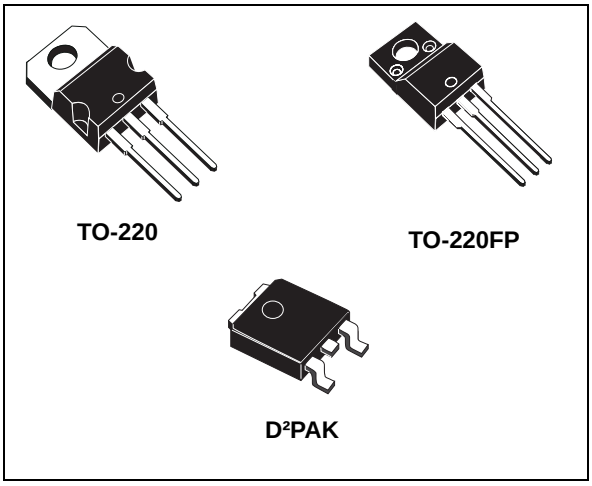
L79

Negative voltage regulators

Datasheet - production data



Features

- Output current up to 1.5 A
- Output voltages of - 5; - 8; - 12; - 15 V
- Thermal overload protection
- Short circuit protection
- Output transition SOA protection
- Output tolerance 2% (AC version) or 4% (C version) at 25°C

Description

The L79 series of three-terminal negative regulators is available in TO-220, TO-220FP and D²PAK packages and several fixed output voltages, making it useful in a wide range of applications. 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 L78 positive standard series, they are particularly suited for split power supplies. If adequate heat sinking is provided, they can deliver over 1.5 A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

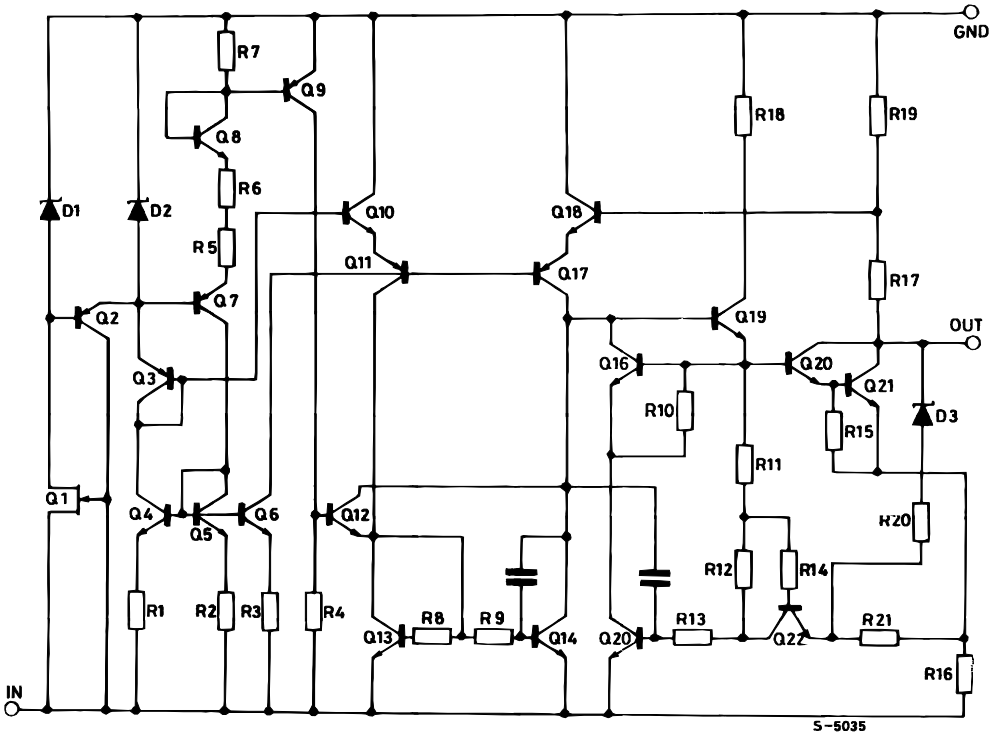
Table 1. Device summary

Order codes				Output voltages
TO-220 (single gauge)	TO-220 (dual gauge)	D²PAK	TO-220FP	
L7905ACV	L7905ACV-DG	L7905ACD2T-TR		- 5 V
L7905CV	L7905CV-DG	L7905CD2T-TR	L7905CP	- 5 V
L7908CV	L7908CV-DG			- 8 V
L7912ACV	L7912ACV-DG			- 12 V
L7912CV	L7912CV-DG	L7912CD2T-TR	L7912CP	- 12 V
L7915ACV	L7915ACV-DG			- 15 V
L7915CV	L7915CV-DG		L7915CP	- 15 V

