LD6836 series

Ultra low dropout regulators, low noise, 300 mA

Rev. 2 — 5 October 2012 Product data sheet

1. Product profile

1.1 General description

The LD6836 series is a small-size Low DropOut regulator (LDO) family with a typical voltage drop of 90 mV at 300 mA current rating. Operating input voltages can range from 2.3 V to 5.5 V. The devices are available with fixed output voltages between 1.2 V and 3.6 V.

In disabled mode the LD6836x/xxH devices show a high-ohmic state at the output pin while the LD6836x/xxP devices contain a pull-down switching transistor to provide a low-ohmic output state (auto discharge function).

The LD6836CX4 and LD6836CX4/C devices are in a 0.4 mm pitch Wafer-Level Chip-Scale Package (WLCSP) making them ideal for use in portable applications requiring component miniaturization. The LD6836TD devices are in a small SOT753 Surface-Mounted Device (SMD) plastic package. All devices are manufactured in monolithic silicon technology.

1.2 Features and benefits

- 300 mA output current rating
- Input voltage range 2.3 V to 5.5 V
- Fixed output voltage between 1.2 V and 3.6 V
- Dropout voltage 90 mV at 300 mA output rating
- Low quiescent current in shutdown mode (typical 0.1 μA)
- 30 μV RMS output noise voltage (typical value) at 10 Hz to 100 kHz
- Turn-on time 150 μs
- 55 dB Power Supply Rejection Ratio (PSRR) at 1 kHz
- Over-temperature protection
- Output current limiter
- LD6836x/xxH: high-ohmic (3-state) output state when disabled
- LD6836x/xxP: low-ohmic output state when disabled (auto discharge function)
- Integrated ElectroStatic Discharge (ESD) protection up to 10 kV Human Body Model (HBM)
- WLCSP with 0.4 mm pitch and package size of 0.76 mm × 0.76 mm × 0.47 mm
- Small SOT753 SMD plastic package (SOT23-5 compatible)
- Pb-free, Restriction of Hazardous Substances (RoHS) compliant and free of halogen and antimony (dark green compliant)

1.3 Applications

Analog and digital interfaces requiring lower than standard supply voltages in mobile appliances such as smartphones, mobile phone handsets and cordless telephones. Other typical applications are digital still cameras, mobile internet devices, personal navigation devices and portable media players.

2. Pinning information

2.1 Pinning

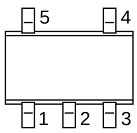


Fig 1. Pin configuration for SOT753

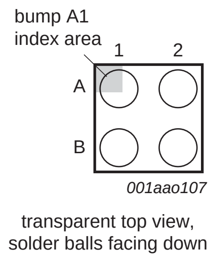


Fig 2. Pin configuration for WLCSP4

2.2 Pin description

Table 1. Pin description for SOT753

Symbol	Pin	Description
IN	1	regulator input voltage
GND	2	supply ground
EN	3	device enable input; active HIGH
n.c.	4	not connected
OUT	5	regulator output voltage

Table 2. Pin description for WLCSP4

Symbol	Pin	Description
GND	A1	supply ground
EN	A2	device enable input; active HIGH
OUT	B1	regulator output voltage
IN	B2	regulator input voltage

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
LD6836CX4	WLCSP4	wafer-level chip-scale package; 4 bumps (2 × 2) [1]	-
LD6836CX4/C	WLCSP4	wafer-level chip-scale package with backside coating; 4 bumps (2 × 2) [1]	-
LD6836TD	-	plastic surface-mounted package; 5 leads	SOT753

[1] Size 0.76 mm × 0.76 mm.

3.1 Ordering options

Further information on output voltage is available on request; see Section 18 "Contact information".

Table 4. Type number extension of high-ohmic output in WLCSP4

Type number	Nominal output voltage	Type number	Nominal output voltage
LD6836CX4/12H	1.2 V	LD6836CX4/25H	2.5 V
LD6836CX4/13H	1.3 V	LD6836CX4/27H	2.7 V
LD6836CX4/14H	1.4 V	LD6836CX4/28H	2.8 V
LD6836CX4/16H	1.6 V	LD6836CX4/29H	2.9 V
LD6836CX4/18H	1.8 V	LD6836CX4/30H	3.0 V
LD6836CX4/20H	2.0 V	LD6836CX4/33H	3.3 V
LD6836CX4/22H	2.2 V	LD6836CX4/36H	3.6 V
LD6836CX4/23H	2.3 V	-	-

Table 5. Type number extension of pull-down output in WLCSP4

Type number	Nominal output voltage	Type number	Nominal output voltage
LD6836CX4/12P	1.2 V	LD6836CX4/23P	2.3 V
LD6836CX4/13P	1.3 V	LD6836CX4/25P	2.5 V
LD6836CX4/14P	1.4 V	LD6836CX4/27P	2.7 V
LD6836CX4/16P	1.6 V	LD6836CX4/28P	2.8 V
LD6836CX4/18P	1.8 V	LD6836CX4/29P	2.9 V
LD6836CX4/20P	2.0 V	LD6836CX4/30P	3.0 V
LD6836CX4/21P	2.1 V	LD6836CX4/33P	3.3 V
LD6836CX4/22P	2.2 V	LD6836CX4/36P	3.6 V

Table 6. Type number extension of pull-down output in WLCSP4 with backside coating

Type number	Nominal output voltage	Type number	Nominal output voltage
LD6836CX4/C12P	1.2 V	LD6836CX4/C23P	2.3 V
LD6836CX4/C13P	1.3 V	LD6836CX4/C25P	2.5 V
LD6836CX4/C14P	1.4 V	LD6836CX4/C27P	2.7 V
LD6836CX4/C16P	1.6 V	LD6836CX4/C28P	2.8 V
LD6836CX4/C18P	1.8 V	LD6836CX4/C29P	2.9 V
LD6836CX4/C20P	2.0 V	LD6836CX4/C30P	3.0 V
LD6836CX4/C21P	2.1 V	LD6836CX4/C33P	3.3 V
LD6836CX4/C22P	2.2 V	LD6836CX4/C36P	3.6 V

Table 7. Type number extension of high-ohmic output in SOT753

Type number	Nominal output voltage	Type number	Nominal output voltage
LD6836TD/12H	1.2 V	LD6836TD/23H	2.3 V
LD6836TD/13H	1.3 V	LD6836TD/27H	2.7 V
LD6836TD/14H	1.4 V	LD6836TD/28H	2.8 V
LD6836TD/16H	1.6 V	LD6836TD/29H	2.9 V
LD6836TD/18H	1.8 V	LD6836TD/30H	3.0 V
LD6836TD/20H	2.0 V	LD6836TD/33H	3.3 V
LD6836TD/22H	2.2 V	LD6836TD/36H	3.6 V

Table 8. Type number extension of pull-down output in SOT753

Type number	Nominal output voltage	Type number	Nominal output voltage
LD6836TD/12P	1.2 V	LD6836TD/23P	2.3 V
LD6836TD/13P	1.3 V	LD6836TD/25P	2.5 V
LD6836TD/14P	1.4 V	LD6836TD/27P	2.7 V
LD6836TD/16P	1.6 V	LD6836TD/28P	2.8 V
LD6836TD/18P	1.8 V	LD6836TD/29P	2.9 V
LD6836TD/20P	2.0 V	LD6836TD/30P	3.0 V
LD6836TD/21P	2.1 V	LD6836TD/33P	3.3 V
LD6836TD/22P	2.2 V	LD6836TD/36P	3.6 V

