

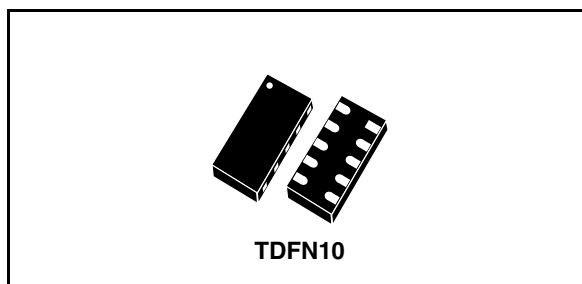


## STG3384

### Low voltage 0.9Ω max dual SPST switch with break before make feature

#### Features

- Low quiescent supply current:  
Max  $\pm 50\mu\text{A}$  for  $V_{1\text{IN}}, V_{2\text{IN}} = 1.80\text{V}$  at  
 $V_{\text{CC}} = 4.3\text{V}$
- Ultra low power dissipation:  
 $I_{\text{CC}} = 0.2\mu\text{A}$  (Max) at  $T_{\text{A}} = 85^\circ\text{C}$ ,  $V_{\text{IN}} = 0\text{V}$
- Switch: low "ON" resistance:
  - $R_{\text{ON}} = 0.7\Omega$  (Max  $T_{\text{A}} = 25^\circ\text{C}$ ) at  $V_{\text{CC}} = 4.3\text{V}$
  - $R_{\text{ON}} = 0.7\Omega$  (Max  $T_{\text{A}} = 25^\circ\text{C}$ ) at  $V_{\text{CC}} = 3\text{V}$
- Wide operating voltage range:  
 $V_{\text{CC}}$  (OPR) = 1.65V to 4.3V single supply
- 4.3V tolerant and 1.8V compatible threshold on digital control input at  $V_{\text{CC}} = 1.65$  to 4.3V
- Latch-up performance exceeds 300mA (JESD 17)
- ESD performance (analog channel vs GND):  
HBM > 2kV (MIL STD 883 method 3015)



#### Description

The STG3384 is a high-speed CMOS low voltage dual analog S.P.S.T. (Single Pole Single Throw) SWITCH fabricated in silicon gate C<sup>2</sup>MOS technology. It is designed to operate from 1.65V to 4.3V, making this device ideal for portable.

The nIN inputs are provided to control the switches.

The switches Sn 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.

Additional key features are fast switching speed, 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.

#### Order codes

Part number	Package	Packaging
STG3384DTR	TDFN10 (2.5mm x 1.3mm)	Tape and reel

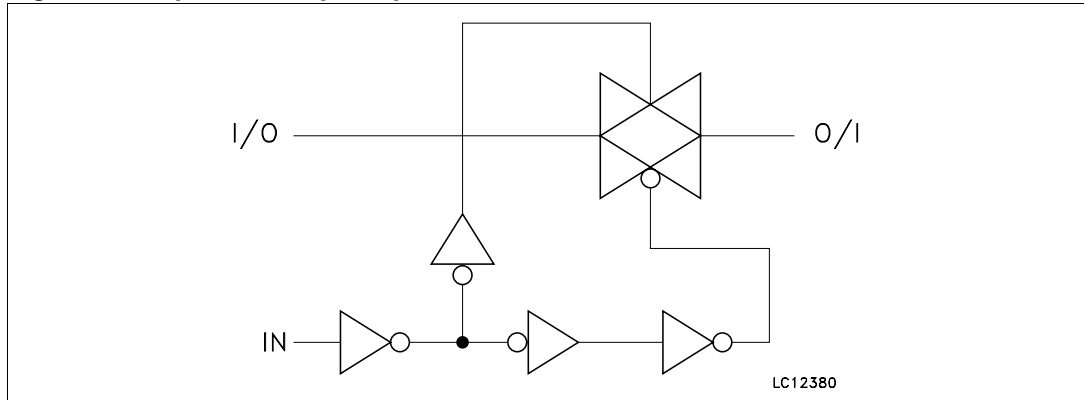
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# 1 Device description

