

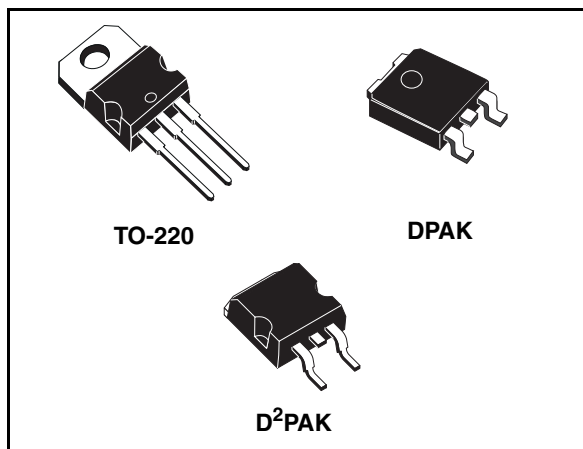
5 A low drop positive voltage regulator adjustable and fixed

Features

- Typical dropout 1.3 V (at 5 A)
- Three terminal adjustable or fixed output voltage 1.8 V, 2.5 V, 3.3 V.
- Guaranteed output current up to 5 A
- Output tolerance $\pm 1\%$ at 25 °C and $\pm 2\%$ in full temperature range for the "A" version
- Output tolerance $\pm 2\%$ at 25 °C and $\pm 3\%$ in full temperature range internal power and thermal limit
- Wide operating temp. range -40 °C to 125 °C
- Package available: TO-220, D²PAK, DPAK
- Pinout compatibility with standard adjustable VREG

Description

The KD1084xx is a LOW DROP voltage regulator able to provide up to 5 A of output current. Dropout is guaranteed at a maximum of 1.5 V at the maximum output current, decreasing at lower loads. The KD1084xx is pin to pin compatible with the older 3-terminal adjustable regulators but has better performances in term of drop and output tolerance.



A 2.85 V output version is suitable for SCSI-2 active termination. Unlike PNP regulators, where a part of the output current is wasted as quiescent current, the KD1084xx quiescent current flows into the load, so increase efficiency. Only a 10 μ F minimum capacitor is needed for stability.

The devices are supplied in TO-220, D²PAK and DPAK. On chip trimming allows the regulator to reach a very tight output voltage tolerance, within $\pm 1\%$ at 25 °C for "A" version and $\pm 2\%$ at 25 °C for standard version.

Table 1. Device summary

Part numbers	Order codes				
	TO-220	D ² PAK	DPAK	Output voltage	Tolerance
KD1084AXX18		KD1084AD2T18R		1.8 V	1%
KD1084XX25		KD1084D2T25R	KD1084DT25R	2.5 V	2%
KD1084AXX25			KD1084ADT25R	2.5 V	1%
KD1084XX33			KD1084DT33R	3.3 V	2%
KD1084AXX33	KD1084AV33		KD1084ADT33R	3.3 V	1%
KD1084XX			KD1084DT-R	ADJ	2%
KD1084AXX			KD1084ADT-R	ADJ	1%

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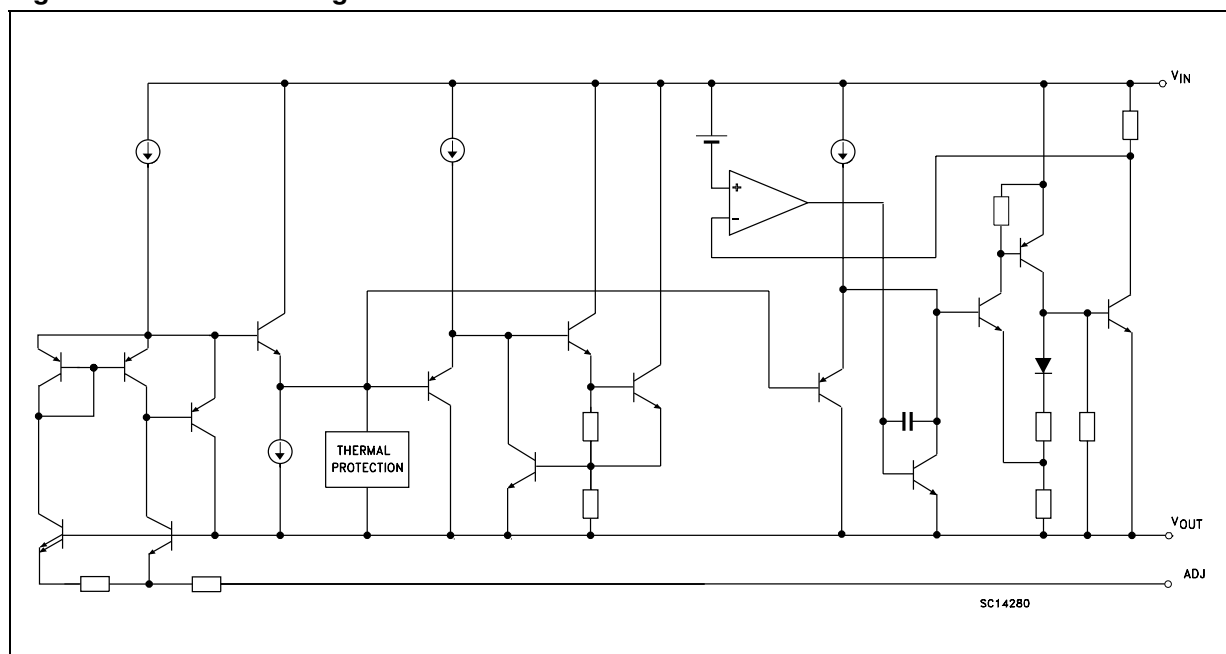
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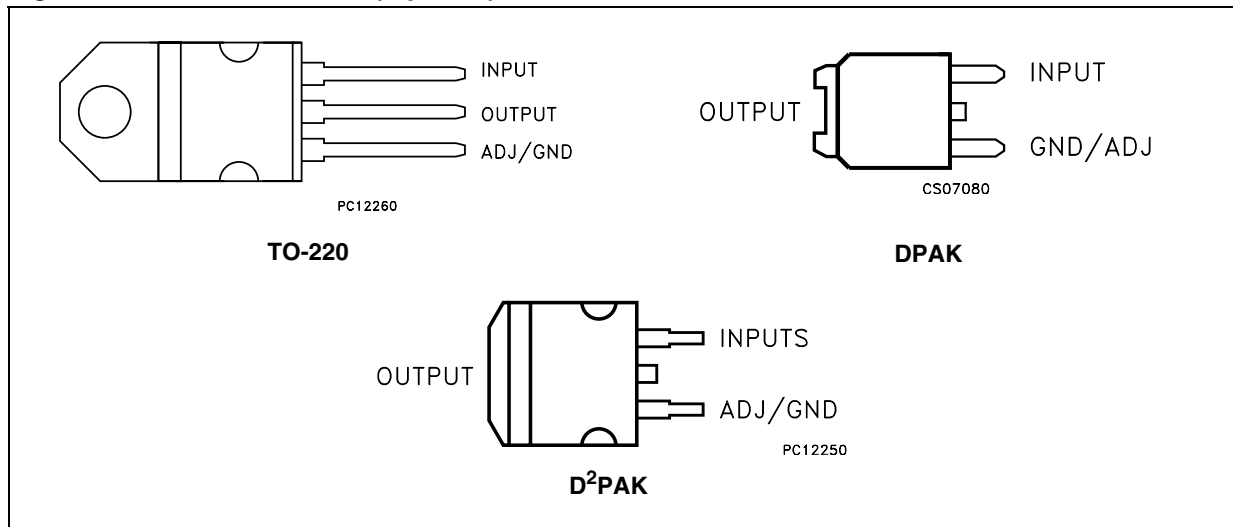
1 Diagram

