HT8A977B/978B

5-Function Remote Controller

Description

The HT8A977B and HT8A978B provide complete control functions to the remote-controlled toy. The HT8A977B has five input pins corresponding with the five function buttons i.e, forward, backward, rightward, leftward and turbo. The encoding circuit in the HT8A977B sends digital codes to the two output pins SO and SC. The digital codes correspond to the definite function buttons or their combinations. The SO and SC outputs are used in wireless and infra-red applications respectively.

The HT8A978B has five output pins corresponding with the five actions. The received signals are amplified by the three-stage amplifier, and then the appropriate amplified signals are sampled, fault-tolerantly checked and decoded to control the actions of the remote-controlled toy.

There is an internal oscillator in the HT8A977B and 978B respectively. By adding an external resistor conveniently, the oscillator will be constructed. The oscillator frequency can be adjusted by the external resistor. The relative error between the frequencies of the two on-chip oscillators in the HT8A977B and HT8A978B must be less than ±25%.

The auto-power-off function is achieved by an internal counter (977B). The PC output is used to control on/off state of the external power supply. Press on any function button will wake up the chip promptly.

FEATURES

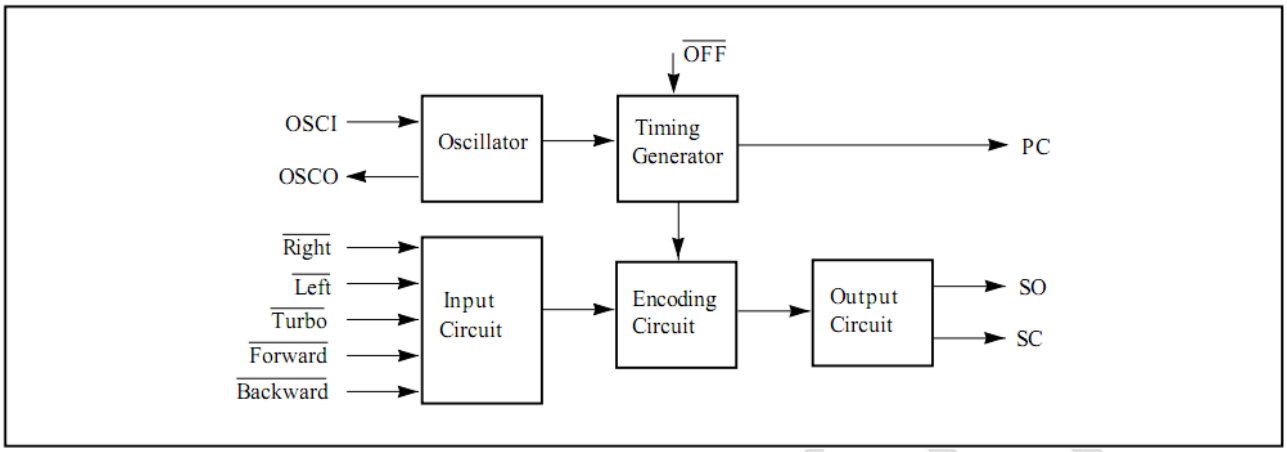
- HT8A977B works as encoder and HT8A978B works as decoder
- Five pins for five control functions
- Operating power-supply voltage: 2.5V to 5.0V (978B), 1.8V to 5.0V(977B)
- Auto-power-off and oscillation-off if no press on any button (977B)
- Press on any button to wake up (977B)
- One output pin used for external power control (977B)
- On-chip oscillator with an external resistor
- On-chip reversing amplifiers (978B)
- Low operating current
- Few external components needed
- Package: 14-pin DIP, 14-pin SOIC, 16-pin DIP, 16-pin SOIC, die form and wafer form

