

High Speed Dual DPDT Analog Switch

General Description

The ET44599 is a dual-independent double-pole/double-throw (DPDT), TTL/CMOS compatible analog switch. It operates from a 1.8V to 5.5V single power supply. The ET44599 features high-speed, low on-resistance, low voltage and high bandwidth. The high performances make it very suitable for multiple applications, such as portable equipment, audio and video signal routing, etc. In addition, the ET44599 can be used as a dual 2-to-1 multiplexer because it has two logic control inputs. The ET44599 is available in Green TQFN-3×3-16L packages. It operates over an ambient temperature range of -40°C to +125°C.

Features

- Single Supply Voltage Range: 1.8V to 5.5V
- On-Resistance: 4Ω(TYP) with $V_S = 4.5V$ Supply
- Low On-Resistance Flatness
- -3dB Bandwidth: 300MHz
- High Off-Isolation: -80dB at 1MHz
- Low Crosstalk: -90dB at 1MHz
- Fast Switching Times: $t_{ON} = 30ns$ / $t_{OFF} = 10ns$
- Rail-to-Rail Input and Output Operation
- TTL/CMOS Compatible
- -40°C to +125°C Operating Temperature Range
- Package information:

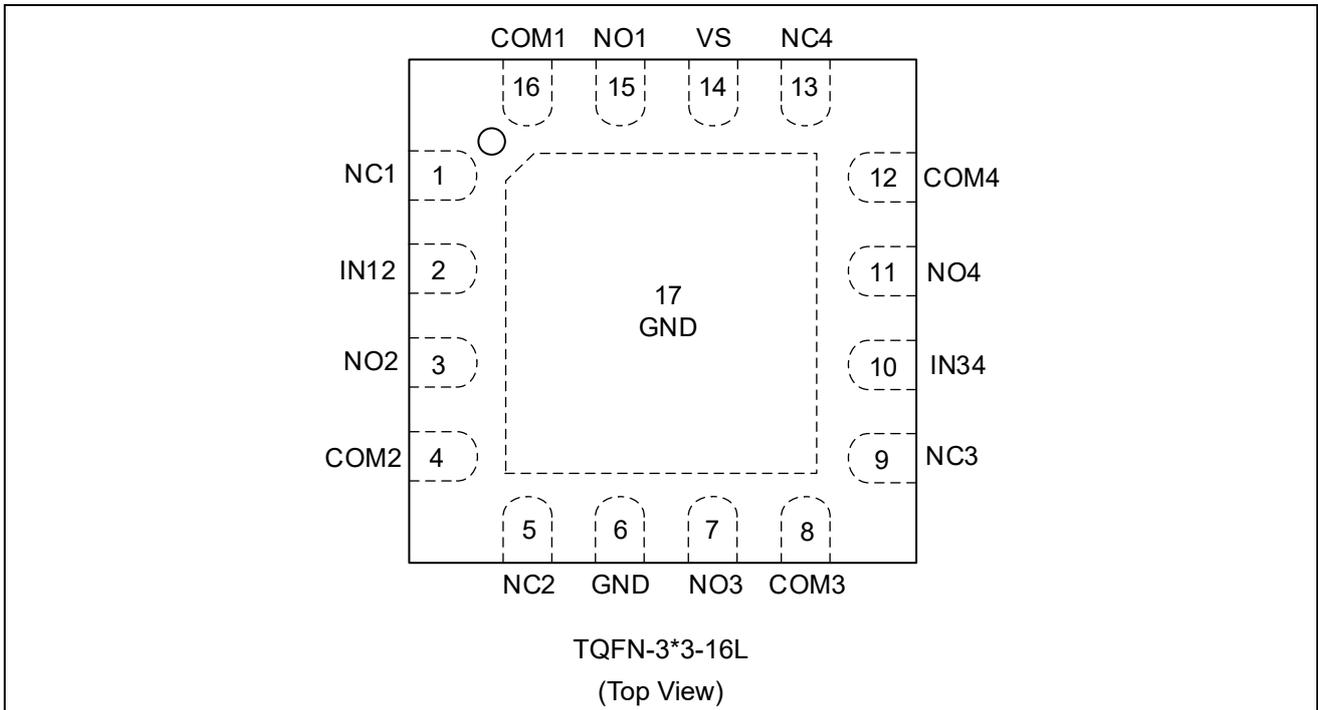
Part No.	Package	Packing Option	MSL
ET44599	TQFN-16L(3mm × 3mm)	Tape and Reel ,3K	Level 1

