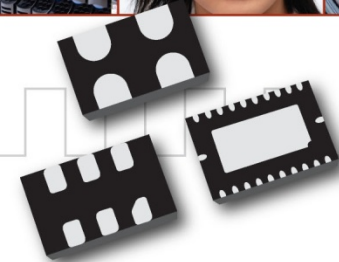




SiTime
Turbo
Webinars

SiTime University Turbo Webinar Series

SiT15xx 32kHz NanoDrive™ Output



June 17-18, 2013

The Smart Timing Choice™

Agenda



- SiT153x XO Status
- MCU Interface
- NanoDrive™ Benefits
- Summary

SiT15xx 32 kHz XO Family



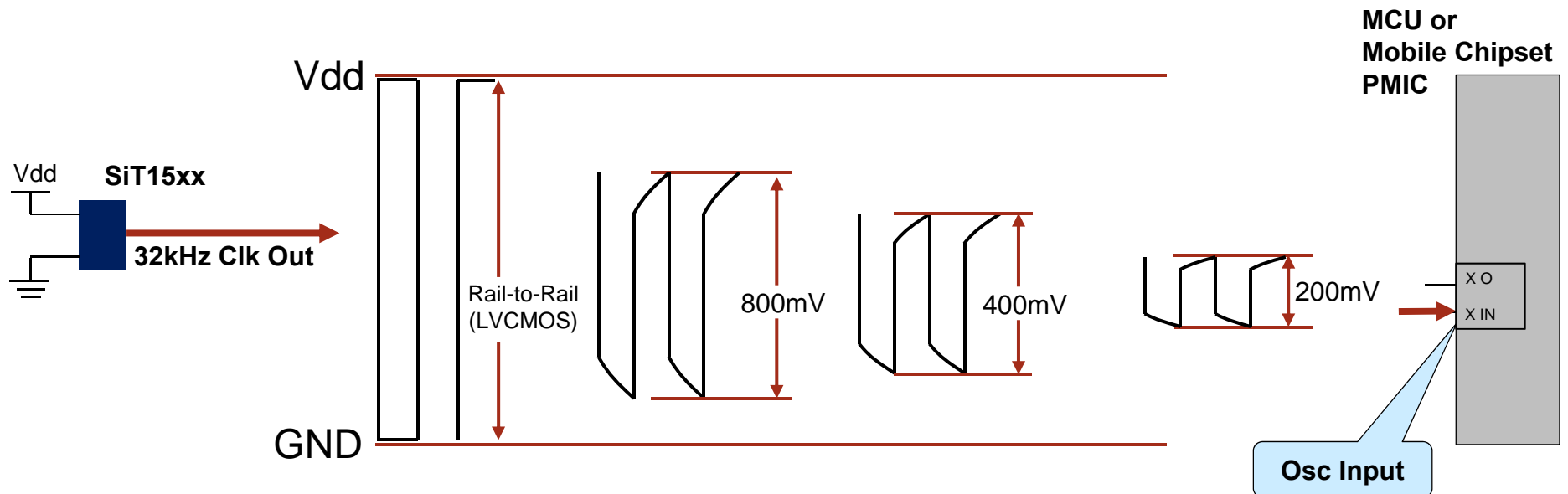
	SiT1532	SiT1533	SiT1534	SiT1542	SiT1543	SiT1544
Key Feature 1	Regulated Supply, 1.2V – 3.63V			Unregulated Li+ 2.7V – 4.5V		
Key Feature 2	CSP	2012 SMD	CSP, 2012	CSP	2012 SMD	CSP, 2012
Key Feature 3	32.768 kHz	32.768 kHz	1 Hz to 32.768 kHz	32.768 kHz	32.768 kHz	1 Hz to 32.768 kHz
Samples	July 15	Now	July 15, Now	Aug	Aug	Aug
Production	Nov	Aug	Nov, Aug	Nov	Nov	Nov

Preliminary Datasheets Available on the Web

NanoDrive Output Designed to Interface to MCU XTAL Input



- Interfaces Directly into XTAL Input
- NanoDrive™ Output Optimizes Swing for Lowest Power
- Factory Programmable from 200mV to Full-Swing LVCMOS



Standard XO LVCMOS Swing Consumes too Much Power
And Package is too Large!

