

# 低功耗，双端口，高速 USB2.0 (480 Mbps) 开关

## FSUSB42

### 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。

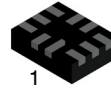
FSUSB42 在开关的 I/O 管脚包含有特殊的电路针对当  $V_{CC} = 0$  时允许元件耐过压的应用。这个元件被设计最小化了电流消耗即使用在 SEL 管脚的控制电压低于供电电。这种特性对手机类超便携式应用尤其重要, 通过它可以直接与基带处理器通用 I/O 口连接。其它应用包括在便携式手机 PDAs, 数字相机, 打印机, 和笔记本电脑中的切换和。

### 特性

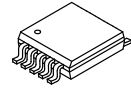
- 低导通电容: 3.7 pF 典型值
- 低导通电阻: 3.9  $\Omega$  典型值
- 低功耗: 1  $\mu$ A 最大值
  - ◆ 在扩展的电压范围内 ( $V_{IN} = 1.8$  V,  $V_{CC} = 4.4$  V), 最大  $I_{CCT}$  电流为 15  $\mu$ A
- 宽广的 -3 db 带宽: > 720 MHz
- Packaged in:
  - ◆ 10-Lead UMLP (1.4 x 1.8 mm)
  - ◆ 10-Lead MSOP
- 8 kV 的 ESD, >16 kV 电源对地 ESD
- 当  $V_{CC} = 0$  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

### 应用

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

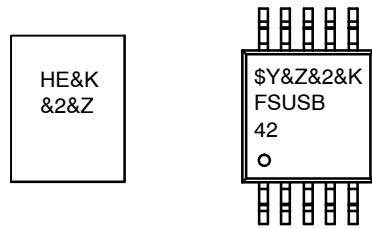


UQFN10 1.4 x 1.8, 0.4 P  
CASE 523BC



MSOP10  
CASE 846AP

### MARKING DIAGRAMS



HE, FSUCB42 = Specific Device Code  
\$Y = onsemi Logo  
&K = 2 Digit Lot Run Traceability Code  
&2 = 2-Digit Date Code  
&Z = Assembly Location

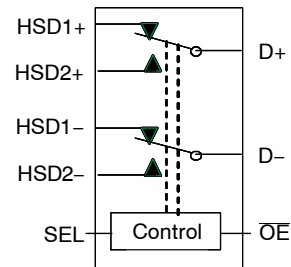


图 1. 模拟符号

### ORDERING INFORMATION

See detailed ordering and shipping information on page 7 of this data sheet.

管脚分配图

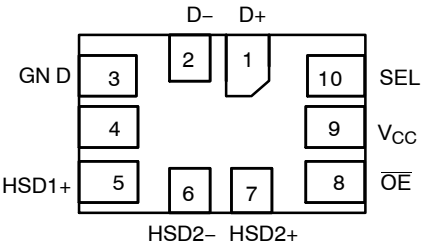


图 2. 管脚分配图 10L UMLP(俯视图)

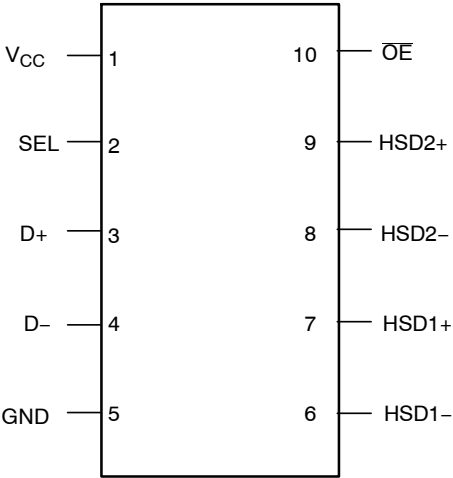


图 3. 10L MSOP 管脚分配图(俯视图)

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	VCC	供电电压
10	2	Sel	开关选择脚

真值表

SEL	OE	功能
X	HIGH	断开
LOW	LOW	D+ = HSD1+, D- = HSD1-
HIGH	LOW	D+ = HSD2+, D- = HSD2-

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

# FSUSB42

## 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		-0.5	5.6	V
$V_{CNTRL}$	DC 输入电压 (S, OE) (说明 4)		-0.5	$V_{CC}$	V
$V_{SW}$	DC 开关 I/O 电压 (说明 4) ( $V_{CC} = 0$ V)		-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
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	-	
		电源对地	16	-	
		D+/D-	9	-	
	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	-	

