# HY10P40
# Datasheet

8-Bit RISC-like Mixed Signal Microcontroller
Embedded 24-Bit ΣΔADC

# 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。

2、 本規格書中的圖形、應用電路等，因第三方工業所有權引發的問題，本公司不承擔其責任。

3、 本產品在單獨應用的情況下，本公司保證它的性能、典型應用和功能符合說明書中的條件。當使用在客戶的產品或設備中，以上條件我們不作保證，建議客戶做充分的評估和測試。

4、 請注意輸入電壓、輸出電壓、負載電流的使用條件，使 IC 內的功耗不超過封裝的容許功耗。對於客戶在超出說明書中規定額定值使用產品，即使是瞬間的使用，由此所造成的損失，本公司不承擔任何責任。

5、 本產品雖內置防靜電保護電路，但請不要施加超過保護電路性能的過大靜電。

6、 本規格書中的產品，未經書面許可，不可使用在要求高可靠性的電路中。例如健康醫療器械、防災器械、車輛器械、車載器械及航空器械等對人體產生影響的器械或裝置，不得作為其部件使用。

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

- 8-Bit RISC-like 微控制器，具有 46 條高性能指令集 H08B
- 24-Bit ΣΔADC 類比數位轉換器
  - 梳狀濾波器採二階設計，轉換頻率達 1.95Ksps
  - 取樣頻率 250KHz
  - 超取樣頻率設置 128～32768
  - 全差動輸入信號與測量範圍的零點調整
  - 信號放大 x1/4,x1/2,x1,x2,x4,x8,x16
  - 測量信號輸入通道 8ch
  - 低溫飄係數
- 內部電源系統
  - 內置 LDO 線性穩壓電源 VDDA
    - 內部類比電路或外部傳感器電壓源
    - 輸出可設置 2.4/2.7/3.0V，可外灌輸入電壓
    - 低操作功耗與低溫飄係數
  - 內置參考電壓源 ACM
    - 類比電路參考電壓源(1.2V)
    - 低操作功耗與低溫飄係數
- 計時器
  - Watch Dog
    - 復位事件與中斷事件
  - 8-bit Timer
    - 中斷事件
  - 16-bit Timer
    - 16-Bit PWM 輸出
    - 兩個 8-Bit PWM 輸出
    - 中斷事件
- 工作電壓與操作溫度範圍
  - $V_{DD}$：2.2V ~ 3.6V
  - - 40°C ~ 85°C
- 工作頻率
  - 內建高精度 HAO 震盪器 2MHz/4MHz/8MHz
  - 內建低功耗 LPO 震盪器 14KHz
- 記憶體型式
  - 2KW OTP 程式記憶體
  - 128B 資料記憶體
  - 6 層堆棧
  - Build-In EPROEM
    - VPP 工作電壓 6.0V
    - 64W EPROM 記憶體
- 引腳特色
  - 具 10mA 驅動能力
  - 自定義功能模組輸出引腳設計
- 復位機制
  - Power On Reset
  - Brown Out Reset
  - Watch Dog Reset
- $I^2C$ 通訊介面

## 2. 引腳定義

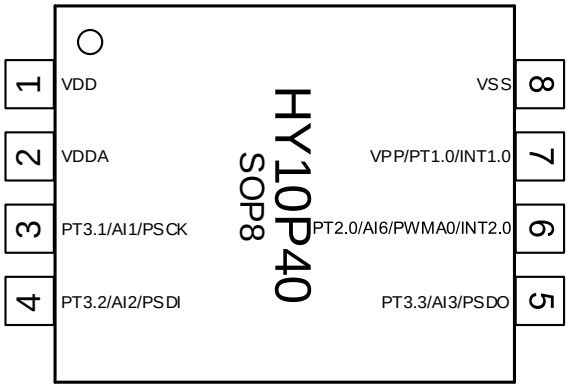



圖 2-1 HY10P40 SOP8 引腳圖

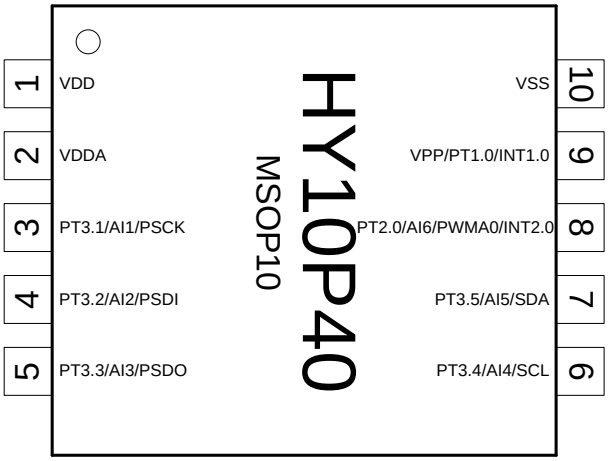



圖 2-2 HY10P40 MSOP10 引腳圖

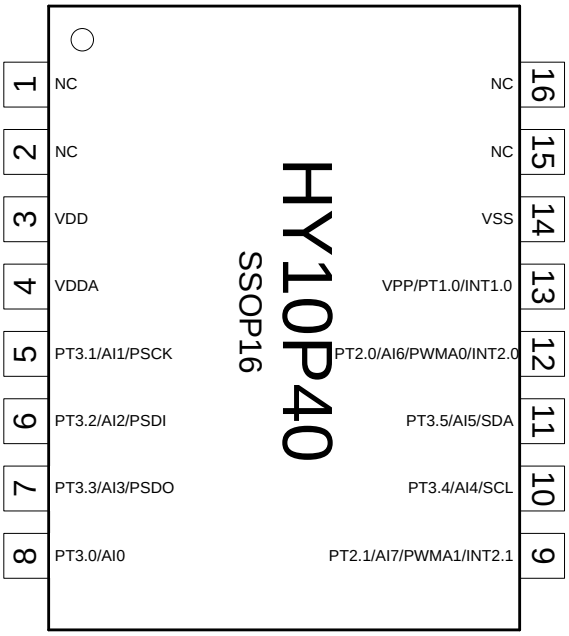



圖 2-3 HY10P40 SSOP16 引腳圖

## 2.1. 引腳定義說明

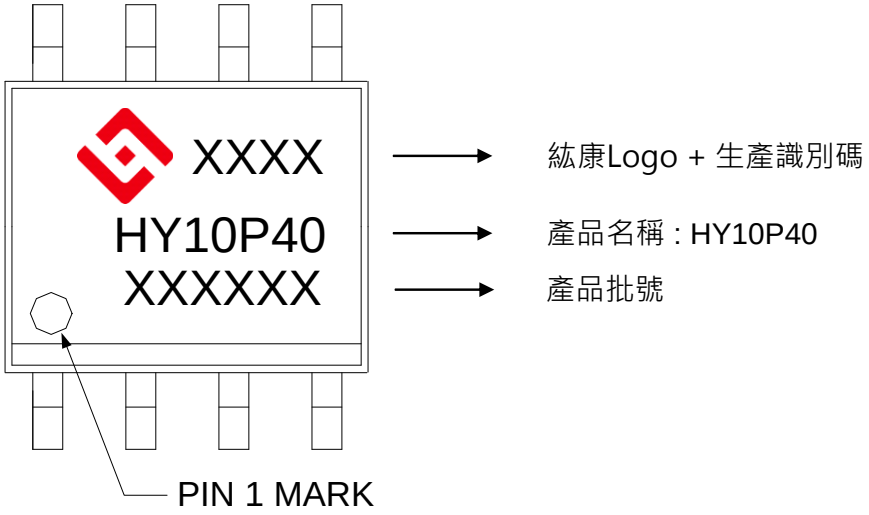
"腳定：輸入,輸入義：輸出,輸出義：類比，比義說：史密斯觸發，密斯觸：CMOS I/O,SOP：電壓源,電壓源：或,或壓源：可忽略

| 封裝 | | | 引腳名稱 | 設計 | | 描述 |
|---|---|---|---|---|---|---|
| SSOP16 | MSOP10 | SOP8 | | 型式 | 緩衝 | |
| 1 | - | - | NC | X | X | - |
| 2 | - | - | NC | X | X | - |
| 3 | 1 | 1 | VDD | P | P | 晶片工作電壓源接引腳 |
| 4 | 2 | 2 | VDDA | P | P | LDO 線性穩壓電源輸出引腳 |
| 5 | 3 | 3 | PT3.1 | I/O | S/C | 數位輸入 / 輸出引腳 |
| | | | AI1 | A | A | 類比輸入通道 |
| | | | PSCK | I | S | OTP 讀/寫介面 PSCK 接口 |
| 6 | 4 | 4 | PT3.2 | I/O | C | 數位輸入 / 輸出引腳 |
| | | | AI2 | A | A | 類比輸入通道 |
| | | | PSDI | I | S | OTP 讀/寫介面 PSDI 接口 |
| 7 | 5 | 5 | PT3.3 | I/O | C | 數位輸入 / 輸出引腳 |
| | | | AI3 | A | A | 類比輸入通道 |
| | | | PSDO | I/O | S | OTP 讀/寫介面 PSDO 接口 |
| 8 | - | - | PT3.0 | I/O | C | 數位輸入 / 輸出引腳 |
| | | | AI0 | A | A | 類比輸入通道 |
| 9 | - | - | PT2.1 | I/O | C | 數位輸入 / 輸出引腳 |
| | | | AI7 | A | A | 類比輸入通道 |
| | | | PWMA1 | O | C | TMB1 的 PWM1 輸出引腳 |
| | | | INT2.1 | I | S | 外部中斷源(Falling Edge Trigger Interrupt) |
| 10 | 6 | - | PT3.4 | I/O | C | 數位輸入 / 輸出引腳 |
| | | | AI4 | A | A | 類比輸入通道 |
| | | | SCL | I/O | S | I2C 通訊介面引腳 |
| 11 | 7 | - | PT3.5 | I/O | C | 數位輸入 / 輸出引腳 |
| | | | AI5 | A | A | 類比輸入通道 |
| | | | SDA | I/O | S | I2C 通訊介面引腳 |
| 12 | 8 | 6 | PT2.0 | I/O | C | 數位輸入 / 輸出引腳 |
| | | | AI6 | A | A | 類比輸入通道 |
| | | | PWMA0 | O | C | TMB1 的 PWM0 輸出引腳 |
| | | | INT2.0 | I | S | 外部中斷源(Falling Edge Trigger Interrupt) |
| 13 | 9 | 7 | PT1.0 | I | S | 數位輸入 |
| | | | VPP | P | P | OTP 燒錄電壓引腳 |
| | | | INT1.0 | I | S | 外部中斷源 |

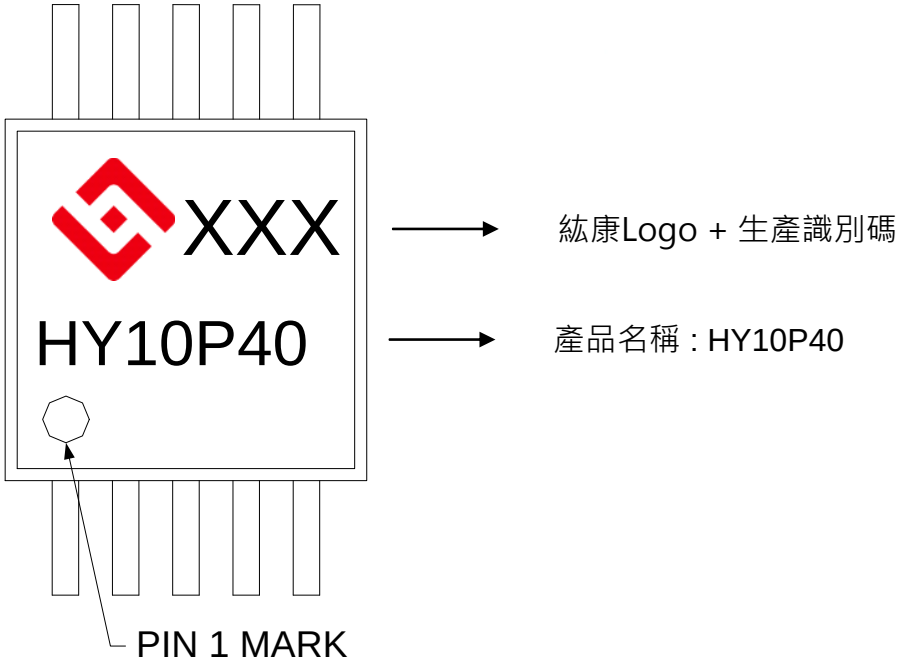
| | | | | | | |
|---|---|---|---|---|---|---|
| **14** | **10** | **8** | VSS | P | P | 晶片工作電壓源接地端引腳 |
| **15** | **-** | **-** | NC | X | X | - |
| **16** | **-** | **-** | NC | X | X | - |

