



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.



FSUSB40 — 低功耗双端口高速 USB2.0 (480Mbps) 开关

特性

- 低导通电容: 5.9pF典型值
- 低导通电阻: 3.9Ω 典型值
- 低功耗: 1μA最大值
 - 在扩展的电压范围内 ($V_{IN}=1.8V$, $V_{CC}=4.3V$), 最大 I_{CCT} 电流为15μA
- 宽广的 -3db带宽: > 720MHz
- 封装:
 - 无铅10-引脚 MicroPak™ (1.6 x 2.1mm)
 - 无铅10-引脚 UMLP (1.4 x 1.8mm)
- 8kV的ESD, >16kV 电源对地 ESD
- 当 $V_{CC}=0V$ 时所有管脚有断电保护
-D+/D-管脚可耐压高达5.25V
- 在无需额外元件的情况下所有的USB端口可耐过压高达5.25V

应用

- 手机, PDA, 数字相机, 和笔记本
- LCD显示屏, TV, 和机顶盒

描述

FSUSB40是双向低功耗双端口高速USB2.0 开关。结构类似于双刀双掷开关，它对于切换两个高速源(480Mbps)或一个高速和全速源(12Mbps)是优化选择。

FSUSB40是兼容USB2.0要求和拥有5.9pF超低电容的特性。元件宽广的带宽(720MHz)超过了需要通过三阶谐波的带宽，从而可以最小化边缘和相位的失真，超高品质的通道与通道之间的串扰特性也最小化了干扰。

FSUSB40在开关的I/O管脚包含有特殊的电路针对当 $V_{CC}=0$ 时允许元件耐过压的应用。这个元件被设计最小化了电流消耗即使用在SEL 管脚的控制电压低于供电电压。这种特性对手机类超便携式应用尤其重要，通过它可以直接与基带处理器通用I/O口连接。其它应用包括在便携式手机, PDAs, 数字相机, 打印机, 和笔记本电脑中的切换和连接。

重要注解

欲知其它详情, 请联系 analogswitch@fairchildsemi.com.

订货信息

订货号码	表面标记	操作温度范围	Eco Status	封装
FSUSB40L10X	HD	-40 到 +85°C	RoHS	10-引脚MicroPak™ 1.6 x 2.1mm, JEDEC MO-255B
FSUSB40UMX	HC	-40 到+85°C	Green	10-引脚, 方型, 超薄模塑无脚封 (UMLP), 1.4 x 1.8mm

MicroPak™ is a trademark of Fairchild Semiconductor Corporation.

For Fairchild's definition of Eco Status, please visit: http://www.fairchildsemi.com/company/green/rohs_green.html

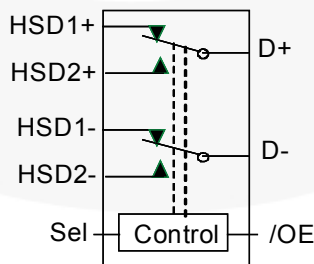


图1: 模拟符号

管脚分配图

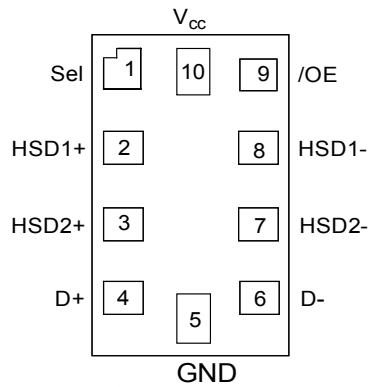


图2: MicroPak™ 分配图 (俯视图)

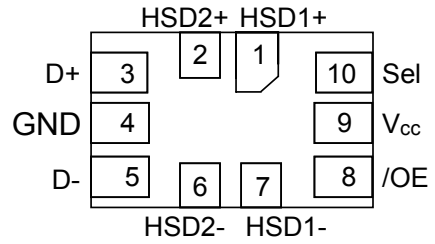


图3: 管脚分配图 UMLP (俯视图)

