



Is Now Part of



ON Semiconductor®

To learn more about ON Semiconductor, please visit our website at
www.onsemi.com

Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

ON Semiconductor and the ON Semiconductor logo are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.



FSA831A — USB2.0 高速(480Mbps)充电器检测器, 带隔离开关

特性

USB检测	USB 电池充电修订版 1.2; 支持数据通信检测 (DCD), 带 30 分钟计时器的死电池充电 (DBP)
开关类型	隔离开关关闭, 支持 充电下行端口 (CDP) 标准下行端口 (SDP)
V _{BUS}	28V 过压容差 -2V 欠压容差
封装	10 引脚 MicroPak™ 1.6 x 2.1mm, 0.5mm 间距
订购信息	FSA831AL10X

应用

- MP3、移动互联网设备 (MID)、手机、掌上电脑、数码相机、笔记本电脑和上网本

典型应用

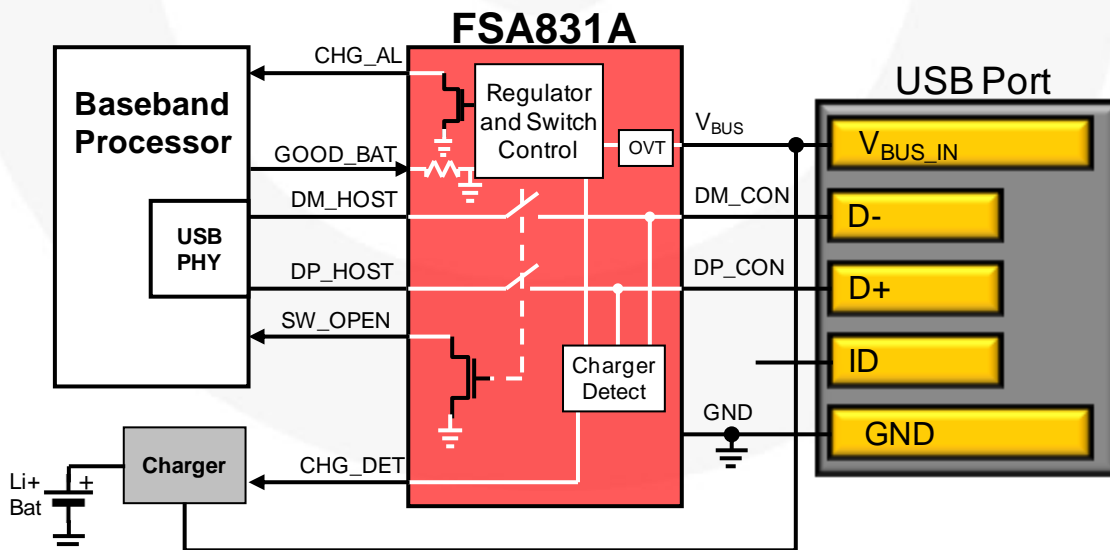


图 1. 移动电话示例

说明

FSA831是一款充电器检测IC, 带集成隔离开关, 和微型/mini USB端口一起使用。

FSA831检测电池充电器, 符合USB电池充电规定, 修订版1.2 (BC1.2)。

算法包括数据接触检测 (DCD), 保证了USB连接器相对更短的内部引脚优先继续电池充电器检测。

该器件决定连接的是一个专用充电端口 (DCP)、充电下游端口 (CDP) 还是一个典型PC主机, 成为标准下游端口 (SDP)。

如果检测到的是充电器,

FSA831A决定该充电器是DCP还是CDP。

对于SDP和CDP检测, 一个内部隔离开关被关闭以连接USB电缆的D+/D-线路至便携设备内部的驻存USB收发器。

FSA831符合所有BC 1.2规定内的无电电池充电 (DBP) 限制,

包括根据BC1.2不能超过45分钟的30分钟计时器。

相关资源

- 有关样品、疑问请联系:
analogswitch@fairchildsemi.com

引脚布局

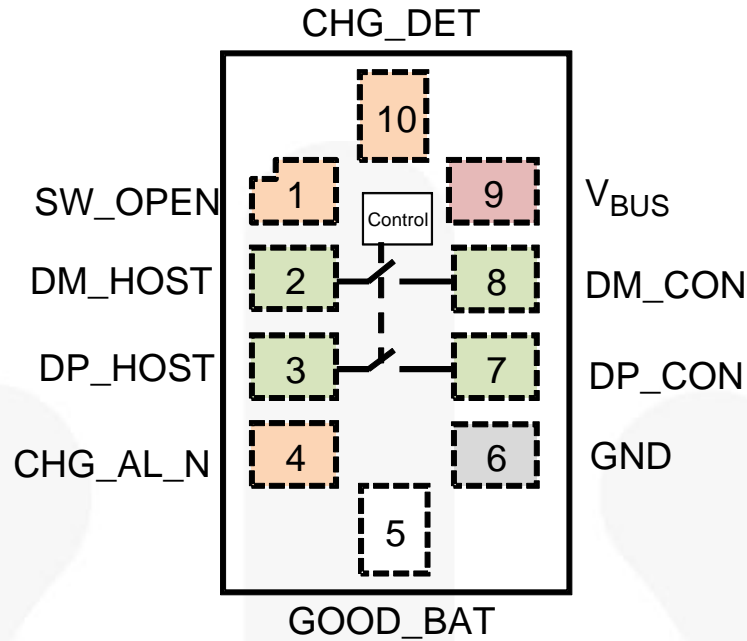


图 2. 引脚分配 (顶视图/俯视图)

