HY11P36
Datasheet

8-Bit RISC-like Mixed Signal Microcontroller
Embedded 4x32 LCD Driver
18-Bit ΣΔADC

目錄

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，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 位元加強型精簡指令集，共有 66 個指令包含硬體乘法指令及查表指令
- 2.2V to 3.6V 工作電壓範圍，-40~85℃工作溫度範圍.
- 外部石英震盪器及內部高精度 RC 震盪器，6 種 CPU 工作時脈切換選擇，可讓使用者達到最佳省電規劃
  - 運行模式 300uA@2MHz
  - 待機模式 3uA@28KHz
  - 休眠模式 1uA
- 4KWord OTP (One Time Programmable) Type 程式記憶體，256Byte 資料記憶體
- Brownout detector 及 Watch dog Timer，可防止 CPU 進入死機模式.
- 18bit 全差動輸入 ΣΔADC 類比數位轉換器
  - 內置 PGA (Programmable Gain Amplifier) 及可有 1/4、1/2、1. …..128 倍多種輸入信號放大倍率選擇
  - 內置輸入零點調整，可針對不同應用增加其量測範圍
  - 可選擇不同的數據輸出速率，最高可達 1.95ksps
- 1.0V 的內部類比電路共地電壓源，具有 Push-Pull 驅動能力，可提供傳感器驅動電壓
- LVD 低電壓檢測功能具 14 段檢測電壓設置與外部輸入電壓檢測功能
- 類比電壓源 VDDA 具 10mA 穩壓電壓源輸出能力
- 4x32 LCD 液晶驅動器
  - 1/4 Duty、1/3 Bias
  - 內建 Charge Pump 穩壓線路，可提供 4 種 LCD 偏壓
- 8-bit Timer A
- 8-bit Timer C 模組具 PWM/PFD 波形產生功能
- Built-In EPROM (BIE)
- Support 6 stack level.

2. 引腳定義

2.1 HY11P36 LQFP64 引腳圖

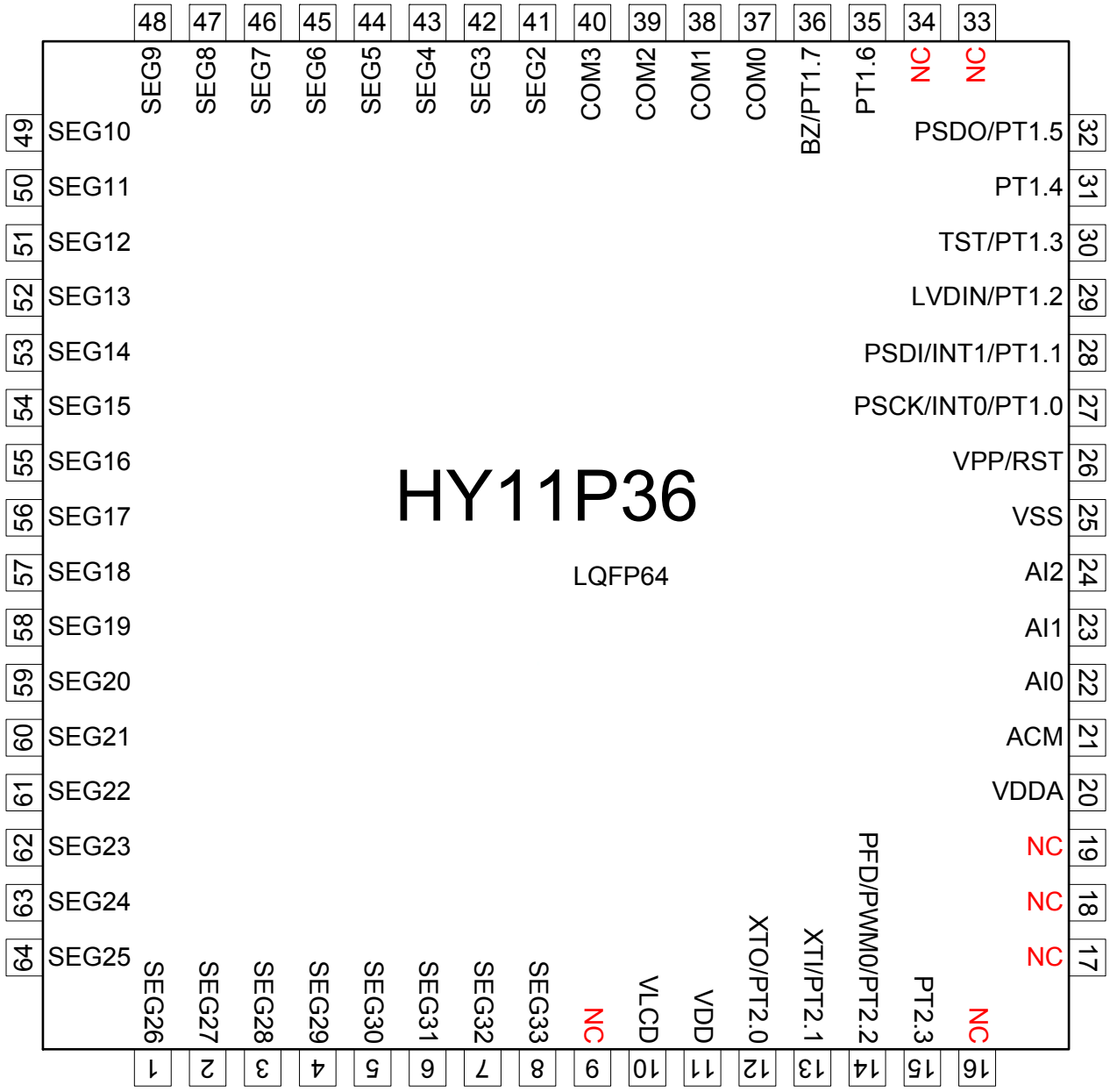


圖 2-1 HY11P36 LQFP64 引腳圖

註 1：VPP 與 RST 復用同一接口，非燒錄 EPROM 時禁止輸入電壓超過 5.8V

註 2：TST 與 PT1.3 復用同一接口，操作時禁止輸入電壓超過 VDD+0.3V

註 3：若不將 PT1.3 設定成外部引腳按鍵，可以提升抗干擾能力

2.2 HY11P36 I/O 定義與說明

"I/O"輸入/輸出,"I"輸入,"O"輸出,"S"史密斯觸發,"C"CMOS 特性兼容輸出與輸入,"P"電壓源,"A"類比通道

編號	引腳名稱 HY11P36	引腳特性 緩衝	引腳特性 緩衝	功能說明
1	SEG26	O	A	LCD 的 Segment 輸出
2	SEG27	O	A	LCD 的 Segment 輸出
3	SEG28	O	A	LCD 的 Segment 輸出
4	SEG29	O	A	LCD 的 Segment 輸出
5	SEG30	O	A	LCD 的 Segment 輸出
6	SEG31	O	A	LCD 的 Segment 輸出
7	SEG32	O	A	LCD 的 Segment 輸出
8	SEG33	O	A	LCD 的 Segment 輸出
9	NC	-	-	未使用
10	VLCD	P	P	LCD 的電壓源
11	VDD	P	P	晶片工作電壓源
12	PT2.0/XTO PT2.0 XTO	 I/O A	 S A	 數位輸入/輸出 外接振盪器輸出端
13	PT2.1/XTI PT2.1 XTI	 I/O A	 S A	 數位輸入/輸出 外接振盪器輸入端
14	PT2.2/PWM0/PFD PT2.2 PWM0 PFD	 I/O O O	 C C C	 數位輸入/輸出 PWM 輸出接口 PFD 輸出接口
15	PT2.3 PT2.3	 I/O	 S	 數位輸入/輸出
16	NC	-	-	未使用
17	NC	-	-	未使用
18	NC	-	-	未使用
19	NC	-	-	未使用
20	VDDA	P	P	穩壓器輸出，類比電路電壓源
21	ACM	P	P	內部類比電路共地引腳
22	AI0	A	A	類比輸入通道
23	AI1	A	A	類比輸入通道
24	AI2	A	A	類比輸入通道
25	VSS	P	P	晶片工作電壓源接地端

26	RST/VPP			
	RST	I	S	復位晶片
	VPP	P	P	EPROM 讀/寫時的電壓源
27	PT1.0/INT0/PSCK			
	PT1.0	I	S	數位輸入
	INT0	I	S	中斷源 INT0
	PSCK	I	S	OTP 讀/寫介面 SCK 接口
28	PT1.1/INT1/PSDI			
	PT1.1	I	S	數位輸入
	INT1	I	S	中斷源 INT1
	PSDI	I	S	OTP 讀/寫介面 SDI 接口
29	PT1.2/LVDIN			
	PT1.2	I	S	數位輸入
	LVDIN	A	A	LVD 外部信號輸入接口
30	PT1.3/TST			
	PT1.3	I	S	數位輸入
	TST	I	S	測試模式致能輸入（未開放）
31	PT1.4	I/O	S	數位輸入/輸出
32	PT1.5/PSDO			
	PT1.5	I/O	S	數位輸入/輸出
	PSDO	O	C	OTP 讀/寫介面 SDO 接口
33	NC	-	-	未使用
34	NC	-	-	未使用
35	PT1.6			
	PT1.6	I/O	S	數位輸入/輸出
36	PT1.7/BZ			
	PT1.7	I/O	S	數位輸入/輸出
	BZ	O	C	蜂鳴器輸出端
37	COM0	O	A	LCD 的 COM 輸出
38	COM1	O	A	LCD 的 COM 輸出
39	COM2	O	A	LCD 的 COM 輸出
40	COM3	O	A	LCD 的 COM 輸出
41	SEG2	O	A	LCD 的 Segment 輸出
42	SEG3	O	A	LCD 的 Segment 輸出
43	SEG4	O	A	LCD 的 Segment 輸出
44	SEG5	O	A	LCD 的 Segment 輸出
45	SEG6	O	A	LCD 的 Segment 輸出

