

**ΩmniWavejr. SAMPLE ROMS**

The ks0174-1M is a 1M-byte sample ROM for the KS0164 ΩmniWavejr. The ROM utilizes a word mode 524, 288x16 bit organization (8M-bit).

The KS0174-2M is a 2M-byte sample ROM for the KS0164 ΩmniWavejr. The ROM utilizes a word mode 1,048,576 x 16 bit organization (16M-bit).

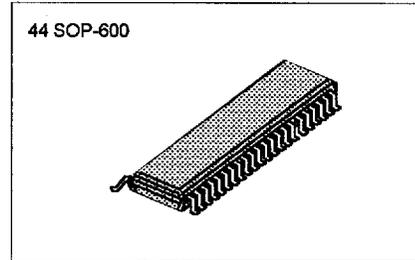
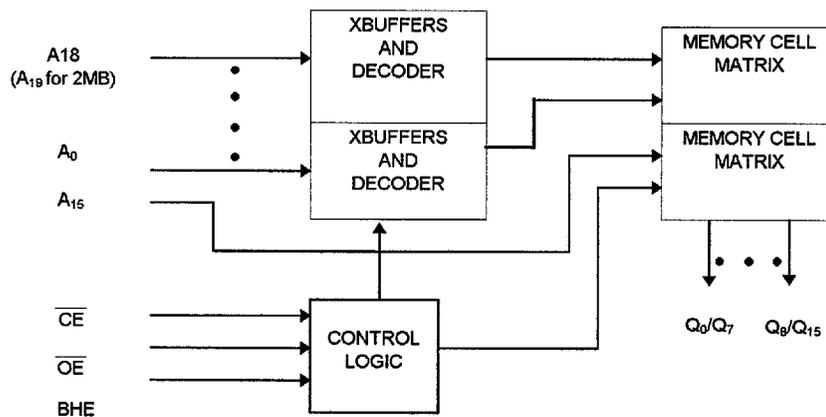
Both ROM support General MIDI (GM), MT-32, and a large portion of General Sound (GS) sample sets. The ROMs are fabricated using a fully static silicon gate CMOS process technology.

The ROMs operate with a single 5 volt power supply, and all inputs and outputs are TTL compatible. Both ROMs are designed to interface directly to the Samsung KS0164 ΩmniWavejr wavetable synthesizer.

**FEATURES**

- General MIDI (GM) sample set
- MT-32 compatible, includes 8 of 9 GS drum sets
- Current consumptin :  
Operating : 60mA (max.), Standby: 50μA (max.)
- Fully static operation
- Interfaces directly to the Samsung ΩmniWavejr KS0164 wavetable synthesizer
- Includes patch code and ΩmniWave CPU code
- All inputs and outputs are TTL compatible
- Single +5v supply wih power down mode(CE)
- 44-Pin Small Outline Package (SOP)

**BLOCK DIAGRAM**



**ORDERING INFORMATION (1M-BYTE)**

Device	Package	Temperature Range
KS0174-1M	44 SOP	0 °~+70°C

**ORDERING INFORMATION (1M-BYTE)**

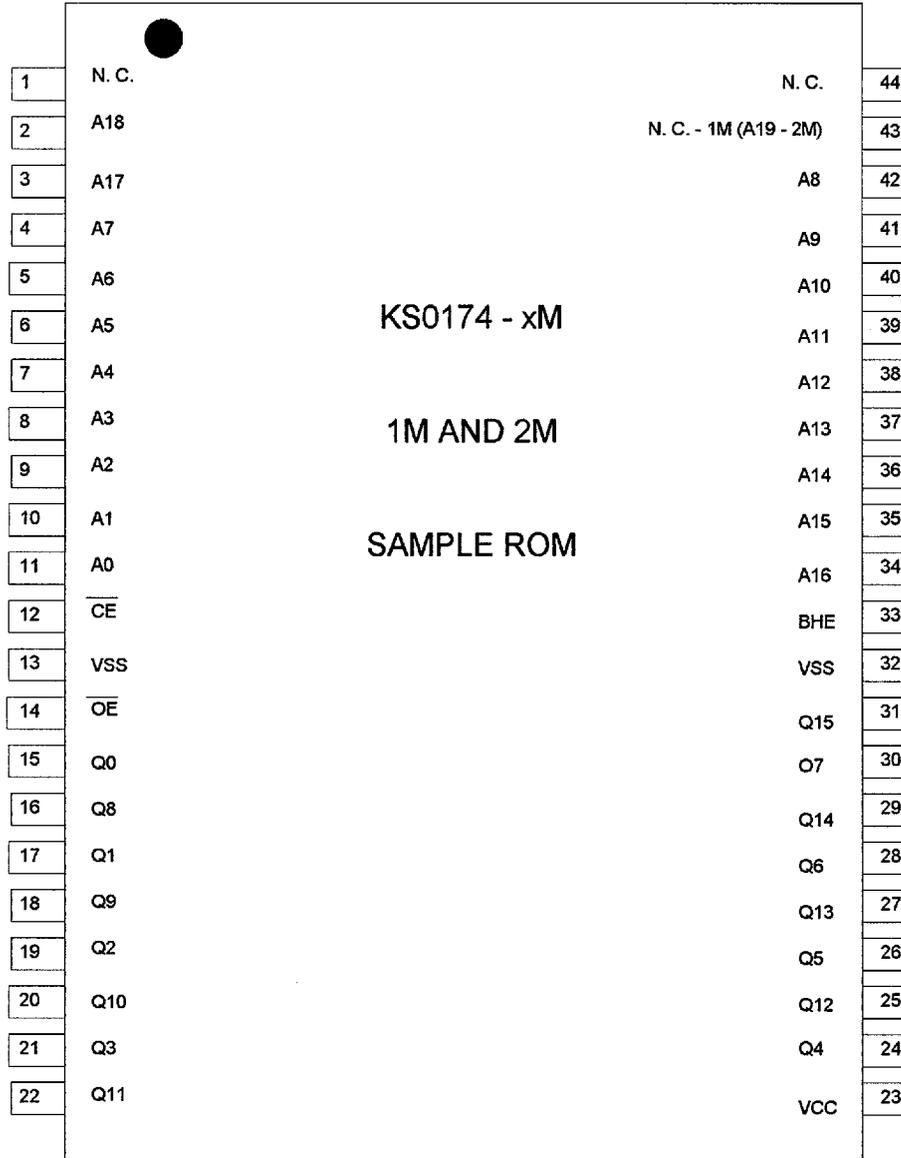
Device	Package	Temperature Range
KS0174-1M	44 SOP	0 °~+70°C

