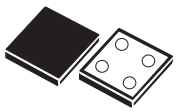
LD39015J

150 mA low quiescent current low noise voltage regulator

Datasheet - production data



Flip-chip 4

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 µA typ. at no load, 35 µA typ. at 150 mA load, 1 µA max in off mode)
- Low noise (54 μV_{RMS} from 10 Hz to 100 kHz at V_{OUT} = 1.8 V)
- Output voltage tolerance: ± 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_{OUT} = 1 µF
- 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 µA. 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.

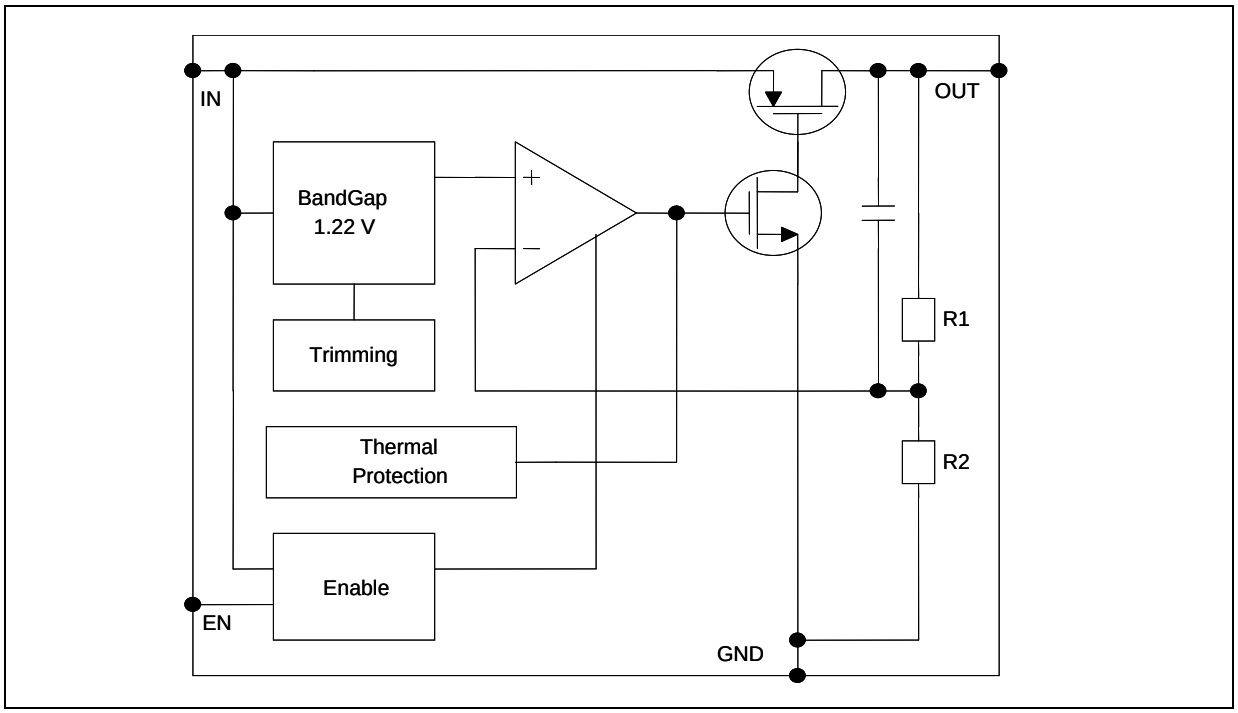
Table 1. Device summary

Order code	Output voltage
LD39015J12R	1.2 V

Contents

1 Diagram

Figure 1. Block diagram



2 Pin configuration

Figure 2. Pin connection (top view)

