

Single bilateral switch

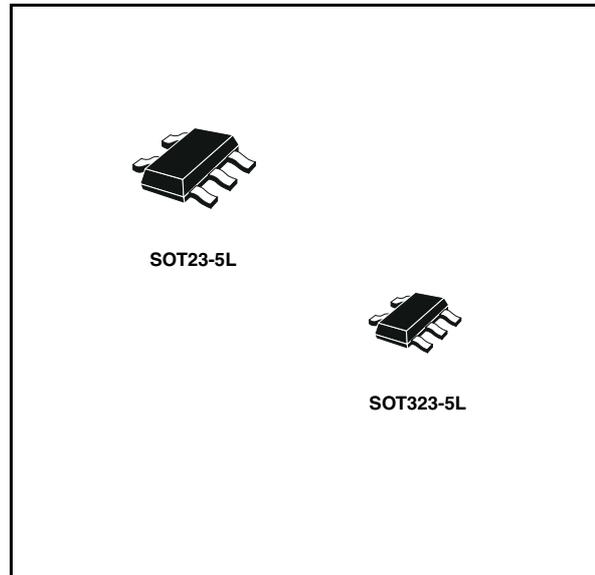
Features

- High speed:
 $t_{PD} = 0.3 \text{ ns (typ.) at } V_{CC} = 5 \text{ V}$
 $t_{PD} = 0.4 \text{ ns (typ.) at } V_{CC} = 3.3 \text{ V}$
- Low power dissipation:
 $I_{CC} = 1 \mu\text{A (max.) at } T_A = 25 \text{ }^\circ\text{C}$
- Low "ON" resistance:
 $R_{ON} = 6.5 \Omega \text{ (typ.) at } V_{CC} = 5 \text{ V } I_{I/O} = 1 \text{ mA}$
 $R_{ON} = 8.5 \Omega \text{ (typ.) at } V_{CC} = 3.3 \text{ V } I_{I/O} = 1 \text{ mA}$
- Sine wave distortion:
 $0.04\% \text{ at } V_{CC} = 3.3 \text{ V } f = 1 \text{ kHz}$
- Wide operating range:
 $V_{CC} \text{ (opr)} = 2 \text{ V to } 5.5 \text{ V}$
- Improved latch-up immunity

Description

The 74V1G66 is an advanced high-speed CMOS single bilateral switch fabricated in silicon gate C²MOS technology. It achieves high speed propagation delay and very low ON resistances while maintaining true CMOS low power consumption. This bilateral switch handles rail to rail analog and digital signals that may vary across the full power supply range (from GND to V_{CC}).

The C input is provided to control the switch and it is compatible with standard CMOS outputs. The switch is ON (port I/O is connected to port O/I) when the C input is held high and OFF (high impedance state exists between the two ports) when C is held low. It can be used in many applications as battery powered systems or test equipments.



The 74V1G66 is available in the commercial and extended temperature range in SOT23-5L and SOT323-5L packages.

All inputs and outputs are equipped with protection circuits against static discharge, giving them ESD immunity and transient excess voltage.

Table 1. Device summary

Order code	Package	Packaging
74V1G66STR	SOT23-5L	Tape and reel
74V1G66CTR	SOT323-5L	Tape and reel

1 Pin connection

Figure 1. Pin connection and IEC logic symbols

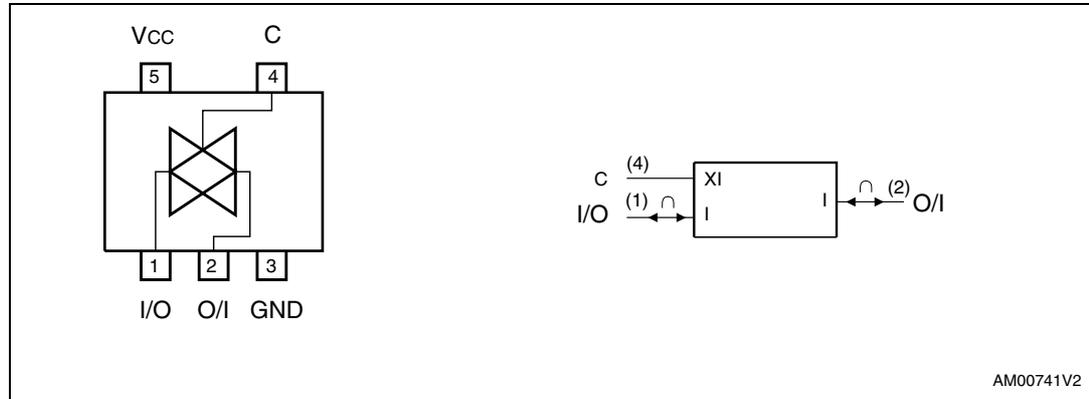


Table 2. Pin description

Pin number	Symbol	Name and function
1	I/O	Independent input/output
2	O/I	Independent output/input
3	GND	Ground (0 V)
4	C	Enable input (active high)
5	V _{CC}	Positive supply voltage

