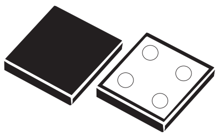
# LD39030SJ

## 300 mA low quiescent current soft-start, low noise voltage regulator

**Datasheet - production data**



**Flip-chip 4**

## Features

- Input voltage from 1.5 to 5.5 V
- Ultra low dropout voltage (200 mV typ. at 300 mA load)
- Very low quiescent current (20 $\mu$A typ. at no load, 40 $\mu$A typ. at 300 mA load, 1 $\mu$A max. in off mode)
- Very low noise (30 $\mu V_{RMS}$ from 1 kHz to 100 kHz at $V_{OUT}$ = 1.8 V)
- Output voltage tolerance: ± 2.0 % @ 25 °C
- 300 mA guaranteed output current
- Wide range of output voltages available on request: 0.8 V to 4.5 V with 100 mV step
- Logic-controlled electronic shutdown
- Compatible with ceramic capacitor $C_{OUT}$ = 1 $\mu$F
- Internal current and thermal limit
- Flip-chip 4 bumps 0.8 x 0.8 mm pitch 0.4 mm
- Internal soft-start (typ. 100 $\mu$s)
- Temperature range: - 40 °C to 125 °C

## Applications

- Mobile phones
- Personal digital assistants (PDAs)
- Cordless phones and similar battery-powered systems
- Digital still cameras.

## Description

The LD39030SJ is a low noise voltage regulator that provides 300 mA maximum current from an input voltage in the 1.5 V to 5.5 V range, with a typical dropout voltage of 200 mV. It is stabilized with a ceramic capacitor on the output. 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 typically 62 dB at low frequencies and starts to roll off at 10 kHz. An enable logic control function puts the LD39030SJ in shutdown mode allowing a total current consumption lower than 1 $\mu$A. The device also includes a short-circuit constant current limiting and thermal protection.

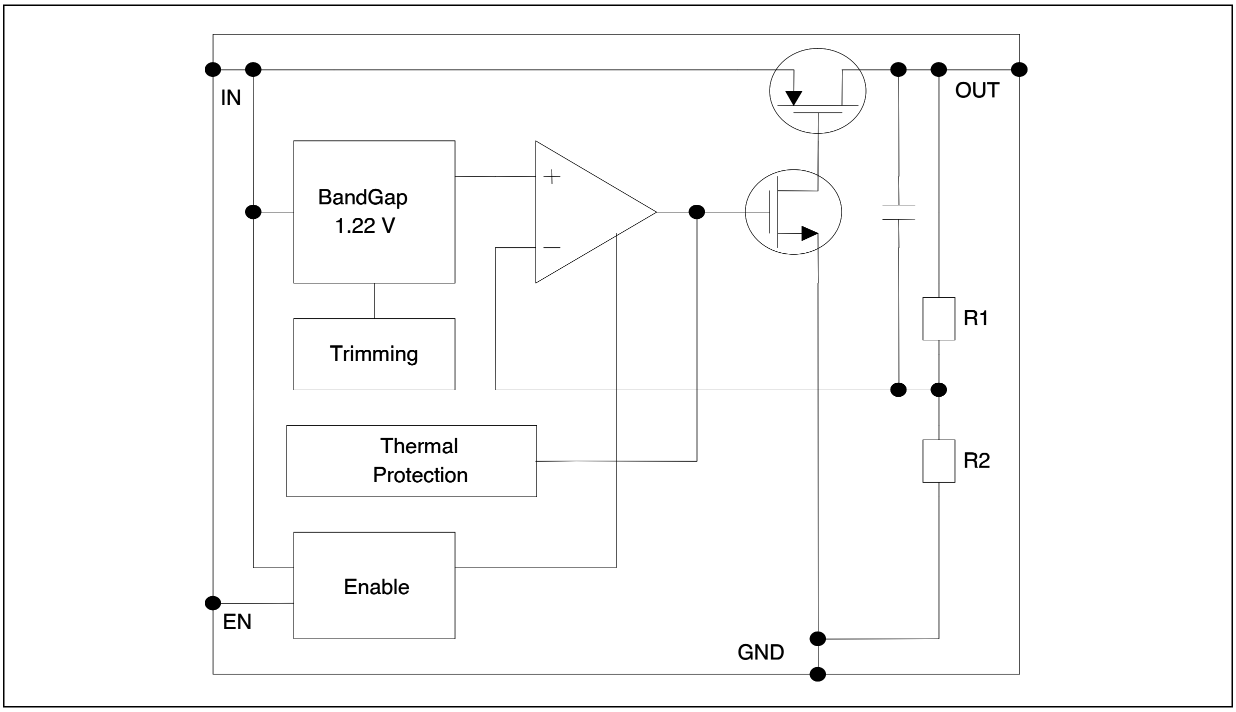
**Table 1. Device summary**

| Order codes | Output voltages |
|---|---|
| LD39030SJ10R | 1 V |
| LD39030SJ12R | 1.2 V |
| LD39030SJ126R | 1.26 V |
| LD39030SJ28R | 2.8 V |
| LD39030SJ285R | 2.85 V |
| LD39030SJ33R | 3.3 V |

