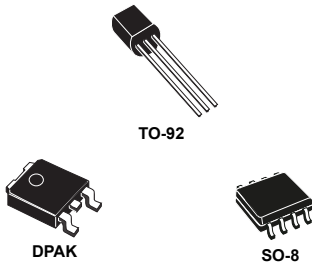


Very low drop voltage regulators with inhibit



Features

- Very low dropout voltage (0.4 V)
- Very low quiescent current
- Typ. 50 μ A in OFF mode, 600 μ A in ON mode
- Output current up to 250 mA
- Logic controlled electronic shutdown
- Output voltages: 3.3; 3.5; 5;
- Automotive-grade product: 3.3 V V_{OUT} in SO-8 package only
- Internal current and thermal limit
- Only 2.2 μ F for stability
- Available in $\pm 1\%$ (AB) or 2% (C) selection at 25 °C
- Supply voltage rejection: 70 dB typ. for 5 V version
- Temperature range: from -40 to 125 °C

Description

The L4931 is a very low drop regulator available in SO-8, DPAK and TO-92 packages and in a wide range of output voltages.

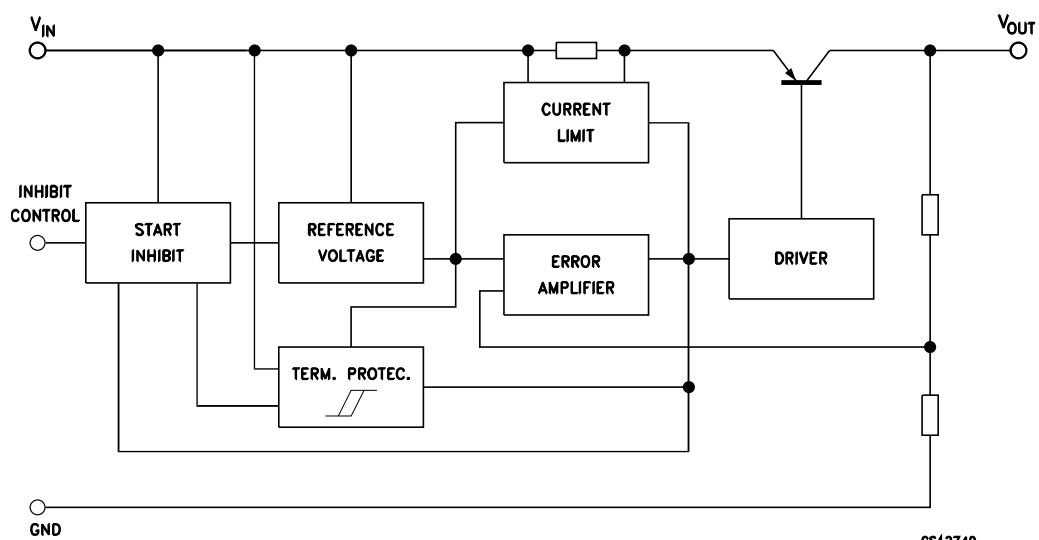
The very low drop voltage (0.4 V) and the very low quiescent current make it particularly suitable for low noise, low power applications and especially in battery-powered systems.

A TTL compatible shutdown logic control function is available in PPAK and SO-8 packages. This means that when the device is used as a local regulator, a part of the board can be put in standby mode, decreasing the total power consumption. It requires only a 2.2 μ F capacitor for stability allowing space and cost saving.

The L4931 is available as automotive-grade in SO-8 package only. This device is qualified according to the specification AEC-Q100 of the automotive market, in the temperature range from 40 °C to 125 °C, and the statistical tests: PAT, SYL, SBL are performed.

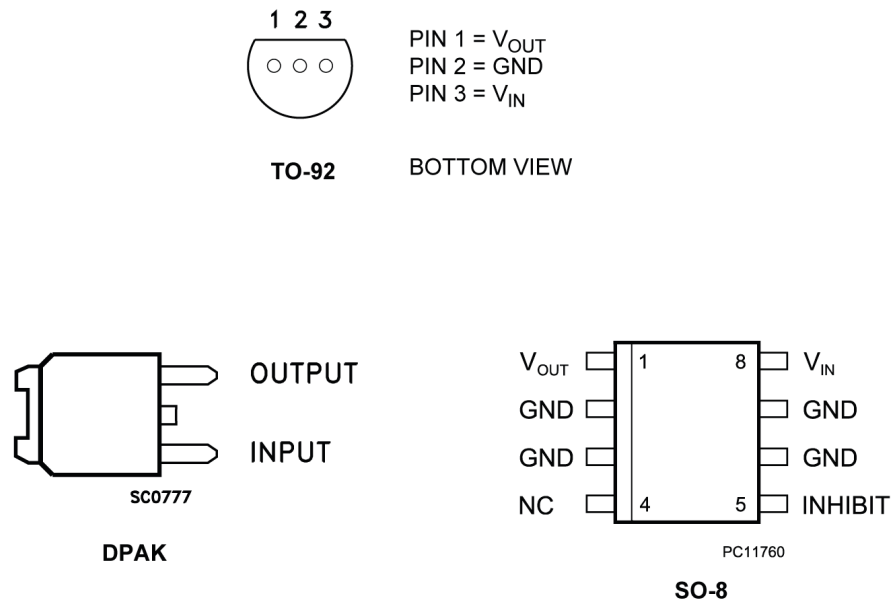
1 Diagram

Figure 1. Schematic diagram



2 Pin configuration

Figure 2. Pin connections (top view)



3 Maximum ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_I	DC Input voltage	20	V
I_O	Output current	Internally limited	mA
P_D	Power dissipation	Internally limited	mW
T_{STG}	Storage temperature range	-40 to 150	°C
T_{OP}	Operating junction temperature range	-40 to 125	°C

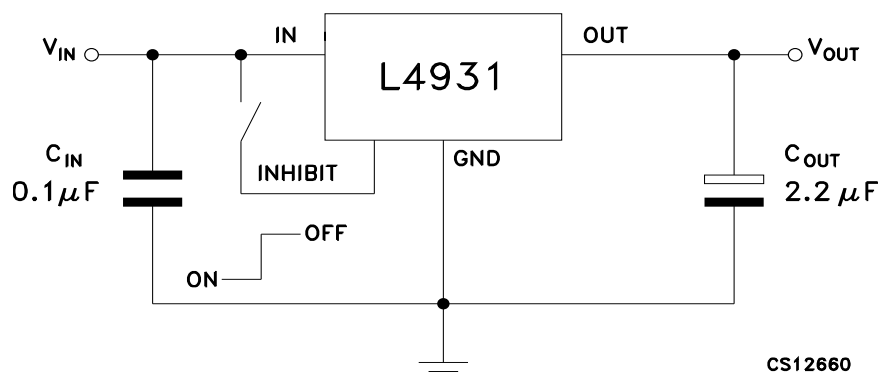
Note: *Absolute maximum ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.*