Ordering Information

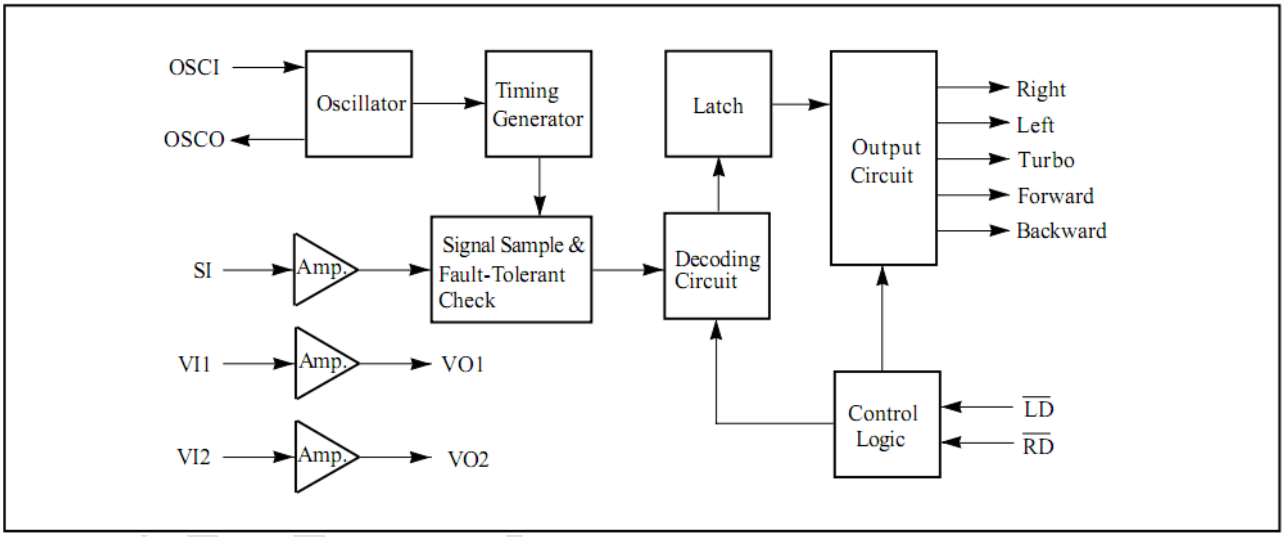
Part No.	Package
HT8A977BPE	Lead free 14-pin DIP
HT8A977BWE	Lead free 14-pin SOIC
HT8A978BPE	Lead free16-Pin DIP
HT8A978BLWE	Lead free 16-pin SOIC

BLOCK Diagram

Block Diagram of 977B

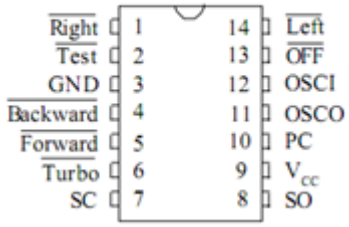


Block Diagram of 978B



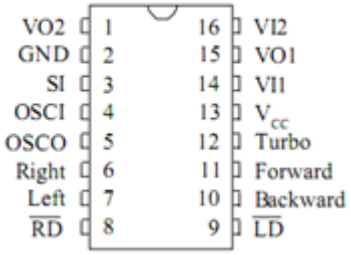
Pin Configuration

14-Pin DIP/14-Pin SOIC



PT8A977BP/977BW

16-Pin DIP/16-pin SOIC



PT8A978BP/978BLW

Pin/Pad Description

Pin/Pad Description of 977B

Pin No.	Pin/Pad Name	Description
1	Right	With Pull-up resistor, rightward function selected if this pin connected to GND.
2	GND	Negative power supply
3	Backward	With Pull-up resistor, backward function selected if this pin connected to GND.
4	Forward	With Pull-up resistor, forward function selected if this pin connected to GND.
5	Turbo	With Pull-up resistor, turbo function selected if this pin connected to GND.
6	SC	Output pin of the encoding signal with carrier frequency
7	SO	Output pin of the encoding signal without carrier frequency
8	Vcc	Positive power supply
9	PC	Power control output pin
10	OSCO	Oscillator output pin
11	OSCI	Oscillator input pin
12	OFF	With Pull-up resistor, this pin is used to shut down the external power supply.
13	Left	With Pull-up resistor, leftward function selected if this pin connected to GND.

