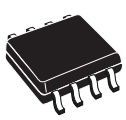
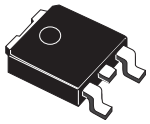
KFXX

Very low drop voltage regulators with inhibit

Datasheet - production data



SO-8



DPAK

Features

- Very low dropout voltage (0.4 V)
- Very low quiescent current (typ. 50 µA in OFF mode, 500 µA in ON mode)
- Output current up to 500 mA
- Logic-controlled electronic shutdown
- Output voltages of 2.5; 3.3; 5; 8 V
- Internal current and thermal limit
- Only 2.2 µF for stability
- Available in ± 2 % accuracy at 25 °C
- Supply voltage rejection: 70 db (typ.)
- Temperature range: - 40 to 125 °C

Description

The KF series are very low drop regulators available in SO-8 and DPAK packages and in a wide range of output voltages.

The very low dropout voltage (0.4 V) and the very low quiescent current make them particularly suitable for low noise, low power applications and especially in battery powered systems.

A shutdown logic control function is available (pin 5, TTL compatible). This means that when the device is used as a local regulator, it is possible to put a part of the board in standby, decreasing the total power consumption. It requires only a 2.2 µF capacitor for stability allowing space and cost saving.

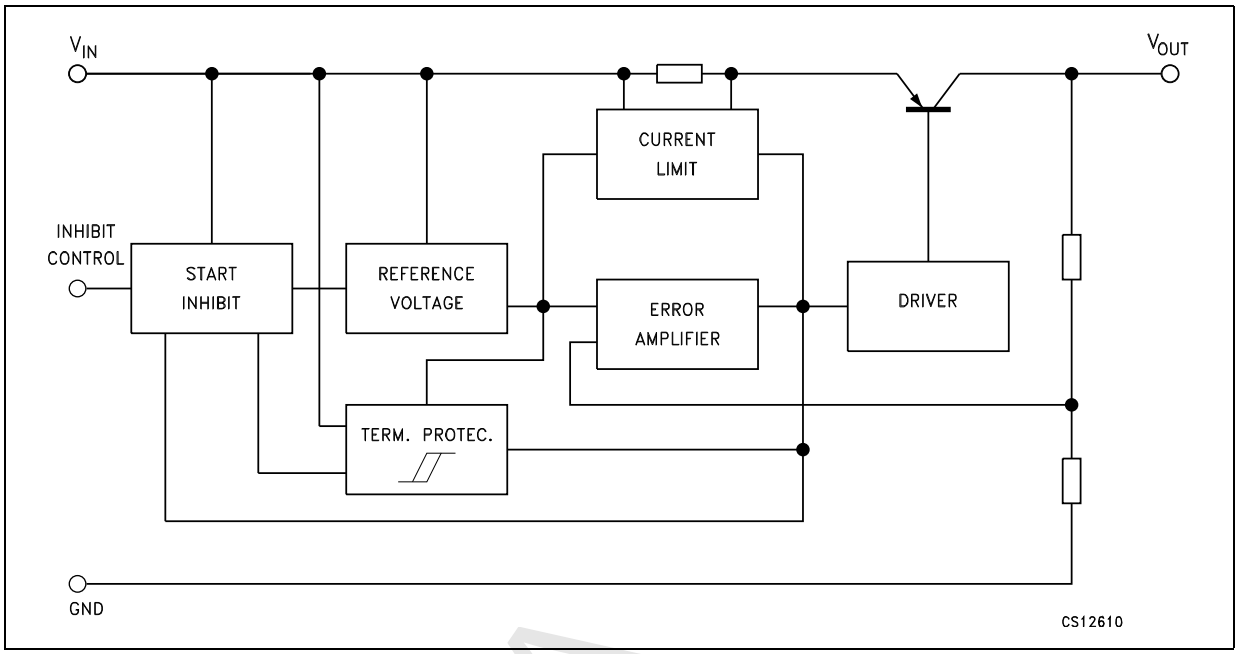
Table 1. Device summary

Order codes		Output voltages
SO-8 (tape and reel)	DPAK (tape and reel)	
KF25BD-TR	KF25BDT-TR	2.5 V
KF33BD-TR	KF33BDT-TR	3.3 V
KF50BD-TR	KF50BDT-TR	5 V
	KF80BDT-TR	8 V

Contents

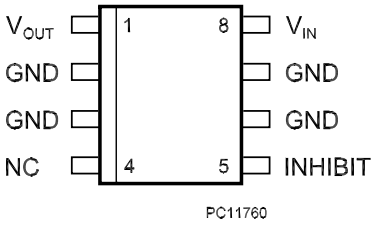
1 Diagram

Figure 1. Schematic diagram

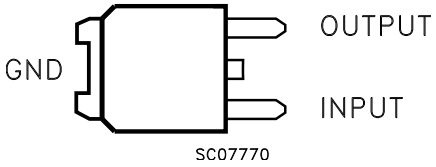


2 Pin configuration

Figure 2. Pin connections (top view)



