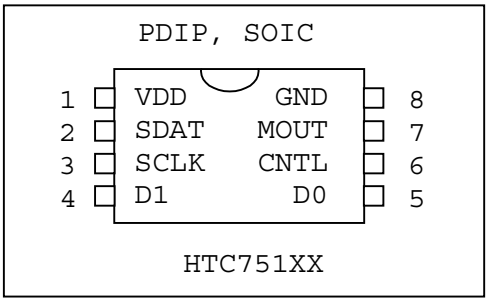
Melody Generator

1.0 General description.

HTC751 is designed to play melodies stored in serial EEPROM. HTC751 can play any note in three octave range which include octave three, four and five. User can write a melody and compile it with Melody compiler, available for download in our web site. Melody compiler will generate binary file that would be used to program the serial EEPROM. We went as far as defining our own proprietary melody coding scheme that minimizes memory requirements per given melody compared with popular schemes like MIDI, Wave and even MPEG file formats. Our efforts will help users to reproduce melodies at fraction of cost compared with other melody coding schemes. HTC751 supports 2401, 2402, 2408 and 2416 serial EEPROM's available from Microchip, National Semiconductors, Atmel and other semiconductor vendors. HTC751 will play selected melody (selection is done by driving D0 and D1 inputs to low or high value) and once melody is finished it will enter power saving mode which we call Sleep mode. Note that In Sleep mode HTC751 consumes less then few microamps of current. One of possible uses of HTC751 is designing it in a doorbell. HTC751 can play up to four melodies stored in serial EEPROM. It can directly drive piezo-electrical sound element or a speaker with use of external amplifier. Control output is provided to control external relay or power switch. This output goes high for duration of melody and could be used to control the power to HTC751 and amplifier for duration of melody.



Features:

- Flexible solution for storing and playing melodies.
- Minimum external components.
- Four selectable melodies easily extendible.
- Minimum power consumption while in SLEEP mode.

Possible uses are:

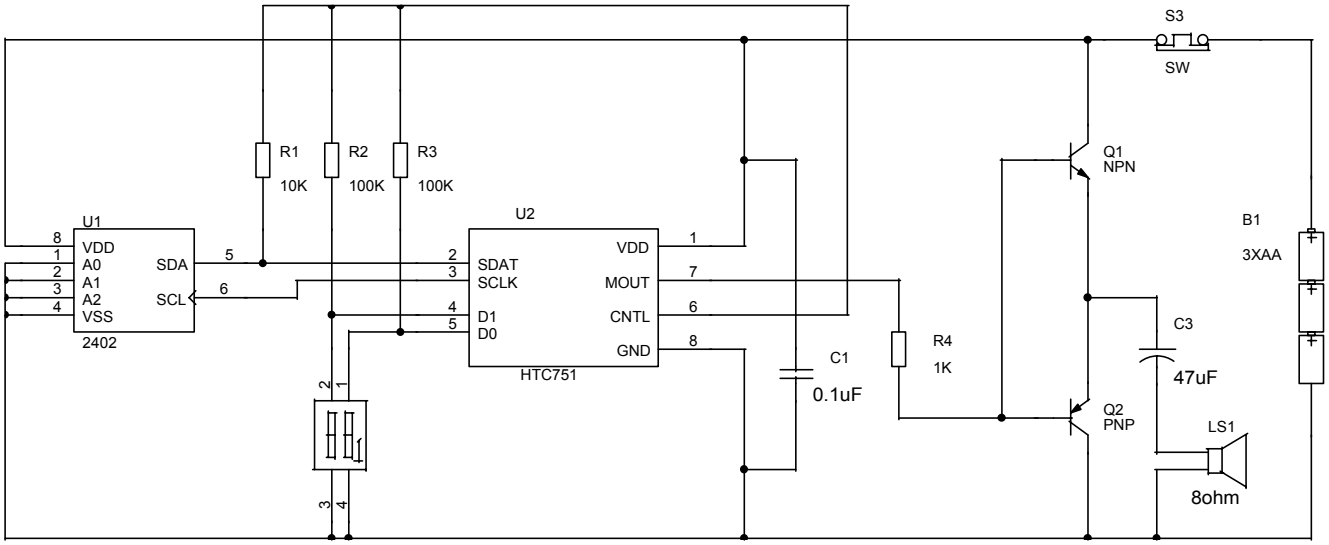
- Musical doorbells.
- Melody generator for alarm clock.
- Musical toys.
- Musical boxes for gifts, accessories or jewelry.

