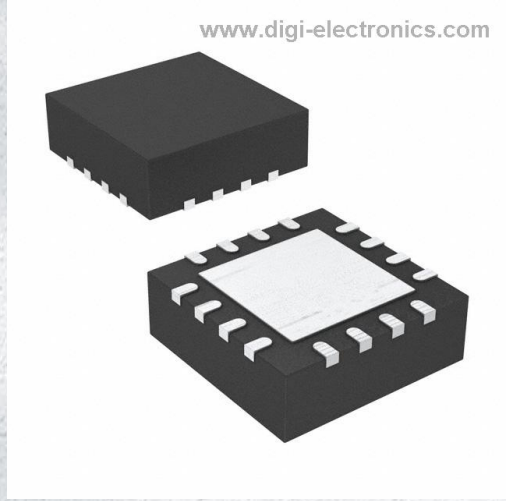
DG445BDN-T1-E4 Datasheet



DiGi Electronics Part Number	DG445BDN-T1-E4-DG
Manufacturer	Vishay Siliconix
Manufacturer Product Number	DG445BDN-T1-E4
Description	IC SWITCH SPST-NOX4 80OHM 16QFN
Detailed Description	4 Circuit IC Switch 1:1 80Ohm 16-QFN (4x4)

https://www.DiGi-Electronics.com

Tel: +00 852-30501935

RFQ Email: Info@DiGi-Electronics.com

Purchase and inquiry

Manufacturer Product Number:	Manufacturer:
DG445BDN-T1-E4	Vishay Siliconix
Series:	Product Status:
-	Active
Switch Circuit:	Multiplexer/Demultiplexer Circuit:
SPST - NO	1:1
Number of Circuits:	On-State Resistance (Max):
4	80Ohm
Channel-to-Channel Matching (ΔRon):	Voltage - Supply, Single (V+):
-	13V ~ 36V
Voltage - Supply, Dual (V±):	Switch Time (Ton, Toff) (Max):
±7V ~ 22V	300ns, 200ns
-3db Bandwidth:	Charge Injection:
-	1pC
Channel Capacitance (CS(off), CD(off)):	Current - Leakage (IS(off)) (Max):
5pF, 5pF	500pA
Crosstalk:	Operating Temperature:
-95dB @ 100kHz	-40°C ~ 85°C (TA)
Mounting Type:	Package / Case:
Surface Mount	16-VQFN Exposed Pad
Supplier Device Package:	Base Product Number:
16-QFN (4x4)	DG445

Environmental & Export classification

RoHS Status:	Moisture Sensitivity Level (MSL):
ROHS3 Compliant	1 (Unlimited)
ECCN:	HTSUS:
EAR99	8542.39.0001

DG444B, DG445B

Vishay Siliconix

Improved Quad SPST CMOS Analog Switches

DESCRIPTION

The DG444B, DG445B are monolithic quad analog switches designed to provide high speed, low error switching of analog and audio signals. The DG444B, DG445B are upgrades to the original DG444, DG445.

Combing low on-resistance (45 Ω, typ.) with high speed (t_{ON} 120 ns, typ.), the DG444B, DG445B are ideally suited for Data Acquisition, Communication Systems, Automatic Test Equipment, or Medical Instrumentation. Charge injection has been minimized on the drain for use in sample-and-hold circuits.

The DG444B, DG445B are built using Vishay Siliconix's high-voltage silicon-gate process. An epitaxial layer prevents latchup.

When on, each switch conducts equally well in both directions and blocks input voltages to the supply levels when off.

FEATURES

- Low On-Resistance: 45 W
- Low Power Consumption: 1 mW
- Fast Switching Action - t_{ON}: 120 ns
- Low Charge Injection
- TTL/CMOS-Compatible Logic
- Material categorization:
  For definitions of compliance please see
  www.vishay.com/doc?99912

Pb-free
RoHS COMPLIANT
HALOGEN FREE

BENEFITS

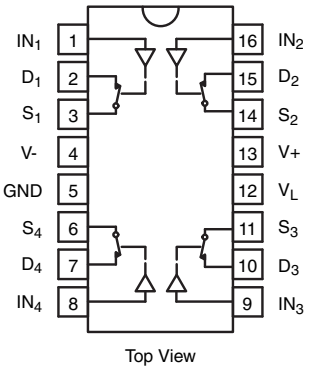
- Low Signal Errors and Distortion
- Reduced Power Supply Consumption
- Faster Throughput
- Reduced Pedestal Errors
- Simple Interfacing

APPLICATIONS

- Audio Switching
- Data Acquisition
- Sample-and-Hold Circuits
- Communication Systems
- Automatic Test Equipment
- Medical Instruments

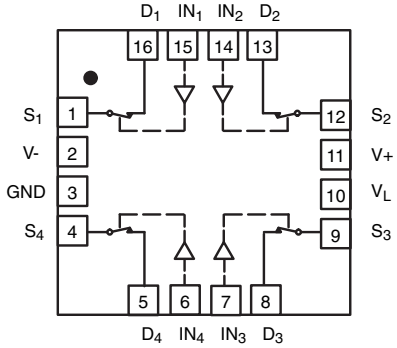
FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION

DG444B
Dual-In-Line and SOIC



Top View

DG444B
QFN16 (4 x 4 mm)



