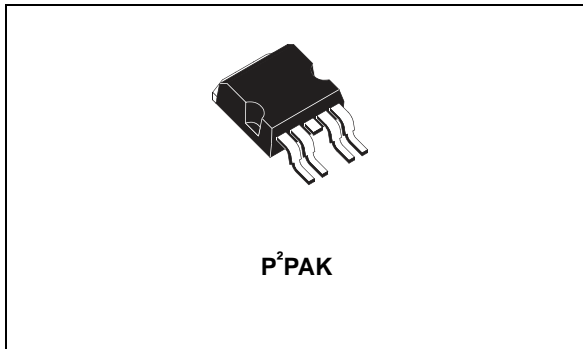


## 7 A very low drop adjustable positive voltage regulator

Datasheet - production data



### Description

The LD1580 is a very low-dropout positive linear voltage regulator particularly suitable for applications requiring output currents up to 7 A.

The LD1580 typical dropout voltage is 400 mV at 7 A while it decreases at lighter loads.

The low-dropout is given by a second input voltage pin, named  $V_{\text{CONTROL}}$ , which also drives the output power stage.

The LD1580 is provided with an output voltage remote sense pin which reduces drastically any output voltage variation due to load changes.

The ADJ pin is available. A small capacitor on this pin improves transient response.

The LD1580 also features a built-in output current limit function and a thermal shutdown protection with hysteresis which avoids excessive power dissipation in case of insufficient heatsinking. On-chip trimming allows the regulator to reach a very tight output voltage tolerance, within  $\pm 2\%$  at the maximum output current and over the full temperature range.

### Features

- Output current limit
- Low-dropout voltage: typically 400 mV at 7 A output current
- Output voltage remote sense pin
- Fast transient response
- Thermal shutdown protection with hysteresis
- Wide operating temperature range: from  $-40\text{ }^{\circ}\text{C}$  to  $125\text{ }^{\circ}\text{C}$
- No supply sequencing problems in dual supply mode
- Output voltage available: adjustable

**Table 1. Device summary**

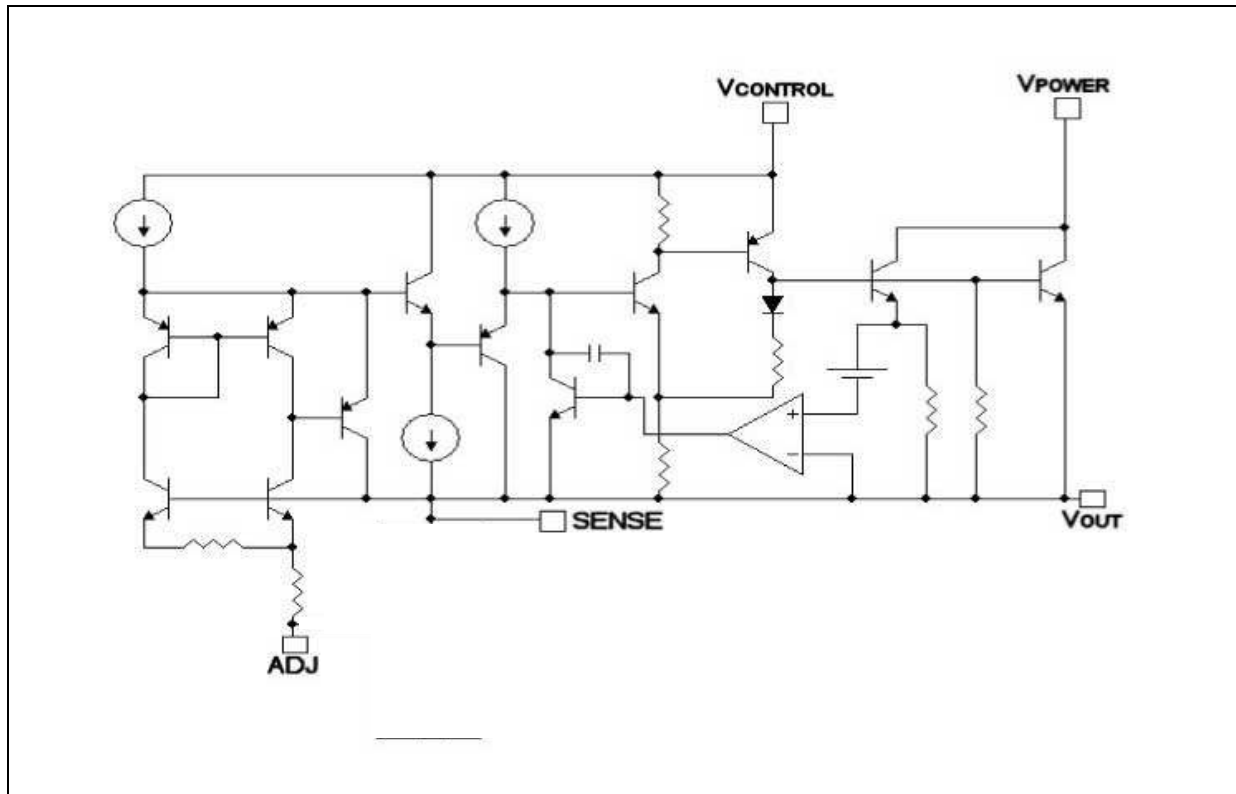
Order code	Packaging
LD1580P2T-R	tape and reel

