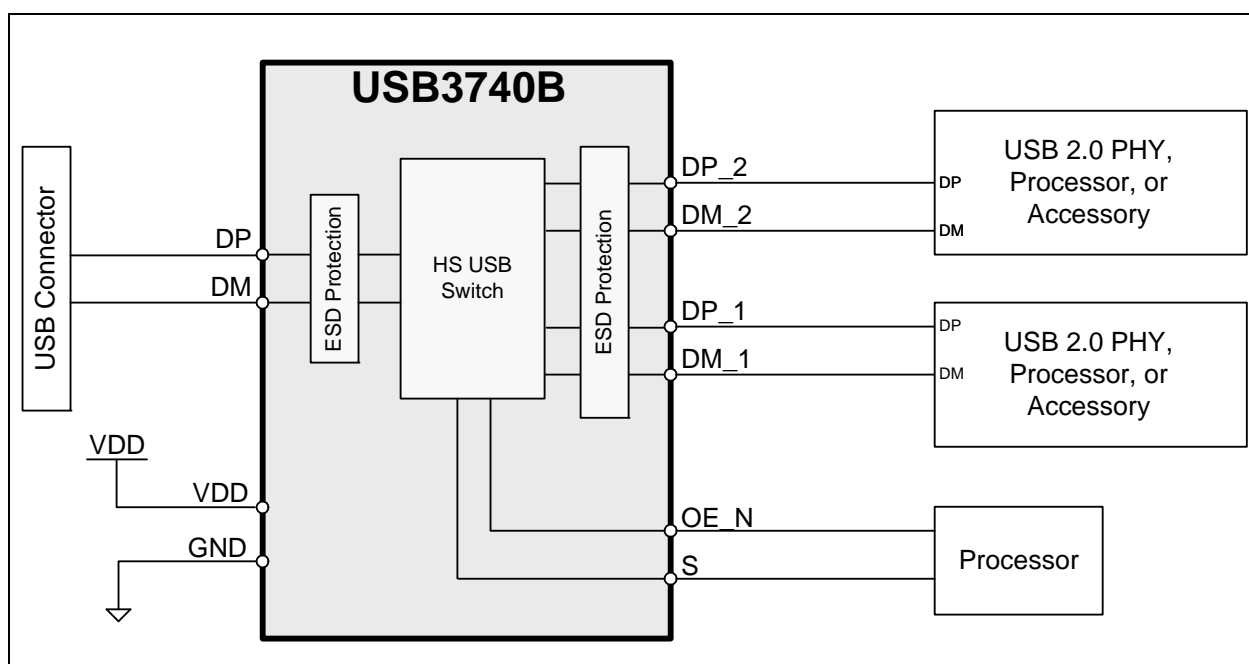


High Speed USB 2.0 Switch with ESD Protection and Low Standby Current

Features

- High Speed USB Mux for multiplexing the USB lanes between different functions
 - Switch the USB connector between two different functions
 - Up to 1GHz Bandwidth
- USB Port ESD Protection (DP/DM)
 - 8kV HBM
- flexPWR™ Technology
 - 30nA Active/Standby Current
 - Extremely low power design ideal for battery powered applications
- Control inputs accommodate 1.8V to 5V inputs
- DP/DM tolerate up to 5.5V
- -40°C to +85°C Operating Temperature
- 10-pin, QFN, RoHS compliant package; (1.3mm x 1.8mm x 0.55mm height, 0.4mm pitch)
- 10-pin, QFN, RoHS compliant package; (1.6mm x 2.1mm x 0.55mm height, 0.5mm pitch)
- Automotive option

Block Diagram



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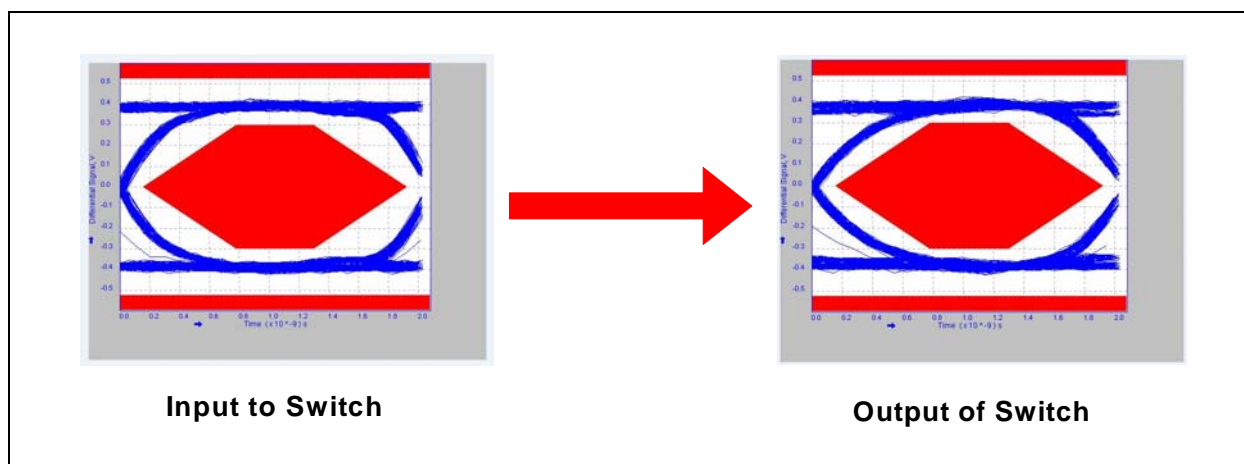
USB3740B

