

Low Voltage, Low On-Resistance, Dual DPDT Analog Switch

DESCRIPTION

The DG2799 is a dual double-pole/double-throw monolithic CMOS analog switch designed for high performance switching of analog signals. Combining low power, high speed, low on-resistance and small physical size, the DG2799 is ideal for portable and battery powered applications requiring high performance and efficient use of board space.

The DG2799 is built on Vishay Siliconix's low voltage process. An epitaxial layer prevents latchup. Break-before-make is guaranteed.

The switch conducts equally well in both directions when on, and blocks up to the power supply level when off.

As a committed partner to the community and the environment, Vishay Siliconix manufactures this product with the lead (Pb)-free device terminations. For analog switching products manufactured in QFN packages, the lead (Pb)-free "-E3/E4" only suffix is being used as a designator. Lead (Pb)-free QFN products purchased at any time will have either a nickel-palladium-gold device termination or a 100 % matte tin device termination. The different lead (Pb)-free materials are interchangeable and meet all JEDEC standards for reflow and MSL rating.

FEATURES

- Low Voltage Operation (1.65 V to 4.3 V)
- Low On-Resistance - r_{ON} : 0.25 Ω @ 2.7 V
- Fast Switching: t_{ON} = 28 ns
 t_{OFF} = 17 ns
- QFN-16 (3 x 3) Package
- Latch-Up Current > 300 mA (JESD78)

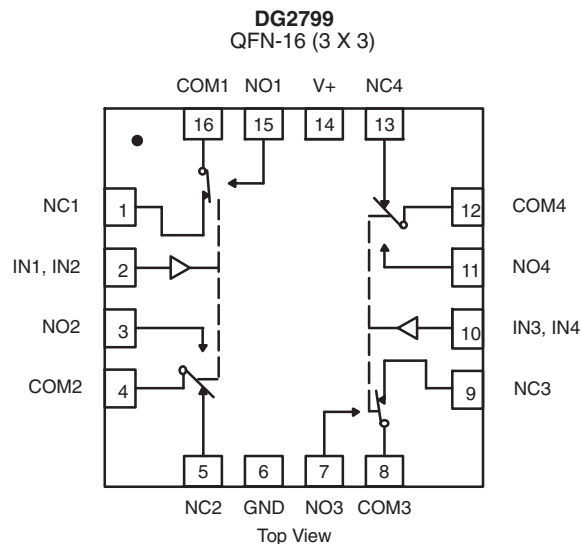
BENEFITS

- Reduced Power Consumption
- High Accuracy
- Reduce Board Space
- TTL/1.8-V Logic Compatible
- High Bandwidth

APPLICATIONS

- Cellular Phones
- Speaker Headset Switching
- Audio and Video Signal Routing
- PCMCIA Cards
- Battery Operated Systems

FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION



NOTE:

Underside exposed pad has no device electrical connection. It is recommended that no electrical connection is made to it.

TRUTH TABLE		
Logic	NC1, 2, 3 and 4	NO1, 2, 3 and 4
0	ON	OFF
1	OFF	ON

ORDERING INFORMATION		
Temp Range	Package	Part Number
-40 to 85°C	16-Pin QFN (3 x 3 mm) Variation 2	DG2799DN-T1—E4

ABSOLUTE MAXIMUM RATINGS $T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted				
Parameter		Symbol	Limit	Unit
Reference to GND	V+		-0.3 to 5.0	V
	IN, COM, NC, NO ^a		-0.3 to (V+ + 0.3)	
Current (Any terminal except NO, NC or COM)			30	mA
Continuous Current (NO, NC, or COM)			± 300	
Peak Current (Pulsed at 1 ms, 10 % duty cycle)			± 500	
Storage Temperature (D Suffix)			-65 to 150	$^{\circ}\text{C}$
Package Solder Reflow Conditions ^d	16-Pin QFN (3 x 3 mm)		250	
Power Dissipation (Packages) ^b	QFN-16 ^c		1385	mW

Notes

- a. Signals on NC, NO, or COM or IN exceeding V+ will be clamped by internal diodes. Limit forward diode current to maximum current ratings.
- b. All leads welded or soldered to PC Board.
- c. Derate 17.3 mW/ $^{\circ}\text{C}$ above 70 $^{\circ}\text{C}$
- d. Manual soldering with iron is not recommended for leadless components. The QFN is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper lip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.

