LD39030SJXX12

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

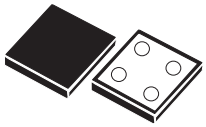
Preliminary data

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 µA typ. at no load, 40 µA typ. at 300 mA load, 1 µA max. in off mode)
- Very low noise (33 μV_{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 µF
- Internal current and thermal limit
- Flip-chip 4 bumps 0.8 x 0.8 mm pitch
- Internal soft-start
- Turn on time typ. 100 µs
- Temperature range: -40 °C to 125 °C

Applications

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



Flip-chip 4

Description

The LD39030SJxx 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 LD39030SJxx in shutdown mode allowing a total current consumption lower than 1 µA. The device also includes a short-circuit constant current limiting and thermal protection.

Table 1. Device summary

Part numbers	Order codes	Output voltages
LD39030SJXX12	LD39030SJ12R	1.2 V

This is preliminary information on a new product now in development or undergoing evaluation. Details are subject to change without notice.

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Contents

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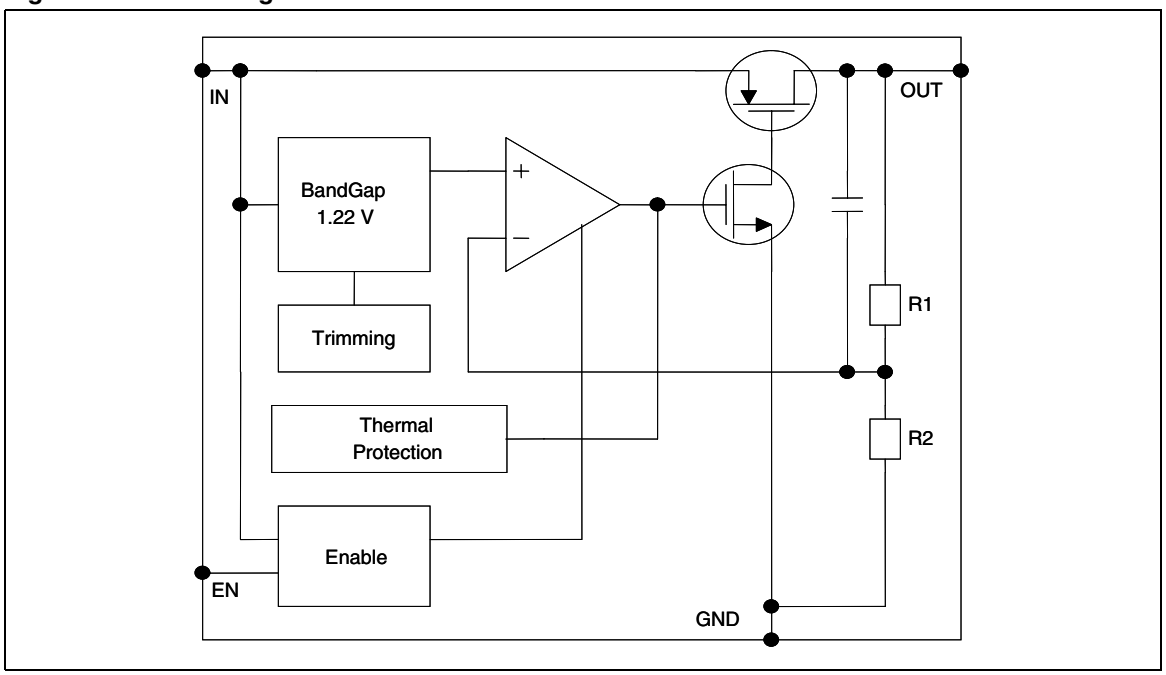
1 Block diagram

Figure 1. Block diagram



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2 Pin configuration

Figure 2. Pin connection (top view)