46	SEG7	O	A	LCD 的 Segment 輸出
47	SEG8	O	A	LCD 的 Segment 輸出
48	SEG9	O	A	LCD 的 Segment 輸出
49	SEG10	O	A	LCD 的 Segment 輸出
50	SEG11	O	A	LCD 的 Segment 輸出
51	SEG12	O	A	LCD 的 Segment 輸出
52	SEG13	O	A	LCD 的 Segment 輸出
53	SEG14	O	A	LCD 的 Segment 輸出
54	SEG15	O	A	LCD 的 Segment 輸出
55	SEG16	O	A	LCD 的 Segment 輸出
56	SEG17	O	A	LCD 的 Segment 輸出
57	SEG18	O	A	LCD 的 Segment 輸出
58	SEG19	O	A	LCD 的 Segment 輸出
59	SEG20	O	A	LCD 的 Segment 輸出
60	SEG21	O	A	LCD 的 Segment 輸出
61	SEG22	O	A	LCD 的 Segment 輸出
62	SEG23	O	A	LCD 的 Segment 輸出
63	SEG24	O	A	LCD 的 Segment 輸出
64	SEG25	O	A	LCD 的 Segment 輸出

表 2-1 引腳定義與功能說明

3. 應用電路

3.1 橋式感測器 I

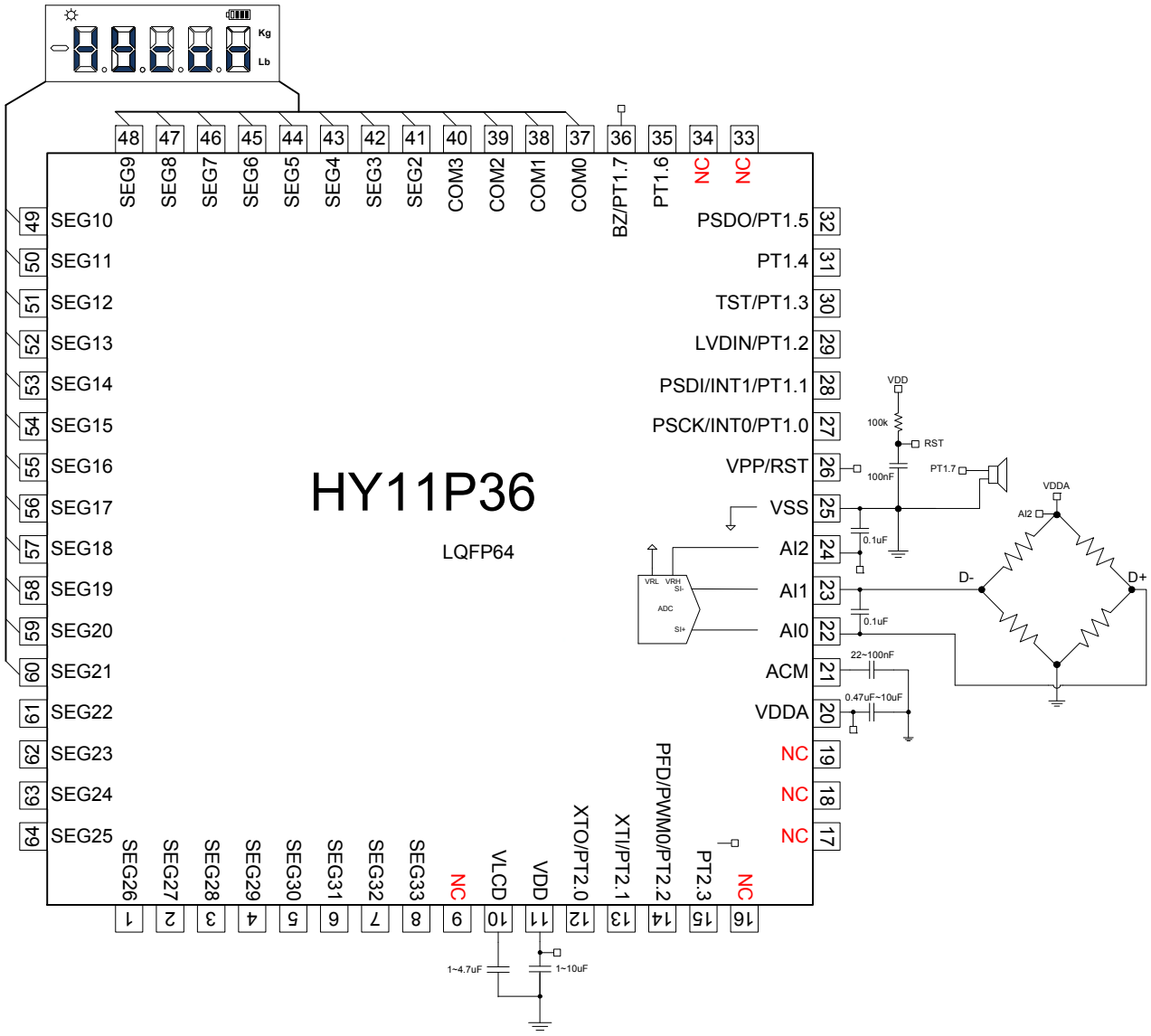


圖 3-1 橋式感測器應用電路

註：Load Cell 零點電壓位置可透過 DCSET[2:0] 進行偏壓調整。

4. 功能概述

4.1 內部方塊圖

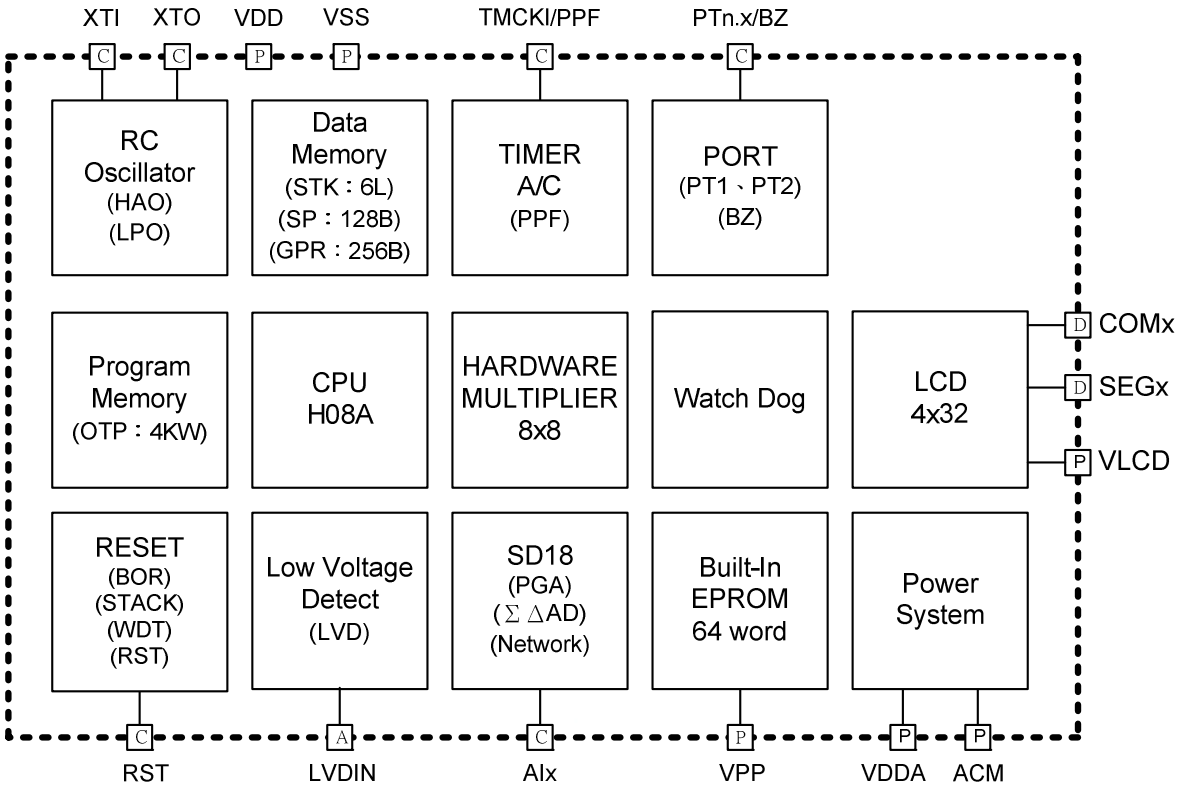


圖 4-1 HY11P36 內部方塊圖

4.2 相關說明與支援文件

晶片功能相關使用說明書

DS-HY11P36-Vxx	HY11P36 說明書
UG-HY11S14-Vxx	HY11Pxx 系列使用說明書
APD-CORE002-Vxx	H08A 指令說明書

開發工具相關使用說明書

APD-HYIDE006-Vxx	HY11xxx 系列開發工具軟體使用說明書
APD-HYIDE005-Vxx	HY11xxx 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-HY11P36-Vxx	HY11P36 個別產品的裸片打線資訊

