INSTRUCTION SET

Arithmetic Operations

			bytes	OSC periods
ADD	A,source	add source to A	1,2	12
ADD	A,#data		2	12
ADDC	A,source	add with carry	1,2	12
ADDC	A,#data		2	12
SUBB	A,source	subtract from A with borrow	1,2	12
SUBB	A,#data		2	12
INC	A	increment	1	12
INC	source		1,2	12
INC	DPTR *		1	24
DEC	A	decrement	1	12
DEC	source		1,2	12
MUL	AB	multiply A by B	1	48
DIV	AB	divide A by B	1	48
DA	A	decimal adjust	1	12

Legend

Rn	register addressing using R0-R7
direct	8bit internal address (00h-FFh)
@Ri	indirect addressing using R0 or R1
source	any of [Rn, direct, @Ri]
dest	any of [Rn, direct, @Ri]
#data	8bit constant included in instruction
#data16	16bit constant included in instruction
bit	8bit direct address of bit
rel	signed 8bit offset
addr11	11bit address in current 2K page
addr16	16bit address

* INC DPTR increments the 24bit value DPP/DPH/DPL

Data Transfer Operations

			bytes	OSC periods
MOV	A,source	move source to destination	1,2	12
MOV	A,#data		2	12
MOV	dest,A		1,2	12
MOV	dest,source		1,2,3	24
MOV	dest,#data		2,3	12,24
MOV	DPTR,#data16		3	24
MOVC	A,@A+DPTR	move from code memory	1	24
MOVC	A,@A+PC		1	24
MOVX	A,@Ri	move to/from data memory	1	24
MOVX	A,@DPTR		1	24
MOVX	@Ri,A		1	24
MOVX	@DPTR,A		1	24
PUSH	direct	push onto stack	2	24
POP	direct	pop from stack	2	24
XCH	A,source	exchange bytes	1,2	12
XCHD	A,@Ri	exchg low digits	1	12

Program Branching

			bytes	OSC periods
ACALL	addr11	call subroutine	2	24
LCALL	addr16		3	24
RET		return from sub.	1	24
RETI		return from int.	1	24
AJMP	addr11	jump	2	24
LJMP	addr16		3	24
SJMP	rel		2	24
JMP	@A+DPTR		1	24
JZ	rel	jump if A = 0	2	24
JNZ	rel	jump if A not 0	2	24
CJNE	A,direct,rel	compare and jump if not equal	3	24
CJNE	A,#data,rel		3	24
CJNE	Rn,#data,rel		3	24
CJNE	@Ri,#data,rel		2	24
DJNZ	Rn,rel	decrement and jump if not zero	2	24
DJNZ	direct, rel		3	24
NOP		no operation	1	12

Logical Operations

			bytes	OSC periods
ANL	A,source	logical AND	1,2	12
ANL	A,#data		2	12
ANL	direct,A		2	12
ANL	direct,#data		3	24
ORL	A,source	logical OR	1,2	12
ORL	A,#data		2	12
ORL	direct,A		2	12
ORL	direct,#data		3	24
XRL	A,source	logical XOR	1,2	12
XRL	A,#data		2	12
XRL	direct,A		2	12
XRL	direct,#data		3	24
CLR	A	clear A to zero	1	12
CPL	A	complement A	1	12
RL	A	rotate A left	1	12
RLC	A	...through C	1	12
RR	A	rotate A right	1	12
RRC	A	...through C	1	12
SWAP	A	swap nibbles	1	12

Boolean Variable Manipulation

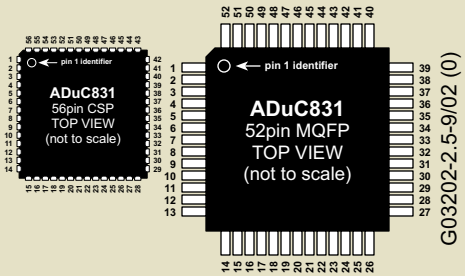
			bytes	OSC periods
CLR	C	clear bit to zero	1	12
CLR	bit		2	12
SETB	C	set bit to one	1	12
SETB	bit		2	12
CPL	C	complement bit	1	12
CPL	bit		2	12
ANL	C,bit	AND bit with C	2	24
ANL	C,/bit	...NOTbit with C	2	24
ORL	C,bit	OR bit with C	2	24
ORL	C,/bit	...NOTbit with C	2	24
MOV	C,bit	move bit to bit	2	12
MOV	bit,C		2	24
JC	rel	jump if C set	2	24
JNC	rel	jmp if C not set	2	24
JB	bit,rel	jump if bit set	3	24
JNB	bit,rel	jmp if bit not set	3	24
JBC	bit, rel	jmp&clear if set	3	24