Top View

TRUTH TABLE		
Logic	**DG444B**	**DG445B**
0	ON	OFF
1	OFF	ON

Logic "0" ≤ 0.8 V
Logic "1" ≥ 2.4 V

ORDERING INFORMATION		
Temp Range	**Package**	**Part Number**
- 40 °C to 85 °C	16-pin Plastic DIP	DG444BDJ
		DG444BDJ-E3
		DG445BDJ
		DG445BDJ-E3
	16-pin Narrow SOIC	DG444BDY-E3
		DG444BDY-T1-E3
		DG445BDY-E3
		DG445BDY-T1-E3
	16 pin QFN 4 x 4 mm (Variation 1)	DG444BDN-T1-E4
		DG445BDN-T1-E4

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise noted)				
Parameter		**Symbol**	**Limit**	**Unit**
V+ to V-			44	V
GND to V-			25	
V_L			(GND - 0.3 V) to (V+) + 0.3 V	
Digital Inputs[a], V_S, V_D			(V-) - 2 to (V+) + 2 or 30 mA, whichever occurs first	
Continuous Current (Any Terminal)			30	mA
Current, S or D (Pulsed at 1 ms, 10 % duty cycle)			100	
Storage Temperature			- 65 to 125	°C
Power Dissipation (Package)[b]	16-pin Plastic DIP[c]		470	mW
	16-pin Narrow Body SOIC[d]		640	
	QFN-16		850	

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 mW/°C above 75 °C.
d. Derate 8 mW/°C above 75 °C.

For technical questions, contact: pmostechsupport@vishay.com
Document Number: 72626
S13-1287-Rev. C, 27-May-13

SPECIFICATIONS (for dual supplies)							
Parameter	**Symbol**	**Test Conditions Unless Otherwise Specified** V+ = 15 V, V- = - 15 V V_L = 5 V, V_{IN} = 2.4 V, 0.8 V[e]	**Temp.[a]**	**Limits - 40 °C to 85 °C** **Min.[b]**	**Typ.[c]**	**Max.[b]**	**Unit**
Analog Switch							
Analog Signal Range[d]	V_{ANALOG}		Full	- 15		15	V
Drain-Source On-Resistance	$R_{DS(on)}$	I_S = 1 mA, V_D = ± 10 V	Room Full		45	80 95	Ω
Switch Off Leakage Current	$I_{S(off)}$	V_D = ± 14 V, V_S = ± 14 V	Room Full	- 0.5 - 5	± 0.01	0.5 5	nA
	$I_{D(off)}$		Room Full	- 0.5 - 5	± 0.01	0.5 5	
Channel On Leakage Current	$I_{D(on)}$	V_S = V_D = ± 14 V	Room Full	- 0.5 - 10	± 0.02	0.5 10	
Digital Control							
Input Voltage Low	V_{INL}		Full			0.8	V
Input Voltage High	V_{INH}		Full	2.4			
Input Current V_{IN} Low	I_{INL}	V_{IN} under test = 0.8 V All Other = 2.4 V	Full	- 1	- 0.01	1	µA
Input Current V_{IN} High	I_{INH}	V_{IN} under test = 2.4 V All Other = 0.8 V	Full	- 1	0.01	1	
Dynamic Characteristics							
Turn-On Time	t_{ON}	R_L = 1 kΩ, C_L = 35 pF V_S = ± 10 V, See Figure 2	Room			300	ns
Turn-Off Time	t_{OFF}		Room			200	
Charge Injection[e]	Q	C_L = 1 nF, V_S = 0 V V_{gen} = 0 V, R_{gen} = 0 Ω	Room		1		pC
Off Isolation[e]	OIRR	R_L = 50 Ω , C_L = 15 pF V_S = 1 V_{RMS}, f = 100 kHz	Room		- 90		dB
Crosstalk (Channel-to-Channel)[d]	X_{TALK}		Room		- 95		
Source Off Capacitance	$C_{S(off)}$	V_S = 0 V, f = 100 kHz	Room		5		pF
Drain Off Capacitance	$C_{D(off)}$		Room		5		
Channel On Capacitance	$C_{D(on)}$	V_S = V_D = 0 V, f = 1 MHz	Room		16		
Power Supplies							
Positive Supply Current	I+	V_{IN} = 0 V or 5 V	Room Full			1 5	µA
Negative Supply Current	I-		Room Full	- 1 - 5			
Logic Supply Current	I_{IN}		Room Full			1 5	

DG444B, DG445B

Vishay Siliconix

SPECIFICATIONS (for unipolar supplies)

Parameter	Symbol	Test Conditions Unless Otherwise Specified V+ = 12 V, V- = 0 V V_L = 5 V, V_{IN} = 2.4 V, 0.8 V[e]	Temp.[a]	D Suffix - 40 °C to 85 °C Min.[b]	Typ.[c]	Max.[b]	Unit
Analog Switch							
Analog Signal Range[d]	V_{ANALOG}		Full	0		12	V
Drain-Source On-Resistance[d]	$R_{DS(on)}$	I_S = 1 mA, V_D = 3 V, 8 V	Room Full		90	160 200	Ω
Dynamic Characteristics							
Turn-On Time	t_{ON}	R_L = 1 kΩ, C_L = 35 pF, V_S = 8 V See Figure 2	Room		120	300	ns
Turn-Off Time	t_{OFF}		Room		60	200	
Charge Injection	Q	C_L = 1 nF, V_{gen} = 6 V, R_{gen} = 0 Ω	Room		4		pC
Power Supplies							
Positive Supply Current	I+	V_{IN} = 0 or 5 V	Room Full			1 5	µA
Negative Supply Current	I-		Room Full	- 1 - 5			
Logic Supply Current	I_{IN}	V_L = 5.25 V, V_{IN} = 0 or 5 V	Room Full			1 5	

Notes:

a. Room = 25 °C, Full = as determined by the operating temperature 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.