表 2-1 引腳定義與功能說明

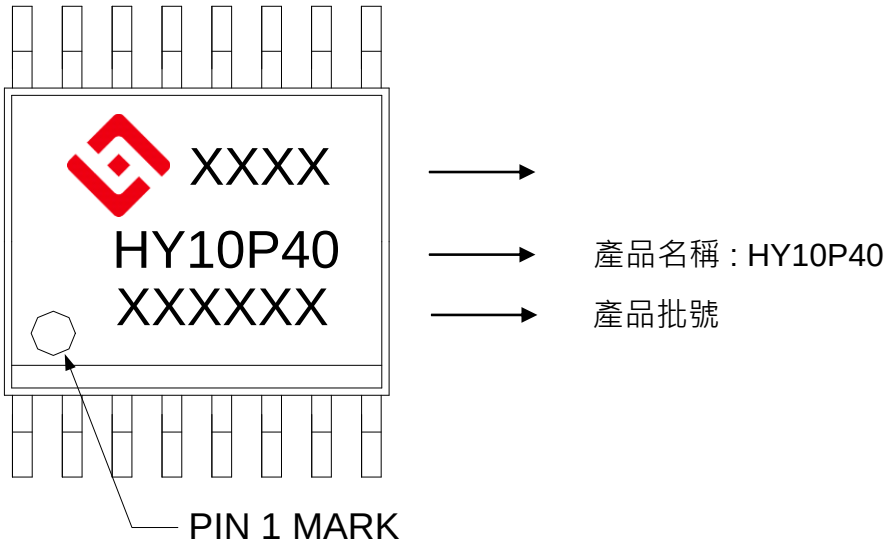
### 2.1.1. SOP8 封裝片標記信息




### 2.1.2. MSOP10 封裝片標記信息



### 2.1.3. SSOP16 封裝片標記信息



# 3. 應用電路

## 3.1. PIR application (Pyroelectric infrared-detector)

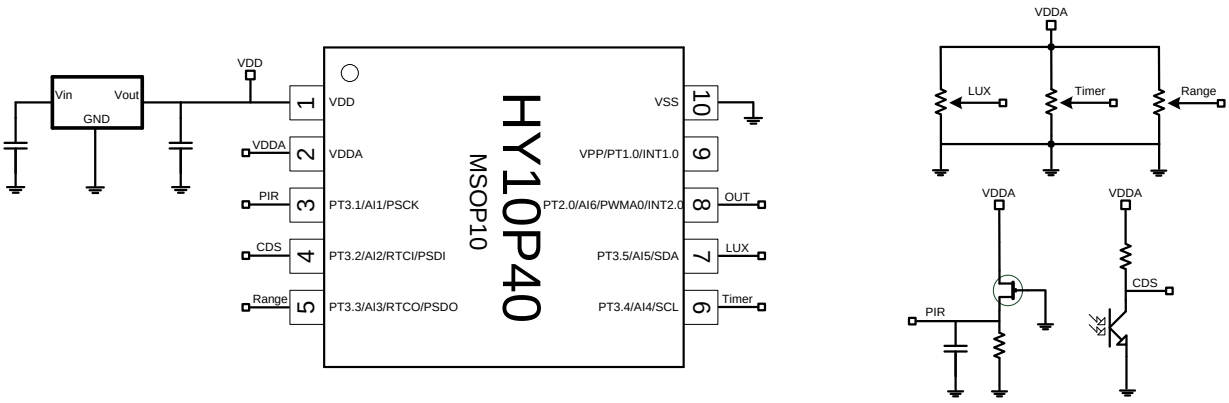



圖 3-1 PIR 應用電路

## 3.2. Smart Pressure sensor application

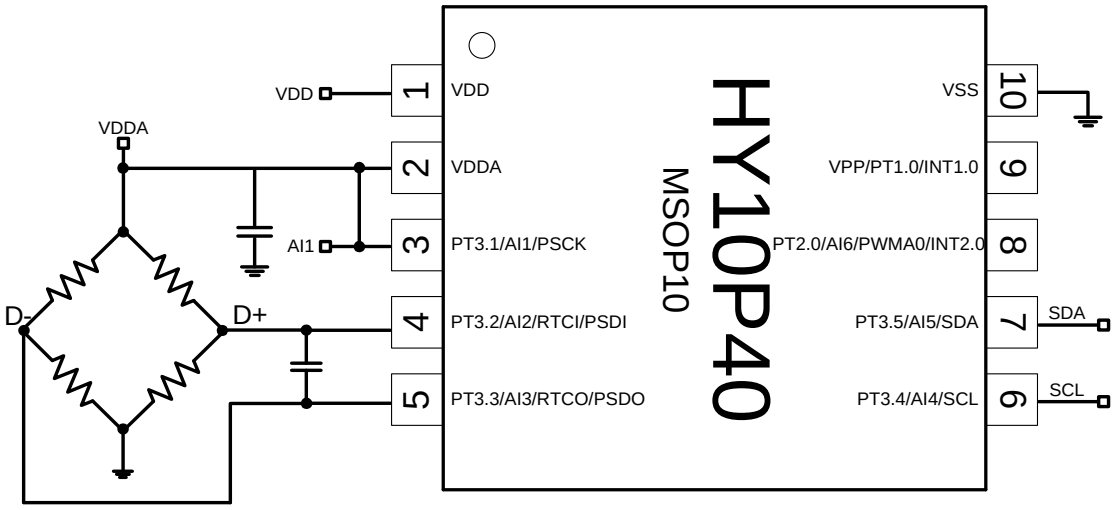



圖 3-2 Smart Pressure Sensor 應用電路

# 4. 功能概述

## 4.1. 內部方塊圖

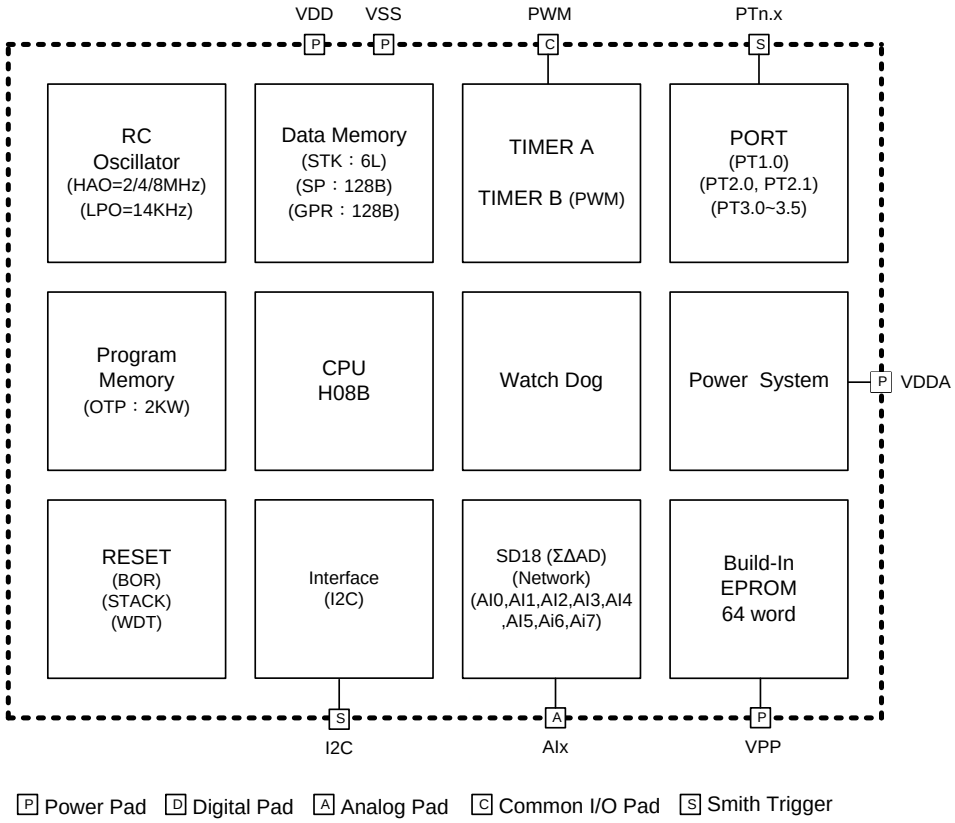



圖 4-1 HY10P40 內部方塊圖

## 4.2. 相關說明與支援文件

晶片功能相關使用說明書

DS-HY10P40　　HY10P40 說明書

UG-HY10SXX　　HY10Pxx 系列使用說明書

APD-CORE003-Vxx　H08B 指令說明書

開發工具相關使用說明書

APD-HYIDE00X-Vxx　HY10xxx 系列開發工具軟體使用說明書

APD-HYIDE00X-Vxx　HY10xxx 系列開發工具硬體使用說明書

APD-OTP001-Vxx　　OTP 產品燒錄引腳說明書

產品生產相關使用說明書

APD-HYIDE004-Vxx　HY1xxxx 系列生產線專用燒錄器說明書

BDI-HY10P40-Vxx　　HY10P40 個別產品的裸片打線資訊

## 4.3. SD18 Network

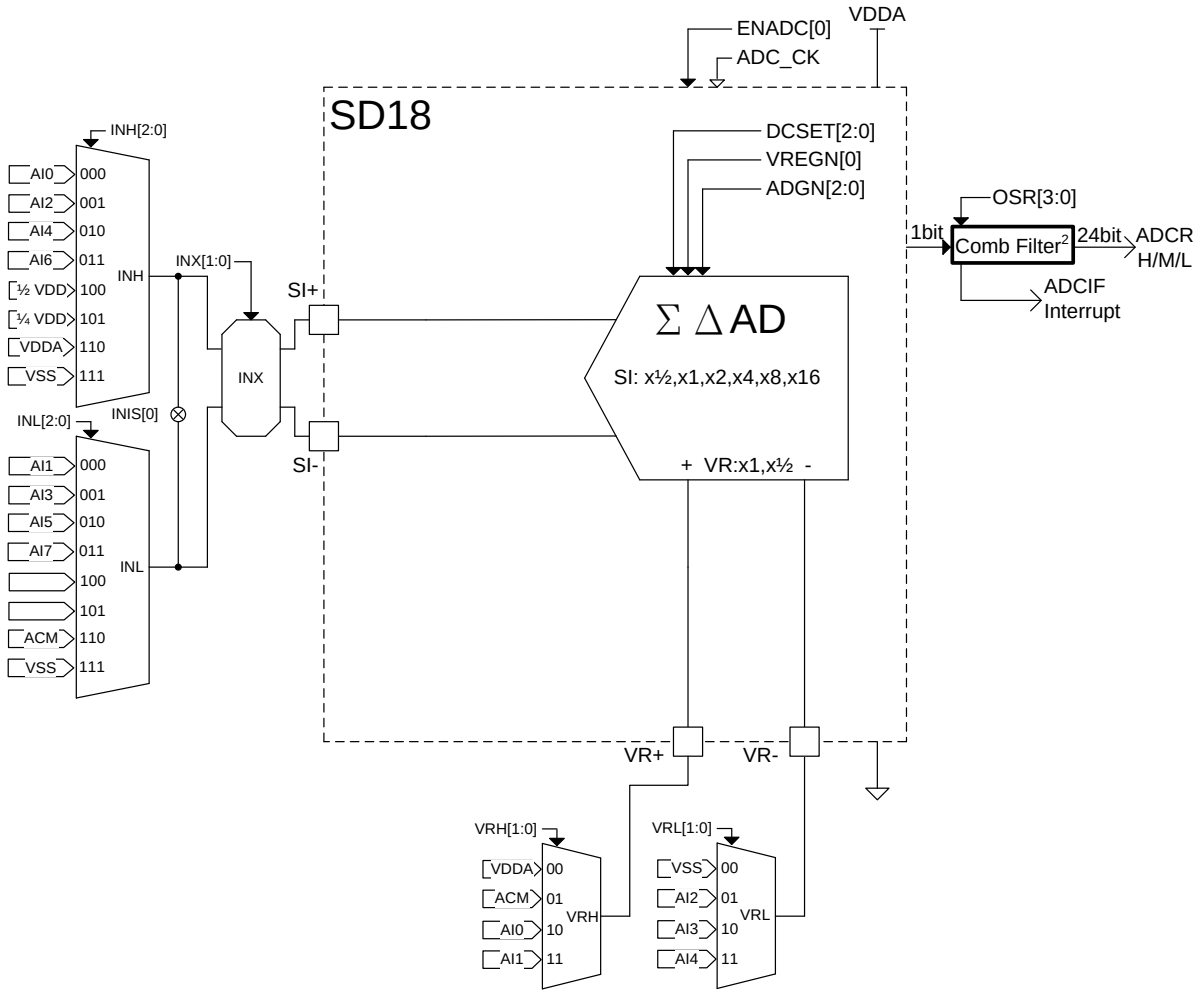



圖 4-2 SD18 Network

# 5. 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

| 位址 | 名稱 | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 | A-RESET | I-RESET | R/W |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 000h | INDF0 | Contents of FSR0 to address data memory–value of FSR0 not changed | | | | | | | | xxxx xxxx | uuuu uuuu | *,*,*,*,*,*,*,* |
| 001h | POINC0 | Contents of FSR0 to address data memory–value of FSR0 post-incremented | | | | | | | | xxxx xxxx | uuuu uuuu | *,*,*,*,*,*,*,* |
| 002h | PODEC0 | Contents of FSR0 to address data memory–value of FSR0 post-decremented | | | | | | | | xxxx xxxx | uuuu uuuu | *,*,*,*,*,*,*,* |
| 003h | PRINC0 | Contents of FSR0 to address data memory–value of FSR0 pre-incremented | | | | | | | | xxxx xxxx | uuuu uuuu | *,*,*,*,*,*,*,* |
| 004h | PLUSW0 | Contents of FSR0 to address data memory–value of FSR0 offset by W | | | | | | | | xxxx xxxx | uuuu uuuu | *,*,*,*,*,*,*,* |
| 010H | FSR0L | Indirect Data Memory Address Pointer 0 Low Byte,FSR0[7:0] | | | | | | | | xxxx xxxx | uuuu uuuu | *,*,*,*,*,*,*,* |
| 016h | TOSH | - | - | - | - | - | TOS[10] | TOS[9] | TOS[8] | …. xxxx | …. uuuu | -,-,-,- -,*,*,* |
| 017h | TOSL | Top-of-Stack Low Byte (TOS<7:0>) | | | | | | | | xxxx xxxx | uuuu uuuu | *,*,*,*,*,*,*,* |
| 018h | STKPTR | SKFL | SKUN | SKOV | - | - | SKPRT[2:0] | | | 000. .000 | u$$. .$$$ | rw0,rw0,rw0,- -,*,*,* |
| 01Ah | PCLATH | - | - | - | - | - | PC[10] | PC[9] | PC[8] | …. .0000 | …. 0000 | -,-,-,- -,*,*,* |
| 01Bh | PCLATL | PC Low Byte for PC<7:0> | | | | | | | | 0000 0000 | 0000 0000 | *,*,*,*,*,*,*,* |
| 023h | INTE0 | GIE | ADIE | E21IE | WDTIE | TB1IE | TMAIE | E20IE | E10IE | 0000 0000 | 0uuu uuuu | *,*,-,*,*,*,-,* |
| 024h | INTE1 | - | - | - | - | I2CERIE | I2CIE | - | - | 0000 0000 | uuuu uuuu | *,*,*,*,*,*,*,* |
| 026h | INTF0 | - | ADIF | E21IF | WDTIF | TB1IF | TMAIF | E20IF | E10IF | .000 0000 | .uuu uuuu | *,*,-,*,*,*,-,* |
| 027h | INTF1 | - | - | - | - | I2CERIF | I2CIF | - | - | 0000 0000 | uuuu uuuu | *,*,*,* r,r,*,* |
| 029h | WREG | Working Register | | | | | | | | xxxx xxxx | uuuu uuuu | *,*,*,*,*,*,*,* |
| 02Bh | STATUS | - | - | - | C | - | - | - | Z | …x xxxx | ...u uuuu | -,-,-,*,*,*,*,* |
| 02Ch | PSTATUS | BOR | PD | TO | IDL | - | SKERR | - | - | $000 $00. | uu$u u$u. | rw0,rw0,rw0,rw0 rw0,rw0,rw0,- |
| 02Eh | BIECN | - | - | - | - | VPPHV | - | BIEWR | BIERD | 1… $.00 | 1... $.uu | r1,-,-,- r,-,*,* |
| 02Fh | BIEARH | ENBIE | - | - | - | - | 11-bit look-up Table as BIEAH[2:0] | | | 0... xxxx | u... uuuu | *,-,-,- *,*,*,* |
| 030h | BIEARL | BIE Address Register as BIEAL[5:0] or 11-bit look-up Table as BIEAL[7:0] | | | | | | | | xxxx xxxx | uuuu uuuu | *,*,*,*,*,*,*,* |
| 031h | BIEDRH | BIE High Byte Data Register | | | | | | | | xxxx xxxx | uuuu uuuu | *,*,*,*,*,*,*,* |
| 032h | BIEDRL | BIE Low Byte Data Register | | | | | | | | xxxx xxxx | uuuu uuuu | *,*,*,*,*,*,*,* |
| 033h | PWRCN | ENLDO[1:0] | | VDDAX[1:0] | | - | - | ADRST | CSFON | 0000 0000 | uuuu u00u | *,*,*,*,*,wr0,wr0,* |
| 034h | OSCCN0 | OSCS[1:0] | | DHS[1:0] | | DMS[2:0] | | | CPUS | 0000 0000 | uuuu uuuu | *,*,*,*,*,*,*,* |
| 035h | OSCCN1 | - | - | ADCS[2:0] | | | DTMB[1:0] | | TMBS | 0000 0000 | uuuu uuu. | *,*,*,*,*,*,*,- |
| 036h | OSCCN2 | - | - | - | - | HAOM[1:0] | | ENHAO | LPO | .000 0011 | .uuu uu11 | .,*,*,*,*,*,*,r |
| 037h | WDTCN | - | - | – | | ENWDT | DWDT[2:0] | | | 0000 0000 | uuuu $000 | -,*,*,* rw1,*,*,* |
| 038h | TMACN | ENTMA | TMACL | TMAS | DTMA[2:0] | | | - | - | 0000 00.. | u0uu uu.. | *,rw1,*,*,*,*,-,- |
| 039h | TMAR | TMA counter Register | | | | | | | | 0000 0000 | uuuu uuuu | rw0,rw0,rw0,rw0 rw0,rw0,rw0,rw0 |
| 041h | CSFCN0 | SKRST | - | HAOTR[5:0] | | | | | | 0.10 0000 | u.uu uuuu | *,-,*,*,*,*,*,* |
| 043h | ADCRH | ADC conversion memory HighByte | | | | | | | | xxxx xxxx | uuuu uuuu | r,r,r,r r,r,r,r |
| 044h | ADCRM | ADC conversion memory Middle Byte | | | | | | | | xxxx xxxx | uuuu uuuu | r,r,r,r r,r,r,r |
| 045h | ADCRL | ADC conversion memory Low Byte | | | | | | | | xxxx xxxx | uuuu uuuu | r,r,r,r r,r,r,r |
