

ETRX358USB Reference Manual

Zigbee® & Thread Compatible Radio for IoT Applications in a USB Stick Form Factor

The ETRX358USB is a USB device peripheral designed to enable USB host devices to connect to the Internet of Things over 802.15.4 Networks. The in-field upgradeable firmware allows interaction with either ZigBee or Thread wireless mesh networks.

Featuring the Telegesis™ ETRX3588 wireless mesh networking module (based on the EM3588 System-on-Chip (SOC) from Silicon LabsInc.), the ETRX358USB takes advantage of a powerful 32-bit ARM® processor with 512 kB of flash memory and 64 kB of RAM. A link budget of up to 110 dB is ideal for typical ZigBee and Thread applications.

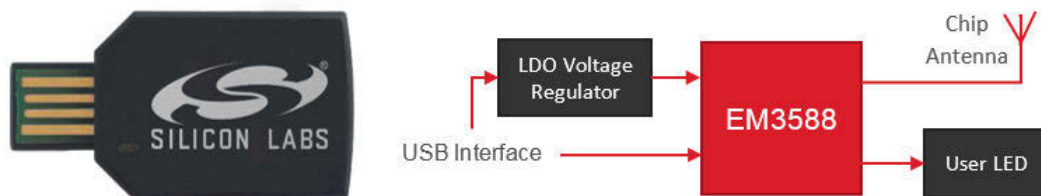
The devices make use of the standard USB communication device class (CDC) allowing the best possible native driver support across a wide range of operating systems.

Typical Applications

- Home Automation
- Smart Metering
- Industrial Automation (Industry 4.0)
- Commercial Building Automation

KEY FEATURES

- Complete IoT Capable Device
 - 32-bit ARM Cortex M3 Processor
 - 24 MHz CPU operation
 - 2.4 GHz IEEE 802.15.4-2003 transceiver & lower MAC
 - 512 kB Flash with read protection
 - 64 kB RAM memory
 - AES128 encryption accelerator
 - General purpose timers
 - USB 2.0 Full Speed communication
- Excellent RF Performance
 - Normal Mode Link budget up to 110 dB
 - -100 dBm nominal receiver sensitivity
 - -102 dBm max receiver sensitivity (1% PER, 20 Byte packet)
 - +8 dBm max transmit power
 - Robust Wi-Fi & Bluetooth co-existence
 - Integrated high performance chip antenna
- Flexible Form Factor
 - Discrete small form factor and design
 - Monolithic PCB style integrated USB connector
 - Integrated bright activity white LED configurable for application



1. Electrical Specifications

Table 1.1. Absolute Maximum Ratings¹

Parameter	Min	Max
USB Supply Voltage (V_{USB})	-0.3 V	6.5 V
USB Data Line Voltage	-0.3 V	3.6 V
Storage Temperature Range	-40 °C	85 °C
ESD on any pin (Human Body Model)	—	2 kV

Note:

1. The absolute maximum ratings given above should under no circumstances be violated. Exceeding one or more of the limiting values may cause permanent damage to the device.

Table 1.2. Recommended Operating Conditions

Parameter	Min	Typ	Max
USB Supply Voltage (V_{USB})	—	5 V	—
USB Data Voltage	0 V	—	3.3 V
Operating Ambient Temperature	-40 °C	—	85 °C

Table 1.3. Electrical Characteristics¹

Parameter ²	Min	Typ	Max
Operating Current (Quiescent)	—	—	14.6 mA
Operating Current (Quiescent + LED)	—	—	15.9 mA
Operating Current (RX On)	—	—	30.1 mA
Operating Current (TX One Packet per 25mS)	—	—	33.8 mA
Radio Frequency Range	2400 MHz	—	2500 MHz
Receiver Sensitivity	—	-100 dBm	-102 dBm ³
Packet Error Rate	—	—	1%
Output Transmit Power	0 dBm	3 dBm	8 dBm ³
Carrier Frequency Error	-40 ppm	—	40 ppm

Note:

1. For advanced radio characteristics, refer to the Silicon Labs EM358x Product data sheet.
2. For electrical characteristics, $V_{USB} = 5$ V and $T_{AMB} = 25$ °C.
3. "Boost mode" selectable in software.