4. Block diagram

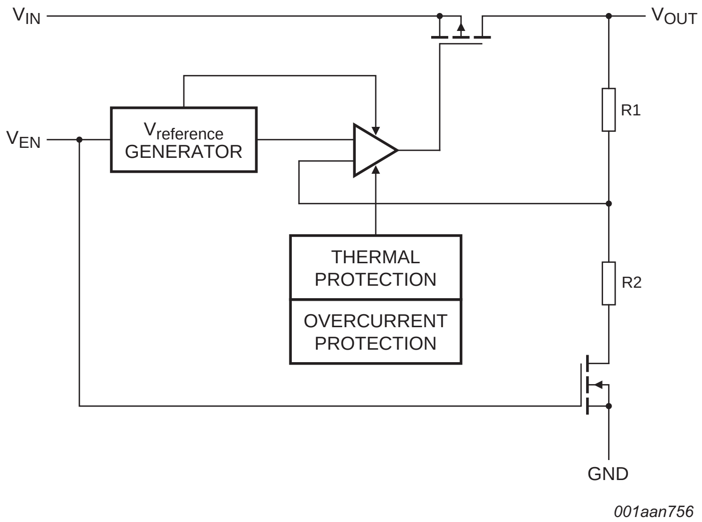


Fig 3. Block diagram of LD6836x/xxH

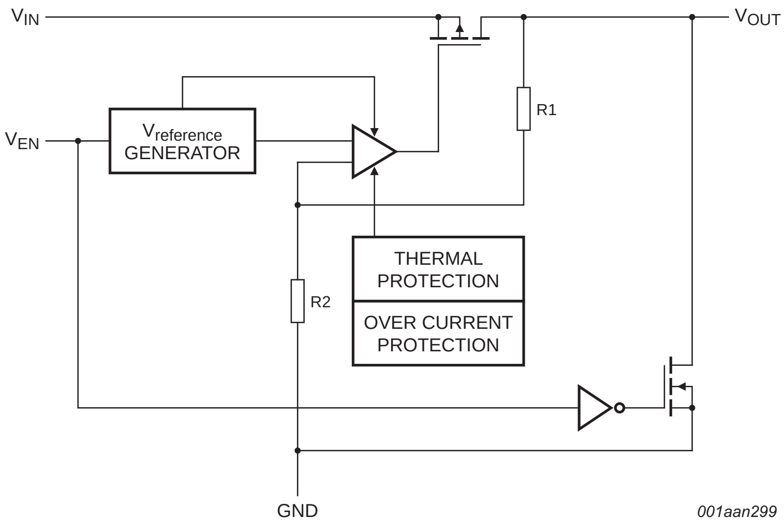


Fig 4. Block diagram of LD6836x/xxP (auto discharge function)

5. Limiting values

Table 9. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions		Min	Max	Unit
V_{IN}	voltage on pin IN	4 ms transient		–0.5	+6.0	V
P_{tot}	total power dissipation	LD6836CX4, LD6836CX4/C	[1]	-	770	mW
		LD6836TD	[1]	-	800	mW
T_{stg}	storage temperature			–55	+150	°C
T_j	junction temperature			–40	+125	°C
T_{amb}	ambient temperature			–40	+85	°C
V_{ESD}	electrostatic discharge voltage	human body model level 6	[2]	-	±10	kV
		machine model class 3	[3]	-	±400	V

[1] The (absolute) maximum power dissipation depends on the junction temperature T_j. Higher power dissipation is allowed with lower ambient temperatures. The conditions to determine the specified values are T_{amb} = 25 °C and the use of a two layer Printed-Circuit Board (PCB).

[2] According to IEC 61340-3-1.

[3] According to JESD22-A115C.

6. Recommended operating conditions

Table 10. Operating conditions

Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
T_{amb}	ambient temperature			–40	-	+85	°C
T_j	junction temperature			-	-	+125	°C
Pin IN							
V_{IN}	voltage on pin IN			2.3	-	5.5	V
Pin EN							
V_{EN}	voltage on pin EN			0	-	V_{IN}	V
Pin OUT							
$C_{L(ext)}$	external load capacitance		[1]	0.7	1.0	-	µF

[1] See Section 10.1 "Capacitor values".

7. Thermal characteristics

Table 11. Thermal characteristics

Symbol	Parameter	Conditions		Typ	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	LD6836CX4, LD6836CX4/C	[1][2]	130	K/W
		LD6836TD	[1][2]	125	K/W

[1] The overall $R_{th(j-a)}$ can vary depending on the board layout. To minimize the effective $R_{th(j-a)}$, all pins must have a solid connection to larger Cu layer areas for example to the power and ground layer. In multi-layer PCB applications, the second layer is used to create a large heat spreader area directly below the LDO. If this layer is either ground or power, it is connected with several vias to the top layer connecting to the device ground or supply. Avoid the use of solder-stop varnish under the chip.

[2] Use the measurement data given for a rough estimation of the $R_{th(j-a)}$ in your application. The actual $R_{th(j-a)}$ value can vary in applications using different layer stacks and layouts.

8. Characteristics

Table 12. Electrical characteristics

At recommended input voltages and T_{amb} = −40 °C to +85 °C; voltages are referenced to GND (ground = 0 V); unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Output voltage							
V_{do}	dropout voltage	I_{OUT} = 300 mA; V_{IN} < $V_{O(nom)}$	[1]				
		LD6836CX4, LD6836CX4/C		-	90	160	mV
		LD6836TD		-	100	200	mV
ΔV_O	output voltage variation	V_{OUT} < 1.8 V; I_{OUT} = 1 mA					
		T_{amb} = +25 °C		−3	±0.5	+3	%
		−30 °C ≤ T_{amb} ≤ +85 °C		−4	-	+4	%
		V_{OUT} ≥ 1.8 V; I_{OUT} = 1 mA					
		T_{amb} = +25 °C		−2	±0.5	+2	%
		−30 °C ≤ T_{amb} ≤ +85 °C		−3	-	+3	%
Line regulation error							
$\Delta V_O/(V_O x \Delta V_I)$	relative output voltage variation with input voltage	V_{IN} = ($V_{O(nom)}$ + 0.2 V) to 5.5 V	[1]	−0.1	-	+0.1	%/V
Load regulation error							
$\Delta V_O/(V_O x \Delta I_O)$	relative output voltage variation with output current	1 mA ≤ I_{OUT} ≤ 300 mA		-	0.0025	0.01	%/mA
Output current							
I_{OUT}	current on pin OUT			-	-	300	mA
I_{OM}	peak output current	V_{IN} = ($V_{O(nom)}$ + 0.2 V) to 5.5 V	[1]				
		$V_{O(nom)}$ > 1.8V; V_{OUT} = 0.95 × $V_{O(nom)}$		350	-	-	mA
		$V_{O(nom)}$ < 1.8 V; V_{OUT} = 0.9 × $V_{O(nom)}$		350	-	-	mA
I_{sc}	short-circuit current	pin OUT		-	600	-	mA

Table 12. Electrical characteristics *...continued*

At recommended input voltages and T_{amb} = −40 °C to +85 °C; voltages are referenced to GND (ground = 0 V); unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Regulator quiescent current							
I_q	quiescent current	V_{EN} = 1.4 V; I_{OUT} = 0 mA		-	70	100	µA
		V_{EN} = 1.4 V; 1 mA ≤ I_{OUT} ≤ 300 mA		-	155	250	µA
		V_{EN} ≤ 0.4 V		-	0.1	1	µA
Ripple rejection and output noise							
PSRR	power supply rejection ratio	V_{IN} = $V_{O(nom)}$ + 1.0 V; I_{OUT} = 30 mA; f_{ripple} = 1 kHz	[1]	-	−55	-	dB
$V_{n(o)(RMS)}$	RMS output noise voltage	f_{ripple} = 10 Hz to 100 kHz; $C_{L(ext)}$ = 1 µF		-	30	-	µV
Enable input and timing							
V_{IL}	LOW-level input voltage	pin EN		0	-	0.4	V
V_{IH}	HIGH-level input voltage	pin EN		1.1	-	5.5	V
$t_{startup(reg)}$	regulator start-up time	V_{IN} = 5.5 V; V_{OUT} = 0.95 × $V_{O(nom)}$; I_{OUT} = 300 mA; $C_{L(ext)}$ = 1 µF	[1]	-	150	-	µs
LD6836x/xxP; auto discharge function							
$t_{sd(reg)}$	regulator shutdown time	V_{IN} = 5.5 V; V_{OUT} = 0.05 × $V_{O(nom)}$; $C_{L(ext)}$ = 1 µF		-	300	-	µs
R_{pd}	pull-down resistance			-	100	-	Ω
Over-temperature protection							
T_{sd}	shutdown temperature			-	160	-	°C
$T_{sd(hys)}$	shutdown temperature hysteresis			-	20	-	°K