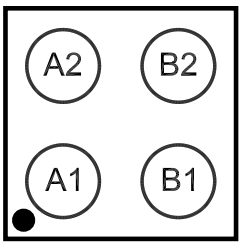

Table 2. Pin description

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

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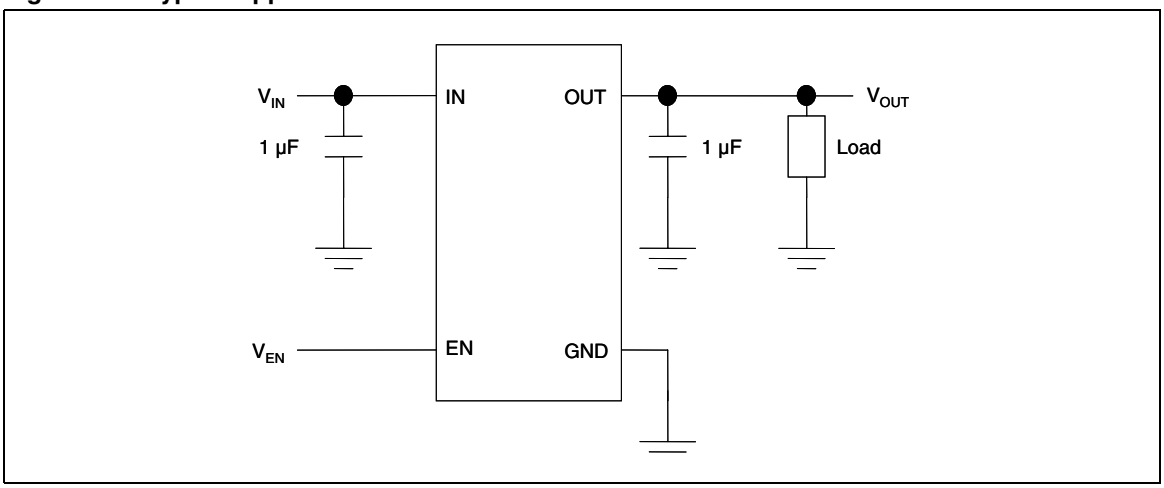
3 Typical application

Figure 3. Typical application circuit



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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

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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 for LD39030SJ (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} ≤ 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		mV
ΔV_{OUT}	Static line regulation	V_{OUT} +1 V ≤ V_{IN} ≤ 5.5 V, I_{OUT}=1 mA		0.01		%/V
ΔV_{OUT}	Transient line regulation (2)	ΔV_{IN}=+500 mV, I_{OUT}=1 mA, T_R=T_F=5 µs		10		mVpp
ΔV_{OUT}	Static load regulation	I_{OUT}=1 mA to 300 mA		0.002		%/mA
ΔV_{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		mV
e_N	Output noise voltage	10 Hz to 100 kHz, I_{OUT}=10 mA		30		μV_{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
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

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Table 5. Electrical characteristics for LD39030SJ (continued)(1)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
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.

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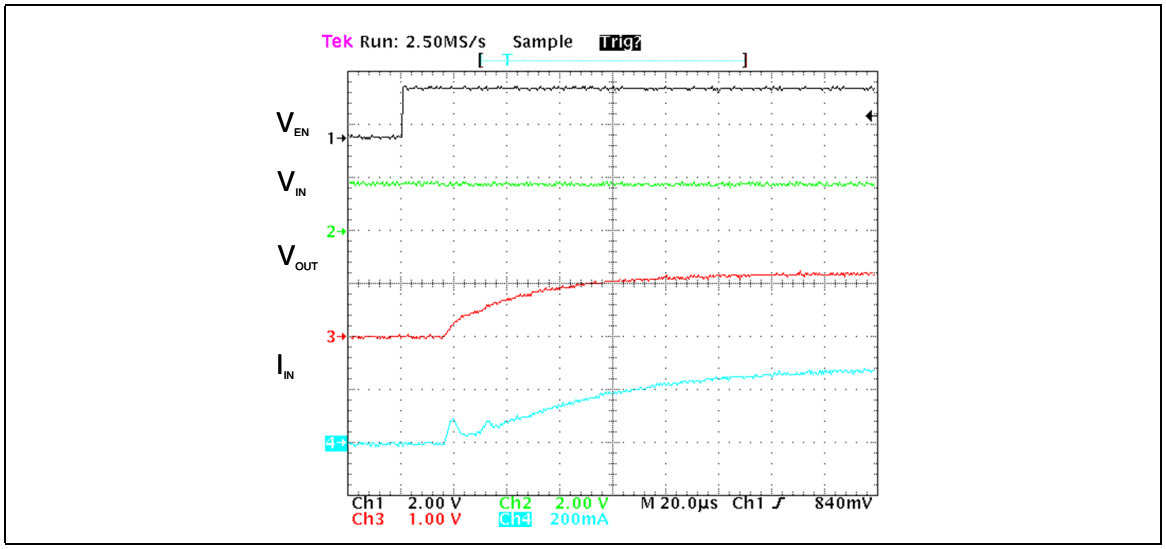
6 Soft-start function

