

LOW VOLTAGE 0.5/0.8Ω MAX DUAL SPDT SWITCH WITH BREAK BEFORE MAKE FEATURE

- **HIGH SPEED:**
 $t_{PD} = 0.3ns$ (TYP.) at $V_{CC} = 3.0V$
 $t_{PD} = 0.4ns$ (TYP.) at $V_{CC} = 2.3V$
- **ULTRA LOW POWER DISSIPATION:**
 $I_{CC} = 0.2\mu A$ (MAX.) at $T_A = 85^\circ C$
- **LOW "ON" RESISTANCE $V_{IN} = 0V$:**
 $R_{ON-S1} = 0.5\Omega$ (MAX. $T_A = 25^\circ C$) at $V_{CC}=2.7V$
 $R_{ON-S2} = 0.8\Omega$ (MAX. $T_A = 25^\circ C$) at $V_{CC}=2.7V$
- **WIDE OPERATING VOLTAGE RANGE:**
 V_{CC} (OPR) = 1.65V to 4.3V SINGLE SUPPLY
- **4.3V TOLERANT AND 1.8V COMPATIBLE THRESHOLD ON DIGITAL CONTROL INPUT** at $V_{CC} = 2.3$ to $3.0V$
- **LATCH-UP PERFORMANCE EXCEEDS 300mA (JESD 17)**
- **ESD PERFORM. (ANALOG CHAN. vs GND):**
HBM > 7KV (MIL STD 883 method 3015)

DESCRIPTION

The STG3680 is an high-speed CMOS DUAL ANALOG S.P.D.T. (Single Pole Dual Throw) SWITCH or DUAL 2:1 Multiplexer/Demultiplexer Bus Switch fabricated in silicon gate C²MOS technology. It is designed to operate from 1.65V to 4.3V, making this device ideal for portable applications.

It offers very low ON-Resistance (<0.5Ω 1S1 and 2S1 channels; <0.8Ω 1S2 and 2S2 channels) at $V_{CC}=2.7V$. The nIN inputs are provided to control

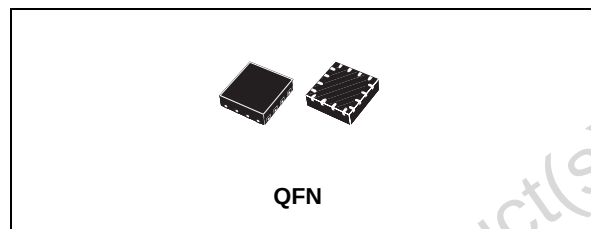


Table 1: Order Codes

PACKAGE	T & R
QFN	STG3680QTR

the switches. The switches nS1 are ON (they are connected to common Ports Dn) when the nIN input is held high and OFF (high impedance state exists between the two ports) when nIN is held low; the switches nS2 are ON (they are connected to common Ports Dn) when the nIN 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 Ultra Low Power Consumption. All inputs and outputs 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 the QFN package.