Figure 2. Input equivalent circuit

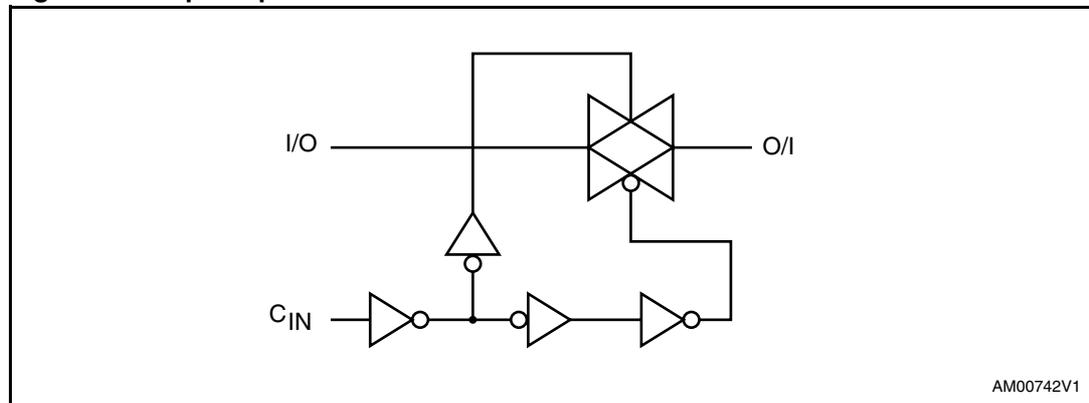


Table 3. Truth table

Control	Switch function
H	ON
L	OFF ⁽¹⁾

1. High impedance state.

2 Maximum rating

Stressing the device above the rating listed in the “Absolute Maximum Ratings” table may cause permanent damage to the device. These are stress ratings only and operation of the device at these or any other conditions above those indicated in the Operating sections of this specification is not implied. Exposure to Absolute Maximum Rating conditions for extended periods may affect device reliability.

Table 4. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CC}	Supply voltage	-0.5 to +7.0	V
V_I	DC input voltage	-0.5 to $V_{CC} + 0.5$	V
V_{IC}	DC control input voltage	-0.5 to +7.0	V
V_O	DC Output voltage	-0.5 to $V_{CC} + 0.5$	V
I_{IK}	DC input diode current	± 20	mA
I_{IK}	DC control input diode current	- 20	mA
I_{OK}	DC output diode current	± 20	mA
I_O	DC output current	± 50	mA
I_{CC} or I_{GND}	DC V_{CC} or ground current	± 50	mA
T_{stg}	Storage temperature	-65 to +150	°C
T_L	Lead temperature (10 sec)	300	°C

Table 5. Recommended operating conditions

Symbol	Parameter	Value	Unit
V_{CC}	Supply voltage	2 to 5.5	V
V_I	Input voltage	0 to V_{CC}	V
V_{IC}	Control input voltage	0 to 5.5	V
V_O	Output voltage	0 to V_{CC}	V
T_{op}	Operating temperature	-55 to 125	°C
dt/dv	Input rise and fall time ⁽¹⁾ $V_{CC} = 5.0$ V	0 to 20	ns/V

