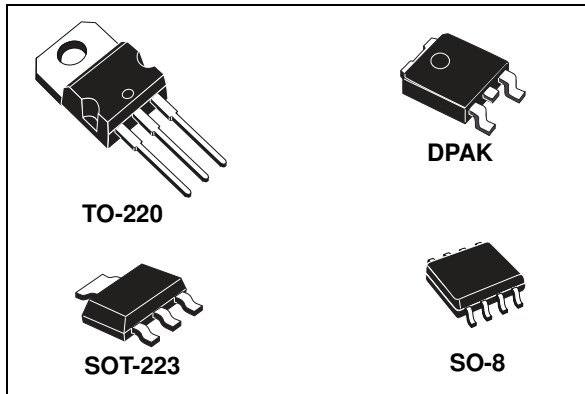


Adjustable and fixed low drop positive voltage regulator

Datasheet - production data



Description

The LD1117 is a low drop voltage regulator able to provide up to 800 mA of output current, available even in adjustable version ($V_{REF} = 1.25$ V). Concerning fixed versions, are offered the following output voltages: 1.2 V, 1.8 V, 2.5 V, 2.85 V, 3.3 V and 5.0 V. The device is supplied in: SOT-223, DPAK, SO-8 and TO-220. The SOT-223 and DPAK surface mount packages optimize the thermal characteristics even offering a relevant space saving effect. High efficiency is assured by NPN pass transistor. In fact in this case, unlike than PNP one, the quiescent current flows mostly into the load. Only a very common 10 μ F minimum capacitor is needed for stability. On chip trimming allows the regulator to reach a very tight output voltage tolerance, within ± 1 % at 25 °C. The adjustable LD1117 is pin to pin compatible with the other standard. Adjustable voltage regulators maintaining the better performances in terms of drop and tolerance.

Features

- Low dropout voltage (1 V typ.)
- 2.85 V device performances are suitable for SCSI-2 active termination
- Output current up to 800 mA
- Fixed output voltage of: 1.2 V, 1.8 V, 2.5 V, 3.3 V, 5.0 V
- Adjustable version availability ($V_{REF} = 1.25$ V)
- Internal current and thermal limit
- Available in ± 1 % (at 25 °C) and 2 % in full temperature range
- Supply voltage rejection: 75 dB (typ.)

Contents

1	Diagram	5
2	Pin configuration	6
3	Maximum ratings	7
4	Schematic application	8
5	Electrical characteristics	9
6	Typical application	21
7	LD1117 adjustable: application note	24
8	Package information	25
9	Packaging mechanical data	38
10	Order codes	44
11	Revision history	45

List of tables

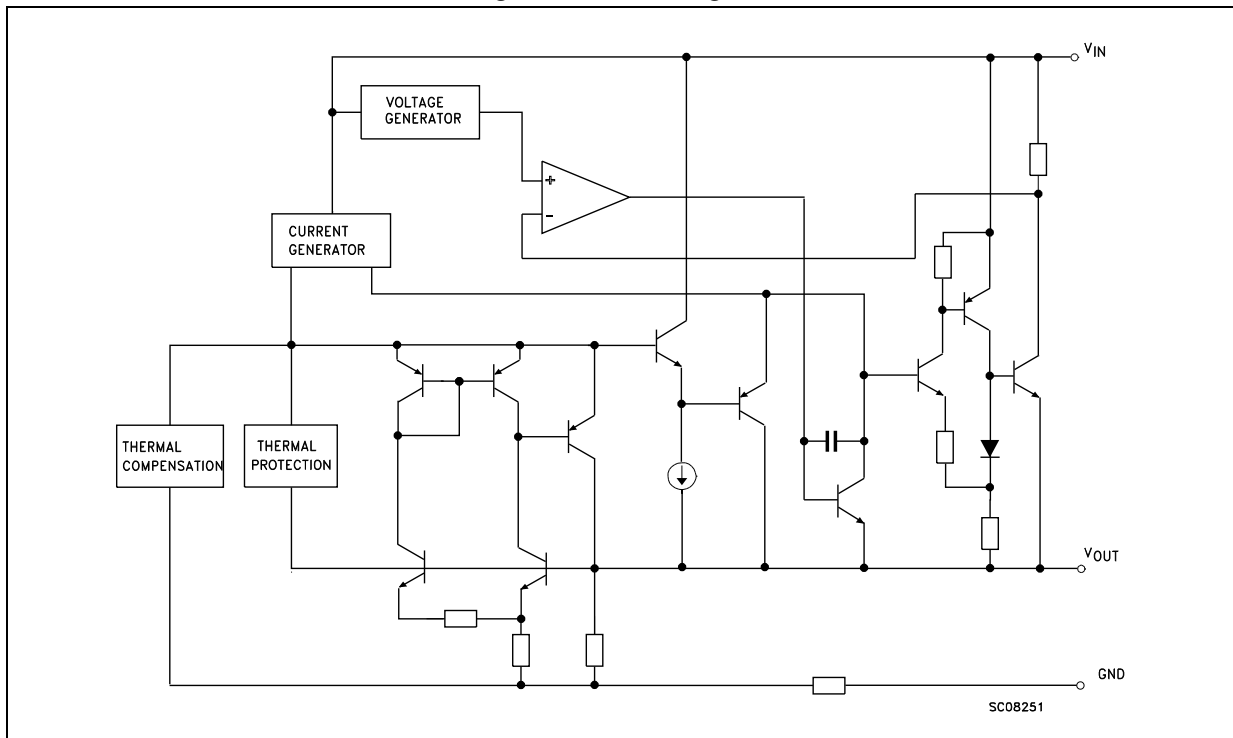
Table 1.	Absolute maximum ratings	7
Table 2.	Thermal data	7
Table 3.	Electrical characteristics of LD1117#12	9
Table 4.	Electrical characteristics of LD1117#18	10
Table 5.	Electrical characteristics of LD1117#25	11
Table 6.	Electrical characteristics of LD1117#33	12
Table 7.	Electrical characteristics of LD1117#50	13
Table 8.	Electrical characteristics of LD1117 (adjustable)	14
Table 9.	Electrical characteristics of LD1117#12C	15
Table 10.	Electrical characteristics of LD1117#18C	16
Table 11.	Electrical characteristics of LD1117#25C	17
Table 12.	Electrical characteristics of LD1117#33C	18
Table 13.	Electrical characteristics of LD1117#50C	19
Table 14.	Electrical characteristics of LD1117C (adjustable)	20
Table 15.	TO-220 mechanical data (type STD-ST Dual Gauge)	25
Table 16.	TO-220 mechanical data (type STD-ST Single Gauge)	27
Table 17.	SOT-223 mechanical data	29
Table 18.	SO-8 mechanical data	30
Table 19.	DPAK (TO-252) mechanical data (type A)	31
Table 20.	DPAK (TO-252) mechanical data (type E)	33
Table 21.	DPAK (TO-252) mechanical data type I	35
Table 22.	Footprint data	37
Table 23.	SOT-223 tape and reel mechanical data	39
Table 24.	SO-8 tape and reel mechanical data	41
Table 25.	DPAK tape and reel mechanical data	42
Table 26.	Order codes	44
Table 27.	Document revision history	45

List of figures

Figure 1.	Block diagram	5
Figure 2.	Pin connections (top view)	6
Figure 3.	Application circuit (for 1.2 V)	8
Figure 4.	Application circuit (for other fixed output voltages)	8
Figure 5.	Negative supply	21
Figure 6.	Circuit for increasing output voltage	21
Figure 7.	Voltage regulator with reference	21
Figure 8.	Battery backed-up regulated supply	22
Figure 9.	Post-regulated dual supply	23
Figure 10.	Adjustable output voltage application	24
Figure 11.	Adjustable output voltage application with improved ripple rejection	24
Figure 12.	Drawing dimension TO-220 (type STD-ST Dual Gauge)	26
Figure 13.	Drawing dimension TO-220 (type STD-ST Single Gauge)	28
Figure 14.	Drawing dimension SOT-223	29
Figure 15.	Drawing dimension SO-8	30
Figure 16.	DPAK (TO-252) package outline A	32
Figure 17.	DPAK (TO-252) package outline E	34
Figure 18.	DPAK (TO-252) package outline I	36
Figure 19.	DPAK footprint recommended data	37
Figure 20.	Drawing dimension tube for TO-220 Dual Gauge (mm.)	38
Figure 21.	Drawing dimension tube for TO-220 Single Gauge (mm.)	38
Figure 22.	Tape for SOT-223 (dimensions are in mm)	39
Figure 23.	Reel for SOT-223 (dimensions are in mm)	40
Figure 24.	SO-8 tape and reel dimensions	41
Figure 25.	Tape for DPAK	43
Figure 26.	Reel for DPAK	43

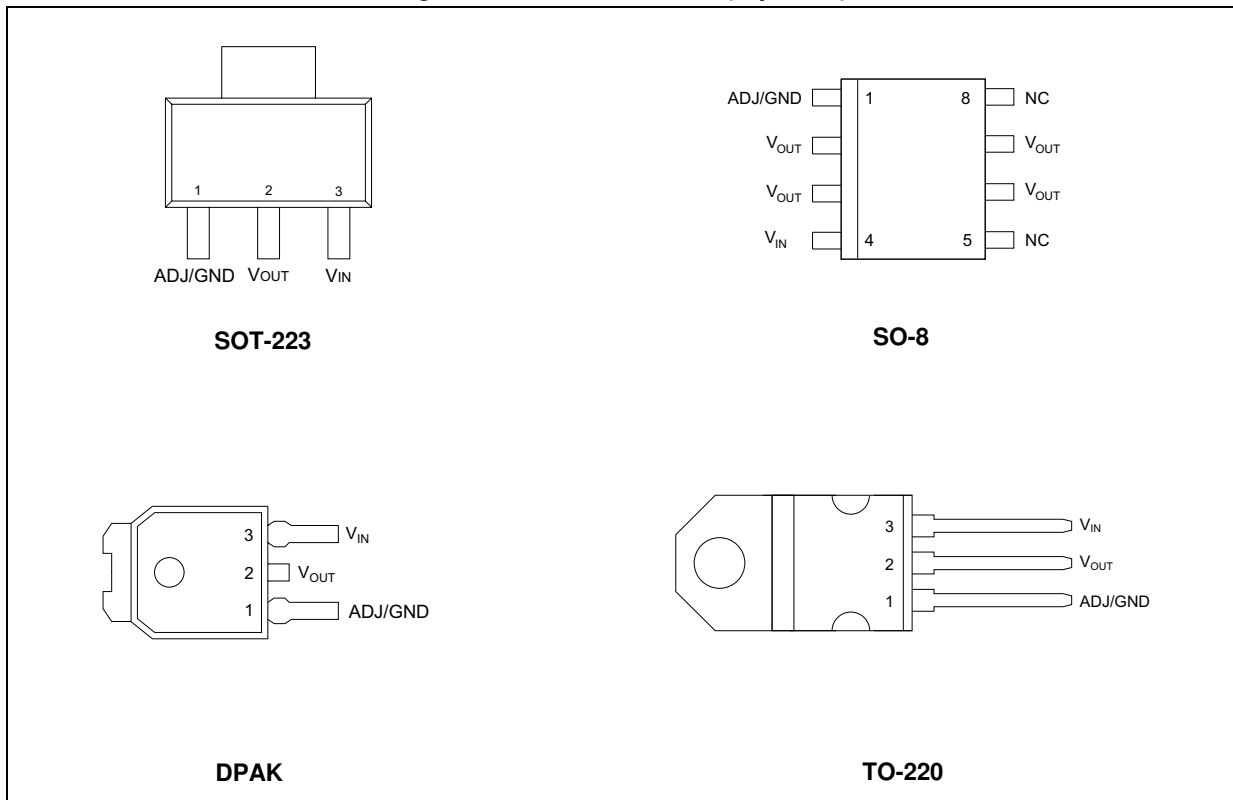
1 Diagram

Figure 1. Block diagram



2 Pin configuration

Figure 2. Pin connections (top view)



Note: The TAB is connected to the V_{OUT}.

3 Maximum ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit	
$V_{IN}^{(1)}$	DC input voltage	15	V	
P_{TOT}	Power dissipation	12	W	
T_{STG}	Storage temperature range	-40 to +150	°C	
T_{OP}	Operating junction temperature range	for C version	-40 to +125	°C
		for standard version	0 to +125	°C

1. Absolute maximum rating of $V_{IN} = 18$ V, when I_{OUT} is lower than 20 mA.

Table 2. Thermal data

Symbol	Parameter	SOT-223	SO-8	DPAK	TO-220	Unit
R_{thJC}	Thermal resistance junction-case	15	20	8	5	°C/W
R_{thJA}	Thermal resistance junction-ambient	110	55	100	50	°C/W

4 Schematic application

Figure 3. Application circuit (for 1.2 V)

