

TOSHIBA CMOS LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

# TC75W51FU, TC75W51FK

## DUAL OPERATIONAL AMPLIFIER

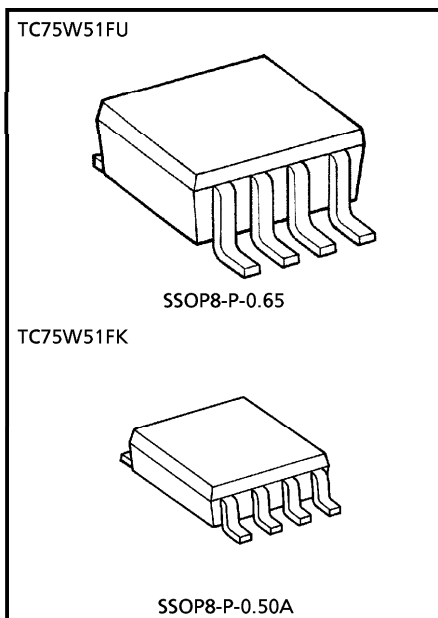
TC75W51 is a CMOS operational amplifier with low supply voltage, low supply current.

### 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

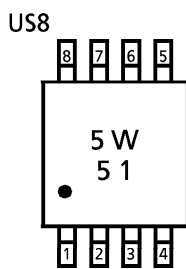
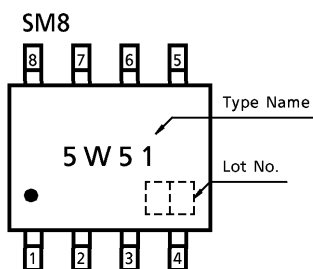
### MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	N
Supply Voltage	$V_{DD}, V_{SS}$	7	V
Differential Input Voltage	$DV_{IN}$	$\pm 7$	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

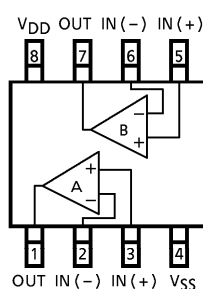


Weight  
 SSOP8-P-0.65 : 0.021g (Typ.)  
 SSOP8-P-0.50A : 0.01g (Typ.)

### MARKING (TOP VIEW)



### PIN CONNECTION (TOP VIEW)



980508EBA1

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## ELECTRICAL 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	$R_S = 1k\Omega$ , $R_F = 100k\Omega$	—	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	$\mu A$

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	$\mu A$

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

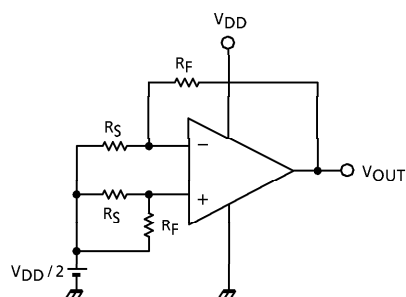
CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Slew Rate	SR	—	$A_V = 0dB$	—	0.5	—	$V / \mu s$
Unity Gain Cross Frequency	$f_T$	—	$A_V = 40dB$	—	0.6	—	MHz

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,  $V_{IO}$



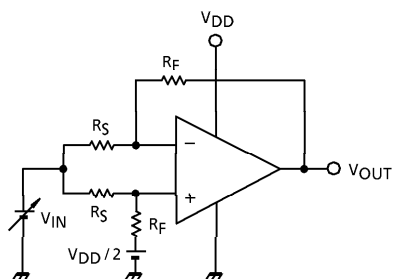
- SVRR  
 $V_{DD} = 1.5V : V_{DD} = V_{DD1}, V_{OUT} = V_{OUT1}$   
 $V_{DD} = 7.0V : V_{DD} = V_{DD2}, V_{OUT} = V_{OUT2}$   

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

- $V_{IO}$   

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

2. CMRR,  $CMV_{IN}$

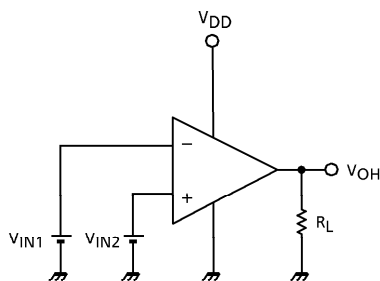


- CMRR  
 $V_{IN} = 0.0V : V_{IN} = V_{IN1}, V_{OUT} = V_{OUT1}$   
 $V_{IN} = 2.5V : V_{IN} = V_{IN2}, V_{OUT} = V_{OUT2}$   

