

Low Voltage, Dual DPDT in miniQFN16

DESCRIPTION

The DG2599 is a C_{MOS} Dual DPDT (Dual Double Pole Double Throw) analog switch that operates over a wide voltage range of 1.65 V to 5 V. It is optimized for portable applications switching audio, SIM card signals, and other low power signals.

The DG2599 features low ON resistance of 2.8Ω at 3 V power supply, fast switching speed, and low power consumption even when control logic signals are below $V+$ power supply voltage. The well matched dual DPDT switches conduct signals equally in both directions. The DG2599 is designed to guarantee break before make switching.

As a committed partner to the community and the environment, Vishay Siliconix manufactures this product with lead (Pb)-free device terminations. DG2599 are offered in a miniQFN package. The miniQFN package has a nickel palladium- gold device termination and is represented by the lead (Pb)-free “-E4” suffix. The nickel-palladium-gold device terminations meet all JEDEC standards for reflow and MSL ratings.

FEATURES

- Halogen-free according to IEC 61249-2-21 definition
- Low voltage operation - 1.65 V to 5 V
- Low on-resistance - 2.8Ω at $V+ = 3 V$
- Power off protection on COM1 and COM2 pins
- Latch up current great than 300 mA per JESD78
- Compliant to RoHS Directive 2002/95/EC



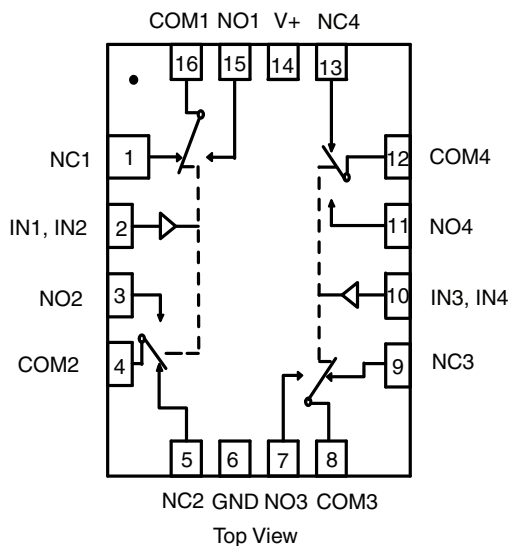
RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Cellular phones
- PMPs and PDAs
- Modems and peripherals
- Computers and ebooks
- Tablet devices
- Displays and gaming
- STB

ORDERING INFORMATION

Part Number	Package
DG2599DN-T1-GE4	miniQFN16 1.8 mm x 2.6 mm

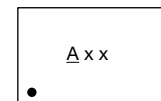


TRUTH TABLE (DG2599)

Logic	NC1, 2, 3 and 4	NO 1, 2, 3 and 4
0	ON	OFF
1	OFF	ON

Device Marking: A xx
xx = Date/Lot Traceability Code

(Top View)