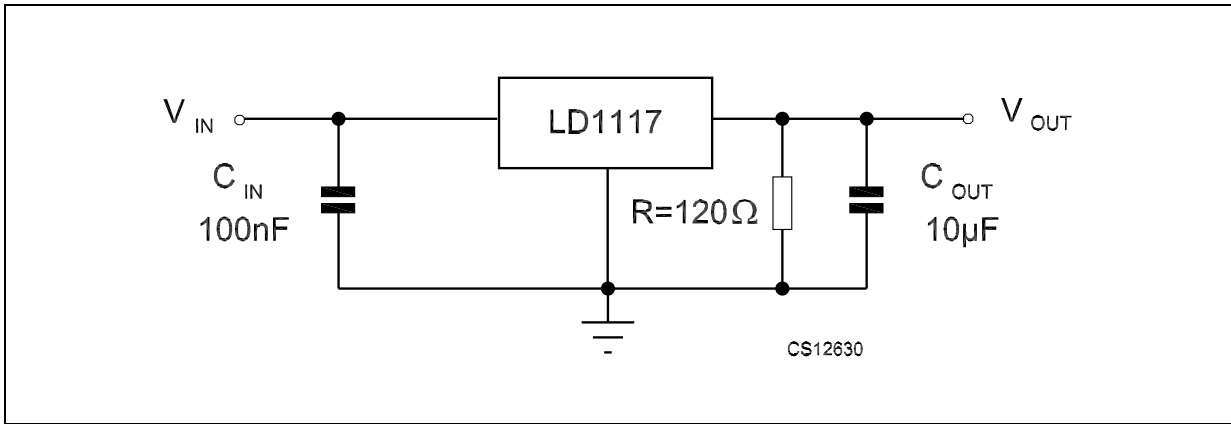
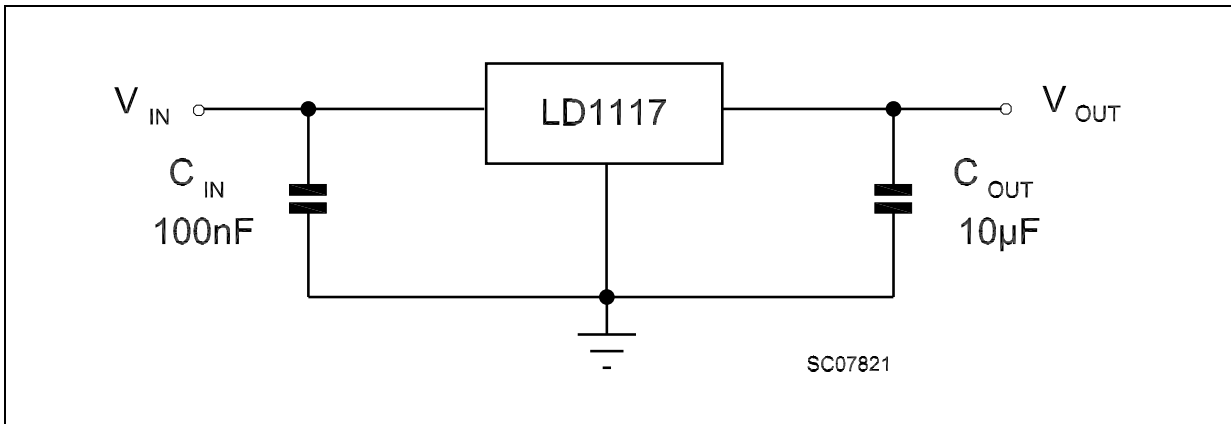


Figure 4. Application circuit (for other fixed output voltages)



5 Electrical characteristics

Refer to the test circuits, $T_J = 0$ to 125 °C, $C_O = 10$ μ F, $R = 120$ Ω between GND and OUT pins, unless otherwise specified.

Table 3. Electrical characteristics of LD1117#12

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_O	Output voltage	$V_{in} = 3.2$ V, $I_O = 10$ mA, $T_J = 25$ °C	1.188	1.20	1.212	V
V_O	Output voltage	$I_O = 10$ to 800 mA $V_{in} - V_O = 1.4$ to 10 V	1.140	1.20	1.260	V
ΔV_O	Line regulation	$V_{in} - V_O = 1.5$ to 13.75 V, $I_O = 10$ mA		0.035	0.2	%
ΔV_O	Load regulation	$V_{in} - V_O = 3$ V, $I_O = 10$ to 800 mA		0.1	0.4	%
ΔV_O	Temperature stability			0.5		%
ΔV_O	Long term stability	1000 hrs, $T_J = 125$ °C		0.3		%
V_{in}	Operating input voltage				15	V
I_{adj}	Adjustment pin current	$V_{in} \leq 15$ V		60	120	μ A
ΔI_{adj}	Adjustment pin current change	$V_{in} - V_O = 1.4$ to 10 V $I_O = 10$ to 800 mA		1	5	μ A
$I_{O(min)}$	Minimum load current	$V_{in} = 15$ V		2	5	mA
I_O	Output current	$V_{in} - V_O = 5$ V, $T_J = 25$ °C	800	950	1300	mA
eN	Output noise (% V_O)	$B = 10$ Hz to 10 kHz, $T_J = 25$ °C		0.003		%
SVR	Supply voltage rejection	$I_O = 40$ mA, $f = 120$ Hz, $T_J = 25$ °C $V_{in} - V_O = 3$ V, $V_{ripple} = 1$ V _{PP}	60	75		dB
V_d	Dropout voltage	$I_O = 100$ mA		1	1.1	V
		$I_O = 500$ mA		1.05	1.15	
		$I_O = 800$ mA		1.10	1.2	
	Thermal regulation	$T_a = 25$ °C, 30 ms Pulse		0.01	0.1	%/W

Refer to the test circuits, $T_J = 0$ to $125\text{ }^\circ\text{C}$, $C_O = 10\text{ }\mu\text{F}$, unless otherwise specified.

Table 4. Electrical characteristics of LD1117#18

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_O	Output voltage	$V_{in} = 3.8\text{ V}$, $I_O = 10\text{ mA}$, $T_J = 25\text{ }^\circ\text{C}$	1.78	1.8	1.82	V
V_O	Output voltage	$I_O = 0$ to 800 mA , $V_{in} = 3.3$ to 8 V	1.76		1.84	V
ΔV_O	Line regulation	$V_{in} = 3.3$ to 8 V , $I_O = 0\text{ mA}$		1	6	mV
ΔV_O	Load regulation	$V_{in} = 3.3\text{ V}$, $I_O = 0$ to 800 mA		1	10	mV
ΔV_O	Temperature stability			0.5		%
ΔV_O	Long term stability	1000 hrs, $T_J = 125\text{ }^\circ\text{C}$		0.3		%
V_{in}	Operating input voltage	$I_O = 100\text{ mA}$			15	V
I_d	Quiescent current	$V_{in} \leq 8\text{ V}$		5	10	mA
I_O	Output current	$V_{in} = 6.8\text{ V}$, $T_J = 25\text{ }^\circ\text{C}$	800	950	1300	mA
eN	Output noise voltage	$B = 10\text{ Hz}$ to 10 kHz , $T_J = 25\text{ }^\circ\text{C}$		100		μV
SVR	Supply voltage rejection	$I_O = 40\text{ mA}$, $f = 120\text{ Hz}$, $T_J = 25\text{ }^\circ\text{C}$ $V_{in} = 5.5\text{ V}$, $V_{ripple} = 1\text{ V}_{PP}$	60	75		dB
V_d	Dropout voltage	$I_O = 100\text{ mA}$		1	1.1	V
		$I_O = 500\text{ mA}$		1.05	1.15	
		$I_O = 800\text{ mA}$		1.10	1.2	
	Thermal regulation	$T_a = 25\text{ }^\circ\text{C}$, 30 ms Pulse		0.01	0.1	%/W

Refer to the test circuits, $T_J = 0$ to $125\text{ }^\circ\text{C}$, $C_O = 10\text{ }\mu\text{F}$, unless otherwise specified.

Table 5. Electrical characteristics of LD1117#25

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_O	Output voltage	$V_{in} = 4.5\text{ V}$, $I_O = 10\text{ mA}$, $T_J = 25\text{ }^\circ\text{C}$	2.475	2.5	2.525	V
V_O	Output voltage	$I_O = 0$ to 800 mA , $V_{in} = 3.9$ to 10 V	2.45		2.55	V
ΔV_O	Line regulation	$V_{in} = 3.9$ to 10 V , $I_O = 0\text{ mA}$		1	6	mV
ΔV_O	Load regulation	$V_{in} = 3.9\text{ V}$, $I_O = 0$ to 800 mA		1	10	mV
ΔV_O	Temperature stability			0.5		%
ΔV_O	Long term stability	1000 hrs, $T_J = 125\text{ }^\circ\text{C}$		0.3		%
V_{in}	Operating input voltage	$I_O = 100\text{ mA}$			15	V
I_d	Quiescent current	$V_{in} \leq 10\text{ V}$		5	10	mA
I_O	Output current	$V_{in} = 7.5\text{ V}$, $T_J = 25\text{ }^\circ\text{C}$	800	950	1300	mA
eN	Output noise voltage	$B = 10\text{ Hz}$ to 10 kHz , $T_J = 25\text{ }^\circ\text{C}$		100		μV
SVR	Supply voltage rejection	$I_O = 40\text{ mA}$, $f = 120\text{ Hz}$, $T_J = 25\text{ }^\circ\text{C}$ $V_{in} = 5.5\text{ V}$, $V_{ripple} = 1\text{ V}_{PP}$	60	75		dB
V_d	Dropout voltage	$I_O = 100\text{ mA}$		1	1.1	V
		$I_O = 500\text{ mA}$		1.05	1.15	
		$I_O = 800\text{ mA}$		1.10	1.2	
	Thermal regulation	$T_a = 25\text{ }^\circ\text{C}$, 30 ms Pulse		0.01	0.1	%/W

Refer to the test circuits, $T_J = 0$ to $125\text{ }^\circ\text{C}$, $C_O = 10\text{ }\mu\text{F}$, unless otherwise specified.

Table 6. Electrical characteristics of LD1117#33

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_O	Output voltage	$V_{in} = 5.3\text{ V}$, $I_O = 10\text{ mA}$, $T_J = 25\text{ }^\circ\text{C}$	3.267	3.3	3.333	V
V_O	Output voltage	$I_O = 0$ to 800 mA , $V_{in} = 4.75$ to 10 V	3.235		3.365	V
ΔV_O	Line regulation	$V_{in} = 4.75$ to 15 V , $I_O = 0\text{ mA}$		1	6	mV
ΔV_O	Load regulation	$V_{in} = 4.75\text{ V}$, $I_O = 0$ to 800 mA		1	10	mV
ΔV_O	Temperature stability			0.5		%
ΔV_O	Long term stability	1000 hrs, $T_J = 125\text{ }^\circ\text{C}$		0.3		%
V_{in}	Operating input voltage	$I_O = 100\text{ mA}$			15	V
I_d	Quiescent current	$V_{in} \leq 15\text{ V}$		5	10	mA
I_O	Output current	$V_{in} = 8.3\text{ V}$, $T_J = 25\text{ }^\circ\text{C}$	800	950	1300	mA
eN	Output noise voltage	$B = 10\text{ Hz}$ to 10 kHz , $T_J = 25\text{ }^\circ\text{C}$		100		μV
SVR	Supply voltage rejection	$I_O = 40\text{ mA}$, $f = 120\text{ Hz}$, $T_J = 25\text{ }^\circ\text{C}$ $V_{in} = 6.3\text{ V}$, $V_{ripple} = 1\text{ V}_{PP}$	60	75		dB
V_d	Dropout voltage	$I_O = 100\text{ mA}$		1	1.1	V
		$I_O = 500\text{ mA}$		1.05	1.15	
		$I_O = 800\text{ mA}$		1.10	1.2	
	Thermal regulation	$T_a = 25\text{ }^\circ\text{C}$, 30 ms Pulse		0.01	0.1	%/W

Refer to the test circuits, $T_J = 0$ to 125 °C, $C_O = 10$ μ F, unless otherwise specified.

Table 7. Electrical characteristics of LD1117#50

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_O	Output voltage	$V_{in} = 7$ V, $I_O = 10$ mA, $T_J = 25$ °C	4.95	5	5.05	V
V_O	Output voltage	$I_O = 0$ to 800 mA, $V_{in} = 6.5$ to 15 V	4.9		5.1	V
ΔV_O	Line regulation	$V_{in} = 6.5$ to 15 V, $I_O = 0$ mA		1	10	mV
ΔV_O	Load regulation	$V_{in} = 6.5$ V, $I_O = 0$ to 800 mA		1	15	mV
ΔV_O	Temperature stability			0.5		%
ΔV_O	Long term stability	1000 hrs, $T_J = 125$ °C		0.3		%
V_{in}	Operating input voltage	$I_O = 100$ mA			15	V
I_d	Quiescent current	$V_{in} \leq 15$ V		5	10	mA
I_O	Output current	$V_{in} = 10$ V, $T_J = 25$ °C	800	950	1300	mA
eN	Output noise voltage	B = 10 Hz to 10 kHz, $T_J = 25$ °C		100		μ V
SVR	Supply voltage rejection	$I_O = 40$ mA, $f = 120$ Hz, $T_J = 25$ °C $V_{in} = 8$ V, $V_{ripple} = 1$ V _{PP}	60	75		dB
V_d	Dropout voltage	$I_O = 100$ mA		1	1.1	V
		$I_O = 500$ mA		1.05	1.15	
		$I_O = 800$ mA		1.10	1.2	
	Thermal regulation	$T_a = 25$ °C, 30 ms Pulse		0.01	0.1	%/W

Refer to the test circuits, $T_J = 0$ to $125\text{ }^\circ\text{C}$, $C_O = 10\text{ }\mu\text{F}$, unless otherwise specified.

Table 8. Electrical characteristics of LD1117 (adjustable)

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_{ref}	Reference voltage	$V_{in} - V_O = 2\text{ V}$, $I_O = 10\text{ mA}$, $T_J = 25\text{ }^\circ\text{C}$	1.238	1.25	1.262	V
V_{ref}	Reference voltage	$I_O = 10$ to 800 mA , $V_{in} - V_O = 1.4$ to 10 V	1.225		1.275	V
ΔV_O	Line regulation	$V_{in} - V_O = 1.5$ to 13.75 V , $I_O = 10\text{ mA}$		0.035	0.2	%
ΔV_O	Load regulation	$V_{in} - V_O = 3\text{ V}$, $I_O = 10$ to 800 mA		0.1	0.4	%
ΔV_O	Temperature stability			0.5		%
ΔV_O	Long term stability	1000 hrs, $T_J = 125\text{ }^\circ\text{C}$		0.3		%
V_{in}	Operating input voltage				15	V
I_{adj}	Adjustment pin current	$V_{in} \leq 15\text{ V}$		60	120	μA
ΔI_{adj}	Adjustment pin current change	$V_{in} - V_O = 1.4$ to 10 V , $I_O = 10$ to 800 mA		1	5	μA
$I_{O(min)}$	Minimum load current	$V_{in} = 15\text{ V}$		2	5	mA
I_O	Output current	$V_{in} - V_O = 5\text{ V}$, $T_J = 25\text{ }^\circ\text{C}$	800	950	1300	mA
eN	Output noise (% V_O)	$B = 10\text{ Hz}$ to 10 kHz , $T_J = 25\text{ }^\circ\text{C}$		0.003		%
SVR	Supply voltage rejection	$I_O = 40\text{ mA}$, $f = 120\text{ Hz}$, $T_J = 25\text{ }^\circ\text{C}$ $V_{in} - V_O = 3\text{ V}$, $V_{ripple} = 1\text{ V}_{PP}$	60	75		dB
V_d	Dropout voltage	$I_O = 100\text{ mA}$		1	1.1	V
		$I_O = 500\text{ mA}$		1.05	1.15	
		$I_O = 800\text{ mA}$		1.10	1.2	
	Thermal regulation	$T_a = 25\text{ }^\circ\text{C}$, 30 ms Pulse		0.01	0.1	%/W

Refer to the test circuits, $T_J = -40$ to 125 °C, $C_O = 10$ μ F, $R = 120$ Ω between GND and OUT pins, unless otherwise specified.

