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## FSUSB42 — 低功耗, 双端口, 高速 USB2.0 (480Mbps) 开关

### 特性

- 低导通电容: 3.7 pF 典型值
- 低导通电阻: 3.9 Ω 典型值
- 低功耗: 1 μA 最大值
  - 在扩展的电压范围内 ( $V_{IN}=1.8\text{ V}$ ,  $V_{CC}=4.4\text{ V}$ ), 最大  $I_{CCr}$  电流为 15 μA
- 宽广的 -3 db 带宽: > 720 MHz
- Packaged in:
  - 10-Lead UMLP (1.4 x 1.8 mm)
  - 10-Lead MSOP
- 8 kV 的 ESD, >16 kV 电源对地 ESD
- 当  $V_{CC}=0\text{V}$  时所有管脚有断电保护
  - D+/D- 管脚耐压达 5.25 V
- 在无需额外元件的情况下所有的 USB 端口可耐过压高达 5.25 V

### 描述

FSUSB42 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 (480 Mbps) 或一个高速和全速源 (12 Mbps) 是优化选择。

FSUSB42 是兼容 USB2.0 要求和拥有 3.7 pF 超低电容的特性。元件宽广的带宽 (720 MHz) 超过了需要通过三阶谐波带宽, 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。

FSUSB42 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。这种特性对于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, 数码相机, 打印机, 和笔记本电脑中的切换和

### 应用

- 手机, PDA, 数码相机, 和笔记本
- LCD 显示屏, TV, 和机顶盒

### 订货信息

订货号码	表面标记	操作温度范围	封装
FSUSB42UMX	HE	-40 到 +85°C	10-引脚, 方型, 超薄模塑无脚封 (UMLP), 1.4x1.8 mm
FSUSB42MUX	FSUSB42	-40 到 +85°C	10-引脚, 模塑小外形封装 MSOP0, JEDEC MO-187, 3.0 mm 宽

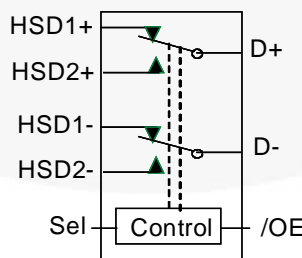


图 1. 模拟符号

### 管脚分配图

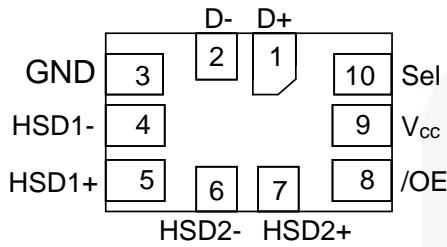


图 2. 管脚分配图10L UMLP(俯视图)

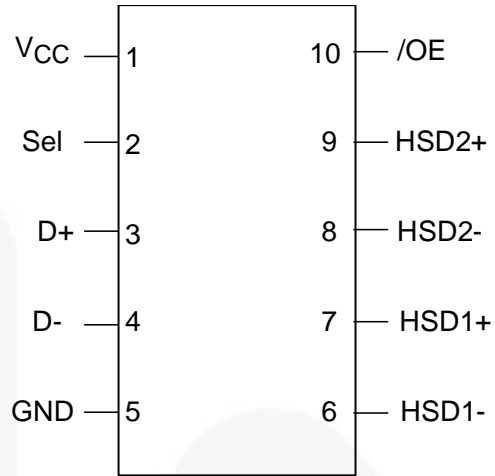


图 3. 10L MSOP管脚分配图(俯视图)

### 管脚定义

UMLP Pin#	MSOP Pin#	管脚名称	描述
1	3	D+	USB数据线
2	4	D-	USB数据线
3	5	GND	接地
4	6	HSD1-	多路复用源输入
5	7	HSD1+	多路复用源输入
6	8	HSD2-	多路复用源输入
7	9	HSD2+	多路复用源输入
8	10	/OE	开关使能
9	1	V <sub>CC</sub>	供电电压
10	2	Sel	开关选择脚

**Notes:**

1. 低  $\leq V_{IL}$ .
2. 高  $\geq V_{IH}$ .
3. X=Don't Care.

