

0.9Ω/ 1Ω Dual SPDT Analog Switch

Features

- Maximum 0.9Ω ON-State Resistance at 2.7V Supply for NC Switch
- Maximum 1Ω ON-State Resistance at 2.7V Supply for NO Switch
- Low Charge Injection
- Excellent ON Resistance Matching
- +2.7V to +5.5V Single-Supply Operation
- Low Total Harmonic Distortion
- Low supply Current (<0.2μA)
- Break-before-make Enable Circuitry
- Control Inputs 5V Tolerant
- WLCSP Package and TDFN 3X3 Package

Applications

- Speaker Headset Switching
- MP3 Players
- Power Routing
- Battery-Operated Equipment
- Relay Replacement
- Audio and Video Signal Routing
- Communication circuits
- PCMCIA Cards
- Cellular Phones
- Modems

General Description

The G3203 is a low on-resistance, dual SPDT (Single-Pole/Double-Throw) analog switch that operates from a 2.7V to 5.5V supply. The G3203 features a 0.9Ω (max) R_{ON} for its NC switch and a 1Ω(max) R_{ON} for its NO switch at a +2.7V supply. The device offers an excellent ON-resistance matching, and low total harmonic distortion (THD) performance. The device is designed for fast switching speeds with the break-before-make feature to prevent signal distortion during the transferring of signal from one channel to another. These features make this device suitable for portable audio applications.

The G3203 is available in the WLCSP3X4-10, WLCSP3X4-12 and TDFN3X3-10 package.

Ordering Information

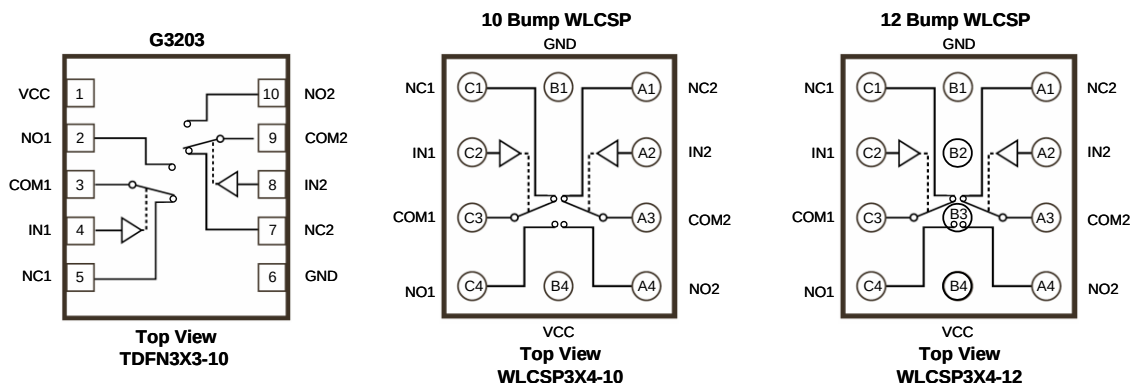
ORDER NUMBER	MARKING	TEMP. RANGE	PACKAGE (Pb free/Green)	REMARK
G3203RE1U	3203	-40°C to 85°C	TDFN3X3-10	
G3203B51U	323x	-40°C to 85°C	WLCSP3X4-12	OBSOLETE
G3203B52D	32032	-40°C to 85°C	WLCSP3X4-10	

Note :RE: TDFN3X3-10 B51: WLCSP3X4-12 B52: WLCSP3X4-10

1: Bonding Code (only TDFN3X3-10)

U & D: Tape & Reel

Pin Configuration



Summary of Characteristics ⁽¹⁾

CONFIGURATION	DUAL SPST
Number of channels	2
On-State resistance (r_{on}) of NC/NO	0.9Ω/1Ω
On-State resistance match (Δr_{on}) of NC/NO	0.25Ω/0.25Ω
On-State resistance flatness ($r_{on(flat)}$) of NC/NO	0.4Ω/0.4Ω
Turn-on / Turn-off time (t_{ON} / t_{OFF})	15ns / 14ns
Charge injection (Q_C)	20pC
Bandwidth (BW)	20MHz
OFF isolation (O_{ISO})	- 74dB at 100kHz
Crosstalk (X_{TALK})	- 72dB at 100kHz
Total harmonic distortion (THD)	0.1%
Power-supply current (I_+)	0.2μA
Package options	WCSP3X4-10, WCSP3X4-12 and TDFN3X3-10

(1) $V_+ = 5V$, $T_A = 25^\circ C$ and the value are the worst one.

Function Table

IN ₋	NO ₋	NC ₋
0	OFF	ON
1	ON	OFF

Absolute Maximum Ratings

VCC supply voltage to GND. -0.3V to +7V
 IN1, IN2 input voltage to GND -0.3 to +7V
 NO, NC, COM switch I/O voltage to GND. . -0.3 to +7V
 Output Short-Current Indefinite
 Thermal Resistance of Junction to Ambient (θ_{JA})
 TDFN3X3-10. 100°C/W
 Continuous Power Dissipation ($T_A = +25^\circ C$)
 TDFN3X3-10. 1.25W

Thermal Resistance of Junction to Case, (θ_{JC})
 TDFN3X3-10. 33°C/W
 Maximum Junction Temperature 150°C
 Continuous Current NO_NC_COM ±500mA
 Operating Temperature Range -40°C to 85°C
 Storage Temperature Range. -65 °C to 150°C
 Reflow Temperature (soldering, 10sec) 260°C
 ESD(HBM)(Note 1) 2KV

Note 1 : Human body model is a 100pF capacitor discharged through a 1.5kΩ resistor into each pin.