Pin/Pad Description of 978B

Pin No.	Pin/Pad Name	Description
1	VO2	Output pin for the amplifier 2
2	GND	Negative power supply
3	SI	Input pin of the encoding signal
4	OSCI	Oscillator input pin
5	OSCO	Oscillator output pin
6	Right	Rightward output pin
7	Left	Leftward output pin
8	RD	With Pull-up resistor, rightward function disabled if this pin connected to GND.
9	LD	With Pull-up resistor, leftward function disabled if this pin connected to GND.
10	Backward	Backward output pin
11	Forward	Forward output pin
12	Turbo	Turbo output pin
13	Vcc	Positive power supply
14	VI1	Input pin for the amplifier 1
15	VO1	Output pin for the amplifier 1
16	VI2	Input pin for the amplifier 2

Maximum Ratings

(Above which the useful life may be impaired. For user guidelines, not tested)

Storage Temperature ..... -25°C to +85°C
Ambient Temperature with Power Applied ..... -10°C to +40°C
Supply Voltage to Ground Potential (Inputs & V_{CC} Only) ..... -0.5 to +6.0V
Supply Voltage to Ground Potential (Outputs & D/O Only) ... -0.5 to +6.0V
DC Input Voltage ..... -0.5 to +6.0V
DC Output Current 20mA
Power Dissipation 500mW

Note:

Stresses greater than those listed under MAXI-MUM RATINGS may cause permanent damage to the device. This is a stress rating only and func-tional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Expo-sure to absolute maximum rating conditions for ex-tended periods may affect reliability.

DC Electrical Charateristics

DC Electrical Charateristics of 977B

Parameters	Description		Test Condition	Min.	Type	Max.	Units
V_{CC}	Operating Voltage			1.8	4.0	5.0	V
I_{CC}	Supply Current		Output unloaded			150	uA
I_{STB}	Stand-by Current		OFF State			5	uA
V_{IL}	Input Low Voltage		Guaranteed Logic LOW level			0.8	V
V_{IH}	Input High Voltage		Guaranteed Logic HIGH level	3.0			V
I_{IL}	Input Low Current Pin 1, 3, 4, 5, 13		VIH = 0V, ON state			-60	uA
I_{IH}	Input High Current Pin 1, 3, 4, 5, 13		VIH = 4V, ON state			10	uA
I_I	Input Current Pin 11		VIH = 0 ~ 4V, ON state			±10	uA
I_{OL}	Output Low Current		VOUT = 0.5 V	150			uA
I_{OH}	Output High Current	Pin 6, 7, 9	VOUT = 3.5 V	-1.0			mA
		Pin 10	VOUT = 3.5 V	-500			uA

Note: Over the Operating Rating, $0^oC \leqslant T_A \leqslant 70^oC$, V_{CC} = 4V

DC Electrical Charateristics of 978B

Parameters	Description		Test Condition	Min.	Type	Max.	Units
V_{CC}	Operating Voltage			2.5	4.0	5.0	V
I_{CC}	Supply Current		Output unloaded			1.2	mA
I_{STB}	Stand-by Current		OFF State			10	uA
V_{IL}	Input Low Voltage		Guaranteed Logic LOW level			0.8	V
V_{IH}	Input High Voltage		Guaranteed Logic HIGH level	3.0			V
I_{IL}	Input Low Current	Pin 3, 8, 9	V_{IL} = 0V, ON state		L	-60	uA
I_{IH}	Input High Current	Pin 3	V_{IH} = 4V, ON state			60	uA
	Input High Current	Pin 8, 9	V_{IH} = 4V, ON state			10	uA
I_I	Input Current	Pin 14, 16	V_{IH} = 0 ~ 4V, ON state			±10	uA
I_{OL}	Output Low Current	Pin 1, 15	V_{OUT} = 0.5 V	200			uA
		Pin 5	V_{OUT} = 0.5 V	500			uA
		Pin 6, 7, 10, 11, 12	V_{OUT} = 0.5 V	1			mA
I_{OH}	Output High Current	Pin 1, 15	V_{OUT} = 3.5 V	-200			uA
		Pin 5	V_{OUT} = 3.5 V	-500			uA
		Pin 6, 7, 10, 11, 12	V_{OUT} = 2.5 V	-600			uA

Note: Over the Operating Rating, $0^oC \leqslant T_A \leqslant 70^oC$, V_{CC} = 4V

