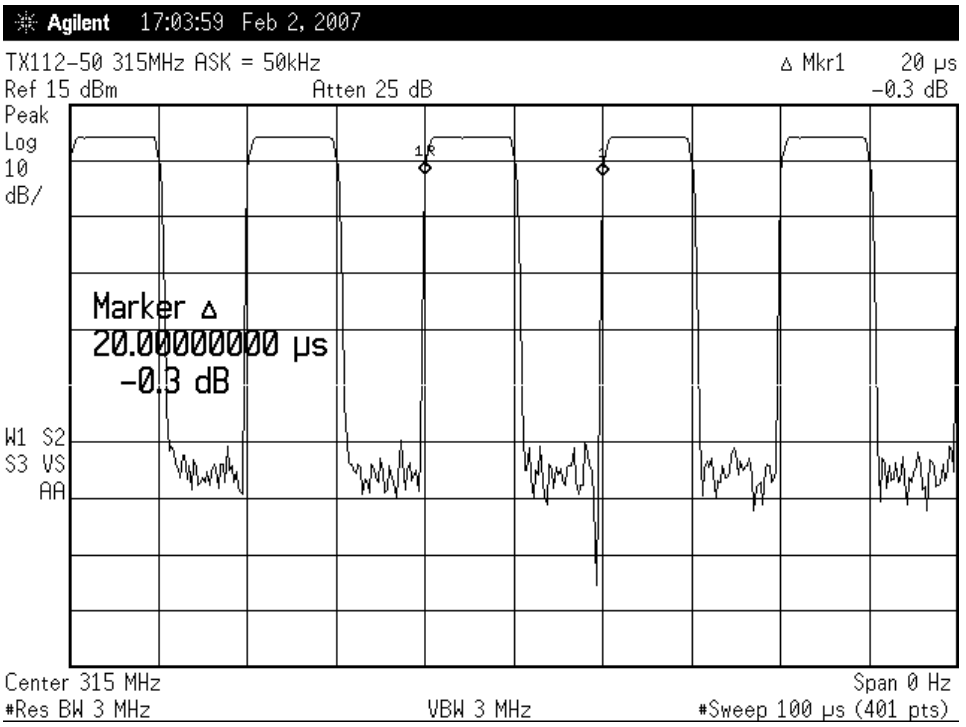


Figure 5-9. 315 MHz, Phase Noise, ASK = 1 kHz, 100 kHz Offset, -75.59 dBc/Hz

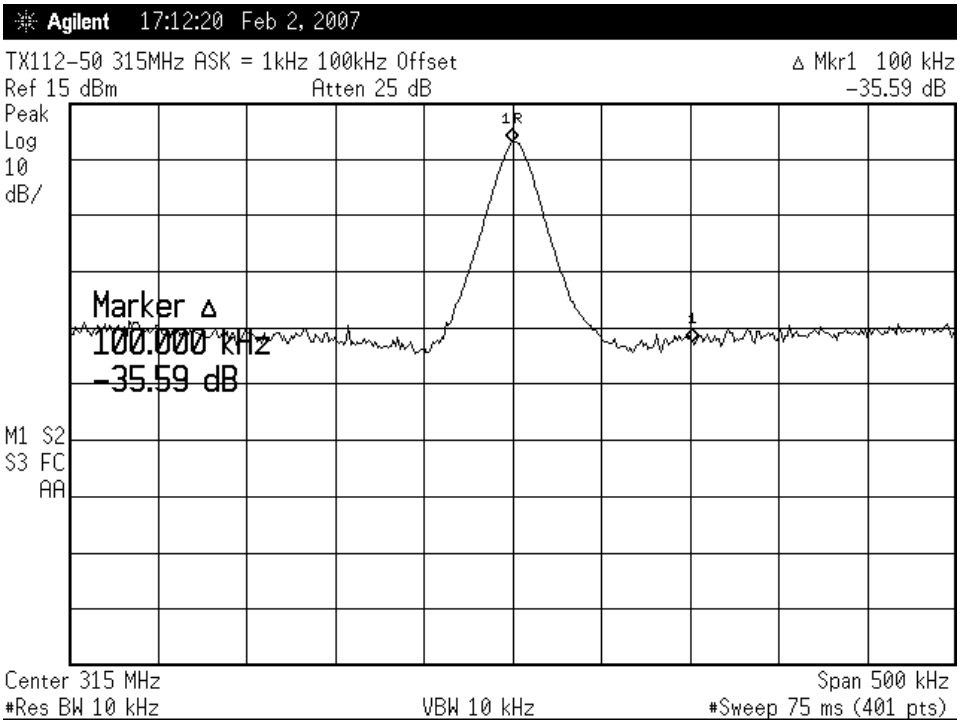


Figure 5-10. 315 MHz, Phase Noise, ASK = 1 kHz, 1 MHz Offset, -78.99 dBc/Hz

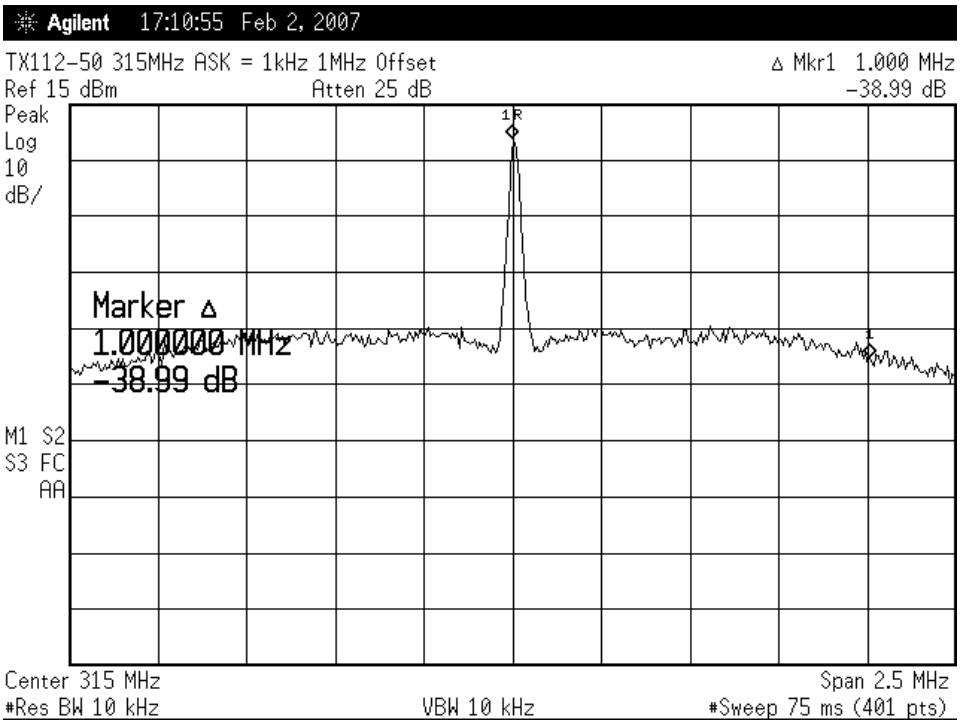


Figure 5-11. 315 MHz, Phase Noise, ASK = CW, 100 kHz Offset, -74.39 dBc/Hz

