



- Provides RF Uart Functions, 12 Bit Symbols to Serial TX
- And Serial RX to 12 bit Symbols with Start Symbol Detection
- Supports data rates from 100Kbps to 1Mbps
- Allows unsquelched receiver operation for improved sensitivity
- Compatible with RFM's TR-Series ASH transceivers

The IC1003 RF Uart IC detects a start-of-data pulse sequence and then provides clocking pulses in the middle of each following data bit. The IC1003 is designed to support a host protocol processor which can be in sleep mode until interrupted into active operation by the start-of-data detect pulse. The IC1003 is compatible with RFM's 2nd generation ASH transceivers and receivers and allows these radios to operate with no threshold for improved system sensitivity.

#### Absolute Maximum Ratings

Please refer to the latest revision of Xilinx data sheet for the XC9572-7VQ64

## IC1003

## RF Uart IC



Characteristic	Sym	Notes	Minimum	Typical	Maximum	Units
Supply Voltage	VDD		3.0		3.5	V
Supply Current At 40Mhz Clock(1Mbs Data)	IDD			48		mA
Logic Low Input	VIL		0.8		0.2	VDD
Logic High Input	VIH					VDD
Logic Low Output	VOL		VDD - 0.7		0.6	V
Logic High Output	VOH					V
Supported Data Rates:			100		1000	Kbps
Transmitted Bit Rate Tolerance					±1	%
Operating Temperature Range			-40		85	°C

# RF Uart IC1003

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## Operation

A typical IC1003 application the RX Data output from the 2nd generation ASH transceiver (or receiver) is applied to the IC1003. In receive mode the IC1003 detects the presence of a specific unique Start Symbol sequence and outputs a Start Detect. The IC1003 generates data clocking (data valid) and shifts the data into a 12 bit shift register and will rise the data Ready pin when a Symbol is ready to be read. After the packet is received the Start Detect Signal must be reset by Start Detect reset pin going high. The IC1003 used as an transmitter interface will write in a 12 bit symbol and while TX Enable is high will shift out the data out the data out pin at the Clock Frequency divided by 40(40Mhz clock will obtain a 1Mbps data rate). The IC1003 supports data rates from 100K – 1000K bits per second (bps)..

The IC1003 is implemented in an industrial temperature range of Xilinx data sheet for the XC9572-7VQ64 CPLD. Please refer to the latest revision of Xilinx data sheet for detailed electrical and mechanical specifications.

## Start-of-Data Pulse Sequence Generation

The IC1003 start-of-data pulse sequence is a steady High pulse of eight bit periods, followed by a sequence of eight bits in an alternating high-low-high-low... pattern. This pulse sequence is very unlikely to occur in a stream of white noise (data sliced), providing good false triggering performance. The IC1003 outputs the Start Detect pulse when the RX Data input line to the IC1003 has remained a steady low for eight bit periods. After eight bit periods of a steady high, the data input should begin the eight-bit sequence of alternating high and low bits. The eight-bit alternating high-low sequence provides data clocking alignment training under low signal-to-noise conditions (data edge jitter) and should be used for best results.

Note that the ASH radio RX Data output signal is inverted before being applied to the IC1003. The steady high pulse that begins the start-of-data pulse sequence to the IC1003 is generated by the reception of an eight-bit long RF transmission. This pulse also helps "train" the base-band coupling capacitor in the ASH radio for best data slicer noise rejection. The host processor should generate inverted data for transmission by the ASH radio and should input the same inverted data that drives the IC1003.

## Data Encoding

Data should be encoded to provide frequent logic state transitions (edges) to facilitate data clock alignment, and should exhibit good dynamic DC-balance (50% high bits and 50% low bits over any interval of 16 bits or less) to maintain the radio's base-band capacitor training for best noise performance. The popular encoding method is byte-to-12 bit symbolizing, which encodes each byte as a pattern of 12 bits, always with six one bits and six zero bits. Symbolizing requires fewer bits than Manchester to encode a message, and also provides frequent state transitions and good DC-balance. An example of 12-bit symbolizing can be found in page 4.