SO-8



DPAK

3 Maximum ratings

Table 2. Absolute maximum ratings

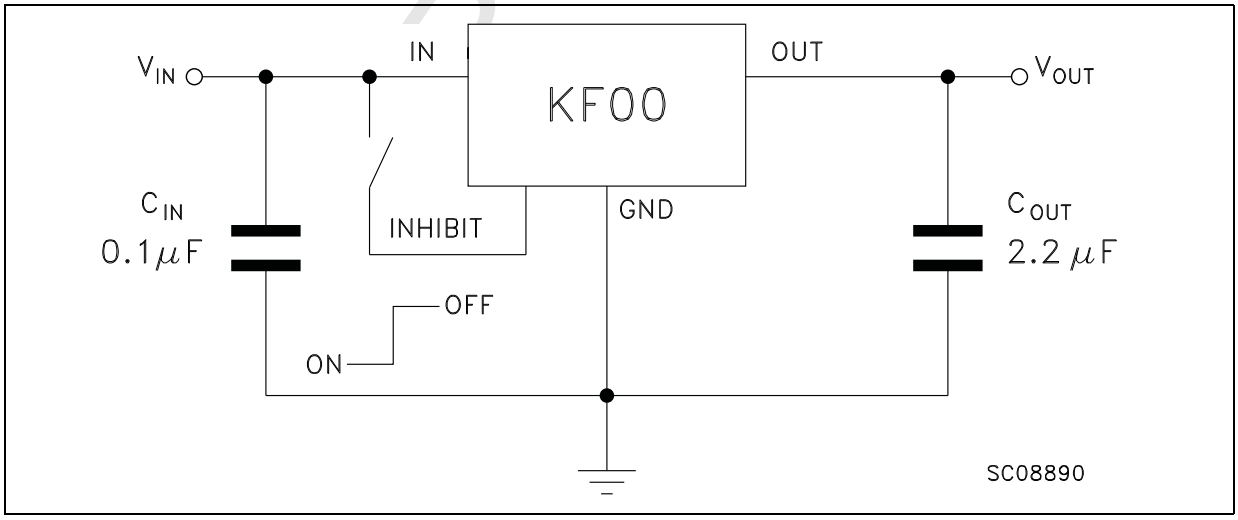
Symbol	Parameter	Value	Unit
V_I	DC input voltage	- 0.5 to 20	V
I_O	Output current	Internally Limited	
P_{TOT}	Power dissipation	Internally Limited	
T_{STG}	Storage temperature range	- 40 to 150	°C
T_{OP}	Operating junction temperature range	- 40 to 125	°C

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	DPAK	SO-8	Unit
R_{thJC}	Thermal resistance junction-case	8	20	°C/W
R_{thJA}	Thermal resistance junction-ambient	100	55	°C/W

Figure 3. Test circuit



4 Electrical characteristics

Refer to the test circuits, T_J = 25 °C, C_I = 0.1 µF, C_O = 2.2 µF unless otherwise specified.

Table 4. Electrical characteristics (V_O= 2.5 V)

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
V_O	Output voltage	I_O = 50 mA, V_I = 4.5 V		2.45	2.5	2.55	V
		I_O = 50 mA, V_I = 4.5 V, T_a = -25 to 85°C		2.4		2.6	
V_I	Operating input voltage	I_O = 500 mA				20	V
I_O	Output current limit				1		A
ΔV_O	Line regulation	V_I = 3.5 to 20 V, I_O = 5 mA			2	12	mV
ΔV_O	Load regulation	V_I = 3.8 V, I_O = 5 to 500 mA			2	50	mV
I_d	Quiescent current	V_I = 3.5 to 20V, I_O = 0mA	ON MODE		0.5	1	mA
		V_I = 3.8 to 20V, I_O=500mA				12	
		V_I = 6 V	OFF MODE		50	100	µA
SVR	Supply voltage rejection	I_O = 5 mA, V_I = 4.5 ± 1 V	f = 120 Hz		82		dB
			f = 1 kHz		77		
			f = 10 kHz		60		
eN	Output noise voltage	B = 10 Hz to 100 KHz			50		µV
V_d	Dropout voltage	I_O = 200 mA			0.2	0.35	V
		I_O = 500 mA			0.4	0.7	
V_{IL}	Control input logic low	T_a = -40 to 125°C				0.8	V
V_{IH}	Control input logic high	T_a = -40 to 125°C		2			V
I_I	Control input current	V_I = 6 V, V_C = 6 V			10		µA
C_O	Output bypass capacitance	ESR = 0.1 to 10 Ω, I_O = 0 to 500 mA		2	10		µF

Refer to the test circuits, T_J = 25 °C, C_I = 0.1 µF, C_O = 2.2 µF unless otherwise specified.

Table 5. Electrical characteristics (V_O= 3.3 V)

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
V_O	Output voltage	I_O = 50 mA, V_I = 5.3 V		3.234	3.3	3.366	V
		I_O = 50 mA, V_I = 5.3 V, T_a = -25 to 85°C		3.168		3.432	
V_I	Operating input voltage	I_O = 500 mA				20	V
I_O	Output current limit				1		A
ΔV_O	Line regulation	V_I = 4.3 to 20 V, I_O = 5 mA			2	12	mV
ΔV_O	Load regulation	V_I = 4.6 V, I_O = 5 to 500 mA			2	50	mV
I_d	Quiescent current	V_I = 4.3 to 20V, I_O = 0mA	ON MODE		0.5	1	mA
		V_I = 4.6 to 20V, I_O=500mA				12	
		V_I = 6 V	OFF MODE		50	100	µA
SVR	Supply voltage rejection	I_O = 5 mA, V_I = 5.3 ± 1 V	f = 120 Hz		80		dB
			f = 1 kHz		75		
			f = 10 kHz		60		
eN	Output noise voltage	B = 10 Hz to 100 KHz			50		µV
V_d	Dropout voltage	I_O = 200 mA			0.2	0.35	V
		I_O = 500 mA			0.4	0.7	
V_{IL}	Control input logic low	T_a = -40 to 125°C				0.8	V
V_{IH}	Control input logic high	T_a = -40 to 125°C		2			V
I_I	Control input current	V_I = 6 V, V_C = 6 V			10		µA
C_O	Output bypass capacitance	ESR = 0.1 to 10 Ω, I_O = 0 to 500 mA		2	10		µF

Refer to the test circuits, T_J = 25 °C, C_I = 0.1 µF, C_O = 2.2 µF unless otherwise specified.

