Denso Lexus GS250 TCU Teardown

FEATURES:

- Telematics Control Unit
- CDMA
- Cypress MB91F577BH, 32-bit, 80MHz

Click here for detailed data from Fomalhaut's teardown analysis.

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Manufacturer	Denso
Model Number	86741-53045
Carrier	-
Assembled in	unknown
Retail Price	Unknown
Product Release	2015.??.??
Document ID	1113 - Tachiyomi

SPECIFICATIONS

manufactured by Denso for Lexus U.S. model. Functions; Emergency connection to Police and Emergency Units, with a button.
Format; CDMA　Supporting 800MHz (high diffraction) and 1900MHz (high straight-stability).

BASIC	Product Name	Lexus GS250 TCU, 86741-53045					
	Manufacturer	Denso Corporation					
	Minimum Size (mm)	139.9 x 118.9 x 28.8					
	Weight (g)	417					
BATTERY TIME	Standby (hours)	3.9G: FDD-LTE: -	3.9G: TD-LTE: -	3G: WCDMA: -	3G: CDMA: ?	3G: TD-SCDMA: -	2G: GSM:
	Voice Call (minutes)	3.9G: FDD-LTE: -	3.9G: TD-LTE: -	3G: WCDMA: -	3G: CDMA: -	3G: TD-SCDMA: -	2G: GSM: -
	Video Call (minutes)	-					
	Digital TV (minutes)	-					
	Other	-					
	Battery (size in mm)	-					
SYSTEM	OS	unknown					
	CPU / ROM / RAM	CPU: Cypress (Fujitsu) MB91F577BH, 32-bit, 80MHz ROM: 256MByte + 256MByte RAM: 128MByte					
DISPLAY	Main Display	-					
	Sub Display	-					
COMMUNICATION	Protocol (MHz)	3.9G: FDD-LTE: - 3.9G: TD-LTE: - 3G: WCDMA: - 3G: CDMA: 800, 1900 3G: TD-SCDMA: - 2G: GSM: -					
	HSDPA/HSUPA (Mbps)	3G: unknown			LTE: -		
	Wireless LAN	-					
	Bluetooth	-					
	GPS	Yes					
	Infrared	-					
	RFID/NFC	-					
CAMERA	Main Camera	-					
	Sub Camera	-					
SENSOR	Motion	Accelerometer: -	Digital Compass: -		Gyroscope: -		Barometer: -
		Gesture Recognition: -	-		-		-
	Ambient	Light Sensor: -	Proximity Sensor: -		Temperature Sensor: -		Humidity Sensor: -
	Security	Fingerprint Sensor: -	-		-		-
	Healthcare	Heart Rate Monitor: -					
	Touch Panel	-					
OTHER	HDMI	-					
	MicroSD (max capacity)	-					
	Waterproof/Anti-shock	-					

 / Phone: +81-3-6759-4289 / Mail: minatake_kashio@fomalhaut.co.jp

OUTLOOK / PRODUCT INFORMATION

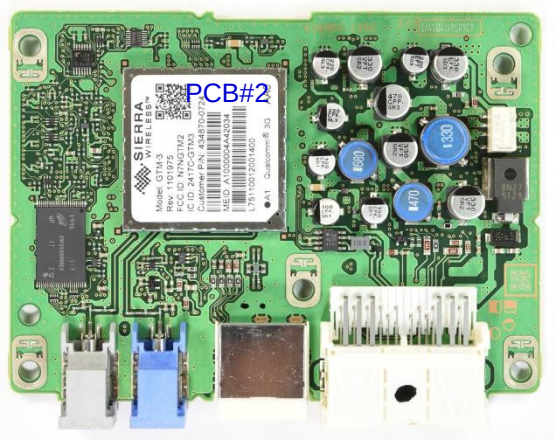
The inscription shows name of supplier ; Denso.
Production country ; unknown.
Installed under the driver or front passenger seat (estimation)
Housing ; Aluminum alloy

TEARDOWN

Housing ; Aluminum, implementing a circuit board inside.
Reason to use the metal housing ; shielding of noise not to disturb transmission of electric wave.
The circuit board consists of a big main one plus island-like sub boards on the main one,
The island-like boards associated with telecommunication.