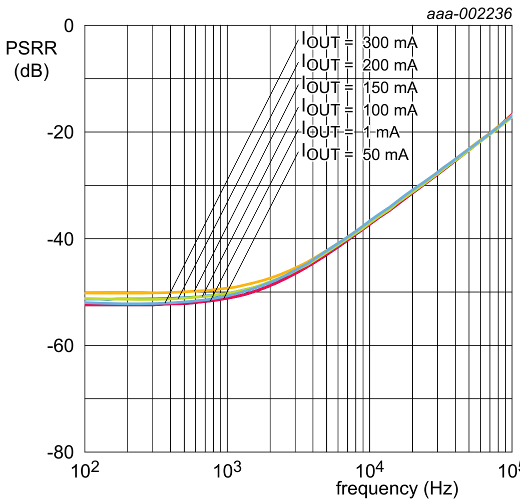
[1] $V_{O(nom)}$ = nominal output voltage (device specific).

9. Dynamic behavior

9.1 Power Supply Rejection Ratio (PSRR)

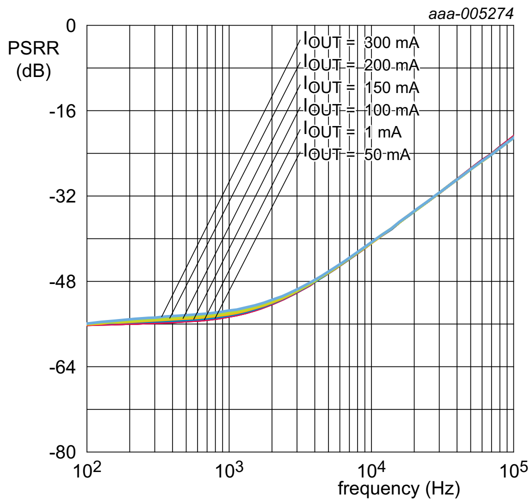
PSRR stands for the capability of the regulator to suppress unwanted signals on the input voltage like noise or ripples.

$$PSRR[dB] = 20log\frac{V_{out(ripple)}}{V_{in(ripple)}} \text{ for all frequencies}$$



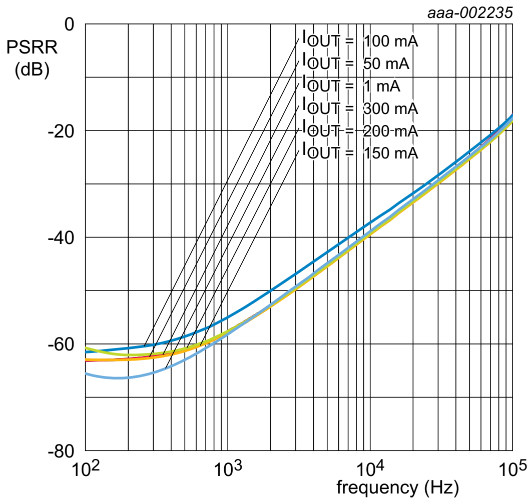
V_{IN} = 4.6 V; V_{OUT} = 3.6 V; $C_{L(ext)}$ = 1 μF

Fig 5. PSRR for LD6836CX4/36H



V_{IN} = 3.5 V; V_{OUT} = 2.5 V; $C_{L(ext)}$ = 1 μF

Fig 6. PSRR of LD6836TD/25H



V_{IN} = 2.2 V; V_{OUT} = 1.2 V; $C_{L(ext)}$ = 1 μF

Fig 7. PSRR of LD6836CX4/12H

9.2 Dropout

The dropout voltage is defined as the smallest input to output voltage difference at a specified load current when the regulator operates within its linear region. This means that the input voltage is below the nominal output voltage value and the pass transistor works as a plain resistor.

A small dropout voltage guarantees lower power consumption and efficiency maximization.

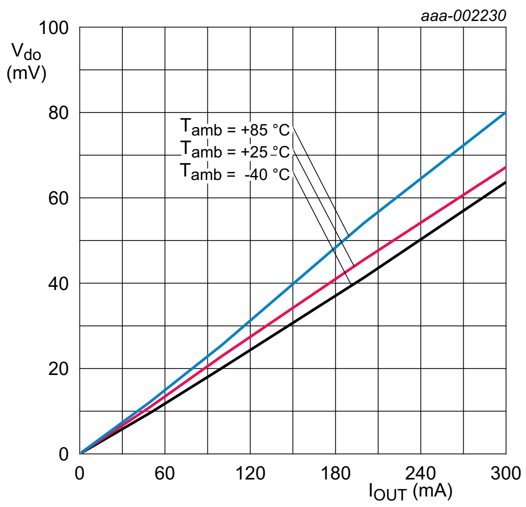


Fig 8. Dropout voltage as a function of output current for LD6836CX4/25x

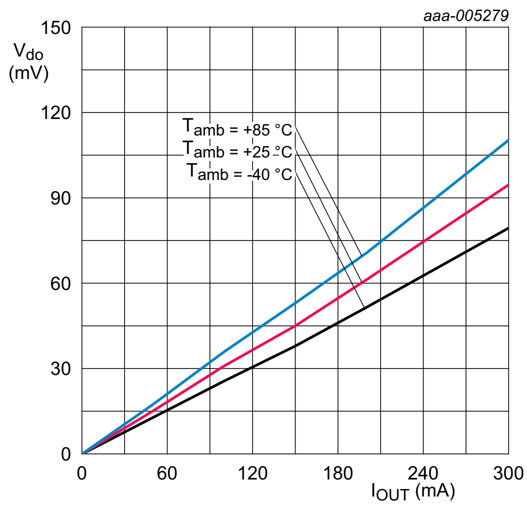


Fig 9. Dropout voltage as a function of output current for LD6836TD/36x

9.3 Accuracy

The LD6836 series guarantees high accuracy of the nominal output voltage.

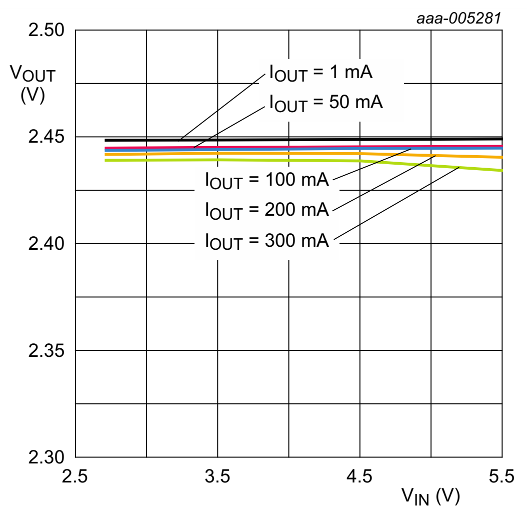
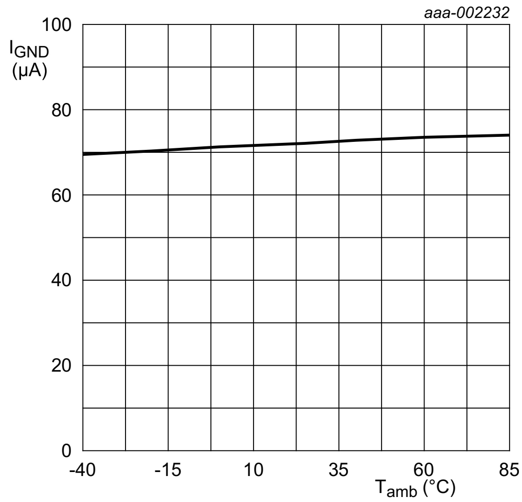


Fig 10. Working voltage tolerance for LD6836CX4/25x

9.4 Quiescent current

Quiescent (or ground) current is the difference between input and output current of the regulator.



