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SW4684
Ultra-Low Resistance Dual SPDT Analog Switch

General Description

The SW4684 is an advanced CMOS analog switch that operates from a single +1.8V to +5.5V supply. The device is a dual independent single pole double throw (SPDT) switch featuring ultra-low R_{ON} of 0.5Ω for the normally closed (NC) switch, and 0.8Ω for the normally opened switch (NO) at 2.7 V.

The switch features break-before-make switching action with t_{ON} = 50ns and t_{OFF} = 40ns at +3V. The digital logic inputs are 1.8V logic interface compatible with a +2.7V to +3.3V supply.

Key Specifications

■ Single Supply Operation	1.8V to 5.5V
■ High Isolation	-66dB at 100kHz
■ Low Standby Current	<50nA
■ Low Crosstalk	<-66dB at 100kHz
■ 3dB Bandwidth at V_{CC} = 5V	10MHz(typ)

Features

- Ultra Low NC R_{ON}, 0.5Ω Max at 2.7V
- Ultra Low NO R_{ON}, 0.8Ω Max at 2.7V
- Low Distortion, <0.14% THD
- Full 0-Vcc Signal Handling
- High Continuous Current Capability

Applications

- Mobile Phones
- Speaker Switches
- Power Switches

Schematic Diagram

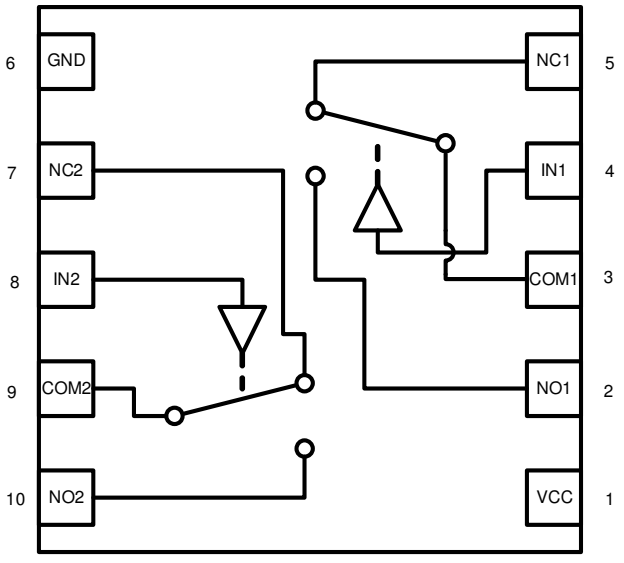


Figure 1 Ultra-Low Resistance dual SPDT Analog Switch

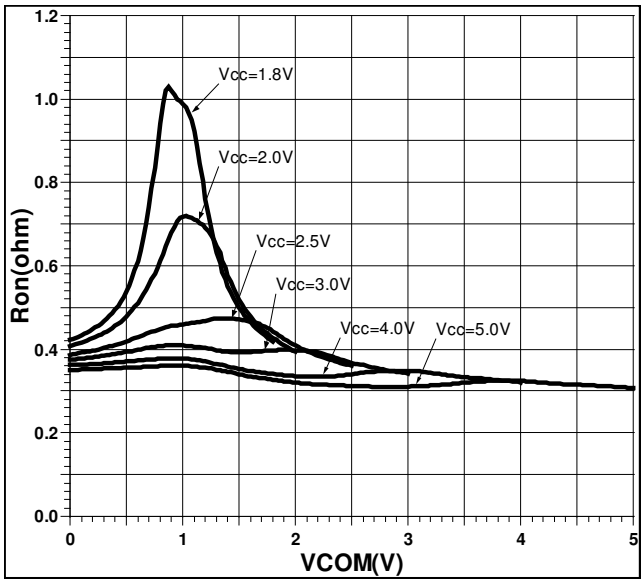
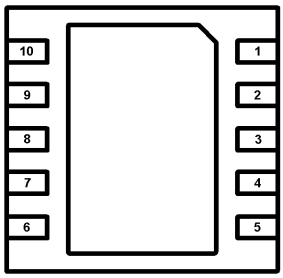


Figure 2 On-Resistance vs COM Voltage

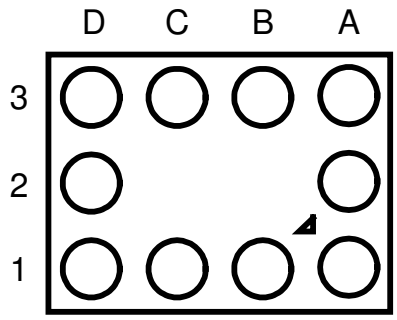
Pin Assignment



SW4684D10-3 (Bottom View)

