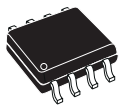
L9857

High voltage high-side driver

Features

- High voltage rail up to 450V
- dV/dt immunity ±50V/nsec in full temperature range
- Driver current capability:
  500mA SOURCE,
  500mA SINK
- Switching times 100ns rise/fall with 2.5nF load
- CMOS/TTL Schmitt trigger inputs with hysteresis and pull down
- Under voltage lock out
- Clamping on V_{CC}
- Non inverting input
- Reset circuitry
- SO8 package



SO-8

It has the capability of driving N Channel Power MOS transistors. The Upper (Floating) Section is enabled to work with voltage Rail up to 450V. The Logic Inputs are CMOS/TTL compatible for ease of interfacing with controlling devices..

Description

The L9857 is an high voltage device, manufactured with the BCD "OFF-LINE" technology.

Order codes

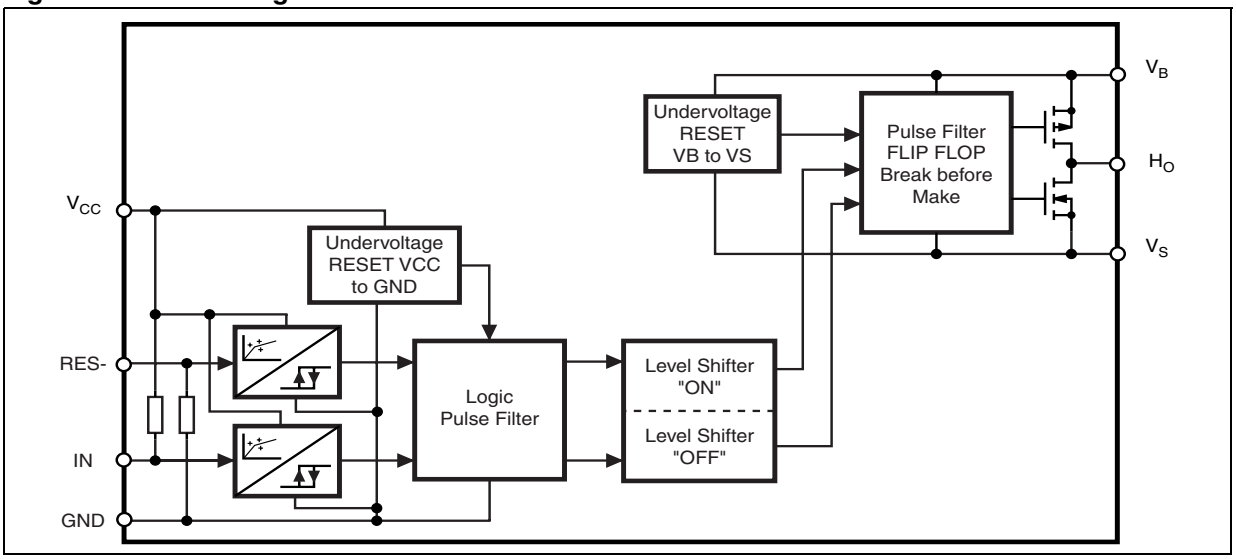
Part number	Op. Temp range, °C	Package	Packing
L9857	-40 to +125	SO-8	Tube
L9857-TR	-40 to +125	SO-8	Tape & Reel

Content

1 Block diagram & pin description

1.1 Block diagram

Figure 1. Block diagram



1.2 Pin description

Figure 2. Pin connection (Top view)

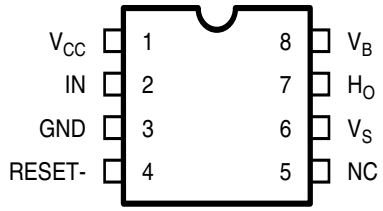


Table 1. Pin Function

Pin #	Pin Name	Description
1	V_{CC}	Driver Supply, typically 17V
2	IN	Driver Control Signal Input (positive logic)
3	GND	Ground
4	RESET-	Driver Enable Signal Input (negative logic)
5	NC	No connection (no bondwire)
6	V_S	MOSFET Source Connection
7	H_O	MOSFET Gate Connection
8	V_B	Driver Output Stage Supply

