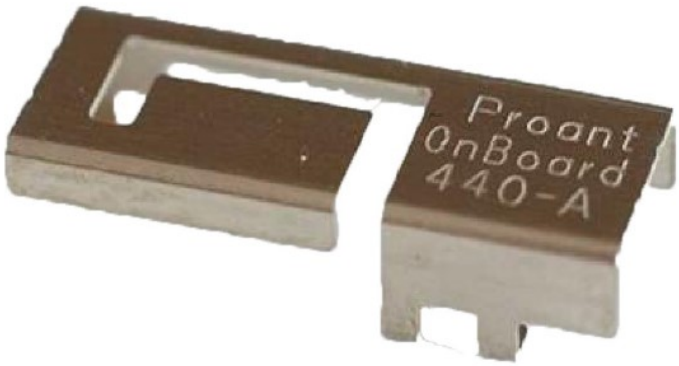
2.4GHz WiFi Antenna

ONOBARD-24G

Features

- High Performance SMD Antenna
- 2400—2500MHz
- Total Efficiency > 75% (-1.25dB)
- Return Loss <-10dB
- Impedance 50 ohm
- Measures 13.8 x 6.0 x 3.5mm
- Supplied Tape and Reel
- -40 to +85°C



Applications

- WLAN, Bluetooth, Zigbee, RFID
- Space Saving Applications
- M2M Industrial

Description

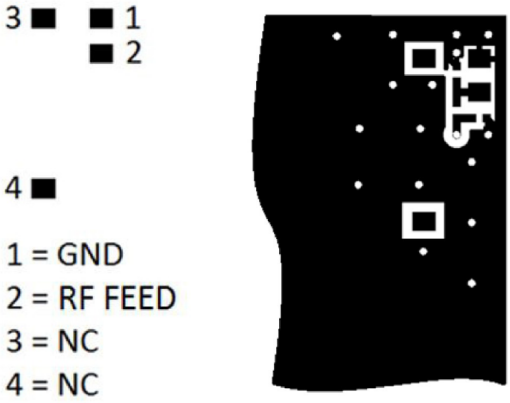
A Proant ONBOARD miniature Antenna for 2.4GHz / WLAN applications provides a high performance surface mounting Component Antenna.
Integrated antenna are a trade off of different aspects of RF design. This antenna provides a significantly higher performance over many embedded antennas whilst having a marginally larger footprint.

Ordering Information

Part Number	Description
ONBOARD-24G	Mini antenna 2.4GHz
ONBOARD-24GEVAL	Evaluation Board

Design Considerations

The antenna is developed for optimum performance when mounted on a ground plane. Therefor it is very suitable on a printed circuit board, where all empty space in the layout shall be filled solid Copper. This also means that no ground cut-out area is required under the antenna. If there are several layers on the PCB, there is an advantage to add via holes for interconnection of the ground areas. It is also very important that there is a ground clearance around the NC pads, through all layers of the PCB. Otherwise there will be capacitive coupling which may detune the antenna.



Pin configuration

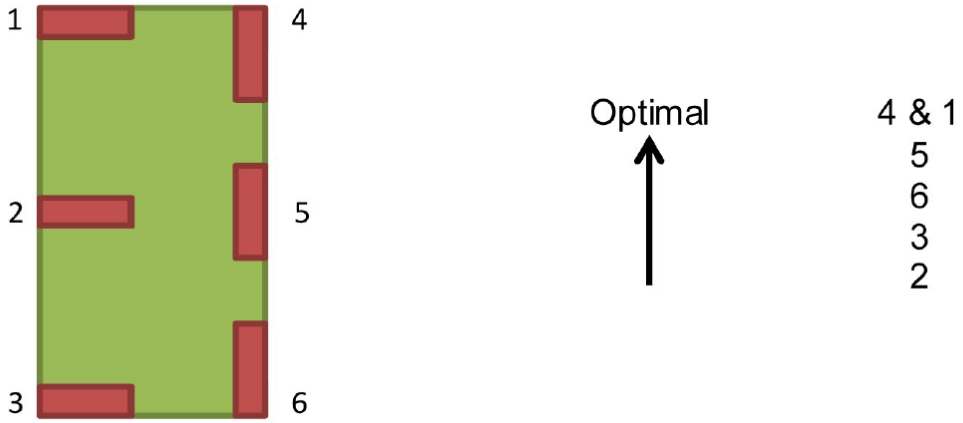
PCB Layout (from evaluation board)

The antenna is preferably positioned along one side of the PBC ground plane, where pin 1 shall be as close as possible to the layout corner.

