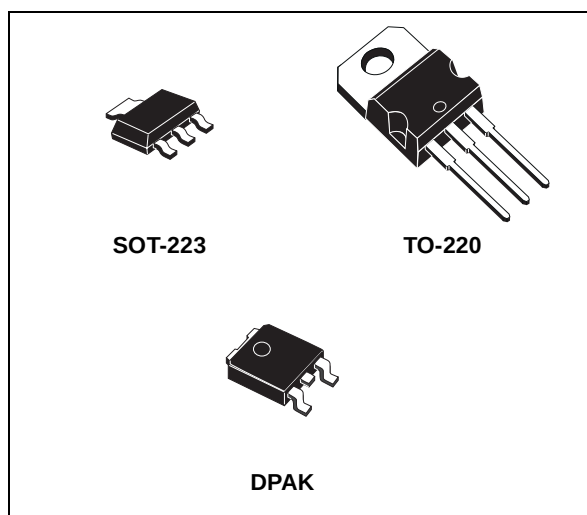




LD1117A SERIES

LOW DROP FIXED AND ADJUSTABLE POSITIVE VOLTAGE REGULATORS

- LOW DROPOUT VOLTAGE
(1.15V TYP. @ $I_{OUT} = 1A$, 25°C)
- VERY LOW QUIESCENT CURRENT
(5 mA TYP. @ 25°C)
- OUTPUT CURRENT UP TO 1A
- FIXED OUTPUT VOLTAGE OF: 1.8V, 2.5V, 2.85V, 3.3V, 5.0V
- ADJUSTABLE VERSION AVAILABILITY
($V_{ref} = 1.25V$)
- INTERNAL CURRENT AND THERMAL LIMIT
- ONLY 10 μF FOR STABILITY
- AVAILABLE IN $\pm 2\%$ (AT 25°C) AND 4% IN FULL TEMPERATURE RANGE
- HIGH SUPPLY VOLTAGE REJECTION:
(80dB TYP. AT 25°C)
- TEMPERATURE RANGE: 0°C TO 125°C

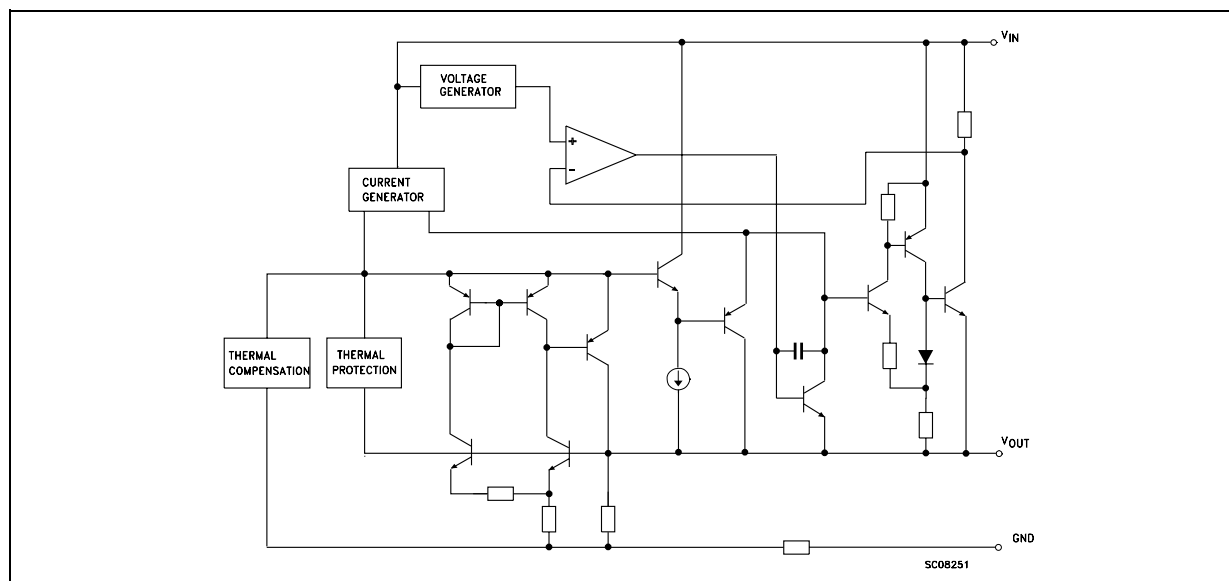


DESCRIPTION

The LD1117A is a LOW DROP Voltage Regulator able to provide up to 1A of Output Current, available even in adjustable version ($V_{ref}=1.25V$). Concerning fixed versions, are offered the following Output Voltages: 1.8V, 2.5V, 2.85V, 3.3V and 5.0V. The 2.85V type is ideal for SCSI-2 lines active termination. The device is supplied in:

SOT-223, DPAK and TO-220. The surface mount packages optimize the thermal characteristics even offering a relevant space saving effect. High efficiency is assured by NPN pass transistor. Only a very common 10 μF minimum capacitor is needed for stability. Only chip trimming allows the regulator to reach a very tight output voltage tolerance, within $\pm 2\%$ at 25 °C.

BLOCK DIAGRAM



LD1117A SERIES

ABSOLUTE MAXIMUM RATINGS

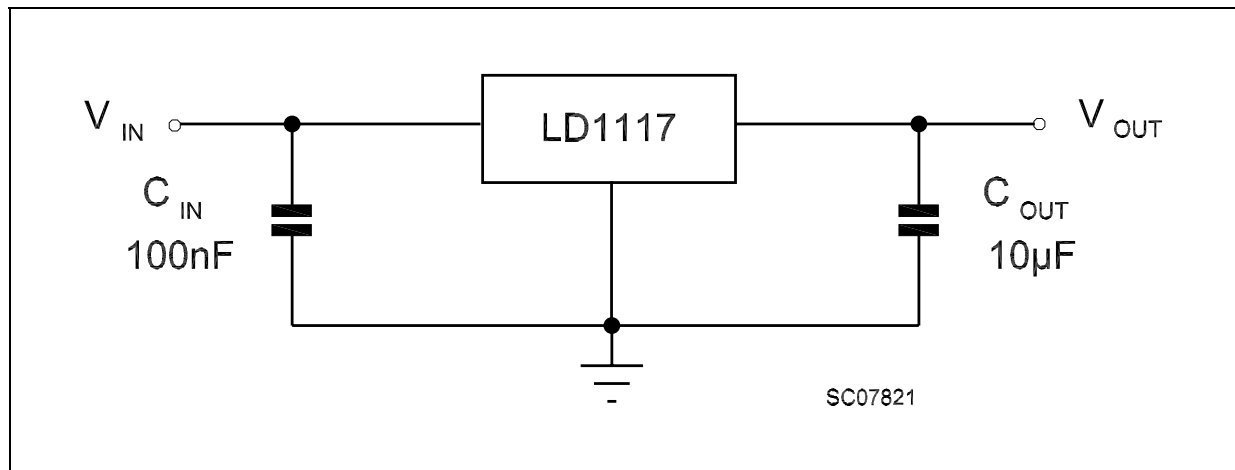
Symbol	Parameter ²	Value	Unit
V_{IN}	DC Input Voltage	10	V
P_{tot}	Power Dissipation	12	W
T_{stg}	Storage Temperature Range	-40 to +150	°C
T_{op}	Operating Junction Temperature Range	0 to +125	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied. Over the above suggested Max Power Dissipation a Short Circuit could definitively damage the device.