### 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 <sub>CC</sub>	供电电压	-0.5	5.6	V
V <sub>CNTRL</sub>	DC 输入电压(S, /OE) <sup>(4)</sup>	-0.5	V <sub>CC</sub>	V
V <sub>SW</sub>	DC 开关 I/O 电压 <sup>(4)</sup> (V <sub>CC</sub> =0V)	-0.50	5.25	V
I <sub>IK</sub>	DC 输入二极管电流	-50		mA
I <sub>OUT</sub>	DC 输出电流		100	mA
T <sub>STG</sub>	储存温度	-65	+150	°C
MSL	湿度敏感性		1	等级
ESD	人体电流模式, JEDEC: JESD22-A114	所有管脚	7	kV
		I/O对地	8	
		D+ / D-	9	
		电源对地	16	
	IEC 61000-4-2 System on USB Connector Pins D+ & D-	Air Discharge	15	
		Contact	8	
	充放电模式, JEDEC: JESD22-C101	2		

注:

4. 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 <sub>CC</sub>	供电电压	2.4	4.4	V
V <sub>CNTRL</sub> <sup>(5)</sup>	控制输入电压 (S, /OE)	0	V <sub>CC</sub>	V
V <sub>SW</sub>	开关 I/O 电压	-0.5	4.5	V
T <sub>A</sub>	操作温度	-40	+85	°C

注:

5. 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 <sub>CC</sub> (V)	T <sub>A</sub> =- 40°C 至 +85°C			单位
				最小	典型	最大	
V <sub>IK</sub>	钳位二极管电压	I <sub>IN</sub> =-18 mA	3.0			-1.2	V
V <sub>IH</sub>	输入高电平		2.4 至 3.6	1.3			V
			4.3	1.7			V
V <sub>IL</sub>	输入低电平		2.4 至 3.6			0.5	V
			4.3			0.7	V
I <sub>IN</sub>	控制输入漏电流	V <sub>SW</sub> =0 to V <sub>CC</sub>	0 至 4.3	-1		1	μA
I <sub>OZ</sub>	断开漏电流	0 ≤ Dn, HSD1n, HSD2n ≤ 3.6 V	4.3	-2		2	μA
I <sub>OFF</sub>	断电漏电流 (所有I/O端口)	V <sub>SW</sub> =0 V to 4.3 V, V <sub>CC</sub> =0 V 见图 5	0	-2		2	μA
R <sub>ON</sub>	高速开关导通电阻 <sup>(6)</sup>	V <sub>SW</sub> =0.4 V, I <sub>ON</sub> =-8 mA 见图 4	2.4		4.5	7.5	Ω
			3.0		3.9	6.5	
ΔR <sub>ON</sub>	高速导通电阻差 <sup>(7)</sup>	V <sub>SW</sub> =0.4V, I <sub>ON</sub> =-8 mA	3.0		0.65		Ω
I <sub>CC</sub>	静态供电电流	V <sub>CNTRL</sub> =0 or V <sub>CC</sub> , I <sub>OUT</sub> =0	4.3			1.0	μA
I <sub>CCT</sub>	控制电压和V <sub>CC</sub> 增加时I <sub>CC</sub> 相应的增加量	V <sub>CNTRL</sub> =2.6 V V <sub>CC</sub> =4.3 V	4.3			10.0	μA
		V <sub>CNTRL</sub> =1.8 V V <sub>CC</sub> =4.3 V	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, 3.3 V V<sub>CC</sub>下的标准值.