## 1.1 I/O equivalent circuit

Figure 1. Input and output equivalent circuit



## 1.2 Truth table

Table 1. Truth table

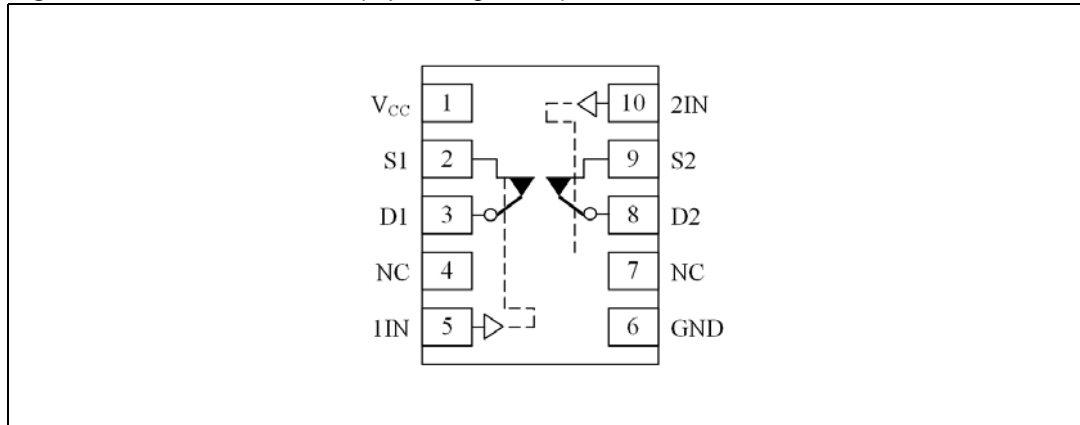
nIN	Switch Sn
H	ON
L	OFF <sup>(1)</sup>

1. High impedance

## 2 Pin settings

### 2.1 Pin connection

Figure 2. Pin connection (top through view)



### 2.2 Pin description

Table 2. Pin description

Pin N°	Symbol	Name and function
5, 10	1IN, 2IN	Controls
2, 9	S1, S2	Independent channels
3, 8	D1, D2	Common channels
1	V <sub>CC</sub>	Positive supply voltage
6	GND	Ground (0V)
4, 7	NC	Not connected

### 3 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. refer also to the STMicroelectronics sure program and other relevant quality documents.

**Table 3. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{CC}$	Supply voltage	-0.5 to 5.5	V
$V_I$	DC input voltage	-0.5 to $V_{CC} + 0.5$	V
$V_{IC}$	DC control input voltage	-0.5 to 5.5	V
$V_O$	DC output voltage	-0.5 to $V_{CC} + 0.5$	V
$I_{IKC}$	DC Input diode current on control pin ( $V_{IN} < 0V$ )	-50	mA
$I_{IK}$	DC input diode current ( $V_{IN} < 0V$ )	$\pm 50$	mA
$I_{OK}$	DC output diode current	$\pm 20$	mA
$I_O$	DC output current	$\pm 200$	mA
$I_{OP}$	DC output current peak (pulse at 1ms, 10% duty cycle)	$\pm 400$	mA
$I_{CC}$ or $I_{GND}$	DC $V_{CC}$ or ground current	$\pm 100$	mA
$P_D$	Power dissipation at $T_A = 70^\circ C^{(1)}$	1120	mW
$T_{stg}$	Storage temperature	-65 to 150	$^\circ C$
$T_L$	Lead temperature (10 sec)	300	$^\circ C$

1. Derate above 70C by 18.5mW/C

### 3.1 Recommended operating conditions

**Table 4. Recommended operating conditions**

Symbol	Parameter	Value	Unit
$V_{CC}$	Supply voltage <sup>(1)</sup>	1.4 to 4.3	V
$V_I$	Input voltage	0 to $V_{CC}$	V
$V_{IC}$	Control input voltage	0 to 4.3	V
$V_O$	Output voltage	0 to $V_{CC}$	V
$T_{op}$	Operating temperature	-55 to 125	$^\circ C$
dt/dv	Input rise and fall time control input	$V_{CC} = 1.65V$ to $2.7V$	0 to 20
		$V_{CC} = 3.0$ to $4.3V$	0 to 10