Application

- Portable Equipment
- Medical Equipment
- Sample-and-Hold Circuits
- Personal Digital Assistants
- Battery-Powered Systems
- Audio and Video Signal Routing

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Pin Configuration



Pin Function

Pin No.	Pin Name	Description
14	VS	Positive Power Supply Pin.
6	GND	Ground.
2,10	IN _x	Digital Control Input Pin to Connect the COM Pins to the NO or NC Pins.
4,8,12,16	COM _x	Common Pins.
3,7,11,15	NO _x	Normally Open Pins.
1,5,9,13	NC _x	Normally Closed Pins.
17	GND	Exposed Pad. It should be soldered to PCB board and connected to GND.

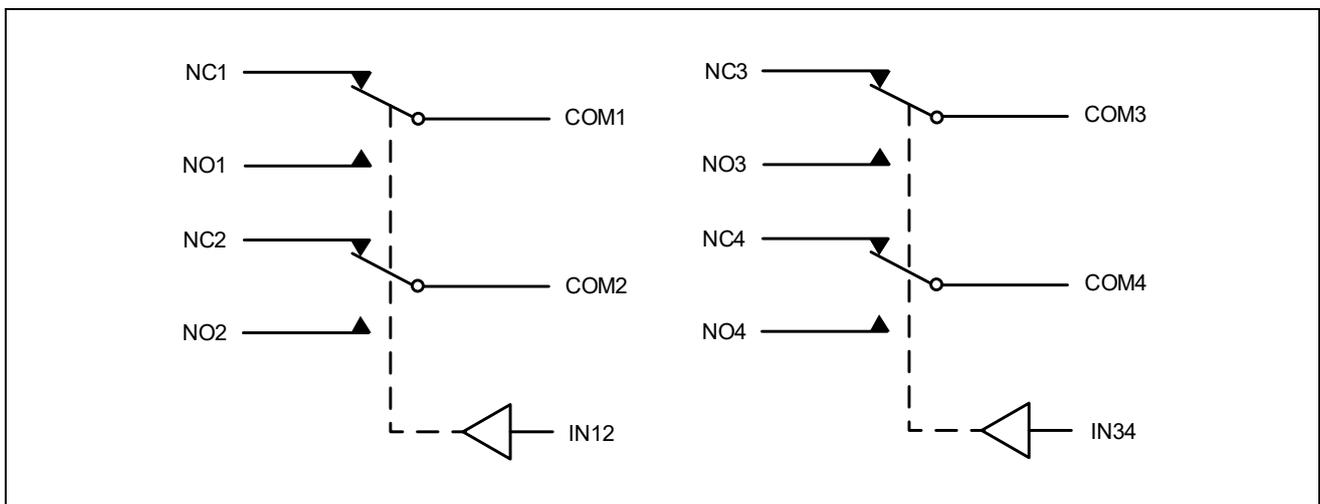
Note: Any input terminal can be used as an output terminal, and any output terminal can also be used as an input terminal. Signal transmission in both directions is equally well.

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Truth Table

IN12	NC1-COM1,NC2-COM2	NO1-COM1,NO2-COM2
0	ON	OFF
1	OFF	ON
IN34	NC3-COM3,NC4-COM4	NO3-COM3,NO4-COM4
0	ON	OFF
1	OFF	ON

Analog Symbol



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Absolute Maximum Ratings

Over operating free-air temperature range (unless otherwise noted)

Characteristic	Symbol	Value	Unit
VS to GND ⁽¹⁾	V _S	-0.3 to 6	V
Continuous Current NO,NC,or COM	I _{IS}	±100	mA
Junction Temperature	T _J	-40 to 150	°C
Storage temperature range	T _{STG}	-65 to 150	°C
Human Body Model ⁽²⁾	ESD	±2000	V
Machine Model ⁽³⁾		±200	V

Note1. Voltages exceeding V_S or GND on any signal terminal are clamped by internal diodes. Limit forward-diode current to maximum current rating.