Table 9. Electrical characteristics of LD1117#12C

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_O	Output voltage	$V_{in} - V_O = 2$ V, $I_O = 10$ mA, $T_J = 25$ °C	1.176	1.20	1.224	V
V_O	Output voltage	$I_O = 10$ to 800 mA, $V_{in} - V_O = 1.4$ to 10 V	1.120	1.20	1.280	V
ΔV_O	Line regulation	$V_{in} - V_O = 1.5$ to 13.75 V, $I_O = 10$ mA			1	%
ΔV_O	Load regulation	$V_{in} - V_O = 3$ V, $I_O = 10$ to 800 mA			1	%
ΔV_O	Temperature stability			0.5		%
ΔV_O	Long term stability	1000 hrs, $T_J = 125$ °C		0.3		%
V_{in}	Operating input voltage				15	V
I_{adj}	Adjustment pin current	$V_{in} \leq 15$ V		60	120	μ A
ΔI_{adj}	Adjustment pin current change	$V_{in} - V_O = 1.4$ to 10 V $I_O = 10$ to 800 mA		1	5	μ A
$I_{O(min)}$	Minimum load current	$V_{in} = 15$ V		2	5	mA
I_O	Output current	$V_{in} - V_O = 5$ V, $T_J = 25$ °C	800	950	1300	mA
eN	Output noise (% V_O)	$B = 10$ Hz to 10 kHz, $T_J = 25$ °C		0.003		%
SVR	Supply voltage rejection	$I_O = 40$ mA, $f = 120$ Hz, $T_J = 25$ °C $V_{in} - V_O = 3$ V, $V_{ripple} = 1$ V _{PP}	60	75		dB
V_d	Dropout voltage	$I_O = 100$ mA, $T_J = 0$ to 125 °C		1	1.1	V
		$I_O = 500$ mA, $T_J = 0$ to 125 °C		1.05	1.2	
		$I_O = 800$ mA, $T_J = 0$ to 125 °C		1.10	1.3	
	Thermal regulation	$T_a = 25$ °C, 30 ms Pulse		0.01	0.1	%/W

Refer to the test circuits, $T_J = -40$ to 125 °C, $C_O = 10$ μ F, unless otherwise specified.

Table 10. Electrical characteristics of LD1117#18C

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_O	Output voltage	$V_{in} = 3.8$ V, $I_O = 10$ mA, $T_J = 25$ °C	1.76	1.8	1.84	V
V_O	Output voltage	$I_O = 0$ to 800 mA, $V_{in} = 3.9$ to 10 V	1.73		1.87	V
ΔV_O	Line regulation	$V_{in} = 3.3$ to 8 V, $I_O = 0$ mA		1	30	mV
ΔV_O	Load regulation	$V_{in} = 3.3$ V, $I_O = 0$ to 800 mA		1	30	mV
ΔV_O	Temperature stability			0.5		%
ΔV_O	Long term stability	1000 hrs, $T_J = 125$ °C		0.3		%
V_{in}	Operating input voltage	$I_O = 100$ mA			15	V
I_d	Quiescent current	$V_{in} \leq 8$ V		5	10	mA
I_O	Output current	$V_{in} = 6.8$ V $T_J = 25$ °C	800	950	1300	mA
eN	Output noise voltage	B = 10 Hz to 10 kHz, $T_J = 25$ °C		100		μ V
SVR	Supply voltage rejection	$I_O = 40$ mA, $f = 120$ Hz, $T_J = 25$ °C $V_{in} = 5.5$ V, $V_{ripple} = 1$ V _{PP}	60	75		dB
V_d	Dropout voltage	$I_O = 100$ mA, $T_J = 0$ to 125 °C		1	1.1	V
		$I_O = 500$ mA, $T_J = 0$ to 125 °C		1.05	1.15	
		$I_O = 800$ mA, $T_J = 0$ to 125 °C		1.10	1.2	
V_d	Dropout voltage	$I_O = 100$ mA			1.1	V
		$I_O = 500$ mA			1.2	
		$I_O = 800$ mA			1.3	
	Thermal regulation	$T_a = 25$ °C, 30 ms Pulse		0.01	0.1	%/W

Refer to the test circuits, $T_J = -40$ to 125 °C, $C_O = 10$ μ F, unless otherwise specified.

Table 11. Electrical characteristics of LD1117#25C

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_O	Output voltage	$V_{in} = 4.5$ V, $I_O = 10$ mA, $T_J = 25$ °C	2.45	2.5	2.55	V
V_O	Output voltage	$I_O = 0$ to 800 mA, $V_{in} = 3.9$ to 10 V	2.4		2.6	V
ΔV_O	Line regulation	$V_{in} = 3.9$ to 10 V, $I_O = 0$ mA		1	30	mV
ΔV_O	Load regulation	$V_{in} = 3.9$ V, $I_O = 0$ to 800 mA		1	30	mV
ΔV_O	Temperature stability			0.5		%
ΔV_O	Long term stability	1000 hrs, $T_J = 125$ °C		0.3		%
V_{in}	Operating input voltage	$I_O = 100$ mA			15	V
I_d	Quiescent current	$V_{in} \leq 10$ V		5	10	mA
I_O	Output current	$V_{in} = 7.5$ V $T_J = 25$ °C	800	950	1300	mA
eN	Output noise voltage	B = 10 Hz to 10 kHz, $T_J = 25$ °C		100		μ V
SVR	Supply voltage rejection	$I_O = 40$ mA, $f = 120$ Hz, $T_J = 25$ °C $V_{in} = 5.5$ V, $V_{ripple} = 1$ V _{PP}	60	75		dB
V_d	Dropout voltage	$I_O = 100$ mA, $T_J = 0$ to 125 °C		1	1.1	V
		$I_O = 500$ mA, $T_J = 0$ to 125 °C		1.05	1.15	
		$I_O = 800$ mA, $T_J = 0$ to 125 °C		1.10	1.2	
V_d	Dropout voltage	$I_O = 100$ mA			1.1	V
		$I_O = 500$ mA			1.2	
		$I_O = 800$ mA			1.3	
	Thermal regulation	$T_a = 25$ °C, 30 ms Pulse		0.01	0.1	%/W

Refer to the test circuits, $T_J = -40$ to 125 °C, $C_O = 10$ μ F, unless otherwise specified.

Table 12. Electrical characteristics of LD1117#33C

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_O	Output voltage	$V_{in} = 5.3$ V, $I_O = 10$ mA, $T_J = 25$ °C	3.24	3.3	3.36	V
V_O	Output voltage	$I_O = 0$ to 800 mA, $V_{in} = 4.75$ to 10 V	3.16		3.44	V
ΔV_O	Line regulation	$V_{in} = 4.75$ to 15 V, $I_O = 0$ mA		1	30	mV
ΔV_O	Load regulation	$V_{in} = 4.75$ V, $I_O = 0$ to 800 mA		1	30	mV
ΔV_O	Temperature stability			0.5		%
ΔV_O	Long term stability	1000 hrs, $T_J = 125$ °C		0.3		%
V_{in}	Operating input voltage	$I_O = 100$ mA			15	V
I_d	Quiescent current	$V_{in} \leq 15$ V		5	10	mA
I_O	Output current	$V_{in} = 8.3$ V, $T_J = 25$ °C	800	950	1300	mA
eN	Output noise voltage	B = 10 Hz to 10 kHz, $T_J = 25$ °C		100		μ V
SVR	Supply voltage rejection	$I_O = 40$ mA, $f = 120$ Hz, $T_J = 25$ °C $V_{in} = 6.3$ V, $V_{ripple} = 1$ V _{PP}	60	75		dB
V_d	Dropout voltage	$I_O = 100$ mA, $T_J = 0$ to 125 °C		1	1.1	V
		$I_O = 500$ mA, $T_J = 0$ to 125 °C		1.05	1.15	
		$I_O = 800$ mA, $T_J = 0$ to 125 °C		1.10	1.2	
V_d	Dropout voltage	$I_O = 100$ mA			1.1	V
		$I_O = 500$ mA			1.2	
		$I_O = 800$ mA			1.3	
	Thermal regulation	$T_a = 25$ °C, 30 ms Pulse		0.01	0.1	%/W

Refer to the test circuits, $T_J = -40$ to $125\text{ }^\circ\text{C}$, $C_O = 10\text{ }\mu\text{F}$, unless otherwise specified.

Table 13. Electrical characteristics of LD1117#50C

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_O	Output voltage	$V_{in} = 7\text{ V}$, $I_O = 10\text{ mA}$, $T_J = 25\text{ }^\circ\text{C}$	4.9	5	5.1	V
V_O	Output voltage	$I_O = 0$ to 800 mA , $V_{in} = 6.5$ to 15 V	4.8		5.2	V
ΔV_O	Line regulation	$V_{in} = 6.5$ to 15 V , $I_O = 0\text{ mA}$		1	50	mV
ΔV_O	Load regulation	$V_{in} = 6.5\text{ V}$, $I_O = 0$ to 800 mA		1	50	mV
ΔV_O	Temperature stability			0.5		%
ΔV_O	Long term stability	1000 hrs, $T_J = 125\text{ }^\circ\text{C}$		0.3		%
V_{in}	Operating input voltage	$I_O = 100\text{ mA}$			15	V
I_d	Quiescent current	$V_{in} \leq 15\text{ V}$		5	10	mA
I_O	Output current	$V_{in} = 10\text{ V}$, $T_J = 25\text{ }^\circ\text{C}$	800	950	1300	mA
eN	Output noise voltage	$B = 10\text{ Hz}$ to 10 kHz , $T_J = 25\text{ }^\circ\text{C}$		100		μV
SVR	Supply voltage rejection	$I_O = 40\text{ mA}$, $f = 120\text{ Hz}$, $T_J = 25\text{ }^\circ\text{C}$ $V_{in} = 8\text{ V}$, $V_{ripple} = 1\text{ V}_{PP}$	60	75		dB
V_d	Dropout voltage	$I_O = 100\text{ mA}$, $T_J = 0$ to $125\text{ }^\circ\text{C}$		1	1.1	V
		$I_O = 500\text{ mA}$, $T_J = 0$ to $125\text{ }^\circ\text{C}$		1.05	1.15	
		$I_O = 800\text{ mA}$, $T_J = 0$ to $125\text{ }^\circ\text{C}$		1.10	1.2	
V_d	Dropout voltage	$I_O = 100\text{ mA}$			1.1	V
		$I_O = 500\text{ mA}$			1.2	
		$I_O = 800\text{ mA}$			1.3	
	Thermal regulation	$T_a = 25\text{ }^\circ\text{C}$, 30 ms Pulse		0.01	0.1	%/W

Refer to the test circuits, $T_J = -40$ to 125 °C, $C_O = 10$ μ F, unless otherwise specified.

Table 14. Electrical characteristics of LD1117C (adjustable)

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_{ref}	Reference voltage	$V_{in} - V_O = 2$ V, $I_O = 10$ mA, $T_J = 25$ °C	1.225	1.25	1.275	V
V_{ref}	Reference voltage	$I_O = 10$ to 800 mA, $V_{in} - V_O = 1.4$ to 10 V	1.2		1.3	V
ΔV_O	Line regulation	$V_{in} - V_O = 1.5$ to 13.75 V, $I_O = 10$ mA			1	%
ΔV_O	Load regulation	$V_{in} - V_O = 3$ V, $I_O = 10$ to 800 mA			1	%
ΔV_O	Temperature stability			0.5		%
ΔV_O	Long term stability	1000 hrs, $T_J = 125$ °C		0.3		%
V_{in}	Operating input voltage				15	V
I_{adj}	Adjustment pin current	$V_{in} \leq 15$ V		60	120	μ A
ΔI_{adj}	Adjustment pin current change	$V_{in} - V_O = 1.4$ to 10 V, $I_O = 10$ to 800 mA		1	10	μ A
$I_{O(min)}$	Minimum load current	$V_{in} = 15$ V		2	5	mA
I_O	Output current	$V_{in} - V_O = 5$ V, $T_J = 25$ °C	800	950	1300	mA
eN	Output noise (% V_O)	B = 10 Hz to 10 kHz, $T_J = 25$ °C		0.003		%
SVR	Supply voltage rejection	$I_O = 40$ mA, $f = 120$ Hz, $T_J = 25$ °C $V_{in} - V_O = 3$ V, $V_{ripple} = 1$ V _{PP}	60	75		dB
V_d	Dropout voltage	$I_O = 100$ mA, $T_J = 0$ to 125 °C		1	1.1	V
		$I_O = 500$ mA, $T_J = 0$ to 125 °C		1.05	1.15	
		$I_O = 800$ mA, $T_J = 0$ to 125 °C		1.10	1.2	
V_d	Dropout voltage	$I_O = 100$ mA			1.1	V
		$I_O = 500$ mA			1.2	
		$I_O = 800$ mA			1.3	
	Thermal regulation	$T_a = 25$ °C, 30 ms Pulse		0.01	0.1	%/W

