

SLL 高级总线接口 逻辑产品

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SLL 高级 总线接口逻辑产品

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总线接口解决方案概述

引言

在当今渴望信息的社会中,电脑内存与显示屏之间几英寸距 离的数据传输,和通过光纤把数据传输到地球的另一端相比 同等重要。德州仪器不断的推进几乎每一个数据传输标准的能 力,并扩展其性能参数;这些数据传输标准包括:RS-232、 RS-423、RS-422、RS-485、光纤信道、VME、LVDS(低电压 差分信号)、IEEE 1394(火线)、USB(通用串行总线)、 GeoPort、IrDA(红外数据协会)、BTL和GTL。在过去的3 年中,德州仪器 SLL结合了自身在高速数字及模拟技术的专 长,为分布式负载提供更高的数据速率,使二级使用可被更复 杂、更具成本差异性的解决方案所替代。

在一个数据传输系统中,可以以多种方式来连接发射器、接收器、电路板和背板。图 1 给出的是在一个典型的设备柜中卡与卡之间是如何进行连接的。在某些情况下,使用数据吞吐量较高的点到点连接将单独的卡连在一起是必要的,但大多数设备柜都具备了多重卡背板,控制或数据信号可通过背板走线进行共享。本选择指南给出了最好的单端解决方案,能够通过多重卡背板为二级使用者提供出色的信号完整性。

"数据传输"这一短语表述的是数据从一个位置移动到 另一个位置的全过程,其中两个参数是很重要的——发 送与接收系统之间的距离,以及数据被传递到接收装置 所具有的速率。不同的传输标准,如 RS-232、火线、 LVDS 和 Gigabit CMOS,从速率和线路长度这两个方面 为一级、二级和三级使用者的各种需求提供解决方案,如 图 2 所示。先进的总线解决方案逻辑产品能向二级使用者提供更短的传输长度选择,尤其是使用新的 GTLP 器件。

每一个数据传输解决方案都可视作是一个转换器,一侧的设 备工作在一般的 LVTTL 信号电平上,而另一侧的设备则为更 高的数据吞吐量进行了优化。更短的电压摆动能减少电磁干 扰 (EMI),这是因为边沿速率(转换速率)将变慢但仍允许 具有更高的传输速率。差分互补信号能抵消共模噪声,提高 信号质量。

对于差分传输或平衡传输,每一个通道都需要一对电缆或一 对走线。在其中一条线路上,传输的是"真正的"信号,而 在另一条线路上,传输的是反转的信号。接收器主要检测输 入信号间的差异和电压交替,其输出取决于哪一条输入线路 与另一条相比更加积极。由于差分放大器的共模抑制能力, 这种噪声将被消除。此外,任何外部噪声都将同时耦合到两 条线路上而成为共模电压,被接收器所消除。

单端传输是在一条信号线上进行的,其输出是相对于地电平 而言的。单端传输的优点是简单,实施成本低。由于单端系 统对于每一路信号只需要一条线路,而差分信号则需要两 条线路,因此它非常适用于需要多条线路的并行通信,如 PC、打印机并行端口,或具有许多握手线路的串行通信,如 三级层次上的 EIA-232 和 VME 总线上,或二级层次上的专 有背板。最后,单端设备在传送数据的同时,也提供各种逻 辑功能,除了小、中、大比特宽度的收发器之外,还包括双 稳态多谐振荡器和一些寄存器。而大部分差分设备仅能发送 或接收数据。



图1. 系统连接解决方案

图2. 数据速率 vs. 传输距离



单端解决方案的主要缺点是它的抗噪声能力差。由于地线作 为系统的一部分,将有可能引入瞬态电压或电压电势位的漂 移(从附近的高频逻辑或高电流功率电路处引入),从而导 致信号衰减。这可能会导致接收器被误触发。例如,位于系 统末端接收器处地电势的漂移,可能会导致接收器设备输入 它们都具有较慢的边沿速率(0.4 至 0.5 V/ns), 能减少振铃 波并改善信号的完整性。

为了更好的理解并行传输和串行传输的原理,图4给出了两者之间的差别。在一个完全的并行情况下,比如

开关门限的改变,因而使其 更易受到电磁场的影响。此 外,大的电压摆动将会加剧 电磁干扰。

然而,像 GTLP 和 VME 所 具有的新的高级总线接口 逻辑设备,都已阿经经过 了优化,不仅克服了这些 缺点,同时还提供了实现 这些单端设备的简易性。 GTLP 电压摆动相对较小的 特点降低了电磁干扰,并且 具有一个降低了的差分输入 门限,提高了噪声容限。同 样的, VME 也提供一个降 低了的门限输入区以提高噪 声容限,但它却具有全摆输 出,这是因为它是设计运行 在现有的 TTL 背板上的。 GTLP 和 VME 都被设计用 于分布式负载模型中。其性 能专门针对它们将在低阻抗 环境下工作而进行了优化。

图3. 每一个总线解决方案都是一个转换器



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一个典型的电信背板,位于总线上的驱动器将 n-bit 数 据并行的发送到总线上,所有信息在同一时间内通过背 板进行发送。在串行传输的情况下,数据必须先转换为 串行数据流,以便有效的利用所能达到的更高的吞吐 量。这就是所谓的串行化。之后,串行数据在线路中被 高速发送至接收器,然后经过反序列化,信息被还原为 原始的并行数据。SERDES 设备中使用了串行化技术, 该设备具有多个并行输入和一个(或几个)串行输出。

高级总线接口逻辑

长期以来,TTL 总线一直是背板系统的标准解决方案。很多不同的逻辑系列产品都能够满足背板总线的需求,而选择一个适合的逻辑主要取决于总线的物理特性和所需的信号完整性。影响信号完整性的主要因素是连接到总线上的接收和发送模块的数量。背板上更多的板卡之间具有更紧密的空间,这会因为额外的电容负载(驱动器与接收器的输入/输出电容、印制电路板走线电容和连接器电容)而降低总线的阻抗,其结果是需要一个具有更高驱动能力的逻辑设备。



图4. 并行传输 vs. 串行传输

LVDS 设备可用于并行应用中,提供非常高速的点对点传输。 并行传输的优点包括:

- 对于较短的传输距离,具有非常高的数据速率
- 每通道仅需要一条传输线路
- 通常情况下,并行标准没有软件开销,仅需要1个比特作为 信号标志位即可
- 系统的反应时间非常快,这是因为串行码字必须首先被完全 接收并解码
- 在许多工业及电信应用中已经使用了并行背板。(许多设计师和工程师对这类系统非常熟悉,具有快速实现此类系统的知识和经验。)
- 串行传输的优点包括:
- 对于数据速率而言是更加灵活的传输方式,能实现更长的线 缆距离和更低成本
- 如使用 SERDES 设备进行点对点数据传送,将减少所需的信号线和地线的数量
- 使用差分解决方案,每通道的数据速率吞吐量将会更高

图5. 典型的终端模型







成熟的 5-V TTL、5-V CMOS 以及 3.3-V CMOS 技术可提 供 24 mA 的驱动能力,当线路阻抗下降到不超过 50 欧姆 时还能继续工作。随着 BiCMOS 技术的应用,驱动能力 已被扩展到了 32/64 mA (SN74ABTxxx、SN74LVTxxx 和 SN74ALVTxxx),并且通过使用所谓的事件波开关驱动器 (SN74ABT25xxx),更使得以低至 25 欧姆的阻抗来驱动总线 线路成为了可能。

标准逻辑器件要么用于点对点连接,要么用于实现由总线上 许多驱动器和接收器所组成的背板总线。这两种使用标准 逻辑器件的解决方案通常都被设置为并行总线;最多 36 比 特由一个器件进行转换。工作频率可以从几兆赫兹直至 50 MHz 的时钟频率这一范围内进行选择,每个器件的数据吞 吐量都在 1 到 2 Gbps 的范围内。并未规定背板的最大总线 长度;然而在实际当中,并行背板的总线长度应不超过 50 cm。通常情况下,这些器件使用 Thevenin 或 AC 终端,如 图 5 所示。

特点:

- 4-, 8-, 16-, 32-bit 器件, 支持背板/内存总线上的并行操作。
- 在 LVT 和 ABT 中的边界扫描装置 (JTAG IEEE 1149.1)
 使设计和生产更易测量。SCOPETM 产品符合 IEEE Standard 1149.1-1990 (JTAG) 标准中所规定的测试访问端 口和边界扫描架构。
- •数据输入端的总线保持选项免除了对外部上拉电阻的需要。
- 在点到点总线中,26 欧姆串联电阻的选用将在输出阶段 做出判断,使之与总线阻抗相匹配,而避免使用外部电阻 并改善信号的完整性。
- ABT、LVT和 ALVT都支持热插拔,这是因为三态输出能 防止进行插拔时,Vcc向上或向下的倾斜所引起的总线竞争。

这些器件的转换速率约为 1.2 至 1.4 V/ns,这一更高的转换 速率在分布式负载当中引发了信号的完整性问题,正如在背 板中所发现的那样。这使得它们在许多多点应用中的使用 受到了限制,并且要求反射波的转换频率要更低。GTLP 和 VME 器件专门进行了优化,通过将转换速率降低至 0.4 至 0.5 V/ns,以及将这些器件设计用于一个分布式负载中,而不 是数据表中所指定的集中的测试负载下,因而这些器件在分 布式负载中具有了更好的信号完整性。你也许会认为在 GTLP 和 VME 的数据表中 AC 数值并不是很理想,但这只是因为对 它们进行的测试和确认是在典型的集中测试负载下完成的, 而工业范围内却不存在分布式的测试负载。然而,一旦这些 器件工作在背板之中,它们将证明是专门针对这种环境进行 了优化。

增强型收发逻辑

增强型收发逻辑(ETL) 以噪声容限的改善为特征,同时还保持 了对 TTL 开关电平的兼容,实现了 VME 背板中的更高速传 输。通常情况下, Thevenin 终端用于标准化的 64 比特、21 槽 VME64x 背板中,它的一个典型用法如图 6 所示。

VME 总线历史

VME 总线在 1981 年被提出作为工业和商业应用的背板总 线结构。数据传输协议曾定义 VME 总线是从摩托罗拉的 VERSA 总线架构发展而来的,最近推出的摩托罗拉 68000 微 处理器正是继承了 VERSA 总线架构。在被提出时,VME 总 线定义了两种基本的数据传输操作:单周期传输,由一个地 址和一个数据传输所组成,以及块传输 (BLT),由一个地址和 一系列的数据传输所组成。这些传输都是异步的,通过主从 握手的方式实现。主设备会在总线上发送地址及数据,并等 待确认。所选定的从设备从总线上读取或向总线写入数据, 然后提供一个数据确认 (DTACK*) 信号。VME 总线系统的数 据吞吐量为 40 Mbytes/s。在 VME 总线之前,对于背板总线 的接口设计需要经过精确计算以确定负载和驱动电流,这种 情况并不罕见。这种方式使得设计变得困难,并造成了制造 厂商之间的兼容性问题。为了简化接口设计并确保兼容性,

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图6. 用于 ETL VME64x 背板的 Thevenin 终端

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VME 总线的开发者们基于一个 21 槽背板定义了延迟指标, 并授权使用某些大电流 TTL 驱动器、接收器和收发器。

1989 年,复用块传输 (MBLT) 有效的增加了比特数,从 32 增至 64,因而成倍的提高了传输速率,如表 1 所示。1995 年,在双沿传输 (2eVME)协议中,握手的边沿数从 4 个减 少到了 2 个,再次成倍的提高了传输速率。1997 年,VME 总线国际贸易协会 (VITA)设立了一个工作组,定义了一个同 步协议,以提高数据传输速率,使之达到 320 Mbytes/s 或 更高。新规范 VITA 1.5 - 199X,双边源同步传输 (2eSST), 正是基于同步 2eVME 协议而提出的。它无需等待接收器对 数据的确认,但需要入射波切换。由于利用了 2eSST 和 21 槽 VME320 星级配置的背板,使得 1 Gbytes/s 的持续数据 速率成为可能,与传统的、使用单边沿信号的 VME64 背板 相比速率超过其 10 倍以上。VME320 背板近似于一个集中 负载,因而对于 VME64x 分布式负载背板而言将会达到实 质上更高的工作频率。获得关于 VME 总线的更多信息,敬 请访问 www.vita.com。

最大数据传输速率

即将发布的 SN74VMEH22501 器件, 能提供用于提高 2eSST 协议的数据吞吐量所必须的单调入射波切换。 VME320 背板近似于一个集中负载,因而对于 VME 总线和 VME64x 分布式负载背板而言将会达到实质上更高的工作频率。