3215 is smallest XO package (4.8mm² Area)

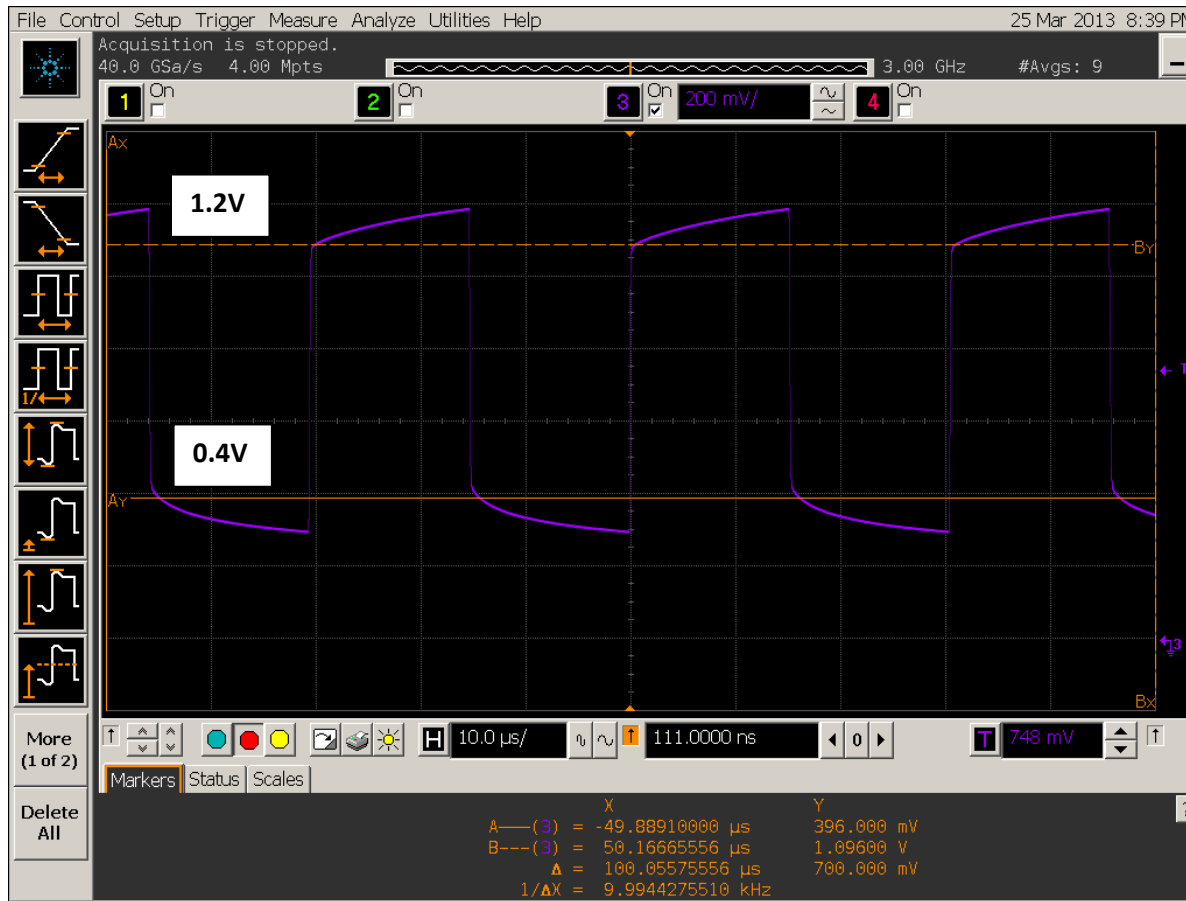
NanoDrive 800mV Output Voltage



SiT1533AI-H4-D14-32.768