**RELATED DEVICES**

- KS0164 ΩmniWavejr Synthesizer
- KDA0316-bit D/A Converter
- KF353 Dual Operational Amplifier
- 78L05A +5v Voltage Regulator

PIN ASSIGNMENT - 44 PIN SOP

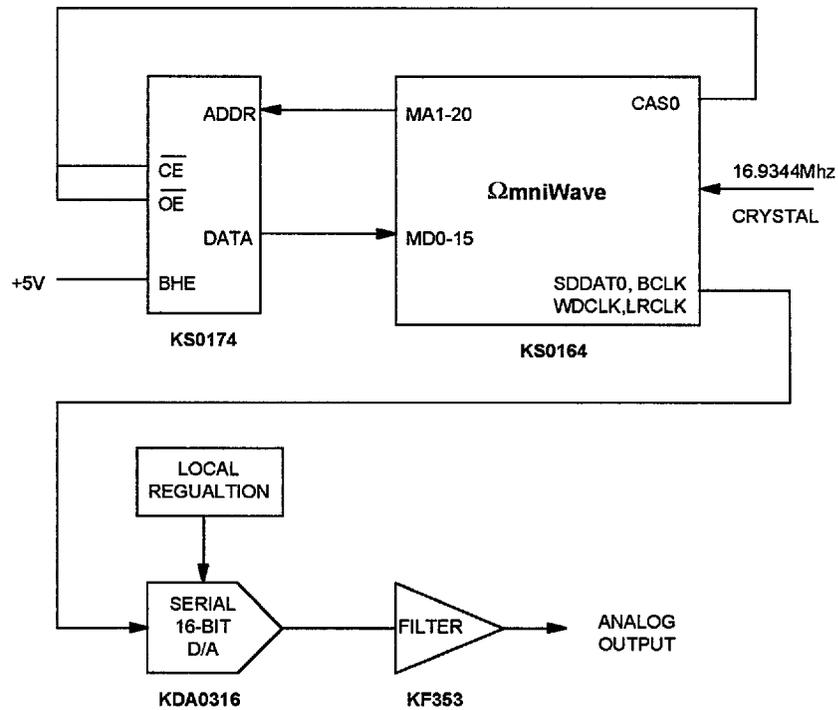
Figure 1. Pinout



**TYPICAL APPLICATION**

The KS0174 is shown in a typical application with the KS0164 wavetable sumtjesozer. A wavetable daughter card can be cpmstricter wotj tjese few components.

**Figure 2. Typical application**



**Table 1: PIN DESCRIPTION**

Pin Name	Pin#	Type	Description
A <sub>0</sub> - A <sub>18</sub>	1 -11, 34-42		Address Input. TTL
A <sub>19</sub>	43 (2M only)		MSB Address Input for 2M ROM. NC on 1M.
Q <sub>0</sub> - Q <sub>15</sub>	15-22, 24-31	O	Data Outputs. TTL
BHE	33		Word Mode Select, Always set WORD mode, connect to VCC
CE	12		Chip Enable. TTL
OE	14		Output Enable. TTL
V <sub>CC</sub>	23	PWR	Power (+5v)
V <sub>SS</sub>	13,32	GND	Ground
N.C.	1,44	—	No Connection
N.C.	43 (1M only)	—	No Connection on 1M, can connect to MA <sub>20</sub> of 164 if desired.

