

**TRUTH TABLE (DG408)**

A ₂	A ₁	A ₀	EN	ON SWITCH
X	X	X	0	None
0	0	0	1	1
0	0	1	1	2
0	1	0	1	3
0	1	1	1	4
1	0	0	1	5
1	0	1	1	6
1	1	0	1	7
1	1	1	1	8

TRUTH TABLE (DG409)

A ₁	A ₀	EN	ON SWITCH
X	X	0	None
0	0	1	1
0	1	1	2
1	0	1	3
1	1	1	4

Notes

- Logic "0" = $V_{AL} \leq 0.8\text{ V}$
- Logic "1" = $V_{AH} \geq 2.4\text{ V}$
- X = Do not care

ORDERING INFORMATION (Commercial)

PART	CONFIGURATION	TEMP. RANGE	PACKAGE	ORDERING PART NUMBER
DG408	8:1 x 1	-40 °C to 85 °C	16-pin plastic DIP	DG408DJ
				DG408DJ-E3
			16-pin SOIC	DG408DY
				DG408DY-E3
				DG408DY-T1
				DG408DY-T1-E3
			16-pin TSSOP	DG408DQ-E3
				DG408DQ-T1-E3
DG409	4:1 x 2	-40 °C to 85 °C	16-pin plastic DIP	DG409DJ
				DG409DJ-E3
			16-pin SOIC	DG409DY
				DG409DY-E3
				DG409DY-T1
				DG409DY-T1-E3
			16-pin TSSOP	DG409DQ-E3
				DG409DQ-T1-E3

Note

- T1 indicates Tape and Reel, -E3 indicates Lead-Free and RoHS Compliant, NO -E3 indicates standard Tin/Lead finish.

ABSOLUTE MAXIMUM RATINGS

PARAMETER		LIMIT	UNIT
Voltages Referenced to V-	V+ to V- ^e	44	V
	GND to V-	-25	
Digital Inputs ^a , V _S , V _D		(V-) - 2 to (V+) + 2 or 20 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	(DJ, DY suffix)	-65 to 125	°C
Power Dissipation (Package) ^b	16-pin plastic DIP ^c	450	mW
	16-pin narrow SOIC and TSSOP ^d	600	

Notes

- 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.
- All leads soldered or welded to PC board.
- Derate 6 mW/°C above 75 °C.
- Derate 7.6 mW/°C above 75 °C.
- Also applies when V- = GND.

**SPECIFICATIONS ^a**

PARAMETER		SYMBOL	TEST CONDITIONS UNLESS OTHERWISE SPECIFIED	TEMP. ^b	TYP. ^c	D SUFFIX -40 °C to 85 °C		UNIT	
			V ₊ = 15 V, V ₋ = -15 V			MIN. ^d	MAX. ^d		
			V _{AL} = 0.8 V, V _{AH} = 2.4 V ^f						
Analog Switch									
Analog Signal Range ^e		V _{ANALOG}		Full	-	-15	15	V	
Drain-Source On-Resistance		R _{DS(on)}	V _D = ± 10 V, I _S = -10 mA	Room	40	-	100	Ω	
				Full	-	-	125		
R _{DS(on)} Matching Between Channels ^g		ΔR _{DS(on)}	V _D = ± 10 V	Room	-	-	15		
Source Off Leakage Current		I _{S(off)}	V _S = ± 10 V, V _D = ± 10 V, V _{EN} = 0 V	Room	-	-0.5	0.5	nA	
				Full	-	-5	5		
DG408	Drain Off Leakage Current	I _{D(off)}	V _D = ± 10 V, V _S = ± 10 V, V _{EN} = 0 V	Room	-	-1	1		
DG408				Full	-	-20	20		
DG409				Room	-	-1	1		
DG409				Full	-	-10	10		
DG408	Drain On Leakage Current	I _{D(on)}	V _S = V _D = ± 10 V sequence each switch on	Room	-	-1	1		
DG408				Full	-	-20	20		
DG409				Room	-	-1	1		
DG409				Full	-	-10	10		
Digital Control									
Logic High Input Voltage		V _{INH}		Full	-	2.4	-	V	
Logic Low Input Voltage		V _{INL}		Full	-	-	0.8		
Logic High Input Current		I _{AH}	V _A = 2.4 V, 15 V	Full	-	-10	10	μA	
Logic Low Input Current		I _{AL}	V _{EN} = 0 V, 2.4 V, V _A = 0 V	Full	-	-10	10		
Logic Input Capacitance		C _{in}	f = 1 MHz	Room	8	-	-	pF	
Dynamic Characteristics									
Transition Time		t _{TRANS}	see figure 2	Full	160	-	250	ns	
Break-Before-Make Interval		t _{OPEN}	see figure 4	Room	-	10	-		
Enable Turn-On Time		t _{ON(EN)}	see figure 3	Room	115	-	150		
				Full	-	-	-		
Enable Turn-Off Time		t _{OFF(EN)}		Room	105	-	150		
Charge Injection		Q	C _L = 10 nF, V _S = 0 V	Room	20	-	-	pC	
Off Isolation ^h		OIRR	V _{EN} = 0 V, R _L = 1 kΩ, f = 1 MHz	Room	-75	-	-	pF	
Source Off Capacitance		C _{S(off)}	V _{EN} = 0 V, V _S = 0 V, f = 1 MHz	Room	3	-	-		
DG408	Drain Off Capacitance	C _{D(off)}	V _{EN} = 0 V, V _D = 0 V, f = 1 MHz	Room	26	-	-		
DG409				Room	14	-	-		
DG408	Drain On Capacitance	C _{D(on)}		Room	37	-	-		
DG409				Room	25	-	-		
Power Supplies									
Positive Supply Current		I ₊		V _{EN} = V _A = 0 V or 5 V	Full	10	-	75	μA
Negative Supply Current		I ₋			Full	1	-75	-	
Positive Supply Current		I ₊	V _{EN} = V _A = 0 V or 5 V	Room	0.2	-	0.5	mA	
				Full	-	-	2		
Negative Supply Current		I ₋			Full	-	-500	-	μA



