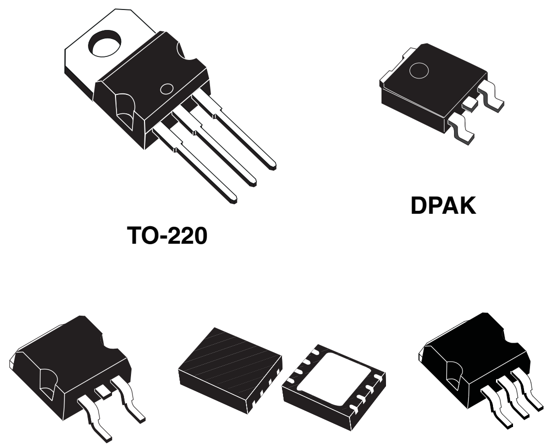
LD1086

1.5 A adjustable and fixed low drop positive voltage regulator

Datasheet - production data



Features

- Typical dropout: 1.3 V at 1.5 A
- Three-terminal adjustable or fixed output voltage: 1.8 V, 2.5 V, 3.3 V, 5 V, 12 V
- Automotive grade (adjustable V_{OUT} in TO-220 and DPAK packages only)
- Output current guaranteed up to 1.5 A
- Output tolerance: ± 1 % at 25 °C and ± 2 % in full temperature range
- Internal power and thermal limit
- Wide operating temperature range - 40 °C to 125 °C
- Package available: TO-220, D²PAK, D²PAK/A, DPAK and DFN8 (4 x 4 mm)
- Pinout compatibility with standard adjustable voltage regulators

Description

The LD1086 is a low drop voltage regulator capable of providing up to 1.5 A of output current. Dropout is guaranteed at a maximum of 1.2 V at the maximum output current, decreasing at lower loads. The LD1086 is pin-to-pin compatible with older 3-terminal adjustable regulators, but has better performance in terms of drop and output tolerance. Unlike PNP regulators, where a part of the output current is wasted as quiescent current, the LD1086 quiescent current flows into the load, increasing efficiency. Only a 10 µF (minimum) capacitor is needed for stability. The device is available in a TO-220, D²PAK, D²PAK/A, DPAK or DFN8 (4x4 mm) package. On-chip trimming allows the regulator to reach a very tight output voltage tolerance; within ± 1% at 25 °C. The LD1086xx is available as automotive grade for adjustable output voltages in the TO-220 and DPAK packages. The PAT, SYL, SBL statistical tests have been performed, and the devices are qualified according to the AEC-Q100 specification for the automotive market in the temperature range of - 40 °C to 125 °C.

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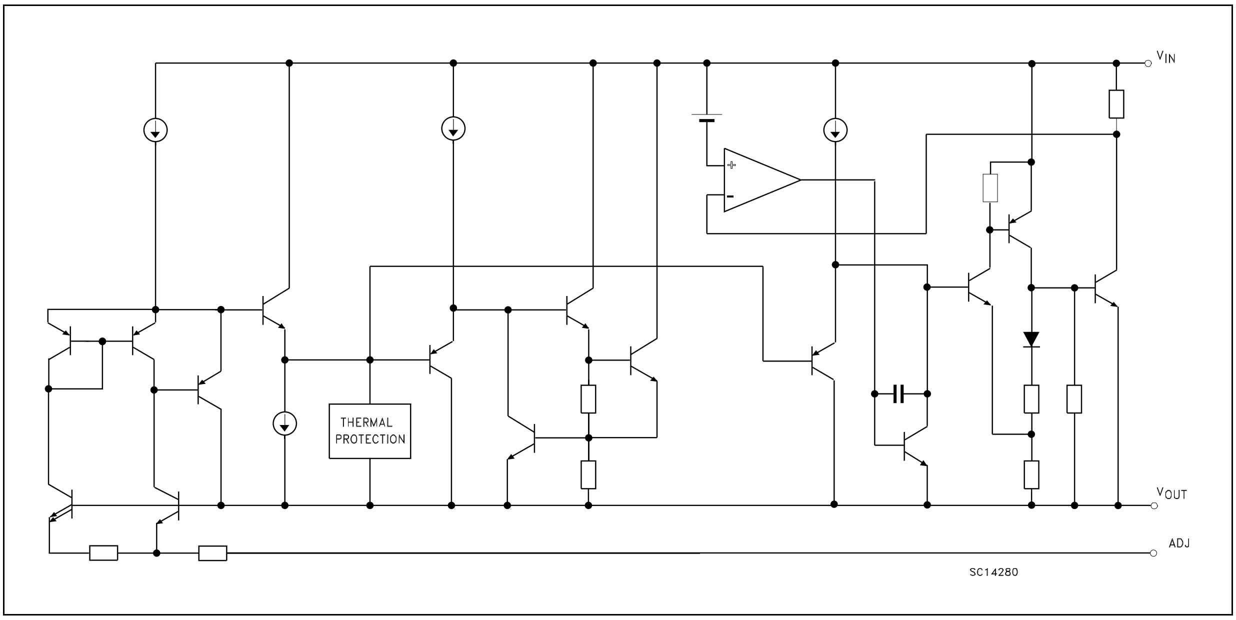
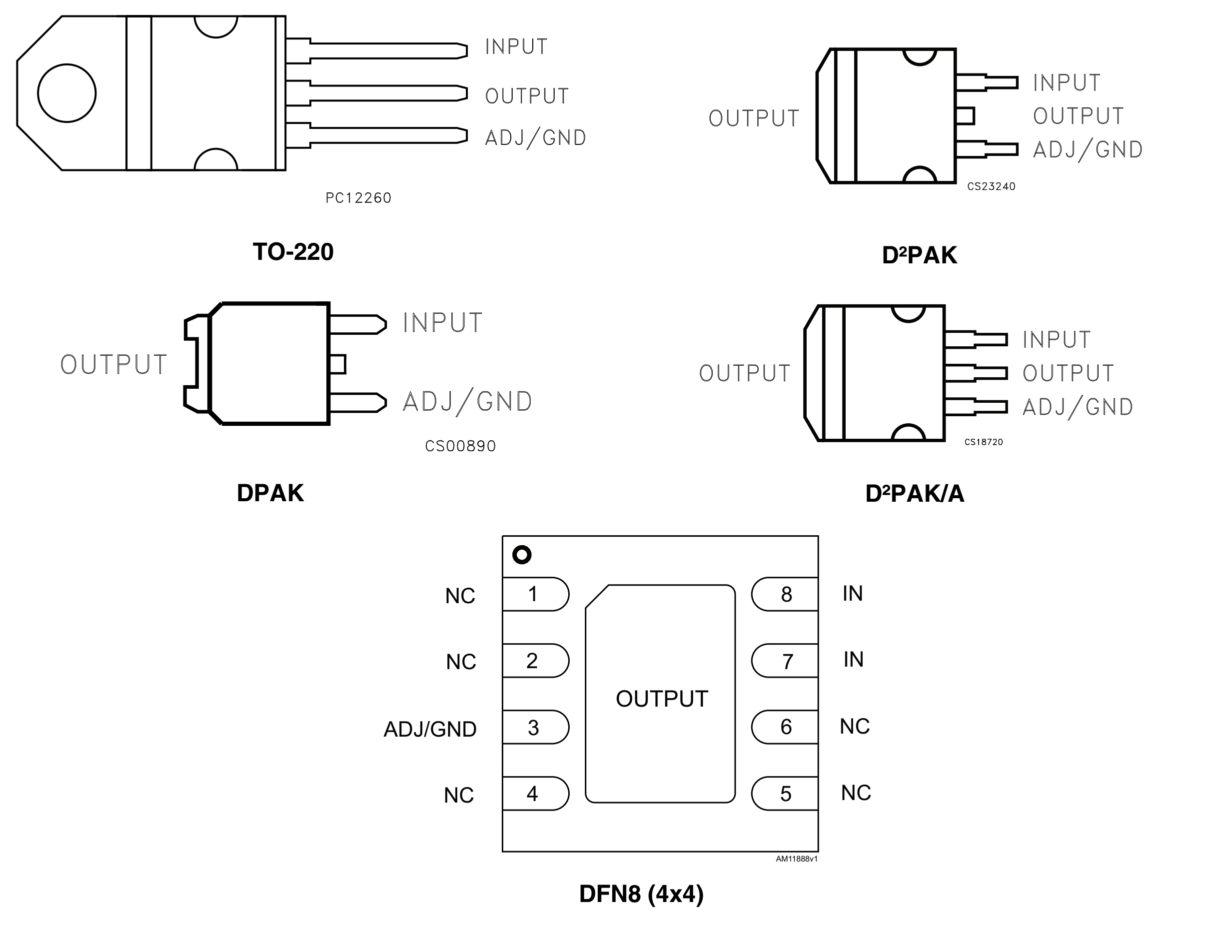
Figure 1. Schematic diagram



2 Pin configuration

Figure 2. Pin connections (top view)



Note: The TAB is physically connected to the output (this is valid for the TO-220 package too).

3 Maximum ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_I	DC input voltage	30	V
I_O	Output current	Internally Limited	mA
P_D	Power dissipation	Internally Limited	mW
T_{STG}	Storage temperature range	-55 to +150	°C
T_{OP}	Operating junction temperature range	-40 to +125	°C

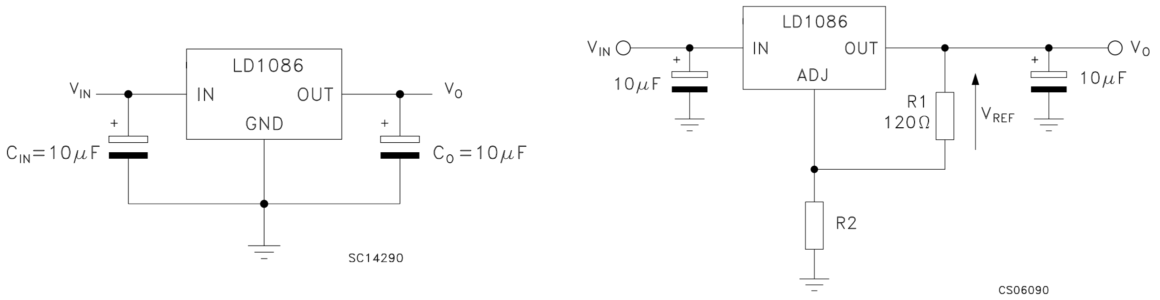
Note: Absolute maximum ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

Table 2. Thermal data

Symbol	Parameter	TO-220	D²PAK D²PAK/A	DPAK	DFN8	Unit
R_{thJC}	Thermal resistance junction-case	5	3	8	1.5	°C/W
R_{thJA}	Thermal resistance junction-ambient	50	62.5	100	33	°C/W

4 Schematic application

Figure 3. Application circuit



$$V_O = V_{REF} \cdot \left(1 + \frac{R_2}{R_1}\right)$$

5 Electrical characteristics

V_I = 4.8 V, C_I = C_O =10 µF, T_A = -40 to 125 °C, unless otherwise specified.

Table 3. Electrical characteristics of LD1086#18

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_O	Output voltage [1]	I_O = 0 mA, T_J = 25 °C	1.782	1.8	1.818	V
		I_O = 0 to 1.5 A, V_I = 3.4 to 30 V	1.764	1.8	1.836	V
ΔV_O	Line regulation	I_O = 0 mA, V_I = 3.4 to 18 V, T_J = 25 °C		0.2	4	mV
		I_O = 0 mA, V_I = 3.4 to 15 V		0.4	4	mV
ΔV_O	Load regulation	I_O = 0 to 1.5 A, T_J = 25 °C		0.5	8	mV
		I_O = 0 to 1.5 A		1	16	mV
V_d	Dropout voltage	I_O = 1.5 A		1.3	1.5	V
I_q	Quiescent current	$V_I \leq$ 30 V		5	10	mA
I_{sc}	Short circuit current	V_I - V_O = 5 V	1.5	2		A
		V_I - V_O = 25 V	0.05	0.02		A
	Thermal regulation	T_A = 25 °C, 30 ms pulse		0.01	0.04	%/W
SVR	Supply voltage rejection	f = 120 Hz, C_O = 25 µF, I_O = 1.5 A V_I = 6.8 ± 3 V	60	82		dB
eN	RMS output noise voltage (% of V_O)	T_A = 25 °C, f =10 Hz to 10 kHz		0.003		%
S	Temperature stability			0.5		%
S	Long term stability	T_A = 125 °C, 1000 Hrs		0.5		%

1. See short-circuit current curve for available output current at fixed dropout.

V_I = 5.5 V, C_I = C_O =10 µF, T_A = -40 to 125 °C, unless otherwise specified.

Table 4. Electrical characteristics of LD1086#25

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_O	Output voltage [(1)]	I_O = 0 mA, T_J = 25 °C	2.475	2.5	2.525	V
		I_O = 0 to 1.5 A, V_I = 4.1 to 30 V	2.45	2.5	2.55	V
ΔV_O	Line regulation	I_O = 0 mA, V_I = 4.1 to 18 V, T_J = 25°C		0.2	4	mV
		I_O = 0 mA, V_I = 4.1 to 18 V		0.4	4	mV
ΔV_O	Load regulation	I_O = 0 to 1.5 A, T_J = 25 °C		0.5	8	mV
		I_O = 0 to 1.5 A		1	16	mV
V_d	Dropout voltage	I_O = 1.5 A		1.3	1.5	V
I_q	Quiescent current	$V_I \leq$ 30 V		5	10	mA
I_{sc}	Short circuit current	V_I - V_O = 5 V	1.5	2		A
		V_I - V_O = 25 V	0.05	0.2		A
	Thermal regulation	T_A = 25 °C, 30 ms pulse		0.008	0.04	%/W
SVR	Supply voltage rejection	f = 120 Hz, C_O = 25 µF, I_O = 1.5 A V_I = 7.5 $\pm$ 3 V	60	81		dB
eN	RMS output noise voltage (% of V_O)	T_A = 25 °C, f =10 Hz to 10 kHz		0.003		%
S	Temperature stability			0.5		%
S	Long term stability	T_A = 125 °C, 1000 Hrs		0.5		%

1. See short-circuit current curve for available output current at fixed dropout.

V_I = 6.3 V, C_I = C_O =10 µF, T_A = -40 to 125 °C, unless otherwise specified.

