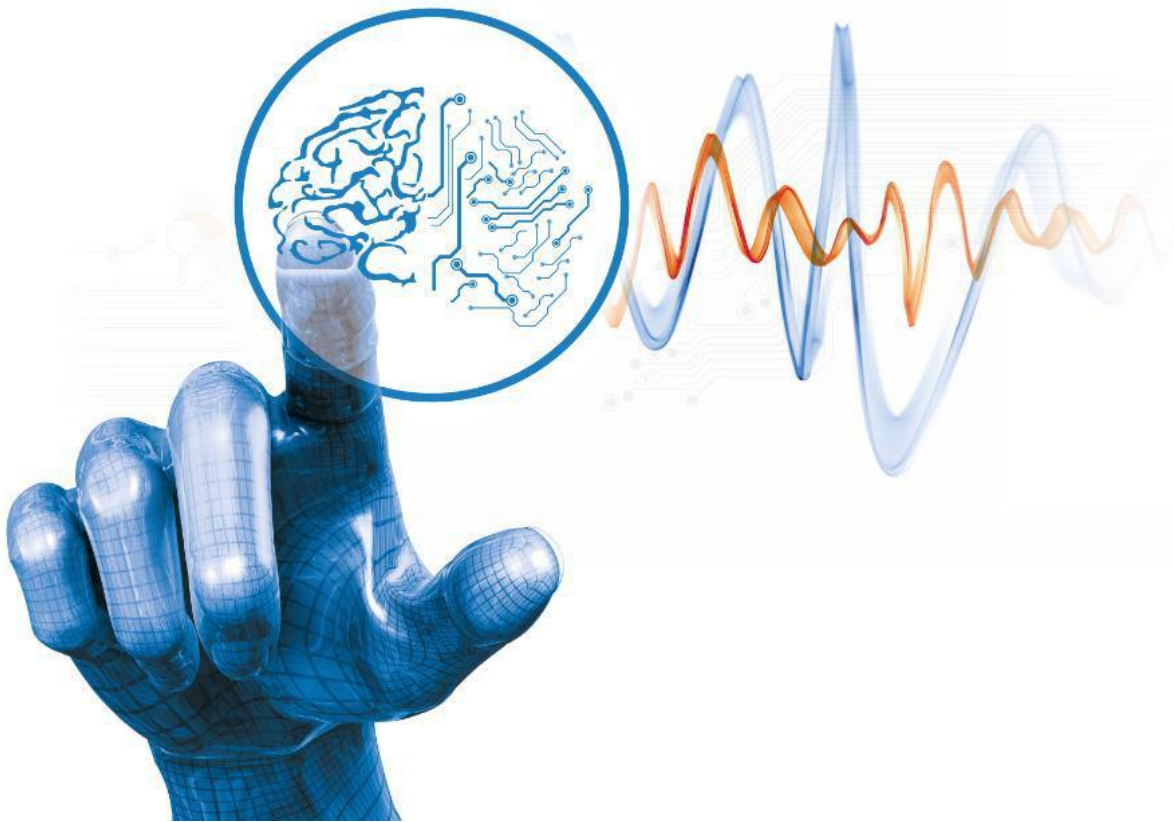


# CONNECTING YOUR INTELLIGENCE to the **ANALOG WORLD**

Mixed Signal IP for Sensing & Communicating



**Mixed Signal IP Design Guide from S3semi**

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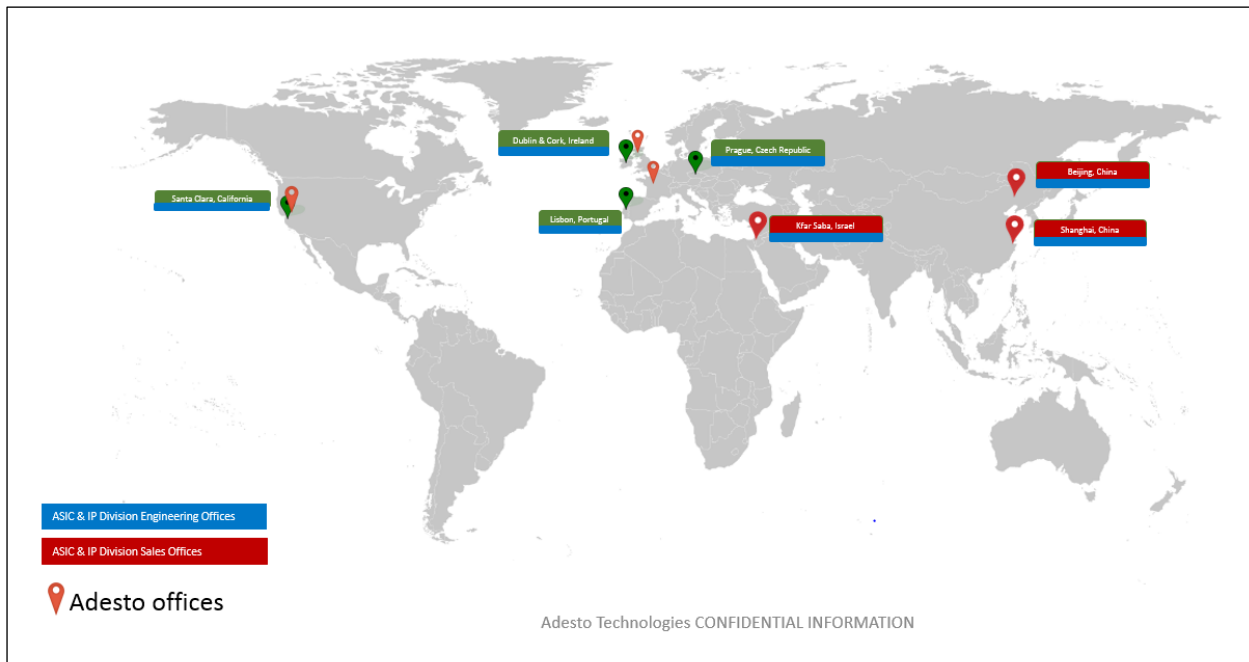
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## Company Overview

S3semi delivers IP and tailored silicon solutions to semiconductor vendors, OEMs and service operators. We are the #1 ranked Mixed-Signal IP provider.

We have over 30 year's successful track record in semiconductor design, and develop and license high-performance mixed-signal IPs targeting SoC, ASSP and ASIC products manufactured in the world's leading foundries (TSMC, GF, SMIC, UMC, etc.), and provides our global customers with leading, advanced low-power Mixed Signal, Digital and Systems Level design services, best-in-class SoC solutions and single chip RF SoC solutions.