管脚定义

MicroPak™ Pin #	UMLP Pin #	管脚名称	描述
9	8	/OE	开关使能
1	10	Sel	开关选择脚
4, 6	3, 5	D+, D-	USB 数据线
2, 3, 7, 8	1, 2, 6, 7	HSDn+, HSDn-	多路复用源输入
5	4	GND	Ground

真值表

Sel	/OE	功能
X	H	断开
L	L	D+, D-=HSD1+, HSD1-
H	L	D+, D-=HSD2+, HSD2-

最大绝对额定值

超出绝对最大额定值会破坏设备，设备会不工作或者说不建议设备在和超过建议的工作条件下被操作。另外，过长的暴露在超过建议工作条件下会影响设备的可靠性。这种绝对最大额定值仅仅是极端额定值。

表达符号	参数	最小值	最大值	单位
V _{CC}	供电电压	-0.5	+5.5	V
V _{CNTRL}	DC 输入电压 (S, /OE) ⁽¹⁾	-0.5	V _{CC}	V
V _{SW}	DC 开关 I/O 电压 ⁽¹⁾	-0.50	5.25	V
I _{IK}	DC 输入二极管电流	-50		mA
I _{OUT}	DC 输出电流		100	mA
T _{STG}	储存温度	-65	+150	°C
ESD	人体电流模式, JEDEC: JESD22-A114	所有管脚	7	kV
		I/O对地	8	
		电源对地	16	
	充放电模式, JEDEC: JESD22-C101	2		

注:

- 如输入及输出二极管电流额定值均达到时则可能会超出输入及输出负额定值。

推荐工作条件

推荐工作条件表中定义的是实际元件工作的条件，推荐工作条件指定用于保证实现数据表规范的最佳性能，Fairchild 建议不得超出以上值或设计至最大绝对额定值。

表达符号	参数	最小值	最大值	单位
V _{CC}	供电电压	3.0	4.3	V
V _{CNTRL}	控制输入电压 (S, /OE) ⁽²⁾	0	V _{CC}	V
V _{SW}	开关 I/O 电压	-0.5	4.5	V
T _A	操作温度	-40	+85	°C

注:

- 控制输入必须保持高平或低平且不得悬空。

DC 电气特性

如未说明均为25°C下的标准值。

表达符号	参数	条件	V _{CC} (V)	T _A =- 40°C 至 +85°C			单位
				最小	典型	最大	
V _{IK}	钳位二极管电压	I _{IN} =-18mA	3.0			-1.2	V
V _{IH}	输入高电平		3.0 至 3.6	1.3			V
			4.3	1.7			V
V _{IL}	输入低电平		3.0 至 3.6			0.5	V
			4.3			0.7	V
I _{IN}	控制输入漏电流	V _{SW} =0 to V _{CC}	4.3	-1		1	μA
I _{OZ}	断开漏电流	0 ≤ Dn, HSD1n, HSD2n ≤ 3.6V	4.3	-2		2	μA
I _{OFF}	断电漏电流 (所有I/O端口)	V _{SW} =0V to 4.3V, V _{CC} =0V 见图5	0	-2		2	μA
R _{ON}	高速开关导通电阻 ⁽³⁾	V _{SW} =0.4V, I _{ON} =-8mA 见图4	3.0		3.9	6.5	Ω
ΔR _{ON}	高速导通电阻差 ⁽⁴⁾	V _{SW} =0.4V, I _{ON} =-8mA	3.0		0.65		Ω
I _{CC}	静态供电电流	V _{CNTRL} =0 or V _{CC} , I _{OUT} =0	4.3			1.0	μA
I _{CCT}	控制电压和V _{CC} 增加时I _{CC} 相应的增加量	V _{CNTRL} =2.6V V _{CC} =4.3V	4.3			10.0	μA
		V _{CNTRL} =1.8V V _{CC} =4.3V	4.3			15.0	μA

注:

