

BOOLEAN MINIMISATION V1.0
=====

Minterms:

0 1 5 7 8 10 14 15

Don't cares:

*** none ***

The function order is 4

Prime Implicants:

p. i.	cell	literals	cost	status
1	0, 8	-000	3	non-essential
2	0, 1	000-	3	non-essential
3	1, 5	0-01	3	non-essential
4	5, 7	01-1	3	non-essential
5	7, 15	-111	3	non-essential
6	8, 10	10-0	3	non-essential
7	10, 14	1-10	3	non-essential
8	14, 15	111-	3	non-essential

Prime Implicant Chart:

p. i.	0	1	5	7	8	10	14	15
1	*				*			
2	*	*						
3		*	*					
4			*	*				
5				*				*
6					*	*		
7						*	*	
8							*	*

Minimum Cost Solution:

$F = (1+3+5+7)(2+4+6+8)$

(parenthesised expressions are alternatives)

Cost = 12 literals

A CYCLIC PI CHART

BOOLEAN MINIMISATION V1.0

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Minterms:

0 1 5 7 8 10 14 15

Don't cares:

3 6 11

The function order is 4

Prime Implicants:

p.i.	cell	literals	cost	status
1	0,8	-000	3	minimum-cost essential
2	0,1	000-	3	minimum-cost redundant
3	1,7	0--1	2	essential
4	3,15	--11	2	minimum-cost redundant
5	6,15	-11-	2	minimum-cost redundant
6	8,10	10-0	3	minimum-cost redundant
7	10,15	1-1-	2	minimum-cost essential

Prime Implicant Chart:

p.i.	0	1	5	7	8	10	14	15
1	*				*			
2	*	*						
3		*	*	*				
4				*				*
5				*			*	*
6					*	*		
7						*	*	*

Minimum Cost Solution:

F = 1+3+7

Cost = 7 literals

BOOLEAN MINIMISATION V1.0
=====

Minterms:

1 4 5 7 8 9 11 13 14 15 18 19 20 21 23 24 25 26 27 28 29 30

Don't cares:

*** none ***

The function order is 5

Prime Implicants:

p. i.	cell	literals	cost	status
1	1, 13	0--01	3	essential
2	4, 21	-010-	3	essential
3	5, 29	--101	3	minimum-cost redundant
4	5, 23	-01-1	3	minimum-cost essential
5	5, 15	0-1-1	3	minimum-cost redundant
6	8, 25	-100-	3	essential
7	9, 29	-1-01	3	minimum-cost redundant
8	9, 27	-10-1	3	minimum-cost redundant
9	9, 15	01--1	3	minimum-cost essential
10	14, 30	-1110	4	minimum-cost essential
11	14, 15	0111-	4	minimum-cost redundant
12	18, 27	1-01-	3	essential
13	19, 23	10-11	4	minimum-cost redundant
14	20, 29	1-10-	3	non-essential
15	24, 30	11--0	3	minimum-cost redundant
16	24, 29	11-0-	3	non-essential
17	24, 27	110--	3	redundant

Prime Implicant Chart:

minterm -->											
p. i.	1	4	5	7	8	9	11	13	14	15	18
1	*		*			*		*			
2		*	*								
3			*					*			
4			*	*							
5			*	*				*		*	
6					*	*					
7						*		*			
8						*	*				
9						*	*	*		*	
10									*		
11									*	*	
12											*
13											
14											
15											
16											

minterm -->											
p. i.	19	20	21	23	24	25	26	27	28	29	30
1											
2		*	*								
3			*							*	

ref INTRODUCTION TO THE THEORY OF
SWITCHING CIRCUITS
E.J. MCCLUSKEY
MCGRAW-HILL
p 148

4		*	*													
5																
6				*	*											
7					*								*			
8					*			*								
9																
10															*	
11																
12	*					*	*									
13	*			*												
14		*	*							*	*					
15					*	*				*	*			*		
16					*	*				*	*			*		

