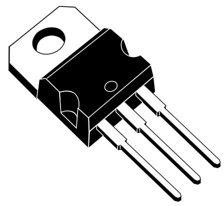
2% NEGATIVE VOLTAGE REGULATORS

- OUTPUT CURRENT TO 1.5A
- OUTPUT VOLTAGES OF -5; -6; -8; -12; -15; -18; -20; -24V
- THERMAL OVERLOAD PROTECTION
- SHORT CIRCUIT PROTECTION
- OUTPUT TRANSITION SOA PROTECTION

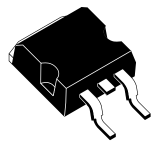
DESCRIPTION

The L7900AC series of three-terminal negative regulators is available in TO-220 and D^2PAK packages and several fixed output voltages. These regulators can provide local on-card regulation, eliminating the distribution problems associated with single point regulation; furthermore, having the same voltage option as the L7800A positive standard series, they are particularly suited for split power supplies. If adequate heat sinking is provided, they can deliver over 1.5A output current.

Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.



TO-220



D^2PAK

SCHEMATIC DIAGRAM

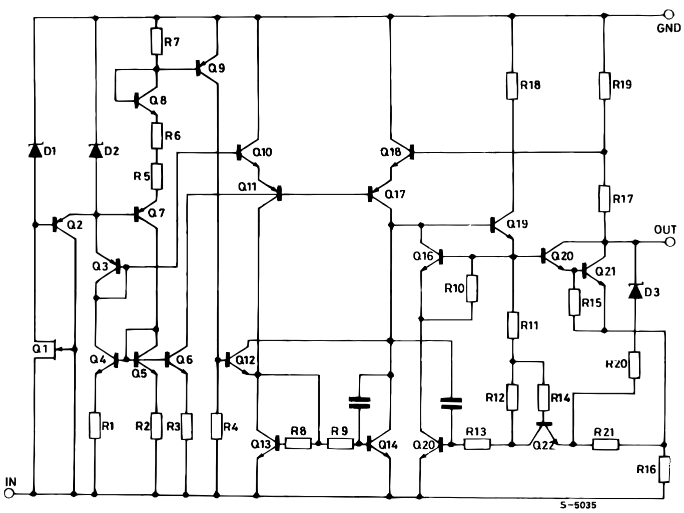


Table 1: Absolute Maximum Ratings

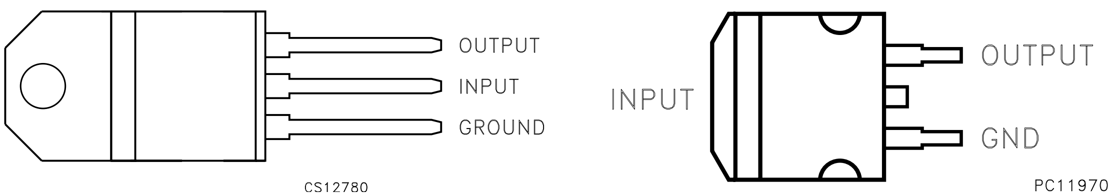
Symbol	Parameter		Value	Unit
V_I	DC Input Voltage	for V_O = -5 to -18V	-35	V
		for V_O = -20, -24V	-40	
I_O	Output Current		Internally Limited	
P_{tot}	Power Dissipation		Internally Limited	
T_{stg}	Storage Temperature Range		-65 to 150	°C
T_{op}	Operating Junction Temperature Range		0 to 125	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

Table 2: Thermal Data

Symbol	Parameter		D^2PAK	TO-220	Unit
$R_{thj-case}$	Thermal Resistance Junction-case	Max	3	3	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5	50	°C/W

Figure 1: Connection Diagram (top view)



TO-220 D^2PAK

Table 3: Ordering Codes

TYPE	TO-220	D^2PAK (*)	OUTPUT VOLTAGE
L7905AC	L7905ACV	L7905ACD2T	-5 V
L7906AC	L7906ACV (**)	L7906ACD2T (**)	-6 V
L7908AC	L7908ACV	L7908ACD2T	-8 V
L7912AC	L7912ACV	L7912ACD2T	-12 V
L7915AC	L7915ACV	L7915ACD2T (**)	-15 V
L7918AC	L7918ACV (**)	L7918ACD2T (**)	-18 V
L7920AC	L7920ACV	L7920ACD2T (**)	-20 V
L7924AC	L7924ACV	L7924ACD2T (**)	-24 V

(*) Available in Tape & Reel with the suffix "-TR".