ASSEMBLER DIRECTIVES

EQU	define symbol
DATA	define internal memory symbol
IDATA	define indirect addressing symbol
XDATA	define external memory symbol
BIT	define internal bit memory symbol
CODE	define program memory symbol
DS	reserve bytes of data memory
DBIT	reserve bits of bit memory
DB	store byte values in program memory
DW	store word values in program memory
ORG	set segment location counter
END	end of assembly source file
CSEG	select program memory space
XSEG	select external data memory space
DSEG	select internal data memory space
ISEG	select indirectly addressed internal data memory space
BSEG	select bit addressable memory space

PIN FUNCTIONS

MQFP	CSP	
1	56	P1.0 / ADC0 / T2
2	1	P1.1 / ADC1 / T2EX
3	2	P1.2 / ADC2
4	3	P1.3 / ADC3
5	4,5	AV_{DD}
6	6,7,8	AGND
7	9	C_{REF}
8	10	V_{REF}
9	11	DAC0
10	12	DAC1
11	13	P1.4 / ADC4
12	14	P1.5 / ADC5 / $\overline{SS}$
13	15	P1.6 / ADC6
14	16	P1.7 / ADC7
15	17	RESET
16	18	P3.0 / RxD
17	19	P3.1 / TxD
18	20	P3.2 / $\overline{INT0}$
19	21	P3.3/$\overline{INT1}$/MISO/PWM1
20	22	DV_{DD}
21	23	DGND
22	24	P3.4/T0/PWMC/PWM0
23	25	P3.5 / T1 / $\overline{CONVST}$
24	26	P3.6 / $\overline{WR}$
25	27	P3.7 / $\overline{RD}$
26	28	SCLOCK
27	29	SDATA / MOSI
28	30	P2.0 / A8 / A16
29	31	P2.1 / A9 / A17
30	32	P2.2 / A10 / A18
31	33	P2.3 / A11 / A19
32	34	XTAL1 (in)
33	35	XTAL2 (out)
34	36	DV_{DD}
35	37,38	DGND
36	39	P2.4 / A12 / A20
37	40	P2.5 / A13 / A21
38	41	P2.6/A14/A22/PWM0
39	42	P2.7/A15/A23/PWM1
40	43	$\overline{EA}$
41	44	$\overline{PSEN}$
42	45	ALE
43	46	P0.0 / AD0
44	47	P0.1 / AD1
45	48	P0.2 / AD2
46	49	P0.3 / AD3
47	50	DGND
48	51	DV_{DD}
49	52	P0.4 / AD4
50	53	P0.5 / AD5
51	54	P0.6 / AD6
52	55	P0.7 / AD7



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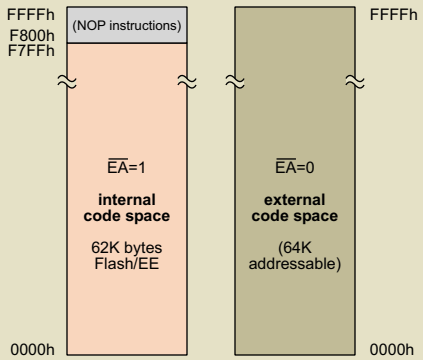
CODE MEMORY SPACE



INTERRUPT VECTOR ADDRESSES

Interrupt Bit	Interrupt Name	Vector Address	Priority within Level
PSMCON.5	Power Supply Monitor Interrupt	43h	1
WDS	WatchDog Timer Interrupt	5Bh	2
IE0	External Interrupt 0	03h	3
ADCI	End of ADC Conversion Interrupt	33h	4
TF0	Timer0 Overflow Interrupt	0Bh	5
IE1	External Interrupt 1	13h	6
TF1	Timer1 Overflow Interrupt	1Bh	7
ISPI/I2CI	SPI/I2C Interrupt	3Bh	8
RI/TI	UART Interrupt	23h	9
TF2/EXF2	Timer2 Interrupt	2Bh	10
TIMECON.2	Time Interval Counter Interrupt	53h	11

