
MiDAS1.0B Family

8-bit Turbo Microcontroller

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1 MiDAS1.0B Family Overview

1.1 General Description

MiDAS1.0B Family is a high-speed 80C52 compatible Microcontroller. It executes all of the conventional 80C52 instructions.

MiDAS1.0B Family has three 16-bit timer/counters, 40(44-MQFP), 28(32-QFN), 24(28-SOP) programmable I/O ports, 1 16-bit Watchdog timer, POR (Power-On Reset), and 1 LVD (Low Voltage Detector) as peripherals. In addition, it contains two internal ring oscillators, which can generate the 6 MHz system clock signal and 32KHz clock signal instead of a crystal oscillator.

MiDAS1.0B Family operates over the extended -40°C to +85°C temperature range, and is available in the 44-MQFP, 32-QFN, 28-SOP packages.

1.2 Features

- ◆ **CPU**
 - ✓ 8-bit turbo 80C52 architecture
 - ✓ 4 cycles/1 machine cycle
 - ✓ instruction level compatible with Intel 80C52
- ◆ **8KB FLASH (Including 1KB User EEPROM)**
- ◆ **256B Internal AUX. RAM**
- ◆ **256B Internal RAM**
- ◆ **Operating Voltage: +2.2V ~ +5.5V**
- ◆ **Operating Temperature: -40°C ~ 85°C**
- ◆ **Operating Frequency**
 - ✓ Max. 6MHz @ 3V
- ◆ **Max. Programmable 40 I/O Pins (44-MQFP)**
 - ✓ Pull-up control, Open drain, Push-Pull output
 - ✓ Pull-down control, Open drain, Push-Pull output (P4.7)
 - ✓ TTL and CMOS compatible logic levels
- ◆ **Low Voltage Detector: +1.6V**
- ◆ **Internal Ring OSC with Calibration function**

- ✓ Max. 6MHz @ 5.0V
- ✓ 4MHz @ 2.7V ~ 5.0V (+/- 3%)
- ✓ 32KHz @ 2.7V (+/-10%) (Low power OSC)
- ◆ **32-channel 10-bit ADC (44-MQFP)**
- ◆ **Supporting ISP/IAP/MDS**
- ◆ 16-bit Programmable Watchdog Timer
- ◆ Three 16-bit Timer/Counters
- ◆ 1-channel I2C (Master/Slave)
- ◆ 1-channel SPI (Master/Slave)
- ◆ 1-channel UART
- ◆ 16-channel 8bit high speed PWM for DIMMING
- ◆ 14 Interrupt Sources
 - ✓ Timer0 / 1 / 2, ADC, WDT, LVD, I2C, SPI,
 - ✓ 6 External Source: both edge/level
 - ✓ Two-level interrupt priority
- ◆ Reset Sources
 - ✓ On-chip power-on-reset
 - ✓ External reset
 - ✓ Low voltage detector reset.
 - ✓ Watchdog timer reset.
- ◆ Power Down Wake-up Sources
 - ✓ Reset Sources + 6 External interrupt (both edges)
- ◆ Power Consumption
 - ✓ active current : Max 1mA @3.3V, 2MHz
 - ✓ idle current : Max 0.5mA @3.3V, 2MHz
 - ✓ stop current : Max 1uA @3.3V (all clock off)
- ◆ E.S.D. Protection Up to 2,000V
- ◆ Latch-up Protection Up to $\pm 200\text{mA}$
- ◆ Package
 - ✓ 44-MQFP
 - ✓ 32-QFN
 - ✓ 28-SOP

1.3 Applications

- ◆ Mobile Devices
- ◆ Multimedia

- ◆ Navigation Systems
- ◆ Home Appliance
- ◆ Other Electronic Devices

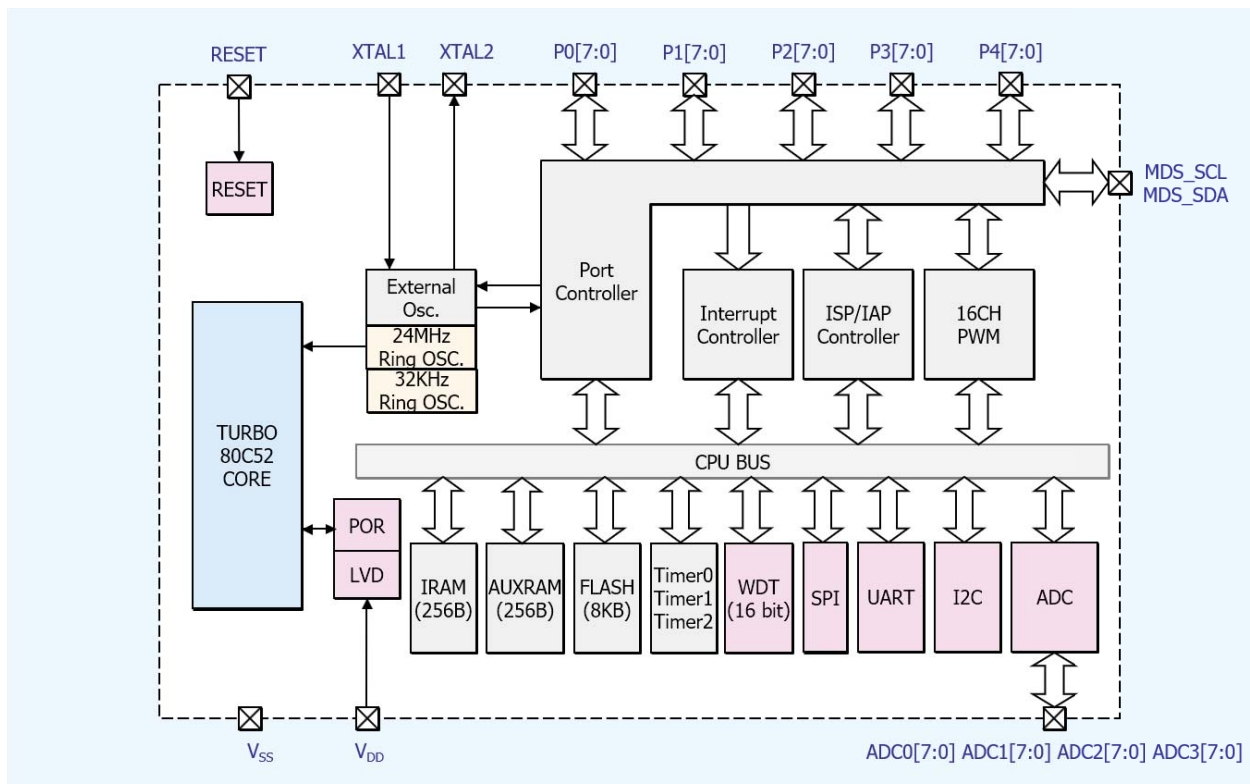
1.4 Product Family Guide

Product	Flash [Byte]	EEPROM (byte)	RAM [Byte]	Package	Programmable I/O	ADC (bit X Ch)	PWM (bit x ch)	Other Peripherals
GC89C521A0-MQ44I	8K	(1K)	512	44-MQFP	40	10 X32	8 X 16	ISP IAP EJTAG LVD POR RING
GC89C521A0-QF32I	8K	(1K)	512	32-QFN	28	10 X 24	8 X 12	
GC89C521A0-SO28I	8K	(1K)	512	28-SOP	24	10 X 20	8 X 10	

