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Contents

Glossary

Symbol	Description	Unit
A	the amplitude of a sinusoidal in-phase and quadrature component in a complex signal	
A_{i}	half of the amplitude of a sinusoidal image signal	
A_{if}	half of the amplitude of a sinusoidal image signal after RF filtering	
A_{id}	half of the amplitude of a sinusoidal down-converted image signal	
A_{id}	the amplitude of a sinusoidal in-phase and quadrature component in a complex down-converted image signal	
A_{idf}	the amplitude of a sinusoidal in-phase and quadrature component in a complex down-converted image signal after IF filtering	
A_{ip}	the amplitude of a sinusoidal parasitic in-phase and quadrature component in a complex down-converted image signal	
A_{ipf}	the amplitude of a sinusoidal parasitic in-phase and quadrature component in a complex down-converted image signal after IF filtering	
$A_{\mathrm{i}-}$	magnitude of the component in the spectrum of an image signal located at frequency $-\omega_{\mathrm{i}}$	
$A_{\mathrm{i}+}$	magnitude of the component in the spectrum of an image signal located at frequency ω_{i}	
$A_{\mathrm{if}-}$	magnitude of the component in the spectrum of a complex image signal after RF filtering located at frequency $-\omega_{\mathrm{i}}$	
$A_{\mathrm{if}+}$	magnitude of the component in the spectrum of a complex image signal after RF filtering located at frequency ω_{i}	
A_{IM3}	magnitude of the third-order intermodulation products	
A_{lo}	half of the amplitude of a sinusoidal local oscillator signal	
A_{lo}	the amplitude of a sinusoidal in-phase and quadrature component in a complex local oscillator signal	
A_{lop}	the amplitude of a parasitic sinusoidal in-phase and quadrature component in a complex local oscillator signal	

A_{w}	half of the amplitude of a sinusoidal wanted signal	
A_{wd}	half of the amplitude of a sinusoidal down-converted wanted signal	
A_{wd}	the amplitude of a sinusoidal in-phase and quadrature component in a complex down-converted wanted signal	
A_{wdf}	the amplitude of a sinusoidal in-phase and quadrature component in a complex down-converted wanted signal after IF filtering	
A_{wf}	half of the amplitude of a sinusoidal wanted signal after RF filtering	
A_{wp}	the amplitude of a sinusoidal parasitic in-phase and quadrature component in a complex down-converted wanted signal	
A_{wpf}	the amplitude of a sinusoidal parasitic in-phase and quadrature component in a complex down-converted wanted signal after IF filtering	
$A_{\mathrm{w}-}$	magnitude of the component in the spectrum of a wanted signal located at frequency $-\omega_{\mathrm{w}}$	
$A_{\mathrm{w}+}$	magnitude of the component in the spectrum of a wanted signal located at frequency ω_{w}	
$A_{\mathrm{wf}-}$	magnitude of the component in the spectrum of a complex wanted signal after RF filtering located at frequency $-\omega_{\mathrm{w}}$	
$A_{\mathrm{wf}+}$	magnitude of the component in the spectrum of a complex wanted signal after RF filtering located at frequency ω_{w}	
B	bandwidth	Hz
C	capacitance	F
C_{gs}	gate-source capacitance	F
C_{ox}	oxide capacitance per unit area	F
g_{m}	MOST transconductance	A/V
g_{mbs}	transconductance from the bulk of a switching MOST	A/V
g_{mn}	NMOST transconductance	A/V
g_{mp}	PMOST transconductance	A/V
g_{ms}	transconductance of a switching MOST	A/V
$\mathrm{DR}_{\mathrm{fe}}$	front-end dynamic range	dB
$\mathrm{DR}_{\mathrm{adc}}$	ADC dynamic range	dB
f_{bt}	Bluetooth operating frequency	Hz
f_{dect}	DECT operating frequency	Hz
f_{r}	resonance frequency	Hz
f_{sig}	carrier frequency	Hz
f_{sam}	sampling frequency	Hz
F	noise factor	
G	voltage gain	dB
H	open-circuit transfer function related to branch k in N-phase filter	
H_{c}	complex transfer function	
H_{cn}	part of a complex transfer function corresponding to negative frequencies	
H_{cp}	part of a complex transfer function corresponding to positive frequencies	
H_{i}	imaginary part of a complex transfer function	
H_{n}	open-circuit transfer function related to branch k in N-phase filter for a negative input polyphase sequence	
H_{p}	open-circuit transfer function related to branch k in N-phase filter for a positive input polyphase sequence	