Contents

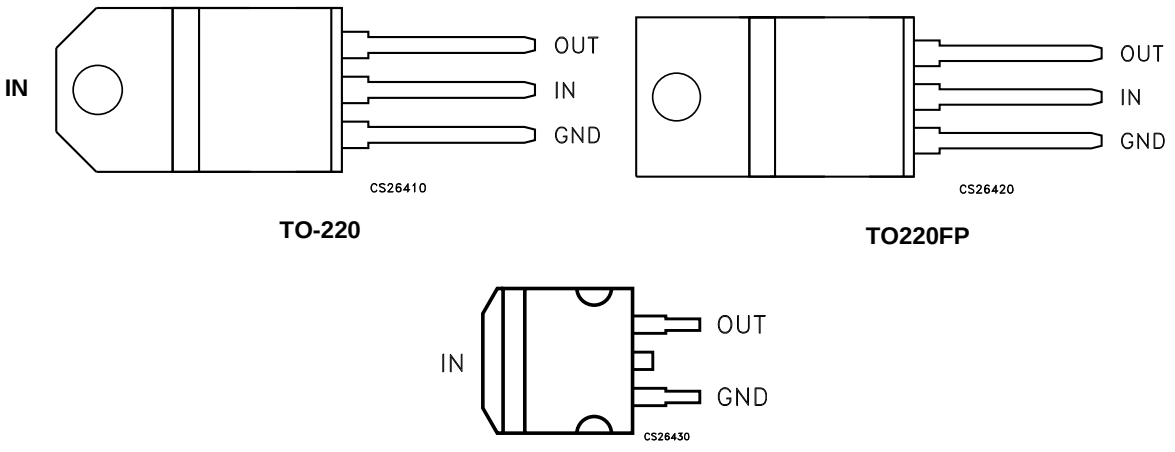
1 Diagram

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_I	DC input voltage		-35	V
I_O	Output current		Internally limited	
P_D	Power dissipation		Internally limited	
T_{STG}	Storage temperature range		-65 to 150	°C
T_{OP}	Operating junction temperature range	for L79xxC	0 to 150	°C
		for L79xxAC	0 to 125	

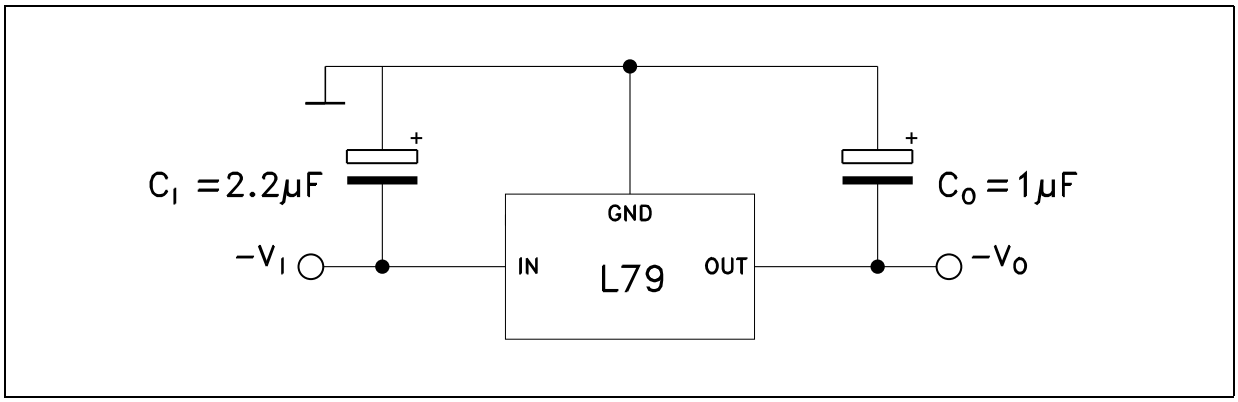
Note: Absolute maximum ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

Table 3. Thermal data

Symbol	Parameter	D²PAK	TO-220	TO-220FP	Unit
R_{thJC}	Thermal resistance junction-case	3	5	5	°C/W
R_{thJA}	Thermal resistance junction-ambient	62.5	50	60	°C/W

4 Test circuit

Figure 3. Test circuit



5 Electrical characteristics

Refer to the test circuits, T_J = 0 to 125 °C, V_I = -10 V, I_O = 500 mA, C_I = 2.2 µF, C_O = 1 µF unless otherwise specified.

Table 4. Electrical characteristics of L7905AC

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, $P_O \leq$ 15 W V_I = -8 to -20 V	-4.8	-5	-5.2	V
ΔV_O(1)	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(1)	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 = 10 Hz to 100 kHz, T_J = 25°C		100		µV
SVR	Supply voltage rejection	ΔV_I = 10 V, f = 120 Hz	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

1. 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.

Refer to the test circuits, T_J = 0 to 125 °C, V_I = -10 V, I_O = 500 mA, C_I = 2.2 µF, C_O = 1 µF unless otherwise specified.

Table 5. Electrical characteristics of L7905C

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	T_J = 25°C	-4.8	-5	-5.2	V
V_O	Output voltage	I_O = -5 mA to -1 A, $P_O \leq$ 15 W V_I = -8 to -20 V	-4.75	-5	-5.25	V
ΔV_O(1)	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(1)	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 = 10 Hz to 100 kHz, T_J = 25°C		100		µV
SVR	Supply voltage rejection	ΔV_I = 10 V, f = 120 Hz	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

1. 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.

Refer to the test circuits, T_J = 0 to 125 °C, V_I = -14 V, I_O = 500 mA, C_I = 2.2 µF, C_O = 1 µF unless otherwise specified.

Table 6. Electrical characteristics of L7908C

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	T_J = 25°C	-7.7	-8	-8.3	V
V_O	Output voltage	I_O = -5 mA to -1 A, $P_O \leq$ 15 W V_I = -11.5 to -23 V	-7.6	-8	-8.4	V
ΔV_O(1)	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(1)	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 = 10 Hz to 100 kHz, T_J = 25°C		175		µV
SVR	Supply voltage rejection	ΔV_I = 10 V, f = 120 Hz	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

1. 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.

Refer to the test circuits, T_J = 0 to 125 °C, V_I = -19 V, I_O = 500 mA, C_I = 2.2 µF, C_O = 1 µF unless otherwise specified.

