

TOSHIBA CMOS LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TC75W51FU, TC75W51FK

DUAL OPERATIONAL AMPLIFIER

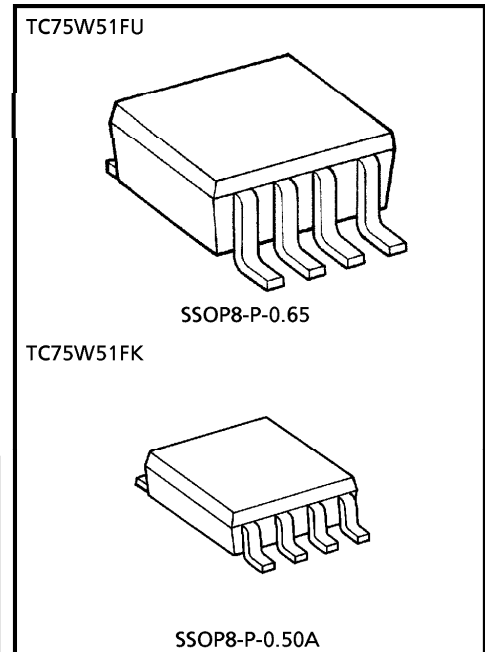
TC75W51 is a CMOS operational amplifier with low supply voltage, low supply current.

FEATURES

- Low supply voltage : $V_{DD} = \pm 0.75 \sim \pm 3.5V$ or $1.5 \sim 7V$
- Low supply current : $I_{DD} (V_{DD} = 3V) = 120\mu A$ (Typ.)
- The internally phase compensated operational amplifier.
- Small package

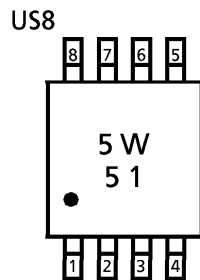
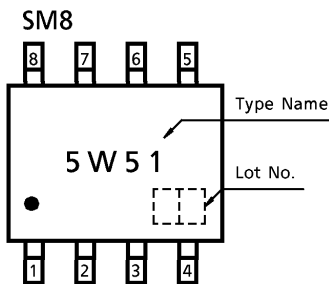
MAXIMUM RATINGS (Ta = 25°C)

| CHARACTERISTIC | SYMBOL | RATING | N |
|----------------------------|------------------|----------------------|----|
| Supply Voltage | V_{DD}, V_{SS} | 7 | V |
| Differential Input Voltage | DV_{IN} | ± 7 | V |
| Input Voltage | V_{IN} | $V_{DD} \sim V_{SS}$ | V |
| Power Dissipation | P_D | 250 (SM8) | mW |
| | | 200 (US8) | |
| Operating Temperature | T_{opr} | -40~85 | °C |
| Storage Temperature | T_{stg} | -55~125 | °C |

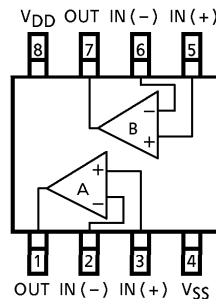


Weight
 SSOP8-P-0.65 : 0.021g (Typ.)
 SSOP8-P-0.50A : 0.01g (Typ.)

MARKING (TOP VIEW)



PIN CONNECTION (TOP VIEW)



980508EBA1

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ELECTRICAL CHARACTERISTICSDC CHARACTERISTICS ($V_{DD} = 3.0V$, $V_{SS} = GND$, $T_a = 25^\circ C$)

| CHARACTERISTIC | SYMBOL | TEST CIR-CUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|--|------------|---------------|---------------------------------------|------|------|------|---------|
| Input Offset Voltage | V_{IO} | 1 | $R_S = 1k\Omega$, $R_F = 100k\Omega$ | — | 2 | 10 | mV |
| Input Offset Current | I_{IO} | — | — | — | 1 | — | pA |
| Input Bias Current | I_I | — | — | — | 1 | — | pA |
| Common Mode Input Voltage | CMV_{IN} | 2 | $R_S = 1k\Omega$, $R_F = 100k\Omega$ | 0 | — | 2.5 | V |
| Voltage Gain (Open Loop) | G_V | — | — | 60 | 70 | — | dB |
| Maximum Output Voltage | V_{OH} | 3 | $R_L \geq 100k\Omega$ | 2.9 | — | — | V |
| | V_{OL} | 4 | $R_L \geq 100k\Omega$ | — | — | 0.1 | V |
| Common Mode Input Signal Rejection Ratio | CMRR | 2 | $V_{IN} = 0.0 \sim 2.5V$ | 55 | 65 | — | dB |
| Supply Voltage Rejection Ratio | SVRR | 1 | $V_{DD} = 1.5 \sim 7.0V$ | 60 | 70 | — | dB |
| Supply Current | I_{DD} | 5 | — | — | 120 | 400 | μA |

