HY14E10/HY14E10M

Datasheet

Digital Pressure Sensor Platform

Table of Contents

注意：

1、 本說明書中的內容，隨著產品的改進，有可能不經過預告而更改。請客戶及時到本公司網站下載更新 http://www.hycontek.com。

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7、 本公司一直致力於提高產品的品質和可靠度，但所有的半導體產品都有一定的失效概率，這些失效概率可能會導致一些人身事故、火災事故等。當設計產品時，請充分留意冗餘設計並採用安全指標，這樣可以避免事故的發生。

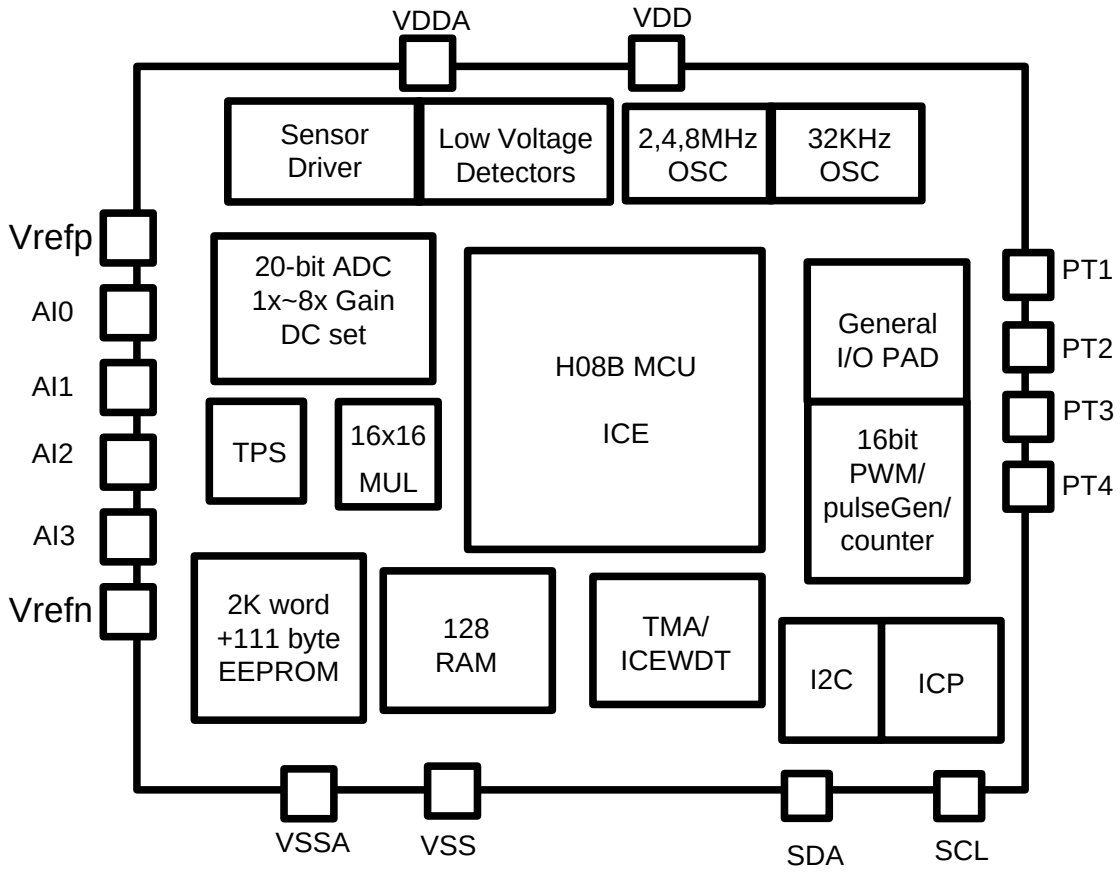
8、 本規格書中內容，未經本公司許可，嚴禁用於其他目的之轉載或複製。

1. 特點

- 用於 整合式 壓阻壓力傳感器
  - 內建一個 20位元ADC，用於電壓和溫度測量
  - 內建 一個PGA輸入信號放大
- 較寬的工作電壓範圍: 2.0V ~ 5.5V
- 內建 2K words EEPROM
  - 支援線上燒錄
  - 100,000燒錄次數
- 128 bytes SRAM
- 16bit x 16bit 硬體乘法器
- I^2C從機通訊界面
- 4 個通用 I/O 埠(PT0/PT1 支援輸入中斷功能)
- 16-bit PWM
- 2 線式JTAG開發介面(與I^2C共用)
- 可程式感測器驅動電壓
- 只有VDD外部電容是必需的
- 內建VDDA LDO(選擇性啓動)
- 兩組類比多工輸入

2. 功能概述

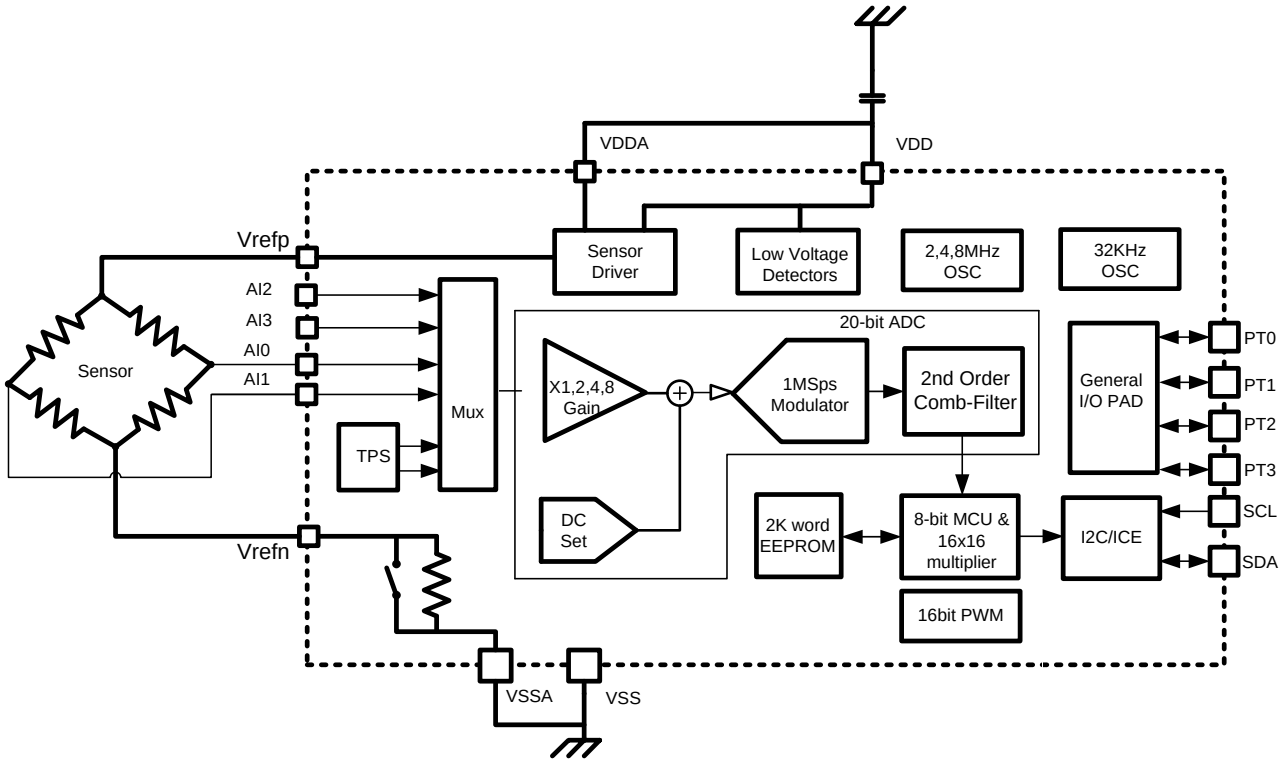
2.1. 內部方塊圖



應用類別 ： *Smart Pressure Sensor

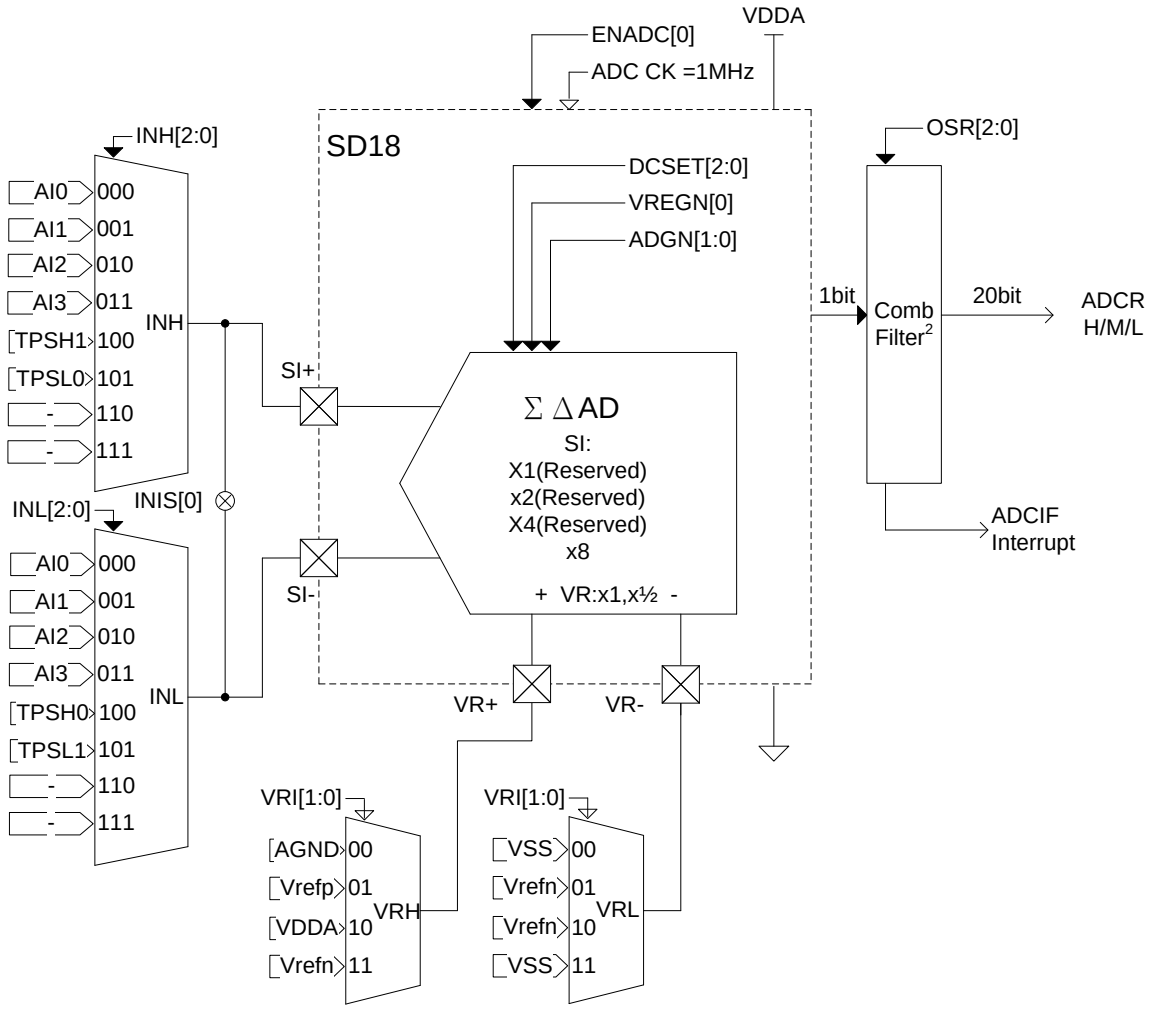
Note： 在電壓放大倍率 x1/x2/x4 為 Reserved，建議使用 8 倍放大倍率。

2.2. 應用電路



Note： 在電壓放大倍率 x1/x2/x4 為 Reserved，建議使用 8 倍放大倍率。

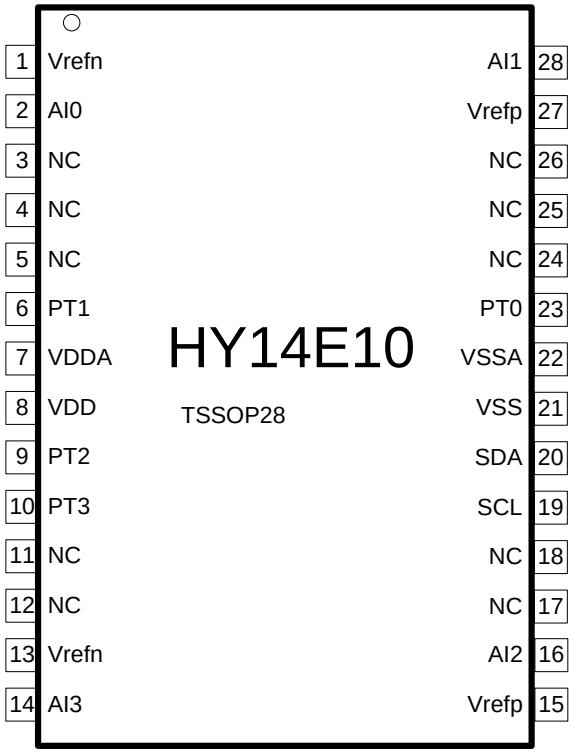
2.3. SD18 Network



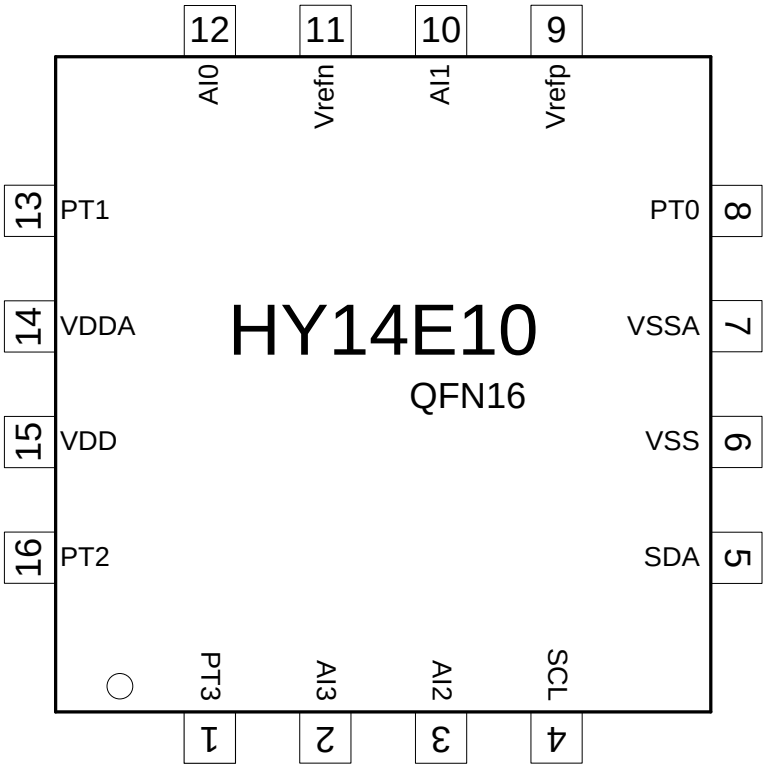
Note： 在電壓放大倍率 x1/x2/x4 為 Reserved，建議使用 8 倍放大倍率。