Table 5. Electrical characteristics of LD1086#33

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_O	Output voltage [(1)]	I_O = 0 mA, T_J = 25 °C	3.267	3.3	3.333	V
		I_O = 0 to 1.5 A, V_I = 4.9 to 30 V	3.234	3.3	3.366	V
ΔV_O	Line regulation	I_O = 0 mA, V_I = 4.9 to 18 V, T_J = 25 °C		0.5	6	mV
		I_O = 0 mA, V_I = 4.9 to 18 V		1	6	mV
ΔV_O	Load regulation	I_O = 0 to 1.5 A, T_J = 25 °C		1	10	mV
		I_O = 0 to 1.5 A		7	25	mV
V_d	Dropout voltage	I_O = 1.5 A		1.3	1.5	V
I_q	Quiescent current	$V_I \leq$ 30 V		5	10	mA
I_{sc}	Short-circuit current	V_I - V_O = 5 V	1.5	2		A
		V_I - V_O = 25 V	0.05	0.2		A
	Thermal regulation	T_A = 25 °C, 30 ms pulse		0.008	0.04	%/W
SVR	Supply voltage rejection	f = 120 Hz, C_O = 25 µF, I_O = 1.5 A V_I = 8.3 ± 3 V	60	79		dB
eN	RMS output noise voltage (% of V_O)	T_A = 25 °C, f =10 Hz to 10 kHz		0.003		%
S	Temperature stability			0.5		%
S	Long term stability	T_A = 125 °C, 1000 Hrs		0.5		%

1. See short-circuit current curve for available output current at fixed dropout.

V_I = 6.6 V, C_I = C_O =10 µF, T_A = -40 to 125 °C, unless otherwise specified.

Table 6. Electrical characteristics of LD1086#36

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_O	Output voltage (1)	I_O = 0 mA, T_J = 25 °C	3.564	3.6	3.636	V
		I_O = 0 to 1.5 A, V_I = 5.2 to 30 V	3.528	3.6	3.672	V
ΔV_O	Line regulation	I_O = 0 mA, V_I = 5.2 to 18 V, T_J = 25 °C		0.5	10	mV
		I_O = 0 mA, V_I = 5.2 to 18 V		1	10	mV
ΔV_O	Load regulation	I_O = 0 to 1.5 A, T_J = 25 °C		3	15	mV
		I_O = 0 to 1.5 A		7	25	mV
V_d	Dropout voltage	I_O = 1.5 A		1.3	1.5	V
I_q	Quiescent current	$V_I \leq 30$ V		5	10	mA
I_{sc}	Short circuit current	V_I - V_O = 5 V	1.5	2		A
		V_I - V_O = 25 V	0.05	0.2		A
	Thermal regulation	T_A = 25 °C, 30 ms pulse		0.01	0.04	%/W
SVR	Supply voltage rejection	f = 120 Hz, C_O = 25 µF, I_O = 1.5 A $V_I = 8.6 \pm 3$ V	60	78		dB
eN	RMS output noise voltage (% of V_O)	T_A = 25 °C, f =10 Hz to 10 kHz		0.003		%
S	Temperature stability			0.5		%
S	Long term stability	T_A = 125 °C, 1000 Hrs		0.5		%

1. See short-circuit current curve for available output current at fixed dropout.

V_I = 15 V, C_I = C_O =10 µF, T_A = -40 to 125 °C, unless otherwise specified.

Table 7. Electrical characteristics of LD1086#12

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_O	Output voltage (1)	I_O = 0 mA, T_J = 25 °C	11.88	12	12.12	V
		I_O = 0 to 1.5 A, V_I = 13.8 to 30 V	11.76	12	12.24	V
ΔV_O	Line regulation	I_O = 0 mA, V_I = 13.8 to 25 V, T_J = 25 °C		1	25	mV
		I_O = 0 mA, V_I = 13.8 to 25 V		2	25	mV
ΔV_O	Load regulation	I_O = 0 to 1.5 A, T_J = 25 °C		12	36	mV
		I_O = 0 to 1.5 A		24	72	mV
V_d	Dropout voltage	I_O = 1.5 A		1.3	1.5	V
I_q	Quiescent current	$V_I \leq 30$ V		5	10	mA
I_{sc}	Short circuit current	V_I - V_O = 5 V	1.5	2		A
		V_I - V_O = 25 V	0.05	0.2		A
	Thermal regulation	T_A = 25 °C, 30 ms pulse		0.01	0.04	%/W
SVR	Supply voltage rejection	f = 120 Hz, C_O = 25 µF, I_O = 1.5 A V_I = 17 ± 3 V	54	66		dB
eN	RMS output noise voltage (% of V_O)	T_A = 25 °C, f =10 Hz to 10 kHz		0.003		%
S	Temperature stability			0.5		%
S	Long term stability	T_A = 125 °C, 1000 Hrs		0.5		%

1. See short-circuit current curve for available output current at fixed dropout.

V_I = 4.25 V, C_I = C_O =10 µF, T_A = -40 to 125 °C, unless otherwise specified.

Table 8. Electrical characteristics of LD1086B#

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_{ref}	Reference voltage [(1)]	I_O = 10 mA T_J = 25 °C	1.231	1.25	1.269	V
		I_O = 10 mA to 1.5 A, V_I = 2.85 to 30 V	1.219	1.25	1.281	V
ΔV_O	Line regulation	I_O = 10 mA, V_I = 2.8 to 16.5 V, T_J = 25 °C		0.015	0.2	%
		I_O = 10 mA, V_I = 2.8 to 16.5 V		0.035	0.2	%
ΔV_O	Load regulation	I_O = 10 mA to 1.5 A, T_J = 25 °C		0.1	0.3	%
		I_O = 0 to 1.5 A		0.2	0.4	%
V_d	Dropout voltage	I_O = 1.5 A		1.3	1.5	V
$I_{O(min)}$	Minimum load current	V_I = 30 V		3	10	mA
I_{sc}	Short circuit current	V_I - V_O = 5 V	1.5	2.3		A
		V_I - V_O = 25 V	0.05	0.2		A
	Thermal regulation	T_A = 25 °C, 30 ms pulse		0.01	0.04	%/W
SVR	Supply voltage rejection	f = 120 Hz, C_O = 25 µF,C_{ADJ} = 25 µF, I_O = 1.5 A, V_I = 6.25 ± 3 V	60	88		dB
I_{ADJ}	Adjust pin current	V_I = 4.25 V, I_O = 10 mA		40	120	µA
ΔI_{ADJ}	Adjust pin current change [(1)]	I_O = 10 mA to 1.5 A, V_I = 2.8 to 16.5 V		0.2	5	µA
eN	RMS output noise voltage (% of V_O)	T_A = 25 °C, f =10 Hz to 10 kHz		0.003		%
S	Temperature stability			0.5		%
S	Long term stability	T_A = 125 °C, 1000 Hrs		0.5		%

1. See short-circuit current curve for available output current at fixed dropout.

V_I = 4.25 V, C_I = C_O =10 µF, T_A = -40 to 125 °C, unless otherwise specified.

Table 9. Electrical characteristics of LD1086#

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_{ref}	Reference voltage (1)	I_O = 10 mA T_J = 25 °C	1.237	1.25	1.263	V
		I_O = 10 mA to 1.5 A, V_I = 2.85 to 30 V	1.225	1.25	1.275	V
ΔV_O	Line regulation	I_O = 10 mA, V_I = 2.8 to 16.5 V, T_J = 25 °C		0.015	0.2	%
		I_O = 10 mA, V_I = 2.8 to 16.5 V		0.035	0.2	%
ΔV_O	Load regulation	I_O = 10 mA to 1.5 A, T_J = 25 °C		0.1	0.3	%
		I_O = 0 to 1.5 A		0.2	0.4	%
V_d	Dropout voltage	I_O = 1.5 A		1.3	1.5	V
$I_{O(min)}$	Minimum load current	V_I = 30 V		3	10	mA
I_{sc}	Short circuit current	V_I - V_O = 5 V	1.5	2.3		A
		V_I - V_O = 25 V	0.05	0.2		A
	Thermal regulation	T_A = 25 °C, 30 ms pulse		0.01	0.04	%/W
SVR	Supply voltage rejection	f = 120 Hz, C_O = 25 µF, C_{ADJ} = 25 µF, I_O = 1.5 A, V_I = 6.25 ± 3 V	60	88		dB
I_{ADJ}	Adjust pin current	V_I = 4.25 V, I_O = 10 mA		40	120	µA
ΔI_{ADJ}	Adjust pin current change (1)	I_O = 10 mA to 1.5 A, V_I = 2.8 to 16.5 V		0.2	5	µA
eN	RMS output noise voltage (% of V_O)	T_A = 25 °C, f =10 Hz to 10 kHz		0.003		%
S	Temperature stability			0.5		%
S	Long term stability	T_A = 125 °C, 1000 Hrs		0.5		%

1. See short-circuit current curve for available output current at fixed dropout.

V_I = 4.25 V, C_I = C_O =10 µF, T_A = -40 to 125 °C, unless otherwise specified.

Table 10. Electrical characteristics of LD1086DTTRY and LD1086VY (Automotive grade)

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_{ref}	Reference voltage [(1)]	I_O = 10 mA T_A = 25 °C	1.237	1.25	1.263	V
		I_O = 10 mA to 1.5 A, V_I = 2.85 to 30 V	1.225	1.25	1.275	V
ΔV_O	Line regulation	I_O = 10 mA, V_I = 2.8 to 16.5 V		0.035	0.2	%
ΔV_O	Load regulation	I_O = 0 to 1.5 A		0.2	0.4	%
V_d	Dropout voltage	I_O = 1.5 A		1.3	1.5	V
$I_{O(min)}$	Minimum load current	V_I = 30 V		3	10	mA
I_{sc}	Short circuit current	V_I - V_O = 5 V, T_A = 25 °C	1.5	2.3		A
		V_I - V_O = 25 V, T_A = 25 °C	0.05	0.2		A
	Thermal regulation	T_A = 25 °C, 30 ms pulse		0.01	0.04	%/W
SVR	Supply voltage rejection	f = 120 Hz, C_O = 25 µF,C_{ADJ} = 25 µF, I_O = 1.5 A, V_I = 6.25 ± 3 V, T_A = 25 °C	60	88		dB
I_{ADJ}	Adjust pin current	V_I = 4.25 V, I_O = 10 mA		40	120	µA
ΔI_{ADJ}	Adjust pin current change [(1)]	I_O = 10 mA to 1.5 A, V_I = 2.8 to 16.5 V		0.2	5	µA
eN	RMS output noise voltage (% of V_O)	T_A = 25 °C, f =10 Hz to 10 kHz		0.003		%
S	Temperature stability			0.5		%
S	Long term stability	T_A = 125 °C, 1000 Hrs		0.5		%

1. See short-circuit current curve for available output current at fixed dropout.

6 Typical application

Unless otherwise specified T_J = 25 °C, C_I = C_O = 10 µF.

Figure 4. Output voltage vs. temp. (V_I = 5 V)

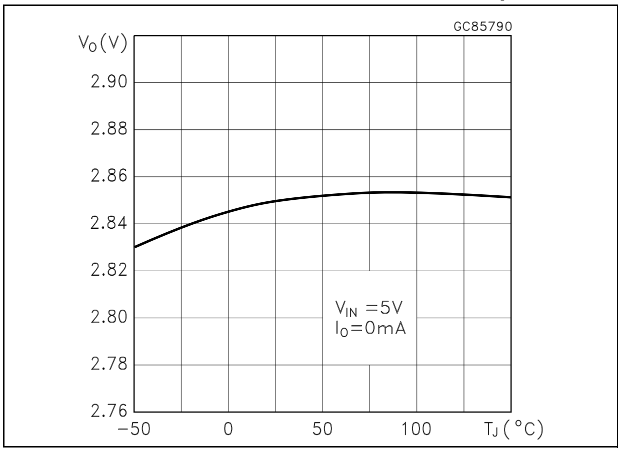


Figure 5. Output voltage vs. temp. (V_I = 15 V)

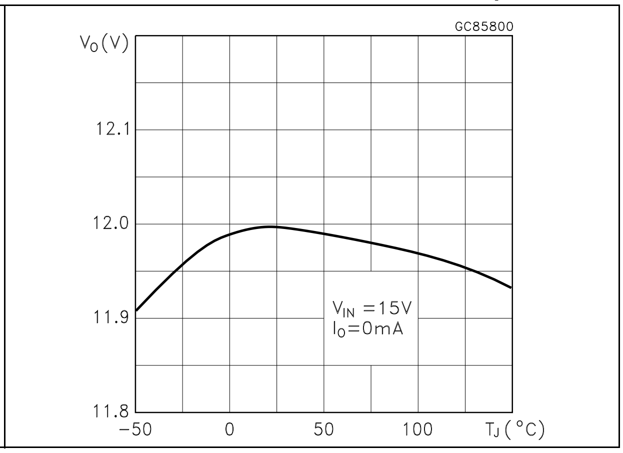


Figure 6. Output voltage vs. temperature (V_I = 4.25 V)