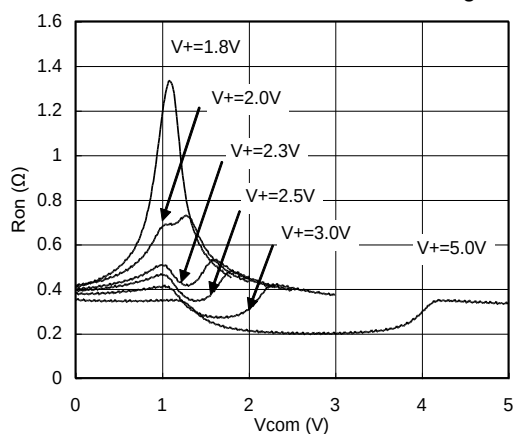
Electrical Characteristics
 $T_A=25^{\circ}\text{C}$, unless otherwise noted.

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
DC Characteristics					
Analog signal range		0	---	V+	V
NC On-Resistance, $R_{ON(NC)}$	V+=2.7, $I_{COM}=100\text{mA}$, $V_{NC}=0$ to V+	---	0.45	0.9	Ω
	V+=4.5, $I_{COM}=100\text{mA}$, $V_{NC}=0$ to V+	---	0.35	0.7	
	V+=2.7, $I_{COM}=100\text{mA}$, $V_{NC}=0$ to V+	---	0.45	0.9	
	V+=4.5, $I_{COM}=100\text{mA}$, $V_{NC}=0$ to V+	---	0.35	0.7	
NO On-Resistance, $R_{ON(NO)}$	V+=2.7, $I_{COM}=100\text{mA}$, $V_{NO}=0$ to V+	---	0.6	1	Ω
	V+=4.5, $I_{COM}=100\text{mA}$, $V_{NO}=0$ to V+	---	0.6	1	
On-Resistance Match Between Switches, ΔR_{ON}	V+=2.7, $I_{COM}=100\text{mA}$, V_{NO} or $V_{NC}=1.5\text{V}$	---	0.1	0.25	Ω
	V+=4.5, $I_{COM}=100\text{mA}$, V_{NO} or $V_{NC}=2.5\text{V}$	---	0.1	0.25	
NC On-Resistance Flatness, $R_{FLAT(NC)}$	$0 \leq V_{NC} \leq V+$, $I_{COM}=100\text{mA}$, V+=2.7V	---	0.12	0.4	Ω
	$0 \leq V_{NC} \leq V+$, $I_{COM}=100\text{mA}$, V+=4.5V	---	0.16	0.4	
NO On-Resistance Flatness, $R_{FLAT(NO)}$	$0 \leq V_{NO} \leq V+$, $I_{COM}=100\text{mA}$, V+=2.7V	---	0.2	0.4	Ω
	$0 \leq V_{NO} \leq V+$, $I_{COM}=100\text{mA}$, V+=4.5V	---	0.16	0.4	
NO or NC Off leakage current, $I_{NO(OFF)}$ or $I_{NC(OFF)}$	V+=5.5V, V_{NO} or $V_{NC}=1\text{V}$, 4.5V, $V_{COM}=4.5\text{V}$, 1V	---	---	20	nA
COM On Leakage Current, $I_{COM(ON)}$	V+=5.5V, $V_{NO}=1\text{V}$ or 4.5V with V_{NC} floating, or $V_{NC}=1\text{V}$ or 4.5V with V_{NO} floating, $V_{COM}=1\text{V}$ or 4.5V	---	---	20	nA
Input Logic High, V_{IH}	V+=3V	1.4	---	---	V
	V+=5V	2	---	---	
Input Logic Low, V_{IL}	V+=3V	---	---	0.5	V
	V+=5V	---	---	0.8	
Input leakage Current	$V_{IN}=5.5\text{V}$ or 0V, V+=5.5V	---	---	1	μA
Supply Current, $I+$	$V_{IN}=0$ or 5.5V, V+=5.5V	---	---	0.2	μA
Dynamic					
Turn-On Time, t_{ON}	V+=3V, V_{NO} or $V_{NC}=1.5\text{V}$, $R_L=50\Omega$, $C_L=35\text{pF}$	---	26	50	ns
	V+=5V, V_{NO} or $V_{NC}=2.5\text{V}$, $R_L=50\Omega$, $C_L=35\text{pF}$	---	16	40	
Turn-Off Time, t_{OFF}	V+=3V, V_{NO} or $V_{NC}=1.5\text{V}$, $R_L=50\Omega$, $C_L=35\text{pF}$	---	14	40	ns
	V+=5V, V_{NO} or $V_{NC}=2.5\text{V}$, $R_L=50\Omega$, $C_L=35\text{pF}$	---	16	30	
Break-Before Make Time, t_{BBM}	V+=3V, $V_{NO}=V_{NC}=1.5\text{V}$, $R_L=300\Omega$, $C_L=35\text{pF}$	7.8	10	---	ns
Charge injection, Q_C	V+=3V, $V_{COM}=0\text{V}$, $R_S=0\text{V}$, $C_L=1\text{nF}$	---	30	---	pC
OFF isolation, O_{ISO}	V+=3V, $R_L=50\Omega$, $C_L=5\text{pF}$, $f=100\text{kHz}$, $V_{COM}=1V_{RMS}$, Switch OFF	---	-74	---	dB
Crosstalk, X_{Talk}	V+=3V, $R_L=50\Omega$, $C_L=5\text{pF}$, $f=100\text{kHz}$, $V_{COM}=1V_{RMS}$, Switch OFF	---	-72	---	dB
Total harmonic distortion, THD	V+=3V, $R_L=600\Omega$, $C_L=50\text{pF}$, $V_{IN}=1V_{RMS}$, $f=20\text{Hz}$ to 20kHz	---	0.1	---	%
3 db Bandwidth, BW	Input centered between V+ and GND, $R_L=50\Omega$	---	20	---	MHz
NO OFF capacitance, $C_{NO(OFF)}$	V+=5V, $f=1\text{MHz}$	---	79	---	pF
NC OFF capacitance, $C_{NC(OFF)}$	V+=5V, $f=1\text{MHz}$	---	95	---	pF
NO ON capacitance, $C_{NO(ON)}$	V+=5V, $f=1\text{MHz}$	---	211	---	pF
NC ON capacitance, $C_{NC(ON)}$	V+=5V, $f=1\text{MHz}$	---	273	---	pF

