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 QFN16 packages. It operates over an ambient temperature range of -40°C to +125°C.

Features

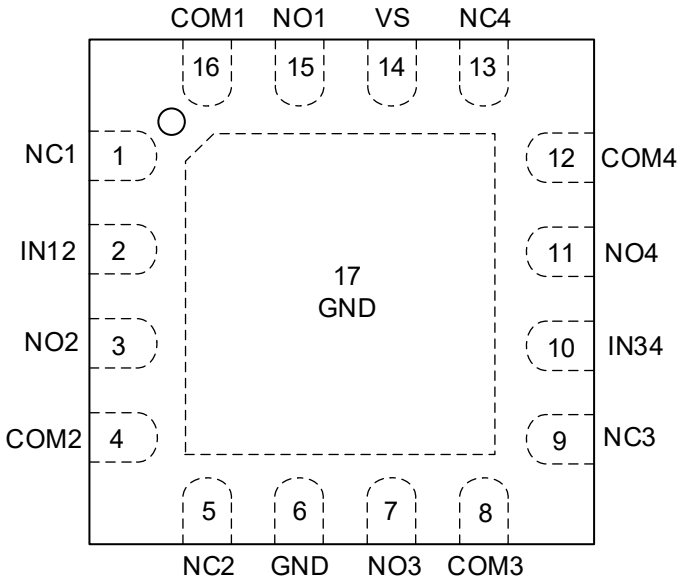
- Single Supply Voltage Range: 1.8V to 5.5V
- On-Resistance: 4Ω(TYP) with V_S = 4.5V Supply
- Low On-Resistance Flatness
- -3dB Bandwidth: 300MHz
- High Off-Isolation: -80dB at 1MHz
- Low Crosstalk: -90dB at 1MHz
- Fast Switching Times: t_{ON} = 30ns / t_{OFF}= 10ns
- Rail-to-Rail Input and Output Operation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

Part No.	Package	Packing Option	MSL
ET44599	QFN16(3mm × 3mm)	Tape and Reel ,5K	Level 1

Application

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

Pin Configuration



QFN16(Top View)

Pin Function

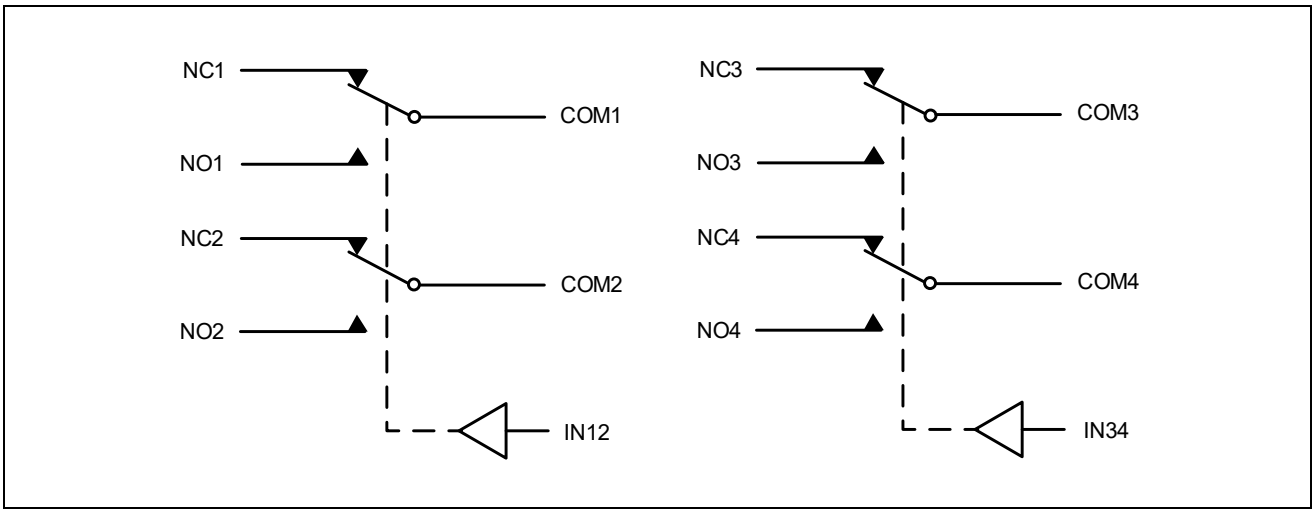
Pin No.	Pin Name	Description
14	VS	Positive Power Supply Pin.
6	GND	Ground.
2,10	IN_X	Digital Control Input Pin to Connect the COM Pins to the NO or NC Pins.
4,8,12,16	COM_X	Common Pins.
3,7,11,15	NO_X	Normally Open Pins.
1,5,9,13	NC_X	Normally Closed Pins.
17	GND	Exposed Pad. It should be soldered to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

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



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		±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.

