

**LA7775M****Wideband FSK Receiver****Overview**

The LA7775M is an FM receiver for CATV or FM communications equipment. In addition to functions for FM demodulation (oscillator, mixer, limiting IF amplifier, and quadrature detection circuits) it also includes on chip an FSK data shaper circuit, an RF amplifier, and a local oscillator frequency switching circuit.

**Functions**

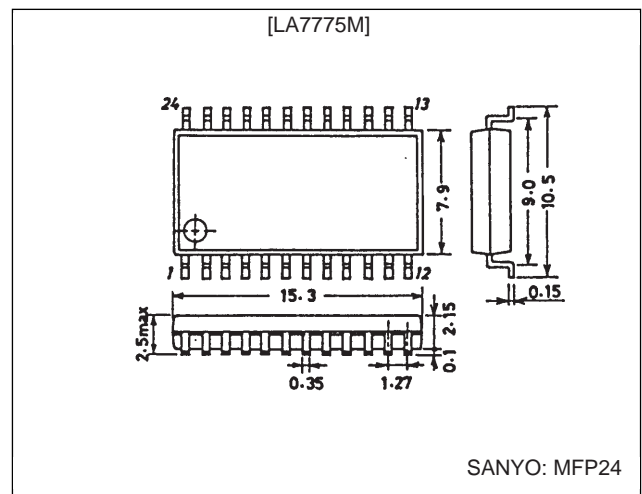
- RF amplifier
- Mixer
- Oscillator
- Oscillator switching
- Limiting IF amplifier
- Quadrature detection
- Data shaper

**Features**

- Wideband RF input
- On-chip RF amplifier
- On-chip oscillator frequency switching circuit

**Package Dimensions**

unit: mm

**3045B-MFP24****Specifications****Maximum Ratings at Ta = 25°C**

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC \text{ max}}$		7	V
Allowable power dissipation	$P_{d \text{ max}}$		350	mW
Operating temperature	$T_{opr}$		-20 to +75	°C
Storage temperature	$T_{stg}$		-55 to +125	°C

**Operating Conditions at Ta = 25°C**

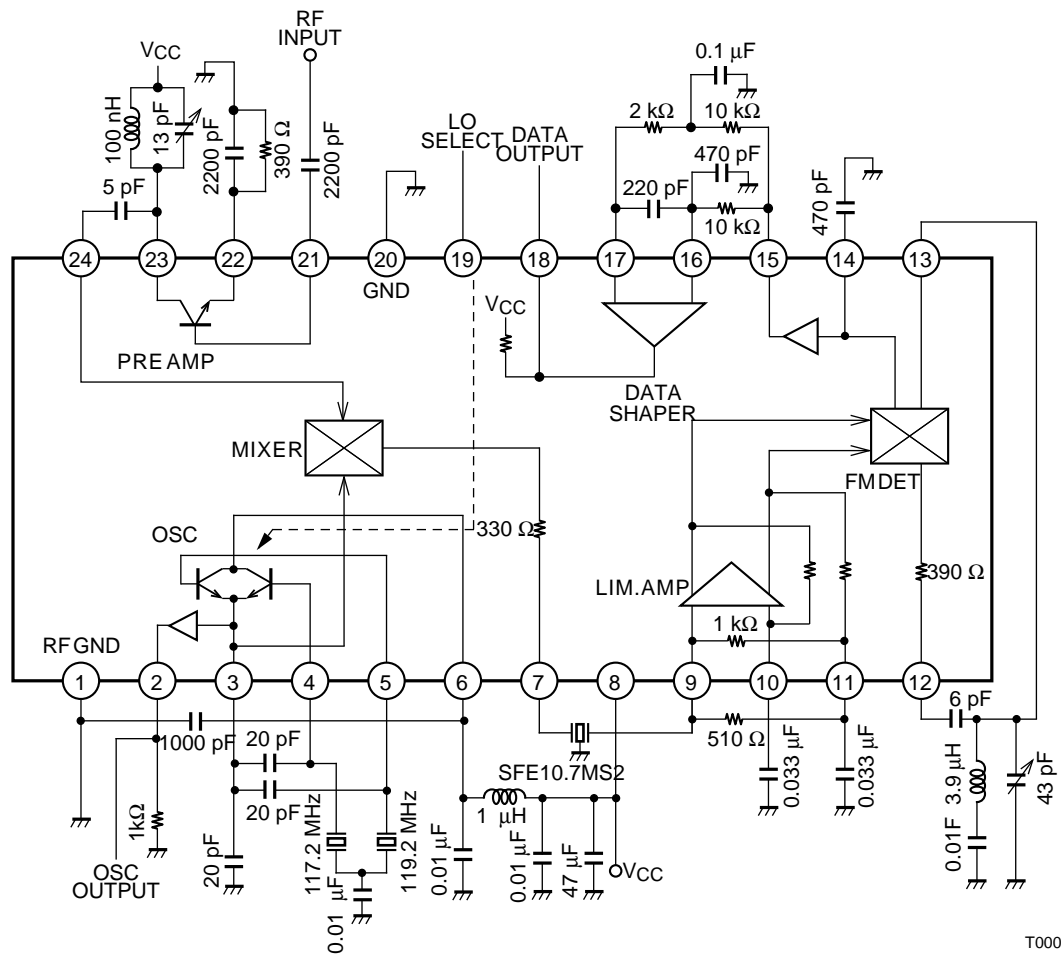
Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	$V_{CC}$		5	V
Operating supply voltage range	$V_{CCop}$		4.5 to 5.5	V
Input frequency	$f_{in21}, f_{in24}$		40 to 350	MHz