2. Mechanical Properties

Device Width:	25 mm
Device Length:	46 mm
Device Depth:	8 mm
Weight:	7 g (Without packaging)
USB Connector Length:	12 mm (According to USB Specification)
Case Material:	Polycarbonate (Black)
Light Guide Material:	Polycarbonate (Clear)

3. Transmit Power Characteristics

The diagrams below show the typical output power and current in dependency on power setting. Power settings above 3 dBm have Boost Mode enabled. Note that the output power is independent of the supply voltage as the radio is supplied by an internally regulated voltage.

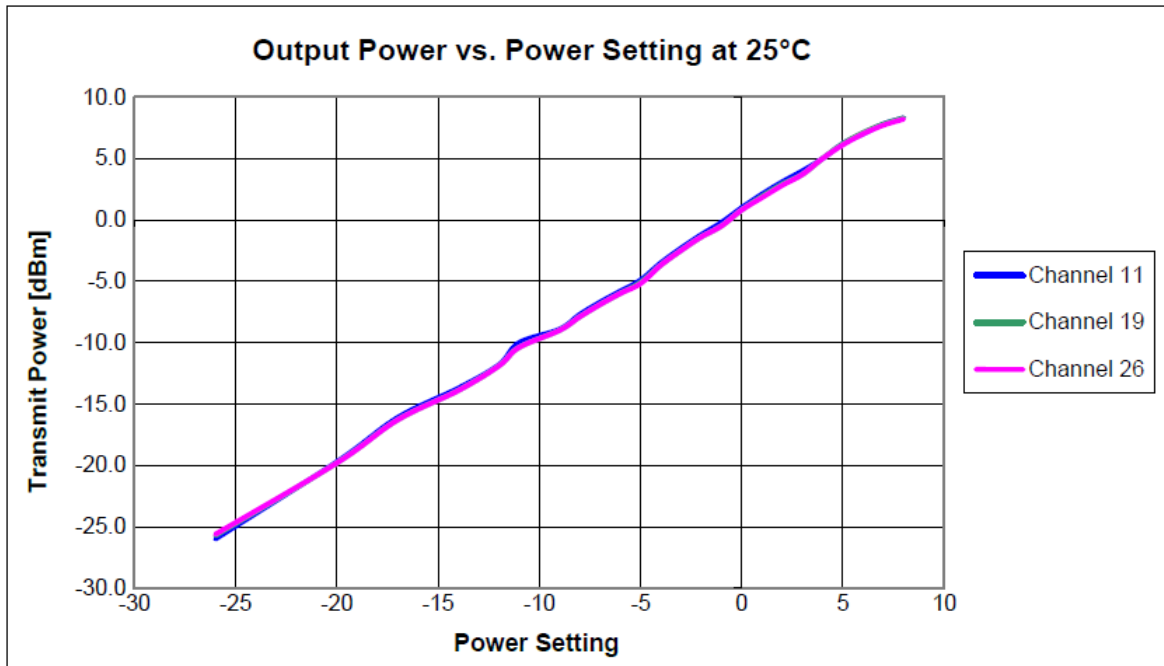


Figure 3.1. Output Power vs. Power Setting

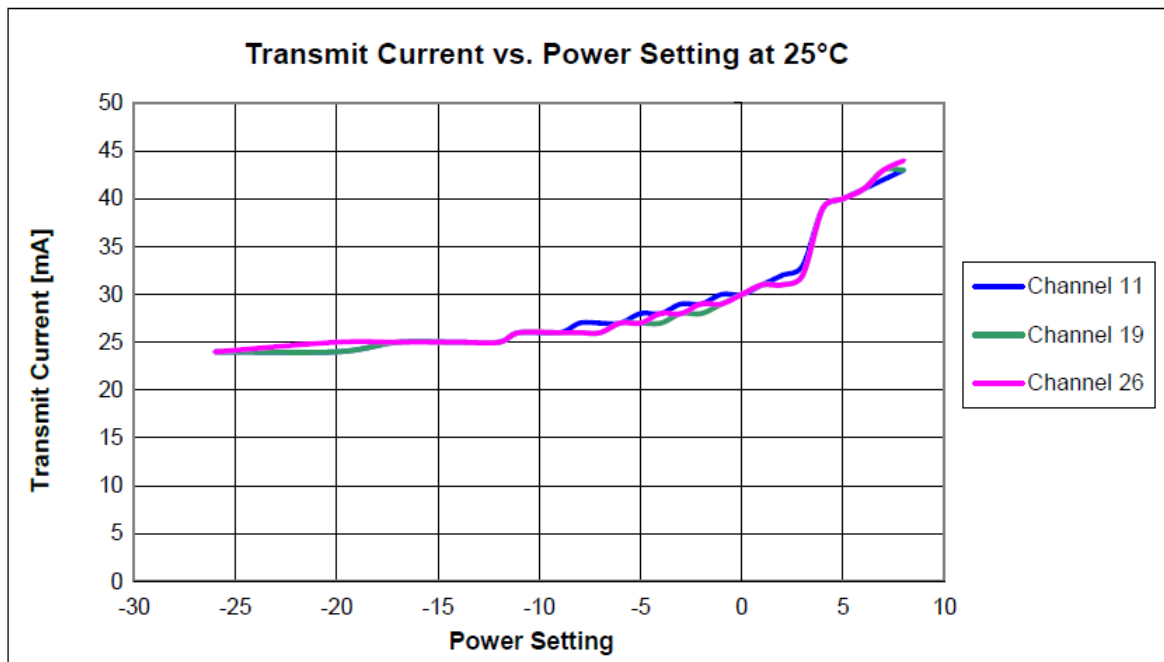


Figure 3.2. Transmit Power vs. Power Setting

4. OS & Driver Support

The USB stick uses the Silicon Labs CDC Driver to allow for virtual COM port communication over USB. These drivers are required for proper device enumeration and are available for Windows (Vista/7/8/10) and Linux from the Silicon Labs [product page](#).

Information regarding ZigBee & Thread Mesh networking firmware can be found [here](#).

5. Bootloading Firmware

Bootloading allows the user to change or upgrade the device firmware via USB serial using the `XMODEM` protocol.

If no application is present on the device, the device will automatically start into bootloader mode. If the device already contains an AT-Command style application firmware, the bootloader may be accessed using the `AT+BLOAD` command.

Once the device is powered, connect to the device using suitable terminal software such as HyperTerminal, PuTTY or Telegesis Terminal.

- Baud rate: 19,200 baud
- Parity: No
- Flow Control: No
- Data bits: 8

Sending a Carriage Return character (ASCII: `0x0D`) will display the bootloader command prompt. The white LED will also be lit.

```
ETRX3588 Serial Bootloader v0000.06.03
EUI:000D6F000C0A91D7
1. upload ebl
2. run
3. eblinfo
BL>
```

Press '1' to begin uploading a valid .ebl binary file. An XMODEM (128 Byte) protocol is required to upload the file. Once the upload is complete, press '2' to run the application.