Minimum Cost Solution:

$$F = 1+2+4+6+9+10+12+(14)(16)$$

(parenthesised expressions are alternatives)

Cost = 25 literals

BOOLEAN MINIMISATION V1.0

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Minterms:

1 4 5 7 8 9 11 13 14 15 18 19 20 21 23 24 25 26 27 28 29 30

Don't cares:

0 10 17 31

The function order is 5

Prime Implicants:

p. i.	cell	literals	cost	status
1	0, 9	0-00-	3	non-essential
2	0, 5	00-0-	3	non-essential
3	1, 29	---01	2	minimum-cost redundant
4	4, 21	-010-	3	non-essential
5	5, 31	--1-1	2	essential
6	8, 27	-10--	2	non-essential
7	9, 31	-1--1	2	minimum-cost redundant
8	10, 31	-1-1-	2	essential
9	17, 31	1---1	2	minimum-cost redundant
10	18, 27	1-01-	3	essential
11	20, 29	1-10-	3	non-essential
12	24, 31	11---	2	non-essential

Prime Implicant Chart:

p. i.	minterm -->											
	1	4	5	7	8	9	11	13	14	15	18	
1	*				*	*						
2	*	*	*									
3	*		*			*		*				
4		*	*									
5			*	*				*		*		
6					*	*	*					
7						*	*	*		*		
8							*		*	*		
9												
10											*	
11												
12												

p. i.	minterm -->											
	19	20	21	23	24	25	26	27	28	29	30	
1												
2												
3			*			*				*		
4		*	*									
5		*	*	*						*		
6					*	*	*	*				
7						*	*	*		*		
8							*	*			*	
9	*		*	*		*	*	*		*		
10	*						*	*				
11		*	*						*	*		
12					*	*	*	*	*	*	*	

Minimum Cost Solution:

$$F = 5+8+10+(2+6+11)(1+4+12)$$

(parenthesised expressions are alternatives)

Cost = 15 literals

BOOLEAN MINIMISATION V1.0
=====

Minterms:

0 4 12 16 19 24 27 28 29 31

Don't cares:

*** none ***

The function order is 5

Prime Implicants:

p. i.	cell	literals	cost	status
1	0, 16	-0000	4	non-essential
2	0, 4	00-00	4	non-essential
3	4, 12	0-100	4	non-essential
4	12, 28	-1100	4	non-essential
5	16, 24	1-000	4	non-essential
6	19, 27	1-011	4	essential
7	24, 28	11-00	4	non-essential
8	27, 31	11-11	4	minimum-cost redundant
9	28, 29	1110-	4	minimum-cost redundant
10	29, 31	111-1	4	minimum-cost essential

Prime Implicant Chart:

p. i.	0	4	12	16	19	24	27	28	29	31
1	*			*						
2	*	*								
3		*	*							
4			*					*		
5				*		*				
6					*		*			
7						*		*		
8							*			*
9								*	*	
10									*	*

Minimum Cost Solution:

$$F = 6+10+(2+4+5)(1+3+7)$$

(parenthesised expressions are alternatives)

Cost = 20 literals

ref INTRODUCTION TO THE THEORY OF
SWITCHING CIRCUITS
E. J. MCCLOSKEY
Mc GRAW-HILL
p 153

BOOLEAN MINIMISATION V1.0
=====

ref AN INTRODUCTION TO COMPUTER LOGIC
NAGLE / ^{CARROLL} ~~NAGLE~~ / IRWIN
PRENICE - HALL
P173

Minterms:

3 7 12 14 15 19 27 28 29 31 35 39 44 45 46 48 49 50 52 53 55 56 57 59 60 62 63

Don't cares:

0 11 13 23 30 32 43 47 51 54 61

The function order is 6

Prime Implicants:

p. i.	cell	literals	cost	status
1	0, 32	-00000	5	redundant
2	3, 63	----11	2	essential
3	12, 63	--11--	2	essential
4	32, 48	1-0000	5	redundant
5	48, 61	11--0-	3	essential
6	48, 55	110---	3	essential
7	49, 63	11---1	3	redundant
8	52, 63	11-1--	3	redundant

Prime Implicant Chart:

p. i.	3	7	12	14	15	19	27	28	29	31	35	39	44	45
2	*	*			*	*	*			*	*	*		
3			*	*	*			*	*	*			*	*
5														
6														

p. i.	46	48	49	50	52	53	55	56	57	59	60	62	63
2							*			*			*
3	*										*	*	*
5		*	*		*	*		*	*		*		
6		*	*	*	*	*	*						

Unique Solution:

$$F = 2+3+5+6$$

Cost = 10 literals

BOOLEAN MINIMISATION V1.0
=====

PRIME NUMBERS IN RANGE 1-31

Minterms:

1 2 3 5 7 11 13 17 19 23 29 31

Don't cares:

*** none ***

The function order is 5

Prime Implicants:

p. i.	cell	literals	cost	status
1	1, 19	-00-1	3	essential
2	1, 7	00--1	3	non-essential
3	2, 3	0001-	4	essential
4	3, 23	-0-11	3	non-essential
5	3, 11	0-011	4	essential
6	5, 13	0-101	4	non-essential
7	13, 29	-1101	4	non-essential
8	23, 31	1-111	4	non-essential
9	29, 31	111-1	4	non-essential

Prime Implicant Chart:

p. i.	minterm -->											
	1	2	3	5	7	11	13	17	19	23	29	31
1	*		*					*	*			
2	*		*	*	*							
3		*	*									
4			*		*				*	*		
5			*			*						
6				*			*					
7							*				*	
8										*		*
9											*	*

Minimum Cost Solution:

$$F = 1+3+5+(2+7+8)(4+6+9)$$

(parenthesised expressions are alternatives)

Cost = 22 literals

BOOLEAN MINIMISATION V1.0
=====

Minterms:

0 1 3 4 7 13 15 19 20 22 23 29 31

Don't cares:

*** none ***

The function order is 5

Prime Implicants:

p. i.	cell	literals	cost	status
1	0, 4	00-00	4	non-essential
2	0, 1	0000-	4	non-essential
3	1, 3	000-1	4	non-essential
4	3, 23	-0-11	3	essential
5	4, 20	-0100	4	non-essential
6	7, 31	--111	3	redundant
7	13, 31	-11-1	3	essential
8	20, 22	101-0	4	non-essential
9	22, 23	1011-	4	non-essential

Prime Implicant Chart:

	minterm -->												
p. i.	0	1	3	4	7	13	15	17	20	22	23	29	31
1	*			*									
2	*	*											
3		*	*										
4			*		*			*			*		
5				*					*				
7						*	*					*	*
8									*	*			
9										*	*		

Minimum Cost Solution:

$$F = 4+7+(2+5+8)(1+2+8)(1+3+8)(2+5+9)$$

(parenthesised expressions are alternatives)

Cost = 18 literals

BOOLEAN MINIMISATION V1.0
=====

ref AN INTRODUCTION TO COMPUTER LOGIC
NAGLE / CARROLL / IRWIN
(PRENTICE-HALL)
p174

Minterms:

17 20 21 23 25 32 34 35 38 39 48 49 53 54 64 65 66 70 71 72 73 84 85 86 87 98 99
100 101 102 114 115 116 117 118 119 132 133 134 135 136 137 151 152 153

Don't cares:

0 10 11 12 13 14 15 26 27 28 29 30 31 42 43 44 45 46 47 58 59 60 61 62 63 74 75
76 77 78 79 90 91 92 93 94 95 106 107 108 109 110 111 122 123 124 125 126 127 13
8 139 140 141 142 143 154 155 156 157 158 159 160 161 162 163 164 165 166 167 16
8 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 18
8 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 20
8 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 22
8 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 24
8 249 250 251 252 253 254 255

CPU TIME:

5secs to find PIs
8 1/2 mins to find minimal solution.