Figure 1. Schematic diagram



2 Pin configuration

Figure 2. Pin connections (top view)



3 Maximum ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_I	DC input voltage	12	V
I_O	Output current	Internally limited	
P_D	Power dissipation	Internally limited	
T_{STG}	Storage temperature range	-55 to +150	°C
T_{OP}	Operating junction temperature range	-40 to +125	°C

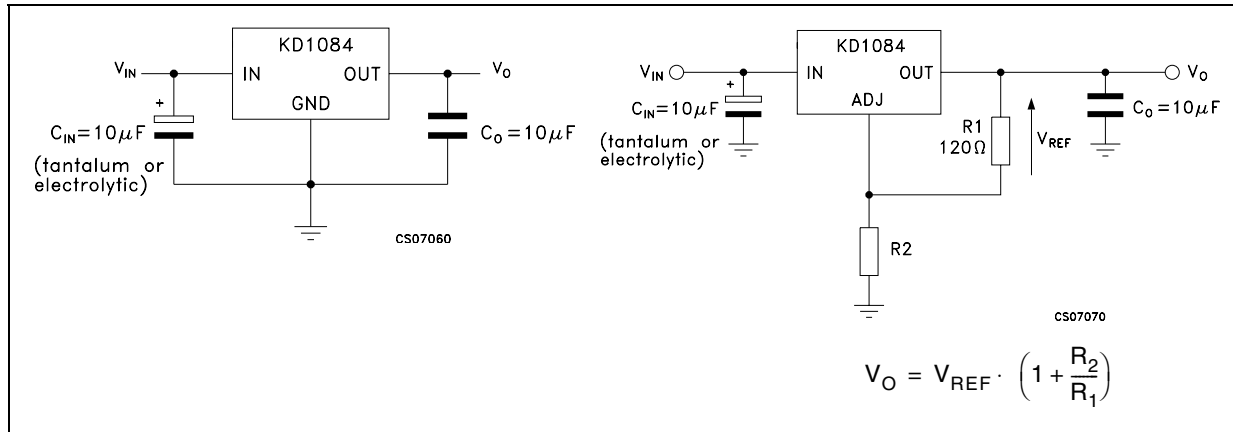
Note: Absolute maximum ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

Table 3. Thermal data

Symbol	Parameter	TO-220	DPAK	D ² PAK	Unit
R_{thJC}	Thermal resistance junction-case	3	8	3	°C/W
R_{thJA}	Thermal resistance junction-ambient	50	100	62.5	°C/W

4 Schematic application

Figure 3. Application circuit



5 Electrical characteristics

Table 4. Electrical characteristics of KD1084A#18 ($V_I = 4.8\text{ V}$, $C_I = C_O = 10\text{ }\mu\text{F}$ (tant.), $T_A = -40\text{ to }125\text{ }^\circ\text{C}$, unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$I_O = 0\text{ mA}$, $T_J = 25^\circ\text{C}$	1.782	1.8	1.818	V
		$I_O = 0\text{ to }5\text{ A}$, $V_I = 3.4\text{ to }10\text{ V}$	1.764	1.8	1.836	V
ΔV_O	Line regulation	$I_O = 0\text{ mA}$, $V_I = 3.4\text{ to }10\text{ V}$ $T_J = 25^\circ\text{C}$		0.5	6	mV
		$I_O = 0\text{ mA}$, $V_I = 3.4\text{ to }10\text{ V}$		1	6	mV
ΔV_O	Load regulation	$I_O = 0\text{ to }5\text{ A}$, $T_J = 25^\circ\text{C}$		3	15	mV
		$I_O = 0\text{ to }5\text{ A}$		7	20	V
V_d	Dropout voltage	$I_O = 5\text{ A}$		1.3	1.5	V
I_q	Quiescent current	$V_I \leq 10\text{ V}$		5	10	mA
I_{sc}	Short circuit current	$V_I - V_O = 5\text{ V}$	5.5	7		A
	Thermal regulation	$T_A = 25^\circ\text{C}$, 30ms pulse		0.003	0.015	%/W
SVR	Supply voltage rejection	$f = 120\text{ Hz}$, $C_O = 25\mu\text{F}$, $I_O = 5\text{ A}$ $V_I = 5.3 \pm 1.5\text{ V}$	60	75		dB
eN	RMS Output noise voltage (% of V_O)	$T_A = 25^\circ\text{C}$, $f = 10\text{ Hz to }10\text{ kHz}$		0.003		%
S	Temperature stability			0.5		%
S	Long term stability	$T_A = 125^\circ\text{C}$, 1000Hrs		0.5		%

Table 5. Electrical characteristics of KD1084A#25 ($V_I = 5.5\text{ V}$, $C_I = C_O = 10\text{ }\mu\text{F}$ (tant.),
 $T_A = -40\text{ to }125\text{ }^\circ\text{C}$, unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$I_O = 0\text{ mA}$, $T_J = 25^\circ\text{C}$	2.475	2.5	2.525	V
		$I_O = 0\text{ to }5\text{ A}$, $V_I = 4.1\text{ to }10\text{ V}$	2.45	2.5	2.55	V
ΔV_O	Line regulation	$I_O = 0\text{ mA}$, $V_I = 4.1\text{ to }10\text{ V}$ $T_J = 25^\circ\text{C}$		0.5	6	mV
		$I_O = 0\text{ mA}$, $V_I = 4.1\text{ to }10\text{ V}$		1	6	mV
ΔV_O	Load regulation	$I_O = 0\text{ to }5\text{ A}$, $T_J = 25^\circ\text{C}$		3	15	mV
		$I_O = 0\text{ to }5\text{ A}$		7	20	V
V_d	Dropout voltage	$I_O = 5\text{ A}$		1.3	1.5	V
I_q	Quiescent current	$V_I \leq 10\text{ V}$		5	10	mA
I_{sc}	Short circuit current	$V_I - V_O = 5\text{ V}$	5.5	7		A
	Thermal regulation	$T_A = 25^\circ\text{C}$, 30ms pulse		0.003	0.015	%/W
SVR	Supply voltage rejection	$f = 120\text{ Hz}$, $C_O = 25\mu\text{F}$, $I_O = 5\text{ A}$ $V_I = 6 \pm 1.5\text{ V}$	60	72		dB
eN	RMS Output noise voltage (% of V_O)	$T_A = 25^\circ\text{C}$, $f = 10\text{ Hz to }10\text{ kHz}$		0.003		%
S	Temperature stability			0.5		%
S	Long term stability	$T_A = 125^\circ\text{C}$, 1000Hrs		0.5		%

