

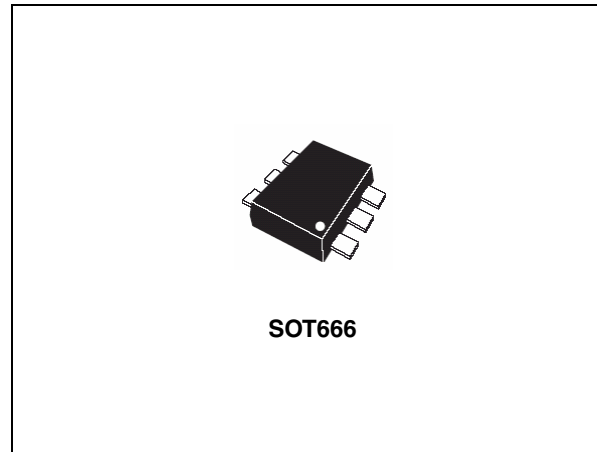


STLQ015xx

150 mA, ultra-low quiescent current
linear voltage regulator

Features

- Input voltage from 1.5 to 5.5 V
- Very low quiescent current:
 - 1.0 μA (typ) at no load
 - 1.4 μA (typ) at 150 mA load
 - 1 nA (typ) in OFF mode
 - 200 nA max in OFF mode at 125 °C
- Output voltage tolerance: $\pm 2\%$ at 25 °C
- 150 mA guaranteed output current
- Wide range of output voltages: 0.8 V to 3.3 V in 100 mV steps
- Logic-controlled electronic shutdown
- Compatible with ceramic capacitor ($C_{\text{OUT}} = 1 \mu\text{F}$)
- Internal current and thermal limit
- Package: SOT666-6L
- Temperature range: -40 °C to 125 °C



requiring very long standby time. The enable logic control function puts the STLQ015xx in shutdown mode, reducing total current consumption to 1 nA. The device also includes short-circuit constant-current limiting and thermal protection. Typical applications for the device are portable and battery-powered systems, electronic sensors, and microcontroller power supply.

Description

The STLQ015xx provides 150 mA of maximum current from an input voltage ranging from 1.5 V to 5.5 V, with a typical dropout voltage of 112 mV. The key feature of this device is its quiescent current, which is just 1.4 μA at maximum output current. The device is stable with a ceramic capacitor on the output. It offers very low quiescent current, extending battery life and making the device suitable for applications

Table 1. Device summary

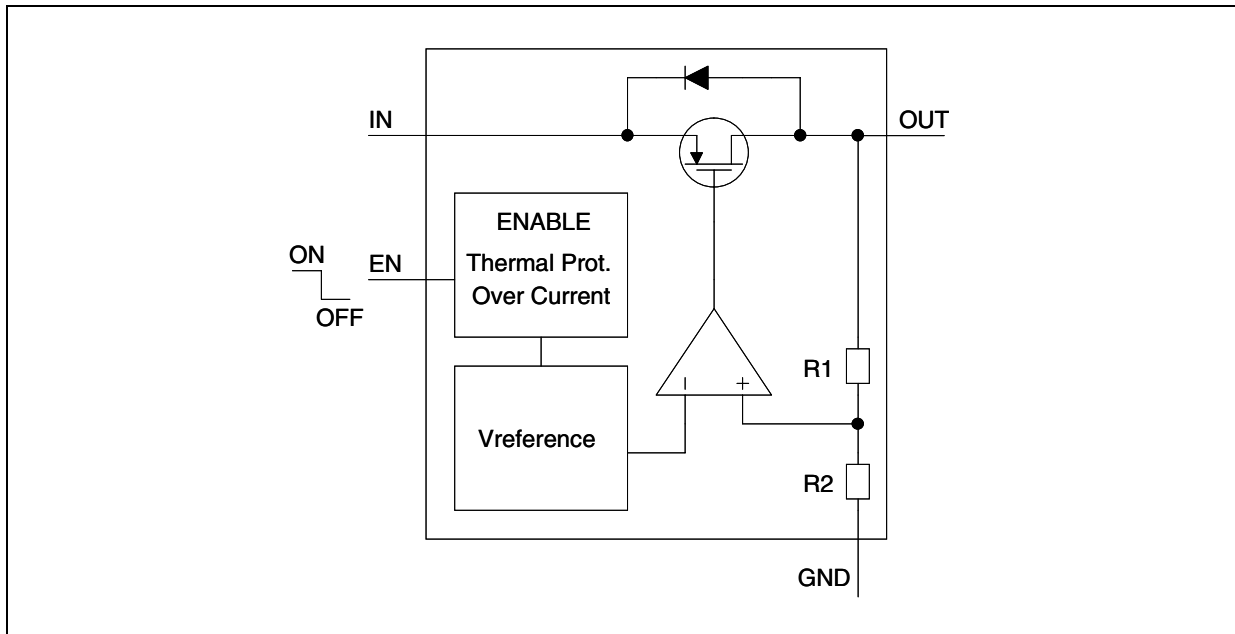
| Part numbers | Order codes | Output voltages |
|--------------|--------------|-----------------|
| STLQ015XX25 | STLQ015XG25R | 2.5 V |
| STLQ015XX28 | STLQ015XG28R | 2.8 V |
| STLQ015XX30 | STLQ015XG30R | 3.0 V |
| STLQ015XX31 | STLQ015XG31R | 3.1 V |
| STLQ015XX33 | STLQ015XG33R | 3.3 V |