DC CHARACTERISTICS ($V_{DD} = 1.5V$, $V_{SS} = GND$, $T_a = 25^\circ C$)

| CHARACTERISTIC | SYMBOL | TEST CIR-CUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---------------------------|------------|---------------|--|------|------|------|---------|
| Input Offset Voltage | V_{IO} | 1 | $R_S = 10k\Omega$, $R_F = 100k\Omega$ | — | 2 | 10 | mV |
| Input Offset Current | I_{IO} | — | — | — | 1 | — | pA |
| Input Bias Current | I_I | — | — | — | 1 | — | pA |
| Common Mode Input Voltage | CMV_{IN} | 2 | $R_S = 10k\Omega$, $R_F = 100k\Omega$ | 0 | — | 1.0 | V |
| Voltage Gain (Open Loop) | G_V | — | — | 60 | 70 | — | dB |
| Maximum Output Voltage | V_{OH} | 3 | $R_L \geq 100k\Omega$ | 1.4 | — | — | V |
| | V_{OL} | 4 | $R_L \geq 100k\Omega$ | — | — | 0.1 | V |
| Supply Current | I_{DD} | 5 | — | — | 100 | 300 | μA |

(Note) This device should be operated less than $70\mu A$ source current.AC CHARACTERISTICS ($V_{DD} = 3.0V$, $V_{SS} = GND$, $T_a = 25^\circ C$)

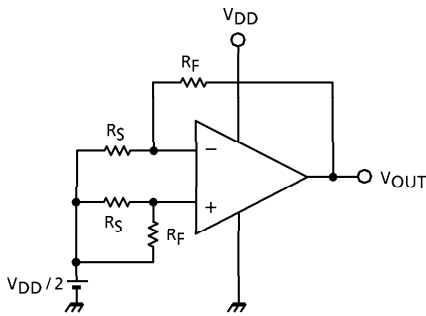
| CHARACTERISTIC | SYMBOL | TEST CIR-CUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|----------------------------|--------|---------------|----------------|------|------|------|-------------|
| Slew Rate | SR | — | $A_V = 0dB$ | — | 0.5 | — | $V / \mu s$ |
| Unity Gain Cross Frequency | f_T | — | $A_V = 40dB$ | — | 0.6 | — | MHz |

AC CHARACTERISTICS ($V_{DD} = 1.5V$, $V_{SS} = GND$, $T_a = 25^\circ C$)

| CHARACTERISTIC | SYMBOL | TEST CIR-CUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|----------------------------|--------|---------------|----------------|------|------|------|-------------|
| Slew Rate | SR | — | $A_V = 0dB$ | — | 0.3 | — | $V / \mu s$ |
| Unity Gain Cross Frequency | f_T | — | $A_V = 40dB$ | — | 0.5 | — | MHz |

TEST CIRCUIT

1. SVRR, V_{IO}



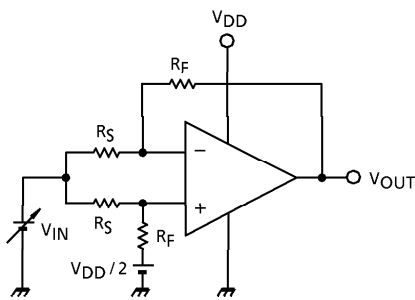
- SVRR
 $V_{DD} = 1.5V : V_{DD} = V_{DD1}, V_{OUT} = V_{OUT1}$
 $V_{DD} = 7.0V : V_{DD} = V_{DD2}, V_{OUT} = V_{OUT2}$

$$SVRR = 20 \log \left(\left| \frac{V_{OUT1} - V_{OUT2}}{V_{DD1} - V_{DD2}} \right| \times \frac{R_S}{R_F + R_S} \right)$$