- 在开关指定电流下通过测量管脚 HSDn 和 Dn 管脚之间的电压降获得。导通电阻由两管脚上较低的电压决定。
- 由特性保证。

AC 电气特性

如未说明均为 25°C, 3.3V V_{CC} 下的标准值。

表达符号	参数	条件	V _{CC} (V)	T _A =- 40°C 至 +85°C			单位
				最小	典型	最大	
t _{ON}	开启时间 S, /OE到输出	R _L =50Ω, C _L =5pF; V _{SW} =0.8V 见图 6, 7	3.0 至 3.6		13	30	ns
t _{OFF}	关断时间 S, /OE到输出	R _L =50Ω, C _L =5pF; V _{SW} =0.8V 见图 6, 7	3.0 至 3.6		12	25	ns
t _{PD}	传播延迟 ⁽⁵⁾	C _L =5 pF, R _L =50Ω 见图 6, 8	3.3		0.25		ns
t _{BBM}	先断后开	R _L =50Ω, C _L =5pF V _{SW1} =V _{SW2} =0.8V 见图 12	3.0 至 3.6	2.0		6.5	ns
O _{IRR}	隔离度	R _L =50Ω, f=240MHz 见图 14	3.0 至 3.6		-30		dB
Xtalk	非相邻通道串扰	R _L =50Ω, f=240MHz 见图 15	3.0 至 3.6		-45		dB
BW	-3db带宽	R _L =50Ω, C _L =0pF 见图 13	3.0 至 3.6		720		MHz
		R _L =50Ω, C _L =5pF 见图 13			550		MHz

注:

5. 由特性保证。

与USB高速相关的AC电气特性

表达符号	参数	条件	V _{CC} (V)	T _A =- 40°C 至 +85°C			单位
				最小	典型	最大	
t _{SK(P)}	同一输出相反传输方向上的偏差 ⁽⁶⁾	C _L =5pF, R _L =50Ω 见图 9	3.0 至 3.6		20		ps
t _J	总抖动 ⁽⁶⁾	R _L =50Ω, C _L =5pf, t _R =t _F =500ps (10-90%) 在 480Mbps时 (PRBS=2 ¹⁵ - 1)	3.0 至 3.6		200		ps

Note:

6. 由特性保证。

电容

表达符号	参数	条件	T _A =- 40°C 至 +85°C			单位
			最小	典型	最大	
C _{IN}	控制管脚输入电容	V _{CC} =0V		1.5		pF
C _{ON}	D+/D- 导通电容	V _{CC} =3.3V, /OE=0V, f=1MHz 见图 11		5.9	6.5	
C _{OFF}	D1n, D2n 断开电容	V _{CC} and /OE=3.3V 见图 10		2.0		

测试图

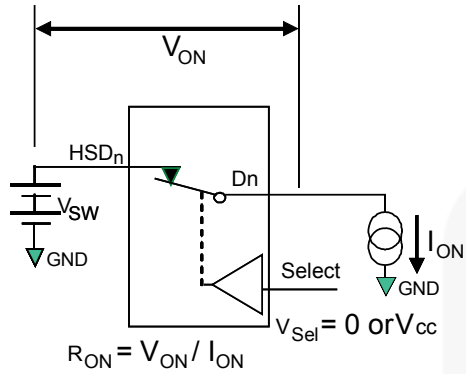
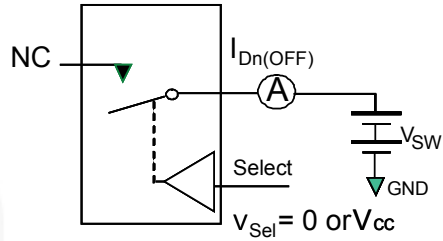
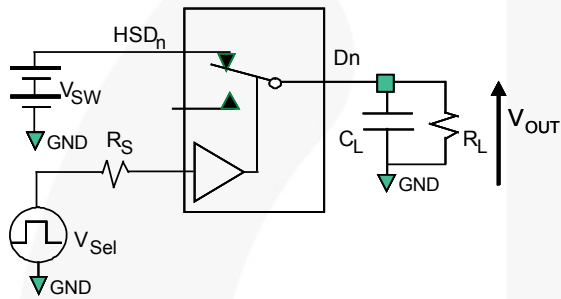


图4.导通电阻



**Each switch port is tested separately

图5.断开漏电流



R_L , R_S , and C_L are functions of the application environment (see AC Tables for specific values)
 C_L includes test fixture and stray capacitance.

