

MA113

Data Sheet

Version: 0.21

Features

- USB Interface
 - Standard USB Virtual COM Port device
 - USB Full speed (12Mbps) operation and USB specification 2.0 compliant
 - 4 I/O mode configuration on each GPIO
 - Built-in USB transceiver and 3.3V regulator
 - Integrated clock recovery, no external crystal required
 - USB suspend states reported via UPD/nUPD pins
 - Windows standard driver
 - * Support Windows 7, Windows 8.1, Windows 10, Windows 11
- UART Interface
 - 8-bit data format
 - Transmission parity control: odd, even, mark, space and none
 - Stop bit: 1 bit and 2 bit
 - Baud Rate: 600, 1200, 2400, 4800, 7200, 9600, 14400, 19200, 28800, 38400, 57600, 115200 and 230400
 - Line break transmission
 - Provide DE for RS485 transceiver control
 - Support CTS/RTS/DSR/DTR
 - Hardware handshaking supported
- Operating voltage range: 4.2V – 5.5V or 3.0V – 3.6V
 - Operating Temperature: Industrial (-40°C to +85°C)*
- Package Types:
 - SOP16: MA113AS16
 - QFN16: MA113AY16

*: Tested by sampling.

List of Contents

Features	2
1. General Description	4
2. Block Diagram	4
3. Pin Configurations	5
3.1 Package Instruction	5
3.2 Pin Description	6
4. MA113 USB Function	7
5. MA113 UART Function	7
5.1 Serial Data Connection	7
5.2 RS-232 Connection	8
5.3 RS-485 Connection	8
6. Application Notes	9
6.1 MA113 Connect for 5V Signal Level	9
6.2 MA113 Connect for 3.3V Signal Level	9
7. Electrical Characteristics	10
7.1 Absolute Maximum Rating	10
7.2 DC Characteristics	11
7.3 USB Transceiver Electrical Characteristics	11
8. Package Dimension	12
8.1 SOP-16(150 mil)	12
8.2 QFN-16 (4x4)	13
9. Revision History	14
10. Disclaimers	15