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

(参考译文)

如果电压超过最大额定值表中列出的值范围, 器件可能会损坏。如果超过任何这些限值, 将无法保证器件功能, 可能会导致器件损坏, 影响可靠性。

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

表达符号	参数		最小值	最大值	单位
$V_{CC}$	供电电压		2.4	4.4	V
$V_{CNTRL}$	控制输入电压 (S, OE) (说明 5)		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

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

(参考译文)

高于推荐工作范围表格中所列电压时, 不保证能够正常运行。长时间在推荐工作范围表格中规定范围以外的电压下运行, 可能会影响器件的可靠性。

5. 控制输入必须保持高电平或 低电平且不得悬空。

## 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)	$T_A = -40^{\circ}\text{C to } +85^{\circ}\text{C}$			单位
				最小	典型	最大	
$V_{IK}$	钳位二极管电压	$I_{IN} = 18$ mA	3.0	-	-	-1.2	V
$V_{IH}$	输入高电平		2.4 至 3.6	1.3	-	-	V
			4.3	1.7	-	-	
$V_{IL}$	输入低电平		2.4 至 3.6	-	-	0.5	V
			4.3	-	-	0.7	
$I_{IN}$	控制输入漏电流	$V_{SW} = 0$ to $V_{CC}$	0 至 4.3	-1	-	1	μA
$I_{OZ}$	断开漏电流	$0 \leq Dn, HSD1n, HSD2n \leq 3.6$ V	4.3	-2	-	2	μA
$I_{OFF}$	断电漏电流 (所有 I/O 端口)	$V_{SW} = 0$ V to 4.3 V, $V_{CC} = 0$ V 图 5	0	-2	-	2	μA

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## DC 电气特性 (continued) (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 to +85°C			单位
				最小	典型	最大	
R <sub>ON</sub>	高速开关导通电阻 (说明 6)	V <sub>SW</sub> = 0.4 V, I <sub>ON</sub> = 8 mA 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 (说明 7)	V <sub>SW</sub> = 0.4, 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	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 <sub>CC</sub> = 4.3 V	4.3	–	–	10	μA
		V <sub>CNTRL</sub> = 1.8, V <sub>CC</sub> = 4.3 V	4.3	–	–	15	μA

6. 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。  
7. 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 to +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, 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> = 0.8 V, 图 6, 图 7	2.4	–	15	35	ns
			3.0 至 3.6	–	12	25	
t <sub>PD</sub>	传播延迟 (说明 8)	C <sub>L</sub> = 5 pF, R <sub>L</sub> = 50 Ω, 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> = 5 pF, V <sub>SW1</sub> = V <sub>SW2</sub> = 0.8 V, 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> = 50 Ω, f = 240 MHz, 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, 图 13	3.0 至 3.6	–	–45	–	dB
BW	–3 db 带宽	R <sub>L</sub> = 50 Ω, C <sub>L</sub> = 0 pF, 图 11	3.0 至 3.6	–	720	–	MHz
		R <sub>L</sub> = 50 Ω, C <sub>L</sub> = 5 pF, 图 11		–	550	–	MHz

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 to +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 (说明 9)	C <sub>L</sub> = 5 pF, R <sub>L</sub> = 50 Ω, 图 9	–	–	20	–	ps
t <sub>J</sub>	总抖动 (说明 9)	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)	–	–	200	–	ps

9. 由特性保证。

## 电容

表达符号	参数	条件	T <sub>A</sub> = -40°C to +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 = 0 V, f = 240 MHz, 图 15	–	3.7	–	pF
C <sub>OFF</sub>	D1n, D2n 断开电容	V <sub>CC</sub> and OE = 3.3 V, 图 14	–	2.0	–	pF

