Case Design Guidelines for Apple Devices

Release R8

Developer

Contents

Figures

1. Cases

1.1 Product Design

A well-designed case will securely house an Apple device while not interfering with the device's operation. Significant factors in mechanical design include access to the device's sensors, controls, and connectors.

1.1.1 Device Layouts and Dimensions for Apple Devices

Cases must be designed to accommodate the full range of Apple device sizes within each product's dimensional variation. Dimensional drawings with tolerances for all Apple devices can be found in Device Dimensional Drawings (page 15).

1.1.2 Access to Controls

The case must readily permit the user to access and operate the device's mechanical controls. This includes volume and ring/silent controls, sleep/wake control, and the home button.

1.1.3 Access to the Headphone Jack and 30-pin or Lightning Connector

The case must provide ready access to the headphone jack. The headphone jack opening must be at least 6.0 mm in diameter and at most 14.0 mm deep. At least 6.5 mm in diameter and at most 10.0 mm deep is recommended for best compatibility with a range of headphones.

The case must also provide unobstructed access to either the 30-pin connector or the Lightning connector.

If the case is for an Apple device with the Lightning connector, the opening must be at least 12.05 mm by 6.30 mm with full radii rounded edges. 13.65 mm by 6.85 mm is recommended for best compatibility with a range of cables and docks.

In addition, the headphone jack and 30-pin or Lightning connector openings must be designed with enough margin to compensate for shifting or dimensional changes of the case material.

1.1.4 Device Protection

Cases must protect the Apple device from a 1 m drop onto a hard paved surface in any device orientation.

Specifically, exposed glass on the Apple device must not come within 1 mm of a flat surface, such as a table or floor, in any orientation when the case is attached. This may be achieved by either covering the exposed glass or creating features around it that will space the exposed glass at least 1 mm away from the flat surface.

1.1.5 Cover Glass Contact

Cases that claim compatibility with iPhone 6 or iPhone 6 Plus should not contact the cover glass as defined in their dimensional drawings. See iPhone 6 (page 17) and iPhone 6 Plus (page 18).

1.1.6 Dock Compatibility

For compatibility with docks, the distance from bottom of the Apple device to the outside of a case should not exceed 1.8 mm.

1.2 Acoustics

The case must not impair or degrade the acoustical performance of an Apple device.

1.2.1 Speaker and Microphone Openings

When Apple devices have speakers or microphones, their locations may vary from model to model. Refer to the dimensional drawings for various Apple devices cited in Device Layouts and Dimensions for Apple Devices (page 7). The case must not obstruct the speaker or microphone ports.

1.2.2 Speaker to Microphone Coupling

The case must not facilitate the conduction of sound from the speaker to any microphone. Such sound conduction can cause echoing in phone calls.

1.2.3 Call Quality

The case must not impair or degrade the user's experience making and receiving both audio calls over a cellular network or video calls using Apple's FaceTime software. User testing must be conducted in handset, speakerphone, and headset modes of operation, to confirm that the case does not change the loudness or frequency response of the speakers or microphones. In addition, the user must not be able to detect any sound distortion resulting from enclosing the Apple device in the case.

1.3 Sensors

Some Apple devices contain several sensors, including an ambient light sensor, a magnetic compass, a proximity sensor, an accelerometer, and a three-axis gyroscope. Cases must be designed so they do not interfere with the operation of these sensors.

1.3.1 Ambient Light and Proximity Sensor Interference

The ambient light sensor and proximity sensor locations for various Apple devices are shown in the dimensional drawings cited in Device Layouts and Dimensions for Apple Devices (page 7). Some of the dimensional drawings specify a recommended keep-out area around these sensors. No material must be allowed to cover these sensors or their keep-out areas, this includes films and privacy screens. Cases that allow the Apple device to slide around must not obstruct any sensors.

1.3.2 Magnetic Interference

Apple recommends avoiding the use of magnets and metal components in cases.

Cases for Apple devices must not affect the device's built-in magnetic compass (if present).

Additionally, the iPhone 6 Plus has an autofocus rear camera equipped with optical image stabilization that can be affected by magnets and metal components in cases and rear camera accessories. Cases and rear camera accessories that claim compatibility with iPhone 6 Plus must not affect operation of the autofocus rear camera.

1.3.3 Touch ID Sensor

Cases for Apple devices must not inhibit the use of the device's Touch ID sensor (if present). See the device's dimensional drawing for the keep-out area.

1.4 Camera

This section applies to all Apple devices that are equipped with a camera (with or without a flash). The field of view (FOV) of the camera and the illumination provided by the flash is designed for each Apple product. It is imperative that manufacturers consult technical specifications released for each product and do not assume these parameters are shared between products.

Images from the camera may be affected by the geometry, color and surface finish of the camera opening in the case.

1.4.1 Geometry

The camera lens field of view must not be blocked. Making the case opening around the camera too small may block the field of view of the lens. This may cause vignetting in the image, where the corners of the image are darker than the center. Blocking marginal rays just outside the field of view of the lens may also reduce the sharpness of the image. See Device Layouts and Dimensions for Apple Devices (page 7) for the detailed mechanical keep-out.

The case opening must not be designed in a way that directs stray light into the camera. If the opening is too narrow or too steep, it may reflect light into the camera, washing out the image or adding an unwanted color cast. Adding a chamfer to the camera window and making the window larger can help to direct stray light away from the camera. Additionally, where the product is equipped with a flash, a narrow or steep opening may reflect light from the case opening back into the camera or scene. This may cause the image to appear washed out or contain unwanted artifacts. A wider opening and chamfer will help direct light reflected from the case edges away from the scene and camera.

1.4.2 Color

Note: A matte black material or coating around the camera hole opening is recommended.

Any light reflected from the case may pick up the color of the case. Black material or black coating can help avoid color bleeding into the camera from an external light source or the flash. The darker the color, the less light may be reflected from the source into the camera.

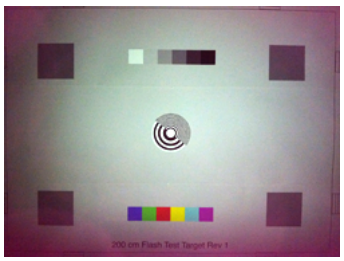
1.4.3 Surface Finish

If the cone opening is < 120°, then a semi-gloss finish around the camera opening is recommended. The flash is a strong source of light and reflections from the camera case opening edge should be managed so they do not reflect back into the camera or the scene. Semi-gloss material can direct light away from the camera if combined with a > 95° angle. If the angle is too narrow a high gloss material may reflect light back into the camera. Matte or diffuse materials scatter light in all directions and may increase the likelihood that light from the flash or strong sources in the scene is reflected into the camera.

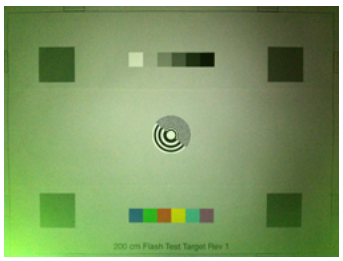
1.4.4 Image Degradation Examples

Figure 1-1 Image degradation by color shifting

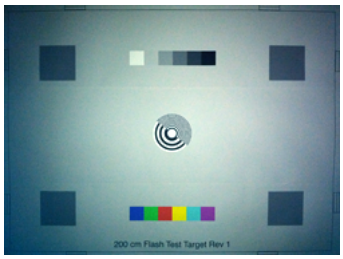
Reference



Degraded (red)



Degraded (green)

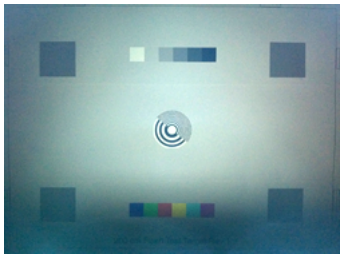


Degraded (blue)

1.4.4.1 Contrast Decrease

Figure 1-2 Image degradation by decrease of contrast

Reference



Degraded

1.4.4.2 Image Blocking

Figure 1-3 Image degradation by blocking

Reference Degraded

1.4.4.3 Flash Interference

Figure 1-4 Image degradation by flash interference

Reference Degraded

1.5 Reliability

Cases for Apple devices must be tested to verify that they will withstand long-term use under typical use conditions, and that they do not impair or degrade the functionality of the device, damage it or its immediate surroundings, or adversely affect the user.

1.5.1 Device Insertion and Removal

The case must hold the Apple device securely while permitting its easy insertion and removal. The case and the enclosed device must not be damaged by the repeated insertion and removal of the device from the case under conditions representative of long-term use in a variety of environments.

1.5.2 Colorfastness

Any dyes, inks, or coatings in or on the case must not bleed color onto either the device or its user, particularly while the case is in contact with common substances such as water or sunscreen.

1.6 Environmental

Cases for Apple devices must comply with applicable environmental regulations in the regions in which such cases are to be sold, and any applicable substance or material restrictions, including applicable restrictions on the following substances:

- Lead (Pb)
- Cadmium (Cd)
- Mercury (Hg)
- Hexavalent Chromium (Cr(VI))
- Hexavalent Chromium (Cr(VI)) in leather
- Nickel (Ni) plating on user-accessible surfaces
- Polybrominated biphenyls (PBB)
- Polybrominated diphenyl ethers (PBDE)
- Azo-based dyes that release the aromatic amines specified in European Directive 2002/61/EC
- Natural rubber latex
- Formaldehyde
- Endangered species of flora and fauna in products or packaging (US Lacey Act)
- Perfluorooctanoic Acid (PFOA)
- Perfluorooctane Sulfonates (PFOS)
- Phthalates

1.7 RF

1.7.1 Materials and Coatings

Cases for Apple devices must not contain materials or coatings that absorb radio frequency energy. Such materials can impair or degrade the performance of cellular communication antennas or GPS, Wi-Fi, or Bluetooth antennas. Examples include (but are not limited to) the following:

- Metals (e.g. steel, aluminum, magnesium, titanium, etc.)
- Plastics with any carbon content
- Plastics with any glass content
- Plastics with metallic plating
- Metallic paints
- Black paints with high carbon loading
- White paints with high titanium dioxide loading Metallic
- Physical Vapor Deposition (PVD) coatings

1.7.2 Near Field Communication (NFC)

Cases that claim compatibility with NFC enabled Apple devices (such as iPhone 6 and iPhone 6 Plus) must not degrade device NFC transaction performance.

1.8 Touchscreen

The touch interface in an Apple device senses the presence of one or more fingers on its surface. Any material between the surface and the user's hand, even a very thin sheet of plastic, can affect the performance of the touch interface.

1.8.1 Overlay

If a case design requires a touchscreen to be overlaid with another material, the material must be:

- Thinner than 0.3 mm
- Designed so that there are no air gaps between it and the touchscreen surface
- Not be electrically conductive

1.8.2 Edge Swipe Gestures

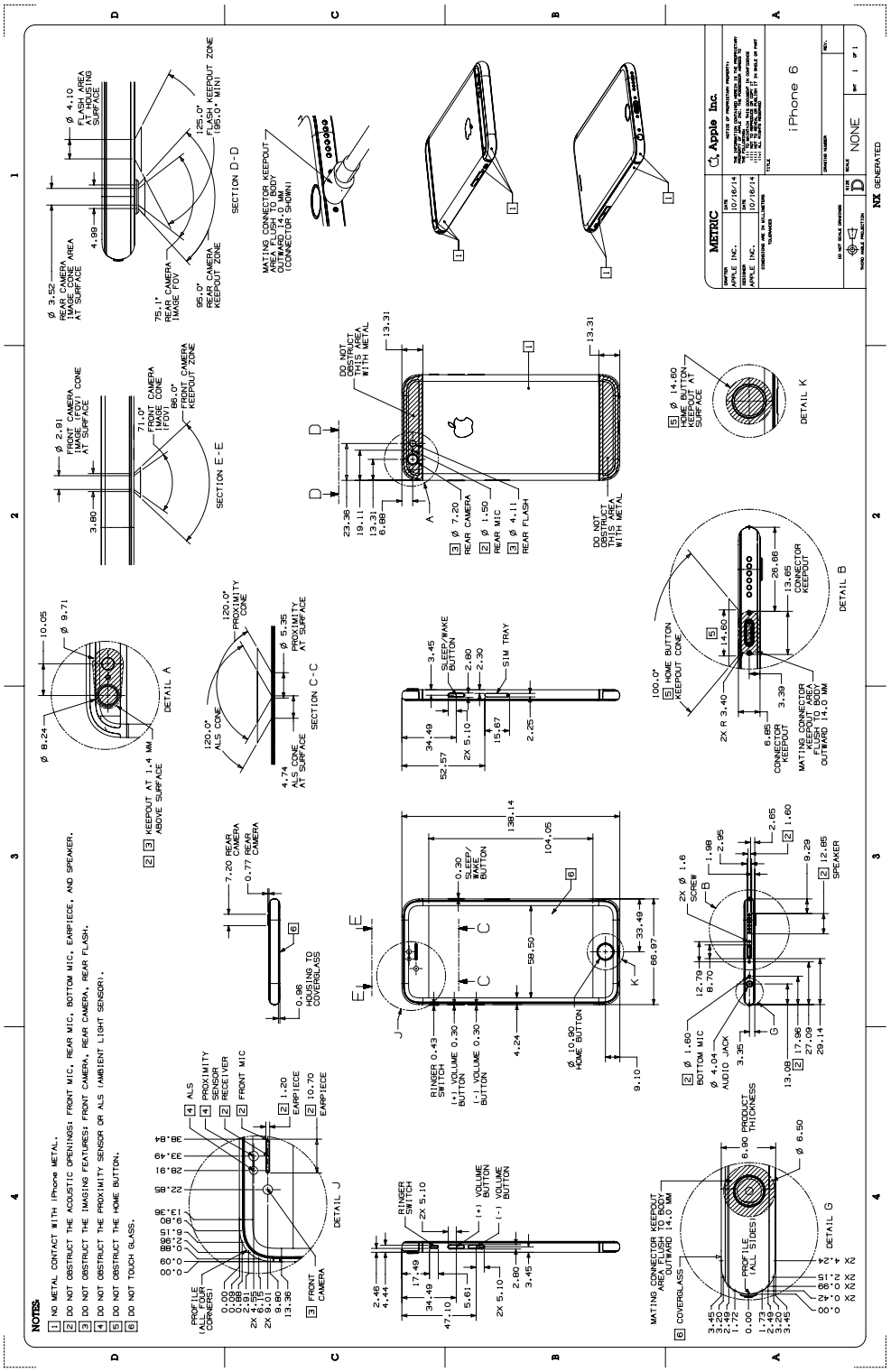
A case must allow the user to use edge swipe gestures that were introduced in iOS 7.0. These gestures include bringing up Control Center, Notification Center, and swiping back from apps that may use edge swipe gestures (such as the Messages app).

2. Device Dimensional Drawings

This chapter contains the following dimensional drawings:

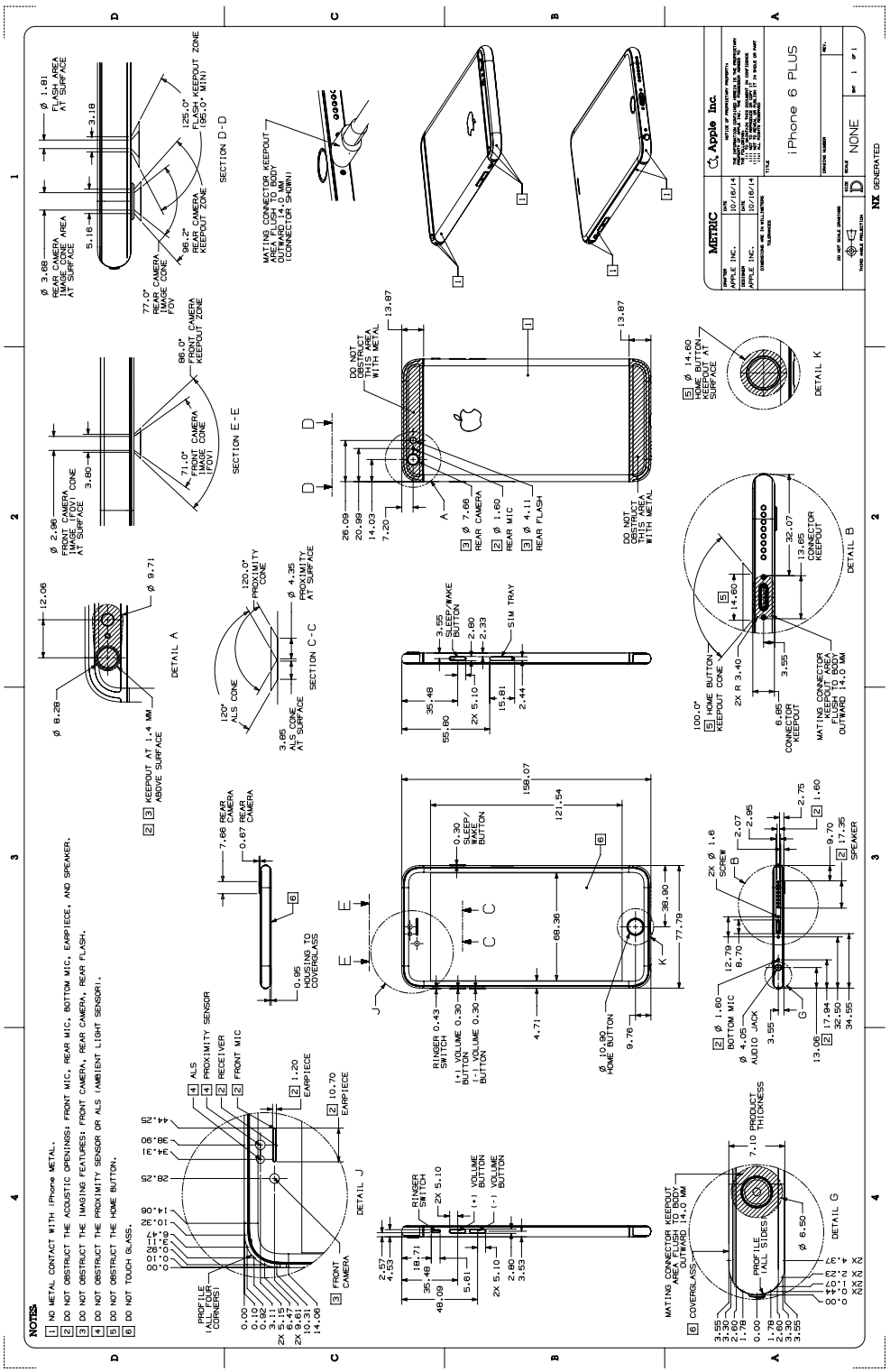
2.1 iPhone 6

Figure 2-1 iPhone 6 Dimensional Drawing



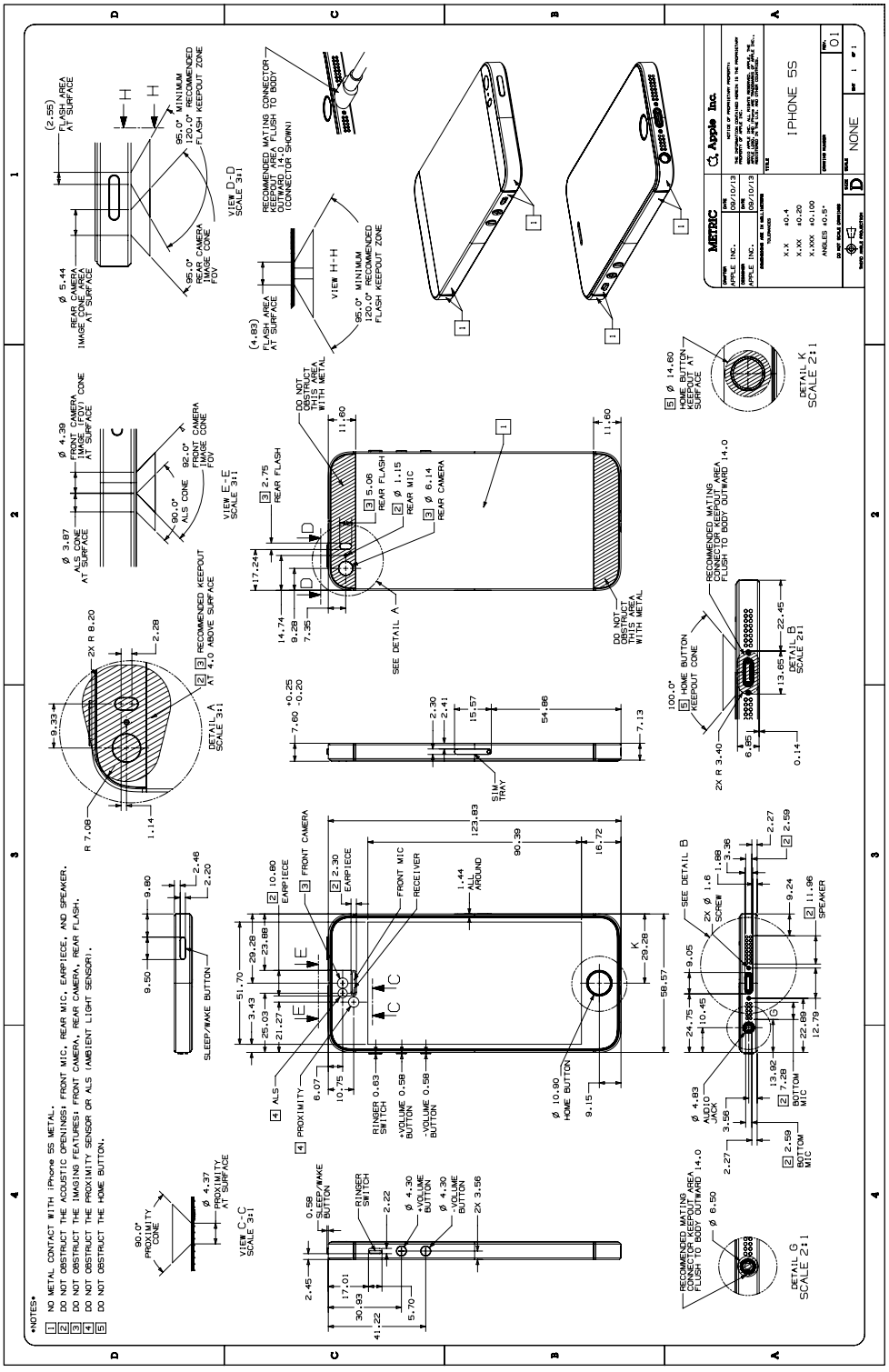
2.2 iPhone 6 Plus

Figure 2-2 iPhone 6 Plus Dimensional Drawing



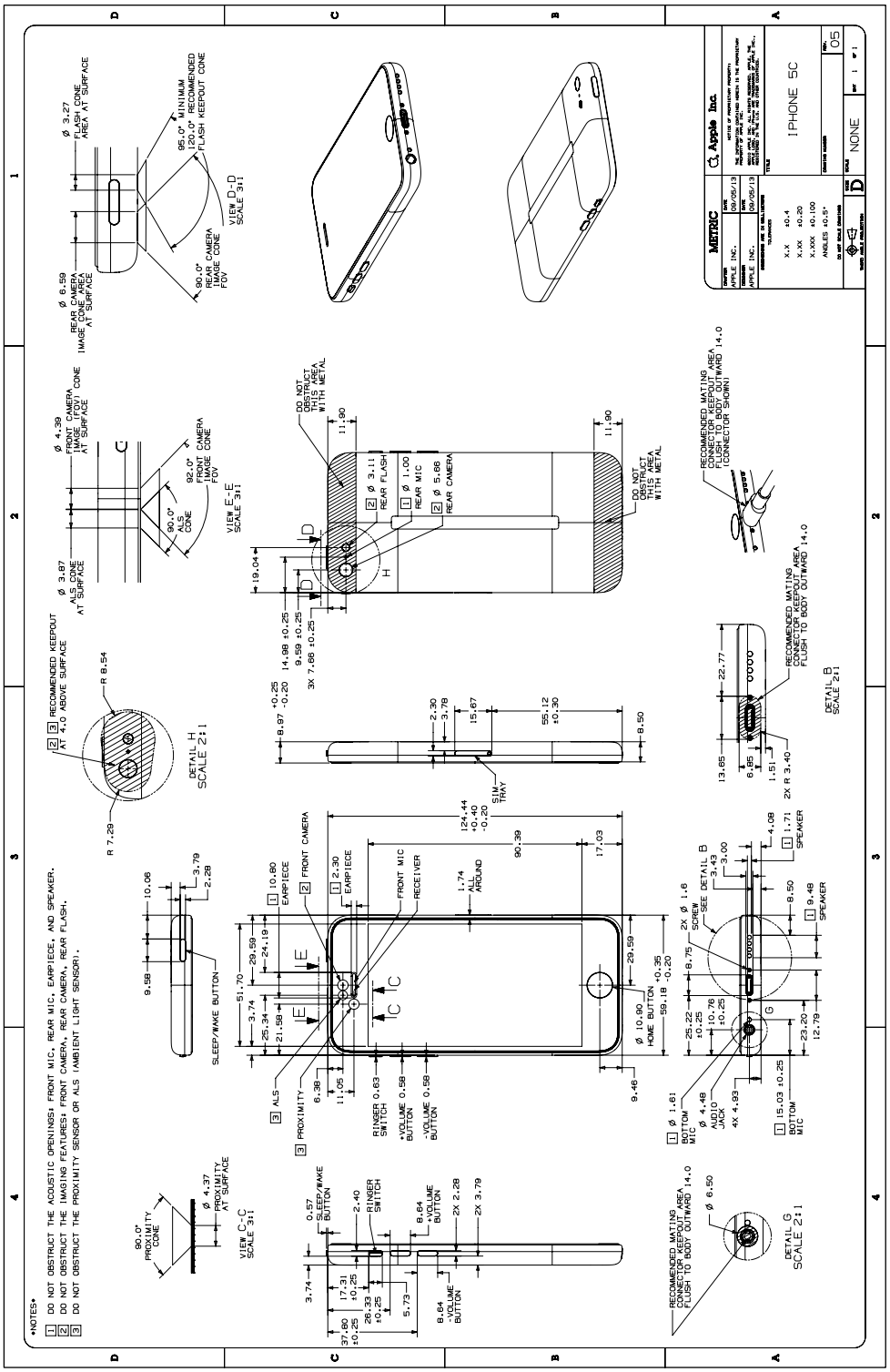
2.3 iPhone 5s

Figure 2-3 iPhone 5s Dimensional Drawing



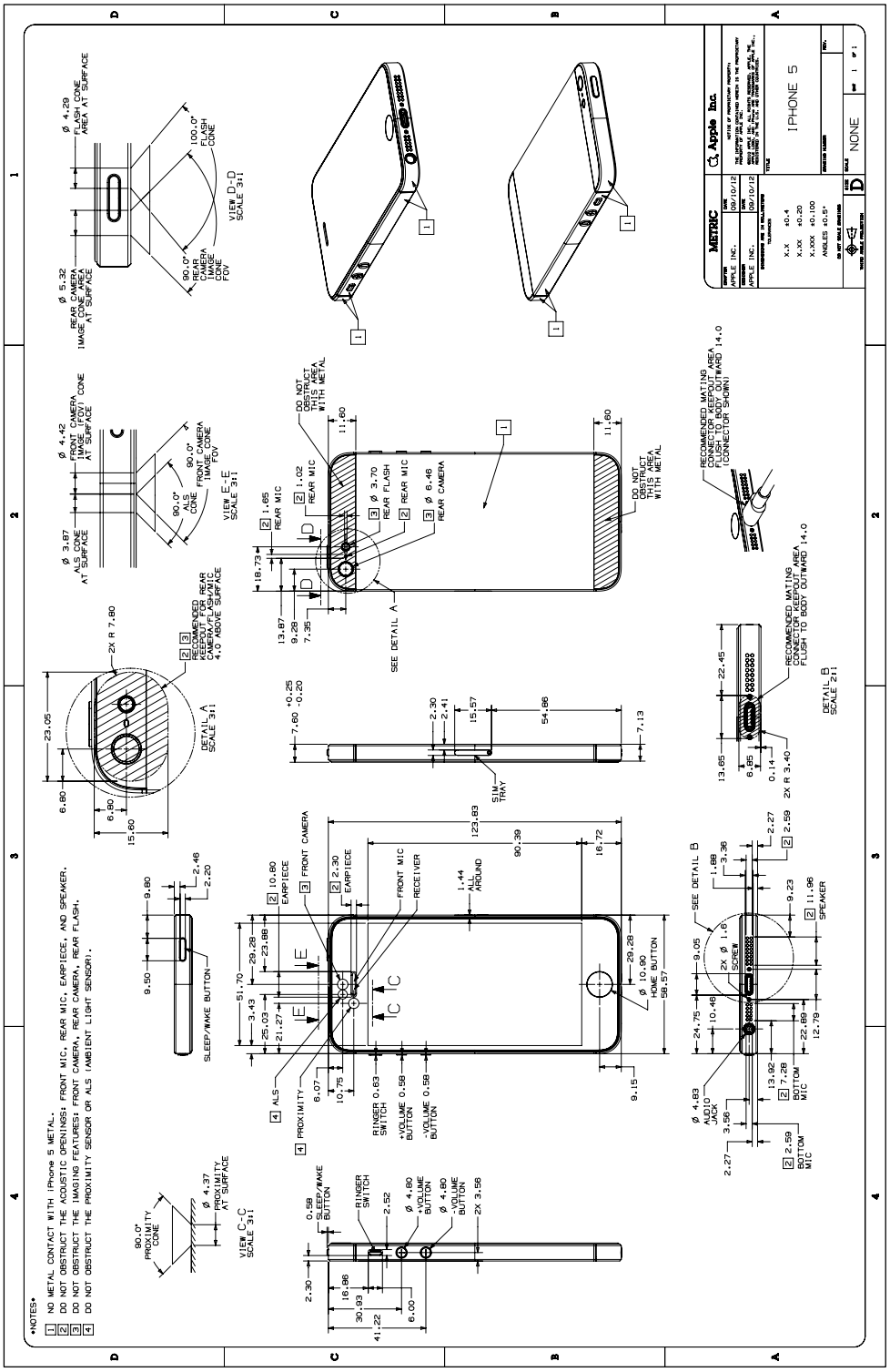
2.4 iPhone 5c

Figure 2-4 iPhone 5c Dimensional Drawing



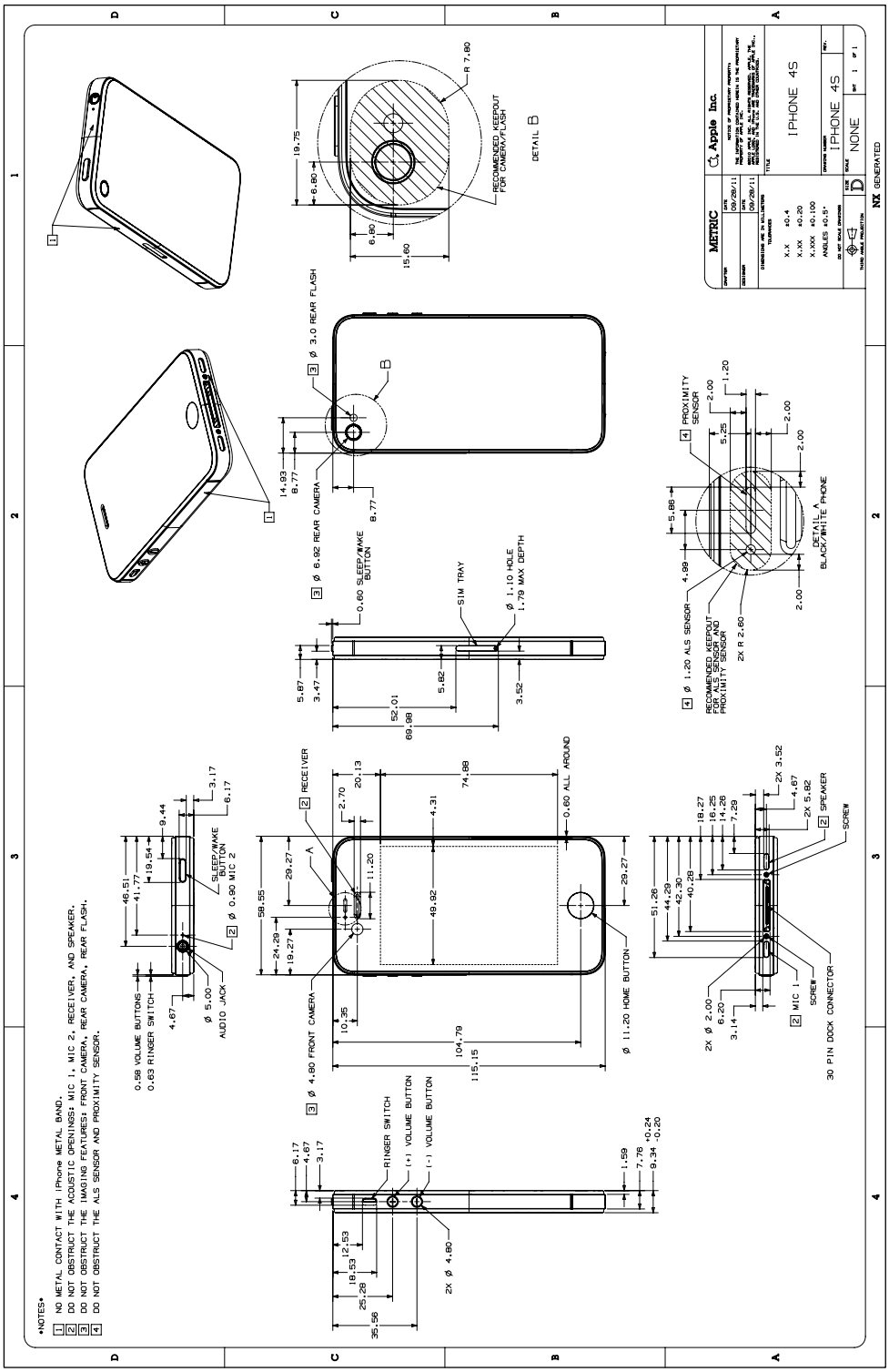
2.5 iPhone 5

Figure 2-5 iPhone 5 Dimensional Drawing



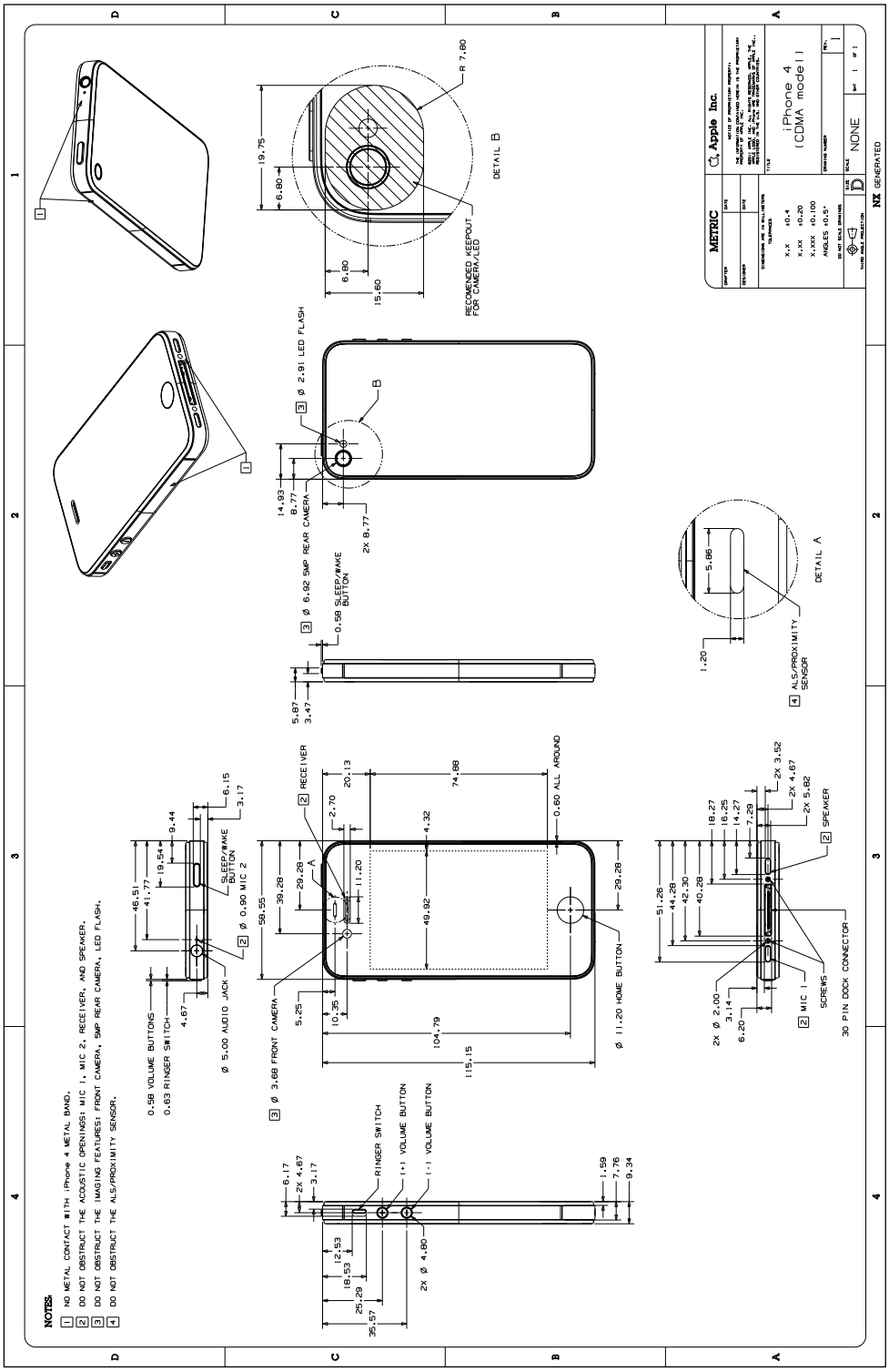
2.6 iPhone 4s

Figure 2-6 iPhone 4s Dimensional Drawing



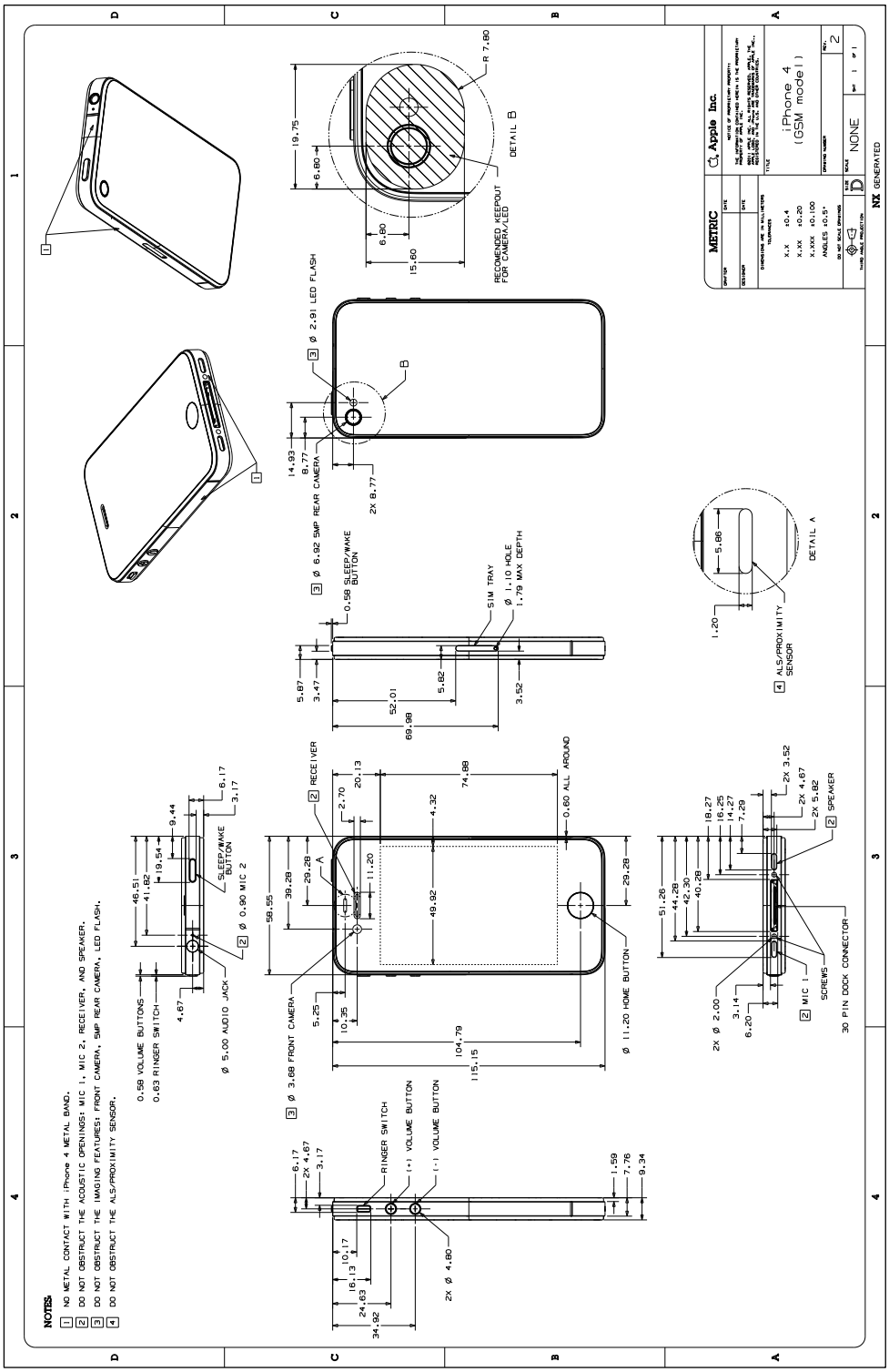
2.7 iPhone 4 (CDMA model)

Figure 2-7 iPhone 4 CDMA Dimensional Drawing



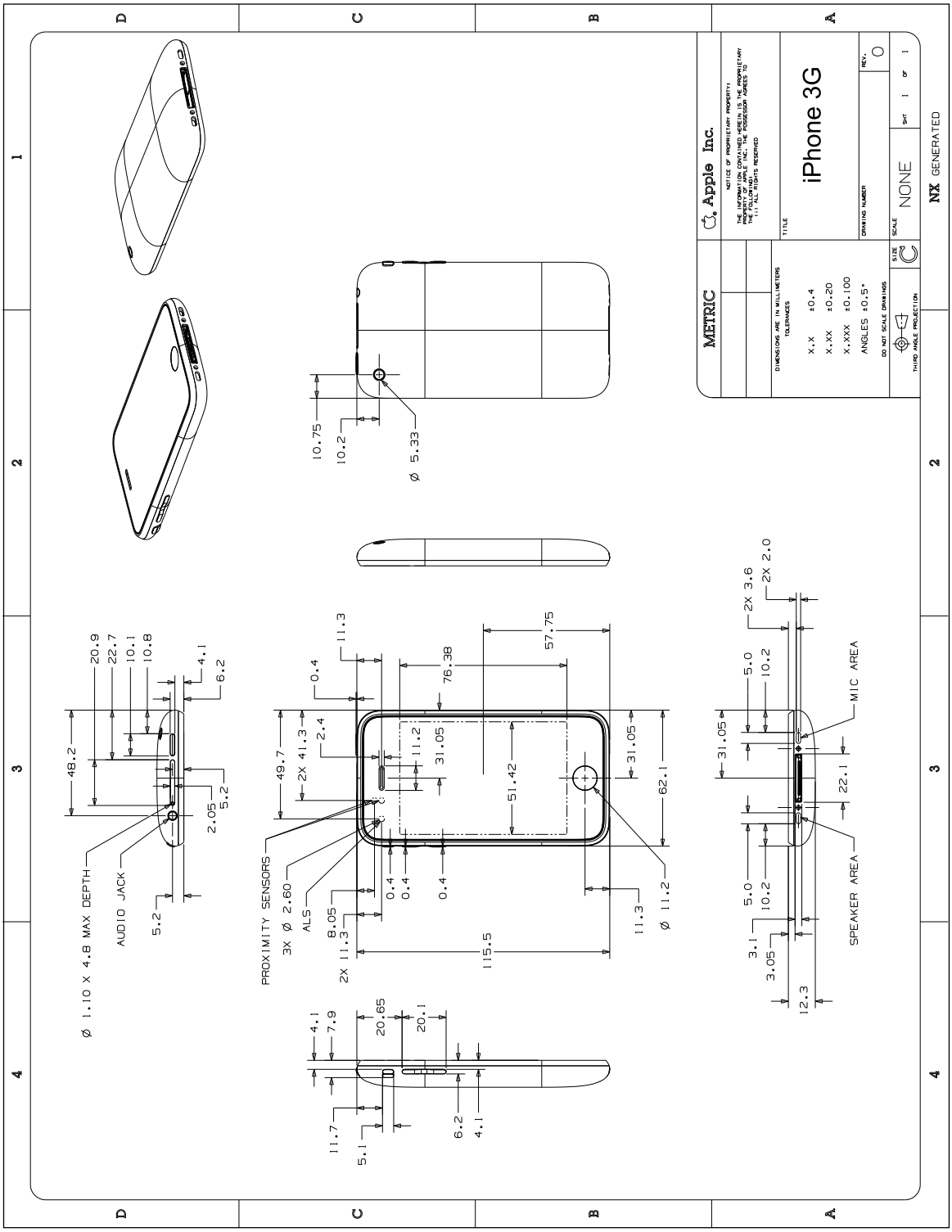
2.8 iPhone 4 (GSM model)

