

## Dual wideband high output current operational amplifier

### Features

- Wideband of 200 MHz/gain = 4
- Very high slew rate
- High output current
- Specified on 25 and 100-Ω loads
- Thermal shut-down set at  $T_j = 150^\circ \text{C}$
- Large protection on outputs
- Power-down mode with high Z-out
- Very low noise
- Tested at 5 and 12-V supplies
- Single or dual supply operation
- Minimum and maximum limits are tested in full production

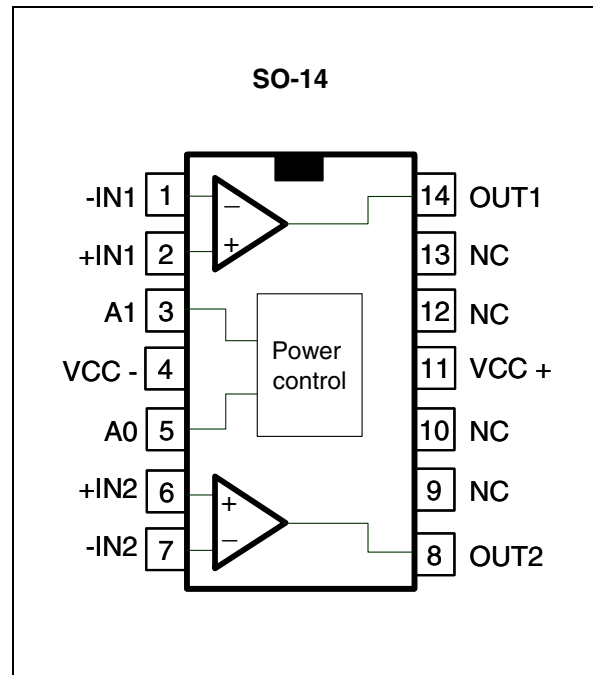
### Applications

- Power line equipment
- Drivers for xDSL modems
- Video drivers
- Video distribution

### Description

The TS617 is a wideband high output current dual operational amplifier optimized for driving high data rates on power lines and twisted pair telephone lines.

The TS617 features a linearity on low resistive loads, large output swing and high output current, very low noise, low consumption and I-supply control and power-down mode with high Z-out and short settling times.



# 1 Absolute maximum ratings and operating conditions

**Table 1. Absolute maximum ratings**

| Symbol        | Parameter  | Value       | Unit          |
|---------------|--|-------------|---------------|
| $V_{CC}$      | Supply voltage <sup>(1)</sup>  | 14          | $V_{DC}$      |
| $V_{id}$      | Differential input voltage <sup>(2)</sup>  | $\pm 2$     | V             |
| $T_{oper}$    | Operating free air temperature range   | -40 to +85  | $^{\circ}C$   |
| $T_{stg}$     | Storage temperature  | -65 to +150 | $^{\circ}C$   |
| $T_j$         | Maximum junction temperature   | 150         | $^{\circ}C$   |
| $\Theta_{JA}$ | SO14 thermal resistance junction to ambient  | 103         | $^{\circ}C/W$ |
| $\Theta_{JC}$ | SO14 thermal resistance junction to case   | 31          | $^{\circ}C/W$ |
| $P_{max}$     | SO14 maximum power dissipation <sup>(3)</sup> (at $T_a = 25^{\circ}C$ ) for $T_j = 150^{\circ}C$ | 1.2         | W             |
| ESD           | HBM: human body model <sup>(4)</sup>   | 2           | kV            |
|               | MM: machine model <sup>(5)</sup>   | 200         | V             |
|               | CDM: charged device model  | 1           | kV            |

- All voltage values are measured with respect to the ground pin.
- Differential voltage is between the non-inverting input terminal and the inverting input terminal.
- Short-circuits can cause excessive heating. Destructive dissipation can result from short circuits on amplifiers. An internal thermal shut-down set the circuit in power down mode automatically when the silicon temperature reaches  $150^{\circ}C$ .
- Human body model: 100 pF discharged through a 1.5 k $\Omega$  resistor into  $P_{min}$  of device.
- This is a minimum value. Machine model ESD: a 200 pF capacitor is charged to the specified voltage, then discharged directly into the IC with no external series resistor.

**Table 2. Operating conditions**

| Symbol    | Parameter                           | Value     | Unit |
|-----------|-------------------------------------|-----------|------|
| $V_{CC}$  | Power supply voltage <sup>(1)</sup> | 4.5 to 13 | V    |
| $V_{icm}$ | Common mode input voltage           | $\pm 6$   | V    |

- Tested in full production at  $\pm 2.5$  V and  $\pm 6$  V supply voltages.

## 2 Electrical characteristics

Table 3.  $V_{CC} = \pm 2.5\text{ V}$ ,  $T_{amb} = 25^\circ\text{ C}$ , full power mode (unless otherwise specified)

| Symbol  | Parameter   | Test conditions  | Min. | Typ.             | Max. | Unit                         |
|---|---|--|------|------------------|------|------------------------------|
| <b>DC performance</b>                                 |   |  |      |                  |      |                              |
| $V_{io}$  | Input offset voltage  | $T_{amb}$  | -10  | 2.5              | 10   | mV                           |
|   |   | $T_{min.} < T_{amb} < T_{max.}$  |      | 2.7              |      |                              |
| $\Delta V_{io}$                                       | $V_{io}$ drift vs. temperature  | $T_{min.} < T_{amb} < T_{max.}$  |      | 5                |      | $\mu\text{V}/^\circ\text{C}$ |
| $I_{ib+}$   | Non-inverting input bias current  | $T_{amb}$  | -50  | -15              | +50  | $\mu\text{A}$                |
|   |   | $T_{min.} < T_{amb} < T_{max.}$  |      | -20              |      |                              |
| $I_{ib-}$   | Inverting input bias current  | $T_{amb}$  | -30  | -11              | -30  | $\mu\text{A}$                |
|   |   | $T_{min.} < T_{amb} < T_{max.}$  |      | -12              |      |                              |
| CMR   | Common mode rejection ratio<br>$20 \log (\Delta V_{ic}/\Delta V_{io})$    | $\Delta V_{ic} = \pm 1\text{ V}$   | 45   | 51               |      | dB                           |
|   |   | $T_{min.} < T_{amb} < T_{max.}$  |      | 50               |      |                              |
| SVR   | Supply voltage rejection ratio<br>$20 \log (\Delta V_{CC}/\Delta V_{io})$ | $\Delta V_{CC} = \pm 2\text{ V to } \pm 2.5\text{ V}$  | 50   | 76               |      | dB                           |
|   |   | $T_{min.} < T_{amb} < T_{max.}$  |      | 55               |      |                              |
| PSRR  | Power supply rejection ratio<br>$20 \log (\Delta V_{CC}/\Delta V_{out})$  | Gain = +4, Rfb = 390 $\Omega$<br>$\Delta V_{CC} = \pm 100\text{ mV at } 100\text{ kHz}$  |      | 50               |      | dB                           |
| $I_{CC}$  | Supply current per operator   | Full power, no load  |      | 9                | 11   | mA                           |
|   |   | $T_{min.} < T_{amb} < T_{max.}$  |      | 10               |      |                              |
|   |   | Medium power, no load  |      | 7                | 8    | mA                           |
|   |   | $T_{min.} < T_{amb} < T_{max.}$  |      | 7.5              |      |                              |
|   |   | Low power, no load   |      | 2                | 3    | mA                           |
| $T_{min.} < T_{amb} < T_{max.}$                       |   | 2.3  |      |                  |      |                              |
| <b>Dynamic performance and output characteristics</b> |   |  |      |                  |      |                              |
| Bw  | -3 dB bandwidth in small signal   | Small signal $V_{out} = 20\text{ mVp-p}$<br>$R_L = 100\ \Omega$<br>Gain = +2, Rfb = 620 $\Omega$<br>Gain = +4, Rfb = 390 $\Omega$<br>Gain = +8, Rfb = 390 $\Omega$ | 70   | 125<br>105<br>55 |      | MHz                          |
|   |   | Gain = +4, medium power  |      | 90               |      |                              |
|   |   | Gain = +4, low power   |      | 33               |      |                              |
|   |   | $T_{min.} < T_{amb} < T_{max.}$  |      | 90               |      |                              |
| $R_{OL}$  | Open-loop transimpedance  | $R_L = 100\ \Omega, V_{out} = 2\text{ Vp-p}$   | 50   | 110              |      | k $\Omega$                   |
|   |   | $T_{min.} < T_{amb} < T_{max.}$  |      | 90               |      |                              |
| SR  | Slew rate   | $V_{out} = 3\text{ Vp-p, gain} = +4,$<br>$R_L = 100\ \Omega$   | 300  | 450              |      | V/ $\mu\text{s}$             |
|   |   | Medium power   |      | 400              |      |                              |
|   |   | Low power  |      | 100              |      |                              |

