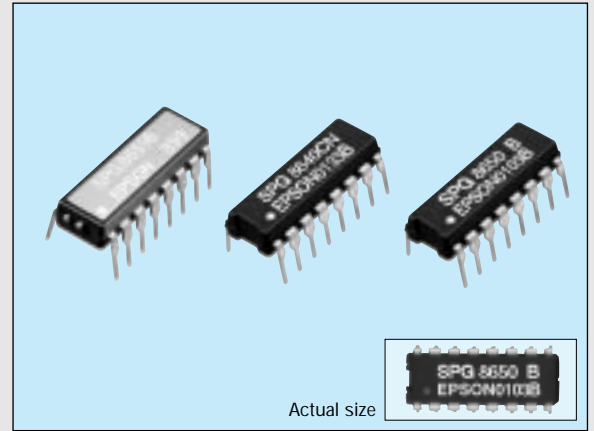


SELECTABLE-OUTPUT CRYSTAL OSCILLATOR

# 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	8650E	8651A	8651B	8651E		
Oscillation source frequency	$f_o$	600kHz	1MHz	768kHz	60kHz	100kHz	96kHz	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	$T_{STG}$										-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.	$V_{DD}=5V, T_a=25^\circ C, \text{first year}$
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 form 75cm		

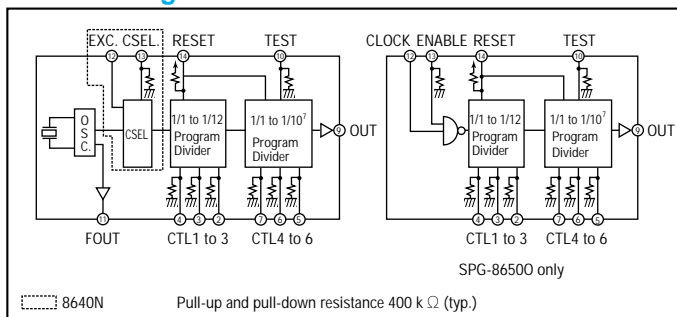
\*1 Frequency tolerance of 8651 system shows the value guaranteed at the time of shipment.

## 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	DataSheet4U
H. input voltage	$V_{IH}$	$V_{DD}-1.0$		$V_{DD}$		
L. input current (Reset)	$I_{RL}$	-30		-5	$\mu A$	Reset=GND
H input current (Reset)	$I_{RH}$			0.5		Reset= $V_{DD}$
L. input current (input terminal except for Reset)	$I_{IL}$	-0.5			$\mu A$	
H input current (input terminal except for Reset)	$I_{IH}$	5		30	$\mu A$	$I_{OL}=1.6mA$
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	$\mu A$	
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			$\mu s$	
Reset delay time	$t_r$			1.0	$\mu s$	
Reset release synchronous error	$t_e$	$t_w \times \frac{1}{1/2}$ to		$t_w \times 2$	$\mu s$	
External signal input frequency	$F_{IN}$			1M	Hz	8640N only
External signal input pulse width	$t_{IN}$	0.5			$\mu s$	
Oscillation start up time	$t_{OSC}$		0.2	1	s	* 3

\* 1  $t_o$ -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.

