

Improved Quad CMOS Analog Switches

DESCRIPTION

The DG201B, DG202B analog switches are highly improved versions of the industry-standard DG201A, DG202. These devices are fabricated in Vishay Siliconix' proprietary silicon gate CMOS process, resulting in lower on-resistance, lower leakage, higher speed, and lower power consumption.

These quad single-pole single-throw switches are designed for a wide variety of applications in telecommunications, instrumentation, process control, computer peripherals, etc. An improved charge injection compensation design minimizes switching transients. The DG201B and DG202B can handle up to ± 22 V input signals, and have an improved continuous current rating of 30 mA. An epitaxial layer prevents latchup.

All devices feature true bi-directional performance in the on condition, and will block signals to the supply voltages in the off condition.

The DG201B is a normally closed switch and the DG202B is a normally open switch. (see Truth Table.)

FEATURES

- ± 22 V supply voltage rating
- TTL and CMOS compatible logic
- Low on-resistance - $R_{DS(on)}$: 45 Ω
- Low leakage - $I_{D(on)}$: 20 pA
- Single supply operation possible
- Extended temperature range
- Fast switching - t_{ON} : 120 ns
- Low glitching - Q: 1 pC
- Compliant to RoHS Directive 2002/95/EC



RoHS*
COMPLIANT

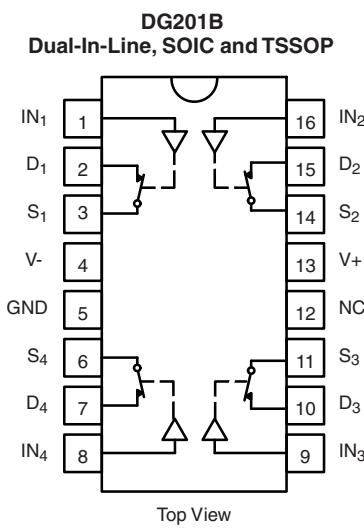
BENEFITS

- Wide analog signal range
- Simple logic interface
- Higher accuracy
- Minimum transients
- Reduced power consumption
- Superior to DG201A, DG202
- Space savings (TSSOP)

APPLICATIONS

- Industrial instrumentation
- Test equipment
- Communications systems
- Disk drives
- Computer peripherals
- Portable instruments
- Sample-and-hold circuits

FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION



TRUTH TABLE

Logic	DG201B	DG202B
0	ON	OFF
1	OFF	ON

Logic "0" ≤ 0.8 V

Logic "1" ≥ 2.4 V

* Pb containing terminations are not RoHS compliant, exemptions may apply

ORDERING INFORMATION

Temp. Range	Package	Part Number
- 55 °C to 125 °C	16-pin CerDIP	DG201BAK
		DG202BAK
	16-pin Plastic DIP	DG201BDJ
		DG201BDJ-E3
	16-pin narrow SOIC	DG202BDJ
		DG202BDJ-E3
		DG201BDY
		DG201BDY-E3
	16-pin TSSOP	DG201BDY-T1
		DG201BDY-T1-E3
		DG202BDY
		DG202BDY-E3
	16-pin TSSOP	DG202BDY-T1
		DG202BDY-T1-E3
	16-pin TSSOP	DG201BDQ
		DG201BDQ-E3
	16-pin TSSOP	DG201BDQ-T1
		DG201BDQ-T1-E3
	16-pin TSSOP	DG202BDQ
		DG202BDQ-E3
	16-pin TSSOP	DG202BDQ-T1
		DG202BDQ-T1-E3

ABSOLUTE MAXIMUM RATINGS

Parameter	Limit	Unit
Voltages Referenced, V+ to V-	44	V
GND	25	
Digital Inputs ^a , V _S , V _D	(V-) - 2 to (V+) + 2 or 30 mA, whichever occurs first	
Current (Any terminal)	30	mA
Peak Current S or D (Pulsed at 1 ms, 10 % duty cycle max.)	100	
Storage Temperature	(AK, DK suffix)	°C
	(DJ, DY, DQ suffix)	
Power Dissipation (Package) ^b	16-pin plastic DIP ^c	mW
	16-pin narrow SOIC and TSSOP ^d	
	16-pin CerDIP ^e	
	LCC-20 ^f	

Notes:

- a. Signals on S_X, D_X, or I_{NX} exceeding V+ or 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 6.5 mW/°C above 75 °C.
- d. Derate 7.6 mW/°C above 75 °C.
- e. Derate 12 mW/°C above 75 °C.
- f. Derate 10 mW/°C above 75 °C.

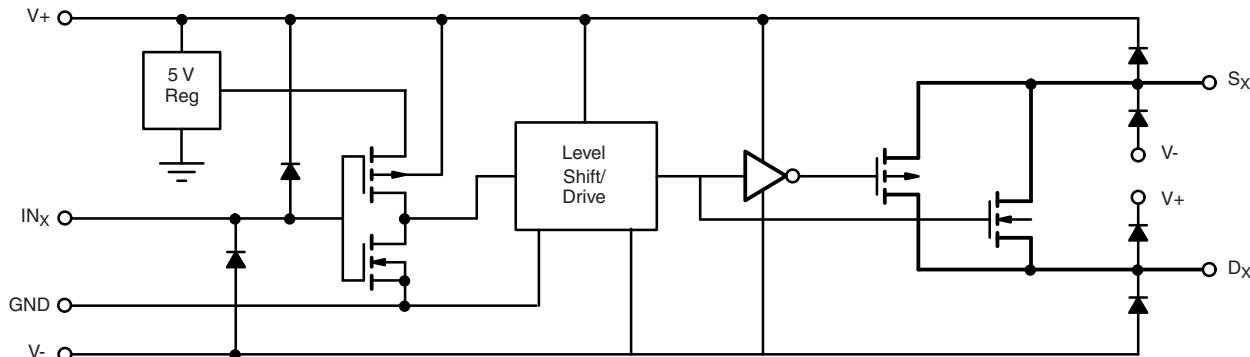
SCHEMATIC DIAGRAM (typical channel)


Figure 1.

