TONE GENERATOR

The S-7116A is a tone generator that uses the CMOS process. It is composed of 11-stage program counters, 8-stage Johnson counter, program decoders and a resistor ladder network.

■ Features

- Highly accurate and stable tones of both 38 frequencies (ranging from 67Hz to 250.3Hz) and 19 frequencies (ranging from 500Hz to 2975Hz) are attained by using a 3.579545MHz quartz crystal oscillator.
- Well suited for battery driving because of low power consumption due to the use of CMOS.
  Standby current: 60μA (max.) at V_{DD}=5.0V
  Operating current: 1mA (max.) at V_{DD}=5.0V
- Reduction of current consumption is attainable by employing chip-enable terminals. Oscillation will activate only when CE1="H" and $\overline{CE2}$="L" Otherwise, the standby mode is in operation
- False sinewave tones are generated by a 5-bit D/A converter.
- The standby mode is always in operation, except when codes of P1 to P6 are input
- 6-program input(built-in pull-down resistor)

■ Block Diagram

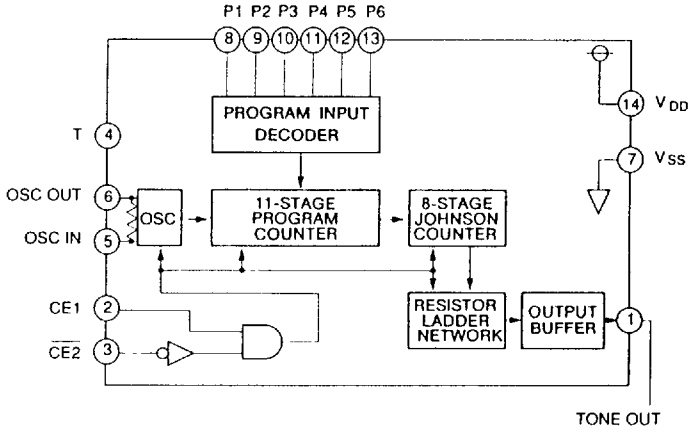


Figure 1

*Program Terminal
CE1 with a built-in pull-down resistor
$\overline{CE2}$ with a built-in pull-up resistor
*T=Test Terminal

■ Pin Arrangement 14-PIN DIP

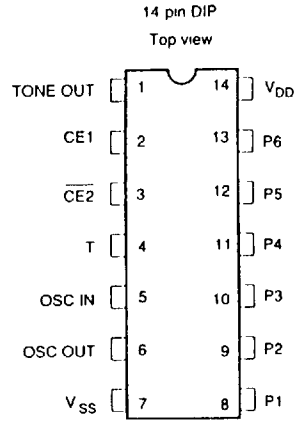


Figure 2

■ Absolute Maximum Ratings

Table 1

Item	Symbol	Min.	Max.	Unit
Power supply voltage	$V_{DD}-V_{SS}$		12.0	V
Input voltage	V_{IN}	$V_{SS}-0.3$	$V_{DD}+0.3$	
Output voltage	V_{OUT}	$V_{SS}-0.3$	$V_{DD}+0.3$	
Operating ambient temperature	T_{opr}	−25	+70	°C
Storage temperature	T_{stg}	−40	+125	
Power dissipation	P_D		300	mW

■ Electrical Characteristics

Table 2

f_{OSC}=3.579545MHz Ta=25°C

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power supply voltage	V_{DD}	Ta=−25 to +70°C	3.0		10.0	V
Operating supply current	I_{DDO}	V_{DD}=5.0V, CE1=V_{DD} $\overline{CE2}$=V_{SS}, $C_G=C_D$=10pF		0.4	1.0	mA
Standby supply current	I_{DDS}	V_{DD}=5.0V Input Open R_L=50kΩ		20	60	μA

■ Tone Output

Table 3

Item	Symbol	Conditions	Min	Typ	Max.	Unit
Tone output level	V_{OT}	V_{DD}=5.0(V), R_L=50kΩ	240	340	440	mVrms
Deviation in power supply voltage at output level		V_{DD}=3.0 to 10.0 (V) R_L=50kΩ	−2.5		2.5	dB
Distortion rate	T_{HD}	V_{DD}=3.0(V), R_L=50kΩ			10	%
Deviation in temperature at output level		V_{DD}=5.0(V), R_L=50kΩ Ta=−10 to +60 (°C)		±0.1		%/°C

■ Program Input

*CE1 input
(input terminal with built-in pull-down resistor)

Table 4

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
High-level input current	$I_{IH}1$	V_{DD}=5.0(V), V_{IH}=5.0(V)		5	15	μA
High-level input current (at open)	$I_{IH}2$	V_{DD}=5.0(V), V_{IH}=0.5(V)	8	20	40	

*$\overline{CE2}$ input
(input terminal with built-in pull-up resistor)

Table 5

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Low-level input current	$\lvert I_{IL}1 \rvert$	V_{DD}=5.0(V), V_{IL}=0(V)		4	12	μA
Low-level input current (at open)	$\lvert I_{IL}2 \rvert$	V_{DD}=5.0(V), V_{IL}=4.5(V)	5	15	35	
Input voltage	V_{IH}		0.8×V_{DD}		V_{DD}	V
	V_{IL}		V_{SS}		0.2×V_{DD}	