SPECIFICATIONS (V+ = 1.8 V)							
Parameter	Symbol	Test Condition Otherwise Unless Specified V+ = 1.8 V, V _{IN} = 0.4 or 1.1 V ^e	Temp ^a	Limits −40 to 85°C			Unit
				Min ^b	Typ ^c	Max ^b	
Analog Switch							
Analog Signal Range ^d	V _{NO} , V _{NC} , V _{COM}		Full	0		V+	V
On-Resistance	r _{ON}	V+ = 1.8 V, V _{COM} = 0.2 V, I _{NO} , I _{NC} = 100 mA	Room		0.35	1.3	Ω
		V+ = 1.8 V, V _{COM} = 0.9 V, I _{NO} , I _{NC} = 100 mA			0.45		
			Full			1.4	
Digital Control							
Input High Voltage	V _{INH}		Full	1.1			V
Input Low Voltage	V _{INL}		Full			0.4	
Input Capacitance	C _{in}		Full		6		pF
Input Current	I _{INL} or I _{INH}	V _{IN} = 0 or V+	Full	−1		1	μA
Dynamic Characteristics							
Turn-On Time	t _{ON}	V _{NO} or V _{NC} = 1.5 V, R _L = 50 Ω, C _L = 35 pF	Romm Full		62	94 97	ns
Turn-Off Time	t _{OFF}		Room Full		24	52 55	
Break-Before-Make Time	t _d		Full	8			
Charge Injection ^d	Q _{INJ}	C _L = 1 nF, V _{GEN} = 0 V, R _{GEN} = 0 Ω	Room		66		pC
Off-Isolation ^d	OIRR	R _L = 50 Ω, C _L = 5 pF, f = 100 kHz	Room		−74		dB
Crosstalk ^d	X _{TALK}		Room		−74		
N _O , N _C Off Capacitance ^d	C _{NO(off)}	V _{IN} = 0 or V+, f = 1 MHz	Room		108		pF
	C _{NC(off)}		Room		108		
Channel-On Capacitance ^d	C _{NO(on)}		Room		240		
	C _{NC(on)}		Room		240		
Power Supply							
Power Supply Current	I+	V _{IN} = 0 or V+	Full			1.0	μA