SPECIFICATIONS^a								
Parameter	Symbol	Test Conditions Unless Specified $V_+ = 15 \text{ V}$, $V_- = -15 \text{ V}$ $V_{IN} = 2.4 \text{ V}, 0.8 \text{ V}^f$	Temp. ^b	A Suffix -55°C to 125°C		D Suffix -40°C to 85°C		Unit
				Typ. ^c	Min. ^d	Max. ^d	Min. ^d	
Analog Switch								
Analog Signal Range ^e	V_{ANALOG}		Full		-15	15	-15	15
Drain-Source On-Resistance	$R_{DS(on)}$	$V_D = \pm 10 \text{ V}$, $I_S = 1 \text{ mA}$	Room	45		85		Ω
$R_{DS(on)}$ Match	$\Delta R_{DS(on)}$		Room	2		100		
Source Off Leakage Current	$I_{S(off)}$	$V_S = \pm 14 \text{ V}$, $V_D = \pm 14 \text{ V}$	Room Full	± 0.01	-0.5 -20	0.5 20	-0.5 -5	0.5 5
Drain Off Leakage Current	$I_{D(off)}$	$V_D = \pm 14 \text{ V}$, $V_S = \pm 14 \text{ V}$	Room Full	± 0.01	-0.5 -20	0.5 20	-0.5 -5	0.5 5
Drain On Leakage Current	$I_{D(on)}$	$V_S = V_D = \pm 14 \text{ V}$	Room Full	± 0.02	-0.5 -40	0.5 40	-0.5 -10	0.5 10
Digital Control								
Input Voltage High	V_{INH}		Full		2.4		2.4	
Input Voltage Low	V_{INL}		Full			0.8		0.8
Input Current	I_{INH} or I_{INL}	V_{INH} or V_{INL}	Full		-1	1	-1	1
Input Capacitance	C_{IN}		Room	5				pF
Dynamic Characteristics								
Turn-On Time	t_{ON}	$V_S = 2 \text{ V}$ see switching time test circuit	Room Full	120		300		300
Turn-Off Time	t_{OFF}		Room Full	65		200		200
Charge Injection	Q	$C_L = 1000 \text{ pF}$, $V_g = 0 \text{ V}$ $R_g = 0 \Omega$	Room	1				pC
Source-Off Capacitance	$C_{S(off)}$	$V_S = 0 \text{ V}$, $f = 1 \text{ MHz}$	Room	5				pF
Drain-Off Capacitance	$C_{D(off)}$		Room	5				
Channel On Capacitance	$C_{D(on)}$	$V_D = V_S = 0 \text{ V}$, $f = 1 \text{ MHz}$	Room	16				dB
Off Isolation	$OIRR$	$C_L = 15 \text{ pF}$, $R_L = 50 \Omega$ $V_S = 1 \text{ V}_{\text{RMS}}$, $f = 100 \text{ kHz}$	Room	90				
Channel-to-Channel Crosstalk	X_{TALK}		Room	95				
Power Supply								
Positive Supply Current	I_+	$V_{IN} = 0$ or 5 V	Room Full			50 100		50 100
Negative Supply Current	I_-		Room Full		-1 -5		-1 -5	μA
Power Supply Range for Continuous Operation	V_{OP}		Full		± 4.5	± 22	± 4.5	± 22
Document Number: 70037 S11-0800-Rev. J, 25-Apr-11								
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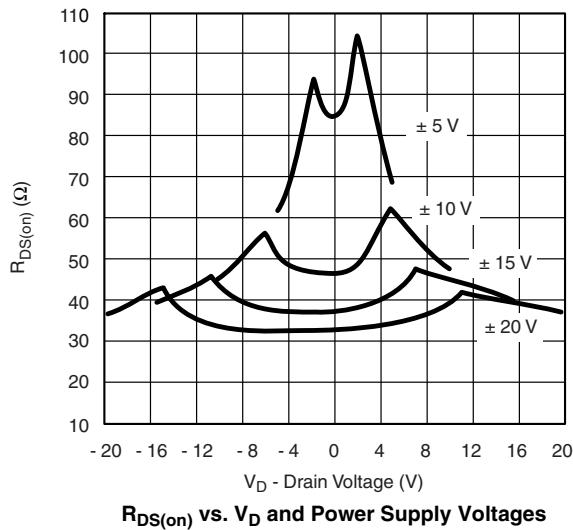
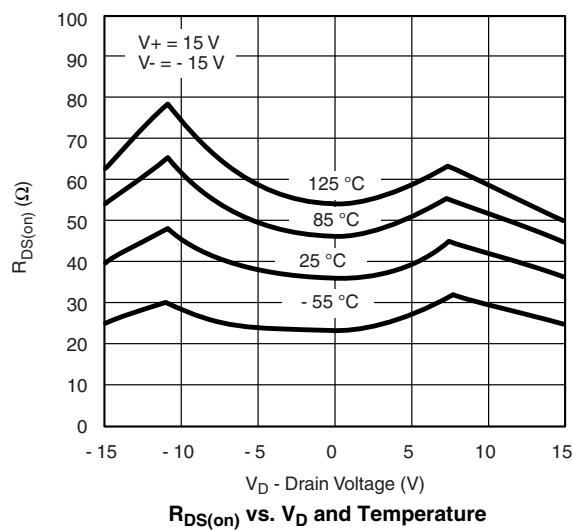
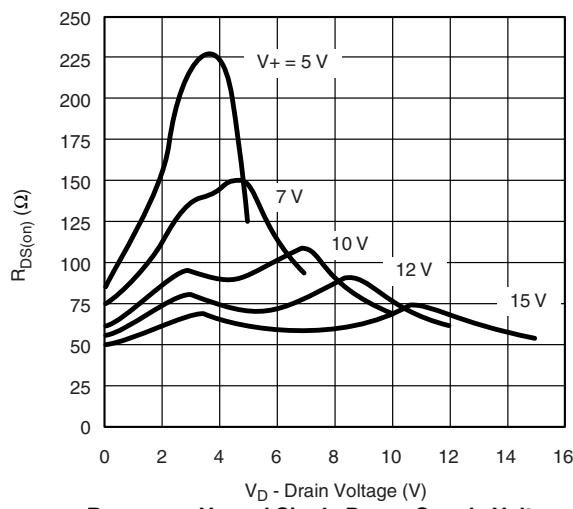
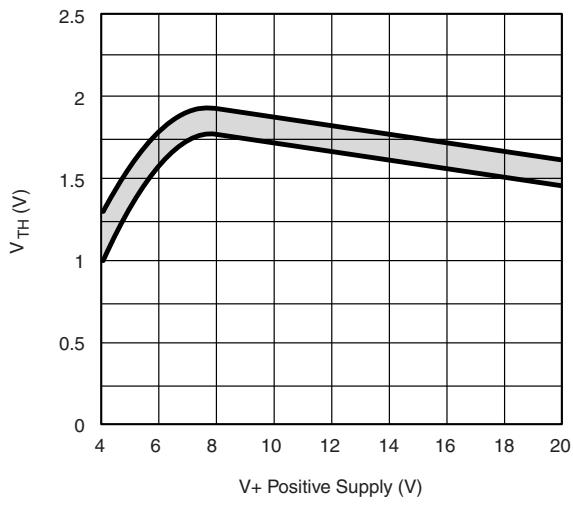
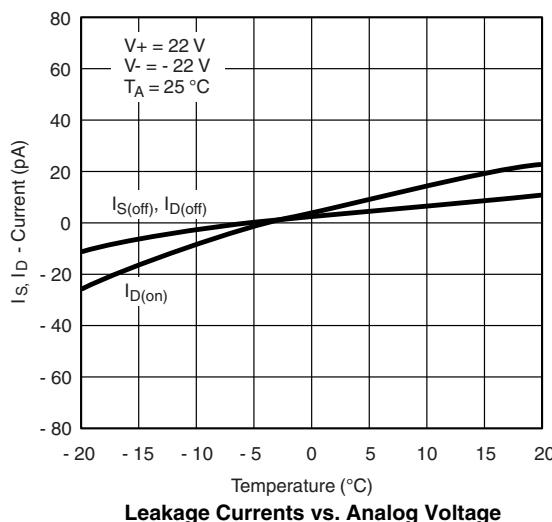
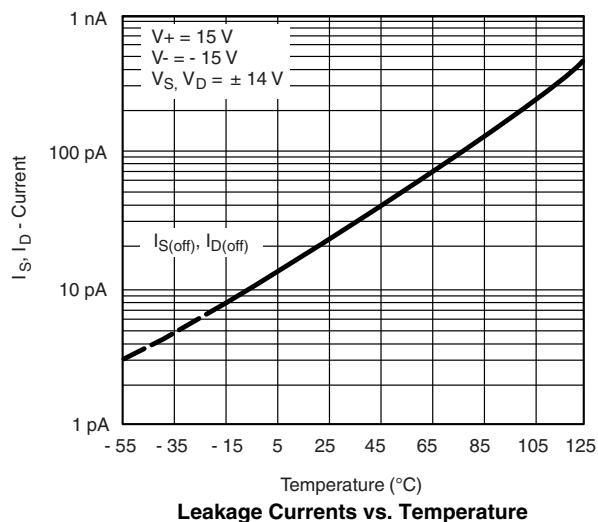
SPECIFICATIONS (for Single Supply)^a