Table 7. Electrical characteristics of L7912AC

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, $P_O \leq$ 15 W V_I = -15.5 to -27 V	-11.5	-12	-12.5	V
ΔV_O(1)	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(1)	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 -30 V			1	
$\Delta V_O/\Delta T$	Output voltage drift	I_O = 5 mA		-0.8		mV/°C
eN	Output noise voltage	B = 10 Hz to 100 kHz, T_J = 25°C		200		µV
SVR	Supply voltage rejection	ΔV_I = 10 V, f = 120 Hz	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

1. 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.

Refer to the test circuits, T_J = 0 to 125 °C, V_I = -19 V, I_O = 500 mA, C_I = 2.2 µF, C_O = 1 µF unless otherwise specified.

Table 8. Electrical characteristics of L7912C

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	T_J = 25°C	-11.5	-12	-12.5	V
V_O	Output voltage	I_O = -5 mA to -1 A, $P_O \leq$ 15 W V_I = -15.5 to -27 V	-11.4	-12	-12.6	V
ΔV_O(1)	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(1)	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 -30 V			1	
$\Delta V_O/\Delta T$	Output voltage drift	I_O = 5 mA		-0.8		mV/°C
eN	Output noise voltage	B = 10 Hz to 100 kHz, 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

1. 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.

Refer to the test circuits, T_J = 0 to 125 °C, V_I = -23 V, I_O = 500 mA, C_I = 2.2 µF, C_O = 1 µF unless otherwise specified.

Table 9. Electrical characteristics of L7915AC

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, $P_O \leq$ 15 W V_I = -18.5 to -30 V	-14.4	-15	-15.6	V
ΔV_O(1)	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(1)	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 = 10 Hz to 100 kHz, T_J = 25°C		250		µV
SVR	Supply voltage rejection	ΔV_I = 10 V, f = 120 Hz	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		2.5		A

1. 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.

Refer to the test circuits, T_J = 0 to 125 °C, V_I = -23 V, I_O = 500 mA, C_I = 2.2 µF, C_O = 1 µF unless otherwise specified.

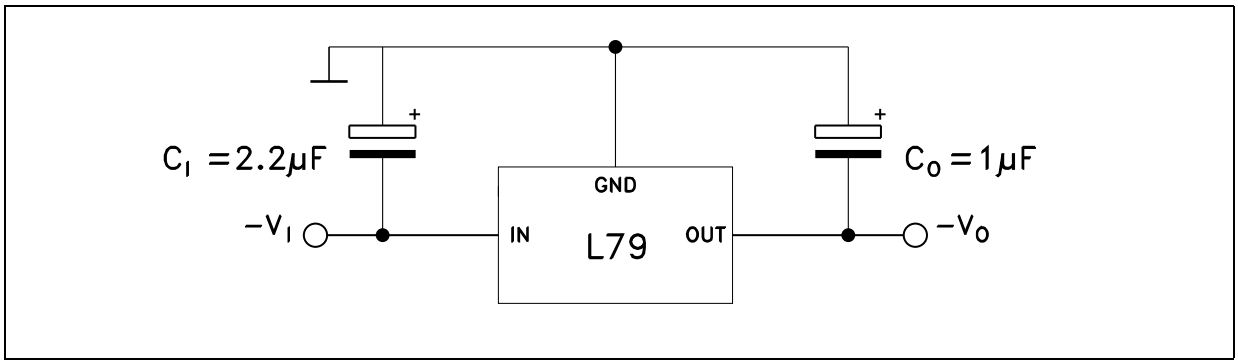
Table 10. Electrical characteristics of L7915C

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	T_J = 25°C	-14.4	-15	-15.6	V
V_O	Output voltage	I_O = -5 mA to -1 A, $P_O \leq$ 15 W V_I = -18.5 to -30 V	-14.3	-15	-15.7	V
ΔV_O(1)	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(1)	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 = 10 Hz to 100 kHz, T_J = 25°C		250		µV
SVR	Supply voltage rejection	ΔV_I = 10 V, f = 120 Hz	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

1. 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.

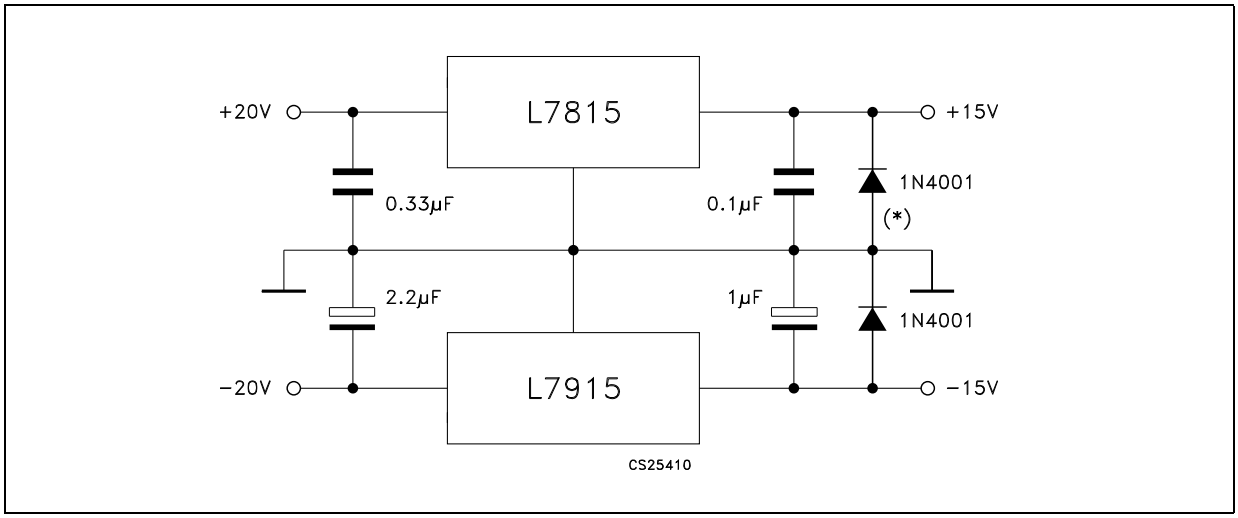
6 Application information

Figure 4. Fixed output regulator



Note: C_I is required for stability. For value given, capacitor must be solid tantalum. If aluminium electrolytic are used, at least ten times value should be selected. C_O is required if regulator is located an appreciable distance from power supply filter. 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 5. Split power supply (± 15 V - 1 A)