**Device Mode Selection**

Table 2 indicates the various mode selection parameters for the wavetable ROM. CE and OE are normally connected to the CASO line of the KS0164. The KS0164 will control the power cycling of the ROM. BHE is always tied high

**Table 2 : MODE Selection**

CE	OE	MODE	DATA	POWER
H	X	Standby	High-z	Standby
L	H	Operating	High-z	Active
L	L	Operating	Q <sub>0</sub> -Q <sub>15</sub> : D <sub>out</sub>	Active

**Table 3 : NUMERICAL PIN LIST**

Pin #	Name						
1	N.C	12	C <sub>E</sub>	23	V <sub>CC</sub>	34	A <sub>16</sub>
2	A <sub>18</sub>	13	V <sub>SS</sub>	24	Q <sub>4</sub>	35	A <sub>15</sub>
3	A <sub>17</sub>	14	O <sub>E</sub>	25	Q <sub>12</sub>	36	A <sub>14</sub>
4	A <sub>7</sub>	15	Q <sub>0</sub>	26	Q <sub>5</sub>	37	A <sub>13</sub>
5	A <sub>6</sub>	16	Q <sub>8</sub>	27	Q <sub>13</sub>	38	A <sub>12</sub>
6	A <sub>5</sub>	17	Q <sub>1</sub>	28	Q <sub>6</sub>	39	A <sub>11</sub>
7	A <sub>4</sub>	18	Q <sub>9</sub>	29	Q <sub>14</sub>	40	A <sub>10</sub>
8	A <sub>3</sub>	19	Q <sub>2</sub>	30	Q <sub>7</sub>	41	A <sub>9</sub>
9	A <sub>2</sub>	20	Q <sub>10</sub>	31	Q <sub>15</sub>	42	A <sub>8</sub>
10	A <sub>1</sub>	21	Q <sub>3</sub>	32	V <sub>SS</sub>	43	N.C. (A <sub>19</sub> )
11	A <sub>0</sub>	22	Q <sub>11</sub>	33	BHE	44	N.C.

**Table 4 : ALPHABETICAL PIN LIST**

Name	Pin #	Name	Pin #	Name	Pin #	Name	Pin #
A <sub>0</sub>	10	A <sub>11</sub>	39	Q <sub>2</sub>	15	Q <sub>11</sub>	22
A <sub>1</sub>	9	A <sub>12</sub>	38	Q <sub>3</sub>	17	Q <sub>12</sub>	25
A <sub>2</sub>	8	A <sub>13</sub>	37	Q <sub>4</sub>	19	Q <sub>13</sub>	27
A <sub>3</sub>	7	A <sub>14</sub>	36	Q <sub>5</sub>	21	Q <sub>14</sub>	29
A <sub>4</sub>	6	A <sub>15</sub>	35	Q <sub>6</sub>	24	Q <sub>15</sub>	31
A <sub>5</sub>	5	A <sub>16</sub>	34	Q <sub>7</sub>	26	N.C.	1
A <sub>6</sub>	4	A <sub>17</sub>	3	Q <sub>8</sub>	28	N.C. (A <sub>19</sub> )	43
A <sub>7</sub>	3	A <sub>18</sub>	2	Q <sub>7</sub>	30	N.C.	44
A <sub>8</sub>	42	BHE	33	Q <sub>8</sub>	16	V <sub>CC</sub>	23
A <sub>9</sub>	41	CE	12	Q <sub>9</sub>	18	V <sub>SS</sub>	13
A <sub>10</sub>	40	OE	14	Q <sub>10</sub>	20	V <sub>SS</sub>	32

## GENERAL DESCRIPTION

The ROM contains various data for the KS0164 waverable synthesizer. All of the samples were custom created by recording instruments and sounds using a digital audio tape (DAT) recorder. After a rather elaborate process of editing, tuning and looping the DAT recordings, A 16 bit uncompressed sample set, specific to the architecture of the KS0164, was created. This set contains 16bit linear (no compression) words sampled at 44.1 Khz, and is slightly larger than the ROM based 2M set that Samsung offers. This set includes the MMA define General MIDI sample et and a large portion of the General Sound (GS) extensions. Eigh of the nine GS drum sets are included. The excluded ninth drum set is the SFX (sound effects) map. The 2M byte and 1M byte sample sets are derived from the master 16 bit linear set. The 2M set contains mostly 16 bit linear samples, yet some are compressed so that all the samples fit in a single 2M ROM. The 1M set contains u-law compressed samples of the 16 bit linear set. All of the samples in the 1M set are compressed.

In addition to the wave samples, the ROM contains the patch set requirde for implementing GM, GS, and MT-32. A separate ROM is not require for the patches. Other code is included in the sample ROM for the embedded CPU of the KS0164. No additional memory is required for the processor code.

Synthesizers are frequently compared to the Roland Sound Canvas ; therefore, it is beneficial to describe some details of the Roland Sound Canvas, General Sound, and how it relates to the Samsung KS0164/ 174. The Roland Sound canvas was the first commercially available, General MIDI synthesizer sold at a reasonable cost. The Sound Canvas is a 24 voice, 16- part multi-timbral synthesizer that includes built in reverb and chorus. The Sound Canvas includes 128 General MIDI sounds, 61 variations of these sounds, MT-32 sounds, and nine different drum sets (GS). The MT-32 is an earlier Roland synthesizer popular before General MIDI. Some older computer games supported MT-32, but today, General MIDI is the most widely accepted MIDI foramt. Different "General Sound" compatible synthesizers include a varying number of total drum maps. The Roland Sound Canvas included nine Gs drum sets. Other less expensive GS compatible Roland synthesizers (SC-7) include only 6 drum sets. Some newer products from Roland (SC-88) offer 14 different drum sets. With all of these variations, the original 9 drum sets are considered the standard for full GS compatibility.