Figure 2-8 iPhone 4 GSM Dimensional Drawing



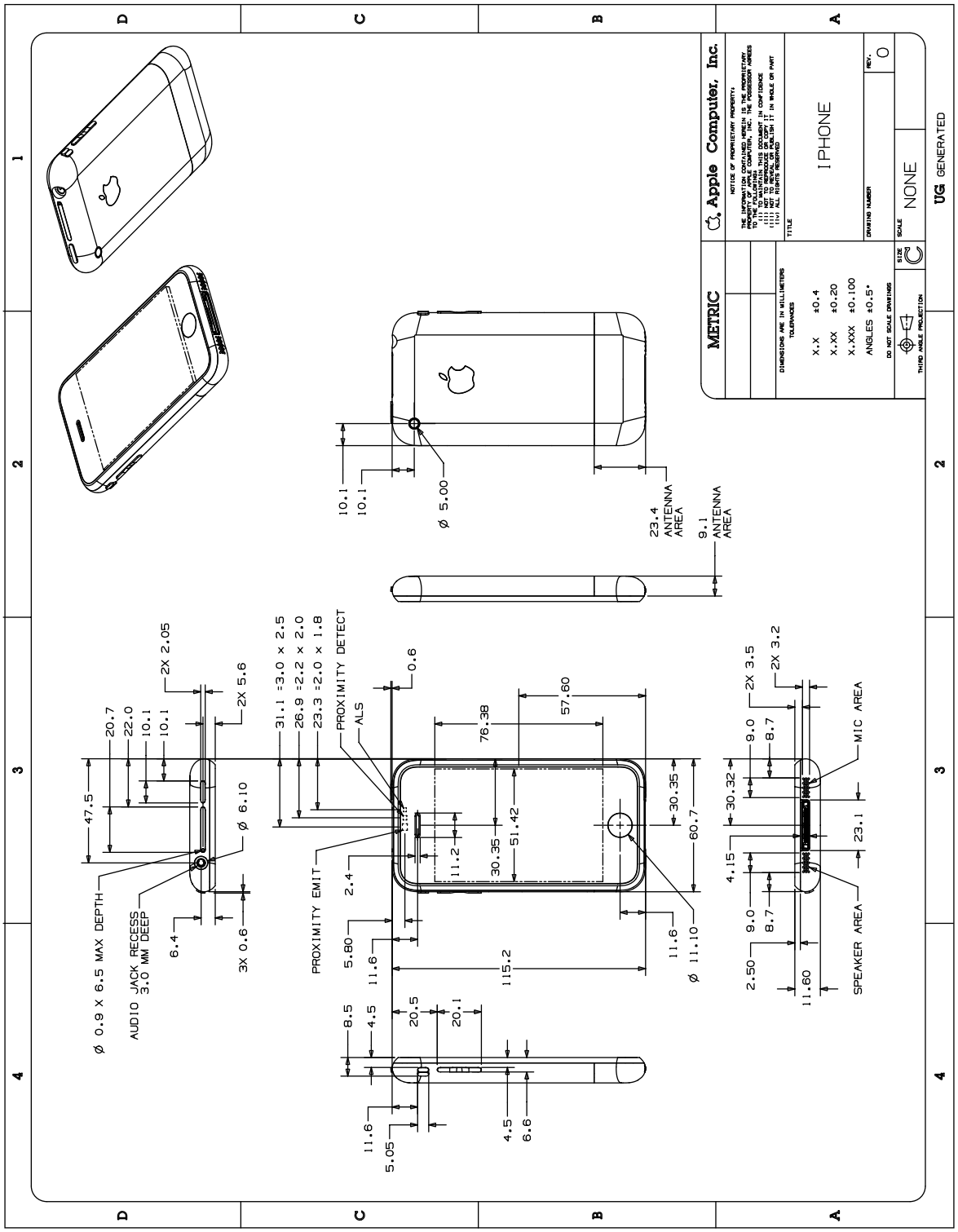
2.9 iPhone 3G and iPhone 3GS

Figure 2-9 iPhone 3G and iPhone 3GS Dimensional Drawing



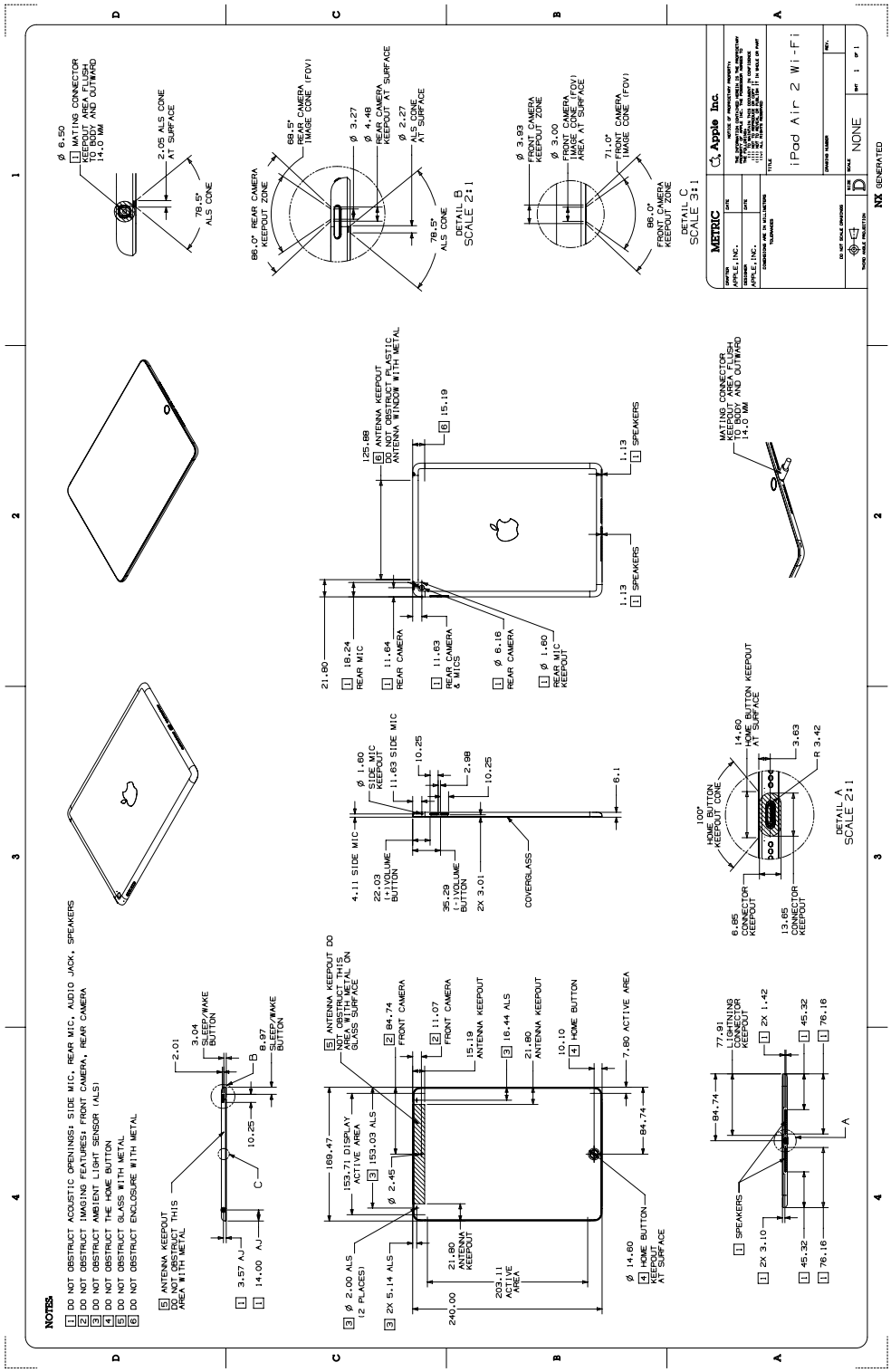
2.10 iPhone

Figure 2-10 iPhone Dimensional Drawing



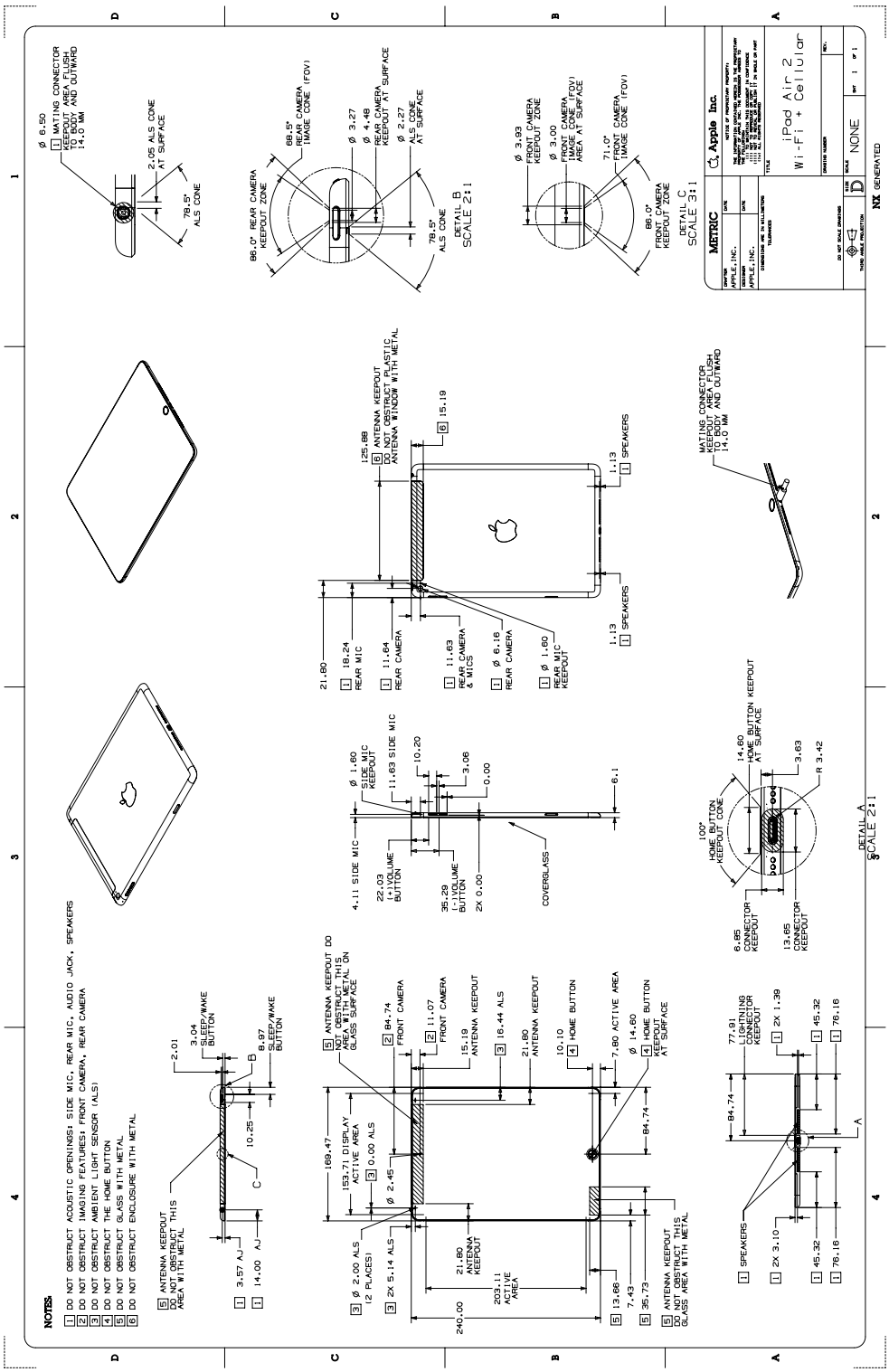
2.11 iPad Air 2 Wi-Fi

Figure 2-11 iPad Air 2 Wi-Fi Dimensional Drawing



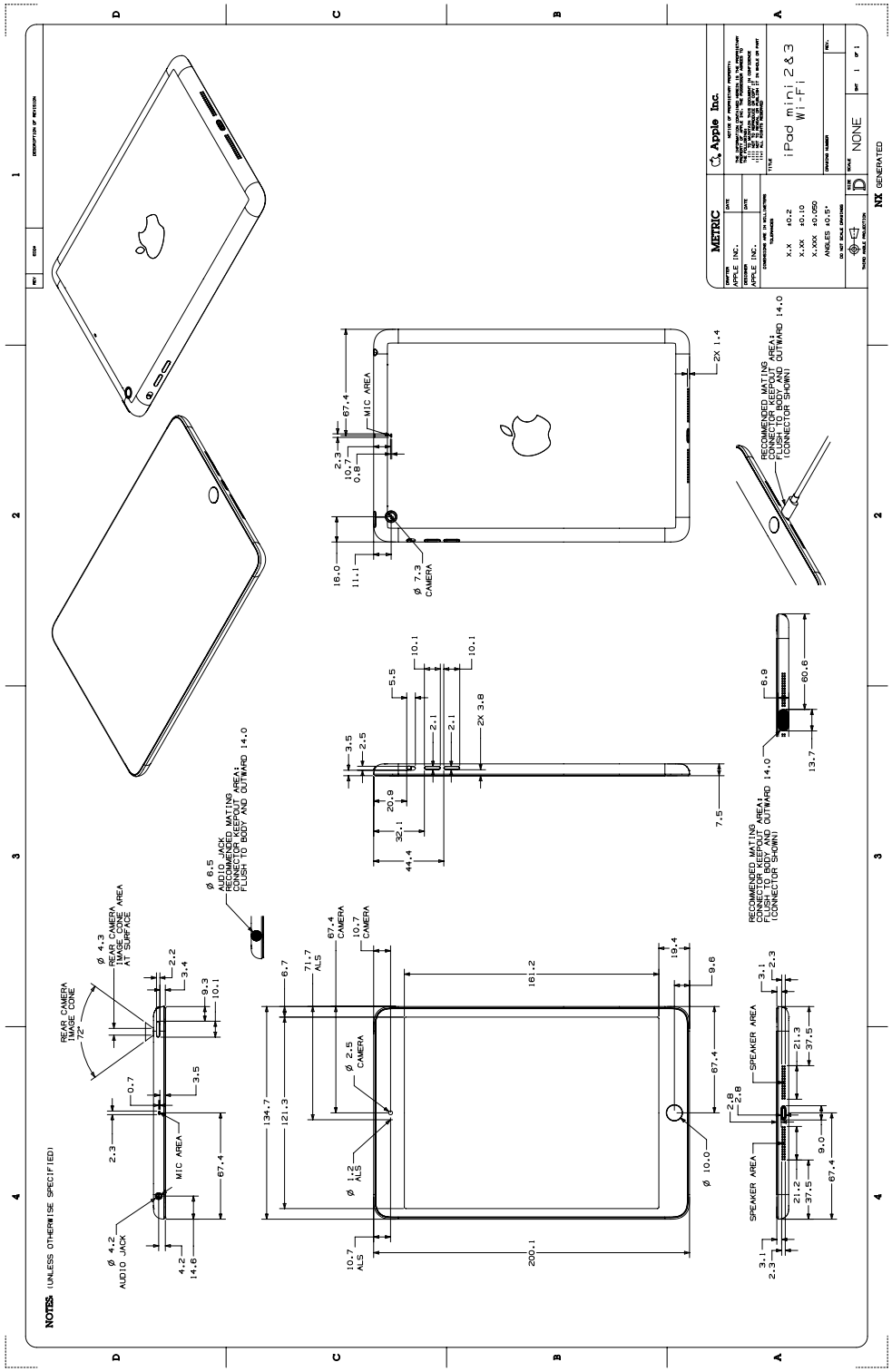
2.12 iPad Air 2 Wi-Fi + Cellular

Figure 2-12 iPad Air 2 Wi-Fi + Cellular Dimensional Drawing



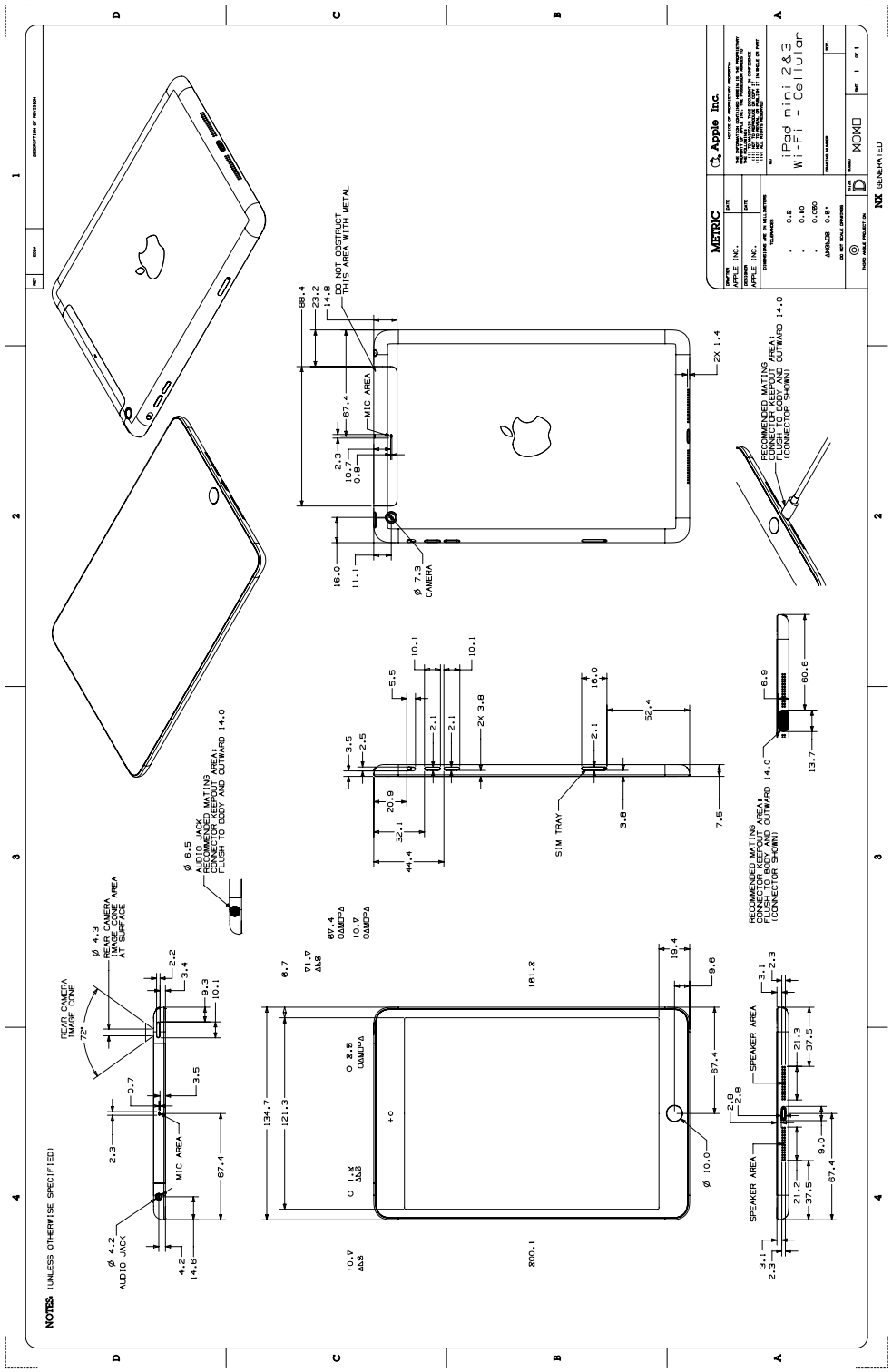
2.13 iPad mini 2 & 3 Wi-Fi

Figure 2-13 iPad mini 2 & iPad mini 3 Wi-Fi Dimensional Drawing



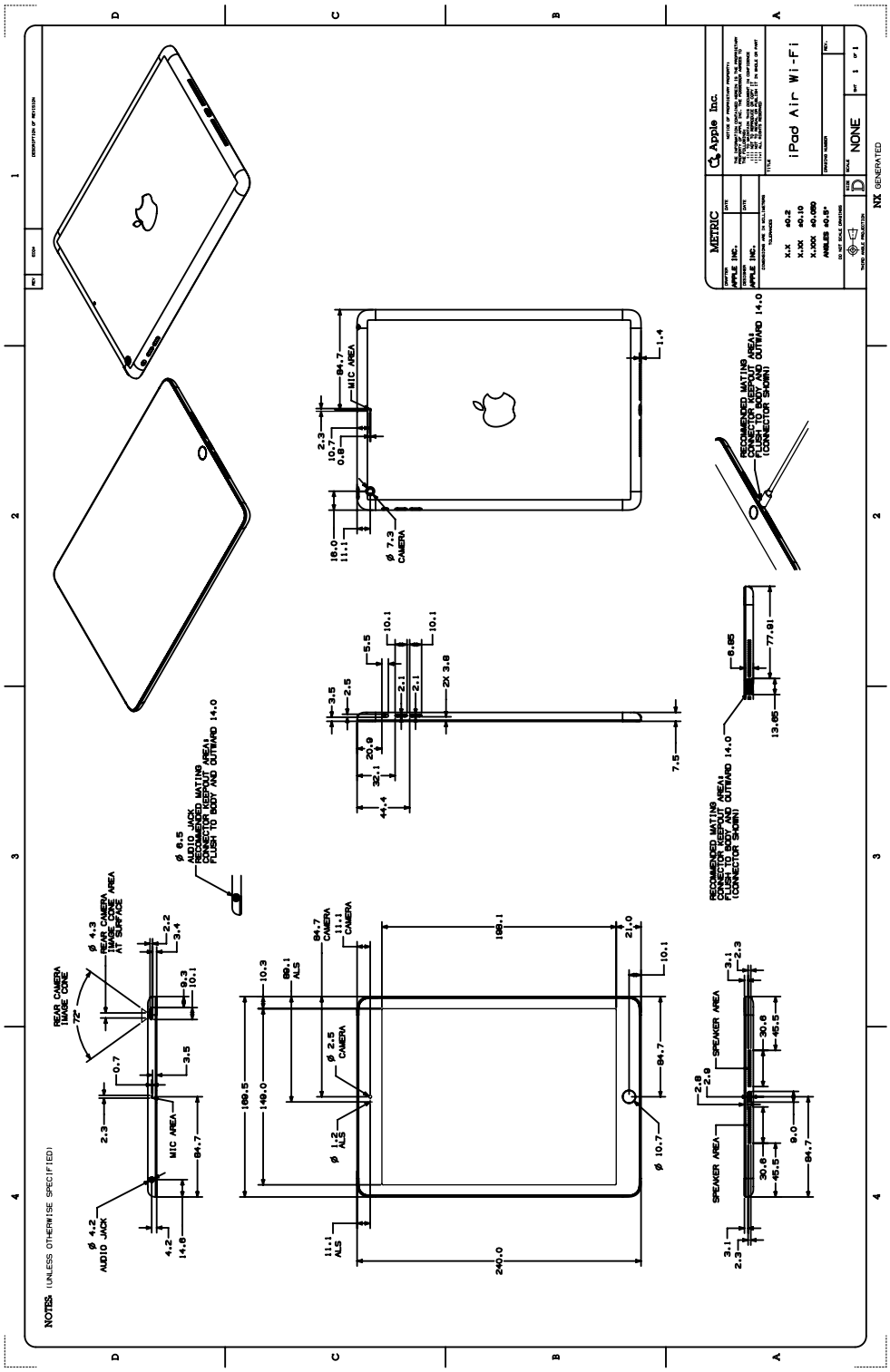
2.14 iPad mini 2 & 3 Wi-Fi + Cellular

Figure 2-14 iPad mini 2 & iPad mini 3 Wi-Fi + Cellular Dimensional Drawing



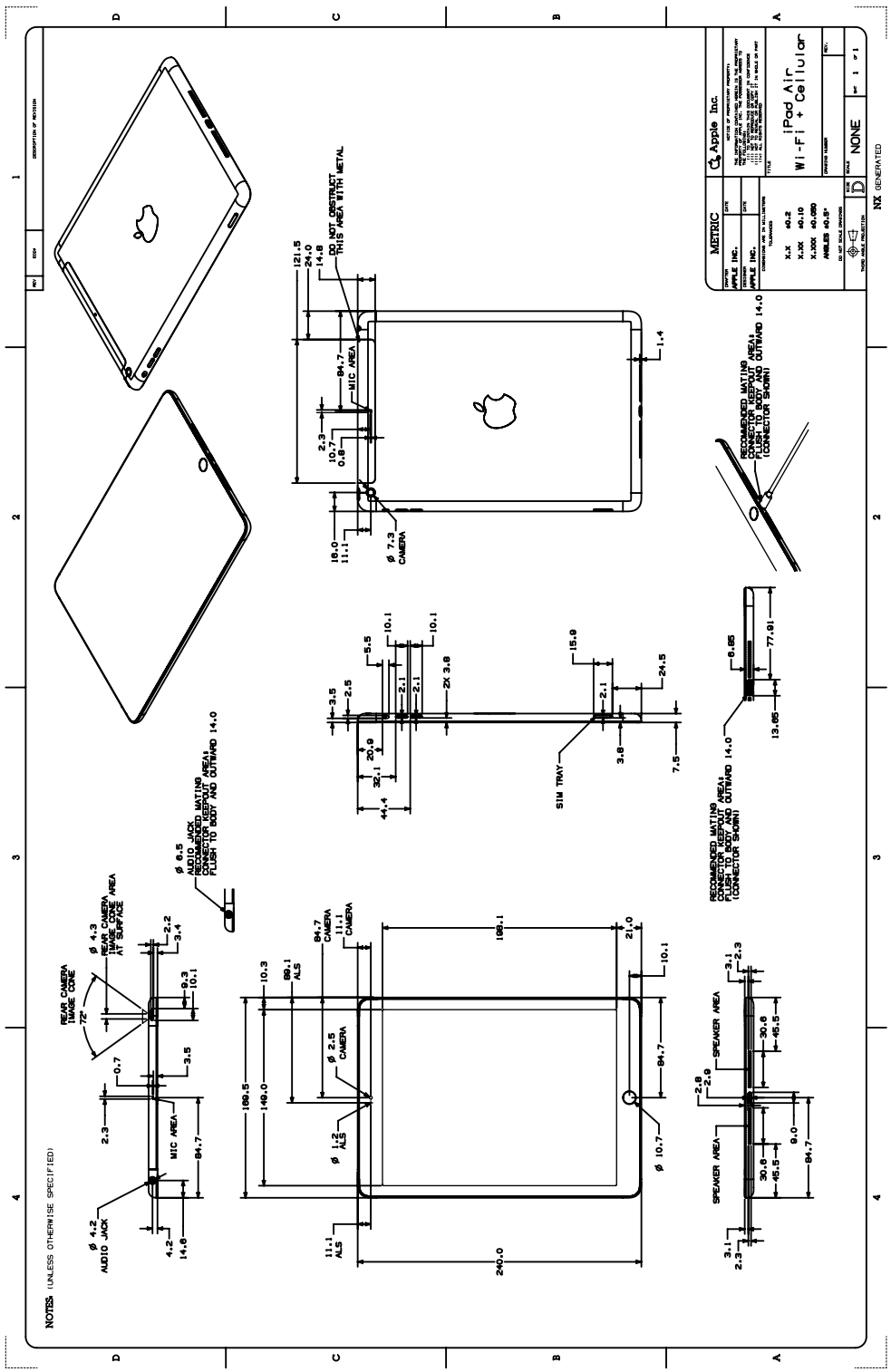
2.15 iPad Air Wi-Fi

Figure 2-15 iPad Air Wi-Fi Dimensional Drawing