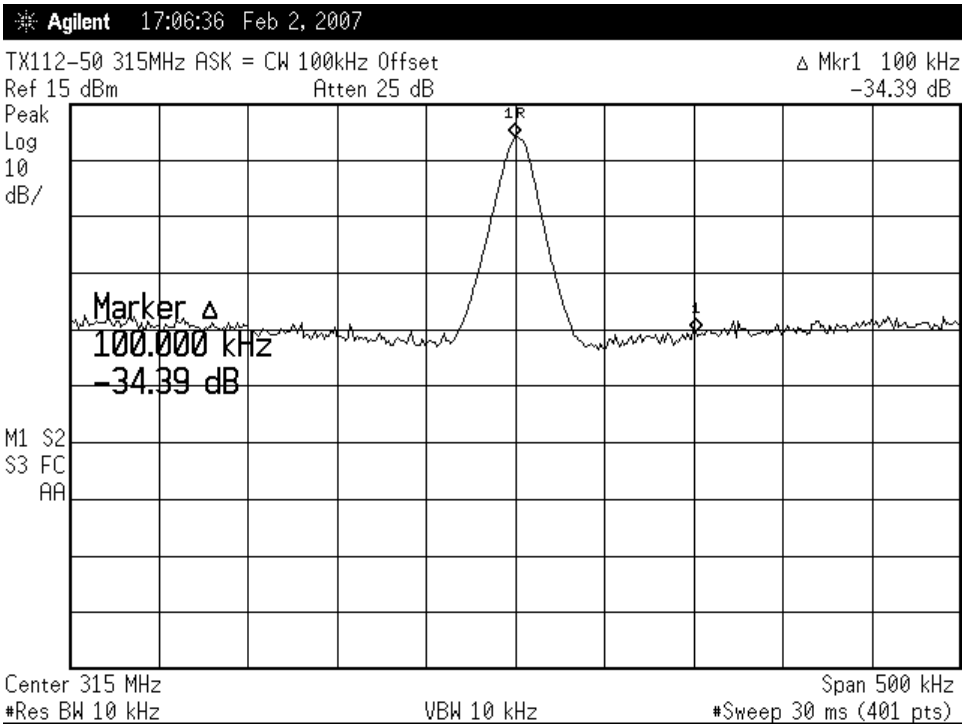


Figure 5-12. 315 MHz, Phase Noise, ASK = CW, 1 MHz Offset, -77.28 dBc/Hz

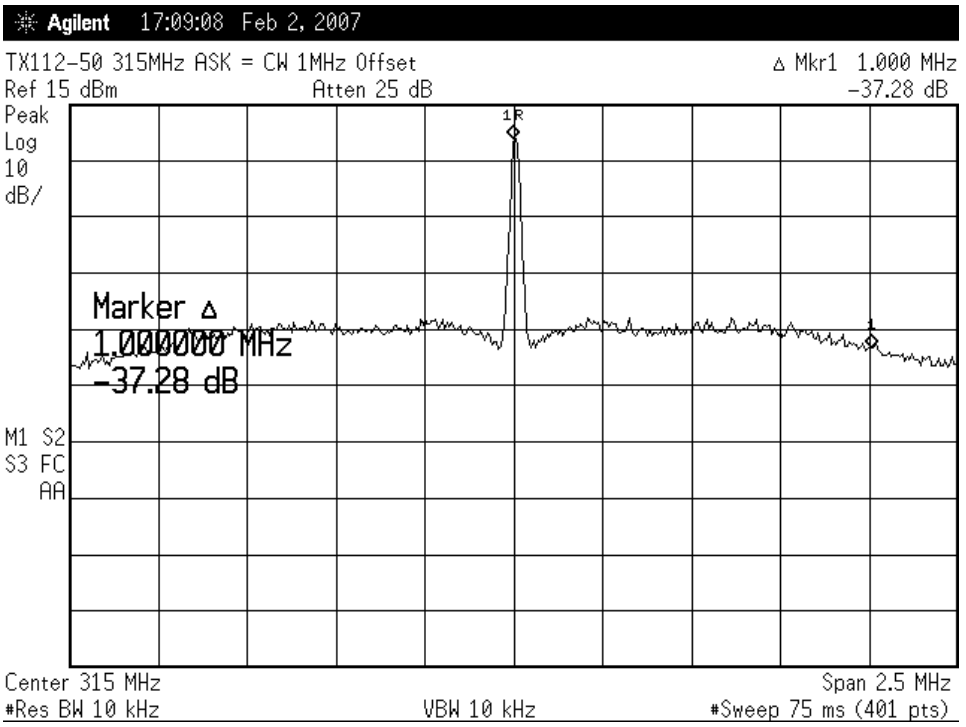


Figure 5-13. 433.92 MHz OBW, ASK = 1 kHz

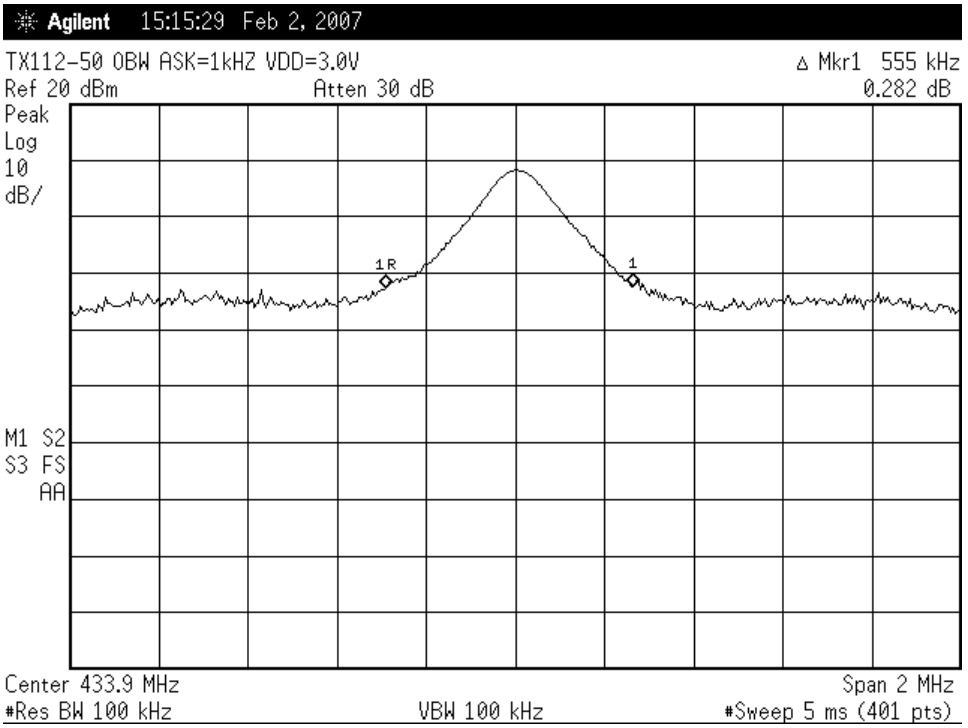


Figure 5-14. 433.92 MHz OBW, ASK = 50 kHz

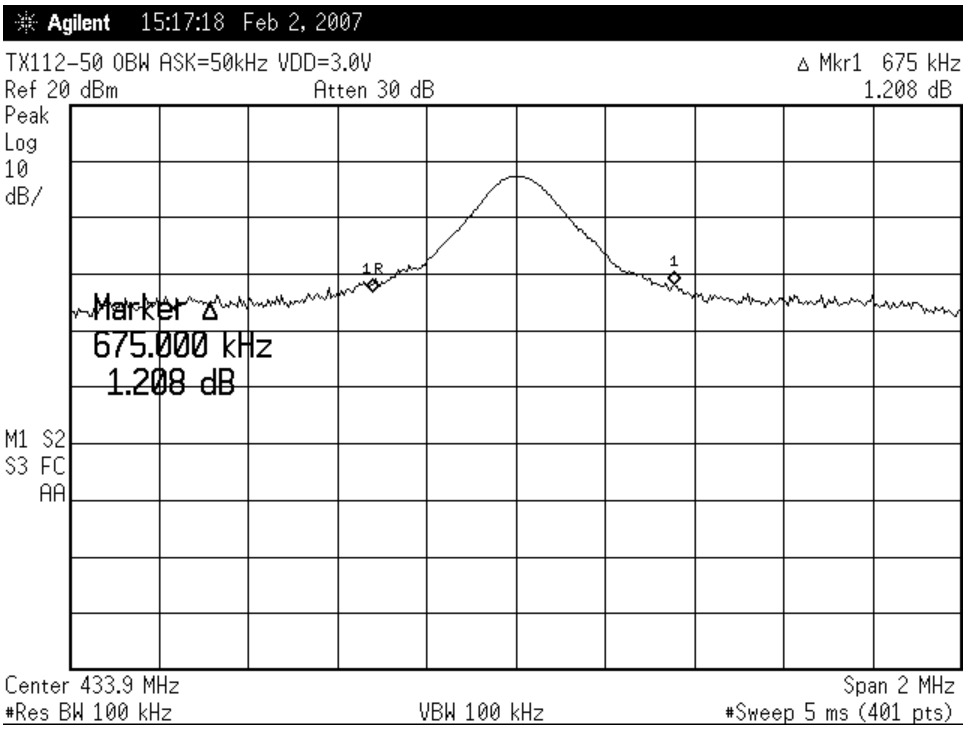
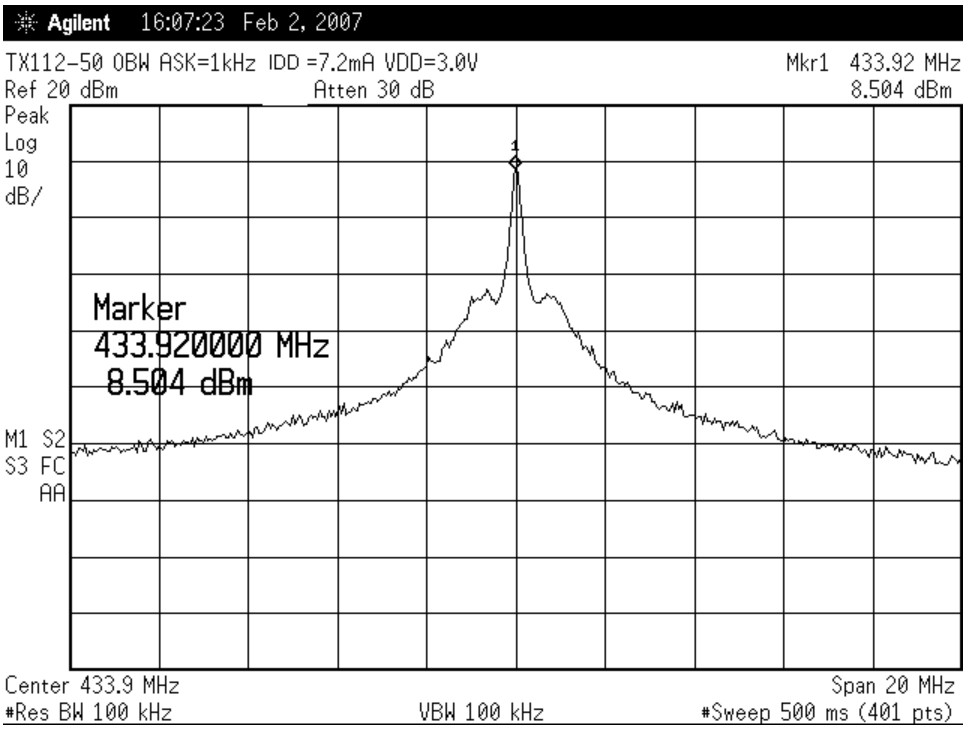


