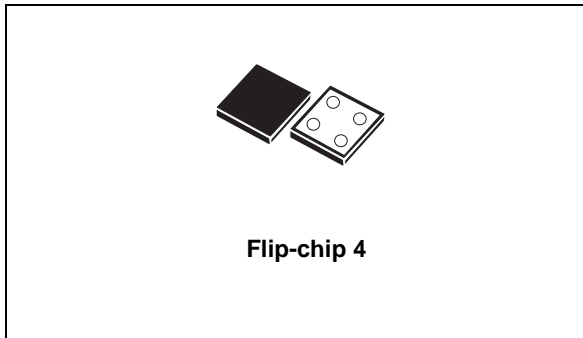


## 150 mA low quiescent current low noise voltage regulator

Datasheet - production data



### Features

- Input voltage from 1.5 to 5.5 V
- Ultra low dropout voltage (90 mV typ. at 100 mA load)
- Very low quiescent current (20  $\mu$ A typ. at no load, 35  $\mu$ A typ. at 150 mA load, 1  $\mu$ A max in off mode)
- Low noise (54  $\mu$ V<sub>RMS</sub> from 10 Hz to 100 kHz at V<sub>OUT</sub> = 1.8 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 4.5 V with 100 mV step

- Logic-controlled electronic shutdown
- Compatible with ceramic capacitor C<sub>OUT</sub> = 1  $\mu$ F
- Internal current and thermal limit
- Flip-chip 4 bumps 1.1 x 1.1 mm.
- Temperature range: -40 °C to 125 °C

### Description

The LD39015J provides 150 mA maximum current from an input voltage ranging from 1.5 V to 5.5 V with a typical dropout voltage of 90 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 74 dB at low frequencies and starts to roll off at 10 kHz. Enable logic control function puts the LD39015J in shut-down mode allowing a total current consumption lower than 1  $\mu$ A. The device also includes a short-circuit constant current limiting and thermal protection. Typical applications are mobile phones, personal digital assistant (PDAs), cordless phone and similar battery powered systems.

**Table 1. Device summary**

Order codes	Output voltages
LD39015J12R	1.2 V
LD39015J15R	1.5 V
LD39015J18R	1.8 V
LD39015J25R	2.5 V
LD39015J28R	2.8 V