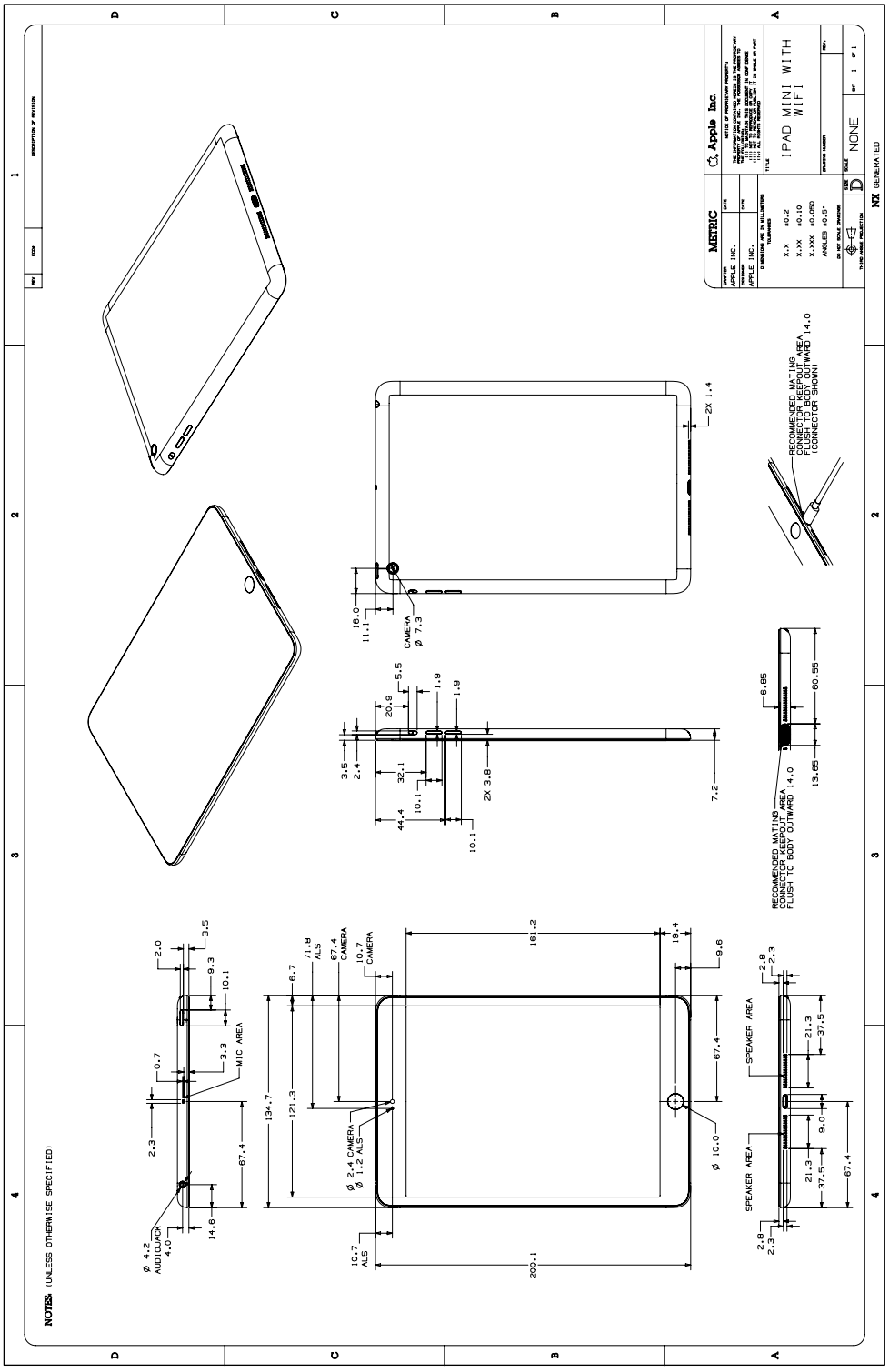
2.16 iPad Air Wi-Fi + Cellular

Figure 2-16 iPad Air Wi-Fi + Cellular Dimensional Drawing



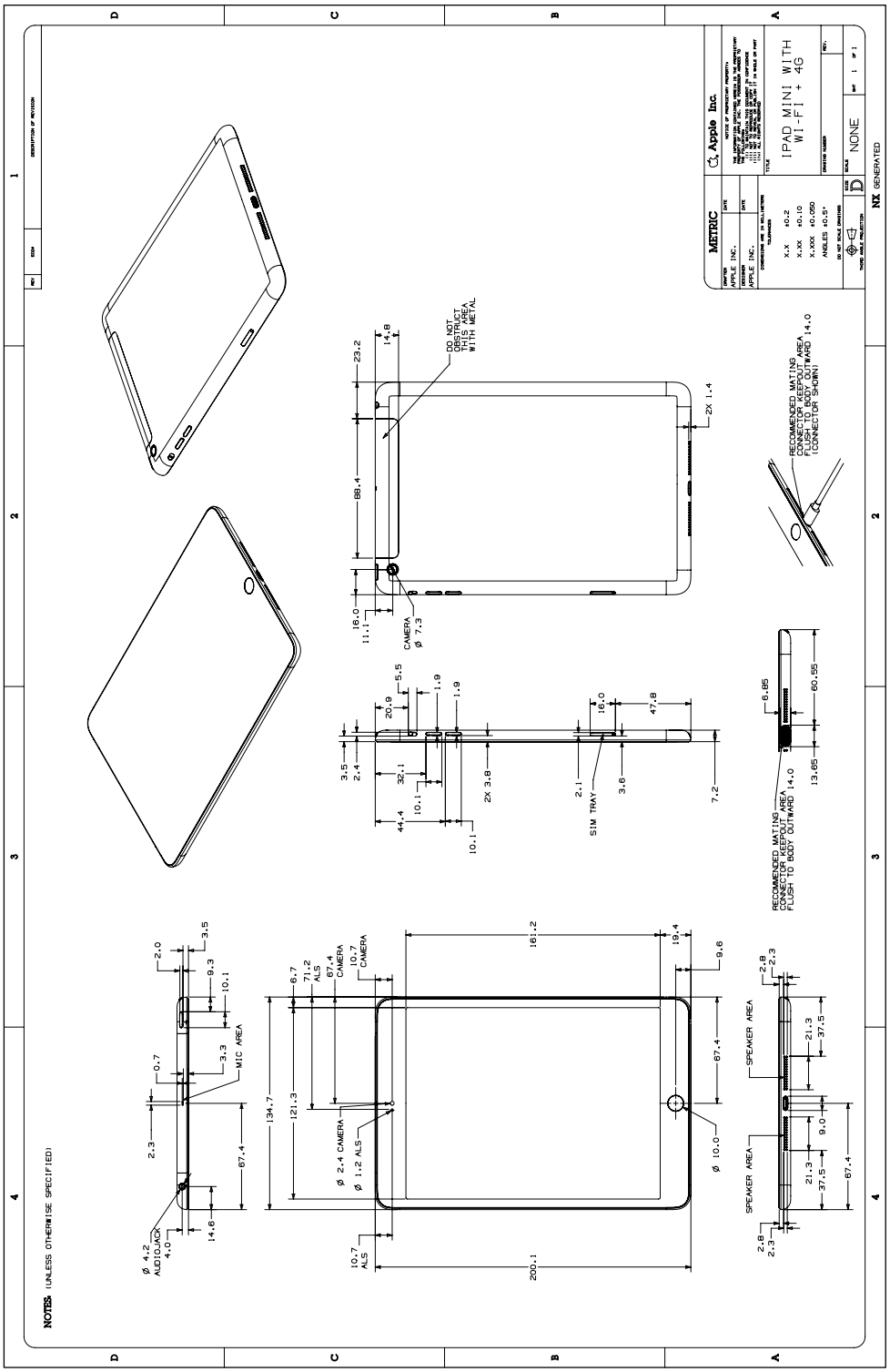
2.17 iPad mini with Wi-Fi

Figure 2-17 iPad mini with Wi-Fi Dimensional Drawing



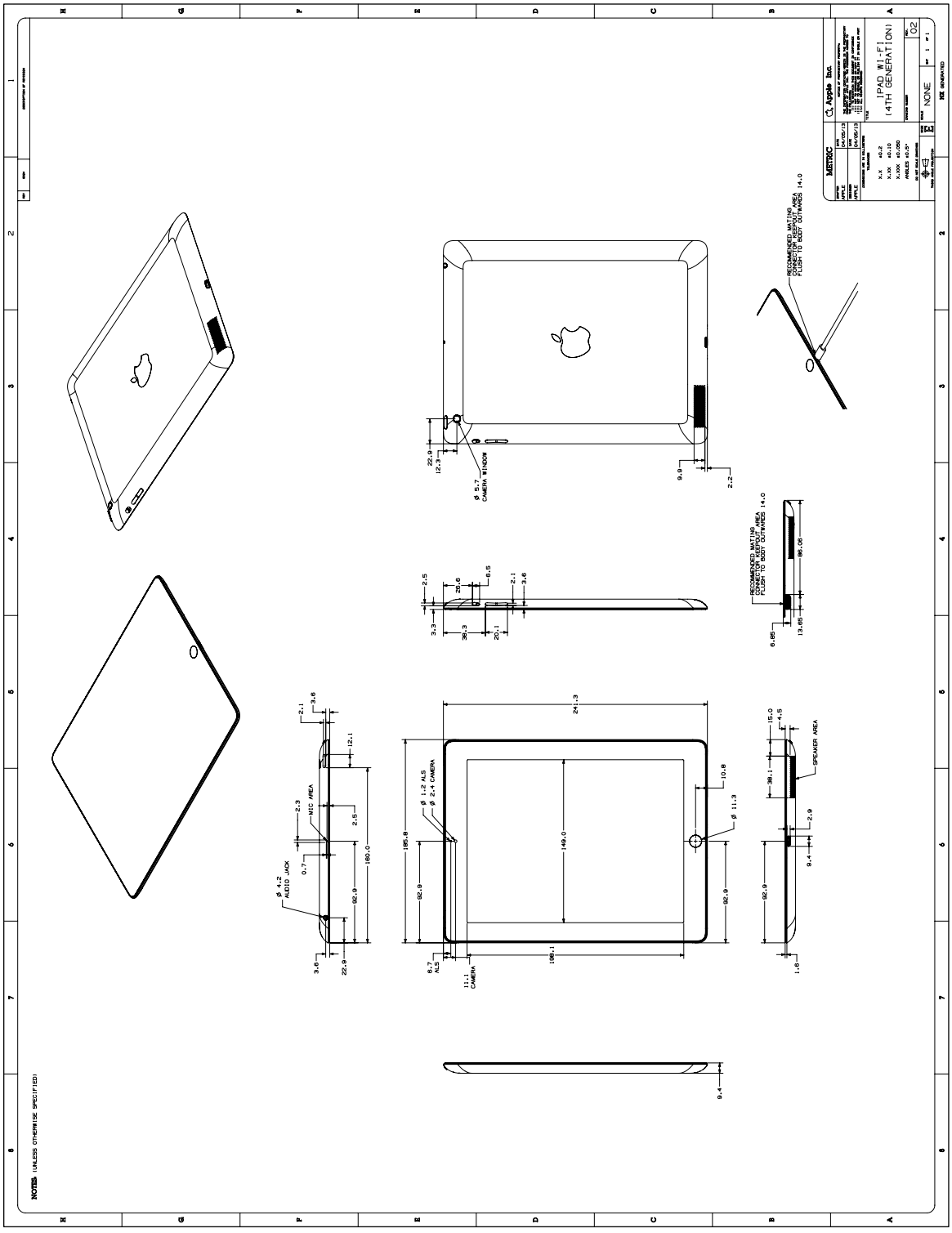
2.18 iPad mini with Wi-Fi + Cellular

Figure 2-18 iPad mini Wi-Fi + Cellular Dimensional Drawing



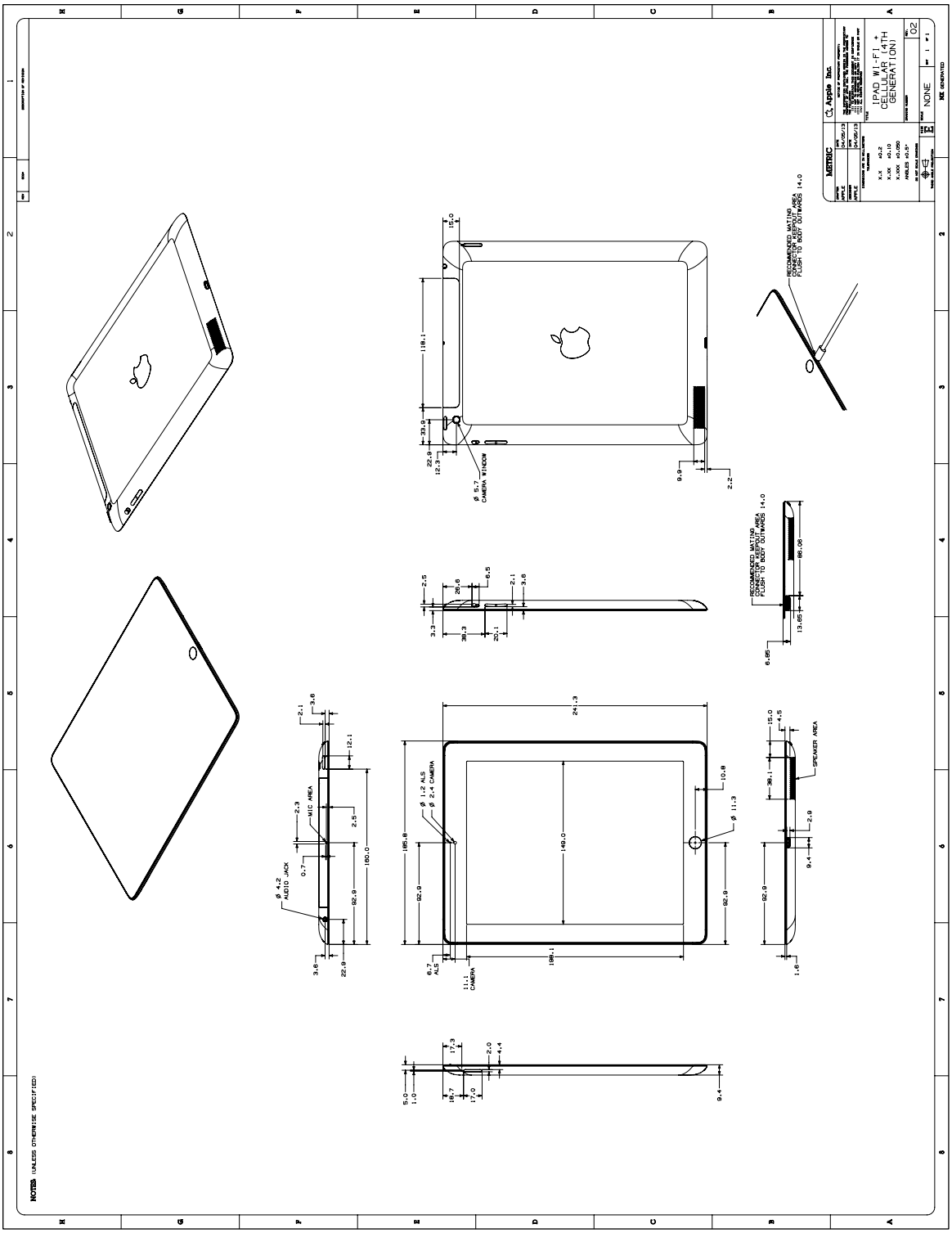
2.19 iPad with Wi-Fi (4th generation)

Figure 2-19 iPad Wi-Fi (4th generation) Dimensional Drawing



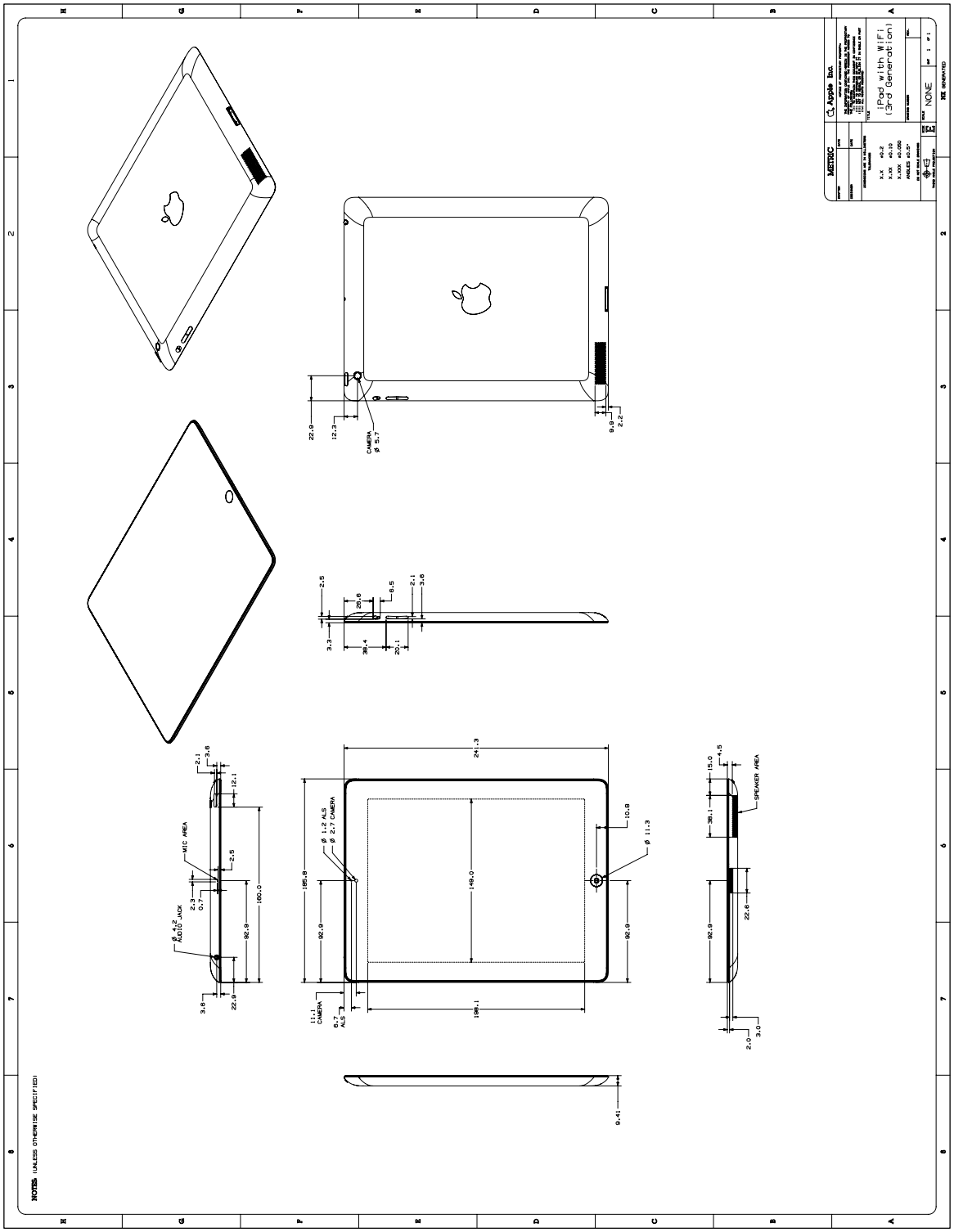
2.20 iPad with Wi-Fi + Cellular (4th generation)

Figure 2-20 iPad Wi-Fi + Cellular (4th generation) Dimensional Drawing



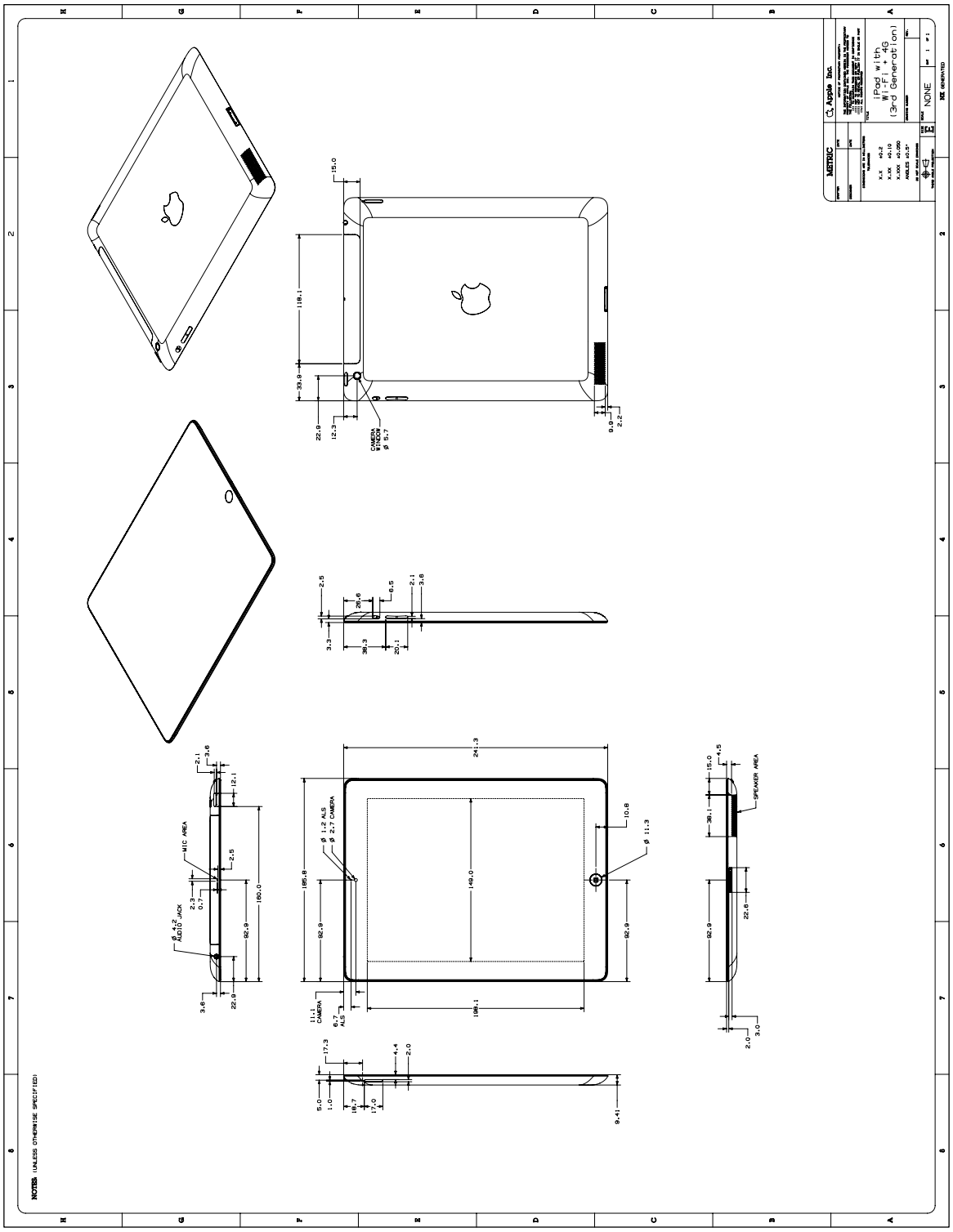
2.21 iPad with Wi-Fi (3rd generation)

Figure 2-21 iPad Wi-Fi (3rd Generation) Dimensional Drawing



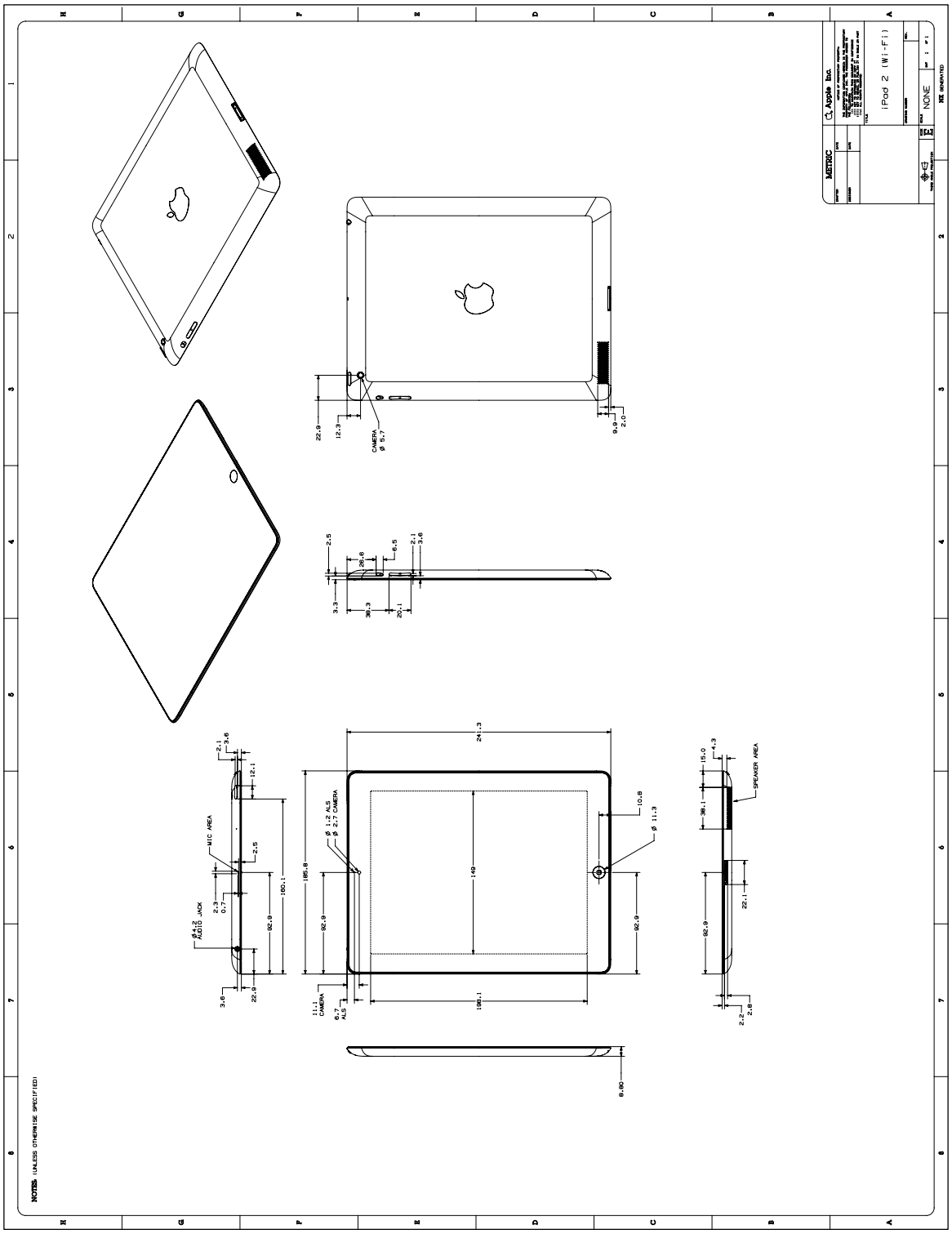
2.22 iPad with Wi-Fi + 4G (3rd generation)