It is also recommended to implement a pi-matching network as seen in the PCB layout to compensate for eventual mismatch due to the practical implementation. The components can be positioned below the antenna next to the feed pad. See part 8 for more details.

PCB Layout

The antenna can be positioned in many ways, although there are some positions which are more beneficial. Below picture shows a typical PCB with six possible antenna positions. We have arranged the positions according to the general best fit.



The antenna should be aligned with the PCB edge if possible. It is also important to align pin 1 & 2 along the outer side of the PCB, and even more preferably close to a corner. This fact makes position 2, 3 and 6 difficult to define, why these positions are less optimal.

The OnBoard SMD 2400 antenna enables that small electrical components are mounted inside the antenna keep-out block. This may have an impact on the antenna tuning and radiated performance, but is fully possible if there is limited space on the PCB.

Another general aspect on surface mounted antennas is regarding the PCB population. If other electrical components are positioned in the surrounding area of the antenna, some impact on the antenna tuning and radiated performance may be expected. It is recommended that such components are distributed below a topographical slope that starts on PCB level at the antenna keep-out block, and slowly increases the height.

It shall also be highlighted that plastic and metal parts in the near proximity of antennas may influence the antenna tuning and/or impedance. This aspect should be noted as a general guideline for all antennas. The effects are difficult to estimate without detailed information, but it is recommended to measure the antenna in the actual device after implementation.

Impedance Matching

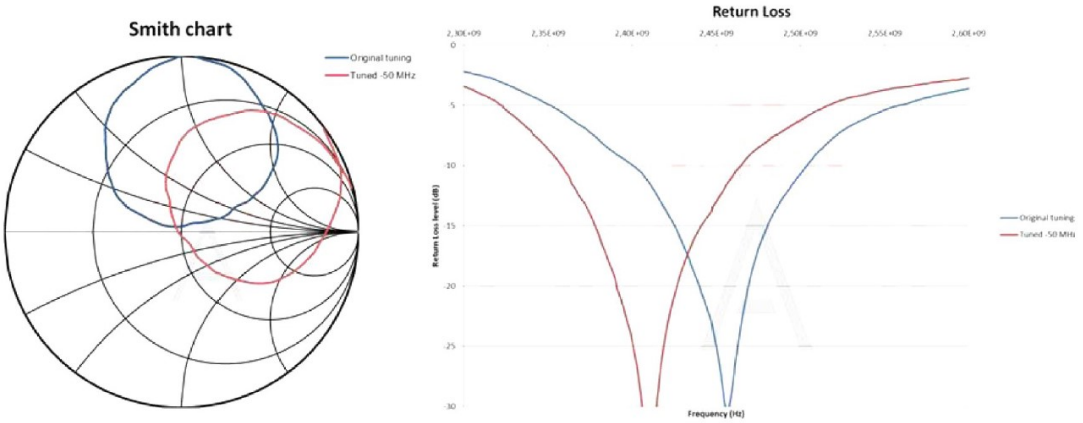
The antenna should have nominal tuning in most applications when C1 = 0 Ohm (measured with coaxial cable on the evaluation board). However the user may like to elaborate with the tuning if the implementation causes a resonate frequency shift. This part shows two examples of how a simple frequency tuning can be implemented.

Tune 50 MHz low

C1 = 2.7 nH (Murata LQW15AN2N7C00)

C2 = 0.75pF (Murata GRM1555C1HR75CZ01)