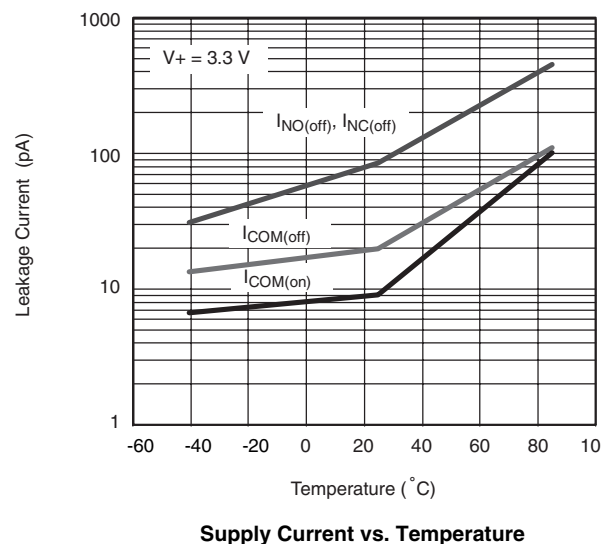
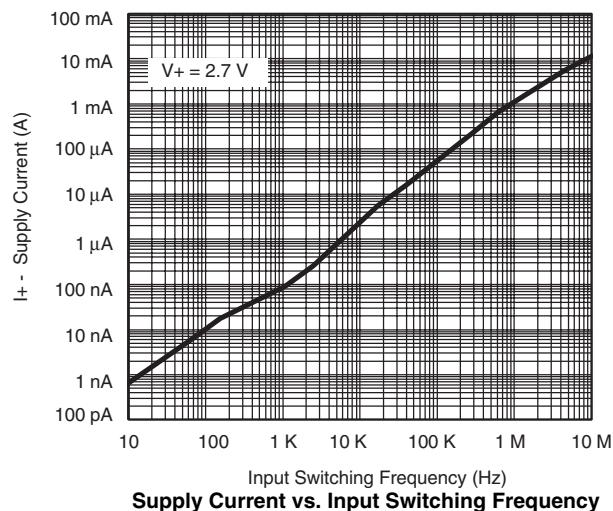
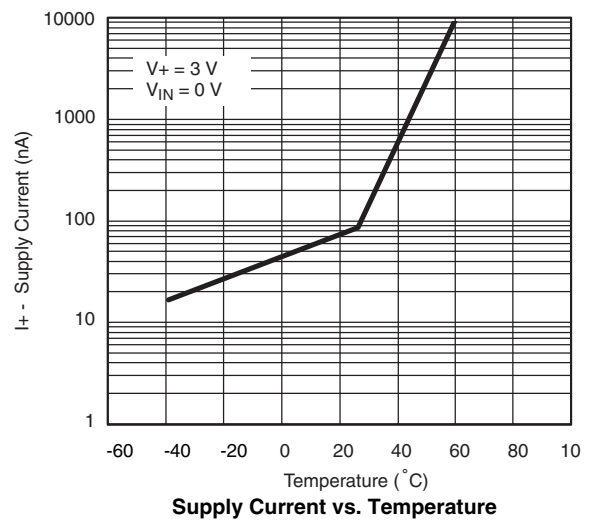
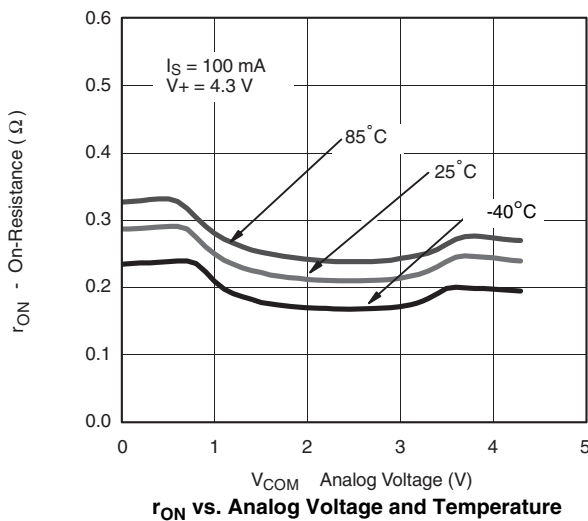
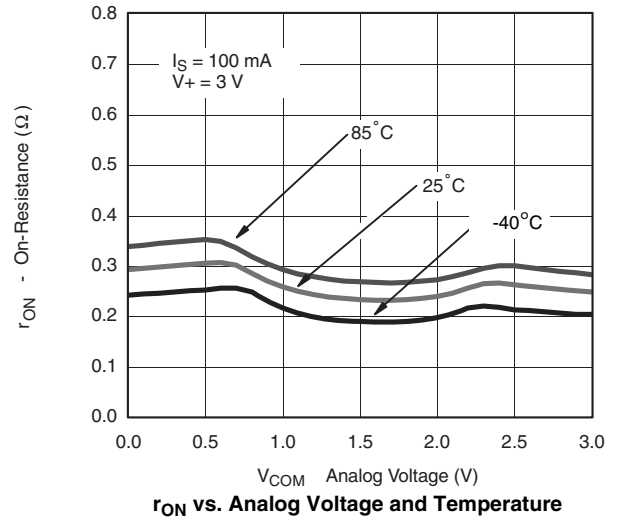
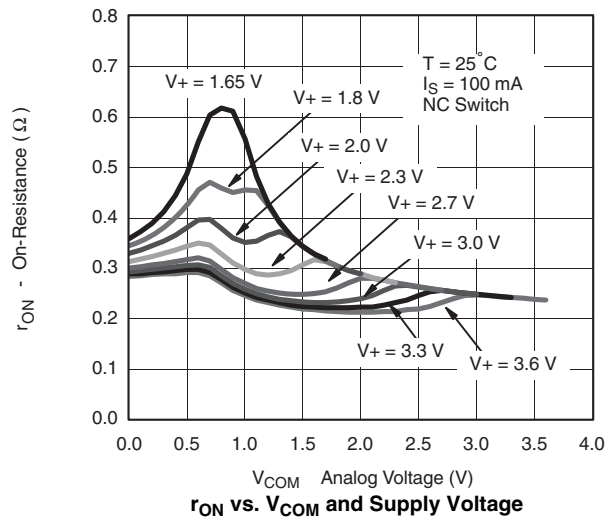
SPECIFICATIONS (V+ = 3 V)							
Parameter	Symbol	Test Condition Otherwise Unless Specified V+ = 3 V, ±10 %, VIN = 0.5 or 1.4 V ^e	Temp ^a	Limits −40 to 85°C			Unit
				Min ^b	Typ ^c	Max ^b	
Analog Switch							
Analog Signal Range ^d	VNO, VNC, VCOM		Full	0		V+	V
On-Resistance	rON	V+ = 2.7 V, VCOM = 0.2 V, INO, INC = 100 mA	Room		0.3	0.45	Ω
		V+ = 2.7 V, VCOM = 1.5 V, INO, INC = 100 mA			0.25		
			Full			0.55	
rON Flatness ^d	rON Flatness	V+ = 2.7 V, VCOM = 0 to V+, INO, INC = 100 mA	Room		0.07	0.15	
rON Match ^d	ΔrON		Room		0.05		
Switch Off Leakage Current	INO(off), INC(off)	V+ = 3.3 V, VNO, VNC = 0.3 V / 3.0 V, VCOM = 3.0 V / 0.3 V	Room Full	−1 −10		1 10	nA
	ICOM(off)		Room Full	−1 −10		1 10	
Channel-On Leakage Current	ICOM(on)	V+ = 3.3 V, VNO, VNC = VCOM = 0.3 V / 3.0 V	Room Full	−1 −10		1 10	
Digital Control							
Input High Voltage	VINH		Full	1.4			V
Input Low Voltage	VINL		Full			0.5	
Input Capacitance	Cin		Full		6		pF
Input Current	IINL or IINH	VIN = 0 or V+	Full	−1		1	μA
Dynamic Characteristics							
Turn-On Time	tON	VNO or VNC = 1.5 V, RL = 50 Ω, CL = 35 pF	Romm Full		28	57 60	ns
Turn-Off Time	tOFF		Room Full		17	45 47	
Break-Before-Make Time	td		Full	1			
Charge Injection ^d	QINJ	CL = 1 nF, VGEN = 0 V, RGEN = 0 Ω	Room		160		pC
Off-Isolation ^d	OIRR	RL = 50 Ω, CL = 5 pF, f = 100 kHz	Room		−75		dB
Crosstalk ^d	XTALK		Room		−75		
NO, NC Off Capacitance ^d	CNO(off)	VIN = 0 or V+, f = 1 MHz	Room		102		pF
	CNC(off)		Room		102		
Channel-On Capacitance ^d	CNO(on)		Room		234		
	CNC(on)		Room		234		
Power Supply							
Power Supply Range	V+			2.7		3.3	V
Power Supply Current	I+	VIN = 0 or V+	Full			1.0	μA

