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## Appendix B - ATtiny25/45/85 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 ATtiny25/45/85 automotive datasheet can be found on [www.atmel.com](http://www.atmel.com)



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**8-bit AVR<sup>®</sup>**  
**Microcontroller**  
**with 2/4/8K**  
**Bytes In-System**  
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**Flash**

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**ATtiny25**  
**ATtiny45**  
**ATtiny85**

**Appendix B**

**Preliminary**

7669C-AVR-03/07



## Electrical Characteristics

### Absolute Maximum Ratings\*

Operating Temperature.....	-55°C to +150°C
Storage Temperature .....	-65°C to +175°C
Voltage on any Pin except <u>RESET</u> with respect to Ground .....	-0.5V to $V_{CC}+0.5V$
Voltage on <u>RESET</u> 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

$T_A = -40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ ,  $V_{CC} = 1.8\text{V}$  to  $3.6\text{V}$  (unless otherwise noted)

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
$V_{IL}$	Input Low Voltage, except XTAL1 and <u>RESET</u> pin	$V_{CC} = 1.8\text{V} - 3.6\text{V}$	-0.5		$0.2V_{CC}^{(1)}$	V
$V_{IH}$	Input High Voltage, except XTAL1 and <u>RESET</u> pins	$V_{CC} = 1.8\text{V} - 3.6\text{V}$	$0.7V_{CC}^{(2)}$		$V_{CC} + 0.5$	V
$V_{IL1}$	Input Low Voltage, XTAL1 pin	$V_{CC} = 1.8\text{V} - 3.6\text{V}$	-0.5		$0.1V_{CC}^{(1)}$	V
$V_{IH1}$	Input High Voltage, XTAL1 pin	$V_{CC} = 1.8\text{V} - 3.6\text{V}$	$0.9V_{CC}^{(2)}$		$V_{CC} + 0.5$	V
$V_{IL2}$	Input Low Voltage, <u>RESET</u> pin	$V_{CC} = 1.8\text{V} - 3.6\text{V}$	-0.5		$0.2V_{CC}^{(1)}$	V
$V_{IH2}$	Input High Voltage, <u>RESET</u> pin	$V_{CC} = 1.8\text{V} - 3.6\text{V}$	$0.9V_{CC}^{(2)}$		$V_{CC} + 0.5$	V
$V_{IL3}$	Input Low Voltage, <u>RESET</u> pin as I/O	$V_{CC} = 1.8\text{V} - 3.6\text{V}$	-0.5		$0.3V_{CC}^{(1)}$	V
$V_{IH3}$	Input High Voltage, <u>RESET</u> pin as I/O	$V_{CC} = 1.8\text{V} - 3.6\text{V}$	$0.6V_{CC}^{(2)}$		$V_{CC} + 0.5$	V
$V_{OL}$	Output Low Voltage <sup>(3)</sup> , I/O pin except <u>RESET</u>	$I_{OL} = 0.5\text{mA}$ , $V_{CC} = 1.8\text{V}$			0.4	V
$V_{OH}$	Output High Voltage <sup>(4)</sup> , I/O pin except <u>RESET</u>	$I_{OH} = -0.5\text{mA}$ , $V_{CC} = 1.8\text{V}$	1.2			V
$I_{IL}$	Input Leakage Current I/O Pin	$V_{CC} = 3.6\text{V}$ , pin low (absolute value)			1	$\mu\text{A}$
$I_{IH}$	Input Leakage Current I/O Pin	$V_{CC} = 3.6\text{V}$ , pin high (absolute value)			1	$\mu\text{A}$
$R_{RST}$	Reset Pull-up Resistor		30		60	$\text{k}\Omega$
$R_{PU}$	I/O Pin Pull-up Resistor		20		50	$\text{k}\Omega$