Table 6. Electrical characteristics (V_O= 5 V)

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
V_O	Output voltage	I_O = 50 mA, V_I = 7 V		4.9	5	5.1	V
		I_O = 50 mA, V_I = 7 V, T_a = -25 to 85°C		4.8		5.2	
V_I	Operating input voltage	I_O = 500 mA				20	V
I_O	Output current limit				1		A
ΔV_O	Line regulation	V_I = 6 to 20 V, I_O = 5 mA			3	18	mV
ΔV_O	Load regulation	V_I = 6.3 V, I_O = 5 to 500 mA			2	50	mV
I_d	Quiescent current	V_I = 6 to 20V, I_O = 0mA	ON MODE		0.5	1	mA
		V_I = 6.3 to 20V, I_O=500mA				12	
		V_I = 6 V	OFF MODE		50	100	µA
SVR	Supply voltage rejection	I_O = 5 mA, V_I = 7 ± 1 V	f = 120 Hz		76		dB
			f = 1 kHz		71		
			f = 10 kHz		60		
eN	Output noise voltage	B = 10 Hz to 100 KHz			50		µV
V_d	Dropout voltage	I_O = 200 mA			0.2	0.35	V
		I_O = 500 mA			0.4	0.7	
V_{IL}	Control input logic low	T_a = -40 to 125°C				0.8	V
V_{IH}	Control input logic high	T_a = -40 to 125°C		2			V
I_I	Control input current	V_I = 6 V, V_C = 6 V			10		µA
C_O	Output bypass capacitance	ESR = 0.1 to 10 Ω, I_O = 0 to 500 mA		2	10		µF

Refer to the test circuits, T_J = 25 °C, C_I = 0.1 µF, C_O = 2.2 µF unless otherwise specified.

Table 7. Electrical characteristics (V_O= 8 V)

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
V_O	Output voltage	I_O = 50 mA, V_I = 10 V		7.84	8	8.16	V
		I_O = 50 mA, V_I = 10 V, T_a = -25 to 85°C		7.68		8.32	
V_I	Operating input voltage	I_O = 500 mA				20	V
I_O	Output current limit				1		A
ΔV_O	Line regulation	V_I = 9 to 20 V, I_O = 5 mA			4	24	mV
ΔV_O	Load regulation	V_I = 9.3 V, I_O = 5 to 500 mA			2	50	mV
I_d	Quiescent current	V_I = 9 to 20V, I_O = 0mA	ON MODE		0.7	1.5	mA
		V_I = 9.3 to 20V, I_O=500mA				12	
		V_I = 9 V	OFF MODE		70	140	µA
SVR	Supply voltage rejection	I_O = 5 mA, V_I = 10 ± 1 V	f = 120 Hz		72		dB
			f = 1 kHz		67		
			f = 10 kHz		60		
eN	Output noise voltage	B = 10 Hz to 100 KHz			50		µV
V_d	Dropout voltage	I_O = 200 mA			0.2	0.35	V
		I_O = 500 mA			0.4	0.7	
V_{IL}	Control input logic low	T_a = -40 to 125°C				0.8	V
V_{IH}	Control input logic high	T_a = -40 to 125°C		2			V
I_I	Control input current	V_I = 6 V, V_C = 6 V			10		µA
C_O	Output bypass capacitance	ESR = 0.1 to 10 Ω, I_O = 0 to 500 mA		2	10		µF

5 Typical performance characteristics

Unless otherwise specified $V_{O(NOM)}$ = 3.3 V.

Figure 4. Dropout voltage vs. output current

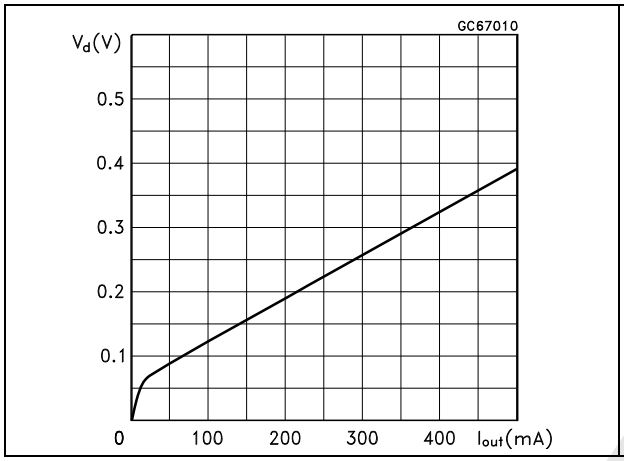


Figure 5. Dropout voltage vs. temperature

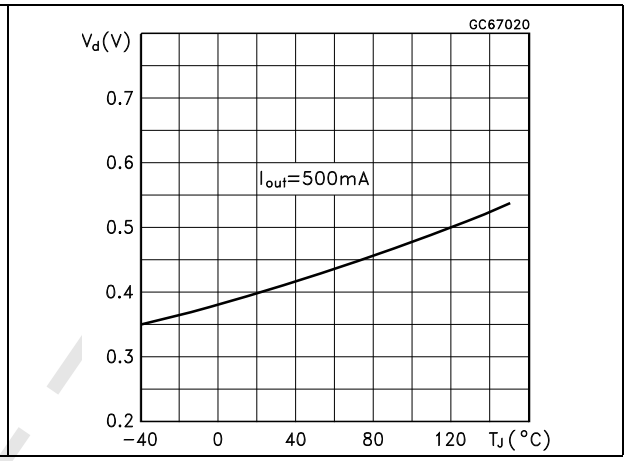


Figure 6. Supply current vs. input voltage (I_{OUT} = 500 mA)

