Appendix A - ATtiny261/461/861 Automotive specification at 150°C

This document contains information specific to devices operating at temperatures up to 150°C. Only deviations are covered in this appendix, all other information can be found in the complete Automotive datasheet. The complete Automotive datasheet can be found on www.atmel.com

8-bit AVR® Microcontroller with 2K/4K/8K Bytes In-System Programmable Flash

**ATtiny261
ATtiny461
ATtiny861
Automotive**

Appendix A

Preliminary

7793A–AVR–08/08

Electrical Characteristics

Absolute Maximum Ratings*

Operating Temperature................................... -55°C to +150°C

Storage Temperature .... -65°C to +175°C

Voltage on any Pin except $\overline{\text{RESET}}$
with respect to Ground ....-0.5V to V_{CC}+0.5V

Voltage on $\overline{\text{RESET}}$ with respect to Ground......-0.5V to +13.0V

Maximum Operating Voltage 6.0V

DC Current per I/O Pin .... 30.0 mA

DC Current V_{CC} and GND Pins............................... 200.0 mA

*NOTICE: 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 other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

DC Characteristics

T_A = -40°C to 150°C, V_{CC} = 4.5V to 5.5V (unless otherwise noted)

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
V_{IL}	Input Low Voltage, except XTAL1 and $\overline{\text{RESET}}$ pin	V_{CC} = 4.5V - 5.5V	-0.5		$0.2V_{CC}$[1]	V
V_{IH}	Input High Voltage, except XTAL1 and $\overline{\text{RESET}}$ pins	V_{CC} = 4.5V - 5.5V	$0.6V_{CC}$[2]		V_{CC} + 0.5	V
V_{IL1}	Input Low Voltage, XTAL1 pin	V_{CC} = 4.5V - 5.5V	-0.5		$0.1V_{CC}$[1]	V
V_{IH1}	Input High Voltage, XTAL1 pin	V_{CC} = 4.5V - 5.5V	$0.7V_{CC}$[2]		V_{CC} + 0.5	V
V_{IL2}	Input Low Voltage, $\overline{\text{RESET}}$ pin	V_{CC} = 4.5V - 5.5V	-0.5		$0.2V_{CC}$[1]	V
V_{IH2}	Input High Voltage, $\overline{\text{RESET}}$ pin	V_{CC} = 4.5V - 5.5V	$0.9V_{CC}$[2]		V_{CC} + 0.5	V
V_{IL3}	Input Low Voltage, $\overline{\text{RESET}}$ pin as I/O	V_{CC} = 4.5V - 5.5V	-0.5		$0.2V_{CC}$[1]	V
V_{IH3}	Input High Voltage, $\overline{\text{RESET}}$ pin as I/O	V_{CC} = 4.5V - 5.5V	$0.8V_{CC}$[2]		V_{CC} + 0.5	V
V_{OL}	Output Low Voltage[3], I/O pin except RESET	I_{OL} = 10mA, V_{CC} = 5V			0.8	V
V_{OH}	Output High Voltage[4], I/O pin except RESET	I_{OH} = -10mA, V_{CC} = 5V	4.0			V
I_{IL}	Input Leakage Current I/O Pin	V_{CC} = 5.5V, pin low (absolute value)			1	µA
I_{IH}	Input Leakage Current I/O Pin	V_{CC} = 5.5V, pin high (absolute value)			1	µA
R_{RST}	Reset Pull-up Resistor		30		200	kΩ
R_{PU}	I/O Pin Pull-up Resistor		20		50	kΩ

T$_A$ = -40°C to 150°C, V$_{CC}$ = 4.5V to 5.5V (unless otherwise noted) (Continued)

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
I$_{CC}$	Power Supply Current[4]	Active 16 MHz, V$_{CC}$ = 5V, Ext Clock, PRR = 0xFF,		14		mA
I$_{CC\ IDLE}$		Idle 16 MHz, V$_{CC}$ = 5V, Ext Clock		5.5		mA
I$_{CC\ PWD}$	Power-down mode	WDT enabled, V$_{CC}$ = 5V		80		µA
		WDT disabled, V$_{CC}$ = 5V		70		µA
I$_{ACLK}$	Analog Comparator Input Leakage Current	V$_{CC}$ = 5V V$_{in}$ = V$_{CC}$/2	TBD		TBD	nA
t$_{ACPD}$	Analog Comparator Propagation Delay	V$_{CC}$ = 4.0V		TBD		ns