| 046h | ADCCN1 | ENADC | ENHIGN | ENCHP | - | - | ADGN[2:0] | | | 0000 0000 | 0000 0000 | *,*,*,*,*,*,*,* |
| 047h | ADCCN2 | - | - | - | - | VREGN | DCSET[2:0] | | | …. 0000 | …. 0000 | -,-,-,- *,*,*,* |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 048h | ADCCN3 | OSR[3:0] | | | | - | - | - | - | 000. ..0. | 000. ..0. | *,*,*,- -,-,*,- |
| 049h | AINET1 | INH[2:0] | | | INL[2:0] | | | INIS | - | 0000 000. | 0000 000. | *,*,*,*,*,*,- |
| 04Ah | AINET2 | - | VRH[1:0] | | INX[1:0] | | VRL[1:0] | | - | .000 000. | .000 000. | -,*,*,*,*,*,- |
| 04Eh | TB1Flag | - | - | PWM6A | PWM5A | PWM4A | PWM3A | PWM2A | PWM1A | ..00 0000 | ..uu uuuu | -,-,r,r r,r,r,r |
| 04Fh | TB1CN0 | ENTB1 | TB1M[1:0] | | TB1RT[1:0] | | TB1CL | - | - | 0000 0000 | uuuu u0uu | *,*,*,*,rw1,*,* |
| 050h | TB1CN1 | PA1IV | PWMA1[2:0] | | | PA0IV | PWMA0[2:0] | | | 0000 0000 | uuuu uuuu | *,*,*,*,*,*,*,* |
| 051h | TB1RH | TimerB1 counter Register [15:8] | | | | | | | | xxxx xxxx | uuuu uuuu | r,r,r,r r,r,r,r |
| 052h | TB1RL | TimerB1 counter Register [7:0] | | | | | | | | xxxx xxxx | uuuu uuuu | r,r,r,r r,r,r,r |
| 053h | TB1C0H | TimerB1 counter Condition Register [15:8] | | | | | | | | xxxx xxxx | uuuu uuuu | *,*,*,*,*,*,*,* |
| 054h | TB1C0L | TimerB1 counter Condition Register [7:0] | | | | | | | | xxxx xxxx | uuuu uuuu | *,*,*,*,*,*,*,* |
| 055h | TB1C1H | TimerB1 counter Condition Register [15:8] | | | | | | | | xxxx xxxx | uuuu uuuu | *,*,*,*,*,*,*,* |
| 056h | TB1C1L | TimerB1 counter Condition Register [7:0] | | | | | | | | xxxx xxxx | uuuu uuuu | *,*,*,*,*,*,*,* |
| 057h | TB1C2H | TimerB1 counter Condition Register [15:8] | | | | | | | | xxxx xxxx | uuuu uuuu | *,*,*,*,*,*,*,* |
| 058h | TB1C2L | TimerB1 counter Condition Register [7:0] | | | | | | | | xxxx xxxx | uuuu uuuu | *,*,*,*,*,*,*,* |
| 061h | CFG | Rsv. | | | | | I2CRST | ENI2CT | ENI2C | .... .000 | .... .uuu | -,-,-,- -,*,*,* |
| 062h | ACT | SLAVE | - | - | I2CER | START | STOP | I2CINT | ACK | 0000 0000 | uuuu uuuu | *,*,*,*,*,*,*,* |
| 063h | STA | MACTF | SACTF | RDBF | RWF | DFF | ACKF | GCF | ARBF | 0001 0000 | uuuu uuuu | *,*,*,*,*,*,*,* |
| 064h | CRG | CRG[7:0] | | | | | | | | 0000 0000 | uuuu uuuu | *,*,*,*,*,*,*,* |
| 065h | TOC | I2CTF | DI2C[2:0] | | | I2CTLT[3:0] | | | | 0000 0000 | uuuu uuuu | *,*,*,*,*,*,*,* |
| 066h | RDB | RDB[7:1] | | | | | | | RDB[0] | xxxx xxxx | uuuu uuuu | *,*,*,*,*,*,*,* |
| 067h | TDB0 | TDB0[7:1] | | | | | | | TDB[0] | xxxx xxxx | uuuu uuuu | *,*,*,*,*,*,*,* |
| 068h | SID0 | SID[7:1],The corresponding address of the 7-bit mode | | | | | | | SIDV[0] | 0000 0000 | uuuu uuuu | *,*,*,*,*,*,*,* |
| 070h | PT1 | - | - | - | - | - | - | - | PT10 | xx.. ..xx | xx.. ..xx | *,*,-,- -,-,*,* |
| 071h | TRISC1 | - | - | - | - | - | - | - | - | 0000 0000 | uuuu uuuu | *,*,-,- -,-,*,* |
| 072h | PT1DA | - | - | - | - | - | - | - | - | 0000 0000 | uuuu uuuu | -,-,-,- *,-,*,* |
| 073h | PT1PU | - | - | - | - | - | - | - | - | 0000 0000 | uuuu uuuu | *,*,-,- -,-,*,* |
| 074h | PT1EG | - | - | FPWMA1 | FPWMA0 | - | - | E0EG[1:0] | | .... 0000 | .... uuuu | -,-,-,- *,*,*,* |
| 075h | PT2 | - | - | - | - | - | - | PT21 | PT20 | .... ..xx | .... ..xx | -,-,-,- -,-,*,* |
| 076h | TRISC2 | - | - | - | - | - | - | TC21 | TC20 | .... ..00 | .... ..uu | -,-,-,- -,-,*,* |
| 077h | PT2DA | - | - | - | - | - | - | DA21 | DA20 | .... ..00 | .... ..uu | -,-,-,- -,-,*,* |
| 078h | PT2PU | - | - | - | - | - | - | PU21 | PU20 | .... ..00 | .... ..uu | -,-,-,- -,-,*,* |
| 079h | PT3 | - | - | PT35 | PT34 | PT33 | PT32 | PT31 | PT30 | ..xx xxxx | ..xx xxxx | -,-,*,*,*,*,*,* |
| 07Ah | TRISC3 | - | - | TC35 | TC34 | TC33 | TC32 | TC31 | TC30 | ..00 0000 | ..uu uuuu | -,-,*,*,*,*,*,* |
| 07Bh | PT3DA | - | - | DA35 | DA34 | DA33 | DA32 | DA31 | DA30 | ..00 0000 | ..uu uuuu | -,-,*,*,*,*,*,* |
| 07Ch | PT3PU | - | - | PU35 | PU34 | PU33 | PU32 | PU31 | PU30 | ..00 0000 | ..uu uuuu | -,-,*,*,*,*,*,* |
| 080h ~ 0FFh | GPR0 | General Purpose Register as 128Byte | | | | | | | | uuuu uuuu | uuuu uuuu | *,*,*,*,*,*,*,* |

# 6. 電器特性

## 6.1. Recommended operating conditions

$T_A$ = -40℃ ~ 85℃,unless otherwise noted

| Sym. | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{REGVSS}$ | Supply Voltage | Connect to VSS | 0 | | 0 | |
| $V_{DD}$ | Supply Voltage | All digital peripherals and CPU | 2.2 | | 3.6 | V |
| | | Analog peripherals | 2.4 | | 3.6 | |
| $V_{SS}$ | Supply Voltage | | 0 | | 0 | |

## 6.2. Internal RC Oscillator

$T_A$ = 25℃,$V_{DD}$ = 3.0V,unless otherwise noted

| Sym. | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| HAO(2.0MHz) | High Speed Oscillator frequency | ENHAO[0]=1 | 1.8 | 2.0 | 2.2 | MHz |
| HAO(3.8MHz) | High Speed Oscillator frequency | | 3.42 | 3.8 | 4.18 | MHz |
| HAO(7.0MHz) | High Speed Oscillator frequency | | 6.3 | 7.0 | 7.7 | MHz |
| LPO | Low Power Oscillator frequency | $V_{DD}$ supply voltage be enable LPO | | 14 | | KHz |

