## Low-Voltage, Low R ${ }_{\text {ON }}$ Quad SPST Analog Switch

## DESCRIPTION

The DG2041/2042/2043 are quad single-pole/single-throw monolithic CMOS analog switch designed for high performance switching of analog signals. Combining low power, fast switching, low on-resistance $\left(\mathrm{R}_{\mathrm{DS}(o n)}\right): 1 \Omega$ at 2.7 V ) and small physical size, the DG2041/2042/2043 are ideal for portable and battery powered applications requiring high performance and efficient use of board space.
The DG2041/2042/2043 are built on Vishay Siliconix's new high density low voltage process. An epitaxial layer prevents latchup.
Each switch conducts equally well in both directions when on, and blocks up to the power supply level when off.

## FEATURES

- Low Voltage Operation (1.8 V to 5.5 V )
- Low On-Resistance - R $\mathrm{RS}_{\text {(on) }}: 1 \Omega$
- Fast Switching - $14 \mathrm{~ns} \mathrm{t}_{\mathrm{ON}}$
- Low Charge Injection - $Q_{I N J}: 1 \mathrm{pC}$
- Low Power Consumption
- TTL/CMOS Compatible
- TSSOP-16 and QFN-16 Packages
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912


## BENEFITS

- Reduced Power Consumption
- Simple Logic Interface
- High Accuracy
- Reduce Board Space


## APPLICATIONS

- Cellular Phones
- Communication Systems
- Portable Test Equipment
- Battery Operated Systems
- Sample and Hold Circuits

FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION - DG2041


## TRUTH TABLE - DG2041

| Logic | Switch |
| :---: | :---: |
| 0 | On |
| 1 | Off |

Switches Shown for Logic "0" Input

## FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION - DG2042, DG2043



| TRUTH TABLE - DG2042 |  |
| :---: | :---: |
| Logic | Switch |
| 0 | Off |
| 1 | On |

Switches Shown for Logic "0" Input


| TRUTH TABLE - DG2043 |  |  |  | Switches 1, 4 | Switches 2, 3 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Logic | Off | On |  |  |  |
| 0 | On | Off |  |  |  |
| 1 |  |  |  |  |  |

Switches Shown for Logic"0" Input

| ORDERING INFORMATION |  |  |
| :---: | :---: | :---: |
| Temp Range | Package | Part Number |
| $-40^{\circ} \mathrm{C}$ to $85^{\circ} \mathrm{C}$ | TSSOP-16 | DG2041DQ-T1 |
|  |  | DG2041DQ-T1-E3 |
|  |  | DG2042DQ-T1 |
|  |  | DG2042DQ-T1-E3 |
|  |  | DG2043DQ-T1 |
|  |  | DG2043DQ-T1-E3 |
|  | QFN-16 (4 mm x 4 mm ) <br> (Variation 1) | DG2041DN-T1-E4 |
|  |  | DG2042DN-T1-E4 |
|  |  | DG2043DN-T1-E4 |


| ABSOLUTE MAXIMUM RATINGS |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Parameter |  | Symbol | Limit | Unit |
| Reference V+ to GND |  |  | -0.3 to +6 | V |
| IN, COM, NC, $\mathrm{NO}^{\text {a }}$ |  |  | -0.3 to (V+ + 0.3) |  |
| Continuous Current (Any terminal) |  |  | $\pm 50$ | mA |
| Peak Current (Pulsed at $1 \mathrm{~ms}, 10 \%$ duty cycle) |  |  | $\pm 200$ |  |
| Storage Temperature (D Suffix) |  |  | - 65 to 150 | ${ }^{\circ} \mathrm{C}$ |
| Power Dissipation (Packages) ${ }^{\text {b }}$ | TSSOP-16 ${ }^{\text {c }}$ |  | 450 | mW |
|  | QFN-16 (4 mm $\times 4 \mathrm{~mm})^{\text {d }}$ |  | 1880 |  |