适用性

VME 背板和 ETL 器件的应用领域包括工业控制、军事、航 空航天、交通、电信、仿真、医疗、高能物理、办公自动化 以及仪表系统。

电气规格

ABTE 5-V V_{cc}器件功能与其他TTL器件相同,只是ETL(背板)端口的噪声容限有所增加,它的V_{IH}和V_{IL}值在 1.5-V 门限值的 ±100mV范围内,ETL输出可提供 –64/+90mA的驱动能力。新的 3.3-V V_{cc}、兼容 5-V 的VME器件,其V_{IH}和V_{IL}值在可变的½-V_{cc}门限值的 ±50 mV 范围内,具有更好的经过

平衡的噪声容限,而 ±48 mA 的 ETL 输出能确保单调的入 射波切换。

VME 协议

最基本的单周期 VME 总线数据传输协议是很简单的。主设备把地址发送到总线上,经过一个最小值为 35 ns 的延时,然后声明地址选通 (AS*)。对于一个写入操作,主设备把数据发送到总线上,经过一个最小值为 35 ns 的延时,然后声明其中一个或全部两个数据选通 (D50* 和/或 DS1*)。总线上的所有从卡都监测这一地址。每一个从卡都设置为只能对一个唯一的地址进行解码。对 AS* 的声明将通知从卡地址是有效的。在一个写周期中,被选定的从卡就从总线上读取数据。对数据选通的声明通知从卡,总线上的数据是有效的,可以被选通至内存中。然后,从卡声明数据确认(DTACK*),发出数据被捕获的信号。

2eVME 协议使用了和基本的单周期协议相同的异步传输协议,但时钟数据通过总线时,在其上升沿和下降沿都将执行数据选通,从而在每一周期中获得了2倍的速度增长。另一方面,2eSST使用了一个同步传输协议,数据时钟使用DS0*来写入,使用 DTACK*来读取。2eSST 提高了时钟速度以加快数据传输,并要求使用背板来确保信号的单调,如VME320 星级背板所提供的信号。

特点:

- 采用 BiCMOS 工艺制造
- •入射波切换需要背板驱动电平的支持
- 卡端的数据位特征,总线保持电路免除了对外部上拉电阻器的需要
- 卡端的数据位特征,26 欧姆的串行输出电阻器能降低信
 号反射

表1. VME 背板发展过程

			每周期	每时钟周期	每个系统	频率 (MHz)
时间	拓扑	协议	数据位数	的数据传输	(MBytes/s)	背板	时钟
1981	VME bus	BLT	32	1	40	10	10
	IEEE-1014						
1989	VME64	MBLT	64	1	80	10	10
1995	VME64x	2eVME	64	2	160	10	20
1997	VME64x	2eSST	64	2-No Ack	160-320	10-20	20-40
1999	VME320	2eSST	64	2-No Ack	320-1000	20-62.5	40-125

- IOFF, PU/D-3-state, BIAS V_{CC} 引脚预加压, 控制引脚上的内部上拉电阻支持现场插入/提取
- SN74ABTExxx具有更宽的噪声容限,背板上的 ETL 逻辑 电平支持 ANSI/VITA 1-1994 规范(VME64) 中对于过渡时间 和倾斜的严格限制
- TI 与 VITA 一道,正在开发 SN74VMEH22501 以支持 2eVME 和 2eSST 协议,并提供更高的数据吞吐量
- 如需获得关于 ABTE 和新的 VME 器件的更多信息, 敬请 访问: www.ti.com/sc/etl

背板收发逻辑 (SN74FBxxx)

BTL 总线实现了一种开放式集电极模式的总线。在这种情况 下,由驱动器产生下降沿。在重负载背板中,只有一个低阻 抗驱动器可以通过入射波对总线进行切换。上升沿是由被动 的上拉网络产生的。在有负载总线线路的阻抗范围内选择上 拉网络的输出阻抗,是针对信号完整性的最佳解决方案。然 而,在这种情况下,可以在一个信号线路中使用较大的低电 平电流。这已经在背板收发逻辑电路中被考虑到了。它们能 够处理高达 100 mA 的电流 (I_{OL}),这相当于 22 欧姆的线路 阻抗。

适用性

BTL 器件的应用领域是电信部门,尤其是强制具备现场插入 能力的场合。

电气规格

5-V V_{CC} FutureBus 器件的物理层称为 BTL,仅使用一个开放 的集电极总线系统时其工作电压摆动为 1.1 V。下拉晶体管的 饱和电压和串联二极管的正向电压共同产生了 1 V 的输出低 电平电压。2.1 V 的高电平是由连接到 2.1 V 终端电压的终端 电阻所产生的。这一终端电阻的阻值如果等于总线线路的阻 抗,则表示总线线路的终止是正确的。对于逻辑电平的安全 检测,输入端被设计为带有差分放大器和一个 1.55 V 的固定 门限值,正好是电压摆动的中间位置。

为了减少 I_{CC} 电流峰值,下降时间被定义为 2 ns 甚至更慢。 上升时间并不是由有源电子器件所确定的,而是由上拉电阻 所确定。

协议

FutureBus+ 的逻辑层规范是根据 IEEE 896.2 规范所制定 的,描述了节点管理、现场插入以及配置文件。然而,物理 层也可以独立于逻辑层单独使用。

特点:

- 降低的电压摆动: VoL = 1 V; VoH = 2.1 V 对 11 欧姆的有效 电阻(或两个并联的 22 欧姆的线路终端电阻)产生较低 的切换噪声
- 线路末端的上拉电阻与负载走线阻抗相匹配,避免发生线 路反射
- 解耦二极管使输出电容降低至 <5 pF, 并增加了线路阻抗
- •最大输出边沿速率为 2 ns; 梯形波型降低了系统噪声
- IOFF、PU3S 和 BIAS Vcc, 支持现场插入/提取

射电收发逻辑 (SN74GTLxxx)

射电收发逻辑 (GTL) 总线的概念与一个 BTL 系统相类似。 由于在开放集电极/漏极输出处取消了二极管(与 BTL 解决 方案相比),因而低电平为 0.4 V。由于高电平被指定为 1.2 V,电压摆动就被减少到只有 0.8 V。同样,门限值被外部 变量输入 VREF 控制引脚设定在 0.8 V 的电压摆动的中间位 置。随着 GTL 大约高达 40 mA 的输出驱动能力,GTL 器件 能够驱动的有效终端电阻值为 0.8 V/40 mA = 20 欧姆。如 果总线线路终止正确,那么在总线中间位置处,能够被一个 GTL 驱动器所驱动的最低阻抗将是 20 欧姆(驱动器视为有 效的阻值: 40 欧姆 || 40 欧姆 = 20 欧姆)。由于 0.8-V 的摆 动和 40-mA 的 I_{OL},因而一个输出的最大功耗为 16 mW。 这样,把这些低功耗的驱动器整合进 ASIC 中就成为了可能。

应用性

GTL 系列产品设计用于板上的小型总线,例如,处理器和内 存模块之间,它的特点是具有更快的边沿速率。由于 GTL 的目标应用并不是背板总线,而是板上的总线,因而在规范 中并没有热插拔或现场插入/提取的要求。GTL1655 是个例 外,它是一个高驱动 (100 mA)、快速边沿器件,支持现场插入。

电气规格

3.3-V V_{cc}、兼容 5-V 的 GTL 器件支持两种不同的逻辑电平规 范:GTL(根据 JEDEC 标准 JESD8-3)和 GTL+ 电平。正 如前面所述,GTL V_{TT}/V_{OH} = 1.2 V,V_{IH}/V_{IL} = \pm 50 mV,变量 V_{REF} 门限值通常被设定为 0.8 V。V_{OL} 是独立于器件、走线和 有效终端电阻的,通常是 0.4 V 或更低。

特点:

- 差分放大器保证了接收器具有稳定的门限电压
- •低电压摆动产生较低的切换噪声并降低电磁干扰
- GTL1655 的高驱动能力使得入射波能够对低至 11 欧姆的 有效电阻或两个并联的 22 欧姆的线路终端电阻进行切换

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图7. 高性能背板转换器



接上页

- 线路末端的上拉电阻与负载走线阻抗相匹配,避免发生线
 路反射
- GTL1655的边沿速率控制选择输入引脚(由 V_{CC} 或 GND 保持)能改变 GTL 转换速率,使边沿速率从快速变为更 加快速,以补偿负载的变化。

射电收发逻辑增强型 (SN74GTLPxxx)

射电收发逻辑增强型 (GTLP) 器件是高速、高性能的背板收 发器,工作原理与 GTL 系列产品基本相同,只有两个主要 的差异:它们针对多槽背板中的分布式负载进行了优化,具 有更慢的边沿速率;它们都支持现场插入应用。GTLP 降低 了输出摆动 (<1 V) 和输入门限电平,而更慢的边沿速率允 许更高的背板频率。GTLP 器件在功能上和覆盖区域上等同 于一般的 ABT、FCT、LVT、ALVT 和 FB+ 器件,但可作为 高数据吞吐量应用中更复杂的串行技术的一种替代方式。 GTLP 16245 型总线收发器如图 7 所示。在背板应用中, GTLP 成功的关键是:

 GTLP 的输出被设计为在背板负载中,而不是典型的集中 负载,具有更慢、更多的受控边沿速率

- •边沿速率受控,减小的电压摆动使电磁干扰降至最低
- 如果 R_{TT} 接近或小于有效的走线阻抗,则任何频率的入射 波切换都能获得保证

如果 V_{TT} 在切换操作中发生波动, 差分 V_{REF} 输入和 R/2R 电 阻分压网络能确保噪声容限不会丢失, 并向设计者提供针对 不寻常的情况下调节切换门限灵活性。通过简单的改变电阻 值就能实现对 V_{REF} 的调节, 使之更高或更低。

GTLP 提供两种不同的驱动, 50 或 100-mA, 使得设计者能 灵活进行器件与背板长度、槽空间和终端电阻的匹配。中等 驱动器件能驱动线路降低至 19 欧姆(能够被位于总线中间位 置处的驱动器所驱动的最低的终端阻值是 38 欧姆——驱动 器的有效负载是 38 欧姆 || 38 欧姆 = 19 欧姆)。高驱动器件 能驱动负载降低至 11 欧姆(总线配置的最小的终端电阻值为 22 欧姆)。重要的是, 要选择一个能够与带负载的背板走线 阻抗相匹配的终端电阻, 以实现最佳的信号完整性/入射波切 换, 但它同时也要在驱动器的能力范围内。高驱动器件能够 以更大的终端电阻值(例如, 75 欧姆)来替代中等驱动器件 而无需担忧, 尽管中等驱动器件的成本较低, 但只有与具体 应用相匹配的驱动, 才能提供最佳的解决方案。

表2. GTLP EVM 规格参数表的测量范围

无	负载(固有)走	线	0.94 ["] 时 20 个空	的走线和 的连接器	0.94 20 个十	+ C₁	
Ζ₀	T _{PD}	C _O	Ζ₀	t _{PD}	Ζ₀	t _{PD}	(pF)
(Ω)	(ps/in)	(pF/in)	(Ω)	(ps/in)	(Ω)	(ps/in)	
47	164	3.49	39	197	21	371	11.6
94	211	2.24	72	274	34	585	12.1

带负载的走线阻抗是关于固有走线阻抗 (Z₀)、插头长度、连接器阻抗、器件阻抗和卡空间的函数。GTLP EVM 的构成与 一个典型的开漏电信背板相类似,看上去就像是双端上拉的 终端走线,如图 8 所示。

当 GTLP 开漏器件关闭时,通过终端电阻 (R_{TT} = 22 欧 姆),总线被拉高至端接电压 (V_{TT} =1.5 V);而当 GTLP 开漏 器件开启时,总线则被拉低。开漏背板的优点是不会发生总 线争用,它实现简单,并且与 Thevenin 终端背板相比具有更 低的功耗。

GTLP EVM 的实际测量范围如表 2 所示。这清楚的表明,在 一个负载较重的背板中,终端电阻应能很轻易的达到低至 21 欧姆的阻值,然而受 GTLP 高驱动的 loL 最大推荐值限制,它 将不得低于 22 欧姆。通过增加固有走线阻抗能够改变终端电 阻值,使之达到高驱动器件的能力范围内,并可实现对中等 驱动器件处理能力的更好的近似。背板飞行时间的下落侧现 在将变慢约 58%。卡电容的典型值在 10 到 18 pF 间,取决 于器件的 Clo 和插头长度(插头长度是最关键的因素,应始 终小于 1 英寸)。 准 JESD8-3)。GTLP 电压摆动范围从 1.5 V到 0.55 V, 围 绕 1.0 V 的 V_{REF} 门限具有 ±50 mV 的变化范围,这与 GTL+ 是一样的,但通常用 GTLP 来表示这些背板优化器件。除了 具有更低的边沿速率,以及器件已被设计成了分布式负载之 外,这一总线系统基本等同于 GTL 总线。