- V_{IO}

$$V_{IO} = \left(V_{OUT} - \frac{V_{DD}}{2} \right) \times \frac{R_S}{R_F + R_S}$$

2. CMRR, CMV_{IN}

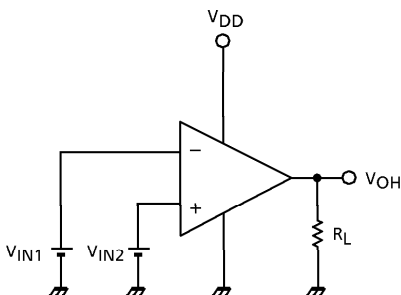


- CMRR
 $V_{IN} = 0.0V : V_{IN} = V_{IN1}, V_{OUT} = V_{OUT1}$
 $V_{IN} = 2.5V : V_{IN} = V_{IN2}, V_{OUT} = V_{OUT2}$

$$CMRR = 20 \log \left(\left| \frac{V_{OUT1} - V_{OUT2}}{V_{IN1} - V_{IN2}} \right| \times \frac{R_S}{R_F + R_S} \right)$$

- CMV_{IN}

3. V_{OH}

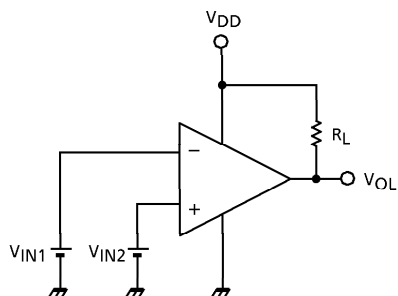


- V_{OH}

$$V_{IN1} = \frac{V_{DD}}{2} - 0.05V$$

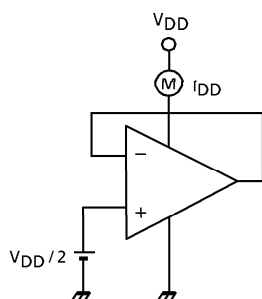
$$V_{IN2} = \frac{V_{DD}}{2} + 0.05V$$

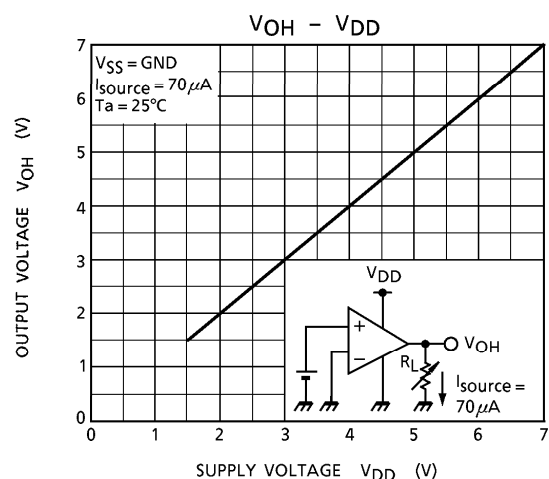
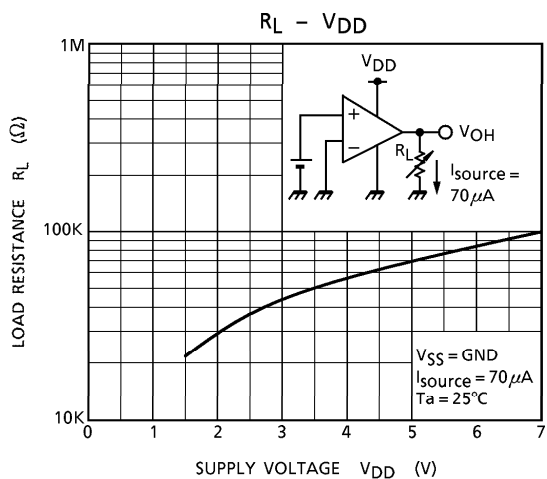
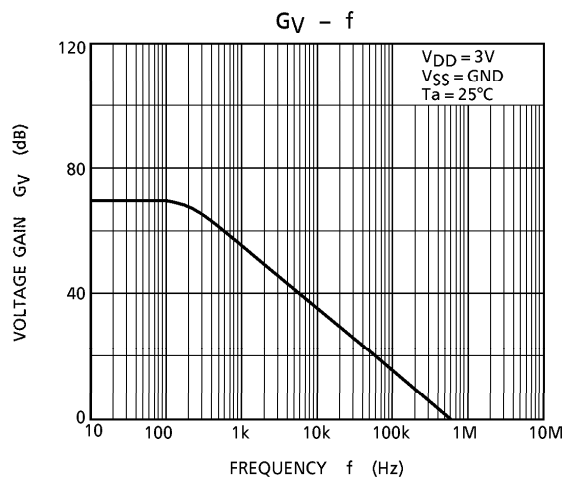
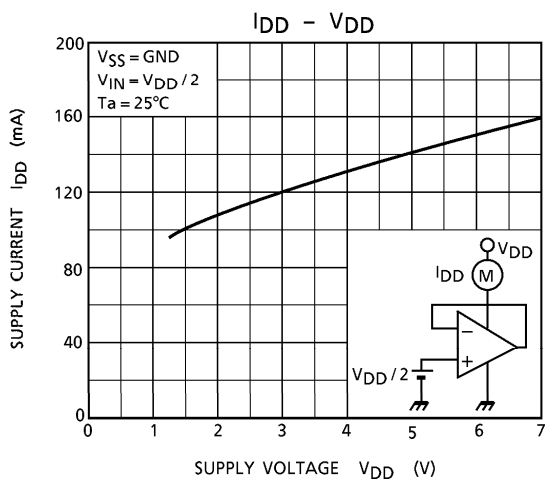
4. V_{OL}