# Contents

1	Diagram .....	3
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4	Typical application .....	6
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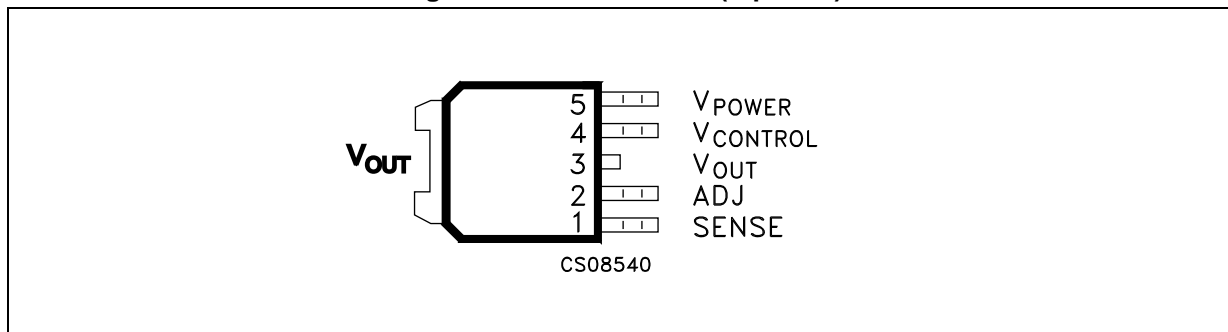
# 1 Diagram

Figure 1. Schematic diagram



## 2 Pin configuration

Figure 2. Pin connection (top view)



### 3 Maximum ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{POWER}$	DC $V_{POWER}$ voltage	From -0.3 to 6	V
$V_{CONTROL}$	DC $V_{CONTROL}$ voltage	From -0.3 to 13	V
$I_{OUT}$	Output current	Internally limited	A
$P_D$	Power dissipation	Internally limited	W
$T_{STG}$	Storage temperature range	-55 to +150	°C
$T_{OP}$	Operating junction temperature range	-40 to +125	°C

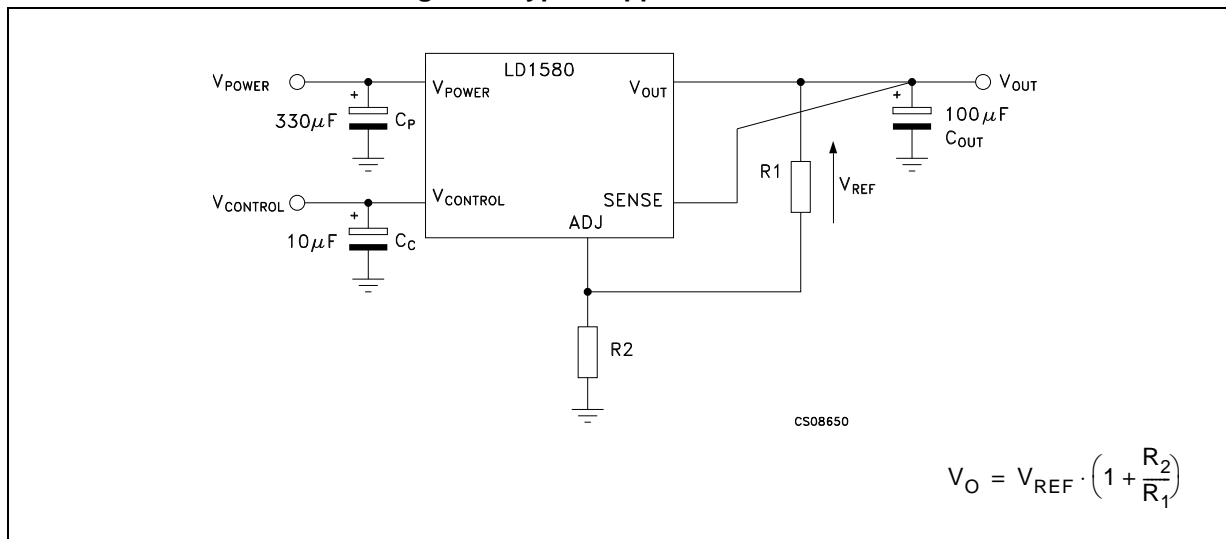
*Note: Absolute maximum ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied.*

**Table 3. Thermal data**

Symbol	Parameter	P <sup>2</sup> PAK	Unit
$R_{thJC}$	Thermal resistance junction-case	3	°C/W
$R_{thJA}$	Thermal resistance junction-ambient	62.5	°C/W

# 4 Typical application

Figure 3. Typical application circuits



## 5 Electrical characteristics

$T_J = -40\text{ °C}$  to  $125\text{ °C}$ ,  $C_P = 330\text{ }\mu\text{F}$ ,  $C_C = 10\text{ }\mu\text{F}$ ,  $C_{OUT} = 100\text{ }\mu\text{F}$ , unless otherwise specified.