2 Electrical specifications

2.1 Thermal data

Table 2. Thermal Data

Symbol	Parameter	Value	Unit
$R_{th(j\text{-}amb)}$	Thermal Resistance Junction to ambient Max.	150	°C/W

2.2 Absolute maximum ratings

Absolute maximum ratings indicate sustained limits beyond which damage to the device may occur. All voltage parameters are absolute voltages referenced to GND, all currents are defined positive into any lead. This is a stress only rating and operation of the device at these or any conditions exceeding those indicated in the operational sections of this specifications is not implied.

Table 3. Absolute maximum ratings

Parameter		Value		Units
Symbol	Definition	Min.	Max.	
V_{BS}	High Side Floating Supply Voltage	-0.3	20	V
V_B	High Side Driver Output Stage Voltage	-0.3	300	V
V_S	High Side Floating Supply Offset Voltage	V_B – 20	300	V
VH_O	Output Voltage Gate Connection	V_S - 0.3	V_B + 0.3	V
V_{CC}	Supply Voltage	-0.3	20	V
V_{IN}	Input Voltage	-0.3	V_{CC} + 0.3	V
I_{IN}	Input Injection Current. Full function, no latch-up; (guaranteed by design). Test at 10V and 17V on Eng. Samples.	---	+1	mA
V_{RES}	Reset Input Voltage	-0.3	V_{CC} + 0.3	V
V_{esd}	Electrostatic Discharge Voltage (Human body model)	2k		V
V_{CDM}	Charge Device Model CDM, EOS/ESD Ass. Std 5.3. Number of discharges per pin: 6	500		V
dV/dt	Allowable Offset Voltage Slew Rate	-50	50	V/nsec
T_J	Junction Temperature	-55	150	°C
T_{stg}	Storage Temperature	-55	150	
T_L	Lead Temperature (Soldering, 10 seconds) 3 times Bosch soldering profil acc. to Bosch soldering conditions, Gen. Spec.	-	300	

2.3 Recommended operating conditions

For proper operations the device should be used within the recommended conditions.

Table 4. Recommended operating conditions

Parameter		Value		Units
Symbol	Definition	Min.	Max.	
V_B	High Side Driver Output Stage Voltage -5V Transient 0.1µs	VS+10 (1)	VS+18	V
V_S	High Side Floating Supply Offset Voltage - 20V Transient 0.1µs	-5	300	V
VH_O	Output Voltage Gate Connection	V_S	V_B	V
V_{CC}	Supply Voltage	10	18	V
V_{IN}	Input Voltage	0	V_{CC}	V
V_{RES}	Reset Input Voltage	0	V_{CC}	V
F_S	Switching Frequency		200	kHz
T_{amb}	Ambient Temperature	-40	125	°C

1. Reset-Logic functional for V_B-V_S=2V, independent from VCC-level

2.4 Electrical characteristics

Table 5. Electrical characteristics

Unless otherwise specified, V_{CC} = 15V, V_{BS} = 15V, V_S = 0V, IN = 0V, RES = 5V, load R = 50Ω, C = 2.5nF. Unless otherwise noted, these specifications apply for an operating junction temperature range of -40°C ≤ T_j ≤ 125°C.

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
V_{CC} Supply						
V_{CCUV}	V_{CC} Supply Undervoltage	V_{CC} rising from 0V V_{CC} dropping from 10V	7.2		9.6	V
$V_{CCUVHYS}$	V_{CC} Supply Undervoltage Lockout Hysteresis		0.02	0.2	0.4	V
td_{UVCC}	Undervoltage Lockout Response Time	V_{CC} steps either from 10V to 6V or from 6V to 10V	0.5		20	µs
I_{QCC}	V_{CC} Supply Current				400	µA
V_{BS} Supply						
V_{BSUV}	V_{BS} Supply Undervoltage	V_{BS} rising from 0V V_{BS} dropping from 10V	7.2		9.6	V
td_{UVBS}	Undervoltage Lockout Response Time	V_{BS} steps either from 10V to 6V or from 6V to 10V	0.5		20	µs
$V_{BSUVHYS}$	V_{BS} Supply Undervoltage Lockout Hysteresis		0.02	0.2	0.4	V

Table 5. Electrical characteristics (continued)
Unless otherwise specified, V_{CC} = 15V, V_{BS} = 15V, V_S = 0V, IN = 0V, RES = 5V, load R = 50Ω, C = 2.5nF. Unless otherwise noted, these specifications apply for an operating junction temperature range of -40°C ≤ T_j ≤ 125°C.

