High Speed, Low Voltage, 3 Ω, Quad SPDT CMOS Analog Switch

DESCRIPTION

The DG2706 is a high speed, low voltage, low On-resistance, quad SPDT (single pole double throw) analog switch. It operates from a 1.65 V to 4.3 V single power supply and achieves 3 Ω switch On-resistance. When turned on, each switch conducts equally in both directions. Its switch on resistance flatness is 0.6 Ω and channel to channel matching is of 0.3 Ω when powered with single 3.15 V supply. All channels guaranteed break before make switching.

Control logic input has 0.5 V to 1.65 V logic threshold. It features a 190 MHz - 3 dB bandwidth, - 90 dB crosstalk and - 70 dB off-isolation at 1 MHz.

The DG2706 is an ideal fit for low voltage battery powered devices switching audio, video, multi-media data streams, and control signals between different functional circuits or ports.

The DG2707 comes in a small miniQFN-16 lead package (1.8 mm x 2.6 mm x 0.75 mm). As a committed partner to community and the environment, Vishay Siliconix manufactures this product with the lead(Pb)-free device terminations and is 100 % RoHS compliant.

FEATURES

- Operation voltage range: 1.65 V to 4.3 V
- Guaranteed On-resistance: 3.0 Ω at 3.15 V
- Low voltage logic threshold
- Low crosstalk: - 70 dB
- High off-isolation: - 90 dB
- Ultra small package: miniQFN16 of 1.8 mm x 2.6 mm

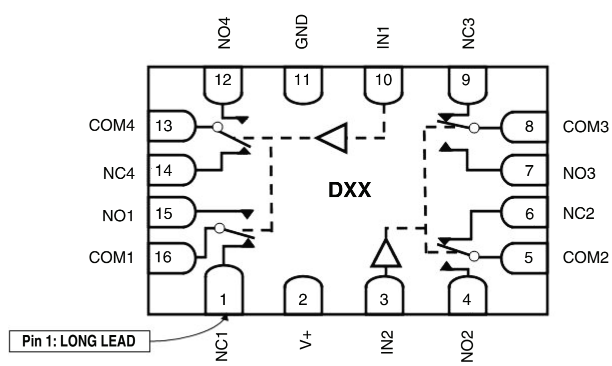
Pb-free
RoHS
COMPLIANT

APPLICATIONS

- Dual SIM card switch
- A/V and analog signal routing
- Battery operated devices
- Data acquisition systems
- Communications systems
- Medical and ATE equipments

FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION

miniQFN-16L



Top View

Device Marking: DXX
Traceability Code:
D is DG2706DN
XX = Date/Lot

ORDERING INFORMATION		
Temp Range	**Package**	**Part Number**
- 40 °C to 85 °C	miniQFN-16	DG2706DN-T1-E4

TRUTH TABLE DG2706 QUAD SPDT, miniQFN-16L

Select Input		On Switches	
IN1 (Pin 10)	**IN2 (Pin 3)**	**Description (Pin)**	**Common (Pin)**
0	X	NC1 (Pin 1)	COM1 (Pin 16)
1	X	NO1 (Pin 15)	
0	X	NC4 (Pin 14)	COM4 (Pin 13)
1	X	NO4 (Pin 12)	
X	0	NC2 (Pin 6)	COM2 (Pin 5)
	1	NO2 (Pin 4)	
X	0	NC3 (Pin 9)	COM3 (Pin 3)
	1	NO3 (Pin 7)	

ABSOLUTE MAXIMUM RATINGS T_A = 25 °C, unless otherwise noted

Parameter		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)		± 250	
Peak Current (Pulsed at 1 ms, 10 % Duty Cycle)		± 500	
Storage Temperature (D Suffix)		- 65 to 150	°C
Thermal Resistance (Package)[b]	miniQFN-16	152	°C/W
Power Dissipation (Package)[b]	miniQFN-16[c, d]	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.

