

## **BUFFER ISSUE RESOLUTION DOCUMENT (BIRD)**

**BIRD NUMBER:** TBD  
**ISSUE TITLE:** New Rules for Unavailable min/max Data  
**REQUESTOR:** Arpad Muranyi, Mentor Graphics  
**DATE SUBMITTED:** ???, 2016  
**DATE REVISED:**  
**DATE ACCEPTED BY IBIS OPEN FORUM:**

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### **STATEMENT OF THE ISSUE:**

The IBIS specification supports typical, minimum and maximum data but only the typical data is required. The specification does not define what the EDA tool should do when the minimum and/or maximum data is missing. For some of the keywords the specification states that when the minimum or maximum data is not available, the typical data should be used, but this rule is not stated for all of the keywords. EDA tool vendors might raise the question whether they may or are expected to synthesize minimum or maximum data from the available data in the IBIS file, or simply make use of the existing typical data whenever minimum or maximum data is not available.

Also, the specification does not define rules for model makers about how the keywords relate or depend on each other. Consequently, according to the current version of the specification (v6.1) it is perfectly legal to create an IBIS file with any combination of missing or existing minimum or maximum data, even if the keywords are strongly dependent on each other.

This BIRD proposes to add a new general rule to the IBIS specification to define that minimum or maximum data should be present or missing uniformly for each keyword within an IBIS [Model]? file? List of keywords?

Examples:

1) The following keywords are all on the “[Component] level”. There are strong dependencies between these:

[Model]  
 [Submodel]  
 [External Circuit]  
 [Test Load]  
 [Test Data]

Each of these keywords may “contain” other keywords or subparameters, most of which have typ/min/max columns. What if any of these groups of keywords have “unsynchronized” min and/or max data? How good is a [Model] with min data and a [Submodel] with max data, etc...? It seems that these keywords need to be synchronized.

2) There are keywords or subparameters within [Model] which may be treated independently. For example, any of the “Series” keywords, [C\_comp] keywords may be independent variables from the I-V curve, V-t curve, etc... keywords. There is no need to require them to be synchronized.

3) Also, the entire .ibs file does not need to be synchronized either. Package and EBD keywords might be treated as independent variables.

What should be the governing rule then for synchronizing typ/min/max data?

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### **ANALYSIS PATH/DATA THAT LED TO SPECIFICATION:**

The following is a list of all occurrences of the rules defined for minimum and maximum data in the IBIS specification v6.1.

pg. 36: [Model Spec]

All four columns are required under the [Model Spec] keyword. However, data is required only in the typical column. If minimum and/or maximum values are not available, the reserved word “NA” must be used indicating the typical value by default.

pg. 52: [TTgnd] [TTpower]

All three columns are required under these keywords. However, data is required only in the typical column. If minimum and/or maximum values are not available, the reserved word “NA” must be used indicating the TT(typ) value by default.

pg. 53: [Pullup] [Pulldown] [GND Clamp] [POWER Clamp]

All four columns are required under these keywords. However, data is only required in the typical column. If minimum and/or maximum current values are not available, the reserved word “NA” must be used.

pg. 56: [ISSO PD] [ISSO PU]

All four columns are required under this keyword. However, data is only required in the typical column. If minimum and/or maximum current values are not available, the reserved word “NA” must be used.

pg. 61: [Rgnd] [Rpower] [Rac] [Cac]

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All three columns are required under these keywords. However, data is only required in the typical column. If minimum and/or maximum values are not available, the reserved word “NA” must be used indicating the R(typ) or C(typ) value by default.

pg. 63: [R Series] [L series] [Rl Series] [C series] [Lc series] [Rc series]

All three columns are required under these keywords. However, data is only required in the typical column. If minimum and/or maximum values are not available, the reserved word “NA” must be used.

pg. 64: [Series Current]

All four columns are required under these keywords. However, data is only required in the typical column. If minimum and/or maximum current values are not available, the reserved word “NA” must be used.

pg. 65: [Series MOSFET]

All four columns are required under this keyword. However, data is only required in the typical column. If minimum and/or maximum current values are not available, the reserved word “NA” must be used.

pg. 69: [Rising Waveform] [Falling Waveform]

All four columns are required. However, data is only required in the typical column. If minimum or maximum data is not available, use the reserved word “NA”.

pg. 71: [Composite Current]

All four columns are required. However, data is only required in the typical column. If minimum or maximum data is not available, use the reserved word “NA”.

pg. 79: [Submodel Spec]

All four columns are required under the [Submodel Spec] keyword. However, data is required only in the typical column. If minimum and/or maximum values are not available, the reserved word “NA” must be used to indicate the typical value by default.

pg. 81: [GND Pulse Table] [POWER Pulse Table]

All four columns are required. However, data is only required in the typical column. If minimum or maximum data is not available, use the reserved word "NA".

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**ANY OTHER BACKGROUND INFORMATION:**

This issue was raised in the Advanced Technology Modeling Task Group and the IBIS Open Forum teleconference in several meetings during the month of July, 2014. The concensus was to simplify the situation by the rule proposed in this BIRD.

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Please note...