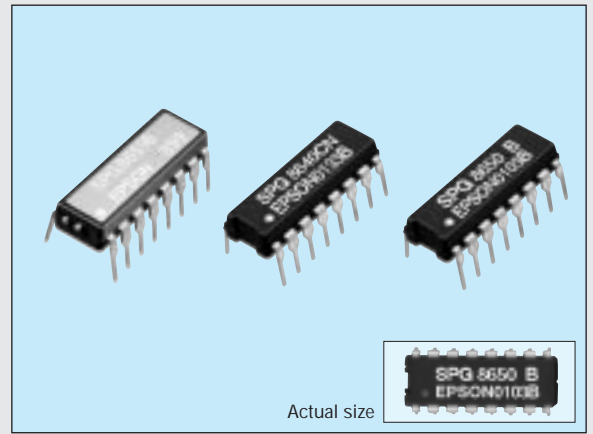


SELECTABLE-OUTPUT CRYSTAL OSCILLATOR

SPG series

- Capable of selecting 57 varieties of frequency output.
- Low current consumption.
- Easy to mount DIP 16-pin package.



Specifications (characteristics)

Item	Symbol	Specifications											Remarks
Model name		8640AN	8640BN	8640CN	8650A	8650B	8650C	8650D	8650E	8651A	8651B	8651E	
Oscillation source frequency	f_o	600kHz	1MHz	768kHz	60kHz	100kHz	96kHz	153.6kHz	32.768kHz	60kHz	100kHz	32.768kHz	For output frequency, refer to the table in the next page
Power source voltage	Max. supply voltage	V_{DD-GND} -0.3V to +7.0V											
	Operating voltage	V_{DD} 5.0V±0.5V											
Temperature range	Storage temperature	-55°C to +125°C											-30°C to +80°C
	Operating temperature	T_{OPR} -10°C to +70°C											-10°C to +60°C
Soldering condition (lead part)	T_{SOL}	Under 260°C within 10 sec.											Package should be less than 150°C
Frequency tolerance	$\Delta f/f_o$	±100ppm			±50ppm				±5ppm *1				$V_{DD}=5V, T_a=25^\circ C$
Frequency temperature characteristics		+10/-120ppm											$V_{DD}=5V$
Frequency voltage characteristics		±20ppm	±10ppm	±20ppm	±10ppm				±5ppm				$V_{DD}=4.5$ to 5.5V
Aging	f_a	±5ppm/year max.											±3ppm/year max.
Current consumption	I_{OP}	1.0mA max.	2.0mA max.	1.5mA max.	0.5mA max.								No load condition
Shock resistance	S.R.	±5ppm max.			±5ppm max.				±10ppm max.				Three drops on a hard wooden board from 75cm

*1 Frequency tolerance of 8651 system shows the value guaranteed at the time of shipment.

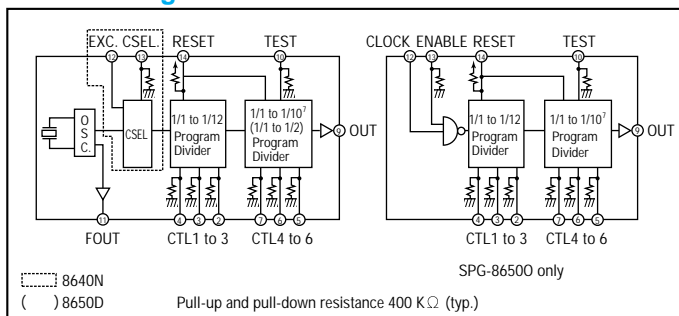
Electric characteristics ($V_{DD}=5V\pm 0.5V, T_a=-10$ to $70^\circ C, C_L \leq 15pF$)

Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
L. input voltage	V_{IL}	0		0.8	V	
H. input voltage	V_{IH}	$V_{DD}-1.0$		V_{DD}	V	
L. input current (Reset)	I_{RL}	-30		-5	μA	Reset=GND
H. input current (Reset)	I_{RH}			0.5	μA	Reset= V_{DD}
L. input current (input terminal except for Reset)	I_{IL}	-0.5			μA	
H. input current (input terminal except for Reset)	I_{IH}	5		30	μA	$I_{OL}=1.6mA$
L. output voltage	V_{OL}			0.4	V	$I_{OH}=-40\mu A$
H. output voltage	V_{OH}	$V_{DD}-1.0$			V	$V_{OL}=0.4V$
L. output current	I_{OL}	1.6			mA	$V_{OH}=V_{DD}-1.0V$
H. output current	I_{OH}			-40	μA	
Output rise time	t_{TLH}		30	60	ns	
Output fall time	t_{THL}		25	50	ns	
Duty		40		60	%	Except in the case of 1/3 and 1/5
Min. reset pulse width	t_{rw}	1.0			μs	
Reset delay time	t_r			1.0	μs	
Reset release synchronous error	t_e	$t_w \cdot \frac{1}{2}$ to		$t_w \cdot \frac{1}{2}$	μs	
External signal input frequency	F_{IN}			1M	Hz	8640N only
External signal input pulse width	t_{IN}	0.5			μs	
Oscillation start up time	t_{OSC}	0.2	1		s	* 3

* 1 t_{osc} to oscillation source cycle. * 2 $t_w=1/2$ cycle of preset frequency.