Pin No.	Pin Name	Type	Description
1	V_{CC}	I	Power Supply
2	NO1	I/O	Analog Switch 1 Normally Open Pin
3	COM1	I/O	Analog Switch 1 Common Pin
4	IN1	I	Analog Switch 1 Digital Control Input
5	NC1	I/O	Analog Switch 1 Normally Closed Pin
6	GND	I	Ground
7	NC2	I/O	Analog Switch 2 Normally Closed Pin
8	IN2	I	Analog Switch 2 Digital Control Input
9	COM2	I/O	Analog Switch 2 Common Pin
10	NO2	I/O	Analog Switch 2 Normally Open Pin

Pin Assignment (Cont)



SW4684CS10 (Ball View)

Pin No.	Pin Name	Type	Description
A1	NC1	I/O	Analog Switch 1 Normally Closed Pin
A2	GND	I	Ground
A3	NC2	I/O	Analog Switch 2 Normally Closed Pin
B1	IN1	I	Analog Switch 1 Digital Control Input
B3	IN2	I	Analog Switch 2 Digital Control Input
C1	COM1	I/O	Analog Switch 1 Common Pin
C3	COM2	I/O	Analog Switch 2 Common Pin
D1	NO1	I/O	Analog Switch 1 Normally Open Pin
D2	V_{CC}	I	Power Supply
D3	NO2	I/O	Analog Switch 2 Normally Open Pin

Operation Conditions

Parameter	Symbol	Min	Typ	Max	Unit
Power Supply Voltage	V_{CC}	1.8		5.5	V
Digital Select Input Voltage	V_{IN}	GND		5.5	V
Analog Input voltage (NC, NO, COM)	V_{IS}	GND		V_{CC}	
Operating Temperature Range	T_A	-55		125	°C

Ordering Information

Part Number	Package	Marking+
SW4684D10-3	10-lead DFN 3x3 (Pb-Free)	A4684D WXYZ
SW4684CS10	10-Ball CSP10 (Pb-Free)	4684 WXYZ

+ WXYZ = assembly and date code

Absolute Maximum Ratings

If Military/Aerospace specified devices are required, please contact the Analog Express Sales Office/Distributors for availability and specifications.

Supply Voltage V_{CC}	-0.5V to +7.0V
Storage Temperature	-65℃ to +150℃
Digital Input Voltage, V_{IN}	-0.5V ≤ V_{IN} + 7.0V
Continuous DC Current, COM to NC/NO	± 300mA
Peak Passing Current, 10 duty cycle	± 500mA
Continuous DC Current into Device	± 300mA
Peak Current into Input Clamp Diodes at COM/NC/NO	± 500mA

Thermal Resistance	
θ_{JC} (DFN10 3x3)	55℃/W
θ_{JA} (DFN10 3x3)	10℃/W

Electrical Characteristics

The following specifications apply for the circuit shown in Parametric Measurement Information, unless otherwise specified. Limits apply for T_A = 25℃.

Symbol	Parameter	Conditions	Min	Typ	Max	Units
V_{NO}, V_{NC}, V_{COM}	Analog Signal Range		0		V_{CC}	V
$R_{ON\ (NC)}$	NC On-Resistance	V_{CC} = 2.7V, I_{COM} = 100 mA, V_{NC} =0 to V_{CC}		0.4	0.5	Ω
$R_{ON\ (NO)}$	NO On-Resistance	V_{CC} = 2.7V, I_{COM} = 100 mA, V_{NO} =0 to V_{CC}		0.4	0.8	Ω
ΔR_{ON}	On-Resistance Match Between Channels	V_{CC} = 2.7V, I_{COM} = 100 mA, V_{NC} or V_{NO} =1.5V		1.11	60	mΩ
$R_{FLAT(NC)}$	NC-On-Resistance Flatness	V_{CC} = 2.7V, I_{COM} = 100 mA, V_{NC} = 0 to V_{CC} T_J = -40℃ to 85℃		0.1	0.25	Ω
$R_{FLAT(NO}$	NO On-Resistance Flatness	V_{CC} = 2.7V, I_{COM} = 100 mA, V_{NO} = 0 to V_{CC}		0.18	0.35	Ω
$I_{NO(OFF)}$ or $I_{NC(OFF)}$	NO or NC Off Leakage Current	V_{CC} = 3.3V, V_{NO} or V_{NC} = 3V, 0.3V; V_{COM} = 0.3V, 3V	-1		1	nA
			-10		10	
$I_{COM\ (ON)}$	COM On Leakage Current	V_{CC} = 3.3V, V_{NO} or V_{NC} = 3V, 0.3V, or floating; V_{COM} = 3V, or floating	-2		2	nA
			-20		20	
Dynamic Characteristics						
BW	-3 dB Bandwidth	V_{CC} = 3V, R_L = 50Ω V_{IN} = 0 dBm		10		MHz
t_{ON}	Turn-On Time	V_{CC} = 2.7V, V_{NO} or V_{NC} = 1.5V; R_L = 50Ω; C_L = 100 pF;			60	ns
					70	
t_{OFF}	Turn-Off Time	V_{CC} = 2.7V, V_{NO} or V_{NC} = 1.5V; R_L = 50Ω; C_L = 100 pF;			40	ns
					50	
t_{BBM}	Break-Before-Make Delay	V_{CC} = 2.7V, V_{NO} or V_{NC} = 1.5V; R_L = 50Ω; C_L = 100 pF;	2			ns
Q	Charge Injection	COM = 0; R_S = 0; C_L= 1 nF;		200		pC