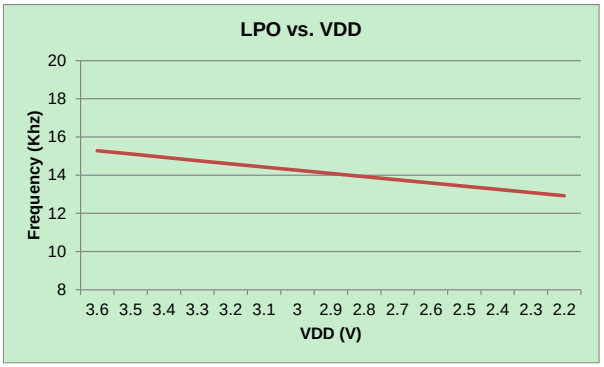



Figure 6.2-1 LPO vs. VDD

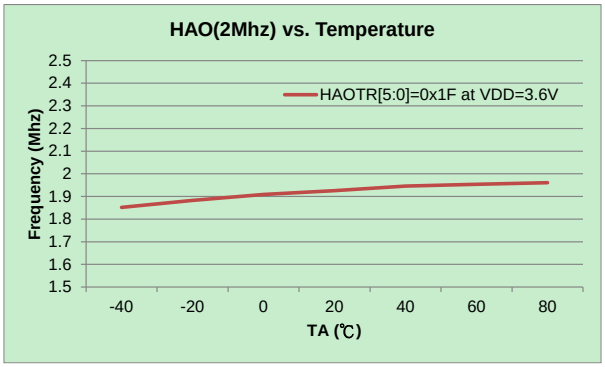



Figure 6.2-3 HAO(2.0MHz) vs. Temperature

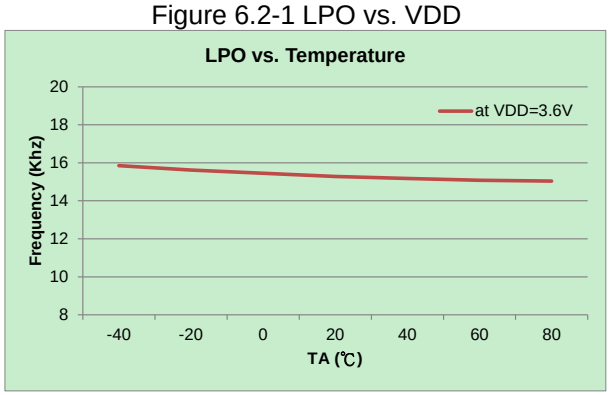



Figure 6.2-2 LPO vs. Temperature

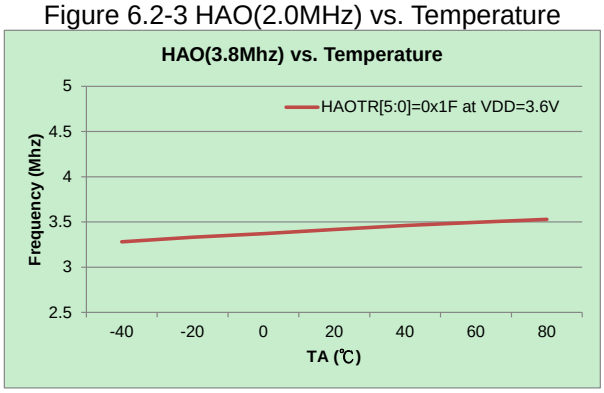



Figure 6.2-4 HAO(3.8MHz) vs. Temperature

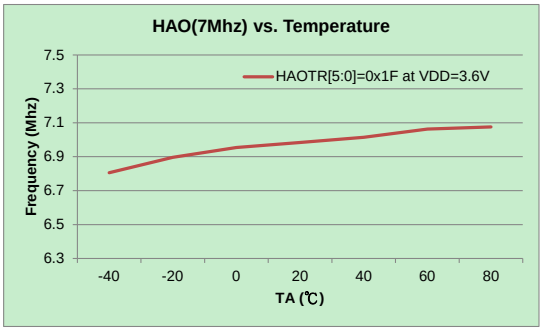



Figure 6.2-5 HAO(7.0MHz) vs. Temperature

## 6.3. Supply current into VDD excluding peripherals current

$T_A$ = 25℃,$V_{DD}$ = 3.0V,OSC_LPO = 14KHz,unless otherwise noted

| Sym. | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_{AM1}$ | Active mode 1 | OSC_CY = off, OSC_HAO = 8MHz, CPU_CK = 8MHz | | 0.78 | | mA |
| $I_{AM2}$ | Active mode 2 | OSC_CY = off, OSC_HAO =4MHz, CPU_CK = 4MHz | | 0.43 | | mA |
| $I_{AM3}$ | Active mode 3 | OSC_CY = off, OSC_HAO = 2MHz, CPU_CK = 2MHz | | 0.24 | | mA |
| $I_{AM4}$ | Active mode 4 | OSC_CY = off, OSC_HAO = 2MHz, CPU_CK = 1MHz | | 0.14 | | mA |
| $I_{LP1}$ | Low Power 1 | OSC_CY = off, OSC_HAO = off, CPU_CK = LPO, | | 2.5 | | uA |
| $I_{LP2}$ | Low Power 2 | OSC_CY = off, OSC_HAO = off, CPU_CK = LPO, Idle state | | 1.2 | | uA |
| $I_{LP3}$ | Low Power 3 | OSC_CY = off, OSC_HAO = off, CPU_CK = off, Sleep state | | 0.6 | | uA |

OSC_HAO：Internal High Accuracy Oscillator frequency.

CPU_CK：CPU core work frequency.

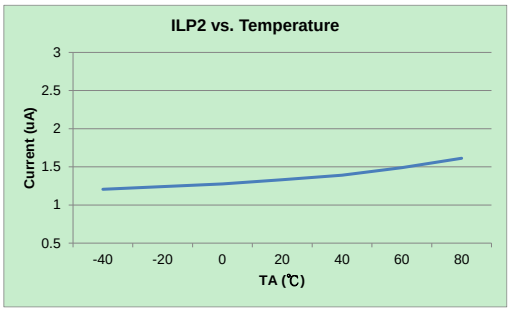



Figure 6.3-1 ILP2 vs. Temperature

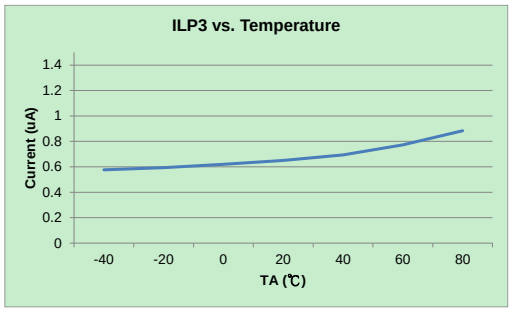



Figure 6.3-2 ILP3 vs. Temperature

## 6.4. Port1~3

$T_A$ = 25℃,$V_{DD}$ = 3.0V,unless otherwise noted

| Sym. | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Input voltage and Schmitt trigger and leakage current and timing** | | | | | | |
| $V_{IH}$ | High-Level input voltage | | 0.7*VDD | | VDD | V |
| $V_{IL}$ | Low-Level input voltage | | VSS | | 0.3*VDD | |
| $V_{hys}$ | Input Voltage hysteresis(VIH - VIL ) | | | 0.8 | | V |
| $I_{LKG}$ | Leakage Current | | | | 0.1 | uA |
| $R_{PU}$ | Port pull high resistance | | | 180 | | kΩ |
| **Output voltage and current and frequency** | | | | | | |
| $V_{OH}$ | High-level output voltage | $I_{OH}$=10mA | $V_{DD}$ -0.3 | | | V |
| $V_{OL}$ | Low-level output voltage | $I_{OL}$=-10mA | | | VSS +0.3 | |

## 6.5. Rest(Brownout)

$T_A$ = 25℃,$V_{DD}$ = 3.0V,unless otherwise noted

| Sym. | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| BOR | Pulse length needed to accepted reset internally, $t_{d\text{-}LVR}$ | | 2 | | | uS |
| | $V_{DD}$ Start Voltage to accepted reset internally (L➔H),$V_{LVR}$ | | 1.6 | 1.85 | 2.1 | V |
| | Hysteresis, $V_{HYS\text{-}LVR}$ | | | 70 | | mV |
| BOR：Brownout Reset<br>LVR：Low Voltage Reset of BOR | | | | | | |

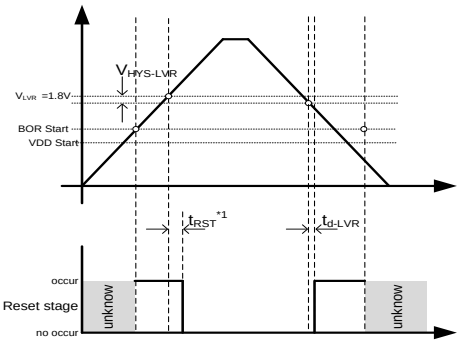



Figure6.5-1 BOR reset diagram

*1 rRST：Please see BOR Introduce of HY10Pxx series User's Guide (UG-HY10S00-Vxx).

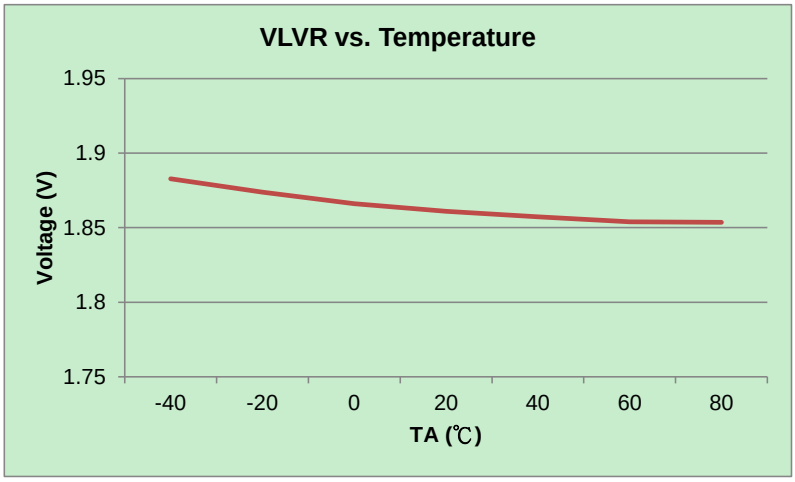



Figure6.5-3 LVR vs. Temperature

## 6.6. Power System

$T_A$ = 25℃,$V_{DD}$ = 3.0V,unless otherwise noted

| Sym. | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| VDDA | VDDA operation current, $I_{VDDA}$ | $I_L$ = 0mA | ENLDO[1:0]=11b | | 13 | | uA |
| | Select VDDA output voltage | $I_L$ = 0.1mA, VDD≧VDDA+0.2V | VDDAX[1:0]=01b | | 3.0 | | V |
| | | | VDDAX[1:0]=10b | | 2.7 | | |
| | | | VDDAX[1:0]=11b | | 2.4 | | |
| | Dropout voltage | $I_L$ = 10mA | VDDAX[1:0]=01b | | 150 | | mV |
| | | | VDDAX[1:0]=10b | | 165 | | |
| | | | VDDAX[1:0]=11b | | 180 | | |
| | Temperature drift | ENLDO[1:0]=11b, $I_L$ = 0.1mA | $T_A$=-40℃~85℃ | | 50 | | ppm/℃ |
| | $V_{DD}$ Voltage drift | | $V_{DD}$=2.5V~3.6V | | ±0.2 | | %/V |
| ACM | Analog Common Mode Voltage ,$V_{ACM}$ | ENADC[0]=1 | $I_L$ = 0uA | | 1.2 | | V |
| | Analog Common Mode Voltage with Load | | $I_L$ = ±200uA | 0.98 | | 1.02 | $V_{ACM}$ |
| | Temperature drift | ENADC[0]=1, $I_L$ = 10uA | $T_A$=-40℃~85℃ | | 50 | | ppm/℃ |
| | VDDA Voltage drift | | | | 100 | | uV/V |
| VDDA：Adjust Voltage Regulator<br>ACM：Analog Common Mode Voltage | | | | | | | |

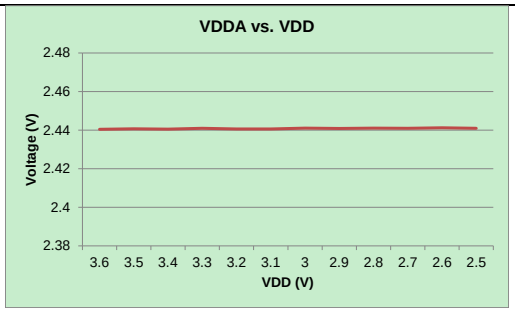



Figure6.6-1 VDDA vs. VDD

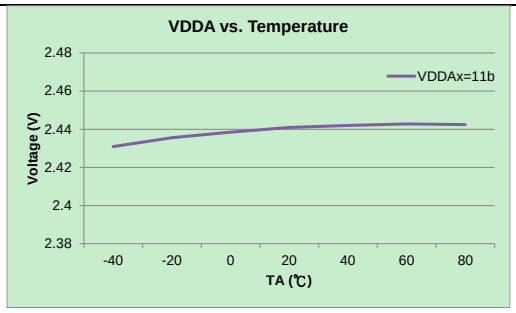



Figure6.6-2 VDDA vs. Temperature

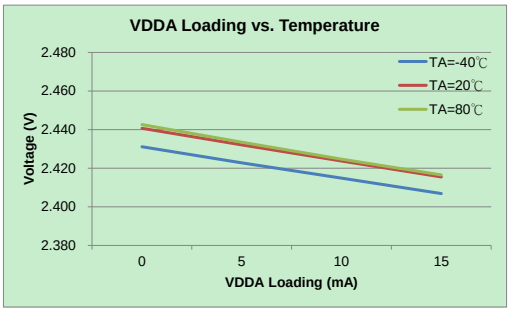



Figure6.6-3 VDDA Loading vs. Temperature

## 6.7. SD18, Power Supply and recommended operating conditions

$T_A$ = 25℃,$V_{DD}$ = 3.0V, VDDA=2.4V,unless otherwise noted

| Sym. | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| $V_{SD18}$ | Supply Voltage at VDDA | ENVDDA[0]=0 | | 2.4 | | 3.6 | V |
| $f_{SD18}$ | Modulator sample frequency, ADC_CK | | | 25 | 250 | 300 | KHz |
| | Over Sample Ratio, OSR | | | 128 *1 | | 32768 | |
| $I_{SD18}$ | Operation supply current without PGA | ENADC[0]=1 | GAIN =4, ADC_CK=250KHz | | 120 | | uA |
| *1, OSR=128, setting by ADCCN3[ OSR[3] ] bit.<br>OSR[3:0]=1010, OSR=128; OSR[3:0]=0xxx, OSR=256 ~ 32768 | | | | | | | |