特点

- 3.3-V 工作电压兼容 5-V 的 LVTTL 输入/输出, 允许器件作 为一个 5-V 或 3.3-V "LVTTL 对 GTLP"转换器。
- 对于 GTLP 输出的上升沿和下降沿均有较大提高的输出 边沿控制 (OEC™) 电路,减少了线路反射和电磁干扰 (EMI),并改善了整体信号完整性,允许时钟频率超过 120 MHz。
- 使用系统时钟时,最大数据频率约为 60 MHz,而在源同步时钟模式下,最大数据频率为 135 MHz。
- 通过 I_{OFF}、PU3S 和 BIAS V_{CC} 电路,实现对现场插入的完 全支持。
- 高驱动器件的边沿速率控制 (ERC) 电路可以实现一个缓慢的和一个稍快一点的边沿速率。稍快的边沿速率将降低传播延迟并增加终止背板的最佳频率所可能达到的最大值。

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适用性

行育做中, 主委的 Q 计考虑因素是更高的 数据吞吐量、现场插 入能力、更好的信号 完整性或更低功耗的 场合。

电气规格

GTLP 器件针对 GTLP 信号电平规范进行了 优化,但仍符合 GTL 规范(符合 JEDEC 标



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- CMOS 结构使得静态功耗只有 BiCMOS 逻辑器件的 1/3。
- LVTTL 侧的平衡驱动为 ± 24 mA, 具有可选的总线保持电路。

混合应用

有众多的 TI 器件可供选择,设计工程师们能够解决数据传输 中需要考虑的问题,并且实现性能与成本、可用性和电路板 空间限制之间的平衡。

TI 的 SLL 高级总线接口逻辑能够以合理的成本提供可靠的二级性能,并且有多种不同的封装类型可供选择,如 SOIC、SSOP、TSSOP、TVSOP、VFBGA 和 LFBGA。

图9所示的 TSB14C01 1394 背板物理层 (PHY)和 SN74GTLP1394 是一个最好的例子,用以说明如何将两者以 最佳的方式在一个应用中结合起来。通过一个简单且成本有 效的开漏 GTLP 总线收发器,它们被用于向每块电信卡提供 鲁棒的 1394 链路层控制器信号。1394 背板物理层与 1394 链路层和微处理器相结合,能实现对每块卡的绝对控制,并 能够检测和关闭任何锁死系统的卡,实现安全重启和系统运 行的连续性。许多光学路由器就是以这种实现方案来使用这 些器件的。SN74GTLP1394 提供了发送串行数据信号和以卓 越的信号完整性、以 S100 (50 MHz) 的速度对整个不断扩大 的背板进行滤波的手段。SN74GTLP1394 具有多种功能,它 还被用作 GTLP 时钟驱动器和精确的差分输入/TTL 时钟通过 一个电阻分压网络的 LVTTL 电平转换器。

图9. SN74GTLP1394 背板应用



- 1394 背板串行总线在背板系统中起到了一个支撑的作用, 提供了诊断、系统增强和外围监测的手段。
- 数据传输速率分别为 50 Mbps (S50) 和 100 Mbps (S100), 由 GTLP 以 25- 或 50-MHz 的频率提供支持。
- •边沿速率专门针对高性能多槽并行背板应用进行了优化。
- 与更复杂的 LVDS 解决方案相比,更具成本效益且更易实现
- 与现有的 FB+ 解决方案相比,具有更好的信号完整性和成本效益。

SN74GTLP1394 主要特征包括:

- LVTTL 对 GTLP 双向转换器
- 高 GTLP 驱动 (100 mA)
- TI-OPCTM 过冲保护电路
- BIAS Vcc 支持真正的现场插入
- 3.3-V V_{CC} 兼容 5-V
- 16 引脚 SOIC (D&DR)、TSSOP (PWR) 和TVSOP (DGVR) 封装

产品选择指南

ABT

DevicePinsDescriptionMILPDPOFPSOCSSOPTGFPTSSOPTVSOPNT74ABT12514Quad Bus Biffers with 3-State Outputs
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SN74ABT126 14 Quad Bus Buffers with 3-State Outputs ✓ <
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SN74ABT241 20 Octal Buffers/Drivers with 3-State Outputs ✓
SN74ABT241A 20 Octal Buffers/Drivers with 3-State Outputs ✓
SN54ABT244 20 Octal Buffers and Line Drivers with 3-State Outputs ✓
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SN74ABT545B 20 Octal Bus Transceivers with 3-State Outputs ✓
SN74ABTH245 20 Octal Bus Transceivers with 3-State Outputs ✓
SN74ABT273 20 Octal D-Type Flip-Flops with 3-State Outputs ✓
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SN54AB1574Z0Octal Edge-Inggered D-Type Flip-Flops with 3-State OutputsImage: Constraint outputsSN74AB1574A20Octal Edge-Triggered D-Type Flip-Flops with 3-State OutputsImage: Constraint outputsSN74AB162020Octal Bus Transceivers with 3-State OutputsImage: Constraint outputs
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SN/4AB1646A 24 Uctal Registered Bus Iransceivers with 3-State Uutputs
SN/4AB1651 24 Uctal Bus Iransceivers and Registers with a State Outputs
SN/4AB1652A 24 Uctal Bus Iransceivers and Registers with 3-State Dutputs
SN/4AB165/A 24 Octal Bus Transceivers with Parity Generators/Checkers
and 3-State Outputs
SN54AB1821 24 10-Bit Bus-Interface Flip-Flops with 3-State Outputs
SN74AB1821A 24 10-Bit Bus-Interface Flip-Flops with 3-State Outputs
SN74AB1823 24 9-Bit Bus-Interface Hip-Hops with 3-State Outputs
SN74AB1827 24 10-Bit Buffers/Drivers with 3-State Outputs
SN74AB1833 24 8-Bit to 9-Bit Parity Bus Transceivers
SN74ABT841 24 10-Bit Bus-Interface D-Type Latches with 3-State Outputs
SN74AB1841A 24 10-Bit Bus-Interface D-Type Latches with 3-State Outputs
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SN74AB1853 24 8-Bit to 9-Bit Parity Bus Transceivers V V V V
SN74ABT861 24 10-Bit Transceivers with 3-State Outputs
SN74ABT863 24 9-Bit Bus Transceivers with 3-State Outputs
SN74ABT2240A 20 Octal Buffers and Line/MOS Drivers with Series Damping
Resistors and 3-State Outputs
SN74AB12241 20 Octal Buffers and Line/MOS Drivers with Series Damping
Resistors and 3-State Outputs
SN74ABT2244A 20 Octal Buffers/Line Drivers with Series Damping Resistors
and 3-State Outputs 🗸 🗸 🗸 🗸
SN74ABT2245 20 Octal Transceivers and Line MOS Drivers with Series
Damping Resistors and 3-State Outputs 🗸 🗸 🗸 🗸
SN74ABTR2245 20 Octal Transceivers and Line MOS Drivers with Series
Damping Resistors and 3-State Outputs \checkmark \checkmark \checkmark \checkmark \checkmark

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ABT (接上页)

	No.					Avail	ability			
Device	Pins	Description	MIL	PDIP	QFP	SOIC	SSOP	TQFP	TSSOP	TVSOP
SN74ABT2827	24	10-Bit Buffers/Drivers with Series Damping Resistors								
		and 3-State Outputs		1		1	1		1	
SN74ABT2952A	24	Octal Bus Transceivers and Registers with 3-State Outputs	1	1		1	1		1	
SN74ABT5400A	28	11-Bit Line/Memory Drivers with 3-State Outputs				1				
SN74ABT5401	28	11-Bit Line/Memory Drivers with 3-State Outputs								
SN74ABT5402A	28	12-Bit Line/Memory Drivers with 3-State Outputs								
SN74ABT5403	28	12-Bit Line/Memory Drivers with 3-State Outputs				1				
SN54ABT16240	48	16-Bit Buffers/Drivers with 3-State Outputs	1			•				
SN74ABT16240	18	16-Bit Buffers/Drivers with 3-State Outputs	•				1		1	1
SN74ADT10240A	40	16 Rit Puffere /Drivers with 2 State Outputs	•				•		• (· /
SN74ADT1024TA	40	16 Rit Puffere /Drivers with 2 State Outputs	v				· /		× /	· /
SN74ADT10244A	40	16 Pit Puffere / Drivers with 2 State Outputs					v (V (v (
	40	10-Dit Duriers/Drivers with 2 State Outputs	•				× ,		×	· ·
SIN/4ABT 16245A	48	10-Bit Bus Transceivers with 3-State Outputs					<i>√</i>		<i>√</i>	<i>✓</i>
SIN/4AB1H16245	48	16-Bit Bus Transceivers with 3-State Outputs	~				~		~	~
SN/4AB1H16260	56	12-Bit to 24-Bit Multiplexed D-Type Latches with								
		3-State Outputs	~				~			
SN74ABT16373A	48	16-Bit Transparent D-Type Latches with 3-State Outputs	1				1		✓	1
SN74ABT16374A	48	16-Bit Edge-Triggered D-Type Flip-Flops with 3-State								
		Outputs	✓				✓		✓	✓
SN74ABTH16460	56	4-to-1 Multiplexed/Demultiplexed Transceivers with								
		3-State Outputs					1		1	
SN74ABT16470	56	16-Bit Registered Transceivers with 3-State Outputs					1		1	
SN74ABT16500B	56	18-Bit Universal Bus Transceivers with 3-State Outputs					1		1	
SN74ABT16501	56	18-Bit Universal Bus Transceivers with 3-State Outputs					1		1	
SN74ABT16540A	48	16-Bit Buffers/Drivers with 3-State Outputs					1		1	1
SN74ABT16541A	48	16-Bit Buffers/Drivers with 3-State Outputs					1		1	1
SN74ABT16543	56	16-Bit Registered Transceivers with 3-State Outputs	1						· /	1
SN74ABTH16543	56	16-Bit Begistered Transceivers with 3-State Outputs	-				1			1
SN74ABT16600	56	18-Bit Universal Bus Transceivers with 3-State Outputs								•
SN74ABT16601	56	18-Bit Universal Bus Transceivers with 3-State Outputs	1				1			
SN7/ABT16623	//8	16-Bit Bus Transceivers with 3-State Outputs	•				•		•	
SN74AD110023	18	16-Bit Bus Transceivers with 3-State Outputs	1				· /		· /	
SN74ADT10040	56	16-Bit Bus Transceivers and Begisters with 3-State Outputs	•				v /		v (
SN74AD110040	56	16 Bit Bus Transceivers and Registers with 2 State Outputs	•				· /		v	
SN74ADT10032	50	16 Pit Transpeivers with Parity Congretere /Checkers and	V				V			
SIN/4AD11003/	00	2 State Outpute					,			,
	50	3-State Outputs					~		<i>.</i>	✓
SIN74AB116821	50	20-Bit D-Type Flip-Flops with 3-State Outputs					<i>√</i>		<i>√</i>	,
SN/4AB116823	50	18-Bit D-Type Flip-Flops with 3-State Outputs	~				1		1	~
SN/4ABTH16823	56	18-Bit D-Type Flip-Flops with 3-State Outputs					1		~	
SN/4AB116825	56	18-Bit Buffers/Drivers with 3-State Outputs					<i>✓</i>			_
SN74AB116833	56	Dual 8-Bit to 9-Bit Parity Bus Transceivers	_						 ✓ 	 ✓
SN74AB116841	56	20-Bit Bus-Interface D-Type Latches with 3-State Outputs	1				~			
SN74AB116843	56	18-Bit Bus-Interface D-Type Latches with 3-State Outputs					~		<i>√</i>	
SN74ABT16853	56	Dual 8-Bit to 9-Bit Parity Bus Transceivers					~		<i>√</i>	
SN74ABT16863	56	18-Bit Bus-Interface Transceivers with 3-State Outputs					<i>√</i>			
SN74ABT16952	56	16-Bit Registered Transceivers with 3-State Outputs	1				1		1	1
SN74ABTH25245	24	25-Ohm Octal Bus Transceivers with 3-State Outputs		1		1				
SN74ABTH32245	100	32-Bit Bus Transceivers with 3-State Outputs						1		
SN74ABTH32316	80	16-Bit Tri-Port Universal Bus Exchangers	✓		✓					
SN74ABTH32318	80	18-Bit Tri-Port Universal Bus Exchangers			✓					
SN74ABTH32501	100	32-Bit Universal Bus Transceivers with 3-State Outputs						1		
SN74ABTH32543	100	32-Bit Registered Bus Transceivers with 3-State Outputs						1		
SN74ABT162244	48	16-Bit Buffers/Drivers with Series Damping Resistors and								
		3-State Outputs	✓				1		✓	1
SN74ABT162245	48	16-Bit Bus Transceivers with Series Damping Resistors and								
		3-State Outputs	1				1		1	1
SN74ABTH162245	48	16-Bit Bus Transceivers with Series Damping Resistors								
		and 3-State Outputs					1		1	1
SN74ABTH162260	56	12-Bit to 24-Bit Multiplexed D-Type Latches with Series								
		Damping Resistors and 3-State Outputs					1			

