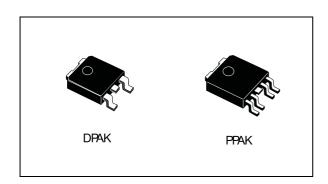


#### 1.5 A, very low drop voltage regulators

Datasheet - production data



#### **Features**

- Very low dropout voltage (typ. 0.4 at 1.5 A)
- Guaranteed output current up to 1.5 A
- Fixed and adjustable output voltage (± 1% at 25 °C)
- Internal current and thermal limit
- Logic controlled electronic shutdown available in PPAK

#### **Description**

The LD29150 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.

**Table 1. Device summary** 

Order	- Output voltages		
DPAK	PPAK	Output voltages	
LD29150DT18R		1.8 V	
LD29150DT25R		2.5 V	
LD29150DT33R		3.3 V	
LD29150DT50R	LD29150PT50R	5.0 V	
	LD29150PTR	ADJ	

Contents LD29150

## **Contents**

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LD29150 Diagram

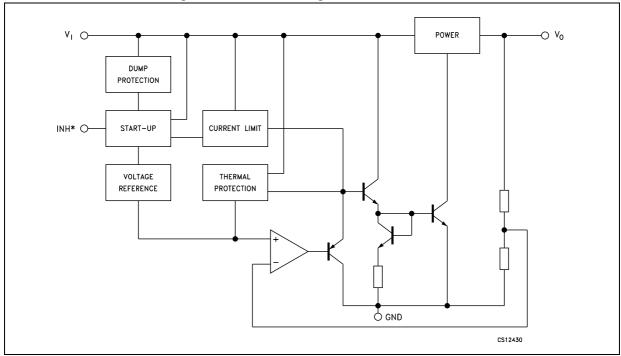
## 1 Diagram

VI OUMP PROTECTION
INH OSTART-UP CURRENT LIMIT
VOLTAGE REFERENCE PROTECTION

ADJ GND CS15250

Figure 1. Schematic diagram for adjustable version

Figure 2. Schematic diagram for fixed version

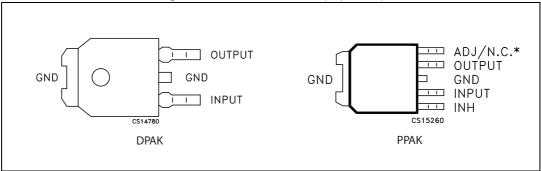


<sup>\*</sup> Only for version with inhibit function.

Pin configuration LD29150

# 2 Pin configuration

Figure 3. Pin connections (top view)

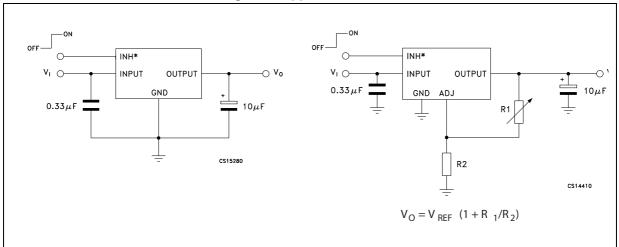


<sup>\*</sup> Not connected for fixed version.

LD29150 Typical application

# 3 Typical application

Figure 4. Application circuit



<sup>\*</sup> Only for version with inhibit function.

Maximum ratings LD29150

## 4 Maximum ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V <sub>I</sub>	DC input voltage	30 <sup>(1)</sup>	V
V <sub>O</sub>	DC output voltage	-0.3 to 20	V
V <sub>INH</sub>	Inhibit input voltage	-0.3 to 20	V
Io	Output current	Internally limited	mA
P <sub>D</sub>	Power dissipation	Internally limited	mW
T <sub>STG</sub>	Storage temperature range	-55 to 150	°C
T <sub>OP</sub>	Operating junction temperature range	-40 to 125	°C

<sup>1.</sup> 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	DPAK	PPAK	Unit
R <sub>thJA</sub>	Thermal resistance junction-ambient	100	100	°C/W
R <sub>thJC</sub>	Thermal resistance junction-case	8	8	°C/W

150

#### 5 Electrical characteristics

 $I_O$  = 10 mA,  $T_J$  = 25 °C,  $V_I$  = 3.8 V,  $V_{INH}$  = 2 V (*Note 3*),  $C_I$  = 330 nF,  $C_O$  = 10  $\mu$ F, unless otherwise specified.