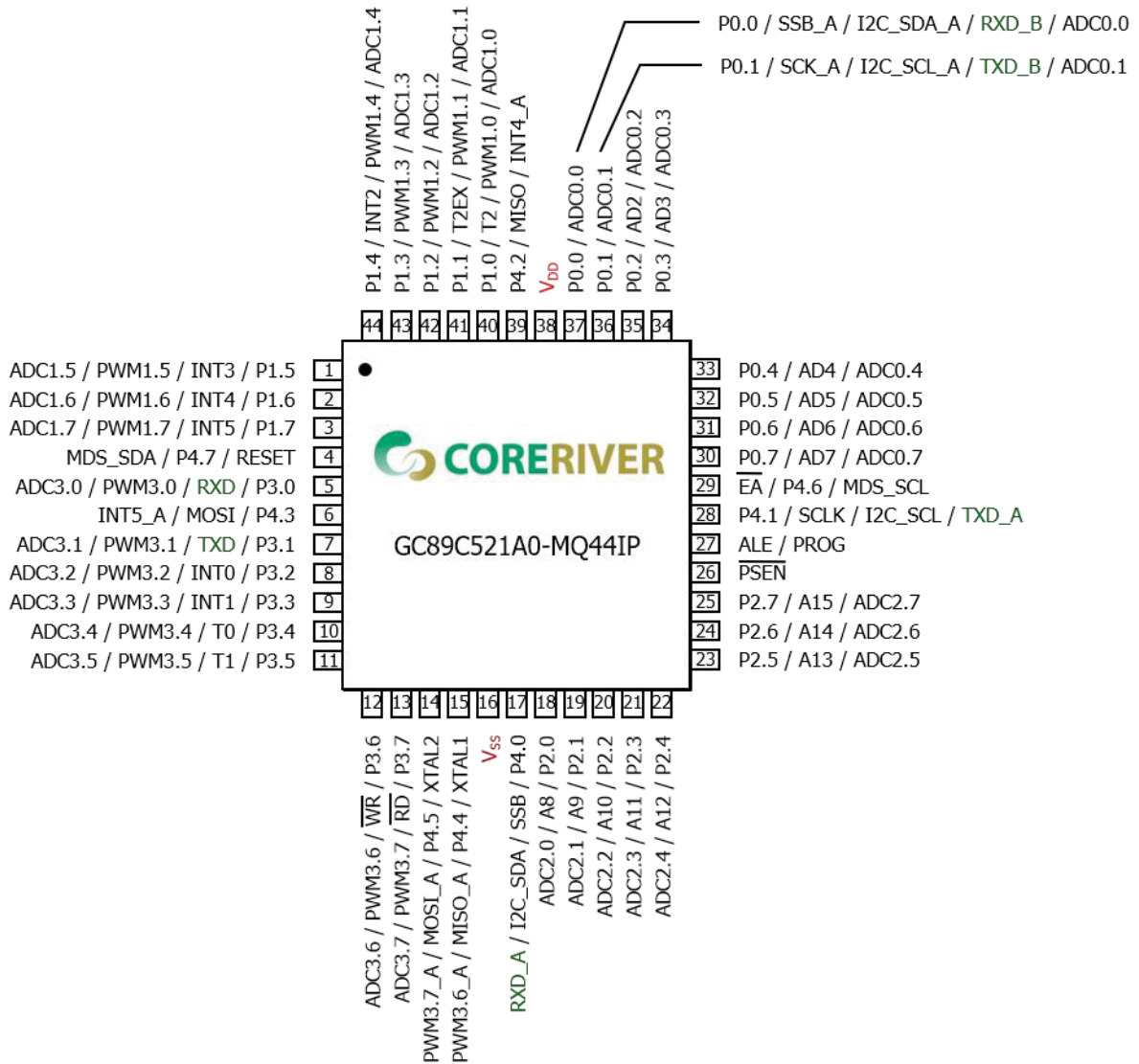
2 Block Diagram

Figure shows the block diagram of **MiDAS1.0B Family**. Programs reside in the internal program memory (Embedded Flash Memory). Data are read from or written to data memory (SRAM) or special function registers (SFRs).

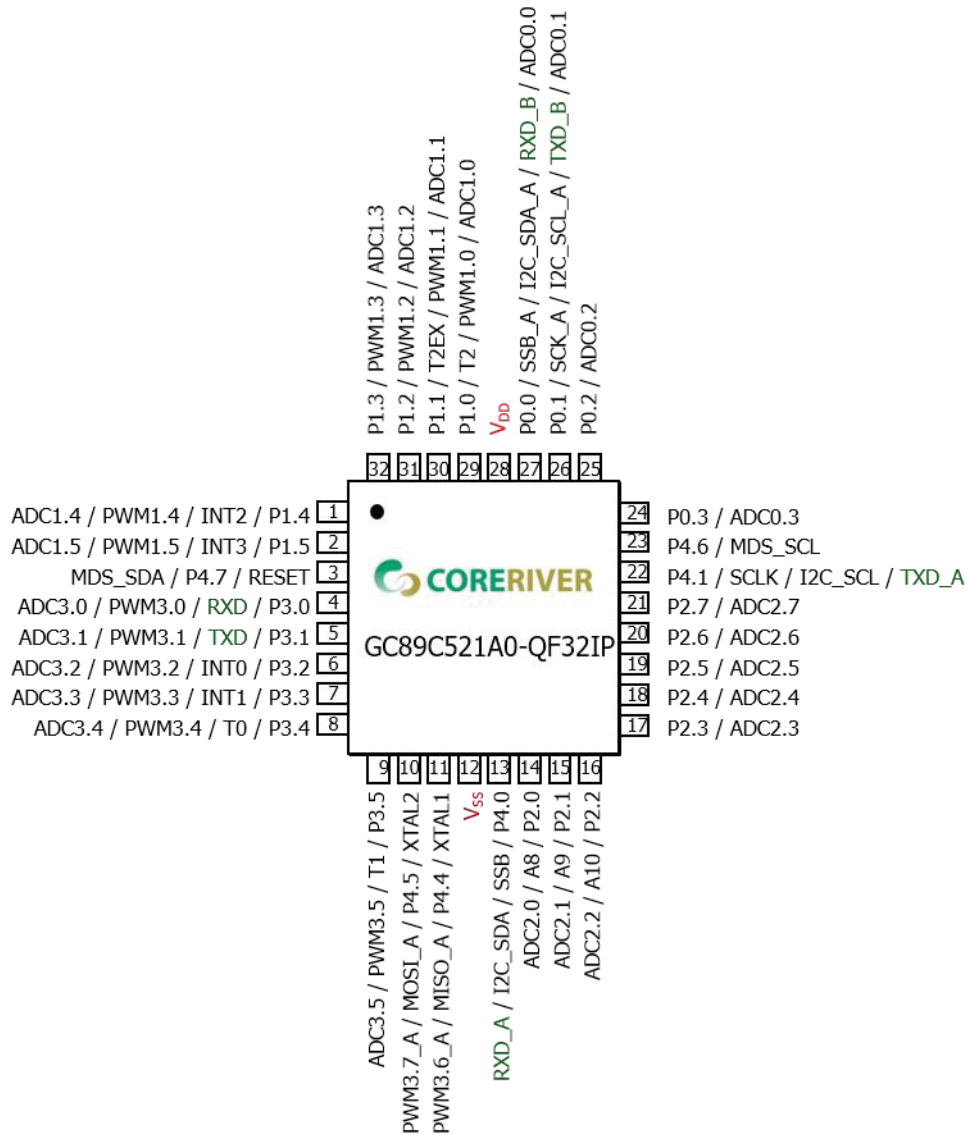
The internal registers of **MiDAS1.0B Family** are configured as part of the on-chip RAM: therefore, each register has an address. This is reasonable for **MiDAS1.0B Family** since it has so many registers.