Electrical Characteristics

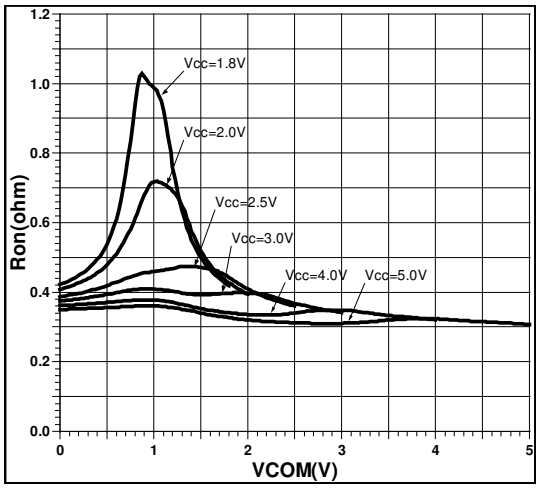
The following specifications apply for the circuit shown in Parametric Measurement Information, unless otherwise specified. Limits apply for T_A = 25℃.

Dynamic Characteristics *(continous)*

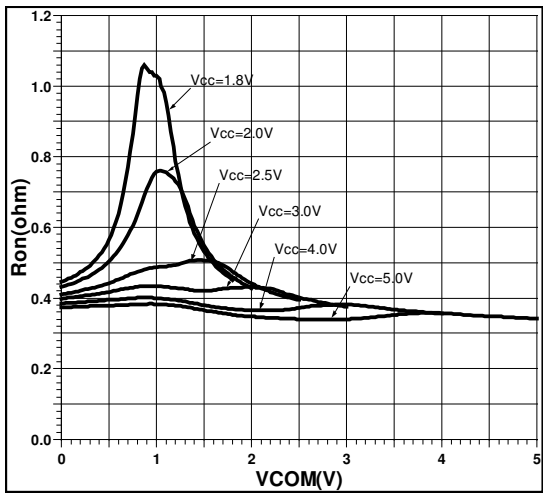
Symbol	Parameter	Conditions	Min	Typ	Max	Units
V_{ISO}	Off-Isolation	R_L = 50Ω; C_L= 5 pF; f = 100 kHz		-66		dB
V_{CT}	Crosstalk			-66		dB
Digital I/O						
V_{IH}	Input Logic High		1.6			V
V_{IL}	Input Logic Low				0.5	V
I_{IN}	IN Input Leakage Current	V_{IN} = 0 or V_{CC}	-1		1	μA
Power Supply						
V_{CC}	Power-Supply Range		1.8		5.5	V
I_{CC}	Supply Current	V_{CC} = 5.5V		5		nA

