



# nanoLTE

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where it's needed most

## nanoLTE E40 AP Product Description

NANO\_GST\_43310

101\_0.5

ip.accessLtd  
Building 2020  
Cambourne Business Park  
Cambourne  
Cambridgeshire  
CB23 6DW  
United Kingdom

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**Registered Office:  
Building 2020  
Cambourne Business Park  
Cambourne  
CB23 6DW  
UK  
Tel: +44 (0) 1954 713 700  
Fax: +44 (0) 1954 713 799**

**Further company information may be found at [www.ipaccess.com](http://www.ipaccess.com).**

## ***Revision History***

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<b>Version</b>	<b>Change Summary</b>	<b>Date</b>	<b>Author</b>
101_0.1	Updated for N4G_1.1	15 Dec 2015	AM4
101_0.2	Update details for E40 US band support	18 Jan 2016	AM4
101_0.3	Cosmetic adjustments	31 Mar 2016	AM4
101_0.4	Update references to other manuals	22 Jun 2016	AM4
101_0.5	Add hardware capability equivalence statement for 248 and 278	19 Jul 2016	AM4

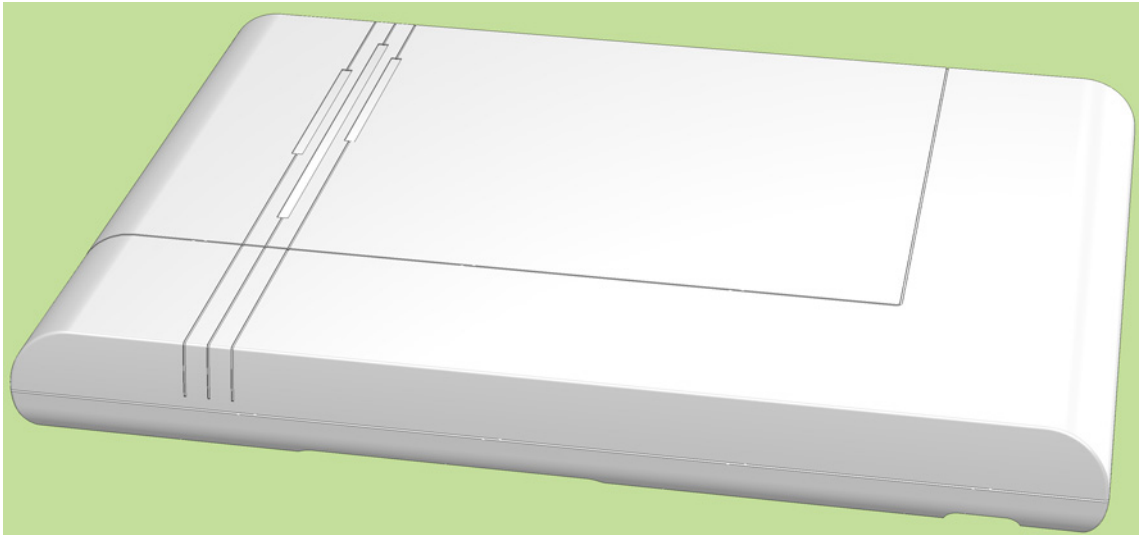
# Table of Contents

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<b>1</b>	<b>Introduction.....</b>	<b>1</b>
1.1	Related Information.....	1
1.2	Terminology .....	1
<b>2</b>	<b>Key Features .....</b>	<b>2</b>
<b>3</b>	<b>Product Details .....</b>	<b>4</b>
3.1	RF Capabilities.....	4
3.2	Throughput Performance .....	4
3.3	Operational Range.....	4
3.3.1	Long Range Extension (LRE).....	4
3.4	OA&M .....	5
3.5	Electrical and Mechanical .....	5
3.5.1	Power .....	5
3.5.2	Mechanical Design and Form Factor .....	5
3.5.3	Physical Interfaces .....	6
3.5.4	Antennas .....	6
3.5.5	Network Interfaces .....	7
3.5.6	Reset Button Description.....	7
3.5.7	Visual Indicators .....	7
3.5.8	Environmental Conditions .....	7
3.6	Accessories.....	8
3.7	Hardware Installation Options.....	8
3.8	Network Architecture.....	8
3.9	NOS OA&M Support for LTE APs.....	9
<b>4</b>	<b>Compliance to Standards .....</b>	<b>10</b>
4.1	Electromagnetic Compatibility (EMC) .....	10
4.2	Storage .....	10
4.3	Transportation.....	11
4.4	Safety.....	11
4.5	Hardware Equivalence for 248 and 278 Product Variants .....	11