Table 2. Thermal data

Symbol	Parameter	TO-92	DPAK	SO-8	Unit
R_{thJC}	Thermal resistance junction-case		8	20	°C/W
R_{thJA}	Thermal resistance junction-ambient	200	100	55	°C/W

4 Application circuit

Figure 3. Test circuit



AMG050320171502MT

5 Electrical characteristics

(Refer to the test circuits, $T_A = 25\text{ }^{\circ}\text{C}$, $C_I = 0.1\text{ }\mu\text{F}$, $C_O = 2.2\text{ }\mu\text{F}$ unless otherwise specified).

Table 3. L4931ABxx33 electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$I_O = 5\text{ mA}$, $V_I = 5.3\text{ V}$	3.267	3.3	3.333	V
		$I_O = 5\text{ mA}$, $V_I = 5.3\text{ V}$, $T_A = -25\text{ to }85\text{ }^{\circ}\text{C}$	3.234		3.366	
V_I	Operating input voltage	$I_O = 250\text{ mA}$			20	V
I_{out}	Output current limit			300		mA
ΔV_O	Line regulation	$V_I = 4\text{ to }20\text{ V}$, $I_O = 0.5\text{ mA}$		3	15	mV
ΔV_O	Load regulation ⁽¹⁾	$V_I = 4.2\text{ V}$, $I_O = 0.5\text{ to }250\text{ mA}$		3	15	mV
I_d	Quiescent current ON mode	$V_I = 4.2\text{ to }20\text{ V}$, $I_O = 0\text{ mA}$		0.6	1	mA
		$V_I = 4.2\text{ to }20\text{ V}$, $I_O = 250\text{ mA}$		4	6	
	OFF mode	$V_I = 6\text{ V}$		50	100	μA
SVR	Supply voltage rejection	$I_O = 5\text{ mA}$ $V_I = 5.2 \pm 1\text{ V}$	$f = 120\text{ Hz}$	73		dB
			$f = 1\text{ kHz}$	70		
			$f = 10\text{ kHz}$	55		
eN	Output noise voltage	$B = 10\text{ Hz to }100\text{ kHz}$		50		μV
V_d	Dropout voltage ⁽¹⁾	$I_O = 250\text{ mA}$		0.4	0.6	V
		$I_O = 250\text{ mA}$, $T_A = -40\text{ to }125\text{ }^{\circ}\text{C}$			0.8	V
V_{IL}	Control input logic low	$T_A = -40\text{ to }125\text{ }^{\circ}\text{C}$			0.8	V
V_{IH}	Control input logic high	$T_A = -40\text{ to }125\text{ }^{\circ}\text{C}$	2			V
I_I	Control input current	$V_I = 6\text{ V}$, $V_C = 6\text{ V}$		10		μA
C_O	Output bypass capacitance	$\text{ESR} = 0.1\text{ to }10\text{ }\Omega$, $I_O = 0\text{ to }250\text{ mA}$	2	10		μF

1. For SO-8 package the maximum limit of load regulation and dropout should be increased by 20 mV.

(Refer to the test circuits, $T_A = 25\text{ }^{\circ}\text{C}$, $C_I = 0.1\text{ }\mu\text{F}$, $C_O = 2.2\text{ }\mu\text{F}$ unless otherwise specified).

Table 4. L4931Cxx33 electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$I_O = 5\text{ mA}$, $V_I = 5.3\text{ V}$	3.234	3.3	3.366	V
		$I_O = 5\text{ mA}$, $V_I = 5.3\text{ V}$, $T_A = -25\text{ to }85\text{ }^{\circ}\text{C}$	3.168		3.432	
V_I	Operating input voltage	$I_O = 250\text{ mA}$			20	V
I_{out}	Output current limit			300		mA
ΔV_O	Line regulation	$V_I = 4.1\text{ to }20\text{ V}$, $I_O = 0.5\text{ mA}$		3	18	mV
ΔV_O	Load regulation ⁽¹⁾	$V_I = 4.3\text{ V}$, $I_O = 0.5\text{ to }250\text{ mA}$		3	18	mV
I_d	Quiescent current ON mode	$V_I = 4.3\text{ to }20\text{ V}$, $I_O = 0\text{ mA}$		0.6	1	mA
		$V_I = 4.3\text{ to }20\text{ V}$, $I_O = 250\text{ mA}$		4	6	
	OFF mode	$V_I = 6\text{ V}$		50	100	μA
SVR	Supply voltage rejection	$I_O = 5\text{ mA}$	$f = 120\text{ Hz}$	73		dB

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
SVR	Supply voltage rejection	$V_I = 5.3 \pm 1 \text{ V}$	$f = 1 \text{ kHz}$		70		dB
			$f = 10 \text{ kHz}$		55		
eN	Output noise voltage	$B = 10 \text{ Hz to } 100 \text{ kHz}$			50		μV
V_d	Dropout voltage ⁽¹⁾	$I_O = 250 \text{ mA}$			0.4	0.6	V
		$I_O = 250 \text{ mA}, T_A = -40 \text{ to } 125 \text{ }^\circ\text{C}$				0.8	V
V_{IL}	Control input logic low	$T_A = -40 \text{ to } 125 \text{ }^\circ\text{C}$				0.8	V
V_{IH}	Control input logic high	$T_A = -40 \text{ to } 125 \text{ }^\circ\text{C}$		2			V
I_I	Control input current	$V_I = 6 \text{ V}, V_C = 6 \text{ V}$			10		μA
C_O	Output bypass capacitance	$\text{ESR} = 0.1 \text{ to } 10 \text{ } \Omega, I_O = 0 \text{ to } 250 \text{ mA}$		2	10		μF

1. For SO-8 package the maximum limit of load regulation and dropout should be increased by 20 mV.

(Refer to the test circuits, $T_A = 25 \text{ }^\circ\text{C}$, $C_I = 0.1 \text{ } \mu\text{F}$, $C_O = 2.2 \text{ } \mu\text{F}$ unless otherwise specified).