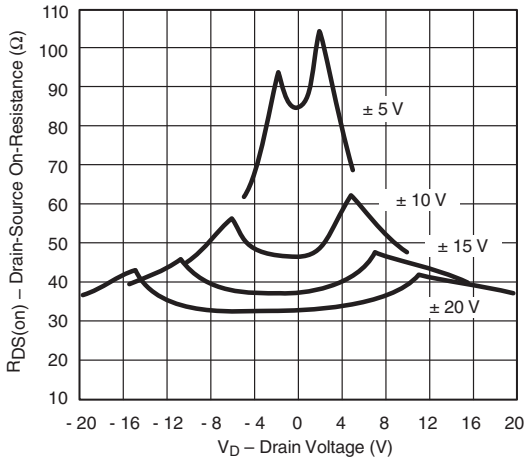
c. Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.

d. Guaranteed by design, not subject to production test.

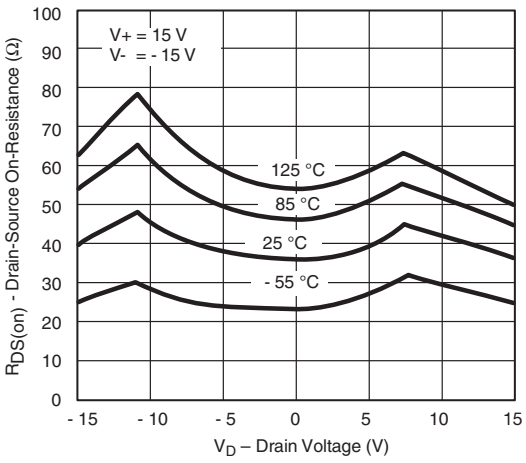
e. V_{IN} = input voltage to perform proper function.

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 (T_A = 25 °C, unless otherwise noted)



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

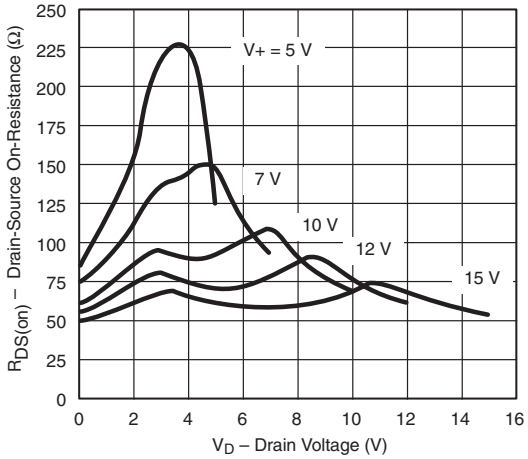


$R_{DS(on)}$ vs. V_D and Temperature

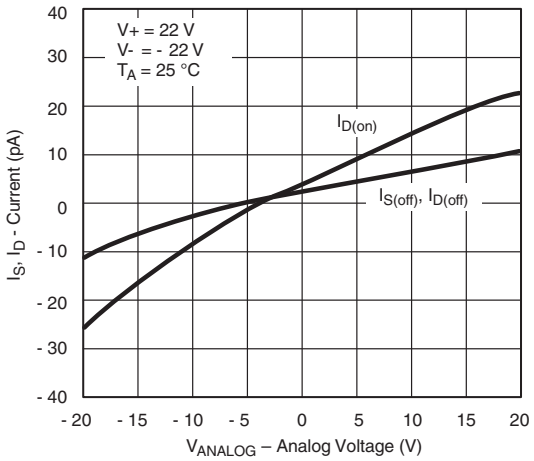
For technical questions, contact: pmostechsupport@vishay.com

Document Number: 72626
S13-1287-Rev. C, 27-May-13

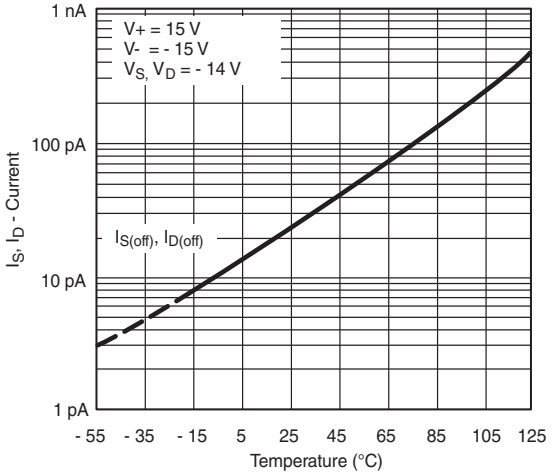
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



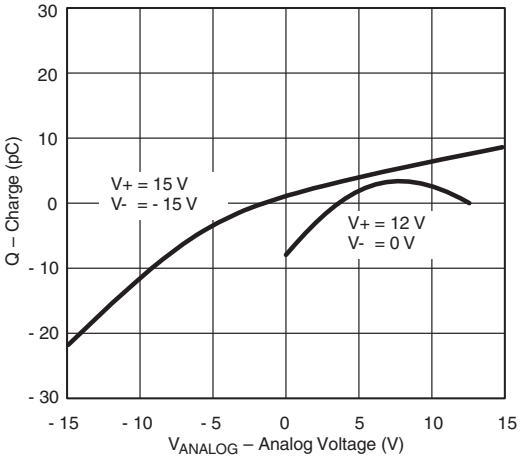
$R_{DS(on)}$ vs. V_D and Single Power Supply Voltages