The LD39030SJ 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.

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7 Typical performance characteristics

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

Figure 5. Output voltage vs. temperature

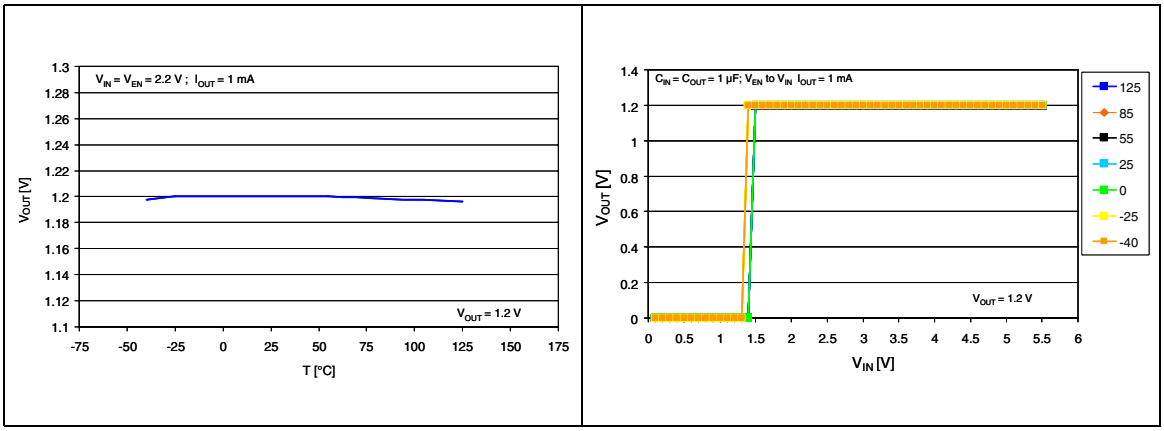

Figure 6. Output voltage vs. input voltage

Figure 7. Line regulation vs. temperature

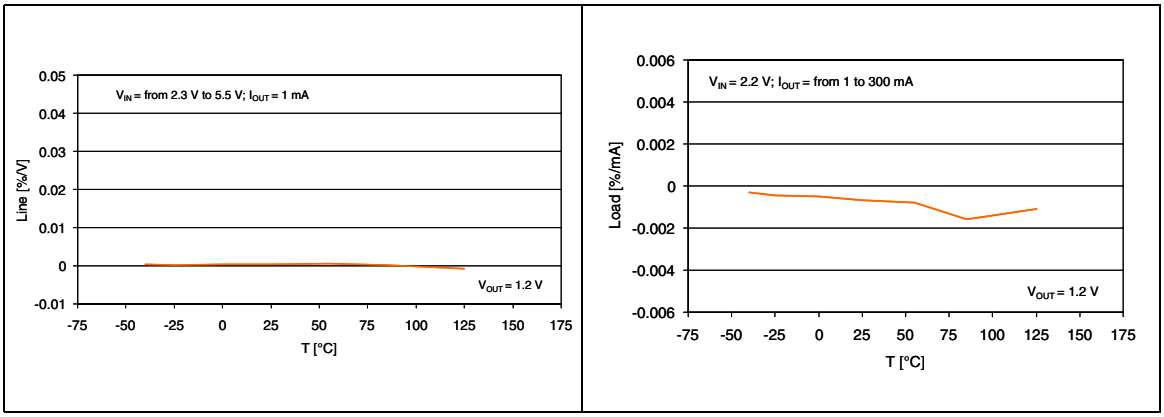

Figure 8. Load regulation vs. temperature

Figure 9. Short-circuit current vs. drop voltage

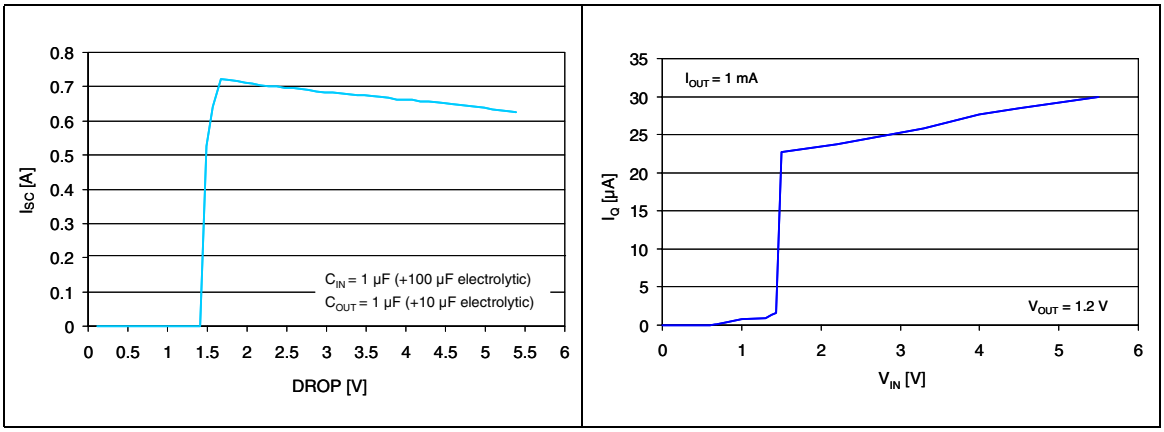

Figure 10. Quiescent current vs. input voltage

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Figure 11. Enable threshold vs. temperature