ABT (接上页)

	No.		Availability							
Device	Pins	Description	MIL	PDIP	QFP	SOIC	SSOP	TQFP	TSSOP	TVSOP
SN74ABTH162460	56	4-to-1 Multiplexed/Demultiplexed Registered Transceivers								
		with 3-State Outputs					1		1	1
SN74ABT162500	56	18-Bit Universal Bus Transceivers with 3-State Outputs					✓			
SN74ABT162501	56	18-Bit Universal Bus Transceivers with 3-State Outputs					✓		✓	
SN74ABT162601	56	18-Bit Universal Bus Transceivers with 3-State Outputs	1				✓		✓	
SN74ABT162823A	56	18-Bit Bus-Interface Flip-Flops with 3-State Outputs					✓		✓	
SN74ABT162825	56	18-Bit Buffers/Drivers with Series Damping Resistors								
		and 3-State Outputs					1			
SN74ABT162827A	56	20-Bit Buffers/Drivers with Series Damping Resistors								
		and 3-State Outputs					1		1	1
SN74ABT162841	56	20-Bit Bus-Interface D-Type Latches with 3-State Outputs					1		1	

ABTE/ETL (接上页)

	No.			Availability	
Device	Pins	Description	MIL	SSOP	TSSOP
SN74ABTE16245	48	16-Bit Incident-Wave-Switching Bus Transceivers with 3-State Outputs	✓	 ✓ 	1
SN74ABTE16246	48	11-Bit Incident-Wave-Switching Bus Transceivers with 3-State and Open-Collector Outputs		1	1

ALVT (接上页)

	No.		Availability				
Device	Pins	Description	LFBGA	SSOP	TSSOP	TVSOP	
SN74ALVTH16240	48	16-Bit Buffers/Drivers with 3-State Outputs		1	1	1	
SN74ALVTH16244	48	16-Bit Buffers/Drivers with 3-State Outputs		1	1	1	
SN74ALVTH16245	48	16-Bit Bus Transceivers with 3-State Outputs		+	+	+	
SN74ALVTHR16245	48	16-Bit Bus Transceivers with I/O Series Damping Resistors and 3-State Outputs		+	+	+	
SN74ALVTH16260	56	12-Bit to 24-Bit Multiplexed D-Type Latches with 3-State Outputs		+	+	+	
SN74ALVTH16373	48	16-Bit Transparent D-Type Latches with 3-State Outputs		1	1	1	
SN74ALVTH16374	48	16-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs		1	1	1	
SN74ALVTH16500	56	18-Bit Universal Bus Transceivers with 3-State Outputs		+	+	+	
SN74ALVTH16501	56	18-Bit Universal Bus Transceivers with 3-State Outputs		+	+	+	
SN74ALVTH16543	56	16-Bit Registered Transceivers with 3-State Outputs		+	+	+	
SN74ALVTH16601	56	18-Bit Universal Bus Transceivers with 3-State Outputs		1	1	1	
SN74ALVTH16646	56	16-Bit Bus Transceivers and Registers with 3-State Outputs		+	+	+	
SN74ALVTH16652	56	16-Bit Bus Transceivers and Registers with 3-State Outputs		+	+	+	
SN74ALVTH16721	56	20-Bit D-Type Flip-Flops with 3-State Outputs		+	+	+	
SN74ALVTH16821	56	20-Bit D-Type Flip-Flops with 3-State Outputs		1	1	1	
SN74ALVTH16827	56	20-Bit Buffers/Drivers with 3-State Outputs		1	1	1	
SN74ALVTH16841	56	20-Bit Bus Interface D-Type Latches with 3-State Outputs		+	+	+	
SN74ALVTH32244	96	32-Bit Buffers/Drivers with 3-State Outputs	 Image: A second s				
SN74ALVTH32373	96	32-Bit Transparent D-Type Latches with 3-State Outputs	 Image: A second s				
SN74ALVTH32374	96	32-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs	 Image: A second s				
SN74ALVTH162244	48	16-Bit Buffers/Drivers with Series Damping Resistors and 3-State Outputs		1	1	1	
SN74ALVTH162245	48	16-Bit Bus Transceivers with Series Damping Resistors and 3-State Outputs		+	+	+	
SN74ALVTH162827	56	20-Bit Buffers/Drivers with Series Damping Resistors and 3-State Outputs		1	1	1	

FB+/BTL (接上页)

	No.		Availability		
Device	Pins	Description	MIL	QFP	TQFP
SN74FB1650	100	18-Bit TTL/BTL Universal Storage Transceivers			1
SN74FB1651	100	17-Bit TTL/BTL Universal Storage Transceivers with Buffered Clock Lines			1
SN74FB1653	100	17-Bit LVTTL/BTL Universal Storage Transceivers with Buffered Clock Lines			1
SN74FB2031	52	9-Bit TTL/BTL Address/Data Transceivers	1	1	
SN74FB2032	52	9-Bit TTL/BTL Competition Transceivers		1	
SN74FB2033A	52	8-Bit TTL/BTL Registered Transceivers	1	1	
SN74FB2033K	52	8-Bit TTL/BTL Registered Transceivers		1	
SN74FB2040	52	8-Bit TTL/BTL Transceivers	1	1	
SN74FB2041A	52	7-Bit TTL/BTL Transceivers		1	

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	No.		Availability				
Device	Pins	Description	MIL	PDIP	SOIC	SSOP	TSSOP
CY29FCT52CT	24	Octal Registered Transceivers with 3-State Outputs			1	1	
CY74FCT138AT	16	1-of-8 Decoders			1	1	
CY74FCT138CT	16	1-of-8 Decoders	1		1	✓	
CY74FCT138T	16	1-of-8 Decoders				✓	
CY74FCT157AT	16	Quad 2-Input Multiplexers			1	1	
CY74FCT157CT	16	Quad 2-Input Multiplexers			1	1	
CY74FCT163CT	16	Synchronous 4-Bit Binary Counters			1	✓	
CY74FCT163T	16	Synchronous 4-Bit Binary Counters	1				
CY74FCT191AT	16	Presettable Synchronous 4-Bit Up/Down Binary Counters			1		
CY74FCT191CT	16	Presettable Synchronous 4-Bit Up/Down Binary Counters			1	1	
CD74FCT240	20	Octal Buffers/Drivers with 3-State Outputs		1	1		
CY74FCT240AT	20	Octal Buffers/Drivers with 3-State Outputs	1		1	✓	
CY74FCT240CT	20	Octal Buffers/Drivers with 3-State Outputs			1	1	
CY74FCT240T	20	Octal Buffers/Drivers with 3-State Outputs			1	1	
CD74FCT244	20	Octal Buffers and Line Drivers with 3-State Outputs		1	1		
CD74FCT244AT	20	Octal Buffers and Line Drivers with 3-State Outputs		1			
CY74FCT244AT	20	Octal Buffers and Line Drivers with 3-State Outputs	1	1	1		
CY74FCT244CT	20	Octal Buffers and Line Drivers with 3-State Outputs	1		1	1	
CY74FCT244DT	20	Octal Buffers and Line Drivers with 3-State Outputs			1	1	
CY74FCT244T	20	Octal Buffers and Line Drivers with 3-State Outputs	1		1	1	
CD74FCT245	20	Octal Bus Transceivers with 3-State Outputs		1	1		
CY74FCT245AT	20	Octal Bus Transceivers with 3-State Outputs	1	1	1	1	
CY74FCT245CT	20	Octal Bus Transceivers with 3-State Outputs	1		1	1	
CY74FCT245DT	20	Octal Bus Transceivers with 3-State Outputs				1	
CY74FCT245T	20	Octal Bus Transceivers with 3-State Outputs	1		1	1	
CY74FCT257AT	16	Quad 1-of-2 Data Selectors/Multiplexers with 3-State Outputs				1	
CY74FCT257CT	16	Quad 1-of-2 Data Selectors/Multiplexers with 3-State Outputs			1	1	
CY74FCT257T	16	Quad 1-of-2 Data Selectors/Multiplexers with 3-State Outputs				1	
CD74FCT273	20	Octal D-Type Flip-Flops with Clear		1	1		
CY74FCT273AT	20	Octal D-Type Flip-Flops with Clear	1		1	1	
CY74FCT273CT	20	Octal D-Type Flip-Flops with Clear			1	1	
CY74FCT273T	20	Octal D-Type Flip-Flops with Clear			1	1	
CD74FCT373	20	Octal Transparent D-Type Latches with 3-State Outputs		1	1		
CY74FCT373AT	20	Octal Transparent D-Type Latches with 3-State Outputs	1		1	1	
CY74FCT373CT	20	Octal Transparent D-Type Latches with 3-State Outputs			1	1	
CY74FCT373T	20	Octal Transparent D-Type Latches with 3-State Outputs			1		
CD74FCT374	20	Octal Transparent D-Type Latches with 3-State Outputs		1	1		
CY74FCT374AT	20	Octal Transparent D-Type Latches with 3-State Outputs	1	1	1	1	
CY74FCT374CT	20	Octal Transparent D-Type Latches with 3-State Outputs	1		1	1	
CY74FCT374T	20	Octal Transparent D-Type Latches with 3-State Outputs	 Image: A second s		1	1	
CY74FCT377AT	20	Octal D-Type Flip-Flops with Enable			1	1	
CY74FCT377CT	20	Octal D-Type Flip-Flops with Enable	1		1	1	
CY74FCT377T	20	Octal D-Type Flip-Flops with Enable				1	
CY74FCT399AT	16	Quad 2-Input Multiplexers with Storage			1		
CY74FCT399CT	16	Quad 2-Input Multiplexers with Storage			1		
CY74FCT480AT	24	Dual 8-Bit Parity Generators/Checkers		✓		1	
CY74FCT480BT	24	Dual 8-Bit Parity Generators/Checkers	1	✓	1	1	
CY29FCT520AT	24	8-Bit Multi-Level Pipeline Registers		1	1		
CY29FCT520BT	24	8-Bit Multi-Level Pipeline Registers			1		
CY29FCT520CT	24	8-Bit Multi-Level Pipeline Registers			1		
CD74FCT540	20	Inverting Octal Buffers and Line Drivers with 3-State Outputs		1	1		
CY74FCT540CT	20	Inverting Octal Buffers and Line Drivers with 3-State Outputs				1	
CD74FCT541	20	Octal Buffers and Line Drivers with 3-State Outputs		1	1		
CY74FCT541AT	20	Octal Buffers and Line Drivers with 3-State Outputs		1	1	1	
CY74FCT541CT	20	Octal Buffers and Line Drivers with 3-State Outputs			1	1	
CY74FCT541T	20	Octal Buffers and Line Drivers with 3-State Outputs			1		
CD74FCT543	24	Octal Registered Transceivers with 3-State Outputs		1	1		
CY74FCT543AT	24	Octal Registered Transceivers with 3-State Outputs			1	1	
CY74FCT543CT	24	Octal Registered Transceivers with 3-State Outputs			1	1	