Parameter	Symbol	Test Conditions Unless Specified $V_+ = 12 \text{ V}$, $V_- = 0 \text{ V}$ $V_{IN} = 2.4 \text{ V}, 0.8 \text{ V}^f$	Temp. ^b	Typ. ^c	A Suffix - 55 °C to 125 °C		D Suffix - 40 °C to 85 °C		Unit
					Min. ^d	Max. ^d	Min. ^d	Max. ^d	
Analog Switch									
Analog Signal Range ^e	V_{ANALOG}		Full		0	12	0	12	V
Drain-Source On-Resistance	$R_{DS(on)}$	$V_D = 3 \text{ V}, 8 \text{ V}$, $I_S = 1 \text{ mA}$	Room Full	90		160 200		160 200	Ω
Dynamic Characteristics									
Turn-On Time	t_{ON}	$V_S = 8 \text{ V}$ see switching time test circuit	Room	120		300		300	ns
Turn-Off Time	t_{OFF}		Room	60		200		200	
Charge Injection	Q	$C_L = 1 \text{ nF}$, $V_{gen} = 6 \text{ V}$ $R_{gen} = 0 \Omega$	Room	4					pC
Power Supply									
Positive Supply Current	I_+	$V_{IN} = 0 \text{ or } 5 \text{ V}$	Room Full			50 100		50 100	μA
Negative Supply Current	I_-		Room Full		- 1 - 5		- 1 - 5		
Power Supply Range for Continuous Operation	V_{OP}		Full		+ 4.5	+ 25	+ 4.5	+ 25	V

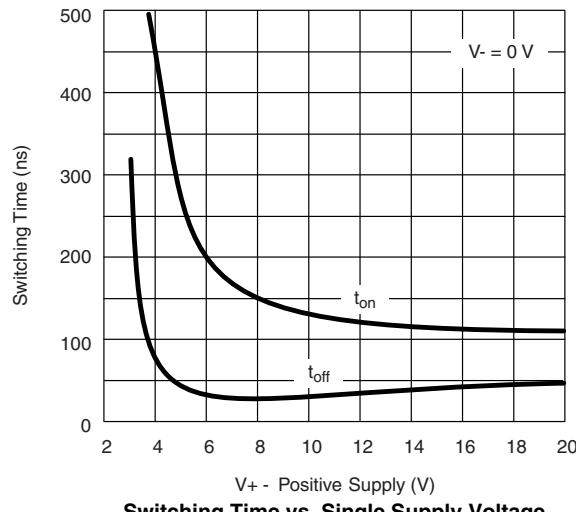
Notes:

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

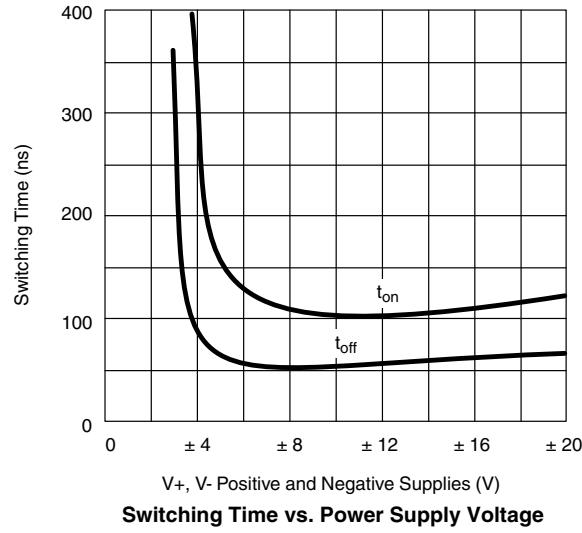
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