I_{OUT} = 0 mA

Fig 11. Quiescent current for LD6836CX4/25H

9.5 Noise

Output noise voltage of an LDO circuit is given as noise density or RMS output noise voltage over a defined frequency spectrum (10 Hz to 100 kHz). Permanent conditions are a constant output current and a ripple-free input voltage. The output noise voltage is generated by the LDO regulator.

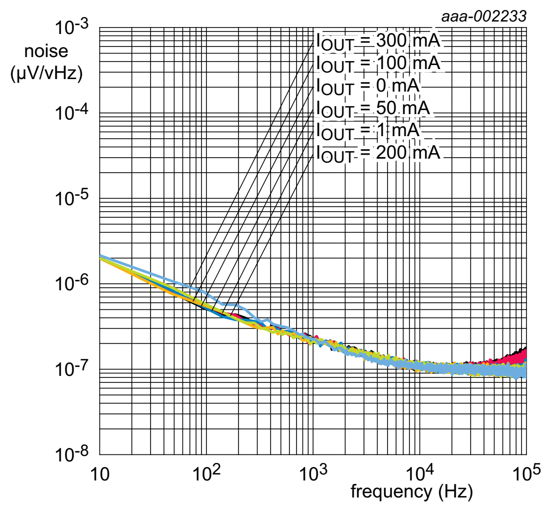
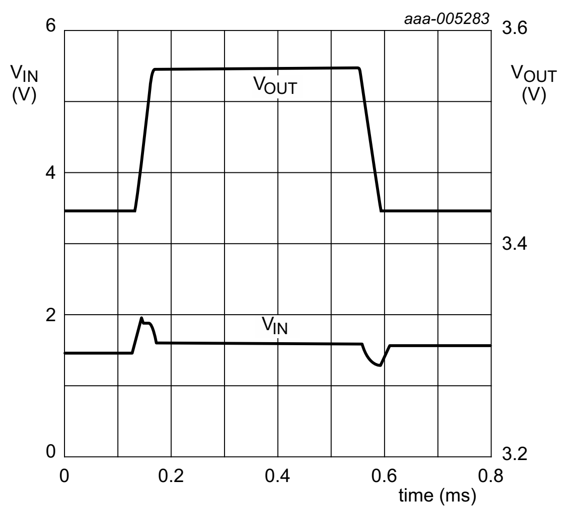


Fig 12. Noise density for LD6836x/25x

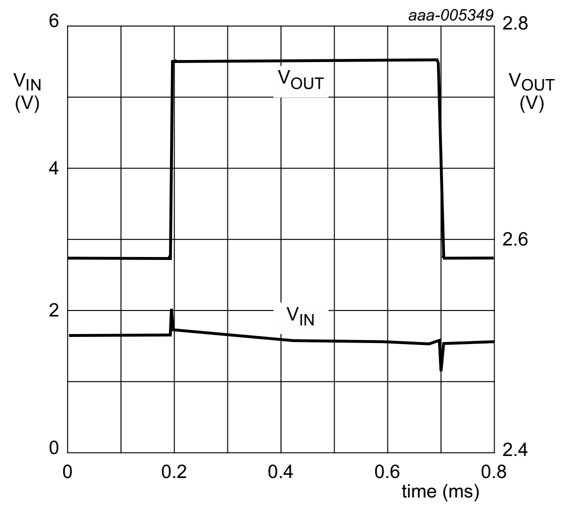
9.6 Line Regulation

Line regulation is the capability of the circuit to maintain the nominal output voltage while varying the input voltage.



I_{OUT} = 300 mA

Fig 13. Line regulation for LD6836CX4/33P

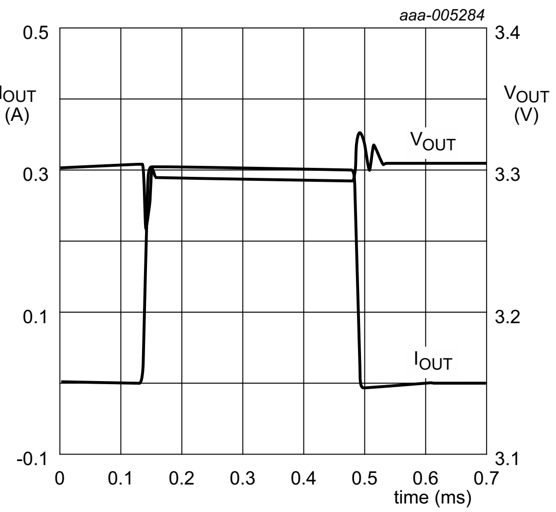


I_{OUT} = 300 mA

Fig 14. Line regulation for LD6836CX4/25P

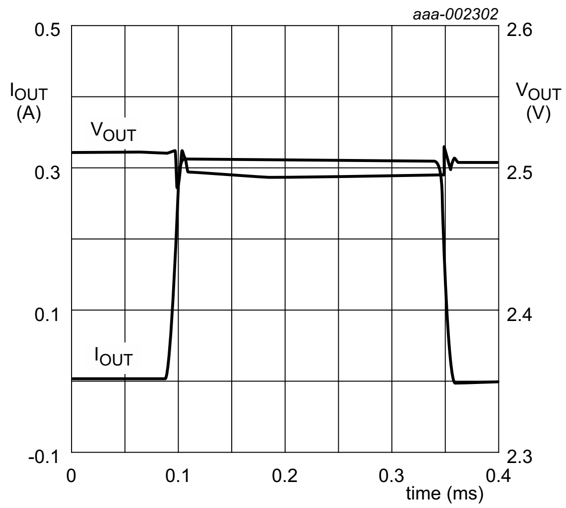
9.7 Load Regulation

Load regulation is the capability of the circuit to maintain the nominal output voltage while varying the output current.



V_{IN} = 5.5 V

Fig 15. Load regulation for LD6836CX4/33P



V_{IN} = 5.5 V

Fig 16. Load regulation for LD6836CX4/25P

9.8 Start-up and shutdown

Start-up time defines the time needed for the LDO to achieve 95 % of its typical output voltage level after activation via the enable pin. Shutdown time defines the time needed for the LDO to pull-down the output voltage to 10 % of its nominal output voltage after deactivation via the enable pin.

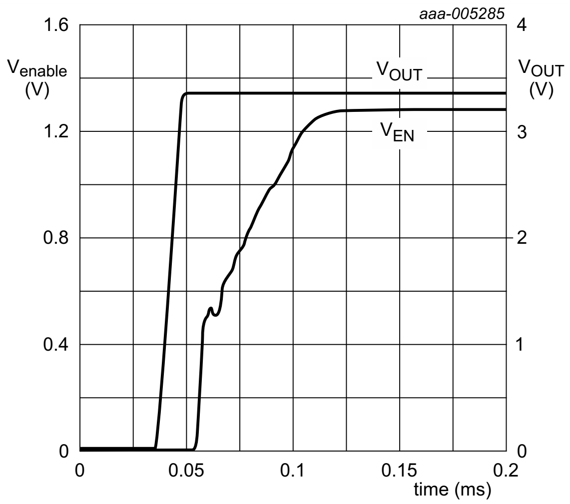


Fig 17. Start-up for LD6836x/33P

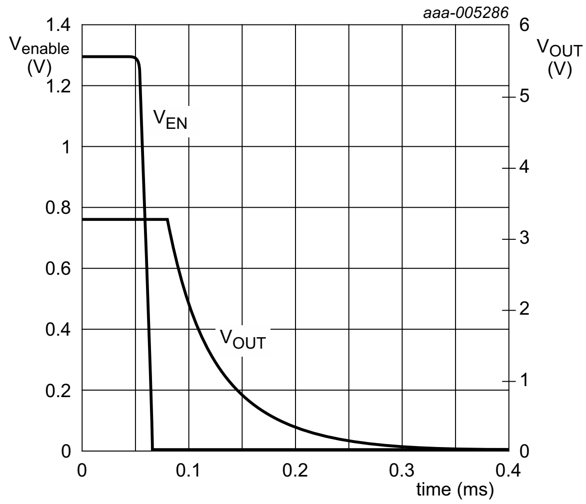


Fig 18. Shutdown for LD6836x/25P

9.9 Enable threshold voltage

An active HIGH signal enables the LDO when the signal exceeds the minimum input HIGH voltage threshold. The LDO is in Off state as long the signal is below the maximum LOW threshold. The input voltage threshold is independent from the LDO input voltage.

