UTMC Application Note

Calculation of SμMMIT™ E Stand-Alone Current Utilization

The following describes the typical supply current consumed by the SμMMIT E protocol device (UT69151E) during 1553 message processing. Within the SμMMIT E package drawing current is the JA01 protocol die (figure 1). Considering the SμMMIT's power saving architecture, it is appropriate to calculate supply current with respect to some reference of message rate or duty cycle. Therefore, characterization data and device specifications exist for 0%, 25%, 50%, 87.5%, and 100% duty cycles. These percentages comprehend actual intermessage gap and RT response times defined by the 1553 bus protocol (i.e. 12μs and 4μs, respectively). In rare cases where a maximum number of data words are transferred, the protocol circuitry operates at just above 90% duty cycle, well below the maximum rating. **Note**: Characterization and specification data do not usually include 100% duty cycle by definition of 1553 not that the devices can not operate at this maximum.

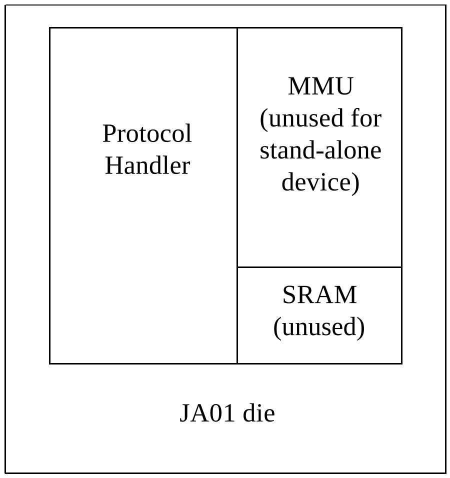
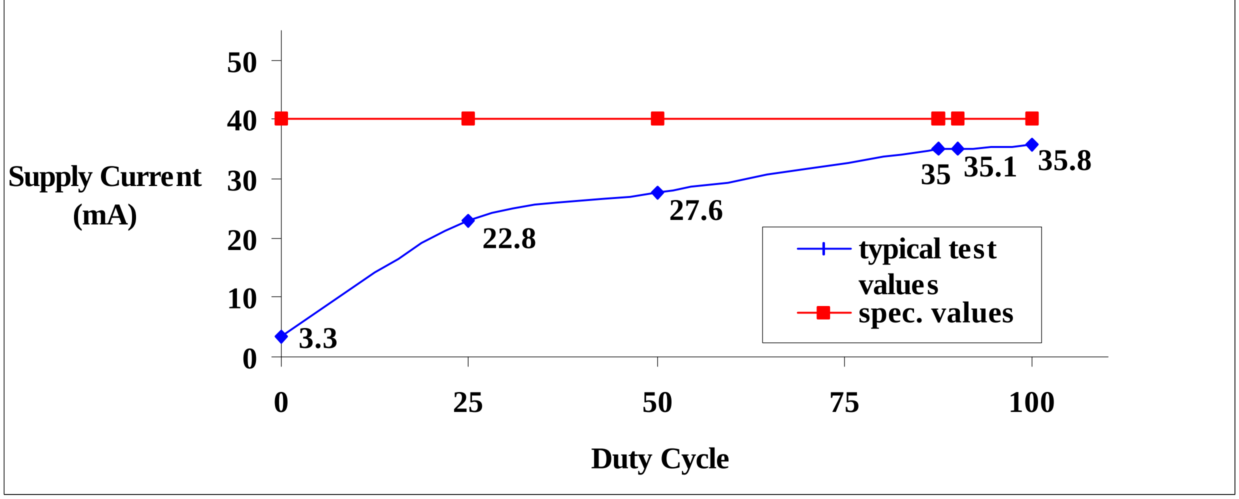


Figure 1. SμMMIT E Device

With regard to the current consumption during 1553 message processing, the JA01 circuitry facilitates 1553 operations. This situation is comprehended by data specified in the SμMMIT handbook for the stand-alone device. Table 1 relates typical test data collected, at worst case temperature and voltage, for the stand-alone SμMMIT part in comparison to 40mA standby current specified within the SμMMIT handbook (Chapter 16). Using specification data and typical characterization data at various duty cycles simplifies power and supply current calculations required by the designer.

Using information provided by the table on the next page, it is possible to generate total current and subsequent power consumption by the SμMMIT E during 1553 processing.

Table 1. SuMMIT Current vs. Duty Cycle



At 0% duty cycle the observed current consumption for the stand-alone SμMMIT E is 3.3mA. Using values for each duty cycle provide the following results:

0% $I_{S\mu MMIT\ E}$ = 3.3mA

25% $I_{S\mu MMIT\ E}$ = 22.8mA

50% $I_{S\mu MMIT\ E}$ = 27.6mA

87.5% $I_{S\mu MMIT\ E}$ = 35.0mA

100% $I_{S\mu MMIT\ E}$ = 35.8mA

Multiplying these total currents by the nominal voltage supply value of 5 Volts provides the following power consumption equations per respective duty cycle:

0% $P_{S\mu MMIT\ E}$ = 5V(3.3mA) = 0.017 Watts

25% $P_{S\mu MMIT\ E}$ = 5V(22.8mA) = 0.114 Watts

50% $P_{S\mu MMIT\ E}$ = 5V(27.6mA) = 0.138 Watts

87.5% $P_{S\mu MMIT\ E}$ = 5V(35.0mA) = 0.175 Watts

100% $P_{S\mu MMIT\ E}$ = 5V(35.8mA) = 0.179 Watts

From the above it can be seen that under the most intensive 1553 message processing the SμMMIT E consumes considerably less than a fifth of a Watt of power. For the sake of comparison it might be worth noting and calculating absolute worst case power consumption by considering the very guard-banded specification value at 100%. Using data from the table above provides the following:

$$100\%_{rated}\ \ I_{S\mu MMIT\ E} = 40.0mA$$

Then calculate power using maximum voltage rating:

$$100\%_{rated}\ \ P_{S\mu MMIT\ E} = 5.5V(40.0mA) = 0.22\ Watts$$