We leverage this to deliver low risk solutions, with a faster time to market. We deliver ASIC solutions that sense, control and connect their environment. Our core expertise is our experienced people who deliver project and supply chain management, Analog-Mixed Signal and RF design, leading Data Converter Intellectual Property and the ability to architect compelling economic and technical solutions for our customers.



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\* Latest IP \*

## ADCs

Bits	Speed MS/s	Vdd (V)	Process Node	Short Description	IP Reference
*16*	1	1.1/1.8	40nm	16-Bit 1MS/s Ultra low SAR ADC	S3ADS1M16BT40LP
*16*	122S/s	1.2	65nm	16-Bit 122S/s Ultra low power Sigma-Delta ADC	S3AD01M16BGF65LPE
*14*	200	1.1	40nm	16-Bit 1.4MHz Bandwidth CTSD ADC	S3ADSD3M14BT40LP
14	80	1.1/1.8	40nm	1-to-80MS/s Multi-Mode Wireless Sigma-Delta ADC	S3ADIQ14BSDT40LPA
14	50	1.8	180nm	14-Bit 50MS/s ADC	S3AD50M14BC18
14	25	1.8	180nm	14-Bit 25MS/s ADC	S3AD25M14BC18
14	20	1.8	180nm	14-bit 20MS/s Dual ADC	S3ADIQ19M14BC18B
14	19	1.8/3.3	180nm	14-Bit 19MS/s Dual ADC	S3ADIQ19M14BC18C
14	15	1.8/3.3	180nm	14-Bit 15MS/s Dual ADC	S3ADIQ15M14BC18HV
14	10	1.8	180nm	14-Bit 10MS/s ADC	S3AD10M14BLP18
14	9	1.8/3.3	180nm	14-Bit 9MS/s ADC	S3AD9M14BC18
14	5	0.9	180nm	14-Bit 10kHz BW ADC	S3AD5M14BC18
*14*	2	1.8	40nm	14-Bit 2MS/s Ultra-efficient SAR ADC for IoT & Sensing	S3ADS2M14BT40LP
*14*	1.2	0.9	40nm	14-Bit 1.2MS/s Ultra-efficient SAR ADC for IoT & Sensing in ULP process	S3ADS1M14BT40ULP
13	80	1.2	90nm	13-Bit 80MS/s ADC	S3AD80M13BC90
13	80	1.2	90nm	13-Bit 80MS/s ADC Rad. Hardened	S3AD80M13BC90S
13	40	1.2	90nm	13-Bit 40MS/s ADC	S3AD40M13BC90
13	40	1.2	90nm	13-Bit 40MS/s ADC Rad. Hardened	S3AD40M13BC90S
*12*	420	1.1/3.3	40nm	12-bit 420MS/s Ultra-efficient SAR ADC	S3ADS424M12BT40LP
*12*	320	1.1/2.5	40nm	12-bit 320MS/s Ultra-efficient SAR ADC	S3ADS320M12BSM40LL
*12*	320	1.05/1.8	28nm	12-bit 320MS/s Ultra-efficient SAR ADC	S3ADS320MD12BSM28PS
12	250	1.2/2.5	65nm	12-bit 250MS/s ADC	S3AD250M12BIT65LPX
12	212	1.2/2.5	65nm	12-bit 212MS/s ADC	S3AD212M12BIT65LPI
12	160	1.05/1.8	28nm	12-bit 160MS/s Ultra-efficient SAR ADC	S3ADS160MD12BSM28PS
12	160	1.1/2.5	40nm	12-bit 160MS/s Ultra-efficient SAR ADC	S3ADS160M12BSM40LLB
12	160	1.1/2.5	40nm	12-bit 160MS/s Ultra-efficient SAR ADC	S3ADS160M12BT40LP
12	150	1.2/3.3	55nm	12-bit 150MS/s ADC	S3AD150M12BIC55LPA
12	150	1.2/3.3	65nm	12-bit 150MS/s ADC	S3AD150M12BICH65LPEA
12	122	1.1/2.5	40nm	12-bit 15-to-122MS/s Ultra-efficient SAR ADC	S3ADS122MD12BT40LPB
12	122	1.1/2.5	40nm	12-bit 15-to-122MS/s Ultra-efficient SAR ADC	S3ADS122M12BSM40LL