ADC Characteristics[4]

T$_A$ = -40°C to 150°C, V$_{CC}$ = 4.5V to 5.5V (unless otherwise noted)

Symbol	Parameter	Condition	Min	Typ	Max	Units
	Resolution			10		Bits

Notes: 1. "Max" means the highest value where the pin is guaranteed to be read as low

2. "Min" means the lowest value where the pin is guaranteed to be read as high

3. Although each I/O port can sink more than the test conditions (20mA at V$_{CC}$ = 5V) under steady state conditions (non-transient), the following must be observed:
1] The sum of all IOL, for all ports, should not exceed 400 mA.
2] The sum of all IOL, for ports C0 - C5, should not exceed 200 mA.
3] The sum of all IOL, for ports C6, D0 - D4, should not exceed 300 mA.
4] The sum of all IOL, for ports B0 - B7, D5 - D7, should not exceed 300 mA.
If IOL exceeds the test condition, VOL may exceed the related specification. Pins are not guaranteed to sink current greater than the listed test condition.

4. For temperature range +125°C to +150°C only. For -40°C to +125°C, refer to ATtiny261/461/861automotive datasheet.

Grade 0 Qualification

The ATtiny261/461/861 has been developed and manufactured according to the most stringent quality assurance requirements of ISO-TS-16949 and verified during product qualification as per AEC-Q100 grade 0.

AEC-Q100 qualification relies on temperature accelerated stress testing. High temperature field usage however may result in less significant stress test acceleration. In order to prevent the risk that ATtiny261/461/861 lifetime would not satisfy the application end-of-life reliability requirements, Atmel has extended the testing, whenever applicable (High Temperature Operating Life Test, High Temperature Storage Life, Data Retention, Thermal Cycles), far beyond the AEC-Q100 requirements. Thereby, Atmel verified the ATtiny261/461/861 has a long safe lifetime period after the grade 0 qualification acceptance limits.

The valid domain calculation depends on the activation energy of the potential failure mechanism that is considered. Therefore any temperature mission profile which could exceed the AEC-Q100 equivalence domain shall be submitted to Atmel for a thorough reliability analysis

ATtiny261/461/861 Automotive
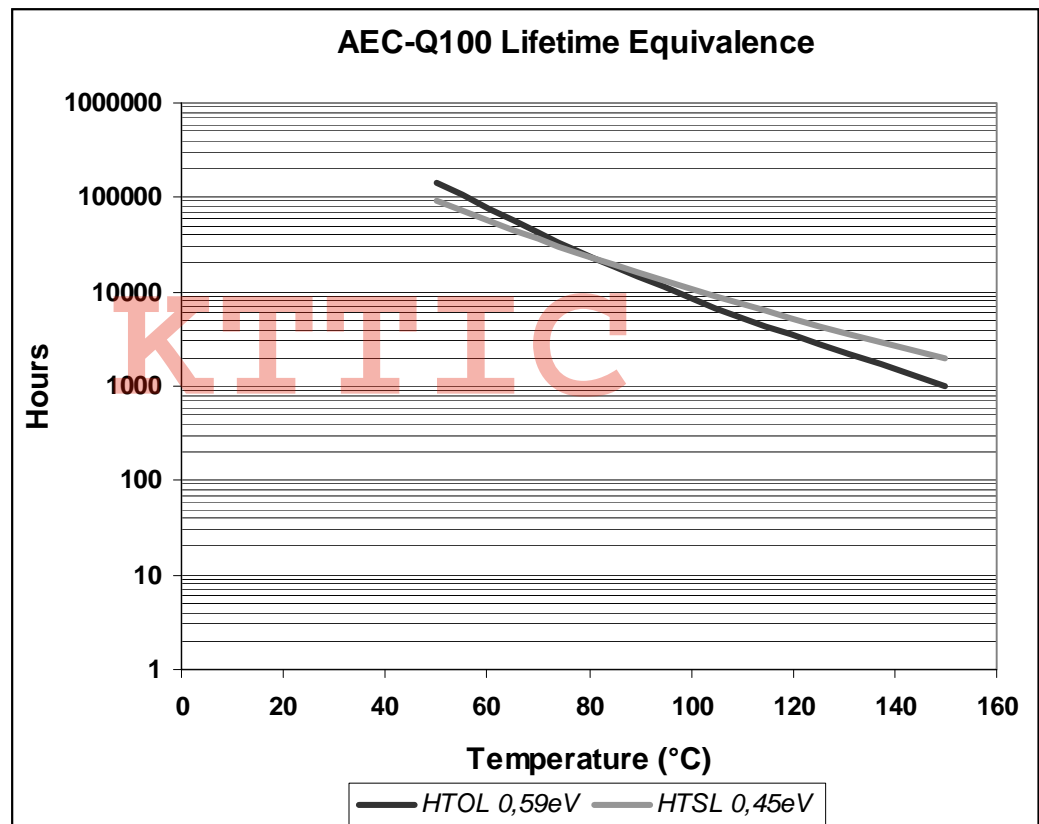
Ordering Information