H_r	real part of a complex transfer function	
in	AC current through NMOST	A
ip	AC current through PMOST	A
IIP3	input third intercept point	dBm
$\overline{I_{in}^2}$	mean square current of an equivalent input current noise source	A^2/Hz
$I_{in,k}$	input current in branch k in N-phase filter	
A I_{intr}	interferer level	dB
I_n	drain current of a NMOST	A
$I_{OUT,k}$	output current in branch k in N-phase filter	
A I_p	drain current of a PMOST	A
I_p	current through a load resistor	A
I_s	drain current of a switching MOST	A
IRR	image rejection ratio	dB
IRR_{cf}	image rejection that has to be provided by IF complex filter	dB
IRR_{LO}	image rejection ratio achieved in LO path	dB
IRR_{max}	maximal image rejection ratio	dB
IRR_{RCPF}	image rejection ratio provided by RC polyphase filter	dB
IRR_{RF}	image rejection ratio achieved in RF path	dB
I_{tail}	tail current of a differential pair	A
IRR_{tot}	total image rejection ratio	dB
L	Inductance	H
L	MOST channel length	m
NF	noise figure	dB
n	ratio of inductances	
n_b	number of bits	
Q	quality factor of a bad-pass filter	
Q_L	quality factor of inductor	
P	power	dBm
P_{in}	input power	dBm
$P_{max,int}$	level of the strongest out-of band interferer	dBm
P_{nf}	level of noise floor	dBm
P_{out}	output power	dBm
P_{qn}	level of ADC quantization noise	dBm
P_{sens}	front-end sensitivity	dBm
P_w	power of a wanted signal	dBm
R	load resistance	Ω
R_d	load resistance	Ω
R_d	input resistance of an OCFE	Ω
$R_{PRFB,in}$	input resistance of a PRFB	Ω
$R_{PRFB,out}$	output resistance of a PRFB	Ω
R_s	source resistance	Ω
SNR	signal to noise ratio	dB
vrf	single ended voltage at mixer RF port	V
$\overline{vrf}$	complementary single ended voltage at mixer RF port	V
vlo	single ended voltage at mixer LO port	V
$\overline{vlo}$	complementary single ended voltage at mixer LO port	V

V	voltage	V
$\overline{V^2}$	mean square noise voltage	V^2/Hz
V_{dc}	biasing voltage	V
V_{dd}	supply voltage of a MOS circuit	V
$V_{dd,min}$	minimal supply voltage of a MOS circuit	V
V_{fs}	ADC full-scale voltage	V
V_{gs}	gate-source voltage of a MOST	V
V_{in}	input voltage	V
$V_{in,k}$	input voltage at branch k in N-phase filter	V
V_{lodc}	biasing voltage at mixer LO port	V
$V_{lo,dif}$	differential LO voltage	V
V_{nf}	rms voltage that corresponds to noise floor	V
V_{out}	output voltage	V
$V\text{outdif}$	differential voltage at mixer output port	V
$\overline{V_{out,fn}^2}$	mean square voltage of the flicker noise at the output of a Gilbert cell mixer	V^2/Hz
$\overline{V_{in}^2}$	mean square voltage of an equivalent input voltage noise source	V^2/Hz
$\overline{V_{out}^2}$	mean square voltage of output noise	V^2/Hz
$V_{out,k}$	output voltage at branch k in N-phase filter	V
V_{ovn}	overdrive voltage of a NMOST	V
V_{ovp}	overdrive voltage of a PMOST	V
V_{rf}	RF voltage	V
V_{rfdc}	biasing voltage at mixer RF port	V
V_{rfdcn}	biasing voltage of a NMOST at mixer RF port	V
V_{rfdcp}	biasing voltage of a PMOST at mixer RF port	V
V_{rfdif}	differential voltage at mixer RF port	V
V_{sens}	rms voltage that corresponds to sensitivity level	V
V_t	MOST threshold voltage	V
Vx	voltage at node x	V
W	MOST channel width	m
X	attenuation provided by a IF complex filter at offset frequency	dB
Z_{in}	input impedance	Ω
Z_{out}	output impedance	Ω
x_c	complex signal	
x_i	imaginary part of a complex signal	
x_{if}	IF signal	
$x_{if,I}$	I component of a quadrature IF signal	
$x_{if,Q}$	Q component of a quadrature IF signal	
x_{lo}	LO signal	
$x_{lo,I}$	sinusoidal I signal provided by quadrature local oscillator	
$x_{lo,Q}$	sinusoidal Q signal provided by quadrature local oscillator	
x_r	real part of a complex signal	
x_{rf}	RF signal	
X_c	amplitude spectrum of a complex signal	
X_{id}	amplitude spectra of a down-converted image signal	
X_{id}	amplitude spectra of a component in a complex down-converted image signal located at negative frequencies	

