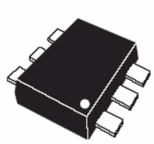
STLQ015

150 mA, ultra low quiescent current linear voltage regulator

Datasheet - production data



SOT666

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
- Package: SOT666-6L
- Temperature range: from -40 °C to 125 °C

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.

Table 1. Device summary

Order codes	Output voltages
STLQ015XG12R	1.2 V
STLQ015XG15R	1.5 V
STLQ015XG18R	1.8 V
STLQ015XG25R	2.5 V
STLQ015XG28R	2.8 V
STLQ015XG30R	3.0 V
STLQ015XG31R	3.1 V
STLQ015XG33R	3.3 V

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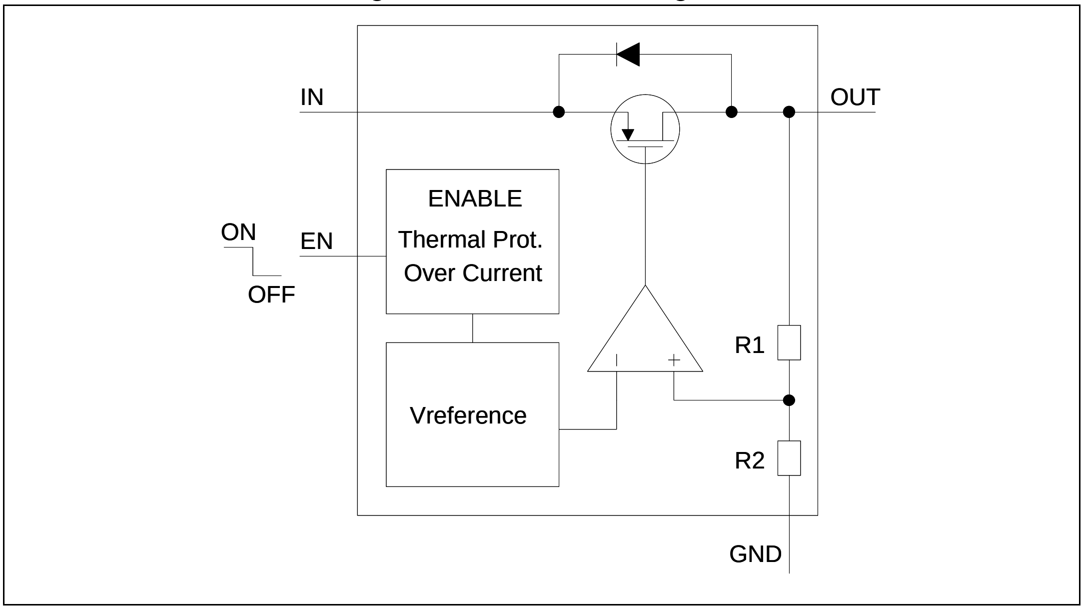
1 Block diagram

Figure 1. Device block diagram



2 Pin configuration and description

Figure 2. Pin configuration (top view)

