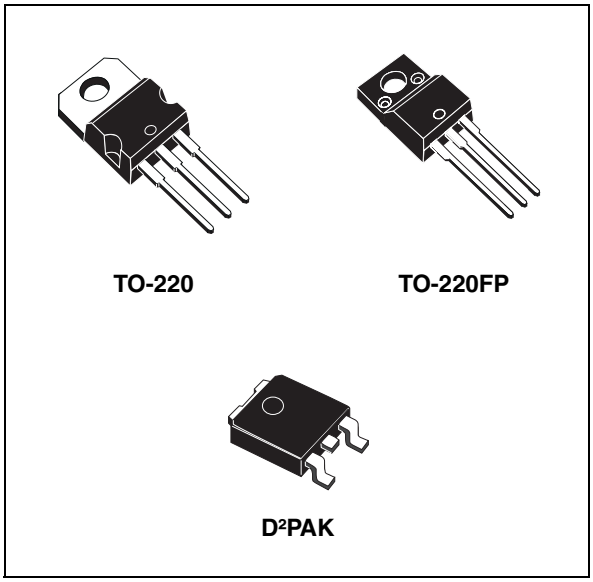
L79xxC

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



Description

The L79xxC 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 L78xx 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

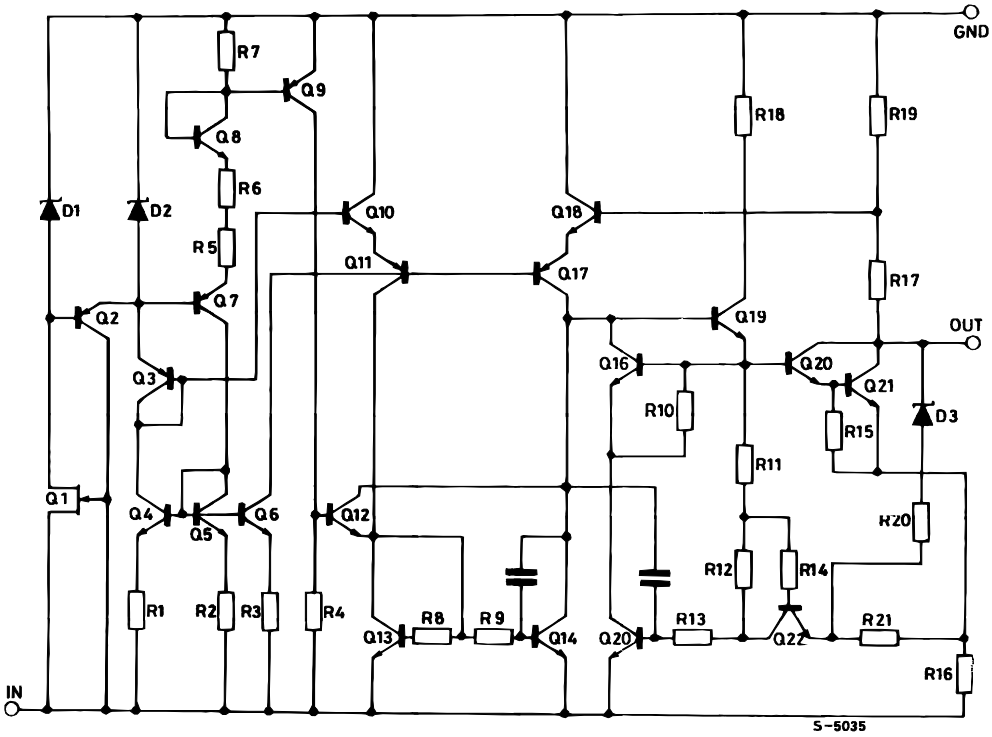
Part numbers	Order codes				Output voltages
	TO-220		D²PAK	TO-220FP	
L7905C	L7905CV	L7905CV-DG (1)	L7905CD2T-TR	L7905CP	- 5 V
L7908C	L7908CV	L7908CV-DG (1)			- 8 V
L7912C	L7912CV	L7912CV-DG (1)	L7912CD2T-TR	L7912CP	- 12 V
L7915C	L7915CV	L7915CV-DG (1)	L7915CD2T-TR	L7915CP	- 15 V

1. TO-220 Dual Gauge frame.

Contents

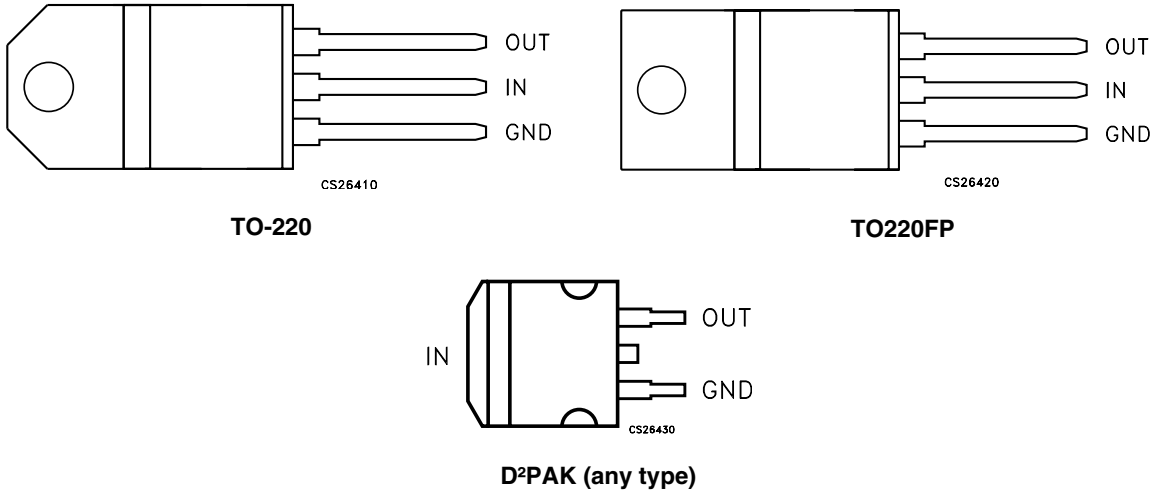
1 Diagram

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	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