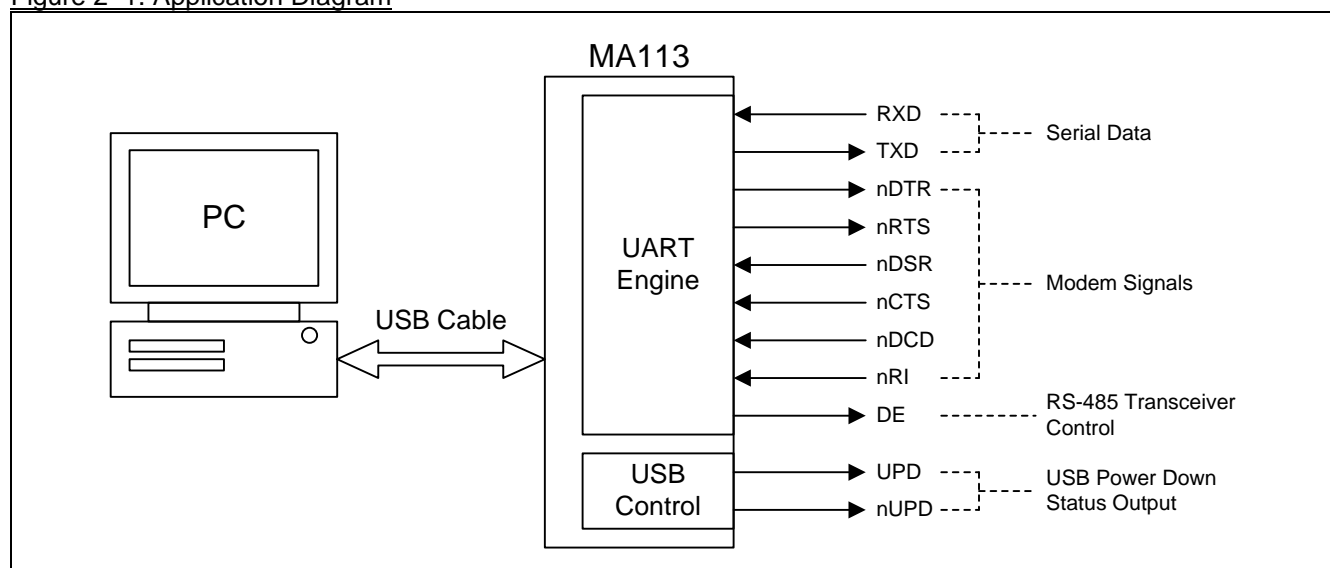
1. General Description

The MA113 is a USB to UART Data Bridge controller. It includes a USB 2.0 full-speed function controller, USB transceiver, oscillator and on-chip 3.3V regulator for USB transceiver power (that is applied on VDD range from 4.0V to 5.5V).

The UART function of MA113 supports the RS-232/RS-485 connection. On RS-232 connection, MA113 provides the full modem control signals. On RS-485 application, MA113 provides DE signals on RS-485 transceiver control.

2. Block Diagram

Figure 2–1. Application Diagram



3. Pin Configurations

3.1 Package Instruction

Figure 3–1. MA113 SOP16 Top View

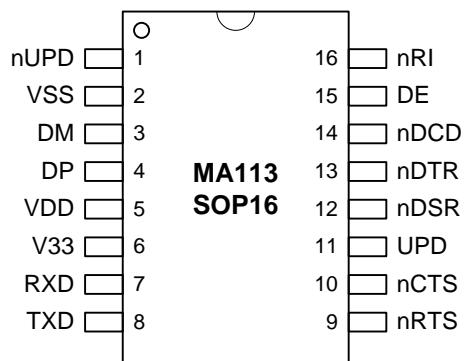
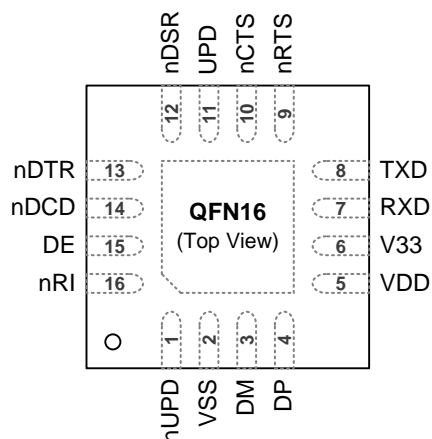


Figure 3–2. MA113 QFN16 Top View



3.2 Pin Description

Table 3–1. Pin Description

MNEMONIC	PIN NUMBER		I/O TYPE	DESCRIPTION
	16-Pin SOP	16-Pin QFN		
RXD	7	7	I	* RXD: UART serial input port.
TXD	8	8	O	* TXD: UART serial output port.
nRTS	9	9	O	* nRTS: Request To Send output, low active.
nCTS	10	10	I	* nCTS: Clear To Send input, low active. -- If nCTS function is not used, it should add external pull-low 470K ~ 1M ohm resistor on this pin.
UPD	11	11	O	* UPD: USB Power Down status output, high active. -- If USB suspend, UPD output high -- If USB un-connected, UPD output low
nDSR	12	12	I	* nDSR: Data Set Ready input, low active.
nDTR	13	13	O	* nDTR: Data Terminal Ready output, low active.
nDCD	14	14	I	* nDCD: Data Carrier Detect input, low active.
DE	15	15	O	* DE: Driver Enable output for RS-485 transceiver control, high active.
nRI	16	16	I	* nRI: Ring Indicator input, low active.
nUPD	1	1	O	* nUPD: USB Power Down status output, low active. -- If USB suspend, nUPD output low -- If USB un-connected, nUPD output high
DP	4	4	I/O	* DP: USB DP (D+) pin.
DM	3	3	I/O	* DM: USB DM (D-) pin.
V33	6	6	P	Core power supply. 3.3V input/output
VDD	5	5	P	Power supply input. 5V input.
VSS	2	2	G	Ground, 0 V reference.

