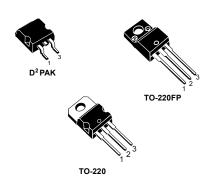


Negative voltage regulators



Features

- Output current up to 1.5 A
- Output voltages: -5, -8, -12, and -5 V
- · Thermal overload protection
- · Short-circuit protection
- Output 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.

Maturity status link

L79



1 Diagram

R1 R2 R3 R4 Q13 R8 R9 Q14 Q15 R13 Q22 R21 R16

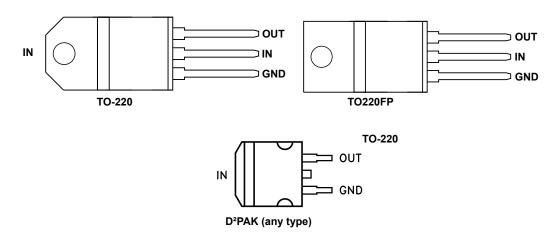
Figure 1. Schematic diagram

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Pin configuration

Figure 2. Pin connections (top view)



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3 Maximum ratings

Table 1. Absolute maximum ratings

Symbol	Parameter		Value	Unit
VI	DC input voltage		-35	V
Io	Output current	Output current		
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
I OP	Operating junction temperature range	for L79xxAC	0 to 125	C

Note: Note: 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

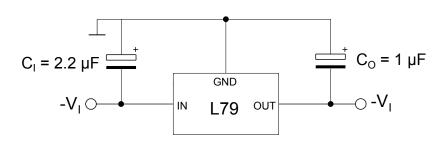
Symbol	Parameter	D ² PAK	TO-220	TO-220FP	Unit
R _{thJC}	Thermal resistance junction-case	3	5	5	°C/W
R _{thJA}	Thermal resistance junction-ambient	62.5	50	60	°C/W

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4 Test circuit

Figure 3. Test circuit



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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 μ F, C_O = 1 μ F unless otherwise specified.

Test conditions **Symbol Parameter** Min. Max. Unit Тур. V_{O} $T_J = 25$ °C Output voltage -4.9 -5 -5.1 V I_O = -5 mA to -1 A, $P_O \le 15$ W V_{O} ٧ Output voltage -4.8 -5 -5.2 $V_1 = -8 \text{ to } -20 \text{ V}$ V_I = -7 to -25 V, T_J = 25 °C 100 $\Delta V_O\ ^{(1)}$ Line regulation mV V_I = -8 to -12 V, T_J = 25 °C 50 I_O = 5 mA to 1.5 A, T_J = 25 °C 100 $\Delta V_O^{\ (1)}$ Load regulation mV I_O = 250 to 750 mA, T_J = 25 °C 50 Quiescent current T_{.1} = 25 °C I_d 3 mA I_O = 5 mA to 1 A 0.5 ΔI_d Quiescent current change $\mathsf{m}\mathsf{A}$ $V_1 = -8 \text{ to } -25 \text{ V}$ 1.3 $\Delta V_O/\Delta VT$ Output voltage drift $I_O = 5 \text{ mA}$ mV/°C -0.4 B = 10 Hz to 100 kHz, T_J = 25 °C 100 eN Output noise voltage μV $\Delta V_1 = 10 \text{ V, f} = 120 \text{ Hz}$ SVR Supply voltage rejection 54 60 dΒ I_O = 1 A, T_J = 25 °C, ΔV_O = 100 V_d ٧ Dropout voltage 1.4 Short circuit current 1.8 Α I_{sc}

