HY10P40
Datasheet

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

Table of Contents

注意：

1、本说明书中的内容，随着产品的改进，有可能不经过预告而更改。请客户及时到本公司网站下载更新 http://www.hycontek.com。

2、本规格书中的图形、应用电路等，因第三方工业所有权引发的问题，本公司不承担其责任。

3、本产品在单独应用的情况下，本公司保证它的性能、典型应用和功能符合说明书中的条件。当使用在客户的产品或设备中，以上条件我们不作保证，建议客户做充分的评估和测试。

4、请注意输入电压、输出电压、负载电流的使用条件，使 IC 内的功耗不超过封装的容许功耗。对于客户在超出说明书中规定额定值使用产品，即使是瞬间的使用，由此所造成的损失，本公司不承担任何责任。

5、本产品虽内置防静电保护电路，但请不要施加超过保护电路性能的过大静电。

6、本规格书中的产品，未经书面许可，不可使用在要求高可靠性的电路中。例如健康医疗器械、防灾器械、车辆器械、车载器械及航空器械等对人体产生影响的器械或装置，不得作为其部件使用。

7、本公司一直致力于提高产品的质量和可靠度，但所有的半导体产品都有一定的失效概率，这些失效概率可能会导致一些人身事故、火灾事故等。当设计产品时，请充分留意冗余设计并采用安全指标，这样可以避免事故的发生。

8、本规格书中内容，未经本公司许可，严禁用于其他目的之转载或复制。

1. 特点

- 8-Bit RISC-like 微控制器，具有 46 条高性能指令集 H08B
- 24-Bit ΣΔADC 模拟数字转换器
  - 梳状滤波器采二阶设计，转换频率达 1.95Ksps
  - 取样频率 250KHz
  - 超取样频率设置 128～32768
  - 全差动输入信号与测量范围的零点调整
  - 信号放大 x1/4,x1/2,x1,x2,x4,x8,x16
  - 测量信号输入信道 8ch
  - 低温飘系数
- 内部电源系统
  - 内置 LDO 线性稳压电源 VDDA
    - 内部模拟电路或外部传感器电压源
    - 输出可设置 2.4/2.7/3.0V，可外灌输入电压
    - 低操作功耗与低温飘系数
  - 内置参考电压源 ACM
    - 模拟电路参考电压源(1.2V)
    - 低操作功耗与低温飘系数
- 定时器
  - Watch Dog
    - 复位事件与中断事件
  - 8-bit Timer
    - 中断事件
  - 16-bit Timer
    - 16-Bit PWM 输出
    - 两个 8-Bit PWM 输出
    - 中断事件
- 工作电压与操作温度范围
  - V_{DD}：2.2V ～ 3.6V
  - - 40°C ～ 85°C
- 工作频率
  - 内建高精度 HAO 震荡器 2MHz/4MHz/8MHz
  - 内建低功耗 LPO 震荡器 14KHz
- 记忆体型式
  - 2KW OTP 程序内存
  - 128B 数据存储器
  - 6 层堆栈
  - Build-In EPROEM
    - VPP 工作电压 6.0V
    - 64W EPROM 内存
- 引脚特色
  - 具 10mA 驱动能力
  - 自定义功能模块输出引脚设计
- 复位机制
  - Power On Reset
  - Brown Out Reset
  - Watch Dog Reset
- I^2C 通讯接口

