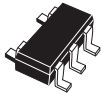## 150 mA, ultra low quiescent current linear voltage regulator

SOT23-5L

Features

- Input voltage from 1.5 to 5.5 V
- Very low quiescent current:
  - 1.0 µA (typ.) at no load
  - 1.4 µA (typ.) at 150 mA load
  - 1 nA (typ.) in OFF mode
  - 200 nA max. in OFF mode at 125 °C
- Output voltage tolerance: ± 2% at 25 °C
- 150 mA guaranteed output current
- Wide range of output voltages: 0.8 V to 3.3 V in 100 mV steps
- Logic-controlled electronic shutdown
- Compatible with ceramic capacitor (C_{OUT} = 1 µF)
- Internal current and thermal limit
- Temperature range: from -40 °C to 125 °C

Application

- Mobile phones
- Digital still cameras (DSC)
- Battery-powered equipment
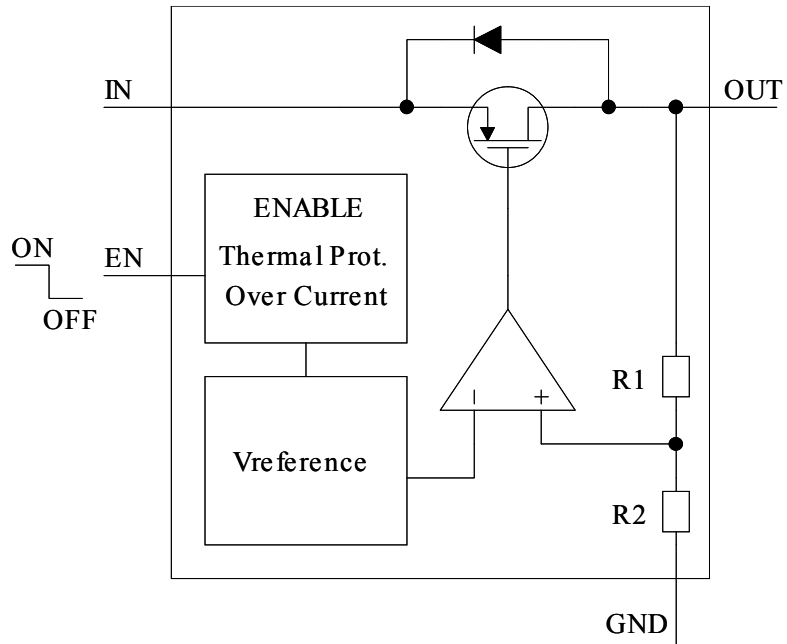- Portable media players

Maturity status link
STLQ015

Description

The STLQ015 provides 150 mA of maximum current with an input voltage range from 1.5 V to 5.5 V and a typical dropout voltage of 112 mV. The key feature of this device is its quiescent current, which is just 1.4 µA at maximum output current. The device is stable with a ceramic capacitor on the output. It offers very low quiescent current and extends battery-life of applications requiring very long standby time. The enable logic control function puts the STLQ015 in shutdown mode, reducing total current consumption to 1 nA. The device also includes short-circuit constant-current limiting and thermal protection. Typical applications are: portable and battery-powered systems, electronic sensors and microcontroller power supply.

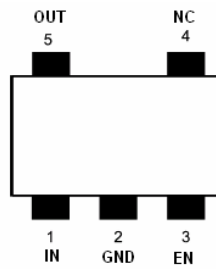**DS6765 - Rev 7 - February 2020**
For further information contact your local STMicroelectronics sales office.