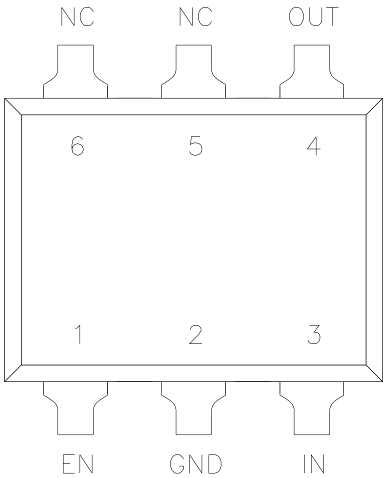
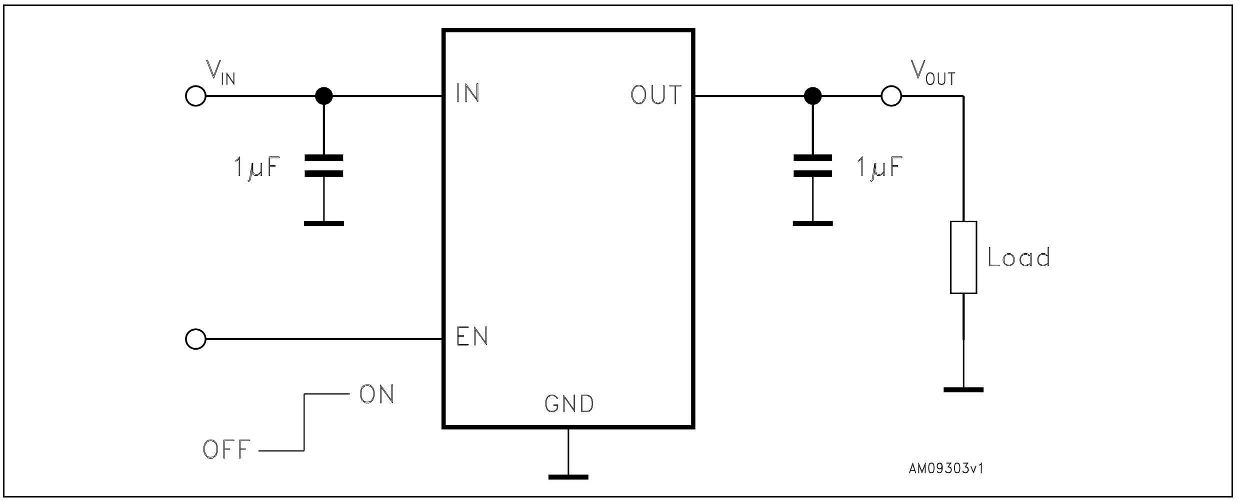


Table 2. Pin description

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

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_{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 4. Thermal data

Symbol	Parameter	SOT666	Unit
R_{thJA}	Thermal resistance junction-ambient	132	°C/W
R_{thJC}	Thermal resistance junction-case	56	°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

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

Table 5. Electrical characteristics (continued)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
T_{SHDN}	Thermal shutdown			170		°C
	Hysteresis			15		
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

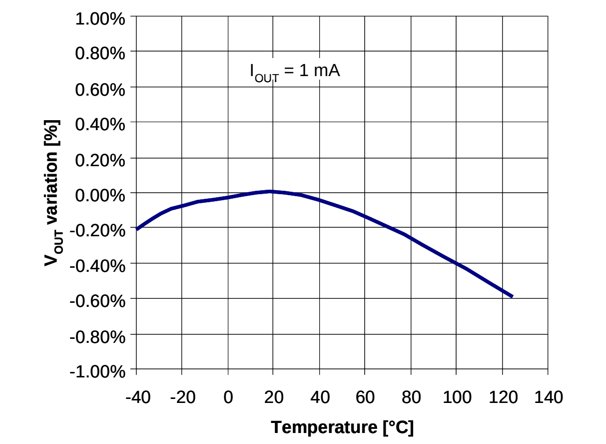


Figure 5. Output voltage vs. input voltage (V_{OUT} = 0.8 V)

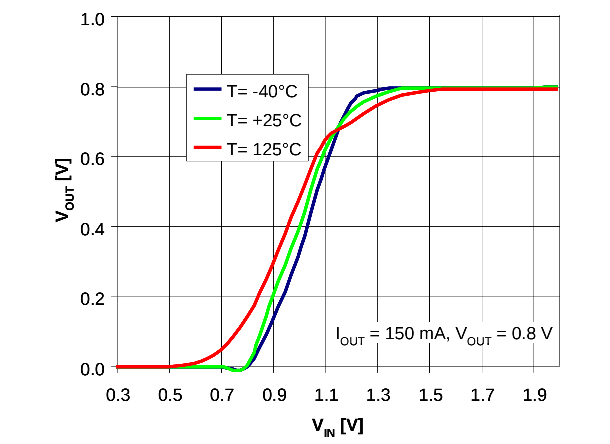


Figure 6. Output voltage vs. input voltage (V_{OUT} = 3.3 V)