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ANALOG DEVICES

ADuC831

MicroConverter® Quick Reference Guide

a "Data Acquisition System on a Chip"

the ADuC831 is:

ADC: 12bit, 5µs, 8channel, self calibrating
0.5LSB INL & 70dB SNR

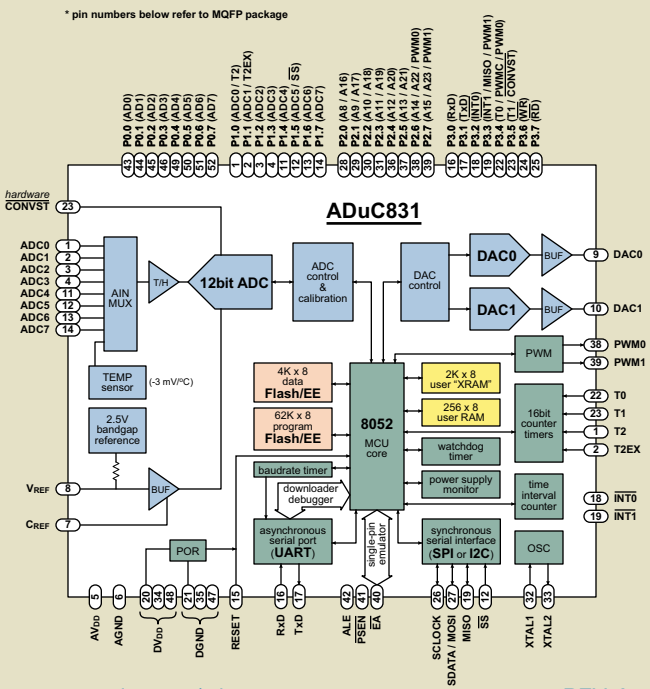
DAC: dual, 12bit, 15µs, voltage output
1LSB DNL

Flash/EEPROM: 62K bytes Flash/EE program memory
4K bytes Flash/EE data memory

microcontroller: industry standard 8052
DC to 16MHz, up to 1.3MIPS, 32 I/O lines

other on-chip features: temperature sensor, power supply monitor, watchdog timer, flexible serial interface ports, voltage reference, time interval counter, dual 8/16bit PWM, power-on-reset

FUNCTIONAL BLOCK DIAGRAM



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REV. 0

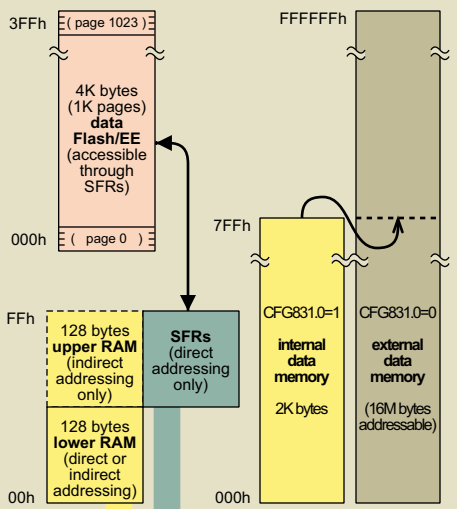
DATA MEMORY: RAM, SFRs, user Flash/EE (all read/write)