AC Electrical Characteristics

AC Electrical Characteristics of 977B

Parameters	Description	Test Condition	Min.	Type	Max.	Units
fOSC	Oscillator Frequency *	T_A= 25oC, R = 200 kΩ	102	128	154	kHz
fmax-fmin	Oscillator Frequency Fluctuation	T_A=25oC, V_{CC}= 1.8 ~ 5V			15	kHz
tFUN	Cycle Time of Function Code	f_{OSC} = 102 to 154 kHz	0.8	1	1.2	ms
tSTA	Cycle Time of Start Code	f_{OSC} = 102 to 154 kHz	1.6	2	2.4	ms
fCSC	Carrier Frequency of SC Pin	f_{OSC} = 102 to 154 kHz	51	64	77	kHz

Note: Over the Operating Rating, $0^oC \leqslant T_A \leqslant 70^oC$, V_{CC} = 4V

* The relative error between the frequencies of the two on-chip oscillators in the HT8A977B and HT8A978B must be less than +25%.

AC Electrical Characteristics of 978B

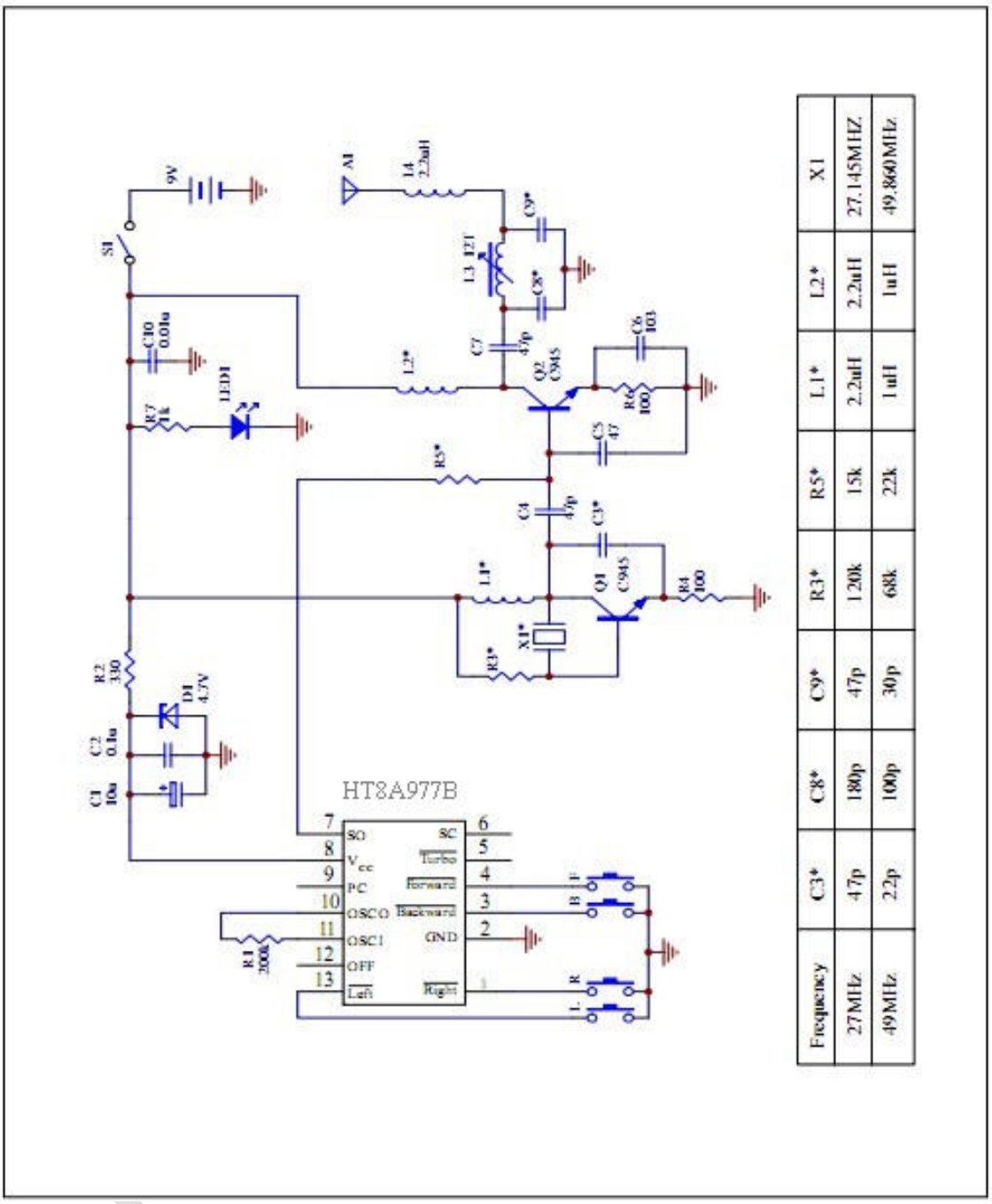
Parameters	Description	Test Condition	Min.	Type	Max.	Units
f_{OSC}	Oscillator Frequency *	T_A= 25°C, R = 200 kΩ	102	128	154	kHz
f_{max}-f_{min}	Oscillator Frequency Fluctuation - 978B	T_A=25°C, V_{CC}=2.5 ~ 5V			15	kHz
	Oscillator Frequency Fluctuation - 978BL	T_A=25°C, V =2.0 ~ 5V			10	kHz
V_{SI}	SI Pin Receive Sensitivity (VPP)	Guaranteed Effective Decoding	300			mV
t_{FUN}	Cycle Time of Function Code	f_{OSC} = 128 kHz	0.75	1	1.25	ms
t_{STA}	Cycle Time of Start Code	f_{OSC} = 128 kHz	1.5	2	2.5	ms

