TSMC 07: I2C

Libraries

Name	Process	Form Factor
RGO_TSMC07_18V33_7FF_20C_I2C	7FF	Staggered

Summary

The I2C library provides open-drain bi-directional I/O cells designed for the I²C two-line interface. It is compliant with the I²C-bus specification – UMC10204 I²C-bus specification and user manual, Rev.4 – 13 February 2012, NXP.

The design supports the Sm, Fm and Fm+ modes of operation at the I²C bus operating voltage (VDDP) of either extended range 3.3V or standard 1.8V logic.

This 7nm library is available in a staggered flip chip implementation.

To utilize these cells in the pad ring, an additional library is required – 1.8V Support: Power. That library contains the power cells, the POC cell, and a rail splitter to isolate the I2C cells in their own power domain as recommended. It also contains an input-only buffer, isolated analog I/O, and a full complement of power cells along with corner and spacer cells to assemble a complete pad ring by abutment. The rail splitter allows multiple power domains to be isolated in the same pad ring while maintaining continuous VDD/VSS for robust ESD protection.

ESD Protection:

- JEDEC compliant
  - 2KV ESD Human Body Model (HBM)
  - 500 V ESD Charge Device Model (CDM)

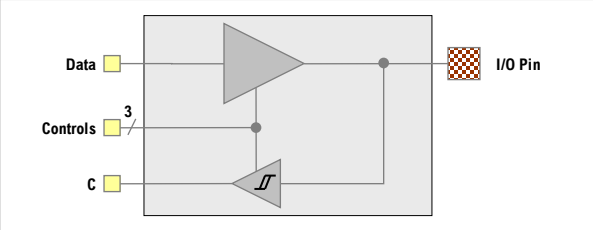
Latch-up Immunity:

- JEDEC compliant
  - Tested to I-Test criteria of ± 100mA @ 125°C

Cell Size & Form Factor

- Staggered (pad-limited) – 17.04µm x 213µm

I2P_ON_003_1833V_NC



Product Features

- Supported I2C operating modes:
  - Standard-mode (Sm) – 100 Kbps data rate
  - Fast mode (Fm) – 400 Kbps data rate
  - Fast mode (Fm+) – 3.4 Mbps data rate
- Open drain operation only (floating NWELL with PMOS used for ESD protection only)
- Built-in output slew rate control to meet I²C T_{of} minimum of (20 x VDDP/5.5V) ns
- Output enable
- Receiver enable
- ESD protection is accomplished with an SCR (no diode to the positive power supply)
- Standard LVCMOS compatible inputs with Schmitt trigger (hysteresis) option
- Power-on sequencing independent design with Power-On Control
- DVDD = 1.62V to 1.98V
- Pad VDDP (power supply reference for Output)
  - 2.7V to 3.63V – extended range 3.3V
  - 1.62V to 1.98V – standard range 1.8V
- The circuit consumes no DC supply current in the static state

An open-drain design, this cell requires an external pull-up resistor to a high voltage power supply. The pull-up power supply (VDDP) can be 3.63V maximum, independent of the I/O cell power supply (DVDD). In a 1.8V I2C bus application, VDDP can track DVDD but it is not necessary. The sizing of the external resistor is application dependent and can range from 1.1 KΩ to 40 KΩ operating at 3.3V.

Vertical-only (_V) and and horizontal-only (_H) variants provided.

Recommended operating conditions

	Description		Min	Nom	Max	Units
V_{DVDD}	I/O supply voltage		1.62	1.8	1.98	V
V_{VDDP}	External pull-up supply to PAD	3.3V	2.70	3.3	3.63	V
		1,8V	1.62	1.8	1.98	V
V_{VDD}	Core supply voltage		0.675	0.75	0.825	V
			0.765	0.85	0.935	V
T_J	Junction temperature		-40	25	125	°C
V_{PAD}	Voltage at PAD		V_{DVSS} – 0.3	-	3.63	V

Characterization Corners *

Model	LPE Type	VDD [1]	DVDD [2]	Temp
FF	Cbest_CCbest	+10%	+10%	-40°C
FF	Cbest_CCbest	+10%	+10%	125°C
TT	Ctypical	nominal	nominal	25°C
TT	Ctypical	nominal	nominal	85°C
SS	Cworst_CCworst	-10%	-10%	-40°C
SS	Cworst_CCworst	-10%	-10%	125°C

[1] VDD = 0.75V
[2] DVDD = 1.8V
* PRELIMINARY

Published by:

Aragio Solutions
2201 K Avenue
Section B Suite 200
Plano, TX 75074-5918
Phone: **(972) 516-0999**
Fax: **(972) 516-0998**
Web: http://www.aragio.com/

Printed in the United States of America