# 1.03 V REGULATOR WITH ON/OFF SWITCH

## FEATURES

- **Low Input Voltage Operation (Single Battery Cell)**
- **Internal PNP Transistor**
- **Built-In Shutdown Control (Off Current, 8 μA Typ)**
- **Low Dropout Voltage (30 mV Typ)**
- **Very Small Surface Mount Package (SOT-25)**

## APPLICATIONS

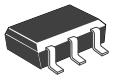
- **Pagers**
- **Personal Communication Equipment**
- **Portable Consumer Equipment**
- **Radio Control Systems**
- **Single Battery Cell Systems**

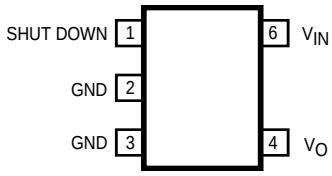
## DESCRIPTION

The TK702xx is a very low dropout, low input voltage operation regulator suitable for single battery cell applications. This regulator provides 1.03 V output with a dropout voltage of only 30 mV. The active high control provides on/off switching of the output. In the off mode, the standby supply current is 8 μA, thus extending battery life.

The TK702xx is available in a very small plastic surface mount package (SOT-25).

**TK702xx**






## ORDERING INFORMATION

TK702 □□M □□

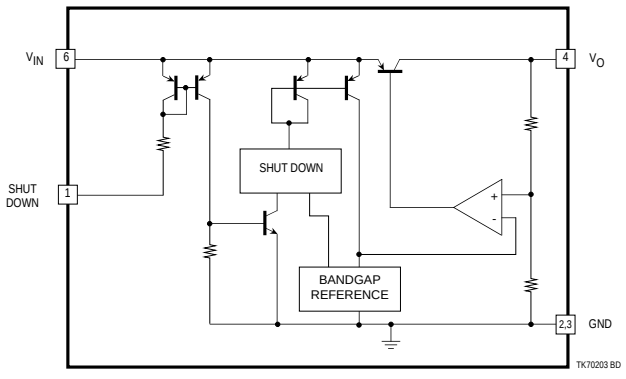
Tape/Reel Code

Voltage Code

**VOLTAGE CODE**
03 = 1.03 V

**TAPE/REEL CODE**
BX : Bulk/Bag
TL : Tape Left

**BLOCK DIAGRAM**



## ABSOLUTE MAXIMUM RATINGS

Input Voltage ..... 6 V
Power Dissipation ..... 150 mW
Operating Voltage Range ..... 0.9 to 5.0 V
Junction Temperature ..... 150 °C
Storage Temperature Range ..... -55 to +150 °C
Operating Temperature Range ..... -10 to +60 °C
Lead Soldering Temp. (10 sec.) ..... 240 °C

