# DN0025
# Design note

DESIGNS from our LABS

# Maximize Power Line Communication signal level on ST7590 PRIME compliant applications

***Designs from our labs*** *describe tested circuit designs from ST labs which provide optimized solutions for specific applications. For more information or support, visit www.st.com*

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| Main components | |
|---|---|
| ST7590 | Narrow-band OFDM power line networking<br>PRIME compliant system-on-chip |

## Specification

- ST7590 Power supply voltage: VCC = 16.5 V +/- 5%
- ST7590 Power Amplifier output level: V(PA_OUT) = 16 V pk-pk = 2.25 V rms
- Compliance with output level limits for Power Line Communication devices set by EN50065-1 standard

## Circuit description

This design note gives an alternative Power Amplifier configuration with respect to the existing ST7590 reference designs based on ST7590 and ST7590T, giving maximum performance in terms of transmitted Power Line Communication (PLC) signal level.

The purpose is maximizing the dynamic range, making the PLC node based on ST7590 capable of coping with higher attenuation, in field or during performance evaluation tests.

The main change is an increase in the Power Amplifier (PA) gain, exploiting a wider output range. This clearly impacts on VCC supply voltage minimum level: it shall allow reaching the desired PA output swing without increasing the signal distortion.

The suggested circuit can be applied to the existing ST7590 development kits by applying a few BOM changes and changing the VCC power supply source.

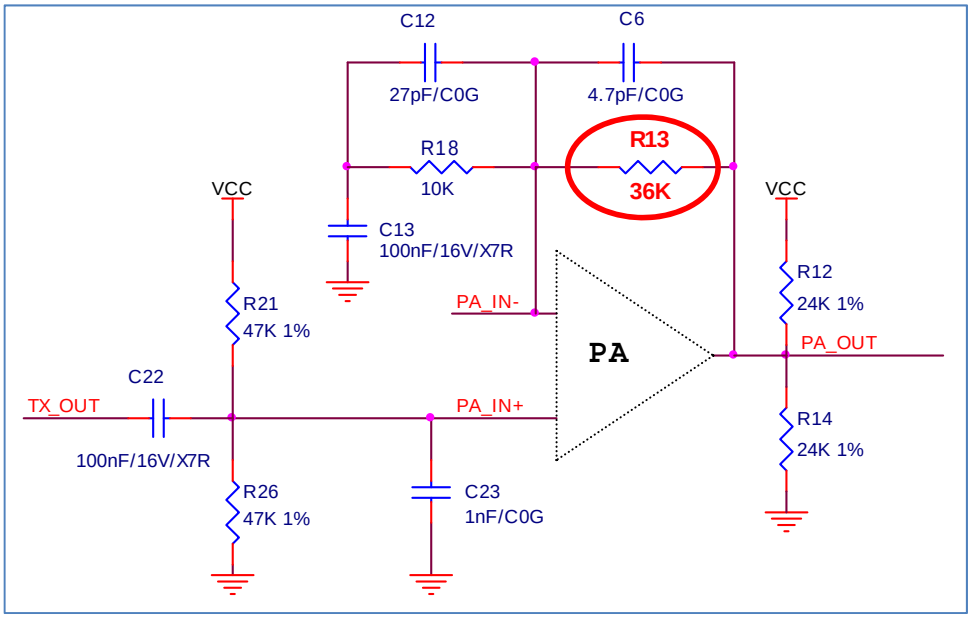


**Figure 1. Schematics of the suggested Power Amplifier configuration**

## Measurement results

### Test conditions

The following conditions have been applied to the ST7590 device to validate the circuit performance:

- ST7590 protocol configuration: PHY mode
- Subcarriers' modulation = DBPSK with FEC (convolutional coding)
- Transmission frame  duration = 29 ms
- Transmission period = 1 s

### Test results

The circuit performance has been evaluated against the maximum output level and conducted emission level set by the European standard EN50065-1.

