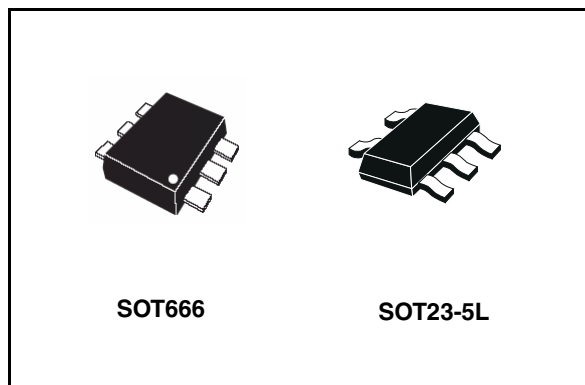


### Features

- Input voltage from 1.5 to 5.5 V
- Ultra low dropout voltage (80 mV typ. at 100 mA load)
- Very low quiescent current (18  $\mu$ A typ. at no load, 35  $\mu$ A typ. at 150 mA load, 1  $\mu$ A max in off mode)
- Very low noise without bypass capacitor (29  $\mu$ V<sub>RMS</sub> at V<sub>OUT</sub> = 0.8 V)
- Output voltage tolerance:  $\pm 2.0\%$  @ 25 °C
- 150 mA guaranteed output current
- Wide range of output voltages available on request: 0.8 V to 3.3 V with 100 mV step
- Logic-controlled electronic shutdown
- Compatible with ceramic capacitors C<sub>O</sub> = 1  $\mu$ F
- Internal current and thermal limit
- Available in SOT666 and SOT23-5L packages
- Temperature range: -40 °C to 125 °C

### Description

The LD39015xx series provides 150 mA maximum current from an input voltage ranging



from 1.5 V to 5.5 V with a typical dropout voltage of 80 mV. It is stable with ceramic capacitor. The ultra-low drop voltage, low quiescent current and low noise features make it suitable for low power battery-powered applications. Power supply rejection is 65 dB at low frequencies and starts to roll off at 10 kHz. Enable logic control function puts the LD39015xx in shut-down mode allowing a total current consumption lower than 1  $\mu$ A. The device also includes short-circuit constant current limiting and thermal protection. Typical applications are mobile phones, personal digital assistants (PDAs), cordless phones or similar battery-powered systems.

**Table 1. Device summary**

| Part numbers | Order codes                 |              | Output voltages |
|--------------|-----------------------------|--------------|-----------------|
|              | SOT666                      | SOT23-5L     |                 |
| LD39015XX08  | LD39015XG08R                | LD39015M08R  | 0.8 V           |
| LD39015XX10  | LD39015XG10R <sup>(1)</sup> | LD39015M10R  | 1.0 V           |
| LD39015XX12  | LD39015XG12R                | LD39015M12R  | 1.2 V           |
| LD39015XX125 |                             | LD39015M125R | 1.25 V          |
| LD39015XX15  | LD39015XG15R <sup>(1)</sup> | LD39015M15R  | 1.5 V           |
| LD39015XX18  | LD39015XG18R <sup>(1)</sup> | LD39015M18R  | 1.8 V           |
| LD39015XX25  | LD39015XG25R <sup>(1)</sup> | LD39015M25R  | 2.5 V           |
| LD39015XX33  | LD39015XG33R                | LD39015M33R  | 3.3 V           |

1. Available on request. Other voltages available on request from 0.8 V to 3.3 V in 100 mV step.

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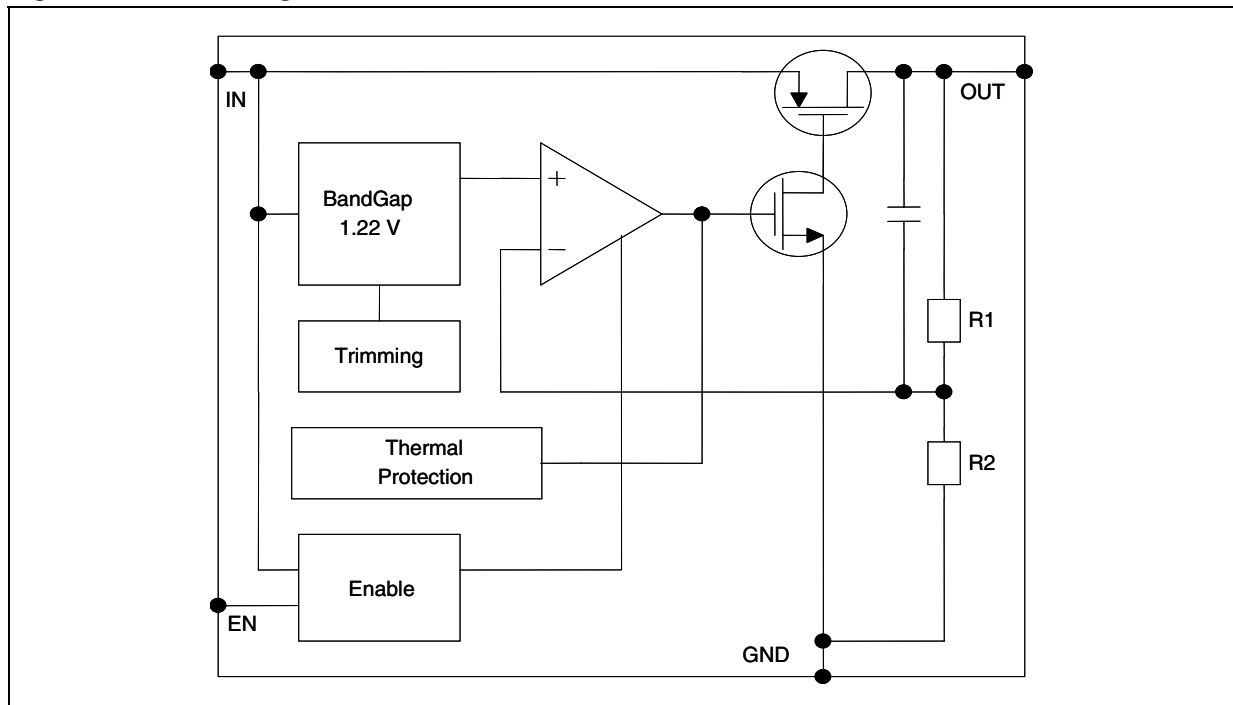
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# 1 Diagram