3. 包裝與引腳定義

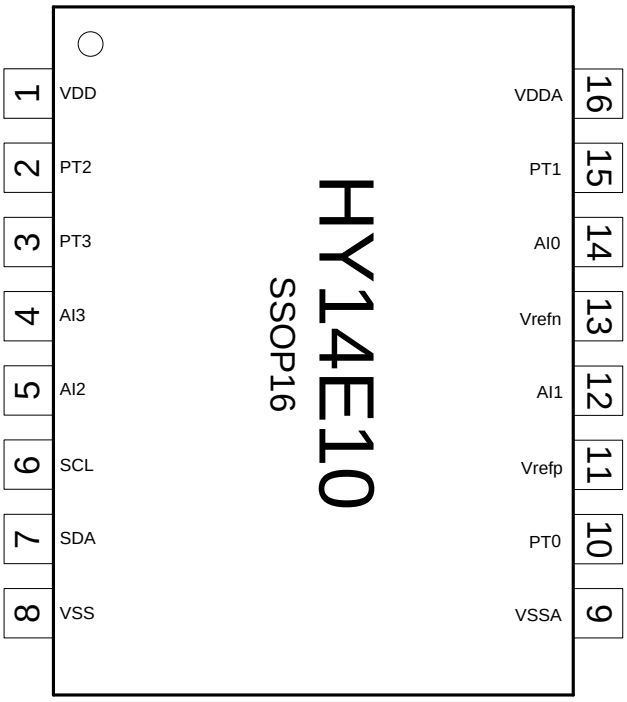
3.1. TSSOP28(T028)引腳圖



3.2. QFN16(N016)引腳圖



3.3. SSOP16(E016)引腳圖



3.4. 引腳定義說明

"I/O" Input/Output, "I" Input, "O" Output, "D" Digital Open-Drain, "S" Schmitt Trigger, "C" CMOS, "P" Power, "A" Analog

N016	E016	T028	Pin	Characteristic		Description
			Name	I/O	Type	
11	13	1	Vrefn	O	A	**Sense Ground.** Used to ground resistive bridge sensor.
12	14	2	AI0	I	A	**Sensing Input 0.** Used for analog input to ADC multiplexer
-	-	3~5	NC	-	-	**No Connect**
13	15	6	PT1	I/O	S	**Digital Input/Output Port 1** Used as general digital input or output pad. It has level change interrupt
14	16	7	VDDA	I	P	**Analog Power Supply.** A 2.0V ~ 5.5V voltage input. (Short with VDD by wire bonding or LDO output option)
15	1	8	VDD	I	P	**Power Supply.** A 2.0V ~ 5.5V voltage input. Connect a 1uF capacitor to VSS.
16	2	9	PT2	I/O	S	**Digital Input/Output Port 2** Used as general digital input or output pad. It has level

						change interrupt
1	3	10	PT3	I/O	S	**Digital Input/Output Port 3** Used as general digital input or output pad
-	-	11~12	NC	-	-	**No Connect**
-	-	13	Vrefn	O	A	**Sense Ground.** Used to ground resistive bridge sensor.
2	4	14	AI3	I	A	**Sensing Input 3.** Used for analog input to ADC multiplexer
-	-	15	Vrefp	O	A	**Power Supply.** Used to power resistive bridge sensor.
3	5	16	AI2	I	A	**Sensing Input 2.** Used for analog input to ADC multiplexer
-	-	17~18	NC	-	-	**No Connect**
4	6	19	SCL	I	C	**I2C Serial Clock Input.** Slave I2C communication clock line
5	7	20	SDA	I/O	D	**I2C Serial Data Input/Output** Slave I2C communication data line. Open-drain output. Use with an external pull-up resistor
6	8	21	VSS	I	P	**Device Ground.**
7	9	22	VSSA	I	P	**Device Analog Ground.**
8	10	23	PT0	I/O	S	**Digital Input/Output Port 0** Used as general digital input or output pad
-	-	24~26	NC	-	-	**No Connect**
9	11	27	Vrefp	O	A	**Power Supply.** Used to power resistive bridge sensor.
10	12	28	AI1	I	A	**Sensing Input 1.** Used for analog input to ADC multiplexer

4. 暫存器列表

“-”no use,“*”read/write,“w”write,“r”read,“r0”only read 0,“r1”only read 1,“w0”only write 0,“w1”only write 1											
“$”for event status,“.”unimplemented bit,“x”unknown,“u”unchanged,“d”depends on condition											
Address	**File Name**	**Bit7**	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**	**A-RESET**	**R/W**
00H	INDF0	Contents of FSR0 to address data memoryvalue of FSR0 not changed								N/A	*,*,*,*,*,*,*,*
0FH	FSR0H									x	-,-,-,- -,-,-,*
10H	FSR0L	Indirect Data Memory Address Pointer 0 Low Byte,FSR0[7:0]								xxxx xxxx	*,*,*,*,*,*,*,*
16H	TOSH	-	-	-	-	-	TOS[10]	TOS[9]	TOS[8]	 0000	-,-,-,- *,*,*,*
17H	TOSL	Top-of-Stack Low Byte (TOS<7:0>)								0000 0000	*,*,*,*,*,*,*,*
18H	STKPTR	STKFL	STKUN	STKOV	-	-	STKPRT[2:0]			000. .000	r,rw0,rw0,- -,r,r,r
1AH	PCLATH	-	-	-	-	-	PC[10]	PC[9]	PC[8]	 0000	-,-,-,- *,*,*,*
1BH	PCLATL	PC Low Byte for PC<7:0>								0000 0000	*,*,*,*,*,*,*,*
1DH	TBLPTRH	TBLW+	TBLW	TBLR+	TBLR	TBLPTR[11]	TBLPTR[10]	TBLPTR[9]	TBLPTR[8]	 0000	-,-,-,- *,*,*,*
1EH	TBLPTRL	Program Memory Table Pointer Low Byte (TBLPTR<7:0>)								0000 0000	*,*,*,*,*,*,*,*
20H	TBLDL	Program Memory Table Latch Low Byte								0000 0000	*,*,*,*,*,*,*,*
23H	INTE0	GIE	ADCIE	TMBIE	TMAIE	LVD_BE	LVDE	E1IE	E0IE	000. 0000	*,*,*,*,*,*,*,*
24H	INTE1	I2CW7IE	I2CW6IE	I2CW5IE	I2CW4IE	I2CW3IE	I2CW2IE	I2CW1IE	I2CW0IE	000. 0000	*,*,*,*,*,*,*,*
25H	INTE2	-	-	-	-	-	I2CW10IE	I2CW9IE	I2CW8IE	000. 0000	*,*,*,*,*,*,*,*
26H	INTF0	-	ADCIF	TMBIF	TMAIF	LVD_BF	LVDF	E1IF	E0IF	000. 0000	w0
27H	INTF1	I2CW7IF	I2CW6IF	I2CW5IF	I2CW4IF	I2CW3IF	I2CW2IF	I2CW1IF	I2CW0IF	000. 0000	w0
28H	INTF2	-	-	-	-	-	I2CW10IF	I2CW9IF	I2CW8IF	000. 0000	w0
29H	WREG	Working Register								xxxx xxxx	*,*,*,*,*,*,*,*
2BH	STATUS	-	-	-	C	-	-	-	Z	...x xxxx	-,-,-,- *,*,*,*
2CH	PSTATUS	BOR	PD	-	IDLE	ICP_Crst	STK_ERR	I2C_RST	I2C_GC_RST	000d .0..	rw0,rw0,rw0,rw0 -,rw0,-,-
2DH	ADCR0H	ADC[19:12]								xxxx xxxx	*,*,*,*,*,*,*,*
2EH	ADCR0M	ADC[11:4]								xxxx xxxx	*,*,*,*,*,*,*,*
2FH	ADCR0L	ADC[3:0]				0	0	0	0	xxxx xxxx	*,*,*,*,*,*,*,*
30H	ADCR1H	ADC[19]	ADC[19]	ADC[19]	ADC[19]	ADC[19]	ADC[18]	ADC[17]	ADC[16]	xxxx xxxx	*,*,*,*,*,*,*,*
31H	ADCR1M	ADC[15:8]								xxxx xxxx	*,*,*,*,*,*,*,*
32H	ADCR1L	ADC[7:0]								xxxx xxxx	*,*,*,*,*,*,*,*
33H	PWRCN0	ENBGR	ENTPS	ENSDR	INIS	TPSL	ENLDO	ENLVD	ENADC	000. 0000	*,*,*,*,*,*,*,*
34H	PWRCN1	ADHV	SDRV[1:0]		LVDV[1:0]		LDOV[1:0]		LVDO	000. 0000	*,*,*,*,*,*,*,*
35H	ADCCN0	OSR[2:0]			VREGN	ADG[1:0]		SACM[1:0]		000. 0000	*,*,*,*,*,*,*,*
36H	ADCCN1	INL[2:0]			INH[2:0]			VRI[1:0]		000. 0000	*,*,*,*,*,*,*,*
37H	ADCCN2	DCSET[2:0]			TCR[1:0]		-	-	ADRST	000. 0000	*,*,*,*,*,*,*,*
38H	CLKCN	-	-	-	HAOM[1:0]		CPUCKS	ENHAO	ENLPO	000. 0011	*,*,*,*,*,*,*,*
39H	AL_MO0	LSB for multiplexer input A / LSB for multiplexer output								xxxx xxxx	*,*,*,*,*,*,*,*
3AH	AH_MO1	MSB for multiplexer input A / 15-8 bit multiplexer output								xxxx xxxx	*,*,*,*,*,*,*,*
3BH	BL_MO2	LSB for multiplexer input B / 23-16 bit multiplexer output								xxxx xxxx	*,*,*,*,*,*,*,*
3CH	BH_MO3	MSB for multiplexer input B / MSB for multiplexer output								xxxx xxxx	*,*,*,*,*,*,*,*
3DH	PT0	-	-	PT0EG[1:0]		ENPWM1O	PU0	TC0	PT0IO	000. 0000	*,*,*,*,*,*,*,*
3EH	PT1	-	-	PT1EG[1:0]		ENPWM0O	PU1	TC1	PT1IO	000. 0000	*,*,*,*,*,*,*,*
3FH	PT2	-	-	-	-	ENPWM1O	PU2	TC2	PT2IO	000. 0000	*,*,*,*,*,*,*,*
40H	PT3	-	-	-	-	ENPWM0O	PU3	TC3	PT3IO	000. 0000	*,*,*,*,*,*,*,*

表 4-1 資料記憶體列表

										“-”no use,“*”read/write,“w”write,“r”read,“r0”only read 0,“r1”only read 1,“w0”only write 0,“w1”only write 1	
										“$”for event status,“.”unimplemented bit,“x”unknown,“u”unchanged,“d”depends on condition	
Address	**File Name**	**Bit7**	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**	**A-RESET**	**R/W**
41H	LSB_SEL	SEL_FLAG[7:0]								0000 0000	********
42H	I2C_CMD	TIP	scu_L3	SP	0	0	0	0	EN_SCLO	0000 0000	RRRRRRRW
43H	I2C_O0	I2C Data Output Buffer 0								xxxx xxxx	w
44H	I2C_O1	I2C Data Output Buffer 1								xxxx xxxx	w
45H	I2C_O2	I2C Data Output Buffer 2								xxxx xxxx	w
46H	I2C_O3	I2C Data Output Buffer 3								xxxx xxxx	w
47H	I2C_O4	I2C Data Output Buffer 4								xxxx xxxx	w
48H	I2C_O5	I2C Data Output Buffer 5								xxxx xxxx	w
49H	I2C_O6	I2C Data Output Buffer 6								xxxx xxxx	w
4AH	I2C_O7	I2C Data Output Buffer 7								xxxx xxxx	w
4BH	I2C_I0	I2C Data Intput Buffer 0								xxxx xxxx	r
4CH	I2C_I1	I2C Data Intput Buffer 1								xxxx xxxx	r
4DH	I2C_I2	I2C Data Intput Buffer 2								xxxx xxxx	r
4EH	I2C_I3	I2C Data Intput Buffer 3								xxxx xxxx	r
4FH	I2C_I4	I2C Data Intput Buffer 4								xxxx xxxx	r
50H	I2C_I5	I2C Data Intput Buffer 5								xxxx xxxx	r
51H	I2C_I6	I2C Data Intput Buffer 6								xxxx xxxx	r
52H	I2C_I7	I2C Data Intput Buffer 7								xxxx xxxx	r
53H	I2C_I8	I2C Data Intput Buffer 8								xxxx xxxx	r
54H	I2C_I9	I2C Data Intput Buffer 9								xxxx xxxx	r
55H	I2C_I10	I2C Data Intput Buffer 10								xxxx xxxx	r
56H	TMACN	ENTMA	TMACL	TMAS	DTMA[2:0]			-	-	0000 $000	*,*,*,* rw1,*,*,*
57H	TMAR	TMAR[7:0]								0000 0000	r,r,r,r r,r,r,r
58H	TB1CN0	ENTMB	TB1M[1:0]		DTMB[1:0]		-	-	TMBCL	0000 0000	*,*,*,*,*,*,*,*
59H	TB1C0L	TimerB1 counter Condition Register0 [7:0]								xxxx xxxx	*,*,*,*,*,*,*,*
5AH	TB1C0H	TimerB1 counter Condition Register0 [15:8]								xxxx xxxx	*,*,*,*,*,*,*,*
5BH	TB1C1L	TimerB1 counter Condition Register1 [7:0]								xxxx xxxx	*,*,*,*,*,*,*,*
5CH	TB1C1H	TimerB1 counter Condition Register1 [15:8]								xxxx xxxx	*,*,*,*,*,*,*,*
5EH	EE_CTRL	EN_TBL	PGM	0	0	0	0	0	0		0,1,1,1,1,1,0,0
80H ~ FFH	GPR0	General Purpose Register as 128Byte								xxxx xxxx	

表 4-2 資料記憶體列表(續)

5. 電氣特性

5.1. Absolute Maximum Ratings

Absolute maximum ratings over operating free-air temperature (unless otherwise noted)

Voltage applied at VDD to VSS(VSSA) ..... −0.3 V to 6.5 V

Voltage applied at VDDA to VSS(VSSA) ..... −0.3 V to V_{DD} + 0.3 V

Voltage applied to any pin ..... −0.3 V to V_{DD} + 0.3 V

Storage temperature range, Tstg: (unprogrammed device) ..... −55℃ to 150℃

(programmed device)..... −40℃ to 85℃

Operating temperature range ..... −40℃ to 85℃

5.2. Power System

Typical values are at TA = 25℃ and VDD = 3.0V.