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

Electrical Characteristics

V_S = 3.6V to 5.5V, Full = -40°C to +125°C, unless otherwise noted.

Typical values are at V_S = 4.5V, T_A = +25°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 ≤ V_{NO} or V_{NC} ≤ 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	uA
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	uA
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	uA
DYNAMIC CHARACTERISTICS								
Turn-On Time	t_{ON}	V_{NC} or V_{NO} = 3V, R_L = 300Ω, 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 = 300Ω, 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 = 50Ω, Test Circuit 5	1MHz	25°C		-80		dB
			10MHz	25°C		-60		dB
Channel-to-Channel Crosstalk	X_{TALK}	R_L = 50Ω, Test Circuit 6	1MHz	25°C		-90		dB
			10MHz	25°C		-80		dB

Electrical Characteristics(Continued)

Parameters	Symbol	Conditions	Temp	Min	Typ	Max	Unit
–3dB Bandwidth	BW	R_L = 50Ω,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	uA

Electrical Characteristics

V_S = 1.8V to 3.6V, Full = -40°C to +125°C, unless otherwise noted.

Typical values are at V_S = 2.7V, T_A = +25°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 ≤ V_{NO} or V_{NC} ≤ 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	Ω
			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	uA
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	uA
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	uA
DYNAMIC CHARACTERISTICS							
Turn-On Time	t_{ON}	V_{NC} or V_{NO} = 1.5V, R_L = 300Ω, 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 = 300Ω, 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

Electrical Characteristics(Continued)

Parameters	Symbol	Conditions		Temp	Min	Typ	Max	Unit
Off-Isolation	V_{ISO}	R_L = 50Ω, Test Circuit 5	1MHz	25°C		-80		dB
			10MHz	25°C		-60		dB
Channel-to-Channel Crosstalk	X_{TALK}	R_L = 50Ω, Test Circuit 6	1MHz	25°C		-90		dB
			10MHz	25°C		-80		dB
-3dB Bandwidth	BW	R_L = 50Ω, 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