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 $5.6 \mathrm{~mW} /{ }^{\circ} \mathrm{C}$ above $70^{\circ} \mathrm{C}$
d. Derate $23.5 \mathrm{~mW} /{ }^{\circ} \mathrm{C}$ above $70^{\circ} \mathrm{C}$
e. Manual soldering with soldering 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+ = 2 V ) |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Parameter | Symbol | Test Conditions Otherwise Unless Specified $\mathrm{V}+=2 \mathrm{~V}, \mathrm{~V}_{\mathrm{IN}}=0.4 \mathrm{~V}$ or $1.6 \mathrm{~V}^{\mathrm{e}}$ | Temp. ${ }^{\text {a }}$ | $\begin{gathered} \text { Limits } \\ -40^{\circ} \mathrm{C} \text { to } 85^{\circ} \mathrm{C} \\ \hline \end{gathered}$ |  |  | Unit |
|  |  |  |  | Min. ${ }^{\text {b }}$ | Typ. ${ }^{\text {c }}$ | Max. ${ }^{\text {b }}$ |  |
| Analog Switch |  |  |  |  |  |  |  |
| Analog Signal Range ${ }^{\text {d }}$ | $\mathrm{V}_{\mathrm{NO}}, \mathrm{V}_{\mathrm{NC}}$ $\mathrm{V}_{\text {COM }}$ |  | Full | 0 |  | V+ | V |
| On- Resistance | $\mathrm{R}_{\mathrm{ON}}$ | $\mathrm{V}+=2 \mathrm{~V}, \mathrm{~V}_{\mathrm{COM}}=0.2 \mathrm{~V} / 1.2 \mathrm{~V}, \mathrm{I}_{\mathrm{NO}}, \mathrm{I}_{\mathrm{NC}}=10 \mathrm{~mA}$ | Room Full |  | 3 | $\begin{aligned} & 6.3 \\ & 6.3 \end{aligned}$ | $\Omega$ |
| $\mathrm{R}_{\text {ON }}$ Flatness ${ }^{\text {d }}$ | $\mathrm{R}_{\mathrm{ON}}$ Flatness | $\mathrm{V}+=2 \mathrm{~V}, \mathrm{~V}_{\text {COM }}=0 \mathrm{~V}$ to $\mathrm{V}+\mathrm{I}_{\mathrm{NO}}, \mathrm{I}_{\mathrm{NC}}=10 \mathrm{~mA}$ | Room |  |  | 4.2 |  |
| $\mathrm{R}_{\text {ON }}$ Match Between Channels | $\Delta \mathrm{R}_{\text {ON }}$ |  | Room |  |  | 0.4 |  |
| Switch Off Leakage Current ${ }^{\text {f }}$ | $\mathrm{I}_{\mathrm{NO} \text { (off) }}$ $\mathrm{I}_{\mathrm{NC} \text { (off) }}$ | $\begin{gathered} \mathrm{V}+=2.2 \mathrm{~V} \\ \mathrm{~V}_{\mathrm{NO}}, \mathrm{~V}_{\mathrm{NC}}=0.2 \mathrm{~V} / 2 \mathrm{~V}, \mathrm{~V}_{\mathrm{COM}}=2 \mathrm{~V} / 0.2 \mathrm{~V} \end{gathered}$ | $\begin{aligned} & \text { Room } \\ & \text { Full }^{\text {d }} \end{aligned}$ | $\begin{gathered} \hline-1 \\ -10 \end{gathered}$ |  | $\begin{gathered} 1 \\ 10 \end{gathered}$ | nA |
|  | Ісом(off) |  | $\begin{aligned} & \text { Room } \\ & \text { Full }^{d} \end{aligned}$ | $\begin{gathered} \hline-1 \\ -10 \end{gathered}$ |  | $\begin{gathered} 1 \\ 10 \end{gathered}$ |  |
| Channel-On Leakage Current ${ }^{\text {f }}$ | $\mathrm{I}_{\text {COM(on) }}$ | $\mathrm{V}+=2.2 \mathrm{~V}, \mathrm{~V}_{\mathrm{NO}}, \mathrm{V}_{\mathrm{NC}}=\mathrm{V}_{\mathrm{COM}}=0.2 \mathrm{~V} / 2 \mathrm{~V}$ | $\begin{aligned} & \hline \text { Room } \\ & \text { Full }^{\text {d }} \end{aligned}$ | $\begin{gathered} \hline-1 \\ -10 \end{gathered}$ |  | $\begin{gathered} \hline 1 \\ 10 \end{gathered}$ |  |