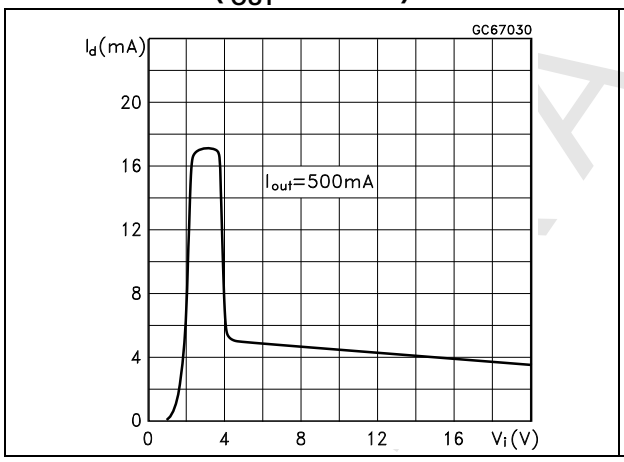


Figure 7. Supply current vs. input voltage (I_{OUT} = 0 mA)

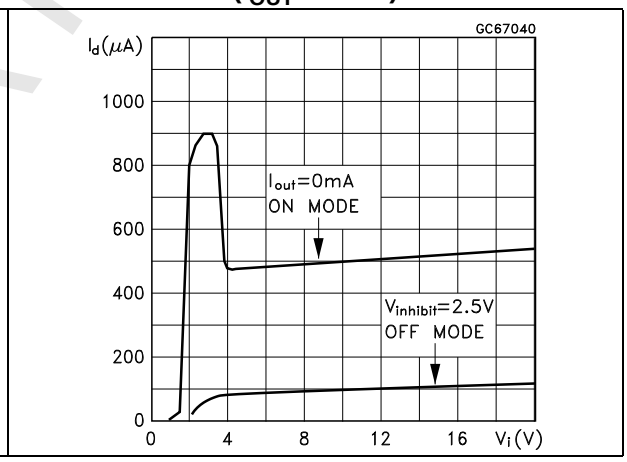


Figure 8. Short circuit current vs. input voltage

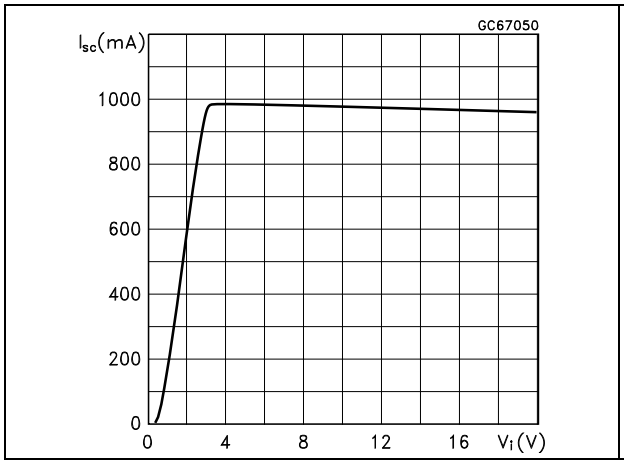
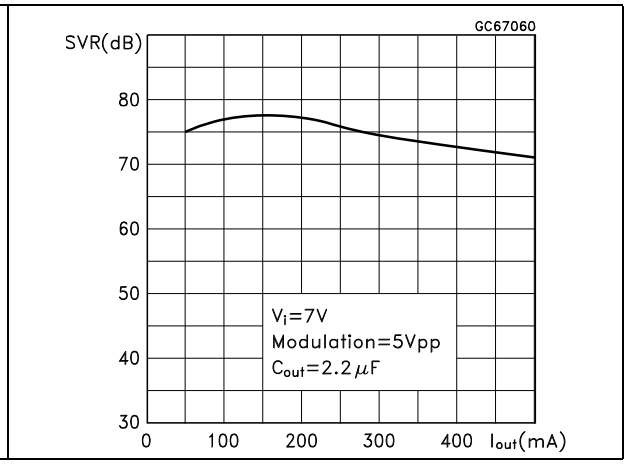


Figure 9. SVR vs. output current (f= 120 Hz)



6 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.