Sym.	Parameter	Test Conditions	Min.	Typ.	Max.	unit
V_{DD}	Supply Voltage		2.0		5.5	V
SDR	Vs error	After Trim		1%		V
	Temperature drift	VDD=VDDA=3.5V, TA=-−40℃~125℃		100		ppm/C
	Driving Current	VDD – Vs > 0.15			1000	uA
	Sensor Drive Voltage	SDRV[1:0]=00		1.65		V
		SDRV[1:0]=01		2.2		
		SDRV[1:0]=10		2.8		
		SDRV[1:0]=11		3.8		
VDDA LDO	Current	VDDA = 1.65		12		uA
	Temperature drift	VDD=3.5V, TA=-−40℃~125℃		100		ppm/C
	C load		100		10,000	nF
	R load			10K		KOhm
		LDOV[1:0]=00		1.8		V
		LDOV[1:0]=01		2.3		
		LDOV[1:0]=10		3.0		
		LDOV[1:0]=11		3.95		

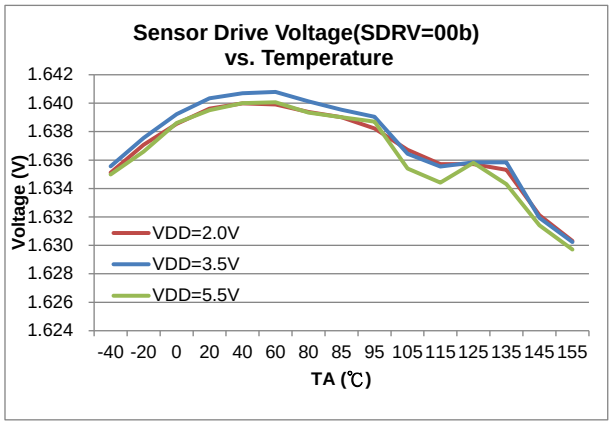


Figure 5.2-1(a) SDR vs. Temperature

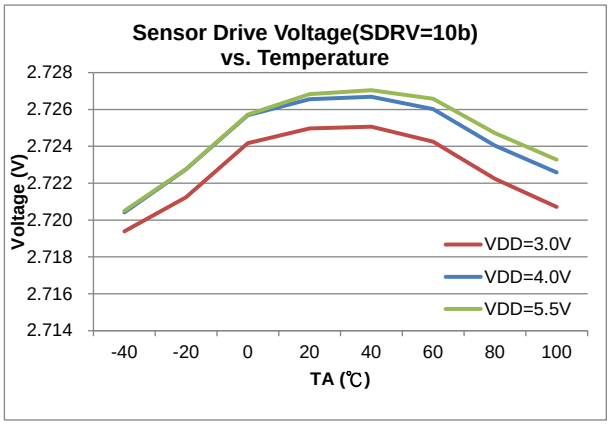


Figure 5.2-1(c) SDR vs. Temperature

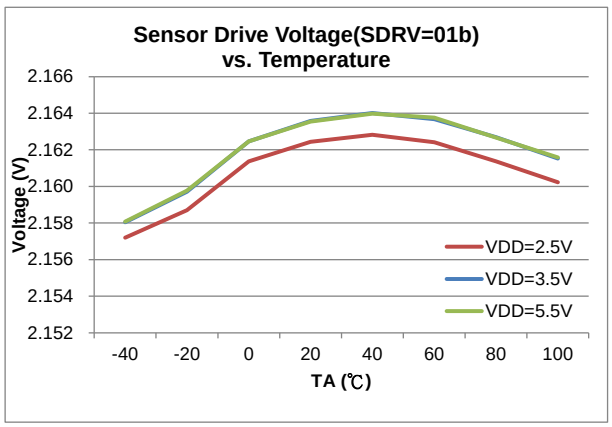


Figure 5.2-1(b) SDR vs. Temperature

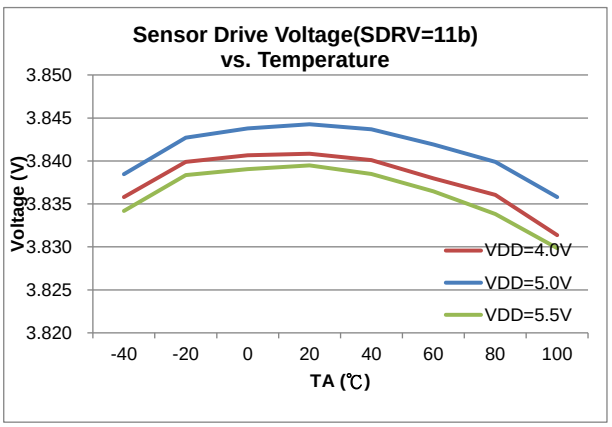


Figure 5.2-1(d) SDR vs. Temperature

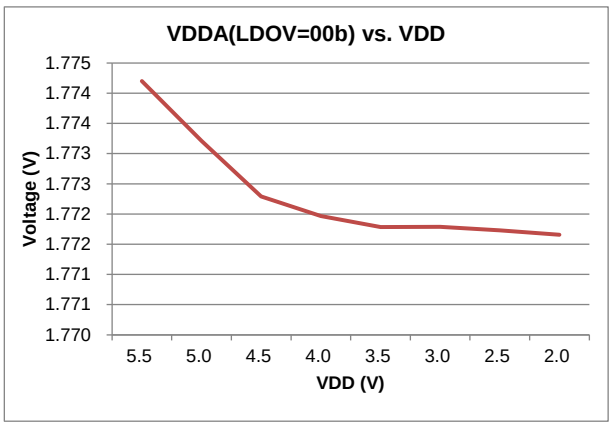


Figure 5.2-2(a) VDDA vs. VDD

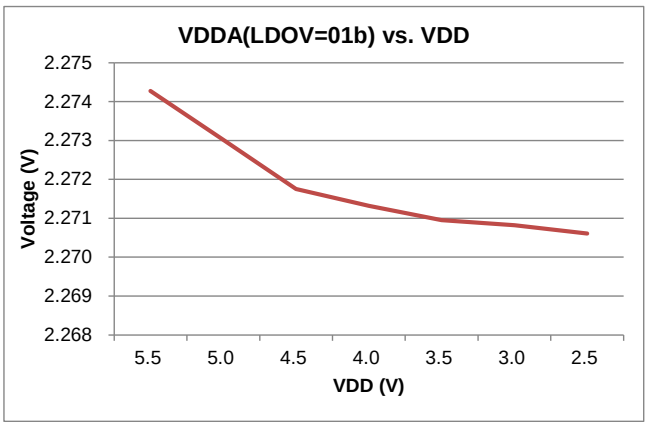


Figure 5.2-2(b) VDDA vs. VDD

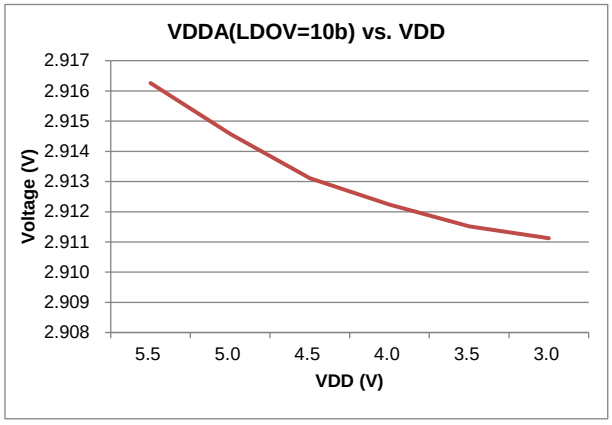


Figure 5.2-2(c) VDDA vs. VDD

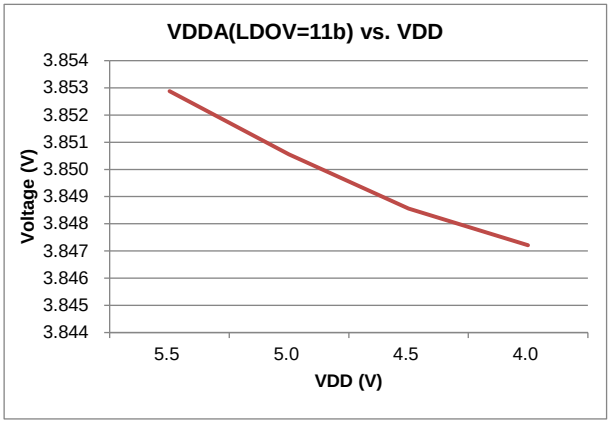


Figure 5.2-2(d) VDDA vs. VDD

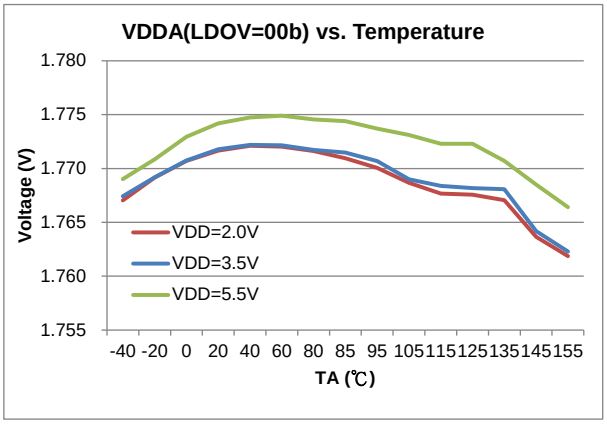


Figure 5.2-3(a) VDDA vs. Temperature

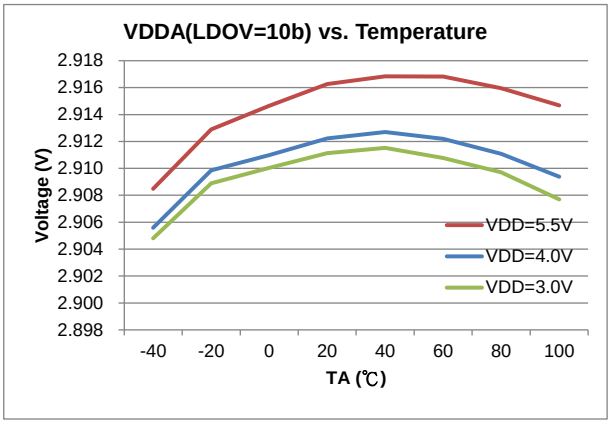


Figure 5.2-3(c) VDDA vs. Temperature

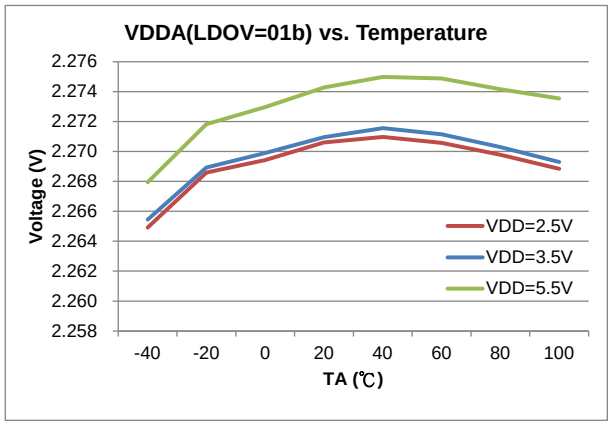


Figure 5.2-3(b) VDDA vs. Temperature

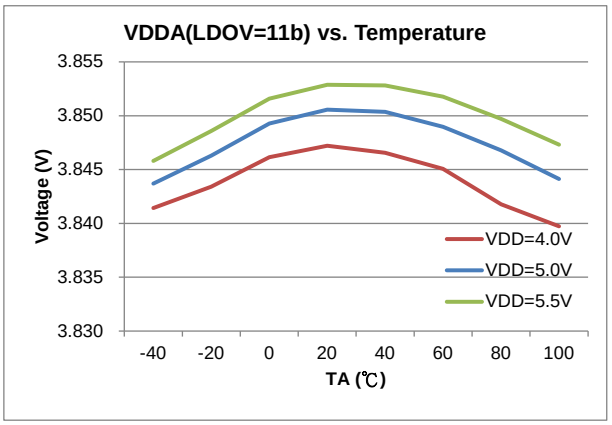


Figure 5.2-3(d) VDDA vs. Temperature

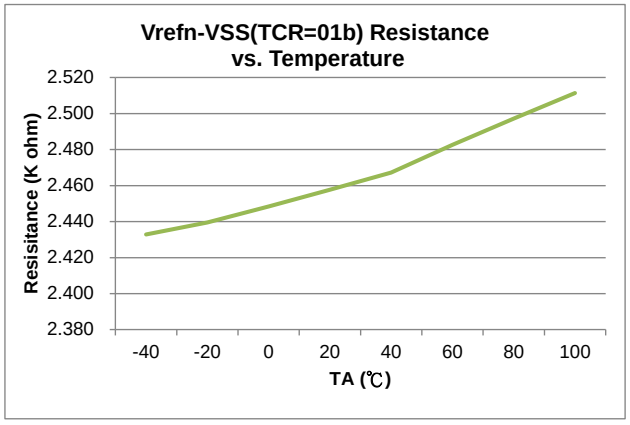


Figure 5.2-4(a) Vrefn resistance vs. Temperature

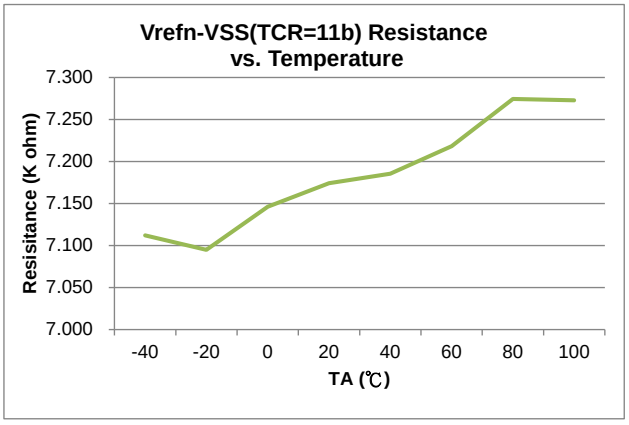


Figure 5.2-4(c) Vrefn resistance vs. Temperature

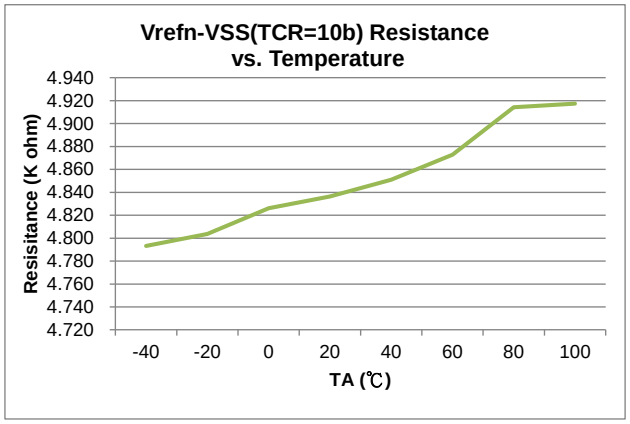


Figure 5.2-4(b) Vrefn resistance vs. Temperature

5.3. ΣΔADC, Power Supply and recommended operating conditions

Typical values are at TA = 25℃ and VDD = 3.0V.

Sym.	Parameter	Test Conditions	Min.	Typ.	Max.	unit
	Input Range	Vr = Vrefp –Vrefn Gain = AD Gain x Ref Gain	- 0.8Vr/Gain		+ 0.8Vr/Gain	V
	Resolution	Total gain = 8		20		bit
	INL	OSR = 16384		±0.003	±0.01	%FSR
	Gain drift	VDD=VDDA=3.6V, OSR = 16384, Gain=8, ADC VR=external 2.048V/2. TA=-−40℃~85℃		10		ppm/C
		VDD=VDDA=3.6V, OSR = 16384, Gain=8, ADC VR=external 2.048V/2. TA=-−40℃~125℃		30		ppm/C