## DG2041, DG2042, DG2043

Vishay Siliconix

| SPECIFICATIONS (V+ = 2 V ) |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Parameter | Symbol | Test Conditions Otherwise Unless Specified $\mathrm{V}+=2 \mathrm{~V}, \mathrm{~V}_{\mathrm{IN}}=0.4 \mathrm{~V}$ or $1.6 \mathrm{~V}^{\mathrm{e}}$ | Temp. ${ }^{\text {a }}$ | $\begin{gathered} \text { Limits } \\ -40^{\circ} \mathrm{C} \text { to } 85^{\circ} \mathrm{C} \end{gathered}$ |  |  | Unit |
|  |  |  |  | Min. ${ }^{\text {b }}$ | Typ. ${ }^{\text {c }}$ | Max. ${ }^{\text {b }}$ |  |
| Digital Control |  |  |  |  |  |  |  |
| Input High Voltage | $\mathrm{V}_{\text {INH }}$ |  | Full | 1.6 |  |  | V |
| Input Low Voltage | $\mathrm{V}_{\text {INL }}$ |  | Full |  |  | 0.4 |  |
| Input Capacitance ${ }^{\text {d }}$ | $\mathrm{C}_{\text {in }}$ |  | Full |  | 4 |  | pF |
| Input Current | $\mathrm{I}_{\mathrm{INL}}$ or $\mathrm{I}_{\mathrm{INH}}$ | $\mathrm{V}_{\text {IN }}=0 \mathrm{~V}$ or $\mathrm{V}+$ | Full | -1 |  | 1 | $\mu \mathrm{A}$ |
| Dynamic Characteristics |  |  |  |  |  |  |  |
| Turn-On Time | $\mathrm{t}_{\mathrm{O}}$ | $\mathrm{V}_{\mathrm{NO}} \text { or } \mathrm{V}_{\mathrm{NC}}=1.5 \mathrm{~V}, \mathrm{R}_{\mathrm{L}}=300 \Omega, \mathrm{C}_{\mathrm{L}}=35 \mathrm{pF}$ <br> fig. 1 and 2 | $\begin{aligned} & \text { Room } \\ & \text { Full } \end{aligned}$ |  | 30 | $\begin{aligned} & 81 \\ & 82 \end{aligned}$ | ns |
| Turn-Off Time | $\mathrm{t}_{\text {OFF }}$ |  | $\begin{aligned} & \hline \text { Room } \\ & \text { Full }^{d} \end{aligned}$ |  | 22 | $\begin{aligned} & 41 \\ & 42 \end{aligned}$ |  |
| Break-Before-Make Time Delay | $t_{\text {D }}$ | $\begin{gathered} \mathrm{V}_{\mathrm{NO}} \text { or } \mathrm{V}_{\mathrm{NC}}=1.5 \mathrm{~V}, \mathrm{R}_{\mathrm{L}}=300 \Omega, \mathrm{C}_{\mathrm{L}}=35 \mathrm{pF} \\ \\ \text { (DG2043 Only) } \end{gathered}$ | Room | 5 |  |  |  |
| Charge Injection ${ }^{\text {d }}$ | $\mathrm{Q}_{\text {INJ }}$ | $\mathrm{C}_{\mathrm{L}}=1 \mathrm{nF}, \mathrm{V}_{\mathrm{GEN}}=0 \mathrm{~V}, \mathrm{R}_{\mathrm{GEN}}=0 \Omega$, fig. 2 | Room |  | 1 |  | pC |
| Off-Isolation ${ }^{\text {d }}$ | OIRR | $\mathrm{R}_{\mathrm{L}}=50 \Omega, \mathrm{C}_{\mathrm{L}}=5 \mathrm{pF}, \mathrm{f}=1 \mathrm{MHz}$ | Room |  | -63 |  | dB |
| Crosstalk ${ }^{\text {d }}$ | $\mathrm{X}_{\text {TALK }}$ |  | Room |  | -95 |  |  |
| NO, NC Off Capacitance ${ }^{\text {d }}$ | $\mathrm{C}_{\mathrm{NO} \text { (off) }}$ $\mathrm{C}_{\mathrm{NC} \text { (off) }}$ | $\mathrm{V}_{\mathrm{IN}}=0 \mathrm{~V}$ or $\mathrm{V}+\mathrm{f}=1 \mathrm{MHz}$ | Room |  | 24 |  | pF |
| Channel-On Capacitance ${ }^{\text {d }}$ | $\mathrm{C}_{\mathrm{ON}}$ |  | Room |  | 48 |  |  |
| Power Supply |  |  |  |  |  |  |  |
| Power Supply Current ${ }^{\text {d }}$ | I+ | $\mathrm{V}_{\text {IN }}=0 \mathrm{~V}$ or $\mathrm{V}+$ |  |  | 0.001 | 1 | $\mu \mathrm{A}$ |


