



# STG3157

## LOW VOLTAGE LOW ON RESISTANCE SPDT SWITCH WITH BREAK BEFORE MAKE FEATURE

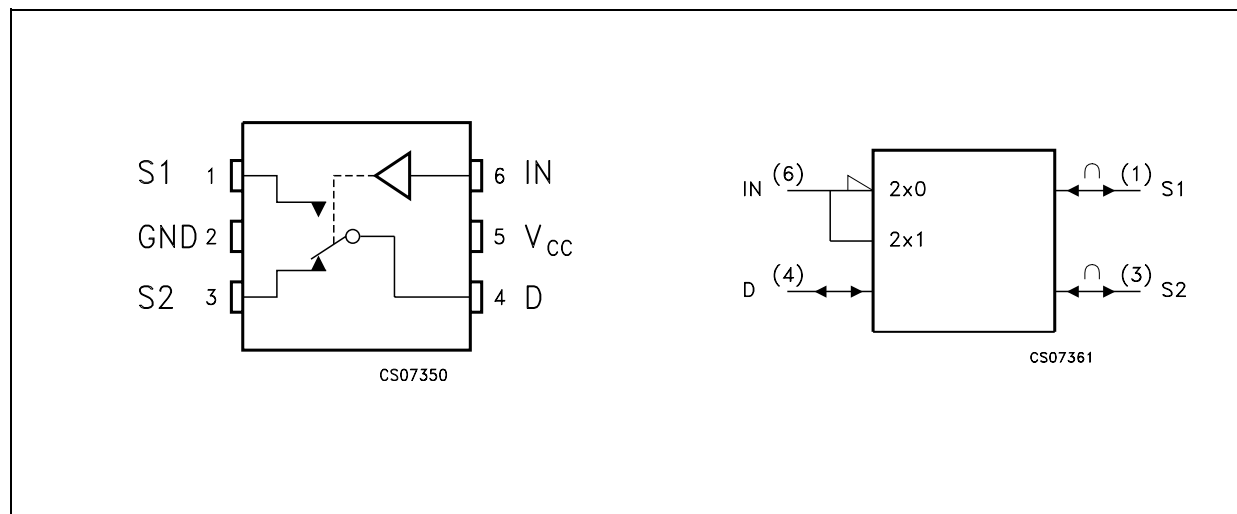
- HIGH SPEED:
  - $t_{PD} = 0.3ns$  (MAX.) at  $V_{CC} = 4.5V$
  - $t_{PD} = 0.8ns$  (MAX.) at  $V_{CC} = 3.0V$
  - $t_{PD} = 1.2ns$  (MAX.) at  $V_{CC} = 2.3V$
- VERY LOW POWER DISSIPATION:
  - $I_{CC} = 1\mu A$  (MAX.) at  $T_A = 85^\circ C$
- LOW "ON" RESISTANCE  $V_{IN} = 0V$ :
  - $R_{ON} = 7\Omega$  (MAX.  $T_A = 85^\circ C$ ) at  $V_{CC} = 4.5V$
  - $R_{ON} = 9\Omega$  (MAX.  $T_A = 85^\circ C$ ) at  $V_{CC} = 3.0V$
- WIDE OPERATING VOLTAGE RANGE:
  - $V_{CC}$  (OPR) = 1.65V to 5.5V SINGLE SUPPLY
- TTL THRESHOLD ON CONTROL INPUT at  $V_{CC} = 2.7$  to  $3.6V$
- PIN AND FUNCTION COMPATIBLE WITH 74 SERIES 3157
- LATCH-UP PERFORMANCE EXCEEDS 300mA (JESD 17)

### DESCRIPTION

The STG3157 is an high-speed spdt CMOS ANALOG S.P.D.T. (Single Pole Dual Throw) SWITCH or 2:1 Multiplexer/Demultiplexer Bus Switch fabricated in silicon gate C<sup>2</sup>MOS technology. It designed to operate from 1.65V to 5.5V, making this device ideal for portable applications.

It offers very low ON-Resistance ( $<9\Omega$ ) at  $V_{CC} = 3.0V$ . The IN input is provided to control the S.P.D.T. switch, it's compatible with standard

