

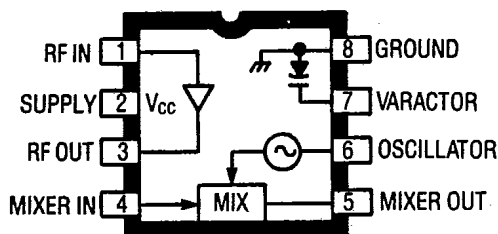
ULN3869M

IECQ MFG.
APPROVAL

RF STAGE AND MIXER FOR FM RADIO APPLICATIONS

Providing all FM front-end functions including RF amplifier, local oscillator, varactor diode for AFC, and mixer, the ULN3869M reduces to a minimum the number of discrete components normally required. This device features improved gain and overload performance over many discrete solutions. The pinning arrangement permits optimum circuit layout and maximum isolation of inputs and outputs, an important consideration for compact radios.

Major applications of this device include wide-band and narrow-band FM applications in personal portable radios, cordless telephones, police and fire scanners, and amateur radio.

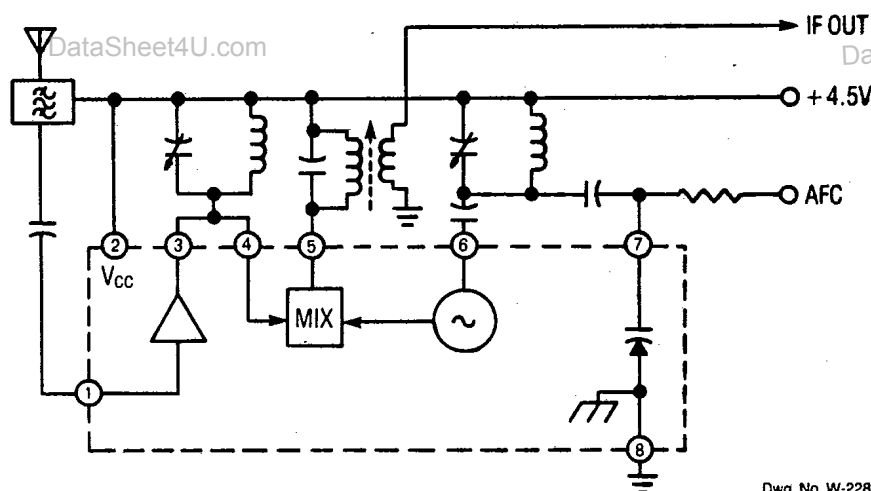


Dwg. No. W-227

FEATURES

- 1.5 V to 6 V Operation
- Linear Mixer
- One-Pin Local Oscillator
- Worldwide Applications
- 8-Pin Mini-DIP Package

SIMPLIFIED APPLICATION



Dwg. No. W-228

ABSOLUTE MAXIMUM RATINGS

Supply Voltage, V_{CC}	7 V
Operating Temperature Range, T_A	0°C to +70°C
Storage Temperature Range, T_S	-65°C to +150°C