# 1 Introduction

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The nanoLTE E40 AP (E40) is a single mode LTE only Access Point, built on advanced DSP technology. Supporting 2x2 MIMO with an output power of +21dBm per port (at the antenna connector), the E40 provides comprehensive LTE operation for Enterprise deployments.

This product is designed to provide coverage and capacity enhancement for indoor deployments.

## 1.1 Related Information

[REF_11105]	nanoLTE System Glossary (NANO_REF_11105)
[21.905]	Vocabulary for 3GPP Specifications (3GPP TR 21.905)
[36.104]	E-UTRA Base Station (BS) radio transmission and reception (3GPP TS 36.104)
[36.300]	E-UTRA and E-UTRAN Overall Description (3GPP TS 36.300)

## 1.2 Terminology

For common ip.access system terminology, see [REF\_11105].

For additional terms defined by 3GPP, see [21.905].

## 2 Key Features

The key features of the nanoLTE E40 AP are:

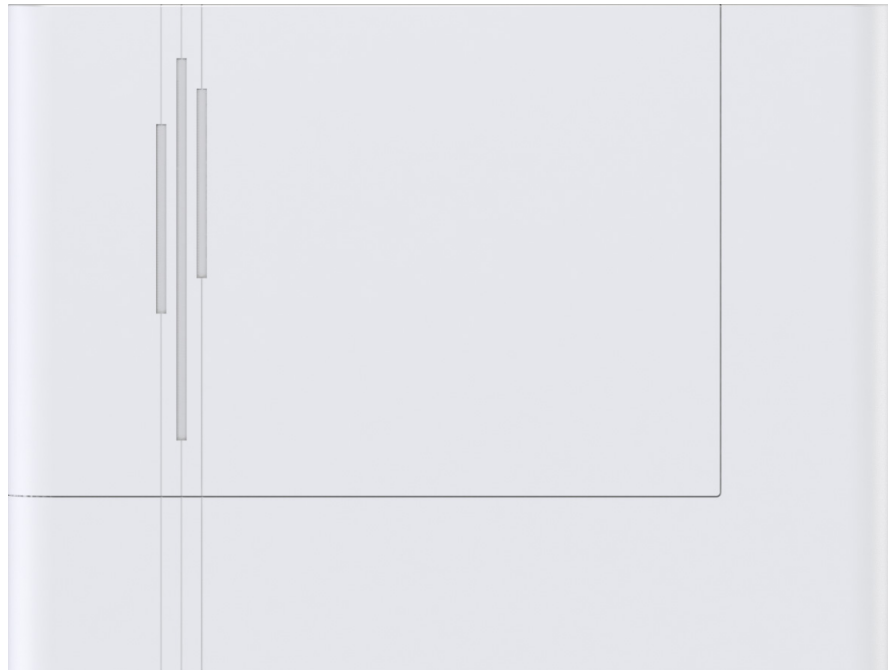
Feature	Details
3GPP Compliance	Compliant to [36.104].
Number of RF Carriers	Single Carrier.
Bandwidth	The nanoLTE AP supports the following bandwidths: <ul style="list-style-type: none"> <li>• 5MHz</li> <li>• 10MHz</li> <li>• 15MHz</li> <li>• 20MHz</li> </ul>
MIMO	2x2 MIMO-Single User Downlink only.
RF Average Output Power	2 x +21dBm (2 x 125mW).
Max Data Rate Throughput	In N4G_1.1, the supported maximum data rates are 75Mbps DL and 25Mbps UL over the air. The maximum throughput achievable also depends on the bandwidth configured and local radio conditions. The nanoLTE E40 AP is software upgradeable to 100Mbps DL and 37.5Mbps UL.
Simultaneous # Active Users	Up to 16 RRC Connected Users.
Network Interfaces	S1 over IP, X2 Interface is planned as a Software update.
Electrical Supply	12V @ 1.7A from external power supply.
Modes supported	FDD-LTE.
3GPP Frequency Bands (for LTE operation, or for LTE or WCDMA Network Listen)	EU 248J and 278J variants: <ul style="list-style-type: none"> <li>• Band 1 (2100 MHz)</li> <li>• Band 3 (1800 MHz)</li> <li>• Band 7 (2600 MHz)</li> <li>• Band 20 (800 MHz)</li> </ul> EU 248L and 278L variants: <ul style="list-style-type: none"> <li>• Band 3 (1800 MHz)</li> <li>• Band 7 (2600 MHz)</li> <li>• Band 8 (900 MHz)</li> <li>• Band 20 (800 MHz)</li> </ul> US 248M and 278M variants: <ul style="list-style-type: none"> <li>• Band 2 (1900 MHz)</li> <li>• Band 4 (2100 MHz)</li> <li>• Band 13 (750 MHz)</li> <li>• Band 17 (740 MHz)</li> </ul>
Operation	Single band operation, configured via OA&M.