# Contents

# 1 Block diagram

Figure 1. Block diagram



# 2 Pin configuration

Figure 2. Pin connection (top view)

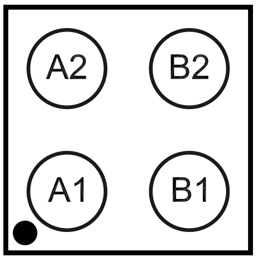
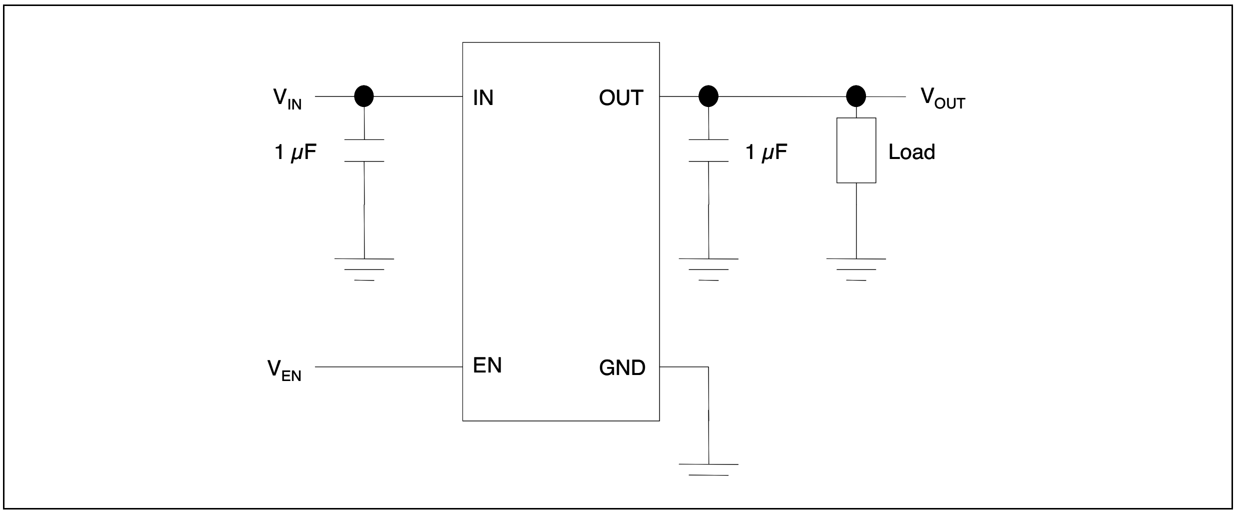



Table 2. Pin description

| Pin n° | Symbol | Function |
|---|---|---|
| A2 | EN | Enable pin logic input: low = shutdown, high = active |
| A1 | GND | Common ground |
| B2 | IN | Input voltage of the LDO |
| B1 | OUT | Output voltage |

# 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 6 | 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 |
| $P_D$ | 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 | Value | Unit |
|---|---|---|---|
| $R_{thJA}$ | Thermal resistance junction-ambient | 180 | °C/W |

# 5 Electrical characteristics

$T_J$ = 25 °C, $V_{IN} = V_{OUT(NOM)}$ + 1 V, $C_{IN} = C_{OUT}$ = 1 μF, $I_{OUT}$ = 1 mA, $V_{EN} = V_{IN}$, unless otherwise specified.

**Table 5. Electrical characteristics [(1)]**

| 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 V, $I_{OUT}$=1 mA, $T_J$=25 °C | -2.0 | | 2.0 | % |
| | | $V_{OUT}$ >1.5 V, $I_{OUT}$=1 mA, -40 °C<$T_J$<125 °C | -3.0 | | 3.0 | % |
| | | $V_{OUT} \leq$ 1.5 V, $I_{OUT}$=1 mA | | ±10 | | mV |
| | | $V_{OUT} \leq$ 1.5 V, $I_{OUT}$=1 mA, -40 °C<$T_J$<125 °C | | ±30 | | mV |
| $\Delta V_{OUT}$ | Static line regulation | $V_{OUT}$ +1 V $\leq V_{IN} \leq$ 5.5 V, $I_{OUT}$=1 mA | | 0.01 | | %/V |
| $\Delta V_{OUT}$ | Transient line regulation [(2)] | $\Delta V_{IN}$=+500 mV, $I_{OUT}$=1 mA, $T_R$=$T_F$=5 μs | | 10 | | mVpp |
| $\Delta V_{OUT}$ | Static load regulation | $I_{OUT}$=1 mA to 300 mA | | 0.002 | | %/mA |
| $\Delta V_{OUT}$ | Transient load regulation [(2)] | $I_{OUT}$=1 mA to 300 mA, $T_R$=$T_F$=5 μs | | 40 | | mVpp |
| $V_{DROP}$ | Dropout voltage [(3)] | $I_{OUT}$=300 mA, $V_{OUT}$>1.5 V -40 °C<$T_J$<125 °C | | 200 | 300 | mV |
| $e_N$ | Output noise voltage | 10 Hz to 100 kHz, $I_{OUT}$=10 mA | | 30 | | $\mu V_{RMS}$/V |
| SVR | Supply voltage rejection $V_{OUT}$ = 1.2 V | $V_{IN}=V_{OUTNOM}$+1 V+/-$V_{RIPPLE}$ $V_{RIPPLE}$=0.1 V Freq.=1 kHz $I_{OUT}$=10 mA | | 62 | | dB |
| | | $V_{IN}=V_{OUTNOM}$+0.5 V+/-$V_{RIPPLE}$ $V_{RIPPLE}$=0.1 V Freq.=10 kHz $I_{OUT}$=10 mA | | 62 | | |
| $I_Q$ | Quiescent current | $I_{OUT}$=0 mA | | 20 | | μA |
| | | $I_{OUT}$=0 mA, -40 °C<$T_J$<125 °C | | | 50 | |
| | | $I_{OUT}$=0 to 300 mA | | 40 | | |
| | | $I_{OUT}$=0 to 300 mA, -40 °C<$T_J$<125 °C | | | 85 | |
| | | $V_{IN}$ input current in OFF MODE: $V_{EN}$=GND | | 0.001 | 1 | |
| $I_{SC}$ | Short-circuit current | $R_L$=0 | 400 | | | mA |