■ Codes and Tone Frequencies of P1 to P6

f_{osc}=3.579545 MHz

Setting	Calculation output	Dividing ratio	P1	P2	P3	P4	P5	P6	Setting	Calculation output	Dividing ratio	P1	P2	P3	P4	P5	P6
67.0	66.98	1670	1						500	499.4	224	1	1	1			1
71.9	71.89	1556		1					600	601.4	186				1		1
74.4	74.38	1504	1	1					700	699.1	160	1			1		1
77.0	76.99	1453			1				800	799.0	140		1		1		1
79.7	79.67	1404	1		1				900	902.1	124	1	1		1		1
82.5	82.49	1356		1	1				1000	998.8	112			1	1		1
85.4	85.39	1310	1	1	1				1600	1598 0	70	1		1	1		1
88.5	88.50	1264				1			1700	1694.9	66		1	1	1		1
91.5	91.46	1223	1			1			1750	1747.8	64	1	1	1	1		1
94.8	94.80	1180		1		1			1800	1804.2	62					1	1
97.4	97.44	1148	1	1		1			1300	1300.7	86	1				1	1
100.0	99.96	1119			1	1			2000	1997.5	56		1			1	1
103.5	103.48	1081	1		1	1			2200	2193.3	51	1	1			1	1
107.2	107.25	1043		1	1	1			2975	2943.7	38			1		1	1
110.9	110.86	1009	1	1	1	1			2550	2542.3	44	1		1		1	1
114.8	114.85	974					1		2295	2282.9	49		1	1		1	1
118.8	118.75	942	1				1		2125	2110.6	53	1	1	1		1	1
123.0	123.06	909		1			1		1275	1271.1	88				1	1	1
127.3	127.26	879	1	1			1		1445	1452.7	77	1			1	1	1
131.8	131.76	849			1		1										
136.5	136.58	819	1		1		1										
141.3	141.24	792		1	1		1										
146.2	146.22	765	1	1	1		1										
151.4	151.37	739				1	1										
156.7	156.67	714	1			1	1										
162.2	162.12	690		1		1	1										
167.9	167.96	666	1	1		1	1										
173.8	173.70	644			1	1	1										
179.9	179.84	622	1		1	1	1										
186.2	186.12	601		1	1	1	1										
192.8	192.86	580	1	1	1	1	1										
203.5	203.38	550						1									
210.7	210.66	531	1					1									
218.1	218.05	513		1				1									
225.7	225.53	496	1	1				1									
233.6	233.53	479			1			1									
241.8	241.60	463	1		1			1									
250.3	250.25	447		1	1			1									

(Note) Vertical line 1 denotes V_{DD}; blank, V_{SS} or Open.

■ Application Circuit

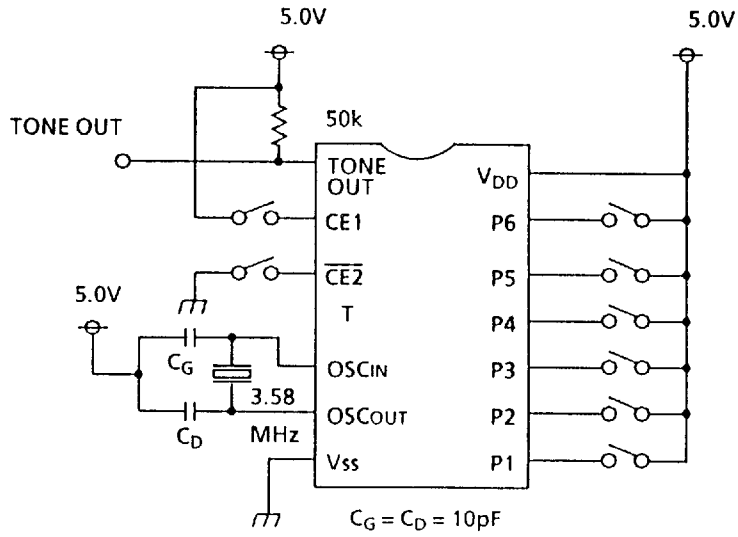
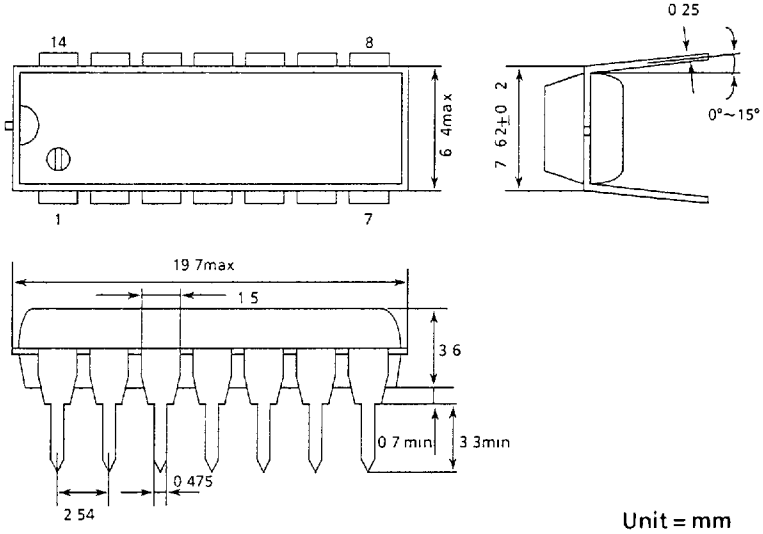


Figure 3

■ Dimensions

14-pin DIP



Unit = mm

Figure 4