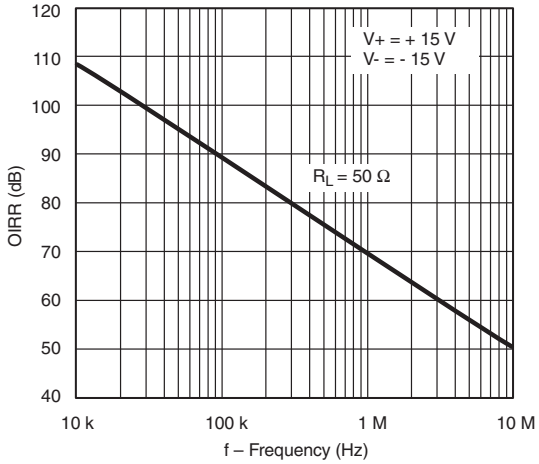
Leakage Currents vs. Analog Voltage



Leakage Current vs. Temperature



Q_S, Q_D - Charge Injection vs. Analog Voltage



Off Isolation vs. Frequency

SCHEMATIC DIAGRAM (typical channel)

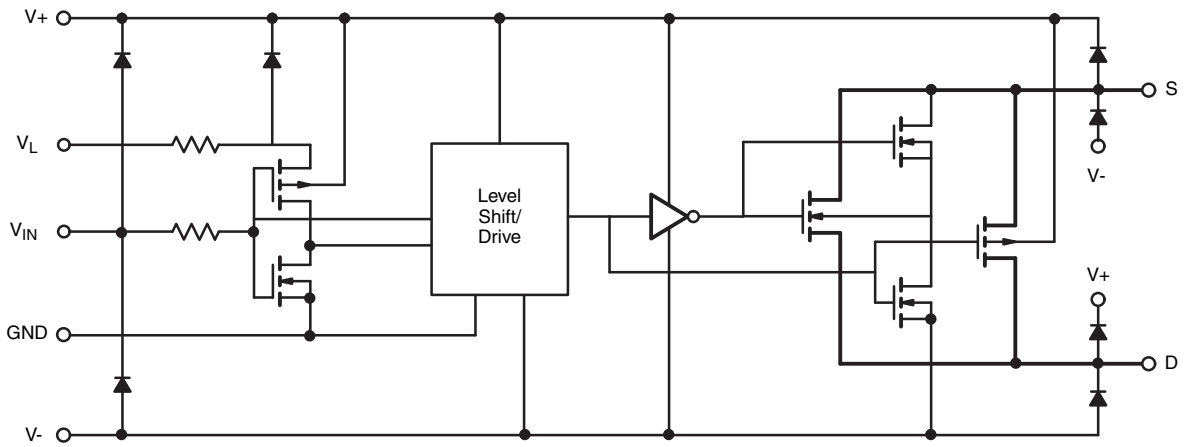
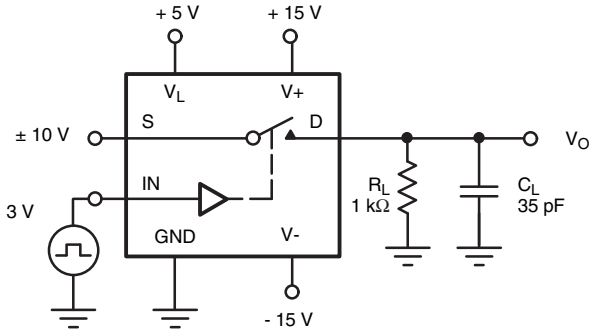
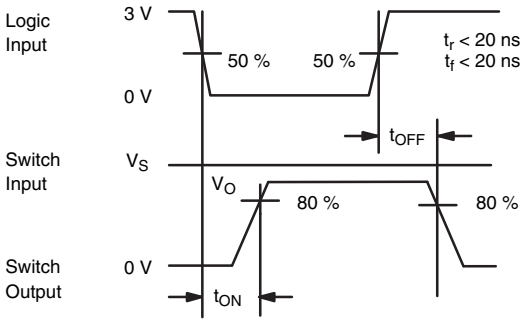


Figure 1.

TEST CIRCUITS

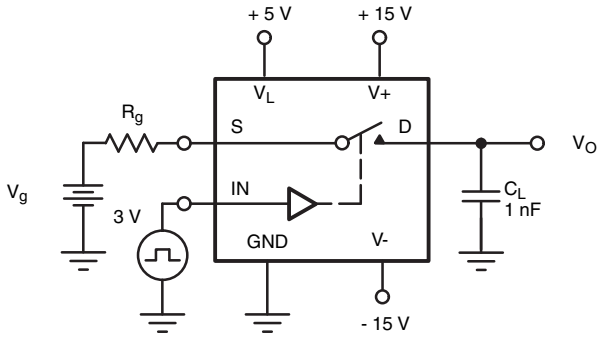


C_L (includes fixture and stray capacitance)



Note: Logic input waveform is inverted for DG445.

