

NLAS4717EP

4.5 Ω 広帯域幅デュアル SPDTアナログ・スイッチ

NLAS4717EPは、サブミクロン・シリコン・ゲートCMOSテクノロジーで製造された高性能CMOSアナログ・スイッチです。このデバイスは、3.0 Vで4.5 Ωの低 $R_{DS(on)}$ を備えたデュアル独立型単極双投(SPDT)スイッチです。

保証されたブレーク・ビフォア・メイク(BBM)スイッチングも備えており、スイッチがドライバを短絡させることはありません。

NLAS4717EPは次の2つの小型サイズ・パッケージで供給されます。

- ◆ Microbump: 2.0 x 1.5 mm
- ◆ WQFN-10: 1.4 x 1.8 mm

特長

- 低 $R_{DS(on)}$: 4.5 Ω@3.0 V
- スイッチ間でのマッチング $\pm 0.5 \Omega$
- 広い電圧範囲: 1.8~5.5 V
- 広帯域幅 > 90 MHz
- 1.65~5.5 Vの動作範囲
- ピン4および8 (CTRLピン)での低スレッショルド電圧
- 超低電荷注入 ≤ 6.0 pC
- 低スタンバイ電流: $I_{CC} = 1.0$ nA (Max) @ $T_A = 25^\circ\text{C}$
- ピン4および8 (CTRLロジック・ピン)でのOVT*
- 鉛フリー・デバイス

代表的アプリケーション

- 携帯電話
- PDA
- MP3
- デジタル・スチル・カメラ
- USB 2.0 Full Speed (USB1.1) – 12 Mbps 準拠

重要情報

- ESD保護:
 - ◆ 人体モデル(HBM) = 2500 V、
 - ◆ マシン・モデル(MM) = 200 V
- ラッチアップ最大定格: 200 mA (JEDEC EIA/JESD78 準拠)
- MAX4717とピン・コンパチブル

*OVT

- 過電圧耐性(OVT)専用ピンは通常の電源電圧より高い電圧で動作し、デバイスやシグナル・インテグリティに損傷を与えません。



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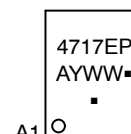
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MARKING DIAGRAMS

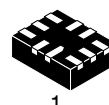


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Microbump-10
CASE 489AA

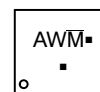


A = Assembly Location
Y = Year
W, WW = Work Week
▪ = Pb-Free Package
(Note: Microdot may be in either location)



1

WQFN-10
CASE 488AQ



AW = Specific Device Code
M = Date Code
▪ = Pb-Free Device
(Note: Microdot may be in either location)

FUNCTION TABLE

IN ₋	NO ₋	NC ₋
0	OFF	ON
1	ON	OFF

ORDERING INFORMATION

Device	Package	Shipping†
NLAS4717EPFCT1G	Microbump-10 (Pb-Free)	3000 / Tape & Reel
NLAS4717EPMTR2G	WQFN-10 (Pb-Free)	3000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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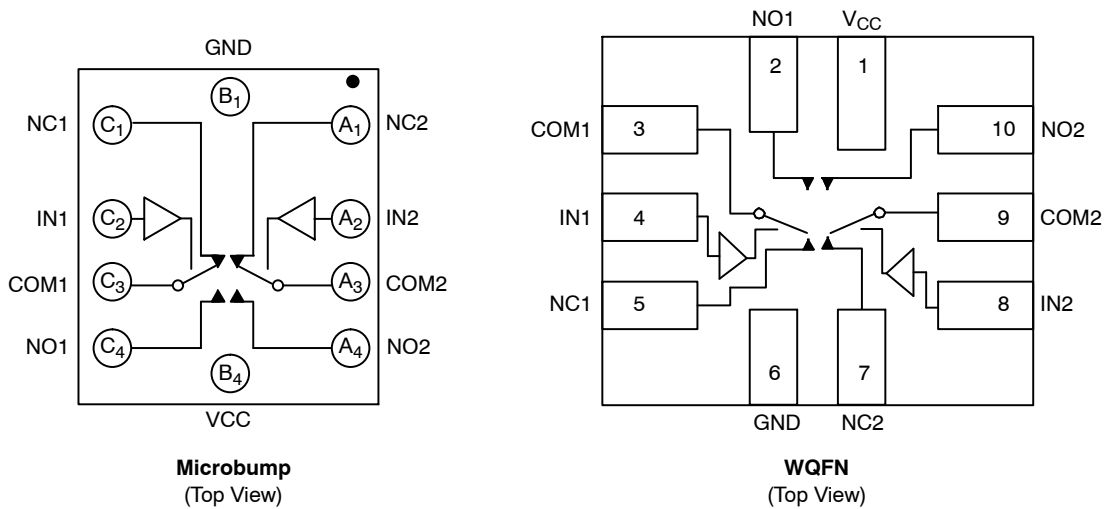