Figure 2-22 iPad Wi-Fi + 4G (3rd Generation) Dimensional Drawing



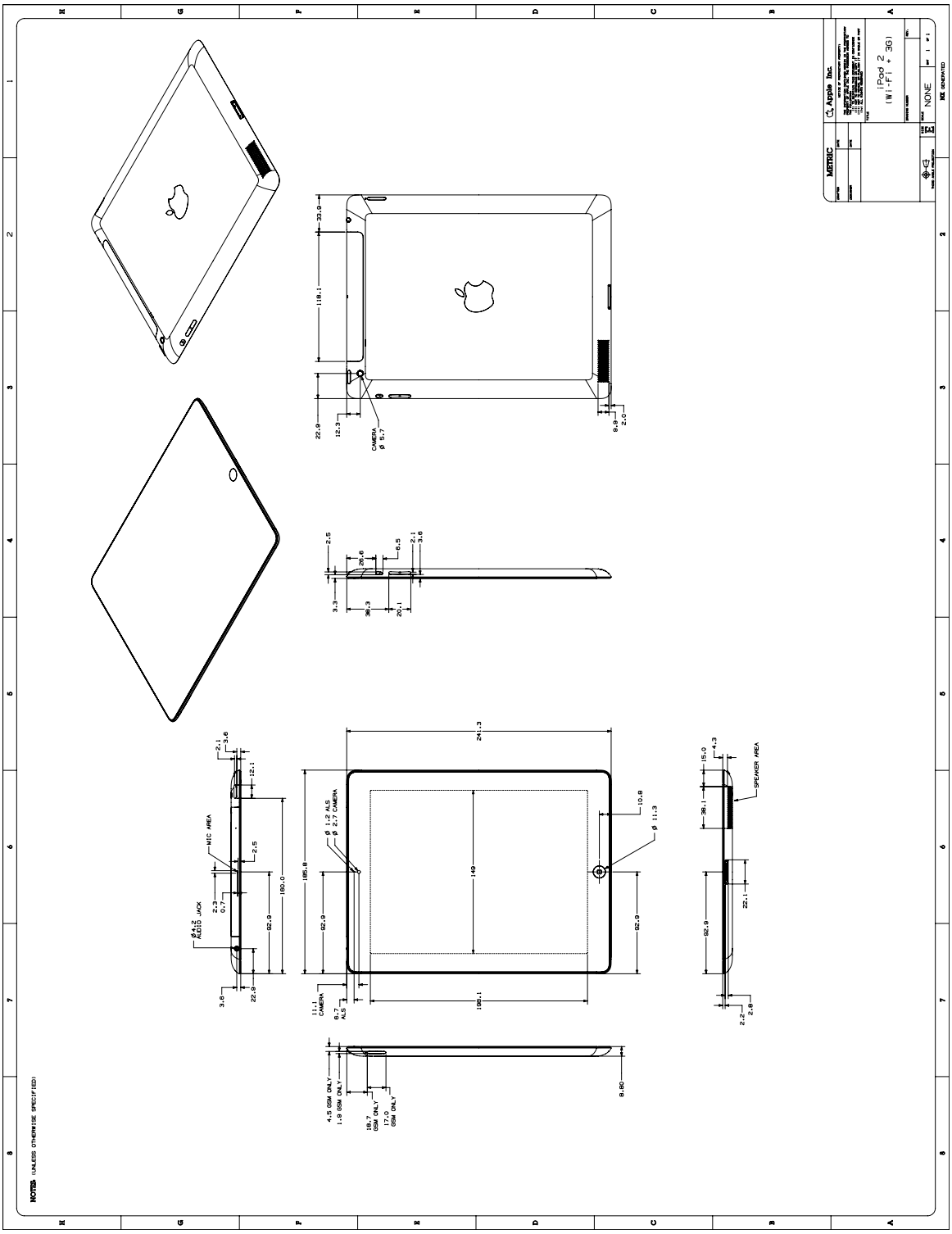
2.23 iPad 2 with Wi-Fi

Figure 2-23 iPad 2 Wi-Fi Dimensional Drawing



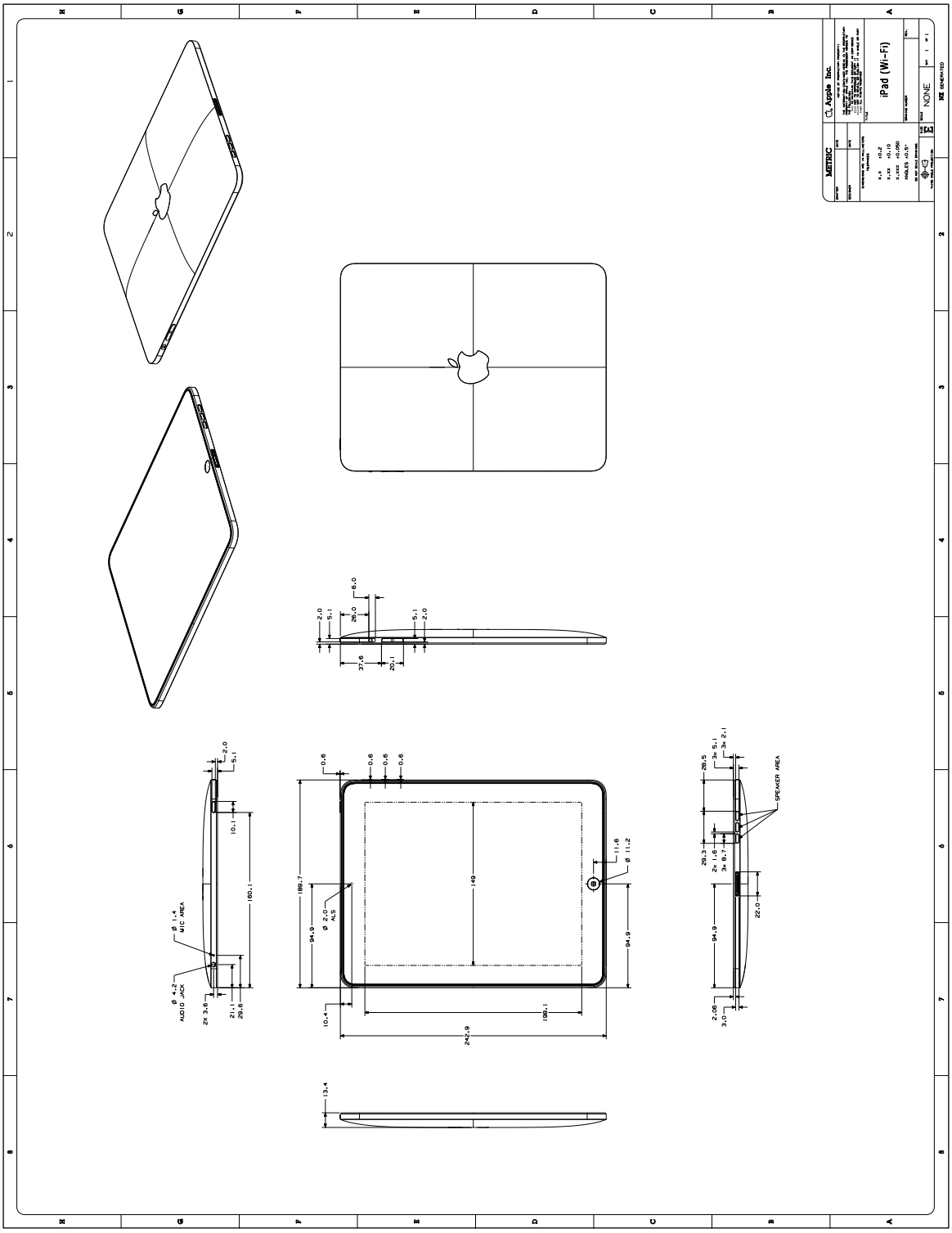
2.24 iPad 2 with Wi-Fi + 3G

Figure 2-24 iPad 2 Wi-Fi + 3G Dimensional Drawing



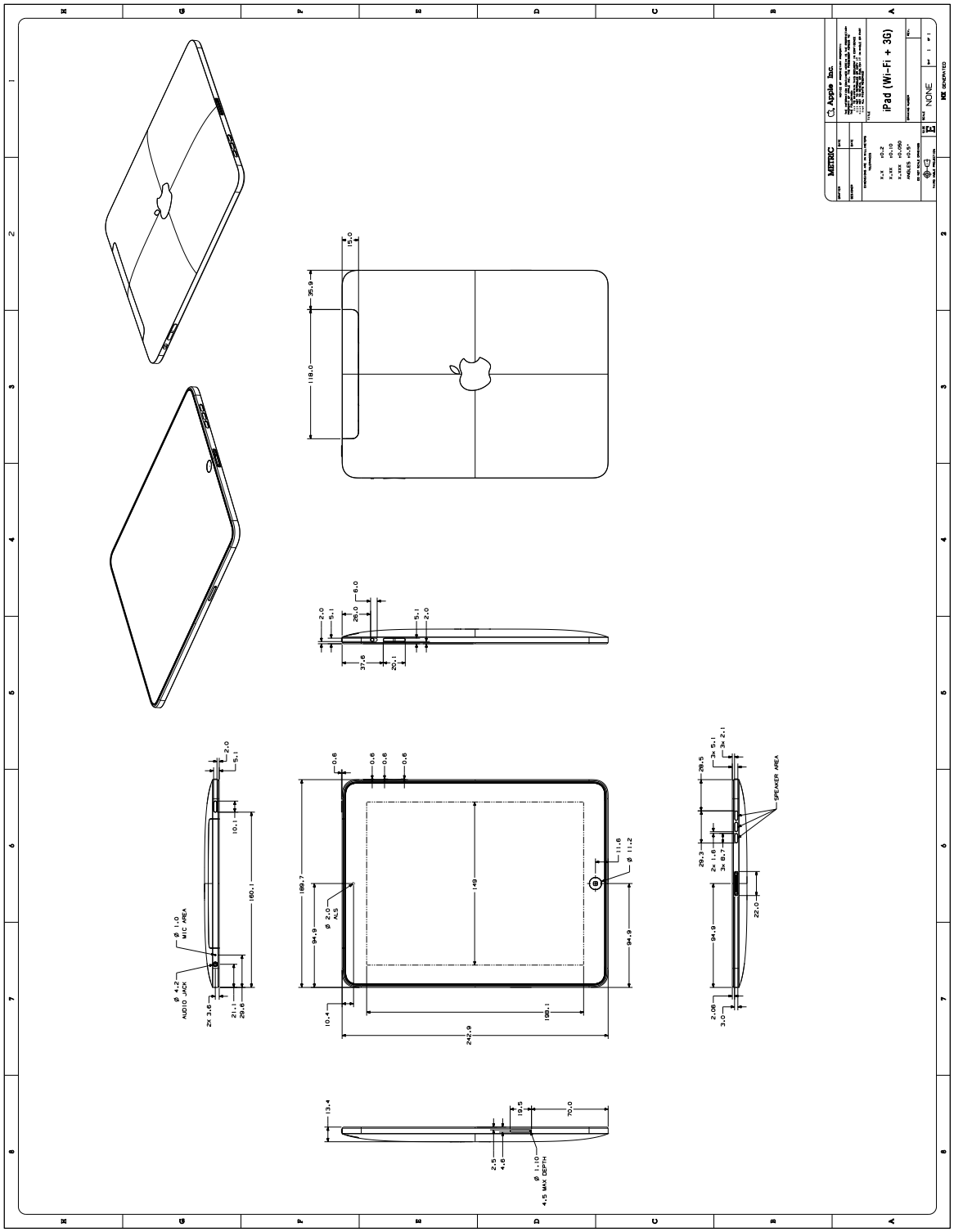
2.25 iPad with Wi-Fi

Figure 2-25 iPad Wi-Fi Dimensional Drawing



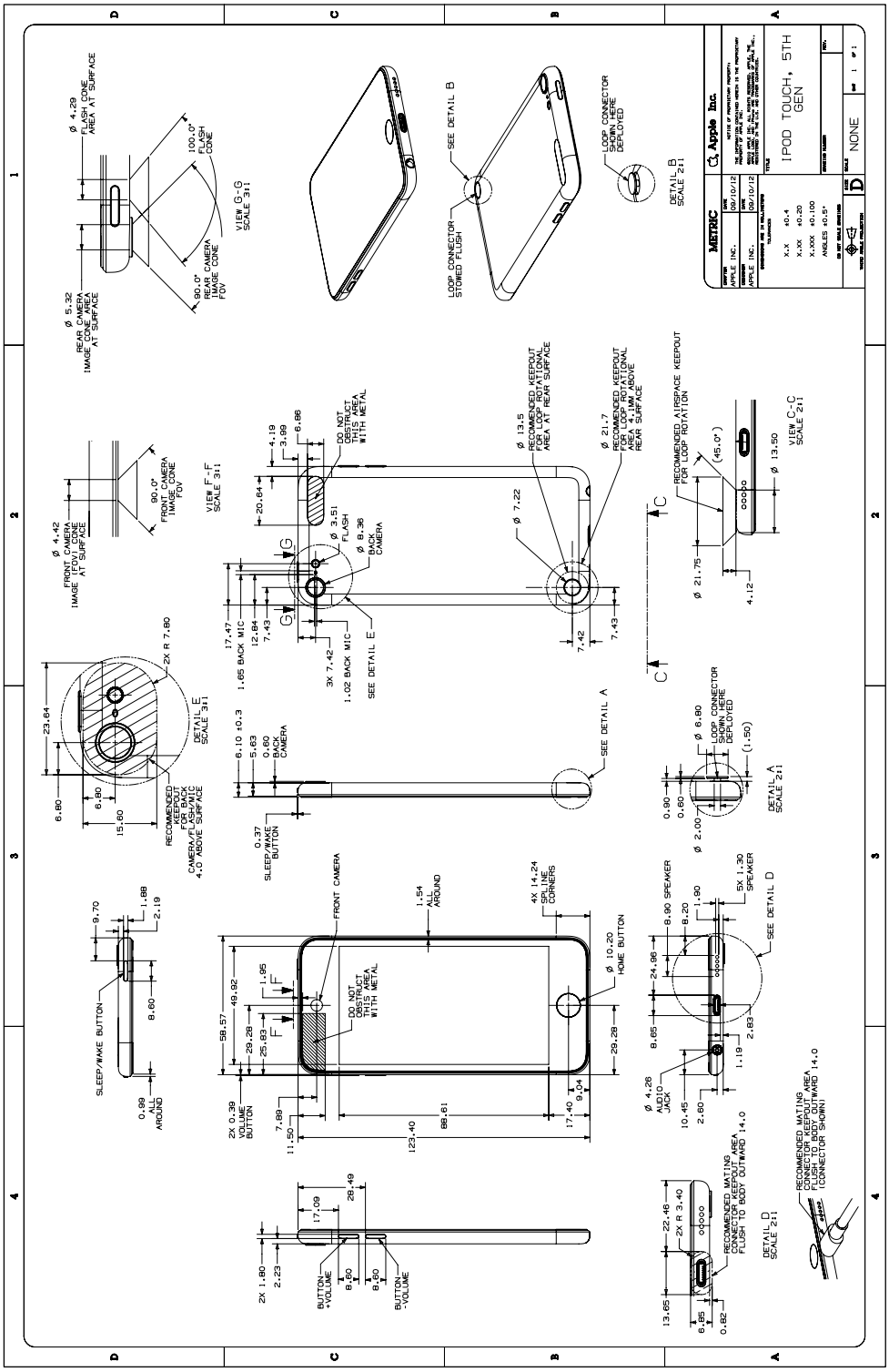
2.26 iPad with Wi-Fi + 3G

Figure 2-26 iPad Wi-Fi + 3G Dimensional Drawing



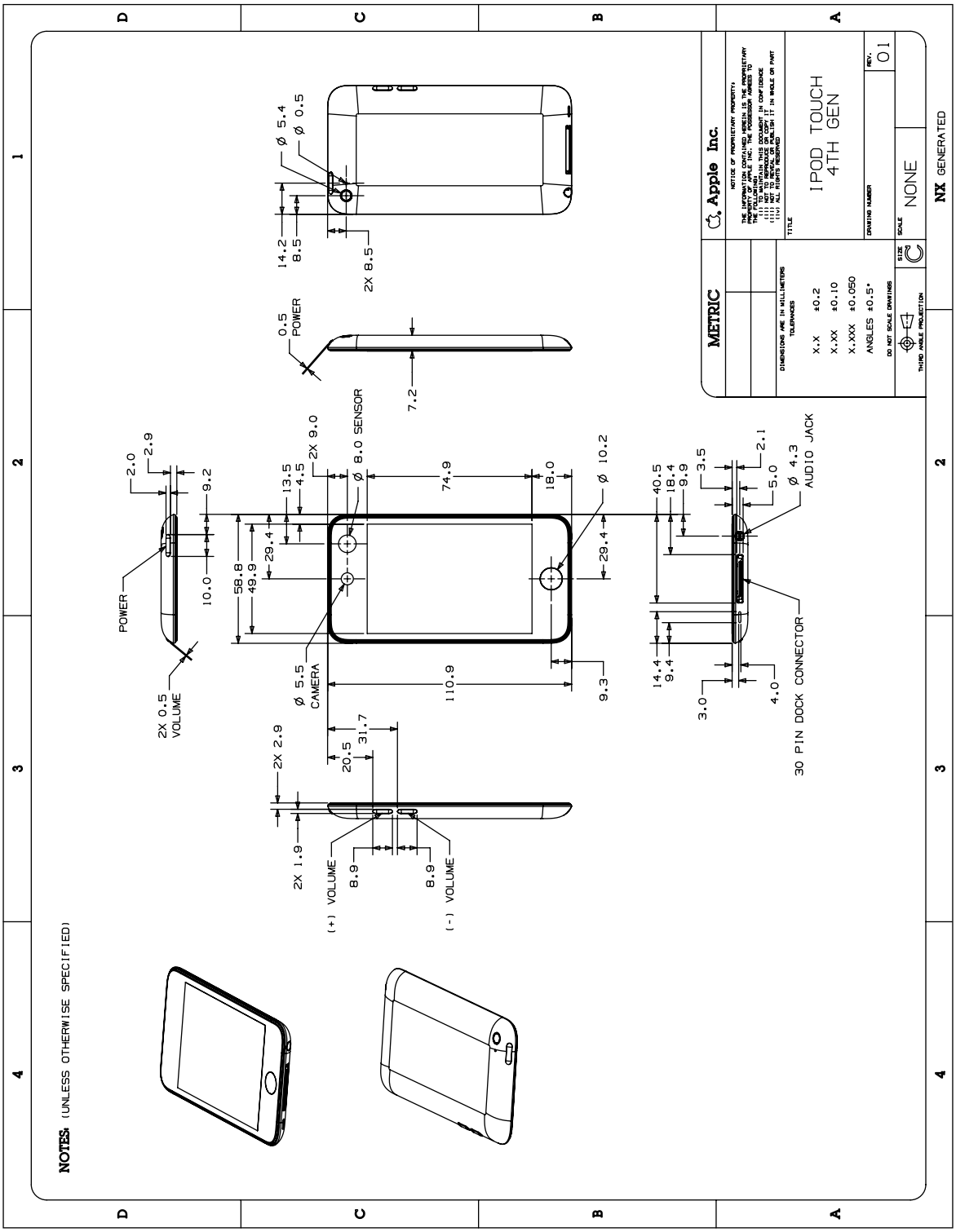
2.27 iPod touch (5th generation)

Figure 2-27 iPod touch 5th gen. Dimensional Drawing



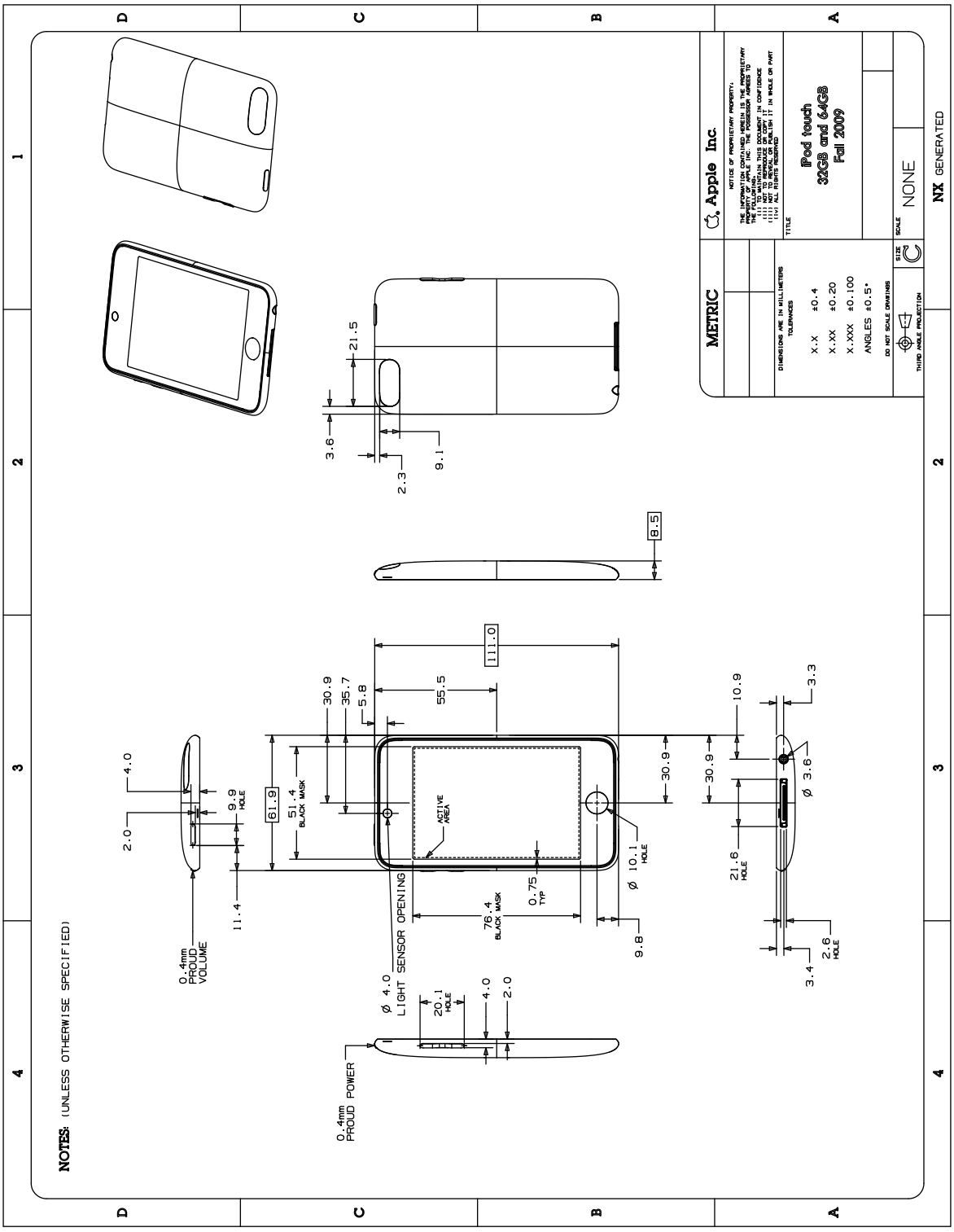
2.28 iPod touch (4th generation)

Figure 2-28 iPod touch 4th gen. Dimensional Drawing



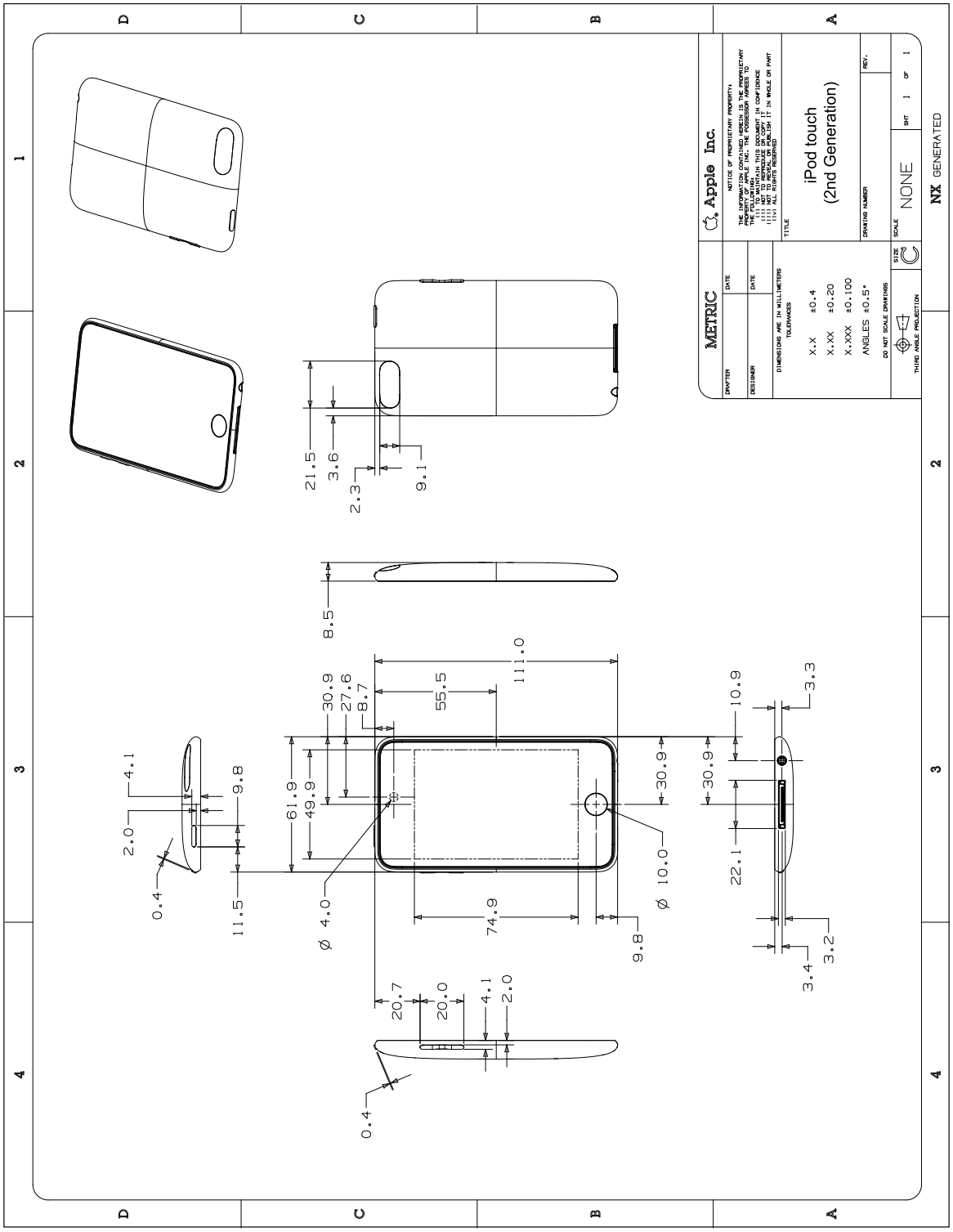
2.29 iPod touch (3rd generation)

Figure 2-29 iPod touch 3rd gen. Fall '09 32GB and 64GB Dimensional Drawing



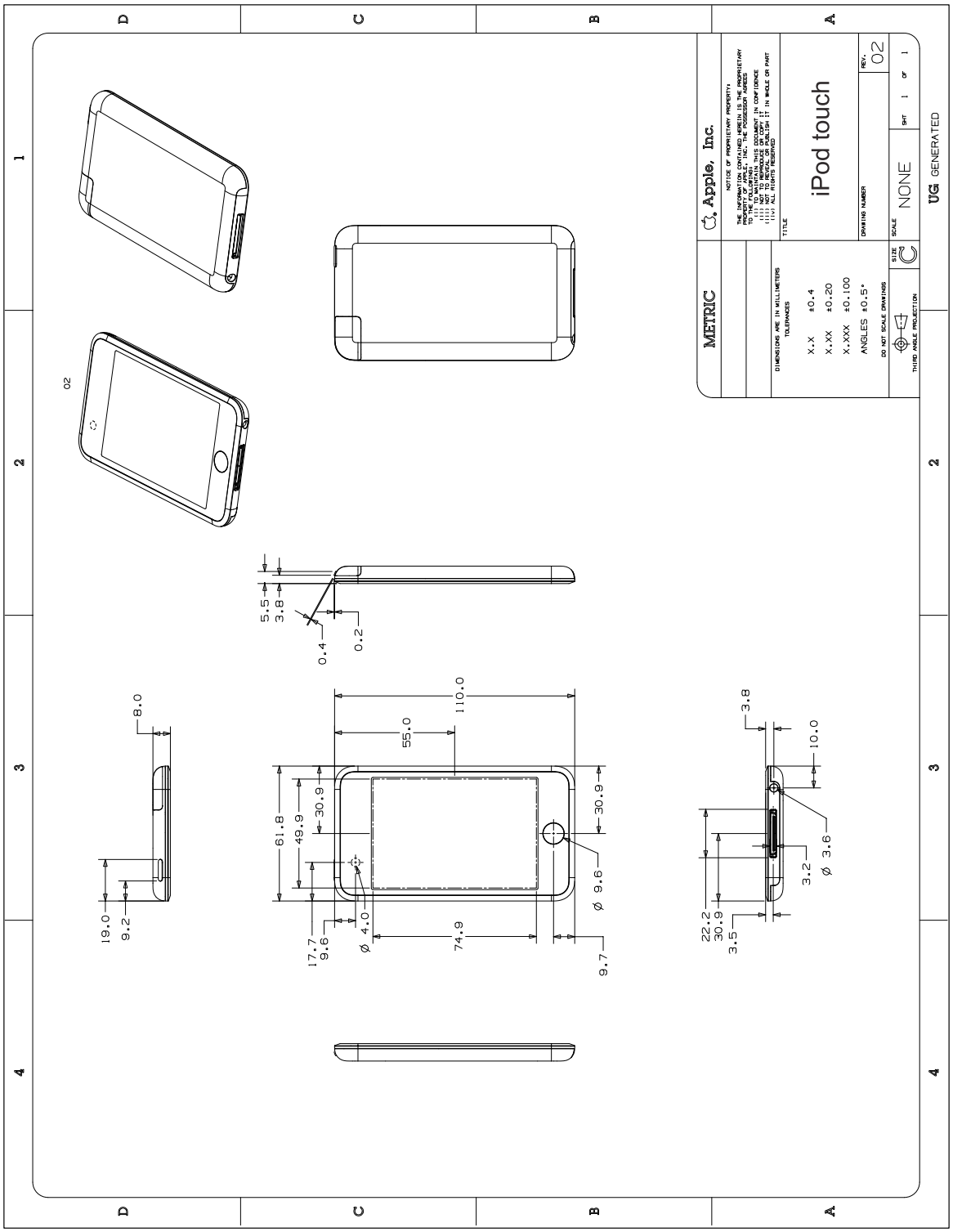
2.30 iPod touch (2nd generation)