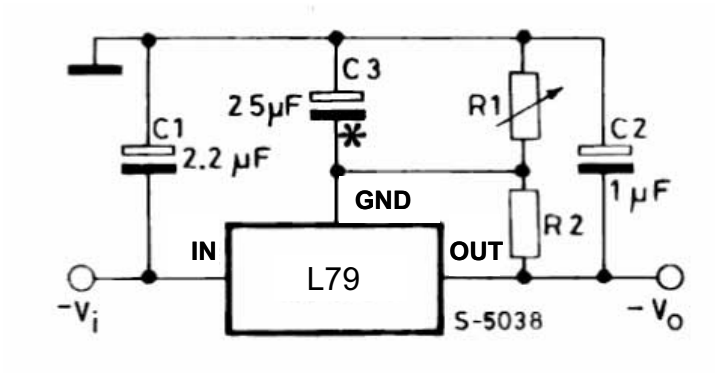


(*) Against potential latch-up problems.

Figure 6. Circuit for increasing output voltage

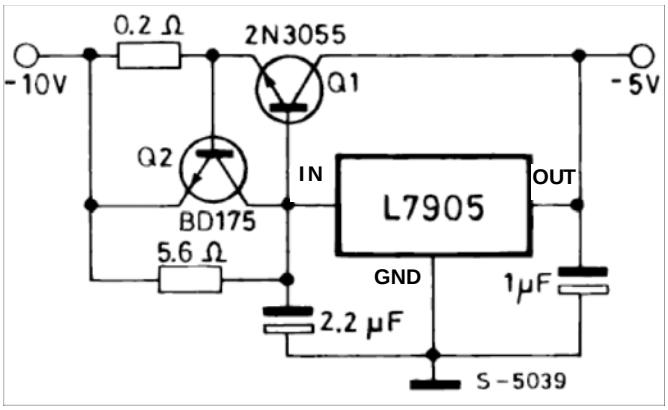
$V_O=V_{XX}(R_1+R_2)/R_2$

$V_{XX}/R_2 > 3I_d$



C3 Optional for improved transient response and ripple rejection.

Figure 7. High current negative regulator (- 5 V / 4 A with 5 A current limiting)