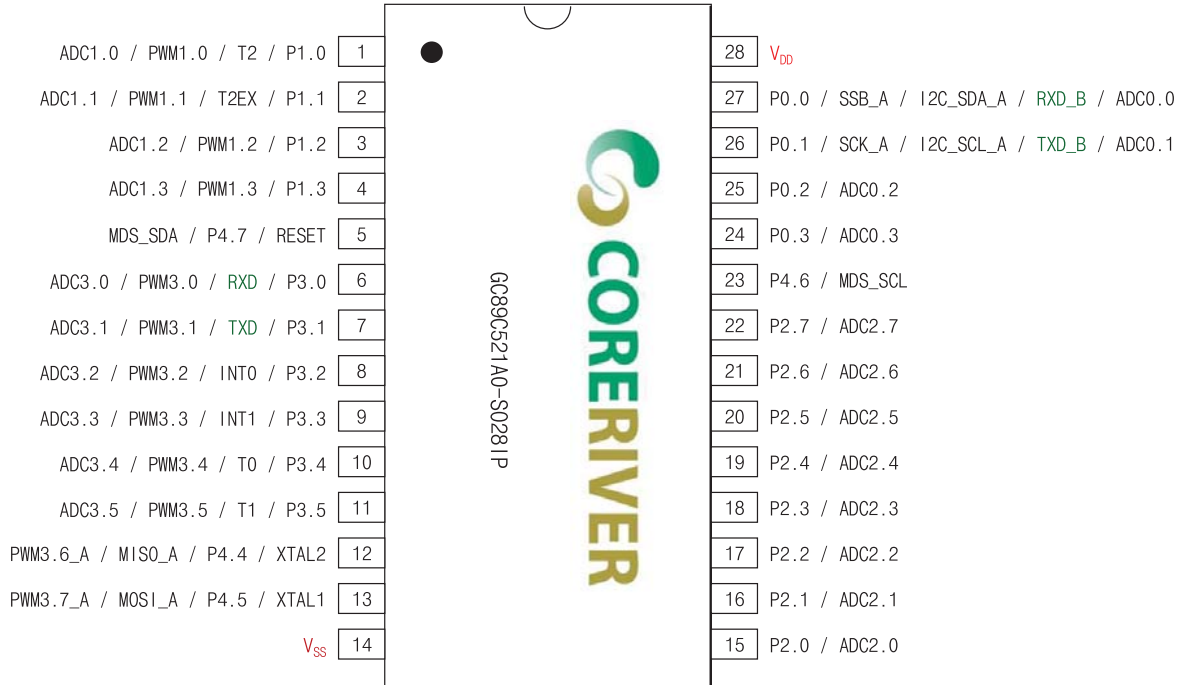
3 Pin Configuration



44-pin Package Diagram



32-pin Package Diagram



28-pin Package Diagram

4 Pin Description

MiDAS1.0B MQ44IP

Pin No.	Name	Type	Description	Share Pins
1	P1.5	I/O	General I/O Port 1.5	ADC1.5 / PWM1.5 / INT3
2	P1.6	I/O	General I/O Port 1.6	ADC1.6 / PWM1.6 / INT4
3	P1.7	I/O	General I/O Port 1.7	ADC1.7 / PWM1.7 / INT5
4	RESET	RESET	External Reset (Active High)	MDS SDA / P4.7
5	P3.0	I/O	General I/O Port 3.0	ADC3.0 / PWM3.0 / RXD
6	P4.3	I/O	General I/O Port 4.3	INT5 A / MOSI
7	P3.1	I/O	General I/O Port 3.1	ADC3.1 / PWM3.1 / TXD
8	P3.2	I/O	General I/O Port 3.2	ADC3.2 / PWM3.2 / INT0
9	P3.3	I/O	General I/O Port 3.3	ADC3.3 / PWM3.3 / INT1
10	P3.4	I/O	General I/O Port 3.4	ADC3.4 / PWM3.4 / T0
11	P3.5	I/O	General I/O Port 3.5	ADC3.5 / PWM3.5 / T1
12	P3.6	I/O	General I/O Port 3.6	ADC3.6 / PWM3.6 / WRB
13	P3.7	I/O	General I/O Port 3.7	ADC3.7 / PWM3.7 / RDB
14	P4.5	I/O	General I/O Port 4.5	PWM3.7 A / MOSI A / XTAL2
15	P4.4	I/O	General I/O Port 4.4	PWM3.6 A / MISO A / XTAL1
16	VSS	GND		
17	P4.0	I/O	General I/O Port 4.0	RXD_A / I2C0_SDA / SSB
18	P2.0	I/O	General I/O Port 2.0	ADC2.0 / A8
19	P2.1	I/O	General I/O Port 2.1	ADC2.1 / A9
20	P2.2	I/O	General I/O Port 2.2	ADC2.2 / A10
21	P2.3	I/O	General I/O Port 2.3	ADC2.3 / A11
22	P2.4	I/O	General I/O Port 2.4	ADC2.4 / A12
23	P2.5	I/O	General I/O Port 2.5	ADC2.5 / A13
24	P2.6	I/O	General I/O Port 2.6	ADC2.6 / A14
25	P2.7	I/O	General I/O Port 2.7	ADC2.7 / A15
26	PSENB	I/O	Program Strobe Enable.	
27	ALE/PROG	I/O	Address Latch Enable	
28	P4.1	I/O	General I/O Port 4.1	SCLK / I2C0_SCL / TXD_A
29	P4.6	I/O	General I/O Port 4.6	MDS_SCL / EAB
30	P0.7	I/O	General I/O Port 0.7	ADC0.7
31	P0.6	I/O	General I/O Port 0.6	ADC0.6
32	P0.5	I/O	General I/O Port 0.5	ADC0.5

33	P0.4	I/O	General I/O Port 0.4	ADC0.4
34	P0.3	I/O	General I/O Port 0.3	ADC0.3 / AD3
35	P0.2	I/O	General I/O Port 0.2	ADC0.2 / AD2
36	P0.1	I/O	General I/O Port 0.1	ADC0.1
37	P0.0	I/O	General I/O Port 0.0	ADC0.0
38	VDD	PWR	Digital I/O Power	
39	P4.2	I/O	General I/O Port 4.2	MISO / INT4 A
40	P1.0	I/O	General I/O Port 1.0	ADC1.0 / PWM1.0 / T2
41	P1.1	I/O	General I/O Port 1.1	ADC1.1 / PWM1.1 / T2EX
42	P1.2	I/O	General I/O Port 1.2	ADC1.2 / PWM1.2
43	P1.3	I/O	General I/O Port 1.3	ADC1.3 / PWM1.3
44	P1.4	I/O	General I/O Port 1.4	ADC1.4 / PWM1.4 / INT2