Note2: HBM tested per JEDEC JS-001.

Note3: CDM tested per JEDEC JS-002.

Recommended Operating Conditions

Characteristic	Symbol	Min	Max	Unit
Supply Voltage Range	V _S	1.8	5.5	V
Operating Temperature Range	T _A	-40	125	°C

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Electrical Characteristics

$V_S = 3.6V$ to $5.5V$, Full = $-40^\circ C$ to $+125^\circ C$, unless otherwise noted.

Typical values are at $V_S = 4.5V$, $T_A = +25^\circ C$, unless otherwise noted.

Parameters	Symbol	Conditions	Temp	Min	Typ	Max	Unit
ANALOG SWITCH							
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}		Full	GND		V_S	V
On-Resistance	R_{ON}	$0V \leq V_{NO}$ or $V_{NC} \leq V_S$, $I_{OUT} = 10mA$, Test Circuit 1	25°C		4	8	Ω
			Full			10	
On-Resistance Match Between Channels	ΔR_{ON}		25°C		0.5	2	Ω
			Full			3	
On-Resistance Flatness	$R_{FLAT(ON)}$		25°C		2	3	Ω
			Full			4	
Source Off Leakage Current	$I_{NC(OFF)}$, $I_{NO(OFF)}$	$V_S = 5.5V$, V_{NO} or $V_{NC} = 3.3V/0.3V$, $V_{COM} = 0.3V/3.3V$	Full			1	μA
Channel On Leakage Current	$I_{NC(ON)}$, $I_{NO(ON)}$, $I_{COM(ON)}$	$V_S = 5.5V$, $V_{COM} = 0.3V/3.3V$, V_{NO} or $V_{NC} = 0.3V/3.3V$ or floating	Full			1	μA
LOGIC INPUTS							
Logic voltage high	V_{IH}		Full	2			V
Logic voltage low	V_{IL}		Full			0.7	V
Input Leakage Current	I_{IN}	$V_S = 5.5V$, $V_{IN} = 0V$ or $5.5V$	Full			1	μA
DYNAMIC CHARACTERISTICS							
Turn-On Time	t_{ON}	V_{NC} or $V_{NO} = 3V$, $R_L = 300\Omega$, $C_L = 35pF$, Test Circuit 2	25°C		30		ns
Turn-Off Time	t_{OFF}		25°C		10		ns
Break-Before-Make Time Delay	t_{BBM}	V_{NC} or $V_{NO} = 3V$, $R_L = 300\Omega$, $C_L = 35pF$, Test Circuit 3	25°C		30		ns
Charge Injection	Q	$V_{COM} = 0V, C_L = 1nF$, $Q_{INJ} = V_{OUT} * C_L$, Test Circuit 4	25°C		5		pC
Off-Isolation	V_{ISO}	$R_L = 50\Omega$, Test Circuit 5	1MHz	25°C		-80	dB
			10MHz	25°C		-60	dB
Channel-to-Channel Crosstalk	X_{TALK}	$R_L = 50\Omega$, Test Circuit 6	1MHz	25°C		-90	dB
			10MHz	25°C		-80	dB

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Electrical Characteristics(Continued)

Parameters	Symbol	Conditions	Temp	Min	Typ	Max	Unit
-3dB Bandwidth	BW	$R_L = 50\Omega$, Test Circuit 7	25°C		300		MHz
Channel On Capacitance	$C_{NC(ON)}$, $C_{NO(ON)}$ $C_{COM(ON)}$		25°C		15		pF
POWER REQUIREMENTS							
Power Supply Range	V_S		Full	1.8		5.5	V
Power Supply Current	I_S	$V_S = 5.5V$, $V_{IN} = 0V$ or V_S	Full			1	μA

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Electrical Characteristics

$V_S = 1.8V$ to $3.6V$, Full = $-40^\circ C$ to $+125^\circ C$, unless otherwise noted.

