

APPLICATION MANUAL



Dual OPAMP with Full-swing Output TK17020M

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Dual OPAMP with Full-swing Output TK17020M

1. DESCRIPTION

The TK17020M is dual operational amplifier with full-swing output.

The features are low voltage operation, low saturation output, and a small package. It is suitable for use with battery-operated portable equipment.

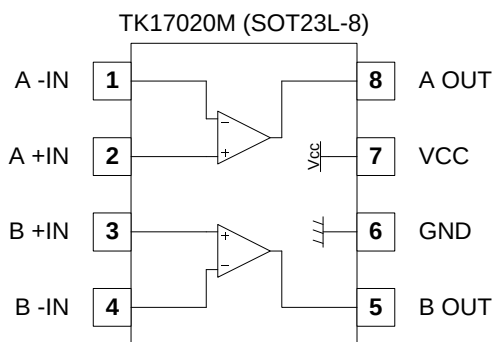
2. FEATURES

- Low Voltage Operation $V_{OP}=1.8V$ to $10V$
- Low Saturation Output Voltage $V_{OM}=V_{CC}-0.14V$
- Slew Rate $SR=0.5V/\mu sec$
- Unity Gain Bandwidth $GB=0.7MHz$
- Small Package SOT23L-8

3. APPLICATIONS

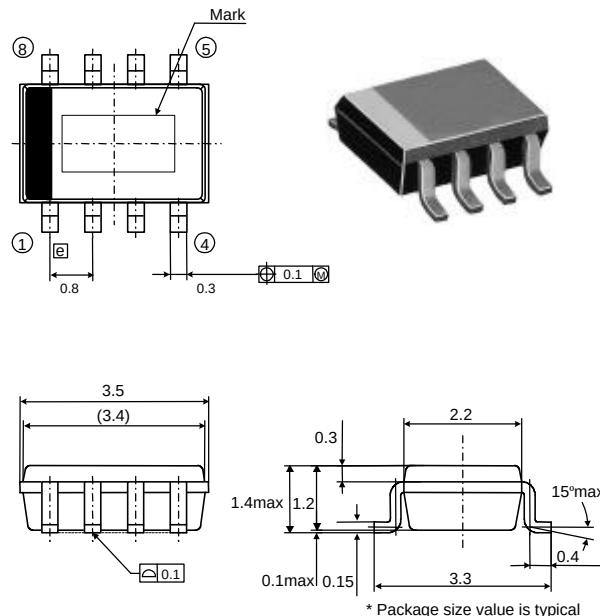
- General Purpose
- Portable Equipment
- Low Operating Voltage Equipment

4. PIN CONFIGURATION



5. PACKAGE OUTLINE

■ SOT23L-8



6. ABSOLUTE MAXIMUM RATINGS

$T_a=25^\circ C$

Parameter	Symbol	Rating	Units	Conditions
Supply Voltage	V_{CC}	12	V	
Power Dissipation	P_D	400	mW	*
Storage Temperature Range	T_{stg}	-55 ~ +150	$^\circ C$	
Operating Temperature Range	T_{OP}	-40 ~ +85	$^\circ C$	
Operating Voltage Range	V_{OP}	1.8 ~ 10	V	

* P_D must be decreased at the rate of $3.2mW/^\circ C$ for operation above $25^\circ C$.