Table 3. Electrical characteristics of L7905AC

1.8

Α

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

 $T_J = 25 \, ^{\circ}C$

Short circuit peak current

I_{scp}

Table 4. Electrical characteristics of L7905C

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
Vo	Output voltage	T _J = 25 °C	-4.8	-5	-5.2	V
Vo	Output voltage	$I_O = -5 \text{ mA to } -1 \text{ A}, P_O \le 15 \text{ W}$ $V_I = -8 \text{ to } -20 \text{ V}$	-4.75	-5	-5.25	٧
ΔV _O ⁽¹⁾	Line regulation	V_I = -7 to -25 V, T_J = 25 °C			100	mV
Δν0 τ	Line regulation	V_{I} = -8 to -12 V, T_{J} = 25 °C			50	IIIV
ΔV _O ⁽¹⁾	Load regulation	I_{O} = 5 mA to 1.5 A, T_{J} = 25 °C			100	mV
ΔVO	Load regulation	I_{O} = 250 to 750 mA, T_{J} = 25 °C			50	IIIV
I _d	Quiescent current	T _J = 25 °C			3	mA

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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.



Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
Δl _d	Ouisseent current change	I _O = 5 mA to 1 A			0.5	m 1
Δid	Quiescent current change	$V_I = -8 \text{ to } -25 \text{ V}$			1.3	mA
ΔV _O /ΔΤ	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			1.8		Α

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 μ F, C_O = 1 μ F unless otherwise specified.

Table 5. Electrical characteristics of L7908C

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
Vo	Output voltage	T _J = 25 °C	-7.7	-8	-8.3	V
V _O	Output voltage	$I_O = -5 \text{ mA to } -1 \text{ A, P}_O \le 15 \text{ W}$ $V_I = -11.5 \text{ to } -23 \text{ V}$	-7.6	-8	-8.4	V
ΔV _O ⁽¹⁾	Line regulation	V_{I} = -10.5 to -25 V, T_{J} = 25 °C			160	mV
Δνο	Line regulation	V _I = -11 to -17 V, T _J = 25 °C			80	IIIV
A)/ (1)	I and an audation	I _O = 5 mA to 1.5 A, T _J = 25 °C			160	>/
$\Delta V_{O}^{(1)}$	Load regulation	I _O = 250 to 750 mA, T _J = 25 °C			80	mV
I _d	Quiescent current	T _J = 25 °C			3	mA
A1.	Outroport surrent shares	I _O = 5 mA to 1 A			0.5	^
Δl _d	Quiescent current change	V _I = -11.5 to -25 V			1	mA
ΔV _O /ΔΤ	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		А

^{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.

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

Table 6. Electrical characteristics of L7912AC

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
V _O	Output voltage	T _J = 25 °C	-11.75	-12	-12.25	V
V _O	Output voltage	$I_O = -5 \text{ mA to } -1 \text{ A, P}_O \le 15 \text{ W}$ $V_I = -15.5 \text{ to } -27 \text{ V}$	-11.5	-12	-12.5	V
ΔV _O ⁽¹⁾	Line regulation	V _I = -14.5 to -30 V, T _J = 25 °C			240	mV
Δνο (Line regulation	V _I = -16 to -22 V, T _J = 25 °C			120	IIIV
ΔV _O ⁽¹⁾	Load regulation	I_O = 5 mA to 1.5 A, T_J = 25 °C			240	mV
Δν ₀ (*)	Load regulation	I_{O} = 250 to 750 mA, T_{J} = 25 °C			120	IIIV
I _d	Quiescent current	T _J = 25 °C			3	mA
Λ1	Outre continues at about	I _O = 5 mA to 1 A			0.5	A
Δl _d	Quiescent current change	V _I = -15 to -30 V			1	mA
$\Delta V_O/\Delta T$	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	$I_O = 1 \text{ A}, T_J = 25 \text{ °C},$ $\Delta V_O = 100 \text{ mV}$		1.1		V
I _{sc}	Short circuit current			1.0		Α
I _{scp}	Short circuit peak current	T _J = 25 °C, V _I = -10 V		1.8		Α

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 μ F, C_O = 1 μ F unless otherwise specified.