Figure 10. DPAK (TO-252) type A drawing

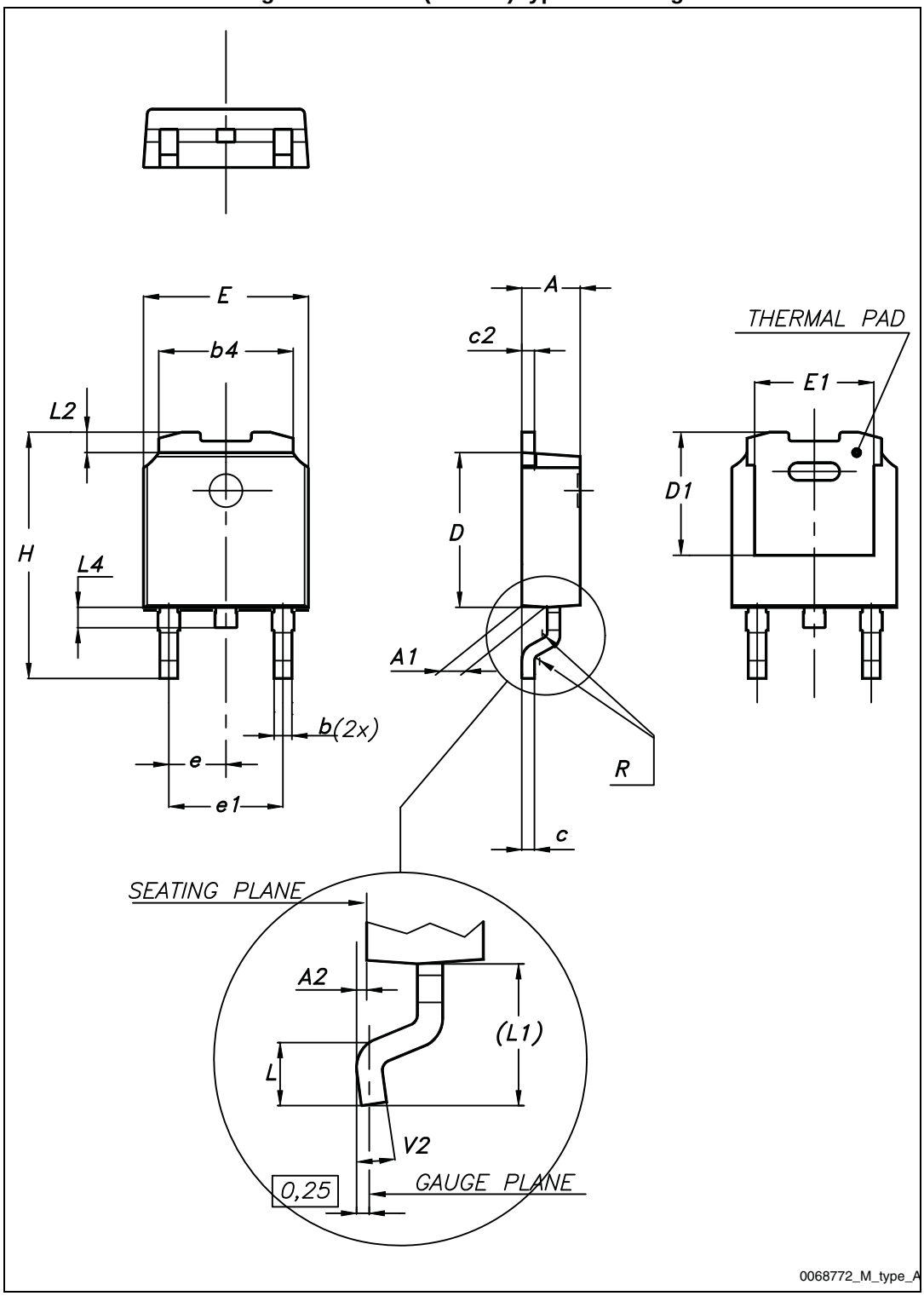
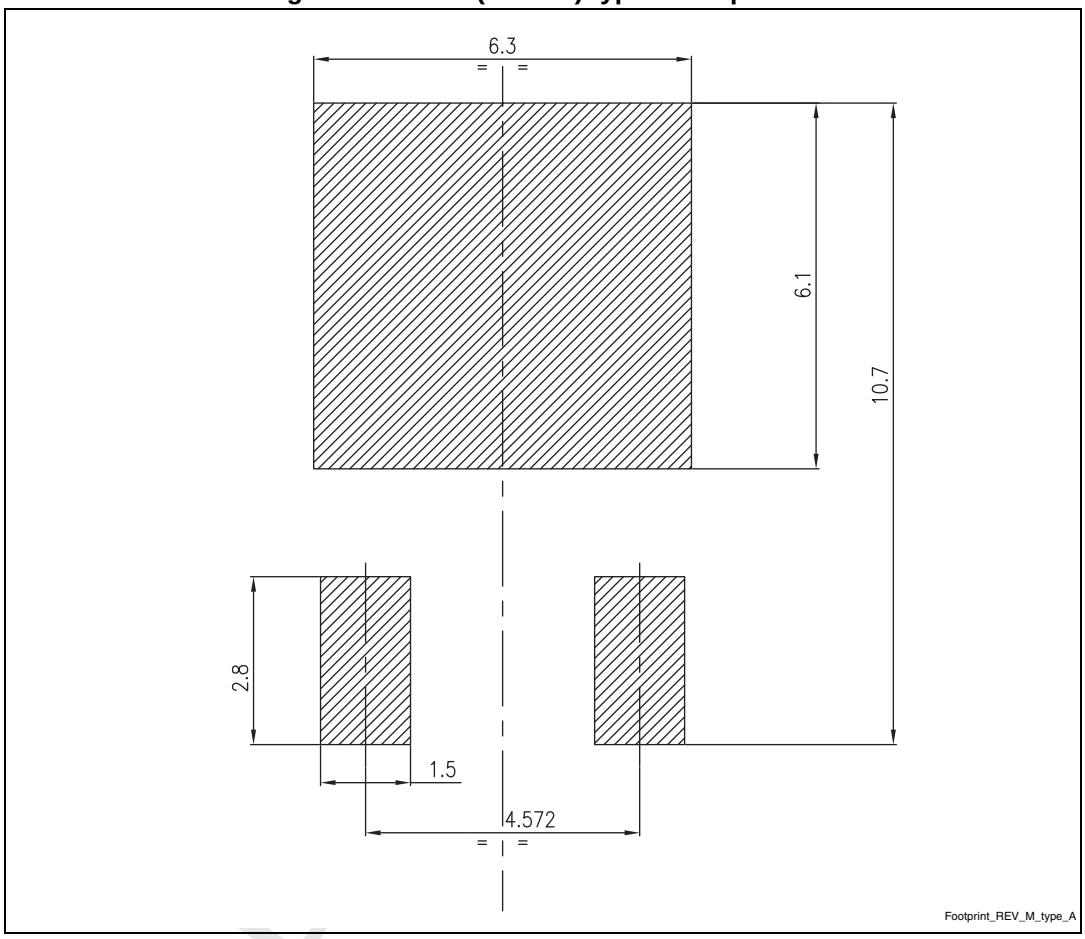


