



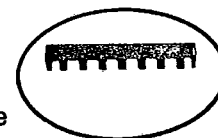
Technical Data

SaRonix

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8650/8651 Series Programmable Clock Pulse Generator

DESCRIPTION The 8650/8651 series is a hybrid IC composed of C-MOS IC and a tuning fork crystal oscillator packed in a conventional 16-pin DIP package. By setting 6 program leads, the 8650/8651 Series can generate 57 kinds of frequencies from the original frequency of the built-in crystal oscillator. This is done through a $1/1 \sim 1/12 \times 10^{-7}$ divider. Crystal oscillator providing original frequency has a wide range from 130 KHz to 30KHz. The time accuracy of 8650 is ± 50 ppm and 8651 is ± 5 ppm. This makes the 8650/8651 Series suitable for use as a clock generator in a wide range of applications, including clocks, instruments, computers, automatic machines and games.



Actual Size

FEATURES

- Standard DIP IC package contains both IC and crystal oscillator — 16 pin DIP package
- Low power consumption — less than 0.5mA
- Variety of presetting steps over wide span — 64 steps (57 of them unique)
- Wide output frequency range — 130KHz ~ 0.00025Hz
- TTL compatible — supply voltage: 5V, capable of driving standard TTL
- Time accuracy — 8650 Series: within ± 50 ppm
8651 Series: within ± 5 ppm
- Custom frequency is also available

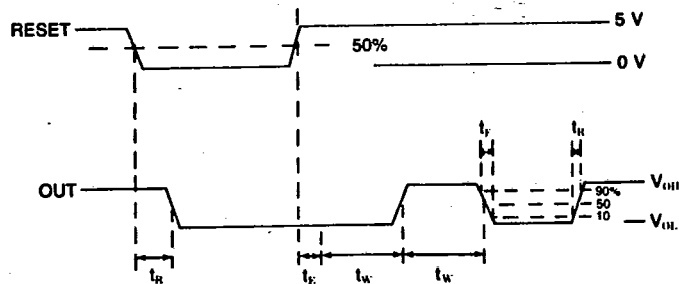
ABSOLUTE MAXIMUM RATINGS

Supply Voltage -0.3 to 8 V
 Operating Temperature .. 8650: -10 to 70°C (14 to 158°F)
 8651: -10 to 60°C (14 to 140°F)
 Storage Temperature 8650: -30 to 80°C (-22 to 176°F)
 8651: -10 to 70°C (14 to 158°F)

FREQUENCY CHARACTERISTICS

Frequency Tolerance 8650: Min. -50, max. 50 ppm
 8651: Min. -5, max. 5 ppm
 Aging Min. -3, max. 3 ppm/year
 Voltage Coefficient Typical 2 ppm/V
 Turnover Temperature ... 8650: Typical 25°C
 8651: Min. 20, typical 25, max. 30°C
 Temperature Coefficient .. Min. 0.03, typical 0.035, max. 0.04 ppm/°C²

TIMING CHART

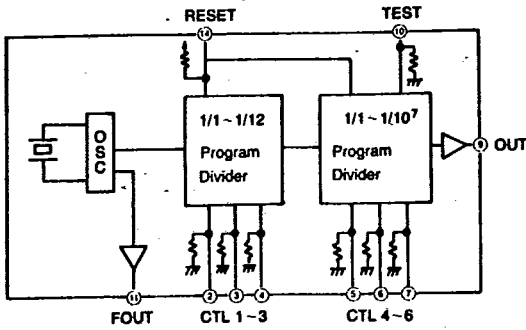


ELECTRICAL CHARACTERISTICS

T_a = 25°C (77°F), V_{DD} = 5 V

Symbol	Item	Min.	Typical	Max.	Unit	Note
V _{DD}	Supply voltage	4.0	5.0	6.0	V	
I _{DD}	Supply current	—	0.35	0.5	mA	
V _{IL}	Input voltage Logic: 0	0.0		1.0	V	
V _{IH}	Input voltage Logic: 1	V _{DD} -1.0		V _{DD}	V	
I _{IH1}	Input current Reset: Hi			0.5	μA	
I _{IL1}	Input current Reset: Lo	-15			μA	
I _{IH2}	Input current: CTL ₁ ~ TEST: Hi			15	μA	
I _{IL2}	Input current: CTL ₁ ~ TEST: Lo	-0.5			μA	
I _O	OUT PUT Current	5			mA	
t _R	Reset delay time			10	μsec	CL = 15pF
t _E	Timing error after reset released			15	μsec	CL = 15pF

BLOCK DIAGRAM



TERMINAL ASSIGNMENT

■ CTL1~CTL6 — Program divide ratio of original frequency. Pull-down register is built-in.