2.0 Functional Description.

We will use schematics below to describe operation of HTC751. At power up HTC751 sets CNTL output high and reads D0 and D1 inputs to select the melody to be played. Melody selection is done by setting up the dip-switch. Next HTC751 will load melody to be played and starts playing it. After finishing melody it goes into sleep mode and drives all outputs to GND. In prototypes we build using schematics below current consumption was less then 10uA. This current is negligible enough to leave circuit constantly powered on. When device is in Sleep mode only way of waking up the circuit is to recycle power. This is done using S1 pushbutton. Note that we are using pushbutton with normal closed contacts. When this pushbutton is activated power to HTC751 is cut down and when this

pushbutton is released then part will play the melody. One can use pushbutton with normal open contacts but it will result partial reproduction of melody. Note the way CNTL output is used to save energy during Sleep mode. Energy saving is achieved by cutting power to R1, R2 and R3 resistors when part enters into Sleep mode and preventing battery discharge through those resistors when associated dip-switch is on. T1 and T2 form simple current amplifier to drive 8-ohm speaker. Almost any small signal transistor could be used in this amplifier. Note that this amplifier will introduce additional distortions to amplified signal, because transistors are not biased. This is done intentionally to simplify amplifier circuit and add one distinct character. This amplifier does not use any current when its input is driven low. Any other amplifier circuit could be used as long as care is taken to shut down the amplifier with CNTL output of HTC751 to save buttery.
This could be done by external relay or electronic switch. Please see Application note for HTC751. Quality of sound could be further enhanced if low pass filter is added to output of HTC751.

Doorbell design using HTC751



Pin out description.

Abbreviations used: O - output, I - input, B- bi-directional, P - power.

Pin	Name	I / O	Description	Notes
1	VDD	P	Power	+2.5V to +5.5V
2	SDAT	B	Serial Data	Should be connected to SDAT of serial EEPROM.
3	SCLK	O	Not Used	Should be connected to SCLK of serial EEPROM.
4	D1	I	Melody selection input.	Tie it to GND or VDD.
5	D0	I	Melody selection input.	Tie it to GND or VDD.
6	CNTL	O	Control output	This output is driven high when part plays melody. Can deliver up to 25mA current.
7	MOUT	O	Melody output	Signal on this output is square wave.
8	GND	P	Ground	Connect to ground.

3.0 Melody selection with D[0:1]

D1	D0	MELODY
GND	GND	Number 1
GND	VDD	Number 2
VDD	GND	Number 3
VDD	GND	Number 4

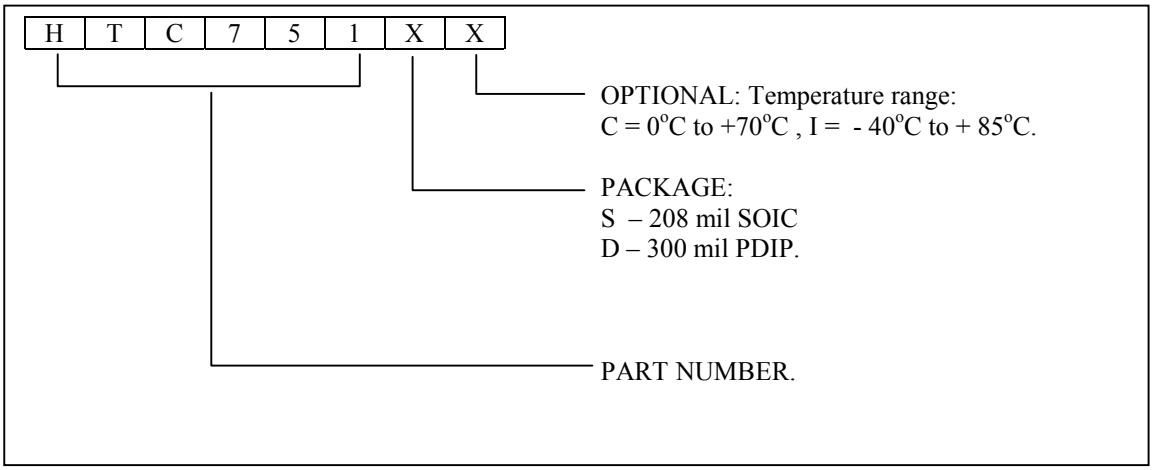
This table shows melody played when D0 and D1 are tied to ground or power. Note that this part can play four different sets of melodies.