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*12*	122	1/1.8	28nm	12-bit 122MS/s Octa-core Ultra-efficient SAR ADC	S3ADS4IQ122M12BGF28SLP
12	120	1.2	130nm	12-Bit 80-to-120MS/s ADC	S3AD120M12BC13
12	106	1.2/2.5	65nm	12-bit 106MS/s Dual ADC	S3AD2106M12BIT65LPI
12	80	1.1/2.5	40nm	12-bit 80MS/s Dual Ultra-efficient SAR ADC	S3ADSIQ80M12BSM40LL
12	80	1.2	130nm	12-Bit 10-to-80MS/s ADC	S3AD80M12BC13
12	80	1.2	130nm	12-Bit 10-to-80MS/s Dual ADC	S3ADIQ80M12BC13
12	80	1.2	130nm	12-bit 80MS/s ADC	S3AD80M12BT13I
12	75	1.2/3.3	65nm	12-bit 75MS/s ADC	S3AD75M12BICH65LPEA
12	65	1.2	55nm	12-Bit 65MS/s Single, 32.5MS/s Dual ADC with Programmable Range	S3AD65MD12BT55
12	64	1.2	65nm	12-Bit 64MS/s Single, 32MS/s Dual ADC	S3AD64MD12BT65D
12	61	1.1/2.5	40nm	12-bit 15-to-61MS/s Dual Ultra-efficient SAR ADC	S3ADSIQ61M12BSM40LL
12	54	0.9/2.0	40nm	12-bit 54MS/s Pipeline ADC	S3AD54M12BT40G
12	54	1.2	65nm	12-bit 54MS/s Single, 27MS/s Dual ADC	S3AD54MD12BT65D
*12*	20	1.8	180nm	12-Bit 20MS/s Ultra-efficient SAR ADC for IoT/Sensing	S3ADS20M12BT180
12	2	1.8	180nm	12-bit 2MS/s Dual ADC with Temperature Sensor	S3ADTS2M12BC18
12	1.7	1.8	180nm	12-bit 2MS/s Dual ADC	S3AD2M12BC18
12	1.7	1.8	180nm	12-bit 2MS/s Dual ADC	S3AD2M12BCF18
12	1	1.8/3.3	180nm	12-bit 1MS/s ADC with 8 Inputs	S3AD1M12B8IGF18
12	1	1.8/3.3	180nm	12-bit 1MS/s ADC with 4 Inputs and T-Sensor	S3AD1M12BC18
12	1	1.8/3.3	180nm	12-bit 1MS/s ADC with 4 Inputs and T-Sensor	S3AD1M12B4IT18B
11	180	1.2	65nm	11-Bit 10Mhz Bw ADC	S3ADIQ180MSD11BT65
11	160	1.2	130nm	11-Bit Multi-Mode ADC	S3ADIQ160MSDC13
11	120	1.2	65nm	11-Bit 4Mhz Bw Sigma-Delta ADC	S3ADIQ120M11BSM65LPA
11	120	1.2	90nm	11-Bit 120MS/s Dual ADC	S3AD120M11BC90LP
11	120	1.2	90nm	11-Bit 120MS/s Dual ADC	S3ADIQ120M11BSM90LP
10	180	1.0/2.5	65nm	10-bit 80-to-180MS/s ADC	S3AD180M10BT65GP
10	180	1.0/2.5	65nm	10-bit 80-to-180MS/s IQ ADC	S3ADIQ180M10BT65GP
10	160	1.2	65nm	10-Bit 80-to-160MS/s ADC	S3AD160M10BT65B
10	160	1.2	65nm	10-Bit 40-to-160MS/s IQ ADC	S3ADIQ160M10BT65B
10	160	1.2	130nm	10-Bit 160MS/s Dual ADC	S3ADIQ160M10BC13
10	160	1.2	130nm	10-Bit 160MS/s ADC	S3AD160M10BC13
10	125	1.2	65nm	10-Bit 125MS/s IQ ADC	S3ADIQ125M10BSM65LPA
10	120	1.2	130nm	10-Bit 80-to-120MS/s ADC	S3AD120M10BC13
10	100	1.2	90nm	10-Bit 100MS/s ADC	S3AD100M10BT90GB
10	100	1.2	90nm	10-Bit 100MS/s Dual ADC	S3ADIQ100M10BT90GA
10	100	1.8	180nm	10-Bit 100MS/s ADC	S3AD100M10BC18

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10	80	1.3	65nm	10-Bit 80MS/s Dual ADC	S3ADIQ80M10BT65A
10	80	1.3	65nm	10-Bit 80MS/s ADC	S3AD80M10BT65A
10	80	1.2	65nm	10-Bit 40-to-80MS/s ADC	S3AD80M10BT65E
10	80	1.2	65nm	10-Bit 40-to-80MS/s Dual ADC	S3ADIQ80M10BT65E
10	80	1.2	90nm	10-Bit 80MS/s ADC	S3AD80M10BC90
10	80	1.2	90nm	10-Bit 80MS/s Dual ADC	S3ADIQ80M10BC90
10	80	1.2	90nm	10-Bit 8-to-80MS/s ADC	S3AD88M10BC90
10	80	1.2	90nm	10-Bit 8-to-80MS/s Dual ADC	S3ADIQ88M10BC90
10	80	1.2	130nm	10-Bit 20-to-80MS/s ADC	S3AD80M10BC13B
10	80	1.2	130nm	10-Bit 20-to-80MS/s Dual ADC	S3ADIQ80M10BC13
10	80	1.2	130nm	10-Bit 80MS/s ADC	S3AD80M10BC13
10	80	1.8	180nm	10-Bit 80MS/s ADC	S3AD80M10BC18
10	75	1.05	65nm	10-Bit 75MS/s ADC	S3AD75M10BCH65G
10	71	1.0/2.5	55nm	10-Bit 28-to-71MS/s ADC	S3AD71M10BT55GP
10	60	1.2	65nm	10-bit 60MS/s Single, 30MS/s Dual ADC with PG	S3AD60MD10BT65D
10	60	1.2/3.3	65nm	10-bit 60MS/s Single, 30MS/s Dual ADC	S3AD60MD10BCH65LPE
10	60	1.2/3.3	90nm	10-bit 6-to-60MS/s Dual Input ADC with 12 Inputs	S3AD65M10BD12C90
10	60	1.8	180nm	10-Bit 60MS/s ADC	S3AD60M10BC18M
10	57	1.0/2.5	65nm	10-Bit 28-57MS/s ADC	S3AD57M10BT65GP
10	48	1.8	180nm	10-Bit 48MS/s ADC	S3AD48M10BC18
10	45	1.2	65nm	10-bit 45MS/s Dual ADC	S3ADIQ45M10BT65D
10	40	1.2	65nm	10-bit 40MS/s Dual Input ADC	S3AD40MD10BT65D
10	40	1.2	90nm	10-Bit 40MS/s Dual ADC	S3ADIQ40M10BC90
10	40	1.8	180nm	10-Bit 40MS/s ADC	S3AD40M10BC18
10	32	1.2	130nm	10-Bit 4-to-32MS/s ADC	S3AD32M10BC13PG
10	32	1.2	130nm	10-Bit 4-to-32MS/s Dual ADC	S3ADIQ32M10BC13
10	30	1.2	90nm	10-Bit 30MS/s Dual ADC	S3ADIQ30M10BC90
10	30	1.8	180nm	10-Bit 30MS/s ADC	S3AD30M10BC18M
10	20	1.2	90nm	10-Bit 1-to-20MS/s ADC	S3AD12M10BC90
*10*	10	1.2	40nm	10-Bit 10MS/s SAR ADC	S3ADS10M10BC40LP
10	10	1.2	40nm	Companion PGA for S3ADS10M10BC40LP	S3PGAC40LP
10	10	1.2	65nm	10-bit 10MS/s Single, 5MS/s Dual ADC	S3AD10MD10BT65D
10	8	1.2/2.5	65nm	10-bit 8MS/s ADC with 16:1 Input MUX	S3AD8M10BT65LPH
10	8	1.2	65nm	10-Bit 4-to-8MS/s ADC	S3AD08M10BT65EB
10	8	1.2	65nm	10-Bit 4-to-8MS/s IQ ADC	S3ADIQ08M10BT65EB
10	6	1.2/3.3	90nm	10-bit 6MS/s ADC with 5 Inputs	S3AD6M10BD5C90

