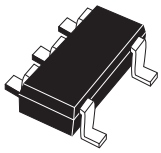
LD59015

150 mA low noise and high PSRR linear voltage regulator

Datasheet - production data



SOT323-5L

Features

- Input voltage from 2.4 to 5.5 V
- Very low quiescent current (31 µA typ. at no load, 75 µA typ. at 150 mA load, 1 µA max. in OFF mode)
- Very low noise (20 μV_{RMS} at V_{OUT} = 1.5 V)
- Output voltage tolerance: ± 1.8% at 25 °C
- 150 mA guaranteed output current
- Wide range of output voltages available on request: 0.8 V to 3.3 V in 100 mV steps
- Logic-controlled electronic shutdown
- Compatible with ceramic capacitors
- Very high PSRR (80 dB @ 100 Hz, 76 @ 10 kHz, 54 @ 100 kHz)
- Internal current and thermal limit
- Package: SOT323-5L
- Temperature range: -40 °C to 125 °C

Description

The LD59015 provides 150 mA maximum current with an input voltage range from 2.4 V to 5.5 V, and a typical dropout voltage of 150 mV. It is stable with ceramic capacitors. High PSRR, low quiescent current and low noise features make it suitable for low power battery-powered applications. Power supply rejection is 80 dB at low frequency and starts to roll off at 10 kHz. The enable logic control function puts the LD59015 in shutdown mode, allowing a total current consumption lower than 1 µA. The device also includes short-circuit constant current limiting and thermal protection. Typical applications are mobile phones, personal digital assistants (PDAs), cordless phones and similar battery-powered systems.

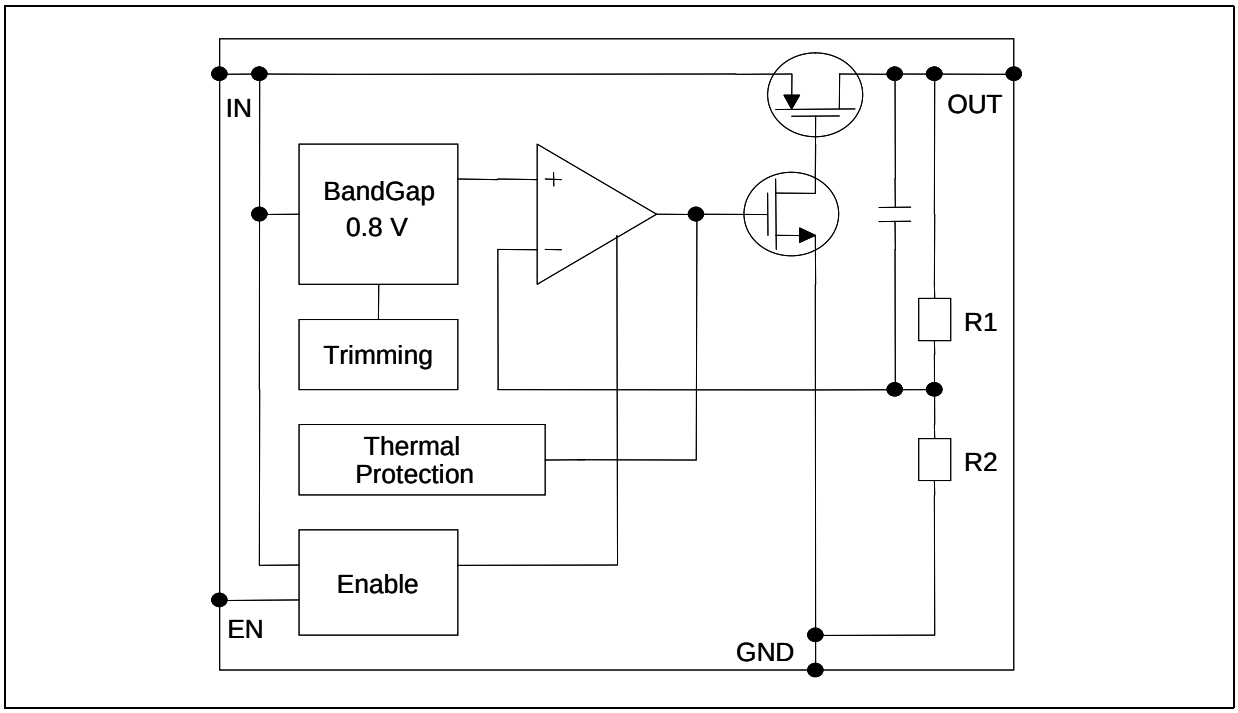
Table 1. Device summary

Order codes	Output voltages
LD59015C08R	0.8 V
LD59015C12R	1.2 V
LD59015C15R	1.5 V
LD59015C18R	1.8 V
LD59015C25R	2.5 V
LD59015C30R	3.0 V
LD59015C33R	3.3 V

Contents

1 Block diagram

Figure 1. LD59015 block diagram



2 Pin configuration

Figure 2. Pin connection (top view)