7 Package mechanical data

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

Figure 8. TO-220 (single gauge) drawing

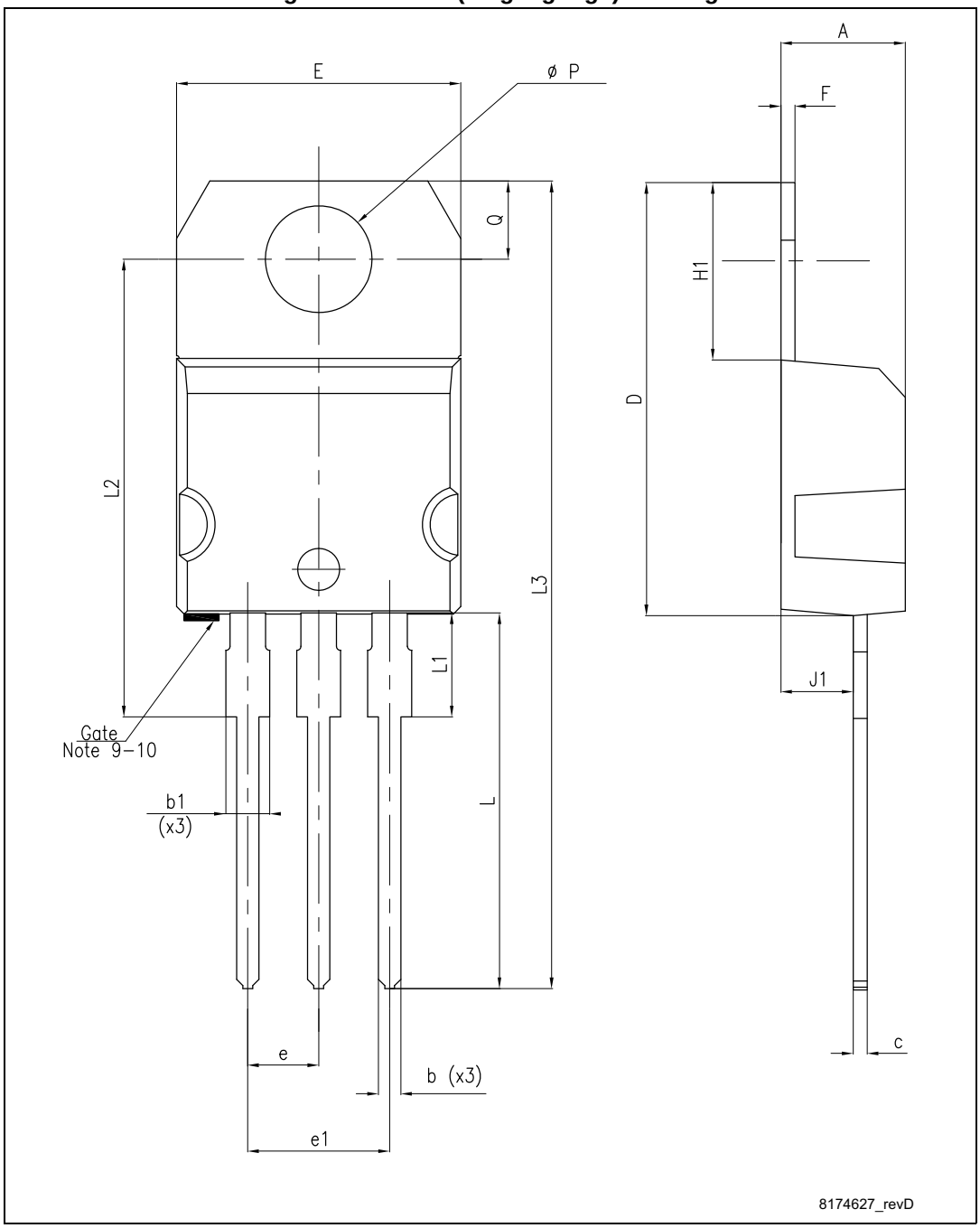


Table 11. TO-220 (single gauge) mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.70
c	0.48		0.70
D	15.25		15.75
E	10		10.40
e	2.40		2.70
e1	4.95		5.15
F	0.51		0.60
H1	6.20		6.60
J1	2.40		2.72
L	13		14
L1	3.50		3.93
L20		16.40	
L30		28.90	
∅P	3.75		3.85
Q	2.65		2.95

Figure 9. TO-220 (dual gauge) drawing

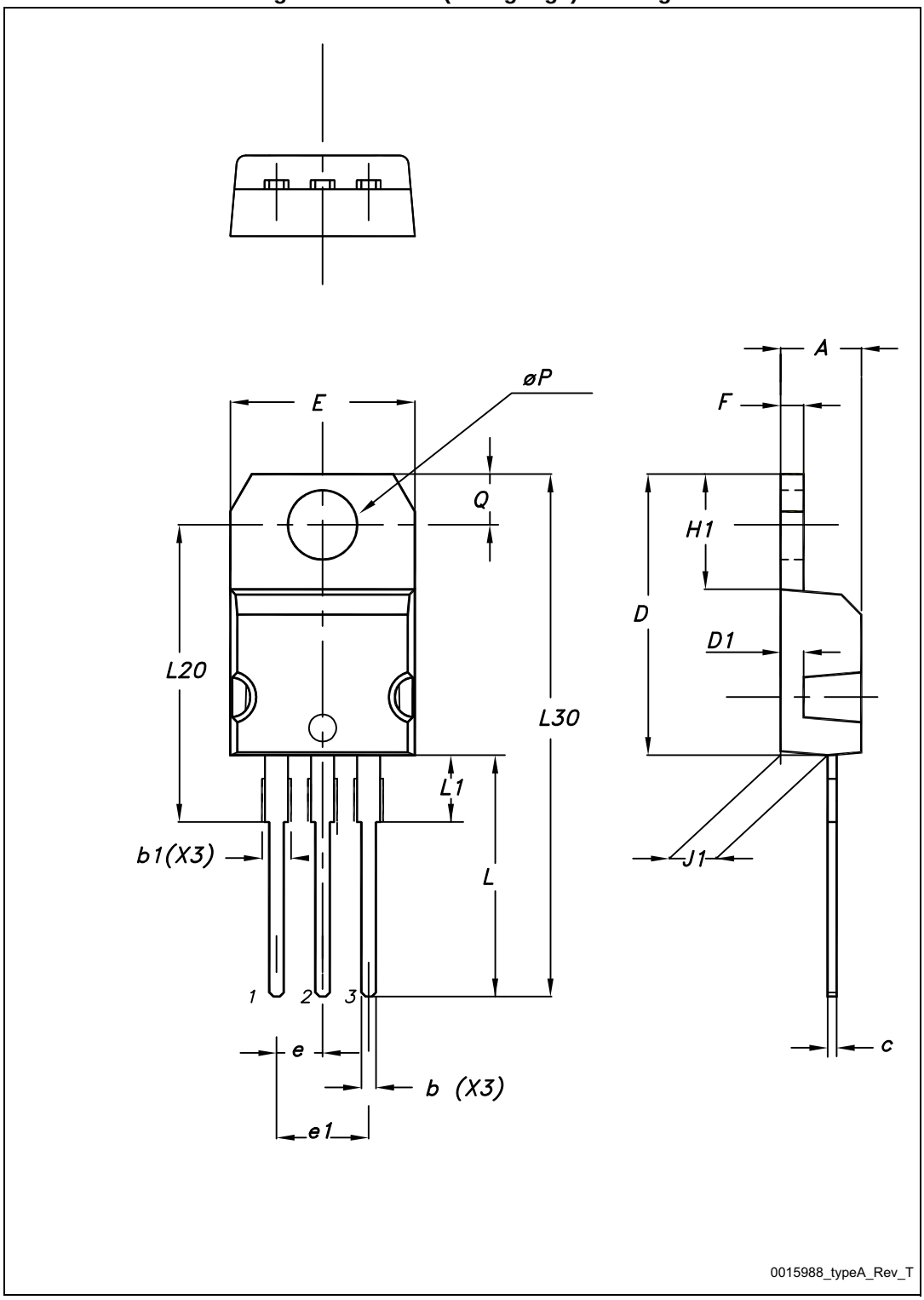


Table 12. TO-220 (dual gauge) mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.70
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10		10.40
e	2.40		2.70
e1	4.95		5.15
F	1.23		1.32
H1	6.20		6.60
J1	2.40		2.72
L	13		14
L1	3.50		3.93
L20		16.40	
L30		28.90	
∅P	3.75		3.85
Q	2.65		2.95

