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ATECC608A

Microchip CryptoAuthentication™ Device

Features

- Cryptographic Co-Processor with Secure Hardware-based Key Storage:
  - Protected Storage for up to 16 Keys, Certificates or Data
- Hardware Support for Asymmetric Sign, Verify, Key Agreement:
  - ECDSA: FIPS186-3 Elliptic Curve Digital Signature
  - ECDH: FIPS SP800-56A Elliptic Curve Diffie-Hellman
  - NIST Standard P256 Elliptic Curve Support
- Hardware Support for Symmetric Algorithms:
  - SHA-256 & HMAC Hash including off-chip context save/restore
  - AES-128: Encrypt/Decrypt, Galois Field Multiply for GCM
- Networking Key Management Support:
  - Turnkey PRF/HKDF calculation for TLS 1.2 & 1.3
  - Ephemeral key generation and key agreement in SRAM
  - Small message encryption with keys entirely protected
- Secure Boot Support:
  - Full ECDSA code signature validation, optional stored digest/signature
  - Optional communication key disablement prior to secure boot
  - Encryption/Authentication for messages to prevent on-board attacks
- Internal High-Quality NIST SP 800-90A/B/C Random Number Generator (RNG)
- Two High-Endurance Monotonic Counters
- Guaranteed Unique 72-bit Serial Number
- Two Interface Options Available:
  - High-speed Single Pin Interface with One GPIO Pin
  - 1 MHz Standard I^2C Interface
- 1.8V to 5.5V IO Levels, 2.0V to 5.5V Supply Voltage
- <150 nA Sleep Current
- 8-pad UDFN and 8-lead SOIC Packages

Applications

- IoT network endpoint key management & exchange
- Encryption for small messages and PII data
- Secure Boot and Protected Download
- Ecosystem Control, Anti-cloning

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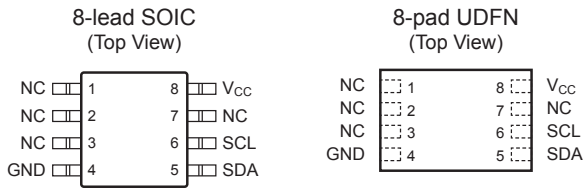
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Pin Configuration and Pinouts

Table 1. Pin Configuration

Pin	Function
NC	No Connect
GND	Ground
SDA	Serial Data
SCL	Serial Clock Input
VCC	Power Supply

Figure 1. Pinouts



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1. Introduction

1.1 Applications

The ATECC608A is a member of the Microchip CryptoAuthentication™ family of high-security cryptographic devices which combine world-class hardware-based key storage with hardware cryptographic accelerators to implement various authentication and encryption protocols.

The ATECC608A has a flexible command set that allows use in many applications, including the following:

- **Network/IoT Node Endpoint Security**
  Manage node identity authentication and session key creation & management. Supports the entire ephemeral session key generation flow for multiple protocols including TLS 1.2 (and earlier) and TLS 1.3
- **Secure Boot**
  Support the MCU host by validating code digests and optionally enabling communication keys on success. Various configurations to offer enhanced performance are available.
- **Small Message Encryption**
  Hardware AES engine to encrypt and/or decrypt small messages or data such as PII information. Supports AES-ECB mode directly. Other modes can be implemented with the help of the host microcontroller. Additional GFM calculation function to support AES-GCM.
- **Key Generation for Software Download**
  Supports local protected key generation for downloaded images. Both broadcast of one image to many systems, each with the same decryption key, or point-to-point download of unique images per system is supported.
- **Ecosystem control and Anti-Counterfeiting**
  Validates that a system or component is authentic and came from the OEM shown on the nameplate.

The ATECC608A is generally compatible with the ATECC508A when properly configured. See Section Microchip ATECC508A for more details.

1.2 Device Features

The ATECC608A includes an EEPROM array which can be used for storage of up to 16 keys, certificates, miscellaneous read/write, read-only or secret data, consumption logging, and security configurations. Access to the various sections of memory can be restricted in a variety of ways and then the configuration can be locked to prevent changes.

Access to the device is made through a standard I^2C Interface at speeds of up to 1 Mb/s. The interface is compatible with standard Serial EEPROM I^2C interface specifications. The device also supports a Single-Wire Interface (SWI), which can reduce the number of GPIOs required on the system processor, and/or reduce the number of pins on connectors. If the Single-Wire Interface is enabled, the remaining pin is available for use as a GPIO, an authenticated output or tamper input.

Each ATECC608A ships with a guaranteed unique 72-bit serial number. Using the cryptographic protocols supported by the device, a host system or remote server can verify a signature of the serial number to prove that the serial number is authentic and not a copy. Serial numbers are often stored in a

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standard Serial EEPROM; however, these can be easily copied with no way for the host to know if the serial number is authentic or if it is a clone.

The ATECC608A features a wide array of defense mechanisms specifically designed to prevent physical attacks on the device itself, or logical attacks on the data transmitted between the device and the system. Hardware restrictions on the ways in which keys are used or generated provide further defense against certain styles of attack.

1.3 Cryptographic Operation

The ATECC608A implements a complete asymmetric (public/private) key cryptographic signature solution based upon Elliptic Curve Cryptography and the ECDSA signature protocol. The device features hardware acceleration for the NIST standard P256 prime curve and supports the complete key life cycle from high quality private key generation, to ECDSA signature generation, ECDH key agreement, and ECDSA public key signature verification.

The hardware accelerator can implement such asymmetric cryptographic operations from ten to one-thousand times faster than software running on standard microprocessors, without the usual high risk of key exposure that is endemic to standard microprocessors.