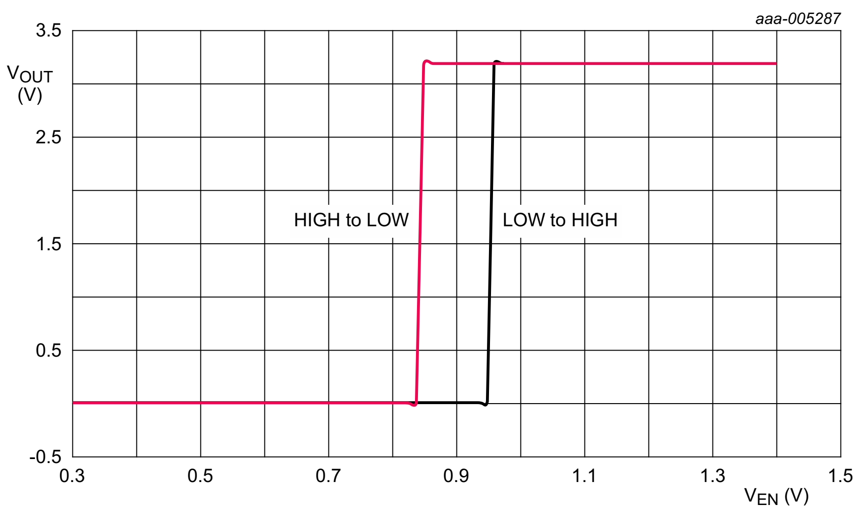


Fig 19. Enable threshold voltage

10. Application information

10.1 Capacitor values

The LD6836 series require external capacitors at the output to guarantee a stable regulator behavior. Do not under-run the specified minimum Equivalent Series Resistance (ESR). The absolute value of the total capacitance attached to the output pin OUT influences the shutdown time ($t_{sd(reg)}$) of the LD6836 series. Also an input capacitor is recommended to keep the input voltage stable.

Table 13. External load capacitor

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$C_{i(ext)}$	external input capacitance		[1]	0.7	1.0		µF
$C_{L(ext)}$	external load capacitance		[1]	0.7	1.0	-	µF
ESR	equivalent series resistance			5	-	500	mΩ

[1] The minimum value of capacitance for stability and correct operation is 0.7 µF. The specified capacitor tolerance is ±30 % or better over the temperature and operating conditions range. The recommended capacitor type is X7R to meet the full device temperature specification of −40 °C to +125 °C.

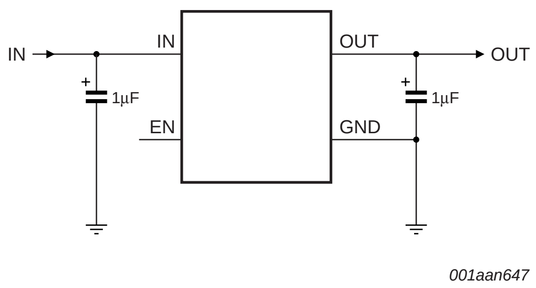


Fig 20. Application diagram

11. Test information

11.1 Quality information

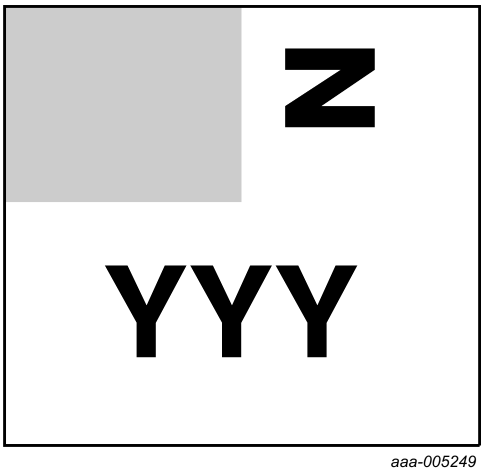
This product has been qualified in accordance with *NX1-00023 NXP Semiconductors Quality and Reliability Specification* and is suitable for use in consumer applications.

12. Marking

12.1 WLCSP4

WLCSP dies are laser marked with the following information (see Table 14 to 16 and Figure 21):

1. Shaded area: marking of pin A1
2. The character N gives the version code and describes the output mode of the LDO. If the code is legible, the LDO has an integrated pull down transistor (“P“ version). If the character N is rotated counterclockwise by 90°, the LDO is a “H“ version.
3. “YYY” symbolizes a placeholder for some characters of the lot ID



Transparent top view

Fig 21. Marking WLCSP4

Table 14. Marking code of high-ohmic output

Type number	Nominal output voltage	Marking code
LD6836CX4/12H	1.2 V	A
LD6836CX4/27H	2.7 V	P

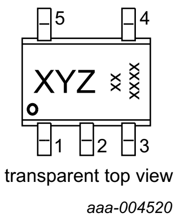
Table 15. Marking of pull-down output

Type number	Nominal output voltage	Marking code	Type number	Nominal output voltage	Marking code
LD6836CX4/12P	1.2 V	A	LD6836CX4/23P	2.3 V	L
LD6836CX4/13P	1.3 V	B	LD6836CX4/25P	2.5 V	N
LD6836CX4/14P	1.4 V	C	LD6836CX4/27P	2.7 V	P
LD6836CX4/16P	1.6 V	E	LD6836CX4/28P	2.8 V	Q
LD6836CX4/18P	1.8 V	G	LD6836CX4/29P	2.9 V	R
LD6836CX4/20P	2.0 V	I	LD6836CX4/30P	3.0 V	S
LD6836CX4/21P	2.1 V	J	LD6836CX4/33P	3.3 V	V
LD6836CX4/22P	2.2 V	K	LD6836CX4/36P	3.6 V	Y

Table 16. Marking code of pull-down output with backside coating

Type number	Nominal output voltage	Marking code	Type number	Nominal output voltage	Marking code
LD6836CX4/C12P	1.2 V	A	LD6836CX4/C23P	2.3 V	L
LD6836CX4/C13P	1.3 V	B	LD6836CX4/C25P	2.5 V	N
LD6836CX4/C14P	1.4 V	C	LD6836CX4/C27P	2.7 V	P
LD6836CX4/C16P	1.6 V	E	LD6836CX4/C28P	2.8 V	Q
LD6836CX4/C18P	1.8 V	G	LD6836CX4/C29P	2.9 V	R
LD6836CX4/C20P	2.0 V	I	LD6836CX4/C30P	3.0 V	S
LD6836CX4/C21P	2.1 V	J	LD6836CX4/C33P	3.3 V	V
LD6836CX4/C22P	2.2 V	K	LD6836CX4/C36P	3.6 V	Y

12.2 SOT753



Circle (bottom left) = marking of pin 1

XYZ = version; for marking code corresponding to type number see Table 17 and 18

All other characters = lot ID information

Fig 22. Marking SOT753

Table 17. Marking code of high-ohmic output

Type number	Nominal output voltage	Marking code	Type number	Nominal output voltage	Marking code
LD6836TD/12H	1.2 V	9AH	LD6836TD/23H	2.3 V	9LH
LD6836TD/13H	1.3 V	9BH	LD6836TD/27H	2.7 V	9PH
LD6836TD/14H	1.4 V	9CH	LD6836TD/28H	2.8 V	9QH
LD6836TD/16H	1.6 V	9EH	LD6836TD/29H	2.9 V	9RH
LD6836TD/18H	1.8 V	9GH	LD6836TD/30H	3.0 V	9SH
LD6836TD/20H	2.0 V	9JH	LD6836TD/33H	3.3 V	9VH
LD6836TD/22H	2.2 V	9KH	LD6836TD/36H	3.6 V	9YH