Note that the IC1003 has no provisions for detecting end-of-data. This provides flexibility in message length and data encoding, but requires the message length and/or an end-of-data symbol to be embedded in the data by the user and Start Symbol Reset brought high will clear Start Symbol Detect.

# RF Uart IC1003

Pin Name	Pin	Discription
TX Data 0	31	Data bit 0 of Transmit Symbol, true data
TX Data 1	47	Data bit 1 of Transmit Symbol, true data
TX Data 2	5	Data bit 2 of Transmit Symbol, true data
TX Data 3	8	Data bit 3 of Transmit Symbol, true data
TX Data 4	10	Data bit 4 of Transmit Symbol, true data
TX Data 5	6	Data bit 5 of Transmit Symbol, true data
TX Data 6	16	Data bit 6 of Transmit Symbol, true data
TX Data 7	17	Data bit 7 of Transmit Symbol, true data
TX Data 8	59	Data bit 8 of Transmit Symbol, true data
TX Data 9	4	Data bit 9 of Transmit Symbol, true data
TX Data 10	49	Data bit 10 of Transmit Symbol, true data
TX Data 11	56	Data bit 11 of Transmit Symbol, true data
TX Write/	32	Transfers TX Data to shift register on falling edge of high to low
TX Enable	57	Enables serial data out to TR1100
RX Data 0	40	Data bit 0 of Receive Symbol, true data
RX Data 1	39	Data bit 1 of Receive Symbol, true data
RX Data 2	38	Data bit 2 of Receive Symbol, true data
RX Data 3	36	Data bit 3 of Receive Symbol, true data
RX Data 4	35	Data bit 4 of Receive Symbol, true data
RX Data 5	34	Data bit 5 of Receive Symbol, true data
RX Data 6	33	Data bit 6 of Receive Symbol, true data
RX Data 7	18	Data bit 7 of Receive Symbol, true data
RX Data 8	42	Data bit 8 of Receive Symbol, true data
RX Data 9	62	Data bit 9 of Receive Symbol, true data
RX Data 10	50	Data bit 10 of Receive Symbol, true data
RX Data 11	22	Data bit 11 of Receive Symbol, true data
RX Read/	11	Transfers RX Data to Output register on falling edge of high to low
Data Ready	44	Receive Symbol Read, cleared by RX Read/, Active High
TX Busy	43	TX Buffer Full, Active High
Start Detect	60	Start Symbol Detected, cleared by Start Symbol Reset, Active High
Start Detect Reset	7	Start Symbol Rest, Active High
RX Enable	58	Enables Start Symbol Detection, Active High
TX OUT	19	TX Serial Data output TR1100, Active High
RX IN	2	RX Serial Data input TR1100, Active High
Reset	64	Reset, Active Low
Clock in	15	Clock In, valid speeds of 8Mhz to 40Mhz, Clock in ÷ 40 = Baud Rate 40Mhz = Data Rate of 1Mbs, 20Mhz = Data Rate of 500Mbs 10Mhz = Data Rate of 250Kbs

# RF Uart IC1003

## DC balanced Symbols

Nibble	Hex value	Binary Value
0	0x15	010101
1	0x31	110001
2	0x32	110010
3	0x23	100011
4	0x34	110100
5	0x25	100101
6	0x26	100110
7	0x16	010110
8	0x1A	011010
9	0x29	101001
10	0x2A	101010
11	0x0B	001011
12	0x2C	101100
13	0x0D	001101
14	0x0E	001110
15	0x1C	011100