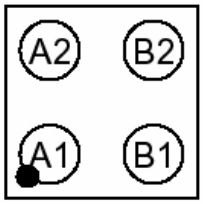
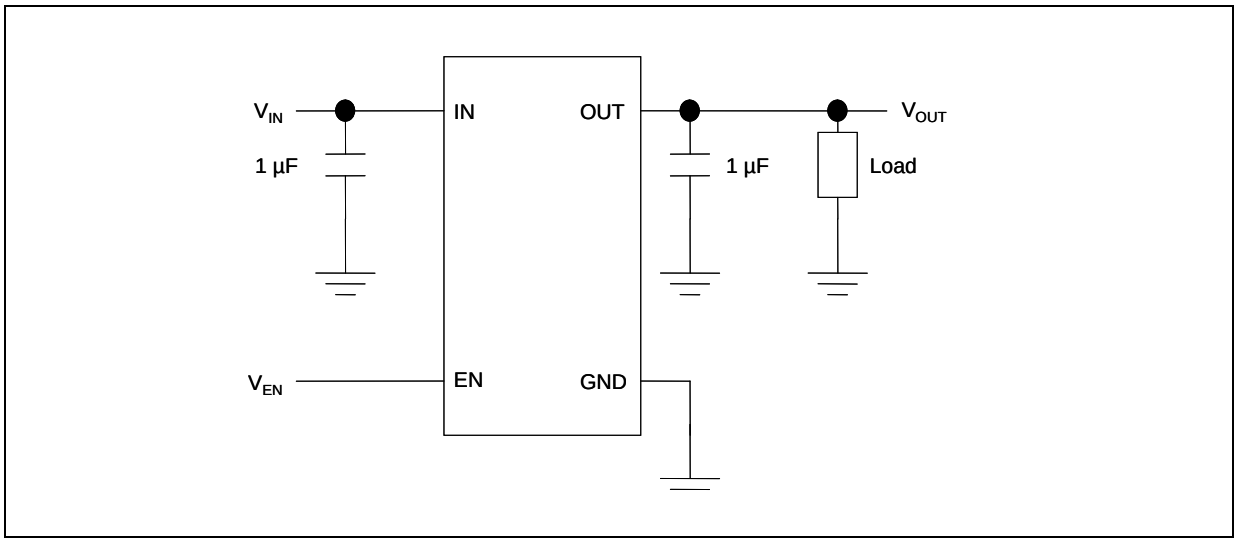


Table 2. Pin description

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 °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

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} ≤ 1.5 V, I_{OUT} = 1 mA		±10		mV
		V_{OUT} ≤ 1.5 V, I_{OUT} = 1 mA, -40 °C < T_J < 125 °C		±30		
ΔV_{OUT}	Static line regulation	V_{OUT} +1 V ≤ V_{IN} ≤ 5.5 V, I_{OUT} = 1 mA		0.01		%/V
ΔV_{OUT}	Static load regulation	I_{OUT} = 1 mA to 150 mA		0.002		%/mA
V_{DROP}	Dropout voltage (1)	I_{OUT} = 100 mA, V_{OUT} > 1.5 V -40 °C < T_J < 125 °C		90	130	mV
e_N	Output noise voltage	10 Hz to 100 kHz, I_{OUT} = 10 mA, V_{OUT} = 1.8 V, V_{IN} = 2.8 V		54		μV_{RMS}
SVR	Supply voltage rejection V_{OUT} = 1.5V	V_{IN} = V_{OUTNOM} + 1 V +/-V_{RIPPLE} V_{RIPPLE} = 0.1 V, freq. = 1 kHz I_{OUT} = 10 mA		74		dB
		V_{IN} = V_{OUTNOM} + 0.5 V +/-V_{RIPPLE} V_{RIPPLE} = 0.1 V, Freq.=10 kHz I_{OUT} = 10 mA		67		
I_Q	Quiescent current	I_{OUT} = 0 mA		20		µA
		I_{OUT} = 0 mA, -40 °C < T_J < 125 °C			40	
		I_{OUT} = 0 to 150 mA		35		
		I_{OUT} = 0 to 150 mA -40 °C < T_J< 125 °C			50	
		V_{IN} input current in OFF MODE: V_{EN} = 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 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			V
I_{EN}	Enable pin input current	V_{SHDN} = V_{IN}, -40 °C < T_J < 125 °C		0.1	1	µA
T_{ON}	Turn on time (2)			30		µs
T_{SHDN}	Thermal shutdown			160		°C
	Hysteresis			20		
C_{OUT}	Output capacitor	Capacitance (see typical performance characteristics for stability)	1		22	µF