C3 = N/A

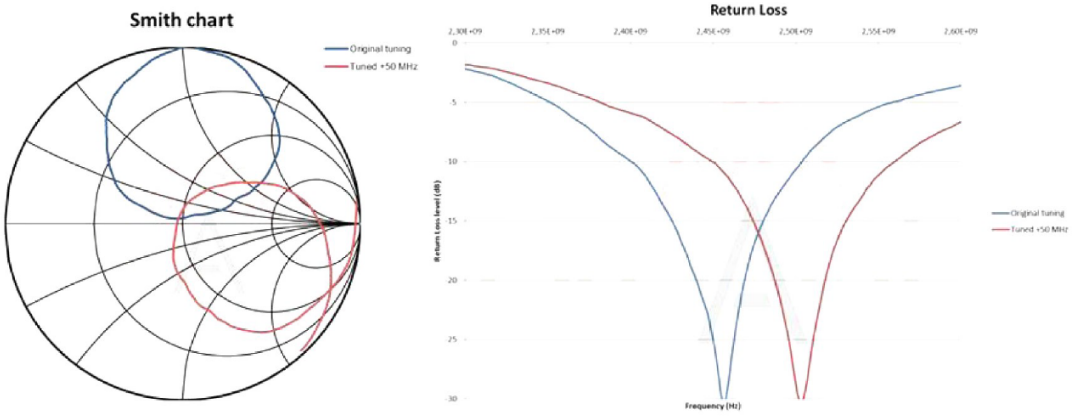


Tune 50 MHz up

C1 = 1.0 nH (Murata LQP15MN1N0W02)

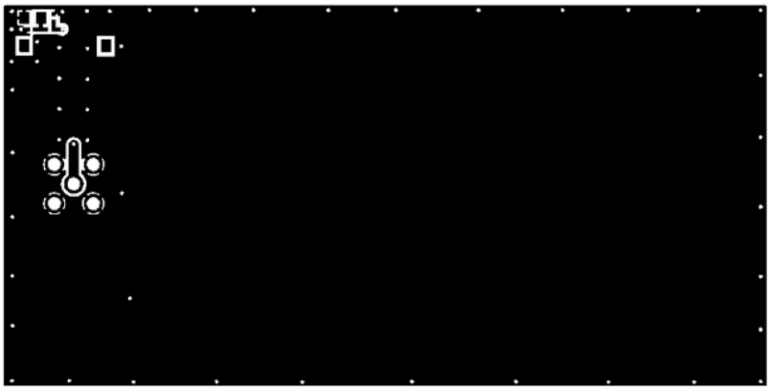
C2 = N/A

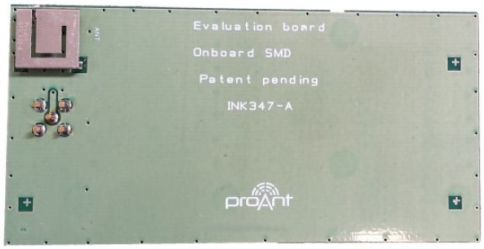
C3 = 1.0pF (Murata GRM1555C1H1R0CZ01)



Evaluation Board

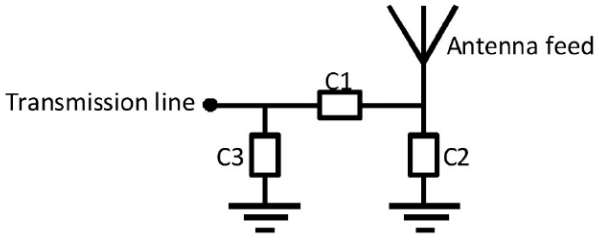
The evaluation board is developed to simplify antenna testing and evaluation. It has an arbitrary size of 100 x 50mm and includes an SMA connector. The purpose is to give a reference design for an optimal antenna implementation. The evaluation board can also be used to test other implementations by cutting and soldering the PCB into any device.





Evaluation board outline

The evaluation board has a matching circuit implemented next to the antenna. This is aimed to enable optimisation possibilities for the user. The component positions have the size for SMD components 0402 (1005 metric).



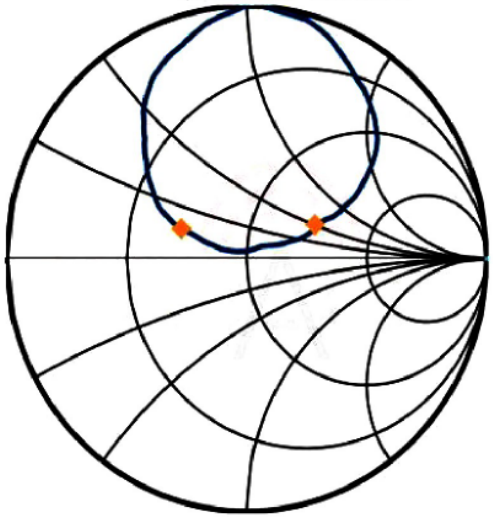
Matching circuit

The antenna is originally tuned for optimum balance at the 2.4GHz band, but it is common that the resonate frequency will shift during implementation in an arbitrary device. Therefore this matching circuit makes it possible to compensate for such effects. This is further described in part 9.