2. 引脚定义

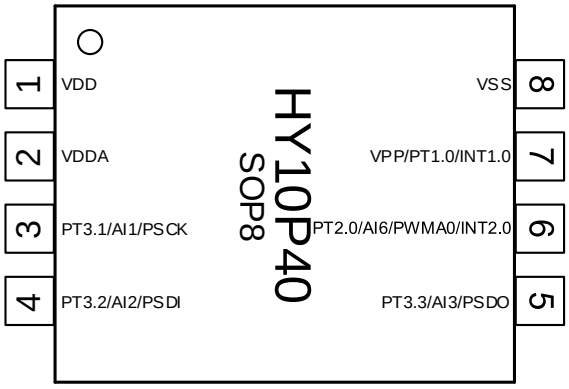


图 2-1 HY10P40 SOP8 引脚图

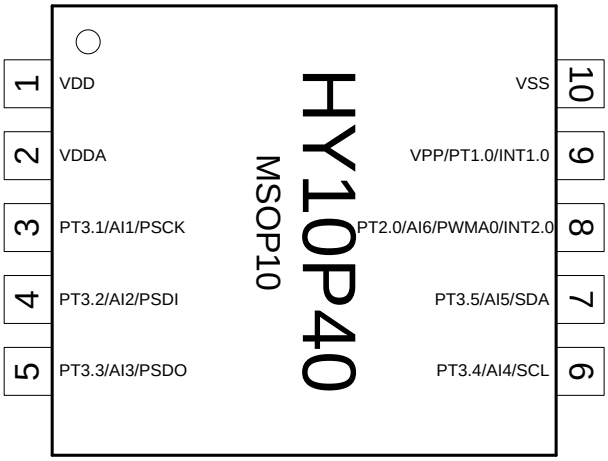


图 2-2 HY10P40 MSOP10 引脚图

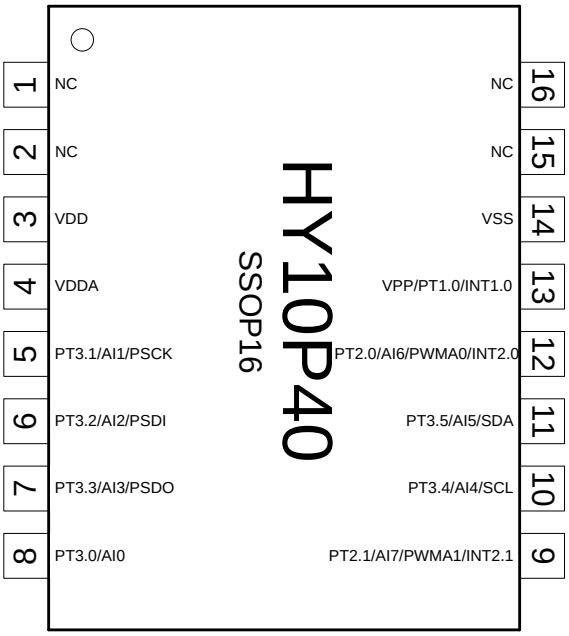


图 2-3 HY10P40 SSOP16 引脚图

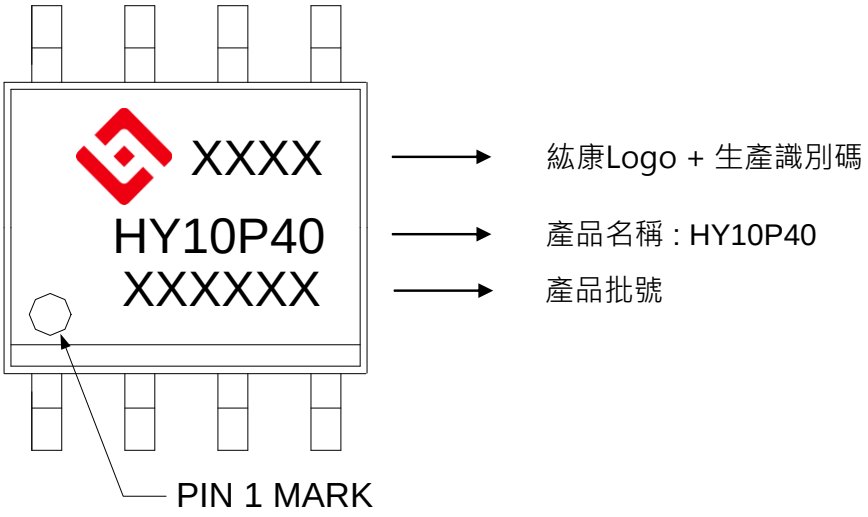
2.1. 引脚定义说明

“脚定：输入,输入义：输出,输出义：模拟，比义说：史密斯触发，密斯触：CMOS I/O,SOP：电压源,电压源：或,或压源：可忽略

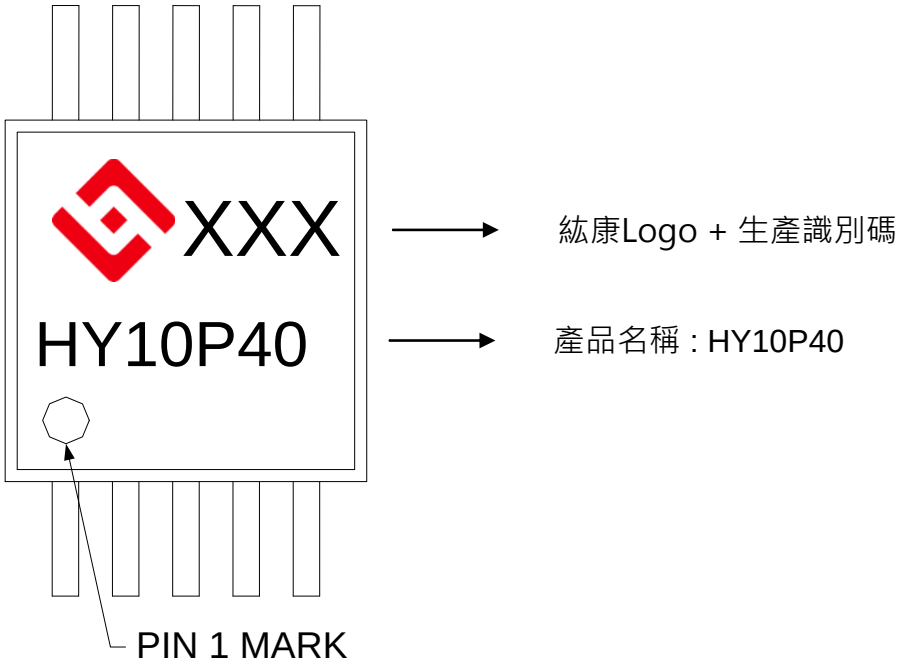
封装			引脚名称	设计		描述
SSOP16	MSOP10	SOP8		型式	缓冲	
1	-	-	NC	X	X	-
2	-	-	NC	X	X	-
3	1	1	VDD	P	P	芯片工作电压源接引脚
4	2	2	VDDA	P	P	LDO 线性稳压电源输出引脚
5	3	3	PT3.1	I/O	S/C	数字输入 / 输出引脚
			AI1	A	A	模拟输入通道
			PSCK	I	S	OTP 读/写界面 PSCK 接口
6	4	4	PT3.2	I/O	C	数字输入 / 输出引脚
			AI2	A	A	模拟输入通道
			PSDI	I	S	OTP 读/写界面 PSDI 接口
7	5	5	PT3.3	I/O	C	数字输入 / 输出引脚
			AI3	A	A	模拟输入通道
			PSDO	I/O	S	OTP 读/写界面 PSDO 接口
8	-	-	PT3.0	I/O	C	数字输入 / 输出引脚
			AI0	A	A	模拟输入通道
9	-	-	PT2.1	I/O	C	数字输入 / 输出引脚
			AI7	A	A	模拟输入通道
			PWMA1	O	C	TMB1 的 PWM1 输出引脚
			INT2.1	I	S	外部中断源(Falling Edge Trigger Interrupt)
10	6	-	PT3.4	I/O	C	数字输入 / 输出引脚
			AI4	A	A	模拟输入通道
			SCL	I/O	S	I2C 通讯接口引脚
11	7	-	PT3.5	I/O	C	数字输入 / 输出引脚
			AI5	A	A	模拟输入通道
			SDA	I/O	S	I2C 通讯接口引脚
12	8	6	PT2.0	I/O	C	数字输入 / 输出引脚
			AI6	A	A	模拟输入通道
			PWMA0	O	C	TMB1 的 PWM0 输出引脚
			INT2.0	I	S	外部中断源(Falling Edge Trigger Interrupt)
13	9	7	PT1.0	I	S	数字输入
			VPP	P	P	OTP 烧录电压引脚
			INT1.0	I	S	外部中断源
14	10	8	VSS	P	P	芯片工作电压源接地端引脚
15	-	-	NC	X	X	-
16	-	-	NC	X	X	-

