

3 A, very low drop voltage regulators

Datasheet - production data

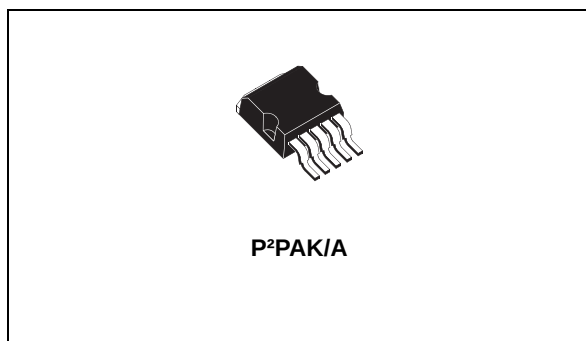


Table 1. Device summary

Order codes	Output voltages
LD29300P2M33R	3.3 V
LD29300P2MTR	ADJ

Features

- Very low dropout voltage (typ. 0.4 at 3 A)
- Guaranteed output current up to 3 A
- Fixed voltage with $\pm 1\%$ tolerance at 25 °C
- Internal current and thermal limit
- Logic controlled electronic shutdown available in P²PAK/A

Description

The LD29300 is a high current, high accuracy, low-dropout voltage regulator series. These regulators feature 400 mV dropout voltage and very low ground current. Designed for high current loads, these devices are also used in lower current, extremely low dropout-critical systems, where their tiny dropout voltage and ground current values are important attributes. Typical applications are in power supply switching post regulation, series power supply for monitors, series power supply for VCRs and TVs, computer systems and battery powered systems.

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1 Diagram

Figure 1. Schematic diagram for adjustable version

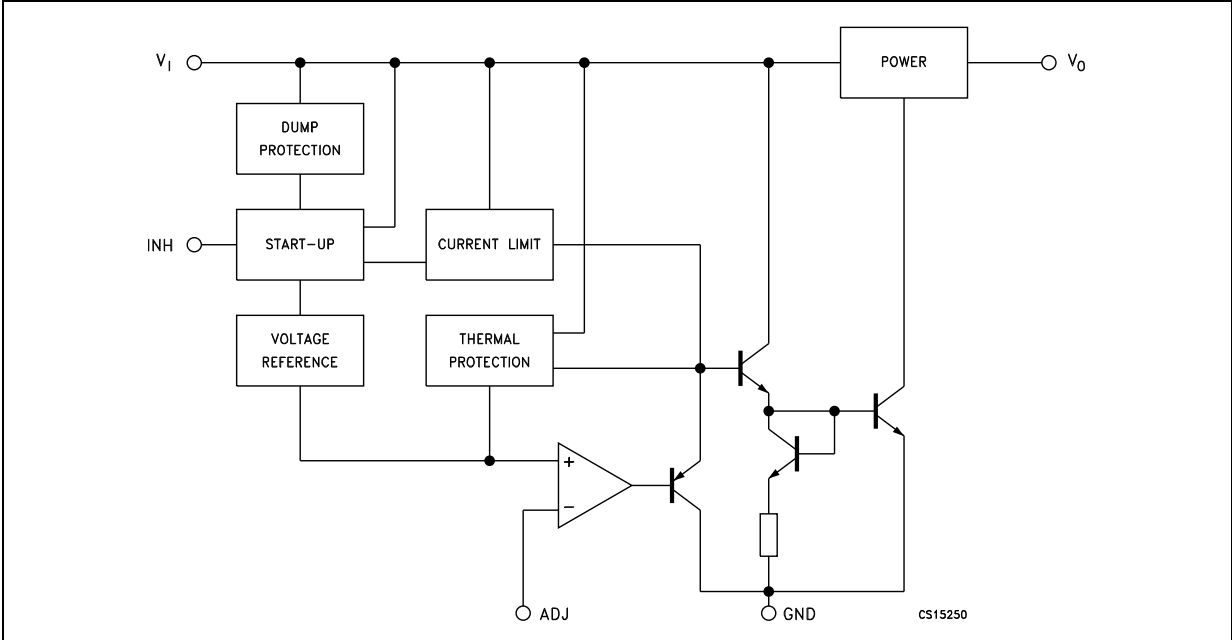
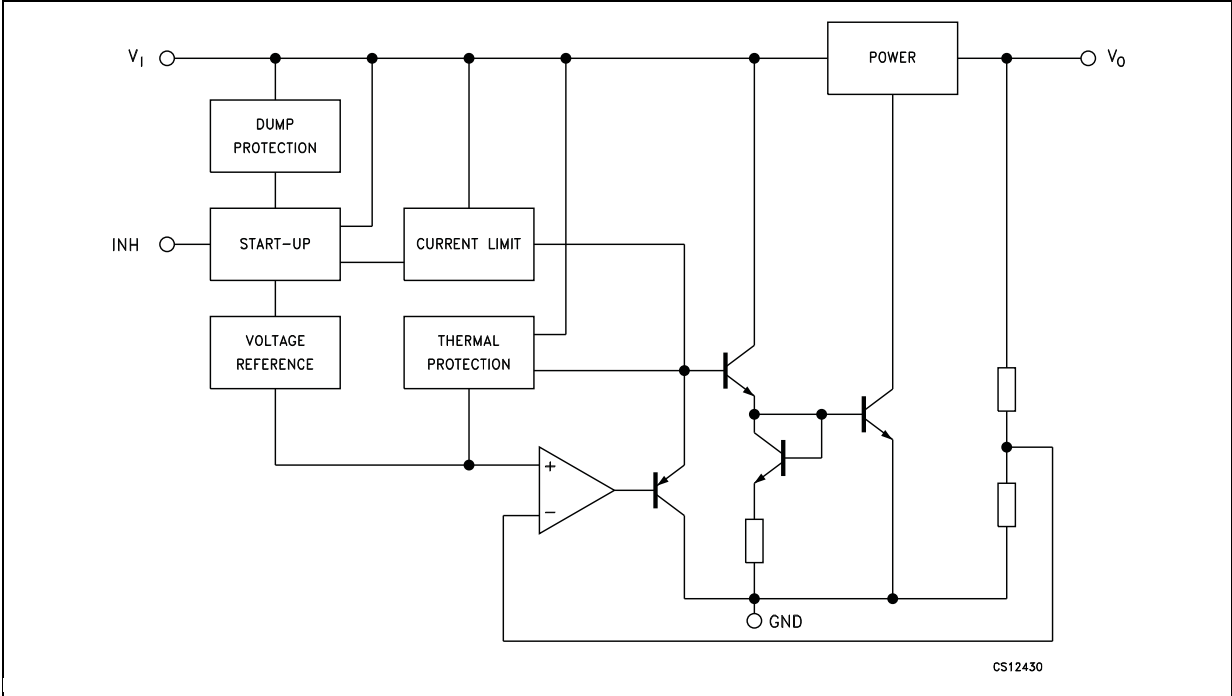
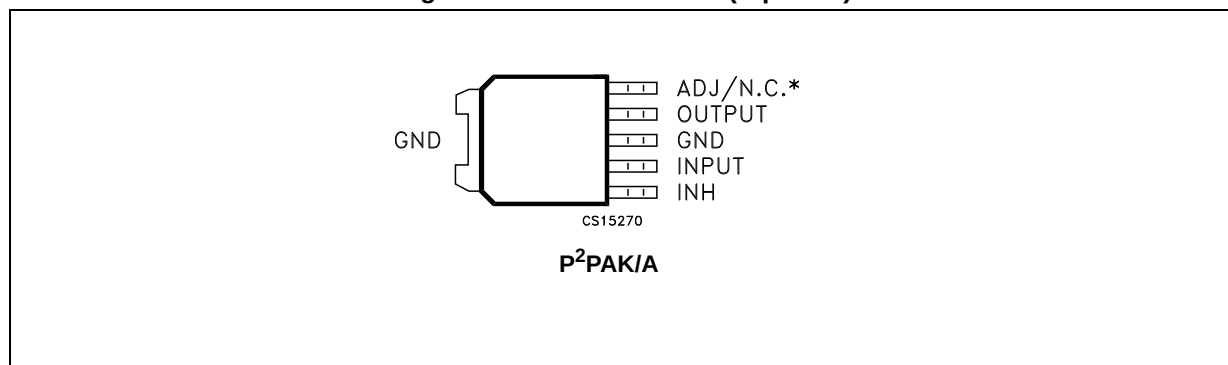