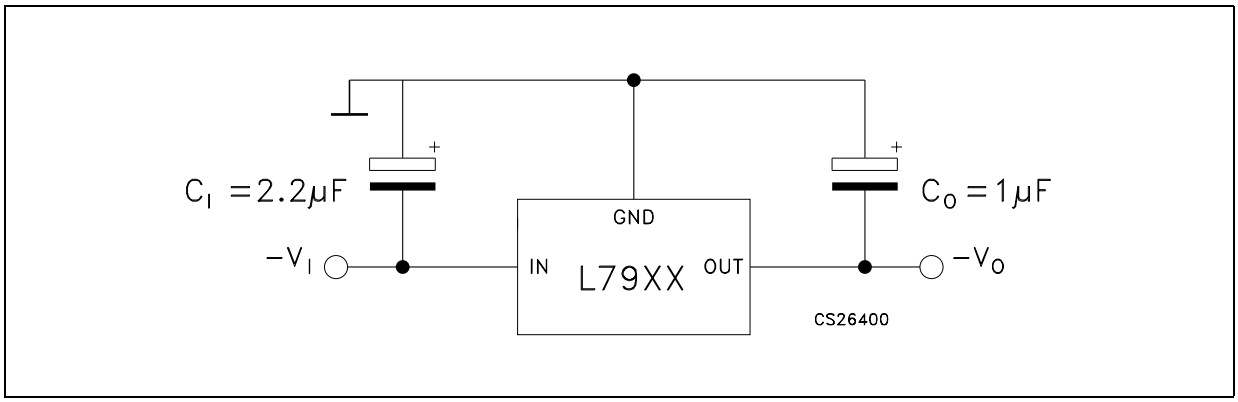
Note: Absolute maximum ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

Table 3. Thermal data

Symbol	Parameter	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 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 = 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

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 5. 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 = 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

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 6. 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 = 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

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.

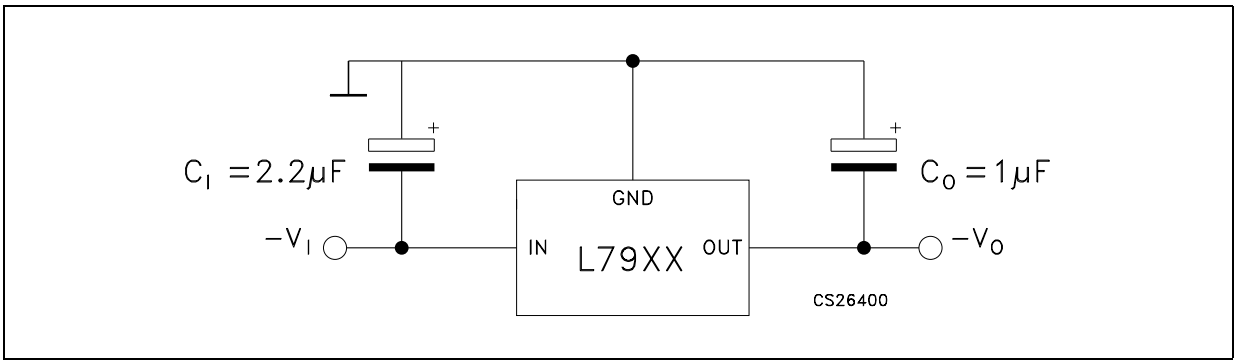
Table 7. Electrical characteristics of L7915C

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 = 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

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.