**Symbol Test conditions** Max. Unit **Parameter** Min. Тур. 1.782 1.818 1.8  $I_O = 10 \text{ mA to } 1.5 \text{ A}, V_I = 3 \text{ to } 7.3 \text{ V}$  $V_{O}$ Output voltage V  $T_J = -40 \text{ to } 125 \,^{\circ}\text{C}$ 1.764 1.836  $I_{O}$  = 10 mA to 1.5 A 0.2 1.0 %  $\Delta V_{O}$ Load regulation Line regulation  $V_1 = 3 \text{ to } 13 \text{ V}$ 0.06 0.5 %  $\Delta V_{O}$ f = 120 Hz,  $V_I$  = 3.8  $\pm$  1 V,  $I_O$  = 0.75 A SVR Supply voltage rejection 62 72 dΒ  $I_O$  = 250 mA,  $T_J$  = - 40 to 125 °C (*Note 2*) 0.1  $I_{O}$  = 0.75 A,  $T_{J}$  = -40 to 125 °C (*Note 2*) 0.2 ٧  $V_{DROP}$ Dropout voltage  $I_O = 1.5 \text{ A}, T_J = -40 \text{ to } 125 \,^{\circ}\text{C} \, (Note \, 2)$ 0.7 0.4  $I_{\rm O}$  = 0.75 A,  $T_{\rm J}$  = - 40 to 125 °C 15 40 mΑ  $I_{O}$  = 1.5 A,  $T_{J}$  = -40 to 125 °C 80 30 Quiescent current  $I_q$  $V_I$  = 13 V,  $V_{INH}$  = GND,  $T_J$  = -40 to 125°C 130 180 μΑ  $V_{I} - V_{O} = 5.5 \text{ V}$ 2.2 Α Short circuit current  $I_{sc}$  $V_{II}$ Control input logic low OFF MODE, (Note 3), T<sub>.I</sub> = -40 to 125°C 0.8 V ON MODE, (*Note 3*),  $T_J = -40$  to 125 °C Control input logic high 2 ٧  $V_{IH}$ Control input current  $T_J$  = - 40 to 125 °C,  $V_{INH}$  = 13 V5 10 μΑ  $I_{INH}$  $B_P = 10 \text{ Hz to } 100 \text{ kHz}, I_O = 100 \text{ mA}$ eN Output noise voltage 72  $\mu V_{RMS}$ (Note 1)

Table 4. Electrical characteristics of LD29150#18

Note: 1 Guaranteed by design.

Thermal shutdown

- 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 V applied to  $V_I$ .
- 3 Only for version with Inhibit function.

T<sub>SHDN</sub>

°C

Electrical characteristics LD29150

 $I_O$  = 10 mA,  $T_J$  = 25 °C,  $V_I$  = 4.5 V,  $V_{INH}$  = 2 V (*Note 3*),  $C_I$  = 330 nF,  $C_O$  = 10  $\mu F$ , unless otherwise specified.