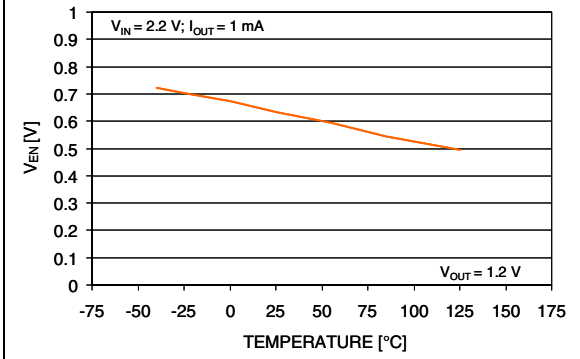

Figure 12. Quiescent current vs. temperature

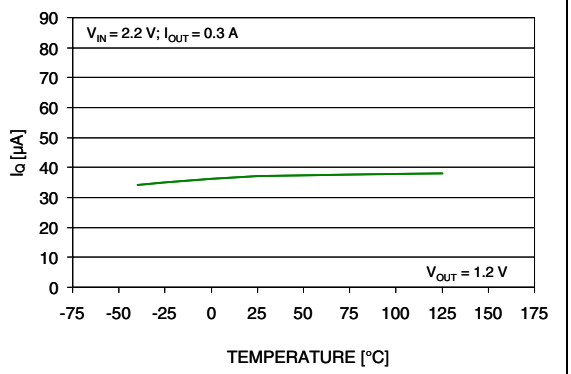

Figure 13. Supply voltage rejection vs. temperature

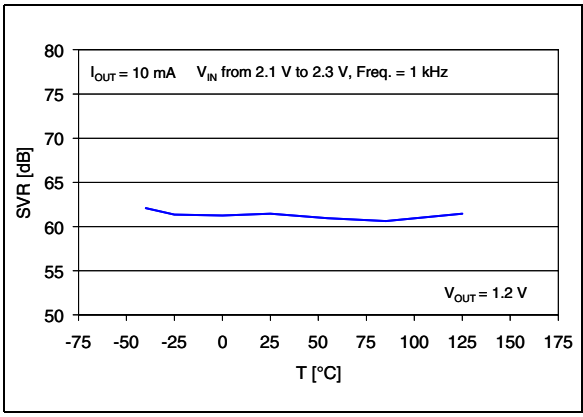

Figure 14. Supply voltage rejection vs. frequency

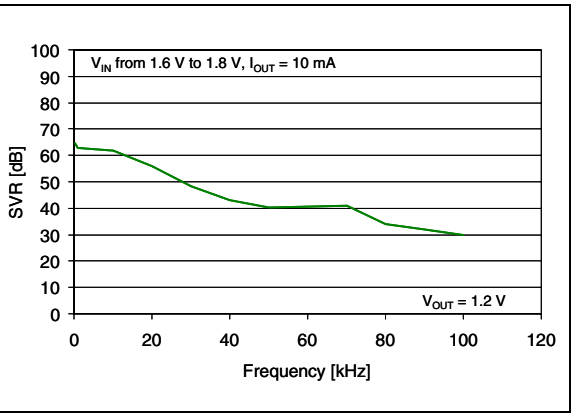