www.st.com

1   Block diagram

Figure 1. Device block diagram

AMG140720160900MT

2   Pin configuration and description

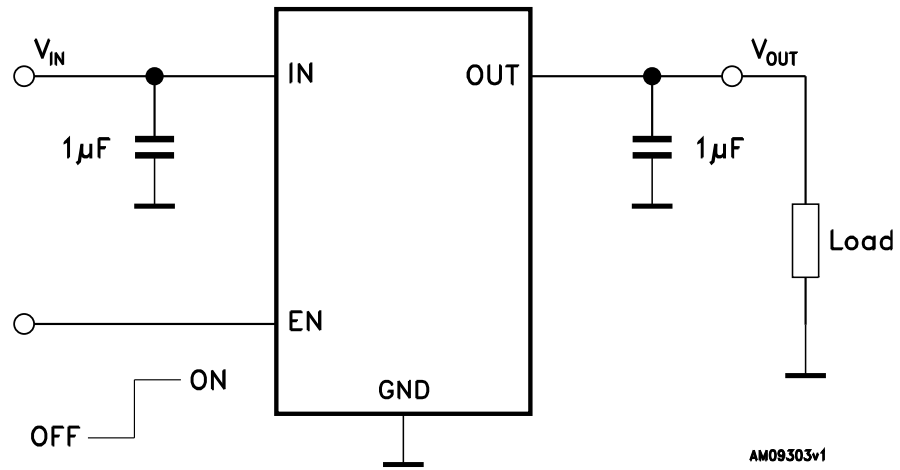Figure 2. **Pin configuration (top view)**

SOT23-5L

AMG140720160901MT

Table 1. **Pin description**

Pin	Symbol	Functions
3	EN	Enable input Set V_{EN} = high to turn on the device Set V_{EN} = low to turn off the device
2	GND	Ground
1	IN	Input voltage
5	OUT	Output voltage
4	NC	Not connected

3 Typical application

Figure 3. Typical application circuit

AMG140720160902

4 Maximum ratings

Table 2. 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_{IN}+0.3	V
V_{EN}	Enable input voltage	-0.3 to V_{IN}+0.3	V
I_{OUT}	Output current	Internally limited	mA
ESD	Human body model	±3	kV
	Machine model	±300	V
P_D	Power dissipation	Internally limited	mW
T_{STG}	Storage temperature range	-65 to 150	°C
T_{OP}	Max. junction temperature	150	°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 3. Thermal data

Symbol	Parameter	Value	Unit
R_{thJA}	Thermal resistance junction-ambient	255	°C/W
R_{thJC}	Thermal resistance junction-case	81	°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 4. **Electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{IN}	Operating input voltage	I_{OUT} = 0	1.5		5.5	V
		-40 °C < T_J < 125 °C, I_{OUT} = 150 mA	1.55		5.5	
V_{OUT}	V_{OUT} accuracy	I_{OUT} = 1 mA	-2		2	%
		I_{OUT} = 1 mA, V_{OUT} < 1 V	-20		+20	mV
		I_{OUT} = 1 mA, -40 °C < T_J < 125 °C	-3		3	%
$\Delta V_{OUT-LINE}$	Static line regulation	V_{OUT} +1 V ≤ V_{IN} ≤ 5.5 V, I_{OUT} = 1 mA		±0.01		%/V
$\Delta V_{OUT-LOAD}$	Static load regulation	I_{OUT} = 1 mA to 150 mA		±0.002		%/mA
V_{DROP}	Dropout voltage [(1)]	I_{OUT} = 150 mA		112		mV
		I_{OUT} = 150 mA, -40 °C < T_J < 125 °C			300	
e_N	Output noise voltage	10 kHz to 100 kHz, I_{OUT} = 10 mA, V_{OUT} = 0.8 V		75		µV_{RMS}
SVR	Supply voltage rejection V_{OUT} = 0.8 V	V_{IN} = V_{OUTNOM} + 1 V +/-V_{RIPPLE} V_{RIPPLE} = 0.1 V, frequency = 1 kHz I_{OUT} = 10 mA		40		dB
		V_{IN} = V_{OUTNOM} + 1 V +/-V_{RIPPLE} V_{RIPPLE} = 0.1 V, frequency =10 kHz I_{OUT} = 1 mA		30		
		V_{IN} = V_{OUTNOM} + 1 V +/-V_{RIPPLE} V_{RIPPLE} = 0.1 V, frequency = 100 kHz I_{OUT} = 1 mA		15		
I_Q	Quiescent current	I_{OUT} = 0		1.0	1.7	µA
		I_{OUT} = 0 to 150 mA, -40 °C < T_J < 125 °C		1.4	2.4	
I_{OFF}	Shutdown current [(2)]	V_{IN} input current in OFF mode: V_{EN} = GND, -40 °C < T_J < 125 °C		1	200	nA
I_{SC}	Short-circuit current	R_L = 0	250	350		mA
V_{EN}	Enable input logic low	V_{IN} = 1.5 V to 5.5 V			0.4	V
	Enable input logic high	V_{IN} = 1.5 V to 5.5 V	0.7			V
I_{EN}	Enable pin input current	V_{EN} = 5.5 V		1	200	nA
T_{ON}	Turn-on time [(3)]	V_{OUT} = 0.8 V, I_{OUT} = 150 mA		160		µs
T_{SHDN}	Thermal shutdown			170		°C
	Hysteresis			15		