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CY74FCT2374AT

CY74FCT2374CT

CY74FCT2374T

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	No.		Availability				
Device	Pins	Description	MIL	PDIP	SOIC	SSOP	TSSOP
CY74FCT543T	24	Octal Registered Transceivers with 3-State Outputs	1		1	1	
CD74FCT564	20	Octal Inverting D-Type Flip-Flops with 3-State Outputs		1	1		
CD74FCT573	20	Octal Transparent D-Type Latches with 3-State Outputs		1	1	1	
CD74FCT573AT	20	Octal Transparent D-Type Latches with 3-State Outputs		1			
CY74FCT573AT	20	Octal Transparent D-Type Latches with 3-State Outputs		1	1	1	
CY74FCT573CT	20	Octal Transparent D-Type Latches with 3-State Outputs			1	1	
CY74FCT573T	20	Octal Transparent D-Type Latches with 3-State Outputs			1	1	
CD74FCT574	20	Octal Edge-Triggered D-Type Flip-Flops with 3-State Outputs		1	1		
CY74FCT574AT	20	Octal Edge-Triggered D-Type Flip-Flops with 3-State Outputs	1		1	1	
CY74FCT574CT	20	Octal Edge-Triggered D-Type Flip-Flops with 3-State Outputs			1	1	
CY74FCT574T	20	Octal Edge-Triggered D-Type Flip-Flops with 3-State Outputs			1	1	
CD74FCT623	20	Octal Bus Transceivers with 3-State Outputs			1		
CY74FCT646AT	24	Octal Benistered Bus Transceivers with 3-State Outputs				1	
CY74FCT646CT	24	Octal Registered Bus Transceivers with 3-State Outputs	1		1	1	
CY74FCT646T	24	Octal Registered Bus Transceivers with 3-State Outputs	•				
	24	Octal Rus Transcaivers and Begisters with 3-State Outputs					
	24	Octal Bus Transceivers and Registers with 3 State Outputs			· ·	•	
CV7/FCT652T	24	Octal Bus Transceivers and Registers with 3-State Outputs			v	•	
	24	Diagnostic Scan Registers	1			v	
	24	Diagnostic Scan Registers	~	,	/	/	
	24	10 Rit Rus Interface Flip Flope with 2 State Outputs				~	
	24	10-Dit Dus-Interface Flip-Flops with 3-State Outputs		~	×	,	
UY74FU18ZTAT	24	10-Bit Bus-Interface Flip-Flops with 3-State Outputs			1	~	
CY74FC1821B1	24	10-Bit Bus-Interface Flip-Flops with 3-State Outputs		~	<i>√</i>		
CY/4FC1821C1	24	10-Bit Bus-Interface Flip-Flops with 3-State Outputs			✓	~	
CD74FC1822A	24	9-Bit Bus-Interface Flip-Flops with 3-State Outputs		1			
CD74FCT823A	24	9-Bit Bus-Interface Flip-Flops with 3-State Outputs		1			
CY74FCT823AT	24	9-Bit Bus-Interface Flip-Flops with 3-State Outputs		✓	~	1	
CY74FCT823BT	24	9-Bit Bus-Interface Flip-Flops with 3-State Outputs		1			
CY74FCT823CT	24	9-Bit Bus-Interface Flip-Flops with 3-State Outputs			1	1	
CD74FCT824A	24	9-Bit Bus-Interface Flip-Flops with 3-State Outputs		1			
CY74FCT825CT	24	8-Bit Bus-Interface Flip-Flops with 3-State Outputs				1	
CY74FCT827AT	24	10-Bit Buffers/Drivers with 3-State Outputs			1	1	
CY74FCT827CT	24	10-Bit Buffers/Drivers with 3-State Outputs			1	1	
CD74FCT841A	24	10-Bit Bus-Interface D-Type Latches with 3-State Outputs		1	1		
CY74FCT841AT	24	10-Bit Bus-Interface D-Type Latches with 3-State Outputs	1		1		
CY74FCT841BT	24	10-Bit Bus-Interface D-Type Latches with 3-State Outputs		1			
CY74FCT841CT	24	10-Bit Bus-Interface D-Type Latches with 3-State Outputs			1	1	
CD74FCT842A	24	10-Bit Bus-Interface D-Type Latches with 3-State Outputs			1		
CD74FCT843A	24	9-Bit Bus-Interface D-Type Latches with 3-State Outputs			1		
CD74FCT844A	24	9-Bit Transparent Latches with 3-State Outputs		1			
CY74FCT2240AT	20	Octal Buffers/Line Drivers with Series Damping Resistors and 3-State Outputs				1	
CY74FCT2240CT	20	Octal Buffers/Line Drivers with Series Damping Resistors and 3-State Outputs			1	1	
CY74FCT2240T	20	Octal Buffers/Line Drivers with Series Damping Resistors and 3-State Outputs			1		
СҮ74ЕСТ2244АТ	20	Octal Buffers/Line Drivers with Series Damping Resistors and 3-State Outputs			1	1	
CY74FCT2244CT	20	Octal Buffers/Line Drivers with Series Damping Resistors and 3-State Outputs			1	1	
CY74FCT224401	20	Octal Buffers/Line Drivers with Series Damping Resistors and 3-State Outputs				1	
CY7/FCT22/5/T	20	Actal Bus Transcolvers with Series Damping Resistors and 2-State Outputs			·	4	
	20	Octal Bus Transceivers with Series Damping Resistors and 2-State Outputs					
	20	Octal Bus transceivers with Series Damping Resistors and 2 State Outputs			· ·		
	20	Quad 1 of 2 Data Salasters (Multiplayers with Caries Deriving Desistors and 3-state Outputs			~	~	
01/4F01225/AI	ĺb	Qual 1-01-2 Data Selectors/iviuitiplexers with Series Damping Resistors and					
	10	3-State Outputs				/	
UY/4FU1225/UT	16	Quad 1-of-2 Data Selectors/iviultiplexers with Series Damping Resistors and					
0)/74507007047		3-State Outputs					
CY/4FC12373AI	20	Uctal Transparent D-Type Latches with Series Damping Resistors and 3-State Outputs					
CY74FC12373CT	20	Uctal Iransparent D-Iype Latches with Series Damping Resistors and 3-State Outputs			1	1	
CY74FCT2373T	20	Uctal Iransparent D-Type Latches with Series Damping Resistors and 3-State Outputs				1	

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Octal Transparent D-Type Latches with Series Damping Resistors and 3-State Outputs

Octal Transparent D-Type Latches with Series Damping Resistors and 3-State Outputs

Octal Transparent D-Type Latches with Series Damping Resistors and 3-State Outputs

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FCT (接上页)

