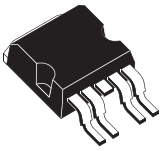
LD1580XX

7 A very low drop positive voltage regulator adjustable

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 -40 °C to 125 °C
- No supply sequencing problems in dual supply mode
- Output voltages available: adjustable



P²PAK

Description

The LD1580 is a very low dropout positive linear voltage regulator particularly suitable in 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.

This very low dropout is achieved thanks to a second input voltage pin, named VCONTROL, which is also responsible of the output power stage driving.

The LD1580 is provided with an output voltage remote sense pin which reduces dramatically any output voltage variations that could occur due to load changes.

The ADJ pin is still available. A small capacitor on this pin helps to improve transient response.

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

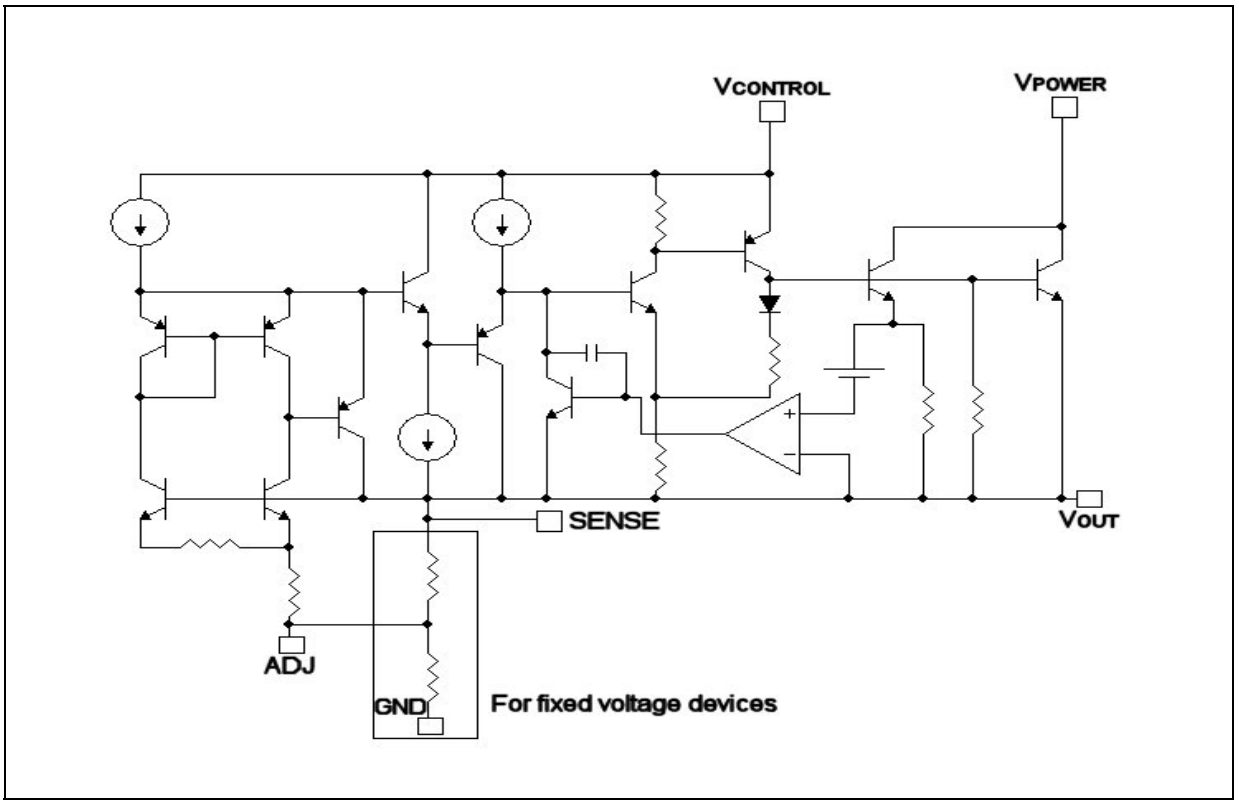
Table 1. Device summary

Part number	Order code	Packaging
LD1580XX	LD1580P2T-R	tape and reel

Contents

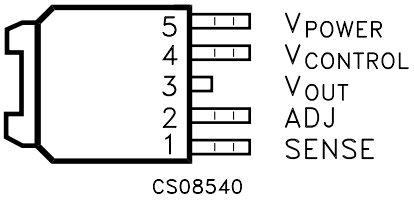
1 Diagram

Figure 1. Schematic diagram



2 Pin configuration

Figure 2. Pin connections (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	
P_D	Power dissipation	Internally limited	
T_{STG}	Storage temperature range	-55 to +150	°C
T_{OP}	Operating junction temperature range	-40 to +125	°C

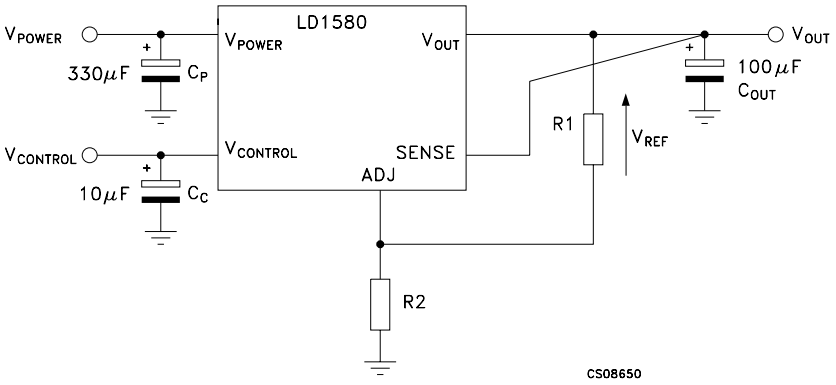
Note: Absolute maximum ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

Table 3. Thermal data

Symbol	Parameter	P^2PAK	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



$$V_O = V_{REF} \cdot \left(1 + \frac{R_2}{R_1}\right)$$

5 Electrical characteristics