引脚描述

名称	引脚号	说明
USB接口		
DP_HOST	3	D+ 信号，连接到电话的内置 USB 收发器
DM_HOST	2	D- 信号，连接到电话的内置 USB 收发器
接头接口		
V _{BUS}	9	输入电压源，连接到USB连接器的V _{BUS} 引脚
GND	6	接地
DP_CON	7	连接到 USB 连接器的 D+ 引脚
DM_CON	8	连接到 USB 连接器的 D- 引脚
状态输出		
CHG_DET	10	连接到充电器 IC 的 CMOS 推/拉输出，用于指示是否已检测到充电器 (LOW = 未检测到充电器，HIGH = 已检测到 DCP 或 GDP 充电器)。
SW_OPEN	1	开漏输出引脚；需要上拉电阻连接到输入/输出电源电压 (LOW = 开关闭合，Hi-Z = 开关断开)。
CHG_AL_N	4	CMOS 开漏输出引脚 (LOW=V _{BUS} 有效且允许从 V _{BUS} 充电，Hi-Z=V _{BUS} 不是有效电压)。
输入引脚		
GOOD_BAT	5	输入指示是有电电池还是死电池 (LOW = 死电池，HIGH = 有电电池)

表 1. 功能

器件检测	GOOD_BA T	SW_OP EN	CHG_AL _N	CHG_DE T	DP_HOST	DM_HOST	DP_CON	DM_CON
DCP	X	Hi-Z	低	高	Hi-Z	Hi-Z	V_{DP_SRC}	Hi-Z ⁽¹⁾
CDP	高	低	低	高	DP_CON	DM_CON	DP_HOST	DM_HOST
CDP	低	高阻	低	高	高阻	高阻	V_{DP_SRC}	Hi-Z
SDP ⁽²⁾	高	低	低	低	DP_CON	DM_CON	DP_HOST	DM_HOST
SDP ⁽²⁾	低	高阻	低	低	高阻	高阻	V_{DP_SRC}	高阻
30 分钟时或之后插入 SDP、CDP、或 DCP	低	高阻	高阻	低	高阻	高阻	高阻	高阻
SDP、CDP、或 DCP 完成检测之前 V_{BUS} < V_{BUS} 有效值至 V_{BUS} > V_{SUB} 有效值。 经检测，所有输出都切换到至以上 各行状态。	X	高阻	高阻	Hi-Z 到 LOW	高阻	高阻	高阻	高阻

注意：

1. Hi-Z 是 DM_CON 的内部状态。由于已检测到 DCP，DM_CON 在外部短路到 DP_CON，并短路到 V_{DP_SRC} 。
2. 使 DP_CON 和 DM_CON 悬浮的专用充电器都被检测为 SDP。强置 DP_CON=2V 和 DM_CON的=7V（或任何其他电压）的专用充电器可能被检测为 CDP、DCP 或 SDP，这取决于 DP_CON 和 DM_CON 上的分压电阻在 DP_CON 和 DM_CON 引脚上建立的电压。

功能说明

数据接触检测 (DCD)

DCD 依赖于当前存在的 D+ 和 D- 线路。DCD 在下列情况下处于等待状态，直到内部超时 ($t_{DCD_TIMEOUT}$)：

- 在 USB 连接器上，充电器没有 D+ 引脚
- 在连接器上 D+ 引脚没有短路到 D- 引脚
- D+ 上拉到电源
- D+ 没有足够的路径接地，泄放 I_{DP_SRC} (10 μ A 典型值) 电流源。

即使充电器很可能不存在，FSA831 仍继续进行充电器检测。如果没有充电器，该检测程序将报告为 SDP 并闭合开关。闭合开关后，如果设备的 D+ 电压被拉高，该电压本身出现在系统级芯片

(SoC) 内的 USB 收发器或物理层接口 (PHY) 模块。

如果 DCD 超时不足，且如此配置 PHY 模块，DCD 和充电程序可在 PHY 模块中重复运行。按照 USB 2.0 标准 (USB 2.0 连接时序)，如果便携式设备没有死电池，规定自 V_{BUS} 有效到 USB 收发器与 1.5k Ω 电阻连接上拉至 3.3V 的总时间必须为一 (1) 秒。

