



Is Now Part of



**ON Semiconductor®**

To learn more about ON Semiconductor, please visit our website at  
[www.onsemi.com](http://www.onsemi.com)

ON Semiconductor and the ON Semiconductor logo are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.



# FUSB3301

## USB Type-C Controller for Mobile Chargers and Power Adapters

### Features

- Fully Autonomous Type-C Controller
- Supports Type-C Version 1.1
- Fixed Source Mode
- Low Standby Power:  $I_{CC} = 5 \mu A$  (Typical)
- VBUS Switch Control
- Advertises Three Standard Type-C VBUS Current Levels (900 mA, 1.5 A, 3.0 A)
- 2 kV HBM ESD Protection
- 10 Lead MLP Package
- $V_{DD}$  Operating Range, 3.0 V- 5.5 V

### Description

The FUSB3301 is an autonomous Source only Type-C controller optimized for mobile chargers and power adapters. It broadcasts the available current of the charger over CC1/CC2 using the USB Type-C standard and prevents VBUS from being asserted until a valid connection has been verified. It can be used for up to 15 W charging using Type-C protocols. The FUSB3301 has very low standby power consumption and is packaged in a 0.5 mm pitch MLP to accommodate power adapter PCBs.

### Applications

- USB Type-C Power Ports
- Mobile Chargers
- Power Adapters
- AC-DC Adapters

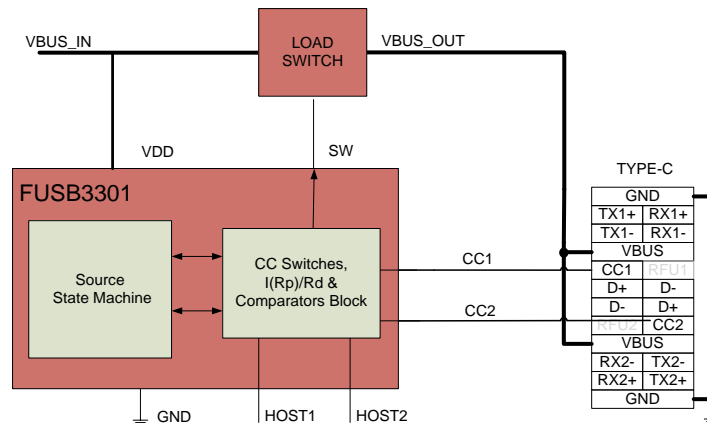


Figure 1. Block Diagram

### Ordering Information

Part Number	Top Mark	Operating Temperature Range	Package	Packing Method
FUSB3301MPX	NZ	-40 to 85°C	10-Lead, MLP, 3 mm x 3 mm	Tape and Reel

## Typical Application

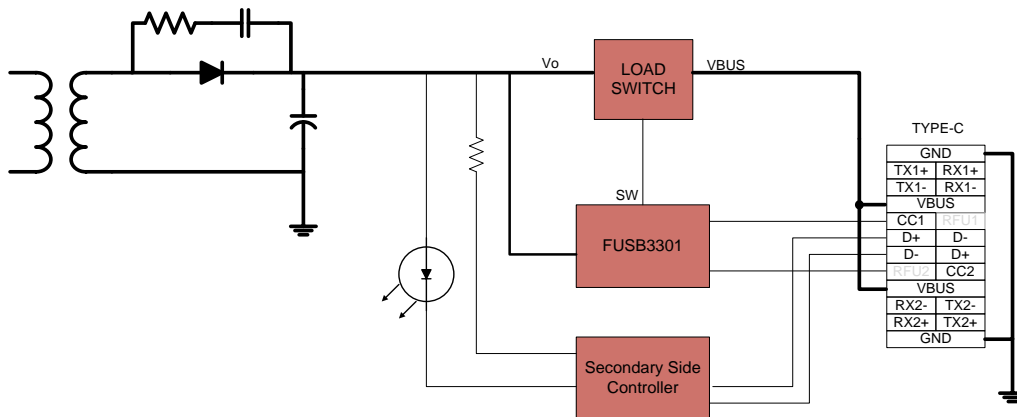


Figure 2. Typical Application

## Pin Configuration

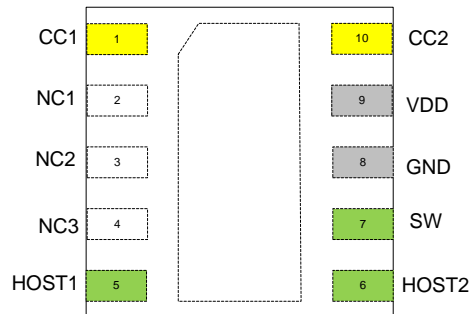


Figure 3. Pin Assignment (Top Through View)