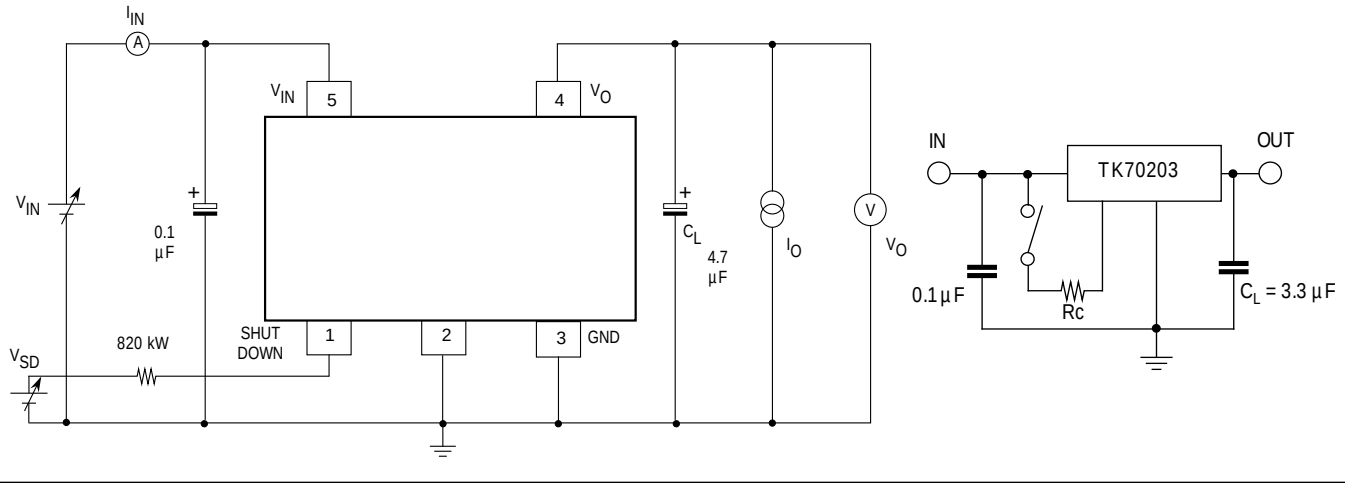
## ELECTRICAL CHARACTERISTICS

Test Conditions: $V_{CC}$ = 1.4 V, $T_A$ = 25 °C, unless otherwise specified.

| SYMBOL | PARAMETER | TEST CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| $I_{IN}$ | Supply Current | $I_O$ = 0 mA | | 180 | 280 | µA |
| | | $V_{IN}$ = $V_{OUT}$ - 50 mV, $I_O$ = 0 mA | | 400 | 800 | µA |
| $I_{STBY}$ | Standby Current | $V_{OUT}$ = Off, R = 820 kΩ, Note 1 | | 8 | 13 | µA |
| $V_O$ | Output Voltage | $I_O$ = 2 mA | 0.98 | 1.03 | 1.065 | V |
| $V_{DROP}$ | In/Out Voltage Drop | $I_O$ = 2 mA | | 30 | 60 | mV |
| $I_O$ | Output Current | Note 2 | 8 | 16 | | mA |
| Line Reg | Line Regulation | $V_{IN}$ = 1.4 → 1.7 V | | 10 | 30 | mV |
| Load Reg | Load Regulation | $I_O$ = 0.1 → 5.0 mA, Note 3 | | 5 | 20 | mV |
| RR | Ripple Rejection | 100 mVrms, f = 400 Hz, $I_O$ = 2 mA | | 36 | | dB |
| $\Delta V_O/\Delta T_A$ | Output Voltage Temperature Dependency | $I_O$ = 2 mA, $T_A$ = -10 to +50 °C | | 0.3 | | mV/°C |
| **Control Terminal Specification** | | R = 820 kΩ (series connection) | | | | |
| $I_{CONT}$ | Control Current | $V_{OUT}$ = Off, $V_{CONT}$ = $V_{CC}$ - 1.4 V | | 2 | | µA |
| $V_{CONT}$ | Control Voltage | $V_{OUT}$ = On, $T_A$ = -10 to +60 °C | $V_{CC}$ - 0.2 | | $V_{CC}$ | V |
| | | $V_{OUT}$ = Off, $T_A$ = -10 to +60 °C | 0 | | $V_{CC}$ - 0.8 | V |

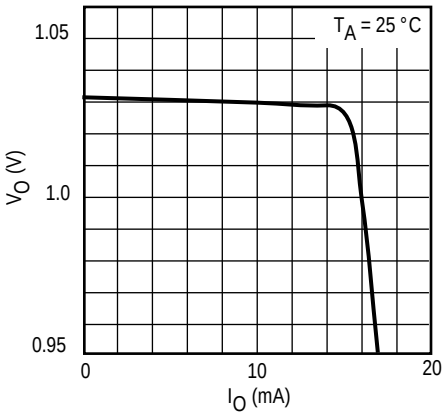
Note 1: Standby current (including control current) is the input current with a 820kΩ connected in series with the control terminal.
Note 2: $I_O$ (Load Current) is a output current value when $V_O$ drops down 0.2 V from $V_O$ at $I_O$ = 2 mA.
Note 3: Since the measurement (pulse measurement) is in a constant $T_J$, the output change due to temperature change is not included.