MA113

4. MA113 USB Function

The USB function controller in the MA113 is a USB 2.0 compliant full-speed device that integrates transceiver and 5V to 3.3V regulator. The USB function controller manages all data transfer between the USB and UART data transmitting and data receiving.

The MA113 can report the USB power down (suspend) event on UPD pin and nUPD pin to indicate the USB host status. UPD is high active output and nUPD is low active output. If MA113 in power-on reset state, these two outputs are floating.

5. MA113 UART Function

The UART function in MA113 supports the TXD and RXD for USB to UART data transfer. It provide the parity options on: none, even, odd, mark and space. It provides the baud rate selections as 110, 300, 600, 1200, 2400, 4800, 7200, 9600, 14400, 19200, 28800, 38400, 57600, 115200 and 230400. It also provide the break output and break detection.

Table 5–1 lists the UART data format and baud rates available in MA113.

Table 5–1. Data Formats and Buad Rates

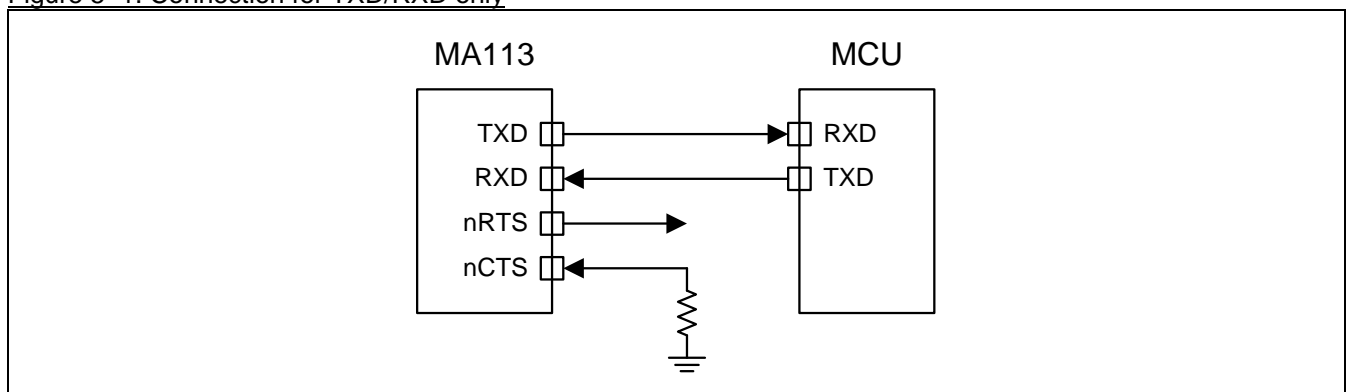
Pin Name	Default Configuration
Data Bits	8
Stop Bits	1 and 2
Parity Type	None, Even, Odd, Mark and Space
Baud Rates	110 bps to 230400 bps

5.1 Serial Data Connection

The MA113 provide the serial data communication on TXD and RXD only.

In this application, the nCTS input of MA113 must be pulled to logic low by external resistor (470K ohm ~1M ohm).