MiDAS1.0B QF32IP

Pin No.	Name	Type	Description	Share Pins
1	P1.4	I/O	General I/O Port 1.4	ADC1.4 / PWM1.4 / INT2
2	P1.5	I/O	General I/O Port 1.5	ADC1.5 / PWM1.5 / INT3
3	RESET	RESET	External Reset (Active High)	MDS_SDA / P4.7
4	P3.0	I/O	General I/O Port 3.0	ADC3.0 / PWM3.0 / RXD
5	P3.1	I/O	General I/O Port 3.1	ADC3.1 / PWM3.1 / TXD
6	P3.2	I/O	General I/O Port 3.2	ADC3.2 / PWM3.2 / INT0
7	P3.3	I/O	General I/O Port 3.3	ADC3.3 / PWM3.3 / INT1
8	P3.4	I/O	General I/O Port 3.4	ADC3.4 / PWM3.4 / T0
9	P3.5	I/O	General I/O Port 3.5	ADC3.5 / PWM3.5 / T1
10	P4.5	I/O	General I/O Port 4.5	PWM3.7_A / MOSI_A / XTAL2
11	P4.4	I/O	General I/O Port 4.4	PWM3.6_A / MISO_A / XTAL1
12	VSS	GND		
13	P4.0	I/O	General I/O Port 4.0	RXD_A / I2C0_SDA / SSB
14	P2.0	I/O	General I/O Port 2.0	ADC2.0 / A8
15	P2.1	I/O	General I/O Port 2.1	ADC2.1 / A9
16	P2.2	I/O	General I/O Port 2.2	ADC2.2 / A10
17	P2.3	I/O	General I/O Port 2.3	ADC2.3
18	P2.4	I/O	General I/O Port 2.4	ADC2.4
19	P2.5	I/O	General I/O Port 2.5	ADC2.5
20	P2.6	I/O	General I/O Port 2.6	ADC2.6
21	P2.7	I/O	General I/O Port 2.7	ADC2.7
22	P4.1	I/O	General I/O Port 4.1	SCLK / I2C0_SCL / TXD_A
23	P4.6	I/O	General I/O Port 4.6	MDS_SCL
24	P0.3	I/O	General I/O Port 0.3	ADC0.3
25	P0.2	I/O	General I/O Port 0.2	ADC0.2
26	P0.1	I/O	General I/O Port 0.1	ADC0.1 / SCK_A / I2C_SCL_A
27	P0.0	I/O	General I/O Port 0.0	ADC0.0 / SSB_A / I2C_SDA_A
28	VDD	PWR	Digital I/O Power	
29	P1.0	I/O	General I/O Port 1.0	ADC1.0 / PWM1.0 / T2
30	P1.1	I/O	General I/O Port 1.1	ADC1.1 / PWM1.1 / T2EX
31	P1.2	I/O	General I/O Port 1.2	ADC1.2 / PWM1.2
32	P1.3	I/O	General I/O Port 1.3	ADC1.3 / PWM1.3

MiDAS1.0B SO28IP

Pin No.	Name	Type	Description	Share Pins
1	P1.0	I/O	General I/O Port 1.0	ADC1.0 / PWM1.0 / T2
2	P1.1	I/O	General I/O Port 1.1	ADC1.1 / PWM1.1 / T2EX
3	P1.2	I/O	General I/O Port 1.2	ADC1.2 / PWM1.2
4	P1.3	I/O	General I/O Port 1.3	ADC1.3 / PWM1.3
5	RESET	RESET	External Reset (Active High)	MDS SDA / P4.7
6	P3.0	I/O	General I/O Port 3.0	ADC3.0 / PWM3.0 / RXD
7	P3.1	I/O	General I/O Port 3.1	ADC3.1 / PWM3.1 / TXD
8	P3.2	I/O	General I/O Port 3.2	ADC3.2 / PWM3.2 / INT0
9	P3.3	I/O	General I/O Port 3.3	ADC3.3 / PWM3.3 / INT1
10	P3.4	I/O	General I/O Port 3.4	ADC3.4 / PWM3.4 / T0
11	P3.5	I/O	General I/O Port 3.5	ADC3.5 / PWM3.5 / T1
12	P4.5	I/O	General I/O Port 4.5	PWM3.7_A / MOSI_A / XTAL2
13	P4.4	I/O	General I/O Port 4.4	PWM3.6_A / MISO_A / XTAL1
14	VSS	GND		
15	P2.0	I/O	General I/O Port 2.0	ADC2.0 / A8
16	P2.1	I/O	General I/O Port 2.1	ADC2.1 / A9
17	P2.2	I/O	General I/O Port 2.2	ADC2.2 / A10
18	P2.3	I/O	General I/O Port 2.3	ADC2.3
19	P2.4	I/O	General I/O Port 2.4	ADC2.4
20	P2.5	I/O	General I/O Port 2.5	ADC2.5
21	P2.6	I/O	General I/O Port 2.6	ADC2.6
22	P2.7	I/O	General I/O Port 2.7	ADC2.7
23	P4.6	I/O	General I/O Port 4.6	MDS_SCL
24	P0.3	I/O	General I/O Port 0.3	ADC0.3
25	P0.2	I/O	General I/O Port 0.2	ADC0.2
26	P0.1	I/O	General I/O Port 0.1	ADC0.1 / SCK_A / I2C_SCL_A
27	P0.0	I/O	General I/O Port 0.0	ADC0.0 / SSB_A / I2C_SDA_A
28	VDD	PWR	Digital I/O Power	

5 Absolute Maximum Ratings

Item	Conditions	Range
Voltage on any pin relative to Ground	-	-0.5 V to ($V_{DDIO}+0.5V$)
Voltage in V_{DD} relative to Ground	-	-0.5V to 3.6V
Output Voltage	-	-0.5 V to ($V_{DDIO}+0.5V$)
Output Current High	One I/O pin active	-25mA
	All I/O pin active	-100mA
Output Current Low	One I/O pin active	+30mA
	All I/O pin active	+150mA
Storage Temperature	-	< 40°C
Soldering Temperature	-	260°C, 10 seconds within 5°C of actual peak temperature

