



義隆電子股份有限公司

ELAN MICROELECTRONICS CORP.

EM78870

8-BIT MICRO-CONTROLLER

Version 1.4

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User Application Note

1. ROM, OTP, ICE

ROM	OTP	ICE
EM78870	EM78P870	EM78808 ICE

2. Main Function Difference

	EM78870	EM78P870
RAM	2.5K x 8	8K x 8



I. General Description

The EM78870 is an 8-bit RISC type microprocessor with low power, high speed CMOS technology. Integrated onto a single chip are on_chip watchdog (WDT), RAM, ROM, programmable real time clock /counter, internal interrupt, power down mode, LCD driver, build-in KEY TONE clock generation, Programming Tone generators, Serial Peripheral Interface(SPI), comparator and tri-state I/O. The EM78870 provides a single chip solution to design a message_display.

II. Feature

CPU

- Operating voltage range : 2.2V~5.5V(Normal mode), 2.0V~5.5V(Green mode)
- 32Kx 13 on chip Program ROM
- 2.5Kx 8 on chip data RAM
- 144 byte working register
- Up to 51 bi-directional tri-state I/O ports (32 shared with LCD Segment pins)
- IO with internal Pull high, wake-up and interrupt functions
- STACK: 32 level stack for subroutine nesting
- TCC: 8-bit real time clock/counter (TCC) with 8-bit prescaler
- COUNTER1: 8-bit counter with 8-bit prescaler can be an interrupt source
- COUNTER2: 8-bit counter with 8-bit prescaler can be an interrupt source
- Watch Dog : Programmable free running on chip watchdog timer
- CPU modes:

Mode	CPU status	Main clock	32.768kHz clock status
Sleep mode	Turn off	Turn off	Turn off
Idle mode	Turn off	Turn off	Turn on
Green mode	Turn on	Turn off	Turn on
Normal mode	Turn on	Turn on	Turn on

- 12 interrupt source : 8 external , 4 internal
- Key Scan : Port key scan function up to 16x4 keys
- Sub-Clock: 32.768kHz crystal
- Main-clock: 3.5826MHz multiplied by 0.25, 0.5, 1 or 3 generated by internal PLL
- Key tone output (shared with IO) : 4kHz, 2kHz, 1kHz
- Comparator: 3-channel comparators, internal (16 level) or external reference voltage (shared with IO)
- Serial Peripheral Interface (SPI) : Interrupt flag available for the read buffer full, Programmable baud rates of communication, Three-wire synchronous communication. (shared with IO)

Programmable Tone Generators

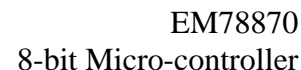
- Operation Voltage 2.2V~5.5V
- Programmable Tone1 and Tone2 generators
- Independent single tone generation for Tone1 and Tone2
- Mixed dual tone generation by Tone1 and Tone2 with 2dB difference

LCD (8x80, 9x80, 16x80, 24x72)

- Maximum common driver pins : 16/24
- Maximum segment driver pins : 80(SEG0..SEG79)/72(SEG8..SEG79)
- Shared COM16 ~ COM23 pins with SEG0 ~ SEG7 pins
- 1/4 bias for 8, 9 and 16 common mode and 1/5 bias for 24 common mode
- 1/8, 1/9, 1/16, 1/24 duty
- 16 Level LCD contrast control (software)
- Internal resistor circuit for LCD bias
- Internal voltage follower for better display

Package type

- 128-pin QFP or chip : EM78870AQ (POVD disable), EM78870BQ (POVD enable), EM78870H



Cordless phones or any telephone product with large LCD needed

SEG17	105	104	SEG18
SEG16	106	103	SEG19
SEG15	107	102	SEG20
SEG14	108	101	SEG21
SEG13	109	100	SEG22
SEG12	110	99	SEG23
SEG11	111	98	SEG24
SEG10	112	97	SEG25
SEG9	123	96	SEG26
SEG8	114	95	SEG27
COM23/SEG7	115	94	SEG28
COM22/SEG6	116	93	SEG29
COM21/SEG5	117	92	SEG30
COM20/SEG4	118	91	SEG31
COM19/SEG3	119	90	SEG32
COM18/SEG2	120	89	SEG33
COM17/SEG1	121	88	SEG34
COM16/SEG0	122	87	SEG35
COM15	123	86	SEG36
COM14	124	85	SEG37
COM13	125	88	SEG38
COM12	126	83	SEG39
COM11	127	82	SEG40
COM10	128	81	SEG41
		80	SEG42
		79	SEG43
		78	SEG44
		77	SEG45
		76	SEG46
		75	SEG47
		74	SEG48/PB0
		73	SEG49/PB1
		72	SEG50/PB2
		71	SEG51/PB3
		70	SEG52/PB4
		69	SEG53/PB5
		68	SEG54/PB6
		67	SEG55/PB7
		66	SEG56/PC0
		65	SEG57/PC1
		64	SEG58/PC2
		63	SEG59/PC3
		62	SEG60/PC4
		61	SEG61/PC5
		60	SEG62/PC6
		59	SEG63/PC7
		58	SEG64/PC8
		57	SEG65/PC8
		56	SEG66/PC8
		55	SEG67/PC8
		54	SEG68/PC8
		53	SEG69/PC8
		52	SEG70/PC8
		51	SEG71/PC8
		50	SEG72/PC8
		49	SEG73/PC9
		48	SEG74/PC9
		47	SEG75/PC9
		46	SEG76/PC9
		45	SEG77/PC9
		44	SEG78/PC9
		43	SEG79/PC9
		42	SEG80/PC9
		41	SEG81/PC9
		40	SEG82/PC9
		39	SEG83/PC9
		38	SEG84/PC9
		37	SEG85/PC9
		36	SEG86/PC9
		35	SEG87/PC9
		34	SEG88/PC9
		33	SEG89/PC9
		32	SEG90/PC9
		31	SEG91/PC9
		30	SEG92/PC9
		29	SEG93/PC9
		28	SEG94/PC9
		27	SEG95/PC9
		26	SEG96/PC9
		25	SEG97/PC9
		24	SEG98/PC9
		23	SEG99/PC9
		22	SEG100/PC9
		21	SEG101/PC9
		20	SEG102/PC9
		19	SEG103/PC9
		18	SEG104/PC9
		17	SEG105/PC9
		16	SEG106/PC9
		15	SEG107/PC9
		14	SEG108/PC9
		13	SEG109/PC9
		12	SEG110/PC9
		11	SEG111/PC9
		10	SEG112/PC9
		9	SEG113/PC9
		8	SEG114/PC9
		7	SEG115/PC9
		6	SEG116/PC9
		5	SEG117/PC9
		4	SEG118/PC9
		3	SEG119/PC9
		2	SEG120/PC9
		1	SEG121/PC9
		0	SEG122/PC9

Fig.1 Pin assignment (128-pin QFP or chip)