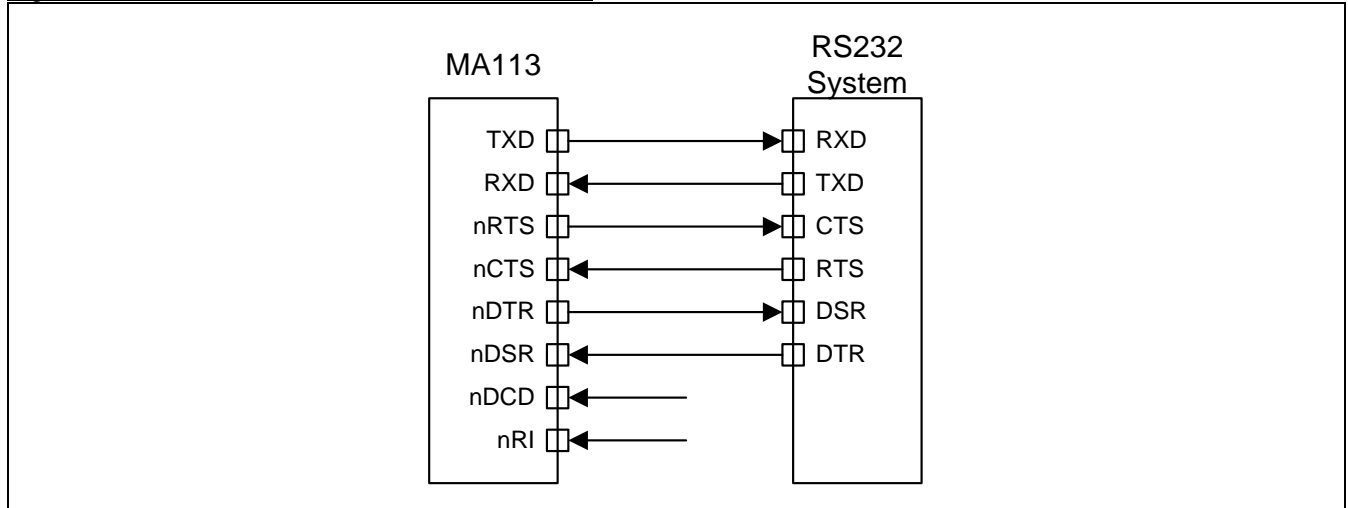
Figure 5–1. Connection for TXD/RXD only



5.2 RS-232 Connection

The MA113 provide the modem signals for RS-232 connection to support the flow control on RTS/CTS or DTR/DSR.

Figure 5–2. Connection of CTS/RTS Flow Control

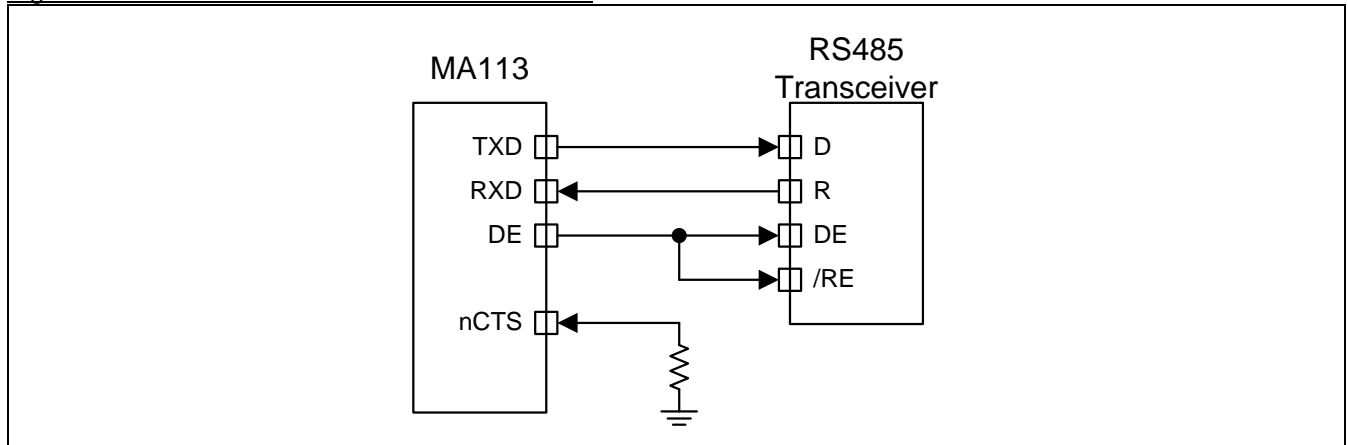


5.3 RS-485 Connection

The MA113 provide the DE output signals for RS-485 bus transceiver's DE and /RE control. The DE signal is high active.

In this application, the nCTS input of MA113 must be pulled to logic low by external resistor (470K ohm ~1M ohm).