R_{DS(on)} vs. V_D and Power Supply Voltages

R_{DS(on)} vs. V_D and Temperature

R_{DS(on)} vs. V_D and Single Power Supply Voltages

Input Switching Threshold vs. Supply Voltage

Leakage Currents vs. Analog Voltage

Leakage Currents vs. Temperature

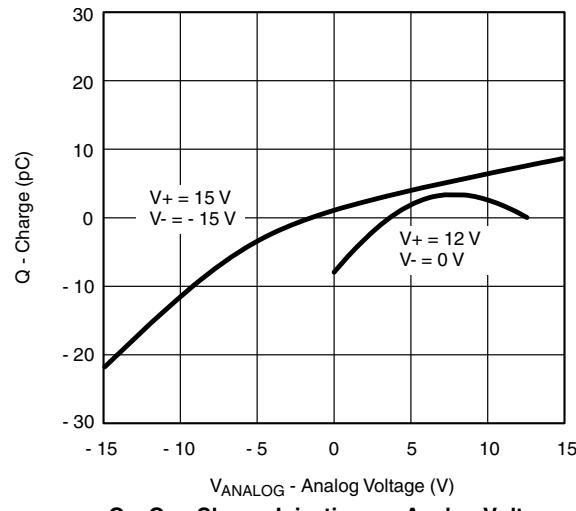
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



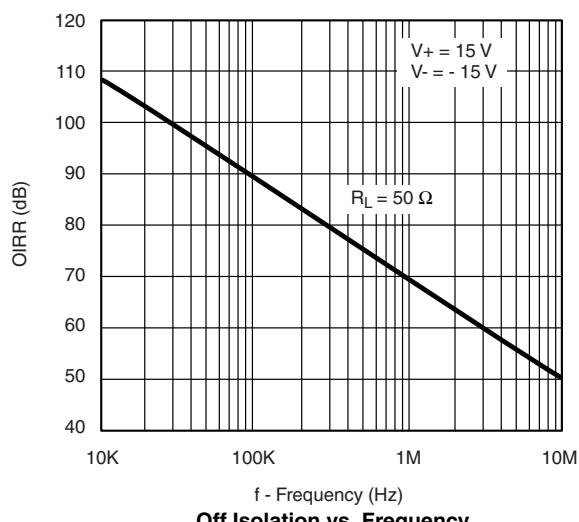
Switching Time vs. Single Supply Voltage



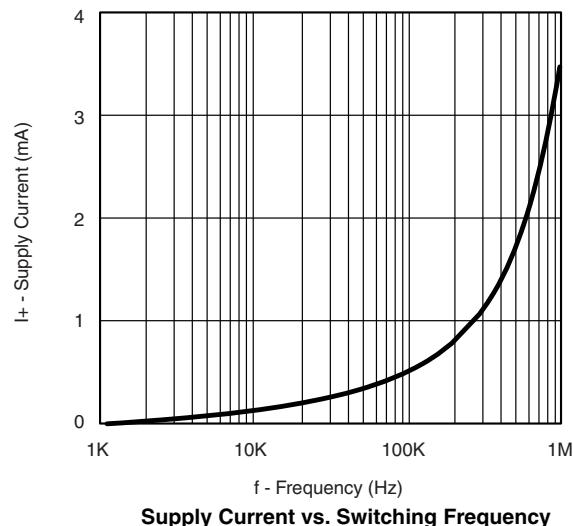
Switching Time vs. Power Supply Voltage



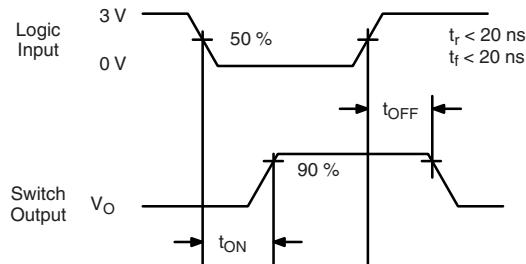
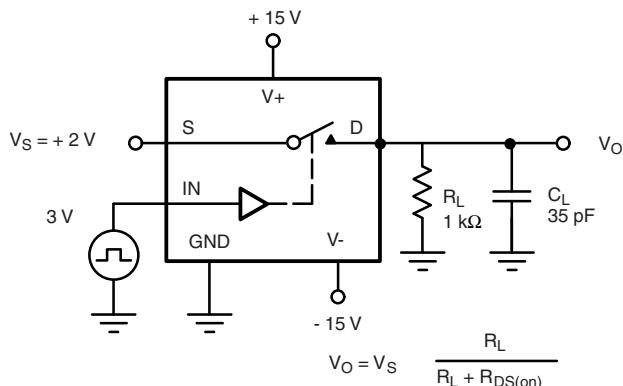
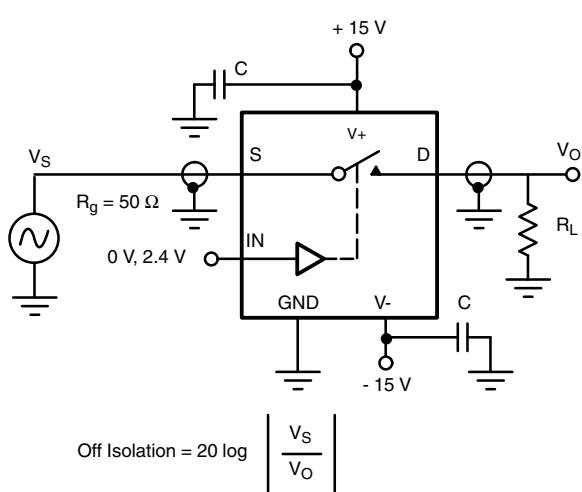
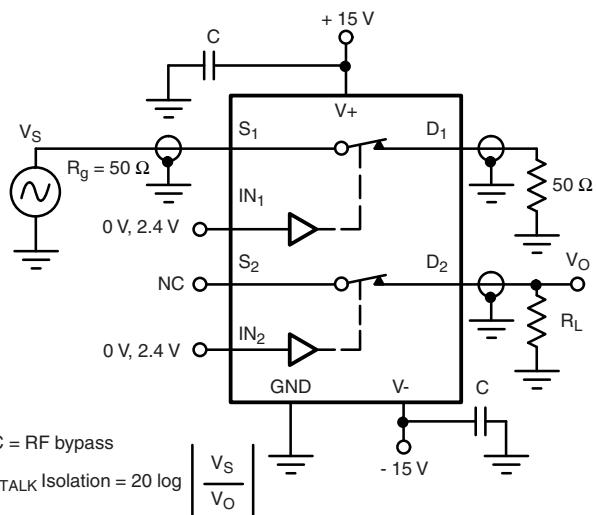
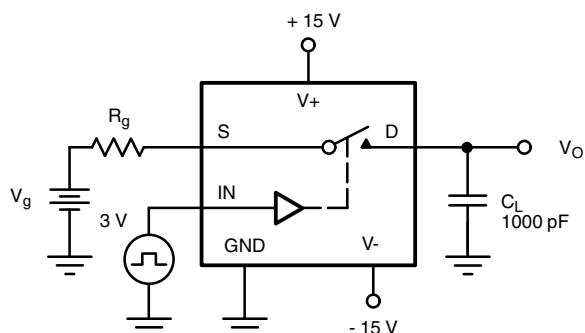
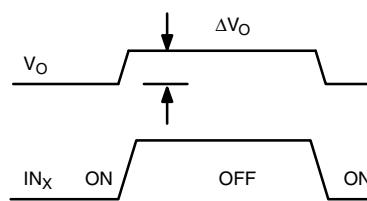
Q_S, Q_D - Charge Injection vs. Analog Voltage



