# TINY-Tiger® 2 *plus* - Data Sheet

## TINY-Tiger® 2 *plus* Generation 3

Tiny, high speed multitasking computers in the size of a component. Tiny-Tiger® 2 *plus* are universal, full featured control computers used in numerous projects and series products as:

- medical equipment
- GPS systems
- communication equipment
- industrial control
- alarm systems
- vending machines
- container tracking
- power plants ... and many more

**New: Pico-series**
**Highly compatible to Tiny-Tiger**




RoHS

Tiny-Tiger®2 *plus* offers

- short develpment cycles
- highest product reliability
- low cost
- innovative features

For further information, detailed literature and manuals in printed or downloadable formats visit:

https://www.wilke.de/
or
https://www.wilke.de/en.html

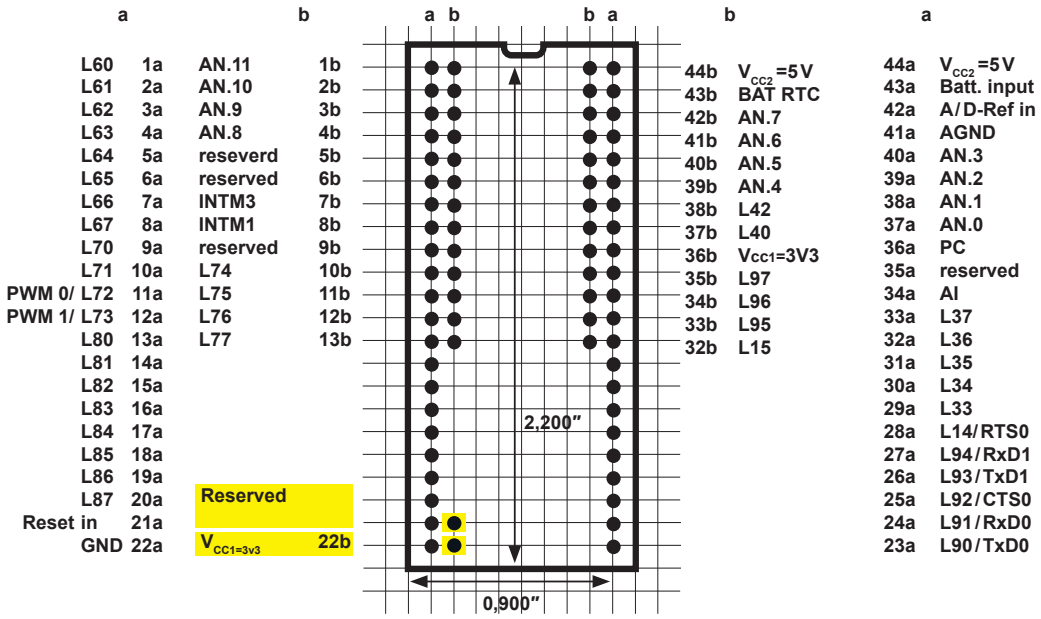
# TINY-Tiger® 2 *plus* - Data Sheet

## Inhalt

Pinout ..... 3
Electrical Specifications ..... 4
Physical Specifications ..... 8
Battery Backup-Tiger Generations 1,2&3 ..... 11
Cross References/Order Codes ..... 14
5 Volt I/O-Tolerance Conditions ..... 15
3.3 Volt I/O Conditions ..... 16
I/O Conditions to GND ..... 17
Document Version History ..... 18

# TINY-Tiger® 2 *plus* - Data Sheet

## Pinout




**Yellow Areas changed compared to TTI-T2CI-X/X-R**

# TINY-Tiger® 2 *plus* - Data Sheet

## Electrical Specifications

Operating voltage: a)VCC2=5 V (integrated regulator to 3.3 V) to pin 44a
abs. max. rating +5.5 V
b)Alternatively VCC1=3.3 V to pin 22b 3.5 Vmax

- Typ. power draw: max. 300 mA (for power supply layout incl. external load on module pins)

| | Syntax/Pseudo code | Speed | Typ. power consumption*) | | |
|---|---|---|---|---|---|
| | | | Tiger 1 | Tiger 2 | Tiger *plus* |
| | USER_FREQUENCY SPEED_25 | 25% | 36 mA | 82 mA | 44 mA |
| Default ▶ | USER_FREQUENCY SPEED_50 | 50% | | | 74 mA |
| | USER_FREQUENCY SPEED_100 | 100% | | | 135 mA |

*)with no external load.

