

LM567/LM567C Tone Decoder

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.

1FEATURES

- 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

APPLICATIONS

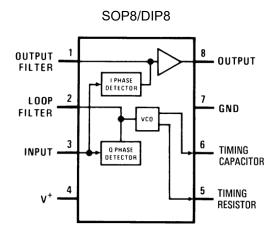
- Touch Tone Decoding
- Precision Oscillator
- Frequency Monitoring and Control
- Wide Band FSK Demodulation

- Wide Band FSK Demodulation
- Ultrasonic Controls
- Carrier Current Remote Controls
- Communications Paging Decoders

Ordering Information

DEVICE	Package Type	MARKING	Packing	Packing Qty
LM567PG	DIP8	LM567	TUBE	2000pcs/Box
LM567CPG	DIP8	LM567C	TUBE	2000pcs/Box
LM567DRG	SOP8	LM567	REEL	2500pcs/Reel
LM567CDRG	SOP8	LM567C	REEL	2500pcs/Reel

CONNECTION DIAGRAM





ABSOLUTE MAXIMUM RATINGS

Supply Voltage Pin	9V
Power Dissipation (4)	1100 mW
V ₈	15V
V ₃	-10V
V ₃	V ₄ + 0.5V
Storage Temperature Range	−65°C to +150°C
Operating Temperature Range	0°C 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) If Military/Aerospace specified devices are required, please contact the Texas Instruments Sales Office/Distributors for availability and specifications.
- (3) 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 SOIC 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		LM56	7		Units		
Parameters	Conditions	Min	Тур	Max	Min	Тур	Max	Units
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	$I_L = 100 \text{ mA}, f_i = f_o$		20	25		20	25	mVrms
Largest No Output Input Voltage	$I_C = 100 \text{ mA}, f_i = f_o$	10	15		10	15		mVrms
Largest Simultaneous Outband Signal toInband 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



ELECTRICAL CHARACTERISTICS (continued)

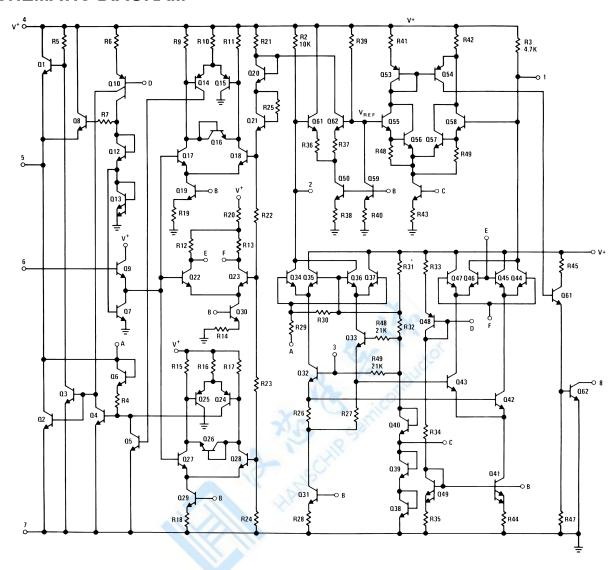
AC Test Circuit, TA = 25°C, V+ = 5V

Parameters	Conditions	LM567				Units		
Parameters	Conditions	Min	Тур	Max	Min	Тур	2.0 2.0 2.0 25 0.4 1.0	Units
Center Frequency Stability	0 < T _A < 70		35 ± 60			35 ± 60		ppm/°C
(4.75–5.75V)	−55 < T _A < +125		35 ± 140			35 ± 140		ppm/°C
Center Frequency Shift with Supply	4.75V-6.75V		0.5	1.0		0.4	2.0	%/V
Voltage	4.75V–9V		0.5	2.0		0.4	2.0	%/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 Caturation Valtage	e _i = 25 mV, I ₈ = 30 mA		0.2	0.4		0.2	0.4	V
Output Saturation Voltage	e _i = 25 mV, I ₈ = 100 mA		0.6	1.0		0.6	2.0 2.0 2.0	\ \
Output Fall Time			30			30		ns
Output Rise Time			150			150		ns



