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

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Inhalt

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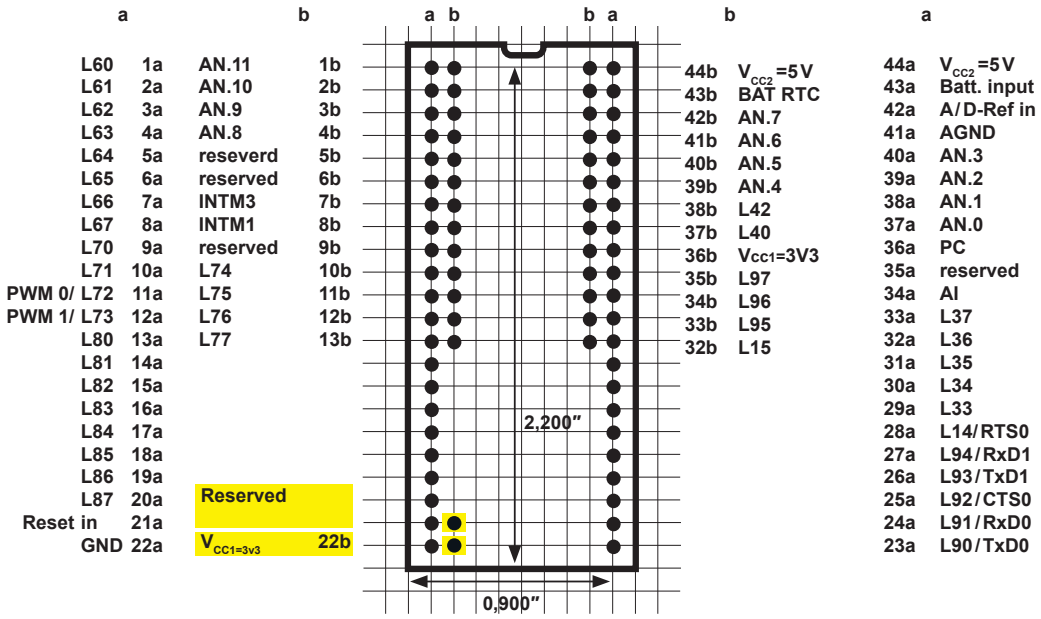
Pinout



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

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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) -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) -0.3 V to + 5.5 V in I/O mode -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