1. V_{IN} from 30% to 70% of V_{CC} on control pin.

Table 6. DC specifications

Symbol	Parameter	Test condition		Value						Unit	
		V _{CC} (V)		T _A = 25°C			-40 to 85°C		-55 to 125°C		
				Min	Typ	Max	Min	Max	Min		Max
V _{IH}	High level input voltage	2.0		1.5			1.5		1.5		V
		2.7 to 5.5		0.7V _C C			0.7V CC		0.7V CC		
V _{IL}	Low level input voltage	2.0				0.5		0.5		0.5	V
		2.7 to 5.5				0.3V _C C		0.3V CC		0.3V CC	
R _{ON}	ON resistance	3.3 ⁽¹⁾	V _{IC} = V _{IH} V _{I/O} = V _{CC} to GND I _{I/O} ≤ 1mA		12.5	21		23		27	Ω
		5.0 ⁽²⁾			7.5	10		12		14	
R _{ON}	ON resistance	3.3 ⁽¹⁾	V _{IC} = V _{IH} V _{I/O} = V _{CC} or GND I _{I/O} ≤ 1mA		8.5	11.5		12.5		15	Ω
		5.0 ⁽²⁾			6.5	8.5		10		12	
I _{OFF}	Input/output leakage current (switch OFF)	5.5	V _{OS} = V _{CC} to GND V _{IS} = V _{CC} to GND V _{IC} = V _{IL}			±0.1		±1		±5	μA
I _{Iz}	Switch input leakage current (switch ON, output open)	5.5	V _{OS} = V _{CC} to GND V _{IC} = V _{IH}			±0.1		±1		±5	μA
I _{IN}	Control input leakage current	0 to 5.5	V _{IC} = 5.5V or GND			±0.1		±1.0		±1.0	μA
I _{CC}	Quiescent supply current	5.5	V _I = V _{CC} or GND			1		10		20	μA

1. Voltage range is 3.3 V ± 0.3 V.
2. Voltage range is 5 V ± 0.5 V.

Table 7. AC electrical characteristics ($C_L = 50$ pF, input $t_r = t_f = 3$ ns)

Symbol	Parameter	Test condition		Value						Unit	
		V_{CC} (V)		$T_A = 25^\circ\text{C}$			-40 to 85°C		-55 to 125°C		
				Min	Typ	Max	Min	Max	Min		Max
t_{PD}	Delay time	3.3 ⁽¹⁾	$t_r = t_f = 6$ ns		0.4	0.8		1.2		2.4	ns
		5.0 ⁽²⁾			0.3	0.6		1.0		2.0	
t_{PLZ} t_{PHZ}	Output disable time	3.3 ⁽¹⁾	$R_L = 500 \Omega$		5.0	7.5		9.0		10.0	ns
		5.0 ⁽²⁾			5.0	7.5		9.0		10.0	
t_{PZL} t_{PZH}	Output enable time	3.3 ⁽¹⁾	$R_L = 1$ K Ω		2.5	4.0		5.0		7.0	ns
		5.0 ⁽²⁾			2.0	4.0		5.0		7.0	

1. Voltage range is $3.3 \text{ V} \pm 0.3 \text{ V}$.

2. Voltage range is $5 \text{ V} \pm 0.5 \text{ V}$.

Table 8. Capacitive characteristics

Symbol	Parameter	Test condition		Value						Unit	
		V_{CC} (V)		$T_A = 25^\circ\text{C}$			-40 to 85°C		-55 to 125°C		
				Min	Typ	Max	Min	Max	Min		Max
C_{IN}	Input capacitance				3	10		10		10	pF
$C_{I/O}$	Output capacitance				10						pF
C_{PD}	Power dissipation capacitance ⁽¹⁾	3.3			2.5						pF
		5.0			3						

1. C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to the test circuit). Average operating current can be obtained by the following equation.

$$I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}$$

Table 9. Analog switch characteristics (GND = 0 V; T_A = 25°C)

Symbol	Parameter	Test condition		Value	Unit	
		V _{CC} (V)	V _{IN} (V _{p-p})	Typ		
	Sine wave distortion (THD)	3.3 ⁽¹⁾	2.75	f _{IN} = 1 KHz R _L = 10 KΩ, C _L = 50 pF	0.04	%
		5.0 ⁽²⁾	4		0.04	
f _{MAX}	Frequency response (switch ON)	3.3 ⁽¹⁾	Adjust f _{IN} voltage to obtain 0 dBm at V _{OS} .	R _L = 50 Ω, C _L = 10 pF	150	MHz
		5.0 ⁽²⁾	Increase f _{IN} Frequency until dB meter reads -3dB		180	
	Feed through attenuation (switch OFF)	3.3 ⁽¹⁾	V _{IN} is centered at V _{CC} /2	R _L = 600Ω, C _L = 50 pF, f _{IN} = 1KHz sine wave	-60	dB
		5.0 ⁽²⁾	Adjust f _{IN} Voltage to obtained 0dBm at V _{IS}		-60	
	Crosstalk (control input to signal output)	3.3 ⁽¹⁾	R _L = 600 Ω, C _L = 50 pF, f _{IN} = 1 KHz square wave	t _r = t _f = 6 ns	60	mV
		5.0 ⁽²⁾			60	