		VDD=VDDA=3.6V, OSR = 16384, Gain=8, ADC VR=internal AGND/1. TA=-−40℃~125℃		50		ppm/C
	Offset drift	VDD=VDDA=3.6V, OSR = 16384, Gain=8			1	%FSR
	Noise	Gain= 8 @ 8192 Gain=8 @ 128		1 15		uV
	Current		-		350	uA
	Offset		-	0.2	1	mV
	Sampling Rate		0.9	1	1.1	MS/s
	Input Gain		-	-	8	V/V
	ADC DC input shift	Vref = Vrefp – Vrefn		Vref/(4*gain)		V

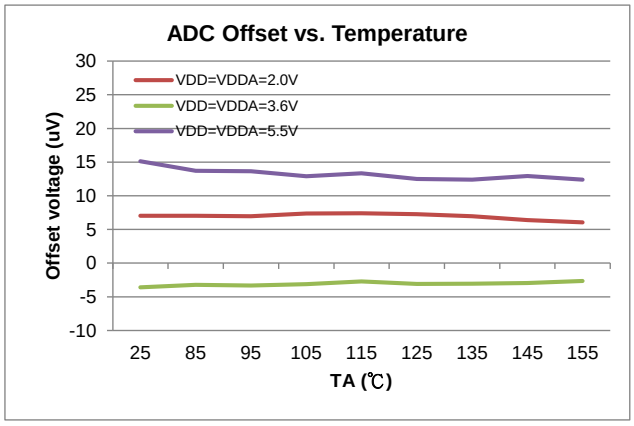


Figure 5.3-1 ADC Offset vs. Temperature

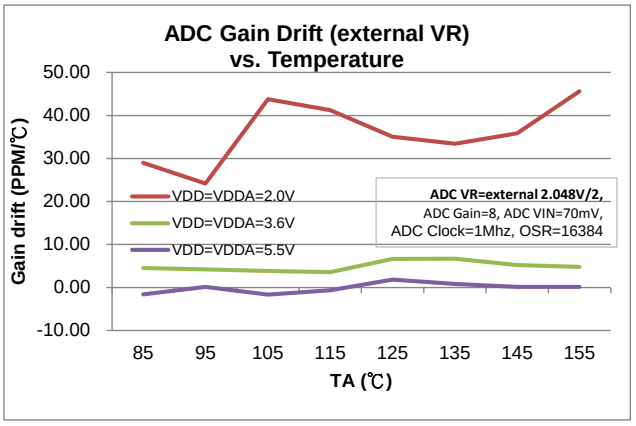


Figure 5.3-2 ADC Gain drift vs. Temperature

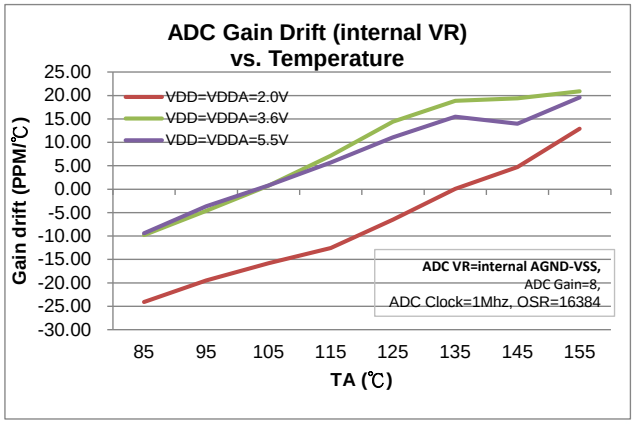


Figure 5.3-3 ADC Gain drift vs. Temperature

5.4. Temperature sensor

Typical values are at TA = 25℃ and VDD = 3.0V.

Sym.	Parameter	Test Conditions	Min.	Typ.	Max.	unit
	Resolution	After 2 points calculation; Monotonic	-	0.01	-	℃
	Temperature Sensor Slope		-	121	-	uV/℃
	Relative accuracy		+1	-	-1	uV/℃
KT	Absolute Temperature Scale 0°K					℃

5.5. Reset(Brownout, Low Voltage Detect)

Typical values are at TA = 25℃ and VDD = 3.0V.

Sym.	Parameter	Test Conditions	Min.	Typ.	Max.	unit
LVD	LVD error	After Trim		1		%
	Current	Including R		7.5		uA
	Temperature drift	TA=-−40℃~85℃		100		ppm/C
	Low Voltage Detection	Mode 1 Voltage		1.65		V
		Mode 2 Voltage		2.2		
		Mode 3 Voltage		2.8		
		Mode 4 Voltage		3.8		
BOR	Detect Voltage		1.5	1.6	1.71	V
	Current			1	3	uA

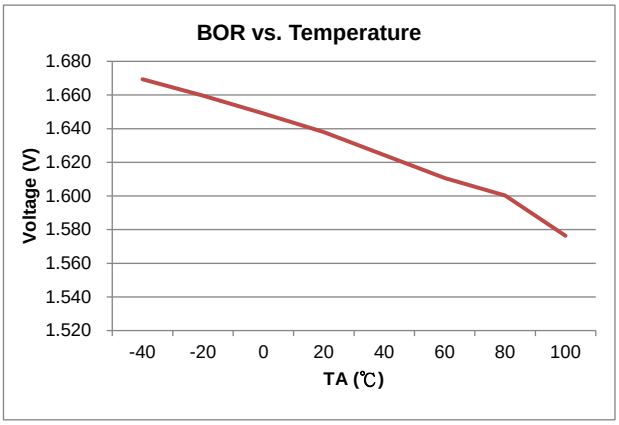


Figure 5.5-1 BOR vs. Temperature

5.6. Internal RC Oscillator

Typical values are at TA = 25℃ and VDD = 3.0V.

Sym.	Parameter	Test Conditions	Min.	Typ.	Max.	unit
LPO	Low Power Oscillator frequency			32		KHz
	Temperature drift	VDD=3.6V, TA=-−40℃~85℃		50		ppm/C
	Temperature drift	VDD=3.6V, TA=-−40℃~125℃		200		ppm/C
	Current			1.5		uA
HAO	High Speed Oscillator frequency	Mode 1	1.6	2	2.4	MHz
		Mode 2	3.2	4	4.8	
		Mode 3	6.4	8	9.6	
	Current			25		uA
	Temperature drift	VDD=3.6V, TA=-−40℃~85℃		200		ppm/C
	Temperature drift	VDD=3.6V, TA=-−40℃~125℃		300		ppm/C

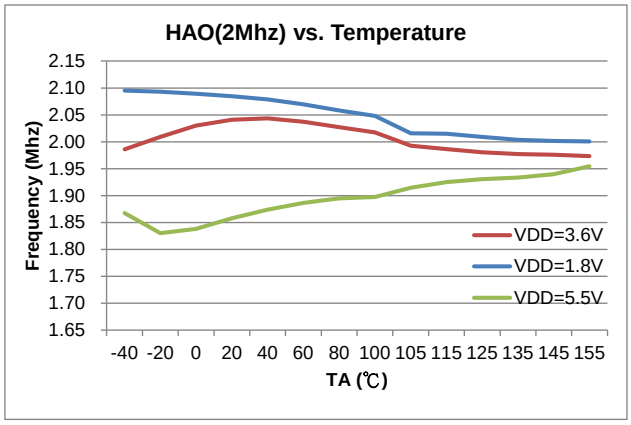


Figure 5.6-1 2Mhz HAO Frequency vs. Temperature

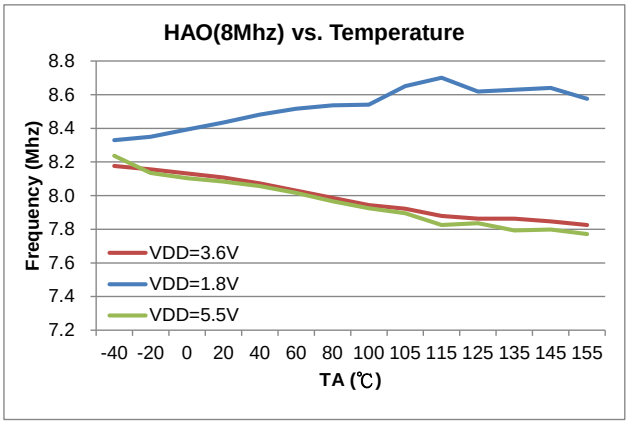


Figure 5.6-3 8Mhz HAO Frequency vs. Temperature

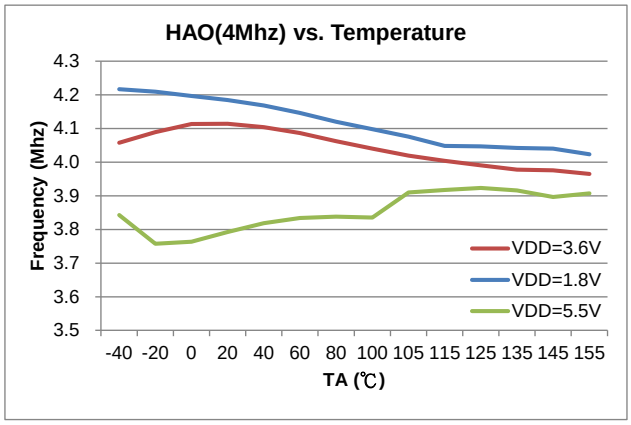


Figure 5.6-2 4Mhz HAO Frequency vs. Temperature

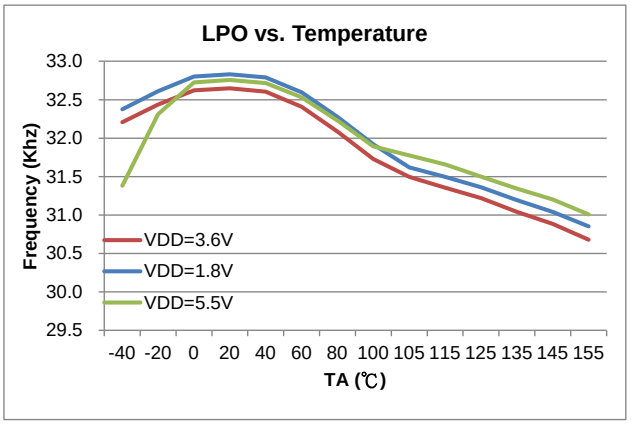


Figure 5.6-4 LPO Frequency vs. Temperature

5.7. Supply current

Typical values are at TA = 25℃ and VDD = 3.6V.