Top Cover

PCB#1



PCB#2

Bottom Cover

PCB DIMENSION & MARKING

Unit: millimeter otherwise specified

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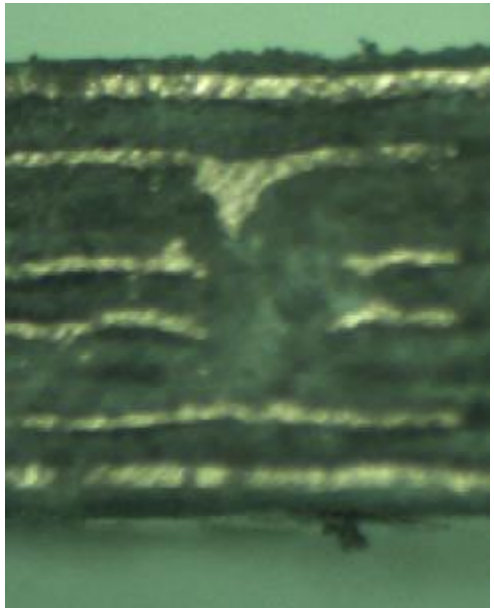
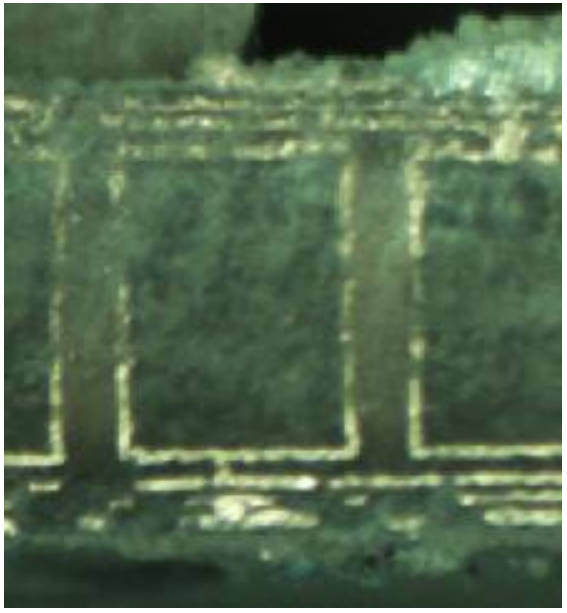
The boards associated with telecommunication have inscription ″Sierra Wireless" (a communication module supplier in Canada)
Many on-board TCU adopt the supplier.

	PCB #1	PCB #2	-	-	-	-
Manufacturer	unknown	unknown	-	-	-	-
Dimension	130.55 x 95.89 x 1.56	40.21 x 40.26 x 1.51	-	-	-	-
Layer	6	8	-	-	-	-
Connector (pin)	0	0	-	-	-	-
Connector (socket)	4	0	-	-	-	-
Connector (ACF)	0	0	-	-	-	-





PCB#1 SIDE A: KEY COMPONENTS

1 notch = 1mm

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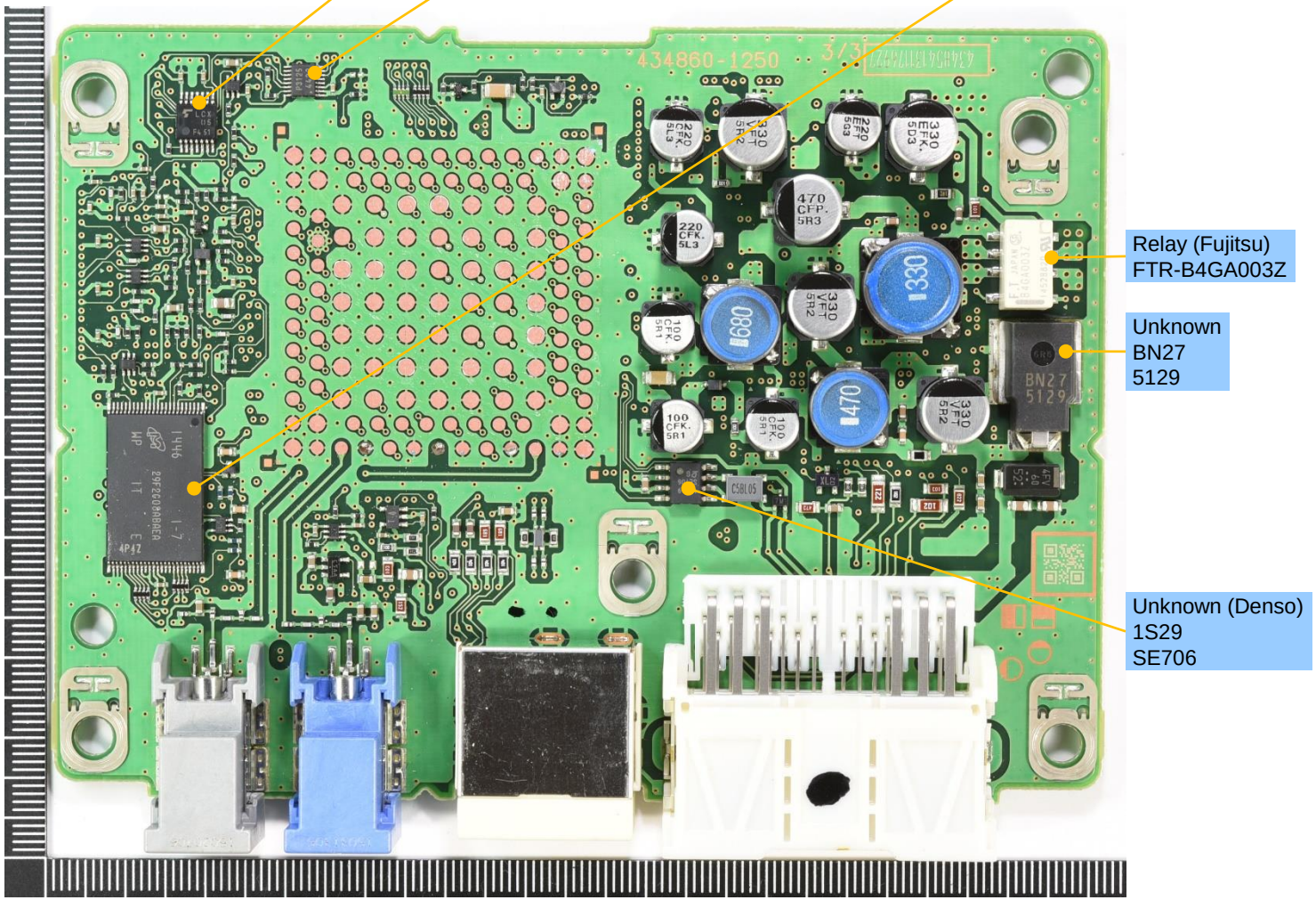
The big main board is mounted components associated with interface (between vehicle system and TCU), antenna socket and system power supply.



