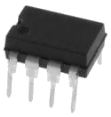
LM567/LM567C Tone Decoder

FEATURES

- 20 to 1 Frequency Range with an External Resistor
- Logic Compatible Output with 100 mA Current Sinking Capability
- Bandwidth Adjustable from 0 to 14%
- High Rejection of Out of Band Signals and Noise
- Immunity to False Signals
- Highly Stable Center Frequency
- Center Frequency Adjustable from 0.01 Hz to 500 kHz


DIP8

SOP8

Ordering Information

DEVICE	Package Type	MARKING	Packing	Packing Qty
LM567N	DIP8	LM567	TUBE	2000pcs/Box
LM567CN	DIP8	LM567C	TUBE	2000pcs/Box
LM567M/TR	SOP8	LM567	REEL	2500pcs/Reel
LM567CM/TR	SOP8	LM567C	REEL	2500pcs/Reel

DESCRIPTION

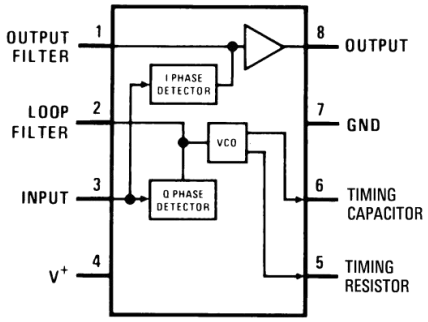
The LM567 and LM567C are general purpose tone decoders designed to provide a saturated transistor switch to ground when an input signal is present within the passband. The circuit consists of an I and Q detector driven by a voltage controlled oscillator which determines the center frequency of the decoder. External components are used to independently set center frequency, bandwidth and output delay.

APPLICATIONS

- Touch Tone Decoding
- Precision Oscillator
- Frequency Monitoring and Control
- Wide Band FSK Demodulation
- Wide Band FSK Demodulation
- Ultrasonic Controls
- Carrier Current Remote Controls
- Communications Paging Decoders

CONNECTION DIAGRAM

SOP8/DIP8



ABSOLUTE MAXIMUM RATINGS

Parameters		Value	Units
Supply Voltage Pin		9	V
Power Dissipation (4)		1100	mW
V_8		15	V
V_3		−10	V
V_3		V_4 + 0.5	V
Storage Temperature Range		−65 to +150	°C
Operating Temperature Range		0 to +70	°C
Soldering Information			
PDIP Package	Soldering (10 sec.)	260	°C
SOIC Package	Vapor Phase (60 sec.)	215	°C
	Infrared (15 sec.)	220	°C

(1) Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not ensure specific performance limits. Electrical Characteristics state DC and AC electrical specifications under particular test conditions which ensure specific performance limits. This assumes that the device is within the Operating Ratings. Specifications are not ensured for parameters where no limit is given, however, the typical value is a good indication of device performance.