**Table 4. LD1580 electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_O$	Output voltage	$V_{CONTROL}=2.75\text{ V}$ , $V_{POWER}=2\text{ V}$ $T_J=25\text{ °C}$ , $I_{OUT}=10\text{ mA}$	1.237	1.250	1.263	V
		$V_{CONTROL}=2.7\text{ V}$ to $12\text{ V}$ $V_{POWER} = 2.05\text{ V}$ to $5.5\text{ V}$ , $I_{OUT} = 0.01$ to $7\text{ A}$	1.225	1.250	1.275	
$\Delta V_O$	Line regulation	$V_{CONTROL}=2.5\text{ V}$ to $12\text{ V}$ $V_{POWER}=1.75\text{ V}$ to $5.5\text{ V}$ , $I_{OUT}=10\text{ mA}$		0.08	0.24	%
$\Delta V_O$	Load regulation	$V_{CONTROL} = 2.75\text{ V}$ , $V_{POWER} = 2.1\text{ V}$ $I_{OUT} = 0.01$ to $7\text{ A}$		0.08	0.4	%
$I_C$	$V_{CONTROL}$ pin current	$V_{CONTROL} = 2.75\text{ V}$ , $V_{POWER} = 2.05\text{ V}$ $I_{OUT} = 100\text{ mA}$		6	10	mA
		$V_{CONTROL} = 2.75\text{ V}$ , $V_{POWER} = 2.05\text{ V}$ $I_{OUT} = 4\text{ A}$		30	60	
		$V_{CONTROL} = 2.75\text{ V}$ , $V_{POWER} = 1.75\text{ V}$ $I_{OUT} = 4\text{ A}$		33	70	
		$V_{CONTROL} = 2.75\text{ V}$ , $V_{POWER} = 2.05\text{ V}$ $I_{OUT} = 7\text{ A}$		60	120	
$I_{ADJ}$	Adjustable pin current	$V_{CONTROL} = 2.75\text{ V}$ , $V_{POWER} = 2.05\text{ V}$ $I_{OUT} = 10\text{ mA}$		50	120	$\mu\text{A}$
$I_{OUT}$	Output current limit	$V_{CONTROL} = 2.75\text{ V}$ , $V_{POWER} = 2.05\text{ V}^{(1)}$	8	9		A
SVR	Supply voltage rejection	$V_{CONTROL} = V_{POWER} = 3.75\text{ V}$ $V_{RIPPLE} = 1\text{ V}_{P-P}$ , $I_{OUT} = 4\text{ A}$ , $T_J = 25\text{ °C}$	61.5	81.5		dB
$V_{DC}$	Minimum $V_{CONTROL}$ voltage, ( $V_{CONTROL}-V_O$ )	$V_{POWER}=2.05\text{ V}$ , $I_{OUT} = 100\text{ mA}^{(2)}$		0.95	1.15	V
		$V_{POWER} = 2.05\text{ V}$ , $I_{OUT} = 1\text{ A}$		0.95	1.15	
		$V_{POWER} = 2.05\text{ V}$ , $I_{OUT} = 4\text{ A}$		1	1.2	
		$V_{POWER} = 2.05\text{ V}$ , $I_{OUT} = 7\text{ A}$		1.05	1.3	
$V_{DP}$	Minimum $V_{POWER}$ voltage ( $V_{POWER}-V_O$ )	$V_{CONTROL} = 2.75\text{ V}$ , $I_{OUT} = 1\text{ A}^{(2)}$		0.05	0.15	V
		$V_{CONTROL} = 2.75\text{ V}$ , $I_{OUT} = 4\text{ A}$		0.2	0.4	
		$V_{CONTROL} = 2.75\text{ V}$ , $I_{OUT} = 7\text{ A}$		0.4	0.6	
$T_{SHDN}$	Shutdown temperature threshold			170		$^{\circ}\text{C}$
$T_{HYST}$	Thermal shutdown hysteresis			5		$^{\circ}\text{C}$

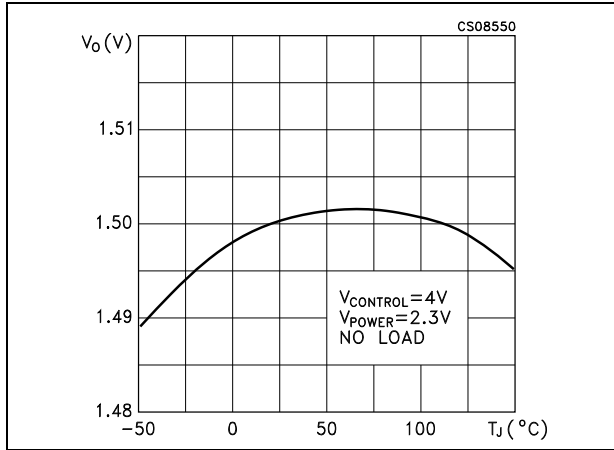
1. Measured when the  $V_{OUT}$  voltage drops below 100 mV with respect to its nominal value.