Typical Performance Characteristics

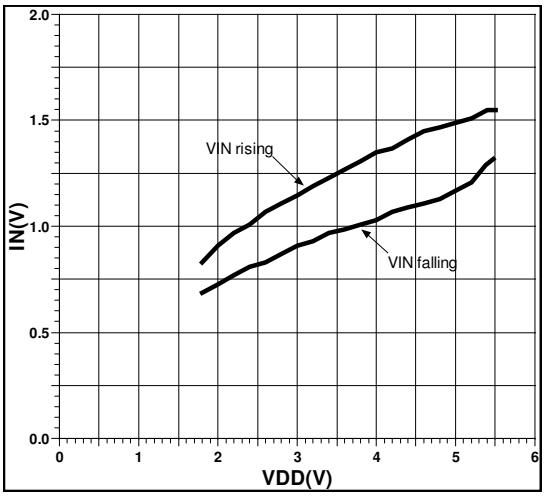
NO ON Resistance vs. COM Voltage



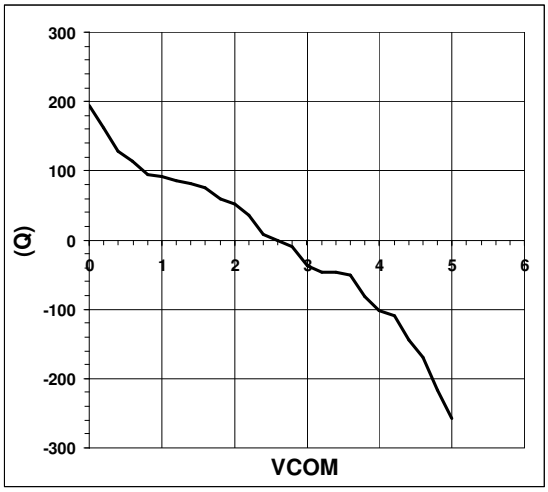
NC ON Resistance vs. COM Voltage



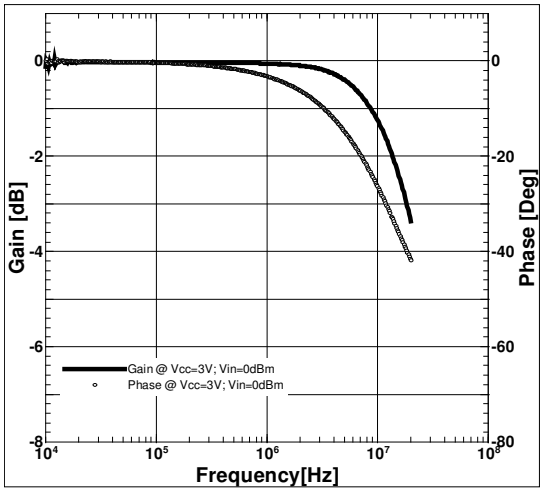
Logic Threshold Voltage vs. Supply Voltage