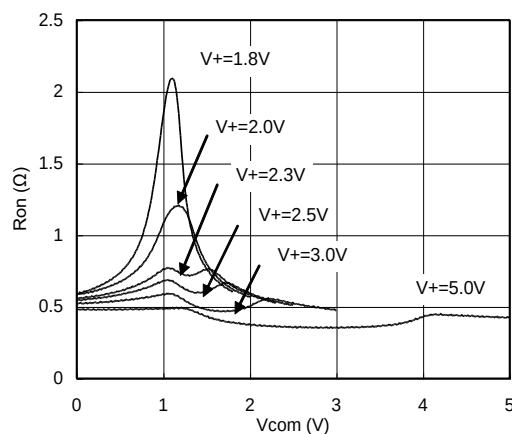
Typical Performance Characteristics

$T_A = 25^\circ\text{C}$, unless otherwise specified.

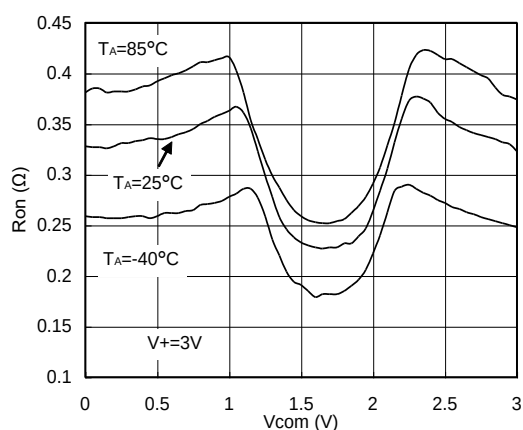
NC On-Resistance vs. Com Voltage



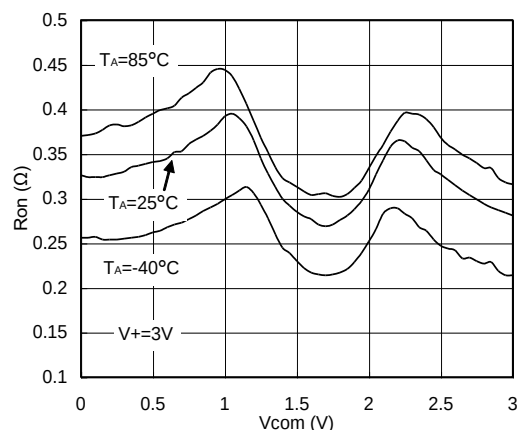
NO On-Resistance vs. Com Voltage



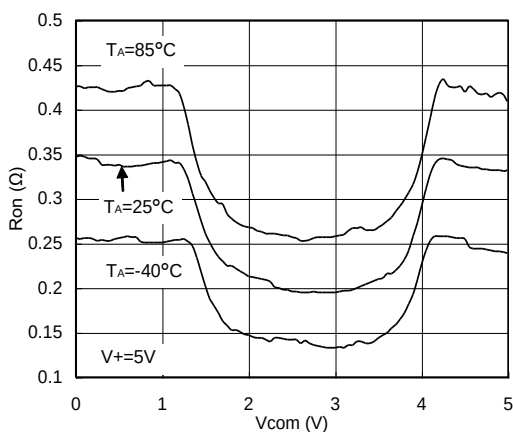
NC On-Resistance vs. Com Voltage



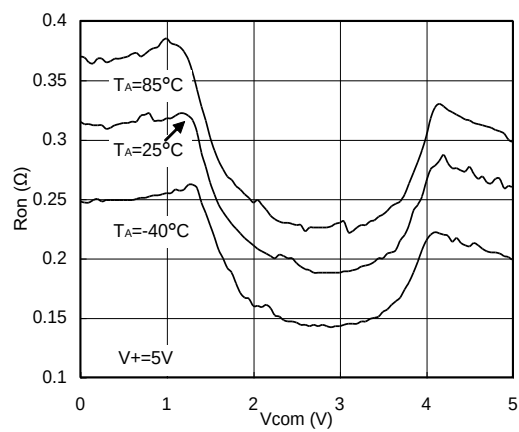
NO On-Resistance vs. Com Voltage



NC On-Resistance vs. Com Voltage

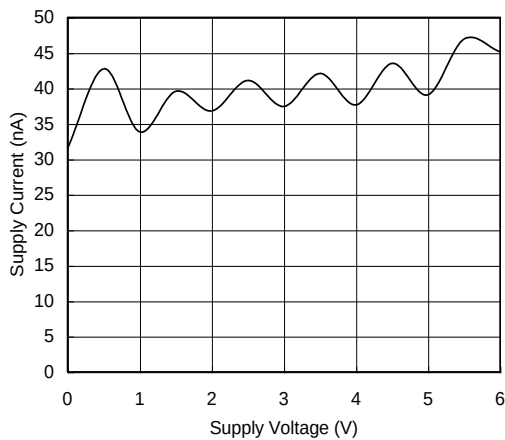


NO On-Resistance vs. Com Voltage

