

## 5 A low drop positive voltage regulator adjustable and fixed

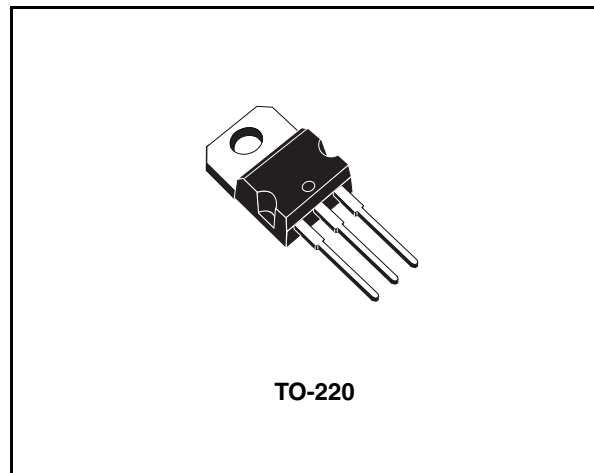
### Features

- Typical dropout 1.3 V (at 5 A)
- Three terminal adjustable or fixed output voltage 2.5 V, 5 V, 12 V.
- Guaranteed output current up to 5 A
- Output tolerance  $\pm 1\%$  at 25 °C and  $\pm 2\%$  in full temperature range
- Internal power and thermal limit
- Wide operating temperature range -40 °C to 125 °C
- Package available: TO-220
- Pinout compatibility with standard adjustable VREG

### Description

The LD1084xx is a low drop voltage regulator able to provide up to 5 A of output current. Dropout is guaranteed at a maximum of 1.5 V at the maximum output current, decreasing at lower loads. The LD1084xx is pin to pin compatible with the older 3-terminal adjustable regulators, but has better performances in term of drop and output tolerance.

A 2.85 V output version is suitable for SCSI-2 active termination. Unlike PNP regulators, where a part of the output current is wasted as quiescent current, the LD1084xx quiescent current flows into the load, so increase efficiency. Only a 10  $\mu$ F minimum capacitor is need for stability.



The device is supplied in TO-220. On chip trimming allows the regulator to reach a very tight output voltage tolerance, within  $\pm 1\%$  at 25 °C.

**Table 1. Device summary**

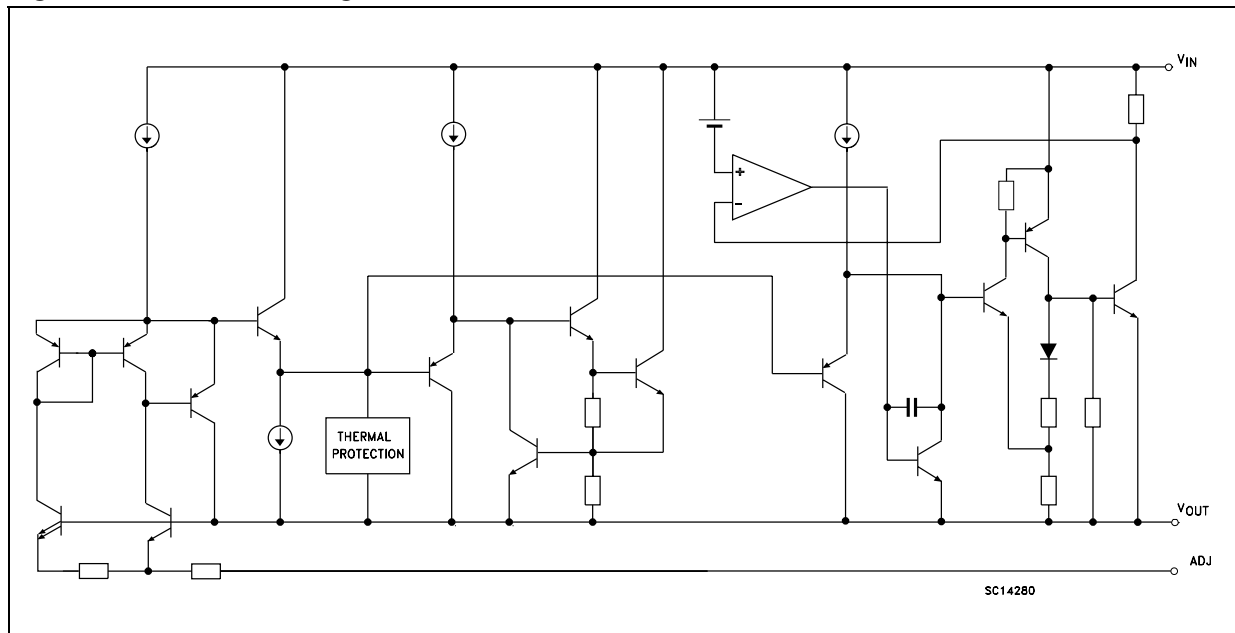
Part numbers	Order codes	Output voltage
LD1084XX12	LD1084V12	12 V
LD1084XX25	LD1084V25	2.5 V
LD1084XX50	LD1084V50	5.0 V
LD1084XX	LD1084V	Adjustable

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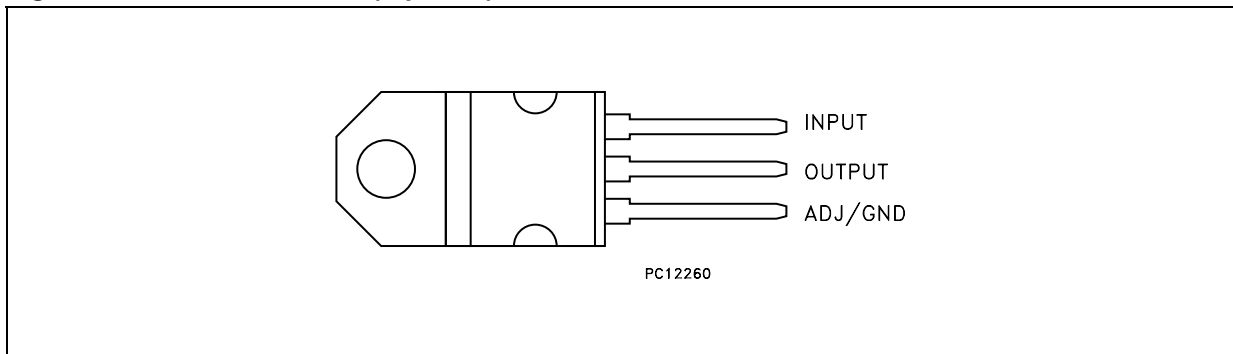
# 1 Diagram