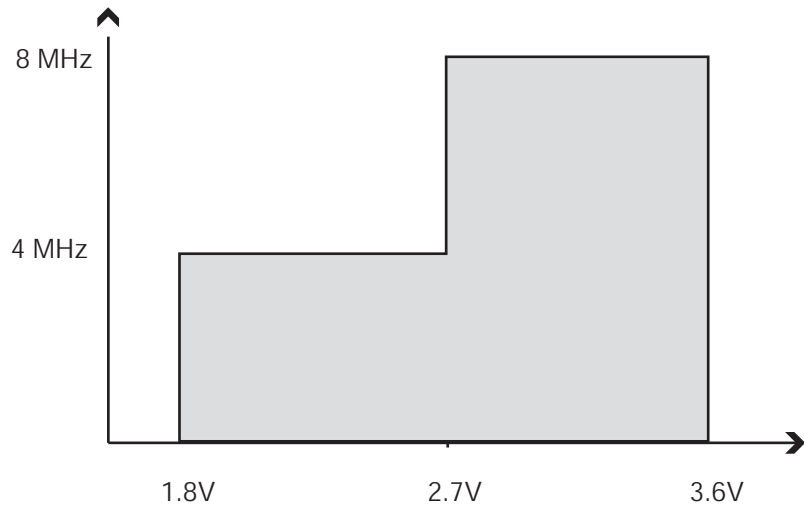
$T_A = -40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ ,  $V_{CC} = 1.8\text{V}$  to  $3.6\text{V}$  (unless otherwise noted) (Continued)

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
$I_{CC}$	Power Supply Current <sup>(5)</sup>	Active 4MHz, $V_{CC} = 1.8\text{V}$		0.8	1	mA
		Idle 4MHz, $V_{CC} = 1.8\text{V}$		0.2	0.3	mA
	Power-down mode	WDT disabled, $V_{CC} = 1.8\text{V}$ WDT enabled, $V_{CC} = 1.8\text{V}$		0.2 4	10 20	$\mu\text{A}$
$V_{ACIO}$	Analog Comparator Input Offset Voltage	$V_{CC} = 2.7\text{V}$ $V_{in} = V_{CC}/2$		<10	40	mV
$I_{ACLK}$	Analog Comparator Input Leakage Current	$V_{CC} = 2.7\text{V}$ $V_{in} = V_{CC}/2$	-50		50	nA
$t_{ACPD}$	Analog Comparator Propagation Delay	$V_{CC} = 2.7\text{V}$		500		ns

## Maximum Speed vs. $V_{CC}$

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

**Figure 1.** Maximum Frequency vs.  $V_{CC}$



## ADC Characteristics<sup>(6)</sup> Preliminary

$T_A = -40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ ,  $V_{CC} = 1.8\text{V}$  to  $3.6\text{V}$  (unless otherwise noted)

Symbol	Parameter	Condition	Min	Typ	Max	Units
	Resolution			8		Bits
	Absolute accuracy (Including INL, DNL, quantization error, gain and offset error)	$V_{REF} = 2.7\text{V}$ , $V_{CC} = 2.7\text{V}$ , ADC clock = 200 kHz		2	3.5	LSB
		$V_{REF} = 2.7\text{V}$ , $V_{CC} = 2.7\text{V}$ , ADC clock = 200 kHz Noise Reduction Mode		2	3.5	LSB
	Integral Non-Linearity (INL)	$V_{REF} = 2.7\text{V}$ , $V_{CC} = 2.7\text{V}$ , ADC clock = 200 kHz		0.6	2.5	LSB
	Differential Non-Linearity (DNL)	$V_{REF} = 2.7\text{V}$ , $V_{CC} = 2.7\text{V}$ , ADC clock = 200 kHz		0.30	1.0	LSB
	Gain Error	$V_{REF} = 2.7\text{V}$ , $V_{CC} = 2.7\text{V}$ , ADC clock = 200 kHz	-3.5	-1.3	3.5	LSB
	Offset Error	$V_{REF} = 2.7\text{V}$ , $V_{CC} = 2.7\text{V}$ , ADC clock = 200 kHz		1.8	3.5	LSB
	Conversion Time	Free Running Conversion	13 cycles			$\mu\text{s}$
	Clock Frequency		50		200	kHz
$AV_{CC}$	Analog Supply Voltage		$V_{CC} - 0.3$		$V_{CC} + 0.3$	V
$V_{REF}$	Reference Voltage		1.0		$AV_{CC}$	V
$V_{IN}$	Input Voltage		GND		$V_{REF} - 50\text{mV}$	V
	Input Bandwidth			38.5		kHz
$V_{INT}$	Internal Voltage Reference		1.0	1.1	1.2	V
$R_{REF}$	Reference Input Resistance		25.6	32	38.4	$\text{k}\Omega$
$R_{AIN}$	Analog Input Resistance			100		$\text{M}\Omega$

