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**

Pb-free Available
RoHS*
COMPLIANT

BENEFITS

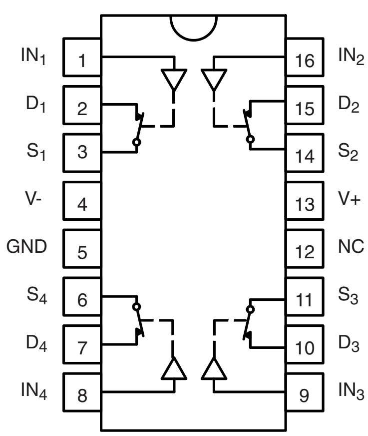
- Wide analog signal range
- Simple logic interface
- Higher accuracy
- Minimum transients
- Reduced power consumption
- Superior to DG201A, DG202
- Space savings (TSSOP)

APPLICATIONS

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

FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION

DG201B
Dual-In-Line, SOIC and TSSOP



Top View

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
- 40 °C to 85 °C	16-pin Plastic DIP	DG201BDJ DG201BDJ-E3
		DG202BDJ DG202BDJ-E3
	16-pin narrow SOIC	DG201BDY DG201BDY-E3 DG201BDY-T1 DG201BDY-T1-E3
		DG202BDY DG202BDY-E3 DG202BDY-T1 DG202BDY-T1-E3
	16-pin TSSOP	DG201BDQ DG201BDQ-E3 DG201BDQ-T1 DG201BDQ-T1-E3
		DG202BDQ DG202BDQ-E3 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)	- 65 to 150	°C
	(DJ, DY, DQ suffix)	- 65 to 125	
Power Dissipation (Package)[b]	16-pin plastic DIP[c]	470	mW
	16-pin narrow SOIC and TSSOP[d]	640	
	16-pin CerDIP[e]	900	
	LCC-20[f]	750	

Notes:
a. Signals on S_X, D_X, or IN_X 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)

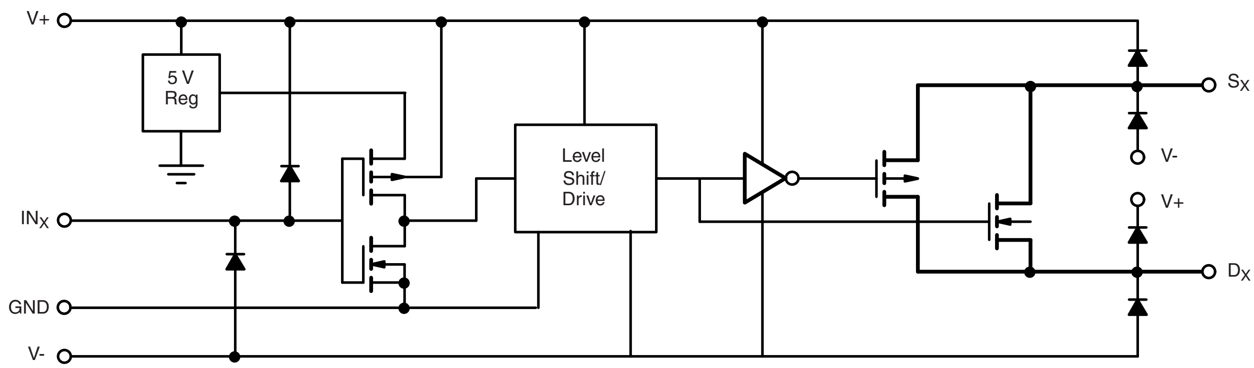


Figure 1.

SPECIFICATIONS[a]

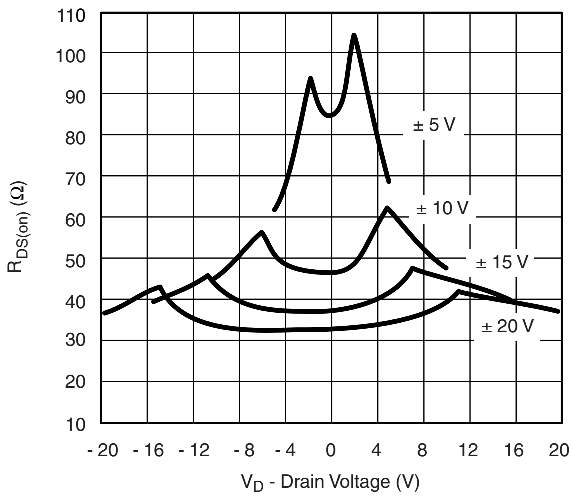
Parameter	Symbol	Test Conditions Unless Specified V+ = 15 V, V- = - 15 V V_{IN} = 2.4 V, 0.8 V[f]	Temp.[b]	Typ.[c]	A Suffix - 55 °C to 125 °C Min.[d]	A Suffix Max.[d]	D Suffix - 40 °C to 85 °C Min.[d]	D Suffix Max.[d]	Unit
Analog Switch									
Analog Signal Range[e]	V_{ANALOG}		Full		- 15	15	- 15	15	V
Drain-Source On-Resistance	$R_{DS(on)}$	V_D = ± 10 V, I_S = 1 mA	Room Full	45		85 100		85 100	Ω
$R_{DS(on)}$ Match	$\Delta R_{DS(on}$		Room	2					
Source Off Leakage Current	$I_{S(off)}$	V_S = ± 14 V, V_D = ± 14 V	Room Full	± 0.01	- 0.5 - 20	0.5 20	- 0.5 - 5	0.5 5	nA
Drain Off Leakage Current	$I_{D(off)}$	V_D = ± 14 V, V_S = ± 14 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 = ± 14 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		V
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	µA
Input Capacitance	C_{IN}		Room	5					pF
Dynamic Characteristics									
Turn-On Time	t_{ON}	V_S = 2 V see switching time test circuit	Room Full	120		300		300	ns
Turn-Off Time	t_{OFF}		Room Full	65		200		200	
Charge Injection	Q	C_L = 1000 pF, V_g = 0 V R_g = 0 Ω	Room	1					pC
Source-Off Capacitance	$C_{S(off)}$	V_S = 0 V, f = 1 MHz	Room	5					pF
Drain-Off Capacitance	$C_{D(off)}$		Room	5					
Channel On Capacitance	$C_{D(on)}$	V_D = V_S = 0 V, f = 1 MHz	Room	16					
Off Isolation	OIRR	C_L = 15 pF, R_L = 50 Ω V_S = 1 V_{RMS}, f = 100 kHz	Room	90					dB
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	µA
Negative Supply Current	I-		Room Full		- 1 - 5		- 1 - 5		
Power Supply Range for Continuous Operation	V_{OP}		Full		± 4.5	± 22	± 4.5	± 22	V