1. Voltage range is 3.3 V ± 0.3 V

2. Voltage range is 5.0 V ± 0.5 V

3 Switching characteristics test circuit

Figure 3. Enable and disable timing (circuit)

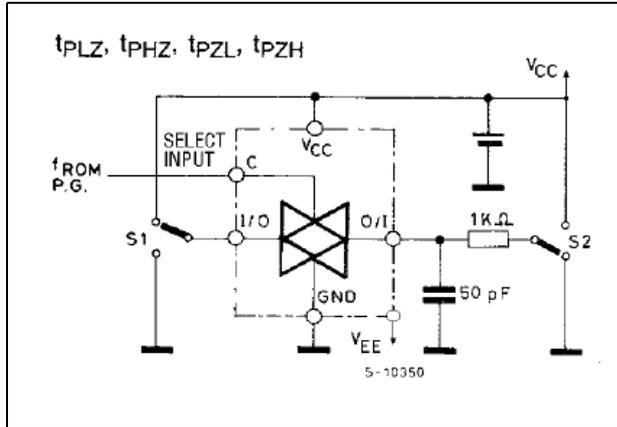


Figure 4. Enable and disable timing (waveform)

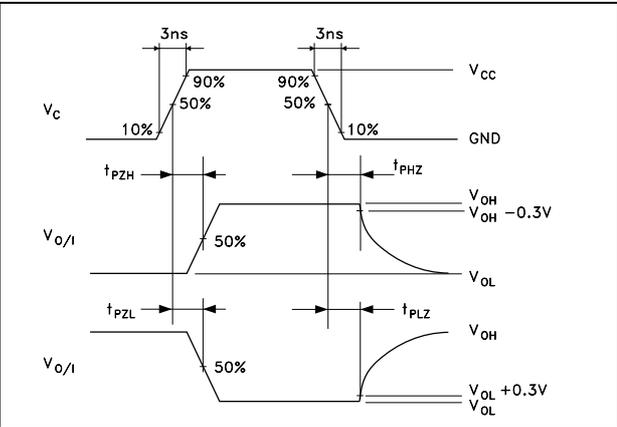


Figure 5. Resistive feedthrough attenuation

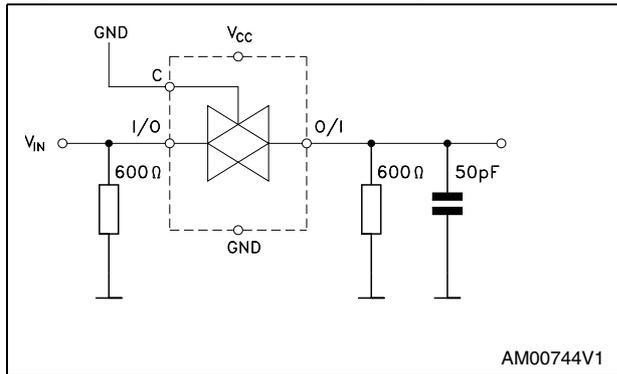