Table 5. Electrical characteristics of LD29150#25

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit	
V	Output voltage	I <sub>O</sub> = 10 mA to 1.5 A, V <sub>I</sub> = 3.5 to 8 V	2.475	2.5	2.525	V	
Vo	Output voltage	$T_{\rm J}$ = - 40 to 125 °C	2.45		2.55	v	
$\Delta V_{O}$	Load regulation	I <sub>O</sub> = 10 mA to 1.5 A		0.2	1.0	%	
ΔV <sub>O</sub>	Line regulation	V <sub>I</sub> = 3.5 to 13 V		0.06	0.5	%	
SVR	Supply voltage rejection	f = 120 Hz, $V_I$ = 4.5 ±1 V, $I_O$ = 0.75 A ( <i>Note 1</i> )	55	70		dB	
		$I_{O}$ = 250 mA, $T_{J}$ = -40 to 125 °C ( <i>Note 2</i> )		0.1			
$V_{DROP}$	Dropout voltage	I <sub>O</sub> = 0.75 A, T <sub>J</sub> = -40 to 125 °C ( <i>Note 2</i> )		0.2		V	
		I <sub>O</sub> = 1.5 A, T <sub>J</sub> = -40 to 125 °C ( <i>Note 2</i> )		0.4	0.7		
		I <sub>O</sub> = 0.75 A, T <sub>J</sub> = -40 to 125 °C		15	40	mA	
Iq	Quiescent current	I <sub>O</sub> = 1.5 A, T <sub>J</sub> = - 40 to 125 °C		30	80	IIIA	
		$V_I = 13 \text{ V}, V_{INH} = \text{GND}, T_J = -40 \text{ to } 125^{\circ}\text{C}$		130	180	μA	
I <sub>sc</sub>	Short circuit current	$V_{I} - V_{O} = 5.5 \text{ V}$		2.2		Α	
V <sub>IL</sub>	Control input logic low	OFF MODE, ( <i>Note 3</i> ), $T_J = -40$ to 125 °C			0.8	V	
$V_{IH}$	Control input logic high	ON MODE, ( <i>Note 3</i> ), $T_J = -40$ to 125 °C	2			V	
I <sub>INH</sub>	Control input current	$T_J$ = - 40 to 125 °C, $V_{INH}$ = 13 V		5	10	μA	
eN	Output noise voltage	$B_P = 10 \text{ Hz to } 100 \text{ kHz}, I_O = 100 \text{ mA}$ ( <i>Note 1</i> )		100		μV <sub>RMS</sub>	
T <sub>SHDN</sub>	Thermal shutdown			150		°C	

Note: 1 Guaranteed by design.

- 2 Dropout voltage is defined as the input-to-output differential when the output voltage drops to 9 9% of its nominal value with  $V_O + 1$  V applied to  $V_I$ .
- 3 Only for version with Inhibit function.



 $I_O$  = 10 mA,  $T_J$  = 25 °C,  $V_I$  = 5.3 V,  $V_{INH}$  = 2 V (*Note 3*),  $C_I$  = 330 nF,  $C_O$  = 10  $\mu F$ , unless otherwise specified.