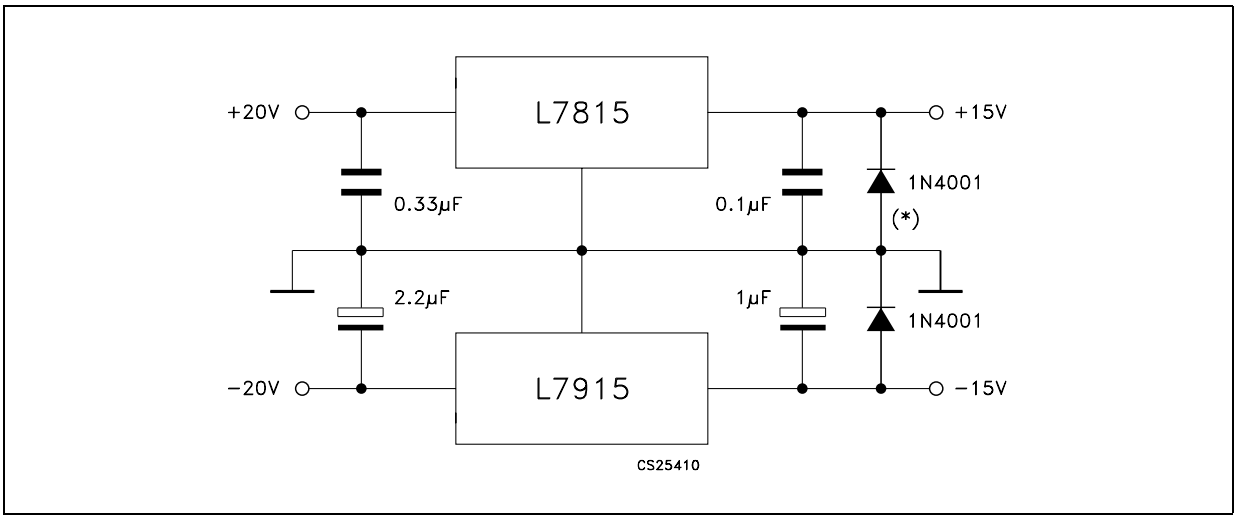
6 Application information

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. 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 5. Split power supply (± 15 V - 1 A)

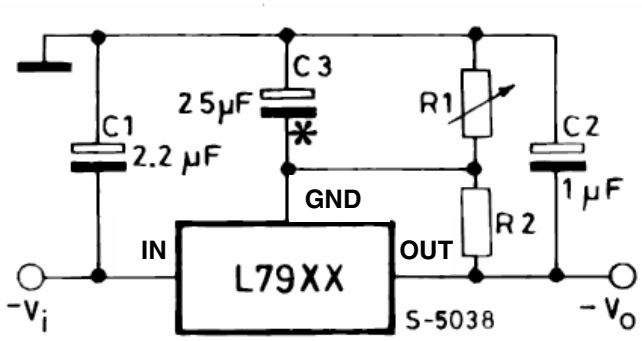


(*) Against potential latch-up problems.

Figure 6. Circuit for increasing output voltage

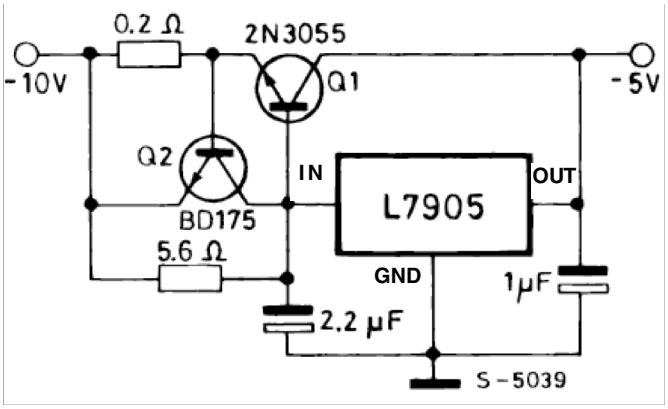
$V_O=V_{XX}(R_1+R_2)/R_2$

$V_{XX}/R_2 > 3I_d$



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.

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	
∅P	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)