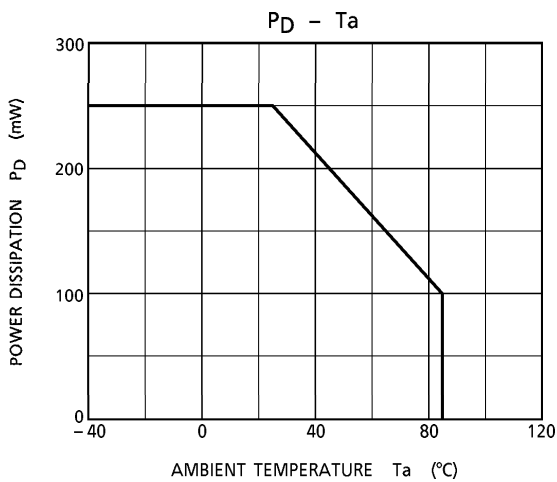
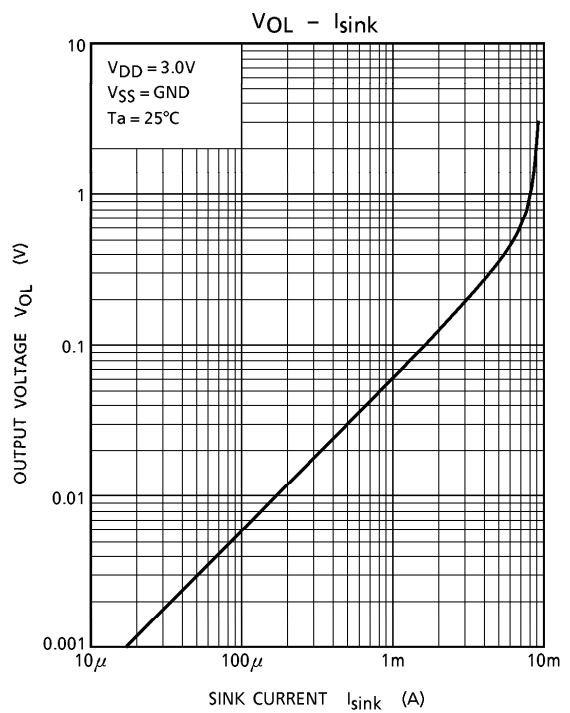
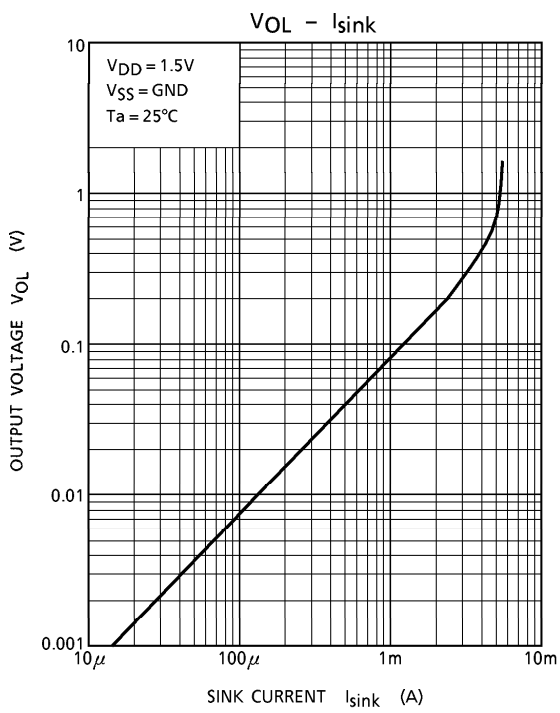