LOWER RAM

decimal address	HEX address		MSB address			(bit addresses)			LSB address
127	7Fh	General Purpose Area							
...	...								
48	30h								
47	2Fh	Bit Addressable Area	7Fh	7Eh	7Dh	7Ch	7Bh	7Ah	79h	78h
46	2Eh		77h	76h	75h	74h	73h	72h	71h	70h
45	2Dh		6Fh	6Eh	6Dh	6Ch	6Bh	6Ah	69h	68h
44	2Ch		67h	66h	65h	64h	63h	62h	61h	60h
43	2Bh		5Fh	5Eh	5Dh	5Ch	5Bh	5Ah	59h	58h
42	2Ah		57h	56h	55h	54h	53h	52h	51h	50h
41	29h		4Fh	4Eh	4Dh	4Ch	4Bh	4Ah	49h	48h
40	28h		47h	46h	45h	44h	43h	42h	41h	40h
39	27h		3Fh	3Eh	3Dh	3Ch	3Bh	3Ah	39h	38h
38	26h		37h	36h	35h	34h	33h	32h	31h	30h
37	25h		2Fh	2Eh	2Dh	2Ch	2Bh	2Ah	29h	28h
36	24h		27h	26h	25h	24h	23h	22g	21h	20h
35	23h		1Fh	1Eh	1Dh	1Ch	1Bh	1Ah	19h	18h
34	22h		17h	16h	15h	14h	13h	12h	11g	10h
33	21h		0Fh	0Eh	0Dh	0Ch	0Bh	0Ah	09h	08h
32	20h		07h	06h	05h	04h	03h	02h	01h	00h

31	1Fh	R7	Register Bank 3
30	1Eh	R6	
29	1Dh	R5	
28	1Ch	R4	
27	1Bh	R3	
26	1Ah	R2	
25	19h	R1	
24	18h	R0	
23	17h	R7	Register Bank 2
22	16h	R6	
21	15h	R5	
20	14h	R4	
19	13h	R3	
18	12h	R2	
17	11h	R1	
16	10h	R0	
15	0Fh	R7	Register Bank 1
14	0Eh	R6	
13	0Dh	R5	
12	0Ch	R4	
11	0Bh	R3	
10	0Ah	R2	
9	09h	R1	
8	08h	R0	
7	07h	R7	Register Bank 0
6	06h	R6	
5	05h	R5	
4	04h	R4	
3	03h	R3	
2	02h	R2	
1	01h	R1	
0	00h	R0	

DATA MEMORY SPACE
(read/write area)



lower RAM details

SFR MAP & RESET VALUES

(reserved)	SPIDAT 00h F7h	ADCCON1 00h EFh	(reserved)	PSMCON DEh DFh	(reserved)	(reserved)	EADRH 00h C7h	EDATA4 00h BFh	SPH 00h B7h	CFG831 10h AFh	DPCON 00h A7h	(not used)	(not used)	(reserved)	PCON 00h 87h
(reserved)	(reserved)	(reserved)	(reserved)	(reserved)	(reserved)	(reserved)	EADRL 00h C6h	EDATA3 00h BEh	(not used)	PWMCON 00h AEh	INTVAL 00h A6h	T3CON 00h 9Eh	(not used)	(not used)	(reserved)	
DACCON 04h FDh	ADCCON3 00h F5h	(reserved)	(reserved)	(reserved)	(reserved)	(reserved)	TH2 00h CDh	(reserved)	EDATA2 00h BDh	(not used)	(reserved)	HOUR 00h A5h	T3FD 00h 9Dh	(not used)	TH1 00h 8Dh	(reserved)
DAC1H 00h FCh	ADCGAINH *00h F4h	(reserved)	(reserved)	(reserved)	DMAP 00h D4h	TL2 00h CCh	(reserved)	EDATA1 00h BCh	PWM1H 00h B4h	(reserved)	MIN 00h A4h	T3CON 00h 9Ch	(not used)	(not used)	TH0 00h 8Ch	DPP 00h 84h
DAC1L 00h FBh	ADCGAINL *00h F3h	(reserved)	(reserved)	(reserved)	DMAH 00h D3h	RCAP2H 00h CBh	(reserved)	(reserved)	PWM1L 00h B3h	(reserved)	SEC 00h A3h	I2CADD 55h 9Bh	(not used)	(not used)	TL1 00h 8Bh	DPH 00h 83h
DAC0H 00h FAh	ADCOFSH *20h F2h	(reserved)	(reserved)	ADCDATAH 00h DAh	DMAL 00h D2h	RCAP2L 00h CAh	CHIPID 3Xh C2h	(reserved)	PWM0H 00h B2h	(reserved)	HTHSEC 00h A2h	I2CDAT 00h 9Ah	(not used)	(not used)	TL0 00h 8Ah	DPL 00h 82h
DAC0L 00h F9h	ADCOFSL *00h F1h	(reserved)	(reserved)	ADCDATAL 00h D9h	(reserved)	(reserved)	ECON 00h B9h	PWM0L 00h B1h	IEIP2 A0h A9h	TIMECON 00h A1h	SBUF 00h 99h	(not used)	(not used)	TMOD 00h 89h	SP 07h 81h	
SPICON 04h F8h	B 00h F0h	I2CCON 00h E8h	ACC 00h E0h	ADCCON2 00h D8h	PSW 00h D0h	T2CON 00h C8h	WDCON 10h C0h	IP 00h B8h	P3 FFh B0h	IE 00h A8h	P2 FFh A0h	SCON 00h 98h	P1 FFh 90h	TCON 00h 88h	P0 FFh 80h	