2. Measured when the  $V_{OUT}$  voltage drops below 2% with respect to its nominal value.

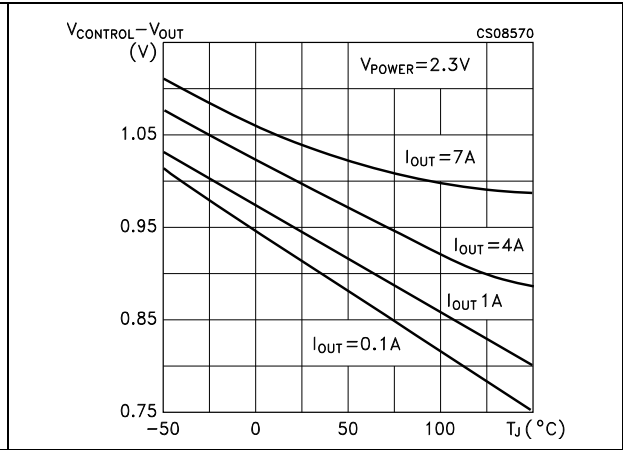
## 6 Typical characteristics

(Unless otherwise specified  $T_J = 25\text{ }^\circ\text{C}$ ,  $C_P = 330\text{ }\mu\text{F}$ ,  $C_C = 10\text{ }\mu\text{F}$ ,  $C_{OUT} = 100\text{ }\mu\text{F}$ )

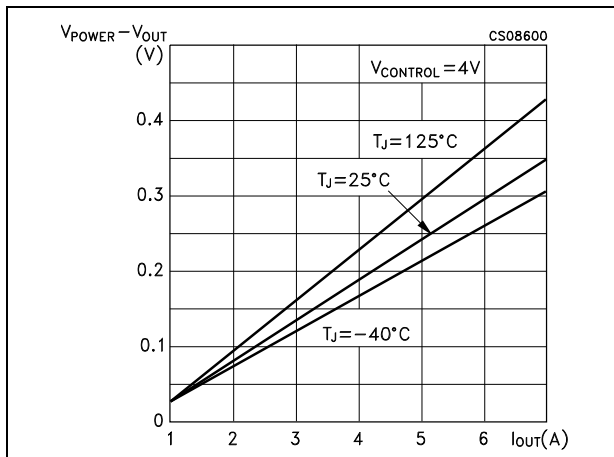
**Figure 4. Output voltage vs temperature (no load)**