X_{idf} amplitude spectra of a component in a complex down-converted image signal after IF filtering which is located at negative frequencies

X_{ip} amplitude spectra of a parasitic component in a complex down-converted image signal located at positive frequencies

X_{ipf} amplitude spectra of a parasitic component in a complex down-converted image signal after IF filtering which is located at positive frequencies

$X_{\mathrm{id}+}$ amplitude spectra of the down-converted image signal located at positive frequencies

$X_{\mathrm{id}-}$ amplitude spectra of a down-converted image signal located at negative frequencies

X_{if} amplitude spectra of an IF signal

X_{iff} amplitude spectra of an IF signal after IF filtering

$X_{\mathrm{i}+}$ amplitude spectra of an image signal located at positive frequencies

$X_{\mathrm{i}-}$ amplitude spectra of an image signal located at negative frequencies

X_{lo} amplitude spectra of a local oscillator signal

X_{lo} amplitude spectra of a component in a complex local oscillator signal located at negative frequencies

X_{lop} amplitude spectra of a parasitic component in a complex local oscillator signal located at positive frequencies

$X_{\mathrm{lo}+}$ amplitude spectra of a local oscillator signal located at positive frequencies

$X_{\mathrm{lo}-}$ amplitude spectra of a local oscillator signal located at negative frequencies

X_{rf} amplitude spectra of an RF signal

X_{rff} amplitude spectra of an RF signal after RF filtering

X_{wd} amplitude spectra of a down-converted wanted signal

X_{wd} amplitude spectra of a component in a complex down-converted wanted signal located at positive frequencies

X_{wdf} amplitude spectra of a down-converted wanted signal after IF filtering

X_{wdf} amplitude spectra of a component in a complex down-converted wanted signal after IF filtering which is located at positive frequencies

X_{wp} amplitude spectra of a parasitic component in a complex down-converted wanted signal located at negative frequencies

X_{wpf} amplitude spectra of a parasitic component in a complex down-converted wanted signal after IF filtering which is located at negative frequencies

$X_{\mathrm{if}+}$ amplitude spectra of a complex image signal after RF filtering which is located at positive frequencies

$X_{\mathrm{if}-}$ amplitude spectra of a complex image signal after RF filtering which is located at negative frequencies

$X_{\mathrm{w}+}$ amplitude spectra of a wanted signal located at positive frequencies

$X_{\mathrm{w}-}$ amplitude spectra of a wanted signal located at negative frequencies

$X_{\mathrm{wd}+}$ amplitude spectra of a down-converted wanted signal located at positive frequencies

$X_{\mathrm{wd}-}$ amplitude spectra of a down-converted wanted signal located at negative frequencies