Figure 2. Schematic diagram for fixed version



2 Pin configuration

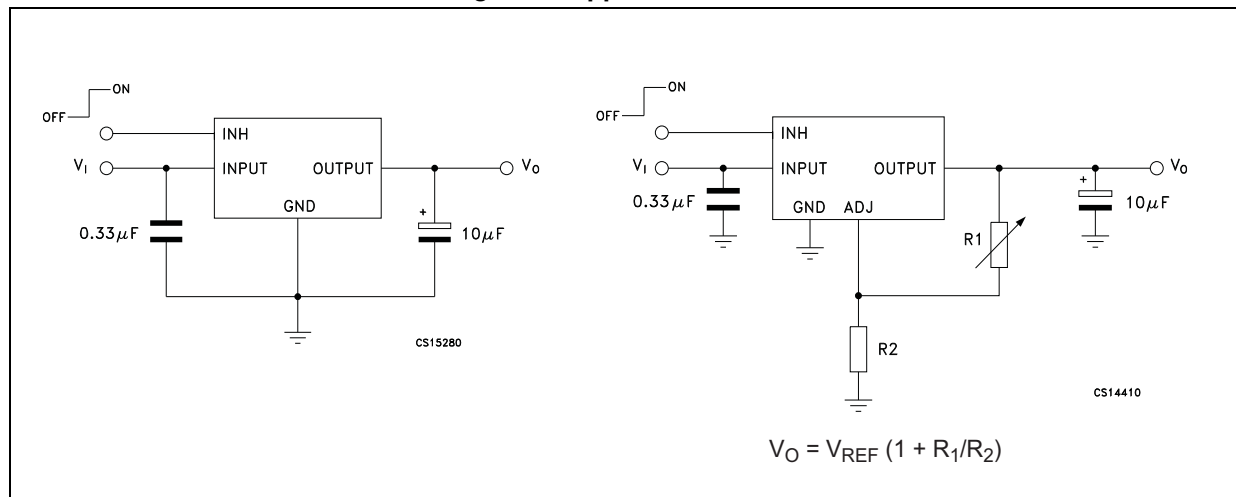
Figure 3. Pin connections (top view)



* Not connected for fixed version.

