

CON007 — BT / WLAN Functional Module

Dual-Band Wi-Fi 6 + Bluetooth LE 5.4 · M.2 E-Key Form Factor

Testo SE & Co. KGaA · Project: FM Connections / Ports (CON)

CON007Bare PCB: 0216 2710
Assembled + chip ant.: 0460 2710 01Status: **Production**

Date: 2026-07-23

STRICTLY CONFIDENTIAL – V.III

1 DESCRIPTION

The CON007 is a Testo-qualified Functional Module (FM) providing combined Wi-Fi 6 (802.11ax) and Bluetooth Low Energy 5.4 connectivity in a compact M.2 E-Key form factor. Based on the Texas Instruments CC3351MOD SimpleLink™ chipset (supplied by BDE as BDE-BW3351N1, later direct TI p/n CC3351MODENIAMOZR), the module integrates a dual-band 2.4/5 GHz RF front-end, an on-board Wuerth WE-MCA chip antenna (assembly option 01), a 3.3 V → 1.8 V LDO regulator (400 mA), and an I²C EEPROM (CAT24C04, Testo 0346 0021) for MAC address and hardware identification. The module connects to a host processor (e.g. EBP001) via a 75-pin M.2 E-Key card-edge connector (Testo 0222 0031) and is designed for seamless reuse across Testo product lines running Linux.

2 KEY FEATURES

- Wi-Fi 6 (802.11ax) – 2.4 GHz & 5 GHz, single spatial stream
- IEEE 802.11 a/b/g/n/ax backward compatible (Wi-Fi 4 / 5 / 6)
- Access Point (AP) mode supported; concurrent STA+AP
- Bluetooth Low Energy 5.4 (LE 1M / 2M / Coded PHY long-range)
- Up to 8 concurrent BLE connections to Smart Probes
- Simultaneous WLAN and BLE operation; internal coexistence (shared antenna)
- 4-bit SDIO (SDIOv2/v3, up to 50 MHz / 200 Mbps) for WLAN
- 4-wire UART HCI (9600 / 115200 / 3 Mbit/s, RTS/CTS) for Bluetooth LE
- On-board chip antenna (01) – dual-band
- I²C EEPROM (CAT24C04, 0346 0021) for MAC address & HW revision
- On-board 3.3 V → 1.8 V LDO (400 mA); single 3.3 V supply input
- EMC shielding can (~13 × 13 mm) over RF section
- Pre-certified: FCC, IC/ISED, CE/ETSI, – RoHS 2 compliant

3 ELECTRICAL SPECIFICATIONS

3.1 Absolute Maximum Ratings

Parameter	Min	Max	Unit
Supply voltage (3.3 V input)	–0.5 V	4.2 V	V
Digital I/O input voltage	–0.5 V	V _{IO} + 0.5 V	V
Operating temperature	–30 °C	+85 °C	°C
Storage temperature	–30 °C	+85 °C	°C

3.2 Recommended Operating Conditions

Parameter	Min	Typ	Max	Unit
Supply voltage V _{IN} (M.2 pins 2/4/72/74)	3.0	3.3	3.6	V
1.8 V rail (on-board LDO output)	1.62	1.8	1.98	V
Operating temperature (module)	–20	25	+85	°C
Operating humidity	15	—	90	%rH (non-condensing)

3.3 Current Consumption

Mode / Condition	1V8 rail (typ)	3V3 rail (typ)	Unit
Shutdown (nReset low)	10 μ A	2 μ A	μ A
Sleep / RAM retention	330 μ A	2 μ A	μ A
2.4 GHz WLAN RX (continuous)	62 mA	—	mA
2.4 GHz WLAN TX @ 1 DSSS +17.9 dBm	92 mA	310 mA	mA
2.4 GHz WLAN TX @ HE MCS7 +15.3 dBm	115 mA	215 mA	mA
5 GHz WLAN RX (continuous)	110 mA	—	mA
5 GHz WLAN TX @ 6 OFDM +18.3 dBm	170 mA	290 mA	mA
BLE TX @ +17.8 dBm	110 mA	275 mA	mA
BLE RX	62 mA	—	mA
BLE Advertise 100 ms interval	3029 μ A	—	μ A
2.4 GHz WLAN DTIM=1 beacon (ext. DC/DC 85%)	562 μ A	—	μ A
Peak current (all modes)	—	< 500 mA	mA

Peak 3V3 current may reach 450 mA during device calibration. System peak stays below 500 mA. On-board LDO: 400 mA rated; typical dissipation ~170 mW at full load.