SPECIFICATIONS ^a (Single Supply)							
PARAMETER	SYMBOL	TEST CONDITIONS UNLESS OTHERWISE SPECIFIED	TEMP. ^b	TYP. ^c	D SUFFIX -40 °C to 85 °C		UNIT
		V ₊ = 12 V, V ₋ = 0 V			MIN. ^d	MAX. ^d	
		V _{AL} = 0.8 V, V _{AH} = 2.4 V ^f					
Analog Switch							
Drain-Source On-Resistance ^{e,f}	R _{DS(on)}	V _D = 3 V, 10 V, I _S = -1 mA	Room	90	-	-	Ω
Dynamic Characteristics							
Switching Time of Multiplexer ^e	t _{TRANS}	V _{S1} = 8 V, V _{S8} = 0 V, V _{IN} = 2.4 V	Room	180	-	-	ns
Enable Turn-On Time ^e	t _{ON(EN)}	V _{INH} = 2.4 V, V _{INL} = 0 V, V _{S1} = 5 V	Room	180	-	-	
Enable Turn-Off Time ^e	t _{OFF(EN)}		Room	120	-	-	
Charge Injection ^e	Q	C _L = 1 nF, V _S = 0 V, R _S = 0	Room	5	-	-	pC

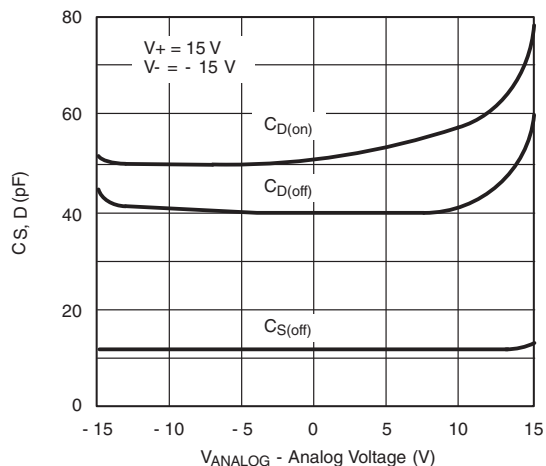
Notes

- 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 datasheet.
- e. Guaranteed by design, not subject to production test.
- f. V_{IN} = input voltage to perform proper function.
- g. ΔR_{DS(on)} = R_{DS(on)} max. - R_{DS(on)} min.
- h. Worst case isolation occurs on channel 4 due to proximity to the drain pin.

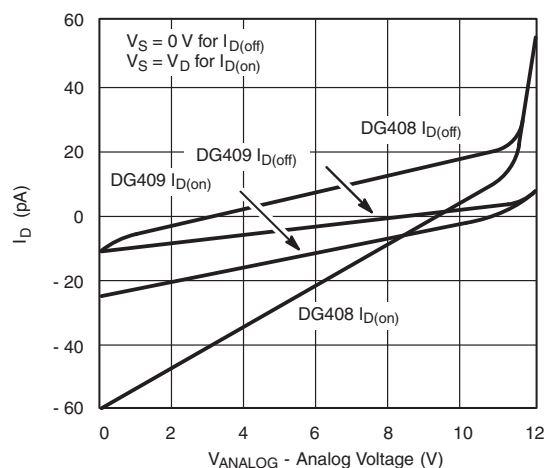
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



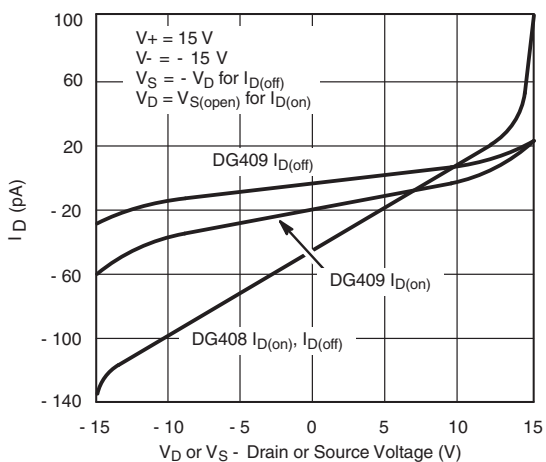
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



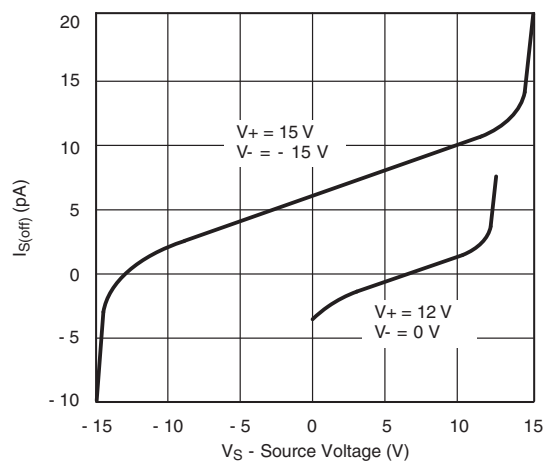
Source/Drain Capacitance vs. Analog Voltage



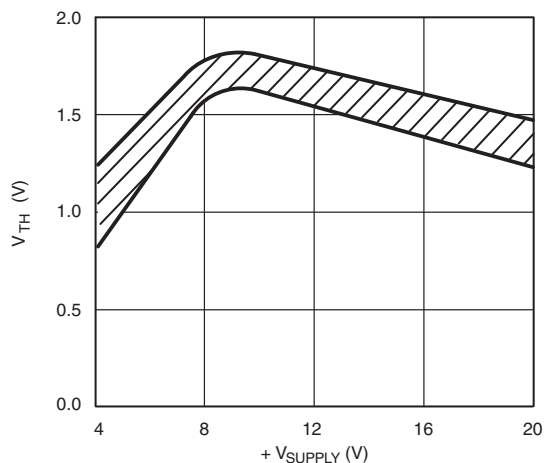
Drain Leakage Current vs. Source/Drain Voltage
(Single 12 V Supply)