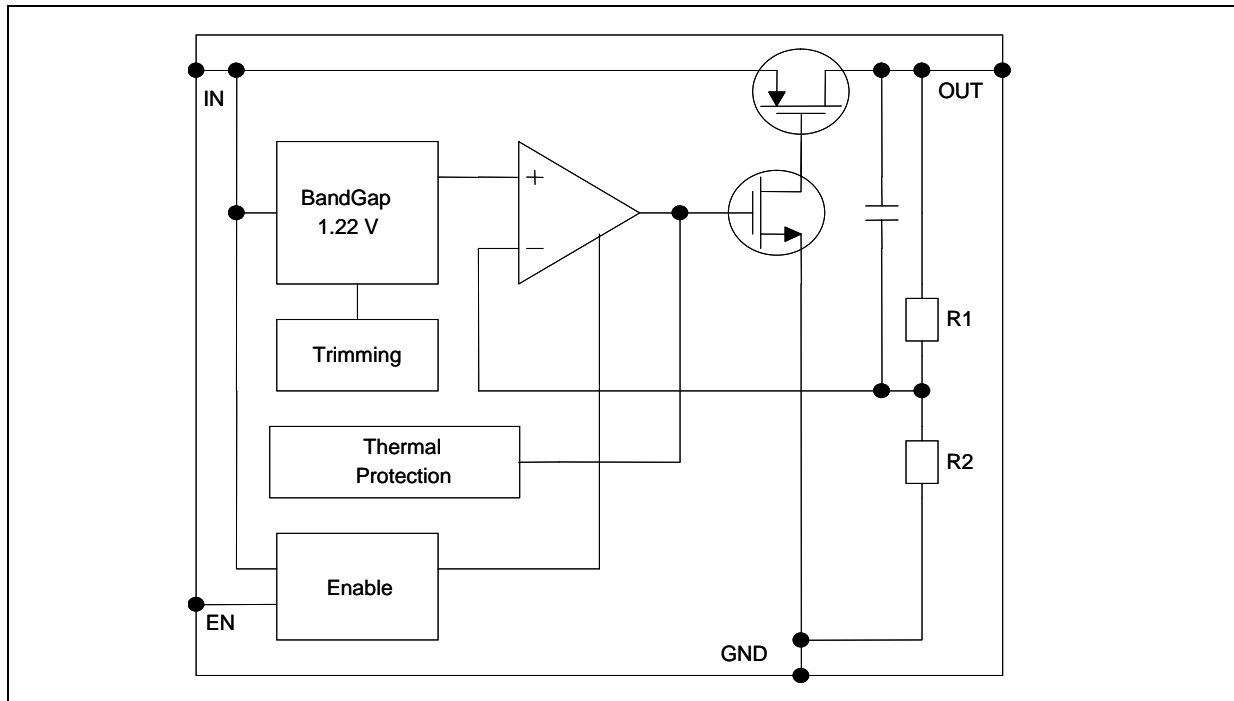
---

## Contents

1	Diagram .....	3
2	Pin configuration .....	4
3	Typical application .....	5
4	Maximum ratings .....	6
5	Electrical characteristics .....	7
6	Typical performance characteristics .....	9
7	Package mechanical data .....	11
8	Packaging mechanical data .....	13
9	Revision history .....	15

# 1 Diagram

Figure 1. Block diagram



## 2 Pin configuration

Figure 2. Pin connection (top view)

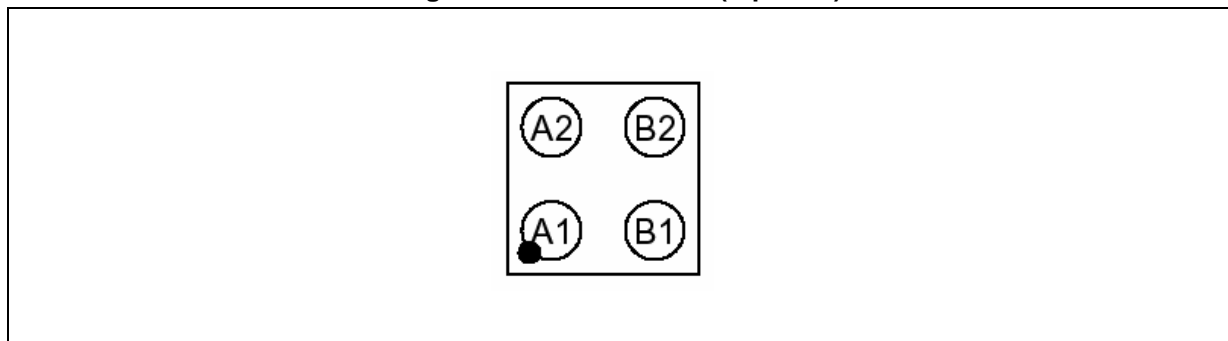
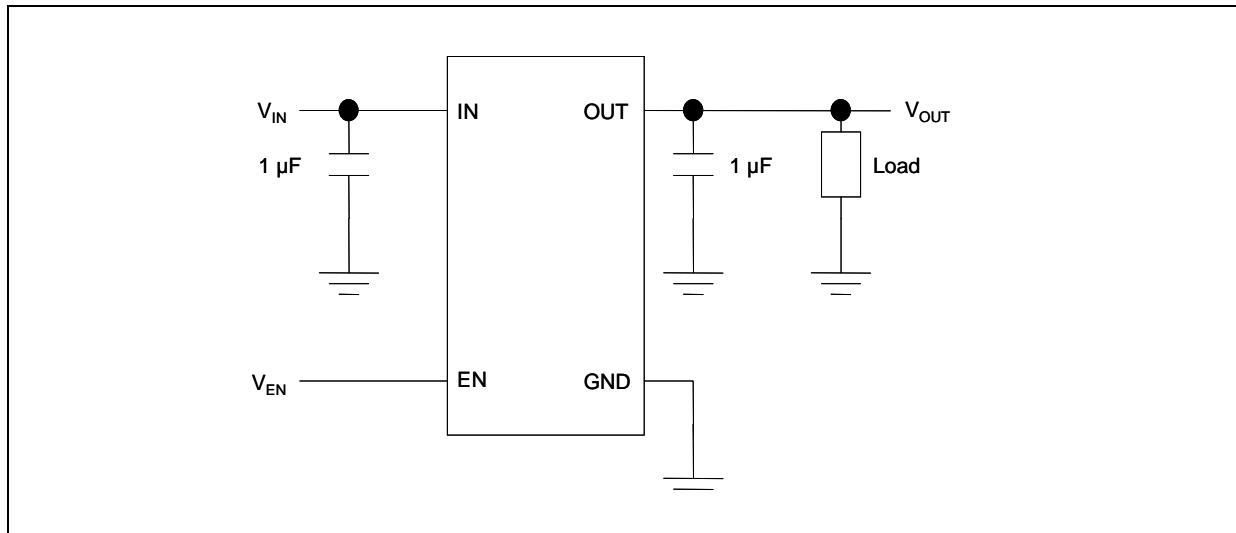


Table 2. Pin description

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 $V_I + 0.3$	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	Value	Unit
$R_{thJA}$	Thermal resistance junction-ambient	180	°C/W