Figure 5-15. 433.92 MHz, CW Max Power @ 3V, ASK = 1 kHz



Note: 1.3 dB cable loss

Figure 5-16. RF Spectrum 2nd Harmonic; Fundamental at 433.92 MHz

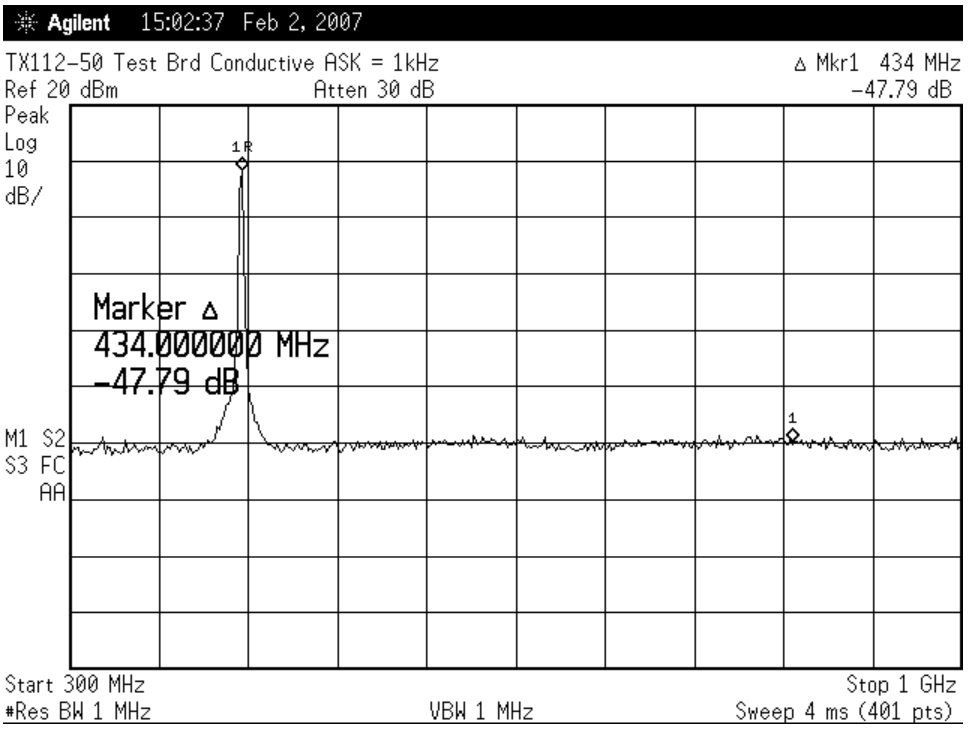


Figure 5-17. RF Spectrum 3rd Harmonic; Fundamental at 433.92 MHz

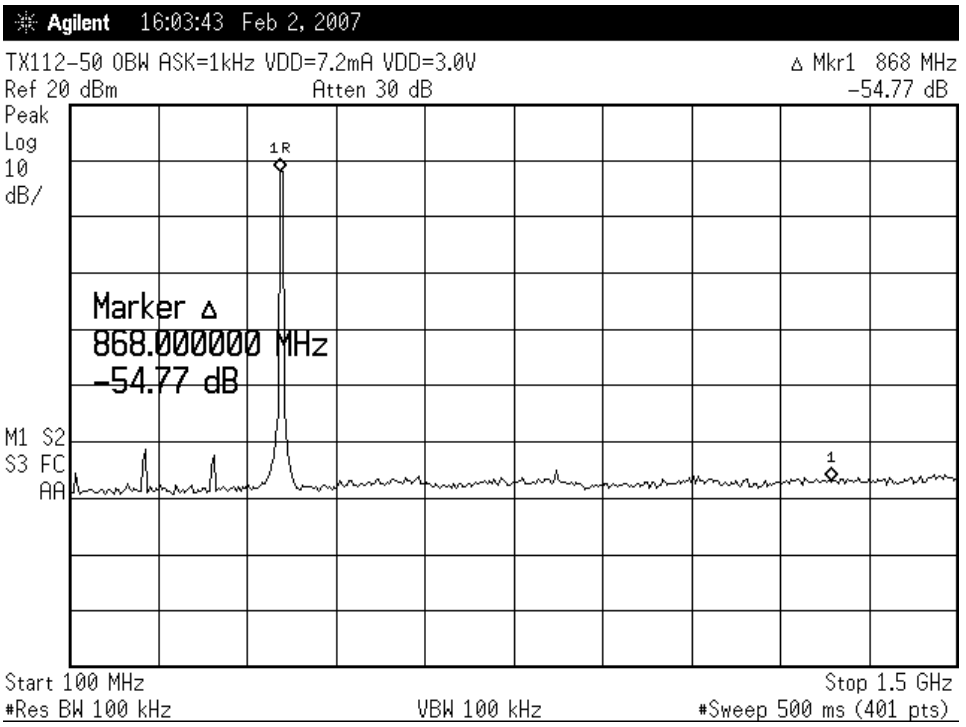


Figure 5-18. 433.92 MHz, Power Level at Space, VDD = 3.0V, ASK = 1 kHz

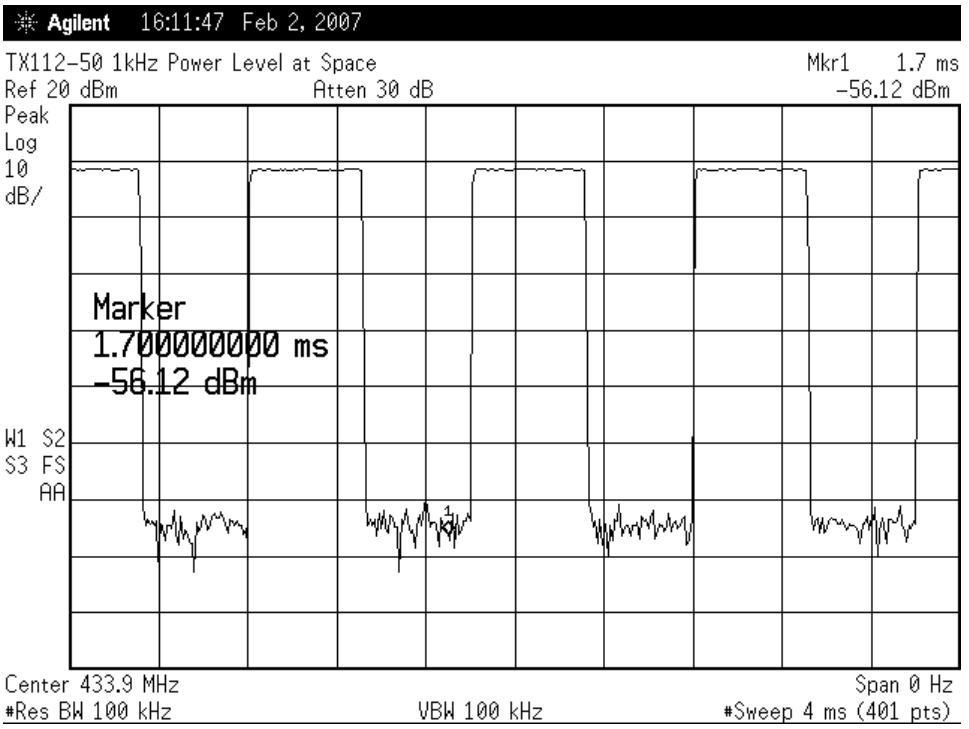


Figure 5-19. 433.92 MHz Zero Span, 1 kHz

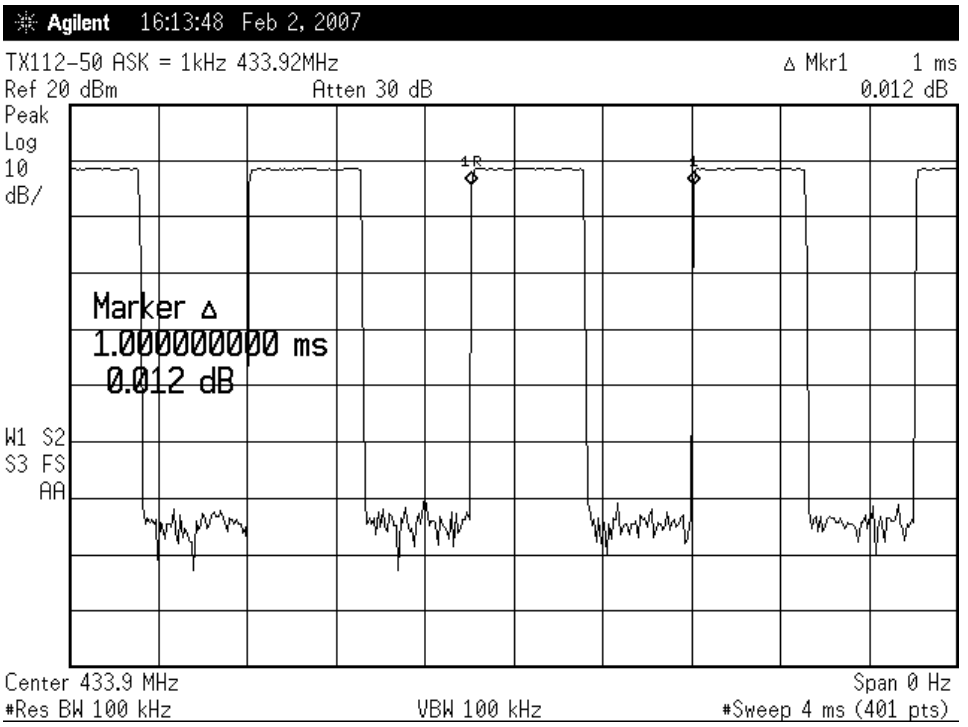