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1 STLQ015xx block diagram

Figure 1. Device block diagram



2 Pin configuration and description

Figure 2. Pin configuration (top view)

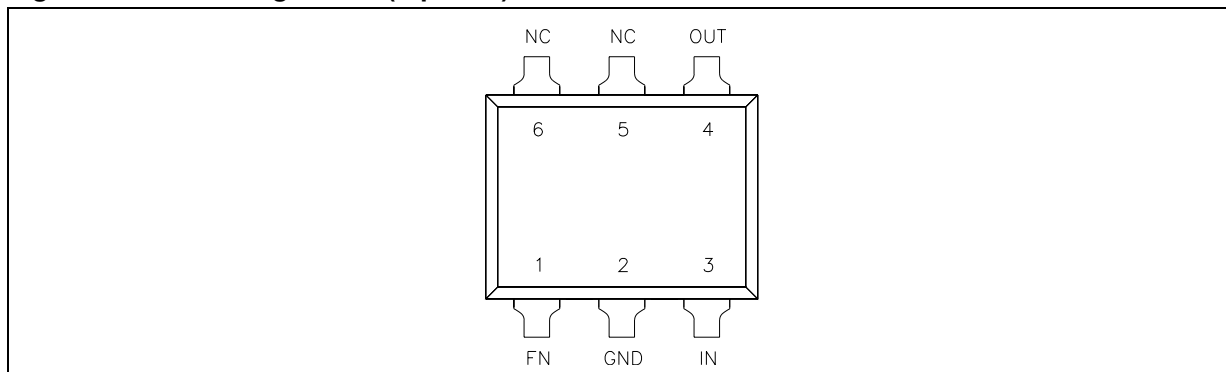
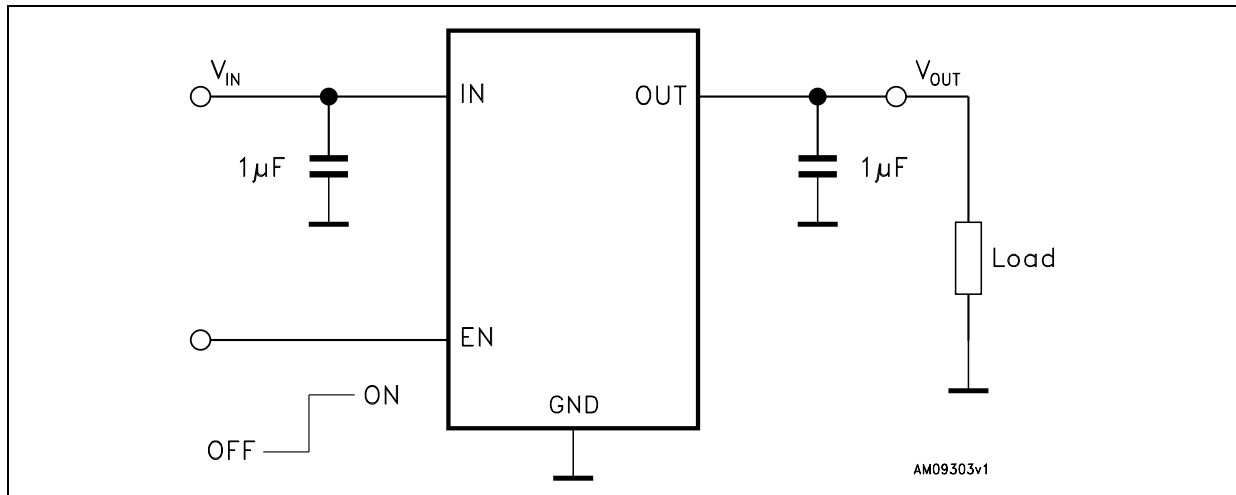


Table 2. Pin description

| Pin | Symbol | Function |
|-----|--------|---|
| 1 | EN | Enable input. Set V_{EN} = High to turn on the device. Set V_{EN} = Low to turn off the device. |
| 2 | GND | Ground |
| 3 | IN | Input voltage |
| 4 | OUT | Output voltage |
| 5 | NC | Not connected |
| 6 | NC | Not connected |

