

TOSHIBA CMOS Linear Integrated Circuit Silicon Monolithic

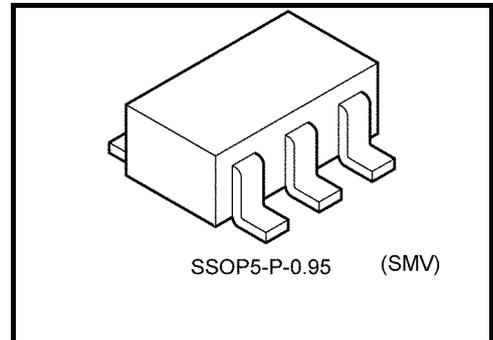
TCR5SB12

200 mA CMOS Low-Dropout Regulator (Point Regulator)

The TCR5SB12 is CMOS general-purpose single-output voltage regulators with an on/off control input, featuring low dropout voltage and low quiescent bias current. The TCR5SB12 can be enabled and disabled via the CONTROL pin.

The TCR5SB12 is available in fixed output voltages 1.2 V and capable of driving up to 200 mA. This device features overcurrent protection.

The TCR5SB12 is offered in the compact SMV (SOT23-5) (SC-74A) and allows the use of small ceramic input and output capacitors. Thus, this device is ideal for portable applications that require high-density board assembly such as cellular phones.

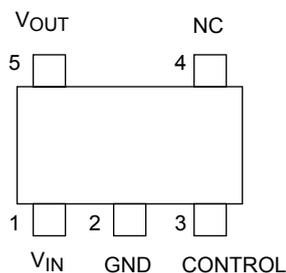


Weight: 0.014 g (typ.)

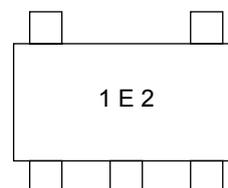
Features

- Low quiescent bias current ($I_B = 40 \mu A$ (typ.) at $I_{OUT} = 0 \text{ mA}$)
- Low stand-by current ($I_{B(OFF)} = 0.1 \mu A$ (typ.) at Stand-by mode)
- Low voltage operation ($V_{IN(min)} = 1.8 \text{ V}$ at $I_{OUT} = 50 \text{ mA}$)
- High current output ($I_{OUT} = 200 \text{ mA}$ (max))
- High ripple rejection ($R.R = 80 \text{ dB}$ (typ.) at $I_{OUT} = 10 \text{ mA}$, $f = 1 \text{ kHz}$)
- Low output noise voltage ($V_{NO} = 25 \mu V_{rms}$ (typ.) at $I_{OUT} = 10 \text{ mA}$, $10 \text{ Hz} \leq f \leq 100 \text{ kHz}$)
- Control voltage can be allowed from -0.3 to 5.5 V regardless of V_{IN} voltage
- Overcurrent protection
- Ceramic capacitors can be used ($C_{IN} = 0.1 \mu F$, $C_{OUT} = 1.0 \mu F$)
- Small package, SMV (SOT23-5) (SC-74A)

Pin Assignment (top view)



Marking



Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Input voltage	V _{IN}	5.5	V
Control voltage	V _{CT}	-0.3 to 5.5	V
Output voltage	V _{OUT}	-0.3 to V _{IN} + 0.3	V
Output current	I _{OUT}	200	mA
Power dissipation	P _D	200 (Note1)	mW
		380 (Note2)	
Operation temperature range	T _{opr}	-40 to 85	°C
Junction temperature	T _j	150	°C
Storage temperature range	T _{stg}	-55 to 150	°C

Note: 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 and the operating ranges.

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).