Table 6. Electrical characteristics of LD29150#33

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit	
V	Output voltage	$I_O$ = 10 mA to 1.5 A, $V_I$ = 4.3 to 8.8 V	3.267	3.3	3.333	V	
Vo	Output voltage	$T_{\rm J}$ = - 40 to 125 °C	3.234		3.366	V	
$\Delta V_{O}$	Load regulation	I <sub>O</sub> = 10 mA to 1.5 A		0.2	1.0	%	
ΔV <sub>O</sub>	Line regulation	V <sub>I</sub> = 4.3 to 13 V		0.06	0.5	%	
SVR	Supply voltage rejection	f = 120 Hz, $V_I$ = 5.3 ±1 V, $I_O$ = 0.75 A ( <i>Note 1</i> )	52	67		dB	
		$I_{O}$ = 250 mA, $T_{J}$ = - 40 to 125 °C ( <i>Note 2</i> )		0.1			
$V_{DROP}$	Dropout voltage	I <sub>O</sub> = 0.75 A, T <sub>J</sub> = -40 to 125 °C ( <i>Note 2</i> )		0.2		V	
		I <sub>O</sub> = 1.5 A, T <sub>J</sub> = -40 to 125 °C ( <i>Note 2</i> )		0.4	0.7		
		I <sub>O</sub> = 0.75 A, T <sub>J</sub> = -40 to 125 °C		15	40	mA	
Iq	Quiescent current	I <sub>O</sub> = 1.5 A, T <sub>J</sub> = - 40 to 125 °C		30	80	ША	
		$V_I = 13 \text{ V}, V_{INH} = \text{GND}, T_J = -40 \text{ to } 125^{\circ}\text{C}$		130	180	μA	
I <sub>sc</sub>	Short circuit current	$V_{I} - V_{O} = 5.5 \text{ V}$		2.2		Α	
V <sub>IL</sub>	Control input logic low	OFF MODE, ( <i>Note 3</i> ), $T_J = -40$ to 125 °C			0.8	V	
V <sub>IH</sub>	Control input logic high	ON MODE, ( <i>Note 3</i> ), T <sub>J</sub> = - 40 to 125 °C	2			V	
I <sub>INH</sub>	Control input current	T <sub>J</sub> = - 40 to 125 °C, V <sub>INH</sub> = 13 V		5	10	μA	
eN	Output noise voltage	B <sub>P</sub> = 10 Hz to 100 kHz, I <sub>O</sub> = 100 mA ( <i>Note 1</i> )		132		μV <sub>RMS</sub>	
T <sub>SHDN</sub>	Thermal shutdown			150		°C	

Note: 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  $V_{\rm O}$  + 1 V applied to  $V_{\rm I}$ .
- 3 Only for version with Inhibit function.

Electrical characteristics LD29150

 $\rm I_O$  = 10 mA, T  $_J$  = 25 °C, V  $_I$  = 7 V, V  $_{INH}$  = 2 V (*Note 3*), C  $_I$  = 330 nF, C  $_O$  = 10  $\mu F$ , unless otherwise specified.

Table 7. Electrical characteristics of LD29150#50

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit	
V	Output voltage	$I_O = 10 \text{ mA to } 1.5 \text{ A}, V_I = 6 \text{ to } 10.5 \text{ V}$	4.95	5	5.05	V	
Vo	Output voltage	T <sub>J</sub> = - 40 to 125 °C	4.9		5.1	V	
ΔV <sub>O</sub>	Load regulation	I <sub>O</sub> = 10 mA to 1.5 A		0.2	1.0	%	
$\Delta V_{O}$	Line regulation	V <sub>I</sub> = 6 to 13 V		0.06	0.5	%	
SVR	Supply voltage rejection	$f = 120 \text{ Hz}, V_I = 7 \pm 1 \text{ V}, I_O = 0.75 \text{ A}$ (Note 1)	49	64		dB	
		$I_{O}$ = 250 mA, $T_{J}$ = -40 to 125 °C ( <i>Note 2</i> )		0.1			
V <sub>DROP</sub>	Dropout voltage	I <sub>O</sub> = 0.75 A, T <sub>J</sub> = -40 to 125 °C ( <i>Note 2</i> )		0.2		V	
		I <sub>O</sub> = 1.5 A, T <sub>J</sub> = -40 to 125 °C ( <i>Note 2</i> )		0.4	0.7		
		I <sub>O</sub> = 0.75 A, T <sub>J</sub> = - 40 to 125 °C		15	40	- mA	
Iq	Quiescent current	I <sub>O</sub> = 1.5 A, T <sub>J</sub> = -40 to 125 °C		30	80	IIIA	
		V <sub>I</sub> = 13 V, V <sub>INH</sub> = GND, T <sub>J</sub> = -40 to 125°C		130	180	μA	
I <sub>sc</sub>	Short circuit current	V <sub>I</sub> - V <sub>O</sub> = 5.5 V		2.2		Α	
V <sub>IL</sub>	Control input logic low	OFF MODE, ( <i>Note 3</i> ), $T_J = -40$ to 125 °C			8.0	V	
V <sub>IH</sub>	Control input logic high	ON MODE, ( <i>Note 3</i> ), T <sub>J</sub> = -40 to 125 °C	2			V	
I <sub>INH</sub>	Control input current	T <sub>J</sub> = - 40 to 125 °C, V <sub>INH</sub> = 13 V		5	10	μΑ	
eN	Output noise voltage	B <sub>P</sub> = 10 Hz to 100 kHz, I <sub>O</sub> = 100 mA ( <i>Note 1</i> )		200		μV <sub>RMS</sub>	
T <sub>SHDN</sub>	Thermal shutdown			150		°C	

