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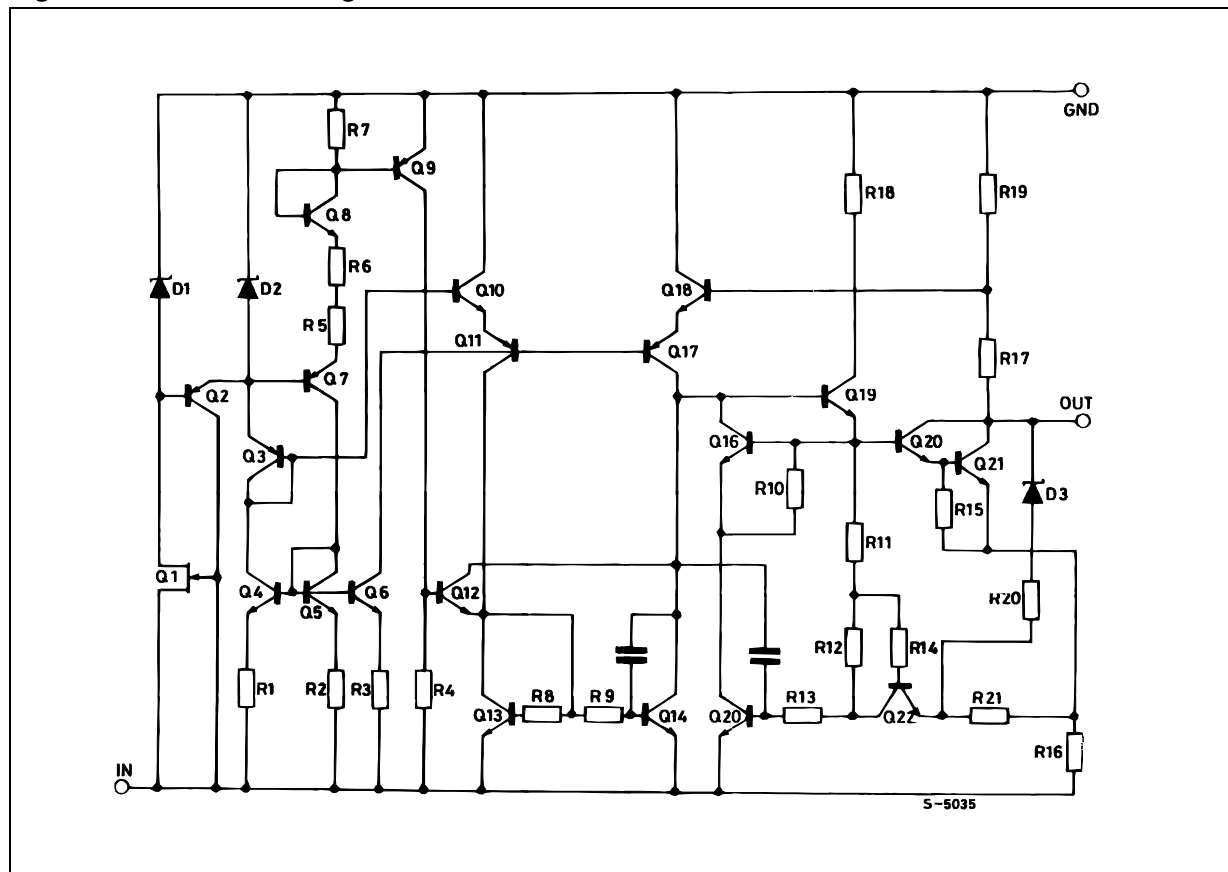
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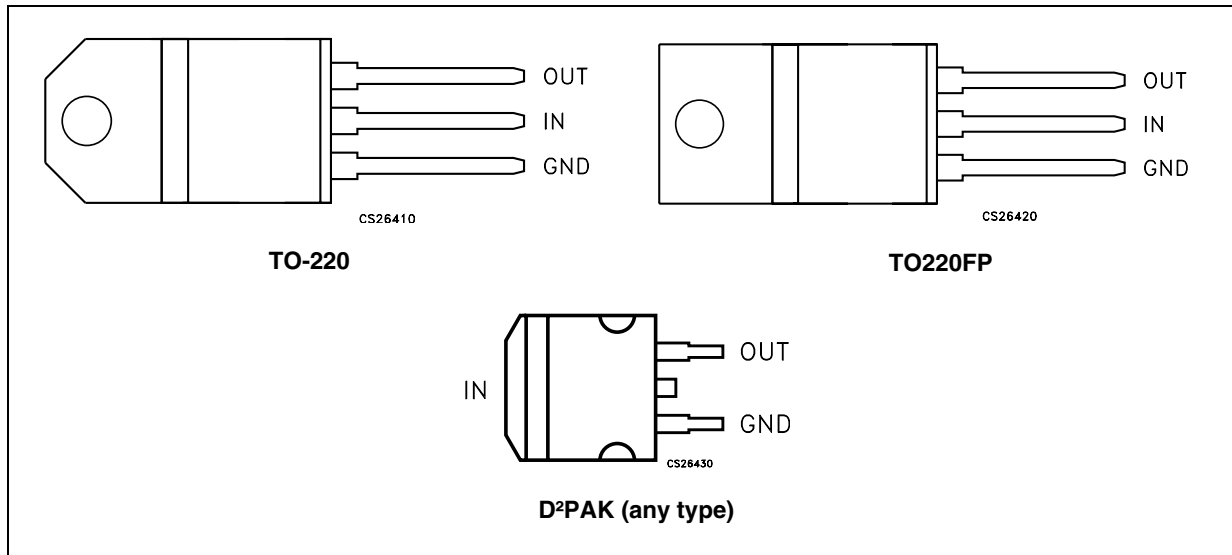
# 1 Diagram

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	for $V_O = -5$ to $-18$ V	-35	V
		for $V_O = -20$ to $-24$ V	-40	
$I_O$	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		0 to 150	°C

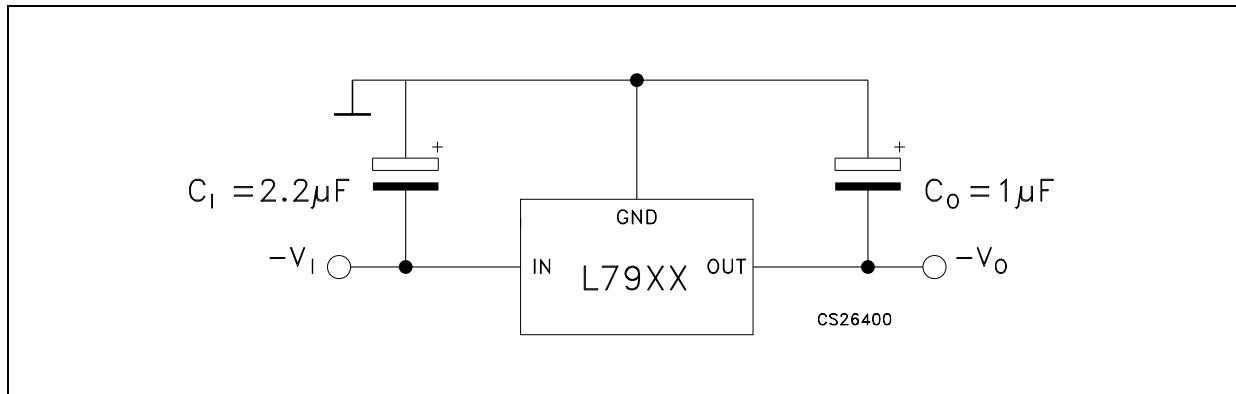
*Note: Absolute maximum ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.*