SPECIFICATIONS (for Single Supply)[a]									
		Test Conditions Unless Specified V+ = 12 V, V- = 0 V V_{IN} = 2.4 V, 0.8 V[f]			**A Suffix** - 55 °C to 125 °C		**D Suffix** - 40 °C to 85 °C		
Parameter	**Symbol**		**Temp.**[b]	**Typ.**[c]	**Min.**[d]	**Max.**[d]	**Min.**[d]	**Max.**[d]	**Unit**
Analog Switch									
Analog Signal Range[e]	V_{ANALOG}		Full		0	12	0	12	V
Drain-Source On-Resistance	$R_{DS(on)}$	V_D = 3 V, 8 V, I_S = 1 mA	Room Full	90		160 200		160 200	Ω
Dynamic Characteristics									
Turn-On Time	t_{ON}	V_S = 8 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 nF, V_{gen} = 6 V R_{gen} = 0 Ω	Room	4					pC
Power Supply									
Positive Supply Current	I+	V_{IN} = 0 or 5 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

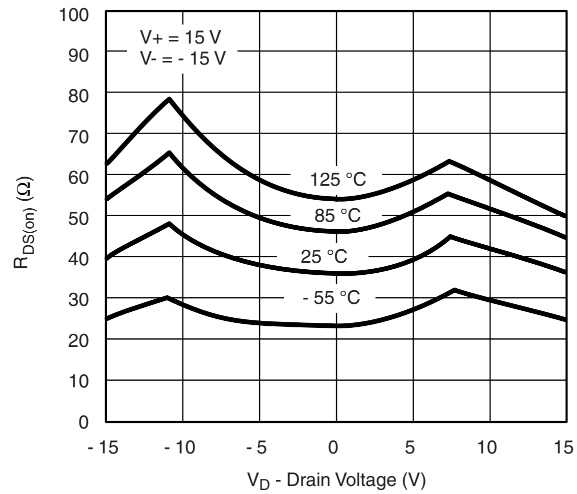
Notes:
a. Refer to PROCESS OPTION FLOWCHART.
b. Room = 25 °C, Full = as determined by the operating temperature suffix.
c. Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
d. The algebraic convention whereby the most negative value is a minimum and the most positive 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.

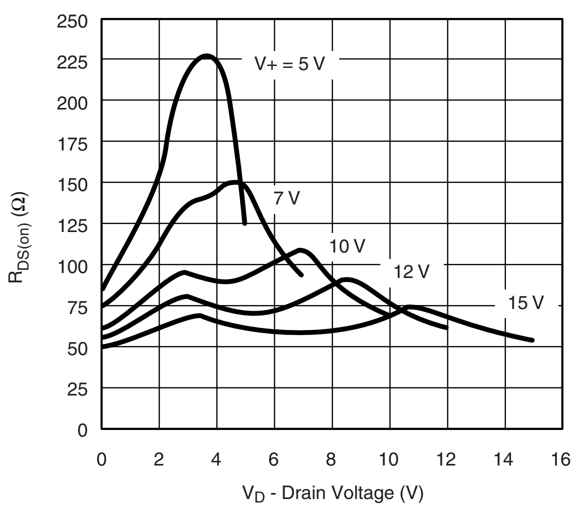
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



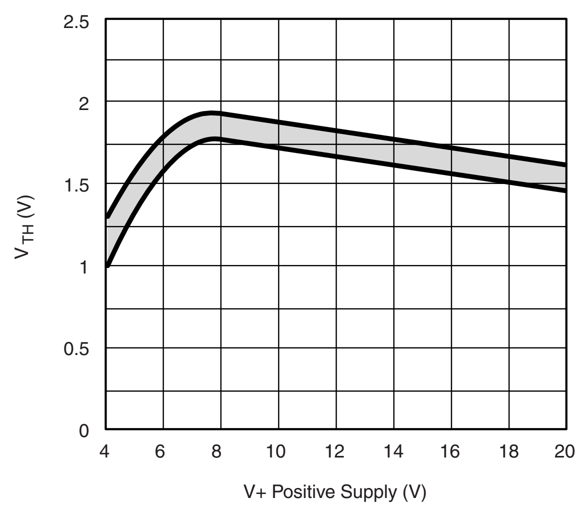
$R_{DS(on)}$ vs. V_D and Power Supply Voltages



