

TOSHIBA CMOS LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TC75S54F, TC75S54FU

SINGLE OPERATIONAL AMPLIFIER

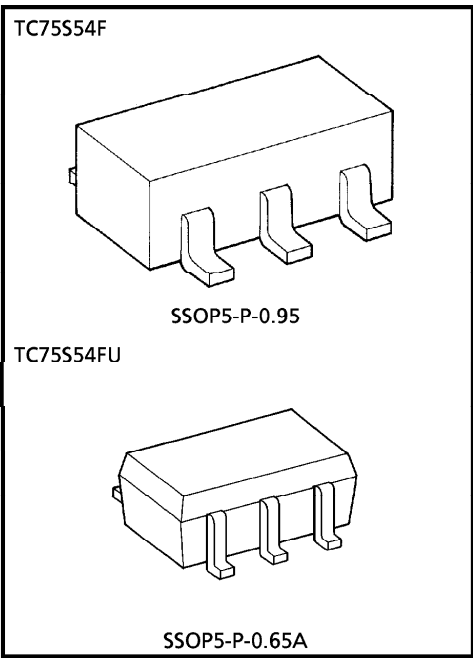
TC75S54F, TC75S54FU are CMOS operational amplifier with low supply voltage, low supply current.

FEATURES

- Low supply voltage : $V_{DD} = \pm 0.9 \sim 3.5V$ or $1.8 \sim 7V$
- Low supply current : $I_{DD} (V_{DD} = 3V) = 100 \mu A$ (Typ.)
- The internally phase compensated operational amplifier.
- Small package

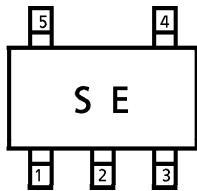
MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
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	200	mW
Operating Temperature	T_{opr}	$-40 \sim 85$	°C
Storage Temperature	T_{stg}	$-55 \sim 125$	°C

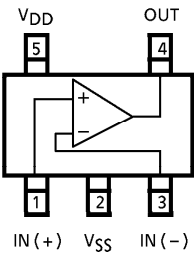


Weight
SSOP5-P-0.95 : 0.014g (Typ.)
SSOP5-P-0.65A : 0.006g (Typ.)

MARKING (TOP VIEW)



PIN CONNECTION (TOP VIEW)



961001EBA2

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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	—	—	100	200	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	—	—	80	160	μA
Source Current	I_{source}	6	—	80	160	—	μA
Sink Current	I_{sink}	7	—	200	600	—	μA

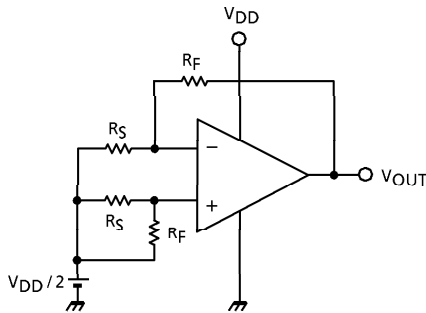
AC CHARACTERISTICS ($V_{DD} = 3.0V$, $V_{SS} = GND$, $T_a = 25^\circ C$)

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} 

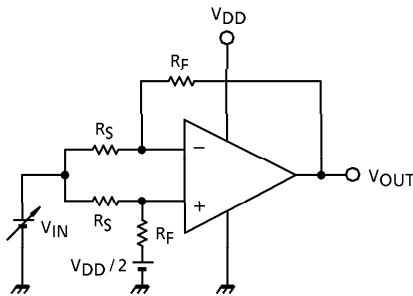
• SVRR

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

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

• V_{IO}

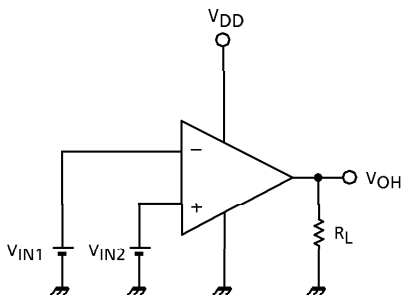
$$V_{IO} = \left(V_{OUT} - \frac{V_{DD}}{2} \right) \times \frac{R_S}{R_F + R_S}$$

2. CMRR, CMV_{IN} 

• CMRR

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

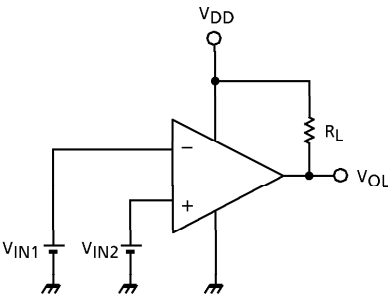
$$CMRR = 20 \log \left(\left| \frac{V_{OUT1} - V_{OUT2}}{V_{IN1} - V_{IN2}} \right| \times \frac{R_S}{R_F + R_S} \right)$$