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

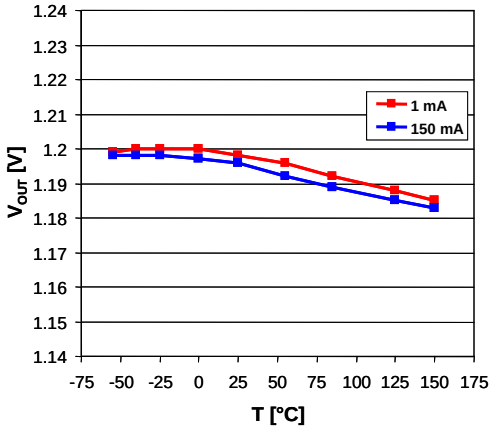


Figure 5. Output voltage vs. input voltage

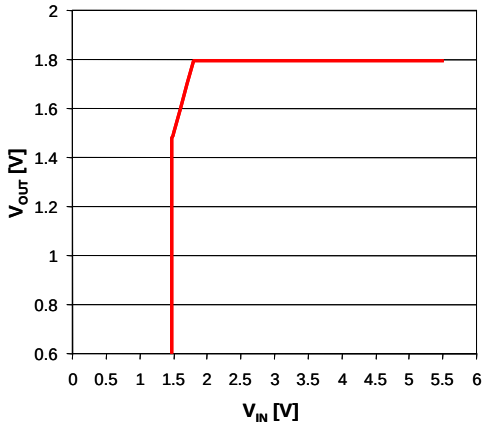


Figure 6. Dropout voltage vs. output current

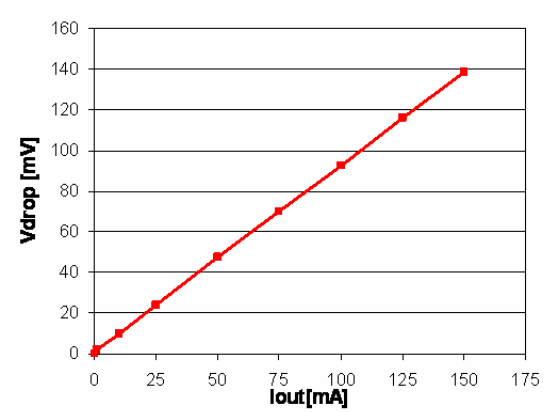


Figure 7. C_{OUT} stability region

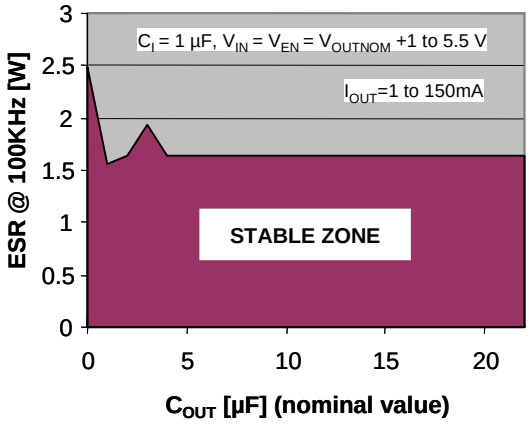


Figure 8. Supply voltage rejection vs. frequency