Table 18. Marking of pull-down output

Type number	Nominal output voltage	Marking code	Type number	Nominal output voltage	Marking code
LD6836TD/12P	1.2 V	9AP	LD6836TD/23P	2.3 V	9LP
LD6836TD/13P	1.3 V	9BP	LD6836TD/25P	2.5 V	9NP
LD6836TD/14P	1.4 V	9CP	LD6836TD/27P	2.7 V	9PP
LD6836TD/16P	1.6 V	9EP	LD6836TD/28P	2.8 V	9QP
LD6836TD/18P	1.8 V	9GP	LD6836TD/29P	2.9 V	9RP
LD6836TD/20P	2.0 V	9JP	LD6836TD/30P	3.0 V	9SP
LD6836TD/21P	2.1 V	9ZP	LD6836TD/33P	3.3 V	9VP
LD6836TD/22P	2.2 V	9KP	LD6836TD/36P	3.6 V	9YP

13. Package outline

WLCSP4: wafer level chip-size package; 4 bumps (2 x 2)

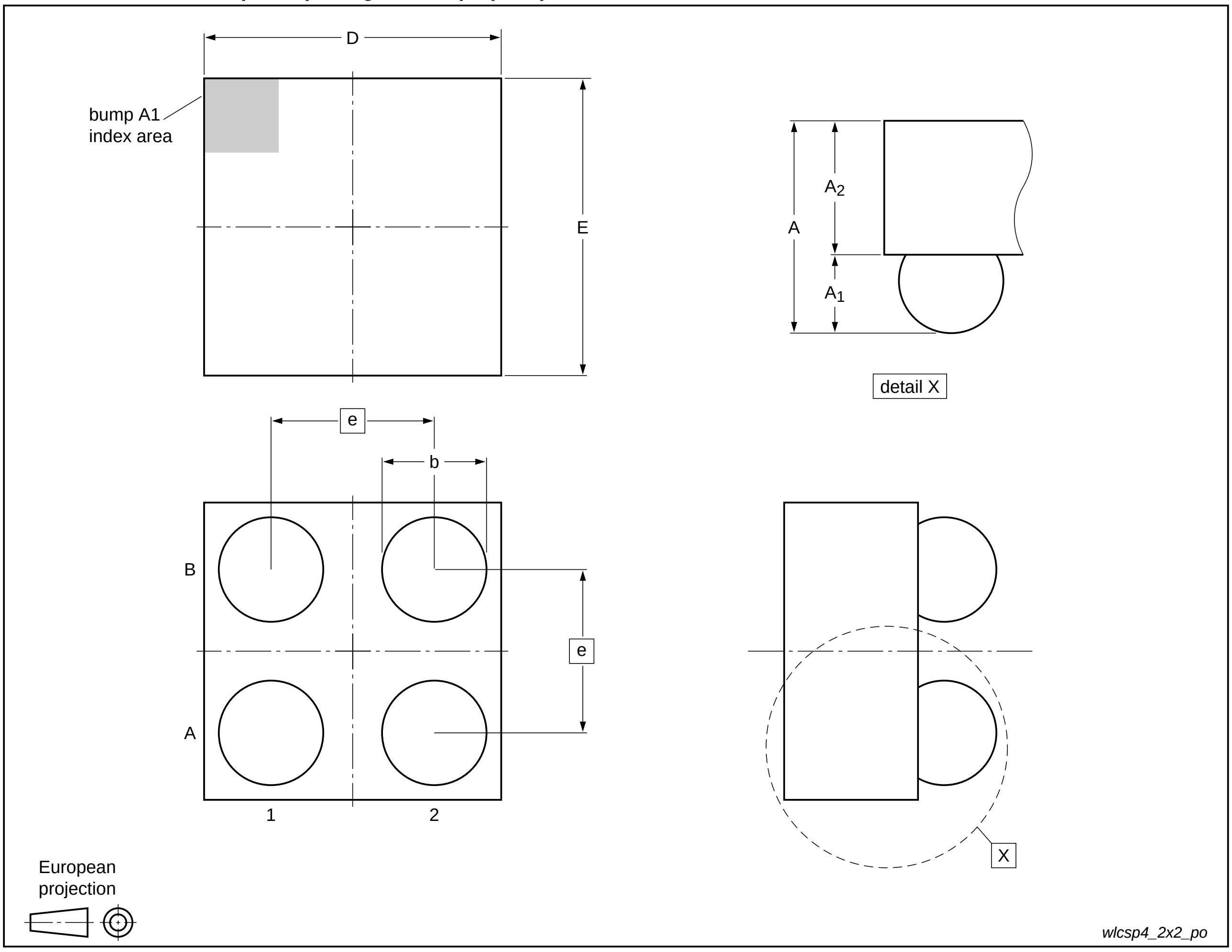


Fig 23. Package outline LD6836CX4 (WLCSP4)

Table 19. Dimensions for Figure 23

Symbol	Min	Typ	Max	Unit
A	0.44	0.47	0.50	mm
A_1	0.18	0.20	0.22	mm
A_2	0.26	0.27	0.28	mm
b	0.21	0.26	0.31	mm
D	0.71	0.76	0.81	mm
E	0.71	0.76	0.81	mm
e	-	0.4	-	mm