Table 5. L4931CD33-TRY (automotive-grade) electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
V_O	Output voltage	$I_O = 5 \text{ mA}, V_I = 5.3 \text{ V}, T_A = 25 \text{ }^\circ\text{C}$		3.234	3.3	3.366	V
				3.168		3.432	
V_I	Operating input voltage	$I_O = 250 \text{ mA}$				20	V
I_{out}	Output current limit	$T_A = 25 \text{ }^\circ\text{C}$			300		mA
ΔV_O	Line regulation	$V_I = 4.1 \text{ to } 20 \text{ V}, I_O = 0.5 \text{ mA}$				20	mV
ΔV_O	Load regulation	$V_I = 4.3 \text{ V}, I_O = 0.5 \text{ to } 250 \text{ mA}$				38	mV
I_d	Quiescent current ON mode	$V_I = 4.3 \text{ to } 20 \text{ V}, I_O = 0 \text{ mA}$				1	mA
		$V_I = 4.3 \text{ to } 20 \text{ V}, I_O = 250 \text{ mA}$				11	mA
	OFF mode	$V_I = 6 \text{ V}$				100	μA
SVR	Supply voltage rejection	$I_O = 5 \text{ mA}, V_I = 5.3 \pm 1 \text{ V}, T_A = 25 \text{ }^\circ\text{C}$	$f = 120 \text{ Hz}$		73		dB
			$f = 1 \text{ kHz}$		70		
			$f = 10 \text{ kHz}$		55		
eN	Output noise voltage	$B = 10 \text{ Hz to } 100 \text{ kHz}, T_A = 25 \text{ }^\circ\text{C}$			50		μV
V_d	Dropout voltage	$I_O = 250 \text{ mA}, T_A = 25 \text{ }^\circ\text{C}$			0.4	0.6	V
		$I_O = 250 \text{ mA}$				0.82	V
V_{IL}	Control input logic low					0.82	V
V_{IH}	Control input logic high			2			V
I_I	Control input current	$V_I = 6 \text{ V}, V_C = 6 \text{ V}, T_A = 25 \text{ }^\circ\text{C}$			10		μA
C_O	Output bypass capacitance	$\text{ESR} = 0.1 \text{ to } 10 \text{ } \Omega, I_O = 0 \text{ to } 250 \text{ mA}, T_A = 25 \text{ }^\circ\text{C}$		2	10		μF

Table 6. L4931ABxx35 electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
V_O	Output voltage	$I_O = 5 \text{ mA}, V_I = 5.5 \text{ V}$		3.465	3.5	3.535	V
		$I_O = 5 \text{ mA}, V_I = 5.5 \text{ V}, T_A = -25 \text{ to } 85 \text{ }^\circ\text{C}$		3.43		3.57	
V_I	Operating input voltage	$I_O = 250 \text{ mA}$				20	V

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
I_{out}	Output current limit				300		mA
ΔV_O	Line regulation	$V_I = 4.2$ to 20 V, $I_O = 0.5$ mA			3	15	mV
ΔV_O	Load regulation ⁽¹⁾	$V_I = 4.4$ V, $I_O = 0.5$ to 250 mA			3	15	mV
I_d	Quiescent current	$V_I = 4.4$ to 20 V, $I_O = 0$ mA			0.6	1	mA
	ON mode	$V_I = 4.4$ to 20 V, $I_O = 250$ mA			4	6	
	OFF mode	$V_I = 6$ V			50	100	μ A
SVR	Supply voltage rejection	$I_O = 5$ mA $V_I = 5.4 \pm 1$ V	$f = 120$ Hz		73		dB
			$f = 1$ kHz		70		
			$f = 10$ kHz		55		
eN	Output noise voltage	$B = 10$ Hz to 100 kHz			50		μ V
V_d	Dropout voltage ⁽¹⁾	$I_O = 250$ mA			0.4	0.6	V
		$I_O = 250$ mA, $T_A = -40$ to 125 °C				0.8	V
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		μ A
C_O	Output bypass capacitance	$ESR = 0.1$ to 10 Ω , $I_O = 0$ to 250 mA		2	10		μ F

1. For SO-8 package the maximum limit of load regulation and dropout should be increased by 20 mV.

(Refer to the test circuits, $T_A = 25$ °C, $C_I = 0.1$ μ F, $C_O = 2.2$ μ F unless otherwise specified).

Table 7. L4931ABxx50 electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
V_O	Output voltage	$I_O = 5$ mA, $V_I = 7$ V		4.95	5	5.05	V
		$I_O = 5$ mA, $V_I = 7$ V, $T_A = -25$ to 85 °C		4.9		5.1	
V_I	Operating input voltage	$I_O = 250$ mA				20	V
I_{out}	Output current limit				300		mA
ΔV_O	Line regulation	$V_I = 5.8$ to 20 V, $I_O = 0.5$ mA			3.5	17.5	mV
ΔV_O	Load regulation ⁽¹⁾	$V_I = 6$ V, $I_O = 0.5$ to 250 mA			3	15	mV
I_d	Quiescent current	$V_I = 6$ to 20 V, $I_O = 0$ mA			0.6	1	mA
	ON mode	$V_I = 6$ to 20 V, $I_O = 250$ mA			4	6	
	OFF mode	$V_I = 6$ V			50	100	μ A
SVR	Supply voltage rejection	$I_O = 5$ mA $V_I = 7 \pm 1$ V	$f = 120$ Hz		70		dB
			$f = 1$ kHz		67		
			$f = 10$ kHz		55		
eN	Output noise voltage	$B = 10$ Hz to 100 kHz			50		μ V
V_d	Dropout voltage ⁽¹⁾	$I_O = 250$ mA			0.4	0.6	V
		$I_O = 250$ mA, $T_A = -40$ to 125 °C				0.8	V
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

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_I	Control input current	$V_I = 6\text{ V}$, $V_C = 6\text{ V}$		10		μA
C_O	Output bypass capacitance	ESR = 0.1 to 10 Ω , $I_O = 0$ to 250 mA	2	10		μF

1. For SO-8 package the maximum limit of load regulation and dropout should be increased by 20 mV.

(Refer to the test circuits, $T_A = 25\text{ }^\circ\text{C}$, $C_I = 0.1\text{ }\mu\text{F}$, $C_O = 2.2\text{ }\mu\text{F}$ unless otherwise specified).