Figure 10. TO-220FP drawing

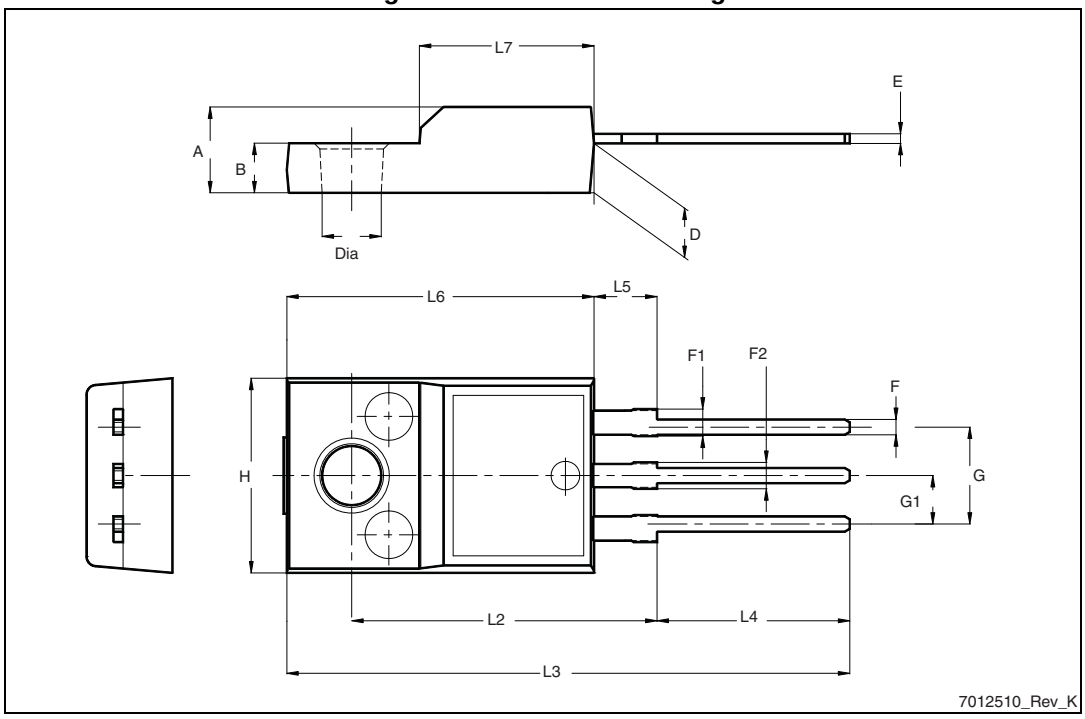


Table 13. TO-220FP mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.4		4.6
B	2.5		2.7
D	2.5		2.75
E	0.45		0.7
F	0.75		1
F1	1.15		1.70
F2	1.15		1.70
G	4.95		5.2
G1	2.4		2.7
H	10		10.4
L2		16	
L3	28.6		30.6
L4	9.8		10.6
L5	2.9		3.6
L6	15.9		16.4
L7	9		9.3
Dia	3		3.2