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

- $CMV_{IN}$

3.  $V_{OH}$

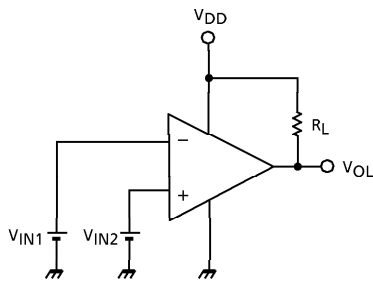


- $V_{OH}$   

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

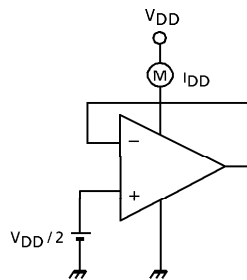
$$V_{IN2} = \frac{V_{DD}}{2} + 0.05V$$

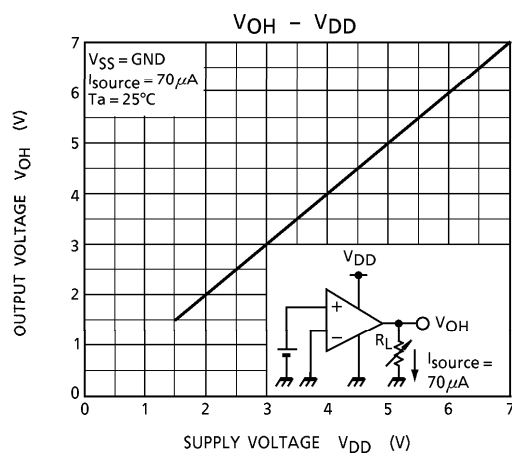
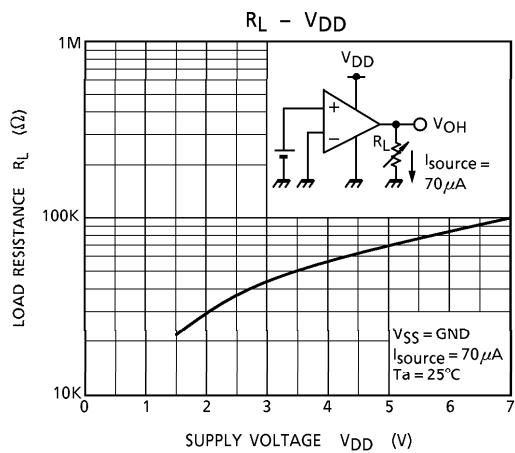
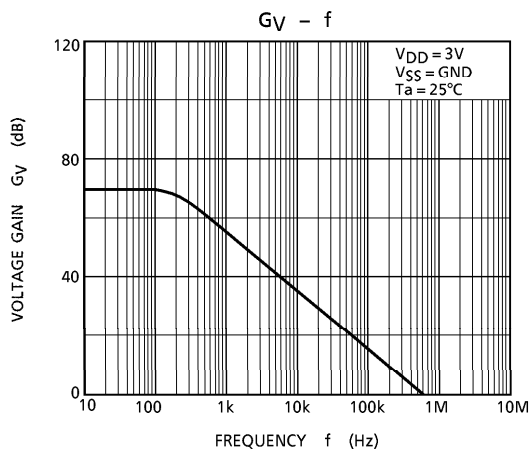
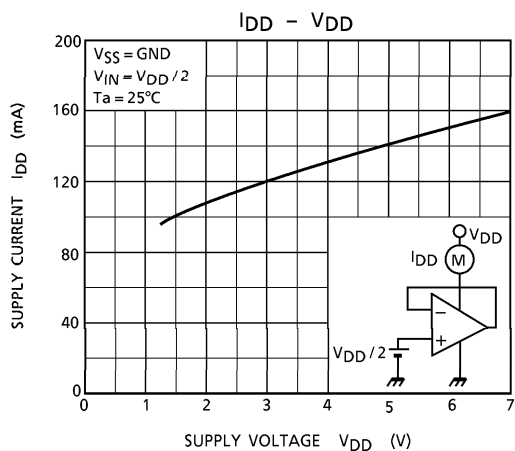
4.  $V_{OL}$