Note 1: Unit Rating

Note 2: Rating at mounting on a board
(Glass epoxy board dimension : 30 mm × 30 mm, Pad area : 50 mm²)

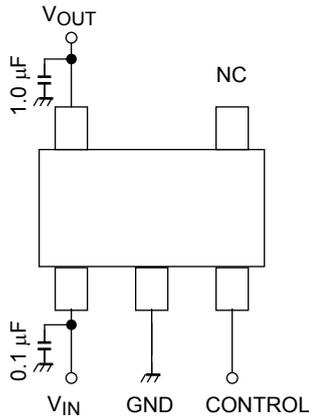
Electrical Characteristics

(Unless otherwise specified, V_{IN} = V_{OUT} + 1 V, I_{OUT} = 50 mA, C_{IN} = 0.1 μF, C_{OUT} = 1.0 μF, T_j = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Output voltage	V _{OUT}	—	1.17	1.2	1.23	V
Line regulation	Reg·line	V _{OUT} + 0.5 V ≤ V _{IN} ≤ 5.5 V, I _{OUT} = 1 mA	—	3	15	mV
Load regulation	Reg·load	1 mA ≤ I _{OUT} ≤ 150 mA	—	25	75	mV
Quiescent current	I _B	I _{OUT} = 0 mA	—	40	75	μA
Stand-by current	I _B (OFF)	V _{CT} = 0 V	—	0.1	1.0	μA
Output noise voltage	V _{NO}	V _{IN} = V _{OUT} + 1 V, I _{OUT} = 10 mA, 10 Hz ≤ f ≤ 100 kHz, Ta = 25°C	—	25	—	μV _{rms}
Dropout voltage	V _{IN} - V _{OUT}	—	—	500	600	mV
Temperature coefficient	T _{CV0}	-40°C ≤ T _{opr} ≤ 85°C	—	100	—	ppm/°C
Input voltage	V _{IN}	I _{OUT} = 50 mA	1.80	—	5.5	V
Ripple rejection ratio	R.R.	V _{IN} = V _{OUT} + 1 V, I _{OUT} = 10 mA, f = 1 kHz, V _{Ripple} = 500 mV _{p-p} , Ta = 25°C	—	80	—	dB
Control voltage (ON)	V _{CT} (ON)	—	1.1	—	5.5	V
Control voltage (OFF)	V _{CT} (OFF)	—	0	—	0.4	V
Control current (ON)	I _{CT} (ON)	V _{CT} = 5.5 V	—	—	0.1	μA
Control current (OFF)	I _{CT} (OFF)	V _{CT} = 0 V	—	—	0.1	μA

Application Note

1. Recommended Application Circuit



Control Level	Operation
HIGH	ON
LOW	OFF

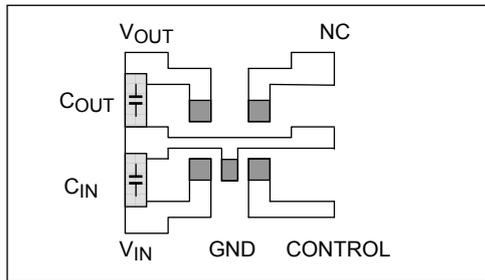
The figure above shows the recommended configuration for using a Low-Dropout regulator. Insert a capacitor at V_{OUT} and V_{IN} pins for stable input/output operation. (Ceramic capacitors can be used)

If the control function is not used, Toshiba recommend that the control pin is connected to the V_{IN} pin.

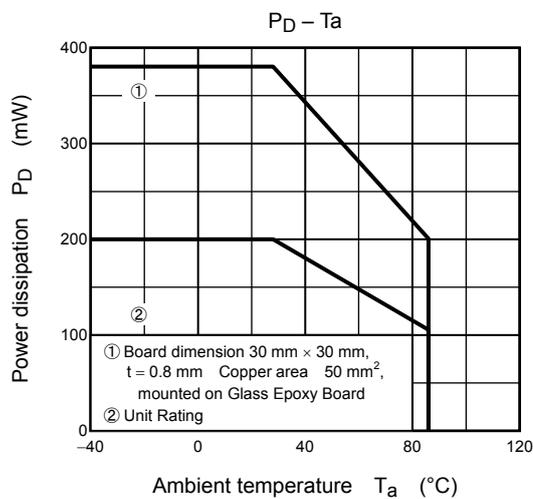
2. Power Dissipation

Power dissipation is measured on the board shown below.