## Start Symbol:

Bit Posion	11	10	9	8	7	6	5	4	3	2	1	0
Symbol	0	0	0	1	1	1	1	1	1	1	1	0

## Preamble Symbol:

Bit Posion	11	10	9	8	7	6	5	4	3	2	1	0
Symbol	1	0	1	0	1	0	1	0	1	0	1	0

## A 12 bit Symbol for a hex 31 would look like:

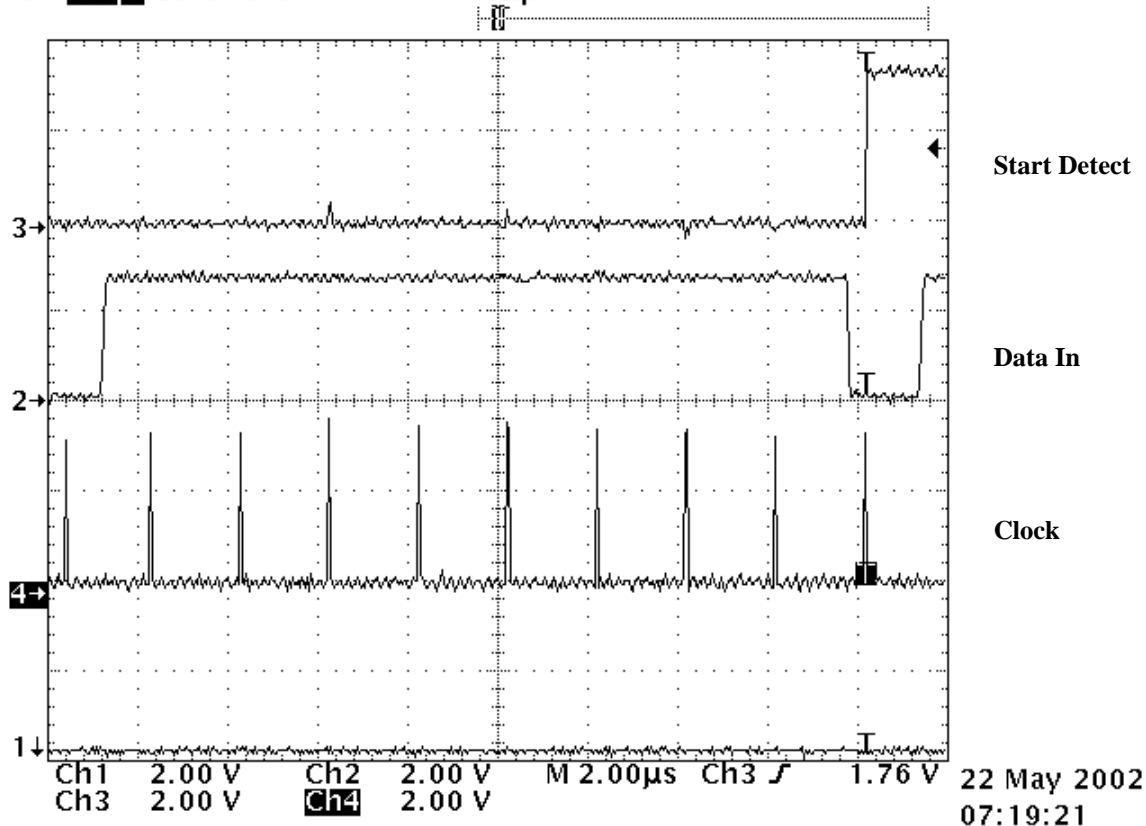
Bit Posion	11	10	9	8	7	6	5	4	3	2	1	0
Symbol	1	0	0	0	1	1	1	1	0	0	0	1

# RF Uart IC1003

Start Symbol Detect

Tek **Stop** 25.0MS/s

7 Acqs



Start Symbol:

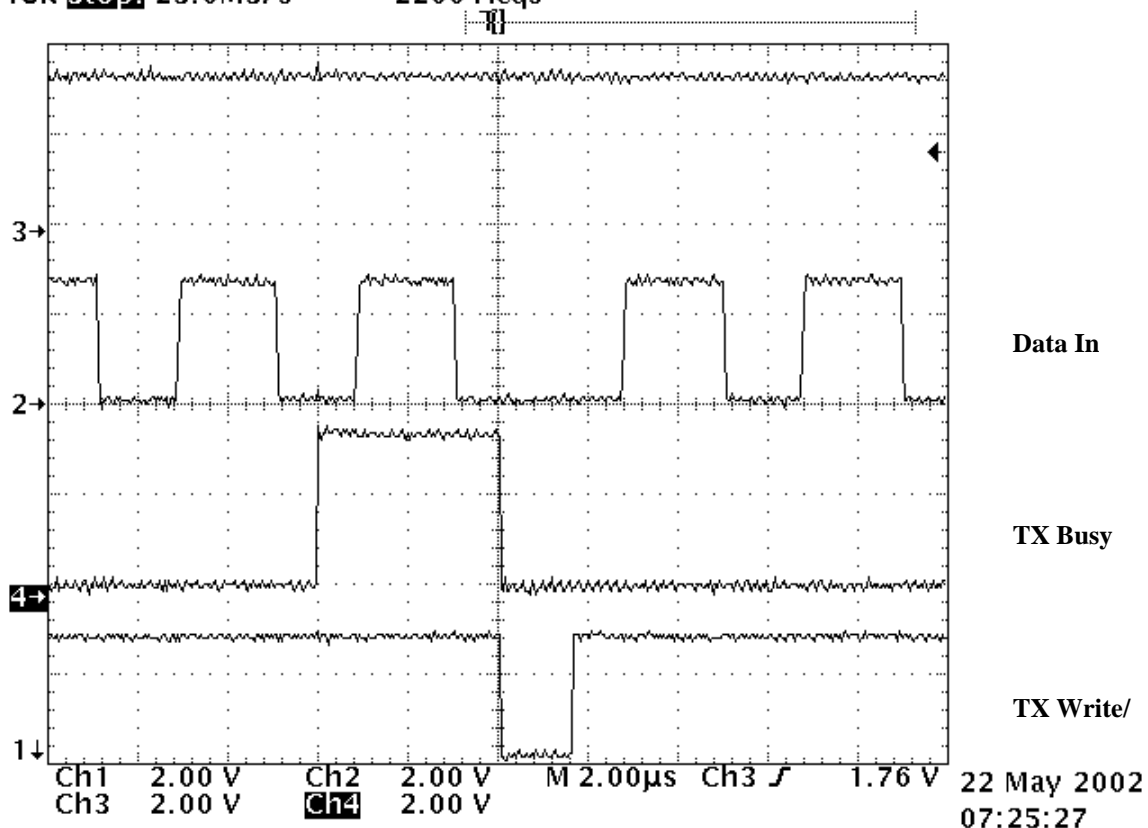
Bit Posion	11	10	9	8	7	6	5	4	3	2	1	0
Symbol	0	0	0	1	1	1	1	1	1	1	1	0