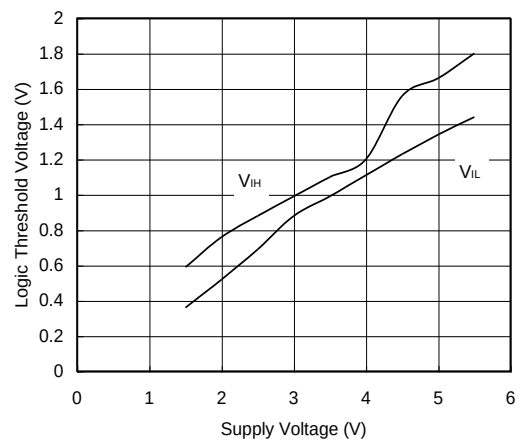


Typical Performance Characteristics (Continued)

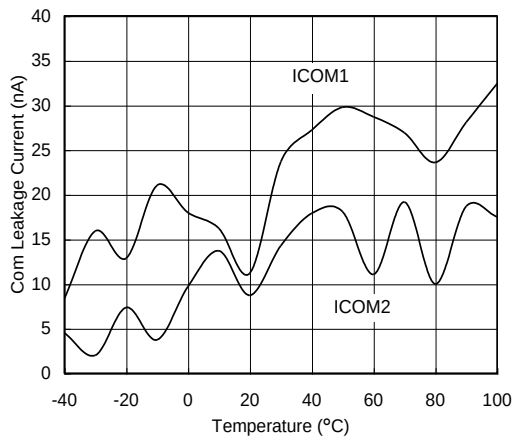
Supply Current vs. Supply Voltage



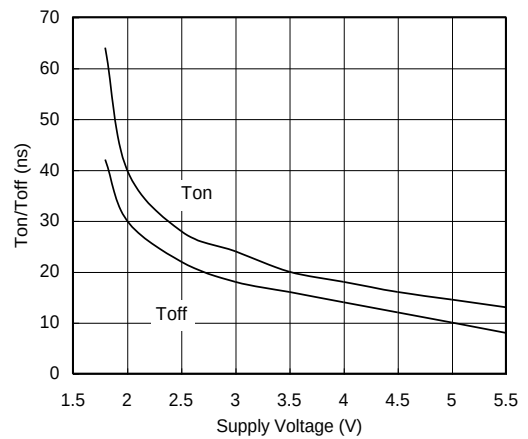
Logic Threshold Voltage vs. Supply Voltage



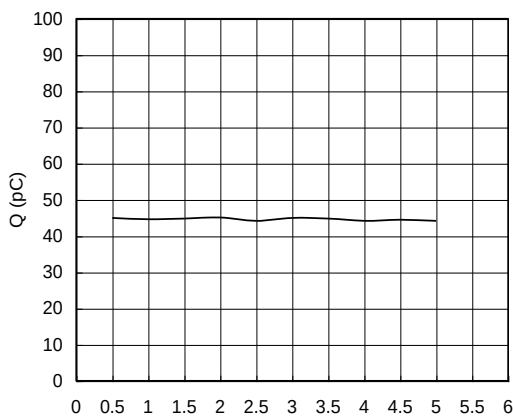
Com Leakage Current vs. Temperature



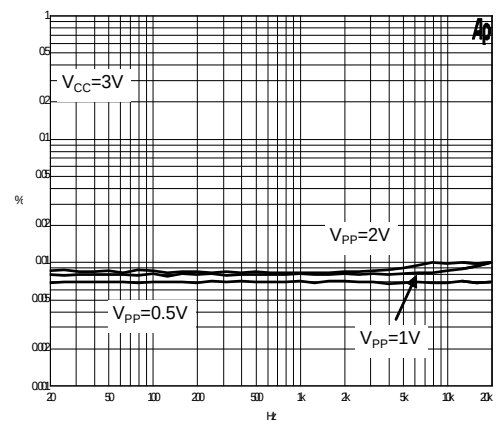
Turn-on/Turn-off Times vs. Supply Voltage



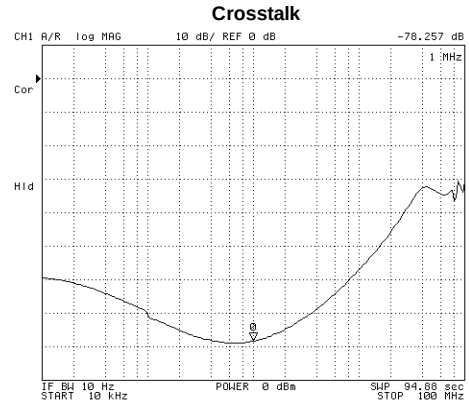
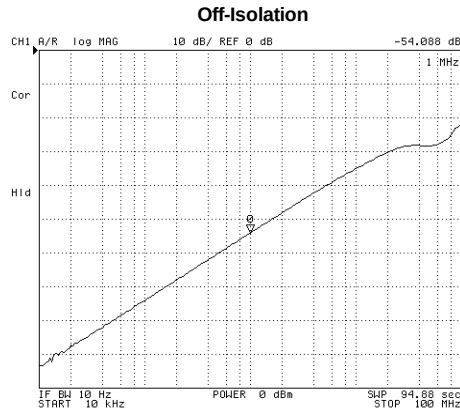
Charge Injection vs. Com Voltage