$V_{OH} = 1.1V$, $V_{OL} = 0.4V$

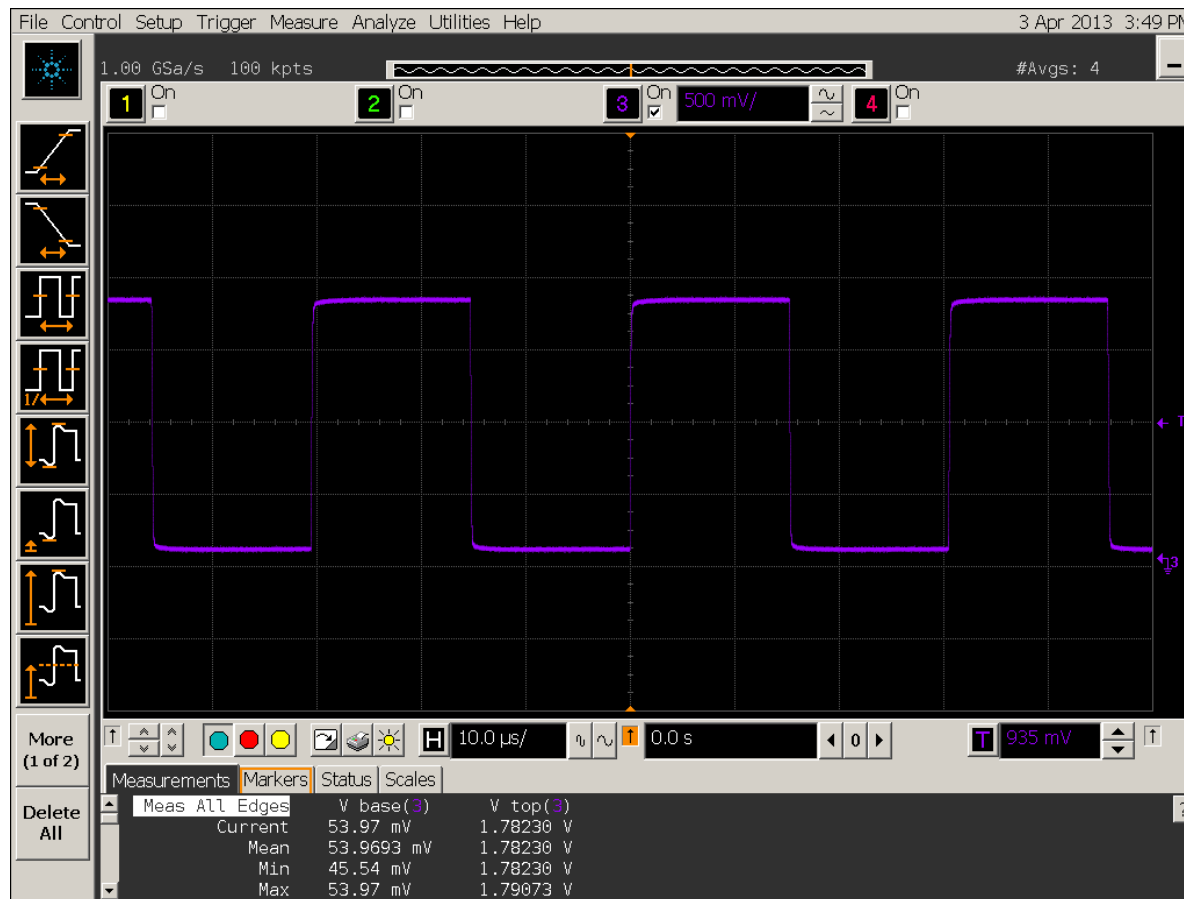
$V_{OUT\ swing} = V_{OH} - V_{OL} = 700mV$