4.3 SD18 Network

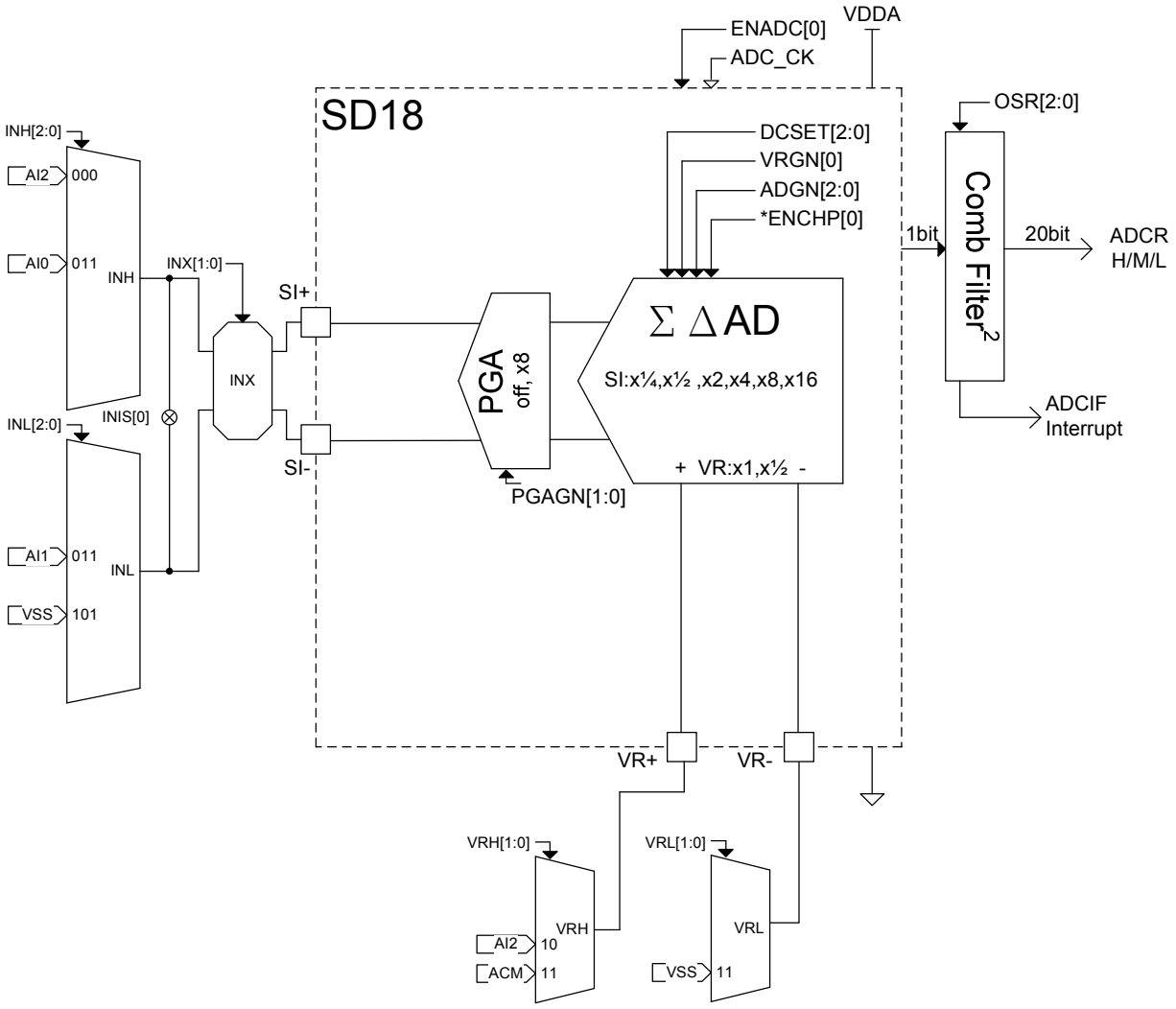


圖 4-2 SD18 Network

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"omly write 1		
										".",unimplemented bit,"x"unknown,"u"unchanged,"d"depends on condition		
Address	**File Name**	**Bit7**	**Bit6**	**Bit5**	**Bit4**	**Bit3**	**Bit2**	**Bit1**	**Bit0**	**A-RESET**	**i-RESET**	**R/W**
00H	INDF0	Contents of FSR0 to address data memory value of FSR0 not changed								N/A	N/A	*,*,*,*,*,*,*,*
01H	POINC0	Contents of FSR0 to address data memory value of FSR0 post-incremented								N/A	N/A	*,*,*,*,*,*,*,*
02H	PODEC0	Contents of FSR0 to address data memory value of FSR0 post-decremented								N/A	N/A	*,*,*,*,*,*,*,*
03H	PRINC0	Contents of FSR0 to address data memory value of FSR0 pre-incremented								N/A	N/A	*,*,*,*,*,*,*,*
04H	PLUSW0	Contents of FSR0 to address data memory value of FSR0 offset by W								N/A	N/A	*,*,*,*,*,*,*,*
05H	INDF1	Contents of FSR1 to address data memory value of FSR0 not changed								N/A	N/A	*,*,*,*,*,*,*,*
06H	POINC1	Contents of FSR1 to address data memory value of FSR0 post-incremented								N/A	N/A	*,*,*,*,*,*,*,*
07H	PODEC1	Contents of FSR1 to address data memory value of FSR0 post-decremented								N/A	N/A	*,*,*,*,*,*,*,*
08H	PRINC1	Contents of FSR1 to address data memory value of FSR0 pre-incremented								N/A	N/A	*,*,*,*,*,*,*,*
09H	PLUSW1	Contents of FSR1 to address data memory value of FSR0 offset by W								N/A	N/A	*,*,*,*,*,*,*,*
0FH	FSR0H								FSR0[8]	x	....u	-,-,-,- -,-,-,*
10H	FSR0L	Indirect Data Memory Address Pointer 0 Low Byte,FSR0[7:0]								xxxx xxxx	uuuu uuuu	*,*,*,*,*,*,*,*
11H	FSR1H								FSR1[8]	x	....u	-,-,-,- -,-,-,*
12H	FSR1L	Indirect Data Memory Address Pointer 1 Low Byte,FSR1[7:0]								xxxx xxxx	uuuu uuuu	*,*,*,*,*,*,*,*
16H	TOSH					TOS[11]	TOS[10]	TOS[9]	TOS[8]	 0000	 0000	-,-,-,- *,*,*,*
17H	TOSL	Top-of-Stack Low Byte (TOS<7:0>)								0000 0000	0000 0000	*,*,*,*,*,*,*,*
18H	STKPTR	STKFL	STKUN	STKOV			STKPRT[2:0]			000. .000	000. .000	r,rw0,rw0,- -,r,r,r
1AH	PCLATH					PC[11]	PC[10]	PC[9]	PC[8]	 0000	 0000	-,-,-,- *,*,*,*
1BH	PCLATL	PC Low Byte for PC<7:0>								0000 0000	0000 0000	*,*,*,*,*,*,*,*
1DH	TBLPTRH					TBLPTR[11]	TBLPTR[10]	TBLPTR[9]	TBLPTR[8]	 0000	 0000	-,-,-,- *,*,*,*
1EH	TBLPTRL	Program Memory Table Pointer Low Byte (TBLPTR<7:0>)								0000 0000	0000 0000	*,*,*,*,*,*,*,*
1FH	TBLDH	Program Memory Table Latch High Byte								0000 0000	0000 0000	*,*,*,*,*,*,*,*
20H	TBLDL	Program Memory Table Latch Low Byte								0000 0000	0000 0000	*,*,*,*,*,*,*,*
21H	PRODH	Product Register of Multiply High Byte								xxxx xxxx	uuuu uuuu	r,r,r,r r,r,r,r
22H	PRODL	Product Register of Multiply Low Byte								xxxx xxxx	uuuu uuuu	r,r,r,r r,r,r,r
23H	INTE1	GIE	ADCIE	TMCIE		TMAIE	WDTIE	E1IE	E0IE	000. 0000	000. 0000	*,*,*,*,*,*,*,*
26H	INTF1		ADCIF	TMCIF		TMAIF	WDTIF	E1IF	E0IF	.00. 0000	.00. 0000	-,*,-,*,*,*,*,*
29H	WREG	Working Register								xxxx xxxx	uuuu uuuu	*,*,*,*,*,*,*,*
2AH	BSRCN								BSR[0]	0	0	-,-,-,- -,-,-,*
2BH	STATUS				C	DC	N	OV	Z	...x xxxx	...u uuuu	-,-,-,*,*,*,*,*
2CH	PSTATUS	PD	TO	IDLEB	BOR		SKERR			000d .0..	uduu .d..	rw0,rw0,rw0,rw0 -,rw0,-,-
2DH	LVDCN		LVDFG	LVD	LVDON	VLDX[3:0]				.000 0000	.000 uuuu	-,*,r,r,*,*,*,*
30H	PWRCN	ENVDDA	**VDDAX[1:0]=11**		ENACM					0xx0	0xx0	*,-,-,* -,-,-,-
31H	MCKCN1	ADCS[2:0]			ADCCK	XTHSP	XTSP	ENXT	ENHAO	0000 0001	0000 0001	*,*,*,*,*,*,*,*
32H	MCKCN2			LSCK	HSCK	HSS[1:0]		CPUCK[1:0]		..00 0000	..00 0000	-,-,*,* *,*,*,*
33H	MCKCN3	LCDS[2:0]				PERCK	BZS[2:0]			000. 0000	000. 0000	*,*,*,-,*,*,*,*
39H	ADCRH	ADC conversion memory HighByte								xxxx xxxx	uuuu uuuu	r,r,r,r r,r,r,r
3AH	ADCRM	ADC conversion memory Middle Byte								xxxx xxxx	uuuu uuuu	r,r,r,r r,r,r,r
3BH	ADCRL	ADC conversion memory Low Byte				0	0	0	0	xxxx 0000	uuuu 0000	r,r,r,r r0,r0,r0,r0
3CH	ADCCN1	ENADC		ENCHP	PGAGN[1:0]		ADGN[2:0]			0.00 0000	0.00 0000	*,-,*,*,*,*,*,*
3DH	ADCCN2			INBUF=0	VRBUF=0	VREGN	DCSET[2:0]			..xx 0000	..xx 0000	-,-,-,*,*,*,*,*
3EH	ADCCN3	OSR[2:0]						**OSR[3]**		000. ..0.	000. ..0.	*,*,*,-,-,-,*,-
3FH	AINET1	**INH[2:0]=XX0 or XX1(AI2 or AI0)**			**INL[2:0]=0XX or 1XX(AI1 or VSS)**			INIS		xx00 xx0x	xx00 xx0x	-,-,*,* -,-,*,-
40H	AINET2		**VRH[1:0]=X0 or X1(AI2 or ACM)**		INX[1:0]		**VRL[1:0]=11(VSS)**			xx00 xx0x	xx00 xx0x	-,-,*,*,*,-,-,-
41H	TMACN	ENTMA	TMACK	TMAS[1:0]		ENWDT	WDTS[2:0]			0000 0000	0000 0000	*,*,*,* w1,*,*,*
42H	TMAR	TimerA data register								xxxx xxxx	uuuu uuuu	r,r,r,r r,r,r,r
46H	TMCCN	ENTMC	TMCCK[1:0]		TMCS1[2:0]			TMCS0[1:0]		0000 0000	0000 0000	*,*,*,*,*,*,*,*
47H	PRC	TimerC programmable register								1111 1111	1111 1111	*,*,*,*,*,*,*,*
48H	TMCR	TimerC register								0000 0000	0000 0000	r,r,r,r r,r,r,r
4FH	PWMCN	ENPWM	ENPFD	PWMRL[1:0]						0000	0000	*,*,*,*,-,-,-,-
51H	PWMR	PWM MSB Byte register								xxxx xxxx	uuuu uuuu	*,*,*,*,*,*,*,*
52H	LCDCN1	ENLCD	LCDPR	VLCDX[1:0]		LCDBF	**LCDBI[1:0]=10**			0000 0xxx	0000 0xxx	*,*,*,*,-,-,-,-
53H	LCDCN2	LCDBL	**LCDMX[1:0]=11**							0xxx xxxx	0xxx xxxx	-,-,-,- -,-,-,-
54H	LCD0	Segment SEG2@[3:0] and SEG3@[7:4] data register of LCD								xxxx xxxx	uuuu uuuu	*,*,*,*,*,*,*,*
55H	LCD1	Segment SEG4@[3:0] and SEG5@[7:4] data register of LCD								xxxx xxxx	uuuu uuuu	*,*,*,*,*,*,*,*
56H	LCD2	Segment SEG6@[3:0] and SEG7@[7:4] data register of LCD								xxxx xxxx	uuuu uuuu	*,*,*,*,*,*,*,*
57H	LCD3	Segment SEG8@[3:0] and SEG9@[7:4] data register of LCD								xxxx xxxx	uuuu uuuu	*,*,*,*,*,*,*,*
58H	LCD4	Segment SEG10@[3:0] and SEG11@[7:4] data register of LCD								xxxx xxxx	uuuu uuuu	*,*,*,*,*,*,*,*
59H	LCD5	Segment SEG12@[3:0] and SEG13@[7:4] data register of LCD								xxxx xxxx	uuuu uuuu	*,*,*,*,*,*,*,*
5AH	LCD6	Segment SEG14@[3:0] and SEG15@[7:4] data register of LCD								xxxx xxxx	uuuu uuuu	*,*,*,*,*,*,*,*
5BH	LCD7	Segment SEG16@[3:0] and SEG17@[7:4] data register of LCD								xxxx xxxx	uuuu uuuu	*,*,*,*,*,*,*,*
5CH	LCD8	Segment SEG18@[3:0] and SEG19@[7:4] data register of LCD								xxxx xxxx	uuuu uuuu	*,*,*,*,*,*,*,*
5DH	LCD9	Segment SEG20@[3:0] and SEG21@[7:4] data register of LCD								xxxx xxxx	uuuu uuuu	*,*,*,*,*,*,*,*
6DH	PT1	PT1.7	PT1.6	PT1.5	PT1.4	PT1.3	PT1.2	PT1.1	PT1.0	xxxx xxxx	uuuu uuuu	*,*,*,* r,r,r,r
6EH	TRISC1	TC1.7	TC1.6	TC1.5	TC1.4					0000	0000	*,*,*,*-,-,-,-
70H	PT1PU	PU1.7	PU1.6	PU1.5	PU1.4	PU1.3	PU1.2	PU1.1	PU1.0	0000 0000	0000 0000	*,*,*,*,*,*,*,*
71H	PT1M1					INTEG1[1:0]		INTEG0[1:0]		 0000	 0000	-,-,-,- *,*,*,*
72H	PT1M2		PM1.7[0]							.0..	.0..	-,*,-,- -,-,-,-
74H	PT2					PT2.3	PT2.2	PT2.1	PT2.0	 xxxx	.... uuuu	-,-,-,- *,*,*,*
75H	TRISC2					TC2.3	TC2.2	TC2.1	TC2.0	 0000	 0000	-,-,-,- *,*,*,*
77H	PT2PU					PU2.3	PU2.2	PU2.1	PU2.0	 0000	 0000	-,-,-,- *,*,*,*
78H	PT2M1			PM2.2[1]	PM2.2[0]					..00	..00	-,-,*,* -,-,-,-
80H ~ FFH	GPR0	General Purpose Register as 128Byte								xxxx xxxx	uuuu uuuu	*,*,*,*,*,*,*,*
100H~17FH	GPR1	General Purpose Register as 128Byte								xxxx xxxx	uuuu uuuu	*,*,*,*,*,*,*,*