Table 5. Electrical characteristics (continued) [(1)]

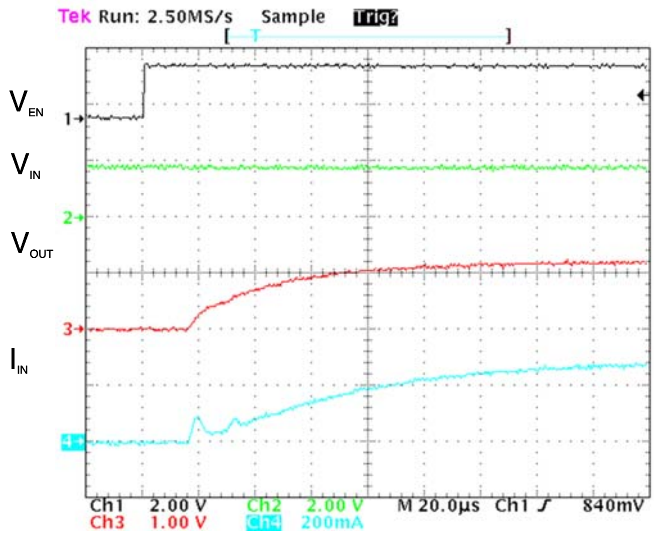
| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{EN}$ | Enable input logic low | $V_{IN}$=1.5 V to 5.5 V, -40 °C<$T_J$<125 °C | | | 0.4 | V |
| | Enable input logic high | $V_{IN}$=1.5 V to 5.5 V, -40 °C<$T_J$<125 °C | 0.9 | | | |
| $I_{EN}$ | Enable pin input current | $V_{SHDN}$=$V_{IN}$ | | 0.1 | 100 | nA |
| $T_{ON}$ | Turn-on time [(4)] | | | 100 | | μs |
| $T_{SHDN}$ | Thermal shutdown | | | 160 | | °C |
| | Hysteresis | | | 20 | | |
| $C_{OUT}$ | Output capacitor | Capacitance (see *Section 7: Typical performance characteristics*) | 1 | | 22 | μF |

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 time measured between the enable input just exceeding $V_{EN}$ high value and the output voltage just reaching 95 % of its nominal value.

# 6 Soft-start function

The LD39030S has an internal soft-start circuit. By increasing the startup time up to 100 μs, without the need of any external soft-start capacitor, this feature is able to reduce the regulator inrush current to 1/3 of the original value.

**Figure 4. Soft-start function**




$V_{IN}$ = 1.8 V, $V_{EN}$ = 1.8 V, $C_{IN}$ = 1 μF, $C_{OUT}$ = 1 μF.

# 7 Typical performance characteristics

$C_{IN} = C_{OUT} = 1\ \mu F$, $V_{EN}$ to $V_{IN}$.