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{OUT}	Output capacitor	Capacitance (see typical performance characteristics for stability)	0.47		10	µF
	ESR		0.056		6	Ω

1. *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 1.5 V.*

2. *During shutdown and at no load, P-channel leakage current flowing through the internal resistor divider causes the V_{OUT} rise.*

3. *Turn-on time is the time measured between the enable input just exceeding V_{EN} high value and the output voltage just reaching 95% of its nominal value.*

6 Typical performance characteristics

Figure 4. Output voltage vs. temperature
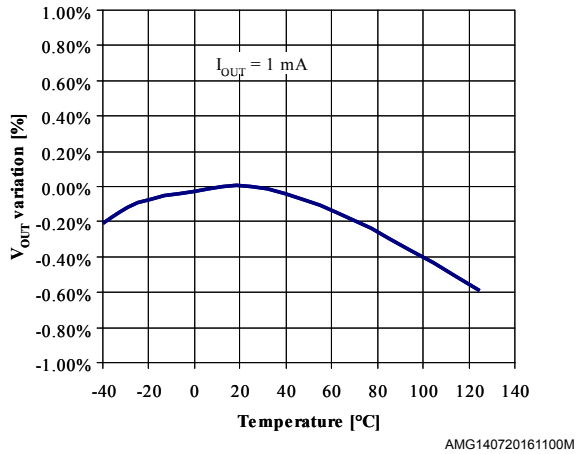
AMG140720161100M

Figure 5. Output voltage vs. input voltage (V_{OUT} = 0.8 V)
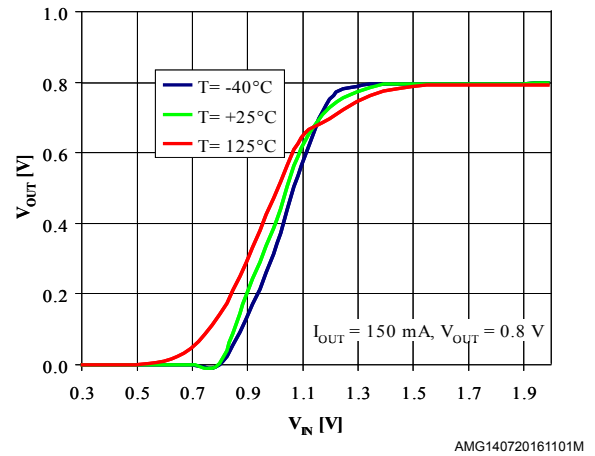
AMG140720161101M