(**) Available on Request.

Figure 2: Application Circuits

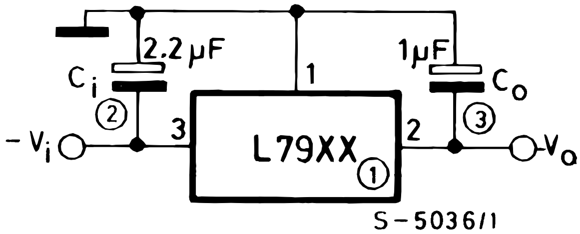


Table 4: Electrical Characteristics Of L7905A (refer to the test circuits, T_J = 0 to 125°C, V_I = -10V, I_O = 500 mA, C_I = 2.2 µF, C_O = 1 µF unless otherwise specified).

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_O	Output Voltage	T_J = 25°C	-4.9	-5	-5.1	V
V_O	Output Voltage	I_O = -5 mA to -1 A P_O ≤ 15W V_I = 8 to 20 V	-4.8	-5	-5.2	V
ΔV_O(*)	Line Regulation	V_I = -7 to -25 V T_J = 25°C			100	mV
		V_I = -8 to -12 V T_J = 25°C			50	
ΔV_O(*)	Load Regulation	I_O = 5 mA to 1.5 A T_J = 25°C			100	mV
		I_O = 250 to 750 mA T_J = 25°C			50	
I_d	Quiescent Current	T_J = 25°C			3	mA
ΔI_d	Quiescent Current Change	I_O = 5 mA to 1 A			0.5	mA
		V_I = -8 to -25 V			1.3	
$\Delta V_O/\Delta T$	Output Voltage Drift	I_O = 5 mA		-0.4		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_J = 25°C		100		µV
SVR	Supply Voltage Rejection	ΔV_I = 10 V f = 120Hz	54	60		dB
V_d	Dropout Voltage	I_O = 1 A T_J = 25°C ΔV_O = 100 mV		1.4		V
I_{sc}	Short Circuit Current			2.1		A
I_{scp}	Short Circuit Peak Current	T_J = 25°C		2.5		A

(*) Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

Table 5: Electrical Characteristics Of L7906A (refer to the test circuits, T_J = 0 to 125°C, V_I = -11V, I_O = 500 mA, C_I = 2.2 µF, C_O = 1 µF unless otherwise specified).

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_O	Output Voltage	T_J = 25°C	-5.88	-6	-6.12	V
V_O	Output Voltage	I_O = -5 mA to -1 A $P_O \leq$ 15W V_I = -9.5 to -21.5 V	-5.76	-6	-6.24	V
ΔV_O(*)	Line Regulation	V_I = -8.5 to -25 V T_J = 25°C			120	mV
		V_I = -9 to -15 V T_J = 25°C			60	
ΔV_O(*)	Load Regulation	I_O = 5 mA to 1.5 A T_J = 25°C			120	mV
		I_O = 250 to 750 mA T_J = 25°C			60	
I_d	Quiescent Current	T_J = 25°C			3	mA
ΔI_d	Quiescent Current Change	I_O = 5 mA to 1 A			0.5	mA
		V_I = -9.5 to -25 V			1.3	
$\Delta V_O/\Delta T$	Output Voltage Drift	I_O = 5 mA		-0.6		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_J = 25°C		144		µV
SVR	Supply Voltage Rejection	ΔV_I = 10 V f = 120Hz	54	60		dB
V_d	Dropout Voltage	I_O = 1 A T_J = 25°C ΔV_O = 100 mV		1.4		V
I_{sc}	Short Circuit Current			2		A
I_{scp}	Short Circuit Peak Current	T_J = 25°C		2.5		A

(*) Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

Table 6: Electrical Characteristics Of L7908A (refer to the test circuits, T_J = 0 to 125°C, V_I = -14V, I_O = 500 mA, C_I = 2.2 µF, C_O = 1 µF unless otherwise specified).