**Figure 5. Minimum  $V_{CONTROL}$  voltage vs temperature**



**Figure 6. Minimum  $V_{POWER}$  voltage vs output current**



**Figure 7. Output voltage vs temperature ( $I_{OUT} = 7\text{ A}$ )**

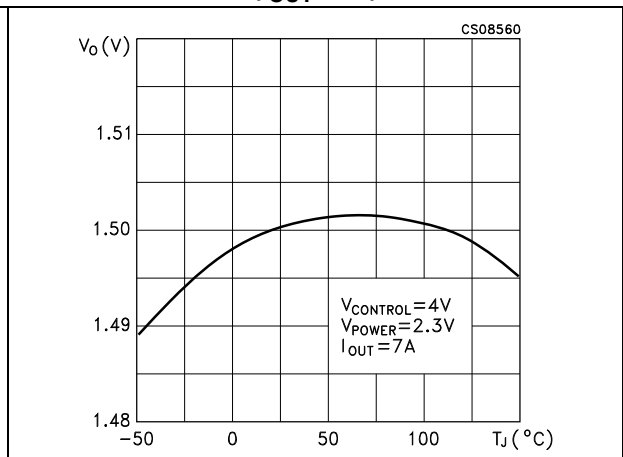




Figure 8.  $V_{CONTROL}$  pin current vs temperature

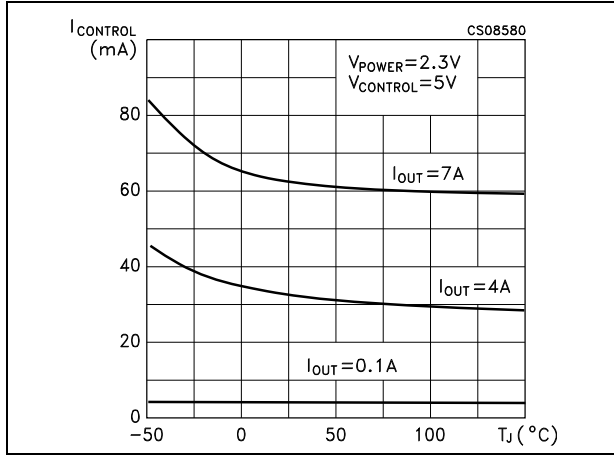


Figure 9. Minimum  $V_{POWER}$  voltage vs temperature

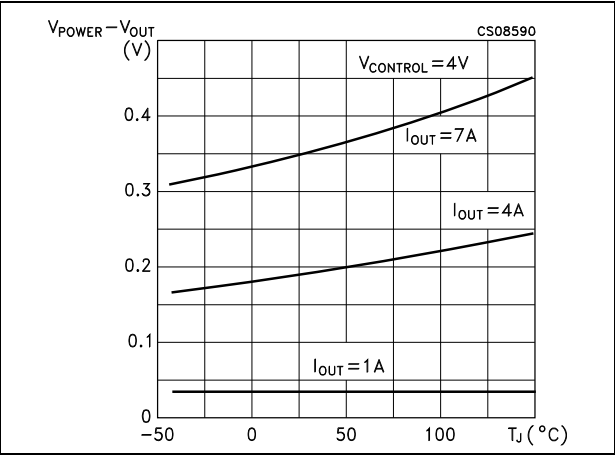


Figure 10.  $V_{CONTROL}$  pin current vs output current

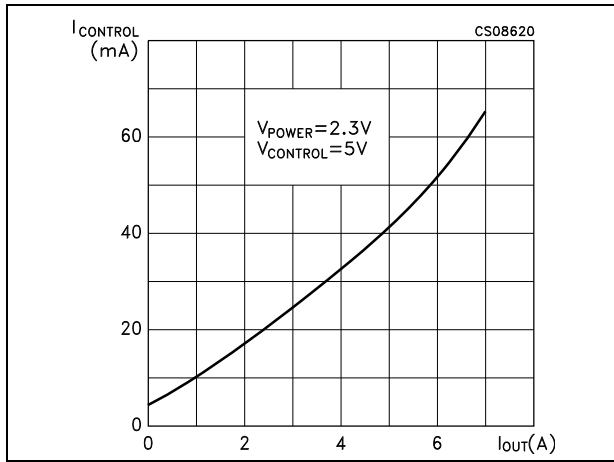


Figure 11. Output current limit vs temperature

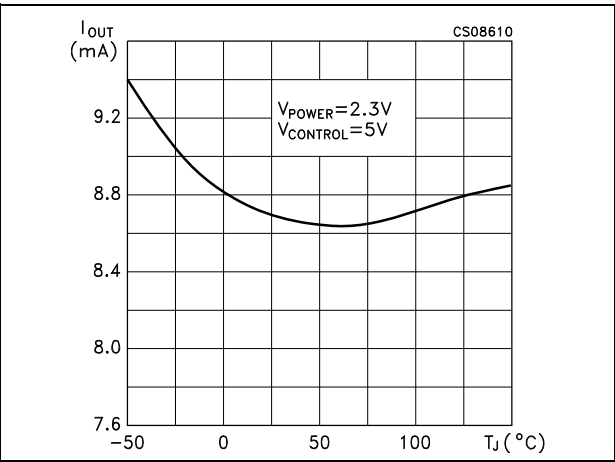


Figure 12. Quiescent current vs temperature

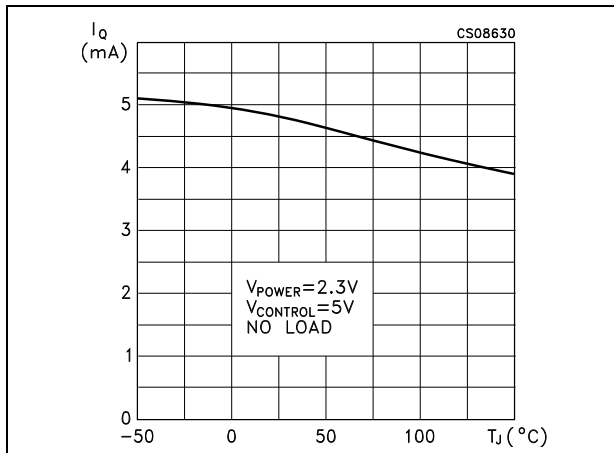