Table 4. Electrical characteristics for LD1580 (T_J= - 40 °C to 125 °C, C_P = 330 µF, C_C = 10 µF, C_{OUT} = 100 µF, unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$V_{CONTROL}$=2.75 V, V_{POWER}=2 V T_J=25 °C, I_{OUT}=10 mA	1.237	1.250	1.263	V
		$V_{CONTROL}$=2.7 V to 12 V V_{POWER}=2.05 V to 5.5 V, I_{OUT}=0.01 to 7A	1.225	1.250	1.275	
ΔV_O	Line regulation	$V_{CONTROL}$=2.5 V to 12 V V_{POWER}=1.75 V to 5.5 V, I_{OUT}=10 mA		0.08	0.24	%
ΔV_O	Load regulation	$V_{CONTROL}$=2.75 V, V_{POWER}=2.1 V I_{OUT}=0.01 to 7 A		0.08	0.4	%
I_C	$V_{CONTROL}$ pin current	$V_{CONTROL}$=2.75 V, V_{POWER}=2.05 V I_{OUT}=100 mA		6	10	mA
		$V_{CONTROL}$=2.75 V, V_{POWER}=2.05 V I_{OUT}=4 A		30	60	
		$V_{CONTROL}$=2.75 V, V_{POWER}=1.75 V I_{OUT}=4 A		33	70	
		$V_{CONTROL}$=2.75 V, V_{POWER}=2.05 V I_{OUT}=7 A		60	120	
I_{ADJ}	Adjust pin current	$V_{CONTROL}$=2.75 V, V_{POWER}=2.05 V I_{OUT}=10 mA		50	120	µA
I_{OUT}	Output current limit	$V_{CONTROL}$=2.75 V, V_{POWER}=2.05 V (1)	8	9		A
SVR	Supply voltage rejection	$V_{CONTROL}$=V_{POWER}=3.75 V Avg V_{RIPPLE}=1 V_{P-P}, I_{OUT}=4 A, T_J=25 °C	61.5	81.5		dB
V_{DC}	Minimum $V_{CONTROL}$ voltage, ($V_{CONTROL}$-V_O)	V_{POWER}=2.05 V, I_{OUT}=100 mA (2)		0.95	1.15	V
		V_{POWER}=2.05 V, I_{OUT}=1 A		0.95	1.15	
		V_{POWER}=2.05 V, I_{OUT}=4 A		1	1.2	
		V_{POWER}=2.05 V, I_{OUT}=7 A		1.05	1.3	
V_{DP}	Minimum V_{POWER} voltage (V_{POWER}-V_O)	$V_{CONTROL}$=2.75 V, I_{OUT}=1 A (2)		0.05	0.15	V
		$V_{CONTROL}$=2.75 V, I_{OUT}=4 A		0.2	0.4	
		$V_{CONTROL}$=2.75 V, I_{OUT}=7 A		0.4	0.6	
T_{SHDN}	Shutdown temperature threshold			170		°C
T_{HYST}	Thermal shutdown hysteresis			5		°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 °C, C_P = 330 µF, C_C = 10 µF, C_{OUT} = 100 µF)