Figure 1. Device Circuit Diagrams and Pin Configurations

MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V ₊	DC Supply Voltage	-0.5 to +7.0	V
V _{IS}	Analog Input Voltage (V _{NO} , V _{NC} , or V _{COM}) (Note 1)	-0.5 ≤ V _{IS} ≤ V _{CC} + 0.5	V
V _{IN}	Digital Select Input Voltage	-0.5 ≤ V _I ≤ +7.0	V
I _{IK}	DC Current, Into or Out of Any Pin (Continuous)	±100	mA
I _{PK}	Peak Current (10% Duty Cycle)	±200	mA

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Signal voltage on NC, NO, and COM exceeding VCC or GND are clamped by the internal diodes. Limit forward diode current to maximum current rating.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V ₊	DC Supply Voltage	1.8	5.5	V
V _{IN}	Digital Select Input Voltage	GND	5.5	V
V _{IS}	Analog Input Voltage (NC, NO, COM)	GND	V _{CC}	V
T _A	Operating Temperature Range	-40	+85	°C
t _r , t _f	Input Rise or Fall Time, SELECT V _{CC} = 3.3 V ± 0.3 V V _{CC} = 5.0 V ± 0.5 V	0 0	100 20	ns/V

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ANALOG SWITCH DC CHARACTERISTICS

Symbol	Parameter	Condition	V _{CC} (V)	-40°C to +85°C		Unit
				Min	Max	
V _{IH}	Input Logic High Voltage	V _{OUT} = 0.1 V I _{OUT} ≤ 20 μA	1.65 to 2.2 2.7 to 3.6 4.5 to 5.5	V _{CC} × 0.55 V _{CC} × 0.5 2.0	- - -	V
V _{IL}	Input Logic Low Voltage	V _{OUT} = -V _{CC} - 0.1 V I _{OUT} ≤ 20 μA	1.65 to 2.2 2.7 to 3.6 4.5 to 5.5	- - -	V _{CC} × 0.2 V _{CC} × 0.2 0.8	V
I _{IN}	Input Leakage Current	V _{IN} = V _{CC} or GND	5.5	-100	+100	nA
V _{CC}	Power Supply Range	All	-	1.65	5.5	V
I _{CC}	Supply Current	V _{IN} = V _{CC} or GND I _{OUT} = 0 μA	1.8 3.3 5.5	- - -	1.0 1.0 1.0	μA

ANALOG SWITCH CHARACTERISTICS – Digital Section (Voltages Referenced to GND)