Table 3.  $V_{CC} = \pm 2.5\text{ V}$ ,  $T_{amb} = 25^\circ\text{ C}$ , full power mode (unless otherwise specified) (continued)

| Symbol   | Parameter                                  | Test conditions   | Min.       | Typ.           | Max.           | Unit                   |
|--|--|---|------------|----------------|----------------|------------------------|
| $V_{OH}$   | High level output voltage                  | $R_L = 100\ \Omega$<br>$R_L = 25\ \Omega$   | 1.6<br>1.5 | 1.68<br>1.58   |                | V                      |
|  |  | $T_{min.} < T_{amb} < T_{max.}$<br>$R_L = 100\ \Omega$<br>$R_L = 25\ \Omega$  |            | 1.6<br>1.5     |                |                        |
| $V_{OL}$   | Low level output voltage                   | $R_L = 100\ \Omega$<br>$R_L = 25\ \Omega$   |            | -1.68<br>-1.57 | -1.60<br>-1.50 | V                      |
|  |  | $T_{min.} < T_{amb} < T_{max.}$<br>$R_L = 100\ \Omega$<br>$R_L = 25\ \Omega$  |            | -1.6<br>-1.5   |                |                        |
| $I_{out}$  | $I_{sink}$                                 | $V_{out} = -1\text{ V}$   | 300        | 350            |                | mA                     |
|  |  | $T_{min.} < T_{amb} < T_{max.}$   |            | 330            |                |                        |
|  | $I_{source}$                               | $V_{out} = +1\text{ V}$   |            | -370           | -300           |                        |
|  |  | $T_{min.} < T_{amb} < T_{max.}$   |            | -350           |                |                        |
| $I_{short\ circuit}$<br>(limited by thermal shut down) | Output to GND                              |   | 600        |                |                |                        |
| <b>Noise and distortion</b>                            |  |   |            |                |                |                        |
| eN   | Input noise voltage                        | $F = 100\text{ kHz}$  |            | 3.5            |                | nV/ $\sqrt{\text{Hz}}$ |
| iNp  | Positive input noise current               | $F = 100\text{ kHz}$  |            | 39             |                | pA/ $\sqrt{\text{Hz}}$ |
| iNn  | Positive input noise current               | $F = 100\text{ kHz}$  |            | 20             |                | pA/ $\sqrt{\text{Hz}}$ |
| H2/H3  | 2nd and 3rd harmonics                      | $V_{out} = 2\text{ Vp-p}$ , gain = +4,<br>$R_{fb} = 390\ \Omega$ , $F = 6\text{ MHz}$<br>$R_L = 25\ \Omega$<br>H2<br>H3 |            | -58<br>-68     |                | dBc                    |
| <b>Power-down function</b>                             |  |   |            |                |                |                        |
| $I_{pdw}$  | Consumption in power-down mode             | $A1 = 0$ , $A0 = 0$   |            | 65             | 200            | $\mu\text{A}$          |
|  |  | $T_{min.} < T_{amb} < T_{max.}$   |            | 80             |                |                        |
| $t_{on}$   | Time for power-down mode to operating mode | $A1 = A0 = 0$ to $A1 = A0 = 1$<br>$V_{out} = 1\text{ Vdc}$ , gain = +4  |            | 80             | 200            | ns                     |
| $t_{off}$  | Time for operating mode to power-down mode | $A1 = A0 = 1$ to $A1 = A0 = 0$<br>$V_{out} = 1\text{ Vdc}$ , gain = +4  |            | 450            | 1000           | ns                     |

Table 4.  $V_{CC} = \pm 6\text{ V}$ ,  $T_{amb} = 25^\circ\text{ C}$ , full power mode (unless otherwise specified)

| Symbol  | Parameter   | Test conditions  | Min. | Typ. | Max. | Unit                         |
|---|---|--|------|------|------|------------------------------|
| <b>DC performance</b>                                 |   |  |      |      |      |                              |
| $V_{io}$  | Input offset voltage  | $T_{amb}$  | -12  | 4.5  | 12   | mV                           |
|   |   | $T_{min.} < T_{amb} < T_{max.}$  |      | 5    |      |                              |
| $\Delta V_{io}$                                       | $V_{io}$ drift vs. temperature  | $T_{min.} < T_{amb} < T_{max.}$  |      | 5    |      | $\mu\text{V}/^\circ\text{C}$ |
| $I_{ib+}$   | Non-inverting input bias current  | $T_{amb}$  | -80  | -25  | 80   | $\mu\text{A}$                |
|   |   | $T_{min.} < T_{amb} < T_{max.}$  |      | -30  |      |                              |
| $I_{ib-}$   | Inverting input bias current  | $T_{amb}$  | -35  | -7   | 35   | $\mu\text{A}$                |
|   |   | $T_{min.} < T_{amb} < T_{max.}$  |      | -9   |      |                              |
| CMR   | Common mode rejection ratio<br>$20 \log (\Delta V_{ic}/\Delta V_{io})$    | $\Delta V_{ic} = \pm 3\text{ V}$   | 45   | 51   |      | dB                           |
|   |   | $T_{min.} < T_{amb} < T_{max.}$  |      | 50   |      |                              |
| SVR   | Supply voltage rejection ratio<br>$20 \log (\Delta V_{CC}/\Delta V_{io})$ | $\Delta V_{CC} = \pm 2.5\text{ V to } \pm 6\text{ V}$  | 50   | 72   |      | dB                           |
|   |   | $T_{min.} < T_{amb} < T_{max.}$  |      | 65   |      |                              |
| PSRR  | Power supply rejection ratio<br>$20 \log (\Delta V_{CC}/\Delta V_{out})$  | Gain = +4, Rfb = 390 $\Omega$<br>$\Delta V_{CC} = \pm 100\text{ mV at } 100\text{ kHz}$  |      | 50   |      | dB                           |
| $I_{CC}$  | Supply current per operator   | Full power, no load  |      | 13   | 16   | mA                           |
|   |   | $T_{min.} < T_{amb} < T_{max.}$  |      | 14   |      |                              |
|   |   | Medium power, no load  |      | 9.7  | 12   | mA                           |
|   |   | $T_{min.} < T_{amb} < T_{max.}$  |      | 10.5 |      |                              |
|   |   | Low power, no load   |      | 2.6  | 4    | mA                           |
| $T_{min.} < T_{amb} < T_{max.}$                       |   | 2.9  |      |      |      |                              |
| <b>Dynamic performance and output characteristics</b> |   |  |      |      |      |                              |
| Bw  | -3 dB bandwidth in small signal   | Small signal $V_{out} = 20\text{ mVp-p}$<br>$R_L = 100\ \Omega$<br>Gain = +2, Rfb = 620 $\Omega$<br>Gain = +4, Rfb = 390 $\Omega$<br>Gain = +8, Rfb = 390 $\Omega$ | 140  | 300  |      | MHz                          |
|   |   |  |      | 210  |      |                              |
|   |   |  |      | 110  |      |                              |
|   |   | Gain = +4, medium power  |      | 160  |      |                              |
|   |   | Gain = +4, low power   |      | 60   |      |                              |
| $R_{OL}$  | Open-loop transimpedance  | $R_L = 100\ \Omega$ , $V_{out} = 7\text{ Vp-p}$  | 30   | 70   |      | k $\Omega$                   |
|   |   | $T_{min.} < T_{amb} < T_{max.}$  |      | 50   |      |                              |
| SR  | Slew rate   | Gain = +4, $R_L = 100\ \Omega$<br>$V_{out} = 5\text{ Vp-p}$<br>$V_{out} = 10\text{ Vp-p}$  | 400  | 650  |      | V/ $\mu\text{s}$             |
|   |   |  |      | 1000 |      |                              |
|   |   | Medium power, $V_{out} = 5\text{ Vp-p}$  |      | 500  |      |                              |
|   | Low power, $V_{out} = 5\text{ Vp-p}$                                      | 200  |      |      |      |                              |
| $V_{OH}$  | High level output voltage   | $R_L = 100\ \Omega$  | 5    | 5.1  |      | V                            |
|   |   | $T_{min.} < T_{amb} < T_{max.}$  |      | 5    |      |                              |