SPECIFICATIONS (V+ = 4.3 V)							
Parameter	Symbol	Test Condition Otherwise Unless Specified V+ = 4.3 V, VIN = 0.5 or 1.6 V ^e	Temp ^a	Limits –40 to 85°C			Unit
				Min ^b	Typ ^c	Max ^b	
Analog Switch							
Analog Signal Range ^d	VNO, VNC, VCOM		Full	0		V+	V
On-Resistance	rON	V+ = 4.3 V, VCOM = 0.5 V, INO, INC = 100 mA	Room		0.29	0.43	Ω
		V+ = 4.3 V, VCOM = 2.1 V, INO, INC = 100 mA		0.21			
			Full		0.53		
rON Flatness ^d	rON Flatness	V+ = 4.3 V, VCOM = 0 to V+, INO, INC = 100 mA	Room		0.07	0.15	
rON Match ^d	ΔrON		Room		0.05		
Switch Off Leakage Current ^d	INO(off), INC(off)	V+ = 4.3 V, VNO, VNC = 0.3 V / 4.0 V, VCOM = 4.0 V / 0.3 V	Room Full	–10 –100		10 100	nA
	ICOM(off)		Room Full	–10 –100		10 100	
Channel-On Leakage Current ^d	ICOM(on)	V+ = 4.3 V, VNO, VNC = VCOM = 3.0 V / 4.0 V	Room Full	–10 –100		10 100	
Digital Control							
Input High Voltage	VINH		Full	1.6			V
Input Low Voltage	VINL		Full			0.5	
Input Capacitance	Cin		Full		6		pF
Input Current	IINL or IINH	VIN = 0 or V+	Full	–1		1	μA
Dynamic Characteristics							
Charge Injection ^d	QINJ	CL = 1 nF, VGEN = 0 V, RGEN = 0 Ω	Room		320		pC
Off-Isolation ^d	OIRR	RL = 50 Ω, CL = 5 pF, f = 100 kHz	Room		–73		dB
Crosstalk ^d	XTALK		Room		–73		
NO, NC Off Capacitance ^d	CNO(off)	VIN = 0 or V+, f = 1 MHz	Room		100		pF
	CNC(off)		Room		100		
Channel-On Capacitance ^d	CNO(on)		Room		230		
	CNC(on)		Room		230		
Power Supply							
Power Supply Range	V+					4.3	V
Power Supply Current	I+	VIN = 0 or V+	Full			1.0	μA