Figure 2. Switching Time



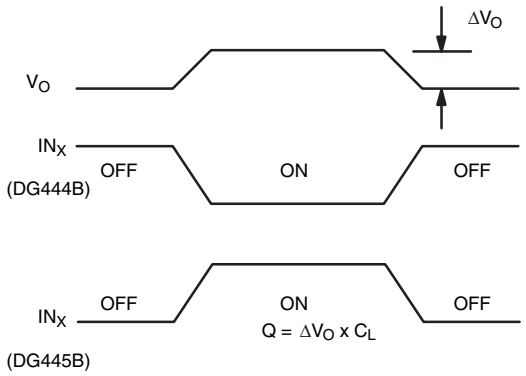


Figure 3. Charge Injection

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Document Number: 72626
S13-1287-Rev. C, 27-May-13

TEST CIRCUITS

C = 1 mF tantalum in parallel with 0.01 mF ceramic

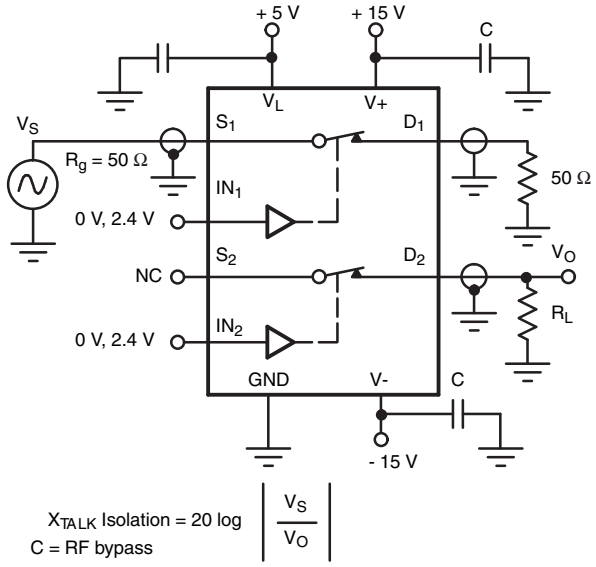


Figure 4. Crosstalk

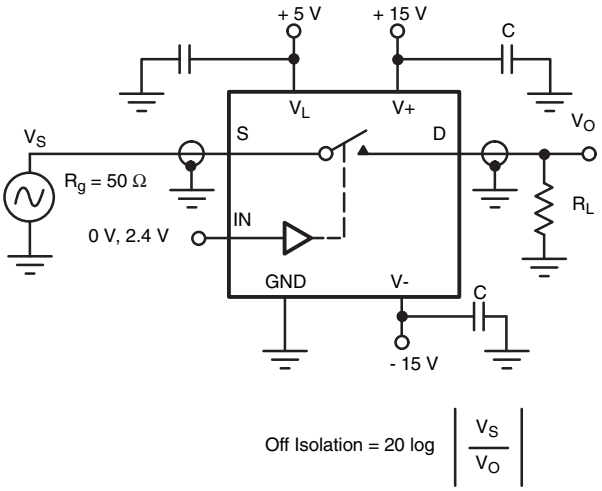


Figure 5. Off Isolation

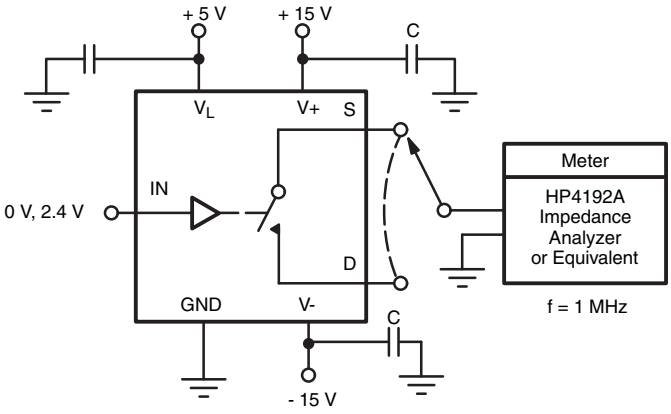