## 5 Electrical characteristics

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

**Table 5. Electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{IN}$	Operating input voltage		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	$V_{OUT} > 1.5\text{ V}$ , $I_{OUT} = 1\text{ mA}$ , $T_J = 25\text{ °C}$	-2.0		2.0	%
		$V_{OUT} > 1.5\text{ V}$ , $I_{OUT} = 1\text{ mA}$ , $-40\text{ °C} < T_J < 125\text{ °C}$	-3.0		3.0	
		$V_{OUT} \leq 1.5\text{ V}$ , $I_{OUT} = 1\text{ mA}$		$\pm 10$		mV
		$V_{OUT} \leq 1.5\text{ V}$ , $I_{OUT} = 1\text{ mA}$ , $-40\text{ °C} < T_J < 125\text{ °C}$		$\pm 30$		
$\Delta V_{OUT}$	Static line regulation	$V_{OUT} + 1\text{ V} \leq V_{IN} \leq 5.5\text{ V}$ , $I_{OUT} = 1\text{ mA}$		0.01		%/V
$\Delta V_{OUT}$	Static load regulation	$I_{OUT} = 1\text{ mA}$ to 150 mA		0.002		%/mA
$V_{DROP}$	Dropout voltage (1)	$I_{OUT} = 100\text{ mA}$ , $V_{OUT} > 1.5\text{ V}$ $-40\text{ °C} < T_J < 125\text{ °C}$		90	130	mV
$e_N$	Output noise voltage	10 Hz to 100 kHz, $I_{OUT} = 10\text{ mA}$ , $V_{OUT} = 1.8\text{ V}$ , $V_{IN} = 2.8\text{ V}$		54		$\mu\text{V}_{RMS}$
SVR	Supply voltage rejection $V_{OUT} = 1.5\text{ V}$	$V_{IN} = V_{OUTNOM} + 1\text{ V} \pm V_{RIPPLE}$ $V_{RIPPLE} = 0.1\text{ V}$ , freq. = 1 kHz $I_{OUT} = 10\text{ mA}$		74		dB
		$V_{IN} = V_{OUTNOM} + 0.5\text{ V} \pm V_{RIPPLE}$ $V_{RIPPLE} = 0.1\text{ V}$ , Freq.=10 kHz $I_{OUT} = 10\text{ mA}$		67		
$I_Q$	Quiescent current	$I_{OUT} = 0\text{ mA}$		20		$\mu\text{A}$
		$I_{OUT} = 0\text{ mA}$ , $-40\text{ °C} < T_J < 125\text{ °C}$			40	
		$I_{OUT} = 0$ to 150 mA		35		
		$I_{OUT} = 0$ to 150 mA $-40\text{ °C} < T_J < 125\text{ °C}$			50	
		$V_{IN}$ input current in OFF MODE: $V_{EN} = \text{GND}$		0.003	1	
$I_{SC}$	Short circuit current	$R_L = 0$	200			mA

Table 5. Electrical characteristics (continued)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{EN}$	Enable input logic low	$V_{IN} = 1.5 \text{ V to } 5.5 \text{ V}$ , $-40 \text{ }^\circ\text{C} < T_J < 125 \text{ }^\circ\text{C}$			0.4	V
	Enable input logic high	$V_{IN} = 1.5 \text{ V to } 5.5 \text{ V}$ , $-40 \text{ }^\circ\text{C} < T_J < 125 \text{ }^\circ\text{C}$	0.9			V
$I_{EN}$	Enable pin input current	$V_{SHDN} = V_{IN}$ , $-40 \text{ }^\circ\text{C} < T_J < 125 \text{ }^\circ\text{C}$		0.1	1	$\mu\text{A}$
$T_{ON}$	Turn on time <sup>(2)</sup>			30		$\mu\text{s}$
$T_{SHDN}$	Thermal shutdown			160		$^\circ\text{C}$
	Hysteresis			20		
$C_{OUT}$	Output capacitor	Capacitance (see typical performance characteristics for stability)	1		22	$\mu\text{F}$

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. 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 Typical performance characteristics