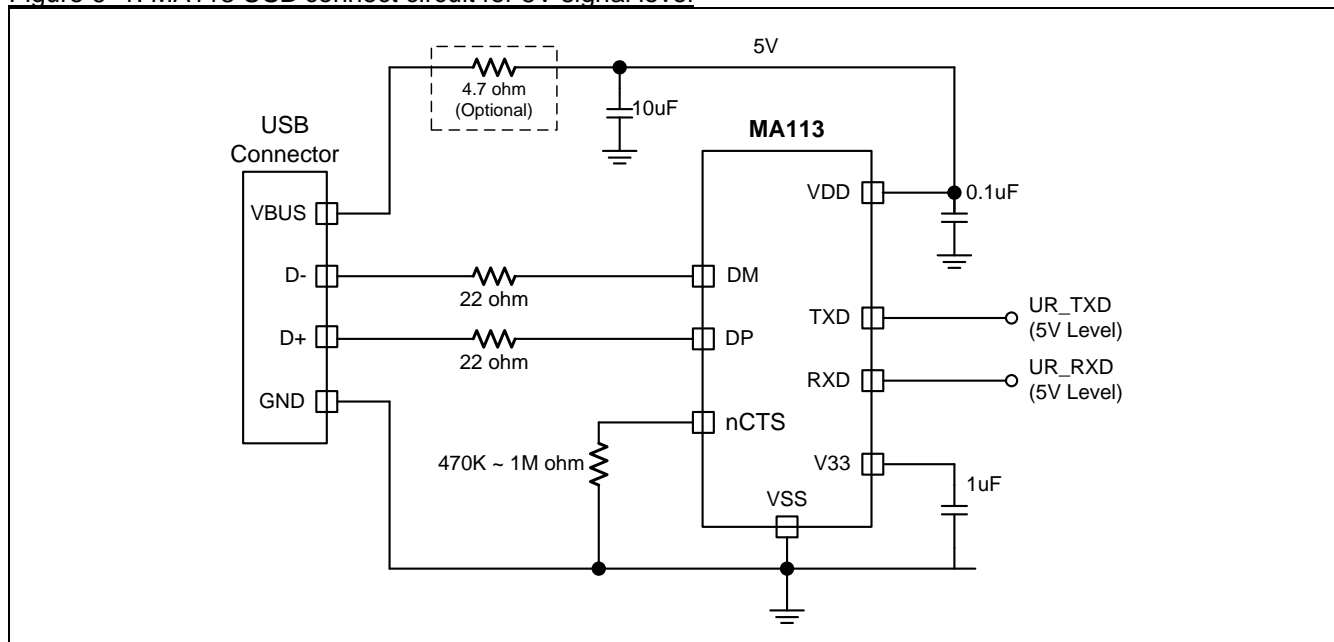
Figure 5–3. Connection of CTS/RTS Flow Control