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
I_{QBS1}	V_{BS} Supply Current	static mode, V_{BS} = 10V, IN = 0V or 5V			100	µA
I_{QBS2}	V_{BS} Supply Current	static mode, V_{BS} = 18V, IN = 0V or V_{CC}			200	µA
ΔV_{BS}	V_{BS} Drop Due to Output Turn-On	V_{BS} = 17V, C_{BS} = 1µF, td_{IG-IN} = 3µs, t_{TEST} = 100µs			210	mV
Gate Driver Characteristics						
I_{PKSo1}	Peak Output Source Current	V_{BS} = 10V, T_j = 25°C PW ≤ 10µs	120	250		mA
I_{PKSo2}	Peak Output Source Current	V_{BS} = 10V PW ≤ 10µs	70	150		
I_{PKSo3}	Peak Output Source Current	V_{BS} = 17V, T_j = 25°C PW ≤ 10µs	250	500		
I_{PKSo4}	Peak Output Source Current	V_{BS} = 17V, PW ≤ 10µs	150	300		
IHOH,off	HOH off-state leakage current	guaranteed by design			1	µA
t_{r1}	Output Rise Time	V_{BS} = 10V, T_j = 25°C		0.2	0.4	µs
t_{r2}	Output Rise Time	V_{BS} = 10V		0.3	0.5	
t_{r3}	Output Rise Time	V_{BS} = 17V, T_j = 25°C		0.1	0.2	
t_{r4}	Output Rise Time	V_{BS} = 17V		0.15	0.3	
I_{PKSi1}	Peak Output Sink Current	IN = V_{CC}, T_j = 25°C V_{BS} = 10V, PW < 10µs	120	250		mA
I_{PKSi2}	Peak Output Sink Current	IN = V_{CC}, V_{BS} = 10V, PW < 10µs	70	150		
I_{PKSi3}	Peak Output Sink Current	IN = V_{CC}, T_j = 25°C V_{BS} = 17V, PW < 10µs	250	500		
I_{PKSi4}	Peak Output Sink Current	IN = V_{CC}, V_{BS} = 17V, PW < 10µs	150	300		
t_{f1}	Output Fall Time	V_{BS} = 10V, T_j = 25°C		0.2	0.4	µs
t_{f2}	Output Fall Time	V_{BS} = 10V		0.3	0.5	µs
t_{f3}	Output Fall Time	V_{BS} = 17V, T_j = 25°C		0.1	0.2	µs

Table 5. Electrical characteristics (continued)
Unless otherwise specified, V_{CC} = 15V, V_{BS} = 15V, V_S = 0V, IN = 0V, RES = 5V, load R = 50Ω, C = 2.5nF. Unless otherwise noted, these specifications apply for an operating junction temperature range of -40°C ≤ T_j ≤ 125°C.