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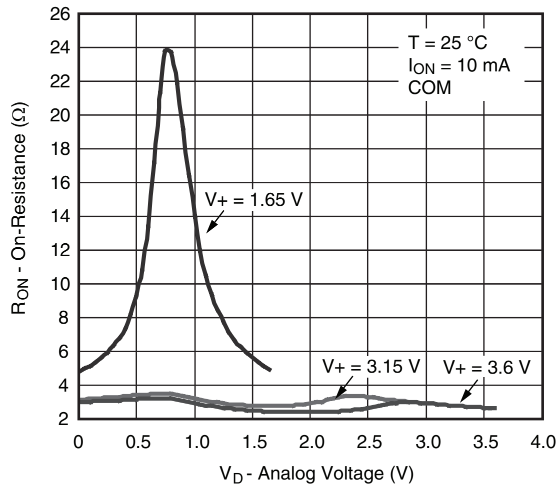
SPECIFICATIONS V+ = 3.15 V

Parameter	Symbol	Test Conditions Otherwise Unless Specified	Temp.[b]	Limits - 40 °C to 85 °C Min.[d]	Typ.[c]	Max.[d]	Unit
Analog Switch							
Analog Signal Range[e]	V_{ANALOG}	$R_{DS(on)}$	Full	0		V+	V
On-Resistance	$R_{DS(on)}$	V+ = 3.15 V, $I_{NO/NC}$ = 10 mA, V_{COM} = 1.0 V	Room		3	5.5	Ω
			Full			6	
R_{ON} Match	$\Delta R_{(ON)}$	V+ = 3.15 V, $I_{NO/NC}$ = 10 mA, V_{COM} = 1.0 V	Room		0.3		
R_{ON} Resistance Flatness	R_{ON} Flatness	V+ = 3.15 V, $I_{NO/NC}$ = 10 mA, V_{COM} = 0 V, 1 V	Room		0.6		
Channel Off Leakage Current	$I_{NO/NC(off)}$	V+ = 3.6 V, $V_{NO/NC}$ = 0.5 V/3 V, V_{COM} = 3 V/0.5 V	Room	- 5		5	nA
			Full	- 10		10	
	$I_{COM(off)}$		Room	- 5		5	
			Full	- 10		10	
Channel-On Leakage Current	$I_{COM(on)}$	V+ = 3.6 V, $V_{NO/NC}$, V_{COM} = 3 V/0.5 V	Room	- 10		10	
			Full	- 20		20	
Digital Control							
Input High Voltage	V_{INH}		Full	1.65			V
Input Low Voltage	V_{INL}		Full			0.4	
Input Current	I_{INL} or I_{INH}	V_{IN} = 0 or V+	Full	- 1		1	µA
Dynamic Characteristics							
Break-Before-Make Time	t_{BBM}	V_{NO}, V_{NC} = 1.5 V, R_L = 50 Ω, C_L = 35 pF	Room		1		ns
			Full	5			
Enable Turn-On Time	$t_{ON(EN)}$		Room		20	45	
			Full			55	
Enable Turn-Off Time	$t_{OFF(EN)}$		Room		15	35	
			Full			45	
Charge Injection[d]	Q_{INJ}	C_L = 1 nF, R_{GEN} = 0 Ω, $V_{NC/NO}$ = 2 V	Room		3		pC
Off-Isolation[d]	OIRR	V+ = 3.15 V, f = 1 MHz, R_L = 50 Ω, C_L = 5 pF	Room		- 70		dB
Crosstalk[d, f]	X_{TALK}		Room		- 90		
Bandwidth[d]	BW	V+ = 3.15 V, R_L = 50 Ω, C_L = 5 pF, - 3 dB	Room		190		MHz
Total Harmonic Distortion[d]	THD	V+ = 3.15 V, R_{LOAD} = 600 Ω	Room		0.02		%
N_O, N_C Off Capacitance[d]	$CS_{NC(off)}$	V+ = 3.15 V, f = 1 MHz	Room		16		pF
	$CS_{NO(on)}$				15		
Channel-On Capacitance[d]	$C_{COM(on)}$				31		
Power Supply							
Power Supply Range	V+			1.65		4.3	V
Power Supply Current	I+	V_{IN} = 0 or V+	Full			1	µA

