Appendix B - ATtiny24V/ATtiny44V/ATtiny84V Automotive Specification at 1.8V

This document contains information specific to devices operating at voltage between 1.8V and 3.6V. Only deviations with standard operating characteristics are covered in this appendix, all other information can be found in the complete Automotive datasheet. The complete ATtiny24/ATtiny44/ATtiny84 automotive datasheet can be found on www.atmel.com

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

ATtiny24V
ATtiny44V
ATtiny84V

Appendix B

Preliminary

7819A–AVR–01/09

1. Electrical Characteristics

1.1 Absolute Maximum Ratings

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 is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Parameters	Value	Unit
Operating temperature	–40 to +85	°C
Storage temperature	–65 to +175	°C
Voltage on any pin except $\overline{\text{RESET}}$ with respect to ground	–0.5 to V_{CC} + 0.5	V
Maximum operating voltage	6.0	V
DC current per I/O pin	30.0	mA
DC current V_{CC} and GND pins	200.0	mA

1.2 DC Characteristics

T_A = –40° C to +85° C, V_{CC} = 1.8V to 3.6V (unless otherwise noted)

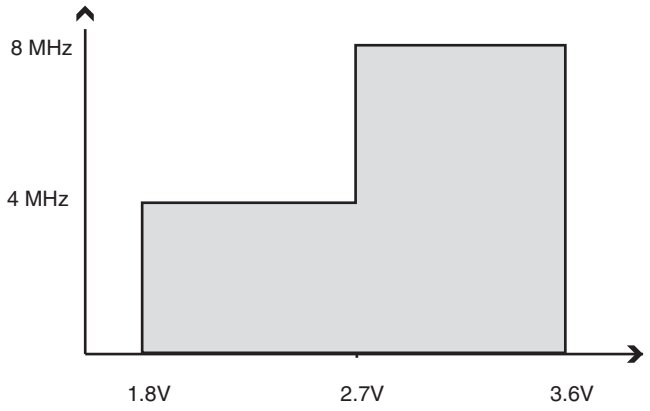
Symbol	Parameters	Condition	Min.	Typ.	Max.	Unit
V_{IL}	Input low voltage, except XTAL1 and $\overline{\text{RESET}}$ pin	V_{CC} = 1.8V to 3.6V	–0.5		+0.2V_{CC}[1]	V
V_{IH}	Input high voltage, except XTAL1 and $\overline{\text{RESET}}$ pins	V_{CC} = 1.8V to 3.6V	0.7V_{CC}[2]		V_{CC} + 0.5	V
V_{IL1}	Input low voltage, XTAL1 pin	V_{CC} = 1.8V to 3.6V	–0.5		+0.2V_{CC}[1]	V
V_{IH1}	Input high voltage, XTAL1 pin	V_{CC} = 1.8V to 3.6V	0.9V_{CC}[2]		V_{CC} + 0.5	V
V_{IL2}	Input low voltage, $\overline{\text{RESET}}$ pin	V_{CC} = 1.8V to 3.6V	–0.5		+0.2V_{CC}[1]	V
V_{IH2}	Input high voltage, $\overline{\text{RESET}}$ pin	V_{CC} = 1.8V to 3.6V	0.9V_{CC}[2]		V_{CC} + 0.5	V
V_{OL}	Output low voltage[3], I/O pin except RESET	I_{OL} = 2 mA, V_{CC} = 1.8V			0.2	V
V_{OH}	Output high voltage[4], I/O pin except RESET	I_{OH} = –2mA, V_{CC} = 1.8V	1.2			V
I_{CC}	Power supply current	Active 4 MHz, V_{CC} = 3V		0.8	2.5	mA
		Idle 4 MHz, V_{CC} = 3V		0.2	0.5	mA
	Power-down mode	WDT disabled, V_{CC} = 3V WDT enabled, V_{CC} = 3V		0.2 4	24 30	µA
V_{ACIO}	Analog comparator Input offset voltage	V_{CC} = 2.7V V_{in} = V_{CC}/2		< 10	40	mV
I_{ACLK}	Analog comparator Input leakage current	V_{CC} = 2.7V V_{in} = V_{CC}/2	–50		+50	nA

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 (2 mA at VCC = 1.8V) under steady state conditions (nontransient), the following must be observed: (1) The sum of all IOL, for all ports, should not exceed 50 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. Although each I/O port can source more than the test conditions (0.5 mA at VCC = 1.8V) under steady state conditions (nontransient), the following must be observed: (1) The sum of all IOL, for ports B0 to B5, should not exceed 50 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.