Table 7. Electrical characteristics of L7912C

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
V _O	Output voltage	T _J = 25 °C	-11.5	-12	-12.5	V
Vo	Output voltage	$I_O = -5 \text{ mA to } -1 \text{ A}, P_O \le 15 \text{ W}$ $V_I = -15.5 \text{ to } -27 \text{ V}$	-11.4	-12	-12.6	V
ΔV _O ⁽¹⁾	Line regulation	$V_I = -14.5 \text{ to } -30 \text{ V}, T_J = 25 ^{\circ}\text{C}$			240	mV
Δν0 τ	Line regulation	V_{I} = -16 to -22 V, T_{J} = 25 °C			120	IIIV
ΔV _O ⁽¹⁾	Load regulation	$I_{\rm O}$ = 5 mA to 1.5 A, $T_{\rm J}$ = 25 °C			240	mV
Δνο (7)	Load regulation	I _O = 250 to 750 mA, T _J = 25 °C			120	IIIV
I _d	Quiescent current	T _J = 25 °C			3	mA

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Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
Λ1.	Quiaccent current change	I _O = 5 mA to 1 A			0.5	m 1
Δl _d	Quiescent current change	V _I = -15 to -30 V			1	mA
ΔV _O /ΔΤ	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			1.0		Α

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 μ F, C_O = 1 μ F unless otherwise specified.

Table 8. Electrical characteristics of L7915AC

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
V _O	Output voltage	T _J = 25 °C	-14.7	-15	-15.3	V
Vo	Output voltage	$I_O = -5 \text{ mA to } -1 \text{ A, P}_O \le 15 \text{ W}$ $V_I = -18.5 \text{ to } -30 \text{ V}$	-14.4	-15	-15.6	V
A)/ (1)	Line regulation	V _I = -17.5 to -30 V, T _J = 25 °C			300	m\/
$\Delta V_{O}^{(1)}$	Line regulation	V _I = -20 to -26 V, T _J = 25 °C			150	mV
A)/ (1)	Land manufation	I_O = 5 mA to 1.5 A, T_J = 25 °C			300	\ /
$\Delta V_{O}^{(1)}$	Load regulation	I _O = 250 to 750 mA, T _J = 25 °C			150	mV
I _d	Quiescent current	T _J = 25 °C			3	mA
Δ1.	Outroport surrent shares	I _O = 5 mA to 1 A			0.5	A
Δl _d	Quiescent current change	V _I = -18.5 to -30 V			1	mA
$\Delta V_O/\Delta T$	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	$I_O = 1 \text{ A}, T_J = 25 \text{ °C},$ $\Delta V_O = 100 \text{ mV}$		1.1		V
I _{sc}	Short circuit current			0.7		Α
I _{scp}	Short circuit peak current	T _J = 25 °C, V _I = -10 V		1.8		Α

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.

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

Table 9. Electrical characteristics of L7915C

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
Vo	Output voltage	T _J = 25 °C	-14.4	-15	-15.6	V
V _O	Output voltage	$I_O = -5 \text{ mA to } -1 \text{ A, P}_O \le 15 \text{ W}$ $V_I = -18.5 \text{ to } -30 \text{ V}$	-14.3	-15	-15.7	V
ΔV _O ⁽¹⁾	Line regulation	V _I = -17.5 to -30 V, T _J = 25 °C			300	mV
Δνο	Line regulation	V _I = -20 to -26 V, T _J = 25 °C			150	IIIV
ΔV _O ⁽¹⁾	Lood regulation	$I_{\rm O}$ = 5 mA to 1.5 A, $T_{\rm J}$ = 25 °C			300	mV
Δνο	Load regulation	I_{O} = 250 to 750 mA, T_{J} = 25 °C			150	IIIV
I _d	Quiescent current	T _J = 25 °C			3	mA
Δl _d	Quiescent current change	I _O = 5 mA to 1 A			0.5	mA
Δid	Quiescent current change	V _I = -18.5 to -30 V			1	IIIA
$\Delta V_O/\Delta T$	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			0.7		Α

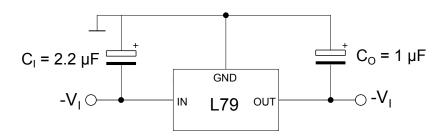
^{1.} Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