Note: 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  $V_{\rm O}$  + 1 V applied to  $V_{\rm I}$ .
- 3 Only for version with Inhibit function.



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 $I_O$  = 10 mA,  $T_J$  = 25 °C,  $V_I$  = 3.23 V,  $V_{INH}$  = 2 V (*Note 3*),  $C_I$  = 330 nF,  $C_O$  = 10  $\mu F$  adjust pin tied to output pin.

Table 8. Electrical characteristics of LD29150#ADJ

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
VI	Minimum operating input voltage	$I_{O}$ = 10 mA to 1.5 A, $T_{J}$ = - 40 to 125 °C	2.5			V
ΔV <sub>O</sub>	Load regulation	I <sub>O</sub> = 10 mA to 1.5 A		0.2	1.0	%
ΔV <sub>O</sub>	Line regulation	V <sub>I</sub> = 2.5 V to 13 V, I <sub>O</sub> = 10 mA		0.06	0.5	%
V	Poforonoo voltago	I <sub>O</sub> = 10 mA to 1.5 A, V <sub>I</sub> = 2.5 to 4.5 V	-1%	1.23	+1%	V
V <sub>REF</sub>	Reference voltage	T <sub>J</sub> = - 40 to 125 °C ( <i>Note 2</i> )	-2%		+2%	V
SVR	Supply voltage rejection	ejection $f = 120 \text{ Hz}, V_I = 3.23 \pm 1 \text{ V}, I_O = 0.75 \text{ A}$ ( <i>Note 1</i> )		75		dB
		I <sub>O</sub> = 0.75 A, T <sub>J</sub> = - 40 to 125 °C		15	40	mΛ
Iq	Quiescent current	I <sub>O</sub> = 1.5 A, T <sub>J</sub> = -40 to 125 °C		30	80	mA
		V <sub>I</sub> = 13 V, V <sub>INH</sub> = GND, T <sub>J</sub> = -40 to 125°C		130	180	μA
I <sub>ADJ</sub>	Adjust pin current	T <sub>J</sub> = - 40 to 125 °C ( <i>Note 1</i> )			1	μA
I <sub>sc</sub>	Short circuit current	V <sub>I</sub> - V <sub>O</sub> = 5.5 V		2.2		Α
V <sub>IL</sub>	Control input logic low	OFF MODE, ( <i>Note 3</i> ),T <sub>J</sub> = - 40 to 125 °C			0.8	V
V <sub>IH</sub>	Control input logic high	ON MODE, ( <i>Note 3</i> ), T <sub>J</sub> = - 40 to 125 °C	2			V
I <sub>INH</sub>	Control input current	T <sub>J</sub> = - 40 to 125 °C, V <sub>INH</sub> = 13 V		5	10	μΑ
eN	Output noise voltage	B <sub>P</sub> = 10 Hz to 100 kHz, I <sub>O</sub> = 100 mA ( <i>Note 1</i> )		50		$\mu V_{RMS}$
T <sub>SHDN</sub>	Thermal shutdown			150		°C

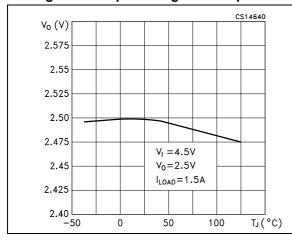
Note: 1 Guaranteed by design.