### PIN CONNECTION AND IEC LOGIC SYMBOLS

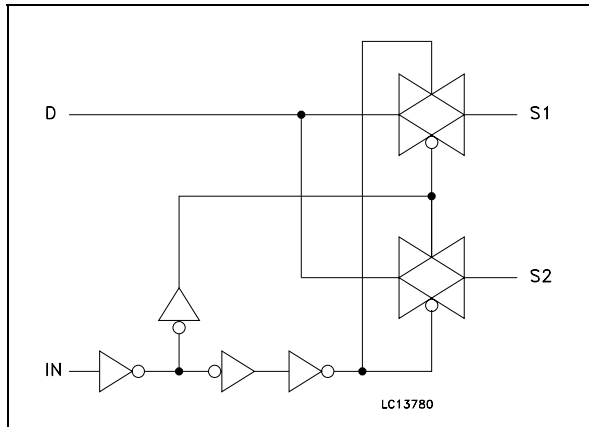


### ORDER CODES

PACKAGE	T & R
SOT323-6L	STG3157CTR

CMOS output. The switch S1 is ON (it is connected to common Port D) when the IN input is held high and OFF (high impedance state exists between the two ports) when IN is held low; the switch S2 is ON (it is connected to common Port D) when the IN input is held low and OFF (high impedance state exists between the two ports) when IN is held high. Additional key features are fast switching speed, Break Before Make Delay Time and Very Low Power Consumption. All inputs and output are equipped with protection circuits against static discharge, giving them ESD immunity and transient excess voltage. It's available in the commercial temperature range in smallest six lead smd package on the market.

**INPUT EQUIVALENT CIRCUIT**



**PIN DESCRIPTION**

PIN No	SYMBOL	NAME AND FUNCTION
1, 3	S1, S2	Independent Channel
4	D	Common Channel
6	IN	Control
5	V <sub>CC</sub>	Positive Supply Voltage
2	GND	Ground (0V)

**TRUTH TABLE**

IN	SWITCH S1	SWITCH S2
H	ON	OFF(*)
L	OFF(*)	ON

\*) High Impedance

**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Supply Voltage	-0.5 to +7.0	V
V <sub>I</sub>	DC Input Voltage	-0.5 to V <sub>CC</sub> + 0.5	V
V <sub>IC</sub>	DC Control Input Voltage	-0.5 to V <sub>CC</sub> + 0.5	V
V <sub>O</sub>	DC Output Voltage	-0.5 to V <sub>CC</sub> + 0.5	V
I <sub>IKC</sub>	DC Input Diode Current on control pin (V <sub>IN</sub> < 0V)	± 50	mA
I <sub>IK</sub>	DC Input Diode Current (V <sub>IN</sub> < 0V)	± 50	mA
I <sub>OK</sub>	DC Output Diode Current	± 20	mA
I <sub>O</sub>	DC Output Current	+ 128	mA
I <sub>CC</sub> or I <sub>GND</sub>	DC V <sub>CC</sub> or Ground Current	± 100	mA
T <sub>stg</sub>	Storage Temperature	-65 to +150	°C
T <sub>L</sub>	Lead Temperature (10 sec)	300	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied

**RECOMMENDED OPERATING CONDITIONS**

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Supply Voltage (note 1)	1.65 to 5.5	V
V <sub>I</sub>	Input Voltage	0 to V <sub>CC</sub>	V
V <sub>IC</sub>	Control Input Voltage	0 to 5.5	V
V <sub>O</sub>	Output Voltage	0 to V <sub>CC</sub>	V
T <sub>op</sub>	Operating Temperature	-55 to 125	°C
dt/dv	Input Rise and Fall Time Control Input for V <sub>CC</sub> = 2.3V - 3.6V	0 to 10	ns/V
	Input Rise and Fall Time Control Input for V <sub>CC</sub> = 4.5V - 5.5V	0 to 5	