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
$V_I$	DC input voltage	30	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

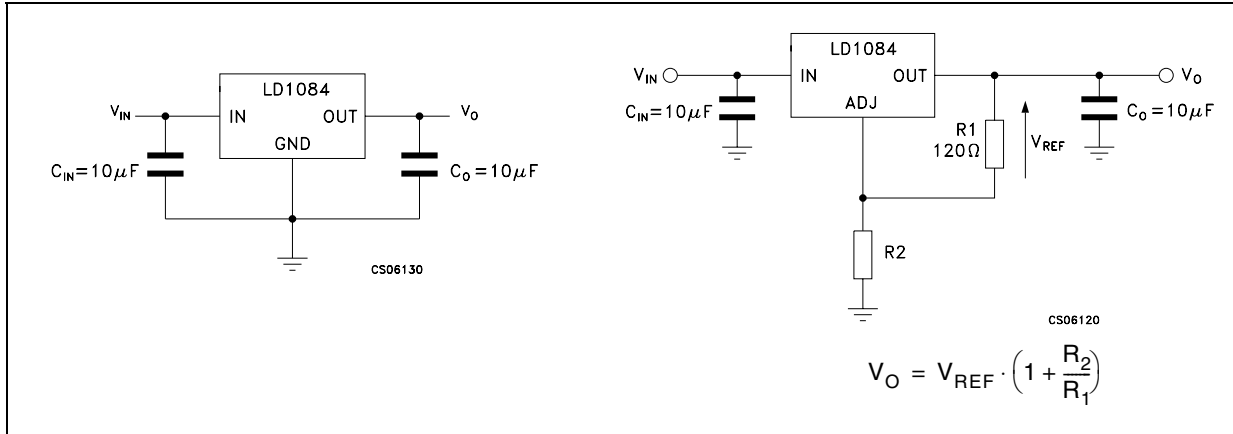
*Note: Absolute maximum ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied*

**Table 3. Thermal data**

Symbol	Parameter	TO-220	Unit
$R_{thJC}$	Thermal resistance junction-case	3	°C/W
$R_{thJA}$	Thermal resistance junction-ambient	50	°C/W

# 4 Schematic application

Figure 3. Application circuit



## 5 Electrical characteristics

**Table 4. Electrical characteristics of LD1084#25**  
( $V_I = 5.5\text{ V}$ ,  $C_I = C_O = 10\ \mu\text{F}$ ,  $T_A = -40\text{ to }125\text{ }^\circ\text{C}$ , unless otherwise specified).

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
$V_O$	Output voltage <sup>(1)</sup>	$I_O = 0\text{ mA}$ , $T_J = 25^\circ\text{C}$	2.475	2.5	2.525	V
		$I_O = 0\text{ to }5\text{ A}$ , $V_I = 4.1\text{ to }30\text{ V}$	2.45	2.5	2.55	V
$\Delta V_O$	Line regulation	$I_O = 0\text{ mA}$ , $V_I = 4.1\text{ to }18\text{ V}$ , $T_J = 25^\circ\text{C}$		0.5	6	mV
		$I_O = 0\text{ mA}$ , $V_I = 4.1\text{ to }18\text{ V}$		0.1	6	mV
$\Delta V_O$	Load regulation	$I_O = 0\text{ to }5\text{ A}$ , $T_J = 25^\circ\text{C}$		3	15	mV
		$I_O = 0\text{ to }5\text{ A}$		7	20	mV
$V_d$	Dropout voltage	$I_O = 5\text{ A}$		1.3	1.5	V
$I_q$	Quiescent current	$V_I \leq 30\text{ V}$		5	10	mA
$I_{sc}$	Short circuit current	$V_I - V_O = 5\text{ V}$	5.5	6.5		A
		$V_I - V_O = 25\text{ V}$	0.5	0.7		A
	Thermal regulation	$T_A = 25^\circ\text{C}$ , 30ms pulse		0.003	0.015	%/W
SVR	Supply voltage rejection	$f = 120\text{ Hz}$ , $C_O = 25\ \mu\text{F}$ , $I_O = 5\text{ A}$ $V_I = 7.5 \pm 3\text{ V}$	60	72		dB
eN	RMS output noise voltage (% of $V_O$ )	$T_A = 25^\circ\text{C}$ , $f = 10\text{ Hz to }10\text{ kHz}$		0.003		%
S	Temperature stability			0.5		%
S	Long term stability	$T_A = 125^\circ\text{C}$ , 1000Hrs		0.5		%

1. See short-circuit current curve for available output current at fixed dropout.

**Table 5. Electrical characteristics of LD1084#50**  
 ( $V_I = 8\text{ V}$ ,  $C_I = C_O = 10\ \mu\text{F}$ ,  $T_A = -40\text{ to }125\text{ }^\circ\text{C}$ , unless otherwise specified).

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
$V_O$	Output voltage <sup>(1)</sup>	$I_O = 0\text{ mA}$ , $T_J = 25^\circ\text{C}$	4.95	5	5.05	V
		$I_O = 0\text{ to }5\text{ A}$ , $V_I = 6.6\text{ to }30\text{ V}$	4.9	5	5.1	V
$\Delta V_O$	Line regulation	$I_O = 0\text{ mA}$ , $V_I = 6.6\text{ to }20\text{ V}$ , $T_J = 25^\circ\text{C}$		0.5	10	mV
		$I_O = 0\text{ mA}$ , $V_I = 6.6\text{ to }20\text{ V}$		1	10	mV
$\Delta V_O$	Load regulation	$I_O = 0\text{ to }5\text{ A}$ , $T_J = 25^\circ\text{C}$		5	20	mV
		$I_O = 0\text{ to }5\text{ A}$		10	35	mV
$V_d$	Dropout voltage	$I_O = 5\text{ A}$		1.3	1.5	V
$I_q$	Quiescent current	$V_I \leq 30\text{ V}$		5	10	mA
$I_{sc}$	Short circuit current	$V_I - V_O = 5\text{ V}$	5.5	6.5		A
		$V_I - V_O = 25\text{ V}$	0.5	0.7		A
	Thermal regulation	$T_A = 25^\circ\text{C}$ , 30ms pulse		0.003	0.015	%/W
SVR	Supply voltage rejection	$f = 120\text{ Hz}$ , $C_O = 25\ \mu\text{F}$ , $I_O = 5\text{ A}$ $V_I = 10 \pm 3\text{ V}$	60	72		dB
eN	RMS output noise voltage (% of $V_O$ )	$T_A = 25^\circ\text{C}$ , $f = 10\text{ Hz to }10\text{ kHz}$		0.003		%
S	Temperature stability			0.5		%
S	Long term stability	$T_A = 125^\circ\text{C}$ , 1000Hrs		0.5		%

1. See short-circuit current curve for available output current at fixed dropout.



**Table 6. Electrical characteristics of LD1084#12**  
 ( $V_I = 15\text{ V}$ ,  $C_I = C_O = 10\ \mu\text{F}$ ,  $T_A = -40\text{ to }125\text{ }^\circ\text{C}$ , unless otherwise specified).

