# "1" - Unprogrammed — "0" - Programmed

## 1 Fuse Bits

- Atmeta328P Has three fuse Byte.

### 1.1 Extended Fuse Byte

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|
| - | - | - | - | - | BODLEVEL2 | BODLEVEL1 | BODLEVEL0 |

- $V_{BOT}$ - Brown-out Threshold Voltage

| *BODLEVEL[2:0]* | **Min** $V_{BOT}$ | **Typ** $V_{BOT}$ | **Max** $V_{BOT}$ |
|---|---|---|---|
| 111 | BOD disabled | | |
| 101 | 2.5 | 2.7 | 2.9 |
| 100 | 4.0 | 4.3 | 4.6 |

### 1.2 High Fuse Byte

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|
| RSTDISBL | DWEN | SPIEN | WDTON | EESAVE | BOOTSZ1 | BOOTSZ0 | BOOTRST |

| High Fuse Byte | Description | Default Value |
|---|---|---|
| RSTDISBL | External reset disable - disable external reset pin and use as input or output pin | 1 |
| DWEN | debugWIRE enable - enabled debugWIRE interface | 1 |
| SPIEN | Enable serial program and data downloading | 0 - enable SPI programming |
| WDTON | Watchdog timer always On | 1 |
| EESAVE | EEPROM memory is preserved through chip erase | 1 |
| BOOTSZ1 | Select boot size | 0 |
| BOOTSZ0 | Select boot size | 0 |
| BOOTRST | Select reset vector - select reset vector location | 1 |

| BOOTSZ[1:0] | Boot size | Pages | Application Flash Section | Boot Loader Falash Section |
|---|---|---|---|---|
| 11 | 256 words | 4 | 0x0000 - 0x3EFF | 0x3F00 - 0x3FFF |
| 10 | 512 words | 8 | 0x0000 - 0x3DFF | 0x3E00 - 0x3FFF |
| 01 | 1024 words | 16 | 0x0000 - 0x3BFF | 0x3C00 - 0x3FFF |
| 00 | 2048 words | 32 | 0x0000 - 0x37FF | 0x3800 - 0x3FFF |

### 1.3 Low Fuse Byte

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|
| CKDIV8 | CKOUT | SUT1 | SUT0 | CKSEL3 | CKSEL2 | CKSEL1 | CKSEL0 |

| High Fuse Byte | Description | Default Value |
|---|---|---|
| CKDIV8 | Divide clock by 8 | 0 - Divide clock by 8 and use as CPU clock |
| CKOUT | Clock output | 1 |
| SUT1 | Select start-up time | 1 |
| SUT0 | Select start-up time | 0 |
| CKSEL3 | Select clock source | 0 |
| CKSEL2 | Select clock source | 0 |
| CKSEL1 | Select clock source | 1 |
| CKSEL0 | Select clock source | 1 |

| CKSEL[3:0] | Device Clocking Option |
|---|---|
| 1111 - 1000 | Low power crystall oscillator |
| 0111 - 0110 | Full swing crystal oscillator |
| 0101 - 0100 | Low frequency crystal oscillator |
| 0011 | Internal 128kHz RC oscillator |
| 0010 | Calibrated internal RC oscillator |
| 0000 | External clock |

# 2  Signature Bytes

- All Atmel microcontrollers have a three-byte Signature code which identifies the devices.

| Part | Sinature Bytes Address | | |
|---|---|---|---|
| | 0x000 | 0x001 | 0x002 |
| ATmega328P | 0x1E | 0x95 | 0x0F |

# 3  Calibration Byte

- The Atmel ATmega328P has a byte calibration value for the internal RC oscillator.

- This byte resides in the high byte of address 0x000 in the signature address space.

- During reset, this byte is automatically written into the **OSCCAL** register to ensure correct frequency of the calibrated RC oscillator.