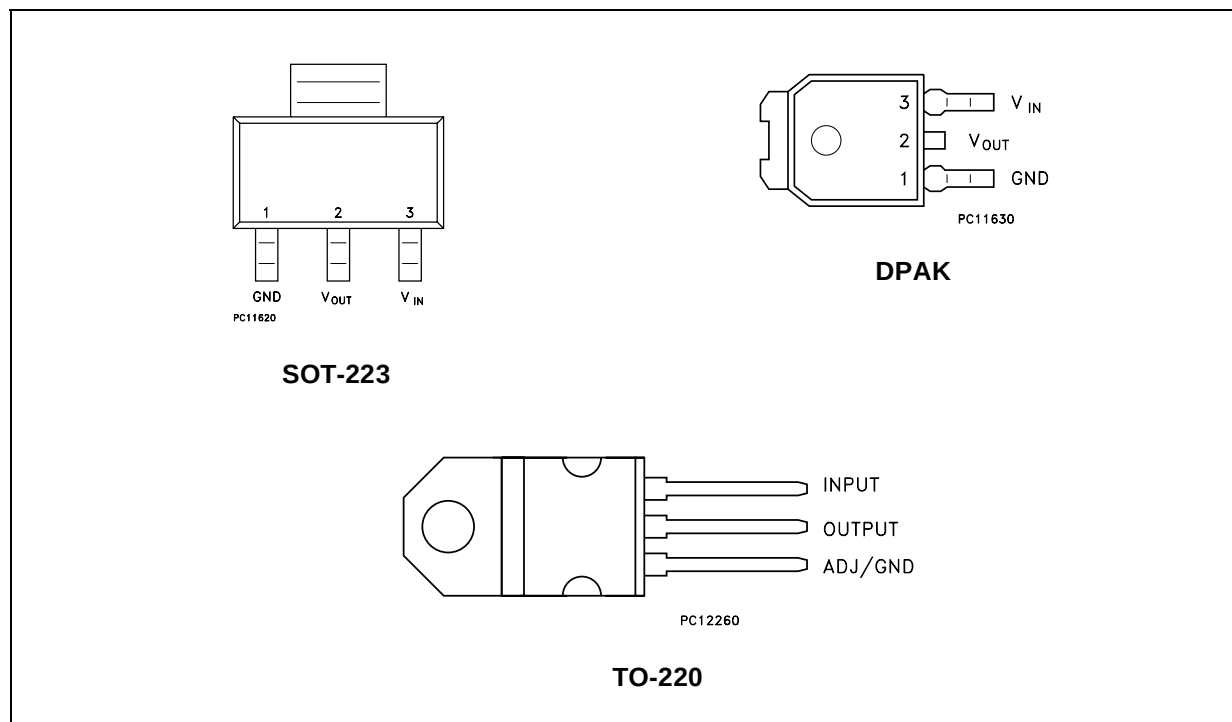
THERMAL DATA

Symbol	Parameter	TO-220	SOT-223	DPAK	Unit
$R_{thj-case}$	Thermal Resistance Junction-case	3	15	8	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	50			°C/W

APPLICATION CIRCUIT (FOR OTHER FIXED OUTPUT VOLTAGES)



CONNECTION DIAGRAM (top view)



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

ORDERING CODES

SOT-223	DPAK	TO-220	OUTPUT VOLTAGE
LD1117AS18TR	LD1117ADT18TR	LD1117AV18	1.8 V
LD1117AS25TR	LD1117ADT25TR	LD1117AV25	2.5 V
LD1117AS28TR	LD1117ADT28TR	LD1117AV28	2.85 V
LD1117AS33TR	LD1117ADT33TR	LD1117AV33	3.3 V
LD1117AS50TR	LD1117ADT50TR	LD1117AV50	5 V
LD1117AST-R	LD1117ADT-R	LD1117AV	ADJUSTABLE FROM 1.25 TO 15 V

LD1117A SERIES

ELECTRICAL CHARACTERISTICS OF LD1117A#18 (refer to the test circuits, $T_J = 0$ to 125°C , $C_O = 10\ \mu\text{F}$, $C_I = 10\ \mu\text{F}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_O	Output Voltage	$V_I = 3.8\ \text{V}$ $I_O = 10\ \text{mA}$ $T_J = 25^\circ\text{C}$	1.764	1.8	1.836	V
V_O	Output Voltage	$I_O = 0$ to $1\ \text{A}$ $V_I = 3.3$ to $8\ \text{V}$	1.728		1.872	V
ΔV_O	Line Regulation	$V_I = 3.3$ to $8\ \text{V}$ $I_O = 0\ \text{mA}$		1	6	mV
ΔV_O	Load Regulation	$V_I = 3.3\ \text{V}$ $I_O = 0$ to $1\ \text{A}$		1	10	mV
ΔV_O	Temperature Stability			0.5		%
ΔV_O	Long Term Stability	1000 hrs, $T_J = 125^\circ\text{C}$		0.3		%
V_I	Operating Input Voltage	$I_O = 100\ \text{mA}$			10	V
I_d	Quiescent Current	$V_I \leq 8\ \text{V}$ $I_O = 0\ \text{mA}$		5	10	mA
I_O	Output Current	$V_I - V_O = 5\ \text{V}$ $T_J = 25^\circ\text{C}$	1000			mA
eN	Output Noise Voltage	$B = 10\text{Hz}$ to 10KHz $T_J = 25^\circ\text{C}$		100		μV
SVR	Supply Voltage Rejection	$I_O = 40\ \text{mA}$ $f = 120\text{Hz}$ $V_I - V_O = 3\ \text{V}$ $V_{\text{ripple}} = 1\ \text{V}_{\text{PP}}$	60	80		dB
V_D	Dropout Voltage	$I_O = 100\ \text{mA}$		1	1.10	V
		$I_O = 500\ \text{mA}$		1.05	1.15	
		$I_O = 1\ \text{A}$		1.15	1.30	
$\Delta V_{O(\text{pwr})}$	Thermal Regulation	$T_a = 25^\circ\text{C}$ 30ms Pulse		0.08	0.2	%/W

ELECTRICAL CHARACTERISTICS OF LD1117A#25 (refer to the test circuits, $T_J = 0$ to 125°C , $C_O = 10\ \mu\text{F}$, $C_I = 10\ \mu\text{F}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_O	Output Voltage	$V_I = 4.5\ \text{V}$ $I_O = 10\ \text{mA}$ $T_J = 25^\circ\text{C}$	2.45	2.5	2.55	V
V_O	Output Voltage	$I_O = 0$ to $1\ \text{A}$ $V_I = 3.9$ to $8\ \text{V}$	2.4		2.6	V
ΔV_O	Line Regulation	$V_I = 3.9$ to $8\ \text{V}$ $I_O = 0\ \text{mA}$		1	6	mV
ΔV_O	Load Regulation	$V_I = 3.9\ \text{V}$ $I_O = 0$ to $1\ \text{A}$		1	10	mV
ΔV_O	Temperature Stability			0.5		%
ΔV_O	Long Term Stability	1000 hrs, $T_J = 125^\circ\text{C}$		0.3		%
V_I	Operating Input Voltage	$I_O = 100\ \text{mA}$			10	V
I_d	Quiescent Current	$V_I \leq 10\ \text{V}$ $I_O = 0\ \text{mA}$		5	10	mA
I_O	Output Current	$V_I - V_O = 5\ \text{V}$ $T_J = 25^\circ\text{C}$	1000	1200		mA
eN	Output Noise Voltage	$B = 10\text{Hz}$ to 10KHz $T_J = 25^\circ\text{C}$		100		μV
SVR	Supply Voltage Rejection	$I_O = 40\ \text{mA}$ $f = 120\text{Hz}$ $V_I - V_O = 3\ \text{V}$ $V_{\text{ripple}} = 1\ \text{V}_{\text{PP}}$	60	80		dB
V_D	Dropout Voltage	$I_O = 100\ \text{mA}$		1	1.10	V
		$I_O = 500\ \text{mA}$		1.05	1.15	
		$I_O = 1\ \text{A}$		1.15	1.30	
$\Delta V_{O(\text{pwr})}$	Thermal Regulation	$T_a = 25^\circ\text{C}$ 30ms Pulse		0.08	0.2	%/W