## TEST CIRCUIT



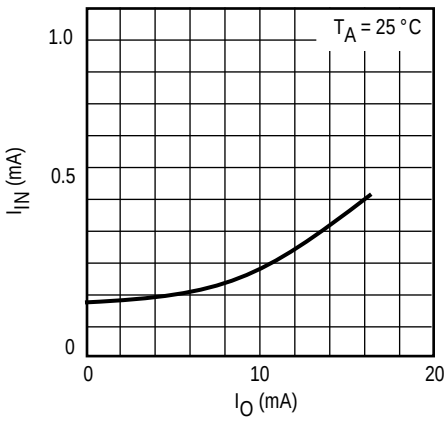

## TYPICAL PERFORMANCE CHARACTERISTICS

**OUTPUT VOLTAGE vs. OUTPUT CURRENT**




1

**INPUT CURRENT vs. OUTPUT CURRENT**

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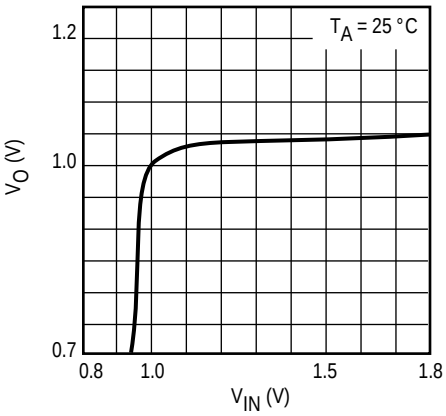
**OUTPUT VOLTAGE vs. SUPPLY VOLTAGE**

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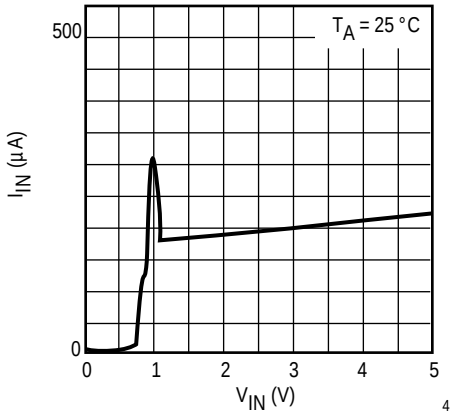
**INPUT CURRENT (NO LOAD) vs. INPUT VOLTAGE**

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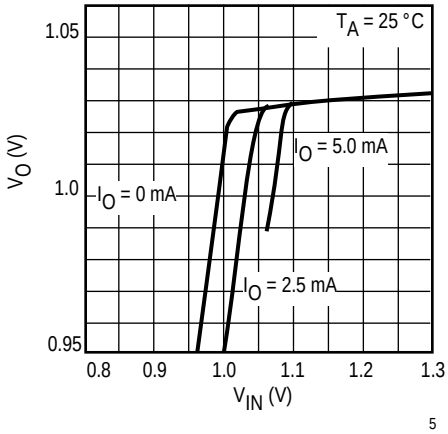
**OUTPUT VOLTAGE vs. SUPPLY VOLTAGE**

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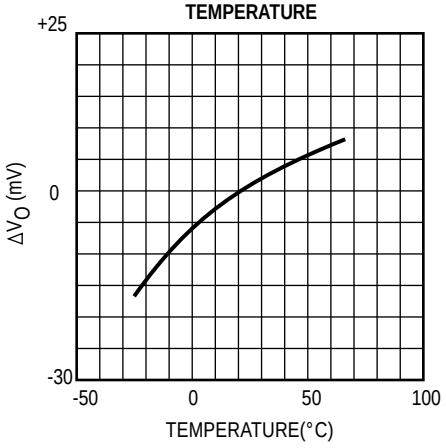
**OUTPUT VOLTAGE DRIFT vs. TEMPERATURE**

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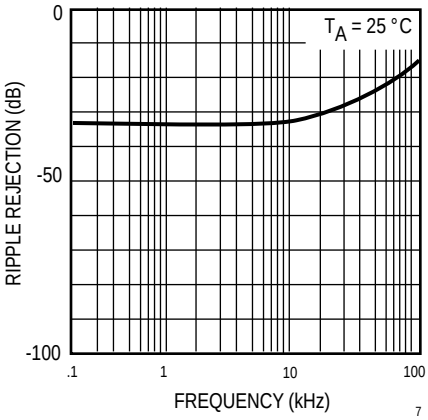
# TYPICAL PERFORMANCE CHARACTERISTICS

**RIPPLE REJECTION**

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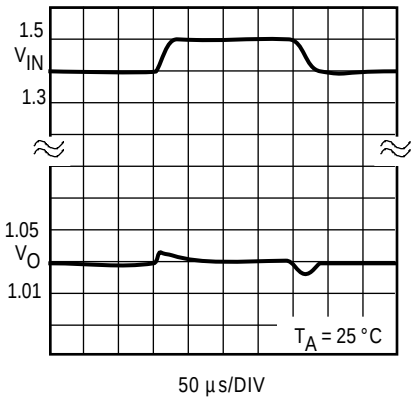
**LINE TRANSIENT RESPONSE**