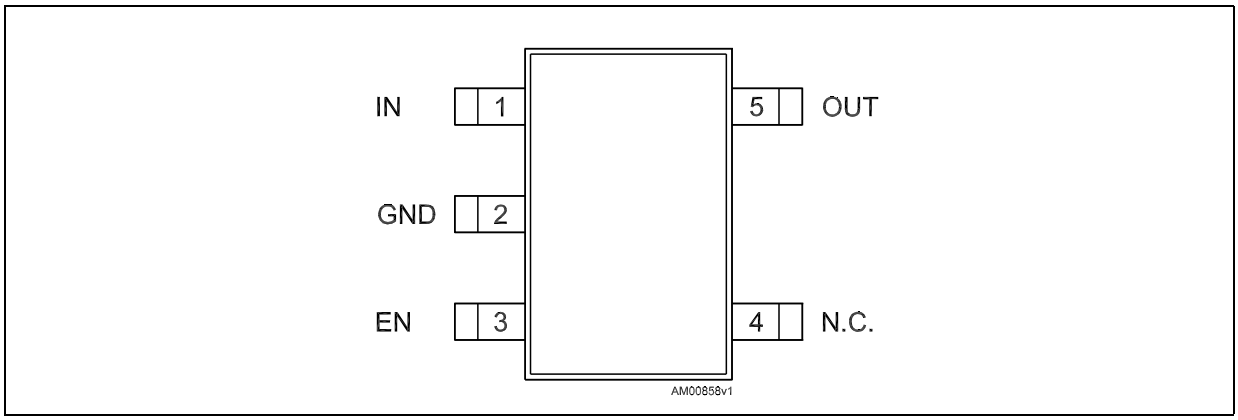
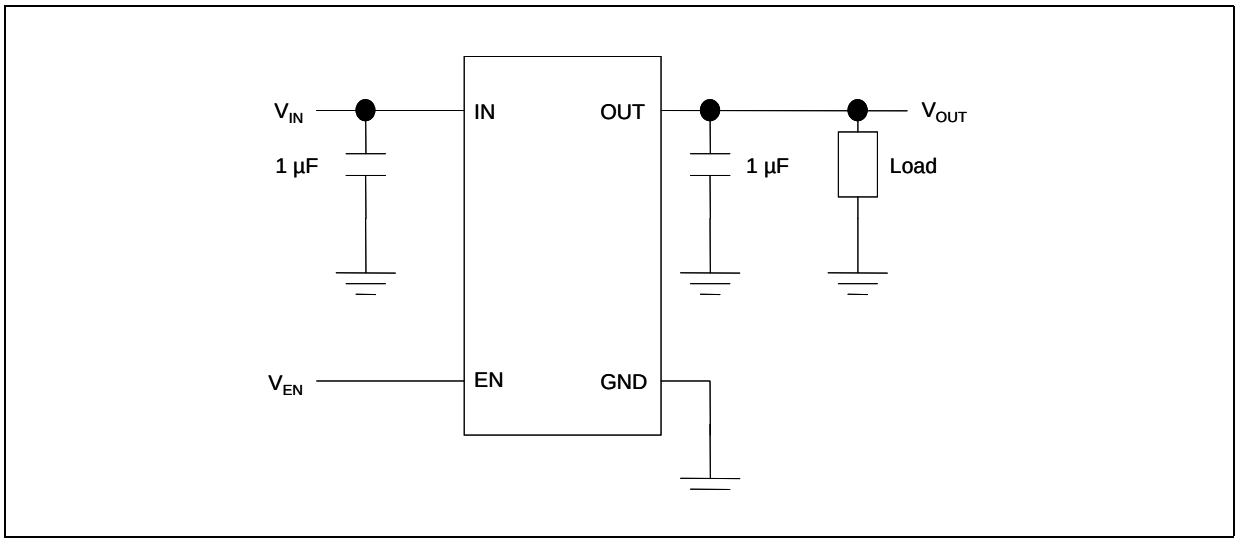


Table 2. Pin description

Pin n°	Symbol	Function
1	IN	Input voltage
2	GND	Ground
3	EN	Enable input Set V_{EN} > 0.9 to turn on the device Set V_{EN} < 0.4 to turn off the device
4	N.C.	Not connected
5	OUT	Output voltage

3 Typical application

Figure 3. Typical application circuit



4 Maximum ratings

Table 3. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{IN}	DC input voltage	- 0.3 to 7	V
V_{OUT}	DC output voltage	- 0.3 to V_I + 0.3 (max. 7)	V
V_{EN}	Enable input voltage	- 0.3 to V_I + 0.3 (max. 7)	V
I_{OUT}	Output current	Internally limited	mA
P_D	Power dissipation	Internally limited	mW
ESD	Human body model	± 3	kV
	Machine model	± 300	V
T_{STG}	Storage temperature range	-65 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 conditions is not implied. All values are referred to GND.