4.0 Electrical characteristics.

Voltage on VDD pin in respect to GND	+2.5 to +5.5V
Operational current with no external load	3 mA[1]
Current used in SLEEP mode	4uA[1]
MOUT output low voltage max (5mA load)	0.4V[1]
MOUT output high voltage min (5mA source)	VDD-0.7V[1]
MOUT maximum sink current	25mA[1]
MOUT maximum source current	25mA[1]
CNTL output low voltage max (5mA load)	0.4V[1]
CNTL output high voltage min (5mA source)	VDD-0.7V[1]
CNTL maximum sink current	25mA[1]
CNTL maximum source current	25mA[1]

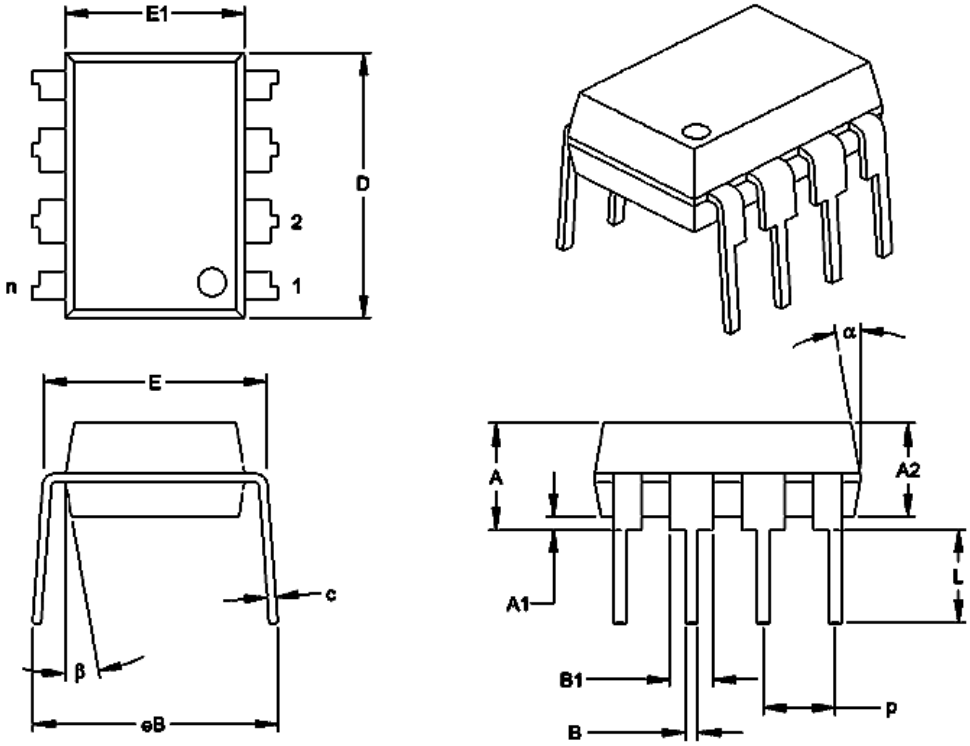
NOTES:
1. Those values are characterized but not tested.