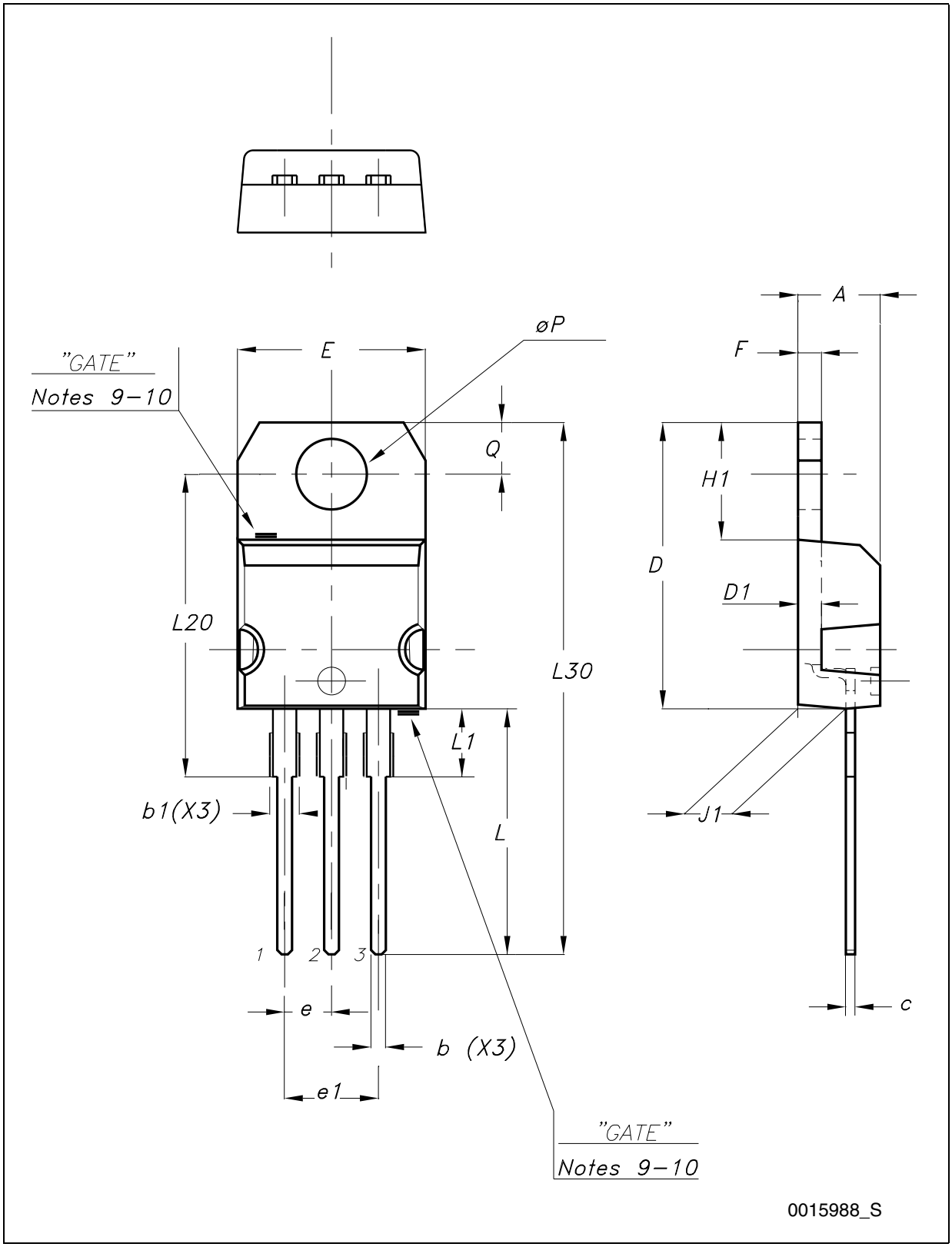


Figure 9. Drawing dimension TO-220 (type STD-ST Single Gauge)

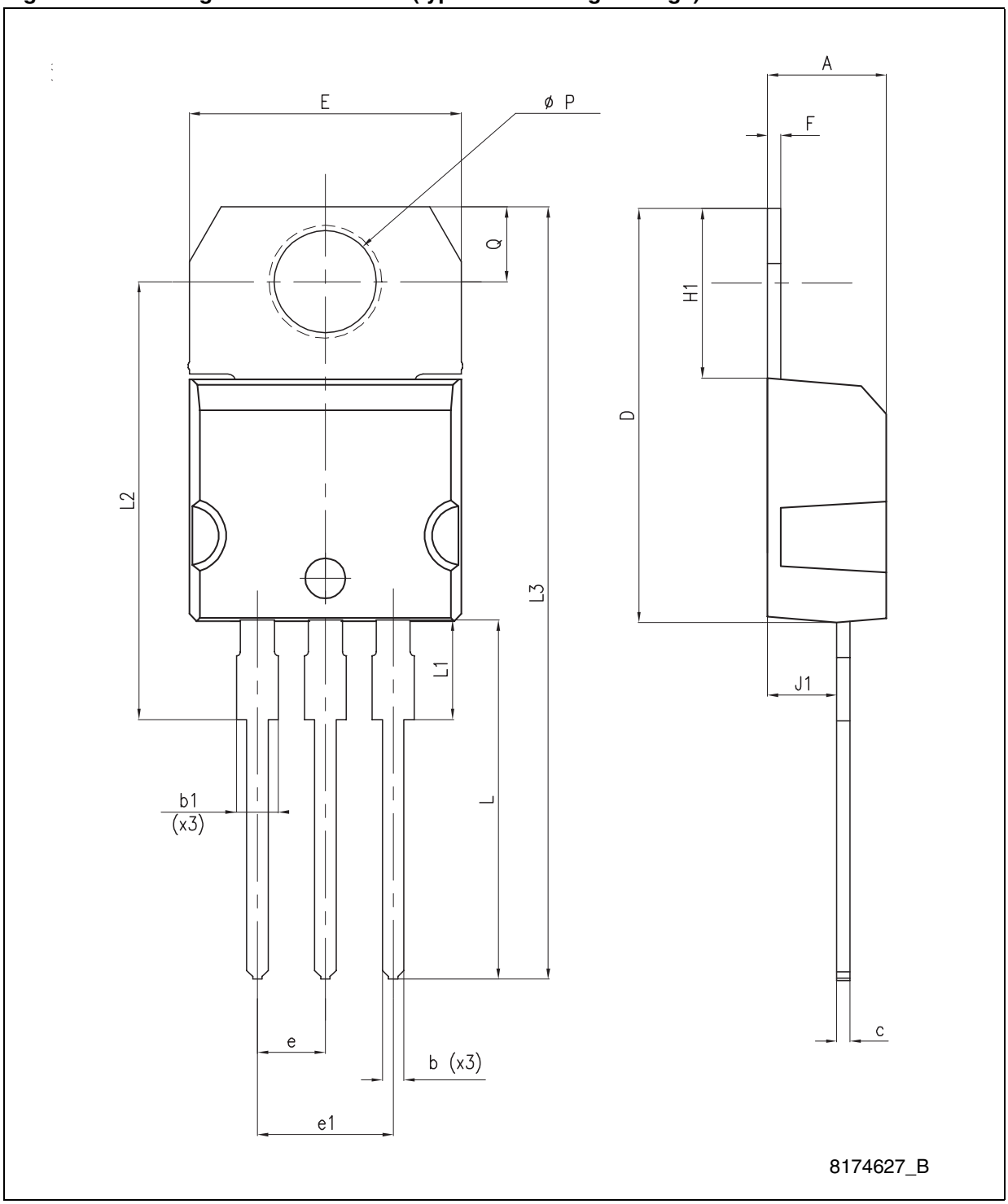


Figure 10. Drawing dimension tube for TO-220 Dual Gauge (mm)