6. Application Notes

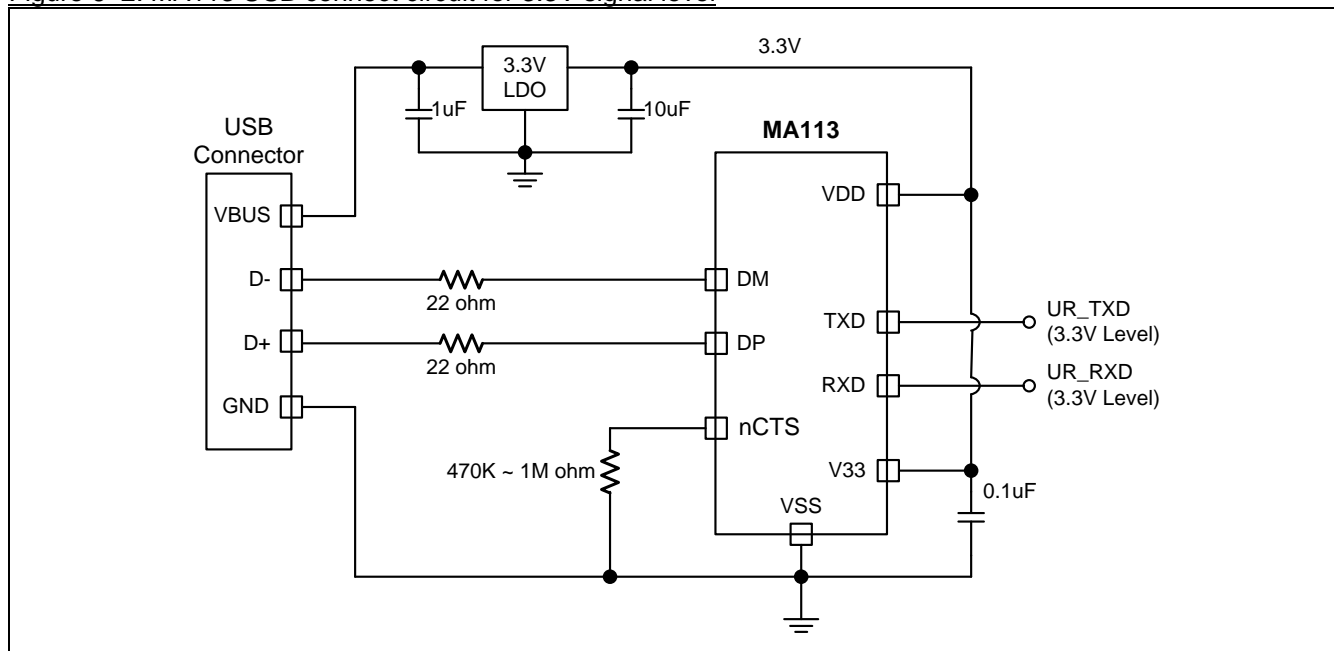
6.1 MA113 Connect for 5V Signal Level

Figure 6–1. MA113 USB connect circuit for 5V signal level



6.2 MA113 Connect for 3.3V Signal Level

Figure 6–2. MA113 USB connect circuit for 3.3V signal level



7. Electrical Characteristics

7.1 Absolute Maximum Rating

Parameter	Rating	Unit
Ambient temperature under bias	-40 ~ +85	°C
Storage temperature	-65 ~ + 150	°C
Voltage on any Port I/O Pin with respect to VSS	-0.5 ~ VDD + 0.5	V
Voltage on VDD with respect to VSS	-0.5 ~ +6.0	V
Maximum total current through VDD and VSS	100	mA
Maximum output current sunk by any Port pin	40	mA

*Note: stresses above those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the devices at those or any other conditions above those indicated in the operation listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

7.2 DC Characteristics

VDD = 5.0V±10%, VSS = 0V, TA = 25°C, unless otherwise specified

Symbol	Parameter	Test Condition	Limits			Unit
			Min.	Typ.	Max.	
Input/Output Characteristics						
V _{IH}	Input High voltage	@RXD pin	0.6			VDD
V _{IL}	Input Low voltage	@RXD pin			0.15	VDD
I _{IH}	Logic 1 input current	V _{PIN} = VDD @RXD		0	10	uA
I _{IL}	Logic 0 input current	V _{PIN} = 0.4V @RXD		20	50	uA
I _{H2L}	Logic 1 to 0 transition current	V _{PIN} = V _{H2L} @RXD		330	500	uA
I _{OH}	Output High current	V _{PIN} =2.4V @TXD, UPD, nUPD	0.1			mA
I _{OL}	Output Low current	V _{PIN} =0.4V @TXD, UPD, nUPD	12			mA
Power Consumption						
I _{OP1}	Normal mode operating current	No load on all IO pins		4.5		mA
I _{PD1}	Power down mode current	USB Connected		256	500	uA
Operating Condition						
V _{PSR}	Power-on Slop Rate	T _A = -40°C to +85°C	0.05			V/ms
V _{POR}	Power-on Reset Valid Voltage	T _A = -40°C to +85°C			0.1	V

⁽¹⁾ Data based on characterization results, not tested in production.