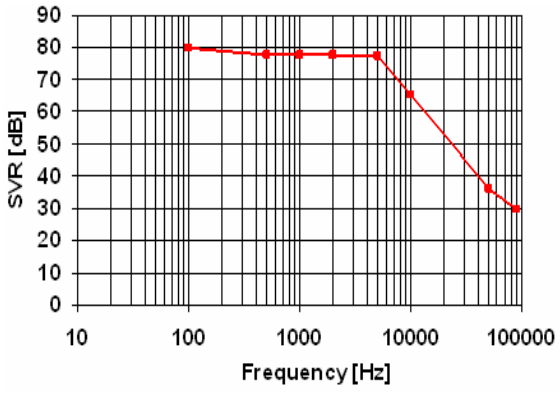


Figure 9. Output noise spectral density

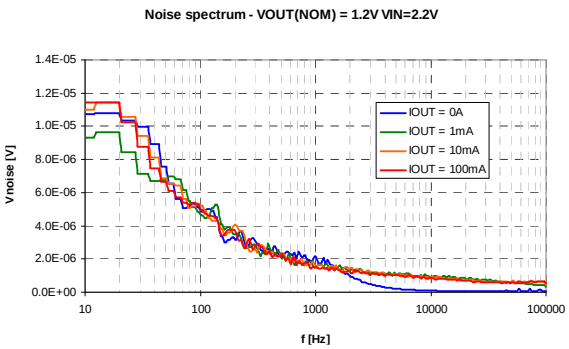


Figure 10. SVR vs. drop

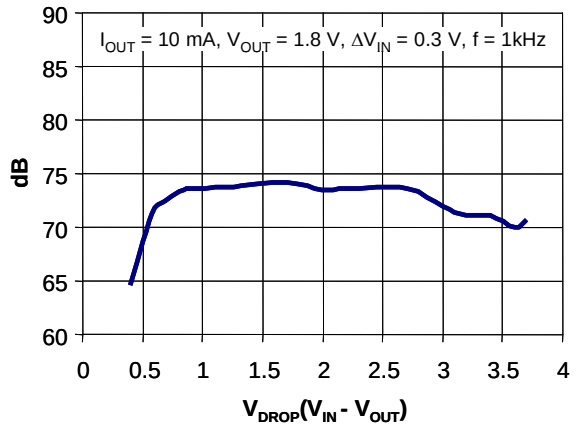


Figure 11. Quiescent current vs. I_{OUT}

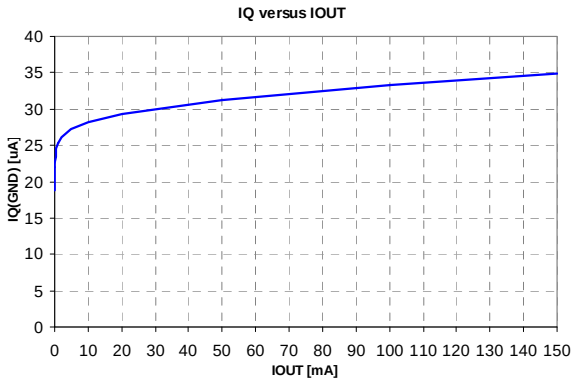


Figure 12. Quiescent current vs. input voltage

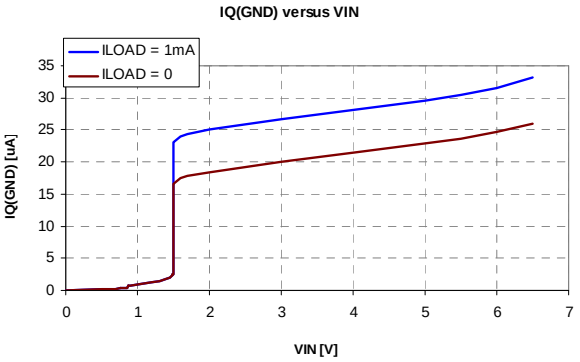
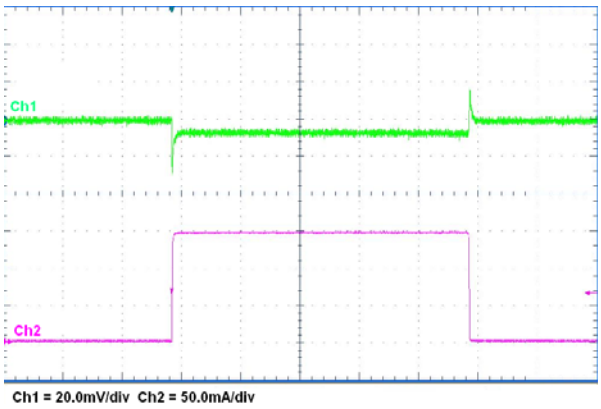
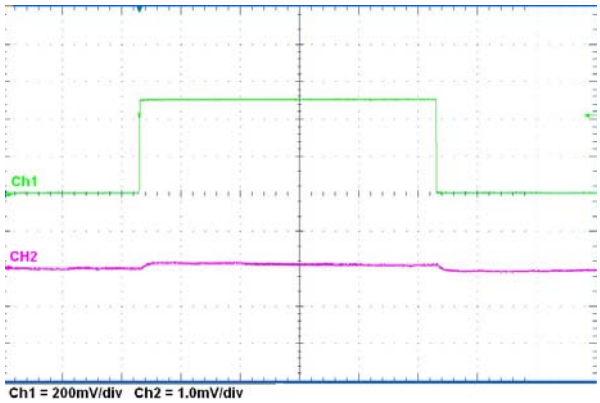


Figure 13. Load transient



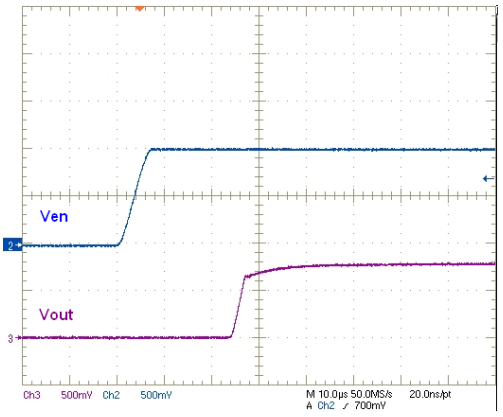
I_{OUT} = 10mA to 150mA, $t_r = t_f$ = 5µs

Figure 14. Line transient



I_{OUT} = 10 mA; V_{OUT}= 1.8 V; ΔV_{IN} = 0.5 V; V_{IN} = from 2.550 to 3.055V; $T_r = T_f$ = 5 µs

Figure 15. Enable transient



V_{IN} = 1.5 V, V_{EN} = 0 to 1 V, I_{OUT} = 1 mA, $C_{IN} = C_{OUT}$ = 1 µF

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.