**Figure 5. Output voltage vs. temperature**

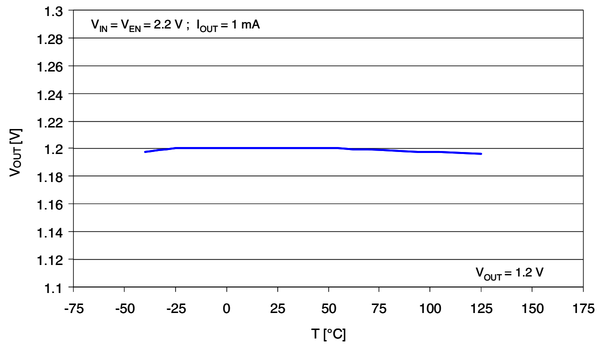



**Figure 6. Output voltage vs. input voltage**

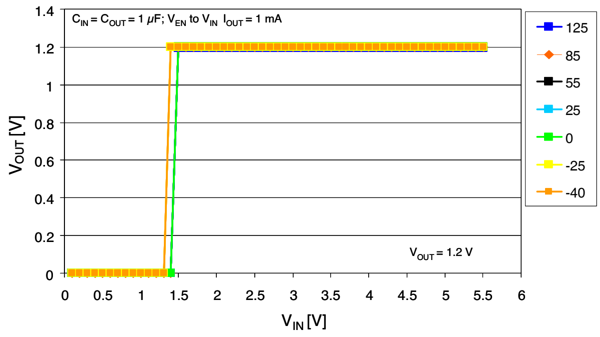



**Figure 7. Line regulation vs. temperature**

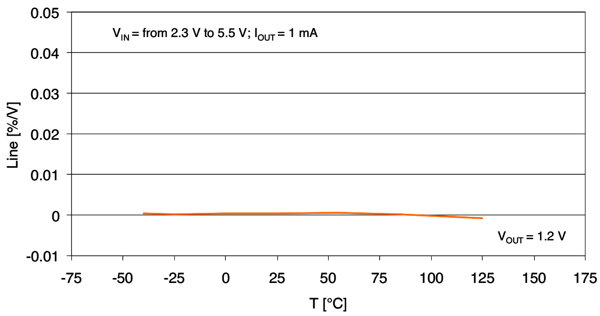



**Figure 8. Load regulation vs. temperature**

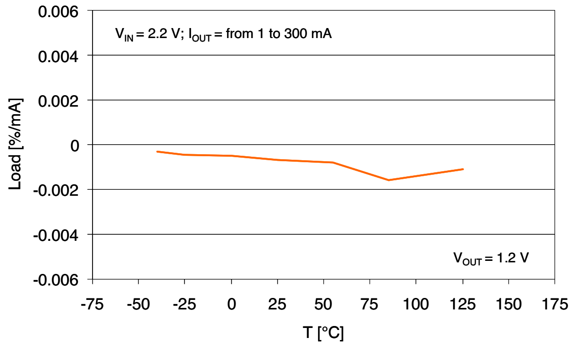



**Figure 9. Short-circuit current vs. drop voltage**

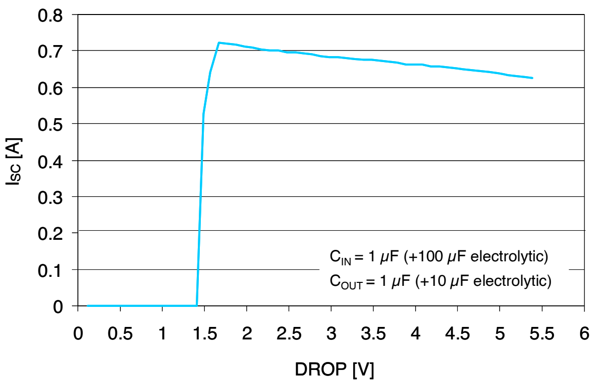



**Figure 10. Quiescent current vs. input voltage**

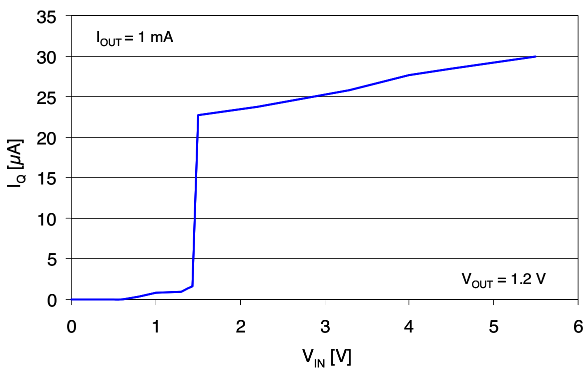


**Figure 11. Enable threshold vs. temperature**

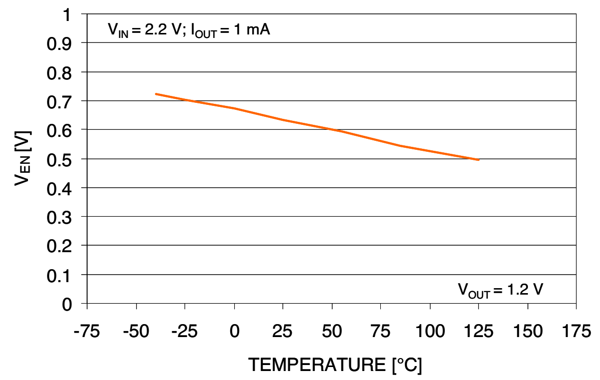