Figure 6. Capacitive feedthrough attenuation

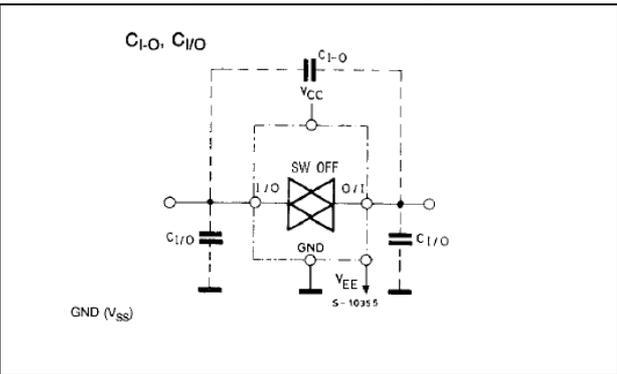


Figure 7. Bandwidth attenuation

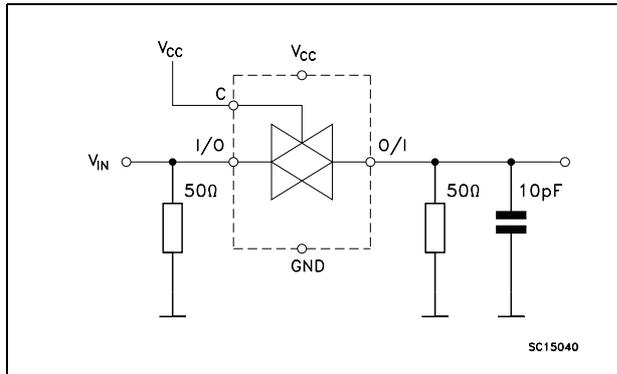


Figure 8. Maximum control frequency

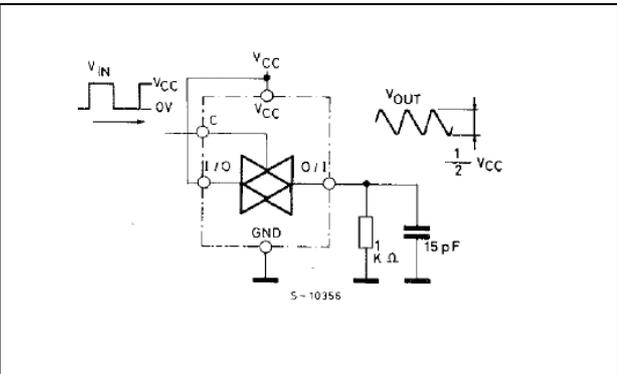


Figure 9. Crosstalk (control to output)

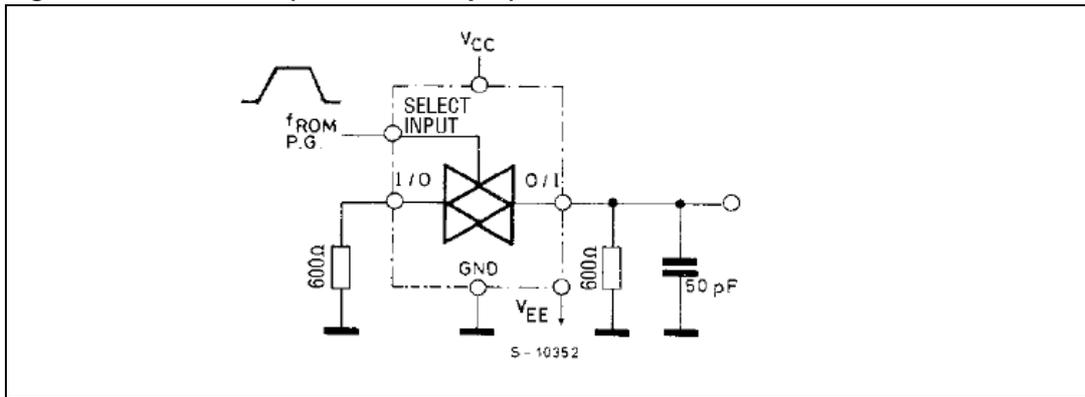


Figure 10. Channel resistance (R_{ON})