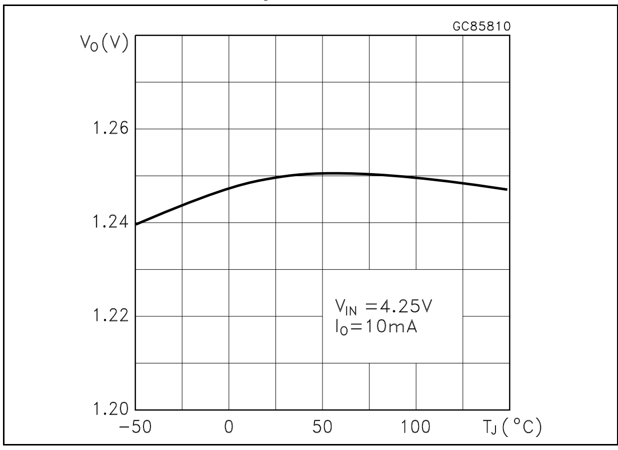


Figure 7. Short circuit current vs. dropout voltage

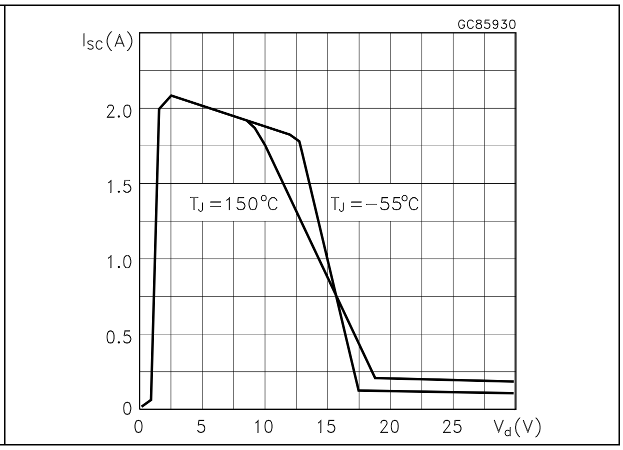


Figure 8. Line regulation vs. temperature

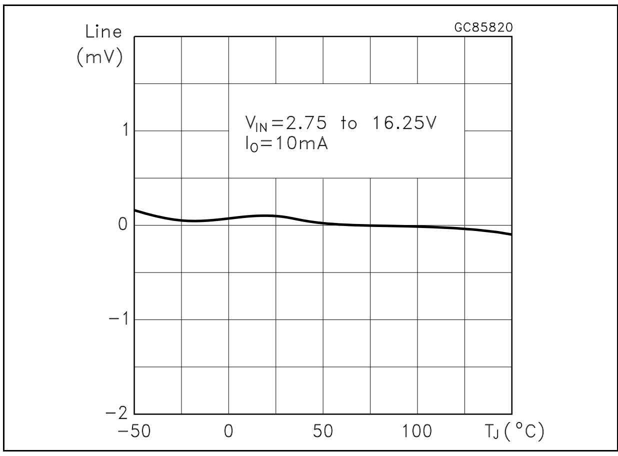


Figure 9. Load regulation vs. temperature

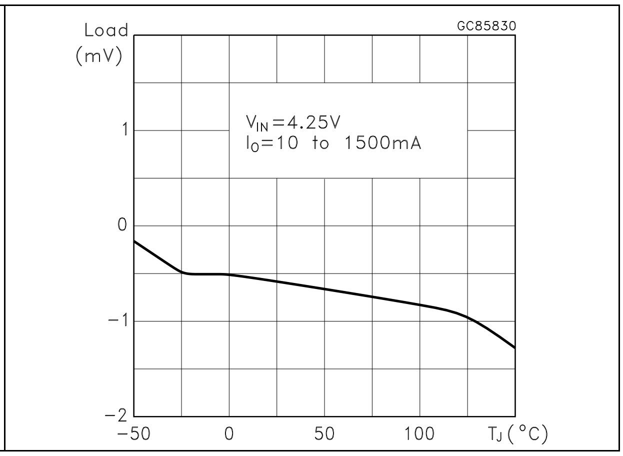


Figure 10. Dropout voltage vs. temperature

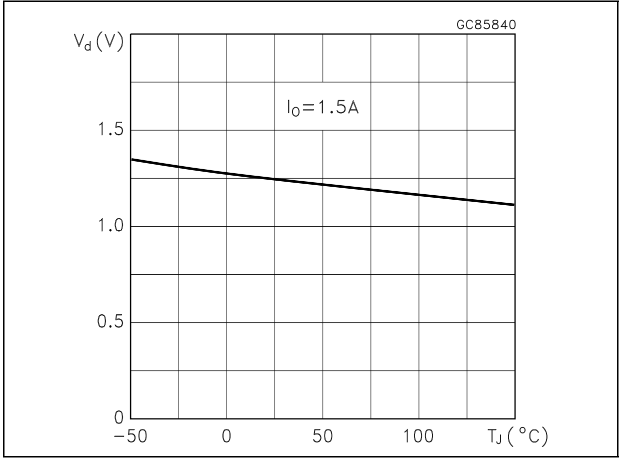


Figure 11. Dropout voltage vs. output current

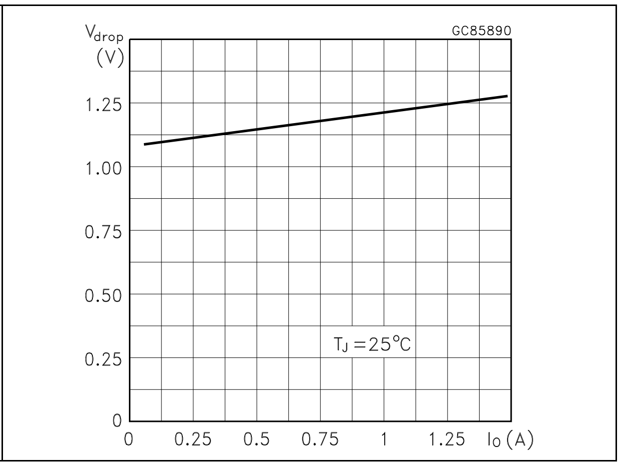


Figure 12. Adjust pin current vs. input voltage

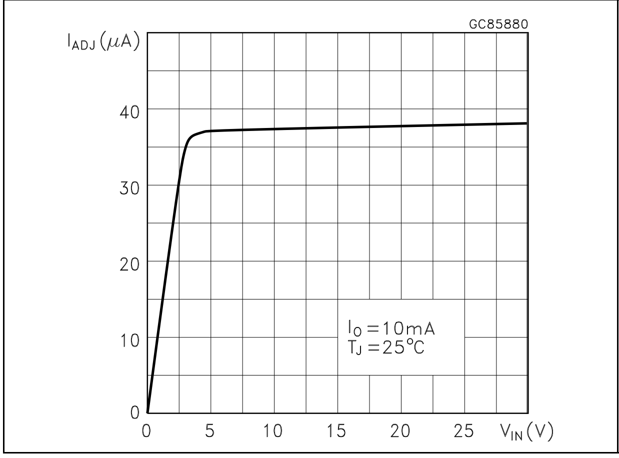


Figure 13. Adjust pin current vs. temperature

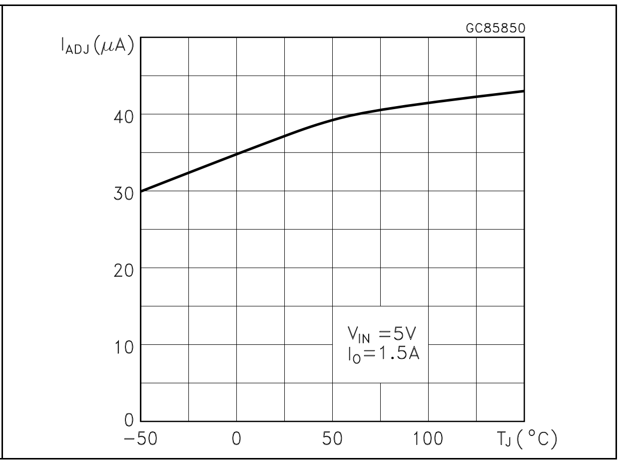


Figure 14. Adjust pin current vs. output current

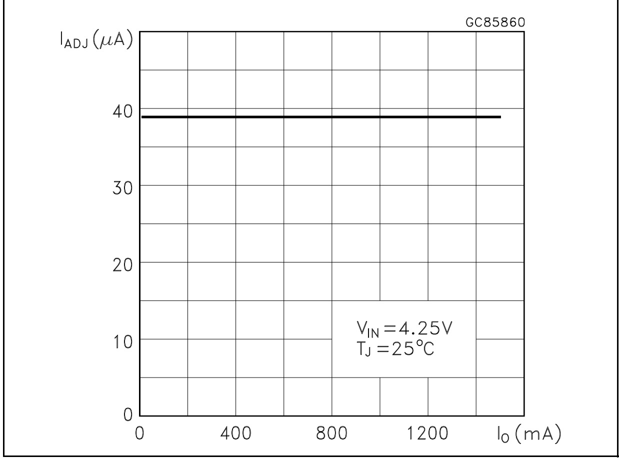


Figure 15. Quiescent current vs. output current

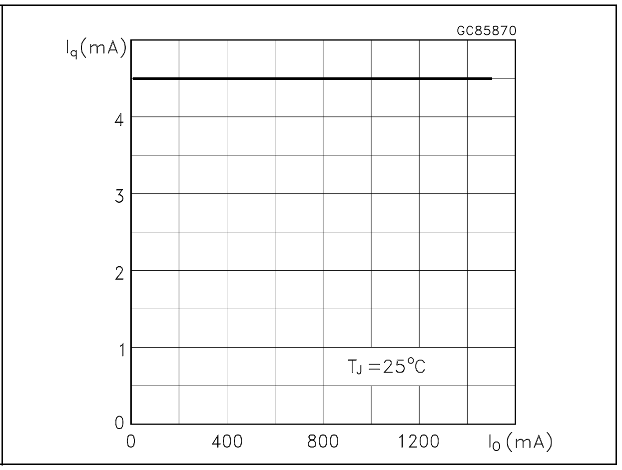


Figure 16. Quiescent current vs. input voltage

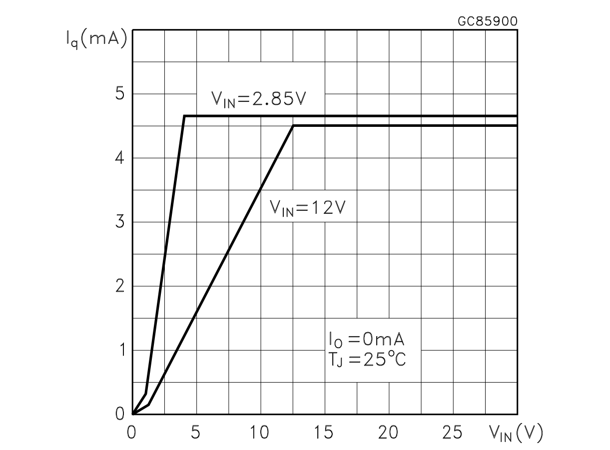


Figure 17. Supply voltage rejection vs. output current

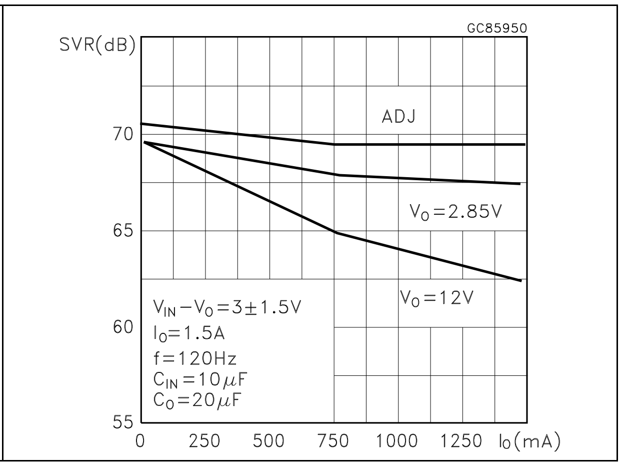


Figure 18. Supply voltage rejection vs. frequency

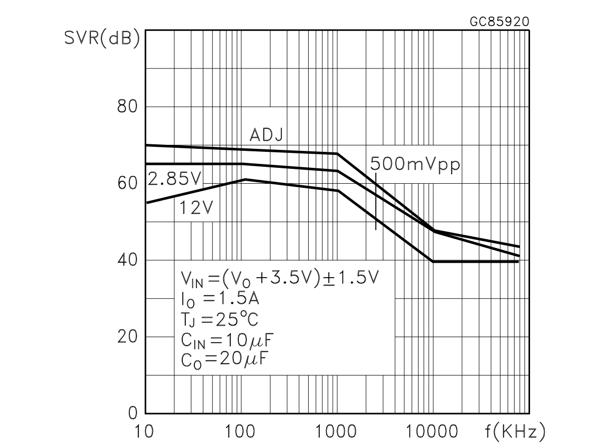


Figure 19. Supply voltage rejection vs. temperature

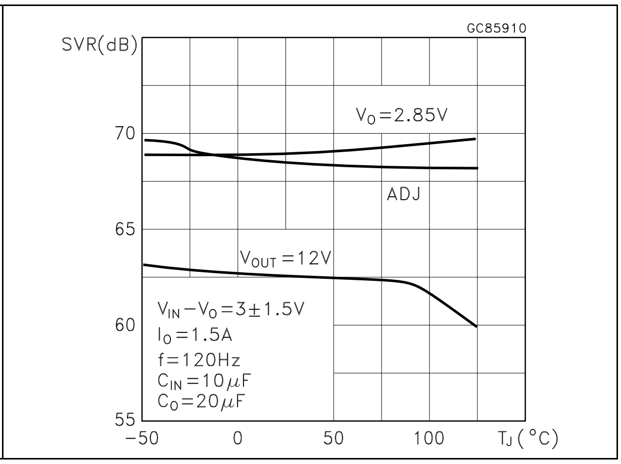


Figure 20. Minimum load current vs. temperature

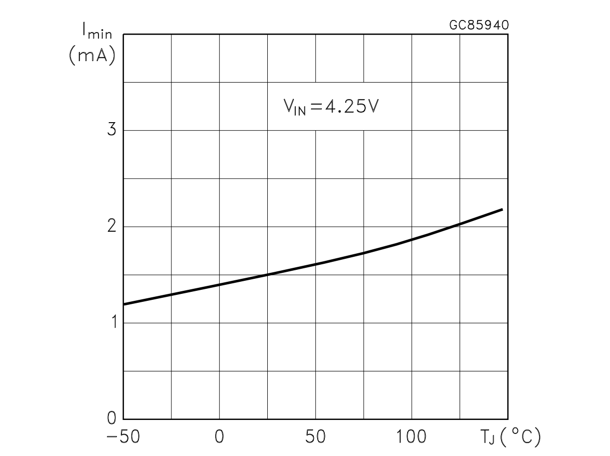


Figure 21. Stability for adjustable

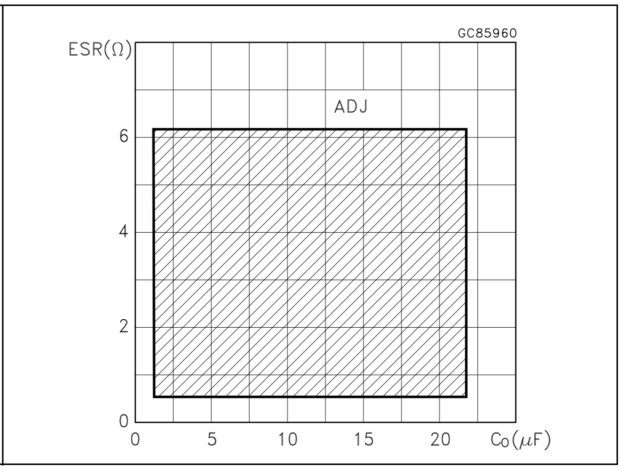


Figure 22. Stability for 2.85 V