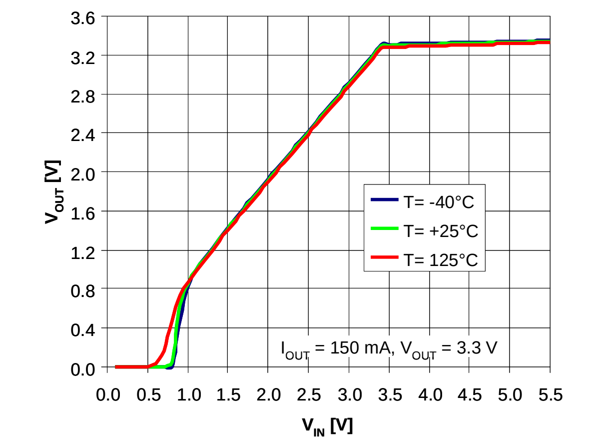


Figure 7. Dropout voltage vs. temperature

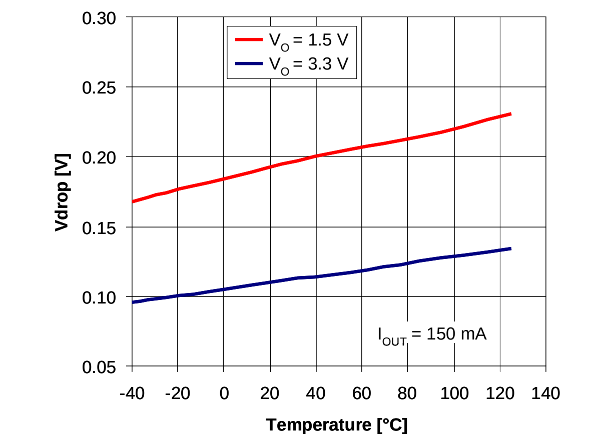


Figure 8. Dropout voltage vs. output current

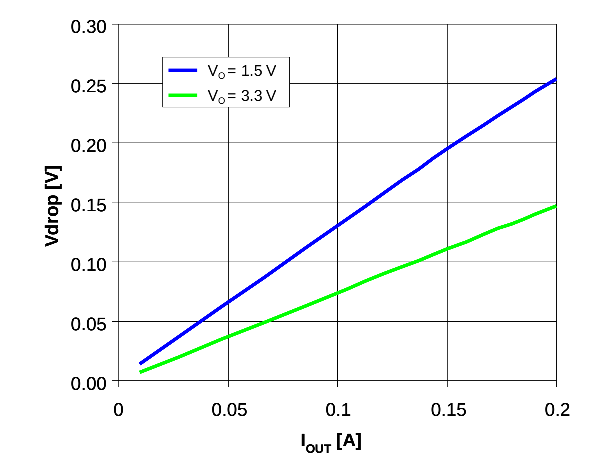


Figure 9. Quiescent current vs. temperature

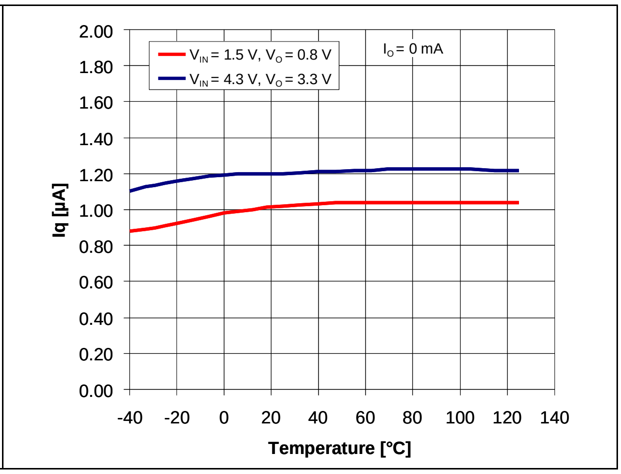