SPR0 0 F8h	0 F0h	I2CI 0 E8h	0 E0h	CS0 0 D8h	P 0 D0h	CAP2 0 C8h	WDWR 0 C0h	PX0 0 B8h	RXD 1 B0h	EX0 0 A8h	1 A0h	RI 0 98h	T2 1 90h	IT0 0 88h	1 80h	
SPR1 0 F9h	0 F1h	I2CTX 0 E9h	F1 0 D1h	CS1 0 D9h	CNT2 0 C9h	WDE 0 C1h	PT0 0 B9h	TXD 1 B1h	ET0 0 A9h	1 A1h	RB8 0 99h	T2EX 1 91h	IE0 0 89h	1 81h		
CPHA 1 FAh	0 F2h	I2CRS 0 EAh	CS2 0 DAh	TR2 0 CAh	WDS 0 C2h	PX1 0 BAh	INT0 1 B2h	ET1 0 AAh	1 A2h	RB8 0 9Ah	IT1 0 8Ah	1 82h				
CPOL 0 FBh	0 F3h	I2CM 0 EBh	OV 0 D2h	EXEN2 0 CBh	WDIR 0 C3h	PT1 0 BBh	INT1 1 B3h	ET2 0 ABh	1 A3h	TB8 0 9Bh	IE1 0 8Bh	1 83h				
SPIM 0 FCh	0 F4h	MDI 0 ECh	RS0 0 D3h	TCLK 0 CCh	PRE0 1 C4h	PS 0 BCh	T0 1 B4h	ES 0 ACh	1 A4h	REN 0 9Ch	TR0 0 8Ch	1 84h				
SPE 0 FDh	0 F5h	MCO 0 EDh	RS1 0 D4h	RCLK 0 CDh	PRE1 0 C5h	PT2 0 BDh	T1 1 B5h	ET2 0 ADh	1 A5h	SM2 0 9Dh	TF0 0 8Dh	1 85h				
WCOL 0 FEh	0 F6h	MDE 0 EEh	AC 0 D6h	DMA 0 DEh	CCONV 0 DDh	F0 0 D5h	RCLK 0 CDh	EXF2 0 CEh	PRE2 0 C6h	PADC 0 BEh	WR 1 B6h	EADC 0 AEh	1 A6h	SM1 0 9Eh	TR1 0 8Eh	1 86h
ISPI 0 FFh	0 F7h	MDO 0 EFh	CY 0 D7h	ADCI 0 DFh	AC 0 D6h	TF2 0 CFh	PRE3 0 C7h	PSI 0 BFh	RD 1 B7h	EA 0 AFh	1 A7h	SM0 0 9Fh	97h	TF1 0 8Fh	1 87h	

SFR DESCRIPTIONS

ADCCON1 ADC Control register #1
- ADCCON1.7 ADC mode (0=off, 1=on)
- ADCCON1.6 external Vref select bit (0=on-chip Vref)
- ADCCON1.5 conversion time = 16 / ADCclk
- ADCCON1.4 ADCclk = 16,777,216Hz / [16,2,4,8]
- ADCCON1.3 acquisition time select bits
- ADCCON1.2 acq time = [1,2,3,4] / ADCclk
- ADCCON1.1 Timer2 convert enable
- ADCCON1.0 external CONVST enable