Figure 11. D²PAK drawing

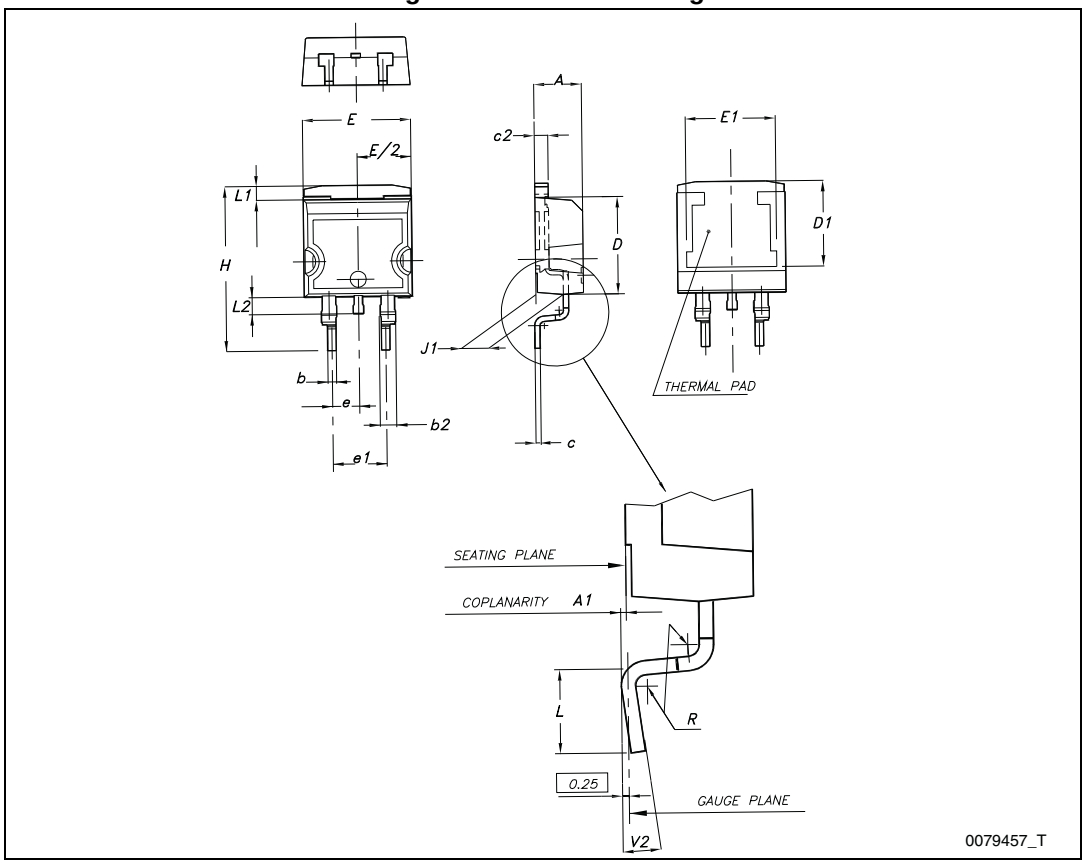
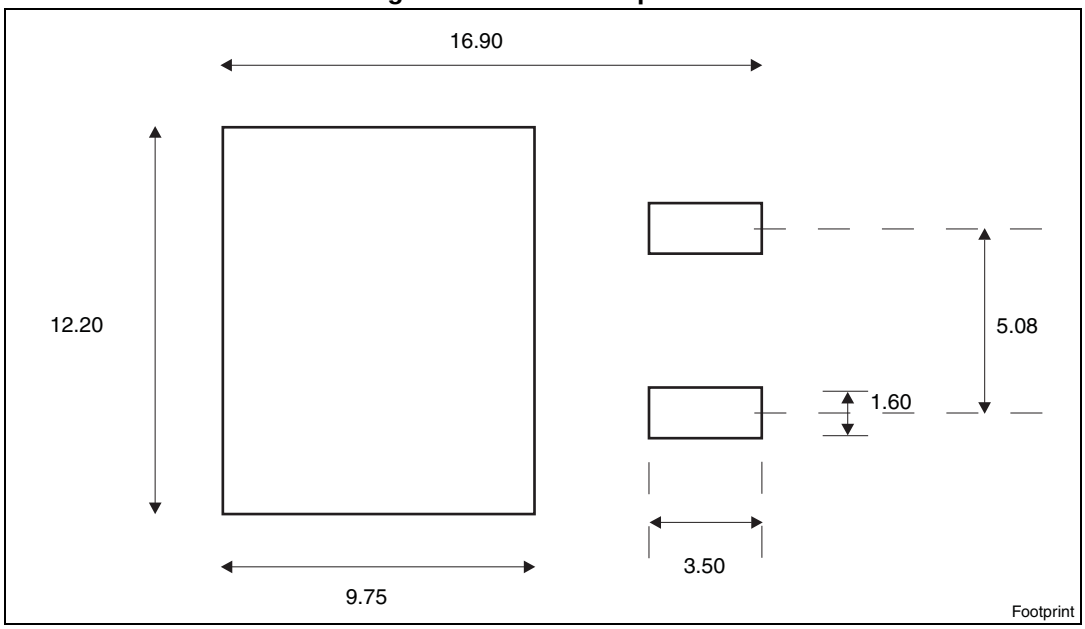


Table 14. D²PAK mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
A1	0.03		0.23
b	0.70		0.93
b2	1.14		1.70
c	0.45		0.60
c2	1.23		1.36
D	8.95		9.35
D1	7.50		
E	10		10.40
E1	8.50		
e		2.54	
e1	4.88		5.28
H	15		15.85
J1	2.49		2.69
L	2.29		2.79
L1	1.27		1.40
L2	1.30		1.75
R		0.4	
V2	0°		8°

Figure 12. D²PAK footprint[(a)]



a. All dimensions are in millimeters.