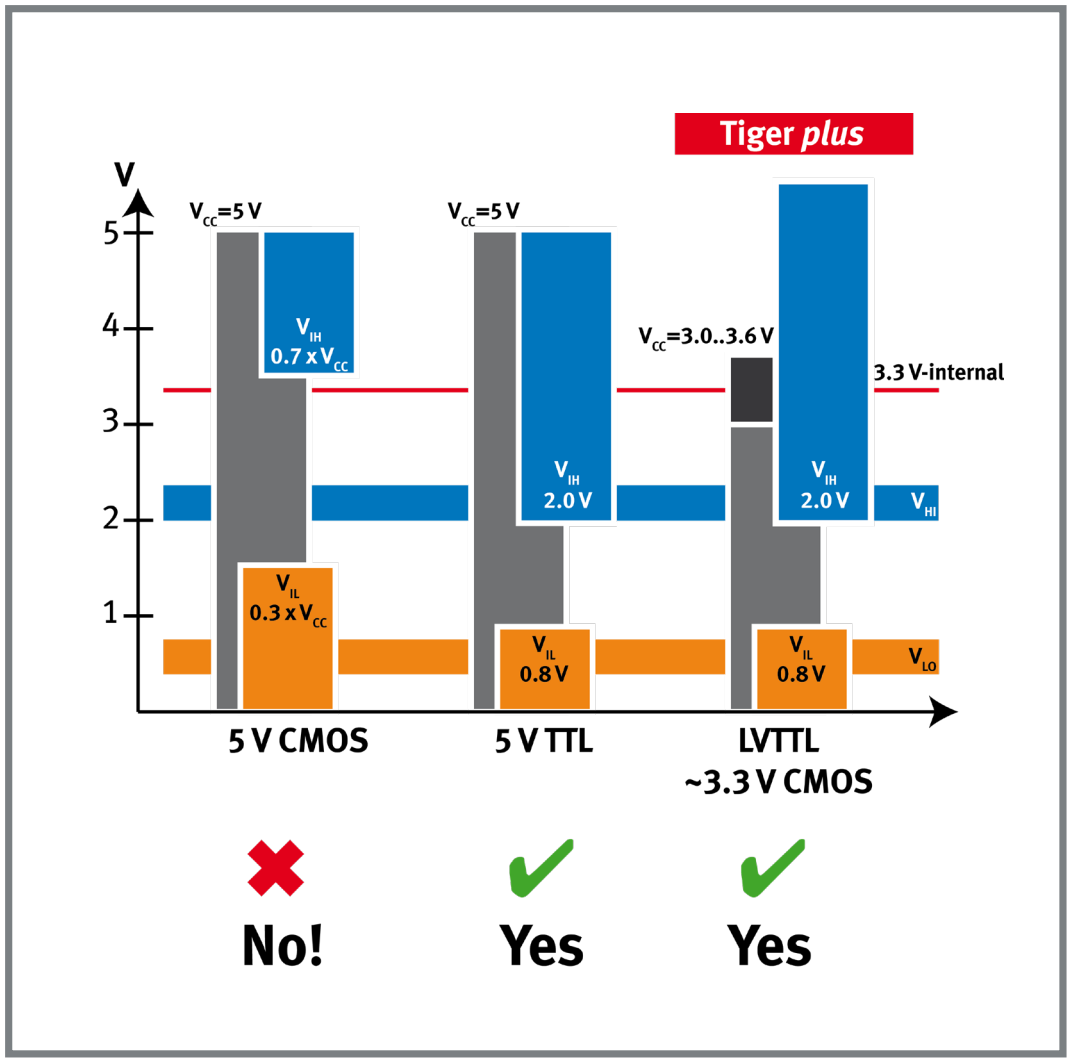
Depends on application from 50 to 200 mA

- Absolut maximum ratings:

| | |
|---|---|
| Max. sink capability: | -5 mA per pin (5.0 V tolerant output)<br>-3 mA @ Alarm pin |
| Max. sink over all pins: | -25 mA (5.0 V tolerant output) |
| Max. source/sink capability: | ±25mA per pin (3.3 V output) |
| Max. source/sink over all pins: | ±125 mA (3.3 V output)<br>-0.3 V to + 5.5 V in I/O mode<br>-3 mA @ Alarm pin |
| Max. voltage | -0.3 V to +5.5 V in I/O mode |
| Pin 37a-40a, 39b-42b, 1b-4b used as Analog-IN: | -0.3 V .. 5.5 V |
| Analog Reference: | +3.3 V .. 5.5 V |
| RTC-Sleep | 1-2µA typ. |
| RAM-Sleep | 200-500µA |