Table 8. L4931Cxx50 electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$I_O = 5\text{ mA}$, $V_I = 7\text{ V}$	4.9	5	5.1	V
		$I_O = 5\text{ mA}$, $V_I = 7\text{ V}$, $T_A = -25$ to $85\text{ }^\circ\text{C}$	4.8		5.2	
V_I	Operating input voltage	$I_O = 250\text{ mA}$			20	V
I_{out}	Output current limit			300		mA
ΔV_O	Line regulation	$V_I = 5.8$ to 20 V , $I_O = 0.5\text{ mA}$		3.5	17.5	mV
ΔV_O	Load regulation ⁽¹⁾	$V_I = 6\text{ V}$, $I_O = 0.5$ to 250 mA		3	15	mV
I_d	Quiescent current	$V_I = 6$ to 20 V , $I_O = 0\text{ mA}$		0.6	1	mA
	ON mode	$V_I = 6$ to 20 V , $I_O = 250\text{ mA}$		4	6	
	OFF mode	$V_I = 6\text{ V}$		50	100	μA
SVR	Supply voltage rejection	$I_O = 5\text{ mA}$ $V_I = 7 \pm 1\text{ V}$	$f = 120\text{ Hz}$	70		dB
			$f = 1\text{ kHz}$	67		
			$f = 10\text{ kHz}$	55		
eN	Output noise voltage	B = 10 Hz to 100 kHz		50		μV
V_d	Dropout voltage ⁽¹⁾	$I_O = 250\text{ mA}$		0.4	0.6	V
		$I_O = 250\text{ mA}$, $T_A = -40$ to $125\text{ }^\circ\text{C}$			0.8	V
V_{IL}	Control input logic low	$T_A = -40$ to $125\text{ }^\circ\text{C}$			0.8	V
V_{IH}	Control input logic high	$T_A = -40$ to $125\text{ }^\circ\text{C}$	2			V
I_I	Control input current	$V_I = 6\text{ V}$, $V_C = 6\text{ V}$		10		μA
C_O	Output bypass capacitance	ESR = 0.1 to 10 Ω , $I_O = 0$ to 250 mA	2	10		μF

1. For SO-8 package the maximum limit of load regulation and dropout should be increased by 20 mV.

(Refer to the test circuits, $T_A = 25\text{ }^\circ\text{C}$, $C_I = 0.1\text{ }\mu\text{F}$, $C_O = 2.2\text{ }\mu\text{F}$ unless otherwise specified).

Table 9. L4931ABxx120 electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$I_O = 5\text{ mA}$, $V_I = 14\text{ V}$	11.88	12	12.12	V
		$I_O = 5\text{ mA}$, $V_I = 14\text{ V}$, $T_A = -25$ to $85\text{ }^\circ\text{C}$	11.76		12.24	
V_I	Operating input voltage	$I_O = 250\text{ mA}$			20	V
I_{out}	Output current limit			300		mA
ΔV_O	Line regulation	$V_I = 12.8$ to 20 V , $I_O = 0.5\text{ mA}$		4	20	mV
ΔV_O	Load regulation ⁽¹⁾	$V_I = 13\text{ V}$, $I_O = 0.5$ to 250 mA		3	15	mV
I_d	Quiescent current	$V_I = 13$ to 20 V , $I_O = 0\text{ mA}$		0.8	1.6	mA

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
I_d	ON mode	$V_I = 13$ to 20 V, $I_O = 250$ mA			4.5	7	mA
	OFF mode	$V_I = 6$ V			90	180	μ A
SVR	Supply voltage rejection	$I_O = 5$ mA $V_I = 14 \pm 1$ V	$f = 120$ Hz		64		dB
			$f = 1$ kHz		61		
			$f = 10$ kHz		55		
eN	Output noise voltage	$B = 10$ Hz to 100 kHz			50		μ V
V_d	Dropout voltage ⁽¹⁾	$I_O = 250$ mA			0.4	0.6	V
		$I_O = 250$ mA, $T_A = -40$ to 125 °C				0.8	V
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		μ A
C_O	Output bypass capacitance	ESR = 0.1 to 10 Ω , $I_O = 0$ to 250 mA		2	10		μ F