It can be noticed that the suggested solution gives an increase of 3.5 V pk-pk, i.e. about 2 dB, with respect to a circuit having a VCC level of 13 V and a Power Amplifier configuration as per reference designs based on ST7590 and ST7590T.


**Figure 2. Output signal on PA_OUT pin vs. VCC supply level**

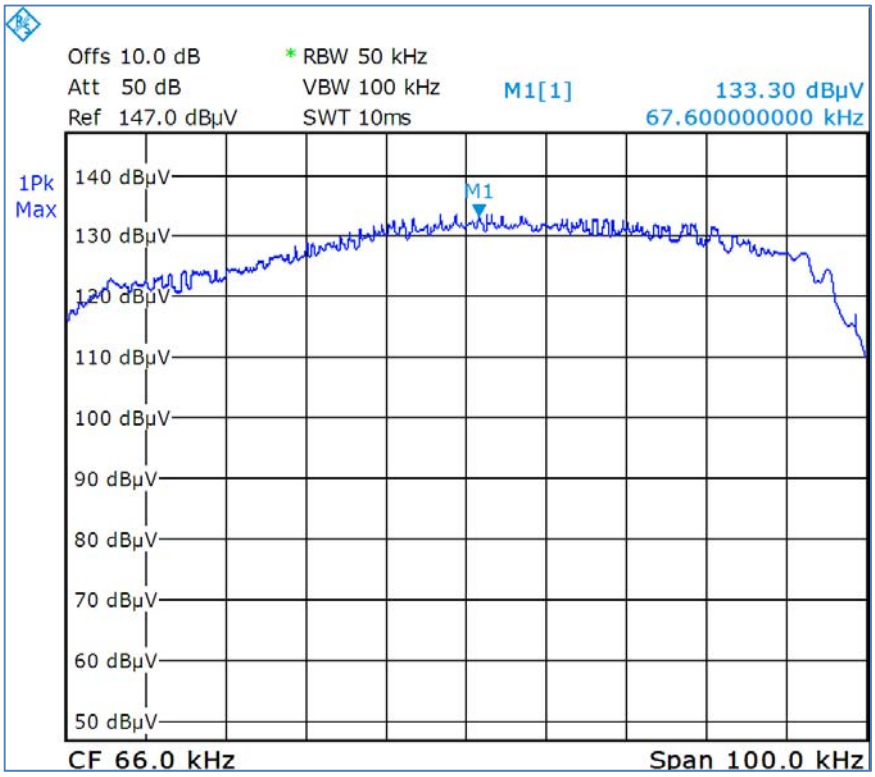


**Figure 3. Maximum output level measured according to EN50065-1**

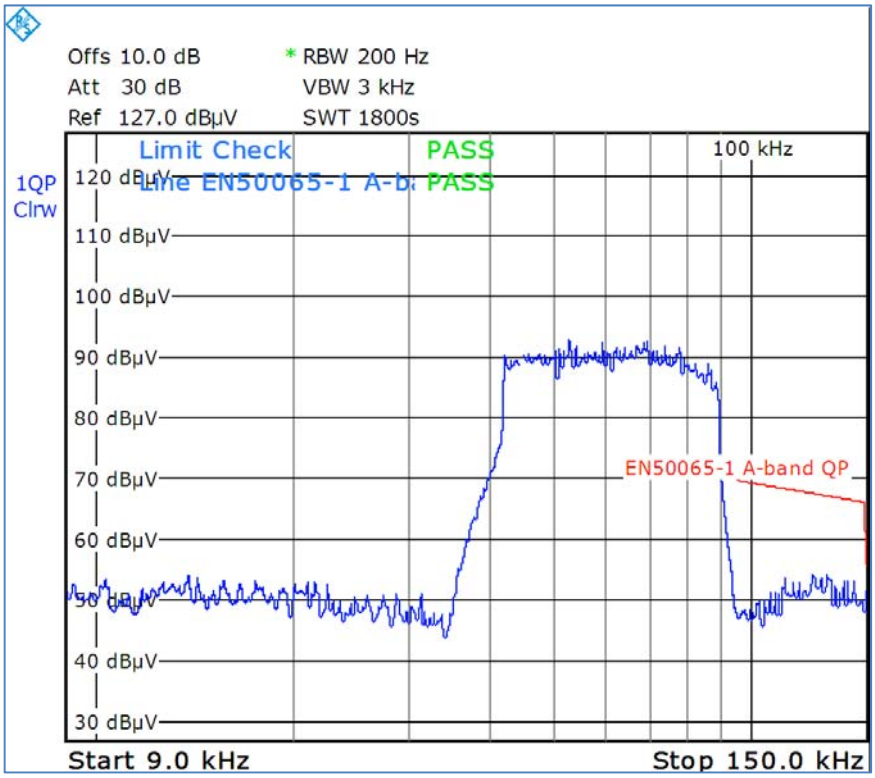


**Figure 4. Conducted emissions – 9 to 150 kHz**

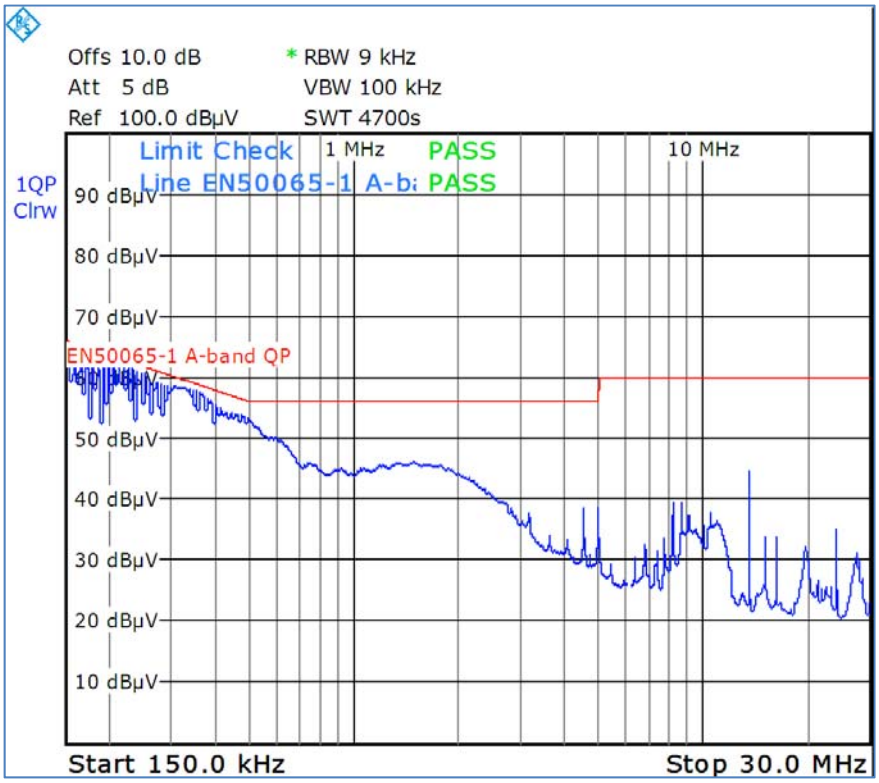


**Figure 5. Conducted emissions – 150 kHz to 30 MHz**

## Support material

| Related design support material |
|---|
| **EVALKITST7590-Q1:** STarGRID ST7590 SoC PRIME power line communication development kit - http://www.st.com/web/catalog/tools/FM116/SC1075/PF259603 |
| **EVALST7590T-2:** STarGRID ST7590T SoC PRIME-certified power line communication development kit - http://www.st.com/web/catalog/tools/FM116/SC1075/PF255284 |
| **Documentation** |
| ST7590 Datasheet **DS7069:** Narrow-band OFDM power line networking PRIME compliant system-on-chip - http://www.st.com/st-web-ui/static/active/en/resource/technical/document/datasheet/CD00294970.pdf |

## Revision history

| Date | Version | Changes |
|---|---|---|
| 16-Jun-2014 | 1 | Initial release |

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