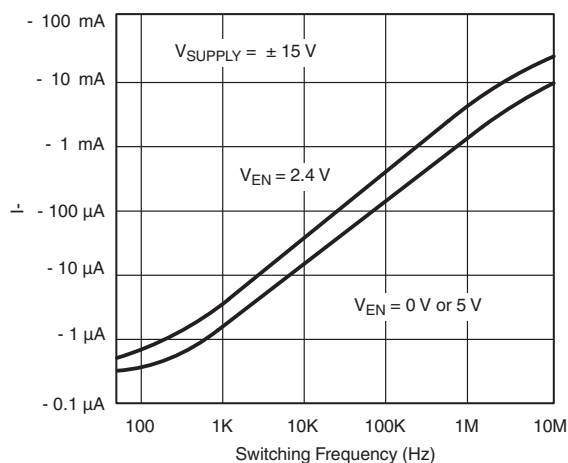
Drain Leakage Current vs. Source/Drain Voltage



Source Leakage Current vs. Source Voltage



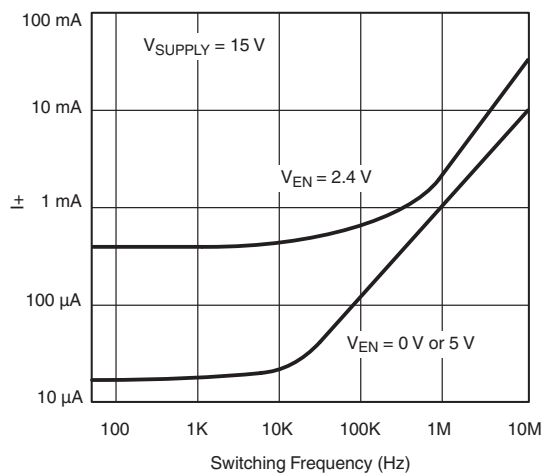
Input Switching Threshold vs. Supply Voltage



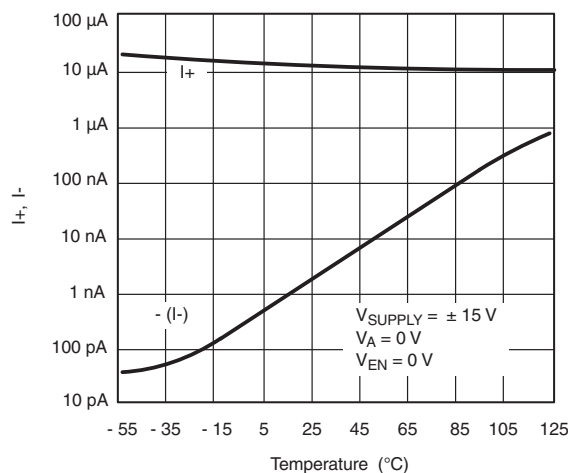
Negative Supply Current vs. Switching Frequency



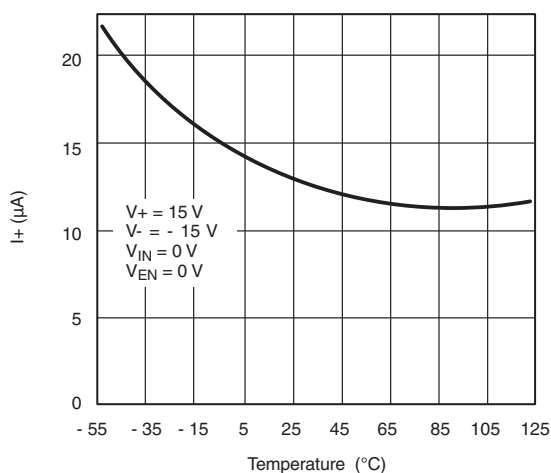
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



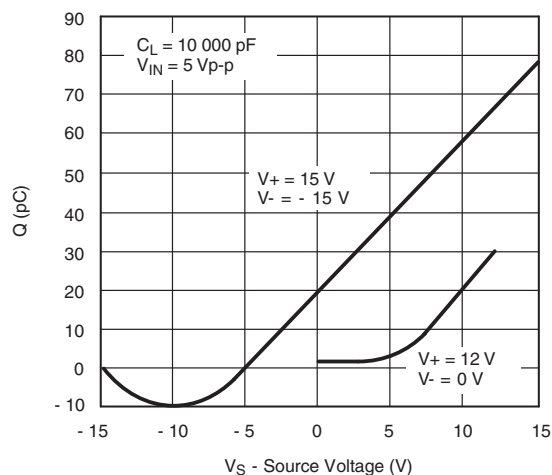
Positive Supply Current vs. Switching Frequency



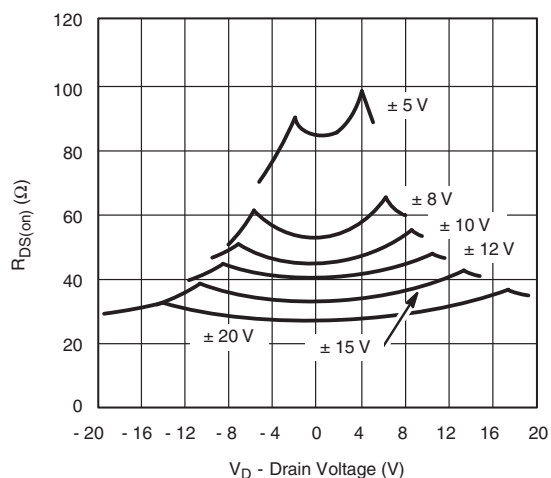
I_{SUPPLY} vs. Temperature



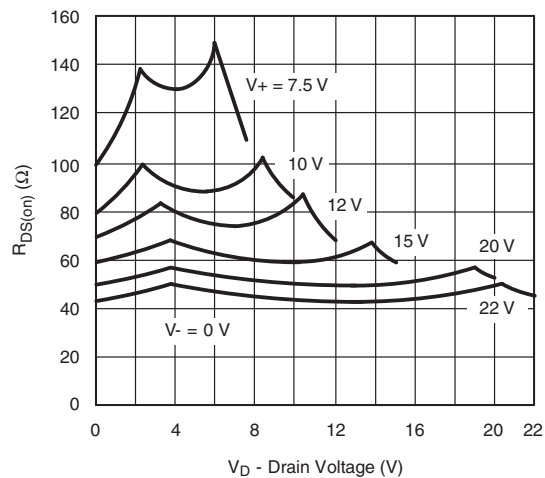
Positive Supply Current vs. Temperature (DG408)