Table 4. Thermal data

Symbol	Parameter	Value	Unit
R_{thJA}	Thermal resistance junction-ambient	645.69	°C/W
R_{thJC}	Thermal resistance junction-case	116	°C/W

5 Electrical characteristics

T_J = 25 °C, V_{IN} = $V_{OUT(NOM)}$ + 1 V, C_{IN} = C_{OUT} = 1 µF, I_{OUT} = 1 mA, V_{EN} = V_{IN}, unless otherwise specified.

Table 5. Electrical characteristics (1)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{IN}	Operating input voltage		2.4		5.5	V
V_{UVLO}	Turn-on threshold			2.0	2.15	V
	Turn-off threshold		1.90	1.95		V
V_{OUT}	V_{OUT} accuracy	I_{OUT} = 1mA, -40°C < T_J < 125°C	-1.8		1.8	%
ΔV_{OUT}	Static line regulation	V_{OUT} +1V ≤ V_{IN} ≤ 5.5V, I_{OUT} = 1mA		0.001		%/V
ΔV_{OUT}	Static load regulation	I_{OUT} = 1mA to 150mA		0.001		%/mA
V_{DROP}	Dropout voltage (2)	I_{OUT} = 150mA, V_{OUT} > 2.2V -40°C < T_J < 125°C		150	210	mV
e_N	Output noise voltage	10Hz to 100kHz, I_{OUT} = 10mA, V_{OUT} = 1.5V		20		μV_{RMS} /V_{OUT}
SVR	Supply voltage rejection V_{OUT} = 1.5V	V_{IN} = V_{OUTNOM} + 1V +/-V_{RIPPLE} V_{RIPPLE} = 0.5V, frequency = 1kHz I_{OUT} = 1mA		76		dB
		V_{IN} = V_{OUTNOM} + 1V +/-V_{RIPPLE} V_{RIPPLE} = 0.5V, frequency =10kHz I_{OUT} = 1mA		76		dB
		V_{IN} = V_{OUTNOM} + 1V +/-V_{RIPPLE} V_{RIPPLE} = 0.5V, frequency =100kHz I_{OUT} = 1mA		54		dB
I_Q	Quiescent current	I_{OUT} = 0mA		31		µA
		I_{OUT} = 0mA, -40°C < T_J < 125°C			60	µA
		I_{OUT} = 0 to 150mA		75		µA
		I_{OUT} = 0 to 150mA -40°C < T_J< 125°C			110	µA
		V_{IN} input current in OFF mode: V_{EN} = GND		0.001	1	µA
I_{SC}	Short-circuit current	R_L = 0	200			mA
V_{EN}	Enable input logic low	V_{IN} = 2.4V to 5.5V, -40°C < T_J < 85°C			0.4	V
	Enable input logic high	V_{IN} = 2.4V to 5.5V, -40°C < T_J < 85°C	0.9			V
I_{EN}	Enable pin input current	V_{SHDN} = 5.5V		0.1	100	nA
T_{ON}	Turn-on time (3)			200		µs

Table 5. Electrical characteristics (continued) (1)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
T_{SHDN}	Thermal shutdown			160		°C
	Hysteresis			20		
C_{OUT}	Output capacitor	Capacitance (see typical performance characteristics for stability)	1		4.7	µF

1. For $V_{OUT(NOM)} < 1.3$ V, $V_{IN} = 2.4$ V.
2. Dropout voltage is the input-to-output voltage difference at which the output voltage is 100 mV below its nominal value. This specification does not apply to output voltages below 1.7 V.
3. Turn-on time is time measured between the enable input just exceeding V_{EN} high value and the output voltage just reaching 95% of its nominal value.

Note: All transient values are guaranteed by design, not tested in production.

6 Typical performance characteristics

$C_{IN} = C_{OUT} = 1\ \mu F$

Figure 4. V_{OUT} vs. temperature (V_{OUT} = 0.8 V)

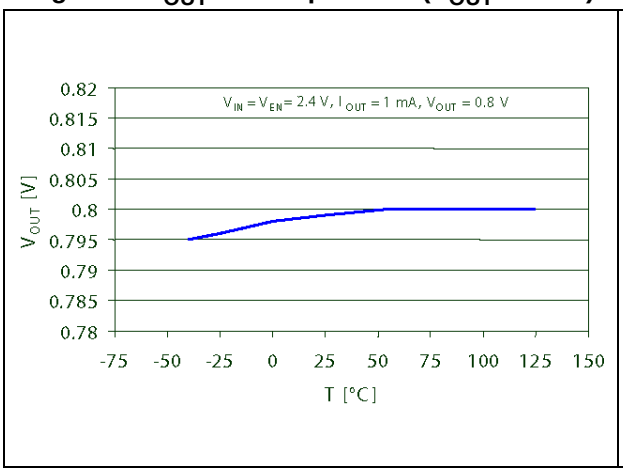


Figure 5. V_{OUT} vs. temperature (V_{OUT} = 3.3 V)