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
$V_O$	Output voltage <sup>(1)</sup>	$I_O = 0\text{ mA}$ , $T_J = 25^\circ\text{C}$	11.88	12	12.12	V
		$I_O = 0\text{ to }5\text{ A}$ , $V_I = 13.6\text{ to }30\text{ V}$	11.76	12	12.24	V
$\Delta V_O$	Line regulation	$I_O = 0\text{ mA}$ , $V_I = 13.6\text{ to }25\text{ V}$ , $T_J = 25^\circ\text{C}$		2	25	mV
		$I_O = 0\text{ mA}$ , $V_I = 13.6\text{ to }25\text{ V}$		4	25	mV
$\Delta V_O$	Load regulation	$I_O = 0\text{ to }5\text{ A}$ , $T_J = 25^\circ\text{C}$		12	36	mV
		$I_O = 0\text{ to }5\text{ A}$		24	72	mV
$V_d$	Dropout voltage	$I_O = 5\text{ A}$		1.3	1.5	V
$I_q$	Quiescent current	$V_I \leq 30\text{ V}$		5	10	mA
$I_{sc}$	Short circuit current	$V_I - V_O = 5\text{ V}$	5.5	6.5		A
		$V_I - V_O = 25\text{ V}$	0.5	0.7		A
	Thermal regulation	$T_A = 25^\circ\text{C}$ , 30ms pulse		0.003	0.015	%/W
SVR	Supply voltage rejection	$f = 120\text{ Hz}$ , $C_O = 25\ \mu\text{F}$ , $I_O = 5\text{ A}$ $V_I = 17 \pm 3\text{ V}$	54	66		dB
eN	RMS output noise voltage (% of $V_O$ )	$T_A = 25^\circ\text{C}$ , $f = 10\text{ Hz to }10\text{ kHz}$		0.003		%
S	Temperature stability			0.5		%
S	Long term stability	$T_A = 125^\circ\text{C}$ , 1000Hrs		0.5		%

1. See short-circuit current curve for available output current at fixed dropout.

**Table 7. Electrical characteristics of LD1084**(V<sub>I</sub> = 4.25 V, C<sub>I</sub> = C<sub>O</sub> = 10 μF, T<sub>A</sub> = -40 to 125 °C, unless otherwise specified).

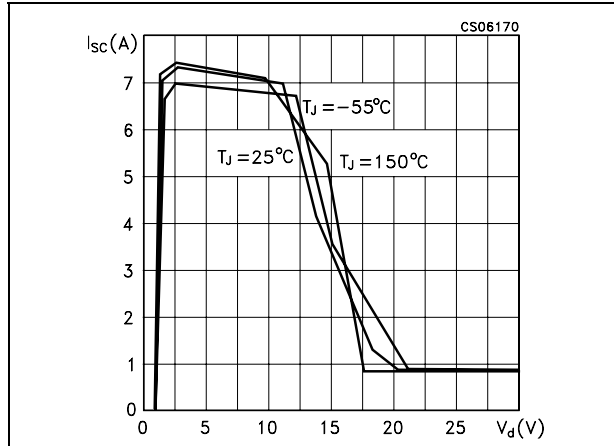
Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V <sub>O</sub>	Output voltage <sup>(1)</sup>	I <sub>O</sub> = 10mA T <sub>J</sub> = 25°C	1.237	1.25	1.263	V
		I <sub>O</sub> = 10mA to 3A, V <sub>I</sub> = 2.85 to 30V	1.225	1.25	1.275	V
ΔV <sub>O</sub>	Line regulation	I <sub>O</sub> = 10mA, V <sub>I</sub> = 2.85 to 16.5V, T <sub>J</sub> = 25°C		0.015	0.2	%
		I <sub>O</sub> = 10mA, V <sub>I</sub> = 2.85 to 16.5V		0.035	0.2	%
ΔV <sub>O</sub>	Load regulation	I <sub>O</sub> = 10mA to 5A, T <sub>J</sub> = 25°C		0.1	0.3	%
		I <sub>O</sub> = 0 to 5A		0.2	0.4	%
V <sub>d</sub>	Dropout voltage	I <sub>O</sub> = 5A		1.3	1.5	V
I <sub>O(min)</sub>	Minimum load current	V <sub>I</sub> = 30V		3	10	mA
I <sub>sc</sub>	Short circuit current	V <sub>I</sub> - V <sub>O</sub> = 5V	5.5	6.5		A
		V <sub>I</sub> - V <sub>O</sub> = 25V	0.5	0.7		A
	Thermal regulation	T <sub>A</sub> = 25°C, 30ms pulse		0.003	0.015	%/W
SVR	Supply voltage rejection	f = 120 Hz, C <sub>O</sub> = 25μF, C <sub>ADJ</sub> = 25 μF, I <sub>O</sub> = 5A, V <sub>I</sub> = 6.25 ± 3V	60	72		dB
I <sub>ADJ</sub>	Adjust pin current	V <sub>I</sub> = 4.25V, I <sub>O</sub> = 10 mA		55	120	μA
ΔI <sub>ADJ</sub>	Adjust pin current change <sup>(1)</sup>	I <sub>O</sub> = 10mA to 5A, V <sub>I</sub> = 2.85 to 16.5V		0.2	5	μA
eN	RMS output noise voltage (% of V <sub>O</sub> )	T <sub>A</sub> = 25°C, f = 10Hz to 10kHz		0.003		%
S	Temperature stability			0.5		%
S	Long term stability	T <sub>A</sub> = 125°C, 1000Hrs		0.5		%

1. See short-circuit current curve for available output current at fixed dropout.

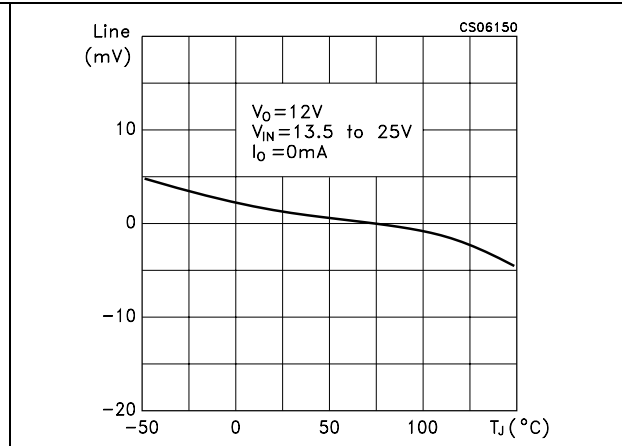
# 6 Typical application

Unless otherwise specified  $T_J = 25^\circ\text{C}$ ,  $C_I = 10\mu\text{F}$  (tant.),  $C_O = 22\mu\text{F}$  (tant.)

