??
I_D
g_m
??
??
??
I_D
??
??
I_D
V_G
I_D
V_G
I_D
I_D
V_G
??
V_{out}
?
g_m
??
v_s
V_{out}
$v_s g_m \times$
R_{TIA}
$I_D V_G$
g_m
$g_m =$
$\frac{\partial I_D}{\partial V_G}$
g_m
V_{out}
g_m
V_G
I_D
I_D
g_m
??
??
??
R_{NW}
I_{NW}
(a)
?
R_{NW}
??
(b)
$I_{NW} =$
$(V_{Ref} -$
$V_{in})/R_{NW}$
$\Delta i =$
$\Delta vi/R_{NW}$
??
$V_{TIA} = V_{Ref} + I_{NW} R_{TIA} + \Delta i R_{TIA}$
(1)
I_{NW}
R_{TIA}
$^{Ref}-$
$VSS \frac{}{R_{TIA} < I_{NW} < \frac{VDD - V_{Ref}}{R_{TIA}}}$
R_{TIA}
I_{NW}
??
??
??
$V_{TIA} = V_{Ref} + (I_{NW} - I_{bias}) R_{TIA} + \Delta i R_{TIA}$
(2)
I_{NW}
Δi
??
??
R_{TIA}
$100k\Omega$
??
??
??
??
Input Current range from $6\mu A$ to $-10\mu A$
Bandwidth 7M Hz
Output referred noise (@10Hz) $0.01mV$
Post-
simulation
re-
sult
of
TIA
$_d c.png The dc simulation results of TIA. The x-axis represents spositive/negative input current (log scale). **(a)** is the $_{out}$
(c)
(b)
(d)
V_{out}
$\frac{\partial V_{out}}{\partial I_{in}}$
(a)
(c)
$_a c.png The ac simulation results of TIA. The x-axis is the input signal frequency. **(a)** is the $_{out}$
(b)