

TOSHIBA CMOS Linear Integrated Circuit Silicon Monolithic

# TC75S101F, TC75S101FU, TC75S101FE

Single Operational Amplifier (Input and Output Full Range)

## Features

- Input and Output Full Range
- Low-input offset voltage :  $V_{IO} = 3.0 \text{ mV (max.)}$
- Low-input bias current :  $I_I = 0.1 \text{ pA (typ.)}$
- Built-in phase-compensated op-amp, obviating the need for any external device
- Ultra-small package

## Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Supply voltage		$V_{DD}, V_{SS}$	6	V
Differential input voltage		$DV_{IN}$	$\pm 6$	V
Input voltage		$V_{IN}$	$V_{DD}$ to $V_{SS}$	V
Power dissipation	TC75S101F/FU	$P_D$	200	mW
	TC75S101FE		100	
Operating temperature		$T_{opr}$	-40 to 85	°C
Storage temperature		$T_{stg}$	-55 to 125	°C

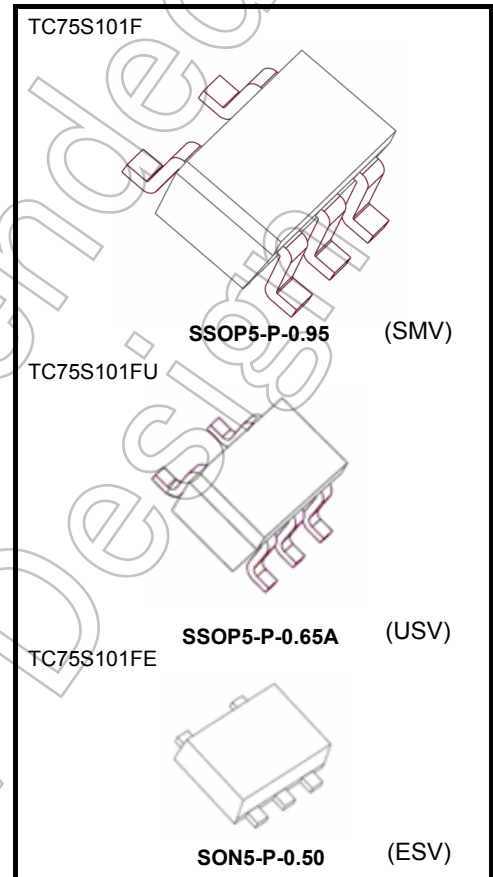
Product device does not use these for open-loop configuration.

Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc)

## Operating Conditions

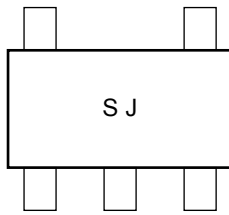
Characteristics	Symbol	Rating	Unit
Supply voltage	$V_{DD}, V_{SS}$	1.5 to 5.5	V
		$\pm 0.75$ to 2.75	



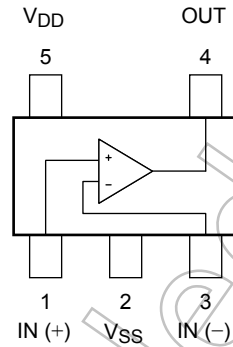
Weight  
 SSOP5-P-0.95 : 14 mg (typ.)  
 SSOP5-P-0.65A : 6.2 mg (typ.)  
 SON5-P-0.50 : 3.0 mg (typ.)

Start of commercial production  
2007-12

## Marking (top view)



## Pin Connection (top view)



## Electrical Characteristics

### DC Characteristics ( $V_{DD} = 3.0\text{ V}$ , $V_{SS} = \text{GND}$ , $T_a = 25^\circ\text{C}$ )

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Input offset voltage	$V_{IO}$	$R_S = 1\Omega$ , $R_F = 100\text{ k}\Omega$	—	1.2	3.0	mV
Input offset current	$I_{IO}$	—	—	0.1	—	pA
Input bias current	$I_I$	—	—	0.1	—	pA
Common mode input voltage	$CMV_{IN}$	$R_S = 1\Omega$ , $R_F = 100\text{ k}\Omega$	0	—	3.0	V
Voltage gain (open loop)	$G_V$	—	40	110	—	dB
Maximum output voltage	$V_{OH}$	$R_L \geq 100\text{ k}\Omega$	2.9	—	—	V
	$V_{OL}$	$R_L \geq 100\text{ k}\Omega$	—	—	0.1	
Common mode input signal rejection ratio	CMRR	$V_{IN} = 0.0\text{ to }3.0\text{ V}$	50	66	—	dB
Supply voltage rejection ratio	SVRR	$V_{DD} = 1.8\text{ to }6.0\text{ V}$	65	90	—	dB
Supply current	$I_{DD}$	—	—	63	90	$\mu\text{A}$
Source current	$I_{source}$	—	70	110	—	$\mu\text{A}$
Sink current	$I_{sink}$	—	800	1500	—	$\mu\text{A}$