Device Pins Description MIL PUP SLOP TSSOP CVFAID:TSMICT 20 Ortal Line Drivers/MDS Dreves with 3-State Outputs		No.		Availability				
CYAPTCISAIT 20 Oracl Line Divers/MDS Divers with 3-State Duptas ////////////////////////////////////	Device	Pins	Description	MIL	PDIP	SOIC	SSOP	TSSOP
CYMPCTPSH1CT 200 Cotal Line Diver-MXOS Diverse with 3 State Durputs ////////////////////////////////////	CY74FCT2541AT	20	Octal Line Drivers/MOS Drivers with 3-State Outputs			1	1	
CV74CT25ATT 20 Cotal Inc Divers/MOS Diverse with Series Damping Resistors and 3-State Dutyts ////////////////////////////////////	CY74FCT2541CT	20	Octal Line Drivers/MOS Drivers with 3-State Outputs			1	1	
CVMECTSMAT P1 Contal Registered Transcovers with Series Damping Resistors and 3-State Outputs Image: CVMECTSMAT Image: CVMECTSMAT <thimage: cvmectsmat<="" th=""></thimage:>	CY74FCT2541T	20	Octal Line Drivers/MOS Drivers with 3-State Outputs			1	1	
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CYMPETERSMT 24 Decal Registered Transcrivers with Series Damping Resistors and 3-State Outputs ////////////////////////////////////	CY74FCT2543CT	24	Octal Registered Transceivers with Series Damping Resistors and 3-State Outputs				1	
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Drive David	CV74ECT2572T	20	Octal Transparent D Type Latches with Series Damping Resistors and 2 State Outputs			•	v	
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CY74FCT16245T4816-Bit Transparent D-Type Latches with 3-State Outputs++CY74FCT16373CT4816-Bit Transparent D-Type Latches with 3-State Outputs++CY74FCT16373CT4816-Bit Transparent D-Type Latches with 3-State Outputs++CY74FCT16374CT4816-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs++CY74FCT16374CT4816-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs++CY74FCT16374CT4816-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs++CY74FCT16374T4816-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs++CY74FCT16501AT5618-Bit Universal Bus Transceivers with 3-State Outputs++CY74FCT16501AT5618-Bit Universal Bus Transceivers with 3-State Outputs++CY74FCT16501AT5618-Bit Universal Bus Transceivers with 3-State Outputs++CY74FCT16504AT5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16504AT5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16543T5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16544T5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT1654AT5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT1654AT5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT1654AT<	CY74FCT16245ET	48	16-Bit Bus Transceivers with 3-State Outputs				+	+
CY74FCT16373CT4816-Bit Transparent D-Type Latches with 3-State Outputs++CY74FCT16373CT4816-Bit Transparent D-Type Latches with 3-State Outputs++CY74FCT16373CT4816-Bit Transparent D-Type Latches with 3-State Outputs++CY74FCT16374T4816-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs++CY74FCT16374T4816-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs++CY74FCT16374T4816-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs++CY74FCT16504T5618-Bit Universal Bus Transceivers with 3-State Outputs++CY74FCT16504T5618-Bit Universal Bus Transceivers with 3-State Outputs++CY74FCT16504T5618-Bit Universal Bus Transceivers with 3-State Outputs++CY74FCT16543T5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16543T5616-Bit Rus Transceivers and Registers with 3-State Outputs++CY74FCT16543T5616-Bit Rus Transceivers and Registers with 3-State Outputs++CY74FCT16646T <td>CY74FCT16245T</td> <td>48</td> <td>16-Bit Bus Transceivers with 3-State Outputs</td> <td></td> <td></td> <td></td> <td>+</td> <td>+</td>	CY74FCT16245T	48	16-Bit Bus Transceivers with 3-State Outputs				+	+
CY74FCT18373CT4816-Bit Transparent D-Type Latches with 3-State Outputs++CY74FCT18374AT4816-Bit Transparent D-Type Latches with 3-State Outputs++CY74FCT18374AT4816-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs++CY74FCT18374AT4816-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs++CY74FCT18374T4816-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs++CY74FCT18374T4816-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs++CY74FCT16500CT5618-Bit Universal Bus Transceivers with 3-State Outputs++CY74FCT16501AT5618-Bit Universal Bus Transceivers with 3-State Outputs++CY74FCT16543AT5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16543CT5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16543AT5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16543CT5616-Bit Bus Transceivers and Registers with 3-State Outputs++CY74FCT1664AT5616-Bit Bus Transceivers and Registers with 3-State Outputs++CY7	CY74FCT16373AT	48	16-Bit Transparent D-Type Latches with 3-State Outputs				+	+
CY74FCT16373ET4816-Bit Transparent D-Type Latches with 3-State Outputs++CY74FCT16374AT4816-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs++CY74FCT16374AT4816-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs++CY74FCT16374T4816-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs++CY74FCT16501AT5618-Bit Universal Bus Transceivers with 3-State Outputs++CY74FCT16543AT5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16543AT5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16543T5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16543T5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16543T5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16646T5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16646T5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16646T5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16646T56 <td>CY74FCT16373CT</td> <td>48</td> <td>16-Bit Transparent D-Type Latches with 3-State Outputs</td> <td></td> <td></td> <td></td> <td>+</td> <td>+</td>	CY74FCT16373CT	48	16-Bit Transparent D-Type Latches with 3-State Outputs				+	+
CY74FCT16374AT4816-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs++CY74FCT16374T4816-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs++CY74FCT16374T4816-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs++CY74FCT1650T5618-Bit Universal Bus Transceivers with 3-State Outputs++CY74FCT1650T5618-Bit Universal Bus Transceivers with 3-State Outputs++CY74FCT1650T5618-Bit Universal Bus Transceivers with 3-State Outputs++CY74FCT1650T5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16543AT5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16543AT5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16543AT5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16543T5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16646AT5616-Bit Bus Transceivers and Registers with 3-State Outputs++CY	CY74FCT16373ET	48	16-Bit Transparent D-Type Latches with 3-State Outputs				+	+
CY74FCT16374CT4816-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs++CY74FCT16374CT4816-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs++CY74FCT16501AT5618-Bit Universal Bus Transceivers with 3-State Outputs++CY74FCT16543AT5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16543AT5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16543CT5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT1664AT5616-Bit Bus Transceivers with 3-State Outputs++CY74FCT1664AT5616-Bit Bus Transceivers and Registers with 3-State Outputs++CY74FCT1664AT5616-Bit Bus Transceivers and Registers with 3-State Outputs++CY74FCT1664AT5616-Bit Bus Transceivers and Registers with 3-State Outputs++CY74FCT16652AT5616-Bit Bus Transceivers and Registers with 3-State Outputs++CY74FCT16652AT5616-Bit Bus Transceivers and Registers with 3-State Outputs++CY74FCT16652AT5616-Bit Bus Transceivers and Registers with 3-State Outputs++C	CY74FCT16374AT	48	16-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs				+	+
CY74FCT16374T4816-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs++CY74FCT16500T5618-Bit Universal Bus Transceivers with 3-State Outputs++CY74FCT16501AT5618-Bit Universal Bus Transceivers with 3-State Outputs++CY74FCT16501ET5618-Bit Universal Bus Transceivers with 3-State Outputs++CY74FCT16501ET5618-Bit Universal Bus Transceivers with 3-State Outputs++CY74FCT16543AT5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16543AT5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16543AT5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16643AT5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16644AT5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16646AT5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16646AT5616-Bit Bus Transceivers and Registers with 3-State Outputs++CY74FCT16642AT5616-Bit Bus Transceivers and Registers with 3-State Outputs++CY74FCT1	CY74FCT16374CT	48	16-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs				+	+
CY74FCT16374T4816-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs+CY74FCT16500CT5618-Bit Universal Bus Transceivers with 3-State Outputs++CY74FCT16501AT5618-Bit Universal Bus Transceivers with 3-State Outputs++CY74FCT16501AT5618-Bit Universal Bus Transceivers with 3-State Outputs++CY74FCT16543AT5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16543AT5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16543AT5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT1664AT5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT1664AT5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT1664AT5616-Bit Bus Transceivers and Registers with 3-State Outputs++CY74FCT1664AET5616-Bit Bus Transceivers and Registers with 3-State Outputs++CY74FCT16646ET5616-Bit Bus Transceivers and Registers with 3-State Outputs++CY74FCT16646ET5616-Bit Bus Transceivers and Registers with 3-State Outputs++CY74FCT16646ET5616-Bit Bus Transceivers and Registers with 3-State Outputs++CY74FCT16642AT5616-Bit Bus Transceivers and Registers with 3-State Outputs++CY74FCT16652AT5616-Bit Bus Transceivers and Registers with 3-State Outputs++CY74FCT16	CY74FCT16374ET	48	16-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs				+	+
CY74FCT16500CT5618-Bit Universal Bus Transceivers with 3-State Outputs++CY74FCT16501AT5618-Bit Universal Bus Transceivers with 3-State Outputs++CY74FCT16501ET5618-Bit Universal Bus Transceivers with 3-State Outputs++CY74FCT16543AT5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16543ET5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16543ET5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16543T5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16543T5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16646AT5616-Bit Bus Transceivers and Registers with 3-State Outputs++CY74FCT16646AT5616-Bit Bus Transceivers and Registers with 3-State Outputs++CY74FCT16646ET5616-Bit Bus Transceivers and Registers with 3-State Outputs++CY74FCT16642AT5616-Bit Bus Transceivers and Registers with 3-State Outputs++CY74FCT16642T5616-Bit Bus Transceivers and Registers with 3-State Outputs++	CY74FCT16374T	48	16-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs				+	
CY74FCT16501AT5618-Bit Universal Bus Transceivers with 3-State Outputs+CY74FCT16501ET5618-Bit Universal Bus Transceivers with 3-State Outputs++CY74FCT16543AT5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16543ET5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16543ET5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16543ET5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT1664AET5616-Bit Bus Transceivers and Registers with 3-State Outputs++CY74FCT16646ET5616-Bit Bus Transceivers and Registers with 3-State Outputs++CY74FCT16652AT5616-Bit Bus Transceivers and Registers with 3-State Outputs++	CY74FCT16500CT	56	18-Bit Universal Bus Transceivers with 3-State Outputs				+	+
CY74FCT16501ET CY74FCT16543AT5618-Bit Universal Bus Transceivers with 3-State Outputs++CY74FCT16543AT CY74FCT16543AT5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16543CT CY74FCT16543T5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16543T CY74FCT16646AT CY74FCT16646AT5616-Bit Registered Transceivers with 3-State Outputs++CY74FCT16646AT CY74FCT16646AT 	CY74FCT16501AT	56	18-Bit Universal Bus Transceivers with 3-State Outputs				+	
CY74FCT16543AT5616-Bit Registered Transceivers with 3-State Outputs+CY74FCT16543CT5616-Bit Registered Transceivers with 3-State Outputs+CY74FCT16543ET5616-Bit Registered Transceivers with 3-State Outputs+CY74FCT16543T5616-Bit Registered Transceivers with 3-State Outputs+CY74FCT16646AT5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16646ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16646T5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652AT5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652AT5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652AT5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652T5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652ET5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16823AT5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16822T5618-Bit D-Type	CY74FCT16501ET	56	18-Bit Universal Bus Transceivers with 3-State Outputs				+	+
CY74FCT16543CT5616-Bit Registered Transceivers with 3-State Outputs+CY74FCT16543ET5616-Bit Registered Transceivers with 3-State Outputs+CY74FCT16543T5616-Bit Registered Transceivers and Registers with 3-State Outputs+CY74FCT16646AT5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16646ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16646ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16646ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652AT5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652CT5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16822AT5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16822T5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16822T5618-Bit Buffers/Drivers with 3-State Outputs+CY74FCT18822T5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT1882ZT5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT1882ZT5620-Bit Buffers/Drivers with 3-State Ou	CY74FCT16543AT	56	16-Bit Registered Transceivers with 3-State Outputs					+
CY74FCT16543ET5616-Bit Registered Transceivers with 3-State Outputs+CY74FCT16543T5616-Bit Registered Transceivers with 3-State Outputs+CY74FCT16646AT5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16646AT5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16646ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16646ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16646T5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652AT5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16823AT5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16823CT5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16823CT5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT18823TT5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT18827AT5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT18827AT5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT18827ET5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT18827ET5620-Bit Buffers/Drivers with 3-State Outputs+	CY74FCT16543CT	56	16-Bit Registered Transceivers with 3-State Outputs				+	
CY74FCT16543T5616-Bit Registered Transceivers with 3-State Outputs+CY74FCT16646AT5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16646AT5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16646ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16646ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16646T5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652AT5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652CT5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16622ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16823AT5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16823CT5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16823ET5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT18827AT5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT18827ET5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT18827ET5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT18827ET5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT18827ET5620-Bit Buffers/Drivers with 3-State Outputs+<	CY74FCT16543ET	56	16-Bit Registered Transceivers with 3-State Outputs				+	+
CY74FCT16646AT5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16646CT5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16646ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16646ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16646ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652AT5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652AT5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652CT5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16823AT5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16823CT5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16823ET5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16827ET5620-Bit Buffers/Drivers with 3-State Outputs+ </td <td>CY74FCT16543T</td> <td>56</td> <td>16-Bit Registered Transceivers with 3-State Outputs</td> <td></td> <td></td> <td></td> <td>+</td> <td></td>	CY74FCT16543T	56	16-Bit Registered Transceivers with 3-State Outputs				+	
CY74FCT16646CT CY74FCT16646ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16646ET CY74FCT16646ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16646ET CY74FCT16652AT5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652AT CY74FCT16652AT5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652CT CY74FCT16652ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652ET CY74FCT16652ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652ET CY74FCT16823AT CY74FCT16823AT CY74FCT16823AT5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16823AT CY74FCT16823ET CY74FCT16823ET CY74FCT16827ET CY74FCT16827ET5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16827ET CY74FCT16827ET CY74FCT16827ET CY74FCT16827ET5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT16827ET CY74FCT16827ET CY74FCT16827ET CH2827ET CH2827ET5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT16827ET CY74FCT16827ET CY74FCT16827ET CH2827ET5620-Bit Buffers/Drivers with 3-State Outputs++CY74FCT16827ET CY74FCT16827ET CH2827ET5620-Bit Buffers/Drivers with 3-State Outputs++CY74FCT16827ET CY74FCT16827ET CH2827ET5620-Bit Buffers/Drivers with 3-State Outputs++CY74FCT16827ET CY74FCT16827ET CH2827ET56<	CY74FCT16646AT	56	16-Bit Bus Transceivers and Registers with 3-State Outputs				+	
CY74FCT16646ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16646T5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652AT5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652AT5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652CT5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16823AT5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16823CT5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16823ET5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16827AT5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT16827CT5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT16827ET5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT16827ET5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT18827ET5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT18827ET5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT18827ET5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT18827ET<	CY74FCT16646CT	56	16-Bit Bus Transceivers and Registers with 3-State Outputs				+	
CY74FCT16646T5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652AT5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652AT5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652CT5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16823AT5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16823CT5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16823ET5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16827AT5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT16827CT5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT16827CT5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT18827ET5620-Bit Buff	CY74FCT16646FT	56	16-Bit Bus Transceivers and Registers with 3-State Outputs				+	
CY74FCT16652AT5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652AT5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16823AT5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16823CT5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16823ET5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16827AT5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT16827CT5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT16827CT5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT18827ET5620-Bit Buffers/Drivers wi	CY74FCT16646T	56	16-Bit Bus Transceivers and Registers with 3-State Outputs				+	
CY74FCT16652CT5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16823AT5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16823CT5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16823ET5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16823ET5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT16827AT5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT16827ET5620-Bit Buffers/Drivers with 3-State Outputs+ </td <td>CY74FCT16652AT</td> <td>56</td> <td>16-Bit Bus Transceivers and Registers with 3-State Outputs</td> <td></td> <td></td> <td></td> <td>+</td> <td></td>	CY74FCT16652AT	56	16-Bit Bus Transceivers and Registers with 3-State Outputs				+	
CY74FCT16652ET5616-Bit Bus Transceivers and Registers with 3-State Outputs+CY74FCT16652ET5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16823AT5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16823ET5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16823ET5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16827AT5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT16827CT5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT16827ET5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT18827ET5620-Bit Buffers/Drivers+CY74FCT18827ET56 <td< td=""><td>CY74FCT16652CT</td><td>56</td><td>16-Bit Bus Transceivers and Registers with 3-State Outputs</td><td></td><td></td><td></td><td>+</td><td></td></td<>	CY74FCT16652CT	56	16-Bit Bus Transceivers and Registers with 3-State Outputs				+	
CY74FCT16822AT5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16823AT5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16823ET5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16823ET5618-Bit D-Type Flip-Flops with 3-State Outputs+CY74FCT16827AT5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT16827CT5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT16827ET5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT16827ET5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT18827ET5620-Bit Buffers/Drivers with 3-State Outputs+CY74FCT18827ET5620-Bit Buffers/Drivers with 3-State Outputs+	CY74FCT16652FT	56	16-Bit Bus Transceivers and Registers with 2-State Outputs				T	Ŧ
CY74FCT16823CT5618-Bit D-Type Flip-Flops with 3-State Outputs++CY74FCT16823ET5618-Bit D-Type Flip-Flops with 3-State Outputs++CY74FCT16827AT5620-Bit Buffers/Drivers with 3-State Outputs++CY74FCT16827CT5620-Bit Buffers/Drivers with 3-State Outputs++CY74FCT16827ET5620-Bit Buffers/Drivers with 3-State Outputs++CY74FCT16827ET5620-Bit Buffers/Drivers with 3-State Outputs++CY74FCT16827ET5620-Bit Buffers/Drivers with 3-State Outputs++CY74FCT16827ET5620-Bit Buffers/Drivers with 3-State Outputs++		56	18-Bit D.Tune Flin-Flone with 2-State Outpute				т	T
CY74FCT168276T5618-Bit D-Type Flip-Flops with 3-State Outputs++CY74FCT16827AT5620-Bit Buffers/Drivers with 3-State Outputs++CY74FCT16827CT5620-Bit Buffers/Drivers with 3-State Outputs++CY74FCT16827ET5620-Bit Buffers/Drivers with 3-State Outputs++CY74FCT16827ET5620-Bit Buffers/Drivers with 3-State Outputs++CY74FCT16827ET5620-Bit Buffers/Drivers with 3-State Outputs++		56	18-Bit D-Type Flip-Flops with 3-State Outputs				.1	+
CY74FCT16827AT 56 20-Bit Buffers/Drivers with 3-State Outputs + + CY74FCT16827AT 56 20-Bit Buffers/Drivers with 3-State Outputs + + CY74FCT16827ET 56 20-Bit Buffers/Drivers with 3-State Outputs + + CY74FCT16827ET 56 20-Bit Buffers/Drivers with 3-State Outputs + + CY74FCT16827ET 56 20-Bit Buffers/Drivers with 3-State Outputs + +	CV7/ECT16023CT	50	18 Bit D. Type Flip-Flops with 2-State Outputs				+	+
CY74FCT16827CT 56 20-Bit Buffers/Drivers with 3-State Outputs + + CY74FCT16827CT 56 20-Bit Buffers/Drivers with 3-State Outputs + + CY74FCT16827TE 56 20-Bit Buffers/Drivers with 3-State Outputs + +	CV7/ECT16023E1	50	20 Rit Duffore /Drivers with 2 State Outputs				+	+
CY74FCT16827FT 56 20-Bit Buffers/Drivers with 3-State Outputs + + CY74FCT16827FT 56 20-Bit Buffers/Drivers with 3-State Outputs + +		50	20-Dit Duffers/Drivers with 2 State Outputs				+	
UT/4FUT1002/ET 30 ZU-DIL DUITETS/DTIVETS WILLT 3-State Outputs + +		50	20 Dit Duffers/Drivers with 2 State Outputs				+	+
		00	20-Dit Duniers/Drivers With 3-State Outputs				+	+