Symbol	Parameter	Condition	V _{CC} (V)	-40°C to +85°C			Unit
				Min	Typ	Max	
R _{ON}	ON Resistance (Note 2)	I _{COM} = 10 mA V _{IS} = 0 to V _{CC}	3.0	-	3.2	4.5	Ω
			5.0	-	2.1	3.5	
ΔR _{ON}	ON Resistance Match Between Channels (Note 2 and 3)	I _{COM} = 10 mA V _{IS} = 0 to V _{CC}	3.0	-	0.1	0.4	Ω
			5.0	-	0.1	0.4	
R _{FLAT[ON]}	ON Resistance Flatness (Note 4)	I _{COM} = 10 mA V _{IS} = 0 to V _{CC}	3.0	-	1.12	1.5	Ω
			5.0	-	0.55	1.36	
I _{NO_[OFF]} I _{NC_[OFF]}	NO_, NC_ Off-Leakage Current (Note 5)	V _{COM} = 0.3 V or 3.3 V V _{NO} or V _{NC} = 0.3 V or 3.3 V	3.6	-1.0	0.01	+1.0	nA
		V _{COM} = 0 V or 5.0 V V _{NO} or V _{NC} = 0 V or 5.0 V	5.5	-1.0	0.01	+1.0	
I _{COM_[ON]}	COM_ On-Leakage Current (Note 5)	V _{COM} = 0.3 V or 3.3 V V _{NO} or V _{NC} = 0.3 V or 3.3 V	3.6	-2.0	0.01	+2.0	nA
		V _{COM} = 0 V or 5.0 V V _{NO} or V _{NC} = 0 V or 5.0 V	5.5	-2.0	0.01	+2.0	

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ANALOG SWITCH AC CHARACTERISTICS

Symbol	Parameter	Condition	V _{CC} (V)	-40°C to +85°C			Unit
				Min	Typ	Max	
t _{ON}	Turn-On Time	V _{NC_} , V _{NO_} = V _{IH} or V _{IL} R _L = 300 Ω, C _L = 35 pF V _{IN[x]} = V _{IH} or V _{IL}	1.8 to 5.5	-	-	30	nS
t _{OFF}	Turn-Off Time	V _{NC_} , V _{NO_} = V _{IH} or V _{IL} R _L = 300 Ω, C _L = 35 pF V _{IN[x]} = V _{IH} or V _{IL}	1.8 to 5.5	-	-	40	nS
t _{BBM}	Break-Before-Make Time Delay (Note 5)	V _{NC_} , V _{NO_} = 1.5 V R _L = 300 Ω, C _L = 35 pF	-	-	8.0	-	nS
t _{SKEW}	Skew (Note 5)	R _S = 39 Ω, C _L = 50 pF	-	-	0.15	2.0	nS

- R_{ON} characterized for V_{CC} range (1.65 V to 5.5 V).
- ΔR_{ON} = R_{ON}(MAX) - R_{ON}(MIN).
- R_{FLAT[ON]} = R_{ON}(MAX) - R_{ON}(MIN), measured over V_{CC} range.
- Guaranteed by design.

ANALOG SWITCH APPLICATION CHARACTERISTICS

Symbol	Parameter	Condition	V _{CC} (V)	-40°C to +85°C			Unit
				Min	Typ	Max	
Q	Charge Injection	V _{IN} = V _{CC} to GND R _{In} = 0 Ω, C _L = 1.0 nF Q = C _L - ΔV _{OUT}	3.0 5.0		6.0 9.0		pC
VISO	Off-Isolation	f = 10 MHz V _{NO_} , V _{NC_} = 1.0 Vp-p R _L = 50 Ω, C _L = 5.0 pF	1.65 to 5.5		-50		dB
		f = 1.0 MHz V _{NO_} , V _{NC_} = 1.0 Vp-p R _L = 50 Ω, C _L = 5.0 pF			-75		
VCT	Cross-Talk	f = 10 MHz V _{NO_} , V _{NC_} = 1.0 Vp-p R _L = 50 Ω, C _L = 5.0 pF	1.65 to 5.5		-80		dB
		f = 1.0 MHz V _{NO_} , V _{NC_} = 1.0 Vp-p R _L = 50 Ω, C _L = 5.0 pF			-110		
BW	On-Channel -3.0 db Bandwidth	Signal = 0 dB R _L = 50 Ω, C _L = 5.0 pF	1.8 to 5.0		90		MHz
THD	Total Harmonic Distortion	V _{COM} = 2.0 Vp-p, R _L = 600 Ω, T _A = 25°C	-		0.02		%
C _{NO_[OFF]} C _{NC_[OFF]}	NO_, NC_ OFF-Capacitance	F = 1.0 MHz	-		15		pF
C _{NO_[ON]} C _{NC_[ON]}	NO_, NC_ ON-Capacitance	F = 1.0 MHz	-		38		pF