Figure 6. Output voltage vs. input voltage (V_{OUT} = 3.3 V)
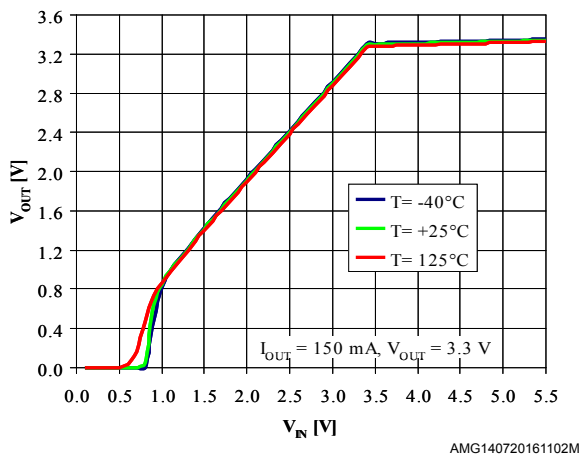
AMG140720161102M

Figure 7. Dropout voltage vs. temperature
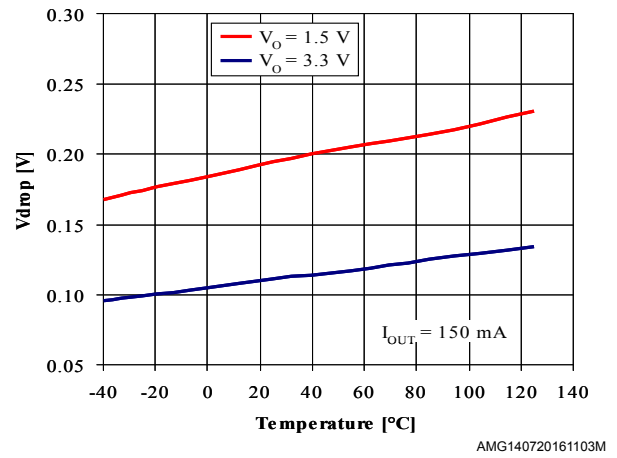
AMG140720161103M

Figure 8. Dropout voltage vs. temperature
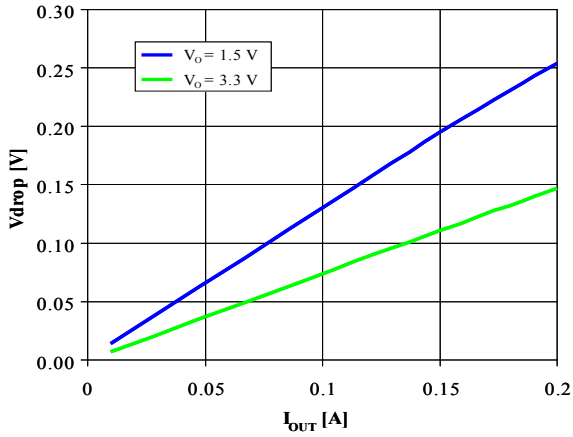
AMG140720161104M

Figure 9. Quiescent current vs. temperature
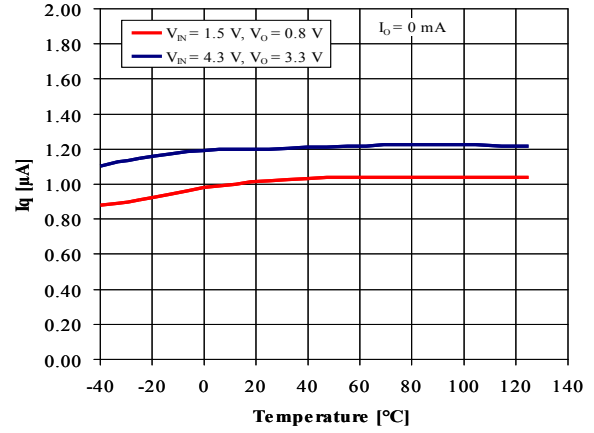
AMG140720161105M