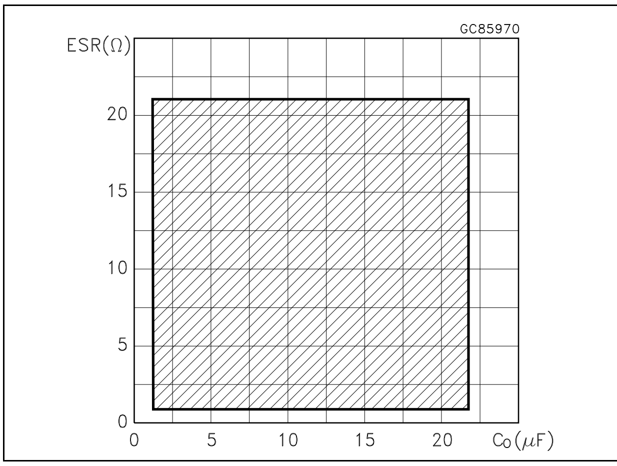


Figure 23. Stability for 12 V

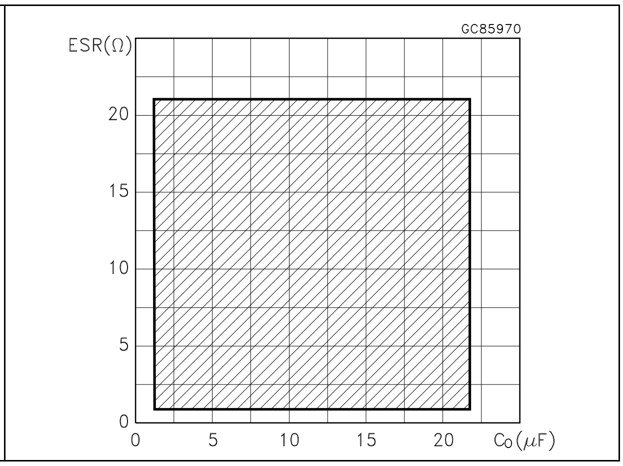
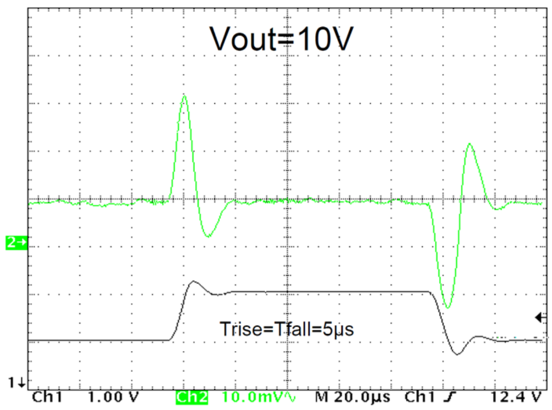
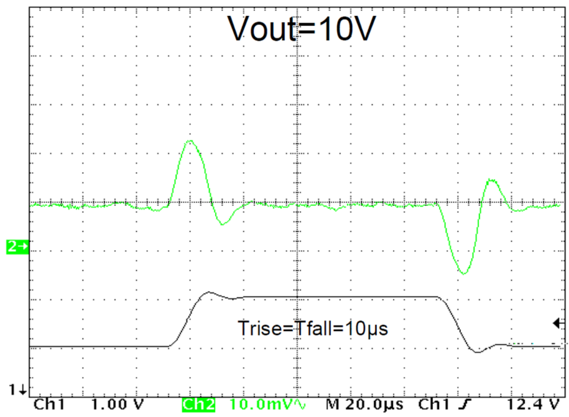


Figure 24. Line transient (V_I = 12 to 13 V)



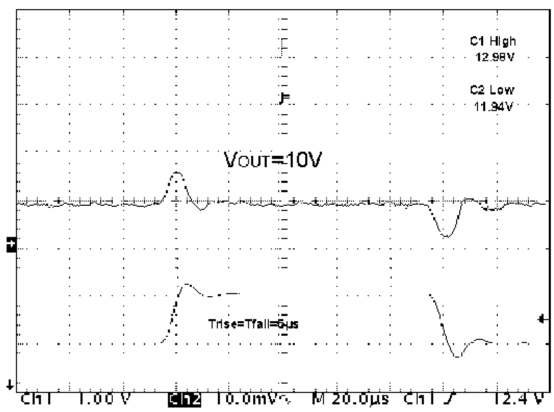
V_I = 12 to 13 V, I_O = 200 mA, C_I = 1 µF (tant), C_O = 10 µF (tant), No C_{ADJ}

Figure 25. Line transient (I_O = 200 mA)



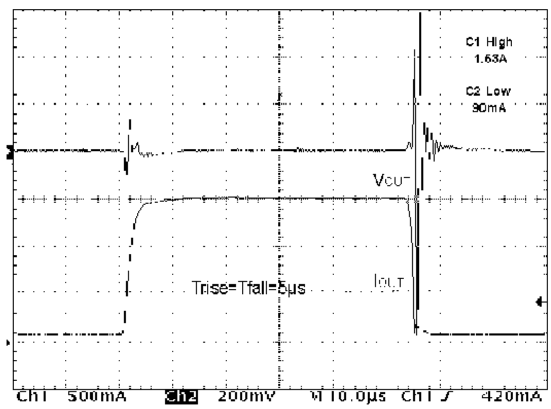
V_I = 12 to 13 V, I_O = 200 mA, C_I = 1 µF (tant), C_O = 10 µF (tant), No C_{ADJ}

Figure 26. Line transient (C_{ADJ} = 1 µF)



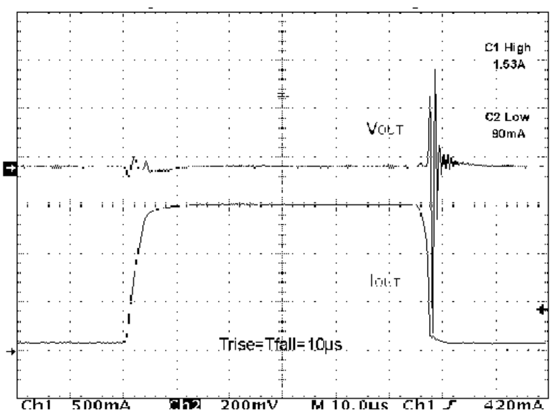
V_I = 12 to 13 V, I_O = 200 mA, C_I = 1 µF (tant), C_O = 10 µF (tant), C_{ADJ} = 1 µF

Figure 27. Load transient



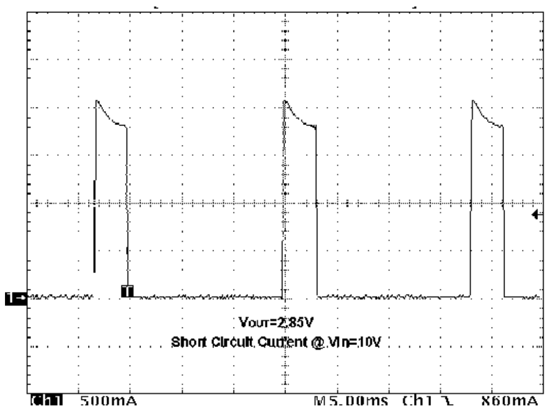
V_I = 13 V, I_O = 0.1 to 1.5 A, C_I = 1 µF (tant), C_O = 10 µF (tant) C_{ADJ} = 1 µF

Figure 28. Load transient ($T_{rise} = T_{fall} = 10$ µs)



$V_I = 13$ V, $I_O = 0.1$ to 1.5 A, $C_I = 1$ µF (tant), $C_O = 10$ µF (tant), $C_{ADJ} = 1$ µF

Figure 29. Thermal protection



$V_O = 2.85$ V

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 11. 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	
∅P	3.75		3.85
Q	2.65		2.95

Figure 30. TO-220 type A drawing

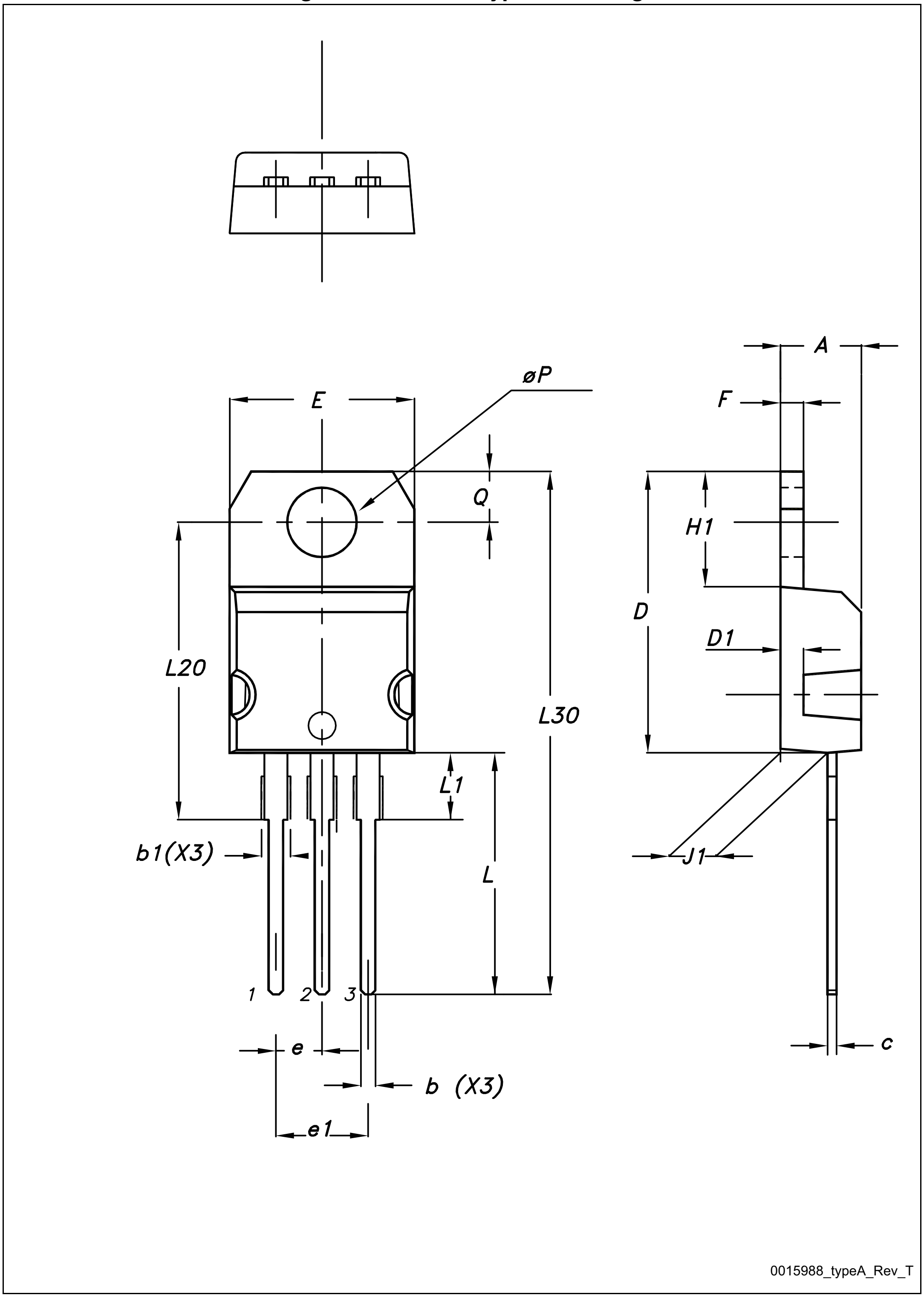


Table 12. TO-220 mechanical data (type STD-ST Single Gauge)

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	
∅P	3.75		3.85
Q	2.65		2.95