LVC MOS Full-Swing Output



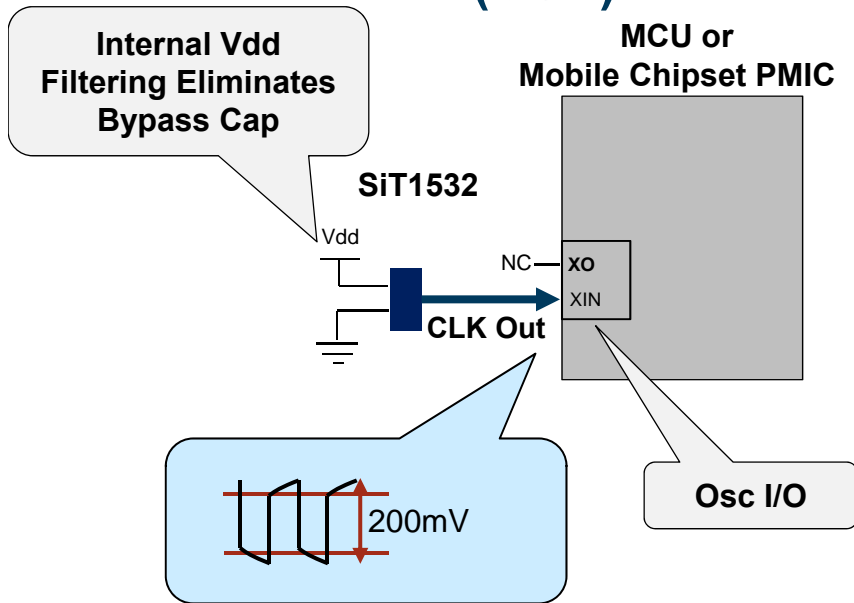
SiT1533AI-H4-DCC-32.768



SiT1532/42 CSP for Smallest Footprint and No External Components

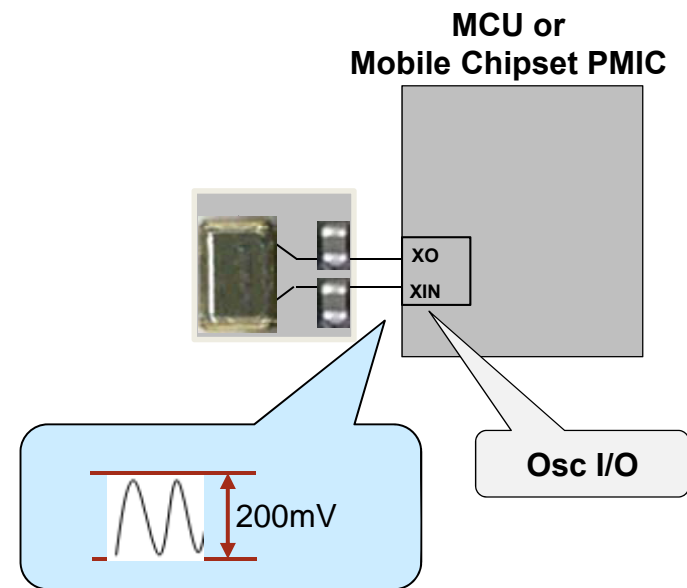


SiTime's MEMS Solution in Chip-Scale (CSP)