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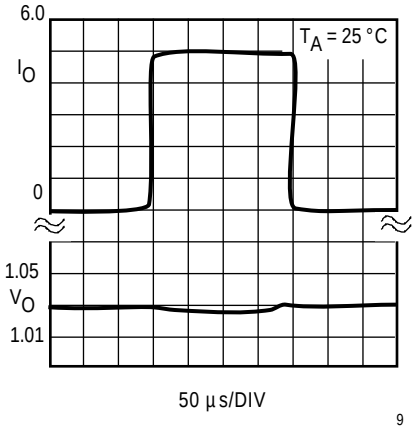
**LOAD TRANSIENT RESPONSE**

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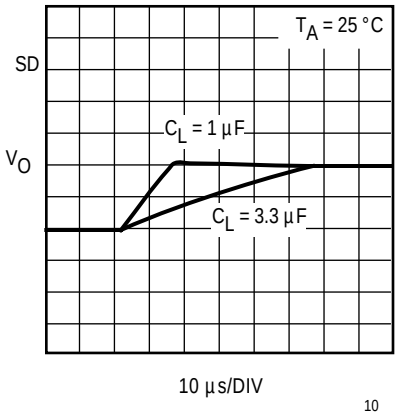
**OUTPUT (ON/OFF) CONTROL RESPONSE**

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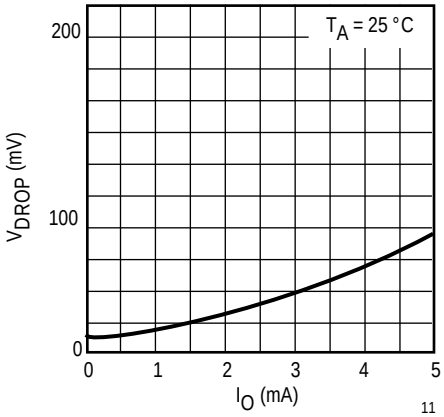
**DROPOUT VOLTAGE vs. OUTPUT CURRENT**

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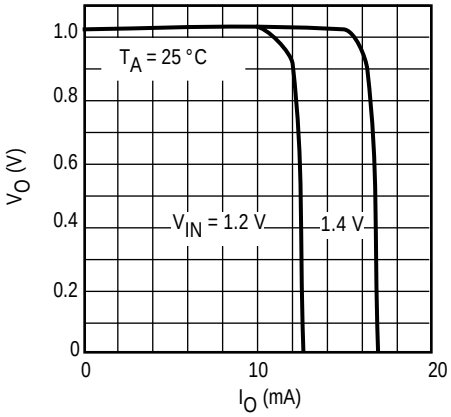
**SHORT CIRCUIT CURRENT**

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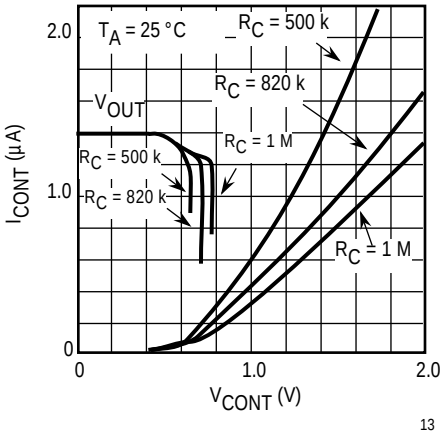
**ON/OFF CONTROL TERMINAL (SERIES RESISTOR $R_C$)**

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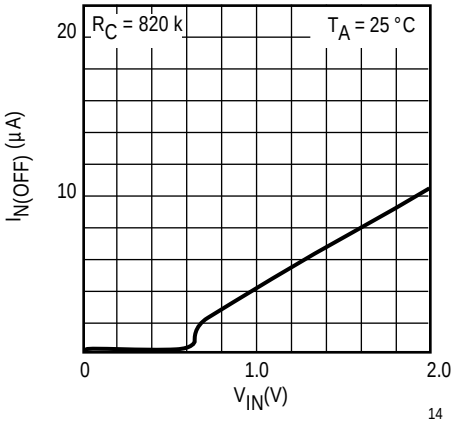
**INPUT CURRENT vs. INPUT VOLTAGE**