Figure 6. Source/Drain Capacitances

APPLICATIONS

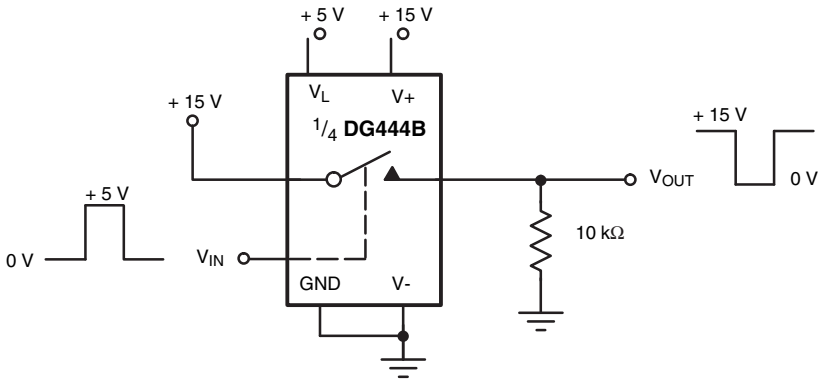


Figure 7. Level Shifter

APPLICATIONS

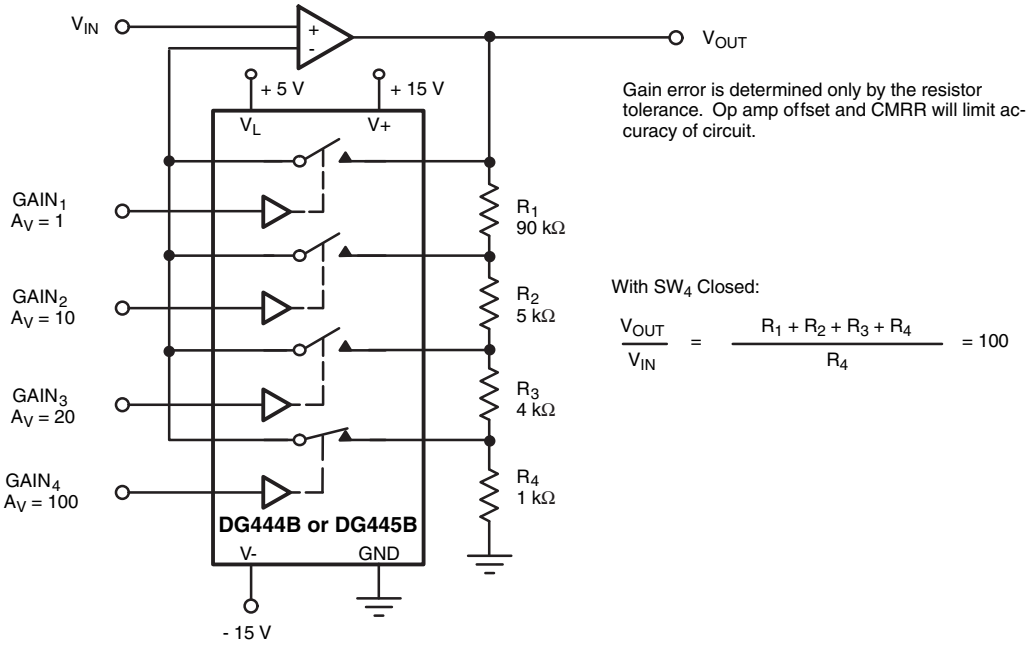


Figure 8. Precision-Weighted Resistor Programmable-Gain Amplifier

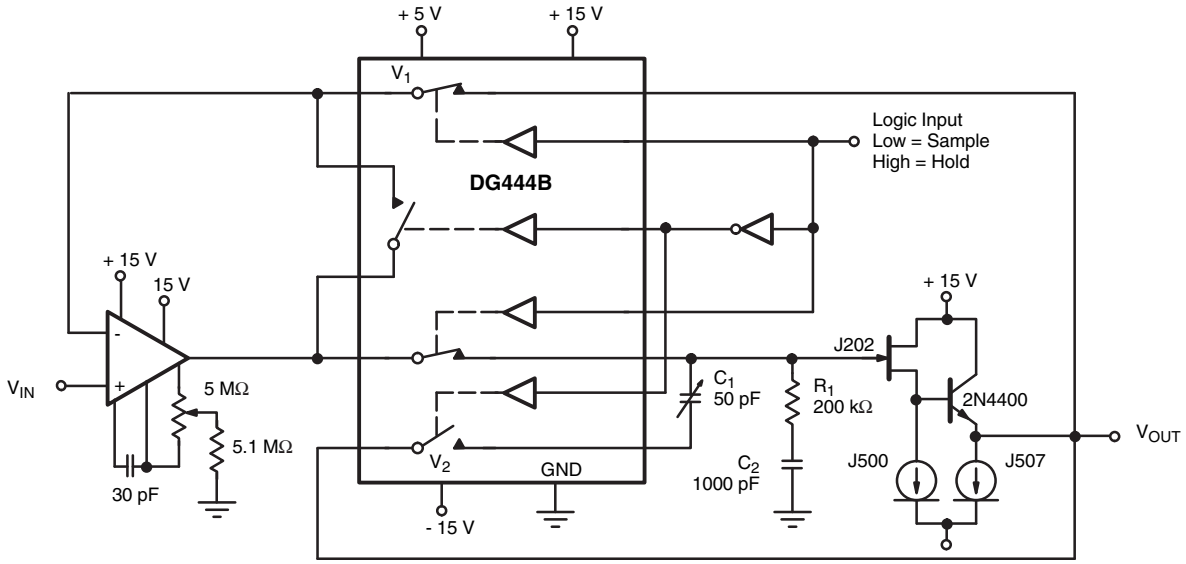
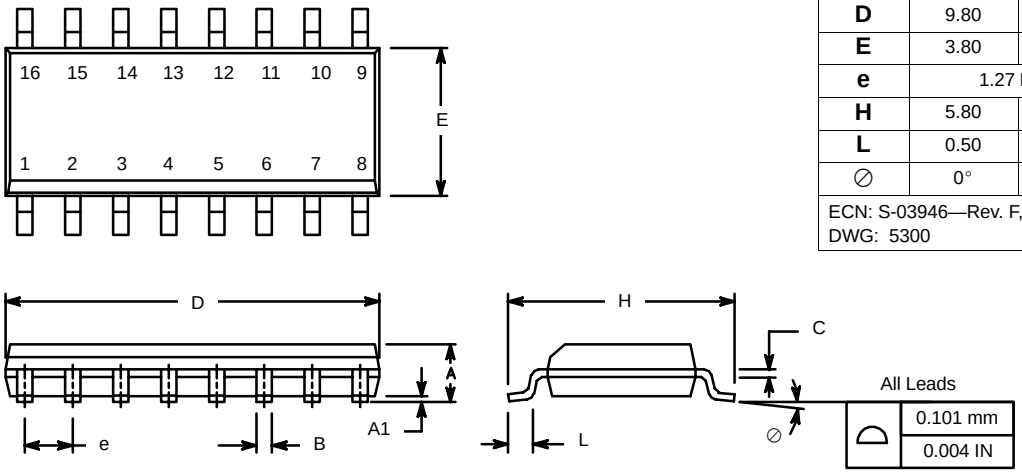


Figure 9. Precision Sample-and-Hold

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?72626.