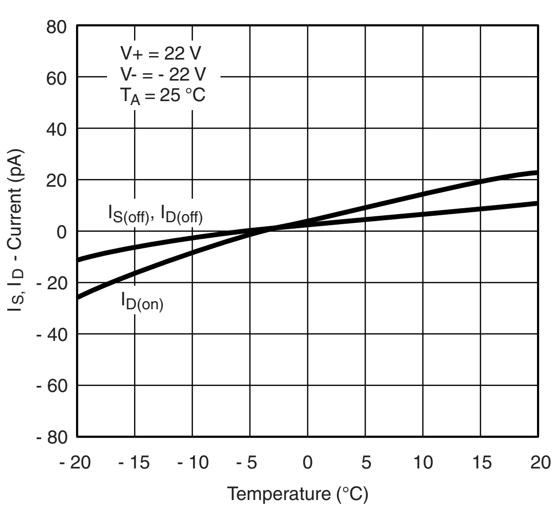
$R_{DS(on)}$ vs. V_D and Temperature



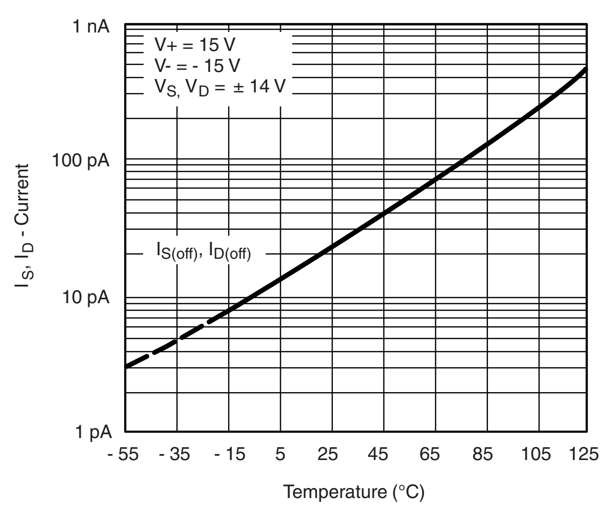
$R_{DS(on)}$ vs. V_D and Single Power Supply Voltages



Input Switching Threshold vs. Supply Voltage

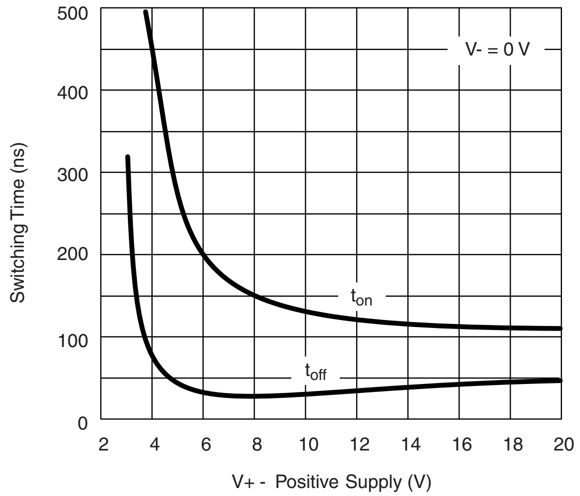


Leakage Currents vs. Analog Voltage

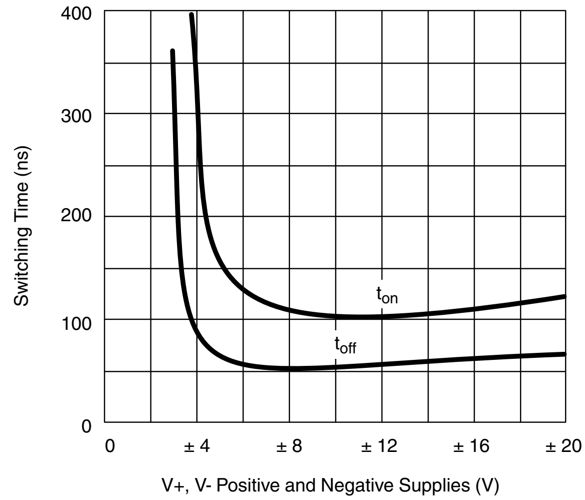


Leakage Currents vs. Temperature

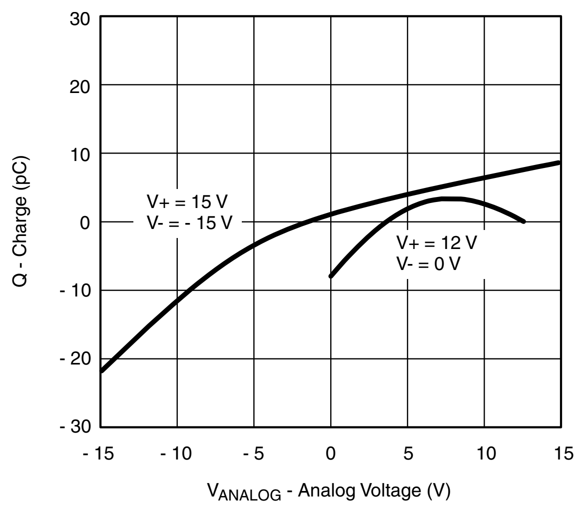
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



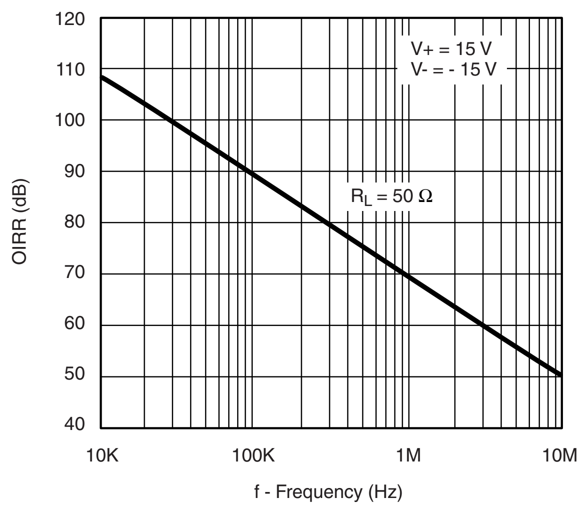
Switching Time vs. Single Supply Voltage