表 2-1 引脚定义与功能说明

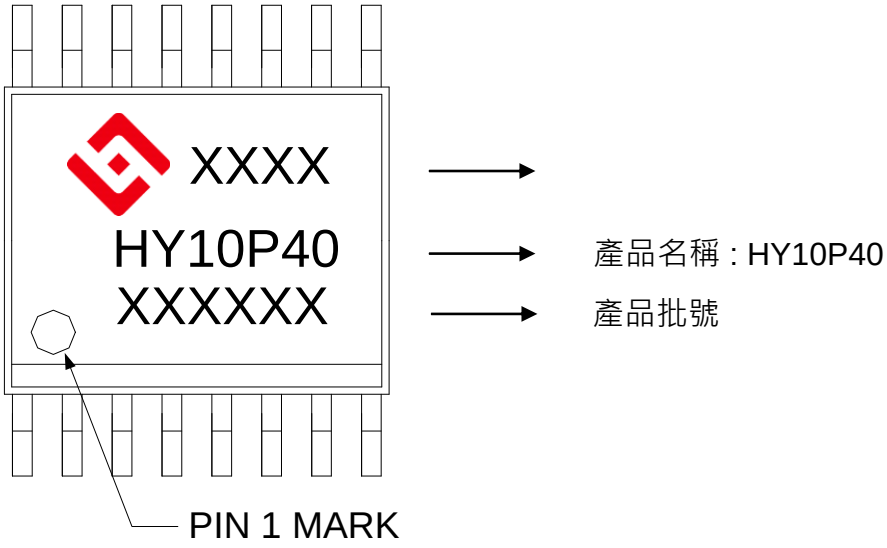
2.1.1. SOP8 封裝片标记信息



2.1.2. MSOP10 封裝片标记信息



2.1.3. SSOP16 封装片标记信息



3. 应用电路

3.1. PIR application (Pyroelectric infrared-detector)

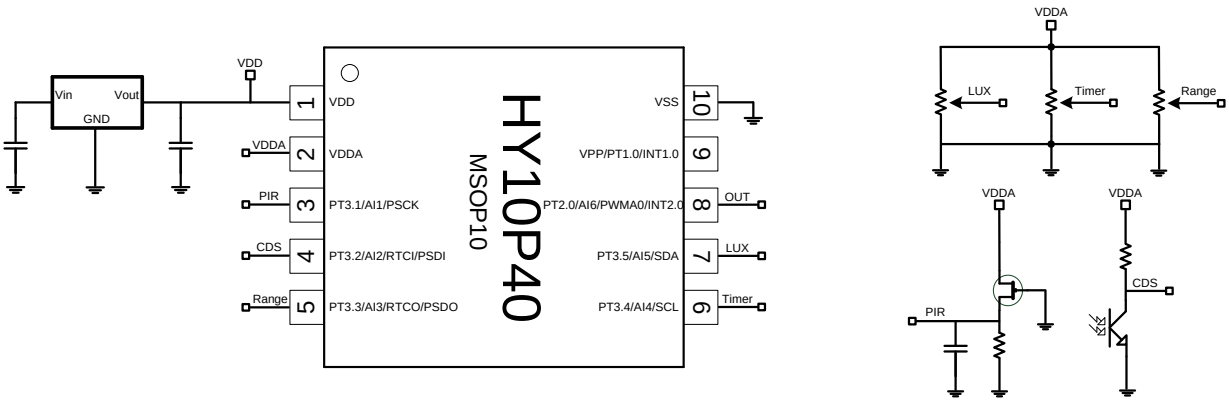


图 3-1 PIR 应用电路

3.2. Smart Pressure sensor application

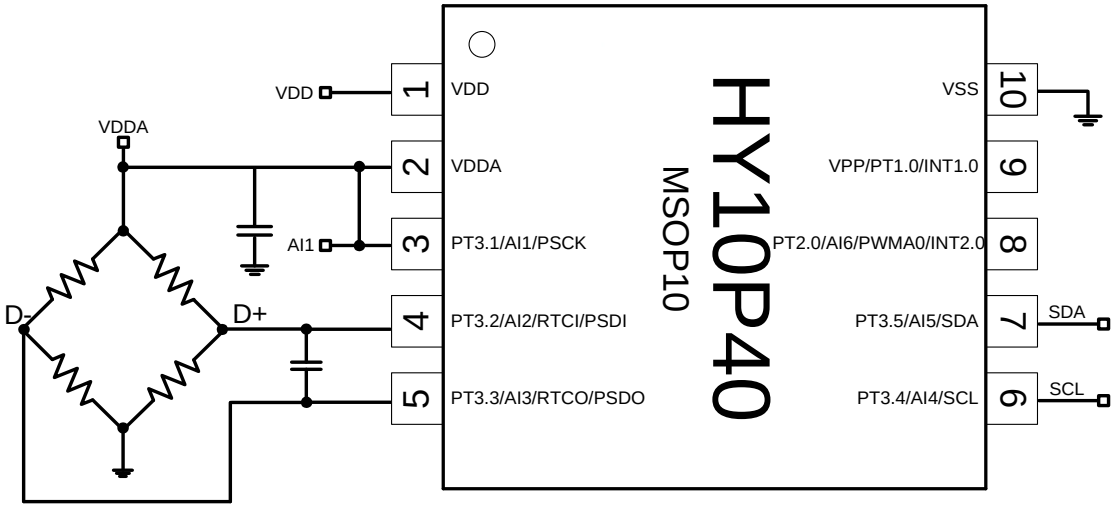


图 3-2 Smart Pressure Sensor 应用电路

4. 功能概述

4.1. 内部方块图

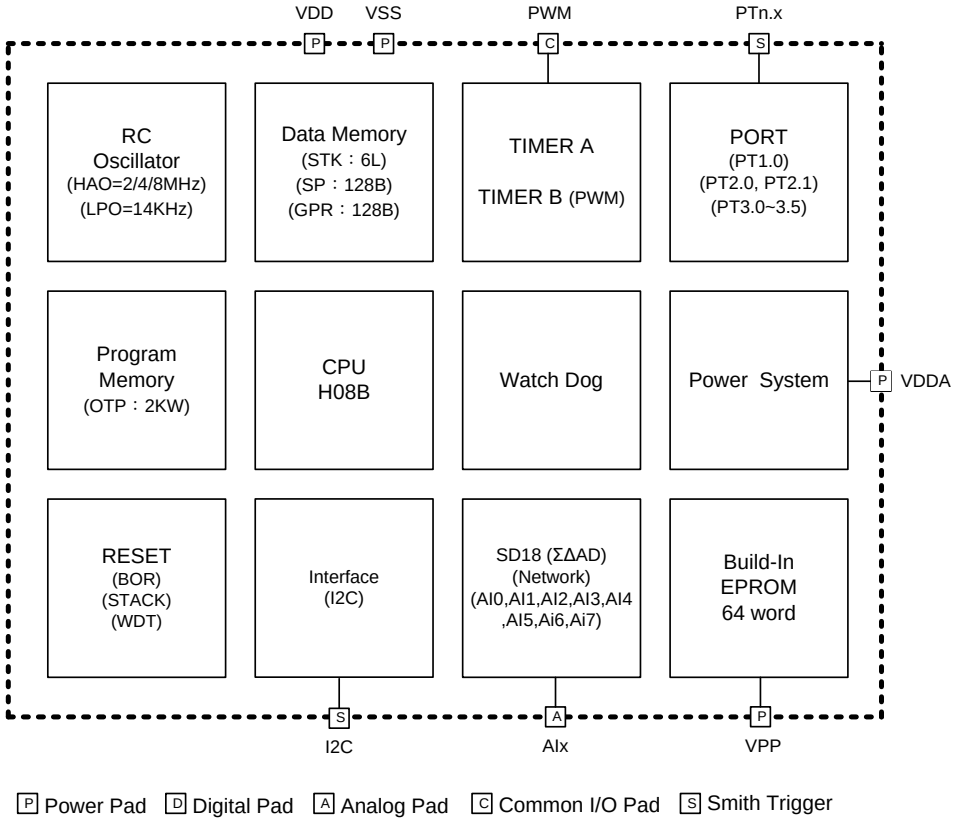


图 4-1 HY10P40 内部方块图

4.2. 相关说明与支持文件

芯片功能相关使用说明书

DS-HY10P40	HY10P40 说明书
UG-HY10SXX	HY10Pxx 系列使用说明书
APD-CORE003-Vxx	H08B 指令说明书

开发工具相关使用说明书

APD-HYIDE00X-Vxx	HY10xxx 系列开发工具软件使用说明书
APD-HYIDE00X-Vxx	HY10xxx 系列开发工具硬件使用说明书
APD-OTP001-Vxx	OTP 产品烧录引脚说明书

产品生产相关使用说明书

APD-HYIDE004-Vxx	HY1xxxx 系列生产线专用烧录器说明书
BDI-HY10P40-Vxx	HY10P40 个别产品的裸片打线信息

4.3. SD18 Network

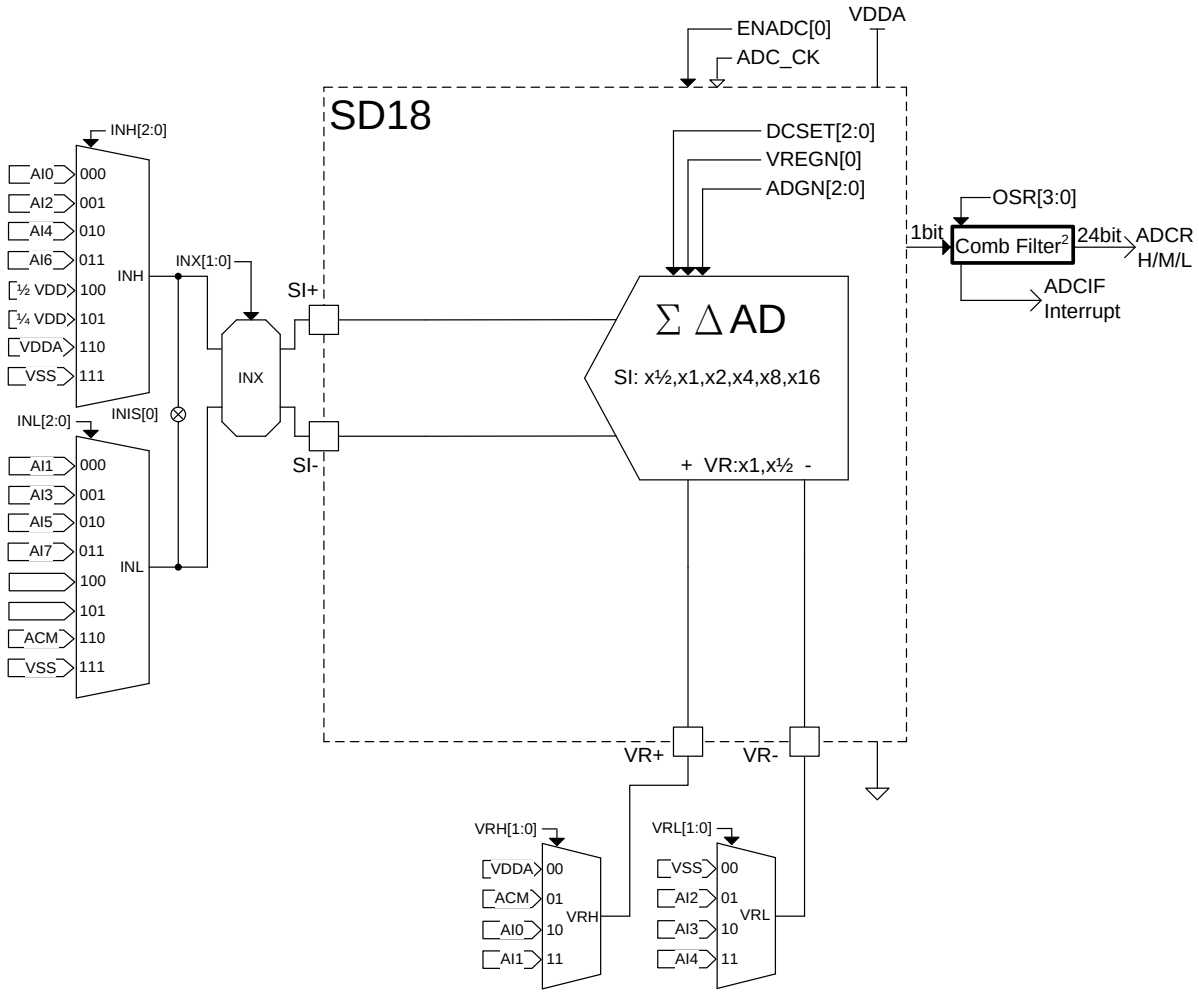


图 4-2 SD18 Network

5. 缓存器列表

"-"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

地址	名称	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. 电器特性

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

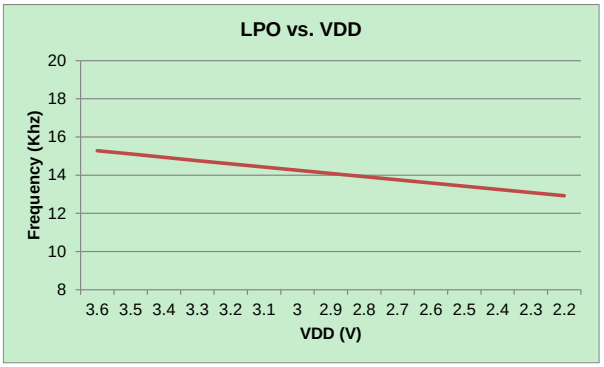


Figure 6.2-1 LPO vs. VDD

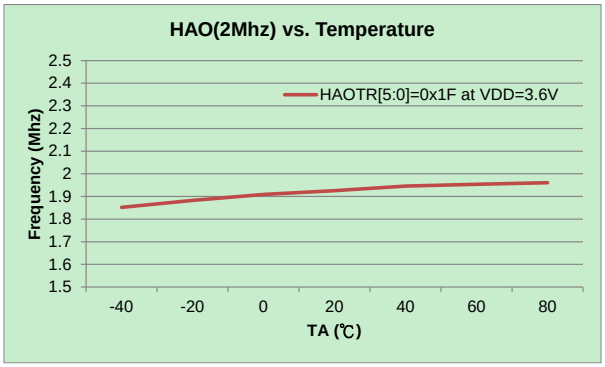


Figure 6.2-3 HAO(2.0MHz) vs. Temperature

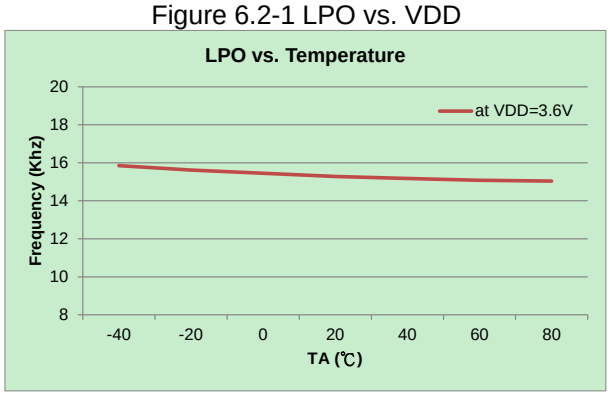


Figure 6.2-2 LPO vs. Temperature

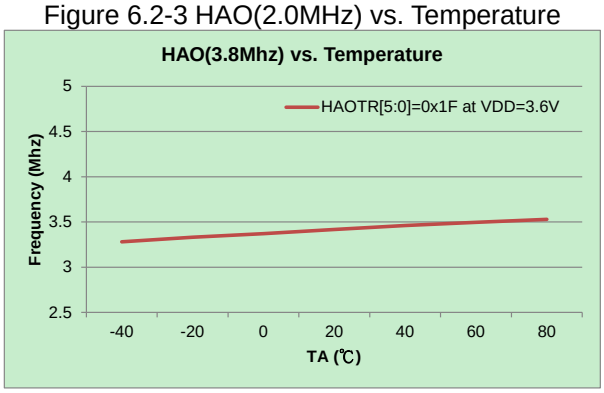


Figure 6.2-4 HAO(3.8MHz) vs. Temperature

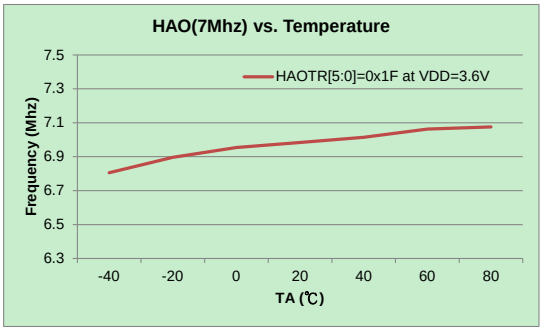


Figure 6.2-5 HAO(7.0MHz) vs. Temperature

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.