Figure 10. Supply voltage rejection vs. frequency
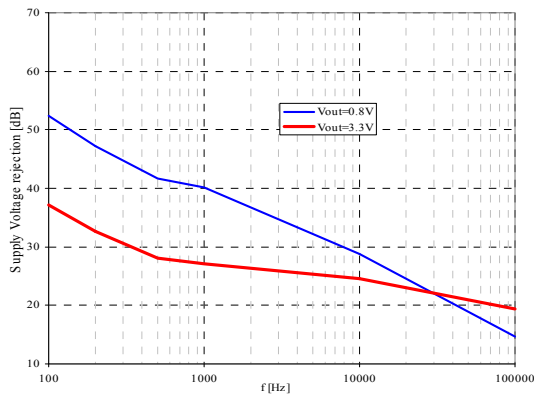
AMG190720161100M

Figure 11. Supply voltage rejection vs. I_{OUT}
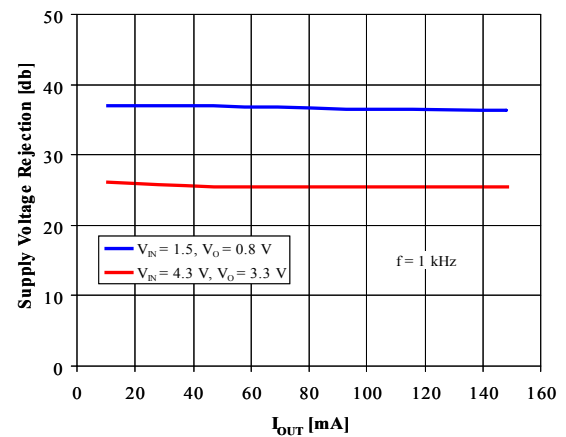
AMG190720161101M

Figure 12. Quiescent current vs. input voltage
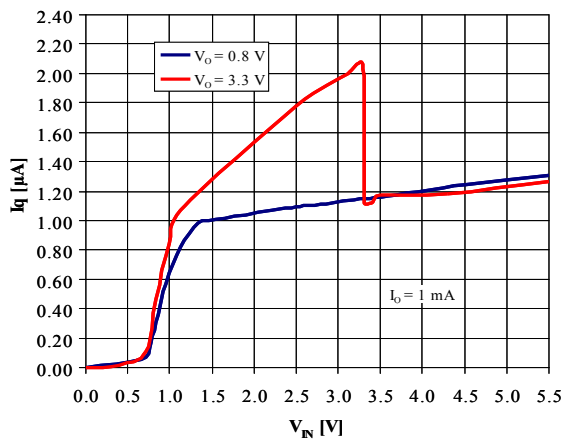
AMG190720161102M

Figure 13. Quiescent current vs. output current
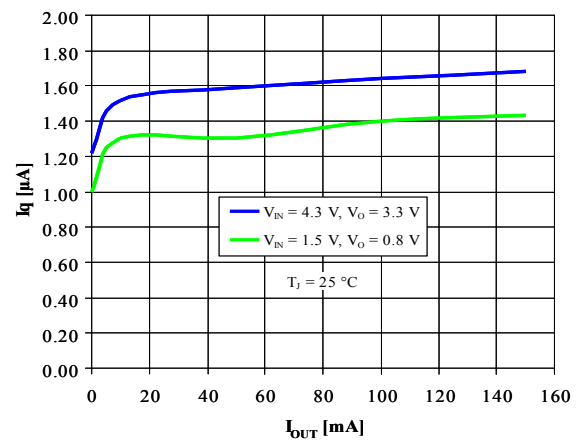
AMG190720161103M