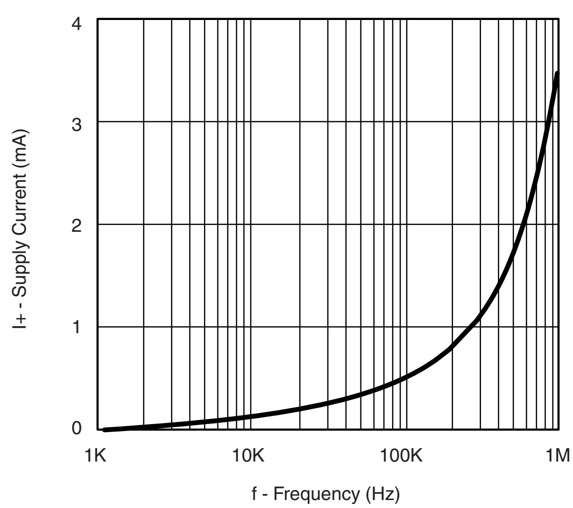
Switching Time vs. Power Supply Voltage



Q_S, Q_D - Charge Injection vs. Analog Voltage



Off Isolation vs. Frequency



Supply Current vs. Switching Frequency

TEST CIRCUITS

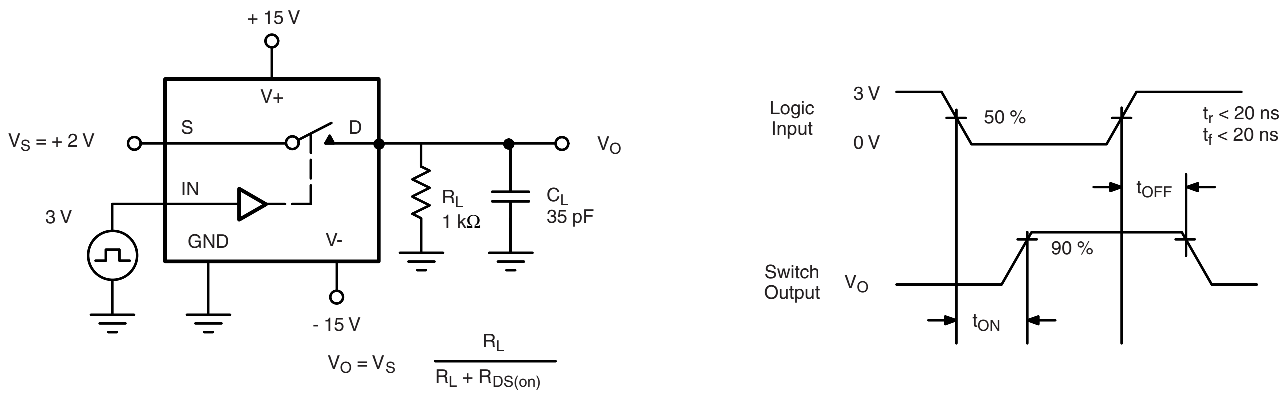


Figure 2. Switching Time

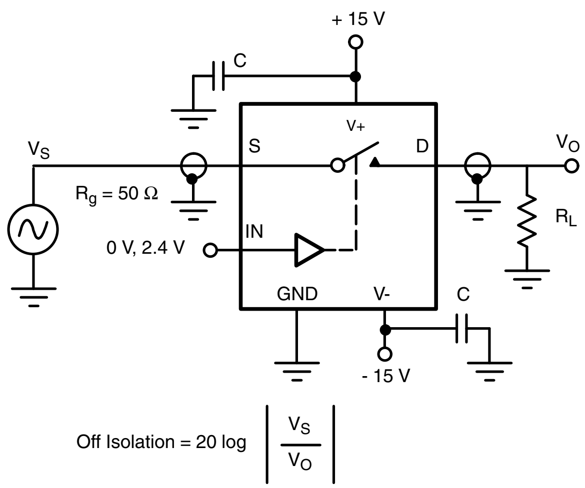


Figure 3. Off Isolation

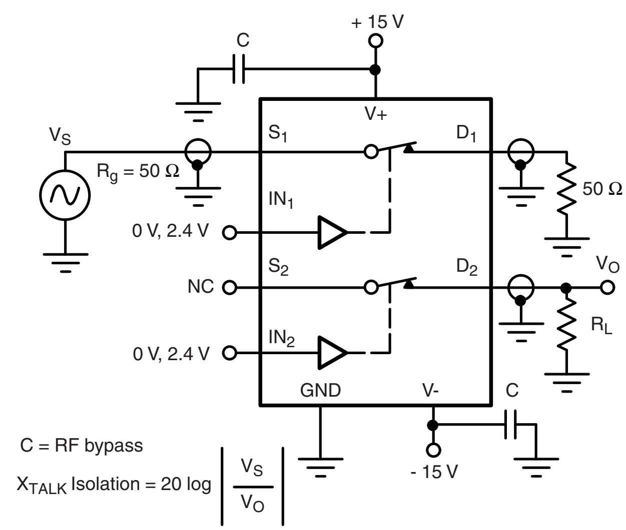
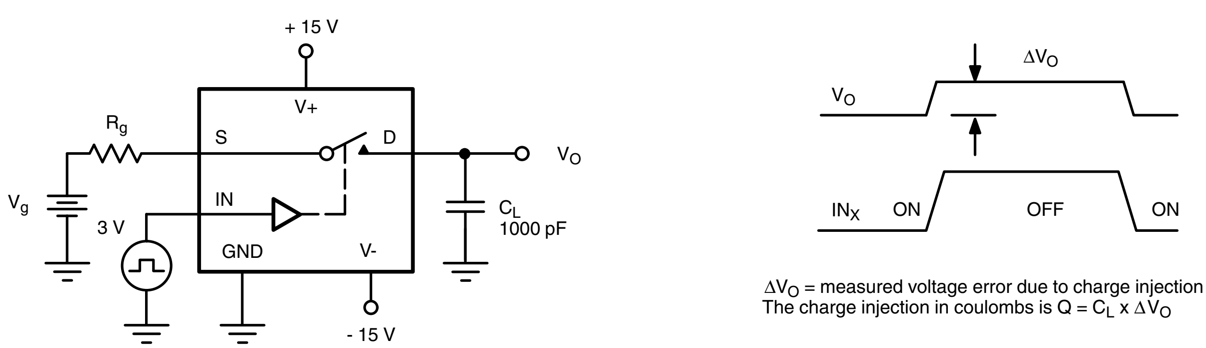


