

# TSMC28: 3.3V GPIO



## Libraries

Name	Process	Form Factor
RGO_TSMC28_18V33_HPM_20C	HPM	Staggered CUP
RGO_TSMC28_18V33_HPC_20C	HPC	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:

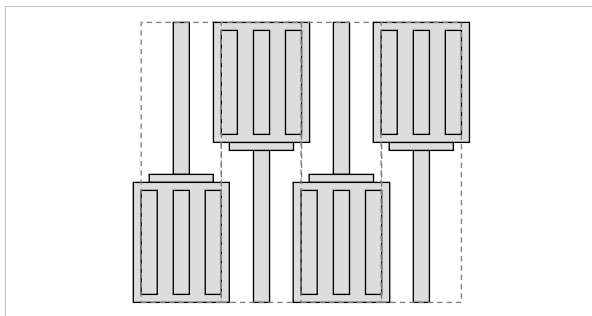
- JEDEC compliant
  - 2KV ESD Human Body Model (HBM)
  - 200 V ESD Machine Model (MM)
  - 500 V ESD Charge Device Model (CDM)

### 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) –  $25\mu\text{m} \times 165\mu\text{m}$

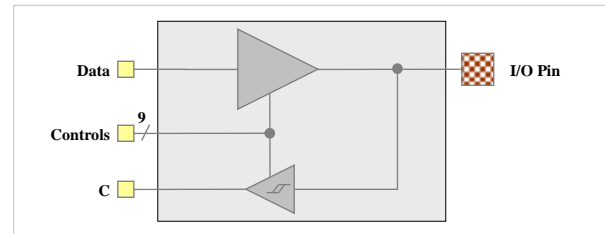


- Vertical-only and horizontal-only orientations

## Recommended operating conditions

Description	Min	Nom	Max	Units
$V_{\text{VDD}}$ Core supply voltage	0.81	0.9	0.99	V
$V_{\text{DVDD}}$ I/O supply voltage	1.62	1.8	1.98	V
$V_{\text{VDD}}$ Core supply voltage	0.81	0.9	0.99	V
$T_{\text{J}}$ Junction temperature	-40	25	125	$^\circ\text{C}$
$V_{\text{PAD}}$ Voltage at PAD	$V_{\text{DVSS}} - 0.3$	-	$V_{\text{DVDD}} + 0.3$	V

## SRP\_BI\_SDS\_33V\_STB

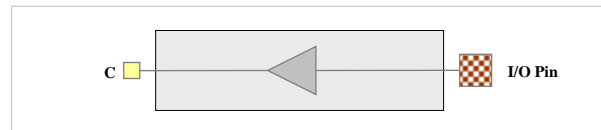


## Bidirectional GPIO Driver Features

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

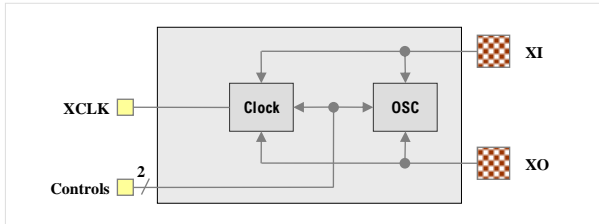
## Characterization Corners

Nominal VDD	Model	VDD	DVDD [1]	Temperature
0.9V	FF	+10%	+10%	-40 $^\circ\text{C}$
	FF	+10%	+10%	0 $^\circ\text{C}$
	FF	+10%	+10%	125 $^\circ\text{C}$
	TT	nominal	nominal	25 $^\circ\text{C}$
	SS	-10%	-10%	-40 $^\circ\text{C}$
	SS	-10%	-10%	0 $^\circ\text{C}$
	SS	-10%	-10%	125 $^\circ\text{C}$

[1] DVDD = 1.8V and 3.3V

Partial set represented – see datasheet for complete detail.

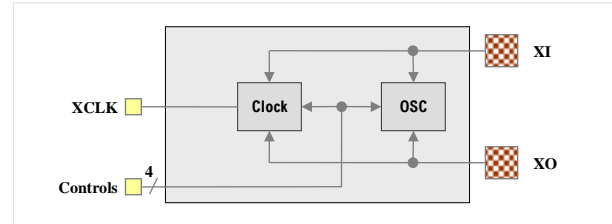
## OSP\_BI\_032\_33V



### 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 (2.6  $\mu$ W max)
- 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.

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