### 6.7.1. SD18, performance(fSD18=250KHz)

$T_A$ = 25℃,$V_{DD}$ = 3.0V, VDDA=3.0V,$V_{VR}$=1.0V,GAIN=1 without PGA, unless otherwise noted

| Sym. | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| INL | Integral Nonlinearity(INL) | VDDA=2.4V,$V_{VR}$=1.0V,ΔSI=±450mV | | | ±0.003 | ±0.01 | %FSR |
| | No Missing Codes[3] | ADC_CK=250KHz,OSR[2:0]=010b | | 23 | | | Bits |
| $G_{SD18}$ | Temperature drift **Gain 1~x16** | | $T_A$= -40℃~85℃ | | 5 | | ppm/℃ |
| $E_{OS}$ | Offset error of Full Scale Rang input voltage range with Chopper without PGA | ΔAI=0V<br>ΔVR=0.9V<br>DCSET[2:0]=<000><br>*ΔAI is external short | Gain=2 | | | 1 | %FSR |
| | Offset temperature drift with chopper without PGA | | GAIN=1 | | 2 | | uV/℃ |
| | | | GAIN=2 | | 1 | | |
| | | | GAIN=4 | | 0.5 | | |
| | | | GAIN=16 | | 0.15 | | |
| $CM_{SD18}$ | Common-mode rejection | $V_{CM}$=0.7V to 1.7V, $V_{VR}$=1.0V,without PGA | $V_{SI}$=0V, GAIN=1 | | 90 | | dB |
| | | $V_{CM}$=0.7V to 1.7V, $V_{VR}$=1.0V, | $V_{SI}$=0V, GAIN=16 | | 75 | | |
| PSRR | DC power supply rejection | VDDA=3.0V,ΔVDDA=±100mV, $V_{VR}$=1.0V, $V_{SI}$=$V_{SI-}$=1.2V, | GAIN=1 PGA=off | | 75 | | dB |
| | | | GAIN=16 | | | | |

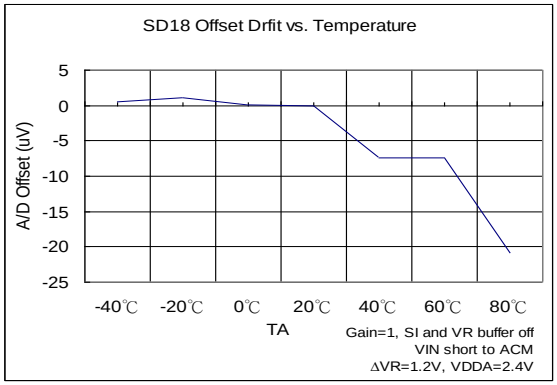



Figure6.7-1(a) SD18 Offset Temperature drift

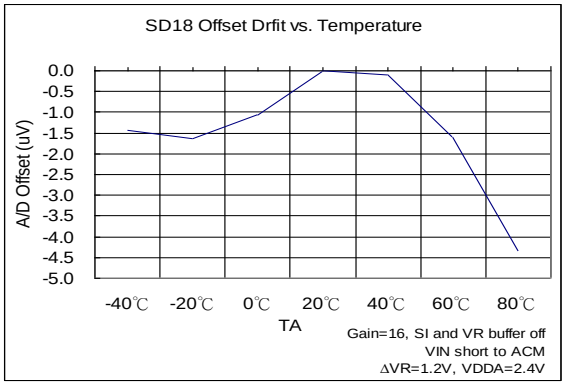



Figure6.7-1(b) SD18 Offset Temperature drift

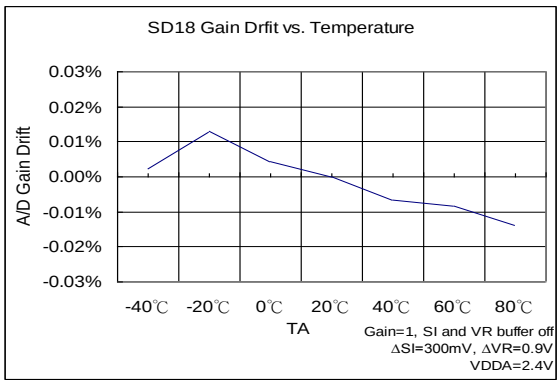



Figure6.7-2(a) SD18 Gain drift with Temperature

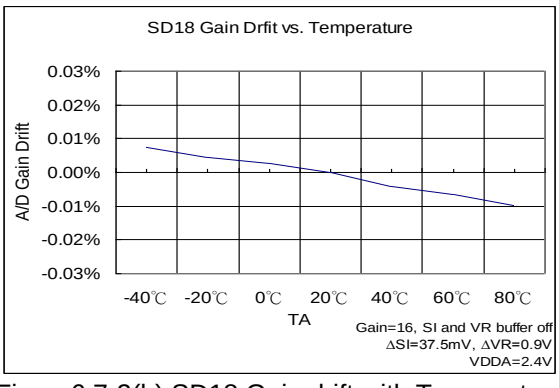



Figure6.7-2(b) SD18 Gain drift with Temperature

### 6.7.2. SD18 Noise Performance

$T_A$ = 25℃,$V_{DD}$ = 3.0V, VDDA=2.4V,unless otherwise noted

HY10P40 針對 SD18 提供了重要的輸入雜訊規格。Table6.7-4(a), Table6.7-4(b) 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，ADC 參考電壓源為使用外部 VDDA 及外部 VSS 當參考電壓源網路，等效參考電壓為 1.2V，取樣 1024 筆資料。

| *ENOB(RMS) with OSR/GAIN at A/D Clock=250Khz, VDDA=2.4V, VREF=1.2V* | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Max. Vin(mV) =0.9*VREF (1) | OSR | | | | | 128 | 256 | 512 | 1024 | 2048 | 4096 | 8192 | 16384 | 32768 |
| | Output rate(HZ) | | | | | 1953 | 977 | 488 | 244 | 122 | 61 | 31 | 15 | 8 |
| | Gain | = | PGA | × | ADGN | | | | | | | | | |
| ±2160 | 0.5 | = | 1 | × | 0.5 | 14.39 | 16.14 | 16.96 | 17.27 | 17.44 | 17.66 | 18.08 | 19.52 | 19.73 |
| ±1080 | 1 | = | 1 | × | 1 | 14.38 | 16.04 | 16.85 | 17.18 | 17.42 | 17.76 | 18.89 | 19.85 | 20.22 |
| ±540 | 2 | = | 1 | × | 2 | 14.4 | 16.01 | 16.79 | 17.03 | 17.31 | 17.53 | 18.02 | 19.55 | 20.1 |
| ±270 | 4 | = | 1 | × | 4 | 14.42 | 15.91 | 16.57 | 16.94 | 17.14 | 17.39 | 17.69 | 18.61 | 19.81 |
| ±135 | 8 | = | 1 | × | 8 | 14.34 | 15.66 | 16.24 | 16.64 | 17.01 | 17.4 | 17.99 | 19.05 | 19.52 |
| ±68 | 16 | = | 1 | × | 16 | 14.22 | 15.3 | 15.88 | 16.34 | 16.85 | 17.41 | 17.85 | 18.53 | 19.01 |

**(1) Max.Vin (mV) is the max. input voltage of single end to ground (VSS).**

Table6.7-4(a) SD18 ENOB Table

| *RMS Noise(uV) with OSR/GAIN at A/D Clock=250Khz, VDDA=2.4V, VREF=1.2V* | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Max. Vin(mV) =0.9*VREF | OSR | | | | | 128 | 256 | 512 | 1024 | 2048 | 4096 | 8192 | 16384 | 32768 |
| | Output rate(HZ) | | | | | 1953 | 977 | 488 | 244 | 122 | 61 | 31 | 15 | 8 |
| | Gain | = | PGA | × | ADGN | | | | | | | | | |
| ±2160 | 0.5 | = | 1 | × | 0.5 | 226.11 | 67.48 | 38.23 | 30.84 | 27.40 | 23.43 | 17.59 | 6.46 | 5.58 |
| ±1080 | 1 | = | 1 | × | 1 | 113.68 | 36.14 | 20.60 | 16.42 | 13.86 | 10.94 | 5.00 | 2.58 | 1.99 |
| ±540 | 2 | = | 1 | × | 2 | 56.28 | 18.46 | 10.69 | 9.06 | 7.49 | 6.40 | 4.58 | 1.58 | 1.09 |
| ±270 | 4 | = | 1 | × | 4 | 27.72 | 9.85 | 6.25 | 4.82 | 4.20 | 3.53 | 2.88 | 1.52 | 0.66 |
| ±135 | 8 | = | 1 | × | 8 | 14.67 | 5.85 | 3.92 | 2.98 | 2.30 | 1.75 | 1.17 | 0.56 | 0.40 |
| ±68 | 16 | = | 1 | × | 16 | 7.95 | 3.76 | 2.52 | 1.83 | 1.29 | 0.87 | 0.64 | 0.40 | 0.29 |

Table6.7-4(b) SD18 RMS Noise Table

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

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

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

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

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

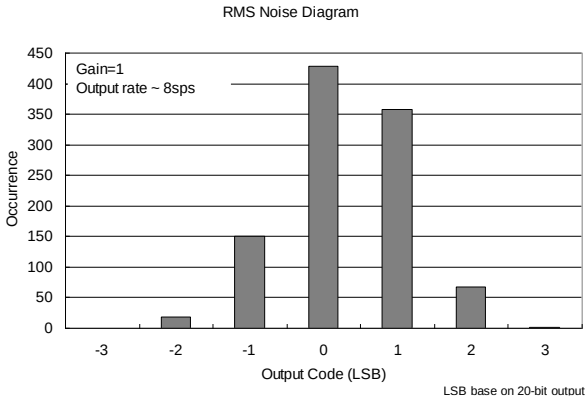



Figure6.7-4(a) RMS Noise Diagram

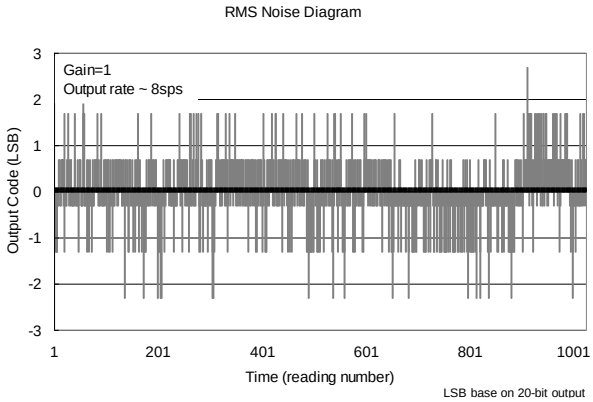



Figure6.7-4(b) Output Code Diagram

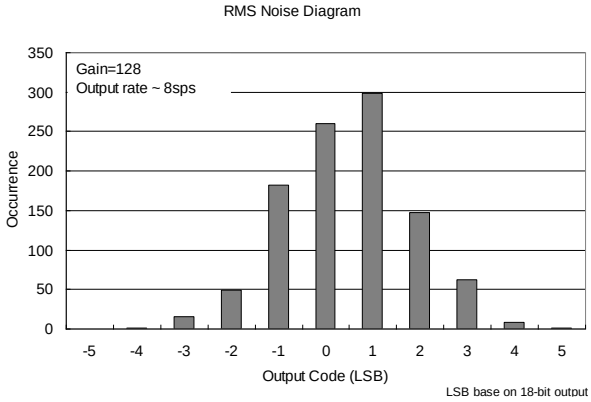



Figure6.7-4(c) RMS Noise Diagram(Gain=16)

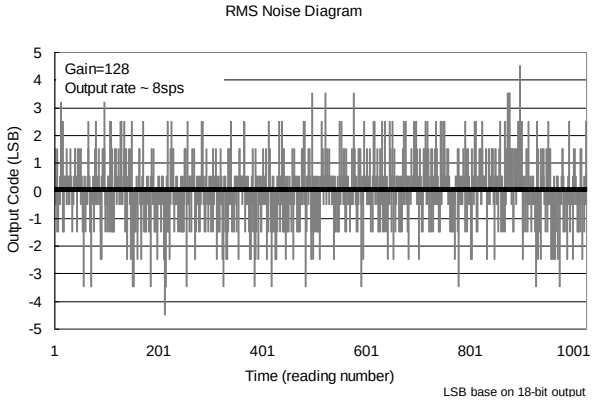



Figure6.7-4(d) Output Code Diagram(Gain=16)