1.3 Maximum Speed versus V_{CC}

Maximum frequency is dependent on V_{CC}. As shown in Figure 1-1, the Maximum Frequency vs. V_{CC} curve is linear between $1.8V < V_{CC} < 3.6V$.

Figure 1-1. Maximum Frequency versus V_{CC}



1.4 Clock Characterizations

Table 1-1. Calibration Accuracy of Internal RC Oscillator

	Frequency	V_{CC}	Temperature	Accuracy
User Calibration	7.3 MHz to 8.1 MHz	1.8V to 3.6V	–40°C to +85°C	±25%

1.5 ADC Characteristics

T_A = –40° C to +85° C, V_{CC} = 1.8V to 3.6V (unless otherwise noted)

Symbol	Parameters	Test Conditions	Min.	Typ.	Max.	Unit
	Resolution	Single ended conversion		10		Bits
	Absolute accuracy (Including INL, DNL, quantization error, gain and offset error)	V_{CC} = 1.8V, V_{Ref} = 1.8V, ADC clock = 200 kHz		2	4.0	LSB
		V_{CC} = 1.8V, V_{Ref} = 1.8V, ADC clock = 200 kHz Noise Reduction Mode		2	4.0	LSB
	Integral Non-Linearity (INL)	V_{CC} = 1.8V, V_{Ref} = 1.8V, ADC clock = 200 kHz		0.5	1.5	LSB
	Differential Non-Linearity (DNL)	V_{CC} = 1.8V, V_{Ref} = 1.8V, ADC clock = 200 kHz		0.2	0.7	LSB
	Gain error	V_{CC} = 1.8V, V_{Ref} = 1.8V, ADC clock = 200 kHz	–7.0	–3.0	+5.0	LSB
	Offset error	V_{CC} = 1.8V, V_{Ref} = 1.8V, ADC clock = 200 kHz	–3.5	+1.5	+3.5	LSB
V_{REF}	Reference voltage		1.8		AV_{CC}	V

1.6 ADC Characteristics

T_A = –40° C to +85° C, V_{CC} = 1.8V to 3.6V (unless otherwise noted)

Symbol	Parameters	Test Conditions	Min.	Typ.	Max.	Unit
	Resolution	Differential conversion, gain = 1x BIPOLAR mode only		8		Bits
	Absolute accuracy (Including INL, DNL, quantization error, gain and offset error)	Gain = 1x, V_{CC} = 1.8V, V_{Ref} = 1.3V, ADC clock = 125 kHz		1.6	5.0	LSB
	Integral Non-Linearity (INL)	Gain = 1x, V_{CC} = 1.8V, V_{Ref} = 1.3V, ADC clock = 125kHz		0.7	2.5	LSB
	Differential Non-Linearity (DNL)	Gain = 1x, V_{CC} = 1.8V, V_{Ref} = 1.3V, ADC clock = 125 kHz		0.3	1.0	LSB
	Gain Error	Gain = 1x, V_{CC} = 1.8V, V_{Ref} = 1.3V, ADC clock = 125 kHz	–7.0	+1.50	+7.0	LSB
	Offset Error	Gain = 1x, V_{CC} = 1.8V. V_{Ref} = 1.3V, ADC clock = 125 kHz	–4.0	0.0	+4.0	LSB
V_{REF}	Reference Voltage		1.30		AVCC – 0.5	V