Table 4.  $V_{CC} = \pm 6\text{ V}$ ,  $T_{amb} = 25^\circ\text{ C}$ , full power mode (unless otherwise specified) (continued)

| Symbol   | Parameter  | Test conditions   | Min. | Typ.       | Max. | Unit                   |
|--|--|---|------|------------|------|------------------------|
| $V_{OL}$   | Low level output voltage                                 | $R_L = 100\ \Omega$   |      | -5.1       | -5   | V                      |
|  |  | $T_{min.} < T_{amb} < T_{max.}$   |      | -5         |      |                        |
| $I_{out}$  | $I_{sink}$   | $V_{out} = -4\text{ V}$   | 450  | 540        |      | mA                     |
|  |  | $T_{min.} < T_{amb} < T_{max.}$   |      | 510        |      |                        |
|  | $I_{source}$   | $V_{out} = +4\text{ V}$   |      | -550       | -450 |                        |
|  |  | $T_{min.} < T_{amb} < T_{max.}$   |      | -490       |      |                        |
| $I_{short\ circuit}$<br>(limited by thermal shut down) | Output to GND<br>(limited by internal thermal shut-down) |   | 800  |            |      |                        |
| <b>Noise and distortion</b>                            |  |   |      |            |      |                        |
| eN   | Equivalent input noise voltage                           | $F = 100\text{ kHz}$  |      | 3.5        |      | nV/ $\sqrt{\text{Hz}}$ |
| iNp  | Positive input noise current                             | $F = 100\text{ kHz}$  |      | 39         |      | pA/ $\sqrt{\text{Hz}}$ |
| iNn  | Positive input noise current                             | $F = 100\text{ kHz}$  |      | 20         |      | pA/ $\sqrt{\text{Hz}}$ |
| H2/H3  | 2nd and 3rd harmonics                                    | $V_{out} = 2\text{ Vp-p}$ , gain = +4,<br>$F = 6\text{ MHz}$<br>$R_L = 100\ \Omega$ ,<br>H2<br>H3 |      | -66<br>-73 |      | dBc                    |
| <b>Power-down function</b>                             |  |   |      |            |      |                        |
| $I_{pdw}$  | Consumption in power-down mode                           | $A1 = 0, A0 = 0$  |      | 90         | 300  | $\mu\text{A}$          |
|  |  | $T_{min.} < T_{amb} < T_{max.}$   |      | 110        |      |                        |
| ton  | Time for power-down mode to operating mode               | $A1 = A0 = 0$ to $A1 = A0 = 1$<br>$V_{out} = 4\text{ Vdc}$ , gain = +4                            |      | 60         | 200  | ns                     |
| toff   | Time for operating mode to power-down mode               | $A1 = A0 = 1$ to $A1 = A0 = 0$<br>$V_{out} = 4\text{ Vdc}$ , gain = +4                            |      | 550        | 1000 | ns                     |

**Table 5. A1 and A0 thresholds**

| Symbol | Parameter           | Test condition | Min.                   | Max.                     |
|--------|---------------------|----------------|------------------------|--------------------------|
| A1     | A1 and A0 threshold | High level     | $-V_{CC} + 2\text{ V}$ | $+V_{CC}$                |
| A0     |                     | Low level      | $-V_{CC}$              | $-V_{CC} + 0.8\text{ V}$ |

**Table 6. A1 and A0 states**

| A1 | A0 | State of the TS617 |
|----|----|--------------------|
| 0  | 0  | Standby            |
| 0  | 1  | Low power          |
| 1  | 0  | Medium power       |
| 1  | 1  | High power         |

**Table 7. Feedback resistor**

| Gain ( $V2/V1$ ) | Rfb ( $\Omega$ ) |
|------------------|------------------|
| 2                | 620              |
| 4                | 390              |
| 8                | 390              |

**Figure 1. Feedback configuration**

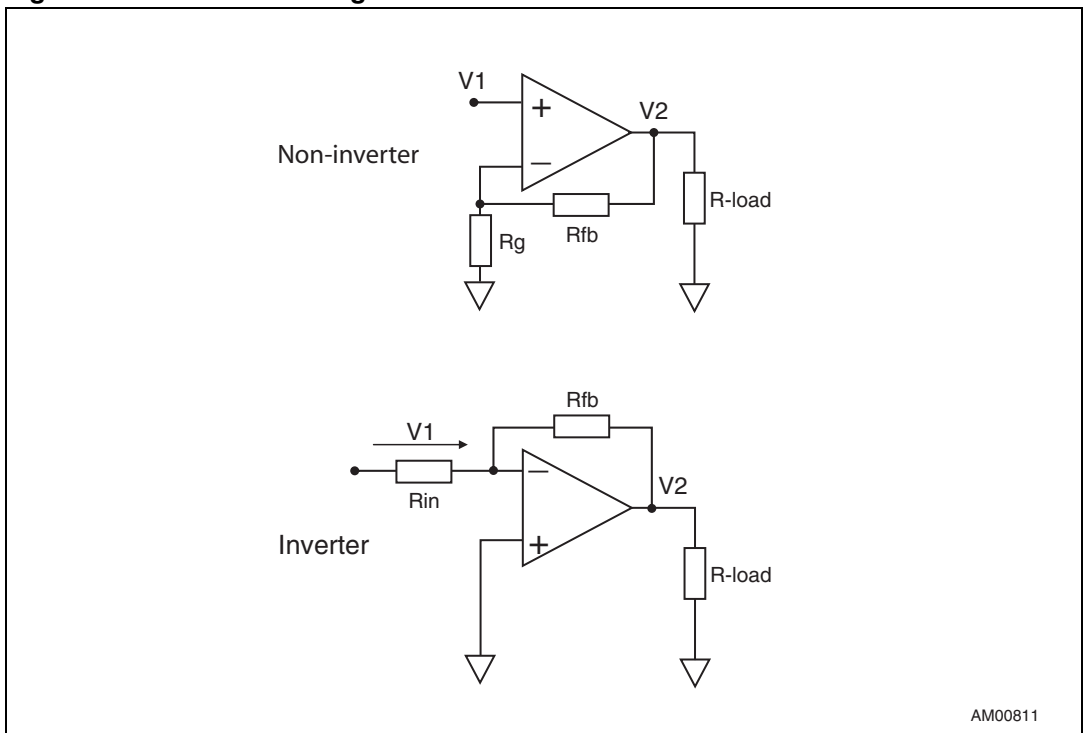


Figure 2. Gain vs. frequency ( $V_{CC} = 5\text{ V}$ )