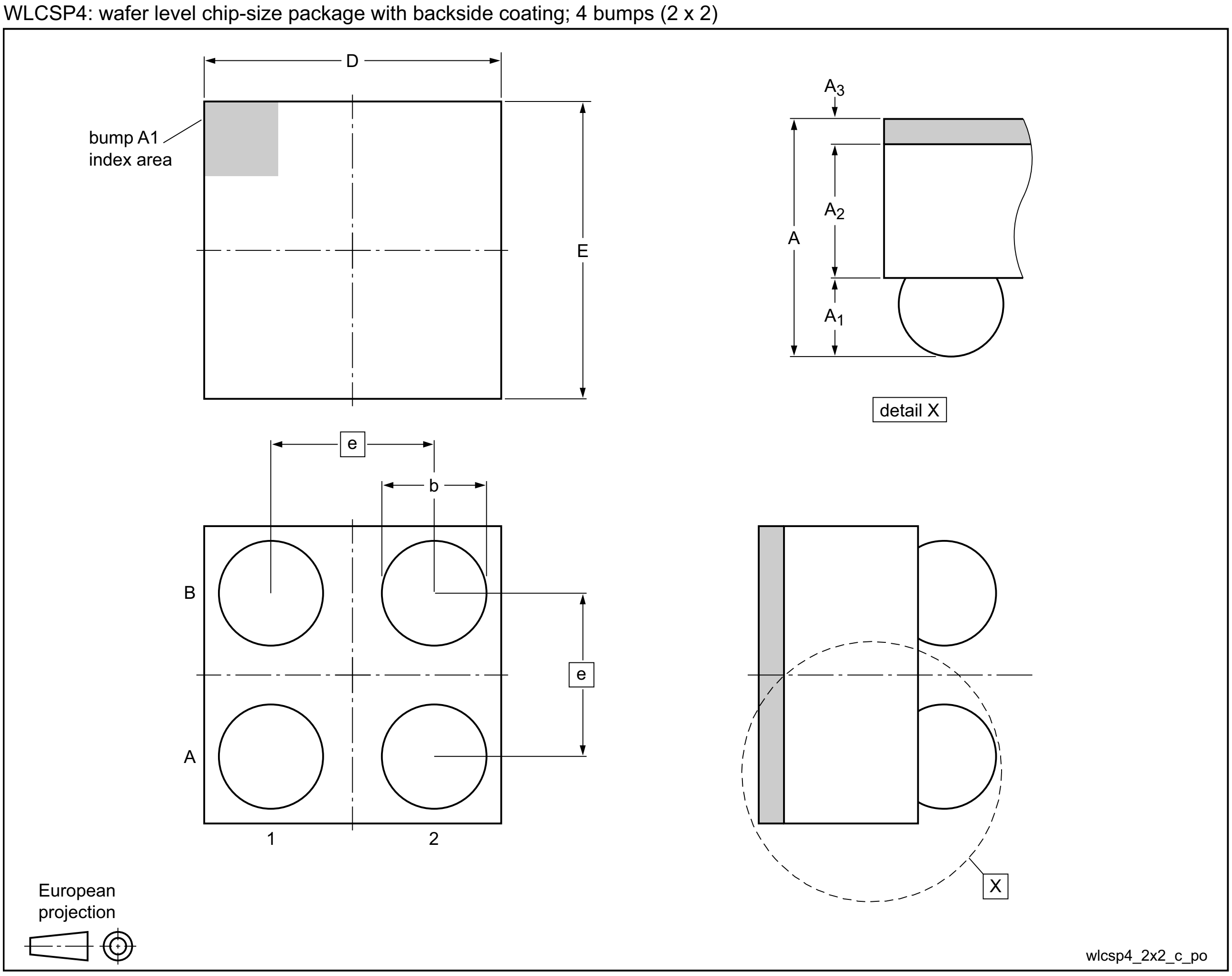
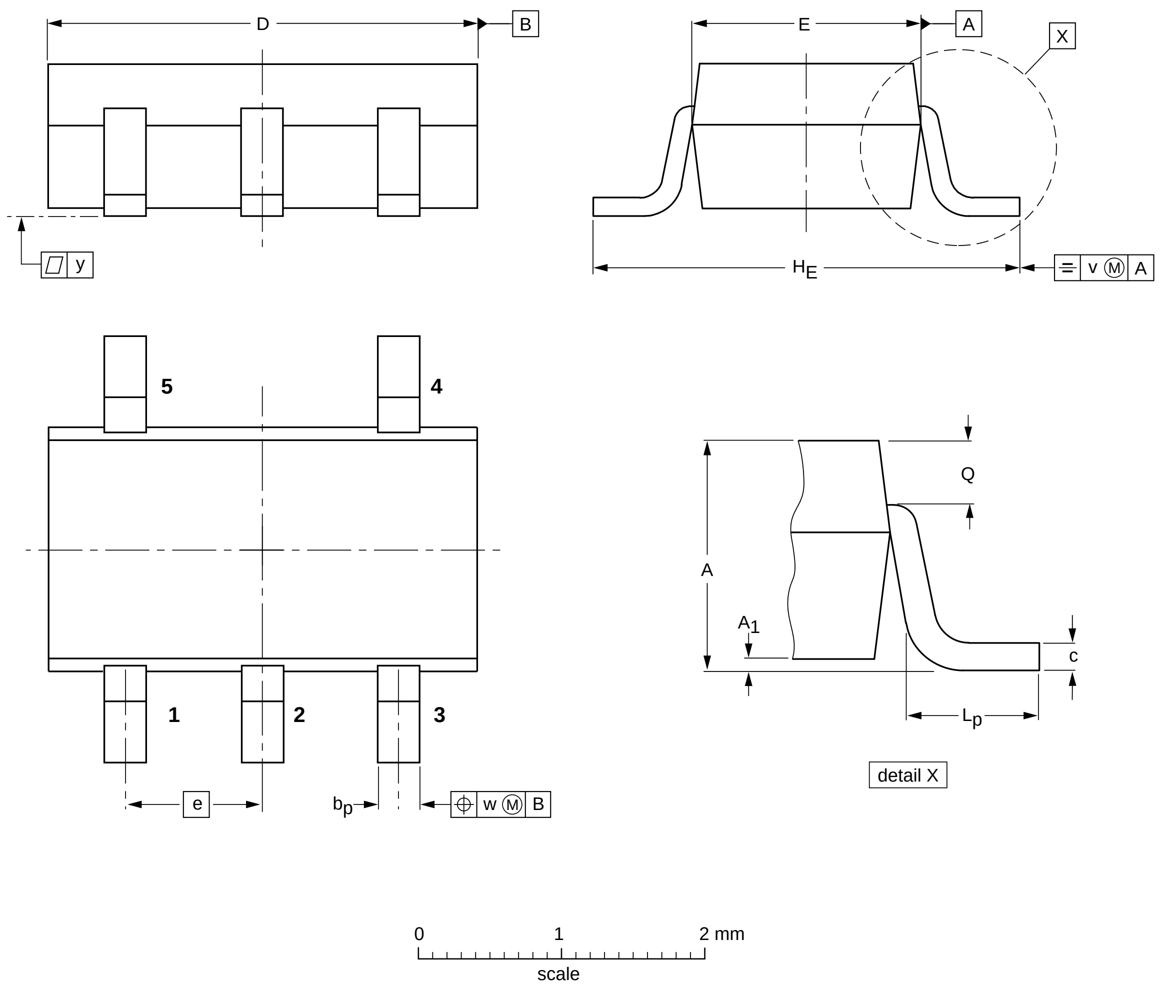


Fig 24. Package outline LD6836CX4/C (WLCSP4 with backside coating)

Table 20. Dimensions for Figure 24

Symbol	Min	Typ	Max	Unit
A	0.47	0.51	0.55	mm
A_1	0.18	0.20	0.22	mm
A_2	0.26	0.27	0.28	mm
A_3	0.03	0.04	0.05	mm
b	0.21	0.26	0.31	mm
D	0.71	0.76	0.81	mm
E	0.71	0.76	0.81	mm
e	-	0.4	-	mm

Plastic surface-mounted package; 5 leads **SOT753**



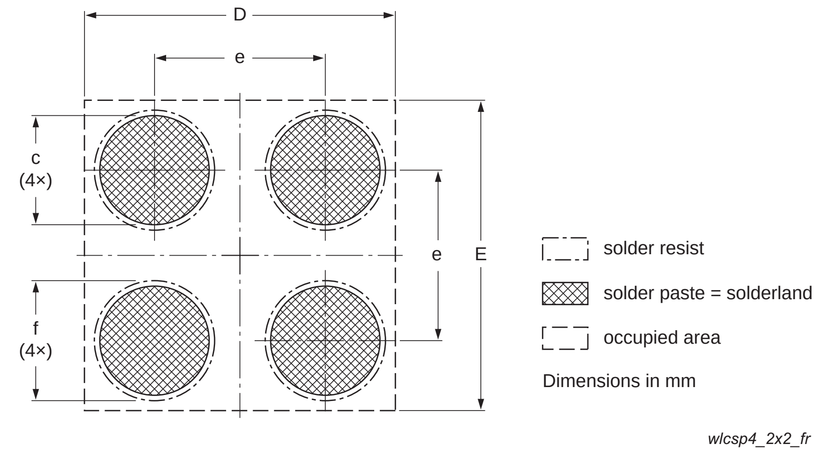
DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b_p	c	D	E	e	H_E	L_p	Q	v	w	y
mm	1.1 0.9	0.100 0.013	0.40 0.25	0.26 0.10	3.1 2.7	1.7 1.3	0.95	3.0 2.5	0.6 0.2	0.33 0.23	0.2	0.2	0.1

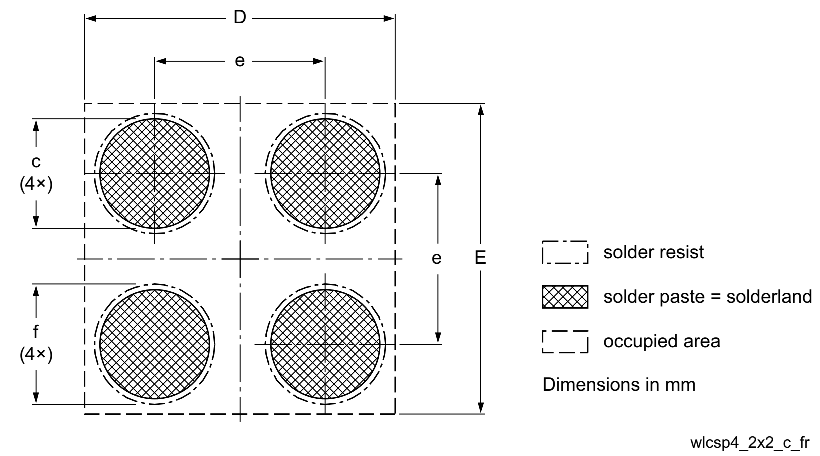
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT753			SC-74A			~~02-04-16~~ 06-03-16