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### Operating Characteristics at $T_a = 25^\circ\text{C}$ ( $V_{CC} = 5\text{ V}$ , $f_o = 106.5\text{ MHz}$ , $f_{IF} = 10.7\text{ MHz}$ )

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Current drain	$I_{CC0}$			20	26	mA
Preamp input capacitance	$C_{i21}$	100 MHz		7		pF
Preamp input resistance	$R_{i21}$	100 MHz		1		k $\Omega$
Preamp voltage gain	$G_p$	350 MHz		15		dB
Mixer input capacitance	$C_{i24}$	100 MHz		7		pF
Mixer input resistance	$R_{i24}$	100 MHz		1		k $\Omega$
Mixer conversion gain	$G_c$	350 MHz		25		dB
-3 dB limiting sensitivity	$V_i$	$\Delta F = 75\text{ kHz dev, at } 1\text{ kHz}$		10	16	dB $\mu$
Demodulation output	$V_o$	$\Delta F = 75\text{ kHz dev, at } 1\text{ kHz}$	180	250		mVrms
SAW switching threshold level	V19TH		1.35	1.50	1.65	V
Data output high level	V18H		4.5			V
Data output low level	V18L				0.5	V
Oscillator output	V2	117.2 MHz	0.35			Vp-p

### Equivalent Circuit Block Diagram and Test Circuit



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## Pin Functions

Pin No.	Pin	Pin voltage(V)	Notes	Equivalent circuit
1	RFGND			
2	LOOUT	3.3	Oscillator output after the limiting amplifier. This pin is used when constructing a PLL synthesizer or related circuit. A 1-k $\Omega$ external resistor is required when using this pin.	<p style="text-align: right;">T00079</p>
3	LOCOM	1.2	When pin 19 is low, pin 4 is selected, when high, pin 5 is selected.	<p style="text-align: right;">T00080</p>
4	LORES1	1.9		
5	LORES2	0.8		
6	RFV <sub>CC</sub>			
7	IFOUT	4.1	A matching resistor for the SAW filter is built in.	<p style="text-align: right;">T00081</p>
8	V <sub>CC</sub>			
9	LIMITER INPUT1	1.5	Insert a 510- $\Omega$ resistor between pins 9 and 11 when using this circuit.	<p style="text-align: right;">T00082</p>
10	LIMITER INPUT2	1.5		
11	LIMITER BIAS	1.5		
12	LIMITER OUTPUT	4.2		<p style="text-align: right;">T00083</p>