ELECTRICAL CHARACTERISTICS OF LD1117A#28 (refer to the test circuits, $T_J = 0$ to 125°C , $C_O = 10\ \mu\text{F}$, $C_I = 10\ \mu\text{F}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_O	Output Voltage	$V_I = 4.85\ \text{V}$ $I_O = 10\ \text{mA}$ $T_J = 25^\circ\text{C}$	2.793	2.85	2.907	V
V_O	Output Voltage	$I_O = 0$ to $1\ \text{A}$ $V_I = 4.25$ to $10\ \text{V}$	2.736		2.964	V
ΔV_O	Line Regulation	$V_I = 4.25$ to $8\ \text{V}$ $I_O = 0\ \text{mA}$		1	6	mV
ΔV_O	Load Regulation	$V_I = 4.25\ \text{V}$ $I_O = 0$ to $1\ \text{A}$		1	10	mV
ΔV_O	Temperature Stability			0.5		%
ΔV_O	Long Term Stability	1000 hrs, $T_J = 125^\circ\text{C}$		0.3		%
V_I	Operating Input Voltage	$I_O = 100\ \text{mA}$			10	V
I_d	Quiescent Current	$V_I \leq 10\ \text{V}$ $I_O = 0\ \text{mA}$		4.5	10	mA
I_O	Output Current	$V_I - V_O = 5\ \text{V}$ $T_J = 25^\circ\text{C}$	1000	1200		mA
eN	Output Noise Voltage	B = 10Hz to 10KHz $T_J = 25^\circ\text{C}$		100		μV
SVR	Supply Voltage Rejection	$I_O = 40\ \text{mA}$ $f = 120\text{Hz}$ $V_I - V_O = 3\ \text{V}$ $V_{\text{ripple}} = 1\ \text{V}_{\text{PP}}$	60	75		dB
V_D	Dropout Voltage	$I_O = 100\ \text{mA}$		1	1.10	V
		$I_O = 500\ \text{mA}$		1.05	1.15	
		$I_O = 1\ \text{A}$		1.15	1.30	
$\Delta V_{O(\text{pwr})}$	Thermal Regulation	$T_a = 25^\circ\text{C}$ 30ms Pulse		0.08	0.2	%/W

ELECTRICAL CHARACTERISTICS OF LD1117A#33 (refer to the test circuits, $T_J = 0$ to 125°C , $C_O = 10\ \mu\text{F}$, $C_I = 10\ \mu\text{F}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_O	Output Voltage	$V_I = 5.3\ \text{V}$ $I_O = 10\ \text{mA}$ $T_J = 25^\circ\text{C}$	3.234	3.3	3.366	V
V_O	Output Voltage	$I_O = 0$ to $1\ \text{A}$ $V_I = 4.75$ to $10\ \text{V}$	3.168		3.432	V
ΔV_O	Line Regulation	$V_I = 4.75$ to $8\ \text{V}$ $I_O = 0\ \text{mA}$		1	6	mV
ΔV_O	Load Regulation	$V_I = 4.75\ \text{V}$ $I_O = 0$ to $1\ \text{A}$		1	10	mV
ΔV_O	Temperature Stability			0.5		%
ΔV_O	Long Term Stability	1000 hrs, $T_J = 125^\circ\text{C}$		0.3		%
V_I	Operating Input Voltage	$I_O = 100\ \text{mA}$			10	V
I_d	Quiescent Current	$V_I \leq 10\ \text{V}$ $I_O = 0\ \text{mA}$		5	10	mA
I_O	Output Current	$V_I - V_O = 5\ \text{V}$ $T_J = 25^\circ\text{C}$	1000	1200		mA
eN	Output Noise Voltage	B = 10Hz to 10KHz $T_J = 25^\circ\text{C}$		100		μV
SVR	Supply Voltage Rejection	$I_O = 40\ \text{mA}$ $f = 120\text{Hz}$ $V_I - V_O = 3\ \text{V}$ $V_{\text{ripple}} = 1\ \text{V}_{\text{PP}}$	60	75		dB
V_D	Dropout Voltage	$I_O = 100\ \text{mA}$		1	1.10	V
		$I_O = 500\ \text{mA}$		1.05	1.15	
		$I_O = 1\ \text{A}$		1.15	1.30	
$\Delta V_{O(\text{pwr})}$	Thermal Regulation	$T_a = 25^\circ\text{C}$ 30ms Pulse		0.08	0.2	%/W

LD1117A SERIES

ELECTRICAL CHARACTERISTICS OF LD1117A#50 (refer to the test circuits, $T_J = 0$ to 125°C , $C_O = 10\ \mu\text{F}$, $C_I = 10\ \mu\text{F}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_O	Output Voltage	$V_I = 7\ \text{V}$ $I_O = 10\ \text{mA}$ $T_J = 25^\circ\text{C}$	4.9	5	5.1	V
V_O	Output Voltage	$I_O = 0$ to $1\ \text{A}$ $V_I = 6.4$ to $10\ \text{V}$	4.8		5.2	V
ΔV_O	Line Regulation	$V_I = 6.4$ to $8\ \text{V}$ $I_O = 0\ \text{mA}$		1	6	mV
ΔV_O	Load Regulation	$V_I = 6.4\ \text{V}$ $I_O = 0$ to $1\ \text{A}$		1	10	mV
ΔV_O	Temperature Stability			0.5		%
ΔV_O	Long Term Stability	1000 hrs, $T_J = 125^\circ\text{C}$		0.3		%
V_I	Operating Input Voltage	$I_O = 100\ \text{mA}$			10	V
I_d	Quiescent Current	$V_I \leq 10\ \text{V}$ $I_O = 0\ \text{mA}$		5	10	mA
I_O	Output Current	$V_I - V_O = 5\ \text{V}$ $T_J = 25^\circ\text{C}$	1000	1200		mA
eN	Output Noise Voltage	B = 10Hz to 10KHz $T_J = 25^\circ\text{C}$		100		μV
SVR	Supply Voltage Rejection	$I_O = 40\ \text{mA}$ $f = 120\text{Hz}$ $V_I - V_O = 3\ \text{V}$ $V_{\text{ripple}} = 1\ \text{V}_{\text{PP}}$	60	80		dB
V_D	Dropout Voltage	$I_O = 100\ \text{mA}$		1	1.10	V
		$I_O = 500\ \text{mA}$		1.05	1.15	
		$I_O = 1\ \text{A}$		1.15	1.30	
$\Delta V_{O(\text{pwr})}$	Thermal Regulation	$T_a = 25^\circ\text{C}$ 30ms Pulse		0.08	0.2	%/W