Figure 1: Pin Connection

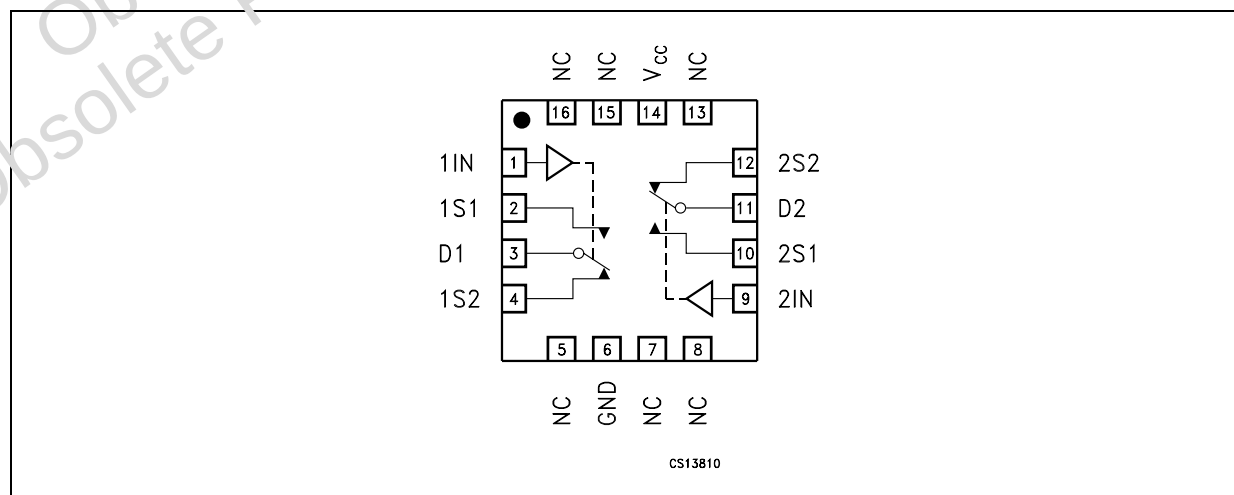


Table 6: DC Specifications

Symbol	Parameter	Test Conditions		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	1.65-1.95		0.65V _{CC}			0.65V _{CC}		0.65V _{CC}		V
		2.3-2.5		1.4			1.4		1.4		
		2.7-3.0		1.4			1.4		1.4		
		3.3		1.5			1.5		1.5		
		3.6		1.7			1.7		1.7		
		4.3		2.2			2.2		2.2		
V _{IL}	Low Level Input Voltage	1.65-1.95				0.40		0.40		0.40	V
		2.3-2.5				0.50		0.50		0.50	
		2.7-3.6				0.50		0.50		0.50	
		3.3				0.50		0.50		0.50	
		3.6				0.50		0.50		0.50	
		4.3				1.3		1.3		1.3	
R _{ON-S1}	Switch ON-S1 Resistance (1)	4.3	V _S =0V to V _{CC} I _S =100mA			0.80		0.80			Ω
		3.0				0.80		0.80			
		2.7				0.80		0.80			
		2.3				2		2			
		1.8				4.0		5.0			
		1.65				4.0		5.0			
R _{ON-S2}	Switch ON-S2 Resistance (1)	4.3	V _S =0V to V _{CC} I _S =100mA		0.40	0.50		0.60			Ω
		3.0			0.40	0.50		0.60			
		2.7			0.40	0.50		0.60			
		2.3			0.50	0.80		0.80			
		1.8			0.70	3.0		4.0			
		1.65			0.80	3.0		4.0			
ΔR _{ON}	ON Resist. Match between channels (1, 2)	2.7	V _S =1.5V I _S =100mA		0.06						Ω
R _{FLAT}	ON Resistance FLATNESS (3)	4.3	V _S =1.5V I _S =100mA								Ω
		3.0									
		2.7			0.07	0.15		0.15			
		2.3									
		1.65	V _S =0.8V I _S =100mA								
I _{OFF}	OFF State Leakage Current (nSn), (Dn)	4.3	V _S =0.3 or 4V			±10		± 100			nA
I _{IN}	Input Leak. Current	0 - 4.3	V _{IN} = 0 to 3.6V			±0.1		± 1			μA
I _{CC}	Quiescent Supply Current (1)	1.65-4.3	V _{IN} =V _{CC} or GND			±0.05		±0.2		±1	μA

Note 1: Guaranteed by design

Note 2: ΔR_{ON} = R_{ON(MAX)} - R_{ON(MIN)}

Note 3: Flatness is defined as the difference between the maximum and minimum value of on-resistance as measured over the specified analog signal ranges.

Table 7: AC Electrical Characteristics ($C_L = 35\text{pF}$, $R_L = 50\Omega$, $t_r = t_f \leq 5\text{ns}$)

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.		
t _{PLH} , t _{PHL}	Propagation Delay	1.65-1.95	V _I =OPEN		0.45							ns
		2.3-2.7			0.40							
		3.0-3.6			0.30							
		3.6-4.3			0.30							
t _{ON}	TURN-ON time	1.65-1.95	V _S =0.8V		70							ns
		2.3-2.7	V _S =1.5V		30	50		60				
		3.0-3.6	V _S =1.5V		30	50		60				
		3.6-4.3	V _S =1.5V		30	50		60				
t _{OFF}	TURN-OFF time	1.65-1.95	V _S =0.8V		45							ns
		2.3-2.7	V _S =1.5V		25	30		40				
		3.0-3.6	V _S =1.5V		25	30		40				
		3.6-4.3	V _S =1.5V		25	30		40				
t _D	Break Before Make Time Delay	1.65-1.95	C _L =35pF R _L = 50Ω V _S =1.5V									ns
		2.3-2.7		2	15							
		3.0-3.6		2	15							
		3.6-4.3		2	15							
Q	Charge injection	1.65-1.95	C _L = 100pF		50							pC
		2.3-2.7	R _L = 1MΩ		40							
		3.0-3.6	V _{GEN} = 0V		35							
		3.6-4.3	R _{GEN} = 0Ω		35							