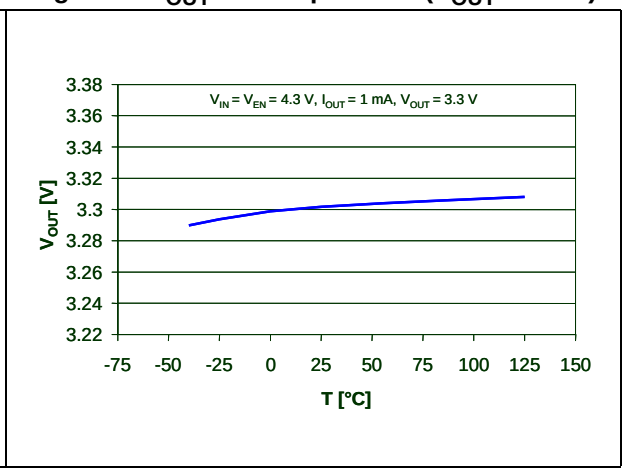


Figure 6. Quiescent current vs. temperature

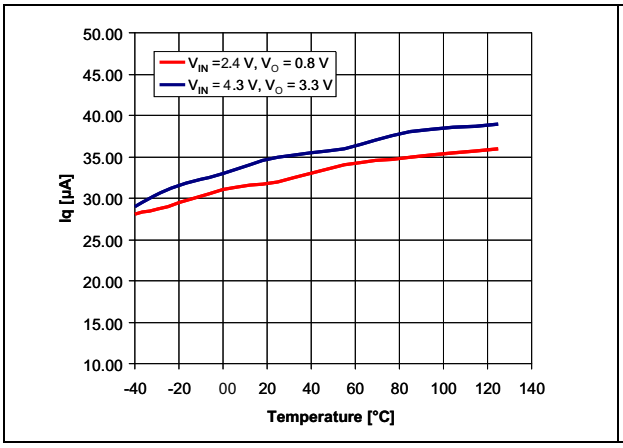


Figure 7. Quiescent current vs. I_{OUT}

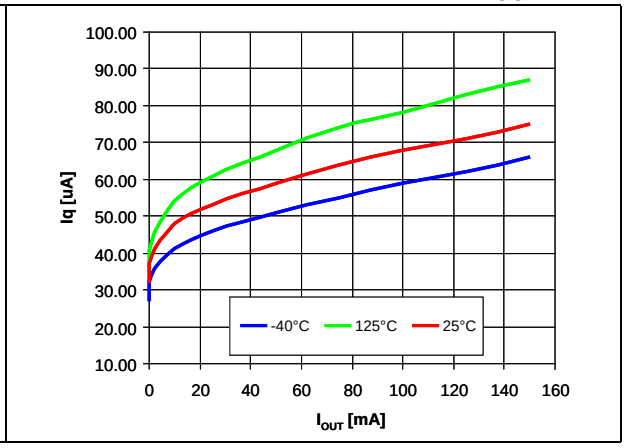


Figure 8. V_{OUT} vs. V_{IN}

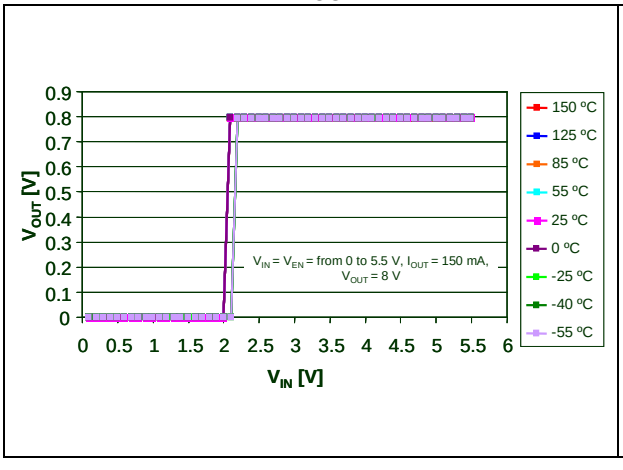


Figure 9. V_{DROP} vs. I_{OUT}

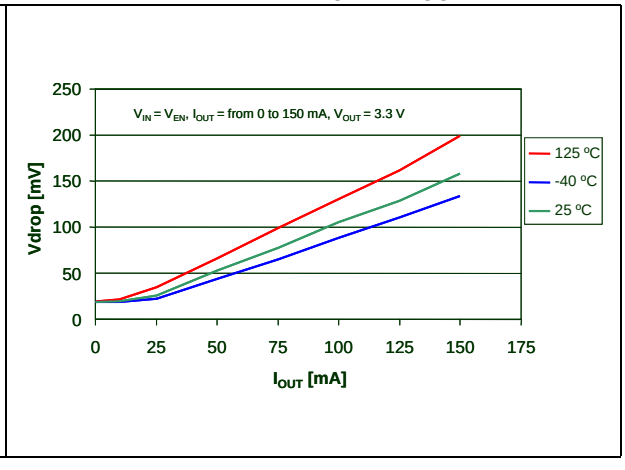


Figure 10. V_{UVLO} vs. temperature

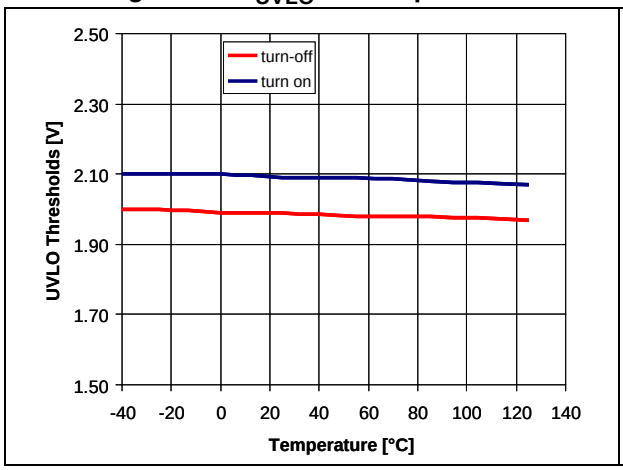


Figure 11. ESR vs. C_{OUT}

