1   Introduction

The **AXIOM** AX54A-3D is a Capacitive Multi-touch controller with the very highest performance for use in demanding applications across markets such as Automotive, Industrial, White Goods and Medical.

In addition to supporting state-of-the-art Capacitive Touch Sensing, the device also features integrated pressScreen force sensing and Haptic feedback output event triggers to allow creation of rich user interfaces. Use of these features allows the device to sense not only conventional contact type touches, but also to detect the force applied to the touch sensor cover lens.

The high performance acquisition engine enables the touchscreen controller to sense regular contacts and gloves and also to detect pre-contact proximity and hover finger targets above the touchscreen surface. Additionally, the same sensing performance allows designers to use thick plastic front lenses, curved or non-uniform thickness lenses and even to sense through a small air gap. Industry leading water rejection and wet finger tracking is also included.
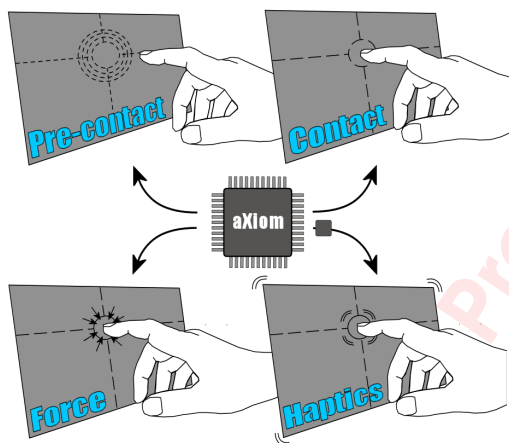

Figure 1-1: **AXIOM** 3D Sensing Capabilities

Combined with the ability to output region based Haptic feedback commands to a 3rd party driver, the device becomes the central controller for a holistic user interface system implementing 3D proximity, 3D hover, 3D overlays/lenses, touch, press and haptic feedback.

A Windows™ based software package, TouchHub, is provided with the AX54A-3D to ease design and tuning tasks. This allows the designer to input simplified design choices and enables TouchHub to automatically create optimized tuning configurations. Additionally, a digitizer driver is available for Linux.

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[1]Subject to configuration
[2]Pending

Features at a glance

Capacitive Multi-touch controller

- Ultra high SNR: >80dB
- Supports up to 54 touch sensing channels
- Flexible channel routing allows arbitrary touch sensor aspect ratios
- Supports non-rectangular sensors
- Concurrently supports 2D (xy), 1D (slider) and 0D (button) sensors
- Touch sensing through very thick plastic lenses and/or air gaps
- Supports non-uniform lens thickness
- Supports both 3D proximity and 3D hover sensing
- Supports up to 2 Dial On Display mechanical rotors
- All touches reported at a frame rate of up to 250Hz[1]
- Glove support without switching modes
- Water suppression and wet finger tracking
- Low emissions, low drive amplitude, high immunity to conducted interference
- Host connection using SPI or I2C slave with interrupt or LIN
- 3V3 and 1V8 supply, no high voltage generators needed
- Independent I/O voltage supporting 1.8V to 3.3V host signaling
- Optional external synchronization with display drivers for highest SNR

pressScreen Force controller

- Supports up to 4 press sensing channels
- Can detect displacement of cover lens <10um
- Supports multi-press
- Force measured concurrently with touch

Haptic Trigger

- User definable region based haptics
- Configurable hot-spot maps and actions
- Trigger uses master I2C or GPIO output to 3rd party driver chip

General

- Register based tuning with non-volatile configuration storage
- Field upgradable firmware
- Sophisticated Built-In-Self-Test routines and diagnostics
- Automotive AEC-Q100 grade 2 qualified[2]
- -40°C to +105°C ambient operating temperature
- Available in QFN88 package with side wettable flanks
- TouchHub evaluation and support software for design and tuning

2   Ordering Information

Contact your local sales office for further details.

Contents

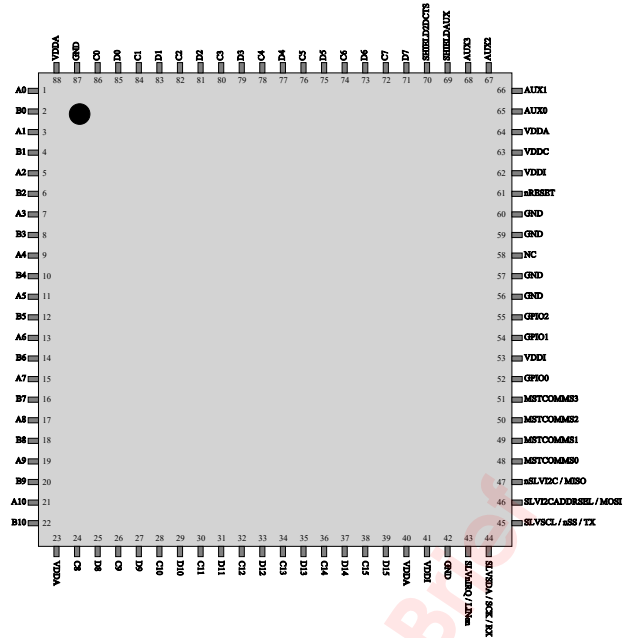# 3   Device Pinout

3.1   Pin Map

3.1.1   QFN88

Figure 3.1.1-1: QFN88 Device Pinout (top view)

Appendix A   Legal Copyright and Disclaimer

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Appendix B   Document History

Revision	Date	Change summary
A1	06/07/2020	Preliminary release
A2	23/07/2020	Change connection advice for unused sense pins
A3	10/08/2020	Correct SLVnIRQ pin type. Add timing data for I2C and SPI
A4	03/09/2020	Correct device name from AX52A to AX54A. Add section about Dial on Display
A5	15/09/2020	Add ref schematic and update pin map to remove leading zeros in sense pin names
A6	10/11/2020	Add reference to LIN
A7	21/01/2021	Update ref. schematic and notes to add 1nF to SHIELD2DCTS. Update screen diagonals plot
A8	15/02/2021	Add notes about Reduced Power Mode, shipping tray details
A9	06/04/2021	Add tuning header in ref schematic
A10	14/06/2021	Add sensing architecture diagram
A11	19/11/2021	Add power requirements detail. Formatting clean ups
A12	28/02/2022	Updated ordering information.
A13	28/03/2022	Added VDDA layout considerations. Changed pin 56 from NC to GND.
B1	12/06/2022	Rename to 3D variant. Include AUXn reference caps.
B2	19/08/2022	Add more details for reference / cal caps.