The ATECC608A also implements AES-128, SHA256 and multiple SHA derivatives such as HMAC(SHA), PRF (the key derivation function in TLS) and HKDF in hardware. Support is included for the Galois Field Multiply (aka Ghash) to facilitate GCM encryption/decryption/authentication.

The device is designed to securely store multiple private keys along with their associated public keys and certificates. The signature verification command can use any stored or an external ECC public key. Public keys stored within the device can be configured to require validation via a certificate chain to speed-up subsequent device authentications.

Random private key generation is supported internally within the device to ensure that the private key can never be known outside of the device. The public key corresponding to a stored private key is always returned when the key is generated and it may optionally be computed at a later time.

The ATECC608A can generate high-quality random numbers using its internal random number generator. This sophisticated function includes runtime health testing designed to ensure that the values generated from the internal noise source contain sufficient entropy at the current time, with the current device and under the current voltage and temperature conditions. The random number generator is designed to meet the requirements documented in the NIST 800-90A, 800-90B and 800-90C documents.

These random numbers can be employed for any purpose, including usage as part of the device's crypto protocols. Because each random number is guaranteed to be essentially unique from all numbers ever generated on this or any other device, their inclusion in the protocol calculation ensures that replay attacks (i.e. re-transmitting a previously successful transaction) will always fail.

The ATECC608A also supports a standard hash-based challenge-response protocol in order to allow its use across a wide variety of additional applications. In its most basic instantiation, the system sends a challenge to the device, which combines that challenge with a secret key via the MAC command and then sends the response back to the system. The device uses a SHA-256 cryptographic hash algorithm to make that combination so that an observer on the bus cannot derive the value of the secret key, but preserving that ability of a recipient to verify that the response is correct by performing the same calculation with a stored copy of the secret on the recipient's system. There are a wide variety of variations possible on this symmetric challenge/response theme.

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2. Electrical Characteristics

2.1 Absolute Maximum Ratings*

Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +150°C
Maximum Operating Voltage	6.0V
DC Output Current	5.0 mA
Voltage on any pin -0.5V to (VCC + 0.5V)	-0.5V to (VCC + 0.5V)

Note: Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

2.2 Reliability

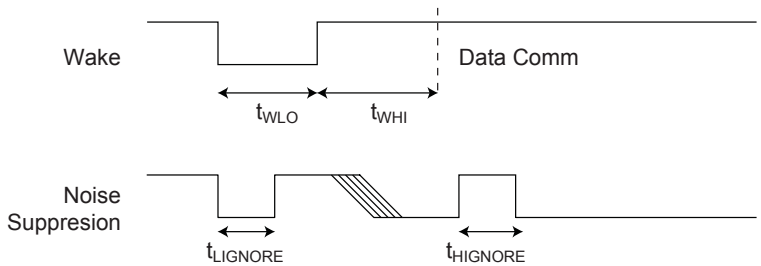
The ATECC608A is fabricated with the Microchip high reliability of the CMOS EEPROM manufacturing technology.

Table 2-1. EEPROM Reliability

Parameter	Min	Typical	Max	Units
Write Endurance at +85°C (Each Byte)	400,000	—	—	Write Cycles
Data Retention at +55°C	10	—	—	Years
Data Retention at +35°C	30	50	—	Years
Read Endurance	Unlimited			Read Cycles

2.3 AC Parameters: All I/O Interfaces

Figure 2-1. AC Timing Diagram: All Interfaces



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Table 2-2. AC Parameters: All I/O Interfaces

Parameter	Symbol	Direction	Min	Typ	Max	Unit	Conditions
Power-Up Delay(2)	t_{PU}	To Crypto Authentication	100	—	—	µs	Minimum time between V_{CC} > V_{CC} min prior to measurement of t_{WLO}.
Wake Low Duration	t_{WLO}	To Crypto Authentication	60	—	—	µs	
Wake High Delay to Data Comm.	t_{WHI}	To Crypto Authentication	1500	—	—	µs	SDA should be stable high for this entire duration.
High Side Glitch Filter at Active	$t_{HIGNORE_A}$	To Crypto Authentication	45(1)	—	—	ns	Pulses shorter than this in width will be ignored by the device, regardless of its state when active.
Low Side Glitch Filter at Active	$t_{LIGNORE_A}$	To Crypto Authentication	45(1)	—	—	ns	Pulses shorter than this in width will be ignored by the device, regardless of its state when active.
Low Side Glitch Filter at Sleep	$t_{LIGNORE_S}$	To Crypto Authentication	15(1)	—	—	µs	Pulses shorter than this in width will be ignored by the device when in sleep mode.
Watchdog Timeout	$t_{WATCHDOG}$	To Crypto Authentication	0.7	1.3	1.7	s	Time from wake until device is forced into sleep mode if Config.ChipMode.Bit2 is 0.
			7.6	13	17	s	Watchdog time : Config.ChipMode.Bit2 is 0.

Note:

1. These parameters are guaranteed through characterization, but not tested.
2. The power-up delay will be significantly longer if Power-On self test is enabled in the configuration zone.

2.3.1 AC Parameters: Single-Wire Interface

Figure 2-2. AC Timing Diagram: Single-Wire Interface

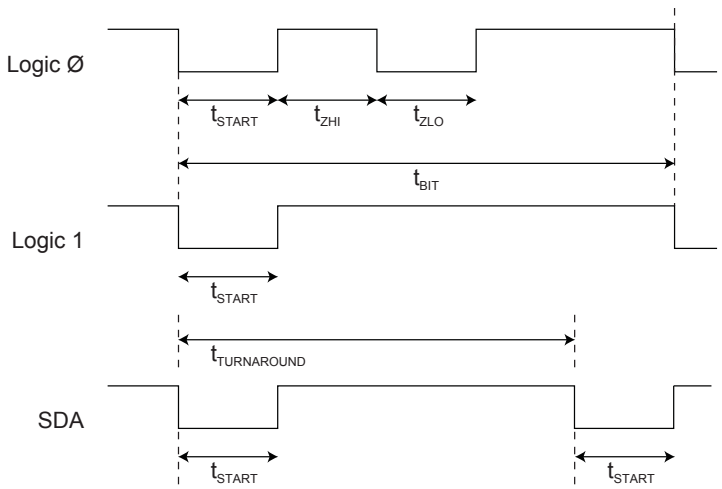


Table 2-3. AC Parameters: Single-Wire Interface

Unless otherwise specified, applicable from T_A = -40°C to +85°C, V_{CC} = +2.0V to +5.5V, C_L = 100 pF.