## 6.8. Build-In EPROM(BIE)

$T_A$ = 25℃,$V_{DD}$ = 3.0V, unless otherwise noted

| Sym. | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{BIE}$ | Supply Voltage | | | 6.0 | 6.5 | V |
| $I_{BIE}$ | Operation supply current | | | 5 | | mA |
| $V_{SS}$ | Supply Voltage | | | 0 | | V |

## 7. 訂貨資訊

| 下單品名 [1] | 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] |
|---|---|---|---|---|---|---|---|---|---|
| HY10P40-D000 | Die | - | D | 000 | 000 | - | 250 | Green[4] | - |
| HY10P40-S008 | SOP | 8 | S | 008 | 000 | Tube | 100 | Green[4] | MSL-3 |
| HY10P40-S008 | SOP | 8 | S | 008 | 000 | Tape & Reel | 2500 | Green[4] | MSL-3 |
| HY10P40-M010 | MSOP | 10 | M | 010 | 000 | Tube | 80 | Green[4] | MSL-3 |
| HY10P40-M010 | MSOP | 10 | M | 010 | 000 | Tape & Reel | 3000 | Green[4] | MSL-3 |
| HY10P40-E016 | SSOP | 16 | E | 016 | 000 | Tube | 100 | Green[4] | MSL-3 |
| HY10P40-E016 | SSOP | 16 | E | 016 | 000 | Tape & Reel | 2500 | Green[4] | MSL-3 |

[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。則下單品名為 HY10P40-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。則下單品名為 HY10P40-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 SSOP16 出貨，則下單品名為 HY10P40-E016，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 SOP8 出貨，則下單品名為 HY10P40-S008-008，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 009,而需求的產品是封裝片 MSOP10 出貨，則下單品名為 HY10P40-M010-009，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。

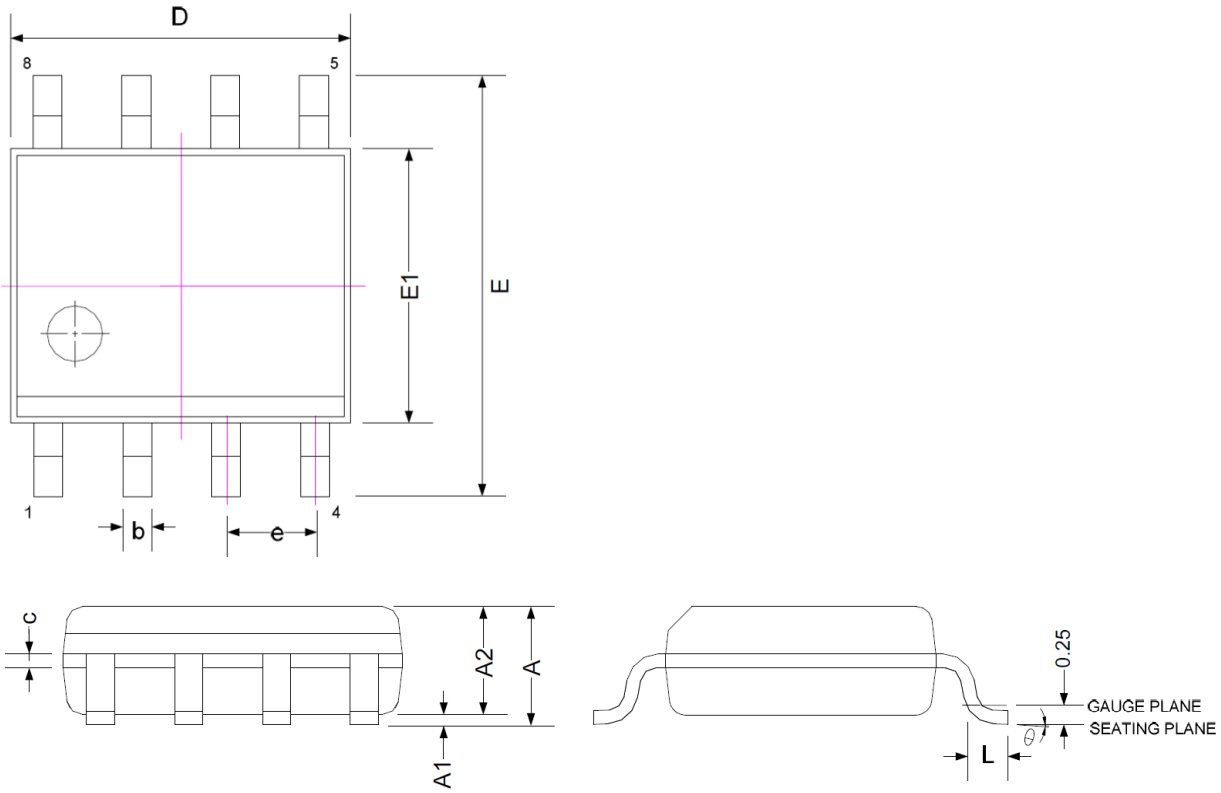
[4] **Green (RoHS & no Cl/Br)**

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。

# 8. 封裝型式資訊

## 8.1. SOP8(S008)

### 8.1.1. Package Dimensions SOP8(150mil)



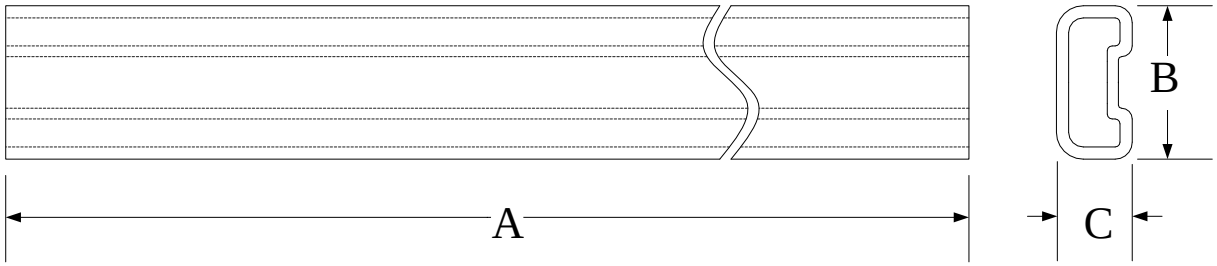

| SYMBOLS | MIN | NOM | MAX |
|---|---|---|---|
| A | - | - | 1.75 |
| A1 | 0.10 | - | 0.25 |
| A2 | 1.25 | - | - |
| b | 0.31 | - | 0.51 |
| c | 0.10 | - | 0.25 |
| D | | 4.90 BSC | |
| E1 | | 3.90 BSC | |
| E | | 6.00 BSC | |
| L | 0.40 | - | 1.27 |
| e | | 1.27 BSC | |
| $\theta^\circ$ | 0 | - | 8 |

Note:

1. All dimensions refer to JEDEC OUTLINE MS-012.
2. Do not include Mold Flash or Protrusions.
3. Unit: mm.

### 8.1.2. Tube Dimensions SOP8(150mil)

Unit : mm




Type 1:

| SYMBOLS | A | B | C |
|---|---|---|---|
| Spec. | 521.0±1.0 | 7.747±0.15 | 3.810±0.15 |

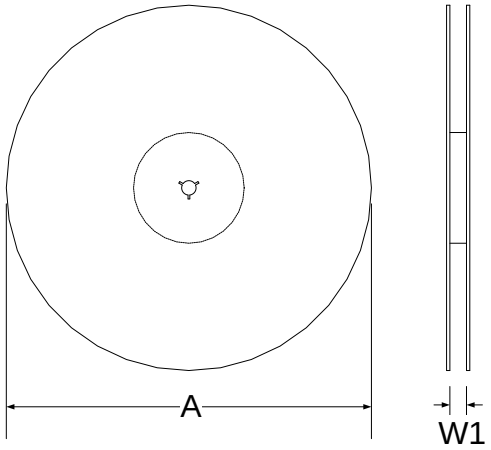
Type 2:

| SYMBOLS | A | B | C |
|---|---|---|---|
| Spec. | 521.0±1.0 | 7.874 REF. | 3.810 REF. |

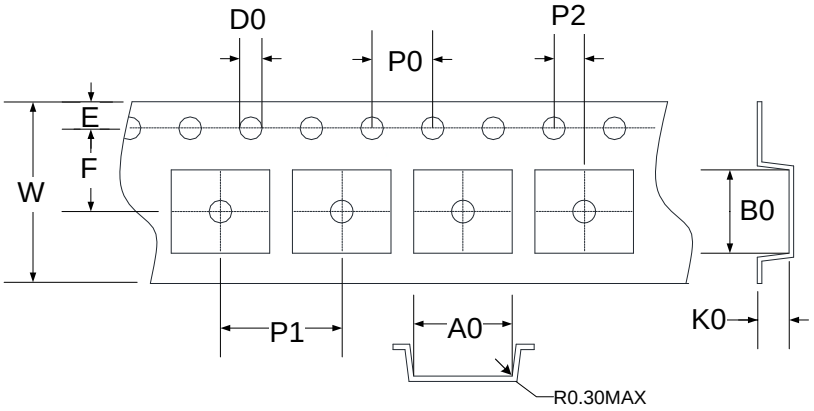
### 8.1.3. Tape & Reel Information

#### 8.1.3.1. Reel Dimensions-Type1

Unit : mm




#### 8.1.3.2. Carrier Tape Dimensions

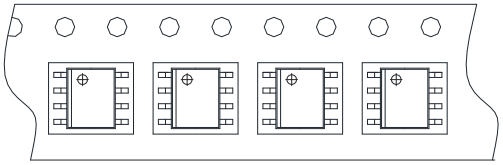



| SYMBOLS | Reel Dimensions | | Carrier Tape Dimensions | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | W1 | A0 | B0 | K0 | P0 | P1 | P2 | E | F | D0 | W |
| Spec. | 330 | 12.5 | 6.90 | 5.40 | 2.00 | 4.00 | 8.00 | 2.00 | 1.75 | 5.50 | 1.50 | 12.00 |
| Tolerance | +6/-3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

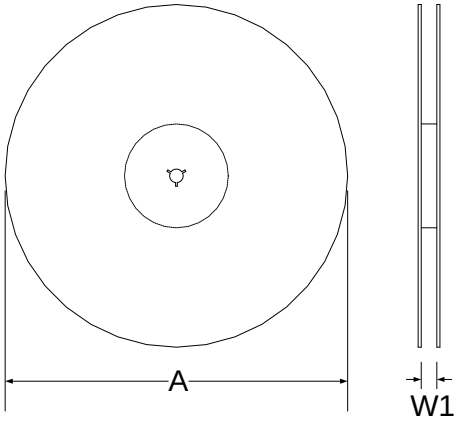
Unit : mm

#### 8.1.3.3. Pin1 direction

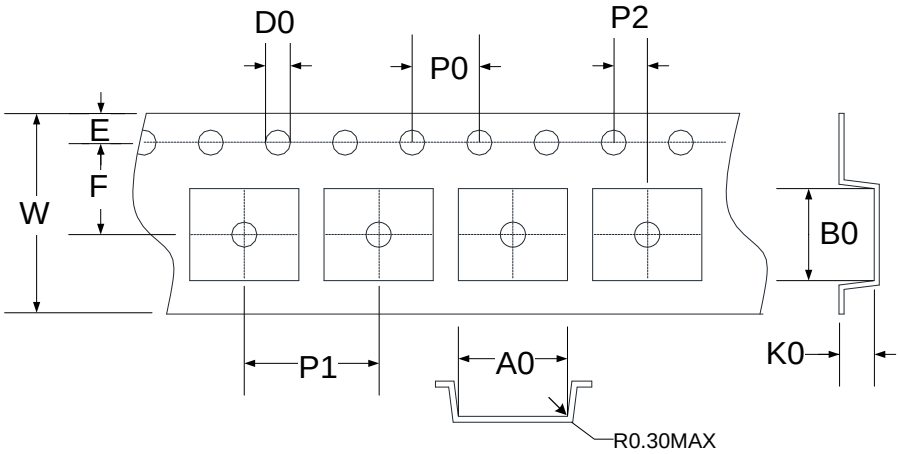


### 8.1.3.4. Reel Dimensions –Type2

Unit : mm




### 8.1.3.5. Carrier Tape Dimensions

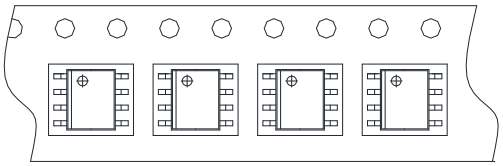



| SYMBOLS | Reel Dimensions | | Carrier Tape Dimensions | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | W1 | A0 | B0 | K0 | P0 | P1 | P2 | E | F | D0 | W |
| Spec. | 330 | 12.5 | 6.50 | 5.20 | 2.10 | 4.00 | 8.00 | 2.00 | 1.75 | 5.50 | 1.50 | 12.00 |
| Tolerance | +6/-3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

