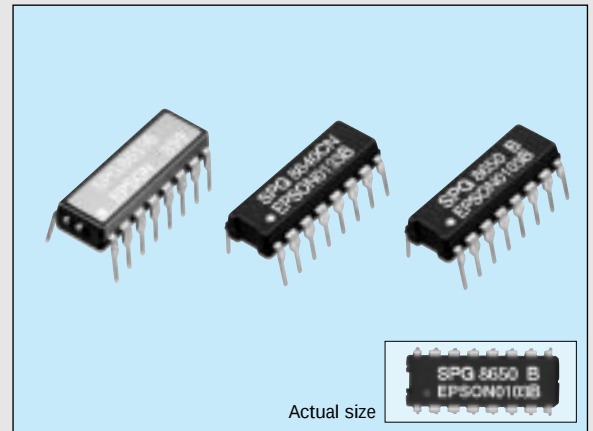


SELECTABLE-OUTPUT CRYSTAL OSCILLATOR

SPG series

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



Actual size

■ 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		Δf/f _o	±100ppm			±50ppm			±5ppm *1			V _{DD} =5V, T _a =25°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°C, 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 from 75cm	

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

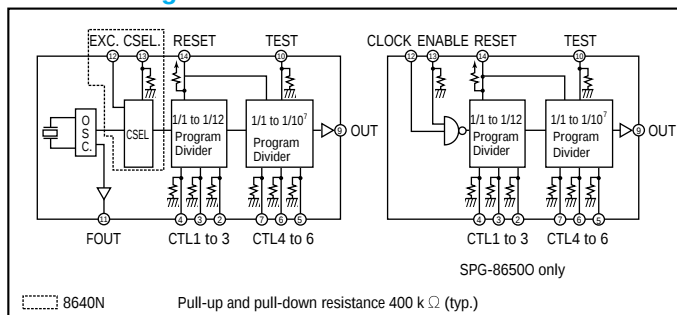
■ Electric characteristics ($V_{DD}=5V \pm 0.5V$, $T_a=-10$ to $+70^\circ C$, $C_L \leq 15pF$)

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	$t_W \times \frac{1}{3}$ to $t_W \times \frac{1}{5}$		$t_W \times 2$	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_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.

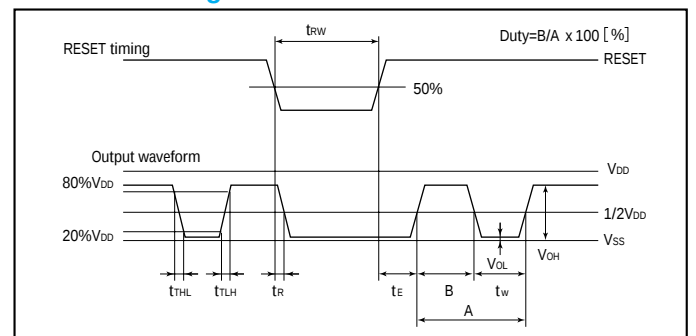
■ Block diagram



● Divider IC (without quartz crystal)

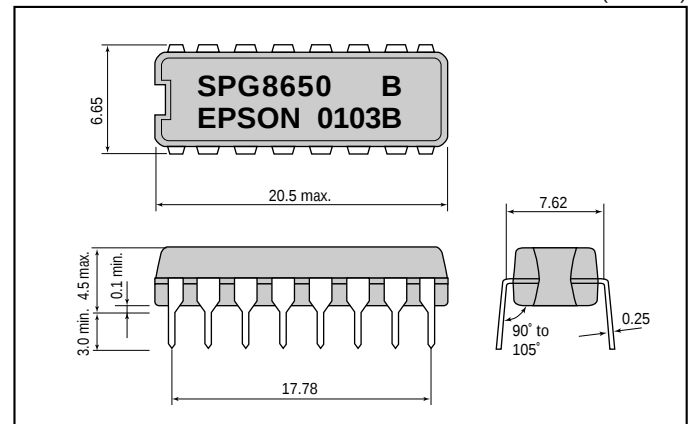
Item	Symbol	Specifications	Remarks
Model name		8650 O	
Input clock frequency		1 MHz max.	
Current consumption	I_{OP}	About 2 mA	No load condition

■ RESET timing



■ External dimensions

(Unit: mm)



Terminal connection

Pinout diagram of the 8650A/8651A crystal oscillator package. The package is a 16-pin DIP. Pins 1-8 are on the bottom, and pins 9-16 are on the top. The diagram shows the physical layout of the pins.

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) 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_{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
0	0	1	1/10	0	0	1	1/10
0	1	0	1/2	0	1	0	1/10 ²
0	1	1	1/3	0	1	1	1/10 ³
1	0	0	1/4	1	0	0	1/10 ⁴
1	0	1	1/5	1	0	1	1/10 ⁵
1	1	0	1/6	1	1	0	1/10 ⁶
1	1	1	1/12	1	1	1	1/10 ⁷

0= "L" 1="H"

Setting of output frequency

8640AN

(Unit: Hz)

Set terminal	CTL4	CTL5	CTL6	CTL1	CTL2	CTL3	CTL4	CTL5	CTL6	Output frequency	Baud rate output example (to/16)
0	0	0	0	0	0	0	0	0	0	768 kHz	48000bits/sec.
0	0	1	0	0	0	0	0	0	0	153.6	9600
0	1	0	0	0	0	0	0	0	0	76.8	4800
0	1	1	0	0	0	0	0	0	0	38.4	2400
1	0	0	0	0	0	0	0	0	0	19.2	1200
1	0	1	0	0	0	0	0	0	0	9.6	600
1	0	1	1	0	0	0	0	0	0	4.8	300
1	1	0	0	0	0	0	0	0	0	2.4	150
1	1	0	1	0	0	0	0	0	0	1.2	75
1	1	1	0	0	0	0	0	0	0	0.6	37.5
1	1	1	1	0	0	0	0	0	0	0.3	18.75