- 2 Reference voltage is measured between output and GND pin, with ADJ PIN tied to  $V_{OUT}$ .
- 3 Only for version with Inhibit function.

### **6** Typical characteristics

Figure 5. Output voltage vs. temperature

Figure 6. Reference voltage vs. temperature



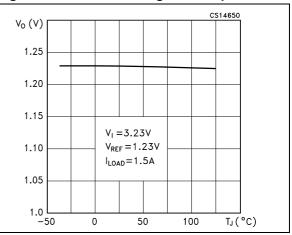
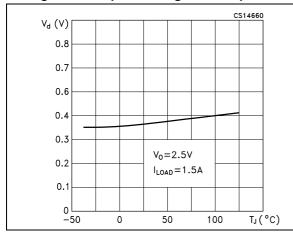


Figure 7. Dropout voltage vs. temperature

Figure 8. Dropout voltage vs. output current



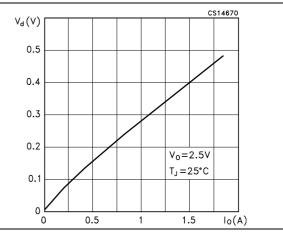
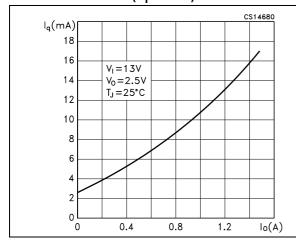
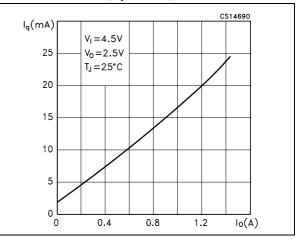


Figure 9. Quiescent current vs. output current  $(V_1 = 13 \text{ V})$  Figure 10. Quiescent current vs. output current  $(V_1 = 4.5 \text{ V})$ 





57

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5

T<sub>J</sub>(°C)

 $(I_0 = 10 \text{ mA})$ CS14700 CS14710  $I_q(mA)$  $I_q(mA)$ 4.5  $V_1 = 4.5V$ 25 4.0  $V_0 = 2.5V$  $V_0 = 2.5V$  $I_0 = 10 \text{mA}$ 3.5 20 NO LOAD 3.0 T<sub>J</sub>=25°C 2.5 15 2.0 10 1.5 1.0

14 Vs (V)

0.5

Figure 11. Quiescent current vs. supply voltage Figure 12. Quiescent current vs. temperature  $(I_O = 10 \text{ mA})$ 

