

MB4207

Frequency-to-Voltage Converter

DESCRIPTION

The Fujitsu MB4207 is a single power supply frequency-to-voltage converter with a comparator. The MB4207 can stabilize a noisy signal using the charge pump driven by a Schmitt trigger and flip-flop circuit.

The comparator provides precise hysteresis output due to clamping at the reference voltage with Zener diode.

FEATURES

- An RC pair provides the coefficient of conversion:

$$V_O = \frac{2}{3} \cdot V_Z \cdot C_T \cdot R_T \cdot f_{IN}$$
- Output is clamped at the built-in reference voltage (High-level).
- Positive-edge trigger frequency input.

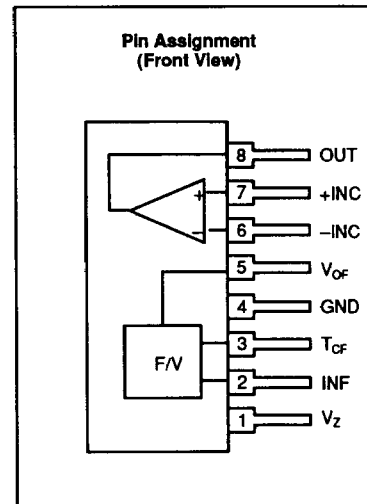
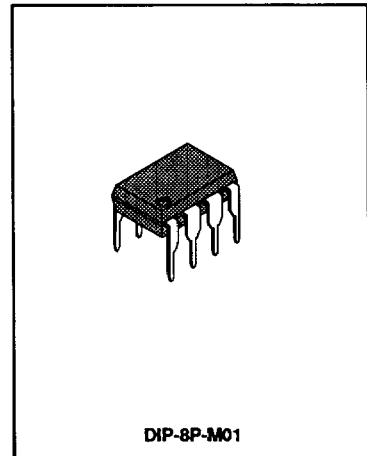
ABSOLUTE MAXIMUM RATING (T_A = 25°C)

Rating	Symbol	Value	Unit
Supply Voltage	V _{CC}	24 ¹	V
Surge Voltage at V _{CC}	V _{CCS}	100 ²	V
Zener Current	I _Z	30	mA
Power Dissipation	P _D	300 ³	mW
Operating Temperature	T _{OP}	-30 to +85	°C
Storage Temperature	T _{STG}	-55 to +125	°C

Notes: ¹R_s = 680 Ω

²t < 50 msec, R_s = 680 Ω

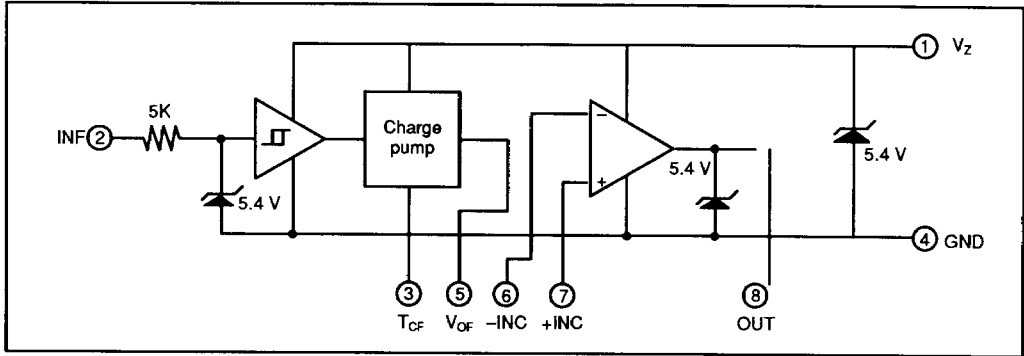
³T_A < 85°C



Note: Permanent device damage may occur if absolute maximum ratings are exceeded. Functional operation should be restricted to the conditions as detailed in the operation sections of this data sheet. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

This device contains circuitry to protect the inputs against damage due to high static voltages or electric fields. However, it is advised that normal precautions be taken to avoid application of any voltage higher than maximum rated voltages to this high impedance circuit.

BLOCK DIAGRAM



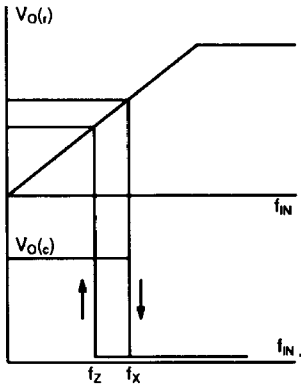
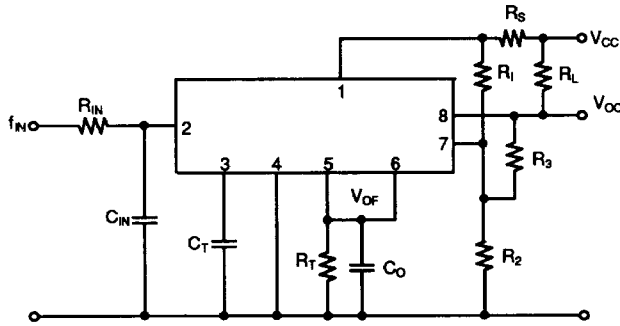
ELECTRICAL CHARACTERISTICS

($T_A = 25\text{ }^\circ\text{C}$, $V_{CC} = 12\text{V}$, $R_S = 680\Omega$)

