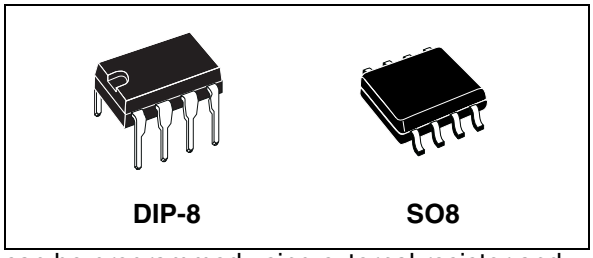
L6571

High voltage half bridge driver with oscillator

Features

- High voltage rail up to 600 V
- BCD off line technology
- 15.6 V Zener clamp on Vs
- Driver current capability:
  - Sink current = 270 mA
  - Source current = 170 mA
- Very low start up current: 150 mA
- Undervoltage lockout with hysteresis
- Programmable oscillator frequency
- Dead time 1.25 µs (L6571A) or 0.72 µs (L6571B)
- dV/dt immunity up to ±50 V/ns
- ESD protection



Description

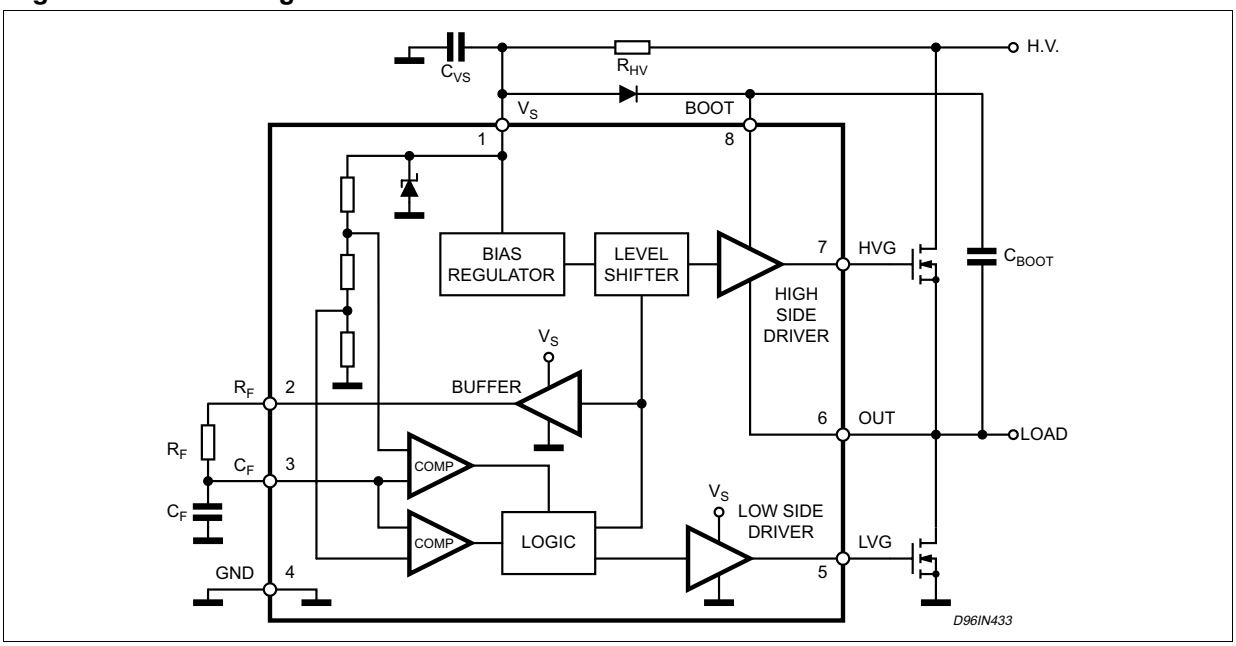
The device is a high voltage half bridge driver with built in oscillator. The frequency of the oscillator can be programmed using external resistor and capacitor.

The internal circuitry of the device allows it to be driven also by external logic signal.