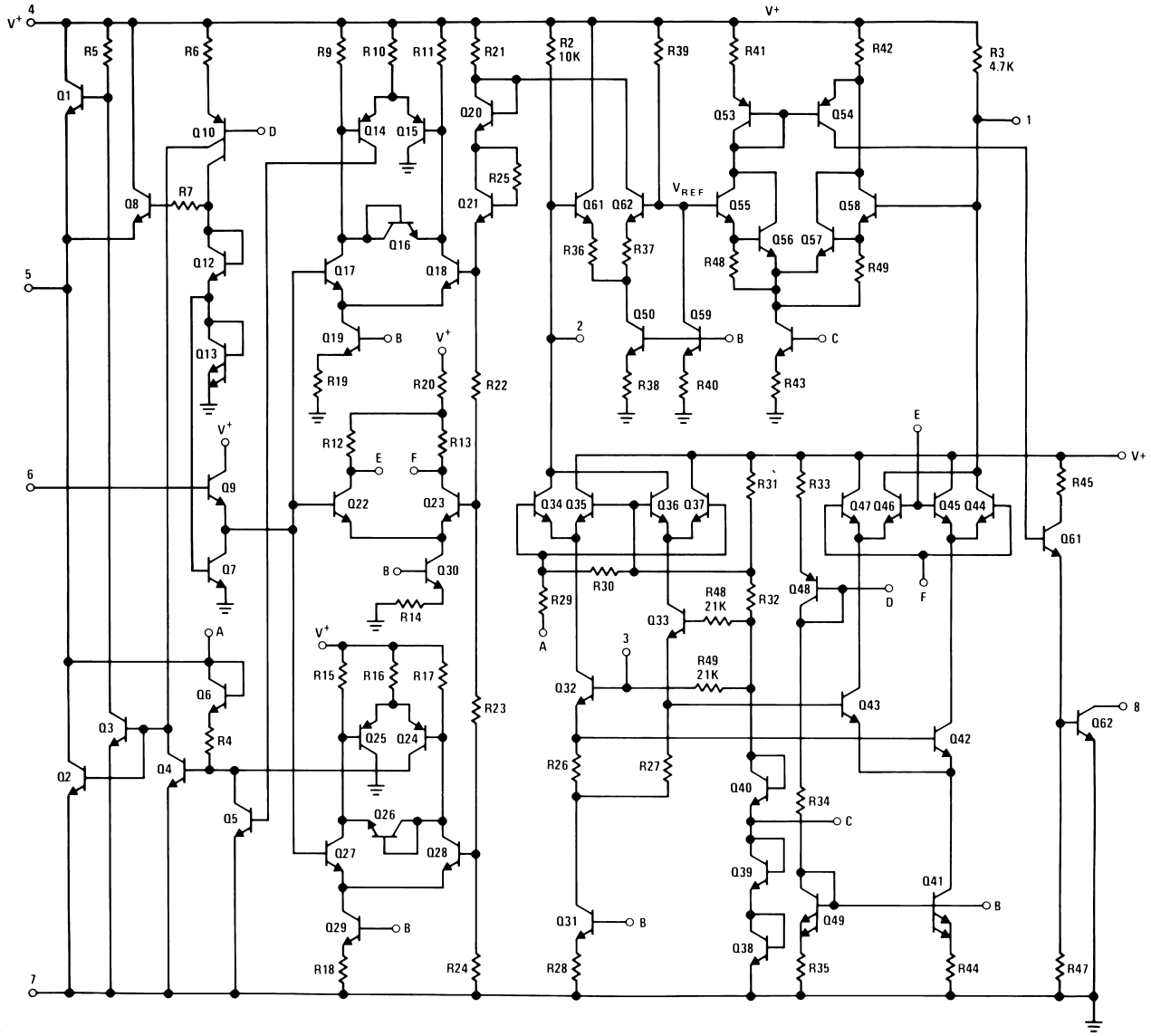
(2) The maximum junction temperature of the LM567 and LM567C is 150°C. For operating at elevated temperatures, devices in the TO-5 package must be derated based on a thermal resistance of 150°C/W, junction to ambient or 45°C/W, junction to case. For the DIP the device must be derated based on a thermal resistance of 110°C/W, junction to ambient. For the SOP package, the device must be derated based on a thermal resistance of 160°C/W, junction to ambient.