3 Typical application

Figure 3. Typical application circuit



4 Maximum ratings

Table 3. Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|-----------|---------------------------|-------------------------|------|
| V_{IN} | DC input voltage | -0.3 to 7 | V |
| V_{OUT} | DC output voltage | - 0.3 to $V_{IN} + 0.3$ | V |
| V_{EN} | Enable input voltage | - 0.3 to $V_{IN} + 0.3$ | V |
| I_{OUT} | Output current | Internally limited | mA |
| ESD | Human Body Model | ± 3 | kV |
| | Machine Model | ± 300 | V |
| P_D | Power dissipation | Internally limited | mW |
| T_{STG} | Storage temperature range | -65 to 150 | °C |
| T_{OP} | Max junction temperature | 150 | °C |

Note: Absolute maximum ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied. All values are referred to GND.

Table 4. Thermal data

| Symbol | Parameter | SOT666 | Unit |
|------------|-------------------------------------|--------|------|
| R_{thJA} | Thermal resistance junction-ambient | 132 | °C/W |
| R_{thJC} | Thermal resistance junction-case | 56 | °C/W |

5 Electrical characteristics

$T_J = 25\text{ }^\circ\text{C}$, $V_{IN} = V_{OUT(NOM)} + 1\text{ V}$, $C_{IN} = C_{OUT} = 1\text{ }\mu\text{F}$, $I_{OUT} = 1\text{ mA}$, $V_{EN} = V_{IN}$, unless otherwise specified.

Table 5. Electrical characteristics

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------------------|---|--|------|-------------|------|---------------------|
| V_{IN} | Operating input voltage | $I_{OUT} = 0$ | 1.5 | | 5.5 | V |
| | | $-40^\circ\text{C} < T_J < 125^\circ\text{C}$, $I_{OUT} = 150\text{mA}$ | 1.55 | | 5.5 | |
| V_{OUT} | V_{OUT} accuracy | $I_{OUT} = 1\text{mA}$ | -2 | | 2 | % |
| | | $I_{OUT} = 1\text{mA}$, $V_{OUT} < 1\text{V}$ | -20 | | +20 | mV |
| | | $I_{OUT} = 1\text{mA}$, $-40^\circ\text{C} < T_J < 125^\circ\text{C}$ | -3 | | 3 | % |
| $\Delta V_{OUT-LINE}$ | Static line regulation | $V_{OUT} + 1\text{V} \leq V_{IN} \leq 5.5\text{V}$, $I_{OUT} = 1\text{mA}$ | | ± 0.01 | | %/V |
| $\Delta V_{OUT-LOAD}$ | Static load regulation | $I_{OUT} = 1\text{mA}$ to 150mA | | ± 0.002 | | %/mA |
| V_{DROP} | Dropout voltage ⁽¹⁾ | $I_{OUT} = 150\text{mA}$ | | 112 | | mV |
| | | $I_{OUT} = 150\text{mA}$, $-40^\circ\text{C} < T_J < 125^\circ\text{C}$ | | | 300 | |
| e_N | Output noise voltage | 10kHz to 100kHz, $I_{OUT} = 10\text{mA}$, $V_{OUT} = 0.8\text{V}$ | | 75 | | μV_{RMS} |
| SVR | Supply voltage rejection $V_{OUT} = 0.8\text{V}$ | $V_{IN} = V_{OUTNOM} + 1\text{V} \pm V_{RIPPLE}$ $V_{RIPPLE} = 0.1\text{V}$, Freq. = 1kHz $I_{OUT} = 10\text{mA}$ | | 40 | | dB |
| | | $V_{IN} = V_{OUTNOM} + 1\text{V} \pm V_{RIPPLE}$ $V_{RIPPLE} = 0.1\text{V}$, Freq.=10kHz $I_{OUT} = 1\text{mA}$ | | 30 | | |
| | | $V_{IN} = V_{OUTNOM} + 1\text{V} \pm V_{RIPPLE}$ $V_{RIPPLE} = 0.1\text{V}$, Freq.=100kHz $I_{OUT} = 1\text{mA}$ | | 15 | | |
| I_Q | Quiescent current | $I_{OUT} = 0$ | | 1.0 | 1.7 | μA |
| | | $I_{OUT} = 0$ to 150mA , $-40^\circ\text{C} < T_J < 125^\circ\text{C}$ | | 1.7 | 2.4 | |
| I_{OFF} | Shutdown current ⁽²⁾ | V_{IN} input current in OFF mode: $V_{EN} = \text{GND}$, $-40^\circ\text{C} < T_J < 125^\circ\text{C}$ | | 1 | 200 | nA |
| I_{SC} | Short circuit current | $R_L = 0$ | 250 | 350 | | mA |
| V_{EN} | Enable input logic low | $V_{IN} = 1.5\text{V}$ to 5.5V | | | 0.4 | V |
| | Enable input logic high | $V_{IN} = 1.5\text{V}$ to 5.5V | 0.7 | | | V |
| I_{EN} | Enable pin input current | $V_{EN} = 5.5\text{V}$ | | 1 | 200 | nA |
| T_{ON} | Turn-on time ⁽³⁾ | $V_{OUT} = 0.8\text{V}$, $I_{OUT} = 150\text{mA}$ | | 160 | | μs |
| T_{SHDN} | Thermal shutdown | | | 170 | | $^\circ\text{C}$ |
| | Hysteresis | | | 180 | | |