Figure 4. Output voltage vs temperature

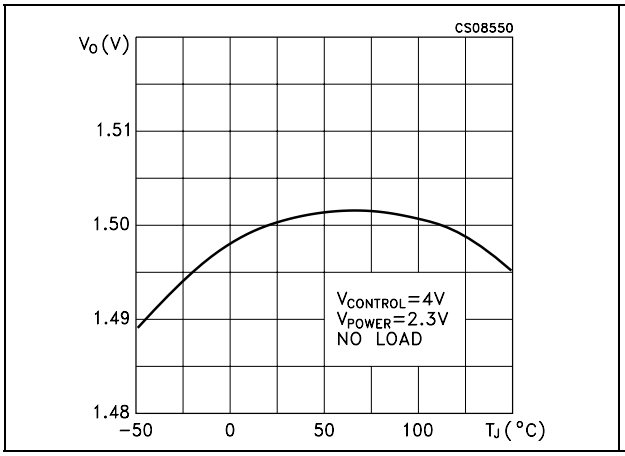


Figure 5. Minimum $V_{CONTROL}$ voltage vs temperature

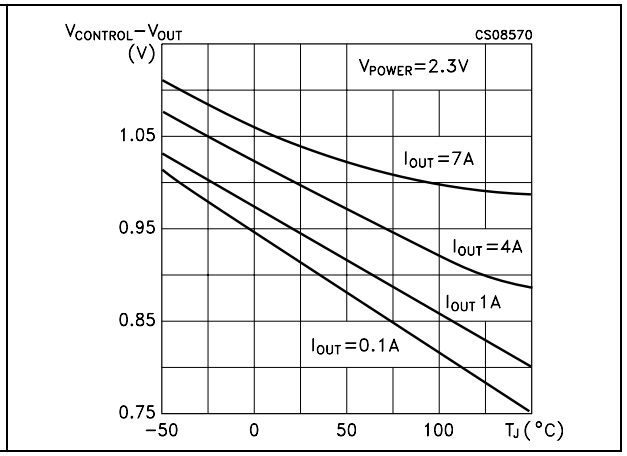


Figure 6. Minimum V_{POWER} voltage vs output current