SPRAGUE

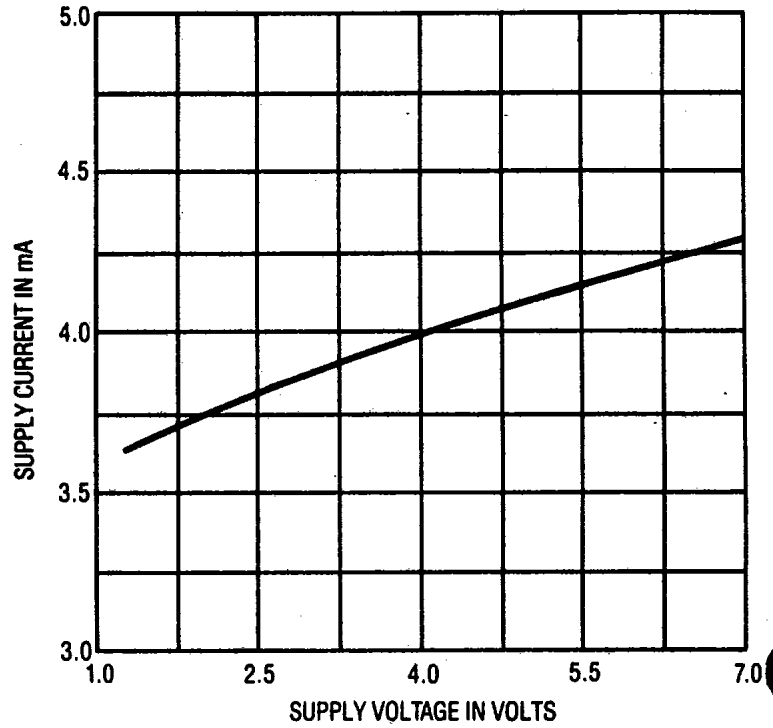
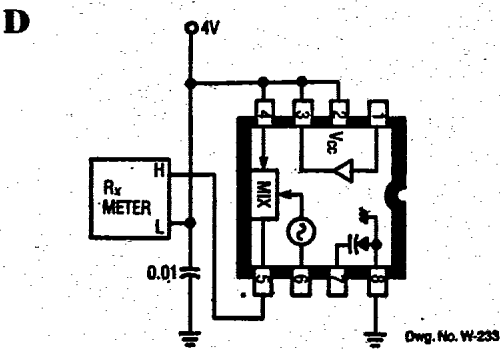
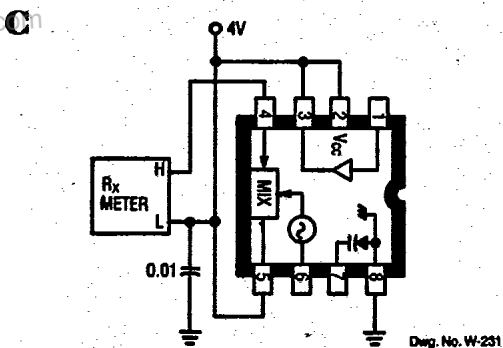
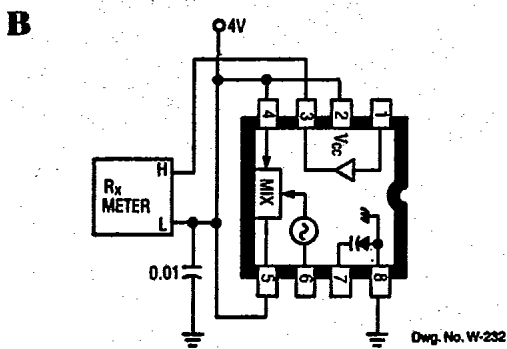
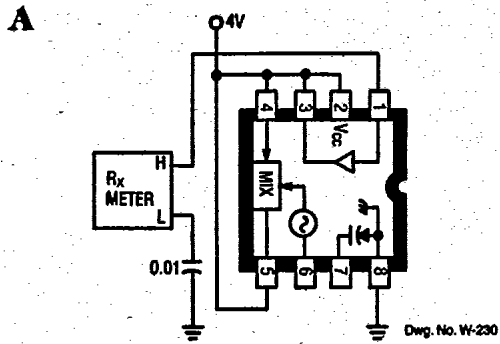
SEMICONDUCTOR GROUP