Figure 1. Block diagram



## 2 Pin configuration

Figure 2. Pin connection (top view)

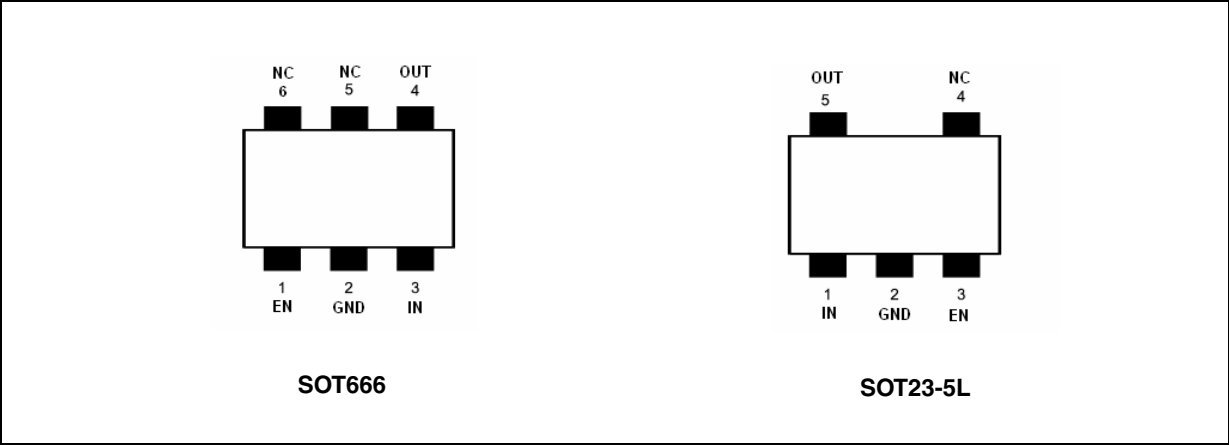
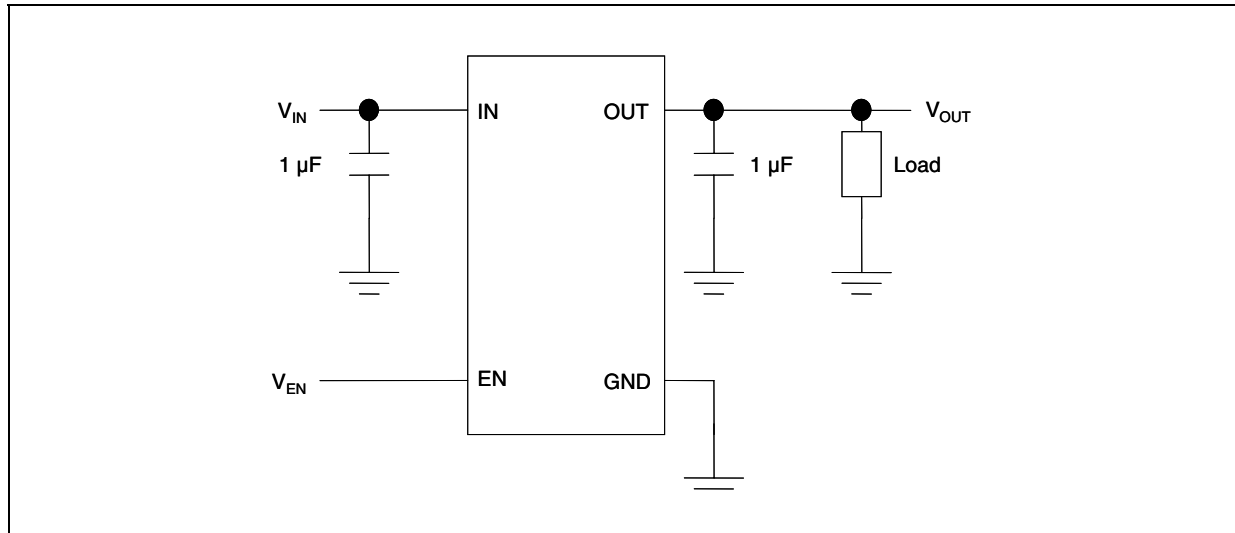