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_O	Output Voltage	T_J = 25°C	-7.84	-8	-8.16	V
V_O	Output Voltage	I_O = -5 mA to -1 A $P_O \leq$ 15W V_I = -11.5 to -23 V	-7.68	-8	-8.32	V
ΔV_O(*)	Line Regulation	V_I = -10.5 to -25 V T_J = 25°C			160	mV
		V_I = -11 to -17 V T_J = 25°C			80	
ΔV_O(*)	Load Regulation	I_O = 5 mA to 1.5 A T_J = 25°C			160	mV
		I_O = 250 to 750 mA T_J = 25°C			80	
I_d	Quiescent Current	T_J = 25°C			3	mA
ΔI_d	Quiescent Current Change	I_O = 5 mA to 1 A			0.5	mA
		V_I = -11.5 to -25 V			1	
$\Delta V_O/\Delta T$	Output Voltage Drift	I_O = 5 mA		-0.6		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_J = 25°C		175		µV
SVR	Supply Voltage Rejection	ΔV_I = 10 V f = 120Hz	54	60		dB
V_d	Dropout Voltage	I_O = 1 A T_J = 25°C ΔV_O = 100 mV		1.1		V
I_{sc}	Short Circuit Current			1.5		A
I_{scp}	Short Circuit Peak Current	T_J = 25°C		2.5		A

(*) Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

Table 7: Electrical Characteristics Of L7912A (refer to the test circuits, T_J = 0 to 125°C, V_I = -19V, I_O = 500 mA, C_I = 2.2 µF, C_O = 1 µF unless otherwise specified).

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_O	Output Voltage	T_J = 25°C	-11.75	-12	-12.25	V
V_O	Output Voltage	I_O = -5 mA to -1 A $P_O \leq$ 15W V_I = -15.5 to -27 V	-11.5	-12	-12.5	V
ΔV_O(*)	Line Regulation	V_I = -14.5 to -30 V T_J = 25°C			240	mV
		V_I = -16 to -22 V T_J = 25°C			120	
ΔV_O(*)	Load Regulation	I_O = 5 mA to 1.5 A T_J = 25°C			240	mV
		I_O = 250 to 750 mA T_J = 25°C			120	
I_d	Quiescent Current	T_J = 25°C			3	mA
ΔI_d	Quiescent Current Change	I_O = 5 mA to 1 A			0.5	mA
		V_I = -15 to -25 V			1	
$\Delta V_O/\Delta T$	Output Voltage Drift	I_O = 5 mA		-0.8		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_J = 25°C		200		µV
SVR	Supply Voltage Rejection	ΔV_I = 10 V f = 120Hz	54	60		dB
V_d	Dropout Voltage	I_O = 1 A T_J = 25°C ΔV_O = 100 mV		1.1		V
I_{sc}	Short Circuit Current			1.5		A
I_{scp}	Short Circuit Peak Current	T_J = 25°C		2.5		A

(*) Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

Table 8: Electrical Characteristics Of L7915A (refer to the test circuits, T_J = 0 to 125°C, V_I = -23V, I_O = 500 mA, C_I = 2.2 µF, C_O = 1 µF unless otherwise specified).

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_O	Output Voltage	T_J = 25°C	-14.7	-15	-15.3	V
V_O	Output Voltage	I_O = -5 mA to -1 A $P_O \leq$ 15W V_I = -18.5 to -30 V	-14.4	-15	-15.6	V
ΔV_O(*)	Line Regulation	V_I = -17.5 to -30 V T_J = 25°C			300	mV
		V_I = -20 to -26 V T_J = 25°C			150	
ΔV_O(*)	Load Regulation	I_O = 5 mA to 1.5 A T_J = 25°C			300	mV
		I_O = 250 to 750 mA T_J = 25°C			150	
I_d	Quiescent Current	T_J = 25°C			3	mA
ΔI_d	Quiescent Current Change	I_O = 5 mA to 1 A			0.5	mA
		V_I = -18.5 to -30 V			1	
$\Delta V_O/\Delta T$	Output Voltage Drift	I_O = 5 mA		-0.9		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_J = 25°C		250		µV
SVR	Supply Voltage Rejection	ΔV_I = 10 V f = 120Hz	54	60		dB
V_d	Dropout Voltage	I_O = 1 A T_J = 25°C ΔV_O = 100 mV		1.1		V
I_{sc}	Short Circuit Current			1.3		A
I_{scp}	Short Circuit Peak Current	T_J = 25°C		2.3		A

(*) Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

Table 9: Electrical Characteristics Of L7918A (refer to the test circuits, T_J = 0 to 125°C, V_I = -27V, I_O = 500 mA, C_I = 2.2 µF, C_O = 1 µF unless otherwise specified).