6 Typical application

Figure 5. Negative supply

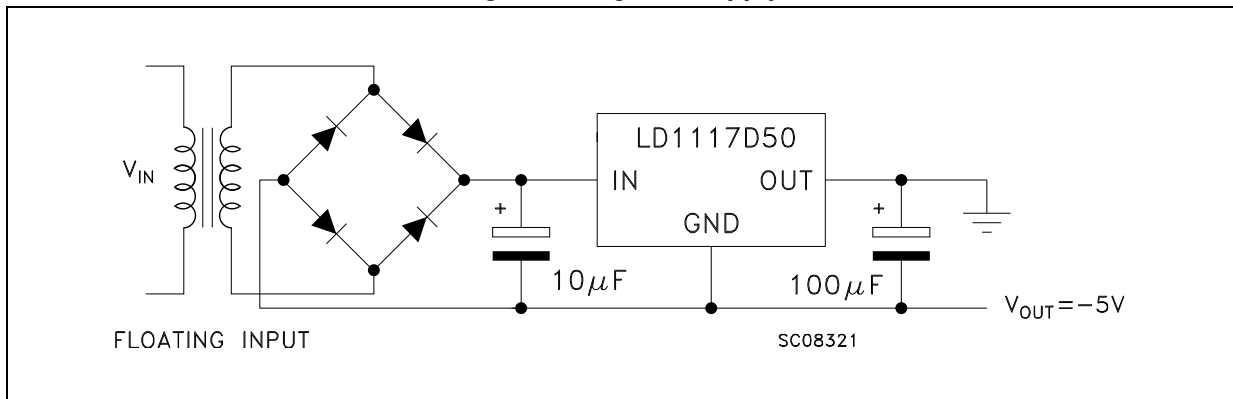


Figure 6. Circuit for increasing output voltage

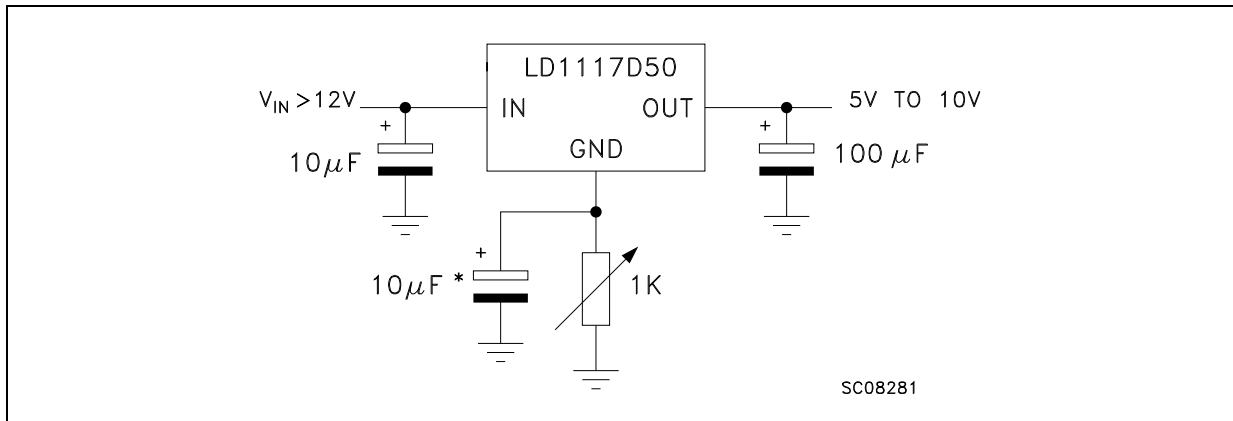


Figure 7. Voltage regulator with reference

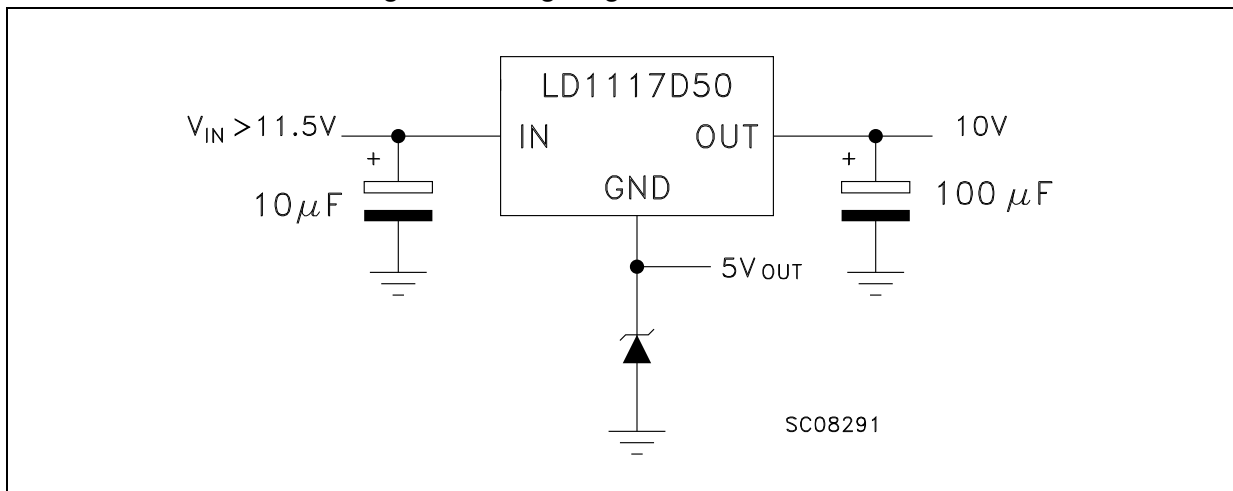


Figure 8. Battery backed-up regulated supply

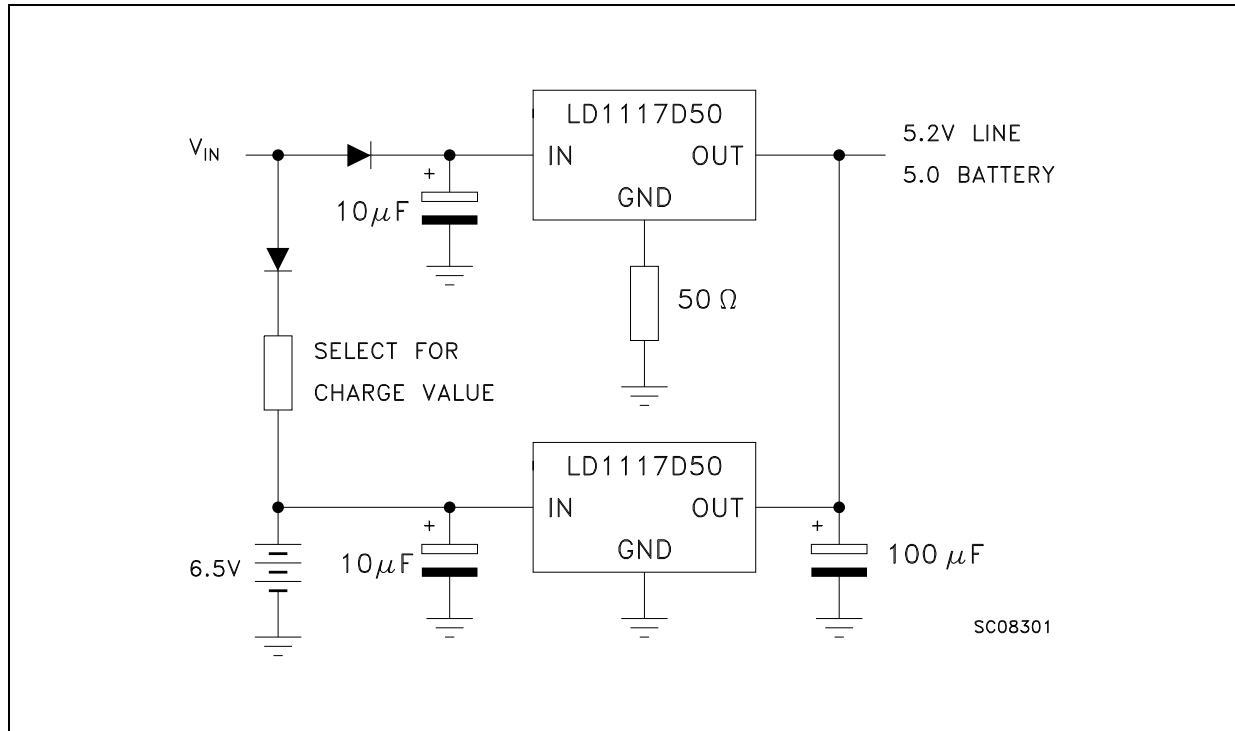
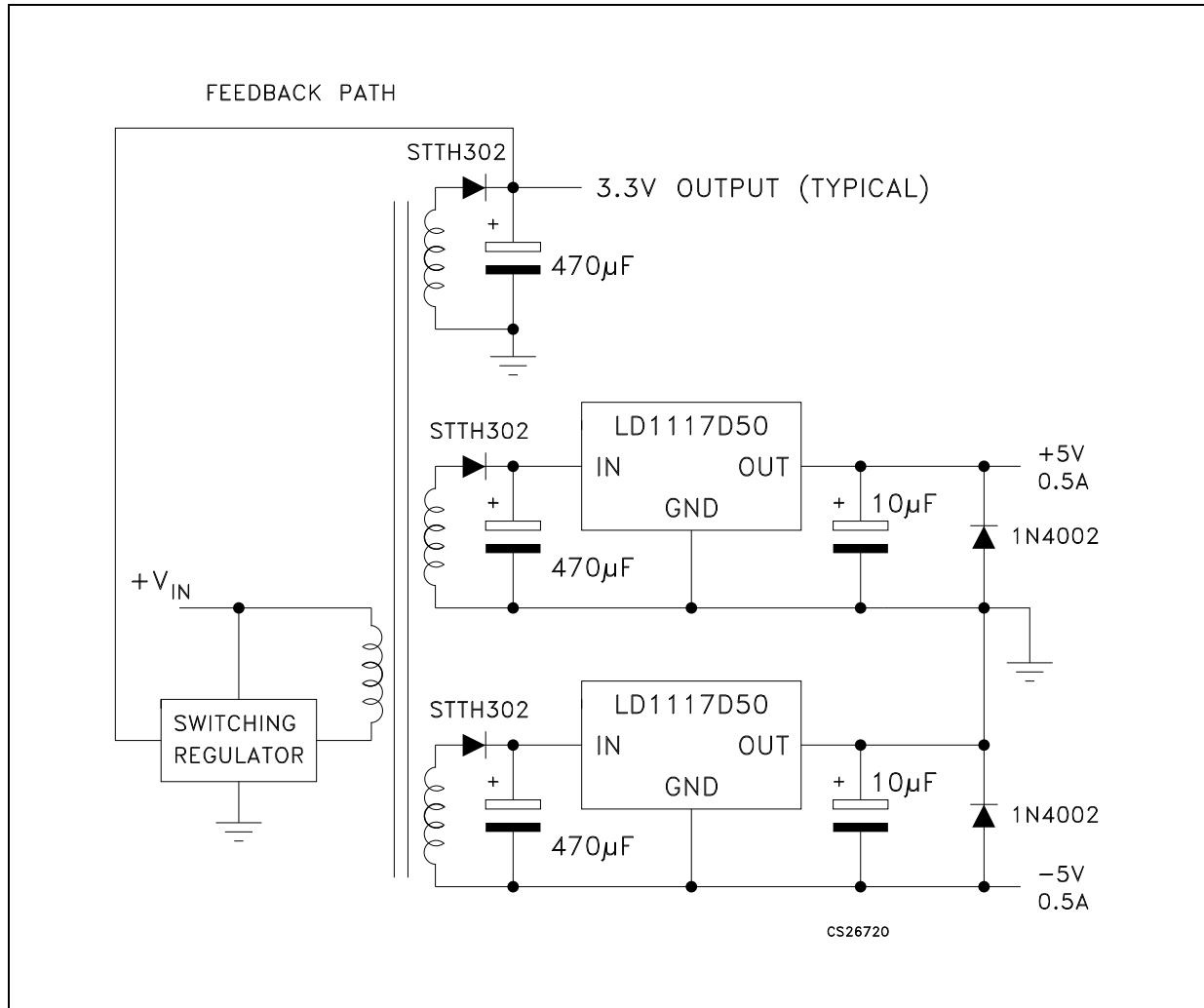


Figure 9. Post-regulated dual supply



7 LD1117 adjustable: application note

The LD1117 adjustable has a thermal stabilized 1.25 ± 0.012 V reference voltage between the OUT and ADJ pins. I_{ADJ} is $60 \mu\text{A}$ typ. ($120 \mu\text{A}$ max.) and ΔI_{ADJ} is $1 \mu\text{A}$ typ. ($5 \mu\text{A}$ max.).

R_1 is normally fixed to 120Ω . From *Figure 9* we obtain:

$$V_{OUT} = V_{REF} + R_2 (I_{ADJ} + I_{R1}) = V_{REF} + R_2 (I_{ADJ} + V_{REF} / R_1) = V_{REF} (1 + R_2 / R_1) + R_2 \times I_{ADJ}$$

In normal application R_2 value is in the range of few $\text{k}\Omega$, so the $R_2 \times I_{ADJ}$ product could not be considered in the V_{OUT} calculation; then the above expression becomes:

$$V_{OUT} = V_{REF} (1 + R_2 / R_1)$$

In order to have the better load regulation it is important to realize a good Kelvin connection of R_1 and R_2 resistors. In particular R_1 connection must be realized very close to OUT and ADJ pin, while R_2 ground connection must be placed as near as possible to the negative Load pin. Ripple rejection can be improved by introducing a $10 \mu\text{F}$ electrolytic capacitor placed in parallel to the R_2 resistor (see *Figure 10*).