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Parameter	Symbol	Direction	Min.	Typ.	Max.	Unit	Conditions
Start Pulse Duration	t_{START}	To Crypto Authentication	4.10	4.34	4.56	µs	
		From Crypto Authentication	4.60	6	8.60	µs	
Zero Transmission High Pulse	t_{ZHI}	To Crypto Authentication	4.10	4.34	4.56	µs	
		From Crypto Authentication	4.60	6	8.60	µs	
Zero Transmission Low Pulse	t_{ZLO}	To Crypto Authentication	4.10	4.34	4.56	µs	
		From Crypto Authentication	4.60	6	8.60	µs	
Bit Time(1)	t_{BIT}	To Crypto Authentication	37	39	—	µs	If the bit time exceeds $t_{TIMEOUT}$ then ATECC608A may enter the sleep mode. .
		From Crypto Authentication	41	54	78	µs	
Turn Around Delay	$t_{TURNAROUND}$	From Crypto Authentication	64	96	131	µs	ATECC608A will initiate the first low going transition after this time interval following the initial falling edge of the start pulse of the last bit of the transmit flag.
		To Crypto Authentication	93	—	—	µs	After ATECC608A transmits the last bit of a group, system must wait this interval before sending the first bit of a flag. It is measured from the falling edge of the start pulse of the last bit transmitted by ATECC608A .
IO Timeout	$t_{TIMEOUT}$	To Crypto Authentication	45	65	85	ms	ATECC608A may transition to the sleep mode if the bus is inactive longer than this duration.

Note: START, ZLO, ZHI, and BIT are designed to be compatible with a standard UART running at 230.4 Kbaud for both transmit and receive. The UART should be set to seven data bits, no parity and one Stop bit.

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2.3.2 AC Parameters: I²C Interface

Figure 2-3. I²C Synchronous Data Timing

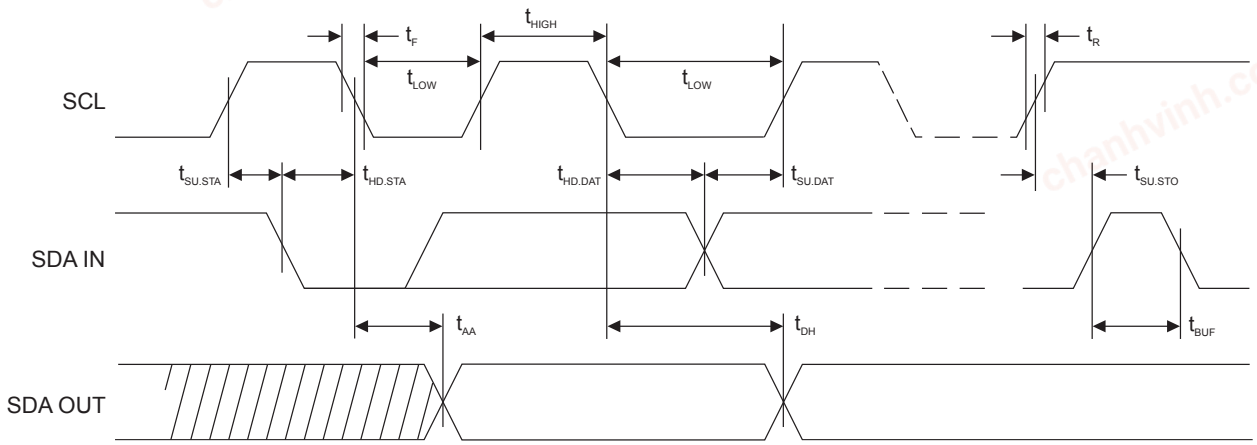


Table 2-4. AC Characteristics of I2C Interface

Unless otherwise specified, applicable over recommended operating range from T_A = -40°C to + 85°C, V_{CC} = +2.0V to +5.5V,
C_L = 1 TTL Gate and 100 pF .

Parameter	Symbol	Min.	Max.	Units
SCK Clock Frequency	f_{SCK}	0	1	MHz
SCK High Time	t_{HIGH}	400	—	ns
SCK Low Time	t_{LOW}	400	—	ns
Start Setup Time	$t_{SU.STA}$	250	—	ns
Start Hold Time	$t_{HD.STA}$	250	—	ns
Stop Setup Time	$t_{SU.STO}$	250	—	ns
Data In Setup Time	$t_{SU.DAT}$	100	—	ns
Data In Hold Time	$t_{HD.DAT}$	0	—	ns
Input Rise Time (1)	t_R	—	300	ns
Input Fall Time (1)	t_F	—	100	ns
Clock Low to Data Out Valid	t_{AA}	50	550	ns
Data Out Hold Time	t_{DH}	50	—	ns
SMBus Timeout Delay	$t_{TIMEOUT}$	25	75	ms
Time bus must be free before a new transmission can start (1)	t_{BUF}	500	—	ns

Note:

1. Values are based on characterization and are not tested.
2. AC measurement conditions:
   - R_L (connects between SDA and V_{CC}): 1.2 kΩ (for V_{CC} = +2.0V to +5.0V)
   - Input pulse voltages: 0.3V_{CC} to 0.7V_{CC}
   - Input rise and fall times: ≤ 50 ns
   - Input and output timing reference voltage: 0.5V_{CC}

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2.4 DC Parameters: All I/O Interfaces

Table 2-5. DC Parameters on All I/O Interfaces

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Ambient Operating Temperature	T_A	-40	—	+85	°C	
Power Supply Voltage	V_{CC}	2.0	—	5.5	V	
Active Power Supply Current	I_{CC}	—	2	3	mA	Waiting for I/O during I/O transfers or execution of non-ECC commands. Independent of Clock Divider value.
		—	—	14	mA	During ECC command execution. Clock divider = 0x0
		—	—	6	mA	During ECC command execution. Clock divider = 0x5
		—	—	3	mA	During ECC command execution. Clock divider = 0xD
Idle Power Supply Current	I_{IDLE}	—	800	—	µA	When device is in idle mode, V_{SDA} and V_{SCL} < 0.4V or > V_{CC} – 0.4
Sleep Current	I_{SLEEP}	—	30	150	nA	When device is in sleep mode, V_{CC} ≤ 3.6V, V_{SDA} and V_{SCL} < 0.4V or > V_{CC} – 0.4, T_A ≤ 55°C
		—	—	2	µA	When device is in sleep mode.
Output Low Voltage	V_{OL}	—	—	0.4	V	When device is in active mode, V_{CC} = 2.5 to 5.5V
Output Low Current	I_{OL}	—	—	4	mA	When device is in active mode, V_{CC} = 2.5 to 5.5V, V_{OL} = 0.4V
Theta JA	Θ_{JA}	—	166	—	°C/W	SOIC (SSH)
		—	173	—	°C/W	UDFN (MAH)
		—	146	—	°C/W	RBH

2.4.1 V_{IH} and V_{IL} Specifications

The input levels of the device will vary dependent on the mode and voltage of the device. The input voltage thresholds when in Sleep or Idle mode are dependent on the V_{CC} level as shown in Figure 2-4. When in sleep or idle mode the TTLenable bit has no effect.

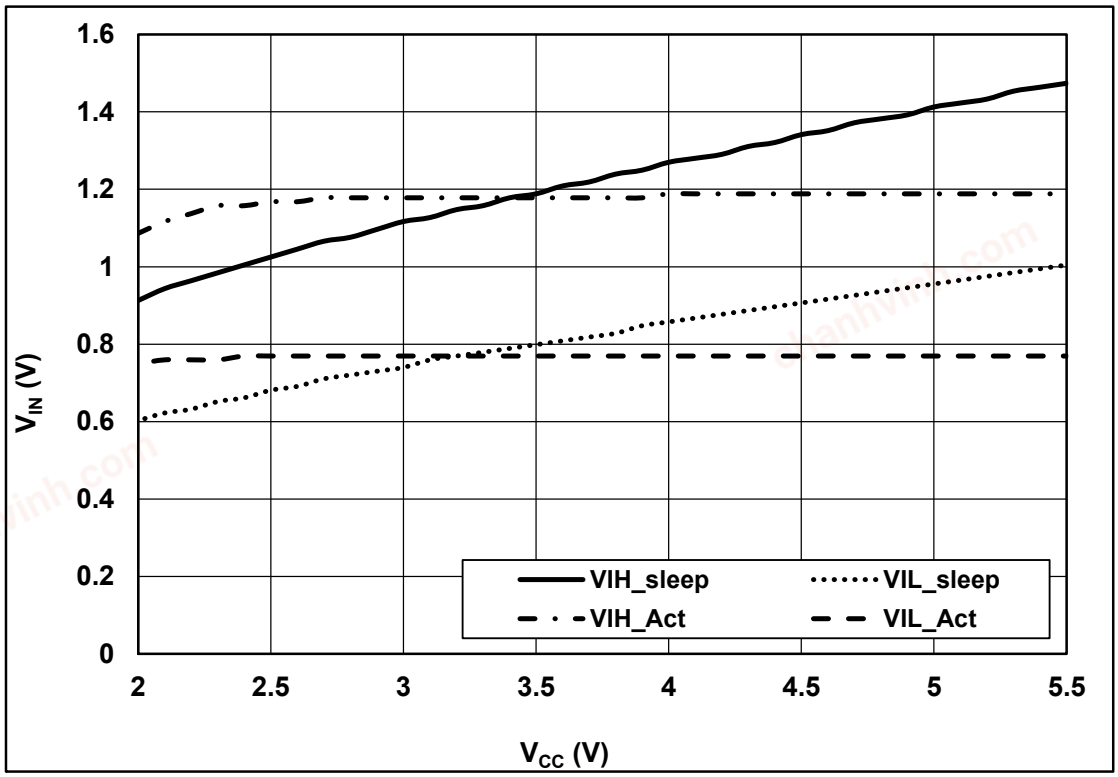
When the device is active (i.e., not in Sleep or Idle mode), the input voltage thresholds are different depending upon the state of TTLenable (bit 1) within the ChipMode byte in the Configuration zone of the EEPROM. If the voltage supplied to the V_{CC} pin of the ATECC608A is different than the system voltage to which the input pull-up resistor is connected, then the system designer may choose to set TTLenable to zero, which enables a fixed input threshold by curves in VIL_ACT and VIH_ACT in Figure 2-4. Table 2-6, which applies only when the device is active, presents the guaranteed levels of operation when operating in this mode:

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Table 2-6. V_{IL}, V_{IH} on All I/O Interfaces (TTLenable = 0)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input Low Voltage	V_{IL}	-0.5	—	0.5	V	When device is active and TTLenable bit in configuration memory is zero; otherwise, see above.
Input High Voltage	V_{IH}	1.5	—	V_{CC} + 0.5	V	When device is active and TTLenable bit in configuration memory is zero; otherwise, see above.