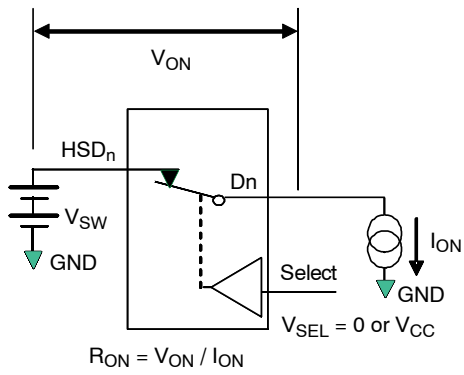
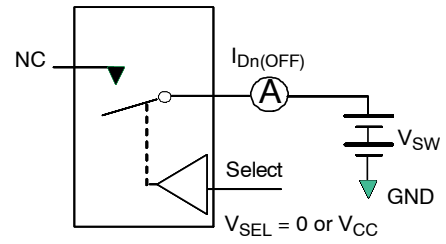
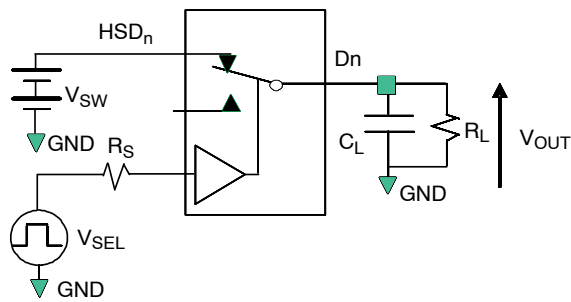


图 4. 导通电阻



**\*\*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**

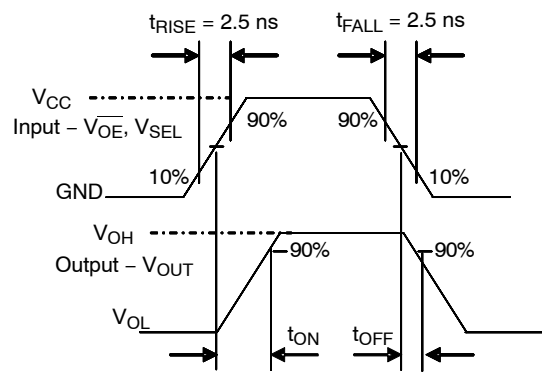


图 7. 开启 / 关断波形

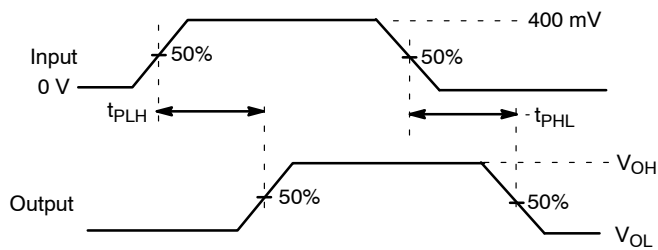


图 8. 传播延迟 ( $t_{RTF} = 500$  ps)

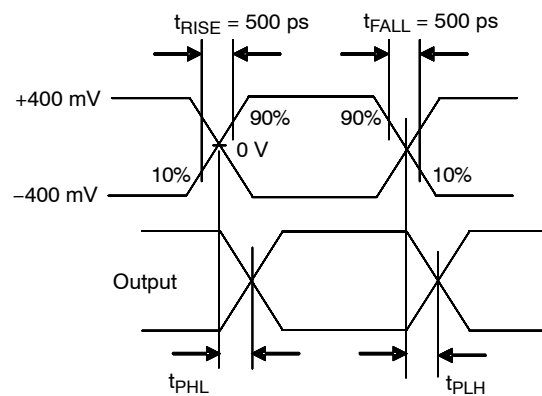


图 9. 对内偏移测试 $t_{SK(P)}$

测试图 (续)