CTL1	CTL2	CTL3	Dividing ratio
0	0	0	1/1
0	0	1	1/10
0	1	0	1/2
0	1	1	1/3
1	0	0	1/4
1	0	1	1/5
1	1	0	1/6
1	1	1	1/12

CTL4	CTL5	CTL6	Dividing ratio
0	0	0	1/1
0	0	1	1/10
0	1	0	1/10 ²
0	1	1	1/10 ³
1	0	0	1/10 ⁴
1	0	1	1/10 ⁵
1	1	0	1/10 ⁶
1	1	1	1/10 ⁷

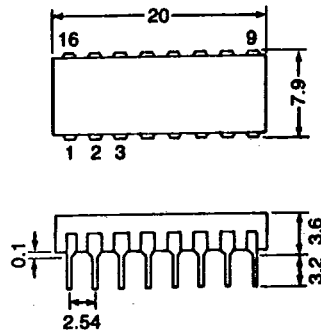
- OUT (Output) — Generate prearranged frequency with rectangular shape of pulse (Duty is 50%).
- TEST — Setting this terminal Hi multiplies prearranged output frequency by one thousand. Exception: in cases where the prearranged divide ratio is less than 1/1000.
- FOUT (Original Frequency Output) — Outputs the original frequency of internal crystal oscillator.
- RESET — Setting this terminal Lo, all counters are reset and output switches to Lo. Pull-down resistor is built-in.

PIN CONNECTIONS

Unit: mm

- 1 N.C.
- 2 CTL3
- 3 CTL2
- 4 CTL1
- 5 CTL6
- 6 CTL5
- 7 CTL4
- 8 V_{SS}
- 16 V_{DD}
- 15 N.C.
- 14 RESET
- 13 N.C.
- 12 N.C.
- 11 FOUT
- 10 TEST
- 9 OUT

N.C.: not connected to IC chip inside.



EXAMPLE: OUTPUT FREQUENCY WITH CRYSTAL OSCILLATOR OF 60KHz (8650A/8651A)

Unit: Hz

SETTING		CTL4	0	0	0	0	1	1	1	1
		CTL5	0	0	1	1	0	0	1	1
CTL1	CTL2	CTL6 CTL3	0	1	0	1	0	1	0	1
0	0	0	60K	6K	600	60	6	0.6	0.06	0.006
0	0	1	6 K	600	60	6	0.6	0.06	0.006	0.0006
0	1	0	30K	3K	300	30	3	0.3	0.03	0.003
0	1	1	20K	2K	200	20	2	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	1K	100	10	1	0.1	0.01	0.001
1	1	1	5 K	500	50	5	0.5	0.05	0.005	0.0005



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OUTPUT FREQUENCIES OF STANDARD TYPES (3)

8650-A

UNIT: Hz

SETTING			CTL4	0	0	0	0	1	1	1	1
			CTL5	0	0	1	1	0	0	1	1
CTL1	CTL2	CTL3	CTL6	0	1	0	1	0	1	0	1
0	0	0		60K	6K	600	60	6	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	3K	300	30	3	0.3	0.03	0.003
0	1	1	*	20K	2K	200	20	2	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	1K	100	10	1	0.1	0.01	0.001
1	1	1		5K	500	50	5	0.5	0.05	0.005	0.0005

