MTA41300

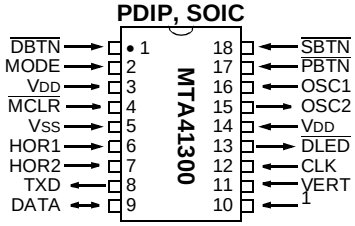
PS/2® and Serial Mouse and Trackball Controller I.C.

FEATURES

- Mouse and trackball controller IC
- Selectable RS-232 Serial or IBM® PS/2 interfaces
- Microsoft® serial interface format and IBM PS/2 mouse compliant
- Single-chip, two-button mouse or trackball controller
- 1200,N,7,1 - RS-232 serial communication format
- 10 kHz PS/2 interface
- Fixed mouse and trackball resolution
- Motion sampling rate of 12000 samples/second in PS/2 Mode and 15000 samples/second in RS-232 Mode
- Available in:
  - 18-lead 300 mil PDIP
  - 18-lead 300 mil SOIC

PACKAGE TYPE

PDIP, SOIC



DESCRIPTION

The MTA41300 is the heart of a simple, low-cost, mouse or trackball solution. It can be configured to operate as either an IBM PS/2 compliant mouse or as a serial mouse that is Microsoft serial format compatible. Both interface options are also available when the MTA41300 is used as a trackball controller. The mouse select and drag operation can be performed with a trackball by using the optional drag lock input and drag lock LED. When using a trackball, this allows for one-handed select and drag.

MTA41300

The MTA41300 is an 18-lead low-power CMOS integrated circuit. Combined with a few simple external components, a complete mouse or trackball system can be realized.

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1.0 PIN DESCRIPTIONS

PIN NAME	TYPE	DESCRIPTION
$\overline{TXD}$	Output	Data port for RS-232 serial data. Active low. For IBM PS/2 Mode, this pin is a no connect and should be left open
MODE	Input	Mode select 1 = PS/2, 0 = RS-232 serial
HOR1	Input	Horizontal quadrature Input #1
HOR2	Input	Horizontal quadrature Input #2
$\overline{PBTN}$	Input	Primary mouse button. Active low, 0 = button depressed
$\overline{SBTN}$	Input	Secondary mouse button. Active low, 0 = button depressed
$\overline{DBTN}$	Input	Optional trackball drag lock button. Active low, 0 = button depressed. For mouse only operation, connect this pin to V_{DD}
VERT1	Input	Vertical quadrature input #1
VERT2	Input	Vertical quadrature input #2
$\overline{DLED}$	Output	Optional trackball drag LED. For mouse only operation, this pin is a no connect and should be left open
OSC1	Input	4 MHz crystal or ceramic resonator connection
OSC2	Output	4 MHz crystal or ceramic resonator connection
DATA	I/O	Bidirectional data port for PS/2. For Serial Mouse Mode, this pin is a no connect and should be left open
CLK	I/O	PS/2 data clock input. For Serial Mouse Mode, this pin is a no connect and should be left open
$\overline{MCLR}$	Input	A “low” voltage on this pin causes a reset condition for the MTA41300 controller
V_{DD}	Pwr	+5V
V_{SS}	Pwr	Ground

2.0 SERIAL MOUSE MODE OPERATION

When operating in serial mouse mode the MTA41300 mouse controller is a transmit only device. The MTA41300 transmits a fixed format data packet at 1200 baud to the host when a button press or mouse motion is detected.

2.1 Reset Initialization

The MTA41300 will transmit a "M" character immediately after power-up or when a reset is initiated by the host. This character notifies the host that the message format is Microsoft serial format compliant. The MTA41300 is placed in the reset state when the $\overline{MCLR}$ pin is driven low.

2.2 Serial Mode Message Format

The following Microsoft serial interface compliant data format is broadcast by the MTA41300 when transmitting data to the host. The 1200 baud data format utilizes a 9-bit data frame that consists of 7 bits of message data and 2 control bits.

Data Frame Format:

Bit	Description
1	Start Bit (always 0)
2	Message Data Bit0, LSB
3	Message Data Bit1
4	Message Data Bit2
5	Message Data Bit3
6	Message Data Bit4
7	Message Data Bit5
8	Message Data Bit6, MSB
9	Stop bit (always 1)

The MTA41300 mouse controller transmits the following three-byte Microsoft serial interface compliant data packet in response to a mouse event.

Message Data Byte 1:

Bit	Description
6	Always = 1 (message sync bit)
5	1 = Primary Button Depressed
4	1 = Secondary Button Depressed
3	Vertical Motion bit 7 (MSB)
2	Vertical Motion bit6
1	Horizontal Motion bit7 (MSB)
0	Horizontal Motion bit6

Message Data Byte 2:

Bit	Description
6	Always = 0
5	Horizontal Motion bit5
4	Horizontal Motion bit4
3	Horizontal Motion bit3
2	Horizontal Motion bit2
1	Horizontal Motion bit1
0	Horizontal Motion bit0

Message Data Byte 3:

Bit	Description
6	Always = 0
5	Vertical Motion bit5
4	Vertical Motion bit4
3	Vertical Motion bit3
2	Vertical Motion bit2
1	Vertical Motion bit1
0	Vertical Motion bit0

3.0 IBM PS/2 MODE OPERATION

Upon power-up the MTA41300 mouse controller initiates an internal reset sequence. First, all internal registers and communication parameters are cleared. Next, the status registers are set to the default condition. Finally, if the MTA41300 receives a Resend command as the first command after power-up, it will transmit a AAh followed by a 00h in response. This notifies the host that the initialization is complete and that the controller is a standard mouse type. This is to ensure compatibility with some hosts that do not follow the normally recommended behavior of issuing a Reset command as the first command after power-up.

The MTA41300 always confirms reception of a command sent by the host by returning an acknowledge byte (FAh). If the host interrupts the transmission of the acknowledge byte, the MTA41300 discards the complete command. The MTA41300 is then ready to receive and acknowledge the next command. Two exceptions to the acknowledge after command received rule exist. The MTA41300 does not issue an acknowledge upon receipt of either the Set Wrap Mode (EEh) or Resend (FEh) commands.

3.1 PS/2 Mode Commands

Command Summary:

Command	Code
Reset	FFh
Resend	FEh
Set Default	F6h
Disable Reporting	F5h
Enable Reporting	F4h
Set Report Rate	F3h, XXh
Read Device Type	F2h
Set Remote Mode	F0h
Set Wrap Mode	EEh
Reset Wrap Mode	ECh
Read Data	EBh
Set Stream Mode	EAh
Status Request	E9h
Set Resolution	E8h, XXh
Set Scaling	E7h
Reset Scaling	E6h

3.1.1 RESET CODE: FFH

This command initiates a reset sequence in the MTA41300 mouse controller. First, all internal registers and communication parameters are cleared. Next, the status registers are set to the default condition. Finally, the MTA41300 transmits a AAh followed by a 00h, this notifies the host that the initialization is complete and that the controller is a standard mouse type.

3.1.2 RESEND CODE: FEH

Anytime the MTA41300 controller receives an invalidly formatted command, it will transmit a Resend command to the host. The controller will ignore invalid commands and will continue to operate in its present mode. When any command other than a resend is received by the controller, it will clear its motion and displacement counters.

The host system may send a Resend command to the controller if an error is detected in a transmission from the controller. When the controller receives a Resend command, it will retransmit the last data packet transmitted. If the last packet transmit was a resend command, the packet prior to the last packet will be retransmitted.

3.1.3 SET DEFAULT CODE: FEH

The Set Default command re-initializes all controller parameters to the power-up state. The controller initializes the following status registers, which only exist to ensure compatibility.

Report rate:	100 reports per second
Scaling:	Linear
Mode:	Streaming
Resolution:	Physical resolution
Reporting:	Disabled

This command does not initiate self test diagnostics. The controller remains in the disabled state until another command is received from the host.

3.1.4 DISABLE REPORTING CODE: F5H

The Disable Reporting command prevents data transmission by the controller while it is in the Stream Mode. However, the controller will still respond to other commands. When reporting is disabled, Stream Mode must be disabled prior to the host sending a command that requires a response by the controller.

3.1.5 ENABLE REPORTING CODE: F4H

The Enable Reporting command allows the controller to transmit data when in Stream Mode. This command has no effect while the controller is in Remote Mode.

3.1.6 SET REPORT RATE CODE: F3H, XXH

This command updates the report rate status register with the data contained in the second byte of the command. However, the actual report rate remains fixed at 40 times per second. This command only exists to ensure compatibility.

3.1.7 READ DEVICE TYPE CODE: F2H

The controller always transmits a 00h in response to receiving this command. This informs the host that a standard mouse is present.

3.1.8 SET REMOTE MODE CODE: F0H

Remote Mode is entered when the controller receives this command. In Remote Mode, event packets are transmitted to the host only when a read data command is received by the controller.

3.1.9 SET WRAP MODE CODE: EEH

Wrap Mode is entered when the controller receives this command. In Wrap Mode, the controller will echo all commands that are received back to the host.

> **Note:** The Reset and Reset Wrap commands will cancel wrap mode and neither of these commands will be echoed back to the host. Wrap Mode can be enabled in either Reporting, Stream or Remote Mode.

3.1.10 RESET WRAP MODE CODE: ECH

This command cancels Wrap Mode. The controller remains in the current Reporting Mode.

> **Note:** If the controller enters Wrap Mode while in Stream Mode and then a Reset Wrap Mode command is received, the controller will reenter the Stream Mode with Wrap Mode disabled.

3.1.11 READ DATA CODE: EBH

The controller will transmit an event packet to the host after a Read Data command is received. This command can be issued in the Remote or Stream Mode. The controller will transmit data even if there has not been any button changes or motion since the last report. The controller clears the motion counters after every read data command.

3.1.12 SET STREAM MODE CODE: EAH

The controller will enter the Stream Mode upon receiving this command. In Stream Mode event packets are transmitted to the host as they occur.

3.1.13 STATUS REQUEST CODE: E9H

A three byte status report packet will transmit in response to this command. These status bytes are defined as follows:

Byte 1:

Bit	Description
0	1= Secondary Button Depressed
1	Reserved
2	1= Primary Button Depressed
3	Reserved
4	1= 2:1 scaling
5	1= Enabled
6	1= Remote Mode
7	Reserved

Byte 2: Current Resolution

Byte 3: Current Sample Rate

3.1.14 SET RESOLUTION CODE: E8H, XXH

This command has no effect and only exists to ensure compatibility. The physical device resolution is always the resolution of the mouse or trackball.