6 DC Characteristics

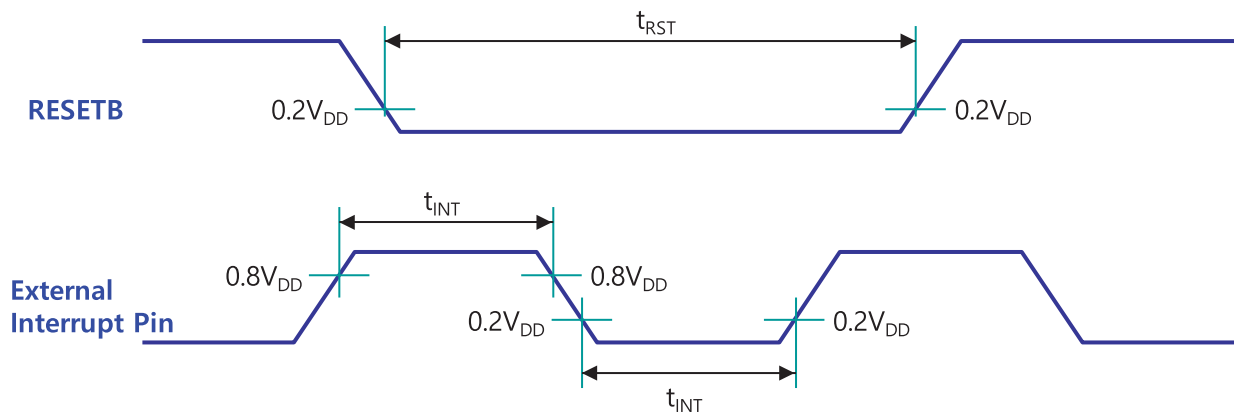
* $T_A = -40^{\circ}\text{C} \sim +85^{\circ}\text{C}$, $V_{DD} = 2.2\text{V} \sim 5.5\text{V}$ unless otherwise specified

Parameter	Symbol	Pin	Conditions	Value			Unit
				Min.	Typ.	Max.	
Input Low Voltage	V_{IL1}	RESETB, P0, P1, P2, P3, P4	$V_{DD} = 2.2\text{V} \sim 5.5\text{V}$	-0.5	-	$0.2V_{DD} - 0.1$	V
	V_{IL2}	XTAL1, XTAL2		0.5	-	$0.3V_{DD}$	
Input high Voltage	V_{IH1}	RESETB, P0, P1, P2, P3, P4	$V_{DD} = 2.2\text{V} \sim 5.5\text{V}$	$0.2V_{DD} + 1.0$	-	$V_{DD} + 0.5$	V
	V_{IH2}	XTAL1, XTAL2		$0.7V_{DD}$	-	$V_{DD} + 0.5$	
Output Low Voltage	V_{OL}	XTAL1, XTAL2, RESET, EA, P0[7:2], P1[7:0], P2[7:0], P3[7:0]	$I_{OL} = 20\text{mA} @ V_{DD} = 5\text{V}$ ($I_{OL} = 3\text{mA} @ V_{DD} = 2.2\text{V}$)	-	-	$0.3V_{DDIO}$	V
	V_{OL1}	P0[1:0], P4[3:0]	$I_{OL} = 4\text{mA} @ V_{DD} = 5\text{V}$	-	-	$0.3V_{DD}$	V
	V_{OLP}	RESET	$I_{OL} = 3.5\mu\text{A} @ V_{DD} = 5\text{V}$	-	-	$0.3V_{DD}$	V
Output High Voltage	V_{OH}	XTAL1, XTAL2, RESET, EA, P0[7:2], P1[7:0], P2[7:0], P3[7:0]	$I_{OH} = -15\text{mA} @ V_{DD} = 5\text{V}$ ($I_{OH} = -2\text{mA} @ V_{DD} = 2.2\text{V}$)	$0.7V_{DD}$	-	-	V
	V_{OH1}	P0[1:0], P4[3:0]	$I_{OL} = -4\text{mA} @ V_{DD} = 5\text{V}$	$0.7V_{DD}$	-	-	V
	V_{OHP}	ALL pin (Pull-up)	$I_{OHP} = -40\mu\text{A} @ V_{DD} = 5\text{V}$ ($I_{OHP} = -15\mu\text{A} @ V_{DD} = 2.2\text{V}$)	$0.7V_{DD}$	-	-	V
Input Leakage Current	I_{IL}	All pins except XTAL1, XTAL2	$V_{IN} = V_{IH}$ or V_{IL}	-	-	± 1	μA
Pin Capacitance	C_{I0}	All pins	$V_{DD} = 5\text{V}$	-	10	-	pF

7 AC Characteristics

* $T_A = -40\text{ }^{\circ}\text{C} \sim +85\text{ }^{\circ}\text{C}$ unless otherwise specified

Parameter	Symbol	Pin	Conditions	Value			Unit
				Min.	Typ.	Max.	
Operating Frequency	F_{SYS}	Internal Oscillator XTAL1, XTAL2	$V_{\text{DD}} = 5\text{V} \pm 10\%$	-	-	24	MHz
			$V_{\text{DD}} = 3\text{V} \pm 10\%$	-	-	12	
RESETB Input Width	t_{RST}	RESETB	$V_{\text{DD}} = 5\text{V} \pm 10\%$	20	-	-	F_{SYS}
			$V_{\text{DD}} = 3\text{V} \pm 10\%$	20	-	-	
External Interrupt Input Width	t_{INT}	External Interrupt	$V_{\text{DD}} = 5\text{V} \pm 10\%$	4	-	-	F_{SYS}
			$V_{\text{DD}} = 3\text{V} \pm 10\%$	4	-	-	

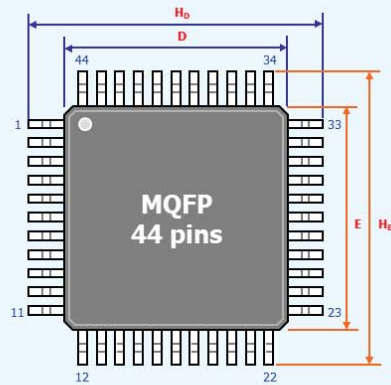


8 ADC Specifications

* $T_A = -40\text{ }^\circ\text{C} \sim +85\text{ }^\circ\text{C}$ unless otherwise specified

Parameter	Symbol	Conditions	Value			Unit	
			Min.	Typ.	Max.		
Supply Voltage	V_{DDADC}	$V_{DDADC} = V_{DD}$	2.2	-	5.5	V	
Input Voltage	V_{INADC}	-	V_{SS}	-	V_{DD}	V	
Resolution	RES_{ADC}	-	-	10	-	bit	
Operating Frequency	F_{ADC}	$V_{DD} = 4.5V \sim 5.5V$ $V_{DD} = 2.4V \sim 3.3V$	-	-	10 5	MHz	
Conversion Time	t_{ADC}	-	-	$96 / F_{ADC}$	-	s	
Overall Accuracy	OA_{ADC}	$V_{DD} = 5V, F_{ADC} = 10MHz$ $V_{DD} = 3V, F_{ADC} = 5MHz$	-	± 2	± 4	LSB	
Integral Nonlinearity	INL_{ADC}	$V_{DD} = 5V, F_{ADC} = 10MHz$ $V_{DD} = 3V, F_{ADC} = 5MHz$	-	± 2	± 4	LSB	
Differential Nonlinearity	DNL_{ADC}	$V_{DD} = 5V, F_{ADC} = 10MHz$ $V_{DD} = 3V, F_{ADC} = 5MHz$	-	± 0.5	± 1	LSB	
Zero Input Error	ZIE_{ADC}	$V_{DD} = 5V, F_{ADC} = 10MHz$ $V_{DD} = 3V, F_{ADC} = 5MHz$	-	± 2	± 4	LSB	
Full Scale Error	FSE_{ADC}	$V_{DD} = 5V, F_{ADC} = 10MHz$ $V_{DD} = 3V, F_{ADC} = 5MHz$	-	± 2	± 4	LSB	
Analog Input Capacitance		C_{INADC}	-	10	15	pF	
ADC Current	Active	I_{ADC}	$V_{DD} = 5V, F_{ADC} = 10MHz$	-	1	2	mA
			$V_{DD} = 3V, F_{ADC} = 5MHz$	-	0.3	0.6	
	Power-down	$V_{DD} = 5V$	-	-	100	nA	