**Figure 12. Quiescent current vs. temperature**

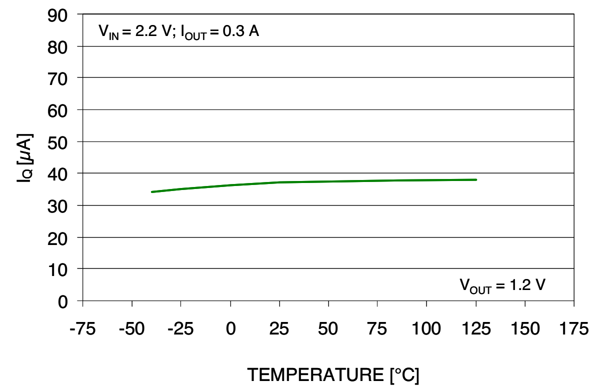



**Figure 13. Supply voltage rejection vs. temperature (Freq. = 1 kHz)**

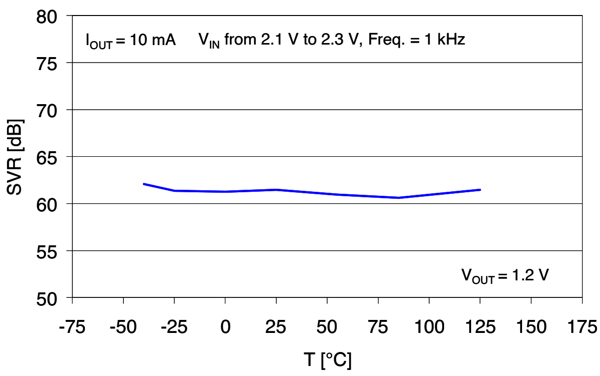



**Figure 14. Supply voltage rejection vs. frequency ($V_{IN}$ = 1.6 V to 1.8 V)**

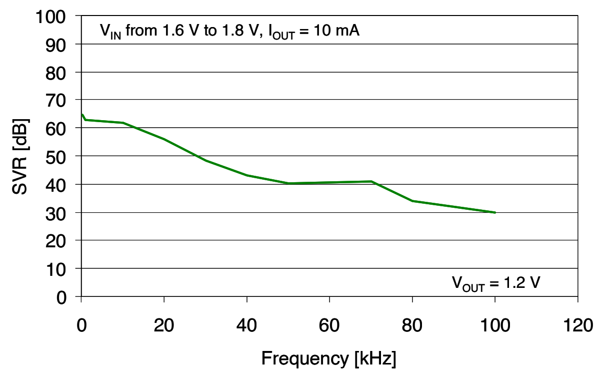



**Figure 15. Supply voltage rejection vs. temperature (Freq. = 10 kHz)**

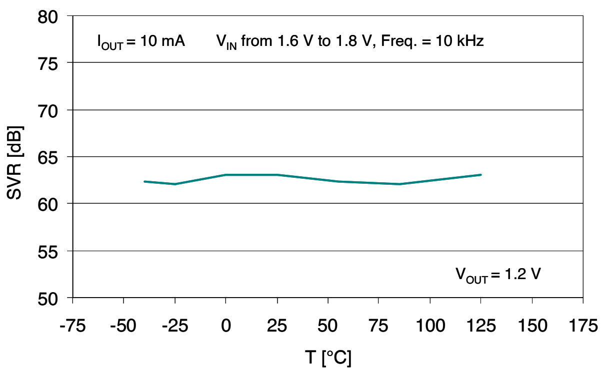



**Figure 16. Supply voltage rejection vs. frequency ($V_{IN}$ = 2.1 V to 2.3 V)**

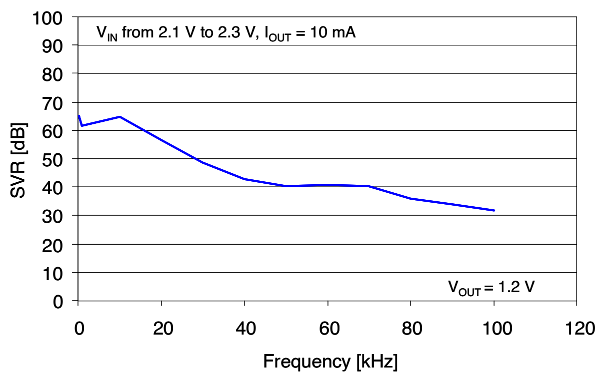
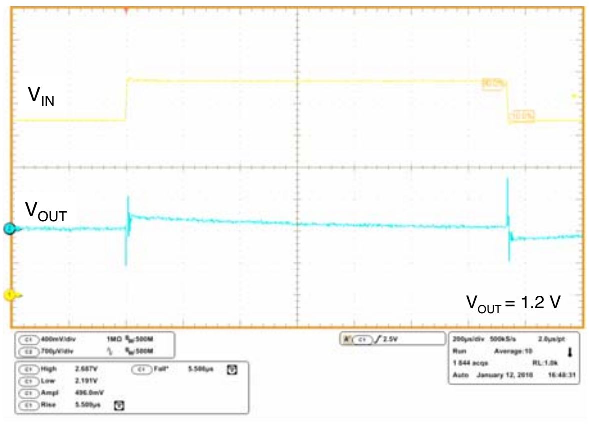
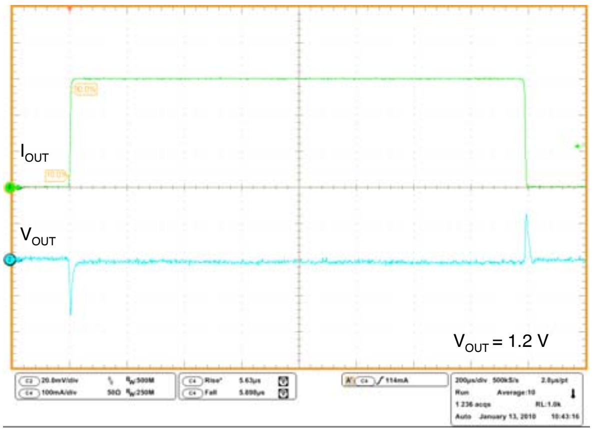


