



This application note describes general methods of reducing emission of electromagnetic radiation (EMI, electromagnetic interference), which can be transferred to SC12 based applications.

*The below described methods are meant as circuit examples without guarantee of functioning in other applications!*

### External Bus Separation

A significant reduction of the activity on the peripheral data/address bus can be achieved by buffering the external processor bus (AD0-AD7) of the SC12 with a bus transceiver (e.g. 74ABT245). The same applies for the control signals /RD, /WR and ALE, which can be combined (logical OR) with the corresponding /PCSx signal. (see schematic example) Peripheral bus and control signals are switched exclusively during the appropriate bus cycles, hence reducing EMI.

*Applicable frequency range of EMI reduction: up to ~200 MHz*

### Ferrites in Bus Signals

Appending ferrites (600 Ohms @ 100MHz, e.g. MLB 2012090600 by Kitagawa) to the above mentioned peripheral bus signals can furthermore reduce EMI. (see schematic example)

*Applicable frequency range of EMI reduction: up to ~200 MHz*

### Ferrites in Power Supply Signals

Additionally ferrites (74275043 by Würth, 3 A max. current, 920 Ohms @ 25 MHz, 960 Ohms @ 100 MHz) can be inserted into the VCC and GND lines going to the SC12.

*Applicable frequency range of EMI reduction: ~100 up to ~800 MHz*

### EMI Filters

When in use, the serial port signals (COM/EXT, TTL) usually cause an increased emission of electromagnetic radiation.

This can be prevented by inserting EMI filters (e.g. NFM3212R13C222R by Murata, 2,2 nF effective capacity, 55 dB @ 600 MHz maximum attenuation) into the serial port signals. (see schematic example)

### Filtering of External Signals

The filtering of signals, which have a connection to outside the application is positive in two ways.

On one hand, the radiated emission from those signals is reduced and on the other hand, the noise immunity of the application is increased. Filtering can be done by a capacitor from the signal to circuit ground. The capacitor should be placed as close as possible to the point, where the respective signal enters the circuit.

### Power- and Ground Planes

Beside the above described methods of reducing EMI by active and passive components, a proper design of a printed circuit board (PCB) with separate layers for power and ground supply is a suitable way of reducing EMI in a wide frequency range (up to ~400 MHz).

The documents listed in the literature section provide useful information on this as well as on related topics regarding system and PCB design.



### Literature

- PCB Design Guidelines for Reduced EMI  
*Texas Instruments Application Note SZZA009*
- Electromagnetic Emission from Logic Circuits  
*Texas Instruments Application Report SZZA007*
- EMI Prevention in Clock-Distribution Circuits  
*Texas Instruments Application Note SCAA031*
- EMI/RFI Board Design  
*National Semiconductor Application Note 643*
- Understanding and Eliminating EMI in Microcontroller Applications  
*National Semiconductor Application Note 1050*
- High Speed Clock Sources and Their Effect on Electromagnetic Compatibility  
*National Semiconductor Application Note 988*
- Designing for Electromagnetic Compatibility (EMC) with HCMOS Microcontrollers  
*Motorola Semiconductor Application Note AN1050*
- Transmission Line Effects in PCB Applications  
*Motorola Semiconductor Application Note AN1051*
- EMC Design Guideline for Microcontroller Board Layout  
*Infineon Technologies Application Note 2426*

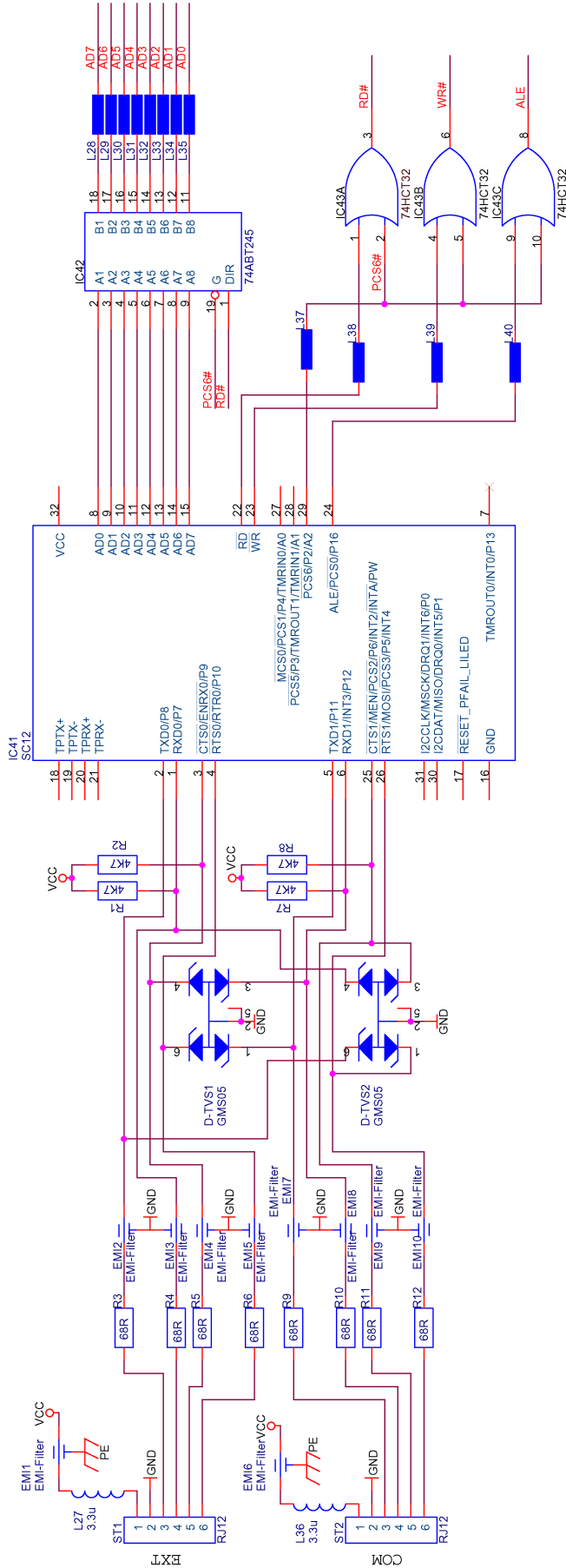


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## Example for Reducing EMI with the SC12

### Schematic

Example for reducing electromagnetic emission with SC12



- use ferrites (100MHz 600 Ohm) / EMI-filters
- place components as close as possible to each other
- use busdriver to connect other components to the SC12 data/address bus
- make a disjunction between RD#, WR#, ALE and the used PCSx line, to reduce switching at the RD#, WR# and ALE lines