Note: *If the application does not upload correctly, or the application does not support bootloading, the bootloader will no longer be accessible.*

6. Product Labeling

The ETRX358USB device exhibits a small label with two barcodes displaying serial number and product revision.



Figure 6.1. Label Dimensions



Figure 6.2. Product Labeling

7. Packaging Information



Figure 7.1. QR Code Label



Figure 7.2. Individual Packaging

Note: A further label on the individual product package displays the same information and QR code link to online resources.

8. Regulatory Information

8.1 United States of America (FCC)

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

Note that this equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

1. Reorient or relocate the receiving antenna.
2. Increase the separation between the equipment and receiver.
3. Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
4. Consult the dealer or an experienced radio/TV technician for help.

Modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment under FCC rules. An FCC declaration of conformity is available separately from Silicon Labs.

The ETRX358USB contains a modular radio transmitter with the FCC ID S4GEM358X. For FCC compliant use, the device should be configured as shown in the table below.

Table 8.1. FCC TX Power Limits

Channels	11 - 18	19 - 24	25	26
Maximum Output Transmit Power	8 dBm	8 dBm	7 dBm	-8 dBm

8.2 Canada (Industry Canada)

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

The ETRX358USB has been designed to comply with safety requirements for exposure to radio waves. SAR testing has been performed in accordance with RSS-102, with the ETRX358USB transmitting at its highest certified power level in all used frequency bands. The highest SAR value for the ETRX358USB when tested was Body: 0.09 W/kg against a limit of 1.6 W/kg.

Cet appareil est conforme au(x) standard(s) RSS exempt(s) de licence d'Industrie Canada. Son fonctionnement est sujet aux deux conditions suivantes:

1. Cet appareil ne doit pas occasionner d'interférence.
2. Cet appareil doit supporter toutes les interférences, y compris celles qui pourraient provoquer un mauvais fonctionnement de cet appareil.