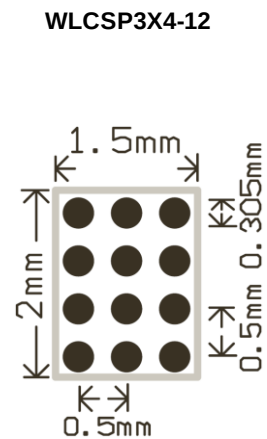
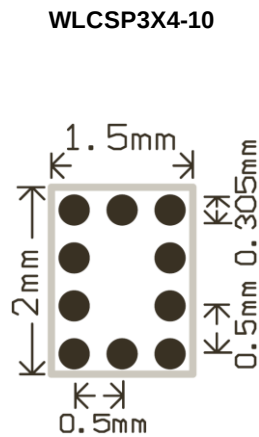
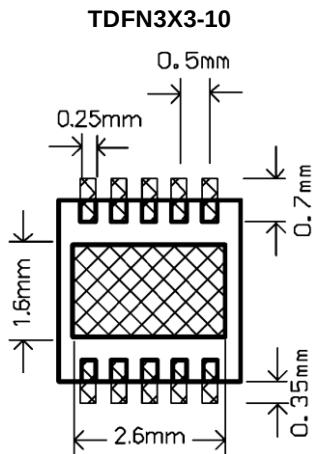
THD+N vs. Frequency



Typical Performance Characteristics (Continued)



Minimum Footprint PCB Layout Section



Pin Descriptions

PIN			NAME	FUNCTION
TDFN3X3-10	WLCSP3X4-10	WLCSP3X4-12		
1	B4	B4	VCC	Power supply
2	C4	C4	NO1	Normally open
3	C3	C3	COM1	Common
4	C2	C2	IN1	Digital control pin
5	C1	C1	NC1	Normally close
6	B1	B1	GND	Digital ground
7	A1	A1	NC2	Normally close
8	A2	A2	IN2	Digital control pin
9	A3	A3	COM2	Common
10	A4	A4	NO2	Normally open
---	---	B2,B3	NC	No connection