Figure 5-20. 433.92 ASK Zero Span at 50 kHz

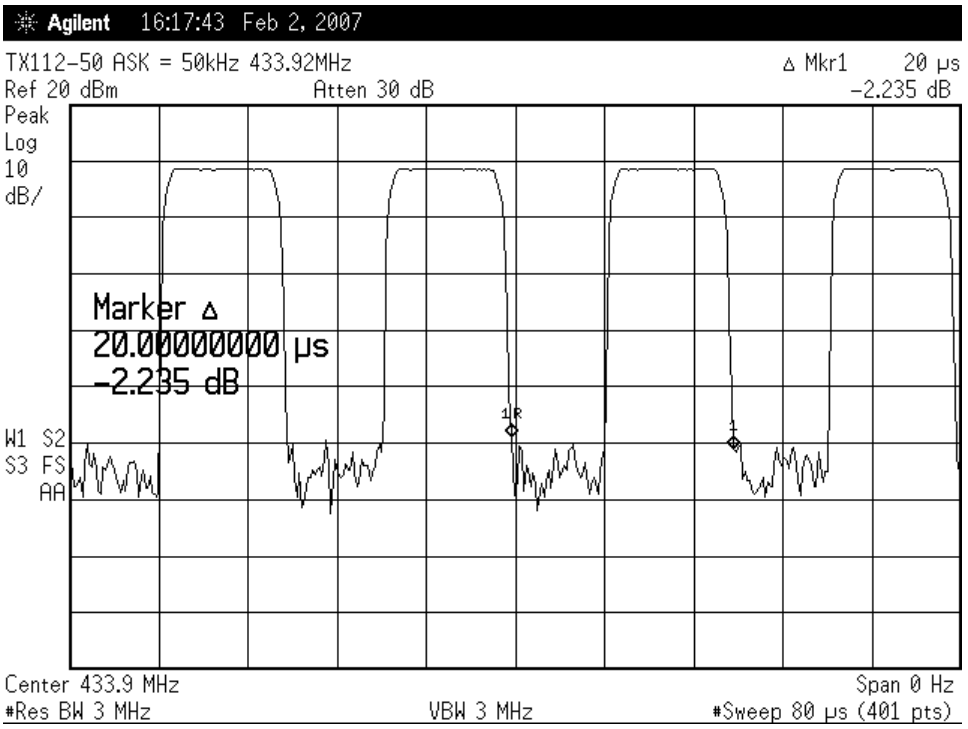


Figure 5-21. 433.92 MHz Phase Noise, ASK = CW, 100 kHz Offset, -81.04 dBc/Hz

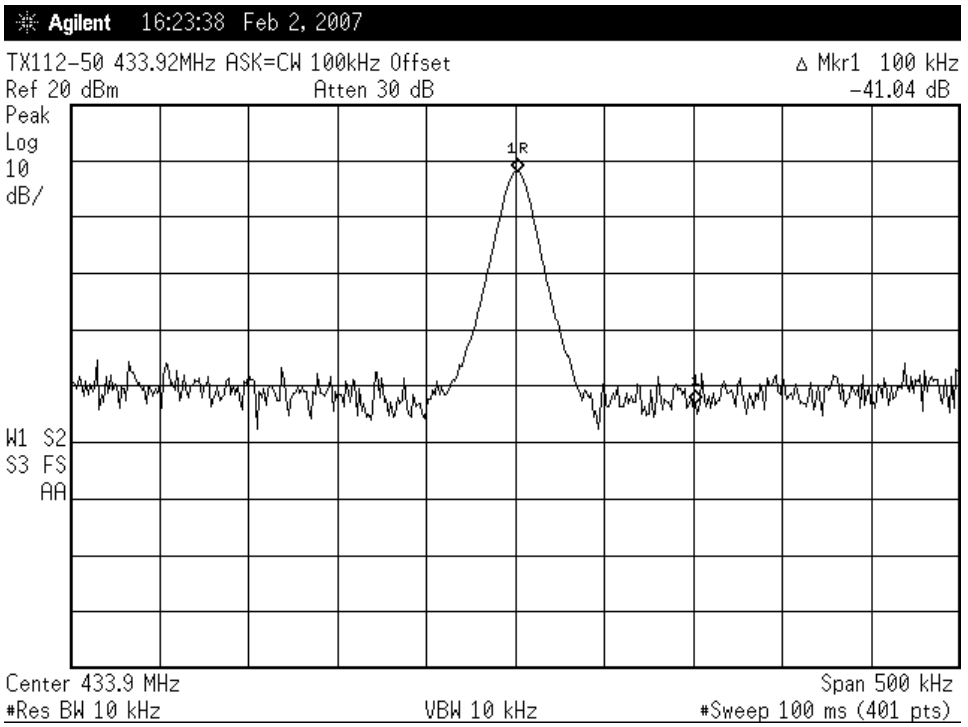


Figure 5-22. 433.92 MHz Phase Noise, ASK = CW, 1 MHz Offset, -78.76 dBc/Hz

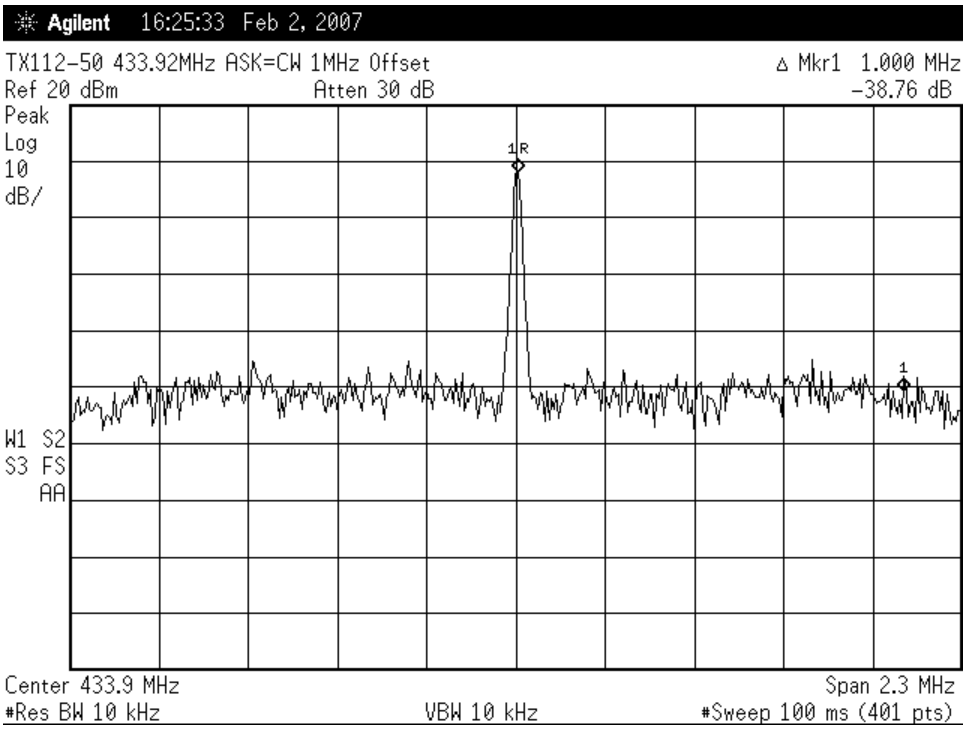


Figure 5-23. 433.92 MHz Phase Noise, ASK = 1 kHz, 100 kHz Offset, -71.73 dBc/Hz

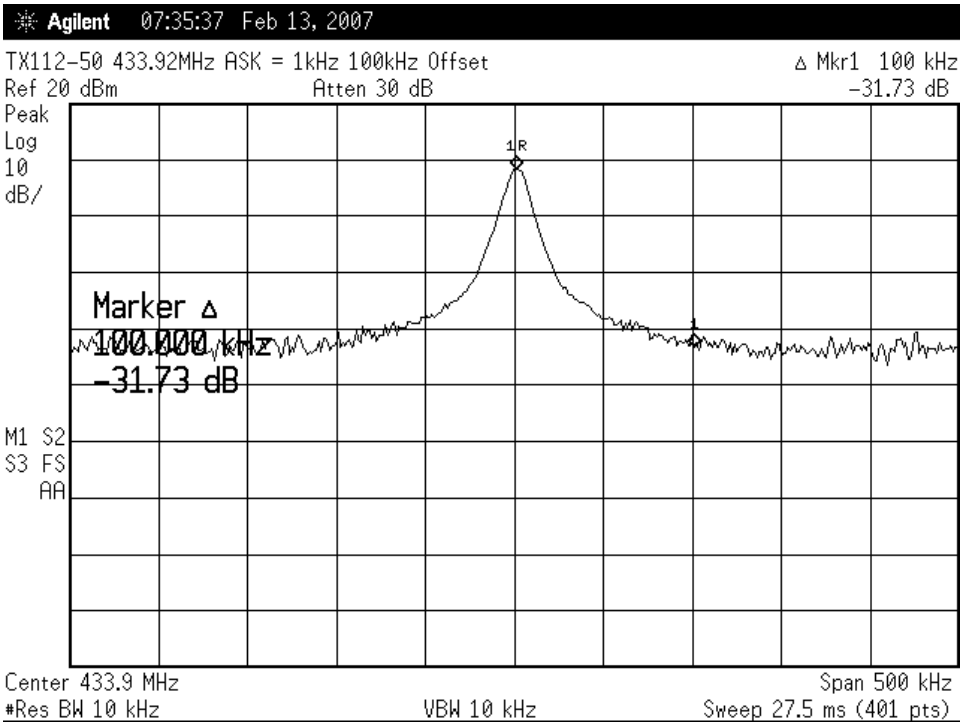
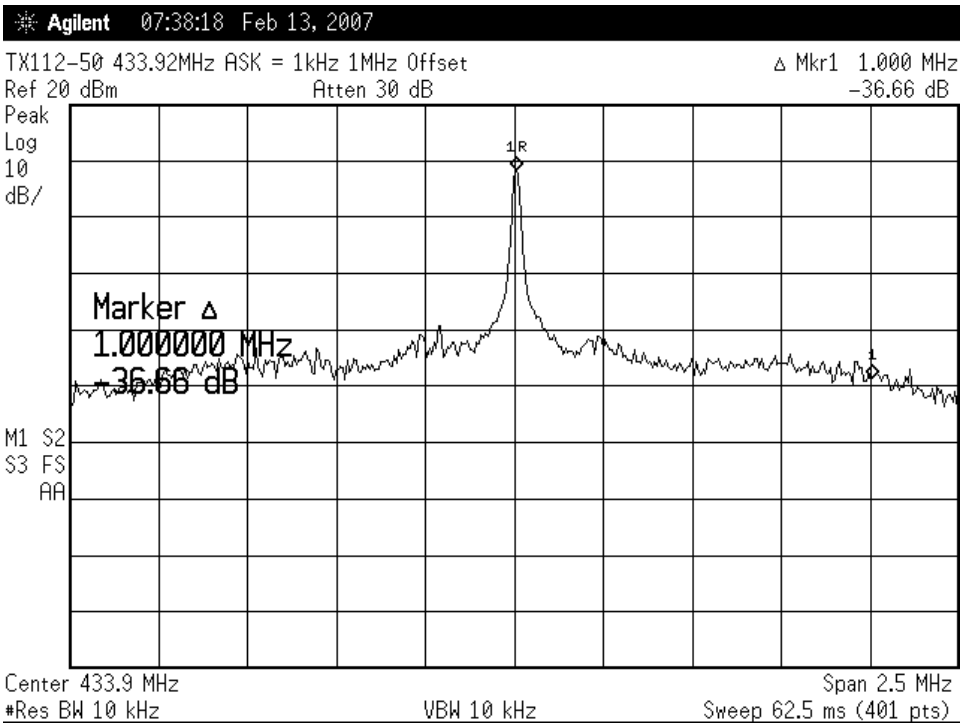