Figure 13. Quiescent current vs. temperature  $(I_O = 1.5 \text{ A})$ 

6 8 10 12

Figure 14. Short circuit current vs. temperature

50

100

0

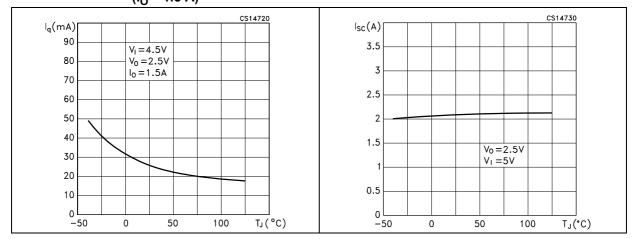


Figure 15. Adjust pin current vs. temperature

Figure 16. Supply voltage rejection vs. temperature

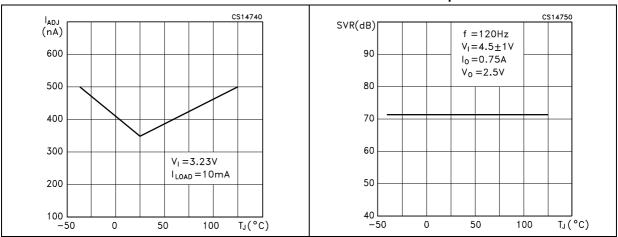


Figure 17. Output voltage vs. input voltage

Figure 18. Stability vs. C<sub>O</sub>

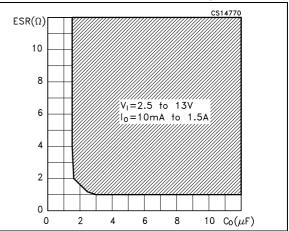


Figure 19. Line transient

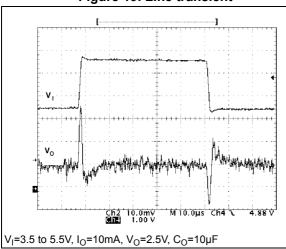


Figure 20. Load transient

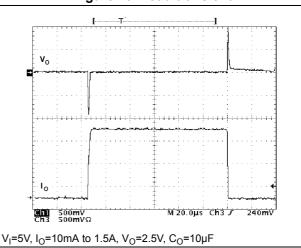


Figure 21. Start-up time 10 mA

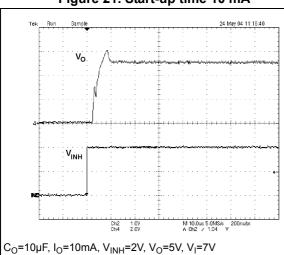
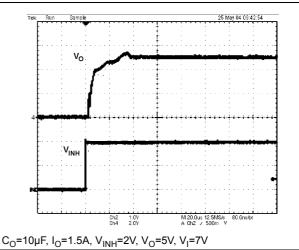


Figure 22. Start-up time 1.5 A



LD29150 Package information

### 7 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: <a href="https://www.st.com">www.st.com</a>. ECOPACK<sup>®</sup> is an ST trademark.

#### 7.1 DPAK package information

Table 9. DPAK mechanical data

Dim.		mm	
Dim.	Min.	Тур.	Max.
А	2.20		2.40
A1	0.90		1.10
A2	0.03		0.23
b	0.64		0.90
b4	5.20		5.40
С	0.45		0.60
c2	0.48		0.60
D	6.00		6.20
D1		5.10	
E	6.40		6.60
E1		4.70	
е		2.28	
e1	4.40		4.60
Н	9.35		10.10
L	1.00		1.50
(L1)		2.80	
L2		0.80	
L4	0.60		1.00
R		0.20	
V2	0°		8°

Package information LD29150

Figure 23. DPAK outline Ε THERMAL PAD c2 E1 L2 D'1D R С SEATING PLANE <u>A2</u> (L1) V2 0,25



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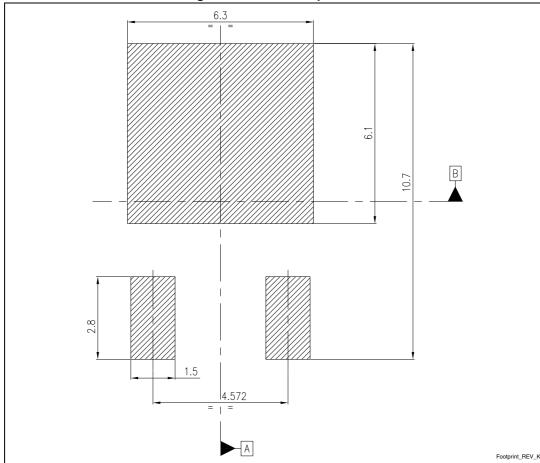


Figure 24. DPAK footprint (a)

a. All dimensions are in millimeters

Package information LD29150

## 7.2 PPAK package information

Table 10. PPAK mechanical data

Dim.		mm				
Dilli.	Min.	Тур.	Max.			
A	2.2		2.4			
A1	0.9		1.1			
A2	0.03		0.23			
В	0.4		0.6			
B2	5.2		5.4			
С	0.45		0.6			
C2	0.48		0.6			
D	6		6.2			
D1		5.1				
E	6.4		6.6			
E1		4.7				
е		1.27				
G	4.9		5.25			
G1	2.38		2.7			
Н	9.35		10.1			
L2		0.8	1			
L4	0.6		1			
L5	1					
L6		2.8				
R		0.20				
V2	0°		8°			