3 Typical application

Figure 4. Application circuit



4 Maximum ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_I	DC input voltage	30 ⁽¹⁾	V
I_O	Output current	Internally limited	mA
P_D	Power dissipation	Internally limited	mW
T_{STG}	Storage temperature range	- 55 to 150	°C
T_{OP}	Operating junction temperature range	- 40 to 125	°C

1. Above 14 V the device is automatically in shut-down.

Note: *Absolute maximum ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied.*

Table 3. Thermal data

Symbol	Parameter	P ² PAK/A	Unit
R_{thJA}	Thermal resistance junction-ambient	60	°C/W
R_{thJC}	Thermal resistance junction-case	3	°C/W

5 Electrical characteristics

$I_O = 10 \text{ mA}$, $T_J = 25 \text{ }^\circ\text{C}$, $V_I = 5.3 \text{ V}$, $V_{INH} = 2 \text{ V}$, $C_I = 330 \text{ nF}$, $C_O = 10 \text{ } \mu\text{F}$, unless otherwise specified.

Table 4. Electrical characteristics of LD29300#33

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$I_O = 10\text{mA to } 3\text{A}$, $V_I = 4.3 \text{ to } 8.8\text{V}$ $T_J = -40 \text{ to } 125^\circ\text{C}$	3.267	3.3	3.333	V
			3.234		3.366	
ΔV_O	Load regulation	$I_O = 10\text{mA to } 3\text{A}$		0.2	1.0	%
ΔV_O	Line regulation	$V_I = 4.3 \text{ to } 13\text{V}$		0.06	0.5	%
SVR	Supply voltage rejection	$f = 120 \text{ Hz}$, $V_I = 5.3 \pm 1\text{V}$, $I_O = 1.5\text{A}$ ⁽¹⁾	52	67		dB
V_{DROP}	Dropout voltage	$I_O = 500\text{mA}$, $T_J = -40 \text{ to } 125^\circ\text{C}$ ⁽²⁾		0.1		V
		$I_O = 1.5\text{A}$, $T_J = -40 \text{ to } 125^\circ\text{C}$ ⁽²⁾		0.2		
		$I_O = 3\text{A}$, $T_J = -40 \text{ to } 125^\circ\text{C}$ ⁽²⁾		0.4	0.7	
I_q	Quiescent current	$I_O = 1.5\text{A}$, $T_J = -40 \text{ to } 125^\circ\text{C}$		20	50	mA
		$I_O = 3\text{A}$, $T_J = -40 \text{ to } 125^\circ\text{C}$		45	100	
		$V_I = 13\text{V}$, $V_{INH} = \text{GND}$, $T_J = -40 \text{ to } 125^\circ\text{C}$		130	180	μA
I_{sc}	Short circuit current	$V_I - V_O = 5.5\text{V}$		4.5		A
V_{IL}	Control input logic low	OFF MODE ⁽¹⁾ , $T_J = -40 \text{ to } 125^\circ\text{C}$			0.8	V
V_{IH}	Control input logic high	ON MODE ⁽¹⁾ , $T_J = -40 \text{ to } 125^\circ\text{C}$	2			V
I_{INH}	Control input current	$T_J = -40 \text{ to } 125^\circ\text{C}$, $V_{INH} = 13\text{V}$		5	10	μA
eN	Output noise voltage	$B_P = 10\text{Hz to } 100\text{kHz}$, $I_O = 100\text{mA}$ ⁽¹⁾		132		μV_{RMS}

1. Guaranteed by design.

2. Dropout voltage is defined as the input-to-output differential when the output voltage drops to 99% of its nominal value with $V_O + 1 \text{ V}$ applied to V_I .

$I_O = 10 \text{ mA}$, $T_J = 25^\circ\text{C}$, $V_I = 3.23 \text{ V}$, $V_{INH} = 2 \text{ V}$, $C_I = 330 \text{ nF}$, $C_O = 10 \text{ }\mu\text{F}$ adjust pin tied to output pin.

Table 5. Electrical characteristics of LD29300#ADJ

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_I	Minimum operating input voltage	$I_O = 10\text{mA}$ to 3A , $T_J = -40$ to 125°C	2.5			V
ΔV_O	Load regulation	$I_O = 10\text{mA}$ to 3A		0.2	1.0	%
ΔV_O	Line regulation	$V_I = 2.5 \text{ V}$ to 13V		0.06	0.5	%
V_{REF}	Reference voltage	$I_O = 10\text{mA}$ to 3A , $V_I = 2.5$ to 4.5V $T_J = -40$ to 125°C ⁽¹⁾	-1%	1.23	+1%	V
			-2%		+2%	
SVR	Supply voltage rejection	$f = 120 \text{ Hz}$, $V_I = 3.23 \pm 1\text{V}$, $I_O = 1.5\text{A}$ ⁽²⁾	65	75		dB
I_q	Quiescent current	$I_O = 1.5\text{A}$, $T_J = -40$ to 125°C		20	50	mA
		$I_O = 3\text{A}$, $T_J = -40$ to 125°C		45	100	
		$V_I = 13\text{V}$, $V_{INH} = \text{GND}$, $T_J = -40$ to 125°C		130	180	μA
I_{ADJ}	Adjust pin current	$T_J = -40$ to 125°C			1	μA
I_{sc}	Short circuit current	$V_I - V_O = 5.5\text{V}$		4.5		A
V_{IL}	Control input logic low	OFF MODE ⁽¹⁾ , $T_J = -40$ to 125°C			0.8	V
V_{IH}	Control input logic high	ON MODE ⁽¹⁾ , $T_J = -40$ to 125°C	2			V
I_{INH}	Control input current	$T_J = -40$ to 125°C , $V_{INH} = 13\text{V}$		5	10	μA
eN	Output noise voltage	$B_P = 10\text{Hz}$ to 100kHz , $I_O = 100\text{mA}$ ⁽²⁾		50		μV_{RMS}