ELECTRICAL CHARACTERISTICS OF LD1117A (ADJUSTABLE) (refer to the test circuits, $T_J = 0$ to 125°C , $C_O = 10\ \mu\text{F}$, $C_I = 10\ \mu\text{F}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_O	Output Voltage	$V_I = 5.3\ \text{V}$ $I_O = 10\ \text{mA}$ $T_J = 25^\circ\text{C}$	1.225	1.25	1.275	V
V_O	Output Voltage	$I_O = 0$ to $1\ \text{A}$ $V_I = 2.75$ to $10\ \text{V}$	1.2		1.3	V
ΔV_O	Line Regulation	$V_I = 2.75$ to $8\ \text{V}$ $I_O = 0\ \text{mA}$		1	6	mV
ΔV_O	Load Regulation	$V_I = 2.75\ \text{V}$ $I_O = 0$ to $1\ \text{A}$		1	10	mV
ΔV_O	Temperature Stability			0.5		%
ΔV_O	Long Term Stability	1000 hrs, $T_J = 125^\circ\text{C}$		0.3		%
V_I	Operating Input Voltage	$I_O = 100\ \text{mA}$			10	V
I_d	Quiescent Current	$V_I \leq 8\ \text{V}$ $I_O = 0\ \text{mA}$		5	10	mA
I_O	Output Current	$V_I - V_O = 5\ \text{V}$ $T_J = 25^\circ\text{C}$	1000	1200		mA
eN	Output Noise Voltage	B = 10Hz to 10KHz $T_J = 25^\circ\text{C}$		100		μV
SVR	Supply Voltage Rejection	$I_O = 40\ \text{mA}$ $f = 120\text{Hz}$ $V_I - V_O = 3\ \text{V}$ $V_{\text{ripple}} = 1\ \text{V}_{\text{PP}}$	60	80		dB
V_D	Dropout Voltage	$I_O = 100\ \text{mA}$		1	1.10	V
		$I_O = 500\ \text{mA}$		1.05	1.15	
		$I_O = 1\ \text{A}$		1.15	1.30	
$\Delta V_{O(\text{pwr})}$	Thermal Regulation	$T_a = 25^\circ\text{C}$ 30ms Pulse		0.08	0.2	%/W