* 3 For more than 1ms until $V_{DD}=0 \rightarrow 4.5V$. Time at 4.5V is to be 0.

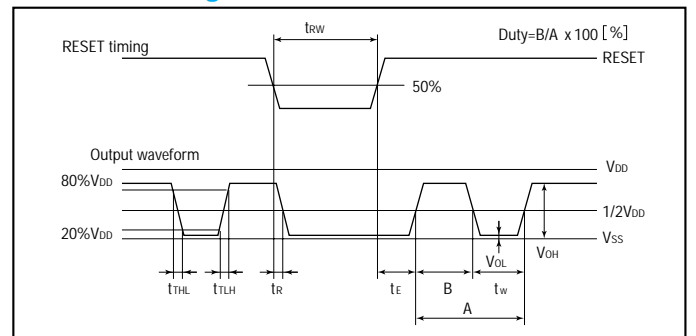
Block diagram



Divider IC (without quartz crystal)

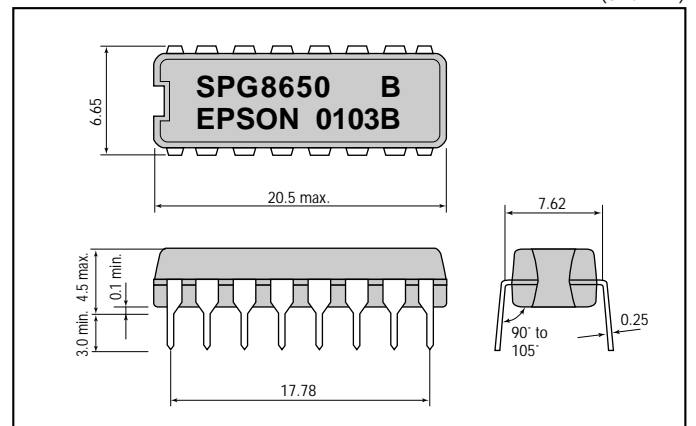
Item	Symbol	Specifications	Remarks
Model name		8650 O	
Input clock frequency		1 MHz max.	
Current consumption	I_{OP}	About 2 mA	No load condition

RESET timing



External dimensions

(Unit: mm)



Terminal connection

No.	Pin terminal	No.	Pin terminal
1	NC	16	V _{DD}
2	CTL 3	15	NC
3	CTL 2	14	RESET
4	CTL 1	13	NC (CSEL)
5	CTL 6	12	NC (EXC)
6	CTL 5	11	FOUT
7	CTL 4	10	TEST
8	GND	9	OUT

() shown 8640N only
For 8650 O
11. NC 12. CLOCK 13. ENABLE

NC: Do not connect to the external terminal.

Explanation of terminal

- (a) CTL 1 to 6 : Programs dividing ratio. (pull-down resistor incorporated.)
- (b) OUT : Output frequency preset by CTL1 to 6. (refer to the procedure for setting output frequency.)
- (c) FOULT : Constantly outputs the oscillation source frequency of builtin crystal unit.
- (d) RESET : Stops output at RESET= "L". (pull-up resistor incorporated.)
- (e) TEST : Used for the input terminal for testing. When CTL4 is H, output will be 1000 times larger than the preset value at TEST= "H". (pull-down resistor incorporated.)
- (f) EXC (8640N only) : Serves as input terminal when using an external clock by changing to the builtin oscillator. Effective only when CSEL is H.
- (g) CSEL (8640N only) : When this terminal is made H, the external clock is selected. (pull-down resistor incorporated.)

(Note) Treatment of empty terminals. When RESET terminal is not used, this should be connected to V_{DD}, and when TEST terminal, CSEL terminal, and CTL 1 to 6 terminals are not used, to GND.

Explanation of terminal (8650 O)

- (a) CLOCK: Clock input (max. 1 MHz)
- (b) ENABLE: Be sure to connect to V_{DD}

Setting of divider output

CTL1	CTL2	CTL3	Dividing ratio	CTL4	CTL5	CTL6	Dividing ratio
0	0	0	1/1	0	0	0	1/1 (1/1)
0	0	1	1/10	0	0	1	1/10 (1/2)
0	1	0	1/2	0	1	0	1/10 ² (1/2) ²
0	1	1	1/3	0	1	1	1/10 ³ (1/2) ³
1	0	0	1/4	1	0	0	1/10 ⁴ (1/2) ⁴
1	0	1	1/5	1	0	1	1/10 ⁵ (1/2) ⁵
1	1	0	1/6	1	1	0	1/10 ⁶ (1/2) ⁶
1	1	1	1/12	1	1	1	1/10 ⁷ (1/2) ⁷

0= "L" 1="H" ()8650D

Setting of output frequency

8640AN (Unit: Hz)