**Table 3. Thermal data**

Symbol	Parameter	D <sup>2</sup> PAK	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  $125^\circ\text{C}$ ,  $V_I = -10\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $C_I = 2.2\text{ }\mu\text{F}$ ,  $C_O = 1\text{ }\mu\text{F}$  unless otherwise specified.

**Table 4. Electrical characteristics of L7905C**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_O$	Output voltage	$T_J = 25^\circ\text{C}$	-4.8	-5	-5.2	V
$V_O$	Output voltage	$I_O = -5\text{ mA to } -1\text{ A}$ , $P_O \leq 15\text{ W}$ $V_I = -8\text{ to } -20\text{ V}$	-4.75	-5	-5.25	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = -7\text{ to } -25\text{ V}$ , $T_J = 25^\circ\text{C}$			100	mV
		$V_I = -8\text{ to } -12\text{ V}$ , $T_J = 25^\circ\text{C}$			50	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5\text{ mA to } 1.5\text{ A}$ , $T_J = 25^\circ\text{C}$			100	mV
		$I_O = 250\text{ to } 750\text{ mA}$ , $T_J = 25^\circ\text{C}$			50	
$I_d$	Quiescent current	$T_J = 25^\circ\text{C}$			3	mA
$\Delta I_d$	Quiescent current change	$I_O = 5\text{ mA to } 1\text{ A}$			0.5	mA
		$V_I = -8\text{ to } -25\text{ V}$			1.3	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5\text{ mA}$		-0.4		mV/ $^\circ\text{C}$
eN	Output noise voltage	$B = 10\text{ Hz to } 100\text{ kHz}$ , $T_J = 25^\circ\text{C}$		100		$\mu\text{V}$
SVR	Supply voltage rejection	$\Delta V_I = 10\text{ V}$ , $f = 120\text{ Hz}$	54	60		dB
$V_d$	Dropout voltage	$I_O = 1\text{ A}$ , $T_J = 25^\circ\text{C}$ , $\Delta V_O = 100\text{ mV}$		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  $125^\circ\text{C}$ ,  $V_I = -14\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $C_I = 2.2\text{ }\mu\text{F}$ ,  $C_O = 1\text{ }\mu\text{F}$  unless otherwise specified.

**Table 5. Electrical characteristics of L7908C**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_O$	Output voltage	$T_J = 25^\circ\text{C}$	-7.7	-8	-8.3	V
$V_O$	Output voltage	$I_O = -5\text{ mA to } -1\text{ A}$ , $P_O \leq 15\text{ W}$ $V_I = -11.5\text{ to } -23\text{ V}$	-7.6	-8	-8.4	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = -10.5\text{ to } -25\text{ V}$ , $T_J = 25^\circ\text{C}$			160	mV
		$V_I = -11\text{ to } -17\text{ V}$ , $T_J = 25^\circ\text{C}$			80	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5\text{ mA to } 1.5\text{ A}$ , $T_J = 25^\circ\text{C}$			160	mV
		$I_O = 250\text{ to } 750\text{ mA}$ , $T_J = 25^\circ\text{C}$			80	
$I_d$	Quiescent current	$T_J = 25^\circ\text{C}$			3	mA
$\Delta I_d$	Quiescent current change	$I_O = 5\text{ mA to } 1\text{ A}$			0.5	mA
		$V_I = -11.5\text{ to } -25\text{ V}$			1	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5\text{ mA}$		-0.6		mV/ $^\circ\text{C}$
eN	Output noise voltage	$B = 10\text{ Hz to } 100\text{ kHz}$ , $T_J = 25^\circ\text{C}$		175		$\mu\text{V}$
SVR	Supply voltage rejection	$\Delta V_I = 10\text{ V}$ , $f = 120\text{ Hz}$	54	60		dB
$V_d$	Dropout voltage	$I_O = 1\text{ A}$ , $T_J = 25^\circ\text{C}$ , $\Delta V_O = 100\text{ mV}$		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  $125^\circ\text{C}$ ,  $V_I = -19\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $C_I = 2.2\text{ }\mu\text{F}$ ,  $C_O = 1\text{ }\mu\text{F}$  unless otherwise specified.

**Table 6. Electrical characteristics of L7912C**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_O$	Output voltage	$T_J = 25^\circ\text{C}$	-11.5	-12	-12.5	V
$V_O$	Output voltage	$I_O = -5\text{ mA to } -1\text{ A}$ , $P_O \leq 15\text{ W}$ $V_I = -15.5\text{ to } -27\text{ V}$	-11.4	-12	-12.6	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = -14.5\text{ to } -30\text{ V}$ , $T_J = 25^\circ\text{C}$			240	mV
		$V_I = -16\text{ to } -22\text{ V}$ , $T_J = 25^\circ\text{C}$			120	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5\text{ mA to } 1.5\text{ A}$ , $T_J = 25^\circ\text{C}$			240	mV
		$I_O = 250\text{ to } 750\text{ mA}$ , $T_J = 25^\circ\text{C}$			120	
$I_d$	Quiescent current	$T_J = 25^\circ\text{C}$			3	mA
$\Delta I_d$	Quiescent current change	$I_O = 5\text{ mA to } 1\text{ A}$			0.5	mA
		$V_I = -15\text{ to } -30\text{ V}$			1	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5\text{ mA}$		-0.8		mV/ $^\circ\text{C}$
eN	Output noise voltage	$B = 10\text{ Hz to } 100\text{ kHz}$ , $T_J = 25^\circ\text{C}$		200		$\mu\text{V}$
SVR	Supply voltage rejection	$\Delta V_I = 10\text{ V}$ , $f = 120\text{ Hz}$	54	60		dB
$V_d$	Dropout voltage	$I_O = 1\text{ A}$ , $T_J = 25^\circ\text{C}$ , $\Delta V_O = 100\text{ mV}$		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  $125^\circ\text{C}$ ,  $V_I = -23\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $C_I = 2.2\text{ }\mu\text{F}$ ,  $C_O = 1\text{ }\mu\text{F}$  unless otherwise specified.