Le ETRX358USB a été conçu pour se conformer aux exigences de sécurité en matière d'exposition aux ondes radio. Des tests SAR ont été effectués conformément à la RSS-102 avec le ETRX358USB transmettant à son plus haut niveau de puissance certifié dans toutes les bandes de fréquences utilisées. La valeur SAR la plus élevée pour la ETRX358USB lors des tests était de Corps: 0.09 W/kg contre une limite de 1.6 W/Kg.

The ETRX358USB contains a modular radio transmitter with the IC ID 8735A-EM358X. For IC compliant use, the device should be configured as shown in the table below.

Table 8.2. IC TX Power Limits

Channels	11 - 18	19 - 24	25	26
Maximum Output Transmit Power	8 dBm	8 dBm	7 dBm	-8 dBm

8.3 European Compliance

The ETRX358USB fulfill the requirements of the R&TTE directive 1999/5/EG and the ROHS2 directive 2011/65/EU. The devices conform to the following harmonized standard(s):

- **EN300 328 V1.9.1** – Electromagnetic Compatibility and Radio spectrum Matters (ERM); Wideband transmission systems; Data Transmission equipment operating in the 2.4GHz ISM band and using wide band modulation techniques
- **EN301 489-17 V2.2.1** – Electromagnetic compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services
- **IEC 60950-1:2005 (Second Edition); Am1:2009 + Am2:2013** – Safety



For European use, the device should be configured as shown in the table below.

Table 8.3. European TX Power Limits

Channels	11 - 18	19 - 24	25	26
Maximum Output Transmit Power	8 dBm	8 dBm	8 dBm	8 dBm

8.4 Taiwan Statement

根據交通部 低功率管理辦法 規定：

第十四條

經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

第十七條

低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。

前項合法通信，指依電信規定作業之無線電信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。



CCAK16LP0700T0

8.5 Israel Statement

מספר אישור אלחוטי של משרד התקשורת הוא 51-557227
אסור להחליף את האנטנה המקורית של המכשיר ולא
לעשות בו כל שינוי טכני אחר

8.6 Thailand Statement

“เครื่องโทรคมนาคมและอุปกรณ์นี้ มีความสอดคล้องตามข้อกำหนดของ กทช.”

(This telecommunication equipment is in compliance with NTC requirements)

8.7 Other

Australia &
New Zealand

Brazil



“Este equipamento opera em caráter secundário, isto é, não tem direito à proteção contra interferência prejudicial, mesmo de estações do mesmo tipo, e não pode causar interferência a sistemas operando em caráter primário.”

China

CMIIT ID: 2016DJ2630

Hong Kong



HK0011601427

Indonesia

46404-SDPPI-2016

[PLG ID: 5551]

Japan



007-AE0116

Korea



MSIP-CRM-BGT-ETRX358USB

Malaysia



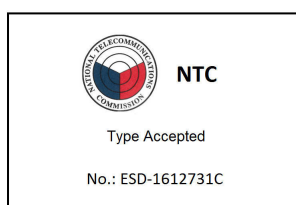
Mexico

Ifetel: RCPSIET16-0589

Morocco

MR 11583 ANRT 2016

Philippines



Russia



Singapore

Complies with IMDA standards

[Dealer's Licence No.: N1130-16]

South Africa



TA-2016/405

Taiwan



CCAK16LP0700T0

EAU



Vietnam





شهادة تسجيل

Registration Certificate

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Based on the Federal Law by Decree No. 3 of 2003 - Regarding Organization of the Telecommunication Sector and its Executive Order and their amendments The Telecommunication Regulatory Authority (TRA) registers.

Silicon Laboratories Inc

Silicon Laboratories Inc

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According to the terms, conditions, policies and regulation of the TRA for the period -

Date of Issue : **07-Apr-2016** تاريخ الإصدار : Date of Expiry : **06-Apr-2021** تاريخ انتهاء الصلاحية :



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Sheikh Zayed Street P.O.Box: 26662

9. Document Change List

9.1 Revision 0.1

- Initial release.

9.2 Revision 0.2

- Updated current consumption values.
- Added regulatory information.
- Updated packaging information.
- Added standards.