The output drivers are designed to drive external nchannel power MOSFET and IGBT. The internal logic assures a dead time to avoid cross-conduction of the power devices.

Two version are available: L6571A and L6571B. They differ in the internal dead time: 1.25µs and 0.72 µs (typ.)

Figure 1. Block diagram



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1 Maximum ratings

1.1 Absolute maximum ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
I_S (1)	Supply current	25	mA
V_{CF}	Oscillator resistor voltage	18	V
V_{LVG}	Low side switch gate output	14.6	V
V_{OUT}	High side switch source output	-1 to V_{BOOT} -18	V
V_{HVG}	High side switch gate output	-1 to V_{BOOT}	V
V_{BOOT}	Floating supply voltage	618	V
$V_{BOOT/OUT}$	Floating supply vs OUT voltage	18	V
$dV_{BOOT/dt}$	VBOOT slew rate (Repetitive)	± 50	V/ns
$dV_{OUT/dt}$	VOUT slew rate (Repetitive)	± 50	V/ns
T_{stg}	Storage temperature	-40 to 150	°C
T_J	Junction temperature	-40 to 150	°C
T_{amb}	Ambient temperature (Operative)	-40 to 125	°C

1. The device has an internal zener clamp between GND and VS (typical 15.6 V).Therefore the circuit should not be driven by a DC low impedance power source.

Note: ESD immunity for pins 6, 7 and 8 is guaranteed up to 900 V (human body model)

1.2 Thermal data

Table 2. Thermal data

Symbol	Parameter	MDIP8	SO8	Unit
R_{thJA}	Thermal resistance junction-ambient max	100	150	°C/W

1.3 Recommended operating conditions

Table 3. Recommended operating conditions

Symbol	Parameter	Min.	Max.	Unit
V_S	Supply voltage	10	VCL	V
V_{BOOT}	Floating supply voltage	-	500	V
V_{OUT}	High side switch source output	-1	VBOOT -VCL	V
f_{out}	Oscillation frequency		200	kHz

2 Pin connection

Figure 2. Pin connection

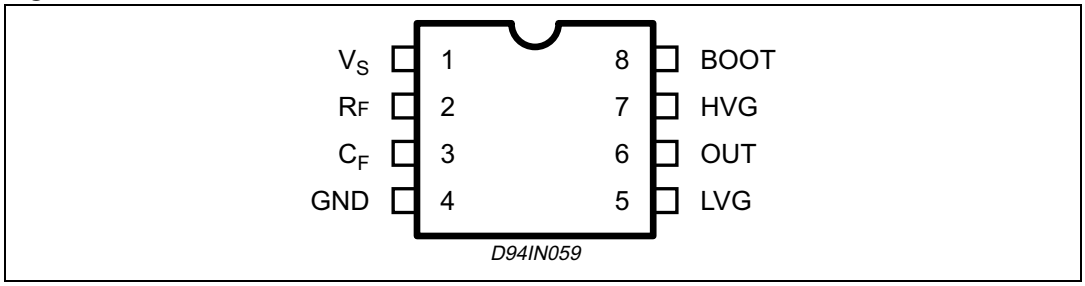


Table 4. Pin description

N°	Pin	Description
1	VS	Supply input voltage with internal clamp [typ. 15.6V]
2	RF	Oscillator timing resistor pin. A buffer set alternatively to VS and GND can provide current to the external resistor RF connected between pin 2 and 3. Alternatively, the signal on pin 2 can be used also to drive another IC (i.e. another L6569/71 to drive a full H-bridge)
3	CF	Oscillator timing capacitor pin. A capacitor connected between this pin and GND fixes (together with RF) the oscillating frequency Alternatively an external logic signal can be applied to the pin to drive the IC.
4	GND	Ground
5	LVG	Low side driver output. The output stage can deliver 170mA source and 270mA sink [typ.values].
6	OUT	Upper driver floating reference
7	HVG	High side driver output. The output stage can deliver 170mA source and 270mA sink [typ.values].
8	BOOT	Bootstrap voltage supply. It is the upper driver floating supply.