Charge Injection vs. Analog Voltage



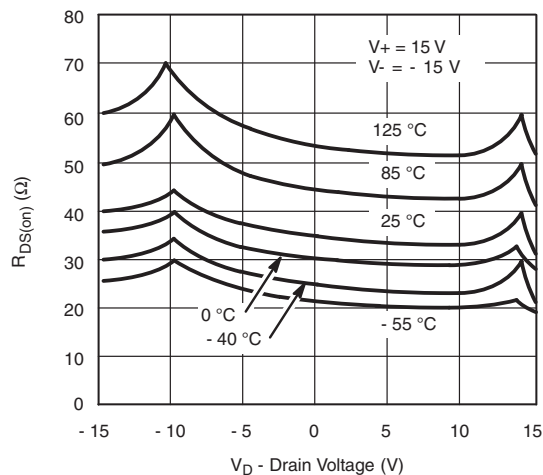
$R_{DS(on)}$ vs. V_D and Supply



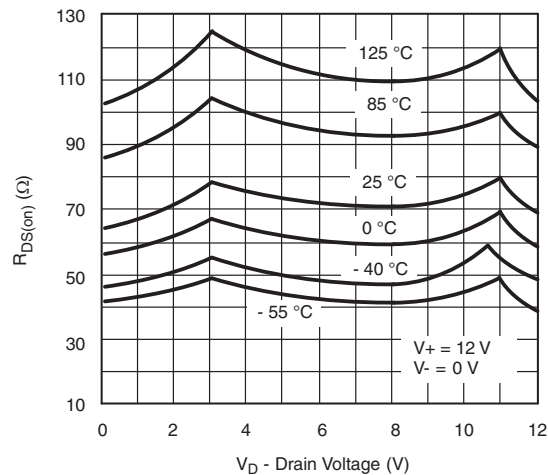
$R_{DS(on)}$ vs. V_D and Supply (Single Supply)



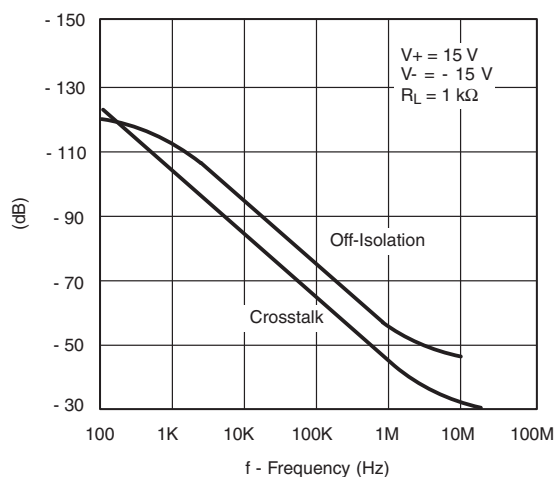
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



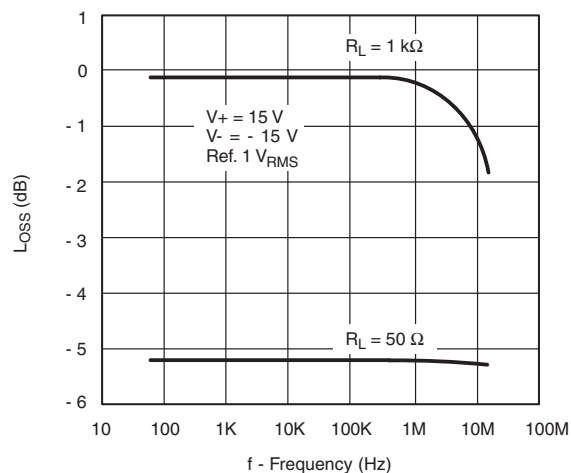
$R_{DS(on)}$ vs. V_D and Temperature



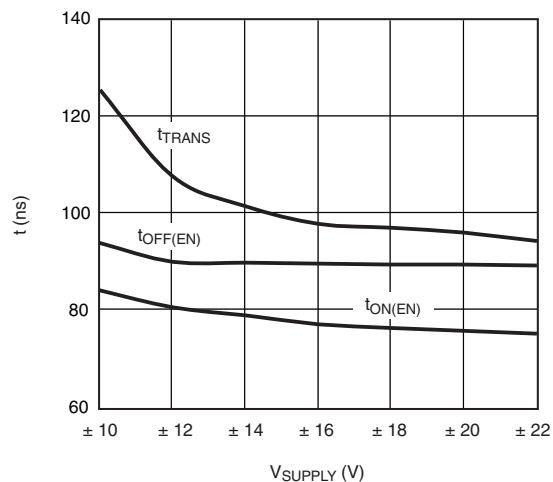
$R_{DS(on)}$ vs. V_D and Temperature (Single Supply)



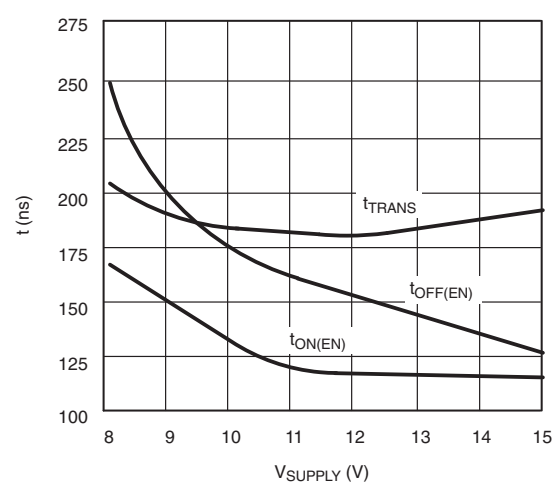
Off Isolation and Crosstalk vs. Frequency