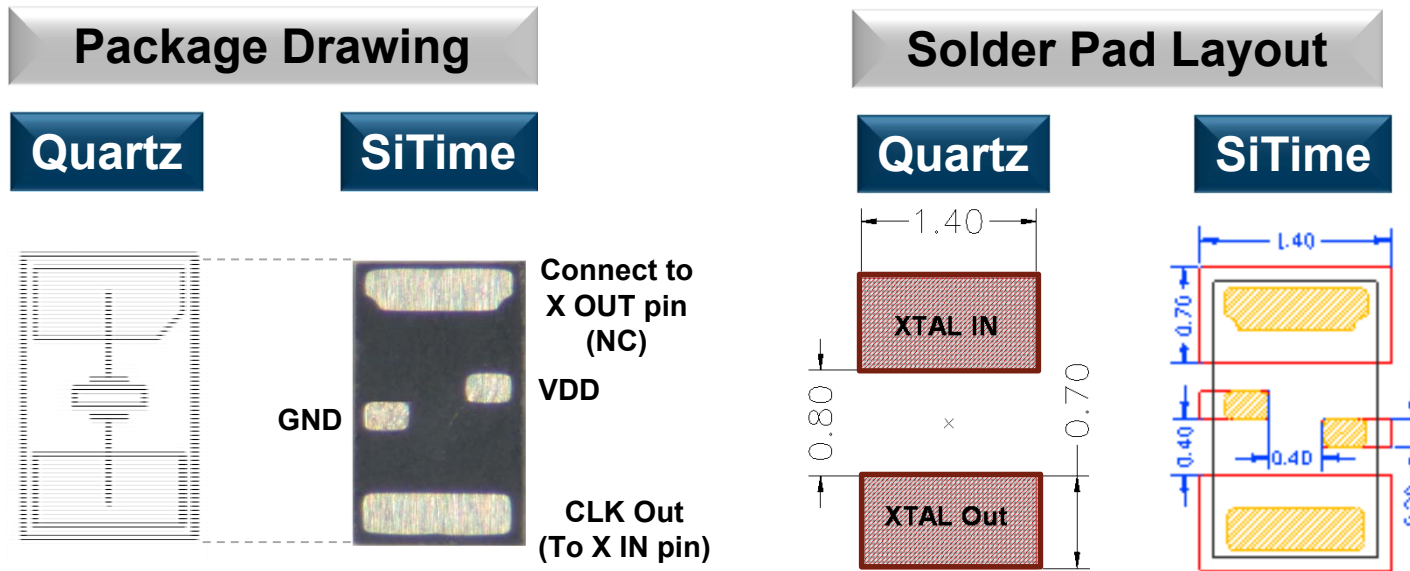
1.2 mm² Footprint with CSP

Quartz XTAL Solution



8 mm² Footprint with 2012 SMD

SiT15xx 2.0x1.2 (2012) Package is Pin Compatible with Quartz Resonator



- SiT15xx is footprint compatible with a crystal resonator
 - Use SiTime's Solder Pad Layout (SPL) → pin-compatible with quartz XTALs
 - Acceptable for mobile and portable design manufacturing (DFM) guidelines
 - Validated by customers

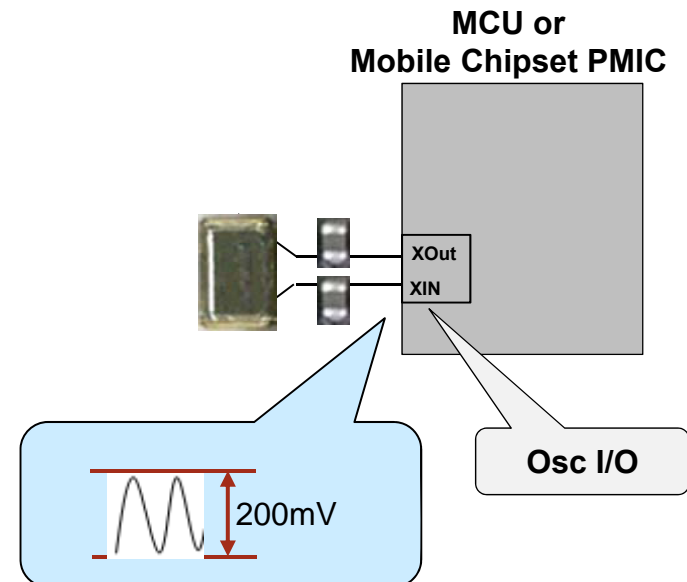
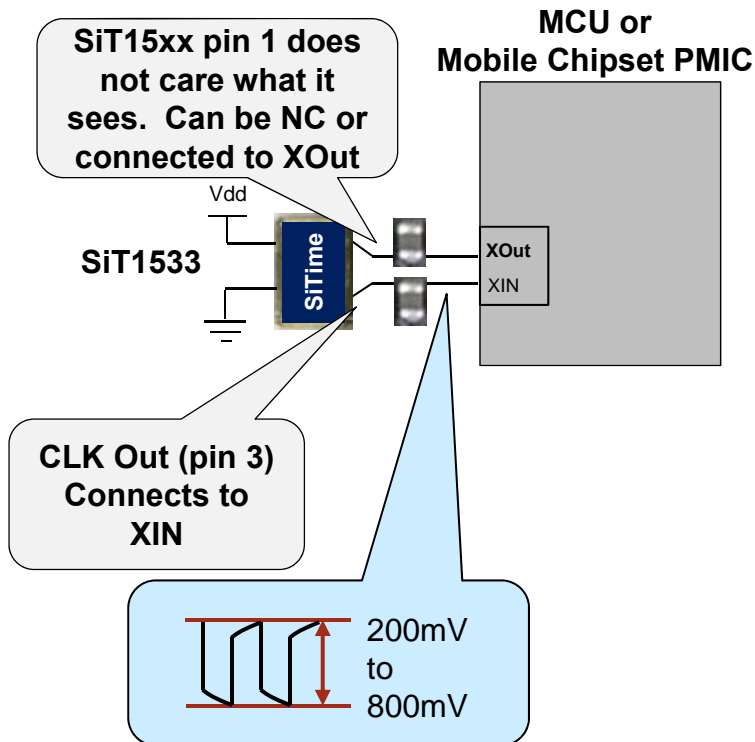
SiT1533/43 Replaces 32 kHz XTALs in 2012 Pkg