# TINY-Tiger® 2 *plus* - Data Sheet

## Electrical Specifications



# TINY-Tiger® 2 *plus* - Data Sheet

## Electrical Specifications

- Impedance digital Inputs:
  - Pull-up resistor: 40 kΩ typ. all I/Os except L72; 10 kΩ typ. L72
- Digital Inputs:
  - Input voltage „high“: 2.0 $V_{min}$
  - Input voltage „low“: 0.8 $V_{max}$
- Analog:
  - Inputs: 12 channels
  - Vref Input: 3.5 V .. 5.0 V
  - Impedance inputs: 375 kΩ typ.
  - Input Range: 0 .. 5 V (abs. max. = -0.3 .. 5.5 V)
  - Input resolution: to be selected by the according device driver
    - 12 bit
    - 10 bit
    - 8 bit
  - Input accuracy: typ. ± 2 LSB, ± $V_{CC1}$ accuracy
  - Sampling rate: up to ~160 kS/sec

| | |
|---|---|
| USER_FREQUENCY SPEED_25 | 80 kS/sec. max |
| USER_FREQUENCY SPEED_50 | 80 kS/sec. max |
| USER_FREQUENCY SPEED_100 | 160 kS/sec. max |

depending on Device Driver used
Sampling buffer: up to 2 MB

# TINY-Tiger® 2 *plus* - Data Sheet

## Electrical Specifications

- Serial channels: 2 UART channels:
  CH-0: RxD, TxD, CTS, [RTS]
  Baudrates: up to 614 400 Bd
  Data/Parity: 7E, 7O, 8N, 8E, 8O, 9N
  CH-1: as above, RxD and TxD lines
  Level systems: 3.3 V TTL level, 5 V tolerant
  Variable buffer-size: Up to 8 KB

- Serial channels (soft UARTs): Up to 8 additional serial I/O channels through software driver SER2_pp_xx.TD3.
  Selectable PIN functions: RxD RTS, CTS
  TxD TE (RS 485)
  RxD + TxD

- System timebase accuracy: ± 50 ppm base tolerance,
  ± 30 ppm over temp. range -20 °C to +70 °C add.drift.
  ± 5 ppm per year max. aging

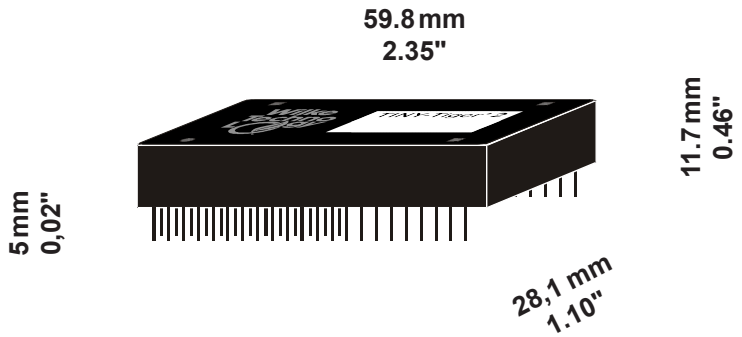
- Reset: Reset input: LOW-active, internal pull-up R = 10 kΩ typ.

- I/O pins: 36 universal I/O-pins

# TINY-Tiger® 2 *plus* - Data Sheet

## Physical Specifications

- Dimensions: approx. 28.1 x 59.8 x 10.7 mm / 1.11 x 2.35 x 0.42“
  46-pin DIP type case
- Case type: pin to pin clearance 2.54 mm / 0.10“, row distance 22.86 mm / 0.9“
- Pin size: square pins 0.64 x 0.64 mm / 0.025 x 0.025“
- Case Dimensions:




Dimensions identical with Tiny-Tiger® 2 moduls of Generation 1 Product

- Weight: approx. 28 g / 1 ounces
- Operating temperature: -40 to 85 °C
  Expanded: expanded temperature ranges on request
- Memory:

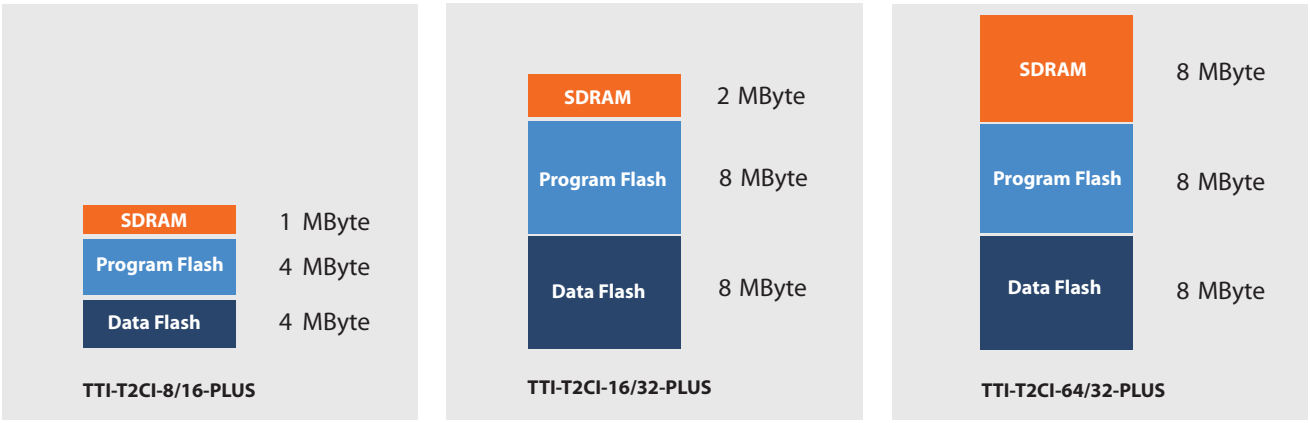
- Flash erase cycles: Min. 10.000 cycles, typ. ~ 500.000
- Flash data retention: > 10 years
- Flash sector size: 64 kB

# TINY-Tiger® 2 *plus* - Data Sheet

## Physical Specifications

Memory constellation overview for TINY-Tiger 2 plus module types

**T2CI-series** | TINY-Tiger 2 Pico

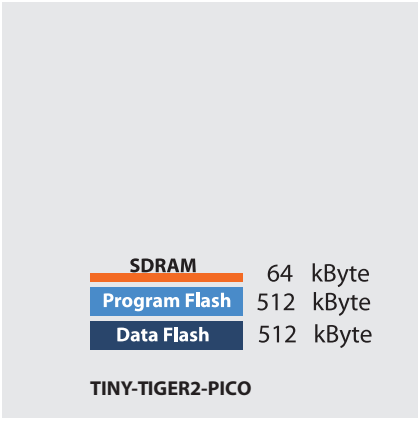


# TINY-Tiger® 2 *plus* - Data Sheet

## Physical Specifications

Memory constellation overview for TINY-Tiger 2 Pico module types

T2CI-series | **TINY-Tiger 2 Pico**



# TINY-Tiger® 2 *plus* - Data Sheet

## Battery Backup-Tiger Generations 1,2&3

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Gen-1 | Tiger A | ACN... | 2,7...4,5 V | 50...300 µA | 1 pin | RTC | SRAM |
| | | ANN... | 2,7...4,5 V | 50...300 µA | 1 pin | | SRAM |
| | TinyTiger | TCN... | 2,7...4,5 V | 50...300 µA | 1 pin | RTC | SRAM |
| | | TNN... | 2,7...4,5 V | 50...300 µA | 1 pin | | SRAM |
| Gen-2 | TinyTiger 2 | T2CI... | 2,7...4,5 V | 15...50 µA | 1 pin | RTC | |
| | | | 2,7...4,5 V | 50...300 µA | 1 pin | | SRAM |

| | | | | | | | | NRB models: | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gen-3 | Tiger A ***plus*** ACN... plus | 2,3...3,5 V | 1...2 µA | 1 pin | RTC | SRAM | | 2,3...3,5 V | 1...2 µA | 1 pin | RTC | SRAM | |
| | | 3,0...3,3 V | 200..500 µA | | | SDRAM | | ~~3,0...3,3 V~~ | ~~200..500 µA~~ | | | ~~SDRAM~~ | |
| | TinyTiger ***plus*** TCN... plus | 2,3...3,5 V | 1...2 µA | 1 pin | RTC | SRAM | | 2,3...3,5 V | 1...2 µA | 1 pin | RTC | SRAM | |
| | | 3,0...3,3 V | 200..500 µA | | | SDRAM | | ~~3,0...3,3 V~~ | ~~200..500 µA~~ | | | ~~SDRAM~~ | |
| | TinyTiger 2 ***plus*** T2CI... plus | 2,3...3,5 V | 1...2 µA | 1 pin | RTC | SRAM | | 2,3...3,5 V | 1...2 µA | 2 pins | RTC | SRAM | |
| | | 3,0...3,3 V | 200..500 µA | 1 pin | | SDRAM | | ~~3,0...3,3 V~~ | ~~200..500 µA~~ | | | ~~SDRAM~~ | |