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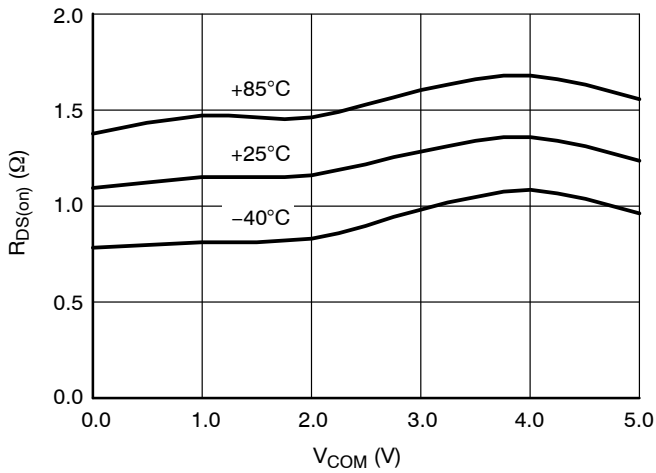


Figure 2. R_{DS(on)} @ V_{CC} = 5.0 V

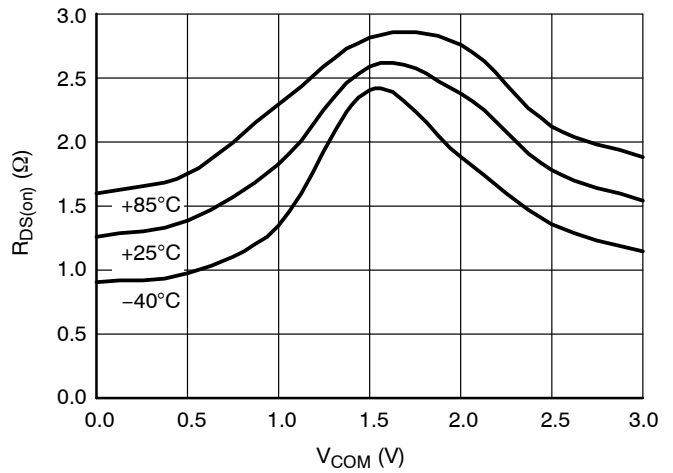


Figure 3. R_{DS(on)} @ V_{CC} = 3.0 V

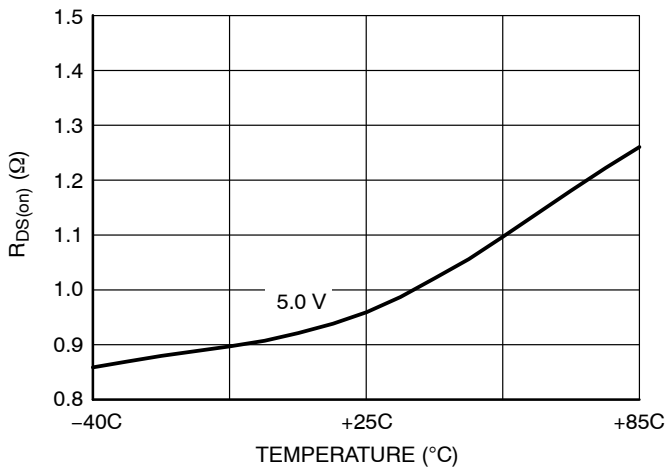


Figure 4. Delta R_{DS(on)} @ V_{CC} = 5.0 V