**Figure 17. Line transient**



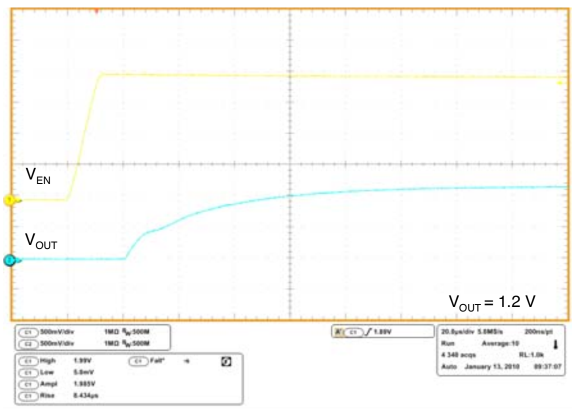

$V_{IN}$ from 2.2 V to 2.7 V, $V_{EN}$ to $V_{IN}$, $I_{OUT}$ = 1 mA, $C_{OUT}$ = 1 $\mu$F, No $C_{IN}$, $t_{RISE/FALL}$ = 5 $\mu$s

**Figure 18. Load transient**



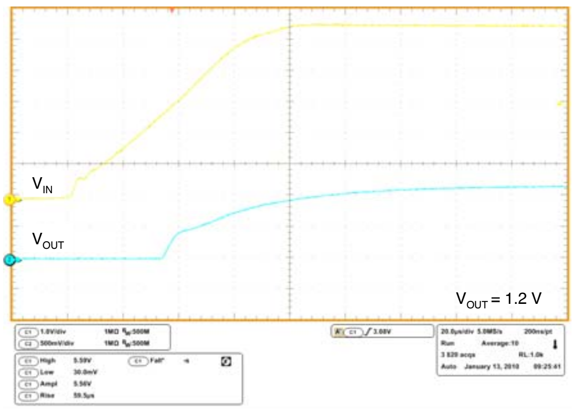

$V_{IN}$ = 2.3 V, $V_{EN}$ to $V_{IN}$, $I_{OUT}$ = from 1 to 300 mA, $C_{IN}$ = $C_{OUT}$ = 1 $\mu$F, $t_{RISE/FALL}$ = 5 $\mu$s

**Figure 19. Enable transient**



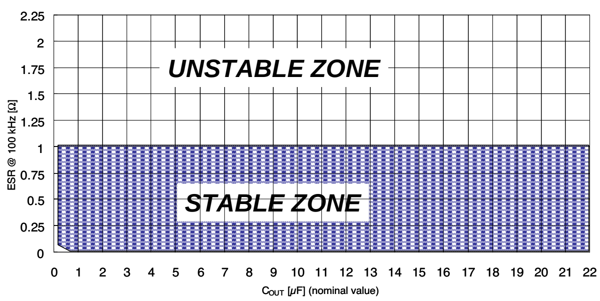

$V_{IN}$ = 2.2 V, $V_{EN}$ from 0 to 2 V, $I_{OUT}$ = 1 mA, $C_{IN}$ = $C_{OUT}$ = 1 $\mu$F, $t_{RISE}$ = 8 $\mu$s

**Figure 20. Startup transient**




$V_{IN}$ from 0 to 5.5 V, $V_{EN}$ to $V_{IN}$, $I_{OUT}$ = 1 mA, $C_{OUT}$ = 1 $\mu$F, No $C_{IN}$, $t_{RISE}$ = 60 $\mu$s

**Figure 21. ESR required for stability with ceramic capacitors**




$V_{IN}$ = $V_{EN}$ = from 2.3 V to 5.5 V, $I_{OUT}$ = from 1 mA to 300 mA, $C_{IN}$ = 1 $\mu$F (ceramic)