ELECTRICAL CHARACTERISTICS

AC Test Circuit, TA = 25°C, V+ = 5V

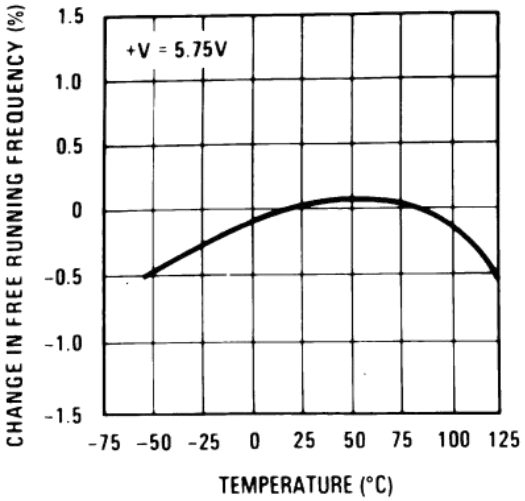
Parameters	Conditions	LM567			LM567C			Units
		Min	Typ	Max	Min	Typ	Max	
Power Supply Voltage Range		4.75	5.0	9.0	4.75	5.0	9.0	V
Power Supply Current Quiescent	R_L = 20k		6	8		7	10	mA
Power Supply Current Activated	R_L = 20k		11	13		12	15	mA
Input Resistance		18	20		15	20		kΩ
Smallest Detectable Input Voltage	I_L = 100 mA, $f_i = f_o$		20	25		20	25	mVrms
Largest No Output Input Voltage	I_C = 100 mA, $f_i = f_o$	10	15		10	15		mVrms
Largest Simultaneous Outband Signal to Inband Signal Ratio			6			6		dB
Minimum Input Signal to Wideband NoiseRatio	B_n = 140 kHz		−6			−6		dB
Largest Detection Bandwidth		12	14	16	10	14	18	% of f_o
Largest Detection Bandwidth Skew			1	2		2	3	% of f_o
Largest Detection Bandwidth Variation with Temperature			±0.1			±0.1		%/°C
Largest Detection Bandwidth Variation with Supply Voltage	4.75–6.75V		±1	±2		±1	±5	%V
Highest Center Frequency		100	500		100	500		kHz
Center Frequency Stability (4.75–5.75V)	0 < T_A < 70 −55 < T_A < +125		35 ± 60 35 ± 140			35 ± 60 35 ± 140		ppm/°C ppm/°C
Center Frequency Shift with Supply Voltage	4.75V–6.75V 4.75V–9V		0.5	1.0 2.0		0.4	2.0 2.0	%/V %/V
Fastest ON-OFF Cycling Rate			f_o/20			f_o/20		
Output Leakage Current	V_8 = 15V		0.01	25		0.01	25	μA
Output Saturation Voltage	e_i = 25 mV, I_8 = 30 mA e_i = 25 mV, I_8 = 100 mA		0.2 0.6	0.4 1.0		0.2 0.6	0.4 1.0	V
Output Fall Time			30			30		ns
Output Rise Time			150			150		ns