图6.AC测试电路负载

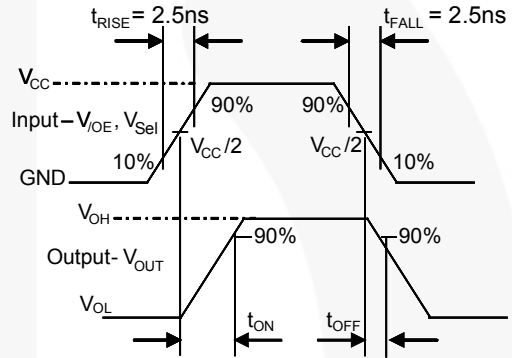


图7.开启/ 关断波形

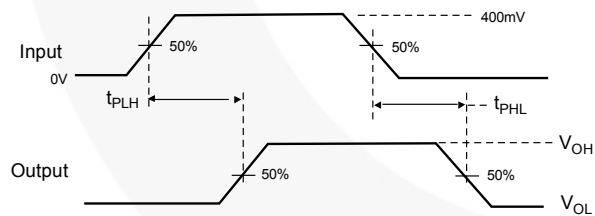


图8.传播延迟 ($t_{rtF} = 500ps$)

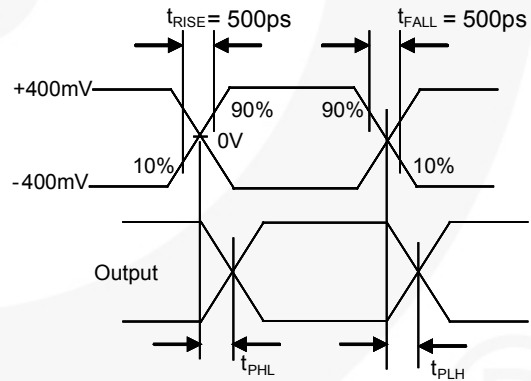


图9.对内偏移测试 $t_{sk(P)}$

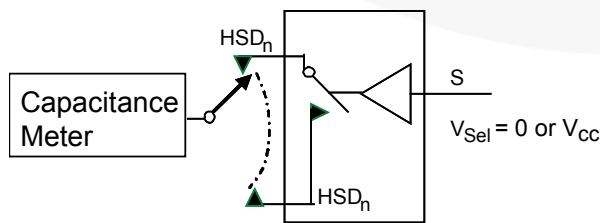


图10.通道断开电容

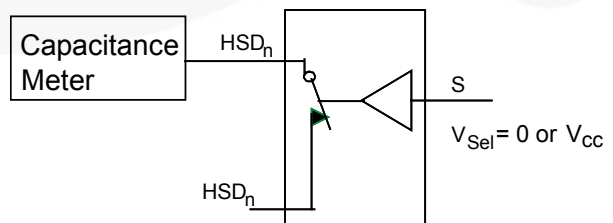
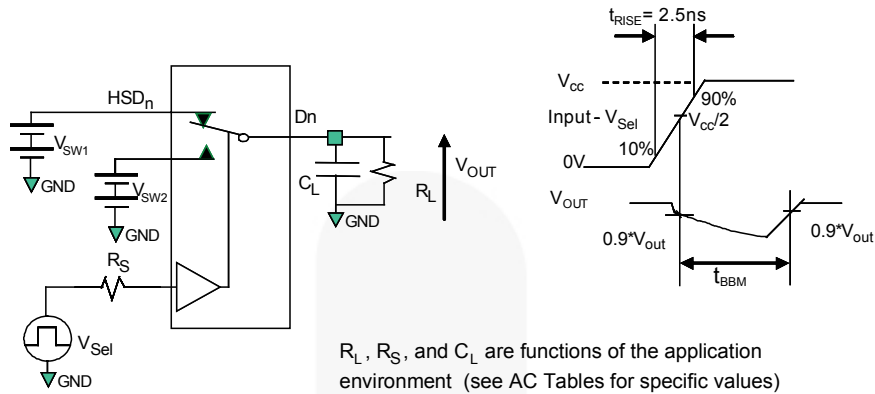