1) Truth Table guaranteed: 1.2V to 6.0V

## DC SPECIFICATIONS

Symbol	Parameter	Test Condition		Value						Unit	
		V <sub>CC</sub> (V)		T <sub>A</sub> = 25°C			-40 to 85°C		-55 to 125°C		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
V <sub>IH</sub>	High Level Input Voltage	1.65-1.95		0.75V <sub>CC</sub>			0.75V <sub>CC</sub>		0.75V <sub>CC</sub>		V
		2.3-5.5		0.7V <sub>CC</sub>			0.7V <sub>CC</sub>		0.7V <sub>CC</sub>		
		2.7-3.6		2			2		2		
V <sub>IL</sub>	Low Level Input Voltage	1.65-1.95				0.25V <sub>CC</sub>		0.25V <sub>CC</sub>		0.25V <sub>CC</sub>	V
		2.3-5.5				0.3V <sub>CC</sub>		0.3V <sub>CC</sub>		0.3V <sub>CC</sub>	
		2.7-3.6				0.8		0.8		0.8	
R <sub>ON</sub>	Switch ON Resistance	4.5	V <sub>S</sub> =0V I <sub>S</sub> =30mA	4.4	7		7		9	Ω	
			V <sub>S</sub> =2.4V I <sub>S</sub> =30mA	4.9	12		12		14.5		
			V <sub>S</sub> = 4.5V I <sub>S</sub> =30mA	6.1	15		15		18		
		3.0	V <sub>S</sub> =0V I <sub>S</sub> =24mA	5.2	9		9		11		
			V <sub>S</sub> =3V I <sub>S</sub> =24mA	7.8	20		20		24		
		2.3	V <sub>S</sub> =0V I <sub>S</sub> =8mA	6.5	12		12		14.5		
			V <sub>S</sub> =2.3V I <sub>S</sub> =8mA	9.6	30		30		36		
		1.65	V <sub>S</sub> =0V I <sub>S</sub> =4mA	9.0	20		20		24		
V <sub>S</sub> =1.65V I <sub>S</sub> =4mA	14		50		50		60				
ΔR <sub>ON</sub>	ON Resistance Match between channels	4.5	V <sub>S</sub> =3.15V I <sub>S</sub> =30mA	0.10						Ω	
		3.0	V <sub>S</sub> =2.1V I <sub>S</sub> =24mA	0.10							
		2.3	V <sub>S</sub> =1.6V I <sub>S</sub> =8mA	0.20							
		1.65	V <sub>S</sub> =1.15V I <sub>S</sub> =4mA	0.35							
R <sub>FLAT</sub>	ON Resistance FLATNESS	5.0	V <sub>S</sub> =0 to V <sub>CC</sub> I <sub>S</sub> =30mA	3						Ω	
		3.3	V <sub>S</sub> =0 to V <sub>CC</sub> I <sub>S</sub> =24mA	6							
		2.5	V <sub>S</sub> =0 to V <sub>CC</sub> I <sub>S</sub> =8mA	14							
		1.8	V <sub>S</sub> =0 to V <sub>CC</sub> I <sub>S</sub> =4mA	80							
I <sub>OFF</sub>	OFF State Leakage Current	1.65-1.95	V <sub>S</sub> =0 to V <sub>CC</sub>		±0.05	±0.1		± 1		±10	μA

Symbol	Parameter	Test Condition		Value						Unit		
		V <sub>CC</sub> (V)		T <sub>A</sub> = 25°C			-40 to 85°C		-55 to 125°C			
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.	
I <sub>IN</sub>	Input Leakage Current	0 - 5.5	V <sub>IN</sub> = 0 to 5.5V		±0.05	±0.1			± 1		±10	μA
I <sub>CC</sub>	Quiescent Supply Current (All Channel ON or OFF)	5.5	V <sub>IN</sub> =V <sub>CC</sub> or GND			1			1		10	μA

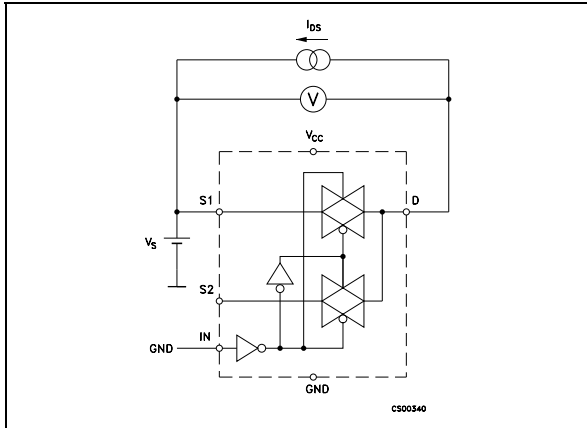
**AC ELECTRICAL CHARACTERISTICS** (C<sub>L</sub> = 50pF, R<sub>L</sub> = 500Ω)

Symbol	Parameter	Test Condition		Value						Unit		
		V <sub>CC</sub> (V)		T <sub>A</sub> = 25°C			-40 to 85°C		-55 to 125°C			
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.	
t <sub>LH</sub> , t <sub>HL</sub>	Propagation Delay	1.65-1.95	V <sub>I</sub> =OPEN									ns
		2.3-2.7				1.2		1.2		1.8		
		3.0-3.6				0.8		0.8		1.2		
		4.5-5.5				0.3		0.3		0.5		
t <sub>PZH</sub> , t <sub>PZL</sub>	Output Enable Time (D to S <sub>n</sub> )	1.65-1.95		7		15	7	20	7	27		ns
		2.3-2.7		3.5		11	3.5	14	3.5	17		
		3.0-3.6		2.5		7	2.5	7.6	2.5	9		
		4.5-5.5		1.7		5.2	1.7	5.7	1.7	7		
t <sub>PLZ</sub> , t <sub>PHZ</sub>	Output Disable Time (D to S <sub>n</sub> )	1.65-1.95		3		10	3	13	3	16		ns
		2.3-2.7		2		7	2	7.5	2	9		
		3.0-3.6		1.5		5	1.5	5.3	1.5	6.5		
		4.5-5.5		1.7		3.5	1.7	3.8	1.7	5		
t <sub>D</sub>	Break Before Make Time Delay	1.65-5.5		0.5			0.5		0.5		ns	
Q	Charge injection	5			23							pC
		3.3			19							