2. Ordering Information

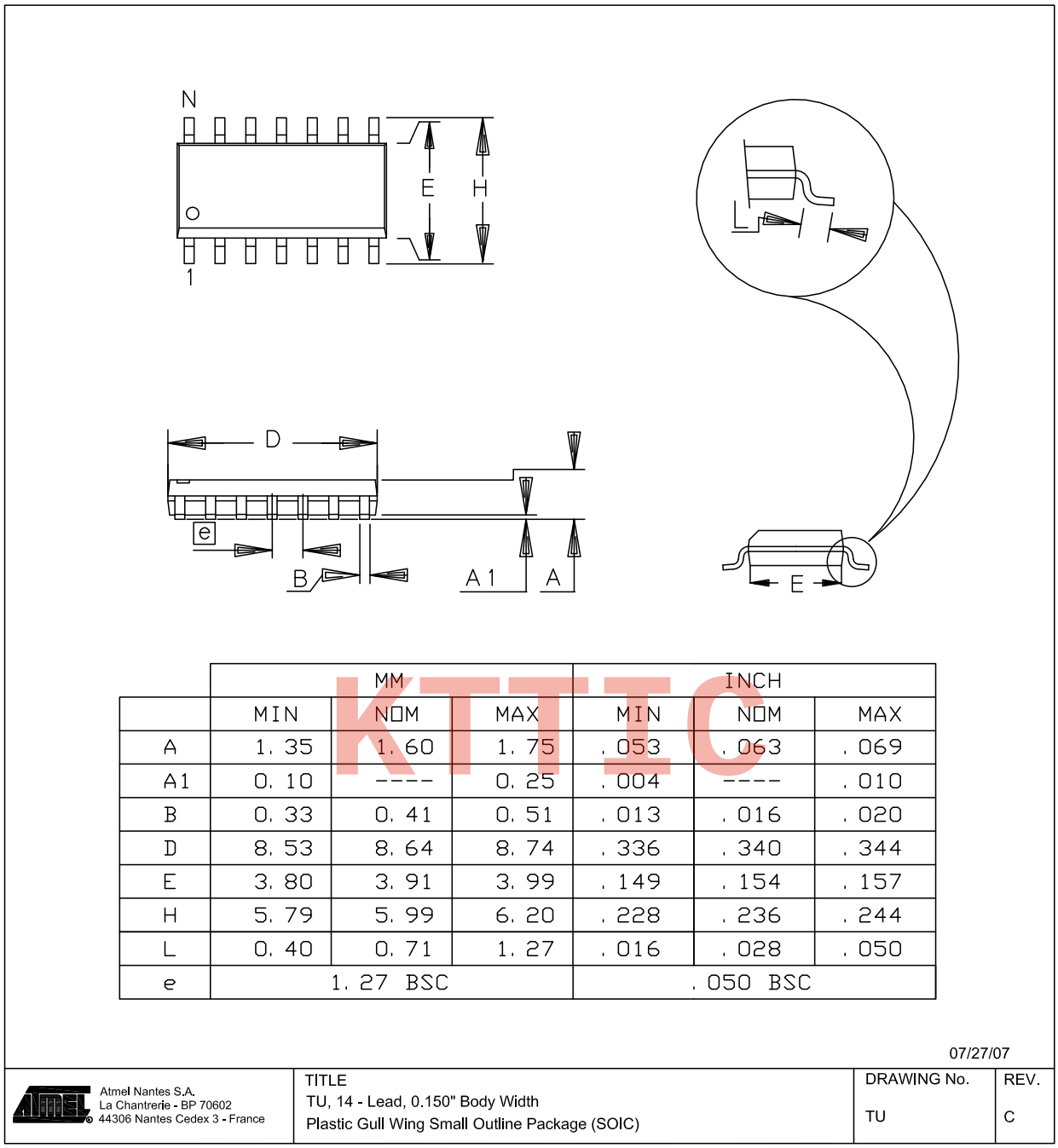
Power Supply	Speed (MHz)	ISP Flash	Ordering Code	Package	Operation Range
1.8V to 3.6V	4-8	2 KB	ATtiny24V-15SST	TU	Automotive (–40°C to +85°C)
1.8V to 3.6V	4-8	2 KB	ATtiny24V-15MT	PN	Automotive (–40°C to +85°C)
1.8V to 3.6V	4-8	4 KB	ATtiny44V-15SST	TU	Automotive (–40°C to +85°C)
1.8V to 3.6V	4-8	4 KB	ATtiny44V-15MT	PN	Automotive (–40°C to +85°C)
1.8V to 3.6V	4-8	8 KB	ATtiny84V-15MT	PN	Automotive (–40°C to +85°C)

3. Package Information

Table 3-1. Package Types

Package Type	Description
TU	TU 14-Lead, 0.150” Body Width Plastic Gull Wing Small Outline Package (SOIC)
PN	PN 32-Lead, 5.0 x 5.0 mm Body, 0.50 mm Pitch Quad Flat No Lead ackage (QFN)