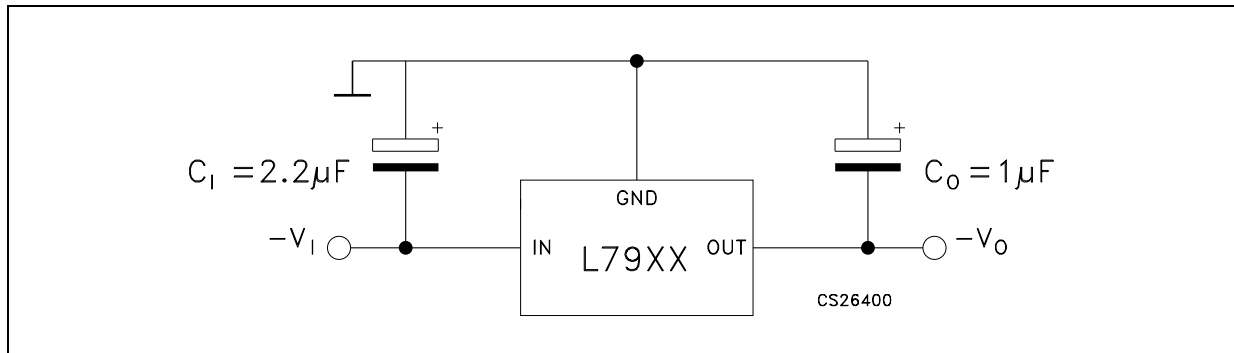
**Table 7. Electrical characteristics of L7915C**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_O$	Output voltage	$T_J = 25^\circ\text{C}$	-14.4	-15	-15.6	V
$V_O$	Output voltage	$I_O = -5\text{ mA to } -1\text{ A}$ , $P_O \leq 15\text{ W}$ $V_I = -18.5\text{ to } -30\text{ V}$	-14.3	-15	-15.7	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = -17.5\text{ to } -30\text{ V}$ , $T_J = 25^\circ\text{C}$			300	mV
		$V_I = -20\text{ to } -26\text{ V}$ , $T_J = 25^\circ\text{C}$			150	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5\text{ mA to } 1.5\text{ A}$ , $T_J = 25^\circ\text{C}$			300	mV
		$I_O = 250\text{ to } 750\text{ mA}$ , $T_J = 25^\circ\text{C}$			150	
$I_d$	Quiescent current	$T_J = 25^\circ\text{C}$			3	mA
$\Delta I_d$	Quiescent current change	$I_O = 5\text{ mA to } 1\text{ A}$			0.5	mA
		$V_I = -18.5\text{ to } -30\text{ V}$			1	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5\text{ mA}$		-0.9		mV/ $^\circ\text{C}$
eN	Output noise voltage	$B = 10\text{ Hz to } 100\text{ kHz}$ , $T_J = 25^\circ\text{C}$		250		$\mu\text{V}$
SVR	Supply voltage rejection	$\Delta V_I = 10\text{ V}$ , $f = 120\text{ Hz}$	54	60		dB
$V_d$	Dropout voltage	$I_O = 1\text{ A}$ , $T_J = 25^\circ\text{C}$ , $\Delta V_O = 100\text{ mV}$		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.

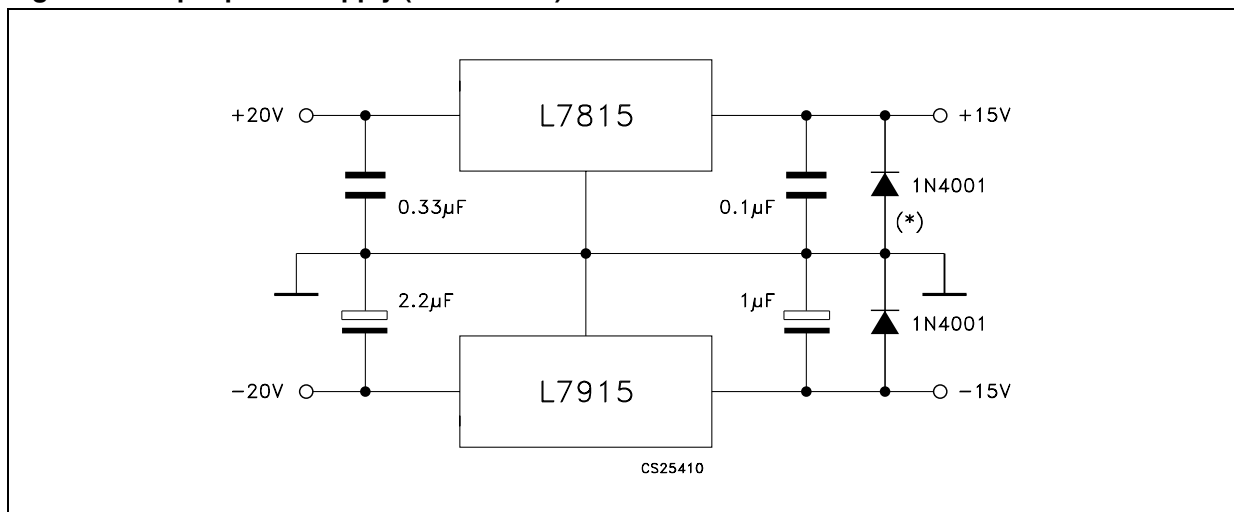
## 6 Application information

**Figure 4. Fixed output regulator**

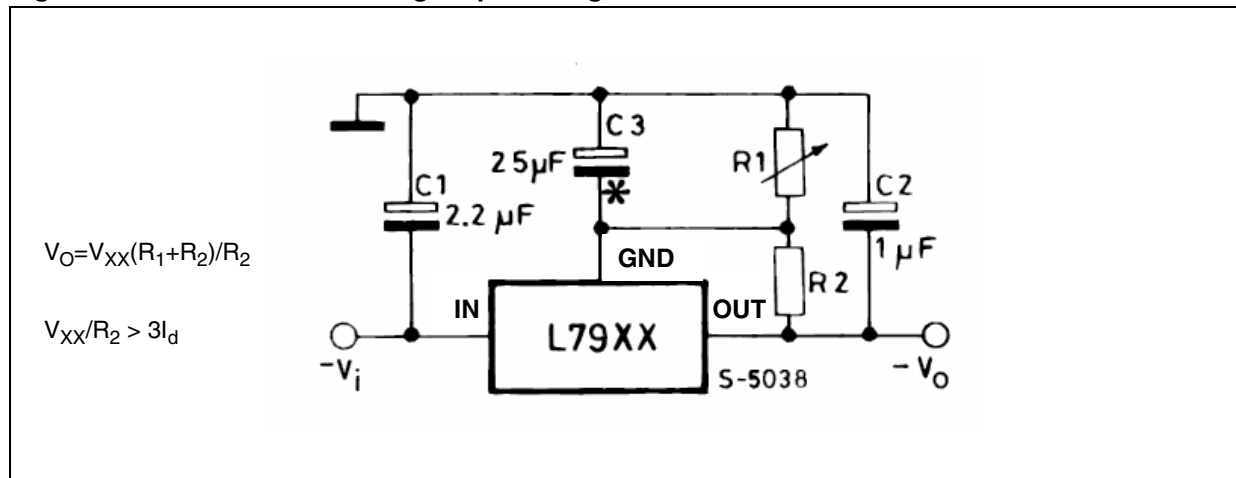


1. To specify an output voltage, substitute voltage value for "XX".
2. Required for stability. For value given, capacitor must be solid tantalum. If aluminium electrolytic are used, at least ten times value should be selected.  $C_I$  is required if regulator is located an appreciable distance from power 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.