Figure 15. Supply voltage rejection vs. temperature

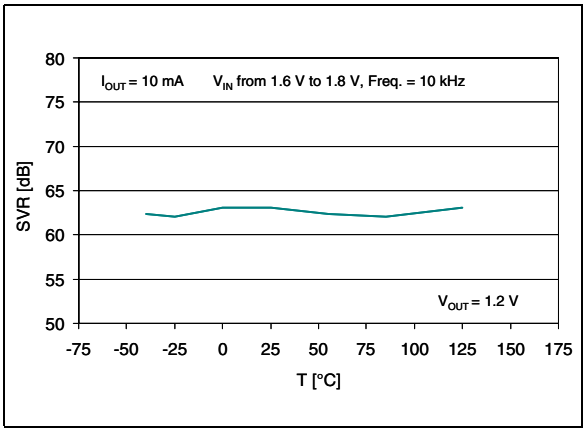

Figure 16. Supply voltage rejection vs. frequency

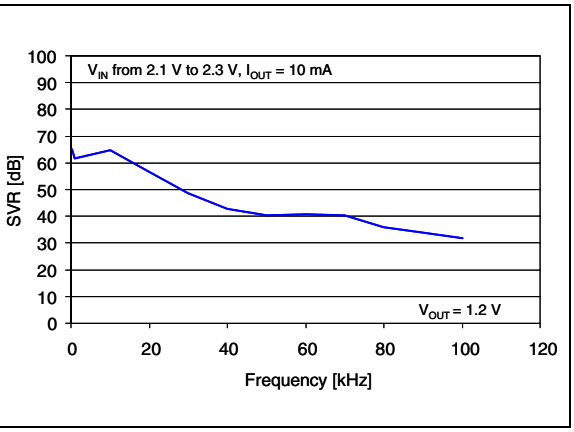

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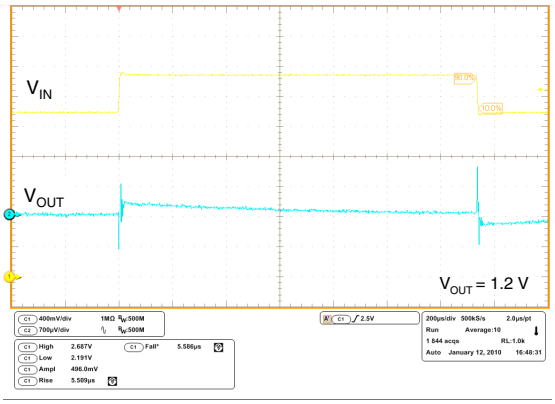
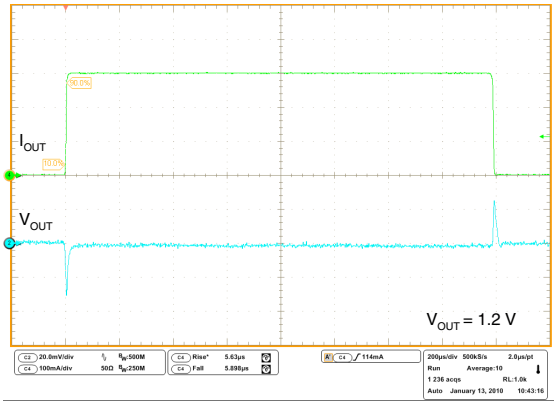
Figure 17. Line transient