Table 6. Electrical characteristics of KD1084A#33 ($V_I = 6.3\text{ V}$, $C_I = C_O = 10\text{ }\mu\text{F}$ (tant.),
 $T_A = -40\text{ to }125\text{ }^\circ\text{C}$, unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$I_O = 0\text{ mA}$, $T_J = 25^\circ\text{C}$	3.267	3.3	3.333	V
		$I_O = 0\text{ to }5\text{ A}$, $V_I = 4.9\text{ to }10\text{ V}$	3.234	3.35	3.366	V
ΔV_O	Line regulation	$I_O = 0\text{ mA}$, $V_I = 4.9\text{ to }10\text{ V}$ $T_J = 25^\circ\text{C}$		0.5	6	mV
		$I_O = 0\text{ mA}$, $V_I = 4.9\text{ to }10\text{ V}$		1	6	mV
ΔV_O	Load regulation	$I_O = 0\text{ to }5\text{ A}$, $T_J = 25^\circ\text{C}$		3	15	mV
		$I_O = 0\text{ to }5\text{ A}$		7	20	V
V_d	Dropout voltage	$I_O = 5\text{ A}$		1.3	1.5	V
I_q	Quiescent current	$V_I \leq 10\text{ V}$		5	10	mA
I_{sc}	Short circuit current	$V_I - V_O = 5\text{ V}$	5.5	7		A
	Thermal regulation	$T_A = 25^\circ\text{C}$, 30ms pulse		0.003	0.015	%/W
SVR	Supply voltage rejection	$f = 120\text{ Hz}$, $C_O = 25\mu\text{F}$, $I_O = 5\text{ A}$ $V_I = 6.8 \pm 1.5\text{ V}$	60	72		dB
eN	RMS Output noise voltage (% of V_O)	$T_A = 25^\circ\text{C}$, $f = 10\text{ Hz to }10\text{ kHz}$		0.003		%
S	Temperature stability			0.5		%
S	Long term stability	$T_A = 125^\circ\text{C}$, 1000Hrs		0.5		%

Table 7. Electrical characteristics of KD1084A ($V_I = 4.25\text{ V}$, $C_I = C_O = 10\text{ }\mu\text{F}$ (tant.),
 $T_A = -40\text{ to }125^\circ\text{C}$, unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$I_O = 10\text{ mA}$, $T_J = 25^\circ\text{C}$	1.237	1.25	1.263	V
		$I_O = 10\text{ mA to }5\text{ A}$, $V_I = 2.85\text{ to }10\text{ V}$	1.225	1.25	1.275	V
ΔV_O	Line regulation	$I_O = 10\text{ mA}$, $V_I = 2.85\text{ to }10\text{ V}$ $T_J = 25^\circ\text{C}$		0.015	0.2	mV
		$I_O = 10\text{ mA}$, $V_I = 2.85\text{ to }10\text{ V}$		0.035	0.2	mV
ΔV_O	Load regulation	$I_O = 10\text{ mA to }5\text{ A}$, $T_J = 25^\circ\text{C}$		0.1	0.3	mV
		$I_O = 10\text{ mA to }5\text{ A}$		0.2	0.4	V
V_d	Dropout voltage	$I_O = 5\text{ A}$		1.3	1.5	V
$I_{O(\min)}$	Quiescent current	$V_I \leq 10\text{ V}$		3	10	mA
I_{sc}	Short circuit current	$V_I - V_O = 5\text{ V}$	5.5	7		A
	Thermal regulation	$T_A = 25^\circ\text{C}$, 30ms pulse		0.003	0.015	%/W
SVR	Supply voltage rejection	$f = 120\text{ Hz}$, $C_O = 25\mu\text{F}$, $C_{ADJ} = 25\mu\text{F}$, $I_O = 5\text{ A}$, $V_I = 4.75 \pm 1.5\text{ V}$	60	72		dB
I_{ADJ}	Adjust pin current	$V_I = 4.25\text{ V}$, $I_O = 10\text{ mA}$		55	120	μA
ΔI_{ADJ}	Adjust pin current change	$V_I = 2.85\text{ to }10\text{ V}$, $I_O = 10\text{ mA to }5\text{ A}$		0.2	5	μA
eN	RMS Output noise voltage (% of V_O)	$T_A = 25^\circ\text{C}$, $f = 10\text{ Hz to }10\text{ kHz}$		0.003		%
S	Temperature stability			0.5		%
S	Long term stability	$T_A = 125^\circ\text{C}$, 1000Hrs		0.5		%

Table 8. Electrical characteristics of KD1084#25 ($V_I = 5.5\text{ V}$, $C_I = C_O = 10\text{ }\mu\text{F}$ (tant.),
 $T_A = -40\text{ to }125^\circ\text{C}$, unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$I_O = 0\text{ mA}$, $T_J = 25^\circ\text{C}$	2.45	2.5	2.55	V
		$I_O = 0\text{ to }5\text{ A}$, $V_I = 4.1\text{ to }10\text{ V}$	2.425	2.5	2.575	V
ΔV_O	Line regulation	$I_O = 0\text{ mA}$, $V_I = 4.1\text{ to }10\text{ V}$ $T_J = 25^\circ\text{C}$		0.5	6	mV
		$I_O = 0\text{ mA}$, $V_I = 4.1\text{ to }10\text{ V}$		1	6	mV
ΔV_O	Load regulation	$I_O = 0\text{ to }5\text{ A}$, $T_J = 25^\circ\text{C}$		3	15	mV
		$I_O = 0\text{ to }5\text{ A}$		7	20	V
V_d	Dropout voltage	$I_O = 5\text{ A}$		1.3	1.5	V
I_q	Quiescent current	$V_I \leq 10\text{ V}$		5	10	mA
I_{sc}	Short circuit current	$V_I - V_O = 5\text{ V}$	5.5	7		A
	Thermal regulation	$T_A = 25^\circ\text{C}$, 30ms pulse		0.003	0.015	%/W
SVR	Supply voltage rejection	$f = 120\text{ Hz}$, $C_O = 25\mu\text{F}$, $I_O = 5\text{ A}$ $V_I = 6 \pm 1.5\text{ V}$	60	72		dB
eN	RMS Output noise voltage (% of V_O)	$T_A = 25^\circ\text{C}$, $f = 10\text{ Hz to }10\text{ kHz}$		0.003		%
S	Temperature stability			0.5		%
S	Long term stability	$T_A = 125^\circ\text{C}$, 1000Hrs		0.5		%