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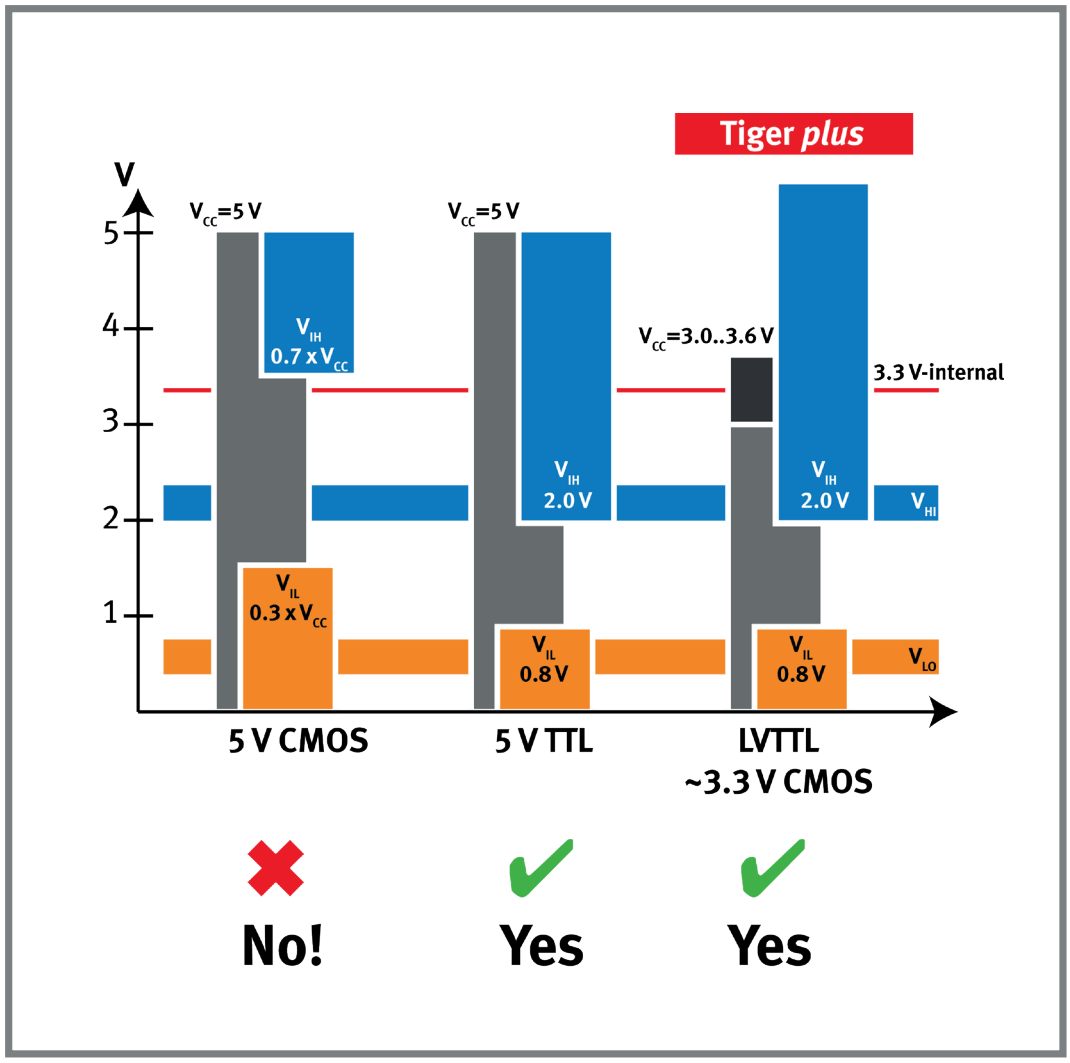
Electrical Specifications



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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: 40 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

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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

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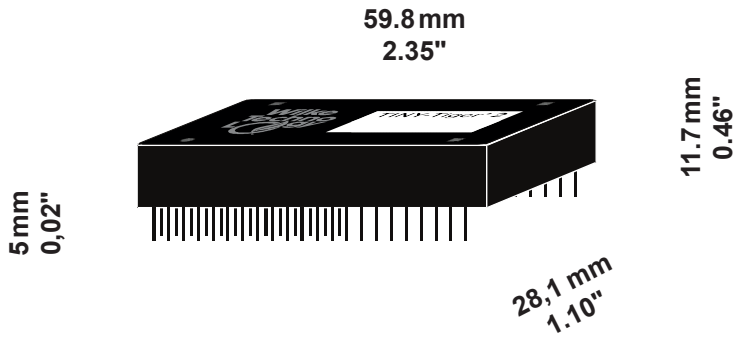
Physical Specifications