1. Reference voltage is measured between output and GND pin, with ADJ PIN tied to V_{OUT} .

2. Guaranteed by design.

6 Typical characteristics

Figure 5. Output voltage vs. temperature

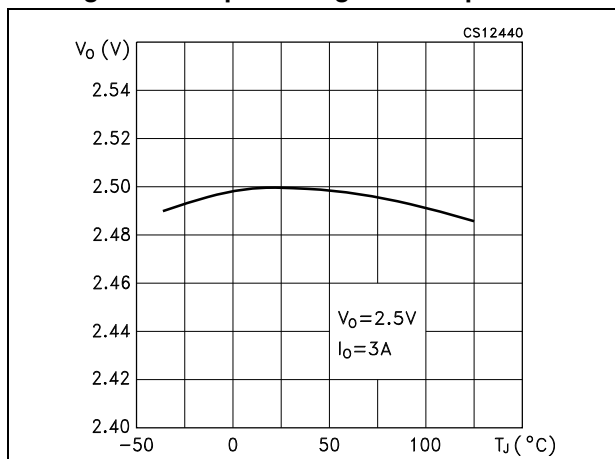


Figure 6. Dropout voltage vs. temperature

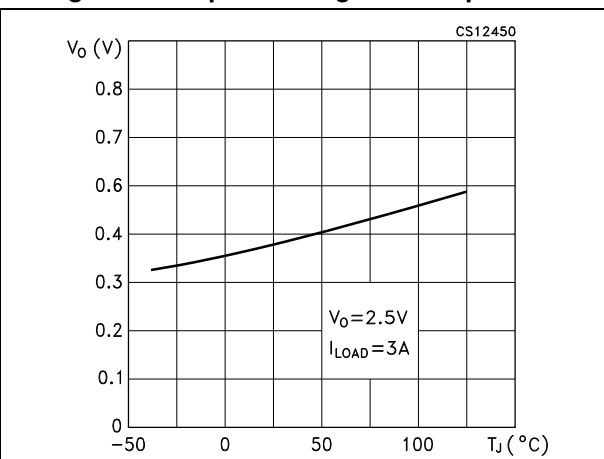


Figure 7. Dropout voltage vs. output current

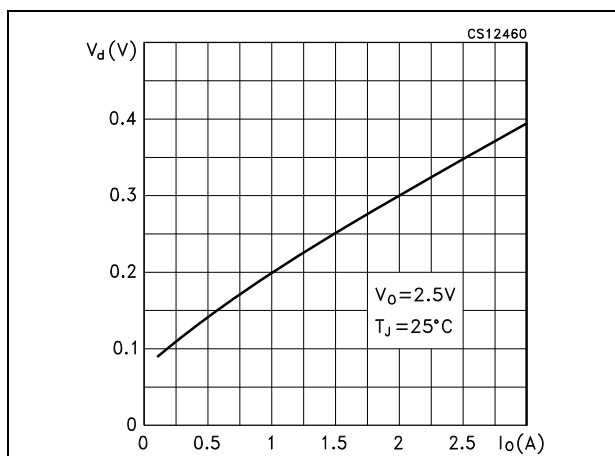
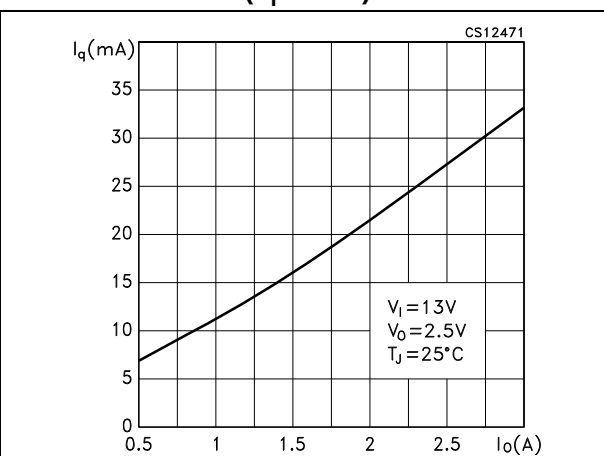
Figure 8. Quiescent current vs. output current ($V_I = 13V$)

Figure 9. Quiescent current vs. output current ($V_I = 4.5\text{ V}$)