LD29150 Package information

"GATE" Note 6 Ε-THERMAL PAD B2 -E1 L2 D1 D L4 <u>A</u>1 B (4x) Note 7 R С G -SEATING PLANE Ľ6 L5 GAUGE PLANE 0,25 0078180\_F

Figure 25. PPAK outline

# 8 Packaging information

### 8.1 PPAK and DPAK packaging information

Table 11. PPAK and DPAK tape and reel mechanical data

Таре				Reel		
Dim.	mm		Dim	mm		
Dilli.	Min.	Max.	Dim.	Min.	Max.	
A0	6.8	7	Α		330	
В0	10.4	10.6	В	1.5		
B1		12.1	С	12.8	13.2	
D	1.5	1.6	D	20.2		
D1	1.5		G	16.4	18.4	
Е	1.65	1.85	N	50		
F	7.4	7.6	Т		22.4	
K0	2.55	2.75				
P0	3.9	4.1		Base qty.	2500	
P1	7.9	8.1		Bulk qty.	2500	
P2	1.9	2.1				
R	40					
Т	0.25	0.35				
W	15.7	16.3				

Top cover tolerance on tape +/- 0.2 mm

Top cover tape

For machine ref. only including draft and radii concentric around B0

User direction of feed

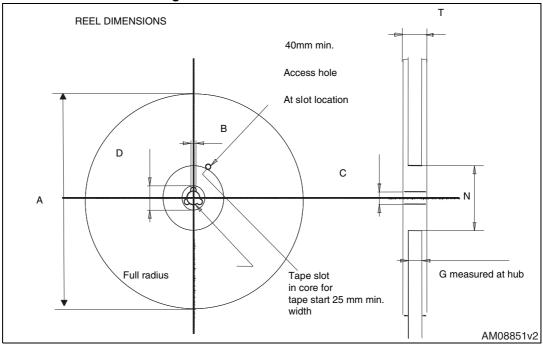
Light direction of feed

Bending radius

AM08852v1

Figure 26. Tape for PPAK and DPAK





Revision history LD29150

# 9 Revision history

Table 12. Document revision history

Date	Revision	Changes
17-Jun-2004	5	Add figures 20 and 21, PPAK, TO-220 and TO-220FP mechanical data updated.
19-Jul-2004	6	Remove Package TO-220FP4.
08-Nov-2004	7	Mistake Figure 7.
21-Mar-2005	8	Add V <sub>O</sub> and V <sub>INH</sub> on Table 2.
21-Oct-2005	9	Order Codes Has Been Updated.
17-Oct-2006	10	Add new package P²PAK.
13-Nov-2006	11	Add row T <sub>SHDN</sub> on tables of the electrical characteristics.
11-May-2007	12	Order codes updated.
15-Feb-2008	13	Added: Table 1 on page 1.
28-Jul-2009	14	Modified: Table 1 on page 1.
22-Sep-2010	15	Modified: Table 1 on page 1.
27-Oct-2010	16	Updated: DPAK mechanical data on page 25.
07-May-2012	17	Modified: pin connections for PPAK, P²PAK and DPAK <i>Figure 3 on page 4</i> .
06-Sep-2012	18	Updated: figure for P²PAK in cover page.
30-Oct-2013	19	Changed the LD29150XX to LD29150. Updated: Description in cover page. Updated Section 5: Electrical characteristics and Section 7: Package mechanical data. Added Section 8: Packaging mechanical data. Minor text changes.
30-Aug-2017	20	Removed P²PAK package option (order code LD29150P2T33R)

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