

Table of Contents

Preface	5
1 Light emitting diodes	9
1.1 History of the light emitting diode	9
1.2 LED characteristics and parameters	10
1.3 PIC interface for LED circuits – design and programming	14
1.4 Case Study RGB VGA monitor tester	32
1.5 Case Study Christmas light	35
1.6 Case Study 3 channel sound to light	39
2 White light emitting diodes	44
2.1 PWM LED brightness and voltage control	44
2.2 TPS60403 charge pump voltage inverter	49
2.3 TPS61040 low power DC/DC boost converter	50
2.4 LT1054 switched-capacitor voltage converter	52
2.5 MAX1848 white LED step-up converter	53
3 7-segment Displays	55
3.1 Fundamentals of 7-segment LED displays	55
3.2 Case Study RS232 Data monitor	57
3.3 Case Study 00 to 99 minute programmable timer	65
3.4 Case Study 4 minute egg timer	69
4 B/W Liquid Crystal Displays	77
4.1 Industry standard alphanumeric LCD displays	78
4.2 Case Study ASCII string generator	87
4.3 Case Study RS232 data monitor	94
4.4 Case Study heart rate monitor -Program OXY.ASM	103
4.5 Case Study IIC real time digital clock	114
5 Graphic Liquid Crystal Displays	123
5.1 Case Study Densitron LM4068 B/W 100 x 64 pixel display	123
5.2 Case Study simple PDA using the Nokia 3310	129
5.3 Icon image editing software	136
5.4 Case Study Nokia 3310 GPS digital clock	140
5.5 Case Study Nokia 3510i Electronic compass	155
5.6 Case Study Nokia 6100 Epson display 8 bit colour	161
5.7 Case Study Nokia 6100 Philips display 16 bit colour	165

6	OEM colour Graphic Displays	168
6.1	OLIMEX	168
6.2	The MPS430-4619LCD (6100)	169
6.3	4D SYSTEMS	169
6.4	The 4D-MICRO-LCD-320-PMD2 DISPLAY	171
6.5	Display3000	173
6.6	ezLCD	174
6.7	REACHtech	176
7	Appendix	178
7.1	References	188
	Index	191