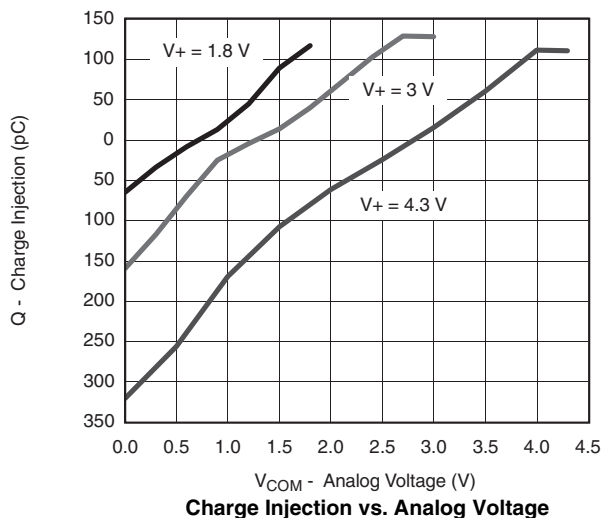
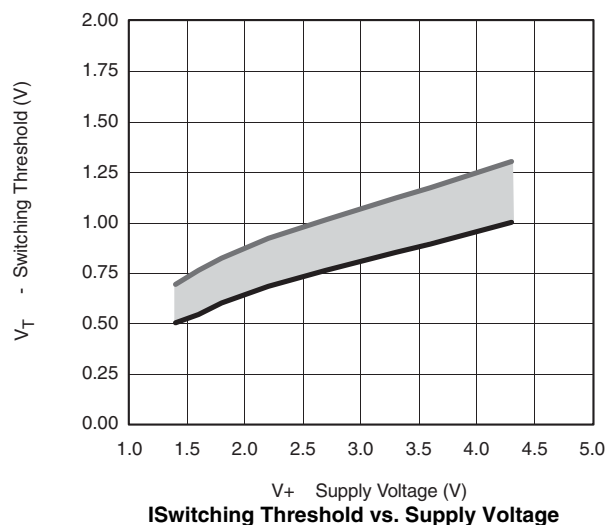
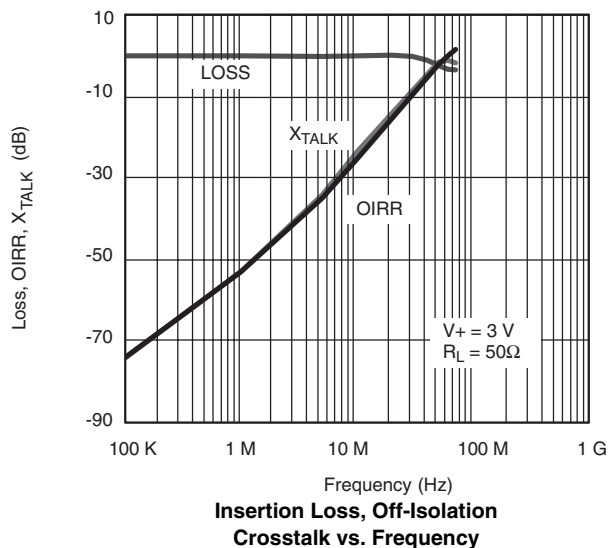
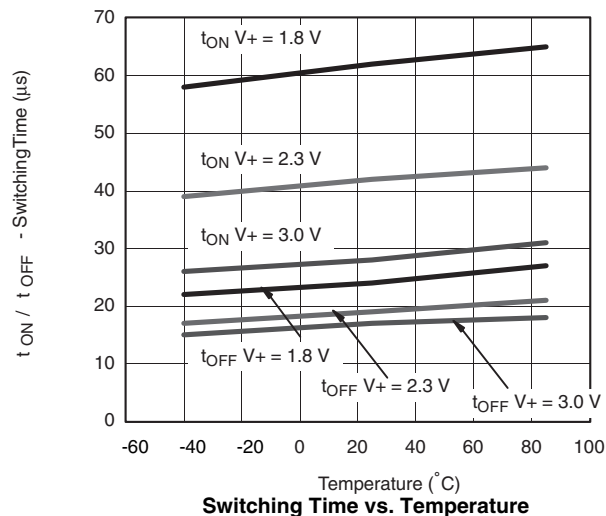
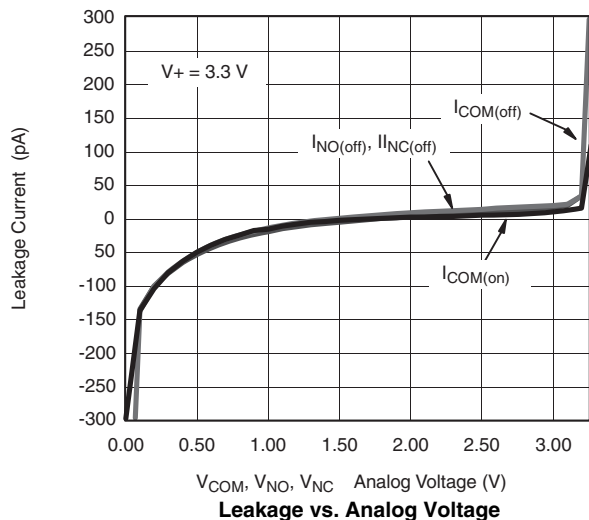
Notes

