

More than Compatibility

MassDuino

MD-3248P

8-bit Microcontroller with 32K bytes In-System Programmable Flash



www.inhaos.com

Features:

More Fast Timers

- Two 8bit Timer/Counter with independent prescaler
- Two 16bit Timer/Counter with independent prescaler
- Up to 9 channel PWM output

More accuracy analog modules

- 12-channel 12bit Analog to Digital Converter (ADC)
- ADC channel achieves 16bit resolution through oversampling technology
- Internal High precision **1.024V 2.048V 4.096V 1%** voltage reference
- 2x Analog comparator with 2x 8bit DAC for internal reference
- 1-channel 8bit DAC output

More other improvements

- High precision internal **32MHz 1%** RC oscillator
- Low power 32KHz RC oscillator
- Low power POR and 8-level Low voltage detector
- More efficiency active and sleep power control

Digital Peripherals

- SWD Two-wire On Chip Debug & Programming Interface
- Programmable Watch dog timer
- Async/Sync Universal Receiver/Transmitter (USART)
- Master/Slave SPI Interface
- Master/Slave Two-wire Interface (TWI), compatible with I2C

More Robust Working Environment

- 0~16MHz @ 1.8V ~ 5.5V
- 40C ~ +85C
- 4000V HBM ESD
- Lowest power consumption 1uA@3.3V
- MD-3248P: QFP48
- MD-328P: QTP32L

Features:

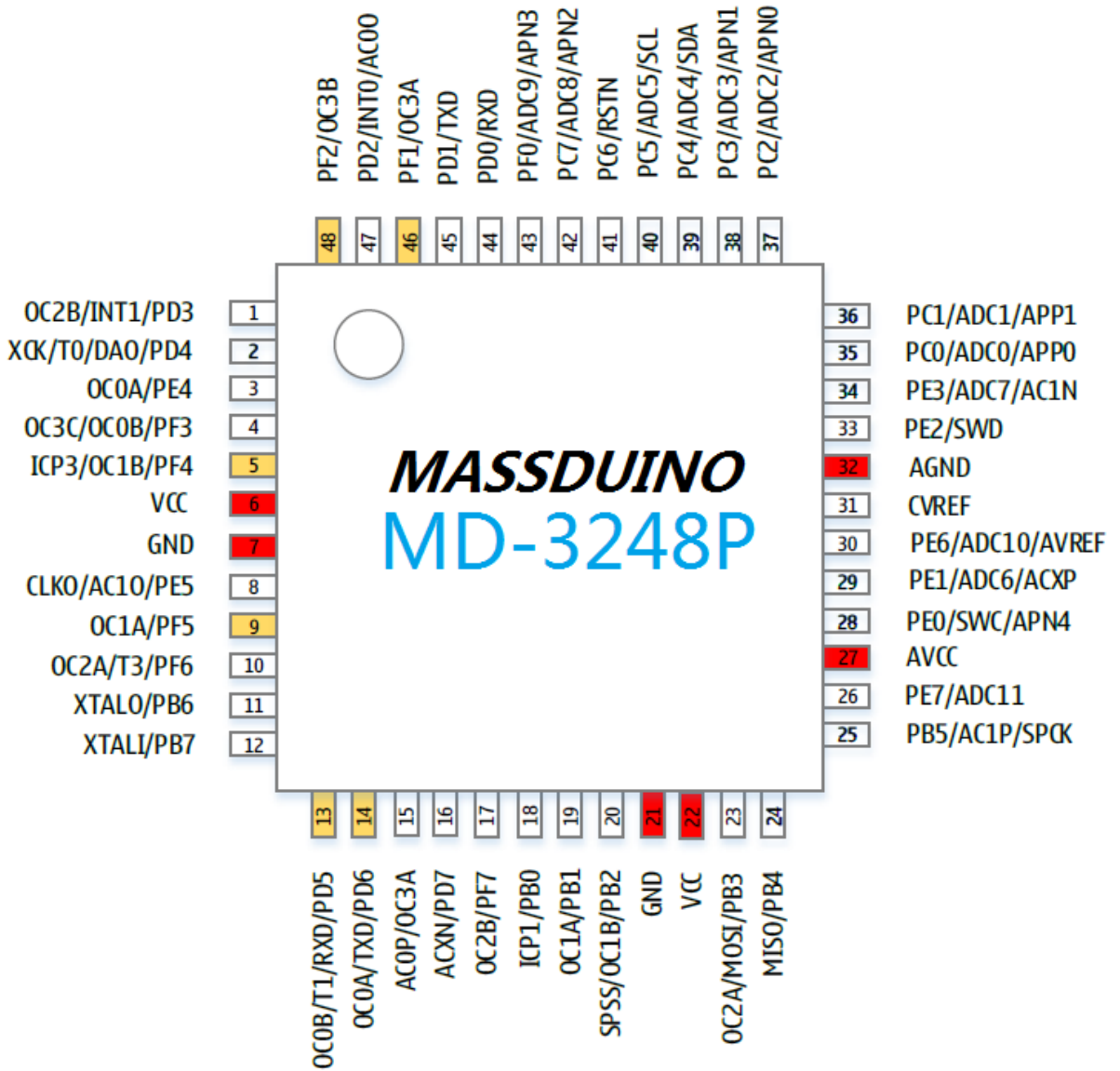
More useful analog modules

- Internal voltage reference for ADC and source of DAC
- 8bit DAC output to one channel of Analog comparator
- Analog comparator support flexible filter backend
- Comparator output can be used to disable PWM output automatically
- AC combined with OPA can be used to implement flexible over-current and over-voltage circuits

More fast timer and PWM

- Internal frequency double generate 64MHz clock for fast timer application
- Up to 500KHz@7bit high resolution PWM
- Dead cycle inserted to protect external MOSFET driver
- PWM can be disabled automatically by analog comparator or other sources
- Up to 6 channel PWM output
- Up to 4 channel support fast PWM and dead cycle insertion

Pin Configurations:



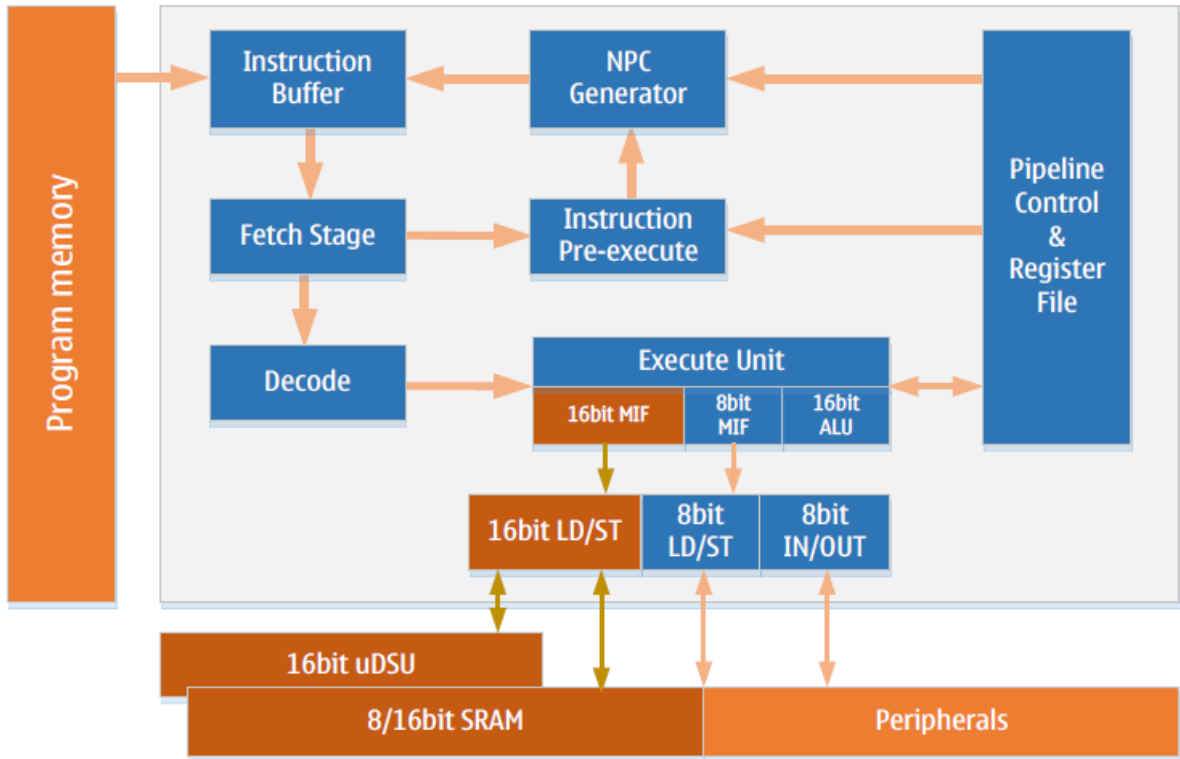
Top View

Pin Description:

Pin No.	IC Pin Function	Arduino Pin Function	Description
1	OC2B/INT1/PD3	D3	
2	XCK/T0/DA0/PD4	DAC0/VUSB_DM/D4	
3	OC0A/PE4	D31	
4	OC3C/OC0B/PF3	D35	
5	ICP3/OC1B/PF4	D36	
6	VCC	VCC	
7	GND	GND	
8	CLK0/AC10/PE5	D32	
9	OC1A/PF5	D37	
10	OC2A/T3/PF6	D38	
11	XTAL0/PB6	XO/D22	
12	XTAL1/PB7	XI/D27	
13	OC0B/T1/RXD/PD5	D5	
14	OC0A/TXD/PD6	D6	
15	AC0P/OC3A		
16	ACXN/PD7	D7	
17	OC2B/PF7	D39	
18	ICP1/PB0	D8	
19	OC1A/PB1	D9	
20	SPSS/OC1B/PB2	CS/D10	
21	GND	GND	
22	VCC	VCC	
23	OC2A/MOSI/PB3	MOSI/D11	
24	MISO/PB4	MISO/D12	
25	AC1P/SPCK/PB5	SCK/D13	
26	ADC11/PE7	A11/D26	
27	AVCC	AVCC	
28	SWC/APN4/PE0	D29	
29	ADC6/ACXP/PE1	A6/D20	
30	ADC10/AVREF/PE6	A10/AREF/D25	
31	CVREF		
32	AGND	AGND	
33	SWD/PE2	D30	
34	ADC7/AC1N/PE3	A7/D21	
35	ADC0/APP0/PC0	A0/D14	
36	ADC1/APP1/PC1	A1/D15	
37	ADC2/APN0/PC2	A2/D16	
38	ADC3/APN1/PC3	A3/D17	
39	ADC4/SDA/PC4	SDA/A4/D18	
40	ADC5/SCL/PC5	SCL/A5/D19	

41	RSTN/PC6	RST/D28	
42	ADC8/APN2/PC7	A8/D23	
43	ADC9/APN3/PF0	A9/D24	
44	RXD/PD0	RXD/D0	
45	TXD/PD1	TXD/D1	
46	OC3A/PF1	D33	
47	INT0/AC00/PD2	VUSB_DP/D2	
48	OC3B/PF2	D34	

Block Diagram:



No.	Module Name	Module Function
1	SWD	Debugging module , implemented In system debugging and In system programmed function
2	MD8XM	8-bit High performance RISC core
3	CMU	Timer manage module , generation all timing for each module in the system
4	PMU	Power consumption manage module
5	POR/LVD	Power Up reset and low voltage detect circuit
6	ADC	8CH 12bit AD converter , it support 10bit / 12bit / 16bit ADC resolution in Arduino System
7	AC	Analog Comparators
8	OPA	Operation Amplifiers
9	Timer	Timer / Counter
10	WDT	Watch dog reset module
11	SPI M/S	SPI Master and Slave Controller
12	I2C M/S	I2C Master and Slave Controller
13	USART	Synchronous / asynchronous serial transceivers
14	AIO	Analog Input Channels
15	PIO	Programmable digital I / O

Electrical Characteristics:

Absolute Maximum Ratings*

No.	Item	Ratings
1	Operating Temperature	-40° C to +85° C
2	Storage Temperature	-55° C to +125° C
3	Voltage on any Pin except RESET with respect to Ground	0 to +VCC
4	Maximum Operating Voltage	5.5V
5	DC Current per I/O Pin	30.0 mA
6	DC Current VCC and GND Pins	200.0 mA
7	ESD Voltage	≥±4KV