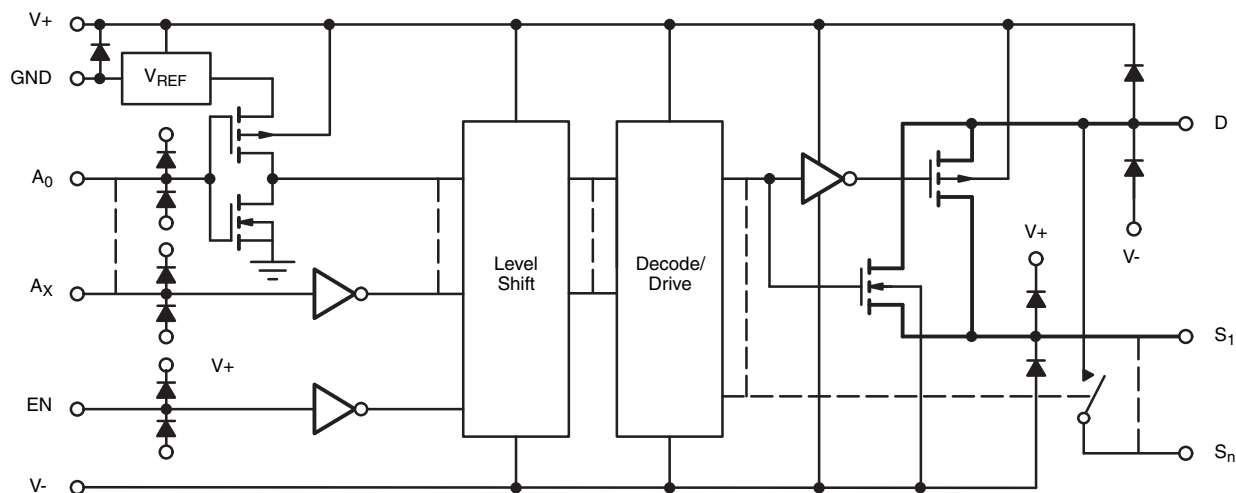
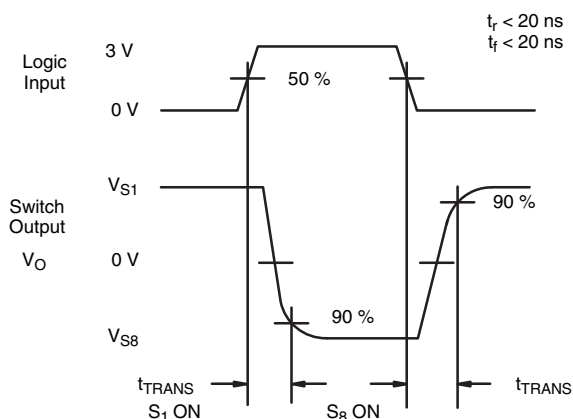
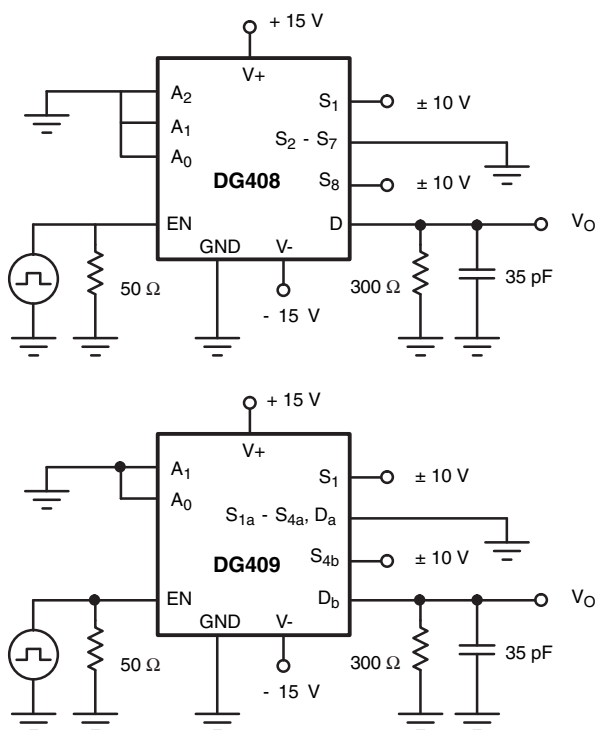
Insertion Loss vs. Frequency

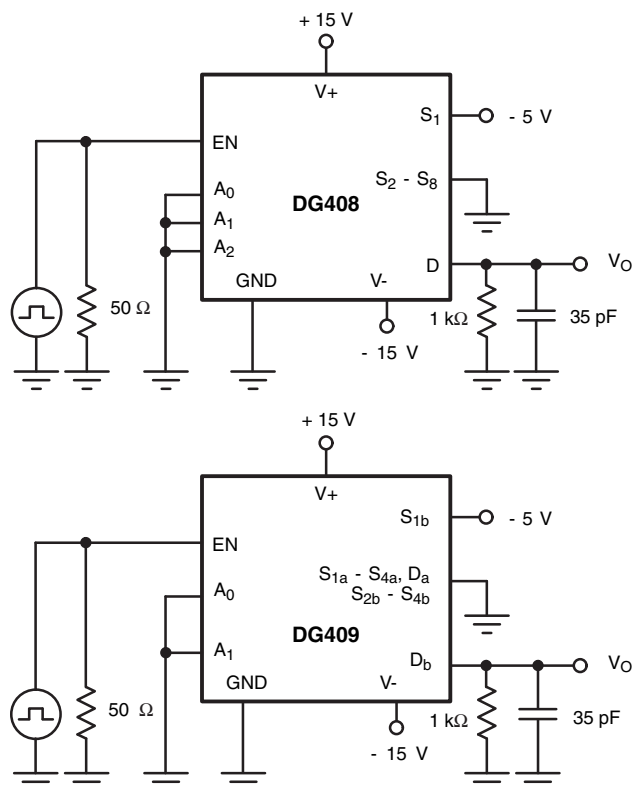
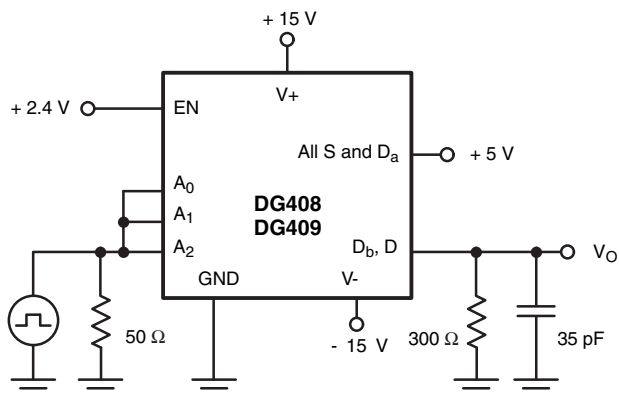
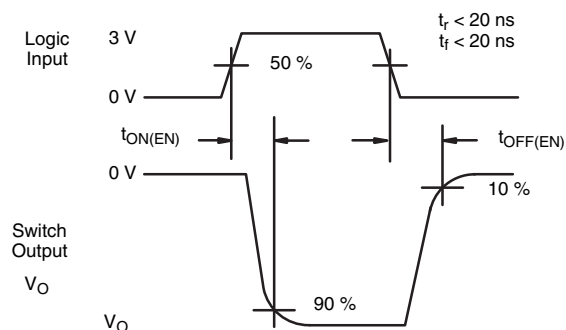
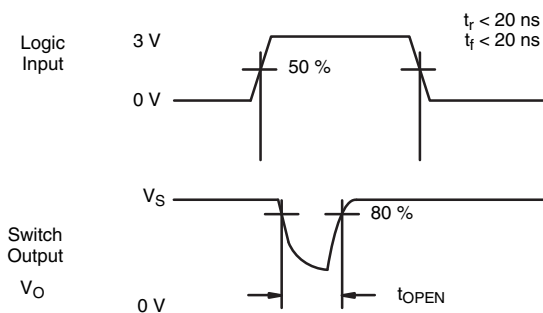