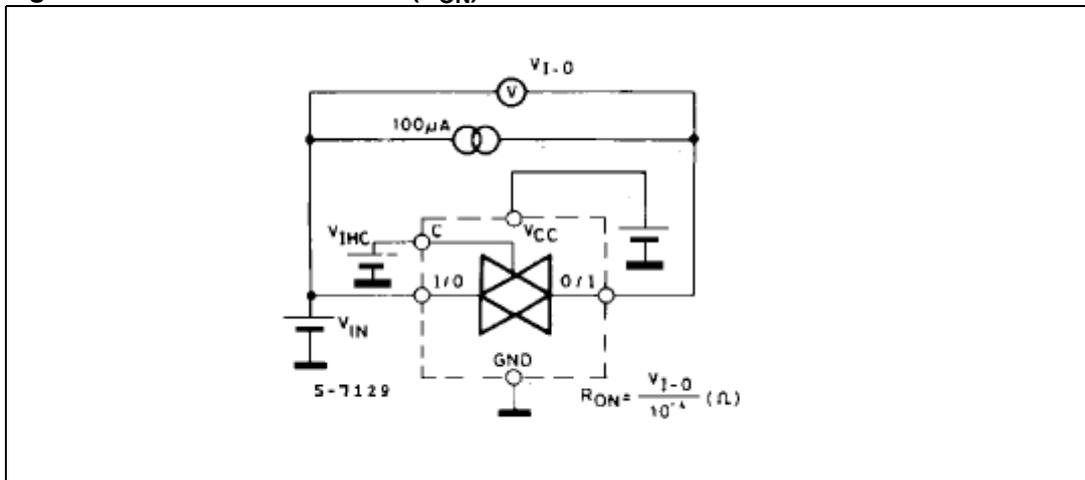
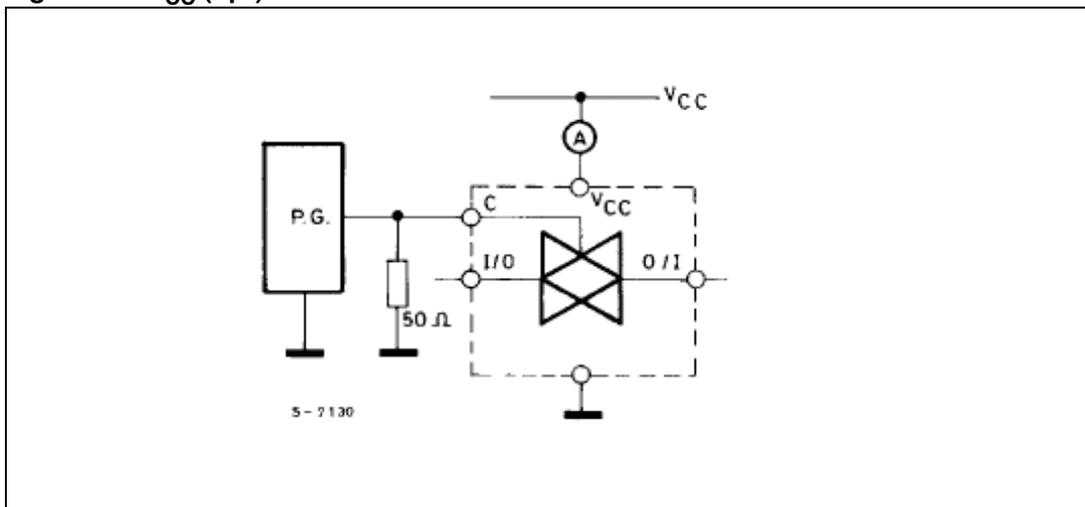


Figure 11. I_{CC} (opr)

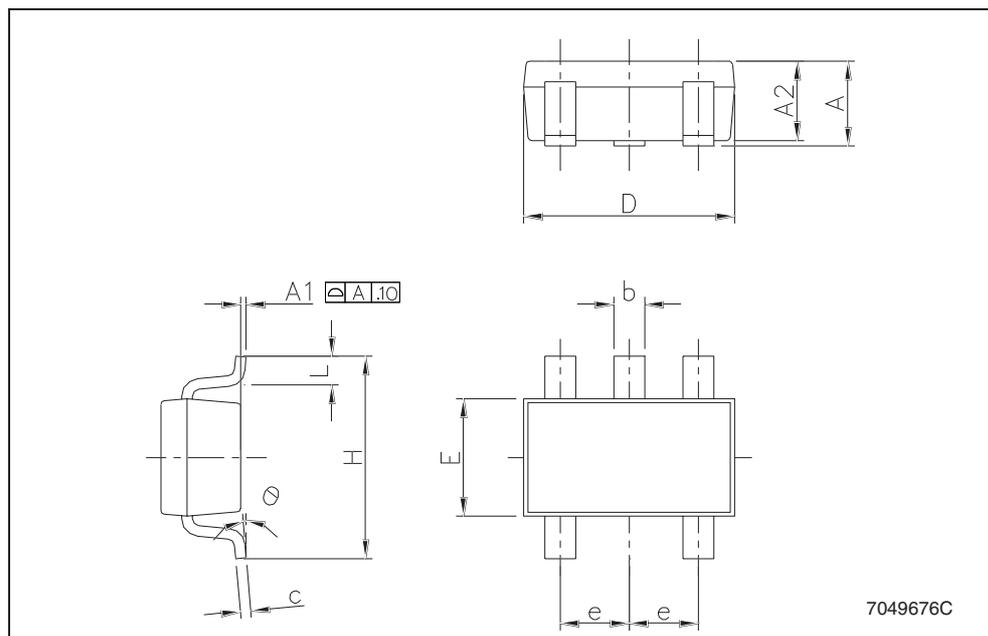


4 Package mechanical data

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.