The KS0164 Omniwave is a 32 voice, 16-part multi-timbral synthesizer. Compared to the Sound Canvas, the KS0164 increases the number of voices from 24 to 32. The present KS0164 requires external components for reverb and chorus. The KS0174 sample ROM includes all of the 128 General MIDI sounds, the 128 MT-32 sounds, and 8 of the 9 drum maps. A trade off was made to excede the unpopular SFX (sound effects, such as laughing, thunder, horse-gallop, etc.) drum set in favor of superior sample resolutions of the more popular GM, MT-32, and GS sounds. The GS extensions generally are not used in computer games, but GS is occasionally found in MIDI musical sequences. GM has been the standard for PC based games.

The following 2 tables list all of the sounds included in the Samsung sample ROMs. General MIDI includes all of the samples listed in the "GS Mode " column, from program number 1 to 128. General MIDI also includes a subset of the " Standard" GS drum set shown in Table 6 . The General MIDI "Standard" Drum Map sub-set includes the drum sounds from Key 35 to key 81 only. The remaining difference between the Roland Sound Canvas and the Samsung sample ROMs are the exclusion of superior samples of the popular GM sound set.

Table 5 : MIDI and MT-32 Instrument sounds

Prg #	GS Mode	MT-32 Mode	Prg #	GS Mode	MT-32 Mode
1	Acoustic Grand Piano	Acoustic Piano 1	32	Guitar Harmonics	Synth Bass 4
2	Bright Acoustic Piano	Acoustic Piano 2	33	Acoustic Upright Bass	Fantasy
3	Electric Grand Piano	Acoustic Piano 3	34	Fingered Electric Bass	Harmo Pan
4	Honky-tonk Piano	Electric Piano 1	35	Picked Electric Bass	Chorale
5	Rhodes Piano	Electric Piano 2	36	Fretless Electric Bass	Glasses
6	DX-7 Piano	Electric Piano 3	37	Slap Bass 1	Soudtrack
7	Harpsichord	Electric Piano 4	38	Slap Bass 2	Atmosphere
8	Clavinet	Honky-tonk Piano	39	Synth Bass 1	Warm Bell
9	Celeste	Electronic Organ 1	40	Synth Bass 2	Funny Vox
10	Glockenspiel	Electronic Organ 2	41	Violin	Echo Bell
11	Music Box	Electronic Organ 3	42	Viola	Ice Rain
12	Vibraphone	Electronic Organ 4	43	Cello	Oboe 2001
13	Marimba	Pipe Organ 1	44	Contrabass	Echo Pan
14	Xylophone	Pipe Organ 2	45	Tremolo Strings	Doctor Solo
15	Tubular Bell	Pipe Organ 3	46	Piaaicato Strings	School Daze
16	Dulcimer	Accordion	47	Harp	Bellsinger
17	Drawbar Organ	Harpsichord 1	48	Timpani	Square Wave
18	Percussive Organ	Harpsichord 2	49	Marcato String Section	String Section 1
19	Rock Orgnan	Harpsichord 3	50	Legato String Section	String Section 2
20	Pipe Organ	Clavinet 1	51	Synth Strings 1	String Section 3
21	Reed Organ	Clavinet 2	52	Synth Strings 2	Pizzicato
22	Accordion	Clavinet 3	53	Choir Aahs	Violin 1
23	Harmonica	Celeste 1	54	Voice Doohs	Violin 2
24	Tango Accordion	Celeste 2	55	Synth Voice	Cello 1
25	Acoustic Nylon Guitar	Synth Brass 1	56	Orchestra Hit	Cello 2
26	Acoustic Steel Guitar	Synth Brass 2	57	Trumpet	Contrabass
27	Jazz Guitar	Synth Brass 3	58	Trombone	Harp 1
28	Clean Electric Guitar	Synth Brass 4	59	Tuba	Harp 2
29	Muted Electric Guitar	Synth Bass 1	60	Muted Trumpet	Guitar 1
30	Overdrive Guitar	Synth Bass 2	61	French Horn	Guitar 2
31	Distortion Guitar	Synth Bass 3	62	Brass Section	Elctric Guitar 1

Prg #	GS Mode	MT-32 Mode	Prg #	GS Mode	MT-32 Mode
63	Synth Brass 1	Electric Guitar 2	96	Sweep Pad	Brass Section 1
64	Synth Brass 2	Sitar	97	Ice Rain	Brass Section 2
65	Soprano Sax	Acoustic Bass 1	98	Soundtrack	Vibe 1
66	Alto Sax	Acoustic Bass 2	99	Crystal	Vibe 2
67	Tenor Sax	Electric Bass 1	100	Atmosphere	Synth Mallet
68	Baritone Sax	Electric Bass 2	101	Brightness	WindBell
69	Oboe	Slap Bass 1	102	Goblins	Glockenspiel
70	English Horn	Slap Bass 2	103	Echo Drops	Tublar Bell
71	Bassoon	Fretless 1	104	Star Theme	Xylophone
72	Clarinet	Fretless 2	105	Sitar	Marimba
73	Piccolo	Flute 1	106	Banjo	Koto
74	Flute	Flute 2	107	Shamisen	Sho
75	Recorder	Piccolo 1	108	Koto	Shakuhachi
76	Pan Flute	Piccolo 2	109	Kalimba	Whistle 1
77	Blown Bottle	Recorder	110	Bagpipe	Whistle 2
78	Shakuhachi	Pan Pipes	111	Fiddle	Bottle Blow
79	Whistle	Sax 1	112	Shanai	Breath Pipe
80	Ocarina	Sax 2	113	Tinkle Bell	Timpani
81	Square Wave	Sax 3	114	Agogo	Melodic Tom
82	Saw Wave	Sax 4	115	Steel Drum	Deep Snare
83	Calliope Synth	Clarinet 1	116	Woodblock	Electronic Percussion 1
84	Chiffer Lead	Clarinet 2	117	Taiko Drum	Electronic Percussion 2
85	Charang	Oboe	118	Melodic Tom	Taiko Drum
86	Solo Vox	English Horn	119	Synth Drum	Taiko Rim
87	Fiths Saw Wave	Bassoon	120	Reverse Cymbal	Cymbal
88	Bass & Lead	Harmonica	121	Guitar Fret Noise	Castanets
89	Fantasia	Trumpet 1	122	Breath Noise	Triangle
90	Warm Pad	Trumpet 2	123	Seashore	Orchestra Hit
91	Polysynth	Trombone 1	124	Bird	Telephone
92	Space Voice	Trombone 2	125	Telephone	Bird
93	Bowed Glass	French Horn 1	126	Helicopter	One Note Jam
94	Metallic Pad	French Horn 2	127	Applause	Water Bell
95	Halo Pad	Tuba	128	Gunshot	Jungle Tune