Pin 1

Note: Pin 1 has long lead

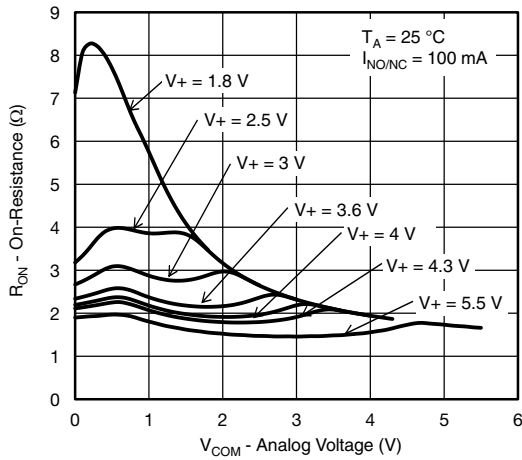
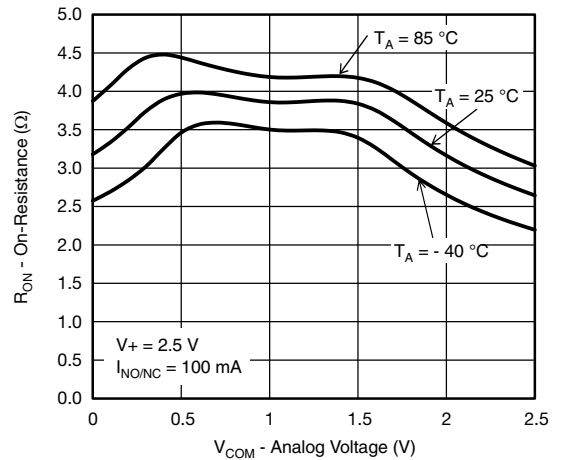
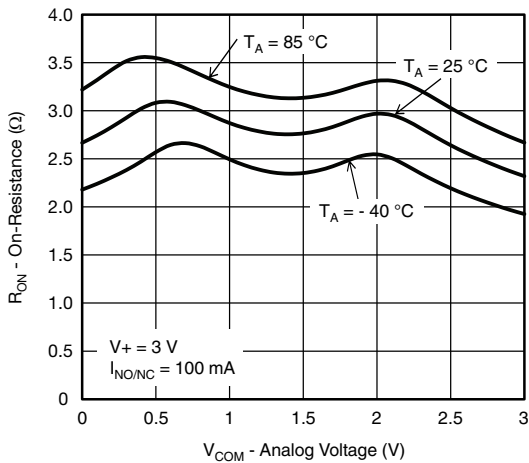
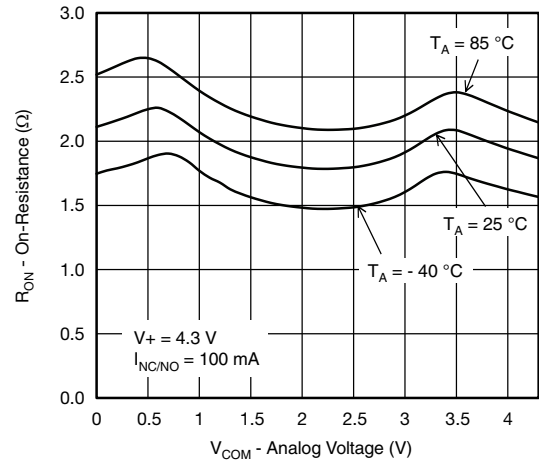
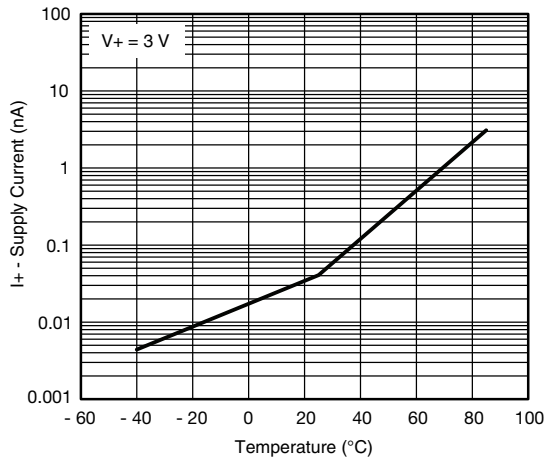
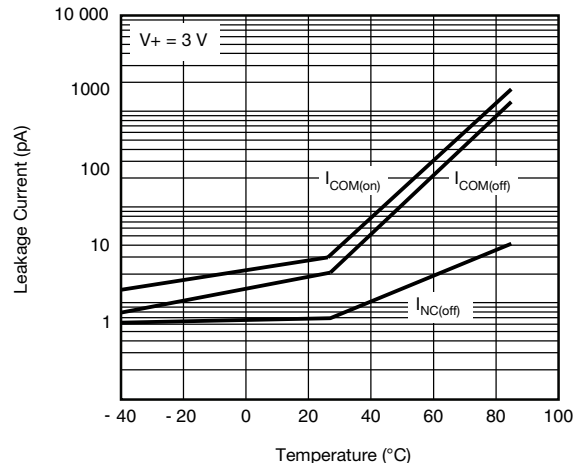