圖 5-1a HY11P36 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”omly write 1		
										“.”unimplemented bit,“x”unknown,“u”unchanged,“d”depends on condition		
Address	File Name	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	A-RESET	i-RESET	R/W
180H	LCD10	Segment SEG22@[3:0] and SEG23@[7:4] data register of LCD								xxxx xxxx	uuuu uuuu	*,*,*,*,*,*,*,*
181H	LCD11	Segment SEG24@[3:0] and SEG25@[7:4] data register of LCD								xxxx xxxx	uuuu uuuu	*,*,*,*,*,*,*,*
182H	LCD12	Segment SEG26@[3:0] and SEG27@[7:4] data register of LCD								xxxx xxxx	uuuu uuuu	*,*,*,*,*,*,*,*
183H	LCD13	Segment SEG28@[3:0] and SEG29@[7:4] data register of LCD								xxxx xxxx	uuuu uuuu	*,*,*,*,*,*,*,*
184H	LCD14	Segment SEG30@[3:0] and SEG31@[7:4] data register of LCD								xxxx xxxx	uuuu uuuu	*,*,*,*,*,*,*,*
185H	LCD15	Segment SEG32@[3:0] and SEG33@[7:4] data register of LCD								xxxx xxxx	uuuu uuuu	*,*,*,*,*,*,*,*
195H	BIECTRL					VPP_HIGH		BIEWR	BIERD	1000 d000	1000 d000	-,-,-,-,- *,r0,*,*
197H	BIEPTRL	0	0	BIE_ADDR[5:0]						0000 0000	0000 0000	w0,w0,*,*,*,*,*
198H	BIEDH	BIE_DATA[15:8]								xxxx xxxx	xxxx xxxx	*,*,*,*,*,*,*,*
199H	BIEDL	BIE_DATA[7:0]								xxxx xxxx	xxxx xxxx	*,*,*,*,*,*,*,*

圖 5-1b HY11P36 暫存器列表

6. 電氣特性

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

Voltage applied at V_{DD} to V_{SS} . . . . −0.2 V to 4.0 V

Voltage applied to any pin . . . . −0.2 V to V_{DD} + 0.3 V

Voltage applied to RST/VPP pin . . . . −0.2 V to 6.9 V

Voltage applied to TST/PT1.3 pin . . . . −0.2 V to V_{DD} + 1 V

Diode current at any device terminal . . . . ±2 mA

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

(programmed device) . . . . −40℃ to 85℃

Total power dissipation. 0.5w

Maximum output current sink by any PORT1 to PORT2 I/O pin. 25mA

6.1 Recommended operating conditions

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

Sym.	Parameter		Test Conditions		Min.	Typ.	Max.	unit
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	
XT	External Oscillator Frequency	Watch crystal	V_{DD} = 2.2V, ENXT[0]=1	XTSP[0]=0, XTHSP[0]=0		32.768K		Hz
		Ceramic resonator		XTSP[0]=1, XTHSP[0]=0	450K		8M	
		Crystal		XTSP[0]=1, XTHSP[0]=0	1M		8M	

6.2 Internal RC Oscillator

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

Sym.	Parameter	Test Conditions	Min.	Typ.	Max.	unit
HAO	High Speed Oscillator frequency	ENHAO[0]=1	1.6	2.0	2.4	MHz
LPO	Low Power Oscillator frequency	V_{DD} supply voltage be enable LPO	22	28	35	KHz

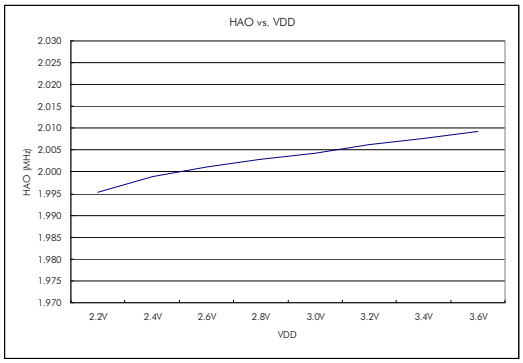


Figure 6.2-1 HAO vs. VDD

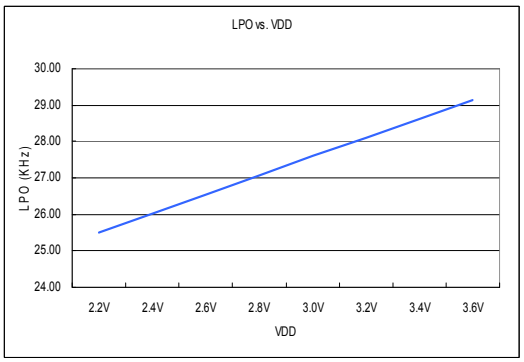


Figure 6.2-2 LPO vs. VDD

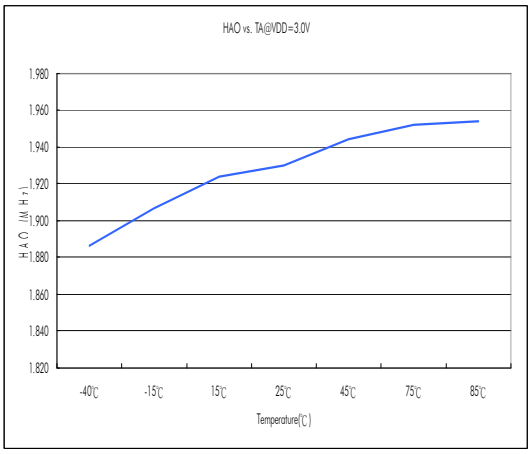


Figure 6.2-3 HAO vs. Temperature

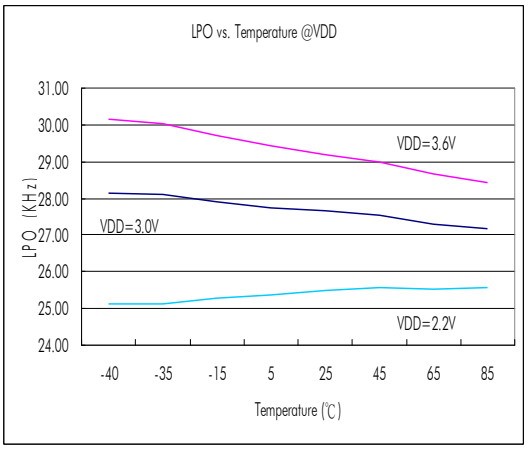


Figure 6.2-4 LPO vs. Temperature

6.3 Supply current into VDD excluding peripherals current

T_A = 25℃,V_{DD} = 3.0V,OSC_LPO = 28KHz,unless otherwise noted

Sym.	Parameter	Test Conditions	Min.	Typ.	Max.	unit
I_{AM1}	Active mode 1	OSC_CY = 8MHz, OSC_HAO = off, CPU_CK = 8MHz		1.2	2	mA
I_{AM2}	Active mode 2	OSC_CY = off, OSC_HAO = 2MHz, CPU_CK = 2MHz		0.32	0.55	mA
I_{AM3}	Active mode 3	OSC_CY = off, OSC_HAO = 2MHz, CPU_CK = 1MHz		0.18	0.3	mA
I_{LP1}	Low Power 1	OSC_CY = 32768Hz, OSC_HAO = off, CPU_CK = 16384Hz		7	12	uA
I_{LP2}	Low Power 2	OSC_CY = off, OSC_HAO = off, CPU_CK = LPO, Idle state		1.65	3	uA
I_{LP3}	Low Power 3	OSC_CY = off, OSC_HAO = off, CPU_CK = off, Sleep state		0.65	1.2	uA