• CMV_{IN} 3. V_{OH} • V_{OH}

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

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

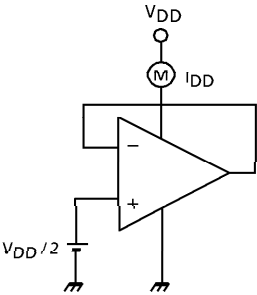
4. V_{OL}



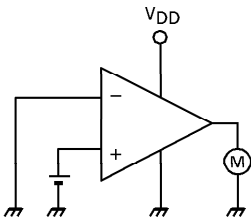
• V_{OL}

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

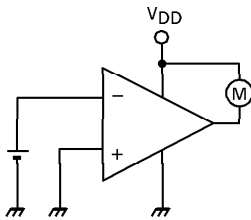
5. I_{DD}

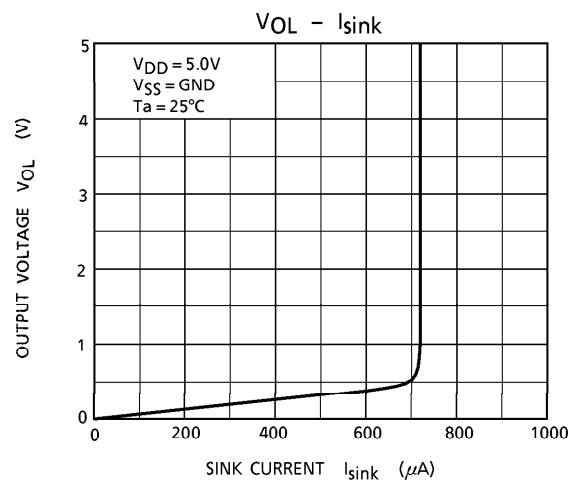
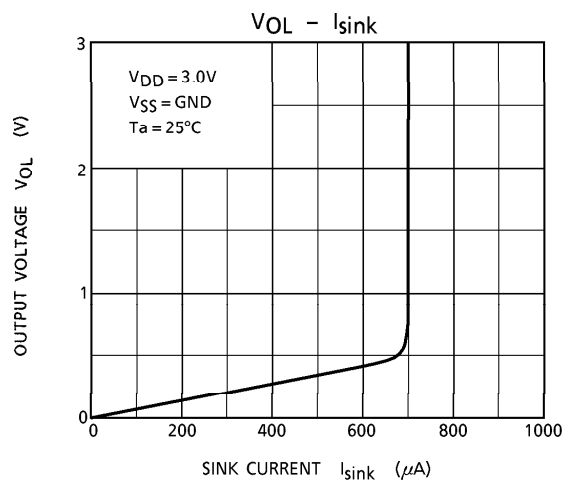
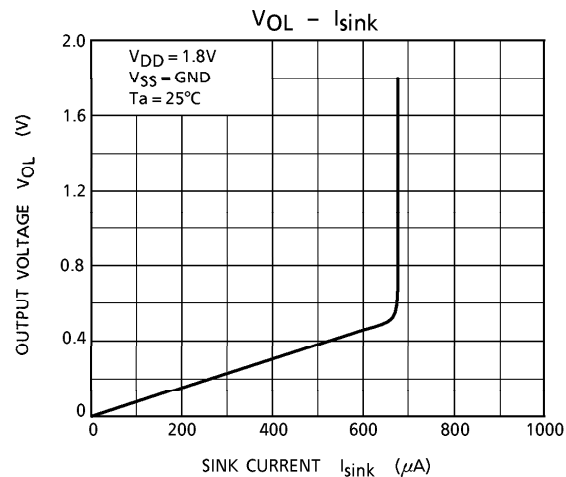
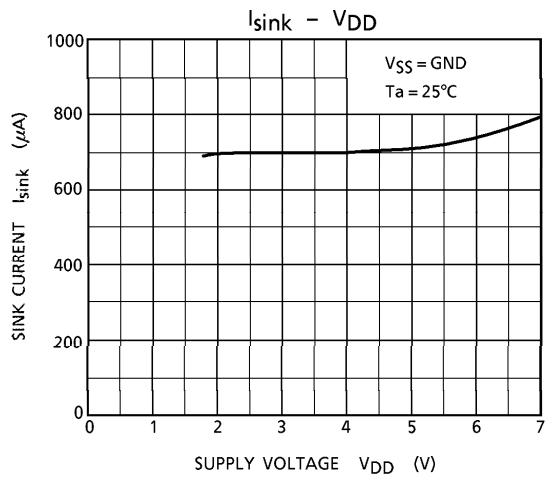
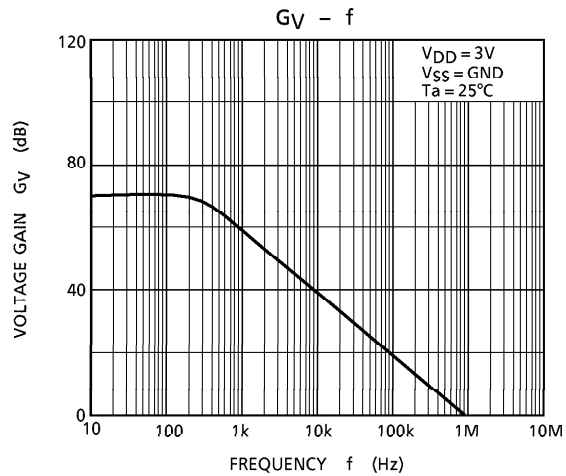
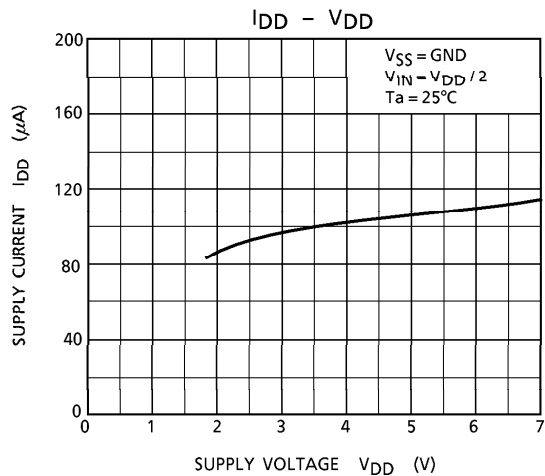