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_O	Output Voltage	T_J = 25°C	-17.64	-18	-18.36	V
V_O	Output Voltage	I_O = -5 mA to -1 A $P_O \leq$ 15W V_I = -22 to -33 V	-17.3	-18	-18.7	V
ΔV_O(*)	Line Regulation	V_I = -21 to -33 V T_J = 25°C			360	mV
		V_I = -24 to -30 V T_J = 25°C			180	
ΔV_O(*)	Load Regulation	I_O = 5 mA to 1.5 A T_J = 25°C			360	mV
		I_O = 250 to 750 mA T_J = 25°C			180	
I_d	Quiescent Current	T_J = 25°C			3	mA
ΔI_d	Quiescent Current Change	I_O = 5 mA to 1 A			0.5	mA
		V_I = -22 to -33 V			1	
$\Delta V_O/\Delta T$	Output Voltage Drift	I_O = 5 mA		-1		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_J = 25°C		300		µV
SVR	Supply Voltage Rejection	ΔV_I = 10 V f = 120Hz	54	60		dB
V_d	Dropout Voltage	I_O = 1 A T_J = 25°C ΔV_O = 100 mV		1.1		V
I_{sc}	Short Circuit Current			1.1		A
I_{scp}	Short Circuit Peak Current	T_J = 25°C		2.2		A

(*) Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

Table 10: electrical characteristics of L7920A (refer to the test circuits, T_J = 0 to 125°C, V_I = -29V, I_O = 500 mA, C_I = 2.2 µF, C_O = 1 µF unless otherwise specified).

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_O	Output Voltage	T_J = 25°C	-19.6	-20	-20.4	V
V_O	Output Voltage	I_O = -5 mA to -1 A $P_O \leq$ 15W V_I = -24 to -35 V	-19.2	-20	-20.8	V
ΔV_O(*)	Line Regulation	V_I = -23 to -35 V T_J = 25°C			400	mV
		V_I = -26 to -32 V T_J = 25°C			200	
ΔV_O(*)	Load Regulation	I_O = 5 mA to 1.5 A T_J = 25°C			400	mV
		I_O = 250 to 750 mA T_J = 25°C			200	
I_d	Quiescent Current	T_J = 25°C			3	mA
ΔI_d	Quiescent Current Change	I_O = 5 mA to 1 A			0.5	mA
		V_I = -24 to -35 V			1	
$\Delta V_O/\Delta T$	Output Voltage Drift	I_O = 5 mA		-1.1		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_J = 25°C		350		µV
SVR	Supply Voltage Rejection	ΔV_I = 10 V f = 120Hz	54	60		dB
V_d	Dropout Voltage	I_O = 1 A T_J = 25°C ΔV_O = 100 mV		1.1		V
I_{sc}	Short Circuit Current			0.9		A
I_{scp}	Short Circuit Peak Current	T_J = 25°C		2.2		A

(*) Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

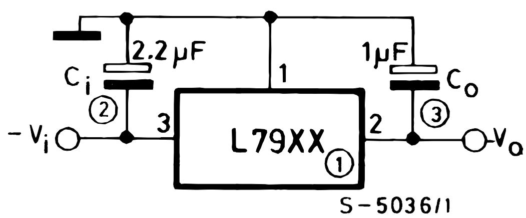
Table 11: Electrical Characteristics Of L7924A (refer to the test circuits, T_J = 0 to 125°C, V_I = -33V, I_O = 500 mA, C_I = 2.2 µF, C_O = 1 µF unless otherwise specified).

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_O	Output Voltage	T_J = 25°C	-23.5	-24	-24.5	V
V_O	Output Voltage	I_O = -5 mA to -1 A $P_O \leq$ 15W V_I = -27 to -38 V	-23	-24	-25	V
ΔV_O(*)	Line Regulation	V_I = -27 to -38 V T_J = 25°C			480	mV
		V_I = -30 to -36 V T_J = 25°C			240	
ΔV_O(*)	Load Regulation	I_O = 5 mA to 1.5 A T_J = 25°C			480	mV
		I_O = 250 to 750 mA T_J = 25°C			240	
I_d	Quiescent Current	T_J = 25°C			3	mA
ΔI_d	Quiescent Current Change	I_O = 5 mA to 1 A			0.5	mA
		V_I = -27 to -38 V			1	
$\Delta V_O/\Delta T$	Output Voltage Drift	I_O = 5 mA		-1		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_J = 25°C		400		µV
SVR	Supply Voltage Rejection	ΔV_I = 10 V f = 120Hz	54	60		dB
V_d	Dropout Voltage	I_O = 1 A T_J = 25°C ΔV_O = 100 mV		1.1		V
I_{sc}	Short Circuit Current			1.1		A
I_{scp}	Short Circuit Peak Current	T_J = 25°C		2.2		A