4 RF PERFORMANCE

4.1 WLAN – 2.4 GHz

Parameter	Condition	Typ	Unit
Frequency range	—	2412 – 2472	MHz
RX sensitivity (1 DSSS)	8% PER	–96.1	dBm
RX sensitivity (HE MCS7)	10% PER	–72.2	dBm
TX output power (1 DSSS)	3V3 > 3.0 V	17.9	dBm
TX output power (HE MCS7)	3V3 > 3.0 V	15.3	dBm
RSSI accuracy	–90 to –30 dBm	± 3	dB

4.2 WLAN – 5 GHz

Parameter	Condition	Typ	Unit
Frequency range	FCC U-NII-1/2A/2C/3 · EU bands 1-4 · JP W52/53/56	5180 – 5845	MHz
RX sensitivity (6 OFDM)	10% PER	–91.6	dBm
RX sensitivity (HE MCS7)	10% PER	–72.1	dBm
TX output power (6 OFDM)	3V3 > 3.0 V	18.3	dBm
TX output power (HE MCS7)	3V3 > 3.0 V	13.2	dBm
RSSI accuracy	–90 to –30 dBm	± 3	dB

4.3 Bluetooth Low Energy

Parameter	PHY / Condition	Typ	Unit
RX sensitivity	1M PHY, PER < 30.2%	-97.2	dBm
RX sensitivity	2M PHY, PER < 30.2%	-95.2	dBm
RX sensitivity	Coded 125k PHY, PER < 30.2%	-101.4	dBm
RX sensitivity	Coded 500k PHY, PER < 30.2%	-98.6	dBm
TX output power	Adjustable: 0 / 5 / 10 / 17.8 dBm	17.8	dBm
RSSI accuracy	-90 to -20 dBm	±4	dB
Radio range	Free field @ +14 dBm EU (CON-9182)	≥ 150 m (JP/KR ~100 m)	m

Link budget @ 150 m / 2.45 GHz: TX +14 dBm – (86 dB path loss + 2×6 dB antenna gain –6 dBi + 2×3 dB misc.) = -90 dBm; margin = -90 – (-95.2) = 5.2 dB. JP/KR (max +10 dBm): 100 m range, margin 6.2 dB.

5 HOST INTERFACE (M.2 E-KEY CARD-EDGE, 75-PIN)

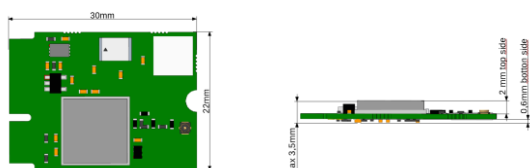
All logic signals are 1.8 V I/O. The 3.3 V supply is provided on M.2 pins 2, 4, 72, 74. When connecting to a 3.3 V host (e.g. EBP001), use a level-shifter (e.g. TXS0102) on the I²C bus. SDIO and UART connect directly through the card-edge without additional level shifting.

5.1 Interface Summary

Interface	M.2 Pins	Parameters	Function
Power (3.3 V)	2, 4, 72, 74	3.0 – 3.6 V; > 500 mA	Single supply input
SDIO 4-bit	9, 10, 12–18, 21, 22	SDIOv2/v3 HS; 50 MHz max; 200 Mbps; 1.8 V	WLAN data transport
UART HCI (BLE)	22 RXD, 32 TXD, 35 CTS, 37 RTS	9600 / 115200 / 3 Mbit/s; 8N1; HW flow; 1.8 V	Bluetooth LE HCI
I ² C (EEPROM)	59 SDA, 61 SCL	1.8 V; CAT24C04 (0346 0021)	MAC addr. / HW rev. / chipset ID
nRESET	Pin 48	Active low; 1.8 V	Module hard reset
WLAN IRQ	Pin 21 (#WIFI.SDIOWAKE)	1.8 V	WLAN interrupt to host
BLE IRQ	Pin 20 (#UART_WAKE)	1.8 V	BLE interrupt to host
SWD	Pin 45 SWCLK, 47 SWDIO	1.8 V	Serial wire debug (optional)
I ² S (audio)	Pins 9, 11, 13, 15	Not available on CC3351 – NC on module	Reserved