Designed to operate with or without load caps for maximum compatibility

SiTime MEMS Solution in 2012 SMD

Quartz XTAL Solution

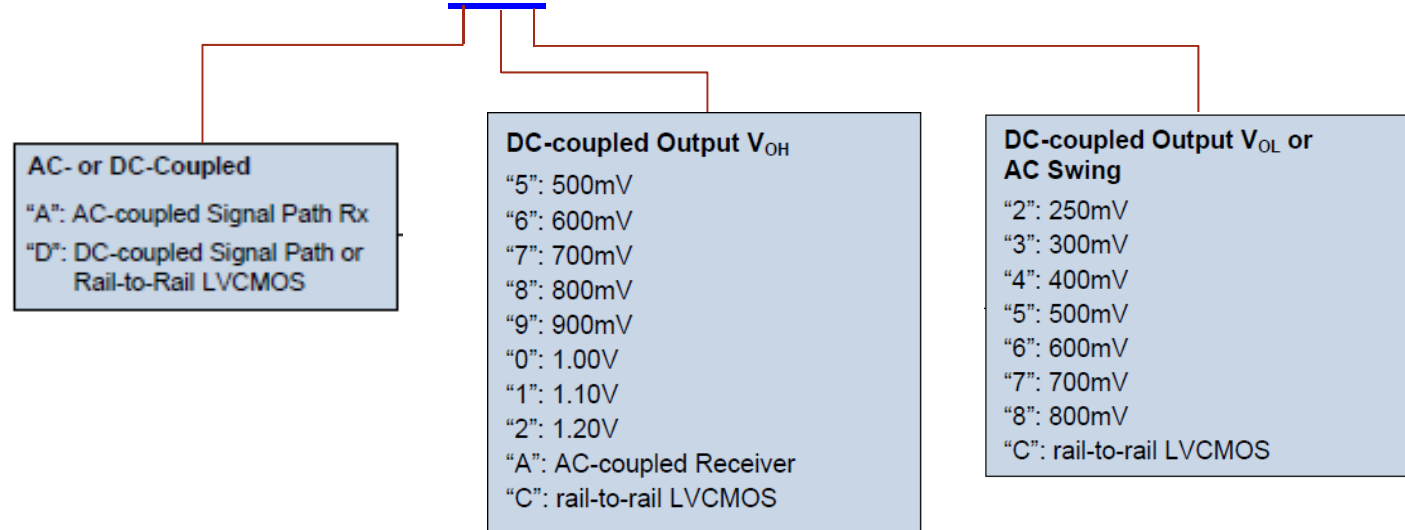


Identifying the Correct Output Configuration



Example 1: Chipset Vdd ≤ 1.8V, Oscillator Enabled or Disabled, Unknown Min/Max XIN Input Requirements

- Chipset/MCU Oscillator is Enabled or Disabled
- If the customer does not know the chipset/MCU min/max input voltage requirements.
- SiT153x voltage setting: DC-Coupled, V_{OH} : 1.1V, V_{OL} : 0.4V → 700mV
- Note: may overdrive XIN Osc. Then select “AA2” Setting (Ex. 2)
- Part Number: **SiT1533AI-H4-D14-32.768**