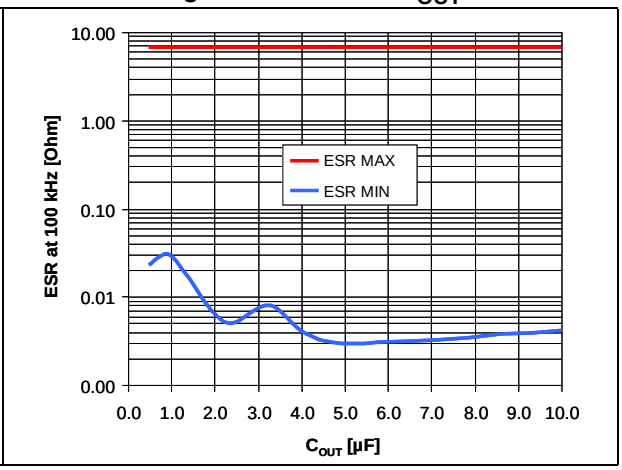


Figure 12. Supply voltage rejection vs. frequency

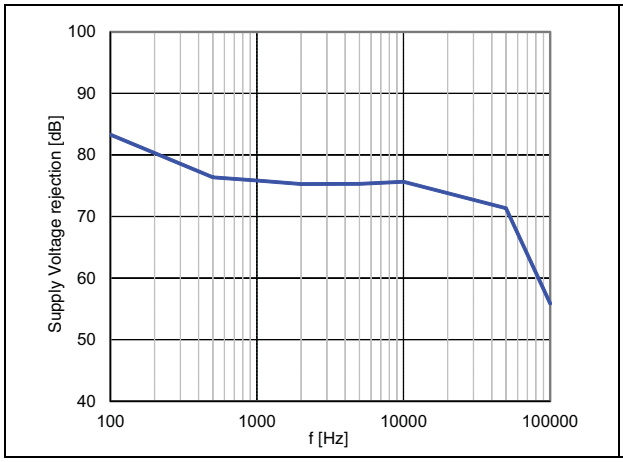


Figure 13. Supply voltage rejection vs. I_{OUT}

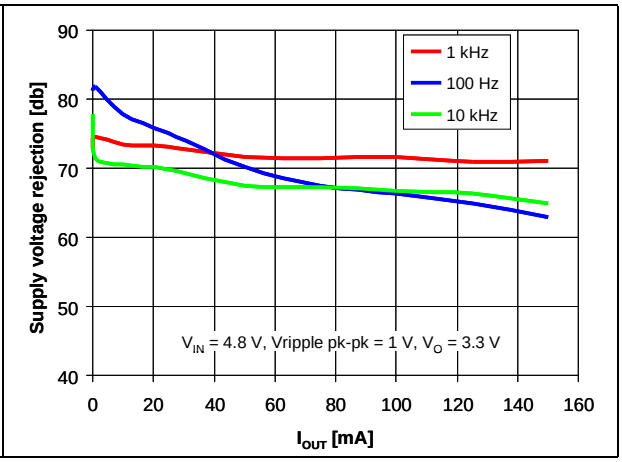


Figure 14. I_{SC} vs. V_{DROP}

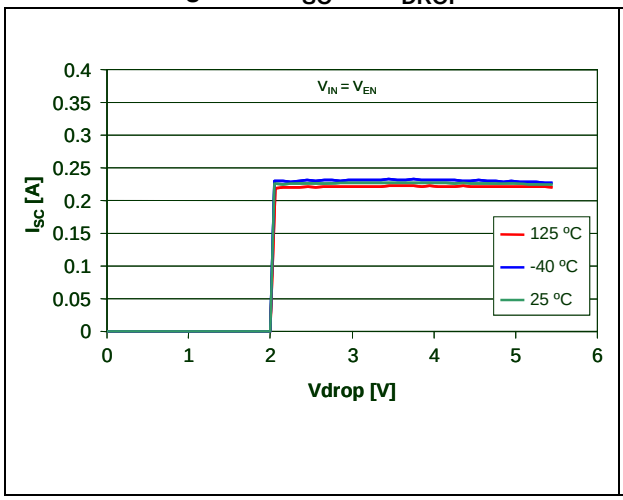
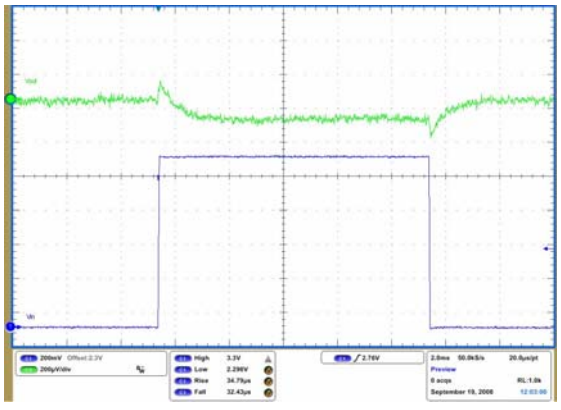
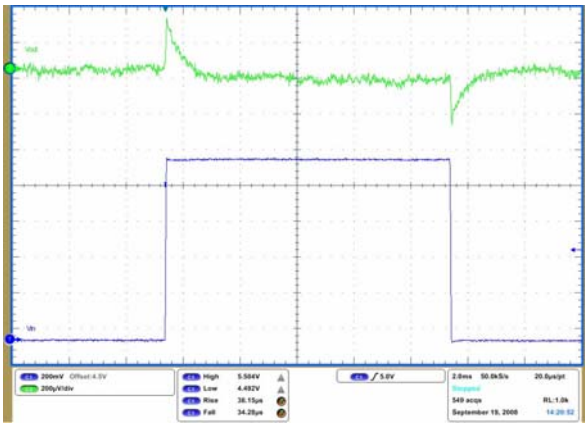


Figure 15. Line transient (V_{OUT} = 0.8 V)



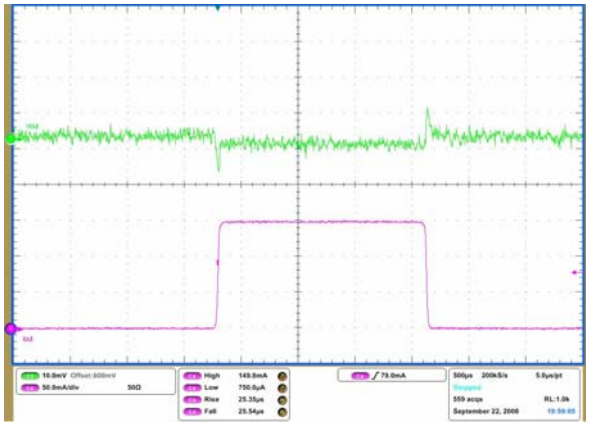