TYPICAL APPLICATIONS

Figure 1 : Negative Supply

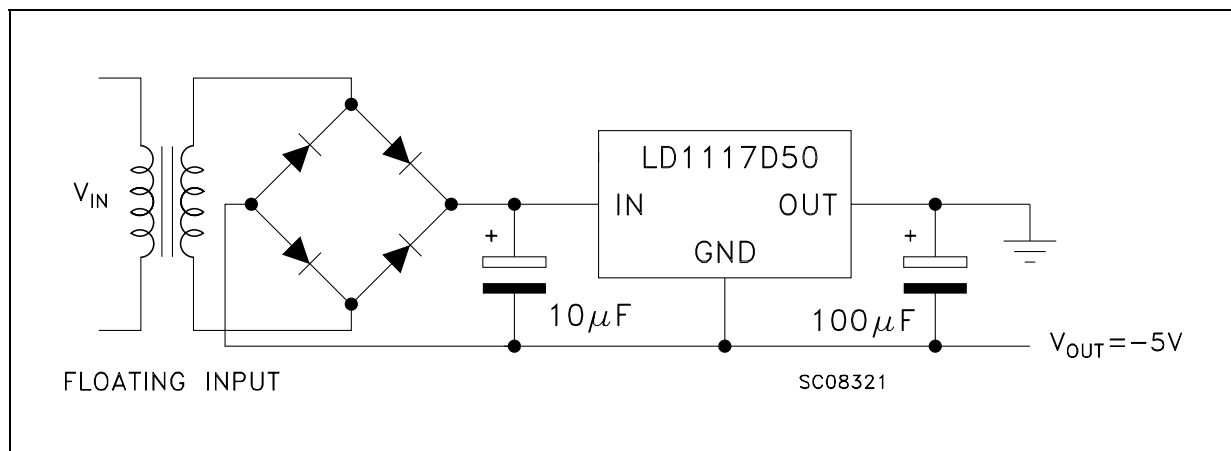


Figure 2 : Active Terminator for SCSI-2 BUS

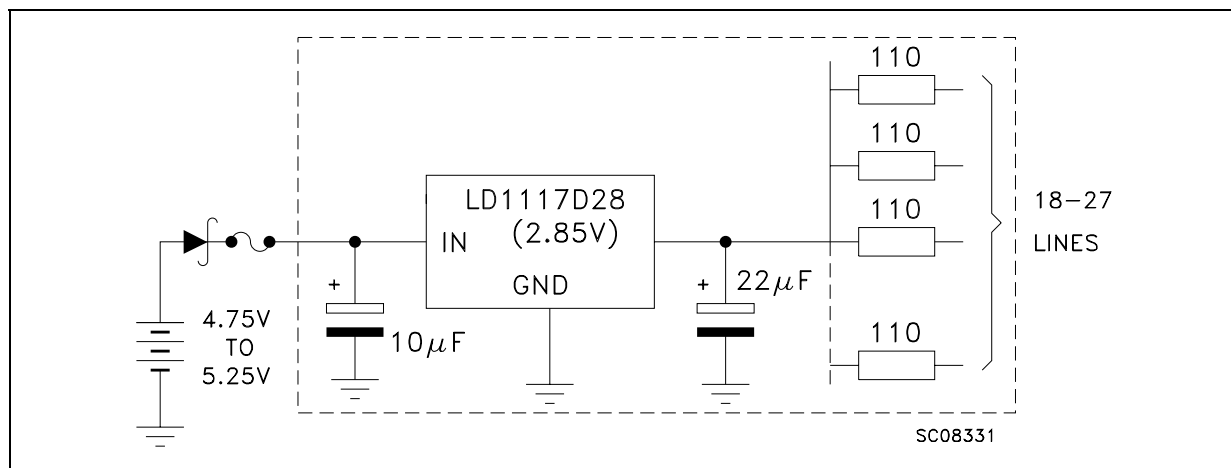


Figure 3 : Circuit for Increasing Output Voltage

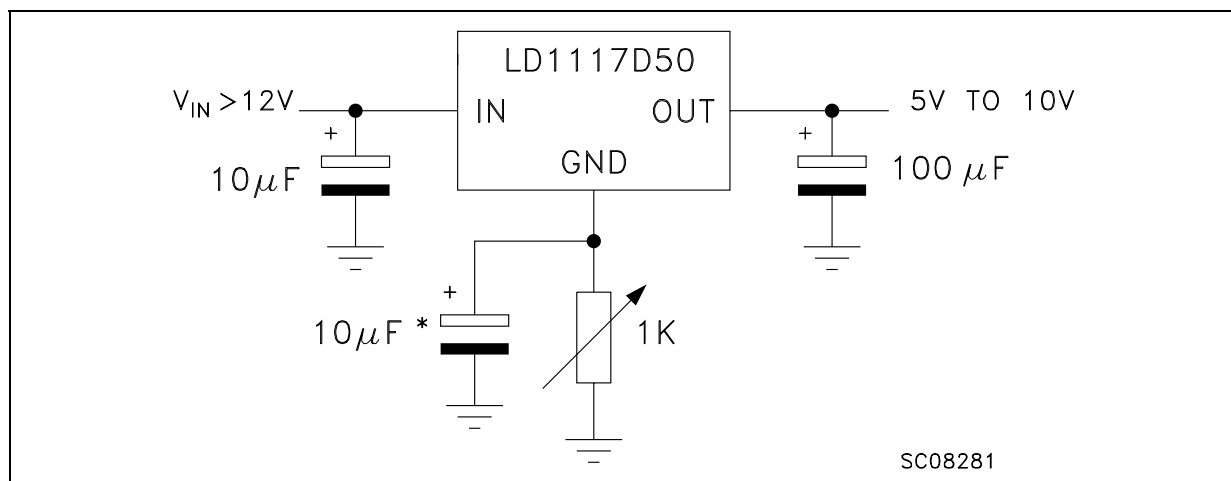


Figure 4 : Voltage Regulator With Reference

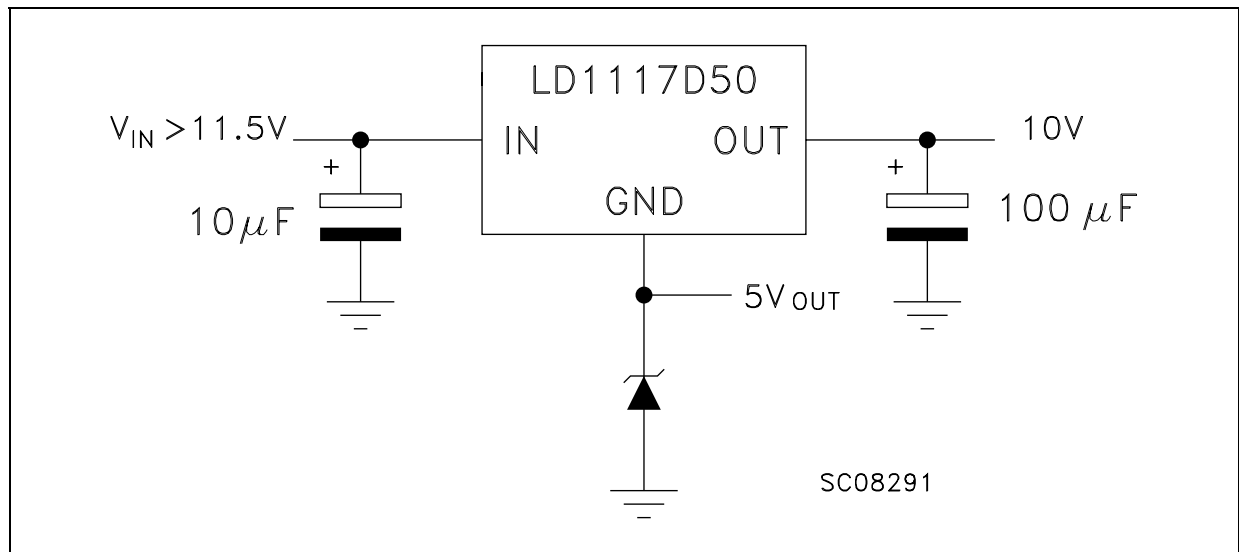


Figure 5 : Battery Backed-up Regulated Supply

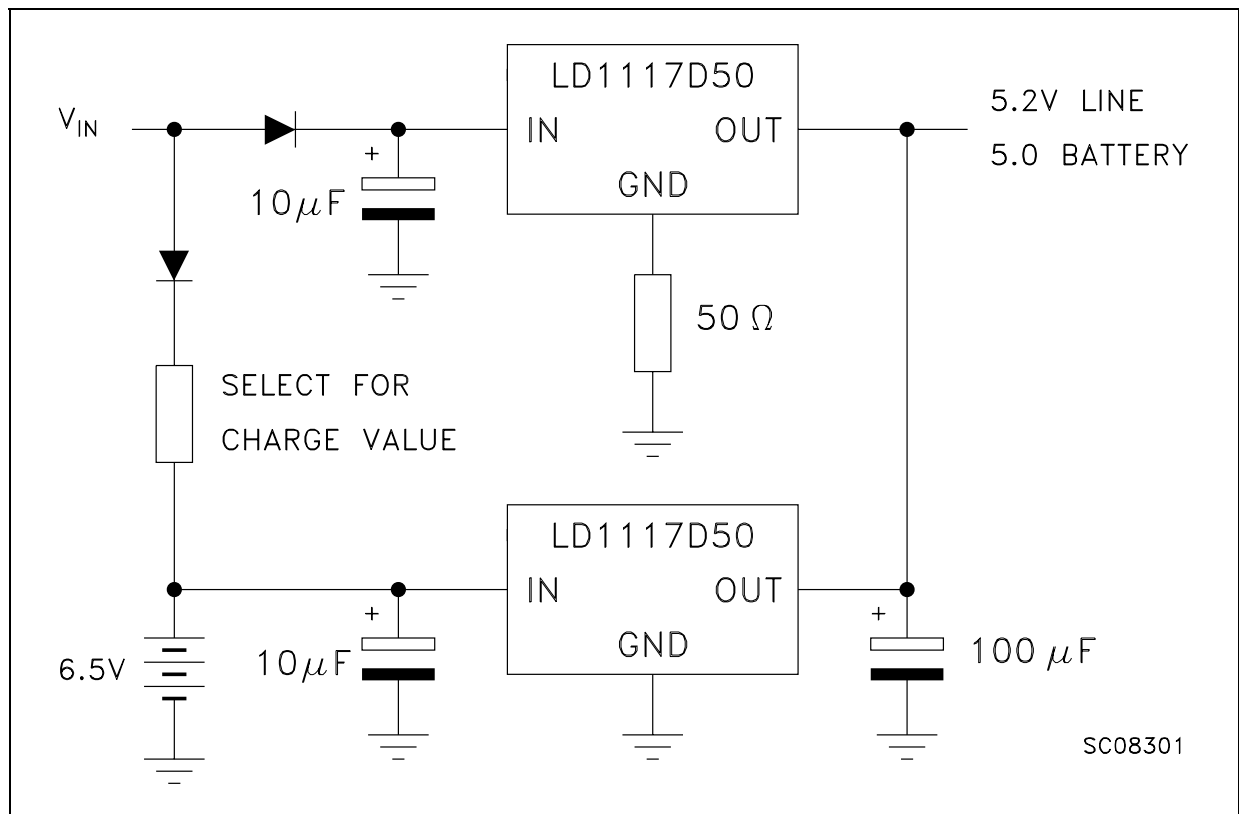
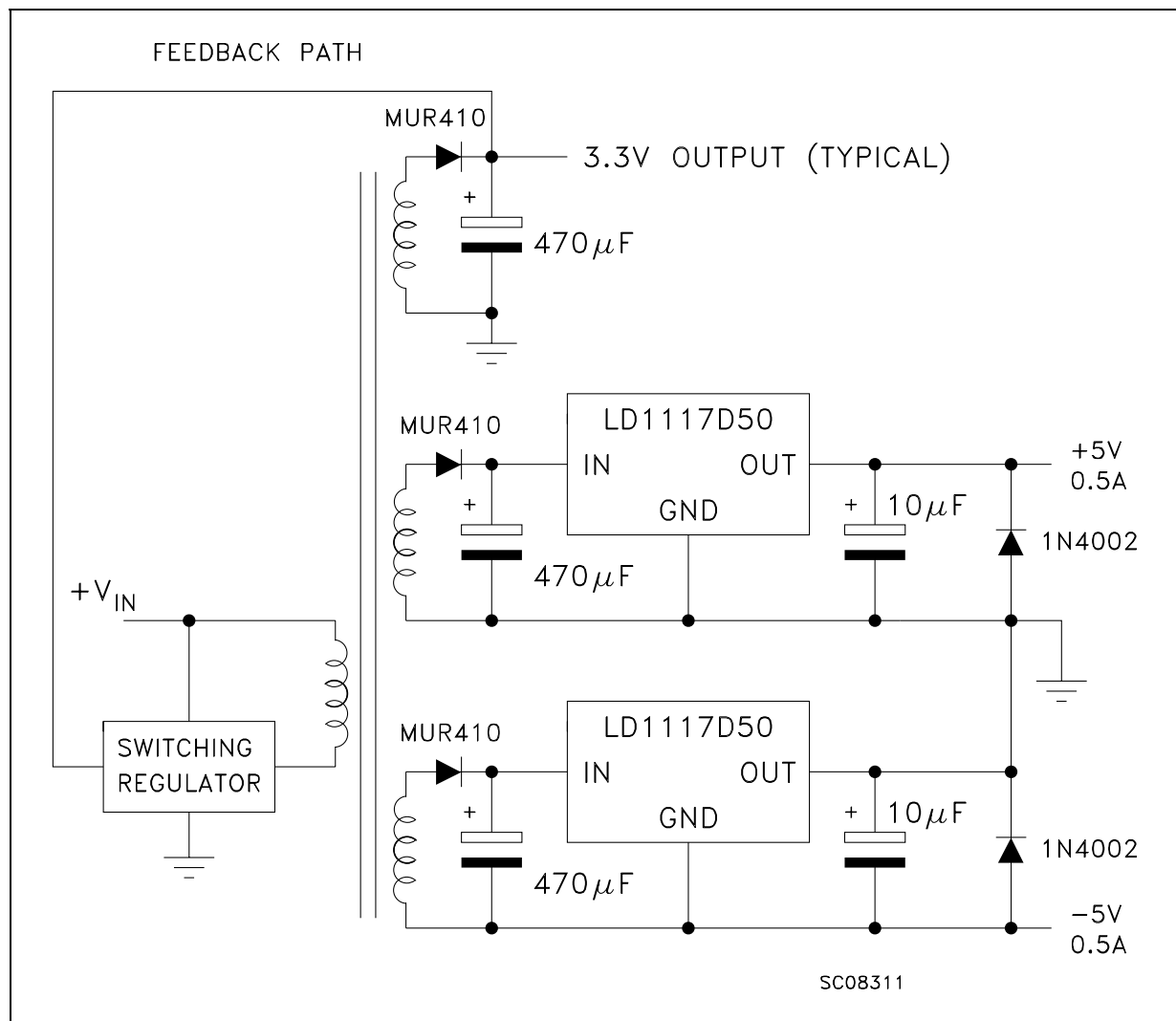