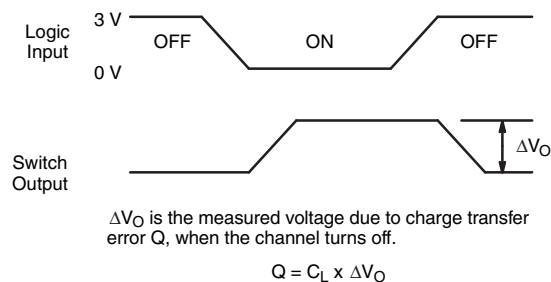
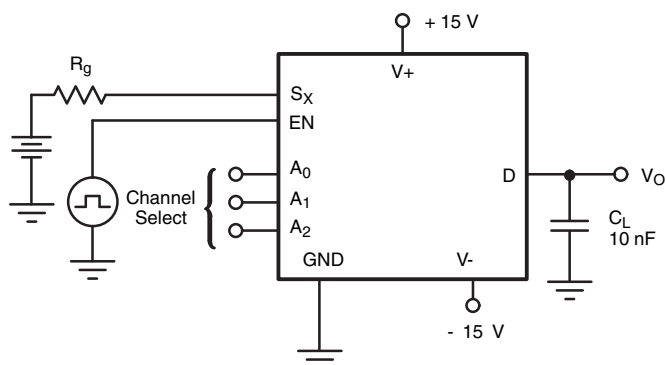
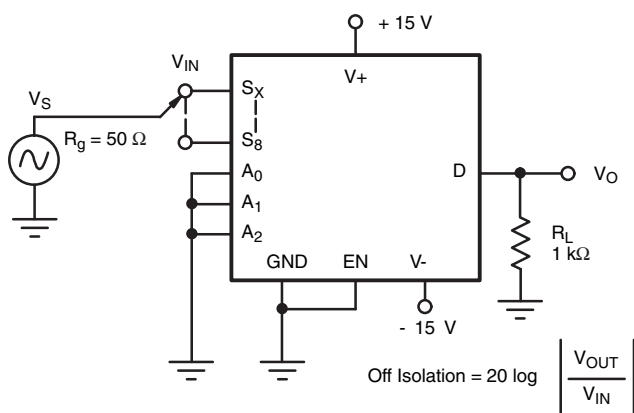
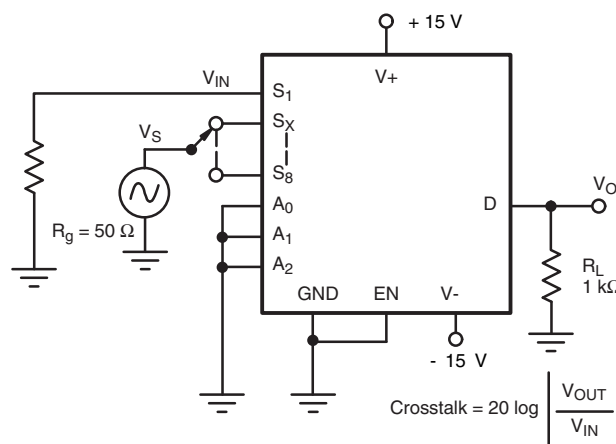
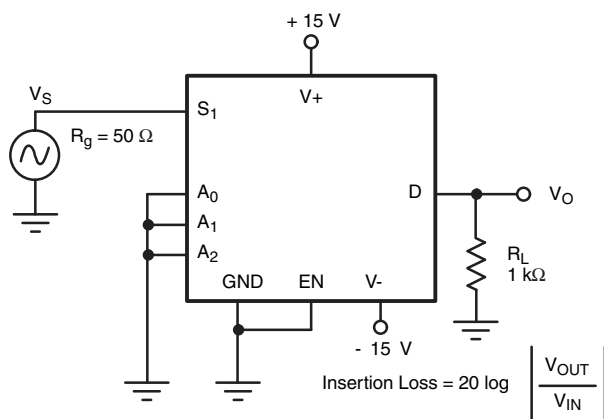
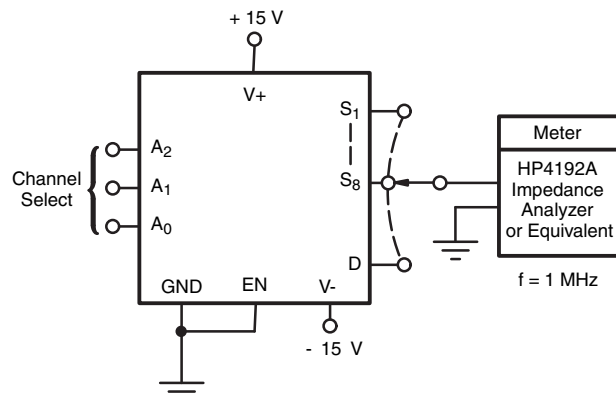
Switching Time vs. Bipolar Supply