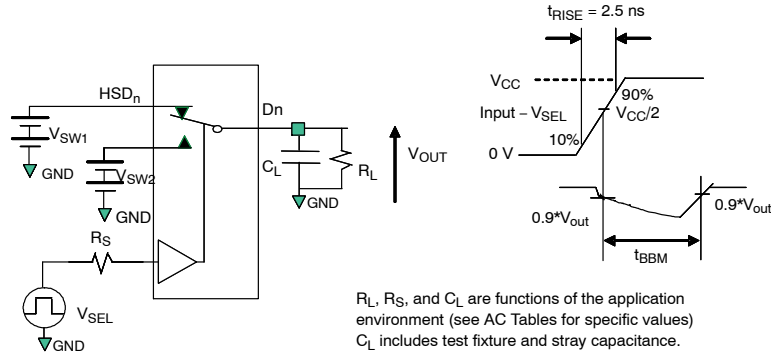


图 10. 先断后开间隔

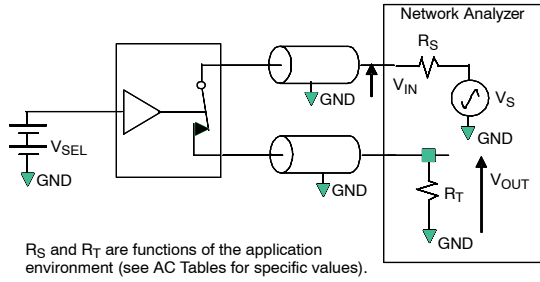


图 11. 带宽

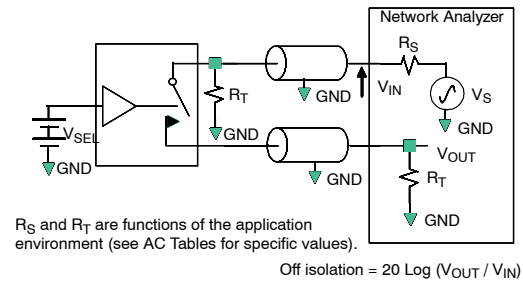


图 12. 通道隔离度

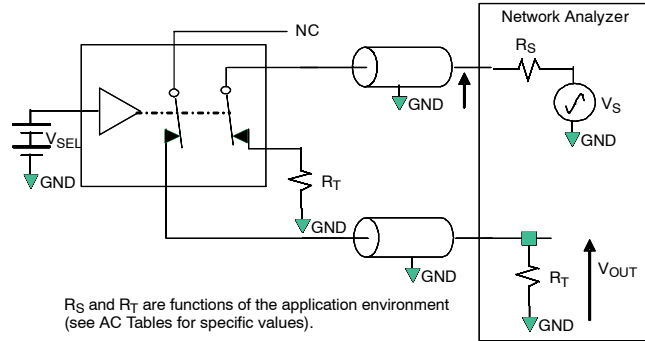


图 13. 非相邻通道串扰

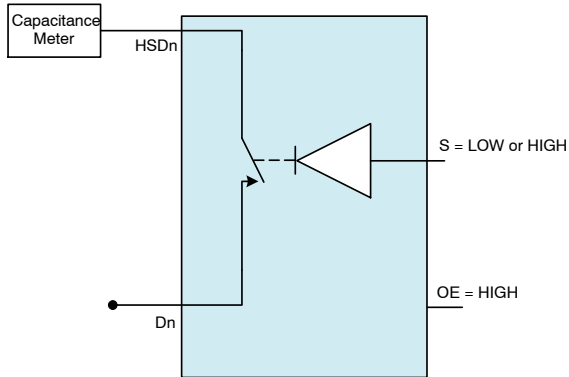


图 14. 通道断开电容

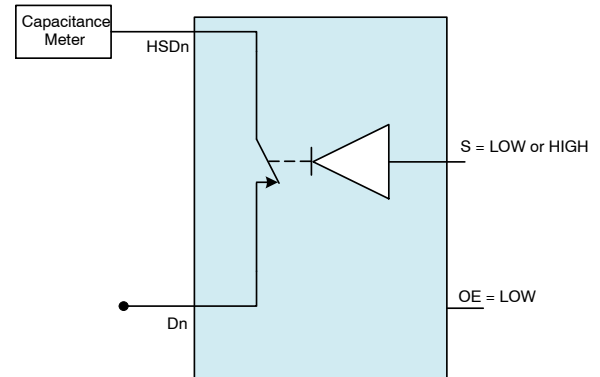


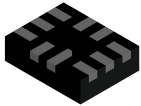
图 15. 通道导通电容

## FSUSB42

### 订货信息

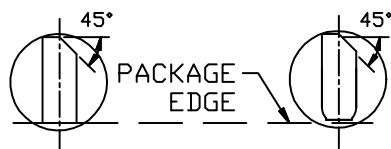
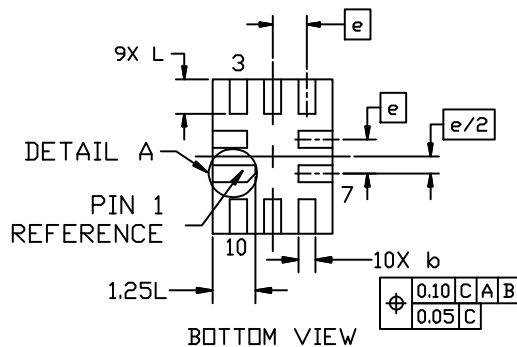
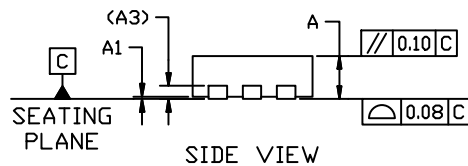
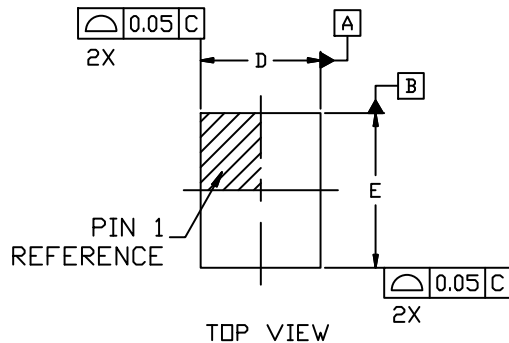
订货号码	表面标记	操作温度范围	封装	Shipping <sup>†</sup>
FSUSB42UMX	HE	-40 至 85°C	10-引脚, 方型, 超薄模塑无脚封 (UQFN10), 1.4 × 1.8 mm	5000 / Tape and Reel
FSUSB42MUX	FSUSB42	-40 至 85°C	10-引脚, 模塑小外形封装 (MSOP) JEDEC MO-187, 3.0 mm 宽	4000 / Tape and Reel

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.