Table 5. Electrical characteristics (continued)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|------------------|------------------|---|-------|------|------|------|
| C _{OUT} | Output capacitor | Capacitance (see typical performance characteristics for stability) | 0.47 | | 10 | μF |
| | ESR | | 0.056 | | 6 | Ω |

1. Dropout voltage is the input-to-output voltage difference at which the output voltage is 100 mV below its nominal value. This specification does not apply for output voltages below 1.5 V
2. During shutdown and at no load, P-channel leakage current flowing through the internal resistor divider determines the increase of V_{OUT}
3. Turn-on time is the time measured between the enable input just exceeding V_{EN} high value and the output voltage just reaching 95% of its nominal value

6 Typical performance characteristics

Figure 4. Output voltage vs. temperature

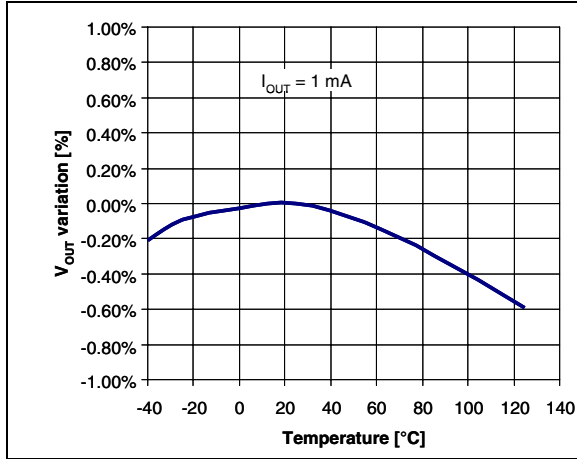


Figure 5. Output voltage vs. input voltage

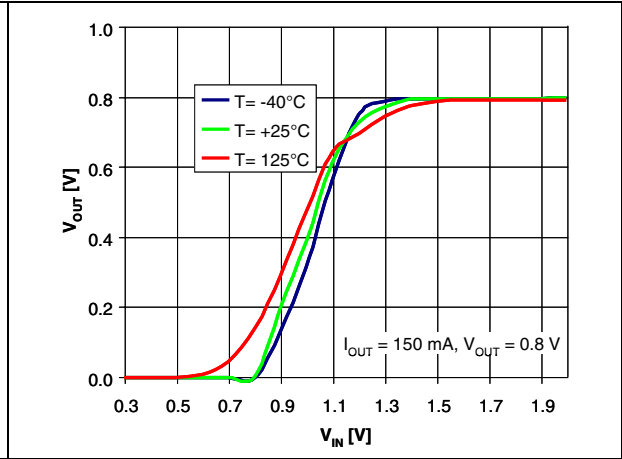


Figure 6. Output voltage vs. input voltage

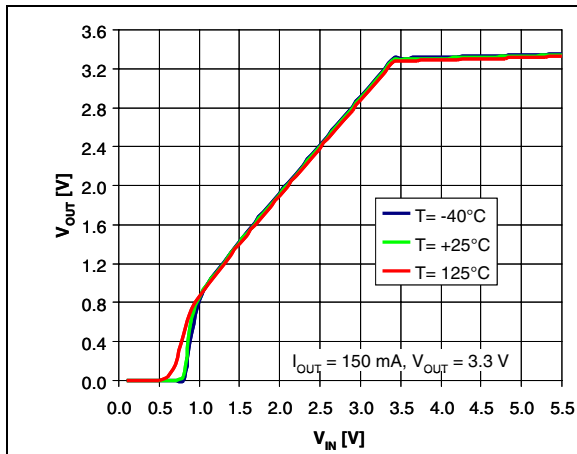


Figure 7. Dropout voltage vs. temperature

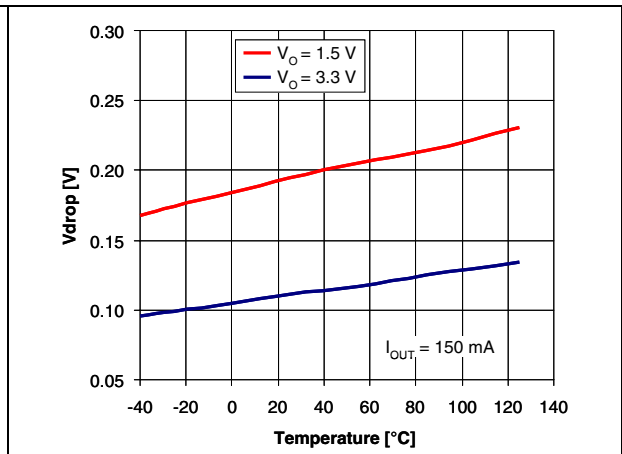


Figure 8. Dropout voltage vs. output current

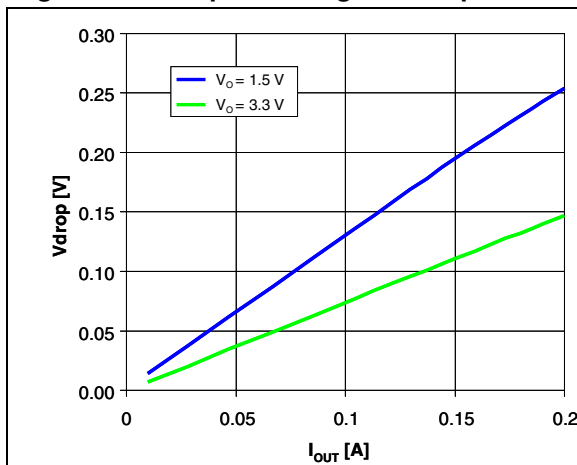


Figure 9. Quiescent current vs. temperature

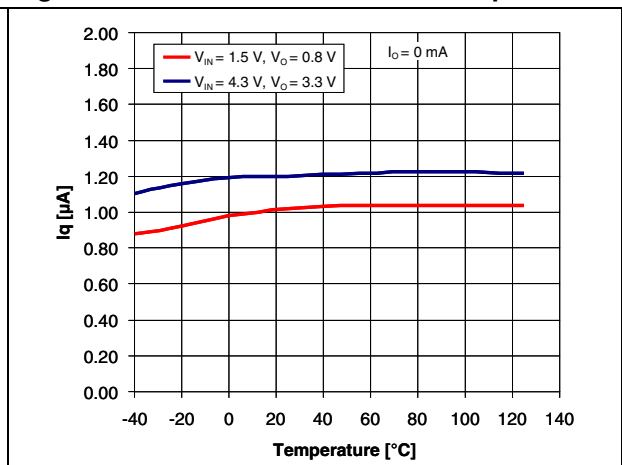


Figure 10. Supply voltage rejection vs. frequency

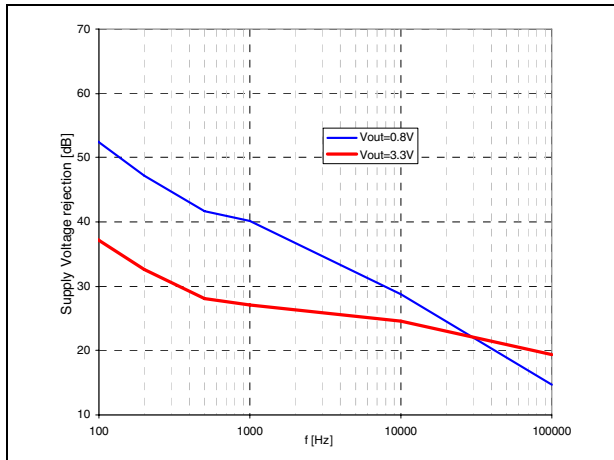


Figure 11. Supply voltage rejection vs. I_{OUT}

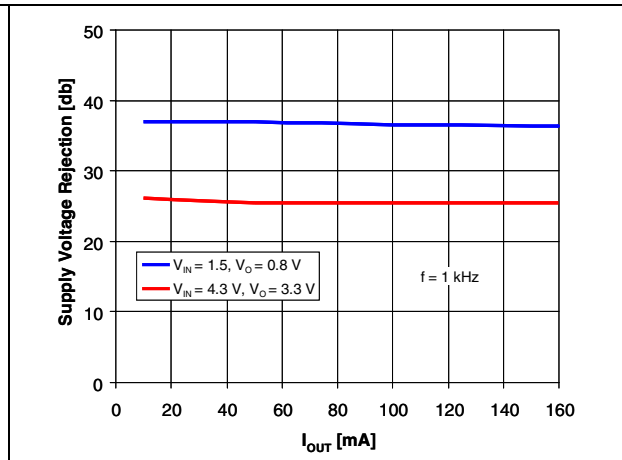


Figure 12. Quiescent current vs. input voltage Figure 13. Quiescent current vs. output current