Typical values are at $V_S = 2.7V$, $T_A = +25^\circ C$, unless otherwise noted.

Parameters	Symbol	Conditions	Temp	Min	Typ	Max	Unit
ANALOG SWITCH							
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}		Full	GND		V_S	V
On-Resistance	R_{ON}	$V_S = 2.7V$, $0V \leq V_{NO}$ or $V_{NC} \leq V_S$, $I_{OUT} = 10mA$, Test Circuit 1	25°C		10	17	Ω
			Full			20	
On-resistance mismatch between channels	ΔR_{ON}		25°C		0.5	2	Ω
			Full			3	Ω
On-resistance flatness	R_{FLAT}		25°C			9	12
		Full				15	Ω
Source Off Leakage Current	$I_{NC(OFF)}$, $I_{NO(OFF)}$	$V_S = 3.6V$, V_{NO} or $V_{NC} = 3.3V/0.3V$, $V_{COM} = 0.3V/3.3V$	Full			1	μA
Channel On Leakage Current	$I_{NC(ON)}$, $I_{NO(ON)}$, $I_{COM(ON)}$	$V_S = 3.6V$, $V_{COM} = 0.3V/3.3V$, V_{NO} or $V_{NC} = 0.3V/3.3V$ or floating	Full			1	μA
LOGIC INPUTS							
Logic voltage high	V_{IH}		Full	1.5			V
Logic voltage low	V_{IL}		Full			0.5	V
Input Leakage Current	I_{IN}	$V_S = 3.6V$, $V_{IN} = 0V$ or $3.6V$	Full			1	μA
DYNAMIC CHARACTERISTICS							
Turn-On Time	t_{ON}	V_{NC} or $V_{NO} = 1.5V$, $R_L = 300\Omega$, $C_L = 35pF$, Test Circuit 2	25°C		40		ns
Turn-Off Time	t_{OFF}		25°C		10		ns
Break-Before-Make Time Delay	T_{BBM}	V_{NC} or $V_{NO} = 1.5V$, $R_L = 300\Omega$, $C_L = 35pF$, Test Circuit 3	25°C		35		ns
Charge Injection	Q	$V_{COM} = 0V, C_L = 1nF$, $Q = V_{OUT} * C_L$, Test Circuit 4	25°C		5		pC

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Electrical Characteristics(Continued)

Parameters	Symbol	Conditions	Temp	Min	Typ	Max	Unit
Off-Isolation	V_{ISO}	$R_L = 50\Omega$, Test Circuit 5	1MHz 25°C		-80		dB
			10MHz 25°C		-60		dB
Channel-to-Channel Crosstalk	X_{TALK}	$R_L = 50\Omega$, Test Circuit 6	1MHz 25°C		-90		dB
			10MHz 25°C		-80		dB
-3dB Bandwidth	BW	$R_L = 50\Omega$, Test Circuit 7	25°C		300		MHz
Channel On Capacitance	$C_{NC(ON)}$, $C_{NO(ON)}$, $C_{COM(ON)}$		25°C		15		pF