Table 9. Electrical characteristics of KD1084#33 ($V_I = 5.85\text{ V}$, $C_I = C_O = 10\text{ }\mu\text{F}$ (tant.),
 $T_A = -40\text{ to }125^\circ\text{C}$, unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$I_O = 0\text{ mA}$, $T_J = 25^\circ\text{C}$	3.234	3.3	3.366	V
		$I_O = 0\text{ to }5\text{ A}$, $V_I = 4.9\text{ to }10\text{ V}$	3.2	3.3	3.4	V
ΔV_O	Line regulation	$I_O = 0\text{ mA}$, $V_I = 4.9\text{ to }10\text{ V}$ $T_J = 25^\circ\text{C}$		0.5	6	mV
		$I_O = 0\text{ mA}$, $V_I = 4.9\text{ to }10\text{ V}$		1	6	mV
ΔV_O	Load regulation	$I_O = 0\text{ to }5\text{ A}$, $T_J = 25^\circ\text{C}$		3	15	mV
		$I_O = 0\text{ to }5\text{ A}$		7	20	V
V_d	Dropout voltage	$I_O = 5\text{ A}$		1.3	1.5	V
I_q	Quiescent current	$V_I \leq 10\text{ V}$		5	10	mA
I_{sc}	Short circuit current	$V_I - V_O = 5\text{ V}$	5.5	7		A
	Thermal regulation	$T_A = 25^\circ\text{C}$, 30ms pulse		0.003	0.015	%/W
SVR	Supply voltage rejection	$f = 120\text{ Hz}$, $C_O = 25\mu\text{F}$, $I_O = 5\text{ A}$ $V_I = 6.8 \pm 1.5\text{ V}$	60	72		dB
eN	RMS Output noise voltage (% of V_O)	$T_A = 25^\circ\text{C}$, $f = 10\text{ Hz to }10\text{ kHz}$		0.003		%
S	Temperature stability			0.5		%
S	Long term stability	$T_A = 125^\circ\text{C}$, 1000Hrs		0.5		%

Table 10. Electrical characteristics of KD1084 ($V_I = 4.25\text{ V}$, $C_I = C_O = 10\text{ }\mu\text{F}$ (tant.),
 $T_A = -40\text{ to }125\text{ }^\circ\text{C}$, unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$I_O = 10\text{ mA}$, $T_J = 25^\circ\text{C}$	1.225	1.25	1.275	V
		$I_O = 10\text{ mA to }5\text{ A}$, $V_I = 2.85\text{ to }10\text{ V}$	1.213	1.25	1.287	V
ΔV_O	Line regulation	$I_O = 10\text{ mA}$, $V_I = 2.85\text{ to }10\text{ V}$, $T_J = 25^\circ\text{C}$		0.015	0.2	mV
		$I_O = 10\text{ mA}$, $V_I = 2.85\text{ to }10\text{ V}$		0.035	0.2	mV
ΔV_O	Load regulation	$I_O = 10\text{ mA to }5\text{ A}$, $T_J = 25^\circ\text{C}$		1	0.3	mV
		$I_O = 10\text{ mA to }5\text{ A}$		0.2	0.4	V
V_d	Dropout voltage	$I_O = 5\text{ A}$		1.3	1.5	V
$I_{O(\min)}$	Quiescent current	$V_I \leq 10\text{ V}$		3	10	mA
I_{sc}	Short circuit current	$V_I - V_O = 5\text{ V}$	5.5	7		A
	Thermal regulation	$T_A = 25^\circ\text{C}$, 30ms pulse		0.003	0.015	%/W
SVR	Supply voltage rejection	$f = 120\text{ Hz}$, $C_O = 25\mu\text{F}$, $C_{ADJ} = 25\mu\text{F}$, $I_O = 5\text{ A}$, $V_I = 4.75 \pm 1.5\text{ V}$	60	72		dB
I_{ADJ}	Adjust pin current	$V_I = 4.25\text{ V}$, $I_O = 10\text{ mA}$		55	120	μA
ΔI_{ADJ}	Adjust pin current change	$V_I = 2.85\text{ to }10\text{ V}$, $I_O = 10\text{ mA to }5\text{ A}$		0.2	5	μA
eN	RMS Output noise voltage (% of V_O)	$T_A = 25^\circ\text{C}$, $f = 10\text{ Hz to }10\text{ kHz}$		0.003		%
S	Temperature stability			0.5		%
S	Long term stability	$T_A = 125^\circ\text{C}$, 1000Hrs		0.5		%

6 Typical application

Unless otherwise specified $T_J = 25\text{ }^{\circ}\text{C}$, $C_I = C_O = 10\text{ }\mu\text{F}$ (tant.)