ADCCON2 ADC Control register #2
- ADCI ADC interrupt flag
- DMA DMA mode enable
- CCONV continuous conversion enable bit
- SCONV single conversion start bit
- CS3 input channel select bits:
- CS2 0 - 7 = ADC0 - ADC7
- CS1 8 = temperature sensor
- CS0 9=DAC0, A=DAC1, B=AGND

ADCCON3 ADC Control register #3
- ADCCON3.7 busy indicator flag (0=ADC not active)
- ADCCON3.6 gain calibration disable (0=gain cal enabled)
- ADCCON3.5 number of averages selection bits:
- ADCCON3.4 [15,1,31,63]
- ADCCON3.3 cal clock divide select (0=ADCclk, 1=ADCclk/2)
- ADCCON3.2 cal mode select (0=device, 1=system)
- ADCCON3.1 cal type select (0=offset, 1=gain)
- ADCCON3.0 start calibration bit, cleared by hardware

ADCDATAH **ADCDATAL** ADC Data registers

DMAP,DMAH,DMAL DMA address pointer

ADCGAINH **ADCGAINL** ADC Gain calibration coefficients

ADCOFSH **ADCOFSL** ADC Offset calibration coefficients

DACCON DAC Control register
- DACCON.7 ModeSelect (0=12bit, 1=8bit)
- DACCON.6 DAC1 RangeSelect (0=V_{REF}, 1=V_{DD})
- DACCON.5 DAC0 RangeSelect (0=V_{REF}, 1=V_{DD})
- DACCON.4 Clear DAC1 (0=0V, 1=normal operation)
- DACCON.3 Clear DAC0 (0=0V, 1=normal operation)
- DACCON.2 SynchronousUpdate (1=asynchronous)
- DACCON.1 PowerDown DAC1 (0=off, 1=on)
- DACCON.0 PowerDown DAC0 (0=off, 1=on)

DAC1H,DAC1L DAC1 data registers

DAC0H,DAC0L DAC0 data registers

TIMECON Time Interval Counter Control Register
- TIMECON.7 (this bit must contain 1)
- TIMECON.5 INTVAL timebase select bits
- TIMECON.4 [128th sec, seconds, minutes, hours]
- TIMECON.3 single time interval control bit (0=reload&restart)
- TIMECON.2 time interval interrupt bit, "TII"
- TIMECON.1 time interval enable bit (0=disable&clear)
- TIMECON.0 time clock enable bit (0=disable)

INTVAL TIC Interval Register

HTHSEC TIC Elapsed 128th Second Register

SEC TIC Elapsed Seconds Register

MIN TIC Elapsed Minutes Register

HOUR TIC Elapsed Hours Register

ECON Data Flash/EE comand register

01h	READ page	82h	PROGRAM byte
02h	PROGRAM page	0Fh	EXIT ULOAD mode
04h	VERIFY page	F0h	ENTER ULOAD mode
05h	ERASE page	(all others reserved)	
06h	ERASE ALL		

EADRH,EADRL Data Flash/EE address registers

EDATA1,EDATA2,EDATA3,EDATA4 Data Flash/EE data registers

SPICON SPI Control register
- ISPI SPI interrupt (set at end of SPI transfer)
- WCOL write collision error flag
- SPE SPI enable (0=I2C enable, 1=SPI enable)
- SPIM master mode select (0=slave)
- CPOL clock polarity select (0=SCLK idles low)
- CPHA clock phase select (0=leading edge latch)
- SPR1 SPI bitrate select bits
- SPR0 bitrate = Fcore / [2,4,8,16] (slave: SPR0=SS)

SPIDAT SPI Data register

I2CCON I2C Control register
- MDO master mode SDATA output bit
- MDE master mode SDATA output enable (0=disable)
- MCO master mode SCLK output bit
- MDI master mode SDATA input bit
- I2CM master mode select bit (0=slave mode)
- I2CRS serial port reset
- I2CTX transmission direction status (0=RX,1=TX)
- I2CI serial interface interrupt