ULN3869M

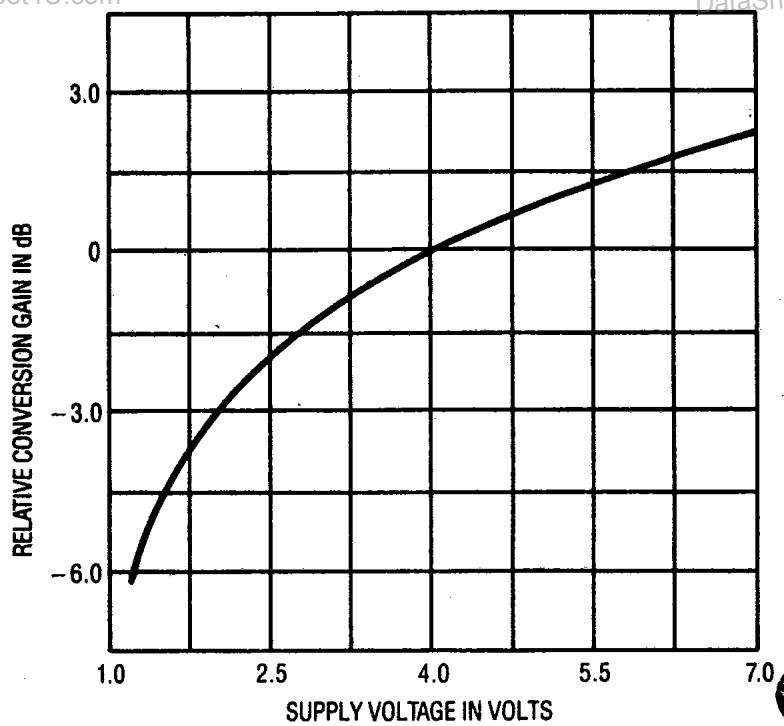
RF STAGE AND MIXER FOR FM RADIO APPLICATIONS

TEST CIRCUITS

TYPICAL CHARACTERISTICS

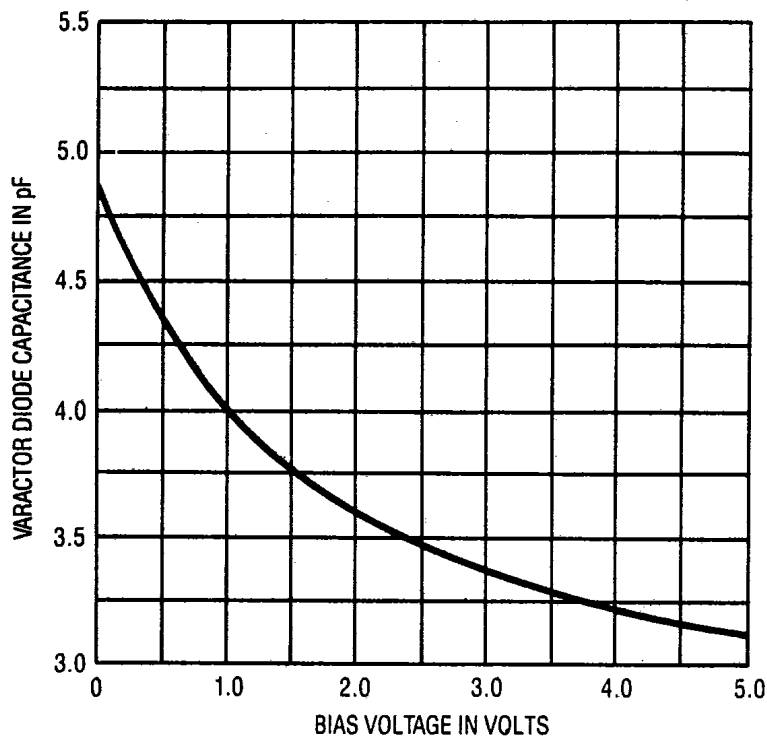


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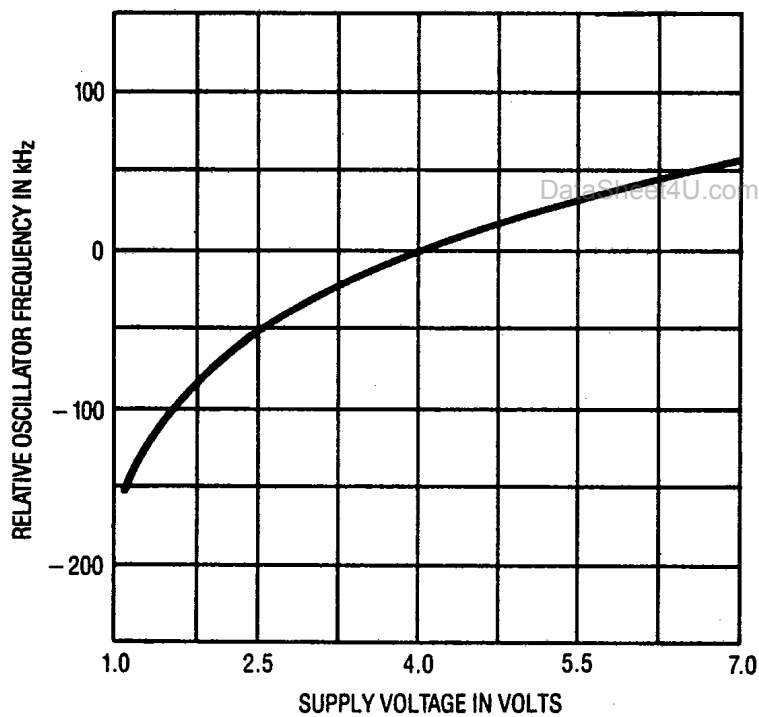


Dwg. No. W-236

TYPICAL CHARACTERISTICS



Dwg. No. W-238

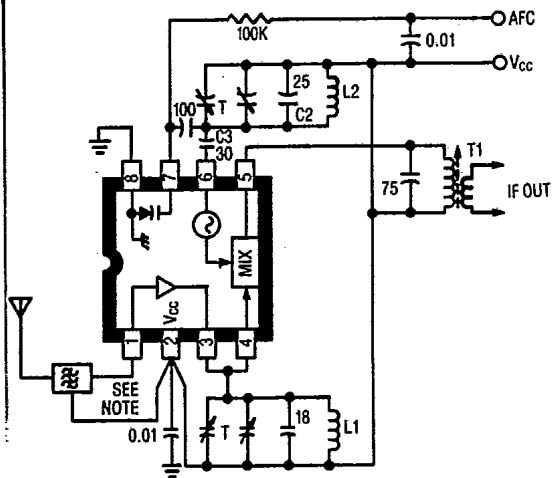


Dwg. No. W-235

APPLICATIONS INFORMATION

1. Capacitor C2 should exhibit a negative temperature coefficient of capacitance to compensate for oscillator drift with temperature.
2. As with all high-gain circuits, care and forethought must be given to the construction and circuit layout. All signals are referenced to pin 2. Layout consideration should be given to returning low-level input and high-level outputs to pin 2 via separate foil runs.
3. Increasing the value of C3 will increase the oscillator injection voltage while increasing the effect of supply voltage on oscillator frequency.
4. Adequate power supply bypassing is necessary for both high frequencies (ceramic capacitor near pin 2) and low frequencies (aluminum or tantalum electrolytic capacitor at the power supply).