- 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 (0.5mA at  $V_{CC} = 1.8\text{V}$ ) under steady state conditions (non-transient), the following must be observed:
    - 1] The sum of all IOL, for ports B0 - 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.
  4. Although each I/O port can source more than the test conditions (0.5mA at  $V_{CC} = 1.8\text{V}$ ) under steady state conditions (non-transient), the following must be observed:
    - 1] The sum of all IOH, for ports B0 - B5 should not exceed 50 mA.
 If IOH exceeds the test condition, VOH may exceed the related specification. Pins are not guaranteed to source current greater than the listed test condition.
  5. Minimum  $V_{CC}$  for Power-down is 2.5V.
  6. Based on standard voltage range (2.7V - 5.5V) characterization results. To be confirmed after actual silicon characterization.



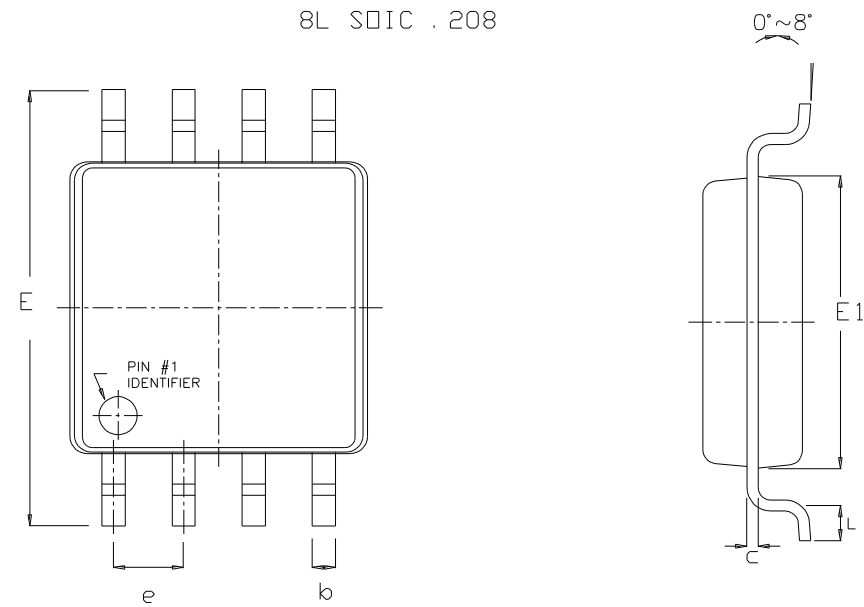
## Ordering Information

Power Supply	Speed (MHz)	ISP Flash	Ordering Code	Package	Operation Range
1.8 - 3.6V	4-8	2KB	ATtiny25V-15ST	T5	Automotive (-40 °C to +85 °C)
1.8 - 3.6V	4-8	4KB	ATtiny45V-15ST	T5	Automotive (-40 °C to +85 °C)
1.8 - 3.6V	4-8	8KB	ATtiny85V-15ST	T5	Automotive (-40 °C to +85 °C)

Package Type	
T5	8-lead, 0.208" Wide, Plastic Gull-Wing Small Outline (EIAJ SOIC)

T5

8L SOIC .208



	MM		INCH	
	Min	Max	Min	Max
A	1.70	2.16	.066	.085
A1	0.05	0.25	.002	.010
b	0.35	0.48	.014	.015
C	0.15	0.35	.006	.014
D	5.13	5.35	.202	.211
E	7.70	8.26	.303	.325
E1	5.18	5.40	.204	.212
L	0.51	0.85	.020	.033
e	1.27			
α	0°		8°	



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