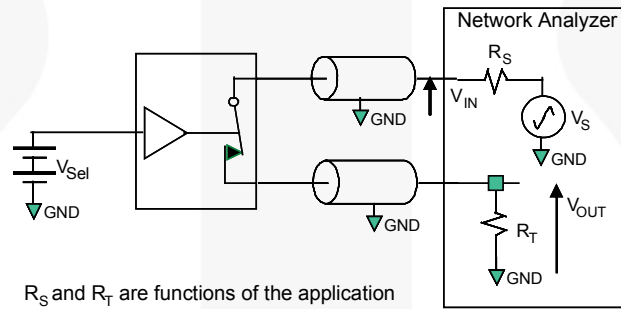
图11.通道导通电容

测试图(续)



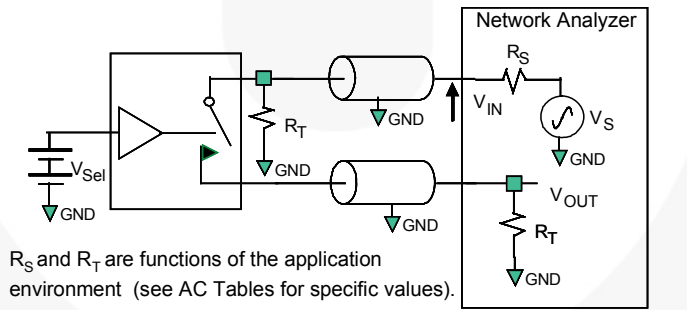
R_L , R_S , and C_L are functions of the application environment (see AC Tables for specific values)
 C_L includes test fixture and stray capacitance.