C_{OUT} = 1 µF; V_{IN} = V_{EN} = from 2.4 to 3.3 V; V_{OUT} = 0.8 V; I_{OUT} = 1 mA; t_{rise} = t_{fall} = 25 µs

Figure 16. Line transient (V_{OUT} = 3.3 V)



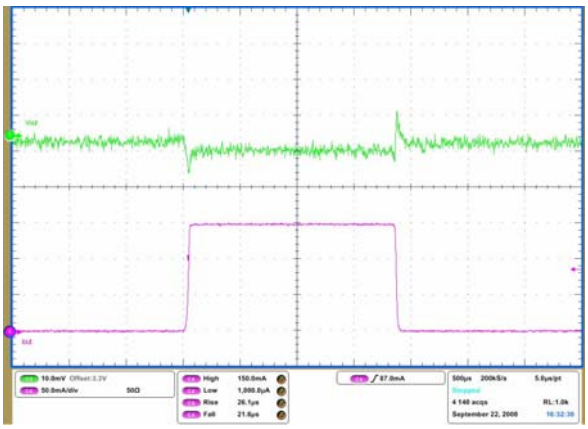
C_{OUT} = 1 µF; V_{IN} = V_{EN} = from 4.5 to 5.5 V; V_{OUT} = 3.3 V; I_{OUT} = 1 mA; t_{rise} = t_{fall} = 25 µs

Figure 17. Load transient (V_{OUT} = 0.8 V)



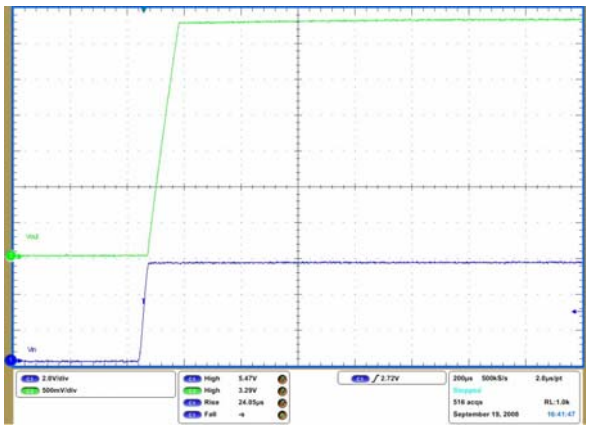
C_{IN} = C_{OUT} = 1 µF; V_{IN} = V_{EN} = 2.4 V; V_{OUT} = 0.8 V; I_{OUT} from 0.1 to 150 mA; t_{rise} = t_{fall} = 25 µs