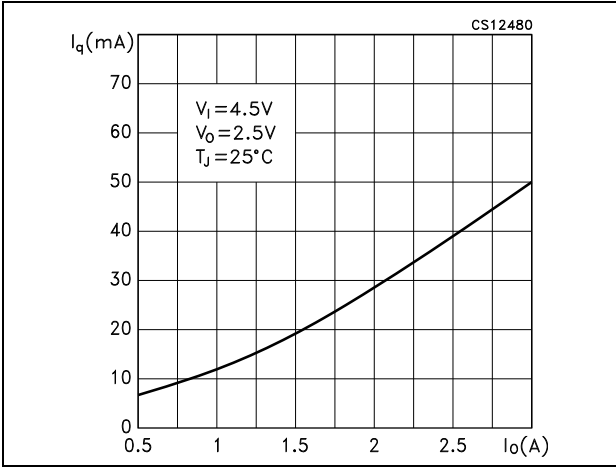


Figure 10. Quiescent current vs. supply voltage

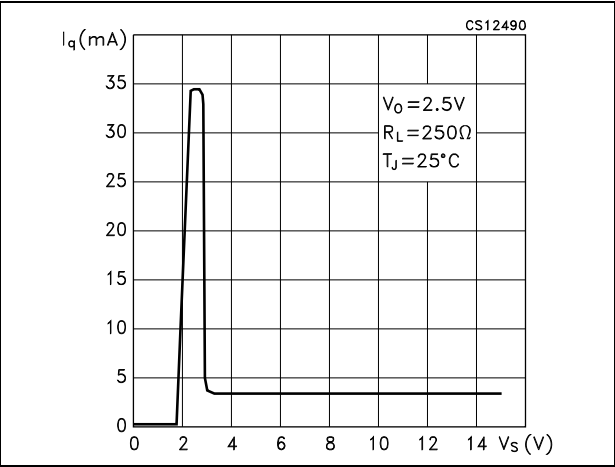


Figure 11. Quiescent current vs. temperature ($I_o = 100\text{ mA}$)

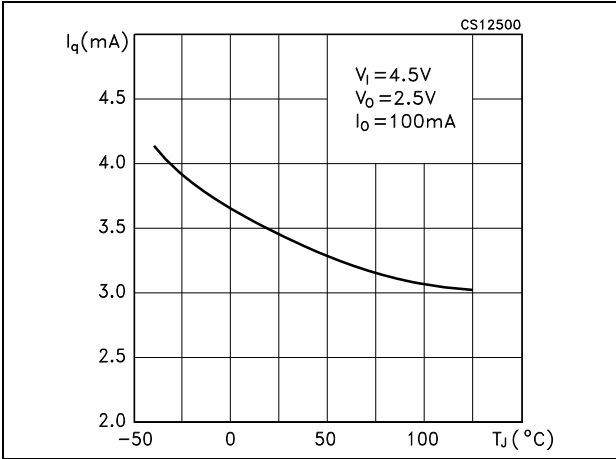


Figure 12. Quiescent current vs. temperature ($I_o = 3\text{ A}$)