# 8 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 registered trademark.

**Figure 22. Flip-chip 4 package drawing (dimensions are in mm.)**

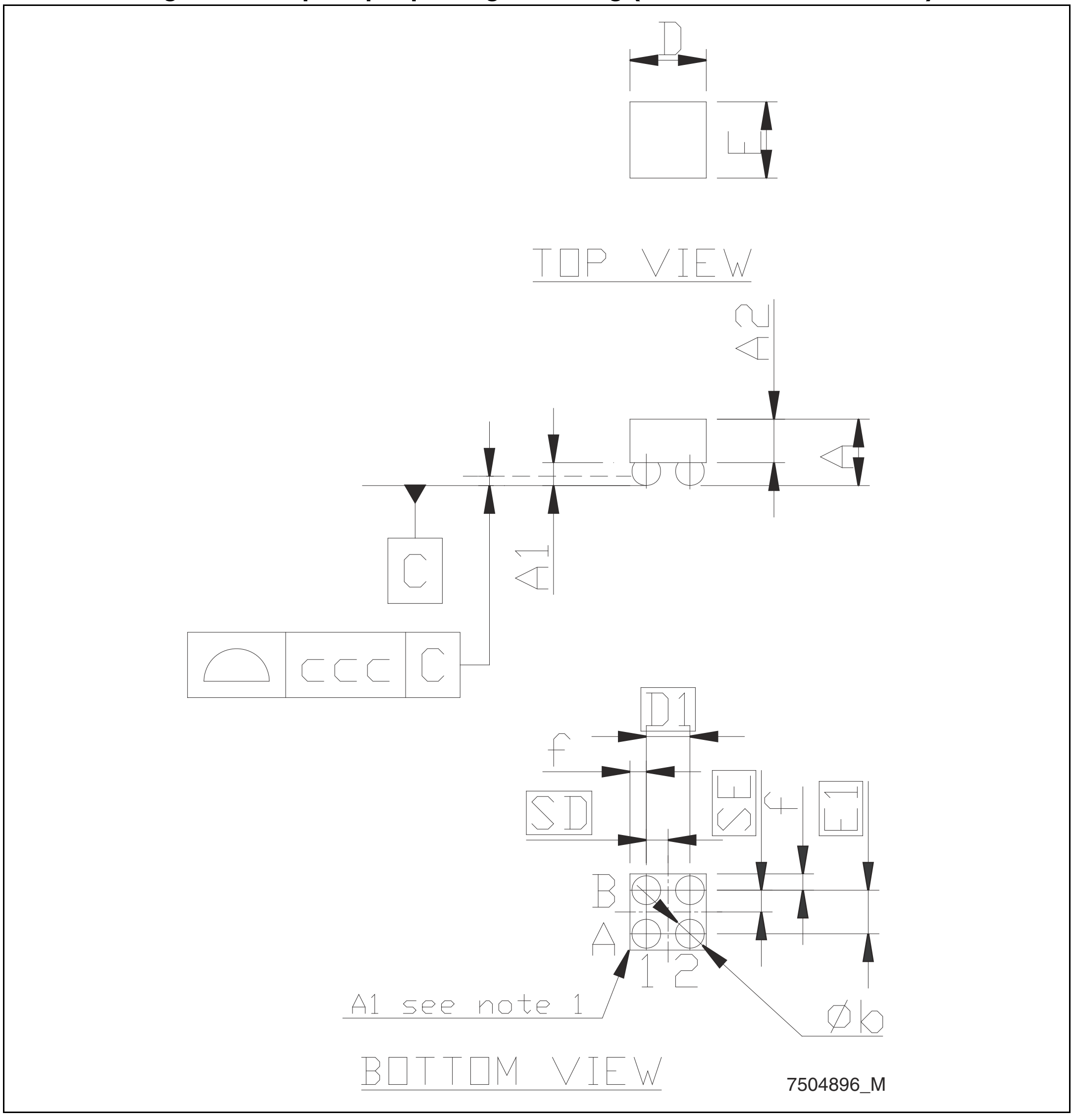
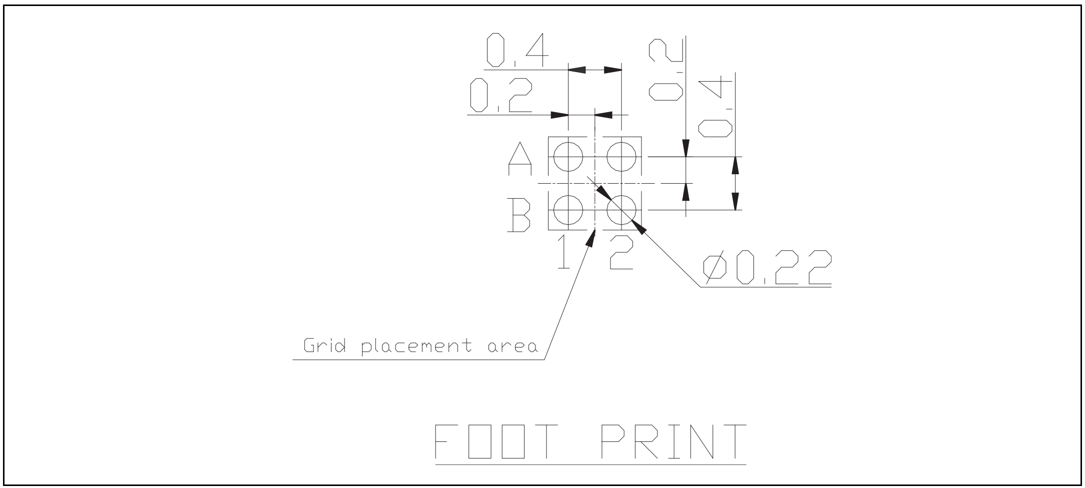


**Table 6. Flip-chip 4 package mechanical data**

| Dim. | mm. | | |
|---|---|---|---|
| | Min. | Typ. | Max. |
| A | 0.52 | 0.56 | 0.60 |
| A1 | 0.17 | 0.20 | 0.23 |
| A2 | 0.35 | 0.36 | 0.37 |
| b | 0.23 | 0.25 | 0.29 |
| D | 0.758 | 0.788 | 0.818 |
| D1 | | 0.4 | |
| E | 0.758 | 0.788 | 0.818 |
| E1 | | 0.4 | |
| SD | 0.18 | 0.2 | 0.22 |
| SE | 0.18 | 0.2 | 0.22 |
| f | | 0.199 | |
| ccc | | 0.075 | |