Figure 14. Output noise voltage vs. frequency
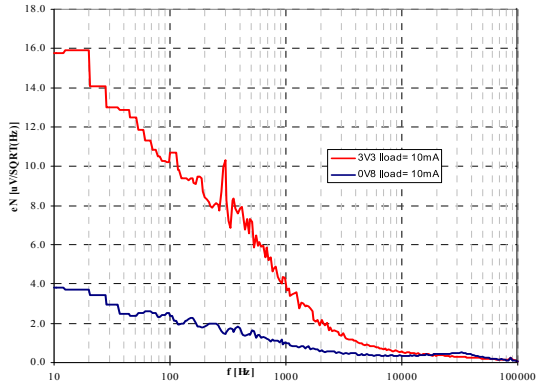
AMG190720161104M

Figure 15. C_OUT stability region
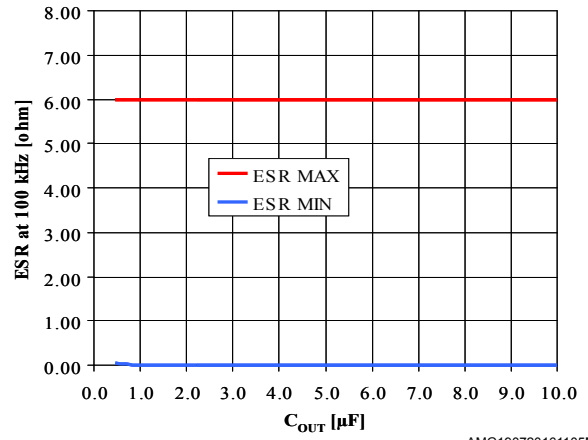
AMG190720161105M

Figure 16. Start-up transient
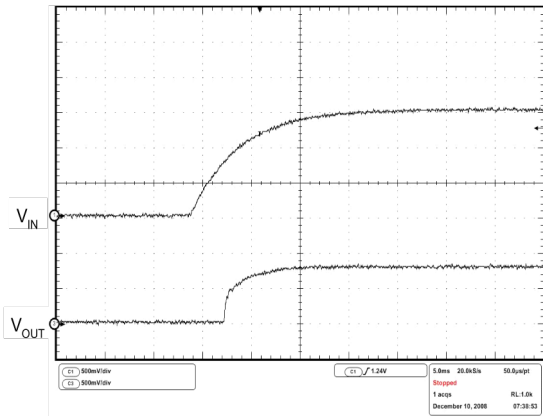
V_{IN} from 0 to 1.5 V, V_{EN} tied to V_{IN}, no load C_{OUT} = 1 µF

AMG190720161106M

Figure 17. Enable transient
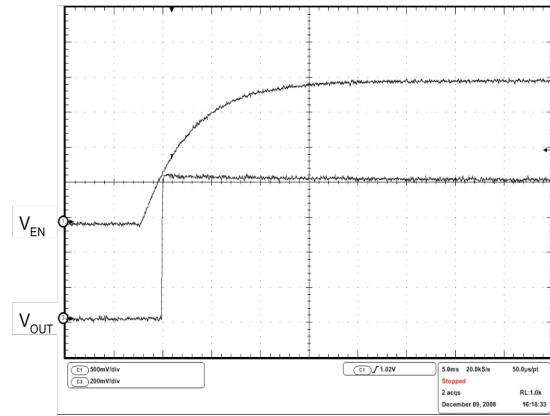
V_{IN} = 1.5 V; V_{EN} from 0 to 2 V, no load, T = 25 °C

AMG190720161107M

7 Package information

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.