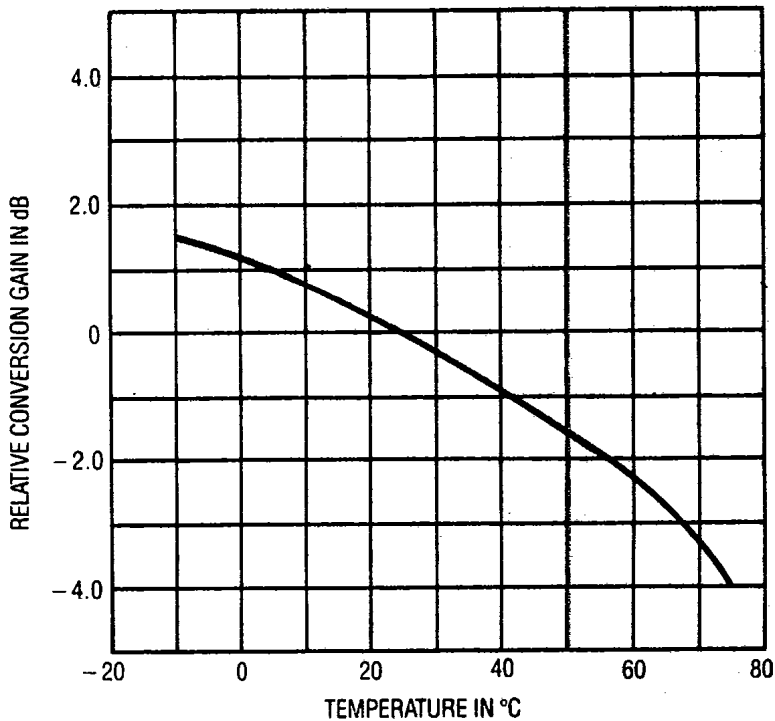
TYPICAL CHARACTERISTICS



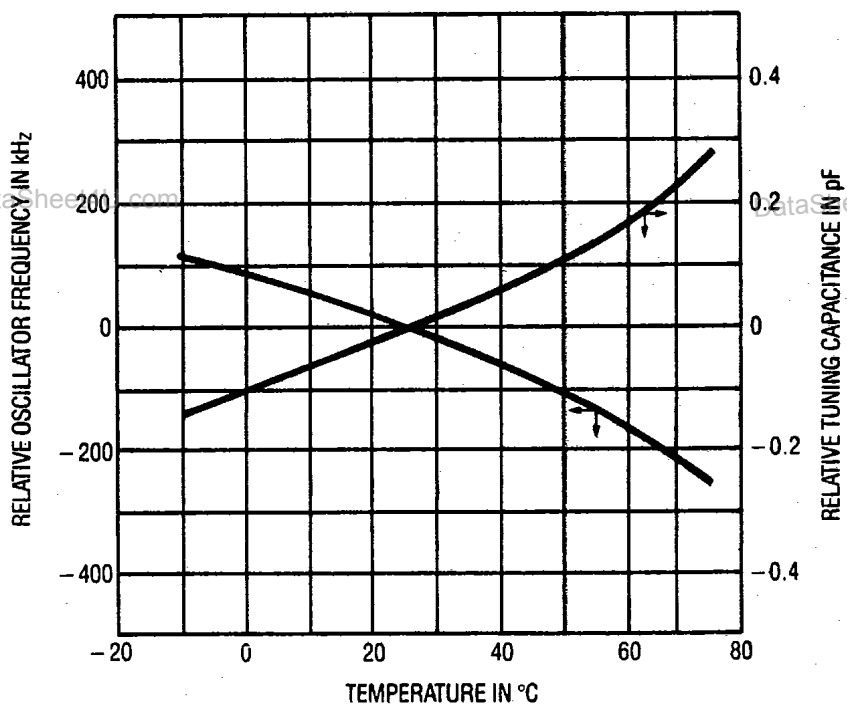
Dwg. No. W-240

TYPICAL APPLICATION ($f_{in} = 88-108$ MHz, $f_{if} = 10.7$ MHz)

L1	RF	3.5 turns, 0.8 mm dia. wire, 4.5 mm dia. form
L2	Oscillator	3.5 turns, 0.8 mm dia. wire, 4.5 mm dia. form
T1	IF	12:2 turns ratio, $Q_u = 120$ Jackson part number 99-1002-0810
	Tuning Capacitor	4-24 pF each section 4 pF trimmer Korea Marvel part number P25-22CHT