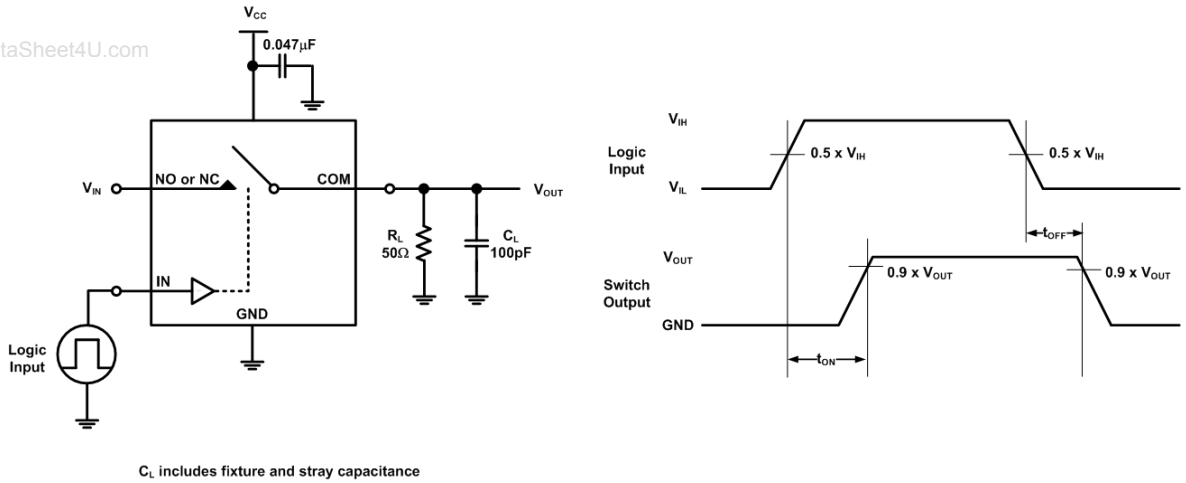
Charge Injection vs. COM Voltage



Frequency Response @ V_{CC} = 3V

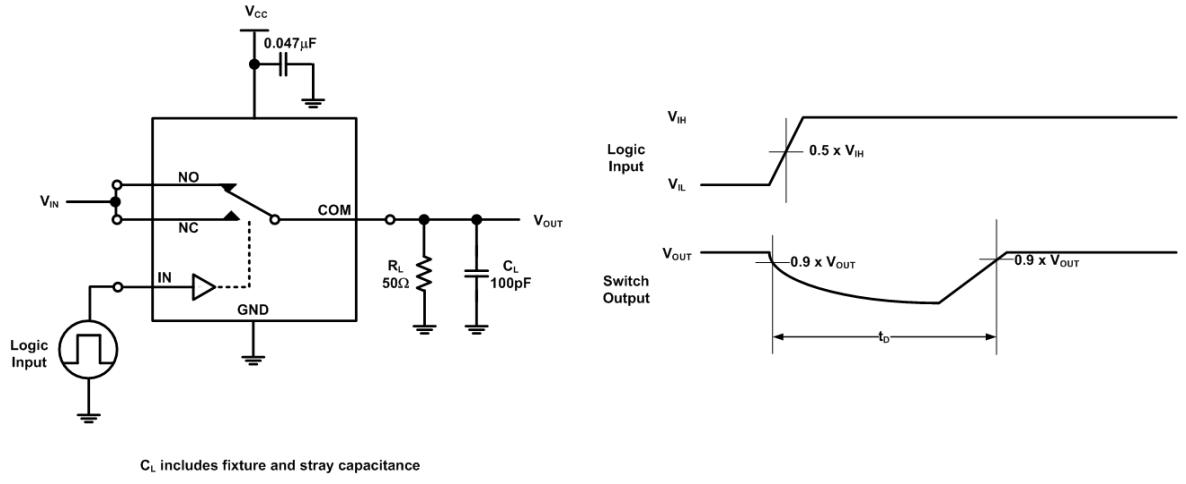


Parametric Measurement Information



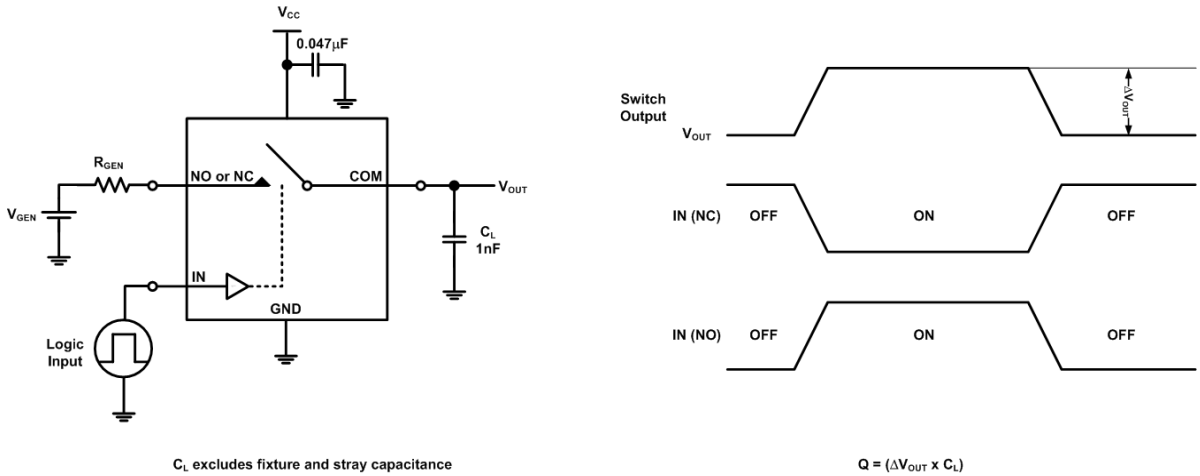
C_L includes fixture and stray capacitance