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Input offset voltage	$V_{IO}$	$R_S = 1\Omega$ , $R_F = 100\text{ k}\Omega$	—	0.9	3.0	mV
Input offset current	$I_{IO}$	—	—	0.1	—	pA
Input bias current	$I_I$	—	—	0.1	—	pA
Common mode input voltage	$CMV_{IN}$	$R_S = 1\Omega$ , $R_F = 100\text{ k}\Omega$	0	—	1.8	V
Voltage gain (open loop)	$G_V$	—	40	100	—	dB
Maximum output voltage	$V_{OH}$	$R_L \geq 100\text{ k}\Omega$	1.7	—	—	V
	$V_{OL}$	$R_L \geq 100\text{ k}\Omega$	—	—	0.1	
Supply current	$I_{DD}$	—	—	57	80	$\mu\text{A}$
Source current	$I_{source}$	—	50	95	—	$\mu\text{A}$
Sink current	$I_{sink}$	—	700	1450	—	$\mu\text{A}$

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Slew rate	SR	$A_V = 0\text{ dB}$	—	0.15	—	V/ $\mu\text{s}$
Unity gain cross frequency	$f_T$	$A_V = 40\text{ dB}$	—	0.62	—	MHz

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

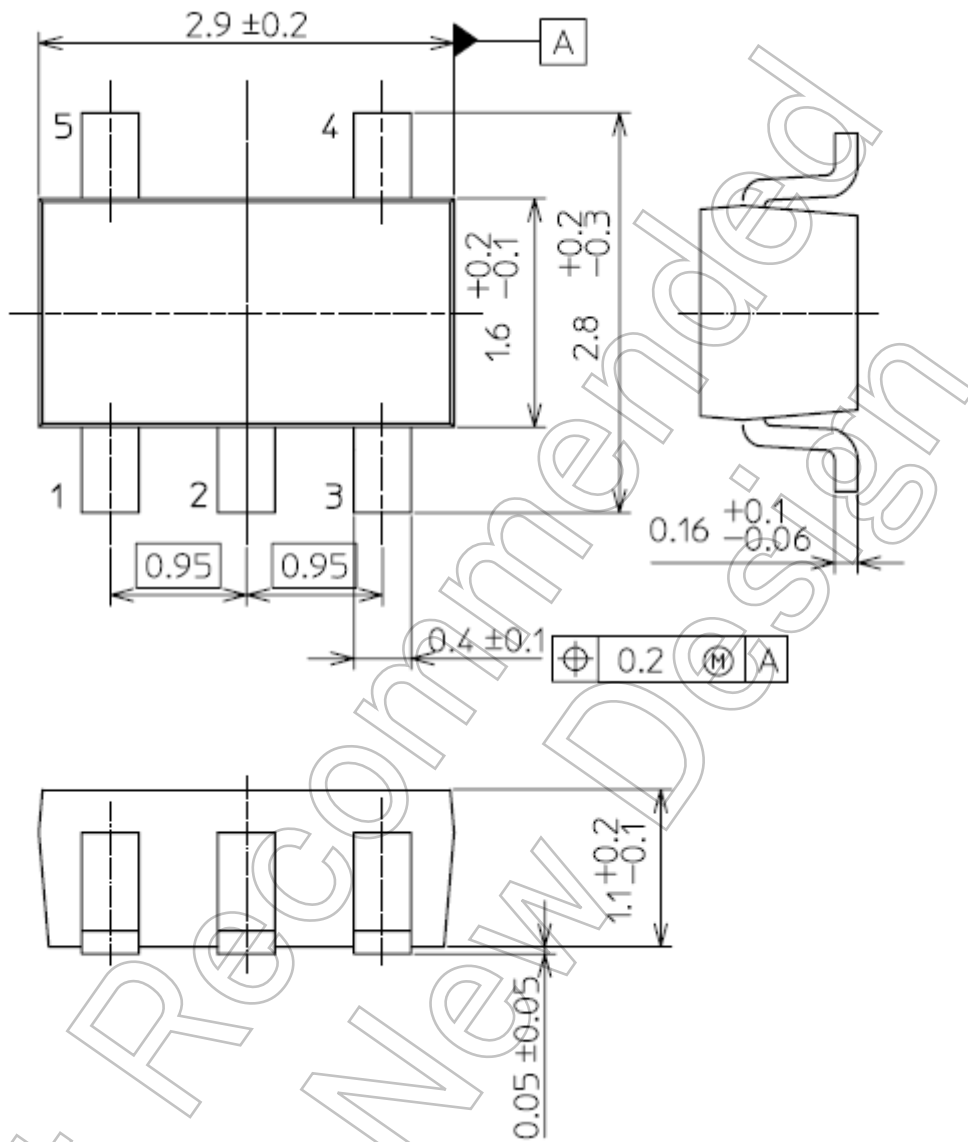
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Slew rate	SR	$A_V = 0\text{ dB}$	—	0.14	—	V/ $\mu\text{s}$
Unity gain cross frequency	$f_T$	$A_V = 40\text{ dB}$	—	0.55	—	MHz