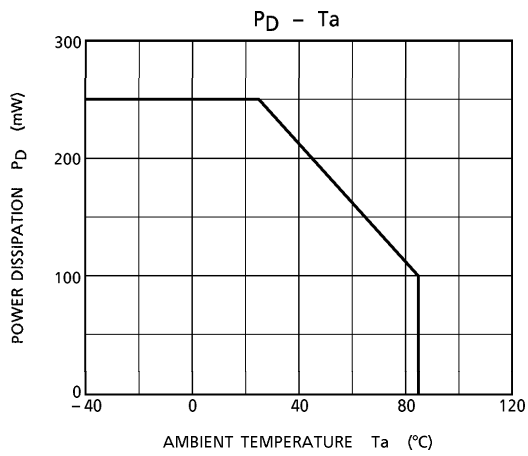
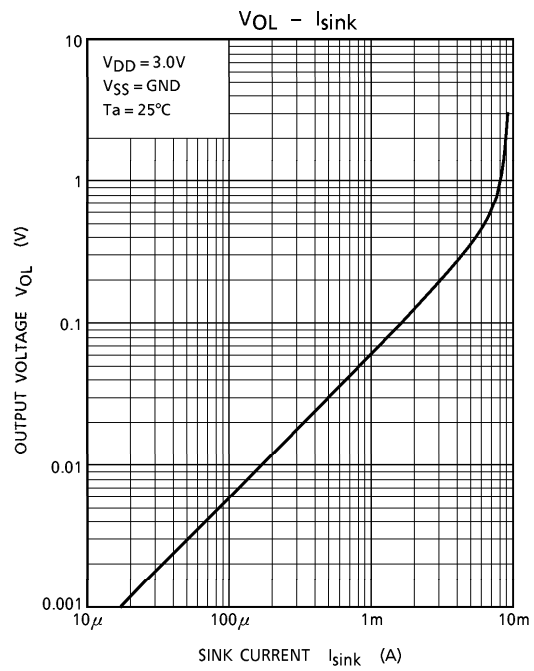
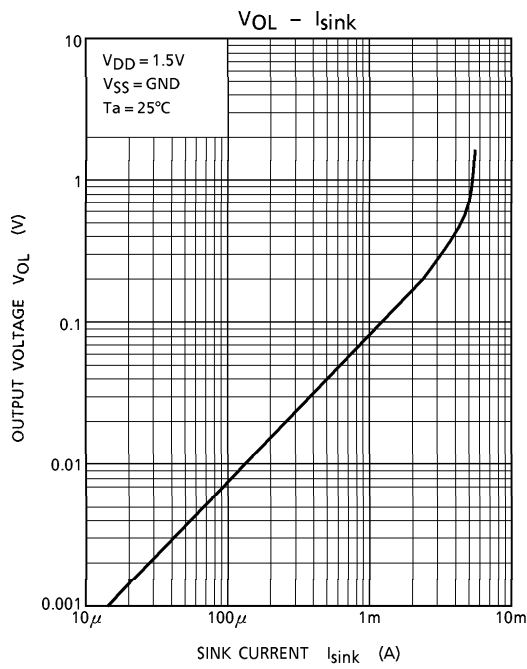


- $V_{OL}$
- $$V_{IN1} = \frac{V_{DD}}{2} + 0.05V$$
- $$V_{IN2} = \frac{V_{DD}}{2} - 0.05V$$

5.  $I_{DD}$

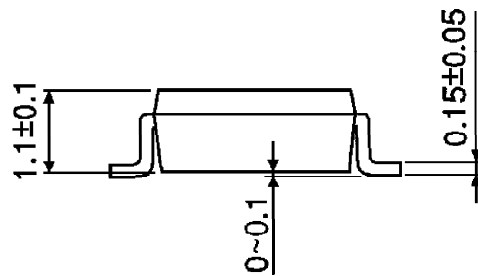
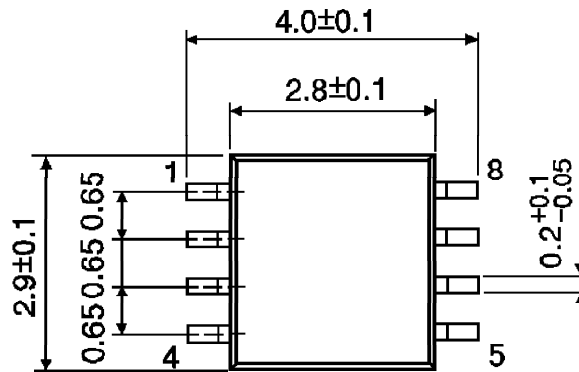






OUTLINE DRAWING  
SSOP8-P-0.65

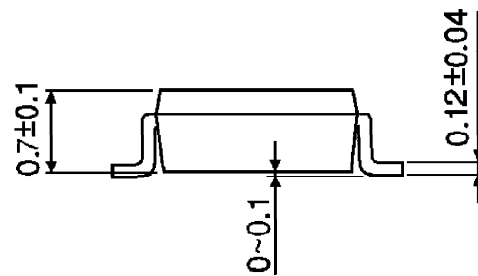
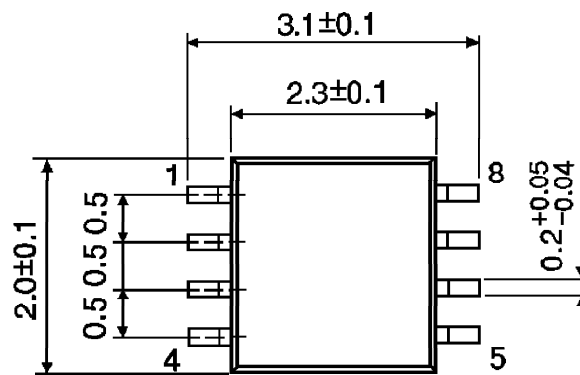
Unit : mm



Weight : 0.021g (Typ.)

**OUTLINE DRAWING**  
SSOP8-P-0.50A

Unit : mm



Weight : 0.01g (Typ.)