Feature	Details
Receive diversity	Yes.
Receive sensitivity	Meets the requirements in [36.104].
Oscillator	High stability OCXO. Absolute frequency stability +/- 100ppb per annum under normal operating conditions.

**Note:** The specified data rates are for a single user and relate to air interface performance assuming an ideal radio channel. The data rates achieved at the application layer may vary subject to radio conditions, available backhaul bandwidth and number of simultaneous active users.

## 3 Product Details

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### 3.1 RF Capabilities

The E40 is Quad Band for both EU and US. See section 2 for band support.

### 3.2 Throughput Performance

The E40 platform is capable of high speed data transfer to LTE capable devices.

The platform is software upgradeable to support the following enhancements:

- Up to 16 simultaneous RRC Connected LTE users
- Up to 75Mbps peak downlink data (software upgradeable to 100Mbps)
- Up to 25Mbps peak uplink data (software upgradeable to 37.5Mbps)
- GBR/non-GBR bearer support

**Note:** The specified data rates are for a single user and relate to air interface performance assuming an ideal radio channel. The data rates achieved at the application layer may vary subject to radio conditions, available backhaul bandwidth and number of simultaneous active users.

### 3.3 Operational Range

With the standard antennae, the nanoLTE E40 AP has an approximate maximum range of 700m with 0dB path loss.

#### 3.3.1 Long Range Extension (LRE)

The LRE feature provides the option to increase the range of the nanoLTE AP by connecting the AP to an external PA. The maximum range is approximately 4km. This is configuration dependent.



## 3.4 OA&M

The E40 supports a management interface which allows direct configuration via the Network Orchestration System (NOS). This is the same NOS as the 3G one that can be updated to support nanoLTE Access Points.