Note: Over the Operating Rating, $0^oC \leqslant T_A \leqslant 70^oC$, V_{CC} = 4V

* The relative error between the frequencies of the two on-chip oscillators in the HT8A977B and HT8A978B must be less than +25%.

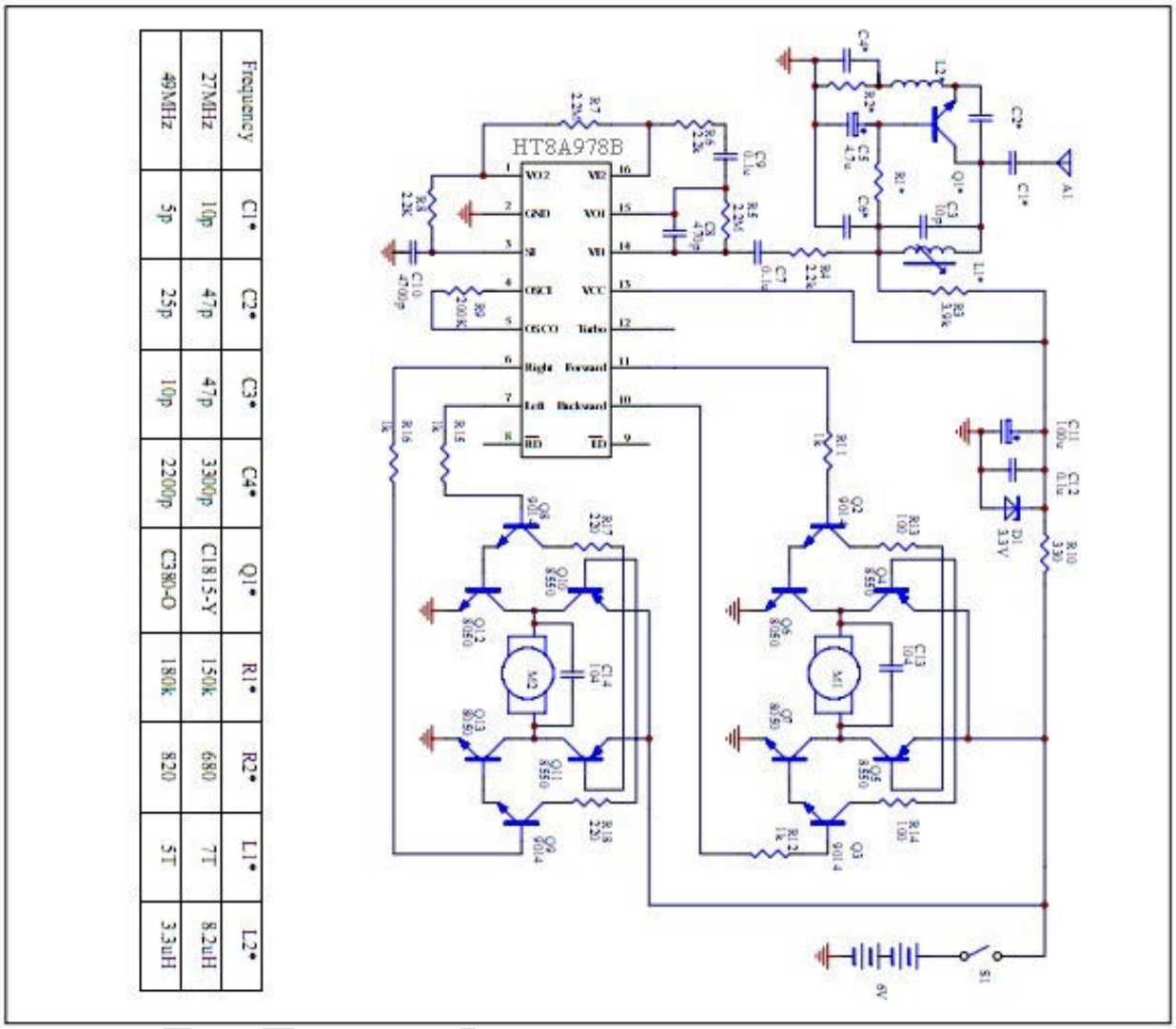
Application Circuits