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10	5	1.8	180nm	10-Bit 5MS/s ADC	S3AD5M10BC18
10	4	1.2	130nm	10-bit 4MS/s SAR ADC	S3ADS4M10BT130
10	3.4	1.8	180nm	10-bit 4MS/s Dual ADC	S3AD4M10BC18
10	1	1.2/3.3	65nm	10-bit 1MS/s SAR ADC with 12:1 Input	S3ADS1M10BT65LP
10	0.5	1.8/3.3	180nm	10-bit 0.5MS/s Triple-Input ADC with T-Sensor	S3AD05M10BC18
10	0.5	1.8/3.3	180nm	10-bit 0.5MS/s Quad-Input ADC with T-Sensor and RF Pw Detector	S3ADTSPD05M10BC18
9	15	1.2	65nm	9-Bit 0.5 MHz BW Sigma-Delta ADC	S3AD15M9BSM65LPA
9	15	1.2	90nm	8-Bit 15MS/s ADC	S3AD15M8BSM90LP
8	135	1.2/3.3	65nm	8-bit 135MS/s Dual ADC	S3ADIQ135M8BCH65LPE
8	125	1.2	65nm	8-Bit 125MS/s Dual ADC	S3ADIQ125M8BT65D
8	100	1.8	180nm	8-Bit 100MS/s ADC	S3AD100M8BC18
8	27	1.2	65nm	8-Bit 27MS/s ADC	S3AD27M8BT65D
8	20	1.3	65nm	8-Bit 20MS/s ADC	S3AD20M8BT65A
8	20	1.2	90nm	8-Bit 20MS/s ADC	S3AD20M8BC90
8	15	1.2	90nm	8-Bit 15MS/s ADC	S3AD15M8BC90LP
8	1	1.2	90nm	8-Bit 1MS/s ADC	S3AD1M8BC90B
8	0.032	1.2	65nm	8-Bit Triple Input ADC with Temperature Sensor	S3ADTS8BT65D

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**Temperature Sensors**

Bits	Speed MS/s	Vdd (V)	Process Node	Short Description	IP Reference
*12*	2	1.8	180nm	12-bit 2MS/s Dual ADC with Temperature Sensor	S3ADTS2M12BC18
*12*	1	1.2	65nm	12-bit Digital Temperature Sensor	S3ADTS1M12BGF65
*12*	1	1.8/3.3	180nm	12-bit 1MS/s ADC with 4 Inputs and T-Sensor	S3AD1M12B4IT18
10	0.5	3.3/1.8	180nm	10-bit 0.5MS/s Triple-Input ADC with Temperature Sensor	S3AD05M10BC18
8	0.032	1.2	65nm	8-Bit Triple Input ADC with Temperature Sensor	S3ADTS8BT65D
8	0.004	1.8	180nm	8-Bit Temperature Sensor	S3TS08M32C18
-	-	1.8	180nm	Temperature Sensor	S3TSC2GF18





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**\*Latest IP\***

### DACs

Bits	Speed MS/s	Vdd (V)	Process Node	Short Description	IP Reference
*14*	800	1.8/1.0	65nm	14-Bit 800MS/s Wide-Band Current Steering DAC	S3DA800M14BT65G
*14*	300	2.5/1.2	65nm	14-Bit 300MS/s Wide-Band Current Steering DAC	S3DA300M14BT65
*12*	1250	1.0/2.5	28nm	12-Bit 1.25GS/s Wide-Band Current Steering DAC	S3DA1G12BGF28SLP
12	450	1.2/2.5	65nm	12-Bit 450MS/s Direct Digital Synthesis DAC	S3DADDS450M12BT65LPH
*12*	420	1.1/3.3	40nm	12-Bit 420MS/s DAC	S3DA424M12BT40LP
12	400	1.8/3.3	180nm	12-Bit 400MS/s DAC	S3DA400M12BC18
*12*	325	3.3/1.2	55nm	12-Bit 325MS/s Current Steering Wide-band DAC	S3DA325M12BSM55LLA
*12*	320	1.8/1.0	28nm	12-Bit 320MS/s Dual Current Steering Wide-band DAC	S3DAIQ320M12BSS28LPP
12	300	1.2/3.3	55nm	12-Bit 300MS/s DAC	S3DA300M12BC55LPA
12	300	1.2/2.5	65nm	12-Bit 300MS/s DAC	S3DA300M12BT65D
12	300	1.2/3.3	65nm	12-Bit 300MS/s DAC	S3DA300M12BCH65LPEA
12	300	1.0/3.3	90nm	12-Bit 300MS/s DAC	S3DA300M12B90G3B
12	300	1.8/3.3	180nm	12-Bit 300MS/s DAC	S3DA300M12BC18
*12*	260	1.1/2.5	40nm	12-Bit 260MS/s DAC	S3DAIQ260M12BSM40LL
*12*	250	1/1.8	28nm	12-Bit 250MS/s IQ DAC	S3DAIQ250M12BSM28PS
12	250	1.1/2.5	40nm	12-Bit 250MS/s DAC	S3DA250M12BT40
12	231	1.2/2.5	65nm	12-Bit 231MS/s DAC	S3DA231M12BT65D
12	212	1.2/2.5	65nm	12-Bit 212MS/s Dual DAC	S3DAIQ212M12BT65LPH
12	200	1.0/3.3	65nm	12-Bit 200MS/s DAC	S3DA200M12BCH65G
12	160	1.2/2.5	65nm	12-Bit 160MS/s Dual DAC	S3DAIQ160M12BT65
12	125	1.2/2.5	65nm	12-Bit 125MS/s Dual DAC	S3DAIQ125M12BT65
12	125	1.2/2.5	65nm	12-Bit 125MS/s Dual DAC	S3DAIQ125M12BGF65LPE
12	80	1.1/2.5	40nm	12-Bit 80MS/s Dual DAC	S3DAIQ80M12BT40
12	80	1.2/2.5	65nm	12-Bit 80MS/s Dual DAC	S3DAIQ80M12BT65
12	80	1.2/2.5	90nm	12-Bit 80MS/s DAC	S3DA80M12BC90
12	80	1.2/3.3	90nm	12-Bit 80MS/s Dual DAC	S3DAIQ80M12BC90
12	62	1.1/2.5	40nm	12-Bit 62MS/s Dual DAC	S3DAIQ62M12BT40LPA
12	40	1.2/3.3	65nm	12-Bit 40MS/s DAC	S3DA40M12BT65LPA
12	20	1.8/3.3	180nm	12-bit 20MS/s Dual DAC	S3DAIQ20M12BC18
12	20	1.8/3.3	180nm	12-bit 20MS/s DAC	S3DA20M12BC18A
12	1	1.2/3.3	65nm	12-Bit 1MS/s DAC	S3DA1M12BT65LP
*12*	0.05	1/1.8	28nm	12-bit 0.05MS/s DAC	S3DA5M12BSM28PS