I2CADD I2C Address register

I2CDAT I2C Data register

PWMCON PWM Control register
- PWMCON.6 PWM mode bits [0=disabled, 1=single/var.res., 2=twin/8bit, 3=twin/16bit, 4=dual/16bitNRZ, 5=dual/8bit, 6=dual/16bitRZ, 7=(reserved)]
- PWMCON.4
- PWMCON.3 PWM clock divide bits
- PWMCON.2 PWM counter = clock / [1,4,16,64]
- PWMCON.1 PWM clock source bits [1=F_{CVR}/15, 2=F_{DIV}, 3=T0 ext.int.rate, 4=F_{CORE}]
- PWMCON.0

PWM0H,PWM0L PWM0 data registers

PWM1H,PWM1L PWM1 data registers

DPCON Data Pointer Control register
- DPCON.6 data pointer auto-toggle enable (0=disable)
- DPCON.5 shadow data pointer mode control bits
- DPCON.4 [1=8052, 2=post-inc, 3=post-dec, 4=LSBtgl]
- DPCON.3 main data pointer mode control bits
- DPCON.2 [1=8052, 2=post-inc, 3=post-dec, 4=LSBtgl]
- DPCON.1 (not implemented to allow INC DPCON toggling)
- DPCON.0 data pointer select [0=main, 1=shadow]

T3CON Timer 3 Control register
- T3CON.7 Timer 3 baud rate enable (0=disable)
- T3CON.2 binary divide factor (DIV)
- T3CON.1 DIV = log[F_{CORE}/(32·baudrate)] / log2
- T3CON.0 (rounded down)

T3FD Timer 3 Fractional Divider register

T3FD = (2·F_{CORE}) / (baudrate·2^{DIV}) - 64

CHIPID Chip ID Register (3X hex = ADuC831)

ACC Accumulator

B auxiliary math register

CFG831 ADuC831 Configuration Register
- CFG831.7 extended stack-pointer enable (0=disable)
- CFG831.6 PWM pins select (0=P2.6/P2.7,1=P3.4/P3.3)
- CFG831.5 DAC output buffer bypass (0=buffer enabled)
- CFG831.4 Flash/EE & PWM clock source divide factor
- CFG831.3 FDIV = FCORE/[32,64,128,256,512,1024,x,x]
- CFG831.2 (set so that FDIV = 32KHz ± 50%)
- CFG831.1 (this bit must contain zero)
- CFG831.0 internal XRAM select (0=external XRAM)

WDCON Watchdog Timer control register
- PRE3 watchdog timeout selection bits
- PRE2 0-7=[15.6,31.2,62.5,125,250,500,1000,2000]ms
- PRE1 8=0ms (immediate reset)
- PRE0 >8=reserved
- WDIR watchdog interrupt response bit
- WDS watchdog status flag (1 indicates watchdog timeout)
- WDE watchdog enable control (0=disabled)
- WDWR watchdog write enable bit (set to enable write)

PSMCON Power Supply Monitor control register
- PSMCON.6 PSM status bit (1=normal / 0=fault)
- PSMCON.5 PSM interrupt bit
- PSMCON.4 trip point select bits
- PSMCON.3 [4.37V, 3.08V, 2.93V, 2.63V]
- PSMCON.2 (this bit must contain zero)
- PSMCON.1 (reserved)
- PSMCON.0 PSM powerdown control (1=on / 0=off)

SP Stack Pointer

SPH Stack Pointer High byte

IE Interrupt Enable register #1
- EA enable interrupts (0=all interrupts disabled)
- EADC enable ADCI (ADC interrupt)
- ET2 enable TF2/EXF2 (Timer2 overflow interrupt)
- ES enable RI/TI (serial port interrupt)
- ET1 enable TF1 (Timer1 overflow interrupt)
- EX1 enable IE1 (external interrupt 1)
- ET0 enable TF0 (Timer0 overflow interrupt)
- EX0 enable IE0 (external interrupt 0)

IEIP2 Interrupt Enable/Priority register #2
- IEIP2.6 priority of TII interrupt (time interval)
- IEIP2.5 priority of PSMI interrupt (power supply monitor)
- IEIP2.4 priority of ISPI interrupt (serial interface)
- IEIP2.3 (this bit must contain zero)
- IEIP2.2 enable TII interrupt (time interval)
- IEIP2.1 enable PSMI (power supply monitor interrupt)
- IEIP2.0 enable ISPI interrupt (serial interface)