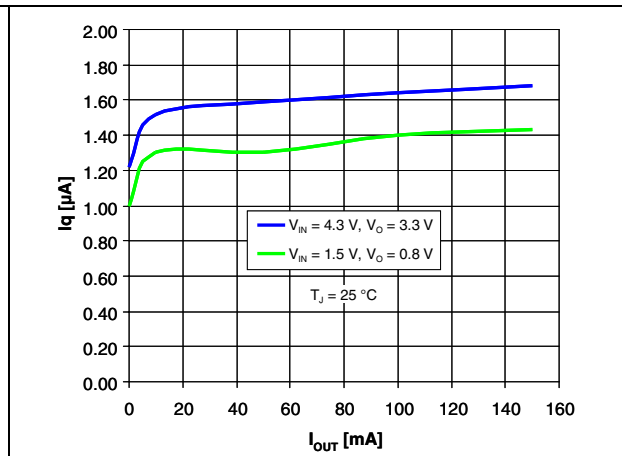
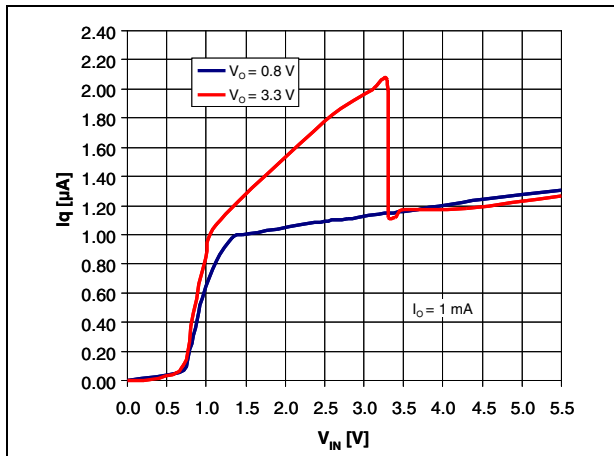


Figure 14. Output noise voltage vs. frequency Figure 15. C_{OUT} stability region

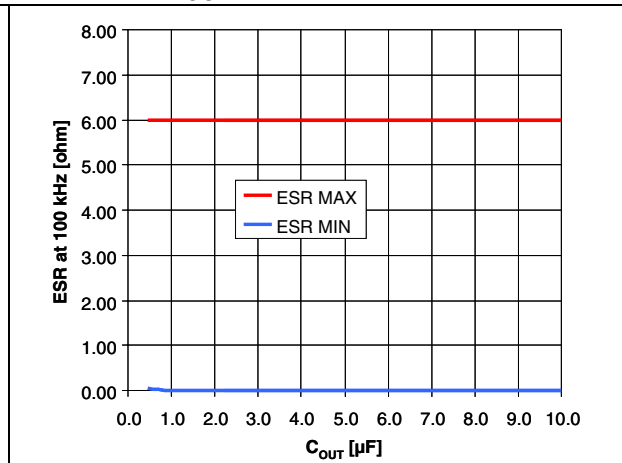
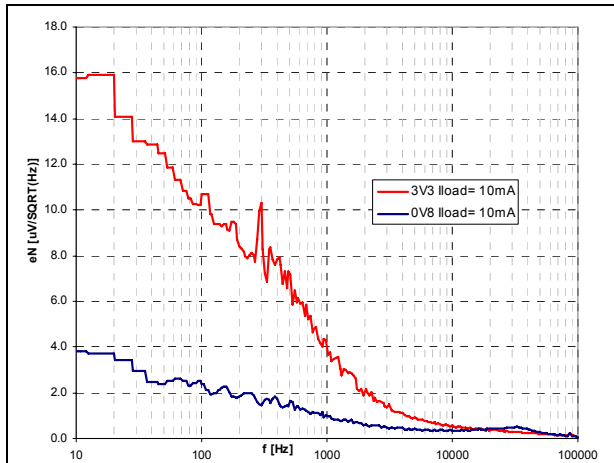
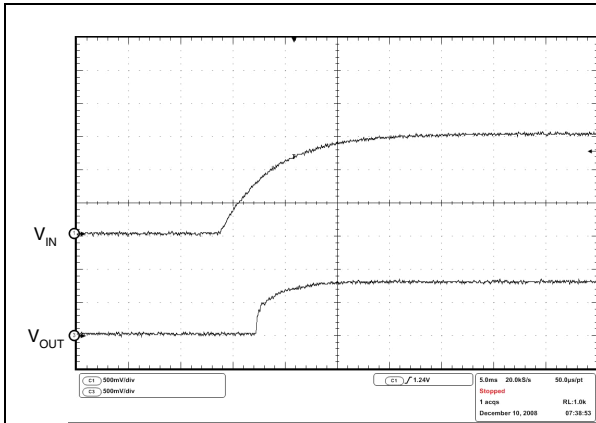
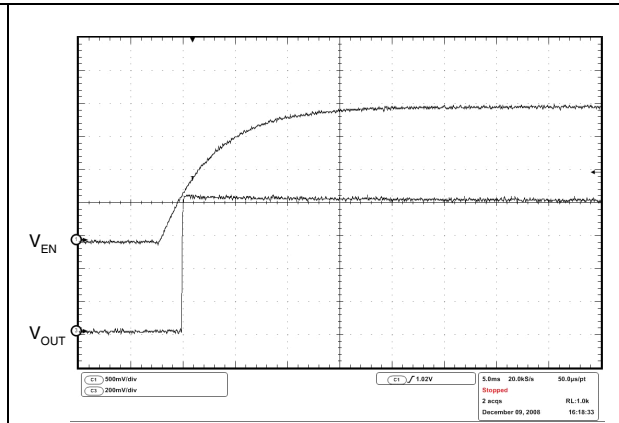