(*) Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

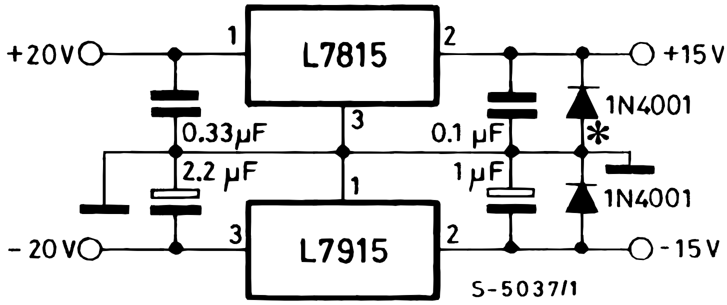
APPLICATIONS INFORMATION

Figure 3: Fixed Output Regulator



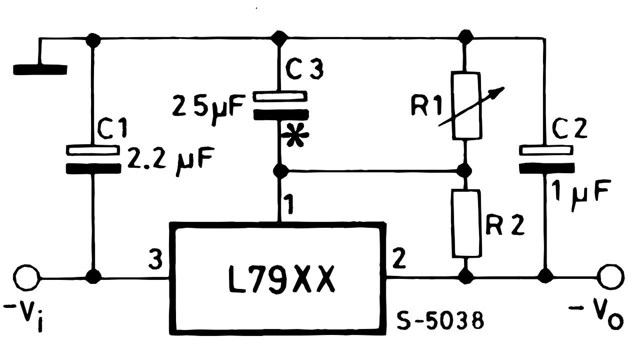
NOTE:
1. To specify an output voltage, substitute voltage value for "XX".
2. Required for stability. For value given, capacitor must be solid tantalum. If aluminium electrolytics are used, at least ten times value should be selected. C1 is required if regulator is located an appreciable distance from power supply filter.
3. To improve transient response. If large capacitors are used, a high current diode from input to output (1N4001 or similar) should be introduced to protect the device from momentary input short circuit.

Figure 4: Split Power Supply (± 15V/1A)



Against potential latch-up problems.

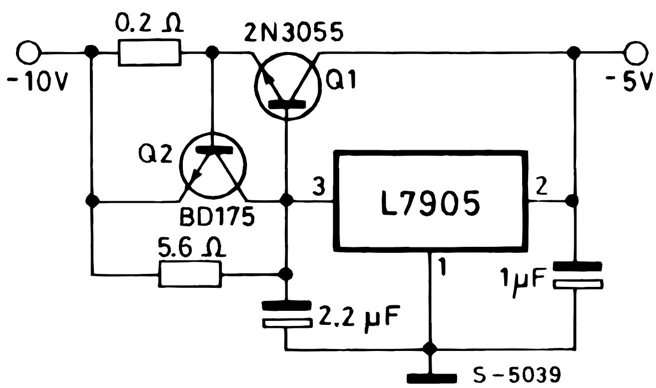
Figure 5: Circuit for Increasing Output Voltage