# RF Uart IC1003

TX Busy, TX Write/

Tek **Stop:** 25.0MS/s

2206 Acqs

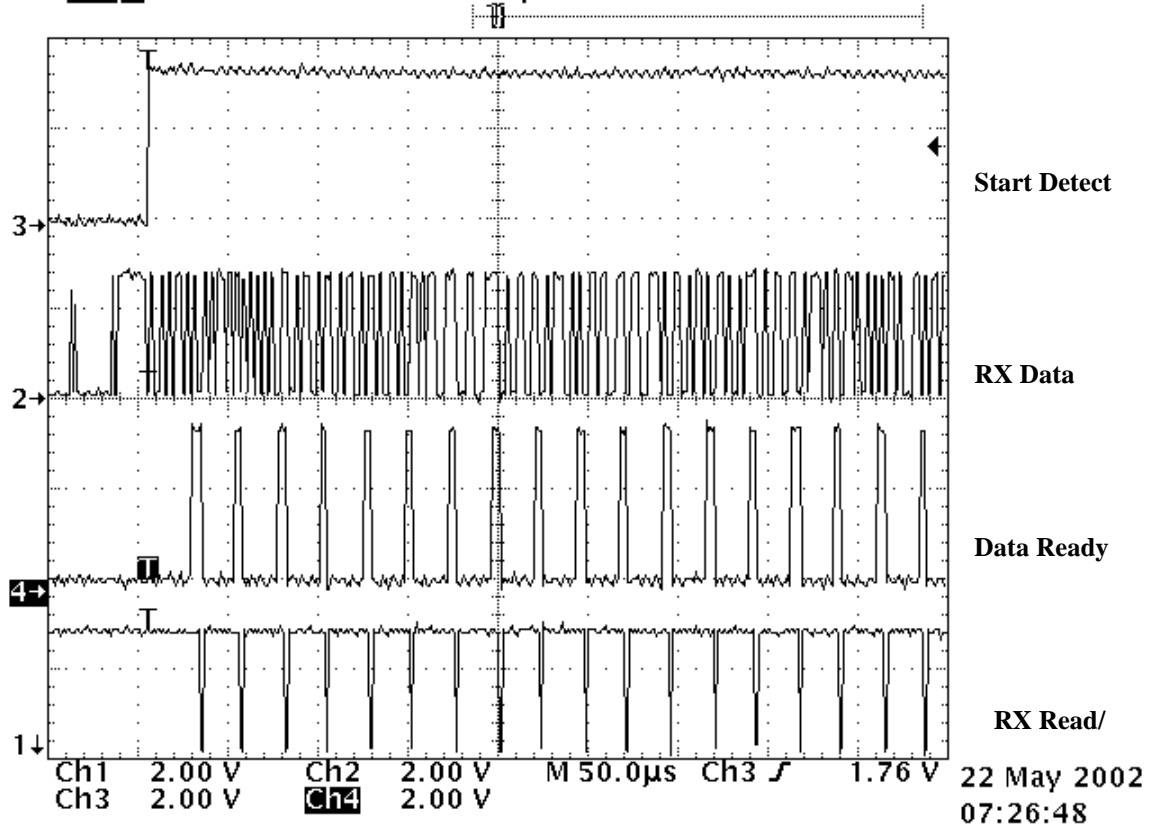


# RF Uart IC1003

Start Detect, RX Data, Data Ready & RX Read/

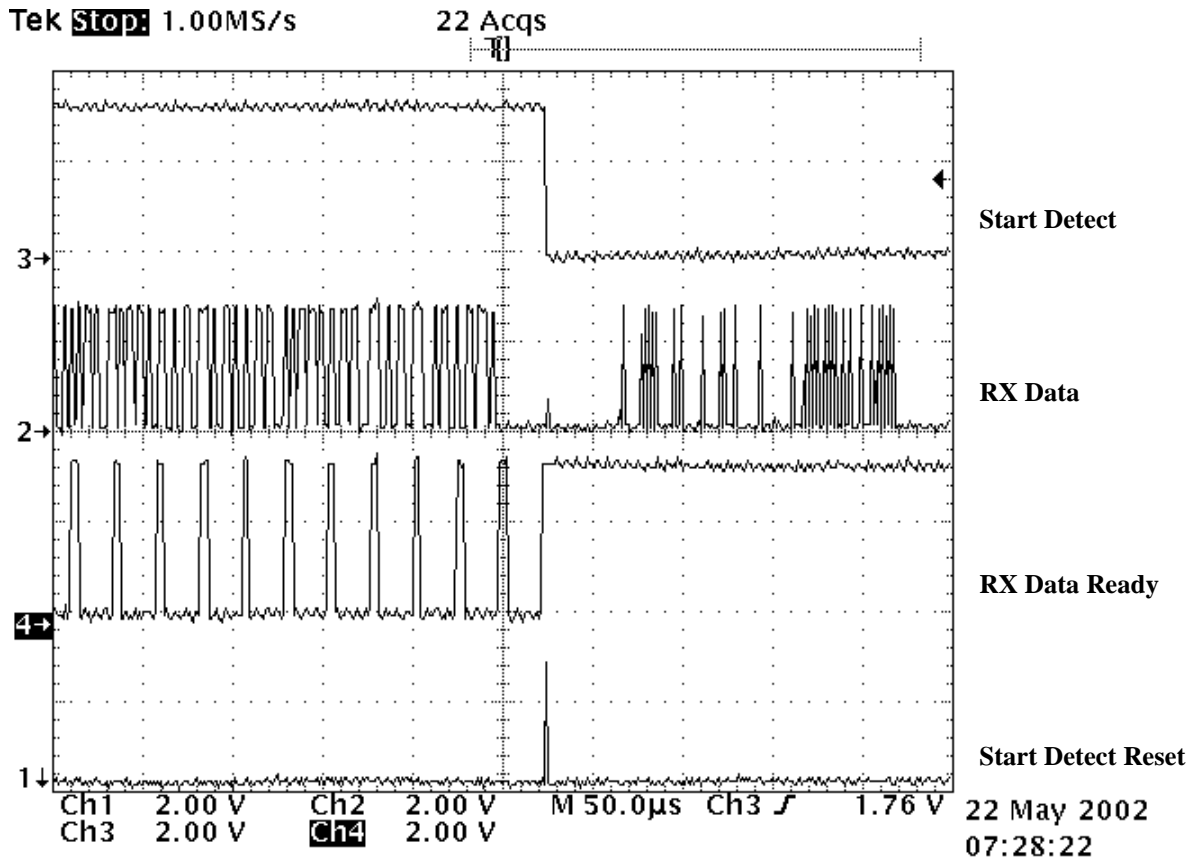
Tek **Stop** 1.00MS/s

181 Acqs



# RF Uart IC1003

Start Detect. RX Data, Data Ready, Start Detect Reset