一个典型的 PS/2 端口 (老式 PC 鼠标/键盘端口) 具备电阻式上拉至 V_{BUS} 。这可能导致 DCD 超过最大等待时间 ($t_{DCD_TIMEOUT}$)，充电器检测将继续进行。充电器检测的可能路径会将 PS/2 端口归类为 SDP 端口。这会导致闭合 USB 开关，

引起 DP_CON 和 DM_CON 引脚上的电压通过此开关分别加到 DP_HOST 和 DM_HOST。由于 PS/2 端口上的电压可能会升至与 V_{BUS} 电压一样高，DP_HOST 和 DM_HOST 引脚电压可能上拉至 V_{BUS} 。必须配置连接到 DP_HOST 和 DM_HOST 的 USB PHY 来处理这些更高的电压。

CHG_AL_N 输出和输出时序

当 CHG_AL_N 为 LOW 时，CHG_AL_N 输出指示允许从 V_{BUS} 充电。FSA831 首次通电及检测之前，CHG_AL_N 引脚可以随着 V_{BUS} 升到 28V，这是允许的绝对最大 V_{BUS} 电压。每当 V_{BUS} 在 GND 时，FSA831 完全关闭，开关和所有 I/Os 处于 Hi-Z 状态。如果 GOOD_BAT 为 HIGH，

当 V_{BUS} 爬升到 V_{BUS} 有效阈值以上，

检测自动进行，并且 CHG_DET、SW_OPEN 和 CHG_AL_N 同时切换到

表 1 所示状态

(对于 GOOD_BAT=LOW，请参阅死电池充电说明)。

死电池充电 (DBP)

BC1.2 和 USB 2.0

支持装有死电池的便携式设备 (定义为使用电池的的设备)，从 USB V_{BUS} 线路最大获取 100mA (最多 45 分钟)，只要便携式设备强制 D+ 线路接到

V_{DP_SRC} (0.6V 典型值)。当 V_{BUS} 穿过 V_{BUSVLD} 阈值时，FSA831 开始检测，如果它检测到 CDP 或 SDP 且 GOOD_BAT 为 HIGH，

将自动闭合开关，不会强制 DP_CON 引脚连到 V_{DP_SRC} 。充电器检测完成后，

FSA831 启动 30 分钟计时器，并强置 DP_CON 引脚至 V_{DP_SRC} ，直到计时结束。

在 30 分钟内，如果 GOOD_BAT 为低电平，

V_{DP_SRC} 将被接到 DP_CON 且 D+/D- 开关打开；如果 GOOD_BAT 为高电平，

V_{DP_SRC} 不会接到 DP_CON 且 D+/D- 开关关闭。如果 30 分钟计时器到时，

GOOD_BAT 仍为低电平，不管之前 SDP、CDP 或 CDP 是否被检测到，

FSA831A 都会从 DP_CON 移除 V_{DP_SRC} ，

并强制将 CHG_DET 为低电平且 CHG_AL_N 为 Hi-Z

(SW_OPEN 保持 Hi Z)。

要退出此故障状态，移除 V_{BUS} ，等待所有的 V_{BUS} 印刷电路板 (PCB) 电容放电，并重新接上 V_{BUS} 。表 1 提供了计时器超时后引脚的功能。

当 GOOD_BAT 为 HIGH 且 V_{BUS} 有效时，从便携式设备上卸下电池，将使 GOOD_BAT 为 LOW；FSA831 打开 DP_CON 和 DM_CON 上的隔离开关并强置 DP_CON 引脚为 V_{DP_SRC} 。在这种情况下，因为 SoC 没有电源使得 GOOD_BAT 为 HIGH，计时器通常超时，

除非 USB 插头插入后 30 分钟内将已卸下的电池重新装上。

在 30 分钟计时期间，如果插入 SDP 或 CDP，且 GOOD_BAT 为 HIGH，则 GOOD_BAT 更改为 LOW；SW_OPEN 更改为 Hi-Z 且计时器继续计时，直到 30 分钟期满。如果 GOOD_BAT 回到 HIGH，则 SW_OPEN 更改为 LOW，30 分钟计时结束。

GOOD_BAT 具有内部下拉电阻，确保 SoC 断电时，GOOD_BAT 为 LOW。

这种输入被设计为具有极低的阈值，从而可以配合 1.2V 电源电压驱动的低电压 SoC 使用。

专用充电器

只有在 V_{DP_SRC} 加到 DP_CON 时使 V_{DM_SRC}

(0.6V 典型值) 电压加到 DM_CON 的合法的 USB 充电器能通过 FSA831 进行检测，

并使得 CHG_DET 信号有效。强置 DP_CON 和 DM_CON 为 HIGH 的任何充电器，可被检测为 CDP、DCP 或 SDP (这取决于 DP_CON 和 DM_CON 上分压电阻)，

并且可用于在这些引脚上创建高电压。

让 DP_CON 和 DM_CON

信号悬浮的任何充电器被检测为 SDP，

CHG_DET 继续无效。在专用充电器被检测为 SDP 或 CDP 的情况下，由于开关闭合且从 USB 连接器 D+ 和 D- 线路到 USB PHY 模块建立通路；因此，可在 PHY 内检测到充电器 (若如此配置)