ATtiny261/461/861

Speed (MHz)	Power Supply	Ordering Code	Package[1]	Operation Range
16[2]	4.5 - 5.5V	ATtiny261-ESMD	PN	Extended (-40°C to 150°C)
16[2]	4.5 - 5.5V	ATtiny261-ESXD	6G	Extended (-40°C to 150°C)
16[2]	4.5 - 5.5V	ATtiny461-ESMD	PN	Extended (-40°C to 150°C)
16[2]	4.5 - 5.5V	ATtiny461-ESXD	6G	Extended (-40°C to 150°C)
16[2]	4.5 - 5.5V	ATtiny861-ESMD	PN	Extended (-40°C to 150°C)
16[2]	4.5 - 5.5V	ATtiny861-ESXD	6G	Extended (-40°C to 150°C)
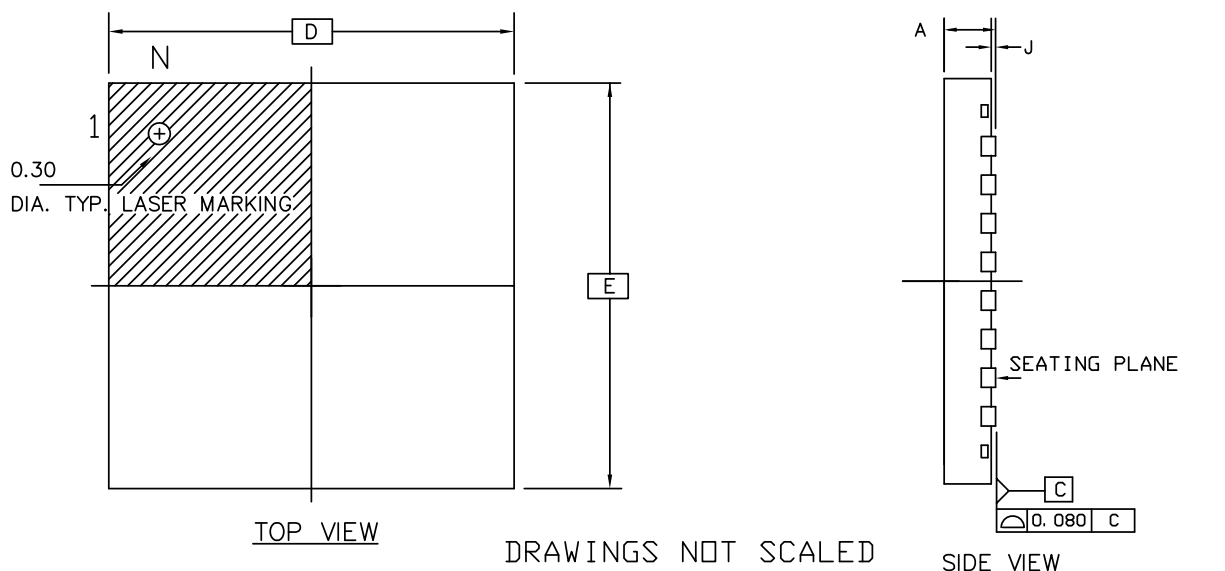
Note: 1. Pb-free packaging, complies to the European Directive for Restriction of Hazardous Substances (RoHS directive). Also Halide free and fully Green.