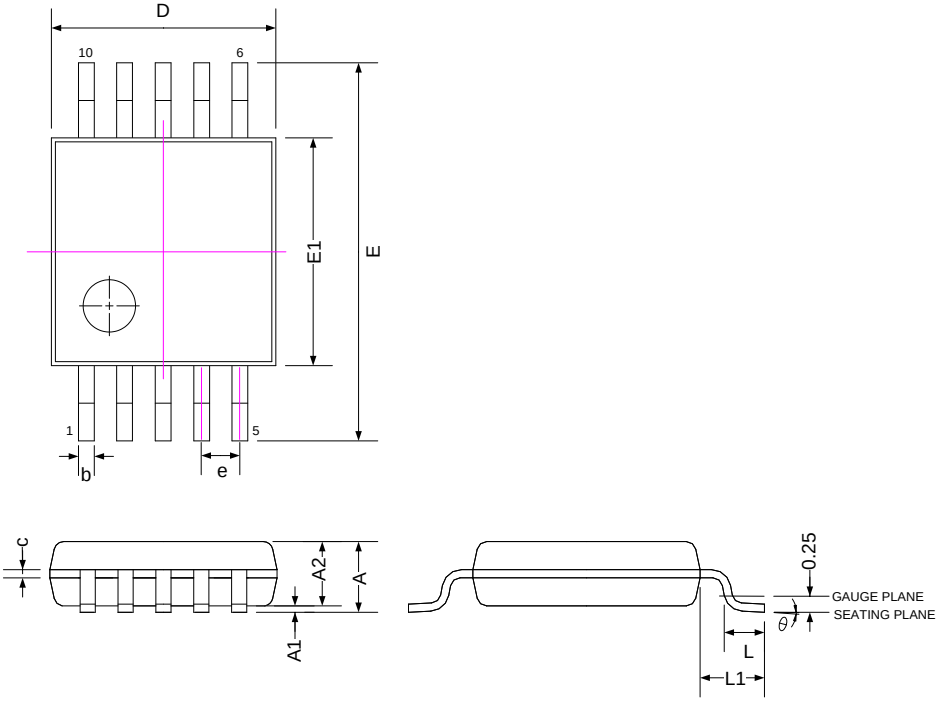
Unit : mm

### 8.1.3.6. Pin1 direction



## 8.2. MSOP10(M010)

### 8.2.1. Package Dimensions

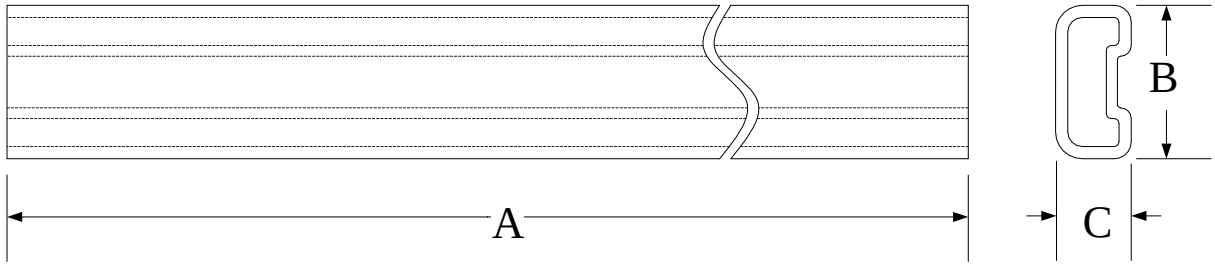



| SYMBOLS | MIN | NOM | MAX |
|---|---|---|---|
| A | - | - | 1.10 |
| A1 | 0.00 | 0.10 | 0.15 |
| A2 | 0.75 | 0.85 | 0.95 |
| b | 0.17 | 0.20 | 0.27 |
| c | 0.08 | 0.15 | 0.23 |
| D | 3.00 BASIC | | |
| E1 | 3.00 BASIC | | |
| E | 4.90 BASIC | | |
| L | 0.40 | 0.60 | 0.80 |
| L1 | 0.95 REF | | |
| e | 0.50 BASIC | | |
| θ° | 0 | - | 8 |

Note:
1. All dimensions refer to JEDEC OUTLINE MO -187.
2. Do not include Mold Flash or Protrusions.
3. Unit：mm.

### 8.2.2. Tube Dimensions MSOP10(M010)

Unit : mm

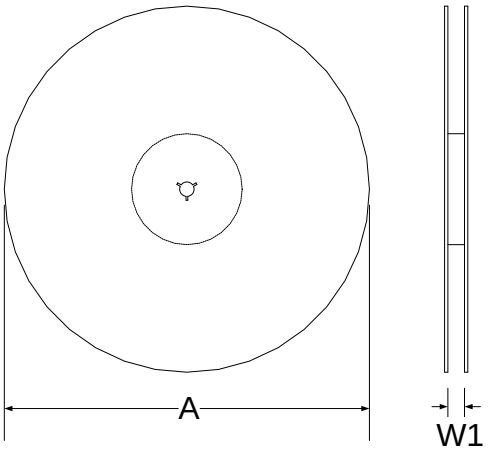



| SYMBOLS | A | B | C |
|---|---|---|---|
| Spec. | 270.0±1.3 | 6.55±0.1 | 3.0±0.1 |

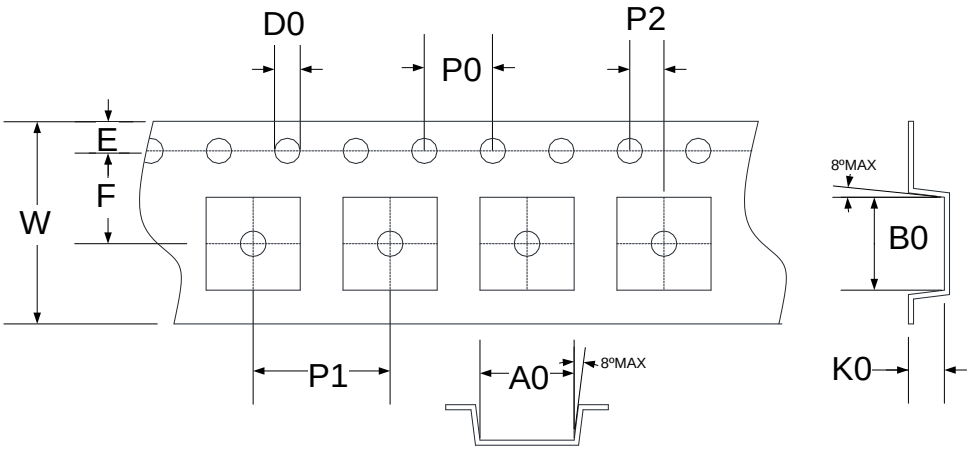
### 8.2.3. Tape & Reel Information

#### 8.2.3.1. Reel Dimensions –Type1

Unit : mm



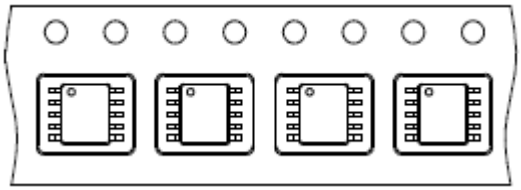

#### 8.2.3.2. Carrier Tape Dimensions




| SYMBOLS | Reel Dimensions | | Carrier Tape Dimensions | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | W1 | A0 | B0 | K0 | P0 | P1 | P2 | E | F | D0 | W |
| Spec. | 330 | 12.5 | 5.30 | 3.40 | 1.40 | 4.00 | 8.00 | 2.00 | 1.75 | 5.50 | 1.50 | 12.00 |
| Tolerance | ±2.00 | ±1.50 | ±0.10 | ±0.10 | ±0.10 | ±0.10 | ±0.10 | ±0.05 | ±0.10 | ±0.05 | +0.1/-0 | ±0.20 |

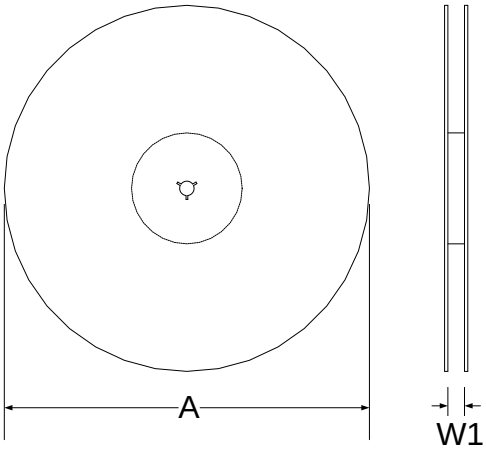
Note: 10 Sprocket hole pitch cumulative tolerance is ±0.20mm.
Unit : mm

#### 8.2.3.3. Pin1 direction

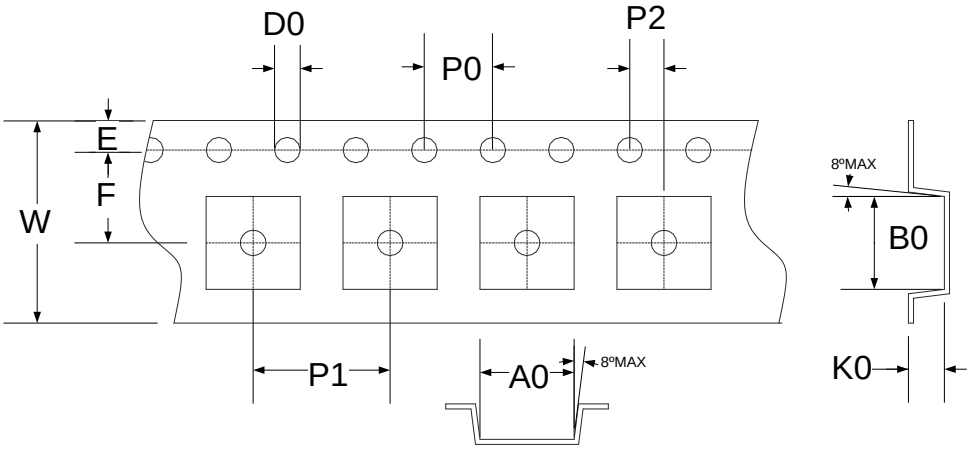


### 8.2.3.4. Reel Dimensions –Type2

Unit : mm



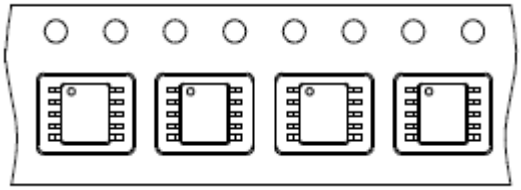

### 8.2.3.5. Carrier Tape Dimensions




| SYMBOLS | Reel Dimensions | | Carrier Tape Dimensions | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | W1 | A0 | B0 | K0 | P0 | P1 | P2 | E | F | D0 | W |
| Spec. | 330 | 12.5 | 5.20 | 3.30 | 1.20 | 4.00 | 8.00 | 2.00 | 1.75 | 5.50 | 1.50 | 12.00 |
| Tolerance | ±2.00 | ±1.50 | ±0.10 | ±0.10 | ±0.10 | ±0.10 | ±0.10 | ±0.05 | ±0.10 | ±0.05 | +0.1/-0 | ±0.30 |

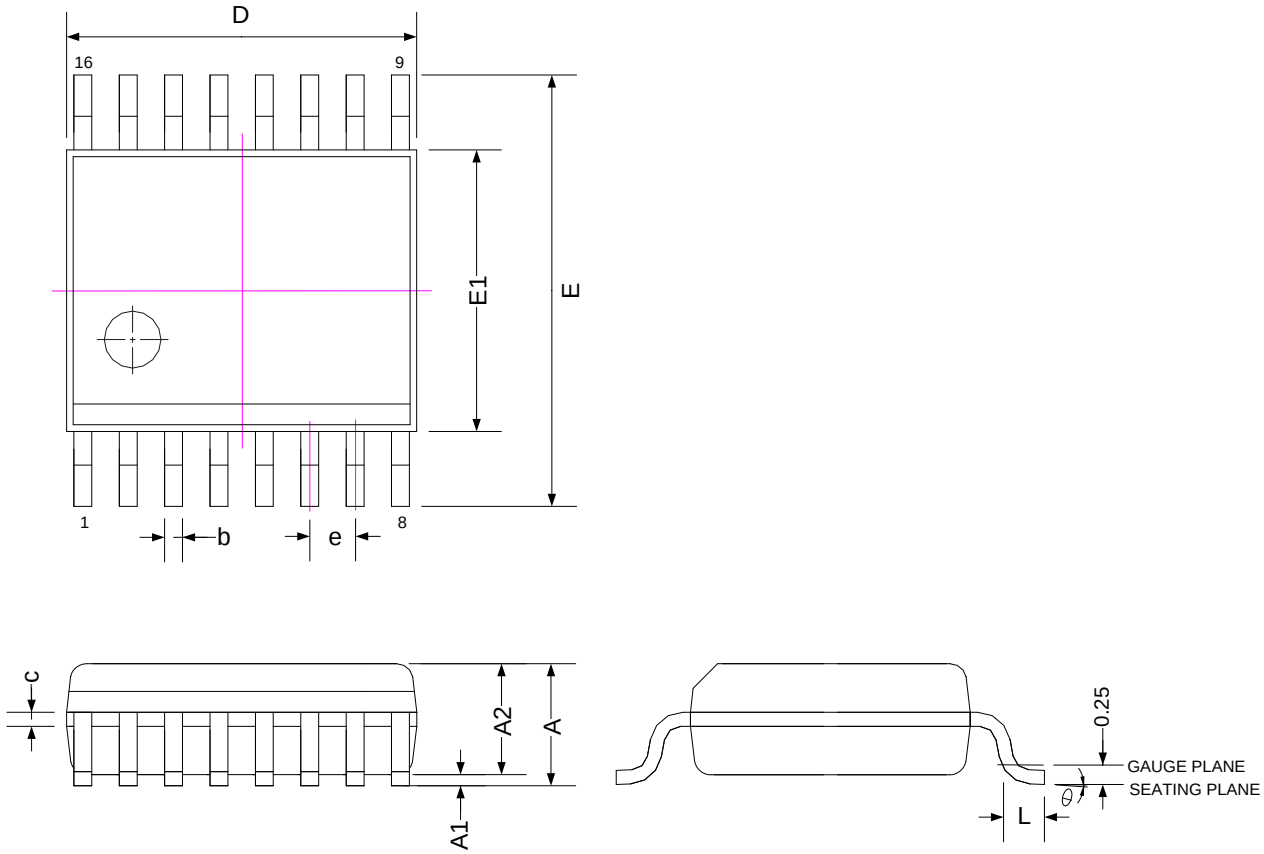
Note: 10 Sprocket hole pitch cumulative tolerance is ±0.20mm.
Unit : mm