9 44-pin MQFP Package Dimension

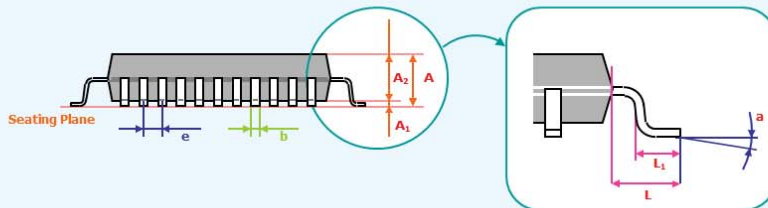


[44-MQFP]

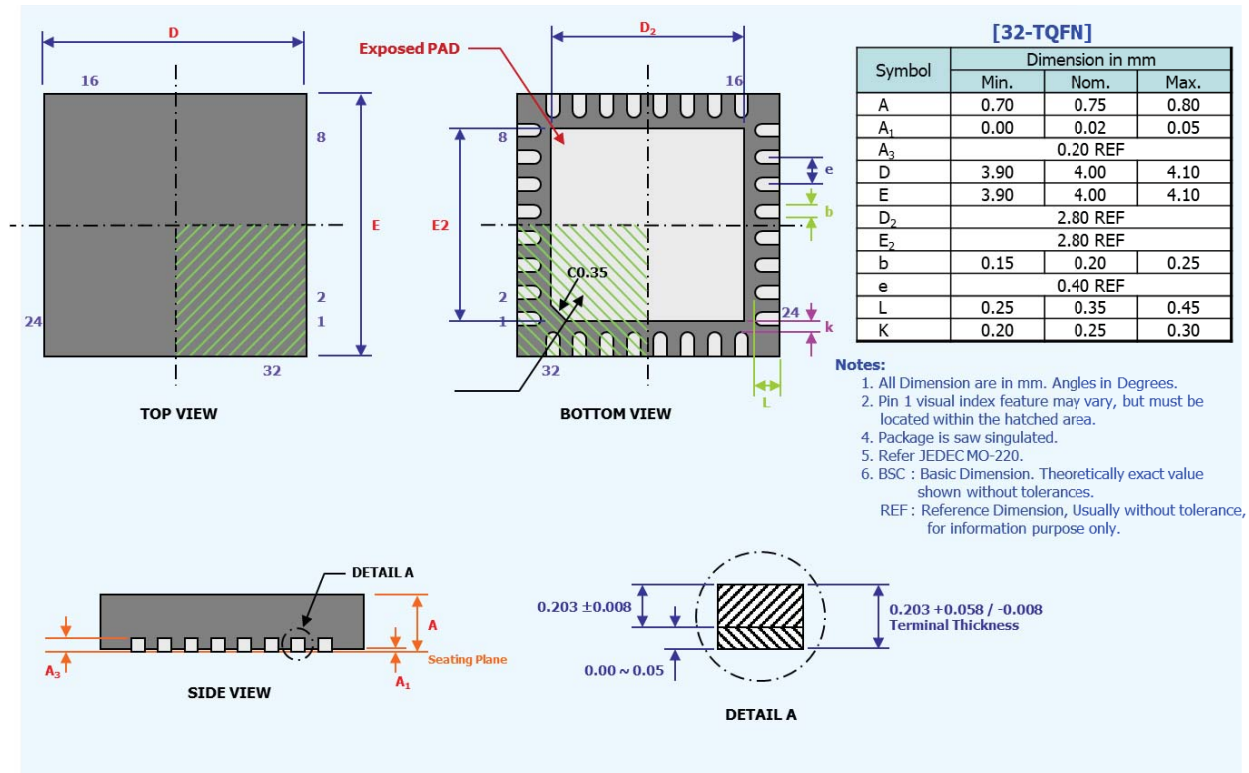
Symbol	Dimension in Inches			Dimension in mm		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	-	-	0.091	-	-	2.30
A ₁	0.002	0.004	0.006	0.05	0.10	0.15
A ₂	0.079	0.083	0.087	2.00	2.10	2.20
b	0.011	-	0.015	0.29	-	0.37
D	0.386	0.394	0.402	9.80	10.00	10.20
E	0.386	0.394	0.402	9.80	10.00	10.20
e	0.031			0.80 BSC		
H _D	0.535	0.543	0.551	13.60	13.80	14.00
H _E	0.535	0.543	0.551	13.60	13.80	14.00
L	-	0.075BSC	-	-	1.90BSC	-
L ₁	0.033	0.039	0.045	0.85	1.00	1.15
a	0°	-	8°	0°	-	8°

Notes:

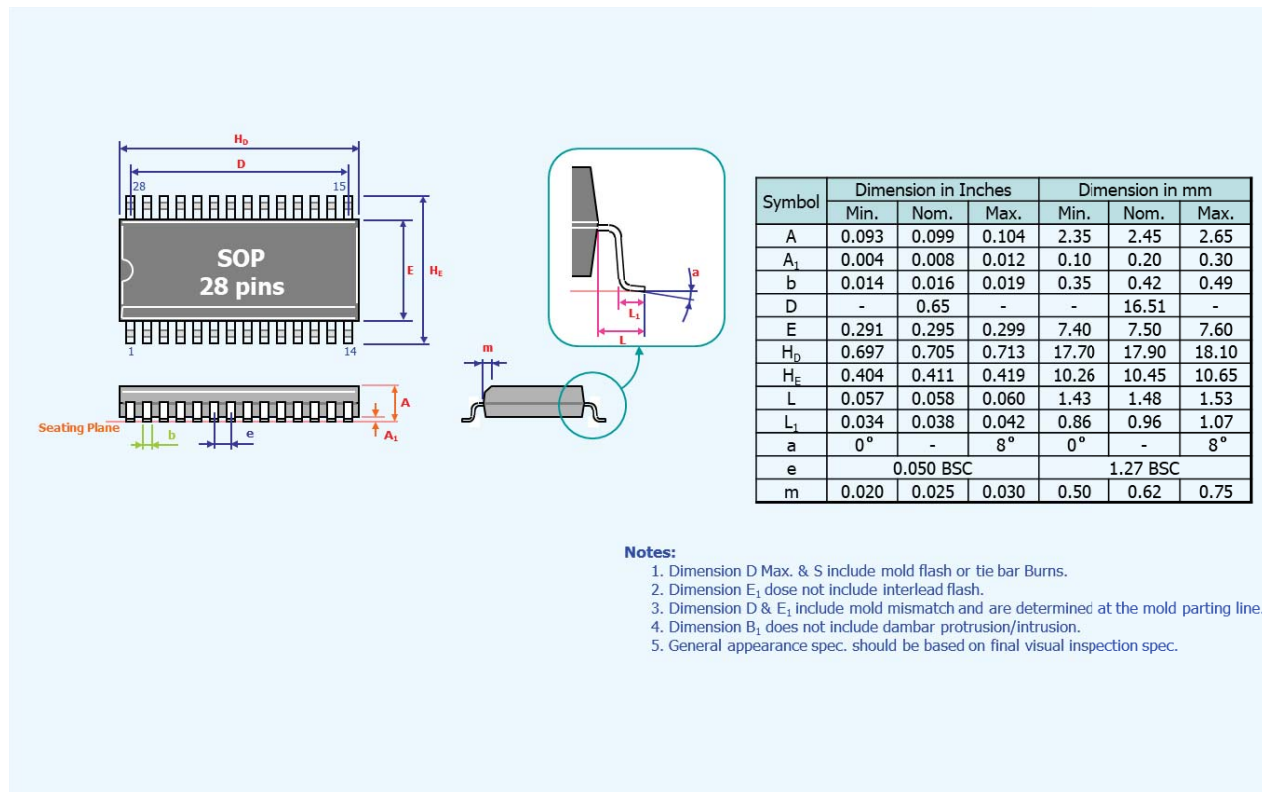
1. Dimension D * E do not include interlead flash.
2. Controlling dimension: Inches
3. General appearance spec. should be based on final visual inspection spec.