## Pin Descriptions

Pin #	Name	Type	Description
1	CC1	Input/Output	Type-C Configuration Channel
2	NC1 <sup>(1)</sup>	NC	No Connect
3	NC2 <sup>(1)</sup>	NC	No Connect
4	NC3 <sup>(1)</sup>	NC	No Connect
5	HOST1	Input	Host Current Select Pin with Internal Pull-up
6	HOST2	Input	Host Current Select Pin with Internal Pull-up
7	SW	Output	Open Drain output to control the VBUS load switch
8	GND	Power	Ground
9	VDD	Power	Power Supply
10	CC2	Input/Output	Type-C Configuration Channel

### Note:

- No connect pins can float or can be tied to ground.

**Table 1. Connection State Table**

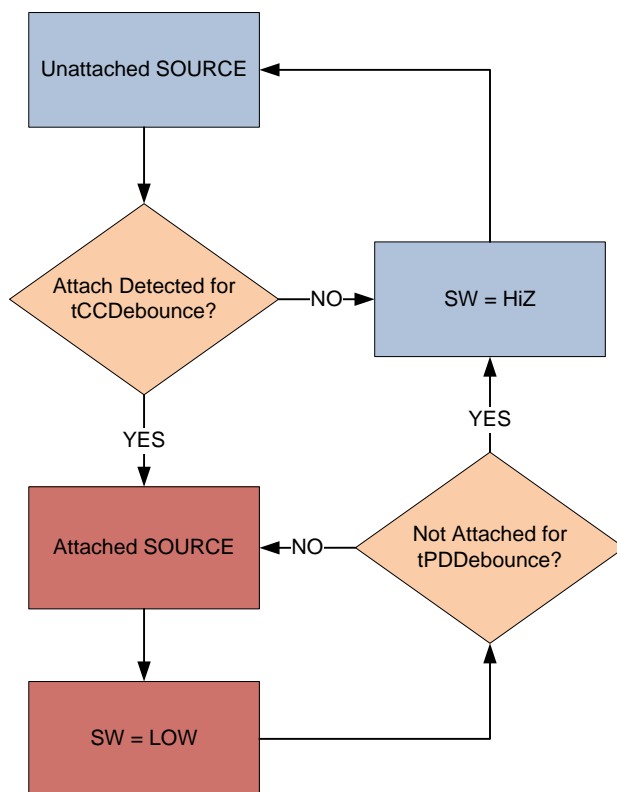
CC1	CC2	SW	Description
NC	NC	HiZ	No Attach
Rd	NC	L	Attach to UFP (Sink)
NC	Rd	L	Attach to UFP (Sink)
Rd	Rd	HiZ	No Attach
Ra	NC	HiZ	No Attach
NC	Ra	HiZ	No Attach
Ra	Ra	HiZ	No Attach

**Host Current**

**Table 2. HOST Input Truth Table**

HOST2	HOST1	CC Current ( $\mu$ A)	Host Current (A)
GND / LOW	GND / LOW	330	3.0
GND / LOW	FLOAT / HIGH	180	1.5
FLOAT / HIGH	GND / LOW	180	1.5
FLOAT / HIGH	FLOAT / HIGH	80	0.9

**Source Attach Flowchart**



**Figure 4. Source Attach Flowchart**

## Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter		Min.	Max.	Unit
V <sub>DD</sub>	Supply Voltage		-0.5	6.0	V
V <sub>CCX</sub>	CC pins when configured as HOST		-0.5	6.0	V
T <sub>STORAGE</sub>	Storage Temperature Range		-65	+150	C
T <sub>J</sub>	Maximum Junction Temperature			+150	C
T <sub>L</sub>	Lead Temperature (Soldering, 10 seconds)			+260	C
ESD	IEC 61000-4-2 System ESD	Connector Pins (VBUS, CC1 & CC2)	Air Gap	15	kV
			Contact	8	
	Human Body Model, JEDEC JESD22-A114	Connector Pins (VBUS, CC1 and CC2)		4	kV
		Others		2	
Charged Device Model, JEDEC JESD22-C101	All Pins		1	kV	

## Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance. Fairchild does not recommend exceeding them or designing to Absolute Maximum Ratings.

Symbol	Parameter	Min.	Typ.	Max.	Unit
V <sub>DD</sub>	Supply Voltage	3.0	5.0	5.5	V
T <sub>A</sub>	Operating Ambient Temperature	-40		+85	C
T <sub>J</sub>	Operating Junction Temperature	-40		+125	C

## DC and Transient Characteristics

All typical values are at T<sub>A</sub>=25°C unless otherwise specified.

