

DESIGN OF SUBSYSTEMS FOR MULTIBAND
WIRELESS TRANSCEIVER

ARJUNA BIN MARZUKI

UNIVERSITI MALAYSIA PERLIS
2010

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**DESIGN OF SUBSYSTEMS FOR MULTIBAND
WIRELESS TRANSCEIVER**

by

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**A thesis submitted
In fulfilment of the requirements for the degree of
Doctor of Philosophy**

**School of Microelectronic Engineering
UNIVERSITI MALAYSIA PERLIS**

2010

DECLARATION OF THESIS

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ACKNOWLEDGEMENTS

First of all I would like to thank Professor Ali Yeon Md. Shakaff and Profesor Madya Zaliman Sauli for their guidance and insight in seeing this thesis through. I would also like to thank certain people in my last and current employment for their valuable assistance especially with their skills in RF measurement techniques.

Thank to School of Microelectronic Engineering, the dean and the administration staffs in supporting my work.

Next I would like to thank my friends, who support me throughout this work. These people are my former colleagues in Avago Technologies; Zulfa, on helping the LNA and MPA development and C-Rad Technologies: Radzi, on moral support.

Thank to my student, Khor Teng Teng in helping me in the simulation of the CMOS VCOs and switch.

I would also like to thank the support and acknowledge the support of Telekom R&D Malaysia Sdn. Bhd. (Project number R05-0607-0, lead by Dr. Ahmad Ismat Abdul Rahim) and Agilent Technologies in the fabrication and measurement of the design.

Next I would like to thank Universiti Sains Malaysia, School of Electrical and Electronic Engineering, my current employer, especially the dean, the administration staffs and colleagues for supporting this endeavor.

Lastly, I would like to thank to my beloved wife and daughter, my parents and brothers for their full support throughout the years. I sincerely dedicated this work to my late brother who has been a very good brother throughout his life. I pray to Almighty for forgiveness and mercy for my humble and simple brother.

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LIST OF SYMBOLS

Ω	Ohm
γ	Noise parameter, $\gamma = 2/3$ for long-channel
δ	Coefficient of gate noise, $\delta = 2\gamma = 4/3$ for long-channel
α	Noise parameter, $\alpha = g_m / g_{d0}$
Γ	Reflection coefficient
Γ_S	Reflection coefficient looking into the source
Γ_{in}	Reflection coefficient looking into the input
Γ_L	Reflection coefficient looking into the load
Γ_{out}	Reflection coefficient looking into the output
μ_n	Mobility of electron
μ_p	Mobility of hole
ξ	Noise parameter of the uncorrelated portion of the transistor's gate noise
ξ_1	V_{DS} to V_{OV} ratio
κ	Noise parameter of the correlated portion of the transistor's gate noise
χ	Noise parameter that includes both correlated and uncorrelated portions of the transistor's gate noise
ρ	$\rho = V_{OV} / LE_{sat}$
ϵ_0	Permittivity of free space, $\epsilon_0 = 8.854 \times 10^{-12}$ F/m
λ	Wavelength of the frequency of operation
A_d	Area drawn
A_v	Voltage gain
A_{vo}	Open-circuit voltage gain
B_c	Correlation susceptance
B_{opt}	Optimum susceptance
B_S	Source noise susceptance

B_{system}	System bandwidth
c	Correlation coefficient, $c = j0.395$ for long-channel devices
C_a	Areal capacitance
C_c	Coupling capacitor
C_{db}	Drain-Body capacitance
C_f	Feedback capacitor
C_{gd}	Gate-Drain capacitance
C_{gs}	Gate-Source capacitance
C_{gsn}	Gate-Source capacitance of NMOS
C_{gsp}	Gate-Source capacitance of PMOS
C_{gsT}	Total Gate-Source capacitance
C_{light}	Speed of light, $C_{\text{light}} = 3 \times 10^8$ m/s
C_{ox}	Oxide capacitance of NMOS
C_{oxn}	Oxide capacitance of PMOS
C_{oxp}	Oxide capacitance
C_p	Capacitance per unit periphery
C_t	Total capacitance
d	Largest dimension of the design
E_b	Average bit energy
$(E_b/N_t)_{\text{eff}}$	Average bit energy to noise and interference power spectral density minimum ratio
E_C	Average energy per PN chip
\bar{e}_n	External voltage noise generator
E_{sat}	Field strength at which the carrier velocity has dropped to one half the value extrapolated at low-field mobility
f	Frequency
F	Noise factor
f_{block}	Frequency of the block signal

f_{cw}	Spurious response frequencies
f_{IF}	Frequency of the IF Signal
f_{LO}	Frequency of the LO Signal
F_{min}	Minimum noise factor
F_{min}^o	Minimum noise factor for the classical noise matching input stage of the LNA
f_{RF}	Frequency of the RF signal
f_T	Transition frequency
F_{UW}	Frequency of unwanted signal
F_{UW1} (CW)	Frequency of the first unwanted signal of the CW nature
F_{UW2} (Modulated)	Frequency of the second unwanted signal of the modulated nature
f_{wanted}	Frequency of the wanted signal
G_c	Correlation conductance
g_{d0}	Drain-Source conductance at 0 V_{DS}
G_f	Conductance of C_f
g_g	Real, noiseless conductance in the gate circuit
g_m	Transconductance of the transistor
G_m	Transconductance of the circuit
g_{mb}	Body-effect transconductance of the MOSFET
G_{m-C}	Transconductance-Capacitor
G_{m_eff}	Effective transconductance of the circuit
g_{mT}	Total transconductance
G_n	Conductance contributing to thermal noise due to $\overline{i_n^2}$
G_{opt}	Optimum conductance
G_S	Conductance contributing to thermal noise due to $\overline{i_s^2}$ or source conductance
$I_{blocking}$ (CW)	Blocking signal (CW) band power spectral density