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2010年4月1日
瑞萨电子公司

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Bi-CMOS 逻辑 HD74BC 系列

规格的定义

1. 负载电路

用于规定HD74BC系列的开关时间的AC负载电路如图1所示。只要没有特别指定，就使用此负载电路。HD74BC系列的负载电路为 $C_L = 50\text{pF}$ ，在增加寄生电容的容限的同时，起输出信号上升或者下降时的负载作用。此负载电路能为系统设计提供接近于一般应用系统假设的负载并且便于使用的开关时间的数值。连接到GND的 500Ω 电阻能被视为示波器的无源探针。换言之，连接GND的 500Ω 电阻能被视为通过 450Ω 的电阻和 50Ω 的同轴电缆，串联到内部连接了 50Ω 终端电阻的采样示波器。器件的输入引脚通过相同阻抗的电缆连接到采样示波器的另一个输入端。相当于脉冲发生器的信号输出端连接了一个 50Ω 的终端电阻。在图1的电路中，在测量器件的输出引脚和开关之间连接了另一个 500Ω 的电阻。在大部分测量时，此开关为断开状态；在测量三态输出的允许时间和禁止时间（Low→OFF、OFF→Low）时，此开关为接通状态。在开关接通后，7V电压被2个 500Ω 的电阻分压，输出引脚的电压变为静态High电平。有关测量波形的定义请参照图2～图6。

