

TOSHIBA CMOS LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TC75W54FU, TC75W54FK

DUAL OPERATIONAL AMPLIFIER

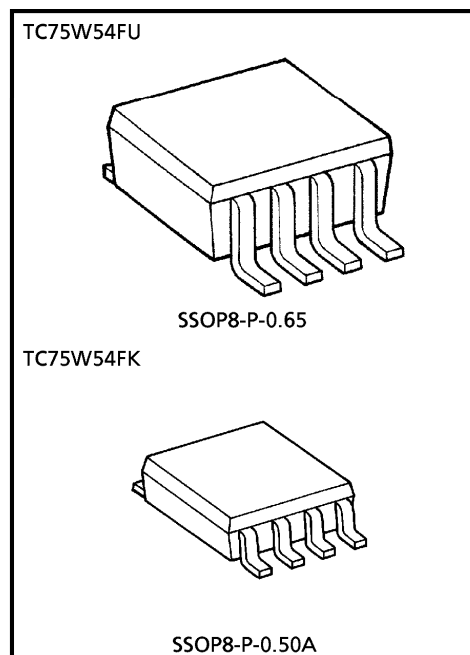
TC75W54 is a CMOS operational amplifier with low supply voltage, low supply current.

FEATURES

- Low supply voltage : $V_{DD} = \pm 0.9 \sim 3.5V$ or $1.8 \sim 7V$
- Low supply current : $I_{DD} (V_{DD} = 3V) = 200\mu A$ (Typ.)
- The internally phase compensated operational amplifier.
- Small package

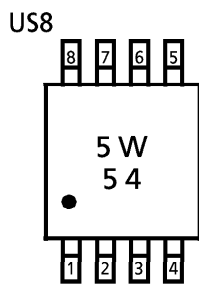
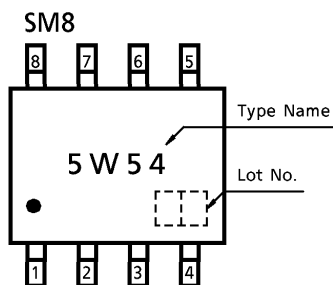
MAXIMUM RATINGS (Ta = 25°C)

| 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} | $-40 \sim 85$ | °C |
| Storage Temperature | T_{stg} | $-55 \sim 125$ | °C |

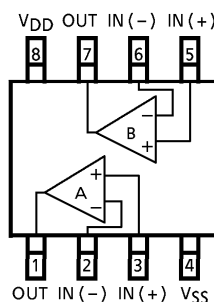


Weight
 SSOP8-P-0.65 : 0.021g (Typ.)
 SSOP8-P-0.50A : 0.01g (Typ.)

MARKING (TOP VIEW)



PIN CONNECTION (TOP VIEW)



980508EBA1

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ELECTRICAL CHARACTERISTICS

DC 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 | $R_S = 1k\Omega$ | — | 2 | 10 | mV |
| Input Offset Current | I_{IO} | — | — | — | 1 | — | pA |
| Input Bias Current | I_I | — | — | — | 1 | — | pA |
| Common Mode Input Voltage | CMV_{IN} | 2 | — | 0.0 | — | 2.1 | 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 | |
| Common Mode Input Signal Rejection Ratio | CMRR | 2 | $V_{IN} = 0.0 \sim 2.1V$ | 60 | 70 | — | dB |
| Supply Voltage Rejection Ratio | SVRR | 1 | $V_{DD} = 1.8 \sim 7.0V$ | 60 | 70 | — | dB |
| Supply Current | I_{DD} | 5 | — | — | 200 | 400 | μA |
| Source Current | I_{source} | 6 | — | 100 | 200 | — | μA |
| Sink Current | I_{sink} | 7 | — | 200 | 700 | — | μA |