Figure 31. TO-220 SG (single gauge) drawing

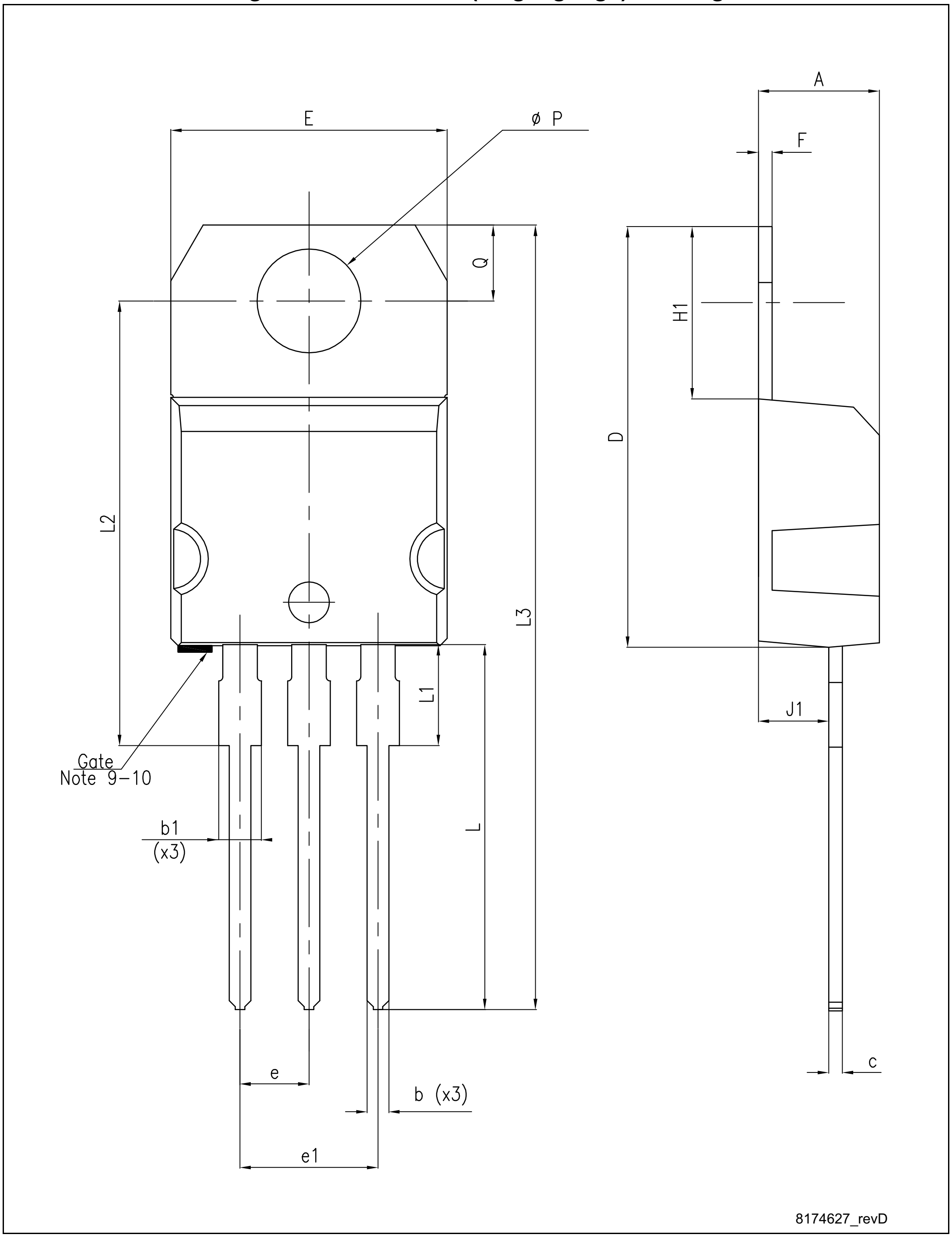


Table 13. DPAK mechanical data

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		5.10	
E	6.40		6.60
E1		4.70	
e		2.28	
e1	4.40		4.60
H	9.35		10.10
L	1.00		1.50
(L1)		2.80	
L2		0.80	
L4	0.60		1.00
R		0.20	
V2	0°		8°

Figure 32. DPAK drawing

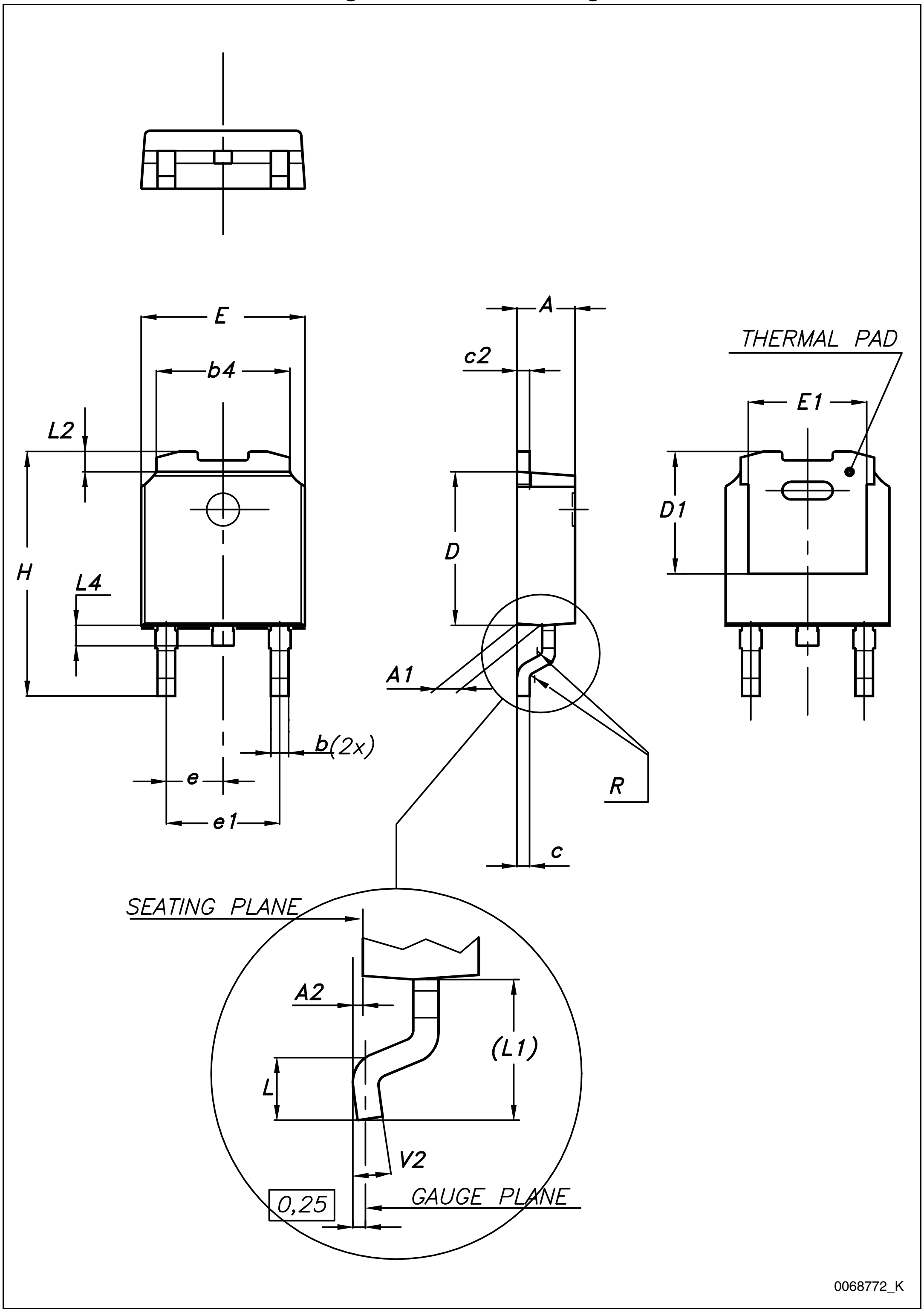
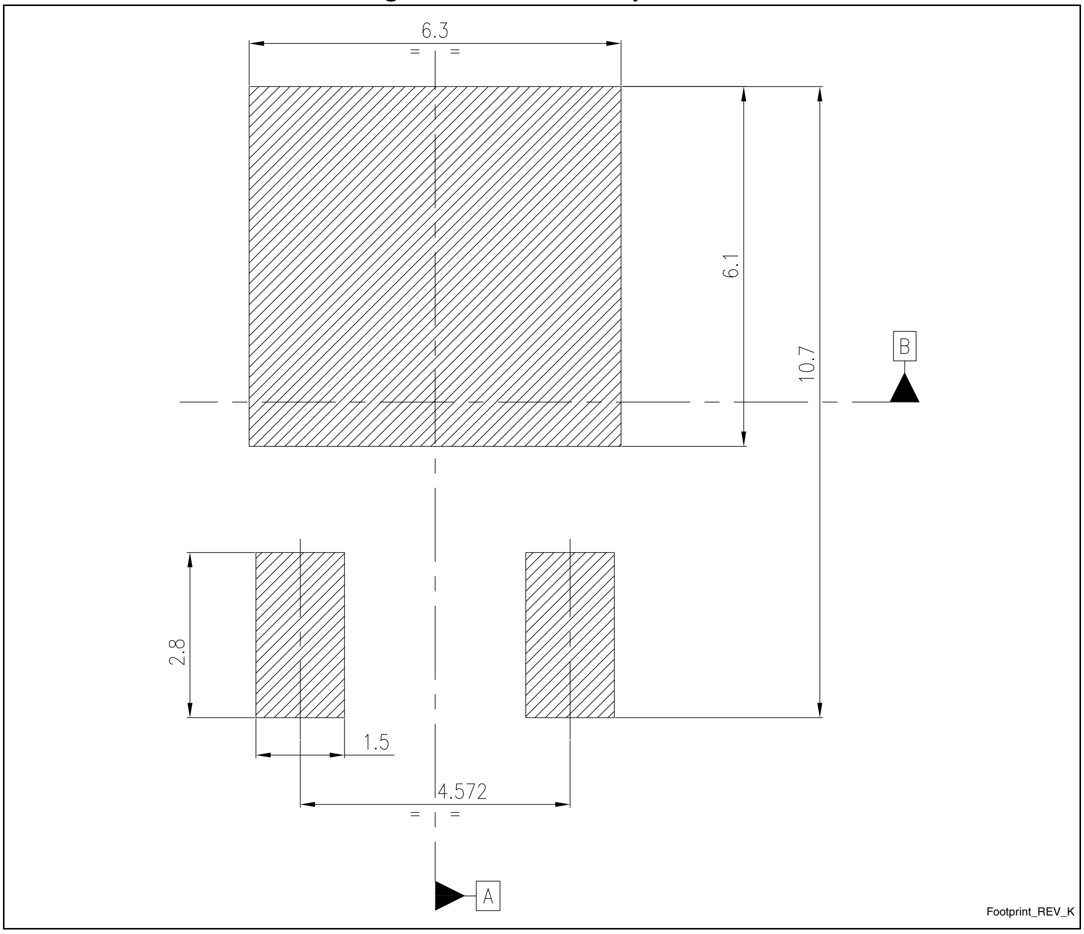


Figure 33. DPAK footprint [a]



a. All dimensions are in millimeters

Table 14. D²PAK (SMD 2L STD-ST) type A mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
A1	0.03		0.23
b	0.70		0.93
b2	1.14		1.70
c	0.45		0.60
c2	1.23		1.36
D	8.95		9.35
D1	7.50		
E	10		10.40
E1	8.50		
e		2.54	
e1	4.88		5.28
H	15		15.85
J1	2.49		2.69
L	2.29		2.79
L1	1.27		1.40
L2	1.30		1.75
R		0.4	
V2	0°		8°

Figure 34. D²PAK (SMD 2L STD-ST) type A drawing

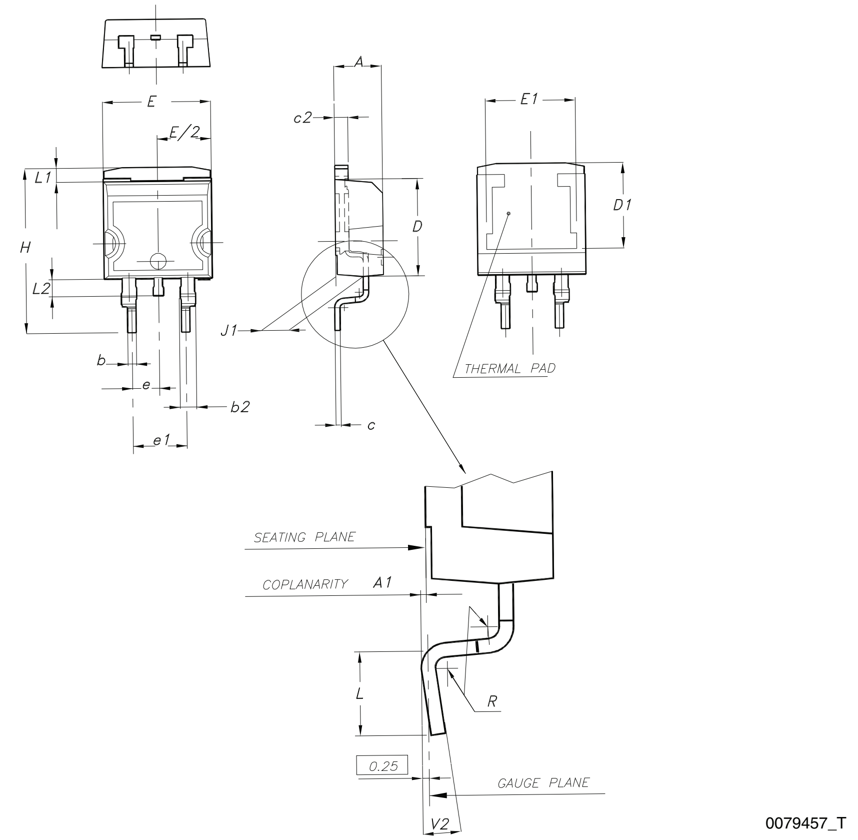


Table 15. D²PAK (SMD 2L Wooseok-subcon.) type C mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.30		4.70
A1	0		0.20
b	0.70		0.90
b2	1.17		1.37
c	0.45	0.50	0.60
c2	1.25	1.30	1.40
D	9	9.20	9.40
D1	7.50		
E	10		10.40
E1	8.50		
e		2.54	
e1	4.88		5.08
H	15		15.30
J1	2.20		2.60
L	1.79		2.79
L1	1		1.40
L2	1.20		1.60
R		0.30	
V2	0°		3°