Figure 4. Dropout voltage vs output current

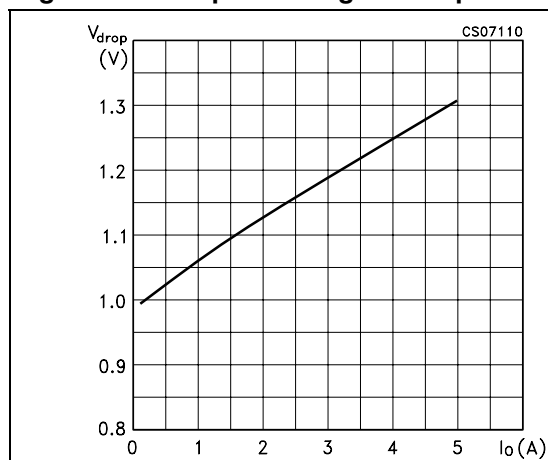


Figure 5. Dropout voltage vs temperature

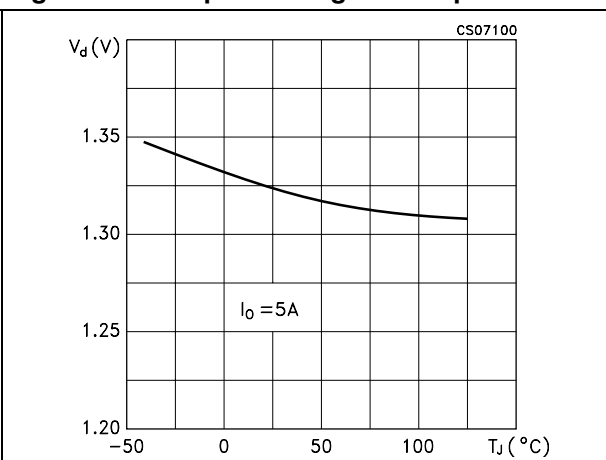


Figure 6. Short circuit current vs dropout voltage

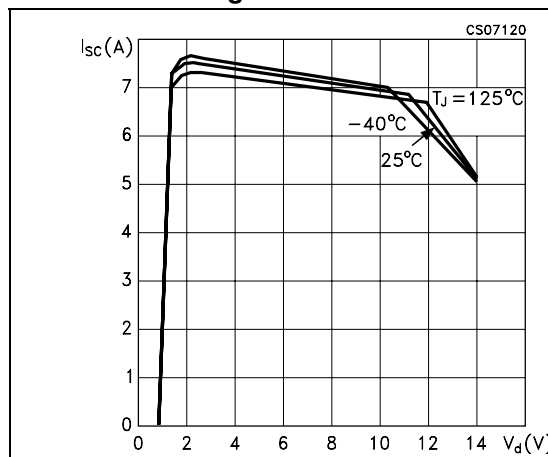


Figure 7. Line regulation vs temperature

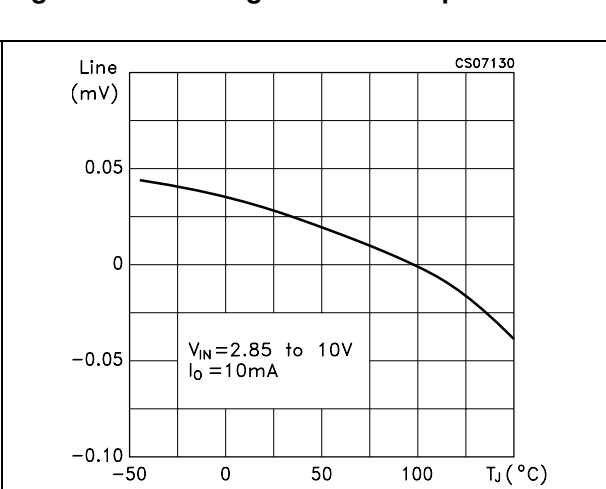


Figure 8. Output voltage vs temperature

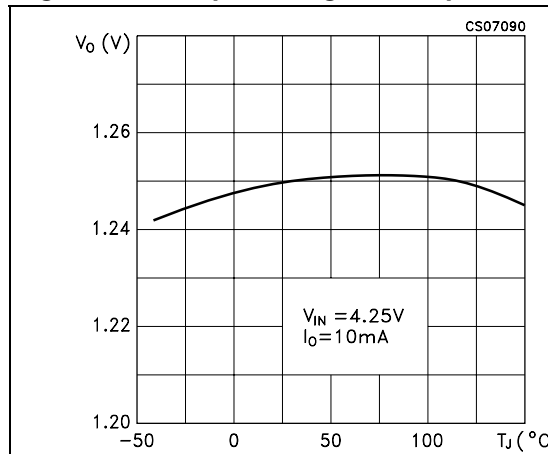


Figure 9. Load regulation vs temperature

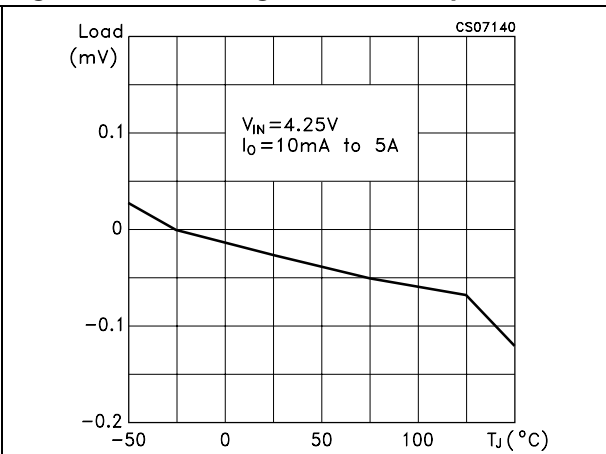


Figure 10. Supply voltage rejection vs frequency