DC CHARACTERISTICS ($V_{DD} = 1.8V$, $V_{SS} = GND$, $T_a = 25^\circ C$)

| CHARACTERISTIC | SYMBOL | TEST CIR-CUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---------------------------|--------------|---------------|-----------------------|------|------|------|---------|
| Input Offset Voltage | V_{IO} | 1 | $R_S = 10k\Omega$ | — | 2 | 10 | mV |
| Input Offset Current | I_{IO} | — | — | — | 1 | — | pA |
| Input Bias Current | I_I | — | — | — | 1 | — | pA |
| Common Mode Input Voltage | CMV_{IN} | 2 | — | 0.2 | — | 0.9 | V |
| Voltage Gain (Open Loop) | G_V | — | — | 60 | 70 | — | dB |
| Maximum Output Voltage | V_{OH} | 3 | $R_L \geq 100k\Omega$ | 1.7 | — | — | V |
| | V_{OL} | 4 | $R_L \geq 100k\Omega$ | — | — | 0.1 | |
| Supply Current | I_{DD} | 5 | — | — | 160 | 320 | μA |
| Source Current | I_{source} | 6 | — | 80 | 160 | — | μA |
| Sink Current | I_{sink} | 7 | — | 200 | 600 | — | μA |

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

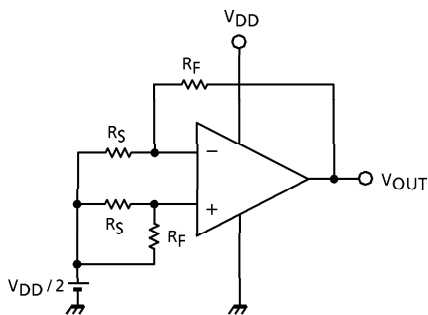
| CHARACTERISTIC | SYMBOL | TEST CIR-CUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|----------------------------|--------|---------------|----------------|------|------|------|-------------|
| Slew Rate | SR | — | — | — | 0.7 | — | $V / \mu s$ |
| Unity Gain Cross Frequency | f_T | — | — | — | 0.9 | — | MHz |

AC CHARACTERISTICS ($V_{DD} = 1.8V$, $V_{SS} = GND$, $T_a = 25^\circ C$)

| CHARACTERISTIC | SYMBOL | TEST CIR-CUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|----------------------------|--------|---------------|----------------|------|------|------|-------------|
| Slew Rate | SR | — | — | — | 0.6 | — | $V / \mu s$ |
| Unity Gain Cross Frequency | f_T | — | — | — | 0.8 | — | MHz |

TEST CIRCUIT

1. SVRR, V_{IO}



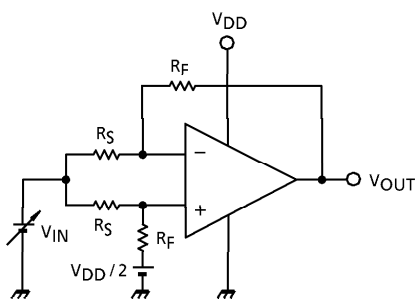
- SVRR
 $V_{DD} = 1.8V : V_{DD} = V_{DD1}, V_{OUT} = V_{OUT1}$
 $V_{DD} = 7.0V : V_{DD} = V_{DD2}, V_{OUT} = V_{OUT2}$