Package Information
Vishay Siliconix

SOIC (NARROW): 16-LEAD
JEDEC Part Number: MS-012

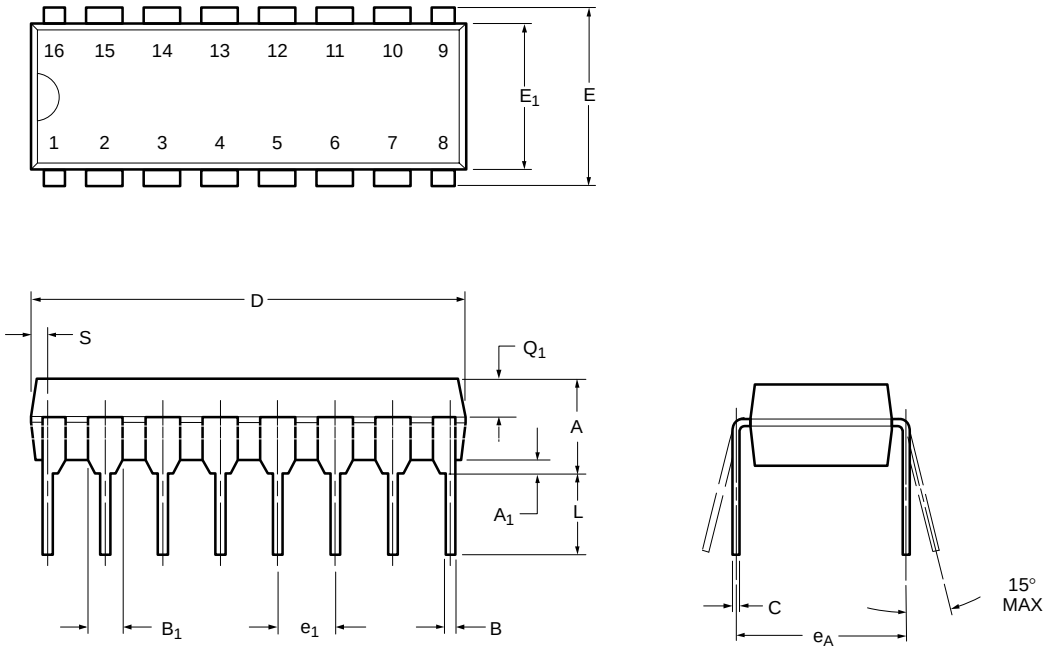


Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	1.35	1.75	0.053	0.069
A_1	0.10	0.20	0.004	0.008
B	0.38	0.51	0.015	0.020
C	0.18	0.23	0.007	0.009
D	9.80	10.00	0.385	0.393
E	3.80	4.00	0.149	0.157
e	1.27 BSC		0.050 BSC	
H	5.80	6.20	0.228	0.244
L	0.50	0.93	0.020	0.037
⊘	0°	8°	0°	8°

ECN: S-03946—Rev. F, 09-Jul-01
DWG: 5300

Package Information
Vishay Siliconix

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

VISHAY

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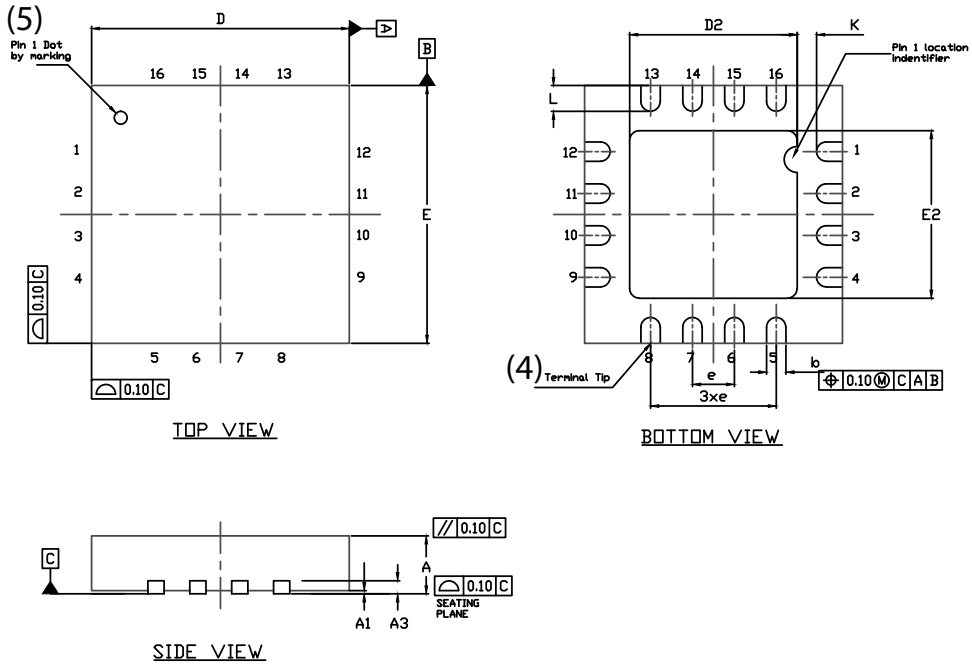
Package Information