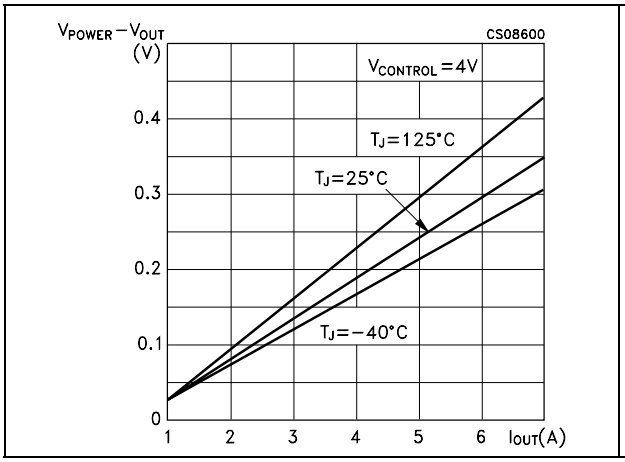


Figure 7. Output voltage vs temperature

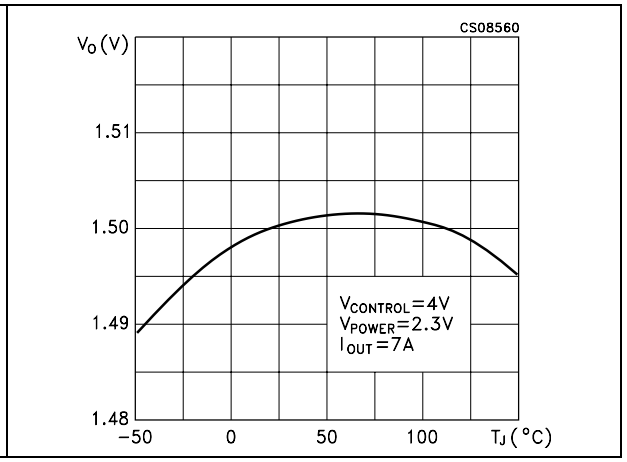


Figure 8. $V_{CONTROL}$ pin current vs temp.

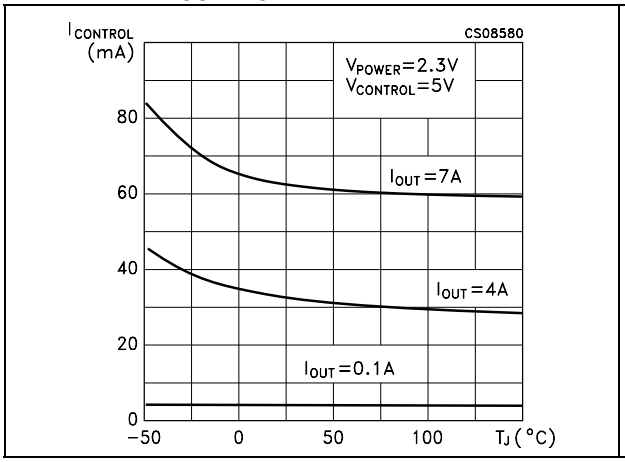


Figure 9. Minimum V_{POWER} voltage vs temp.

