











Observer Based Sensing This method uses the Inductor voltage to measure the Inductor current Inductor current can be calculated by integrating the voltage over time . Integrator time constant should match inductor value Difficult to track the variation in inductors $\frac{di}{dt} \Longrightarrow i_L = \frac{1}{L} \int v_L dt$ Integrator IL Vin 1/L Vou RLoad EE5325 Power Management Integrated Circuits 7 1 Integrated Circuits and Systems Group, Department of EE, IIT Madras











Comparison of Current-Sensing Techniques

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Current Sensing Method	Advantages	Disadvantages
Series Sense Resistor	Good accuracy	Increases conduction loss
MOSFET R_{DS} Sensing	Lossless	Low accuracy as R_{DS} is not constant
MOSFET V_{DS} Sensing	Lossless, relatively better accuracy compared to R_{DS}	Accuracy depends upon matching between transistors, requires post processing to get the final current value
Current Observer	Lossless	Works with known L, does not work under load
RC Filter	Lossless, occupies large on-chip area	Works with known L and $R_{\ensuremath{\text{DCR}}}$
SenseFET	Lossless, smaller area	Poor Accuracy due to V_{DS} mismatch
Modified SenseFET	Lossless, smaller area, relatively good accuracy	Accuracy depends upon transistor matching and op-amp BW
Current Transformer	Lossless	Not cost effective, bulky, can't be integrated on-chip
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