10 32-pin QFN Package Dimension

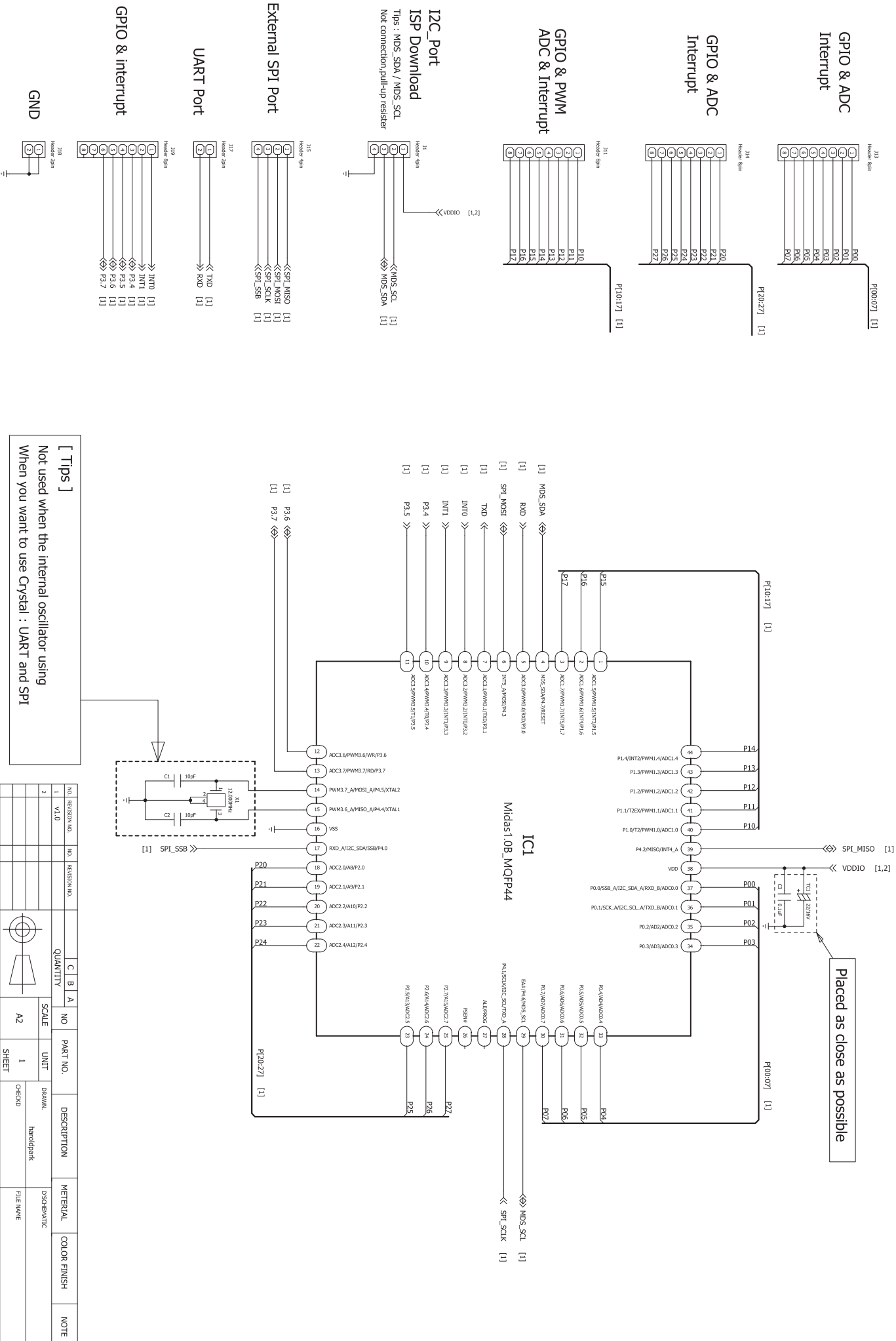


11 28-pin SOP Package Dimension



[Midas1.0B_MQFP44 Reference Schematic]

VDDIO Operating Voltage : +2.2V ~ +5.5V



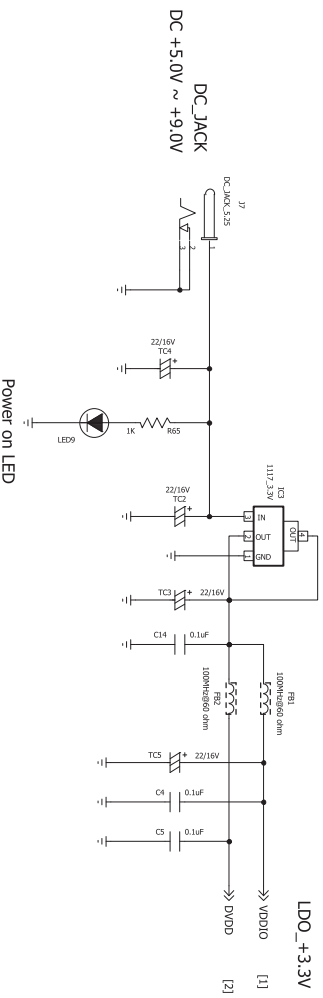
Placed as close as possible

[Tips]
 Not used when the internal oscillator using
 When you want to use Crystal : UART and SPI

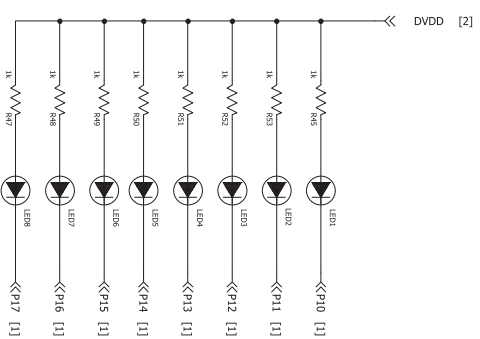
NO.	REVISION NO.	NO.	REVISION NO.	C	B	A	NO.	PART NO.	DESCRIPTION	MATERIAL	COLOR FINISH	NOTE
1	V4.0						1	A2	hoidipark	OSCHENATIC		
2							1		CHECKO	FILE NAME		
									APPROVED	MODEL NAME		
										MIDAS1.0B_MAIN		