Test Circuits/ Timing Diagrams

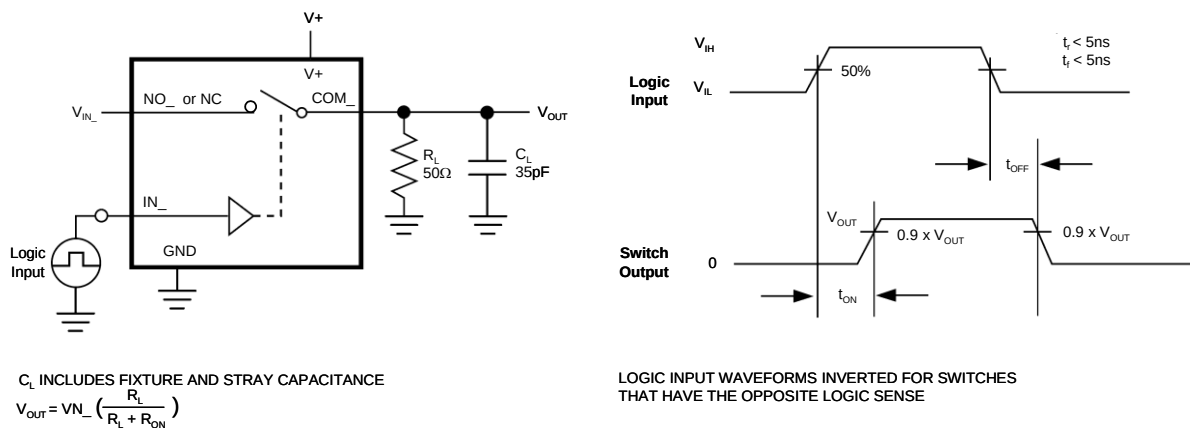


Figure 1. Switching Time

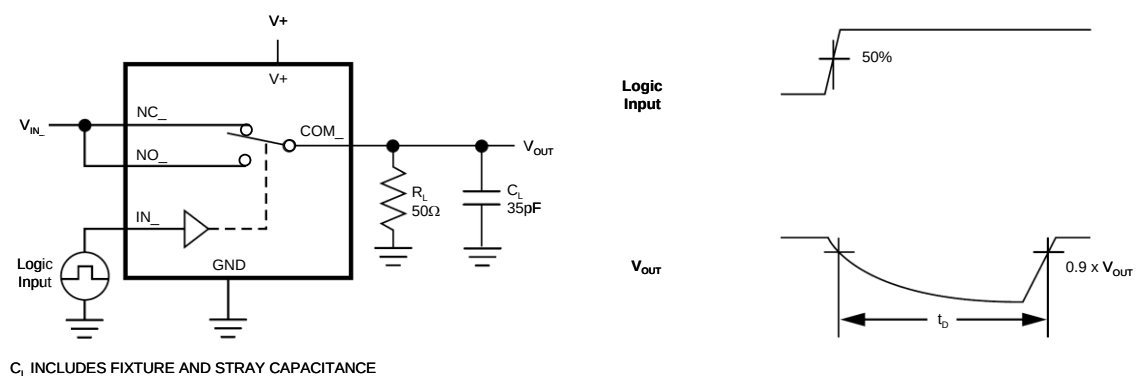


Figure 2. Break Before Make Interval

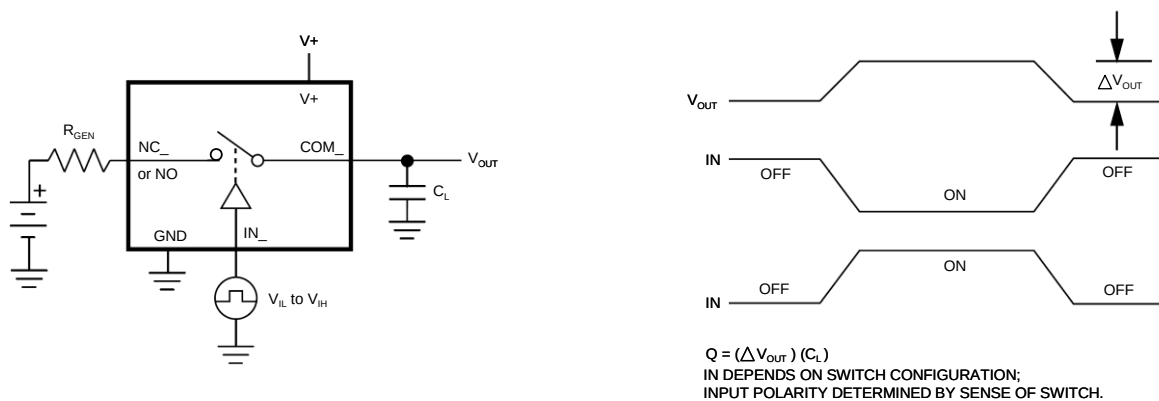
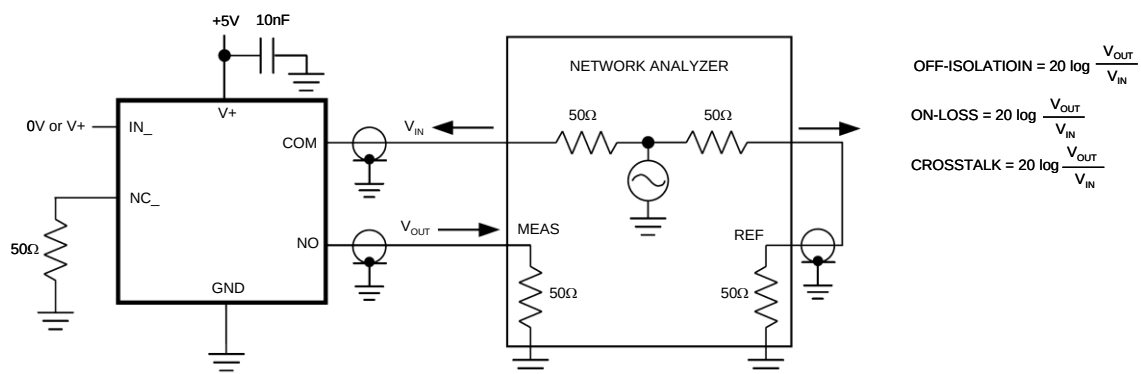


Figure 3. Charge Injection



MEASUREMENTS ARE STANDARDIZED AGAINST SHORTS AT IC TERMINALS.
OFF-ISOLATION IS MEASURED BETWEEN COM_ AND "OFF" NO_ OR NC_ TERMINAL ON EACH SWITCH.
ON-LOSS IS MEASURED BETWEEN COM_ AND "ON" NO_ OR NC_ TERMINAL ON EACH SWITCH.
CROSSTALK IS MEASURED FROM ONE CHANNEL TO ALL OTHER CHANNELS.
SIGNAL DIRECTION THROUGH SWITCH IS REVERSED; WORST VALUES ARE RECORDED.