Table 6 : KS0174 GS Percussion Kits

MIDI Key	1 Standard Set	9 Room Set	17 Power Set	25 Electronic Set
D#1 27	High Q	High Q	High Q	High Q
E 1 28	Slap	Slap	Slap	Slap
F 1 29	Scratch Push	Scratch Push	Scratch Push	Scratch Push
F#1 30	Scratch Pull	Scratch Pull	Scratch Pull	Scratch Pull
G 1 31	Sticks	Sticks	Sticks	Sticks
G#1 32	Square Click	Square Click	Square Click	Square Click
A 1 33	Metro. Click	Metro. Click	Metro. Click	Metro. Click
A#1 34	Metro. Bell	Metro. Bell	Metro. Bell	Metro. Bell
B 1 35	Kick Drum 2	kick Drum 2	Kick Drum 2	Kick Drum 2
C 2 36	Kick Drum 1	Kick Drum 1	Power Kick 1	Electronic Kick
C#2 37	Side Stick	Side Stick	Side Stick	Side Stick
D 2 38	Snare Drum 1	Snare Drum 1	Gated Snare Drum	Snare Drum 1
D#2 39	Hand Clap	Hand Clap	Hand Clap	Hand Clap
E 2 40	Snare Drum 2	Snare Drum 2	Snare Drum 2	Electronic Snare Drum
F 2 41	Low Tom 2	Room Low Tom 2	Power Low Tom 2	Electronic Low Tom 2
F#2 42	Closed Hihat	Closed Hihat	Closed Hihat	Closed Hihat
G 2 43	Low Tom 1	Room Low Tom 1	Power Low Tom 1	Electronic Low Tom 1
G#2 44	Pedal Hihat	Pedal Hihat	Pedal Hihat	Pedal Hihat
A 2 45	Mid Tom 1	Room Mid Tom 2	Power Mid Tom 2	Electronic Mid Tom 2
A#2 46	Open Hihat	Open Hihat	Open Hihat	Open Hihat
B 2 47	Mid Tom 1	Room Mid Tom 1	Power Mid Tom 1	Electronic Mid Tom 1
C 3 48	High Tom 2	Room High Tom 2	Power High Tom 2	Electronic High Tom 2
C#3 49	Crash Cymbal 1	Crash Cymbal 1	Crash Cymbal 1	Crash Cymbal 1
D 3 50	High Tom 1	Room High Tom 1	Power High Tom 1	Electronic High Tom 1
D#3 51	Ride Cymbal 1	Ride Cymbal 1	Ride Cymbal 1	Ride Cymbal 1
E 3 52	Chinese Cymbal	Chinese Cymbal	Chinese Cymbal	Chinese Cymbal
F 3 53	Ride Bell	Ride Bell	Ride Bell	Ride Bell
F#3 54	Tambourine	Tambourine	Tambourine	Tambourine
G 3 55	Splash Cymbal	Splash Cymbal	Splash Cymbal	Splash Cymbal
G#3 56	Cowbell	Cowbell	Cowbell	Cowbell
A 3 57	Crash Chmbal 2	Crash Cymbal 2	Crash Cymbal 2	Crash Cymbal 2