Figure 2-30 iPod touch 2nd gen. 8GB, 16GB, 32GB Dimensional Drawing



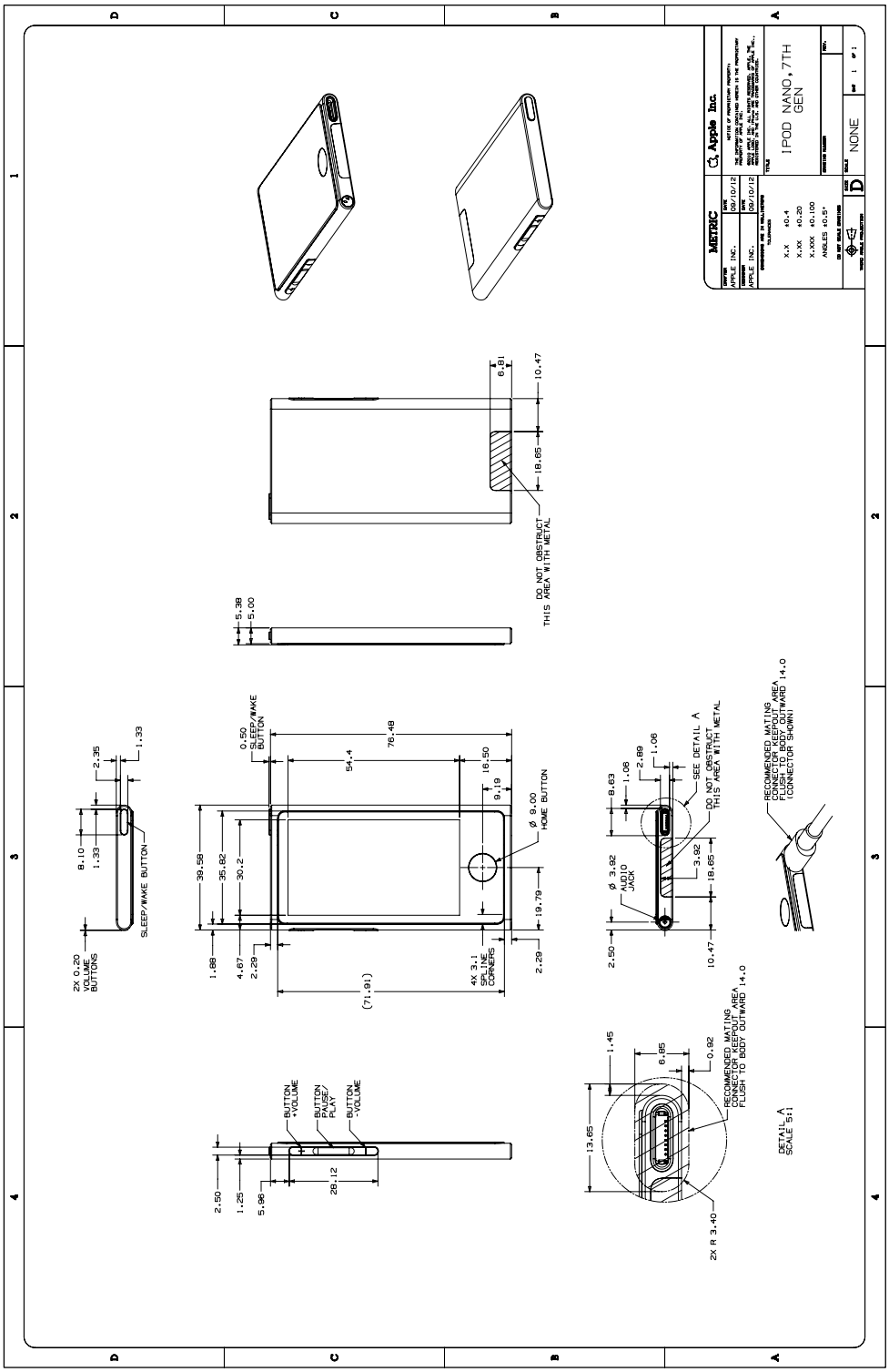
2.31 iPod touch

Figure 2-31 iPod touch Dimensional Drawing



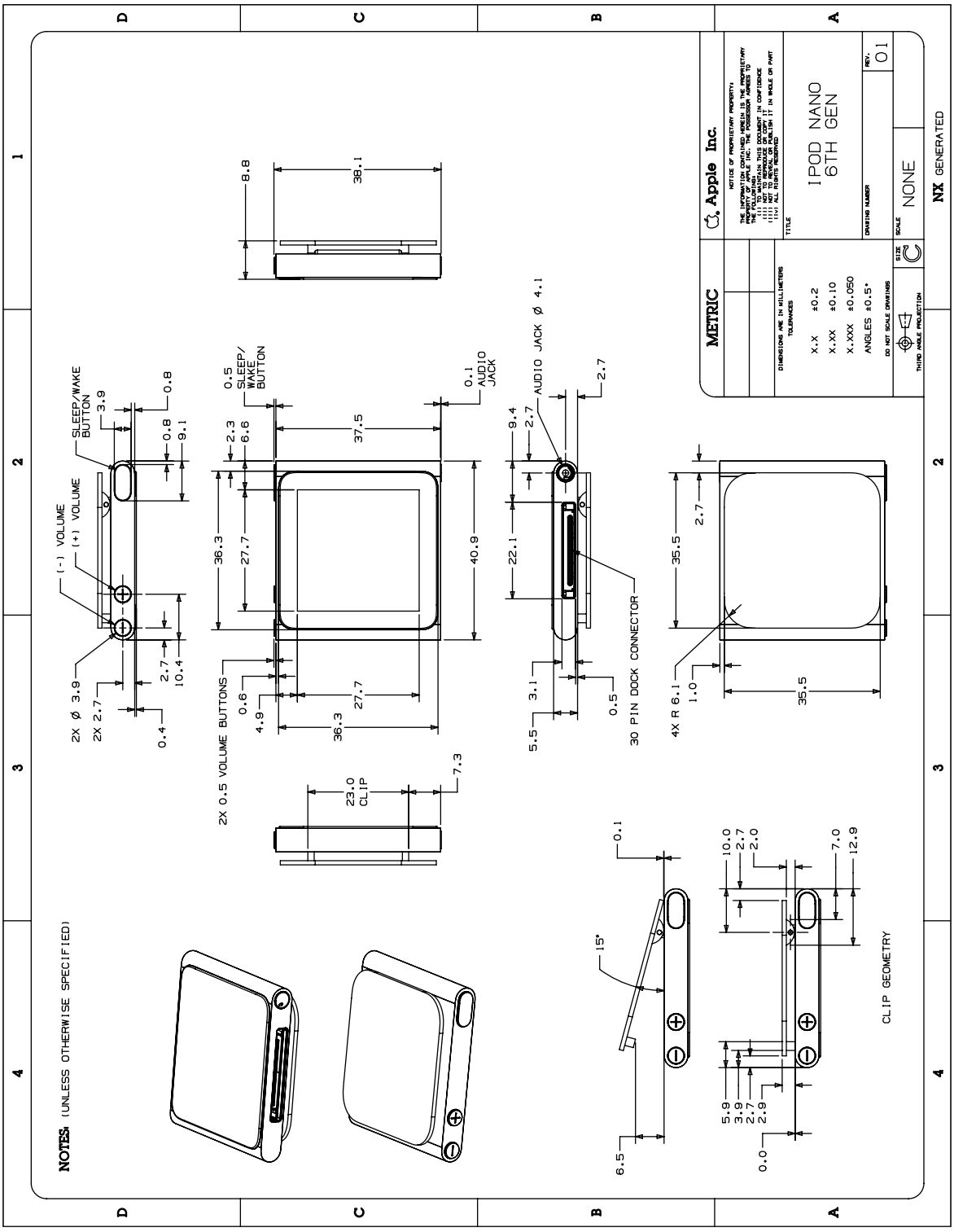
2.32 iPod nano (7th generation)

Figure 2-32 iPod nano 7th gen. Dimensional Drawing



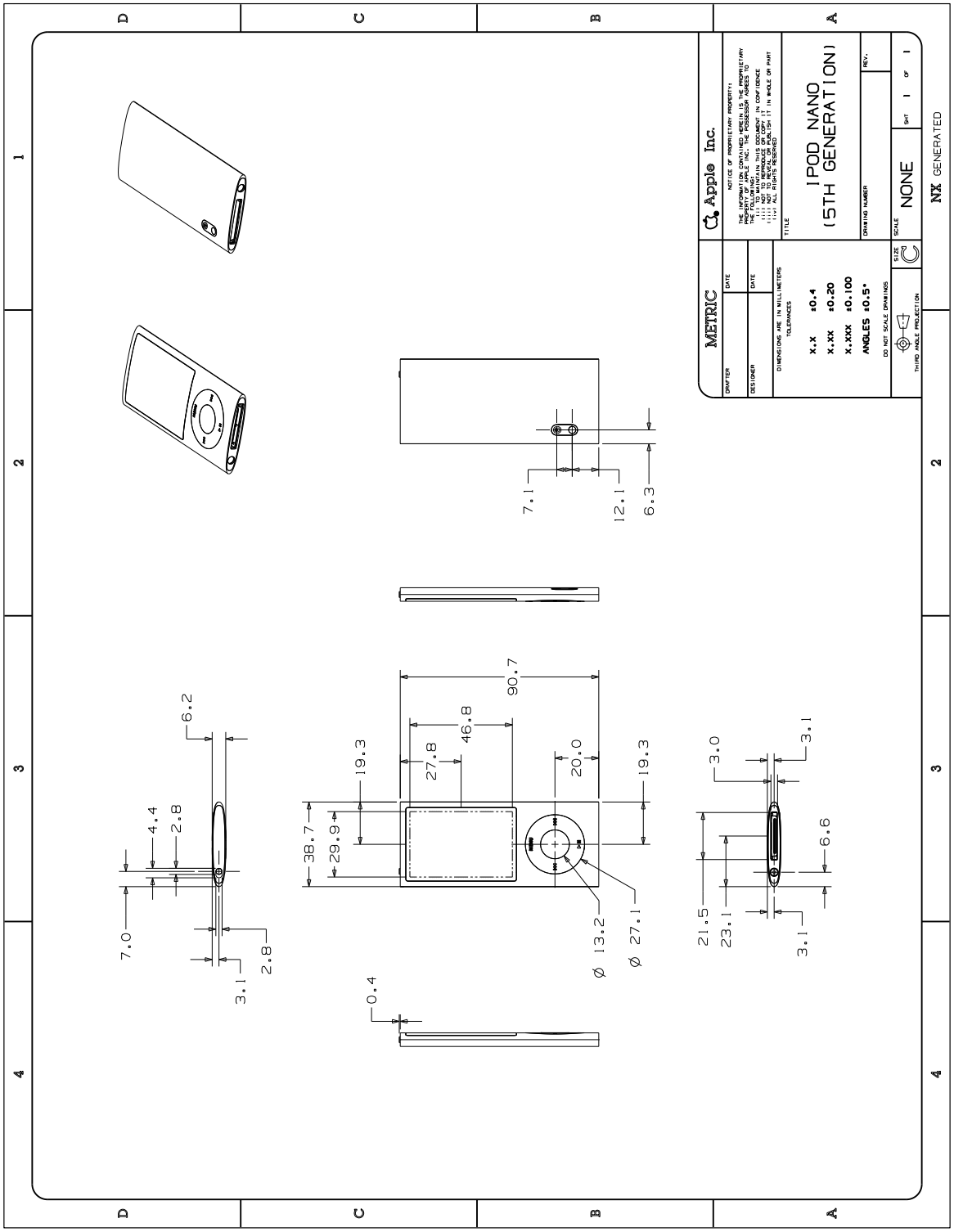
2.33 iPod nano (6th generation)

Figure 2-33 iPod nano 6th gen. Dimensional Drawing



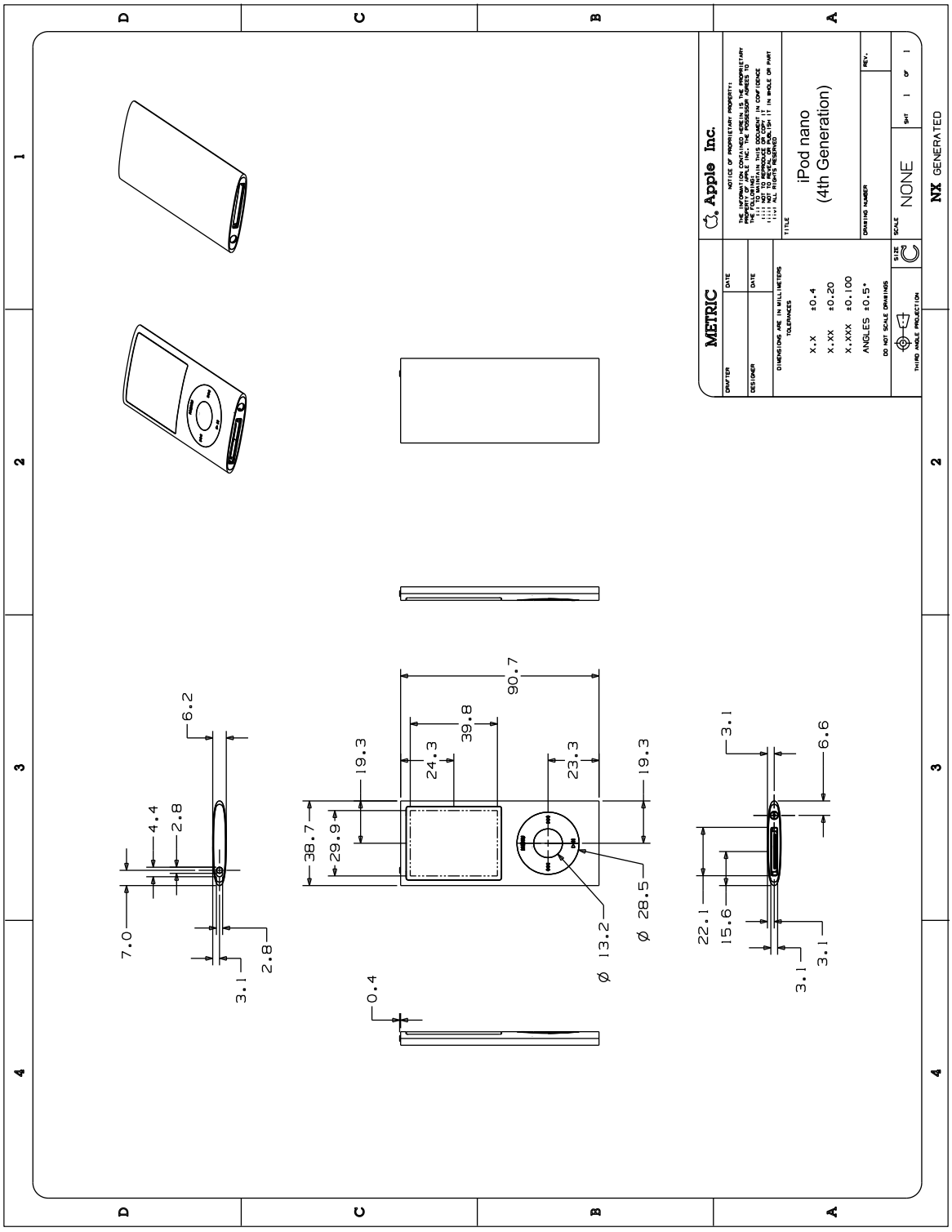
2.34 iPod nano (5th generation)

Figure 2-34 iPod nano 5th gen. Dimensional Drawing



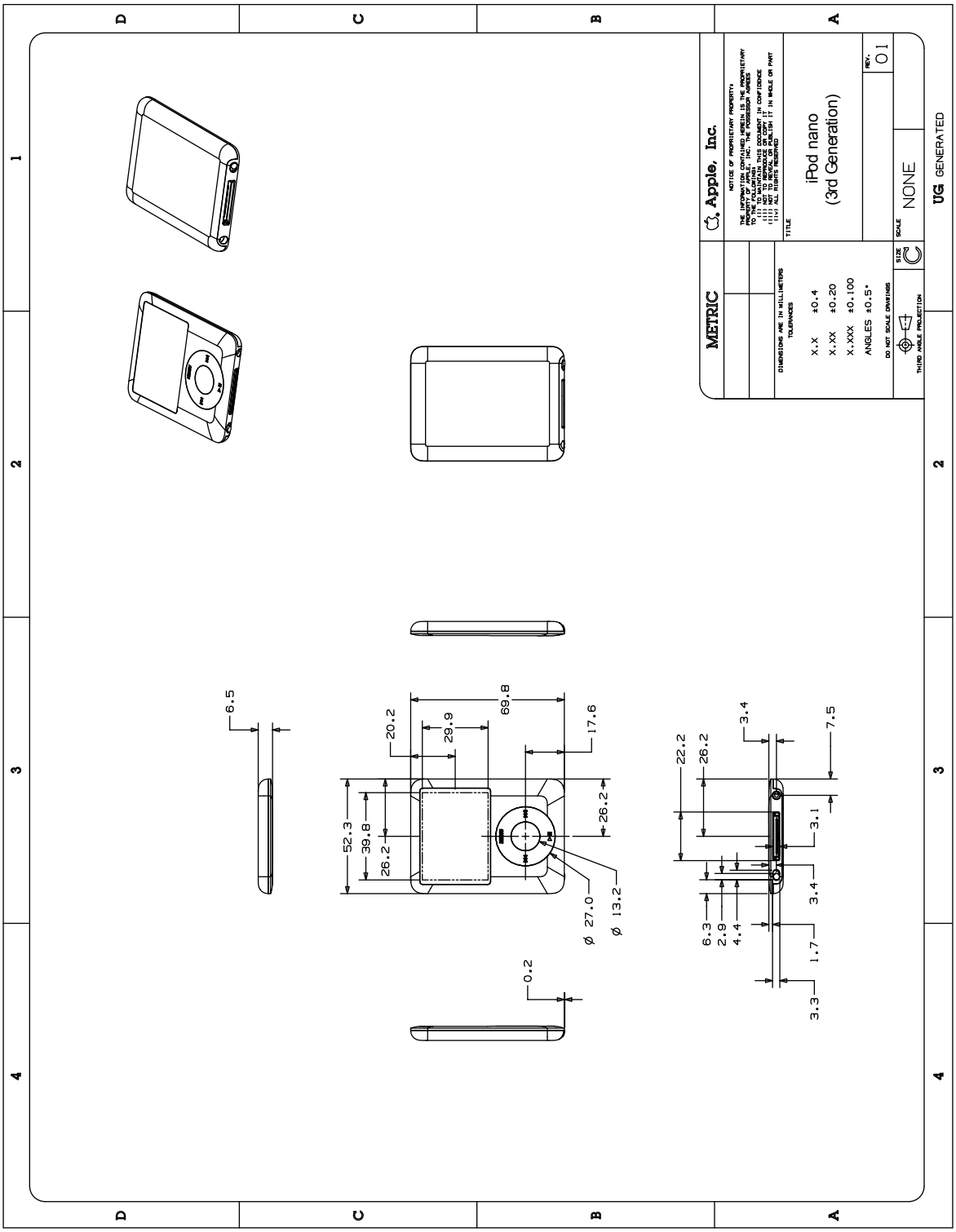
2.35 iPod nano (4th generation)

Figure 2-35 iPod nano 4th gen. Dimensional Drawing



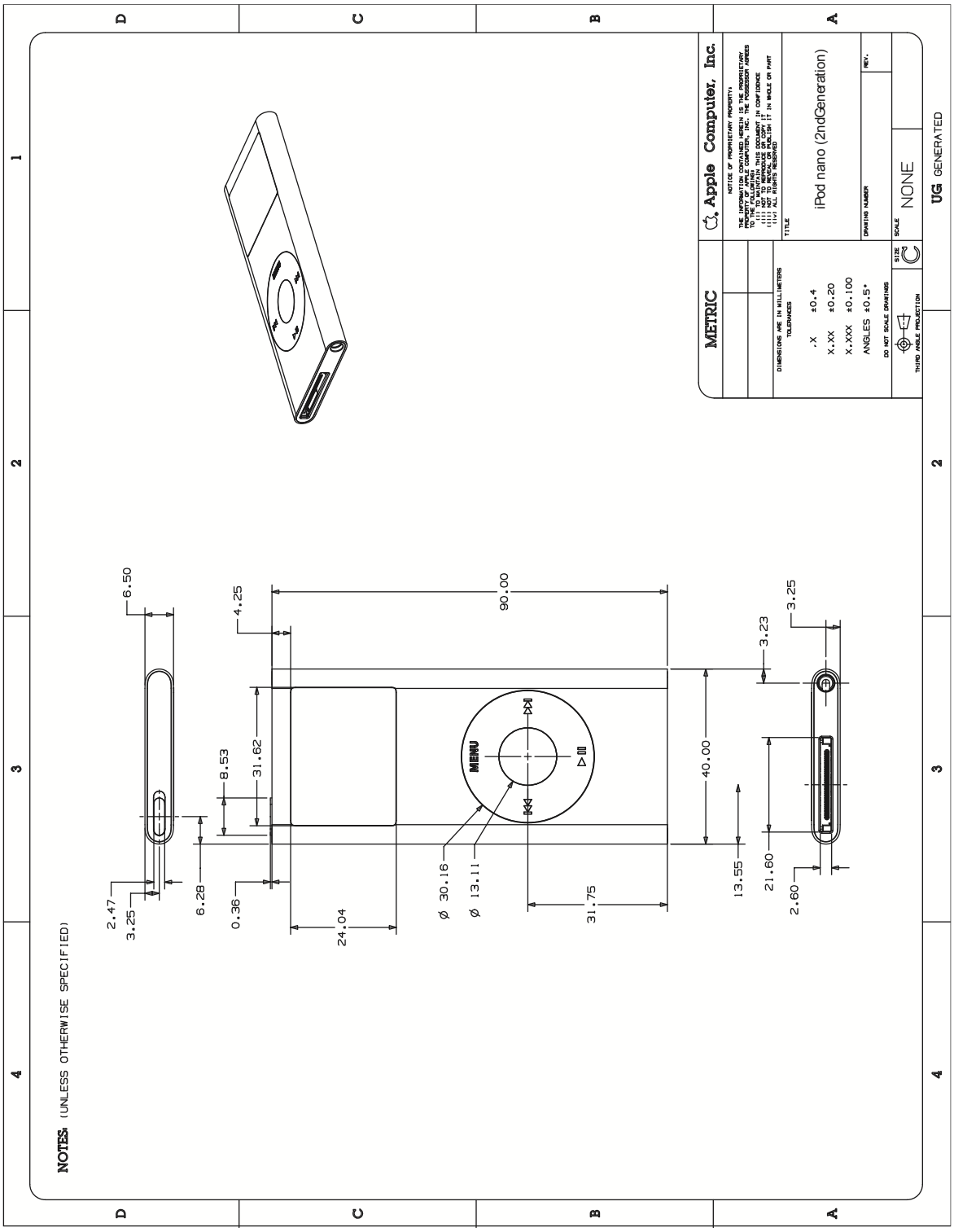
2.36 iPod nano (3rd generation)

Figure 2-36 iPod nano 3rd gen. Dimensional Drawing



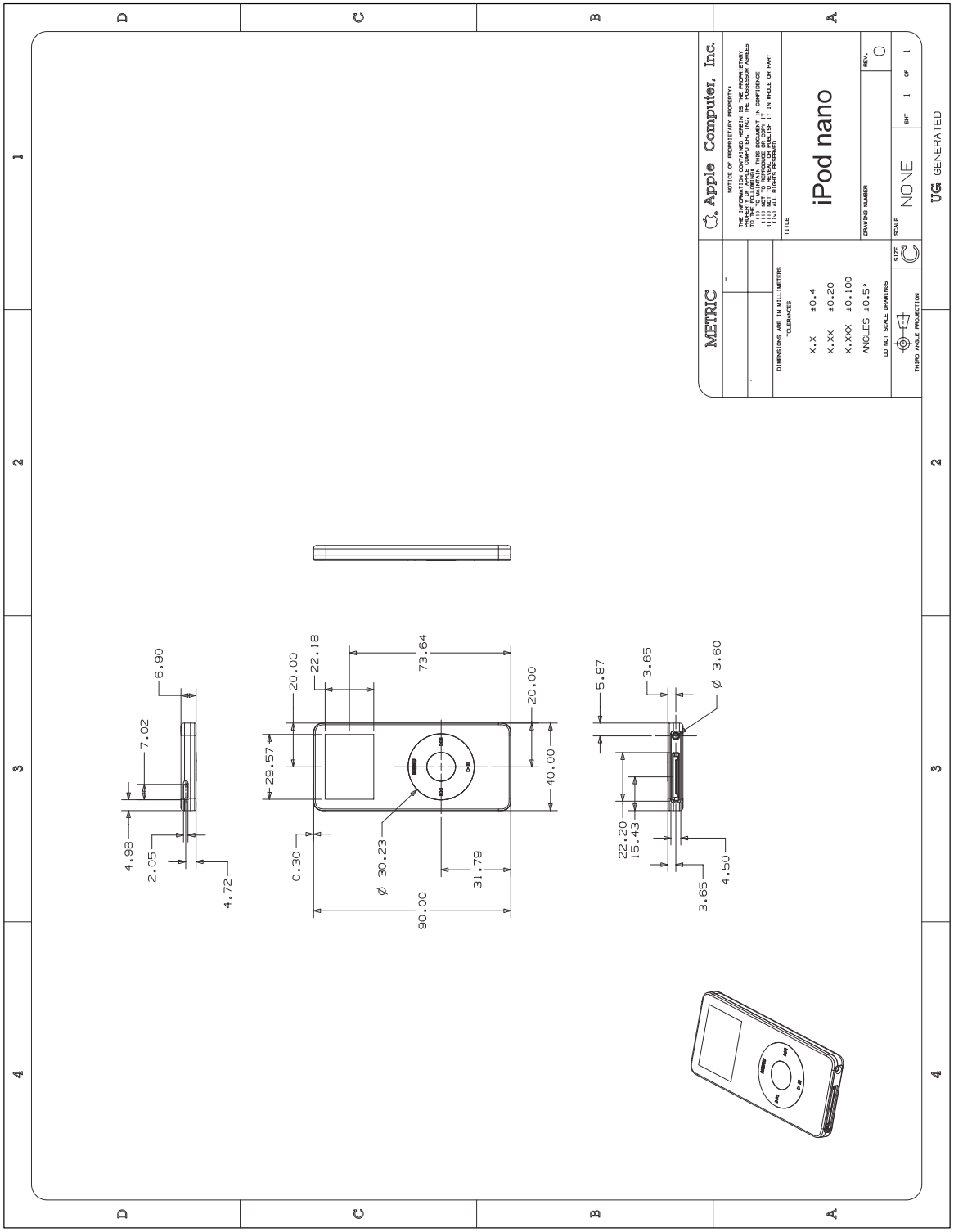
2.37 iPod nano (2nd generation)