SCHEMATIC DIAGRAM

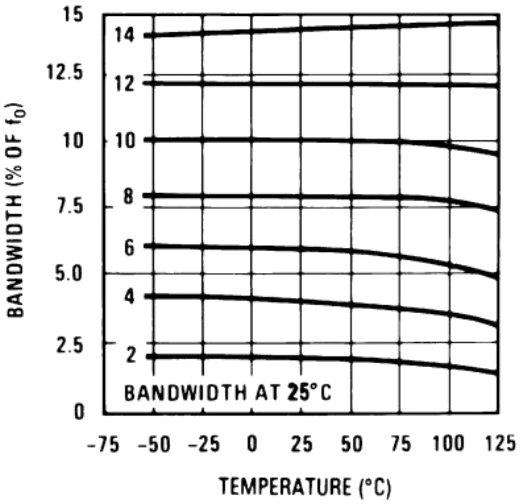


TYPICAL PERFORMANCE CHARACTERISTICS

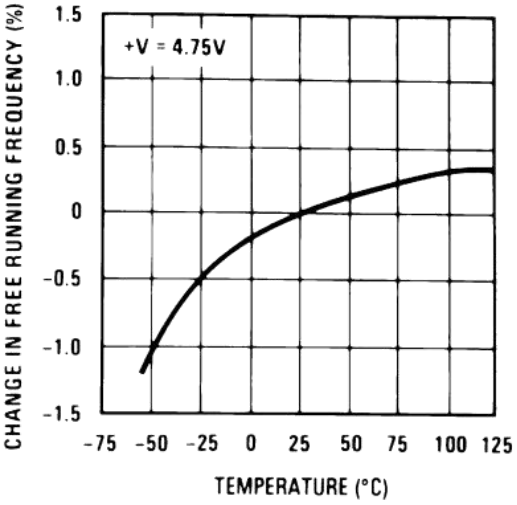
Typical Frequency Drift



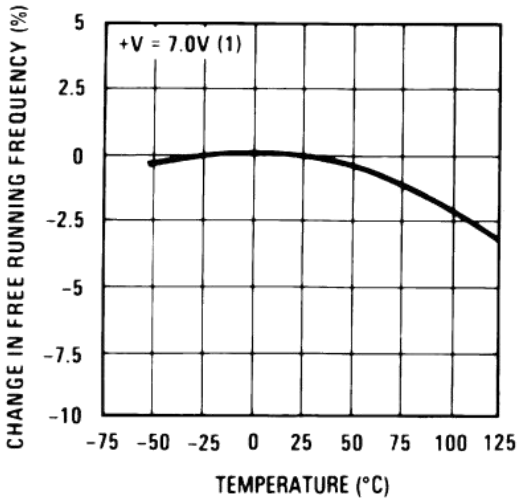
Typical Bandwidth Variation



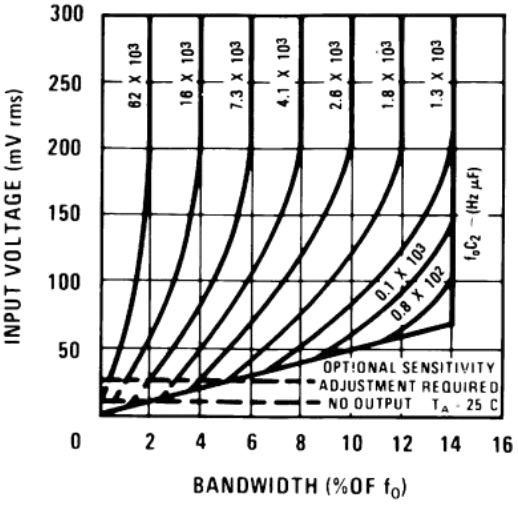
Typical Frequency Drift



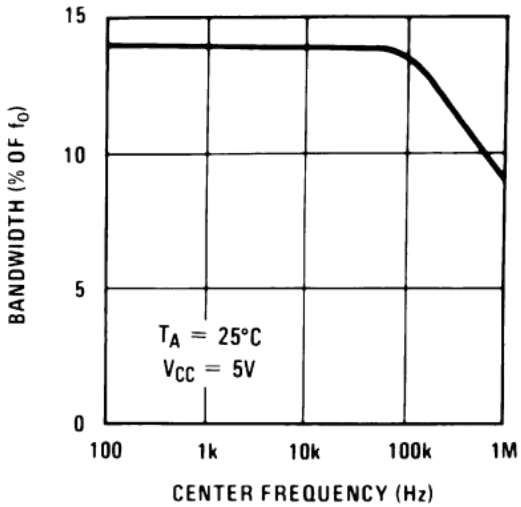
Typical Frequency Drift



Bandwidth
vs
Input SignalAmplitude

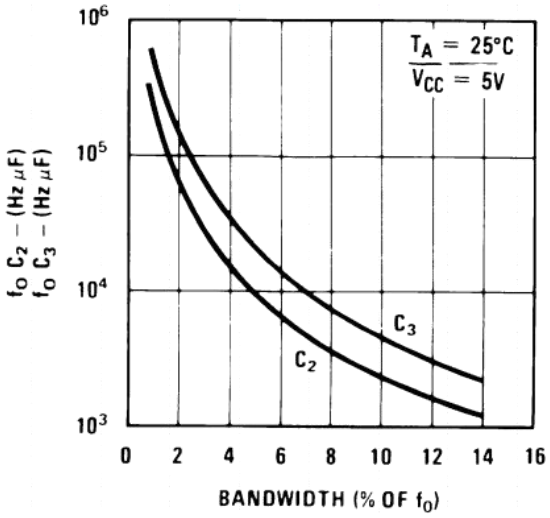


Largest Detection Bandwidth

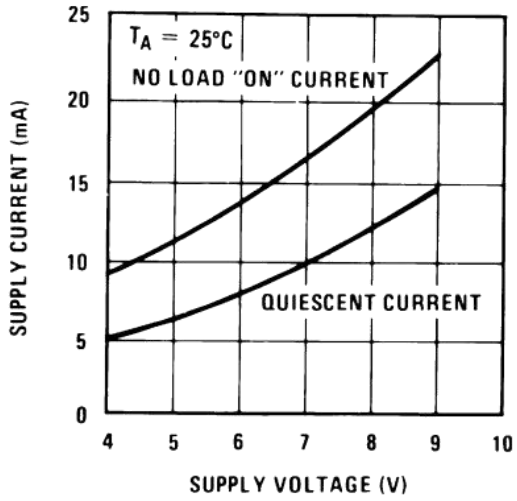


TYPICAL PERFORMANCE CHARACTERISTICS (continued)