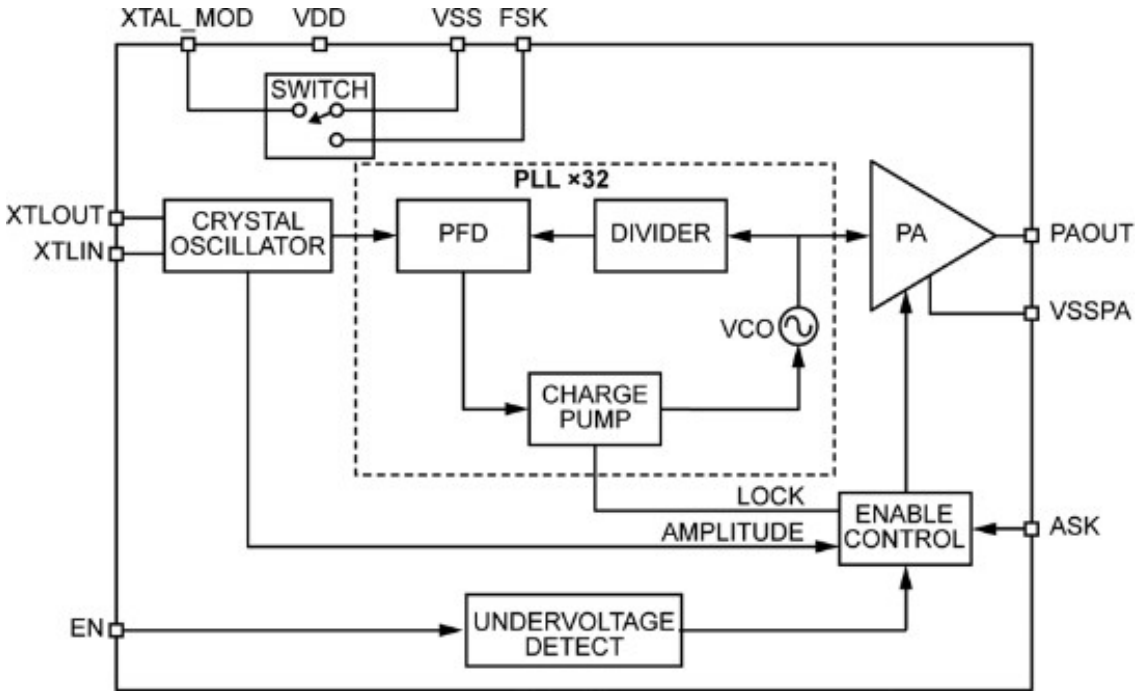
Figure 5-24. 433.92 MHz Phase Noise, ASK = 1 kHz, 1 MHz Offset, -81.04 dBc/Hz



6. Functional Description

The following figure illustrates a functional block diagram of the MICRF112 transmitter. The MICRF112 can be best described as a phase-locked transmitter. The system can be partitioned into six functional blocks: crystal oscillator, PLL×32, power amplifier, enable control, undervoltage detect and open-drain switch for FSK operation.

Figure 6-1. Functional Block Diagram MICRF112 10 Pin ASK/FSK Version



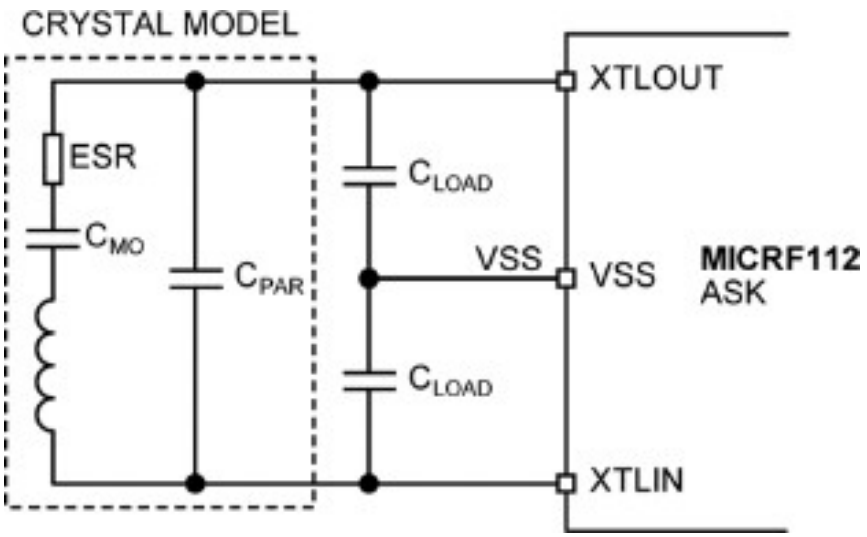
Crystal Oscillator

The reference oscillator is a crystal-based pierce configuration. It is designed to accept crystals with frequencies from 9.375 MHz to 14.0625 MHz.

Crystal Oscillator Parameters for ASK Operation

The following figure illustrates a reference oscillator circuit configuration for ASK operation. The reference oscillator can drive crystals with an ESR range from 20Ω to 300Ω.

Figure 6-2. Reference Oscillator ASK Operation



When the ESR of the crystal is at 20Ω, the crystal parameter limits are:

ESR	20Ω
C_{PAR}	2 to 10 pF
C_{MO}	10 to 40 fF

When the ESR of the crystal is at 300Ω, the crystal parameter limits are:

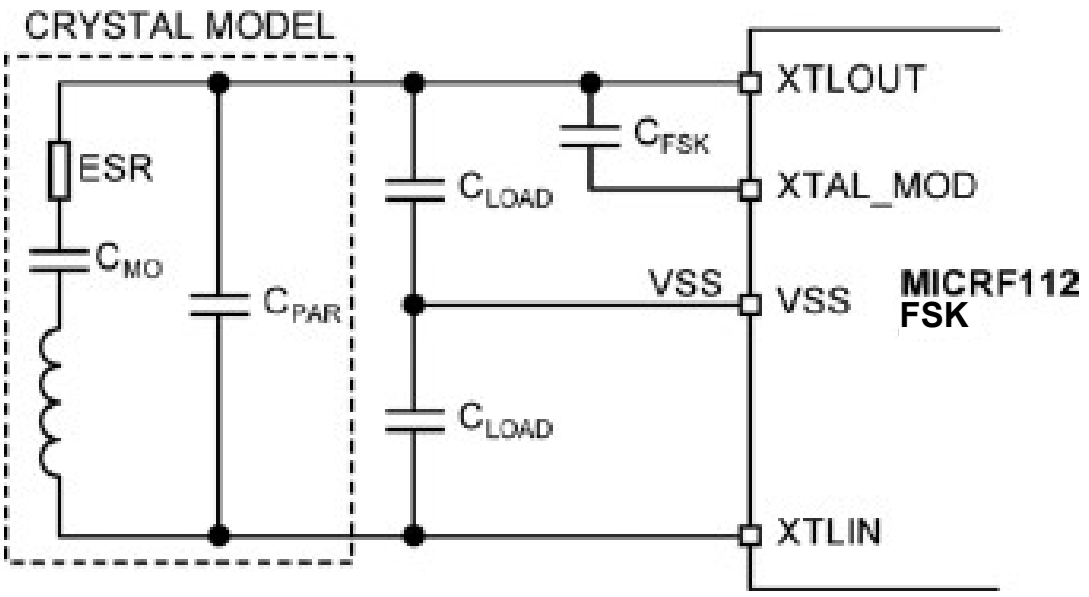
ESR	300Ω
C_{PAR}	2 to 5 pF
C_{MO}	10 to 40 fF
C_{LOAD}	10 to 30 pF

Crystal Oscillator for FSK Operation

The following figure illustrates the reference oscillator circuit configuration for FSK operation. To operate the MICRF112 in FSK mode, one additional capacitor is needed between XTLOUT pin and the XTAL_MOD pin. Crystal parameters for FSK operation are the same as for ASK operation except:

- When the ESR of crystal is at 20Ω, C_{FSK}+ C_{LOAD} must not exceed 70 pF.
- When the ESR of crystal is at 300Ω, C_{FSK} + C_{LOAD} must not exceed 30 pF.

Figure 6-3. Reference Oscillator FSK Operation



PLL×32

The function of PLL×32 is to provide a stable carrier frequency for transmission. It is a “divided by 32” phase-locked oscillator.

Power Amplifier

The power amplifier serves two purposes: to buffer the VCO from external elements and to amplify the phase-locked signal. The power amplifier can produce +10 dBm at 3V (typical).

Enable Control

The enable control gates the ASK data. It only allows transmission when Lock, Amplitude and Undervoltage Detect conditions are valid.

Undervoltage Detect

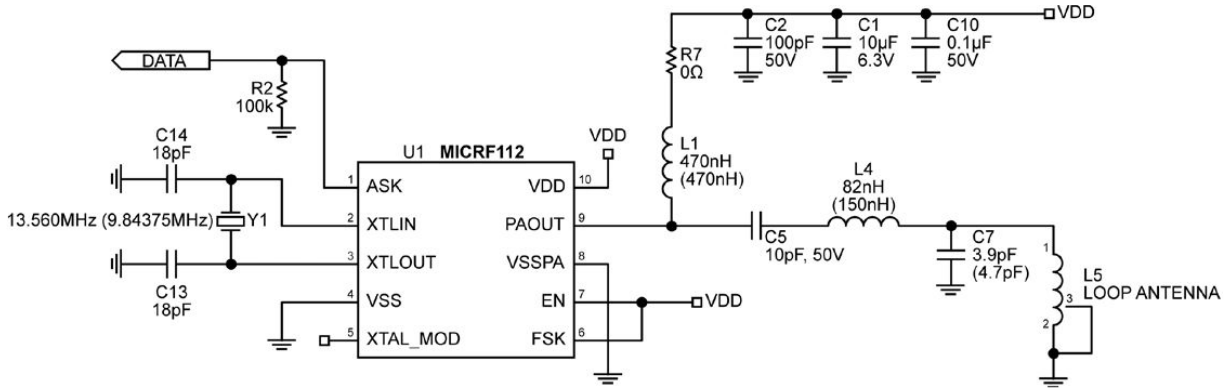
The undervoltage detect block senses operating voltage. If the operating voltage falls below 1.6V, the undervoltage detect block sends a signal to the enable control block to disable the PA.

Open-Drain Switch

The open-drain switch is used for FSK operation. FSK data is fed into the FSK pin. The FSK pin is connected to the gate of the open-drain switch. The open collector is connected to the XTAL_MOD pin. In Figure 6-3, a capacitor is shown connected from the XTAL_MOD pin to XTLOUT. When the FSK pin goes high, the capacitor between XTAL_MOD and XTLOUT pulls the frequency of REFOSC low.

7. Application Information

Figure 7-1. ASK 433.92 MHz and 315 MHz (MSOP)



Note: Values in parenthesis are for 315 MHz.

The MICRF112 is ideal for driving a 50Ω source monopole or a loop antenna. The above figure is an example of a loop antenna configuration. It also illustrates both 315 MHz and 433.92 MHz ASK configurations for a loop antenna. In addition to using a different crystal, modified values are needed for certain frequencies. These are listed in the following table.

Table 7-1. Modified Frequency Values

Frequency (MHz)	L1 (nH)	C5 (pF)	L4 (nH)	C7 (pF)	Y1 (MHz)
315.0	470	10	150	4.7	9.84375
433.92	470	10	82	3.9	13.5600

The reference design illustrated in Figure 7-1 has an antenna optimized for using the matching network, as described in the above table

Power Control Using an External Resistor

R7 is used to adjust the RF output levels that may be needed to meet compliance. As an example, Table 7-2 and Table 7-3 list typical values of conducted RF output levels and corresponding R7 resistor values for the 50Ω test board shown in the Test Circuit.