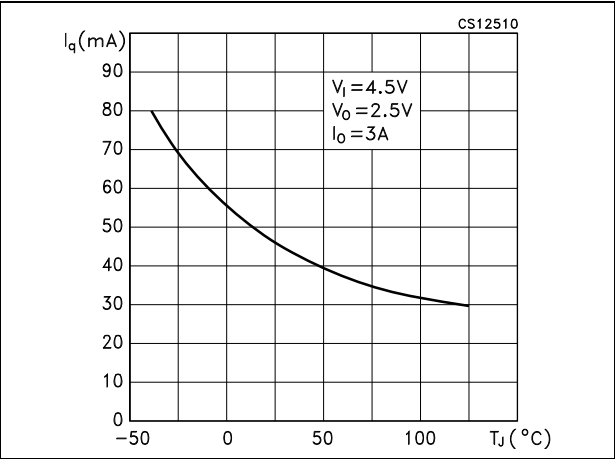


Figure 13. Short circuit current vs. temperature

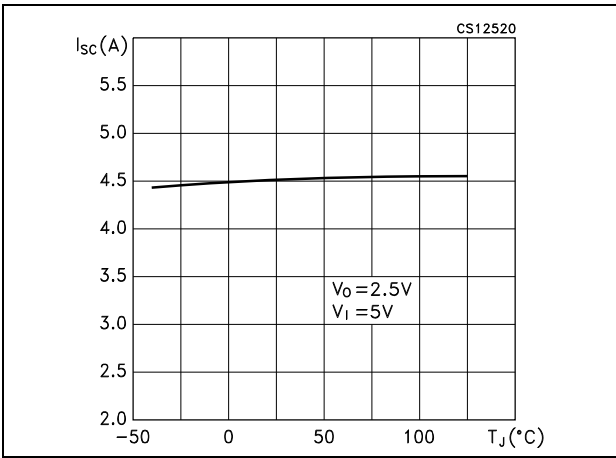


Figure 14. Supply voltage rejection vs. temperature

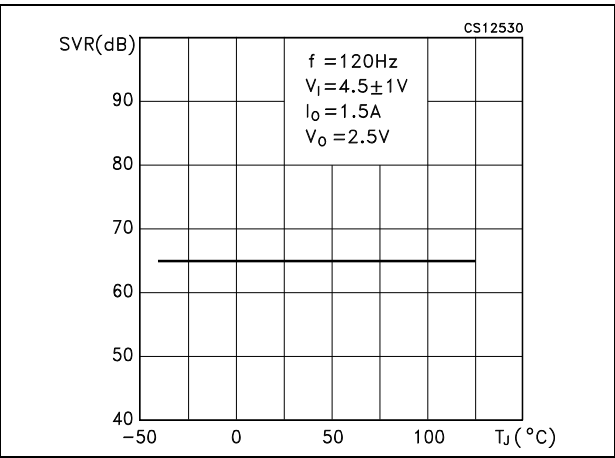


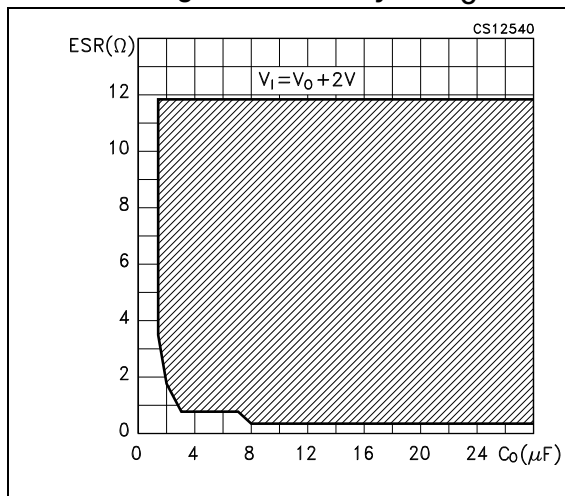
Figure 15. Stability vs. C_O 

Figure 16. Line transient

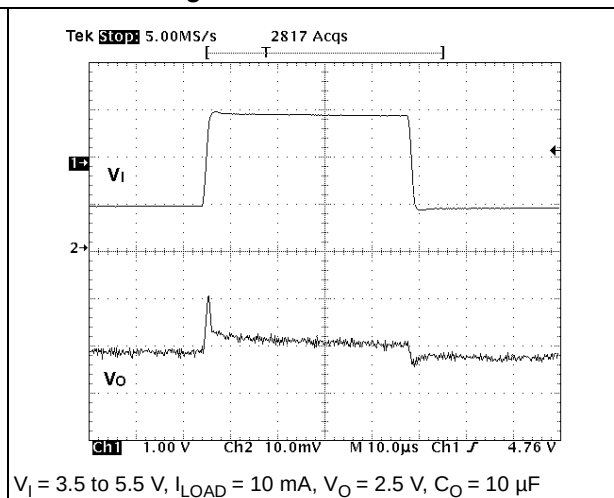
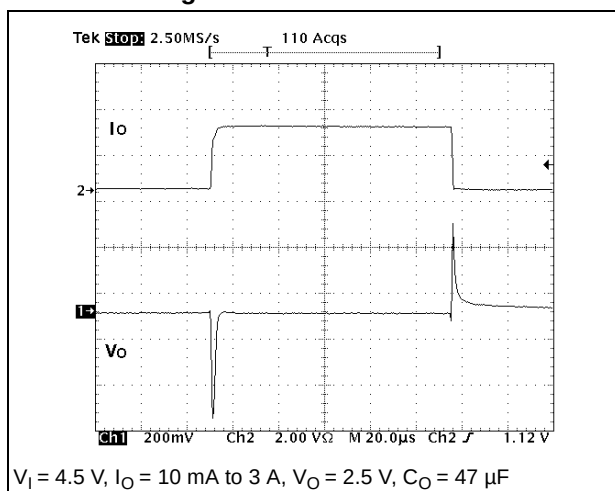


Figure 17. Load transient



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. ECOPACK® is an ST trademark.

Table 6. P²PAK mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.30		4.80
A2	0.03		0.23
C	1.17		1.37
D	2.40		2.80
D1	8.95		9.35
E	0.45		0.60
F	0.80		1.05
G	3.20		3.60
G1	6.60		7.00
H1		8.5	
H2	10.00		10.40
L	15		15.85
L1		8	
L2	1.27		1.40
M	2.4		3.2
R		0.40	
V2	0°		8°