Figure 18. Load transient (V_{OUT} = 3.3 V)



C_{IN} = C_{OUT} = 1 µF; V_{IN} = V_{EN} = 4.3 V; V_{OUT} = 3.3 V; I_{OUT} from 0.1 to 150 mA; t_{rise} = t_{fall} = 25 µs

Figure 19. Start-up transient



C_{OUT} = 1 µF; V_{IN} = V_{EN} = from 0 to 5.5 V; V_{OUT} = 3.3 V; I_{OUT} = 150 mA

Figure 20. Enable transient

C_{IN} = C_{OUT} = 1 µF; V_{IN} = 4.3; V_{EN} = from 0 to 5.5 V; V_{OUT} = 3.3 V; I_{OUT} = 1 mA; t_{rise} = 25 µs

7 Package mechanical data

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Figure 21. SOT323-5L drawings

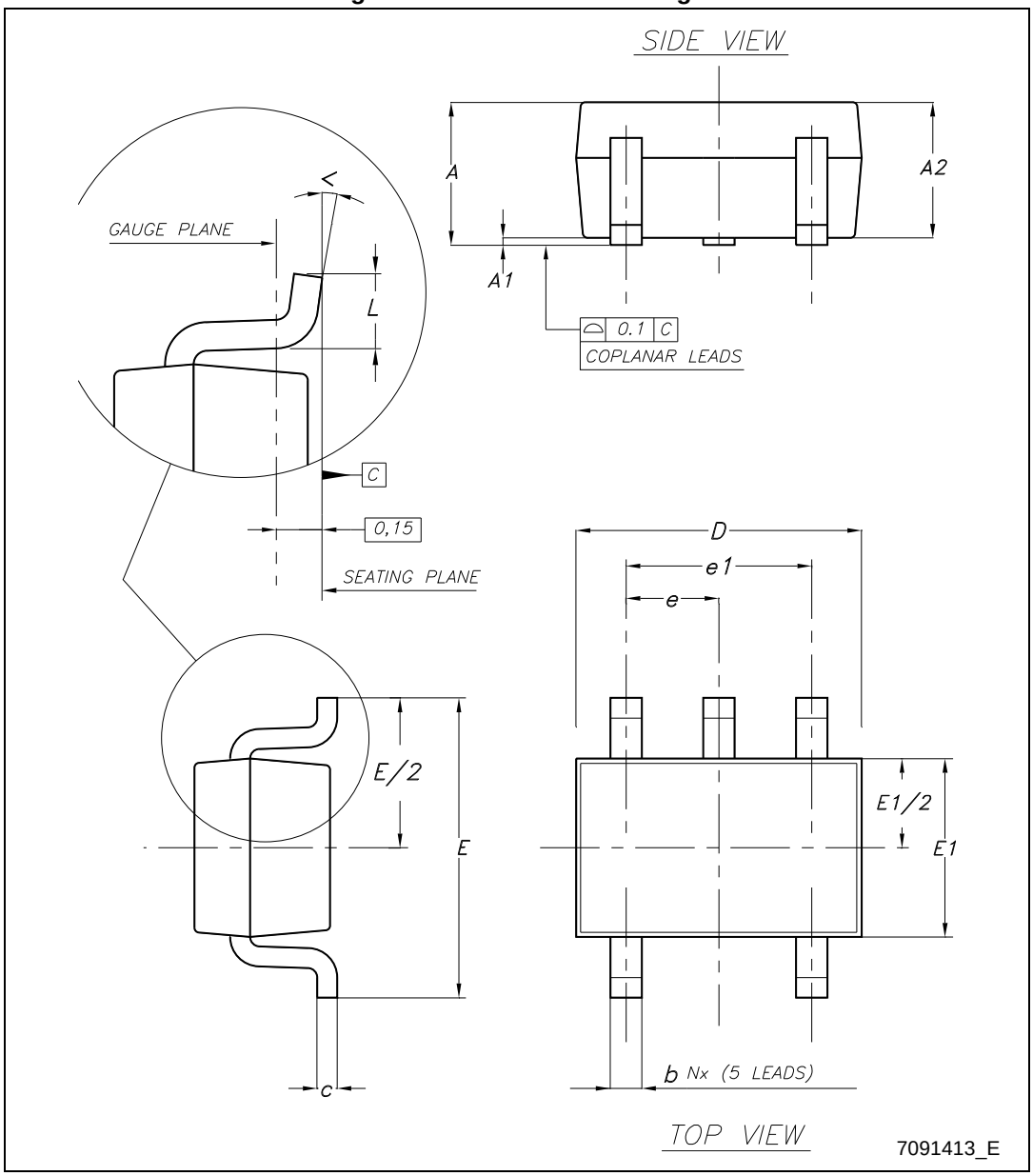

Table 6. SOT323-5L mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	0.80		1.10
A1	0		0.10
A2	0.80	0.90	1
b	0.15		0.30
c	0.10		0.22
D	1.80	2	2.20
E	1.80	2.10	2.40
E1	1.15	1.25	1.35
e		0.65	
e1		1.30	
L	0.26	0.36	0.46
<	0°		8°