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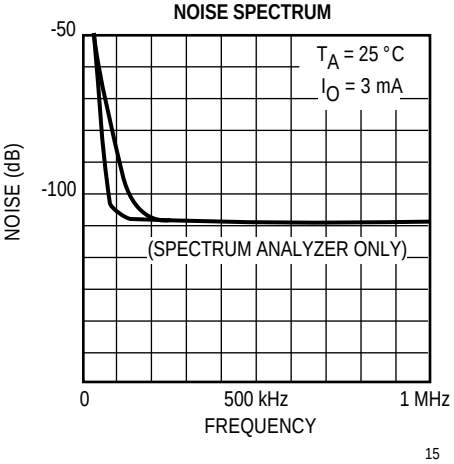
**NOISE SPECTRUM**

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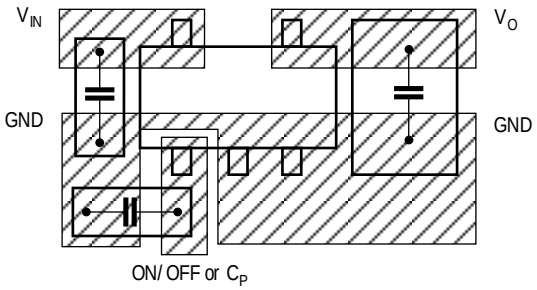
# APPLICATION NOTES

## RECOMMENDED MOUNTING

Optimum performance can only be achieved when the IC is mounted on a PC board according to the diagram below. This is because of the extremely small package and limited power dissipation. Shape the metal portion of the PCB as shown in the following drawing.




TK70203•FIG1A

Use a large bypass capacitor and connect it in a place near GND of the IC. Pay attention to temperature characteristics of the capacitor, especially the increase of ESR and decrease of capacitance in low temperatures. Oscillation, reduction of ripple rejection and increased noise may occur in some cases if the proper capacitor is not used. An output capacitor more than 1.0 µF is required to maintain stability. The standard test condition is 3.3 µF ($T_A$ = 25 °C).

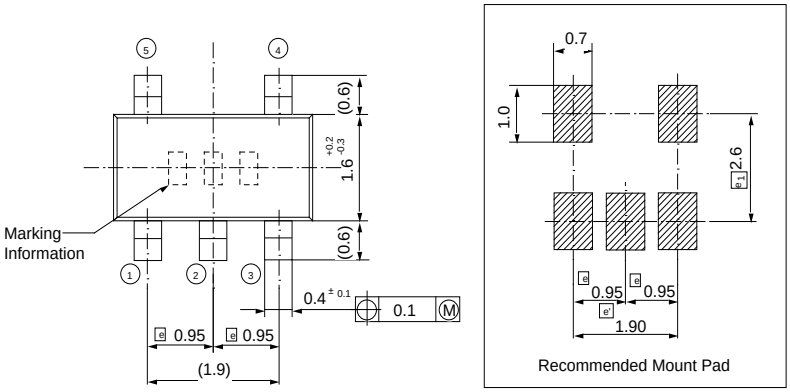
## DROPOUT VOLTAGE

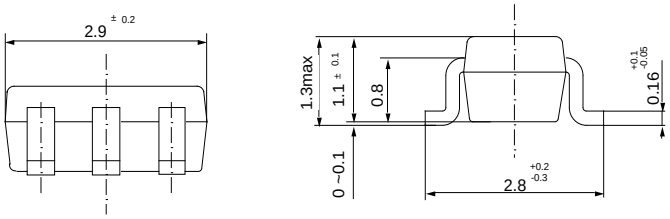
Dropout voltage is the voltage difference between the input voltage and the output voltage where the output voltage decreases to 100 mV below the nominal output voltage as the input voltage is decreased.

To measure dropout voltage, set the input voltage to the nominal output voltage +1 V and measure the output voltage. Reduce the input voltage to the point where the output is 100 mV below the prevoiusly measured value. The dropout voltage is the difference between the input and ouput voltage at this point. This voltage depends on the load current and ambient temperature.

## PACKAGE OUTLINE

### SOT-25




Unit:mm

### Marking Information

TK70203 L03



TOKO

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Please order by literature number:
IC-136-TK70203

Printed in U.S.A.