1. Truth table guaranteed: 1.5V to 3.6V

## 4 Electrical characteristics

### 4.1 DC electrical characteristics

Table 5. DC specifications

Symbol	Parameter	Test conditions		Value						Unit	
				T <sub>A</sub> = 25°C			-40 to 85°C		-55 to 125°C		
		V <sub>CC</sub> (V)		Min	Typ	Max	Min	Max	Min		Max
V <sub>IH</sub>	High level input voltage	1.65-1.95		0.65V <sub>CC</sub>			0.65V <sub>CC</sub>		0.65V <sub>CC</sub>		V
		2.3-2.5		1.4			1.4		1.4		
		2.7-3.0		1.4			1.4		1.4		
		3.3 – 4.3		1.5			1.5		1.5		
V <sub>IL</sub>	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	
		2.7-3.0				0.50		0.50		0.50	
		3.3 – 4.3				0.50		0.50		0.50	
R <sub>ON</sub>	Switch ON resistance	4.3	V <sub>S</sub> = 0V to V <sub>CC</sub> I <sub>S</sub> = 100mA		0.5	0.7		1.4			Ω
		3.0			0.7	0.9		1.4			
		2.7			0.7	0.9		1.7			
		2.3			0.9	1.2		1.7			
		1.8			1.3	1.6		1.9			
		1.65			1.6	2.5		2.2			
ΔR <sub>ON</sub>	ON resistance match between channels Sn	2.7	V <sub>S</sub> @ R <sub>ON</sub> Max I <sub>S</sub> =100mA		0.6						Ω
R <sub>FLAT</sub>	ON resistance flatness (1) (2)	4.3	V <sub>S</sub> = 0V to V <sub>CC</sub> I <sub>S</sub> =100mA		0.18	0.21					Ω
		3.0			0.16	0.19					
		2.7			0.16	0.19					
		2.3			0.18	0.21					
		1.65			0.38	0.44					
I <sub>OFF</sub>	OFF state leakage current (Sn), (Dn)	4.3	V <sub>S</sub> = 0.3 or 4V			±10		±100			nA

Table 5. DC specifications

Symbol	Parameter	Test conditions		Value						Unit	
		Vcc (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 – 4.3	V <sub>IN</sub> = 0 to 4.3V			±0.1		±1			μA
I <sub>CC</sub>	Quiescent supply current	1.65 – 4.3	V <sub>IN</sub> = V <sub>CC</sub> or GND			±0.05		±0.2		±1	μA
I <sub>CCLV</sub>	Quiescent supply current low voltage driving	4.3	V <sub>1IN</sub> , V <sub>2IN</sub> = 1.65V		42	55					μA
			V <sub>1IN</sub> , V <sub>2IN</sub> = 1.80V		38	50					

1.  $\Delta R_{ON} = R_{ON(MAX)} - R_{ON(MIN)}$ .
2. Flatness is defined as the difference between the maximum and minimum value of on-resistance as measured over the specified analog signal ranges.

### 4.2 AC electrical characteristics

$C_L = 35\text{pF}$ ,  $R_L = 50\Omega$ ,  $t_r = t_f \leq 5\text{ns}$

Table 6. AC specifications

Symbol	Parameter	Test conditions		Value						Unit	
		Vcc (V)		T <sub>A</sub> = 25°C			-40 to 85°C		-55 to 125°C		
				Min	Typ	Max	Min	Max	Min		Max
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation delay	1.65-1.95			0.45						ns
		2.3-2.7			0.40						
		3.0-3.3			0.30						
		3.6-4.3			0.30						
t <sub>ON</sub>	Turn-ON time	1.65-1.95	V <sub>S</sub> = 0.8V		70						ns
		2.3-2.7	V <sub>S</sub> = 1.5V		30	60		75			
		3.0-3.3			25	50		60			
		3.6-4.3			25	50		60			
t <sub>OFF</sub>	Turn-OFF time	1.65-1.95	V <sub>S</sub> = 0.8		45						ns
		2.3-2.7	V <sub>S</sub> = 1.5V		25	30		40			
		3.0-3.3			25	30		40			
		3.6-4.3			25	30		40			
t <sub>D</sub>	Break before make time delay	1.65 – 1.95	C <sub>L</sub> = 35pF R <sub>L</sub> = 50Ω V <sub>S</sub> = 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 <sub>L</sub> =100pF R <sub>L</sub> =1MΩ V <sub>GEN</sub> =0V R <sub>GEN</sub> =0Ω		23						pC
		2.3-2.7			32						
		3.0-3.3			40						
		3.6-4.3			44						