7.3 USB Transceiver Electrical Characteristics

VDD = 4.0V ~ 5.5V, VSS = 0V, TA = 25°C, unless otherwise specified

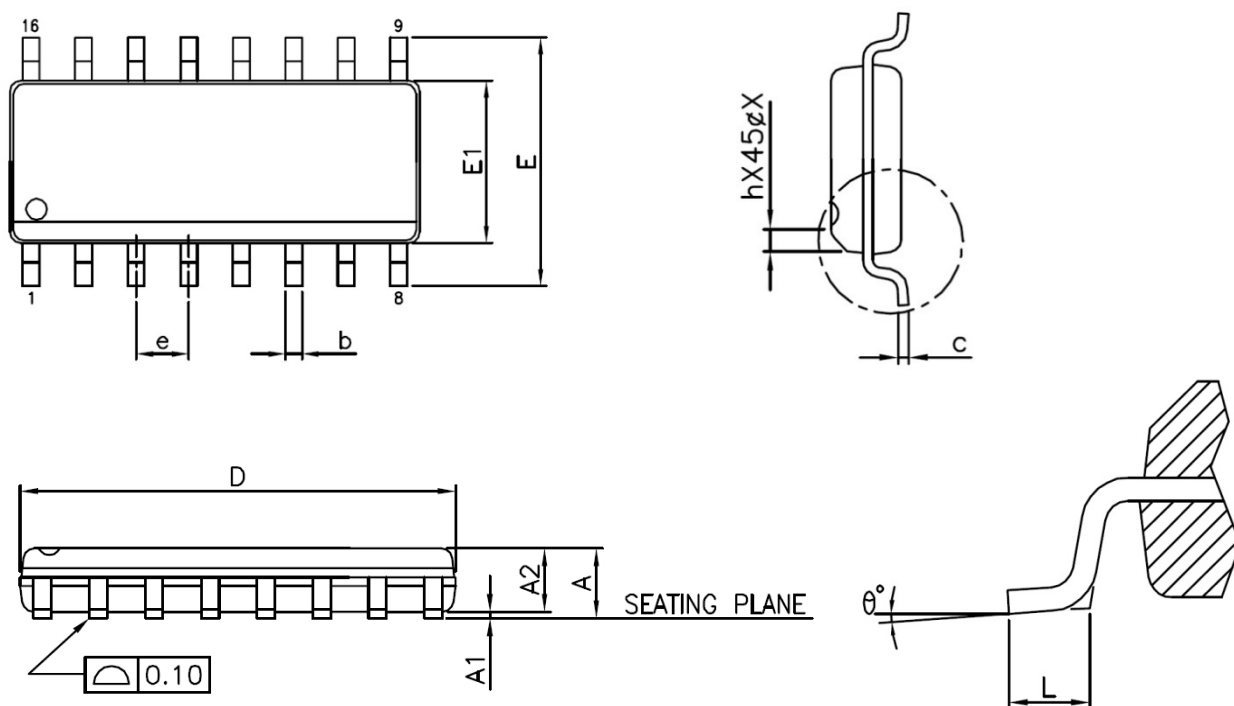
Symbol	Parameter	Test Condition	Limits			Unit
			min	typ	max	
V _{V33}	3.3V regulator output voltage	TA = 25°C	3.0	3.3	3.6	V
I _{V33}	Regulator Output drive current	TA = 25°C			35	mA
R _{PU}	Pull-Up Resistance	On DP	0.95	1.1	1.3	Kohm
Transmitter						
V _{OH}	Output High Voltage		2.8			V
V _{OL}	Output Low Voltage				0.8	V
V _{CRS}	Output Cross Over point		1.3		2.0	V
Z _{DRVH}	Output Impedance on Driving High		28		44	Ohm
Z _{DRVL}	Output Impedance on Driving Low		28		44	Ohm
T _R	Output Rise Time		4		20	ns
T _F	Output Fall Time		4		20	ns
Receiver						
V _{DI}	Differential Input Sensitivity	DP – DM	0.2			V
V _{CM}	Differential Input Common Mode Range		0.8		2.5	V
I _L	Input Leakage current	Pull-up Disabled		<1.0		uA

⁽¹⁾ Data based on characterization results, not tested in production.