1. For SO-8 package the maximum limit of load regulation and dropout should be increased by 20 mV.

6 Typical application

Figure 4. Line regulation vs temperature

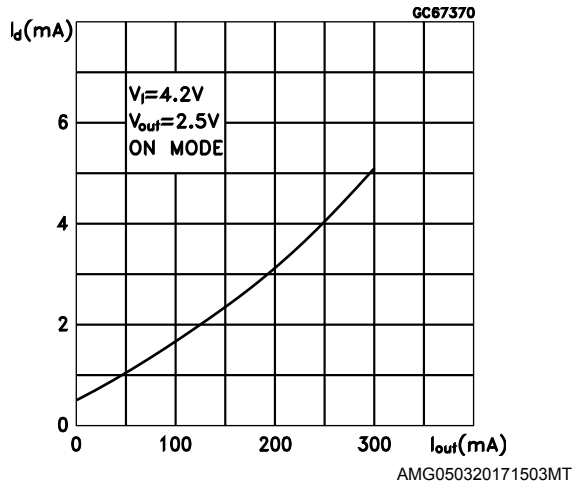


Figure 5. Dropout voltage vs temperature

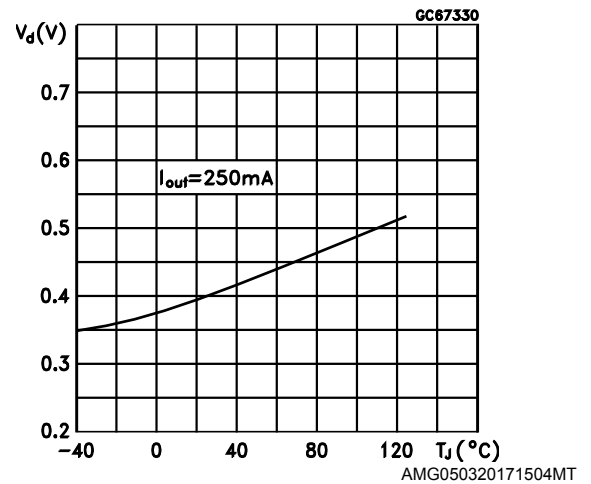


Figure 6. Supply current vs input voltage

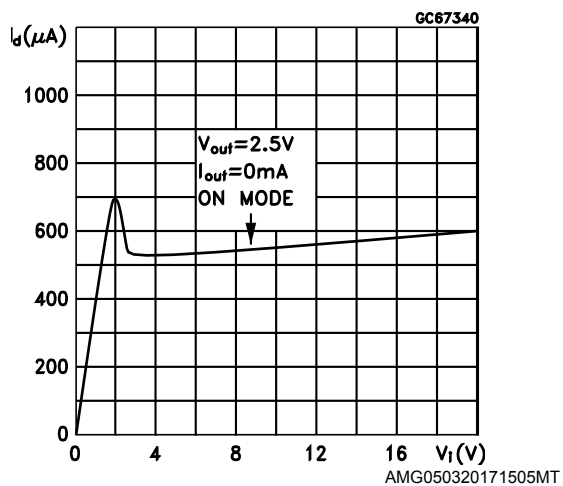


Figure 7. Supply current vs temperature

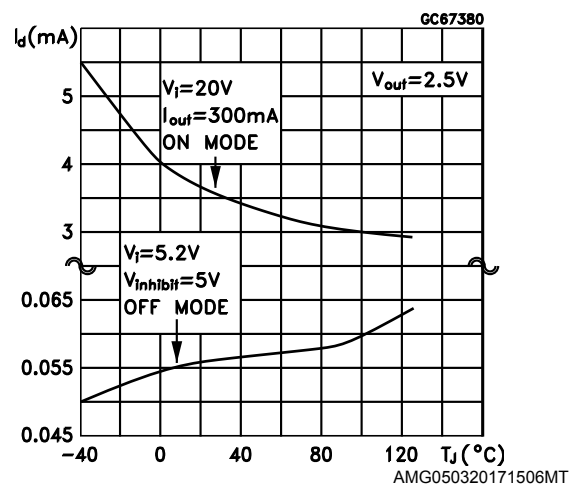


Figure 8. Short-circuit current vs dropout voltage

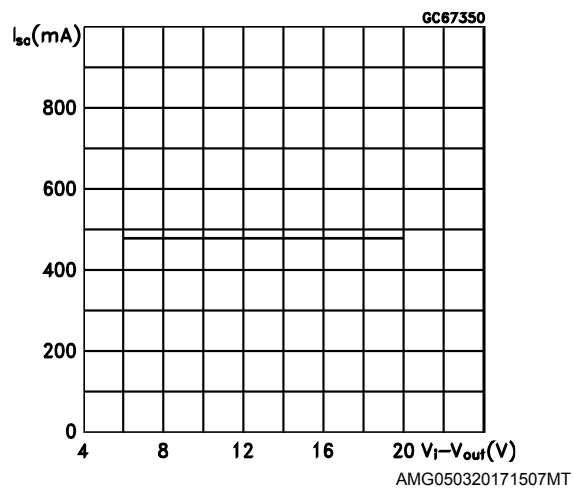
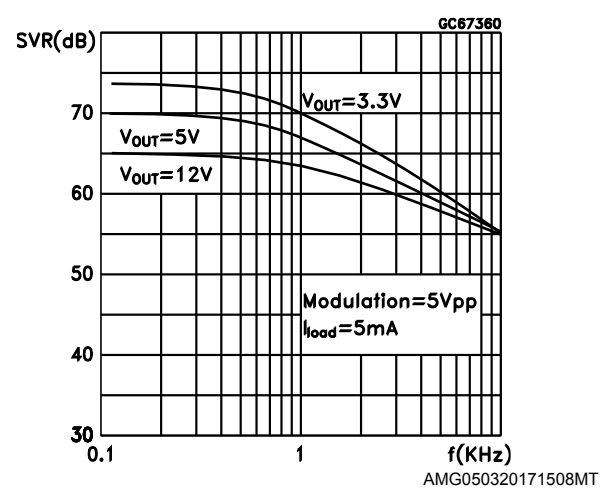


Figure 9. SVR vs input voltage signal frequency

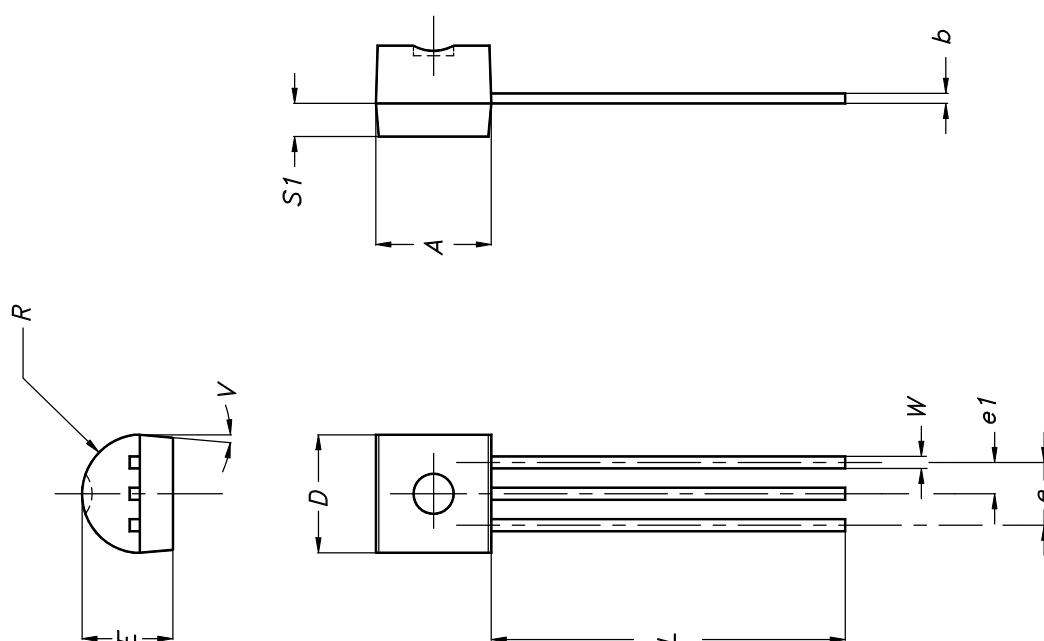


7 Package information

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.