1.0 GENERAL DESCRIPTION

The USB3740B is a USB 2.0 compliant High Speed switch that provides robust ESD protection to the interface in an extremely small package. Outstanding ESD robustness eliminates the need for external ESD protection devices to save eBOM cost and PCB area.

The high bandwidth capabilities of the USB3740B enable extremely low high frequency loss and an exceptionally clean USB 2.0 High Speed eye diagram.

FIGURE 1-1: USB3740B USB 2.0 HIGH SPEED EYE DIAGRAM



1.1 Reference Document

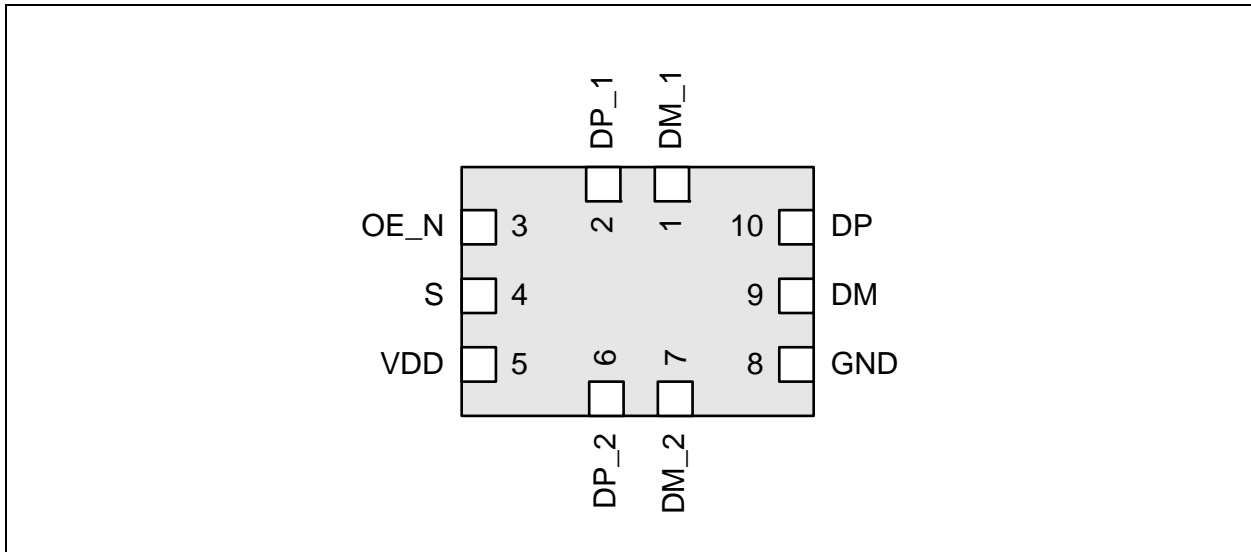
Universal Serial Bus Specification, Revision 2.0

2.0 PIN LAYOUT

2.1 Pin Diagram

The USB3740B is available in both a 0.4mm pitch QFN (1.3mm x 1.8mm x 0.55mm height) and 0.5mm pitch QFN (1.6mm x 2.1mm x 0.55mm height) package. The 0.5mm pitch package can be ordered in standard or automotive configurations. For additional ordering information, refer to the [Product Identification System](#) section.

FIGURE 2-1: USB3740B PACKAGE DIAGRAM



2.2 Ball/Pin Definitions

The following table details the ball/pin definitions for the package diagram above.