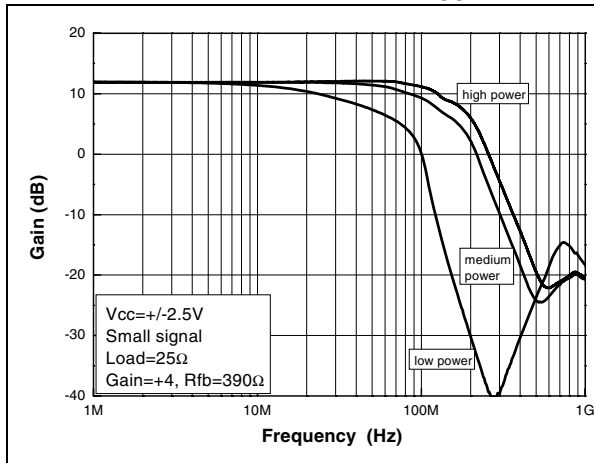


Figure 3. Gain vs. frequency ( $V_{CC} = 12\text{ V}$ )

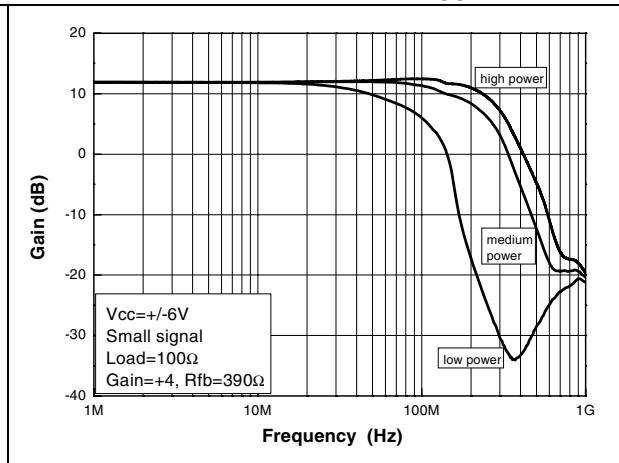


Figure 4. Input noise

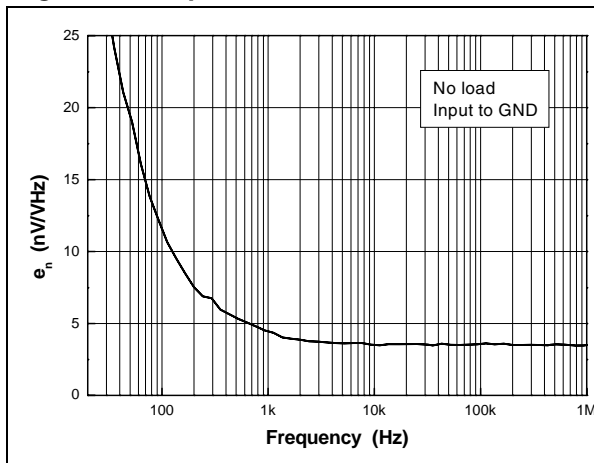


Figure 5. Distortion ( $V_{CC} = 5\text{ V}$ )

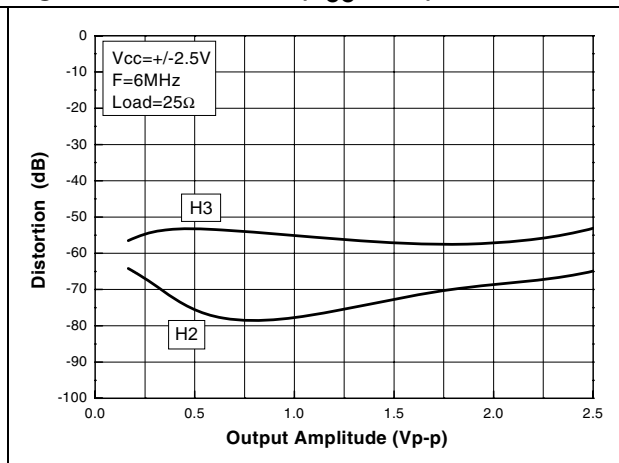


Figure 6. Distortion ( $V_{CC} = 12\text{ V}$ )