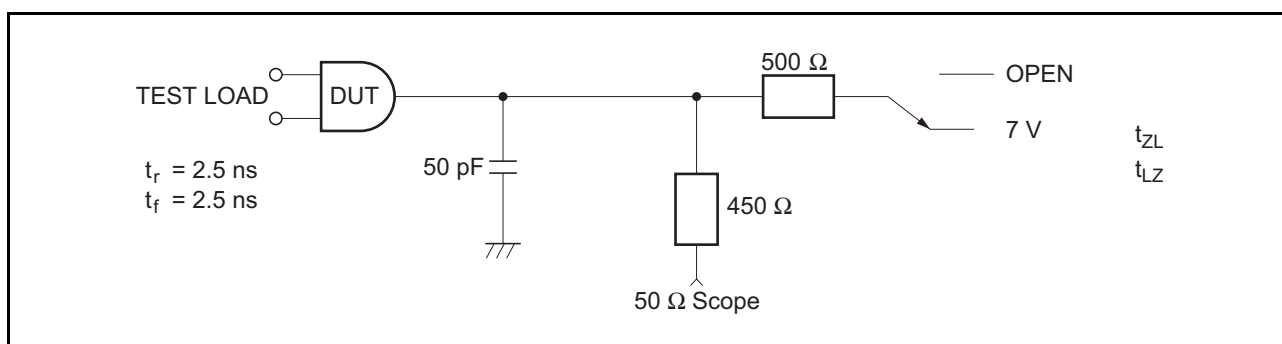


图1 AC负载电路

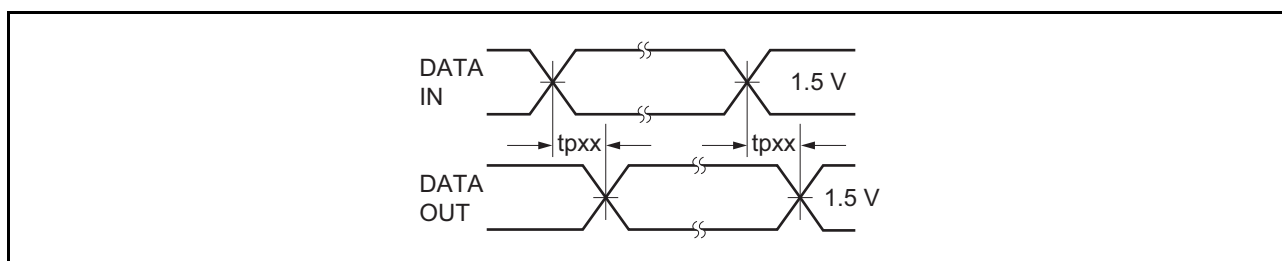


图2 传播延迟时间

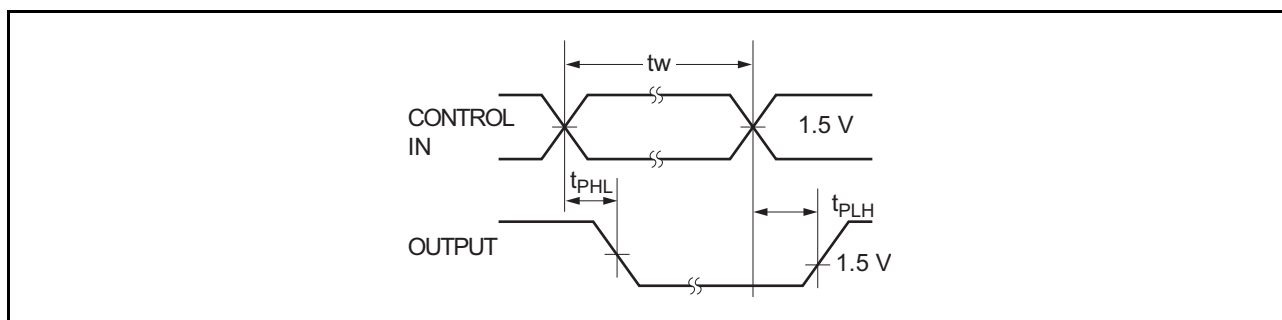


图3 传播延迟时间和脉宽

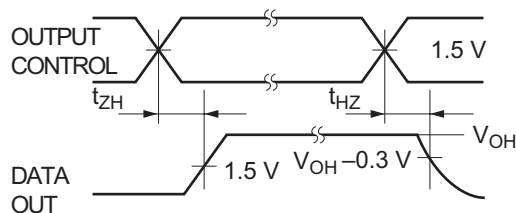


图4 三态输出 t_{ZH} 和 t_{HZ}

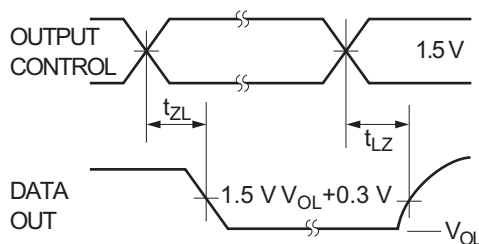


图5 三态输出 t_{ZL} 和 t_{LZ}

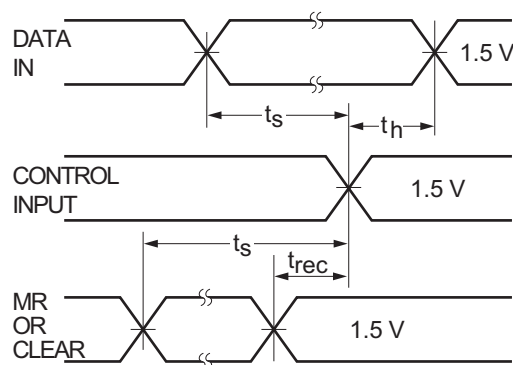


图6 准备时间和保持时间

2. 试验条件

开关特性项目的试验条件和其他族一样，Low 电平为 0V，High 电平为 3V。输入信号的上升时间和下降时间为 2.5ns，但是在测量最大时钟频率和脉宽时不超过 1ns。DC 特性项目的输入电压通常为规格中的 V_{IH} 和 V_{IL} 的值。在试验时，尤其在使用 IC 测试设备和处理设备时，必须注意：需要适当地对电源实施去耦，试验信号不能受噪声的影响。为了提高对测试设备固有噪声（在实际系统中不会发生）的噪声容限，有时需要调整输入电压电平。在试验噪声容限时，必须将输入电压先升高到和电源电压 V_{CC} 相同的值，然后降低到相当于 V_{IH} 的电平，并且再升高到 V_{CC} 电平。对于 V_{IL} ，也需要将输入电压从 0V 升高到 V_{IL} 电平，再返回到 0V。必须确认在输入电压为 V_{IH} 或者 V_{IL} 时输出不发生变化。在制作试验夹具时，必须充分考虑高频特性的布线。为了正确地评价输出波形的波纹和负尖峰，必须尽量缩短负载电容的连线并且加宽 GND 布线（最好是地线面），还必须尽量缩短 V_{CC} 的旁路电容器连接到试验插座的连线。