**Figure 23. Footprint data**



# 9 Packaging mechanical data

Figure 24. Flip-chip 4 tape and reel drawing

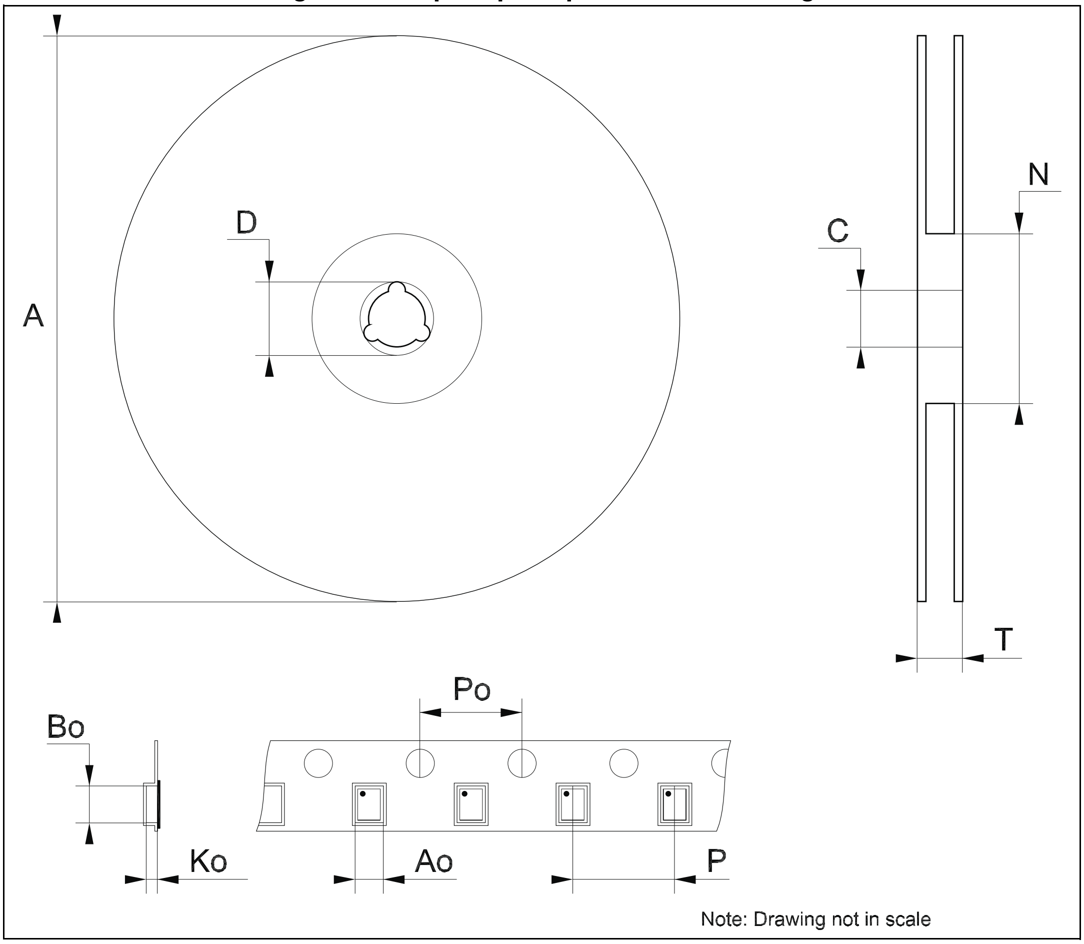


**Table 7. Flip-chip 4 tape and reel mechanical data**

| Dim. | mm | | |
|---|---|---|---|
| | Min. | Typ. | Max. |
| A | | | 178 |
| C | 12.8 | | 13.2 |
| D | 20.2 | | |
| N | 59 | 60 | 61 |
| T | | | 8.4 |
| Ao | 0.82 | 0.87 | 0.92 |
| Bo | 0.82 | 0.87 | 0.92 |
| Ko | 0.64 | 0.69 | 0.74 |
| Po | 3.9 | 4.0 | 4.1 |
| P | 3.9 | 4.0 | 4.1 |

# 10 Revision history

**Table 8. Document revision history**

| Date | Revision | Changes |
|---|---|---|
| 14-Oct-2010 | 1 | First release. |
| 10-Jul-2012 | 2 | Added new order code LD39030SJ33R *Table 1 on page 1*.<br>Updated Flip-chip 4 mechanical data *Table 6 on page 14* and *Figure 22 on page 13*. |
| 25-Oct-2012 | 3 | Added new order code LD39030SJ126R *Table 1 on page 1*.<br>Document status promoted from preliminary data to production data. |
| 08-Feb-2013 | 4 | Added *Table 7: Options available on request on page 15*. |
| 06-Feb-2014 | 5 | Part number LD39030SJxx changed to LD39030SJ.<br>Updated *Table 1: Device summary*, *Section 8: Package mechanical data* and *Section 9: Packaging mechanical data*.<br>Minor text changes. |

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- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

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- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.


### Как с нами связаться

**Телефон:** 8 (812) 309 58 32 (многоканальный)
**Факс:** 8 (812) 320-02-42
**Электронная почта:** org@eplast1.ru
**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.