表达符号	参数	条件	V <sub>CC</sub> (V)	T <sub>A</sub> =- 40°C 至 +85°C			单位
				最小	典型	最大	
t <sub>ON</sub>	开启时间 S, /OE到输出	R <sub>L</sub> =50 Ω, C <sub>L</sub> =5 pF V <sub>SW</sub> =0.8 V 见图 6, 图 7	2.4		24	40	ns
			3.0 至 3.6		13	30	
t <sub>OFF</sub>	关断时间 S, /OE到输出	R <sub>L</sub> =50 Ω, C <sub>L</sub> =5 pF V <sub>SW</sub> =0.8V 见图 6, 图 7	2.4		15	35	ns
			3.0 至 3.6		12	25	
t <sub>PD</sub>	传播延迟 <sup>(8)</sup>	C <sub>L</sub> =5 pF, R <sub>L</sub> =50 Ω 见图 6, 图 8	3.3		0.25		ns
t <sub>BBM</sub>	先断后开	R <sub>L</sub> =50 Ω, C <sub>L</sub> =5pF V <sub>SW1</sub> =V <sub>SW2</sub> =0.8V 见图 10	2.4	2.0		10	ns
			3.0 至 3.6	2.0		6.5	
O <sub>IRR</sub>	隔离度	R <sub>L</sub> =50Ω, f=240 MHz 见图 12	3.0 至 3.6		-30		dB
Xtalk	非相邻通道串扰	R <sub>L</sub> =50 Ω, f=240 MHz 见图 13	3.0 至 3.6		-45		dB
BW	-3db带宽	R <sub>L</sub> =50 Ω, C <sub>L</sub> =0 pF 见图 11	3.0 至 3.6		720		MHz
		R <sub>L</sub> =50 Ω, C <sub>L</sub> =5 pF 见图 11			550		MHz

注:

8. 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 <sub>CC</sub> (V)	T <sub>A</sub> =- 40°C 至 +85°C			单位
				最小	典型	最大	
t <sub>SK(P)</sub>	同一输出相反传输方向上的 偏差 <sup>(9)</sup>	C <sub>L</sub> =5 pF, R <sub>L</sub> =50 Ω 见图 9	3.0 至 3.6		20		ps
t <sub>J</sub>	总抖动 <sup>(9)</sup>	R <sub>L</sub> =50 Ω, C <sub>L</sub> =5 pf, t <sub>R</sub> =t <sub>F</sub> =500 ps (10-90%) 在480 Mbps时 (PRBS=2 <sup>15</sup> -1)	3.0 至 3.6		200		ps

注:

9. 由特性保证.

## 电容

表达符号	参数	条件	T <sub>A</sub> =- 40°C至 +85°C			单位
			最小	典型	最大	
C <sub>IN</sub>	控制管脚输入电容	V <sub>CC</sub> =0 V		1.5		pF
C <sub>ON</sub>	D+/D- 导通电容	V <sub>CC</sub> =3.3 V, /OE=0V, f=1 MHz 见图 15		3.7		
C <sub>OFF</sub>	D1n, D2n 断开电容	V <sub>CC</sub> and /OE=3.3 V 见图 14		2.0		

测试图

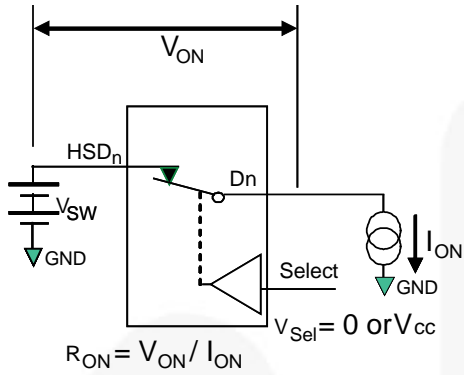
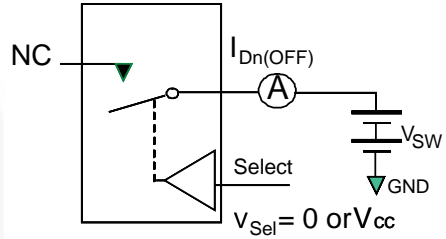
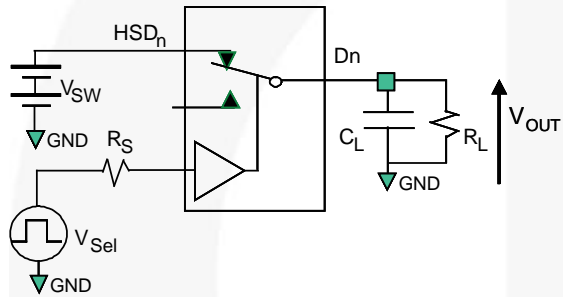