Typical Application of HT8A977B For Transmit Circuit



Frequency	C3*	C8*	C9*	R3*	R5*	L1*	L2*	X1
27MHz	47p	180p	47p	120k	15k	2.2uH	2.2uH	27.145MHZ
49MHz	22p	100p	30p	68k	22k	1uH	1uH	49.860MHz

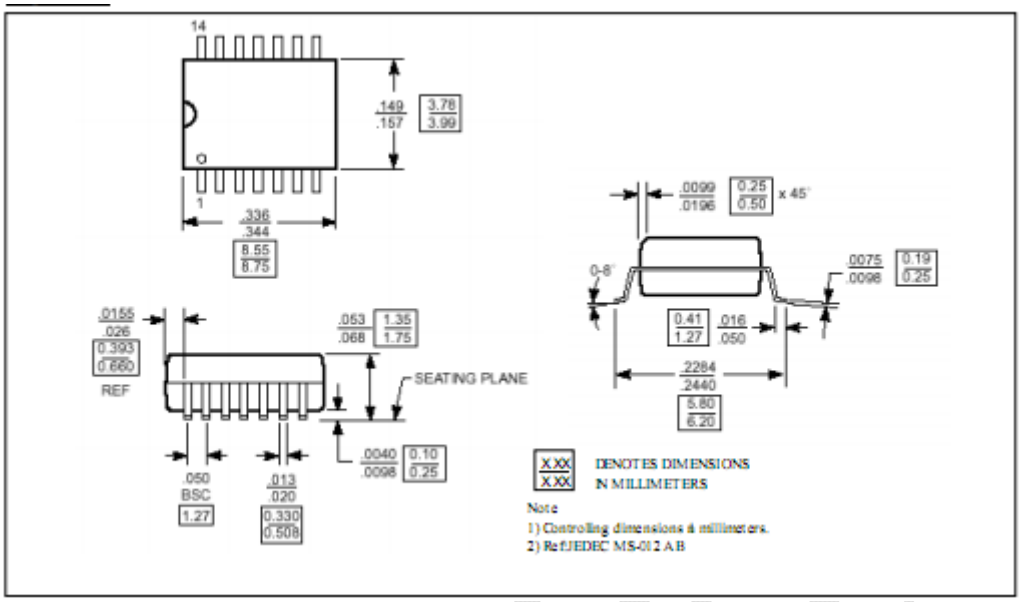
Typical Application of HT8A978B/978BL For Transmit Circuit