OSC_CY：External Oscillator frequency.

OSC_HAO：Internal High Accuracy Oscillator frequency.

CPU_CK：CPU core work frequency.

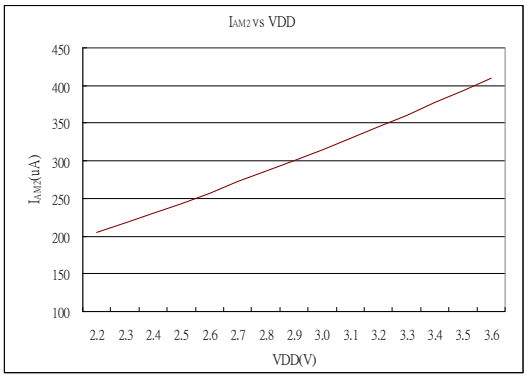


Figure 6.3-1 I_{AM2} vs. VDD

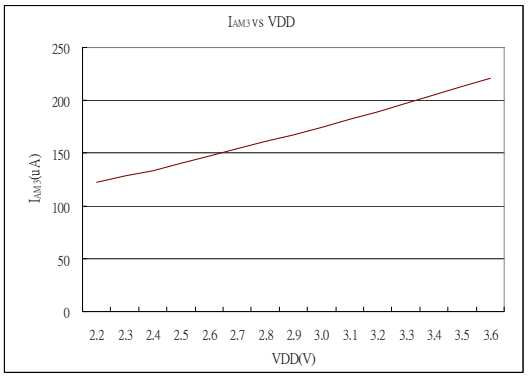


Figure 6.3-2 I_{AM3} vs. VDD

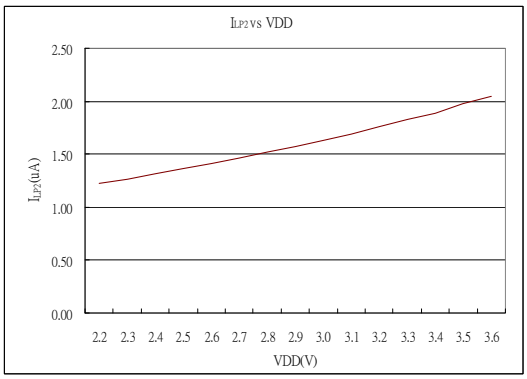


Figure 6.3-3 I_{LP2} vs. VDD

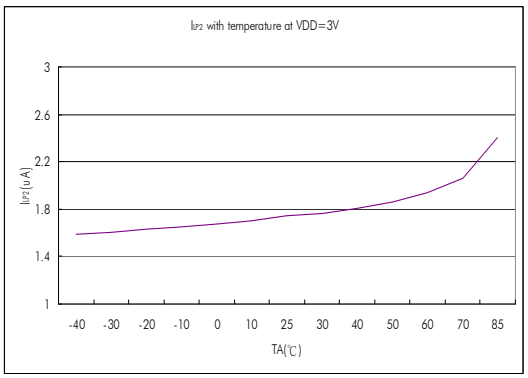


Figure 6.3-4 I_{LP2} vs. Temperature

Figure 6.3-5 I_{LP3} vs. VDD

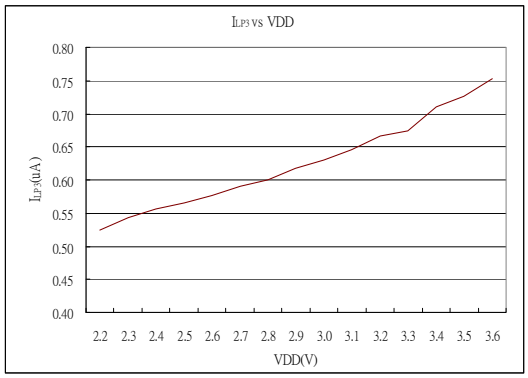


Figure 6.3-5 I_{LP3} vs. VDD

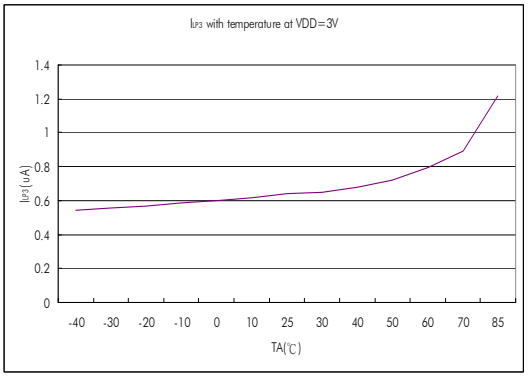


Figure 6.3-6I_{LP3} vs. Temperature

6.4 Port1~2

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				2.1	V
V_{IL}	Low-Level input voltage		0.9			
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	

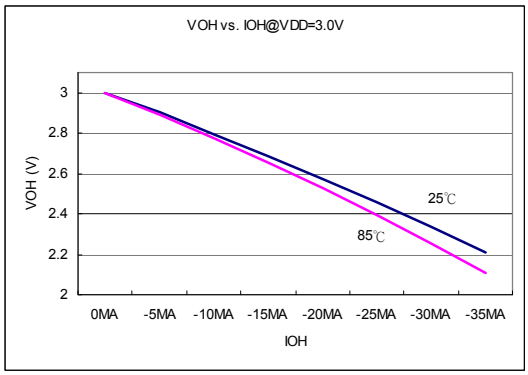


Figure 6.4-1 V_{OH} vs. I_{OH} @VDD=3.0V

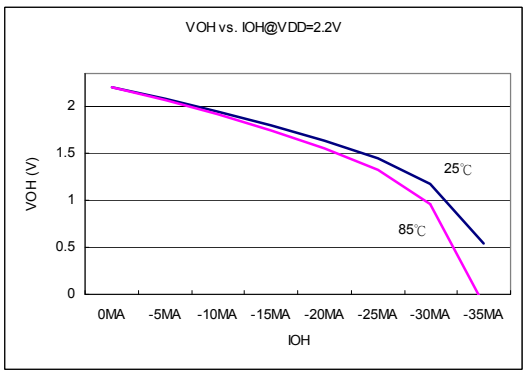


Figure 6.4-2 V_{OH} vs. I_{OH} @VDD=2.2V

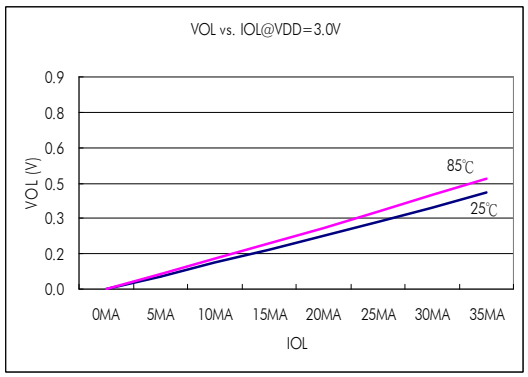


Figure 6.4-3 V_{OL} vs. I_{OL}@VDD=3.0V

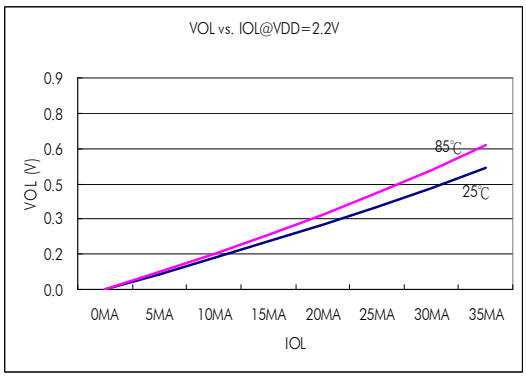


Figure 6.4-4 V_{OL} vs. I_{OL}@VDD=2.2V

6.5 Reset(Brownout, External RST pin, Low Voltage Detect)

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-LVR}		2			us
	V_{DD} Start Voltage to accepted reset internally (L➔H),V_{LVR}		1.6	1.85	2.1	V
	Hysteresis, $V_{HYS-LVR}$			70		mV
RST	Pulse length needed as RST/VPP pin to accepted reset internally, t_{d-RST}		2			us
	Input Voltage to accepted reset internally		0.9			V
	Hysteresis, $V_{HYS-RST}$			0.8		V
LVD	Operation current, I_{LVD}			10	15	uA
	External input voltage to compare reference voltage			1.2		V
	Compare reference voltage temperature drift	T_A = -40℃ ~ 85 ℃		100		ppm/℃
	Detect V_{DD} voltage rang by user option, V_{SVS} VLDx[3:0]=1110b			3.3		V
	Detect V_{DD} voltage rang by user option, V_{SVS} VLDx[3:0]=1101b			3.2		
	Detect V_{DD} voltage rang by user option, V_{SVS} VLDx[3:0]=1100b			3.1		
	Detect V_{DD} voltage rang by user option, V_{SVS} VLDx[3:0]=1011b			3.0		
	Detect V_{DD} voltage rang by user option, V_{SVS} VLDx[3:0]=1010b			2.9		
	Detect V_{DD} voltage rang by user option, V_{SVS} VLDx[3:0]=1001b			2.8		
	Detect V_{DD} voltage rang by user option, V_{SVS} VLDx[3:0]=1000b			2.7		
	Detect V_{DD} voltage rang by user option, V_{SVS} VLDx[3:0]=0111b			2.6		
	Detect V_{DD} voltage rang by user option, V_{SVS} VLDx[3:0]=0110b			2.5		
	Detect V_{DD} voltage rang by user option, V_{SVS} VLDx[3:0]=0101b			2.4		
	Detect V_{DD} voltage rang by user option, V_{SVS} VLDx[3:0]=0100b			2.3		
	Detect V_{DD} voltage rang by user option, V_{SVS} VLDx[3:0]=0011b			2.2		
	Detect V_{DD} voltage rang by user option, V_{SVS} VLDx[3:0]=0010b			2.1		
	Detect V_{DD} voltage rang by user option, V_{SVS} VLDx[3:0]=0001b			2.0		

