

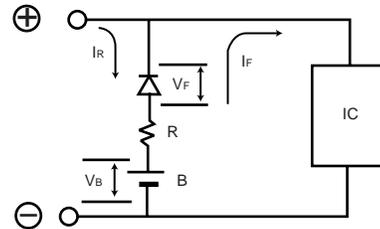
Design for Memory Back-up Use

■ Selecting batteries

When selecting batteries, give consideration to such factors as the current consumption of the equipment in which the batteries are to be used, the expected life of the batteries, and temperature in the operating environment. At low operating environment temperatures, the consumption current of the ICs drops but the discharge voltage of the batteries will also decrease. Also it is important to note that the capacity deterioration of batteries in long-term use becomes significant at high operating temperatures.

■ Memory backup circuit and holding voltage

The circuit typically used for memory backup is shown in the figure on the right. The memory holding voltage is expressed as: $V_B - V_F - I_F \times R > \text{memory holding voltage of IC}$.



■ Reverse current blocking diode

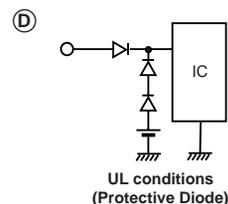
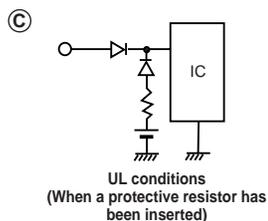
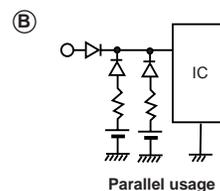
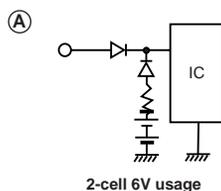
Since lithium primary batteries are not rechargeable, use of a reverse current blocking diode and a protective resistor in series is required (see below for UL Circuit Options) where there is the possibility of charging in the equipment circuit. Use a silicon diode or Schottky diode with a low reverse current as the reverse current blocking diode. To maintain the characteristics of a coin-type lithium battery, the total charging amount of the battery during its total usage period must be kept within 3% of the nominal capacity of the battery. For example, assuming that a CR2477 (1000mAh) will be used in a memory backup power supply for 5 years, charging by the reverse current of the reverse current blocking diode should be no greater than 30mAh (=3% of 1000mAh), thus: $30\text{mAh} \div \text{usage period (5 years} \times 365 \text{ days} \times 24 \text{ hours)} = 0.7\mu\text{A}$ In other words, a reverse current blocking diode whose reverse current is not greater than $0.7\mu\text{A}$ must be selected.

Allowable total charging amount :

Within 3% for coin-type batteries
Within 1% for cylindrical type batteries

Note that the reverse current of reverse current blocking diodes varies with temperature.

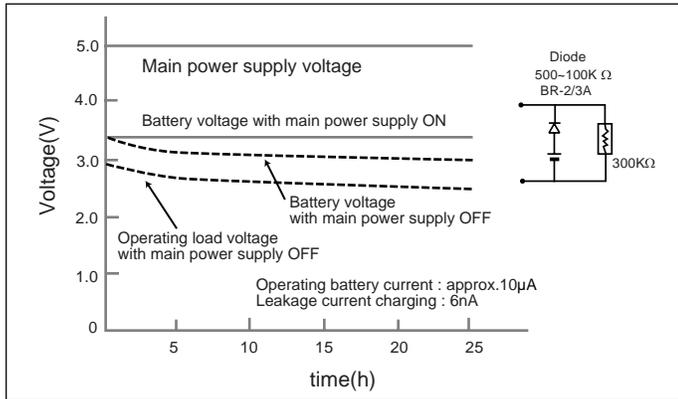
UL Circuit Options



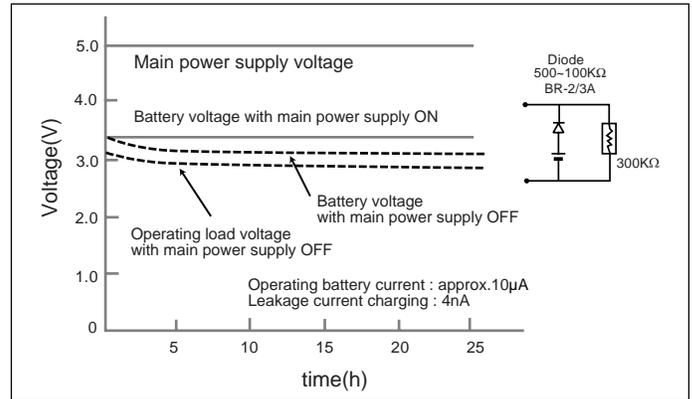
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■ Example of Voltage Characteristics

Using a typical silicone diode

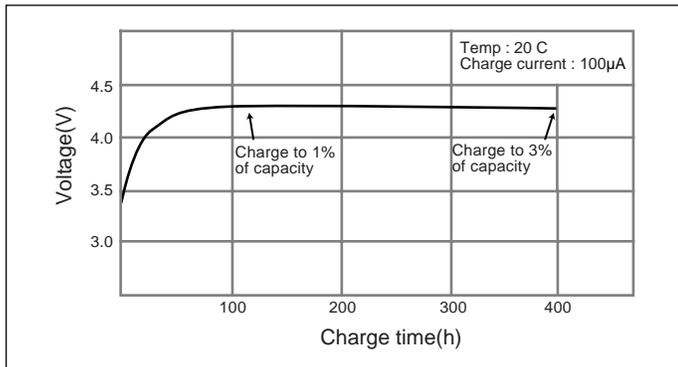


Using a Schottky barrier diode



■ Charge test results assuming diode leakage current

BR-2/3A (Cylindrical type) charge test



BR-2/3(cylindrical type) Discharge test after charging