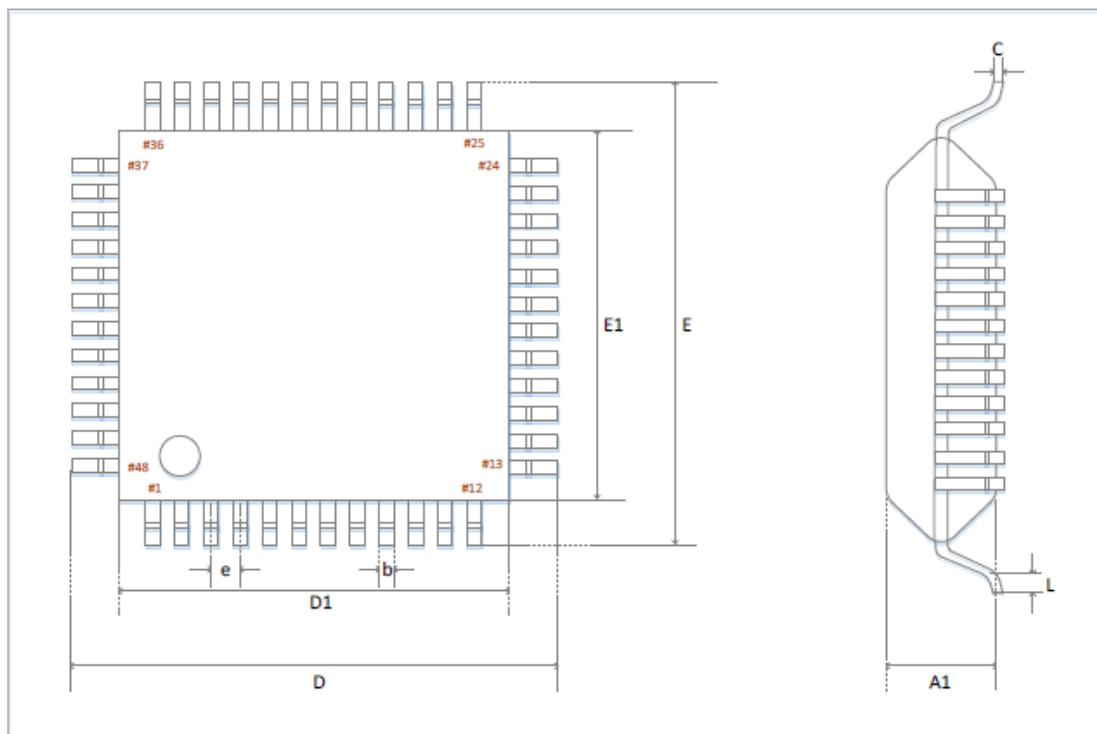
***NOTICE:** Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

DC Characteristics

TA = -40°C to 85°C, VCC = 1.8V to 5.5V (unless otherwise noted)

Symbol	Parameter	Condition	Min	Typ.	Max	Unit
VIL	Input Low Voltage, except XTAL1 and RESET pin			VCC/3		V
VIH	Input High Voltage, except XTAL1 and RESET pins			VCC/2		V
VOL	Output Low Voltage(3) except RESET pin	IOL=40mA, VCC=5V			0.8	V
		IOL=25mA, VCC=3.3V			0.7	
VOH	Output High Voltage except Reset pin	IOH=20mA, VCC=5V	4.4			V
		IOH=12mA, VCC=3.3V	2.6			
IIL	Input Leakage Current I/O Pin				1	uA
IIH	Input Leakage Current I/O Pin				1	uA
RWPU	I/O Pin Weak Pull-up Resistor			80K		Ω
RPU	I/O Pin Pull-up Resistor			15K		Ω
ICC	Active	1MHz @ 3.3V		0.56		mA
		4MHz @ 3.3V		1.25		
	IDLE	4MHz @ 3.3V		0.30		mA
	Power/Off S0	4MHz @ 3.3V		12.0		uA
	Power/Off S1	VCC=3.3V		7.4		uA

Package Information:



LQFP48 通用尺寸定义

字符代号	最小值	典型值	最大值	单位
D	8.80	9.00	9.20	mm
D1	6.80	7.00	7.20	mm
b	0.17	0.22	0.27	mm
e	-	0.50BSC	-	mm
E	8.80	9.00	9.20	mm
E1	6.80	7.00	7.20	mm
C	0.09	-	0.2	mm
L	0.45	0.60	0.75	mm
A1	1.35	1.40	1.45	mm

Order Information:

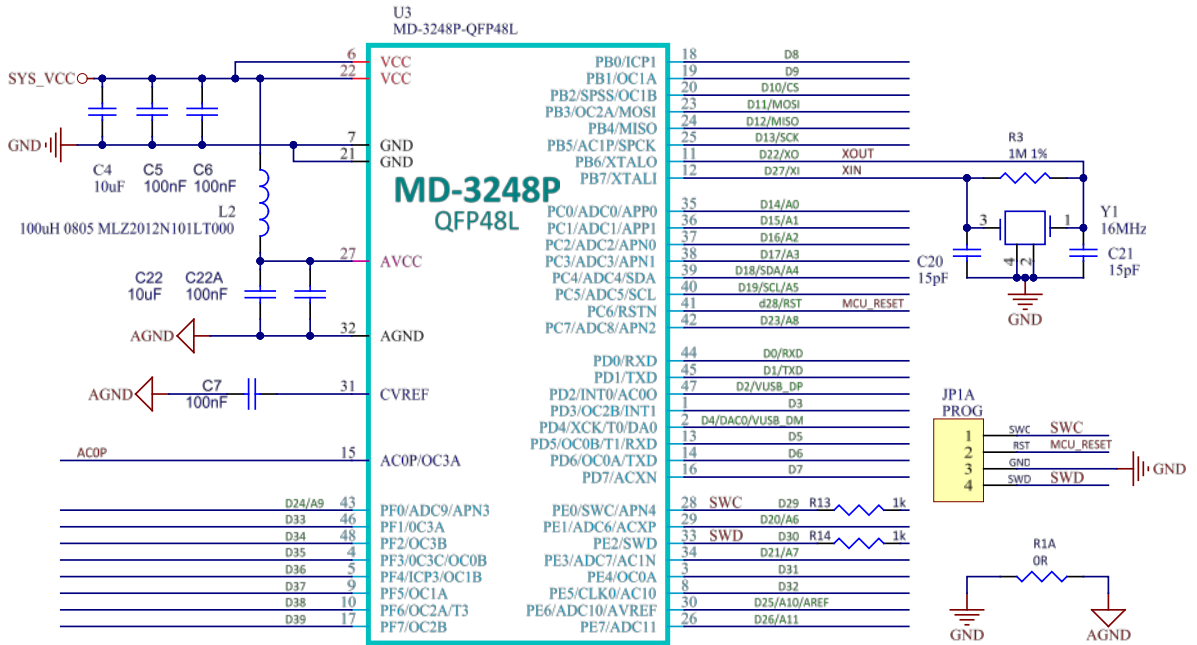
No.	Part Number	Description
1	MD-3248P-STB	MD-3248P Standard Bootloader, support Arduino IDE upload sketch
2	MD-3248P-RS485	MD-3248P RS-485 Bootloader, support both Arduino IDE and RS-485 Bus upgrade code

We have two version of bootloader for MD-3248P. the difference reference below table:



Item	Chip	Arduino IDE Upgrade Support	RS-485 Upgrade Support	Available Flash Size	Available IOs	Development Tools
Standard Bootloader	MD-3248P	V		29 Kbytes	36	Arduino IDE
RS-485 Bootloader	MD-3248P	V	V	26 Kbytes	32	Arduino IDE

Note: the chip will build in bootloader before shipping, we only support Arduino programming.,

Minimal system reference:



Application Product:

No.	Product Name	Picture	Main Feature
1	UNO Pro		<p>DC Input 9 to 24V</p> <p>Onboard 2.048V/4.096V high precision voltage reference</p> <p>4Ch High voltage ADC input</p> <p>4Ch PWM DAC support resolution up to 16bit</p> <p>3 onboard button / 3 onboard LED</p> <p>Compatible to UNO</p> <p>http://www.inhaos.com/product_info.php?products_id=168</p>
2	MD-NANO485		<p>Bus power 12V to 48V</p> <p>Onboard 5V DC/DC output 500mA</p> <p>Onboard 3.3V LDO output 300mA</p> <p>Onboard 5bit Address config</p> <p>MD-3248P-RS485 bootloader pre-programmed</p> <p>System voltage select to 3.3V or 5V</p> <p>http://www.inhaos.com/product_info.php?products_id=184</p>

Notes:

INHAOS China office :

No.6 Building,Songke Estate,Songshan Lake National Hi-tech Industrial
Development Zone,Dongguan,Guangdong Province, 523808,China

E-mail: Support@inhaos.com