3 Electrical data

V_S = 12V; V_{BOOT} - V_{OUT} = 12V; T_j = 25 °C; unless otherwise specified.

Table 5. Electrical characteristcs

Symbol	Pin	Parameter	Test Condition	Min.	Typ.	Max.	Unit
V_{SUVP}	1	VS turn on threshold		8.3	9	9.7	V
V_{SUVN}		VS turn off threshold		7.3	8	8.7	V
V_{SUVH}		VS hysteresis		0.7	1	1.3	V
V_{CL}		VS clamping voltage	I_S = 5 mA	14.6	15.6	16.6	V
I_{SU}		Start up current	$V_S < V_{SUVN}$		150	250	µA
I_q		Quiescent current	$V_S > V_{SUVP}$		500	700	µA
I_{BOOTLK}	8	Leakage current BOOT pin vs GND	V_{BOOT} = 580V			5	µA
I_{OUTLK}	6	Leakage current OUT pin vs GND	V_{OUT} = 562V			5	µA
$I_{HVG\ SO}$	7	High side driver source current	V_{HVG} = 6V	110	175		mA
$I_{HVG\ SI}$		High side driver sink current	V_{HVG} = 6V	190	275		mA
$I_{LVG\ SO}$	5	Low side driver source current	V_{LVG} = 6V	110	175		mA
$I_{LVG\ SI}$		Low side driver sink current	V_{LVG} = 6V	190	275		mA
V_{RFON}	2	RF high level output voltage	I_{RF} =1mA	V_S -0.05		V_S -0.2	V
$V_{RF\ OFF}$		RF low level output voltage	I_{RF} = -1mA	50		200	mV
V_{CFU}	3	CF upper threshold		7.7	8	8.2	V
V_{CFL}		CF lower threshold		3.80	4	4.3	V
t_d		Internal dead time	L6571A L6571B	0.85 0.50	1.25 0.72	1.65 0.94	µs µs
DC		Duty cycle, ratio between dead Time + conduction time of high Side and low side drivers		0.45	0.5	0.55	
I_{AVE}	1	Average current from Vs	No Load, fs = 60KHz		1.2	1.5	mA
f_{out}	6	Oscillation frequency	RT = 12K; CT = 1nF	57	60	63	kHz

4 Oscillator frequency

The frequency of the internal oscillator can be programmed using external resistor and capacitor.

The nominal oscillator frequency can be calculated using the following equation:

Equation 1

$$f_{OSC} = \frac{1}{2 \cdot R_F \cdot C_F \cdot \ln 2} = \frac{1}{1.3863 \cdot R_F \cdot C_F}$$

Where R_F and C_F are the external resistor and capacitor.

The device can be driven in "shut down" condition keeping the C_F pin close to GND, but some cares have to be taken:

1. When CF is to GND the high side driver is off and the low side is on
2. The forced discharge of the oscillator capacitor C_F must not be shorter than 1us: a simple way to do this is to limit the current discharge with a resistive path imposing $R \cdot C_F > 1\ \mu s$ (see fig.1)