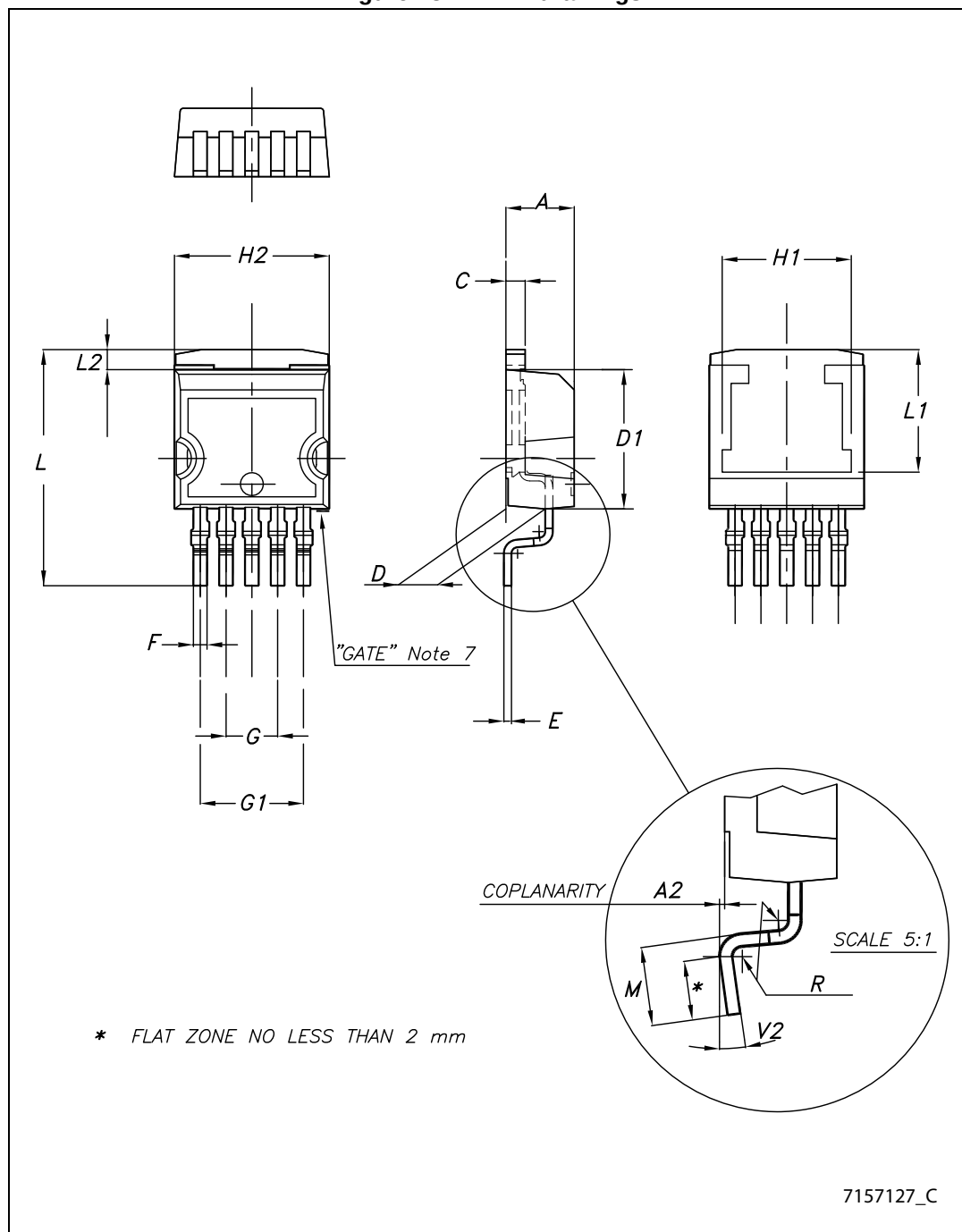
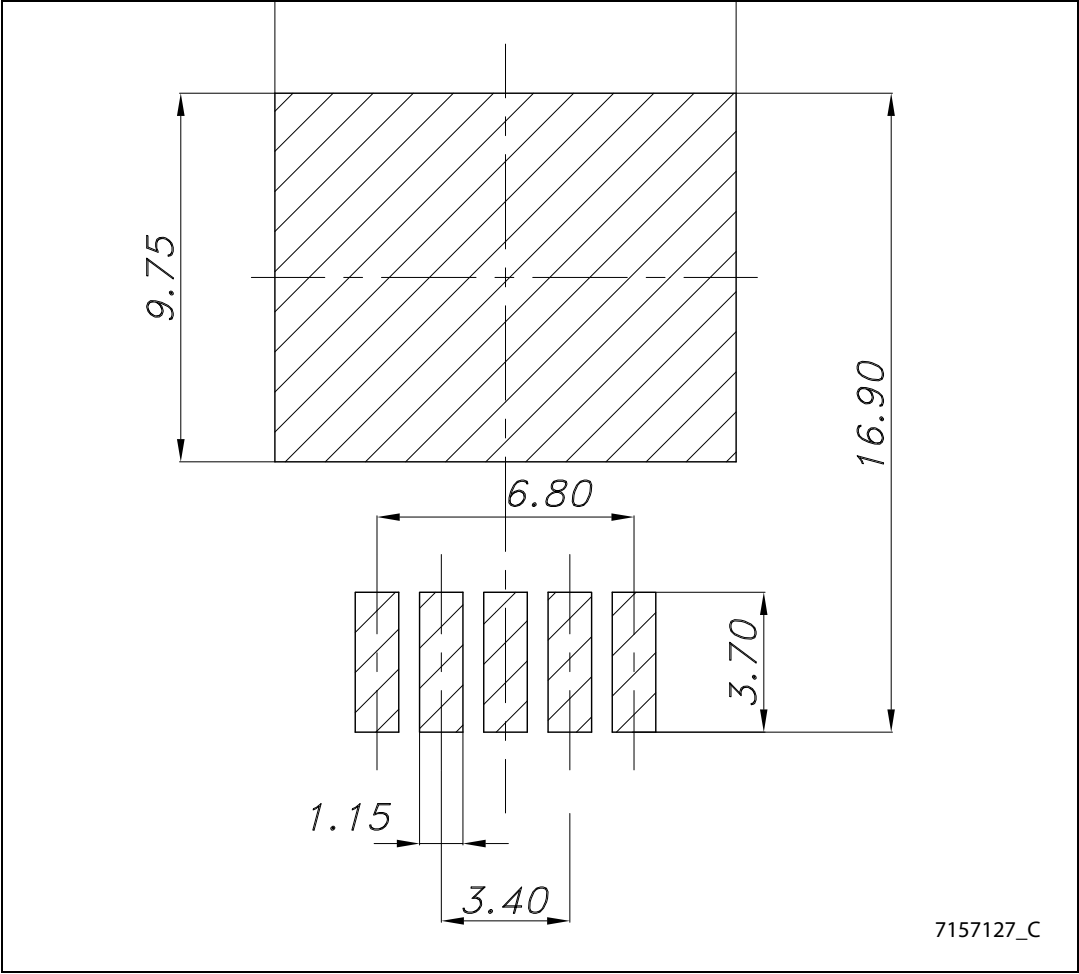
Figure 18. P²PAK drawings