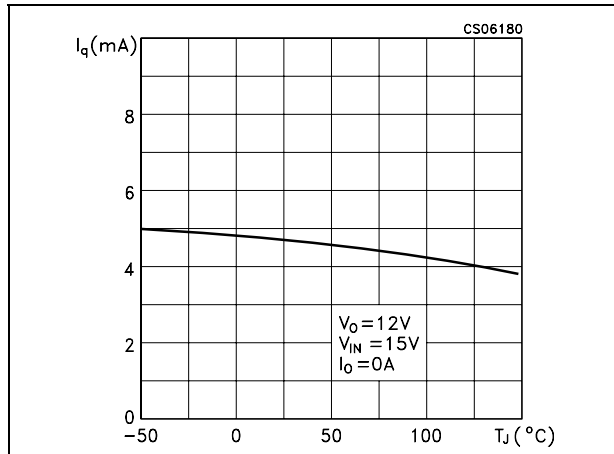
**Figure 4. Short circuit current vs dropout voltage**



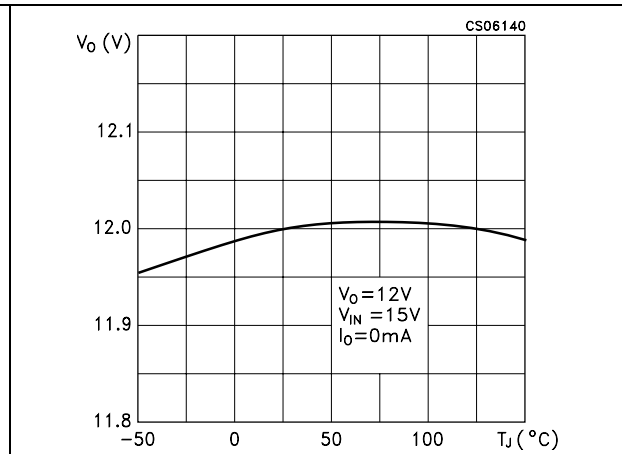
**Figure 5. Line regulation vs temperature**



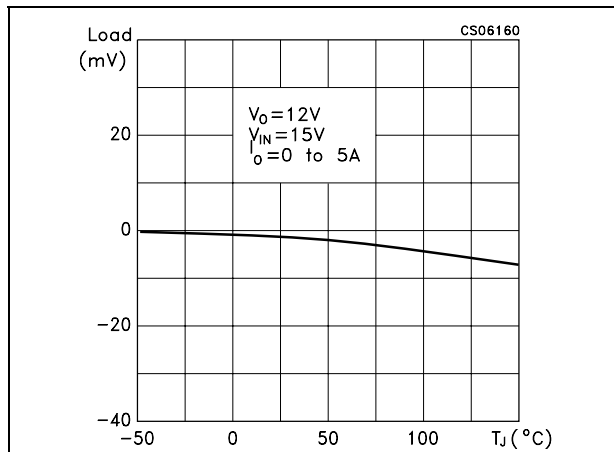
**Figure 6. Quiescent current vs temperature**



**Figure 7. Output voltage vs temperature**



**Figure 8. Load regulation vs temperature**



**Figure 9. Quiescent current vs output voltage**

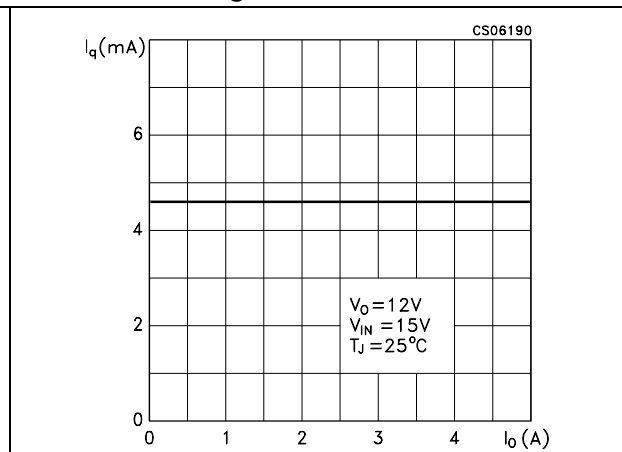


Figure 10. Quiescent current vs input voltage      Figure 11. Dropout voltage vs output current

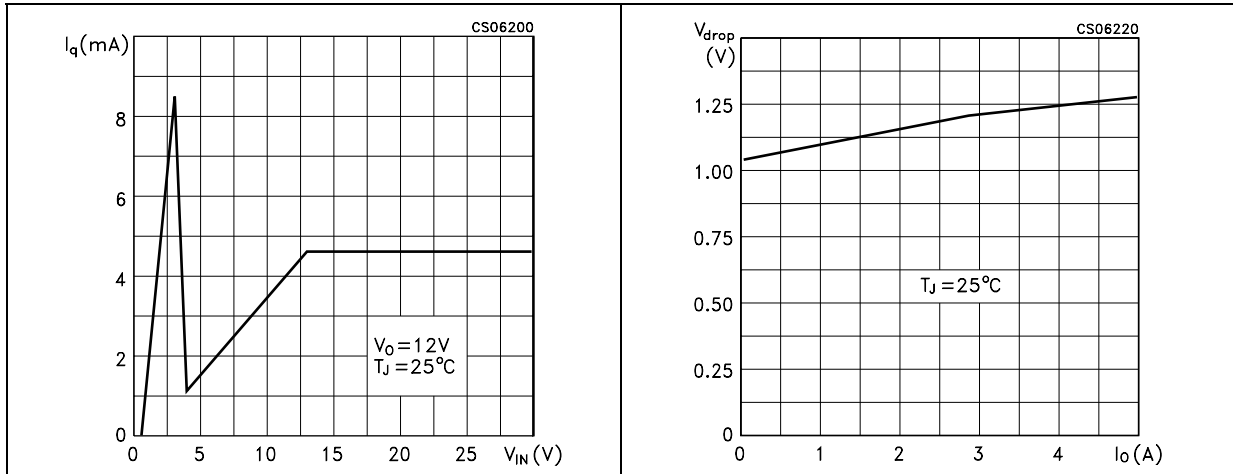


Figure 12. Supply voltage rejection vs output current      Figure 13. Dropout voltage vs temperature