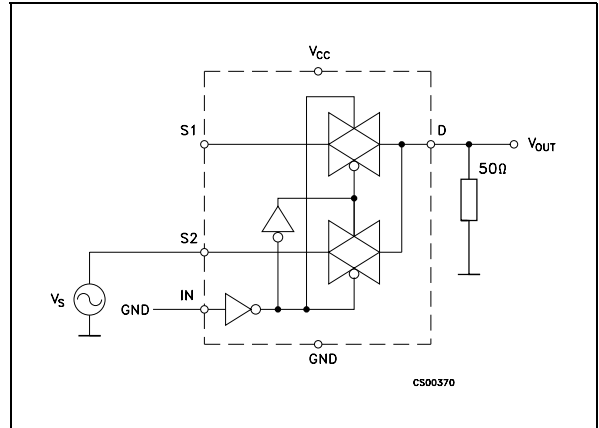
**ANALOG SWITCH CHARACTERISTICS** (C<sub>L</sub>= 5pF, R<sub>L</sub>=50Ω, T<sub>A</sub>=25°C)

Symbol	Parameter	Test Condition		Value						Unit		
		V <sub>CC</sub> (V)		T <sub>A</sub> = 25°C			-40 to 85°C		-55 to 125°C			
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.	
OIRR	Off Isolation	1.65-5.5	R <sub>L</sub> = 50Ω f= 10MHz		-57							dB
Xtalk	Crosstalk	1.65-5.5	R <sub>L</sub> = 50Ω f= 10MHz		-54							dB
BW	-3dB Bandwidth	1.65-5.5	R <sub>L</sub> = 50Ω		250							MHz
C <sub>IN</sub>	Control Pin Input Capacitance				5							pF
C <sub>Sn</sub>	Sn Port Capacitance	5.0	f= 1MHz		13							
C <sub>D</sub>	D Port Capacitance when Switch is Enabled	5.0	f= 1MHz		21							