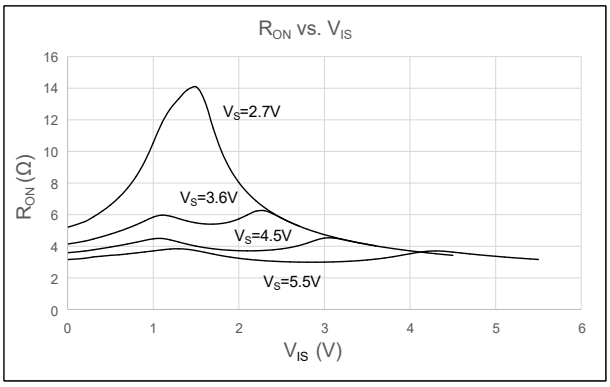


Figure 1. On-Resistance vs. V_{IS}

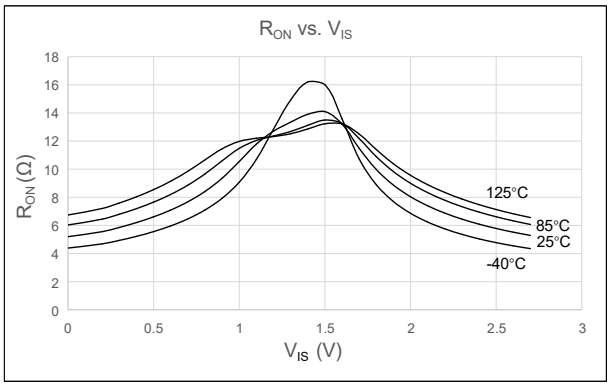


Figure 2. Temperature vs On-Resistance @V_S=2.7V

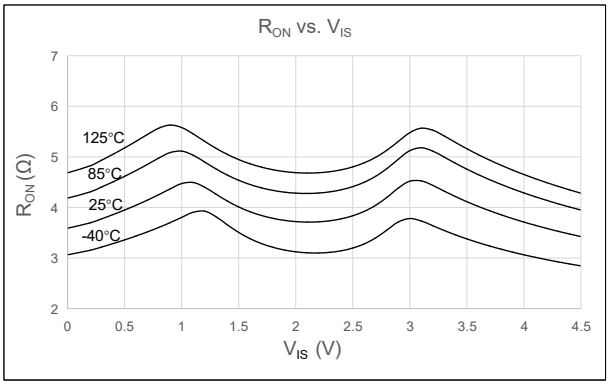


Figure 3. Temperature vs On-Resistance @V_S=4.5V

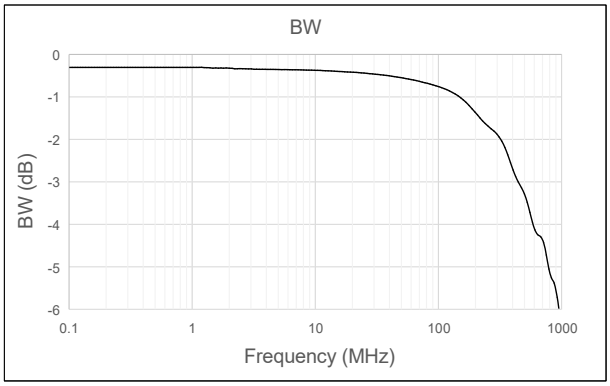


Figure 4. Temperature vs On-Resistance @V_S=4.5V

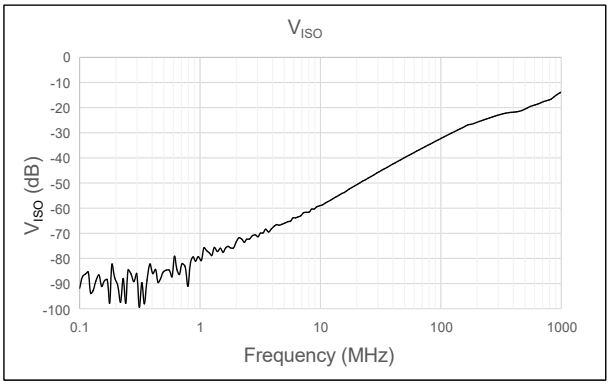


Figure 5. V_{ISO} vs. Frequency @V_S=4.5V

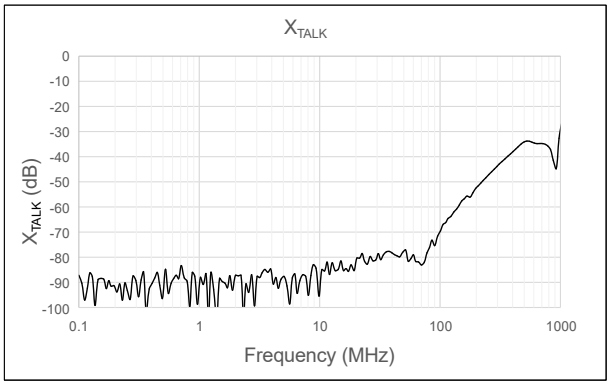
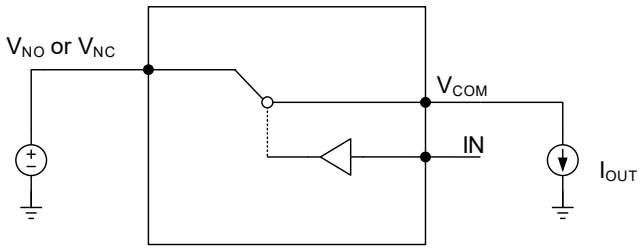