**UQFN10 1.4x1.8, 0.4P**  
CASE 523BC  
ISSUE B

DATE 13 MAY 2022

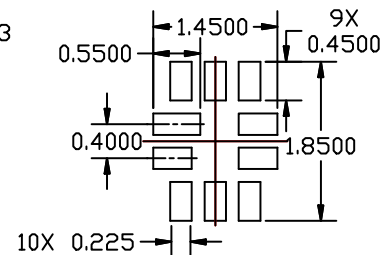
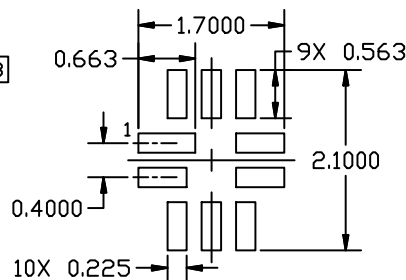


OPTIONAL CONSTRUCTIONS

### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5, 2018
2. ALL DIMENSIONS ARE IN MILLIMETERS
3. DIMENSION *b* APPLIES TO PLATED TERMINALS AND IS MEASURED BETWEEN 0.15mm AND 0.30mm FROM THE TERMINAL TIP.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.45	0.50	0.55
A1	0.00	0.025	0.05
A3	0.152 REF		
<i>b</i>	0.15	0.20	0.25
D	1.35	1.40	1.45
E	1.75	1.80	1.85
<i>e</i>	0.40 BSC		
L	0.35	0.40	0.45



RECOMMENDED LAND PATTERN

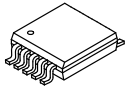
OPTIONAL MINIMAL TOE LAND PATTERN

### RECOMMENDED MOUNTING FOOTPRINT

For additional information on our Pb-Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