$V_O = V_{xx}\frac{R_1 + R_2}{R_2}$ $\frac{V_{xx}}{R_2} > 3I_d$

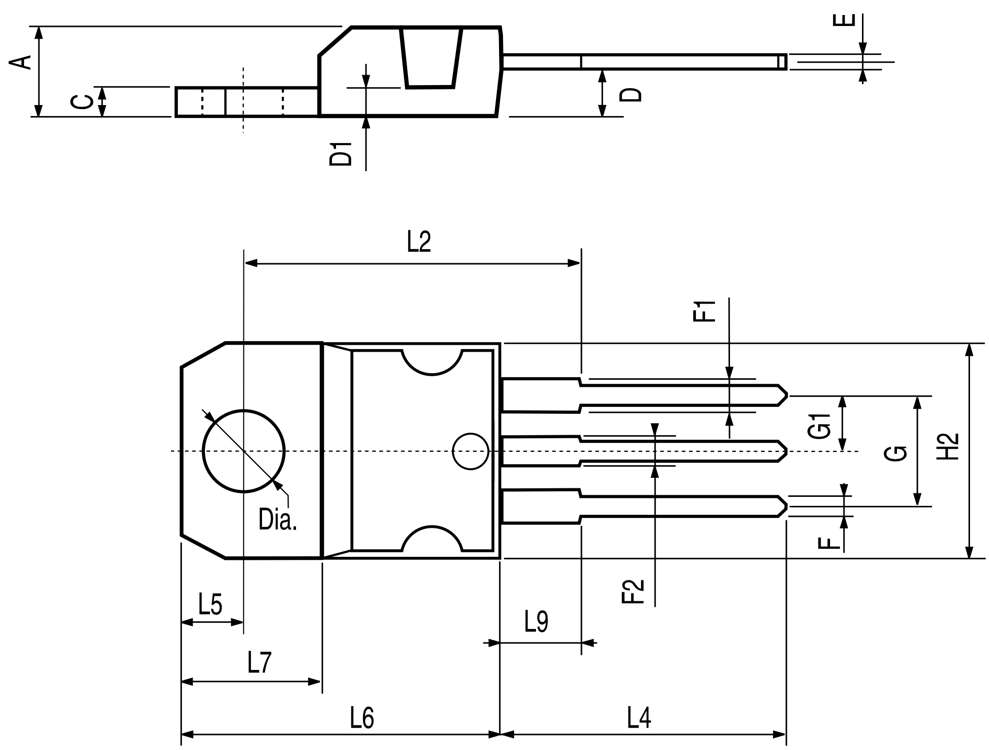
C3 Optional for improved transient response and ripple rejection.

Figure 6: High Current Negative Regulator (-5V/4A with 5A current limiting)



TO-220 MECHANICAL DATA

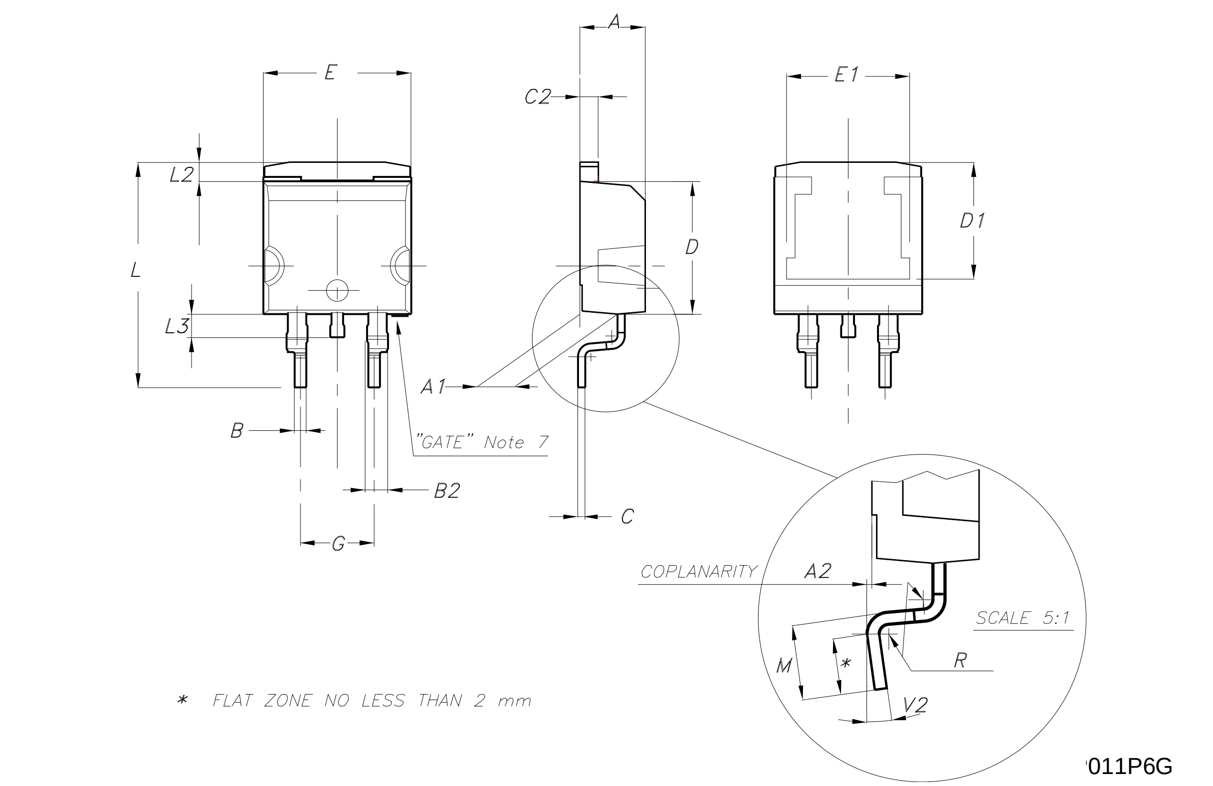
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.4		2.7	0.094		0.106
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