BOR：Brownout Reset

LVR：Low Voltage Reset of BOR

LVD：Low Voltage Detect

RST：External Reset pin

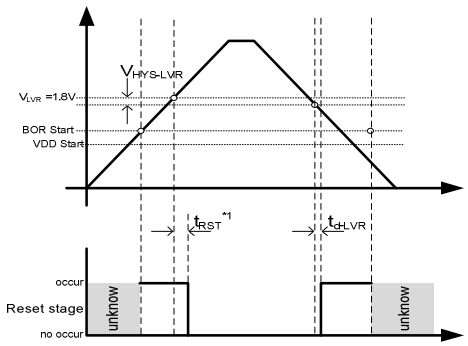


Figure6.5-1 BOR reset diagram

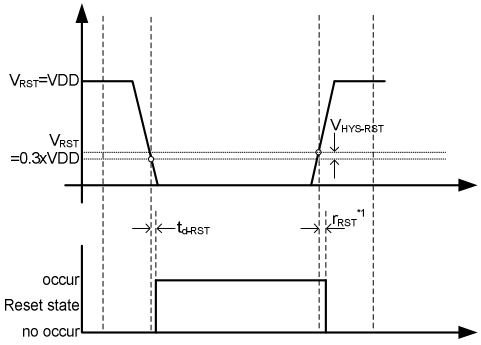


Figure6.5-2 RST reset diagram

*1 r_{RST}：Please see BOR Introduce of HY11Pxx series User's Guide (UG-HY11S14-Vxx).

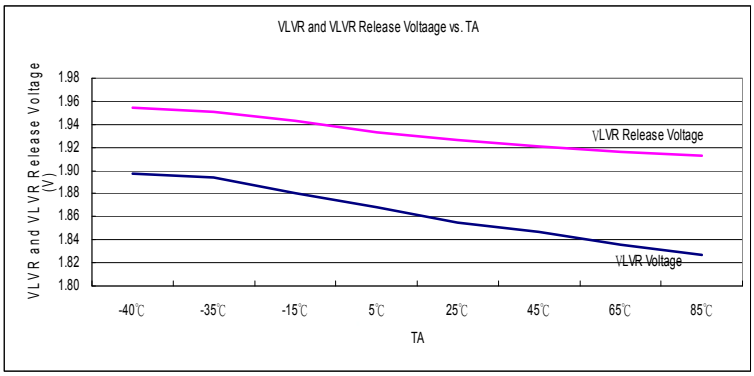


Figure6.5-3 LVR vs. Temperature

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	VDDAX[1:0]=00b		22		uA
	Select VDDA output voltage	I_L = 0.1mA, VDD≧VDDA+0.25V	VDDAX [1:0]=11b		2.4		V
	Dropout voltage	I_L = 10mA	VDDAX [1:0]=11b		250		mV
	Temperature drift	VDDAX [1:0]=11b	T_A=-40℃~85℃		50		ppm/℃
	V_{DD} Voltage drift	I_L = 0.1mA	V_{DD}=2.5V~3.6V		±0.2		%/V
ACM	ACM operation current, I_{ACM}	I_L = 0mA			20		uA
	Output voltage ,V_{ACM}	ENACM[0]=1	I_L = 0uA		1.0		V
	Output voltage with Load		I_L = ±200uA	0.98		1.02	V_{ACM}
	Temperature drift	ENACM[0]=1,	T_A=-40℃~85℃		50		ppm/℃
	VDDA Voltage drift	I_L = 10uA			100		uV/V

VDDA：Adjust Voltage Regulator

ACM：Analog Common Mode Voltage

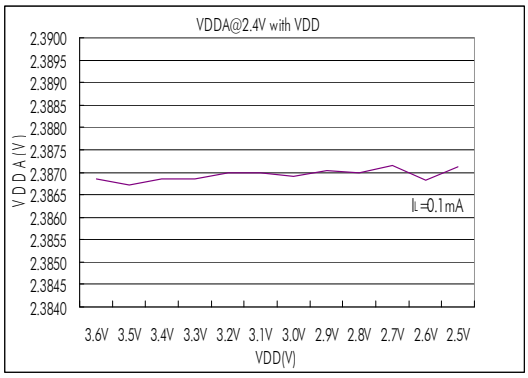


Figure6.6-1 VDDA I_L=0.1mA vs. VDD

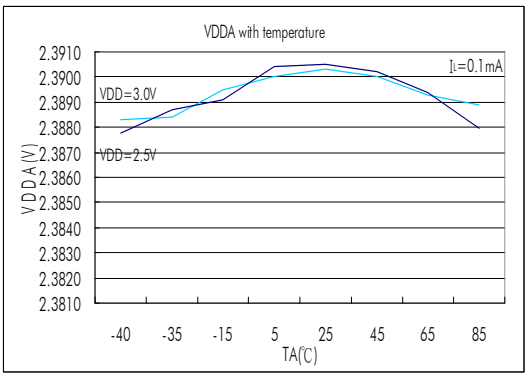


Figure6.6-2 VDDA I_L=0.1mA vs. Temperature

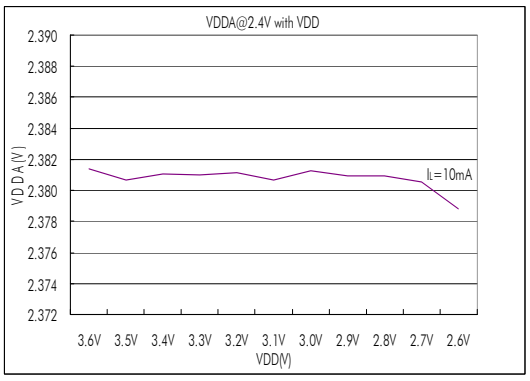


Figure6.6-3 VDDA I_L=10mA vs. VDD

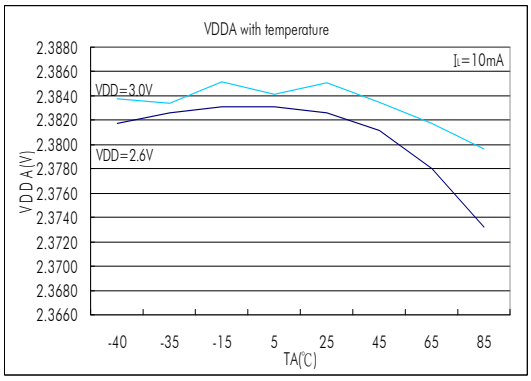


Figure6.6-4 VDDA I_L=10mA vs. Temperature

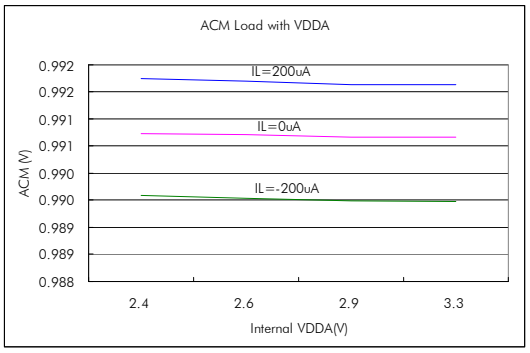


Figure6.6-5 ACM Load vs. VDDA

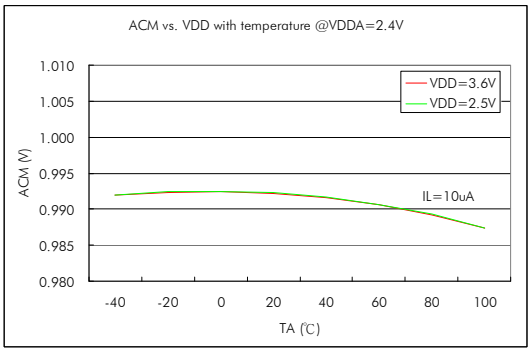


Figure6.6-6 ACM vs. Temperature

6.7 LCD

T_A = 25℃,V_{DD} = 3.0V, C_{VLCD} =4.7uF,unless otherwise noted.