Table 8: Analog Switch Characteristics ($C_L = 5\text{pF}$, $R_L = 50\Omega$, $T_A = 25^\circ\text{C}$)

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.		
OIRR	Off Isolation (1)	1.65-4.3	V _S = 1V _{RMS} f= 100KHz		-64							dB
Xtalk	Crosstalk	1.65-4.3	V _S = 1V _{RMS} f= 100KHz		-54							dB
THD	Total Harmonic Distortion	2.3-4.3	R _L = 600Ω V _{IN} = 2V _{PP} f= 20Hz to 20kHz		0.03							%
BW	-3dB Bandwidth	1.65-4.3	R _L = 50Ω		50							MHz
C _{IN}	Control Pin Input Capacitance				5							pF
C _{Sn}	Sn Port Capacitance	3.3	f= 1MHz		37							
C _D	D Port Capacitance when Switch is Enabled	3.3	f= 1MHz		84							

Note 1: Off Isolation = $20\text{Log}_{10}(V_D/V_S)$, V_D = output. V_S = input at off switch

Figure 3: ON Resistance

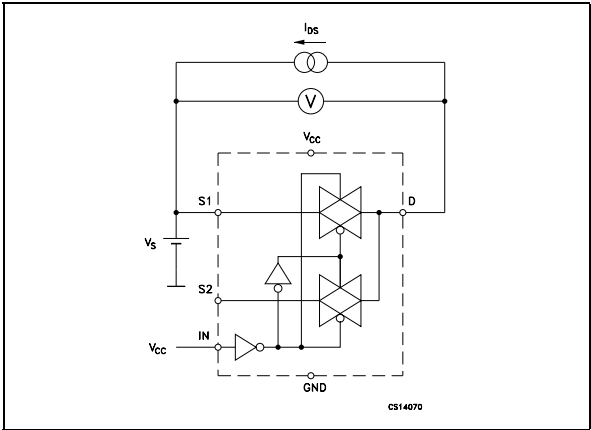


Figure 6: Bandwidth

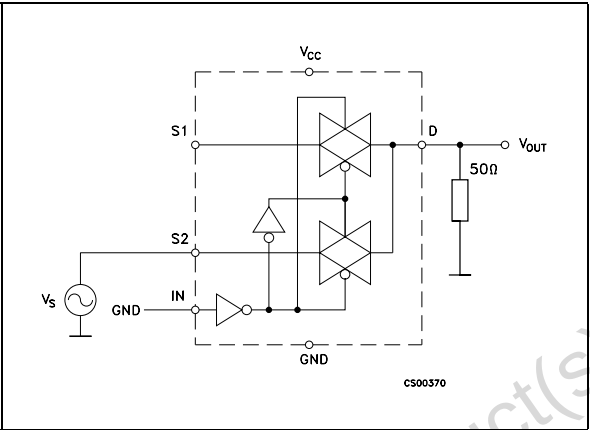


Figure 4: OFF Leakage

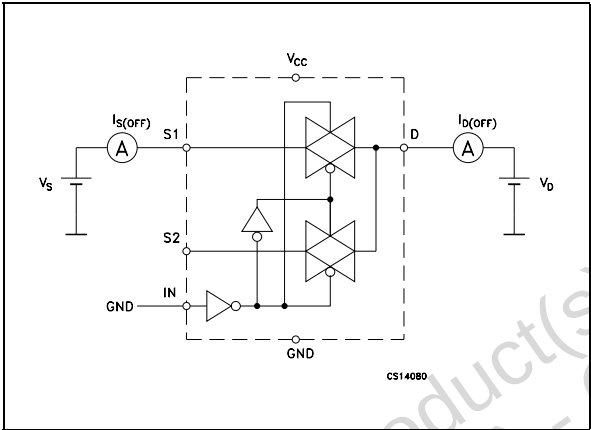


Figure 7: Channel To Channel Crosstalk

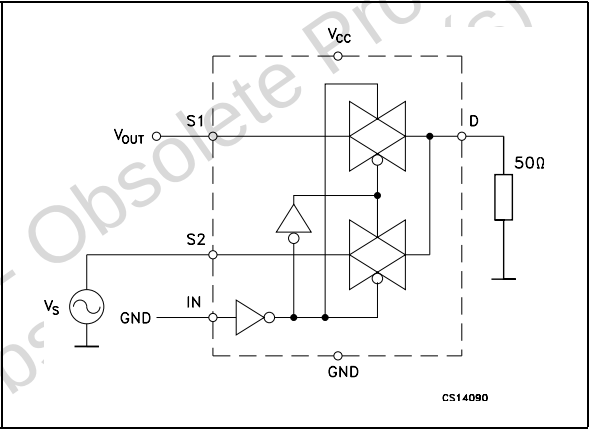


Figure 5: OFF Isolation

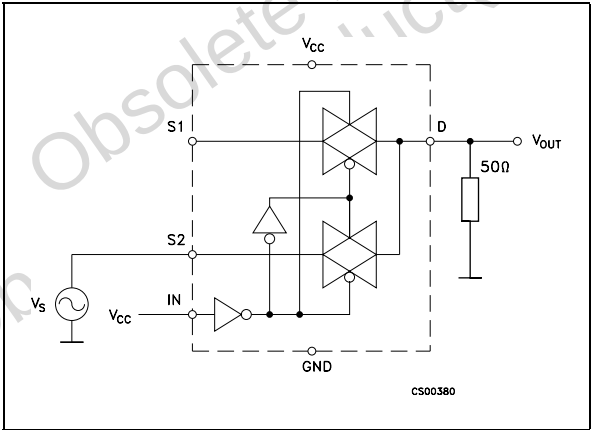
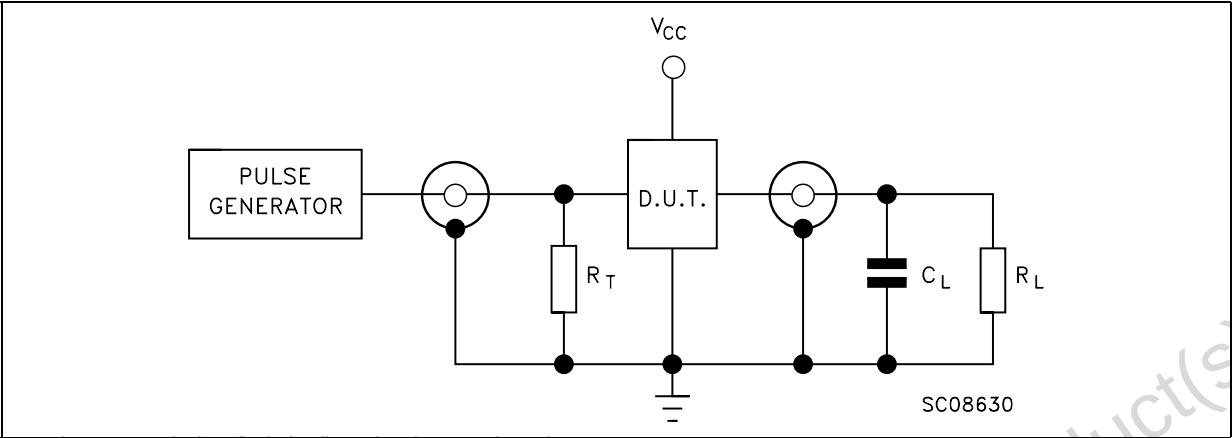


Figure 8: Test Circuit



$C_L = 5/35\text{pF}$ or equivalent (includes jig and probe capacitance)
 $R_L = 50\Omega$ or equivalent
 $R_T = Z_{OUT}$ of pulse generator (typically 50Ω)