接地压降

当检测到 DCP 时，如果 GOOD_BAT 为 HIGH 或者 GOOD_BAT 为 LOW 且 DBP 计时器未超时，则在 DP_CON 上强置 V_{DP_SRC} 。高达 1.5A 的电流流入 USB 电缆的 V_{BUS} 和 GND 线路，这可转化为极大的接地压降，使得便携式设备的地电压上升。

由 DCP D+ 引脚可见，此压降增加了 DP_CON 引脚的电压。

由于 BC1.2 规范中指定的最大接地压降为 375mV，最大 V_{DP_SRC} 为 0.7 V，由 DCP 测得的电压应为 1.075 V。智能 DCP 通过该电压检测方式来确定是否需要考虑接入和分离检测。

V_{BUS} 容差 当 V_{BUS} 升高时，

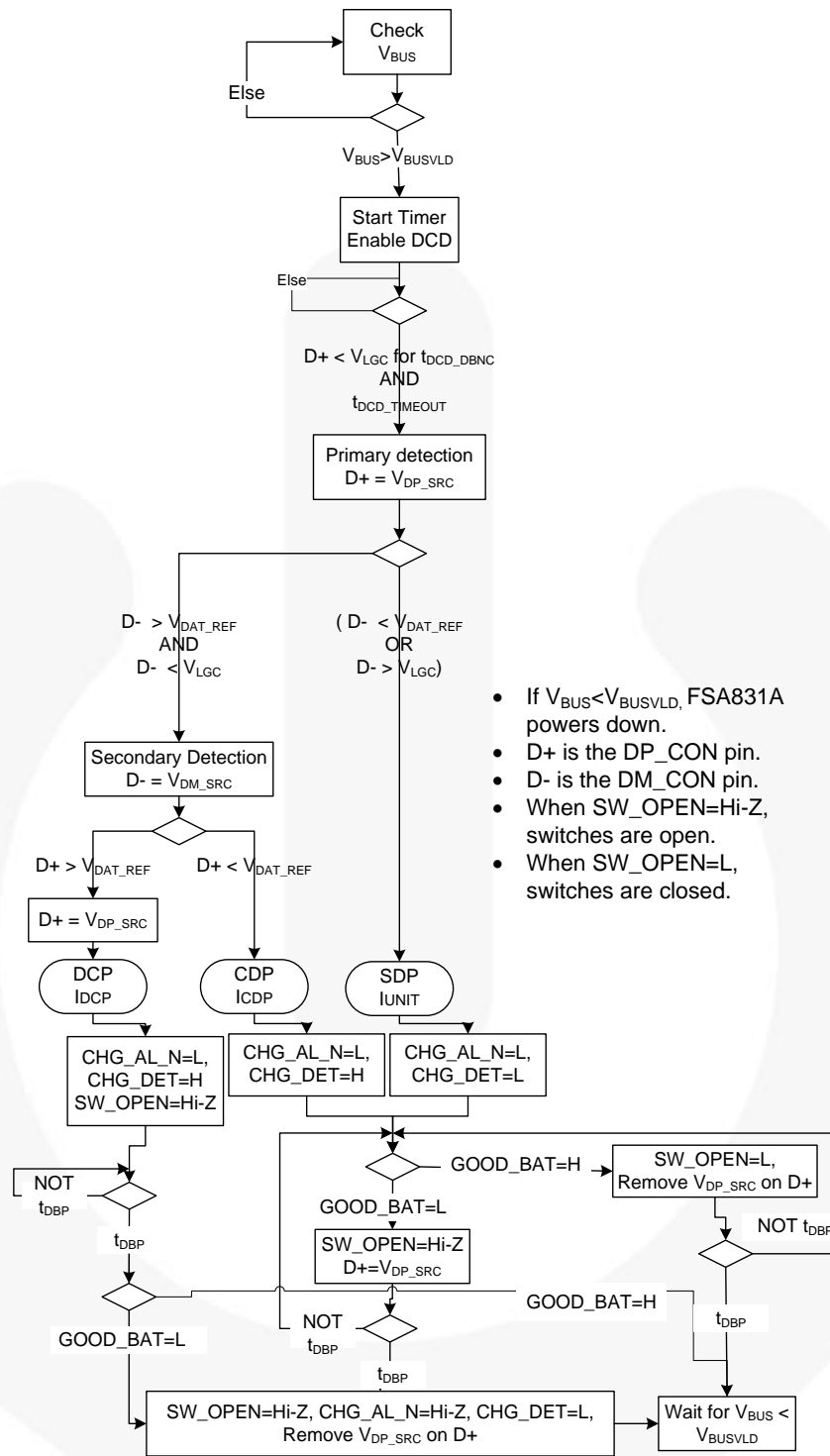
内部上电复位 (POR) 检测到此电压，为 FSA831 做好准备，进行充电器检测。

V_{BUS} 引脚可容许 V_{BUS} 电压高达 28V。充电器插反的情况下，

V_{BUS} 可容许电压达 -2V。

检测流程

图 3 流程图显示了 FSA831 如何按照 BC1.2 对电池充电器进行检测。



- If $V_{BUS} < V_{BUSVLD}$, FSA831A powers down.
- D+ is the DP_CON pin.
- D- is the DM_CON pin.
- When SW_OPEN=Hi-Z, switches are open.
- When SW_OPEN=L, switches are closed.