3.1.15 SET SCALING CODE: E7H

This command has no effect on resolution and only exists to ensure compatibility. The scaling will always be 1:1.

3.1.16 RESET SCALING CODE: E6H

This command has no effect on resolution and only exists to ensure compatibility. The scaling will always be 1:1.

3.2 PS/2 Message Data Format

The following PS/2 compliant data format is used by the MTA41300 when transmitting data to the host and when receiving data from the host. The data format utilizes an 1-bit data frame that utilizes 8 bits for message data and 3 bits for control.

PS/2 Data Frame Format:

Bit	Description
1	Start Bit (always 0)
2	Message Data Bit0, LSB
3	Message Data Bit1
4	Message Data Bit2
5	Message Data Bit3
6	Message Data Bit4
7	Message Data Bit5
8	Message Data Bit6
9	Message Data Bit7, MSB
10	Parity Bit (odd parity)
11	Stop bit (always 1)

The MTA41300 mouse controller transmits the following three-byte data packet in response to a Read Data (EBh) command or when operating in stream mode with reporting enabled.

Status Message Data Byte 1:

Bit	Description
0	1= Primary Button Depressed
1	1= Secondary Button Depressed
2	Reserved
3	Reserved
4	X data sign, 1 = negative
5	Y data sign, 1 = negative
6	X data overflow, 1 = overflow
7	Y data overflow, 1 = overflow

Status Message Data Byte 2: Delta X motion

Status Message Data Byte 3: Delta Y motion

4.0 MOTION ENCODER INPUTS

The MTA41300 is designed to interface with either optical encoders that utilized LED and phototransistor pairs with a chopper wheel, or mechanical encoders utilizing a commutator with wiper contacts. The HOR and VERT inputs detect positive and negative delta motion. Motion direction is defined in the following state table. Refer to Figure 4-1 and Figure 4-2.

Positive Motion:

Hor1, Hor2/ Vert1,Vert2	Description
0,0	
0,1	
1,1	Positive Direction
1,0	Sequence
0,0	
etc.	

Negative Motion:

Hor1, Hor2/ Vert1,Vert2	Description
0,0	
1,0	
1,1	Negative Direction
0,1	Sequence
0,0	
etc.	

The HOR and VERT inputs are sampled at approximately 12000 samples per second with a 4 MHz input clock. The sample rate will decrease when communication traffic to or from the host is occurring. There is a one to one correlation between encoder transitions and the motion data that is transmitted to the host. For example, a transition of 0,1 to 1,1 on the horizontal encoder inputs (HOR1, HOR2) will result in one bit of horizontal motion as broadcast to the host. The sample rate, along with all other timed events related to the controller, is directly proportional to the clock frequency on the OSC1 and OSC2 pins.

An anti-jitter algorithm is employed to eliminate false motion counting when the mouse or trackball is not moving. This is especially useful in designs employing optical encoders since the output of an optical detector is an analog signal. The anti-jitter algorithm eliminates false counting when a voltage that is not a well defined logic low or logic highs applied to either the HOR or VERT inputs.

FIGURE 4-1: POSITIVE MOTION INPUT

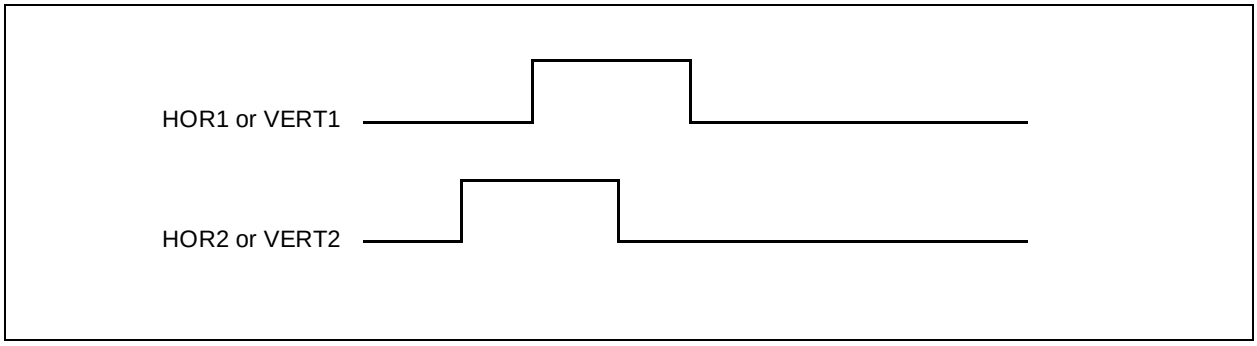
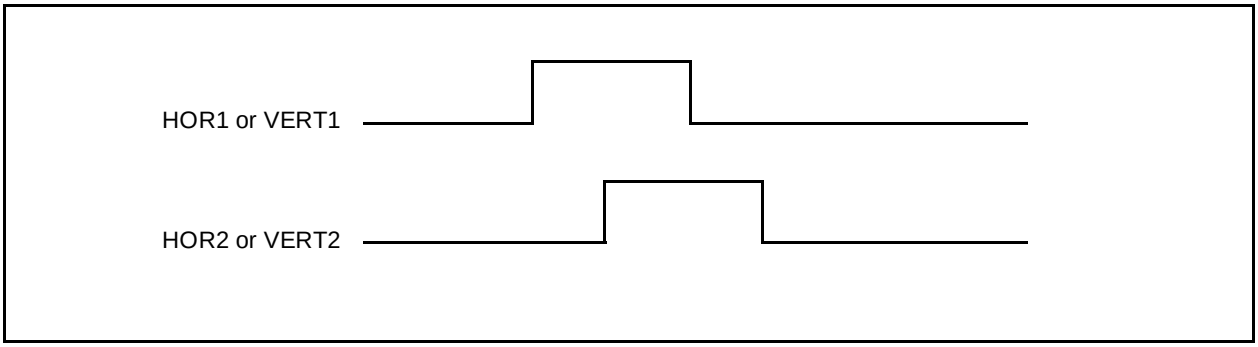


FIGURE 4-2: NEGATIVE MOTION INPUT



5.0 PUSH-BUTTON INPUTS

The MTA41300 push-button inputs are defined to be active when the input pin is in the low state. The appropriate message data bit will be set equal to one when a low is sampled at a switch input. When a switch input is sampled in the high state the appropriate message data bit will be set equal to zero.

6.0 TRACKBALL OPTION

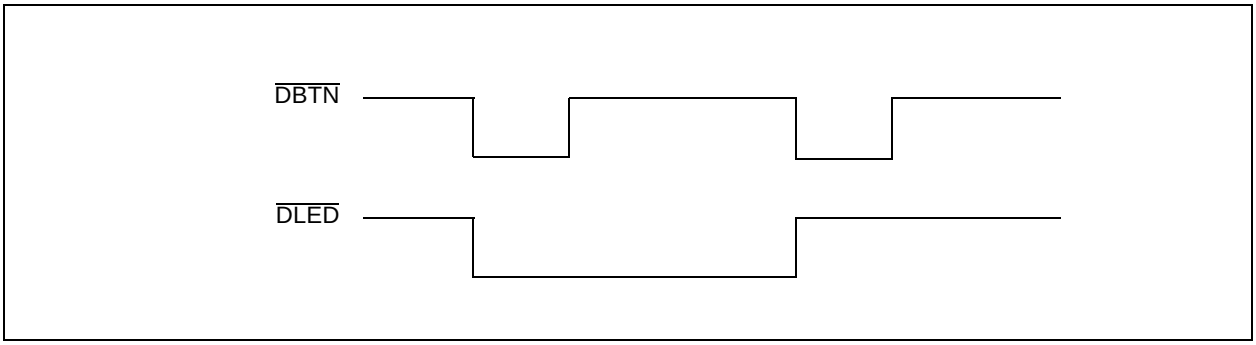
The MTA41300 can also function as a trackball controller. A trackball drag lock switch can be connected to the $\overline{\text{DBTN}}$ input and an LED indicator connected to the $\overline{\text{DLED}}$ output to aid in one-handed trackball operation.

When using a mouse, a select and drag operation is accomplished by clicking on an object and holding the primary mouse button down. Moving the mouse then drags the object to the desired location. When the primary button is released, the object is placed at the desired location. However, when the same select and drag operation is performed using a trackball it may be difficult to hold the button depressed and guide the trackball with the same hand.

The MTA41300's "drag lock" feature allows this function to be accomplished with one hand. The drag lock is set to the "locked" state by momentarily applying a low to the $\overline{\text{DBTN}}$ input. This "locked" state is equivalent to depressing and holding the primary button when using a mouse. The user then guides the object to the desired location without having to hold a button depressed and simultaneously guide the trackball. The object is placed and the "lock" is released when a low (e.g., button depressed) is momentarily applied to any button input.

The $\overline{\text{DLED}}$ output is latched in the low state (0V) when the $\overline{\text{DBTN}}$ input is sampled low (Figure 6-1). The $\overline{\text{DLED}}$ output will remain low ("locked") until the $\overline{\text{DBTN}}$ input is sampled high and then sampled low again. Exiting the locked state also occurs if either the $\overline{\text{PBTN}}$ or $\overline{\text{SBTN}}$ inputs are sampled low when the $\overline{\text{DLED}}$ output is low. When the $\overline{\text{DLED}}$ output is in low "locked" state, the Primary Button depressed bit in the status message is set high.