Figure 4. Output voltage vs. temperature

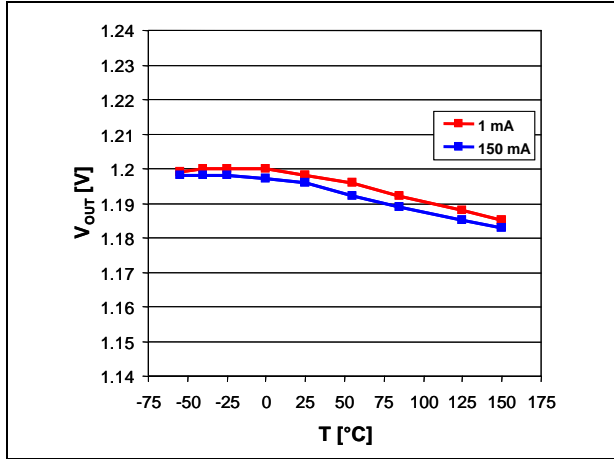


Figure 5. Output voltage vs. input voltage

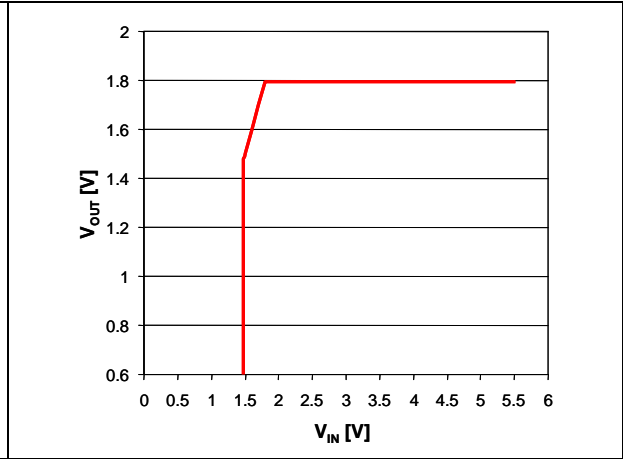


Figure 6. Dropout voltage vs. output current

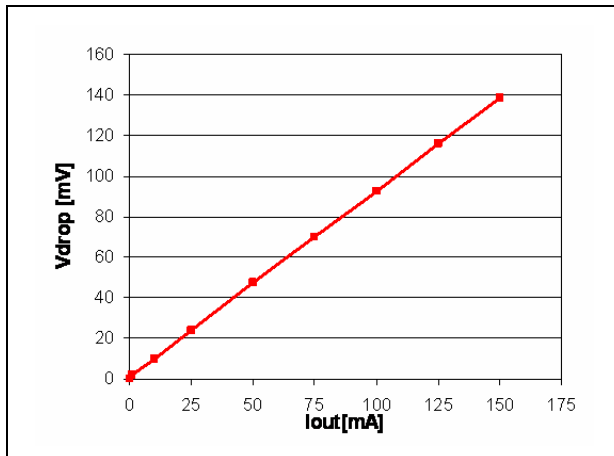


Figure 7. C<sub>OUT</sub> stability region