8. Package Dimension

8.1 SOP-16(150 mil)

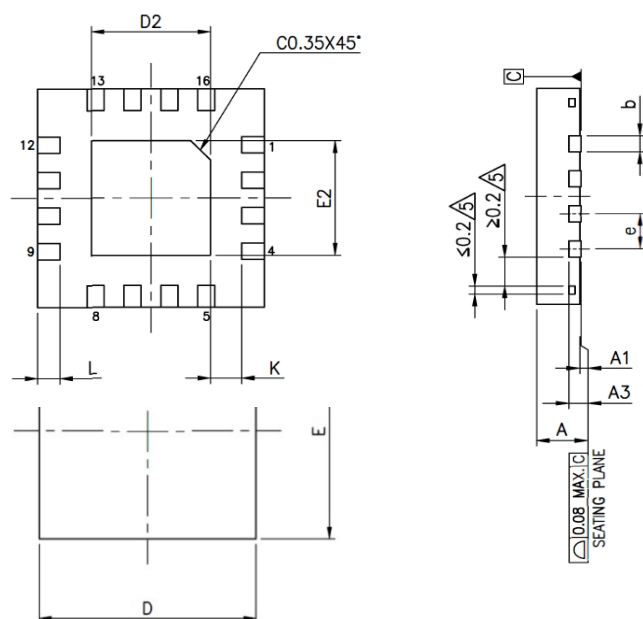
Figure 8–1. SOP-16



Unit	mm		Inch	
Symbols	Min.	Max.	Min.	Max.
A	----	1.75	----	0.069
A1	0.10	0.25	0.004	0.010
A2	1.25	----	0.049	----
b	0.31	0.51	0.012	0.020
c	0.10	0.25	0.004	0.010
D	9.90 BSC		0.390 BSC	
E	6.00 BSC		0.236BSC	
E1	3.90 BSC		0.154BSC	
e	1.27 BSC		0.050BSC	
L	0.40	1.27	0.016	0.235
h	0.25	0.50	0.010	0.020
θ°	0°	8°	0°	8°

8.2 QFN-16 (4x4)

Figure 8–2. QFN-16 (4x4)



Unit	mm			inch		
Symbols	Min.	Nom.	Max.	Min.	Nom.	Max.
A	0.70	0.75	0.80	0.028	0.030	0.032
A1	0.00	0.02	0.05	0.000	0.001	0.002
A3	0.20 REF.			0.008 REF.		
b	0.25	0.30	0.35	0.01	0.012	0.014
D	4.00 BSC			0.157 BSC		
D2	2.00	2.10	2.15	0.079	0.083	0.085
E	4.00 BSC			0.157BSC		
E2	2.00	2.10	2.15	0.079	0.083	0.085
E	0.65 BSC			0.026 BSC		
L	0.50	0.55	0.60	0.020	0.022	0.024
K	0.20	---	----	0.008	----	---

9. Revision History

Table 9–1. Revision History

Rev	Descriptions	Date
V0.20	Initial version	2023/06/09
V0.21	1. Removed Line break detection in feature	2023/06/16
	2. Removed baudrate 110, 300	2023/06/16

10. Disclaimers

Herein, Megawin stands for “***Megawin Technology Co., Ltd.***”

Life Support — This product is not designed for use in medical, life-saving or life-sustaining applications, or systems where malfunction of this product can reasonably be expected to result in personal injury. Customers using or selling this product for use in such applications do so at their own risk and agree to fully indemnify Megawin for any damages resulting from such improper use or sale.

Right to Make Changes — Megawin reserves the right to make changes in the products - including circuits, standard cells, and/or software - described or contained herein in order to improve design and/or performance. When the product is in mass production, relevant changes will be communicated via an Engineering Change Notification (ECN).