Typical Characteristics

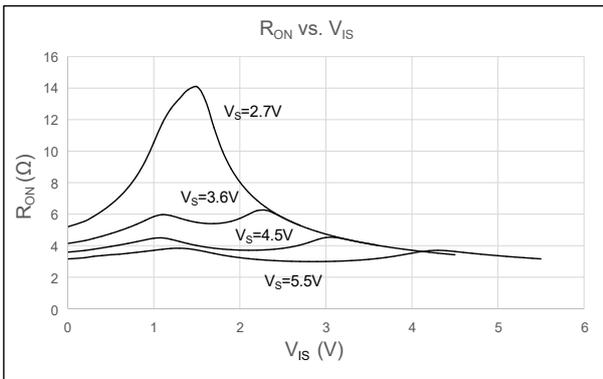


Figure 1. On-Resistance vs. V_{IS}

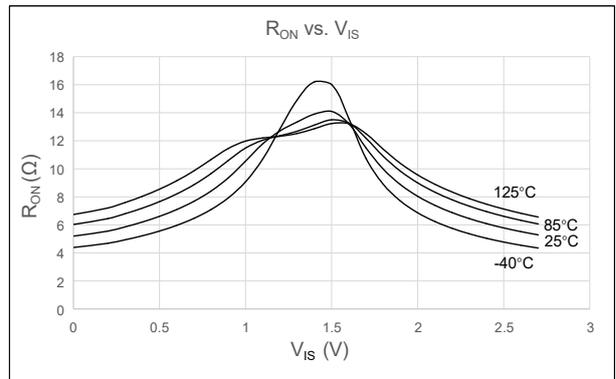


Figure 2. Temperature vs On-Resistance @ $V_S=2.7V$

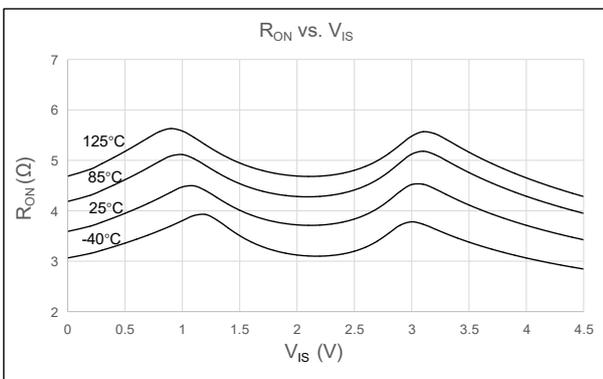


Figure 3. Temperature vs On-Resistance @ $V_S=4.5V$