Table 2. Pin description

| Pin n° |          | Symbol | Function                                          |
|--------|----------|--------|---------------------------------------------------|
| SOT666 | SOT23-5L |        |                                                   |
| 1      | 3        | EN     | Enable pin logic input: Low=shutdown, High=active |
| 2      | 2        | GND    | Common ground.                                    |
| 3      | 1        | IN     | Input voltage of the LDO                          |
| 4      | 5        | OUT    | Output voltage                                    |
| 5      | 4        | 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 $V_I + 0.3$ | V    |
| $V_{EN}$  | Enable input voltage                 | - 0.3 to $V_I + 0.3$ | V    |
| $I_{OUT}$ | Output current                       | Internally limited   | mA   |
| $P_D$     | Power dissipation                    | Internally limited   | mW   |
| $T_{STG}$ | Storage temperature range            | -65 to 150           | °C   |
| $T_{OP}$  | Operating junction temperature range | -40 to 125           | °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                           | SOT23-5L | SOT666 | Unit |
|------------|-------------------------------------|----------|--------|------|
| $R_{thJA}$ | Thermal resistance junction-ambient | 255      | 132    | °C/W |
| $R_{thJC}$ | Thermal resistance junction-case    | 81       | 56     | °C/W |

## 5 Electrical characteristics

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

**Table 5. Electrical characteristics <sup>(1)</sup>**

| Symbol           | Parameter                                            | Test conditions                                                                                                               | Min. | Typ.     | Max. | Unit                |
|------------------|------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|------|----------|------|---------------------|
| $V_{IN}$         | Operating input voltage                              |                                                                                                                               | 1.5  |          | 5.5  | V                   |
| $V_{UVLO}$       | Turn-on threshold                                    |                                                                                                                               |      | 1.45     | 1.48 | V                   |
|                  | Turn-off threshold                                   |                                                                                                                               | 1.30 | 1.35     |      | mV                  |
| $V_{OUT}$        | $V_{OUT}$ accuracy                                   | $V_{OUT} > 1.5\text{ V}$ , $I_{OUT} = 1\text{ mA}$ , $T_J = 25^\circ\text{C}$                                                 | -2.0 |          | 2.0  | %                   |
|                  |                                                      | $V_{OUT} > 1.5\text{ V}$ , $I_{OUT} = 1\text{ mA}$ ,<br>$-40^\circ\text{C} < T_J < 125^\circ\text{C}$                         | -3.0 |          | 3.0  |                     |
|                  |                                                      | $V_{OUT} \leq 1.5\text{ V}$ , $I_{OUT} = 1\text{ mA}$                                                                         |      | $\pm 10$ |      | mV                  |
|                  |                                                      | $V_{OUT} \leq 1.5\text{ V}$ , $I_{OUT} = 1\text{ mA}$ ,<br>$-40^\circ\text{C} < T_J < 125^\circ\text{C}$                      |      | $\pm 30$ |      |                     |
| $\Delta V_{OUT}$ | Static line regulation                               | $V_{OUT} + 1\text{ V} \leq V_{IN} \leq 5.5\text{ V}$ , $I_{OUT} = 1\text{ mA}$                                                |      | 0.01     |      | %/V                 |
| $\Delta V_{OUT}$ | Transient line regulation <sup>(2)</sup>             | $\Delta V_{IN} = +500\text{ mV}$ , $I_{OUT} = 1\text{ mA}$ ,<br>$T_R = T_F = 5\text{ }\mu\text{s}$                            |      | 10       |      | mVpp                |
| $\Delta V_{OUT}$ | Static load regulation                               | $I_{OUT} = 1\text{ mA}$ to $150\text{ mA}$                                                                                    |      | 0.002    |      | %/mA                |
| $\Delta V_{OUT}$ | Transient load regulation <sup>(2)</sup>             | $I_{OUT} = 1\text{ mA}$ to $150\text{ mA}$ , $T_R = T_F = 5\text{ }\mu\text{s}$                                               |      | 40       |      | mVpp                |
| $V_{DROP}$       | Dropout voltage <sup>(3)</sup>                       | $I_{OUT} = 100\text{ mA}$ , $V_{OUT} > 1.5\text{ V}$<br>$-40^\circ\text{C} < T_J < 125^\circ\text{C}$                         |      | 80       | 100  | mV                  |
| $e_N$            | Output noise voltage                                 | 1.1kHz to 100kHz, $I_{OUT} = 10\text{ mA}$ ,<br>$V_{OUT} = 0.8\text{ V}$                                                      |      | 29       |      | $\mu\text{V}_{RMS}$ |
| SVR              | Supply voltage rejection<br>$V_{OUT} = 1.5\text{ V}$ | $V_{IN} = V_{OUTNOM} + 0.5\text{ V} \pm V_{RIPPLE}$<br>$V_{RIPPLE} = 0.1\text{ V}$ , Freq. = 1kHz<br>$I_{OUT} = 10\text{ mA}$ |      | 65       |      | dB                  |
|                  |                                                      | $V_{IN} = V_{OUTNOM} + 0.5\text{ V} \pm V_{RIPPLE}$<br>$V_{RIPPLE} = 0.1\text{ V}$ , Freq.=10kHz<br>$I_{OUT} = 10\text{ mA}$  |      | 62       |      |                     |
| $I_Q$            | Quiescent current                                    | $I_{OUT} = 0\text{ mA}$                                                                                                       |      | 18       |      | $\mu\text{A}$       |
|                  |                                                      | $I_{OUT} = 0\text{ mA}$ , $-40^\circ\text{C} < T_J < 125^\circ\text{C}$                                                       |      |          | 50   |                     |
|                  |                                                      | $I_{OUT} = 0$ to $150\text{ mA}$                                                                                              |      | 38       |      |                     |
|                  |                                                      | $I_{OUT} = 0$ to $150\text{ mA}$<br>$-40^\circ\text{C} < T_J < 125^\circ\text{C}$                                             |      |          | 70   |                     |
|                  |                                                      | $V_{IN}$ input current in OFF MODE:<br>$V_{EN} = \text{GND}$                                                                  |      | 0.001    | 1    |                     |
| $I_{SC}$         | Short circuit current                                | $R_L = 0$                                                                                                                     |      | 350      |      | mA                  |
| $V_{EN}$         | Enable input logic low                               | $V_{IN} = 1.5\text{ V}$ to $5.5\text{ V}$ ,<br>$-40^\circ\text{C} < T_J < 125^\circ\text{C}$                                  |      |          | 0.4  | V                   |
|                  | Enable input logic high                              | $V_{IN} = 1.5\text{ V}$ to $5.5\text{ V}$ ,<br>$-40^\circ\text{C} < T_J < 125^\circ\text{C}$                                  | 0.9  |          |      | V                   |