FIGURE 6-1: TRACKBALL DRAG LOCK OPERATION



7.0 ELECTRICAL CHARACTERISTICS

7.1 Absolute Maximum Ratings †

Ambient temperature under bias . . . . . -55°C to +125°C

Storage temperature . . . . . -65°C to +150°C

Voltage on any pin with respect to V_{SS} (except V_{DD} and $\overline{MCLR}$) . . . . . -0.6V to (V_{DD} +0.6V)

Voltage on $\overline{MCLR}$ pin with respect to V_{SS} . . . . . 0V to +14.0V

Voltage on V_{DD} with respect to V_{SS} . . . . . 0V to +9.5V

Total power dissipation (Note 2). . . . . 800 mW

Maximum current out of V_{SS} pin . . . . . 150 mA

Maximum current into V_{DD} pin . . . . . 50 mA

Maximum current into input pin . . . . . ±500 µA

Maximum output current sinked by any I/O or output pin. . . . . 25 mA

Maximum output current sourced by any I/O or output pin . . . . . 20 mA

Notes:

1. Voltage spikes below V_{SS} at the $\overline{MCLR}$ pin, inducing currents greater than 80 mA may cause latch-up. Thus, a series resistor of 50Ω to 100Ω should be used when applying a “low” level to this pin, rather than connecting this pin directly to V_{SS}.
2. Total power dissipation should not exceed 800 mW for the package. The total power dissipation is calculated as follows:
   $P_{DIS} = V_{DD} \times (I_{DD} - \sum I_{OH}) + \sum\{(V_{DD} - V_{OH}) \times I_{OH}\} + \sum(V_{OL} \times I_{OL})$.

† **Notice:**	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 device 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 MTA41300 (COMMERCIAL)

		Standard Operating Conditions (unless otherwise stated). Operating Temperature 0°C < TA < 70°C for commercial. Operating voltage VDD = 3.0V to 5.5V unless otherwise stated.				
Characteristic	**Sym..**	**Min.**	**Typ.**	**Max**	**Units**	**Conditions**
Supply Voltage	VDD	3.0		6.25	V	FOSC = DC to 4 MHz
VDD start voltage to guarantee power on reset	VPOR		VSS		V	
VDD rise rate to guarantee power on reset	SVDD	0.05[1]			V/mS	
Supply Current	IDD		1.8	3.3	mA	FOSC = 4 MHz, VDD = 5.5V
Input Low Voltage						
$\overline{\text{MCLR}}$ (Schmitt trigger)	VILMC			0.15VDD	V	
OSC1 (Schmitt trigger)	VILOSC			0.3VDD	V	
All other Inputs	VIL			0.2VDD	V	
Input High Voltage						
$\overline{\text{MCLR}}$ (Schmitt trigger)	VIHMC	0.85 VDD		VDD	V	
OSC1 (Schmitt trigger)	VIHOSC	0.7 VDD		VDD	V	
All other Inputs	VIH	0.45 VDD		VDD	V	
		2 V		VDD	V	4.0V < VDD ≤ 5.5V
Input Leakage Current						
$\overline{\text{MCLR}}$	IILMCL	-5			µA	VPIN = VDD + 0.25V
$\overline{\text{MCLR}}$	IILMCH		0.5	+5	µA	VPIN = VDD
OSC1 (Schmitt trigger)	IILMCH		0.5	+3	µA	VDD ≤ VPIN ≤ VDD
All other Inputs	IIL	-1	0.5	+1	µA	VDD ≤ VPIN ≤ VDD
Output Low Voltage						
OSC2	VOL			0.6V	V	IOL = 1.6mA, VDD = 4.5V
All other Outputs	VOL	VDD - 0.7		0.6V	V	IOL = 8.7mA, VDD = 4.5V
Output High Voltage						
OSC2						IOH =-1.0mA, VDD = 4.5V
All other Outputs	VOH				V	IOH =-5.4mA, VDD = 4.5V

Note 1: These parameters are based on characterization and are not tested.

FIGURE 7-1: INPUT THRESHOLD VOLTAGE (V_{TH}) OF ALL INPUT AND I/O PINS EXCEPT $\overline{MCLR}$ AND OSC1

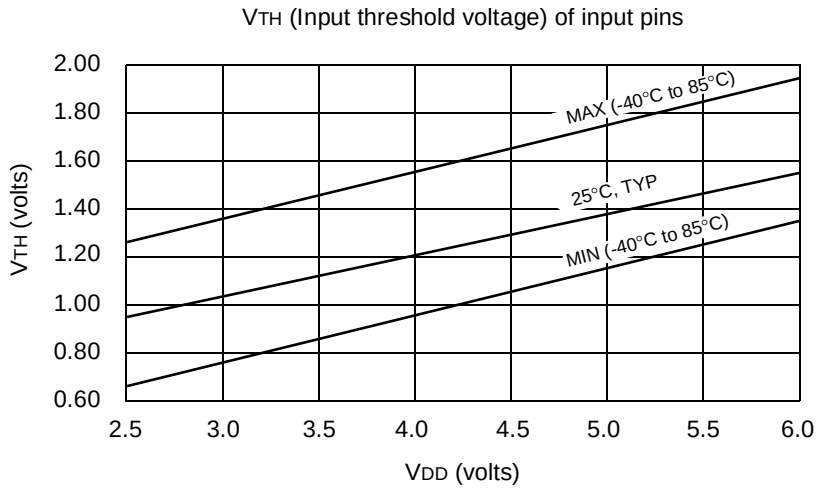
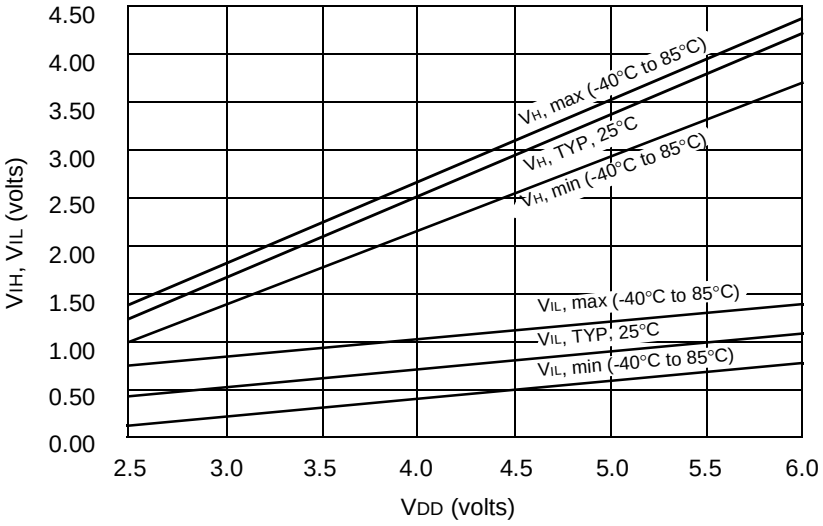


FIGURE 7-2: V_{IH} V_{IL} OF $\overline{MCLR}$ VS V_{DD}



Note: These input pins have Schmitt trigger input buffer.