Figure 3 t_{ON} / t_{OFF} Time



C_L includes fixture and stray capacitance

Figure 4 Break-Before Make Delay



C_L excludes fixture and stray capacitance

$Q = (\Delta V_{OUT} \times C_L)$

Figure 5 Charge Injection

Parametric Measurement Information

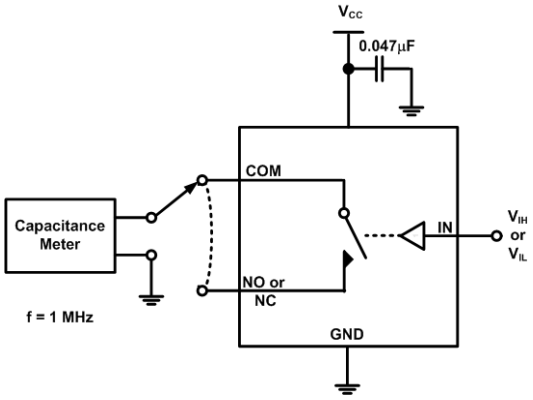


Figure 6 Channel Capacitance

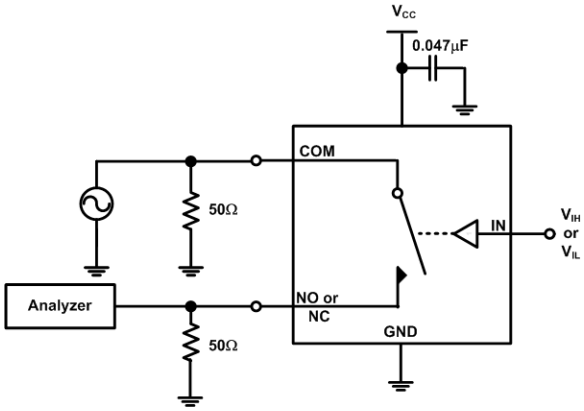


Figure 7 Off Isolation

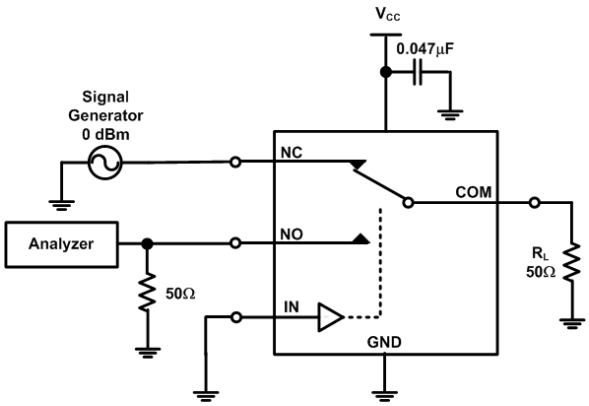


Figure 8 Cross-talk

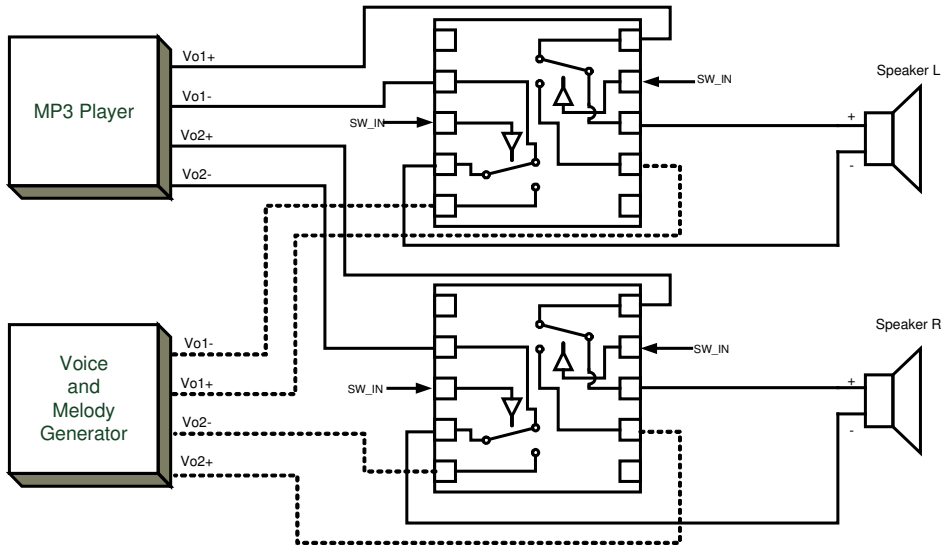
Functional Description

The SW4684 is an Ultra-low On-Resistance Dual analog switch which can operate over a supply voltage range of 1.8V to 5.5V. In application, the SW4684 is fully characterized to operate in 1.8V to 5.5V and feature very low on resistance and fast Turn-Off and Turn-On times with break-before-make switching.

The switch operates asymmetrically; one terminal is normally closed (NC) and the other terminal normally opened (NO). Both NC and NO terminals are connected to a common terminal (COM). This configuration is ideal for applications with asymmetric loads such as speaker handsets and internal speakers.

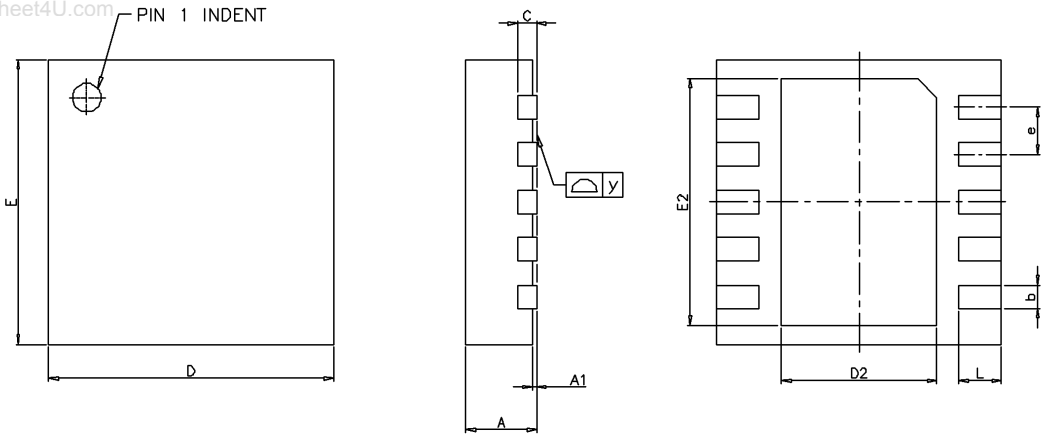
Application Examples

Example for Mobile phone with MP3 player



Note :
When SW_IN = VSS, MP3 Player's Stereo output will connect to speakers.
When SW_IN = VDD, Voice and Melody Generator will connect to speakers.

Package Dimensions



NOTE :
1. THE TERMINAL #1 IDENTIFIER IS A LASER MARKED FEATURE.