Figure 9: Break Before Make Time Delay

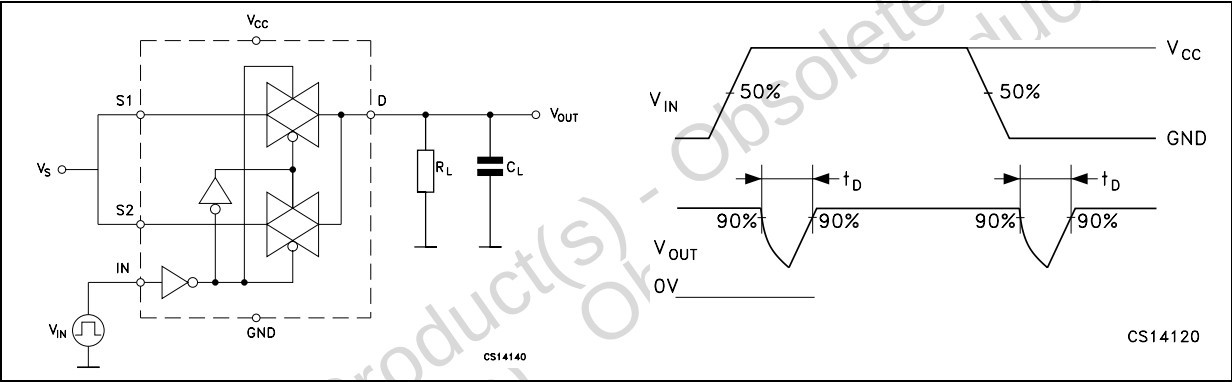


Figure 10: Charge Injection ($V_{GEN}=0V$, $R_{GEN}=0\Omega$, $R_L=1M\Omega$, $C_L=100\text{pF}$)