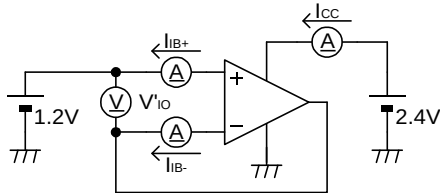
7. ELECTRICAL CHARACTERISTICS

$V_{CC}=2.4V, T_a=25^{\circ}C$

Parameter	Symbol	Value			Units	Conditions
		MIN	TYP	MAX		
Supply Current	I_{CC}	-	1.8	3.0	mA	$R_L=\infty, V_{in}=V_{CC}/2$
Input Offset Voltage	V_{IO}	-	2	20	mV	
Input Offset Current	I_{IO}	-	5	200	nA	
Input Bias Current	I_{IB}	-	120	800	nA	
Common-Mode Input Voltage Range	V_{ICMR}	0.5	-	$V_{CC}-1.2$	V	
Maximum Output Voltage	V_{OM}	$V_{CC}-0.25$	$V_{CC}-0.1$	-	V	$R_L=1k\Omega, V_{OH}$
		-	0.04	0.25	V	$R_L=1k\Omega, V_{OL}$
Source Current	I_{SO}	8	20	-	mA	$A_V=1, V_{IN}=1V, V_O=0.8V$
Sink Current	I_{SI}	18	30	-	mA	$A_V=1, V_{IN}=1V, V_O=1.2V$
Common-Mode Rejection Ratio	CMRR	-	90	-	dB	
Supply Voltage Rejection Ratio	SVRR	-	70	-	dB	
Open Circuit Voltage Gain	G_{VO}	-	100	-	dB	
Slew Rate	SR	-	0.5	-	V/ μs	$A_V=1, R_L=1k\Omega$
Gain-Bandwidth Product	GB	-	0.7	-	MHz	
Cross Talk	CT	-	85	-	dB	$f=1kHz, A_V=1$

8. TEST CIRCUIT

- Supply Current, Input Offset Voltage, Input Offset Current, Input Bias Current

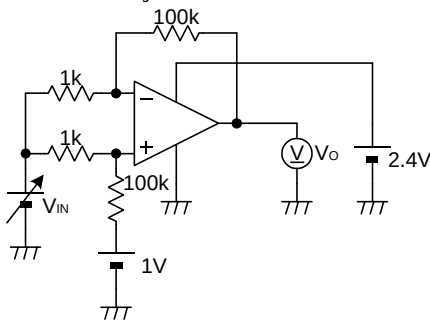


$$V_{IO} = |V'_{IO}|$$

$$I_{IO} = |I_{IB+} - I_{IB-}|$$

$$I_{IB} = \frac{I_{IB+} + I_{IB-}}{2}$$

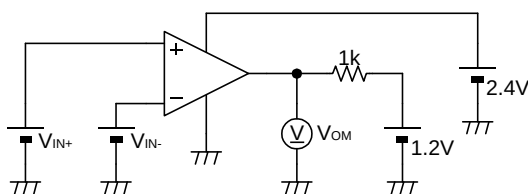
- Common-Mode Rejection Ratio, Common-Mode Input Voltage Range



$$CMRR = 20 \log \left(101 \times \left| \frac{\Delta V_{IN}}{\Delta V_O} \right| \right)$$

$$V_{ICMR} : CMRR > 60dB$$

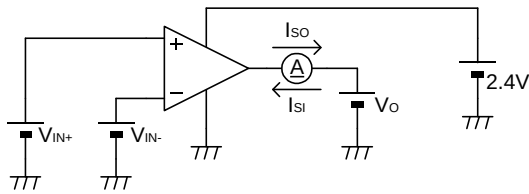
- Maximum Output Voltage



$$V_{OM+} : V_{IN+} = 1.2V, V_{IN-} = 0.8V$$

$$V_{OM-} : V_{IN+} = 0.8V, V_{IN-} = 1.2V$$

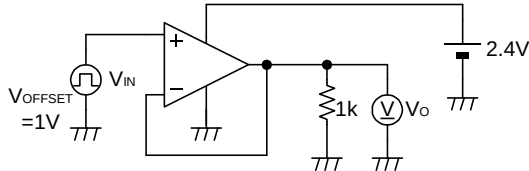
• Source Current, Sink Current



$$I_{SO} : V_{IN+} = 1.2V, V_{IN-} = 0.8V, V_O = 0.8V$$

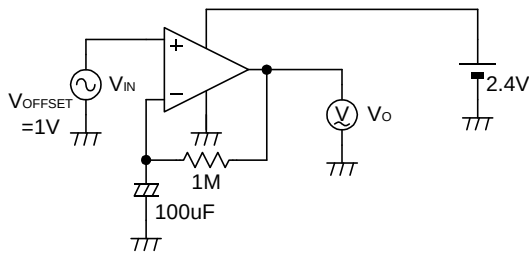
$$I_{SI} : V_{IN+} = 0.8V, V_{IN-} = 1.2V, V_O = 1.2V$$