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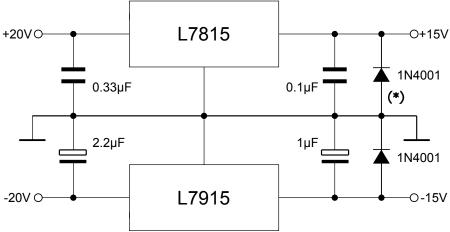
6 Application information

Figure 4. Fixed output regulator



Note: C_l 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_0 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)

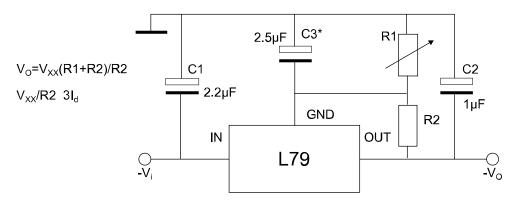


^{*} Against potential latch-up problems

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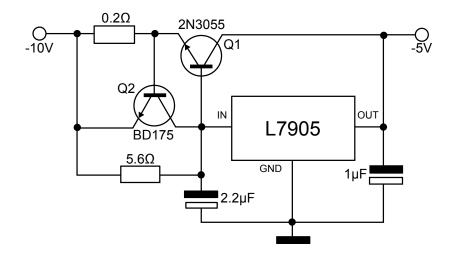


Figure 6. Circuit for increasing output voltage



^{*} C3 Optional for improved transient response and ripple rejection.

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



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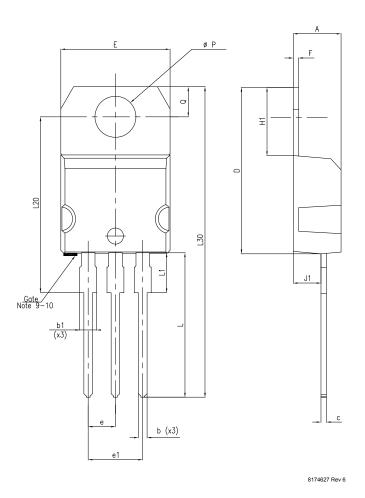
7 Package information

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.

7.1 TO-220 (single gauge) package information

Figure 8. TO-220 (single gauge) package outline



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Table 10. TO-220 (single gauge) package mechanical data

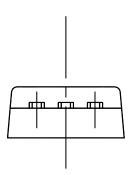
Dim.		mm	
Dim.	Min.	Тур.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.70
С	0.48		0.70
D	15.25		15.75
E	10.00		10.40
е	2.40		2.70
e1	4.95		5.15
F	0.51		0.60
H1	6.20		6.60
J1	2.40		2.72
L	13.00		14.00
L1	3.50		3.93
L20		16.40	
L30		28.90	
ФР	3.75		3.85
Q	2.65		2.95

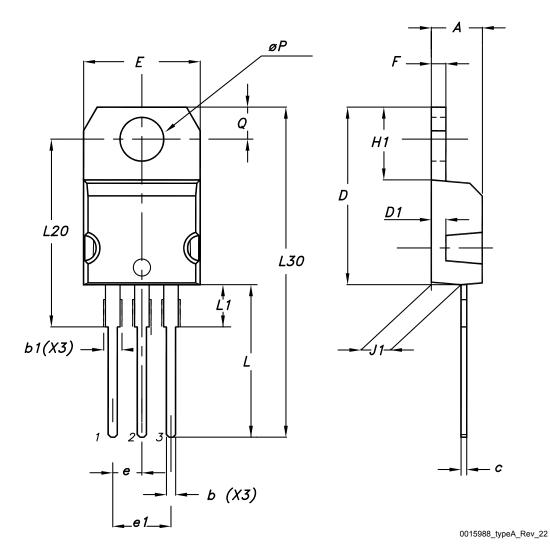
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7.2 TO-220 (dual gauge) package information

Figure 9. TO-220 type A package outline





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Table 11. TO-220 type A package mechanical data