MIDI Key	1 Standard Set	9 Room Set	17 Power Set	25 Electronic Set
A#3 58	Vibraslap	Vibraslap	Vibraslap	Vibraslap
B 3 59	Ride Cymbal 2	Ride Cymbal 2	Ride Cymbal 2	Ride Cymbal 2
C 4 60	High Bongo	High Bongo	High Bongo	High Bongo
C#4 61	Low Bongo	Low Bongo	Low Bongo	Low Bongo
D 4 62	Muter High Conga	Muter High Conga	Muter High Conga	Muter High Conga
D# 4 63	High Conga	High Conga	High Conga	High Conga
E 4 64	Low Conga	Low Conga	Low Conga	Low Conga
F 4 65	Low Timbale	Low Timbale	Low Timbale	Low Timbale
F#4 66	High Timbale	High Timbale	High Timbale	High Timbale
G 4 67	High Agogo	High Agogo	High Agogo	High Agogo
G#4 68	Low Agogo	Low Agogo	Low Agogo	Low Agogo
A 4 69	Cabasa	Cabasa	Cabasa	Cabasa
A#4 70	Maracas	Maracas	Maracas	Maracas
B 4 71	Short Whistle	Short Whistle	Short Whistle	Short Whistle
C 5 72	Long Wistle	Long Wistle	Long Wistle	Long Wistle
C# 5 73	Short Guiro	Short Guiro	Short Guiro	Short Guiro
D 5 74	Long Guiro	Long Guiro	Long Guiro	Long Guiro
D#5 75	Claves	Claves	Claves	Claves
E 5 76	Hi Woodblock	Hi Woodblock	Hi Woodblock	Hi Woodblock
F 5 77	Low Woodbolck	Low Woodbolck	Low Woodbolck	Low Woodbolck
F#5 78	Mute Cuica	Mute Cuica	Mute Cuica	Mute Cuica
G 5 79	Open Cuica	Open Cuica	Open Cuica	Open Cuica
G#5 80	Mute Triangle	Mute Triangle	Mute Triangle	Mute Triangle
A 5 81	Open Triangle	Open Triangle	Open Triangle	Open Triangle
A#5 82	Shaker	Shaker	Shaker	Shaker
B 5 83	Jingle Bell	Jingle Bell	Jingle Bell	Jingle Bell
C 6 84	Bell Tree	Bell Tree	Bell Tree	Bell Tree
C#6 85	Castanets	Castanets	Castanets	Castanets
D 6 86	Mute Surdo	Mute Surdo	Mute Surdo	Mute Surdo
D#6 87	Open Surdo	Open Surdo	Open Surdo	Open Surdo

Table 7 : Continuation OF KS0174 GS Percussion Kits

MIDI Key	26 TR-808 Set	41 Brush Set	49 Orchestra Set	127 MT-32 Set
D#1 27	High Q	High Q	Closed Hihat	High Q
E 1 28	Slap	Slap	Pedal Hihat	Slap
F 1 29	Scratch Push	Scratch Push	Open Hihat	Scratch Push
F#1 30	Scratch Pull	Scratch Pull	Ride Cymbal	Scratch Pull
G 1 31	Sticks	Sticks	Sticks	Sticks
G#1 32	Square Click	Square Click	Square Click	Square Click
A 1 33	Metro. Click	Metro. Click	Metro. Click	Metro. Click
A#1 34	Metro. Bell	Metro. Bell	Metro. Bell	Metro. Bell
B 1 35	Kick Drum 2	kick Drum 2	Kick Drum 2	Kick Drum 2
C 2 36	TR-808 kick 1	Kick Drum 1	Concert Bass Drum	Kick Drum 1
C#2 37	TR-808 Rim Shot	Side Stick	Side Stick	Side Stick
D 2 38	TR-808 Snare Drum	Brush Tap	Concert Bass Drum	Snare Drum 1
D#2 39	Hand Clap	Brush Slap	Castanets	Hand Clap
E 2 40	Snare Drum 2	Brush Swirl	Snare Drum 2	Snare Drum 2
F 2 41	TR-808 Low Tom 2	Low Tom 2	Timpani F	Low Tom 2
F#2 42	TR-808 Closed Hihat	Closde Hihat	Timpani F#	Closed Hihat
G 2 43	TR-808 Low Tom 1	Room Low Tom 1	Timpani G	Low Tom 1
G#2 44	TR-808 Closed Hihat	Pedal Hihat	Timpani G#	Pedal Hihat
A 2 45	TR-808 Mid Tom 1	Mid Tom 2	Timpani A	Mid Tom 2
A#2 46	TR-808 Open Hihat	Open Hihat	Timpani A#	Open Hihat
B 2 47	TR-808 Mid Tom 1	Mid Tom 1	Timpani B	Mid Tom 1
C 3 48	TR-808 High Tom 2	High Tom 2	Timpani C	High Tom 2
C#3 49	Crash Cymbal 1	Crash Cymbal 1	Timpani C#	Crash Cymbal 1
D 3 50	TR-808 High Tom 1	High Tom 1	Timpani D	igh Tom 1
D#3 51	Ride Cymbal 1	Ride Cymbal 1	Timpani D#	Ride Cymbal 1
E 3 52	Chinese Cymbal	Chinese Cymbal	Timpani E	Chinese Cymbal
F 3 53	Ride Bell	Ride Bell	Timpani F	Ride Bell
F#3 54	Tambourine	Tambourine	Timbourine	Tambourine
G 3 55	Splash Cymbal	Splash Cymbal	Splash Cymbal	Splash Cymbal
G#3 56	TR-808 Cowbell	Cowbell	Cowbell	Cowbell
A 3 57	Crash Chmbal 2	Crash Cymbal 2	Concert Cymbal 2	Crash Cymbal 2