Pin	Name	Type/ Direction	Description
10	DP	Analog	USB Mux Output
9	DM	Analog	
2	DP_1	Analog	USB Mux Input 1
1	DM_1	Analog	
6	DP_2	Analog	USB Mux Input 2
7	DM_2	Analog	
8	GND	Analog	Ground
5	VDD	Analog	Power
4	S	Digital Input	Switch control. Refer to Table 4-1 .
3	OE_N	Digital Input	Active low switch Output Enable. Refer to Table 4-1 .

USB3740B

3.0 ELECTRICAL SPECIFICATIONS

3.1 Absolute Maximum Ratings

TABLE 3-1: ABSOLUTE MAXIMUM RATINGS

Description		Rating	Unit
VDD Voltage to GND		-0.3 to 6.0	V
Any other pin to GND		-0.3 to VDD+0.5	V
Operating Temperature Range		-40 to +85	C
Storage Temperature Range		-55 to +150	C
ESD Rating	HBM	8,000	V

Stresses beyond the Absolute Maximum Ratings may damage the USB3740B.

3.2 Electrical Specifications

TABLE 3-2: ELECTRICAL SPECIFICATIONS

Characteristic	Symbol	MIN	TYP	MAX	Units	Conditions
V _{DD} = 5.0V, T _A = -40C to 85C, all typical values at T _A = 25C unless otherwise noted.						
VDD Recommended Operating Conditions						
Input Voltage	V _{DD}	3.0		5.5	V	
Active/Standby	I _{DD}		30	175	nA	
USB Mux Characteristics						
USB Mux On Resistance	R _{ON_USB}	1	2	5	ohm	0V < Vin < 3.3V
		1	2	2.5		0V < Vin < 0.4V
USB Mux Off Leakage	I _{OFF_USB}		100	200	nA	0V < Vin < 3.3V
On Capacitance	C _{ON_USB}		5	7	pF	V _{DD} = 3V
Off Capacitance	C _{OFF_USB}		3	4	pF	V _{DD} = 3V
Off Isolation		-30	-32	-40	dB	R _L = 50 ohm, F = 250MHz
Crosstalk		-30	-45	-60	dB	R _L = 50 ohm, F = 250MHz
Bandwidth (-3dB)	BW	950	1000	1100	MHz	R _L = 50 ohm, C _L = 0pF
		850	950	980		R _L = 50 ohm, C _L = 5pF
		530	560	600		R _L = 50 ohm, C _L = 10pF
Control Signal Characteristics						
Input Logic High Threshold	V _{IN_H}	1.4			V	
Input Logic Low Threshold	V _{IN_L}			0.4	V	

4.0 GENERAL OPERATION

The USB3740B is a high bandwidth switch suitable for many applications, including High Speed USB. The mux allows high speed signals to pass through and still meet HS USB signaling requirements.

The USB3740B will protect the system from ESD stress events on all **DP** and **DM** pins. The USB3740B provides ESD protection to the IEC-61000 ESD specification.

The USB mux is designed to pass High Speed USB signals to the USB connector, and allows for two USB inputs to be multiplexed into one USB output.

The USB Mux is designed to pass USB signals from 0 to **VDD**. It is not designed to pass signals that go above **VDD** or below ground.

The USB3740B switches are controlled by the digital signals OE_N and S, as shown in [Table 4-1](#).

TABLE 4-1: USB3740B SWITCH STATES DEFINITION

OE_N	S	Switch State
1	X	STANDBY: <ul style="list-style-type: none">• Both switch paths disconnected.• Lowest power state
0	0	DP = DP1, DM = DM1:
0	1	DP = DP2, DM = DM2:

5.0 APPLICATION NOTES

5.1 ESD Performance

The USB3740B is protected from ESD strikes. By eliminating the requirement for external ESD protection devices, board space is conserved, and the board manufacturer is enabled to reduce cost. The advanced ESD structures integrated into the USB3740B protect the device whether or not it is powered up.

5.1.1 HUMAN BODY MODEL (HBM) PERFORMANCE

HBM testing verifies the ability to withstand the ESD strikes like those that occur during handling and manufacturing, and is done without power applied to the IC. To pass the test, the device must have no change in operation or performance due to the event. The USB3740B HBM performance is detailed in [Table 3-1](#).