FIGURE 7-3: INPUT THRESHOLD VOLTAGE (V_{TH}) OF OSC1 INPUT

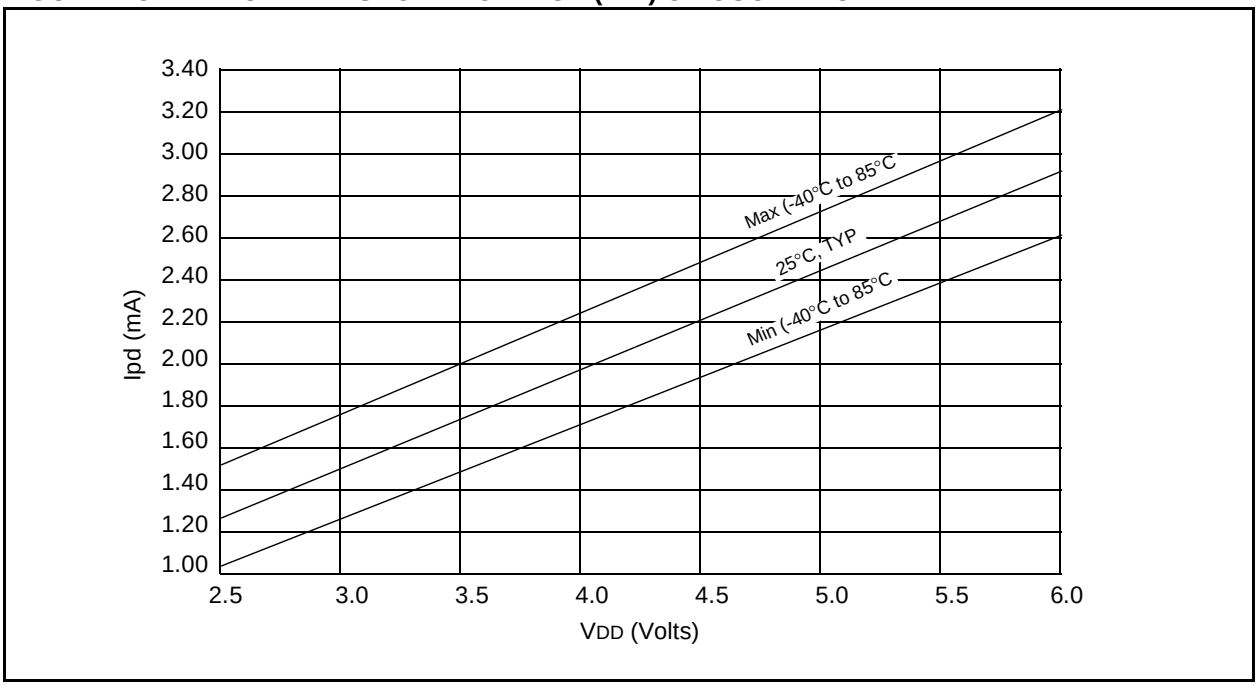


FIGURE 7-4: I_{OH} VS V_{OH}, V_{DD} = 3V

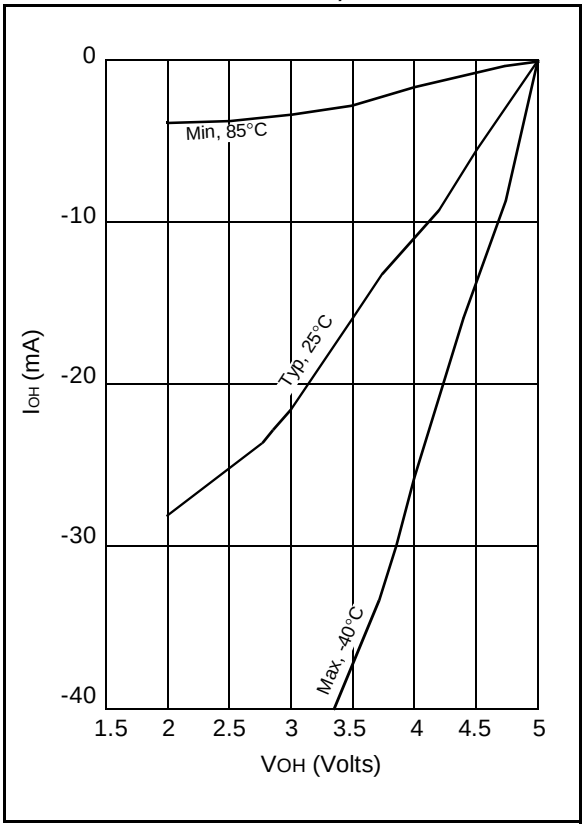


FIGURE 7-5: I_{OH} VS V_{OH}, V_{DD} = 5V

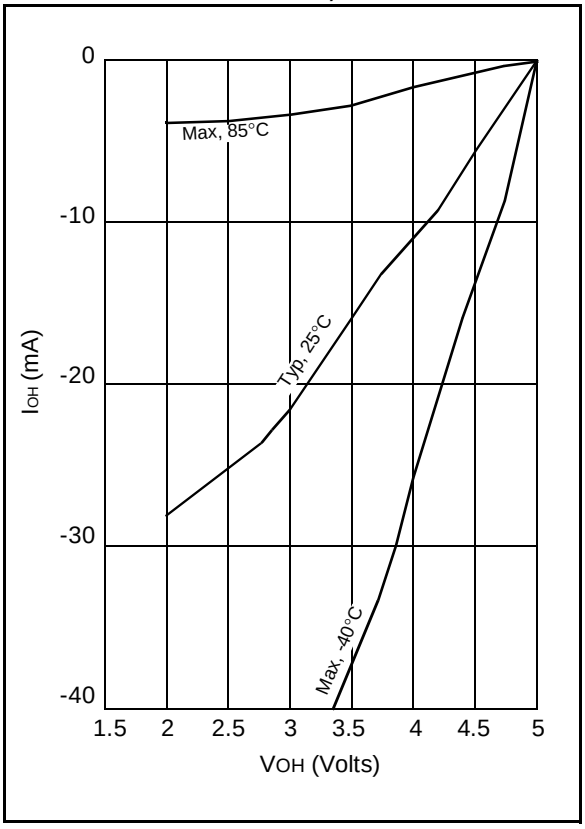


FIGURE 7-6: IOL VS VOL, VDD = 3V

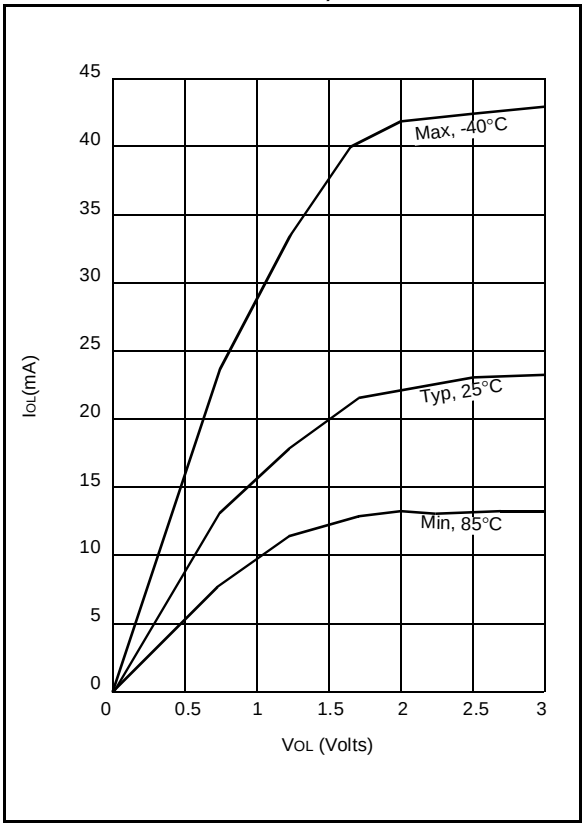
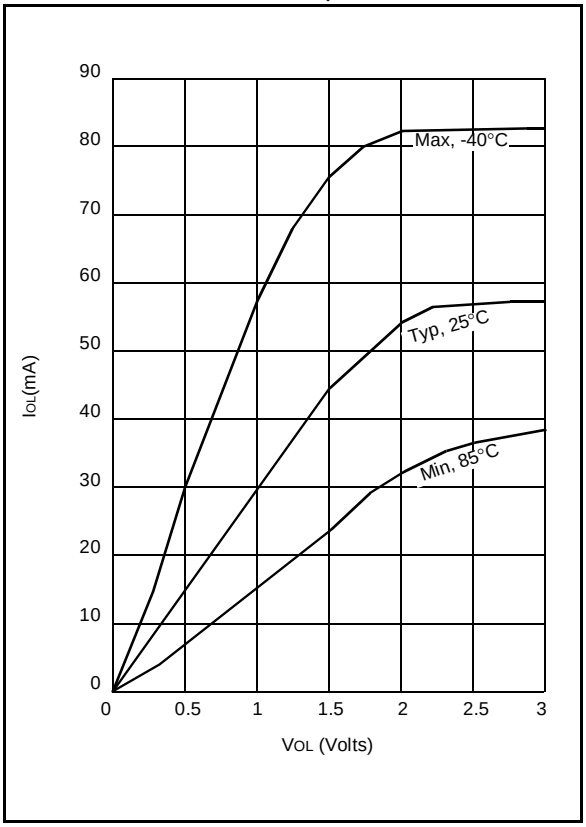


FIGURE 7-7: IOL VS VOL, VDD = 5V



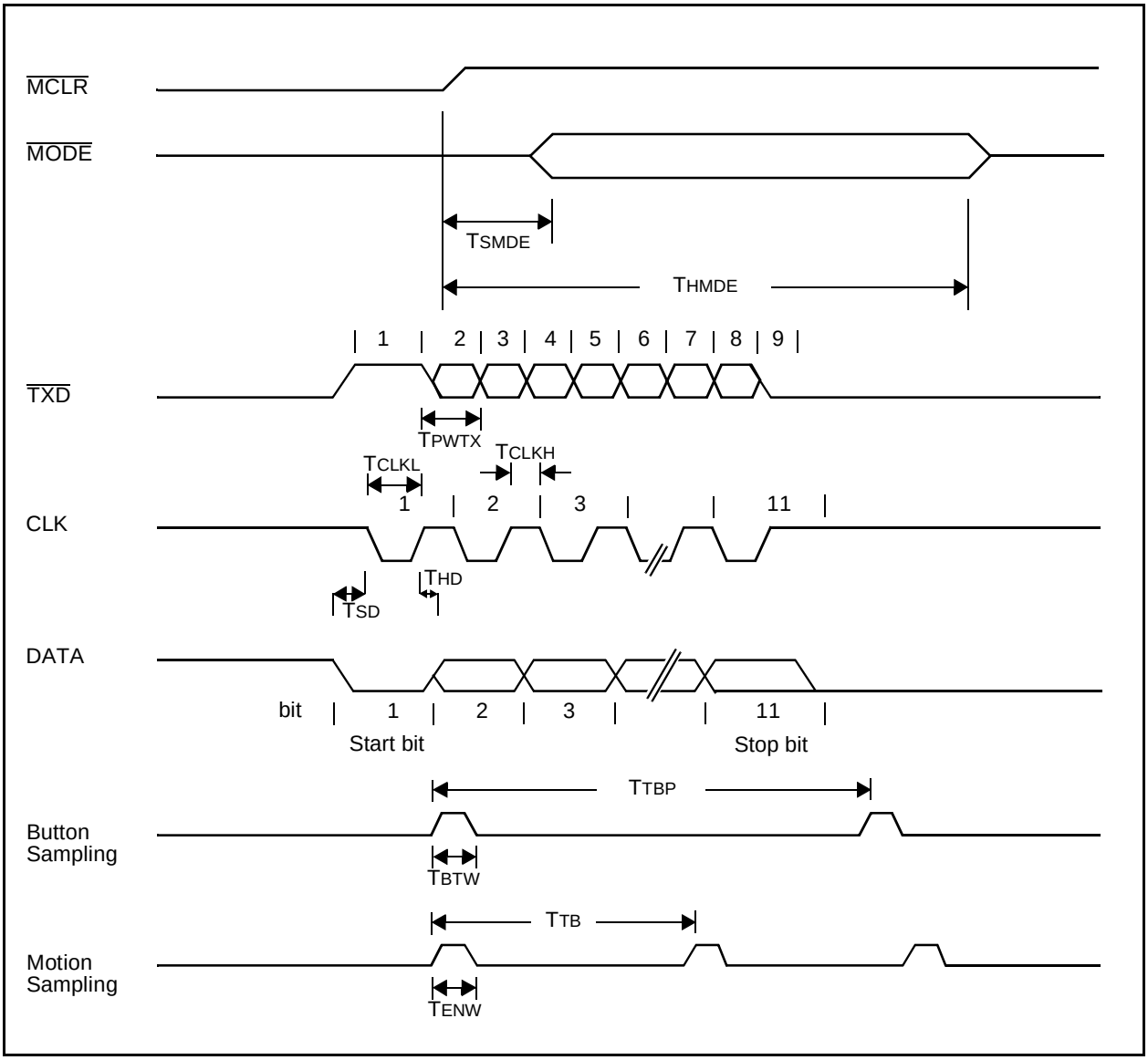
7.3 AC CHARACTERISTICS MTA41300 (COMMERCIAL)

		Standard Operating Conditions (unless otherwise stated). Operating Temperature 0°C < TA < 70°C for commercial. Operating voltage VDD = 3.0V to 5.5V unless otherwise stated. Oscillator Frequency = 4 MHz.				
Characteristic	**Sym.**	**Min.**	**Typ.**	**Max.**	**Units**	**Conditions**
Oscillator Frequency	FOSC	DC		4	MHz	
Serial Mode Output Timing TXD output pulse width (per bit)	TPWTX	800	833	866	µS	1200 baud @ FOSC = 4 MHz
PS/2 Mode I/O Timing CLK High time CLK Low time DATA setup time to CLK falling DATA hold time to CLK rising	 TCLKH TCLKL TSD THD	 27 27 5 5		 53 53 25 45	 µS µS µS	
Input Timing: $\overline{PBTN}$, $\overline{SBTN}$, $\overline{DBTN}$ Input Sample Period Input Sample Window width HOR1,HOR2,VERT1,VERT2 Input Sample Period (PS/2 Mode) Input Sample Period (RS-232 Mode) Input Sample Window width	 TBTP TBTW TENP2 TENPS TENW		 83[1] 66 	 50 280 280	 ms ns µS µS ns	
RESET Timing $\overline{MCLR}$ pulse width (low)	TMCL	100			ns	
Oscillator Start-up Timer Period	TOST	9[2]	18[2]	30[2]	ms	VDD = 5.0V
MODE Timing Setup time Hold time	TSMDE THMDE	-5 50			ms ms	from $\overline{MCLR}$ high from $\overline{MCLR}$ high

Note 1: Sampling can be suspended if device is receiving data from host or if transmission to host is inhibited by host (CLK held low).