Off Isolation vs. Frequency



Supply Current vs. Switching Frequency

TEST CIRCUITS

Figure 2. Switching Time

Figure 3. Off Isolation

Figure 4. Channel-to-Channel Crosstalk

Figure 5. Charge Injection


$\Delta V_O = \text{measured voltage error due to charge injection}$
The charge injection in coulombs is $Q = C_L \times \Delta V_O$

DG201B, DG202B

Vishay Siliconix



APPLICATIONS

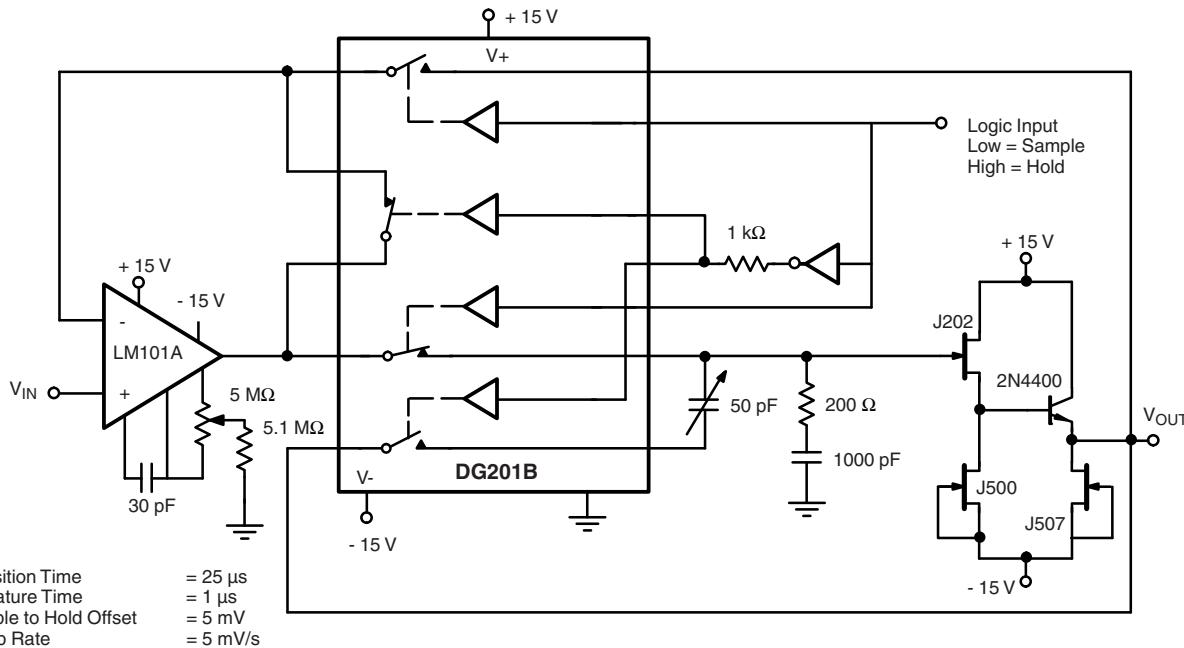
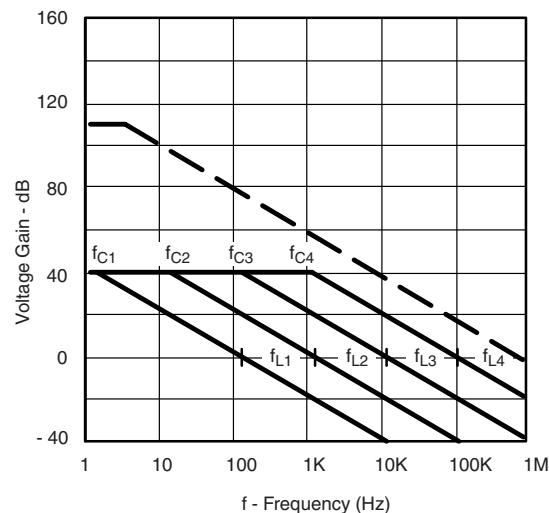
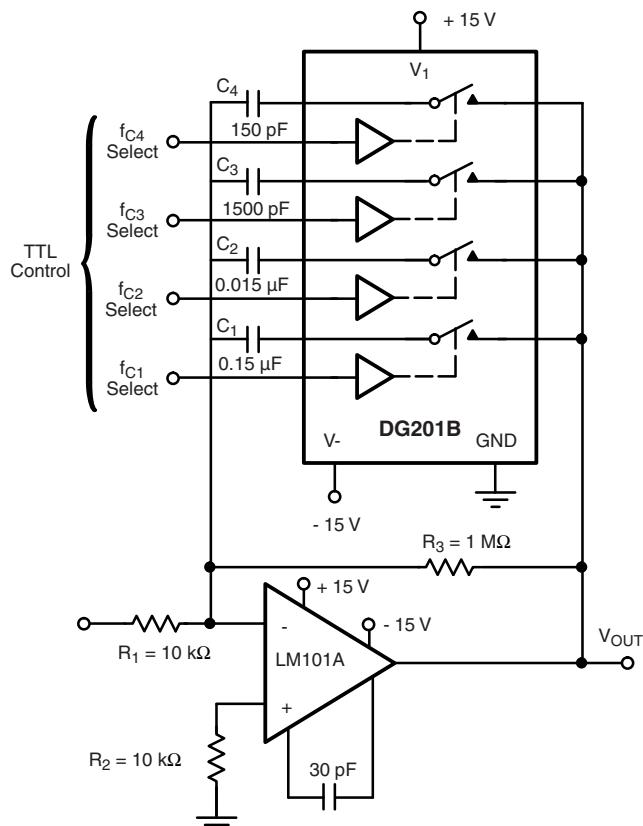