Vishay Siliconix

QFN 4x4-16L Case Outline



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 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
N[3]	16			16			16			16		
Nd[3]	4			4			4			4		
Ne[3]	4			4			4			4		

Notes

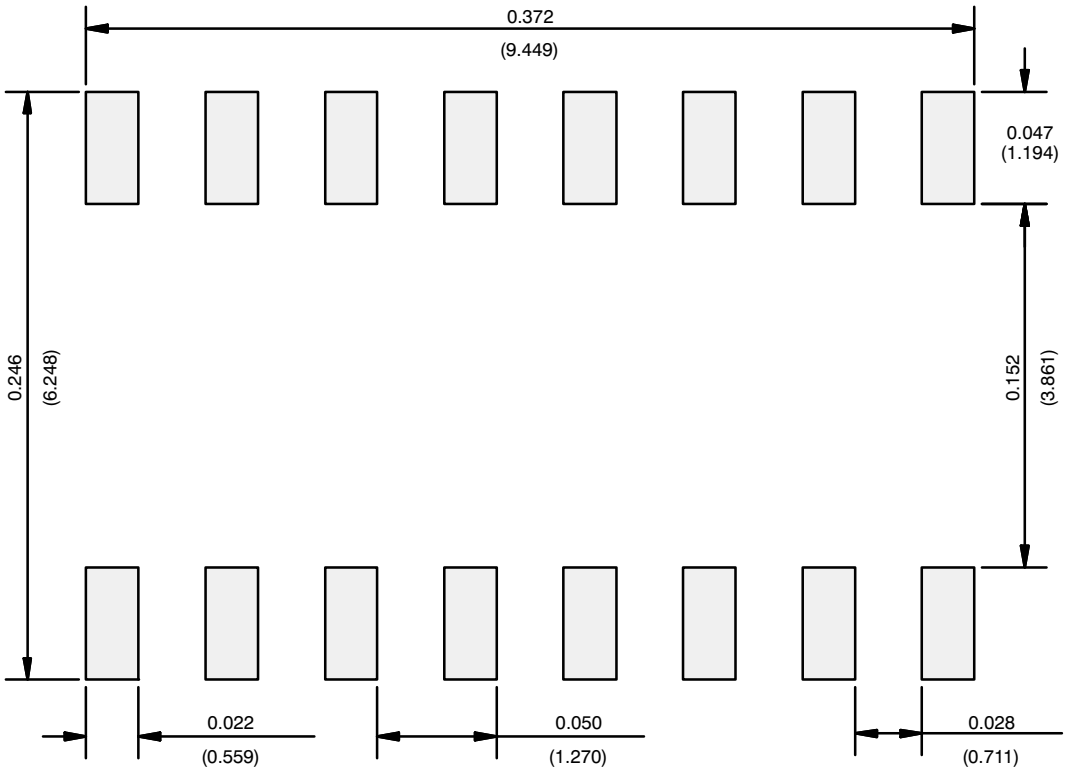
(1) Use millimeters as the primary measurement.
(2) Dimensioning and tolerances conform to ASME Y14.5M. - 1994.
(3) N is the number of terminals. Nd and Ne is the number of terminals in each D and E site respectively.
(4) Dimensions b applies to plated terminal and is measured between 0.15 mm and 0.30 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: 5890

Application Note 826

Vishay Siliconix

RECOMMENDED MINIMUM PADS FOR SO-16



Recommended Minimum Pads
Dimensions in Inches/(mm)

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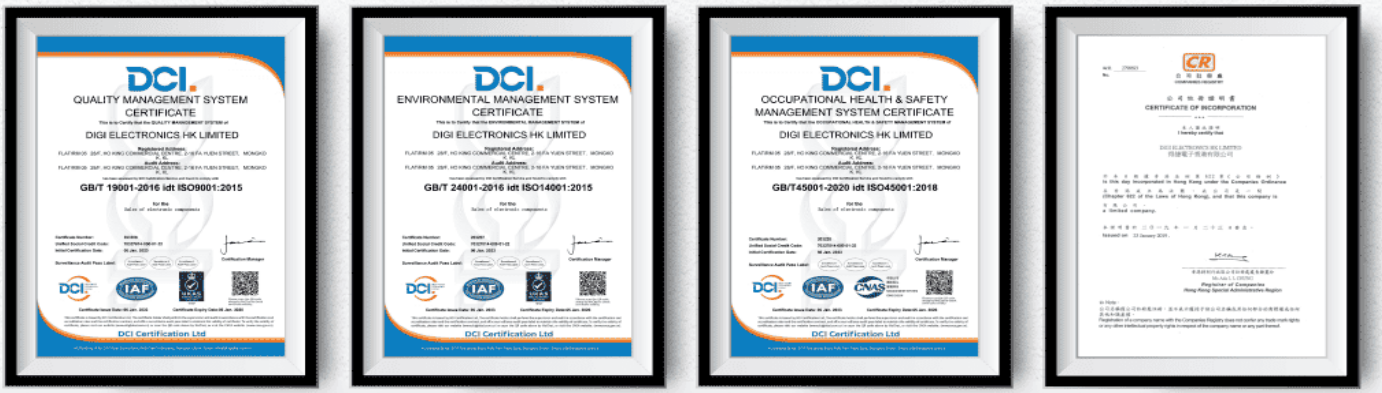

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