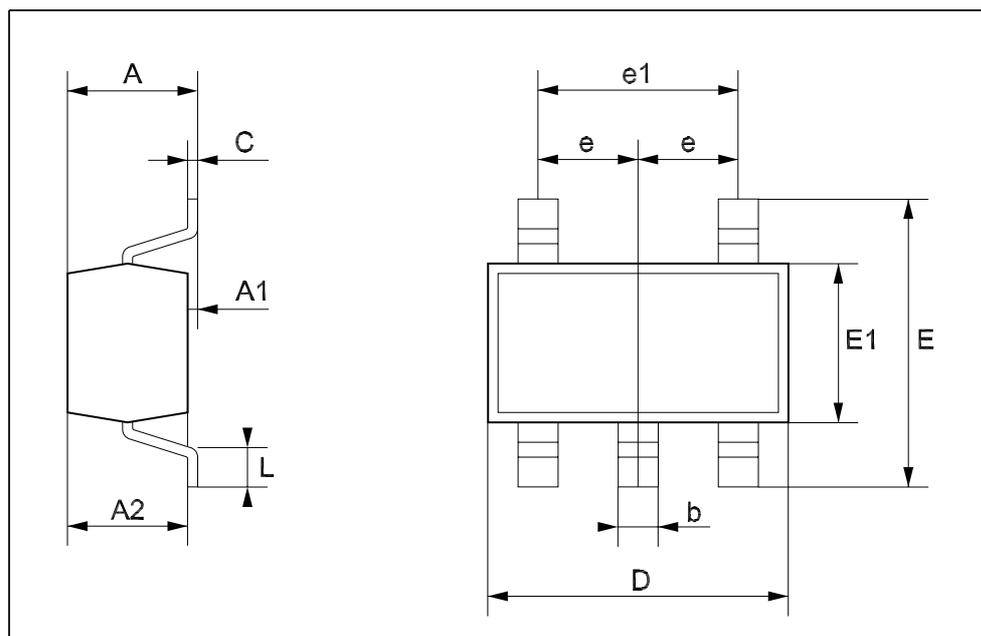
SOT23-5L MECHANICAL DATA

DIM.	mm.			mils		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	0.90		1.45	35.4		57.1
A1	0.00		0.10	0.0		3.9
A2	0.90		1.30	35.4		51.2
b	0.35		0.50	13.7		19.7
C	0.09		0.20	3.5		7.8
D	2.80		3.00	110.2		118.1
E	1.50		1.75	59.0		68.8
e		0.95			37.4	
H	2.60		3.00	102.3		118.1
L	0.10		0.60	3.9		23.6