Table 16. D²PAK (SMD 2L Wooseok-subcon.) type C drawing

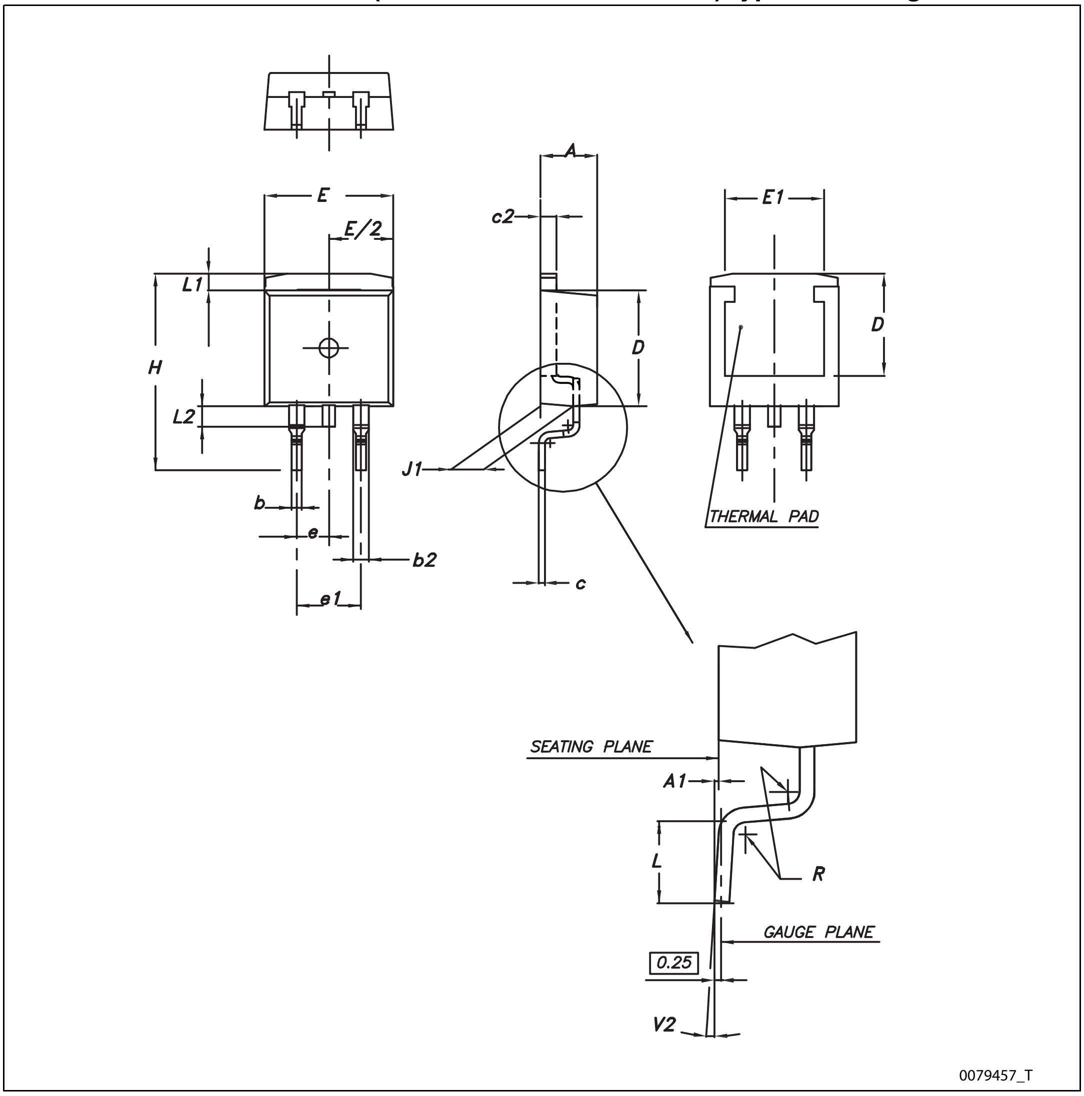


Table 17. D²PAK (SMD 2L) footprint recommended

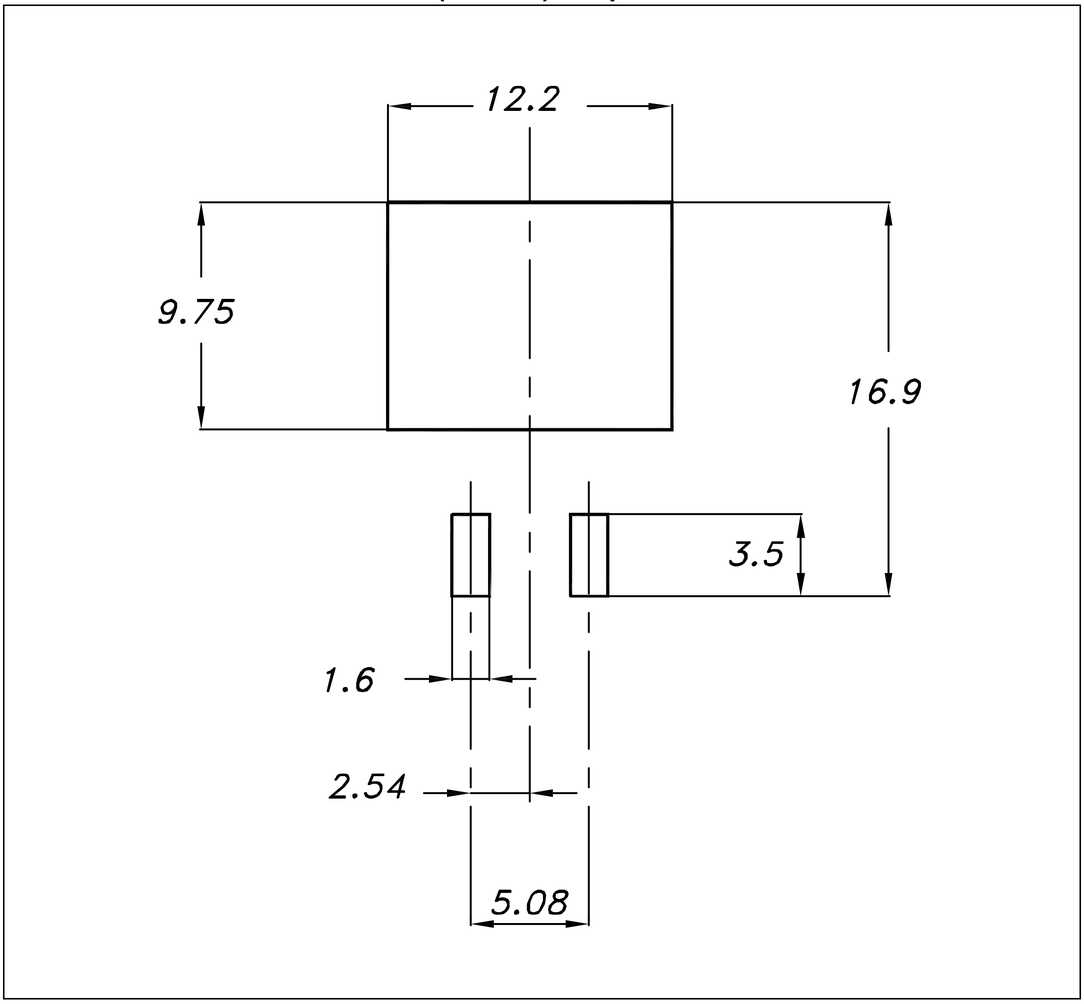


Table 18. DFN8L (4x4 mm.) mechanical data

Dim.	mm.		
	Min.	Typ.	Max.
A	0.80	0.90	1
A1	0	0.02	0.05
A3		0,20	
b	0.23	0.30	0.38
D	3.90	4	4.10
D2	2.82	3	3.23
E	3.90	4	4.10
E2	2.05	2.20	2.30
e		0.80	
L	0.40	0.50	0.60

Figure 35. DFN8L package outline

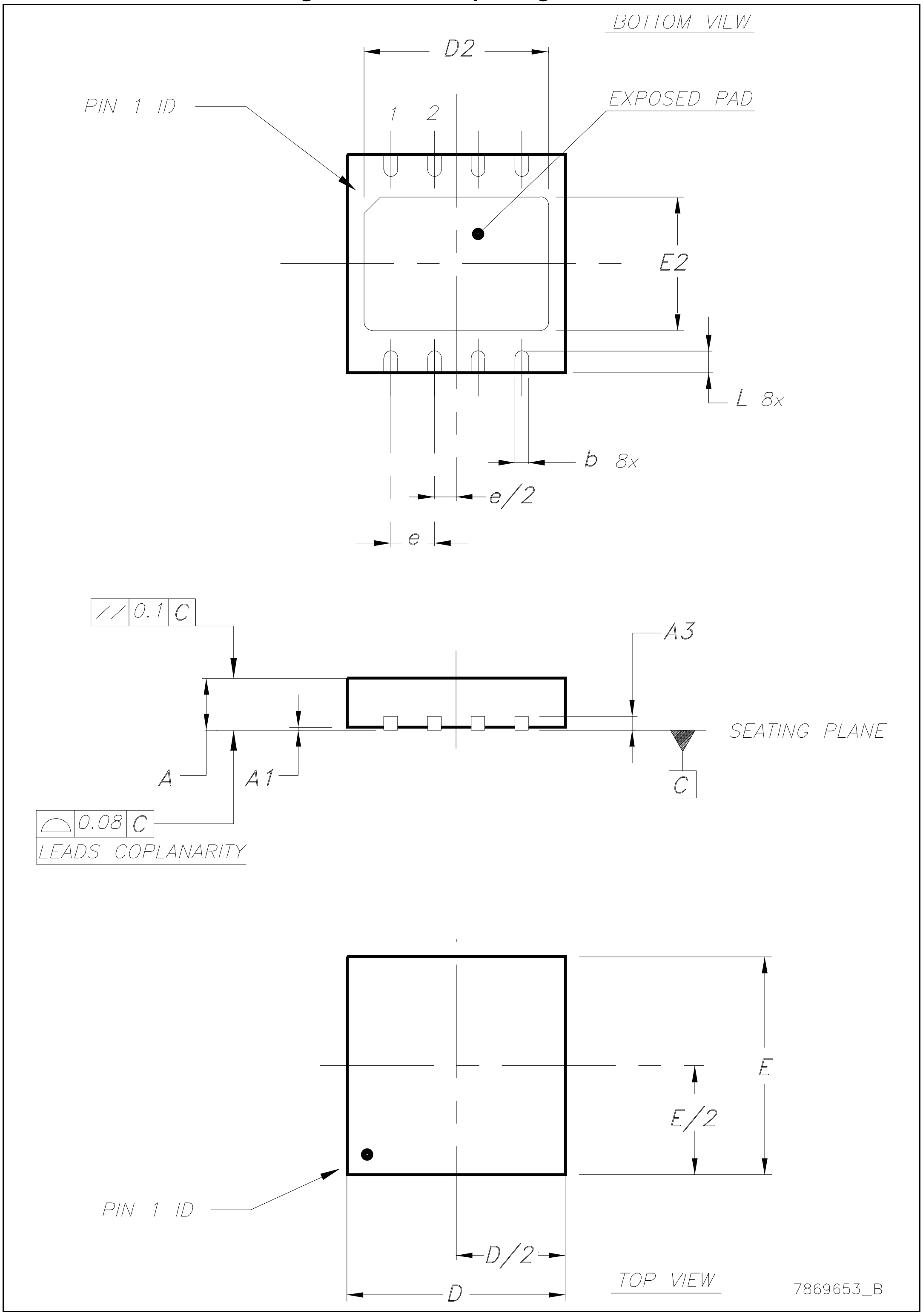


Figure 36. DFN8L footprint recommended

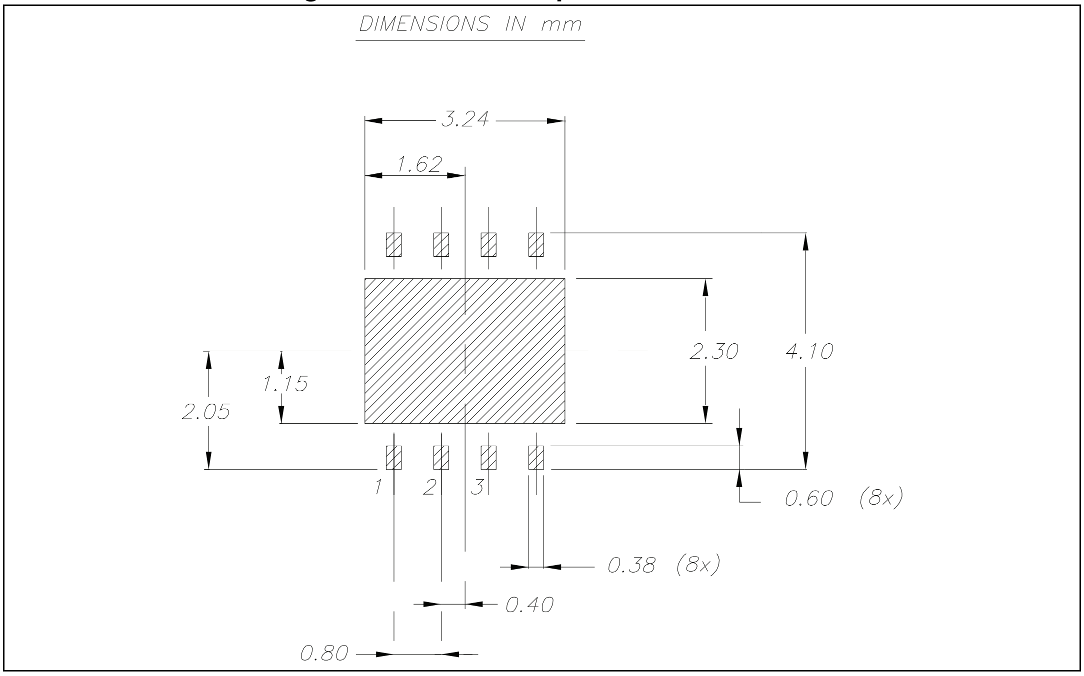


Table 19. D²PAK (SMD 3L STD-ST) type A mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
A1	0.03		0.23
b	0.70		0.93
b2	1.14		1.70
c	0.45		0.60
c2	1.23		1.36
D	8.95		9.35
D1	7.50		
E	10		10.40
E1	8.50		
e		2.54	
e1	4.88		5.28
H	15		15.85
J1	2.49		2.69
L	2.29		2.79
L1	1.27		1.40
R		0.4	
V2	0°		8°