| SPECIFICATIONS (V+ = 3 V ) |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Parameter | Symbol | Test Conditions Otherwise Unless Specified$\mathrm{V}+=3 \mathrm{~V}, \pm 10 \%, \mathrm{~V}_{\mathrm{IN}}=0.4 \mathrm{~V} \text { or } 2 \mathrm{~V}^{\mathrm{e}}$ | Temp. ${ }^{\text {a }}$ | $\begin{gathered} \text { Limits } \\ -40 \text { to } 85^{\circ} \mathrm{C} \end{gathered}$ |  |  | Unit |
|  |  |  |  | Min. ${ }^{\text {b }}$ | Typ. ${ }^{\text {c }}$ | Max. ${ }^{\text {b }}$ |  |
| Analog Switch |  |  |  |  |  |  |  |
| Analog Signal Range ${ }^{\text {d }}$ | $\begin{gathered} \mathrm{V}_{\mathrm{NO}}, \mathrm{~V}_{\mathrm{NC}} \\ \mathrm{~V}_{\mathrm{COM}} \end{gathered}$ |  | Full | 0 |  | V+ | V |
| On-Resistance | $\mathrm{R}_{\mathrm{ON}}$ | $\begin{gathered} \mathrm{V}+=2.7 \mathrm{~V}, \mathrm{~V}_{\mathrm{COM}}=0.7 \mathrm{~V} / 1.5 \mathrm{~V}, \mathrm{I}_{\mathrm{NO}}, \\ \mathrm{I}_{\mathrm{NC}}=10 \mathrm{~mA} \end{gathered}$ | Room Full |  | 1.6 | $\begin{aligned} & 2.1 \\ & 2.2 \end{aligned}$ | $\Omega$ |
| $\mathrm{R}_{\text {ON }}$ Flatness ${ }^{\text {d }}$ | $\mathrm{R}_{\mathrm{ON}}$ Flatness | $\mathrm{V}+=2.7 \mathrm{~V}, \mathrm{~V}_{\mathrm{COM}}=0 \mathrm{~V}$ to $\mathrm{V}_{+}, \mathrm{I}_{\mathrm{NO}}, \mathrm{I}_{\mathrm{NC}}=10 \mathrm{~mA}$ | Room |  |  | 0.7 |  |
| $\mathrm{R}_{\text {ON }}$ Match Between Channels | $\Delta \mathrm{R}_{\text {ON }}$ |  | Room |  |  | 0.3 |  |
| Switch Off Leakage Current ${ }^{\dagger}$ | $\mathrm{I}_{\mathrm{NO} \text { (off) }}$ <br> $I_{\mathrm{NC} \text { (off) }}$ | $\begin{gathered} \mathrm{V}+=3.3 \mathrm{~V} \\ \mathrm{~V}_{\mathrm{NO}}, \mathrm{~V}_{\mathrm{NC}}=0.3 \mathrm{~V} / 3 \mathrm{~V}, \mathrm{~V}_{\mathrm{COM}}=3 \mathrm{~V} / 0.3 \mathrm{~V} \end{gathered}$ | Room Full | $\begin{gathered} -1 \\ -10 \end{gathered}$ |  | $\begin{gathered} 1 \\ 10 \end{gathered}$ | nA |
|  | ICOM(off) |  | Room Full | $\begin{gathered} \hline-1 \\ -10 \end{gathered}$ |  | $\begin{gathered} \hline 1 \\ 10 \end{gathered}$ |  |
| Channel-On Leakage Current ${ }^{\dagger}$ | ICOM(on) | $\mathrm{V}+=3.3 \mathrm{~V}, \mathrm{~V}_{\mathrm{NO}}, \mathrm{V}_{\mathrm{NC}}=\mathrm{V}_{\mathrm{COM}}=0.3 \mathrm{~V} / 3 \mathrm{~V}$ | Room Full | $\begin{gathered} \hline-1 \\ -10 \end{gathered}$ |  | $\begin{gathered} \hline 1 \\ 10 \end{gathered}$ |  |
| Digital Control |  |  |  |  |  |  |  |
| Input High Voltage ${ }^{\text {d }}$ | $\mathrm{V}_{\text {INH }}$ |  | Full | 1.6 |  |  | V |
| Input Low Voltage | $\mathrm{V}_{\text {INL }}$ |  | Full |  |  | 0.4 |  |
| Input Capacitance ${ }^{\text {d }}$ | $\mathrm{C}_{\text {in }}$ |  | Full |  | 4 |  | pF |
| Input Current | $\mathrm{l}_{\text {INL }}$ or $\mathrm{I}_{\text {INH }}$ | $\mathrm{V}_{\text {IN }}=0 \mathrm{~V}$ or $\mathrm{V}+$ | Full | -1 |  | 1 | $\mu \mathrm{A}$ |