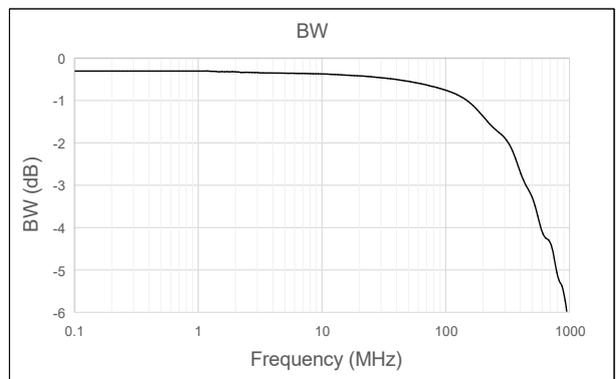


Figure 4. Temperature vs On-Resistance @ $V_S=4.5V$

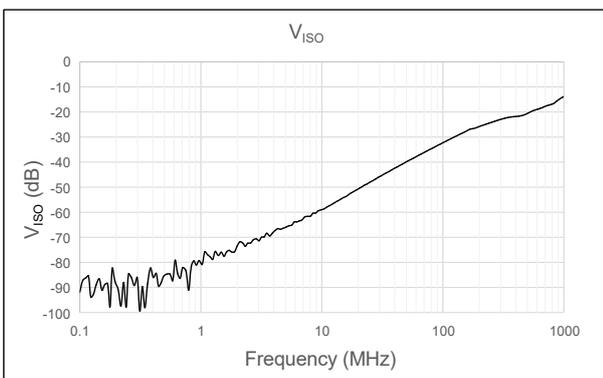


Figure 5. V_{ISO} vs. Frequency @ $V_S=4.5V$

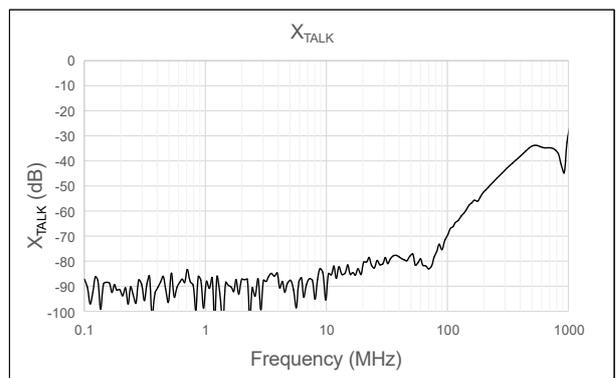
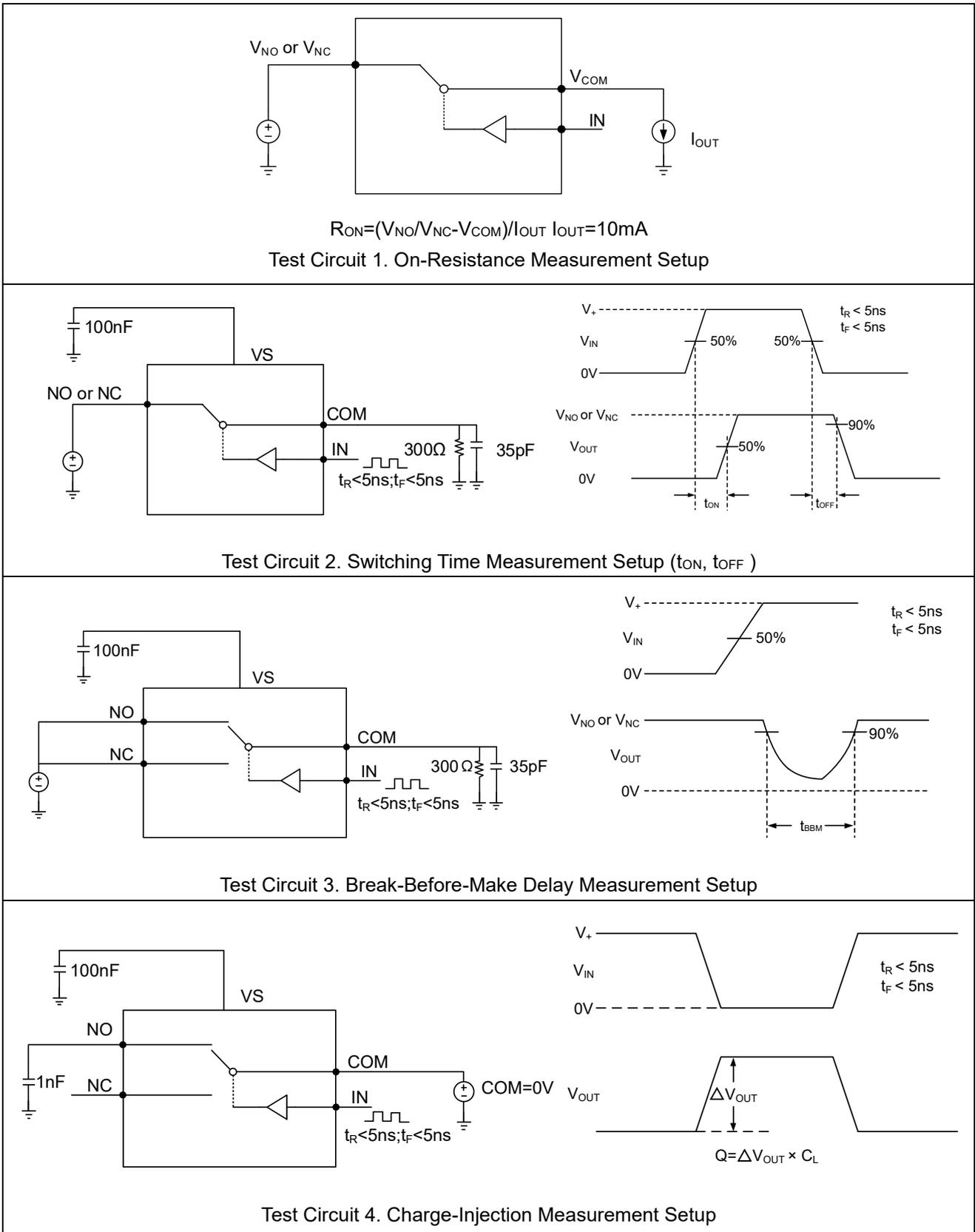