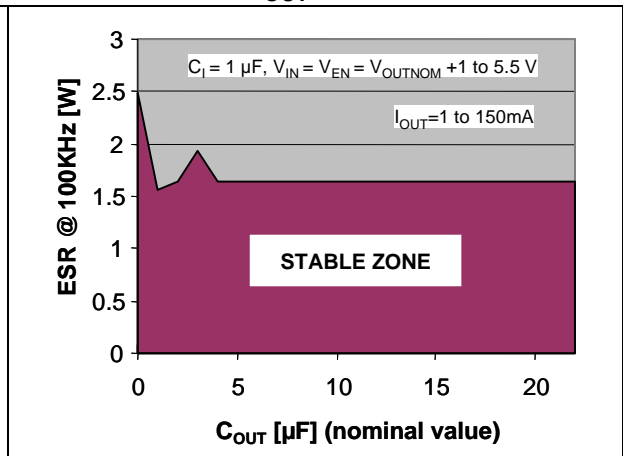


Figure 8. Supply voltage rejection vs. frequency

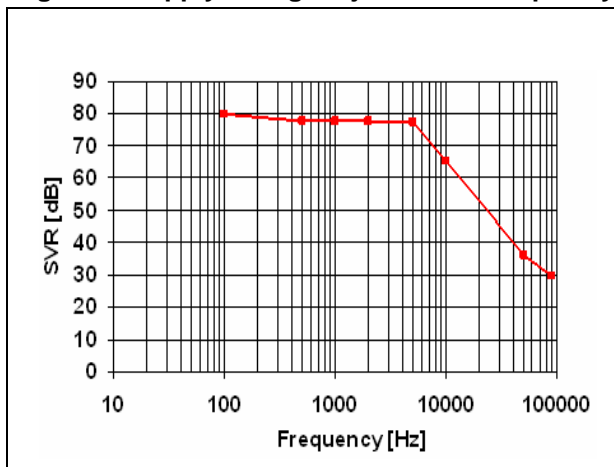


Figure 9. Output noise spectral density

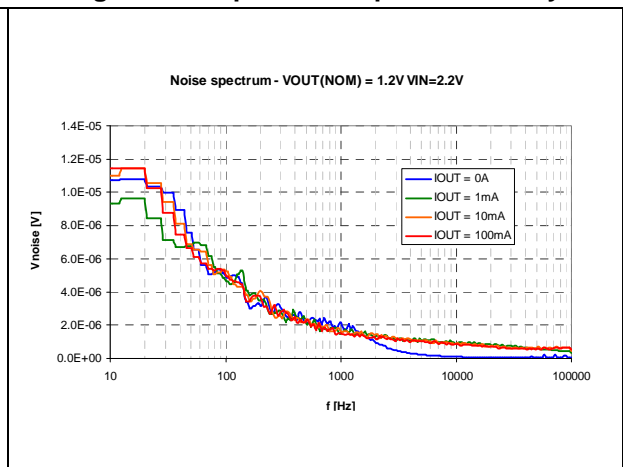


Figure 10. SVR vs. drop

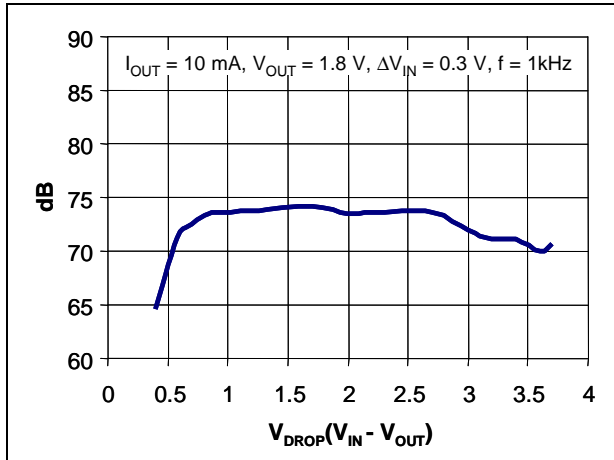


Figure 11. Quiescent current vs. I\_OUT