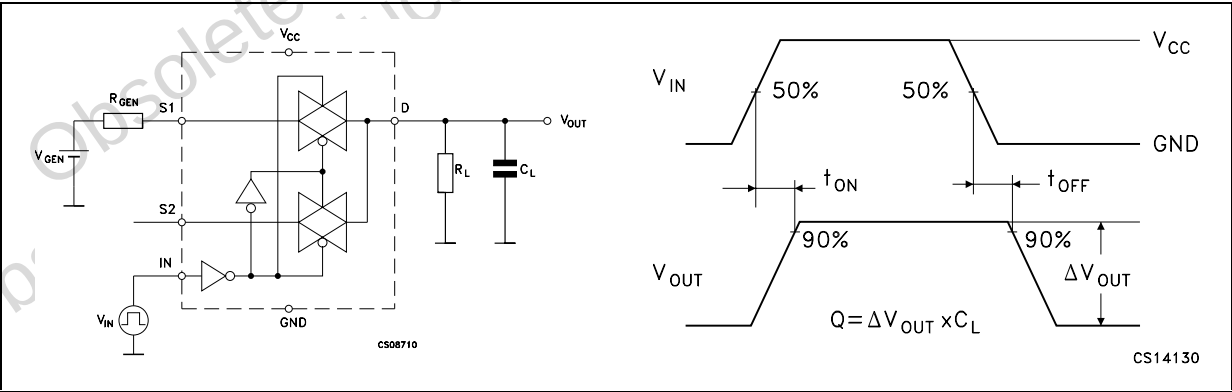
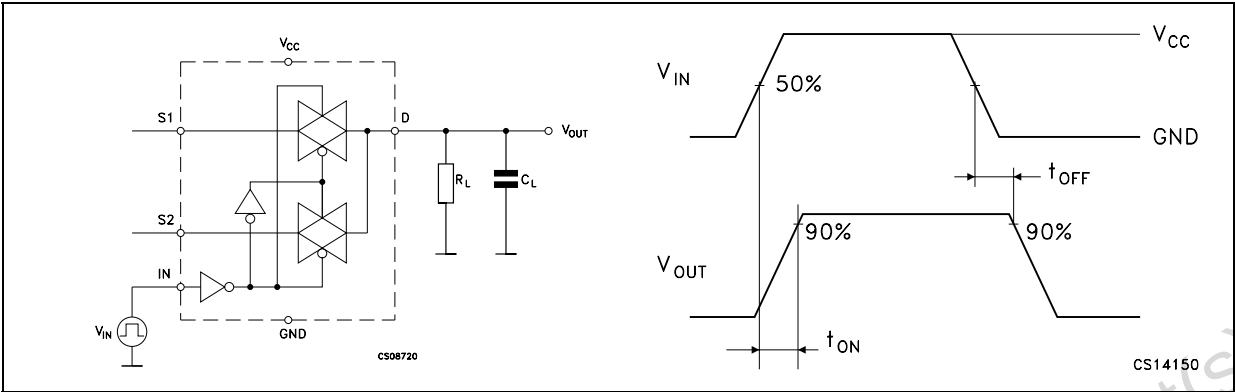
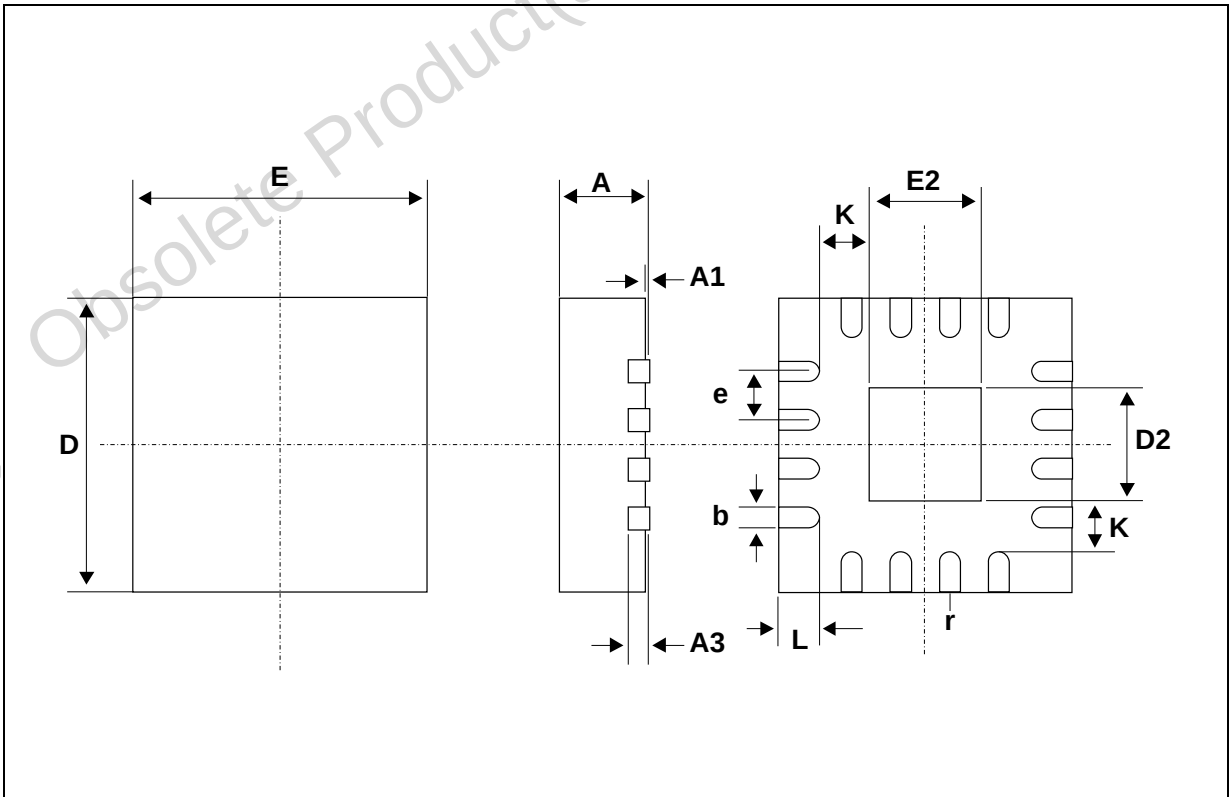


Table 9: Turn ON, Turn OFF Delay Time



QFN16 (3x3) MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	0.80	0.90	1.00	0.032	0.035	0.039
A1		0.02	0.05		0.001	0.002
A3		0.20			0.008	
b	0.18	0.25	0.30	0.007	0.010	0.012
D		3.00			0.118	
D2	1.55	1.70	1.80	0.061	0.067	0.071
E		3.00			0.118	
E2	1.55	1.70	1.80	0.061	0.067	0.071
e		0.50			0.020	
K		0.20			0.008	
L	0.30	0.40	0.50	0.012	0.016	0.020
r	0.09			0.006		



Tape & Reel QFNxx/DFNxx (3x3) MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			330			12.992
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	60			2.362		
T			18.4			0.724
Ao		3.3			0.130	
Bo		3.3			0.130	
Ko		1.1			0.043	
Po		4			0.157	
P		8			0.315	