Sym.	Parameter	Test Conditions	Min.	Typ.	Max.	unit
IAM1	Active mode 1	OSC_HAO = 8MHz, CPU_CK = 8MHz		1600		uA
IAM2	Active mode 2	OSC_HAO = 4MHz, CPU_CK = 4MHz		800		uA
IAM3	Active mode 3	OSC_HAO = 2MHz, CPU_CK = 2MHz		420		uA
ILP1	Low power mode 1	OSC_HAO = off, CPU_CK = LPO		6.5		uA
ILP2	Low power mode 2	OSC_HAO = off, CPU_CK = LPO, idle mode		1.65		uA
ILP3	Low power mode 3	OSC_HAO = off, CPU_CK = off, sleep mode		0.7		uA

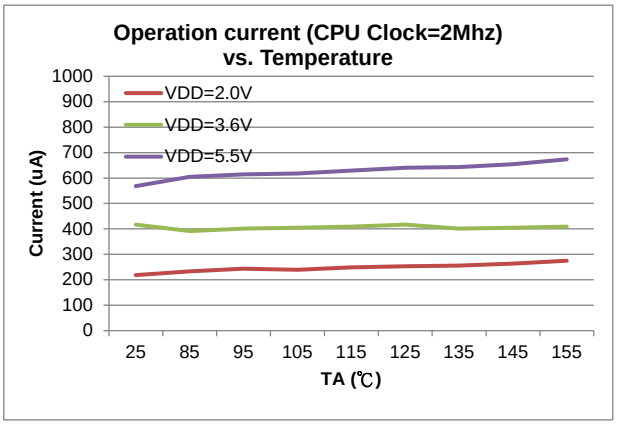


Figure 5.7-1 IAM3 vs. Temperature

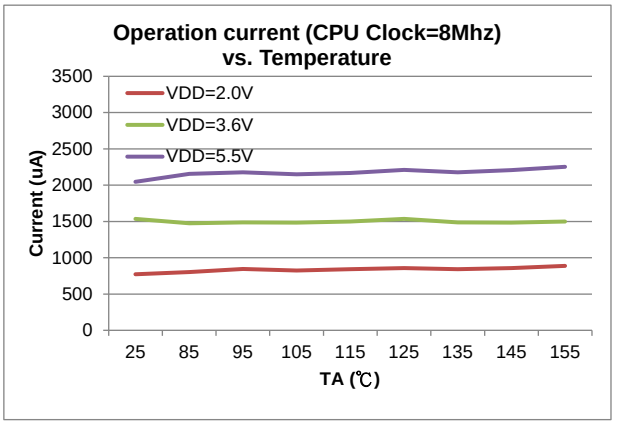


Figure 5.7-3 IAM1 vs. Temperature

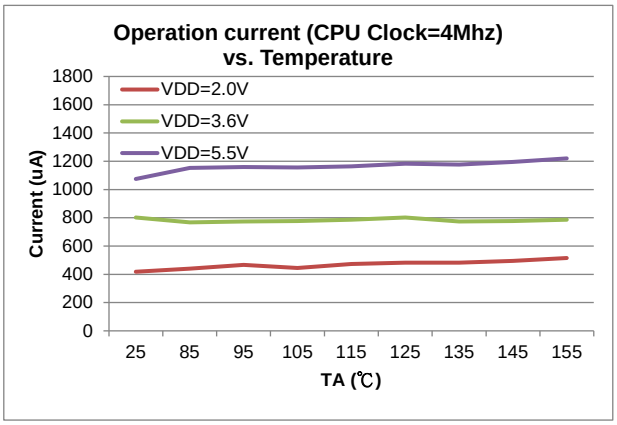


Figure 5.7-2 IAM2 vs. Temperature

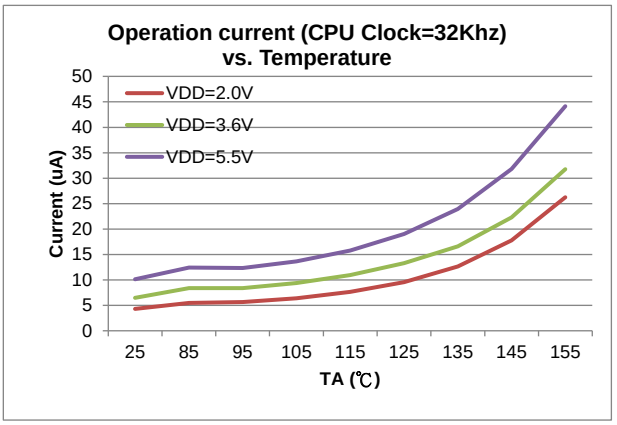


Figure 5.7-4 ILP1 vs. Temperature

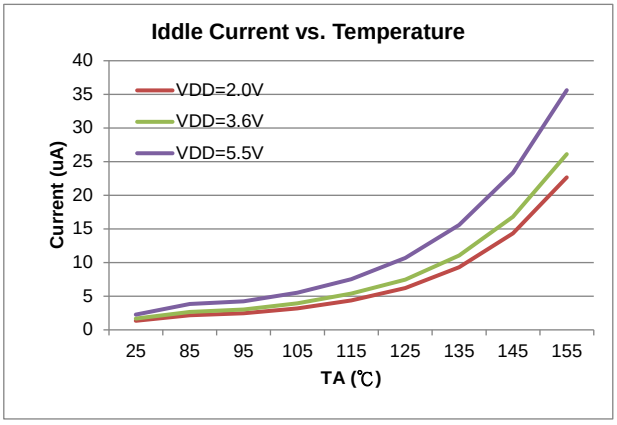


Figure 5.7-5 ILP2 vs. Temperature

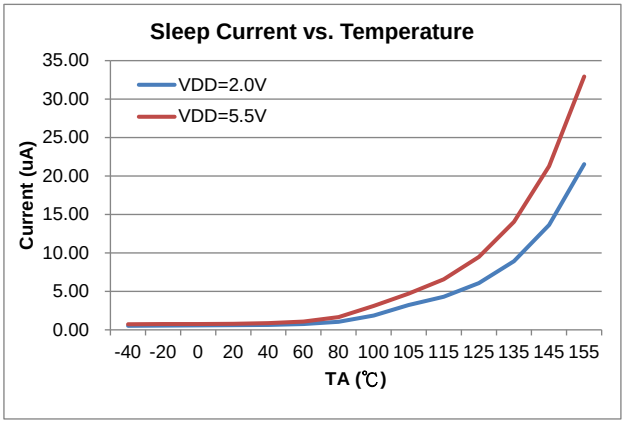


Figure 5.7-6 ILP3 vs. Temperature

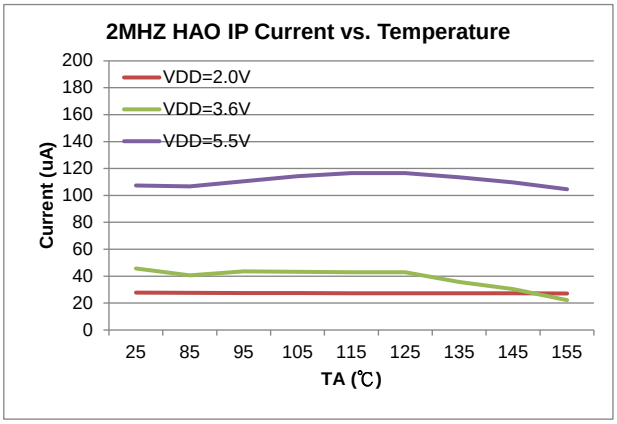


Figure 5.7-7 HAO IP current vs. Temperature

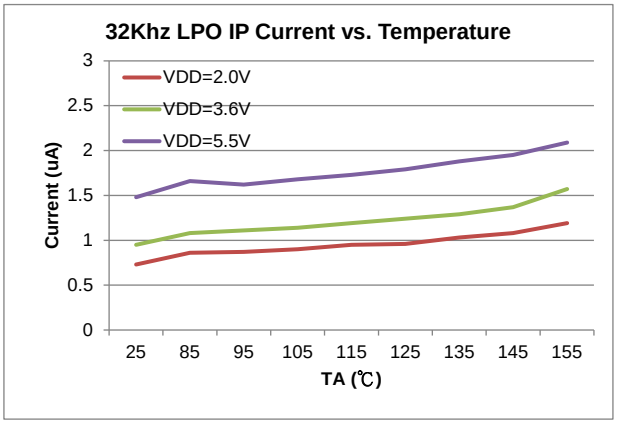


Figure 5.7-8 LPO IP current vs. Temperature

5.8. Port

Typical values are at TA = 25℃ and VDD = 3.0V.

Sym.	Parameter	Test Conditions	Min.	Typ.	Max.	unit
I²C	I²C interface speed				1	MHz
	SDA Output logic low (Open-drain)	IOL = 3mA	-	-	VDD X 0.2	V
	SDA, Output logic high	IOH = -50μA	VDD X 0.9	-	-	V
	SDA, SCL Input logic low		-	-	VDD X 0.2	V
	SDA, SCL Input logic high		VDD X 0.8	-	-	V
	SDA, SCL Digital input hysteresis		-	0.4	-	V
I/O	Sink	VDD = 3V, I/O= 0.3V	5			mA
	Source	VDD = 3V, I/O= 2.7V	5			mA
	Input H	VDD = 3V	1.6			V
	Input L	VDD = 3V			1.3	V

5.9. ΣΔADC Performance

HY14E10 針對 SD18 提供了重要的輸入雜訊規格。Table5.8-1 列出典型的雜訊規格表與 Gain, Output rate, 及單端最大輸入電壓等關係。測試條件設定在外部輸入訊號短路，參考電壓為(Vrefp-Vrefn)/2，取樣 1024 筆資料。

HY14E10 ENOB(RMS) with OSR/GAIN at A/D Clock=1Mhz, VR=(Vrefp-Vrefn)/2										
Max. Vin(mV) =0.9*VREF (1)	OSR			128	256	512	1024	2048	4096	8192	16384
	Output rate(HZ)			7813	3906	1953	977	488	244	122	61
	VDD	GAIN	SDR								
±157	3.3	8	2.8	14.3	15.9	16.3	16.4	16.4	17.1	17.3	18.7
HY14E10 RMS Noise(uV) with OSR/GAIN at A/D Clock=1Mhz, VR=(Vrefp-Vrefn)/2										
Max. Vin(mV) =0.9*VREF (1)	OSR			128	256	512	1024	2048	4096	8192	16384
	Output rate(HZ)			7813	3906	1953	977	488	244	122	61
	VDD	GAIN	SDR								
±157	3.3	8	2.8	16.8	5.7	4.2	4.1	4.1	2.4	2.1	0.8

Table5.8-1 SD18 ENOB and RMS Noise Table

The RMS noise are referred to the input. The Effective Number of Bits (ENOB(RMS Bit)) is defined as:

$$\text{ENOB(RMS)} = \ln\left(\frac{\text{FSR}}{\text{RMS Noise}}\right) \Big/ \ln(2)$$

$$\text{RMS Noise} = \left(2 \times \text{VREF} \times \sqrt{\sum_{k=1}^{1024}(\text{ADO}[k] - \text{Average})^2}\right) \Big/ 2^{23}$$

$$\text{Where FSR (Full - Scale Range)} = 2 \times \text{VREF/Gain.}$$

$$\text{Average} = \frac{\sum_{k=1}^{1024}(\text{ADO}[k])}{1024}$$

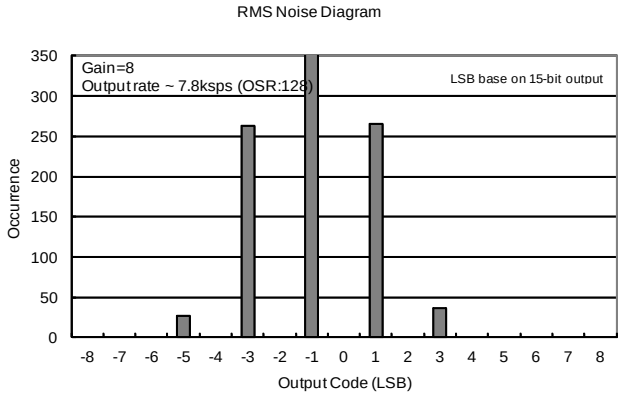


Figure5.9-1(a) RMS Noise Diagram

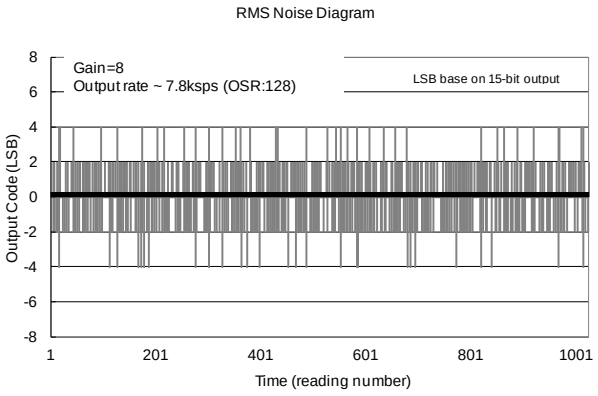


Figure5.9-1(b) Output Code Diagram

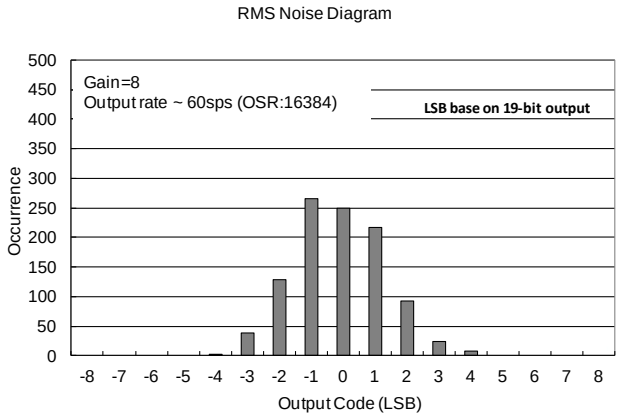


Figure5.9-2(a) RMS Noise Diagram

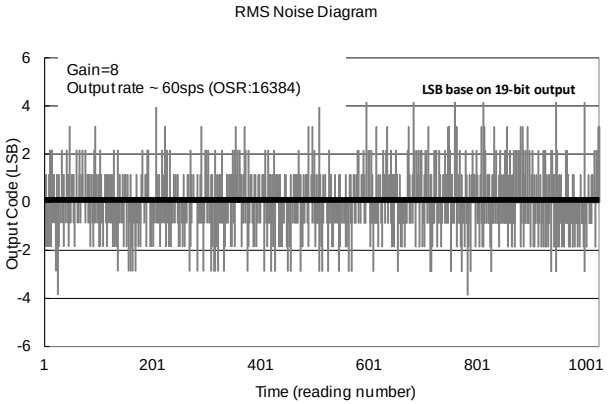


Figure5.9-2(b) Output Code Diagram

6. 訂貨資訊

下單品名[1,5]	封裝型式	引腳數	封裝型式描述方式		程式碼編號[2]	出貨包裝形式	個裝數量	材料組成	MSL[3]	操作溫度範圍
HY14E10-D000	Die	-	D	000	000	-		Green[4]	-	−40℃ ~ 85℃
HY14E10M-D000	Die	-	D	000	000	-		Green[4]	-	−40℃ ~ 125℃
HY14E10-T028	TSSOP	28	T	028	000	Tube	50	Green[4]	MSL-3	−40℃ ~ 85℃
HY14E10-T028	TSSOP	28	T	028	000	Tape & Reel	3000	Green[4]	MSL-3	−40℃ ~ 85℃
HY14E10-E016	SSOP	16	E	016	000	Tube	100	Green[4]	MSL-3	−40℃ ~ 85℃
HY14E10-E016	SSOP	16	E	016	000	Tape & Reel	2500	Green[4]	MSL-3	−40℃ ~ 85℃
HY14E10-N016	QFN	16	N	016	000	Tape & Reel	5000	Green[4]	MSL-3	−40℃ ~ 85℃