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

- V_{IO}

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

2. CMRR, CMV_{IN}

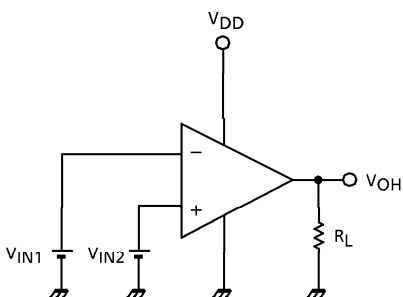


- CMRR
 $V_{IN} = 0.0V : V_{IN} = V_{IN1}, V_{OUT} = V_{OUT1}$
 $V_{IN} = 2.1V : V_{IN} = V_{IN2}, V_{OUT} = V_{OUT2}$

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

- CMV_{IN}

3. V_{OH}

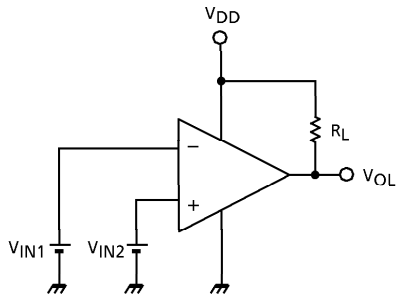


- V_{OH}

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

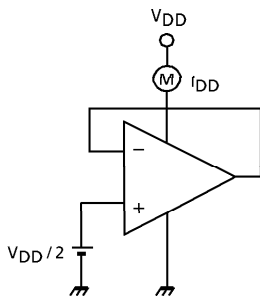
$$V_{IN2} = \frac{V_{DD}}{2} + 0.05V$$

4. V_{OL}

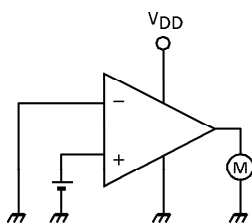


- V_{OL}
- $V_{IN1} = \frac{V_{DD}}{2} + 0.05V$
- $V_{IN2} = \frac{V_{DD}}{2} - 0.05V$