| SPECIFICATIONS (V+ = 3 V) |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Parameter | Symbol | Test Conditions Otherwise Unless Specified$\mathrm{V}+=3 \mathrm{~V}, \pm 10 \%, \mathrm{~V}_{\mathrm{IN}}=0.4 \mathrm{~V} \text { or } 2 \mathrm{~V}^{\mathrm{e}}$ | Temp. ${ }^{\text {a }}$ | $\begin{gathered} \text { Limits } \\ -40^{\circ} \mathrm{C} \text { to } 85^{\circ} \mathrm{C} \end{gathered}$ |  |  | Unit |
|  |  |  |  | Min. ${ }^{\text {b }}$ | Typ. ${ }^{\text {c }}$ | Max. ${ }^{\text {b }}$ |  |
| Dynamic Characteristics |  |  |  |  |  |  |  |
| Turn-On Time ${ }^{\text {d }}$ | $\mathrm{t}_{\mathrm{ON}}$ | $\mathrm{V}_{\mathrm{NO}} \text { or } \mathrm{V}_{\mathrm{NC}}=2 \mathrm{~V}, \mathrm{R}_{\mathrm{L}}=300 \Omega, \mathrm{C}_{\mathrm{L}}=35 \mathrm{pF}$ <br> fig. 1 and 2 | Room Full |  | 19 | $\begin{aligned} & 51 \\ & 52 \\ & \hline \end{aligned}$ | ns |
| Turn-Off Time ${ }^{\text {d }}$ | $t_{\text {OFF }}$ |  | Room Full |  | 17 | $\begin{aligned} & 36 \\ & 37 \end{aligned}$ |  |
| Break-Before-Make Time Delay | $t_{D}$ | $\begin{gathered} \mathrm{V}_{\mathrm{NO}} \text { or } \mathrm{V}_{\mathrm{NC}}=2 \mathrm{~V}, \mathrm{R}_{\mathrm{L}}=300 \Omega, \mathrm{C}_{\mathrm{L}}=35 \mathrm{pF} \\ \text { (DG2043 Only) } \end{gathered}$ | Room | 2 |  |  |  |
| Charge Injection ${ }^{\text {d }}$ | $\mathrm{Q}_{\text {INJ }}$ | $\mathrm{C}_{\mathrm{L}}=1 \mathrm{nF}, \mathrm{V}_{\mathrm{GEN}}=0 \mathrm{~V}, \mathrm{R}_{\mathrm{GEN}}=0 \Omega$, fig. 2 | Room |  | 3 |  | pC |
| Off-Isolation ${ }^{\text {d }}$ | OIRR | $\mathrm{R}_{\mathrm{L}}=50 \Omega, \mathrm{C}_{\mathrm{L}}=5 \mathrm{pF}, \mathrm{f}=1 \mathrm{MHz}$ | Room |  | -63 |  | dB |
| Crosstalk ${ }^{\text {d }}$ | $\mathrm{X}_{\text {TALK }}$ |  | Room |  | -94 |  |  |
| NO, NC Off Capacitance ${ }^{\text {d }}$ | $\mathrm{C}_{\mathrm{NO} \text { (off) }}$ $\mathrm{C}_{\mathrm{NC} \text { (off) }}$ | $\mathrm{V}_{\text {IN }}=0 \mathrm{~V}$ or $\mathrm{V}+\mathrm{f}=1 \mathrm{MHz}$ | Room |  | 25 |  | pF |
| Channel-On Capacitance ${ }^{\text {d }}$ | $\mathrm{Con}^{\text {O }}$ |  | Room |  | 49 |  |  |
| Power Supply |  |  |  |  |  |  |  |
| Power Supply Current | I+ | $\mathrm{V}_{\text {IN }}=0 \mathrm{~V}$ or $\mathrm{V}+$ |  |  | 0.001 | 1 | $\mu \mathrm{A}$ |