- 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

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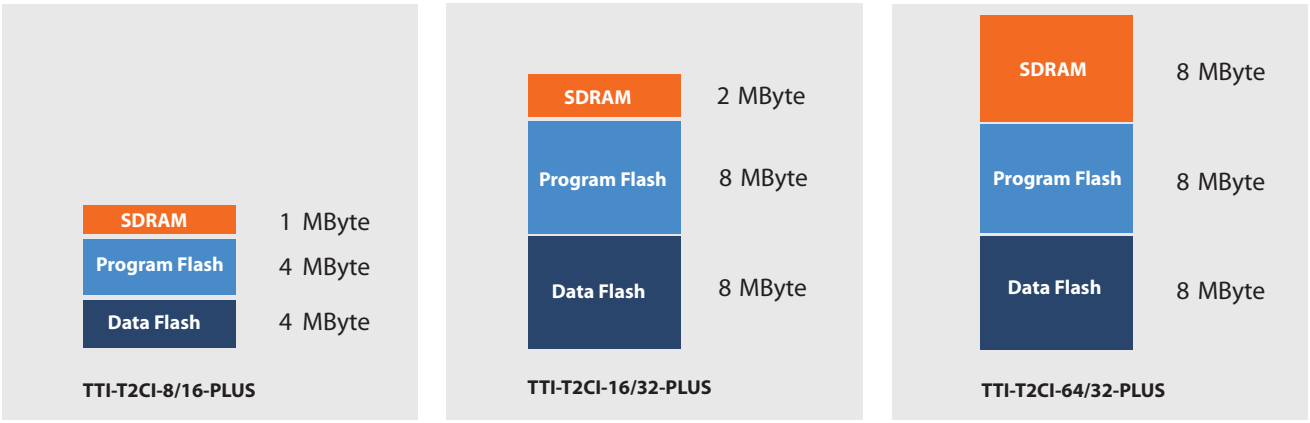
Physical Specifications

Memory constellation overview for TINY-Tiger 2 plus module types

T2CI-series | TINY-Tiger 2 Pico



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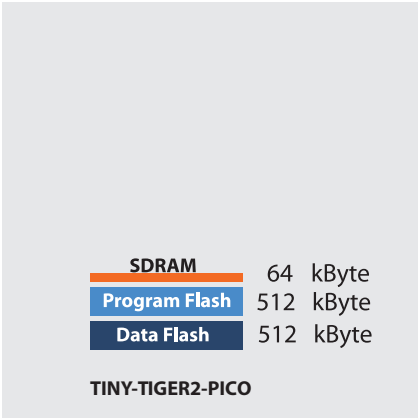
Physical Specifications

Memory constellation overview for TINY-Tiger 2 Pico module types

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



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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.

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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.

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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.

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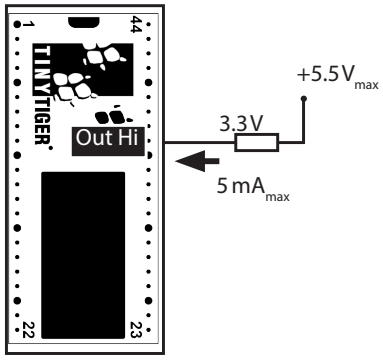
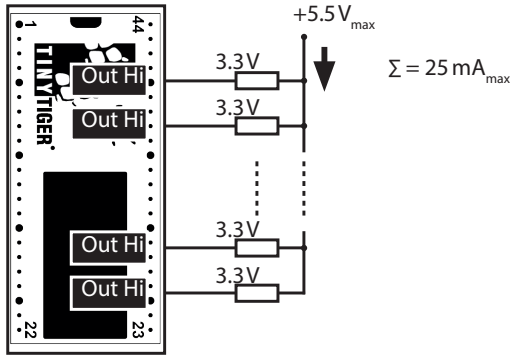
5 Volt I/O-Tolerance Conditions

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



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



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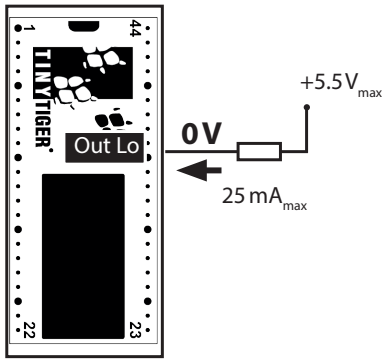