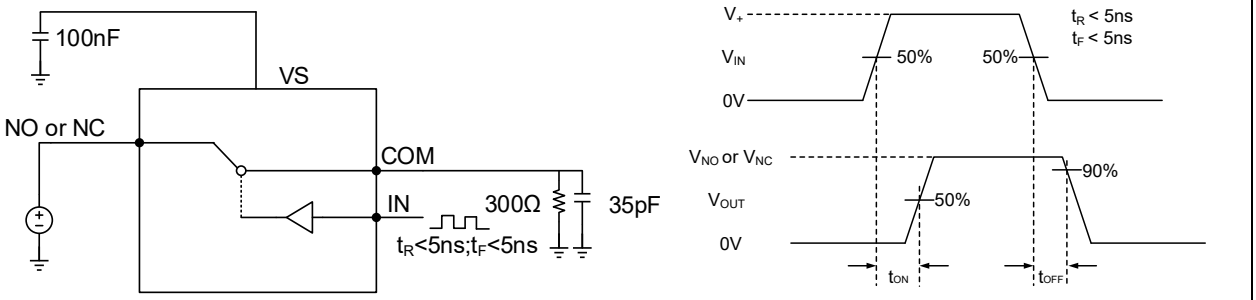
Figure 6. X_{TALK} vs. Frequency @V_S=4.5V

Test Circuit and Waveform

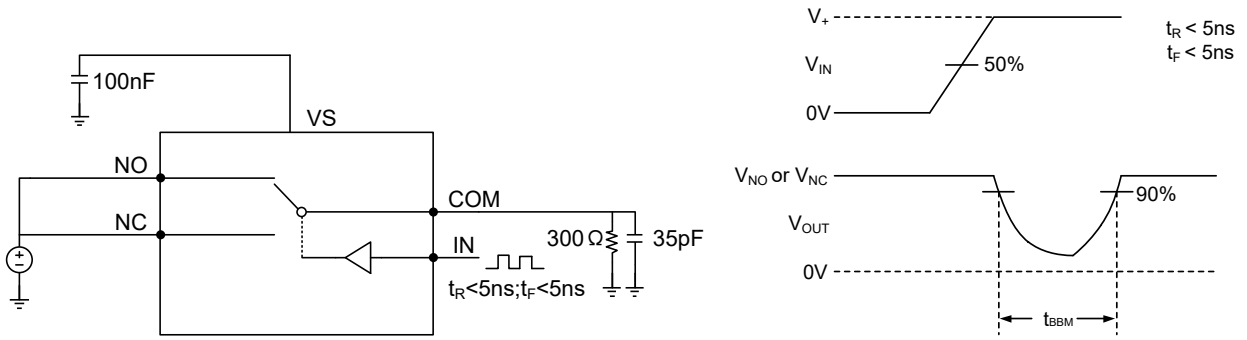


$R_{ON}=(V_{NO}/V_{NC}-V_{COM})/I_{OUT}$ I_{OUT}=10mA

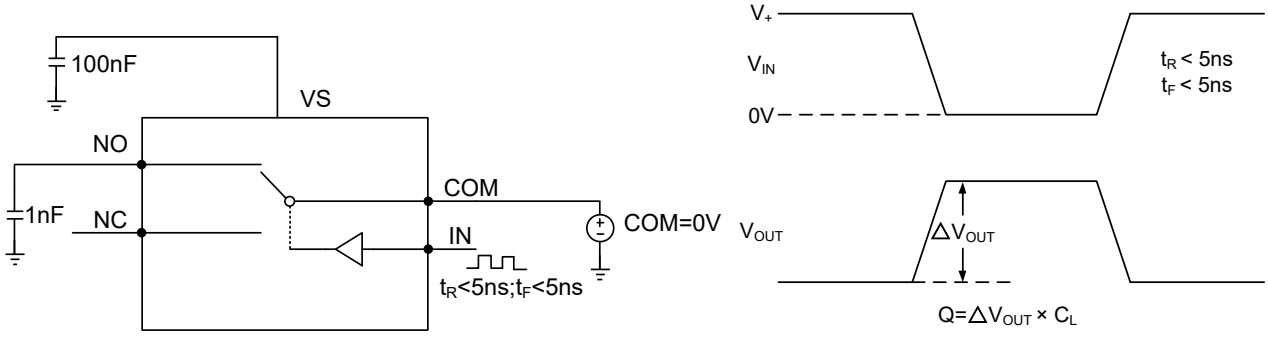
Test Circuit 1. On-Resistance Measurement Setup



Test Circuit 2. Switching Time Measurement Setup (t_{ON}, t_{OFF})