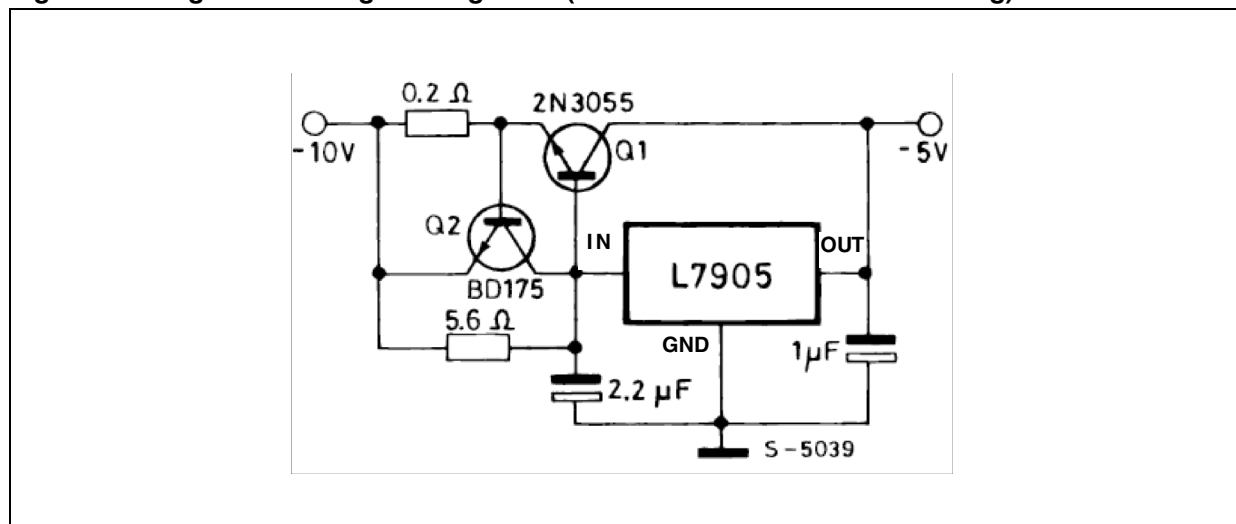
**Figure 5. Split power supply ( $\pm 15\text{ V} - 1\text{ A}$ )**



(\*) Against potential latch-up problems.

**Figure 6. Circuit for increasing output voltage**

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

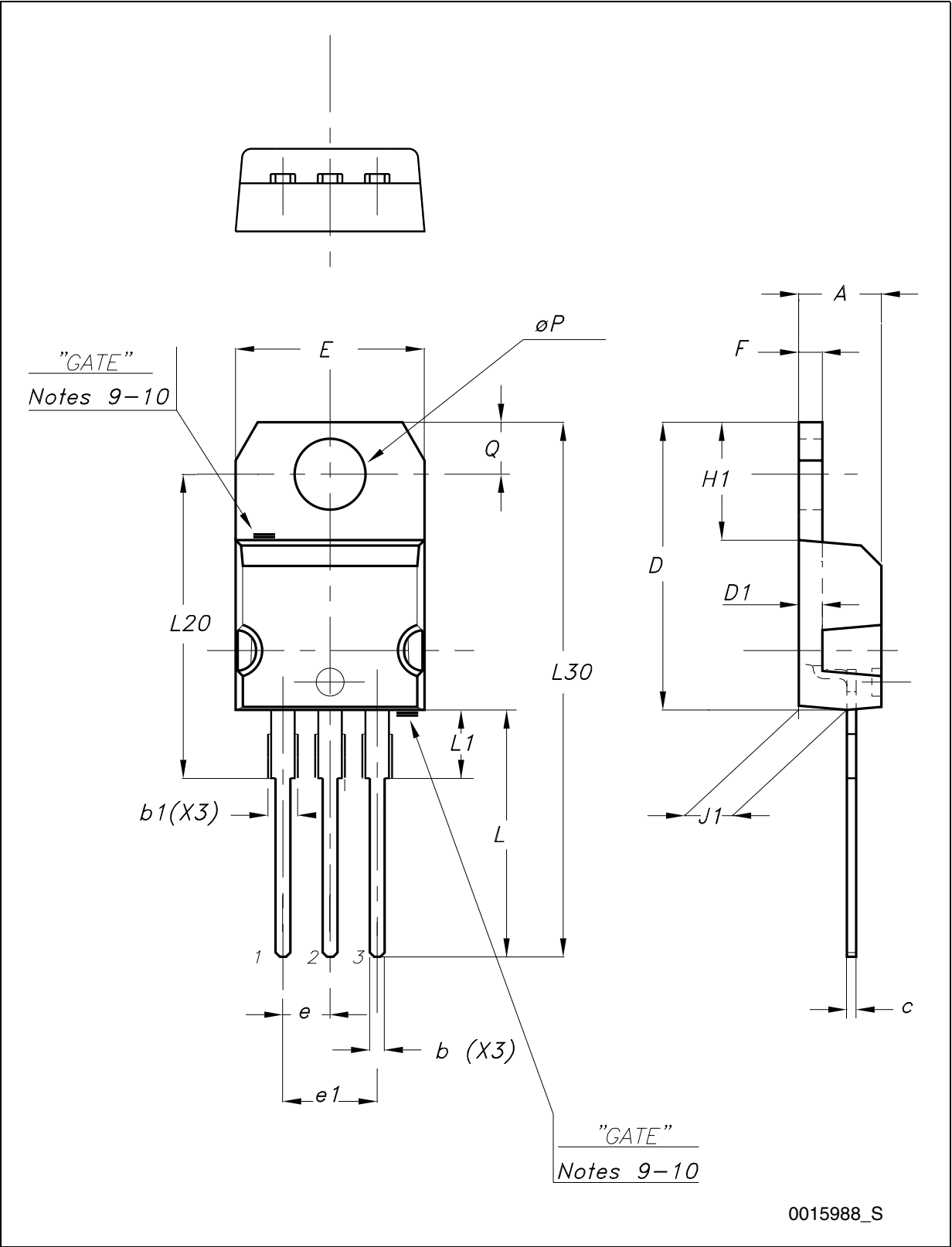
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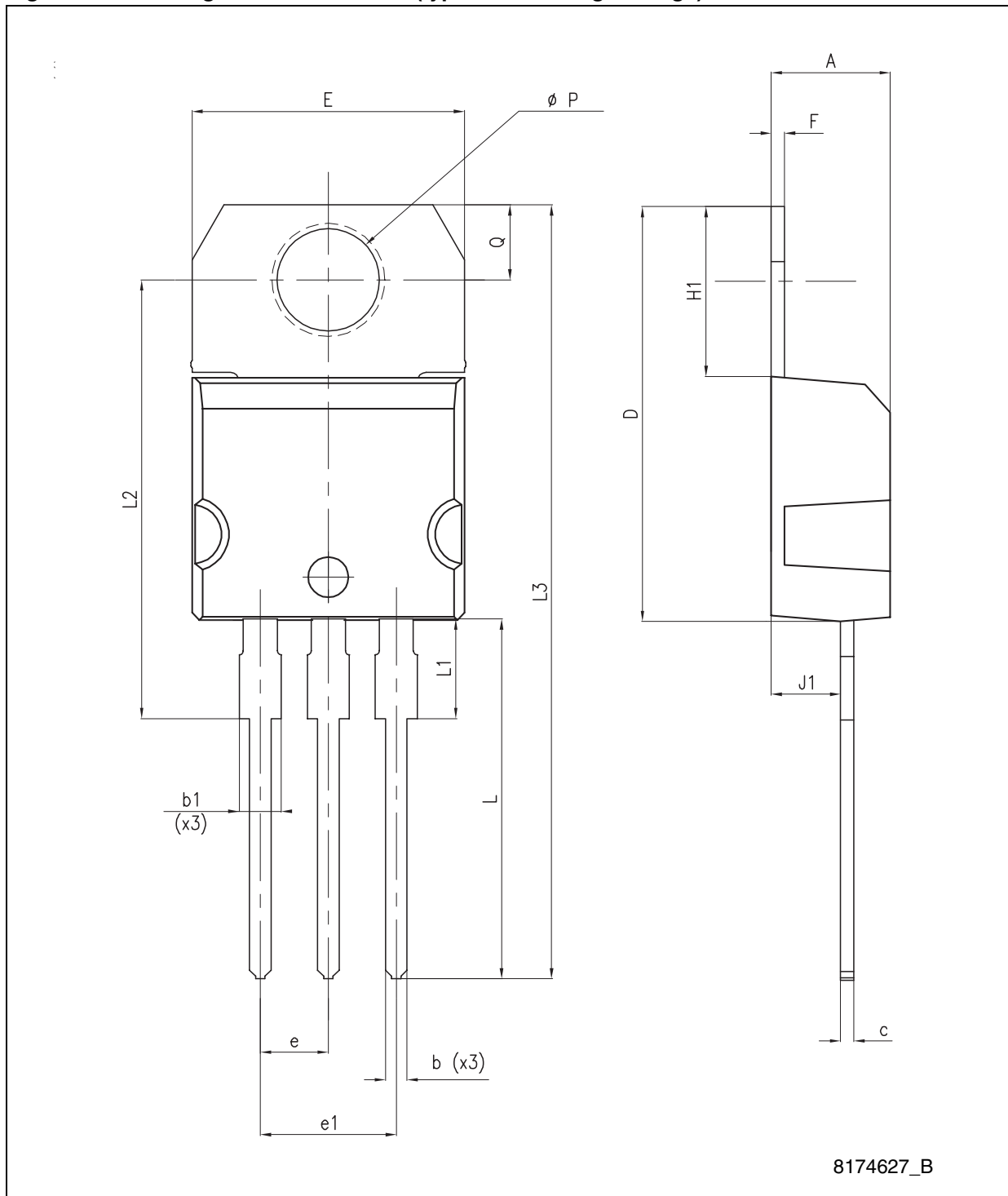
**Table 8. TO-220 mechanical data**