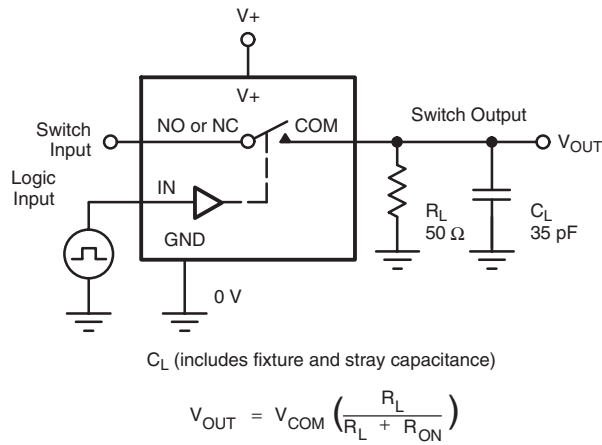
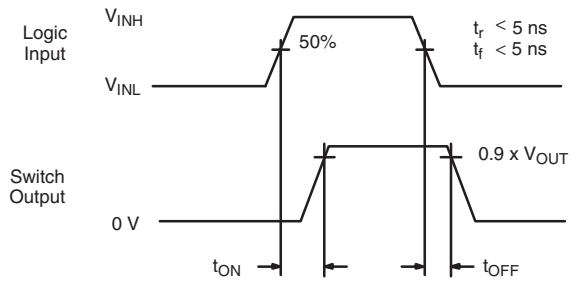
- a. Room = 25°C, Full = as determined by the operating suffix.
b. The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.
c. Typical values are for design aid only, not guaranteed nor subject to production testing.
d. Guarantee by design, not subjected to production test.
e. V_{IN} = input voltage to perform proper function.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