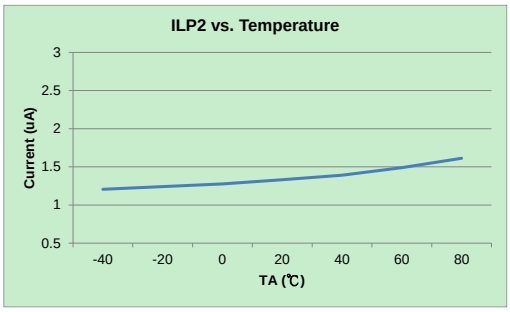


Figure 6.3-1 ILP2 vs. Temperature

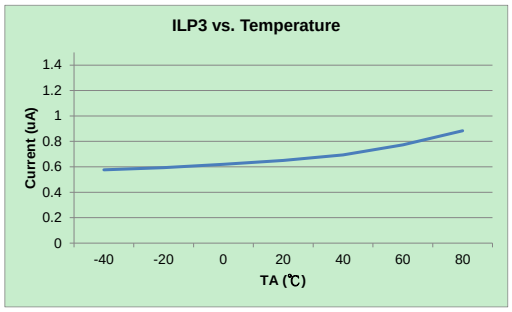


Figure 6.3-2 ILP3 vs. Temperature

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 LVR：Low Voltage Reset of BOR						

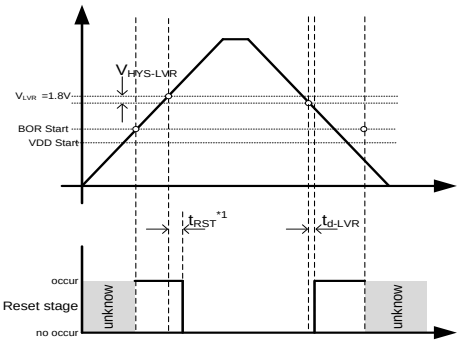


Figure6.5-1 BOR reset diagram

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

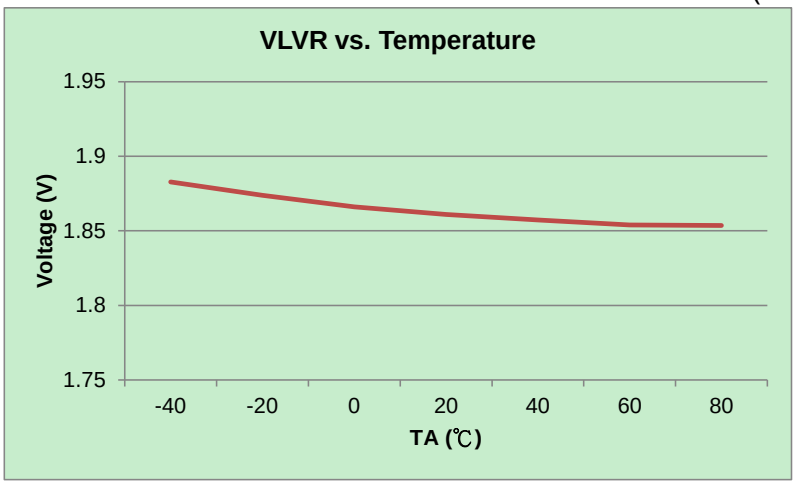


Figure6.5-3 LVR vs. Temperature

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

ACM：Analog Common Mode Voltage

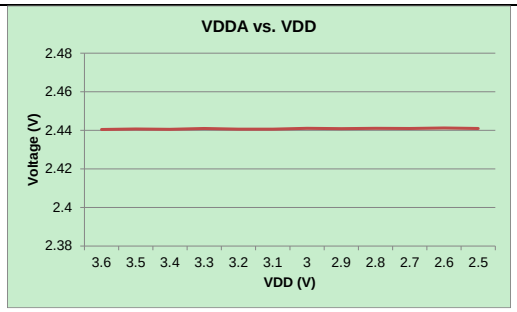


Figure6.6-1 VDDA vs. VDD

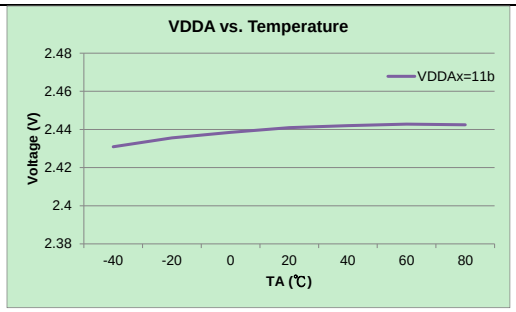


Figure6.6-2 VDDA vs. Temperature

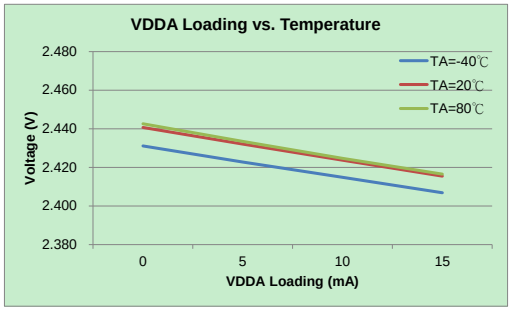


Figure6.6-3 VDDA Loading vs. Temperature

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.

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 ΔVR=0.9V DCSET[2:0]=<000> *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				

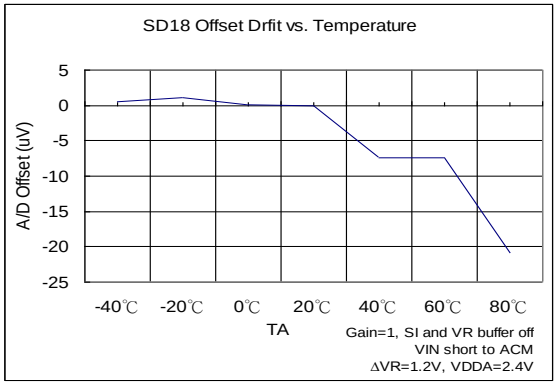


Figure6.7-1(a) SD18 Offset Temperature drift

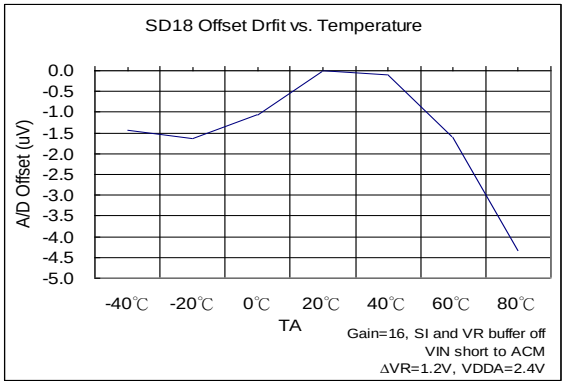


Figure6.7-1(b) SD18 Offset Temperature drift

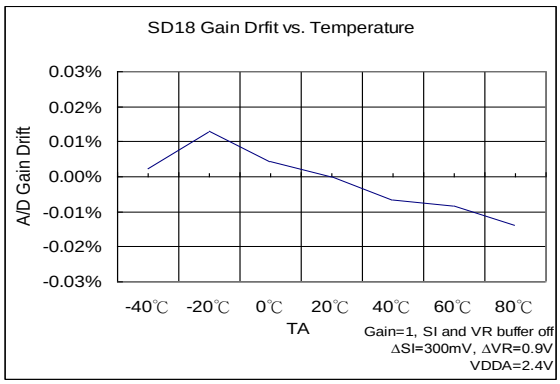


Figure6.7-2(a) SD18 Gain drift with Temperature

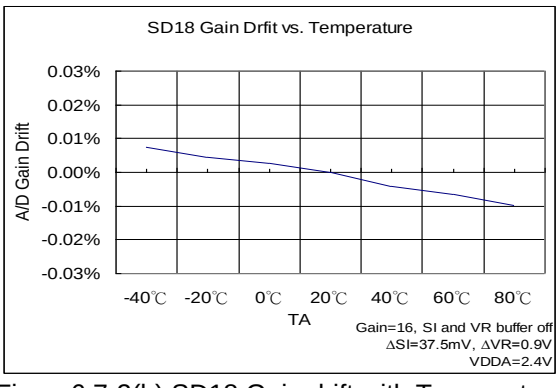


Figure6.7-2(b) SD18 Gain drift with Temperature

6.7.2. SD18 Noise Performance

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

HY10P40 针对 SD18 提供了重要的输入噪声规格。Table6.7-4(a), Table6.7-4(b) 列出典型的噪声规格表与 Gain, Output rate, 及单端最大输入电压等关系。测试条件设定在外部输入讯号短路，ADC 参考电压源为使用外部 VDDA 及外部 VSS 当参考电压源网络，等效参考电压为 1.2V，取样 1024 笔数据。