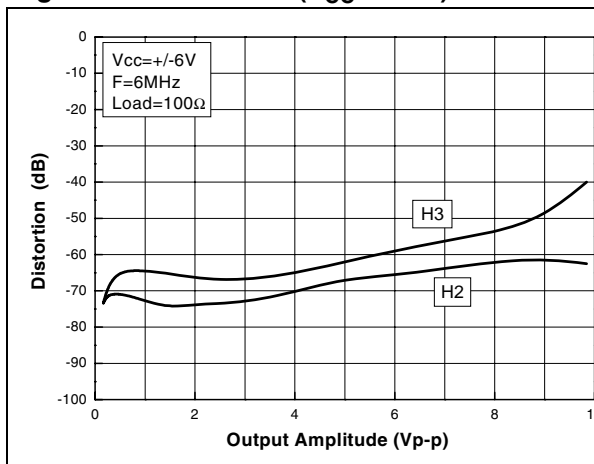


Figure 7.  $I_{CC}$  vs.  $V_{CC}$

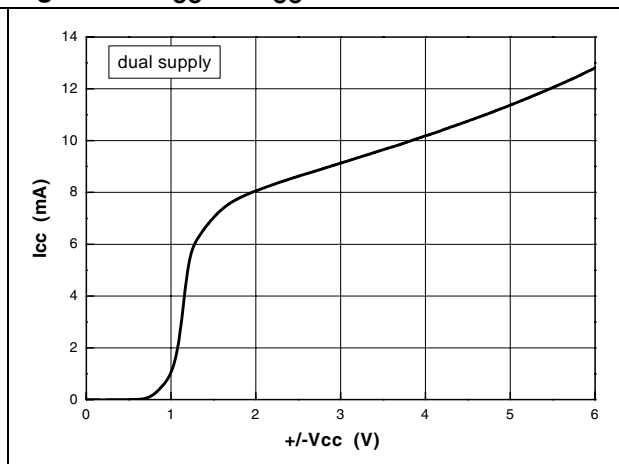




Figure 8. PSRR

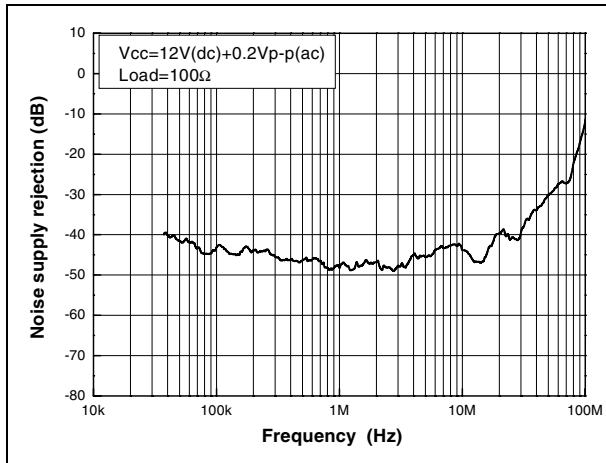


Figure 9. Bandwidth vs. temperature

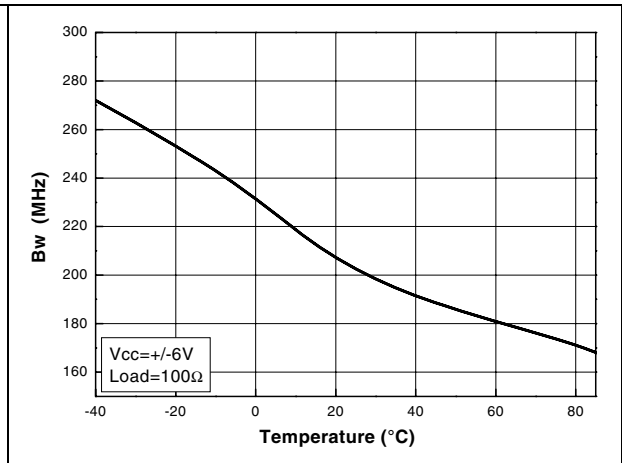


Figure 10. Transimpedance vs. temperature

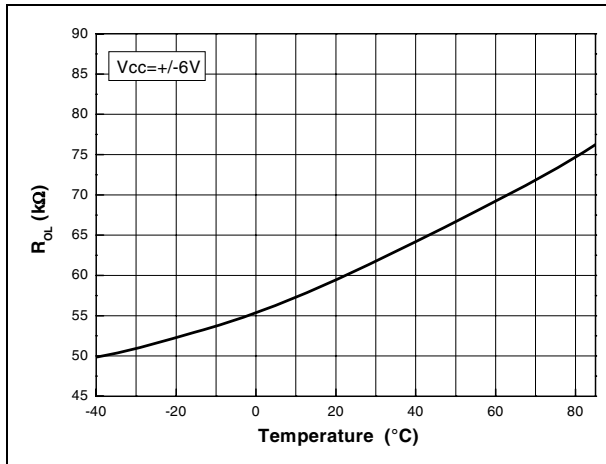


Figure 11. I<sub>CC</sub> vs. temperature

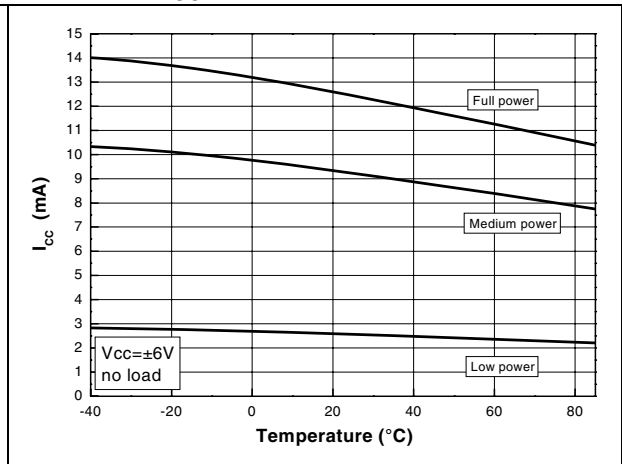


Figure 12. Slew rate vs. temperature

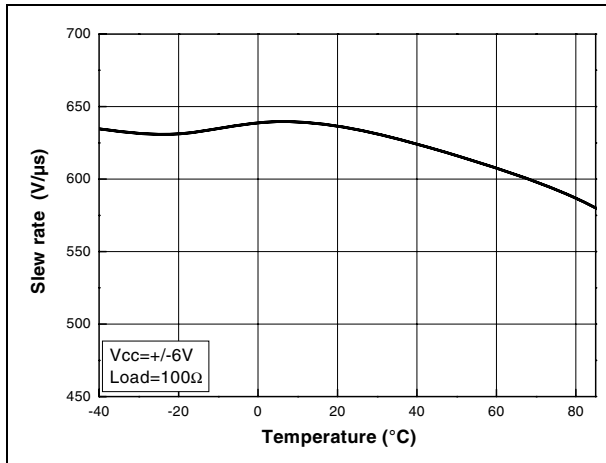


Figure 13. V<sub>io</sub> vs. temperature

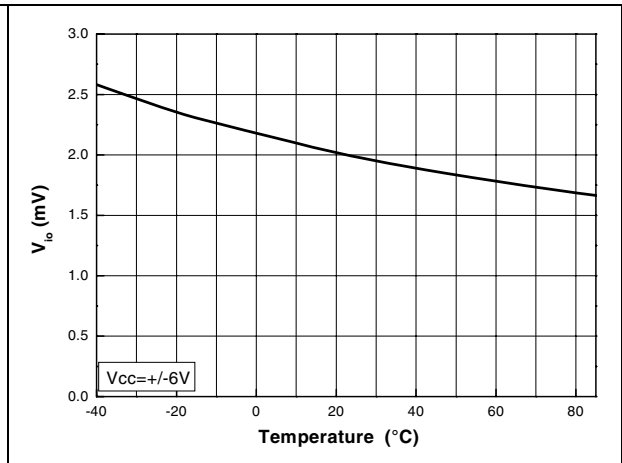


Figure 14. I<sub>BIAS</sub> vs. temperature

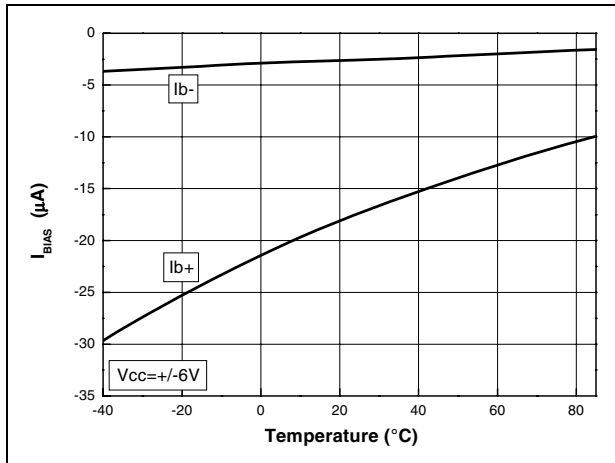


Figure 15. Power down vs. temperature