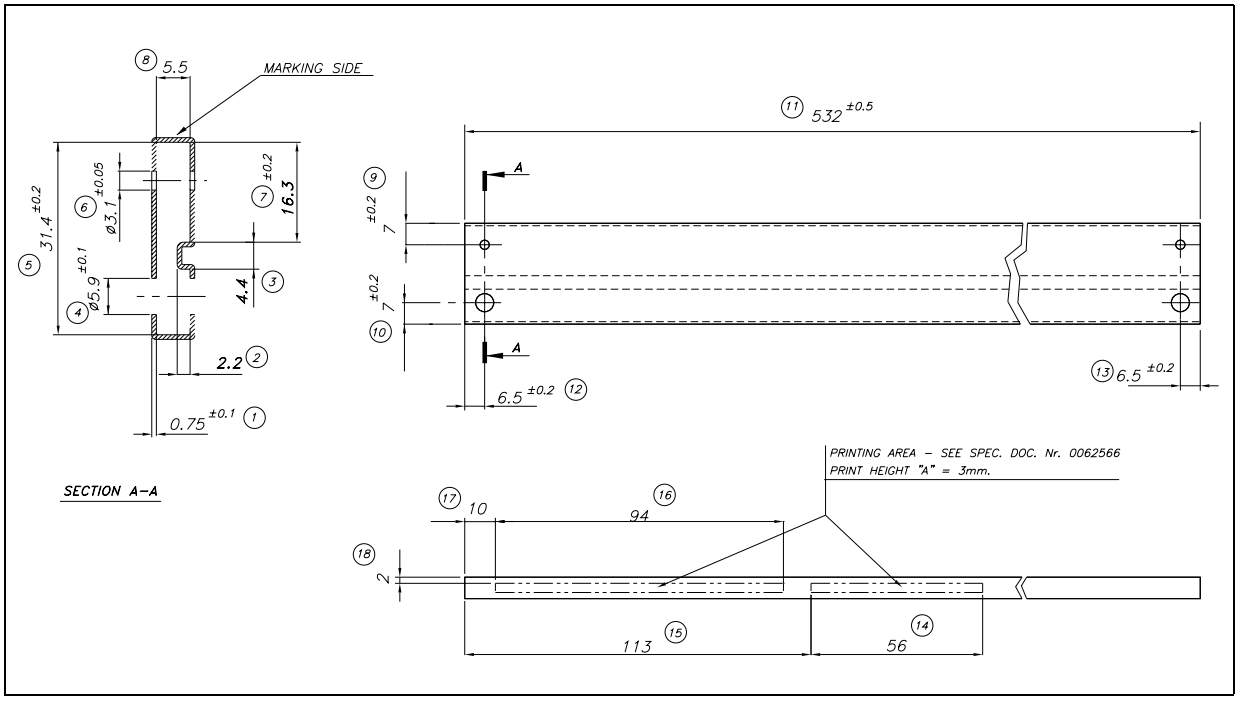
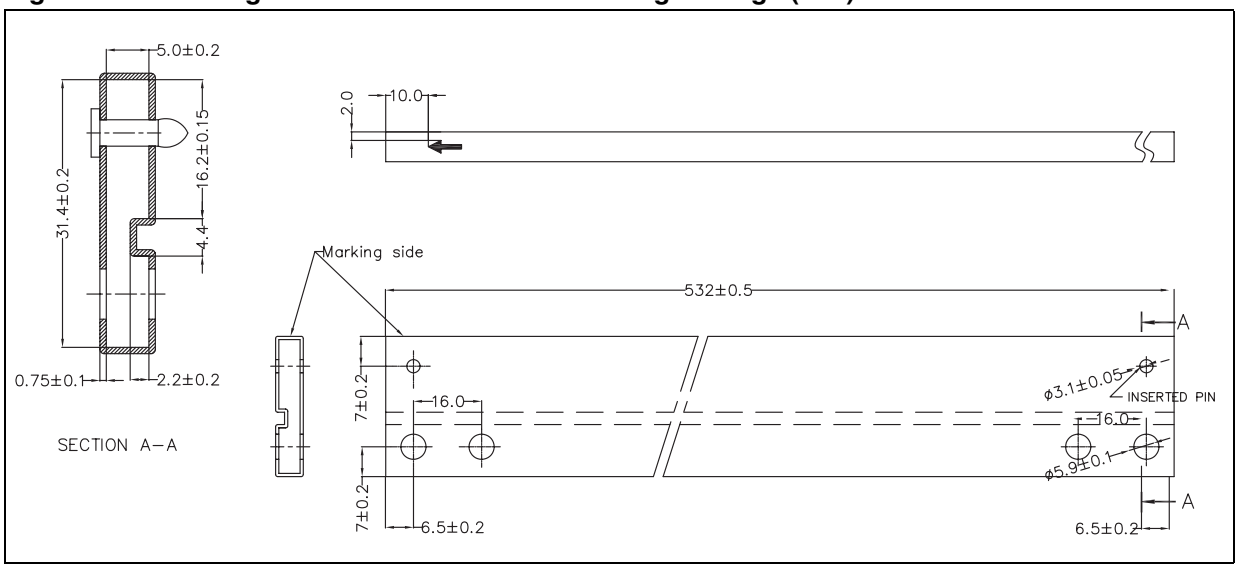


Figure 11. Drawing dimension tube for TO-220 Single Gauge (mm)