$X_{\mathrm{wf}+}$	amplitude spectra of a complex wanted signal after RF filtering which is located at positive frequencies	
$X_{\mathrm{wf}-}$	amplitude spectra of a complex wanted signal after RF filtering which is located at negative frequencies	
γ_{n}	noise factor of a NMOST (2/3 for long channel MOST)	
γ_{p}	noise factor of a PMOST (2/3 for long channel MOST)	
λ	channel length modulation parameter	1/V
μ_n	mobility of electrons	m^2/Vs
ω_{c}	center frequency of IF complex filter	rad/s
ω_{i}	angular frequency of a sinusoidal image signal	rad/s
ω_{if}	angular IF frequency	rad/s
ω_{lo}	angular LO frequency	rad/s
ω_{rf}	angular RF frequency	rad/s
ω_{w}	angular frequency of a sinusoidal wanted signal	rad/s
ω_{x}	offset frequency	rad/s
ΔV	variations of voltage V	V

Abbreviations

2G	Second Generation
3G	Third Generation
3GPP	3rd Generation Partnership Project
4G	Fourth Generation
AC	Alternating Current
AM	Amplitude Modulation
ADC	Analog to Digital Converter
ASW	Antenna Switch
BPSK	Binary Phase Shift Keying
BB	Base Band
CCK	Complementary Code Keying
CDMA	Code Division Multiple Access
CMOS	Complementary Metal Oxide Semiconductor
CSMA	Carrier Sense Multiple Access
CSMA/CA	Carrier Sense Multiple Access with Collision Avoidance
dB	decibel
DAC	Digital to Analog Converter
DC	Direct Current
DCS	Digital Cellular System
DECT	Digital European Cordless Telephone
DEM	Demodulator
DL	Down Link
DQPSK	Differential Quadrature Phase Shift Keying
DR	Dynamic Range
DSP	Digital Signal Processing
EDGE	Enhanced Data rates for Global Evolution
EGSM	Enhanced Global System for Mobile communication
FDD	Frequency Division Duplex
FDMA	Frequency Division Multiple Access
FHSS	Frequency Hopping Spread Spectrum
FM	Frequency Modulation

FOM	Figure of Merit
GFSK	Gaussian Frequency Shift Keying
GMSK	Gaussian Minimum Shift Keying
GPS	Global Positioning System
GPRS	General Packet Radio Service
GSM	Global System for Mobile communication
GPS	Global Positioning System
HPSK	Hybrid Phase Shift Keying
HSDPA	High Speed Down-link Packet Access
IC	Integrated Circuits
IEEE	Institute of Electrical and Electronics Engineers
IF	Intermediate Frequency
IFCF	IF Complex Filter
IFF	IF Filter
IFIRF	IF Image Reject Filter
IS	Interim Standard
LNA	Low Noise Amplifier
LPF	Low Pass Filter
LO	Local Oscillator
LTCC	Low Temperature Co-fired Ceramic
MOS	Metal Oxide Semiconductor
MOST	Metal Oxide Semiconductor Transistor
MX	Mixer
NMOS	Negative channel Metal Oxide Semiconductor
OCFE	On Chip Front-End
OFDM	Orthogonal Frequency Division Multiplexing
OQPSK	Offset Quadrature Phase Shift Keying
QAM	Quadrature Amplitude Modulation
QLO	Quadrature Local Oscillator
QPSK	Quadrature Phase Shift Keying
PBCC	Packet Binary Convolutionarry Code
PCB	Print Circuit Board
PCN	Personal Communications Network
PCS	Personal Communications System
PMOS	Positive channel Metal Oxide Semiconductor
PRFB	Passive RF Block
PSK	Phase Shift Keying
RCPF	RC Polyphase Filter
RF	Radio Frequency
RFIRF	RF Image Reject Filter
RFF	RF Filter
SDC	Single Ended to Differential Converter
SiP	System in Package
SSB	Single Side Band
SoC	System on Chip
TV	Television
UHF	Ultra High Frequency

UL	Up Link
TDMA	Time Division Multiple Access
VGA	Variable Gain Amplifier
VHF	Very High Frequency
WCDMA	Wideband Code Division Multiple Access
WLAN	Wireless Local Area Networks
WPAN	Wireless Personal Area Networks
WWAN	Wireless Wide Area Networks