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CY74FCT16841CT

CY74FCT16952AT

CY74FCT16952CT

CY74FCT16952ET

Device

	Availability				
Description	MIL	PDIP	SOIC	SSOP	TSSOP
20-Bit Bus-Interface D-Type Latches with 3-State Outputs				+	
16-Bit Registered Transceivers with 3-State Outputs				+	
16-Bit Registered Transceivers with 3-State Outputs					+
16-Bit Registered Transceivers with 3-State Outputs				+	
16-Bit Buffers/Drivers with 3-State Outputs				+	+
16-Bit Buffers/Drivers with 3-State Outputs				+	+
16-Bit Buffers/Drivers with 3-State Outputs				+	+
16-Bit Buffers/Drivers with 3-State Outputs				+	+
16-Bit Buffers/Drivers with 3-State Outputs				+	+
16-Bit Buffers/Drivers with 3-State Outputs				+	+
16-Bit Buffers/Drivers with Bus Hold and 3-State Outputs					+

CY74FCT162240CT	48	16-Bit Buffers/Drivers with 3-State Outputs	+	+
CY74FCT162240ET	48	16-Bit Buffers/Drivers with 3-State Outputs	+	+
CY74FCT162244AT	48	16-Bit Buffers/Drivers with 3-State Outputs	+	+
CY74FCT162244CT	48	16-Bit Buffers/Drivers with 3-State Outputs	+	+
CY74FCT162244ET	48	16-Bit Buffers/Drivers with 3-State Outputs	+	+
CY74FCT162244T	48	16-Bit Buffers/Drivers with 3-State Outputs	+	+
CY74FCT162H244AT	48	16-Bit Buffers/Drivers with Bus Hold and 3-State Outputs		+
CY74FCT162H244CT	48	16-Bit Buffers/Drivers with Bus Hold and 3-State Outputs	+	
CY74FCT162H244ET	48	16-Bit Buffers/Drivers with Bus Hold and 3-State Outputs	+	+
CY74FCT162245AT	48	16-Bit Bus Transceivers with 3-State Outputs	+	+
CY74FCT162245CT	48	16-Bit Bus Transceivers with 3-State Outputs	+	+
CY74FCT162245FT	48	16-Bit Bus Transceivers with 3-State Outputs	+	+
CY74FCT162245T	48	16-Bit Bus Transceivers with 3-State Outputs	+	+
CY74FCT162H245AT	48	16-Bit Bus Transceivers with Bus Hold and 3-State Outputs	+	+
CY74FCT162H245CT	/18	16-Bit Bus Transceivers with Bus Hold and 3-State Outputs	, T	- -
CV7/ECT162U2/JEET	40	16 Bit Bus Transceivers with Bus Hold and 2 State Outputs	т 	т ,
CV7/ECT162272AT	40	16 Pit Transparant D Type Latebox with 2 State Outputs	+	+
CV74ECT162272AT	40	16 Bit Transparent D. Type Latches with 2 State Outputs	+	+
	40	16 Dit Transparent D. Type Latches with 2 State Outputs	+	+
	48	16 Dit Edge Triggered D. Type Elections with 3-State Outputs	+	+
UY74FU1162374A1	48	10-Bit Edge-Inggered D-Type Flip-Flops with 3-State Outputs	+	+
UY/4FUT1623/4UT	48	16-Bit Edge-Iriggered D-Type Flip-Flops with 3-State Outputs	+	+
CY/4FCT1623/4E1	48	16-Bit Edge-Iriggered D-Type Flip-Flops with 3-State Outputs	+	+
CY/4FCT1623/41	48	16-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs	+	
CY74FC1162500A1	56	18-Bit Universal Bus Transceivers with 3-State Outputs	+	
CY74FCT162500CT	56	18-Bit Universal Bus Transceivers with 3-State Outputs	+	
CY74FCT162501AT	56	18-Bit Universal Bus Transceivers with 3-State Outputs	+	+
CY74FCT162501CT	56	18-Bit Universal Bus Transceivers with 3-State Outputs	+	+
CY74FCT162501ET	56	18-Bit Universal Bus Transceivers with 3-State Outputs	+	+
CY74FCT162H501CT	56	18-Bit Universal Bus Transceivers with Bus Hold and 3-State Outputs	+	+
CY74FCT162H501ET	56	18-Bit Universal Bus Transceivers with Bus Hold and 3-State Outputs	+	+
CY74FCT162543AT	56	16-Bit Registered Transceivers with 3-State Outputs		+
CY74FCT162543CT	56	16-Bit Registered Transceivers with 3-State Outputs	+	+
CY74FCT162543ET	56	16-Bit Registered Transceivers with 3-State Outputs	+	+
CY74FCT162543T	56	16-Bit Registered Transceivers with 3-State Outputs	+	
CY74FCT162H543CT	56	16-Bit Registered Transceivers with Bus Hold and 3-State Outputs		+
CY74FCT162646AT	56	16-Bit Bus Transceivers and Registers with 3-State Outputs	+	+
CY74FCT162646CT	56	16-Bit Bus Transceivers and Registers with 3-State Outputs	+	+
CY74FCT162646ET	56	16-Bit Bus Transceivers and Registers with 3-State Outputs	+	+
CY74FCT162652AT	56	16-Bit Bus Transceivers and Registers with 3-State Outputs	+	
CY74FCT162652CT	56	16-Bit Bus Transceivers and Registers with 3-State Outputs	+	+
CY74FCT162652ET	56	16-Bit Bus Transceivers and Registers with 3-State Outputs	+	+
CY74FCT162823AT	56	18-Bit D-Type Flip-Flops with 3-State Outputs		+
CY74FCT162823CT	56	18-Bit D-Type Flin-Flons with 3-State Outputs	+	+
CY74FCT162823FT	56	18-Bit D-Type Flip-Flops with 3-State Outputs	+	+
CY74FCT162827AT	56	20-Bit Buffers/Drivers with 3-State Outputs	+	
CY74FCT162827BT	56	20-Bit Buffers/Drivers with 3-State Outputs	+	
CY74FCT162827CT	56	20-Bit Buffers/Drivers with 3-State Outputs	1	+
CY7/FCT162827FT	56	20 Bit Buffers/Drivers with 3-State Outputs	<u>т</u>	
CV74ECT162027ET	56	20 Bit Bus Interface D Type Latebas with 2 State Outputs	T	т -
CV7/ECT162052AT	56	16. Bit Bagistarad Transcolvers with 3-State Outputs	+	+
	50	16 Pit Registered Transceivers with 2 State Outputs		+
	50	16 Dit Degistered Transceivers with 2 State Outputs	+	
	50	10-bit negistered Transceivers with 3-State Outputs	+	
	00	10 Dit negistered Transceivers with Dus Hold and 2 Ct. t. O. t. t.		+
	56	10-Bit Registered Transceivers with Bus Hold and 3-State Uutputs	+	
UY/4FCT162H952ET	56	16-bit Registered Transceivers with Bus Hold and 3-State Outputs		+
UY74FUT163244A	48	10-bit Buffers/Drivers with 3-State Outputs	+	+
UY74FU1163244U	48	Ib-BIT BUTTERS/Drivers with 3-State Outputs	+	+

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	No.		Availability				
Device	Pins	Description	MIL	PDIP	SOIC	SSOP	TSSOP
CY74FCT163H244C	48	16-Bit Buffers/Drivers with Bus Hold and 3-State Outputs				+	+
CY74FCT163245A	48	16-Bit Bus Transceivers with 3-State Outputs				+	+
CY74FCT163245C	48	16-Bit Bus Transceivers with 3-State Outputs				+	+
CY74FCT163H245A	48	16-Bit Bus Transceivers with Bus Hold and 3-State Outputs				+	
CY74FCT163H245C	48	16-Bit Bus Transceivers with Bus Hold and 3-State Outputs				+	+
CY74FCT163373C	48	16-Bit Transparent D-Type Latches with 3-State Outputs				+	+
CY74FCT163374A	48	16-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs					+
CY74FCT163374C	48	16-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs				+	+
CY74FCT163H374C	48	16-Bit Edge-Triggered D-Type Flip-Flops with Bus Hold and 3-State Outputs				+	+
CY74FCT163500A	56	18-Bit Universal Bus Transceivers with 3-State Outputs				+	
CY74FCT163500C	56	18-Bit Universal Bus Transceivers with 3-State Outputs				+	+
CY74FCT163501C	56	18-Bit Universal Bus Transceivers with 3-State Outputs				+	+
CY74FCT163H501C	56	18-Bit Universal Bus Transceivers with Bus Hold and 3-State Outputs				+	+
CY74FCT163543A	56	16-Bit Registered Transceivers with 3-State Outputs				+	
CY74FCT163543C	56	16-Bit Registered Transceivers with 3-State Outputs				+	+
CY74FCT163646C	56	16-Bit Bus Transceivers and Registers with 3-State Outputs				+	+
CY74FCT163652A	56	16-Bit Bus Transceivers and Registers with 3-State Outputs					+
CY74FCT163652C	56	16-Bit Bus Transceivers and Registers with 3-State Outputs				+	+
CY74FCT163827A	56	20-Bit Buffers/Drivers with 3-State Outputs				+	
CY74FCT163827C	56	20-Bit Buffers/Drivers with 3-State Outputs				+	
CY74FCT163952C	56	16-Bit Registered Transceivers with 3-State Outputs				+	+
CY74FCT163H952C	56	16-Bit Registered Transceivers with Bus Hold and 3-State Outputs				+	+

GTL

	No.			Availability	
Device	Pins	Description	MIL	SSOP	TSSOP
SN74GTL1655	64	16-Bit LVTTL-to-GTL/GTLP Universal Bus Transceivers with Live Insertion			1
SN54GTL16612	56	18-Bit LVTTL-to-GTL/GTLP Universal Bus Transceivers	✓		
SN74GTL16616	56	17-Bit LVTTL-to-GTL/GTLP Universal Bus Transceivers with Buffered Clock Outputs		1	1
SN74GTL16622A	64	18-Bit LVTTL-to-GTL/GTLP Registered Bus Transceivers			1
SN74GTL16923	64	18-Bit LVTTL-to-GTL/GTLP Registered Bus Transceivers			1

GTLP

	No.		Availability				
Device	Pins	Description	LFBGA	SOIC	SSOP	TSSOP	TVSOP
SN74GTLPH306	24	8-Bit LVTTL-to-GTLP Bus Transceivers		+		+	+
SN74GTLP817	24	GTLP-to-LVTTL 1-to-6 Fanout Drivers		+		+	+
SN74GTLP1394	16	2-Bit LVTTL-to-GTLP Adjustable-Edge-Rate Bus Transceivers with Selectable Parity		+		+	+
SN74GTLPH1612	64	18-Bit LVTTL-to-GTLP Adjustable-Edge-Rate Universal Bus Transceivers				+	
SN74GTLPH1616	64	17-Bit LVTTL-to-GTLP Adjustable-Edge-Rate Universal Bus Transceivers with					
		Buffered Clock				+	
SN74GTLPH1645	56	16-Bit LVTTL-to-GTLP Adjustable-Edge-Rate Bus Transceivers				+	+
SN74GTLPH1655	64	16-Bit LVTTL-to-GTLP Adjustable-Edge-Rate Universal Bus Transceivers				+	
SN74GTLPH3245	114	32-Bit LVTTL-to-GTLP Adjustable-Edge-Rate Bus Transceivers	+				
SN74GTLPH16612	56	18-Bit LVTTL-to-GTLP Universal Bus Transceivers			✓	✓	
SN74GTLPH16912	56	18-Bit LVTTL-to-GTLP Universal Bus Transceivers				+	+
SN74GTLPH16916	56	17-Bit LVTTL-to-GTLP Universal Bus Transceivers with Buffered Clock				+	+
SN74GTLPH16945	48	16-Bit LVTTL-to-GTLP Bus Transceivers				+	+
SN74GTLPH32945	96	32-Bit LVTTL-to-GTLP Bus Transceivers	+				

LVT

	No.		Availability					
Device	Pins	Description	MIL	LFBGA	SOIC	SSOP	TSSOP	TVSOP
LVT Octals (SN7	74LVT>	xxx, SN74LVTHxxx)						
SN74LVTH125	14	Quad Bus Buffers with 3-State Outputs			1	1	1	1
SN74LVTH126	14	Quad Bus Buffers with 3-State Outputs			+	+	+	+
SN74LVT240A	20	Octal Buffers/Drivers with 3-State Outputs			1	1	1	
SN74LVTH240	20	Octal Buffers/Drivers with 3-State Outputs			1	1	1	
SN74LVTH241	20	Octal Buffers/Drivers with 3-State Outputs			1	1	✓	
SN74LVT244B	20	Octal Buffers and Line Drivers with 3-State Outputs			1	1	 Image: A second s	 Image: A second s