• Slew Rate



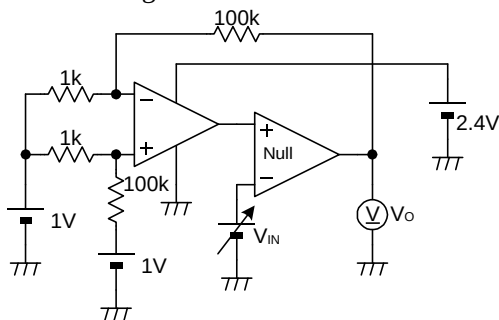
$$SR = \frac{\Delta V_O}{\Delta T_{RISE}}$$

• Gain-Bandwidth Product



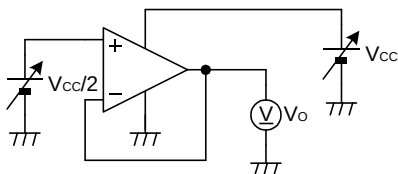
$$GB = \frac{V_O(f_T)}{V_{IN}(f_T)} \times f_T$$

• Open Circuit Voltage Gain



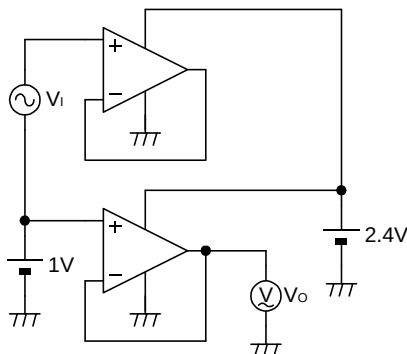
$$G_{VO} = 20 \log \left(101 \times \frac{-\Delta V_{IN}}{\Delta V_O} \right)$$

• Supply Voltage Rejection Ratio



$$SVRR = 20 \log \frac{\Delta V_{CC}}{\Delta V_O}$$

• Cross Talk

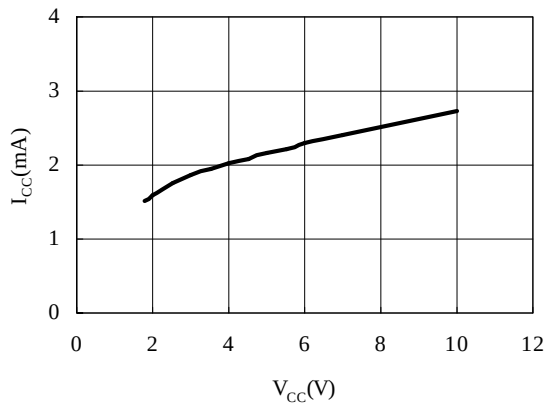


$$CT = 20 \log \frac{\Delta V_I}{\Delta V_O}$$

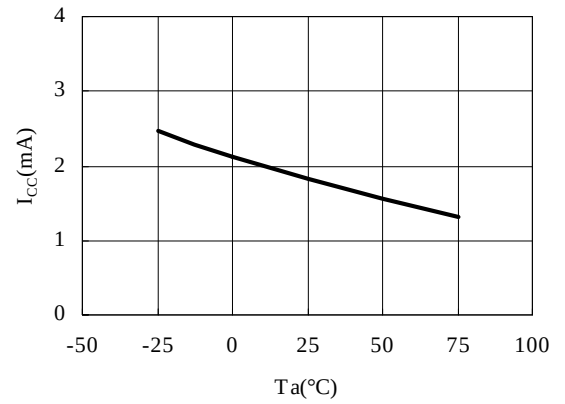
9. TYPICAL CHARACTERISTICS

($T_a=25^{\circ}\text{C}, V_{CC}=2.4\text{V}$)