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11	5	1.1/2.5	40nm	11-Bit 5MS/s Voltage DAC	S3DA5M11BT40LPA
10	400	1.8/3.3	180nm	10-Bit 400MS/s DAC	S3DA400M10BC18
10	300	1.05/1.8	28nm	10-Bit 300MS/s Triple DAC	S3TD300M10BSM28PS
*10*	300	2.5	28nm	10-bit 300MS/s Current Steering DAC	S3DA300M10BT28
10	300	1.1/2.5	40nm	10-Bit 300MS/s DAC	S3DA300M10BT40LP
10	300	1.2/3.3	130nm	10-Bit 300MS/s DAC	S3DA300M10BC13
10	200	1.0/3.3	65nm	10-Bit 200MS/s DAC	S3DA200M10BCH65G
10	160	1.05/1.8	28nm	10-Bit 160MS/s DAC	S3DAIQ160M10BSM28PS
10	160	1.2/2.5	65nm	10-Bit 160MS/s Dual DAC	S3DAIQ160M10BT65
10	160	1.2	90nm	10-Bit 160MS/s DAC	S3DA160M10BC90
10	160	1.2	90nm	10-Bit 160MS/s Dual DAC	S3DAIQ160M10BC90
10	160	1.2	130nm	10-Bit 160MS/s DAC	S3DA160M10B1V2C13
10	160	1.2/3.3	130nm	10-Bit 160MS/s DAC	S3DA160M10BC13
10	160	1.2	130nm	10-Bit 160MS/s DAC	S3DA160M10BC13B
10	160	1.2	130nm	10-Bit 160MS/s Dual DAC	S3DAIQ160M10BC13B
10	160	1.8/3.3	180nm	10-Bit 160MS/s DAC	S3DA160M10BC18
10	80	1.2/3.3	130nm	10-Bit 80MS/s DAC	S3DA80M10BC13
10	2	1.2/3.3	90nm	10-Bit Voltage DAC	S3DA2M10BT90LPA
10	0.1	1.2/2.5	65nm	10-Bit 100kS/s Voltage DAC	S3DA100K10BT65LPH
10	0.1	3.3	180nm	10-Bit 100kS/s Voltage DAC	S3DA100K10BC18
10	0.1	1.8/3.3	180nm	10-bit 100kS/s DAC	S3DA100K10BC18A
10	0.1	3.3	180nm	10-Bit 100kS/s Voltage DAC	S3DA100K10BT18
8	250	1.8/3.3	180nm	8-Bit 250MS/s DAC	S3DA250M8BC18
8	10	1.2/3.3	90nm	8-bit 10MS/s 8-Channels DAC with Programmable Comparators	S3DACMPTD8C90
8	1	1.2/3.3	90nm	8-Bit 1MS/s DAC	S3DA1M8BC90

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**\*Latest IP\***

### DACs (Video Application)

Bits	Speed MS/s	Vdd (V)	Process Node	Short Description	IP Reference
12	300	1.2/3.3	55nm	12-Bit 300MS/s Video DAC	S3DA300M12BGF55LPA
12	300	1.0/2.5	55nm	12-Bit 300MS/s Triple DAC	S3TD300M12BT55GPA
12	300	1.0/2.5	65nm	12-Bit 300MS/s Triple DAC	S3TD300M12BT65GPA
12	160	1.0/2.5	65nm	12-Bit 160MS/s Triple DAC	S3TD160M12B65G
12	160	1.0/3.3	90nm	12-Bit 160MS/s Triple DAC	S3TD160M12B90G3
<b>*10*</b>	300	1.8/1.0	28nm	10-Bit 300MS/s Triple Current Steering DAC	S3TD300M10BSM28PS
10	300	1.1/2.5	40nm	10-Bit 300MS/s Triple DAC	S3TD300M10BGF40LP
10	300	1.2/3.3	55nm	10-Bit 300MS/s Quad DAC	S3QD300M10BT55LPA3
10	240	1.2/2.5	65nm	10-Bit 240MS/s Triple DAC	S3TD240M10BT65LPA
10	240	1.0/2.5	65nm	10-Bit 240MS/s Quad DAC	S3QD240M10BT65GPA
10	240	1.0/3.3	65nm	10-Bit 240MS/s Triple DAC	S3TD240M10BT65GP3A
10	240	1.0/2.5	65nm	10-Bit 240MS/s Triple DAC	S3TD240M10BT65GPA
10	200	0.9/1.8	40nm	10-Bit 200MS/s Triple DAC	S3TD200M10BT40G18A
10	162	1.0/3.3	55nm	10-Bit 162MS/s Triple DAC	S3TD162M10BT55GP3A

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### Analog Front-Ends (AFE)

Bits	Speed MS/s	Vdd (V)	Process Node	Short Description	IP Reference
14	1 to 80	1.1/2.5	40nm	Multi-Mode Wireless AFE for LTE	S3AFE80M14BT40LPA
12	212	1.2/2.5	65nm	AFE for Mobile Communications Base-Station Rx/Tx	S3HSAFET65LPH
12	160	1.8/0.9	28nm	802.11ac Analog Front-End	S3AFE802ACT28
12	160	2.5/1.1	40nm	802.11ac Analog Front-End	S3AFE802ACT40
12	150	1.2/3.3	65nm	AFE for Power Line Communications	S3AFE150M12BCH65LPEA
12	60	1.8/0.9	28nm	LTE-A Analog Front-End	S3AFELTET28
12	40	2.5/1.1	40nm	LTE-A Analog Front-End	S3AFELTET40
12	2	1.8V	180nm	AFE for Solar Panels	S3ADT2M12BC18
10	80	1.2	65nm	WLAN/WiMAX AFE	S3AFE80MT65LP
10	40	1.2/3.3	90nm	WLAN/WiMAX AFE	S3AFE40MT90LP
10	4 to 40	1.8/3.3	180nm	DVB AFE	S3AFE40MC18