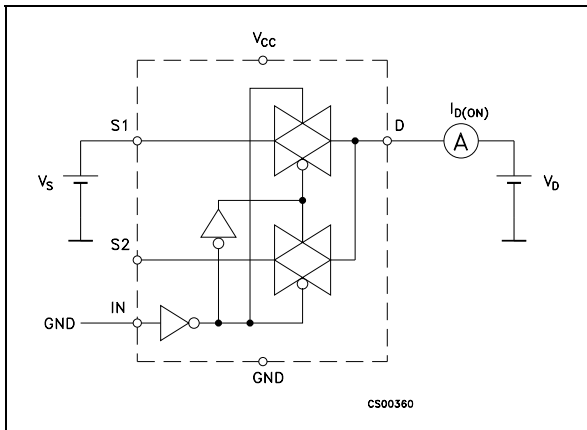
**ON RESISTANCE**



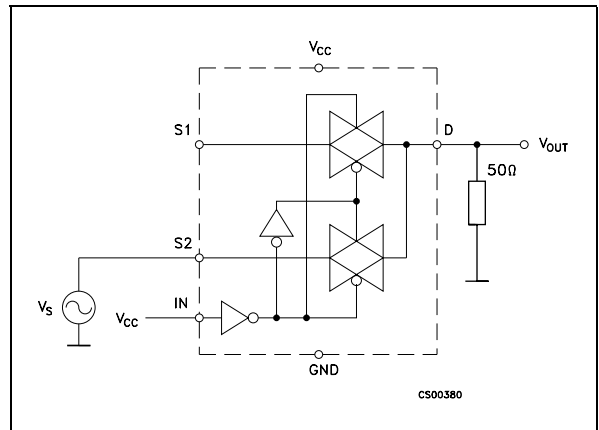
**OFF ISOLATION**



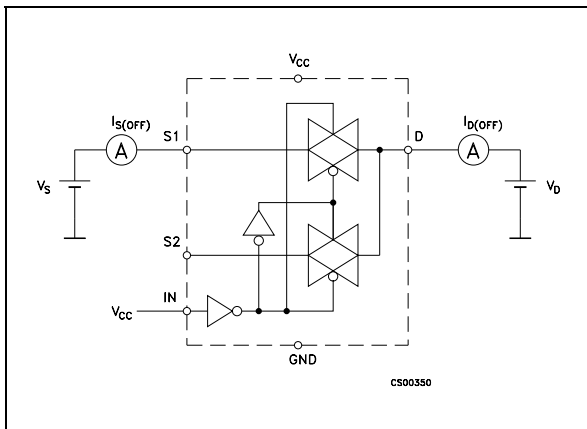
**ON LEAKAGE**



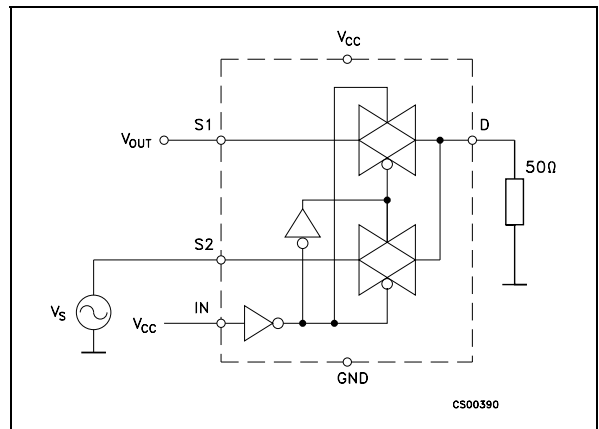
**BANDWIDTH**



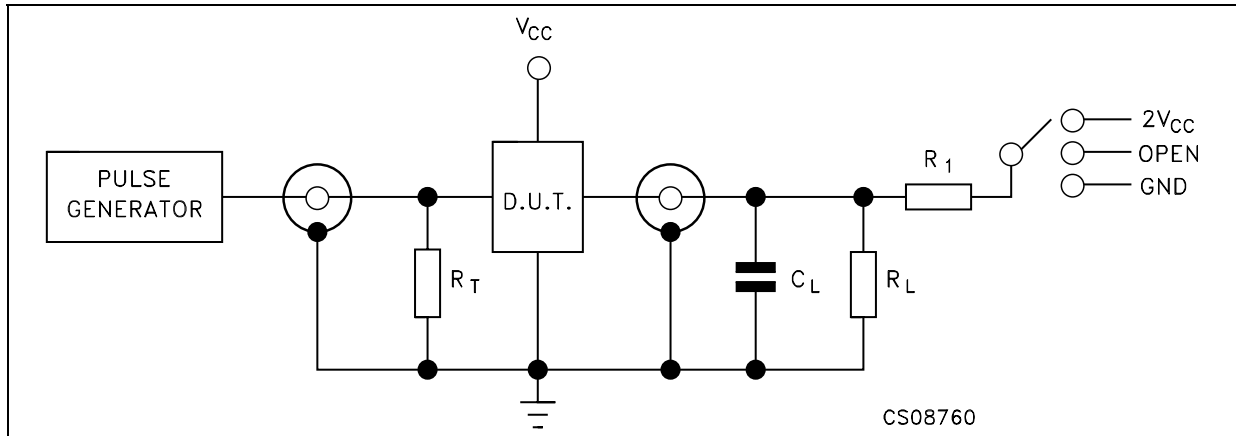
**OFF LEAKAGE**



**CHANNEL TO CHANNEL CROSSTALK**



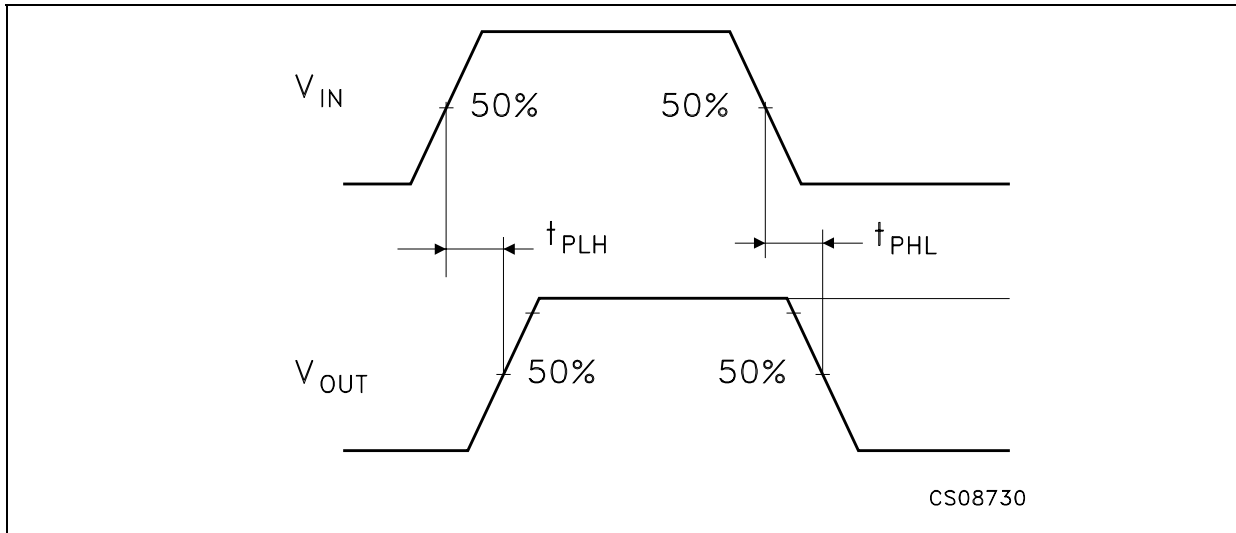