图 3. 电池充电器检测



绝对最大额定值

应力超过绝对最大额定值, 可能会损坏设备。

在超出推荐的工作条件的情况下, 该器件可能无法正常运行或操作, 且不建议让器件在这些条件下长期工作。

此外, 过度暴露在高于推荐的工作条件下, 会影响器件的可靠性。绝对最大额定值仅是额定应力值。

符号	参数		最小值	最大值	单位	
V_{BUS}	来自 USB 连接器的电压		-2	28	V	
V_{SW}	USB 开关输入/输出电压 (DP_CON, DM_CON, DP_HOST, DM_HOST)		-0.5	6.0	V	
I_{SW}	USB 开关电流 (DP_CON 至 DP_HOST, DM_CON 至 DM_HOST)		-30	+30	mA	
$V_{I/O}$	来自 GOOD_BAT、CHG_AL_N、CHG_DET 和 SW_OPEN 输入/输出的电压		-0.5	6.0	V	
V_{CA}	来自 CHG_AL_N 的输出电压		-0.5	28.0	V	
$I_{I/O}$	CHG_AL_N、CHG_DET 和 SW_OPEN 输出灌电流/源电流		-5	+5	mA	
T_{STG}	存储温度范围		-65	+150	°C	
T_J	最大结温			+150	°C	
T_L	引脚温度 (焊接, 10 秒)			+260	°C	
ESD	IEC 61000-4-2 系统	USB 引脚 (DP_CON, DM_CON, V_{BUS})	空气式		15	kV
			接触式		8	
	人体模型, JEDEC JESD22-A114		全部引脚		6	
	充电器件模型, JEDEC JESD22-C101		全部引脚		1	

推荐工作条件

推荐的操作条件定义了器件的真实工作条件。指定推荐的工作条件, 以确保设备的最佳性能达到数据表中的规格。

飞兆半导体建议不要超过推荐工作条件, 也不能按照绝对最大额定值进行设计。

符号	参数	最小值	最大值	单位
V_{BUS}	V_{BUS} 输入高电平	4	6	V
V_{SW}	为 USB 路径切换输入/输出电压	0	3.6	V
T_A	工作温度	-40	+85	°C

直流电气特性

除非另有说明, $V_{BUS}=4V$ 至 $6V$, $T_A=-40$ 至 $+85^{\circ}C$ 。除非另有说明, $T_A=25^{\circ}C$ 时为典型值。

符号	参数	条件	最小值	典型值	最大值	单位
状态输出						
V_{OHCD}	输出高电压 (CHG_DET)	$I_{OH}=-2$ mA	2.0			V
V_{OL}	输出低电压 (CHG_DET, CHG_AL_N, SW_OPEN)	$I_{OL}=2$ mA			0.4	V
t_{DIFF}	相对于其它输出开关的任何输出 (CHG_DET, CHG_AL_N, SW_OPEN) 开关的时间差	$I_{I/O}=\pm 2$ mA, CHG_AL_N=20 k Ω 至 5 V, SW_OPEN=10 k Ω 至 1.8 V			100	ns
V_{BUS} 引脚						
V_{BUSVLD}	V_{BUS} 有效检测阈值 ⁽¹⁾		0.8		4.0	V
I_{BUSIN}	V_{BUS} 输入漏电流	$V_{BUS}=0V$ 至 $0.8V$			3	μA
$I_{VBUSACT}$	V_{BUS} 主动模式平均电流	完成充电器检测后, 有效 USB 路径、USB 开关闭合			250	μA
t_{OUT}	从 V_{BUS} 确定有效至 CHG_DET、CHG_AL_N 和 SW_OPEN 输出有效的时间	DP_CON 下拉至 GND, 15k Ω , 同时强置于 V_{BUS} 、DP_CON、DM_CON 和 GND 的所有电压			250	ms
开关特性						
I_{OFF}	断电漏电流	USB 路径 $V_{BUS}=0V$, $V_{SW}=0V$ 或 $3.6V$, 图 5			10	μA
R_{ONUSB}	高速 USB 开关导通电阻 ⁽¹⁾	$V_{DP_CON} /$ $V_{DM_CON}=0V$, 0.4 V; $I_{ON}=8$ mA; 图 4; $V_{BUS}=4$ V 至 6 V		4.5	6.5	Ω
控制输入						
V_{IH}	输入高电压 (GOOD_BAT)		1.1			V
V_{IL}	输入低电压 (GOOD_BAT)				0.5	V
R_{PD}	下拉电阻 (GOOD_BAT)		1			M Ω
I_{IN}	输入漏电流 (GOOD_BAT)	$V_{BUS}=5V$, GOOD_BAT=0V 至 4.4V			10	μA
I_{IOFF}	OFF状态下漏电流 (GOOD_BAT)	$V_{BUS}=0V$, GOOD_BAT=0V 至 4.4V			10	μA
t_{DBP}	死电池充电 (DBP) 计时器		15	30	45	分钟
t_{GB}	从 GOOD_BAT 有效到 SW_OPEN 无效的时间, 开关闭合, 符合 R_{ONUSB} 规范				30	ms
t_{DB}	从 GOOD_BAT 无效到 SW_OPEN 有效的的时间, 开关打开				65	ms
根据 BC 1.2 规范的电池充电器检测参数						
V_{DAT_REF}	数据检测电压		0.25		0.40	V
V_{DM_SRC}	D- 电源电压 ⁽²⁾		0.5		0.7	V
V_{DP_SRC}	D+ 电源电压 ⁽²⁾		0.5		0.7	V
V_{LGC}	逻辑阈值		0.8		2.0	V
I_{DM_SINK}	D-灌电流		25		175	μA
I_{DP_SINK}	D+灌电流		25		175	μA
I_{DP_SRC}	数据接触检测电流源		7		13	μA
t_{DCD_DBNC}	数据接触检测防反跳		10			ms
t_{DCD_TOUT}	DCD 超时时间		300	450	900	ms
t_{VDPSRC_ON}	D+ 电压电源导通时间		40			ms
t_{VDMSRC_ON}	D- 电压电源导通时间		40			ms