Figure 10. Supply voltage rejection vs. frequency

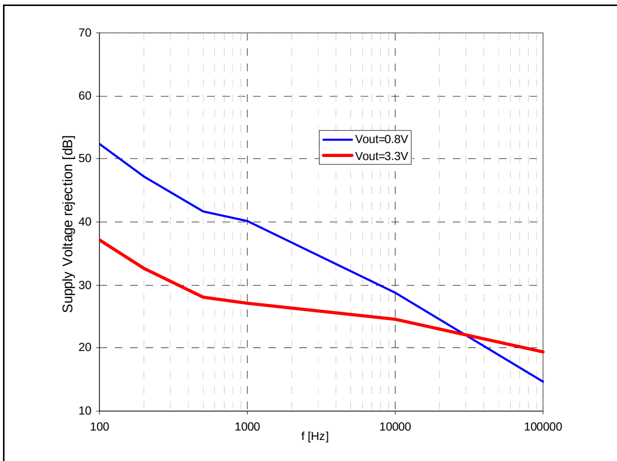


Figure 11. Supply voltage rejection vs. I_{OUT}

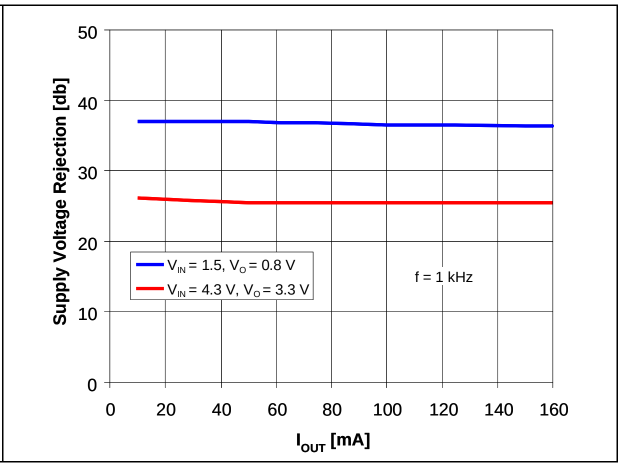


Figure 12. Quiescent current vs. input voltage

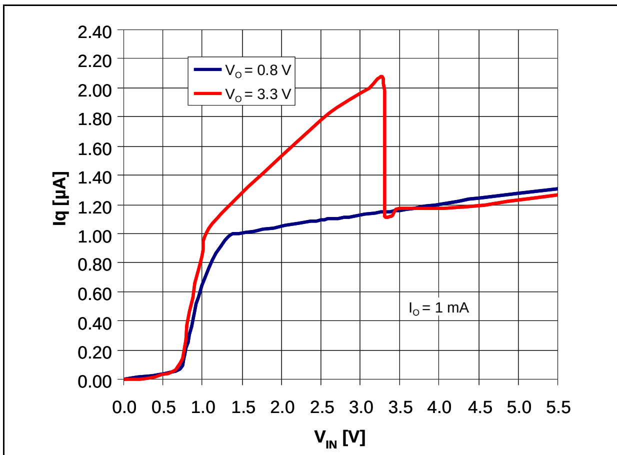


Figure 13. Quiescent current vs. output current