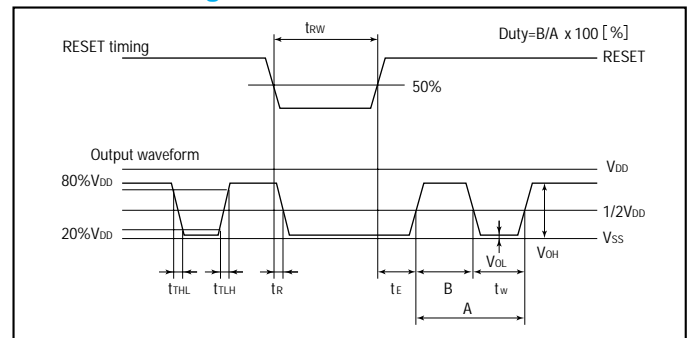
## Block diagram



## Divider IC (without quartz crystal)

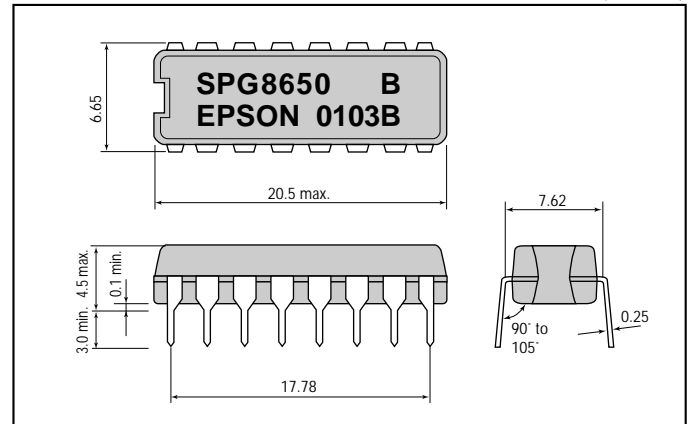
Item	Symbol	Specifications	Remarks
Model name		8650 O	
Input clock frequency		1 MHz max.	
Current consumption	$I_{OP}$	About 2 mA	No load condition

## RESET timing



## External dimensions

(Unit: mm)



**Terminal connection**

No.	Pin terminal	No.	Pin terminal
1	NC	16	V <sub>DD</sub>
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  
NC: Do not connect to the external terminal. 11. NC 12. CLOCK 13. ENABLE

**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) FOUT : 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<sub>DD</sub>, 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<sub>DD</sub>

**Setting of divider output**

CTL1	CTL2	CTL3	Dividing ratio	CTL4	CTL5	CTL6	Dividing ratio
0	0	0	1/1	0	0	0	1/1
0	0	1	1/10	0	0	1	1/10
0	1	0	1/2	0	1	0	1/10 <sup>2</sup>
0	1	1	1/3	0	1	1	1/10 <sup>3</sup>
1	0	0	1/4	1	0	0	1/10 <sup>4</sup>
1	0	1	1/5	1	0	1	1/10 <sup>5</sup>
1	1	0	1/6	1	1	0	1/10 <sup>6</sup>
1	1	1	1/12	1	1	1	1/10 <sup>7</sup>

0="L" 1="H"

**Setting of output frequency**

**8640AN** (Unit: Hz)

Set terminal	CTL4	CTL5	CTL6	CTL3	CTL2	CTL1	Output frequency	Baud rate output example (to/16)		
0	0	0	0	0	1	1	1	1		
0	0	1	1	1	0	0	1	1		
0	1	0	1	0	1	0	1	1		
0	0	0	600k	60k	6k	600	60	6.0	0.6	0.06
0	0	1	60k	6k	600	60	6	0.6	0.06	0.006
0	1	0	300k	30k	3k	300	30	3.0	0.3	0.03
0	1	1	200k	20k	2k	200	20	2.0	0.2	0.02
1	0	0	150k	15k	1.5k	150	15	1.5	0.15	0.015
1	0	1	120k	12k	1.2k	120	12	1.2	0.12	0.012
1	1	0	100k	10k	1k	100	10	1.0	0.1	0.01
1	1	1	50k	5k	500	50	5	0.5	0.05	0.005

**8640BN**

Set terminal	CTL4	CTL5	CTL6	CTL3	CTL2	CTL1	Output frequency	Baud rate output example (to/16)		
0	0	0	0	0	1	1	1	1		
0	0	1	1	1	0	0	1	1		
0	1	0	1	0	1	0	1	1		
0	0	0	1M	100k	10k	1k	100	10	1	1/10
0	0	1	100k	10k	1k	100	10	1	1/10	1/100
0	1	0	500k	50k	5k	500	50	5	1/2	1/20
0	1	1	333.3k	33.3k	3.3k	333.3	33.3	3.33	1/3	1/30
1	0	0	250k	25k	2.5k	250	25	2.5	1/4	1/40
1	0	1	200k	20k	2k	200	20	2	1/5	1/50
1	1	0	166.6k	16.6k	1.6k	166.6	16.6	1.6	1/6	1/60
1	1	1	83.3k	8.3k	833.3	83.3	8.3	0.83	1/12	1/120