PCB#1 SIDE B: KEY COMPONENTS

1 notch = 1mm

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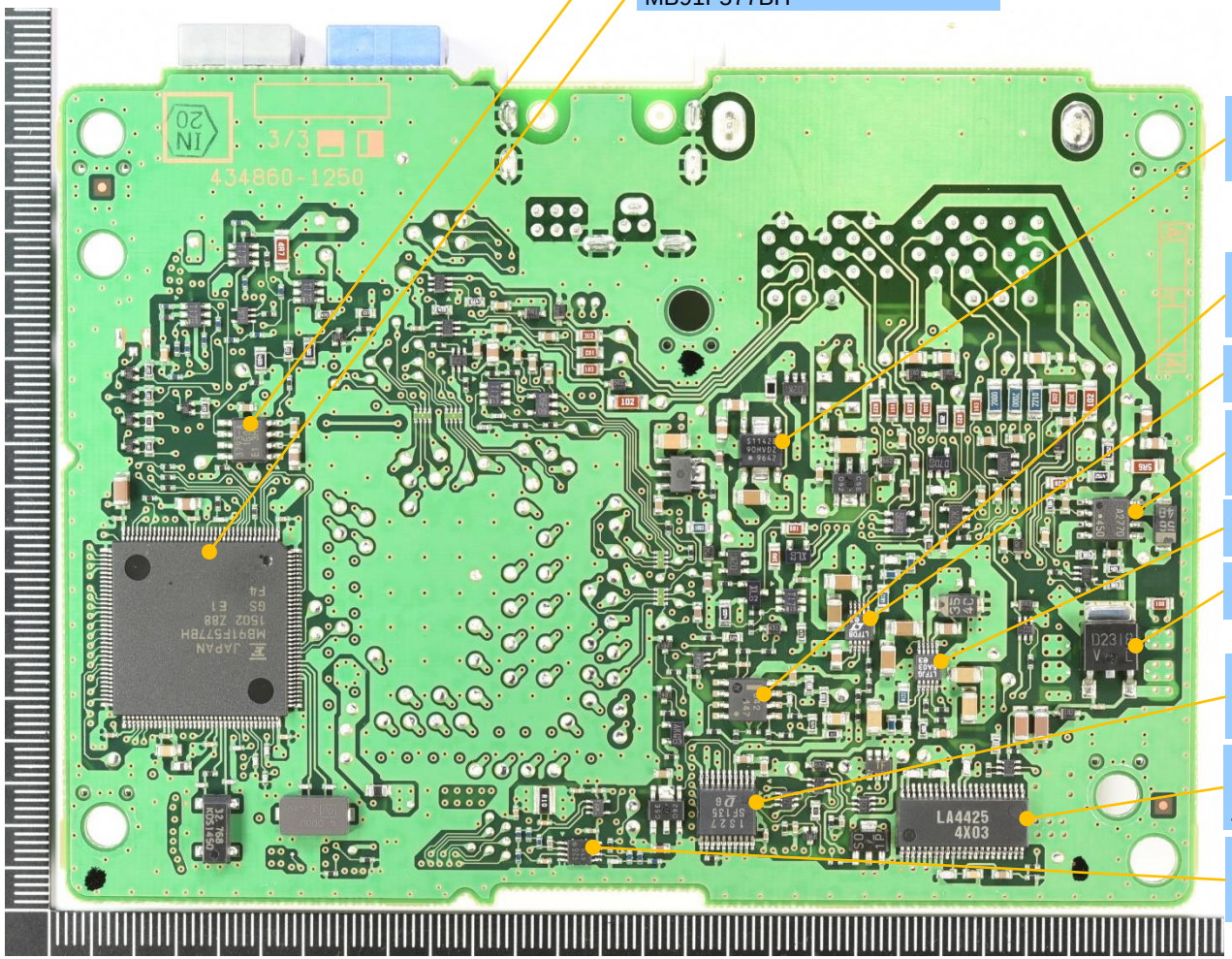
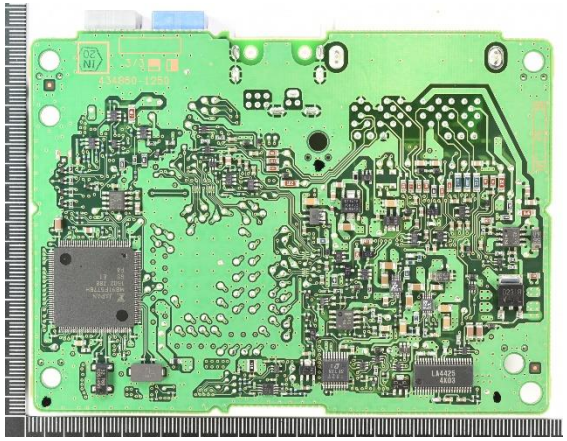
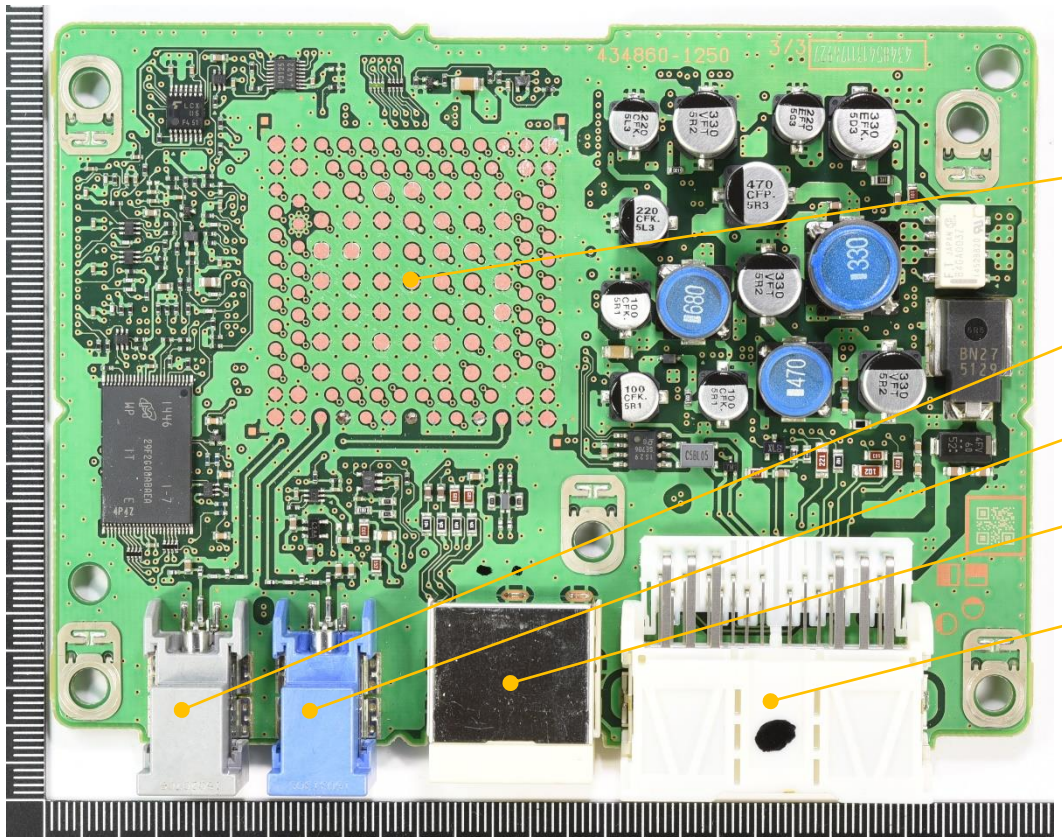
The big chip on the bottom left in the photo is a micro-computer , 32-bits which is associated with communication to other vehicle components on the vehicle.
Price circa $ 4. Many chips on the right side of the board are functioning as system power supply.