Symbol	Parameter	T <sub>A</sub> = -40 to +85°C T <sub>J</sub> = -40 to +125°C			Unit
		Min.	Typ.	Max.	
I <sub>80_CCX</sub>	Source 80 μA CC Current (Default) HOST2=VDD, HOST1=VDD	64	80	96	μA
I <sub>180_CCX</sub>	Source 180 μA CC Current (1.5 A) HOST2=VDD, HOST1=GND or HOST2=GND, HOST1=VDD	166	180	194	μA
I <sub>330_CCX</sub>	Source 330 μA CC Current (3 A) HOST2=GND, HOST1=GND	304	330	356	μA
z <sub>OPEN</sub>	CC Resistance for Disabled State	126			kΩ
v <sub>Ra-SRCdef</sub>	Ra Detection Threshold for CC Pin for Source for Default Current on VBUS	0.15	0.20	0.25	V
v <sub>Ra-SRC1.5A</sub>	Ra Detection Threshold for CC pin for Source for 1.5 A Current on VBUS	0.35	0.40	0.45	V
v <sub>Ra-SRC3A</sub>	Ra Detection Threshold for CC Pin for Source for 3 A Current on VBUS	0.75	0.80	0.85	V
v <sub>Rd-SRCdef</sub>	Rd Detection Threshold for Source for Default Current (HOST2/1=VDD/VDD)	1.50	1.60	1.65	V
v <sub>Rd-SRC1.5A</sub>	Rd detection threshold for Source for 1.5 A Current (HOST2/1=GND/VDD or VDD/GND)	1.50	1.60	1.65	V
v <sub>Rd-SRC3A</sub>	Rd Detection Threshold for Source for 3 A Current (HOST2/1=GND/GND)	2.45	2.60	2.75	V

### Current Consumption

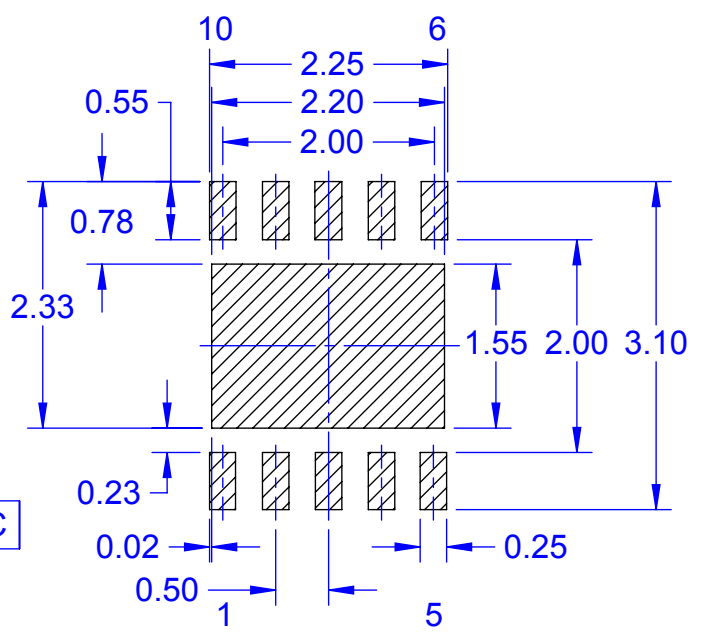
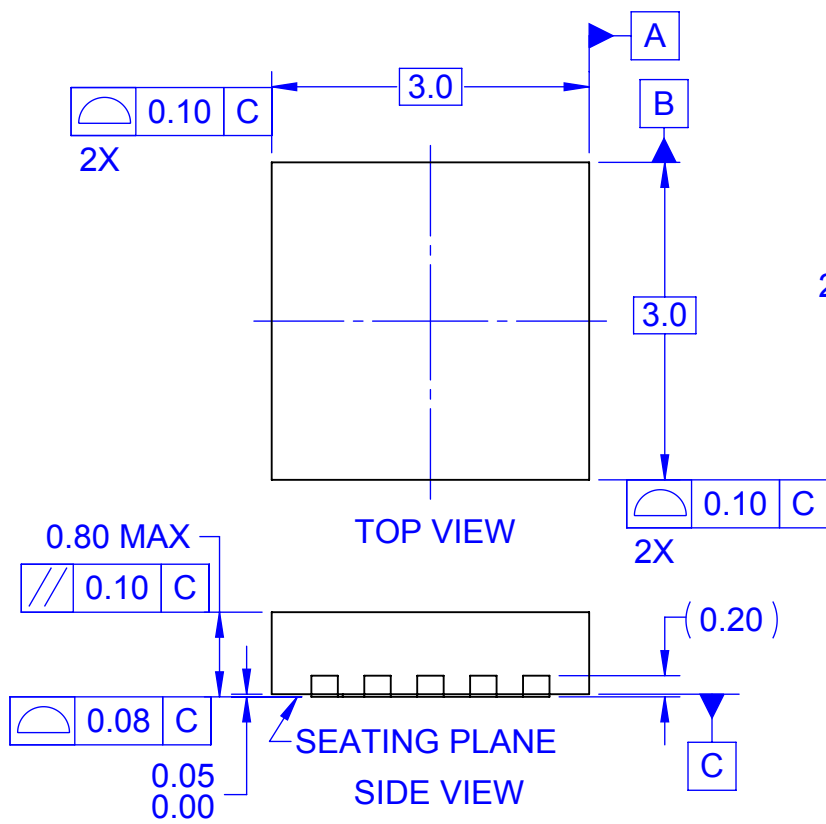
Symbol	Parameter	Conditions	V <sub>DD</sub> (V)	T <sub>A</sub> = -40 to +85°C T <sub>J</sub> = -40 to +125°C			Unit
				Min.	Typ.	Max.	
I <sub>stby</sub>	Unattached Source	Nothing attached, Host Pins = VDD, GND, Float.	3.0 to 5.5		5	20	μA
I <sub>attach</sub>	Attach Current (Less Host Current)	Attached, Host Pins=VDD, GND, Float.	3.0 to 5.5		10	15	μA