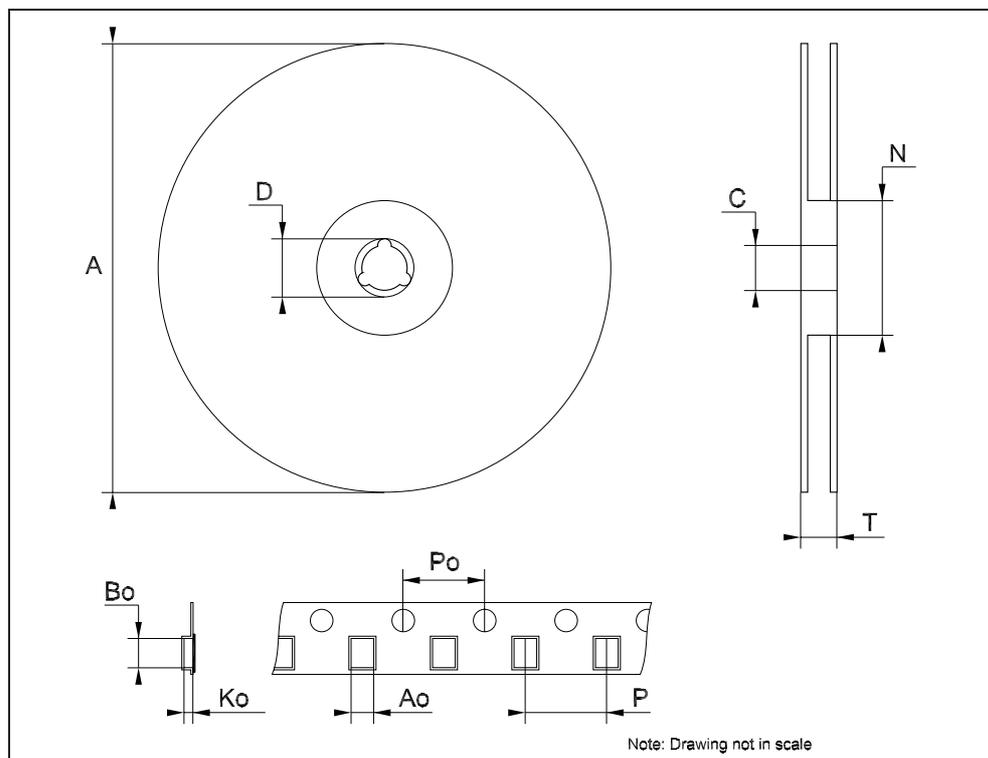
SOT323-5L MECHANICAL DATA

DIM.	mm.			mils		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	0.80		1.10	31.5		43.3
A1	0.00		0.10	0.0		3.9
A2	0.80		1.00	31.5		39.4
b	0.15		0.30	5.9		11.8
C	0.10		0.18	3.9		7.1
D	1.80		2.20	70.9		86.6
E	1.80		2.40	70.9		94.5
E1	1.15		1.35	45.3		53.1
e		0.65			25.6	
e1		1.3			51.2	
L	0.10		0.30	3.9		11.8



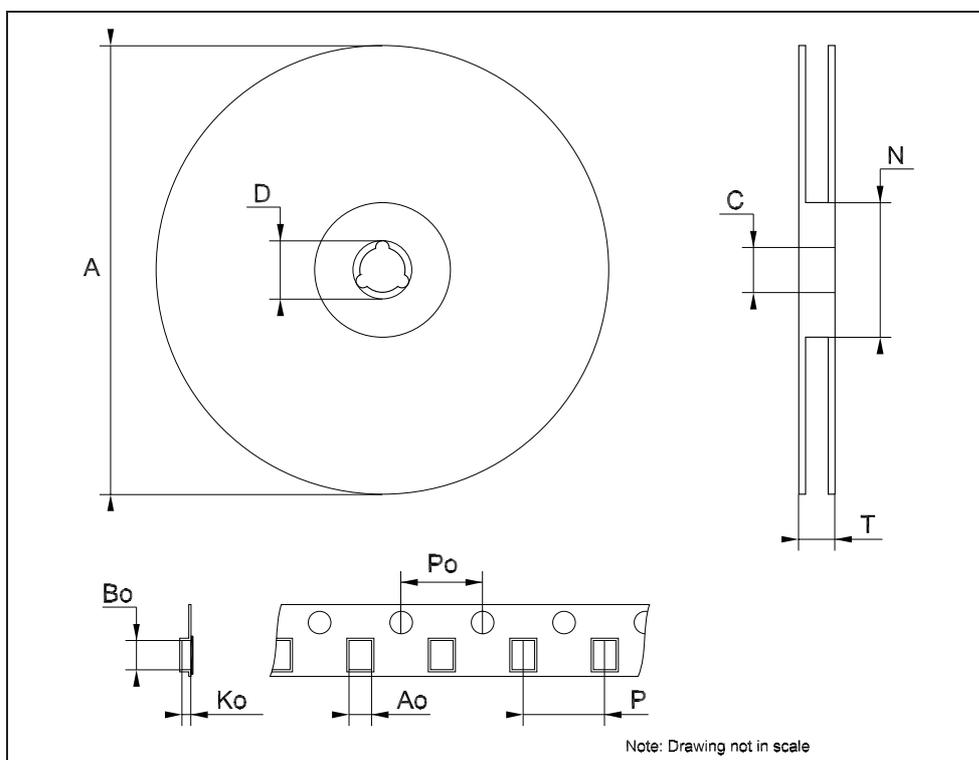
Tape & Reel SOT23-xL MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			180			7.086
C	12.8	13.0	13.2	0.504	0.512	0.519
D	20.2			0.795		
N	60			2.362		
T			14.4			0.567
Ao	3.13	3.23	3.33	0.123	0.127	0.131
Bo	3.07	3.17	3.27	0.120	0.124	0.128
Ko	1.27	1.37	1.47	0.050	0.054	0.058
Po	3.9	4.0	4.1	0.153	0.157	0.161
P	3.9	4.0	4.1	0.153	0.157	0.161



Tape & Reel SOT323-xL MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	175	180	185	6.889	7.086	7.283
C	12.8	13	13.2	0.504	0.512	0.519
D	20.2			0.795		
N	59.5	60	60.5		2.362	
T			14.4			0.567
Ao		2.25			0.088	
Bo		2.7			0.106	
Ko		1.2			0.047	
Po	3.9	4	4.1	0.153	0.157	0.161
P	3.8	4	4.2	0.149	0.157	0.165



5 Revision history

Table 10. Document revision history

Date	Revision	Changes
01-Apr-2004	7	Updated data reel information.
28-Oct-2008	8	Document reformatted to improve readability. Updated Table 6: DC specifications on page 4 .

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