The function order is 8

Prime Implicants:

p. i.	cell	literals	cost	status
1	0, 64	0-000000	7	redundant
2	0, 32	00-00000	7	minimum-cost redundant
3	10, 255	----1-1-	2	redundant
4	12, 255	----11--	2	redundant
5	17, 53	00-10-01	6	minimum-cost essential
6	17, 29	0001--01	6	minimum-cost redundant
7	20, 93	0-01-10-	5	essential
8	21, 125	0--1-101	5	minimum-cost redundant
9	21, 95	0-01-1-1	5	minimum-cost redundant
10	23, 223	--01-111	5	minimum-cost essential
11	25, 159	-0011--1	5	minimum-cost essential
12	32, 176	-01-0000	6	minimum-cost essential
13	32, 162	-01000-0	6	minimum-cost redundant
14	34, 238	--10--10	4	minimum-cost redundant
15	34, 235	--10-01-	4	minimum-cost redundant
16	34, 175	-010--1-	4	essential
17	38, 254	--1--110	4	essential
18	48, 177	-011000-	6	minimum-cost redundant
19	49, 181	-0110-01	6	minimum-cost redundant
20	53, 253	--11-101	5	minimum-cost redundant
21	64, 202	-100-0-0	5	minimum-cost redundant
22	64, 201	-100-00-	5	essential
23	66, 238	-1-0--10	4	minimum-cost essential
24	70, 254	-1---110	4	redundant
25	70, 223	-10--11-	4	essential
26	72, 207	-1001----	4	redundant
27	84, 255	-1-1-1--	3	minimum-cost essential
28	98, 254	-11---10	4	minimum-cost redundant
29	98, 251	-11--01-	4	minimum-cost essential
30	100, 254	-11--1-0	4	redundant
31	100, 253	-11--10-	4	essential
32	114, 255	-111--1-	4	minimum-cost redundant
33	132, 239	1--0-1--	3	essential
34	135, 255	1----111	4	minimum-cost redundant
35	136, 255	1---1---	2	essential

36	160,255	1-1-----	2	redundant
37	192,255	11-----	2	redundant

Prime Implicant Chart:

	minterm -->														
p. i.	17	20	21	23	25	32	34	35	38	39	48	49	53	54	64
2						*									
5	*		*									*	*		
6	*		*		*										
7		*	*												
8			*										*		
9			*	*											
10				*											
11					*										
12						*					*				
13						*	*								
14							*		*						
15							*	*							
16							*	*	*	*					
17									*					*	
18											*	*			
19												*	*		
20													*		
21															*
22															*
23															
25															
27															
28															
29															
31															
32															
33															
34															
35															

	minterm -->														
p. i.	65	66	70	71	72	73	84	85	86	87	98	99	100	101	102
2															
5															
6															
7							*	*							
8								*							
9								*		*					
10										*					
11															
12															
13															
14											*				*
15											*	*			
16															
17															*
18															
19															
20															
21		*				*									
22	*					*	*								
23		*	*								*				*
25			*	*					*	*					
27							*	*	*	*					

```

28          *          *
29          *      *
31              *      *
32
33
34
35
    minterm -->
p. i. 114 115 116 117 118 119 132 133 134 135 136 137 151 152 153
2
5
6
7
8          *
9
10              *
11              *
12
13
14
15
16
17          *
18
19
20          *
21
22
23
25
27          *      *      *      *
28      *          *      *
29      *      *
31          *      *
32      *      *          *      *
33          *      *      *      *
34          *          *
35              *      *          *      *

```

Minimum Cost Solution:

F = 5+7+10+11+12+16+17+22+23+25+27+29+31+33+35

Cost = 64 literals