Figure 16. Startup transient



V_{IN} from 0 to 1.5 V, V_{EN} tied to V_{IN} , No Load $C_{OUT} = 1 \mu\text{F}$

Figure 17. Enable transient



$V_{IN} = 1.5 \text{ V}$; V_{EN} from 0 to 2 V, No Load, $T = 25 \text{ }^\circ\text{C}$

7 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK[®] packages, depending on their level of environmental compliance. ECOPACK[®] specifications, grade definitions and product status are available at: www.st.com. ECOPACK[®] is an ST trademark.

Table 6. SOT666 mechanical data

| Dim. | mm. | | | inch. | | |
|------|------|------|------|-------|-------|-------|
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 0.45 | | 0.60 | 0.018 | | 0.024 |
| A3 | 0.08 | | 0.18 | 0.005 | | 0.007 |
| b | 0.17 | | 0.34 | 0.007 | | 0.013 |
| b1 | 0.19 | 0.27 | 0.34 | 0.007 | 0.011 | 0.013 |
| D | 1.50 | | 1.70 | 0.059 | | 0.067 |
| E | 1.50 | | 1.70 | 0.059 | | 0.067 |
| E1 | 1.10 | | 1.30 | 0.043 | | 0.051 |
| e | | 0.50 | | | 0.020 | |
| L1 | | 0.19 | | | 0.007 | |
| L2 | 0.10 | | 0.30 | 0.004 | | 0.012 |
| L3 | | 0.10 | | | 0.004 | |