Figure 6. X_{TALK} vs. Frequency @ $V_S=4.5V$

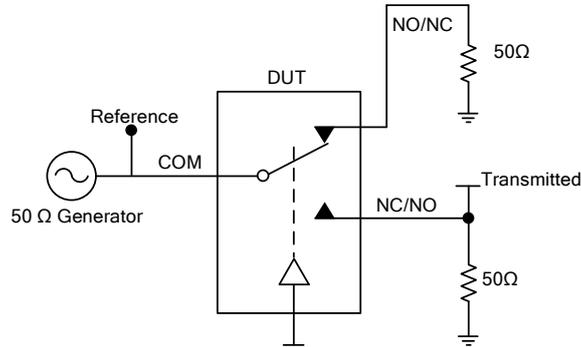
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Test Circuit and Waveform



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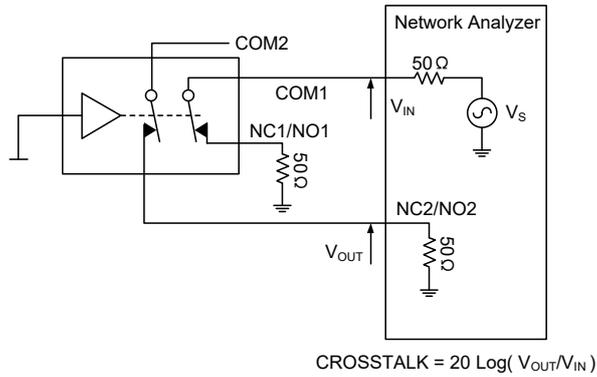
Test Circuit and Waveform(Continued)



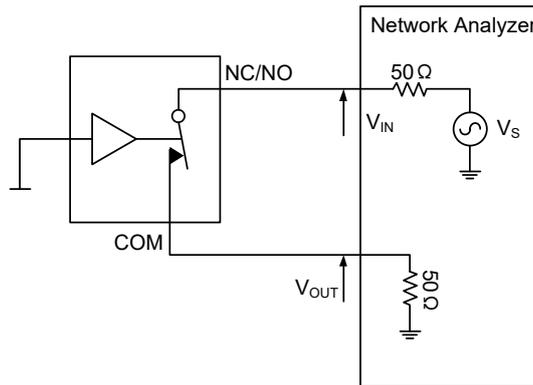
Off Isolation = $20 \log (V_{OUT}/V_{IN})$ (Measured between COMx and "OFF" NCx/NOx Terminal on Each Switch)

On Loss = $20 \log (V_{OUT}/V_{IN})$ (Measured between COMx and "ON" NCx/NOx Terminal on Each Switch)

Test Circuit 5. Off Isolation Measurement Setup



Test Circuit 6. Channel-to-Channel Crosstalk Measurement Setup

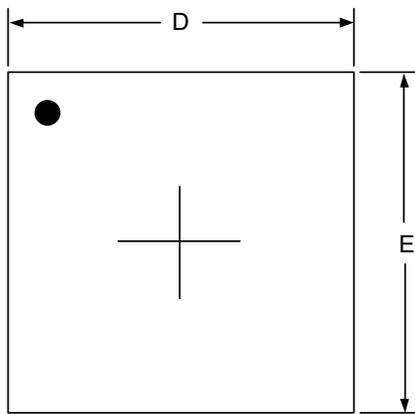


Test Circuit 7. -3dB Bandwidth Measurement Setup

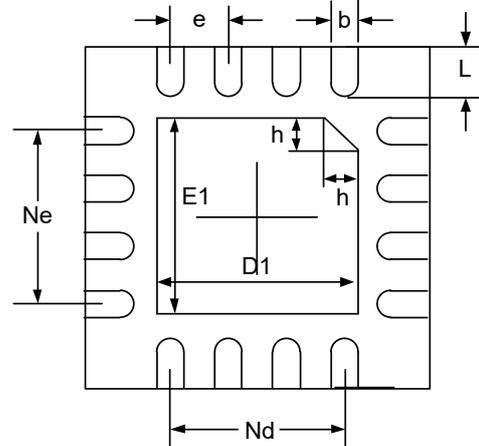
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Package Dimension