Figure 3. Fault signal

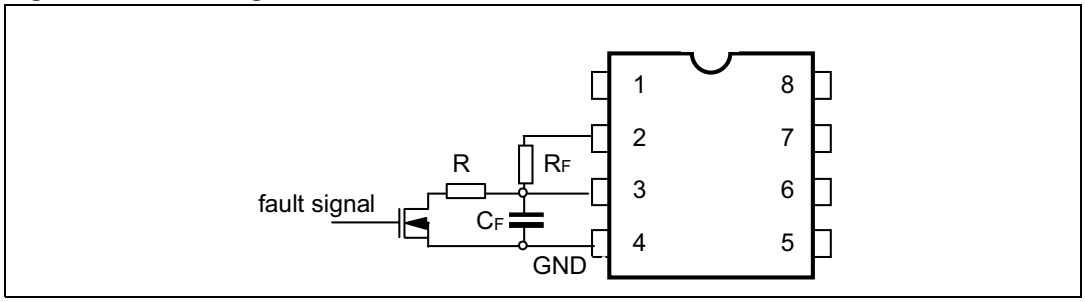


Figure 4. Waveforms

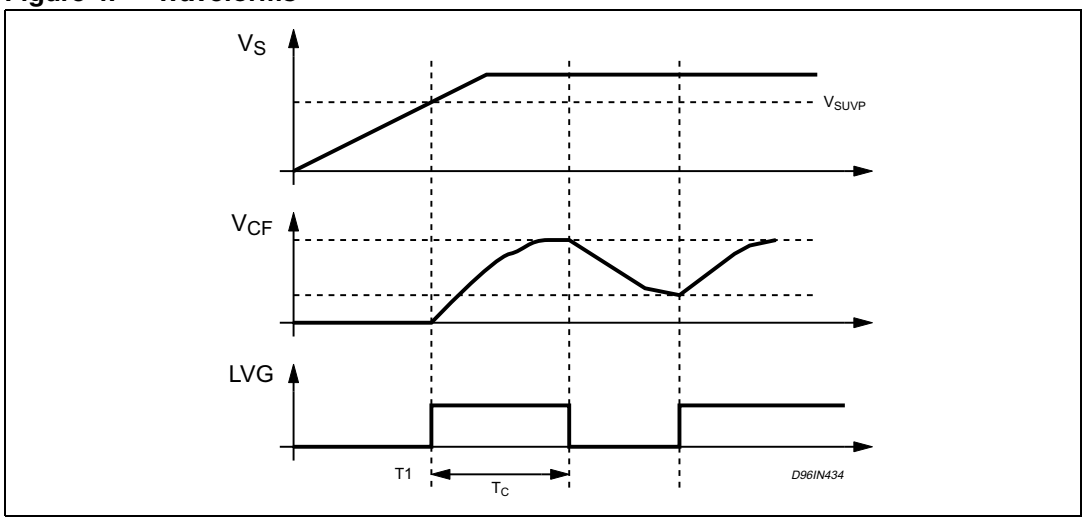


Figure 5. Typical dead time vs. temperature dependency (L6571A)