Figure 4. On-Loss, Off- Isolation, and Crosstalk

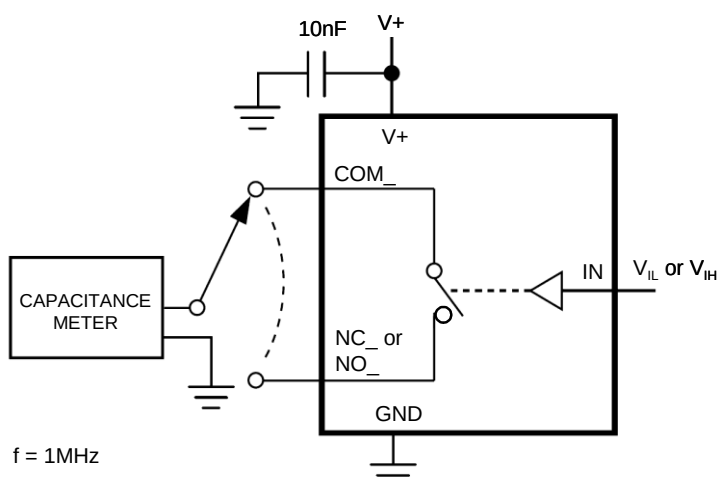
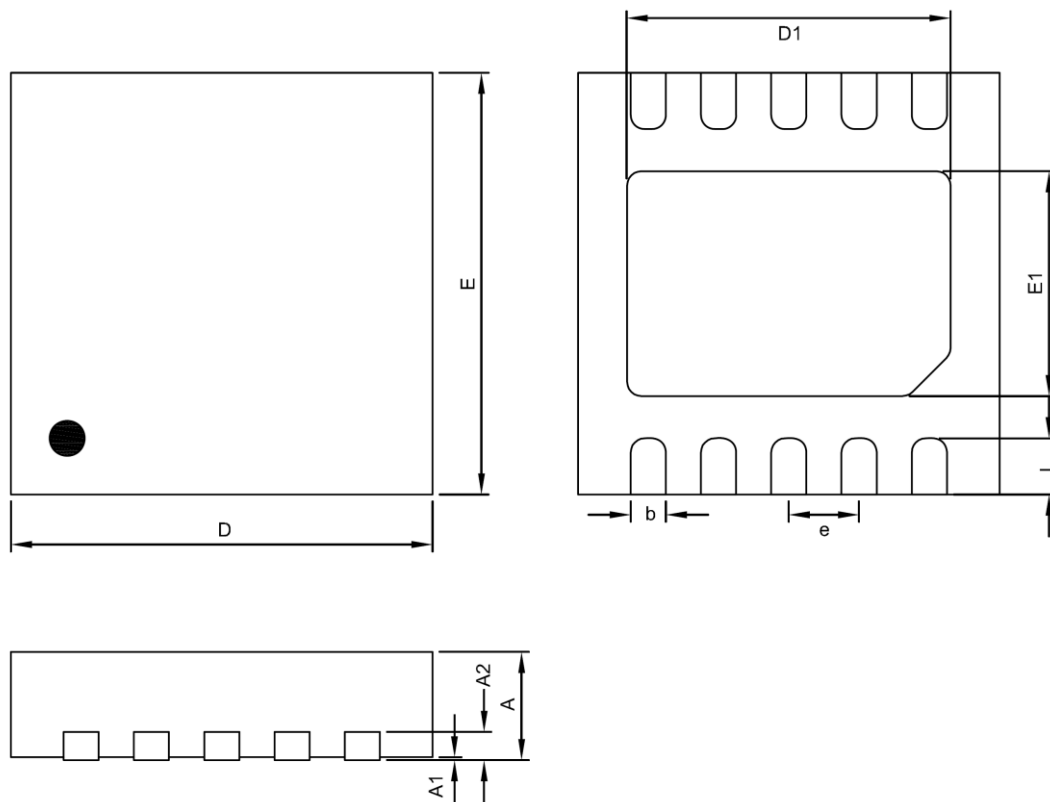
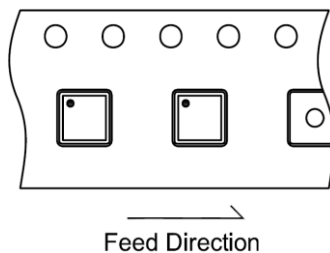


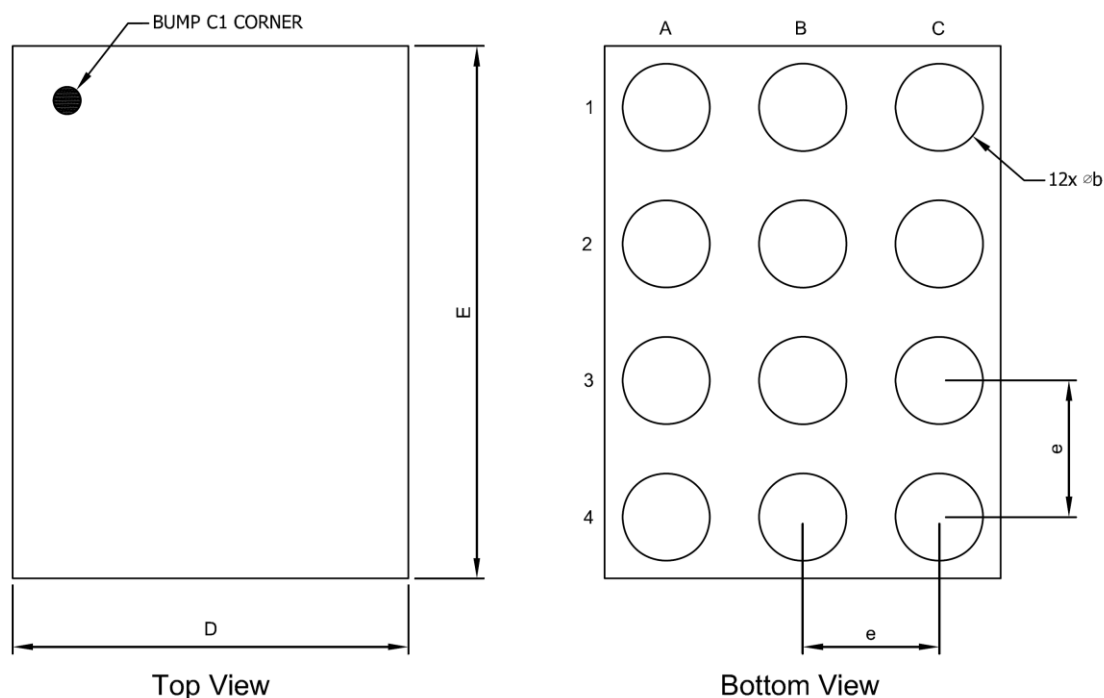
Figure 5. Channel Off/On Capacitance

Package Information

TDFN3X3-10 Package

Symble	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.70	0.75	0.80	0.0276	0.0295	0.0315
A1	0.00	---	0.05	0.0000	---	0.0020
A2	0.19	0.20	0.21	0.0075	0.0079	0.0083
D	2.95	3.00	3.05	0.1161	0.1181	0.1201
E	2.95	3.00	3.05	0.1161	0.1181	0.1201
D1	2.50	2.60	2.70	0.0984	0.1024	0.1063
E1	1.50	1.60	1.70	0.0591	0.0630	0.0669
b	0.18	0.25	0.30	0.0071	0.0098	0.0118
e	0.50 BSC			0.0197 BSC		
L	0.35	0.40	0.50	0.0138	0.0157	0.0197