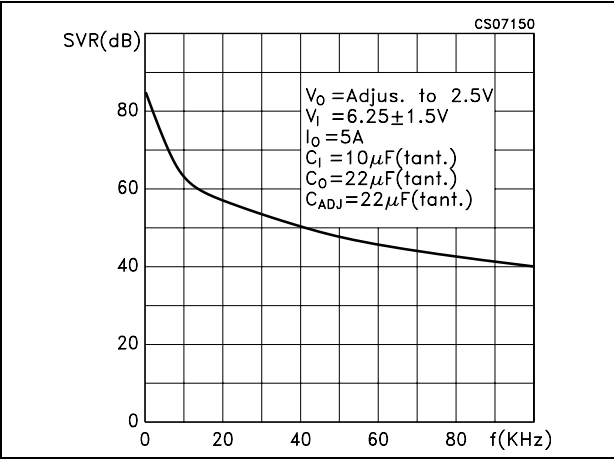


Figure 11. Adjust pin current vs output current

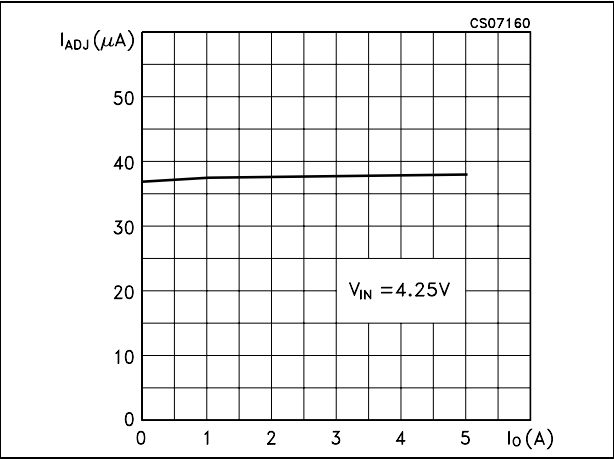


Figure 12. Line transient

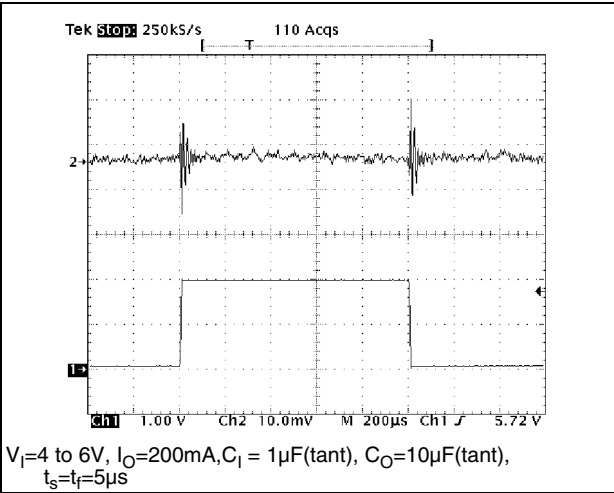
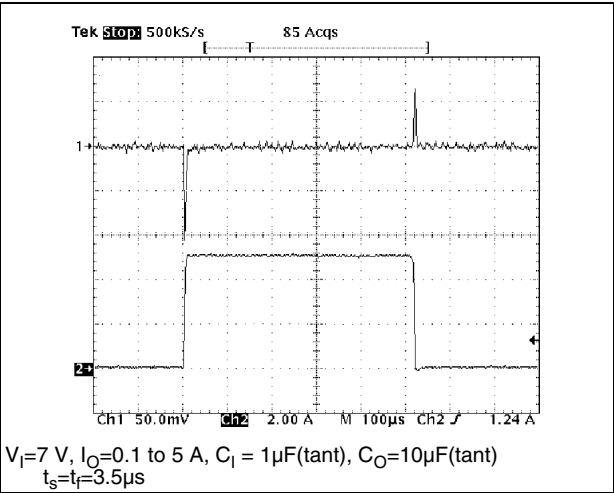


Figure 13. Load transient

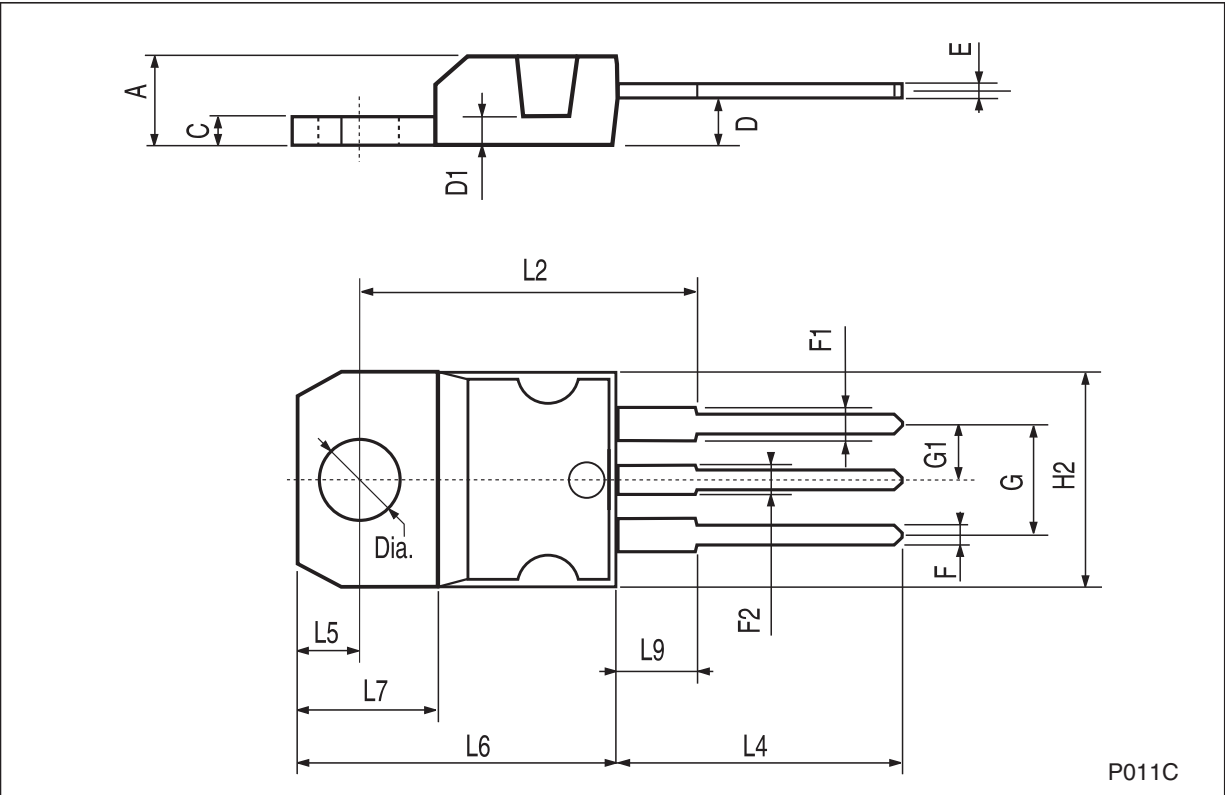


7 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK[®] packages. These packages have a lead-free second level interconnect. The category of second Level Interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com.