图12.先断后开间隔时间



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

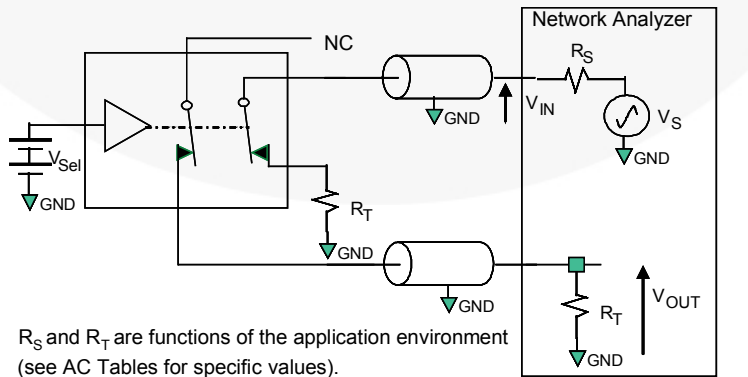
图13. 带宽



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

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

图14. 通道隔离度



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

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

图15. 非相邻通道串扰

物理尺寸

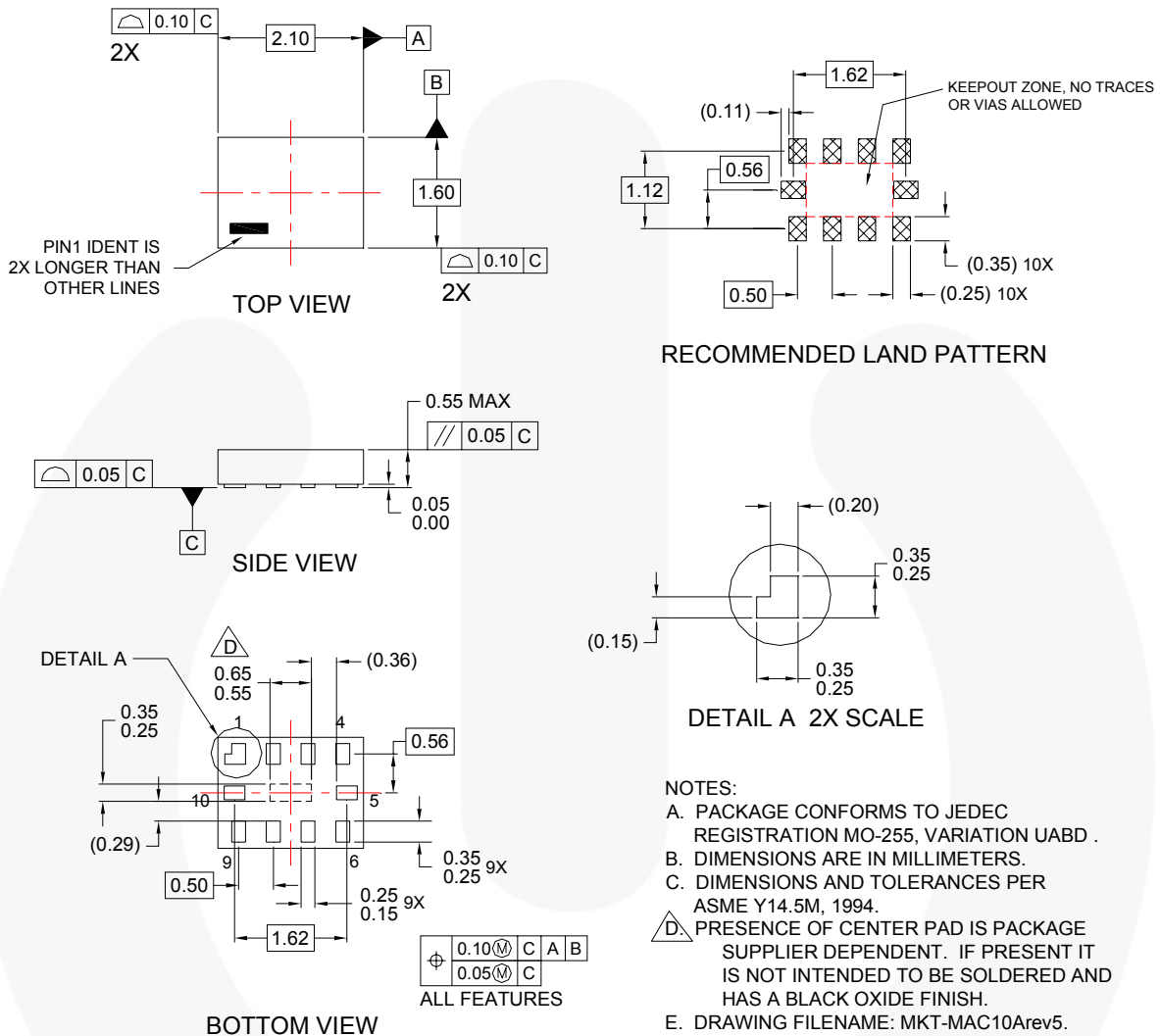
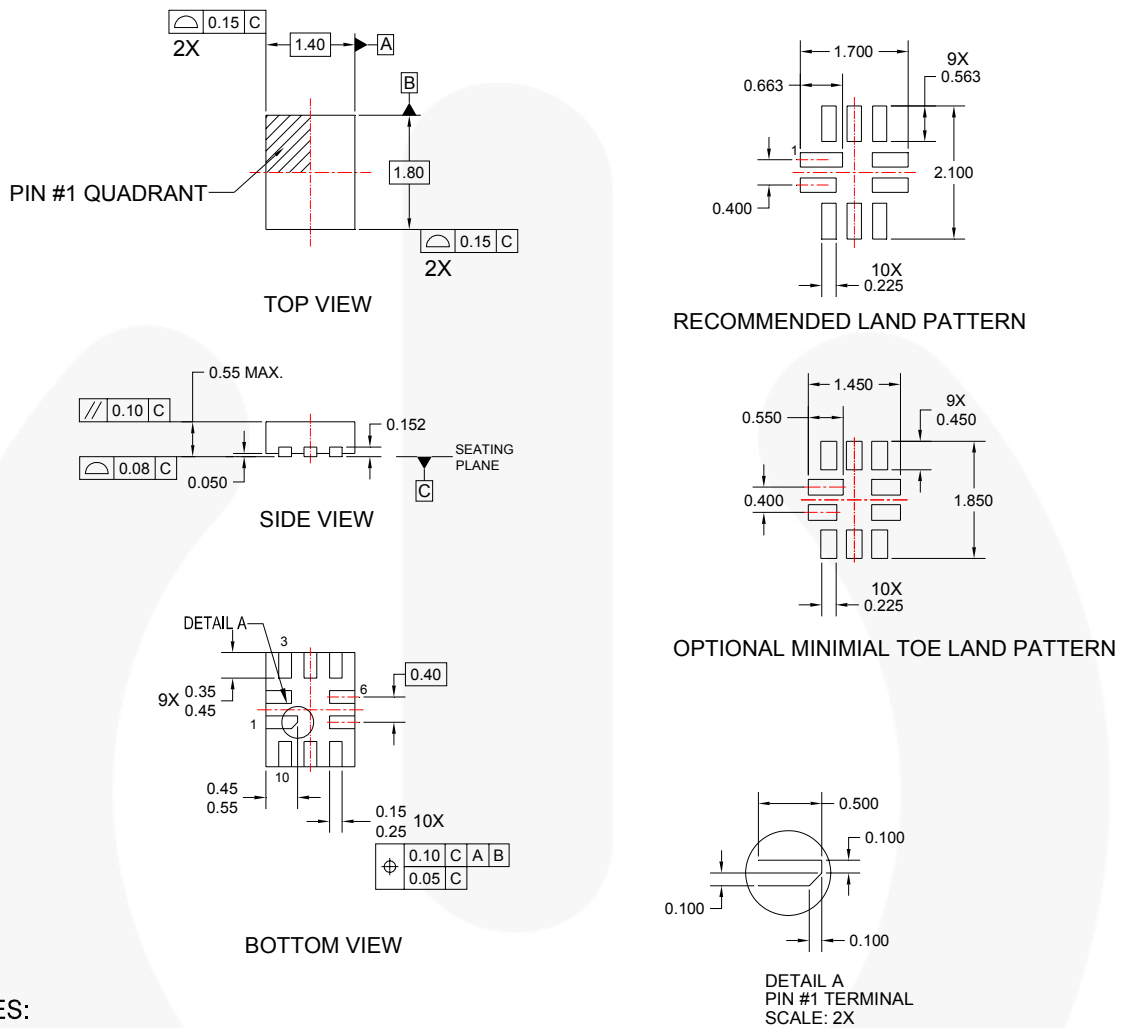