Sym.	Parameter	Test Conditions		Min.	Typ.	Max.	unit
I_{LCD}	Operation supply current without output buffer.(all segment turn on)	LCDPR[0]=1	V_{DD} = 2.2V		10		uA
			V_{DD} = 3.0V				
VLCD	Supply Voltage at VLCD pin	LCDPR[0]=0		2.2		3.6	V
	Embedded Charge Pump output voltage at VLCD pin	V_{DD} = 2.2V, LCDPR[0]=1, C_{VLCD} =4.7uF	VLCDX[1:0]=11b	2.295	2.55	2.805	V
			VLCDX[1:0]=10b	2.52	2.8	3.08	
			VLCDX[1:0]=01b	2.745	3.05	3.355	
			VLCDX[1:0]=00b	2.97	3.3	3.63	
Z_{LCD}	Output impedance with LCD buffer	f_{LCD} =128Hz,VLCD=3.05V			10		kΩ

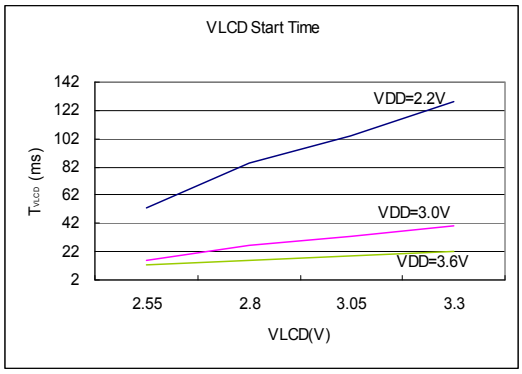


Figure6.7-1 LCD start time

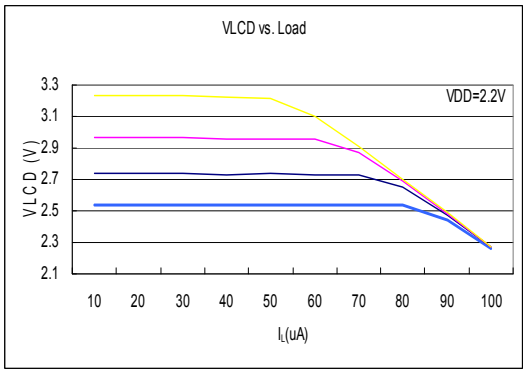


Figure6.7-2 VLCD vs. I_L @VDD=2.2V

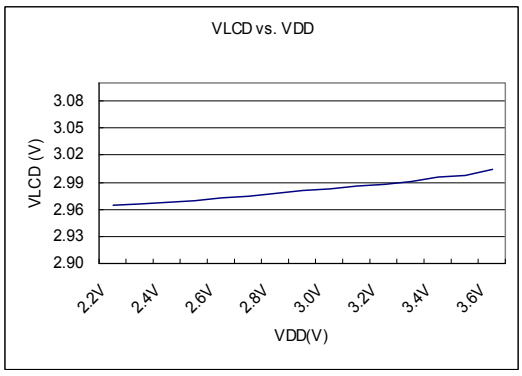


Figure6.7-3 VLCD vs. VDD

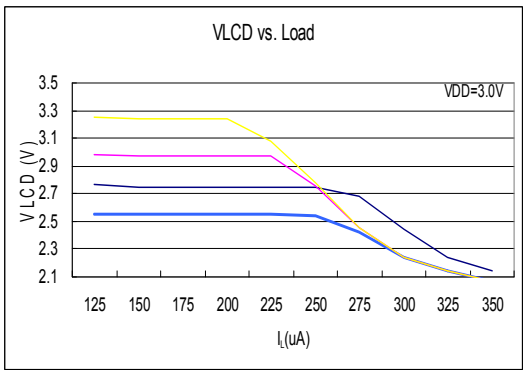


Figure6.7-4 VLCD vs. I_L @VDD=3.0V

6.8 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 INBUF[0]=0,VRBUF[0]=0	GAIN =4, ADC_CK=250KHz		120		uA
*1, OSR=128, setting by ADCCN3[OSR3] bit. OSR[3:0]=1010b, OSR=128; OSR[3:0]=0xxx, OSR=256 ~ 32768 OSR[3:0]=1xxxb can't set by user							

6.8.1 PGA,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_{PGA}	Supply Voltage at VDDA	ENVDDA[0]=0		2.4		3.6	V
I_{PGA}	Operation supply current	PGAGN[1:0]=<11>			320		uA
G_{PGA}	Gain temperature drift	T_A = -40℃~ 85℃	GAIN=128		15		ppm/℃

6.8.2 SD18,performance Ⅱ (fSD18=250KHz)

T_A = 25℃,V_{DD} = 3.0V, VDDA=2.9V,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=±200mV				±0.003	±0.01	%FSR
		VDDA=2.4V,V_{VR}=1.0V,ΔSI=±450mV						
	No Missing Codes[3]	ADC_CK=250KHz,OSR[2:0]=010b			19			Bits
G_{SD18}	Temperature drift **Gain 1~x16** **(INBUF[0]=0b,)**	INBUF[0]=0b,VRBUF[0]=0b		T_A = -40℃~ 85℃		10		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 error temperature drift with chopper without PGA			GAIN=1		2		uV/℃
				GAIN=2		1		
				GAIN=4		0.5		
				GAIN=16		0.15		

T_A = 25℃,V_{DD} = 3.0V, VDDA=2.9V,V_{VR}=1.0V,GAIN=1 without PGA, unless otherwise noted

Sym.	Parameter	Test Conditions		Min.	Typ.	Max.	unit
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, without PGA	V_{SI}=0V, GAIN=16		75		
PSRR	DC power supply rejection	VDDA=3.0V,ΔVDDA=±100mV, V_{VR}=1.0V, V_{SI}=1.2V,V_{SI-}=1.2V,	GAIN=1 PGA=off		75		dB
			GAIN=16 PGA=8				

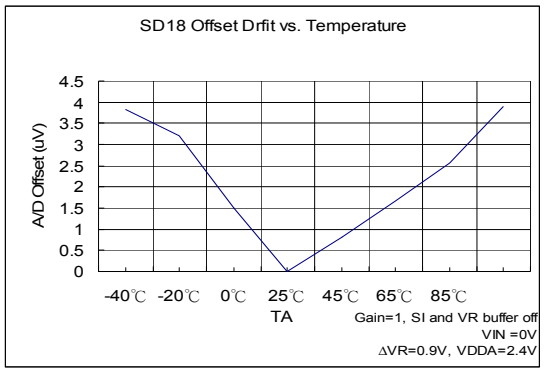


Figure6.8-1(a) SD18 Offset Temperature drift

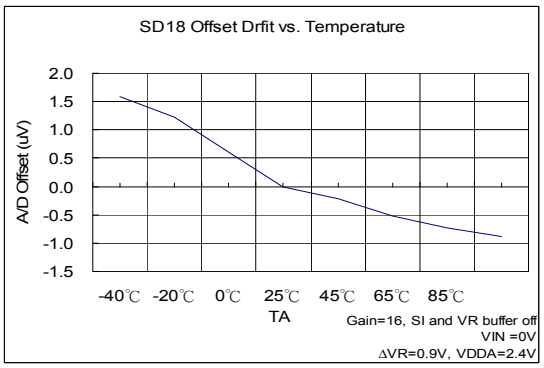


Figure6.8-1(b) SD18 Offset Temperature drift

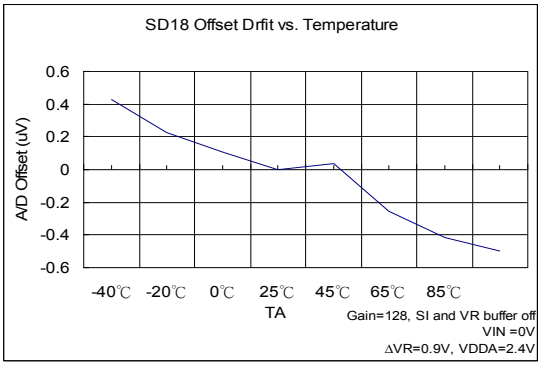


Figure6.8-1(c) SD18 Offset Temperature drift

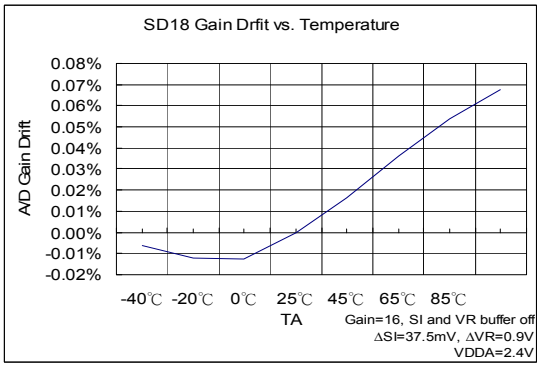


Figure6.8-2(a) SD18 Gain drift with temperature

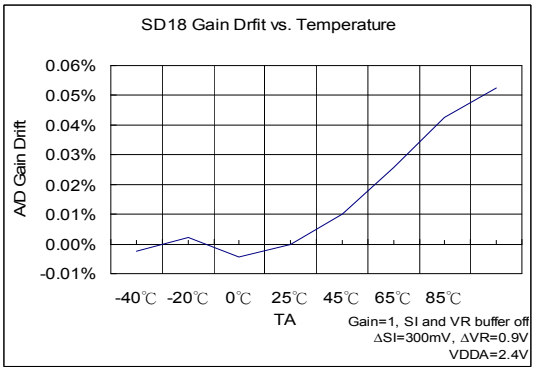


Figure6.8-2(b) SD18 Gain drift with temperature

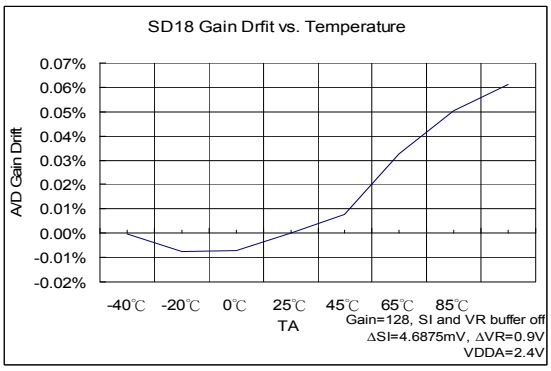


Figure6.8-2(c) SD18 Gain drift with temperature

6.8.3 SD18 Noise Performance

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

HY11P36 針對 SD18 提供了重要的輸入雜訊規格。Table6.8-3(a), Table6.8-3(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，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									
±2400	0.25	=	1	×	0.25	14.43	16.07	17.20	17.86	18.29	18.66	18.98	19.13	19.30
±2160	0.5	=	1	×	0.5	14.34	16.05	17.13	17.84	18.26	18.62	18.90	19.13	19.27
±1080	1	=	1	×	1	14.38	16.06	17.11	17.72	18.13	18.53	18.88	19.05	19.22
±540	2	=	1	×	2	14.40	15.98	16.96	17.59	18.01	18.45	18.79	19.01	19.17
±270	4	=	1	×	4	14.39	15.88	16.82	17.39	17.85	18.28	18.65	18.95	19.13
±135	8	=	1	×	8	14.27	15.75	16.58	17.15	17.60	18.04	18.45	18.78	19.02
±68	16	=	1	×	16	14.14	15.51	16.18	16.73	17.21	17.70	18.15	18.52	18.83
±8	128	=	8	×	16	13.04	13.83	14.32	14.87	15.38	15.86	16.36	16.84	17.28