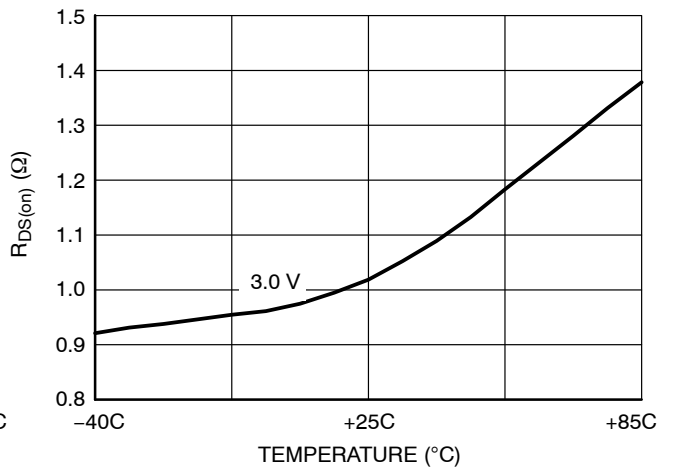


Figure 5. Delta R_{DS(on)} @ V_{CC} = 3.0 V

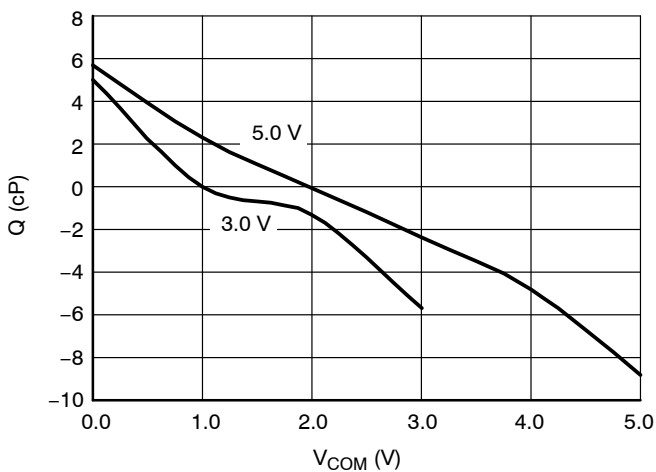


Figure 6. Charge Injection

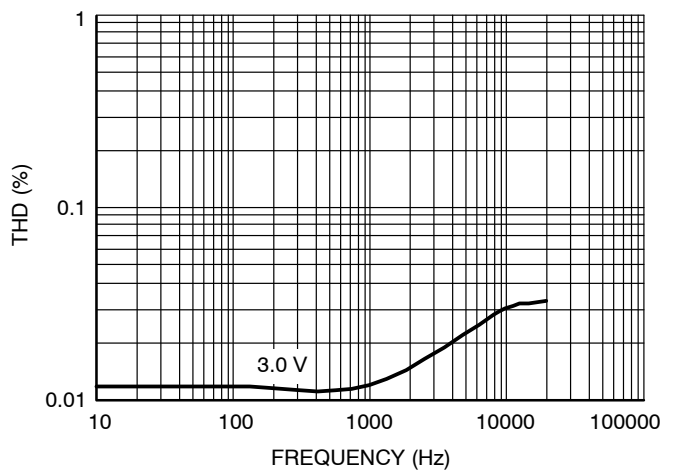


Figure 7. Total Harmonic Distortion

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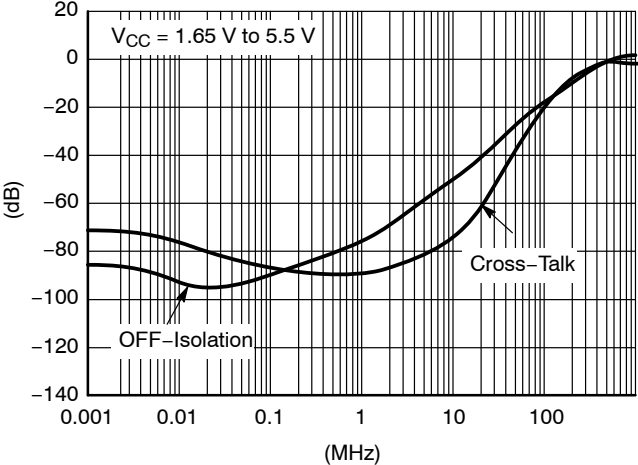