8 Packaging mechanical data

Figure 13. Tape

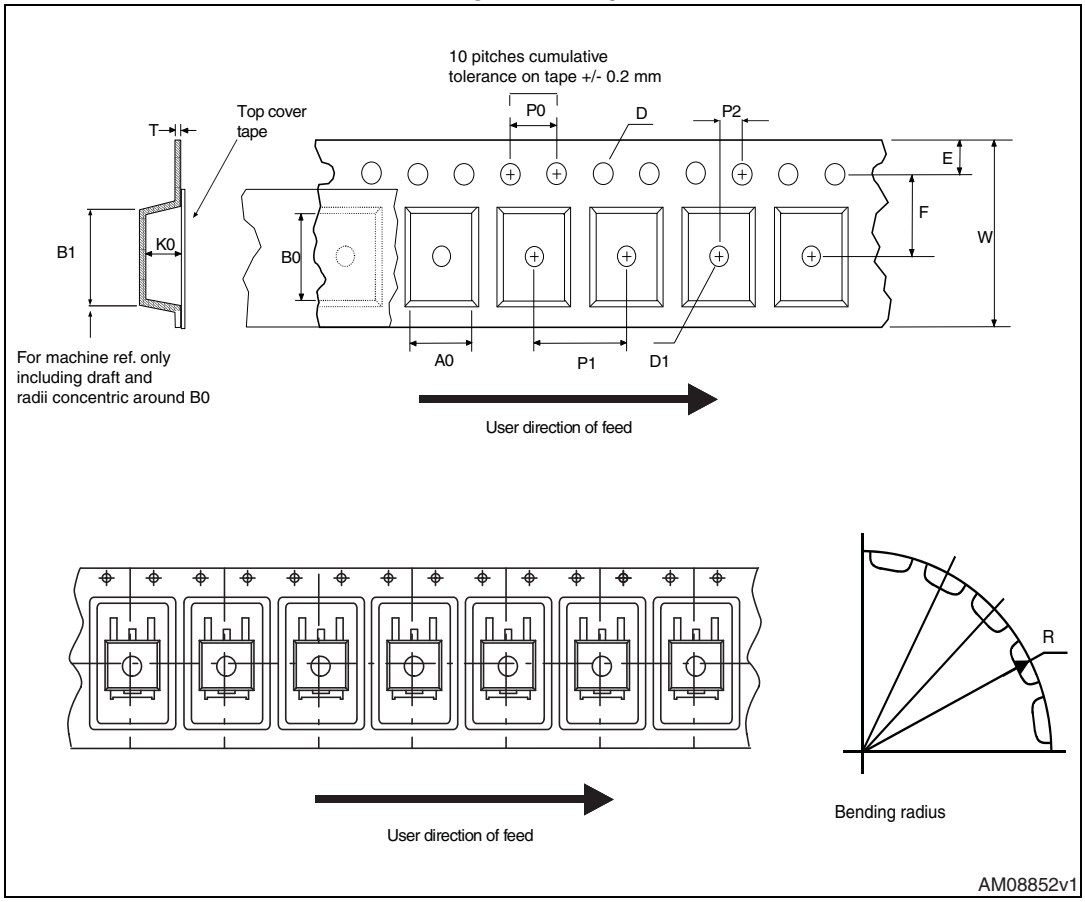


Figure 14. Reel

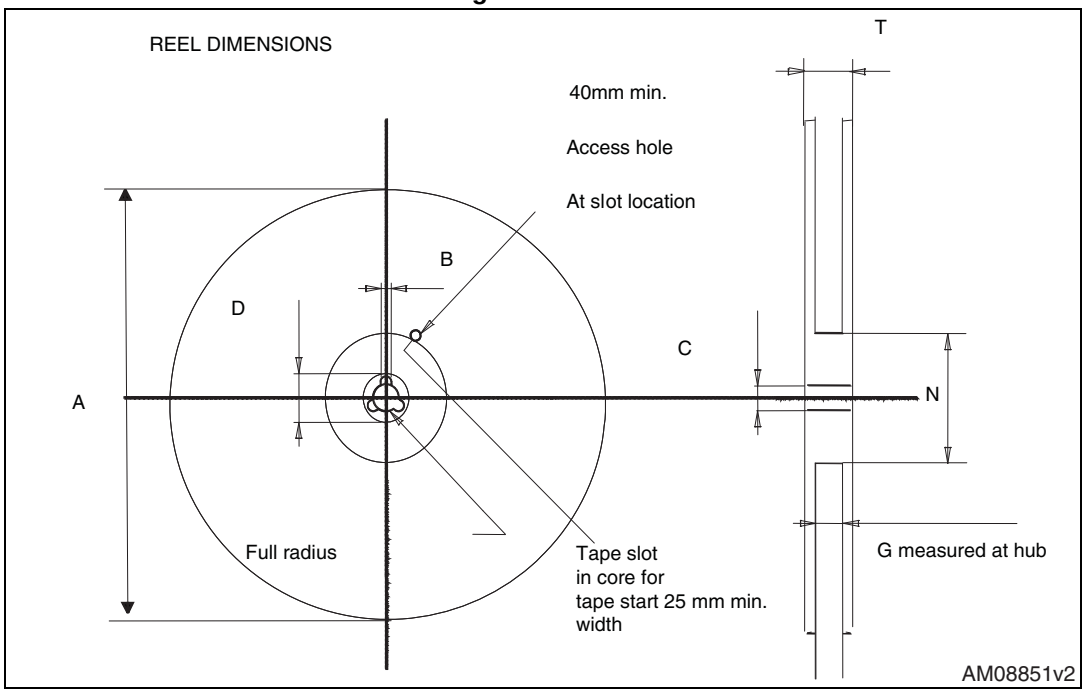


Table 15. D²PAK tape and reel mechanical data

Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	10.5	10.7	A		330
B0	15.7	15.9	B	1.5	
D	1.5	1.6	C	12.8	13.2
D1	1.59	1.61	D	20.2	
E	1.65	1.85	G	24.4	26.4
F	11.4	11.6	N	100	
K0	4.8	5.0	T		30.4
P0	3.9	4.1			
P1	11.9	12.1	Base qty		1000
P2	1.9	2.1	Bulk qty		1000
R	50				
T	0.25	0.35			
W	23.7	24.3			

9 Revision history

Table 16. Document revision history

Date	Revision	Changes
22-Jun-2004	9	Order codes updated Table 3.
31-Aug-2005	10	Add new order codes (TO-220 E Type) on Table 3.
19-Jan-2007	11	D²PAK mechanical data updated and add footprint data.
06-Jun-2007	12	Order codes updated.
25-Oct-2007	13	Modified: *Figure 3*, *Figure 4*, *Figure 6* and *Figure 7*.
05-Dec-2007	14	Modified: *Table 1*.
18-Feb-2008	15	Modified: *Table 1 on page 1*.
15-Jul-2008	16	Modified: *Table 1 on page 1*.
19-Jan-2010	17	Modified: *Table 11 on page 14*, added: *Figure 8 on page 16*, *Figure 9 on page 17*, *Figure 10* and *Figure 11 on page 18*.
26-May-2010	18	Modified: V_I parameter *Table 2 on page 5*.
12-Nov-2010	19	Modified: R_{thJC} value for TO-220 *Table 3 on page 5*.
18-Nov-2011	20	Added: order codes L7905CV-DG, L7912CV-DG and L7915CV-DG *Table 1 on page 1*.
15-May-2012	21	Added: order codes L7908CV-DG *Table 1 on page 1*.
04-Jun-2014	22	Part numbers L79xxC and L79xxAC changed to L79. Updated the features and the description in cover page. Updated *Table 1: Device summary*, *Section 3: Maximum ratings*, *Section 4: Test circuit*, *Section 5: Electrical characteristics*, *Section 6: Application information*, *Section 7: Package mechanical data*. Added *Section 8: Packaging mechanical data*. Minor text changes.

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