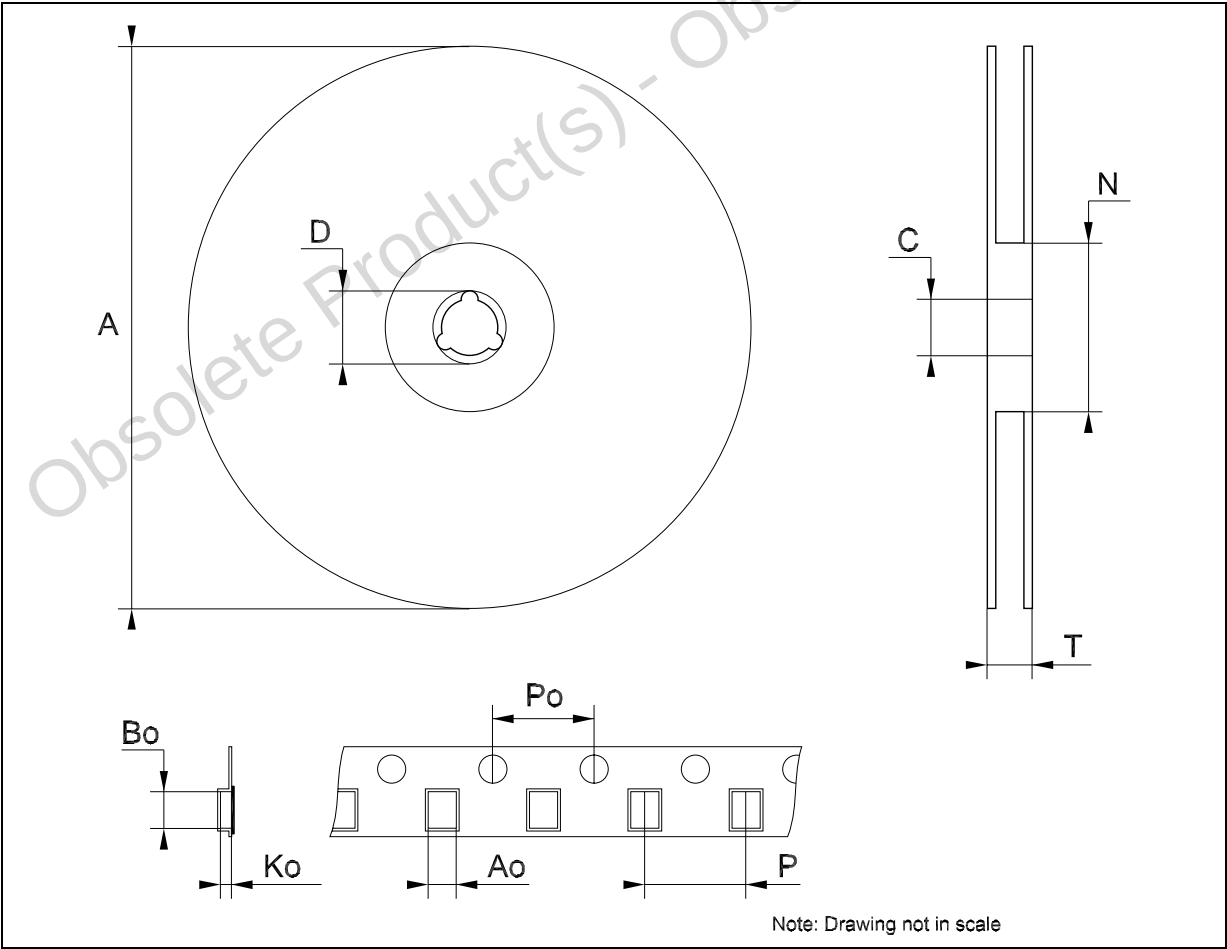


Table 10: Revision History

Date	Revision	Description of Changes
14-May-2004	3	Characteristics at $V_{CC} = 4.3\text{ V}$ Added on Tables 3, 4, 5, 6 and 7.
01-Jun-2004	4	ESD Performance (Analog Channels) added on top page.
04-Jul-2005	5	The Q Values on Table 7 has been updated.

Obsolete Product(s) - Obsolete Product(s)
Obsolete Product(s) - Obsolete Product(s)

Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

The ST logo is a registered trademark of STMicroelectronics

All other names are the property of their respective owners

© 2005 STMicroelectronics - All Rights Reserved

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