Testing Board of Thermal Resistance



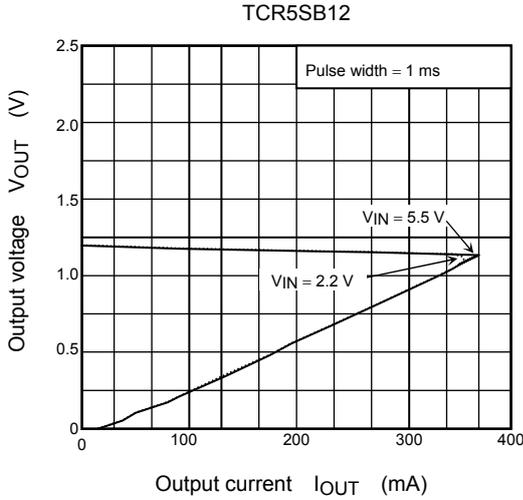
Board material: Glass Epoxy, Board dimension 30 mm × 30 mm
Copper area: 50 mm², t = 0.8 mm



Attention in Use

- **Output Capacitors**
Ceramic capacitors can be used for these devices. However, because of the type of the capacitors, there might be unexpected thermal features. Please consider application condition for selecting capacitors. And Toshiba recommend the ESR of ceramic capacitor is under 10 Ω .
- **Mounting**
The long distance between IC and output capacitor might affect phase assurance by impedance in wire and inductor. For stable power supply, output capacitor need to mount near IC as much as possible. Also GND pattern need to be large and make the wire impedance small as possible.
- **Permissible Loss**
Please have enough design patterns for expected maximum permissible loss. And under consideration of surrounding temperature, input voltage, and output current etc, we recommend proper dissipation ratings for maximum permissible loss; in general maximum dissipation rating is 70 to 80 percent.
- **Overcurrent Protection Circuit**
Overcurrent protection circuit is designed in these products, but this does not assure for the suppression of uprising device operation. If output pins and GND pins are shorted out, these products might be break down. In use of these products, please read through and understand dissipation idea for absolute maximum ratings from the above mention or our 'Semiconductor Reliability Handbook'. Then use these products under absolute maximum ratings in any condition. Furthermore, Toshiba recommend inserting failsafe system into the design.

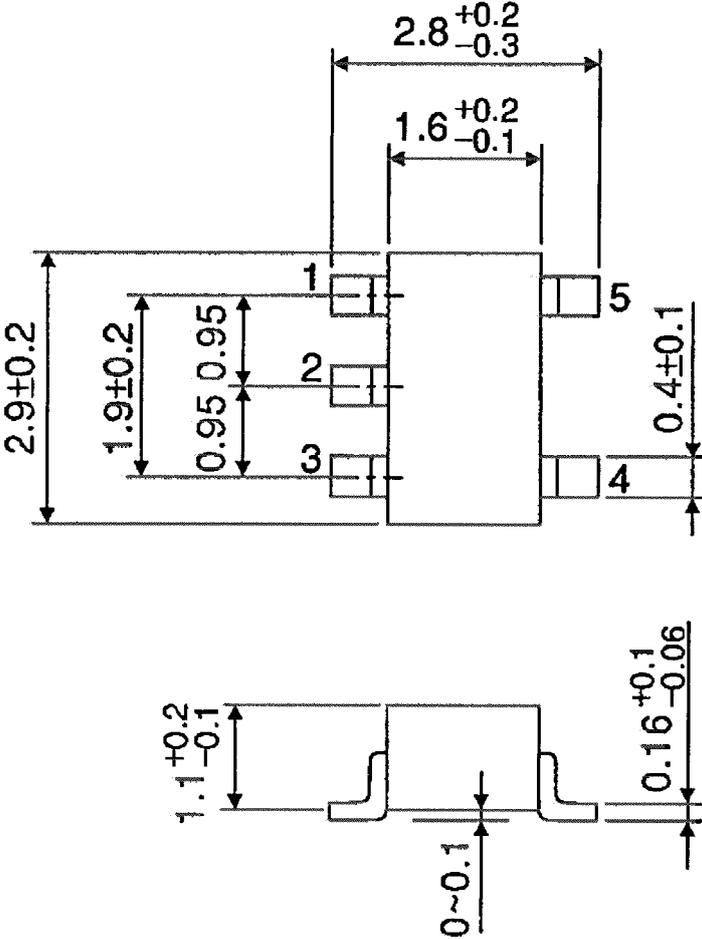
Overcurrent Protection Characteristics



Package Dimensions

SSOP5-P-0.95

Unit : mm



Weight: 0.016 g (typ)

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