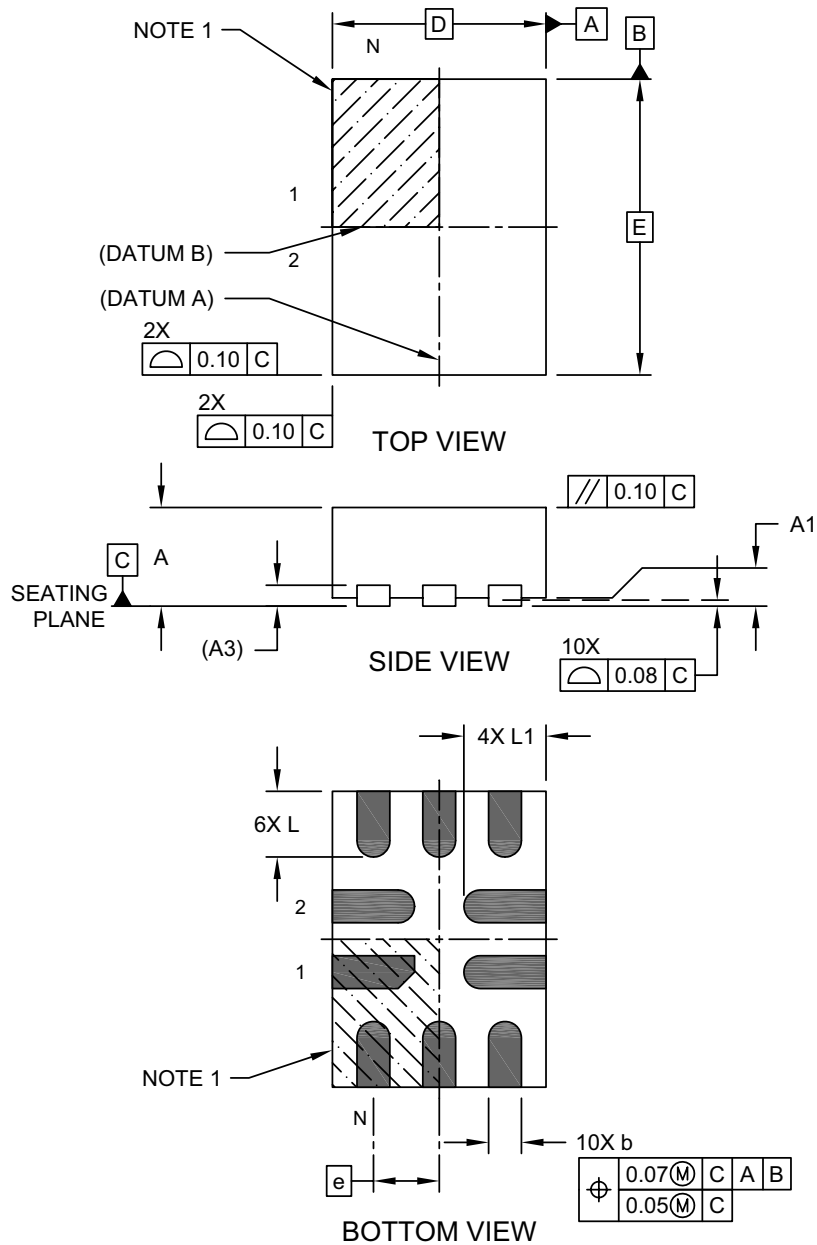
6.0 PACKAGE OUTLINES

6.1 1.3mm x 1.8mm QFN

FIGURE 6-1: 10-PIN, 1.3MM X 1.8MM QFN PACKAGE OUTLINE

10-Lead Ultra Thin Plastic Quad Flat, No Lead Package (2V) - 1.3x1.8x0.6 mm Body [UQFN] Chip-On-Lead

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

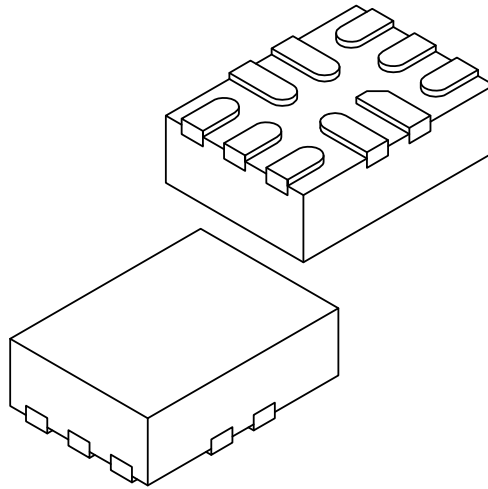


Microchip Technology Drawing C04-386A Sheet 1 of 2

FIGURE 6-2: 10-PIN, 1.3MM X 1.8MM QFN PACKAGE DIMENSIONS

10-Lead Ultra Thin Plastic Quad Flat, No Lead Package (2V) - 1.3x1.8x0.6 mm Body [UQFN] Chip-On-Lead