7.1 TO-92 package information

Figure 10. TO-92 package outline



0102782_E

Table 10. TO-92 mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.32		4.95
b	0.36		0.51
D	4.45		4.95
E	3.30		3.94
e	2.41		2.67
e1	1.14		1.40
L	12.70		15.49
R	2.16		2.41
S1	0.92		1.52
W	0.41		0.56
V		5°	

7.2 TO-92 Ammopak packing information

Figure 11. TO-92 Ammopak tape and reel outline

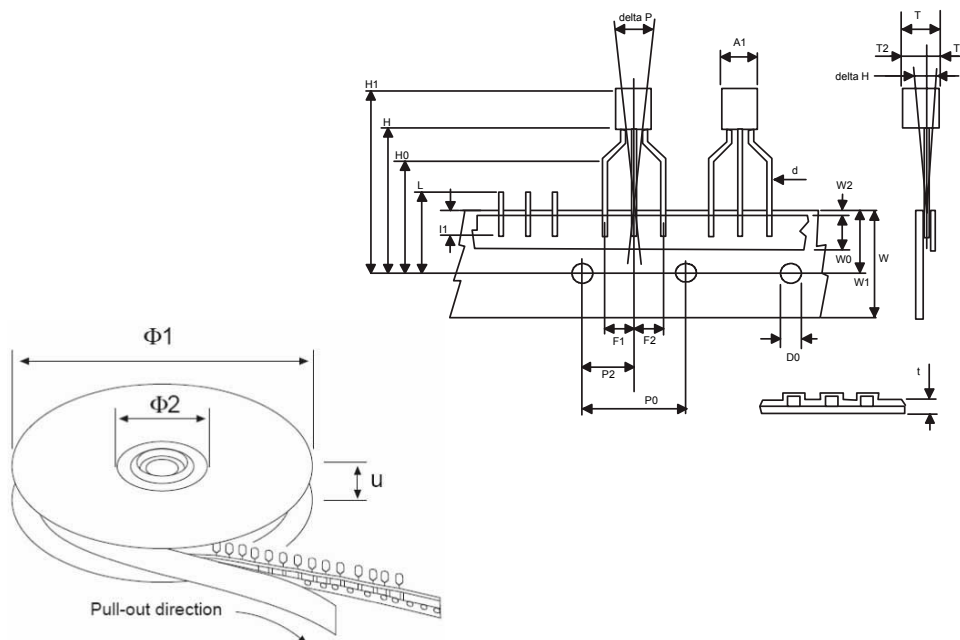


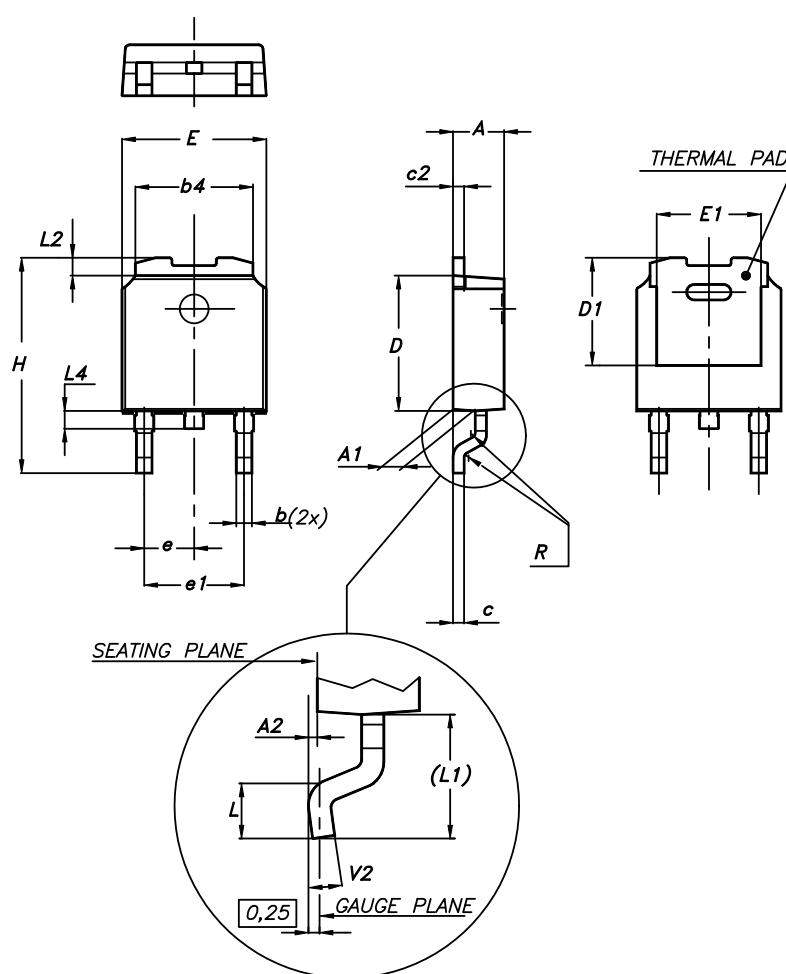
Table 11. TO-92 Ammopak tape and reel mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A1			4.80
T			3.80
T1			1.60
T2			2.30
d	0.45	0.47	0.48
P0	12.50	12.70	12.90
P2	5.65	6.35	7.05
F1, F2	2.40	2.50	2.94
F3	4.98	5.08	5.48
delta H	-2.00		2.00
W	17.50	18.00	19.00
W0	5.5	6.00	6.5
W1	8.50	9.00	9.25
W2			0.50
H		18.50	21
H3	0.5	1	2
H0	15.50	16.00	18.8
H1		25.0	27.0
D0	3.80	4.00	4.20