Figure 6 : Post-Regulated Dual Supply

LD1117A ADJUSTABLE: APPLICATION NOTE

The LD1117A ADJUSTABLE has a thermal stabilized $1.25 \pm 0.012\text{V}$ 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 7 we obtain:

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

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

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

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 Fig.8).

Figure 7 : Adjustable Output Voltage Application

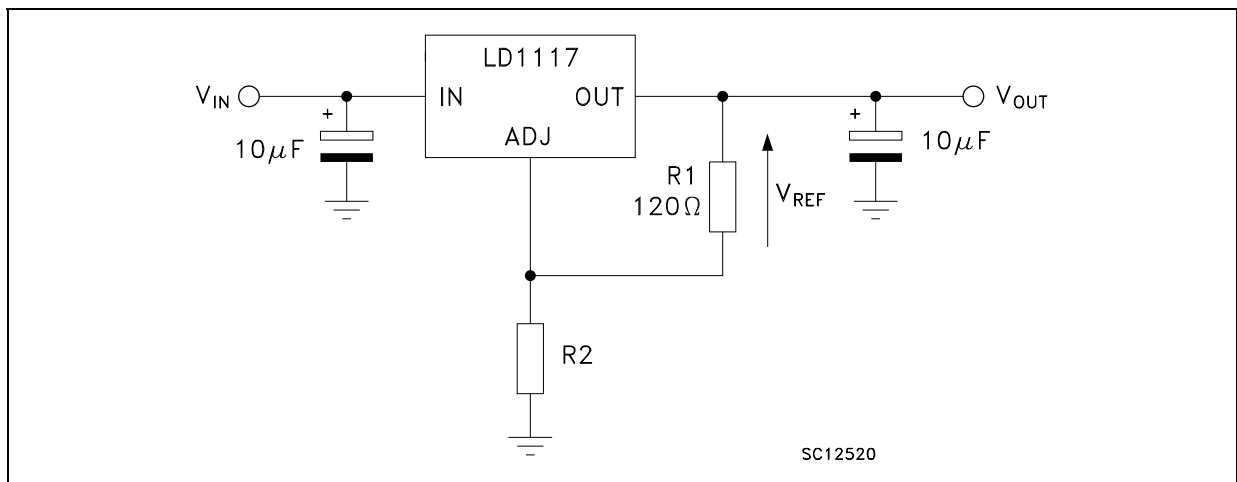
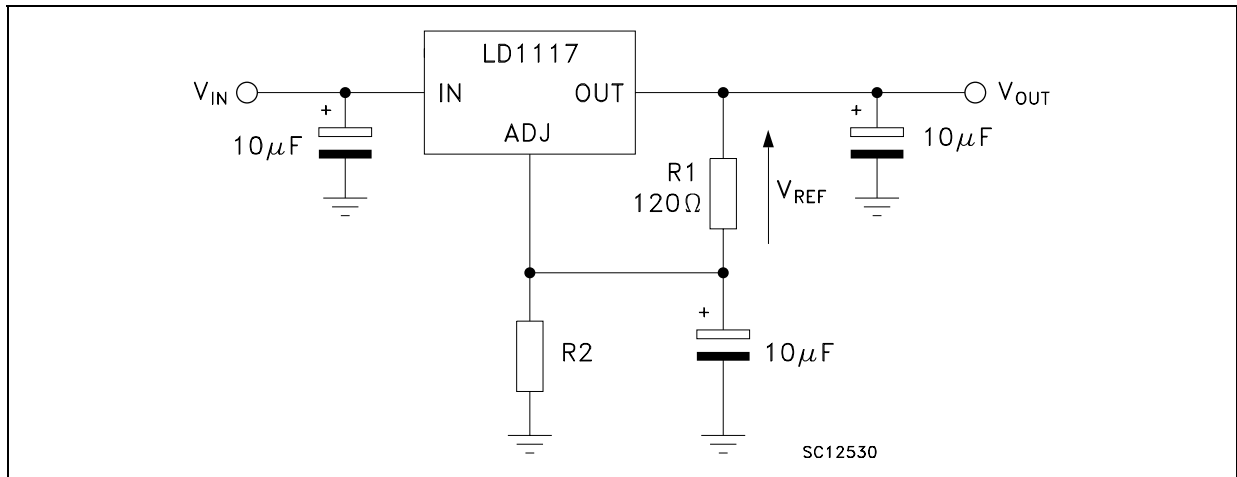
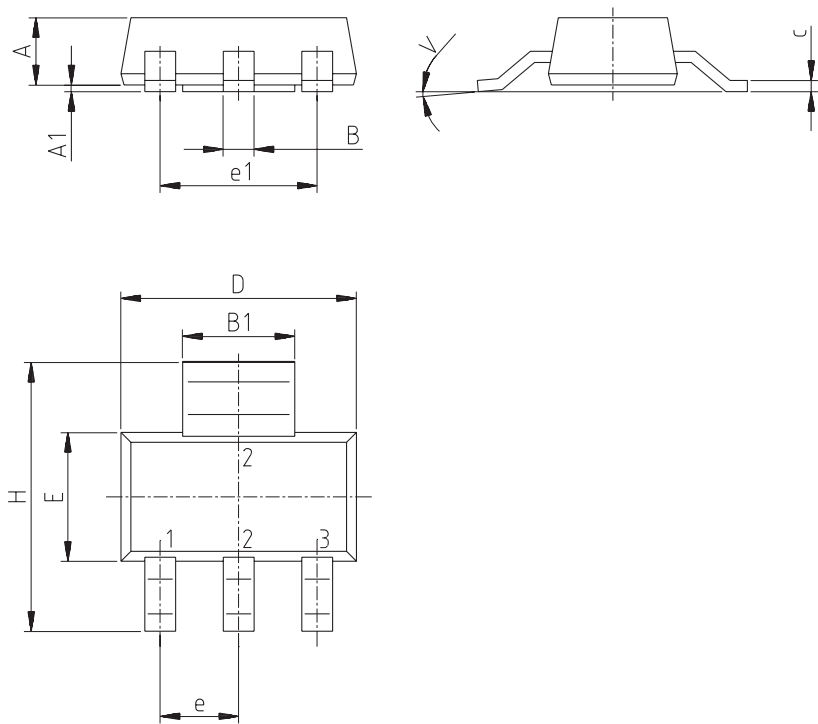