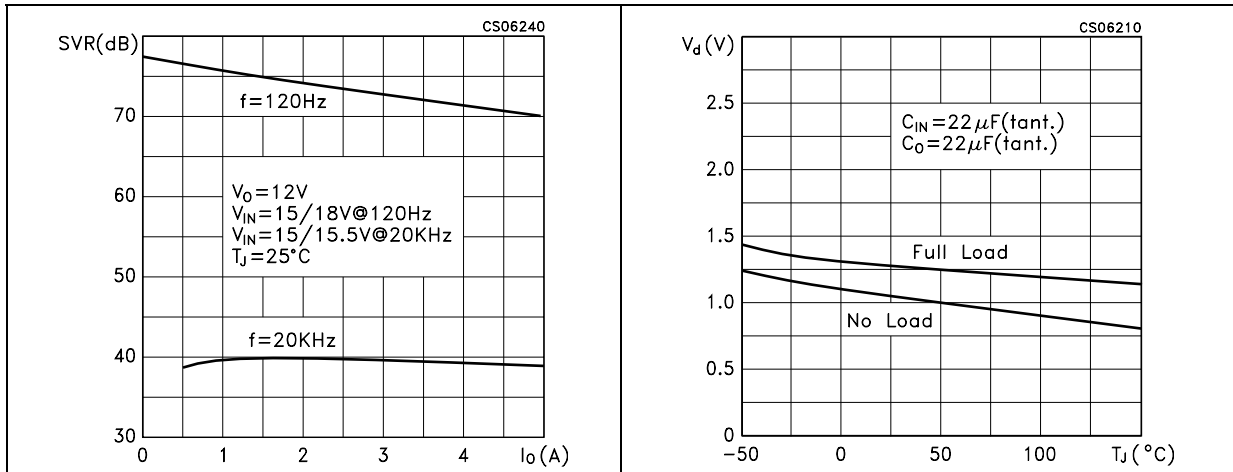
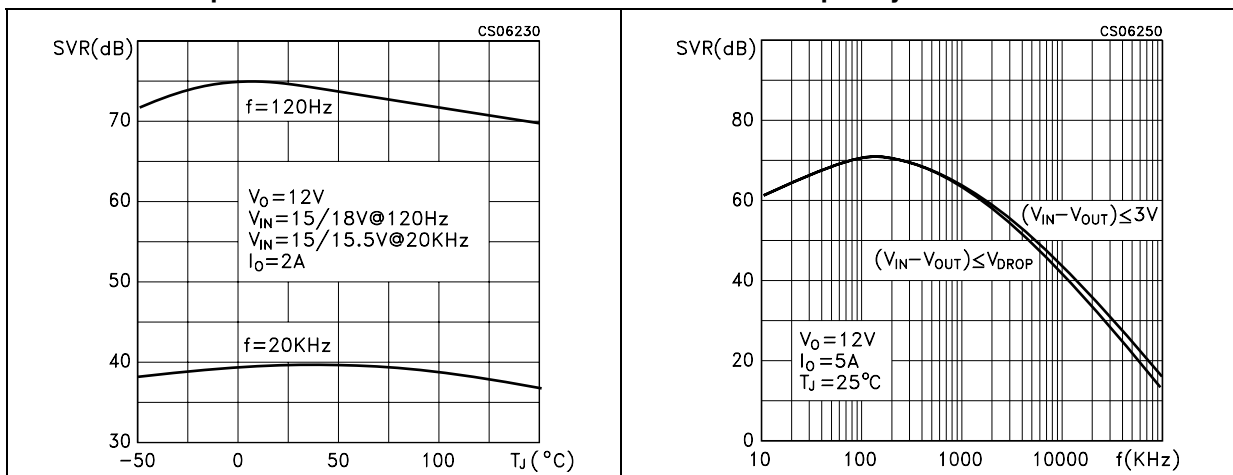
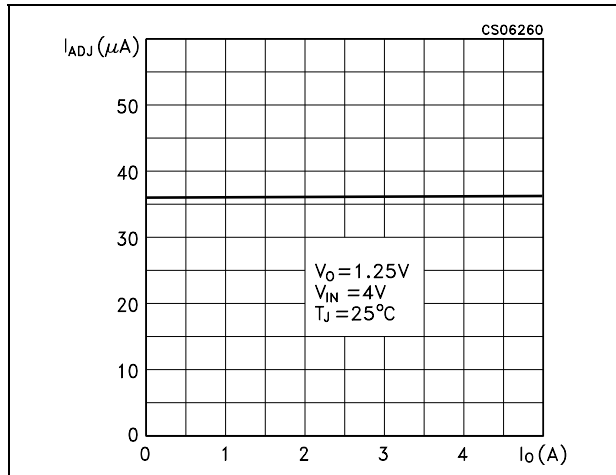


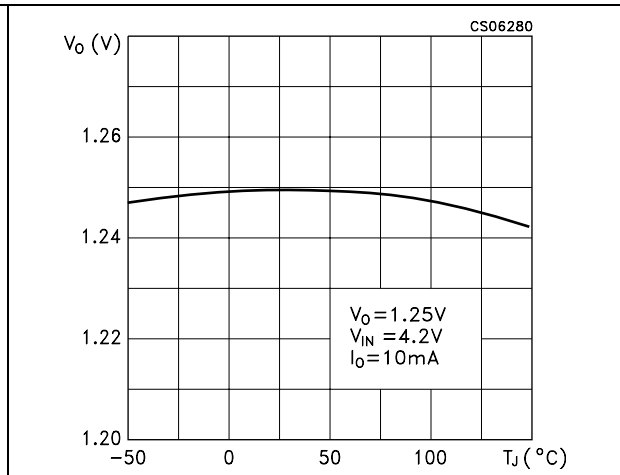
Figure 14. Supply voltage rejection vs temperature      Figure 15. Supply voltage rejection vs frequency