Not Recommended for New Design

## Package Dimensions

SMV

Unit: mm

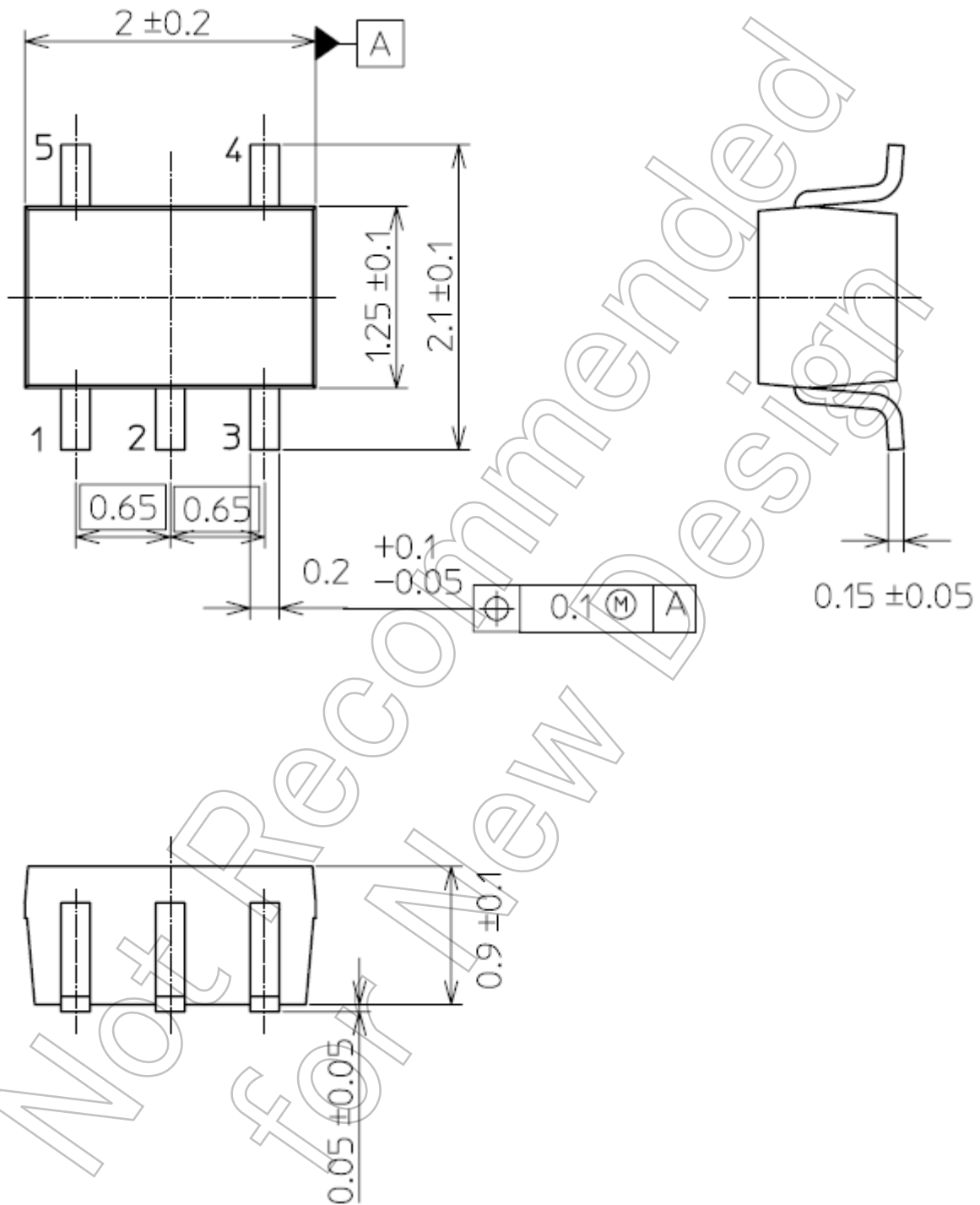


Weight: 14 mg (typ.)