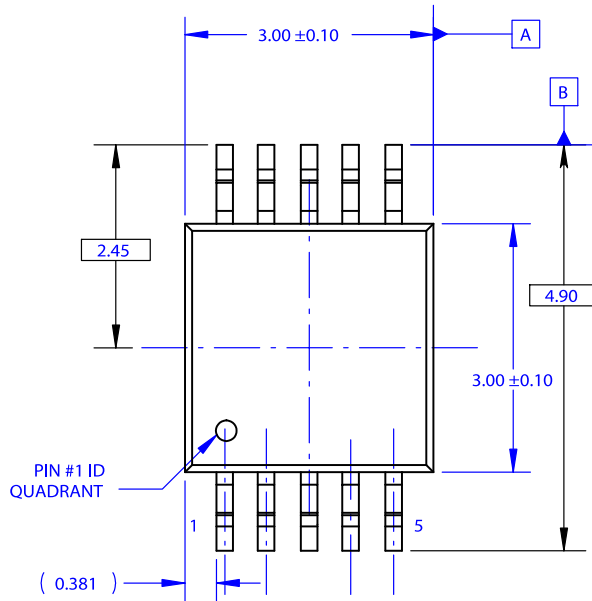
<b>DOCUMENT NUMBER:</b>	<b>98AON13705G</b>	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
<b>DESCRIPTION:</b>	<b>UQFN10 1.4x1.8, 0.4P</b>	<b>PAGE 1 OF 1</b>

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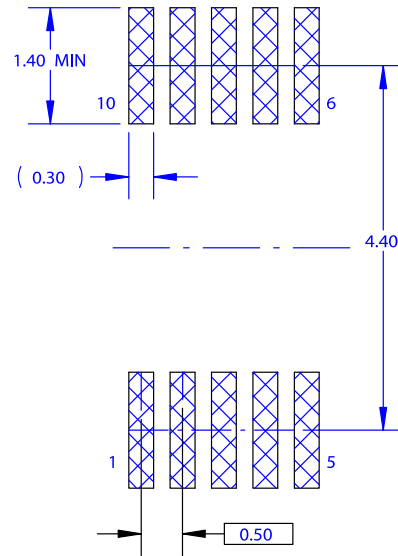


**MSOP10**  
**CASE 846AP**  
**ISSUE O**

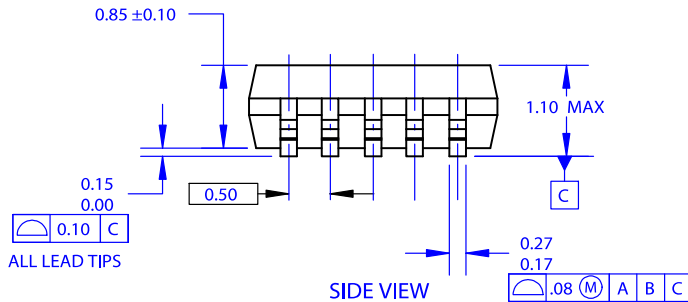
DATE 31 JAN 2017



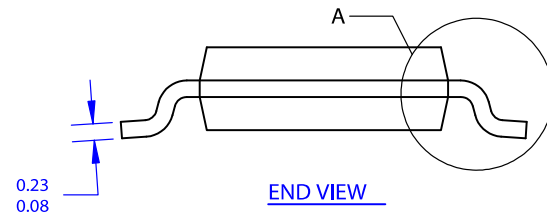
TOP VIEW



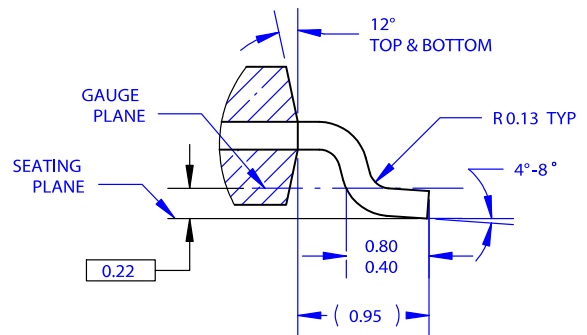
LAND PATTERN RECOMMENDATION



SIDE VIEW



END VIEW



DETAIL A  
SCALE 20 : 1

**NOTES: UNLESS OTHERWISE SPECIFIED**

- A. THIS PACKAGE CONFORMS TO JEDEC MO-187 VARIATION BA.
- B. ALL DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR EXTRUSIONS.
- D. DIMENSIONS AND TOLERANCES AS PER ASME Y14.5-1994.
- E. LAND PATTERN AS PER IPC7351#SOP50P490X110-10AN

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