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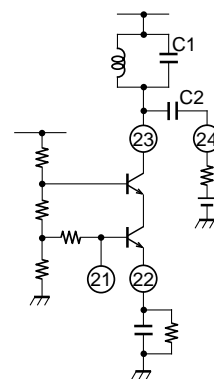
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Pin No.	Pin	Pin voltage(V)	Notes	Equivalent circuit
13	QUAD INPUT	4.3		<p style="text-align: right;">T00084</p>
14	FILTER INPUT	2.5		<p style="text-align: right;">T00085</p>
15	DET. OUTPUT	1.8		
16	DATA-SHAPER INPUT1			<p style="text-align: right;">T00086</p>
17	DATA-SHAPER INPUT2			
18	DATA OUTPUT			
19	LOSELECT		When pin 19 is low, pin 4 is selected, when high, pin 5 is selected.	<p style="text-align: right;">T00087</p>
20	GND			
21	RF AMP INPUT	1.6	The optimal collector current is between 1.5 and 2 mA.	<p style="text-align: right;">T00088</p>
22	RF AMP BIAS	0.6		
23	RF AMP OUTPUT			
24	MIX INPUT	1.9		<p style="text-align: right;">T00089</p>

## Design Notes

### 1. RF amplifier

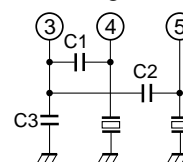
This circuit is formed as a two-transistor cascode amplifier and takes an LC tank circuit as its load. The operating current is set by the external resistor connected to pin 22. The optimal operating current is between 1.5 and 2 mA. The capacitor (C2) connected between pins 23 and 24 is related to the tank circuit Q, and must not be too large.



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### 2. Oscillator circuit

This is a grounded collector oscillator circuit, and supports using either an LC, a crystal, or a SAW resonator. Care is required when constructing this circuit, since the input sensitivity may be suppressed if the oscillator circuit output leaks into the IF limiting amplifier. It is extremely important to use a capacitor (e.g. a ceramic capacitor) with excellent high-frequency characteristics for the 1000 pF bypass capacitor inserted between the oscillator circuit power supply pin (pin 6) and the ground pin (pin 1). In addition, this capacitor must be located as close as possible to pins 1 and 6. When forming an oscillator circuit using a SAW resonator, the optimal values for C1 through C3 will vary with the oscillator frequency. Thus this circuit must be adjusted for optimal performance. Since the capacitor C3 between pin 3 and ground will be shared if a circuit that switches between two SAW resonators is used, the difference between the frequencies must be held to under 10 MHz. If a large frequency difference is required, design a circuit that also switches the capacitance between pin 3 and ground.



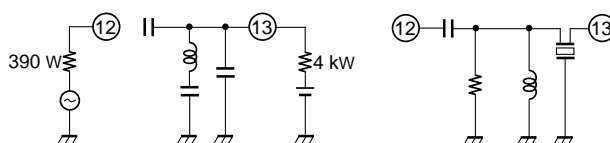
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### 3. IF limiting amplifier

This circuit consists of a six-stage direct coupled differential amplifier to which DC feedback is applied. Since an internal 1-k $\Omega$  resistor is built in between the IF input pin (pin 9) and pin 11, the input and output impedance of the 330- $\Omega$  IF filter can be matched with an external 510- $\Omega$  resistor. No external matching resistor is required for the IF output (pin 7), since a 330- $\Omega$  resistor is built in.

### 4. Quadrature detection circuit

An external phase shifting circuit is formed from an LC tuning circuit and a ceramic discriminator.



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