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	0.50	0.55	0.60
Standoff	A1	0.00	0.02	0.05
Terminal Thickness	A3	0.127 REF		
Overall Length	D	1.30 BSC		
Overall Width	E	1.80 BSC		
Terminal Width	b	0.15	0.20	0.25
Terminal Length	L	0.35	0.40	0.45
Terminal Length	L1	0.45	0.50	0.55

Notes:

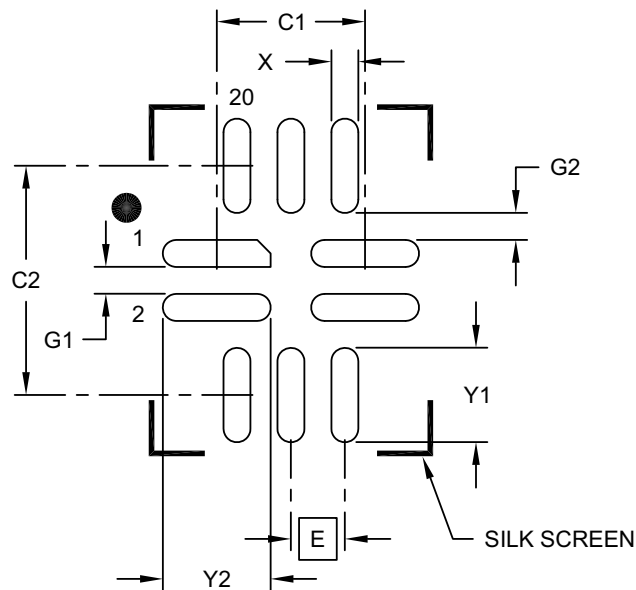
- Pin 1 visual index feature may vary, but must be located within the hatched area.
- Package is saw singulated
- Dimensioning and tolerancing per ASME Y14.5M
 - BSC: Basic Dimension. Theoretically exact value shown without tolerances.
 - REF: Reference Dimension, usually without tolerance, for information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

Microchip Technology Drawing C04-386A Sheet 2 of 2

FIGURE 6-3: 10-PIN, 1.3MM X 1.8MM QFN PACKAGE LAND PATTERN

10-Lead Ultra Thin Plastic Quad Flat, No Lead Package (2V) - 1.3x1.8x0.6 mm Body [UQFN] Chip-On-Lead

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



RECOMMENDED LAND PATTERN

Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Contact Pitch	E	0.40 BSC		
Contact Pad Spacing	C1		1.10	
Contact Pad Spacing	C2		1.70	
Contact Pad Width (X10)	X			0.20
Contact Pad Length (X6)	Y1			0.70
Contact Pad Length (X4)	Y2			0.80
Contact Pad to Pad (X6)	G1	0.20		
Contact Pad to Pad (X4)	G2	0.20		

Notes:

1. Dimensioning and tolerancing per ASME Y14.5M

BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing C04-2386A

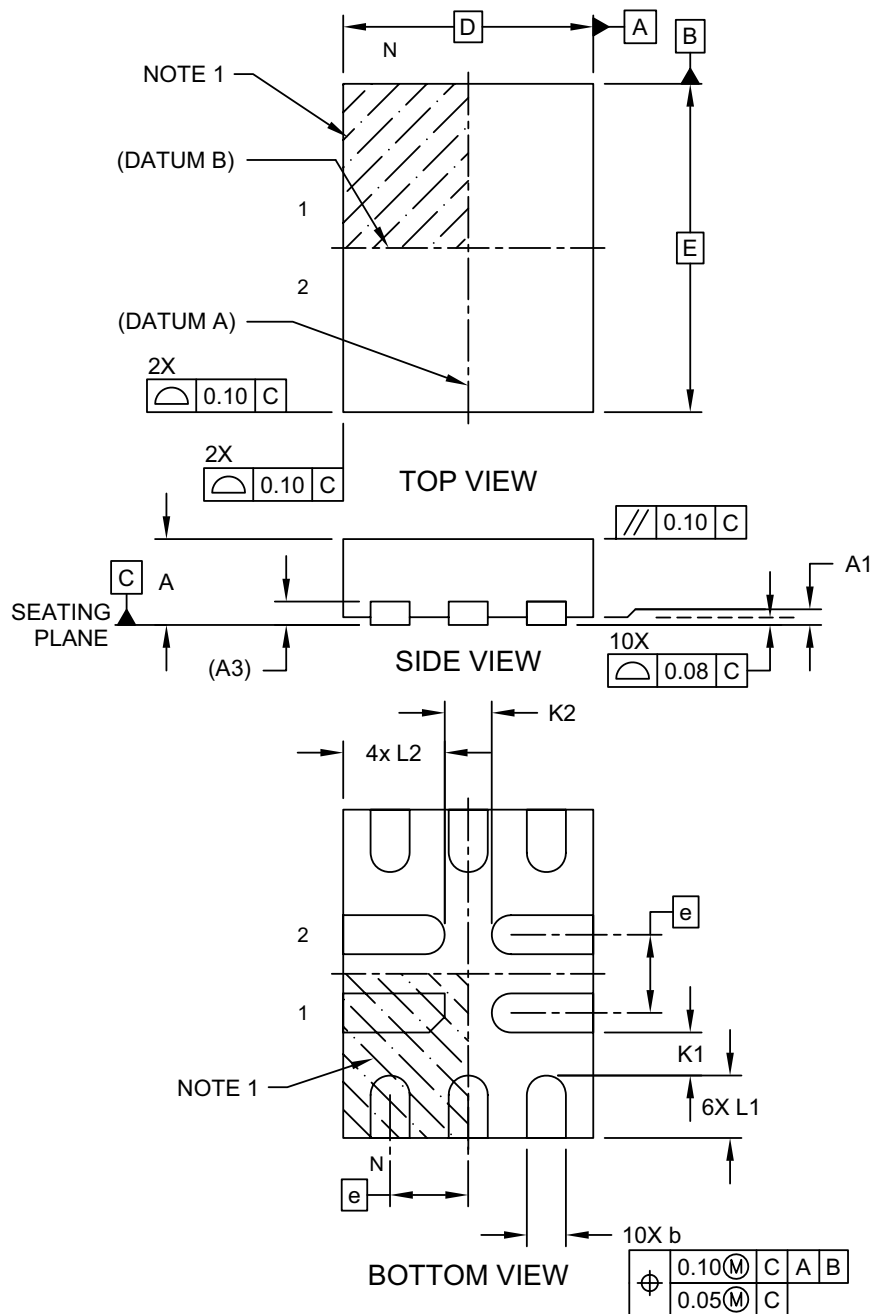
USB3740B

6.2 1.6mm x 2.1mm QFN

FIGURE 6-4: 10-PIN, 1.6MM X 2.1MM QFN PACKAGE OUTLINE

10-Lead Ultra Thin Plastic Quad Flat, No Lead Package (3V) - 1.6x2.1 mm Body [UQFN Chip-On-Lead

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

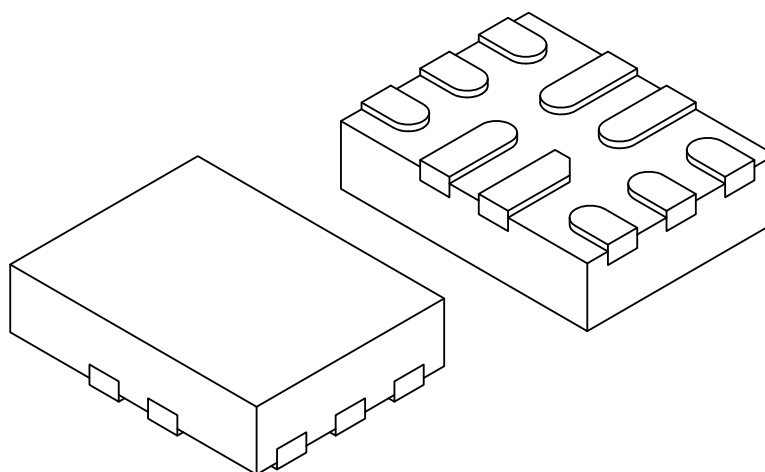


Microchip Technology Drawing C04-381A Sheet 1 of 2

FIGURE 6-5: 10-PIN, 1.6MM X 2.1MM QFN PACKAGE DIMENSIONS

10-Lead Ultra Thin Plastic Quad Flat, No Lead Package (3V) - 1.6x2.1 mm Body [UQFN] Chip-On-Lead

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	0.50 BSC		
Overall Height	A	0.50	0.55	0.60
Standoff	A1	0.00	0.02	0.05
Terminal Thickness	(A3)	0.127 REF		
Overall Width	E	2.10 BSC		
Overall Length	D	1.60 BSC		
Terminal Width	b	0.20	0.25	0.30
Terminal Length	L1	0.35	0.40	0.45
Terminal Length	L2	0.60	0.65	0.70
Terminal Clearance	K1	0.20	-	-
Terminal Clearance	K2	0.20	-	-

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.