PCB#1: CONNECTORS



Central portion of the board has many soldering points which are planned to mount small boards.
(refer to fornt & back side photos on the left below)
Also some points are for testing of the small board, for probe-touching for diagnosis.



Connecting to	**PCB#2**		
Mnf.	-	L (mm)	-
Pin Pitch (mm)	-	W (mm)	-
Pin #	133	(H) (mm)	-
Connecting to	**Antenna Port (CDMA)**		
Mnf.	Sumitomo	L (mm)	24.56
Pin Pitch (mm)	-	W (mm)	13.08
Pin #	1	(H) (mm)	12.80
Connecting to	**Antenna Port (CDMA)**		
Mnf.	Sumitomo	L (mm)	25.64
Pin Pitch (mm)	-	W (mm)	13.04
Pin #	1	(H) (mm)	12.75
Connecting to	**Input / Output**		
Mnf.	JAE	L (mm)	23.50
Pin Pitch (mm)	-	W (mm)	21.21
Pin #	8	(H) (mm)	11.96
Connecting to	**Input / Output**		
Mnf.	unknown	L (mm)	32.41
Pin Pitch (mm)	-	W (mm)	40.23
Pin #	38	(H) (mm)	11.28

PCB#2 SIDE A: CELLULAR

1 notch = 1mm

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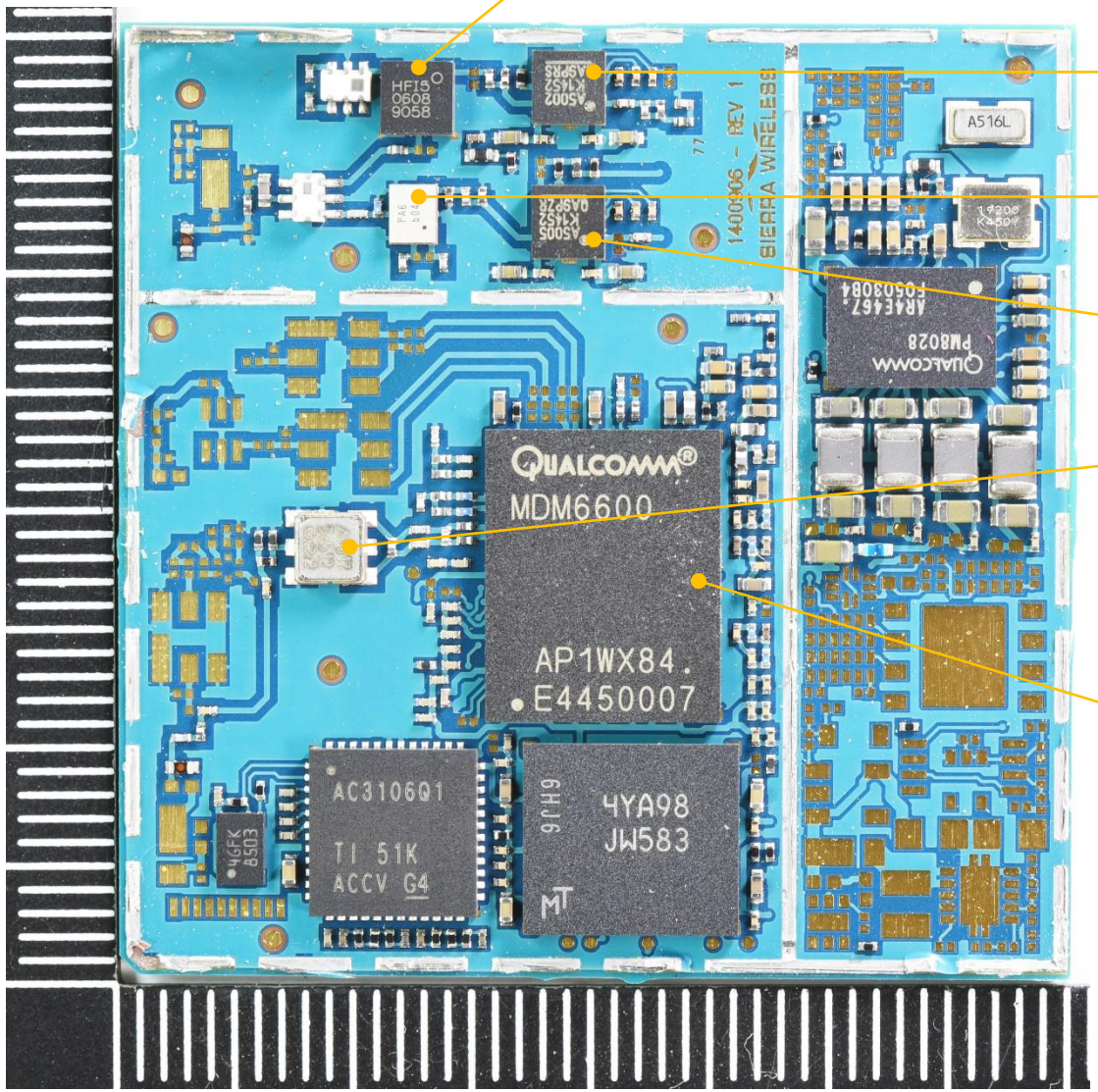
3G Module
GTM-3 (Sierra Wireless)

Communication components are intensively mounted on a small board on the main board.約。
Qualcomm chip set is adopted.
Qualcomm MDM6600 is a processor for telecommunication, which also function as telematics IC and GPS, like Phone 4S.
This is a rare example of BGA mounting for an on-vehicle with many QFPs.