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### LDOs

Features	Process Node	Short Description	IP Reference
400mA load, 1.5V in, 0.625-0.99V out 600mA load, 1.5V in, 0.98V-1.28V out	180nm	LDO Regulator	S3REGSS60015GF18
250mA load, 1.6-2.0V in, 1.2V out	65nm	LDO Regulator	S3REG25016T65LD
250mA load, 1.6-2V in, 1.2V out	65nm	LDO Regulator	S3REG25016T65L
200mA load, 2.5-3.6V in, 1.2V out	90nm	LDO Regulator	S3REG20025T90
200mA load, 2.6 to 3.6V Vin, 1.8V out	180nm	LDO Regulator	S3REG20033TC18M
150mA load, 1.45-2.5V in, 1.3V out	65nm	LDO Regulator	S3REGT65A
150mA load, 1.4-3.6V in, 1.1-3.0V out	65nm	LDO Regulator	S3REG15014T65L
150mA load, 1.8-3.6V in, 1.1-3.0V out	65nm	LDO Regulator	S3REG15018T65L
100mA load, 1.6-3.6V in, 1.2-3.0V out	55nm	LDO Regulator	S3REG10016T55LD
10mA load, 1.6-2.0V in, 1.2V out	65nm	LDO Regulator	S3REG1016T65LD
100mA load, 1.4-3.3V in, 1.1-3.0V out	65nm	LDO Regulator, Capless	S3REGC10014T65LD
100mA load, 1.6-3.6V in, 1.2-3.0V out	65nm	LDO Regulator	S3REG10016T65L
100mA load, 3.0 to 3.6V in, 1.8V out. >64dB PSRR	180nm	LDO Regulator	S3REG10030TC18A
100mA load, 2.7-5.5V in, 1.8V out	180nm	LDO Regulator	S3REG605GF18
80mA load, 3.15 to 5V Vin, 1.8V out	180nm	LDO Regulator	S3REG8051V8T18
80mA load, 3.15 to 5V Vin, 3.1V out	180nm	LDO Regulator	S3REG8053V0T18
80mA load, 1.4-3.6V in, 1.0-1.3V out	65nm	LDO Regulator	S3REG8014T65L
50mA load, 1.4-3.3V in, 1.1-3.0V out	65nm	LDO Regulator, Capless	S3REGC5014T65L
50mA load, 3.3V in, 1.8V out	180nm	LDO Regulator	S3REG5033TC18
20mA load, 3.0 to 3.6V in, 1.8V out	180nm	LDO Regulator	S3REG2030TC18
20mA load, 3.15 to 3.45V in. 2.5-2.7V out. >72dB PSRR	180nm	LDO Regulator	S3REG2031TC18A
20mA load, 3.15 to 5V Vin, 2.5V out	180nm	LDO Regulator	S3REG2052V5T18
10mA load, 1.6-2V in, 1.2V out	65nm	LDO Regulator	S3REG1016T65L
10mA load, 4-15V in, 3.3V out	180nm	LDO Regulator	S3REG104HVT18
3.3mA load, 1.6-3.6V in, 1.17-1.24V out	65nm	LDO Regulator, Capless	S3REG00316GF65LPE
1.3mA load, 1.6-3.6V in, 1.18-1.24V out	65nm	LDO Regulator, Capless	S3REG00116GF65LPE
1mA load, 1.5V in, 0.625 – 0.99V out	180nm	LDO Regulator	S3REG115GF18
15uA load, 2.5-3.6V in, 1.8V out	180nm	LDO Regulator	S3REGU155GF18

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### DC-DC Converters

Short Description	Features	Features	IP Reference
DC-DC Controller	Power Supply from 1.71V to 3.46V, 0.81 to 1.2V, 100mA to 3A load, Programmable Output Voltage, Adjustable switching frequency	28nm	S3DCC31XT28
DC-DC Controller	5V and 1.8V supplies, 0.68 - 3.6V out, 100mA to 8A load	180nm	S3DCC51XGF18
DC-DC Converter	Integrated compensation and adjustable switching frequency		
	100mA load, 2.7 to 5.5V in, 1.8V out	180nm	S3DC521TC18LP

### PMU: Miscellaneous

Short Description	Features	Process Node	IP Reference
Current-Sense Voltage Amplifier, Low Bandwidth	6.2mW	180nm	S3CSAIINT18M
Current-Sense Voltage Amplifier, High Bandwidth	6.5mW	180nm	S3CSAILT18M
Voltage Buffer	10mW	180nm	S3VBUFT18M
Dual Supply Voltage Detector	I/O 3.3V and Core Supply 1.2V	55nm	S3DVDT55LP3
Power Switch	1.0V, 1.8V and 3.3V Sense Supplies	28nm	S3PMGF28SLP
Power Switch	1.2V	65nm	S3PMSM65LPA
Power Switch	1.2V	90nm	S3PMT90LP
Power Switch for Voltage Islands	0.5Ohm, 20mA	90nm	S3PMSM90LP
32MHz RC Oscillator	1.8V, 32MHz output, 400uA	180nm	S3OSC30MGF18
Power On Reset / Oscillator	1.8V, 1.8-3.3V, 0.9-1.0V Sense Supplies	28nm	S3PORT28L
Power On Reset / Oscillator	1.2V	65nm	S3PORSM65LPA
Power On Reset / Oscillator	1.2V, 0.02mW	90nm	S3PORSM90LP
Power On Reset / Oscillator	1.2V, 0.02mW	90nm	S3PORC90LP
Power On Reset Circuit with RC-Oscillator Output / Oscillator	3.3V, 0.9mW	90nm	S3PORTC90
Power On Reset / Oscillator	3.3V and 1.8V Sense Supplies	180nm	S3PORT18
Power On Reset / Oscillator	3.3V and 1.8V Sense Supplies	180nm	S3PORTC18B
Power On Reset / Oscillator	3.3V, 3.3V and 1.8V Sense Supplies	180nm	S3PORTC18B
Power On Reset / Oscillator	130uA 3.3V & 1.8V Sense Supplies	180nm	S3PORTC18D
Power On Reset w/ Brown-Out Detection	Power: 0.3mW 3.3V, 1.8V & 1.2V Sense Supplies	180nm	S3PORTC18BI

### PMU Platform

Short Description	Features	Process Node	IP Reference
Customizable Power Management Platform	Contains DC-DC Converters, LDOs, POR, RTC, OSC, Aux ADC, T-Sensor etc.	180nm	S3PMPGF18