TEST CIRCUIT



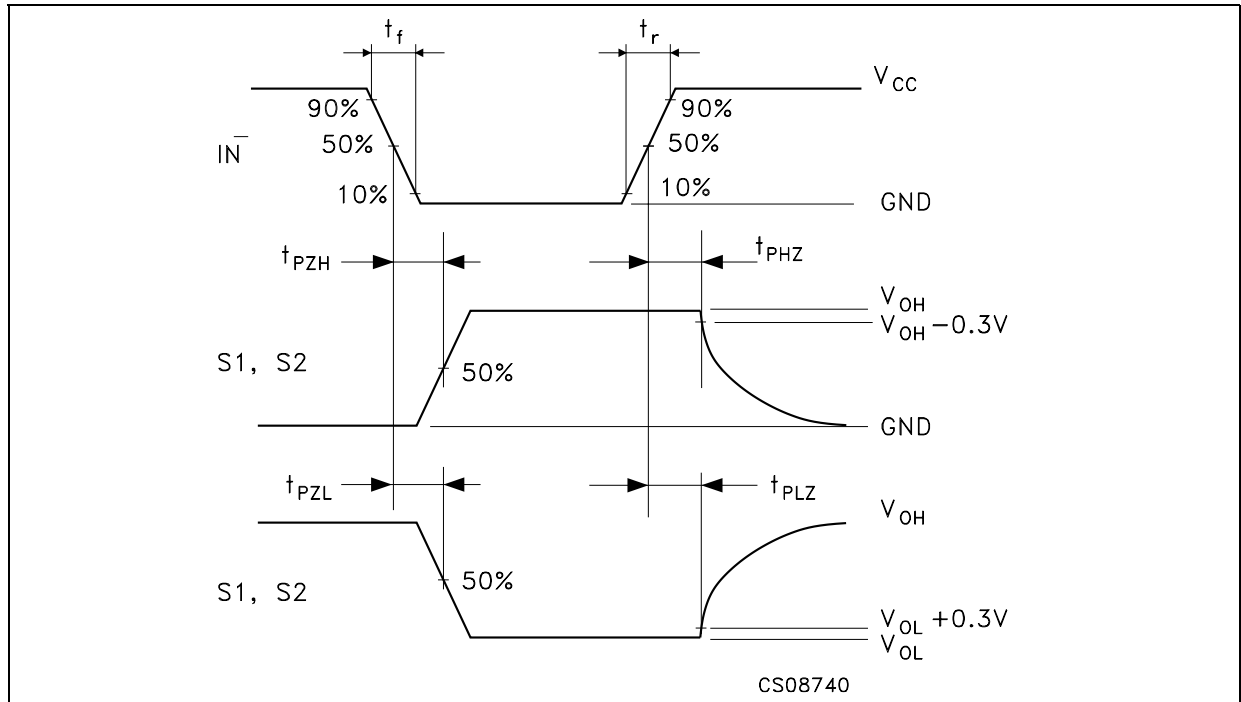
TEST	SWITCH
$t_{PLH}$ , $t_{PHL}$	Open
$t_{PZL}$ , $t_{PLZ}$	$V_{CC}$
$t_{PZH}$ , $t_{PHZ}$	GND

$C_L$  = 50pF or equivalent (includes jig and probe capacitance)  
 $R_L = R_1 = 500\Omega$  or equivalent  
 $R_T = Z_{OUT}$  of pulse generator (typically 50 $\Omega$ )