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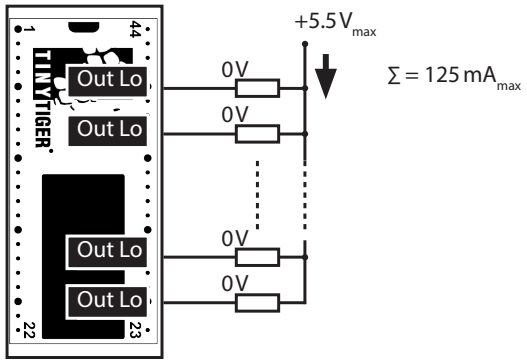
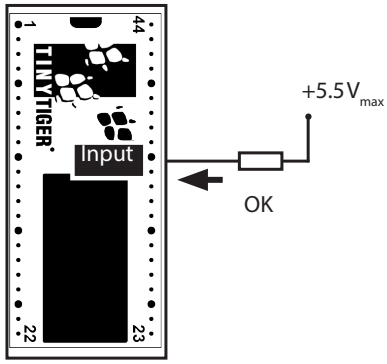
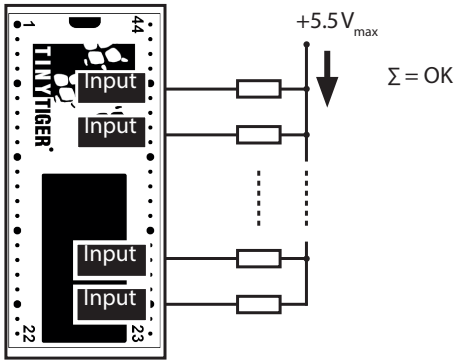


V_{CC1} = +3.3 V OR VCC2 = +5.0 V



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



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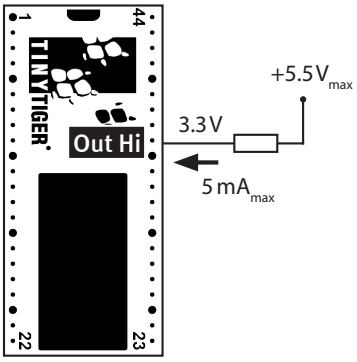
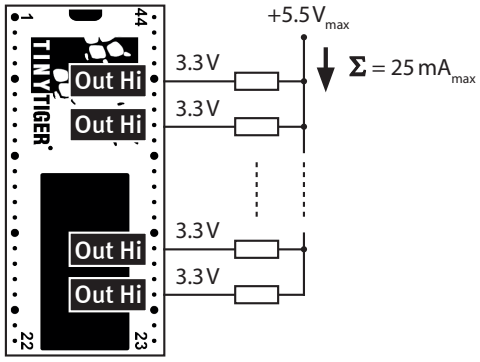
3.3 Volt I/O Conditions