## 3.5 Electrical and Mechanical

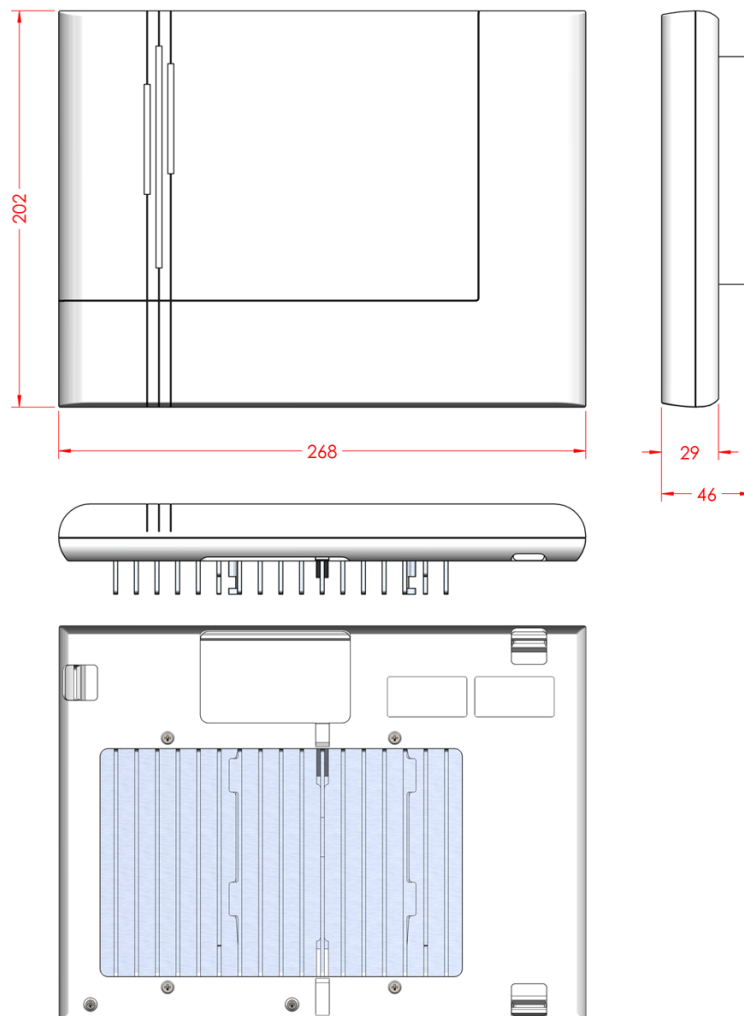
### 3.5.1 Power

Maximum power consumption is approximately 20W. The E40 requires an external power supply with a rating of 12V DC.

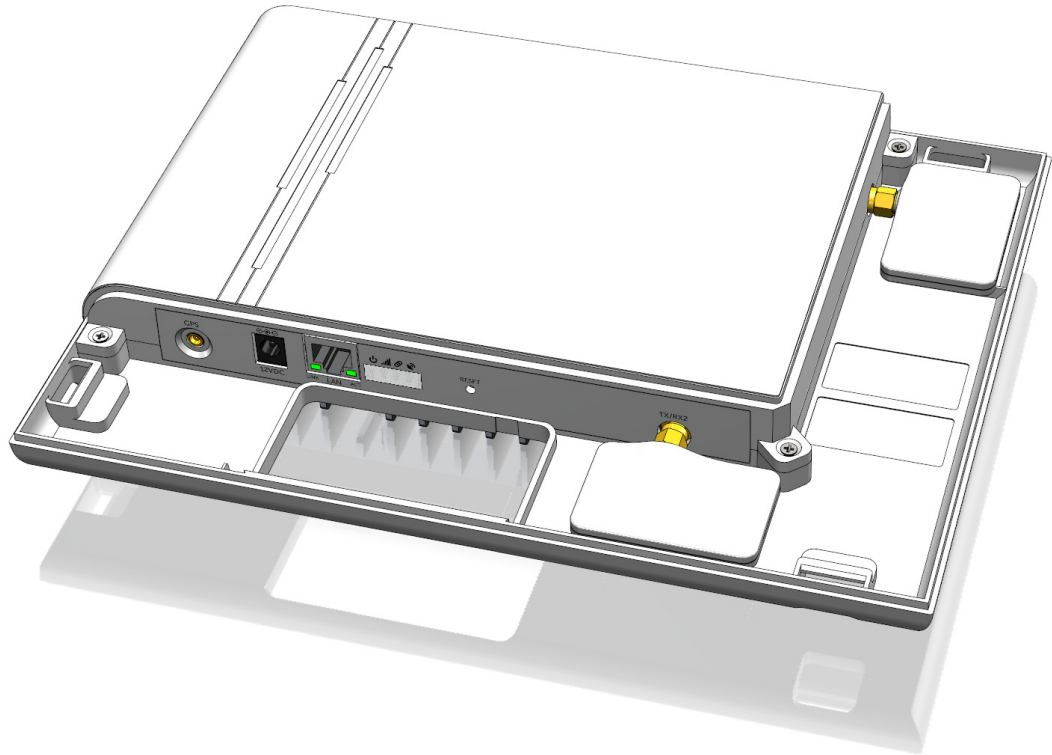
All electrical inputs are protected against over voltage and reverse polarity connections.

### 3.5.2 Mechanical Design and Form Factor

Dimensions - W x H x D	202mm x 46mm x 268mm
Weight - E40 unit only	Approximately 1.2Kg



### 3.5.3 Physical Interfaces



The following physical interfaces are presented on the enclosure panel:

- DC power jack
- RJ45 Ethernet (LAN)
- 2 x SMA female RF
- Reset Switch
- GPS Antenna Port (inactive)

### 3.5.4 Antennas

When used in SISO mode, it is possible to have one antenna for the Tx path and one antenna for the Rx path. The nanoLTE E40 AP has 2 antenna elements housed internally within its external plastic enclosure. These are directly connected to the main PCB assembly by means of SMA connectors. The connectors present duplex transmit and receive RF signals for each port.