Note 2: These parameters are based on characterization and are not tested.

FIGURE 7-8: TIMING DIAGRAMS



8.0 APPLICATION EXAMPLES

Three distinct types of mice or trackball systems can be created using the MTA41300 controller. These systems are distinguished on the type of host interface they use. The three types are:

- RS-232 serial
- IBM PS/2
- or a “combo” interface that can operate in either RS-232 or PS/2.

Also, three example types of motion encoders are shown in the schematics (document number 41XXXEN). Two types of optical encoders and a mechanical type are shown.

All system types use momentary contact type switches for the button inputs including the drag lock input.

8.1 RS-232 Serial Interface Mouse or Trackball

To operate the MTA41300 controller in the RS-232 Serial Mode only, the MODE pin is simply connected to V_{SS}. The example schematic (document number 41300RSa), shows the MTA41300 configured as an RS-232 serial mouse or trackball.

Trackball systems require the addition of the components labeled as trackball only. These components allow support of a drag lock switch and indicator. A pull-up resistor for the drag lock switch must be included for trackball systems. For a mouse the $\overline{DBTN}$ input is simply connected to V_{DD}.

Since the MTA41300 operates from a single supply, a discrete transistor is used as a level shifter to insure that a low output on the RS-232 data line is below the RS-232, -3V threshold.

8.2 PS/2 Interface Mouse or Trackball

To operate the MTA41300 controller in the PS/2 Mode only, the MODE pin is simply connected to V_{DD}. The example schematic, document number 41300PSa, shows the MTA41300 configured as a PS/2 mouse or trackball.

8.3 RS-232 and PS/2 “Combo” Mouse or Trackball

The “combo” mouse system is designed to change its host interface to the desired protocol depending on the type of host system it is connected to. The schematic (document number 41300SPa) shows a typical “combo” mouse or trackball. In this system, the MODE select is wired to the host connector and is not connected directly to either V_{DD} or V_{SS}.

For RS-232 operation, the RTS line is driven by the host to -12V. A protection diode limits the maximum negative voltage applied to the MODE pin to -.6V. This logical low on power-up places the MTA41300 in the RS-232 Serial Interface Mode.

For PS/2 operation, a special adapter plug (document number 41300SPa, page 2) can be used to change the RS-232 DB-9 connector to the mini-DIN type used by PS/2 systems. The adapter plug also connects the MODE pin to +5V thus automatically configuring the MTA41300 for the PS/2 interface.

8.4 Host System Device Drivers

The MTA41300 is compatible with standard IBM PS/2 drivers and Microsoft device drivers. Additionally, host system device drivers for use with the MTA41300 are available from third party vendors. Contact your local Microchip Technology Inc. sales office for a list of vendors currently offering device drivers for use with the MTA41300.