Dwg. No. W-237



Dwg. No. W-239

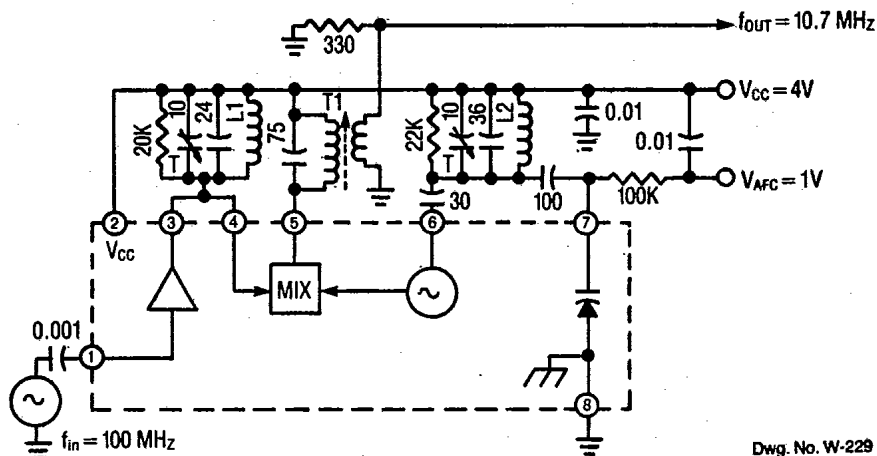
ULN3869M

RF STAGE AND MIXER FOR FM RADIO APPLICATIONS

TEST CIRCUIT

L1	RF	0.0607 μ H Toko part number 301 SN-0200
L2	Oscillator	0.0443 μ H Toko part number 301 SN-0100
T1	IF	12:2 turns ratio, $Q_u = 120$

TYPICAL CHARACTERISTICS



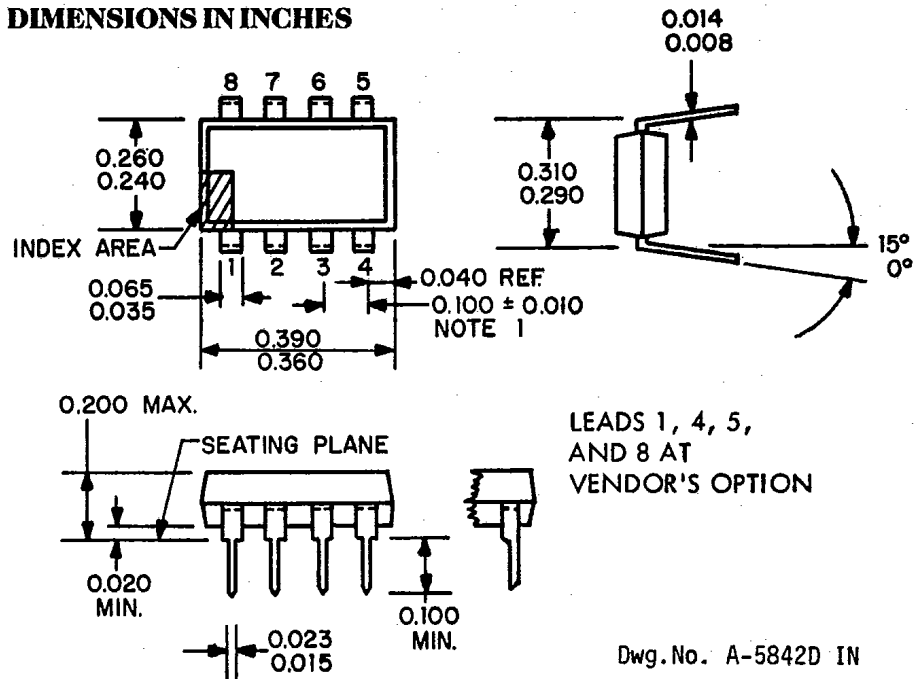
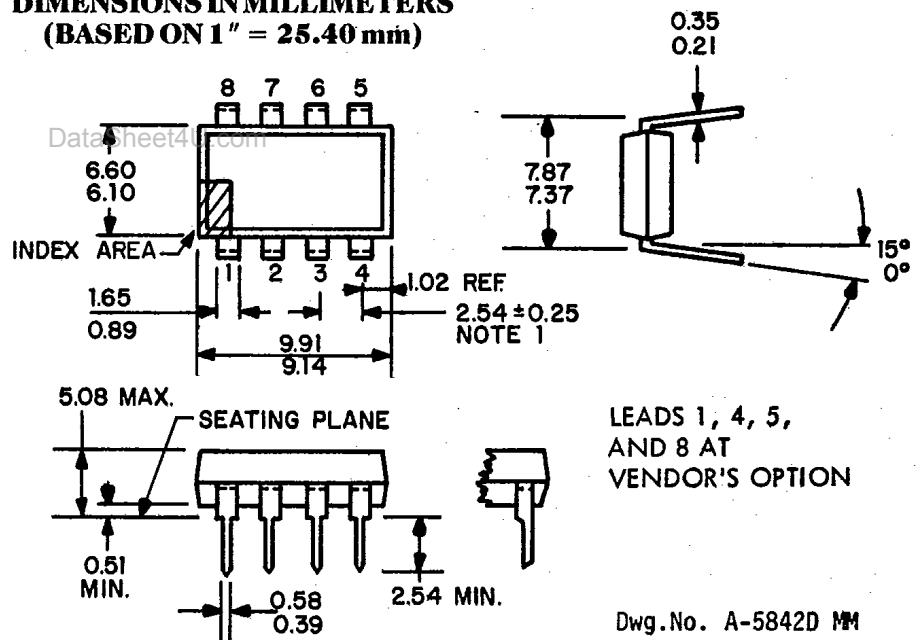
Dwg. No. W-229