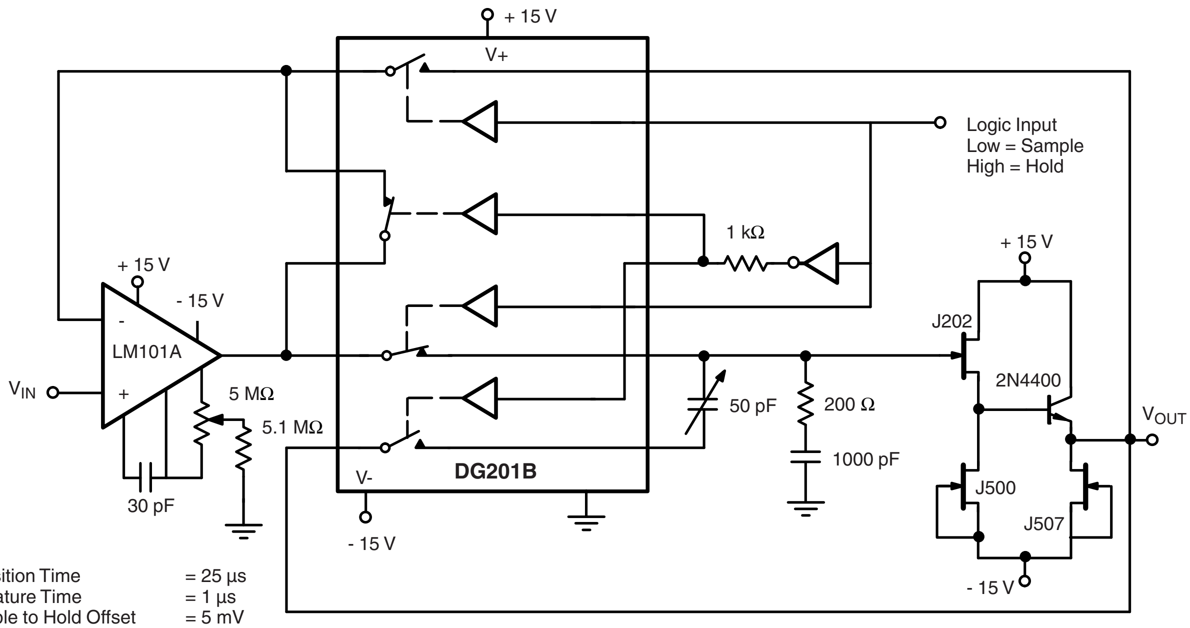
Figure 4. Channel-to-Channel Crosstalk



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

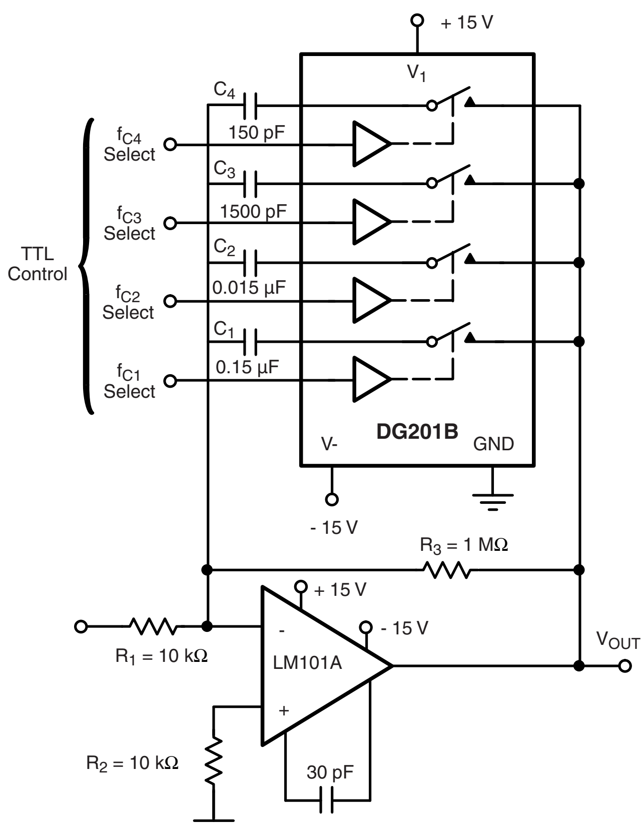
Figure 5. Charge Injection

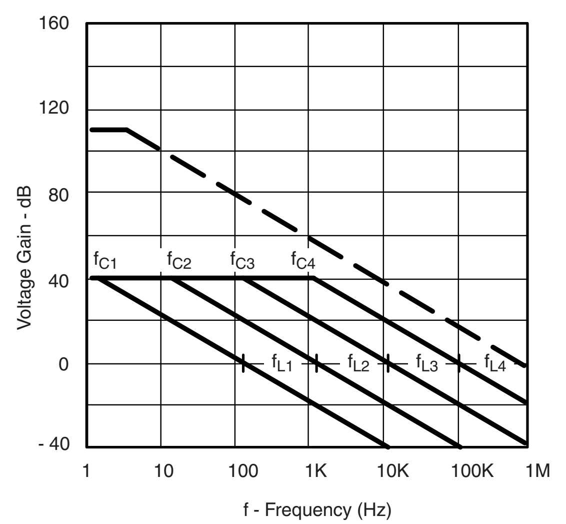
APPLICATIONS



Aquisition Time	= 25 µs
Aperature Time	= 1 µs
Sample to Hold Offset	= 5 mV
Droop Rate	= 5 mV/s

Figure 6. Sample-and-Hold





A_L (Voltage Gain Below Break Frequency) = $\frac{R_3}{R_1}$ = 100 (40 dB)