8650-B

SETTING			CTL4	0	0	0	0	1	1	1	1
			CTL5	0	0	1	1	0	0	1	1
CTL1	CTL2	CTL3	CTL6	0	1	0	1	0	1	0	1
0	0	0		100K	10K	1K	100	10	1	0.1	0.01
0	0	1		10K	1K	100	10	1	0.1	0.01	0.001
0	1	0		50K	5K	500	50	5	0.5	0.05	0.005
0	1	1	*	33.3K	3.3K	333.3	33.3	3.33	0.33	0.033	0.003
1	0	0		25K	2.5	250	25	2.5	0.25	0.025	0.0025
1	0	1		20K	2K	200	20	2	0.2	0.02	0.002
1	1	0		16.6K	1.6K	166.6	16.6	1.6	0.16	0.016	0.0016
1	1	1		8.3K	833.3	83.3	8.3	0.83	0.083	0.0083	0.00083

* DUTY 1/3

**DUTY 2/5

8. 8651-A

UNIT: Hz

SETTING			CTL4	0	0	0	0	1	1	1	1
			CTL5	0	0	1	1	0	0	1	1
CTL1	CTL2	CTL3	CTL6	0	1	0	1	0	1	0	1
0	0	0		60K	6K	600	60	6	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	3K	300	30	3	0.3	0.03	0.003
0	1	1		* 20K	2K	200	20	2	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	1K	100	10	1	0.1	0.01	0.001
1	1	1		5K	500	50	5	0.5	0.05	0.005	0.0005

9. 8651-B

SETTING			CTL4	0	0	0	0	1	1	1	1
			CTL5	0	0	1	1	0	0	1	1
CTL1	CTL2	CTL3	CTL6	0	1	0	1	0	1	0	1
0	0	0		100K	10K	1K	100	10	1	0.1	0.01
0	0	1		10K	1K	100	10	1	0.1	0.01	0.001
0	1	0		50K	5K	500	50	5	0.5	0.05	0.005
0	1	1		* 33.3K	3.3K	333.3	33.3	3.33	0.33	0.033	0.003
1	0	0		25K	2.5K	250	25	2.5	0.25	0.025	0.0025
1	0	1		20K	2K	200	20	2	0.2	0.02	0.002
1	1	0		16.6K	1.6K	166.6	16.6	1.6	0.16	0.016	0.0016
1	1	1		8.3K	833.3	83.3	8.3	0.83	0.083	0.0083	0.00083

* DUTY 1/3

** DUTY 2/5



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NEW MODEL 8650-C

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 Date August 1, 1981
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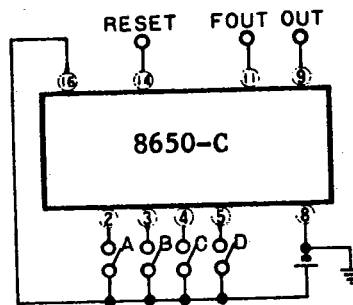
Unit: Hz

SETTING		CTL4	0	0	0	0	1	1	1	1
		CTL5	0	0	1	1	0	0	1	1
CTL1	CTL2	CTL6 CTL3	0	1	0	1	0	1	0	1
0	0	0	96 k	9.6 k	960	96	9.6	0.96	0.096	0.0096
0	0	1	9.6 k	960	96	9.6	0.96	0.096	0.0096	0.00096
0	1	0	48 k	4.8 k	480	48	4.8	0.48	0.048	0.0048
0	1	1	32 k *	3.2 k	320	32	3.2	0.32	0.032	0.0032
1	0	0	24 k	2.4 k	240	24	2.4	0.24	0.024	0.0024
1	0	1	19.2k **	1.92k	192	19.2	1.92	0.192	0.0192	0.00192
1	1	0	16 k	1.6 k	160	16	1.6	0.16	0.016	0.0016
1	1	1	8 k	800	80	8	0.8	0.08	0.008	0.0008

* Duty 1/3 **Duty 2/5

APPLICATION: BAUDRATE GENERATOR

SETTING				DIVIDE RATIO	f	BAUDRATE (f/16)
CTL1	CTL2	CTL3	CTL6			
0	0	0	0	1	96KHz	6000 ^{bit} / _{sec}
1	0	1	0	1/5	19.2k	1200
0	0	1	0	1/10	9.6k	600
0	1	0	1	1/20	4.8k	300
0	1	1	1	1/30	3.2k	200
1	0	0	1	1/40	2.4k	150
1	1	0	1	1/60	1.6k	100
1	1	1	1	1/120	0.8k	50



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