**Table 5. Electrical characteristics (continued) <sup>(1)</sup>**

| Symbol     | Parameter                   | Test conditions                                                     | Min. | Typ. | Max. | Unit    |
|------------|-----------------------------|---------------------------------------------------------------------|------|------|------|---------|
| $I_{EN}$   | Enable pin input current    | $V_{EN} = V_{IN}$                                                   |      | 0.1  | 100  | nA      |
| $T_{ON}$   | Turn on time <sup>(4)</sup> |                                                                     |      | 30   |      | $\mu$ s |
| $T_{SHDN}$ | Thermal shutdown            |                                                                     |      | 160  |      | °C      |
|            | Hysteresis                  |                                                                     |      | 20   |      |         |
| $C_{OUT}$  | Output capacitor            | Capacitance (see typical performance characteristics for stability) | 1    |      | 22   | $\mu$ F |

1. For  $V_{OUT(NOM)} < 1.2$  V,  $V_{IN} = 1.5$  V

2. All transient values are guaranteed by design, not production tested

3. 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

4. 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

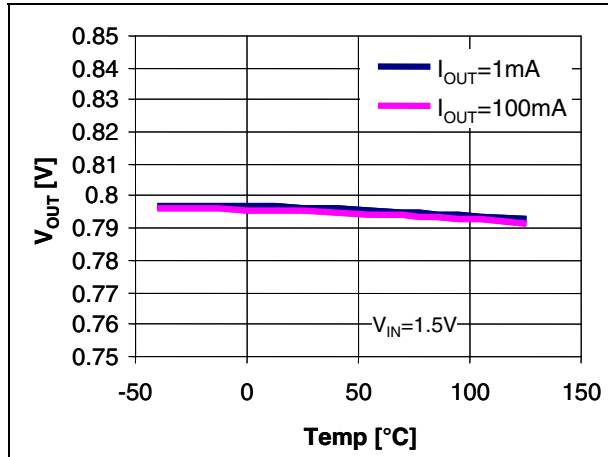


Figure 5. Output voltage vs. input voltage

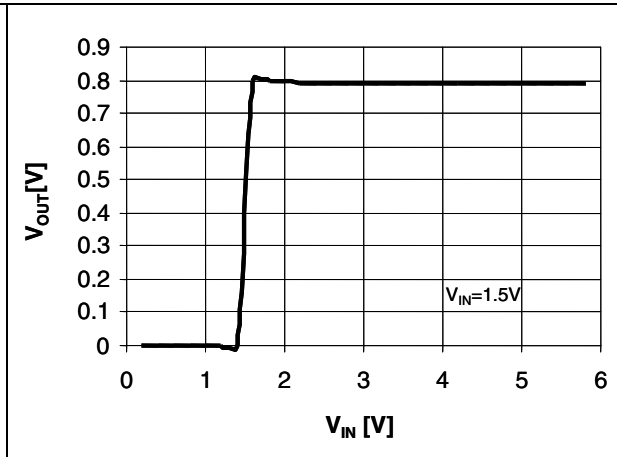


Figure 6. Dropout voltage vs. output current

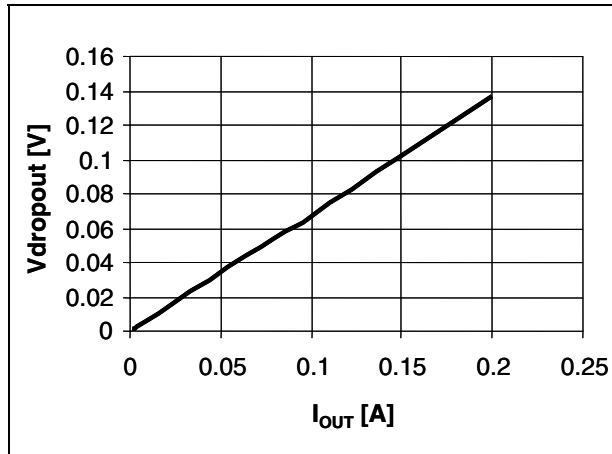


Figure 7. C\_OUT stability region

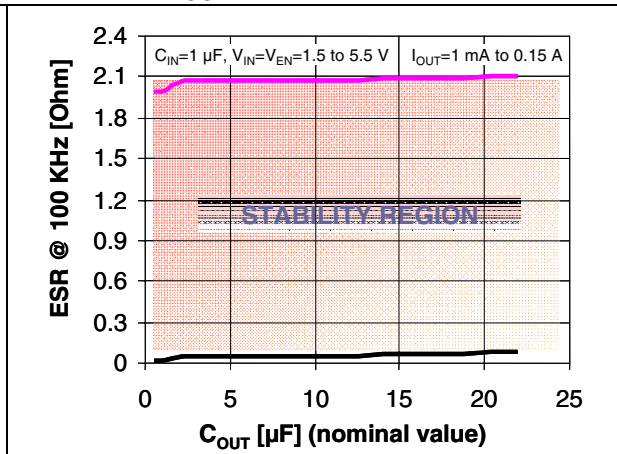


Figure 8. Supply voltage rejection vs. frequency

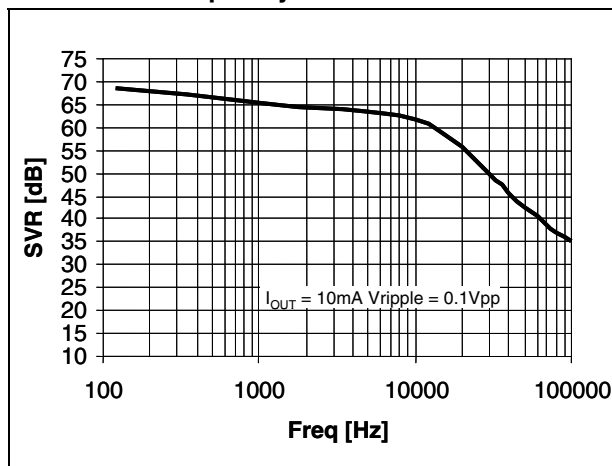


Figure 9. Output noise voltage vs. frequency

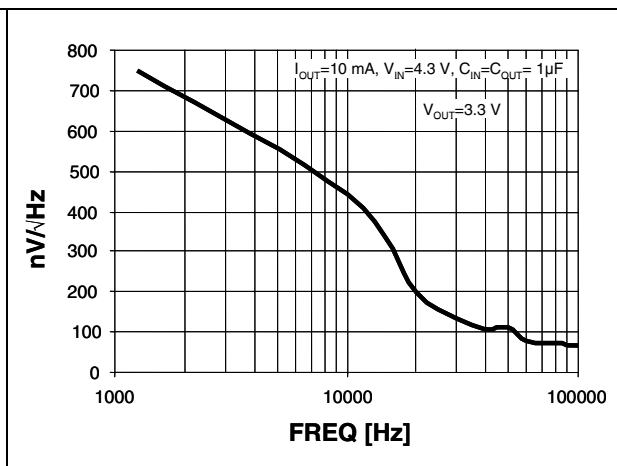


Figure 10. Quiescent current vs. input voltage Figure 11. Load transient

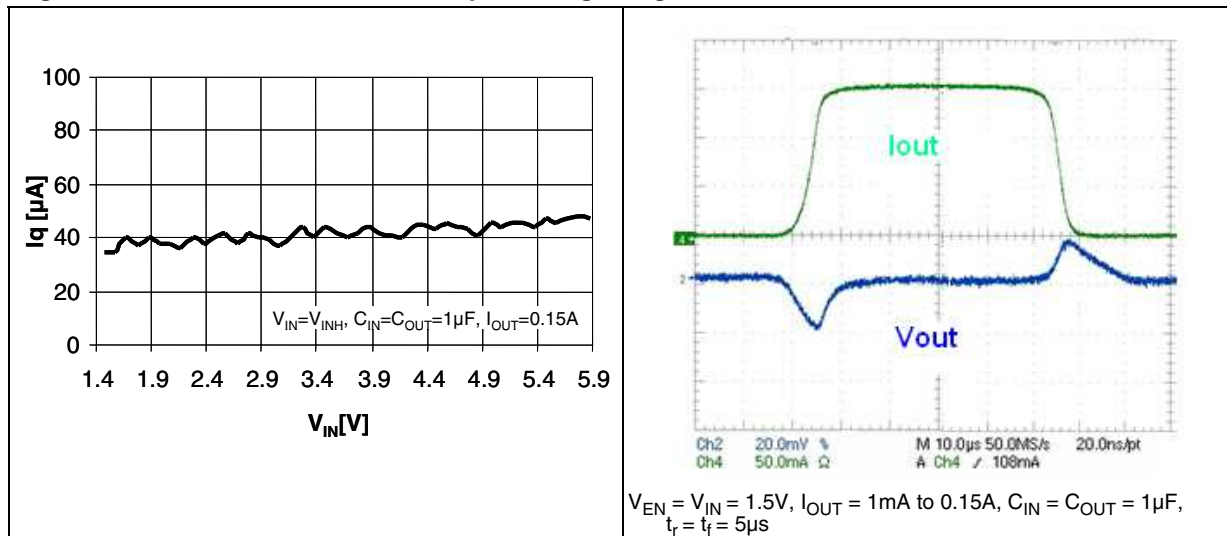


Figure 12. Line transient

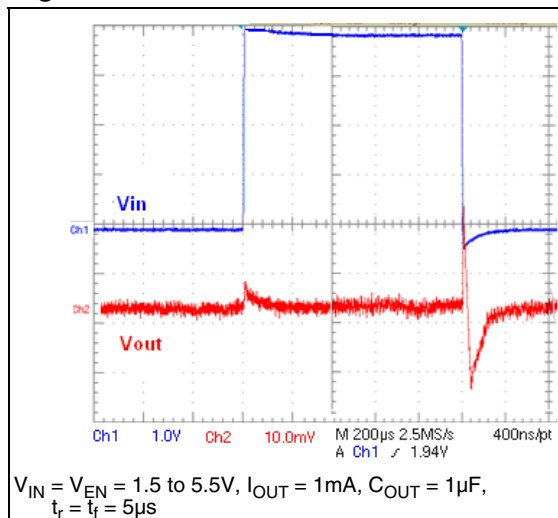
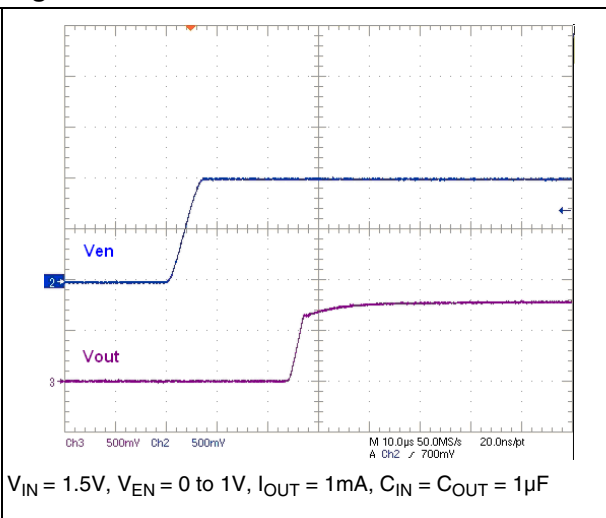