SYMBOLS	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0.00	0.20	0.50
b	0.18	0.25	0.30
c	——	0.20REF.	——
D	2.90	3.00	3.10
D2	1.59	1.64	1.69
E	2.90	3.00	3.10
E2	2.55	2.60	2.65
e	——	0.50	——
L	0.40	0.45	0.50
y	0.00	——	0.075

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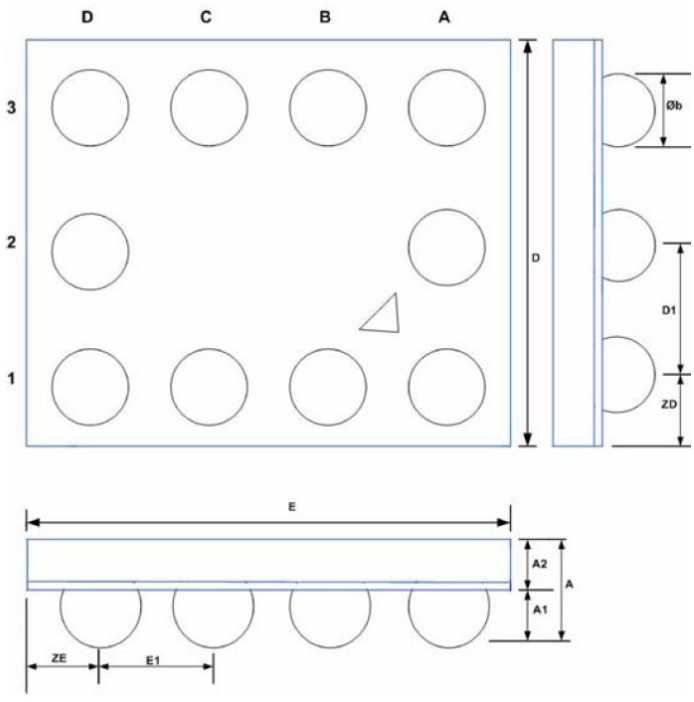
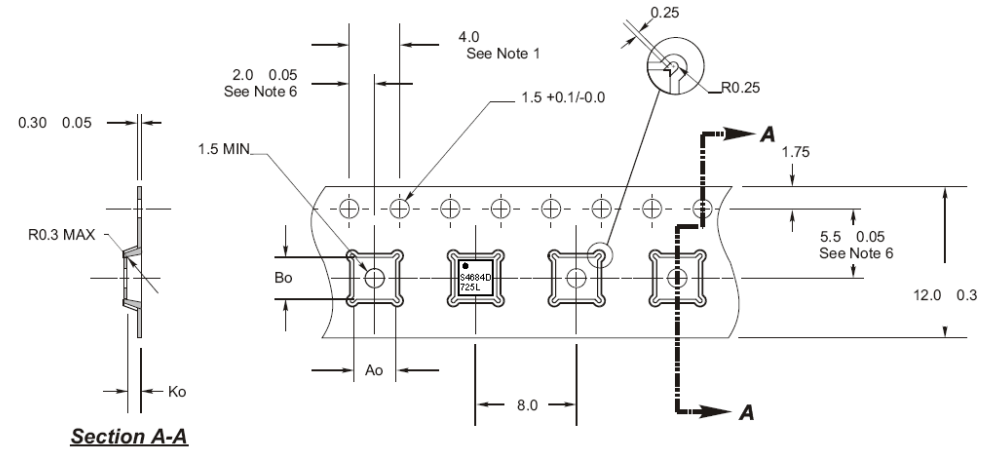
TITLE:
PACKAGE OUTLINE
DFN10 3X3
REF NO. 070314
REV. A



Symbol	Dimensions in Millimeter		
	Min.	Nom.	Max.
A	0.580	0.625	0.670
A1	0.215	0.235	0.255
A2	0.365	0.390	0.415
Ø b	0.280	0.300	0.320
D	1.420	1.470	1.520
D1	0.500		
E	1.870	1.920	1.970
E1	0.500		
ZD	0.210		
ZE	0.235		

Tape and Reel Drawing

10-lead DFN 3x3



Ao = 3.3 mm
Bo = 3.3 mm
Ko = 1.1 mm

-All Dimensions in Millimeters-

Notes:
1. 10 sprocket hole pitch cumulative tolerance .02.
2. Camber not to exceed 1mm in 100mm.
3. Material: PS + C.
4. Ao and Bo measured as indicated.
5. Ko measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
6. Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole.

