1. Manual

> **User Manual**

  The TF26SENI support with 4G/5G network. There will be perform some use-case to demonstrate 4G/5G performances targeted 1. High throughput features 2. Low Latency features.
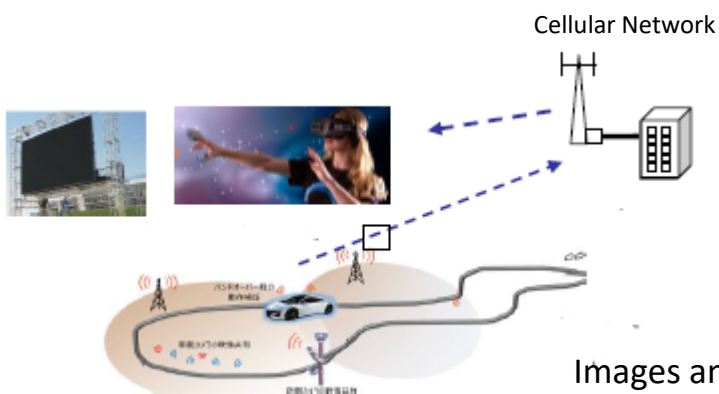
Below is just for example.

- **1. High throughput features**

Demonstrate high-throughput,

high-quality image by hotspot.

- **2. Low Latency features**

Images and file uploaded from the car are displayed without delay to other devices
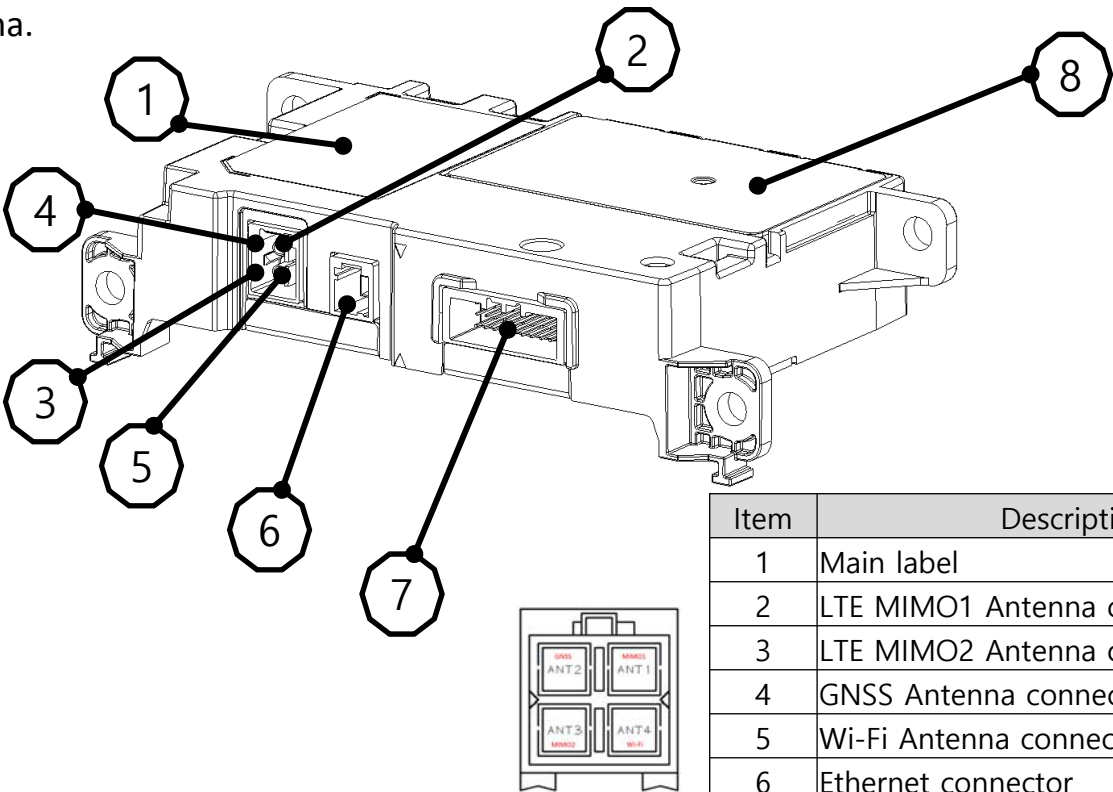
2. System Integration

➢ Telematics Components

Telematics Communication Unit(TCU)

The TCU controls the telematics system, communicating with the vehicle systems over the CAN bus systems.