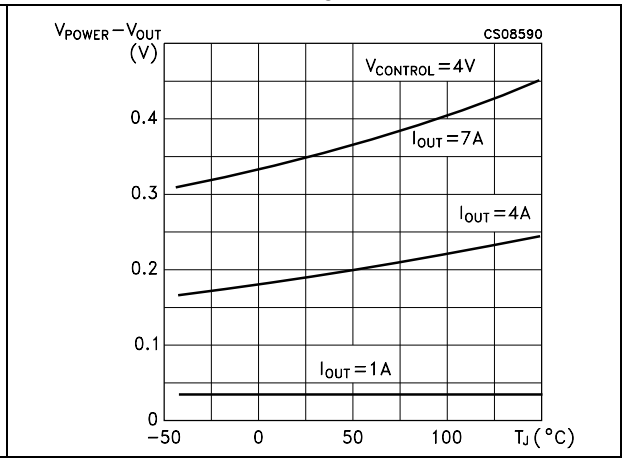


Figure 10. $V_{CONTROL}$ pin current vs output current

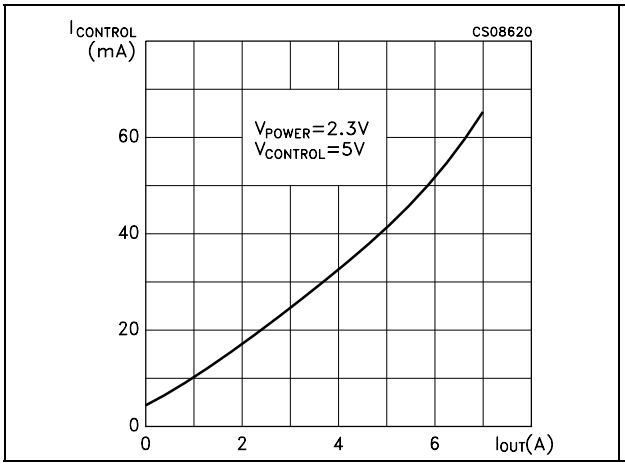


Figure 11. Output current limit vs temperature

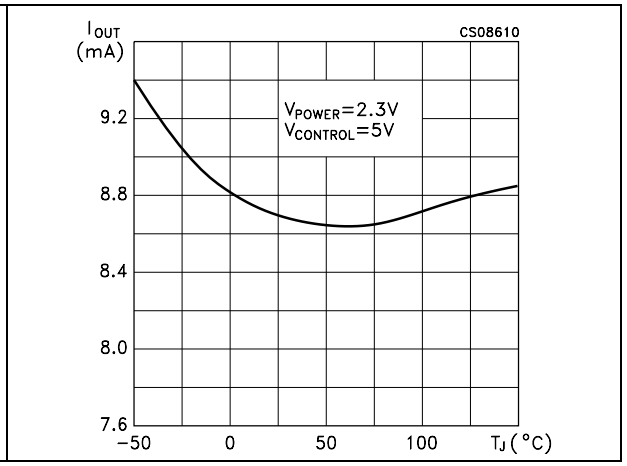


Figure 12. Quiescent current vs temperature

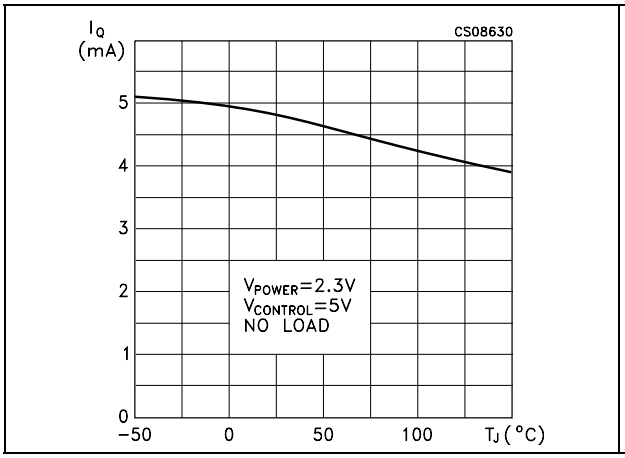


Figure 13. Supply voltage rejection vs output current