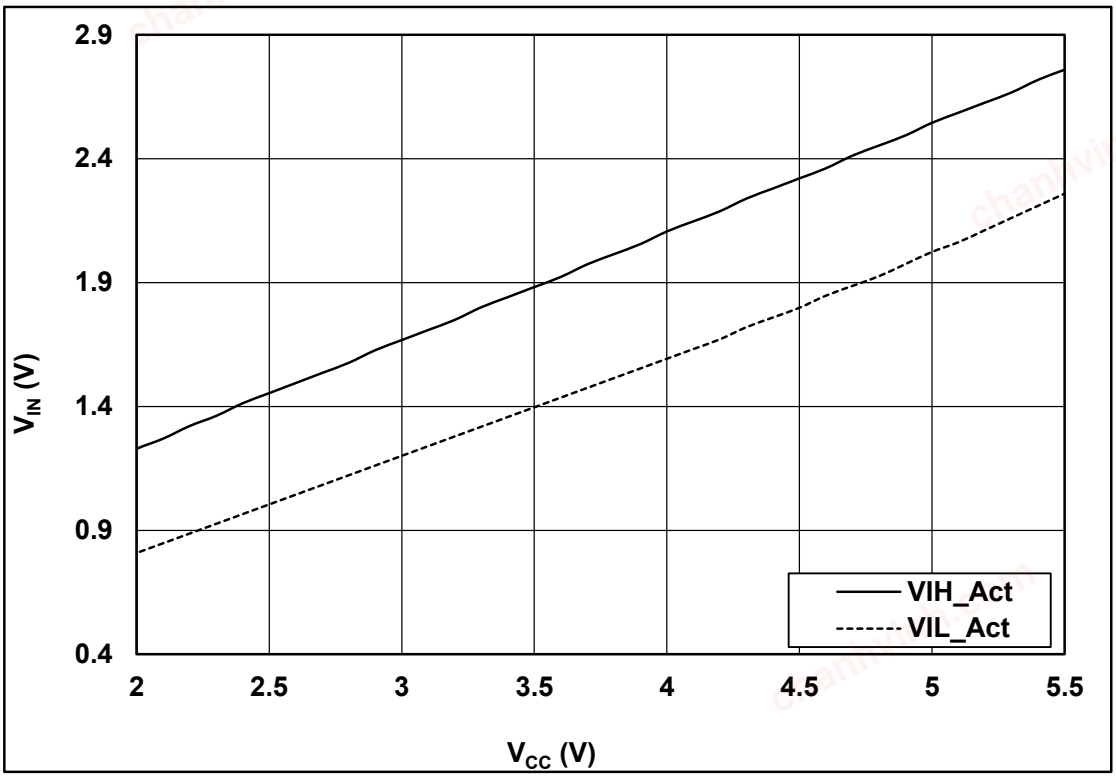
Figure 2-4. V_{IH} and V_{IL} in Sleep and Idle Mode or When TTLenable = 0 on All I/O Interfaces



When a common voltage is used for the ATECC608A V_{CC} pin and the input pull-up resistor, then the TTLenable bit should be set to a one, which permits the input thresholds to track the supply as shown in Figure 2-5.

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Figure 2-5. V_{IH} and V_{IL} When Active and TTLenable = 1 on All I/O Interfaces



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3. Compatibility

3.1 Microchip ATECC508A

The ATECC608A is designed to be fully compatible with the ATECC508A devices with the limited exception of the functions listed below. If the ATECC608A is properly configured, software written for the ATECC508A should work with the ATECC608A without any required changes, again with the exception of the functions listed below.

Note: Most elements of the configuration zone in the ATECC608A are identical in both location and value with the ATECC508A. However, the initial values that had been stored in the LastKeyUse field may need to be changed to conform to the new definition of those bytes which can be found in this document. That field contained the initial count for the Slot 15 limited use function which is supported in the ATECC608A via the monotonic counters.

3.1.1 New Features in ATECC608A vs. ATECC508A

- Secure boot function, with IO encryption and authentication
- `KDF` command, supporting PRF, HKDF, AES
- `AES` command, including encrypt/decrypt
- GFM calculation function for GCM AEAD mode of AES
- Updated NIST SP800-90 A/B/C Random Number Generator
- Flexible `SHA/HMAC` command with context save/restore
- `SHA` command execution time significantly reduced
- Volatile Key Permitting to prevent device transfer
- Transport Key Locking to protect programmed devices during delivery
- Counter Limit Match function
- Ephemeral key generation in SRAM, also supported with ECDH and KDF
- `Verify` command output can be validated with a MAC
- Encrypted output for ECDH
- Added self test command, optional automatic power-on self test
- Unaligned public key for built-in X.509 cert key validation
- Optional power reduction at increased execution time
- Programmable I^2C address after data (secret) zone lock

3.1.2 Features Eliminated in ATECC608A vs. ATECC508A

- `HMAC` command removed, replaced via new more powerful `SHA` command
- OTP consumption mode eliminated, now read only
- Pause command eliminated along with related Selector function in UpdateExtra
- Slot 15 special limited use eliminated, replaced with standard monotonic counter limited use
- `SHA` command no longer uses TempKey during calculation, result in TempKey is unchanged

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3.2 Microchip ATSHA204A, ATECC108A

The ATECC608A is generally compatible with all ATSHA204/A and ATECC108/A devices. If properly configured, it can be used in most situations where these devices are currently employed. For ATSHA204A and ATECC108A compatibility restrictions, see the ATECC508A data sheet.