Figure 13. Supply voltage rejection vs output current

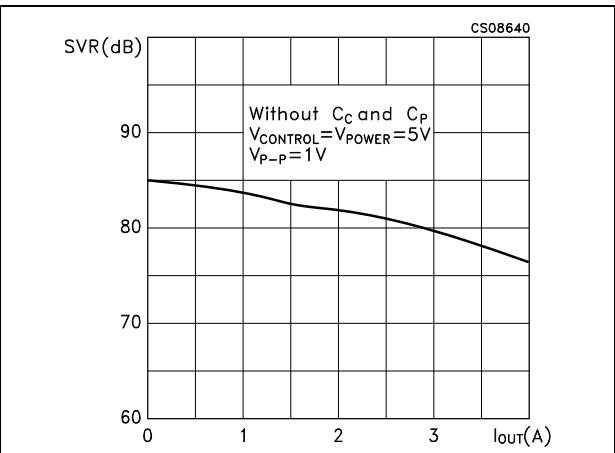


Figure 14. Line transient response  $V_{Power}=3.3\text{ V}$

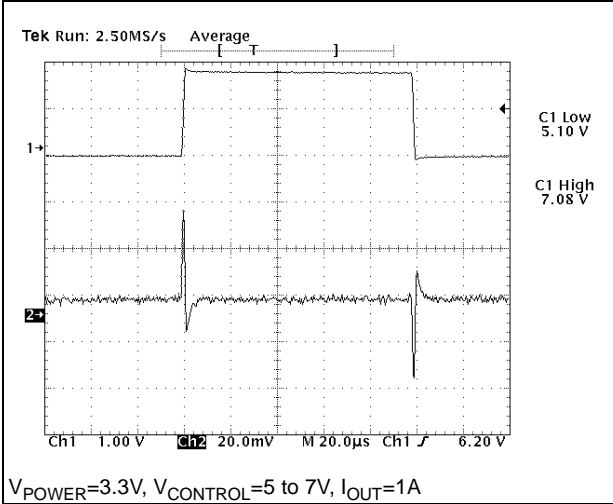


Figure 15. Line transient response  $V_{Power}=5\text{ V}$

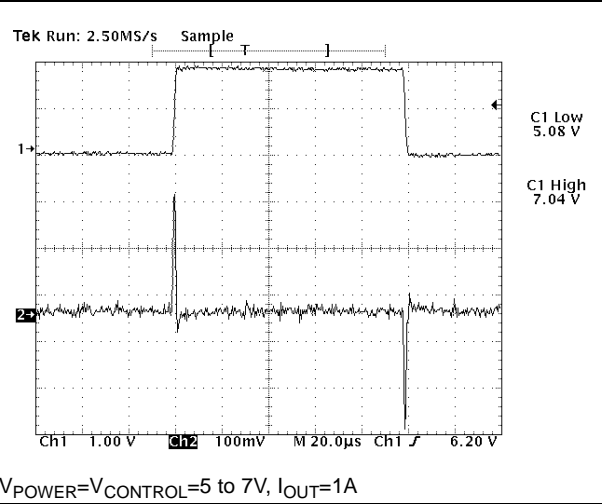


Figure 16. Load transient response

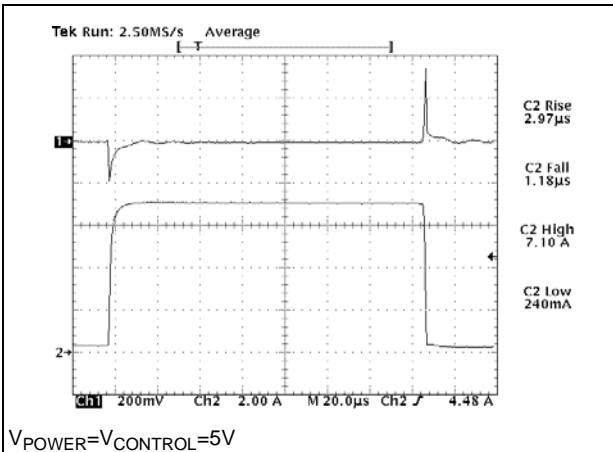


Figure 17. Load transient response (falling edge)

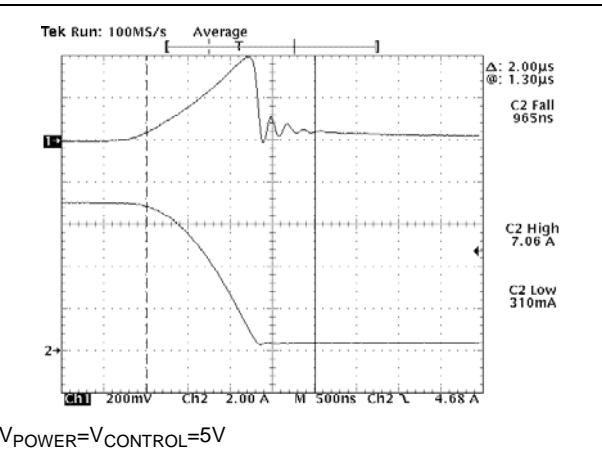
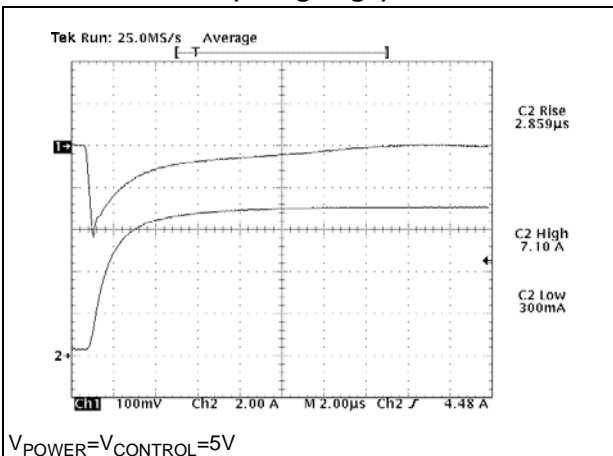


Figure 18. Load transient response (rising edge)



## 7 Package mechanical data

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: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