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### RF

Short Description	Features	Process Node	Vdd (V)	IP Reference
Multi-mode & multi-band RF receiver	3 LB & 4 HB LNA outputs, enables SAWless receivers, supports 3.7GHz to 4.2GHz LO input with divide by 2 & 4 quadrature	180nm	3V	S3RFRX01C18
5.8GHz ISM band direct up-conversion Gilbert cell mixer	Suitable for 802.11a/n & custom applications. Fully differential architecture with high IP2 and noise immunity. Integrated LO feed-through compensation DACs	180nm	3V	S3RFMXISM5G8T18
Class AB 5.8GHz ISM band Power Amplifier Driver	Suitable for 802.11a/n & custom applications. Single ended output with >12dBm P1dB. Low noise density and variable biasing for backed off operation	180nm	2.5V	S3RFDISM5G8T18
5.8GHz ISM band RF power detector	Suitable for TX power control feedback loops or RSSI. 20dB linear range with temperature and offset correction integrated. Ideal for use with S3 Semiconductors's low conversion rate algorithmic and SAR ADCs. Error <1dB. Suitable for 5.8GHz and 2.4GHz dual ISM band superheterodyne radio LO generation.	180nm	3V	S3RFDETISM5G8T18
4GHz Fractional N Synthesizer for RF Local Oscillator Applications.	Output frequency from 3 to 4 GHz (VCO can be tuned to other frequencies on request) Integrated LC VCO Phase Noise < -117dBc/Hz @ 1MHz Ultra low spurious < -80dBc 24 bit frequency resolution	180nm	1.8V/ 3.3V	S3RFLO4GC18
Class AB L Band Power Amplifier Driver	>12.5dBm P1dB, Low Noise Density, Variable Biasing for Backed off Operation	180nm	1.8	S3RFDALBT18
Gilbert Cell L Band Direct Up-Conversion Mixer	Fully Differential Architecture. High IP2 and Noise Immunity.	180nm	3.0	S3RFMXLBT18
Tuned Current Steering L-Band VGA	30dB gain range. <1dB Steps. Fully Differential Architecture. High IP2 and Noise Immunity	180nm	3.0	S3RFVGTAT18
Wide Band Passive Mixer	Fully Differential. High IP2 and Noise Immunity, Low Noise Density, Wide-band Operation 1-3GHz.	180nm	1.8	S3RFMXWT18
Saw-Less Multi-Mode Multi-band RF Receiver	Multimode: GSM/EDGE, WCDMA/HSPA,LTE Low Noise Figure < 3.5dB, IIP2 > +50dBm	180nm	1.8/3.0	S3RFRX01C18
10-bit 0.5MS/s Quad-Input ADC with T-Sensor and RF Power Detector	RF power to digital converter Range > 15dB, Error <1dB Power < 4mW, Area < 0.38mm <sup>2</sup>	180nm	1.8/3.3	S3ADTSPD05M10BC18
Single Ended Inductor Degenerated Common Source L Band LNA	Very Low Noise Figure <1.3dB High Linearity >-2dBm IIP3	180nm	1.8	S3LNALBSET18
Differential Noise Cancelling Tuned L Band LNA	Low Noise Figure <3dB, Three Programmable Gain Modes High Linearity >2dBm IP3	180nm	1.8	S3LNALBDFT18
Differential Wideband LNA Optimized for Low-Power and 200MHz Bandwidth	Voltage Gain = 20dB, NF < 3.6dB Zin = 200Ohm, Power < 5mW	180nm	1.8/3.3	S3WBLNA200MC18
Multi-Input 850MHz to 1GHz LNA & VGA	Multimode: GSM/EDGE, WCDMA/HSPA,LTE Low Noise Figure < 2.3dB IIP3 > -6dBm (max gain) 42dB RF Gain Control Range	180nm	1.8/3.0	S3LNA1GC18
1800MHz to 2200MHz 4-Input RF LNA and VGA	Multimode: GSM/EDGE, WCDMA/HSPA,LTE Low Noise Figure < 2.5dB IIP3 > -5dBm (max gain) 42dB RF Gain Control Range	180nm	1.8/3.0	S3LNA2GC18
Differential Wideband LNA Optimized for Low-Noise and 1GHz Bandwidth	Bandwidth: 50MHz to 1GHz Voltage Gain = 19dB NF < 2.5dB, Zin = 100Ohm, Power < 27mW	180nm	1.8/3.3	S3WBLNA1GC18



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Tuned LNA for 2.4-2.5GHz ISM Band Applications	NF < 2.1dB Gain range: -12dB to +18dB Gain steps: 15dB S11 < -10dB, IP1dB > -9dBm, IIP3 > +1dBm	180nm	1.8/3.	S3LNA2G4C18 3
1.7GHz Frac-N Synthesizer for RF Local Oscillator Applications	Output Frequency 1.6 to 1.8GHz VCO PN < -122dBc/Hz @ 1MHz offset PLL noise floor < -217dBc/Hz Ultra-low spurious < -70dBc 24-bit Frequency Resolution Power = 56mW, Area = 0.75mm <sup>2</sup>	180nm	1.8/3.	S3RFLO2GC18 3
Clock Squarer for Baseband Clock Recovery from RF	Input Frequency: 4-100MHz Duty cycle: <+/-5% Low power consumption: <0.25mA No external components Die area of 0.05mm <sup>2</sup>	90nm	1.2	S3CS100MC90LP

**Mixed Signal IP Design Guide from S3semi**

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**Algorithms for Optimal Communication**

S3 Semiconductors has a wide portfolio of algorithms developed to optimise the implementation of our IP in RX and TX line-ups. Examples of these include:

- DPD (digital pre-distortion) for PA linearization leading to optimal efficiency IQ Calibration
- Image Rejection Calibration
- Local-Oscillator Feedthrough Calibration

Contact us to discuss how we can provide a complete, optimised transceiver system for your RF communication needs.