Filter (mnf. unknown)
HFI5
0608
9058

CDMA Power Amplifier (Avago)
ACPM-5002

Filter (mnf. unknown)
PA6
b04

CDMA Power Amplifier (Avago)
ACPM-5005

SAW Filter (TDK)
B3517

Baseband Processor + CDMA Transceiver + GPS (Qualcomm)
MDM6600

PCB#2 SIDE A: KEY COMPONENTS

1 notch = 1mm

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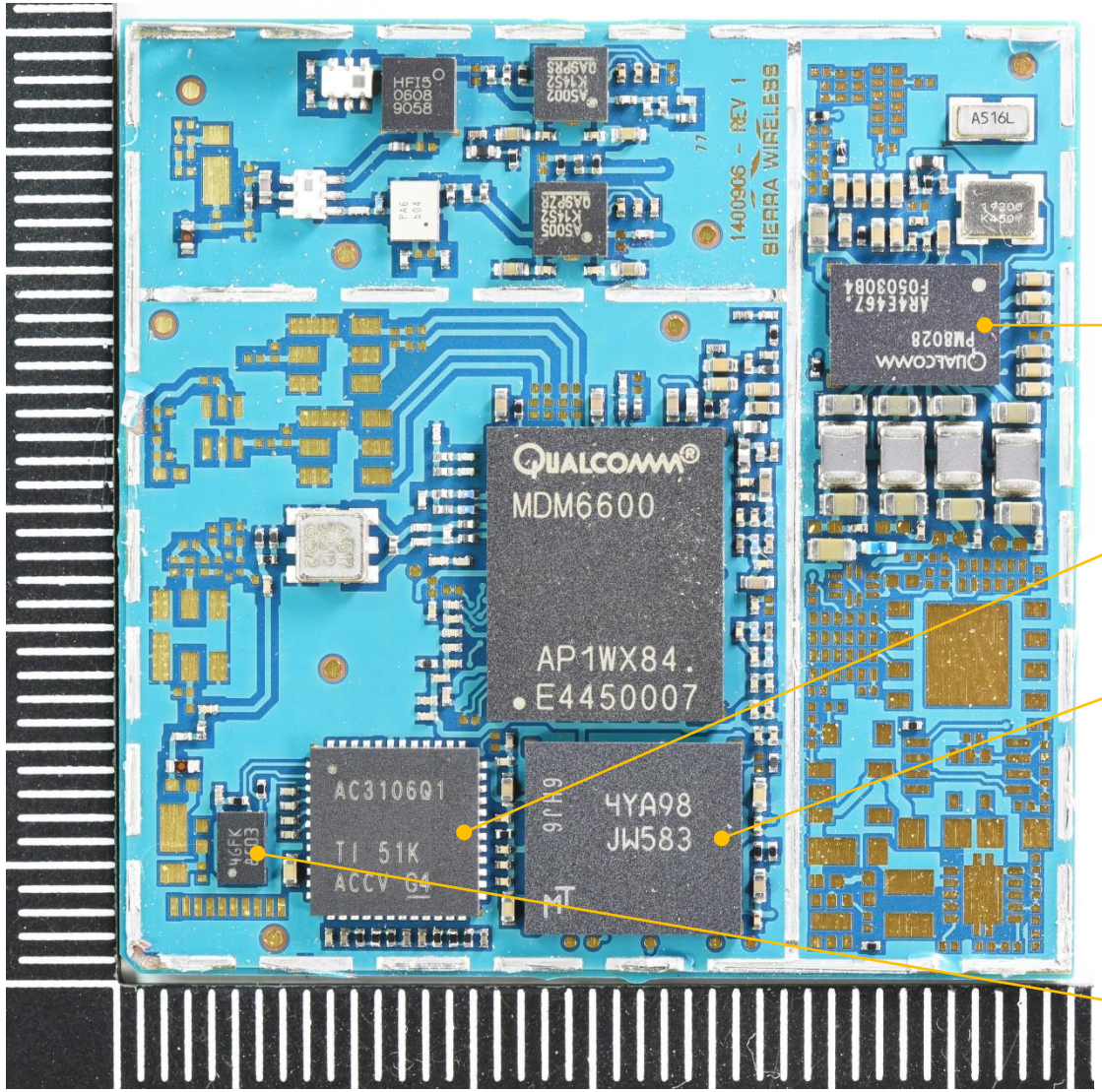
Power supply IC for telecommunication is Qualcomm PM8028.
Implementing audio- for controlling of voice signal. Though the TCU body does not have a mike, is connected to mikes implemented on other part of vehicle, which is potentially expected to realize voice communication as well as emergency signal.
In that case, TCU is able to be utilized as a concierge and be asked search of a restaurant in the vicinity ...,etc.