Figure 10. Adjustable output voltage application

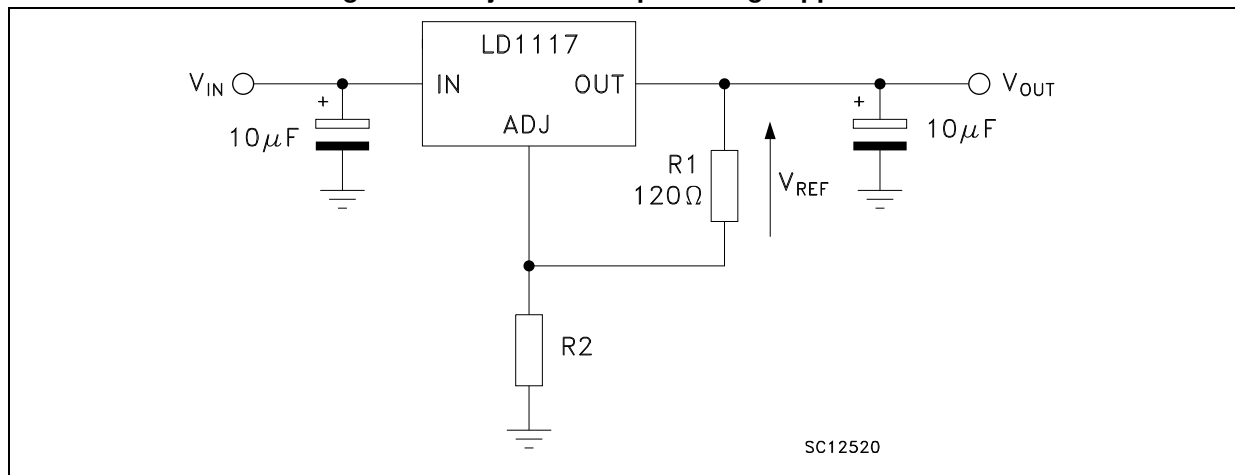
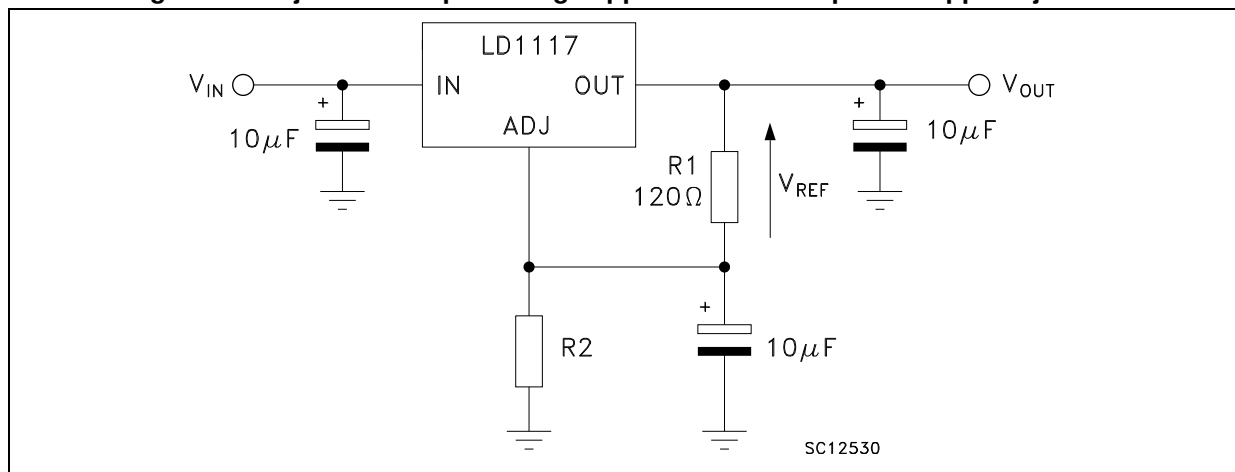


Figure 11. Adjustable output voltage application with improved ripple rejection



8 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.

Table 15. TO-220 mechanical data (type STD-ST Dual Gauge)

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	
ØP	3.75		3.85
Q	2.65		2.95

Figure 12. Drawing dimension TO-220 (type STD-ST Dual Gauge)

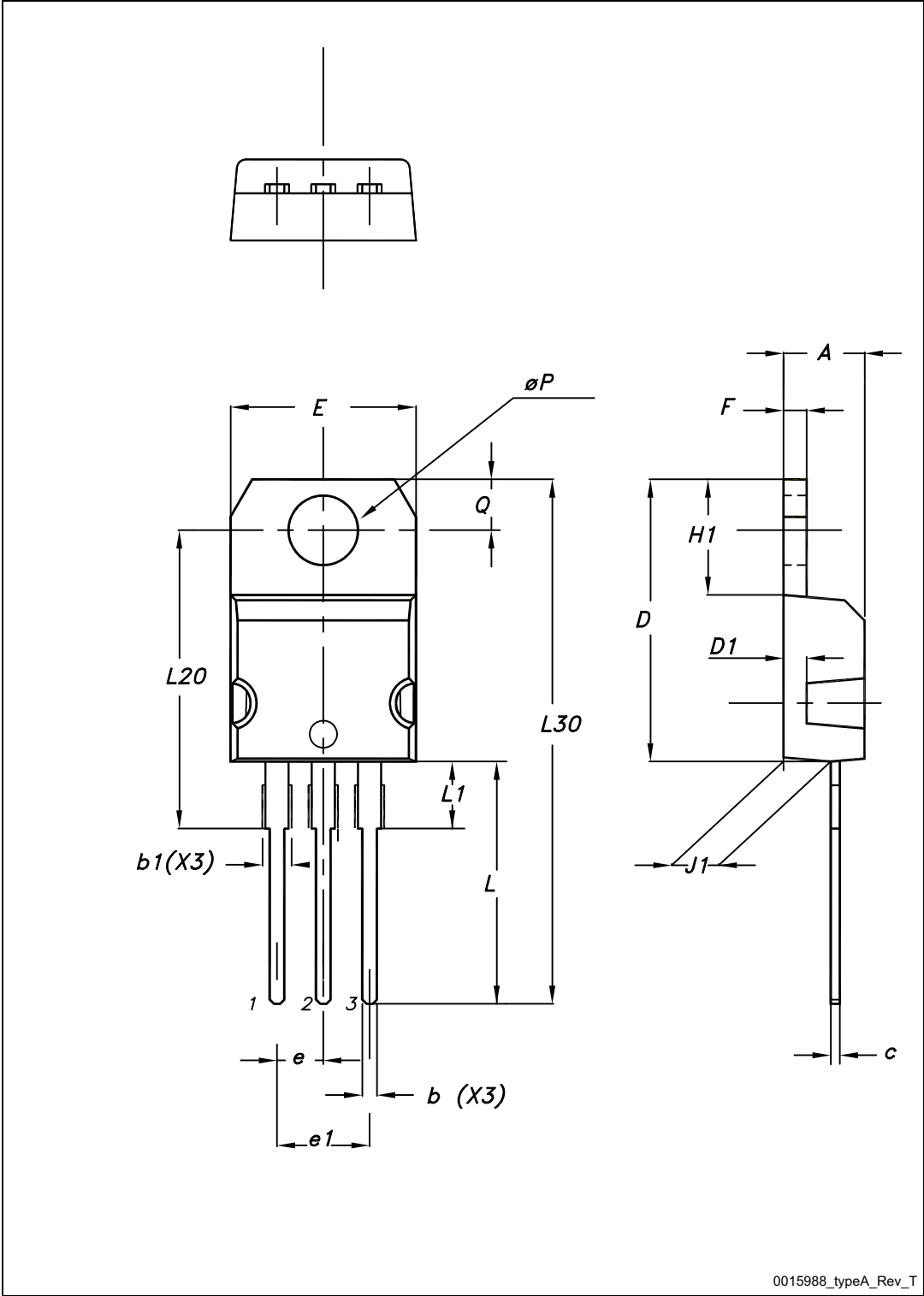


Table 16. TO-220 mechanical data (type STD-ST Single Gauge)

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	
ØP	3.75		3.85
Q	2.65		2.95

Figure 13. Drawing dimension TO-220 (type STD-ST Single Gauge)

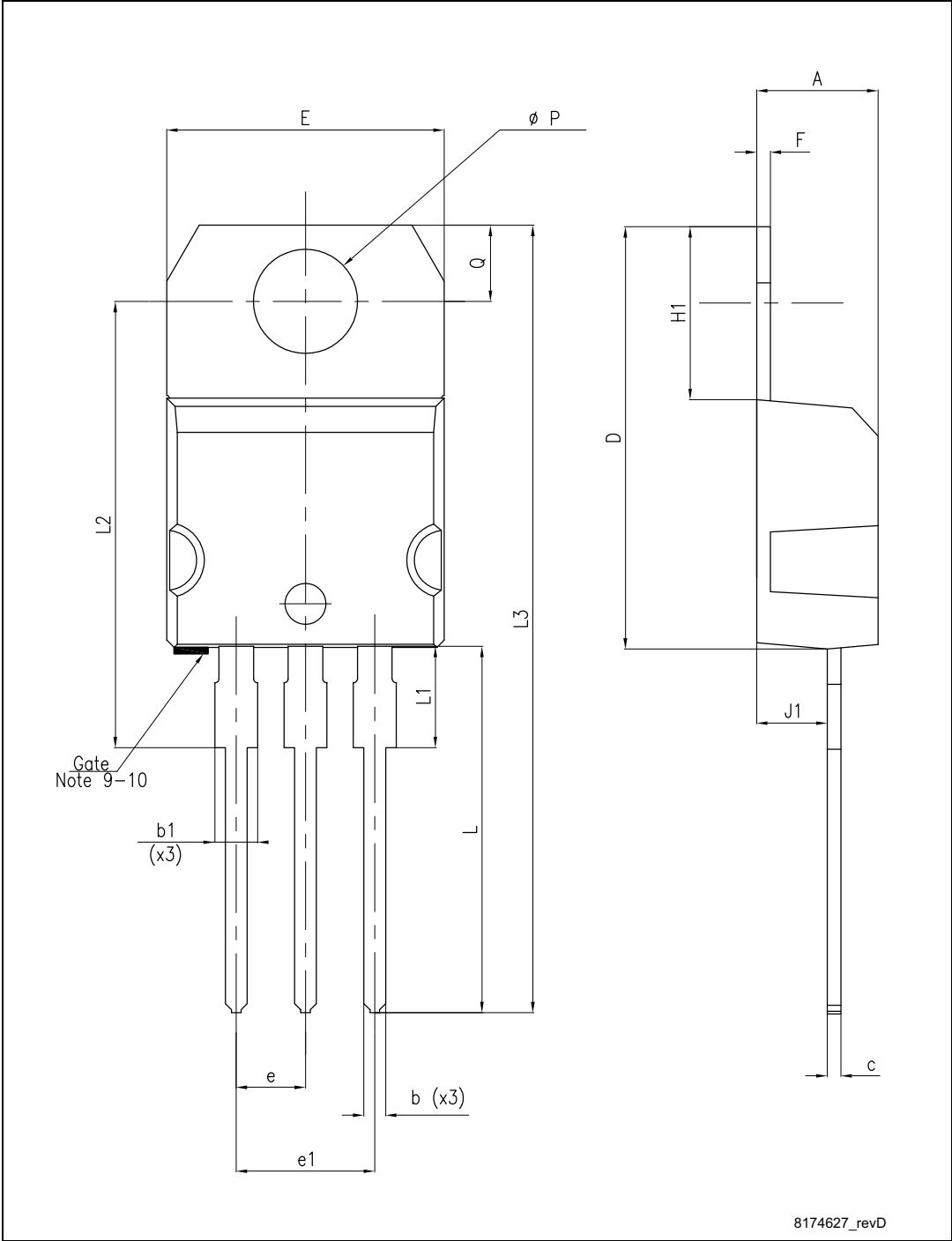


Table 17. SOT-223 mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A			1.80
A1	0.02		0.10
B	0.60	0.70	0.85
B1	2.90	3.00	3.15
c	0.24	0.26	0.35
D	6.30	6.50	6.70
e		2.30	
e1		4.60	
E	3.30	3.50	3.70
H	6.70	7.00	7.30
V			10°

Figure 14. Drawing dimension SOT-223

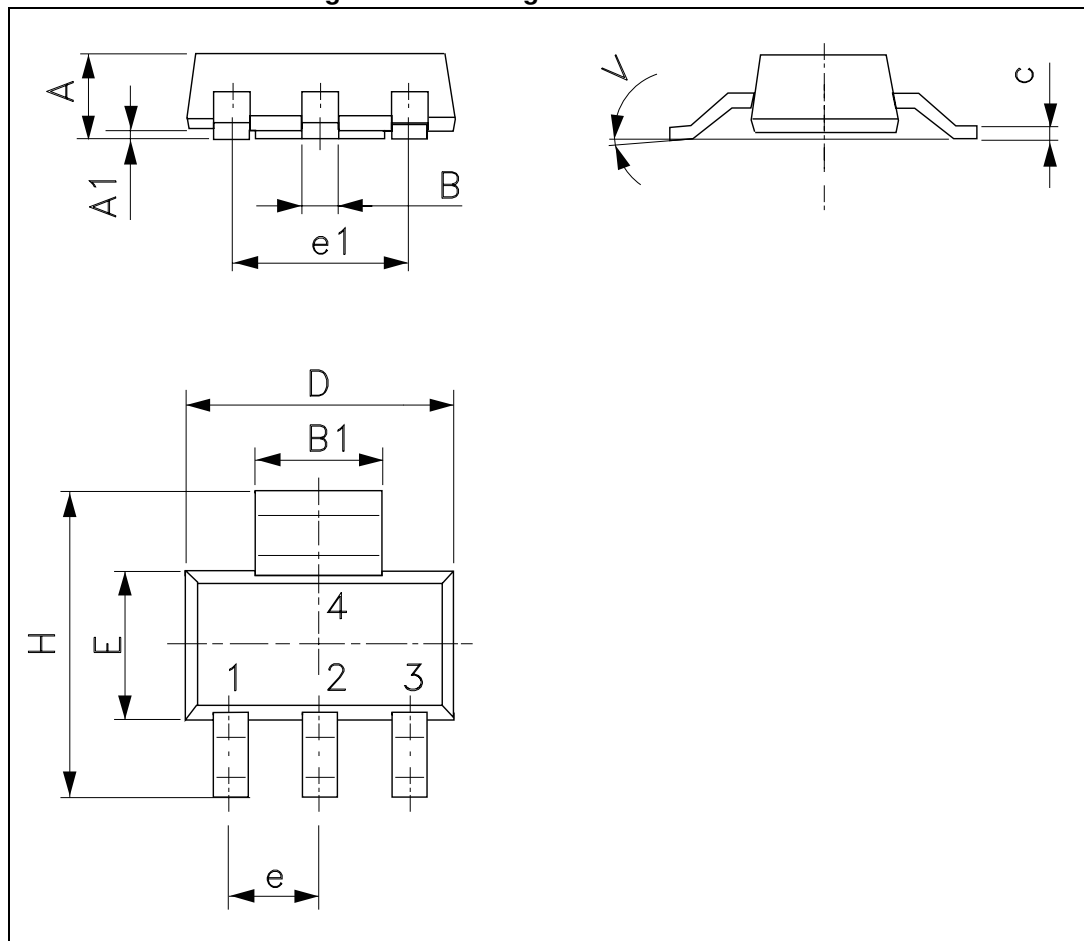


Table 18. SO-8 mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A			1.75
A1	0.10		0.25
A2	1.25		
b	0.28		0.48
c	0.17		0.23
D	4.80	4.90	5.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e		1.27	
h	0.25		0.50
L	0.40		1.27
L1		1.04	
k	0°		8°
ccc			0.10