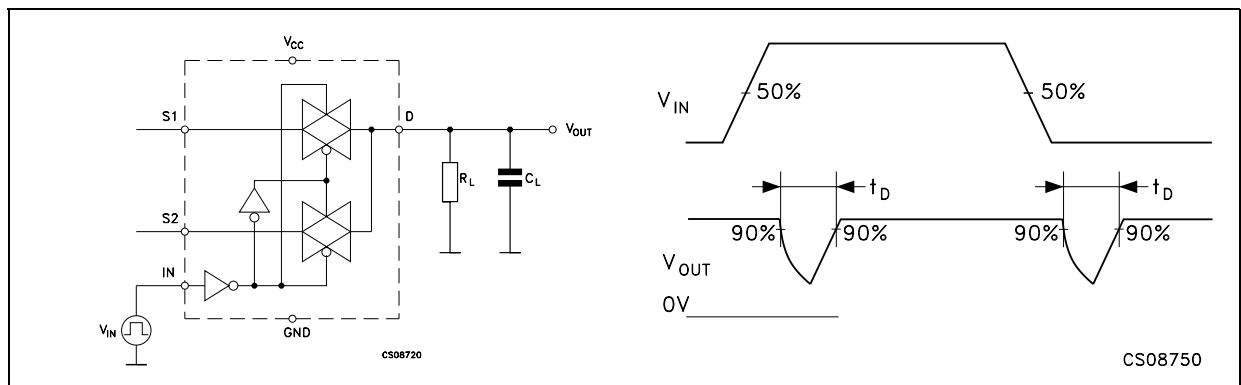
SWITCHING TIMES WAVEFORM



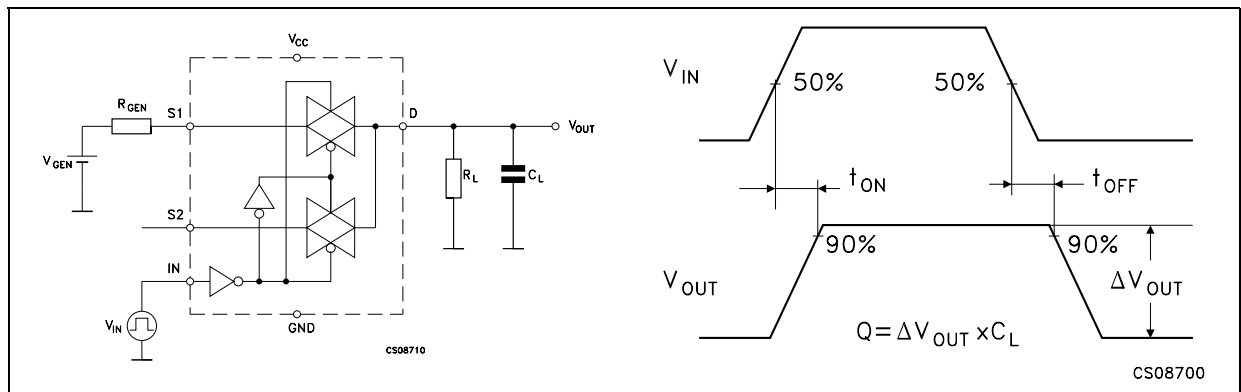
SWITCHING TIMES WAVEFORM



BREAK BEFORE MAKE TIME DELAY

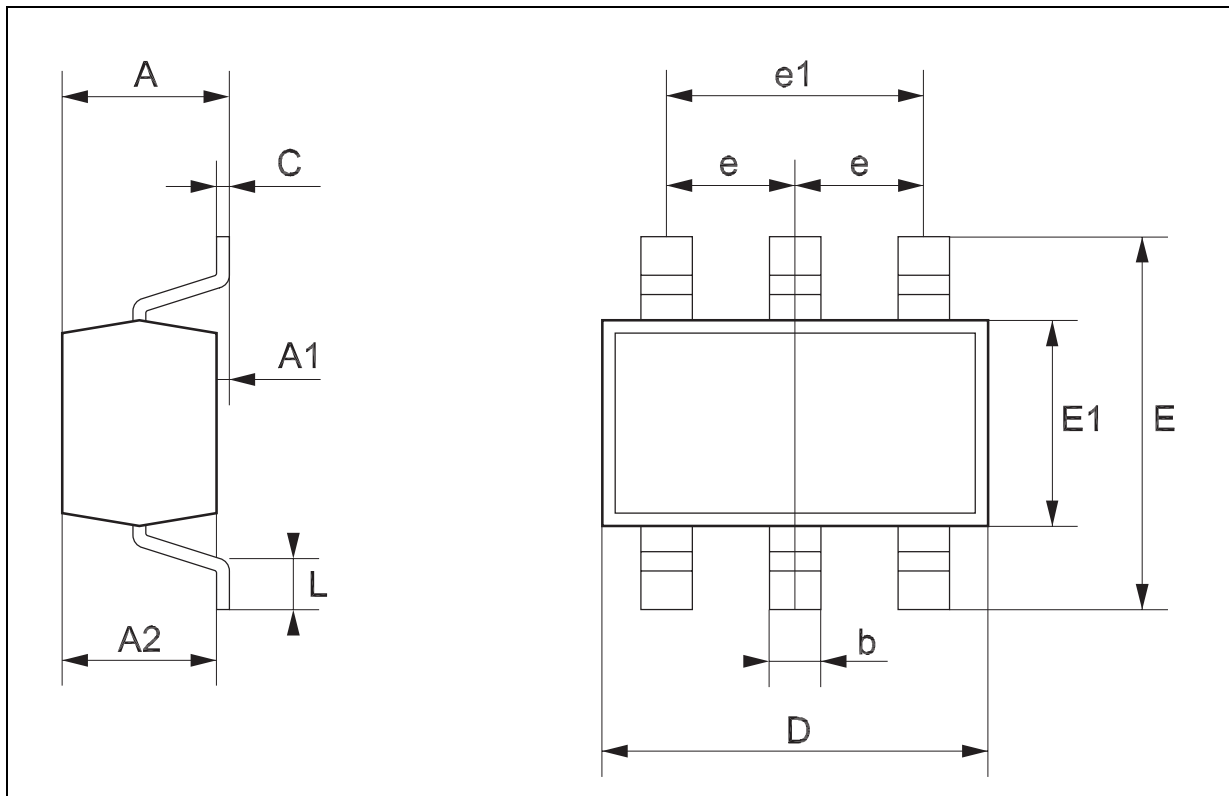


CHARGE INJECTION ( $V_{GEN}=0V$ ,  $R_{GEN}=0\Omega$ ,  $R_L=1M\Omega$ ,  $C_L=100pF$ )