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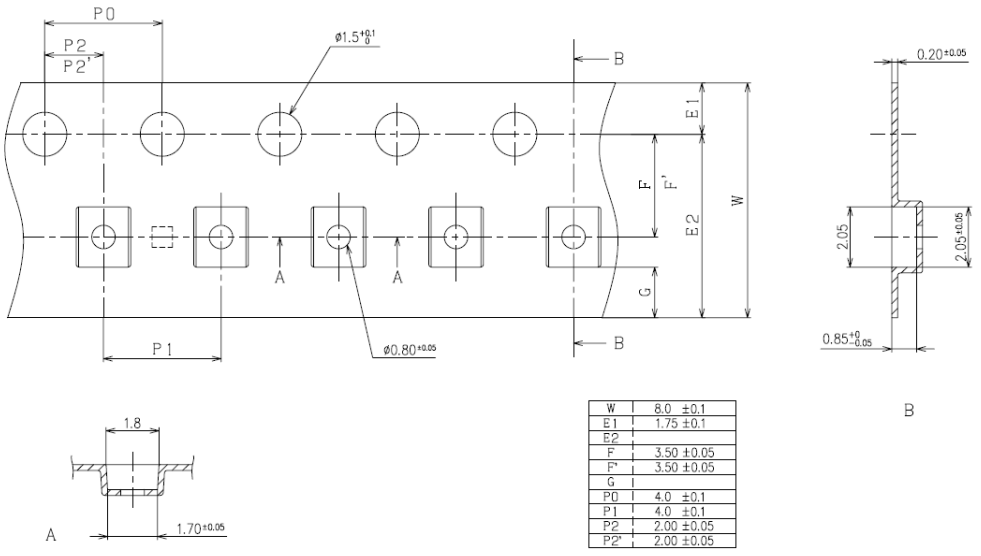
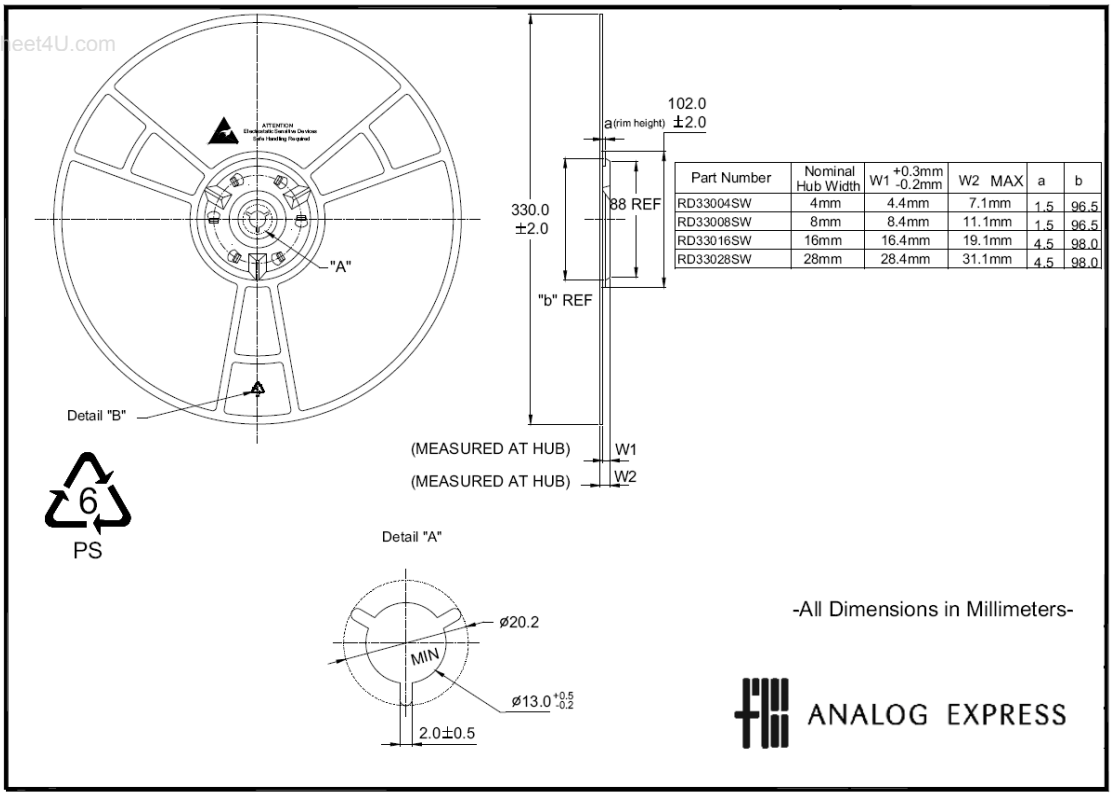
10-Ball CSP



W	8.0 ±0.1
E1	1.75 ±0.1
E2	
F	3.50 ±0.05
F'	3.50 ±0.05
G	
P0	4.0 ±0.1
P1	4.0 ±0.1
P2	2.00 ±0.05
P2'	2.00 ±0.05

Tape and Reel Drawing



Part Number	Nominal Hub Width	W1 +0.3mm -0.2mm	W2 MAX	a	b
RD33004SW	4mm	4.4mm	7.1mm	1.5	96.5
RD33008SW	8mm	8.4mm	11.1mm	1.5	96.5
RD33016SW	16mm	16.4mm	19.1mm	4.5	98.0
RD33028SW	28mm	28.4mm	31.1mm	4.5	98.0

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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