ABSOLUTE MAXIMUM RATINGS (T _A = 25 °C, unless otherwise noted)				
Parameter		Symbol	Limit	Unit
Reference to GND	V+		- 0.3 to 5	V
	IN, COM, NC, NO ^a		- 0.3 to (V+ + 0.3)	
Current (any terminal except NO, NC or COM)			30	mA
Continuous Current (NO, NC, or COM)			± 300	
Peak Current (pulsed at 1 ms, 10 % duty cycle)			± 500	
Storage Temperature (D Suffix)			- 65 to 150	°C
Package Solder Reflow Conditions ^d	miniQFN16		250	
Power Dissipation (Packages) ^b	miniQFN16 ^c		525	mW

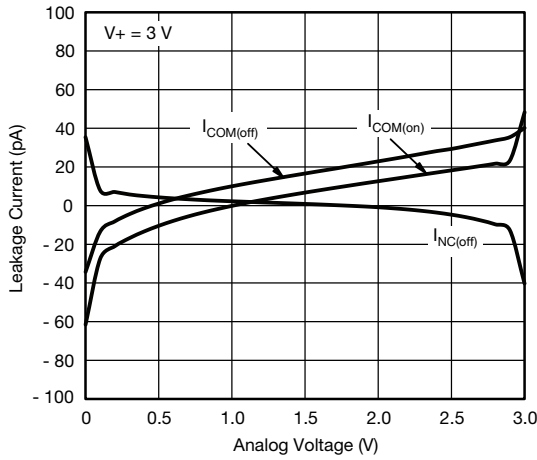
Notes:

- 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 6.6 mW/°C above 70 °C.
- d. Manual soldering with iron is not recommended for leadless components. The miniQFN-16 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.

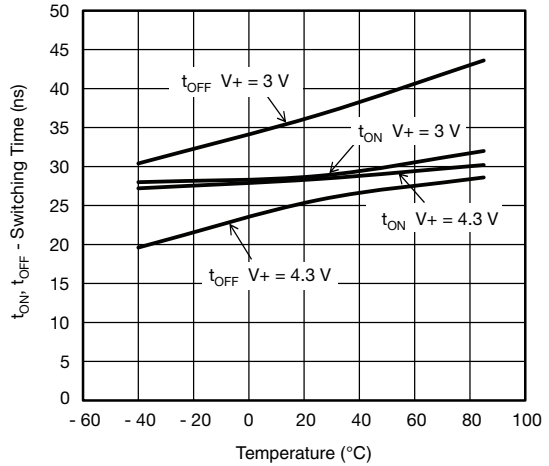
ELECTRICAL CHARACTERISTICS (V+ = 3 V)						
Parameter	Test Conditions	Temp.	Min.	Typ.	Max.	Unit
Power Supply and Signal						
V+ Supply Voltage		Full	1.65		5	V
V+ Supply Current	V _{IN} = 0 or V+	Full		0.001	2	µA
Analog Signal Range		Full	0		V+	V
Switch On-Resistance and Leakage						
Drain-Source On-Resistance	V+ = 3 V, I _{NO/NC} = 100 mA, V _{COM} = 0.9 V, 2.3 V	Room		2.8	3.3	Ω
		Full			3.6	
On-Resistance Flatness	V+ = 3 V, I _{NO/NC} = 100 mA, V _{COM} = 0 to V+	Room		0.24	1.1	Ω
		Full			1.3	
Switch Off Leakage Current	V+ = 4.3 V, V _{NO/NC} = 0.3 V/4 V, V _{COM} = 4 V / 0.3 V	Room	- 10	0.1	10	nA
		Full	- 100		100	
Channel On-Leakage Current	V+ = 4.3 V, V _{NO/NC} and V _{COM} = 0.3 V / 4 V	Room	- 10	0.1	10	nA
		Full	- 100		100	
Digital Control						
Input, High Voltage	V+ = 4.3 V	Full	1.6			V
	V+ = 3 V		1.3			
Input, Low Voltage	V+ = 4.3 V	Full			0.6	V
	V+ = 3 V				0.5	
Input, Bias Current	V _{IN} = V+	Full	- 1	0.01	1	µA
Dynamic Characteristics						
Turn On-Time	V _{COM} or V _{NO/NC} = 3 V, R _L = 50 Ω, C _L = 35 pF	Room			90	ns
		Full			115	
Turn Off-Time	V _{COM} or V _{NO/NC} = 3 V, R _L = 50 Ω, C _L = 35 pF	Room			70	ns
		Full			85	
Break Before Make Time	V _{COM} or V _{NO/NC} = 3 V, R _L = 50 Ω, C _L = 35 pF	Room	2			ns
		Full	2			
Charge Injection	C _L = 1 nF, R _{GEN} = 0 Ω	Room		± 10		pC
Off Isolation	R _L = 50 Ω, C _L = 5 pF, f = 1 MHz			- 66		dB
Crosstalk	R _L = 50 Ω, C _L = 5 pF, f = 1 MHz Non-adjacent channels			- 110		
3dB Bandwidth	C _L = 5 pF, R _L = 50 Ω			186		MHz
Source Off Capacitance	V _{IN} = 0 or V+, f = 1 MHz			9		pF
Channel On Capacitance	V _{IN} = 0 or V+, f = 1 MHz			26		