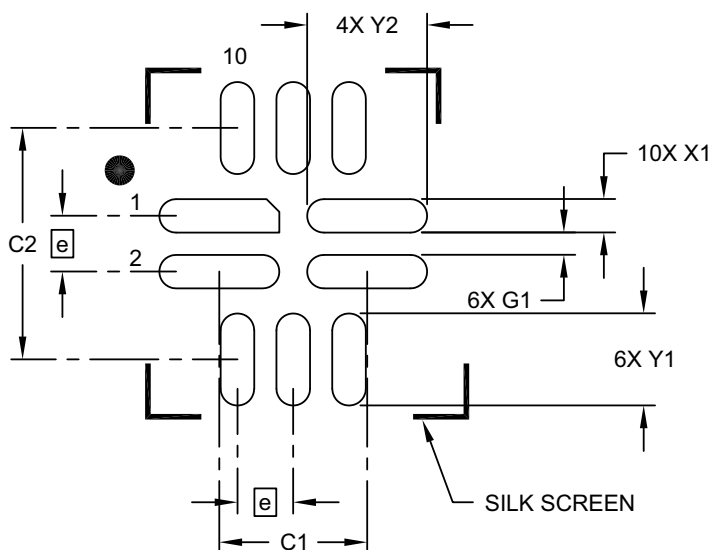
REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-379A Sheet 2 of 2

FIGURE 6-6: 10-PIN, 1.6MM X 2.1MM QFN PACKAGE LAND PATTERN

10-Lead Ultra Thin Plastic Quad Flat, No Lead Package (3V) - 1.6.x2.1 mm Body [UQFN Chip-On-Lead

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



RECOMMENDED LAND PATTERN

Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Contact Pitch	E	0.50 BSC		
Contact Pad Spacing	C1		1.325	
Contact Pad Spacing	C2		2.075	
Contact Pad Width (X10)	X1			0.30
Contact Pad Length (X6)	Y1			0.825
Contact Pad Length (X4)	Y2			1.075
Contact Pad to Center Pad (X6)	G1	0.20		

Notes:

1. Dimensioning and tolerancing per ASME Y14.5M

BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing C04-2381A

APPENDIX A: DATA SHEET REVISION HISTORY

TABLE A-1: REVISION HISTORY

Revision	Section/Figure/Entry	Correction
DS00001725D (03-11-15)	Section 6.0, "Package Outlines," on page 9	Updated 1.6x2.1 UQFN and 1.3x1.8 UQFN package drawings.
DS00001725C (12-11-14)	Cover	Added bullet: "Automotive option (1.6 x 2.1mm, 0.5mm pitch package only)" Added sub-bullet: "8kV HBM"
	FIGURE 6-1: 10-pin, 1.3mm x 1.8mm QFN Package Outline on page 9 and FIGURE 6-4: 10-pin, 1.6mm x 2.1mm QFN Package Outline on page 12	Updated package drawings to latest revision C
	Product Identification System	Added automotive ordering code information. Added tape and reel quantity information.
	Section 2.1, "Pin Diagram," on page 5	Clarified which package is available for the automotive option.
	All: Cover, Order Codes	Made operating temperature references generic "-40°C to +85°C"
DS00001725B (08-21-14)	Document is converted to Microchip template; Product Identification System page replaces Ordering Information.	
DS00001725A replaces the previous SMSC version, Rev. 1.2		Title changed from "High Speed Switch for Mobile and Portable Applications" to "High Speed USB 2.0 Switch with ESD Protection and Low Standby Current"
Rev. 1.2 (07-30-12)	Table 3-1, "Absolute Maximum Ratings," on page 6	Corrected "Any other pin to GND" row's rating to "-0.3 to VDD+0.5V"
Rev. 1.1 (12-15-11)	Section 2.2, "Ball/Pin Definitions"	In Section 2.2 , changed the description of Pin #8 as follows: "Ground"
Rev. 1.0 (08-03-11)	Data Sheet Release	

USB3740B

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Standard Ordering Codes

<u>PART NO.</u>	-	<u>XXX</u>	-	<u>IX1</u> ⁽¹⁾
Device		Package		Tape and Reel Option
<p>Device: USB3740B</p> <p>Package: AI2 = 10-pin QFN (1.3 x 1.8 x 0.55mm, 0.4mm pitch) AI9 = 10-pin QFN (1.6 x 2.1 x 0.55mm, 0.5mm pitch)</p> <p>Tape and Reel Option: Blank = Tray packaging TR = Tape and Reel</p>				
<p>Examples:</p> <p>a) USB3740B-AI2-TR 10-pin QFN RoHS Compliant package (1.3 x 1.8 x 0.55mm, 0.4mm pitch) Tape & Reel</p> <p>b) USB3740B-AI9-TR 10-pin QFN RoHS Compliant package (1.6 x 2.1 x 0.55mm, 0.5mm pitch) Tape & Reel</p> <p>Note 1: Tape and Reel identifier only appears in the catalog part number description. This identifier is used for ordering purposes and is not printed on the device package. Check with your Microchip Sales Office for package availability with the Tape and Reel option. Reel size is 3,000.</p>				