6 MECHANICAL SPECIFICATIONS

Parameter	Value / Description
Form factor	M.2 E-Key, 75-pin card-edge (2.54 mm pitch)
PCB dimensions	≤ 22 × 30 mm, ≤ 4 mm height; 4-layer PCB
Card-edge connector	Testo 0222 0031
Mechanical fixation	Single screw; board cut-out on host PCB required
EMC shielding	Sheet metal can ~13 × 13 mm over RF section
Test points	One PCB side; GND, supply, programming, comms, reset; ≥ 1 mm dia., ≥ 1.4 mm c-c
Panel pilot holes	≥ 2 diagonal pilot holes ≥ 2.8 mm on production panel
TI module (on-board)	CC3351MOD: 65-pin LGA, 11 × 11 mm, 0.65 mm pitch (Testo 0344 3351)
Assembly	SMT only (no hand soldering); RoHS 2 compliant



7 ANTENNA OPTIONS

Option	Testo P/N	Component / Mfg P/N	Description
01 – On-board chip antenna (preferred)	0460 2710 01	Wuerth WE-MCA 7488922455	Integrated dual-band 2.4/5 GHz chip antenna on module PCB; no external hardware required

External antenna wiring must remain inside the device housing. Maintain ≥ 10 mm clearance from enclosure gaps (EMC/ESD). All variants support dual-band (2.4 + 5 GHz) operation.

8 POWER SUPPLY & EMC DESIGN NOTES

Topic	Requirement / Guideline
Supply input	Single 3.3 V rail (3.0 – 3.6 V); host must supply > 500 mA
On-board LDO	3.3 V $\rightarrow$ 1.8 V; 400 mA rated; typical dissipation ~170 mW; integrated on module
Power-up sequence	All supplies stable before nRESET released; hold nRESET low ≥ 10 μ s after supply stable
SDIO trace length	< 100 mm run-length; 68 Ω series termination on SDCLK at EBP001 (source) side
UART trace termination	68 Ω series resistor at each driver side (EBP001 and CON007)
RF clear-out area	Respect copper keep-out under chip antenna per Wuerth / TI application note
Country-specific power	JP/KR: BLE TX limited to +10 dBm; WLAN TX adjusted in software/driver
Crystal tolerance	Fast clock crystal must meet ± 20 ppm (initial + aging + temp) for certification compliance

9 ENVIRONMENTAL SPECIFICATIONS

Parameter	Min	Max	Condition
Operating temperature (module)	-20 °C	+85 °C	Includes internal heating of integrating product
Storage temperature	-30 °C	+85 °C	All BOM components verified
Operating humidity	15 %rH	90 %rH	Non-condensing; no additional coating required

10 REGULATORY CERTIFICATIONS

Region	ID / Mark	Notes
USA	FCC: WAF-04602710 · FCC mark	Module pre-certification simplifies device certification
Canada	IC/ISED: 6127B-04602710	
Europe	CE / ETSI · CE mark	RED compliant
RoHS	RoHS 2 compliant	All components confirmed in BOM inspection

Labeling (top + bottom PCB, split due to space): production date, SAP number, serial number, FCC ID, IC ID, MIC ID, CE mark, FCC mark, UKCA mark, WLAN MAC address, RCM mark, revision. See labeling concept CON007_R100-10415.

11 SOFTWARE & DRIVER SUPPORT

Item	Details
Host OS	Linux (primary; integrated into EBP001 BSP)
WLAN stack	TCP/IP on host; SDIO transport; SDIOv2 / v3 High Speed
BLE stack	Bluetooth stack on host; UART HCI transport
BLE version	BLE 5.4 (SHALL $\geq$ 5.3 per CON-7918); BLE 4.0 backwards compatible
WLAN standards	IEEE 802.11 b/g/n (shall) + ax @ 2.4 GHz (should) + ac/ax @ 5 GHz (shall); AP mode (shall)
Security	WPA2 / WPA3; hardware AES; firmware authentication; anti-rollback protection
MAC address	Stored in EEPROM (CAT24C04); changeable via SACP command
Android	Android $\geq$ 13 drivers: not yet available for CC3351 (rejected in current release)
Reference designs	T3neu Abstatt (0216 0165); EBP001 (0216 1417)
Dev. hardware	TI LP-XDS110ET LaunchPad + CON007 LaunchPad Adapter (level-shift: SN74AVC4T245RSV)

12 ORDERING INFORMATION

Testo P/N	Description	Chipset / Sub-component
0216 2710	Chipset A – bare PCB (CC3351MOD on Testo M.2 PCB)	TI CC3351MODENIAMOZR / BDE BDE-BW3351N1
0460 2710 01	Chipset A – assembled PCB, on-board chip antenna	Wuerth WE-MCA 7488922455
0344 3351	BT/Wi-Fi module CC3351MODENIAMOZ (sub-component)	TI CC3351MODENIAMOZR
0346 0021	I ² C EEPROM CAT24C04 (sub-component, on-board)	CAT24C04 or equivalent