External antennas, for example panel antennas, can be connected instead of the supplied components. This can be achieved by removing the antenna cover, which allows direct access to the SMA connectors for cabling.

### 3.5.5 Network Interfaces

The AP provides a single electrical Ethernet network interface via a standard RJ45 socket. The interface supports 1Gbps with MDI/MDIX cable auto-selection.

The Ethernet interface is used for:

- Backhaul connection to the EPC via S1 over IP
- OA&M connection to NOS via TR-069

This interface is IP access medium (e.g. DSL or LAN) agnostic subject to the bandwidth, jitter and latency being within limits.

The backhaul and management connections are secured using IPsec.

### 3.5.6 Reset Button Description

The nanoLTE E40 AP has an internal reset button to allow manual rebooting of the unit.

- Press for up to 5 seconds (subject to change) to execute a soft reboot of the AP
- Press for more than 5 seconds to execute a restore to factory defaults

The reset button is not exposed on the external enclosure. However, as it is recessed with respect to the external casing and is accessible via a small hole, it can be operated by means of a simple mechanical reset tool, such as a needle.

### 3.5.7 Visual Indicators

The nanoLTE E Class AP has the following LED indicators that display the status of AP:

- 4G Power
  - Red at power up then Green when initialisation is complete
- 4G Service
  - A red/green LED that shows the services status of the AP - steady green indicates normal service, while other states can indicate firmware upgrade in progress, provisioning states and certain fault conditions
- Ethernet - The Ethernet port has integrated LED indicators showing connection status and link activity

### 3.5.8 Environmental Conditions

The AP complies with the environmental conditions set out in EN 300 019.

	Temperature	Humidity
Operating Conditions	0C to +40C	10% to 70% non-condensing
Storage Conditions	-20C to +80C	0% to 90% non-condensing

The nanoLTE E40 AP has an ingress rating of IP40 in accordance with EN 60529 and is cooled passively (i.e. no internal fan).

## 3.6 Accessories

The following accessories are supplied with the product:

- 12V DC power supply
- Wall mounting plate
- Tool for detaching the AP from the wall mounting plate

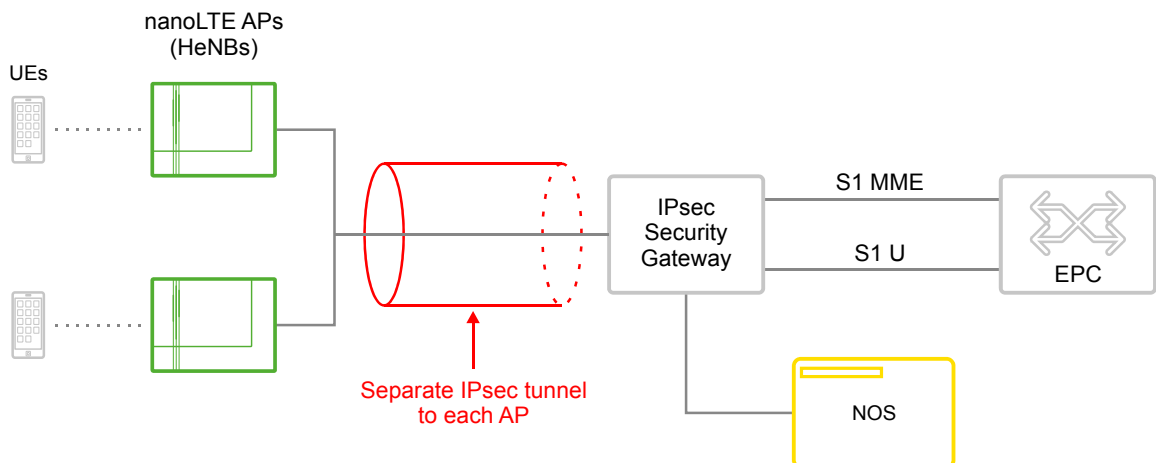
## 3.7 Hardware Installation Options

The nanoLTE E40 Access Points are designed for wall mounting.