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4. Package Marking Information

As part of Microchip's overall security features, the part mark for all crypto devices is intentionally vague. The marking on the top of the package does not provide any information as to the actual device type or the manufacturer of the device. The alphanumeric code on the package provides manufacturing information and will vary with assembly lot. The packaging mark should not be used as part of any incoming inspection procedure.

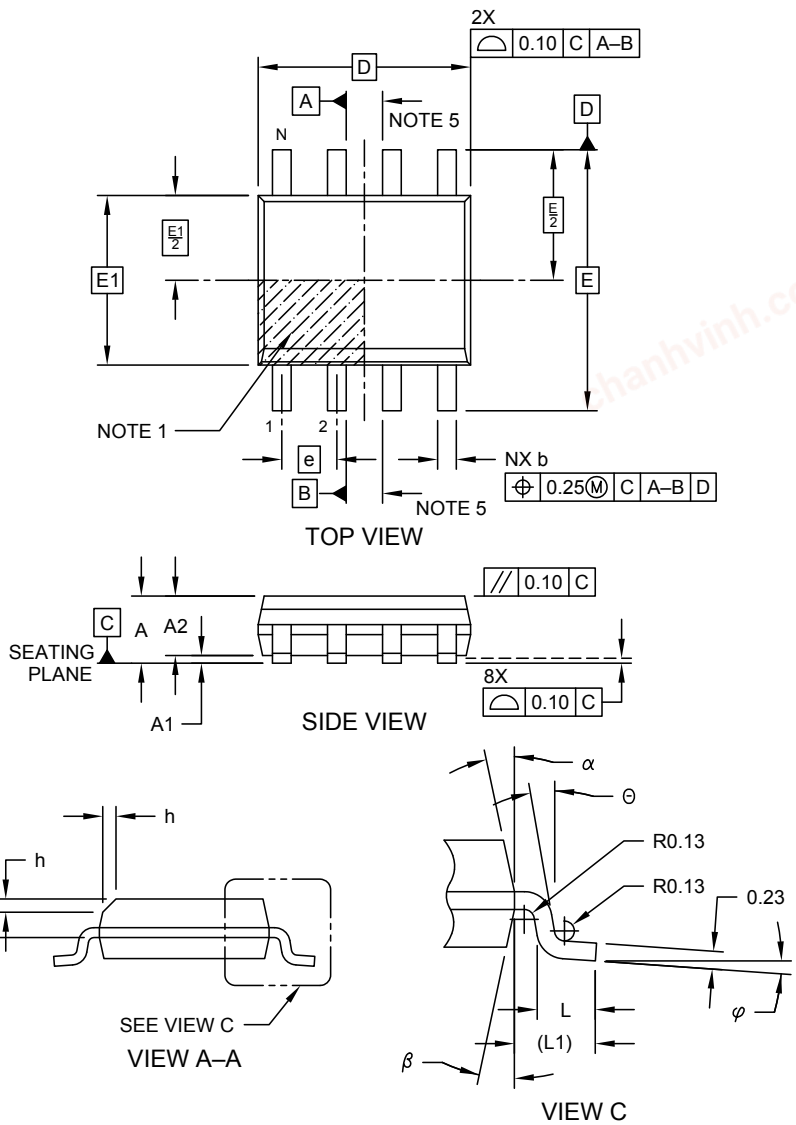
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5. Package Drawings

5.1 8-lead SOIC

8-Lead Plastic Small Outline - Narrow, 3.90 mm (.150 In.) Body [SOIC]
Atmel Legacy

Note:	For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging

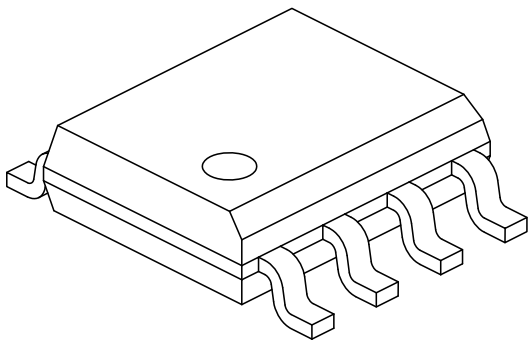


Microchip Technology Drawing No. C04-057-Atmel Rev D Sheet 1 of 2

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8-Lead Plastic Small Outline - Narrow, 3.90 mm (.150 In.) Body [SOIC]
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Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Number of Pins	N		8	
Pitch	e		1.27 BSC	
Overall Height	A	-	-	1.75
Molded Package Thickness	A2	1.25	-	-
Standoff §	A1	0.10	-	0.25
Overall Width	E		6.00 BSC	
Molded Package Width	E1		3.90 BSC	
Overall Length	D		4.90 BSC	
Chamfer (Optional)	h	0.25	-	0.50
Foot Length	L	0.40	-	1.27
Footprint	L1		1.04 REF	
Foot Angle	φ	0°	-	8°
Lead Thickness	c	0.17	-	0.25
Lead Width	b	0.31	-	0.51
Mold Draft Angle Top	α	5°	-	15°
Mold Draft Angle Bottom	β	5°	-	15°

Notes:

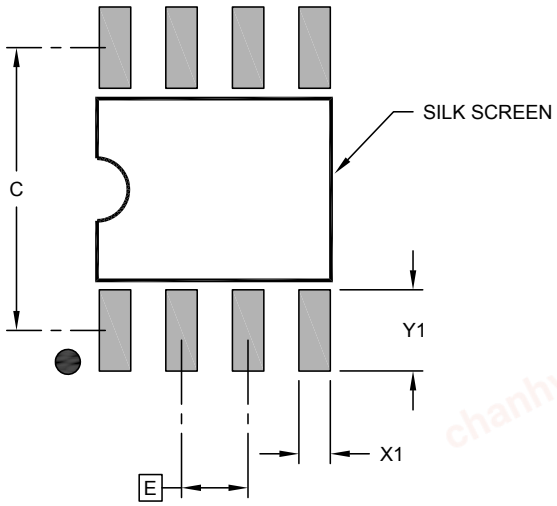
1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. § Significant Characteristic
3. Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.15mm per side.
4. Dimensioning and tolerancing per ASME Y14.5M
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.
   REF: Reference Dimension, usually without tolerance, for information purposes only.
5. Datums A & B to be determined at Datum H.