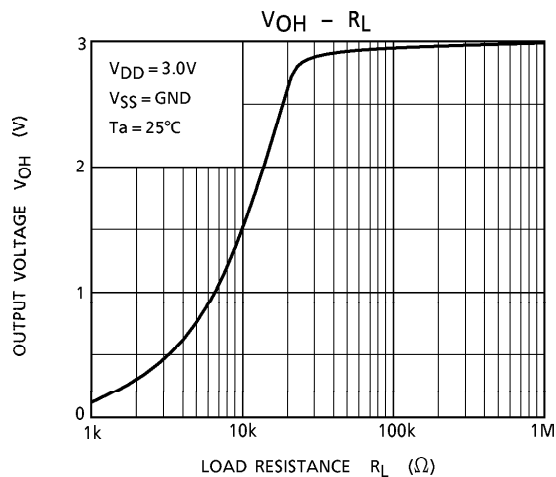
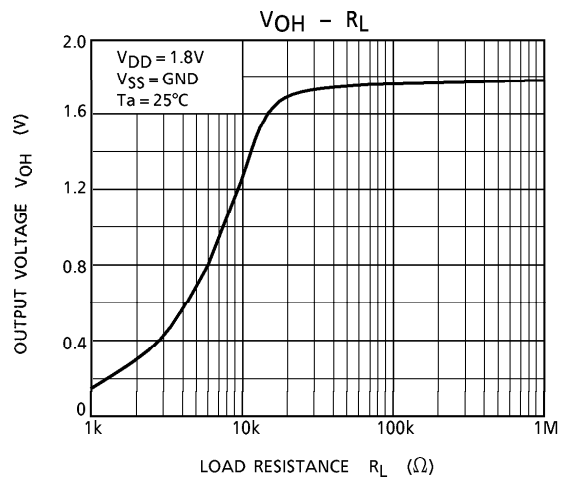
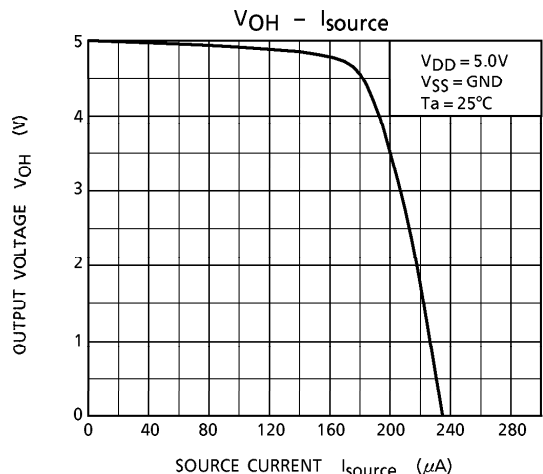
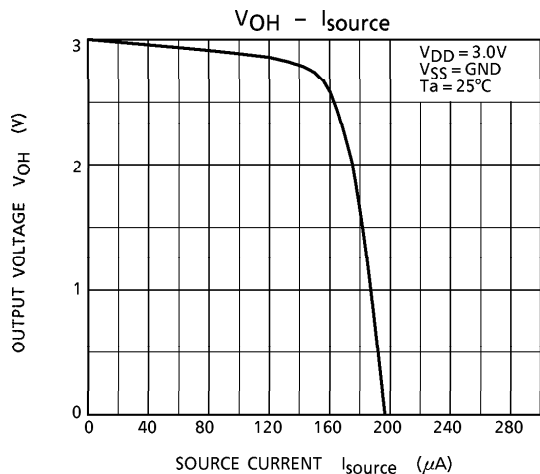
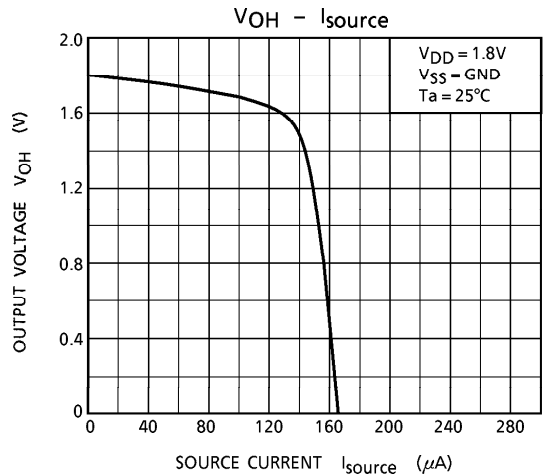
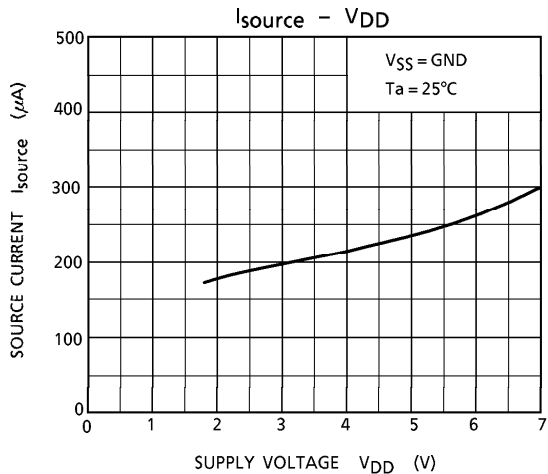
6. I_{source}