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

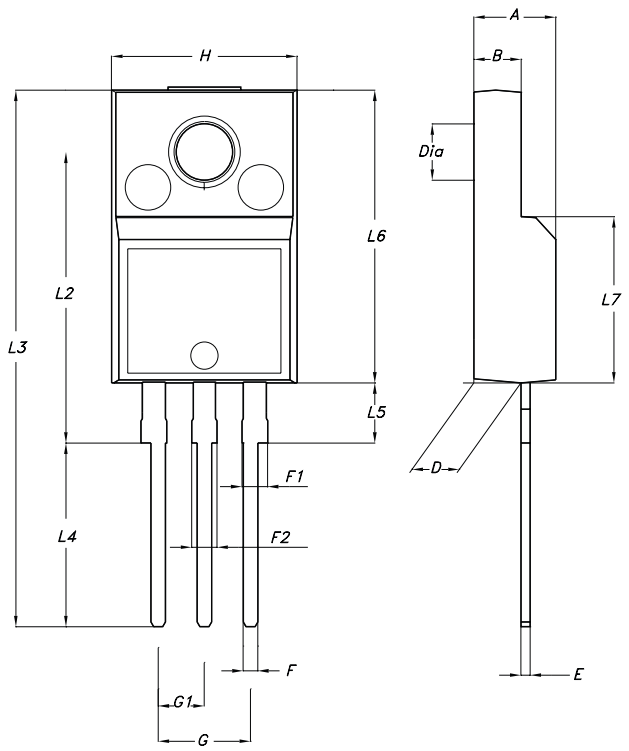


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Figure 12. Drawing dimension D²PAK (type STD-ST)

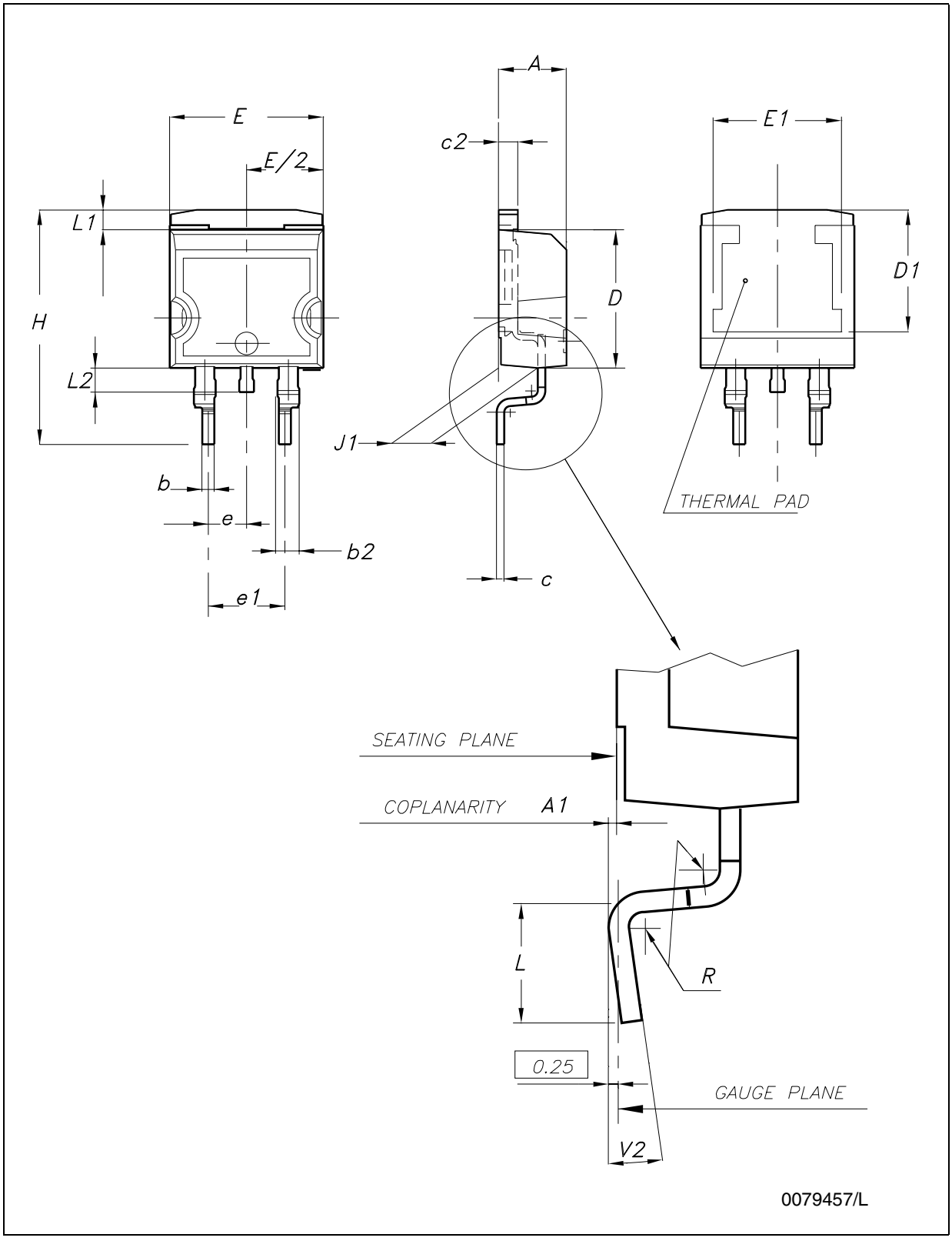


Figure 13. Drawing dimension D²PAK (type WOOSEOK-subcon.)