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

 R_{ON} vs. V_{COM} and Single Supply Voltage

 R_{ON} vs. Analog Voltage and Temperature

 R_{ON} vs. Analog Voltage and Temperature

 R_{ON} vs. Analog Voltage and Temperature

Supply Current vs. Temperature

Leakage Current vs. Temperature

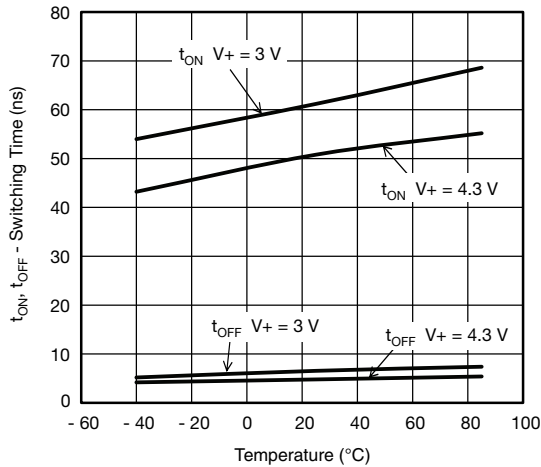
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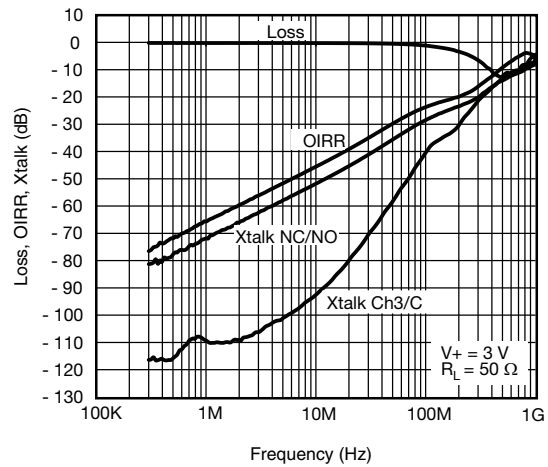
Leakage vs. Analog Voltage