Figure 8. Frequency Response

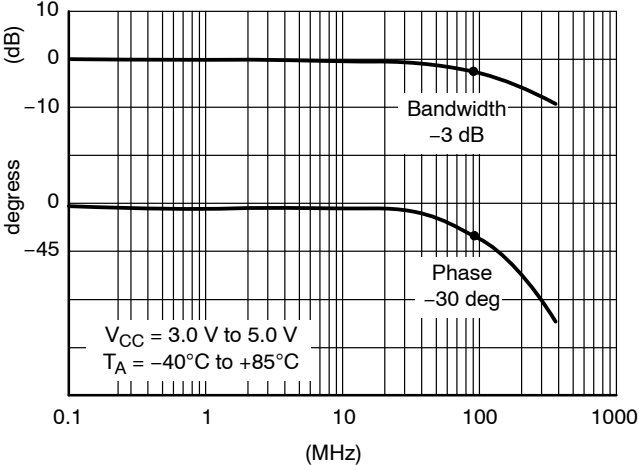


Figure 9. Bandwidth and Phase

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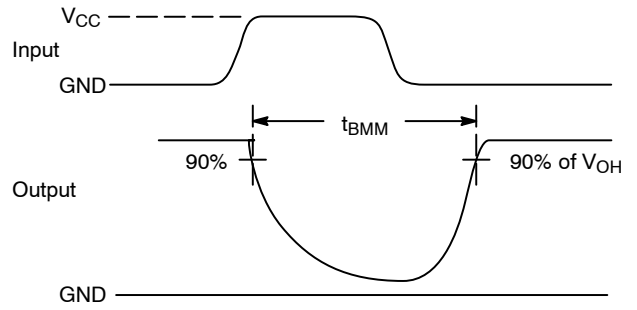
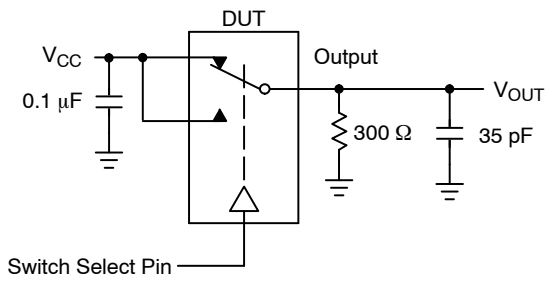


Figure 10. t_{BMM} (Time Break-Before-Make)

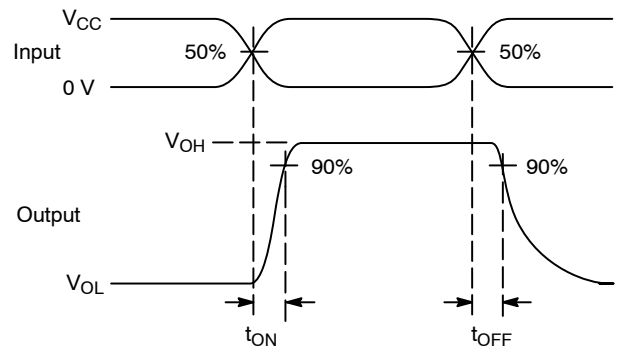
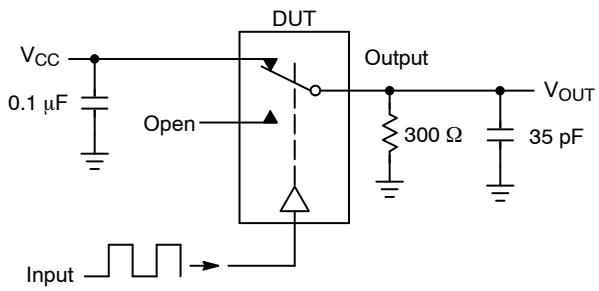