图 4. 导通电阻



\*\*Each switch port is tested separately

图 5. 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

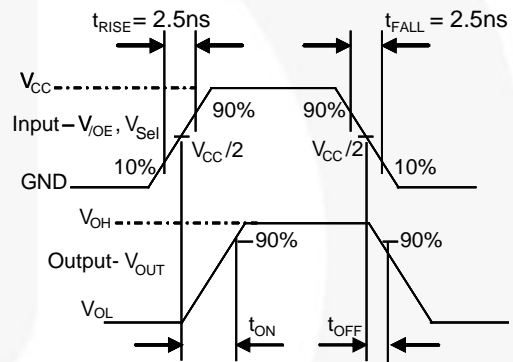


图 7. 开启/关断波形

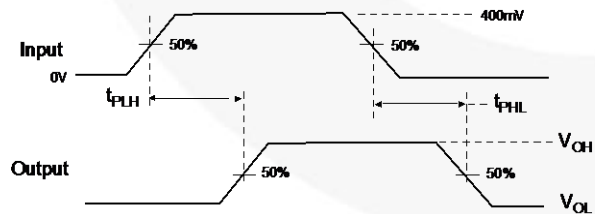


图 8. 传播延迟 ( $t_{rF} = 500ps$ )

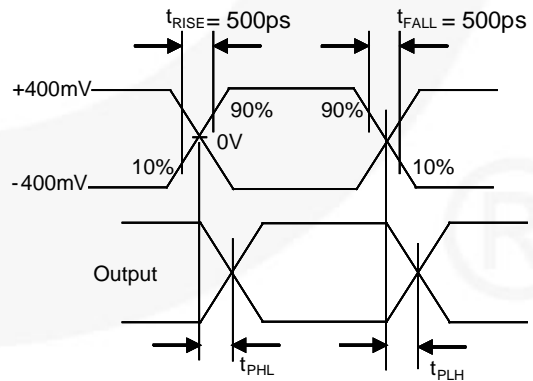


图 9. 对内偏移测试  $t_{sk}(P)$

测试图 (续)