Table 7-2. ASK Output Power at 1 Kbps (Manchester) vs. External Resistor at 315 MHz

R7, Ω	Output Power, dBm	IDD, mA
0	10	6.7
75	8.5	6.3
100	8.0	6.2
500	1.6	4.13
1000	-3.8	4.87

Table 7-3. ASK Output Power at 1 Kbps (Manchester) vs. External Resistor at 433.92 MHz

R7, Ω	Output Power, dBm	IDD,mA
0	8.68	7.5
75	8.34	7.33
100	8.02	7.3
500	4.34	6.3
1000	0.42	5.5

Output Matching Network

Part of the function of the output network is to attenuate the second and third harmonics. When matching to a transmit frequency, be sure not only to optimize for maximum output power but to attenuate unwanted harmonics.

Layout Issues

PCB layout is extremely important to achieve optimum performance and consistent manufacturing results. Be careful with the orientation of the components to ensure that they do not couple or decouple the RF signal. PCB trace length must be short, to minimize parasitic inductance (1in ~ 20nH). For example, depending on inductance values, a 0.5 in trace can change the inductance by as much as 10%. To reduce parasitic inductance, the use of wide traces and a ground plane under signal traces is recommended. Use vias with low-value inductance for components requiring a connection to ground.

Antenna Layout

The antenna trace layout affects directivity. No ground plane must be under the antenna trace. For consistent performance, do not place components inside the loop of the antenna.

8. Demo Board PCB Layout

Figure 8-1. Assembly Drawing MICRF112 Evaluation Board (MSOP)

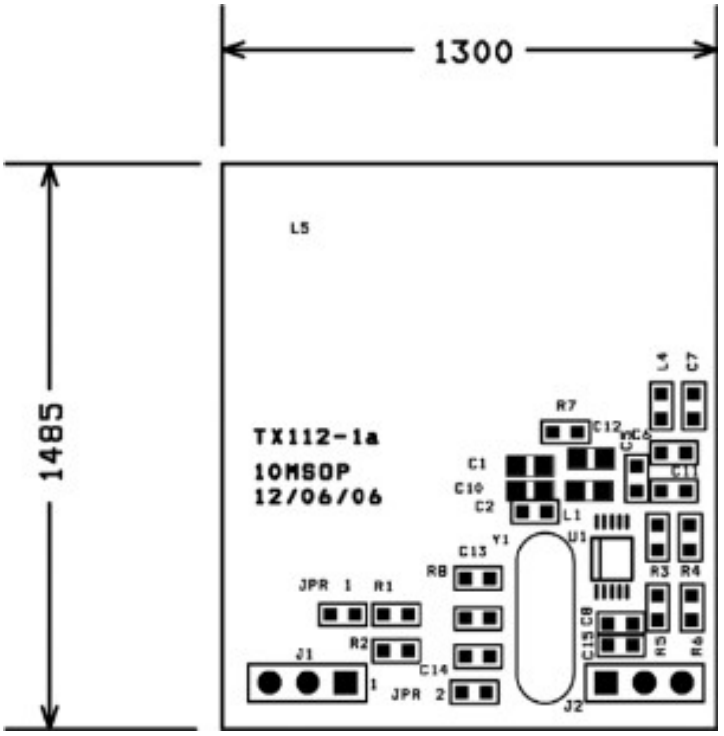


Figure 8-2. Top Layer MICRF112 Evaluation Board (MSOP)

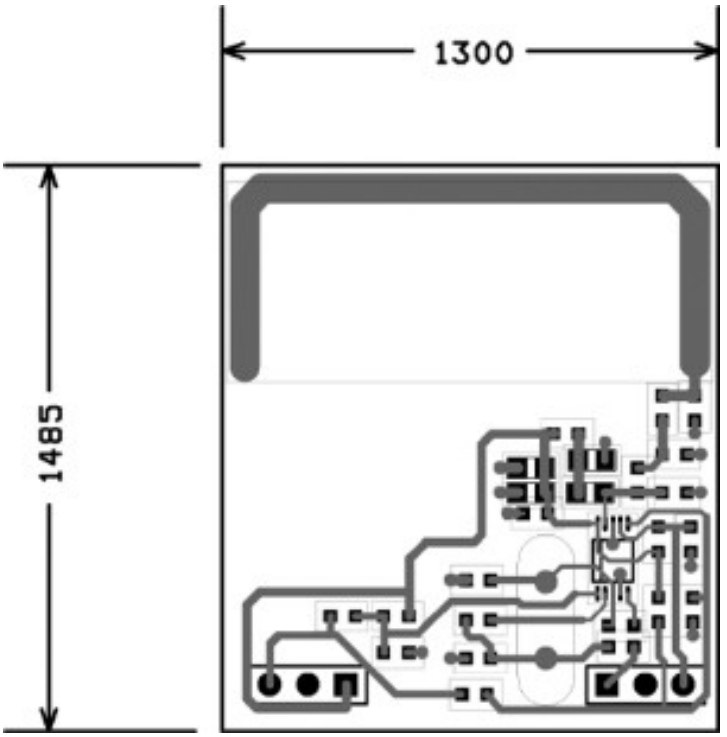
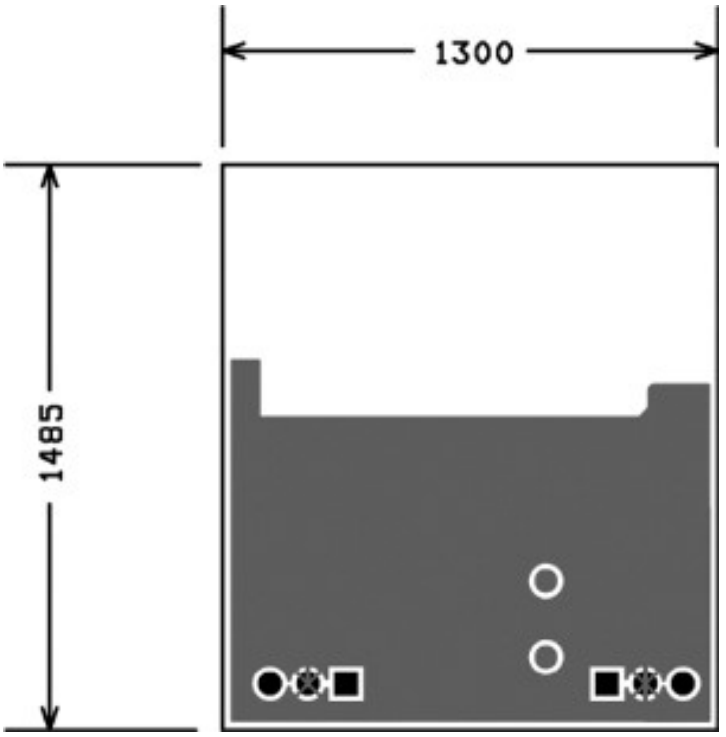
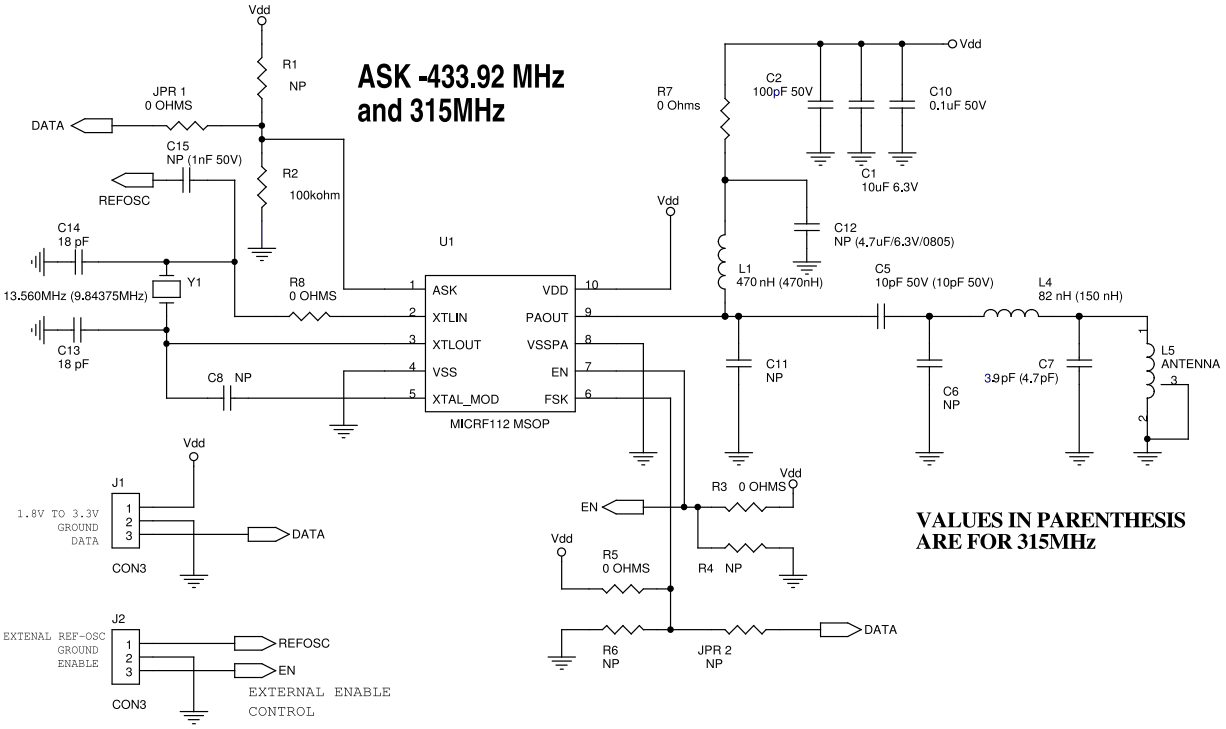


Figure 8-3. Bottom Layer MICRF112 Evaluation Board (MSOP)



9. Evaluation Board Schematic

Figure 9-1. TX112-1 Evaluation Board Schematic (MSOP)



Note: Configurations for ASK operation. Values in parenthesis are for 315 MHz.

10. Functional Description of the TX112-1 Evaluation Board

The layout of the TX112-1 Evaluation Board PCB is illustrated in Figure 9-1. It is a detailed schematic of the TX112-1. Components labeled “NP” use different configurations for FSK operation. Table 7-2 describes each header pin connector used in the evaluation board.