FIGURE 8-1: MTA41300 BASED PS/2 MOUSE OR TRACKBALL

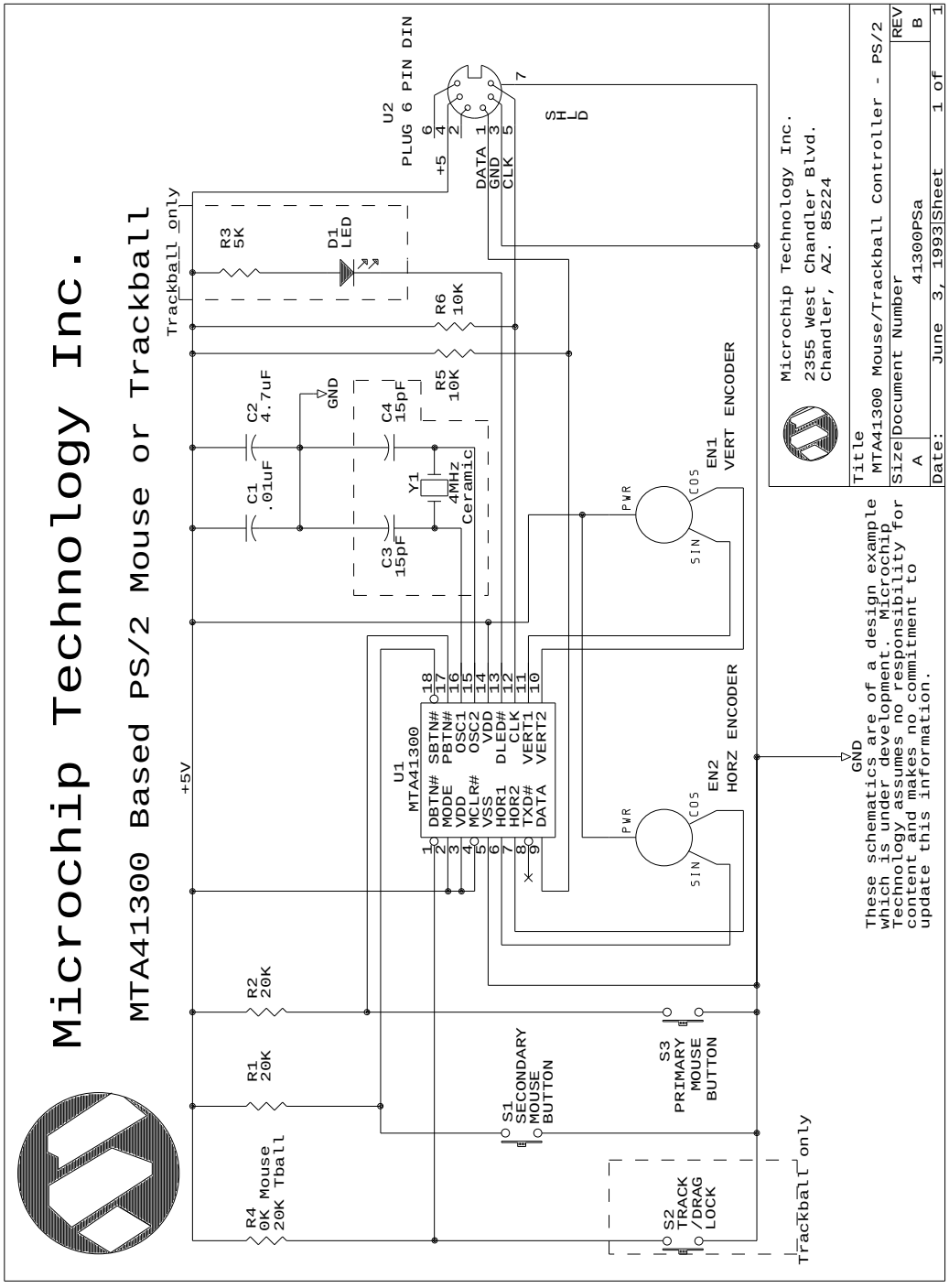


FIGURE 8-2: MTA41300 BASED SERIAL MOUSE OR TRACKBALL

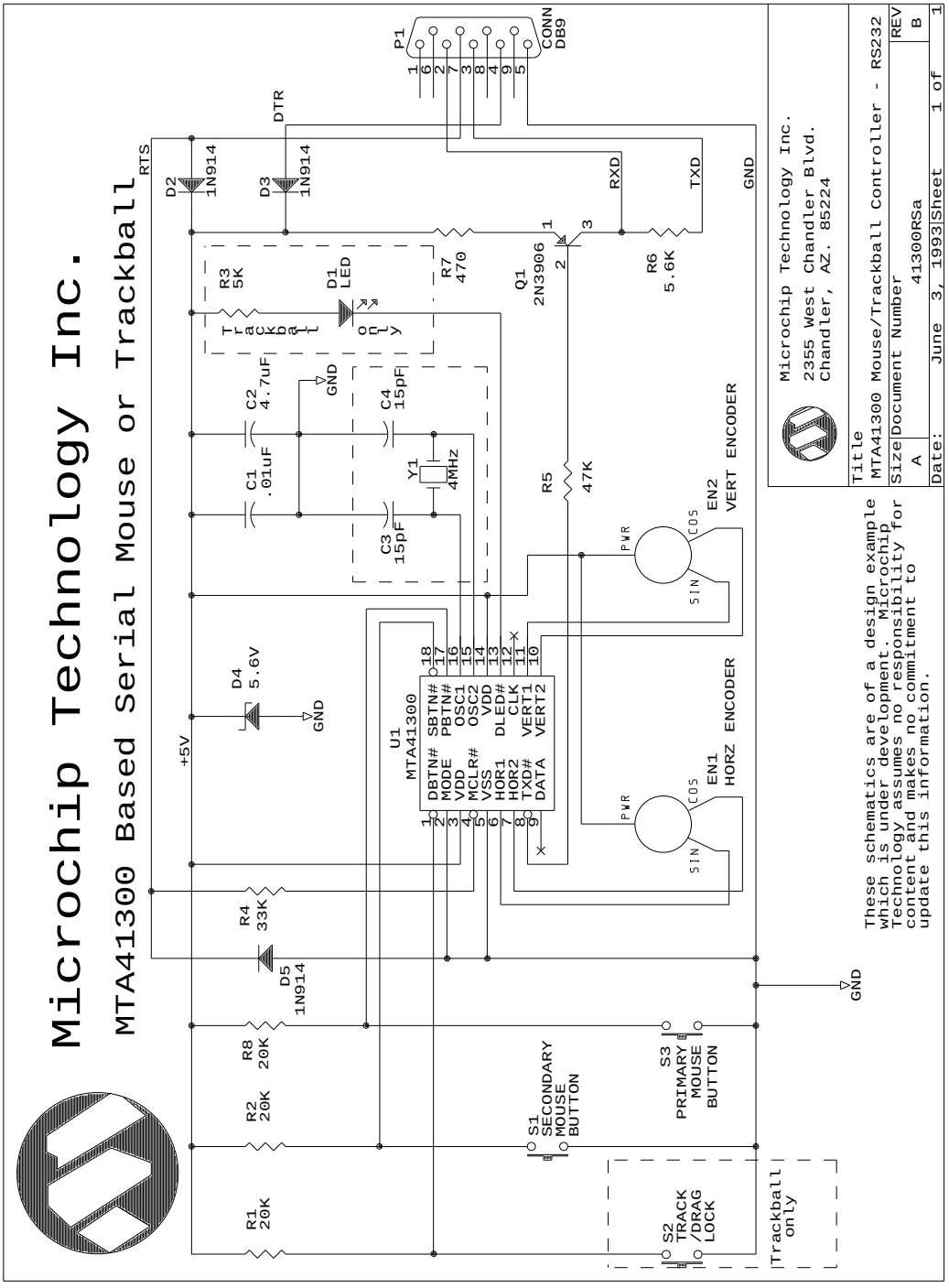


FIGURE 8-3: MTA41300 BASED SERIAL - PS/2 COMBO MOUSE

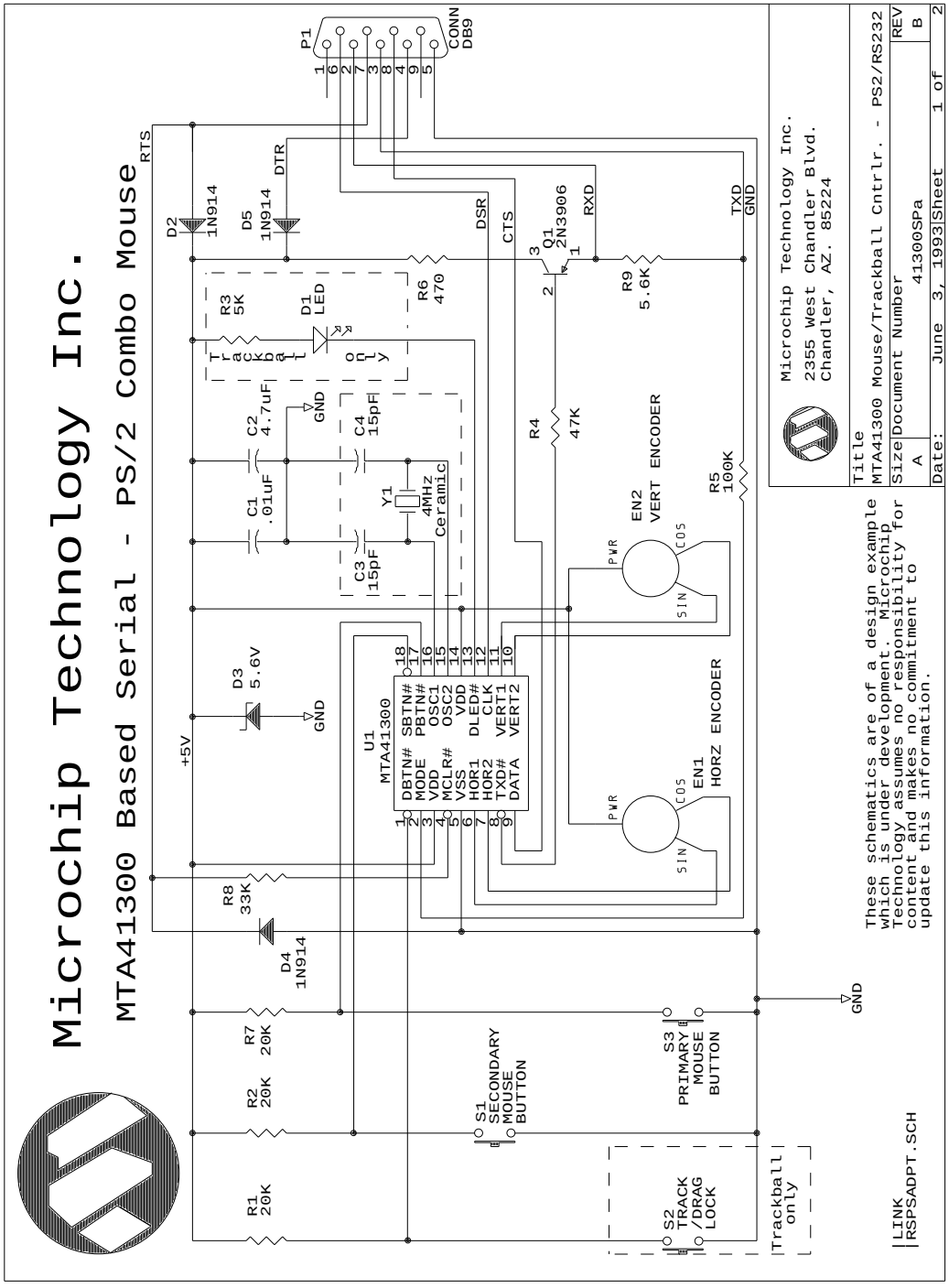


FIGURE 8-4: RS232 TO PS/2 ADAPTER PLUG WIRING FOR MTA41300