Figure 13. Enable transient

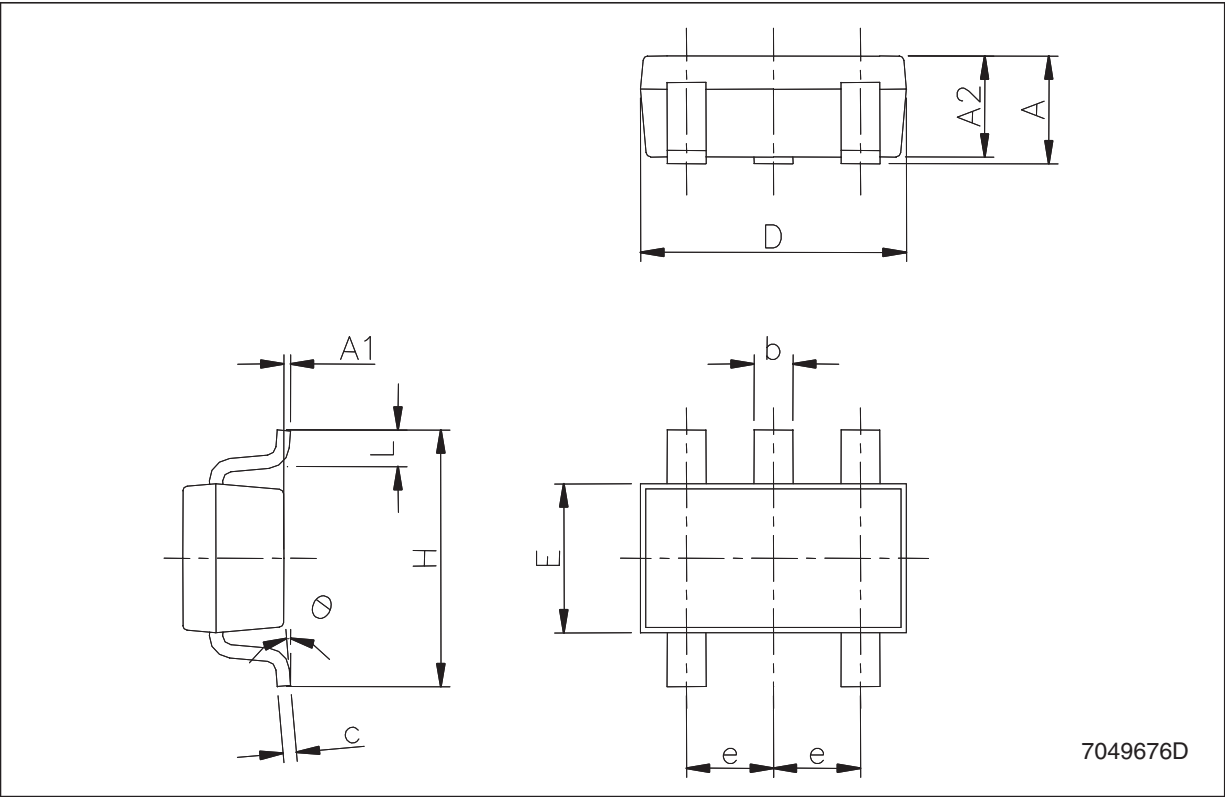


## 7 Package mechanical data

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

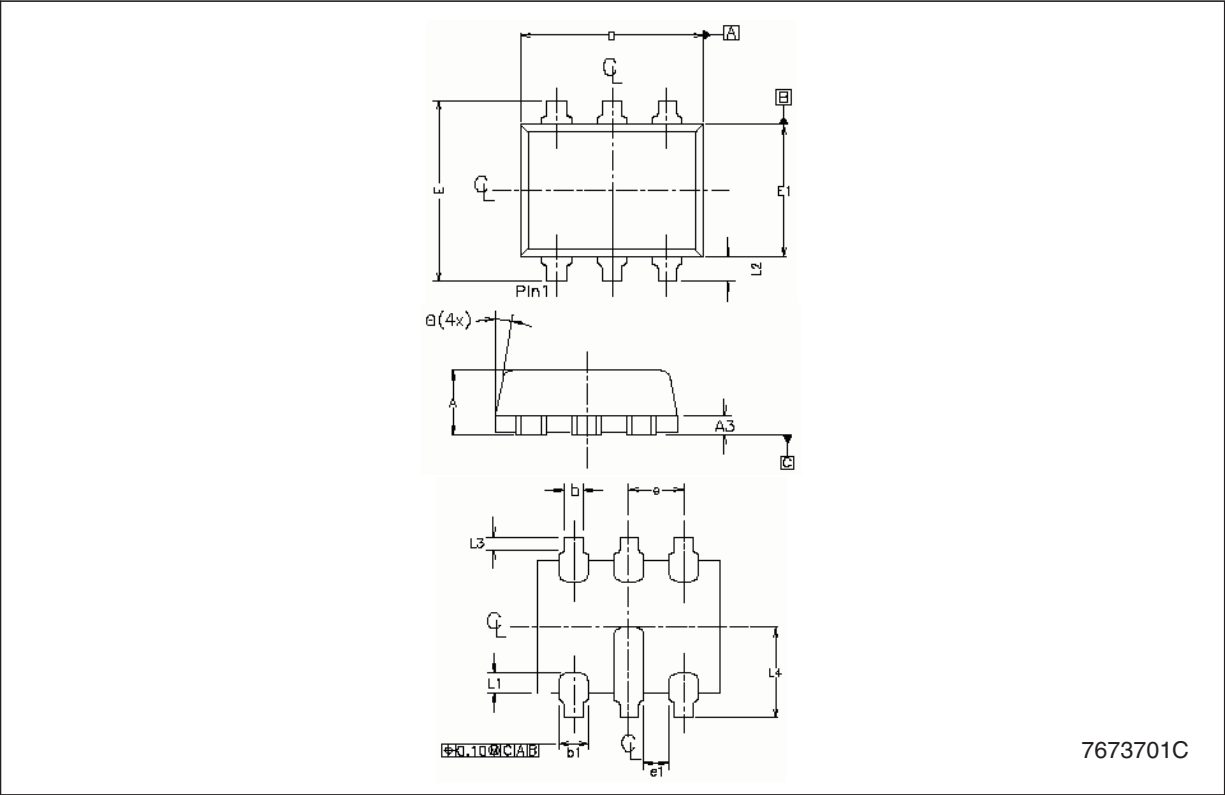
SOT23-5L mechanical data

| Dim. | mm.  |      |      | mils. |      |       |
|------|------|------|------|-------|------|-------|
|      | Min. | Typ. | Max. | Min.  | Typ. | Max.  |
| A    | 0.90 |      | 1.45 | 35.4  |      | 57.1  |
| A1   | 0.00 |      | 0.10 | 0.0   |      | 3.9   |
| A2   | 0.90 |      | 1.30 | 35.4  |      | 51.2  |
| b    | 0.35 |      | 0.50 | 13.7  |      | 19.7  |
| C    | 0.09 |      | 0.20 | 3.5   |      | 7.8   |
| D    | 2.80 |      | 3.00 | 110.2 |      | 118.1 |
| E    | 1.50 |      | 1.75 | 59.0  |      | 68.8  |
| e    |      | 0.95 |      |       | 37.4 |       |
| H    | 2.60 |      | 3.00 | 102.3 |      | 118.1 |
| L    | 0.10 |      | 0.60 | 3.9   |      | 23.6  |