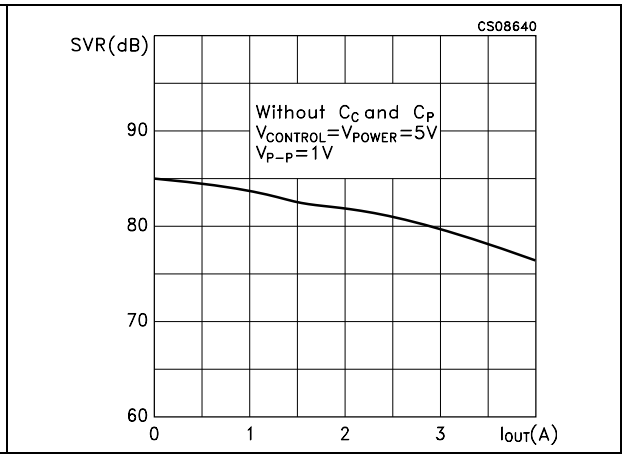
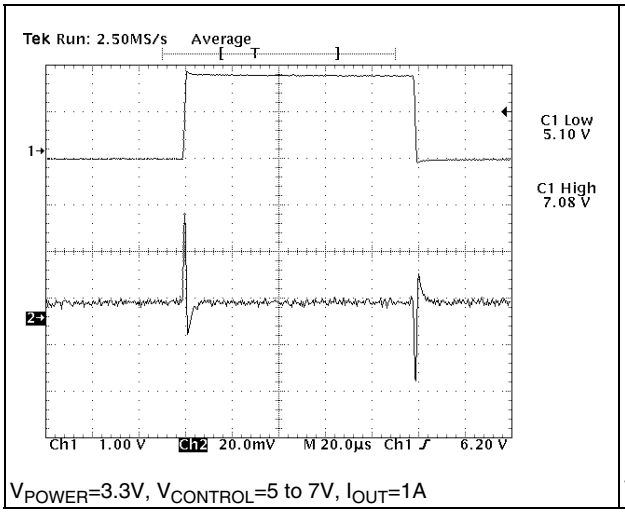
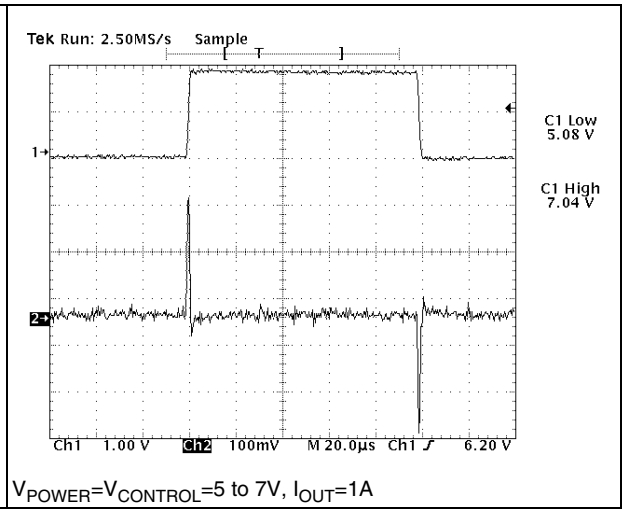


Figure 14. Line transient response



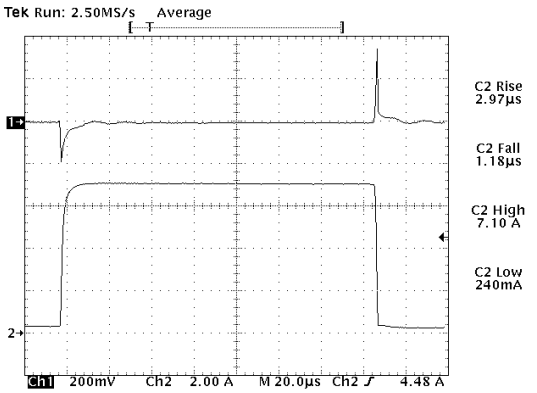
V_{POWER}=3.3V, $V_{CONTROL}$=5 to 7V, I_{OUT}=1A

Figure 15. Line transient response



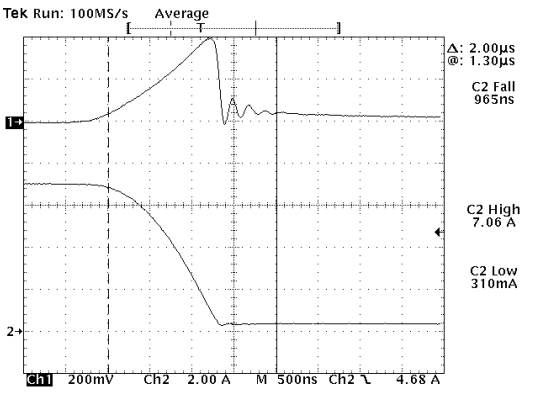
V_{POWER}=$V_{CONTROL}$=5 to 7V, I_{OUT}=1A