Power Management (Qualcomm)
PM8028

Audio Codec (TI)
TLV320AIC3106-Q1

Flash Memory + DRAM (Micron)
MT29C2G24MAAAAHAMD-5IT

Unknown
4GFK
8503

PCB#2 SIDE B: CELLULAR

1 notch = 1mm

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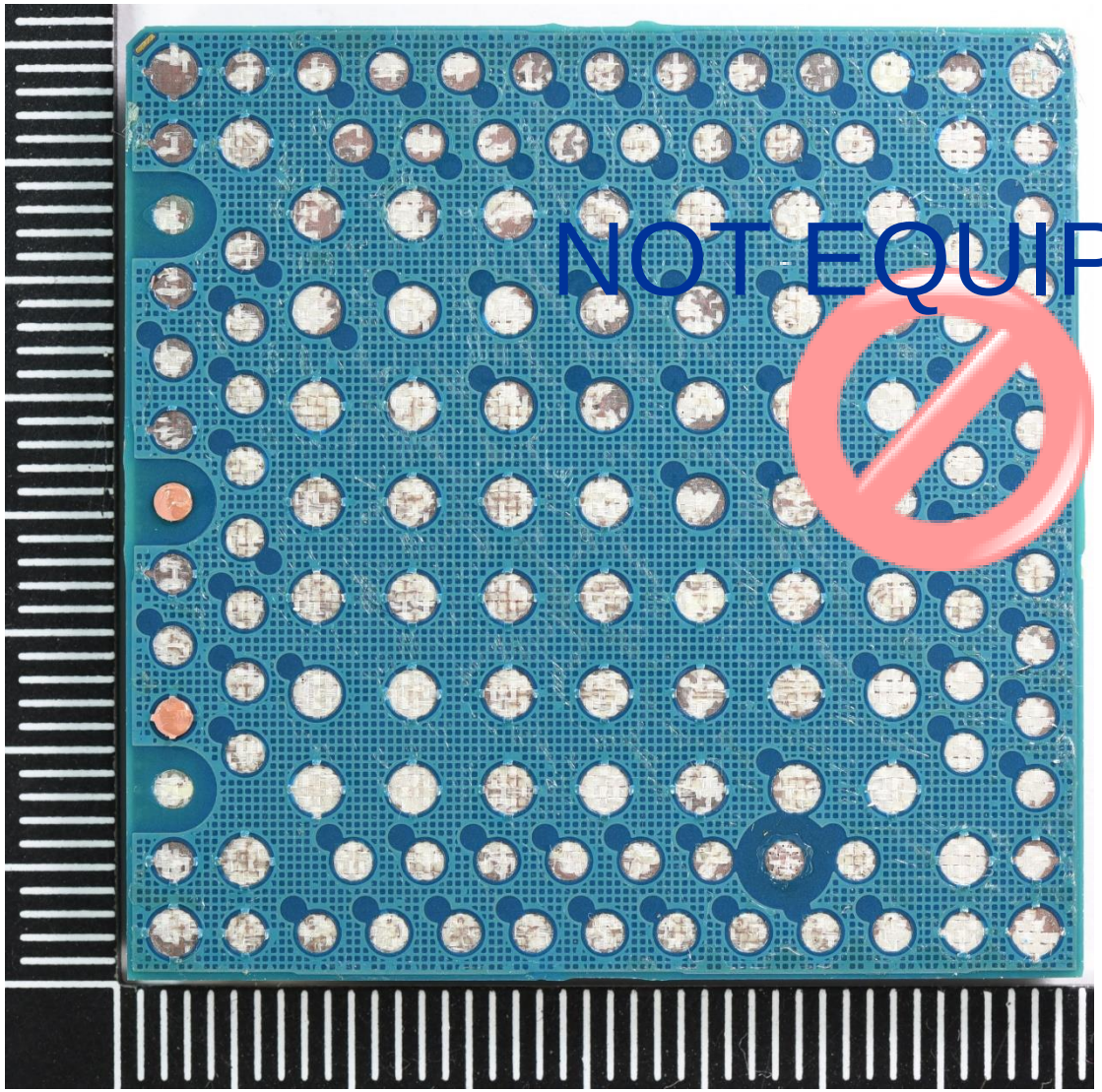
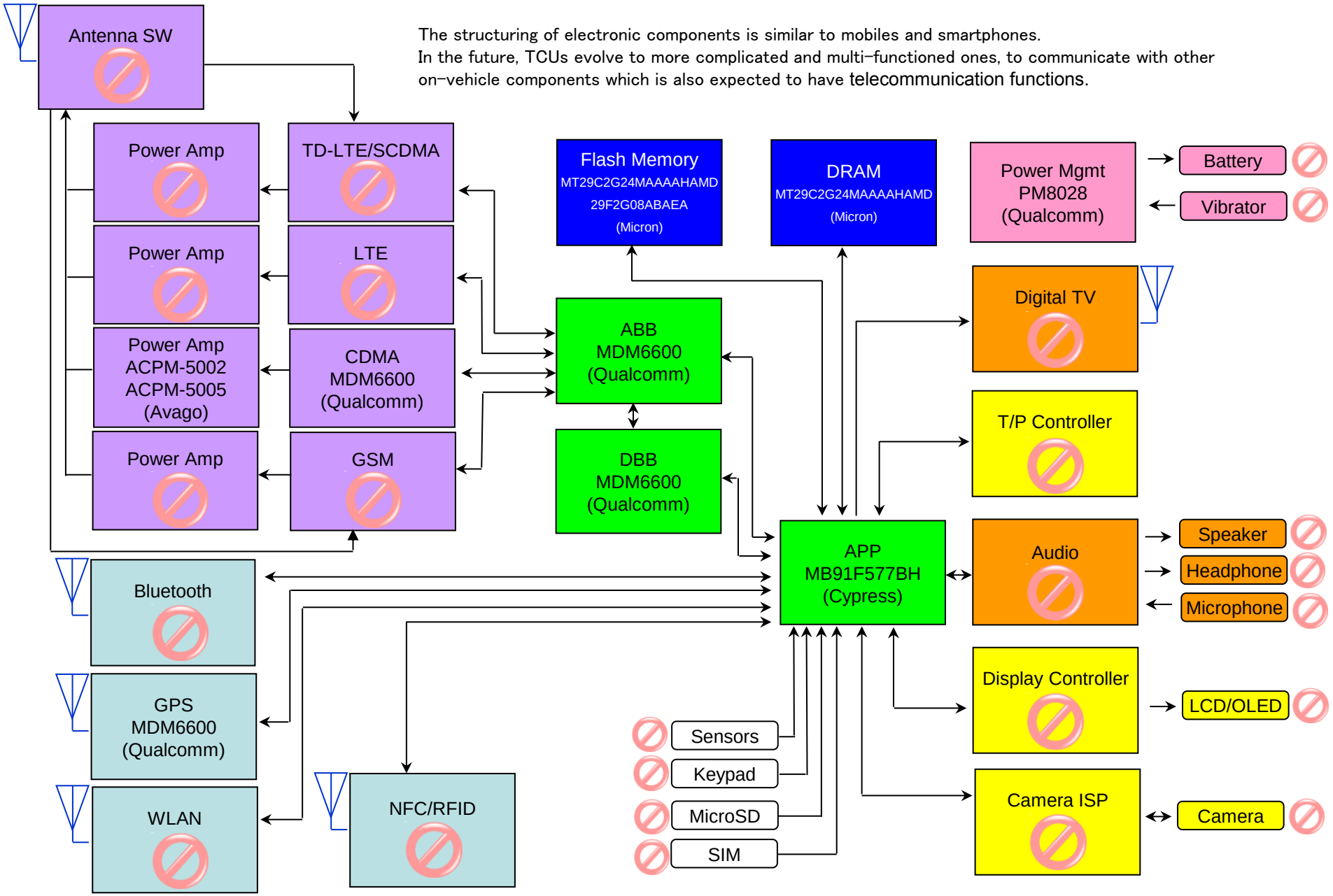
The telecommunication board has sigle-sided mounting. The reverse side is utilized for connection to the mating big board.



BLOCK DIAGRAM (with assumption)

The structuring of electronic components is similar to mobiles and smartphones.
In the future, TCUs evolve to more complicated and multi-functioned ones, to communicate with other on-vehicle components which is also expected to have telecommunication functions.



SERVICES

- TEARDOWN: on cellular phone, smartphone, tablet, laptop PC, digital still camera, LCD TV, and other mobile equipments.
- BILL OF MATERIALS: all-component-cost breakdown into more than 100 categories.
- MARKET REPORT: based on requests.
- SEMINAR: based on requests. Free seminars offered to regular subscribers every quarter.
- INTELLECTUAL PROPERTY: old phones available since 1996 up to date. Most of them are functional.

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