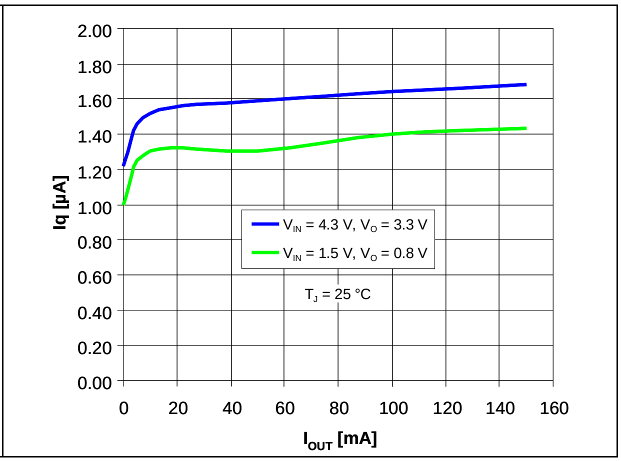


Figure 14. Output noise voltage vs. frequency

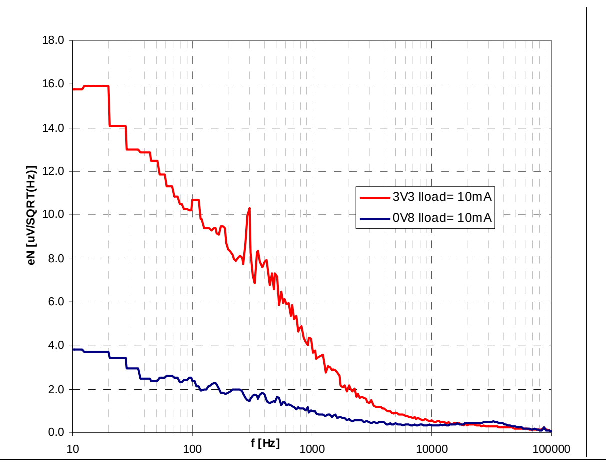


Figure 15. C_{OUT} stability region

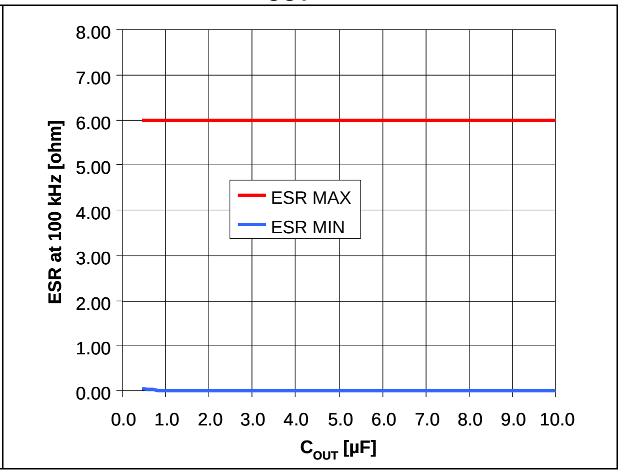
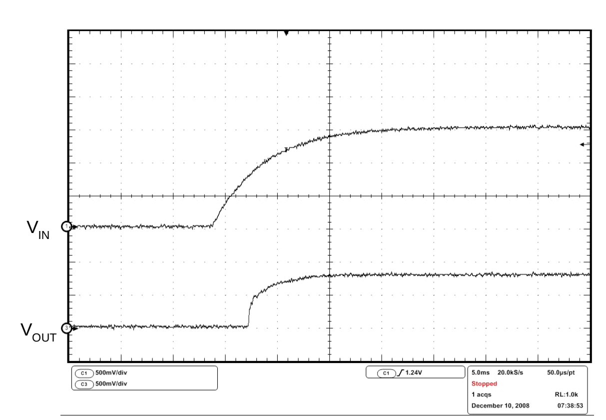
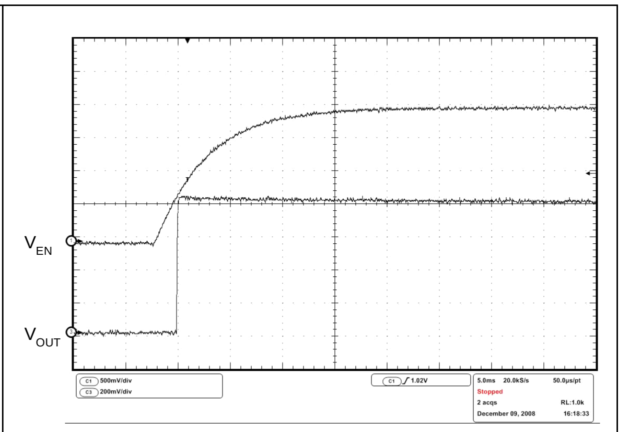