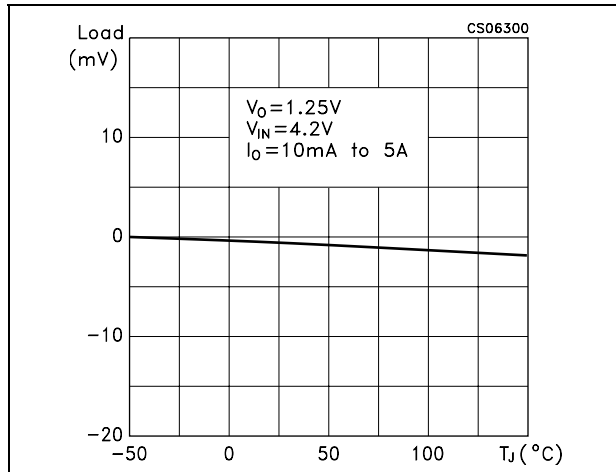
**Figure 16. Adjust pin current vs output current**



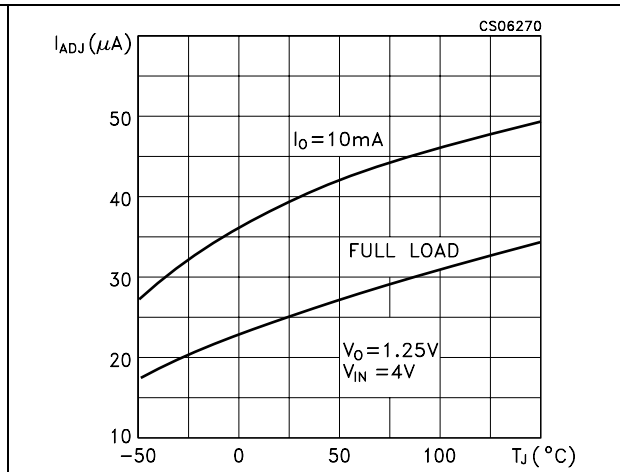
**Figure 17. Reference voltage vs temperature**



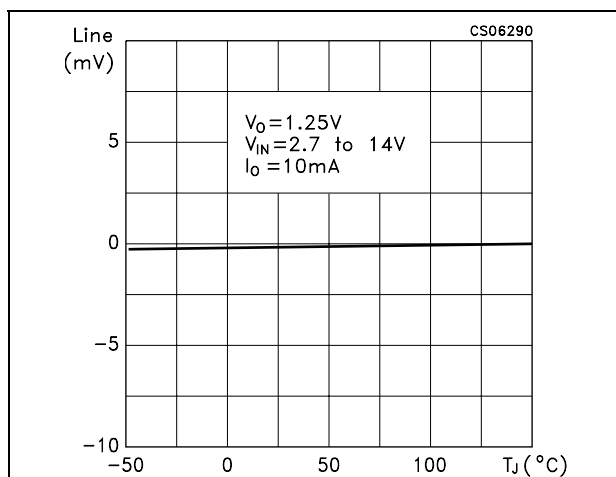
**Figure 18. Load regulation vs temperature**