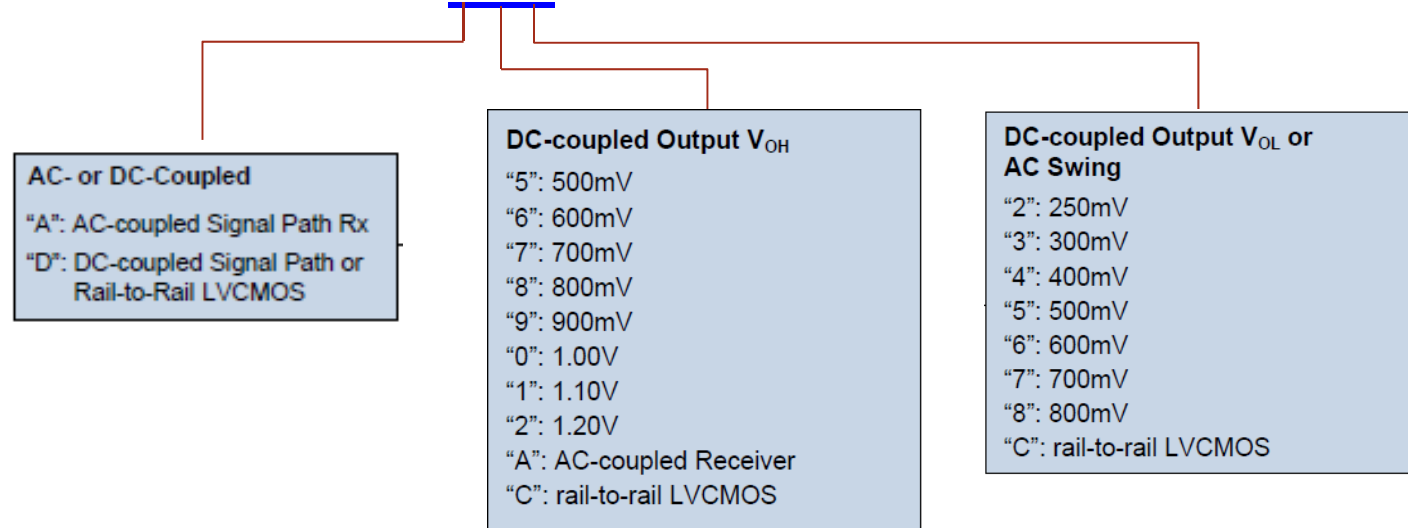


Identifying the Correct Output Configuration



Example 2: XTAL Compatible, Oscillator Enabled

- Chipset/MCU Oscillator is Enabled
- Chipset and SiT153x Vdd = Don't Care
- SiT153x output voltage setting: AC-Coupled, 250mV Swing
- Part Number: **SiT1533AI-H4-AA2-32.768**