Set terminal	CTL4	CTL5	CTL6	CTL3	CTL2	CTL1	Output frequency	Baud rate output example (fo/16)
0	0	0	0	0	0	0	768	48000bits/sec.
0	0	0	1	0	0	0	3276.8	0.03276
0	0	1	0	0	0	0	100K	100K
0	0	1	1	0	0	0	30K	30K
0	1	0	0	0	0	0	50K	50K
0	1	0	1	0	0	0	10K	10K
0	1	1	0	0	0	0	20K	20K
0	1	1	1	0	0	0	5K	5K
1	0	0	0	0	0	0	33.3K	33.3K
1	0	0	1	0	0	0	25K	25K
1	0	1	0	0	0	0	200K	200K
1	0	1	1	0	0	0	100K	100K
1	1	0	0	0	0	0	166.6K	166.6K
1	1	0	1	0	0	0	83.3K	83.3K

8640BN

Set terminal	CTL4	CTL5	CTL6	CTL3	CTL2	CTL1	Output frequency	Baud rate output example (fo/16)
0	0	0	0	0	0	0	153.6 kHz	9600bits/sec.
0	0	0	1	0	0	0	76.8	4800
0	0	1	0	0	0	0	38.4	2400
0	0	1	1	0	0	0	19.2	1200
0	1	0	0	0	0	0	9.6	600
0	1	0	1	0	0	0	4.8	300
0	1	1	0	0	0	0	3.2	200
0	1	1	1	0	0	0	2.4	150
1	0	0	0	0	0	0	1.6	100
1	0	1	0	0	0	0	1.2	75
1	0	1	1	0	0	0	0.8	50

8650A 8651A

Set terminal	CTL4	CTL5	CTL6	CTL3	CTL2	CTL1	Output frequency	Baud rate output example (fo/16)
0	0	0	0	0	0	0	60K	60K
0	0	0	1	0	0	0	6K	6K
0	0	1	0	0	0	0	30K	30K
0	0	1	1	0	0	0	20K	20K
0	1	0	0	0	0	0	15K	15K
0	1	0	1	0	0	0	12K	12K
0	1	1	0	0	0	0	10K	10K
0	1	1	1	0	0	0	5K	5K

8650B 8651B

Set terminal	CTL4	CTL5	CTL6	CTL3	CTL2	CTL1	Output frequency	Baud rate output example (fo/16)
0	0	0	0	0	0	0	100K	100K
0	0	0	1	0	0	0	10K	10K
0	0	1	0	0	0	0	50K	50K
0	0	1	1	0	0	0	33.3K	33.3K
0	1	0	0	0	0	0	25K	25K
0	1	0	1	0	0	0	20K	20K
0	1	1	0	0	0	0	16.6K	16.6K
0	1	1	1	0	0	0	8.3K	8.3K

8650E 8651E

Set terminal	CTL4	CTL5	CTL6	CTL3	CTL2	CTL1	Output frequency	Baud rate output example (fo/16)
0	0	0	0	0	0	0	32768	32768
0	0	0	1	0	0	0	3276.8	3276.8
0	0	1	0	0	0	0	16384	16384
0	0	1	1	0	0	0	10922.6	10922.6
0	1	0	0	0	0	0	8192	8192
0	1	0	1	0	0	0	6553.6	6553.6
0	1	1	0	0	0	0	5461.3	5461.3
0	1	1	1	0	0	0	2730.6	2730.6

Note: Lower digits are omitted.

Baud rate generator

8640CN

CTL1	CTL2	CTL3	CTL4	CTL5	CTL6	Output frequency	Baud rate output example (fo/16)
0	0	0	0	0	0	768 kHz	48000bits/sec.
1	0	0	0	0	0	153.6	9600
0	0	1	0	0	0	76.8	4800
0	1	0	0	0	1	38.4	2400
1	0	0	0	0	1	19.2	1200

8650C

CTL1	CTL2	CTL3	CTL4	CTL5	CTL6	Output frequency	Baud rate output example (fo/16)
0	0	0	0	0	0	96.0 kHz	6000bits/sec.
1	0	0	0	0	0	19.2	1200
0	0	1	0	0	0	9.6	600
0	1	0	0	0	1	4.8	300
0	1	1	0	0	1	3.2	200
1	0	0	0	0	1	2.4	150
1	1	0	0	0	1	1.6	100
1	1	1	0	0	1	0.8	50

8650D

CTL1	CTL2	CTL3	CTL4	CTL5	CTL6	Output frequency	Baud rate output example (fo/16)
0	0	0	0	0	0	153.6 kHz	9600bits/sec.
0	0	0	0	0	1	76.8	4800
0	0	0	0	1	0	38.4	2400
0	0	0	0	1	1	19.2	1200
0	0	0	1	0	0	9.6	600
0	0	0	1	0	1	4.8	300
0	1	1	0	0	0	3.2	200
0	1	0	0	1	0	2.4	150
1	1	0	0	1	0	1.6	100
0	0	0	1	1	1	1.2	75
1	1	1	1	0	0	0.8	50