**Figure 19. Adjust pin current vs temperature**



**Figure 20. Line regulation vs temperature**



**Figure 21. Minimum load current vs temperature**

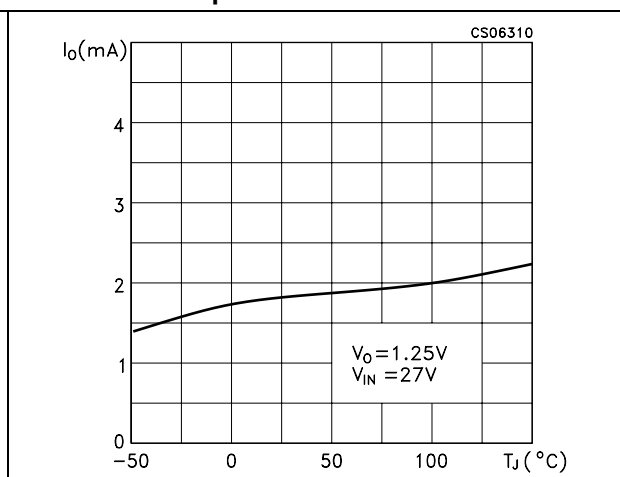


Figure 22. Supply voltage rejection vs temperature

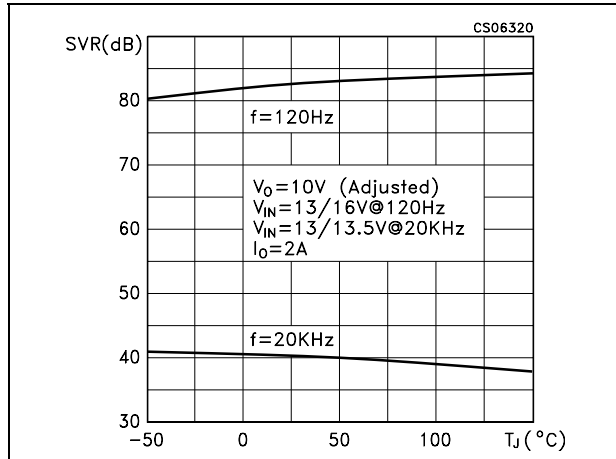


Figure 23. Supply voltage rejection vs frequency

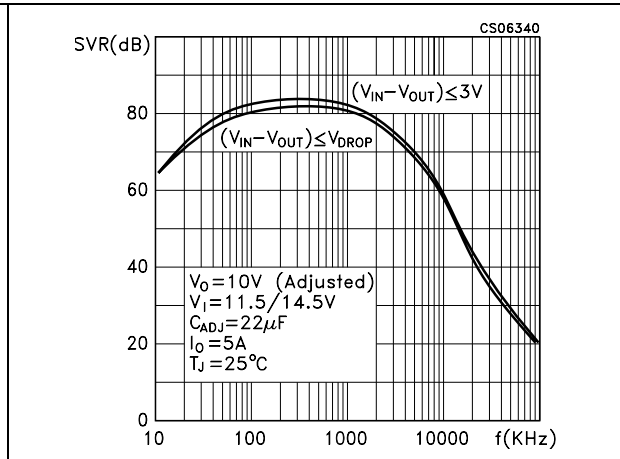


Figure 24. Stability

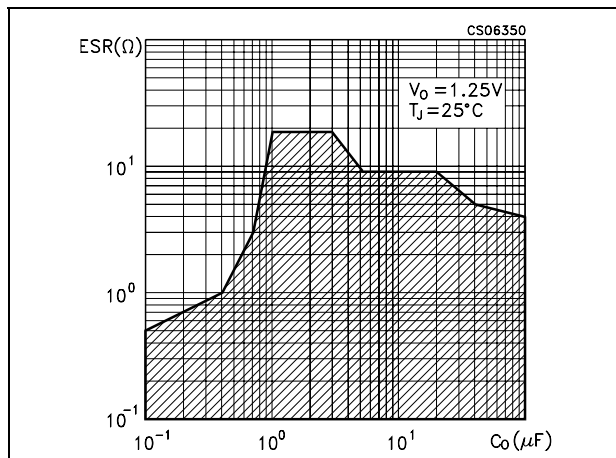


Figure 25. Supply voltage rejection vs output current

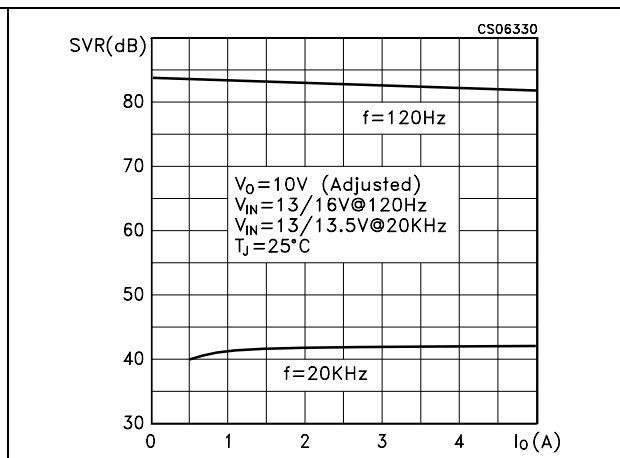


Figure 26. Stability

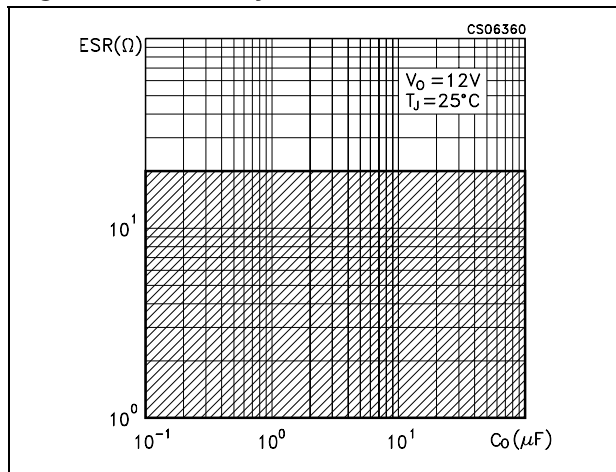


Figure 27. Line transient

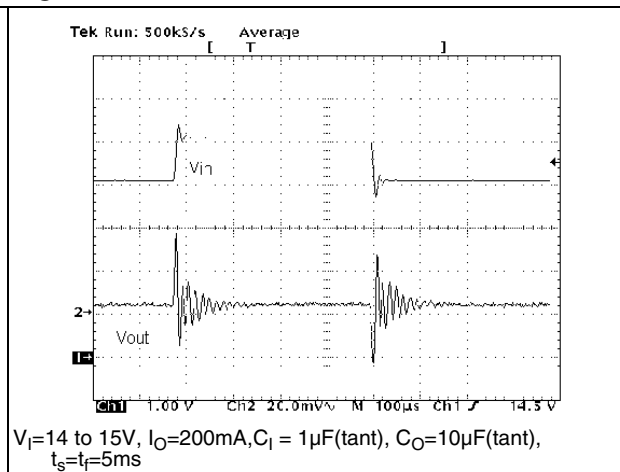


Figure 28. Line transient

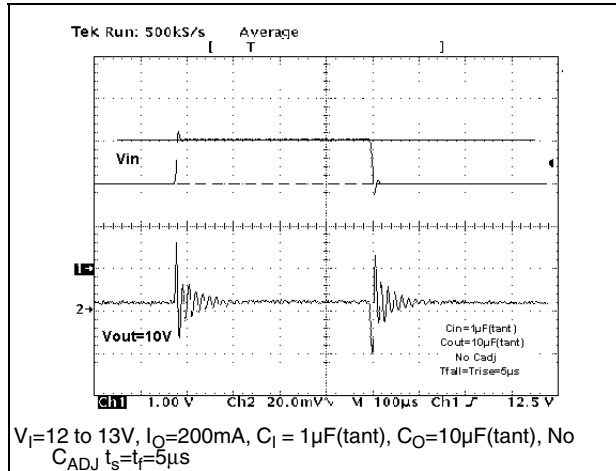


Figure 29. Load transient

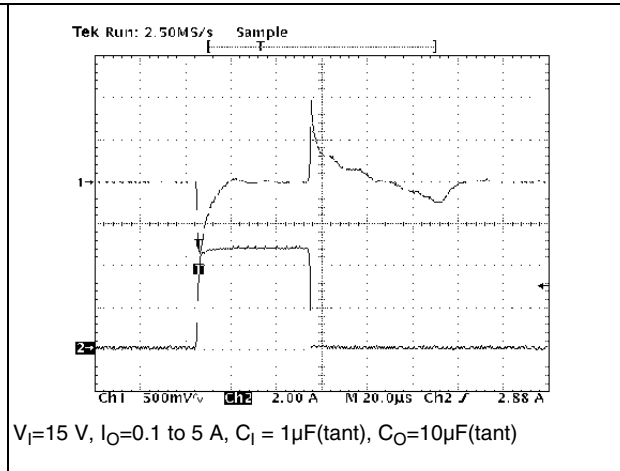


Figure 30. Load transient

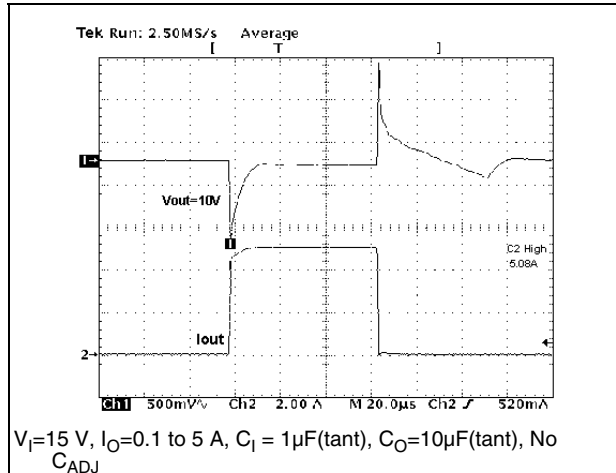


Figure 31. Line transient

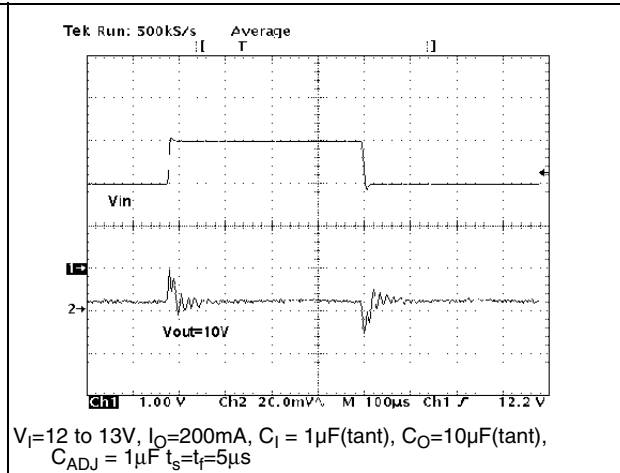
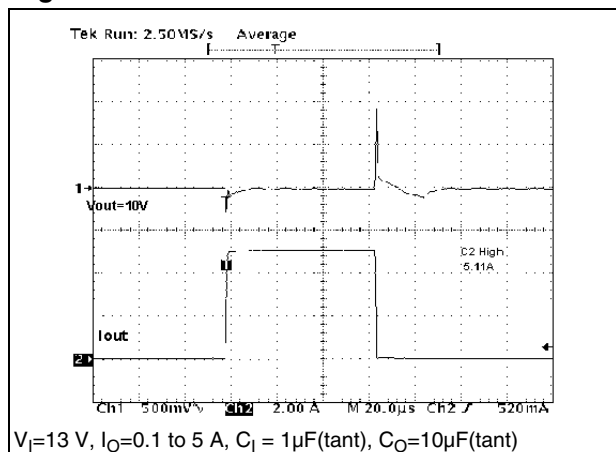