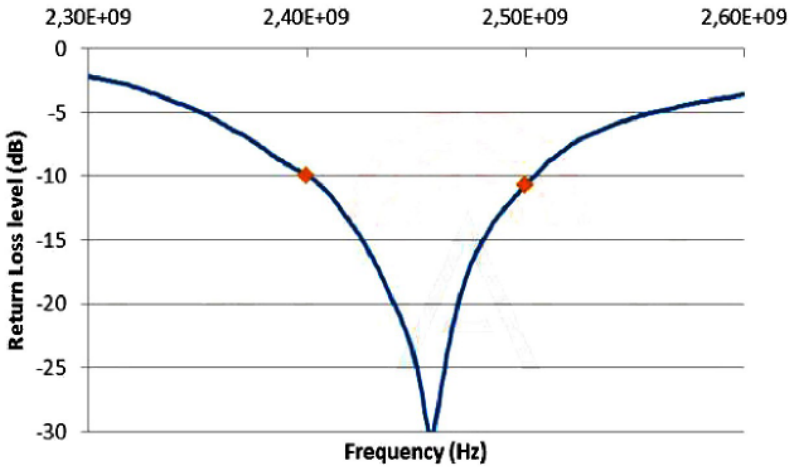
When delivered, C1 = 1.5nH, C2 = 0.5pF, C3 = N/A. This is for compensation of transmission line effects in the evaluation board.

Performance Data

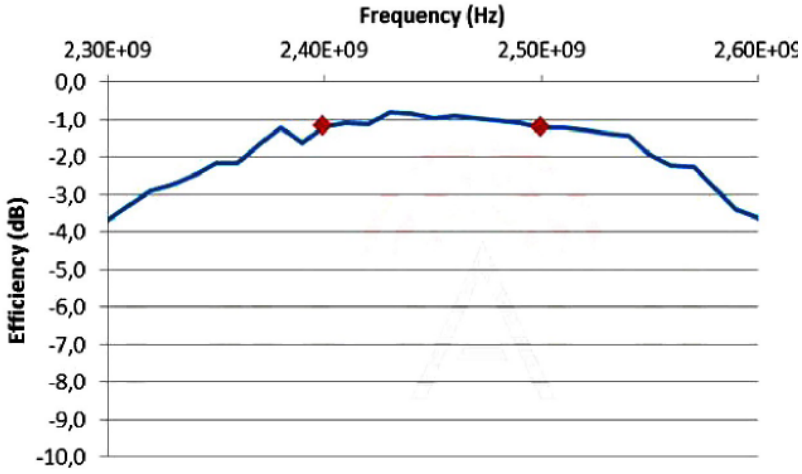
Smith Chart



Return Loss



Total Efficiency

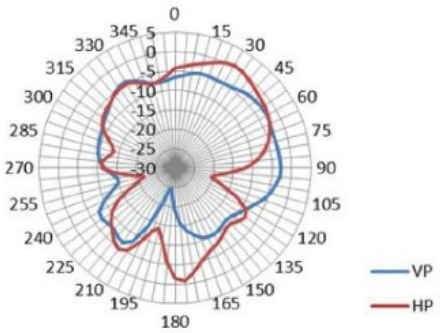


Radiation Pattern

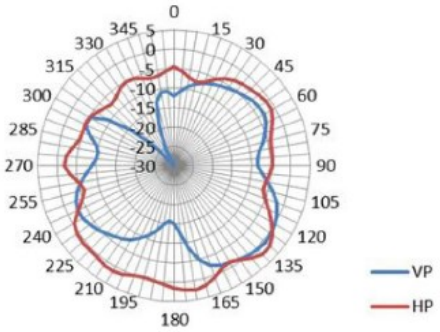
All results are measured with antenna mounted on the evaluation board. The figure to the right shows the corresponding antenna position for each chart. Gain values are given in dBi.