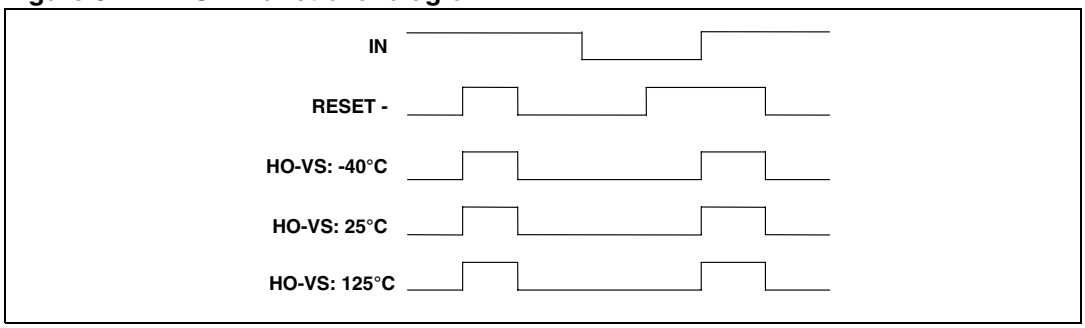
Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
t_{f4}	Output Fall Time	V_{BS} = 17V		0.15	0.3	µs
t_{plh}	Input-to-Output Turn-On Propogation Delay (50% input level to 10% output level)			0.1	0.3	
t_{phl}	Input-to-Output Turn-Off Propogation Delay (50% input level to 90% output level)			0.1	0.2	
t_{phl_res}	RES-to-Output Turn-Off Propogation Delay (50% input level to 90% output levels)			0.1	0.3	
t_{plh_res}	RES-to-Output Turn-On Propogation Delay (50% input level to 10% output levels)			0.1	0.8	
Input Characteristics						
V_{INH}	High Logic Level Input Threshold		9.5			V
V_{INL}	Low Logic Level Input Threshold				6	
R_{IN}	High Logic Level Input Resistance **(Pull-down resistor)**		60		300	kΩ
I_{IN}	Low Logic Level Input Current	V_{IN} = 0			5	µA
V_{H_RES}	High Logic Level RES Input Threshold	Reset signal comes from a 5V system!	3.5			V
V_{L_RES}	Low Logic Level RES Input Threshold	Reset signal comes from a 5V system!			1.4	
R_{RES}	High Logic Level RES Input Resistance **(Pull-down resistor)**	Reset signal comes from a 5V system with pull-up resistor 3.8K to 5V. (1)	60		300	kΩ
I_{RES}	Low Logic Level Input Current	V_{RES} = 0			5	µA

1. 4 HS-driver reset- inputs and other IC with their input pull-down resistors are connected in parallel with the RESET wire. The enable input RES- is an active low input, that means a logic low turns the external Power MOSFET off. The input circuitry has to make sure, that the MOSFET is off, when the pin is open or floating. In the application the RES- pin is tied to a bipolar open collector transistor or MOSFET open drain transistor with pull-up resistor 3.8K to +5V together with other RES- inputs of other IC.

2.5 RESET Functional Diagram

The diagram is guaranteed for the following condition.
V_{CC} = 10V; V_{BS} = 10V @-40°C, V_{CC} = 17V; V_{BS} = 17V @+25°C and 125°C

Figure 3. RESET functional diagram



3 Timing diagrams

Figure 4. Input/output timing diagram

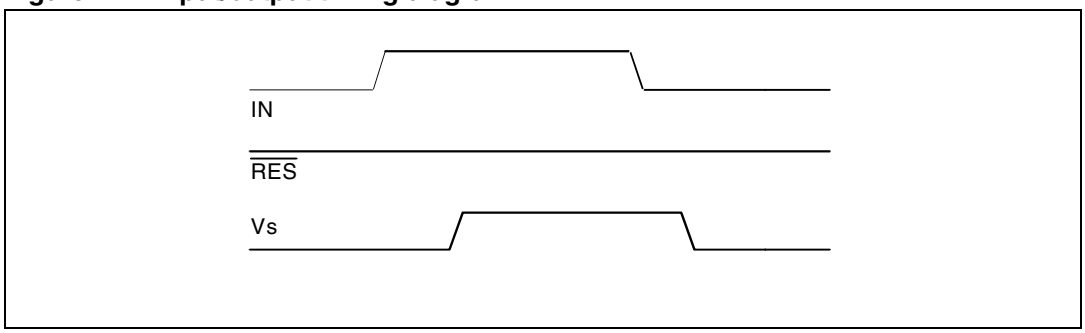
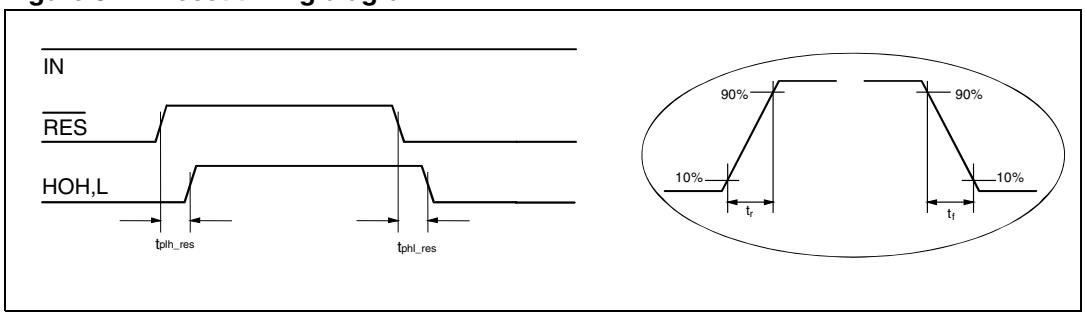