**Note:** Generation 3 Tigers, the „plus“ series, use SRAM memory for backup only and SDRAM as (optionaly buffered) normal working memory

**Important Note:**
(… ignore, if you don't use any Battery Backup in your application)

Battery Backup has changed since Tiger 1 and Tiger 2 generations.
Now in Generation 3 products, the Tiger plus modules, we have 3 function groups, that can be buffered by a battery or another secondary power source.
These 3 function groups are:
A) RTC
B) Backup-RAM = SRAM
C) Main-RAM = SDRAM

# TINY-Tiger® 2 *plus* - Data Sheet

Tiger 1 and Tiger 2 generations had only 2 function groups:
a) RTC
b) Main-RAM = Backup-RAM = SRAM

In both product groups, Tiger 1 and Tiger 2, as well as in Generation 3 Tigers (Tiger plus) we have modules with 1 Battery-Input pin only and modules with 2 Battery-Input pins – see details below.

**Your Application**
Depending on your application you may want to:

**1. Use Real Time Clock and optionally Sleep & Wake Up**
Have the RTC running no matter if the system is powered or not.
Also, you may want to go to deep sleep with the whole system or parts of it and get wake ups once in a while or by event.

In this case the RTC needs to be powered, to enable the "Alarm"-Pin function for deep sleep/wake up. The RTC power requirement is < 2 µA, allowing long term operation with a small backup battery.

An additional feature of the RTC is the "Voltage-Low-Flag" that can be tested in a power on sequence of the Tiger Programm, to detect if the RTC was always powered properly or not. Any interruption of RTC-powering is detected and can be used in the application program for further program flow.

**2. Save Data**
You may want to save data, as parameter settings, calibration data, life status information etc. in a secure, battery buffered RAM space.

Buffered RAM space is the Backup-RAM in Tiger plus series, which is powered together with the RTC, consuming in total < 2 µA. The available space in Backup-RAM is typically 2 kBytes.

To access this memory – see programming guide with examples: READ_BACKUP_RAM / WRITE_BACKUP_RAM.

# TINY-Tiger® 2 *plus* - Data Sheet

Secure storing of data in the Backup-RAM may be done under normal program control or, combined with a power fail detect signal and the execution of an interrupt task, to save important values when the system is powered down hard / unintentionally.

As Backup-RAM and RTC are powered always together, the "Voltage-Low-Flag" also is used to check reliably, if data in this memory is valid or not. No other CRC check or similar is needed.

**3. Save Mass Data**

You may want to save mass data on a regular or intermittent basis into the internal RAM. That can be done by powering the Main-RAM / SDRAM of Tiger plus modules.

The power requirements for the internal SDRAM are significantly higher than for the Backup-RAM, typically by a factor of 1.000 to 5.000 and a backup battery design has to be done accordingly.

Also, the SDRAM has 2 requirements to be fulfilled for proper operation:
- the battery voltage must not exceed 3,3 V
- during initial assembly the battery must never be connected to the battery input pin when the Tiger module is not powered. This would bring the SDRAM into an undefined state, instead of a defined sleep mode that is entered under system control of the Tiger Module in the power down phase.

To allow the system a controlled shut down, do not exceed the gradient of power supply voltage drop during power down of -1 kV/s, what normally is provided in all systems.
This requirement needs some attention to be met under all possible conditions:
(i) in the manufacturing process of your series product
(ii) as well as in any situation, when a Tiger Module gets removed from and re-plugged into the socket in your PCB.

Make sure, that the Tiger Module can bring the SDRAM into proper Sleep Mode through a power down sequence always.

Finally – you may consider data storage is also possible in the internal Data-FLASH as well as in external storage devices through $I^2C$ / SPI Interfaces.