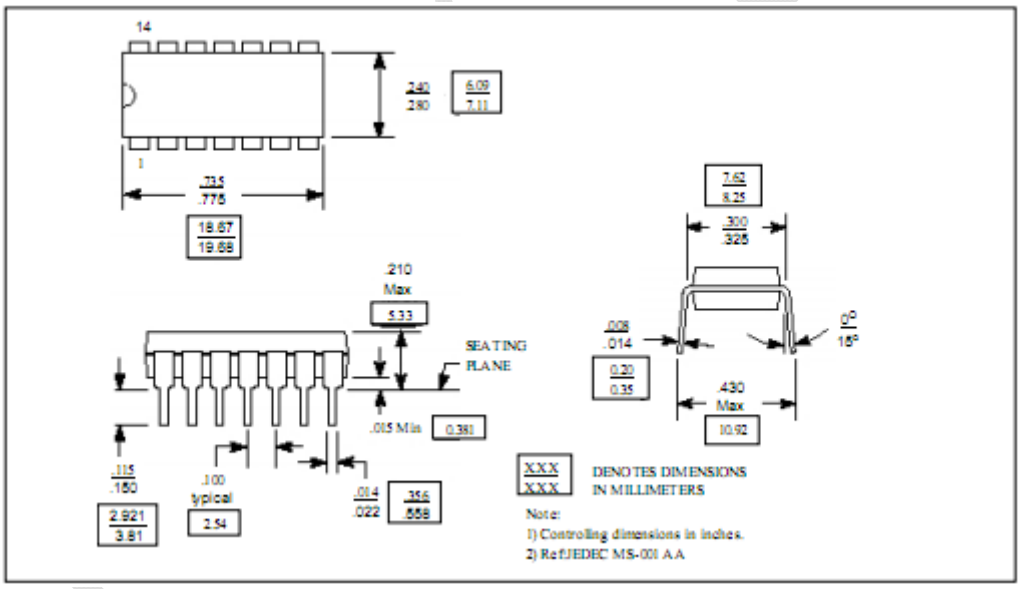
Frequency	C1*	C2*	C3*	C4*	Q1*	R1*	R2*	L1*	L2*
27MHz	10p	47p	47p	3300p	C1815-Y	150k	680	7T	8.2uH
49MHz	5p	25p	10p	2200p	C380-O	180k	820	5T	3.3uH

Mechanical Information

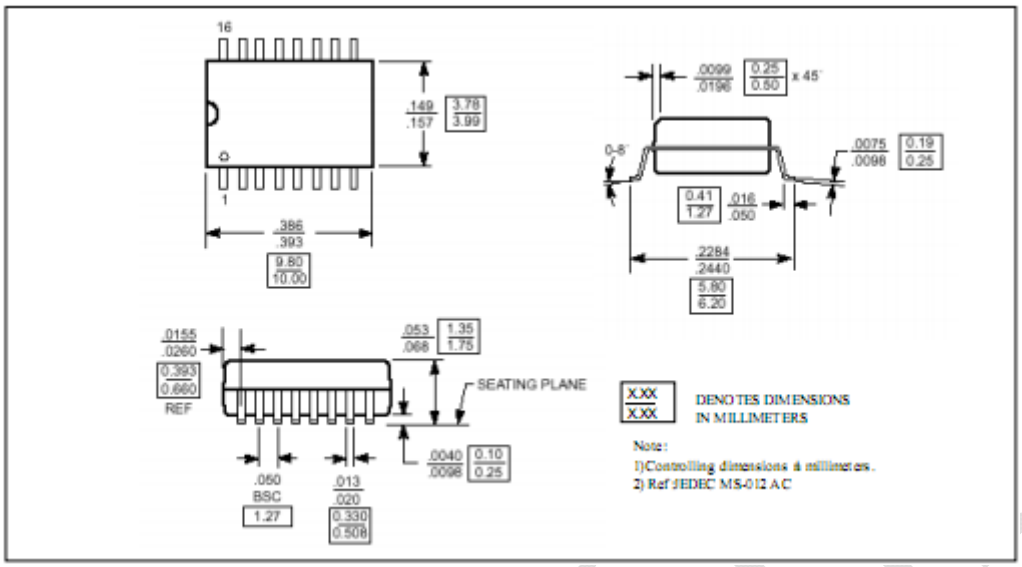
14-pin SOIC



14-pin DIP



16-pin SOIC



16-pin DIP