

# TSMC16: 3.3V GPIO



## Libraries

Name	Process	Form Factor
RGO_TSMC16_18V33_FFC_20C	FFC	Staggered CUP

## Summary

The 3.3V General Purpose I/O library provides bidirectional I/O, 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. An included rail splitter allows multiple power domains to be isolated in the same pad ring while maintaining continuous VDD/VSS for robust ESD protection.

- Programmable bidirectional GPIO
- Input-only buffer
- Isolated analog I/O
- Full complement of power, corner, and spacer cells

### ESD Protection:

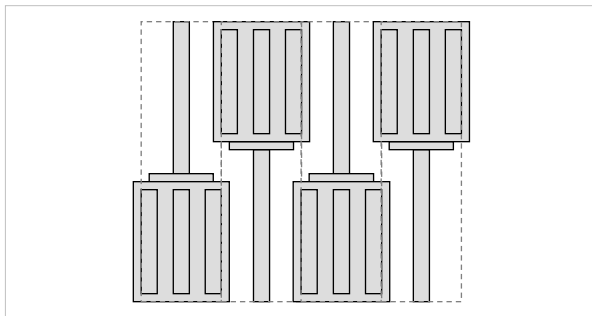
- JEDEC compliant
  - 2KV ESD Human Body Model (HBM)
  - 200 V ESD Machine Model (MM)
  - 500 V ESD Charge Device Model (CDM)

### Latch-up Immunity:

- JEDEC compliant
  - Tested to I-Test criteria of  $\pm 100\text{mA}$  @  $125^\circ\text{C}$

## Cell Size & Form Factor

Staggered (pad-limited) –  $25\mu\text{m} \times 165\mu\text{m}$

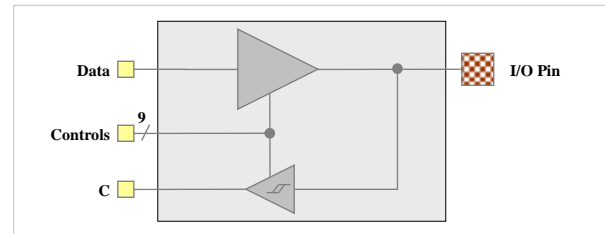


- Vertical-only and horizontal-only orientations

## Recommended operating conditions

Description	Min	Nom	Max	Units
$V_{\text{VDD}}$ Core supply voltage	0.72	0.80	0.88	V
	1.08	1.2	1.32	V
	1.62	1.8	1.98	V
$V_{\text{DVDD}}$ I/O supply voltage	2.25	2.5	2.75	V
	2.97	3.3	3.63	V
	$V_{\text{TJ}}$ Junction temperature	-40	25	125
$V_{\text{PAD}}$ Voltage at PAD	$V_{\text{DVSS}} - 0.3$	-	$V_{\text{DVDD}} + 0.3$	V

## SRP\_BI\_SDS\_33V\_STB

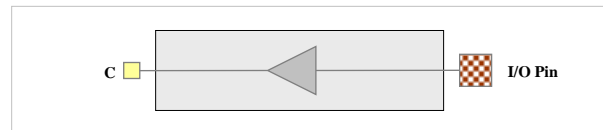


## Bidirectional GPIO Driver Features

- Multi-Voltage (1.2V, 1.8V, 2.5V, 3.3V)
- LVCMOS / LVTTTL input with selectable hysteresis
- Programmable drive strength (rated 2mA to 12mA)
- Selectable output slew rate
- Optimized for EMC with SSO factor of 8
- Open-drain output mode
- Programmable input options (pull-up/pull-down/repeater)
- Power-On Start (POS) capable
- Power sequencing independent design with Power-On Control

In full-drive mode, this driver can operate to frequencies in excess of 100MHz with 15pF external load and 125 MHz with 10pF load. Actual frequency limits are load and system dependent. A maximum of 200 MHz can be achieved under small capacitive loads.

## STP\_IN\_001\_33V\_NC



## Input-Only GPIO Features

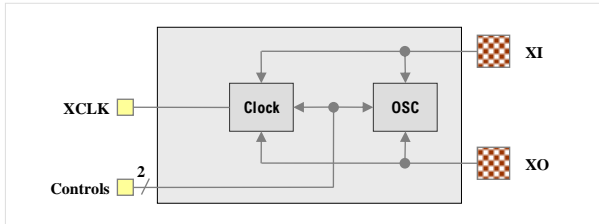
- Multi-voltage (1.2V, 1.8V, 2.5V, 3.3V)
- Wide input slew-rate
- LVCMOS/LVTTTL compatible input with no hysteresis
- Minimized skew for optimum performance over frequency
- No power sequence requirements

## Characterization Corners

Model	LPE Type	VDD=0.8V	DVDD [1]	Temp
FFGNP	Cbest_CCbest_T	+10%	+10%	-40 $^\circ\text{C}$
FFGNP	Cbest_CCbest_T	+10%	+10%	0 $^\circ\text{C}$
FFGNP	Cbest_CCbest_T	+10%	+10%	125 $^\circ\text{C}$
FFG	Ctypical	+10%	+10%	125 $^\circ\text{C}$
TT	Ctypical	nominal	nominal	25 $^\circ\text{C}$
TT	Ctypical	nominal	nominal	85 $^\circ\text{C}$
SSGNP	Cworst_CCworst_T	-10%	-10%	-40 $^\circ\text{C}$
SSGNP	Cworst_CCworst_T	-10%	-10%	0 $^\circ\text{C}$
SSGNP	Cworst_CCworst_T	-10%	-10%	125 $^\circ\text{C}$

[1] DVDD = 1.2V, 1.8V, 2.5V & 3.3V

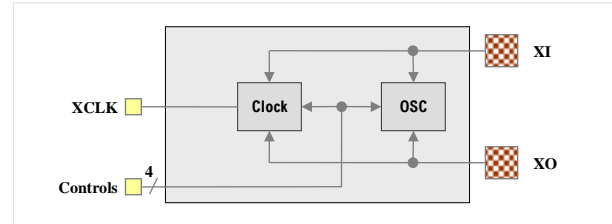
## OSP\_BI\_032\_33V



### 32 KHz RTC Oscillator Features

- Designed to use a 32.786 kHz external crystal for Real Time Clock applications.
- Optimized for low power, stability and minimum jitter
- Characterized with crystal loading capacitors ranging from 4 pF to 25 pF.
- Power-down and bypass modes
- Speed-up circuitry for fast startup
- Low power
- Operates on core power only (VDD/VSS cells embedded)

## OSP\_BI\_100\_33V



### 100 MHz Programmable Oscillator Features

- Programmable drive strength for wider frequency range – 1 MHz to > 100 MHz using industry standard external crystals.
- Optimized for stability and minimum jitter
- Power-down and bypass modes
- Operates on core power only (VDD/VSS cells embedded)

Oscillator libraries are shipped separately.

© 2011-2016 Aragio Solutions. All rights reserved.

Information in this document is subject to change without notice. Aragio Solutions may have patents, patent applications, trademarks, copyrights or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Aragio, the furnishing of this document does not give you any license to the patents, trademarks, copyrights, or other intellectual property.

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/>

While every precaution has been taken in the preparation of this book, the publisher assumes no responsibility for errors or omissions, or for damages resulting from the use of the information contained herein. This document may be reproduced and distributed in whole, in any medium, physical or electronic, under the terms of a license or nondisclosure agreement with Aragio.

Printed in the United States of America