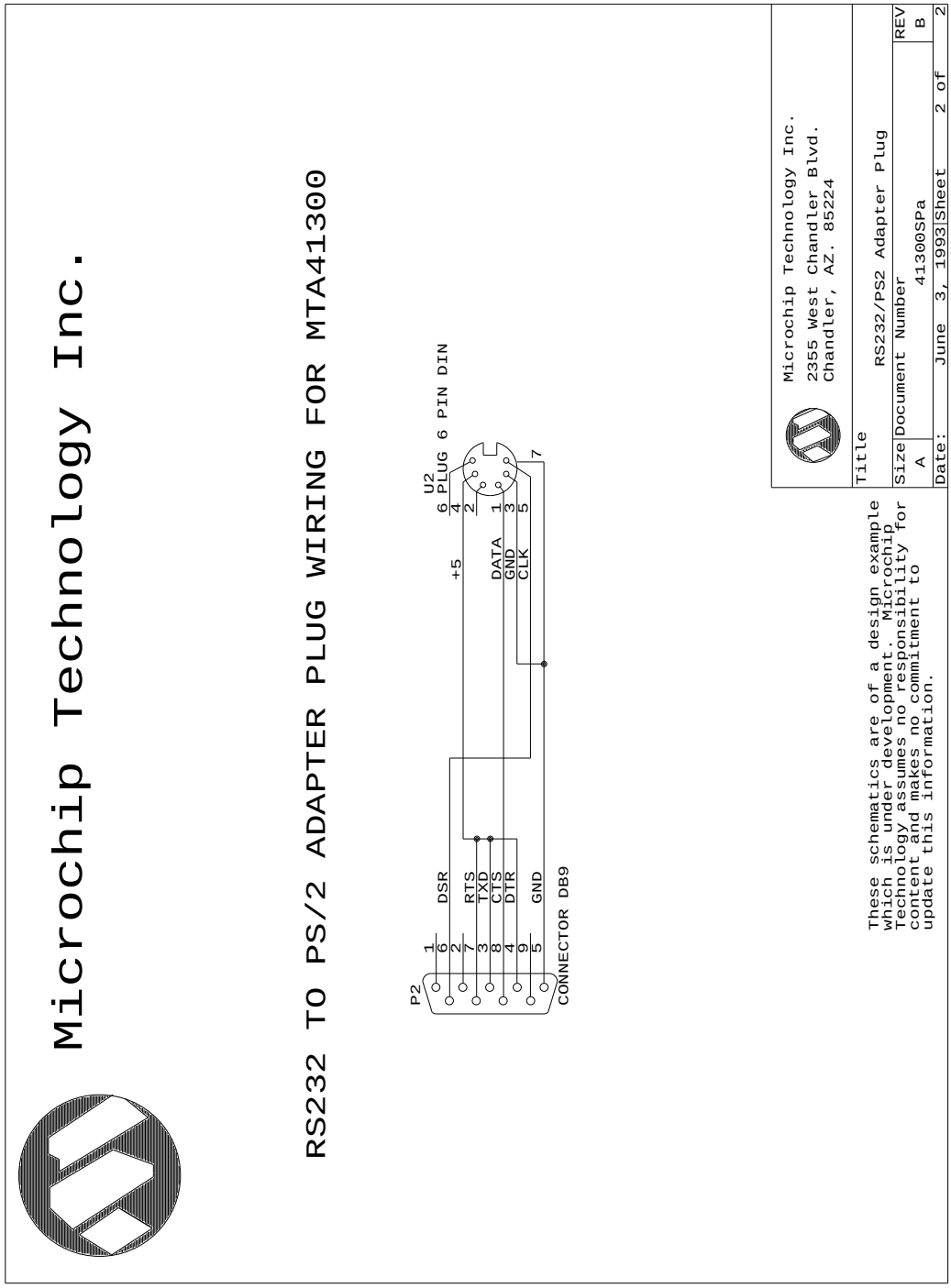


FIGURE 8-5: BASIC MOUSE/TRACKBALL OPTICAL MOTION ENCODER

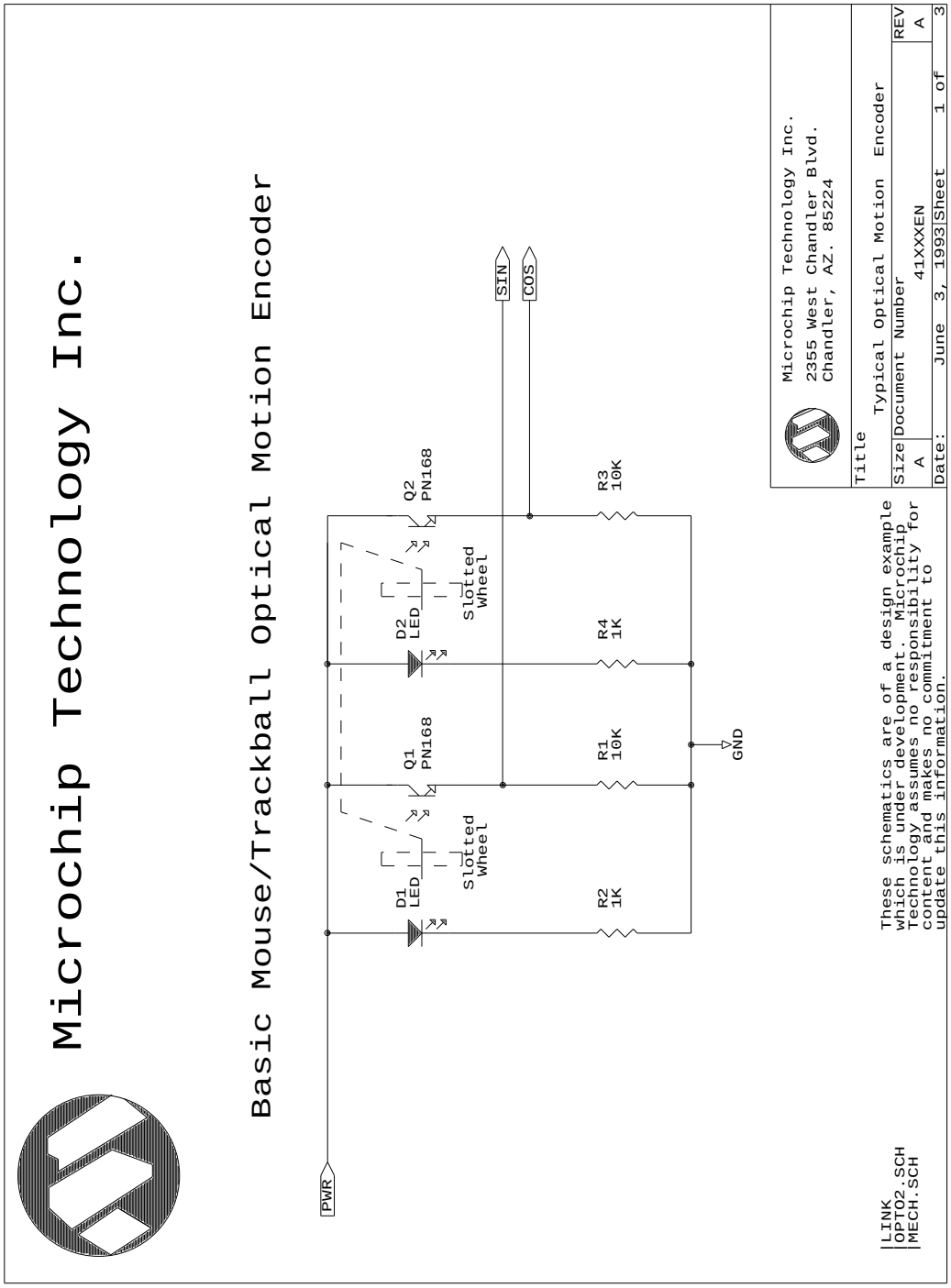


FIGURE 8-6: IMPROVED MOUSE/TRACKBALL OPTICAL MOTION ENCODER

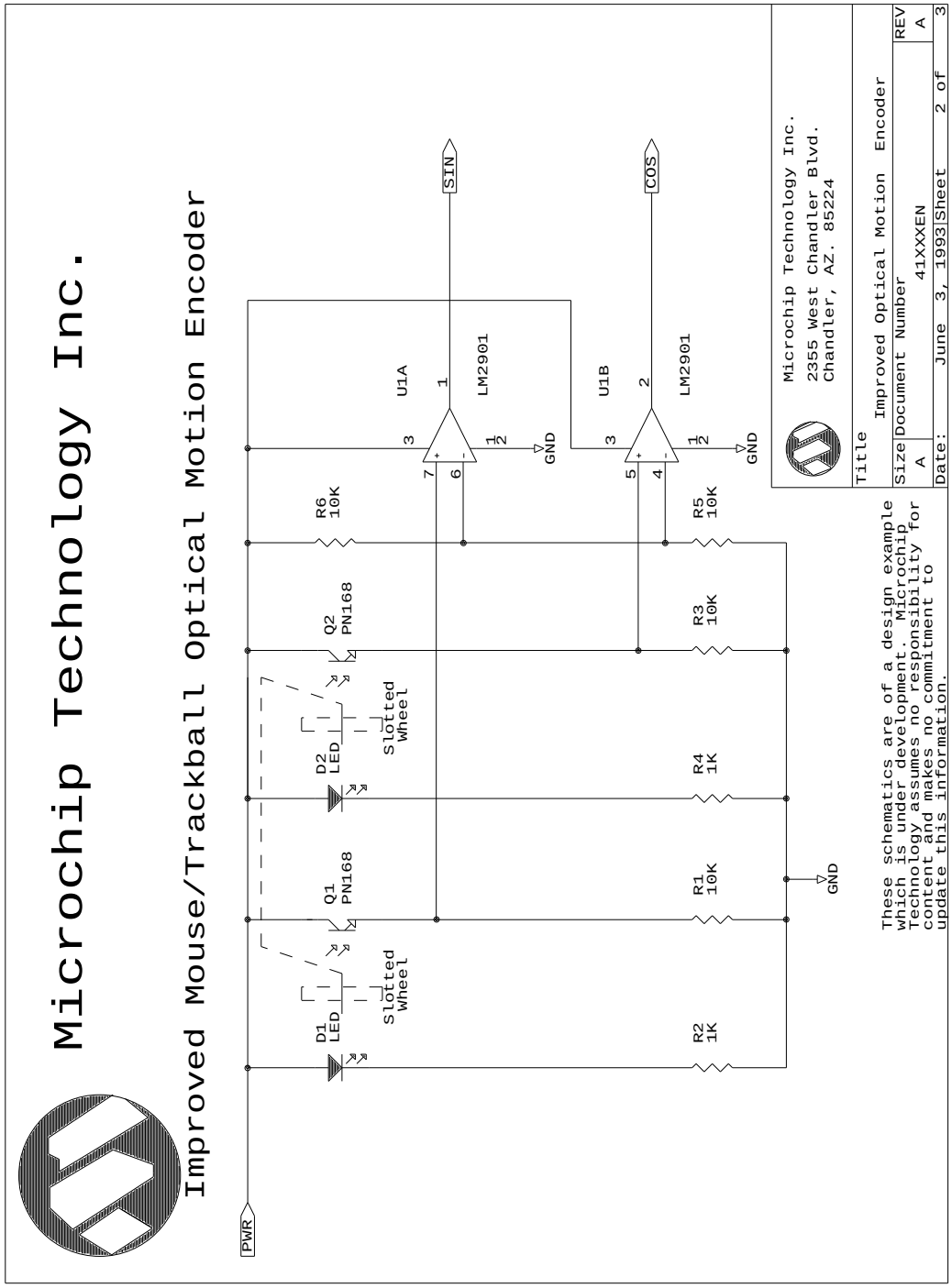
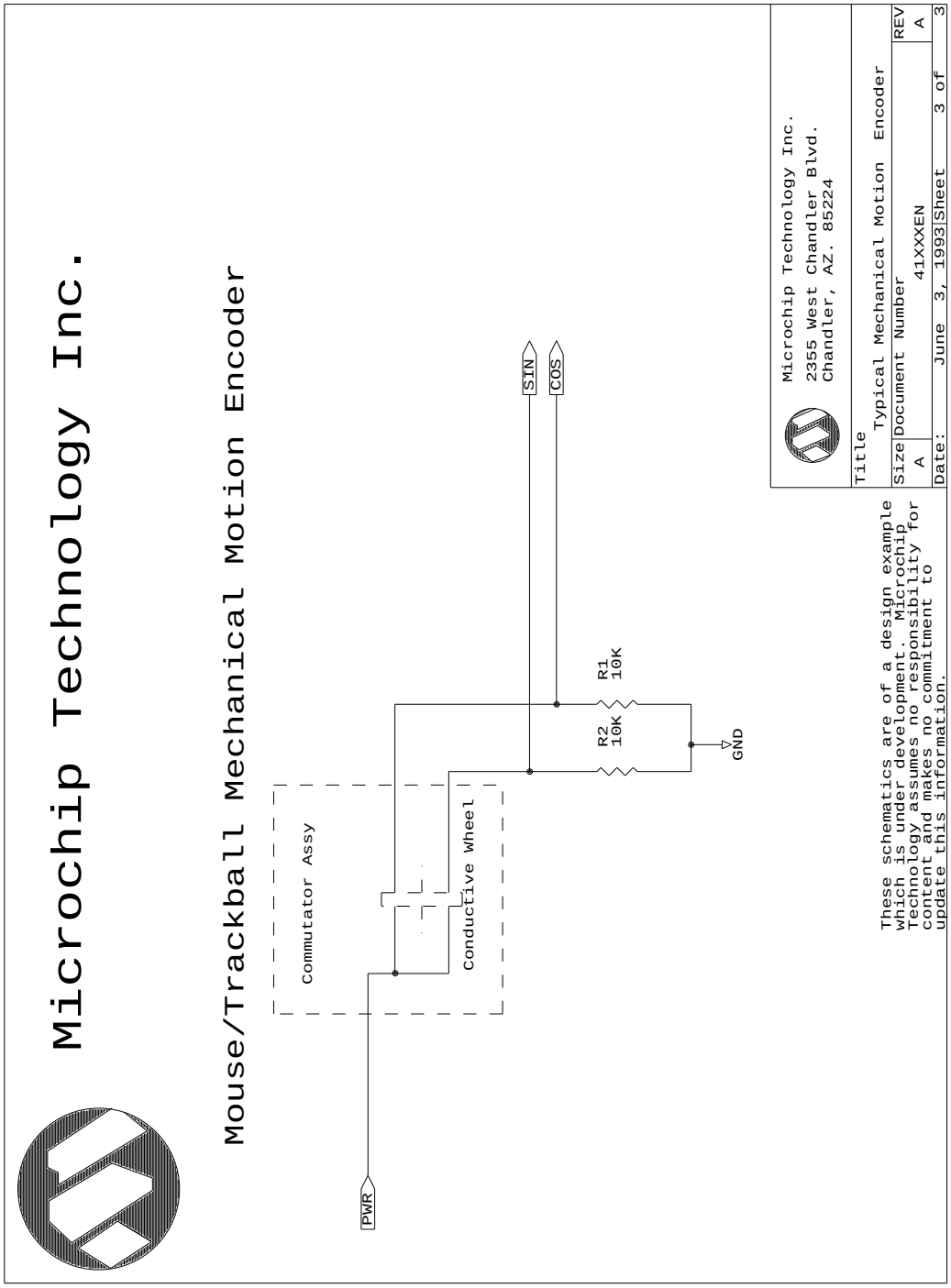
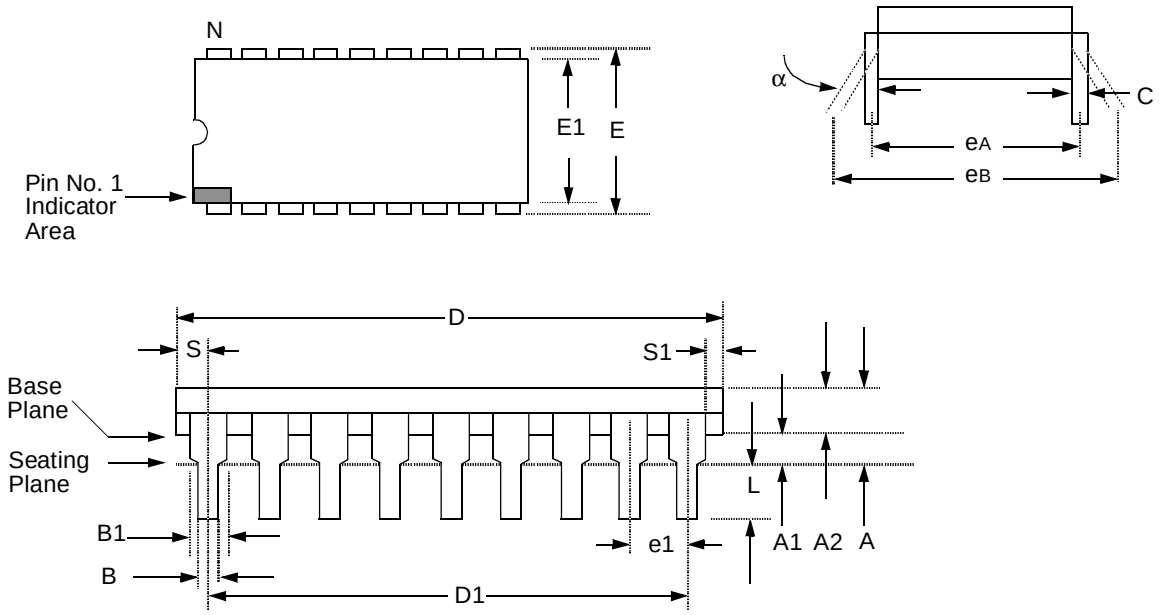