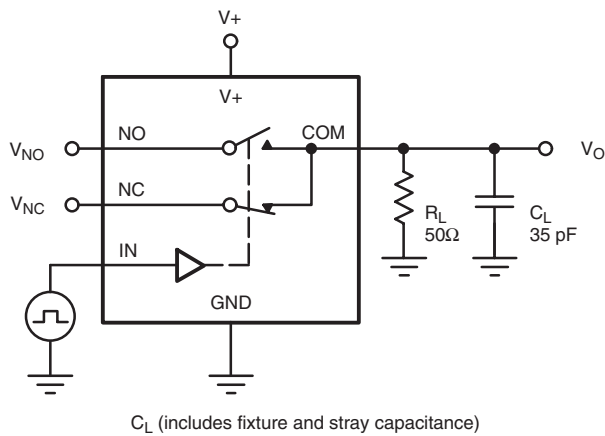
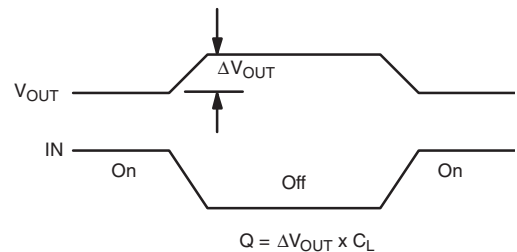
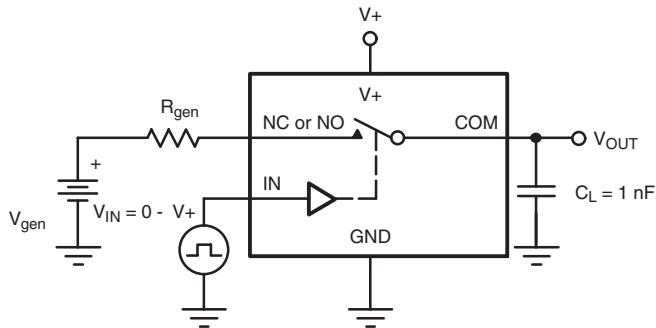
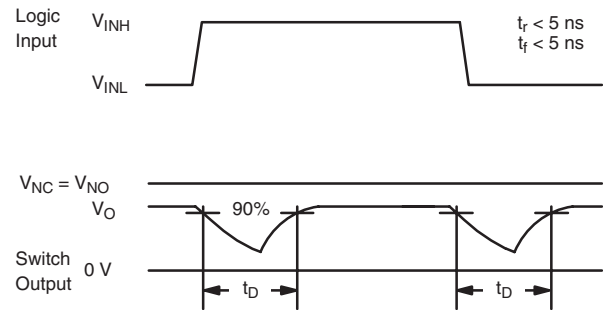
TYPICAL CHARACTERISTICS $T_A = 25^\circ\text{C}$, unless otherwise noted