注意：

1. 由产品特性保证，未经生产测试
2. 电压电源， V_{DP_SRC} / V_{DM_SRC} ，在输出电压为指定范围时，能够提供至少 250 μ A 电流。带有最低阻值为 900 Ω 的电阻时，DP_CON / DM_CON 电压最低被拉至 3.0V，或者带有最大阻值为 1575 Ω 的电阻时，DP_CON / DM_CON 电压最高被拉至 3.6V，此时该电压电源不得将 DP_CON/ DM_CON 拉至 2.2V 以下。

交流电气特性

除非另有说明， $T_A=-40$ 至 $+85^\circ\text{C}$ 时的值；所有典型值用于 $V_{OC}=3.3\text{V}$ ， $T_A=25^\circ\text{C}$ 时。

符号	参数	条件	最小值	典型值	最大值	单位	图
Xtalk	有效通道串扰 DP_CON 至 DM_CON ⁽³⁾	f=1 MHz, $R_T=50\ \Omega$, $C_L=0\ \text{pF}$		-78		dB	图 7
		f=240 MHz, $R_T=50\ \Omega$, $C_L=0\ \text{pF}$		-36			
O_{IRR}	关断隔离抑制比, DM_HOST 至 DM_CON, DP_HOST 至 DP_CON ⁽³⁾	f=1 MHz, $R_T=50\ \Omega$, $C_L=0\ \text{pF}$		-84		dB	图 6
		f=240 MHz, $R_T=50\ \Omega$, $C_L=0\ \text{pF}$		-34			
BW	开关带宽	$R_T=50\ \Omega$		1.7		GHz	图 7

注意：

3. 由产品特性保证，未经生产测试

电容值

除非另有说明， $T_A=-40$ 至 $+85^\circ\text{C}$ 时的值。

符号	参数	条件	典型值	单位	图
C_{OFF}	DP_CON, DM_CON 关断电容 ⁽⁴⁾	$V_{BIAS}=0.2\text{V}$, $f=1\text{MHz}$	3.2	pF	图 8
C_{ON}	DP_CON, DM_CON 导通电容 ⁽⁴⁾	$V_{BIAS}=0.2\text{V}$, $f=1\text{MHz}$	5.8	pF	图 9

注意：

4. 由产品特性保证，未经生产测试

测试框图

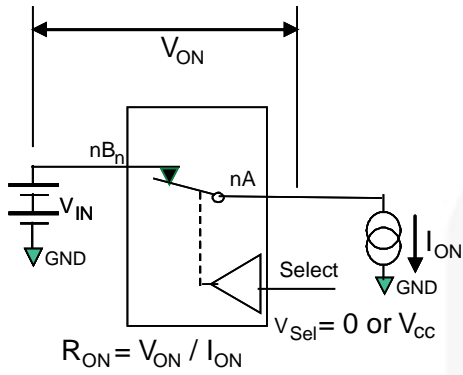
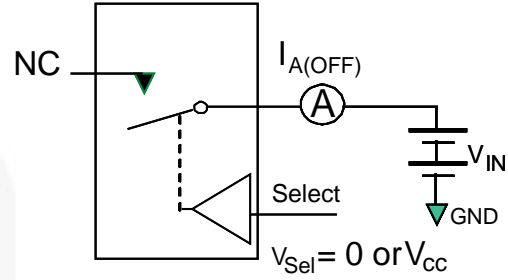
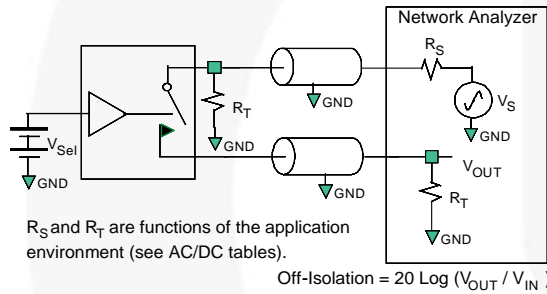