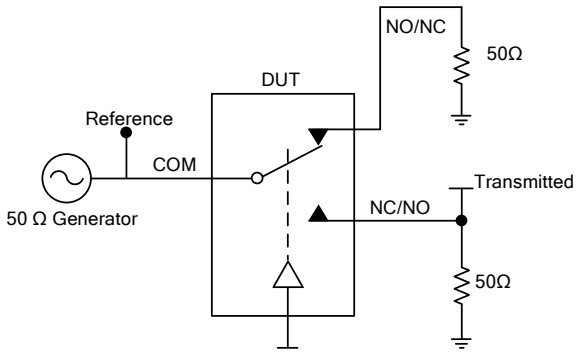


Test Circuit 3. Break-Before-Make Delay Measurement Setup

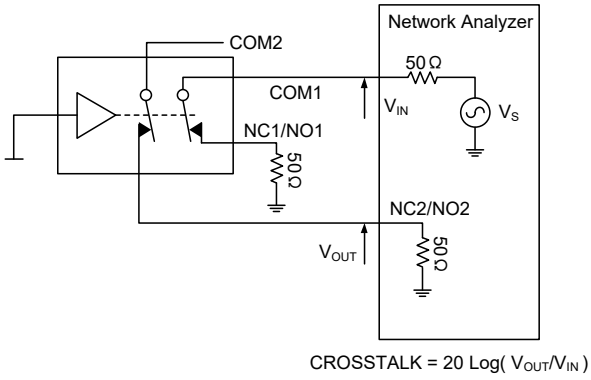


Test Circuit 4. Charge-Injection Measurement Setup

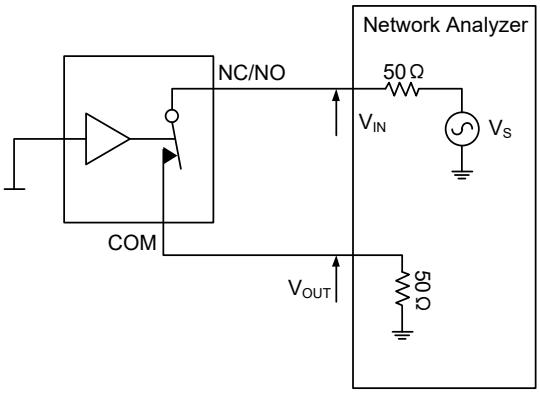
Test Circuit and Waveform(Continued)



Off Isolation = 20log (V_{OUT}/V_{IN}) (Measured between COMx and "OFF" NCx/NOx Terminal on Each Switch)
On Loss = 20log (V_{OUT}/V_{IN}) (Measured between COMx and "ON" NCx/NOx Terminal on Each Switch)
Test Circuit 5. Off Isolation Measurement Setup



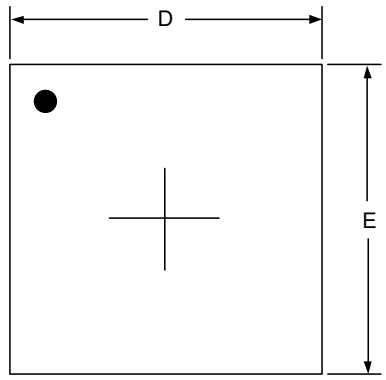
Test Circuit 6. Channel-to-Channel Crosstalk Measurement Setup



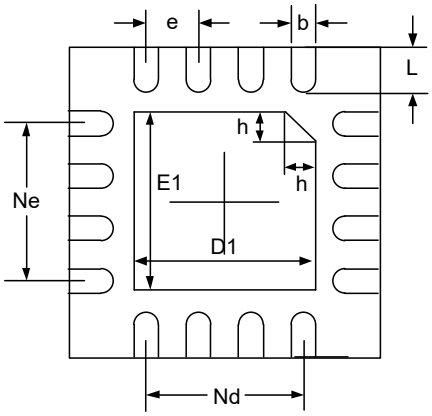
Test Circuit 7. -3dB Bandwidth Measurement Setup

Package Dimension

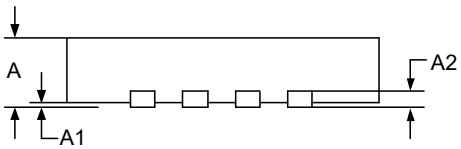
QFN16(3mm × 3mm)