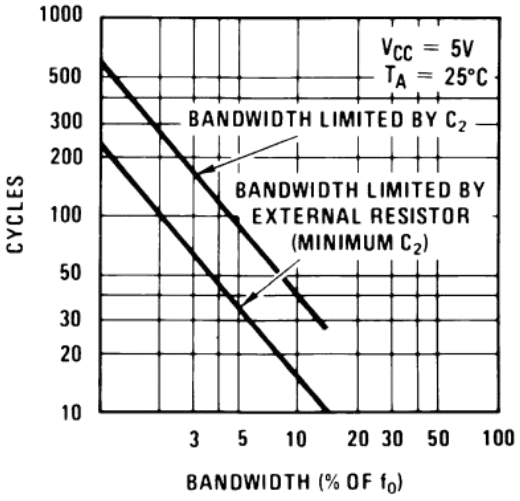
Detection Bandwidth as a Function of C_2 and C_3



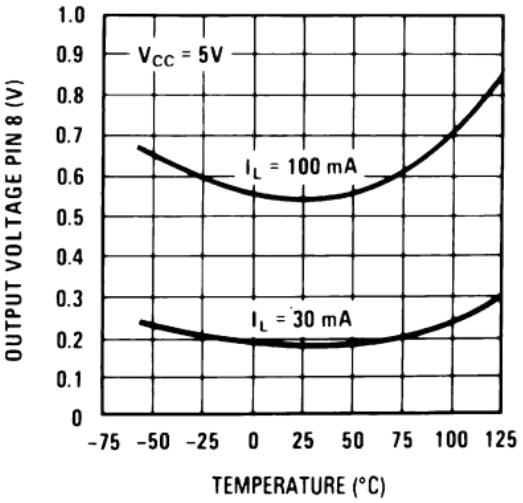
Typical Supply Current vs Supply Voltage