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

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

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

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

APPLICATIONS

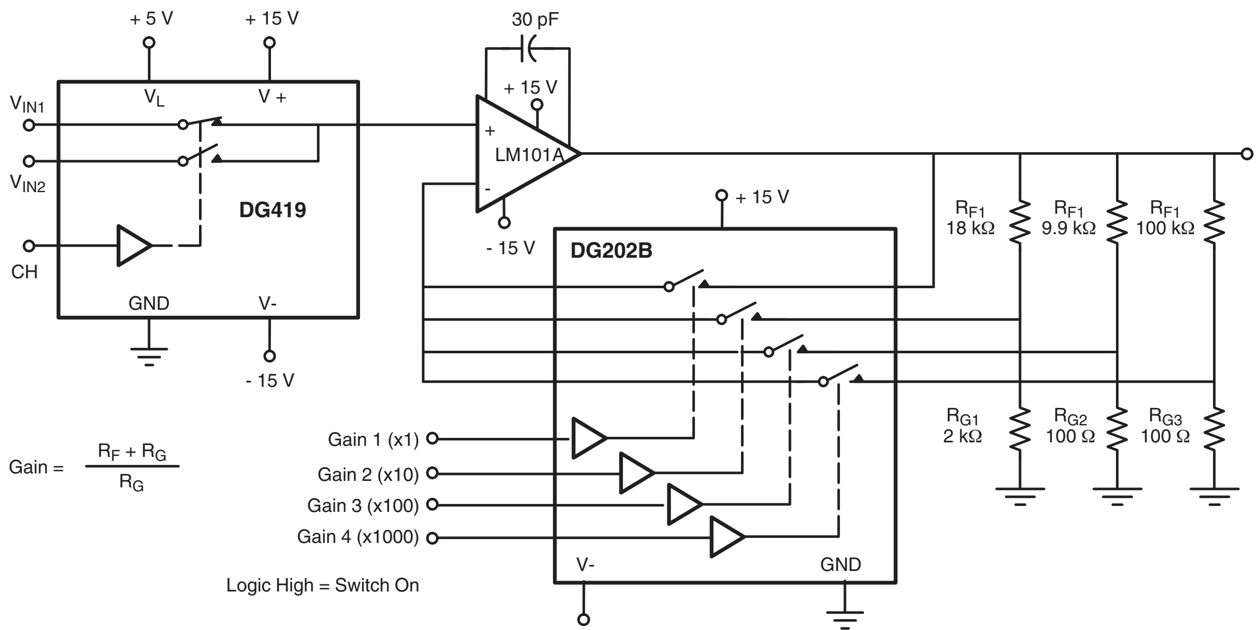
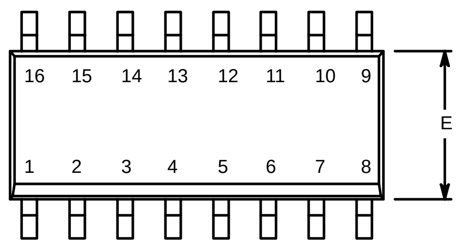


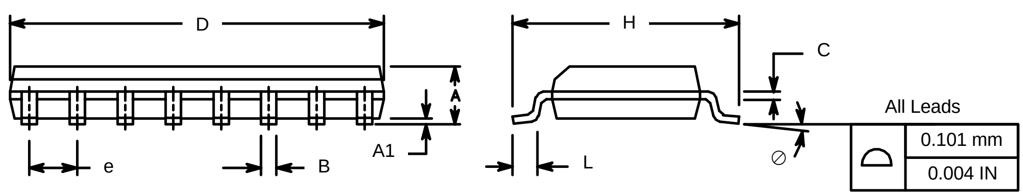
Figure 8. A Precision Amplifier with Digitally Programable Input and Gains

SOIC (NARROW): 16-LEAD

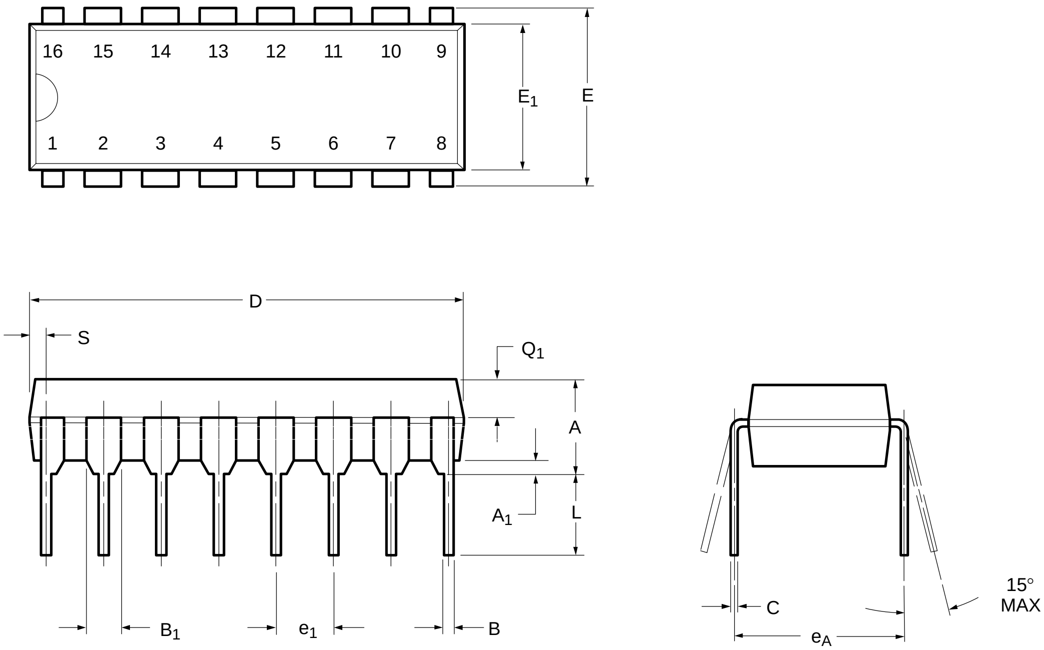
JEDEC Part Number: MS-012

Dim	MILLIMETERS		INCHES	
	Min	**Max**	**Min**	**Max**
A	1.35	1.75	0.053	0.069
A_1	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
∅	0°	8°	0°	8°
ECN: S-03946—Rev. F, 09-Jul-01 DWG: 5300				