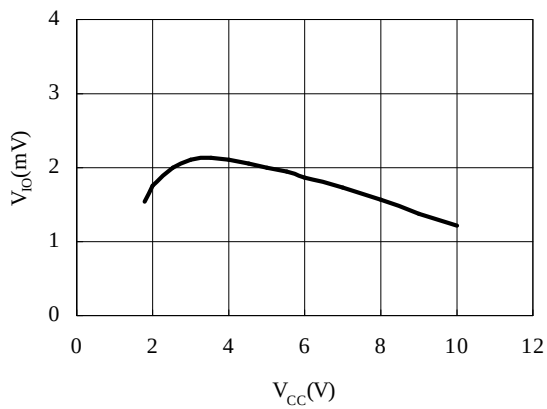
• Supply Current vs. Supply Voltage



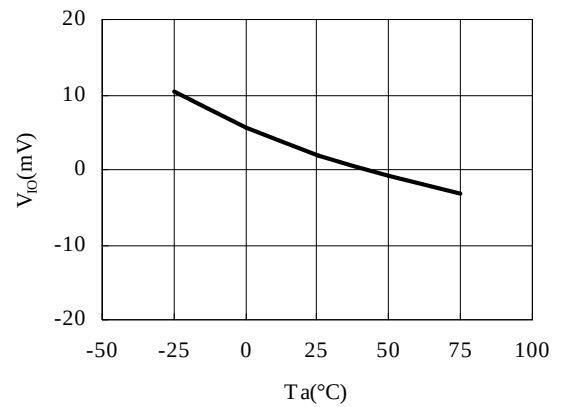
• Supply Current vs. Temperature



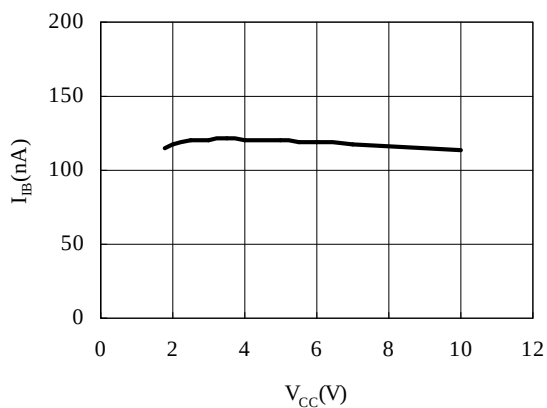
• Input Offset Voltage vs. Supply Voltage