[1] 產品名稱 **–** 封裝型式描述方式 **–** 程式碼編號 **(**空白片 **/** 標準品 **/** 代客燒錄碼**)**

例如：您的代客燒錄服務申請的程式碼編號為 007，且需要的產品是裸片出貨，對溫度要求為−40℃ ~ 85℃。則下單品名為 HY14E10-D000-007

例如：您的需求是不帶程式碼的空白片且需要的產品是裸片出貨，對溫度要求為−40℃ ~ 85℃。則下單品名為 HY14E10-D000

例如：您的需求是不帶程式碼的空白片且需要的產品是裸片出貨，對溫度要求為−40℃ ~ 125℃範圍。則下單品名為 HY14E10M-D000

例如：您的需求是不帶程式碼的空白片且需要的產品是封裝片 QFN16 出貨，則下單品名為 HY14E10-N016，且需以 Tape & Reel 出貨，則除下單品名外，請特別註明出貨包裝形式為 Tape & Reel

例如：您的代客燒錄服務申請的程式碼編號為 008，而需求的產品是封裝片 SSOP 出貨，則下單品名為 HY14E10-E016-008，且需以 Tube 出貨，則除下單品名外，請特別註明出貨包裝形式為 Tube

[2] 程式碼編號

“001”~“999” 為標準品或代客燒錄申請的程式碼編號，而空白晶片不帶此碼。

[3] **MSL:**

濕度敏感性等級係依據 IPC/JEDEC J-STD-020 的規範加以試驗分級，並參考 IPC/JEDEC J-STD-033 的標準處理、包裝、運輸與使用。

[4] **Green (RoHS & no Cl/Br):**

HYCON 產品皆為 Green Product，符合 RoHS 指令，REACH 高關注物質(SVHC)以及無鹵素相關規定。

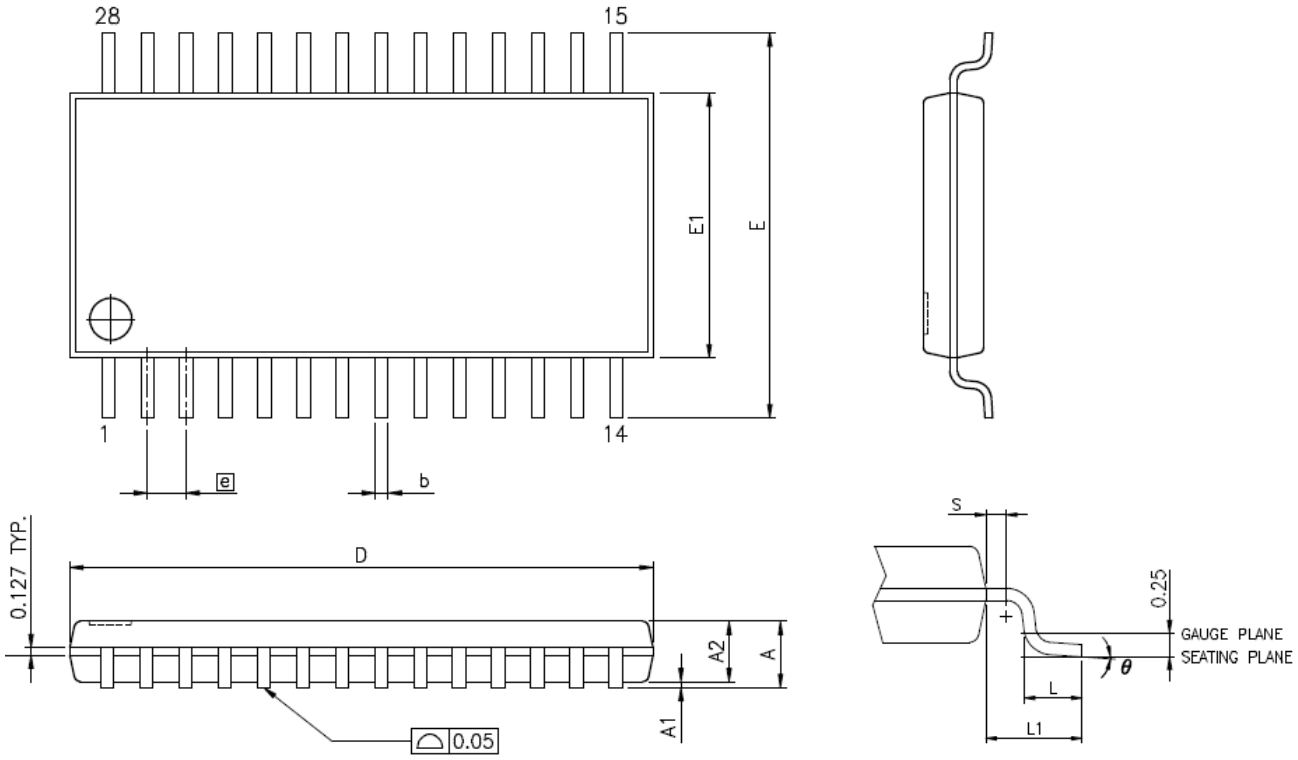
[5]下單品名**:**

HY14E10 表示晶片溫度操作範圍為−40℃ ~ 85℃；HY14E10M 表示晶片溫度操作範圍為−40℃ ~ 125℃，而晶片燒錄範圍仍為−40℃ ~ 85℃；

7. 封裝型式資訊

7.1. TSSOP28(T028)

7.1.1. Package Outline Drawing---TSSOP28(173mil)

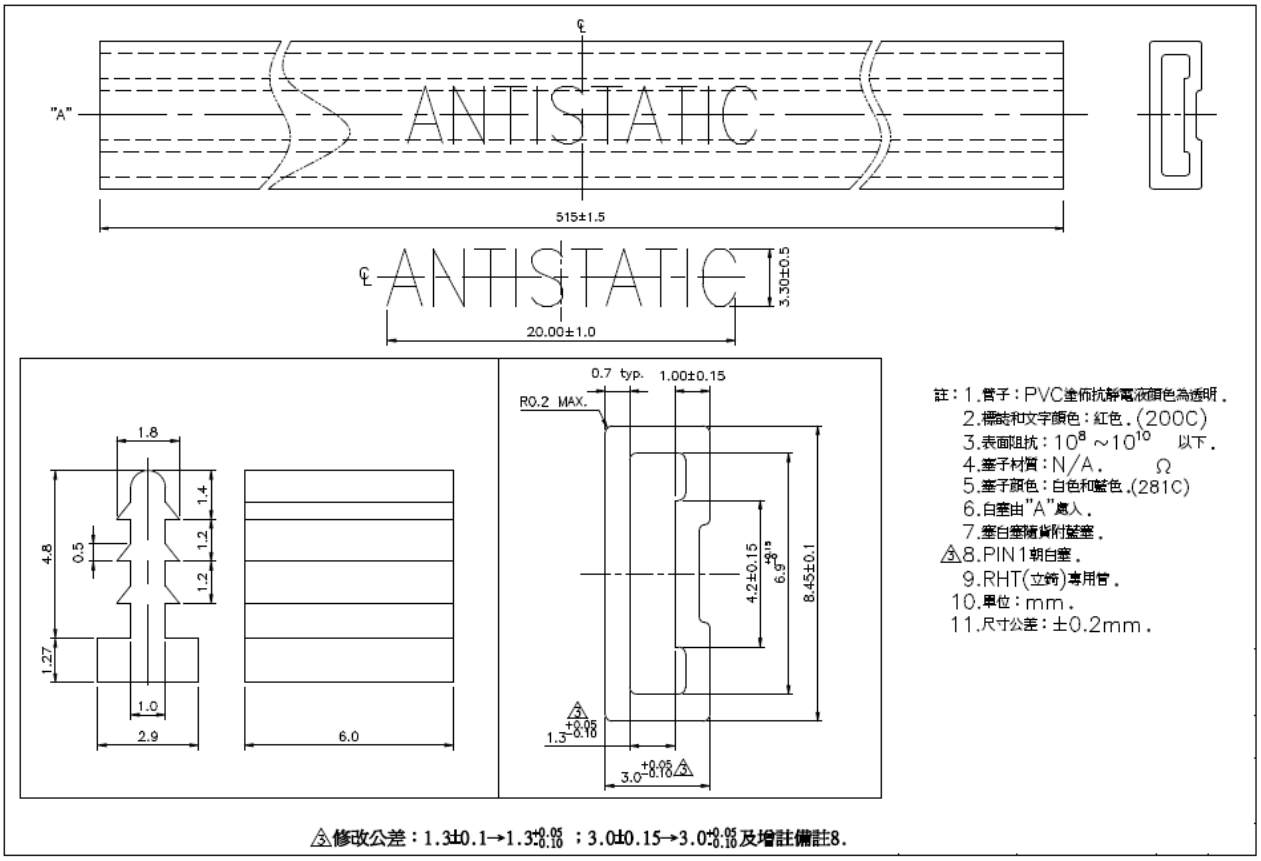


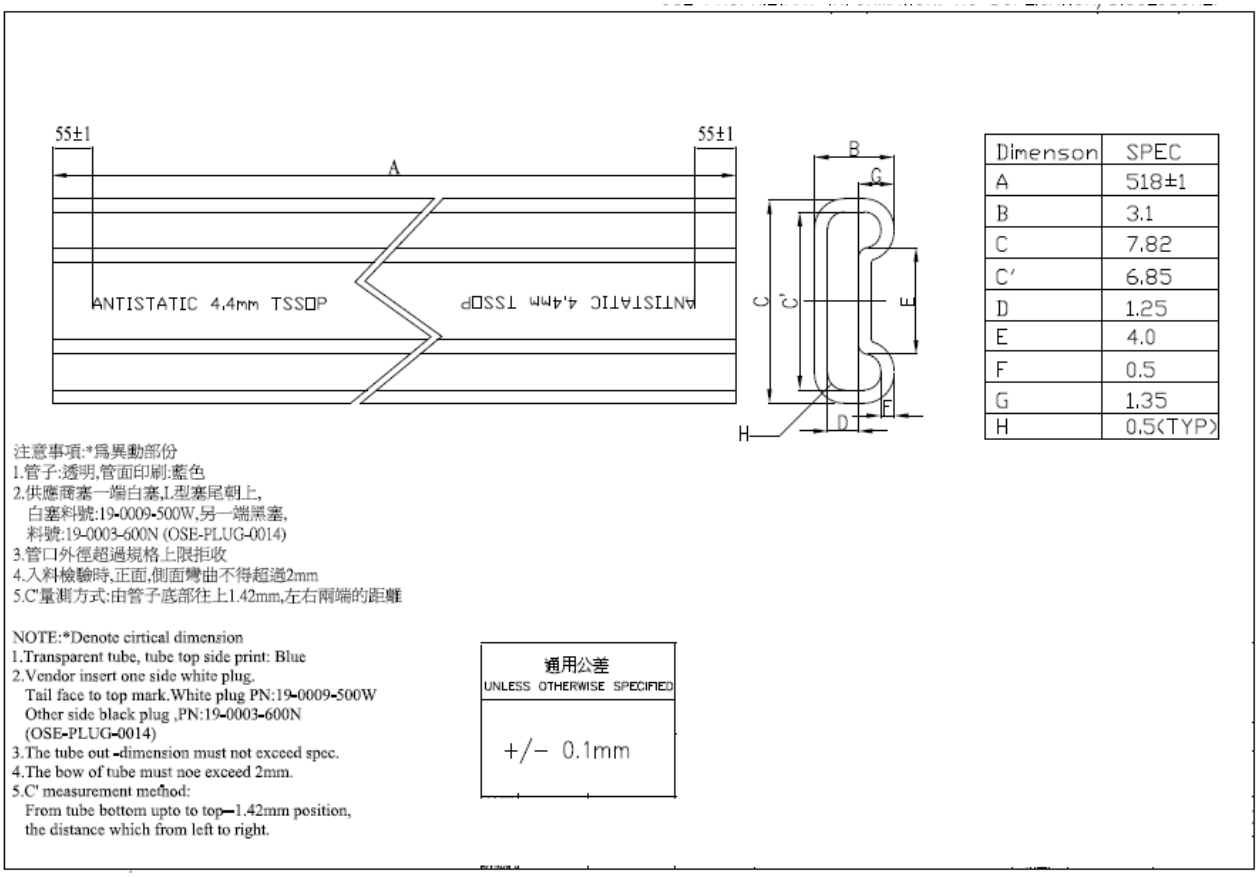
SYMBOLS	MIN.	NOM.	MAX.
A	–	–	1.20
A1	0.00	–	0.15
A2	0.80	1.00	1.05
b	0.19	–	0.30
D	9.60	9.70	9.80
E1	4.30	4.40	4.50
E	6.40 BSC		
e	0.65 BSC		
L1	1.00 REF		
L	0.45	0.60	0.75
S	0.20	–	–
θ	0°	–	8°

Note:

1. All dimensions refer to JEDEC OUTLINE MO-153.
2. Do not include Mold Flash or Protrusions.
3. Unit: mm

7.1.2. Tube Dimensions---TSSOP28(173mil)





Dimenson	SPEC
A	518±1
B	3.1
C	7.82
C'	6.85
D	1.25
E	4.0
F	0.5
G	1.35
H	0.5(TYP)

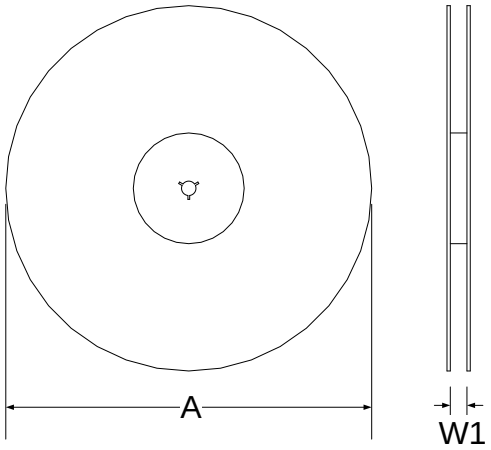
注意事項:*爲異動部份
1.管子:透明,管面印刷:藍色
2.供應商塞一端白塞,L型塞尾朝上,
白塞料號:19-0009-500W,另一端黑塞,
料號:19-0003-600N (OSE-PLUG-0014)
3.管口外徑超過規格上限拒收
4.入料檢驗時,正面,側面彎曲不得超過2mm
5.C'量測方式:由管子底部往上1.42mm,左右兩端的距離

NOTE:*Denote cirtical dimension
1.Transparent tube, tube top side print: Blue
2.Vendor insert one side white plug.
Tail face to top mark.White plug PN:19-0009-500W
Other side black plug ,PN:19-0003-600N
(OSE-PLUG-0014)
3.The tube out -dimension must not exceed spec.
4.The bow of tube must noe exceed 2mm.
5.C' measurement method:
From tube bottom upto to top—1.42mm position,
the distance which from left to right.