IP Interrupt Priority register
- PSI priority of ISPI/I2CI (serial interface interrupt)
- PADC priority of ADCI (ADC interrupt)
- PT2 priority of TF2/EXF2 (Timer2 overflow interrupt)
- PS priority of RI/TI (serial port interrupt)
- PT1 priority of TF1 (Timer1 overflow interrupt)
- PX1 priority of IE1 (external interrupt 1)
- PT0 priority of TF0 (Timer0 overflow interrupt)
- PX0 priority of IE0 (external interrupt 0)

TMOD Timer Mode register
- TMOD.3/.7 gate control bit (0=ignore INTx)
- TMOD.2/.6 counter/timer select bit (0=timer)
- TMOD.1/.5 timer mode selection bits
- TMOD.0/.4 [13bitT, 16bitT/C, 8bitT/Creload, 2x8bitT]
- (upper nibble = Timer1, lower nibble = Timer0)

TCON Timer Control register
- TF1 Timer1 overflow flag (auto cleared on vector to ISR)
- TR1 Timer1 run control (0=off, 1=run)
- TF0 Timer0 overflow flag (auto cleared on vector to ISR)
- TR0 Timer0 run control (0=off, 1=run)
- IE1 external INT1 flag (auto cleared on vector to ISR)
- IT1 IE1 type (0=level trig, 1=edge trig)
- IE0 external INT0 flag (auto cleared on vector to ISR)
- IT0 IE0 type (0=level trig, 1=edge trig)

TH0,TL0 Timer0 registers

TH1,TL1 Timer1 registers

T2CON Timer2 Control register
- TF2 overflow flag
- EXF2 external flag
- RCLK receive clock enable (0=Timer1 used for RxD clk)
- TCLK transmit clock enable (0=Timer1 used for TxD clk)
- EXEN2 external enable (0=ignore T2EX, 1=cap/rld for T2EX)
- TR2 run control (0=stop, 1=run)
- CNT2 timer/counter select (0=timer, 1=counter)
- CAP2 capture/reload select (0=reload, 1=capture)

TH2,TL2 Timer2 register

RCAP2H,RCAP2L Timer2 Reload/Capture

P0 Port0 register (also A0-A7 & D0-D7)

P1 Port1 register (analog & digital inputs)
- T2EX timer/counter 2 capture/reload trigger
- T2 timer/counter 2 external input

P2 Port2 register (also A8-A15 & A16-A23)

P3 Port3 register
- RD external data memory read strobe
- WR external data memory write strobe
- T1 timer/counter 1 external input
- T0 timer/counter 0 external input
- INT1 external interrupt 1
- INT0 external interrupt 0
- TxD serial port transmit data line
- RxD serial port receive data line

SCON Serial communications Control register
- SM0 UART mode control bits baud rate:
- SM1 00 - 8bit shift register - Fosc/12
- 01 - 8bit UART - variable
- 10 - 9bit UART - Fosc/64(x2)
- 11 - 9bit UART - variable
- SM2 in modes 2&3, enables multiprocessor communication
- REN receive enable control bit
- TB8 in modes 2&3, 9th bit transmitted
- RB8 in modes 2&3, 9th bit received
- TI transmit interrupt flag
- RI receive interrupt flag

SBUF Serial port Buffer register

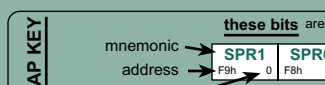
PCON Power Control register
- PCON.7 double baud rate control
- PCON.4 ALE disable (0=normal, 1=forces ALE high)
- PCON.3 general purpose flag
- PCON.2 general purpose flag
- PCON.1 power-down control bit (recoverable with hard reset)
- PCON.0 idle-mode control (recoverable with enabled interrupt)

PSW Program Status Word
- CY carry flag
- AC auxiliary carry flag
- F0 general purpose flag 0
- RS1 register bank select control bits
- RS0 active register bank = [0,1,2,3]
- OV overflow flag
- F1 general purpose flag 1
- P parity of ACC

DPP Data Pointer Page

DPH,DPL (DPTR) Data Pointer

MAP KEY: these bits are contained in this byte



SFR details

* calibration coefficients are preconfigured at power-up to factory calibrated values