Switching Time vs. Single Supply

SCHEMATIC DIAGRAM (Typical Channel)

Fig. 1
TEST CIRCUITS

Fig. 2 - Transition Time

TEST CIRCUITS

Fig. 3 - Enable Switching Time

Fig. 4 - Break-Before-Make Interval


TEST CIRCUITS

Fig. 5 - Charge Injection

Fig. 6 - Off Isolation

Fig. 7 - Crosstalk

Fig. 8 - Insertion Loss

Fig. 9 - Source Drain Capacitance

APPLICATION HINTS

Overvoltage Protection

A very convenient form of overvoltage protection consists of adding two small signal diodes (1N4148, 1N914 type) in series with the supply pins (see figure 10). This arrangement effectively blocks the flow of reverse currents. It also floats the supply pin above or below the normal $V+$ or $V-$ value. In this case the overvoltage signal actually becomes the power

supply of the IC. From the point of view of the chip, nothing has changed, as long as the difference $V_S - (V_-)$ does not exceed + 44 V. The addition of these diodes will reduce the analog signal range to 1 V below $V+$ and 1 V above $V-$, but it preserves the low channel resistance and low leakage characteristics.

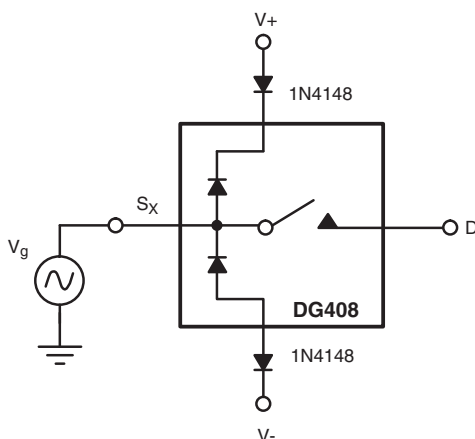


Fig. 10 - Overvoltage Protection Using Blocking Diodes

8-Channel Sequential Multiplexer/Demultiplexer

Differential 4-Channel Sequential Multiplexer/Demultiplexer

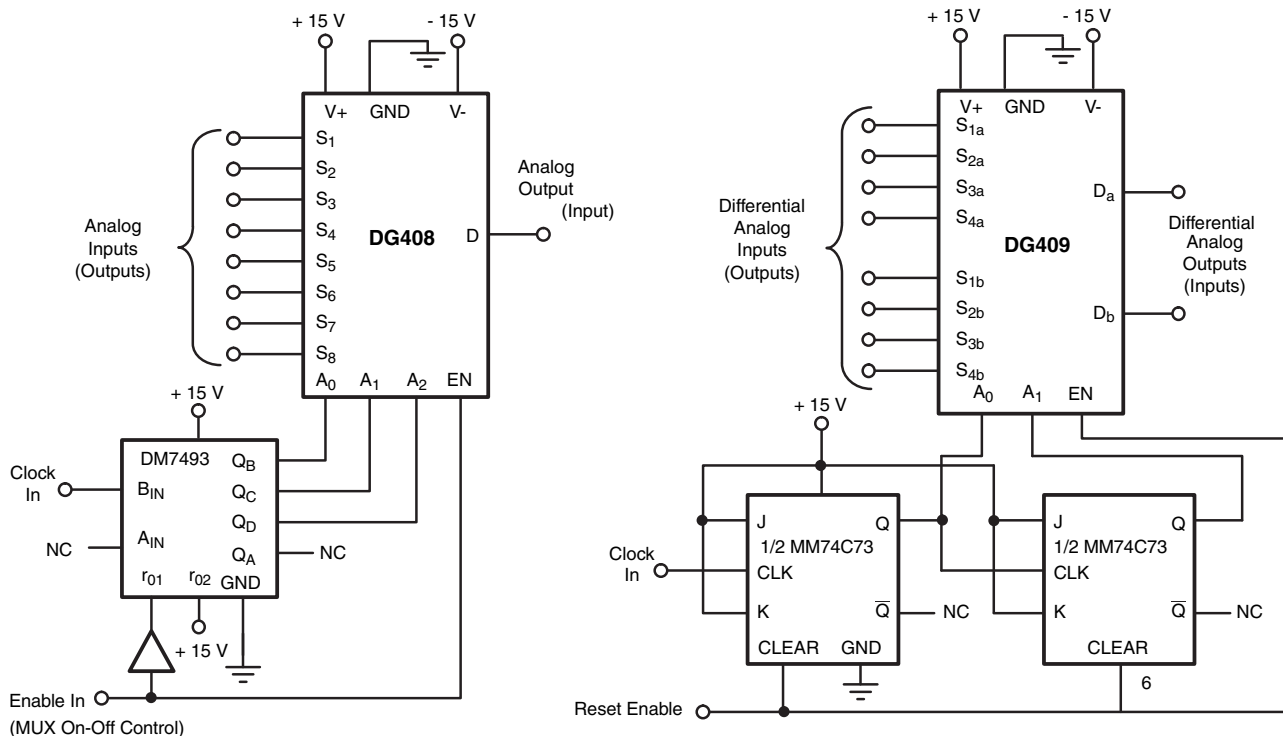


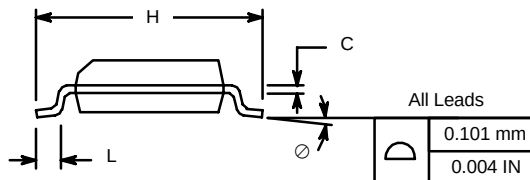
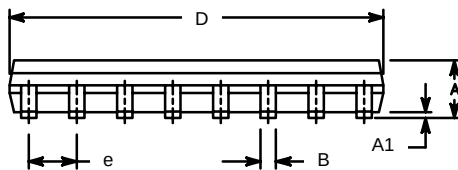
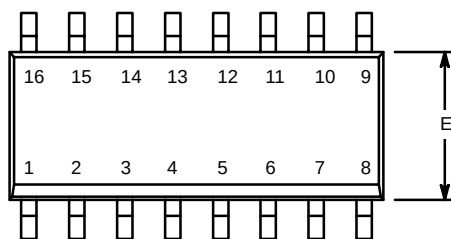
Fig. 11

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?70062.