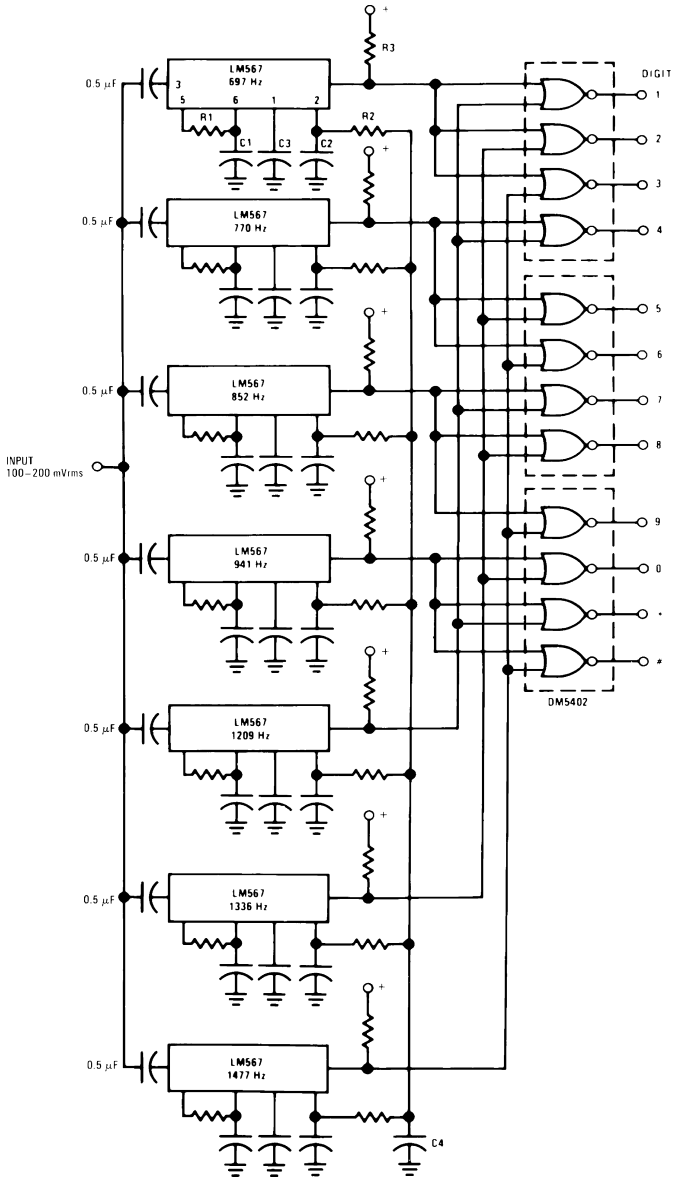
Greatest Number of Cycles Before Output



Typical Output Voltage vs Temperature

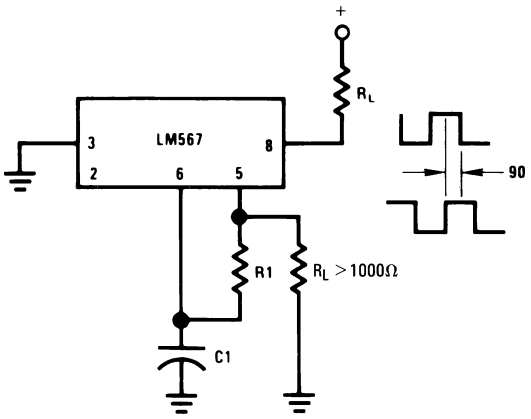


TYPICAL APPLICATIONS



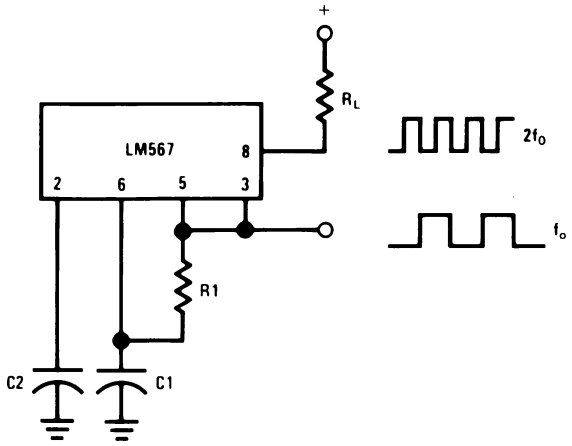
Component values (typ)
R1 6.8 to 15k
R2 4.7k
R3 20k
C1 0.10 mfd
C2 1.0 mfd 6V
C3 2.2 mfd 6V
C4 250 mfd 6V

Touch-Tone Decoder

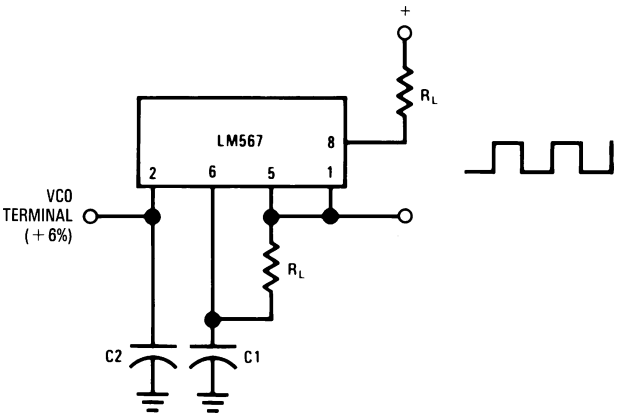


Connect Pin 3 to 2.8V to Invert Output

Oscillator with Quadrature Output

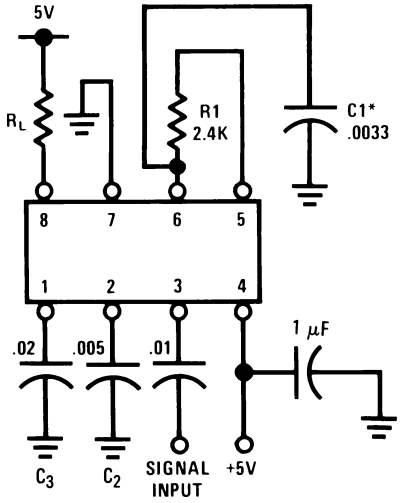


Oscillator with Double Frequency Output



Precision Oscillator Drive 100 mA Loads

AC TEST CIRCUIT



fi = 100 kHz + 5V

*Note: Adjust for fo = 100 kHz.