5.0 Ordering information.



6.0 Mechanical information.

8-Lead Plastic Dual In-line (P) – 300 mil (PDIP)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		8			8	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.140	.155	.170	3.56	3.94	4.32
Molded Package Thickness	A2	.115	.130	.145	2.92	3.30	3.68
Base to Seating Plane	A1	.015			0.38		
Shoulder to Shoulder Width	E	.300	.313	.325	7.62	7.94	8.26
Molded Package Width	E1	.240	.250	.260	6.10	6.35	6.60
Overall Length	D	.360	.373	.385	9.14	9.46	9.78
Tip to Seating Plane	L	.125	.130	.135	3.18	3.30	3.43
Lead Thickness	c	.008	.012	.015	0.20	0.29	0.38
Upper Lead Width	B1	.045	.058	.070	1.14	1.46	1.78
Lower Lead Width	B	.014	.018	.022	0.36	0.46	0.56
Overall Row Spacing	eB	.310	.370	.430	7.87	9.40	10.92
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

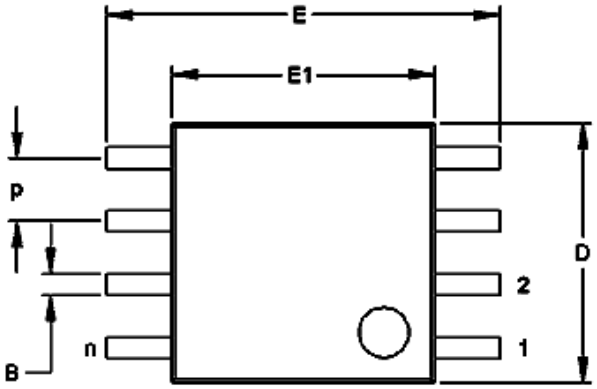
*Controlling Parameter

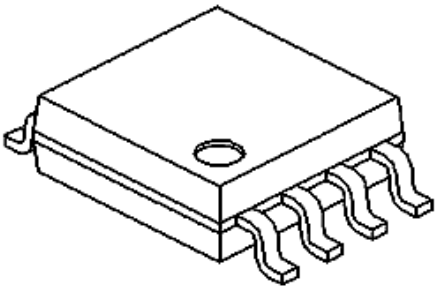
Notes:

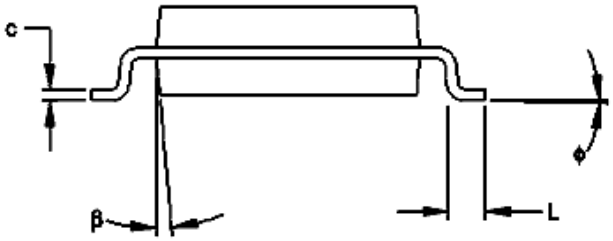
Dimensions D and E1 do not include mold flash protrusions. Mold flash or protrusions shell not exceed .010” (0.254mm)per side.

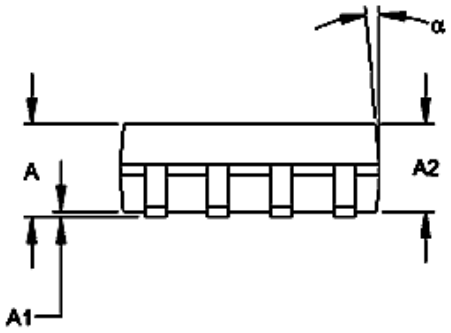
JEDEC Equivalent:MS-001

8-Lead Plastic Small Outline (SM) – Medium, 208 mil (SOIC)









Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		8			8	
Pitch	P		.050			1.27	
Overall Height	A	.070	.075	.080	1.78	1.97	2.03
Molded Package Thickness	A2	.069	.074	.078	1.75	1.88	1.98
Standoff	A1	.002	.005	.010	0.05	0.13	0.25
Overall Width	E	.300	.313	.325	7.62	7.95	8.26
Molded Package Width	E1	.201	.208	.212	5.11	5.28	5.38
Overall Length	D	.202	.205	.210	5.13	5.21	5.33
Foot Length	L	.020	.025	.030	0.51	0.64	0.76
Foot Angle	ϕ	0	4	8	0	4	8
Lead Thickness	c	.008	.009	.010	0.20	0.23	0.25
Lead Width	B	.014	.017	.020	0.36	0.43	0.51
Mold Draft Angle Top	α	0	12	15	0	12	15
Mold Draft Angle Bottom	β	0	12	15	0	12	15

*Controlling Parameter

Notes:

Dimensions D and E1 do not include mold flash protrusions. Mold flash or protrusions shell not exceed .010” (0.254mm)per side.

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