8 Packaging mechanical data

Figure 22. SOT323-5L tape and reel drawings

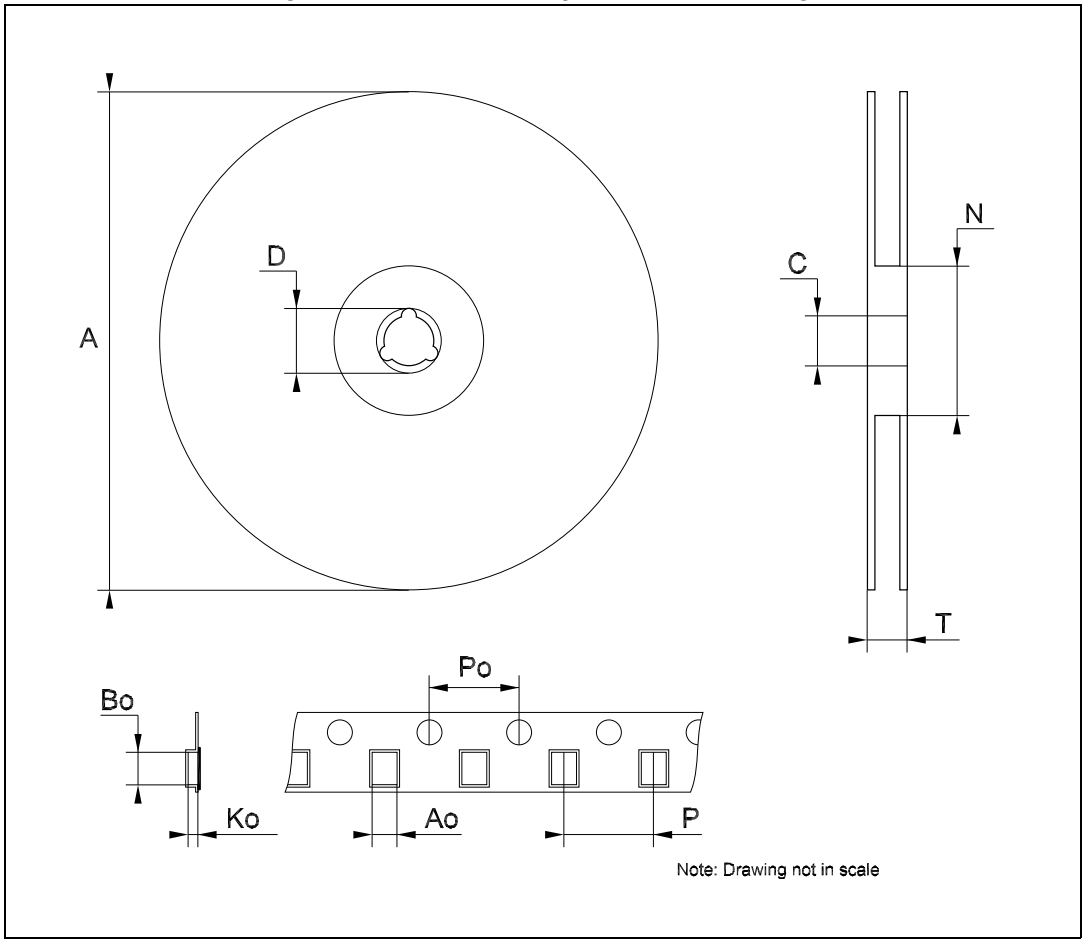

Table 7. SOT323-5L tape and reel mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	175	180	185
C	12.8	13	13.2
D	20.2		
N	59.5	60	60.5
T			14.4
Ao		2.25	
Bo		3.17	
Ko		1.2	
Po	3.9	4.0	4.1
P	3.9	4.0	4.2

9 Revision history

Table 8. Document revision history

Date	Revision	Changes
10-May-2010	1	Initial release.
21-Dec-2011	2	Modified: operating input voltage (V_{IN}) min. value *Table 5 on page 7*. Availability LD59015C08R code *Table 1 on page 1*.
06-Jul-2012	3	Updated: *Table 1 on page 1*.
24-Apr-2014	4	Part number LD59015xx changed to LD59015. Updated the description in cover page and *Section 7: Package mechanical data*. Added *Section 8: Packaging mechanical data*. Minor text changes.

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