7.1 SOT23-5L mechanical data

Figure 18. SOT23-5L package outline
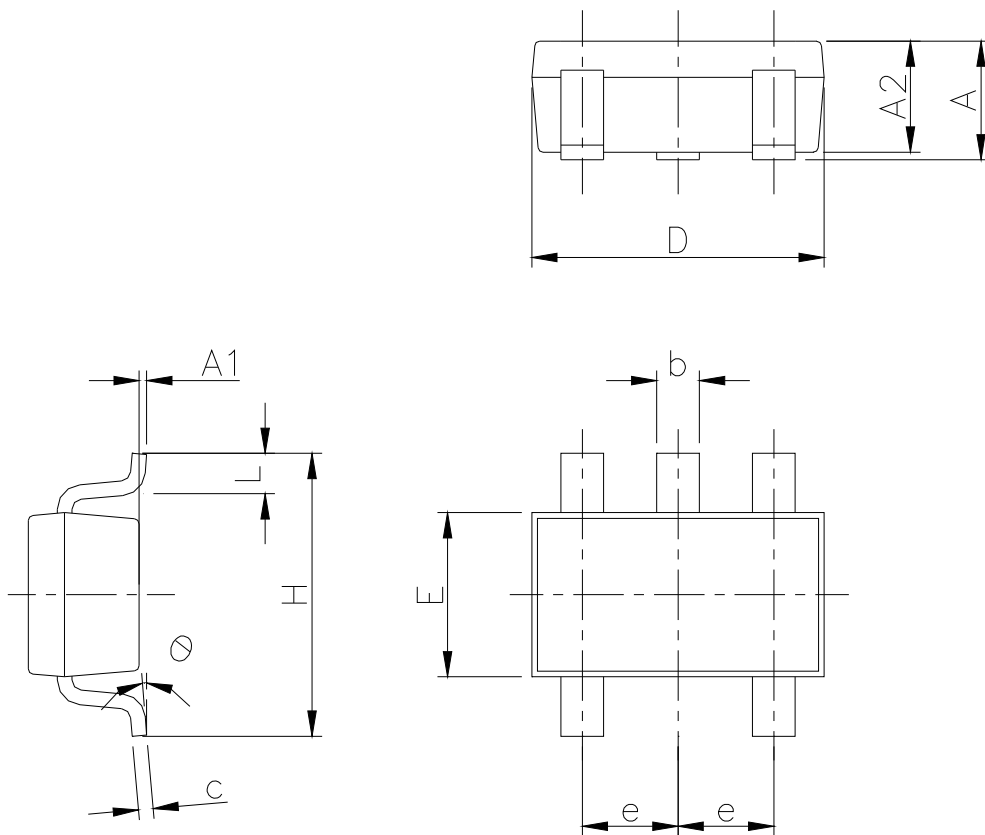
7049676_k

Table 5. **SOT23-5L package mechanical data**

Dim.	mm		
	Min.	**Typ.**	**Max.**
A	0.90		1.45
A1	0		0.15
A2	0.90		1.30
b	0.30		0.50
c	0.09		0.20
D		2.95	
E		1.60	
e		0.95	
H		2.80	
L	0.30		0.60
θ	0°		8°

Figure 19. **SOT23-5L recommended footprint**
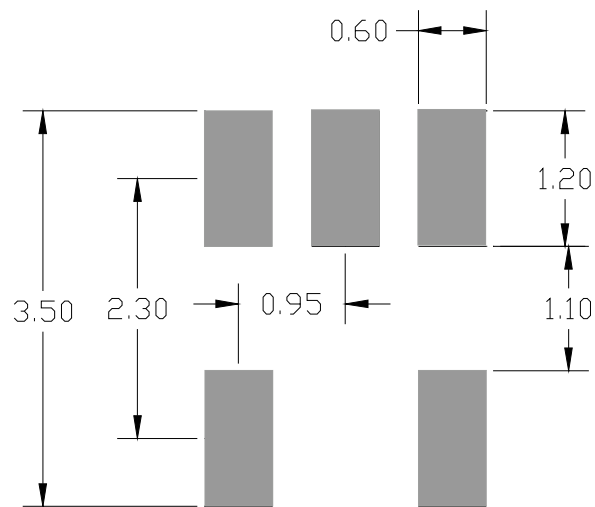
Note: Dimensions are in mm