Figure 6. Sample-and-Hold



$$A_L \text{ (Voltage Gain Below Break Frequency)} = \frac{1}{2\pi R_3 C_X}$$

$$f_C \text{ (Break Frequency)} = \frac{1}{2\pi R_3 C_X}$$

$$f_L \text{ (Unity Gain Frequency)} = \frac{1}{2\pi R_1 C_X}$$

$$\text{Max. Attenuation} = \frac{R_{DS(on)}}{10 k\Omega} \approx -47 \text{ dB}$$

$$\frac{R_3}{R_1} = 100 \text{ (40 dB)}$$

Figure 7. Active Low Pass Filter with Digitally Selected Break Frequency

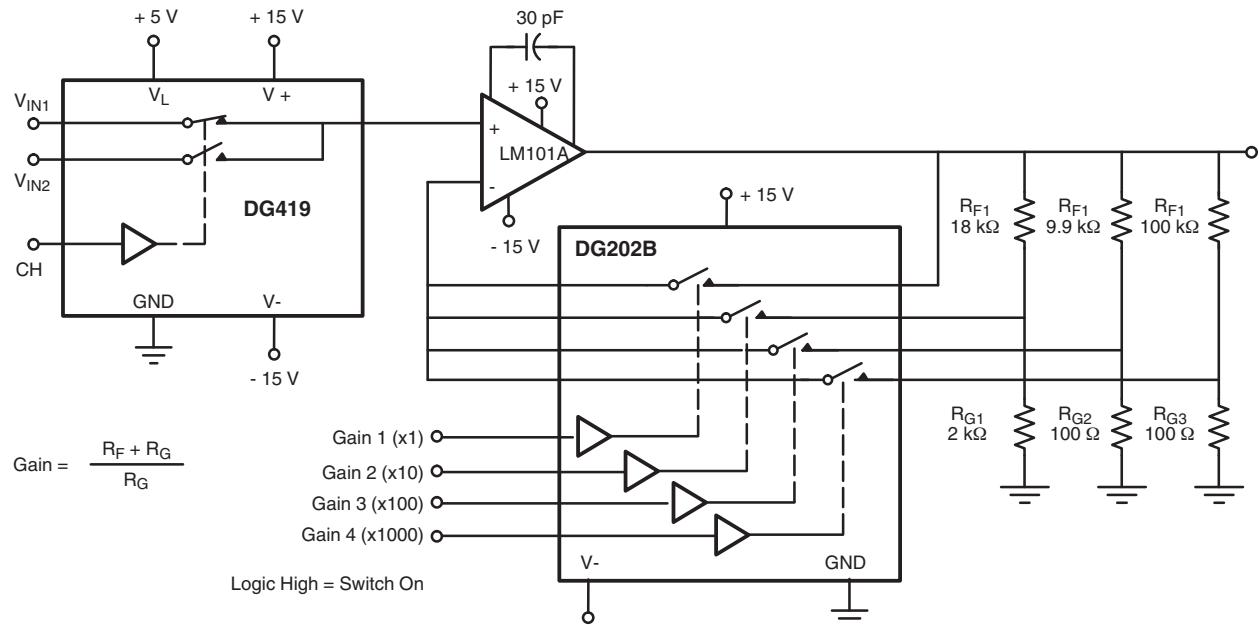
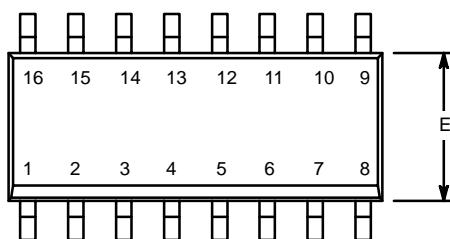
APPLICATIONS


Figure 8. A Precision Amplifier with Digitally Programmable Input and Gains

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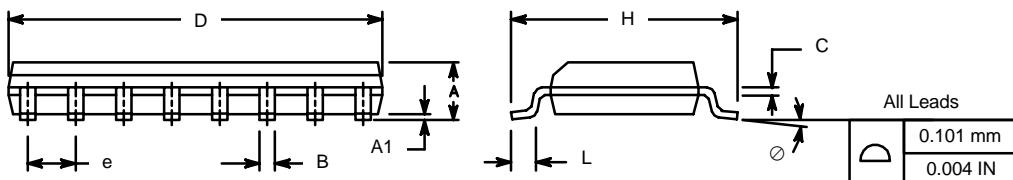
SOIC (NARROW): 16-LEAD

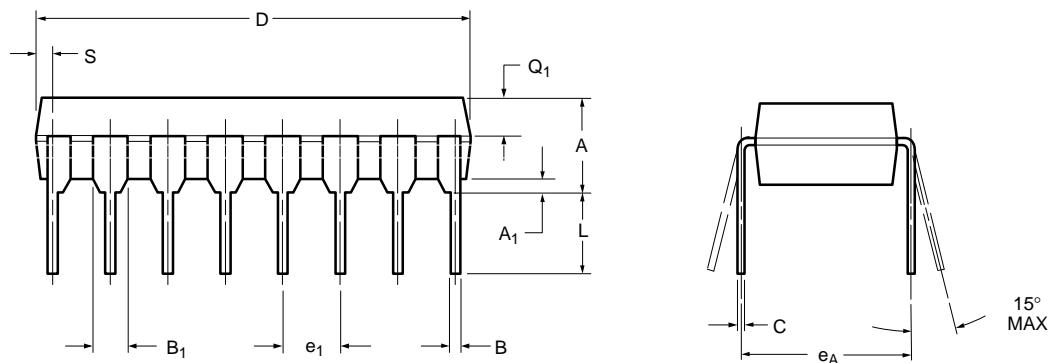
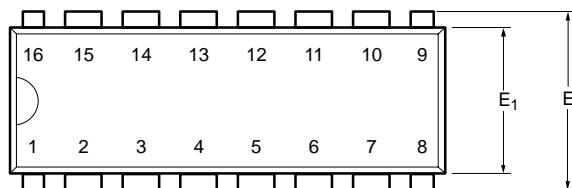
JEDEC Part Number: MS-012



Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	1.35	1.75	0.053	0.069
A₁	0.10	0.20	0.004	0.008
B	0.38	0.51	0.015	0.020
C	0.18	0.23	0.007	0.009
D	9.80	10.00	0.385	0.393
E	3.80	4.00	0.149	0.157
e	1.27 BSC		0.050 BSC	
H	5.80	6.20	0.228	0.244
L	0.50	0.93	0.020	0.037
\emptyset	0°	8°	0°	8°

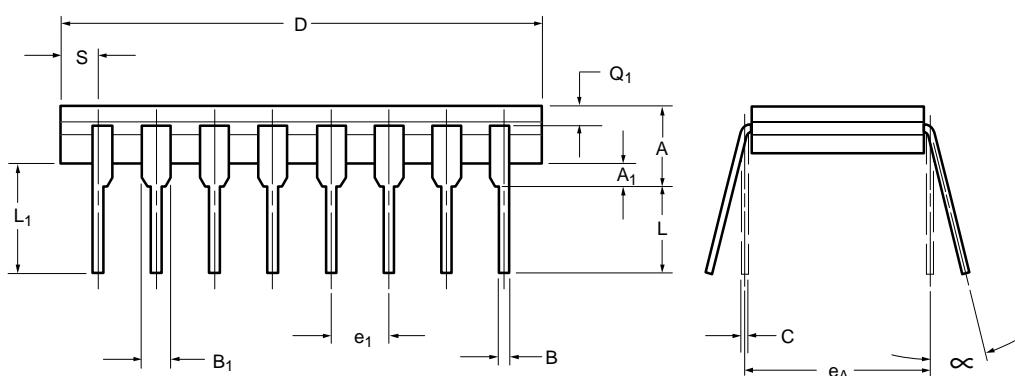
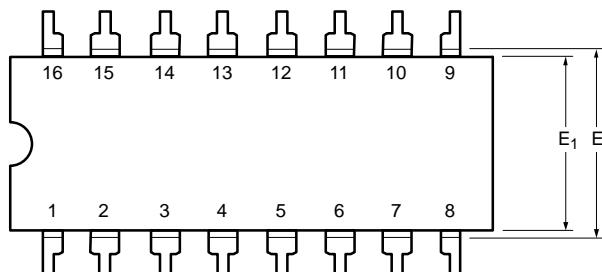
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DWG: 5300



PDIP: 16-LEAD


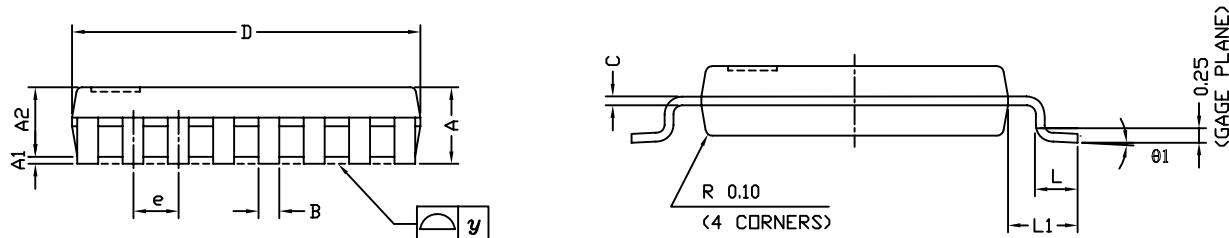
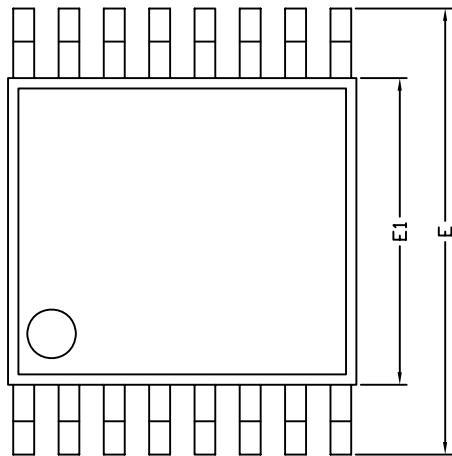
Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	3.81	5.08	0.150	0.200
A₁	0.38	1.27	0.015	0.050
B	0.38	0.51	0.015	0.020
B₁	0.89	1.65	0.035	0.065
C	0.20	0.30	0.008	0.012
D	18.93	21.33	0.745	0.840
E	7.62	8.26	0.300	0.325
E₁	5.59	7.11	0.220	0.280
e₁	2.29	2.79	0.090	0.110
e_A	7.37	7.87	0.290	0.310
L	2.79	3.81	0.110	0.150
Q₁	1.27	2.03	0.050	0.080
S	0.38	1.52	.015	0.060