| SPECIFICATIONS (V+ = 5 V) |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Parameter | Symbol | Test Conditions Otherwise Unless Specified $\mathrm{V}+=5 \mathrm{~V}, \pm 10 \%, \mathrm{~V}_{\mathrm{IN}}=0.8 \mathrm{~V}$ or $2.4 \mathrm{~V}^{\mathrm{e}}$ | Temp. ${ }^{\text {a }}$ | $\begin{gathered} \text { Limits } \\ -40^{\circ} \mathrm{C} \text { to } 85^{\circ} \mathrm{C} \end{gathered}$ |  |  | Unit |
|  |  |  |  | Min. ${ }^{\text {b }}$ | Typ. ${ }^{\text {c }}$ | Max. ${ }^{\text {b }}$ |  |
| Analog Switch |  |  |  |  |  |  |  |
| Analog Signal Range ${ }^{\text {d }}$ | $\begin{gathered} \hline \mathrm{V}_{\mathrm{NO}}, \mathrm{~V}_{\mathrm{NC}} \\ \mathrm{~V}_{\mathrm{COM}} \end{gathered}$ |  | Full | 0 |  | V+ | V |
| On-Resistance | $\mathrm{R}_{\mathrm{ON}}$ | $\begin{gathered} \mathrm{V}+=4.5 \mathrm{~V}, \mathrm{~V}_{\mathrm{COM}}=0.7 \mathrm{~V} / 2.5 \mathrm{~V}, \mathrm{I}_{\mathrm{NO}} \\ \mathrm{I}_{\mathrm{NC}}=10 \mathrm{~mA} \end{gathered}$ | Room Full |  | 1 | $\begin{aligned} & 1.5 \\ & 1.6 \end{aligned}$ | $\Omega$ |
| $\mathrm{R}_{\text {ON }}$ Flatness ${ }^{\text {d }}$ | $\begin{gathered} \mathrm{R}_{\mathrm{ON}} \\ \text { Flatness } \end{gathered}$ | $\mathrm{V}+=4.5 \mathrm{~V}, \mathrm{~V}_{\text {COM }}=0 \mathrm{~V}$ to $\mathrm{V}+\mathrm{I}_{\mathrm{NO}}, \mathrm{I}_{\mathrm{NC}}=10 \mathrm{~mA}$ | Room |  |  | 0.7 |  |
| $\mathrm{R}_{\text {ON }}$ Match Between Channels | $\Delta \mathrm{R}_{\mathrm{ON}}$ |  | Room |  |  | 0.3 |  |
| Switch Off Leakage Current | $\mathrm{I}_{\mathrm{NO} \text { (off) }}$ $\mathrm{I}_{\mathrm{NC} \text { (off) }}$ | $\begin{gathered} \mathrm{V}+=5.5 \mathrm{~V} \\ \mathrm{~V}_{\mathrm{NO}}, \mathrm{~V}_{\mathrm{NC}}=1 \mathrm{~V} / 4.5 \mathrm{~V}, \mathrm{~V}_{\mathrm{COM}}=4.5 \mathrm{~V} / 1 \mathrm{~V} \end{gathered}$ | Room Full | $\begin{gathered} -1 \\ -10 \end{gathered}$ |  | 1 10 | nA |
|  | $\mathrm{I}_{\text {COM (off) }}$ |  | $\begin{aligned} & \text { Room } \\ & \text { Full } \end{aligned}$ | $\begin{gathered} -1 \\ -10 \end{gathered}$ |  | $\begin{gathered} 1 \\ 10 \end{gathered}$ |  |
| Channel-On Leakage Current | ${ }^{\text {COM (on) }}$ | $\mathrm{V}+=5.5 \mathrm{~V}, \mathrm{~V}_{\mathrm{NO}}, \mathrm{V}_{\mathrm{NC}}=\mathrm{V}_{\mathrm{COM}}=1 \mathrm{~V} / 4.5 \mathrm{~V}$ | Room Full | $\begin{gathered} -1 \\ -10 \end{gathered}$ |  | $\begin{gathered} 1 \\ 10 \end{gathered}$ |  |
| Digital Control |  |  |  |  |  |  |  |
| Input High Voltage | $\mathrm{V}_{\text {INH }}$ |  | Full | 2.4 |  |  | V |
| Input Low Voltage | $\mathrm{V}_{\text {INL }}$ |  | Full |  |  | 0.8 |  |
| Input Capacitance | $\mathrm{C}_{\text {in }}$ |  | Full |  | 4 |  | pF |
| Input Current | $\mathrm{I}_{\text {INL }}$ or $\mathrm{I}_{\text {INH }}$ | $\mathrm{V}_{\text {IN }}=0 \mathrm{~V}$ or $\mathrm{V}_{+}$ | Full | -1 |  | 1 | $\mu \mathrm{A}$ |