图16.10引脚MicroPak™

Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:
<http://www.fairchildsemi.com/packaging/>.

物理尺寸



NOTES:

- A. DIMENSIONS ARE IN MILLIMETERS.
- B. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994
- C. DRAWING FILENAME: UMLP10Arev2

图17. 10引脚方型, 超薄模塑无脚封装(UMLP)

Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:
<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.

AccuPower™
Auto-SPM™
Build it Now™
CorePLUS™
CorePOWER™
CROSSVOLT™
CTL™
Current Transfer Logic™
DEUXPEED®
EcoSPARK®
EfficientMax™
EZSWITCH™
Fairchild®
Fairchild Semiconductor®
FACT Quiet Series™
FACT®
FAST®
FastCore™
FETBench™

FlashWriter®*
FPS™
F-PFS™
FRFET®
Global Power Resource™
Green FPS™
Green FPS™ e-Series™
Gmax™
GTO™
IntelliMAX™
ISOPLANAR™
MegaBuck™
MICROCOUPLER™
MicroFET™
MicroPak™
MillerDrive™
MotionMax™
Motion-SPM™
OPTOLOGIC®
OPTOPLANAR®
PDP SPM™

Power-SPM™
PowerTrench®
PowerXS™
Programmable Active Droop™
QFET®
QST™
Quiet Series™
RapidConfigure™
Saving our world, 1mW/W/KW at a time™
SignalWise™
SmartMax™
SMART START™
SPM®
STEALTH™
SuperFET™
SuperSOT™.3
SuperSOT™.6
SuperSOT™.8
SupreMOS™
SyncFET™
Sync-Lock™

SYSTEM GENERAL®
The Power Franchise®
power franchise
TinyBoost™
TinyBuck™
TinyCalc™
TinyLogic®
TINYOPTO™
TinyPower™
TinyPWM™
TinyWire™
TriFault Detect™
TRUECURRENT™*
µSerDes™
UHC®
Ultra FRFET™
UniFET™
VCX™
VisualMax™
XST™

* 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. I44

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