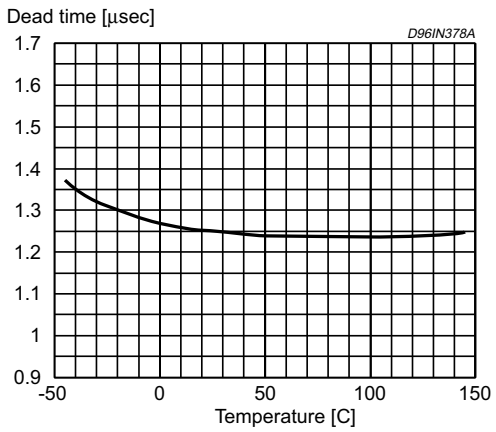


Figure 6. Typical rise and fall times vs. load capacitance

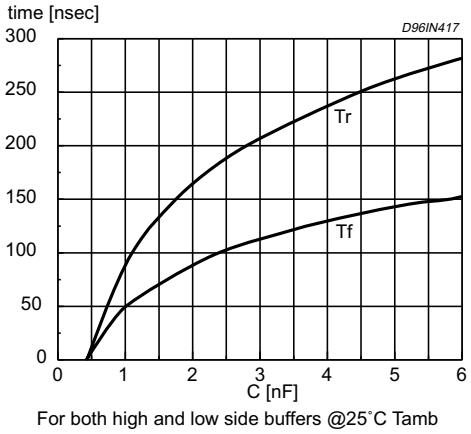


Figure 7. Typical frequency vs temperature dependency

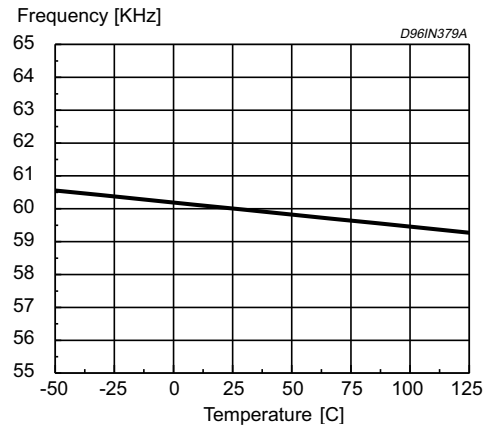


Figure 8. Quiescent current vs. supply voltage

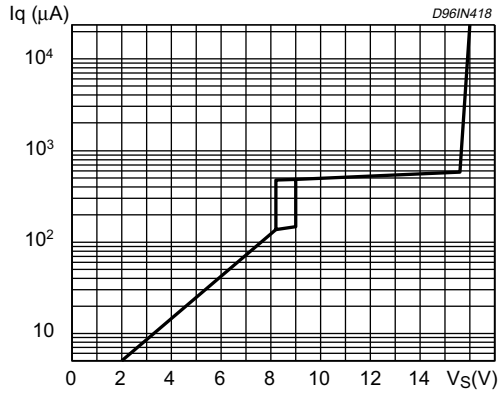
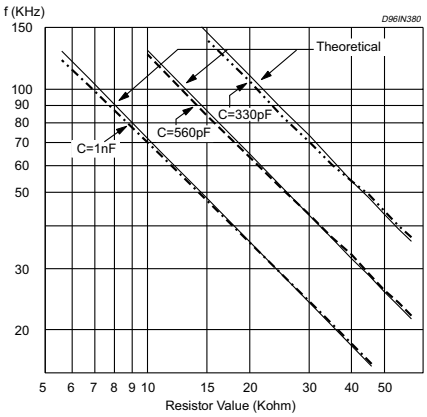


Figure 9. Typical and theoretical oscillator frequency vs resistor value



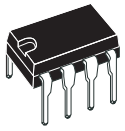
5 Package mechanical data

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 10. DIP-8 mechanical data

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A		3.32			0.131	
a1	0.51			0.020		
B	1.15		1.65	0.045		0.065
b	0.356		0.55	0.014		0.022
b1	0.204		0.304	0.008		0.012
D			10.92			0.430
E	7.95		9.75	0.313		0.384
e		2.54			0.100	
e3		7.62			0.300	
e4		7.62			0.300	
F			6.6			0.260
I			5.08			0.200
L	3.18		3.81	0.125		0.150
Z			1.52			0.060