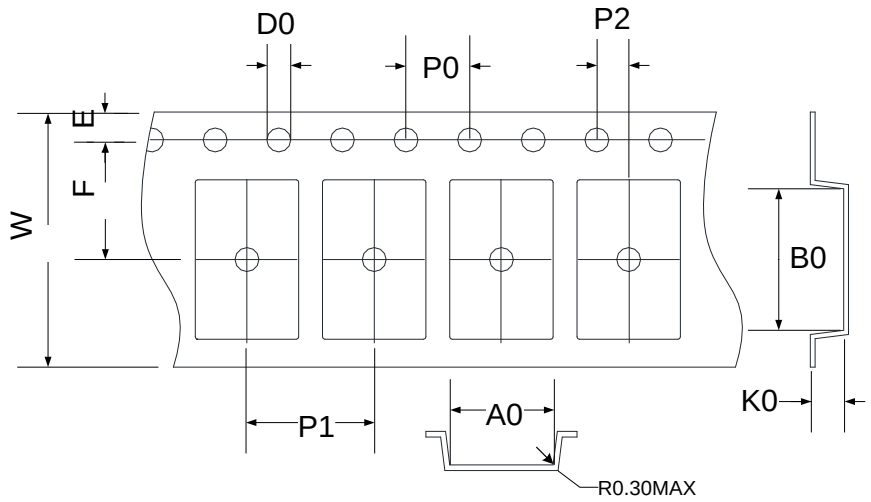
通用公差 UNLESS OTHERWISE SPECIFIED
+/− 0.1mm

7.1.3 Tape & Reel Information---TSSOP28(173mil)

1. Reel Dimensions



2. Carrier Tape Dimensions

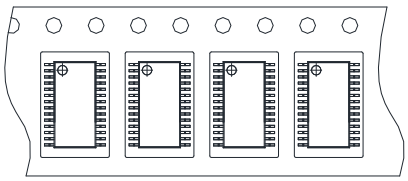


SYMBOLS	Reel Dimensions		Carrier Tape Dimensions									
	A	W1	A0	B0	K0	P0	P1	P2	E	F	D0	W
Spec.	330	16.5	6.80	10.20	1.60	4.00	8.00	2.00	1.75	7.50	1.50	16.00
Tolerance	+6/-3	+1.5/-0	±0.10	±0.10	±0.10	±0.10	±0.10	±0.10	±0.10	±0.10	+0.1/-0	±0.30

Note: 10 Sprocket hole pitch cumulative tolerance is ±0.20mm.

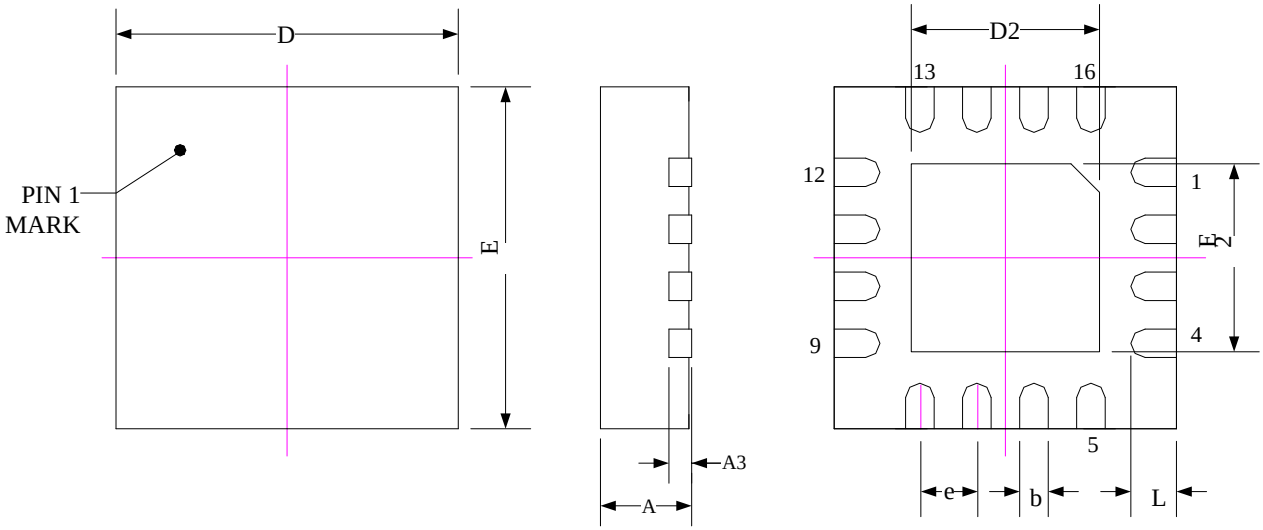
Unit: mm

3. Pin1 direction



7.2. QFN16(N016)

7.2.1. Package Outline Drawing--- QFN 3x3 16

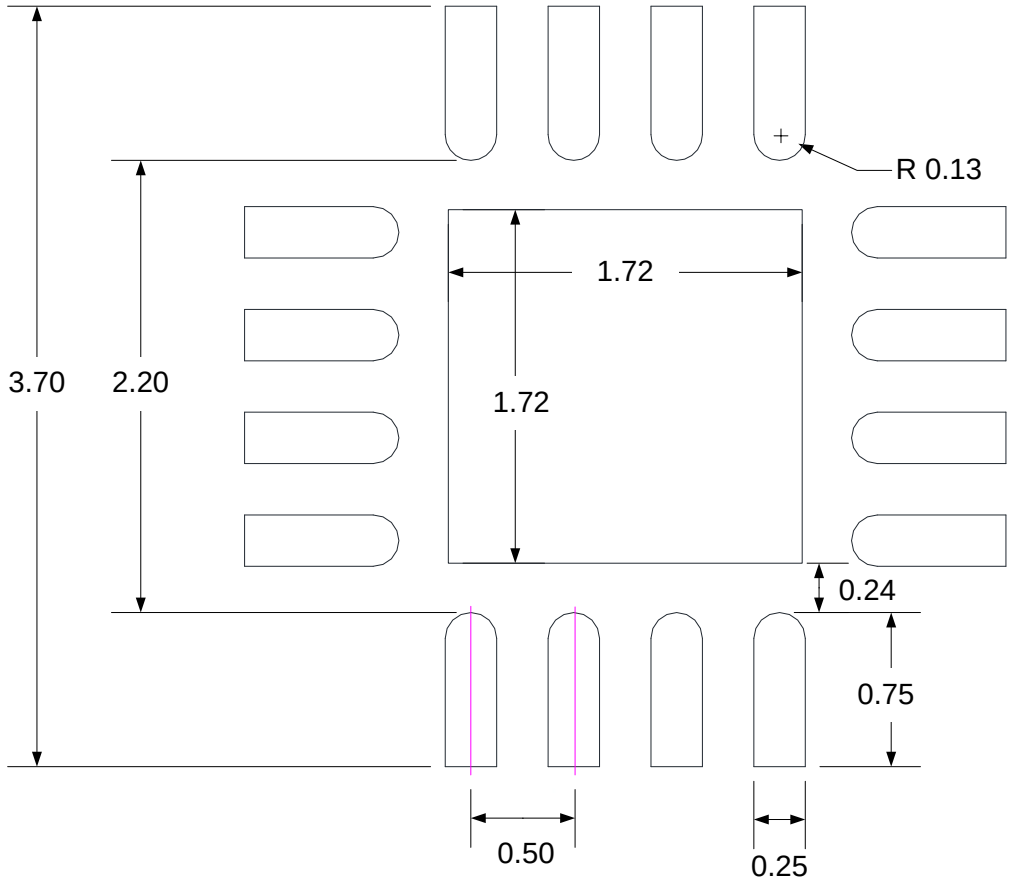


SYMBOLS	MIN	NOM	MAX
A	0.70	0.75	0.80
A3	0.203 REF.		
b	0.20	0.25	0.30
D	2.925	3.000	3.075
E	2.925	3.000	3.075
D2	1.625	1.725	1.825
E2	1.625	1.725	1.825
L	0.30	0.35	0.40
e	0.50 BASIC		

Note:

1. All dimensions refer to JEDEC OUTLINE MO-220.
2. Unit : mm

7.2.2. Land Pattern Design Recommendations--- QFN 3x3 16

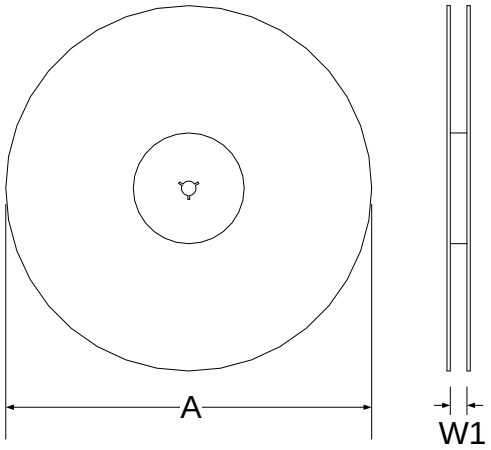


Note:

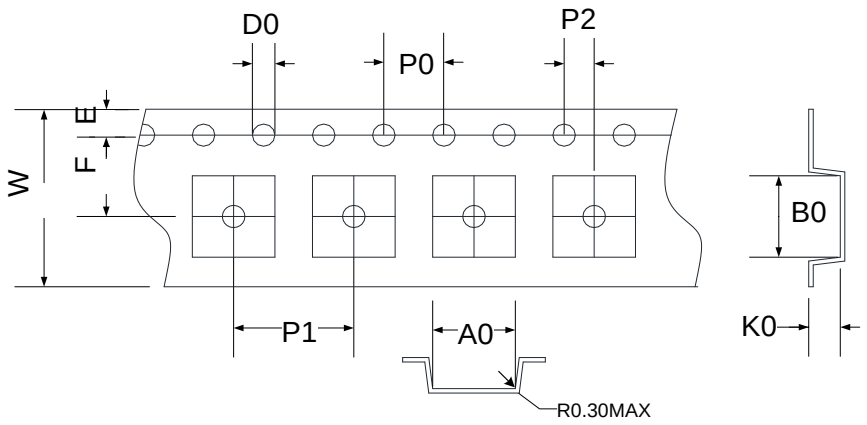
1. Publication IPC-7351 is recommended for alternate designs
2. Unit : mm
3. http://www.hycontek.com/attachments/MSP/OJTI-HM-2013-002.pdf

7.2.3. Tape & Reel Information---QFN 3x3

1. Reel Dimensions



2. Carrier Tape Dimensions

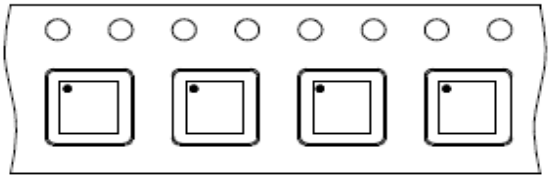


SYMBOLS	Reel Dimensions		Carrier Tape Dimensions									
	A	W1	A0	B0	K0	P0	P1	P2	E	F	D0	W
Spec.	330	12.5	3.30	3.30	1.10	4.00	8.00	2.00	1.75	5.50	1.50	12.00
Tolerance	+6/-3	+1.5/-0	±0.10	±0.10	±0.10	±0.10	±0.10	±0.05	±0.10	±0.05	+0.1/-0	±0.30

Note: 10 Sprocket hole pitch cumulative tolerance is ±0.20mm.