Table 8. DPAK (TO-252) type A mechanical data

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 11. DPAK (TO-252) type A footprint [(a)]



a. All dimensions are in millimeters

Figure 12. SO-8 drawing

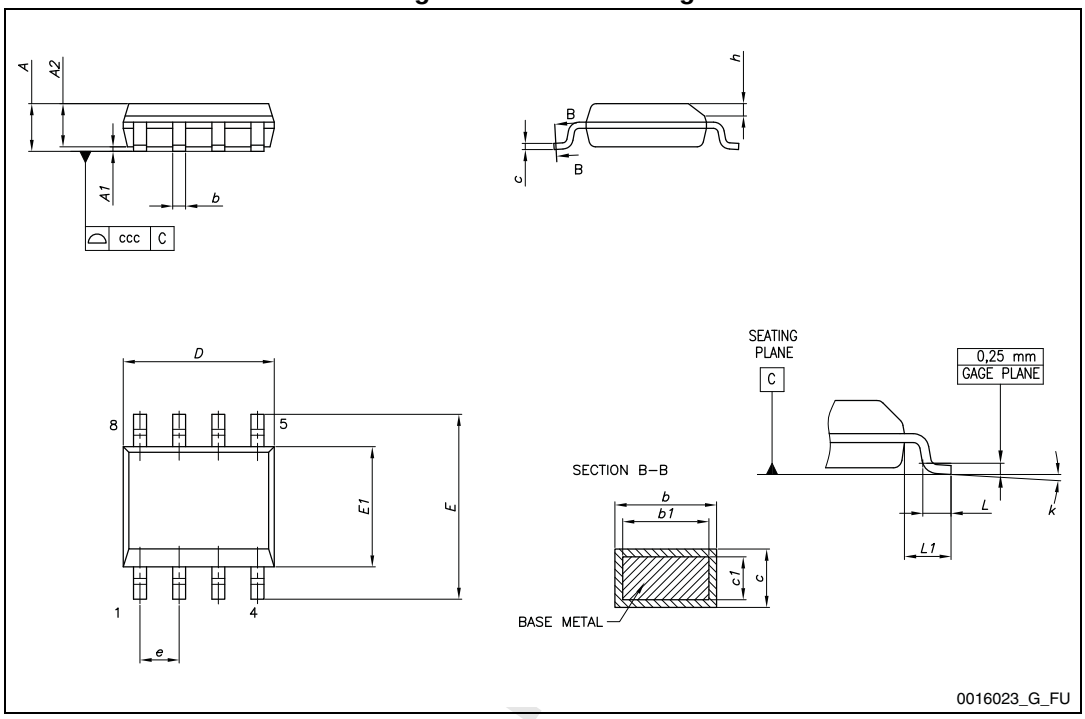


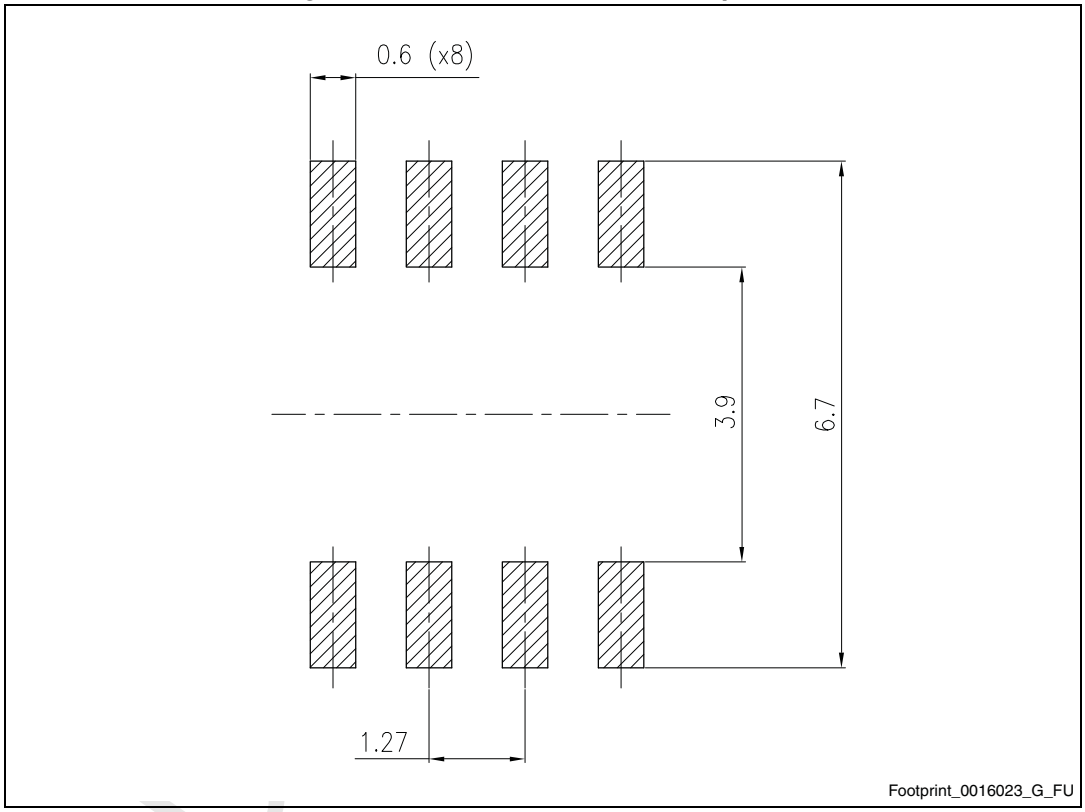
Table 9. SO-8 mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A			1.75
A1	0.10		0.25
A2	1.25		
b	0.31		0.51
b1	0.28		0.48
c	0.10		0.25
c1	0.10		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	
L2		0.25	