Dim.	Type STD - ST Dual Gauge			Type STD - ST Single Gauge		
	mm.			mm.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.40		4.60	4.40		4.60
b	0.61		0.88	0.61		0.88
b1	1.14		1.70	1.14		1.70
c	0.48		0.70	0.48		0.70
D	15.25		15.75	15.25		15.75
D1		1.27				
E	10.00		10.40	10.00		10.40
e	2.40		2.70	2.40		2.70
e1	4.95		5.15	4.95		5.15
F	1.23		1.32	0.51		0.60
H1	6.20		6.60	6.20		6.60
J1	2.40		2.72	2.40		2.72
L	13.00		14.00	13.00		14.00
L1	3.50		3.93	3.50		3.93
L20		16.40			16.40	
L30		28.90			28.90	
ØP	3.75		3.85	3.75		3.85
Q	2.65		2.95	2.65		2.95

**Note:** *In spite of some difference in tolerances, the packages are compatible.*

Figure 8. Drawing dimension TO-220 (type STD-ST Dual Gauge)



**Figure 9. Drawing dimension TO-220 (type STD-ST Single Gauge)**

**SECTION A-A**

MARKING SIDE

Dimensions for SECTION A-A:

- (1)  $0.75 \pm 0.1$
- (2)  $2.2$
- (3)  $4.4$
- (4)  $\varnothing 5.9 \pm 0.1$
- (5)  $31.4 \pm 0.2$
- (6)  $\varnothing 3.1 \pm 0.05$
- (7)  $16.3 \pm 0.2$
- (8)  $5.5$

Dimensions for Side View:

- (9)  $\pm 0.2$
- (10)  $\pm 0.2$
- (11)  $532 \pm 0.5$
- (12)  $6.5 \pm 0.2$
- (13)  $6.5 \pm 0.2$

PRINTING AREA - SEE SPEC. DOC. Nr. 0062566  
PRINT HEIGHT "A" = 3mm.

Dimensions for Top View:

- (14)  $56$
- (15)  $113$
- (16)  $94$
- (17)  $10$
- (18)  $2$

TO-220FP mechanical data

Dim.	mm.			inch.		
	Min.	Typ	Max.	Min.	Typ.	Max.
A	4.40		4.60	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.45		0.70	0.017		0.027
F	0.75		1	0.030		0.039
F1	1.15		1.50	0.045		0.059
F2	1.15		1.50	0.045		0.059
G	4.95		5.2	0.194		0.204
G1	2.4		2.7	0.094		0.106
H	10.0		10.40	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L4	9.8		10.6	0.385		0.417
L5	2.9		3.6	0.114		0.142
L6	15.9		16.4	0.626		0.645
L7	9		9.3	0.354		0.366
DIA.	3		3.2	0.118		0.126