7.2 SOT23-5L packing information

Figure 20. SOT23-5L tape and reel outline
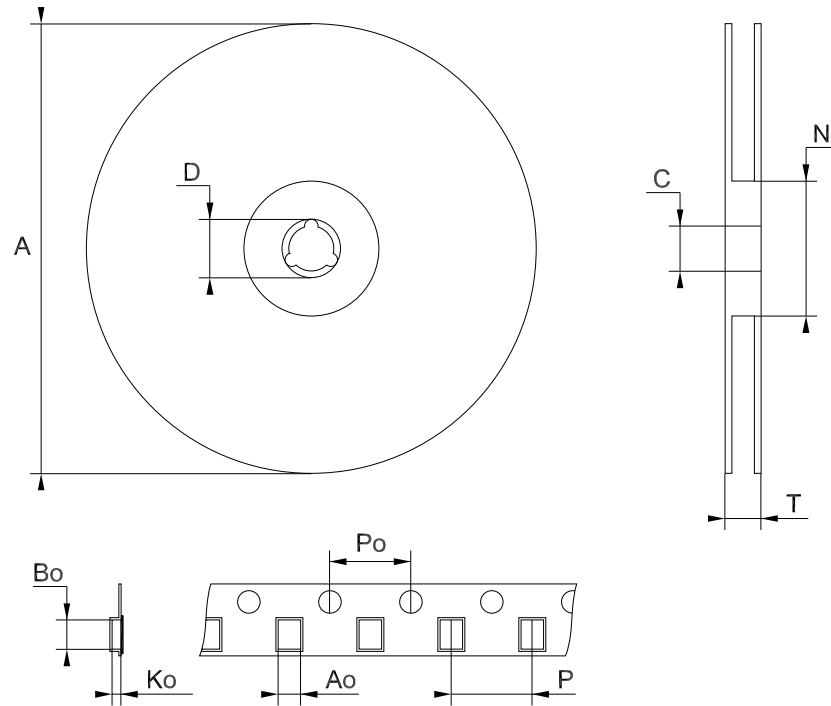
Note: Drawing not in scale

Table 6. SOT23-5L tape and reel mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A			180
C	12.8	13.0	13.2
D	20.2		
N	60		
T			14.4
Ao	3.13	3.23	3.33
Bo	3.07	3.17	3.27
Ko	1.27	1.37	1.47
Po	3.9	4.0	4.1
P	3.9	4.0	4.1

8 Ordering information

Table 7. Order code

Order code	Output voltage	Package	Marking
STLQ015M12R	1.2 V	SOT23-5L	1512
STLQ015M15R	1.5 V		1515
STLQ015M18R	1.8 V		1518
STLQ015M20R	2.0 V		1520
STLQ015M21R	2.1 V		1521
STLQ015M25R	2.5 V		1525
STLQ015M28R	2.8 V		1528
STLQ015M30R	3.0 V		1530
STLQ015M31R	3.1 V		1531
STLQ015M33R	3.3 V		1533

Revision history

Table 8. **Document revision history**

Date	Revision	Changes
23-Mar-2010	1	Initial release.
20-Jan-2011	2	Modified: Table 5 on page 13 and Figure 18. Added: Figure 19.
11-Sep-2012	3	Added: new order codes STLQ015XG12R, STLQ015XG15R and STLQ015XG18R to the device summary table.
17-Feb-2014	4	Changed the part number STLQ015xx to STLQ015. Changed the title in cover page. Updated Description and Table : in cover page. Changed typ. value of I_Q parameter in Table 4: Electrical characteristics. Minor text changes.
03-Jul-2015	5	Added package SOT23-5L. Updated Table 1.: Pin description, Table 3.: Thermal data and Figure 2.: Pin configuration (top view) Updated 8: Order code. Updated Section 7: Package information. Minor text changes.
02-Sep-2016	6	Updated Section 8: "Ordering information". Minor text changes.
14-Feb-2020	7	Added new part number STLQ015M20R in Table 7.

Contents

List of tables

List of figures

IMPORTANT NOTICE – PLEASE READ CAREFULLY