Figure 8 : Adjustable Output Voltage Application with improved Ripple Rejection



SOT-223 MECHANICAL DATA

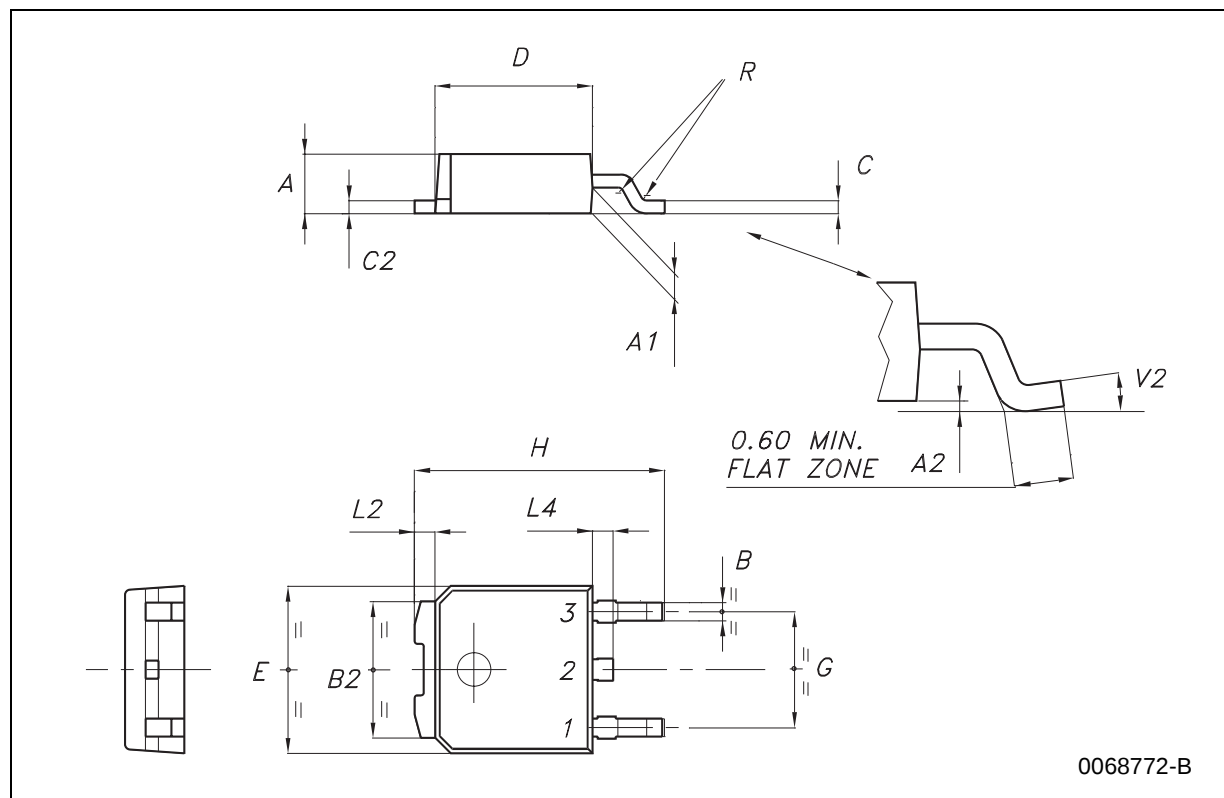
DIM.	mm.			mils		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.8			70.9
A1	0.02		0.1	0.8		3.9
B	0.6	0.7	0.85	23.6	27.6	33.5
B1	2.9	3	3.15	114.2	118.1	124.0
c	0.24	0.26	0.35	9.4	10.2	13.8
D	6.3	6.5	6.7	248.0	255.9	263.8
e		2.3			90.6	
e1		4.6			181.1	
E	3.3	3.5	3.7	129.9	137.8	145.7
H	6.7	7	7.3	129.9	137.8	145.7
V			10°			10°



0046067/H

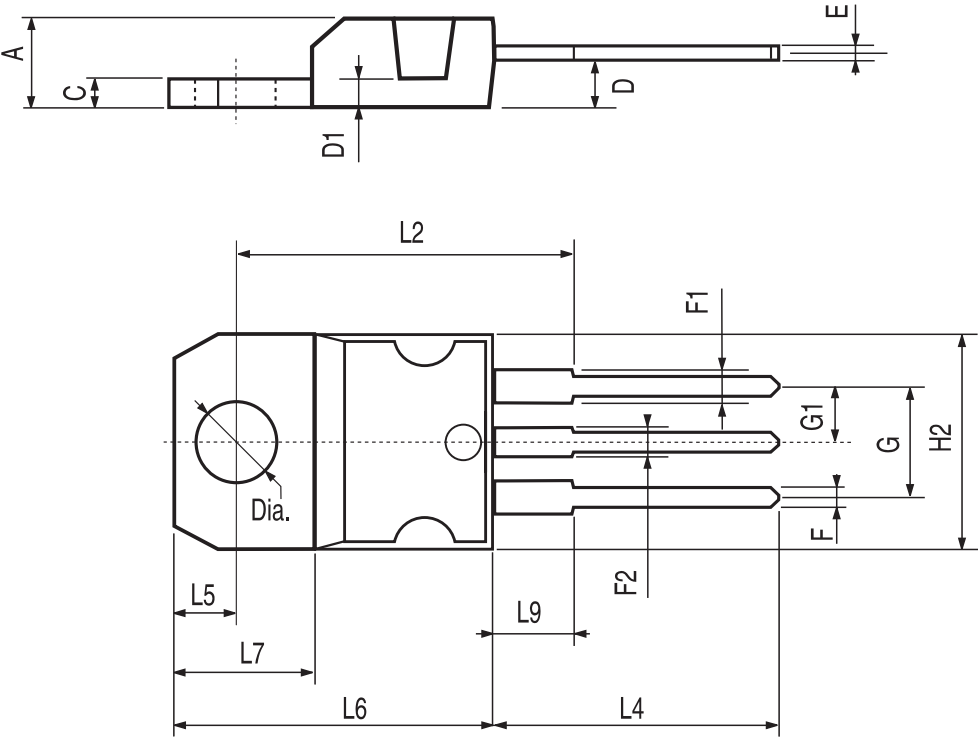
DPAK MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.9	0.025		0.035
B2	5.2		5.4	0.204		0.212
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
E	6.4		6.6	0.252		0.260
G	4.4		4.6	0.173		0.181
H	9.35		10.1	0.368		0.397
L2		0.8			0.031	
L4	0.6		1	0.023		0.039