TOP VIEW



BOTTOM VIEW

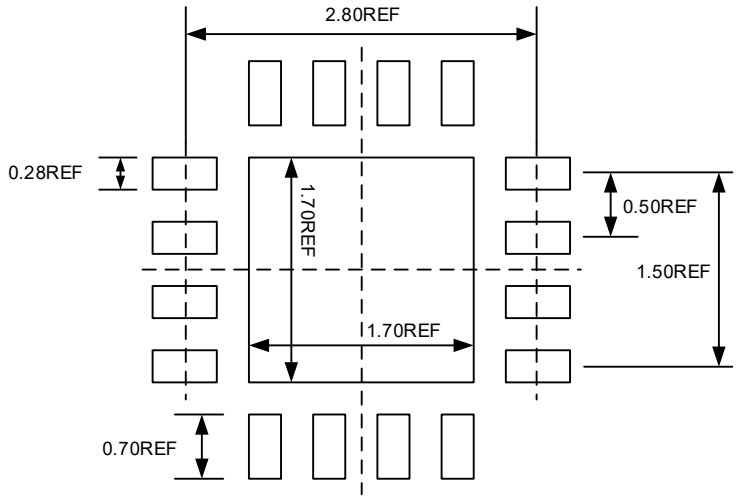


SIDE VIEW

Dimensions Table (Units:mm)

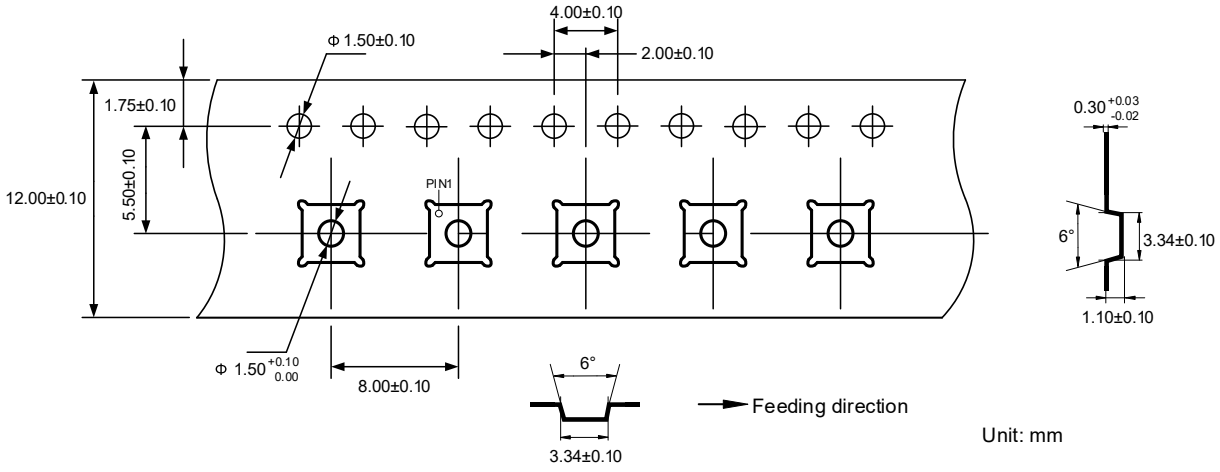
SYMBOL	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
A2		0.203TYP	
b	0.19	0.24	0.29
D	2.90	3.00	3.10
E	2.90	3.00	3.10
D1	1.60	1.70	1.80
E1	1.60	1.70	1.80
e		0.50TYP	
Ne		1.50TYP	
Nd		1.50TYP	
h	0.25	0.30	0.35
L	0.35	0.40	0.45

PCB Land Pattern



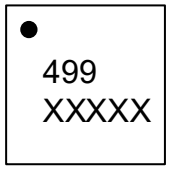
Recommend Land Pattern

Tape Information



Marking Information

QFN16(3mm × 3mm)



499 - Part Number

XXXXX - Tracking Number

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

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
0.1	2023-04-16	Preliminary Version	Qinpl	Zhujy	Liujy
1.0	2025-11-17	Original Version	Pansy	Zhujy	Liujy
1.1	2026-05-21	Add PCB Land Pattern	Pansy	Zhujy	Liujy
1.1a	2026-07-08	Update Package Information	Qinpl	Zhujy	Liujy