Figure 2-37 iPod nano 2nd gen. Dimensional Drawing



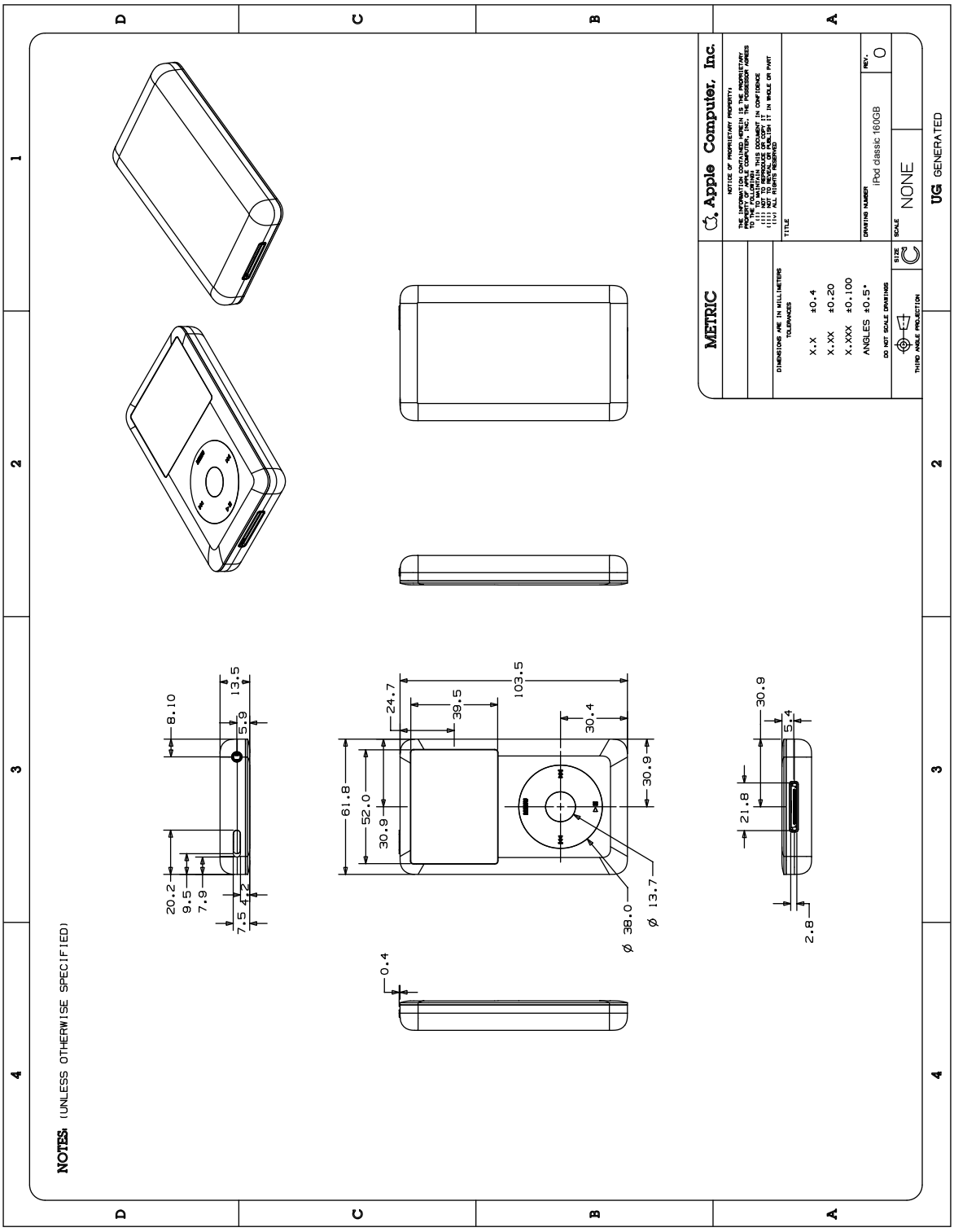
2.38 iPod nano

Figure 2-38 iPod nano Dimensional Drawing



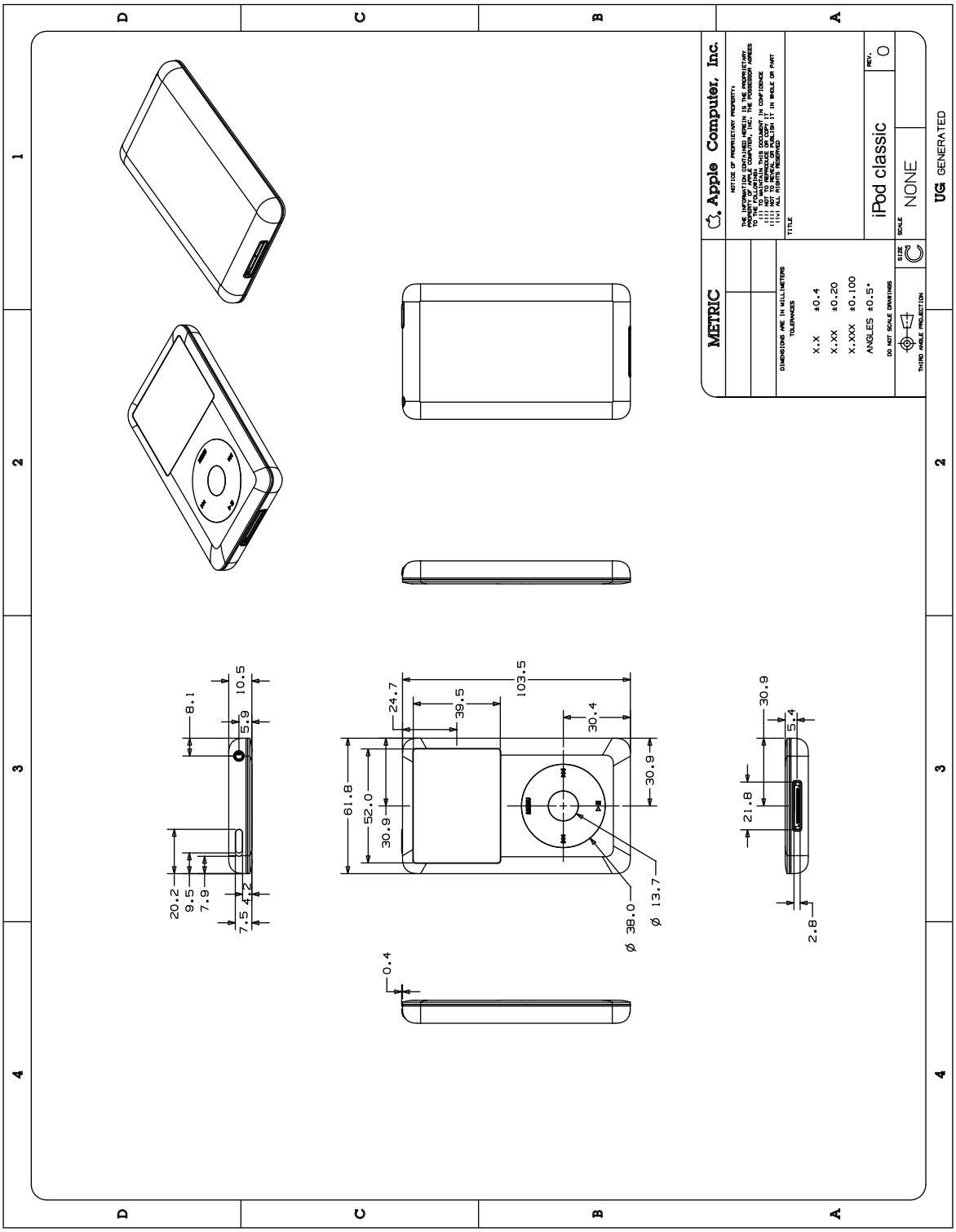
2.39 iPod classic 160GB

Figure 2-39 iPod classic 160GB Dimensional Drawing



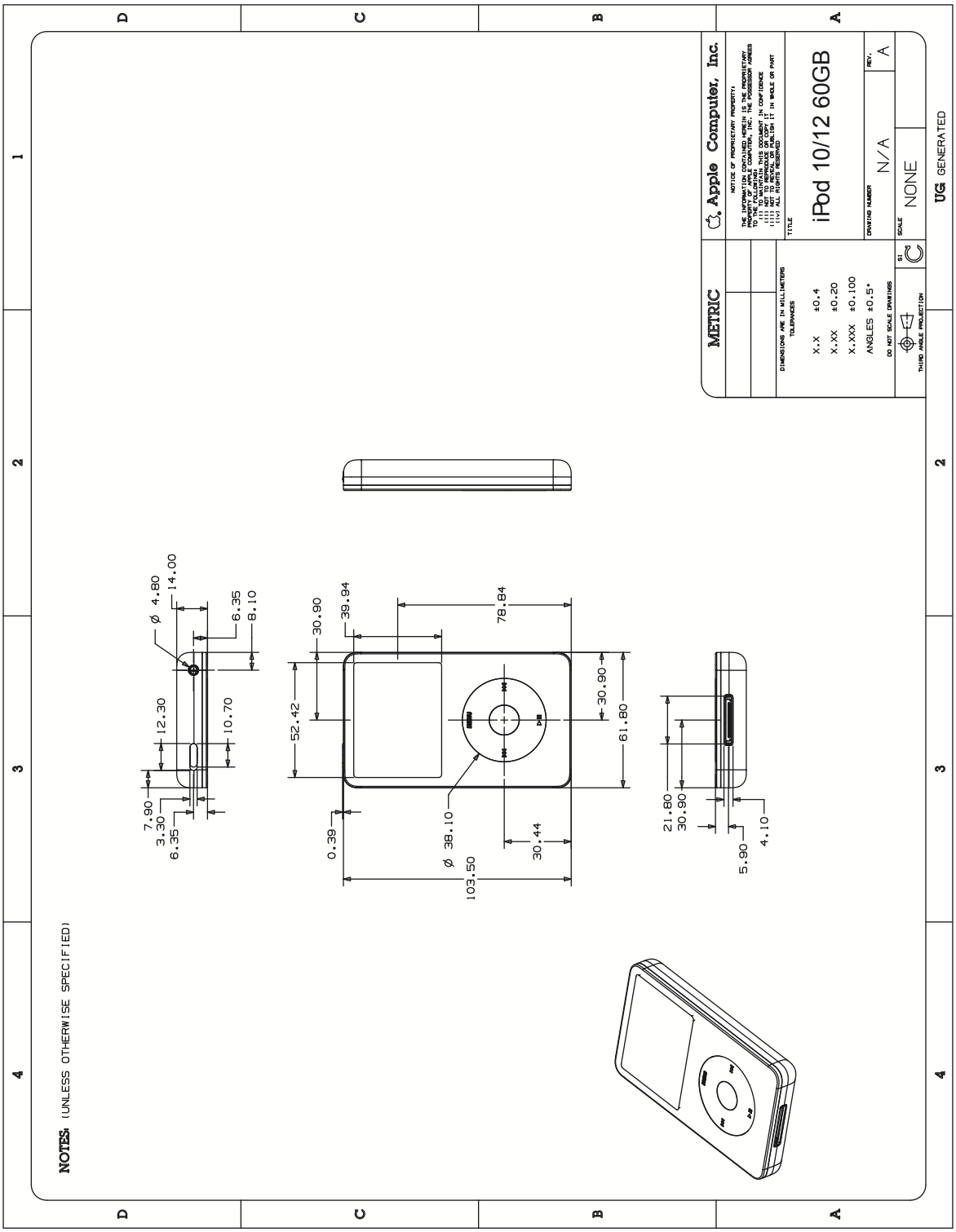
2.40 iPod classic 80GB

Figure 2-40 iPod classic 80GB Dimensional Drawing



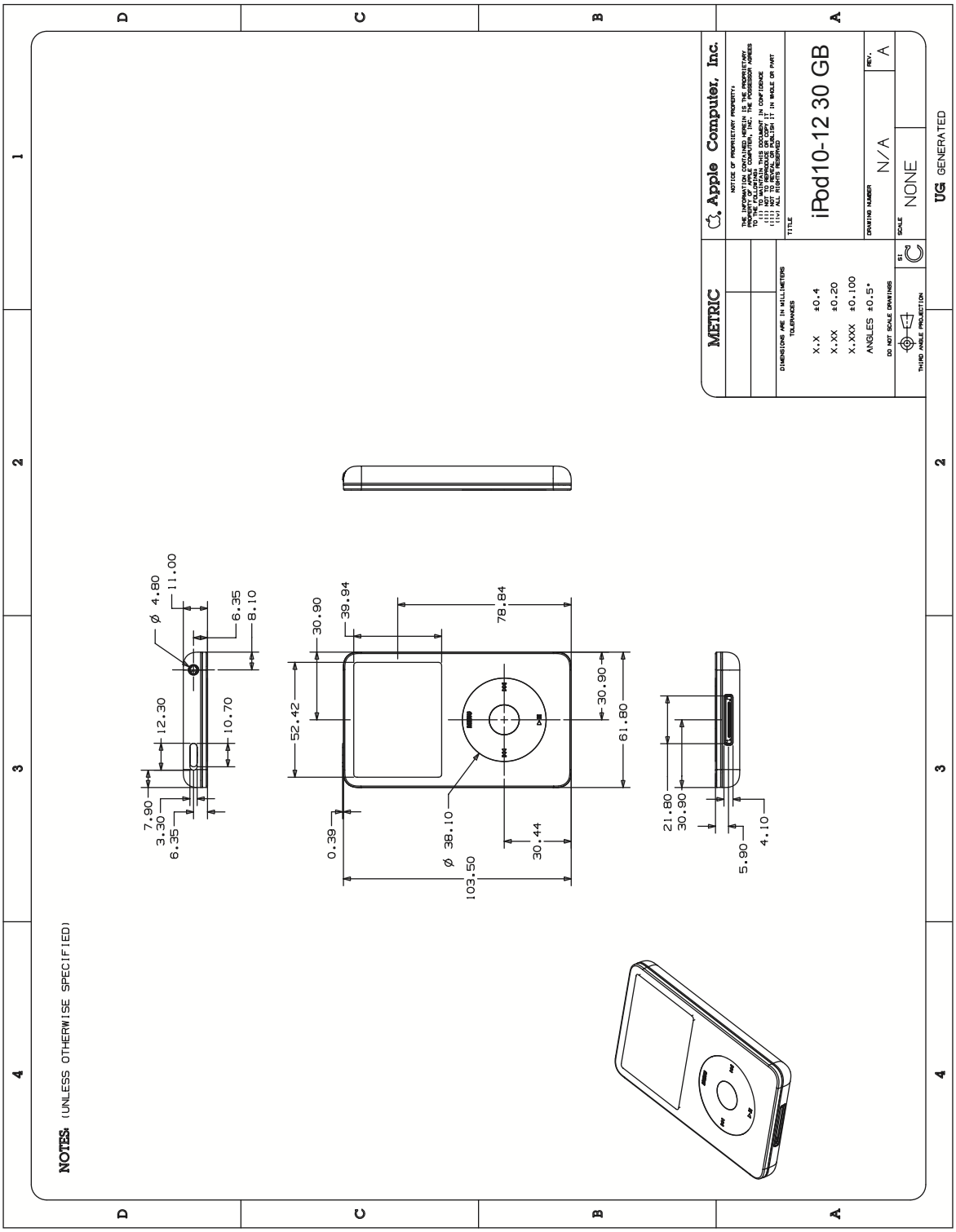
2.41 iPod (5th generation) 60GB/80GB

Figure 2-41 iPod 5th gen. 60GB/80GB Dimensional Drawing



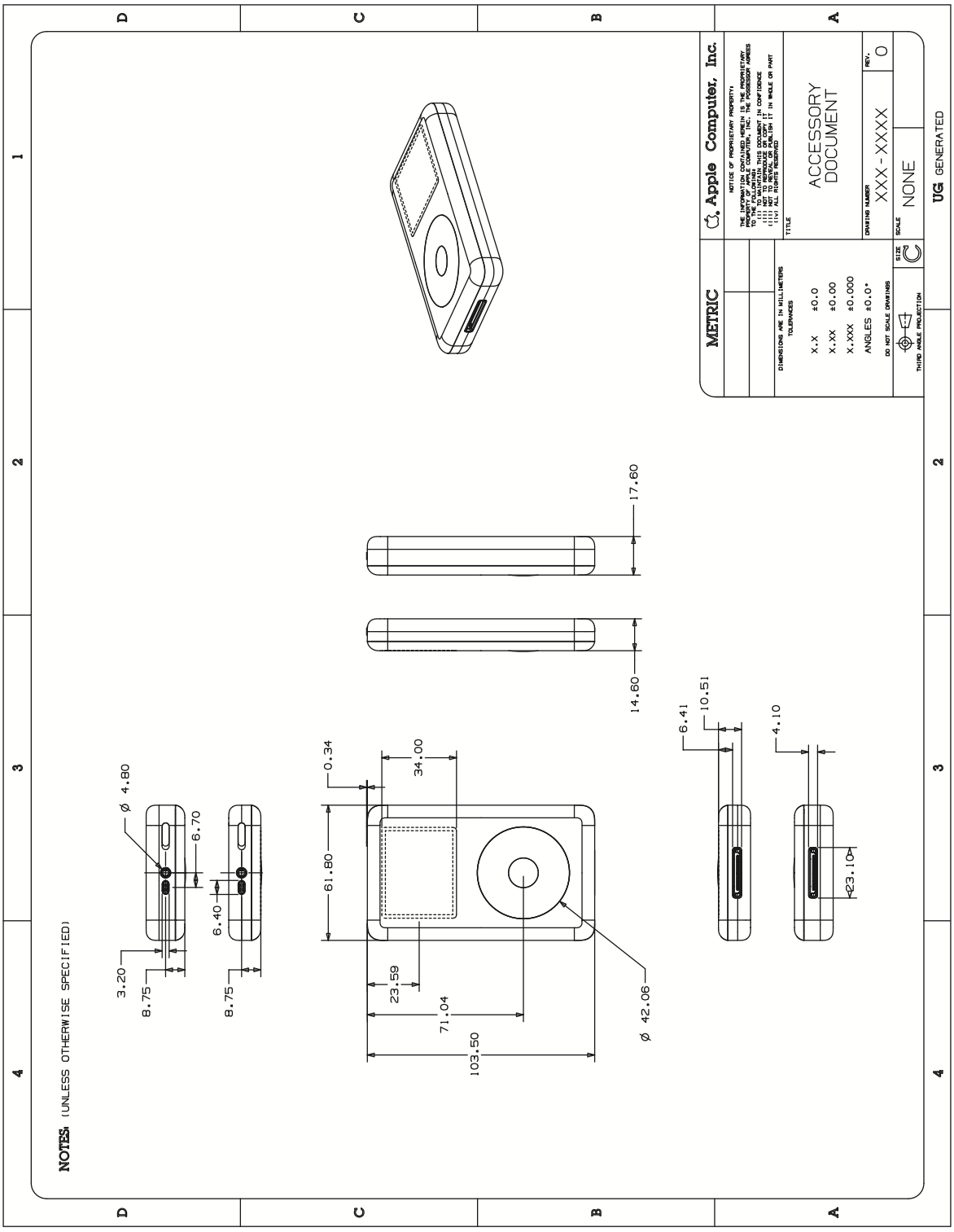
2.42 iPod (5th generation) 30GB

Figure 2-42 iPod 5th gen. 30GB Dimensional Drawing



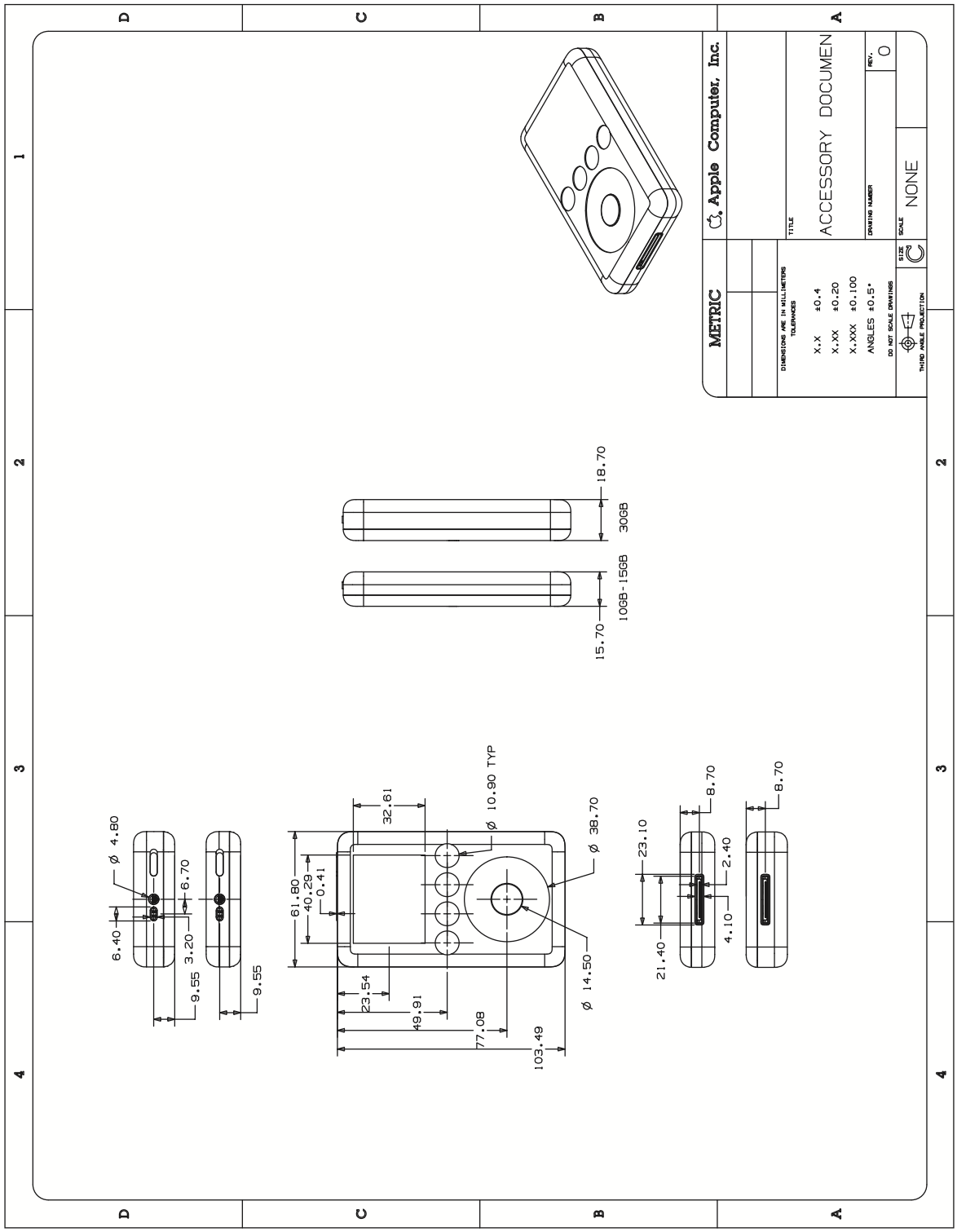
2.43 iPod (4th generation)

Figure 2-43 iPod 4th gen. Dimensional Drawing



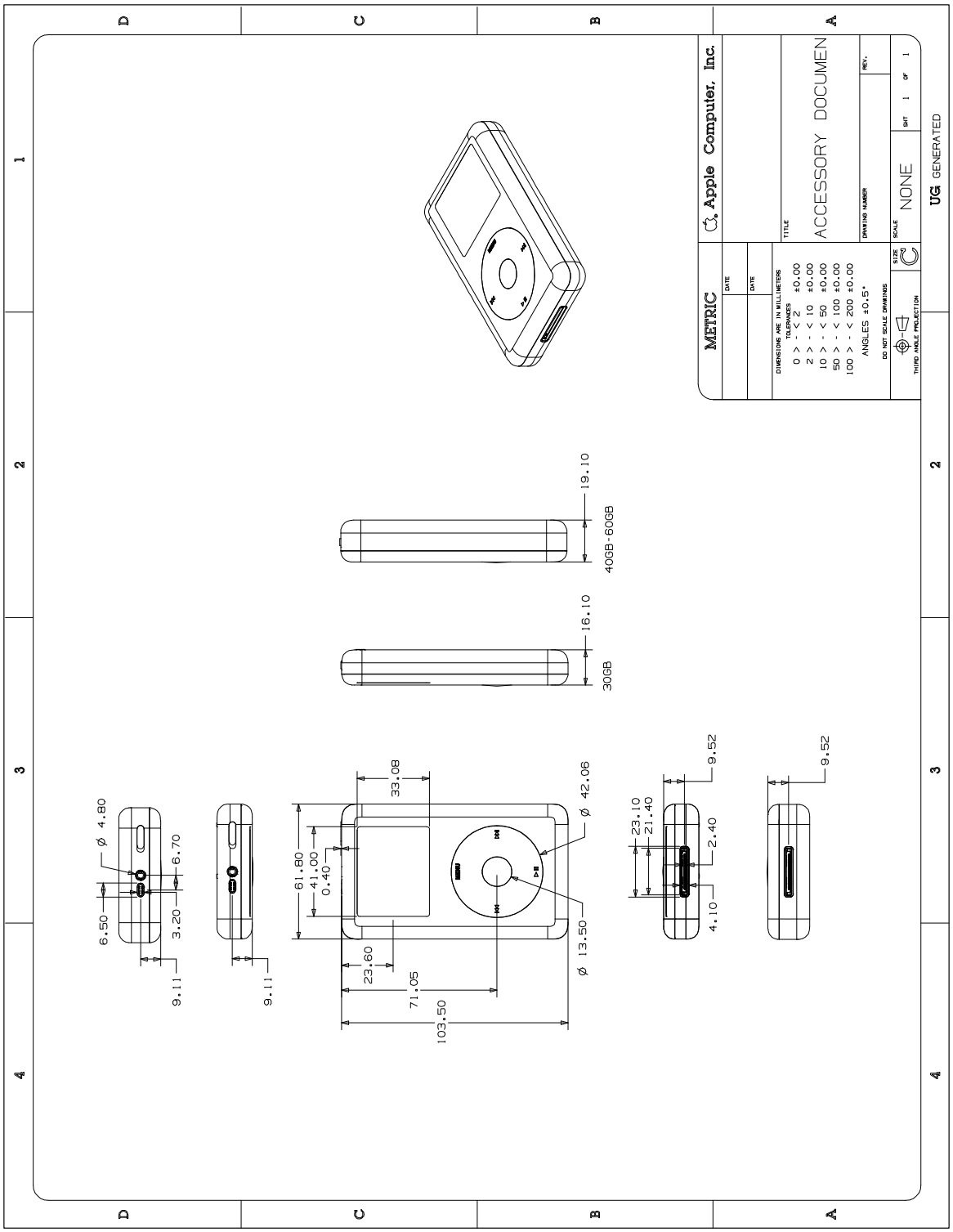
2.44 iPod (3rd generation)