VP = Vertical Polarization, HP = Horizontal Polarization

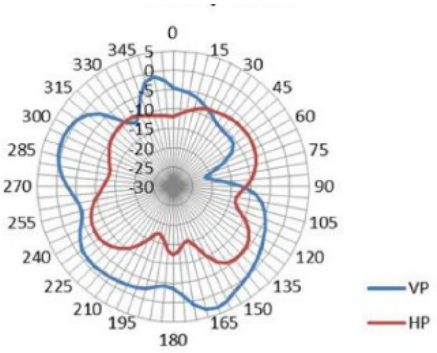
H Plane



V0 Plane

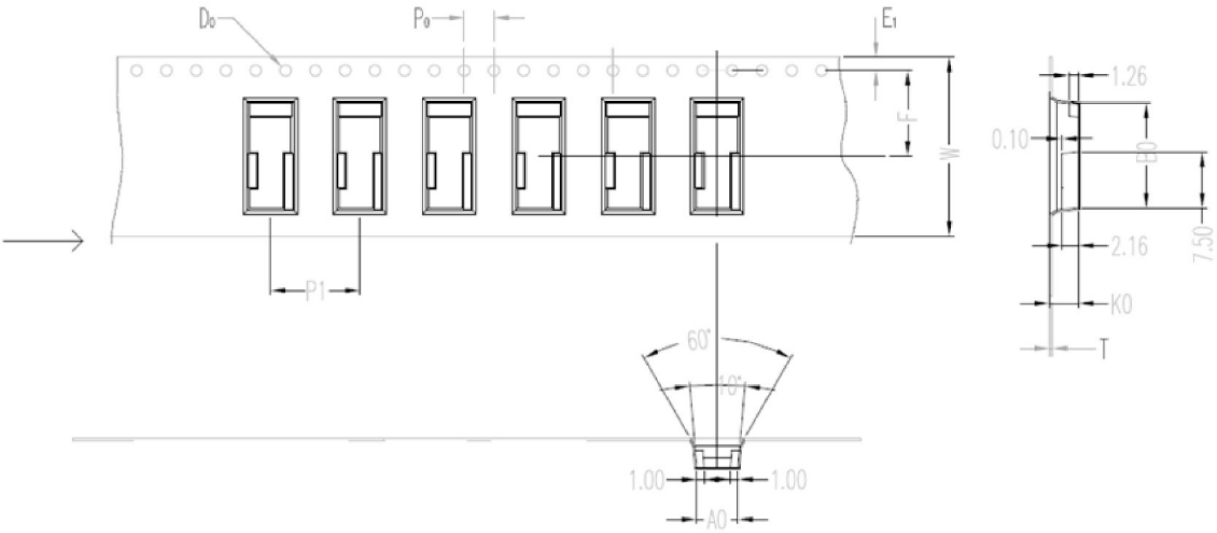


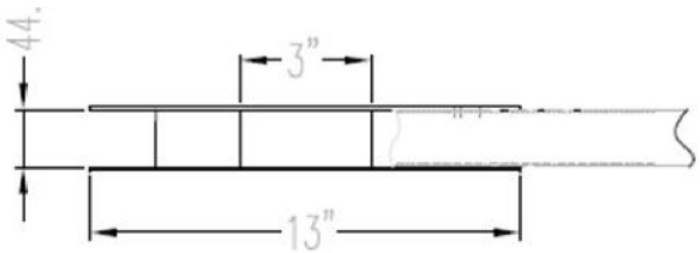
V90 Plane

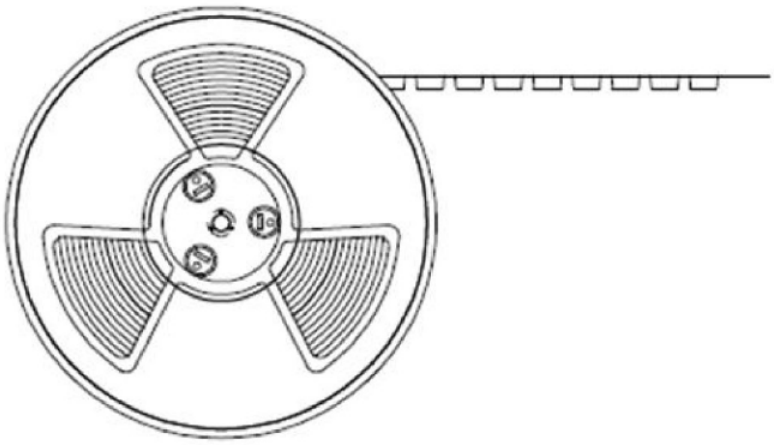


Tape and Reel Packaging Data

The antenna is delivered on tape and reel according to following specification quantity per 13" reel is 1000 pcs.