### Timing Parameters

Symbol	Parameter	T <sub>A</sub> = -40 to +85°C T <sub>J</sub> = -40 to +125°C			Unit
		Min.	Typ.	Max.	
t <sub>CCDebounce</sub>	Time from CC Voltage Detection until SW goes LOW	100	150	200	ms
t <sub>PDDebounce</sub>	Time from CC Voltage Not Detected until SW goes to High-Z	10	15	20	ms

### IO Specifications

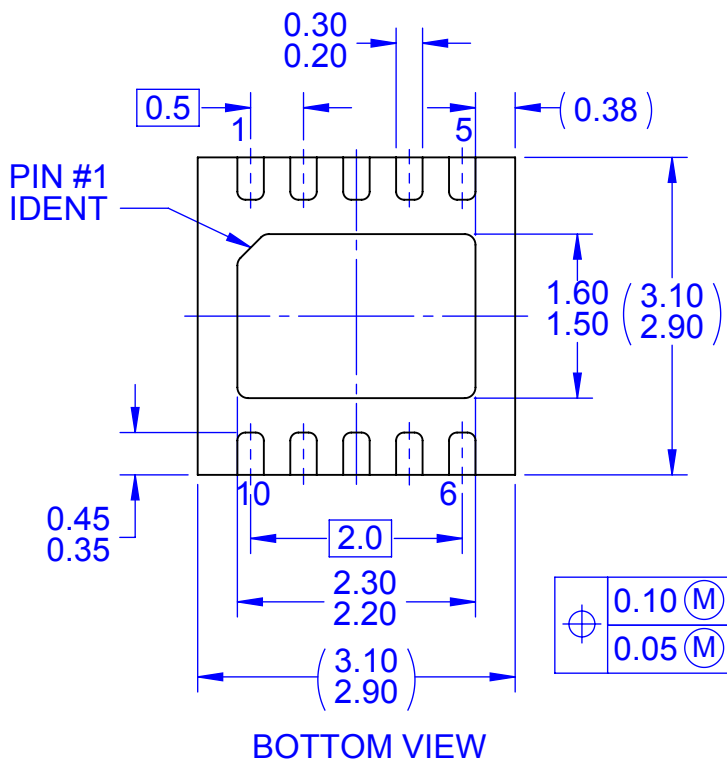
Symbol	Parameter	Conditions	V <sub>DD</sub> (V)	T <sub>A</sub> = -40 to +85°C T <sub>J</sub> = -40 to +125°C			Unit
				Min.	Typ.	Max.	
V <sub>OLSW</sub>	SW Output Low Voltage	I <sub>OL</sub> =4 mA	3.0 to 5.5			0.4	V
V <sub>ILHOST</sub>	HOST1/2 Low-Level Input Voltage		3.0 to 5.5			0.3V <sub>DD</sub>	V
V <sub>IHOST</sub>	HOST1/2 High-Level Input Voltage		3.0 to 5.5	0.7V <sub>DD</sub>			V