Figure 32. Load Transient



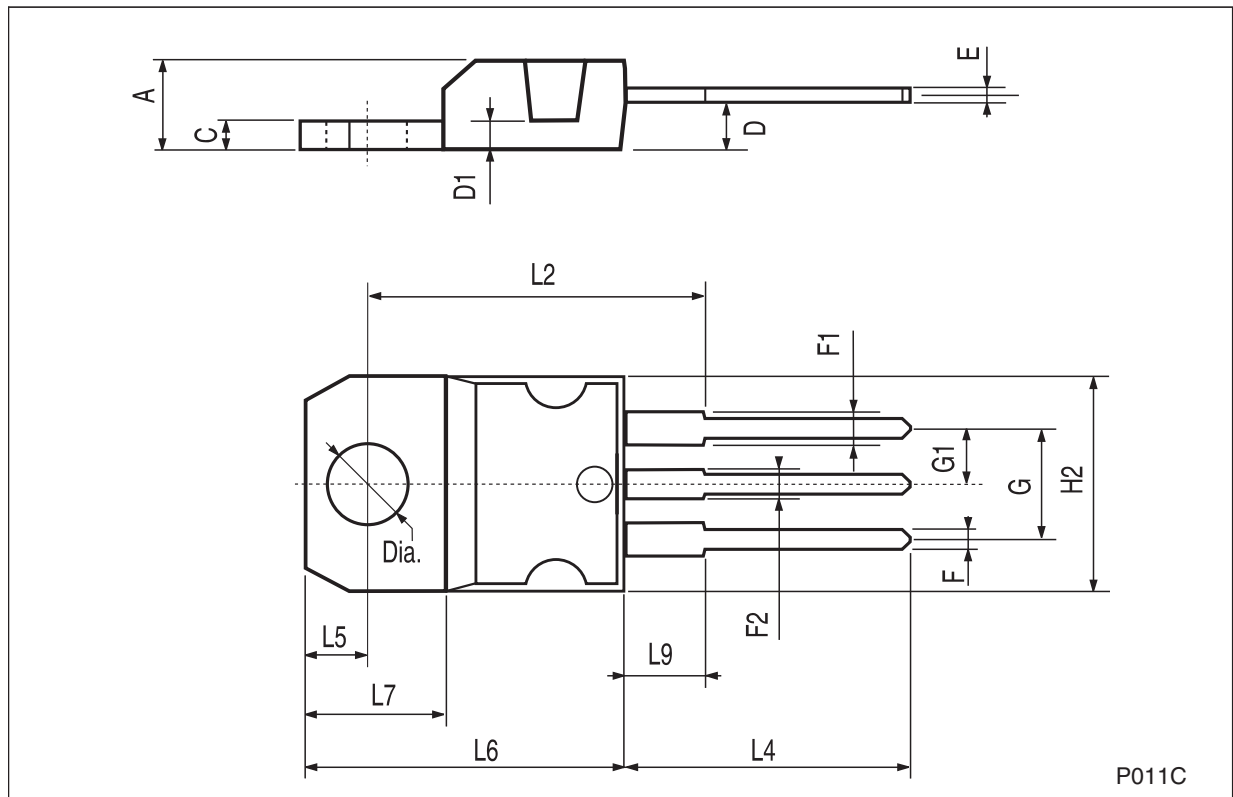
## 7 Package mechanical data

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](http://www.st.com).



**TO-220 mechanical data**

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.4		2.7	0.094		0.106
H2	10.0		10.40	0.393		0.409
L2		16.4			0.645	
L4	13.0		14.0	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.2		6.6	0.244		0.260
L9	3.5		3.93	0.137		0.154
DIA.	3.75		3.85	0.147		0.151



P011C

## 8 Revision history

**Table 8. Document revision history**

Date	Revision	Changes
07-Oct-2004	3	Mistake order codes - Table 1.
08-Feb-2005	4	Mistake U.M. Load Regulation - V ==> mV.
16-Jun-2005	5	Order codes updated.
04-Apr-2007	6	Order code updated.
07-Jun-2007	7	Order codes updated.
08-Apr-2008	8	Modified: <a href="#">Table 1 on page 1</a> . Removed: packages D <sup>2</sup> PAK, D <sup>2</sup> PAK/A and mechanical data.

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