9.3 Revision 0.3

- Added UAE statement.

9.4 Revision 0.4

- Updated type approval codes.
- Updated IC statement.

9.5 Revision 0.5

- Updated type approval codes.

9.6 Revision 0.6

- Updated type approval codes.

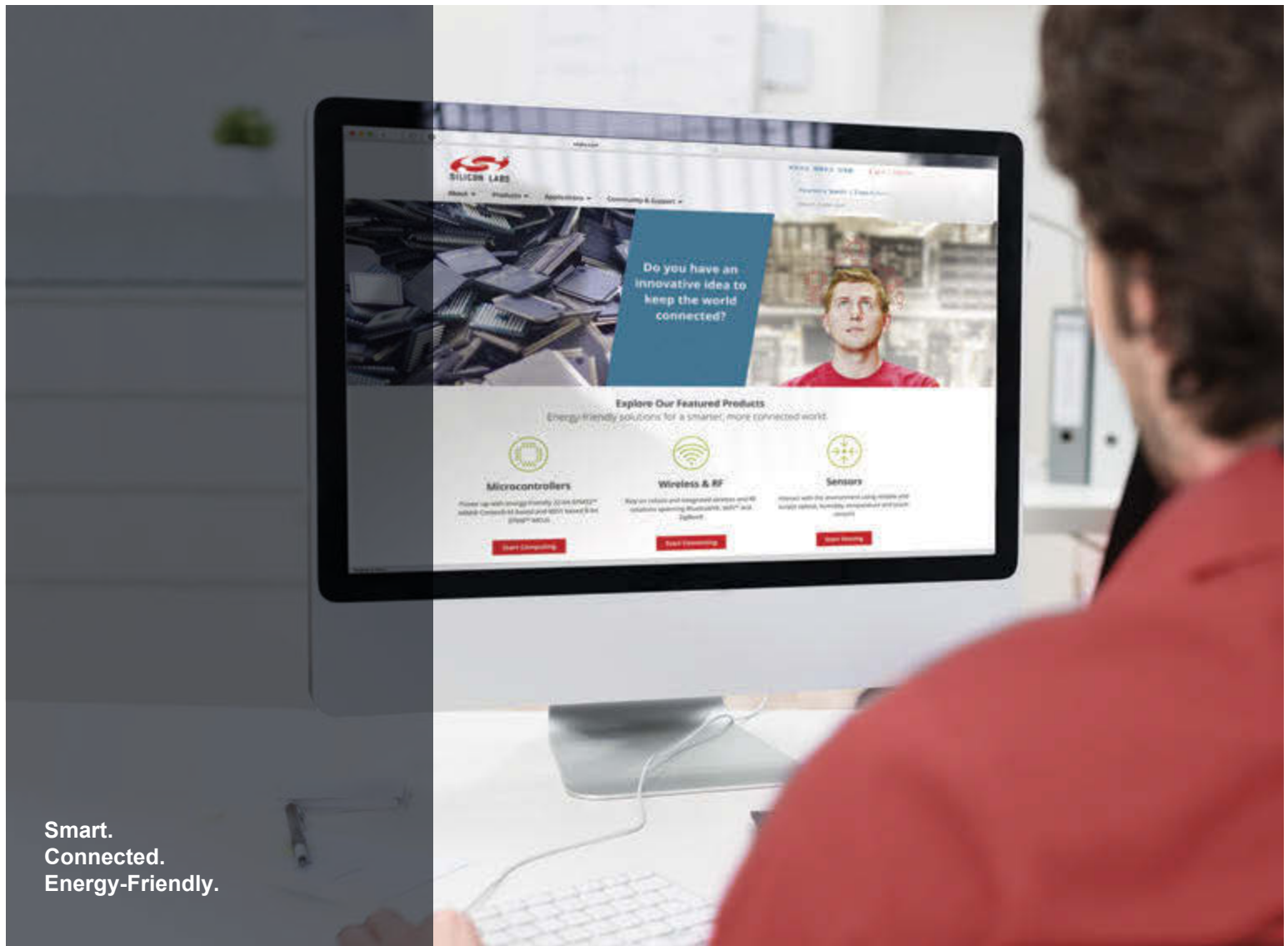
9.7 Revision 0.7

December 15, 2016

- Document converted to current style guide.

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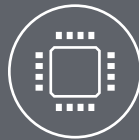
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