OUTLINE AND MECHANICAL DATA



DIP-8

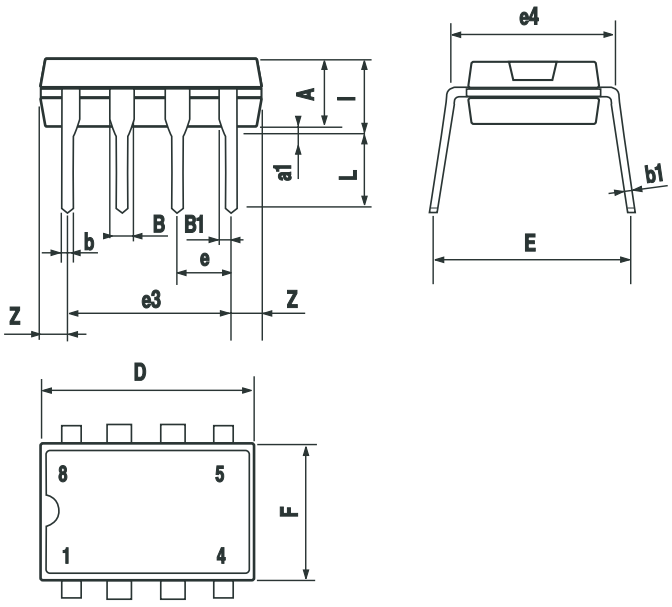
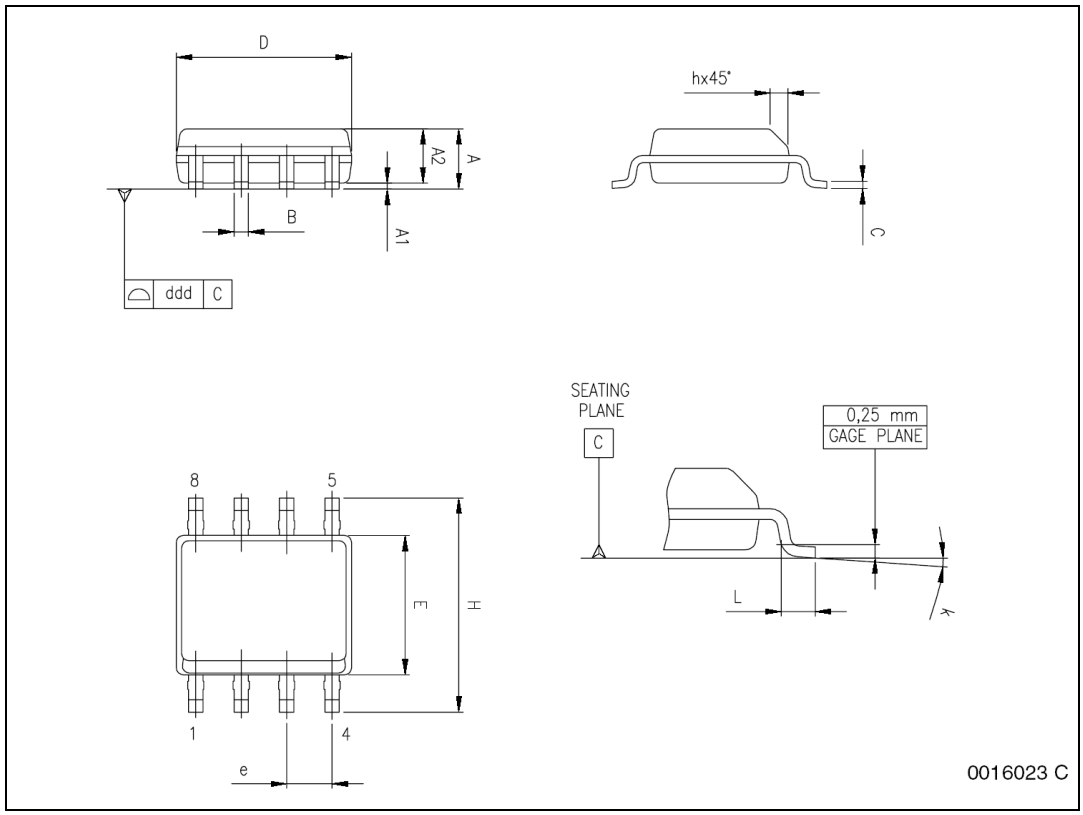


Table 1. SO-8 mechanical data

Dim.	mm.			inch		
	Min	Typ	Max	Min	Typ	Max
A	1.35		1.75	0.053		0.069
A1	0.10		0.25	0.004		0.010
A2	1.10		1.65	0.043		0.065
B	0.33		0.51	0.013		0.020
C	0.19		0.25	0.007		0.010
D (1)	4.80		5.00	0.189		0.197
E	3.80		4.00	0.15		0.157
e		1.27			0.050	
H	5.80		6.20	0.228		0.244
h	0.25		0.50	0.010		0.020
L	0.40		1.27	0.016		0.050
k	0° (min.), 8° (max.)					
ddd			0.10			0.004

1. Dimensions D does not include mold flash, protru-sions or gate burrs. Mold flash, potrusions or gate burrs shall not exceed 0.15mm (.006inch) in total (both side).

Figure 11. Package dimensions



6 Order information

Table 6. Ordering information

Order codes	Package	Packaging
L6571A	DIP-8	Tube
L6571AD	SO8	
L6571AD013TR		Tape and reel
L6571B	DIP-8	Tube
L6571BD	SO8	
L6571BD013TR		Tape and reel

7 Revision history

Table 7. Document revision history

Date	Revision	Changes
14-Jan-2004	5	No history because migration
15-Jan-2010	6	Updated *Table 6 on page 10*

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