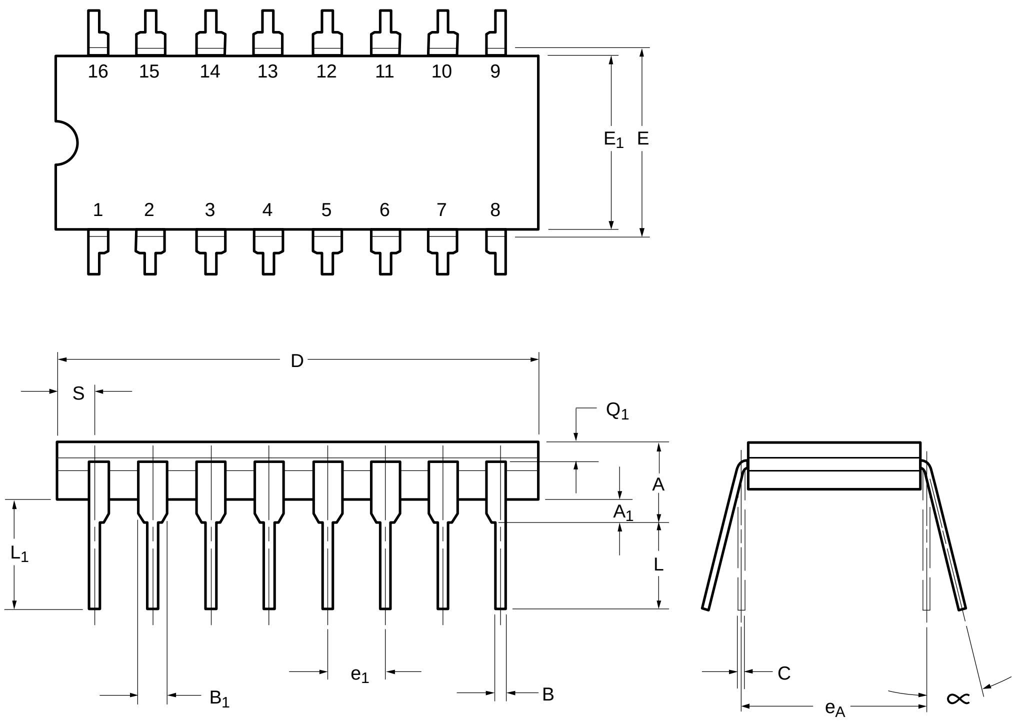


PDIP: 16-LEAD



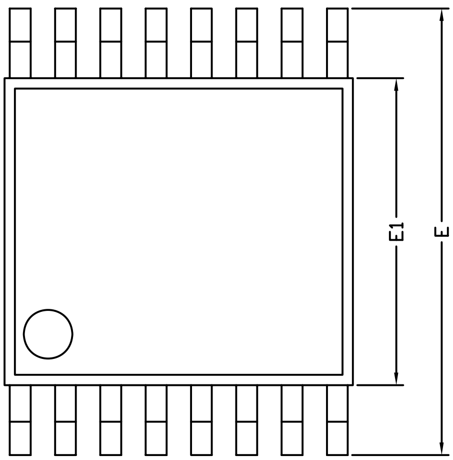
Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	3.81	5.08	0.150	0.200
A_1	0.38	1.27	0.015	0.050
B	0.38	0.51	0.015	0.020
B_1	0.89	1.65	0.035	0.065
C	0.20	0.30	0.008	0.012
D	18.93	21.33	0.745	0.840
E	7.62	8.26	0.300	0.325
E_1	5.59	7.11	0.220	0.280
e_1	2.29	2.79	0.090	0.110
e_A	7.37	7.87	0.290	0.310
L	2.79	3.81	0.110	0.150
Q_1	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				

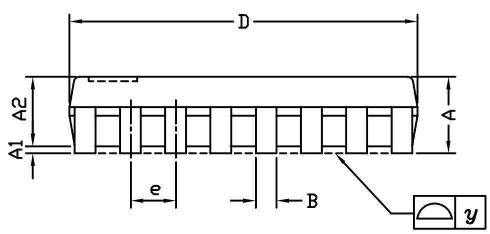
CERDIP: 16-LEAD

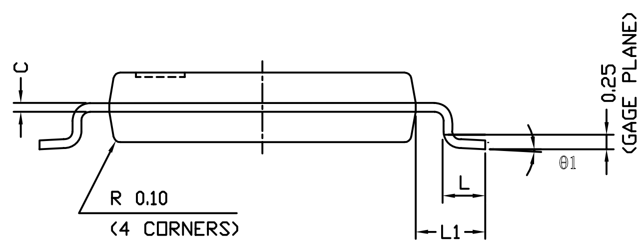


Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	4.06	5.08	0.160	0.200
A_1	0.51	1.14	0.020	0.045
B	0.38	0.51	0.015	0.020
B_1	1.14	1.65	0.045	0.065
C	0.20	0.30	0.008	0.012
D	19.05	19.56	0.750	0.770
E	7.62	8.26	0.300	0.325
E_1	6.60	7.62	0.260	0.300
e_1	2.54 BSC		0.100 BSC	
e_A	7.62 BSC		0.300 BSC	
L	3.18	3.81	0.125	0.150
L_1	3.81	5.08	0.150	0.200
Q_1	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