Figure 16. Flip-chip 4 drawings

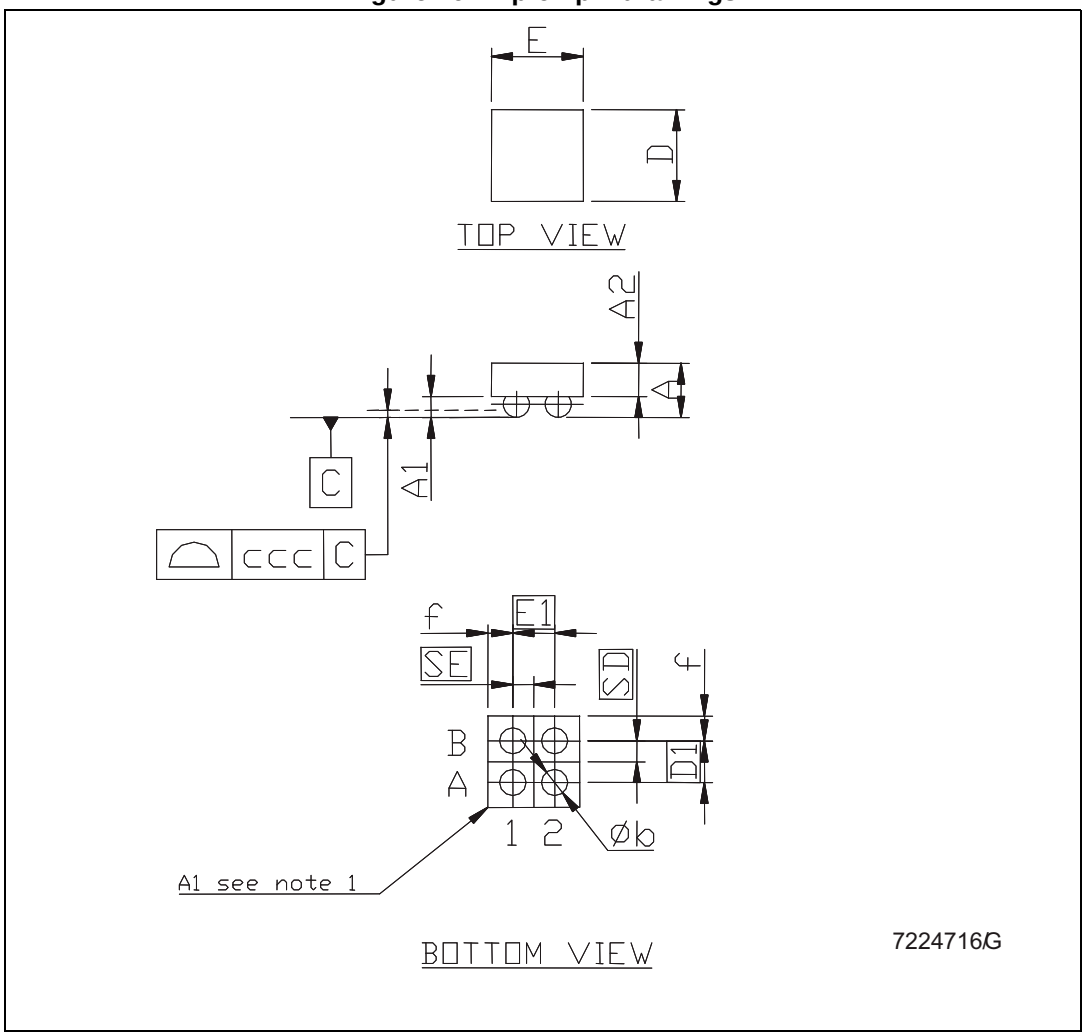


Figure 17. Flip-chip 4 footprint

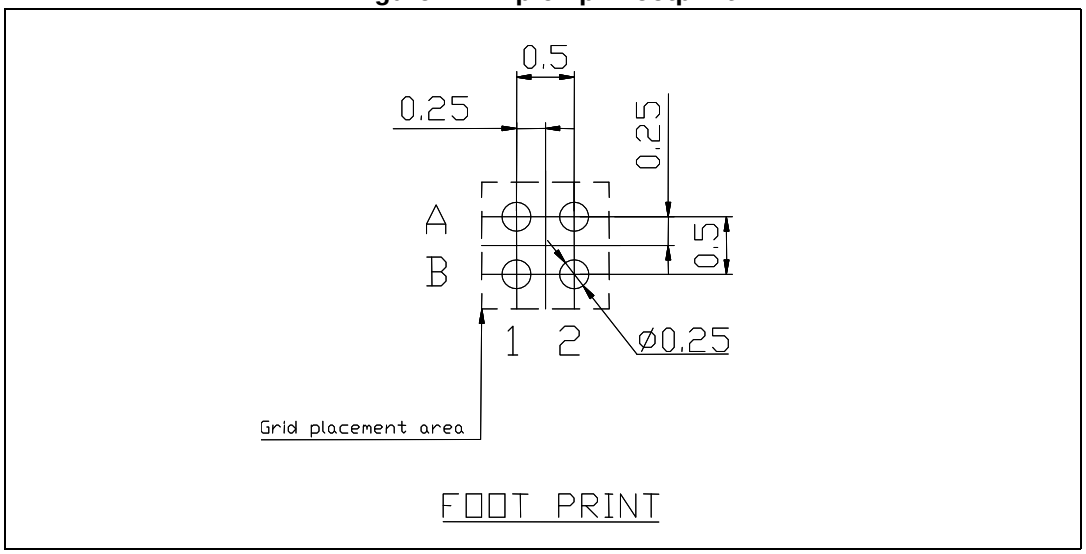


Table 6. Flip-chip 4 mechanical data

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

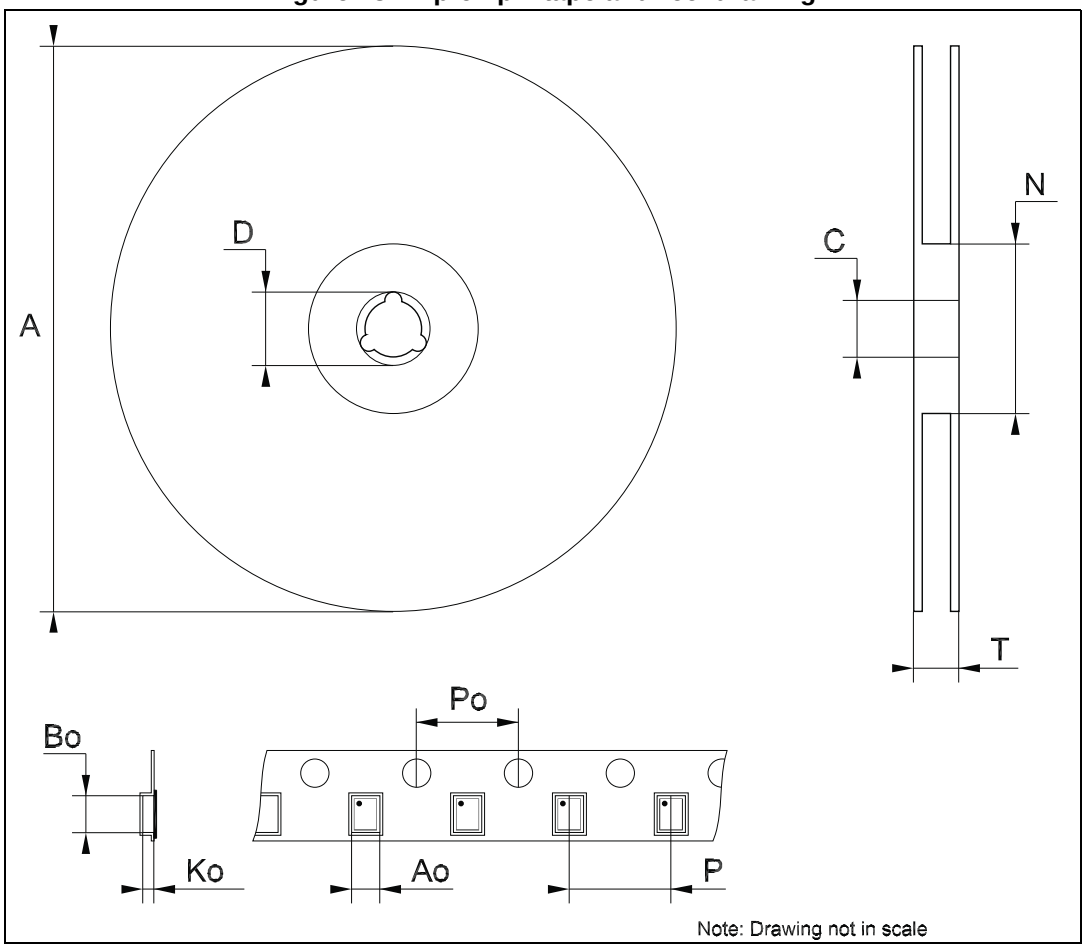


Table 7. Flip-chip 4 tape and reel mechanical data

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 *Table 1 on page 1*.
08-Jan-2014	4	Part number LD39015JXX changed to LD39015J. Updated the Description in cover page, *Section 7: Package mechanical data*. Added *Section 8: Package mechanical data*. Minor text changes.
23-Aug-2017	5	Updated *Table 1: Device summary* on the cover page.