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:

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

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

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

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

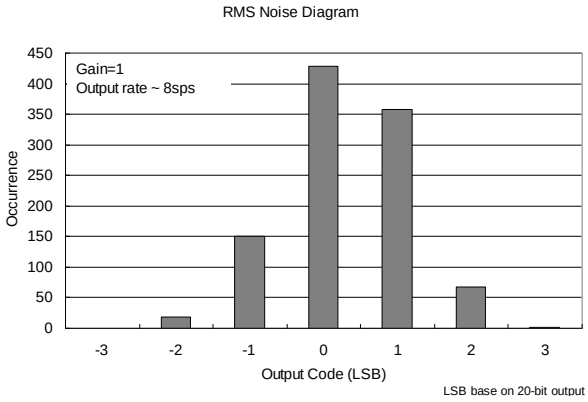


Figure6.7-4(a) RMS Noise Diagram

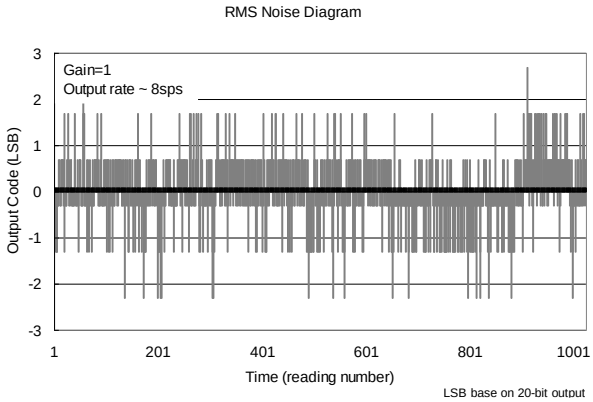


Figure6.7-4(b) Output Code Diagram

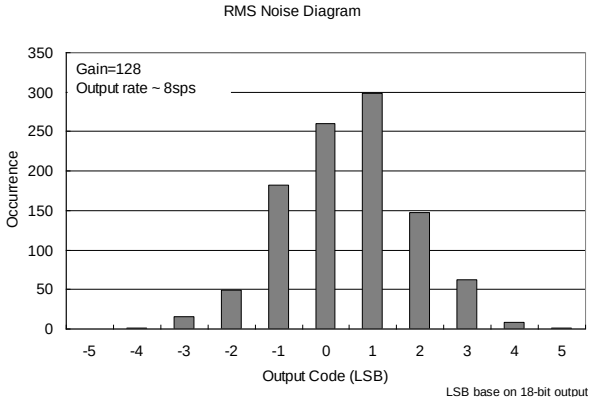


Figure6.7-4(c) RMS Noise Diagram(Gain=16)

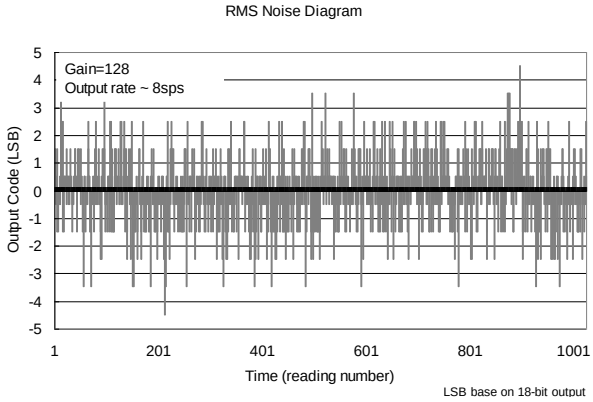


Figure6.7-4(d) Output Code Diagram(Gain=16)

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. 订货信息

下单品名 [1]	封装型式	引脚数	封装型式描述方式		程序代码编号 [2]	出货包装形式	个装数量	材料组成	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] **产品名称 – 封装型式描述方式 – 程序代码编号（空白片 / 标准品 / 代客烧录码）**

例如：您的代客烧录服务申请的程序代码编号为 007，且需要的产品是裸片出货。则下单品名为 HY10P40-D000-007

例如：您的需求是不带程序代码的空白片且需要的产品是裸片出货。则下单品名为 HY10P40-D000

例如：您的需求是不带程序代码的空白片且需要的产品是封装片 SSOP16 出货，则下单品名为 HY10P40-E016，且需以 Tape & Reel 出货，则除下单品名外，请特别注明出货包装形式为 Tape & Reel

例如：您的代客烧录服务申请的程序代码编号为 008，而需求的产品是封装片 SOP8 出货，则下单品名为 HY10P40-S008-008，且需以 Tape & Reel 出货，则除下单品名外，请特别注明出货包装形式为 Tape & Reel

例如：您的代客烧录服务申请的程序代码编号为 009，而需求的产品是封装片 MSOP10 出货，则下单品名为 HY10P40-M010-009，且需以 Tube 出货，则除下单品名外，请特别注明出货包装形式为 Tube

[2] **程序代码编号**

“001”~“999” 为标准品或代客烧录申请的程序代码编号，而空白芯片不带此码。

[3] **MSL:**

湿度敏感性等级系依据 IPC/JEDEC J-STD-020 的规范加以试验分级，并参考 IPC/JEDEC J-STD-033 的标准处理、包装、运输与使用。

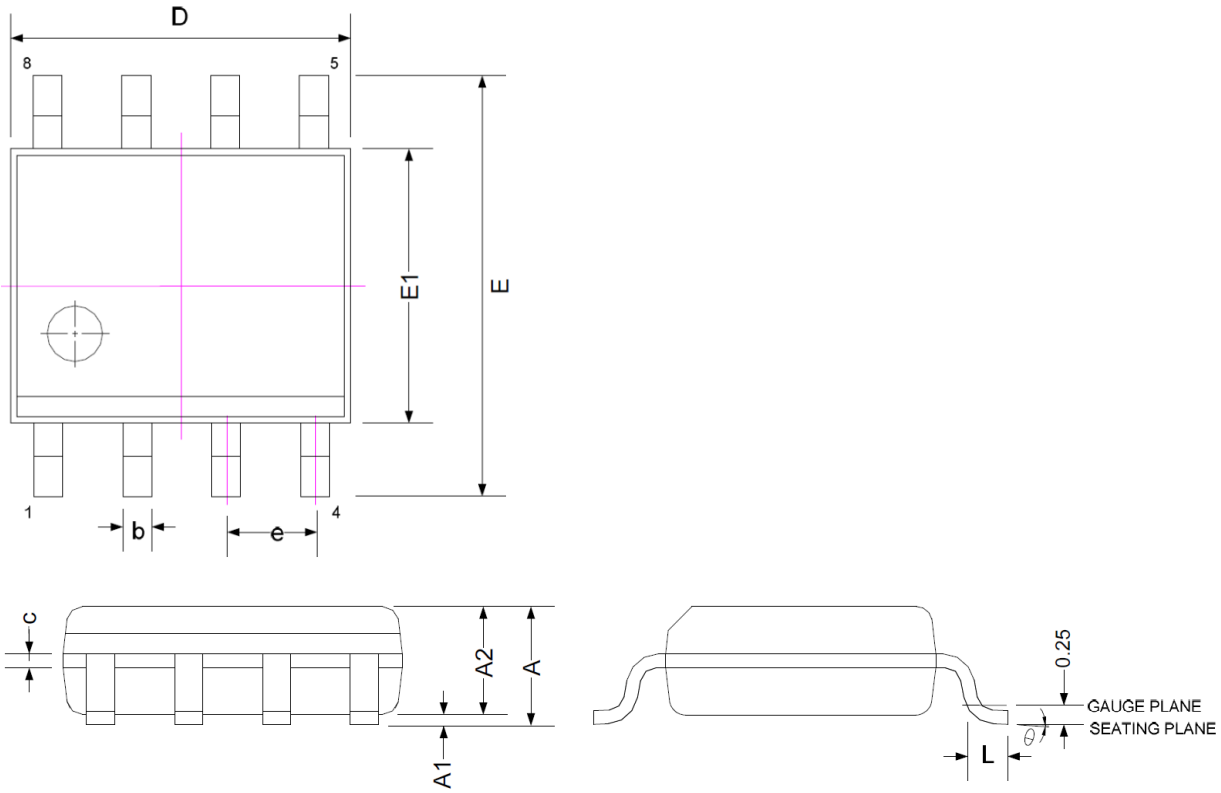
[4] **Green (RoHS & no Cl/Br)**

HYCON 产品皆为 Green Product，符合 RoHS 指令，REACH 高关注物质(SVHC)以及无卤素相关规定。

8. 封装型式信息

8.1. SOP8(S008)

8.1.1. Package Dimensions SOP8(150mil)



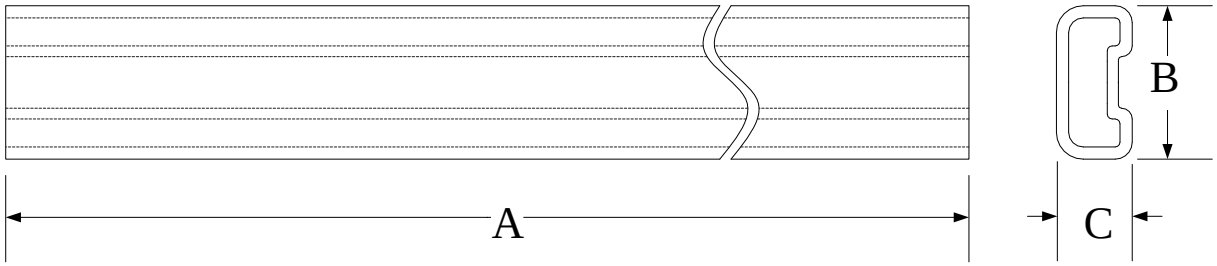
SYMBOLS	MIN	NOM	MAX
A	-	-	1.75
A1	0.10	-	0.25
A2	1.25	-	-
b	0.31	-	0.51
c	0.10	-	0.25
D		4.90 BSC	
E1		3.90 BSC	
E		6.00 BSC	
L	0.40	-	1.27
e		1.27 BSC	
θ°	0	-	8