Table 9. SO-8 mechanical data (continued)

Dim.	mm		
	Min.	Typ.	Max.
k	0°		8°
ccc			0.10

Figure 13. SO-8 recommended footprint(b)



b. All dimensions are in millimeters.

7 Packaging mechanical data

Figure 14. Tape for DPAK (TO-252)

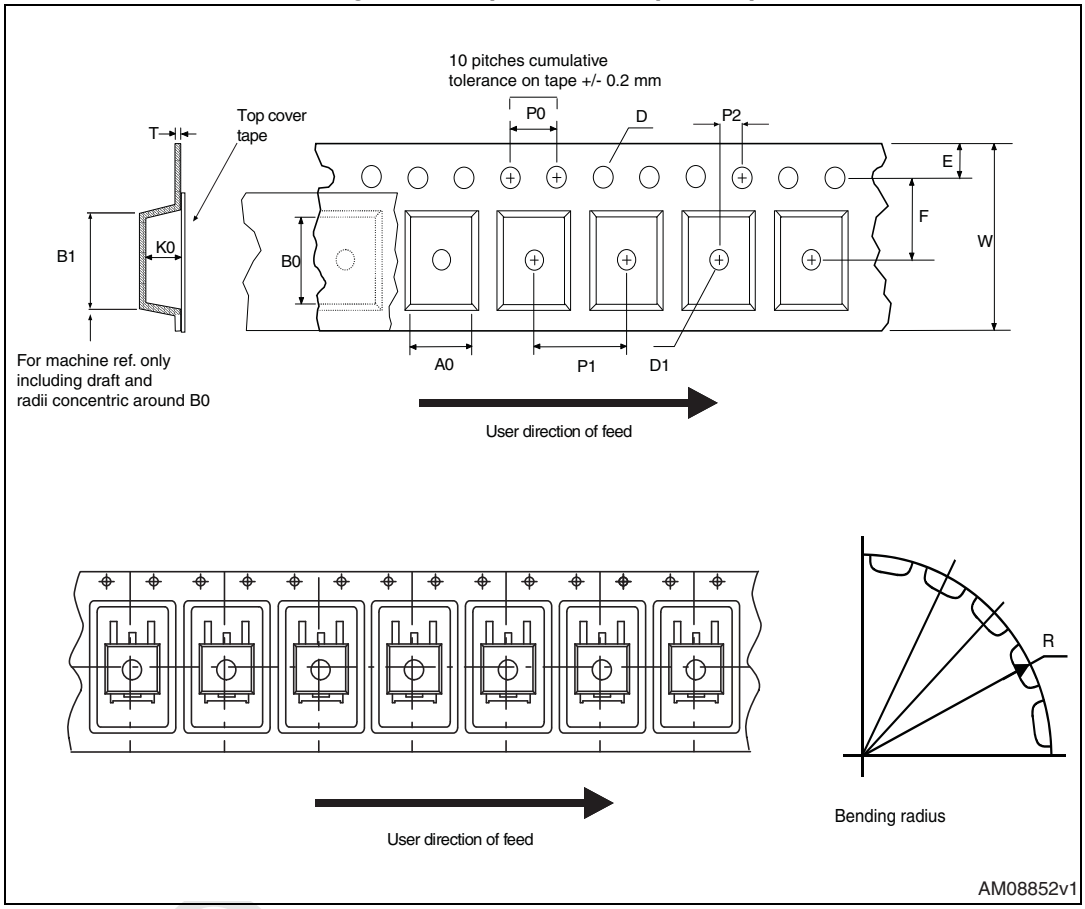


Figure 15. Reel for DPAK (TO-252)