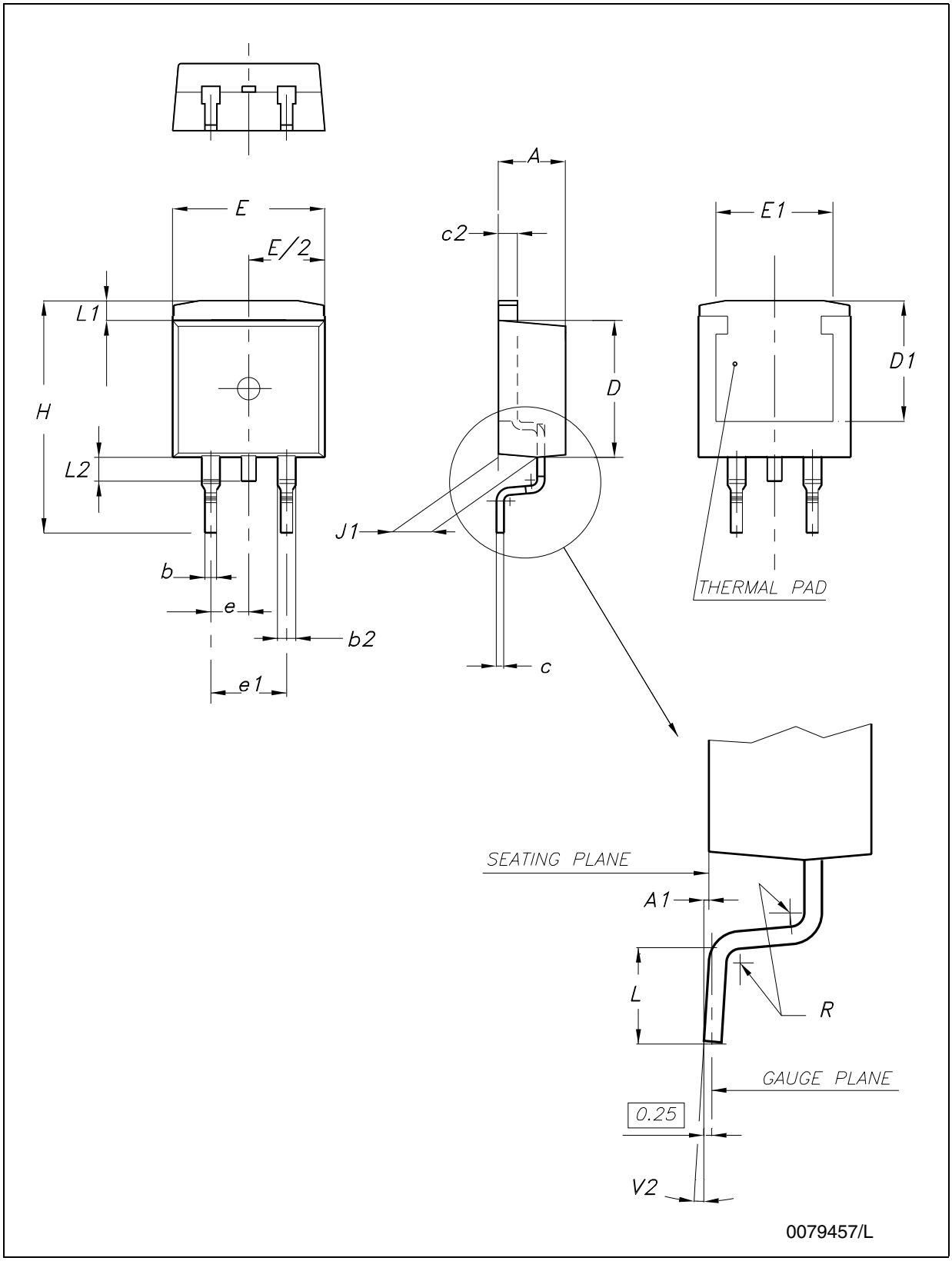


Table 9. D²PAK mechanical data

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 D²PAK package coming from the subcontractor WOOSEOK is fully compatible with the ST's package suggested footprint.