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

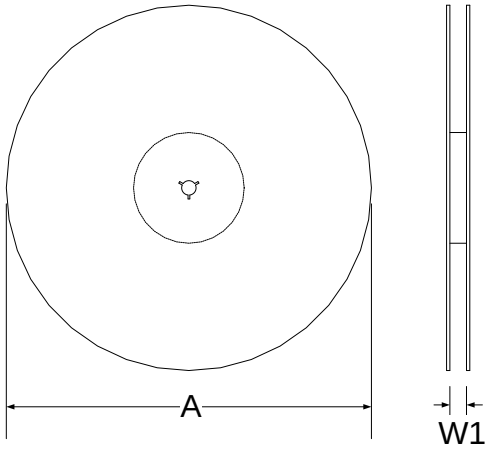
Type 2:

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

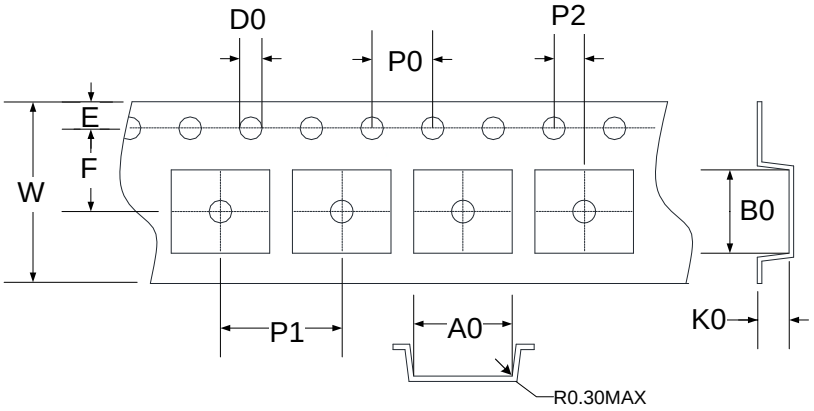
8.1.3. Tape & Reel Information

8.1.3.1. Reel Dimensions-Type1

Unit : mm



8.1.3.2. Carrier Tape Dimensions

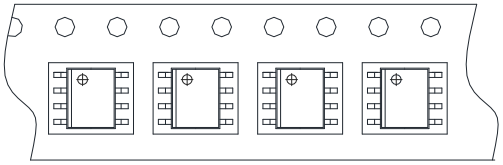


SYMBOLS	Reel Dimensions		Carrier Tape Dimensions									
	A	W1	A0	B0	K0	P0	P1	P2	E	F	D0	W
Spec.	330	12.5	6.90	5.40	2.00	4.00	8.00	2.00	1.75	5.50	1.50	12.00
Tolerance	+6/-3	+1.5/-0	±0.10	±0.10	±0.10	±0.10	±0.10	±0.05	±0.10	±0.05	+0.1/-0	±0.30

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

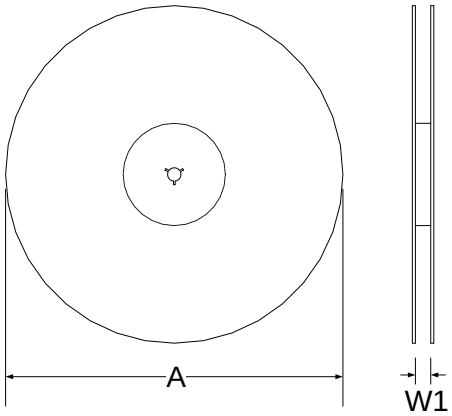
Unit : mm

8.1.3.3. Pin1 direction

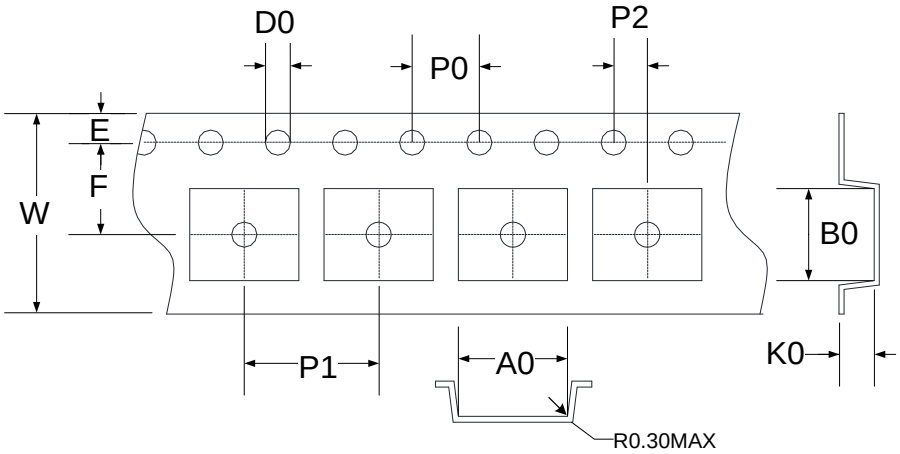


8.1.3.4. Reel Dimensions –Type2

Unit : mm



8.1.3.5. Carrier Tape Dimensions

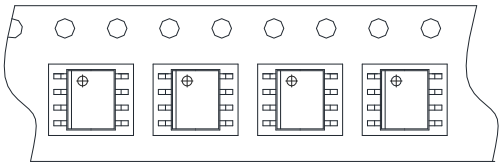


SYMBOLS	Reel Dimensions		Carrier Tape Dimensions									
	A	W1	A0	B0	K0	P0	P1	P2	E	F	D0	W
Spec.	330	12.5	6.50	5.20	2.10	4.00	8.00	2.00	1.75	5.50	1.50	12.00
Tolerance	+6/-3	+1.5/-0	±0.10	±0.10	±0.10	±0.10	±0.10	±0.05	±0.10	±0.05	+0.1/-0	±0.30