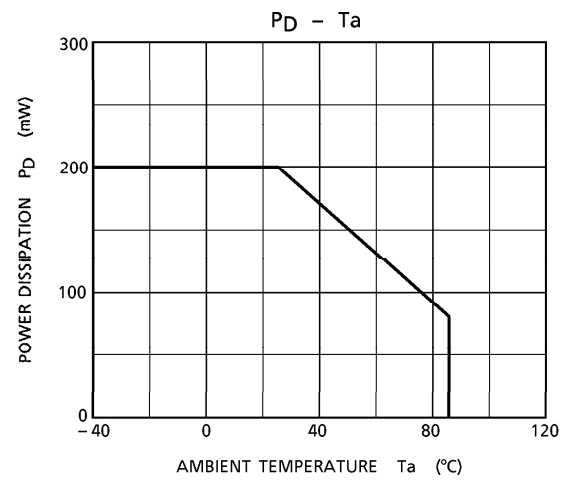
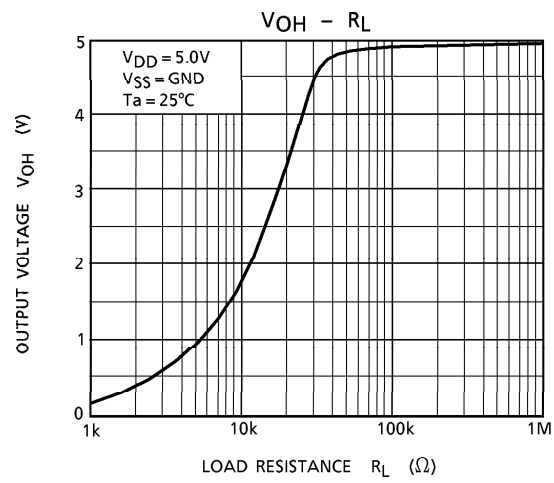