Figure 3-1. TU

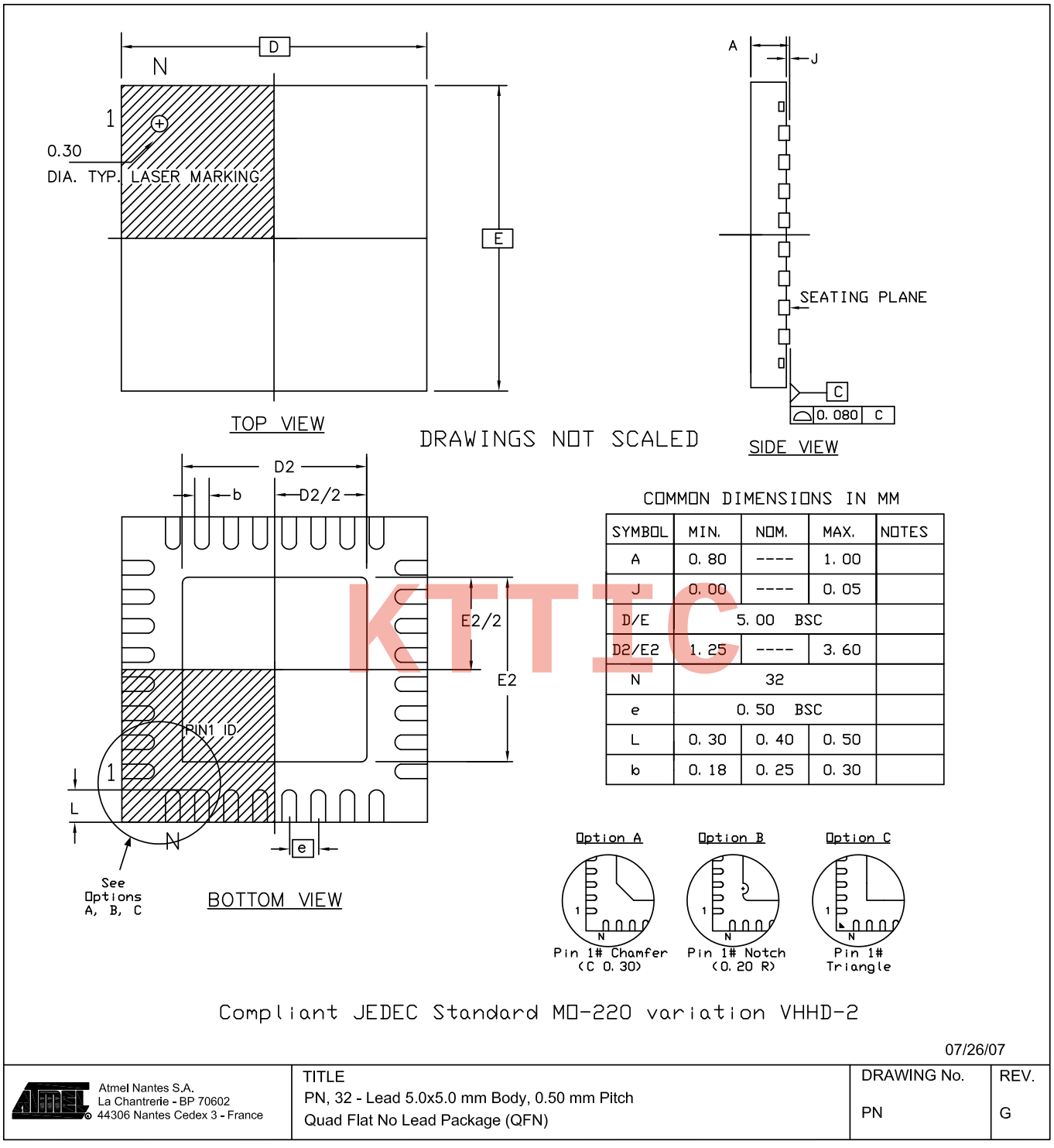


	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.35	1.60	1.75	.053	.063	.069
A1	0.10	----	0.25	.004	----	.010
B	0.33	0.41	0.51	.013	.016	.020
D	8.53	8.64	8.74	.336	.340	.344
E	3.80	3.91	3.99	.149	.154	.157
H	5.79	5.99	6.20	.228	.236	.244
L	0.40	0.71	1.27	.016	.028	.050
e	1.27 BSC			.050 BSC		

07/27/07

Atmel Nantes S.A. La Chantrerie - BP 70602 44306 Nantes Cedex 3 - France	TITLE TU, 14 - Lead, 0.150" Body Width Plastic Gull Wing Small Outline Package (SOIC)	DRAWING No. TU	REV. C

Figure 3-2. PN



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	

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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