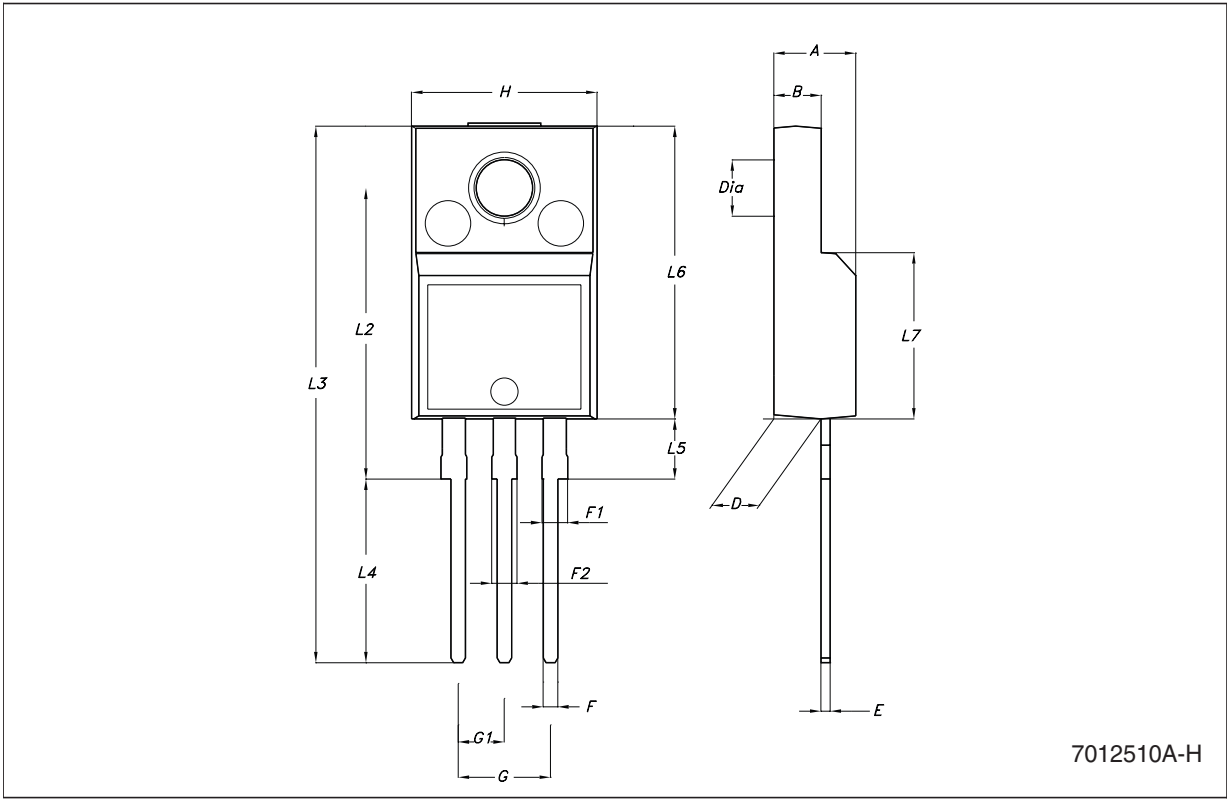




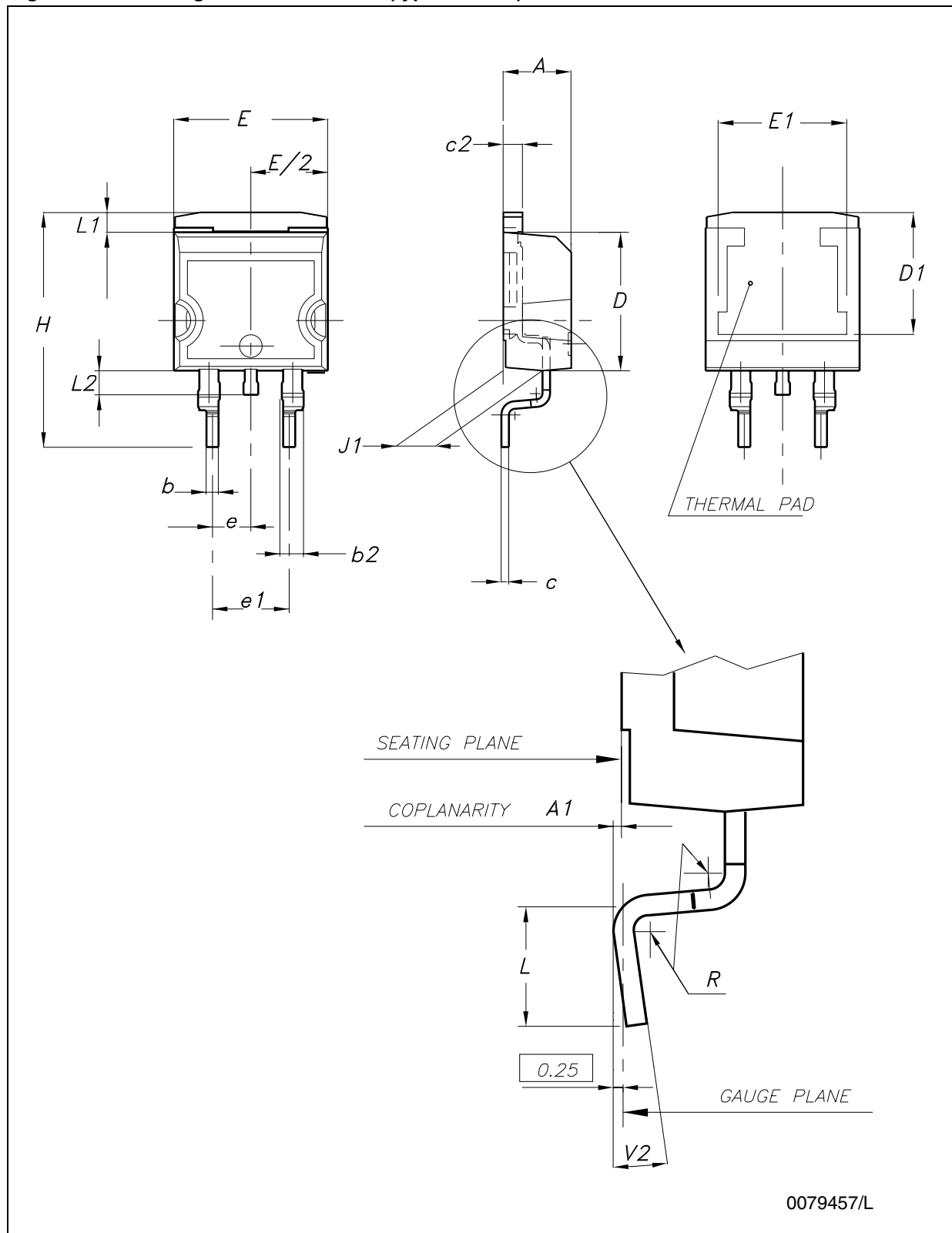
Figure 12. Drawing dimension D<sup>2</sup>PAK (type STD-ST)