ECN: S-03946—Rev. D, 09-Jul-01
DWG: 5482

CERDIP: 16-LEAD


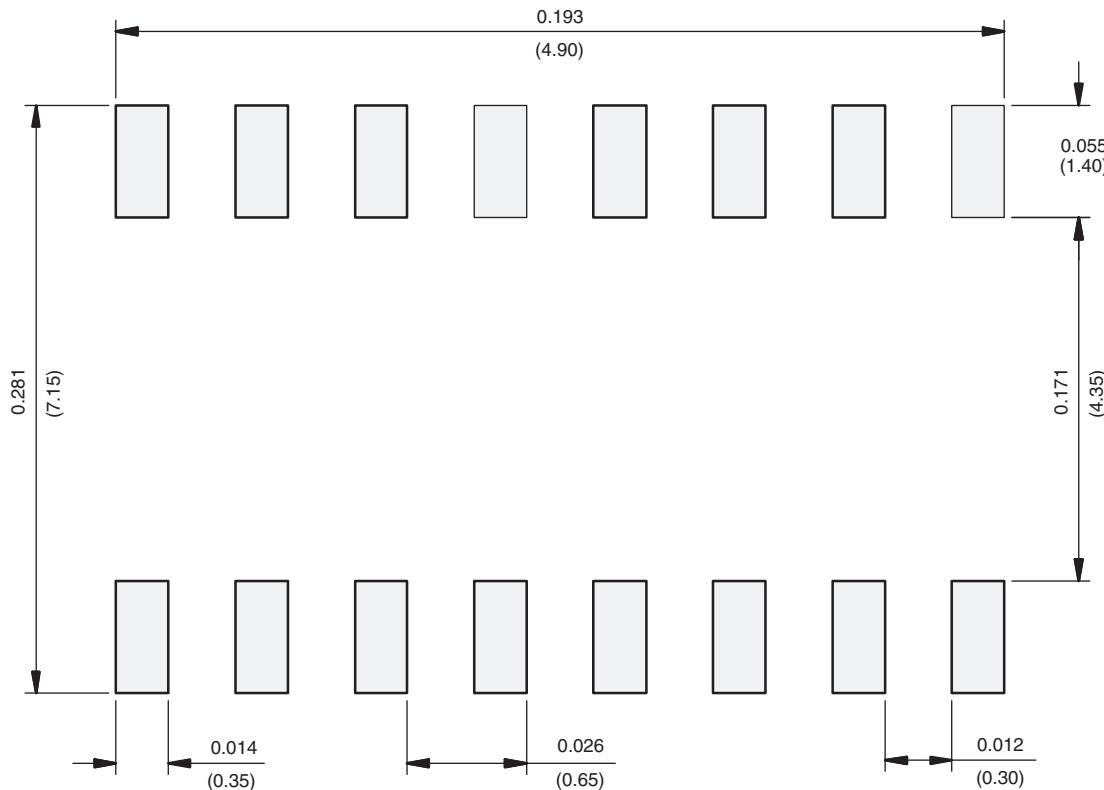
Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	4.06	5.08	0.160	0.200
A₁	0.51	1.14	0.020	0.045
B	0.38	0.51	0.015	0.020
B₁	1.14	1.65	0.045	0.065
C	0.20	0.30	0.008	0.012
D	19.05	19.56	0.750	0.770
E	7.62	8.26	0.300	0.325
E₁	6.60	7.62	0.260	0.300
e₁	2.54 BSC		0.100 BSC	
e_A	7.62 BSC		0.300 BSC	
L	3.18	3.81	0.125	0.150
L₁	3.81	5.08	0.150	0.200
Q₁	1.27	2.16	0.050	0.085
S	0.38	1.14	0.015	0.045
∞	0°	15°	0°	15°
ECN: S-03946—Rev. G, 09-Jul-01				
DWG: 5403				

TSSOP: 16-LEAD



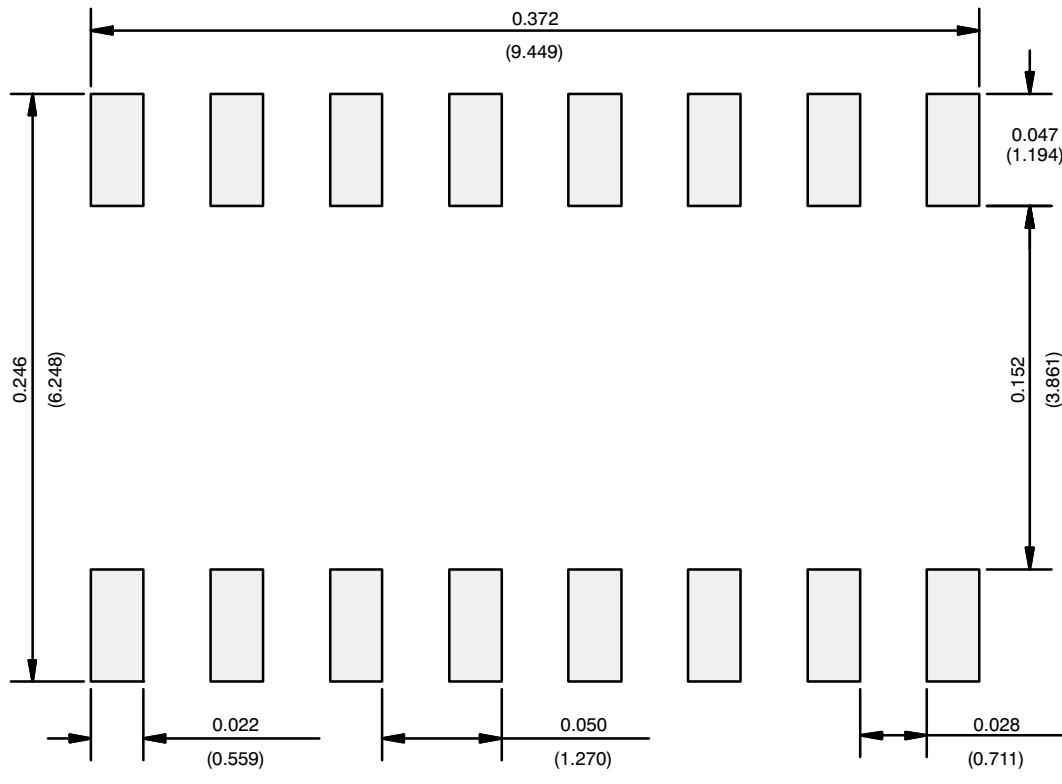
Symbols	DIMENSIONS IN MILLIMETERS		
	Min	Nom	Max
A	-	1.10	1.20
A1	0.05	0.10	0.15
A2	-	1.00	1.05
B	0.22	0.28	0.38
C	-	0.127	-
D	4.90	5.00	5.10
E	6.10	6.40	6.70
E1	4.30	4.40	4.50
e	-	0.65	-
L	0.50	0.60	0.70
L1	0.90	1.00	1.10
y	-	-	0.10
θ1	0°	3°	6°

ECN: S-61920-Rev. D, 23-Oct-06
DWG: 5624

RECOMMENDED MINIMUM PAD FOR TSSOP-16

Recommended Minimum Pads
Dimensions in inches (mm)

RECOMMENDED MINIMUM PADS FOR SO-16



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Material Category Policy

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.

Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.

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Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибуторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ Р В 0015-002 и ЭС РД 009

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