- V_{OL}
- $$V_{IN1} = \frac{V_{DD}}{2} + 0.05V$$
- $$V_{IN2} = \frac{V_{DD}}{2} - 0.05V$$

5. I_{DD}

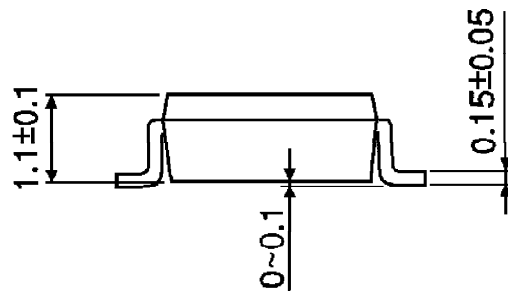
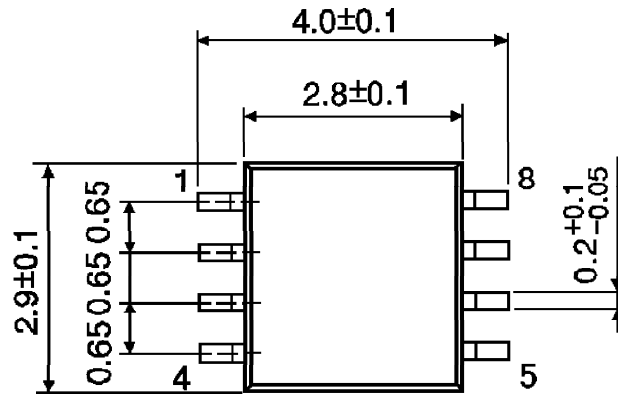






OUTLINE DRAWING
SSOP8-P-0.65

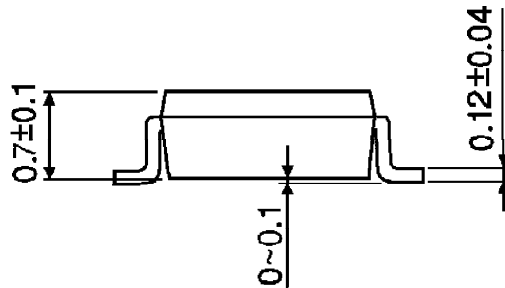
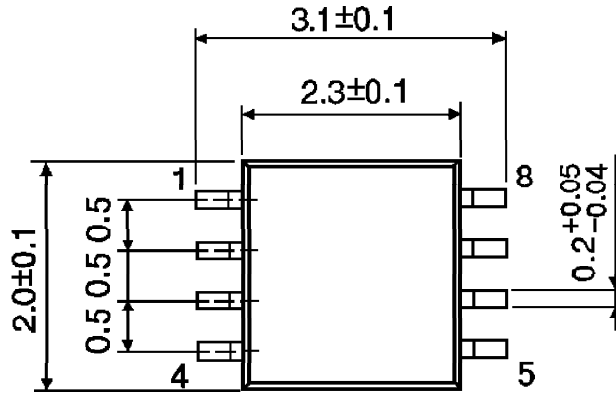
Unit : mm



Weight : 0.021g (Typ.)

OUTLINE DRAWING
SSOP8-P-0.50A

Unit : mm



Weight : 0.01g (Typ.)