Taping Specification


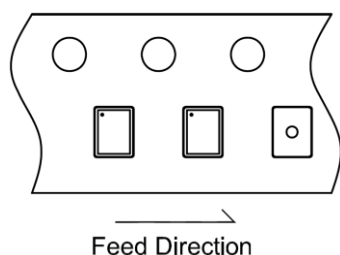
PACKAGE	Q'TY/REEL
TDFN3X3-10	3,000 ea



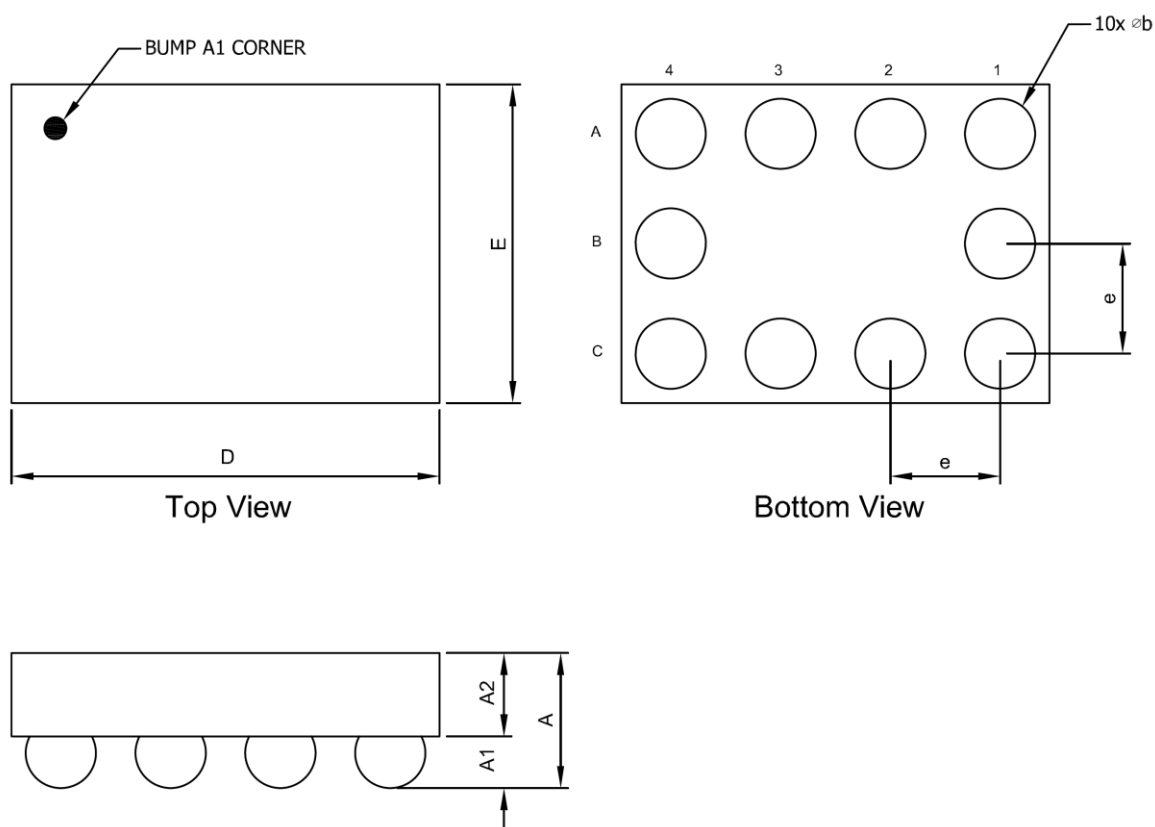
WLCSP3X4-12 Package

Symble	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.540	0.600	0.660	0.0212	0.0236	0.0260
A1	0.210	0.235	0.260	0.0083	0.0093	0.0102
A2	0.330	0.365	0.400	0.0130	0.0144	0.0157
D	1.450	1.470	1.500	0.0571	0.0579	0.0591
E	1.950	1.970	2.000	0.0768	0.0776	0.0787
b	0.300	0.320	0.340	0.0118	0.0126	0.0134
e	0.50 BSC			0.0197 BSC		

Taping Specification



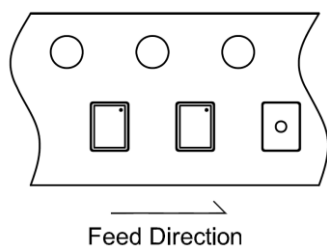
PACKAGE	Q'TY/REEL
WLCSP3X4-12	3,000 ea



WLCSP3X4-10 Package

Symble	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.540	0.600	0.660	0.0212	0.0236	0.0260
A1	0.210	0.235	0.260	0.0083	0.0093	0.0102
A2	0.330	0.365	0.400	0.0130	0.0144	0.0157
D	1.950	1.970	2.000	0.0768	0.0776	0.0787
E	1.450	1.470	1.500	0.0571	0.0579	0.0591
b	0.300	0.320	0.340	0.0118	0.0126	0.0134
e	0.50 BSC			0.0197 BSC		

Taping Specification



PACKAGE	Q'TY/REEL
WLCSP3X4-10	3,000 ea

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