Figure 37. D²PAK (SMD 3L STD-ST) type A mechanical data

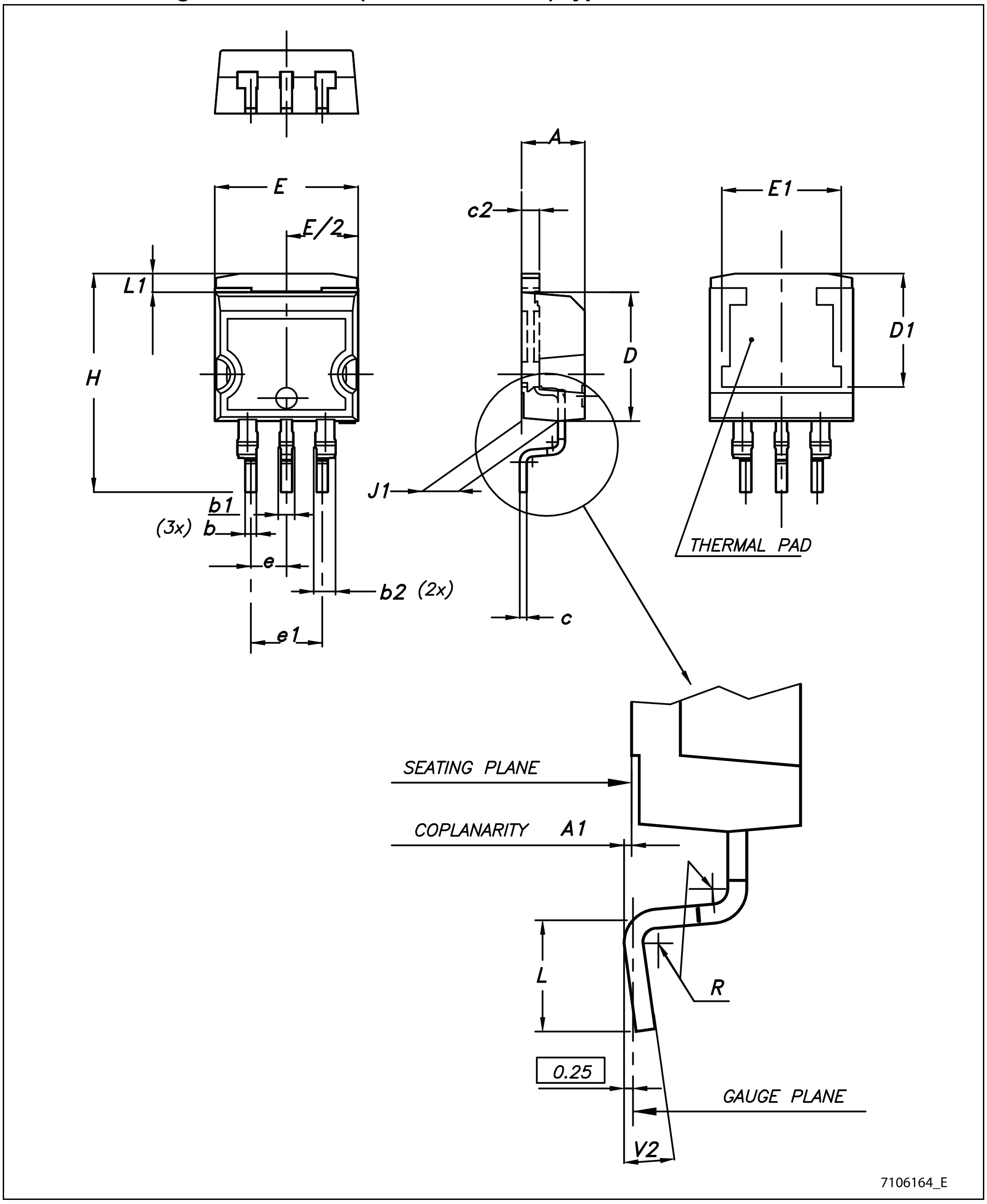


Table 20. D²PAK (SMD 3L Wooseok-subcon.) type B mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.30		4.70
A1	0		0.20
b	0.70		0.90
b2	1.17		1.37
c	0.45	0.50	0.60
c2	1.25	1.30	1.40
D	9	9.20	9.40
D1	7.50		
E	9.80		10.20
E1	7.50		
e		2.54	
e1		5.08	5.08
H	15	15.30	15.60
J1	2.20		2.60
L	1.79		2.79
L1	1		1.40
R		0.30	
V2	0°		3°

Figure 38. D²PAK (SMD 3L Wooseok-subcon.) type B drawing

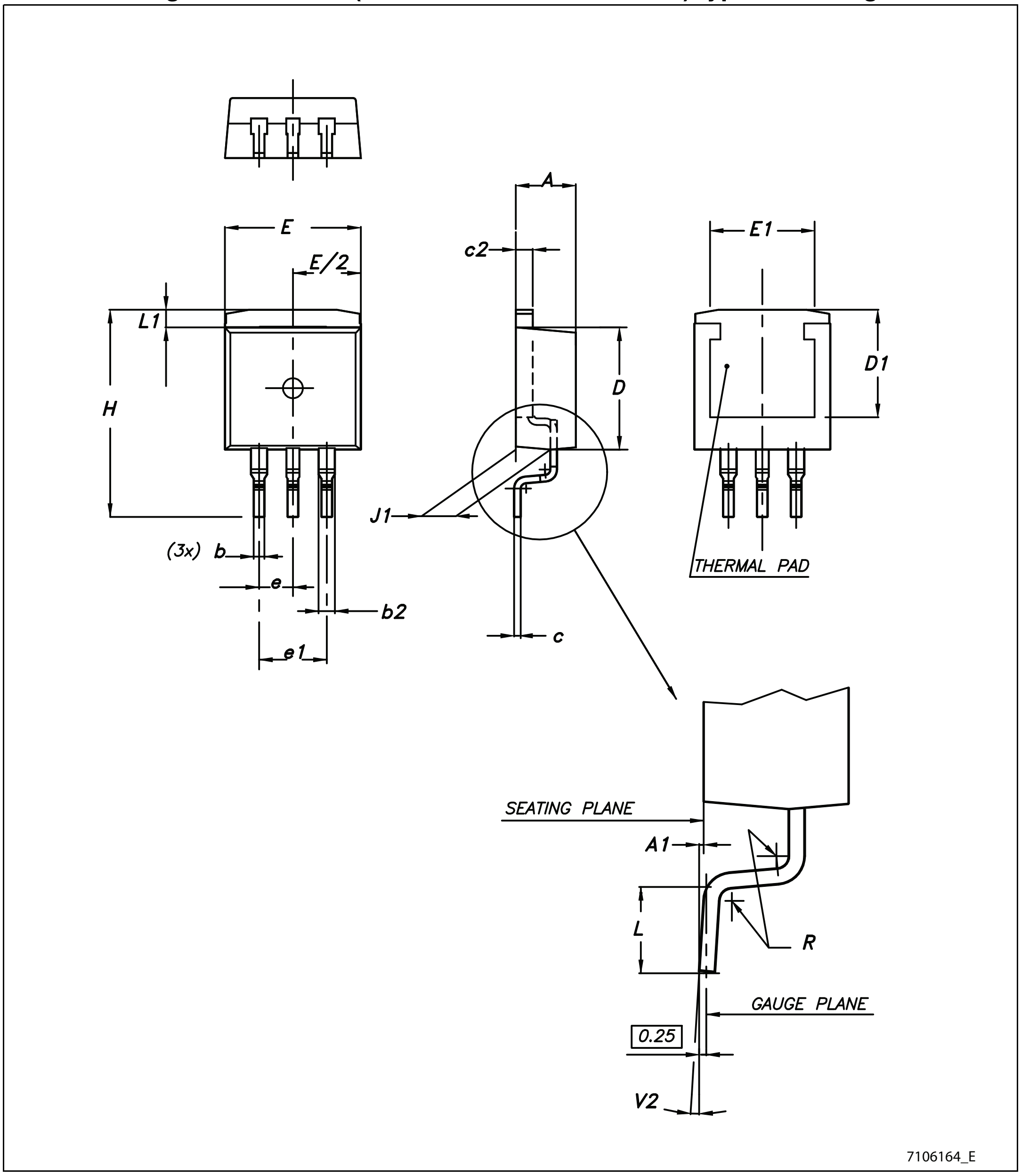
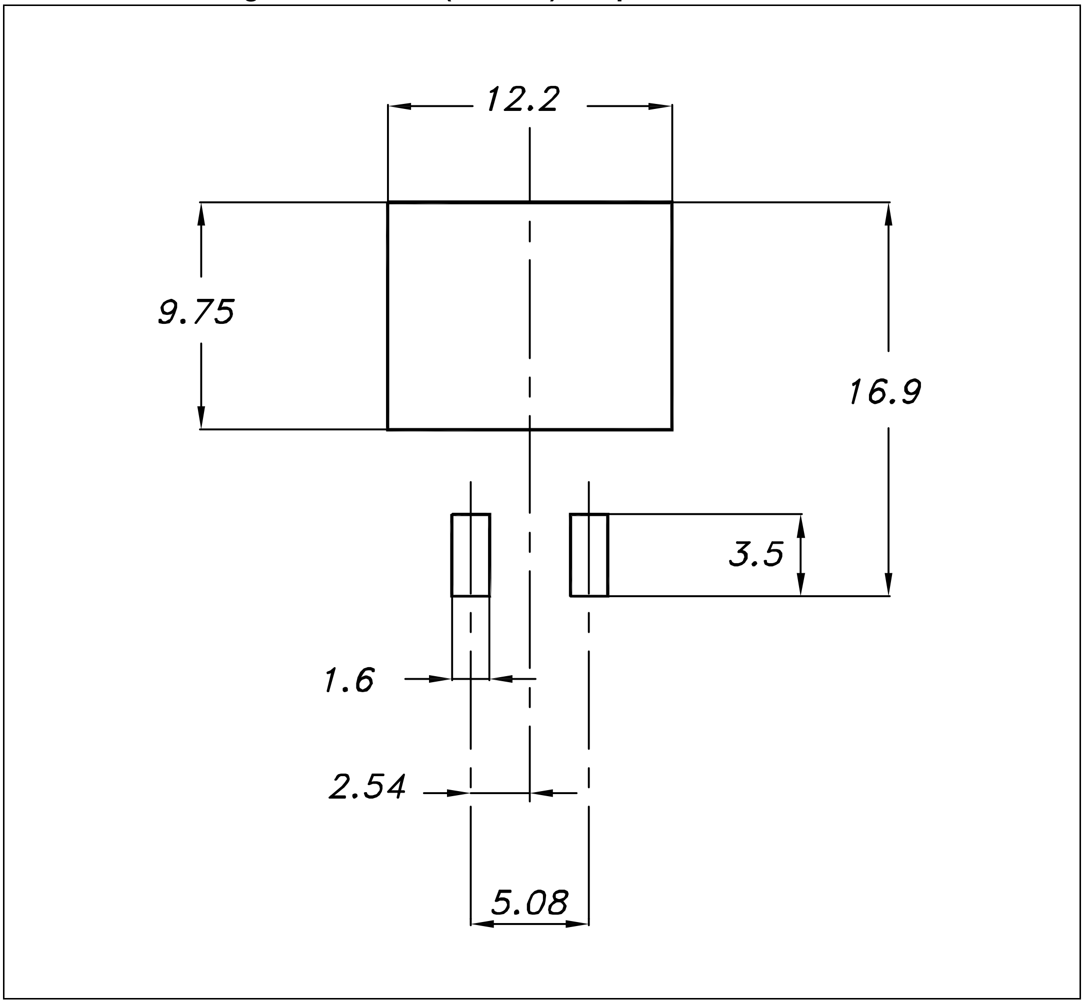


Figure 39. D²PAK (SMD 3L) footprint recommended



8 Packaging mechanical data

Table 21. DPAK and D^2PAK 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 40. Tape for DPAK and D²PAK