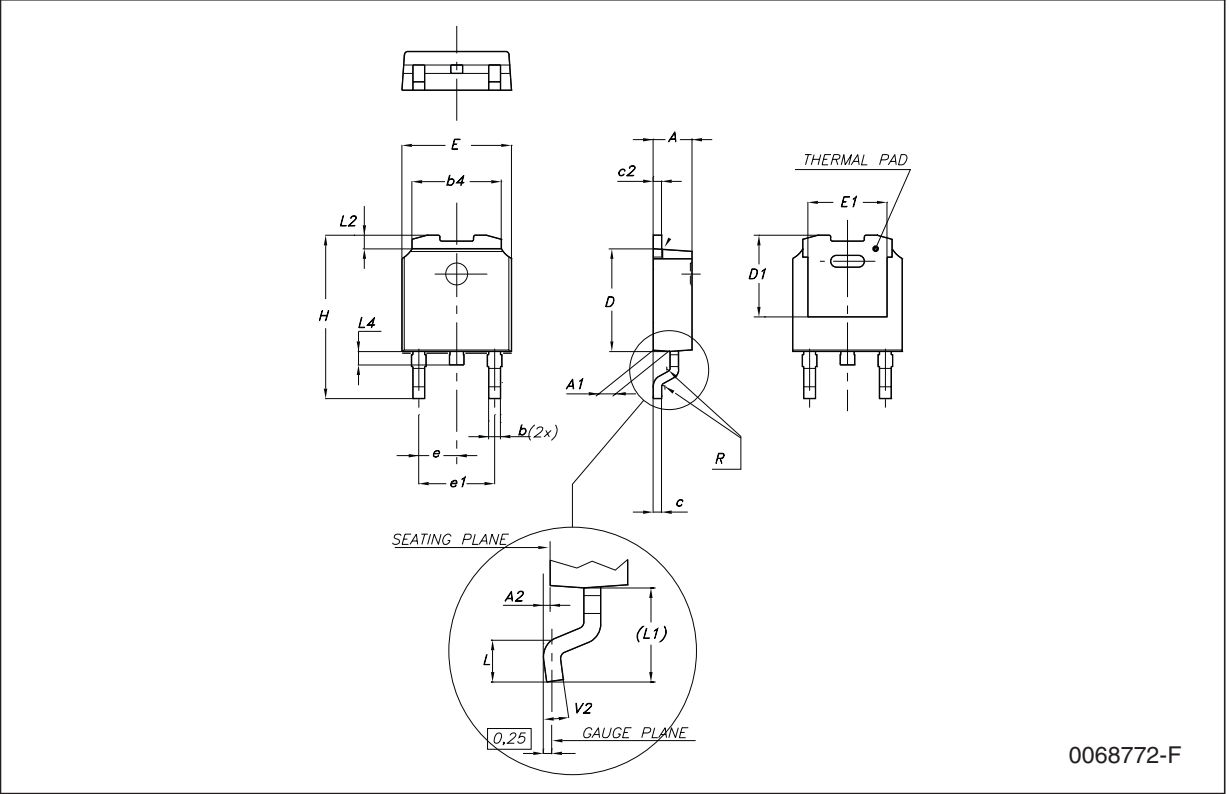
TO-220 mechanical data

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



DPAK mechanical data

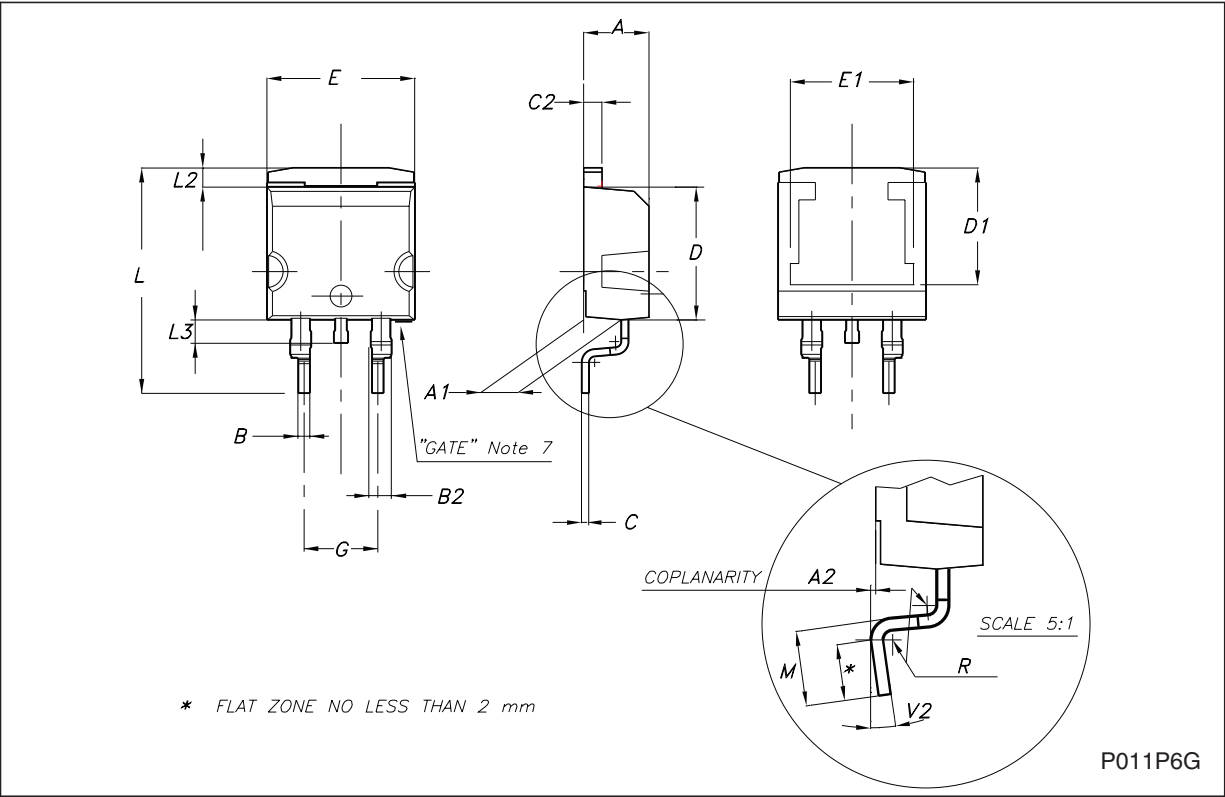
Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.9	0.025		0.035
b4	5.2		5.4	0.204		0.212
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
D1		5.1			0.200	
E	6.4		6.6	0.252		0.260
E1		4.7			0.185	
e		2.28			0.090	
e1	4.4		4.6	0.173		0.181
H	9.35		10.1	0.368		0.397
L	1			0.039		
(L1)		2.8			0.110	
L2		0.8			0.031	
L4	0.6		1	0.023		0.039
R		0.2			0.008	
V2	0°		8°	0°		8°



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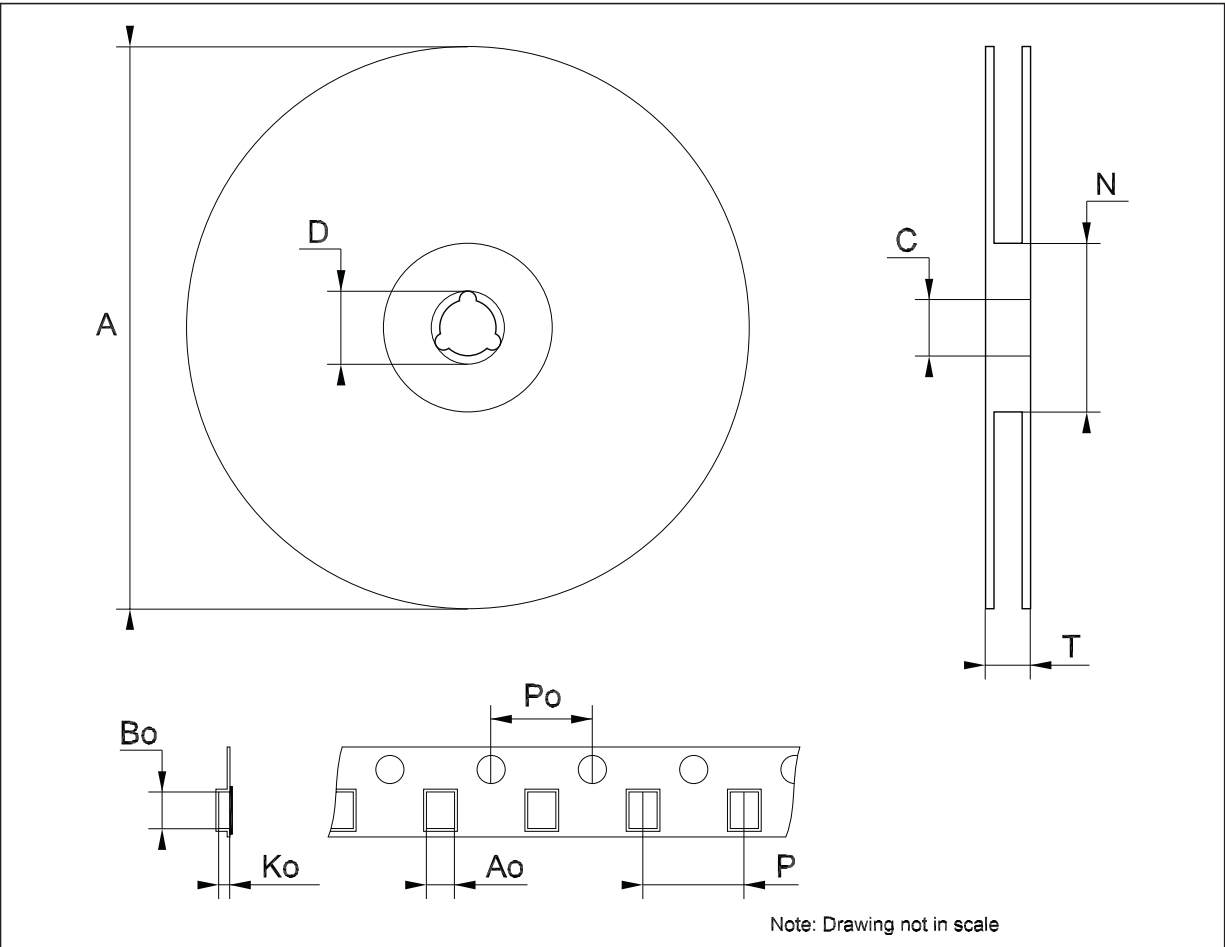
D²PAK mechanical data