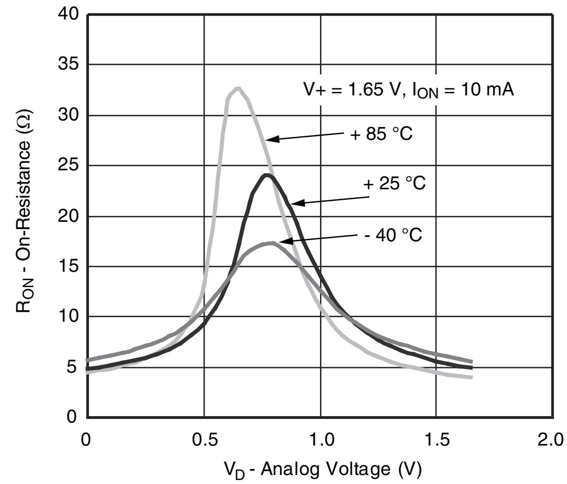
Notes:
a. Room = 25 °C, Full = as determined by the operating suffix.
b. The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.
c. Typical values are for design aid only, not guaranteed nor subject to production testing.
d. Guarantee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

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.

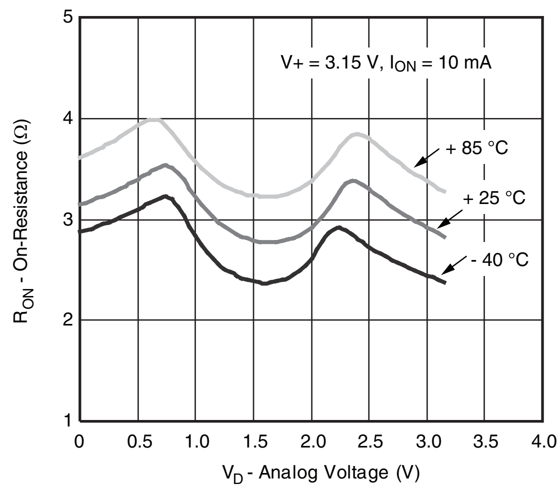
TYPICAL CHARACTERISTICS T_A = 25 °C, unless otherwise noted



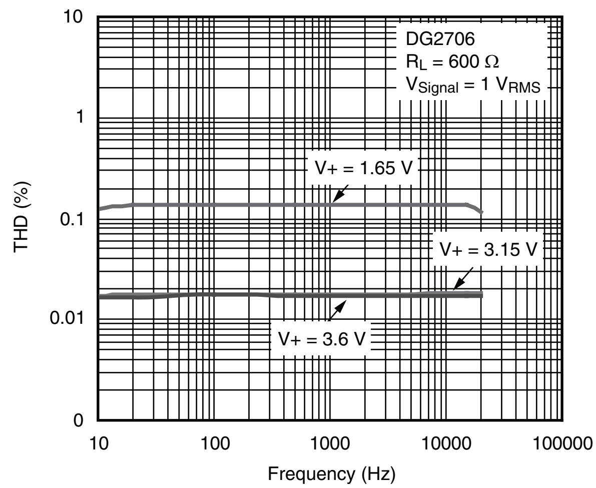
R_{ON} vs. V_D and Single Supply Voltage



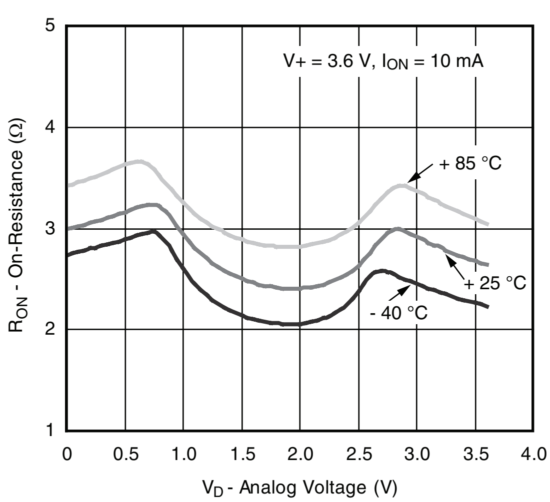
R_{ON} vs. Analog Voltage and Temperature