Figure 2-44 iPod 3rd gen. Dimensional Drawing



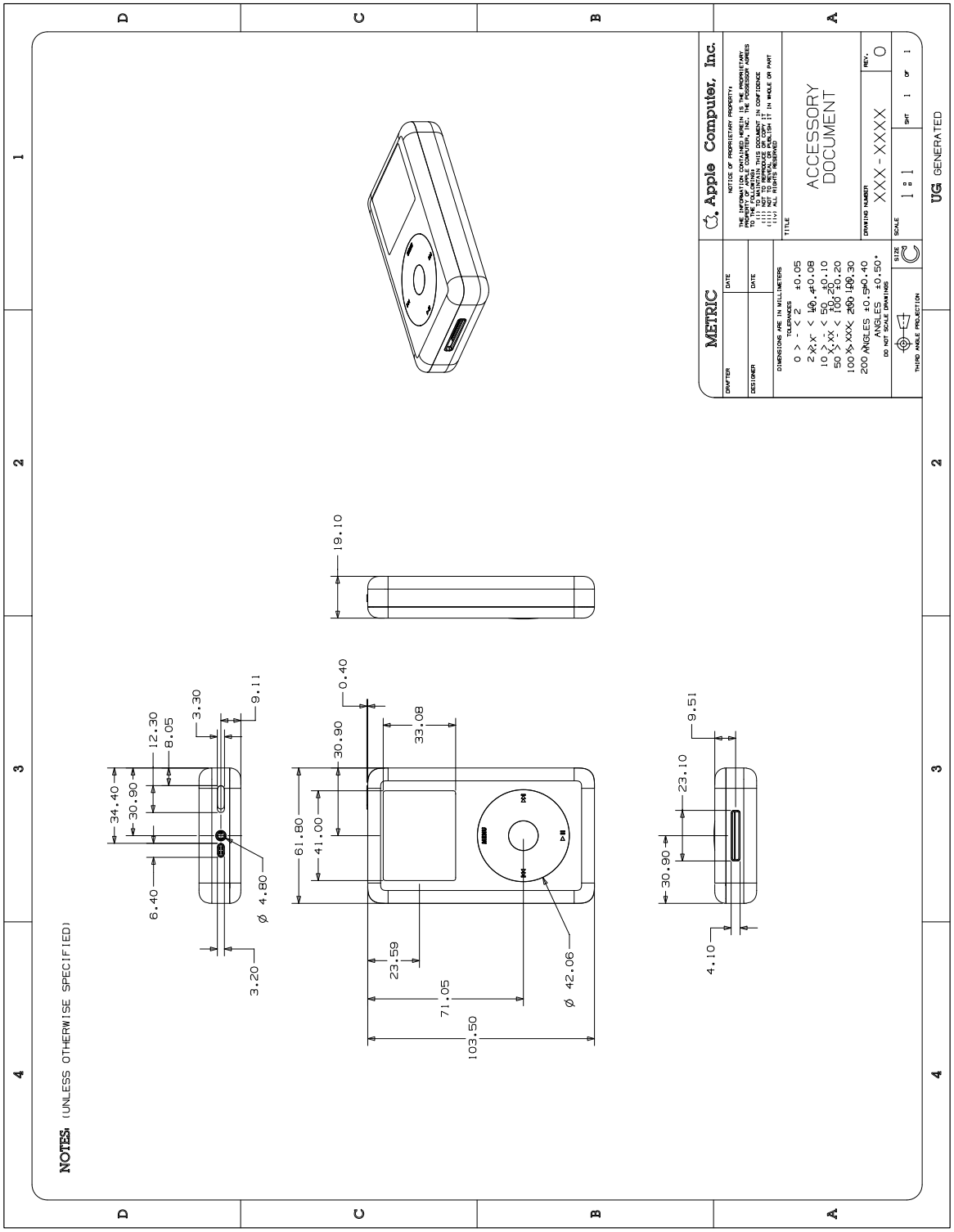
2.45 iPod photo 30GB/60GB

Figure 2-45 iPod photo 30/60GB Dimensional Drawing



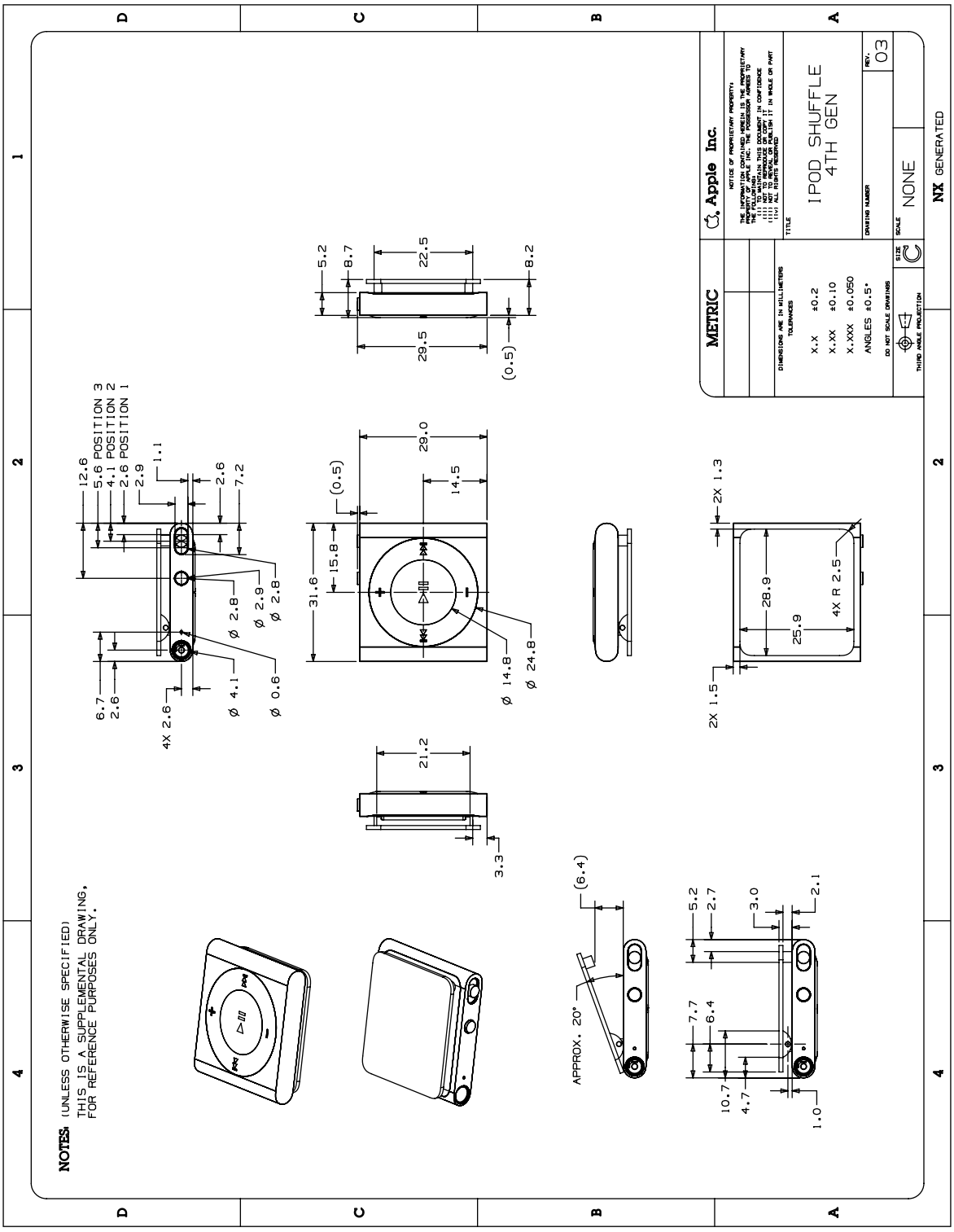
2.46 iPod photo

Figure 2-46 iPod photo Dimensional Drawing



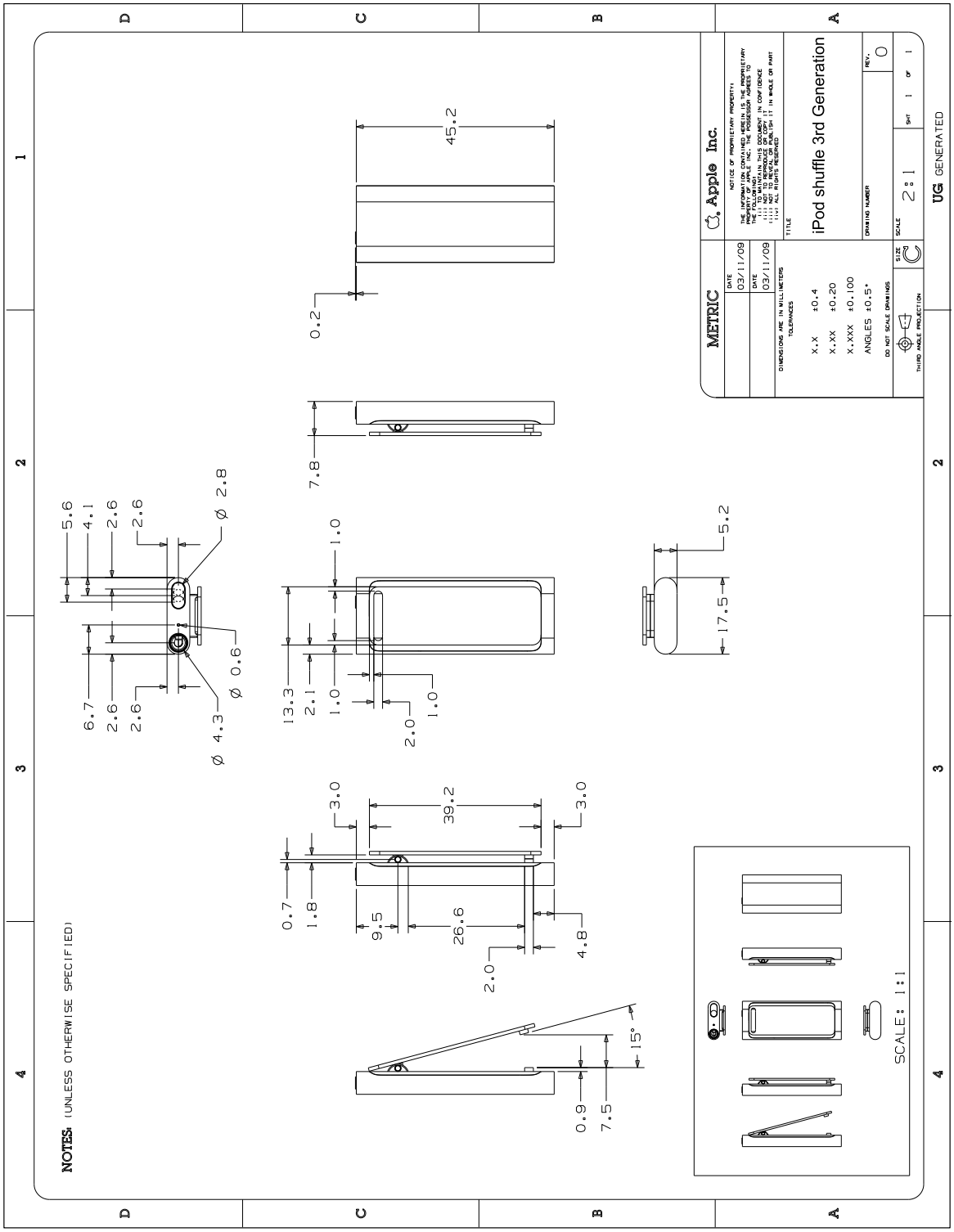
2.47 iPod shuffle (4th generation)

Figure 2-47 iPod shuffle 4th gen. Dimensional Drawing



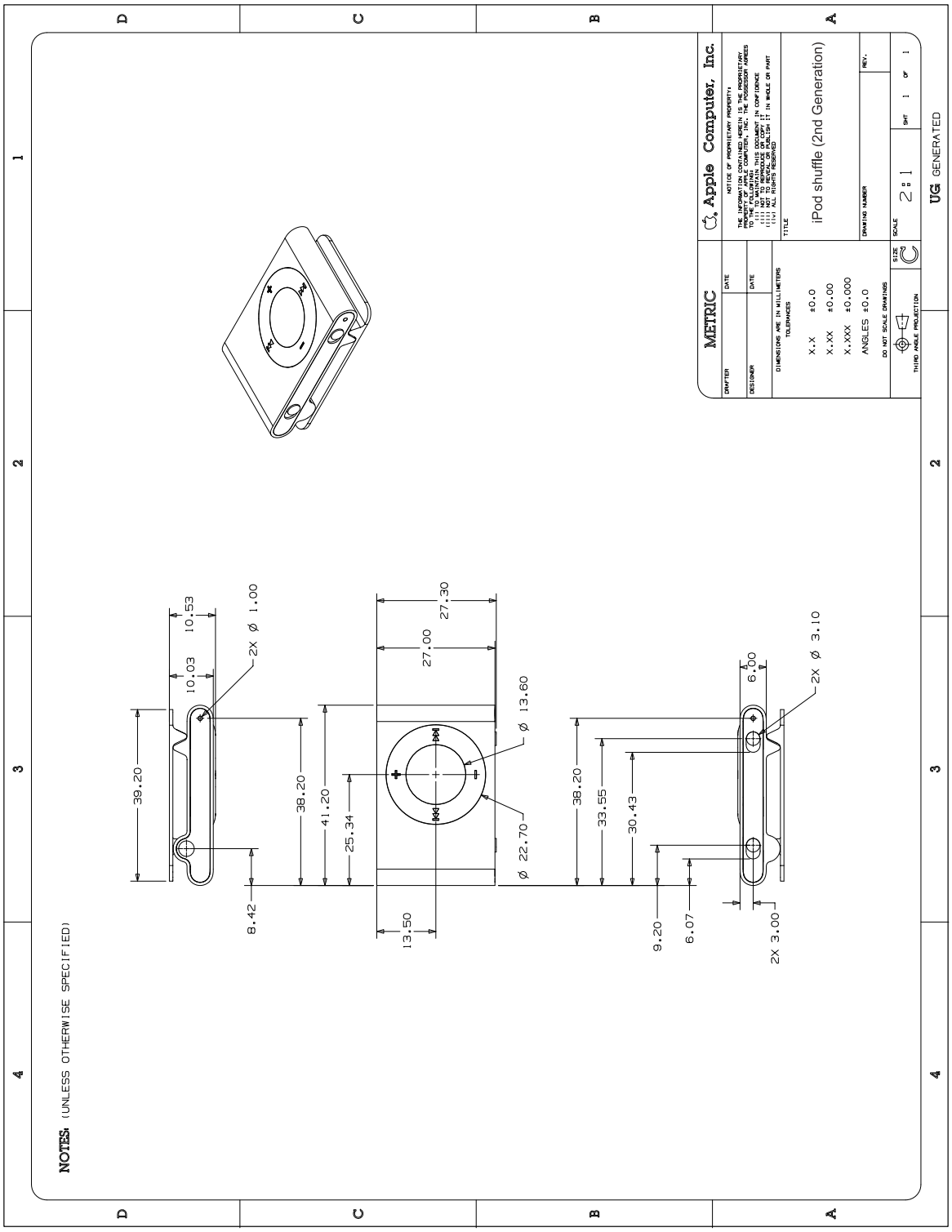
2.48 iPod shuffle (3rd generation)

Figure 2-48 iPod shuffle 3rd gen. Dimensional Drawing



2.49 iPod shuffle (2nd generation)

Figure 2-49 iPod shuffle 2nd gen. Dimensional Drawing



2.50 iPod shuffle

Figure 2-50 iPod shuffle Dimensional Drawing (1 of 2)

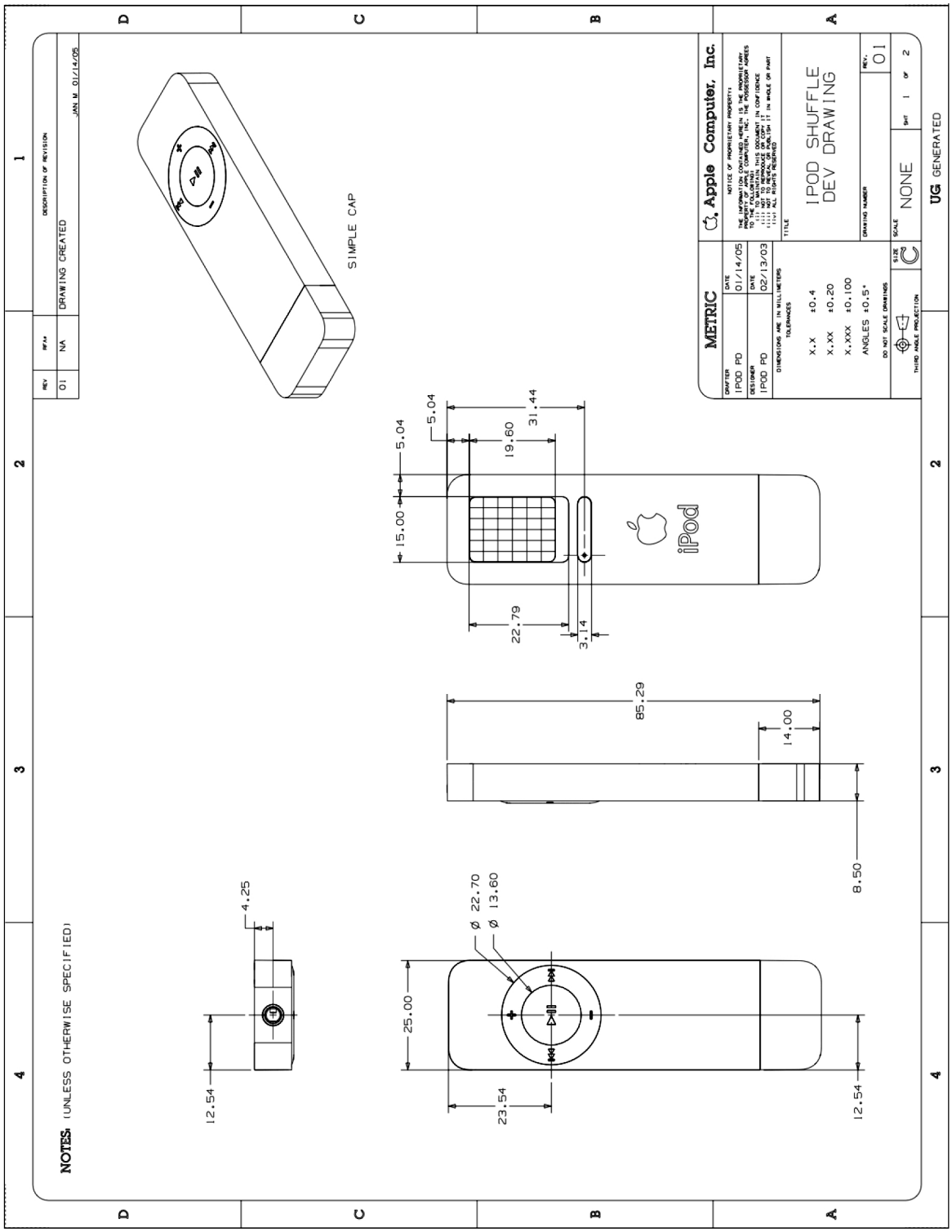
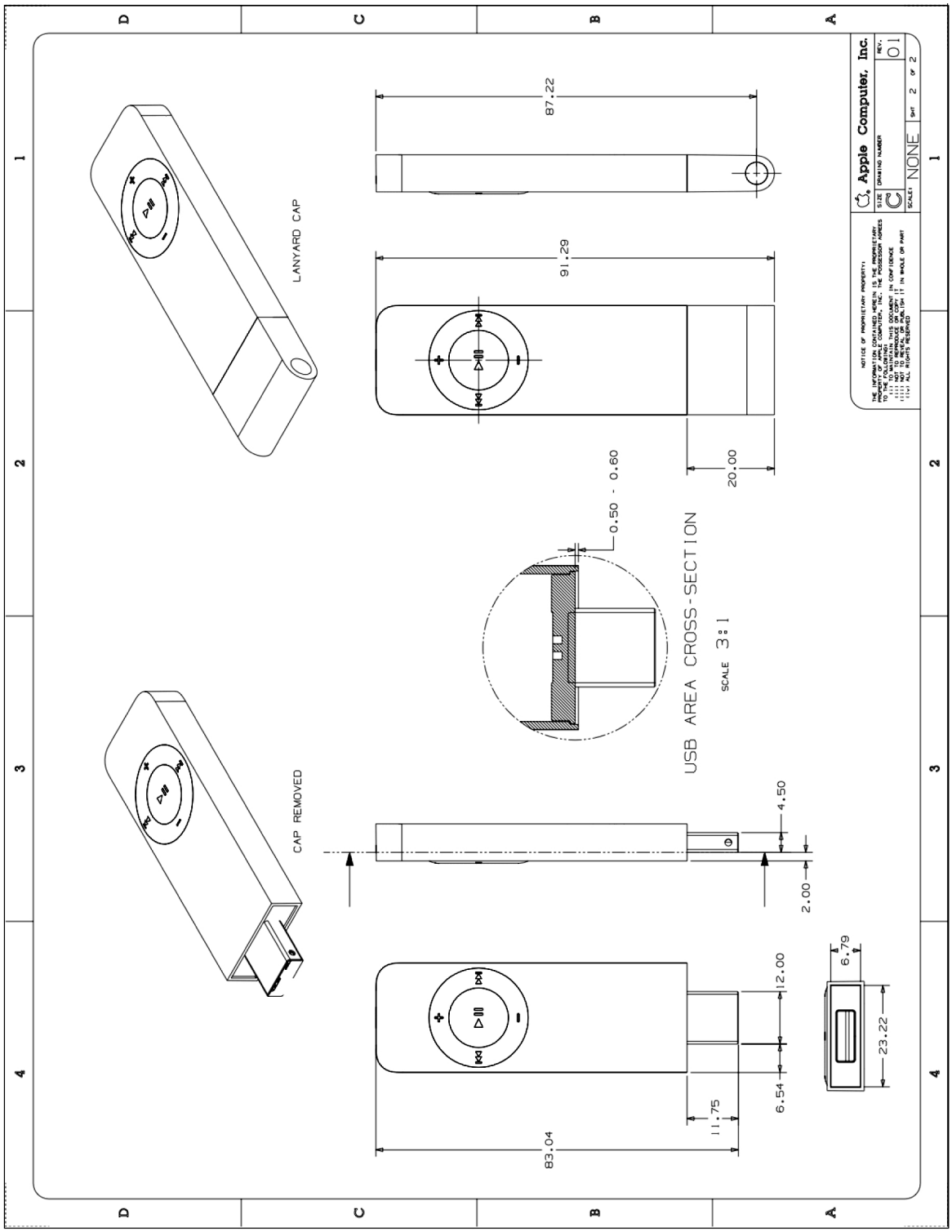
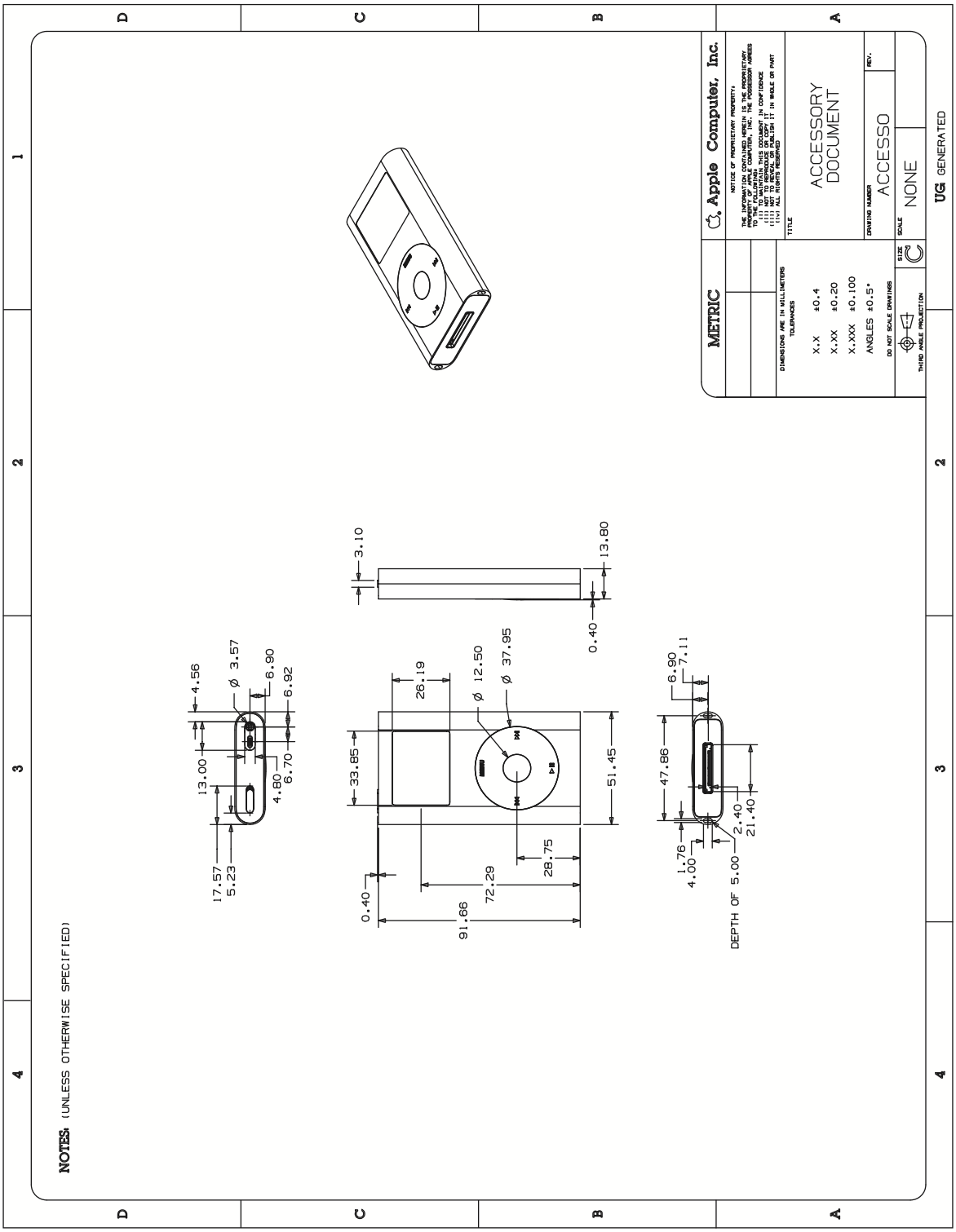


Figure 2-51 iPod shuffle Dimensional Drawing (2 of 2)



2.51 iPod mini

Figure 2-52 iPod mini Dimensional Drawing



3. Revision History

This table describes the changes to the Case Design Guidelines for Apple Devices.

Date	Notes
2014-10-16	*Release R8*
	Updated Product Design (page 7)
	Updated Camera (page 9)
	Updated Environmental (page 13)
	Updated Device Dimensional Drawings (page 15): Updated dimensional drawings for iPhone 6 and iPhone 6 Plus
	Updated Device Dimensional Drawings (page 15): Added dimensional drawings for iPad Air 2
	Updated Device Dimensional Drawings (page 15): Renamed iPad mini with Retina display to iPad mini 2 and iPad mini 3
2014-09-10	*Release R7*
	Renamed 'Mechanical Requirements' to 'Product Design'
	Updated Access to the Headphone Jack and 30-pin or Lightning Connector (page 7)
	Added Device Protection (page 7)
	Added Cover Glass Contact (page 8)
	Added Dock Compatibility (page 8)
	Updated Magnetic Interference (page 9)
	Updated Touch ID Sensor (page 9)
	Updated Environmental (page 13)
	Added Near Field Communication (NFC) (page 14)

	Updated Device Dimensional Drawings (page 15): Added dimensional drawings for iPhone 6 and iPhone 6 Plus
2013-10-22	*Release R6*
	Updated Device Dimensional Drawings (page 15): Added dimensional drawings for iPad mini 2 and iPad Air.
2013-09-13	*Release R5*
	Updated "1.1 Mechanical Requirements"
	Updated Sensors (page 9)
	Updated Camera (page 9)
	Updated Touchscreen (page 14)
	Updated Device Dimensional Drawings (page 15): Added dimensional drawings for iPhone 5s and iPhone 5c
2013-05-08	*Release R4*
	Added Device Dimensional Drawings (page 15)
2012-09-12	*Release R3*
	Added information for devices with the Apple Lightning connector: iPhone 5, iPod touch (5th generation), and iPod nano (7th generation).
2011-03-11	*Release R2*
	Updated guidelines to cover cases for iPads.
	Changed document title from "iPhone Case Design Guidelines" to "Case Design Guidelines for Apple Devices."
2011-02-28	*Release R1*
	First Release of "iPhone Case Design Guidelines"

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