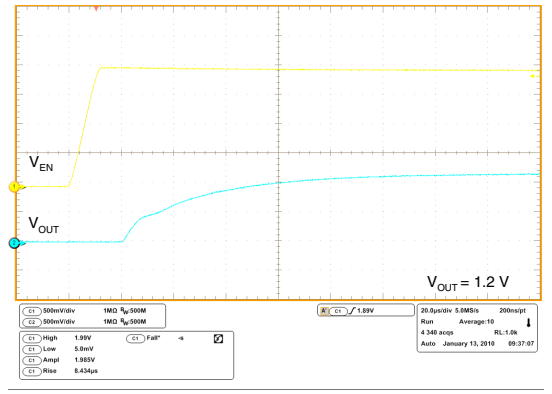
V_{IN} from 2.2 V to 2.7 V, V_{EN} to V_{IN}, I_{OUT} = 1 mA, C_{OUT} = 1 µF, No C_{IN}, $t_{RISE/FALL}$ = 5 µs

Figure 18. Load transient



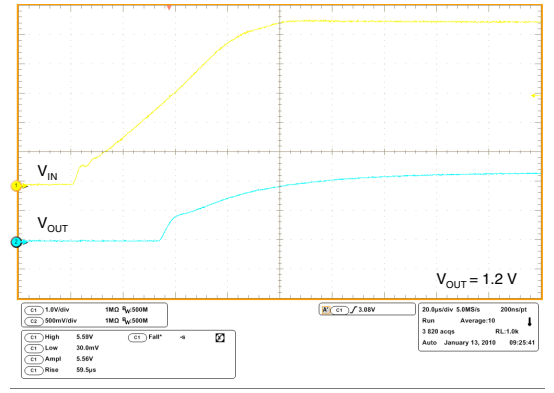
V_{IN} = 2.3 V, V_{EN} to V_{IN}, I_{OUT} = from 1 to 300 mA, C_{IN} = C_{OUT} = 1 µF, $t_{RISE/FALL}$ = 5 µs

Figure 19. Enable transient



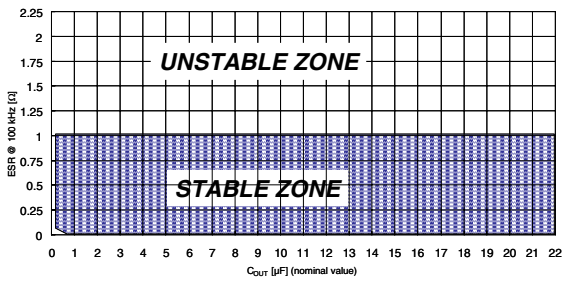
V_{IN} = 2.2 V V_{EN} from 0 to 2 V, I_{OUT} = 1 mA C_{IN} = C_{OUT} = 1 µF t_{RISE} = 8 µs

Figure 20. Startup transient



V_{IN} from 0 to 5.5 V, V_{EN} to V_{IN}, I_{OUT} = 1 mA, C_{OUT} = 1 µF, No C_{IN}, t_{RISE} = 60 µs

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 µF (ceramic)