8640BN

Set terminal	CTL4	CTL5	CTL6	CTL1	CTL2	CTL3	CTL4	CTL5	CTL6	Output frequency	Baud rate output example (to/16)
0	0	0	0	0	0	0	0	0	0	96.0 kHz	6000bits/sec.
0	0	1	0	0	0	0	0	0	0	19.2	1200
0	1	0	0	0	0	0	0	0	0	9.6	600
0	1	1	0	0	0	0	0	0	0	4.8	300
1	0	0	0	0	0	0	0	0	0	2.4	150
1	0	1	0	0	0	0	0	0	0	1.2	75
1	0	1	1	0	0	0	0	0	0	0.6	37.5
1	1	0	0	0	0	0	0	0	0	0.3	18.75
1	1	0	1	0	0	0	0	0	0	0.15	9.375
1	1	1	0	0	0	0	0	0	0	0.075	4.6875
1	1	1	1	0	0	0	0	0	0	0.0375	2.34375

8650A 8651A

Set terminal	CTL4	CTL5	CTL6	CTL1	CTL2	CTL3	CTL4	CTL5	CTL6	Output frequency	Baud rate output example (to/16)
0	0	0	0	0	0	0	0	0	0	60k	6000bits/sec.
0	0	1	0	0	0	0	0	0	0	6k	600
0	1	0	0	0	0	0	0	0	0	30k	300
0	1	1	0	0	0	0	0	0	0	20k	200
1	0	0	0	0	0	0	0	0	0	15k	150
1	0	1	0	0	0	0	0	0	0	12k	120
1	1	0	0	0	0	0	0	0	0	10k	100
1	1	1	0	0	0	0	0	0	0	5k	50

8650B 8651B

Set terminal	CTL4	CTL5	CTL6	CTL1	CTL2	CTL3	CTL4	CTL5	CTL6	Output frequency	Baud rate output example (to/16)
0	0	0	0	0	0	0	0	0	0	100k	10000bits/sec.
0	0	1	0	0	0	0	0	0	0	10k	1000
0	1	0	0	0	0	0	0	0	0	50k	5000
0	1	1	0	0	0	0	0	0	0	33.3k	3333
1	0	0	0	0	0	0	0	0	0	25k	2500
1	0	1	0	0	0	0	0	0	0	20k	2000
1	1	0	0	0	0	0	0	0	0	16.6k	1666
1	1	1	0	0	0	0	0	0	0	8.3k	833

8650E 8651E

Set terminal	CTL4	CTL5	CTL6	CTL1	CTL2	CTL3	CTL4	CTL5	CTL6	Output frequency	Baud rate output example (to/16)
0	0	0	0	0	0	0	0	0	0	32768	32768
0	0	1	0	0	0	0	0	0	0	3276.8	3276.8
0	1	0	0	0	0	0	0	0	0	16384	16384
0	1	1	0	0	0	0	0	0	0	10922.6	10922.6
1	0	0	0	0	0	0	0	0	0	8192	8192
1	0	1	0	0	0	0	0	0	0	6553.6	6553.6
1	1	0	0	0	0	0	0	0	0	5461.3	5461.3
1	1	1	0	0	0	0	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 (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	2.4	150
1	0	0	0	0	1	1.2	75
1	1	0	0	0	1	0.6	37.5
1	1	1	0	0	1	0.3	18.75

THE CRYSTALMASTER



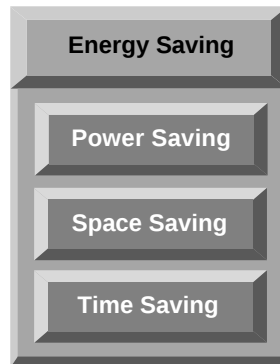
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Power saving technology provides low power consumption at low voltages.

Space saving technology provides further reductions in product size and weight through super-precise processing and high-density assembly technology.

Time saving technology shortens the time required for design and development on the customer side and shortens delivery times.



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In the industrial sector, leading priorities include measures to counter the greenhouse effect by reducing CO₂, measures to preserve the global environment, and the development of energy-efficient products. Environmental problems are of global concern, and although the contribution of energy-saving technology developed by EPSON may appear insignificant, we seek to contribute to the development of energy-saving products by our customers through the utilization of our electronic devices. EPSON is committed to the conservation of energy, both for the sake of people and of the planet on which we live.

Resource Saving



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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Part Numbering System

Selectable-Output Crystal Oscillators

SPG-8640

Selectable-Output Crystal Oscillators

Frequency Tolerance Characteristics

SPG-8640 $\pm 100 \times 10^{-6}$

SPG-8650 $\pm 50 \times 10^{-6}$

SPG-8651 $\pm 5 \times 10^{-6}$

Oscillation Source Frequency

SPG-8640AN - 600kHz

SPG-8640BN - 1MHz

SPG-8640CN - 768kHz

SPG-8650A - 60kHz

SPG-8650B - 100kHz

SPG-8650C - 96kHz

SPG-8650E - 32.768kHz

SPG-8651A - 60kHz

SPG-8651B - 100kHz

SPG-8651E - 32.768kHz

Blank

Packaging

Packaged in Sticks of
25 Pieces

EPSON

EPSON ELECTRONICS AMERICA, INC.