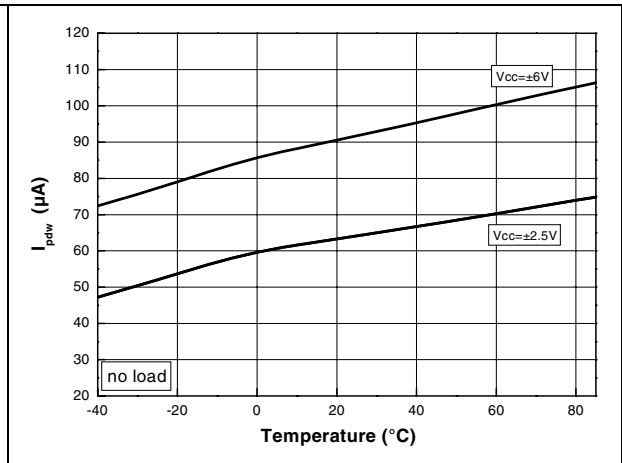


Figure 16. V<sub>OH</sub> vs. temperature

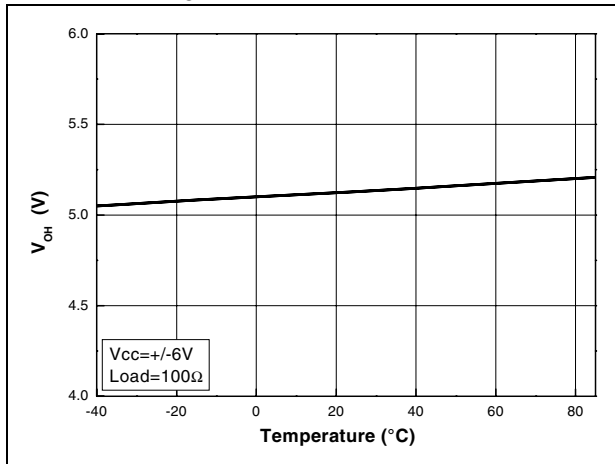


Figure 17. V<sub>OL</sub> vs. temperature

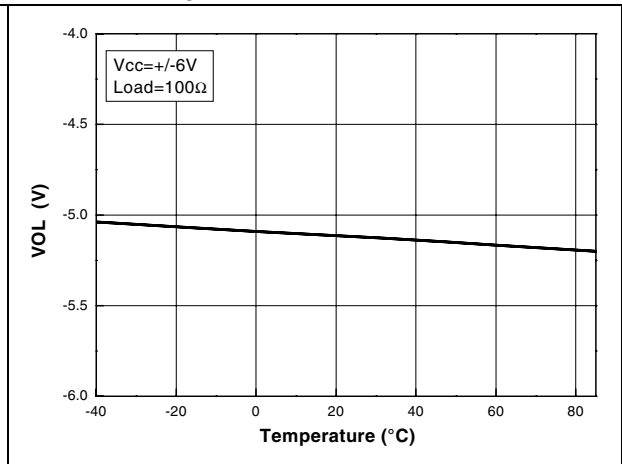


Figure 18. T<sub>on</sub> vs. temperature

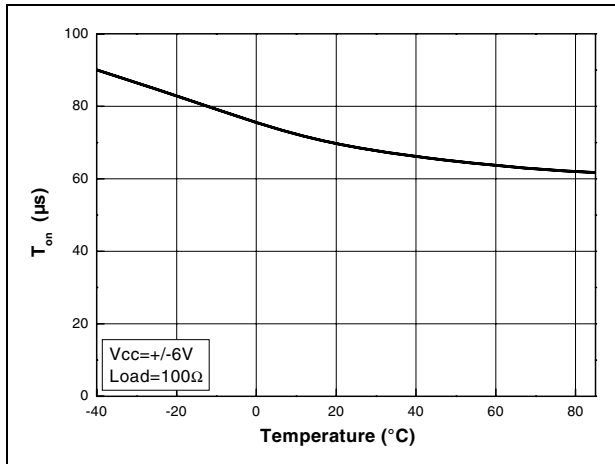


Figure 19. T<sub>off</sub> vs. temperature

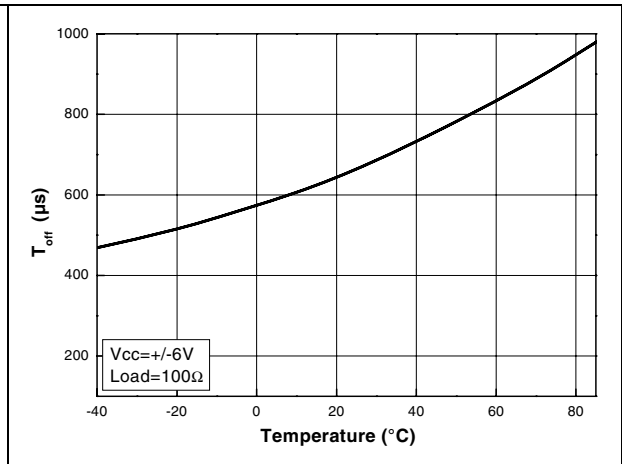


Figure 20.  $I_{sink}$  vs. temperature

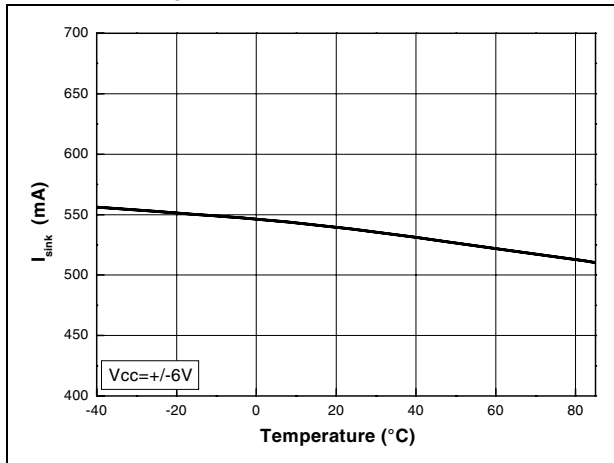


Figure 21.  $I_{source}$  vs. temperature

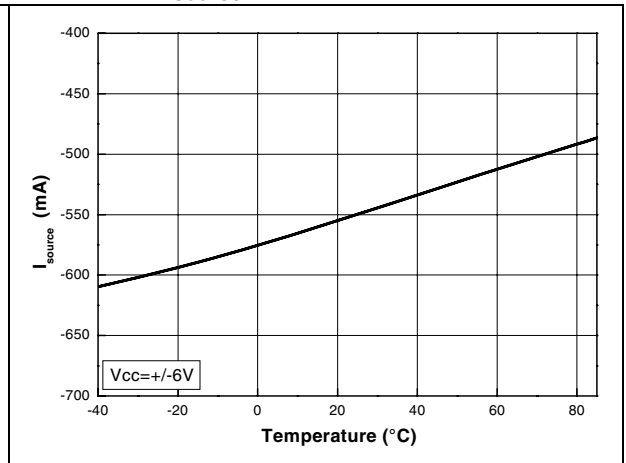


Figure 22. SVR vs. temperature

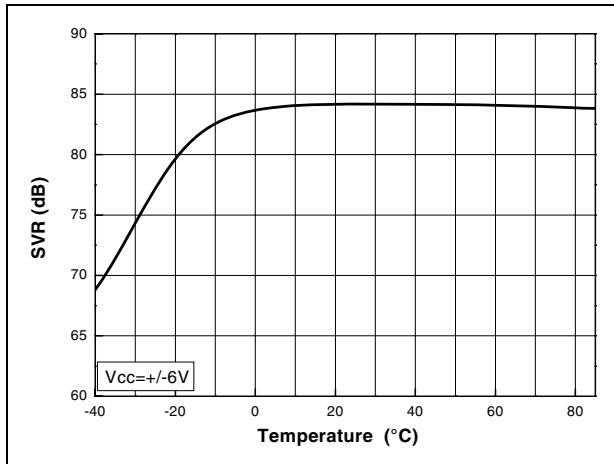
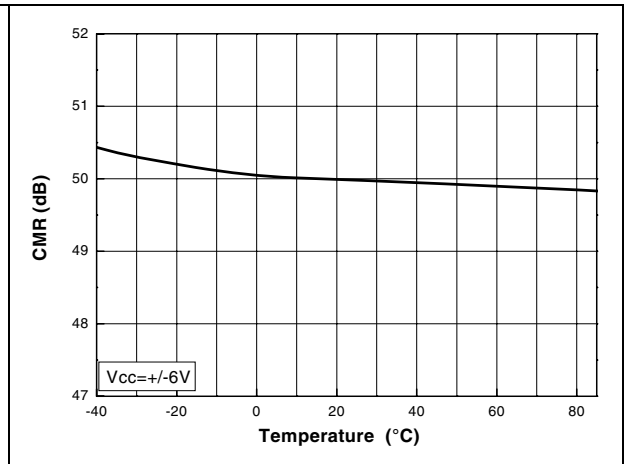
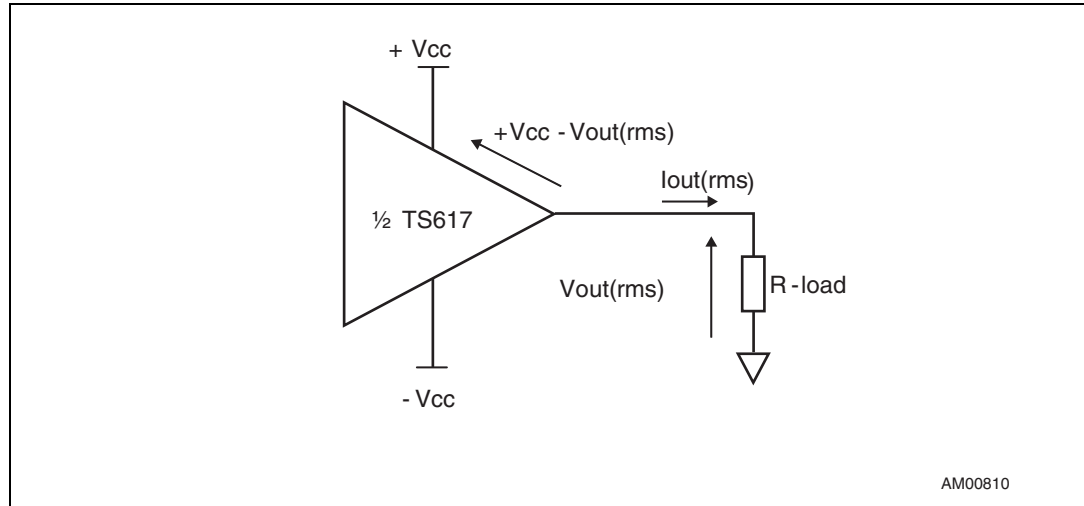