# TINY-Tiger® 2 *plus* - Data Sheet

## Cross References/Order Codes

### Previous TINY-Tiger2 Modules

TINY-Tiger 2

| Product Code | RAM | FLASH |
|---|---|---|
| TTI-T2CI-8/16-R | 1 MByte | 2 MByte |
| TTI-T2CI-16/32-R | 2 MByte | 4 MByte |
| New Module ⟶ | | |
| New Pico Module ⟶ | | |

### NEW TINY-Tiger2 Modules

TINY-Tiger 2 plus

| Product-Code | RAM | Program Flash | Data Flash |
|---|---|---|---|
| TTI-T2CI-8/16-PLUS | 1 MByte | 4 MByte | 4 MByte |
| TTI-T2CI-16/32-PLUS | 2 MByte | 8 MByte | 8 MByte |
| TTI-T2CI-64/32-PLUS | 8 MByte | 8 MByte | 8 MByte |
| TINY-TIGER2-PICO | 64 kByte | 512 kByte | 512 kByte |

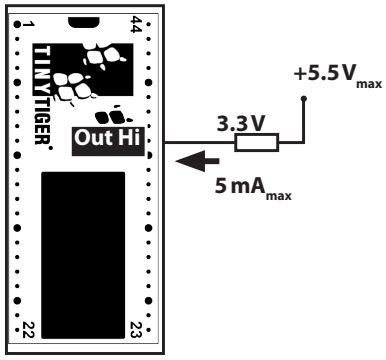
**Note:** All listed modules of the Tiger „Plus“ series are also available as NRB models.
(For example: TTI-T2CI-8/16-PLUS-NRB)

**Note:** *plus* Series products offer and use more firmware resources, so at least use the recommended replacement type or larger part.
10+ years delivery guarantee.