**8650A 8651A**

Set terminal	CTL4	CTL5	CTL6	CTL3	CTL2	CTL1	Output frequency	Baud rate output example (to/16)		
0	0	0	0	0	1	1	1	1		
0	0	1	1	1	0	0	1	1		
0	1	0	1	0	1	0	1	1		
0	0	0	60k	6.0k	600	60	6.0	0.6	0.06	0.006
0	0	1	6k	600	60	6	0.6	0.06	0.006	0.0006
0	1	0	30k	3.0k	300	30	3.0	0.3	0.03	0.003
0	1	1	20k	2.0k	200	20	2.0	0.2	0.02	0.002
1	0	0	15k	1.5k	150	15	1.5	0.15	0.015	0.0015
1	0	1	12k	1.2k	120	12	1.2	0.12	0.012	0.0012
1	1	0	10k	1.0k	100	10	1.0	0.1	0.01	0.001
1	1	1	5k	500	50	5	0.5	0.05	0.005	0.0005

**8650B 8651B**

Set terminal	CTL4	CTL5	CTL6	CTL3	CTL2	CTL1	Output frequency	Baud rate output example (to/16)	
0	0	0	0	0	1	1	1	1	
0	0	1	1	1	0	0	1	1	
0	1	0	1	0	1	0	1	1	
0	0	0	100k	10k	100	10	1	1/10	1/100
0	0	1	10k	1k	100	10	1	1/10	1/1000
0	1	0	50k	5k	500	50	5	1/2	1/200
0	1	1	33.3k	3.3k	333.3	33.3	3.33	1/3	1/300
1	0	0	25k	2.5k	250	25	2.5	1/4	1/400
1	0	1	20k	2k	200	20	2	1/5	1/500
1	1	0	16.6k	1.6k	166.6	16.6	1.6	1/6	1/600
1	1	1	8.3k	833.3	83.3	8.3	0.83	1/12	1/1200

**8650E 8651E**

Set terminal	CTL4	CTL5	CTL6	CTL3	CTL2	CTL1	Output frequency	Baud rate output example (to/16)		
0	0	0	0	0	1	1	1	1		
0	0	1	1	1	0	0	1	1		
0	1	0	1	0	1	0	1	1		
0	0	0	32768	3276.8	327.68	32.768	3.276	0.3276	0.03276	0.003276
0	0	1	3276.8	327.68	32.768	3.276	0.327	0.0327	0.00327	0.000327
0	1	0	16384	1638.4	163.84	16.384	1.638	0.1638	0.01638	0.001638
0	1	1	10922.6	1092.26	109.226	10.922	1.092	0.1092	0.01092	0.001092
1	0	0	8192	819.2	81.92	8.192	0.819	0.0819	0.00819	0.000819
1	0	1	6553.6	655.36	65.536	6.553	0.655	0.0655	0.00655	0.000655
1	1	0	5461.3	546.13	54.613	5.461	0.546	0.0546	0.00546	0.000546
1	1	1	2730.6	273.06	27.306	2.730	0.273	0.0273	0.00273	0.000273

Note: Lower digits are omitted.

**Baud rate generator**

**8640CN**

CTL1	CTL2	CTL3	CTL4	CTL5	CTL6	Output frequency	Baud rate output example (to/16)
0	0	0	0	0	0	768 kHz	48000bits/sec.
1	0	1	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 (to/16)
0	0	0	0	0	0	96.0 kHz	6000bits/sec.
1	0	1	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

# THE CRYSTALMASTER



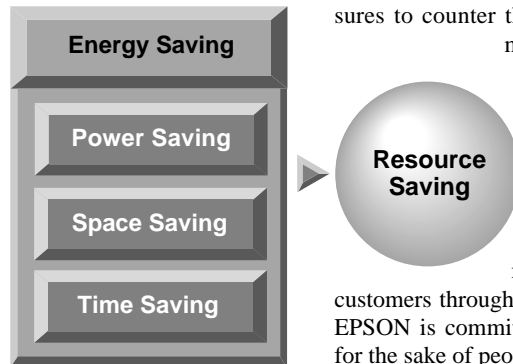
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**SEIKO EPSON CORP. QUARTZ DEVICE DIVISION acquired ISO9001 and ISO14001 certification by B.V.Q.I. (Bureau Veritas Quality International) .**

**ISO9001 in October, 1992.**

**ISO14001 in November, 1997.**

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