Figure 14. D²PAK footprint recommended data

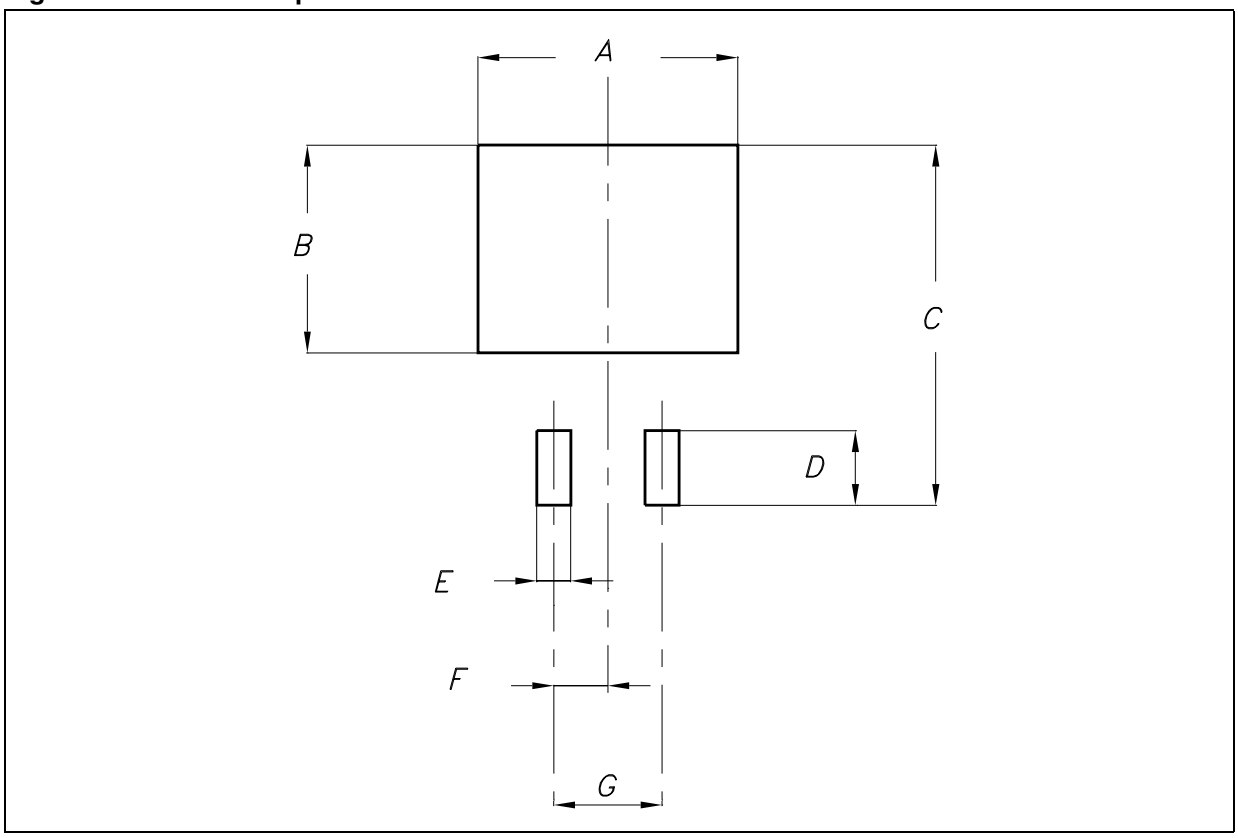
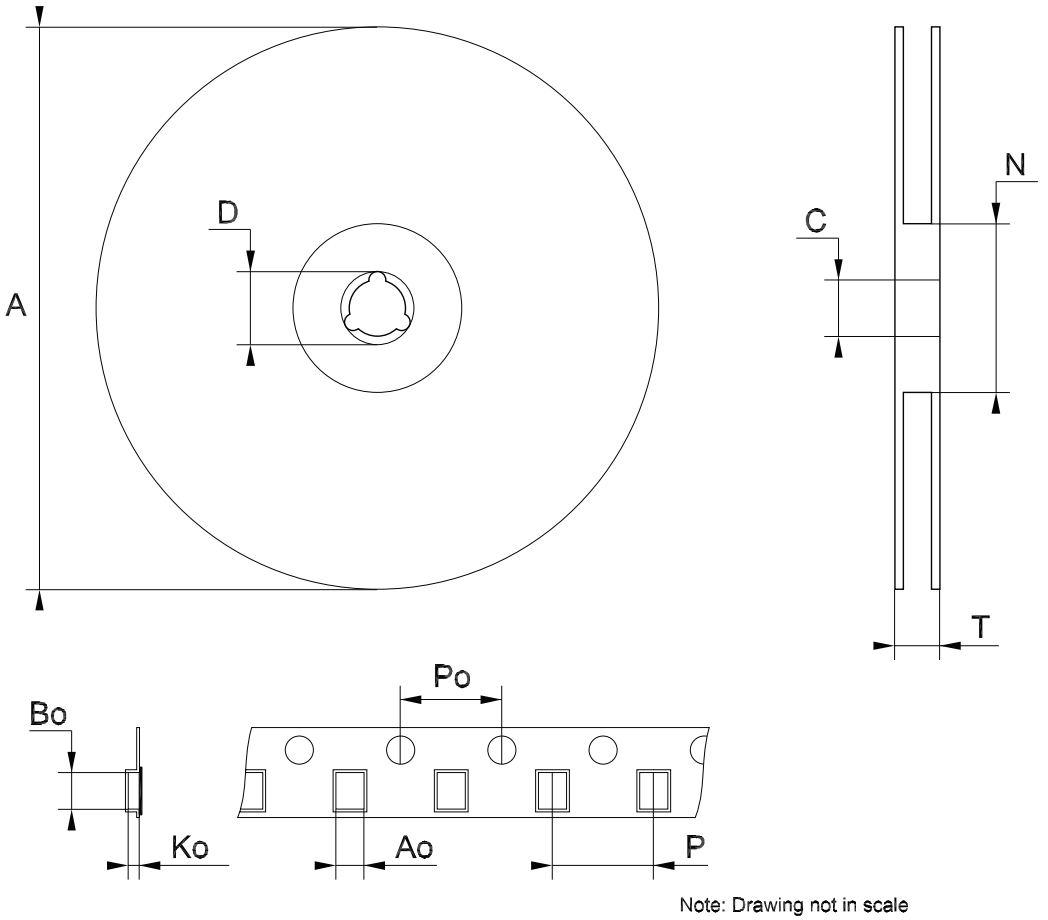


Table 10. Footprint data

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^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 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	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 8 on page 13*, added: *Figure 8 on page 14*, *Figure 9 on page 15*, *Figure 10* and *Figure 11 on page 16*.
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*.

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