The system transmits/receives signals via Radio Frequency(RF), GPS, Wi-Fi by External Antenna.

Item	Description
1	Main label
2	LTE MIMO1 Antenna connector
3	LTE MIMO2 Antenna connector
4	GNSS Antenna connector
5	Wi-Fi Antenna connector
6	Ethernet connector
7	Vehicle IF Connector
8	Backup battery pack

A back-up battery pack, consisting of a battery cell, is integrated into the TCU.

This enables continued operation in the event of a vehicle main power source disconnection, for example in a major accident or in the case of deliberate action of a thief as part of a vehicle theft attempt.

This feature enables the e-Call and vehicle tracking functions to continue operating in the above mentioned circumstances.

The battery cell is controlled separately by the TCU software.

3. Product Introduction

➢ Supported Band

The TF26SENI are designed for the automotive industry. They support NR, LTE, air Interface standards. The TF26SENI are based on the Qualcomm SA525M wireless chipsets and support the following bands.

Operating Band	Uplink (UL) operating band			Downlink (DL) operating band			Duplex Mode	SA525M / SDR875AQ 2x2 MIMO (39 x 47mm)		
	F_{UL_low}	–	F_{UL_high}	F_{DL_low}	–	F_{DL_high}		NA	CN	JP
1	1920 MHz	–	1980 MHz	2110 MHz	–	2170 MHz	FDD		L,N	L
2	1850 MHz	–	1910 MHz	1930 MHz	–	1990 MHz	FDD	L,N		
3	1710 MHz	–	1785 MHz	1805 MHz	–	1880 MHz	FDD		L,N	L,N
4	1710 MHz	–	1755 MHz	2110 MHz	–	2155 MHz	FDD	L		
5	824 MHz	–	849 MHz	869 MHz	–	894MHz	FDD	L,N	L,N	
7	2500 MHz	–	2570 MHz	2620 MHz	–	2690 MHz	FDD			
8	880 MHz	–	915 MHz	925 MHz	–	960 MHz	FDD		L,N	
12	699 MHz	–	716 MHz	729 MHz	–	746 MHz	FDD	L,N		
14	788 MHz	–	798 MHz	758 MHz	–	768 MHz	FDD	L		
18	815 MHz	–	830 MHz	860 MHz	–	875 MHz	FDD			L
19	830 MHz	–	845 MHz	875 MHz	–	890 MHz	FDD			
26	814 MHz	–	849 MHz	859 MHz	–	894 MHz	FDD			L
28	703 MHz	–	748 MHz	758 MHz	–	803 MHz	FDD		N	L,N
34	2010 MHz	–	2025 MHz	2010 MHz	–	2025 MHz	TDD		L	
38	2570 MHz	–	2620 MHz	2570 MHz	–	2620 MHz	TDD		L	
39	1880 MHz	–	1920 MHz	1880 MHz	–	1920 MHz	TDD		L	
40	2300 MHz	–	2400 MHz	2300 MHz	–	2400 MHz	TDD		L	N
41	2496 MHz		2690 MHz	2496 MHz		2690 MHz	TDD		L,N	L,N
42	3400 MHz	–	3600 MHz	3400 MHz	–	3600 MHz	TDD			
66	1710 MHz	–	1780 MHz	2110 MHz	–	2200 MHz	FDD	L,N		
71	663 MHz	–	698 MHz	617 MHz	–	652 MHz	FDD			
n77	3300 MHz	–	4200 MHz	3300 MHz	–	4200 MHz	TDD	N		N
n78	3300 MHz	–	3800 MHz	3300 MHz	–	3800 MHz	TDD		N	
n79	4400 MHz	–	5000 MHz	4400 MHz	–	5000 MHz	TDD		N	

➢ Environmental Specifications

The environmental specification for operating and storage of the TF26SENI are defined in the the table below.

Parameter	Temperature Range
Operating Temperature	-30℃ to 95℃
Storage Temperature	-40℃ to 95℃
Humidity	85% or less

➢ Absolute Maximum Rating

This section defines the Absolute Maximum Ratings of the TF26SENI embedded modules.