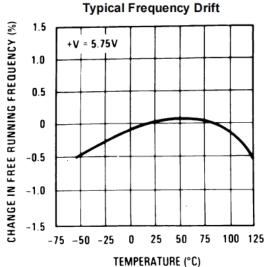


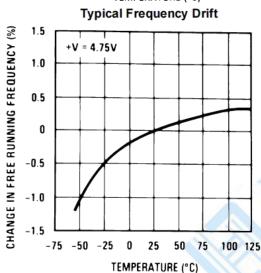
SCHEMATIC DIAGRAM

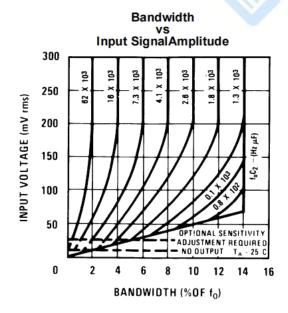


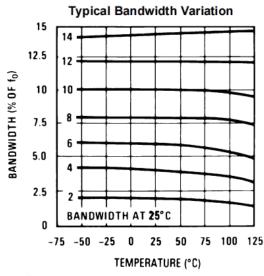


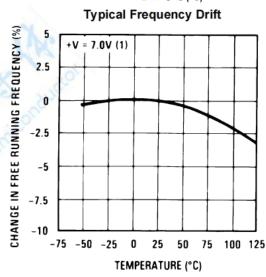
TYPICAL PERFORMANCE CHARACTERISTICS

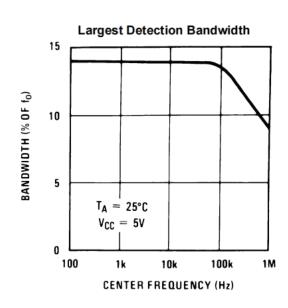






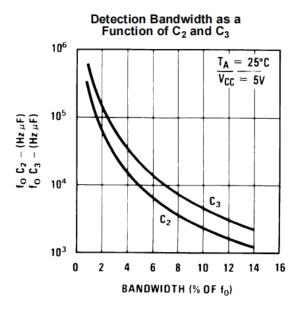


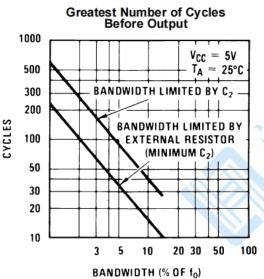


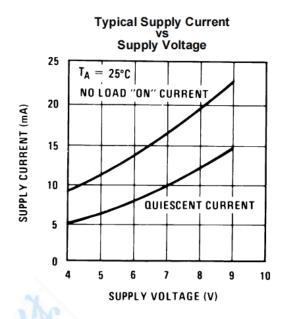


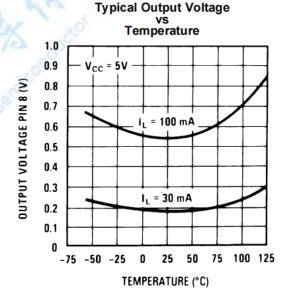


TYPICAL PERFORMANCE CHARACTERISTICS (continued)



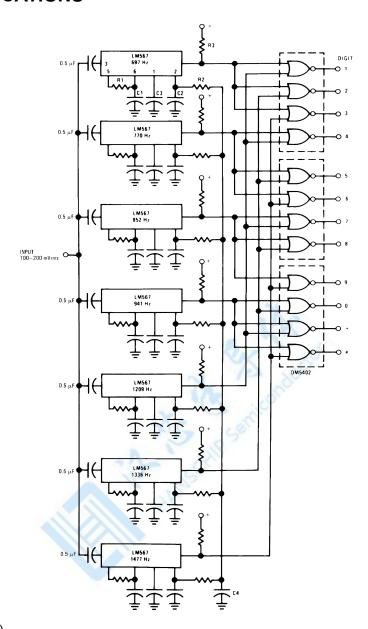








TYPICAL APPLICATIONS



Component values (typ)

R1 6.8 to 15k

R2 4.7k

R3 20k

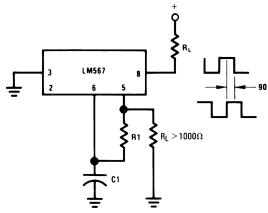
C1 0.10 mfd

C2 1.0 mfd 6V

C3 2.2 mfd 6V

C4 250 mfd 6V





Connect Pin 3 to 2.8V to Invert Output

Figure 14. Oscillator with Quadrature Output

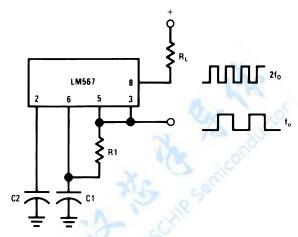


Figure 15. Oscillator with Double Frequency Output

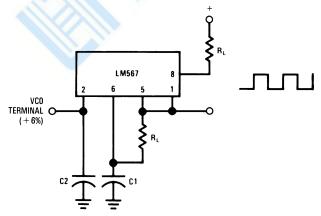
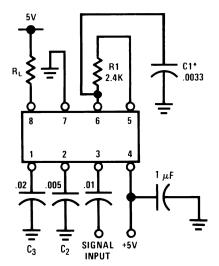


Figure 16. Precision Oscillator Drive 100 mA Loads



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
$$\sqrt{\frac{V_i}{f_o C_2}}$$
 in % of f_o

where

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

C2 = Capacitance at Pin $2(\mu F)$

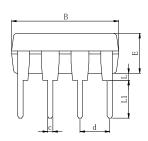
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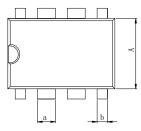


Physical Dimensions

DIP8

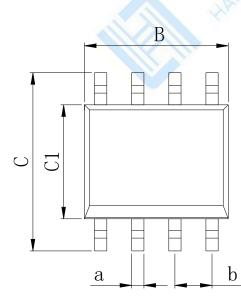


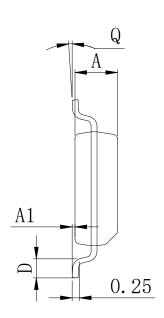




Dimensions In Millimeters(DIP8L)											
Symbol:	А	В	D	D1	Е	L	L1	а	b	С	d
Min:	6.10	9.00	8.40	7.42	3.10	0.50	3.00	1.50	0.85	0.40	0.54.000
Max:	6.68	9.50	9.00	7.82	3.55	0.70	3.60	1.55	0.90	0.50	2.54 BSC

SOP8 (150mil)





Dimensions In Millimeters(SOP8)										
Symbol:	Α	A1	В	С	C1	D	Q	а	р	
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	1.27 650	

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2018 JUN



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