Figure 19. P²PAK footprint

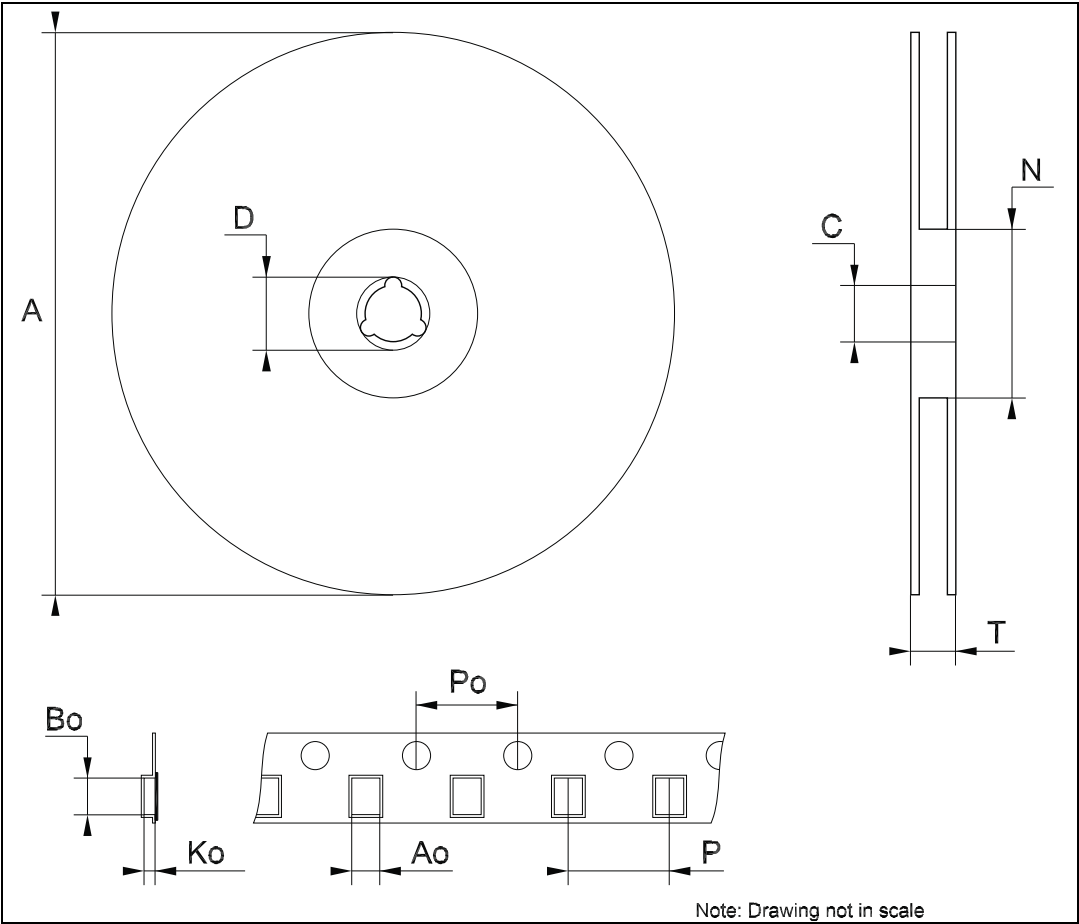


8 Packaging mechanical data

Table 7. P²PAK tape and reel mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A			180
C	12.8	13	13.2
D	20.2		
N	60		
T			14.4
Ao	10.50	10.6	10.70
Bo	15.70	15.80	15.90
Ko	4.80	4.90	5.00
Po	3.9	4.0	4.1
P	11.9	12.0	12.1

Figure 20. P²PAK tape and reel dimensions



9 Revision history

Table 8. Document revision history

Date	Revision	Changes
21-Oct-2005	7	Order codes updated.
10-Apr-2007	8	Order codes updated.
11-May-2007	9	Order codes updated.
08-Jun-2007	10	Order codes updated.
03-Apr-2008	11	Modified: Table 1 on page 1 .
11-Jul-2008	12	Modified: Table 1 on page 1 .
13-Sep-2012	13	Updated: Table 1 on page 1 .
18-Nov-2013	14	Part numbers LD29300XX, LD29300XX18 and LD29300XX33 have been changed to LD29300. Updated the Description in cover page and Table 1: Device summary . Updated Table 3: Thermal data , Section 5: Electrical characteristics and Section 7: Package mechanical data . Added Section 8: Packaging mechanical data . Minor text changes.

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