Figure 18. Drawing dimension SOT666

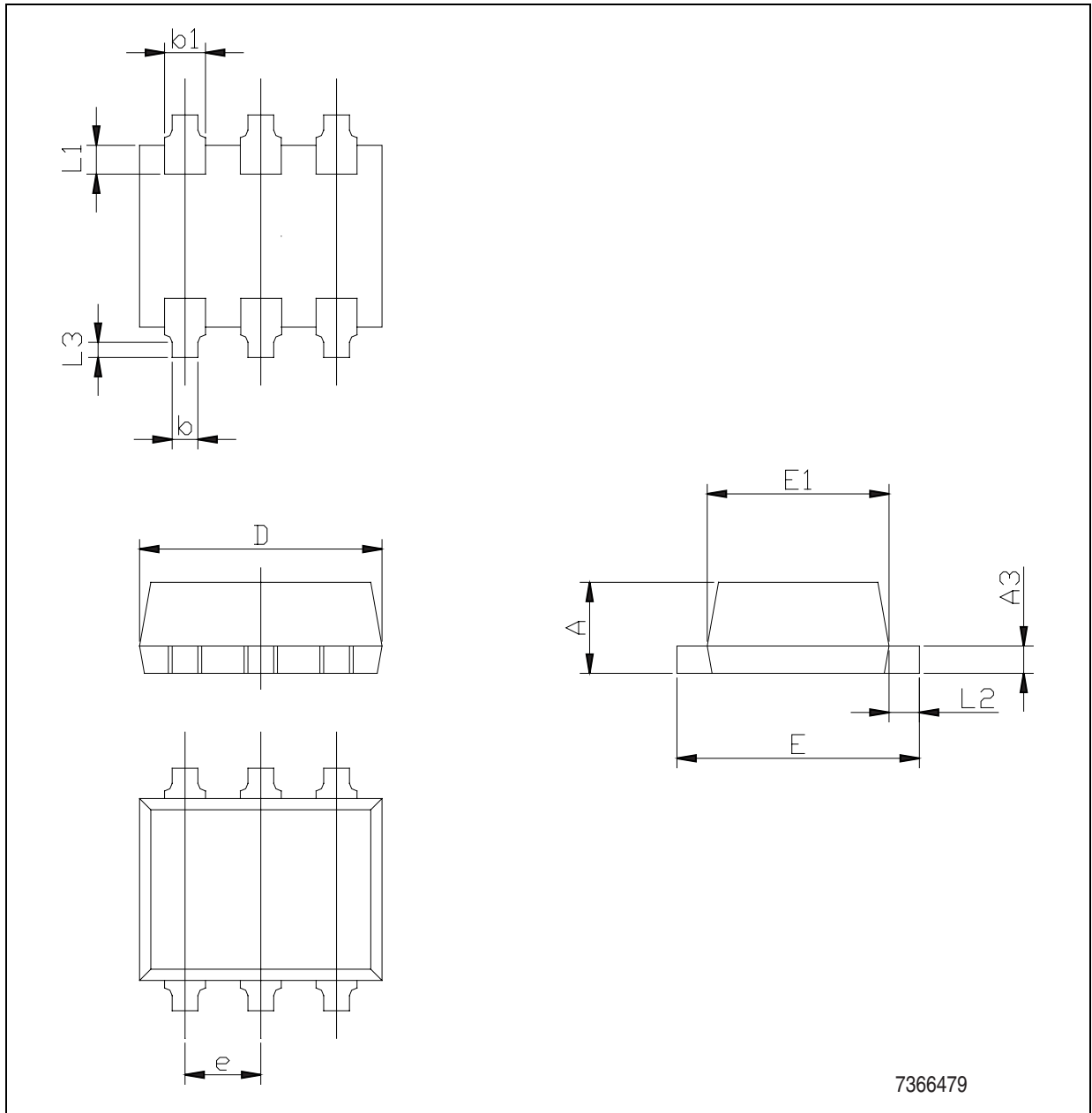
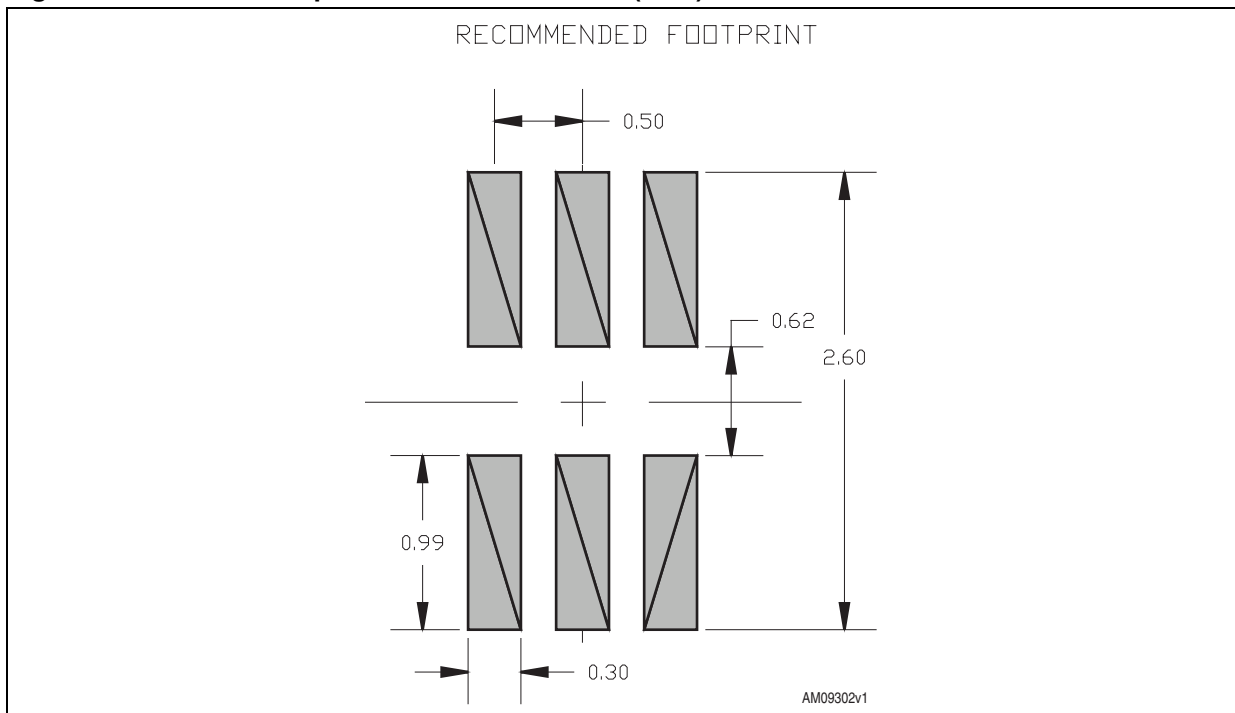


Figure 19. SOT666 footprint recommended data (mm.)



8 Different output voltage versions of the STLQ015xx available on request

Table 7. Options available on request

| Order codes | Output voltages |
|--------------|-----------------|
| STLQ015XG12R | 1.2 V |
| STLQ015XG18R | 1.8 V |

9 Revision history

Table 8. Document revision history

| Date | Revision | Changes |
|-------------|----------|---|
| 23-Mar-2010 | 1 | Initial release. |
| 20-Jan-2011 | 2 | Modified <i>Table 6 on page 12</i> and <i>Figure 18 on page 13</i> . Added <i>Figure 19 on page 14</i> . |

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