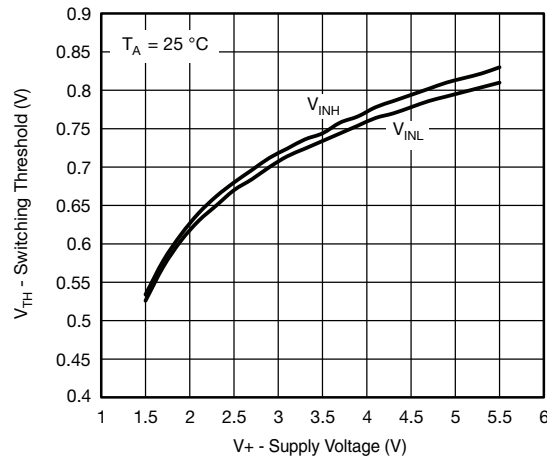
(NO) Switching Time vs. Temperature



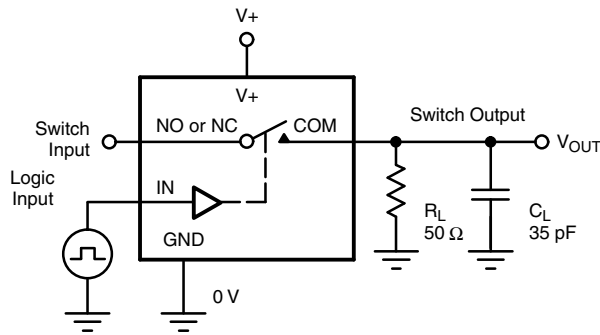
(NC) Switching Time vs. Temperature



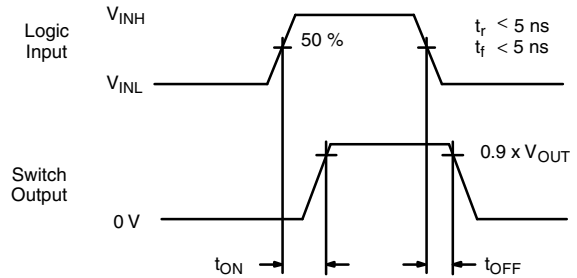
Insertion Loss, Off Isolation and Crosstalk



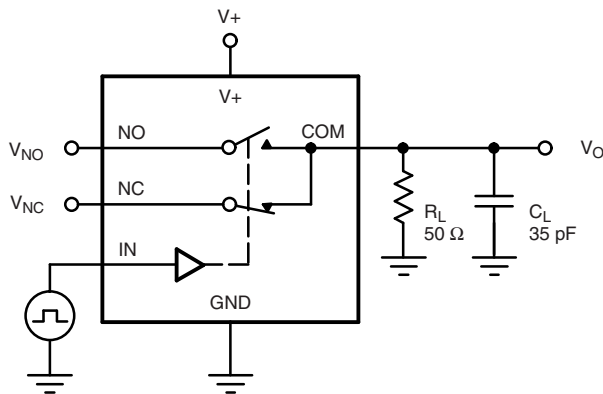
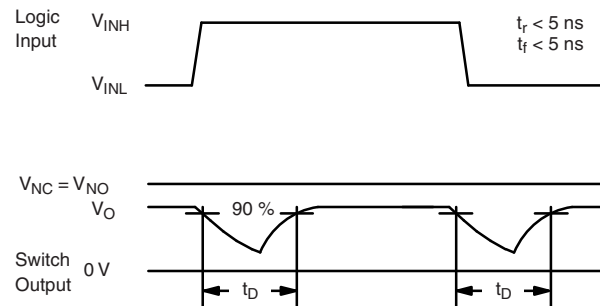
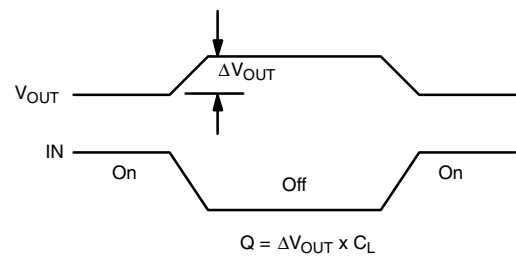
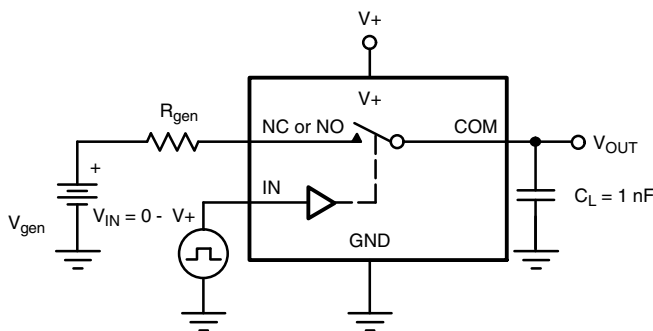
Switching Threshold vs. Supply Voltage