Figure 15. Drawing dimension SO-8

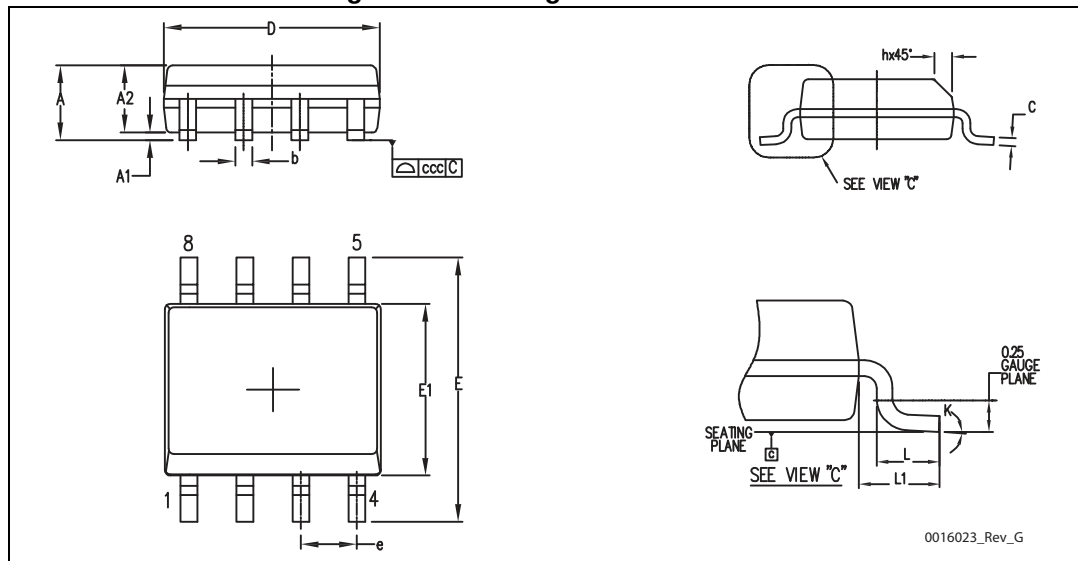


Table 19. DPAK (TO-252) mechanical data (type A)

Dim.	mm		
	Min.	Typ.	Max.
A	2.20		2.40
A1	0.90		1.10
A2	0.03		0.23
b	0.64		0.90
b4	5.20		5.40
c	0.45		0.60
c2	0.48		0.60
D	6.00		6.20
D1	4.95	5.10	5.25
E	6.40		6.60
E1	4.60	4.70	4.80
e	2.159	2.286	2.143
e1	4.445	4.572	4.699
H	9.35		10.10
L	1.00		1.50
L1	2.60	2.80	1.50
L2			3.00
L4	0.60		1.00
R		0.20	
V2	0°		8°

Figure 16. DPAK (TO-252) package outline A

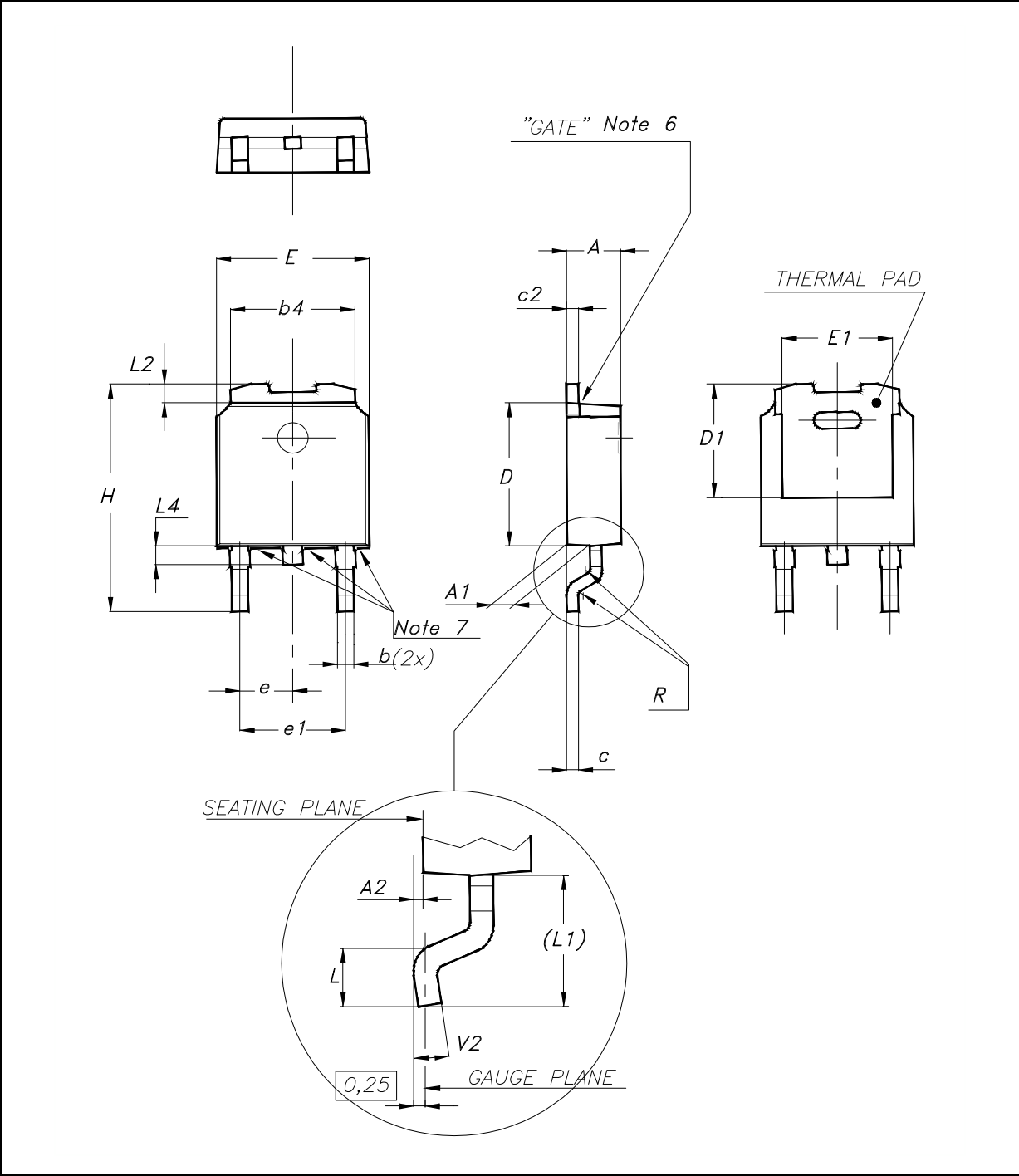


Table 20. DPAK (TO-252) mechanical data (type E)

Dim.	mm		
	Min.	Typ.	Max.
A	2.18		2.39
A2			0.13
b	0.65		0.884
b4	4.95		5.46
c	0.46		0.61
c2	0.46		0.60
D	5.97		6.22
D1	5.21		
E	6.35		6.73
E1	4.32		
e		2.286	
e1		4.572	
H	9.94		10.34
L	1.50		1.78
L1		2.74	
L2	0.89		1.27
L4			1.02

Figure 17. DPAK (TO-252) package outline E

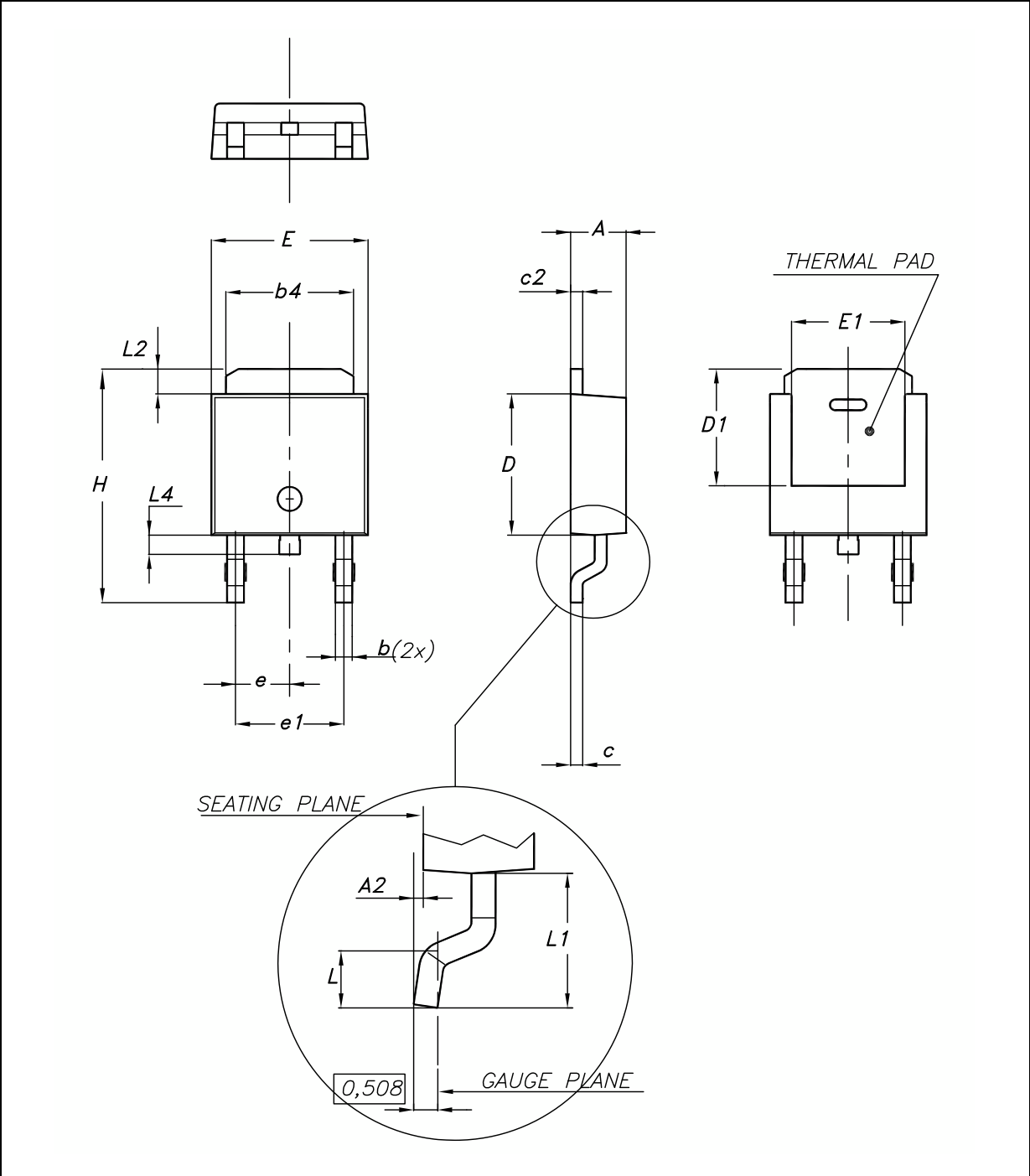


Table 21. DPAK (TO-252) mechanical data type I

Dim.	mm		
	Min.	Typ.	Max.
A	2.20	2.30	2.38
A1	0.90	1.01	1.10
A2	0.00	-	0.10
b	0.77	-	0.89
b1	0.76	0.81	0.86
b2	0.77	-	1.10
b3	5.23	5.33	5.43
c	0.47	-	0.60
c1	0.46	0.51	0.56
c2	0.47	-	0.60
D	6.00	6.10	6.20
D1	5.25	5.40	5.60
E	6.50	6.60	6.70
E1	4.70	4.85	5.00
e	2.286 BSC		
H	9.80	10.10	10.40
L	1.40	1.50	1.70
L1	2.90 REF		
L2	0.90	-	1.25
L3	0.51 BSC		
L4	0.60	0.80	1.00
L5	0.90	-	1.50
L6	1.80 BSC		
Θ	0°	-	8°
Θ 1	3°	5°	7°
Θ 2	1°	3°	5°