Figure 16. Load transient response



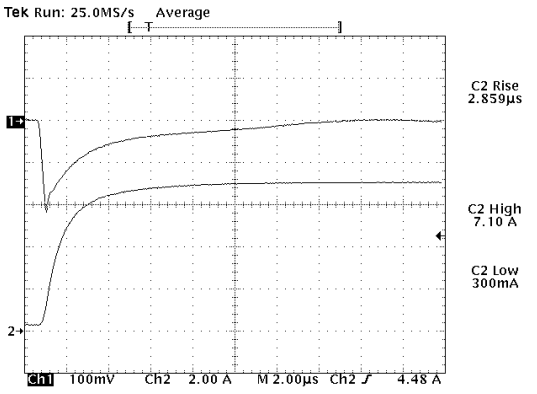
V_{POWER}=$V_{CONTROL}$=5V

Figure 17. Load transient response



V_{POWER}=$V_{CONTROL}$=5V

Figure 18. Load transient response



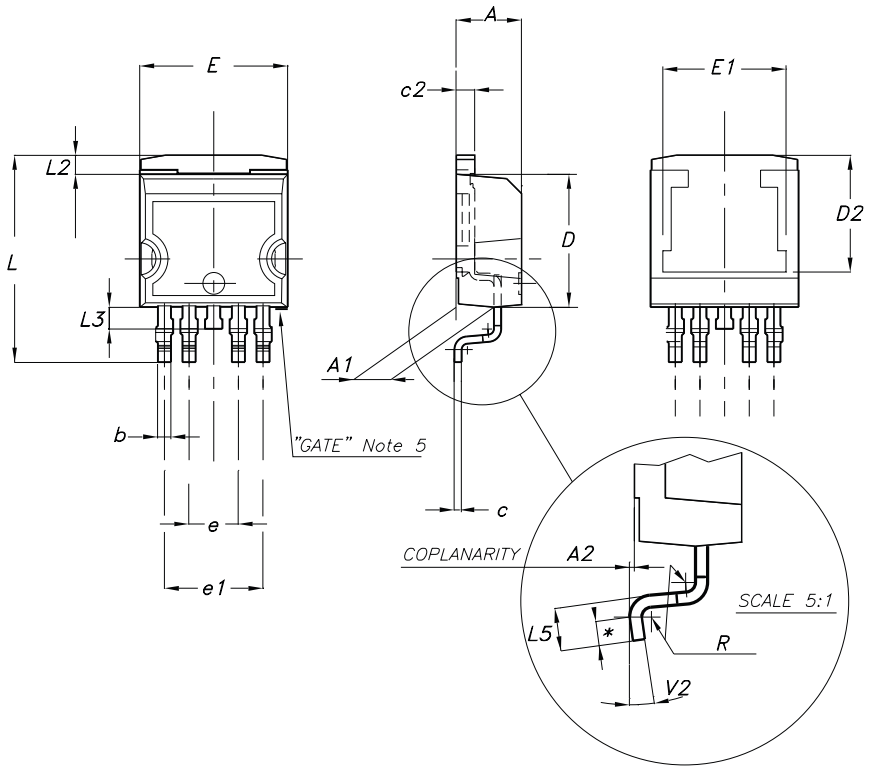
V_{POWER}=$V_{CONTROL}$=5V

7 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect. The category of second Level Interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com.