2. For Speed vs. V_{cc}, see complete datasheet.

| Package Type	
PN	32-pad, 5 x 5 x 1.0 mm body, lead pitch 0.50 mm, Quad Flat No-Lead/Micro Lead Frame Package (QFN/MLF): E2/D2 3.1 +/- 0.1mm
6G	20-leads, 4.4x6.5mm body - 0.65mmPitch - Lead Length: 0.6mm Thin Shrink Small Outline Package (TSSOP)

PN
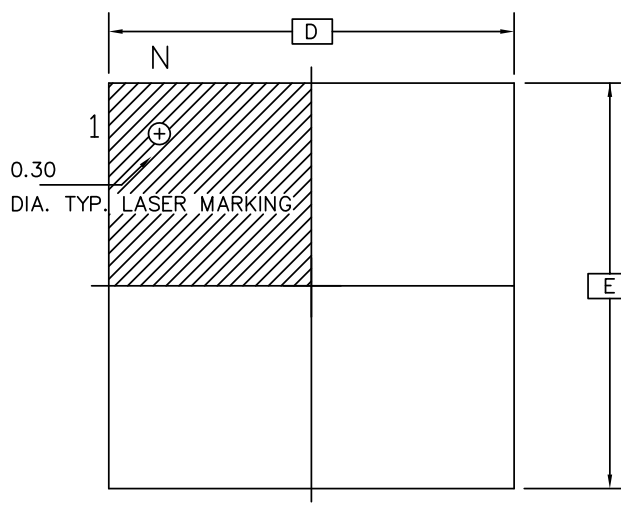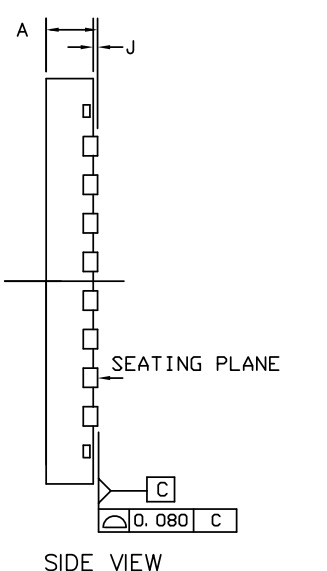
TOP VIEW

DRAWINGS NOT SCALED

SIDE VIEW

SEATING PLANE

BOTTOM VIEW

See Options A, B, C

PIN1 ID
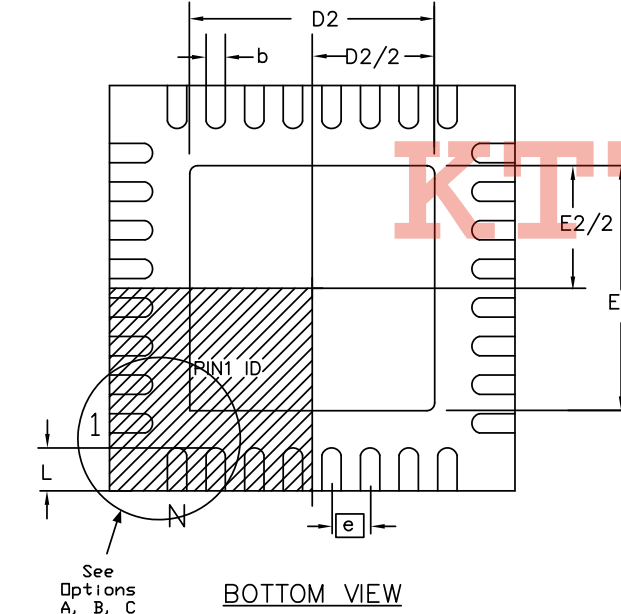
COMMON DIMENSIONS IN MM
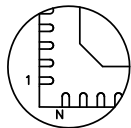
SYMBOL	MIN.	NOM.	MAX.	NOTES
A	0.80	----	1.00	
J	0.00	----	0.05	
D/E		5.00 BSC		
D2/E2	1.25	----	3.60	
N		32		
e		0.50 BSC		
L	0.30	0.40	0.50	
b	0.18	0.25	0.30	
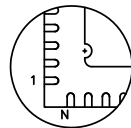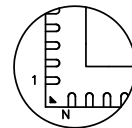
Option A
Pin 1# Chamfer
(C 0.30)