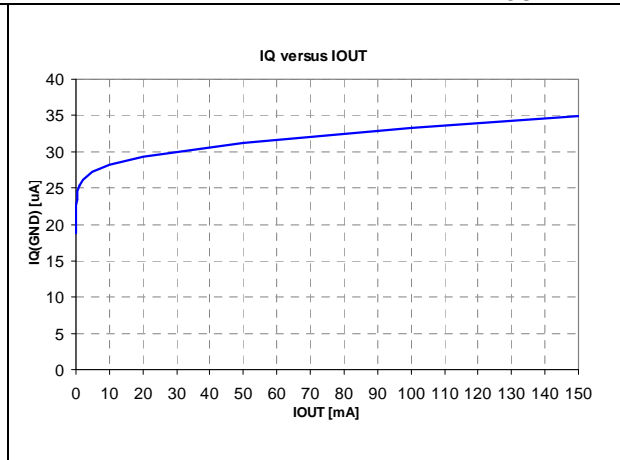


Figure 12. Quiescent current vs. input voltage

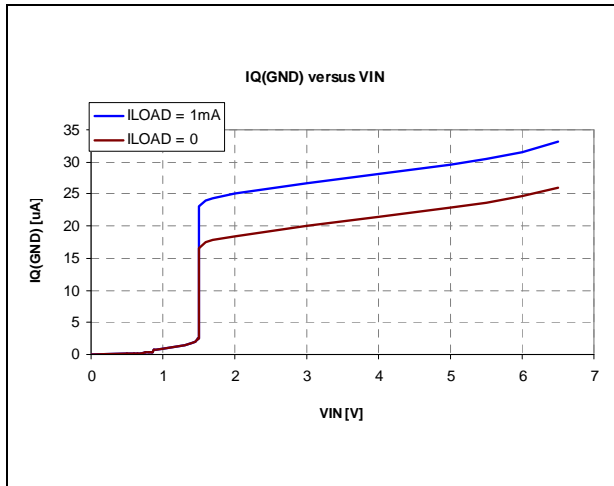


Figure 13. Load transient

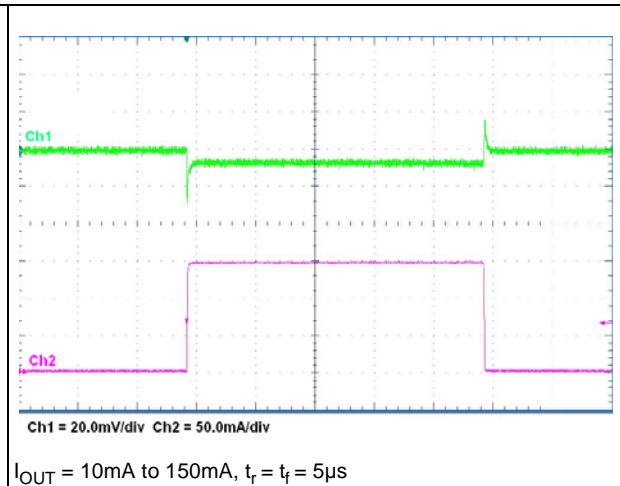


Figure 14. Line transient

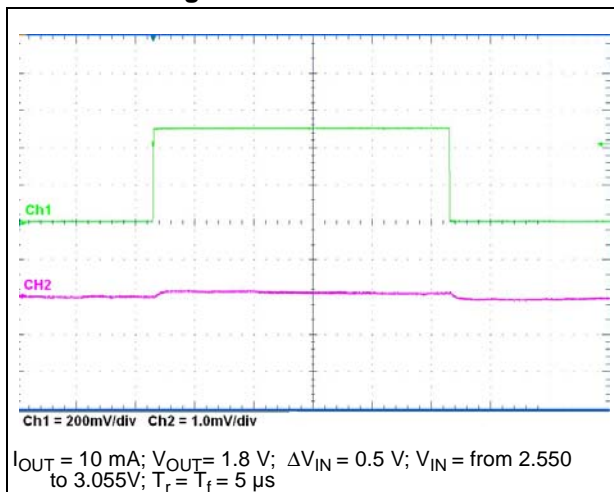
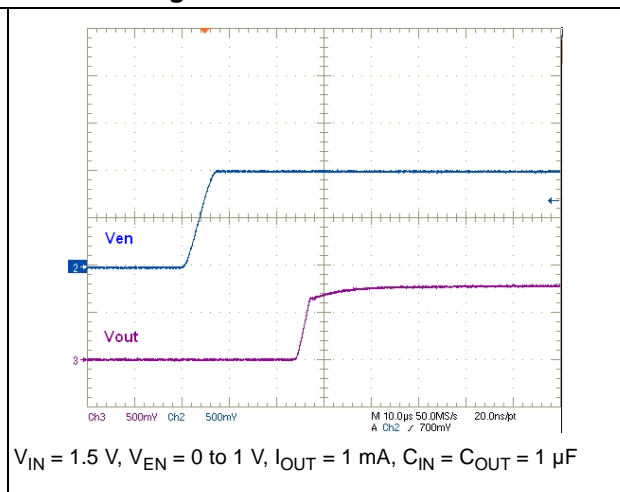