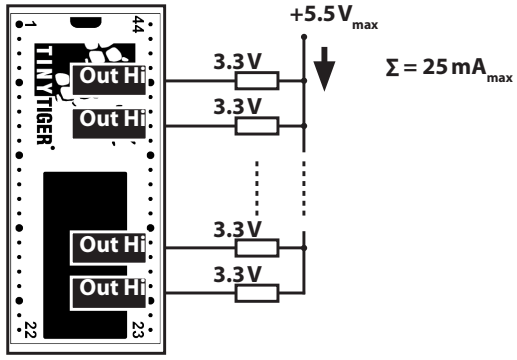
# TINY-Tiger® 2 *plus* - Data Sheet

## 5 Volt I/O-Tolerance Conditions

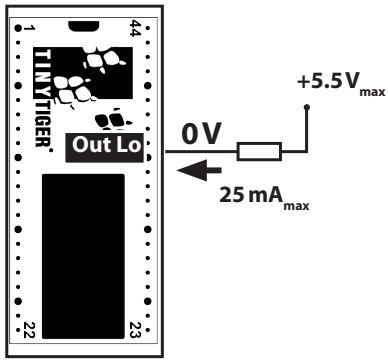
$V_{CC1}$ = +3.3 V OR VCC2 = +5.0 V



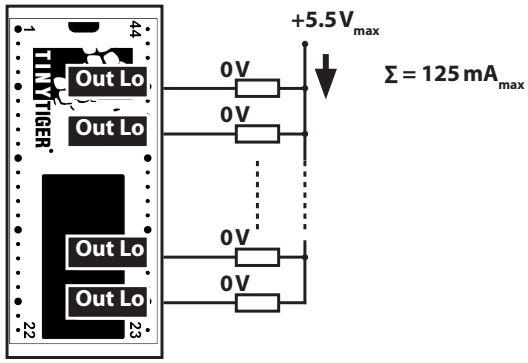

$V_{CC1}$ = +3.3 V OR VCC2 = +5.0 V



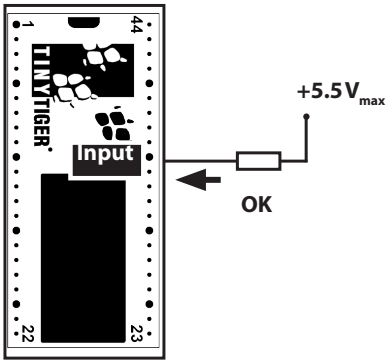

$V_{CC1}$ = +3.3 V OR VCC2 = +5.0 V



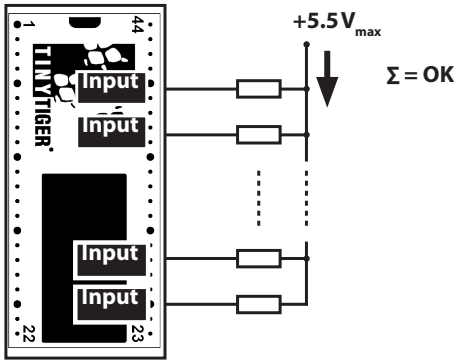

$V_{CC1}$ = +3.3 V OR VCC2 = +5.0 V




$V_{CC1}$ = +3.3 V OR VCC2 = +5.0 V



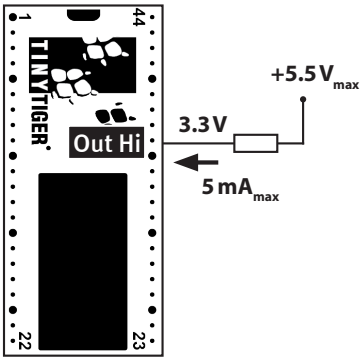

$V_{CC1}$ = +3.3 V OR VCC2 = +5.0 V



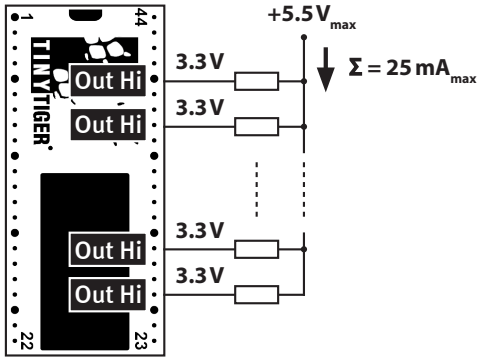
# TINY-Tiger® 2 *plus* - Data Sheet

## 3.3 Volt I/O Conditions

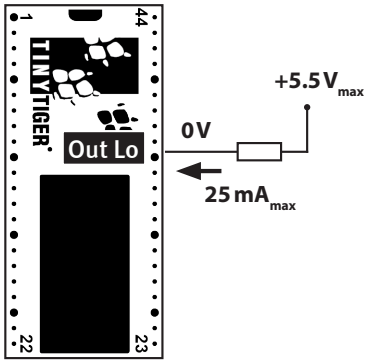
$V_{CC1}$ = +3.3 V OR $V_{CC2}$ = +5.0 V