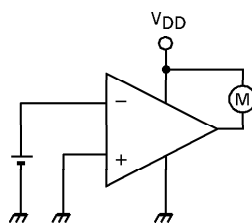
5. I_{DD}

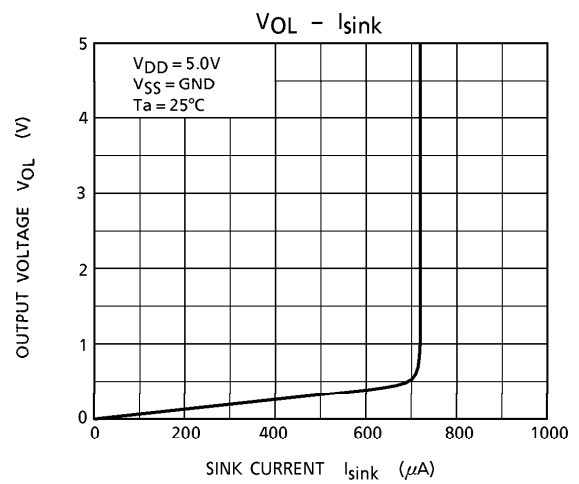
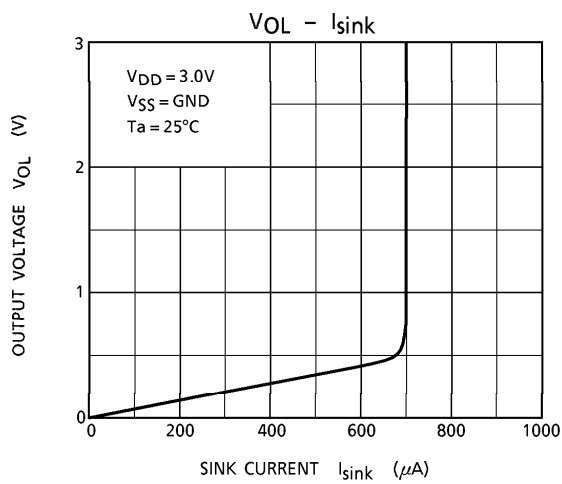
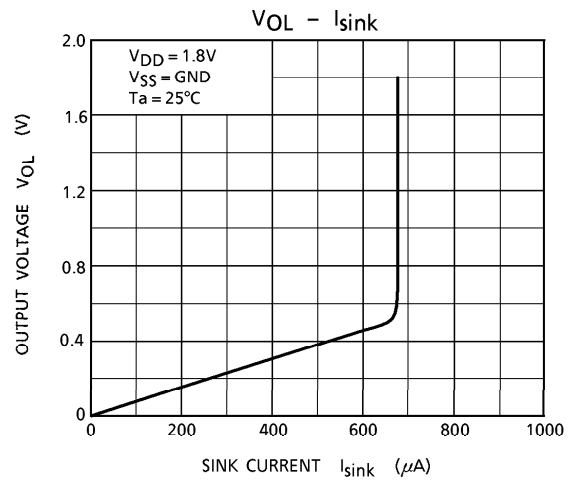
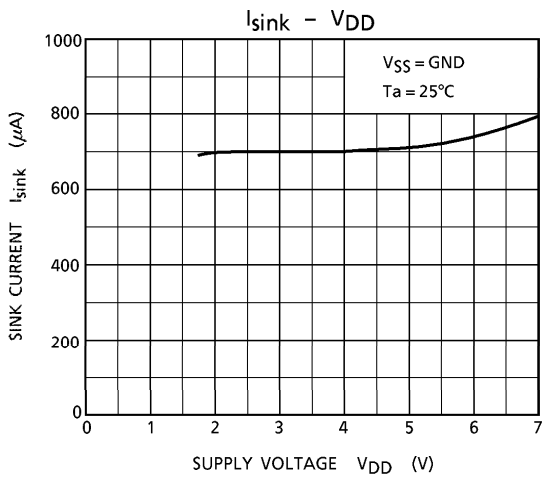
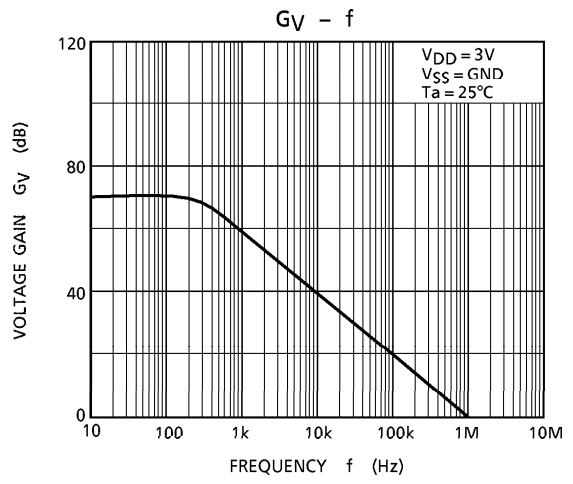
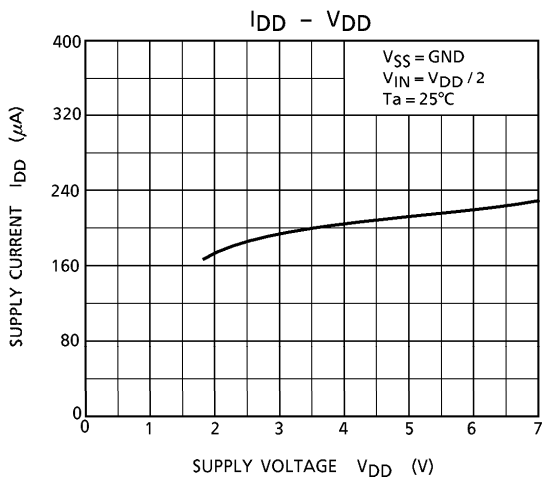