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		0.409
E1		8.5			0.335	
G	4.88		5.28	0.192		0.208
L	15		15.85	0.590		0.624
L2	1.27		1.4	0.050		0.055
L3	1.4		1.75	0.055		0.068
M	2.4		3.2	0.094		0.126
R		0.4			0.016	
V2	0°		8°	0°		8°



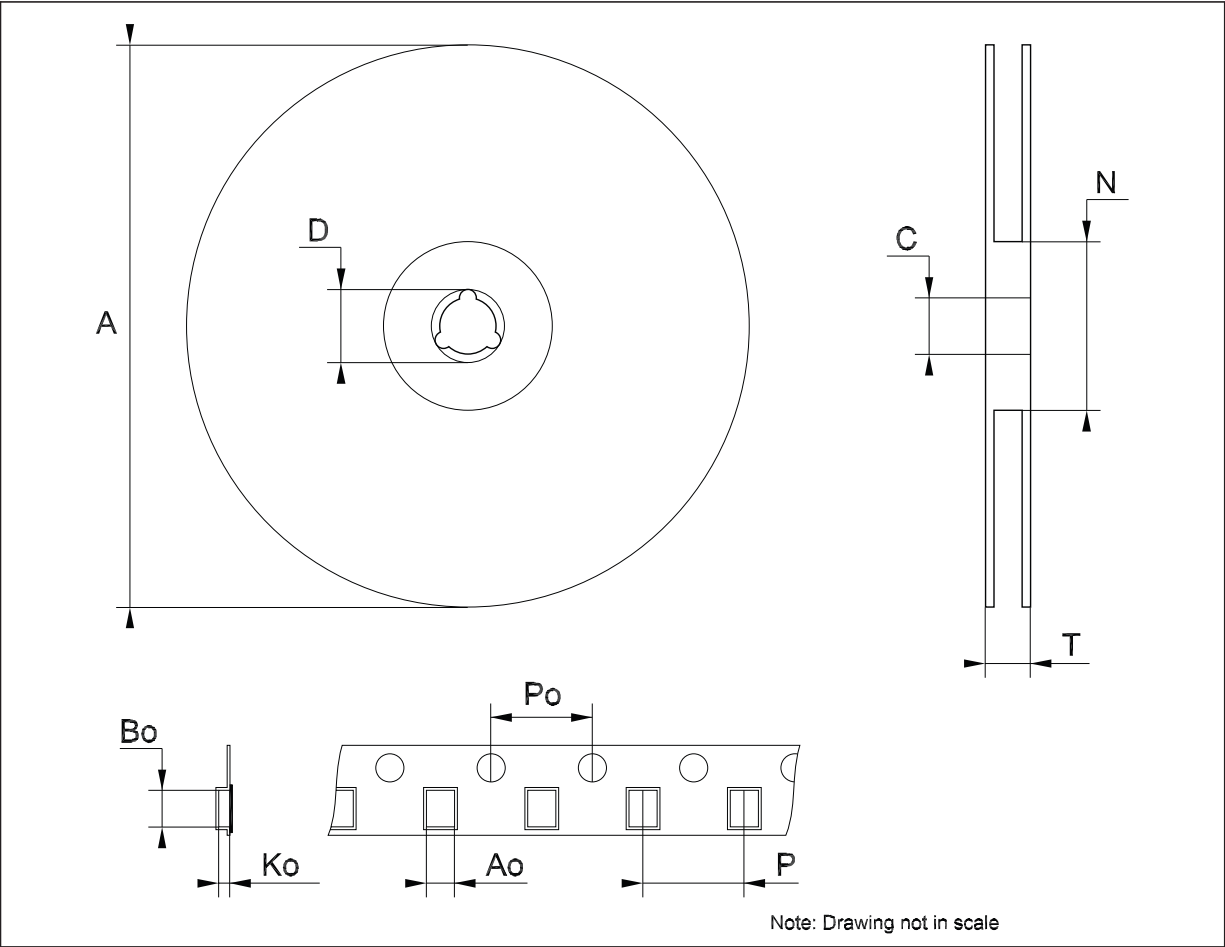
Tape & reel DPAK-PPAK mechanical data

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
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



Tape & reel D²PAK-P²PAK-D²PAK/A-P²PAK/A mechanical data

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			180			7.086
C	12.8	13.0	13.2	0.504	0.512	0.519
D	20.2			0.795		
N	60			2.362		
T			14.4			0.567
Ao	10.50	10.6	10.70	0.413	0.417	0.421
Bo	15.70	15.80	15.90	0.618	0.622	0.626
Ko	4.80	4.90	5.00	0.189	0.193	0.197
Po	3.9	4.0	4.1	0.153	0.157	0.161
P	11.9	12.0	12.1	0.468	0.472	0.476



8 Revision history

Table 11. Document revision history

Date	Revision	Changes
06-Sep-2005	4	Order codes updated.
02-Apr-2007	5	Order codes updated.
30-May-2007	6	Order codes updated.
18-Dec-2007	7	Added Table 1 .
21-Feb-2008	8	Modified: Table 1 on page 1 .

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