Parameter	Conditions	Symbol	Value			Unit	
			Min.	Typ.	Max.		
Supply Current	$R_S=0\Omega$, $V_{CC}=4.8\text{V}$	I_{CC}	—	3.0	5.0	mA	
Reference Voltage	See Figure 1	V_Z	5.0	5.4	5.8	V	
	$V_{CC} = 10$ to 16V	ΔV_Z	—	0.05	0.1	V	
V / F CONVERTER	Input High Level	V_{IH}	2.4	—	24	V	
	Input Low Level	V_{IL}	0	—	1.2	V	
	Positive-edge		1	—	—	V/ms	
	Negative-edge		0.1	—	—	V/ms	
	Input Current	$V_{IH} = 24\text{V}$ $V_{IL} = 1.2\text{V}$	I_{INF}	—	4	8	mA mA
	Output Current	$V_{TCF} = 2.5\text{V}$	I_{OF}	0.26	0.4	0.58	mA
F/V Coefficient	$C_T = 0.1\text{ }\mu\text{F}$, $R_T = 47\text{k}\Omega$ $f = 100\text{ Hz}$	K^1	0.9	1.0	1.1		
Linearity Error	$V_T = 0.1\text{ }\mu\text{F}$, $R_T = 47\text{k}\Omega^2$		—	± 0.3	—	%	
COMPARATOR	Input Offset Voltage	V_{IOC}	—	2	10	mA	
	Input Bias Current	(See Note ³)	I_{IBC}	—	0.5	3	μA
	Common Mode Input Voltage		V_{CM}	0	—	3	V
	Voltage Gain	$R_L = 10\text{k}\Omega$	A_V	—	100	—	dB
	Output Voltage	$I_{SINK} = 3\text{ mA}$	V_{OLC}	—	0.1	0.2	V
		$I_L = 0.5\text{ mA}$	V_{OLC}	5.0	5.4	5.8	V
Sink Current	$V_{OLC} < 1\text{V}$	I_{SINK}	8	20	—	mA	

Notes: ¹ $V_O = (2/3) \cdot K \cdot V_Z \cdot C_T \cdot R_T \cdot f_{IN}$
²At 50/100 Hz on the basis at 100 Hz.
³The current flows outward from the IC.

APPLICATION EXAMPLE



Operating frequency of the comparator is provided by the following equations.

$$f_x \approx \frac{3}{2C_T R_T} \cdot \frac{R_Z}{R_2 + R_I // R_3}$$

$$f_z \approx \frac{3}{2C_T R_T} \cdot \frac{R_2 // R_3}{R_1 + R_2 // R_3}$$

R_{IN} and C_{IN} are needed when the input has chattering noise.

TYPICAL CHARACTERISTIC CURVES

Figure 1. Supply Current/Reference Voltage vs. Supply Voltage

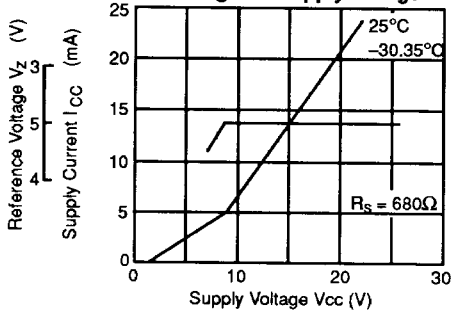


Figure 2. Output Current vs. Ambient Temperature

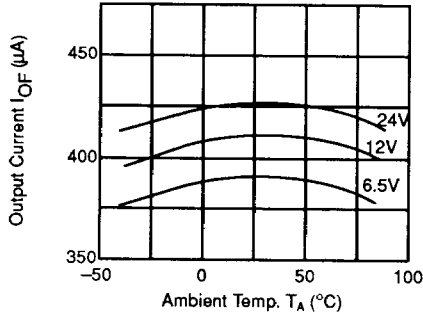
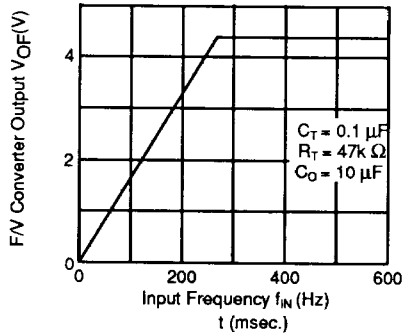


Figure 3. F/V Converter Output Voltage vs. Input Frequency



TYPICAL CHARACTERISTIC CURVES (Continued)

Figure 4. Zener Current vs. Reference Voltage

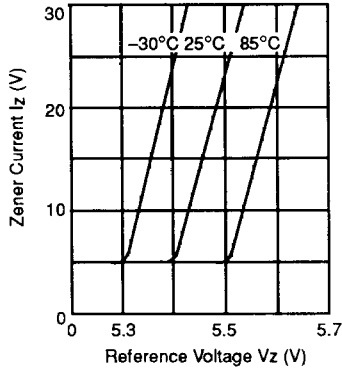


Figure 5. Low-Level Output Voltage vs. Sink Current

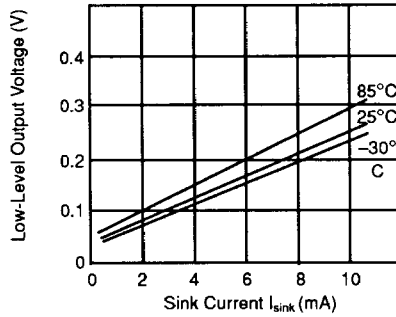
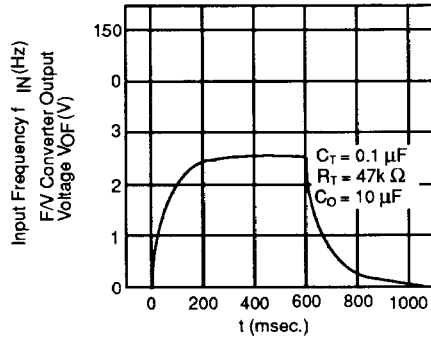


Figure 6. F/V Converter Transition Characteristics



PACKAGE DIMENSIONS