Figure 5. Reset timing diagram



4 Package information

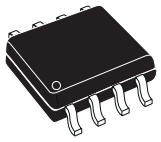
In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect. The category of second Level Interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com.

Figure 6. SO-8 Mechanical Data & Package Dimensions

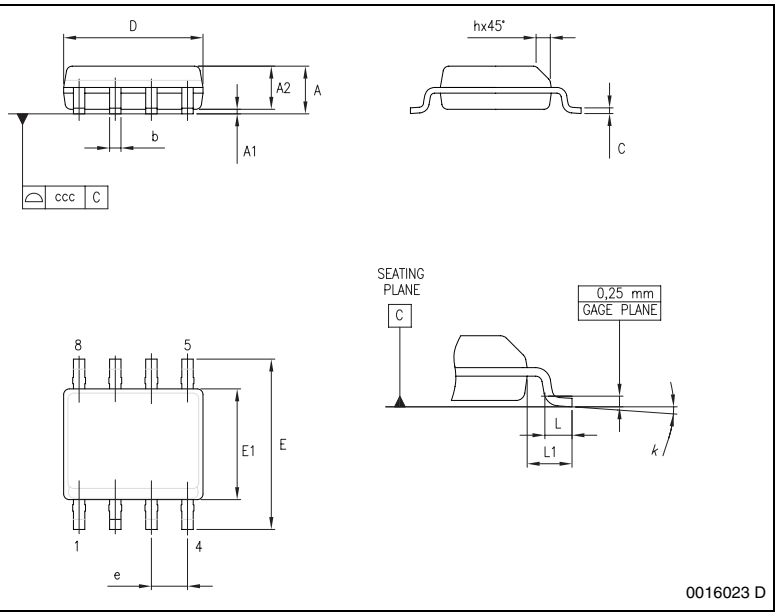
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.750			0.0689
A1	0.100		0.250	0.0039		0.0098
A2	1.250			0.0492		
b	0.280		0.480	0.0110		0.0189
c	0.170		0.230	0.0067		0.0091
D (1)	4.800	4.900	5.000	0.1890	0.1929	0.1969
E	5.800	6.000	6.200	0.2283	0.2362	0.2441
E1(2)	3.800	3.900	4.000	0.1496	0.1535	0.1575
e		1.270			0.0500	
h	0.250		0.500	0.0098		0.0197
L	0.400		1.270	0.0157		0.0500
L1		1.040			0.0409	
k	0°		8°	0°		8°
ccc			0.100			0.0039

Notes: 1. Dimensions D does not include mold flash, protrusions or gate burrs. Mold flash, potrusions or gate burrs shall not exceed 0.15mm in total (both side).
2. Dimension "E1" does not include interlead flash or protrusions. Interlead flash or protrusions shall not exceed 0.25mm per side.

OUTLINE AND MECHANICAL DATA



SO-8



5 Revision history

Table 6. Document revision history

Date	Revision	Changes
20-Nov-2006	1	Initial release.

Please Read Carefully:

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST’s terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN ST’S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS EXPRESSLY APPROVED IN WRITING BY AN AUTHORIZED ST REPRESENTATIVE, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER’S OWN RISK.

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com