Table 10-1. Header Pin Connectors

Pin	Function Name	Functional Description
J1-1	VDD	1.8V to 3.6V
J1-2	Ground	VSS
J1-3	ASK INPUT	Modulating Data Input, ASK or FSK
J2-1	REF-OSC	External Reference Input
J2-2	GROUND	VSS
J2-3	ENABLE	Enable Input, Active High

11. TX112-1-433.92 MHz ASK Bill of Materials

Table 11-1. TX112-1-433.92 MHz ASK Bill of Materials

Item	Part Number	Manufacturer	Description	Qty
C1	CC0805KPX5R6BB106	Yageo Corporation	10 uF Cap, 0805	1
C2	CC0603JRNPO9BN101	Yageo Corporation	100 pF Cap, 0603	1
C5	CC0603JRNPO9BN100	Yageo Corporation	10 pF Cap, 0603	1
R1, R4, R6, JPR2	—	—	—	NP
C6, C8, C11, C12, C15	—	—	—	NP
C7	CC0603CRNPO9BN3R9	Yageo Corporation	3.9 pF Cap, 0603	1
C10	CC0603KRX7R9BB104	Yageo Corporation	0.1 uF Cap, 0603	1
C13, C14	CC0603JRNPO0BN220	Yageo Corporation	22 pF Cap, 0603	2
J1, J2	PRPC003SBAN-M71RC	Sullins Connector Solutions	Con 3	2
L1	LQW2BASR47J00L	Murata Electronics®	470 uH Inductor, 0805	1
L4	LQW18AN82NG00D	Murata Electronics®	82 nH Inductor, 0603	1
L5	Loop antenna, part of PCB	—	Antenna, part of PCB	1
R2	RC0603FR-07100KL	Yageo Corporation	100k Resistor, 0603	1
R3, R5, R7, R8, JPR1	RC0603JR-070RL	Yageo Corporation	0R Resistor, 0603	5
U1	MICRF112YMM	Microchip Technology Inc.	MICRF112	1
Y1	SA-13.5600-F-10-C-3-3	HIB	13.56MHz XTAL	1
	9B-13.560MAAE-B	TXC Corporation		

12. TX112-1-315 MHz ASK Bill of Materials

Table 12-1. TX112-1-315 MHz ASK Bill of Materials

Item	Part Number	Manufacturer	Description	Qty.
C1	CC0805KPX5R6BB106	Yageo Corporation	10 uF Cap, 0805	1
C2	CC0603JRNPO9BN101	Yageo Corporation	100 pF Cap, 0603	1
C5	CC0603JRNPO9BN100	Yageo Corporation	10 pF Cap, 0603	1
R1, R4, R6, JPR2	—	—	—	NP
C6, C8, C11, C12, C15	—	—	—	NP
C7	CC0603CRNPO9BN4R7	Yageo Corporation	4.7 pF Cap, 0603	1
C10	CC0603KRX7R9BB104	Yageo Corporation	0.1 uF Cap, 0603	1
C13, C14	CC0603JRNPO8BN180	Yageo Corporation	18 pF Cap, 0603	2
J1, J2	PRPC003SBAN-M71RC	Sullins Connector Solutions	Con 3	2
L1	LQW2BASR47J00L	Murata Electronics®	470 uH Inductor, 0805	1
L4	LQW18ANR15J00D	Murata Electronics®	150 nH Inductor, 0603	1
L5	Loop antenna, part of PCB	—	Antenna, part of PCB	1
R2	RC0603FR-07100KL	Yageo Corporation	100k Resistor, 0603	1
R3, R5, R7, R8, JPR1	RC0603JR-070RL	Yageo Corporation	0R Resistor, 0603	5
U1	MICRF112YMM	Microchip	MICRF112	1
Y1	SA-9.84375-F-10-C-3-3	HIB	9.84375MHz XTAL	1
	4DC1-09843-CDFAD1	TCI		

13. FSK Operation

The Bill of Materials tables describe the components needed for ASK operation for 433.92 MHz and 315 MHz.

The following table lists the component values that change between ASK and FSK operation.

Note: The use of a high FSK data rate may excite parasitic resonant modes with some crystal types. Recommended crystals from the Bill of Materials tables hold good for both ASK and FSK.

Table 13-1. ASK and FSK Settings

Mode	R1	R2	R5	R6	JPR1	JPR2	C8
ASK	NP	100 kΩ	0Ω	NP	0Ω	NP	NP
FSK	0Ω	NP	NP	100 kΩ	NP	0Ω	3.3 pF(1) 10 pF(2)

Notes:

1. C8 = 3.3 pF for 1 kHz using HC49/U or HC49US type crystals.
2. C8 = 10 pF for 10 kHz using HC49/U, (high profile) only.

Table 13-2. Enable Control (Shutdown)

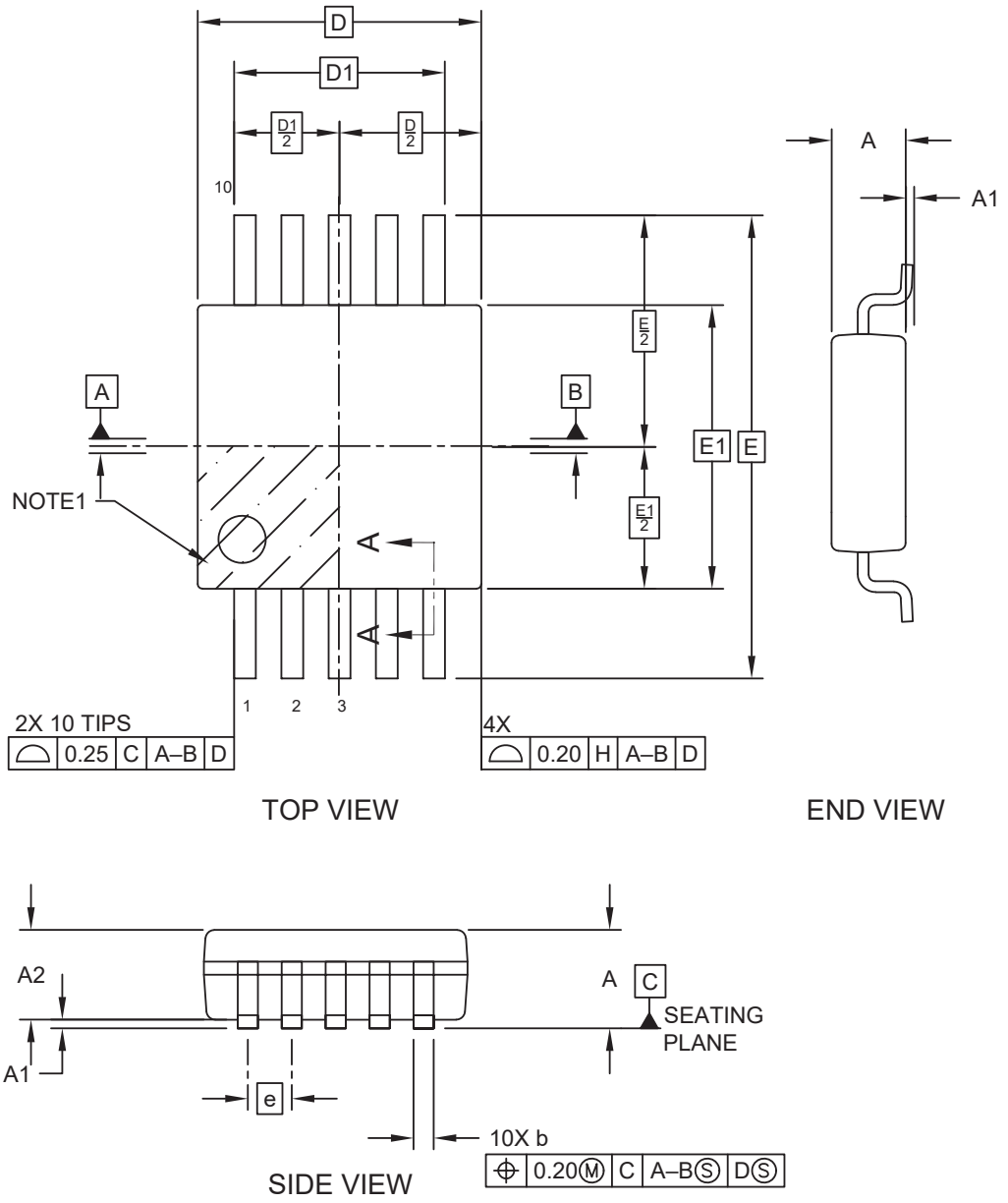
	R3	R4
Constant ON	0Ω	NP
External Standby Control	NP	100 kΩ

14. Package Information

This chapter provides information on package markings, dimension and footprint of the MICRF112 .

10-Lead Plastic Micro Small Outline Package (DQA)- 3x3x1.0 mm Body [MSOP]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



Microchip Technology Drawing C04-01081 Rev A Sheet 1 of 2

10-Lead Plastic Micro Small Outline Package (DQA)- 3x3x1.0 mm Body [MSOP]

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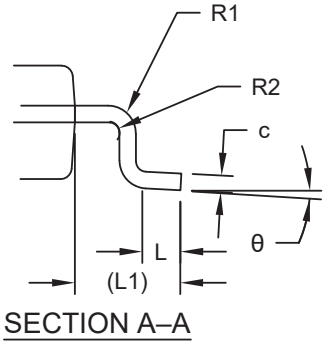
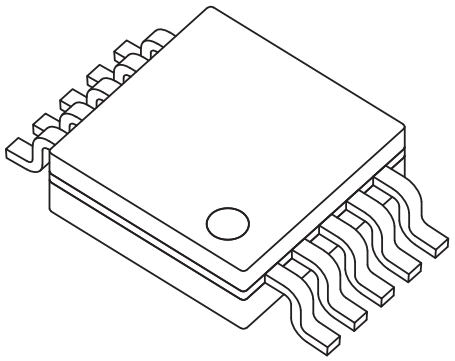


SECTION A–A



Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Number of Terminals	N		10	
Pitch	e		0.50 BSC	
Overall Height	A	0.94	1.02	1.10
Standoff	A1	0.05	0.10	0.15
Molded Package Thickness	A2	0.91	0.92	0.95
Overall Length	D		3.00 BSC	
Molded Package Length	D1		2.23 BSC	
Overall Width	E		4.90 BSC	
Molded Package Width	E1		3.00 BSC	
Terminal Width	b	0.16	0.23	0.30
Terminal Thickness	c	0.13	0.15	0.23
Footprint	L	0.40	0.55	0.70
Terminal Length	L1		0.95 REF	
Lead Bend Radius	R1	0.08	-	-
Lead Bend Radius	R2	0.08	-	0.20
Foot Angle	θ	0°	3°	6°