Figure 19. P<sup>2</sup>PAK drawings

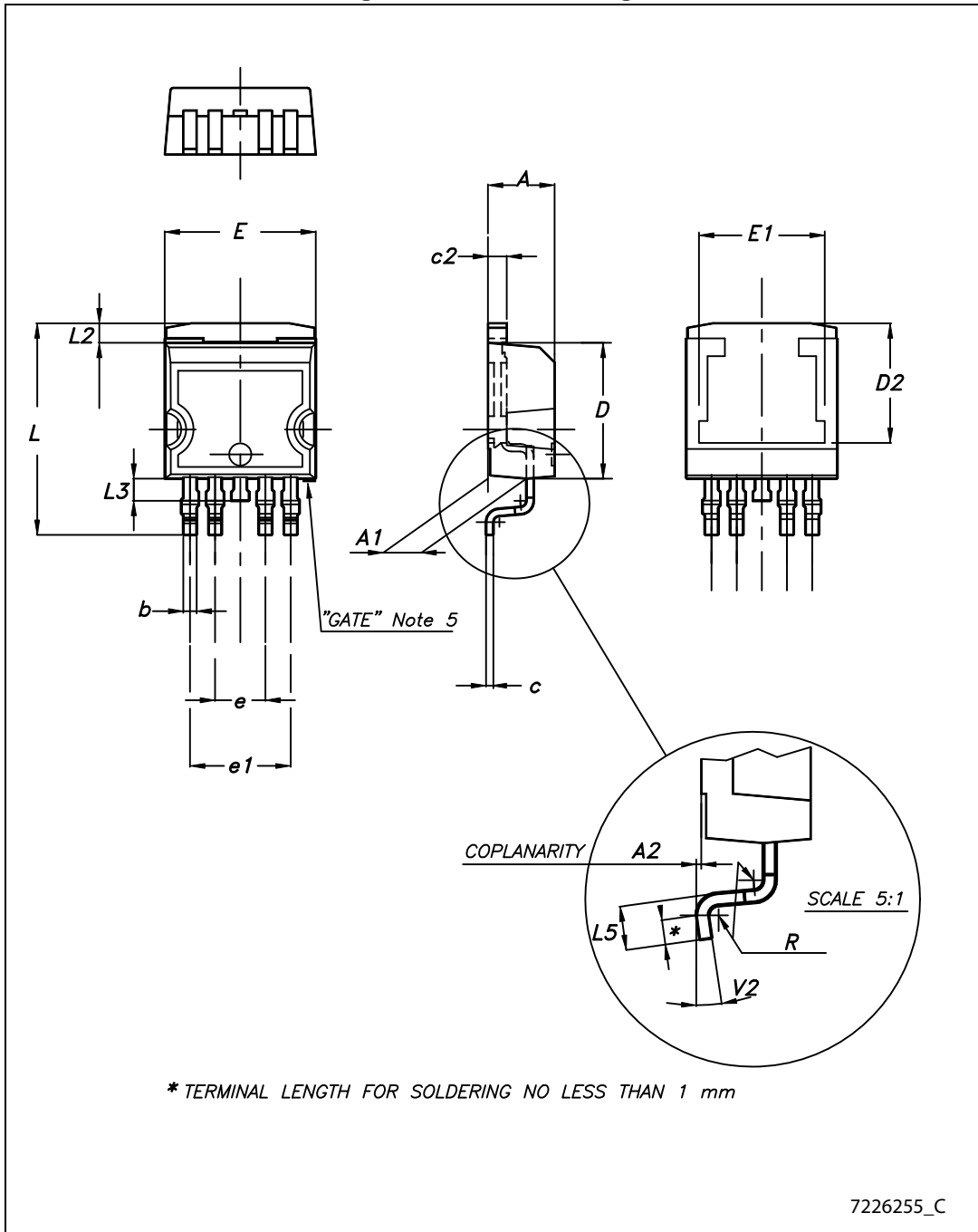
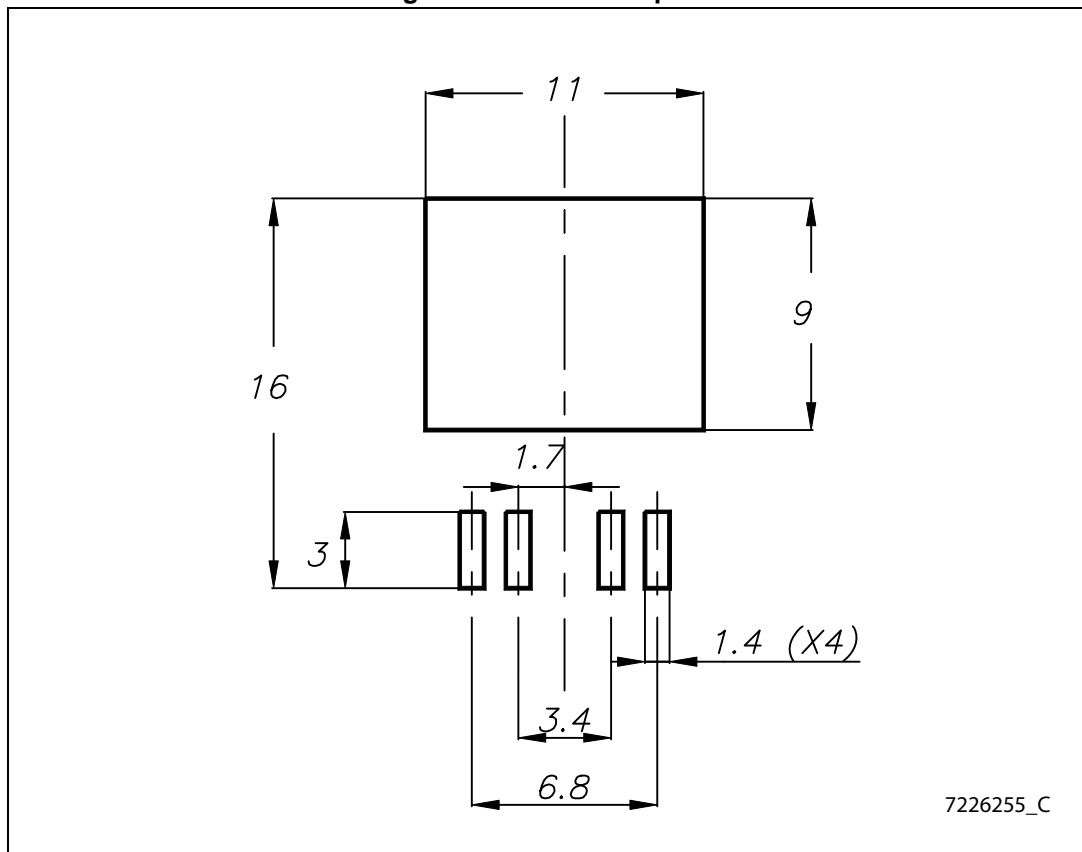