Figure 18. DPAK (TO-252) package outline I

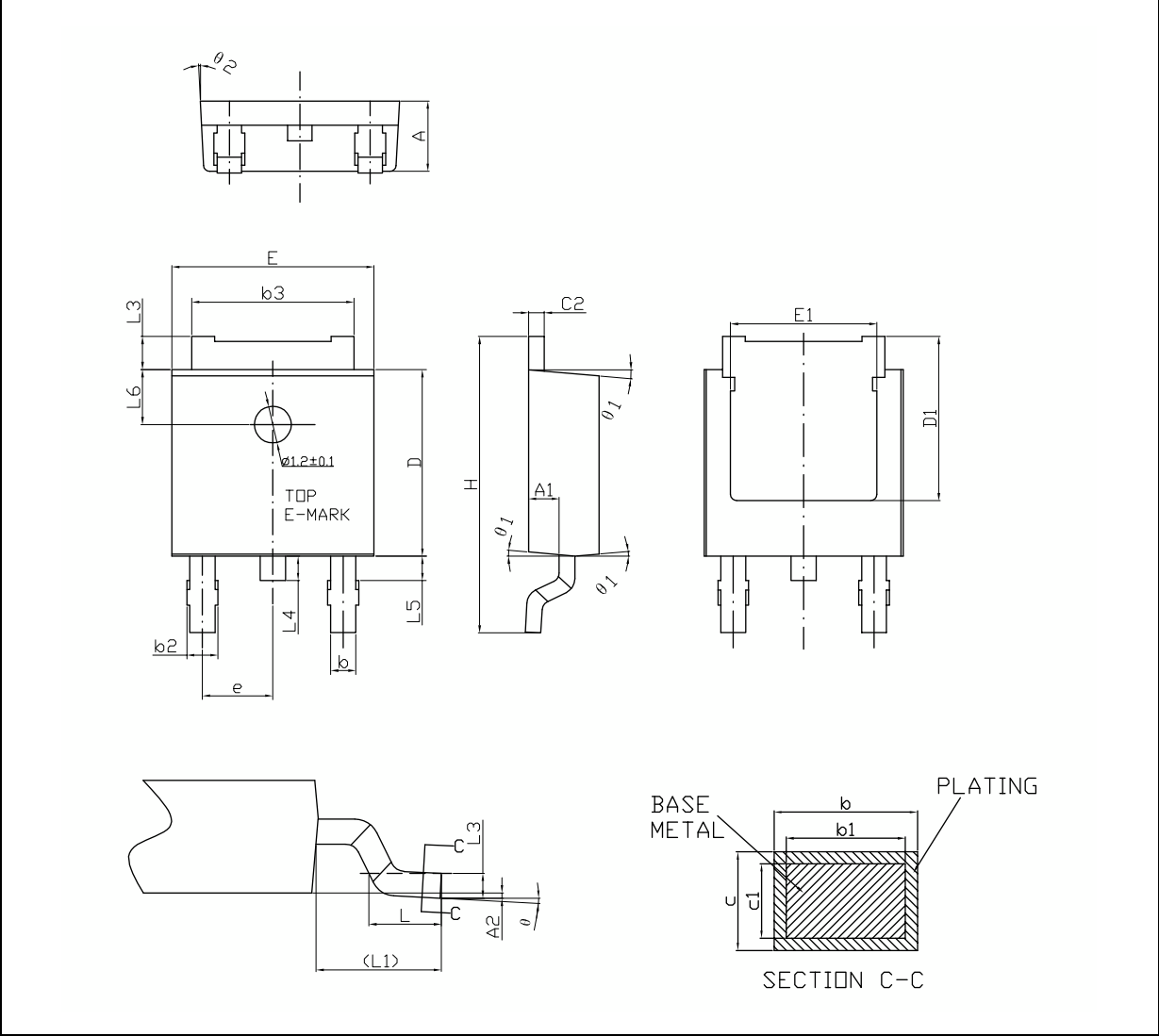
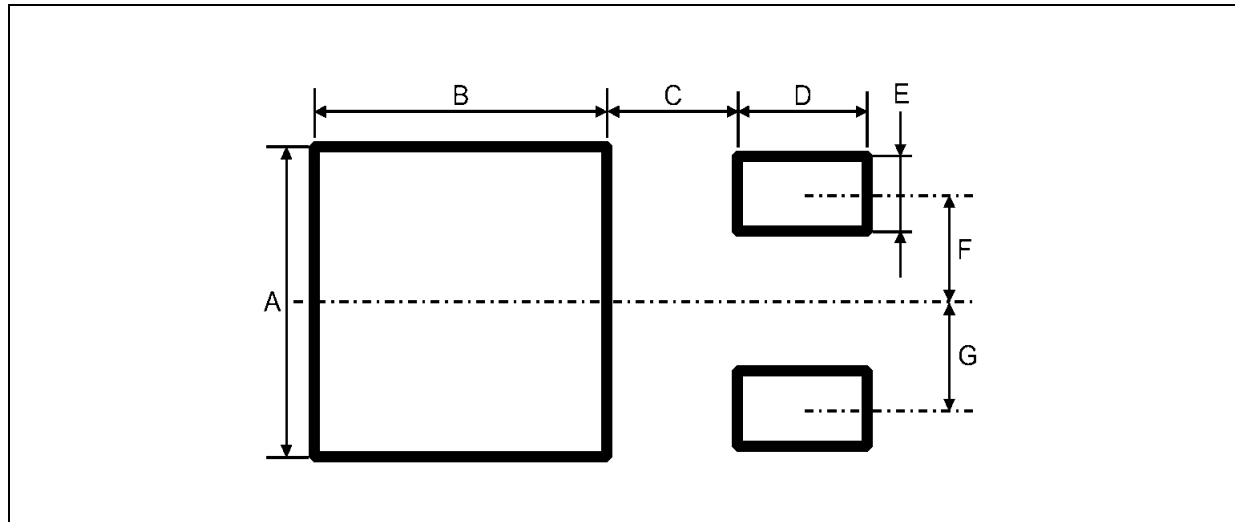


Table 22. Footprint data

	Values	
	mm.	inch.
A	6.70	0.264
B	6.70	0.64
C	1.8	0.070
D	3.0	0.118
E	1.60	0.063
F	2.30	0.091
G	2.30	0.091

Figure 19. DPAK footprint recommended data



9 Packaging mechanical data

Figure 20. Drawing dimension tube for TO-220 Dual Gauge (mm.)

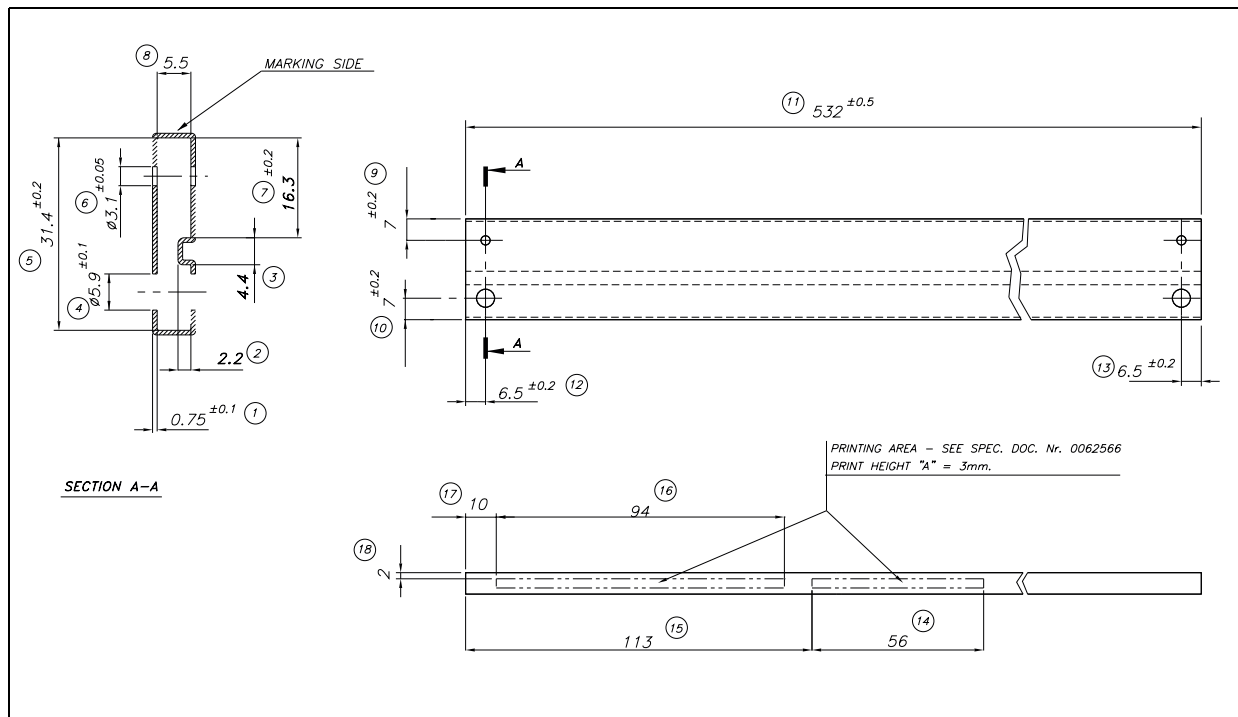


Figure 21. Drawing dimension tube for TO-220 Single Gauge (mm.)

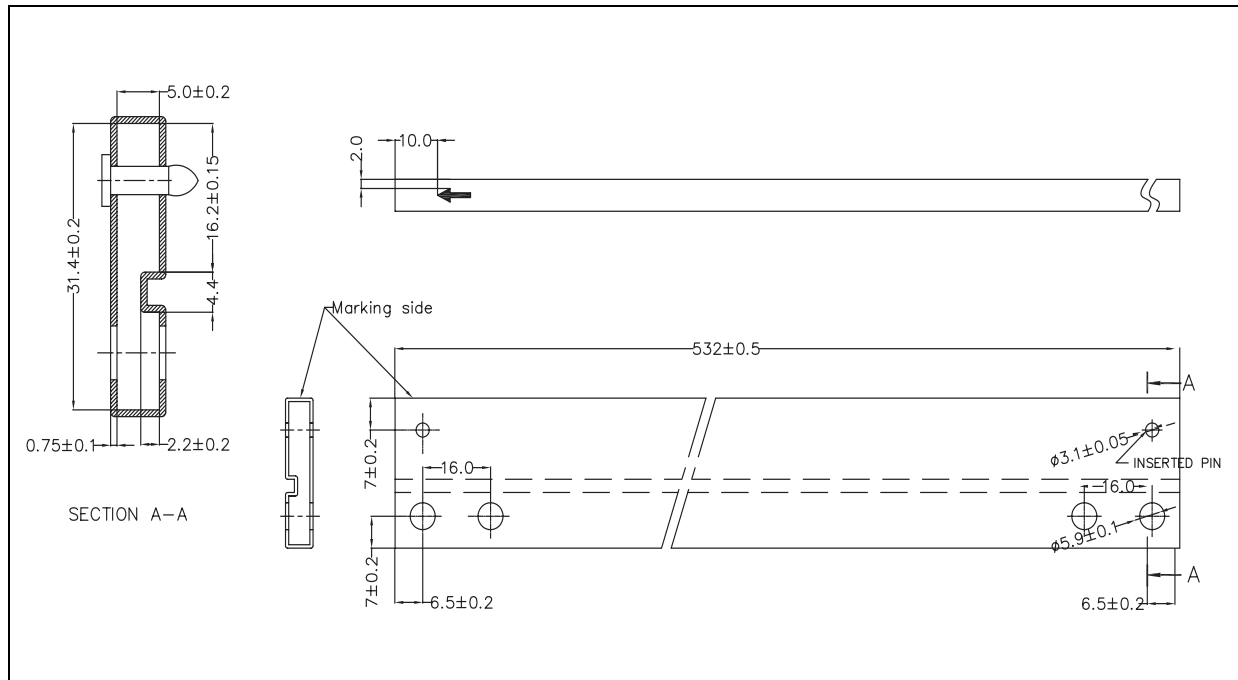


Table 23. SOT-223 tape and reel mechanical data

Tape				Reel		
Dim.	mm			Dim.	mm	
	Min.	Typ.	Max.		Min.	Max.
A0	6.75	6.85	6.95	A		180
B0	7.30	7.40	7.50	N	60	
K0	1.80	1.90	2.00	W1		12.4
F	5.40	5.50	5.60	W2		18.4
E	1.65	1.75	1.85	W3	11.9	15.4
W	11.7	12	12.3			
P2	1.90	2	2.10	Base quantity pcs		1000
P0	3.90	4	4.10	Bulk quantity pcs		1000
P1	7.90	8	8.10			
T	0.25	0.30	0.35			
Dφ	1.50	1.55	1.60			
D1φ	1.50	1.60	1.70			

Figure 22. Tape for SOT-223 (dimensions are in mm)

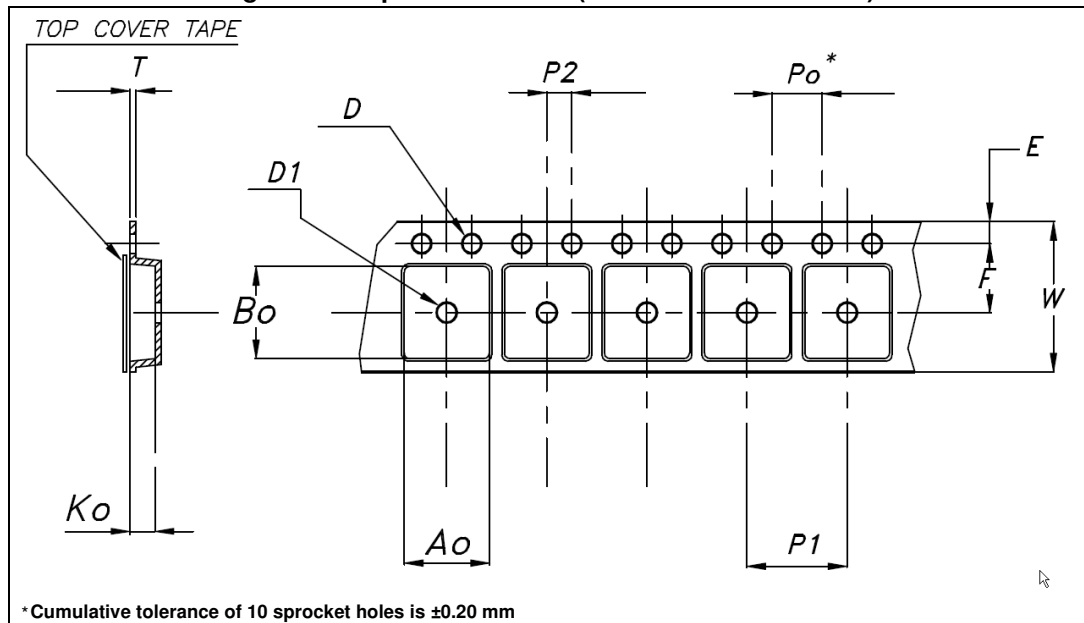


Figure 23. Reel for SOT-223 (dimensions are in mm)