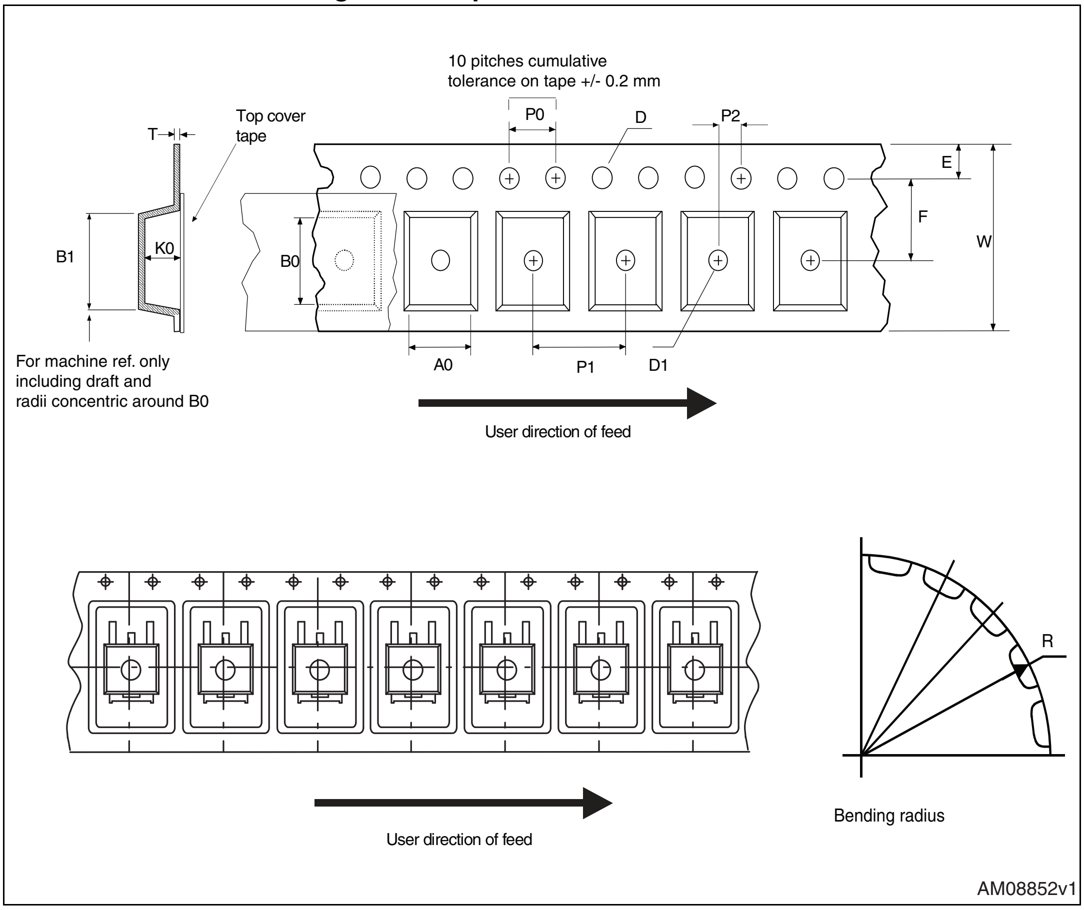


Figure 41. Reel for DPAK and D²PAK

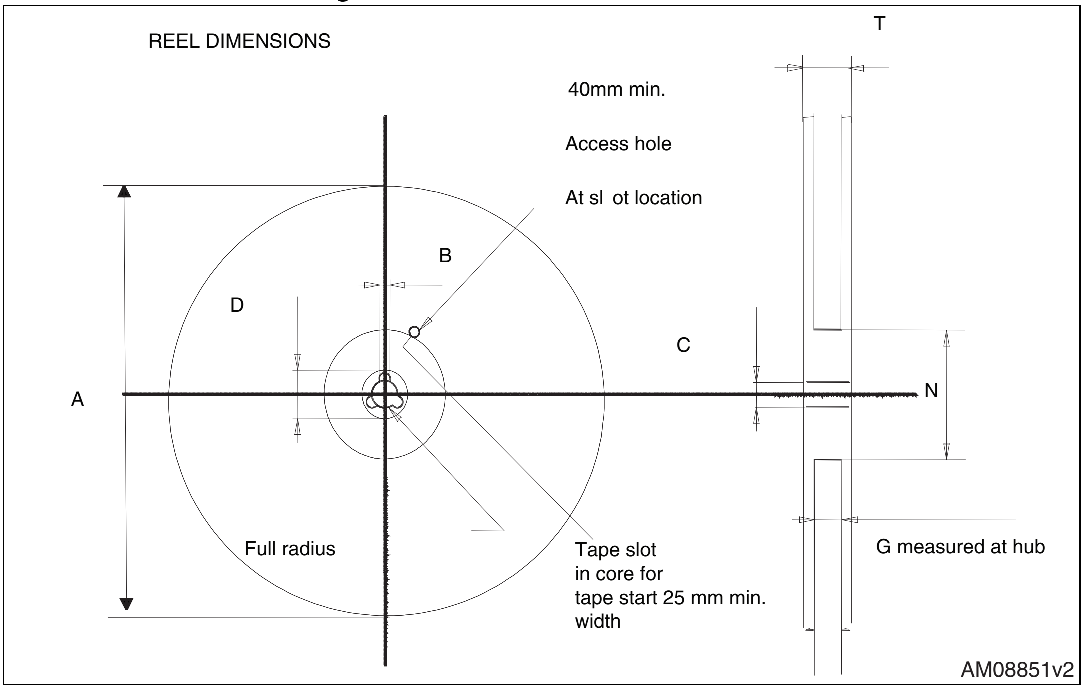


Table 22. Reel DFN8L dimensions

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			330			12.992
C	12.8	13.0	13.2	0.504	0.512	0.519
D	20.2			0.795		
N	60			2.362		
T			22.4			0.882

Figure 42. DFN8L carrier tape (dimension are in mm.)

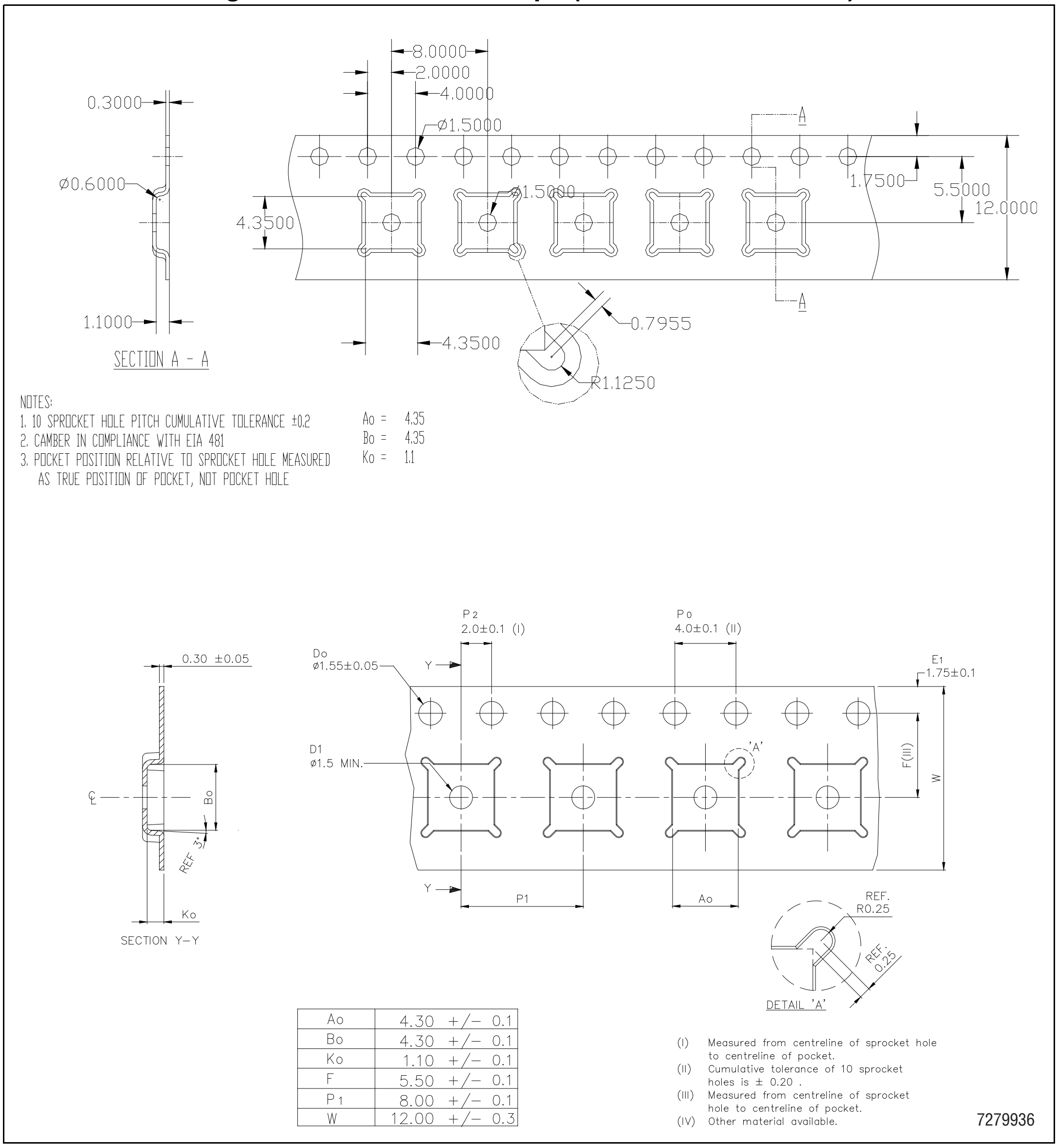
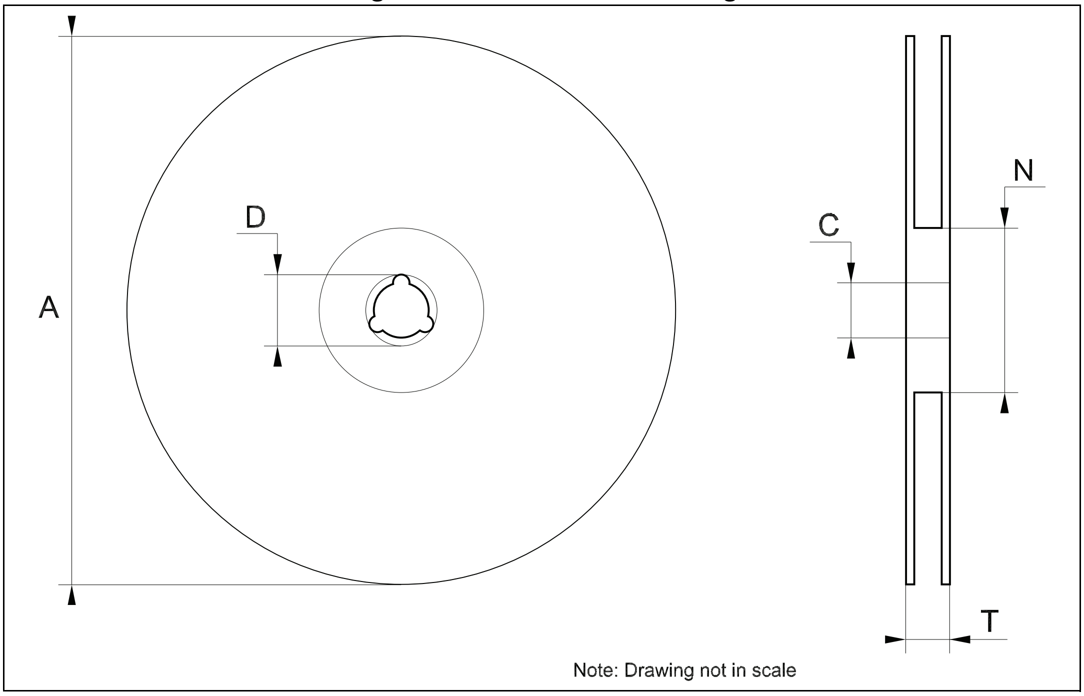


Figure 43. Reel DFN8L drawing



9 Order codes

Table 23. Order codes

Packages					
TO-220	**D²PAK**	**D²PAK/A**	**DPAK**	**DFN8**	**Output voltages**
LD1086V18	LD1086D2T18TR		LD1086DT18TR		1.8 V
			LD1086DT25TR		2.5 V
LD1086V33	LD1086D2T33TR	LD1086D2M33TR	LD1086DT33TR		3.3 V
	LD1086D2T50TR		LD1086DT50TR		5.0 V
	LD1086D2T12TR				12.0 V
LD1086V	LD1086D2TTR	LD1086D2MTR	LD1086DTTR	LD1086PUR	ADJ
LD1086V-DG (1)					ADJ
LD1086VY (2)			LD1086DTTRY (2)		ADJ
LD1086BV	LD1086BD2TTR	LD1086BD2MTR	LD1086BDTTR		ADJ
LD1086BV-DG (1)					ADJ

1. TO-220 Dual Gauge frame.
2. Automotive grade products.

10 Revision history

Table 24. Document revision history

Date	Revision	Changes
16-May-2006	14	Order codes updated and new template.
19-Jan-2007	15	D^2PAK mechanical data updated and add footprint data.
05-Apr-2007	16	Order codes updated.
07-Jun-2007	17	Order codes updated.
19-Jul-2007	18	Add note on *Figure 2*.
03-Dec-2007	19	Modified: *Table 23*.
31-Jan-2008	20	Added new order codes for Automotive grade products.
18-Feb-2008	21	Modified: *Table 23 on page 46*.
14-Jul-2008	22	Modified: *Table 1 on page 1* and *Table 23 on page 46*.
10-Mar-2010	23	Added: *Table 12 on page 22*, *Figure 30 on page 23*, *Figure 31 on page 24*, *Figure 32* and *Figure 33 on page 25*.
15-Nov-2010	24	Modified: R_{thJC} value for TO-220 *Table 2 on page 7*.
11-Jul-2011	25	Modified: *Figure 24*, *Figure 25 on page 20* and *Table 23 on page 46*.
10-Feb-2012	26	Added: order code LD1086V-DG *Table 23 on page 46*.
15-Mar-2012	27	Added: new order code LD1086PUR *Table 23 on page 46* and new package mechanical data DFN8 (4x4 mm) *Table 18 on page 34*, *Figure 35 on page 35*, *Figure 36 on page 36*, *Figure 42 on page 44* and *Figure 43 on page 45*.
19-Oct-2012	28	Added: R_{thJA} value for DPAK *Table 2 on page 7*.
13-Feb-2013	29	Modified: Output voltage in Voltage reference parameter *Table 8 on page 14* and *Table 10 on page 16*.
01-Mar-2013	30	Modified: DFN8 (4 x 4) pin configuration *Figure 2 on page 6*.
17-Jun-2013	31	Added *Table 8: Electrical characteristics of LD1086B#* and *Section 8: Packaging mechanical data*. Updated *Section 7: Package mechanical data* and *Table 23: Order codes*. Minor text changes.
22-Oct-2013	32	RPN LD1086xx changed to LD1086. Updated the Description in cover page. Cancelled Table 1: Device summary. Updated *Figure 2: Pin connections (top view), Section 5: Electrical characteristics*, *Section 7: Package mechanical data* and *Table 23: Order codes*. Minor text changes.