### 8.2.3.6. Pin1 direction



## 8.3. SSOP16(E016)

### 8.3.1. Package Dimensions

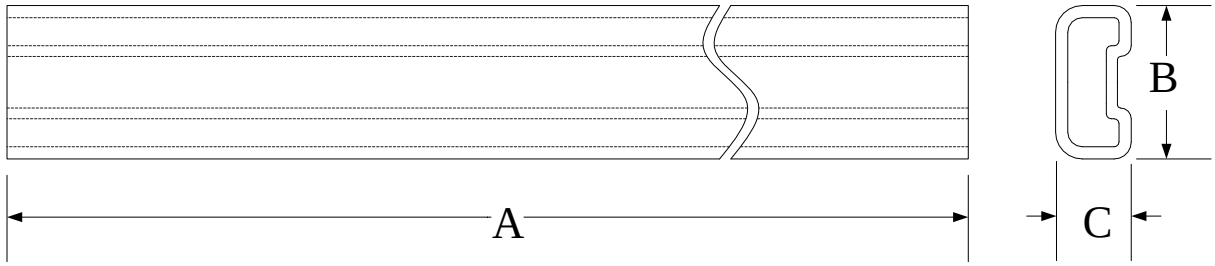



| SYMBOLS | MIN | NOM | MAX |
|---|---|---|---|
| A | - | - | 1.75 |
| A1 | 0.10 | 0.15 | 0.25 |
| A2 | - | - | 1.50 |
| b | 0.20 | - | 0.30 |
| c | 0.18 | - | 0.25 |
| D | 4.80 | 4.90 | 5.00 |
| E1 | 3.81 | 3.91 | 3.99 |
| E | 5.79 | 5.99 | 6.20 |
| L | 0.41 | - | 1.27 |
| e | 0.635 BASIC | | |
| θ°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

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

### 8.3.2. Tube Dimensions SSOP16(E016)

Unit : mm




Type 1:

| SYMBOLS | A | B | C |
|---|---|---|---|
| Spec. | 521.0±1.0 | 7.747±0.15 | 3.810±0.15 |

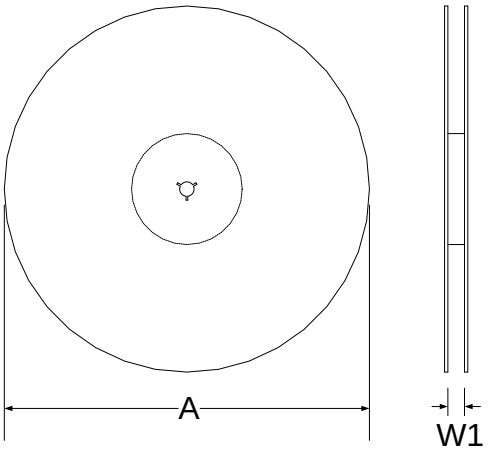
Type 2:

| SYMBOLS | A | B | C |
|---|---|---|---|
| Spec. | 521.0±1.0 | 7.874 REF. | 3.810 REF. |

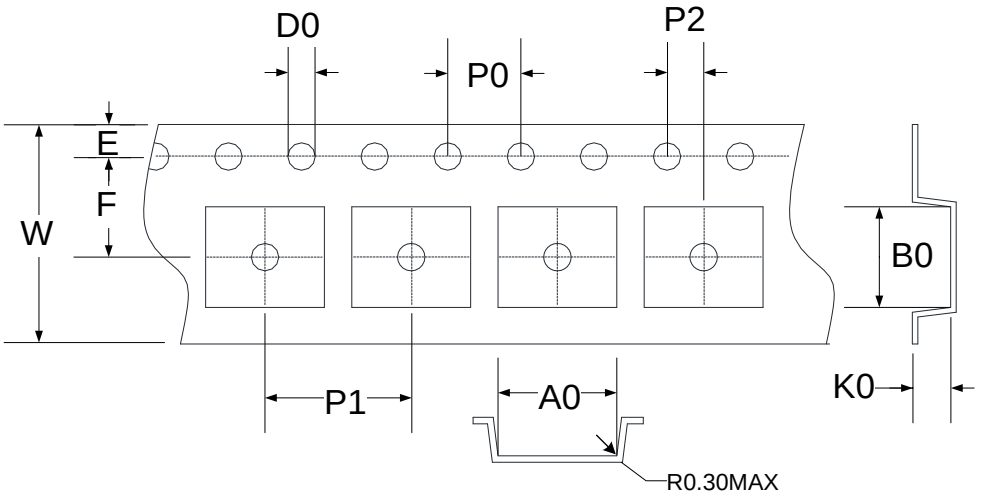
### 8.3.3. Tape & Reel Information

#### 8.3.3.1. Reel Dimensions –Type1

Unit : mm



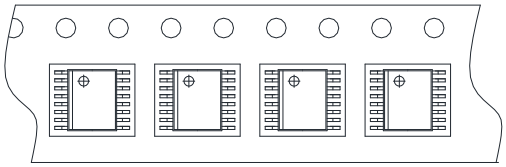

#### 8.3.3.2. Carrier Tape Dimensions




| 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 |

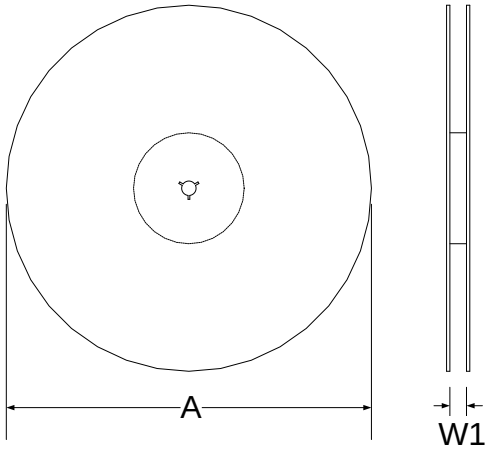
Note: 10 Sprocket hole pitch cumulative tolerance is ±0.20mm.
Unit : mm

#### 8.3.3.3. Pin1 direction

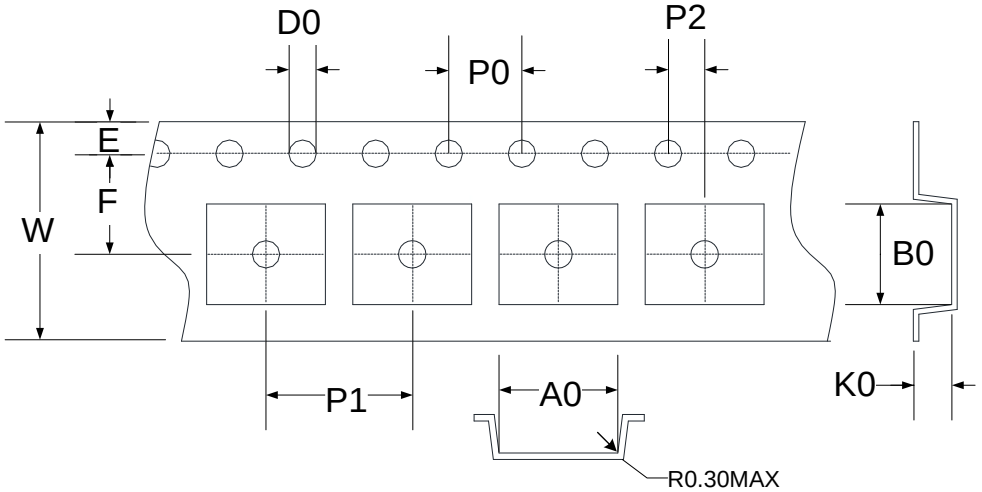


### 8.3.3.4. Reel Dimensions –Type2

Unit : mm



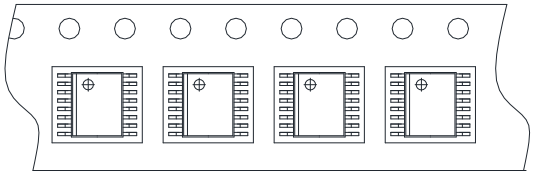

### 8.3.3.5. Carrier Tape Dimensions




| 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

### 8.3.3.6. Pin1 direction



## 9. 修訂記錄

以下描述本文件差異較大的地方，而標點符號與字形的改變不在此描述範圍：

| 版本 | 頁次 | 變更摘要 |
|---|---|---|
| V01 | All | 初版發行 |
| V02 | 5 | 刪除 RTC(32.768KHz)內容 |
| | 5 | VDDA 支援四種電壓輸出(2.4/2.7/3.0/3.3V) |
| | 5 | ADC Gain 存在 x1/4 倍模式 |
| | 5 | 刪除 REFO 內容，修改為 ACM |
| | 5 | 刪除 8+8 PWM 輸出內容 |
| | 6 | 刪除 HY10P40B |
| | 6 | 修正 HY10P40A-M010 為 HY10P40-M010 |
| | 6 | 新增 SOP8(EP)封裝, HY10P40-SE08 |
| | 7,8 | 修正引腳定義說明 |
| | 9,10 | 修正應用電路 |
| | 11 | 修正方塊圖(刪除 RTC) |
| | 13~15 | 修正暫存器列表 |
| | 16 | 刪除 RTC 說明 |
| | 16 | 4Mhz 中心值調到 3.8Mhz; 8Mhz 中心值調到 7Mhz, 上下限 10% |
| | 17 | 修正 6.3 表格內容 |
| | 20 | 修正 6.6, 6.7 表格內容 |
| | 25 | 修正定貨資訊 |
| | 26 | 新增封裝 SOP8(EP) |
| V03 | 5 | 刪除 VDDA=3.3V 資訊 |
| | 5<br>6 | 修正 $V_{REGIN}$ Max=24V<br>刪除 DFN12 封裝資訊 |
| | 16 | 修正 $V_{REGIN}$ Max=24V |
| | 17 | 新增 Fig 6.2-1~Fig 6.2-5 |
| | 18 | 新增 Fig 6.3-1~Fig 6.3-2 |
| | 20 | 新增 Fig 6.5-3 |
| | 21 | 刪除 VDDA=3.3V 資訊 |
| | 21 | 新增 Figure6.6-1~Figure6.6-3 |
| | 26 | 修正訂貨資訊 |
| | 30 | 刪除 DFN 封裝資訊 |
| V04 | 5 | 復位機制：刪除 RESET PIN |
| | 6 | 修改封裝腳位名稱： |
| | | VPP/RST/PT1.0/INT0 修改成 VPP/PT1.0/INT1.0 |
| | | PT2.0/AI6/PWMA0 修改成 PT2.0/AI6/PWMA0/INT2.0 |
| | | PT2.1/AI7/PWMA1 修改成 PT2.1/AI7/PWMA1/INT2.1 |

| | | |
|---|---|---|
| | 7 | 新增 INT2.0 及 INT2.1：外部中斷源(Falling Edge Trigger Interrupt) |
| | 8 | 刪除 RST |
| | 9~10 | 移除 Reset 電路 |
| | | 修改封裝腳位名稱： |
| | | VPP/RST/PT1.0/INT0 修改成 VPP/PT1.0/INT1.0 |
| | | PT2.0/AI6/PWMA0 修改成 PT2.0/AI6/PWMA0/INT2.0 |
| | | PT2.1/AI7/PWMA1 修改成 PT2.1/AI7/PWMA1/INT2.1 |
| | 13 | 0x23h、0x26h：新增 E20IE、E21IE 及 E20IF、E21IF |
| | | 0x23h、0x26h：E0IE 及 E0IF 修改命名為 E10IE 及 E10IF |
| | | 0x2Ch：刪除 RST |
| | | 0x41h：刪除 EN_RST_PIN |
| | 20 | 移除 External RST Pin 相關資訊 |
| V05<br>V06 | 24<br>6<br>10<br>25 | 更正 SD18 ENOB Table 及 SD18 RMS Noise Table<br>移除 HY10P40H SSOP16 引腳圖<br>移除 3.3. Charger Application Circuit<br>移除 HY10P40H SSOP16 訂貨資訊 |
| V07 | 9~10 | 新增封裝型式與正印說明 |
| | 28 | 更新 Green (RoHS & no Cl/Br) |
| | 30<br>31~32<br>34<br>35~36<br>38<br>39~40 | 新增 Tube Dimensions<br>新增 Tape & Reel Information<br>新增 Tube Dimensions<br>新增 Tape & Reel Information<br>新增 Tube Dimensions<br>新增 Tape & Reel Information |
| V08 | All<br>28,32,36 | 將 ADC 解析度的描述更正為 24-Bit ΣΔADC<br>更正 Tube Dimensions |
| V09 | All | 刪除 SOP8(EP)封裝資訊，新增 SOP8 封裝資訊 |