TYPICAL CHARACTERISTICS $T_A = 25^\circ\text{C}$, unless otherwise noted



TEST CIRCUITS

Figure 1. Switching Time


Logic "1" = Switch On
Logic input waveforms inverted for switches that have the opposite logic sense.


Figure 2. Break-Before-Make Interval


IN depends on switch configuration: input polarity determined by sense of switch.

Figure 3. Charge Injection

TEST CIRCUITS

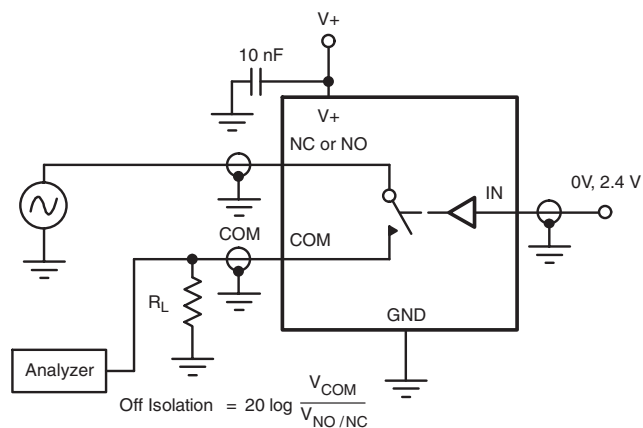


Figure 4. Off-Isolation

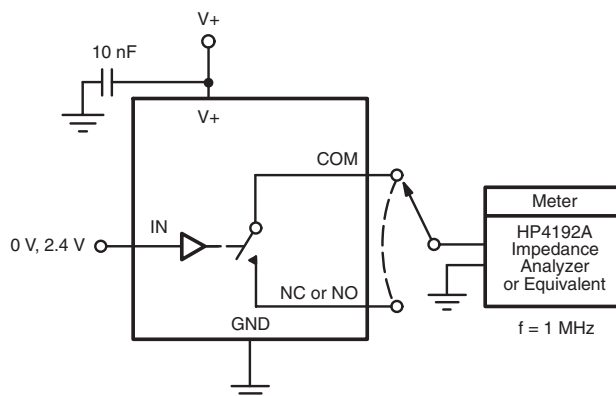


Figure 5. Channel Off/On Capacitance

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see <http://www.vishay.com/ppg?72922>.



Notice

Specifications of the products displayed herein are subject to change without notice. Vishay Intertechnology, Inc., or anyone on its behalf, assumes no responsibility or liability for any errors or inaccuracies.

Information contained herein is intended to provide a product description only. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document. Except as provided in Vishay's terms and conditions of sale for such products, Vishay assumes no liability whatsoever, and disclaims any express or implied warranty, relating to sale and/or use of Vishay products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright, or other intellectual property right.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Vishay for any damages resulting from such improper use or sale.



Disclaimer

All product specifications and data are subject to change without notice.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product.

Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

Product names and markings noted herein may be trademarks of their respective owners.