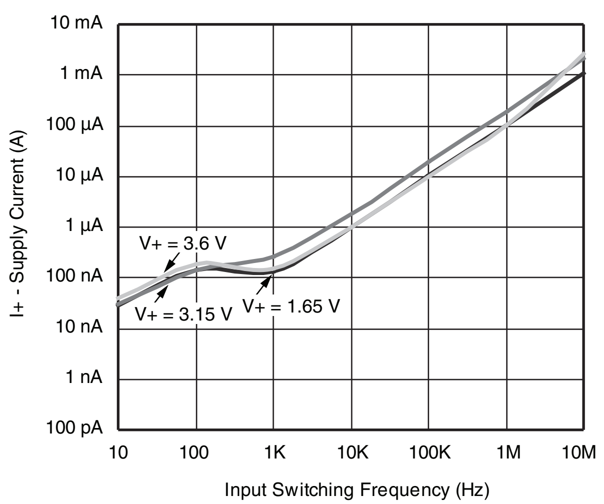
R_{ON} vs. Analog Voltage and Temperature



Switching Threshold vs. Supply Voltage

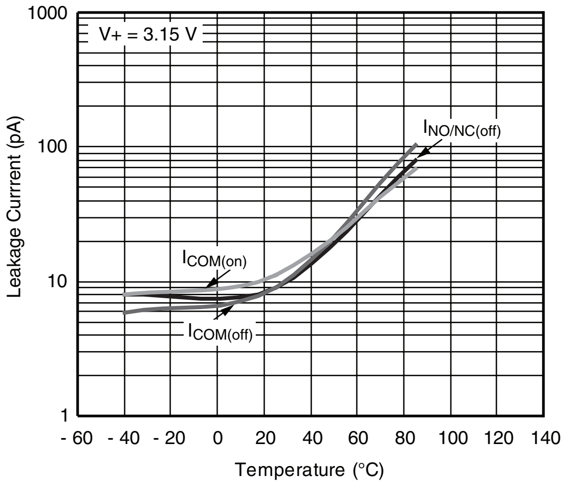


R_{ON} vs. Analog Voltage and Temperature

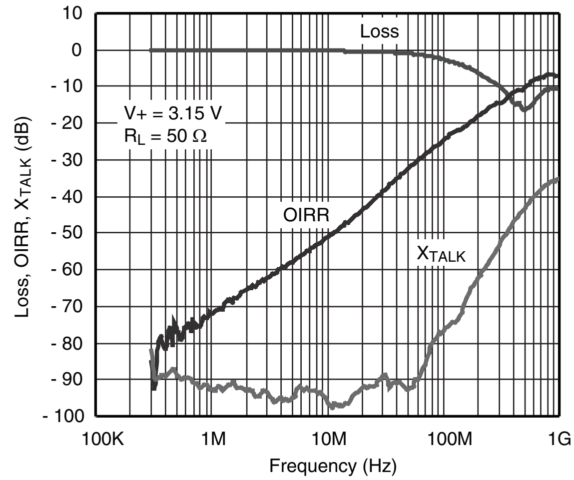


Supply Current vs. Input Switching Frequency

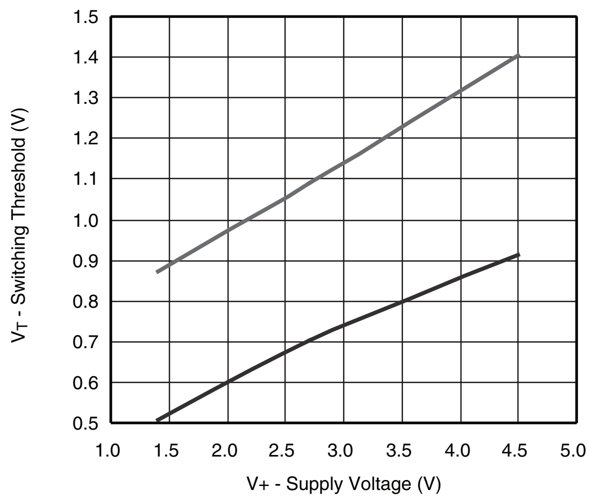
TYPICAL CHARACTERISTICS T_A = 25 °C, unless otherwise noted