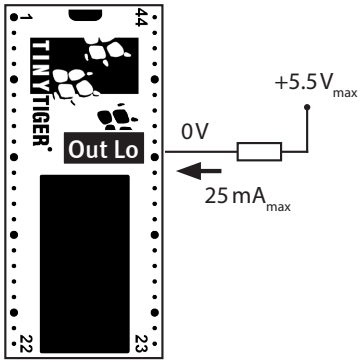
V_{CC1} = +3.3 V OR V_{CC2} = +5.0 V



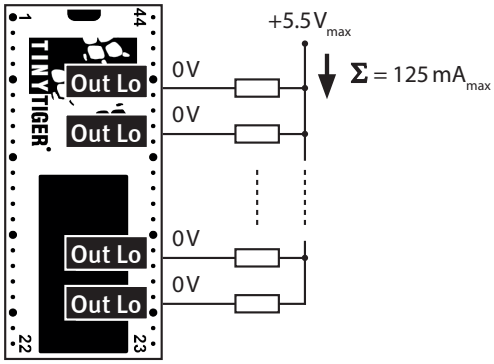
V_{CC1} = +3.3 V OR V_{CC2} = +5.0 V



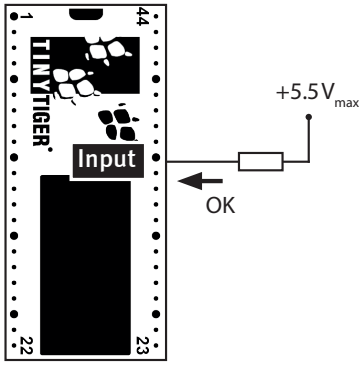
V_{CC1} = +3.3 V OR V_{CC2} = +5.0 V



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



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



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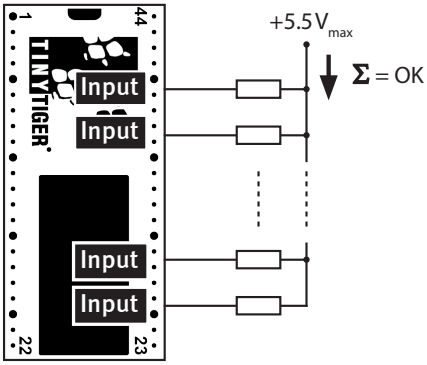

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I/O Conditions to GND

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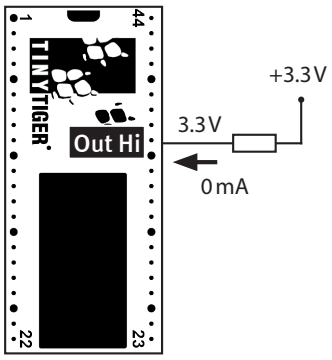
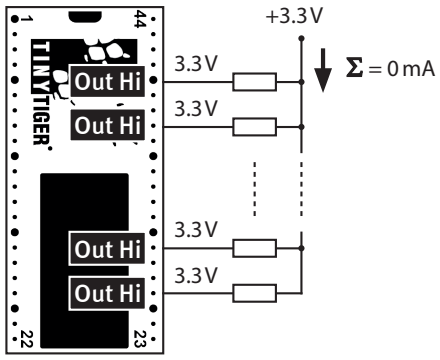


V_{CC1} = +3.3 V OR V_{CC2} = +5.0 V



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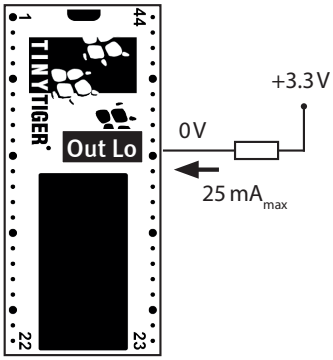
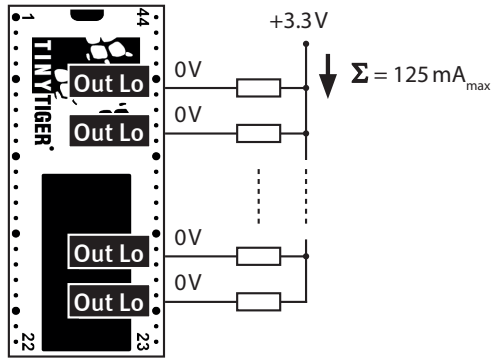


V_{CC1} = +3.3 V OR V_{CC2} = +5.0 V



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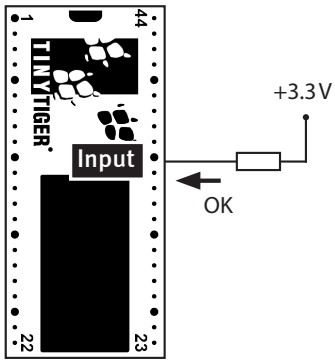

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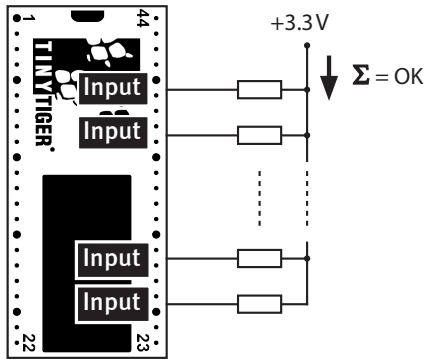

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Document Version History

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

Notes:

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