Microchip Technology Drawing No. C04-057-OA Rev D Sheet 2 of 2

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8-Lead Plastic Small Outline - Narrow, 3.90 mm (.150 In.) Body [SOIC]
Atmel Legacy

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



RECOMMENDED LAND PATTERN

Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Contact Pitch	E		1.27 BSC	
Contact Pad Spacing	C		5.40	
Contact Pad Width (X8)	X1			0.60
Contact Pad Length (X8)	Y1			1.55

Notes:

1. Dimensioning and tolerancing per ASME Y14.5M
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.

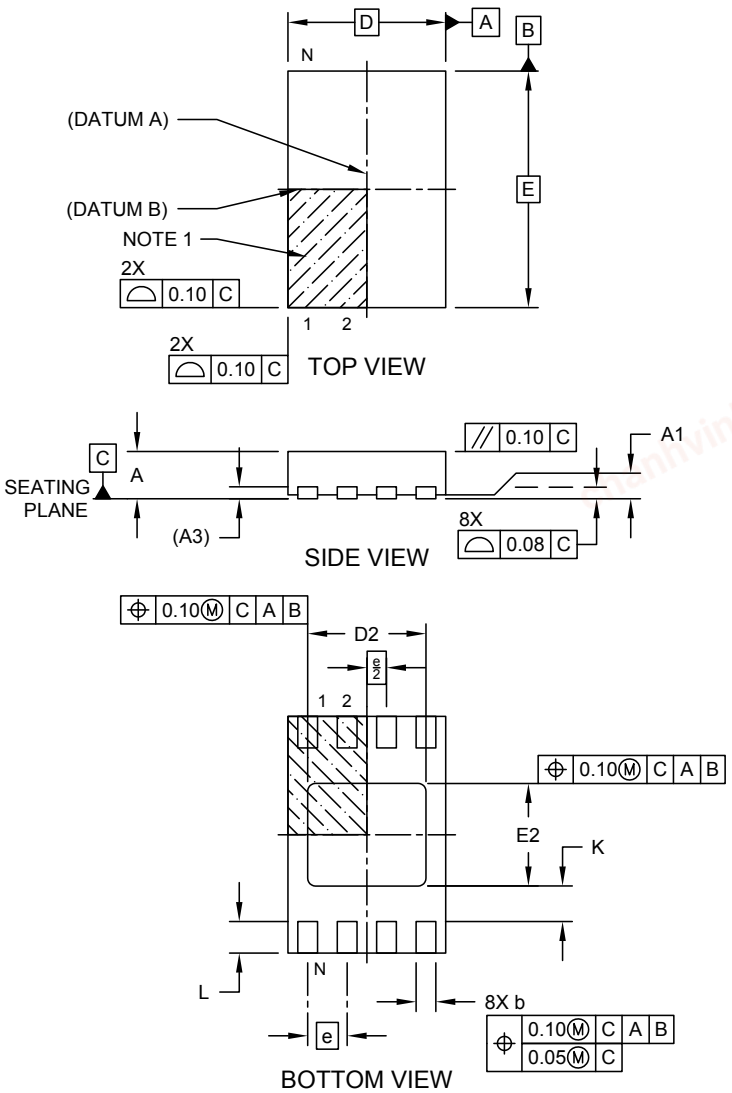
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5.2 8-pad UDFN

8-Lead Ultra Thin Plastic Dual Flat, No Lead Package (Q4B) - 2x3 mm Body [UDFN]
Atmel Legacy YNZ Package

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging

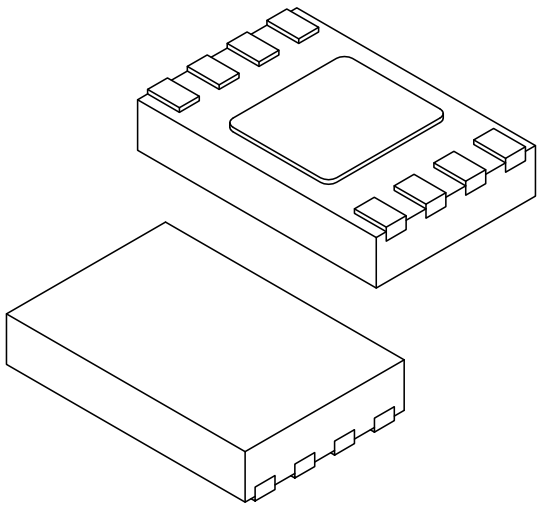


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8-Lead Ultra Thin Plastic Dual Flat, No Lead Package (Q4B) - 2x3 mm Body [UDFN]
Atmel Legacy YNZ Package

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Number of Terminals	N		8	
Pitch	e		0.50 BSC	
Overall Height	A	0.50	0.55	0.60
Standoff	A1	0.00	0.02	0.05
Terminal Thickness	A3		0.152 REF	
Overall Length	D		2.00 BSC	
Exposed Pad Length	D2	1.40	1.50	1.60
Overall Width	E		3.00 BSC	
Exposed Pad Width	E2	1.20	1.30	1.40
Terminal Width	b	0.18	0.25	0.30
Terminal Length	L	0.35	0.40	0.45
Terminal-to-Exposed-Pad	K	0.20	-	-