图 4. 导通电阻



**Each switch port is tested separately.

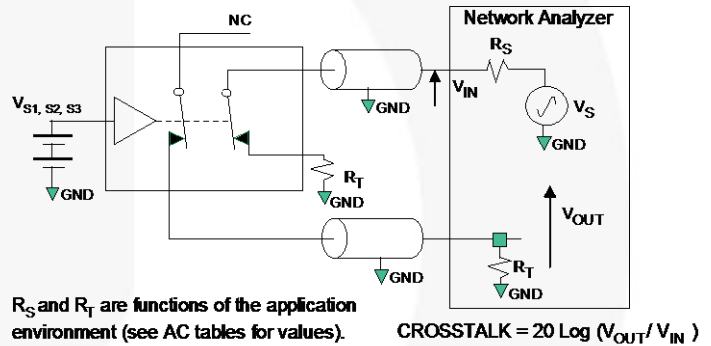
图 5. 关断漏电流



R_S and R_T are functions of the application environment (see AC/DC tables).

$$\text{Off-Isolation} = 20 \text{ Log} (V_{\text{OUT}} / V_{\text{IN}})$$

图 6. 通道的关断隔离



R_S and R_T are functions of the application environment (see AC tables for values).

$$\text{CROSSTALK} = 20 \text{ Log} (V_{\text{OUT}} / V_{\text{IN}})$$

图 7. 导通通道串扰

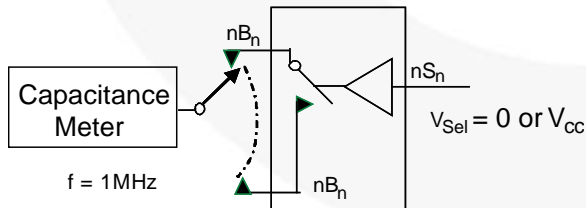


图 8. 通道关断电容

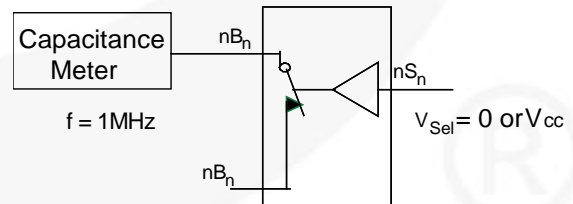


图 9. 通道导通电容

物理尺寸测试

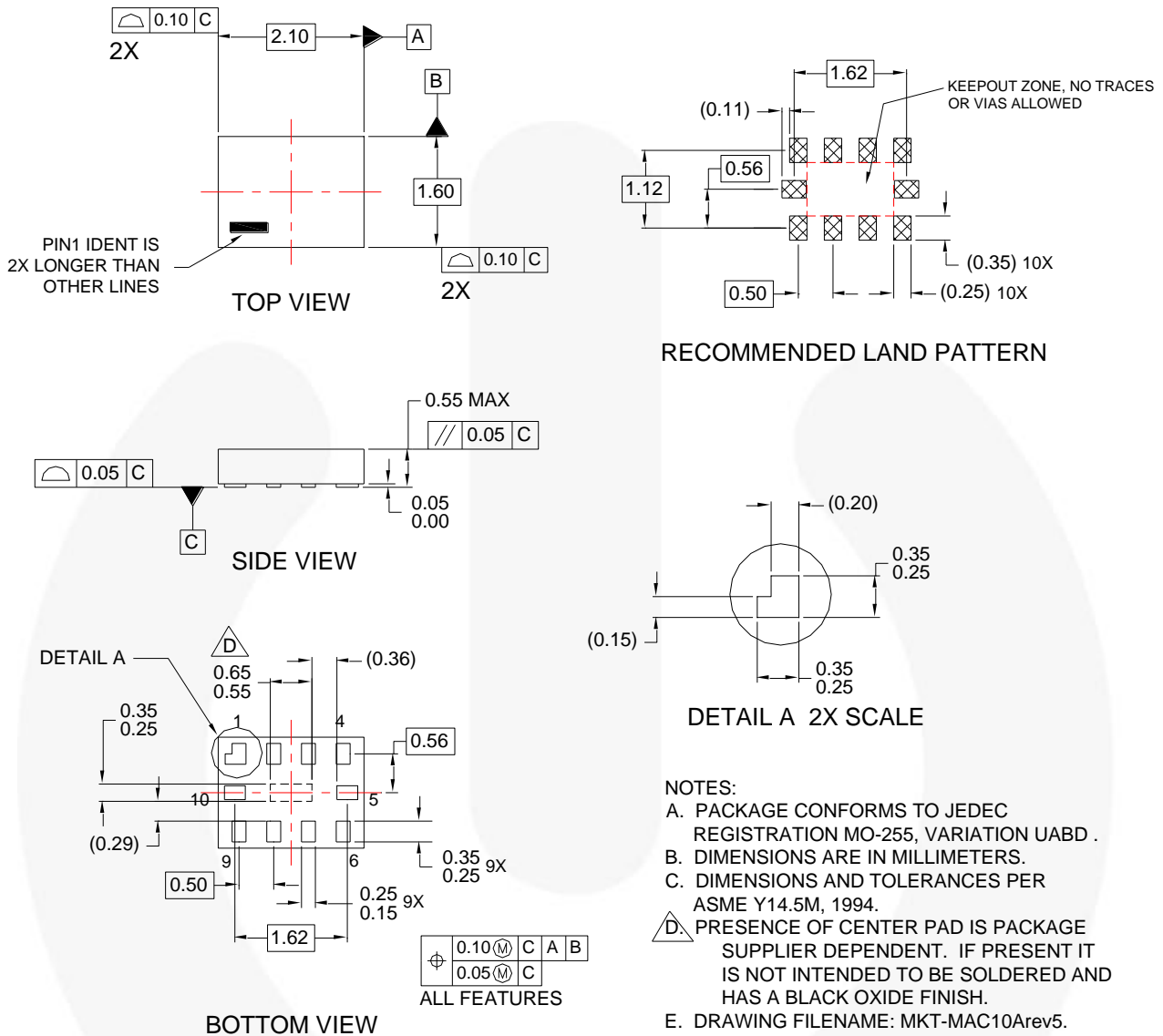


图 10. 10 引脚 MicroPak™

部件编号	顶标	工作温度范围	封装说明	包装方法
FSA831AL10X	NY	-40 至 85° C	10 引脚 MicroPak™ 1.6 x 2.1mm、0.5mm 间距	卷带

封装图纸是作为一项服务而提供给考虑选用飞兆半导体产品的客户。具体参数可进行改动，且无需做出相应通知。请注意图纸上的版本和/或日期，并联系飞兆半导体代表核实或获得最新版本。封装规格并不超出飞兆公司全球范围内的条款与条件，尤其指保修，保修涉及飞兆半导体的全部产品。

随时访问飞兆半导体在线封装网页，可以获得最新的封装图：

HYPERLINK "<http://www.fairchildsemi.com/packaging/>" <http://www.fairchildsemi.com/packaging/>。

TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

2Cool™	FPST™	 PowerTrench®	Sync-Lock™
AccuPower™	F-PFST™	PowerXS™	 SYSTEM GENERAL®
AX-CAP®	FRFET®	Programmable Active Droop™	TinyBoost™
BitSiC™	Global Power Resource™	QFET®	TinyBuck™
Build it Now™	GreenBridge™	QST™	TinyCalc™
CorePLUS™	Green FPS™	Quiet Series™	TinyLogic®
CorePOWER™	Green FPS™ e-Series™	RapidConfigure™	TINYOPTO™