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

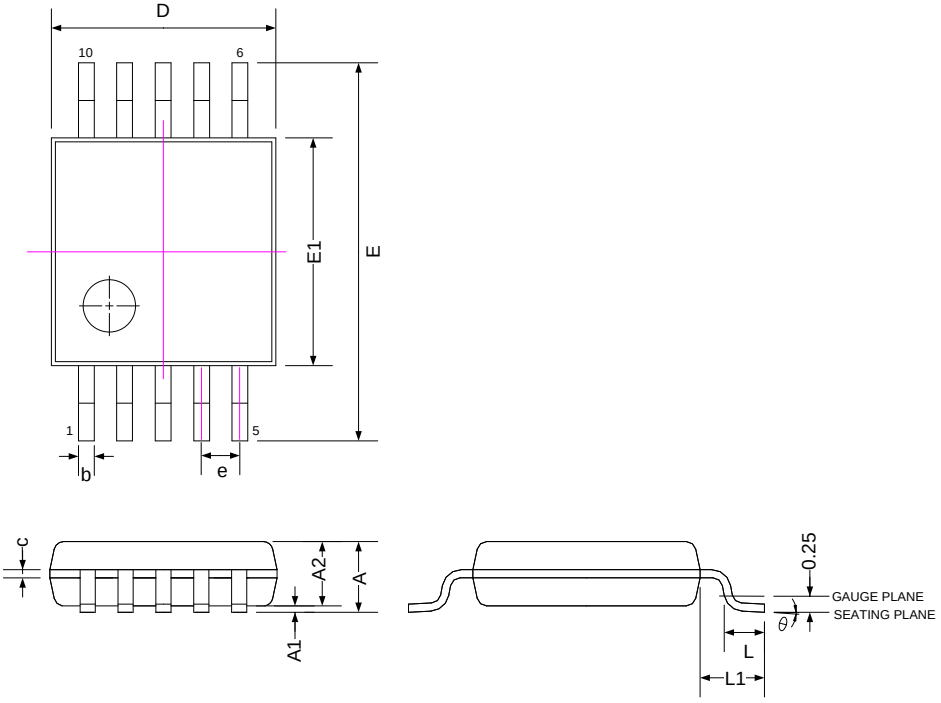
Unit : mm

8.1.3.6. Pin1 direction



8.2. MSOP10(M010)

8.2.1. Package Dimensions

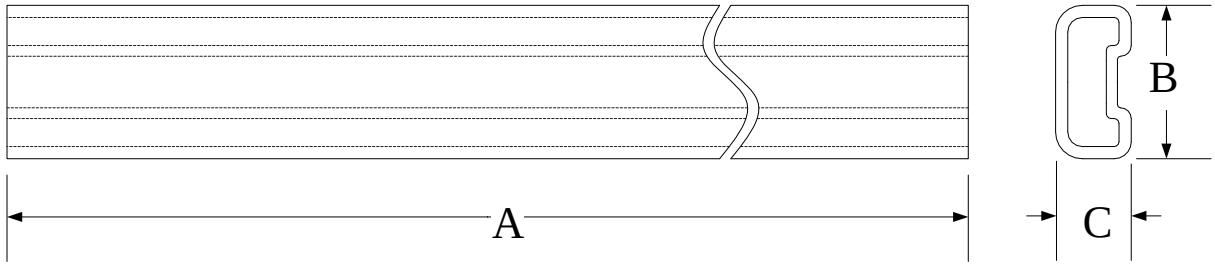


SYMBOLS	MIN	NOM	MAX
A	-	-	1.10
A1	0.00	0.10	0.15
A2	0.75	0.85	0.95
b	0.17	0.20	0.27
c	0.08	0.15	0.23
D	3.00 BASIC		
E1	3.00 BASIC		
E	4.90 BASIC		
L	0.40	0.60	0.80
L1	0.95 REF		
e	0.50 BASIC		
θ°	0	-	8

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

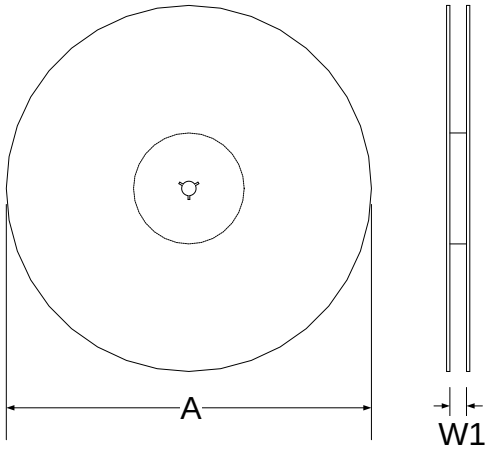


SYMBOLS	A	B	C
Spec.	270.0±1.3	6.55±0.1	3.0±0.1

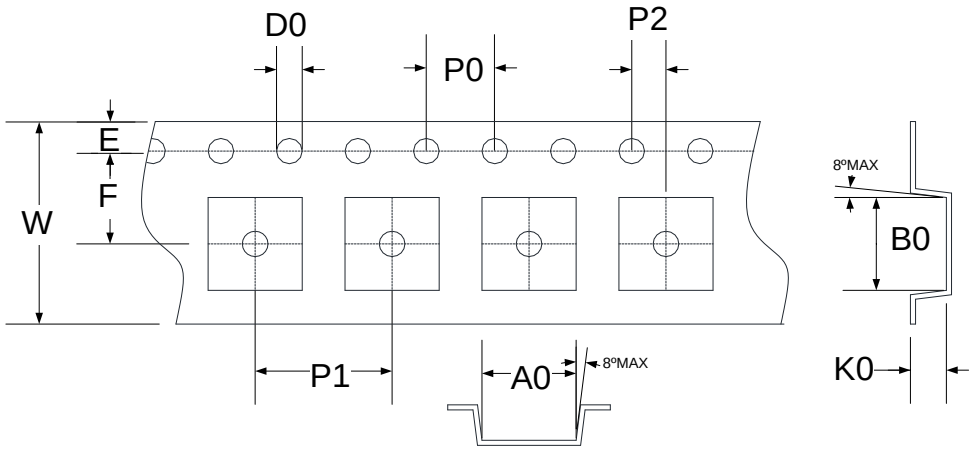
8.2.3. Tape & Reel Information

8.2.3.1. Reel Dimensions – Type1

Unit : mm



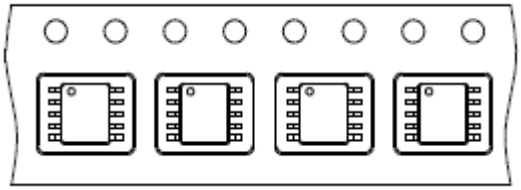
8.2.3.2. Carrier Tape Dimensions



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

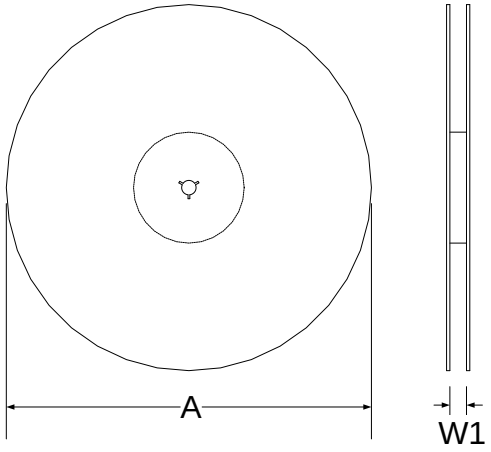
Note: 10 Sprocket hole pitch cumulative tolerance is ±0.20mm.
Unit : mm

8.2.3.3. Pin1 direction

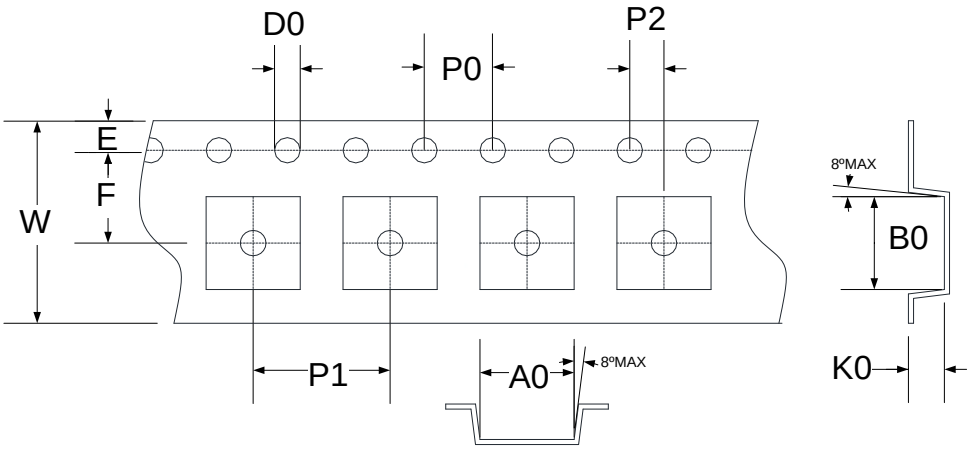


8.2.3.4. Reel Dimensions – Type2

Unit : mm



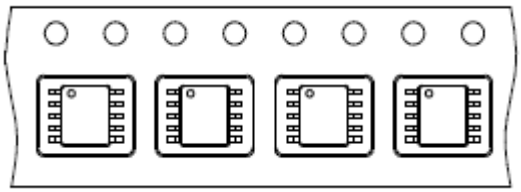
8.2.3.5. Carrier Tape Dimensions



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

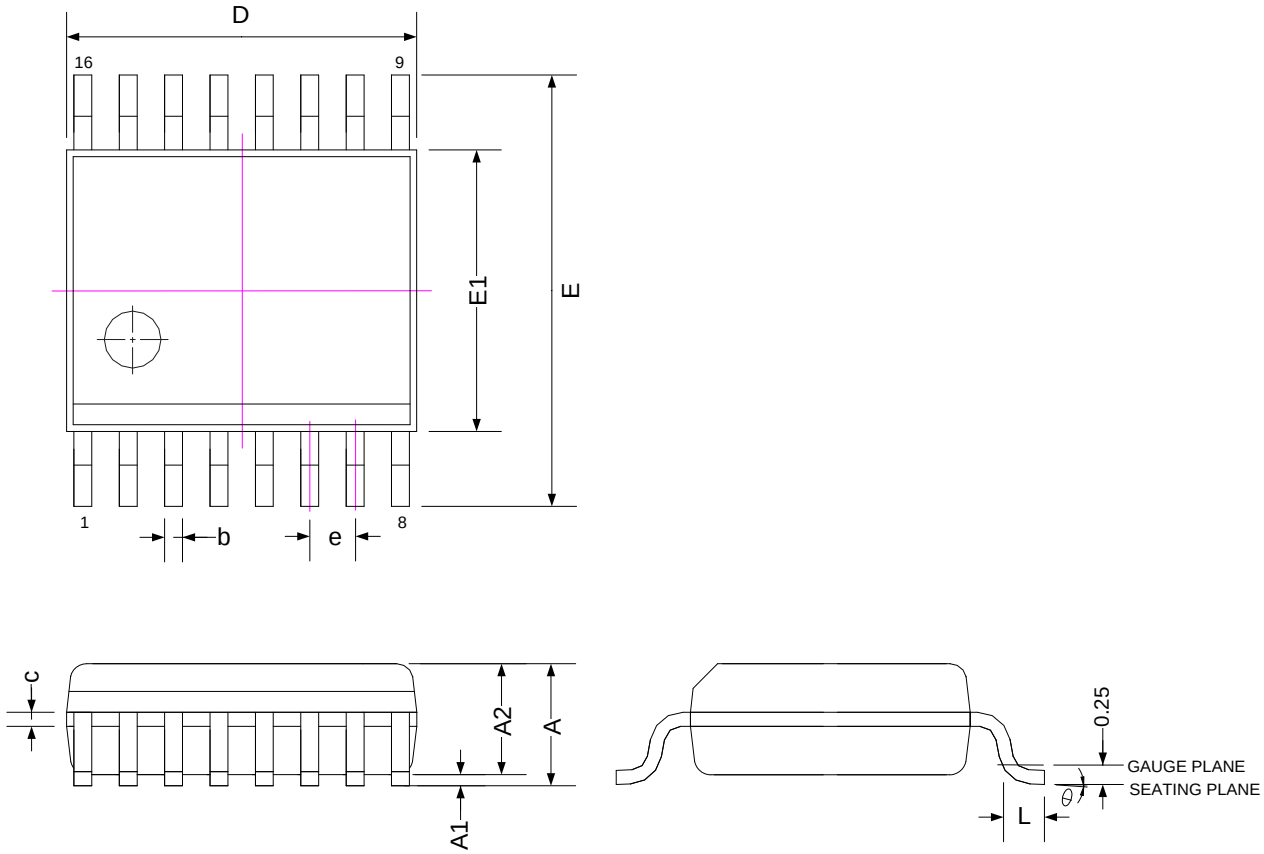
Note: 10 Sprocket hole pitch cumulative tolerance is ±0.20mm.
Unit : mm