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	No.		Availability					
Device	Pins	Description	MIL	LFBGA	SOIC	SSOP	TSSOP	TVSOP
IVT Octals (SN)	741 VT							
	20	Artal Ruffers and Line Drivers with 3-State Outputs	./		./		./	./
SN74LVT245B	20	Octal Bus Transceivers with 3-State Outputs	v				• ./	· ·
SN74LVTE466	20	Octal Bus Transceivers with 3-State Outputs	1		1	1	1	1
SN74IVTH273	20	Octal D-Type Flip-Flops with Clear	•		1	1	1	•
SN74LVTH273	20	Octal Transparent D-Type Latches with 3-State Outputs	1		1	1		
SN74I VTH374	20	Octal Edge-Triggered D-Type Elin-Flops with 3-State Outputs	1		1	1	1	
SN74LVTH540	20	Inverting Octal Buffers and Line Drivers with 3-State Outputs			· /			1
SN74LVTH541	20	Octal Buffers and Line Drivers with 3-State Outputs			1	1	1	1
SN74LVTH543	24	Octal Registered Transceivers with 3-State Outputs			1	1	1	1
SN74LVTH573	20	Octal Transparent D-Type Latches with 3-State Outputs	1		1	1	1	1
SN74LVTH574	20	Octal Edge-Triggered D-Type Flip-Flops with 3-State Outputs	1		1	1	1	1
SN74LVTH646	24	Octal Registered Bus Transceivers with 3-State Outputs	1		1	1	1	1
SN74LVTH652	24	Octal Bus Transceivers and Registers with 3-State Outputs			1	1	1	1
		()/TU4(Commo)						
	(311/4							
SIN/4LV116240	48	16-BIT Buffers/Drivers with 3-State Outputs				+	+	+
SN/4LV1H16240	48	16-Bit Buffers/Drivers with 3-State Outputs						~
SN/4LVTH16241	48	16-BIT BUTTERS/DRIVERS WITH 3-State Outputs				~	v	
SIN/4LV116244B	48	16-Bit Buffers/Drivers with 3-State Outputs	(+	+	+
SIN/4LV1H16244A	48	16-BIL BUITERS/DRIVERS WITH 3-State Outputs	~			1	<i>√</i>	v
SIN74LV116245B	48	16-Bit Bus Transceivers with 3-State Outputs				<i>√</i>	<i>√</i>	+
SIN/4LV1H16245A	48	16-Bit Bus Transceivers with 3-State Outputs	1			1	· ·	~
SIN/4LV1H103/3	48	16-Bit Transparent D-Type Latches with 3-State Outputs	1			1	<i>√</i>	
SIN/4LV1H103/4	48	10-Bit Liniversel Due Transaciures with 2 State Output	~			· ·	<i>.</i>	
SIN/4LV1H10000	00	18-Bit Universal Bus Transceivers with 2-State Outputs				4	<i>√</i>	<i>v</i>
	00	18-Dit Universal bus transceivers with 3-State Outputs	~			1	~	~
SIN74LV1010041	40	10-Dil Dullets/Dilvers with 2-State Outputs				V (V (
SIN74LV1010040	50	16 Dit Due Transceivere and Pagietere with 2 State Outputs				× (× (× (
SN74LV1H10040	50	16 Pit Pus Transceivers and Registers with 2 State Outputs				v (v (V (
SN74LV1110032	50	10-Dit Dus Indiscervers and negisters with 5-state Outputs				v /	× /	· ·
SN74LV1110033	50	16 Bit Registered Trapsceivers with 2 State Outputs				v (V (v (
311/4LV1110332	50	To-bit negistered transcervers with 5-State Outputs	v			v	V	v
LVT Widebus+™	″ (SN7	4LVTH32xxx)						
SN74LVT32244	96	32-Bit Buffers/Drivers with 3-State Outputs		+				
SN74LVTH32244	96	32-Bit Buffers/Drivers with 3-State Outputs		+				
SN74LVT32245	96	32-Bit Bus Transceivers with 3-State Outputs		+				
SN74LVTH32245	96	32-Bit Bus Transceivers with 3-State Outputs		+				
SN74LVTH32373	96	32-Bit Transparent D-Type Latches with 3-State Outputs		+				
SN74LVTH32374	96	32-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs		+				
SN74LVTH32501	114	32-Bit Universal Bus Transceivers with 3-State Outputs		+				
hW\alshi	ehus V	With Series Damning Resistors (SN741VTH2xxx_SN741VT	H162xxx	a)				
SN74I VTH2245	20	Octal Bus Transceivers with Series Damping Resistors and 3-State Outputs		~ ,	1	1	1	1
SN74LVTH2952	20	Octal Bus Transceivers and Registers with 3-State Outputs					•	
SN74LVT162240	48	16-Bit Ruffers/Drivers with Series Damping Resistors and 3-State Outputs			•	+	+	+
SN74LVTH162240	48	16-Bit Buffers/Drivers with Series Damping Resistors and 3-State Outputs				1	1	1
SN74LVTH162241	48	16-Bit Buffers/Drivers with Series Damping Resistors and 3-State Outputs				1	1	
SN74LVT162244A	48	16-Bit Buffers/Drivers with Series Damping Resistors and 3-State Outputs				+	+	+
SN74LVTH162244	48	16-Bit Buffers/Drivers with Series Damping Resistors and 3-State Outputs	1			1	1	
SN74LVT162245A	48	16-Bit Bus Transceivers with Series Damping Resistors and 3-State Outputs	•			1	1	+
SN74LVTH162245	48	16-Bit Bus Transceivers with Series Damping Resistors and 3-State Outputs	1			1	1	
SN74LVTH162373	48	16-Bit Transparent D-Type Latches with 3-State Outputs	1			1	1	
SN74LVTH162374	48	16-Bit Edge-Triggered D-Type Flip-Flops with 3-State Outputs	1			1	1	
SN74LVTH162541	48	16-Bit Buffers/Drivers with 3-State Outputs				1	1	

附录A

更多信息

GTLP 概述: 与传统背板逻辑相比,能提供更高的速度,同时具有更好的信号完整性和更低功耗的新型器件

DALLAS (2000 年 1 月 18 日) — 作为世界领先的逻辑器 件公司, TI 通过发布新的射电收发逻辑器件增强型 (GTLP) 系 列产品,继续推动市场向前发展。与传统的逻辑,如 ABT、 FCT、LVT、ALVT、LVC 和 FutureBus+相比,这一系列产 品能够使设计人员将背板数据吞吐量提高到百分之一百到 三百。这些器件专门设计用于多槽的中等负载或重负载背 板,并且完全支持现场插入,而这种能力在高可用性通信和 网络应用中是十分重要的。此外,其中一些器件与当前在并 行背板中所使用的逻辑器件是引脚兼容的,使设计人员能更 加容易的将 GTLP 集成到下一代系统之中。

www.ti.com/sc/gtlp

应用报告摘要

背板的基本设计考虑因素 (SZZA016)

本应用报告介绍了关于背板设计的一些设计问题。设计一个 高性能的背板是非常复杂的,涉及到的问题包括分布电容、 插头长度、信号完整性、噪声容限、上升时间、飞行时间和 传播延迟都需要加以界定和优化,以实现背板上较好的信号 完整性。本应用报告主要基于一个 GTLP 背板驱动器,用以 研究这些问题所带来的影响。背板设计者实现最佳电路板设 计所应遵循的准则被详细列出。本应用报告中的信息能使设 计工程师成功的设计出一个使用 GTLP 的高性能的背板。

> www.ti.com/sc/docs/psheets/abstract/ apps/szza016a.htm

使用 GTL1655 的快速 GTLP 背板 (SCBA015)

本应用报告介绍了快速总线系统的物理原理以及在开发过程 中可能出现的问题。传输线理论是比较 TTL、BTL、GTL 和 GTLP 等各种规格的集成电路的基础。

SN74GTL1655 通用总线收发器 (UBT) 是作为未来高速总线系 统背板设计的最佳解决方案。对于 SN74GTL1655 的综合测 试结果也在应用报告中给出。

www.ti.com/sc/docs/psheets/ abstract/apps/scba015.htm

GTL/BTL: 一个高速数字逻辑的低摆动解决方案 (SCEA003)

在高速背板和点对点应用中,GTL和BTL收发器能提供高性 能和卓越的信号完整性,并且具有成本效益。本文档讨论了 GTL和BTL器件的I/O结构、功耗、同时切换、转换速**薬**以 及信号完整性。此外还提供了使用这些器件的设计考虑因 www.ti.com/sc/docs/psheets/ abstract/apps/scea003a.htm

薄型超小尺寸封装 (TVSOP) 应用简介 (SCBA009)

发展便携、轻巧、高性能的电子产品正推动着半导体工业向更 小、更薄,具有更高密度的封装这一方向发展。价格上的压力 也迫使整个行业尽最大努力来降低成本。TI 一直作为 IC 封装 领域的领导者,目前又推出了一个新的系列产品——薄型超小 尺寸封装 (TVSOP),以支持行业对于部件的小型化需求。新 的TVSOP 产品系列,分为 14、16、20、24、48、56、80 和 100 引脚等类型,其特点是引脚间距仅为 0.40 mm (16 mil), 并且器件高度满足个人电脑内存卡国际联合会 (PCMCIA) 的要 求。TVSOP 已经被电子元件工业联合委员会 (JEDEC)收入半 导体封装标准 MO-194 中。本应用报告对 TVSOP 系列的规格 参数进行了概述,包括热、电、可靠性以及湿度灵敏度性能。 对于引脚间距仅为 0.40-mm 的器件如何进行装配的指导也一 并给出。

> www.ti.com/sc/docs/psheets/ abstract/apps/scba009c.htm

LFBGA 封装的 32-Bit 系列逻辑产品: 96- 和 114- 焊球、低截 面、细距 BGA 封装(SCEA014)

集成技术器件公司、飞利浦半导体公司和德州仪器共同评估了 许多客户的投入,提出了低截面细距球栅阵列 (LFBGA) 封装 解决方案,以便更好的满足客户对 64 个甚至更多焊球数的需 求。研究表明,LFBGA 是降低感应系数、提高散热性能和减 小电路板空间的最佳解决方案,能更好的支持集成的总线功 能。总之,我们的目标是在一个封装中提供多源产品,当与 现有的封装类型相比时电气性能能得到显著改善,同时节省 OEM 制造工艺的成本。

www-s.ti.com/sc/techlit/scea014

MicroStar JuniorTM 设计综述 (SCET004)

飞利浦半导体公司和德州仪器共同评估了许多客户的投入,提 出了一个 VFBGA 封装解决方案,以便更好的满足客户对 56 个及以下数量的焊球数的需求。研究表明,VFBGA 是降低感 应系数、提高散热性能和减小电路板空间的最佳解决方案,能 更好的支持集成的总线功能。总之,我们的目标是在一个封装 中提供多源产品,当与现有的封装类型相比时电气性能能得到 显著改善,同时节省 OEM 制造工艺的成本。

www-s.ti.com/sc/psheets/scet004/scet004.pdf

Widebus SMD 和 LFBGA 封装在电气和热参数方面的比较 (SCYA007)

80 年代到 90 年代间, 16 位宽和 32 位宽总线系统的发展 趋势,以及表面贴装技术的持续发展,导致封装越来越小而 集成电路的性能也在不断提高。封装电气特性的提高也使得 Widebus 电路具有更小引脚的封装成为可能。在 80 年代中 期, TI 推出了 Widebus 器件, 具有改善的电气特性和扩展 的数据宽度,在单一封装中支持高达 20 bit 的位宽。如今, TI 推出了低截面细距球栅阵列 (LFBGA)。LFBGA 是首个逻辑 元件的 BGA 封装,具有改善的信号特性和更高的集成度。这 一新的设计在单一封装支持中高达 36 bit 的位宽, 能够实现 使用 Widebus 封装令印制电路板上的元件密度加倍。本报告 的目的是,通过比较以下四种封装的机械数据、电气特性和 热参数,使设计师们熟悉这一封装选择的优点,包括 48 引脚 SSOP(缩小型小外形封装)、48 引脚 TSSOP(薄型缩小型 小外形封装)、48 引脚 TVSOP(薄型超小尺寸封装)和 96 引脚 LFBGA(低截面细距球栅阵列封装);使用的是 LVC 逻 辑系列中 224 功能(单向)缓冲/驱动器。

> www.ti.com/sc/docs/psheets/ abstract/apps/scya007.htm

半导体包装方法 (SZZA021A)

TI 半导体集团采用三种方法对半导体进行包装,以便运送 至终端用户。具体采用的方法与器件的装运配置项的等级有 关。器件的终端用户往往需要仔细阅读许多 TI 和行业的出版 物,以便了解装运配置。本应用报告记录了 TI 的三种主要装 运方法和典型尺寸,以方便终端用户查阅。

> www.ti.com/sc/docs/psheets/ abstract/apps/szza021a.htm

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