TO-220 MECHANICAL DATA

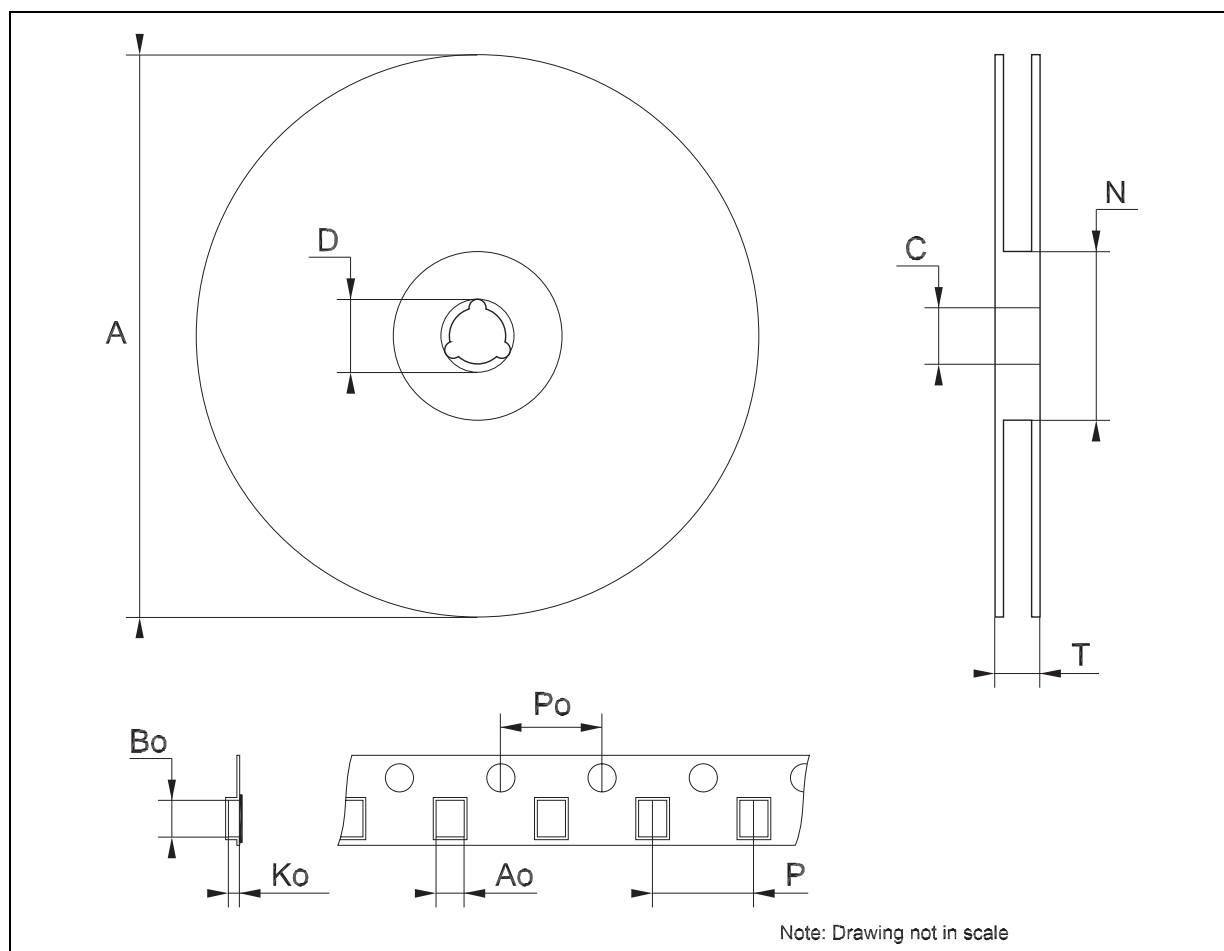
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.4		2.7	0.094		0.106
H2	10.0		10.40	0.393		0.409
L2		16.4			0.645	
L4	13.0		14.0	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.2		6.6	0.244		0.260
L9	3.5		3.93	0.137		0.154
DIA.	3.75		3.85	0.147		0.151



P011C

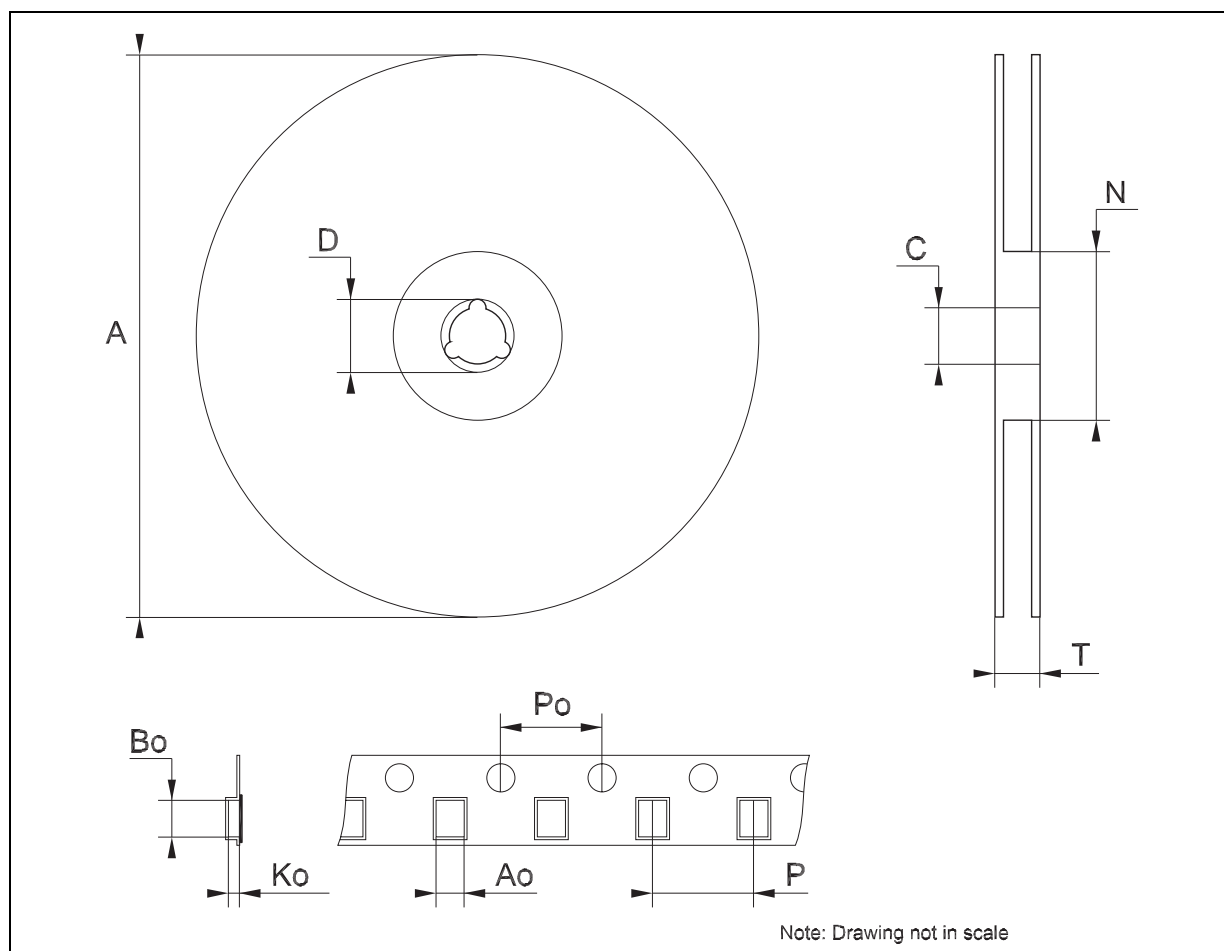
Tape & Reel SOT223 MECHANICAL DATA

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	6.73	6.83	6.93	0.265	0.269	0.273
Bo	7.32	7.42	7.52	0.288	0.292	0.296
Ko	1.78		2	0.070		0.078
Po	3.9	4.0	4.1	0.153	0.157	0.161
P	7.9	8.0	8.1	0.311	0.315	0.319



Tape & Reel DPAK-PPAK 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	6.80	6.90	7.00	0.268	0.272	0.276
Bo	10.40	10.50	10.60	0.409	0.413	0.417
Ko	2.55	2.65	2.75	0.100	0.104	0.105
Po	3.9	4.0	4.1	0.153	0.157	0.161
P	7.9	8.0	8.1	0.311	0.315	0.319



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