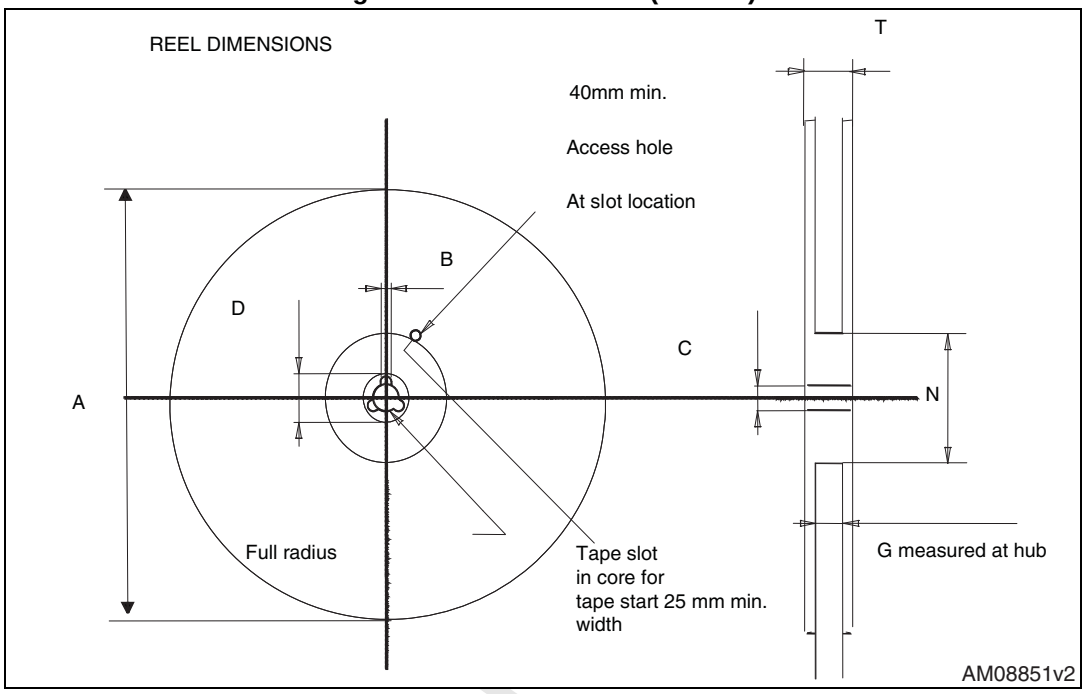


Table 10. DPAK (TO-252) tape and reel mechanical data

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 16. SO-8 tape and reel dimensions

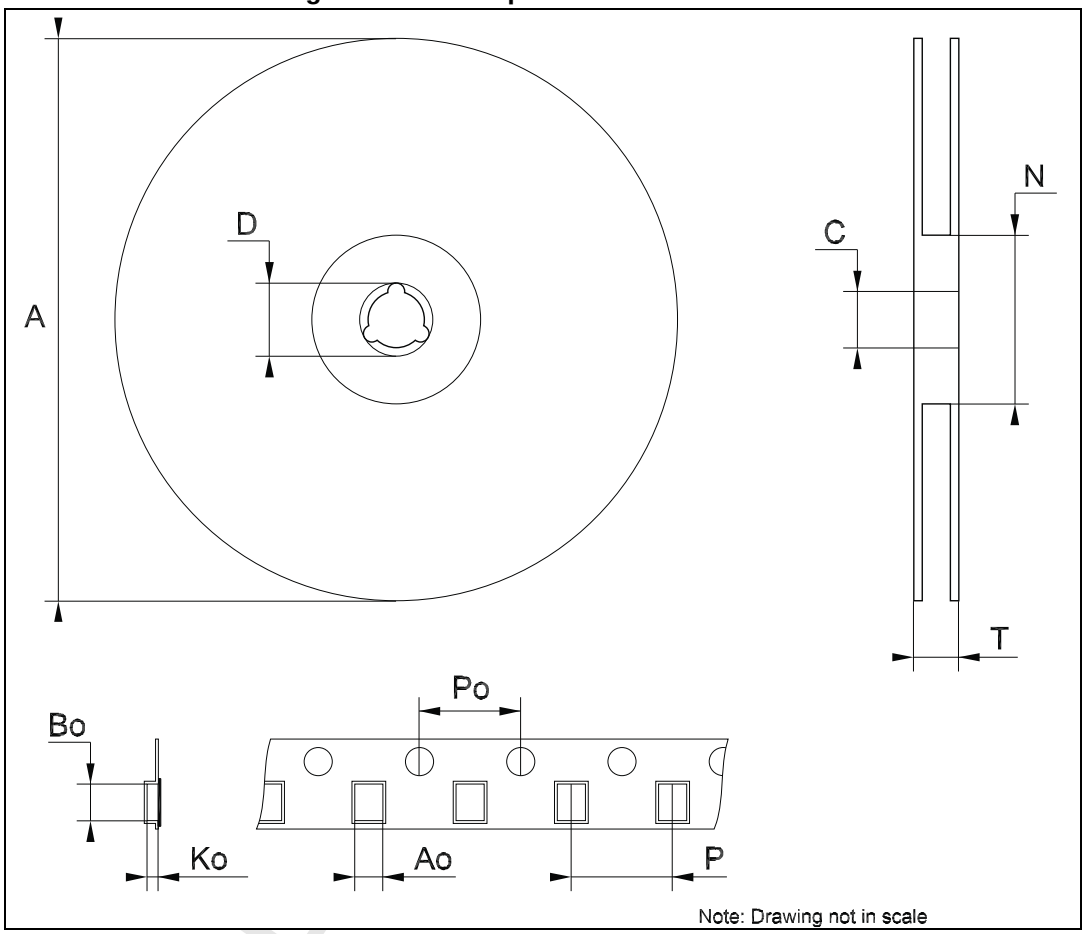


Table 11. SO-8 tape and reel mechanical data

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

8 Revision history

Table 12. Document revision history

Date	Revision	Changes
06-Jun-2007	9	Order codes updated.
14-Dec-2007	10	Modified: *Table 1*.
21-Feb-2008	11	Modified: *Table 1*.
23-Oct-2012	12	Change title description in cover page. Updated: *Table 1 on page 1*. Added: R_{thJA} value for DPAK and SO-8 *Table 3 on page 5*. Modified: titles *Figure 6* and *Figure 7 on page 10*.
19-Mar-2014	13	The part numbers KF25B, KF33B, KF50B, KF80B changed to KF. Updated *Section 6: Package mechanical data* and *Section 7: Packaging mechanical data*. Minor text changes.

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