Preface

Environmental electromagnetic pollution has drastically increased over the last decades. The omnipresence of (wireless) communication systems, new and various electronic appliances and the use of ever increasing frequencies, all contribute to a noisy electromagnetic environment which acts detrimentally on sensitive electronic equipment. Integrated circuits constitute the beating heart of almost any given electronic system nowadays: luckily, owing to their small sizes, they are not easily disturbed by radiated disturbances, because their tiny on-chip interconnections are much too small to function as effective antennas. However, the ultimate contribution comes from the conducted interferences which are present on the noisy and relatively long printed circuit board tracks, used to connect and interconnect the integrated circuits in question.

Aside from a polluted electromagnetic spectrum, integrated circuits must be able to operate satisfactorily while cohabiting harmoniously in the same appliance, and not generate intolerable levels of electromagnetic emission, while maintaining a sound immunity to potential electromagnetic disturbances. As different electronic systems are compactly integrated in the same apparatus, the parasitic electromagnetic coupling between these circuits sharing the same signal, power and ground lines, is a critical design parameter that can no longer be safely excluded from a product design flow. This dense integration level links the electromagnetic compatibility (EMC) issue of integrated circuits to the graceful coexistence between systems: as an example, Bluetooth, GSM and WiFi services have to coexist and operate in harmony within the crammed confinement of a modern mobile phone.

Distinct frequency allocations provide a shield against electromagnetic interferences by separating the signal spectra of different systems from each other: nevertheless, the intrinsic nonlinearity of active devices may cause the demodulation of interfering out of band signals, whereby spurious signals tend to appear in the frequency band of the exposed circuit. Furthermore, these out of band disturbances may induce a severe distortion of the wanted signals (which is certainly not recommended), and DC shift errors on sensitive nodes in the respective circuit, hereby possibly driving the latter out of its correct operation mode (which is even less acceptable). Analog circuits are in practice more easily disturbed than their digital counterparts, since they don't have the benefit of dealing with predefined levels which ensure an innate immunity to disturbances.

The objective of the research domain presented in this book is to improve the electromagnetic immunity of considered analog integrated circuits, so that they start to fail at relevantly higher conduction levels than before.

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