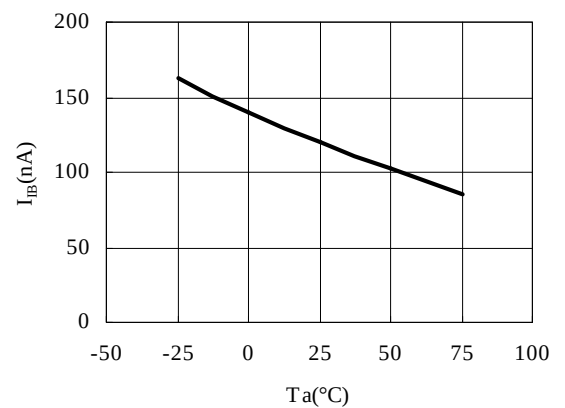
• Input Offset Voltage vs. Temperature



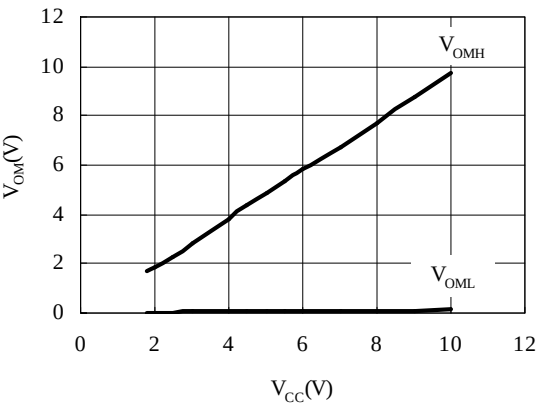
• Input Bias Current vs. Supply Voltage



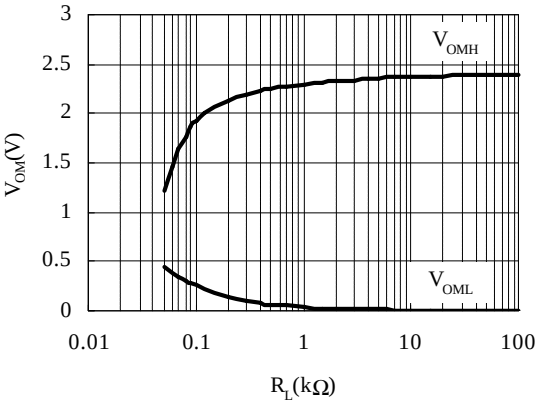
• Input Bias Current vs. Temperature



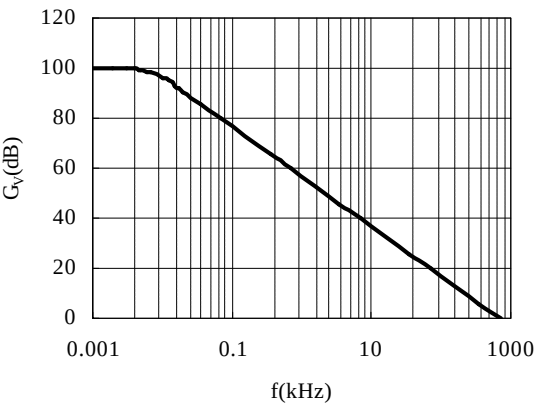
- Maximum Output Voltage vs. Supply Voltage
($R_L=1k\Omega$)



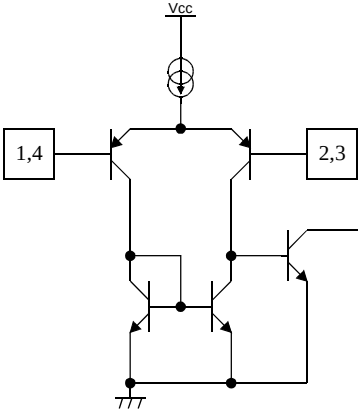
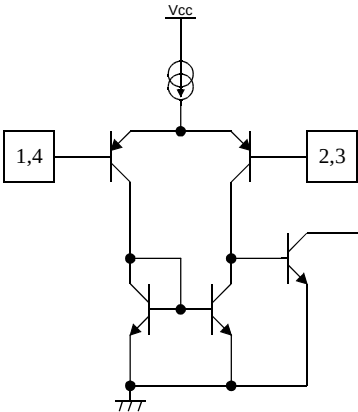
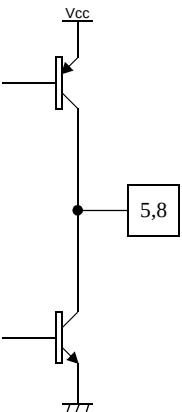
- Maximum Output Voltage vs. Load Resistance
($V_{CC}=2.4V$)



- Open Circuit Voltage Gain vs. frequency



10. PIN DESCRIPTION

Pin No.	Pin Description	Internal Equivalent Circuit	Description
1 4	A-IN B-IN		Inverting Input Terminal.
2 3	A+IN B+IN		Non-Inverting Input Terminal.
5 8	BOUT AOUT		Output terminal. Please connect a 0.022μF capacitor to this terminal to prevent oscillation.
6	GND		Ground Terminal
7	V _{CC}		Supply Voltage Terminal

11. NOTES

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