Leakage Current vs. Temperature

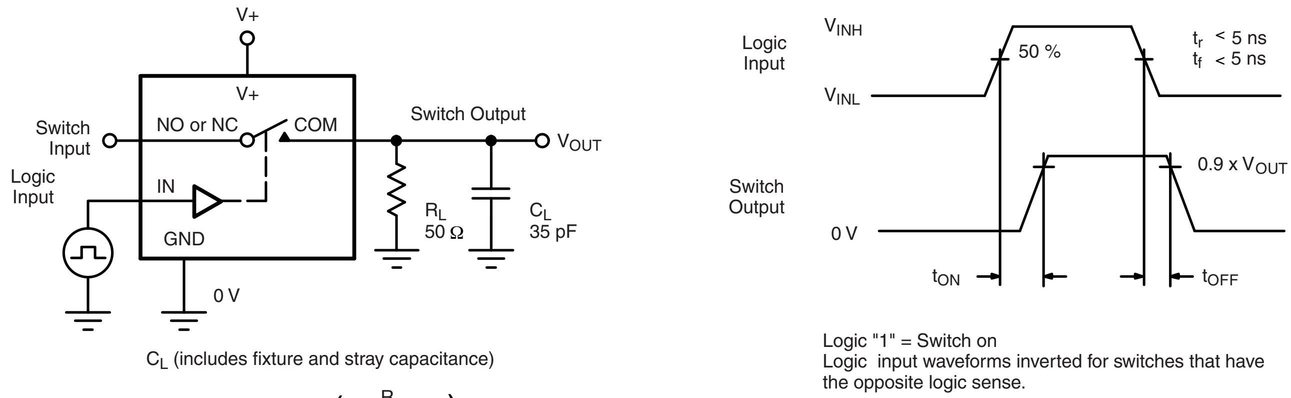


Insertion Loss, Off-Isolation Crosstalk vs. Frequency



Switching Threshold vs. Supply Voltage

TEST CIRCUITS



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

Figure 1. Switching Time

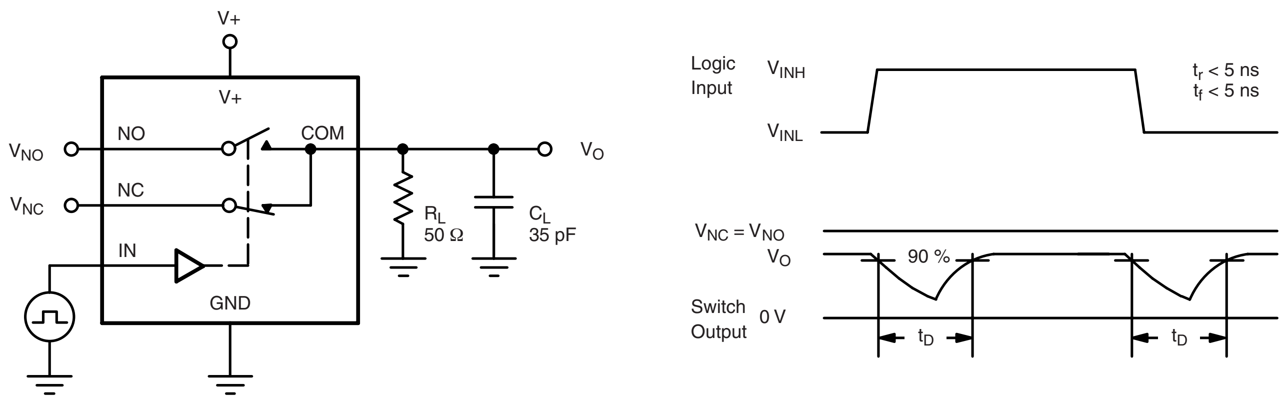