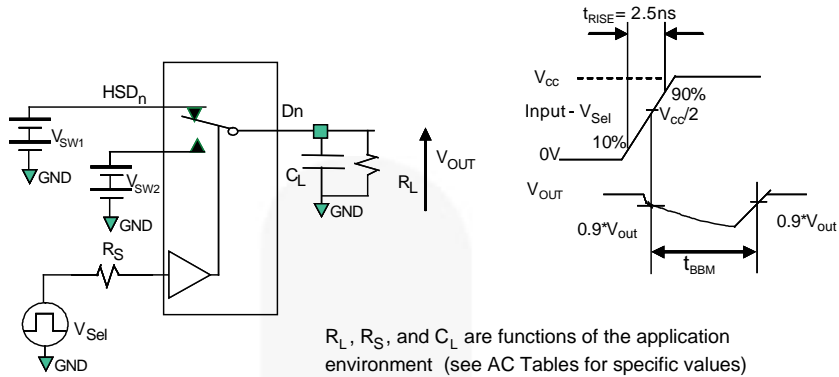


图 10. 先断后开间隔

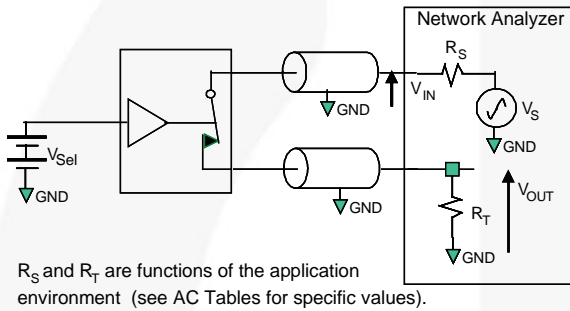


图 11. 带宽

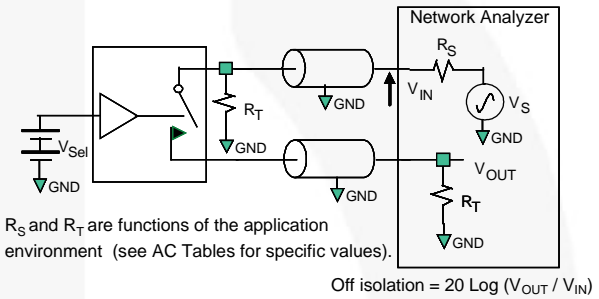


图 12. 通道隔离度

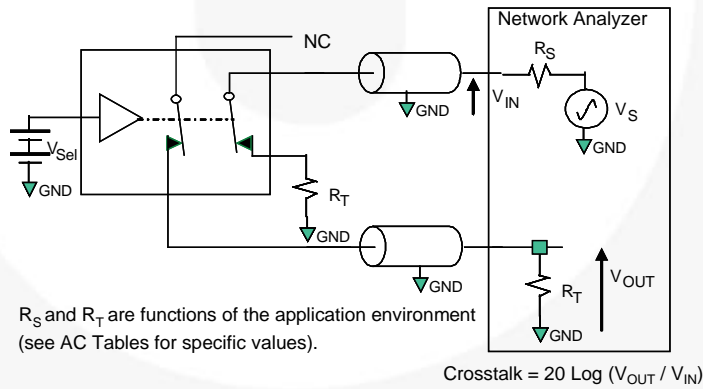


图 13. 非相邻通道串扰

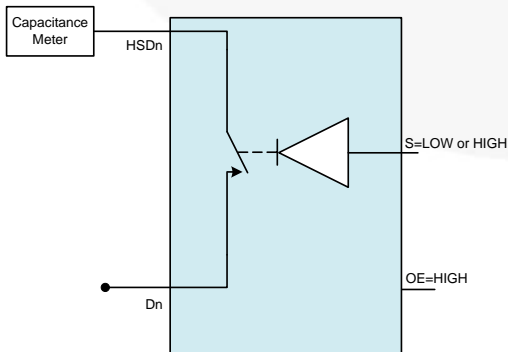


图 14. 通道断开电容

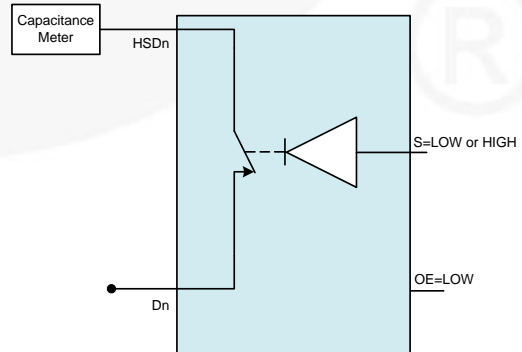
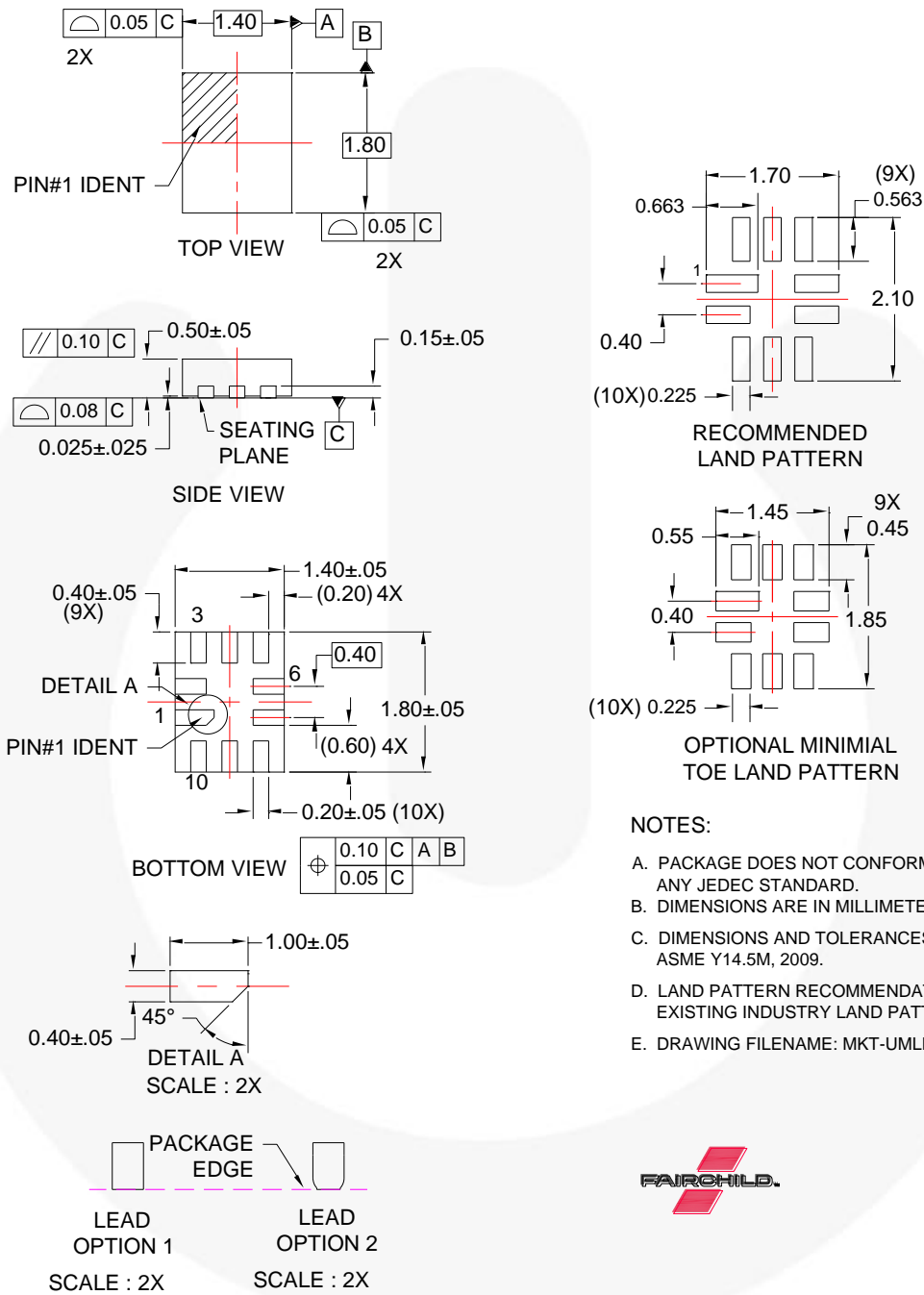


图 15. 通道导通电容



物理尺寸



- NOTES:
- PACKAGE DOES NOT CONFORM TO ANY JEDEC STANDARD.
  - DIMENSIONS ARE IN MILLIMETERS.
  - DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.
  - LAND PATTERN RECOMMENDATION IS EXISTING INDUSTRY LAND PATTERN.
  - DRAWING FILENAME: MKT-UMLP10Arev6.



图 16. 10引脚方型, 超薄模型无脚封装 (UMLP)

物理尺寸 (续)