## 3.8 Network Architecture

The E40 connects to the EPC directly via the S1 interface in accordance with 3GPP standards based LTE architecture (see [36.300]). Specifically, the nanoLTE E40 AP (HeNB) connects to the MME and SGW network elements via the S1-MME and S1-U interfaces respectively by means of IP transmission links. The IP links are secured using IPsec which is terminated by a Security Gateway.

The following diagram summarises this architecture:



**Note:** Although IPsec is shown in this architecture, the general functionality of the nanoLTE E40 AP has no dependency on the use of IPsec. In environments where the end-to-end backhaul between nanoLTE E40 APs and the EPC is fully secure, the use of IPsec is optional.

**Note:** The nanoLTE E40 AP does not require a connection to an LTE HeNB-GW and this element is not provided as part of this solution.

### 3.9 NOS OA&M Support for LTE APs

The NOS provides management capabilities for nanoLTE Access Points via the TR-069 management interface. Configuration Management and Fault Management are provided using the standard TR196 v2 data model.

The nanoLTE AP can also report Performance Management measurements to the NOS, and the NOS can produce KPI reports from the measurement data.

The NOS includes an LTE AP Create Site Wizard and a Neighbour Cell Wizard for selecting previously defined LTE, 3G and 2G neighbours for handover, reselection and CSFB.

**Note:** CSFB is only used when the UE or the core network does not support VoLTE.

## 4 Compliance to Standards

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Any nanoLTE Access Point equipment installed on site conforms to the Essential Requirements of the R&TTE Directive 1999/5/EC and is subject to the legal requirements set by the local authorities.

The equipment is required to fulfil fire load requirements (describing the energy that the equipment would add to a fire) in accordance with EN 60950. The fire load shall not increase with future changes to the hardware.

The nanoLTE Access Points have CE marking.

### 4.1 Electromagnetic Compatibility (EMC)

The nanoLTE Access Points comply with the following standards and specifications:

- EN 61000-4-2 Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques Section 2: Electrostatic discharge immunity test Basic EMC Publication.
- EN 61000-4-3 Electromagnetic compatibility; basic immunity standard: radiated, radio frequency electromagnetic fields; immunity test.
- EN 61000-4-4 Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques Section 4: Electrical fast transient/burst immunity test Basic EMC publication.
- EN 61000-4-5 Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques Section 5: Surge immunity test.
- EN 61000-4-6 Electromagnetic compatibility; basic immunity standard: conducted disturbances induced by radio-frequency fields; immunity test.
- EN 61000-4-11 Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques Section 11: Voltage dips, short interruptions and voltage variations immunity.
- EN 301 489-1: Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services.
- EN 301 489-23: Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services.
- 3GPP TS36.104: 3rd Generation Partnership Project; E-UTRA Base Station (BS) radio transmission and reception; LTE FDD.

### 4.2 Storage

The nanoLTE Access Point complies with the following standard for storage:

- EN 300 019-1-1 Class 1.1 "Partly temperature-controlled storage".

## 4.3 Transportation

The nanoLTE Access Point complies with the following standard for transportation:

- EN 300 019-1-2 "Class 2.3 Public Transportation".

## 4.4 Safety

The nanoLTE Access Point complies with the following standard for safety:

- EN60950-1:2006 Safety of information technology equipment Including Electrical Business Equipment.

## 4.5 Hardware Equivalence for 248 and 278 Product Variants

The 248 and 278 product variants have an identical hardware build for each set of supported bands. Hence the hardware build is identical in each of these cases:

- 248J and 278J
- 248L and 278L
- 248M and 278M

The only difference between 248 and 278 variants is that internal fuses within the processor are configured on the 278 variants in order to store unique security information, allowing the product to boot up securely.

**Note:** To implement the added security, the software/firmware has been adjusted for the 278 variants. Product operation and in particular the RF operation of this variant is not altered in any way. The RF Technology (LTE), frequencies and power level are identical between both variants.

In respect of the 248M and 278M variants of the nanoLTE E40 AP, ip.access has reviewed the Software Changes section of the FCC Permissive Changes Document dated 16th Oct 2015. It has been determined that the difference between these two product models can be classed as a permissive change.