3. 多个输出的同时开关

开关时间受同时变化的输出引脚数的影响。对于输出引脚数为 2 个以上（含 2 个）的器件，同时变化的输出引脚数每增加 1 个，开关时间就比数据手册的值慢大约 250ps。对于 Octal 系列的器件，如果同时变化的输出引脚数不超过 4 个，实际上此延迟值几乎可以忽略。此值适用于 $T_a = -40 \sim +85^\circ\text{C}$ 和 $V_{CC} = 5V \pm 10\%$ 的全部范围。

4. I_{CCT} 特性

在用 HD74BC 系列替换 TTL 时，需要考虑 I_{CCT} 的规格。 I_{CCT} 的规格表示通常的 I_{CC} 增量。对于每个外加 $V_{CC}=2.1V$ 的输入引脚，应该将 I_{CCT} 的值加到静态消耗电流，这样就能求出电路最坏情况下的静态消耗电流。实际上，要减少各输入的 I_{CC} 增量时有几个要素。在一般系统中，由于 CMOS 构成的输入部的低输入电流特性，大部分 TTL 器件能将输入电压至少驱动到 TTL 输出电压的规格值。例如，在标准高速双极逻辑的情况下，HD74BC 系列的输入在 Low 电平时能被驱动到 200mV 左右，在 High 电平时能被驱动到 3.5V 左右。因此，实际上输入引脚的外加电压条件比 I_{CCT} 的测量条件更宽，并且各输入引脚的 I_{CC} 增量的典型值和规格值相比是一个非常小的值。与输入电压相应的 I_{CCT} 变动如图 7 所示。因此，和 TTL 电平兼容的其他 CMOS 一样，当使用 HD74BC 系列进行设计时，在理解 I_{CCT} 的规格含义的同时，应该考虑到：在大部分系统中，实际值和数据手册的规格值相比是一个非常小的值。

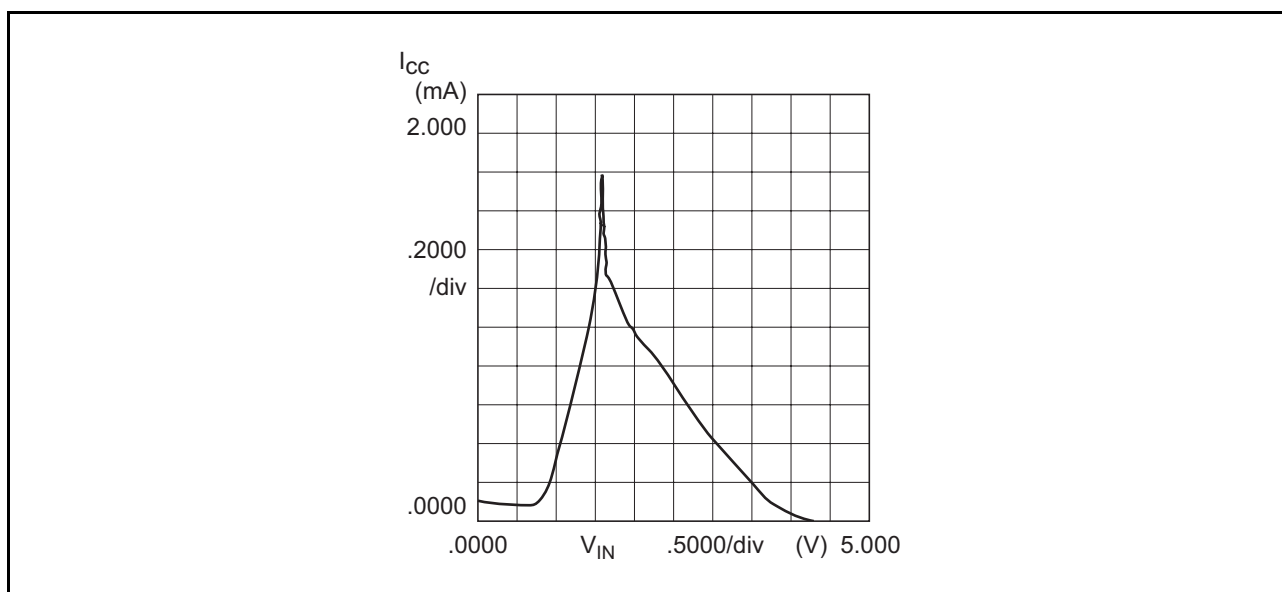


图 7 HD74BC 系列的输入电压- I_{CC} 特性

修订记录

Rev.	发行日	修订内容	
		页	修订处
1.00	2008.03.25	一	初版发行

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