Notes:

1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. Dimensioning and tolerancing per ASME Y14.5M
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.
   REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-01081 Rev A Sheet 2 of 2

10-Lead Plastic Micro Small Outline Package (DQA)- 3x3x1.0 mm Body [MSOP]

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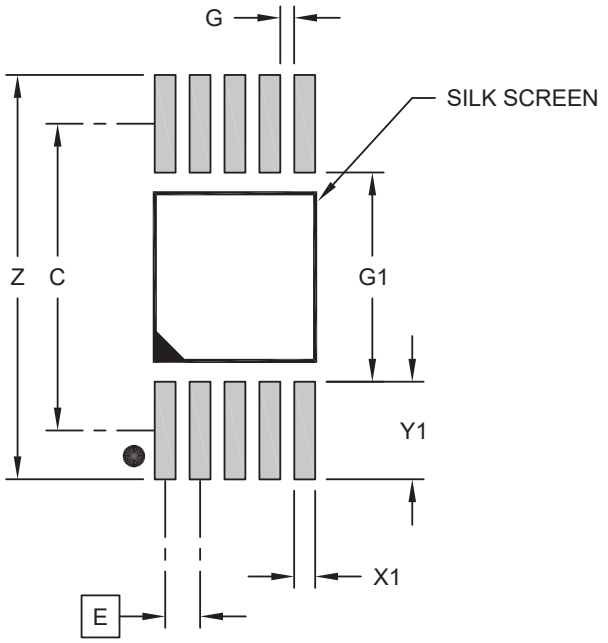


RECOMMENDED LAND PATTERN

Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Contact Pitch	E	0.50 BSC		
Contact Pad Spacing	C		4.40	
Overall Width	Z			6.06
Contact Pad Width (X10)	X1	0.28	0.30	0.32
Contact Pad Length (X10)	Y1	1.24	1.26	1.28
Distance Between Pads (X5)	G1	3.00		
Distance Between Pads (X8)	G	0.20		

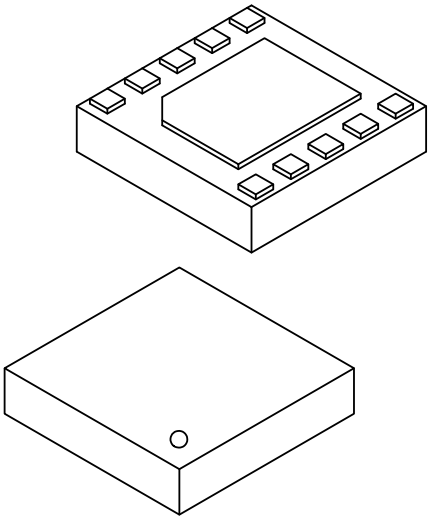
Notes:

1. Dimensioning and tolerancing per ASME Y14.5M
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing No. C04-03081 Rev A

10-Lead Ultra Thin Plastic Dual Flat, No Lead Package (3VW) - 2x2x0.55 mm Body [UDFN] Saw Singulated with Pullback Leads

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Number of Terminals	N		10	
Pitch	e		0.40 BSC	
Overall Height	A	0.45	0.50	0.55
Standoff	A1	0.00	–	0.05
Overall Length	D		2.00 BSC	
Exposed Pad Length	D2	1.35	1.40	1.45
Overall Width	E		2.00 BSC	
Exposed Pad Width	E2	1.05	1.10	1.15
Terminal Width	b	0.15	0.20	0.25
Terminal Length	L	0.15	0.20	0.25
Terminal Pullback	L1		0.05 REF	
Terminal-to-Exposed-Pad	K		0.20 REF	

Notes:

1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. Package is saw singulated
3. Dimensioning and tolerancing per ASME Y14.5M
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.
   REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-574 Rev A Sheet 2 of 2

10-Lead Ultra Thin Plastic Dual Flat, No Lead Package (3VW) - 2x2x0.55 mm Body [UDFN] Saw Singulated with Pullback Leads

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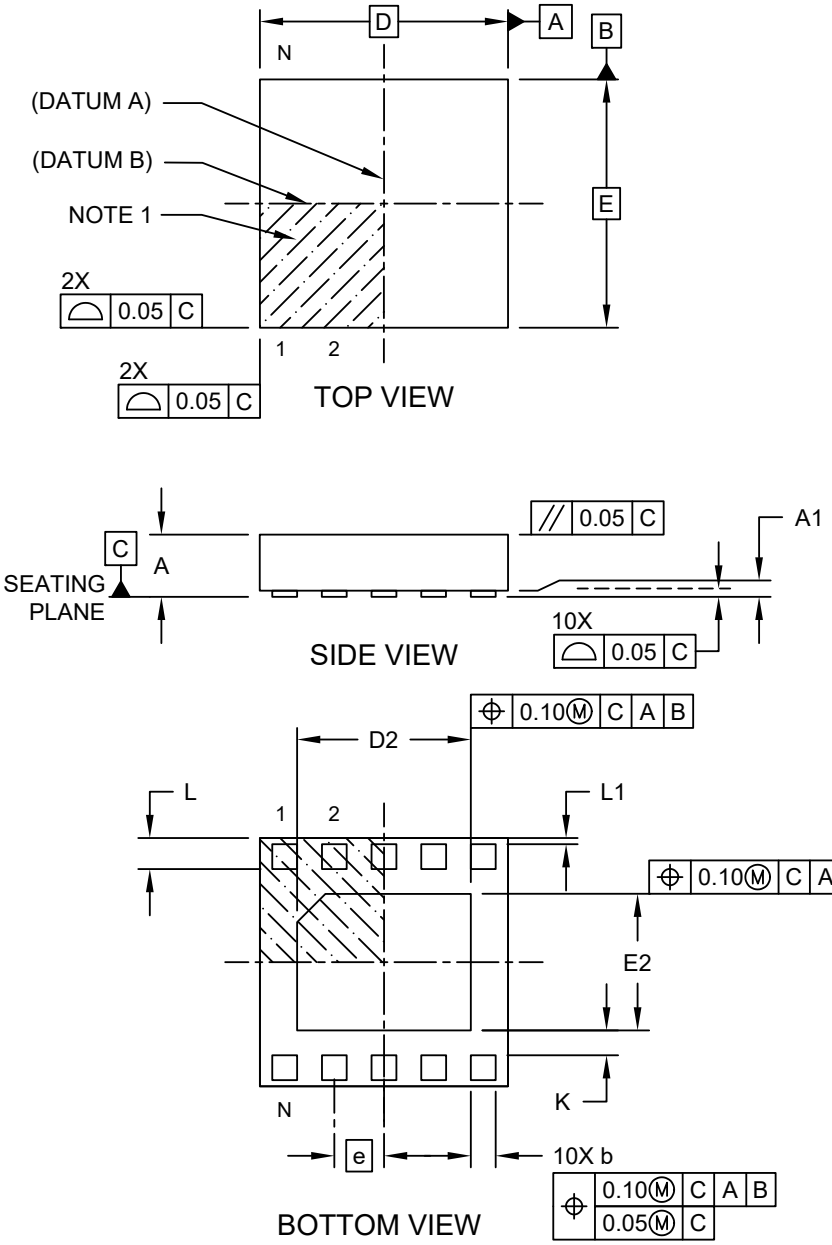

Microchip Technology Drawing C04-574 Rev A Sheet 1 of 2

10-Lead Ultra Thin Plastic Dual Flat, No Lead Package (3VW) - 2x2x0.55 mm Body [UDFN] Saw Singulated with Pullback Leads

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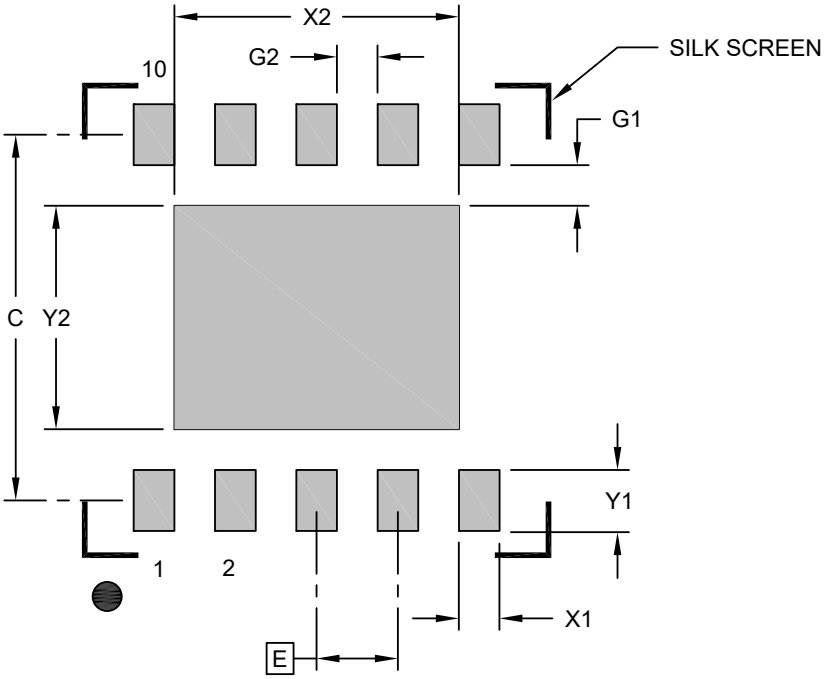

RECOMMENDED LAND PATTERN

Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Contact Pitch	E	0.40 BSC		
Center Pad Width	X2			1.40
Center Pad Length	Y2			1.10
Contact Pad Spacing	C		1.80	
Contact Pad Width (X10)	X1			0.20
Contact Pad Length (X10)	Y1			0.30
Contact Pad to Center Pad (X10)	G1	0.20		
Contact Pad to Contact Pad (X8)	G2	0.20		

Notes:

1. Dimensioning and tolerancing per ASME Y14.5M
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.
2. For best soldering results, thermal vias, if used, should be filled or tented to avoid solder loss during reflow process

Microchip Technology Drawing C04-2574 Rev A

15. Document Revision History

The document revision history describes the changes that were implemented in the document. The changes are listed by revision, starting with the most current publication.

Revision	Date	Section	Description
A	01/2024	Document	• Updated from Micrel to Microchip format • Updated 10-pin MSOP package drawing

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