Figure 23. CMR vs. temperature



### 3 Safe operating area

Figure 24. Equivalent schematic



$V_{out}(rms)$  is the rms output voltage value.  $I_{out}(rms)$  is the rms output current value through the output load R-load. When supplied by +/-Vcc, the power which must be dissipated by one operator is  $p=I_{out}(rms) \times (+V_{cc}-V_{out}(rms))$ . Since the TS617 is used in a differential configuration using both operators, it must dissipate  $2 \times p$ . The power dissipated by the TS617 is derived from:

(eq1),

$$P = 2 \times [ I_{out}(rms) \times (+V_{cc}-V_{out}(rms)) ] .$$

In the following formula:

(eq2),

$$P = \frac{(T_j - T_{amb})}{R_{thja}}$$

$T_j$  is the junction temperature,  $T_{amb}$  is the ambient temperature and  $R_{thja}$  is the junction-to-ambient thermal resistance of the package (SO-14:  $R_{thja} = 103^\circ \text{C/watt}$ ).

Assuming that  $T_j$  must be lower than  $150^\circ \text{C}$  to avoid any damage to the dice, it is derived from (eq2):

(eq3),

$$P_{max} = \frac{150 - T_{amb}}{103}, \text{ (inWatt)}$$

From (eq1) and (eq3) we can easily extract the maximum value of  $V_{out}(rms)$  that the TS617 can drive without any damage (according to  $T_{amb}$  and R-load).

## 4 Typical application

Figure 25. Power line interface

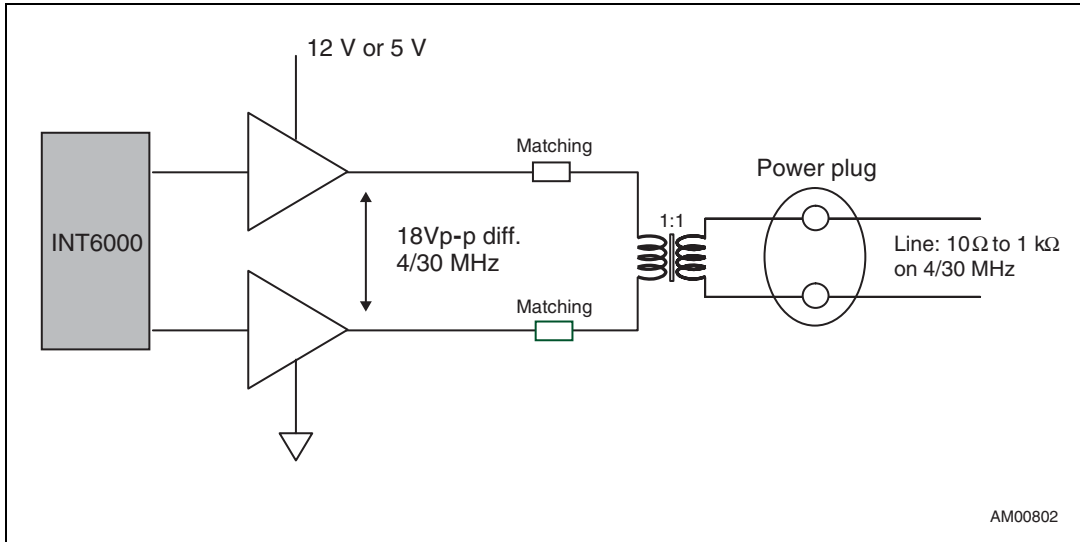
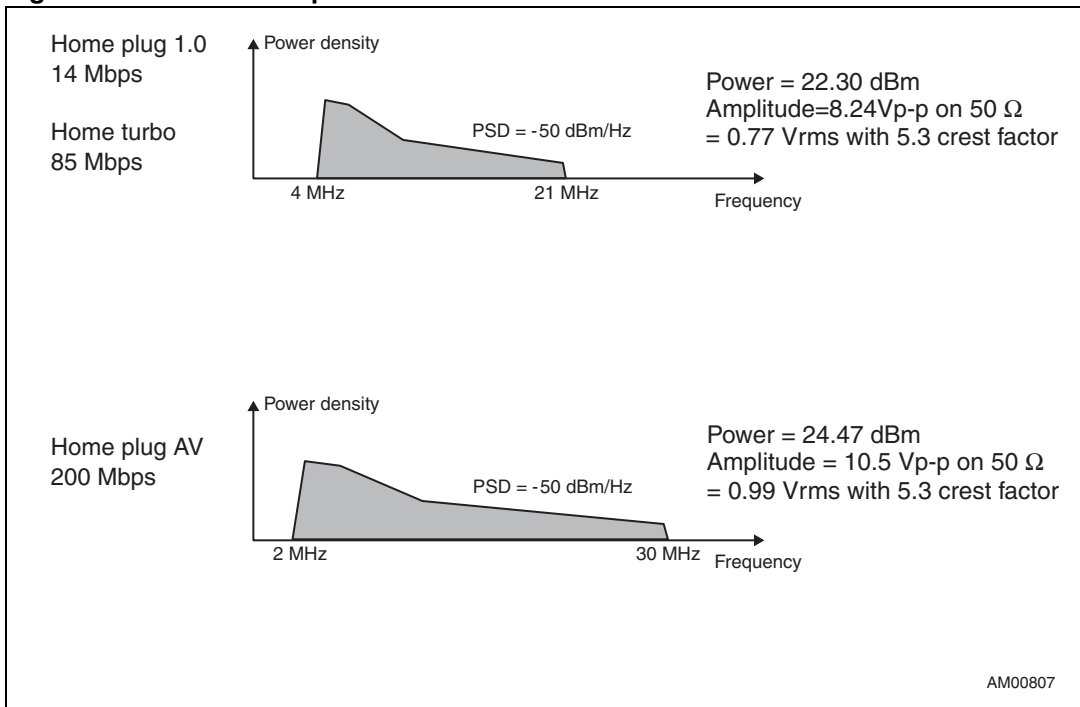


Figure 26. Power line spectrums



- Power on the line:  $P(\text{dBm}) = 10 \text{ Log}(\Sigma Bw \times 10^{PSD/10})$
- PSD: power spectrum density
- $\Sigma Bw$ : total bandwidth summation
- Power line: PSD = -50 dBm/Hz on 50 Ω