External POWER Source



LED Dimming

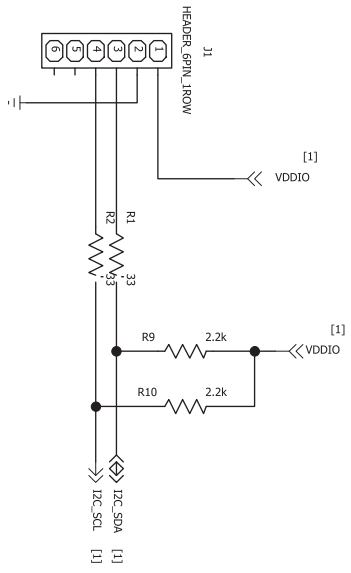


NO.	REVISION NO.	NO.	REVISION NO.	C	B	A	NO	PART NO.	DESCRIPTION	MATERIAL	COLOR FINISH	NOTE
1												
2												

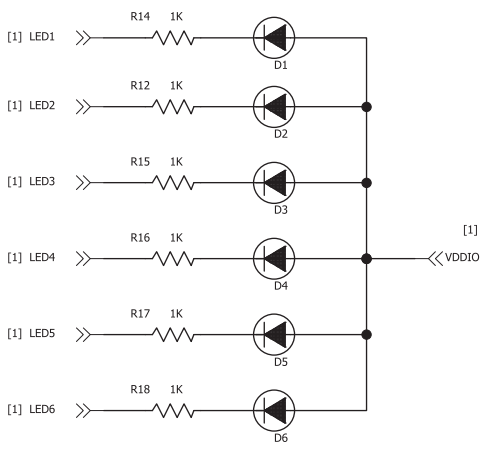
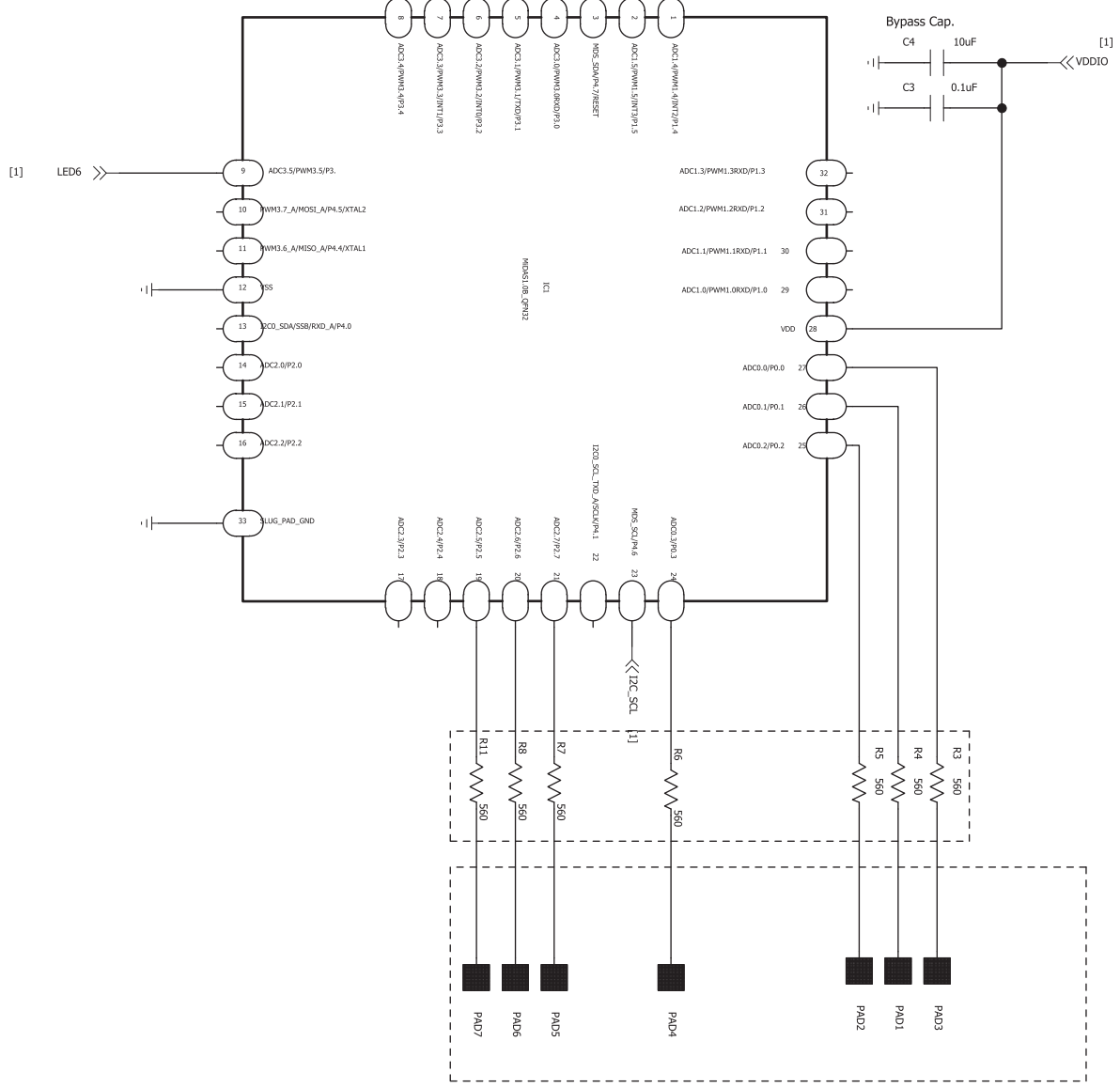
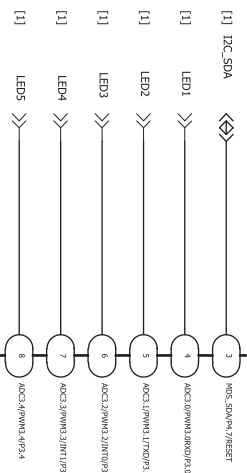
QUANTITY	SCALE	UNIT	DRAWN	CHECKO	FILE NAME	MODEL NAME
	A2	2	haidipark			POWER&LED DIMM

	CORERIVER
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MIDAS1.0B_QFN32
 >> VDDIO (Operating Voltage) : +2.7V to +5.5V



ISP download
 External interface



NO.	REVISION NO.	NO.	REVISION NO.	DESCRIPTION	DATE
1		1			
2		2			
3		3			
4		4			
5		5			

QUANTITY	C	B	A
SCALE	A3		
UNIT	mm		

NO.	REVISION NO.	DESCRIPTION	DATE
1			
2			
3			
4			
5			

NO.	REVISION NO.	DESCRIPTION	DATE
1			
2			
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4			
5			

NO.	REVISION NO.	DESCRIPTION	DATE
1			
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4			
5			

NO.	REVISION NO.	DESCRIPTION	DATE
1			
2			
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5			

NO.	REVISION NO.	DESCRIPTION	DATE
1			
2			
3			
4			
5			

SHEET 1 / 1

DRAWN: 2013-06-09

MIDAS1.0B_QFN32

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