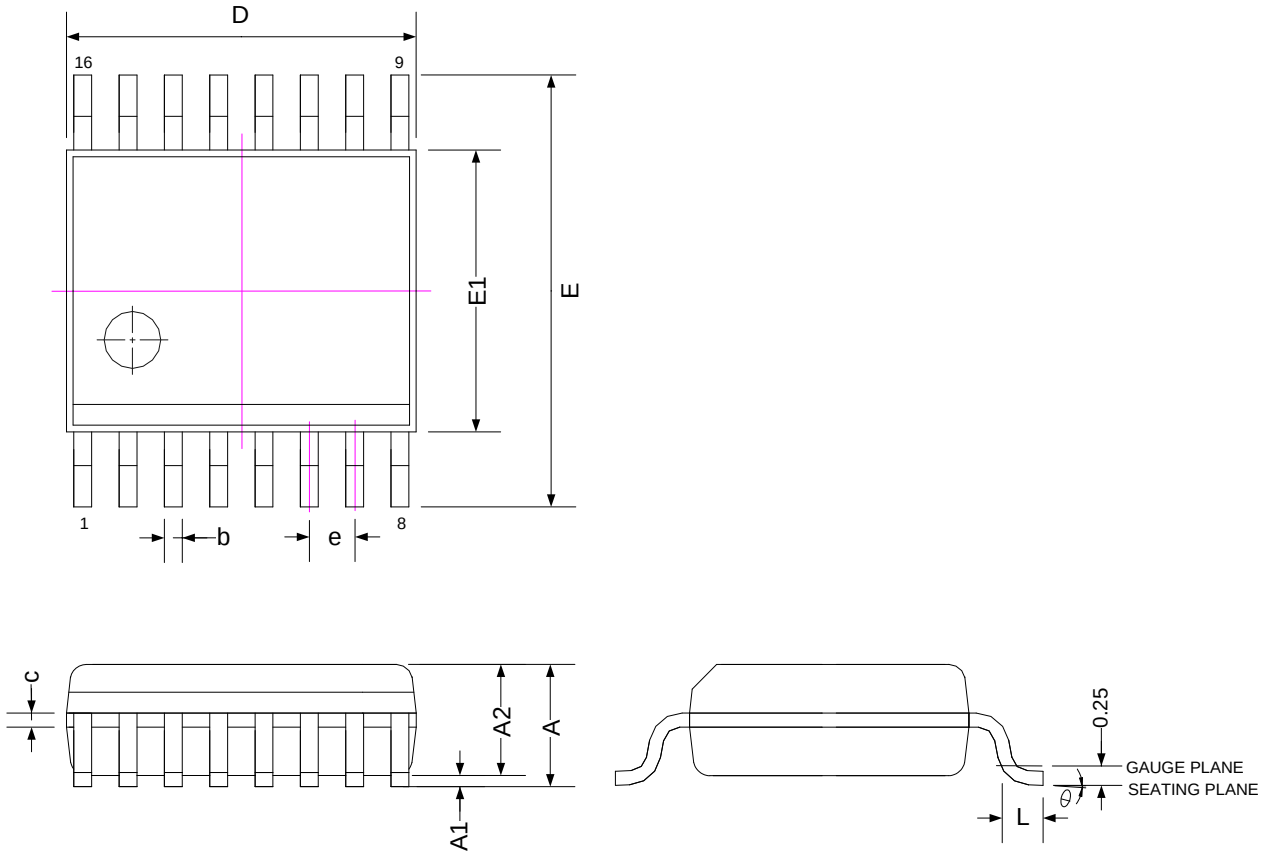
Unit: mm

3. Pin1 direction



7.3. SSOP16(E016)

7.3.1. Package Outline Drawing--- SSOP16 (150mil)

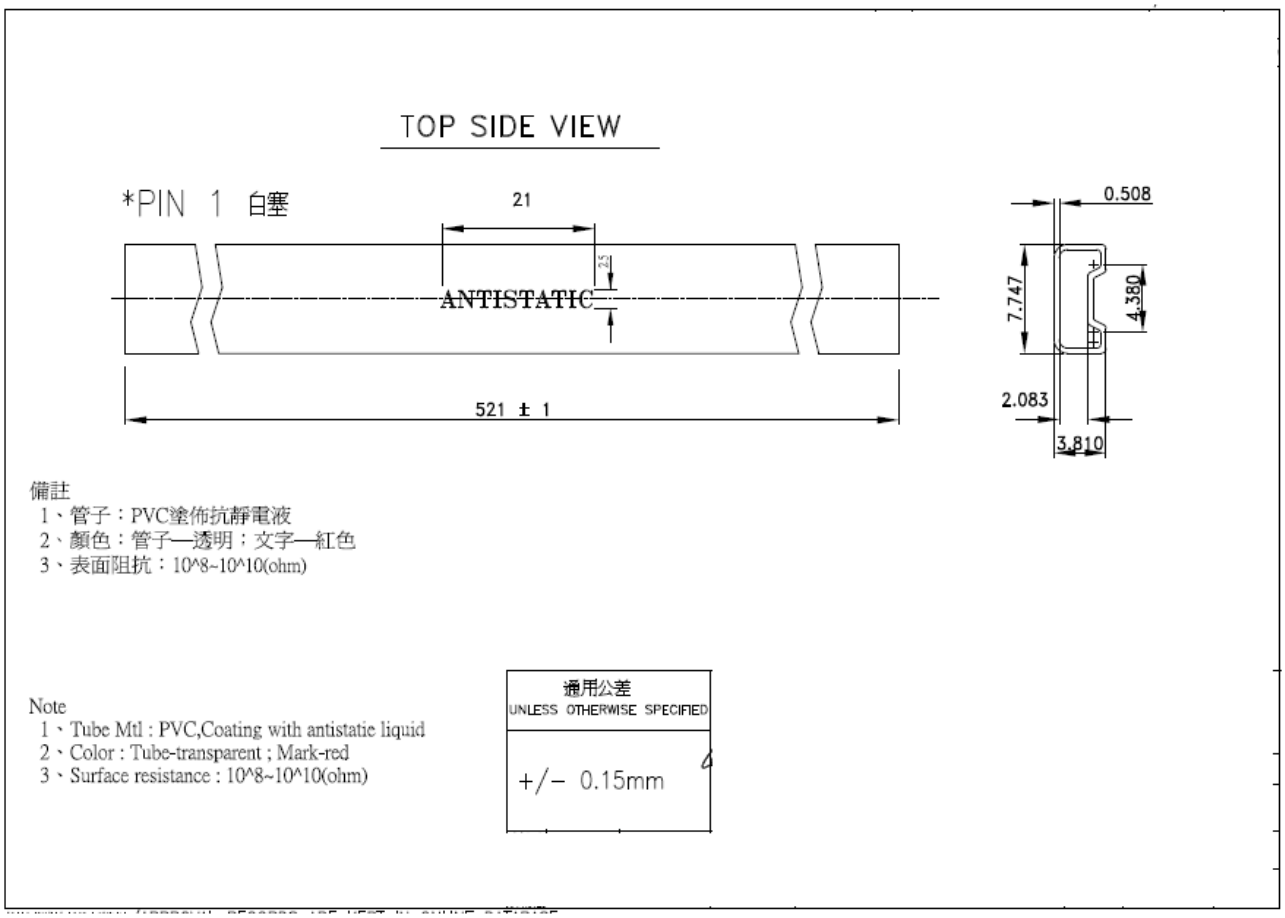


SYMBOLS	MIN	NOM	MAX
A	-	-	1.75
A1	0.10	0.15	0.25
A2	-	-	1.50
b	0.20	-	0.30
c	0.18	-	0.25
D	4.80	4.90	5.00
E1	3.81	3.91	3.99
E	5.79	5.99	6.20
L	0.41	-	1.27
e	0.635 BASIC		
θ °	0	-	8

Note:

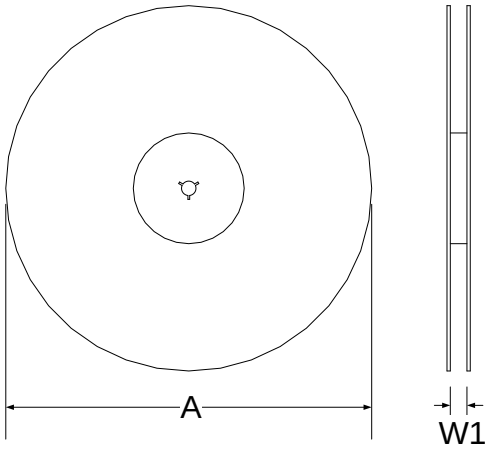
1. All dimensions refer to JEDEC OUTLINE MO-137.
2. Do not include Mold Flash or Protrusions.
3. Unit: mm

7.3.2. Tube Dimensions--- SSOP16 (150mil)

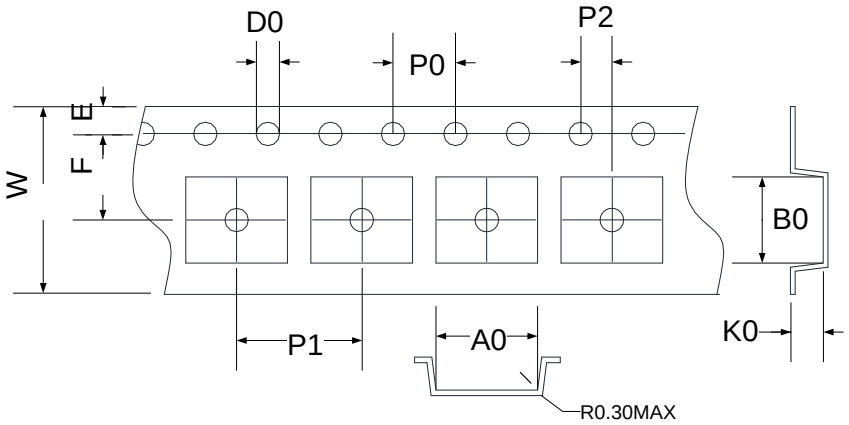


7.3.3. Tape & Reel Information---SSOP16(150mil)-Type 1

1. Reel Dimensions



2. Carrier Tape Dimensions

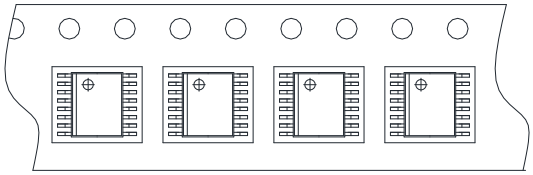


SYMBOLS	Reel Dimensions		Carrier Tape Dimensions									
	A	W1	A0	B0	K0	P0	P1	P2	E	F	D0	W
Spec.	330	12.5	6.90	5.40	2.00	4.00	8.00	2.00	1.75	5.50	1.50	12.00
Tolerance	+6/-3	+1.5/-0	±0.10	±0.10	±0.10	±0.10	±0.10	±0.05	±0.10	±0.05	+0.1/-0	±0.30

Note: 10 Sprocket hole pitch cumulative tolerance is ±0.20mm.

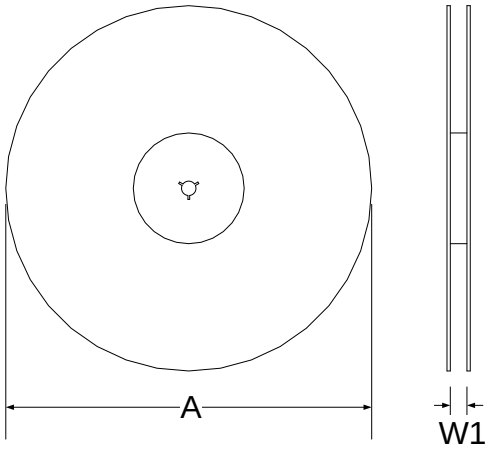
Unit: mm

3. Pin1 direction

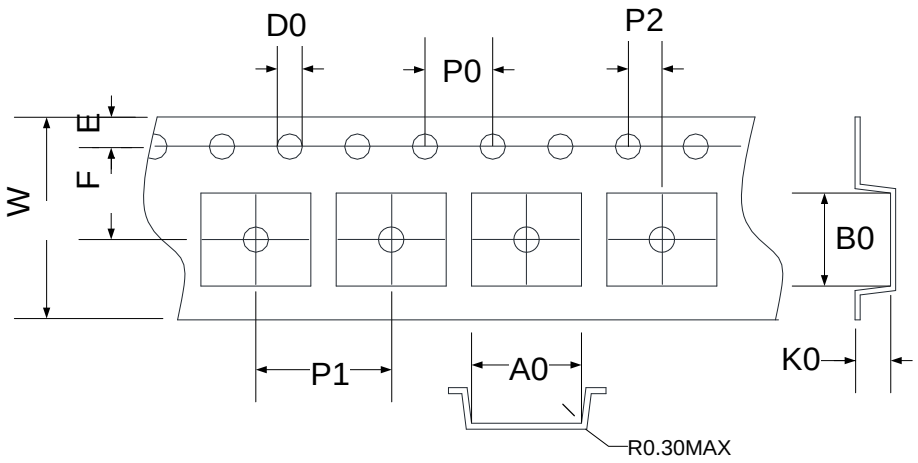


7.3.4. Tape & Reel Information---SSOP16(150mil) -Type 2

1. Reel Dimensions



2. Carrier Tape Dimensions

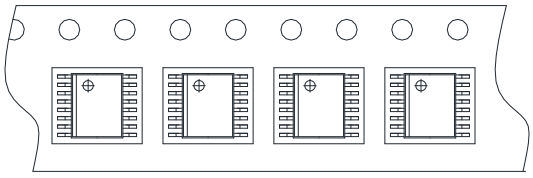


SYMBOLS	Reel Dimensions		Carrier Tape Dimensions									
	A	W1	A0	B0	K0	P0	P1	P2	E	F	D0	W
Spec.	330	12.5	6.50	5.20	2.10	4.00	8.00	2.00	1.75	5.50	1.50	12.00
Tolerance	+6/-3	+1.5/-0	±0.10	±0.10	±0.10	±0.10	±0.10	±0.05	±0.10	±0.05	+0.1/-0	±0.30

Note: 10 Sprocket hole pitch cumulative tolerance is ±0.20mm.

Unit: mm

3. Pin1 direction



8. 修訂記錄

以下描述本檔差異較大的地方，而標點符號與字形的改變不在此描述範圍。

文件版次	頁次	摘要
V01	All	初版發行
V02	12-13	修改 VDDA 輸出電壓、ADC Performance
V03	All	增加 QFN16, SSOP16 封裝引腳
V04	6	更正內部方塊圖為 111bytes EEPROM 區塊可供使用者使用
	8	修正 SD18 Network 方塊圖描述在 TPSH 和 TPSL
	CH7	新增相關封裝形式資訊
V05	All	新增說明，在電壓放大倍率 x1/x2/x4 為 Reserved， 建議使用 8 倍放大倍率。
	All	新增 HY14E10 ENOB and RMS Table 和 RMS Noise Diagram
V06	All	新增溫度曲線圖與-40C~125C 規格內容