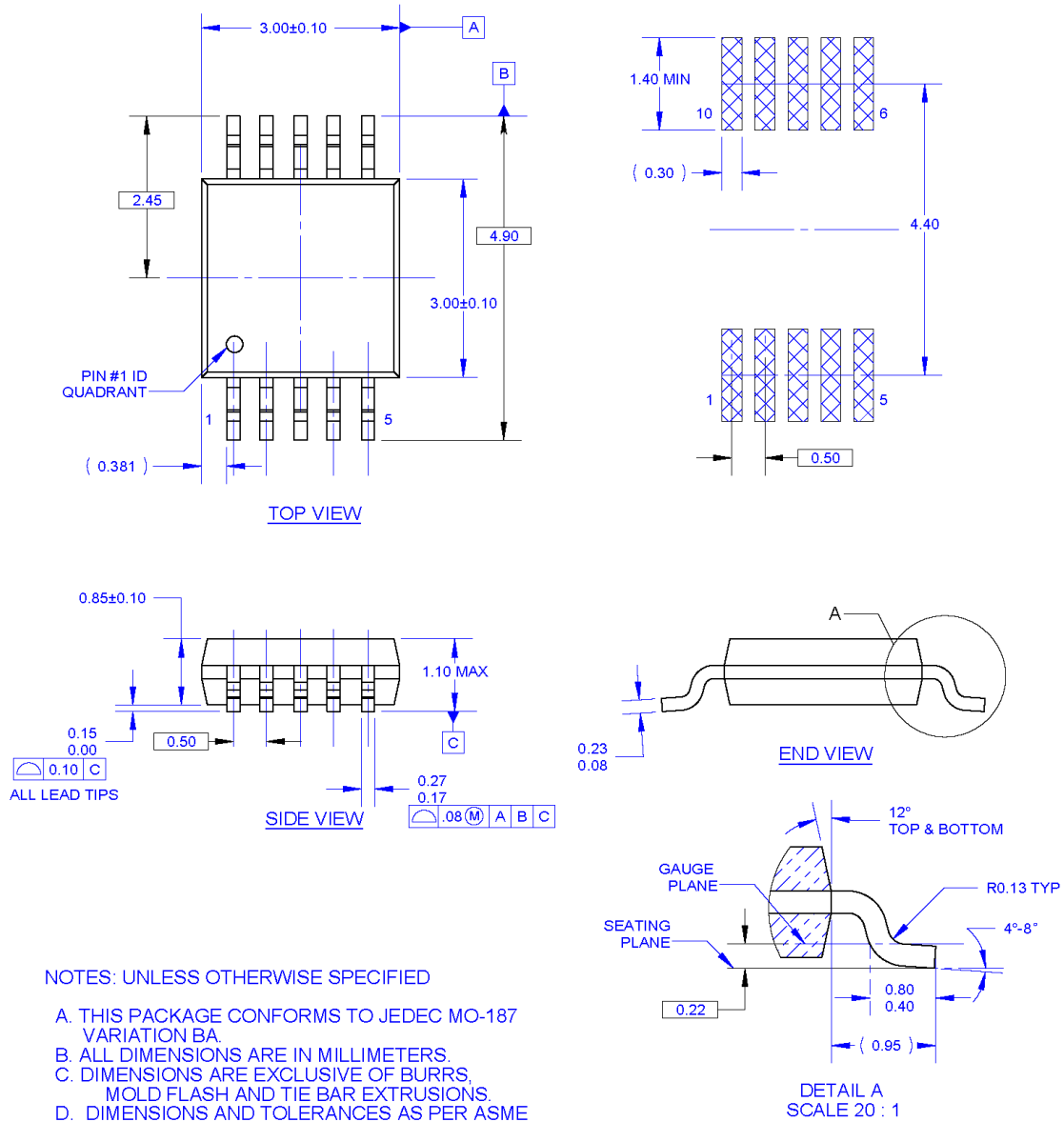


图 17. 10-引脚, 模塑小外形封装 (MSOP)



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| FACT Quiet Series™       | MTI®   | STEALTH™                              | VoltagePlus™     |
| FACT®                    | MTx®   | SuperFET®                             | XS™              |
| FAST®                    | MVN®   | SuperSOT™-3                           | Xsens™           |
| FastvCore™               | mWSaver®                                       | SuperSOT™-6                           | 仙童™              |
| FETBench™                | OptoHiT™                                       | SuperSOT™-8                           |                  |
| FPS™                     | OPTOLOGIC®                                     | SupreMOS®                             |                  |
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