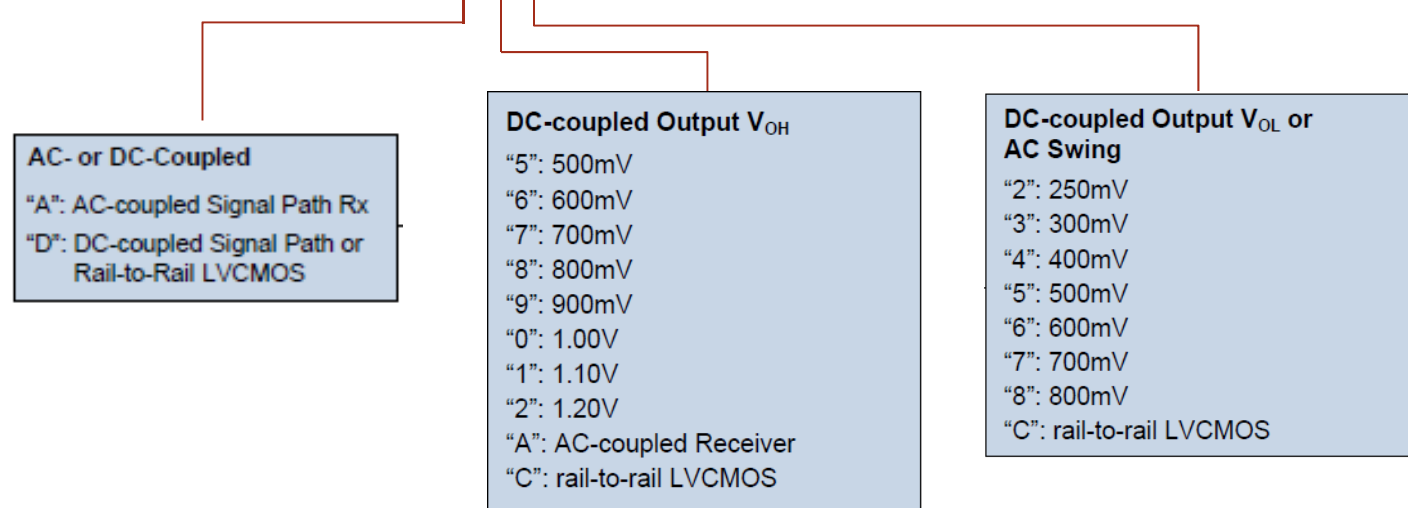


Identifying the Correct Output Configuration



Example 3: Chipset Vdd > 1.8V, Oscillator Disabled (power saving)

- Chipset/MCU Oscillator is Disabled
- Any application with chipset Vdd > 1.8V
- SiT153x Voh must be able to reach chipset/MCU Vih requirements
- SiT153x output voltage setting: LVCMOS
- Part Number: **SiT1533AI-H4-DCC-32.768**



NanoDrive™ Benefit—Ultra Low Power



Total Supply Current (no load) = I_{dd} Core + I_{dd} Output Driver

Example 1: Full-swing LVCMOS

- $V_{dd} = 1.8V$
 - I_{dd} Core = 800nA (typ)
 - $V_{out_p} = 1.8V$
 - I_{dd} Output Driver = $(C_{out})(V_{out})(F_{out}) = (3.5pF)(1.8V)(32768Hz) = 206nA$
- No Load Current = 800nA + 206nA = **1006nA**

Example 2: NanoDrive™ Reduced Swing

- $V_{dd} = 1.8V$
 - I_{dd} Core = 800nA (typ)
 - $V_{out}(\text{Programmable}) = 250mV$
 - I_{dd} Output Driver = $(C_{out})(V_{out})(F_{out}) = (3.5pF)(0.25V)(32768Hz) = 29nA$
- No Load Current = 800nA + 29nA = **829nA**

20% Lower Power with NanoDrive

NanoDrive™ Benefit—Ultra Low Power



Total Current = Idd Core + Idd Output Drive + Load Current

Common Conditions: Vdd = 1.8 V, Load Cap = 10 pF

Example 1: Full-swing LVCMOS

- Idd Core = 800nA
 - Idd Output Driver = (Cout)(Vout)(Fout) = (3.5pF)(1.8V)(32768Hz) = 206nA
 - Load Current: (C_{Load})(Vout)(Fout) = (10pF)(1.8V)(32768Hz) = 590nA
- Total Current with Load = 2.643μA

Example 2: NanoDrive™ Reduced Swing

- Idd Core = 800nA
 - Vout (Programmable): 250mV
 - Idd Output Driver = (Cout)(Vout)(Fout) = (3.5pF)(0.25V)(32768Hz) = 29nA
 - Load Current: (C_{Load})(Vout)(Fout) = (10pF)(0.25V)(32768Hz) = 82nA
- Total Current with Load = 911nA

65% Lower Power with NanoDrive

Summary: SiT15xx Offers Unique Benefits

- First oscillator to target crystal replacement
 - 2.0 x 1.2mm (2012) SMD Package
- Unique power saving features enable XTAL replacement
 - NanoDrive™ output reduces swing to minimize power & eliminate load caps
 - Integrated supply filter eliminates bypass capacitors
- Focus on applications that need the smallest footprint
 - Do not target large 32 kHz Can or molded SMD XTALs
 - Push 3.2mm x 1.5mm (3215) XTAL customers over to SiTime's 2012 package

Contact Information



- **For Questions, contact SiTime Technical Support**
Technicalsupport@sitime.com
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