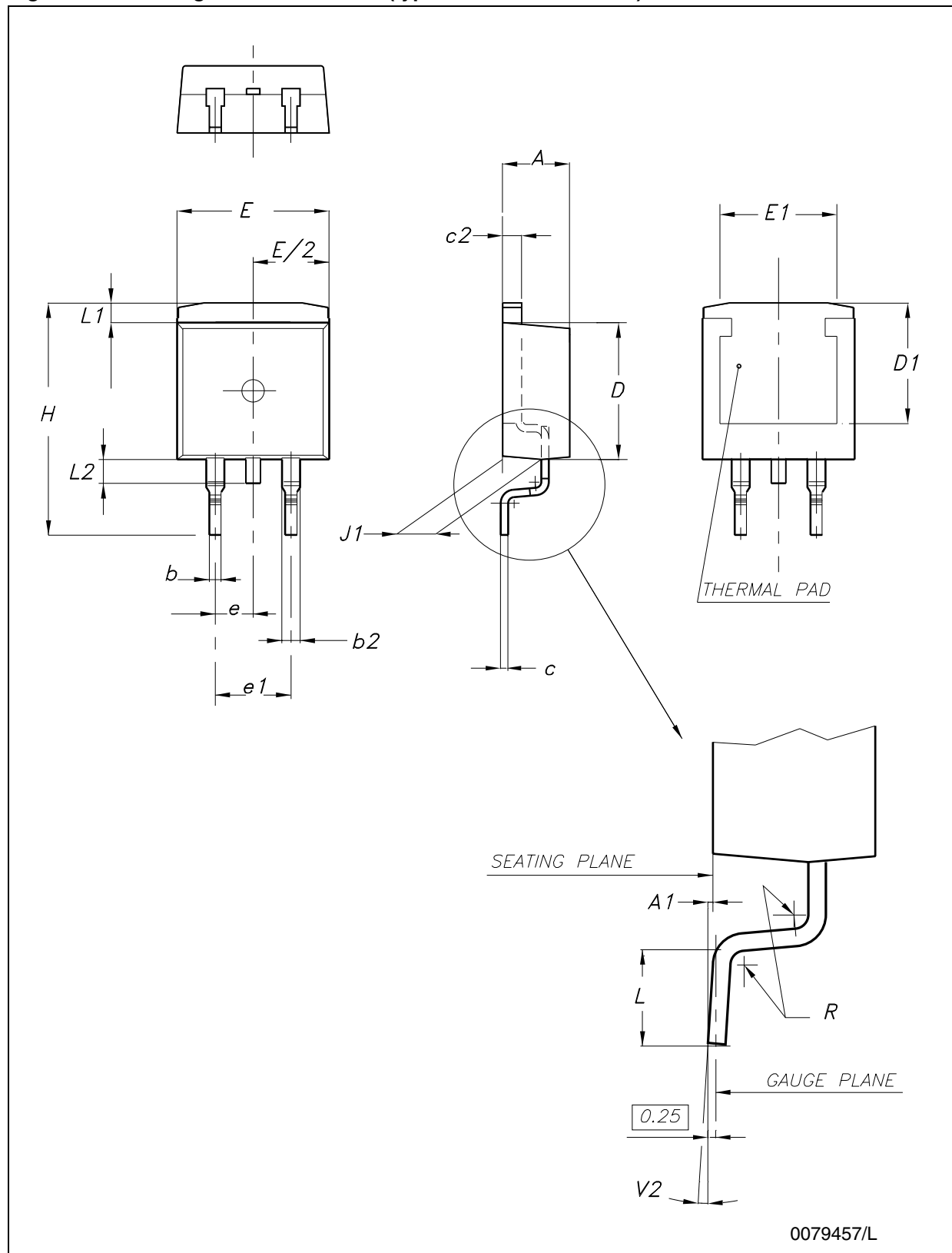
Figure 13. Drawing dimension D<sup>2</sup>PAK (type WOOSEOK-subcon.)

Table 9. D<sup>2</sup>PAK mechanical data

Dim.	Type STD-ST			Type WOOSEOK-subcon.		
	mm.			mm.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.40		4.60	4.30		4.70
A1	0.03		0.23	0		0.20
b	0.70		0.93	0.70		0.90
b2	1.14		1.70	1.17		1.37
c	0.45		0.60	0.45	0.50	0.60
c2	1.23		1.36	1.25	1.30	1.40
D	8.95		9.35	9	9.20	9.40
D1	7.50			7.50		
E	10		10.40	9.80		10.20
E1	8.50			7.50		
e		2.54			2.54	
e1	4.88		5.28		5.08	
H	15		15.85	15	15.30	15.60
J1	2.49		2.69	2.20		2.60
L	2.29		2.79	1.79		2.79
L1	1.27		1.40	1		1.40
L2	1.30		1.75	1.20		1.60
R		0.4			0.30	
V2	0°		8°	0°		3°

**Note:** The D<sup>2</sup>PAK package coming from the subcontractor WOOSEOK is fully compatible with the ST's package suggested footprint.