Warning: If these parameters are exceeded, even momentarily, damage may occur to the device.

Parameter		Min	Max	Units
VPH_PWR	Power Supply Input	-0.5	6	V
VIN	Voltage on any nonpower-supply pin	0	Vxx + 0.5	V

4. RF Specification

➢ Power Level

The Transmitted Power of the TF26SENI are specified in the following table.

RAT	Power Level (dBm)
LTE	23 ± 2.7
NR	23 ± 2.7

➢ Sensitivity

The Receiver Sensitivity of the TF26SENI are specified in the following table.

Conducted RX (Receive) Sensitivity – LTE Bands

BAND	Method (DL CH)	Specification
BAND 1 Reference sensitivity level	Measure BLER of Mid Channel (300) in Band1	sensitivity : ≤-96.3 /10MHz BLER : ≤ 5%
BAND 2 Reference sensitivity level	Measure BLER of Mid Channel (900) in Band2	sensitivity : ≤-94.3 /10MHz BLER : ≤ 5%
BAND 3 Reference sensitivity level	Measure BLER of Mid Channel (1575) in Band3	sensitivity : ≤-93.3 /10MHz BLER : ≤ 5%
BAND 4 Reference sensitivity level	Measure BLER of Mid Channel (2175) in Band4	sensitivity : ≤-96.3 /10MHz BLER : ≤ 5%
BAND 5 Reference sensitivity level	Measure BLER of Mid Channel (2525) in Band5	sensitivity : ≤-94.3 /10MHz BLER : ≤ 5%
BAND 7 Reference sensitivity level	Measure BLER of Mid Channel (3100) in Band7	sensitivity : ≤-94.3 /10MHz BLER : ≤ 5%
BAND 8 Reference sensitivity level	Measure BLER of Mid Channel (3625) in Band8	sensitivity : ≤-93.3 /10MHz BLER : ≤ 5%
BAND 12 Reference sensitivity level	Measure BLER of Mid Channel (5095) in Band12	sensitivity : ≤-93.3 /10MHz BLER : ≤ 5%
BAND 14 Reference sensitivity level	Measure BLER of Mid Channel (5330) in Band14	sensitivity : ≤-93.3 /10MHz BLER : ≤ 5%
BAND 18 Reference sensitivity level	Measure BLER of Mid Channel (5925) in Band18	sensitivity : ≤-96.3 /10MHz BLER : ≤ 5%
BAND 19 Reference sensitivity level	Measure BLER of Mid Channel (6075) in Band19	sensitivity : ≤-96.3 /10MHz BLER : ≤ 5%
BAND 26 Reference sensitivity level	Measure BLER of Mid Channel (8865) in Band26	sensitivity : ≤-93.8 /10MHz BLER : ≤ 5%
BAND 28 Reference sensitivity level	Measure BLER of Mid Channel (9435) in Band28	sensitivity : ≤-94.8 /10MHz BLER : ≤ 5%
BAND 34 Reference sensitivity level	Measure BLER of Mid Channel (36275) in Band34	sensitivity : ≤-96.3 /10MHz BLER : ≤ 5%
BAND 38 Reference sensitivity level	Measure BLER of Mid Channel (38000) in Band38	sensitivity : ≤-96.3 /10MHz BLER : ≤ 5%
BAND 39 Reference sensitivity level	Measure BLER of Mid Channel (38450) in Band39	sensitivity : ≤-96.3 /10MHz BLER : ≤ 5%
BAND 40 Reference sensitivity level	Measure BLER of Mid Channel (39150) in Band40	sensitivity : ≤-96.3 /10MHz BLER : ≤ 5%
BAND 41 Reference sensitivity level	Measure BLER of Mid Channel (40620) in Band41	sensitivity : ≤-94.3 /10MHz BLER : ≤ 5%
BAND 42 Reference sensitivity level	Measure BLER of Mid Channel (42590) in Band42	sensitivity : ≤-95.3 /10MHz BLER : ≤ 5%
BAND 66 Reference sensitivity level	Measure BLER of Mid Channel (66886) in Band66	sensitivity : ≤-95.8 BLER : ≤ 5%