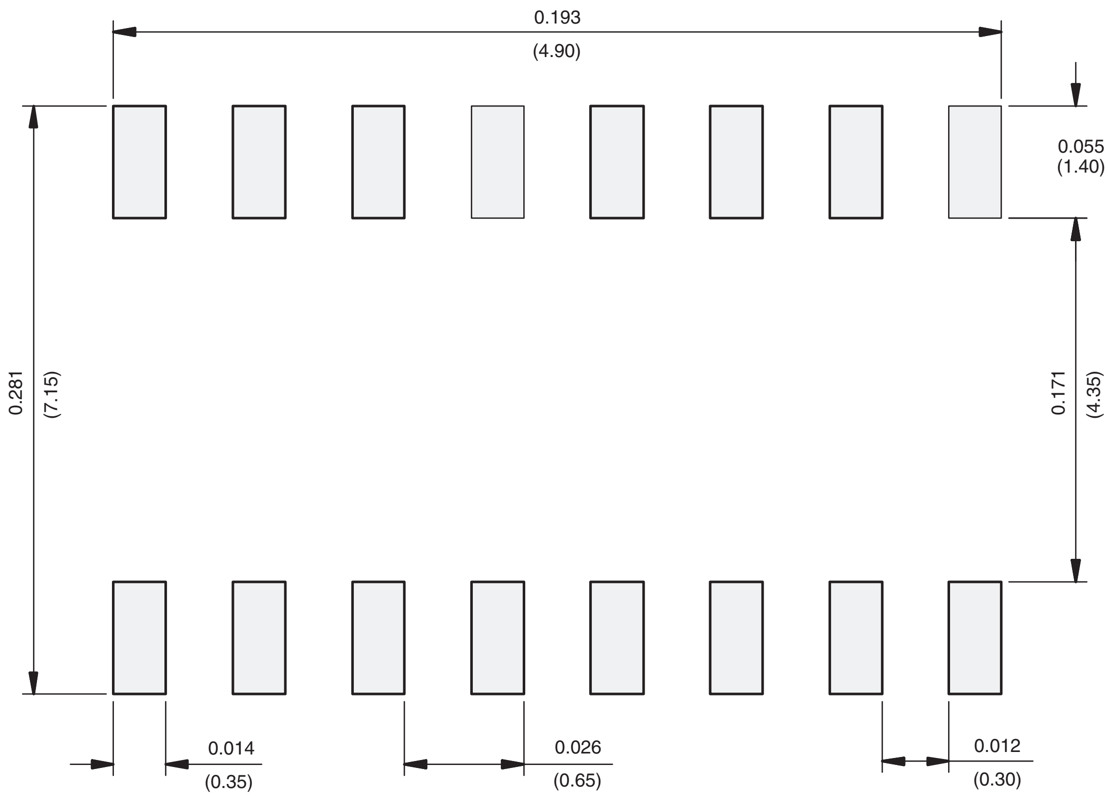






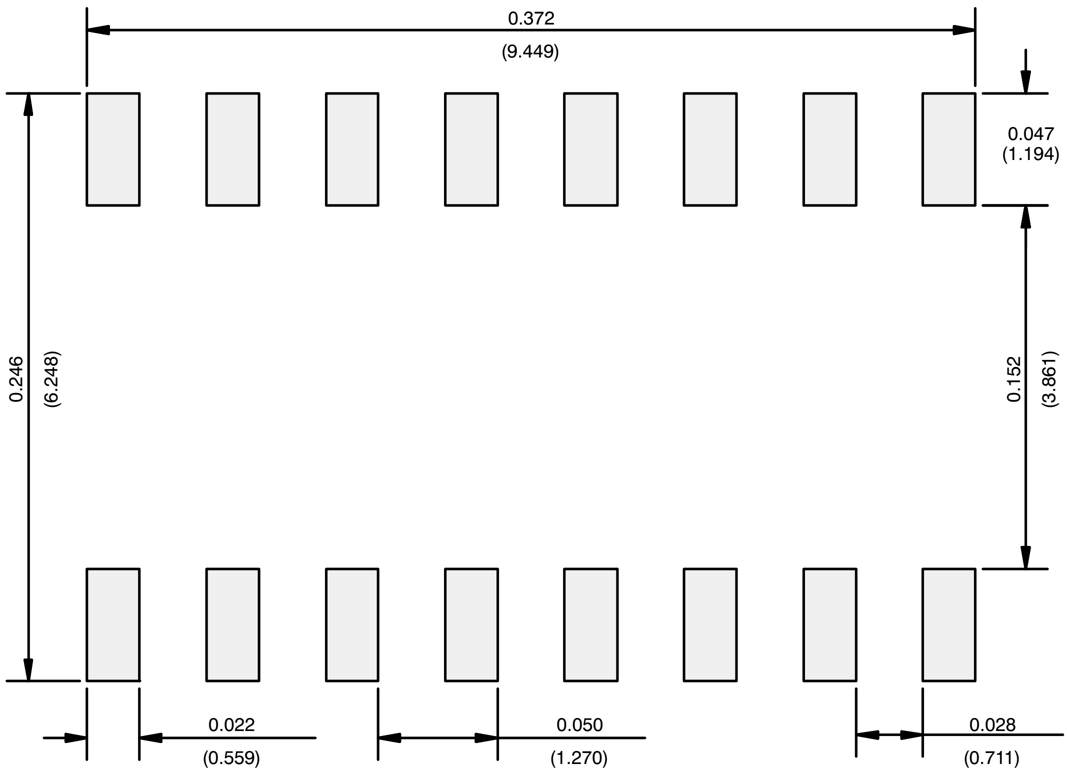
Symbols	DIMENSIONS IN MILLIMETERS		
	Min	Nom	Max
A	-	1.10	1.20
A1	0.05	0.10	0.15
A2	-	1.00	1.05
B	0.22	0.28	0.38
C	-	0.127	-
D	4.90	5.00	5.10
E	6.10	6.40	6.70
E1	4.30	4.40	4.50
e	-	0.65	-
L	0.50	0.60	0.70
L1	0.90	1.00	1.10
y	-	-	0.10
θ1	0°	3°	6°
ECN: S-61920-Rev. D, 23-Oct-06 DWG: 5624			

RECOMMENDED MINIMUM PAD FOR TSSOP-16



Recommended Minimum Pads
Dimensions in inches (mm)

RECOMMENDED MINIMUM PADS FOR SO-16



Recommended Minimum Pads
Dimensions in Inches/(mm)

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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.

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.

Общество с ограниченной ответственностью «МосЧип» ИНН 7719860671 / КПП 771901001
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Данный компонент на территории Российской Федерации

Вы можете приобрести в компании MosChip.

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 дистрибьюторами 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 РВ 0015-002 и ЭС РД 009

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