Dim.	mm		
	Min.	Typ.	Max.
t			0.90
L			11.00
l1	3.00		
delta P	-1.00		1.00

7.3 DPAK package information

Figure 12. DPAK package outline



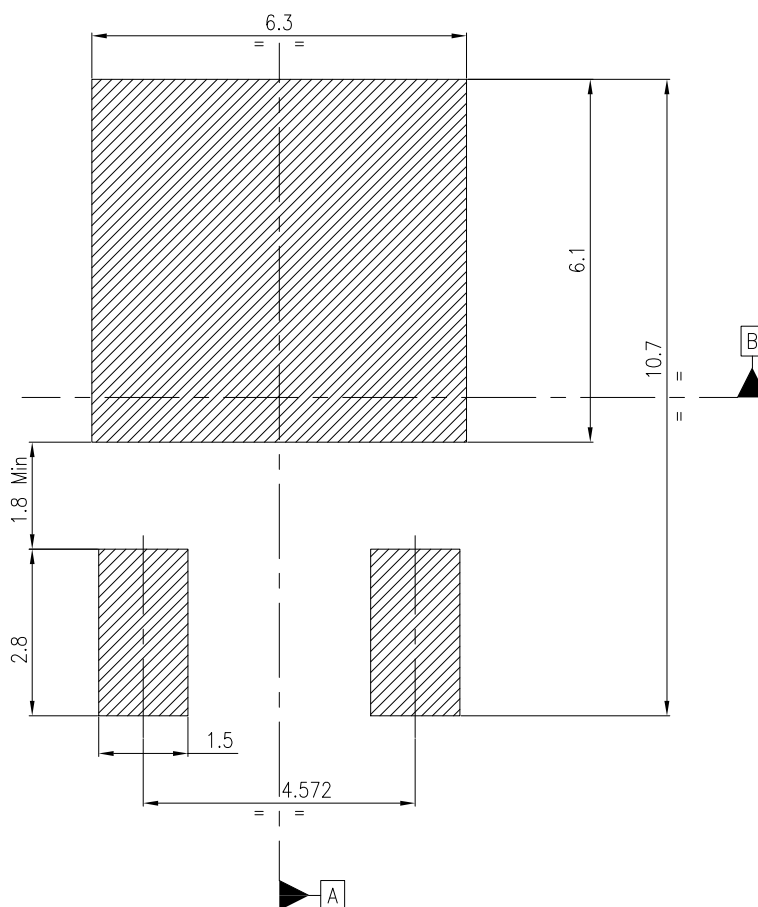
0068772_A_21

Table 12. 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

Dim.	mm		
	Min.	Typ.	Max.
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°

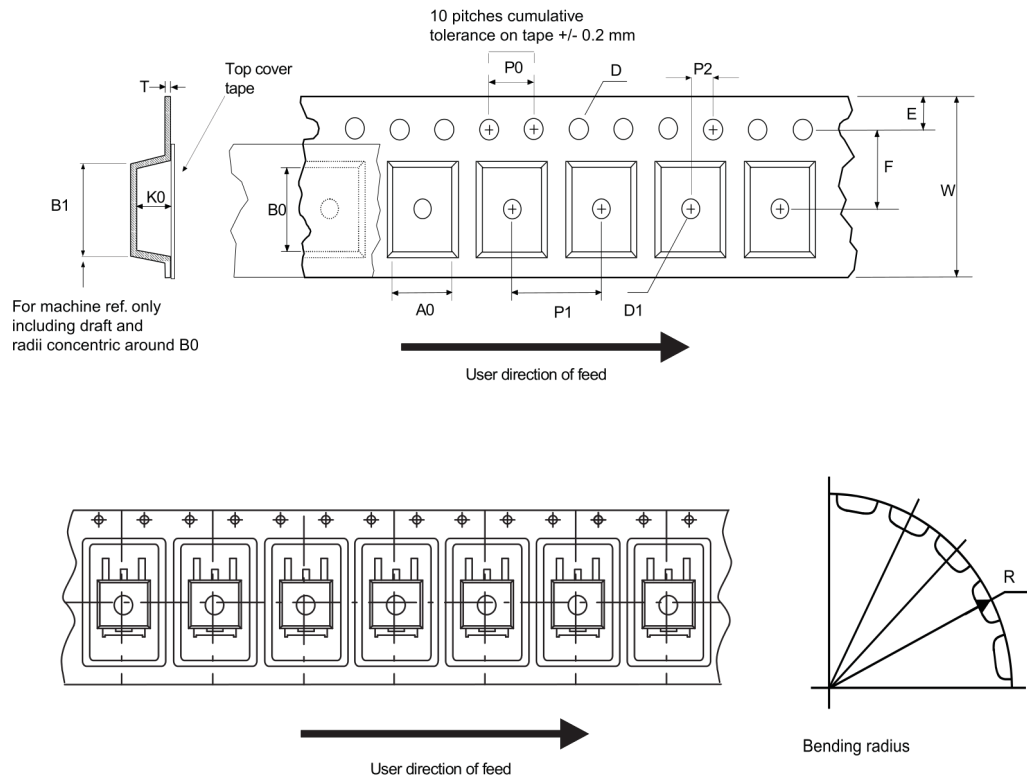
Figure 13. DPAK recommended footprint (dimensions are in mm)