* Blue highlighted band is supported for TF26SENI model

4. RF Specification

Conducted RX (Receive) Sensitivity – NR Bands

BAND	Method (DL CH)	Specification
n1 Reference sensitivity level	Measure BLER of Mid Channel (428000) in Band1	sensitivity : ≤-93.1 BLER : ≤ 5% (SCS:15 kHz / BW:20 MHz)
n2 Reference sensitivity level	Measure BLER of Mid Channel (392000) in Band2	sensitivity : ≤-91.1 BLER : ≤ 5% (SCS:15 kHz / BW:20 MHz)
n3 Reference sensitivity level	Measure BLER of Mid Channel (368500) in Band3	sensitivity : ≤-90.1 BLER : ≤ 5% (SCS:15 kHz / BW:20 MHz)
n5 Reference sensitivity level	Measure BLER of Mid Channel (176300) in Band5	sensitivity : ≤-86.1 BLER : ≤ 5% (SCS:15 kHz / BW:20 MHz)
n7 Reference sensitivity level	Measure BLER of Mid Channel (531000) in Band7	sensitivity : ≤-91.1 BLER : ≤ 5% (SCS:15 kHz / BW:20 MHz)
n8 Reference sensitivity level	Measure BLER of Mid Channel (188500) in Band8	sensitivity : ≤-85.1 BLER : ≤ 5% (SCS:15 kHz / BW:20 MHz)
n12 Reference sensitivity level	Measure BLER of Mid Channel (147500) in Band12	sensitivity : ≤-93.1 BLER : ≤ 5% (SCS:15 kHz / BW:10 MHz)
n26 Reference sensitivity level	Measure BLER of Mid Channel (175300) in Band26	sensitivity : ≤-86.9 BLER : ≤ 5% (SCS:15 kHz / BW:20 MHz)
n28 Reference sensitivity level	Measure BLER of Mid Channel (156100) in Band28	sensitivity : ≤-90.1 BLER : ≤ 5% (SCS:15 kHz / BW:20 MHz)
n40 Reference sensitivity level	Measure BLER of Mid Channel (470000) in Band40	sensitivity : ≤-93.1 BLER : ≤ 5% (SCS:30 kHz / BW:20 MHz)
n41 Reference sensitivity level	Measure BLER of Mid Channel (518598) in Band41	sensitivity : ≤-91.1 BLER : ≤ 5% (SCS:30 kHz / BW:20 MHz)
n66 Reference sensitivity level	Measure BLER of Mid Channel (431000) in Band66	sensitivity : ≤-92.6 BLER : ≤ 5% (SCS:15 kHz / BW:20 MHz)
n71 Reference sensitivity level	Measure BLER of Mid Channel (126900) in Band71	sensitivity : ≤-85.3 BLER : ≤ 5% (SCS:15 kHz / BW:20 MHz)
n77 Reference sensitivity level	Measure BLER of Mid Channel (650000) in Band77	sensitivity : ≤-91.4 BLER : ≤ 5% (SCS:30 kHz / BW:20 MHz)
n78 Reference sensitivity level	Measure BLER of Mid Channel (636666) in Band78	sensitivity : ≤-91.9 BLER : ≤ 5% (SCS:30 kHz / BW:20 MHz)
n79 Reference sensitivity level	Measure BLER of Mid Channel (713334) in Band79	sensitivity : ≤-88.7 BLER : ≤ 5% (SCS:30 kHz / BW:40 MHz)

* Blue highlighted band is supported for TF26SENI model

5. WLAN

➢ Supported Band

The TF26SENI support with 2.4GHz WLAN/5GHz WLAN.

- support the following bands.

BAND		JP	NA	CN
2.4GHz WLAN	ISM	2412MHz(ch1) ~ 2472MHz(ch13)	2412MHz(ch1) ~ 2462MHz(ch11)	2412MHz(ch1) ~ 2472MHz(ch13)
5GHz WLAN	U-NII-1	-	5180MHz(ch36) ~ 5240MHz(ch48)	-
	U-NII-2A	-	-	-
	U-NII-2C	5500MHz(ch100) ~ 5720MHz(ch144)	-	-
	U-NII-3	-	5745MHz(ch149) ~ 5825MHz(ch165)	5745MHz(ch149) ~ 5825MHz(ch165)