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

Table6.8-3(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									
±2400	0.25	=	1	×	0.25	362.92	139.77	64.33	40.65	30.04	23.35	18.70	16.75	14.92
±2160	0.5	=	1	×	0.5	193.22	70.82	33.83	20.60	15.37	12.00	9.86	8.38	7.61
±1080	1	=	1	×	1	94.14	35.38	17.16	11.17	8.40	6.34	5.01	4.44	3.92
±540	2	=	1	×	2	46.23	18.59	9.48	6.13	4.57	3.35	2.66	2.28	2.05
±270	4	=	1	×	4	23.37	9.98	5.20	3.51	2.54	1.89	1.46	1.18	1.05
±135	8	=	1	×	8	12.66	5.47	3.06	2.06	1.51	1.11	0.84	0.67	0.56
±68	16	=	1	×	16	6.93	3.23	2.02	1.38	0.99	0.70	0.51	0.40	0.32
±8	128	=	8	×	16	1.86	1.29	0.91	0.63	0.44	0.32	0.22	0.16	0.12

Table6.8-3(b) SD18 RMS Noise Table

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

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

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

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

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

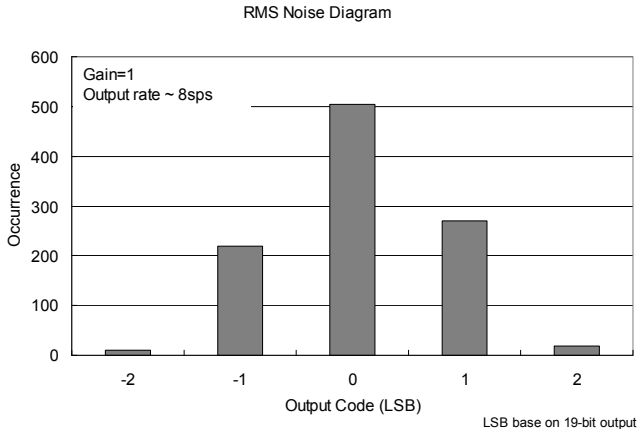


Figure6.8-3(a) RMS Noise Diagram

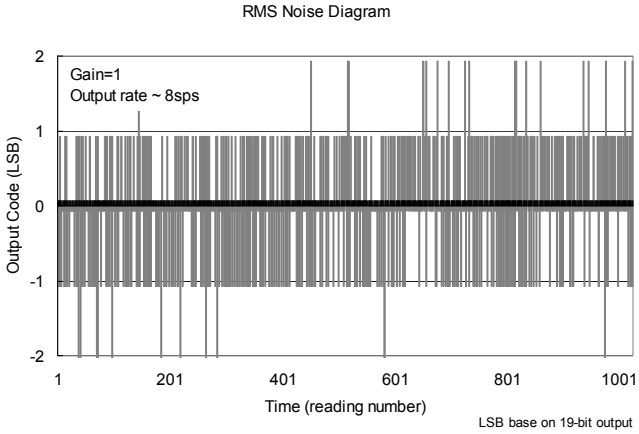


Figure6.8-3(b) Output Code Diagram

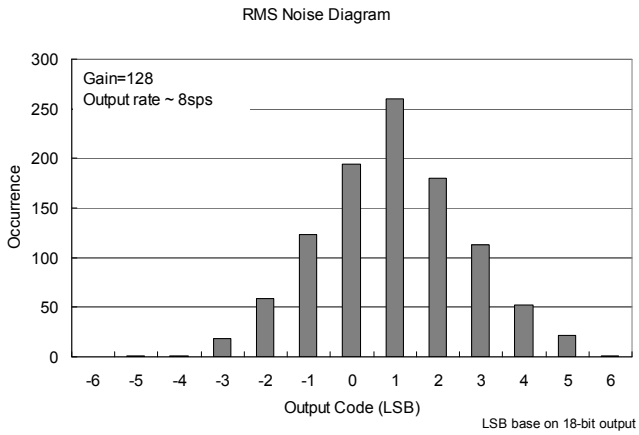


Figure6.8-3(c) RMS Noise Diagram

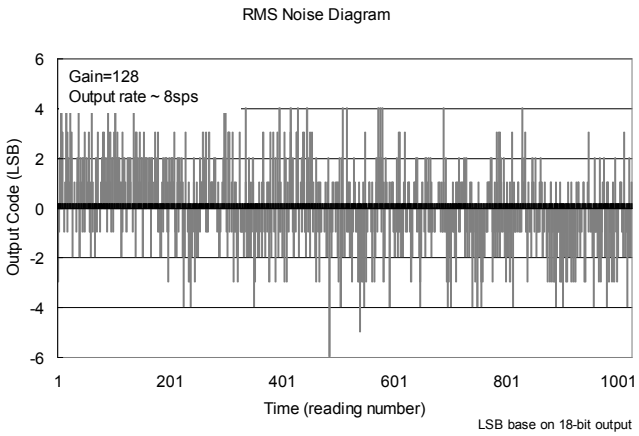


Figure6.8-3(d) Output Code Diagram

6.9 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]
HY11P36-D000	Die	-	D	000	000	-	200	Green[4]	-
HY11P36-L064	LQFP	64	L	064	000	Tray	250	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：您的需求是不帶程式碼的空白片且需要的產品是裸片出貨，晶片型號為 HY11P36。則下單品名為 HY11P36-D000

例如：您的代客燒錄服務申請的程式碼編號為 008，晶片型號為 HY11P36，且需要的產品是裸片出貨。則下單品名為 HY11P36-D000-008

例如：您的需求是晶片型號為 HY11P36，不帶程式碼的空白片且需要的產品是封裝片 LQFP64 出貨，則下單品名為 HY11P36-L064，且需以 Tray 出貨，則除下單品名外，請特別註明出貨包裝形式為 Tray

例如：您的需求是晶片型號為 HY11P36，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 LQFP64 出貨，則下單品名為 HY11P36-L064-009，且需以 Tray 出貨，則除下單品名外，請特別註明出貨包裝形式為 Tray

[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:**

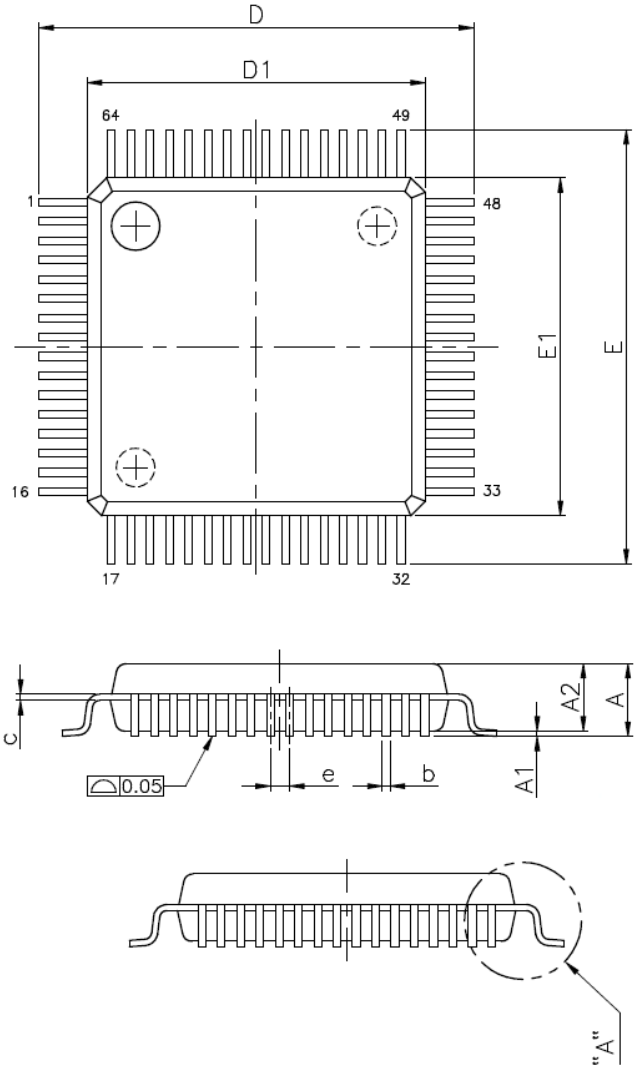
濕度敏感性等級係依據 IPC/JEDEC J-STD-020 的規範加以試驗分級，並參考 IPC/JEDEC J-STD-033 的標準處理、包裝、運輸與使用。

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

HYCON 產品皆為 Green Product，符合 RoHS 指令以及無鹵素規定(Br/Cl<0.1%)

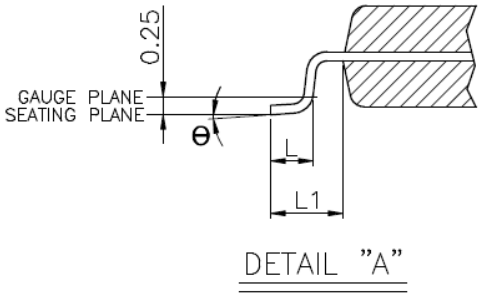
8. 封裝型式資訊

8.1 LQFP64(L064)



VARIATIONS (ALL DIMENSIONS SHOWN IN MM)

SYMBOLS	MIN.	NOM.	MAX.
A	—	—	1.60
A1	0.05	—	0.15
A2	1.35	1.40	1.45
b	0.13	0.18	0.23
c	0.09	—	0.20
D	9.00 BSC		
D1	7.00 BSC		
e	0.40 BSC		
E	9.00 BSC		
E1	7.00 BSC		
L	0.45	0.60	0.75
L1	1.00 REF		
θ	0°	3.5°	7°



JEDEC MS-026 compliant

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
V02	ALL	初版發行
V03	4	修正產品特點-刪除內建低壓燒錄控制電路特性
V04	11	修正 SD18 Network