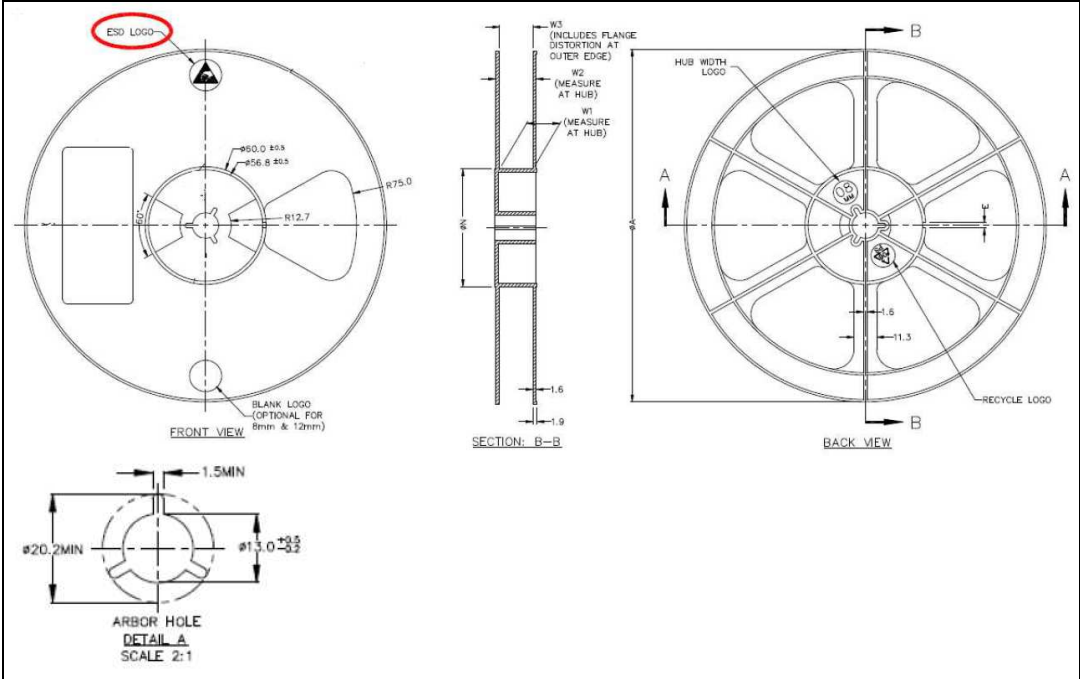


Table 24. SO-8 tape and reel mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A			330
C	12.8		13.2
D	20.2		
N	60		
T			22.4
Ao	8.1		8.5
Bo	5.5		5.9
Ko	2.1		2.3
Po	3.9		4.1
P	7.9		8.1

Figure 24. SO-8 tape and reel dimensions

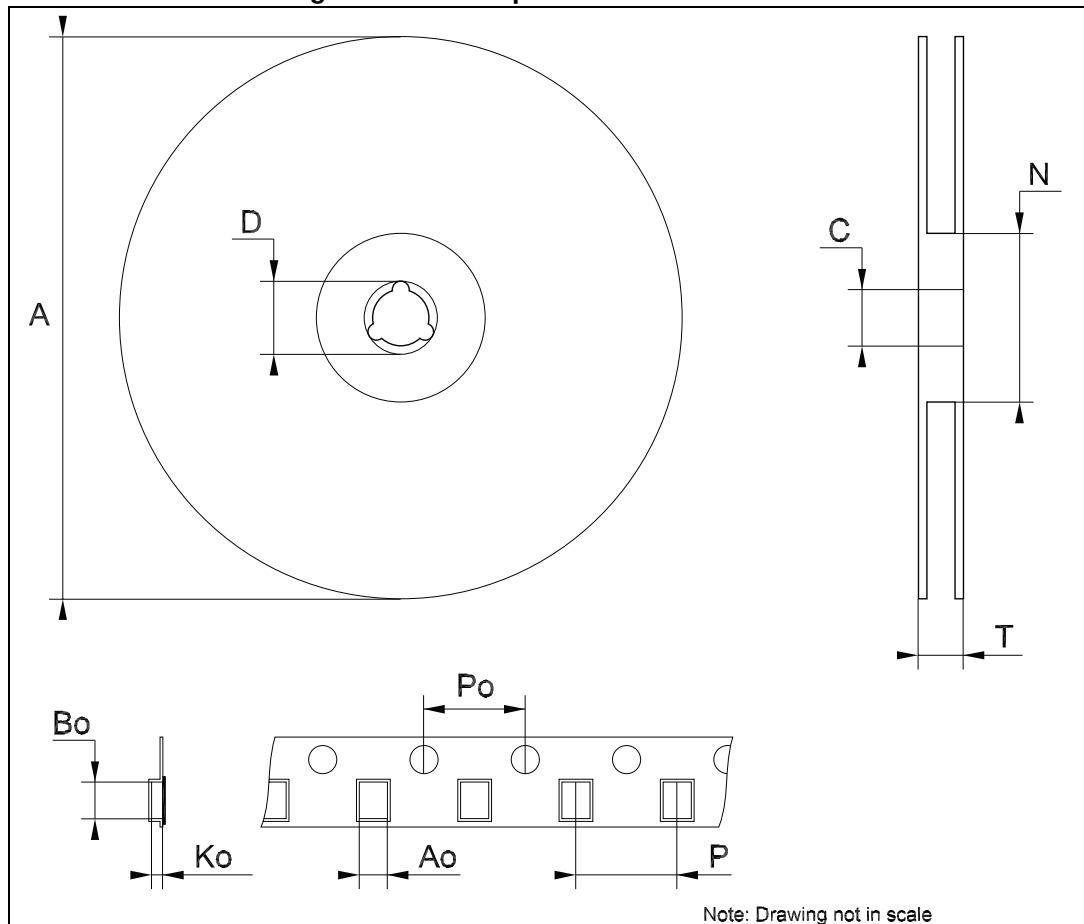


Table 25. DPAK tape and reel mechanical data

Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	6.8	7	A		330
B0	10.4	10.6	B	1.5	
B1		12.1	C	12.8	13.2
D	1.5	1.6	D	20.2	
D1	1.5		G	16.4	18.4
E	1.65	1.85	N	50	
F	7.4	7.6	T		22.4
K0	2.55	2.75			
P0	3.9	4.1	Base qty.		2500
P1	7.9	8.1	Bulk qty.		2500
P2	1.9	2.1			
R	40				
T	0.25	0.35			
W	15.7	16.3			

Figure 25. Tape for DPAK

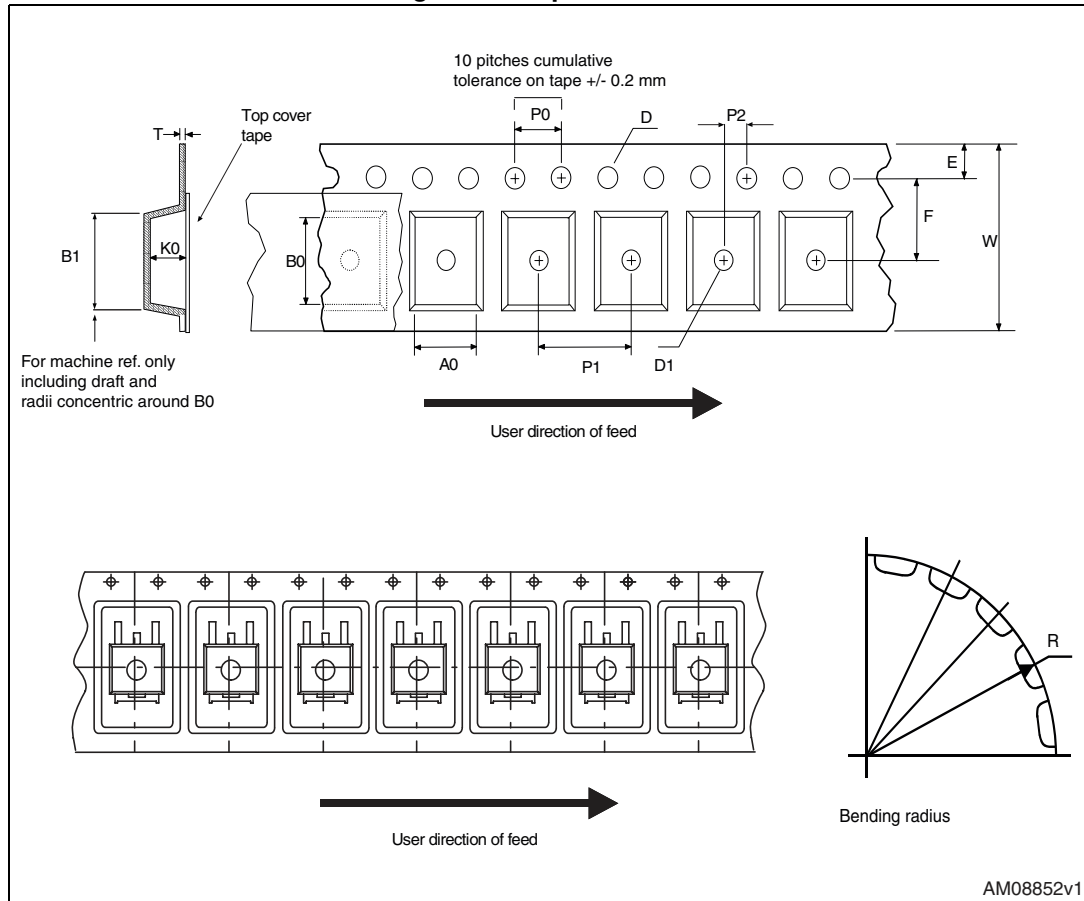
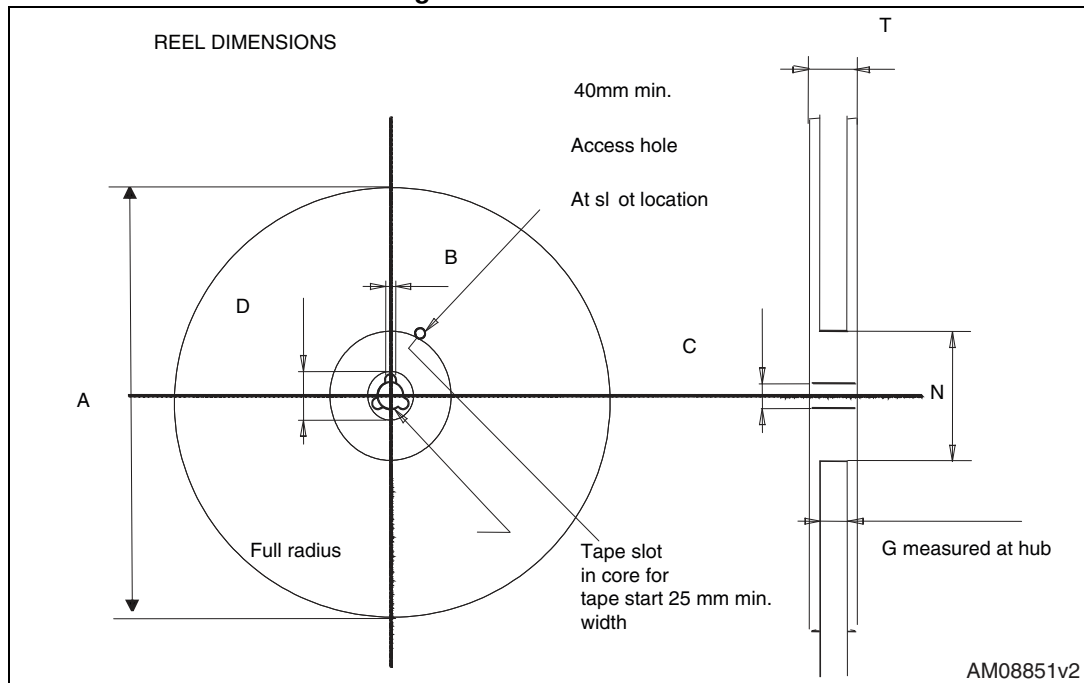


Figure 26. Reel for DPAK



10 Order codes

Table 26. Order codes

Packages					
SOT-223	SO-8	DPAK (Tape and reel)	TO-220	TO-220 (Dual Gauge)	Output voltages
LD1117S12TR		LD1117DT12TR			1.2 V
LD1117S12CTR		LD1117DT12CTR			1.2 V
LD1117S18TR		LD1117DT18TR	LD1117V18		1.8 V
LD1117S18CTR		LD1117DT18CTR			1.8 V
LD1117S25TR		LD1117DT25TR			2.5 V
LD1117S25CTR		LD1117DT25CTR			2.5 V
LD1117S33TR	LD1117D33TR	LD1117DT33TR	LD1117V33	LD1117V33-DG	3.3 V
				LD1117V33C-DG	3.3 V
LD1117S33CTR	LD1117D33CTR	LD1117DT33CTR	LD1117V33C		3.3 V
LD1117S50TR		LD1117DT50TR	LD1117V50	LD1117V50-DG	5 V
					5 V
LD1117S50CTR		LD1117DT50CTR	LD1117V50C		5 V
LD1117STR		LD1117DTTR	LD1117V	LD1117V-DG	ADJ from 1.25 to 15 V
					ADJ from 1.25 to 15 V
LD1117SC-R		LD1117DTC-R			ADJ from 1.25 to 15 V

11 Revision history

Table 27. Document revision history

Date	Revision	Changes
22-Sep-2004	15	Add new part number #12C; typing error: note on table 2.
25-Oct-2004	16	Add V_{ref} reference voltage on table 12.
18-Jul-2005	17	The DPAK mechanical data updated.
25-Nov-2005	18	The TO220FM package removed.
14-Dec-2005	19	The T_{op} on table 2 updated.
06-Dec-2006	20	DPAK mechanical data updated and added footprint data.
05-Apr-2007	21	Order codes updated.
30-Nov-2007	22	Added Table 1.
16-Apr-2008	23	Modified: Table 24 on page 42.
08-Jul-2008	24	Added note 1. on page 7.
30-Mar-2009	25	Modified: V_{IN} max value Table 4 on page 10 and Figure 9 on page 23
29-Jul-2009	26	Modified: Table 24 on page 42.
03-Feb-2010	27	Modified Table 9 on page 15.
22-Mar-2010	28	Added: Table 16 on page 22, Figure 13 on page 23, Figure 14 on page 24, Figure 17 and Figure 18 on page 33
15-Nov-2010	29	Modified: R_{thJC} value for TO-220 Table 2 on page 7.
30-Nov-2011	30	Added: order code LD1117V33-DG Table 24 on page 42.
13-Feb-2012	31	Added: order codes LD1117V50-DG and LD1117V-DG Table 24 on page 42.
19-Oct-2012	32	Added: R_{thJA} value for DPAK, SOT-223 and SO-8 Table 2 on page 7.
20-Nov-2013	33	Part number LD1117xx changed to LD1117. Updated the Description in cover page, Section 8: Package mechanical data and Table 24: Order codes. Cancelled Table 1: Device summary. Added Section 9: Packaging mechanical data. Minor text changes.
12-Jun-2019	34	Updated Table 19, Table 20, Figure 16, Figure 17 and Figure 18.
16-Oct-2019	35	Updated Figure 2: Pin connections (top view).
04-Dec-2019	36	Added Table 20: DPAK (TO-252) mechanical data (type E). Updated pin 3 DPAK package in Figure 2: Pin connections (top view).
11-Feb-2020	37	Updated Figure 14: Drawing dimension SOT-223 .