**Package Dimensions**

**USV**

**Unit: mm**

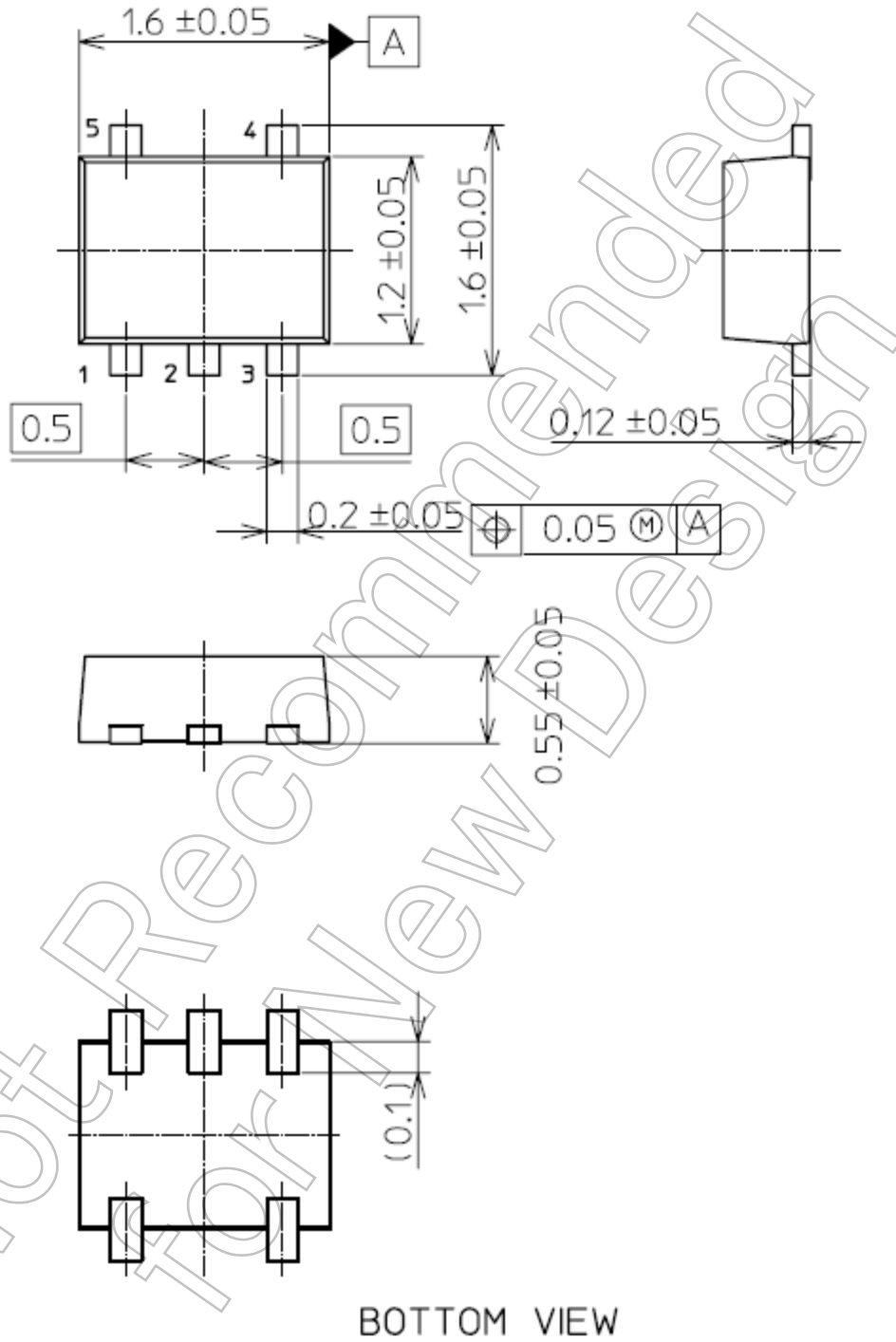


Weight: 6.2 mg (typ.)

Package Dimensions

ESV

Unit: mm



Weight: 3.0 mg (typ.)

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