Figure 11. t_{ON}/t_{OFF}

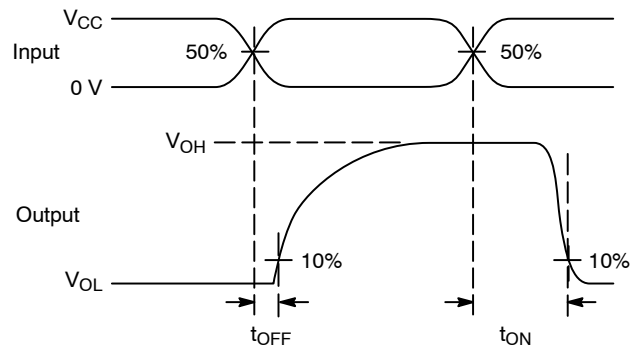
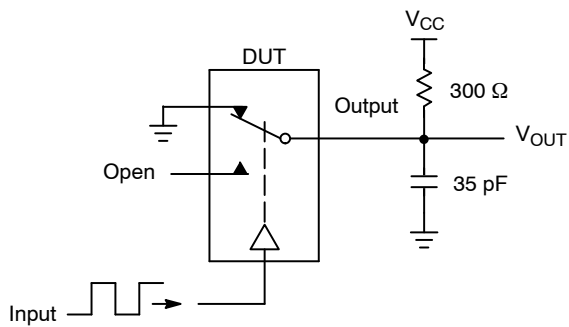
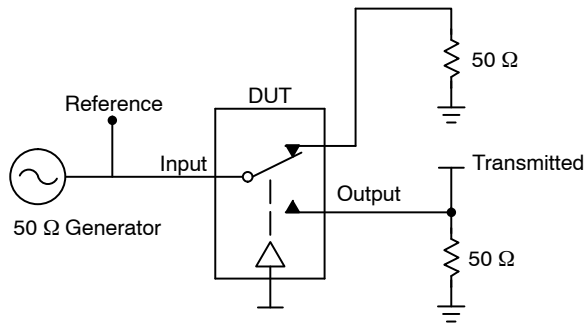


Figure 12. t_{ON}/t_{OFF}

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Channel switch control/s test socket is normalized. Off isolation is measured across an off channel. On loss is the bandwidth of an On switch. V_{ISO} , Bandwidth and V_{ONL} are independent of the input signal direction.

$$V_{ISO} = \text{Off Channel Isolation} = 20 \text{ Log} \left(\frac{V_{OUT}}{V_{IN}} \right) \text{ for } V_{IN} \text{ at } 100 \text{ kHz}$$

$$V_{ONL} = \text{On Channel Loss} = 20 \text{ Log} \left(\frac{V_{OUT}}{V_{IN}} \right) \text{ for } V_{IN} \text{ at } 100 \text{ kHz to } 50 \text{ MHz}$$

Bandwidth (BW) = the frequency 3.0 dB below V_{ONL}

V_{CT} = Use V_{ISO} setup and test to all other switch analog input/outputs terminated with 50 Ω

Figure 13. Off Channel Isolation/On Channel Loss (BW)/Crosstalk (On Channel to Off Channel)/ V_{ONL}

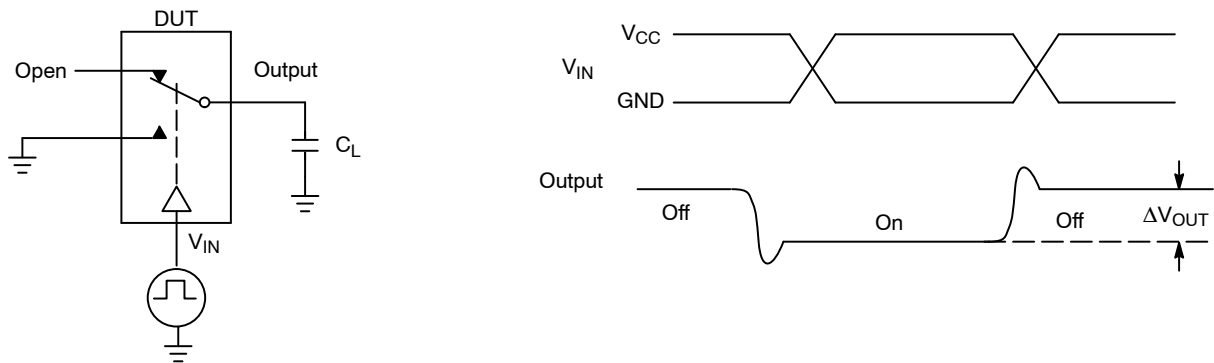


Figure 14. Charge Injection: (Q)

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