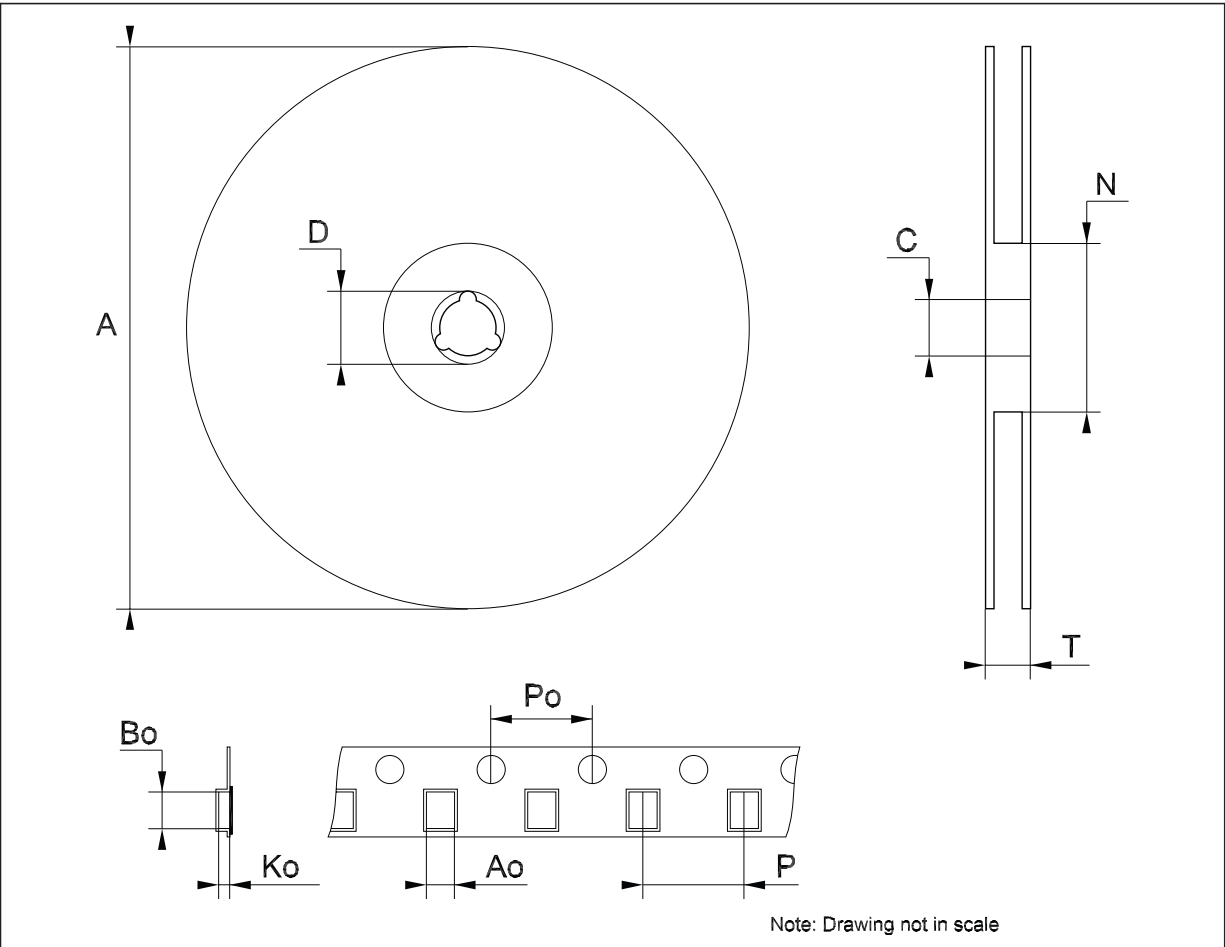
SOT666 mechanical data

| Dim. | mm.  |      |      | inch. |       |       |
|------|------|------|------|-------|-------|-------|
|      | Min. | Typ. | Max. | Min.  | Typ.  | Max.  |
| A    | 0.53 | 0.57 | 0.60 | 0.021 | 0.022 | 0.024 |
| A3   | 0.13 | 0.17 | 0.18 | 0.005 | 0.006 | 0.007 |
| D    | 1.50 | 1.66 | 1.70 | 0.059 | 0.065 | 0.067 |
| E    | 1.50 | 1.65 | 1.70 | 0.059 | 0.065 | 0.067 |
| E1   | 1.10 | 1.20 | 1.30 | 0.043 | 0.047 | 0.051 |
| L1   | 0.11 | 0.19 | 0.26 | 0.004 | 0.007 | 0.010 |
| L2   | 0.10 | 0.23 | 0.30 | 0.004 | 0.009 | 0.012 |
| L3   | 0.05 | 0.10 |      | 0.002 | 0.004 |       |
| b    | 0.17 |      | 0.25 | 0.17  |       | 0.25  |
| b1   |      | 0.27 | 0.34 |       | 0.27  | 0.34  |
| e    |      | 0.50 |      |       | 0.5   |       |
| e1   | 0.20 |      |      | 0.2   |       |       |
| θ    | 8°   | 10°  | 12°  | 8°    | 10°   | 12°   |



Tape & reel SOT23-xL mechanical data

| Dim. | mm.  |      |      | inch. |       |       |
|------|------|------|------|-------|-------|-------|
|      | Min. | Typ. | Max. | Min.  | Typ.  | Max.  |
| A    |      |      | 180  |       |       | 7.086 |
| C    | 12.8 | 13.0 | 13.2 | 0.504 | 0.512 | 0.519 |
| D    | 20.2 |      |      | 0.795 |       |       |
| N    | 60   |      |      | 2.362 |       |       |
| T    |      |      | 14.4 |       |       | 0.567 |
| Ao   | 3.13 | 3.23 | 3.33 | 0.123 | 0.127 | 0.131 |
| Bo   | 3.07 | 3.17 | 3.27 | 0.120 | 0.124 | 0.128 |
| Ko   | 1.27 | 1.37 | 1.47 | 0.050 | 0.054 | 0.058 |
| Po   | 3.9  | 4.0  | 4.1  | 0.153 | 0.157 | 0.161 |
| P    | 3.9  | 4.0  | 4.1  | 0.153 | 0.157 | 0.161 |



## 8 Revision history

**Table 6. Document revision history**

| Date        | Revision | Changes                                      |
|-------------|----------|----------------------------------------------|
| 13-Nov-2007 | 1        | Initial release.                             |
| 11-Apr-2008 | 2        | Modified: <a href="#">Table 5 on page 7.</a> |
| 12-Feb-2009 | 3        | Modified: <a href="#">Table 1 on page 1.</a> |

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