Table 5. P<sup>2</sup>PAK mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.30		4.80
A1	2.40		2.80
A2	0.03		0.23
b	0.80		1.05
c	0.45		0.60
c2	1.17		1.37
D	8.95		9.35
D2		8	
E	10		10.40
E1		8.5	
e	3.20		3.60
e1	6.60		7
L	13.70		14.50
L2	1.25		1.40
L3	0.90		1.70
L5	1.55		2.40
R		0.40	
V2	0°		8°

Figure 20. P<sup>2</sup>PAK footprint

# 8 Packaging mechanical data

Figure 21. P<sup>2</sup>PAK tape and reel dimensions

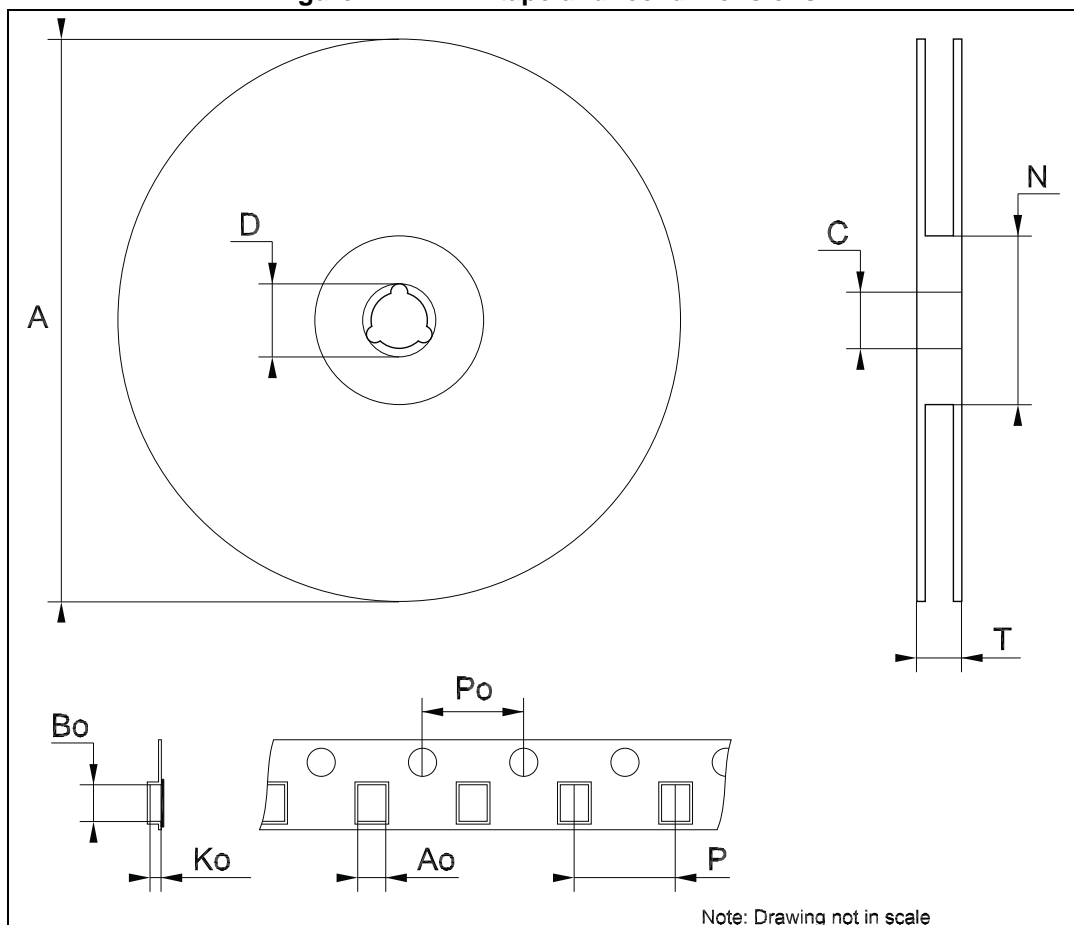


Table 6. P<sup>2</sup>PAK tape and reel mechanical data

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

## 9 Revision history

**Table 7. Document revision history**

Date	Revision	Changes
08-Sep-2005	3	Order codes updated.
09-May-2007	4	Order codes updated.
16-Apr-2008	5	Modified: <a href="#">Table 1 on page 1</a> .
28-Feb-2014	6	Changed the part number LD1580xx to LD1580. Updated the title in cover page. Updated <a href="#">Figure 1: Schematic diagram</a> , <a href="#">Figure 2: Pin connection (top view)</a> , <a href="#">Section 6: Typical characteristics</a> , <a href="#">Section 7: Package mechanical data</a> . Added <a href="#">Section 8: Packaging mechanical data</a> . Minor text changes.



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