### 4.3 Analog switch characteristics

$$C_L = 5\text{pF}, R_L = 50\Omega, T_A = 25^\circ\text{C}$$

Table 7. Analog switch characteristics

Symbol	Parameter	Test conditions		Value						Unit		
		Vcc (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 <sup>(1)</sup>	1.65-4.3	V <sub>S</sub> = 1V <sub>RMS</sub> f = 100kHz		-90							dB
Xtalk	Crosstalk	1.6-4.3	V <sub>S</sub> = 1V <sub>RMS</sub> f = 100kHz		-76							dB
THD	Total Harmonic Distortion	3.0	R <sub>L</sub> = 600Ω V <sub>IN</sub> = 2V <sub>PP</sub> f = 20Hz to 20 kHz		0.03							%
BW	-3dB bandwidth	1.65-4.3	R <sub>L</sub> = 50Ω		85							MHz
C <sub>IN</sub>	Control pin input capacitance				5							pF
C <sub>Sn</sub>	Sn port capacitance	3.3	f = 1MHz		20							
C <sub>D</sub>	D port capacitance when switch is enabled	3.3	f = 1MHz		70							

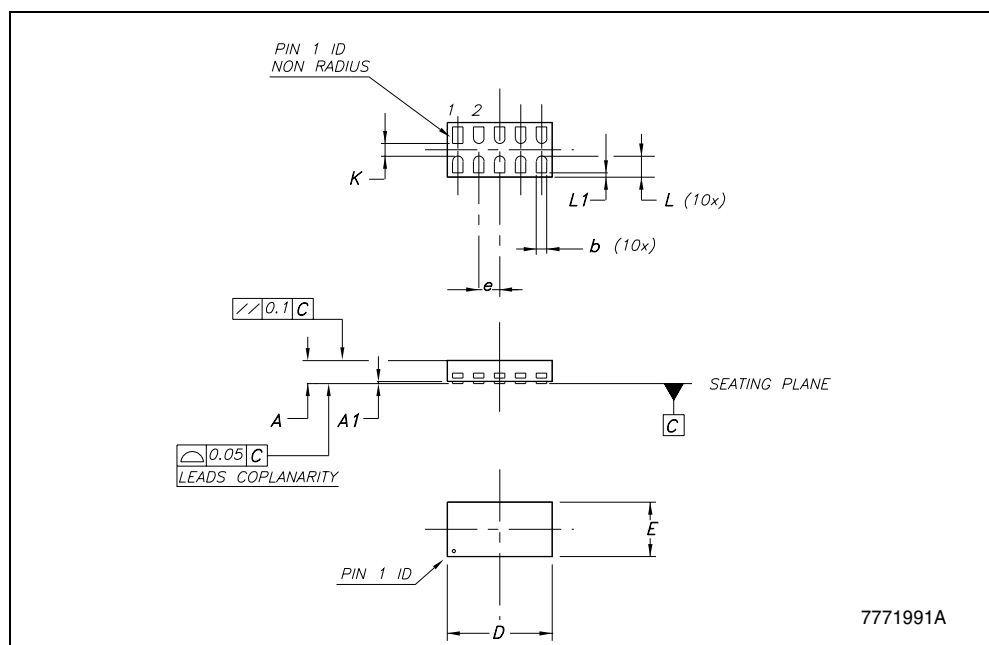
1. OFF Isolation = 20Log<sub>10</sub> (V<sub>D</sub>/V<sub>S</sub>), V<sub>D</sub> = output, V<sub>S</sub> = input at off switch

## 5 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](http://www.st.com)

**DFN10 (2.5x1.3) MECHANICAL DATA**

DIM.	mm.			mils		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	0.50	0.55	0.60	19.7	21.7	23.6
A1	0	0.02	0.05	0	0.8	2.0
b	0.18	0.23	0.30	7.1	9.1	11.8
D	2.40	2.50	2.60	94.5	98.4	102.4
E	1.30	1.40	1.50	51.2	55.1	59.1
e		0.50			19.7	
K	0.20			7.9		
L	0.45	0.50	0.55	17.7	19.7	21.6
L1			0.15			5.9



## 6 Revision history

**Table 8. Revision history**

Date	Revision	Changes
02-Aug-2006	1	First release

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