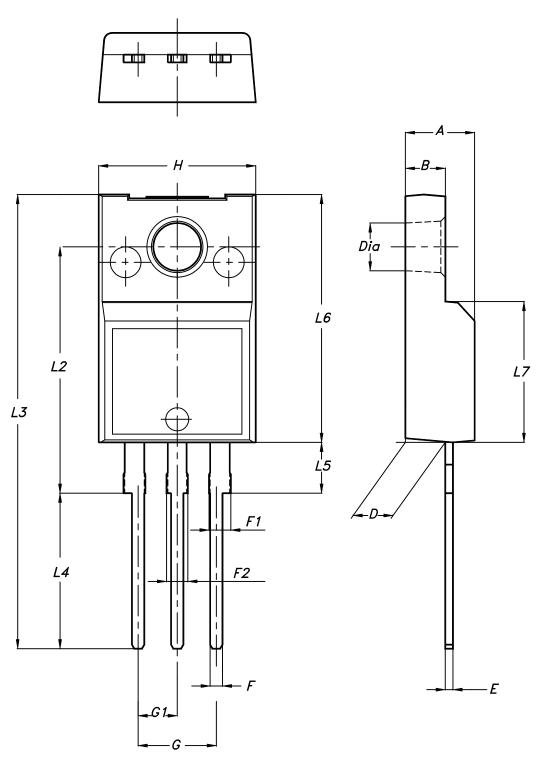
Dim.		mm	
Dim.	Min.	Тур.	Max.
Α	4.40		4.60
b	0.61		0.88
b1	1.14		1.55
С	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10.00		10.40
е	2.40		2.70
e1	4.95		5.15
F	1.23		1.32
H1	6.20		6.60
J1	2.40		2.72
L	13.00		14.00
L1	3.50		3.93
L20		16.40	
L30		28.90	
øΡ	3.75		3.85
Q	2.65		2.95

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7.3 TO-220FP package information

Figure 10. TO-220FP package outline



7012510_Rev_12_B

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Table 12. TO-220FP package mechanical data

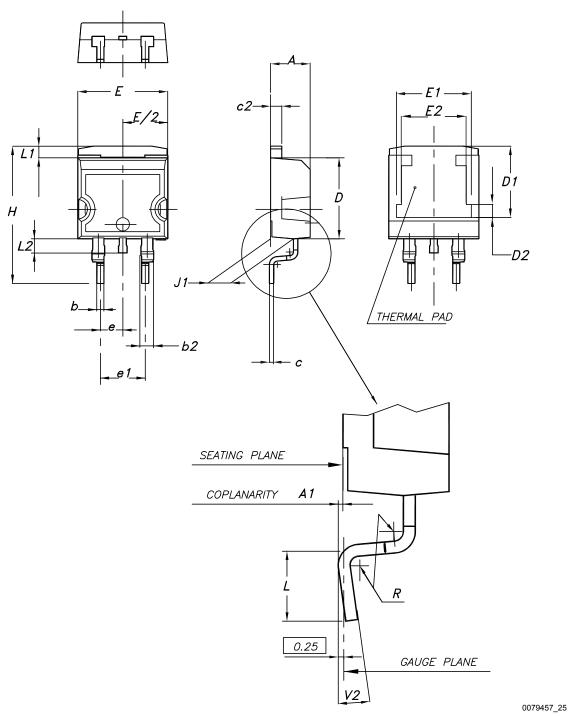
Dim.		mm	
Dilli.	Min.	Тур.	Max.
Α	4.4		4.6
В	2.5		2.7
D	2.5		2.75
E	0.45		0.7
F	0.75		1
F1	1.15		1.70
F2	1.15		1.70
G	4.95		5.2
G1	2.4		2.7
Н	10		10.4
L2		16	
L3	28.6		30.6
L4	9.8		10.6
L5	2.9		3.6
L6	15.9		16.4
L7	9		9.3
Dia	3		3.2

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7.4 D²PAK (TO-263) type A package information

Figure 11. D²PAK (TO-263) type A package outline



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Table 13. D²PAK (TO-263) type A package mechanical data