Figure 15. Enable transient



## 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](http://www.st.com). ECOPACK is an ST trademark.

Figure 16. Flip-chip 4 drawings

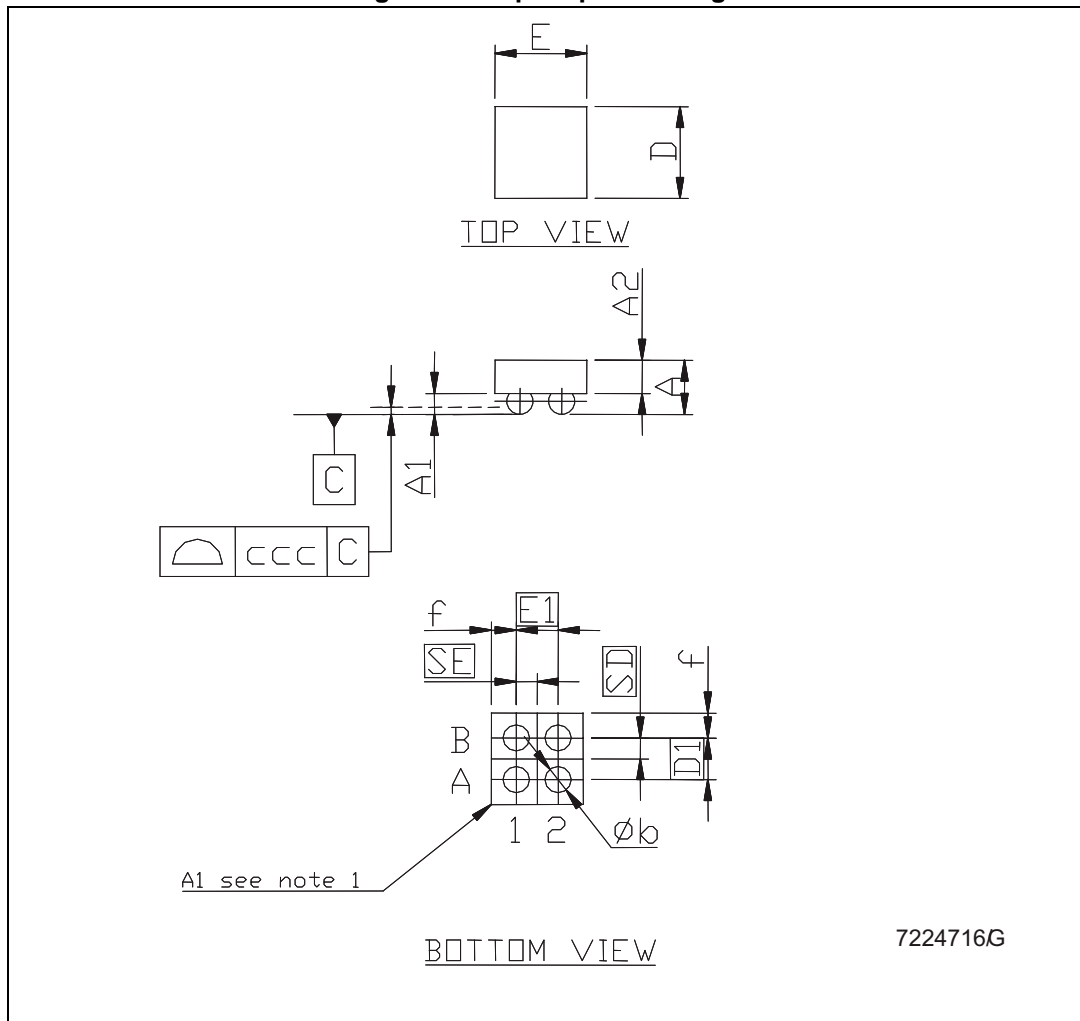


Figure 17. Flip-chip 4 footprint

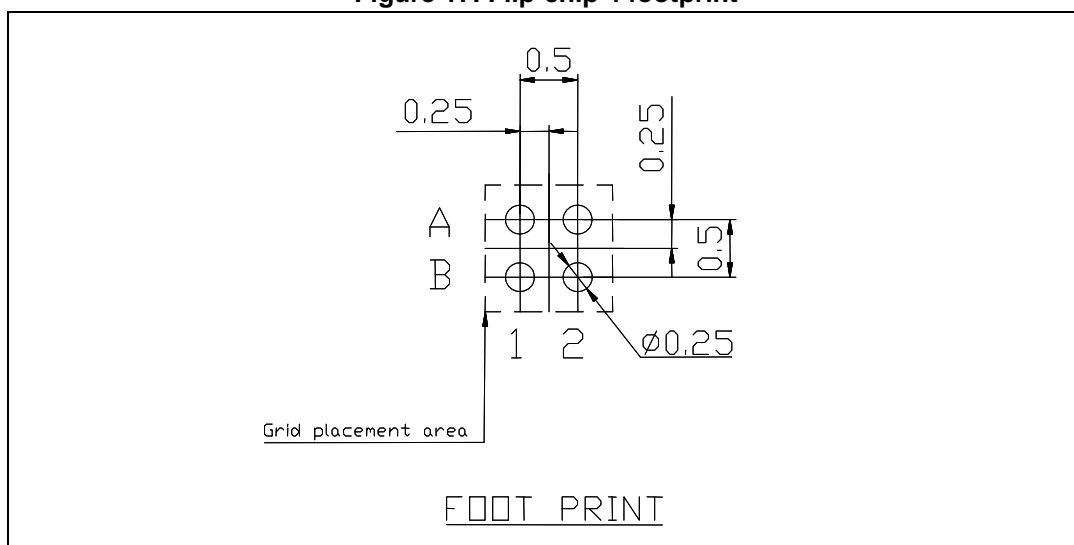


Table 6. Flip-chip 4 mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	0.585	0.65	0.715
A1	0.21	0.25	0.29
A2		0.40	
b	0.265	0.315	0.365
D	1.02	1.07	1.12
D1		0.5	
E	1.02	1.07	1.12
E1		0.5	
SD		0.25	
SE		0.25	