**D**  
LAND PATTERN RECOMMENDATION

**NOTES:**

- A. CONFORMS TO JEDEC REGISTRATION MO-229, VARIATION WEED-5
- B. DIMENSIONS ARE IN MILLIMETERS
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009
- D. LAND PATTERN DIMENSIONS ARE NOMINAL REFERENCE VALUES ONLY
- E. DRAWING FILENAME: MKT-MLP10Brev2



⊕	0.10 (M)	C	A	B
	0.05 (M)	C		





**TRADEMARKS**

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

- |                          |  |                                       |                  |
|--------------------------|--|---------------------------------------|------------------|
| AccuPower™               | F-PFS™   | OPTOPLANAR®                           | SYSTEM GENERAL®  |
| AttitudeEngine™          | FRFET®   | Power Supply WebDesigner™             | TinyBoost®       |
| Awinda®                  | Global Power Resource <sup>SM</sup>            | PowerTrench®                          | TinyBuck®        |
| AX-CAP®*                 | GreenBridge™                                   | PowerXS™                              | TinyCalc™        |
| BitSiC™                  | Green FPS™                                     | Programmable Active Droop™            | TinyLogic®       |
| Build it Now™            | Green FPS™ e-Series™                           | QFET®                                 | TINYOPTO™        |
| CorePLUS™                | Gmax™  | QS™                                   | TinyPower™       |
| CorePOWER™               | GTO™   | Quiet Series™                         | TinyPWM™         |
| CROSSVOLT™               | IntelliMAX™                                    | RapidConfigure™                       | TinyWire™        |
| CTL™                     | ISOPLANAR™                                     | Saving our world, 1mW/W/kW at a time™ | TranSiC™         |
| Current Transfer Logic™  | Making Small Speakers Sound Louder and Better™ | SignalWise™                           | TriFault Detect™ |
| DEUXPEED®                | MegaBuck™                                      | SmartMax™                             | TRUECURRENT®*    |
| Dual Cool™               | MICROCOUPLER™                                  | SMART START™                          | μSerDes™         |
| EcoSPARK®                | MicroFET™                                      | Solutions for Your Success™           | UHC®             |
| EfficientMax™            | MicroPak™                                      | SPM®                                  | Ultra FRFET™     |
| ESBC™                    | MicroPak2™                                     | STEALTH™                              | UniFET™          |
| F <sup>®</sup>           | MillerDrive™                                   | SuperFET®                             | VCX™             |
| Fairchild®               | MotionMax™                                     | SuperSOT™-3                           | VisualMax™       |
| Fairchild Semiconductor® | MotionGrid®                                    | SuperSOT™-6                           | VoltagePlus™     |
| FACT Quiet Series™       | MTi®   | SuperSOT™-8                           | XST™             |
| FACT®                    | MTx®   | SupreMOS®                             | Xsens™           |
| FastvCore™               | MVN®   | SyncFET™                              | 仙童®              |
| FETBench™                | mWSaver®                                       | Sync-Lock™                            |                  |
| FPS™                     | OptoHiT™                                       |                                       |                  |
|                          | OPTOLOGIC®                                     |                                       |                  |

\* Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

**DISCLAIMER**

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. TO OBTAIN THE LATEST, MOST UP-TO-DATE DATASHEET AND PRODUCT INFORMATION, VISIT OUR WEBSITE AT [HTTP://WWW.FAIRCHILDSEMI.COM](http://www.fairchildsemi.com). FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

**AUTHORIZED USE**

Unless otherwise specified in this data sheet, this product is a standard commercial product and is not intended for use in applications that require extraordinary levels of quality and reliability. This product may not be used in the following applications, unless specifically approved in writing by a Fairchild officer: (1) automotive or other transportation, (2) military/aerospace, (3) any safety critical application – including life critical medical equipment – where the failure of the Fairchild product reasonably would be expected to result in personal injury, death or property damage. Customer's use of this product is subject to agreement of this Authorized Use policy. In the event of an unauthorized use of Fairchild's product, Fairchild accepts no liability in the event of product failure. In other respects, this product shall be subject to Fairchild's Worldwide Terms and Conditions of Sale, unless a separate agreement has been signed by both Parties.

**ANTI-COUNTERFEITING POLICY**

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, [www.fairchildsemi.com](http://www.fairchildsemi.com), under Terms of Use

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed applications, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address any warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

**PRODUCT STATUS DEFINITIONS**

**Definition of Terms**

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

Rev. I77



# Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[Fairchild Semiconductor:](#)

[FUSB3301MPX](#)