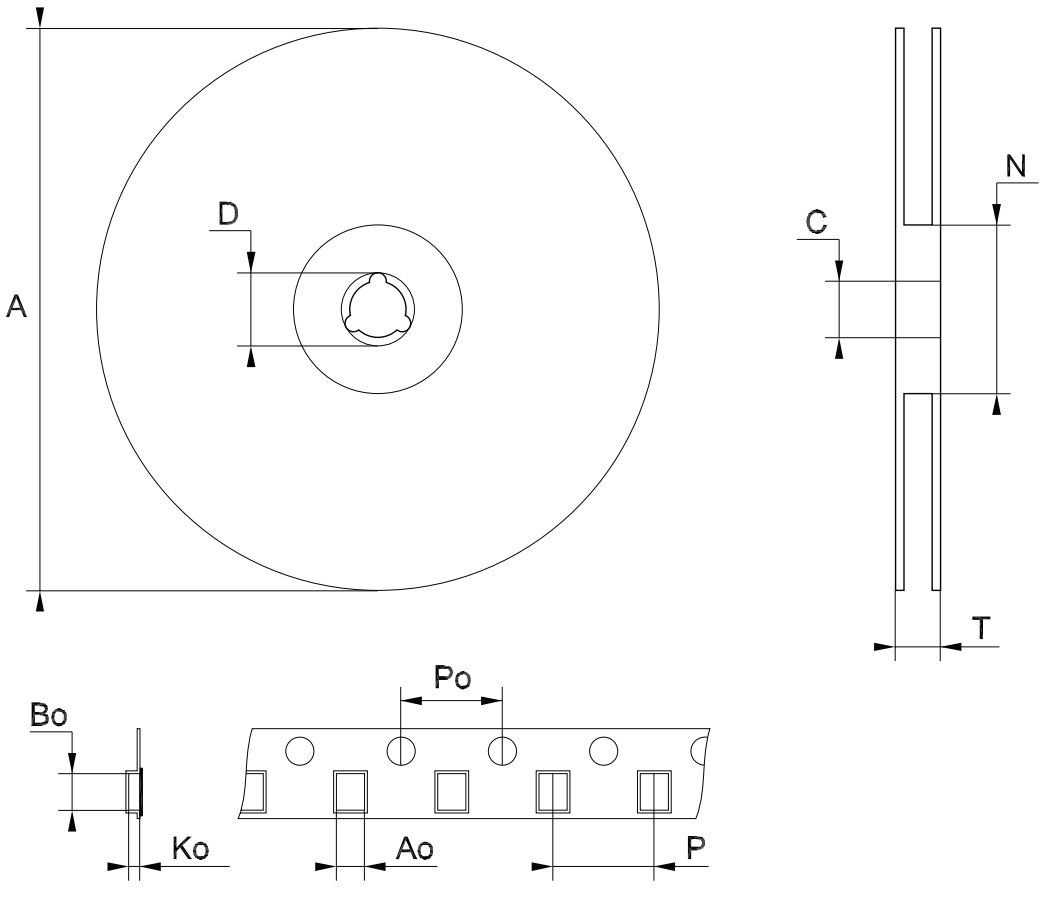
P^2PAK mechanical data

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.30		4.80	0.169		0.188
A1	2.40		2.80	0.094		0.110
A2	0.03		0.23	0.001		0.009
b	0.80		1.05	0.031		0.041
c	0.45		0.60	0.017		0.023
c2	1.17		1.37	0.046		0.053
D	8.95		9.35	0.352		0.368
D2		8			0.315	
E	10.00		10.40	0.393		0.409
E1		8.5			0.334	0.409
e	3.20		3.60	0.126		0.142
e1	6.60		7.00	0.260		0.275
L	13.70		14.50	0.539		0.571
L2	1.25		1.40	0.049		0.055
L3	0.90		1.70	0.035		0.067
L5	1.55		2.40	0.061		0.094
R		0.40			0.016	
V2	0°		8°	0°		8°



Tape & reel D^2PAK-P^2PAK-D^2PAK/A-P^2PAK/A mechanical data

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			180			7.086
C	12.8	13.0	13.2	0.504	0.512	0.519
D	20.2			0.795		
N	60			2.362		
T			14.4			0.567
Ao	10.50	10.6	10.70	0.413	0.417	0.421
Bo	15.70	15.80	15.90	0.618	0.622	0.626
Ko	4.80	4.90	5.00	0.189	0.193	0.197
Po	3.9	4.0	4.1	0.153	0.157	0.161
P	11.9	12.0	12.1	0.468	0.472	0.476



Note: Drawing not in scale

8 Revision history

Table 5. 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: *Table 1 on page 1*.

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