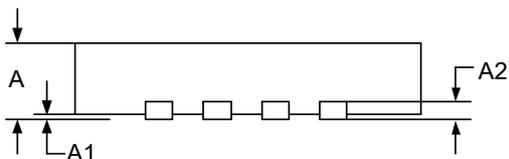
TQFN-3×3-16L



TOP VIEW



BOTTOM VIEW



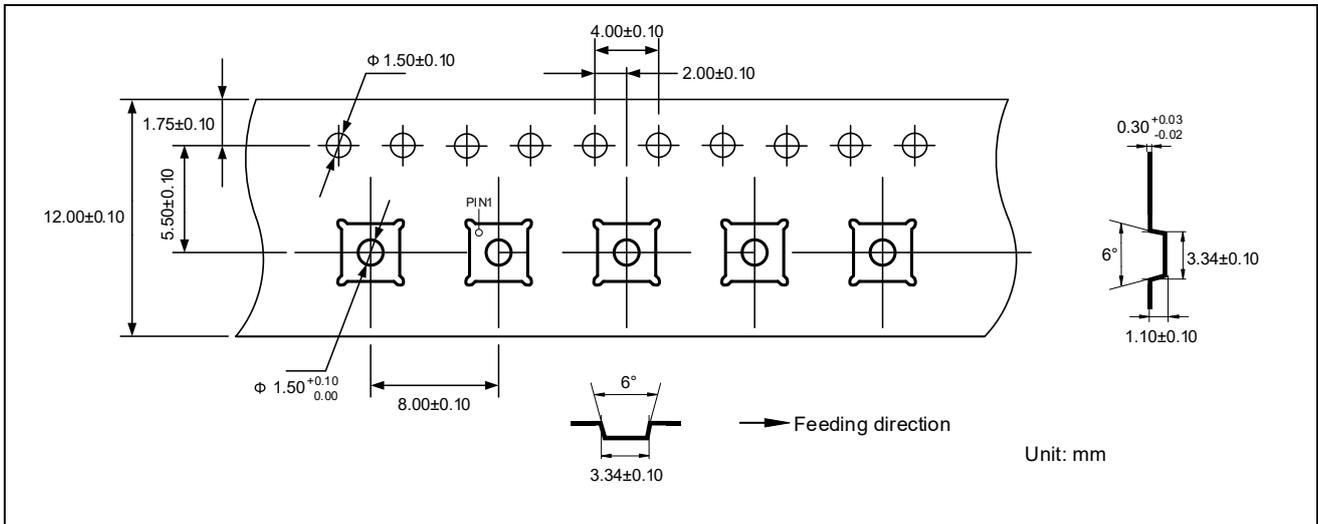
SIDE VIEW

Dimensions Table (Units:mm)

SYMBOL	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
A2	0.203TYP		
b	0.19	0.24	0.29
D	2.90	3.00	3.10
E	2.90	3.00	3.10
D1	1.60	1.70	1.80
E1	1.60	1.70	1.80
e	0.50TYP		
Ne	1.50TYP		
Nd	1.50TYP		
h	0.25	0.30	0.35
L	0.35	0.40	0.45

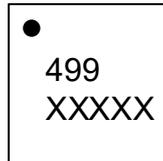
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Tape Information



Marking Information

TQFN-3×3-16L



499 - Part Number

XXXXX - Tracking Number

Note: XXXXX(Tracking Number) is variable, according to the wafer lot number.

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Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
0.1	2023-04-16	Preliminary Version	Qinpl	Zhuji	Liuji
1.0	2025-11-17	Original Version	Pansy	Zhuji	Liuji