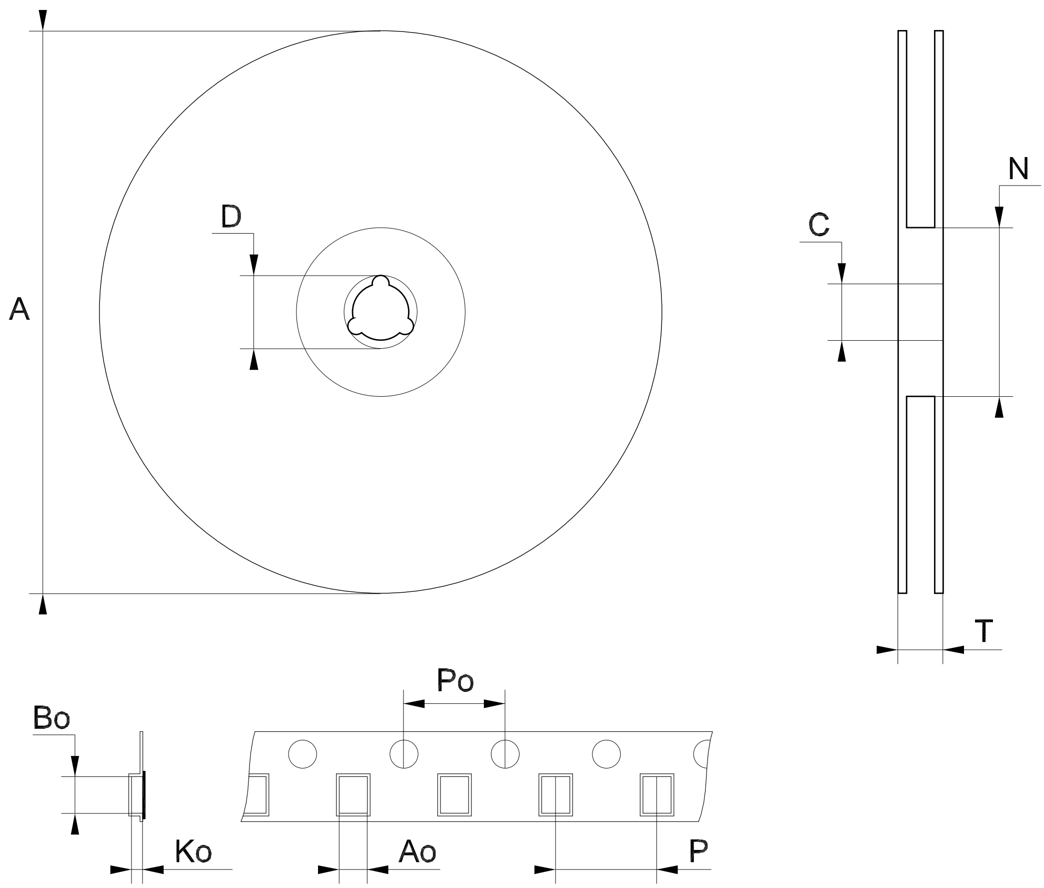
D²PAK MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		0.409
E1		8.5			0.335	
G	4.88		5.28	0.192		0.208
L	15		15.85	0.590		0.624
L2	1.27		1.4	0.050		0.055
L3	1.4		1.75	0.055		0.068
M	2.4		3.2	0.094		0.126
R		0.4			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

Table 12: Revision History

Date	Revision	Description of Changes
22-Jun-2004	7	Ordering Codes updated Table 3, pag. 2.