Figure 27. vDSL interface

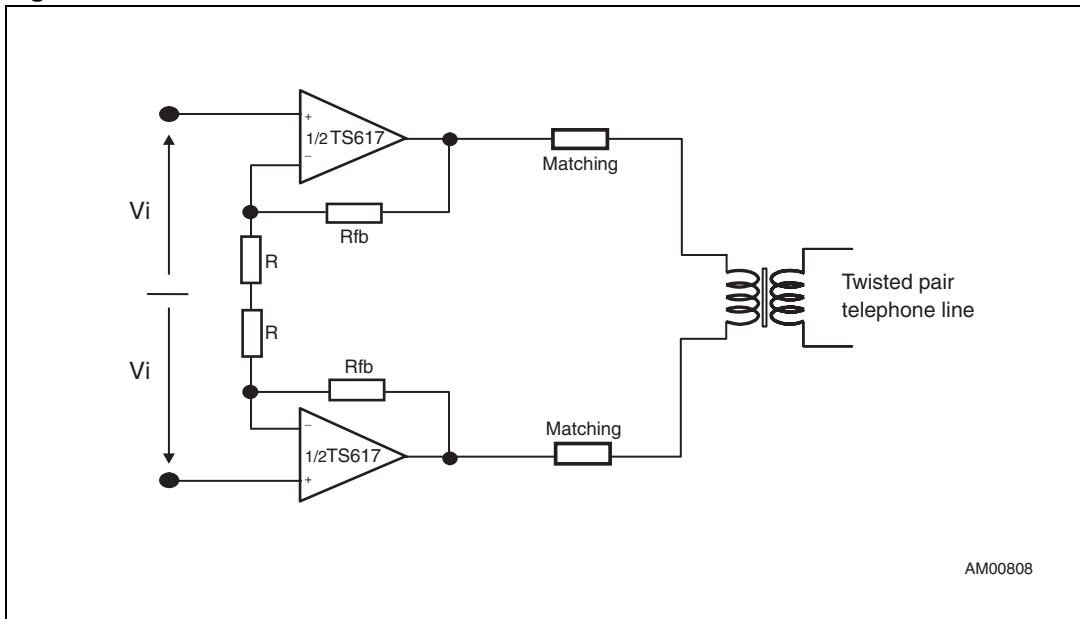


Figure 28. vDSL spectrum

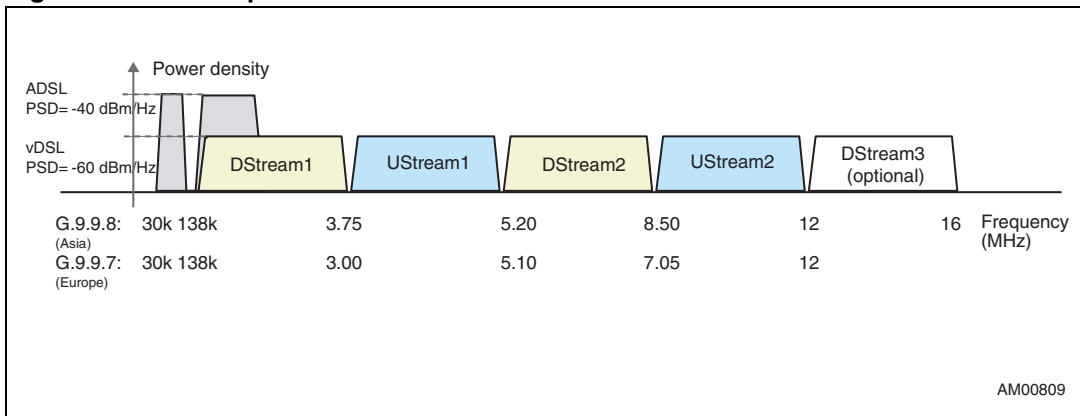


Table 8. vDSL spectrum

| G. 9.9.8 Standard     |                      | G. 9.9.7 Standard     |                      |
|-----------------------|----------------------|-----------------------|----------------------|
| Power (on 100-Ω line) | Vp-p (on 100-Ω line) | Power (on 100-Ω line) | Vp-p (on 100-Ω line) |
| CPE: 6.95 dBm         | 7.9 Vp-p             | CPE: 8.48 dBm         | 9.4 Vp-p             |
| CO: 8.4 dBm           | 9.3 Vp-p             | CO: 6.82 dBm          | 7.8 Vp-p             |
| CO DS3: 10.4 dBm      | 11.7 Vp-p            | CO DS3: 9.45 dBm      | 10.5 Vp-p            |

## 5 Package information

In order to meet environmental requirements, STMicroelectronics offers these devices in ECOPACK<sup>®</sup> packages. These packages have a lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an STMicroelectronics trademark. ECOPACK specifications are available at: [www.st.com](http://www.st.com).

Figure 29. SO-14 package mechanical drawing

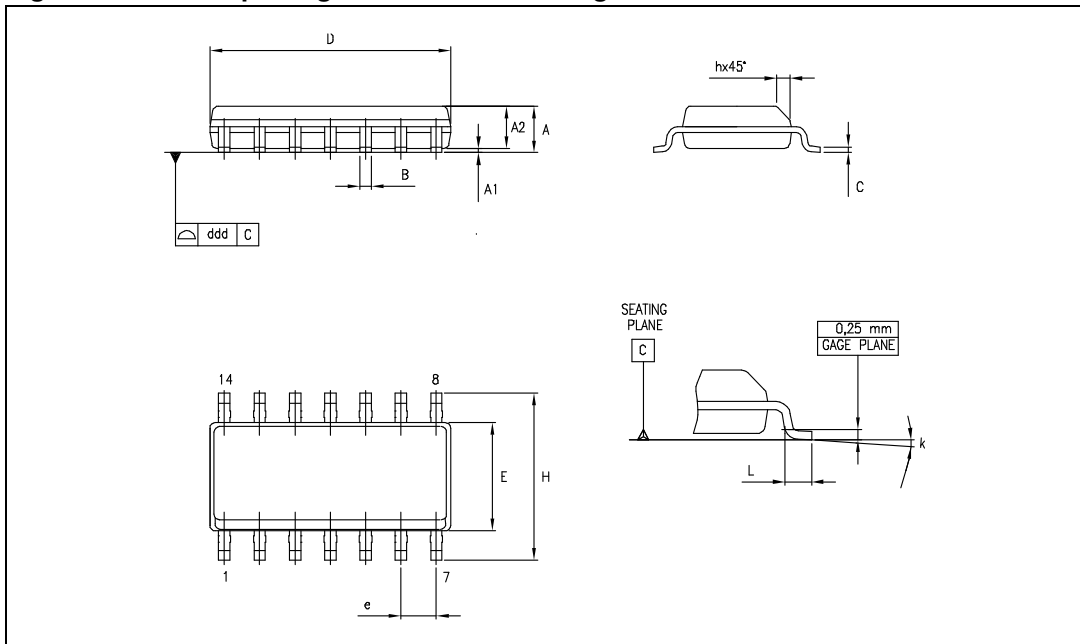


Table 9. SO-14 package mechanical data

| Dimensions |             |      |      |        |      |       |
|------------|-------------|------|------|--------|------|-------|
| Ref.       | Millimeters |      |      | Inches |      |       |
|            | Min.        | Typ. | Max. | Min.   | Typ. | Max.  |
| A          | 1.35        |      | 1.75 | 0.05   |      | 0.068 |
| A1         | 0.10        |      | 0.25 | 0.004  |      | 0.009 |
| A2         | 1.10        |      | 1.65 | 0.04   |      | 0.06  |
| B          | 0.33        |      | 0.51 | 0.01   |      | 0.02  |
| C          | 0.19        |      | 0.25 | 0.007  |      | 0.009 |
| D          | 8.55        |      | 8.75 | 0.33   |      | 0.34  |
| E          | 3.80        |      | 4.0  | 0.15   |      | 0.15  |
| e          |             | 1.27 |      |        | 0.05 |       |
| H          | 5.80        |      | 6.20 | 0.22   |      | 0.24  |
| h          | 0.25        |      | 0.50 | 0.009  |      | 0.02  |
| L          | 0.40        |      | 1.27 | 0.015  |      | 0.05  |
| k          | 8° (max.)   |      |      |        |      |       |
| ddd        |             |      | 0.10 |        |      | 0.004 |

Note: D and F dimensions do not include mold flash or protrusions. Mold flash or protrusions must not exceed 0.15 mm.



## 6 Ordering information

Table 10. Order codes

| Order code | Temperature range | Package | Packaging   | Marking |
|------------|-------------------|---------|-------------|---------|
| TS617ID    | -40°C to +85°C    | SO-14   | Tube        | TS617I  |
| TS617IDT   |                   |         | Tape & reel |         |

## 7 Revision history

Table 11. Document revision history

| Date        | Revision | Changes          |
|-------------|----------|------------------|
| 03-Nov-2008 | 1        | Initial release. |

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