8.2.3.6. Pin1 direction



8.3. SSOP16(E016)

8.3.1. Package Dimensions

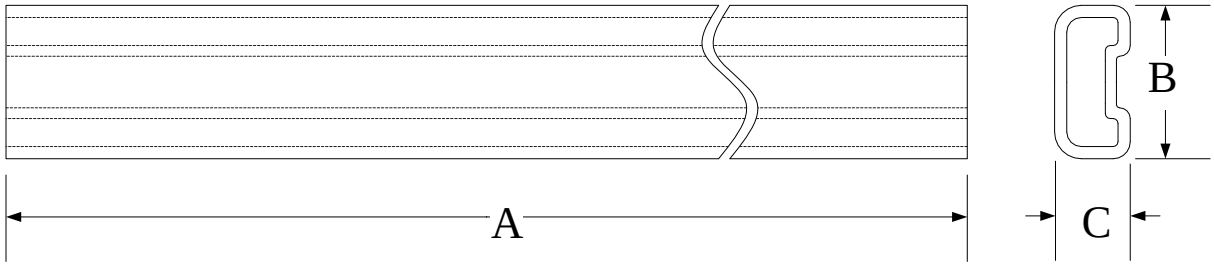


SYMBOLS	MIN	NOM	MAX
A	-	-	1.75
A1	0.10	0.15	0.25
A2	-	-	1.50
b	0.20	-	0.30
c	0.18	-	0.25
D	4.80	4.90	5.00
E1	3.81	3.91	3.99
E	5.79	5.99	6.20
L	0.41	-	1.27
e	0.635 BASIC		
θ°	0	-	8

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

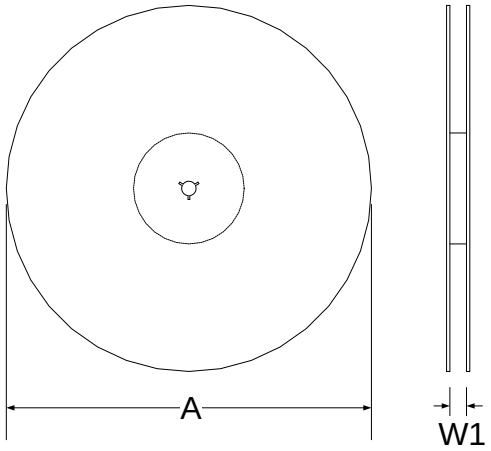
Type 2:

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

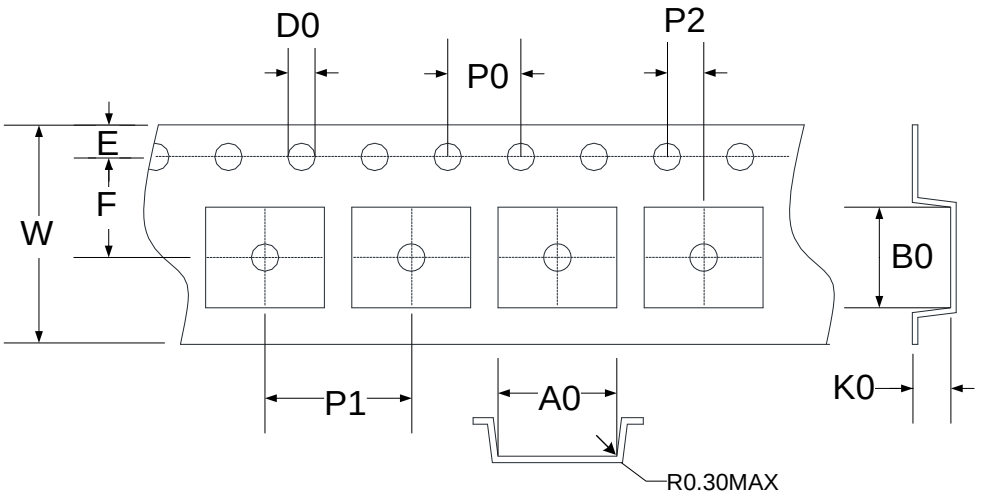
8.3.3. Tape & Reel Information

8.3.3.1. Reel Dimensions – Type1

Unit : mm



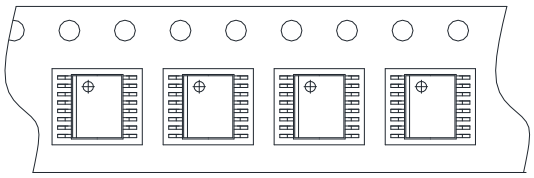
8.3.3.2. Carrier Tape Dimensions



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

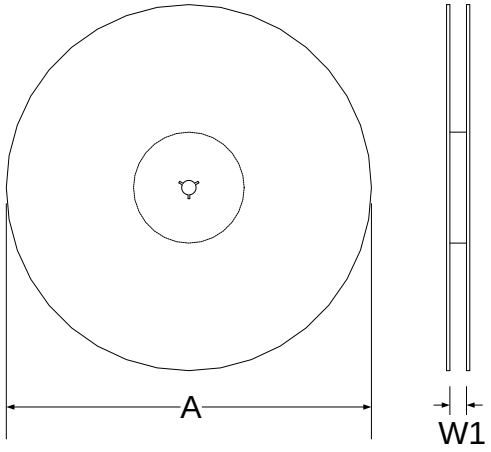
Note: 10 Sprocket hole pitch cumulative tolerance is ±0.20mm.
Unit : mm

8.3.3.3. Pin1 direction

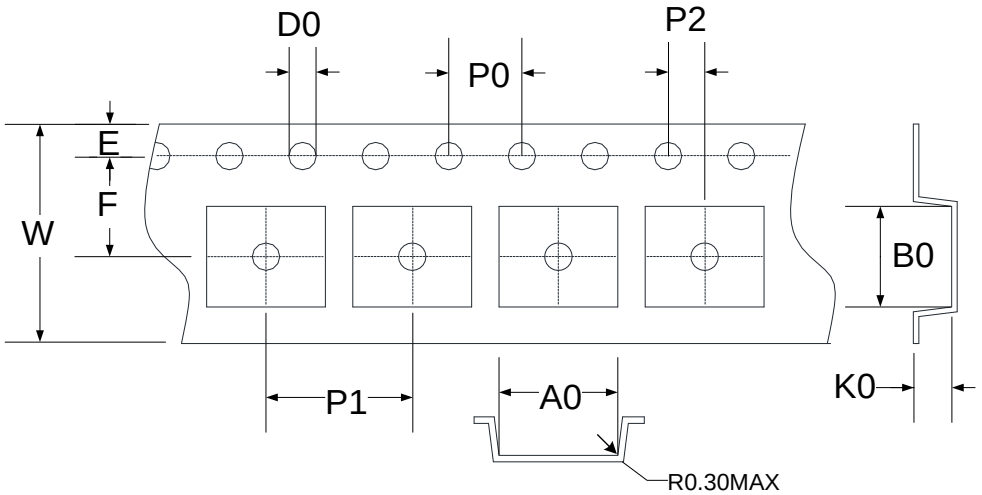


8.3.3.4. Reel Dimensions – Type2

Unit : mm



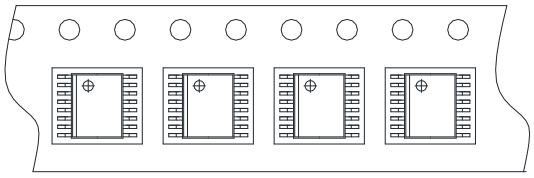
8.3.3.5. Carrier Tape Dimensions



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. 修订记录

以下描述本文件差异较大的地方，而标点符号与字形的改变不在此描述范围。

文件版次	页次	日期	摘要
V09	All	2023/08/09	初版发行