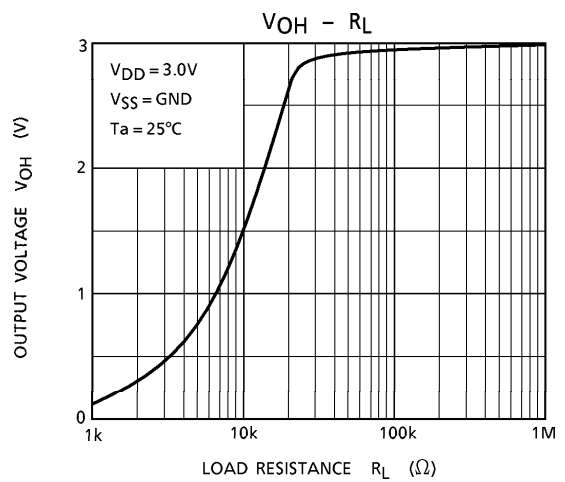
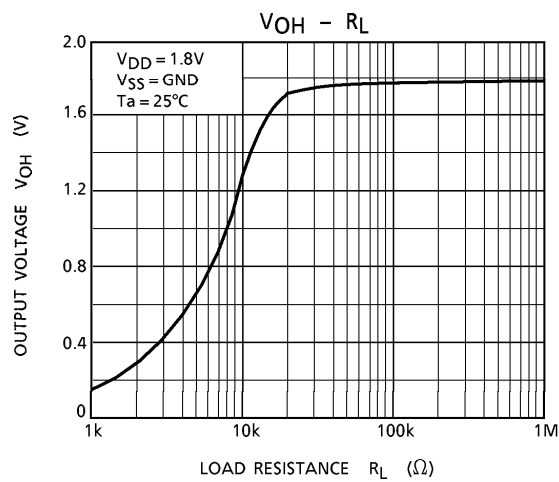
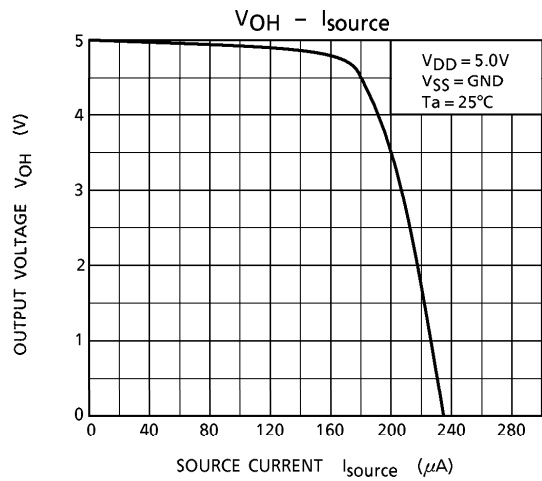
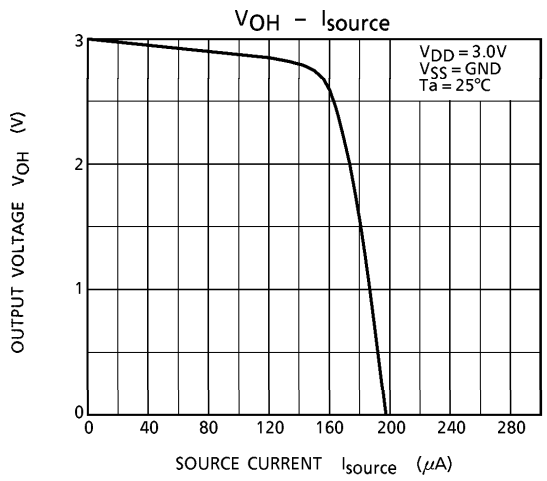
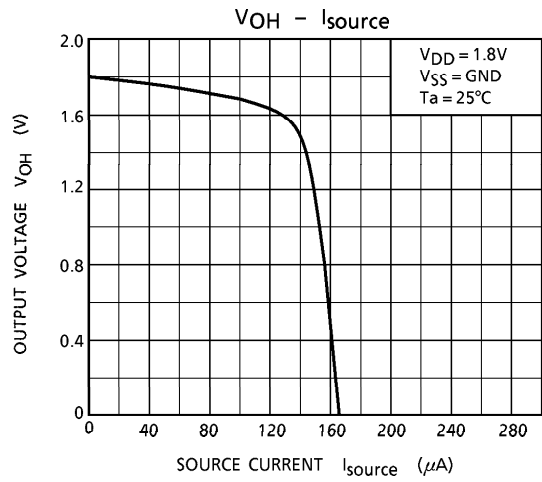
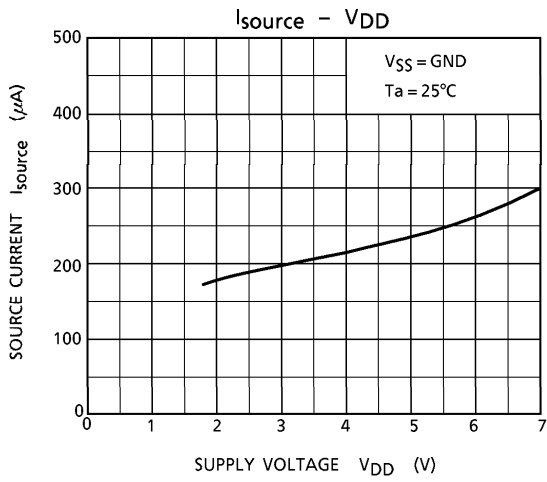
6. I_{source}