Fig 25. Package outline LD6836 series (SOT753)

14. Soldering



a. LD6836CX4 (WLCSP4)



b. LD6836CX4/C (WLCSP4 with backside coating)

Fig 26. Reflow soldering footprint WLCSP4

Table 21. Dimensions for Figure 26

Symbol	Min	Typ	Max	Unit
c	-	0.25	-	mm
D	0.71	0.76	0.81	mm
E	0.71	0.76	0.81	mm
e	-	0.4	-	mm
f	-	0.325	-	mm

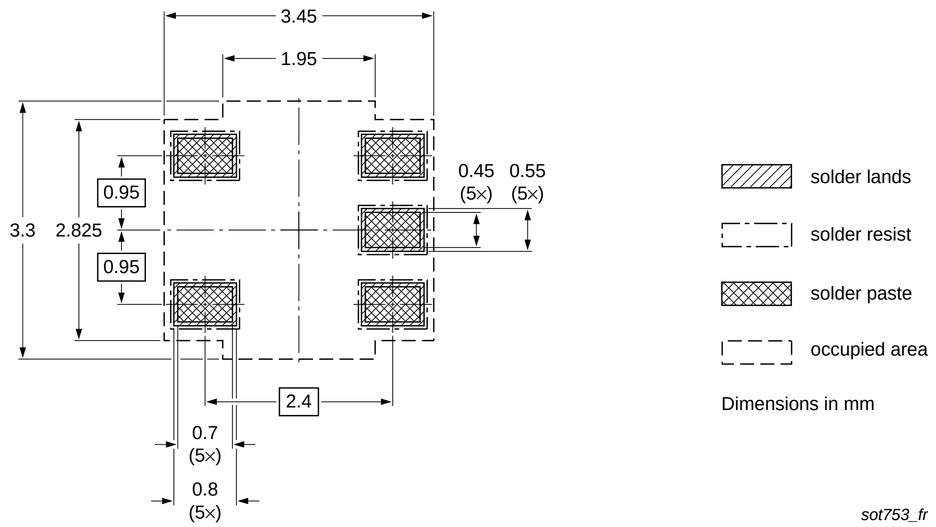


Fig 27. Reflow soldering footprint SOT753

15. Soldering of SMD packages

This text provides a very brief insight into a complex technology. A more in-depth account of soldering ICs can be found in Application Note *AN10365 “Surface mount reflow soldering description”*.

15.1 Introduction to soldering

Soldering is one of the most common methods through which packages are attached to Printed Circuit Boards (PCBs), to form electrical circuits. The soldered joint provides both the mechanical and the electrical connection. There is no single soldering method that is ideal for all IC packages. Wave soldering is often preferred when through-hole and Surface Mount Devices (SMDs) are mixed on one printed wiring board; however, it is not suitable for fine pitch SMDs. Reflow soldering is ideal for the small pitches and high densities that come with increased miniaturization.

15.2 Wave and reflow soldering

Wave soldering is a joining technology in which the joints are made by solder coming from a standing wave of liquid solder. The wave soldering process is suitable for the following:

- Through-hole components
- Leaded or leadless SMDs, which are glued to the surface of the printed circuit board

Not all SMDs can be wave soldered. Packages with solder balls, and some leadless packages which have solder lands underneath the body, cannot be wave soldered. Also, leaded SMDs with leads having a pitch smaller than ~0.6 mm cannot be wave soldered, due to an increased probability of bridging.

The reflow soldering process involves applying solder paste to a board, followed by component placement and exposure to a temperature profile. Leaded packages, packages with solder balls, and leadless packages are all reflow solderable.

Key characteristics in both wave and reflow soldering are:

- Board specifications, including the board finish, solder masks and vias
- Package footprints, including solder thieves and orientation
- The moisture sensitivity level of the packages
- Package placement
- Inspection and repair
- Lead-free soldering versus SnPb soldering

15.3 Wave soldering

Key characteristics in wave soldering are:

- Process issues, such as application of adhesive and flux, clinching of leads, board transport, the solder wave parameters, and the time during which components are exposed to the wave
- Solder bath specifications, including temperature and impurities

15.4 Reflow soldering

Key characteristics in reflow soldering are:

- Lead-free versus SnPb soldering; note that a lead-free reflow process usually leads to higher minimum peak temperatures (see Figure 28) than a SnPb process, thus reducing the process window
- Solder paste printing issues including smearing, release, and adjusting the process window for a mix of large and small components on one board
- Reflow temperature profile; this profile includes preheat, reflow (in which the board is heated to the peak temperature) and cooling down. It is imperative that the peak temperature is high enough for the solder to make reliable solder joints (a solder paste characteristic). In addition, the peak temperature must be low enough that the packages and/or boards are not damaged. The peak temperature of the package depends on package thickness and volume and is classified in accordance with Table 22 and 23

Table 22. SnPb eutectic process (from J-STD-020C)

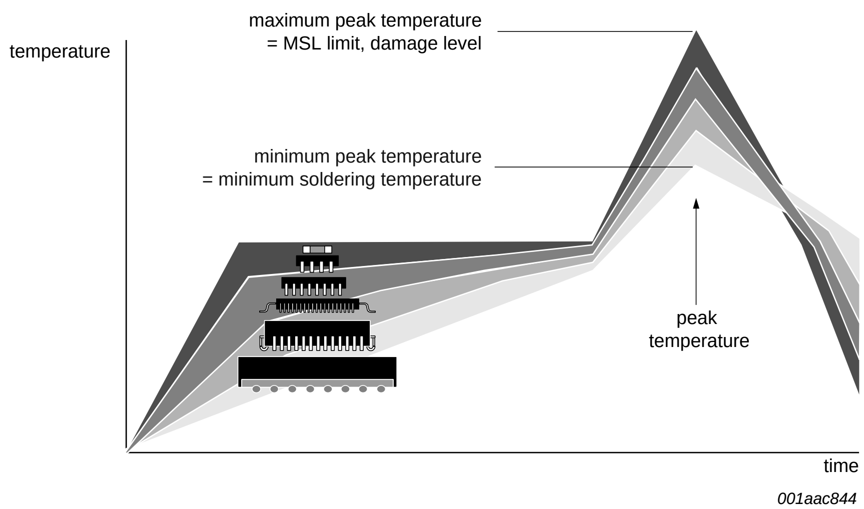
Package thickness (mm)	Package reflow temperature (°C)	
	Volume (mm^3)	
	< 350	≥ 350
< 2.5	235	220
≥ 2.5	220	220

Table 23. Lead-free process (from J-STD-020C)

Package thickness (mm)	Package reflow temperature (°C)		
	Volume (mm^3)		
	< 350	350 to 2000	> 2000
< 1.6	260	260	260
1.6 to 2.5	260	250	245
> 2.5	250	245	245

Moisture sensitivity precautions, as indicated on the packing, must be respected at all times.

Studies have shown that small packages reach higher temperatures during reflow soldering, see Figure 28.



MSL: Moisture Sensitivity Level

Fig 28. Temperature profiles for large and small components

For further information on temperature profiles, refer to Application Note *AN10365 “Surface mount reflow soldering description”*.

16. Revision history

Table 24. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
LD6836_SER v.2	20121005	Product data sheet	-	LD6836_SER v.1
Modifications:	• Section 9.2 “Dropout”: corrected			
LD6836_SER v.1	20121004	Product data sheet	-	-

17. Legal information

17.1 Data sheet status

Document status[1][2]	Product status[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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19. Contents

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