Dim.	mm		
Dim.	Min.	Тур.	Max.
A	4.40		4.60
A1	0.03		0.23
b	0.70		0.93
b2	1.14		1.70
С	0.45		0.60
c2	1.23		1.36
D	8.95		9.35
D1	7.50	7.75	8.00
D2	1.10	1.30	1.50
E	10.00		10.40
E1	8.30	8.50	8.70
E2	6.85	7.05	7.25
е		2.54	
e1	4.88		5.28
Н	15.00		15.85
J1	2.49		2.69
L	2.29		2.79
L1	1.27		1.40
L2	1.30		1.75
R		0.40	
V2	0°		8°

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9.75 16.9 2.54 5.08

Figure 12. D²PAK (TO-263) recommended footprint (dimensions are in mm)

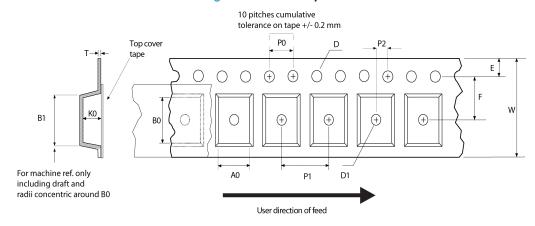
Footprint

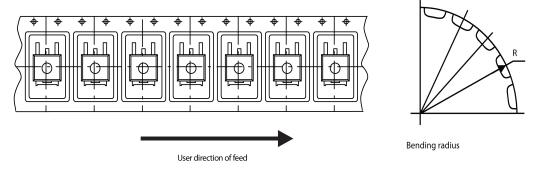
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7.5 D²PAK packing information

Figure 13. D²PAK tape outline



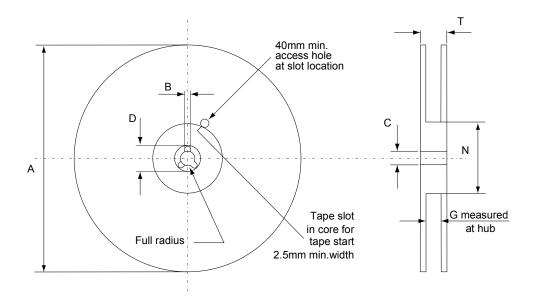


AM08852v1

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Figure 14. D²PAK reel outline



AM06038v1

Table 14. D²PAK tape and reel mechanical data

Таре		Reel			
Dim.	mm		Dim.	mm	
Dim.	Min.	Max.	Dim.	Min.	Max.
A0	10.5	10.7	А		330
В0	15.7	15.9	В	1.5	
D	1.5	1.6	С	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	Т		30.4
P0	3.9	4.1			
P1	11.9	12.1	Base quantity		1000
P2	1.9	2.1	Bulk quantity		1000
R	50				
Т	0.25	0.35			
W	23.7	24.3			

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8 Device summary

Table 15. Order codes

TO-220	TO-220	D ² PAK	TO-220FP	Output voltages
(single gauge)	(dual gauge)			
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

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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: VI 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.
		Part numbers L79xxC and L79xxAC changed to L79.
		Updated the features and the description in cover page.
04-Jun-2014	22	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.
		In Table 4: "Electrical characteristics of L7905AC":
		- updated lsc and lscp Typ. Values
		In Table 5: "Electrical characteristics of L7905C":
		- updated lsc Typ. Values
		In Table 7: "Electrical characteristics of L7912AC":
		- updated lsc Typ. Value
		- updated Iscp Test conditions and Typ. Value
27-Sep-2017	23	In Table_8Electrical_characteristics_of_L
		- updated lsc Typ. Value
		In Table 9: "Electrical characteristics of L7915AC":
		- updated lsc Typ. Value
		- updated Iscp Test conditions and Typ. Value
		In Table 10: "Electrical characteristics of L7915C"
		- updated Isc Typ. Value
45 1 0010	0.4	Updated Section 7: "Package information"
15-Jan-2019	24	Updated: Section 5 Electrical characteristics.

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