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8 Package mechanical data

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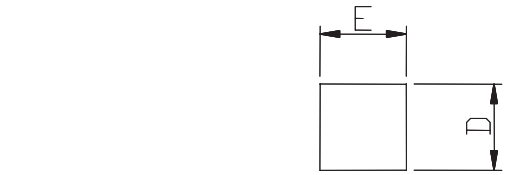
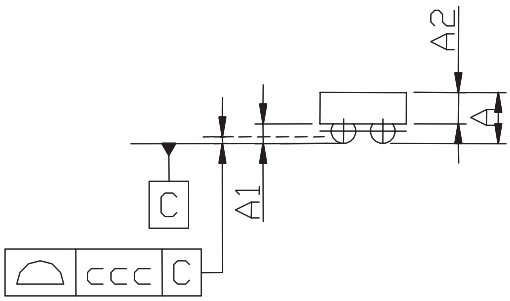
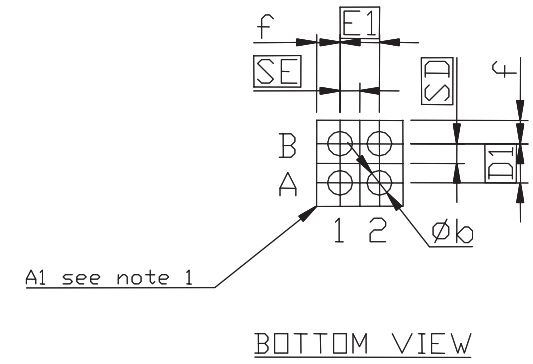
Flip-chip 4 mechanical data

Dim.	mm.			mils.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.585	0.65	0.715	23.03	25.59	28.15
A1	0.21	0.25	0.29	8.27	9.84	11.42
A2		0.40			15.75	
b	0.265	0.315	0.365	10.43	12.40	14.37
D	1.02	1.07	1.12	40.15	42.13	44.09
D1		0.5			19.69	
E	1.02	1.07	1.12	40.15	42.13	44.09
E1		0.5			19.69	
SD		0.25			9.84	
SE		0.25			9.84	







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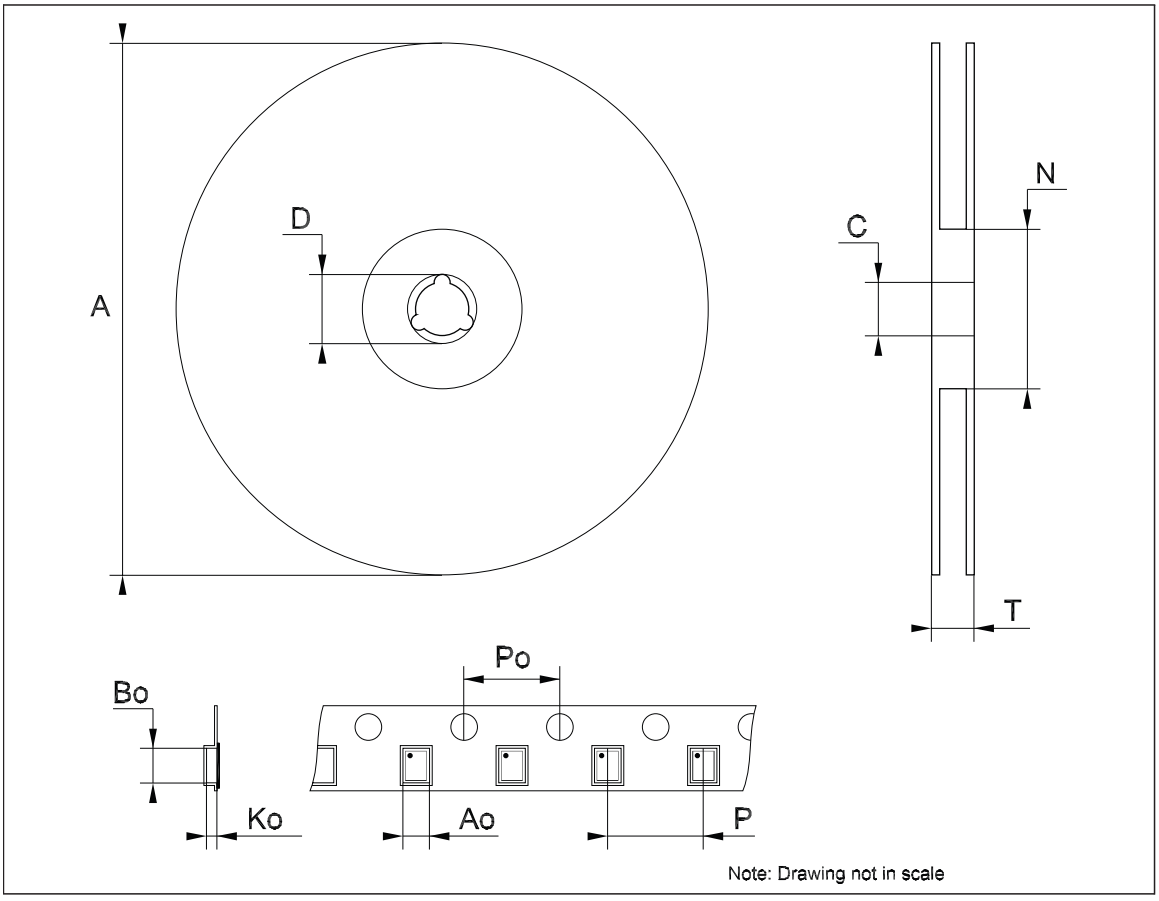
Tape and reel Flip-chip 4 mechanical data

