Electronic Components

EMI / EMC

Applications
Many electric appliances make electromagnetic noise and interfere with each other.
Electrically long portion of the device can be a noise radiating antenna (e.g. power cable).
Noise Reduction

Aggressor (Noise Source)

Inductor/Choke (MAGNETICS) Block with High Impedance

ADD IMPEDANCE

Capacitor Guide to GND with Low Impedance

Radiation

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Purpose of the Noise Countermeasure

1. To Meet Regulations

2. To Avoid Self-Interference

3. To Avoid Real Interference in Field
Electronic devices are not allowed to conduct noise into the wall.

Electronic devices are not allowed to radiate noise into the air.

To improve radio quality such as WiFi Connection.
Transmitted Way of Electromagnetic Noise

Conducted Emission

Radiated Emission

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In order to safely use the electronic equipment in the society, it is necessary to adapt the regulations to all of electromagnetic equipment & devices.
### Standards and Regulations

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Conduction Emission Measurement

RF Shielded Room or Electromagnetic Anechoic Chamber
• Conduction noise is measured by an EUT measurement connected to the LISN via AC cable.

EUT: Equipment Under Test
LISN: Line Impedance Stabilization Network
Open Area Test Site or Electromagnetic Anechoic Chamber
• Radiated noise is measured by antenna height and angle on the maximum noise.

EUT: Equipment Under Test

Power → Turntable

10m, 3m, 1m

Turn 360°

4m

1m

Antenna

Spectrum analyzer
Countermeasures for Noise

Grounding

Shielding

Filtering

Layout

Power Supply

Main Board

Power Supply
Noise Mode

"Differential (Normal) Mode Noise"

Different Direction Noise Currents

Differential mode currents flow in....
“Line to Line”
“Opposite directions” → Cancel each other out
Small loop area → Low emission level
Conduction Emission

"Common Mode Noise"

Same (Common) Direction Noise Currents

Common mode currents flow in....
“Line to Ground”
“Same directions”
Large loop area → High emission level
Conduction Emission
Radiation Emission

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Magnetics Solutions for EMI

150kHz~30MHz
SSR Series
SSRL Series

30MHz~1GHz
SCR Series
NF Series
GL Series

~10GHz and more
ESD Series
Large SCR Series
Smartphone (Scale reference)

Conduction Emission
Radiation Emission
Signal Integrity
Common / Differential Mode Chokes

150kHz~30MHz
- SSR Series
- SSRL Series

Conduction Emission

30MHz~1GHz
- SCR Series
- Large SCR Series

Radiation Emission

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EMI Cores

150kHz~30MHz

Conduction Emission

30MHz~1GHz

Radiation Emission

ESD Series
Flex Suppressor

30MHz~1GHz

~10GHz and more

Smartphone (Scale Reference)

Radiation Emission

Signal Integrity

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Thank You!