TEST CIRCUITS

 C_L (includes fixture and stray capacitance)

$$V_{OUT} = V_{COM} \left(\frac{R_L}{R_L + R_{ON}} \right)$$



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

Figure 1. Switching Time

 C_L (includes fixture and stray capacitance)

Figure 2. Break-Before-Make Interval


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

Figure 3. Charge Injection

TEST CIRCUITS

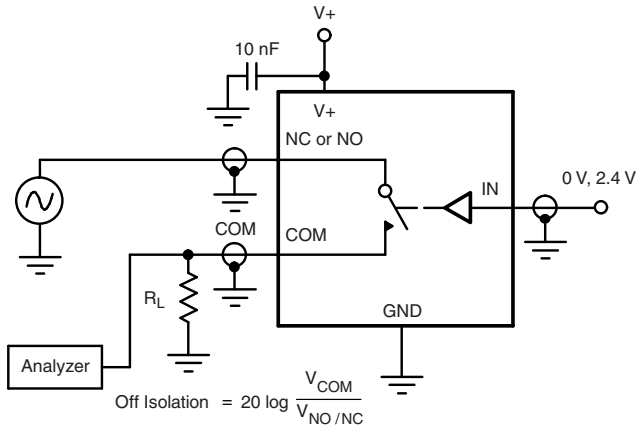


Figure 4. Off-Isolation

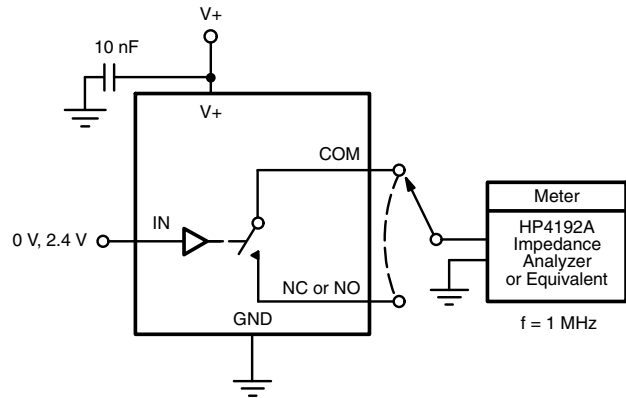
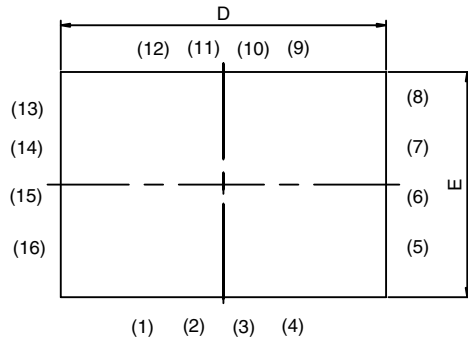


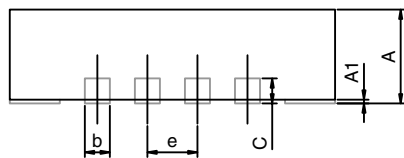
Figure 5. Channel Off/On Capacitance

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MINI QFN-16L



BACK SIDE VIEW



DIM	MILLIMETERS			INCHES		
	MIN.	NAM	MAX.	MIN.	NAM	MAX.
A	0.70	0.75	0.80	0.0275	0.0295	0.0315
A1	0	-	0.05	0	-	0.002
b	0.15	0.20	0.25	0.0059	0.0078	0.0098
C	0.15	0.20	0.25	0.0059	0.0078	0.0098
D	2.60 BSC			0.1023 BSC		
E	1.80 BSC			0.0708 BSC		
e	0.40 BSC			0.0157 BSC		
L	0.35	0.40	0.45	0.0137	0.0157	0.0177
L1	0.45	0.50	0.55	0.0177	0.0196	0.0216

ECN T-06380-Rev. A, 14-Aug-06
DWG: 5954

RECOMMENDED MINIMUM PADS FOR MINI QFN 16L



Mounting Footprint
Dimensions in mm (inch)



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