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			178			6.926
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	59	60	61	2.323	2.362	2.401
T			8.4			0.331
Ao	1.12	1.17	1.22	0.044	0.046	0.048
Bo	1.12	1.17	1.22	0.044	0.046	0.048
Ko	0.68	0.73	0.78	0.027	0.029	0.031
Po	3.9	4	4.1	0.153	0.157	0.161
P	3.9	4	4.1	0.153	0.157	0.161



Note: Drawing not in scale

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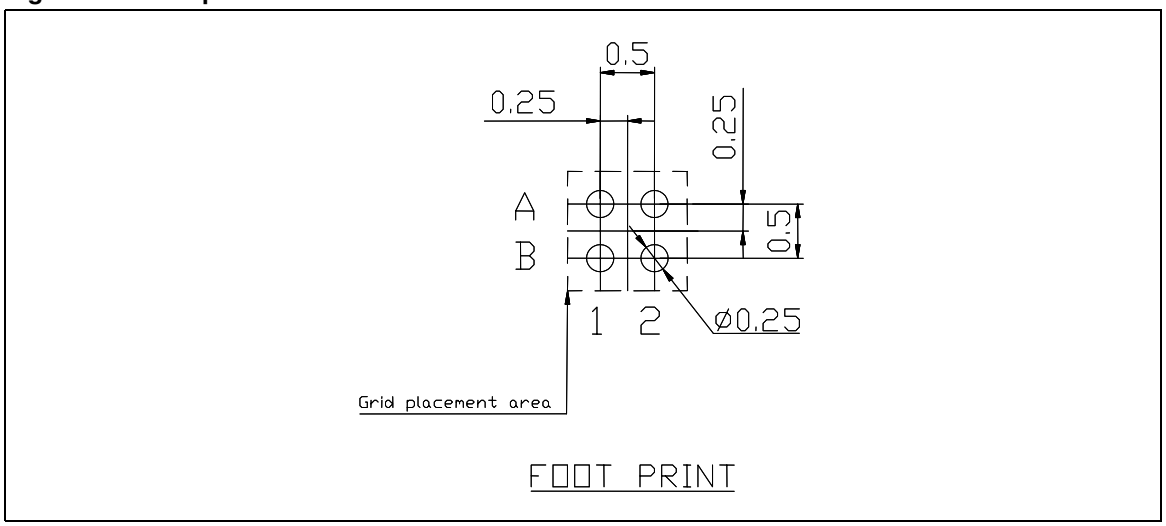
Figure 22. Footprint data



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9 Revision history

Table 6. Document revision history

Date	Revision	Changes
14-Oct-2010	1	release.

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