| SPECIFICATIONS (V+ = 5 V) |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Parameter | Symbol | $\begin{gathered} \text { Test Conditions } \\ \text { Otherwise Unless Specified } \\ \mathrm{V}+=5 \mathrm{~V}, \pm 10 \%, \mathrm{~V}_{\text {IN }}=0.8 \mathrm{~V} \text { or } 2.4 \mathrm{~V} \end{gathered}$ | Temp. ${ }^{\text {a }}$ | $\begin{gathered} \text { Limits } \\ -40^{\circ} \mathrm{C} \text { to } 85^{\circ} \mathrm{C} \end{gathered}$ |  |  | Unit |
|  |  |  |  | Min. ${ }^{\text {b }}$ | Typ. ${ }^{\text {c }}$ | Max. ${ }^{\text {b }}$ |  |
| Dynamic Characteristics |  |  |  |  |  |  |  |
| Turn-On Time ${ }^{\text {d }}$ | $\mathrm{t}_{\mathrm{ON}}$ | $\mathrm{V}_{\mathrm{NO}} \text { or } \mathrm{V}_{\mathrm{NC}}=3 \mathrm{~V}, \mathrm{R}_{\mathrm{L}}=300 \Omega, \mathrm{C}_{\mathrm{L}}=35 \mathrm{pF}$ <br> fig. 1 and 2 | Room Full |  | 13 | $\begin{aligned} & 42 \\ & 43 \end{aligned}$ | ns |
| Turn-Off Time ${ }^{\text {d }}$ | $\mathrm{t}_{\text {OFF }}$ |  | Room Full |  | 19 | $\begin{aligned} & 32 \\ & 33 \end{aligned}$ |  |
| Break-Before-Make Time Delay | $t_{\text {D }}$ | $\begin{gathered} \mathrm{V}_{\mathrm{NO}} \text { or } \mathrm{V}_{\mathrm{NC}}=3 \mathrm{~V}, \mathrm{R}_{\mathrm{L}}=300 \Omega, \mathrm{C}_{\mathrm{L}}=35 \mathrm{pF} \\ \text { (DG2043 Only) } \end{gathered}$ | Room | 1 |  |  |  |
| Charge Injection ${ }^{\text {d }}$ | $Q_{\text {INJ }}$ | $\mathrm{C}_{\mathrm{L}}=1 \mathrm{nF}, \mathrm{V}_{\mathrm{GEN}}=0 \mathrm{~V}, \mathrm{R}_{\mathrm{GEN}}=0 \Omega$, fig. 2 | Room |  | 3 |  | pC |
| Off-Isolation ${ }^{\text {d }}$ | OIRR | $\mathrm{R}_{\mathrm{L}}=50 \Omega, \mathrm{C}_{\mathrm{L}}=5 \mathrm{pF}, \mathrm{f}=1 \mathrm{MHz}$ | Room |  | -63 |  | dB |
| Crosstalk ${ }^{\text {d }}$ | $\mathrm{X}_{\text {TALK }}$ |  | Room |  | -93 |  |  |
| Source-Off Capacitance ${ }^{\text {d }}$ | $\mathrm{C}_{\mathrm{NO} \text { (off) }}$ <br> $\mathrm{C}_{\mathrm{NC} \text { (off) }}$ | $\mathrm{V}_{\text {IN }}=0 \mathrm{~V}$ or $\mathrm{V}+\mathrm{f}$, $=1 \mathrm{MHz}$ | Room |  | 26 |  | pF |
| Channel-On Capacitance ${ }^{\text {d }}$ | $\mathrm{C}_{\mathrm{ON}}$ |  | Room |  | 49 |  |  |
| Power Supply |  |  |  |  |  |  |  |
| Power Supply Current | I+ | $\mathrm{V}_{\text {IN }}=0 \mathrm{~V}$ or $\mathrm{V}+$ |  |  | 0.001 | 1 | $\mu \mathrm{A}$ |

Notes:
a. Room $=25^{\circ} \mathrm{C}$, 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, nor subjected to production test.
e. $\mathrm{V}_{\mathrm{IN}}=$ input voltage to perform proper function.
f. Guaranteed by 5 V leakage testing, not production tested.

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 $\left(25^{\circ} \mathrm{C}\right.$ unless noted)

$R_{\text {ON }}$ vs. $\mathrm{V}_{\text {COM }}$ and Supply Voltage


Supply Current vs. Temperature


Leakage Current vs. Temperature

$R_{\text {ON }}$ vs. Analog Voltage and Temperature


Supply Current vs. Input Switching Frequency


Leakage vs. Analog Voltage

TYPICAL CHARACTERISTICS $\left(25^{\circ} \mathrm{C}\right.$ unless noted)


## TEST CIRCUITS




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

Figure 1. Switching Time


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

Figure 2. Charge Injection


Figure 3. Off-Isolation


Figure 4. 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 www.vishay.com/ppg?72091.