**SOT323-6L MECHANICAL DATA**

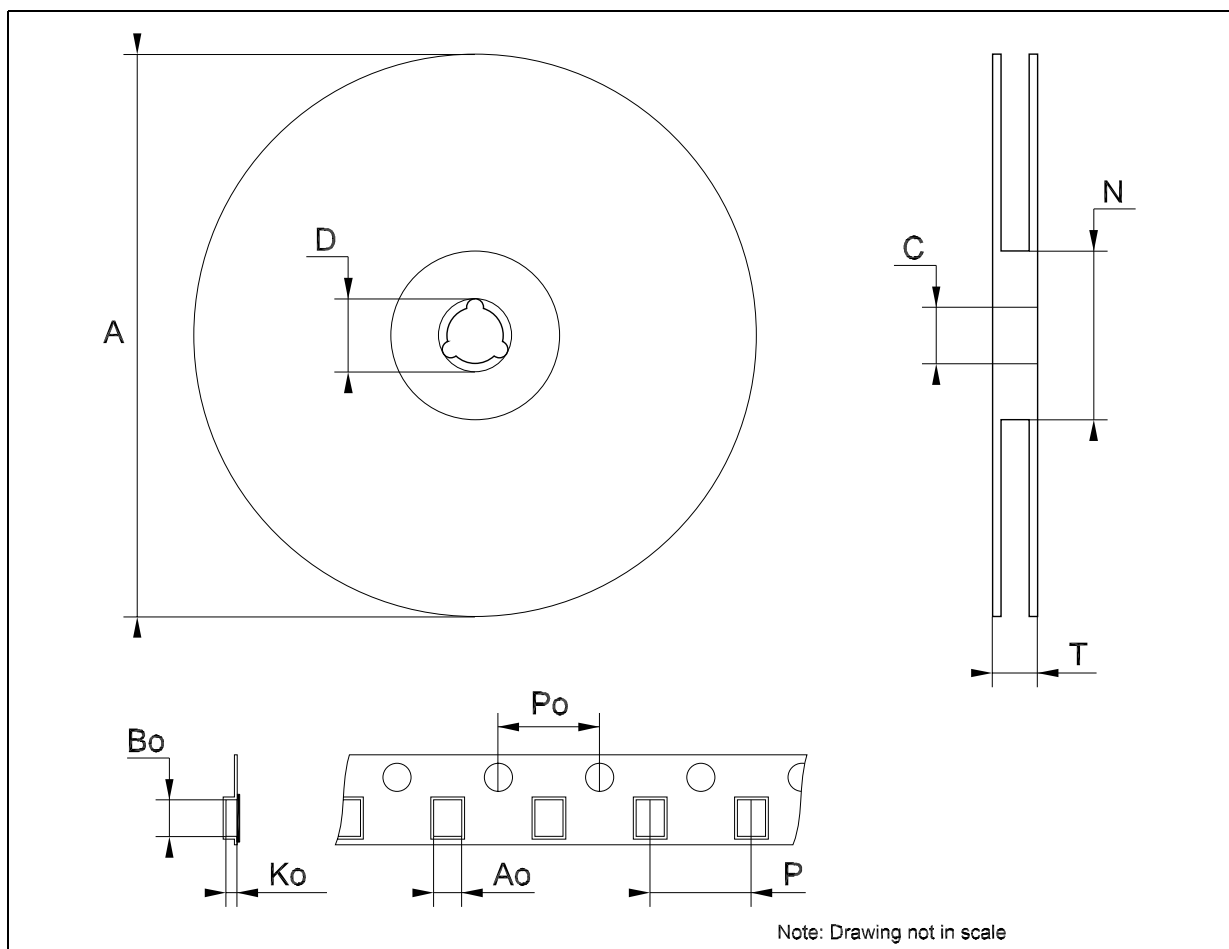
DIM.	mm.			mils		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	0.80		1.10	31.5		43.3
A1	0.00		0.10	0.0		3.9
A2	0.80		1.00	31.5		39.4
b	0.15		0.30	5.9		11.8
C	0.10		0.18	3.9		7.1
D	1.80		2.20	70.9		86.6
E	1.80		2.40	70.9		94.5
E1	1.15		1.35	45.3		53.1
e	0	.65			25.6	
e1		1.3			51.2	
L	0.10		0.30	3.9		11.8





## Tape &amp; 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	3.98	4	4.2	0.156	0.157	0.165
P	3.98	4	4.2	0.156	0.157	0.165



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