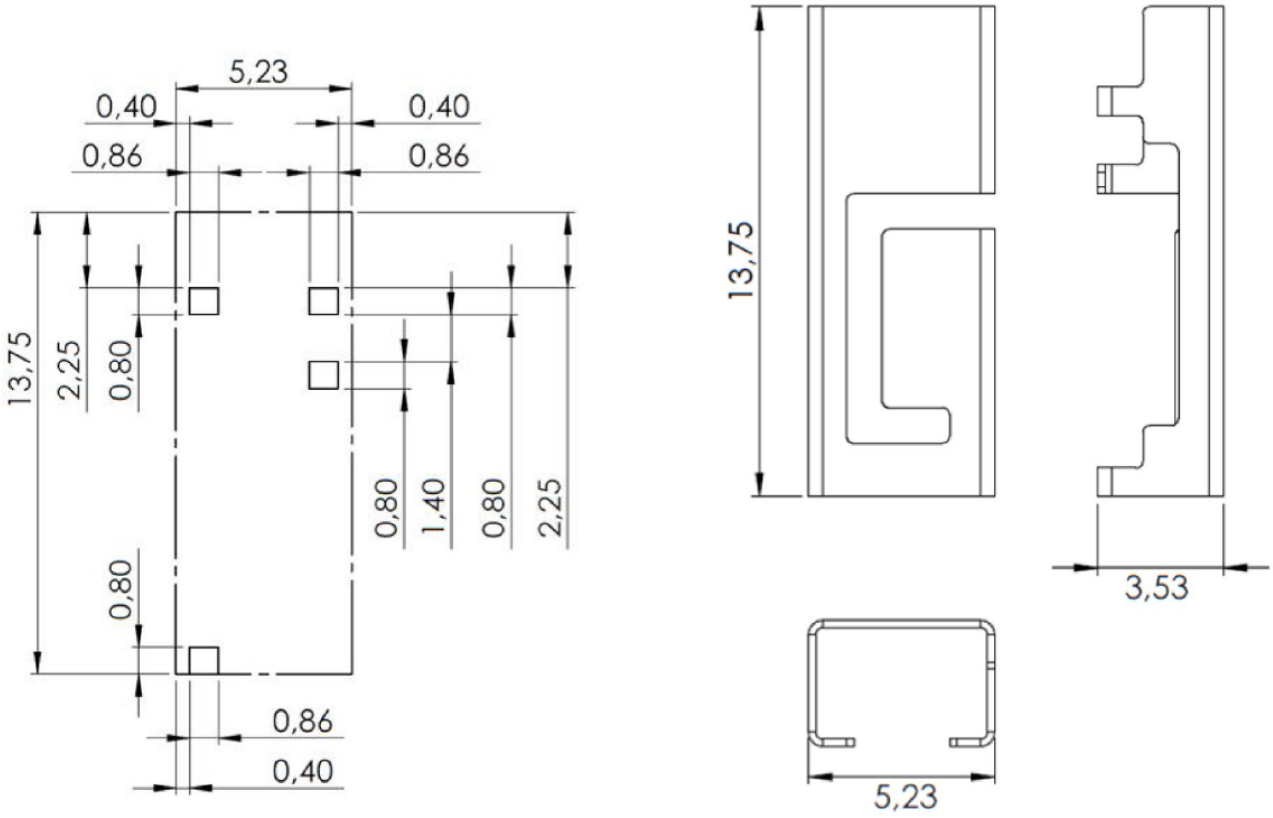






A_0	5.53 ±0.1
B_0	14.05 ±0.1
D_0	ø1.5 $^{+0.10}_{-0.00}$
E_1	1.75 ±0.1
F	11.5 ±0.15
K_0	3.83±0.1
P_0	4.0 ±0.1
P_1	12. ±0.1
P_2	2.0 ±0.15
S_0	
T	0.35 ±0.05
W	24.0 ±0.3

Mechanical Data



The sketch shows the antenna footprint and keep-out block. Above dimensions are given in millimetre.

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