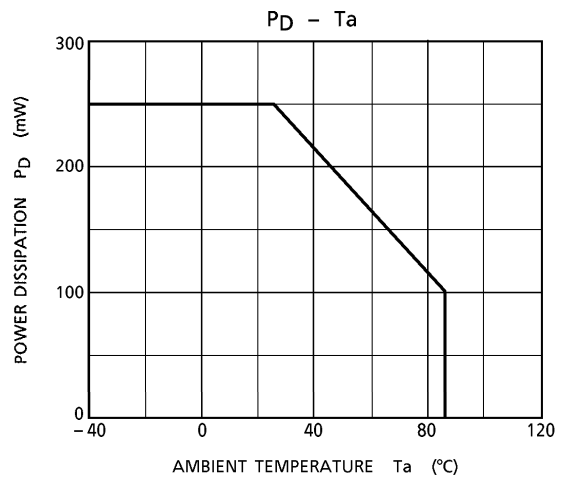
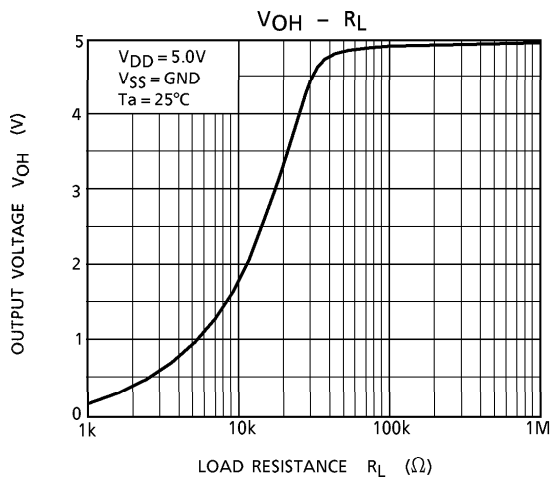


7. I_{sink}



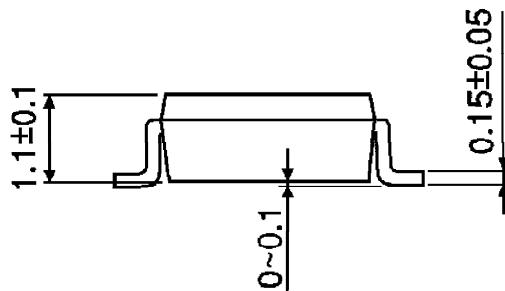
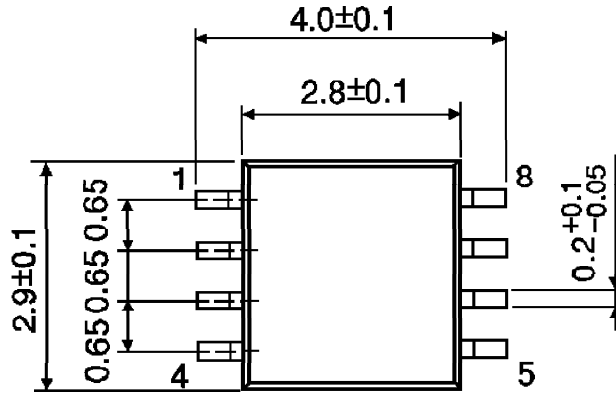






OUTLINE DRAWING
SSOP8-P-0.65

Unit : mm



Weight : 0.021g (Typ.)