ELECTRICAL CHARACTERISTICS at $T_A = 25^\circ\text{C}$, $V_{CC} = 4\text{ V}$, $V_{AFC} = 1\text{ V}$, $f_{in} = 100\text{ MHz}$, $f_{osc} = 110.7\text{ MHz}$ (unless otherwise noted)

Characteristic	Symbol	Test Condition	Limits			Units
			Min.	Typ.	Max.	
Supply Voltage Range	V_{CC}	Operating	1.5	-	6.0	V
Quiescent Supply Current	I_{CC}	$V_{in} = 0$	-	4.0	-	mA
Oscillator Level	V_{osc}		50	110	-	mV
Conversion Gain	G_v		-	25	-	dB
Oscillator Drop-Out Voltage	V_{CC}		-	1.1	-	V
Varactor Diode Capacitance	C_{1V}	$V_{AFC} = 1\text{ V}$	-	4.0	-	pF
Varactor Capacitance Ratio		C_{1V}/C_{3V}	-	1.2	-	-

SMALL-SIGNAL AC CHARACTERISTICS

Characteristic	Pin	Test Condition	Typ.	Units
RF Input Impedance	1	$f = 100\text{ MHz}$, Figure A	58	Ω
RF Output Impedance	3	$f = 100\text{ MHz}$, Figure B	4.0	$k\Omega$
RF Output Capacitance			7.0	pF
Mixer Input Impedance	4	$f = 100\text{ MHz}$, Figure C	3.0	$k\Omega$
Mixer Input Capacitance			4.0	pF
Mixer Output Impedance	5	$f = 10.7\text{ MHz}$, Figure D	8.0	$k\Omega$
Mixer Output Capacitance			4.5	pF

ULN3869M**RF STAGE AND MIXER FOR FM RADIO APPLICATIONS****DIMENSIONS IN INCHES****DIMENSIONS IN MILLIMETERS
(BASED ON 1" = 25.40 mm)**

In the construction of the components described, the full intent of the specification will be met. The Sprague Electric Company, however, reserves the right to make, from time to time, such departures from the detail specifications as may be required to permit improvements in the design of its products. Components made under military approvals will be in accordance with the approval requirements.

The information included herein is believed to be accurate and reliable. However, the Sprague Electric Company assumes no responsibility for its use; nor for any infringements of patents or other rights of third parties which may result from its use.

1. Lead spacing tolerance is non-cumulative.
2. Exact body and lead configuration at vendor's option within limits shown.
3. Lead gauge plane is 0.030" (0.76 mm) max. below seating plane.

SPRAGUE

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