Table 7: Continuation of KS0174 GS Percussion Kits

MIDI Key	26 TR-808 Set	41 BrushSet	49 Orchestra Set	127 MT-32 Set
A#3 58	Vibraslap	Vibraslap	Vibraslap	Vibraslap
B 3 59	Ride Cymbal 2	Ride Cymbal 2	Concert Cymbal 1	Ride Cymbal 2
C 4 60	High Bongo	High Bongo	High Bongo	High Bongo
C#4 61	Low Bongo	Low Bongo	Low Bongo	Low Bongo
D 4 62	TR-808 High Conga	Muter High Conga	Muter High Conga	Muter High Conga
D# 4 63	TR-808 Mid Conga	High Conga	High Conga	High Conga
E 4 64	TR-808 Low Conga	Low Conga	Low Conga	Low Conga
F 4 65	Low Timbale	Low Timbale	Low Timbale	Low Timbale
F#4 66	High Timbale	High Timbale	High Timbale	High Timbale
G 4 67	High Agogo	High Agogo	High Agogo	High Agogo
G#4 68	Low Agogo	Low Agogo	Low Agogo	Low Agogo
A 4 69	Cabasa	Cabasa	Cabasa	Cabasa
A#4 70	Maracas	Maracas	Maracas	Maracas
B 4 71	Short Whistle	Short Whistle	Short Whistle	Short Whistle
C 5 72	Long Wistle	Long Wistle	Long Wistle	Long Wistle
C#5 73	Short Guiro	Short Guiro	Short Guiro	Short Guiro
D 5 74	Long Guiro	Long Guiro	Long Guiro	Long Guiro
D#5 75	TR-808 Claves	Claves	Claves	Claves
E 5 76	Hi Woodblock	Hi Woodblock	Hi Woodblock	Hi Woodblock
F 5 77	Low Woodbolck	Low Woodbolck	Low Woodbolck	Low Woodbolck
F#5 78	Mute Cuica	Mute Cuica	Mute Cuica	Mute Cuica
G 5 79	Open Cuica	Open Cuica	Open Cuica	Open Cuica
G#5 80	Mute Triangle	Mute Triangle	Mute Triangle	Mute Triangle
A 5 81	Open Triangle	Open Triangle	Open Triangle	Open Triangle
A#5 82	Shaker	Shaker	Shaker	Shaker
B 5 83	Jingle Bell	Jingle Bell	Jingle Bell	Jingle Bell
C 6 84	Bell Tree	Bell Tree	Bell Tree	Bell Tree
C#6 85	Castanets	Castanets	Castanets	Castanets
D 6 86	Mute Surdo	Mute Surdo	Mute Surdo	Mute Surdo
D#6 87	Open Surdo	Open Surdo	Open Surdo	Open Surdo
E 6 88			Applause	

### ABSOLUTE MAXIMUM RATINGS

Symbol	Characteristics	Min	Max	Unit
$V_{IN}$	Voltage on Any Pin Relative to VSS	-0.3	+7.0	V
$T_{BIAS}$	Temperature Under Bias	-10	+85	°C
$T_{STG}$	Storage Temperature	-55	+150	°C

Note : Functional operation under any of these conditions is NOT implied. Permanent device damage may occur if the "ABSOLUTE MAXIMUM RATINGS" are exceeded. Functional operation should be restricted to the conditions as detailed in the operational sections of this data sheet. Exposure to the absolute maximum ratings for extended periods may affect device reliability.

### RECOMMENDED OPERATING CONDITIONS

(Voltage reference to  $V_{SS}$ .  $T_A = 0$  to  $70^\circ\text{C}$ )

Symbol	Characteristics	Min	Typ	Max	Unit
$V_{CC}$	Supply Voltage	4.5	5.0	5.5	V
$V_{SS}$	Supply Voltage	0	0	0	V

### DC ELECTRICAL CHARACTERISTICS

Symbol	Characteristics	Test Condition	Min	Max	Unit
$I_{CC}$	Operation Current	$CE = OE = V_{IL}$ , $f = 6.7\text{MHz}$ all outputs open		60	$\text{mA}$
$I_{SB1}$	Standby Current (TTL)	$CE = V_{IH}$ , all outputs open		1	$\text{mA}$
$I_{SB2}$	Standby Current (CMOS)	$CE = V_{CC}$ , all outputs open		50	$\mu\text{A}$
$I_{IL}$	Input Leakage Current	$V_{IN} = 0$ to $V_{CC}$		-10	$\mu\text{A}$
$I_{LO}$	Output Leakage Current	$V_{OUT} = 0$ to $V_{CC}$		10	$\mu\text{A}$
$V_{IH}$	Input High Voltage, All Inputs		2.2	$V_{CC} + 0.3$	V
$V_{IL}$	Input Low Voltage, All Inputs		-0.3	0.8	V
$V_{OH}$	Output High Voltage Level	$I_{OH} = -400\mu\text{A}$	2.4	-	V
$V_{OL}$	Output Low Voltage Level	$I_{OL} = 2.1\text{mA}$	-	0.4	V

### CAPACITANCE

( $T_A = 25^\circ\text{C}$ ,  $f = 1.0\text{MHz}$ )

Symbol	Characteristics	Test Condition	Min	Max	Unit
$C_{OUT}$	Output Capacitance	$V_{OUT} = 0V$	-	12	pF
$C_{IN}$	Input Capacitance	$V_{IN} = 0V$	-	12	pF

### AC CHARACTERISTICS

( $T_A = 0$  to  $70^\circ\text{C}$ ,  $V_{CC} = 5V \pm 10\%$ , Unless otherwise noted)