CROSSVOLT™	Gmax™	 Saving our world, 1mW/W/kW at a time™	TinyPower™
CTL™	GTO™	SignalWise™	TinyPWM™
Current Transfer Logic™	IntelliMAX™	SmartMax™	TinyWire™
DEUXPEED®	ISOPLANAR™	SMART START™	TranSiC™
Dual Cool™	Making Small Speakers Sound Louder and Better™	Solutions for Your Success™	TriFault Detect™
EcoSPARK®	MegaBuck™	SPM®	TRUECURRENT®
EfficientMax™	MICROCOUPLER™	STEALTH™	µSerDes™
ESBC™	MicroFET™	SuperFET®	 SerDes®
 Fairchild®	MicroPak™	SuperSOT™-3	UHC®
Fairchild Semiconductor®	MicroPak2™	SuperSOT™-8	Ultra FRFET™
FACT Quiet Series™	MillerDrive™	SuperSOT™-8	UniFET™
FACT®	MotionMax™	SupreMOS®	VCX™
FAST®	mW/Saver™	SyncFET™	VisualMax™
FastvCore™	OptoHiT™		VoltagePlus™
FETBench™	OPTOLOGIC®		XST™
	OPTOPLANAR®		

* Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

ANTI-COUNTERFEITING POLICY

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, www.fairchildsemi.com, under Sales Support.

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed applications, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address any warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

Rev. 164

ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free
USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81-3-5817-1050

ON Semiconductor Website: www.onsemi.com
Order Literature: <http://www.onsemi.com/orderlit>
For additional information, please contact your local
Sales Representative