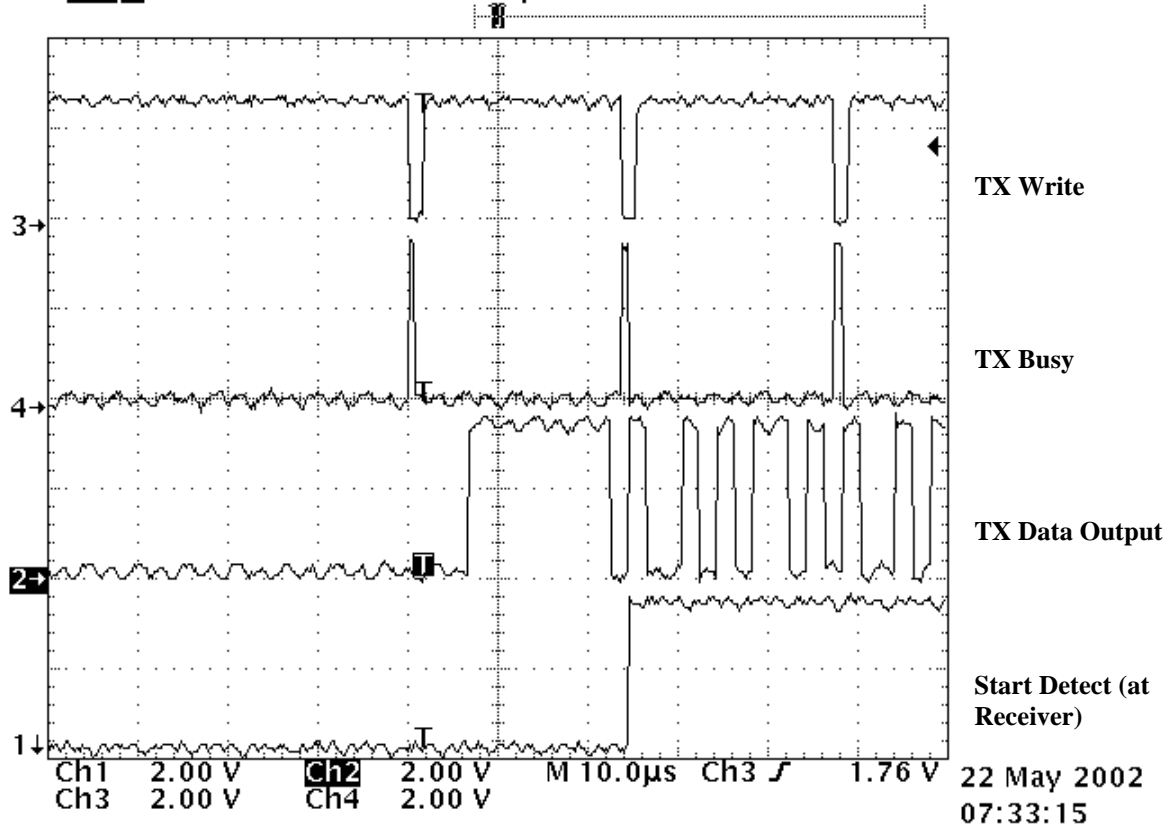


# RF Uart IC1003

TX Busy, TX Write, TX Data Output

Tek **Stop:** 5.00MS/s

18 Acqs

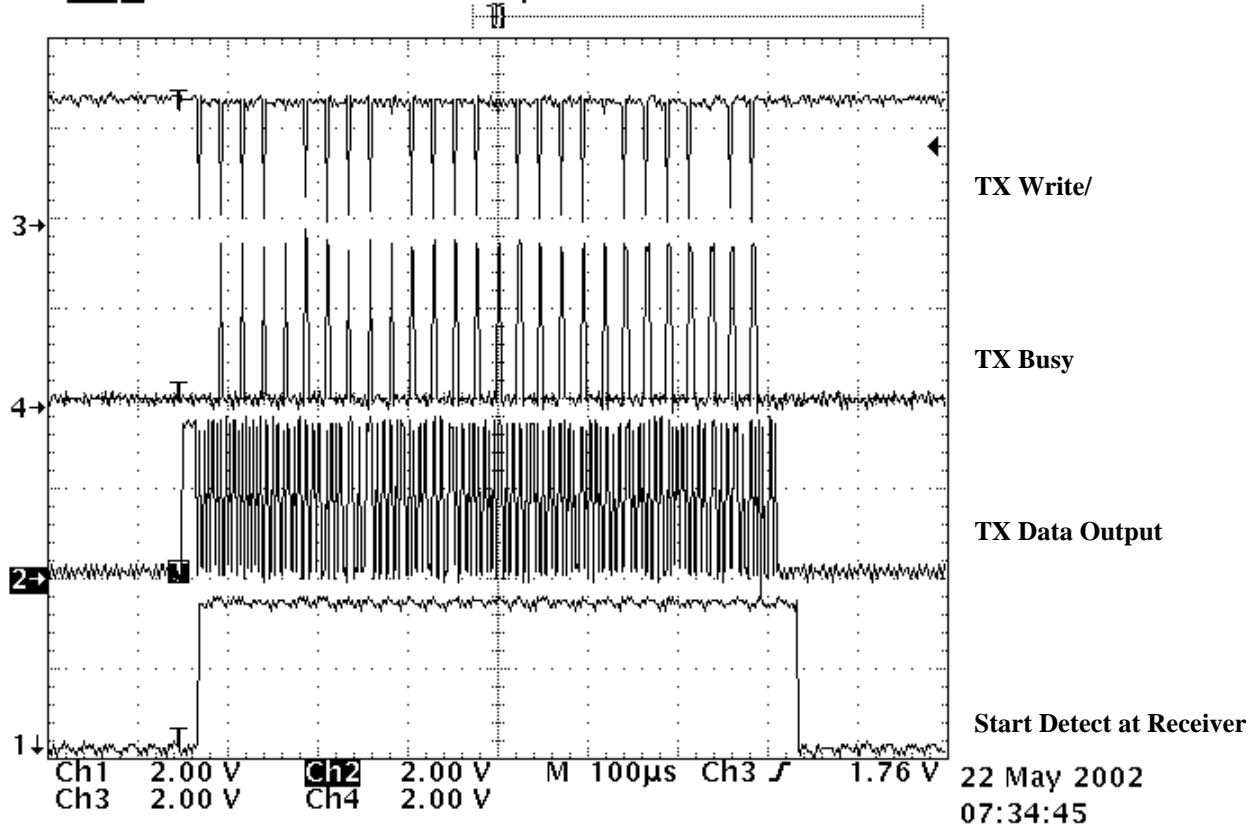


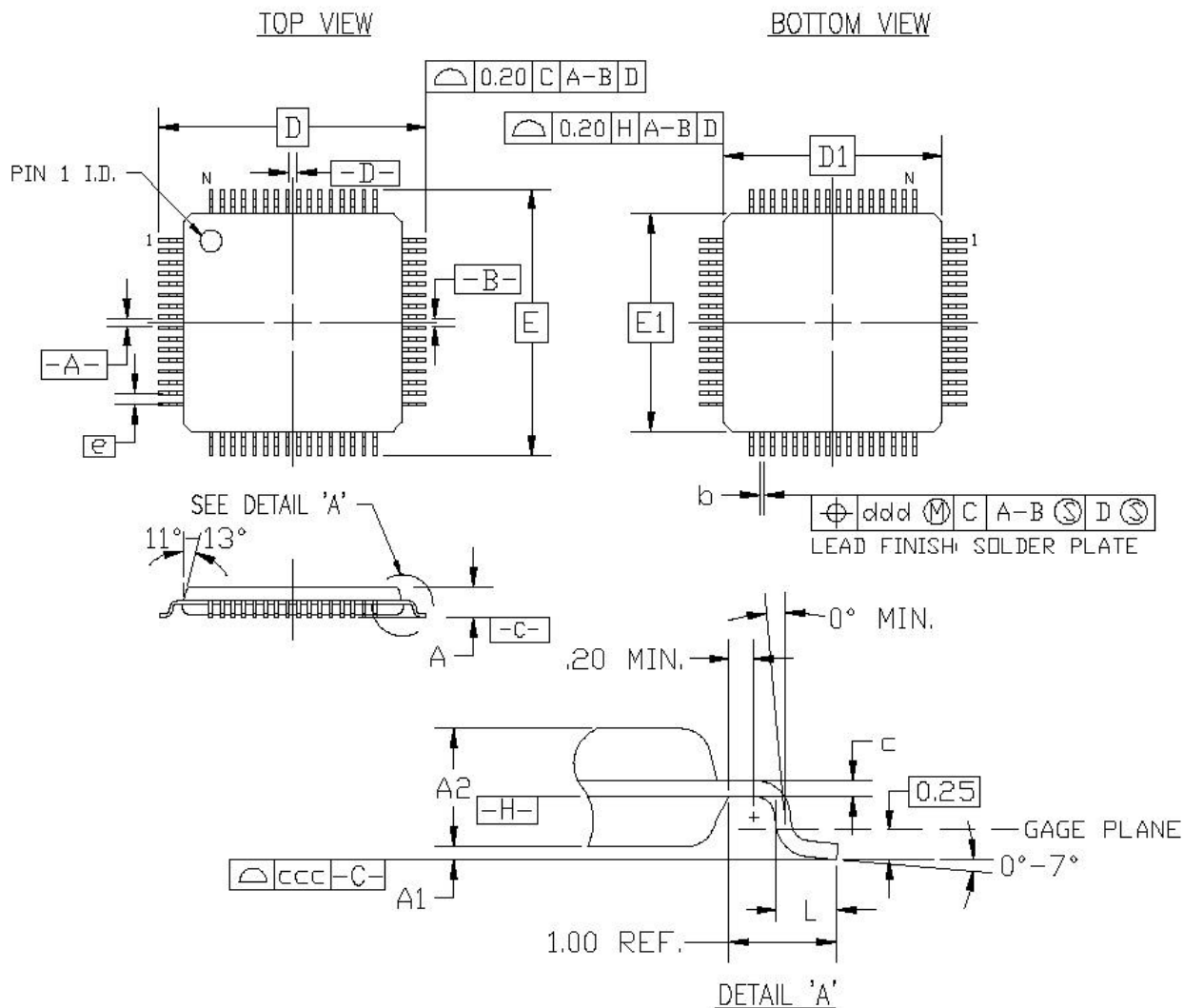
# RF Uart IC1003

TX Busy, TX Write, TX Data, Start Detect

Tek **Stop:** 500kS/s

4 Acqs





VQ64		
MILLIMETERS		
MIN.	NDM.	MAX.
$\frac{1}{16}$	$\frac{1}{16}$	1.20
0.05	0.10	0.15
0.95	1.00	1.05
12.00 BSC.		
10.00 BSC.		
0.17	0.22	0.27
0.09	$\frac{1}{16}$	0.20
0.50 BSC.		
0.45	0.60	0.75
$\frac{1}{16}$	$\frac{1}{16}$	0.08
$\frac{1}{16}$	$\frac{1}{16}$	0.08
64		
JEDEC MS-026-ACD		

## NOTES:

- ALL DIMENSIONS AND TOLERANCES CONFORM TO ANSI Y14.5M-1982.
- DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE MOLD PROTRUSION SHALL NOT EXCEED 0.25mm PER SIDE.
- THE TOP OF PACKAGE MAY BE SMALLER THAN THE BOTTOM OF PACKAGE BY 0.15mm.