APPLICATIONS INFORMATION

The center frequency of the tone decoder is equal to the free running frequency of the VCO. This is given by

$$f_o \cong \frac{1}{1.1\ R_1 C_1}$$

The bandwidth of the filter may be found from the approximation

$$BW = 1070 \sqrt{\frac{V_i}{f_o C_2}} \text{ in \% of } f_o$$

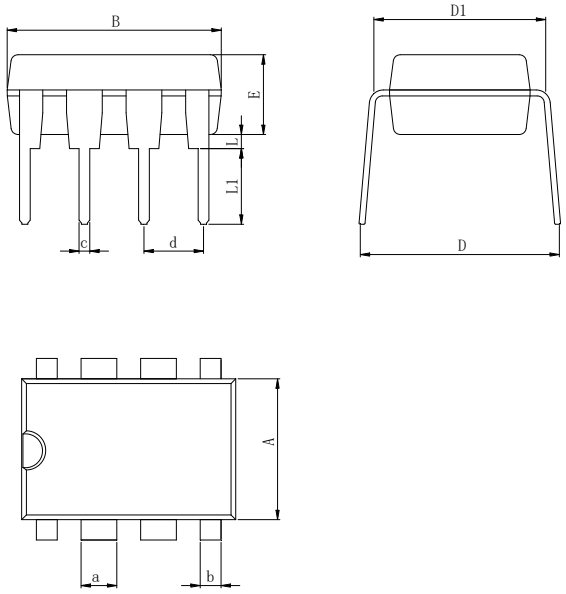
where

Vi = Input voltage (volts rms), Vi ≤ 200mV

C2 = Capacitance at Pin 2(μF)

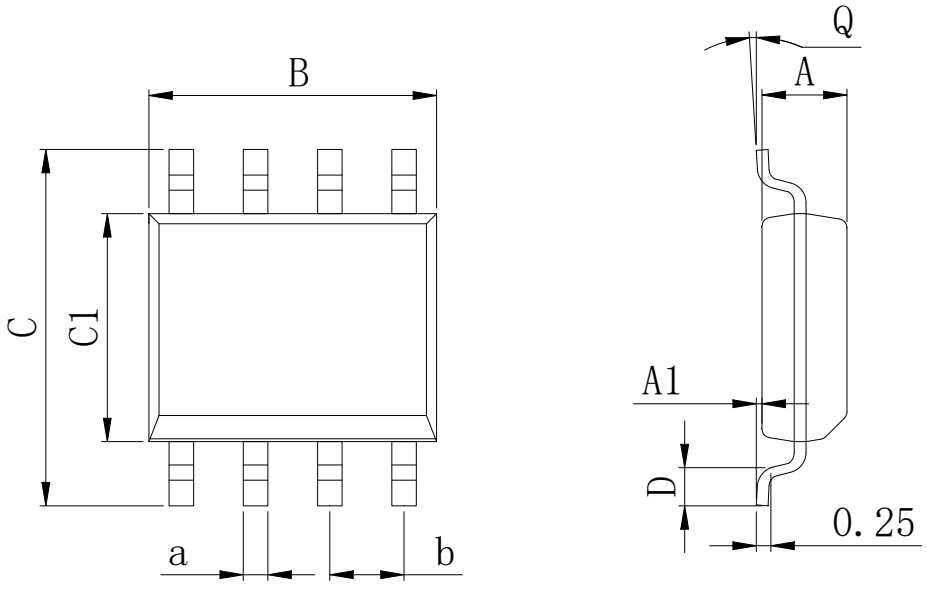
Physical Dimensions

DIP8



Dimensions In Millimeters(DIP8L)											
Symbol:	A	B	D	D1	E	L	L1	a	b	c	d
Min:	6.10	9.00	8.40	7.42	3.10	0.50	3.00	1.50	0.85	0.40	2.54 BSC
Max:	6.68	9.50	9.00	7.82	3.55	0.70	3.60	1.55	0.90	0.50	

SOP8



Dimensions In Millimeters(SOP8)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	1.35	0.05	4.90	5.80	3.80	0.40	0°	0.35	1.27 BSC
Max:	1.55	0.20	5.10	6.20	4.00	0.80	8°	0.45	

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