7. I_{sink}



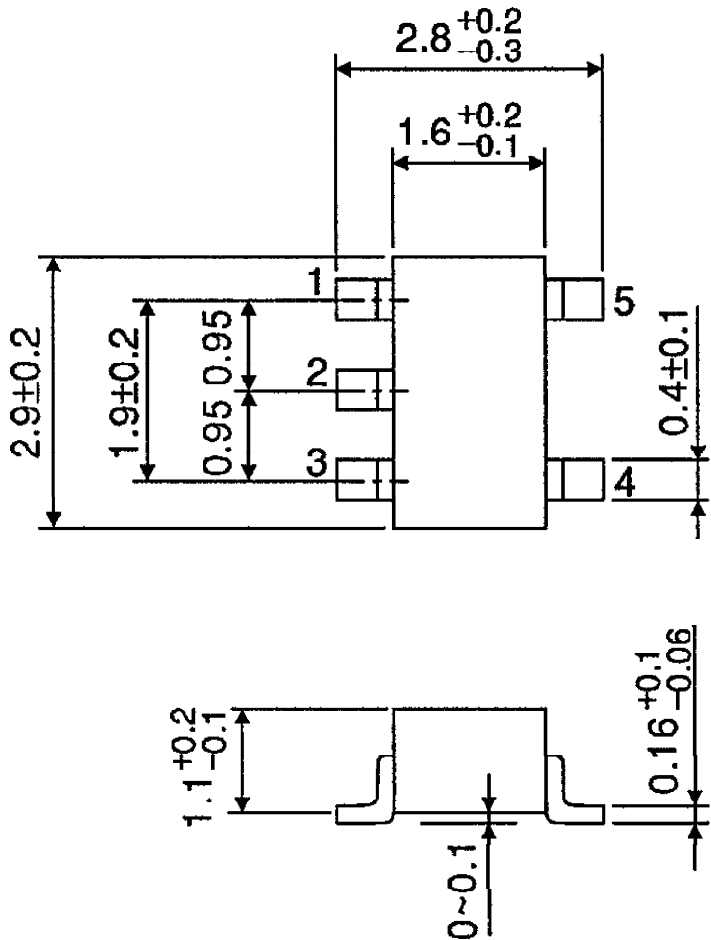






OUTLINE DRAWING
SSOP5-P-0.95

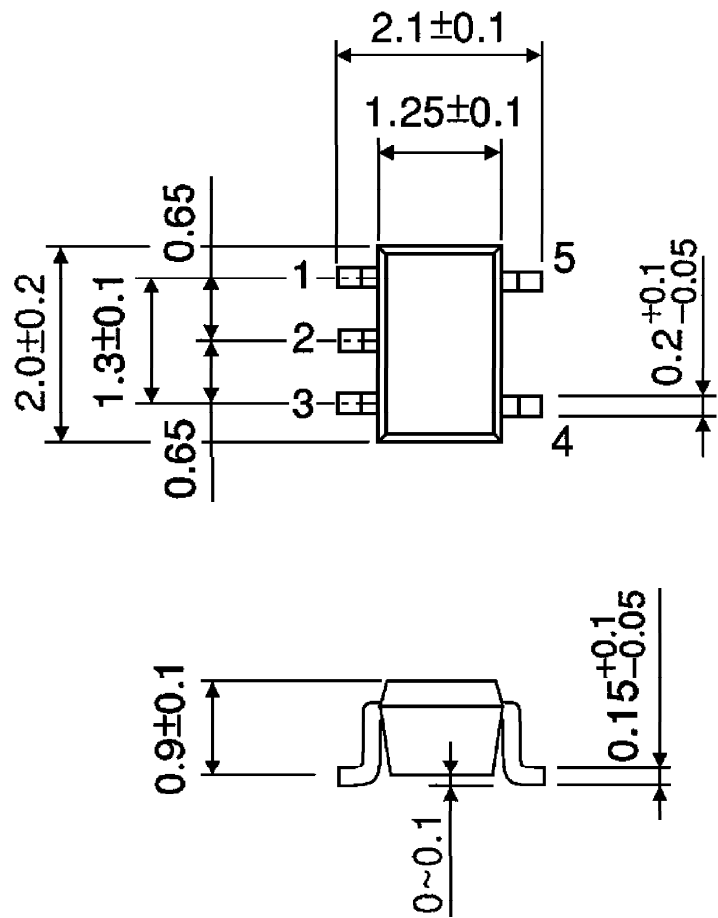
Unit : mm



Weight : 0.014g (Typ.)

OUTLINE DRAWING
SSOP5-P-0.65A

Unit : mm



Weight : 0.006g (Typ.)