Figure 2. Break-Before-Make Interval

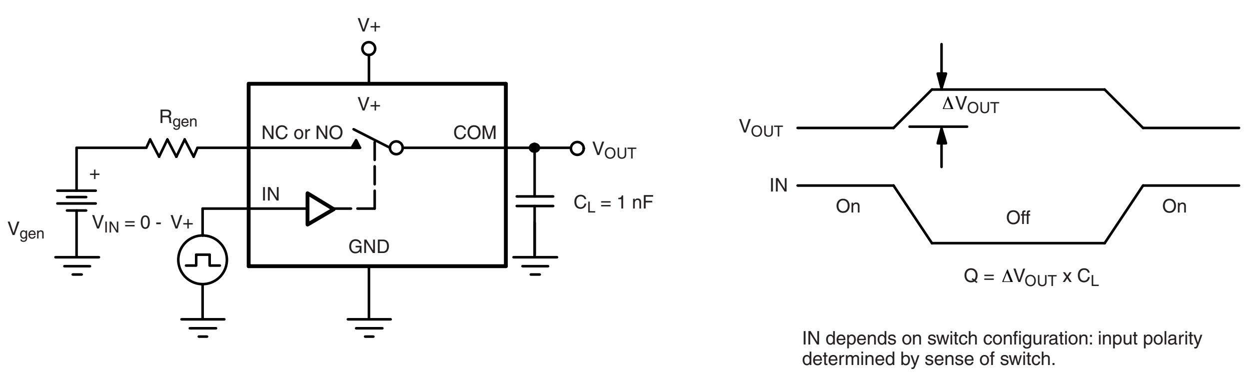


Figure 3. Charge Injection

TEST CIRCUITS

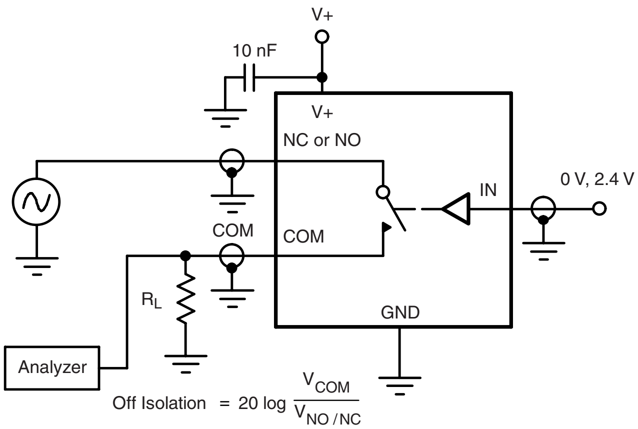


Figure 4. Off-Isolation

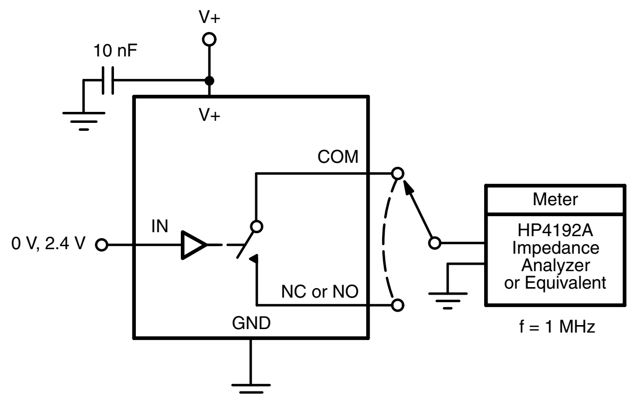


Figure 5. Channel Off/On Capacitance

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