Automotive Ordering Code

<u>PART NO.</u>	<u>X</u> ⁽²⁾	-	<u>X</u>	/	<u>XX</u>	-	<u>XXX</u>
Device	Tape and Reel		Temp.		Package		Automotive Code
<p>Device: USB3740</p> <p>Tape and Reel: T = Tape and Reel</p> <p>Temperature: I = -40°C to +85°C</p> <p>Package: ML = 10-pin QFN (1.6mm x 2.1mm, 0.5mm pitch)</p> <p>Automotive Code: V01 = Automotive</p>							
<p>Example:</p> <p>a) USB3740T-I/ML-V01 Tape & Reel 10-pin QFN RoHS Compliant package (1.6mm x 2.1mm, 0.5mm pitch), Automotive</p> <p>Note 2: Tape and Reel identifier only appears in the catalog part number description. This identifier is used for ordering purposes and is not printed on the device package. Check with your Microchip Sales Office for package availability with the Tape and Reel option. Reel size is 3,000.</p>							

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China - Qingdao
 Tel: 86-532-8502-7355
 Fax: 86-532-8502-7205

China - Shanghai
 Tel: 86-21-5407-5533
 Fax: 86-21-5407-5066

China - Shenyang
 Tel: 86-24-2334-2829
 Fax: 86-24-2334-2393

China - Shenzhen
 Tel: 86-755-8864-2200
 Fax: 86-755-8203-1760

China - Wuhan
 Tel: 86-27-5980-5300
 Fax: 86-27-5980-5118

China - Xian
 Tel: 86-29-8833-7252
 Fax: 86-29-8833-7256

ASIA/PACIFIC

China - Xiamen
 Tel: 86-592-2388138
 Fax: 86-592-2388130

China - Zhuhai
 Tel: 86-756-3210040
 Fax: 86-756-3210049

India - Bangalore
 Tel: 91-80-3090-4444
 Fax: 91-80-3090-4123

India - New Delhi
 Tel: 91-11-4160-8631
 Fax: 91-11-4160-8632

India - Pune
 Tel: 91-20-3019-1500

Japan - Osaka
 Tel: 81-6-6152-7160
 Fax: 81-6-6152-9310

Japan - Tokyo
 Tel: 81-3-6880-3770
 Fax: 81-3-6880-3771

Korea - Daegu
 Tel: 82-53-744-4301
 Fax: 82-53-744-4302

Korea - Seoul
 Tel: 82-2-554-7200
 Fax: 82-2-558-5932 or
 82-2-558-5934

Malaysia - Kuala Lumpur
 Tel: 60-3-6201-9857
 Fax: 60-3-6201-9859

Malaysia - Penang
 Tel: 60-4-227-8870
 Fax: 60-4-227-4068

Philippines - Manila
 Tel: 63-2-634-9065
 Fax: 63-2-634-9069

Singapore
 Tel: 65-6334-8870
 Fax: 65-6334-8850

Taiwan - Hsin Chu
 Tel: 886-3-5778-366
 Fax: 886-3-5770-955

Taiwan - Kaohsiung
 Tel: 886-7-213-7828

Taiwan - Taipei
 Tel: 886-2-2508-8600
 Fax: 886-2-2508-0102

Thailand - Bangkok
 Tel: 66-2-694-1351
 Fax: 66-2-694-1350

EUROPE

Austria - Wels
 Tel: 43-7242-2244-39
 Fax: 43-7242-2244-393

Denmark - Copenhagen
 Tel: 45-4450-2828
 Fax: 45-4485-2829

France - Paris
 Tel: 33-1-69-53-63-20
 Fax: 33-1-69-30-90-79

Germany - Dusseldorf
 Tel: 49-2129-3766400

Germany - Munich
 Tel: 49-89-627-144-0
 Fax: 49-89-627-144-44

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Italy - Milan
 Tel: 39-0331-742611
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Netherlands - Drunen
 Tel: 31-416-690399
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Poland - Warsaw
 Tel: 48-22-3325737

Spain - Madrid
 Tel: 34-91-708-08-90
 Fax: 34-91-708-08-91

Sweden - Stockholm
 Tel: 46-8-5090-4654

UK - Wokingham
 Tel: 44-118-921-5800
 Fax: 44-118-921-5820

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели,
кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



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