FIGURE 8-7: MOUSE/TRACKBALL MECHANICAL MOTION ENCODER



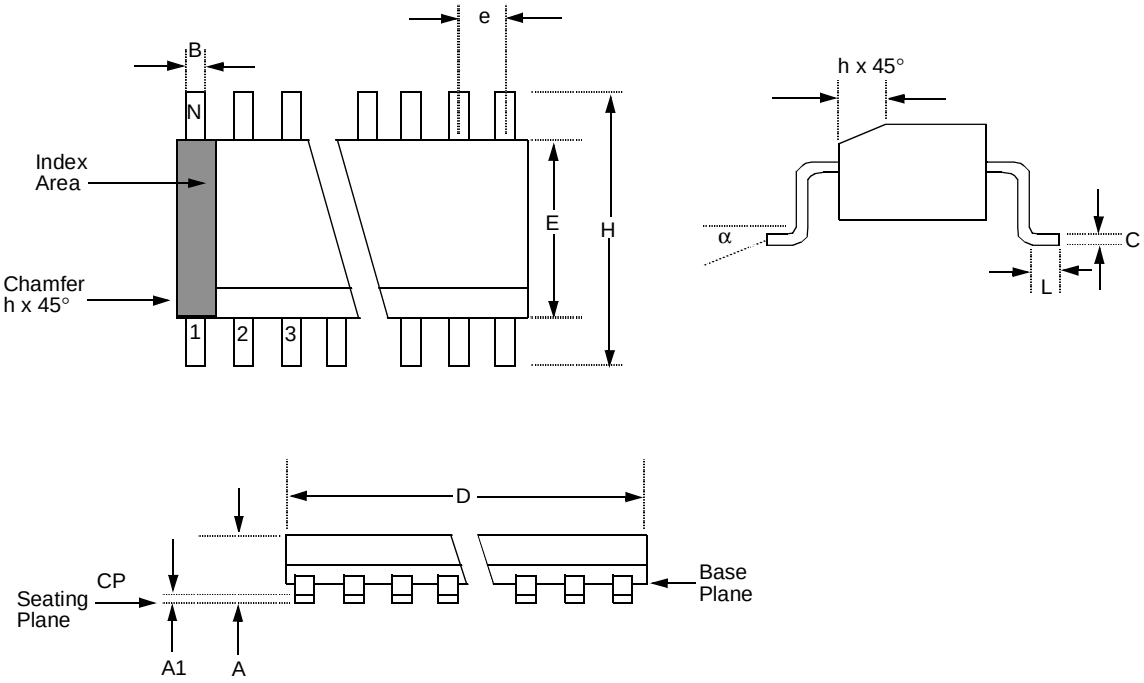
9.0 PACKAGING DIAGRAMS AND DIMENSIONS

9.1 18-Lead Plastic Dual In-Line (300 mil)



Package Group: Plastic Dual In-Line (PLA)						
	Millimeters			Inches		
Symbol	Min	Max	Notes	Min	Max	Notes
α	0°	10°		0°	10°	
A	–	4.064		–	0.160	
A1	0.381	–		0.015	–	
A2	3.048	3.810		0.120	0.150	
B	0.355	0.559		0.014	0.022	
B1	1.524	1.524	**Reference**	0.060	0.060	**Reference**
C	0.203	0.381	**Typical**	0.008	0.015	**Typical**
D	22.479	23.495		0.885	0.925	
D1	20.320	20.320	**Reference**	0.800	0.800	**Reference**
E	7.620	8.255		0.300	0.325	
E1	6.096	7.112		0.240	0.280	
e1	2.489	2.591	**Typical**	0.098	0.102	**Typical**
eA	7.620	7.620	**Reference**	0.300	0.300	**Reference**
eB	7.874	9.906		0.310	0.390	
L	3.048	3.556		0.120	0.140	
N	18	18		18	18	
S	0.889	–		0.035	–	
S1	0.127	–		0.005	–	

9.2 18-Lead Plastic Surface Mount (SOIC - Wide, 300 mil Body)

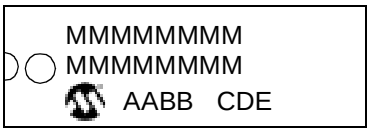


Package Group: Plastic SOIC (SO)						
	Millimeters			Inches		
Symbol	Min	Max	Notes	Min	Max	Notes
α	0°	8°		0°	8°	
A	2.362	2.642		0.093	0.104	
A1	0.101	0.300		0.004	0.012	
B	0.355	0.483		0.014	0.019	
C	0.241	0.318		0.009	0.013	
D	11.353	11.735		0.447	0.462	
E	7.416	7.595		0.292	0.299	
e	1.270	1.270	**Reference**	0.050	0.050	**Reference**
H	10.007	10.643		0.394	0.419	
h	0.381	0.762		0.015	0.030	
L	0.406	1.143		0.016	0.045	
N	18	18		18	18	
CP	–	0.102		–	0.004	

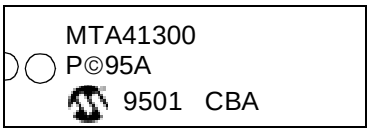
10.0 PACKAGE MARKING INFORMATION

.

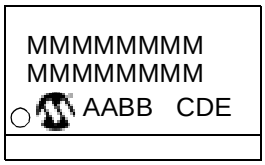
18-Lead PDIP (0.300 mil)



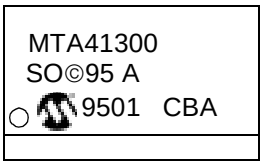
Example



18-Lead SOIC (.300")



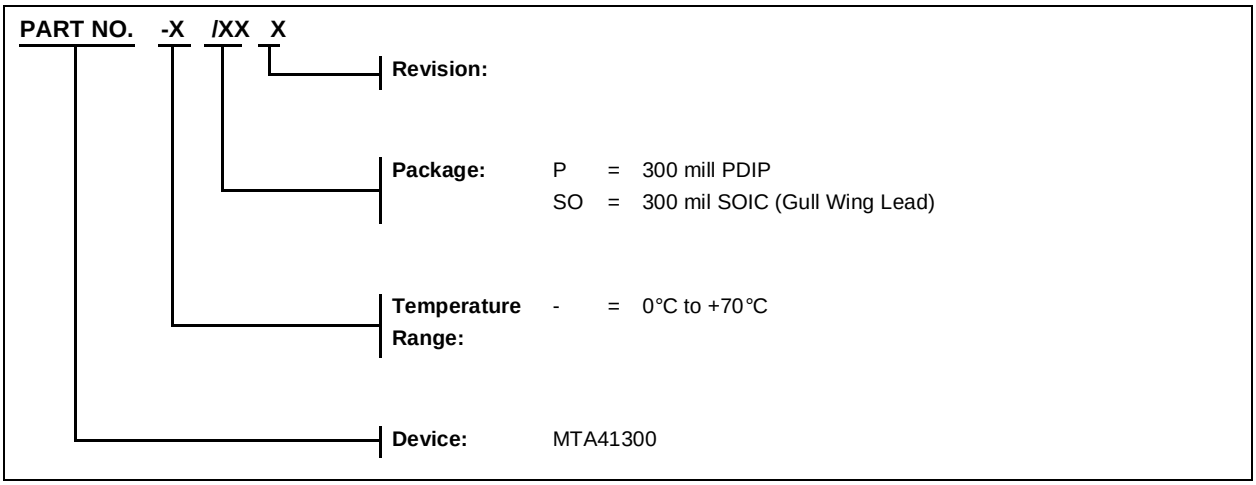
Example



Legend:	MM...M	Microchip part number information
	AA	Year code (last 2 digits of calendar year)
	BB	Week code (week of January 1 is week '01')
	C	Facility code of the plant at which wafer is manufactured. C = Chandler, Arizona, U.S.A.
	D	Mask revision number
	E	Assembly code of the plant or country of origin in which
Note:	In the event the full Microchip part number can not be marked on one line, it will be carried over to the next line.	

MTA41300 Product Identification System

To order or to obtain information (e.g., on pricing or delivery), please use the listed part numbers, and refer to the factory or the listed sales offices.



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