Figure 14. D<sup>2</sup>PAK footprint recommended data

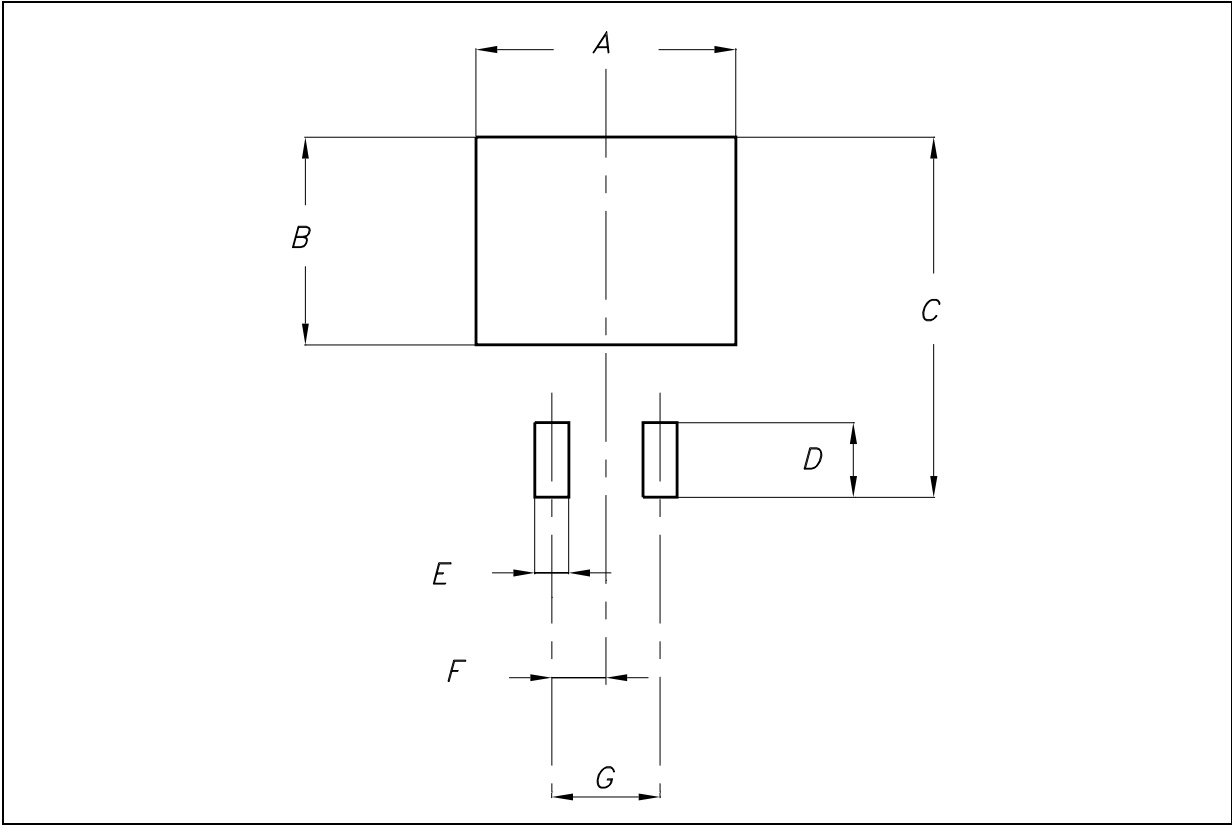
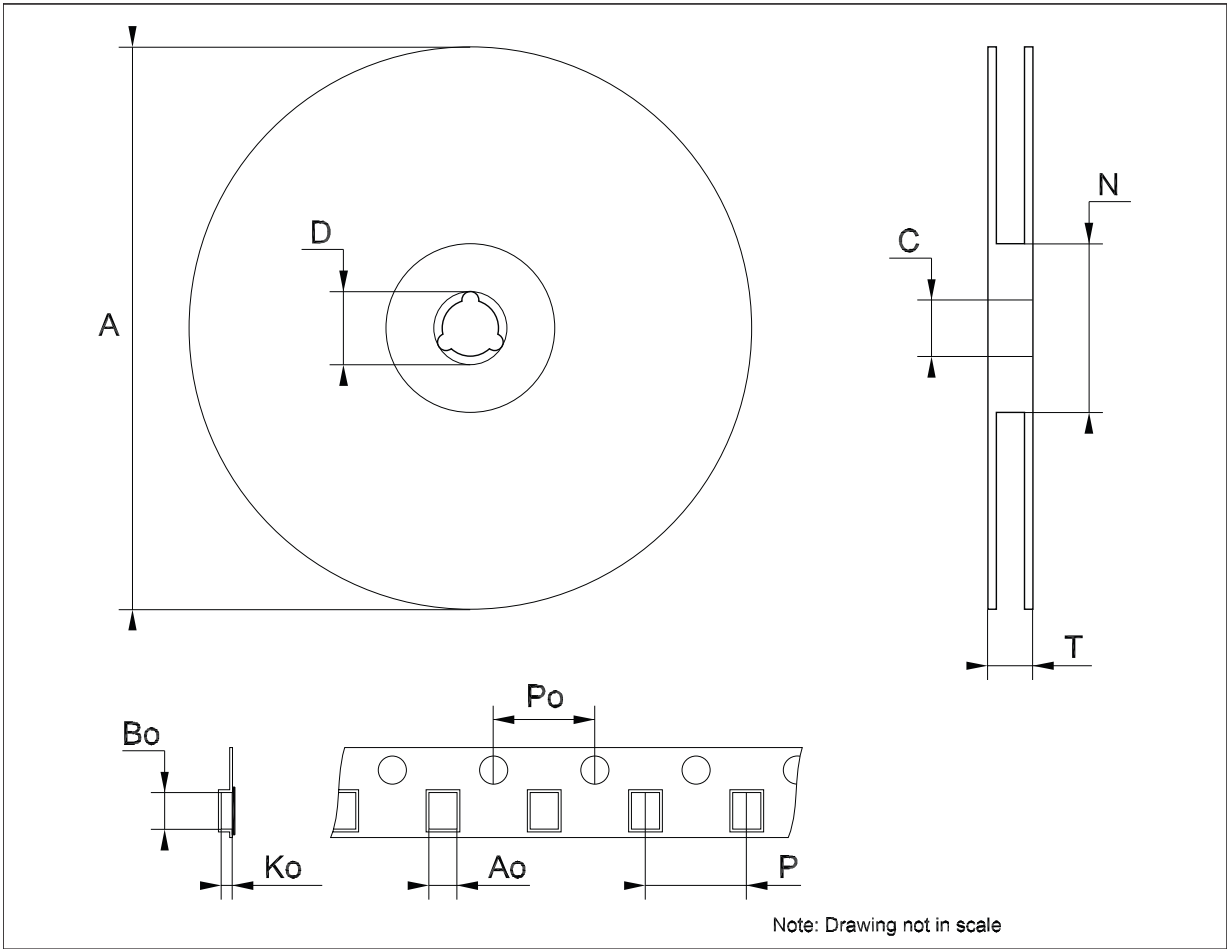


Table 10. Footprint data

Values		
Dim.	mm.	inch.
A	12.20	0.480
B	9.75	0.384
C	16.90	0.665
D	3.50	0.138
E	1.60	0.063
F	2.54	0.100
G	5.08	0.200

Tape & reel D<sup>2</sup>PAK-P<sup>2</sup>PAK-D<sup>2</sup>PAK/A-P<sup>2</sup>PAK/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



## 8 Revision history

**Table 11. 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	D <sup>2</sup> PAK mechanical data updated and add footprint data.
06-Jun-2007	12	Order codes updated.
25-Oct-2007	13	Modified: <a href="#">Figure 3</a> , <a href="#">Figure 4</a> , <a href="#">Figure 6</a> and <a href="#">Figure 7</a> .
05-Dec-2007	14	Modified: <a href="#">Table 1</a> .
18-Feb-2008	15	Modified: <a href="#">Table 1 on page 1</a> .
15-Jul-2008	16	Modified: <a href="#">Table 1 on page 1</a> .
19-Jan-2010	17	Modified: <a href="#">Table 8 on page 13</a> , added: <a href="#">Figure 8 on page 14</a> , <a href="#">Figure 9 on page 15</a> , <a href="#">Figure 10</a> and <a href="#">Figure 11 on page 16</a> .
26-May-2010	18	Modified: $V_I$ parameter <a href="#">Table 2 on page 5</a> .
12-Nov-2010	19	Modified: $R_{thJC}$ value for TO-220 <a href="#">Table 3 on page 5</a> .
18-Nov-2011	20	Added: order codes L7905CV-DG, L7912CV-DG and L7915CV-DG <a href="#">Table 1 on page 1</a> .
15-May-2012	21	Added: order codes L7908CV-DG <a href="#">Table 1 on page 1</a> .

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