Footprint_0068772

7.4 DPAK_PPAK packing information

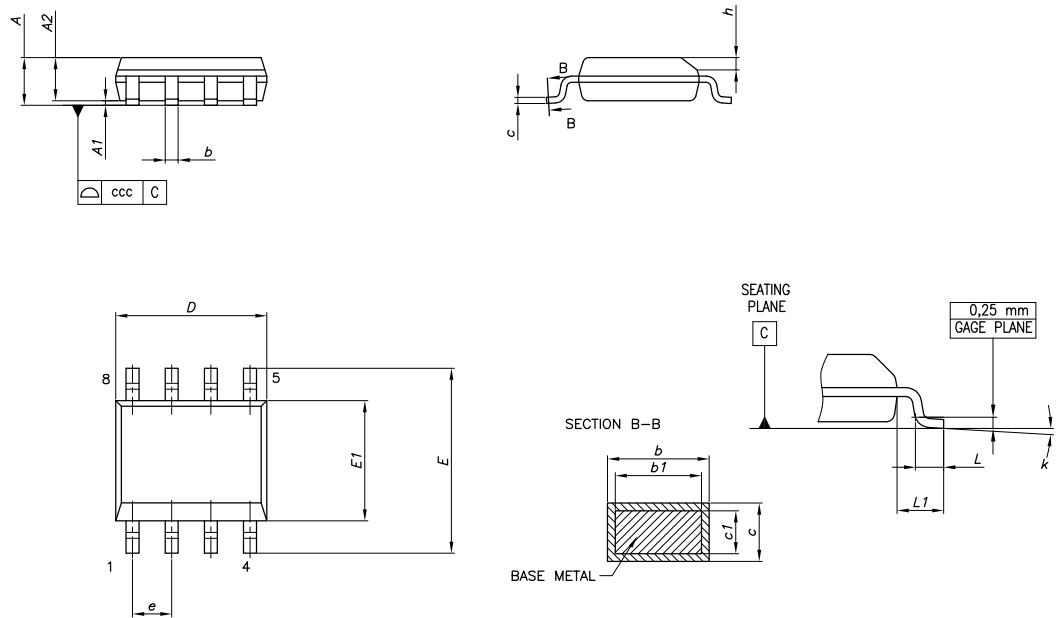
Figure 14. PPAK and DPAK tape



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7.5 SO8 package information

Figure 15. SO-8 package outline

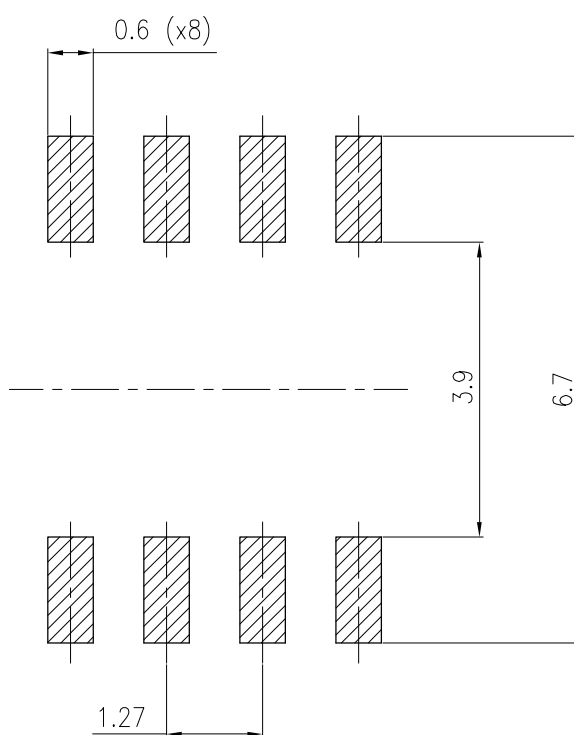


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Table 13. SO-8 mechanical data

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

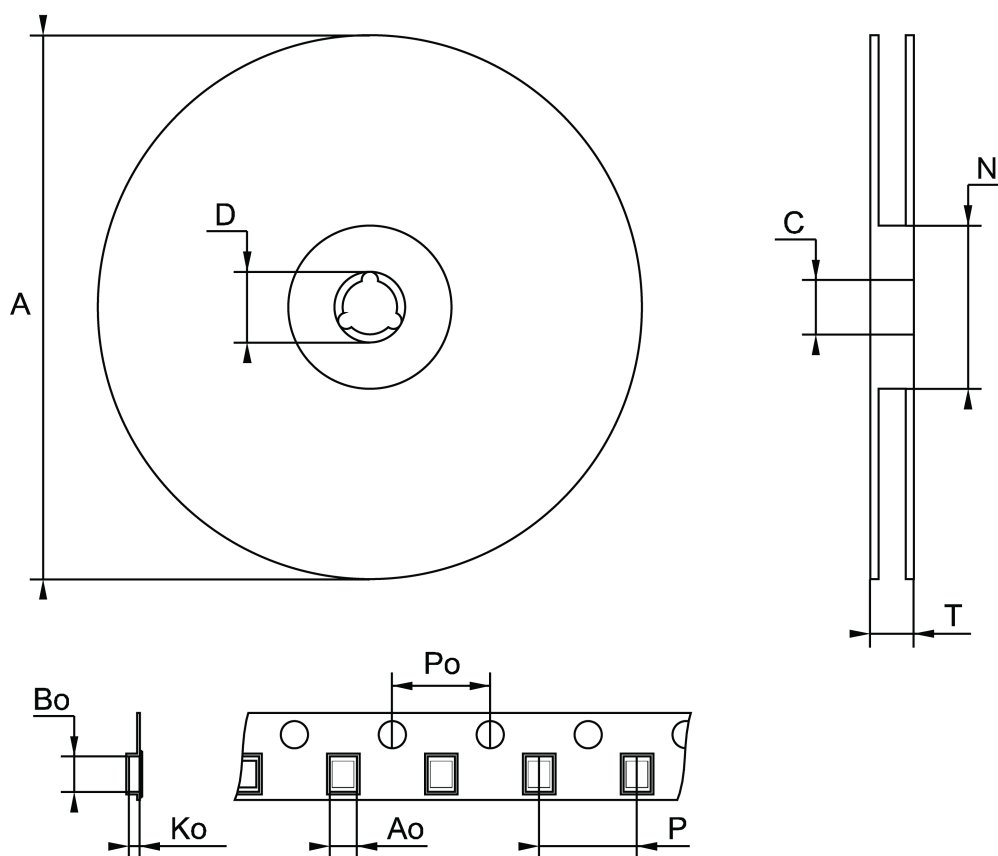
Figure 16. SO-8 recommended footprint



0016023_1

7.6 SO8-batwing packing information

Figure 17. SO8-batwing tape and reel outline



Note: Drawing not in scale

Table 14. SO8-batwing mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A			330
C	12.8		13.2
D	20.2		
N	60		
T			22.4
A0	8.1	-	8.5
B0	5.5		5.9
K0	2.1		2.3
P0	3.9		4.1
P	7.9		8.1

8 Ordering information

Table 15. Order codes

Package				Output voltage
TO-92	SO-8 (automotive-grade)	DPAK	SO-8	
L4931CZ33-AP	L4931CD33-TRY ⁽¹⁾	L4931CDT33-TR	L4931CD33-TR	3.3 V
		L4931ABDT33-TR		3.3 V
L4931CZ50-AP		L4931CDT50-TR	L4931CD50-TR	5 V
			L4931ABD50-TR	5 V

1. Qualified and characterized according to AEC Q100 and Q003 or equivalent, advanced screening according to AEC Q001 and Q002 or equivalent.

Revision history

Table 16. Document revision history

Date	Revision	Changes
21-Jun-2004	11	Document updating.
14-Jun-2006	12	Order codes updated.
31-Jan-2008	13	Added: Table 1 and new order codes for Automotive grade products.
20-Feb-2008	14	Modified: Table 23 on page 36.
11-Mar-2008	15	Modified: Table 1 on page 1 and Table 23 on page 36.
15-Jul-2008	16	Modified: Table 1 on page 1 and Table 23 on page 36.
18-Aug-2008	17	Modified: Table 23 on page 36.
30-Oct-2013	18	Changed the L4931ABxx and L4931Cxx to L4931. Updated: Description in cover page. Deleted table1: Device summary. Updated Figure 2: Pin connections (top view), Table 2: Thermal data, Section 5: Electrical characteristics and Section 7: Package mechanical data. Added Section 8: Packaging mechanical data. Minor text changes.
02-Aug-2017	19	Updated features in cover page. Deleted table 3: L4931Cxx27 electrical characteristics, table 4: L4931Cxx27-TRY (automotive-grade) electrical characteristics, table 12:L4931ABxx80 electrical characteristics, table 13: L4931Cxx80 electrical characteristics. Updated Table 19. Order codes. Minor text changes.
29-Jan-2024	20	Updated Table 5.
09-Aug-2024	21	Updated features and description on the cover page. Removed PPAK package information , updated Table 15
28-Oct-2024	22	updated Table 15

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