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## Mixed Signal IP Design Guide from S3semi

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### Analog-Baseband

Short Description	Features	Process Node	Vdd (V)	IP Reference
Flexible Low IF RX/TX Baseband	Configurable Low-Pass or Poly-Phase Bandpass. Image Rejection Calibration Enables ~50dB Rejection	180nm	3.0	S3ABB04T18
Analog Baseband Macro for Low-IF Applications	Center Frequency: 600kHz (+/- 3%) 3dB Bandwidth: 115kHz (+/- 3%) Input Noise Voltage < 15nV/rt-Hz Gain Range: -6dB to 23dB Gain Step: 1dB	180nm	1.8/3.3	S3ABB03C18
HSPA/WCDMA Analog Base-Band Macro	7 <sup>th</sup> Order Filters with Equalization DC Off-Set Compensation Input Noise Voltage < 20nV/Hz Output Compression Point >1Vppdiff Group Delay Variation < 100ns	180nm	1.8/3.0	S3ABB01C18
GSM/EDGE Analog Base-Band Macro	5 <sup>th</sup> Order Filters with Integrated DC Off-Set Correction Input Noise Voltage < 30nV/Hz Output Compression Point >2Vppdiff	180nm	1.8/3.0	S3ABB02C18



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### PLLs

Features (MHz)	Process Node	Vdd (V)	Power (mW)	Area (mm <sup>2</sup> )	Short Description	IP Reference
Vco=600-1250, Out=5 to 600	40nm	1.1/2.5	11	0.28	Low Noise Programmable PLL	S3PLLT40LPA
Vco=600-1300, Out=4 to 600	40nm	1.1/2.5	9	0.18	Low Noise Programmable PLL	S3PLLT40LP
Vco=900-1000, Out=60-1000	55nm	1.2/3.3	12	0.24	Low Noise Programmable PLL	S3PLLC55LPA
Vco=600-1,200, Out=9.5 -1200	65nm	1.2	8	0.25	Low Noise Programmable PLL	S3PLLT65A
Vco=600-1200, Out=9.5 to 600	65nm	1.2	9	0.28	Low Noise Programmable PLL	S3PLLT65D
Vco=600-1200, Out=9.5-1200	65nm	1.2	8	0.25	Low Noise Programmable PLL	S3PLLT65F
Vco=600-1200, Out=9.5 to 600	65nm	1.2	7	0.28	Low Noise Programmable PLL	S3PLLT65LPH
Vco=600-1200, Out=9.5 to 600	65nm	1.2	10	0.3	Low Noise Fractional PLL	S3PLLFRACT65
Vco=900-1080, Out=243, 256, 270	65nm	1.2/3.3	13	0.24	Low Noise Programmable PLL	S3PLLCH65LPEB
Vco=900-1000, Out=60-1000	65nm	1.2/3.3	12	0.24	Low Noise Programmable PLL	S3PLLCH65LPEA
Vco=600-1200, Out=4.72 to 600	65nm	1.2	5.2	0.28	Low Noise Programmable PLL	S3PLLSM65LPA
Vco = 900-1,000, Out1=60 to 900, Out2=66.7 to 1000	65nm	1.0/3.3	12	0.2	Low Noise Programmable PLL	S3PLLCH65G
Vco=900-1000, Out=125-1000	65nm	1.2/3.3	12	0.2	Low Noise Programmable PLL	S3PLLCH65LPA
Vco=240-320, Out=1-80, 120-160	65nm	1.2	2	0.05	Low Noise Fractional PLL	S3PLLFDFGF65LPE
Vco=1,650-1,850 Long-term Jitter < 1ps-rms Out =1.6 to 1.8GHz or Lower Long-term Jitter < 0.5ps-rms	65nm	1.2/2.5	50	0.4	Ultra-Low Jitter PLL for High Performance ADC Applications	S3ULJPLLT65A
	65nm	1.2	55	0.5	Ultra-Low Jitter PLLw/ Integrated Loop Filter for High Performance ADC Applications	S3ULJPLLT65B
Vco=480-960, Out=3.75 to 960	90nm	1.2	3	0.2	Low Noise Programmable PLL	S3PLLSM90LP
Vco=750, Fout=250 to 375	90nm	1.2	6	0.22	Low Noise Programmable PLL	S3PLLT90GA
Vco=480-960, Out=3.75 to 960	90nm	1.2	3	0.2	Low Noise Programmable PLL	S3PLL250LN90LP
Vco=700-1200, Out=11.1 to 1200	90nm	1.2	4	0.2	Low Noise Programmable PLL	S3PLLPROGC90
Vco=300, Out=4.8 to 1,200	130nm	1.2	2.5	0.16	Low Noise Programmable PLL	S3PLLPROGC13
Vco=384, Out=48 to 192	180nm	1.8	4	0.087	Low Noise Programmable PLL	S3PLL48MC18
Vco=250-550, Out=30 to 550	180nm	1.8	4	0.1	Low Noise Programmable PLL	S3PLLPROGC18
VCO Frequency 1.6 to 1.8GHz Output Frequency 5 to 300MHz Long-term Jitter < 1.2ps-rms	180nm	1.8/3.3	56	0.75	Ultra-Low Jitter PLL for High Performance ADC Applications	S3ULJPLLC18
Vco=480, Out=48	180nm	1.8	8.8	0.42	Low Noise Programmable PLL	S348MPLLC18

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## Standard IP Deliverables

### Datasheet

- Characterization
- Report Flat Netlist (cdl)
- Layout View (gds2)
- Abstract View (lef)
- Timing View (.lib)
- Behavioral Model (VHDL/Verilog)
- Integration Support

## Mixed Signal Design at S3semi

S3semi has been delivering mixed signal design solutions for more than 25 years. We have a proven track record in the efficient delivery of complex mixed signal designs. Our success is based on multiple design disciplines in areas such as RF, Analog, DSP and Digital Design combined with in-depth application knowledge and project management expertise.

Our mixed signal design capability includes several important elements:

### A library of customizable IP components

- Extensive experience of Deep Sub Micron mixed-signal design and IP integration
- Focused experts in key circuit technologies
- Standardized design methodologies
- Systems design knowledge

### Silicon evaluation capability

- Project management expertise
- ISO 9001 Quality certification

## About S3semi

S3semi, a wholly owned division of Adesto Technologies delivers IP and tailored silicon solutions to semiconductor vendors, OEMs and service operators. We are the longest serving silicon solutions provider in the industry. We provide a comprehensive portfolio of RF and mixed-signal IP, in addition to design services. The IP portfolio includes high performance data converters, AFEs, power management and PLL's, silicon proven in all foundries with nodes ranging from 180nm to 28nm. Markets served include Consumer Electronics, Communications Infrastructure, Satellite Communications, Automotive and IoT. We are headquartered in Dublin, Ireland, with development centres in Ireland, Poland, the Czech Republic and Portugal along with sales offices worldwide.

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