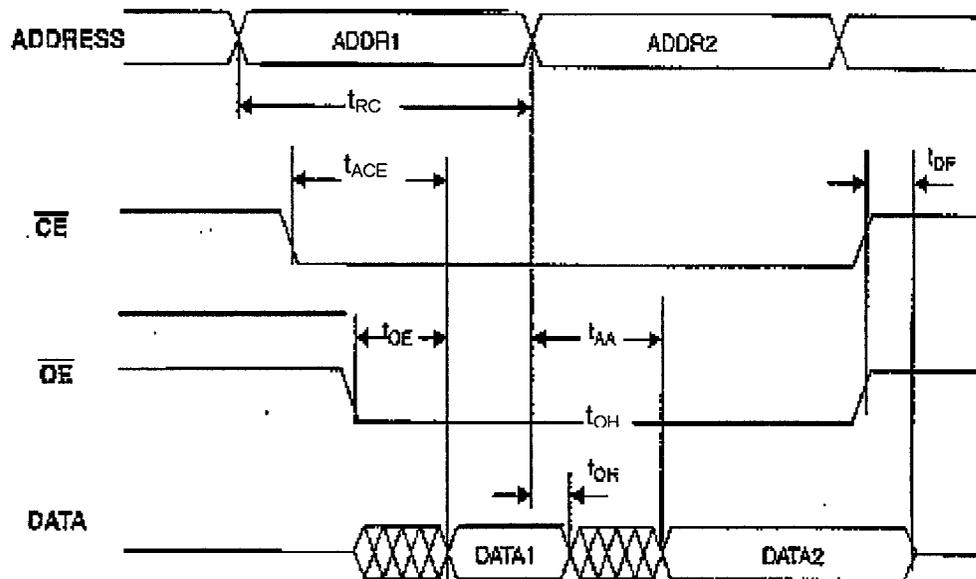
### TEST CONDITIONS

Item	Value
Input Pulse Levels	0.6V to 2.4V
Input Rise and Fall Times	10nS
Input and Output Timing Levels	0.8V and 2.0V
Output Loads	1 TTL Gate and $C_L = 100\text{pF}$

### READ CYCLE

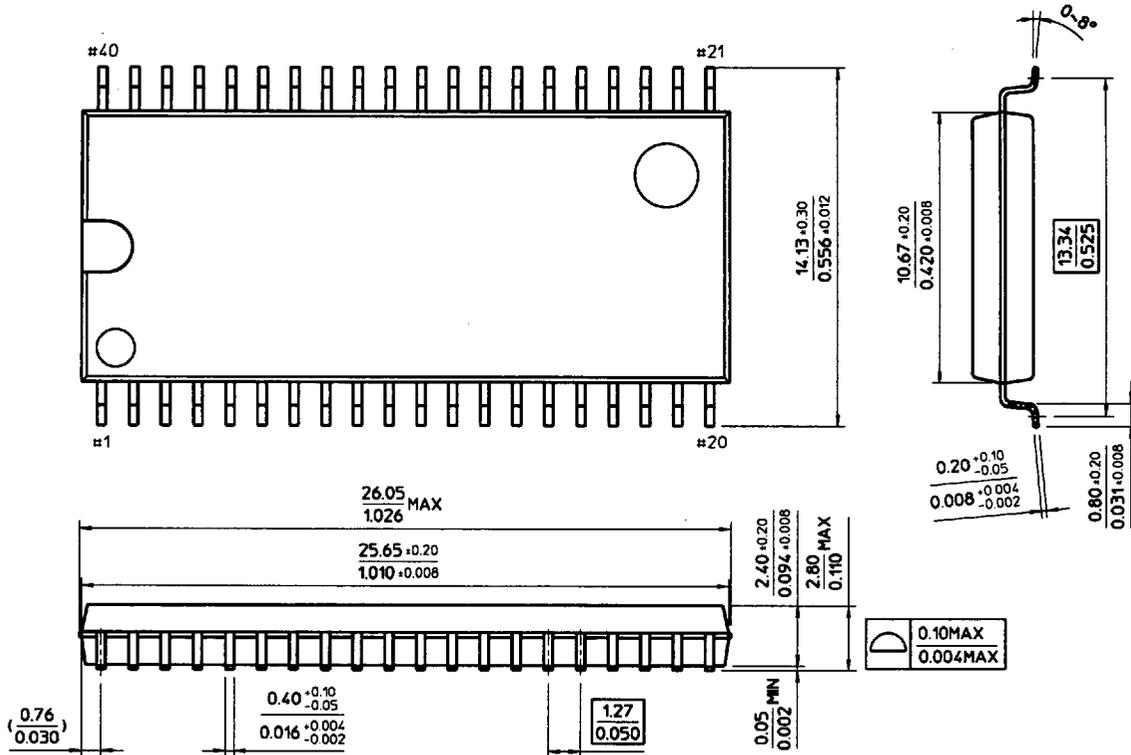
Symbol	Characteristics	Min	Max	Unit
TRC	Read Cycle Time	150		nS
TACE	ChipEnable Access Time		150	nS
TAA	Address Access Time		150	nS
TOE	Output or Enable Access Time		70	nS
TDF	Output or Chip Disable to Output High-z		30	nS
TOH	Output Hold from Address Change	0		nS

Figure 3. Read Timing Diagram



Note:  $t_{DF}$  is defined as the time which the outputs achieve an open circuit condition (high-z) and is not referenced to  $V_{OH}$  or  $V_{OL}$  levels.

40-SOP-525



44-SOP-600

