1.8 Volt Technology - Benefits

Portability is and will continue to be one of the key features driving the design and development of new electronic equipment. Existing products such as palmtop computers, cellular phones and data acquisition devices are becoming increasingly smaller and more powerful. Handheld markets will demand that product feature sets be enhanced and that battery operating life be increased. These market requirements, in turn, will put more demands on battery and integrated circuit technology.

In order to optimize battery technology ICs must be able to operate at voltages well below the 5V range that most ICs operate at today. In fact, even integrated circuits operating at 3 volts do not make the most of the available battery technology. Thus the need for devices that operate below 3 volts.

BATTERY TECHNOLOGY OVERVIEW

Primary versus Secondary

In portable or handheld equipment there are two major battery types employed; primary and secondary. Primary cells are disposable, and alkaline and lithium cells are the main primary batteries in use today. Alkaline batteries are extremely common in consumer applications such as electronic games, cordless phones and palmtop computers. While lithium batteries are used as a primary power source in other consumer products such as cameras and as a back-up supply in palmtops.

Secondary cells are rechargeable batteries. Among the many secondary cells available, lead-acid, Ni-cad and Nickel Metal Hydride (NMH) are the most popular.

Voltage Ratings

Batteries for portable applications, whether primary or secondary, have three different voltage ratings; Rated or nominal, Operating, and End-of-life. The rated voltage is usually the open circuit voltage, which in the case of alkaline “AA” cells is 1.5V. Under normal load the “operating voltage” is realized and in all cases is less than the nominal voltage. The final battery voltage rating is the end-of-life voltage, which is defined as the voltage at which 100% of the usable power of the battery is consumed, or as 75% of the operating voltage. In the case of the same alkaline battery the end-of-life voltage is 0.9 volts. Table 1 lists the operating and end-of-life voltages for a single “AA” or equivalent cell of the five battery types mentioned above.

TABLE 1 - BATTERY VOLTAGE SUMMARY

BATTERY TYPE	OPERATING VOLTAGE	END-OF-LIFE VOLTAGE
ALKALINE	1.2V	0.9V
LITHIUM	2.7V	2.0V
LEAD-ACID	2.0V	1.75V
NI-CAD	1.2V	0.9V
NMH	1.2V	1.0V

With applications employing primary cells this means that batteries are replaced less often, thus reducing operating cost as well as having a positive effect on the environment due to the use and disposal of fewer batteries. In systems with secondary cells time between recharging increased, thus enhancing the performance of the product.

LOW VOLTAGE APPLICATIONS

As mentioned previously, the need for increased portability will drive the employment of low voltage technology. Portable and handheld applications requiring low voltage (sub 3V) technology will be numerous and will in many cases be high volume. These include a variety of personal communications devices such as cellular and cordless phones, computing devices like palmtops and portable PCs, and a number of data acquisition devices for a variety of medical, industrial and commercial applications.

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1.8 Volt Technology - Benefits

MICROCHIP'S LOW VOLTAGE PRODUCT POSITION

Prior to the announcement of a family of 1.8V Serial EEPROMs in November of 1992, Microchip had already established itself as a leader in low voltage semiconductor products. Microchip's current product portfolio consists of: (1) Serial EEPROMs that operate, both READ and WRITE, down to the following voltage levels: 1.8V, 2.0V, 2.5V and 5V; (2) ROM based microcontrollers that operate down to 2V; and (3) 3V One Time Programmable EPROMs.

The 1.8V Serial EEPROM family operates down to 1.8V without the relaxation of any specification. This includes all AC, DC retention and endurance parameters. Currently the 1.8V family consists of three 3-wire devices, in densities ranging from 1K to 4K bits. Packaging options include 8 pin SOIC and 8 pin PDIP devices. Typical operating currents for these devices, at 1.8V, are in the 70uA range, resulting in power consumption levels of less than 150uW. This compares to 1 to 5 mW for comparable devices operating at 5V. In the near future, the 1.8V family of Serial EEPROMs will be expanded to include all 2-wire devices.

SUMMARY

With the introduction of 1.8V Serial EEPROMs, Microchip has made available silicon technology that optimizes existing battery technology. This over time will result in the development, production, marketing and application of more portable and higher performance handheld and portable computing, telecommunications, and data acquisition products.

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- Microchip believes that its family of PICmicro microcontrollers is one of the most secure products of its kind on the market today, when used in the intended manner and under normal conditions.
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