Figure 16. Start-up transient



V_{IN} from 0 to 1.5 V, V_{EN} tied to V_{IN}, no load C_{OUT} = 1 µF

Figure 17. Enable transient



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

7 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 18. SOT666 drawings

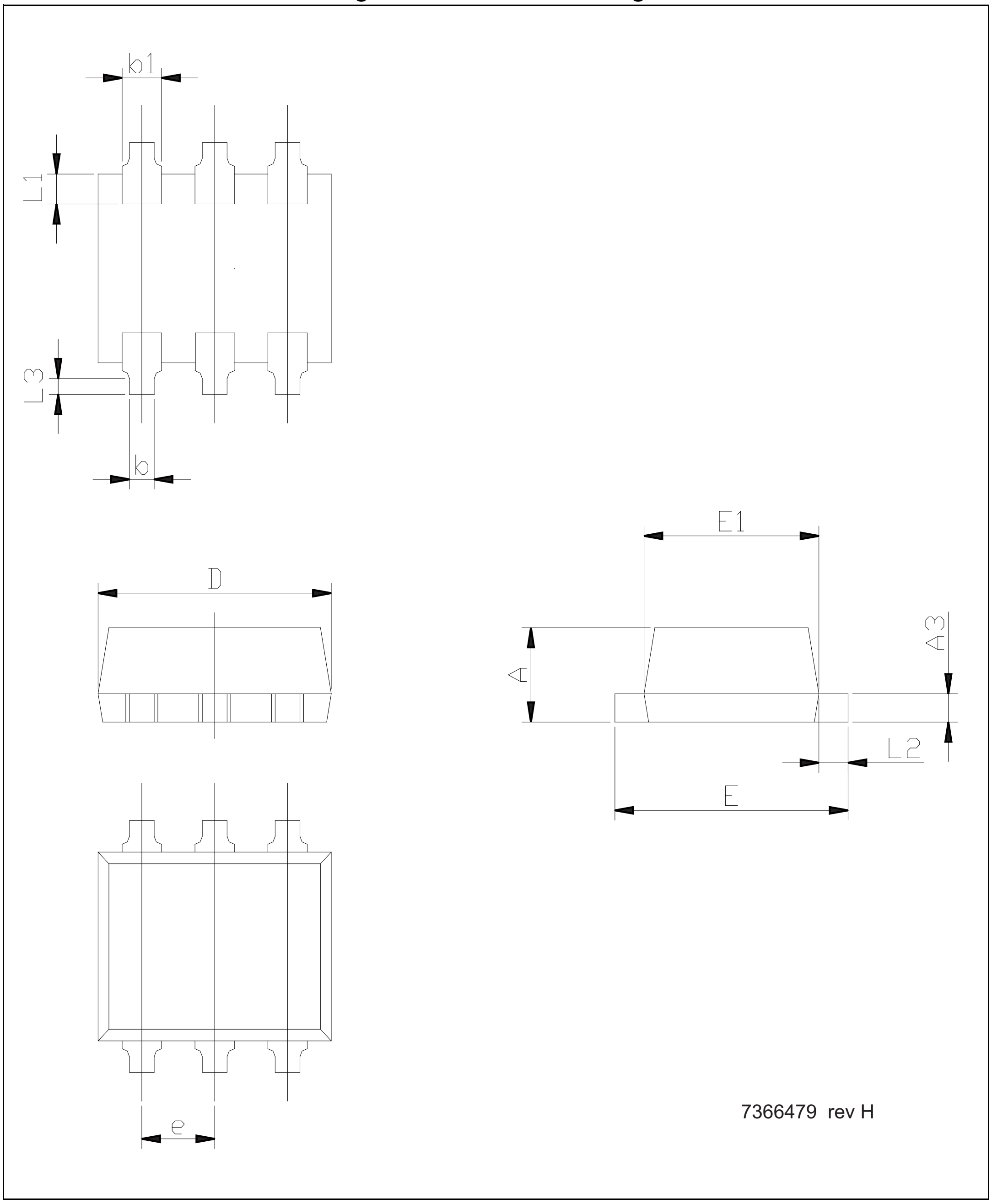
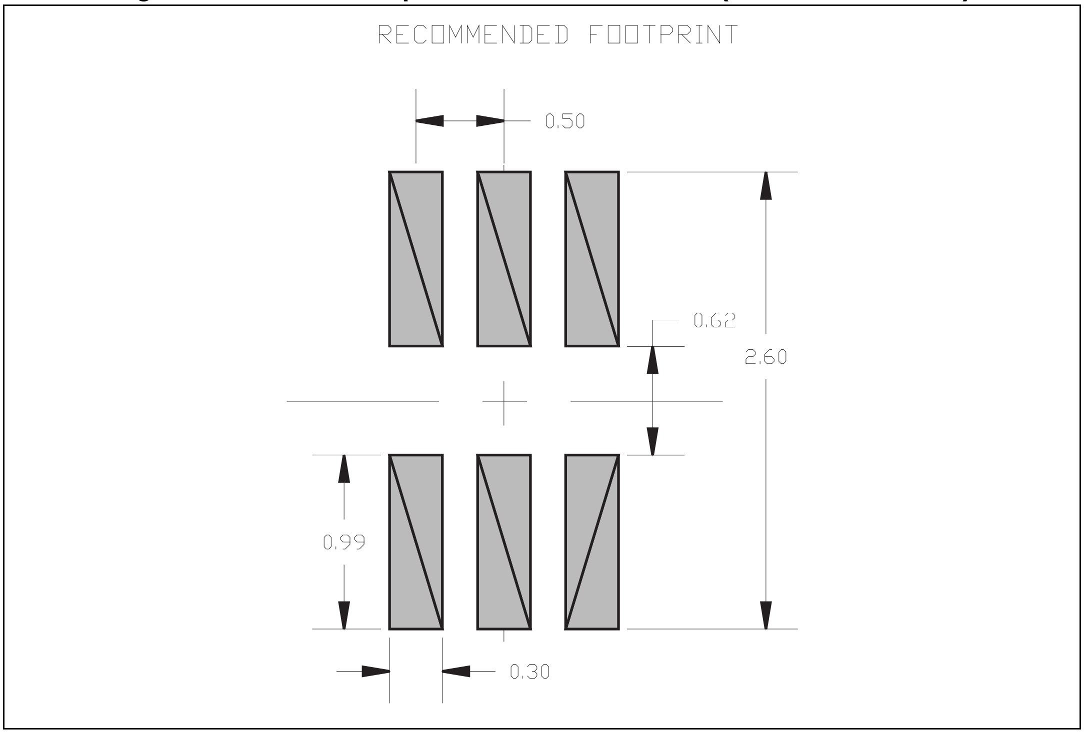


Table 6. SOT666 mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	0.45		0.60
A3	0.08		0.18
b	0.17		0.34
b1	0.19	0.27	0.34
D	1.50		1.70
E	1.50		1.70
E1	1.10		1.30
e		0.50	
L1		0.19	
L2	0.10		0.30
L3		0.10	

Figure 19. SOT666 footprint recommended data (dimensions in mm)



8 Revision history

Table 7. Document revision history

Date	Revision	Changes
23-Mar-2010	1	Initial release.
20-Jan-2011	2	Modified: *Table 6 on page 14* 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 1: Device summary* in cover page. Changed typ. value of I_Q parameter in *Table 5: Electrical characteristics*. Minor text changes.