Option B
Pin 1# Notch
(0.20 R)

Option C
Pin 1# Triangle

Compliant JEDEC Standard MO-220 variation VHHD-2

07/26/07

ATMEL	Atmel Nantes S.A. La Chantrerie - BP 70602 44306 Nantes Cedex 3 - France	**TITLE** PN, 32 - Lead 5.0x5.0 mm Body, 0.50 mm Pitch Quad Flat No Lead Package (QFN)	DRAWING No. PN	REV. G

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6G
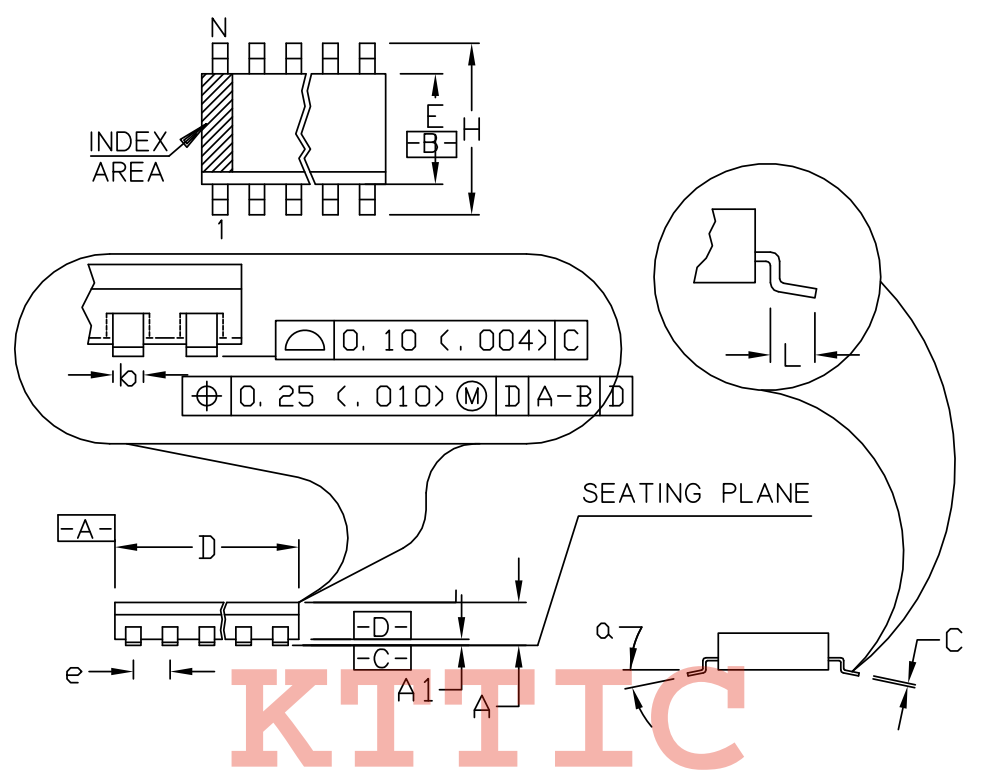
	MM		INCH	
A	----	1.10	----	.043
A1	0.05	0.15	.002	.006
b	0.19	0.30	.007	.012
C	0.09	0.20	.003	.008
D	6.40	6.60	.252	.260
E	4.30	4.50	.169	.177
e	0.65	BSC	.026	BSC
H	6.40 BSC		.252 BSC	
L	0.50	0.70	.020	.028
N	20		20	
α	0° ~8°		0° ~8°	

20/12/2007

	TITLE	DRAWING No.	REV.
Atmel Nantes S.A. La Chantrerie - BP 70602 44306 Nantes Cedex 3 - France	6G, 20 Leads - 4.4x6.5mm body - 0.65mm Pitch - Lead Length: 0.6mm THIN SHRINK SMALL OUTLINE	6G	A

Document Revision History

7793A - 08/08   1.   Document Creation.

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