## QFN 4x4-16L Case Outline



TIP VIEW


BDTTOM VIEW


SIDE VIEW

| DIM | VARIATION 1 |  |  |  |  |  | VARIATION 2 |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | MILLIMETERS ${ }^{(1)}$ |  |  | INCHES |  |  | MILLIMETERS ${ }^{(1)}$ |  |  | INCHES |  |  |
|  | MIN. | NOM. | MAX. | MIN. | NOM. | MAX. | MIN. | NOM. | MAX. | MIN. | NOM. | MAX. |
| A | 0.75 | 0.85 | 0.95 | 0.029 | 0.033 | 0.037 | 0.75 | 0.85 | 0.95 | 0.029 | 0.033 | 0.037 |
| A1 | 0 | - | 0.05 | 0 | - | 0.002 | 0 | - | 0.05 | 0 | - | 0.002 |
| A3 | 0.20 ref. |  |  | 0.008 ref. |  |  | 0.20 ref. |  |  | 0.008 ref. |  |  |
| b | 0.25 | 0.30 | 0.35 | 0.010 | 0.012 | 0.014 | 0.25 | 0.30 | 0.35 | 0.010 | 0.012 | 0.014 |
| D | 4.00 BSC |  |  | 0.157 BSC |  |  | 4.00 BSC |  |  | 0.157 BSC |  |  |
| D2 | 2.0 | 2.1 | 2.2 | 0.079 | 0.083 | 0.087 | 2.5 | 2.6 | 2.7 | 0.098 | 0.102 | 0.106 |
| e | 0.65 BSC |  |  | $0.026 \text { BSC }$ |  |  | 0.65 BSC |  |  | 0.026 BSC |  |  |
| E | 4.00 BSC |  |  | 0.157 BSC |  |  | 4.00 BSC |  |  | 0.157 BSC |  |  |
| E2 | 2.0 | 2.1 | 2.2 | 0.079 | 0.083 | 0.087 | 2.5 | 2.6 | 2.7 | 0.098 | 0.102 | 0.106 |
| K | 0.20 min . |  |  | 0.008 min . |  |  | 0.20 min . |  |  | 0.008 min . |  |  |
| L | 0.5 | 0.6 | 0.7 | 0.020 | 0.024 | 0.028 | 0.3 | 0.4 | 0.5 | 0.012 | 0.016 | 0.020 |
| $\mathrm{N}^{(3)}$ | 16 |  |  | 16 |  |  | 16 |  |  | 16 |  |  |
| Nd(3) | 4 |  |  | 4 |  |  | 4 |  |  | 4 |  |  |
| $\mathrm{Ne}^{(3)}$ | 4 |  |  | 4 |  |  | 4 |  |  | 4 |  |  |

## Notes

(1) Use millimeters as the primary measurement.
(2) Dimensioning and tolerances conform to ASME Y14.5M. - 1994.
${ }^{(3)} \mathrm{N}$ is the number of terminals. Nd and Ne is the number of terminals in each D and E site respectively.
(4) Dimensions b applies to plated terminal and is measured between 0.15 mm and 0.30 mm from terminal tip.
(5) The pin 1 identifier must be existed on the top surface of the package by using identification mark or other feature of package body.
(6) Package warpage max. 0.05 mm .

```
ECN: S13-0893-Rev. B, 22-Apr-13
DWG: }589
```

TSSOP: 16-LEAD


| Symbols | DIMENSIONS IN MILLIMETERS |  |  |
| :---: | :---: | :---: | :---: |
|  | Min | Nom | Max |
| A | - | 1.10 | 1.20 |
| A1 | 0.05 | 0.10 | 0.15 |
| A2 | - | 1.00 | 1.05 |
| B | 0.22 | 0.28 | 0.38 |
| C | - | 0.127 | - |
| D | 4.90 | 5.00 | 5.10 |
| E | 6.10 | 6.40 | 6.70 |
| E1 | 4.30 | 4.40 | 4.50 |
| e | - | 0.65 | - |
| L | 0.50 | 0.60 | 0.70 |
| L1 | 0.90 | 1.00 | 1.10 |
| y | - | - | 0.10 |
| 11 | $0^{\circ}$ | $3^{\circ}$ | $6^{\circ}$ |
| ECN: S-61920-Rev. D, 23-Oct-06 |  |  |  |
| DWG: 5624 |  |  |  |

www.vishay.com

## RECOMMENDED MINIMUM PAD FOR TSSOP-16



Recommended Minimum Pads
Dimensions in inches (mm)

## Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

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 in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

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

## X-ON Electronics

Largest Supplier of Electrical and Electronic Components
Click to view similar products for Analog Switch ICs category:
Click to view products by Vishay manufacturer:
Other Similar products are found below :
PI5A100QEX DG9233EDY-GE3 NLAS4684FCTCG NLAS5223BLMNR2G NLV74HC4066ADR2G MC74HC4067ADTG NLX2G66DMUTCG NS5A4684SMNTAG 732480R 733995E 425541DB 425528R 099044FB FSA221UMX MAX4888ETI+T NLAS5123MNR2G NLAS7222AMTR2G MAX14807ECB+ MAX4968ECM+ PI5A4157CEX NLV14066BDG LC78615E-01US-H PI5A4599BCEX PI5A3157BZUEX NLAS4717EPFCT1G PI5A3167CCEX MAX4744ELB+T MAX4802ACXZ+ SLAS3158MNR2G PI5A392AQE MAX4744HELB+T PI5A4157ZUEX MC74HC4067ADTR2G PI5A4158ZAEX PI5A3166TAEX MAX4901EBL+T MAX14510EEVB+T PI3A3899ZTEX MAX4996ETG+T MAX4889AETO+T MAX14508EEVB+T MAX4701ETE+T MAX4996LETG+T NLX2G66FCTAG TMUX136RSER HV2605FG-G DG302BDJ-E3 ADG741BKSZ-REEL ADG742BKSZ5-REEL7 PI5A100WE