## 8 Packaging mechanical data

Figure 18. Flip-chip 4 tape and reel drawing

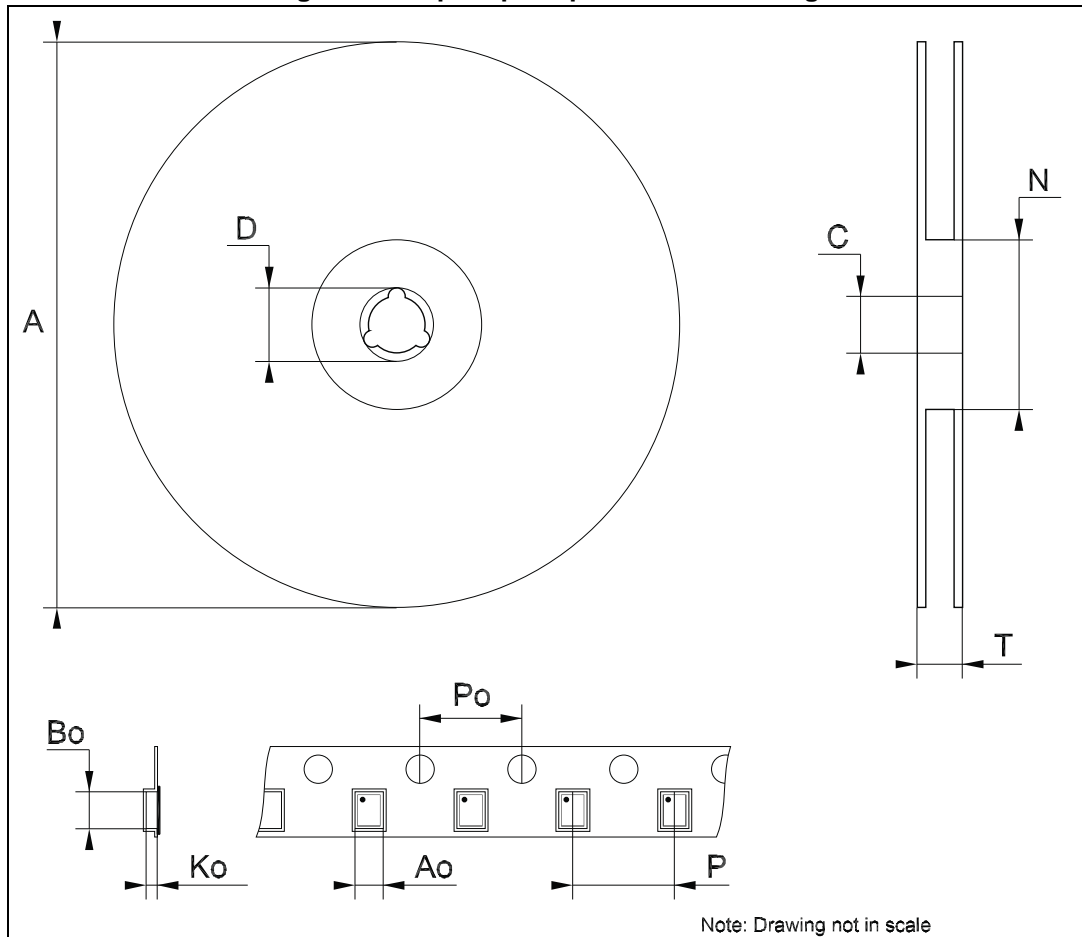


Table 7. Flip-chip 4 tape and reel mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A			178
C	12.8		13.2
D	20.2		
N	59	60	61
T			8.4
Ao	1.12	1.17	1.22
Bo	1.12	1.17	1.22
Ko	0.68	0.73	0.78
Po	3.9	4.0	4.1
P	3.9	4.0	4.1

## 9 Revision history

**Table 8. Document revision history**

Date	Revision	Changes
29-Jun-2009	1	First release.
05-Aug-2009	2	Updated tape and reel mechanical data.
11-Sep-2012	3	Added: new order code LD39015J25R <a href="#">Table 1 on page 1</a> .
08-Jan-2014	4	Part number LD39015JXX changed to LD39015J. Updated the Description in cover page, <a href="#">Section 7: Package mechanical data</a> . Added <a href="#">Section 8: Packaging mechanical data</a> . Minor text changes.

**Please Read Carefully:**

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

**UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.**

**ST PRODUCTS ARE NOT DESIGNED OR AUTHORIZED FOR USE IN: (A) SAFETY CRITICAL APPLICATIONS SUCH AS LIFE SUPPORTING, ACTIVE IMPLANTED DEVICES OR SYSTEMS WITH PRODUCT FUNCTIONAL SAFETY REQUIREMENTS; (B) AERONAUTIC APPLICATIONS; (C) AUTOMOTIVE APPLICATIONS OR ENVIRONMENTS, AND/OR (D) AEROSPACE APPLICATIONS OR ENVIRONMENTS. WHERE ST PRODUCTS ARE NOT DESIGNED FOR SUCH USE, THE PURCHASER SHALL USE PRODUCTS AT PURCHASER'S SOLE RISK, EVEN IF ST HAS BEEN INFORMED IN WRITING OF SUCH USAGE, UNLESS A PRODUCT IS EXPRESSLY DESIGNATED BY ST AS BEING INTENDED FOR "AUTOMOTIVE, AUTOMOTIVE SAFETY OR MEDICAL" INDUSTRY DOMAINS ACCORDING TO ST PRODUCT DESIGN SPECIFICATIONS. PRODUCTS FORMALLY ESCC, QML OR JAN QUALIFIED ARE DEEMED SUITABLE FOR USE IN AEROSPACE BY THE CORRESPONDING GOVERNMENTAL AGENCY.**

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2014 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

[www.st.com](http://www.st.com)