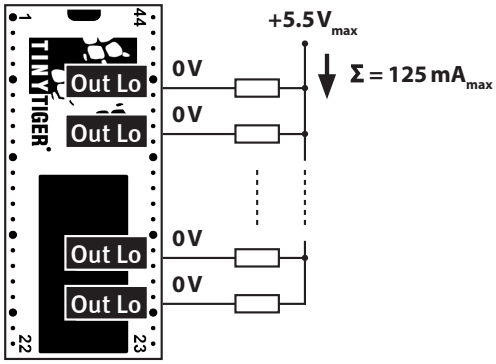

$V_{CC1}$ = +3.3 V OR $V_{CC2}$ = +5.0 V



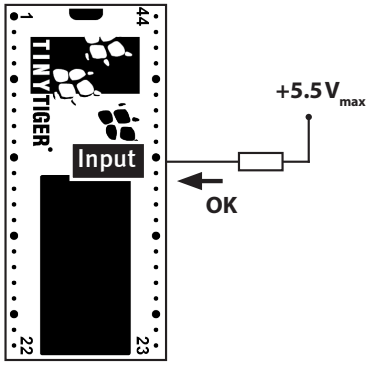

$V_{CC1}$ = +3.3 V OR $V_{CC2}$ = +5.0 V



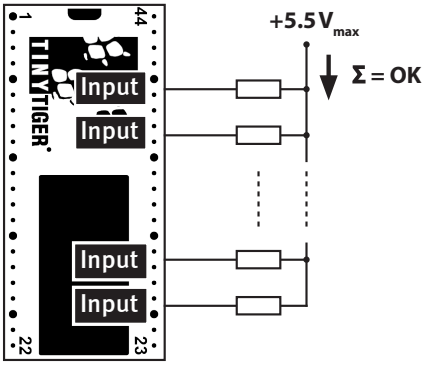

$V_{CC1}$ = +3.3 V OR $V_{CC2}$ = +5.0 V




$V_{CC1}$ = +3.3 V OR $V_{CC2}$ = +5.0 V



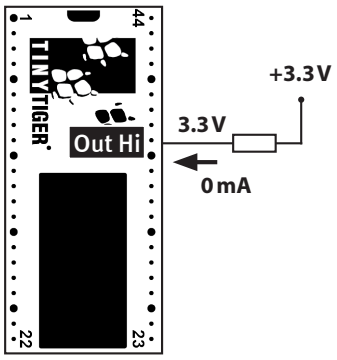

$V_{CC1}$ = +3.3 V OR $V_{CC2}$ = +5.0 V



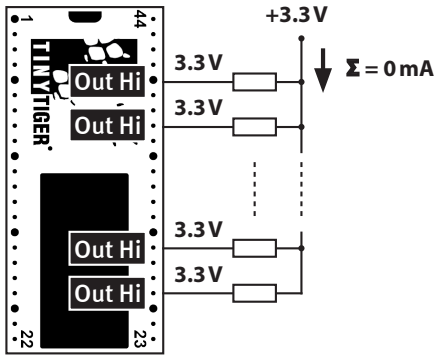
# TINY-Tiger® 2 *plus* - Data Sheet

## I/O Conditions to GND

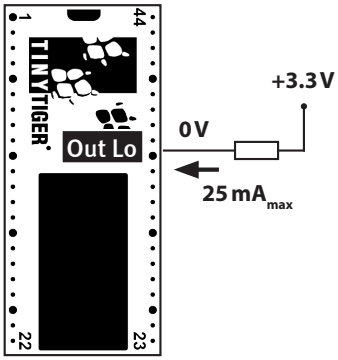
$V_{CC1}$ = +3.3 V OR $V_{CC2}$ = +5.0 V



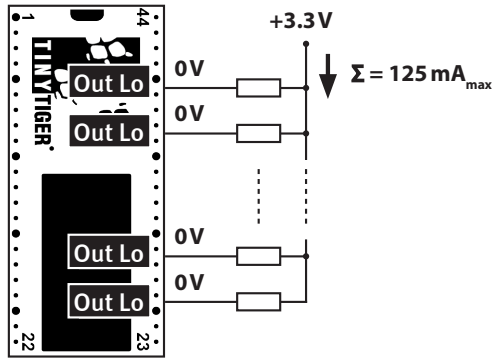

$V_{CC1}$ = +3.3 V OR $V_{CC2}$ = +5.0 V



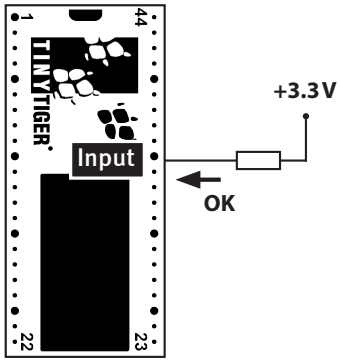

$V_{CC1}$ = +3.3 V OR $V_{CC2}$ = +5.0 V



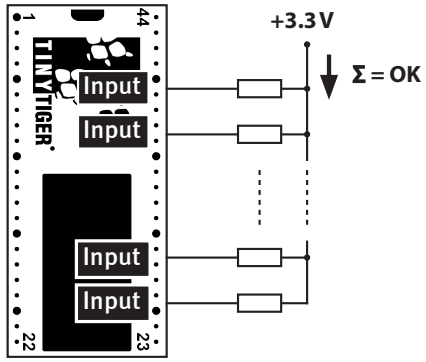

$V_{CC1}$ = +3.3 V OR $V_{CC2}$ = +5.0 V




$V_{CC1}$ = +3.3 V OR $V_{CC2}$ = +5.0 V




$V_{CC1}$ = +3.3 V OR $V_{CC2}$ = +5.0 V



# TINY-Tiger® 2 *plus* - Data Sheet

## Document Version History

| | | |
|---|---|---|
| V01 | Electrical and physical specifications | November 3, 2015 |
| V02 | New electrical specifications | February 23, 2016 |
| V03 | Cross references | March 24, 2016 |
| V04 | Preliminary Data-Sheet | February 17, 2017 |
| V05 | First official release | September 20, 2017 |
| V06 | Small Corrections and Design | October 27, 2017 |
| V07 | Design Corrections | November 09, 2017 |
| V09 | Corrections | August 13, 2018 |
| V10 | Physical Specifications: Flash sector size, Cross References/Order Codes | November 23, 2018 |
| V11 | Physical Specifications: Pico-series | April 18, 2019 |
| V13 | New Chapter added: Battery Backup Tiger Generations 1, 2 & 3 | April 12, 2021 |
| V13 | Small corrections | October 29, 2025 |

## Notes:

**Support:**

**+49.2405.408.55 - 0**

**+49.2405.408.55 - 444**

**support@wilke.de**