Notes:

1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. Package is saw singulated
3. Dimensioning and tolerancing per ASME Y14.5M

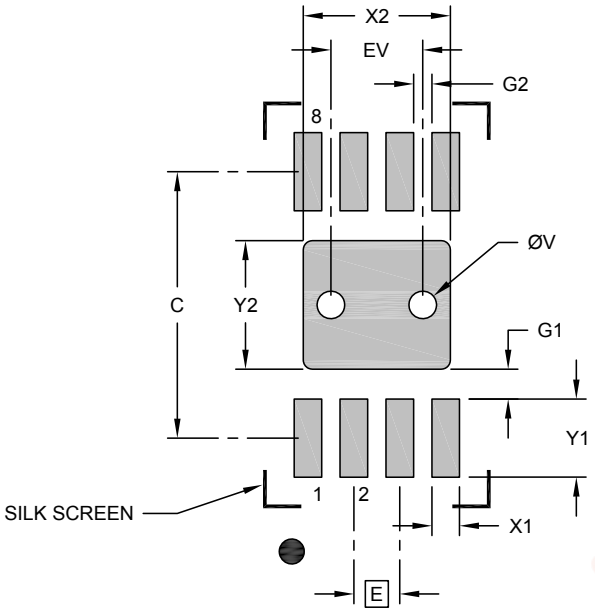
BSC: Basic Dimension. Theoretically exact value shown without tolerances.
REF: Reference Dimension, usually without tolerance, for information purposes only.

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8-Lead Ultra Thin Plastic Dual Flat, No Lead Package (Q4B) - 2x3 mm Body [UDFN]
Atmel Legacy YNZ Package

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



RECOMMENDED LAND PATTERN

Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Contact Pitch	E		0.50 BSC	
Optional Center Pad Width	X2			1.60
Optional Center Pad Length	Y2			1.40
Contact Pad Spacing	C		2.90	
Contact Pad Width (X8)	X1			0.30
Contact Pad Length (X8)	Y1			0.85
Contact Pad to Center Pad (X8)	G1	0.20		
Contact Pad to Contact Pad (X6)	G2	0.33		
Thermal Via Diameter	V		0.30	
Thermal Via Pitch	EV		1.00	

Notes:

1. Dimensioning and tolerancing per ASME Y14.5M
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.
2. For best soldering results, thermal vias, if used, should be filled or tented to avoid solder loss during reflow process

Microchip Technology Drawing C04-21355-Q4B Rev A

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6. Revision History

Revision A (November 2017)
Original release of the document

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PART NO.	-XXX	XX	-X
Device	Package	I/O Type	Tape and Reel

Device:	ATECC608A: Cryptographic Co-processor with Secure Hardware-based Key Storage	
Package Options	SSH	= 8S1, 8-Lead (0.150” Wide Body), Plastic Gull Wing Small Outline (JEDEC SOIC)
	MAH	= 8MA2, 8-Pad 2 x 3 x 0.6 mm Body, Thermally Enhanced Plastic Ultra Thin Dual Flat NoLead Package (UDFN)
I/O Type	CZ	= Single Wire Interface
	DA	= I^2C Interface
Tape and Reel Options	B	= Tube
	T	= Large Reel (Size varies by package type)
	S	= Small Reel (Only available for MAH)

Examples:

- ATECC608A-SSHCZ-T: 8S1, 8-Lead (0.150” Wide Body), Plastic Gull Wing Small Outline (JEDEC SOIC), Single-Wire, Tape and Reel, 4,000 per Reel
- ATECC608A-SSHCZ-B: 8S1, 8-Lead (0.150” Wide Body), Plastic Gull Wing Small Outline (JEDEC SOIC), Single-Wire, Tube, 100 per Tube
- ATECC608A-SSHDA-T: 8S1, 8-Lead (0.150” Wide Body), Plastic Gull Wing Small Outline (JEDEC SOIC), I^2C, Tape and Reel, 4,000 per Reel
- ATECC608A-SSHDA-B: 8S1, 8-Lead (0.150” Wide Body), Plastic Gull Wing Small Outline (JEDEC SOIC), I^2C, Tube, 100 per Tube
- ATECC608A-MAHCZ-T: 8MA2, 8-Pad 2 x 3 x 0.6 mm Body, Thermally Enhanced Plastic Ultra Thin Dual Flat NoLead Package (UDFN), Single-Wire, Tape and Reel, 15,000 per Reel
- ATECC608A-MAHDA-T: 8MA2, 8-Pad 2 x 3 x 0.6 mm Body, Thermally Enhanced Plastic Ultra Thin Dual Flat NoLead Package (UDFN), I^2C, Tape and Reel, 15,000 per Reel
- ATECC608A-MAHCZ-S: 8MA2, 8-Pad 2 x 3 x 0.6 mm Body, Thermally Enhanced Plastic Ultra Thin Dual Flat NoLead Package (UDFN), Single-Wire, Tape and Reel, 3,000 per Reel
- ATECC608A-MAHDA-S: 8MA2, 8-Pad 2 x 3 x 0.6 mm Body, Thermally Enhanced Plastic Ultra Thin Dual Flat NoLead Package (UDFN), I^2C, Tape and Reel, 3,000 per Reel

Note:

1. Tape and Reel identifier only appears in the catalog part number description. This identifier is used for ordering purposes and is not printed on the device package. Check with your Microchip Sales Office for package availability with the Tape and Reel option.
2. Small form-factor packaging options may be available. Please check http://www.microchip.com/packaging for small-form factor package availability, or contact your local Sales Office.

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- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as "unbreakable."

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