SOIC (NARROW): 16-LEAD

JEDEC Part Number: MS-012

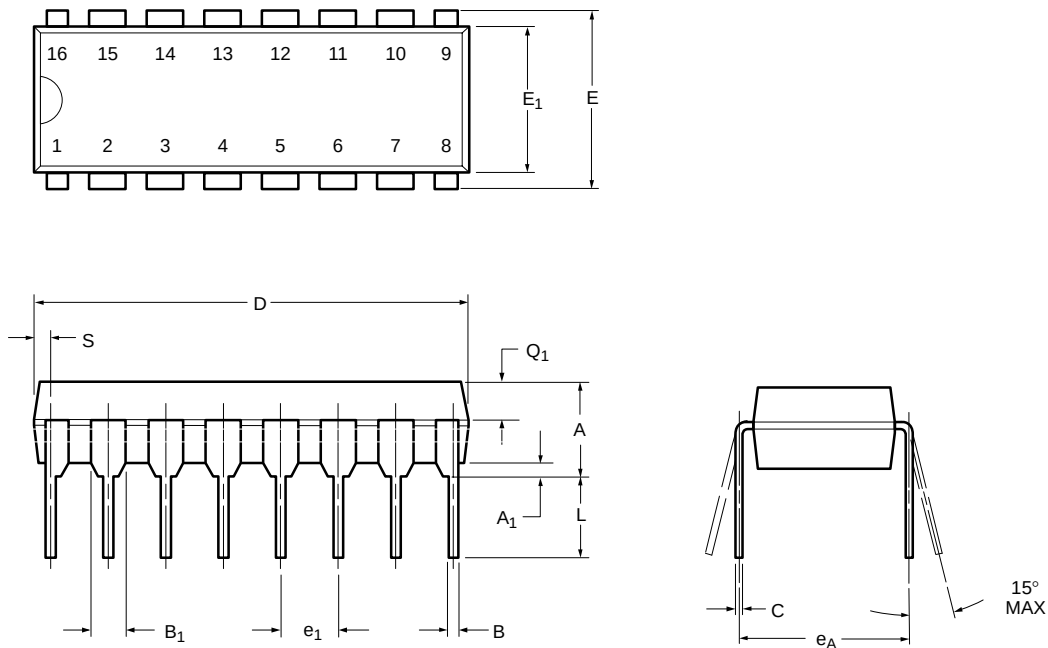


Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	1.35	1.75	0.053	0.069
A ₁	0.10	0.20	0.004	0.008
B	0.38	0.51	0.015	0.020
C	0.18	0.23	0.007	0.009
D	9.80	10.00	0.385	0.393
E	3.80	4.00	0.149	0.157
e	1.27 BSC		0.050 BSC	
H	5.80	6.20	0.228	0.244
L	0.50	0.93	0.020	0.037
Ø	0°	8°	0°	8°

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



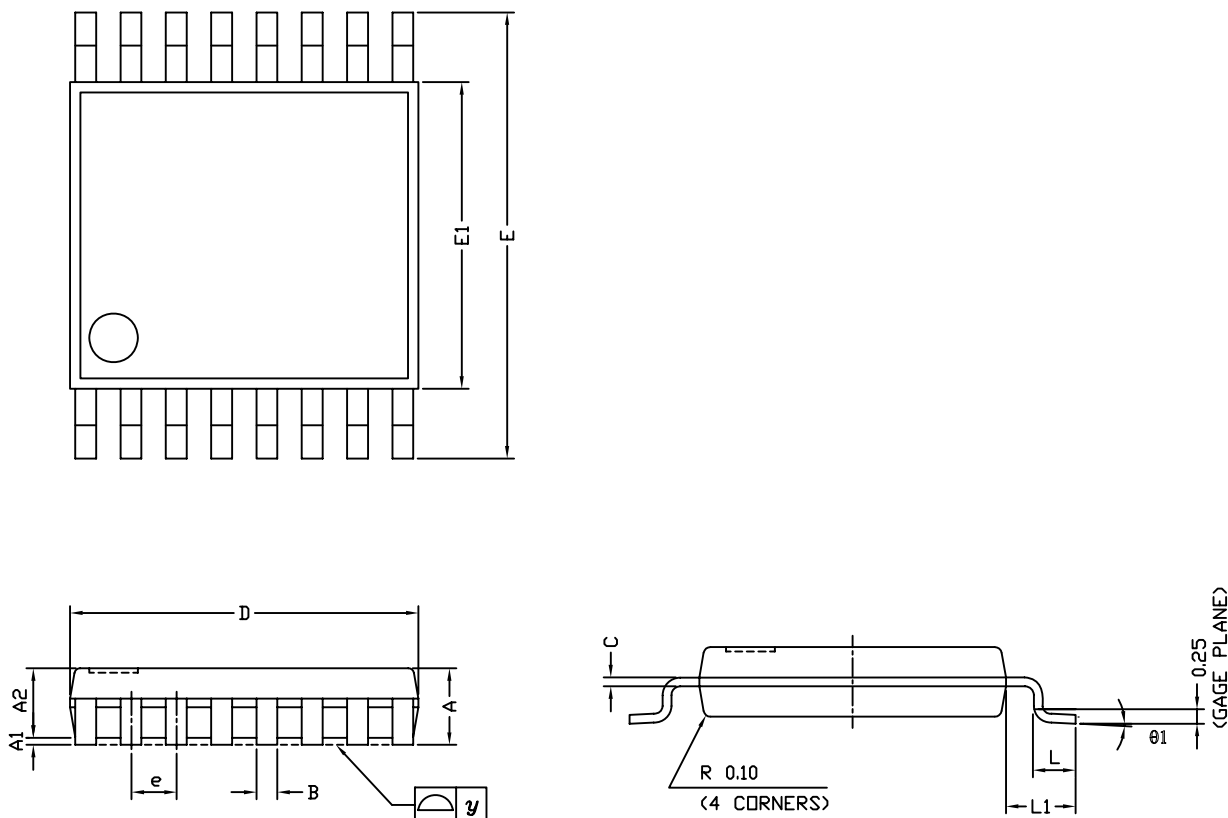
PDIP: 16-LEAD



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

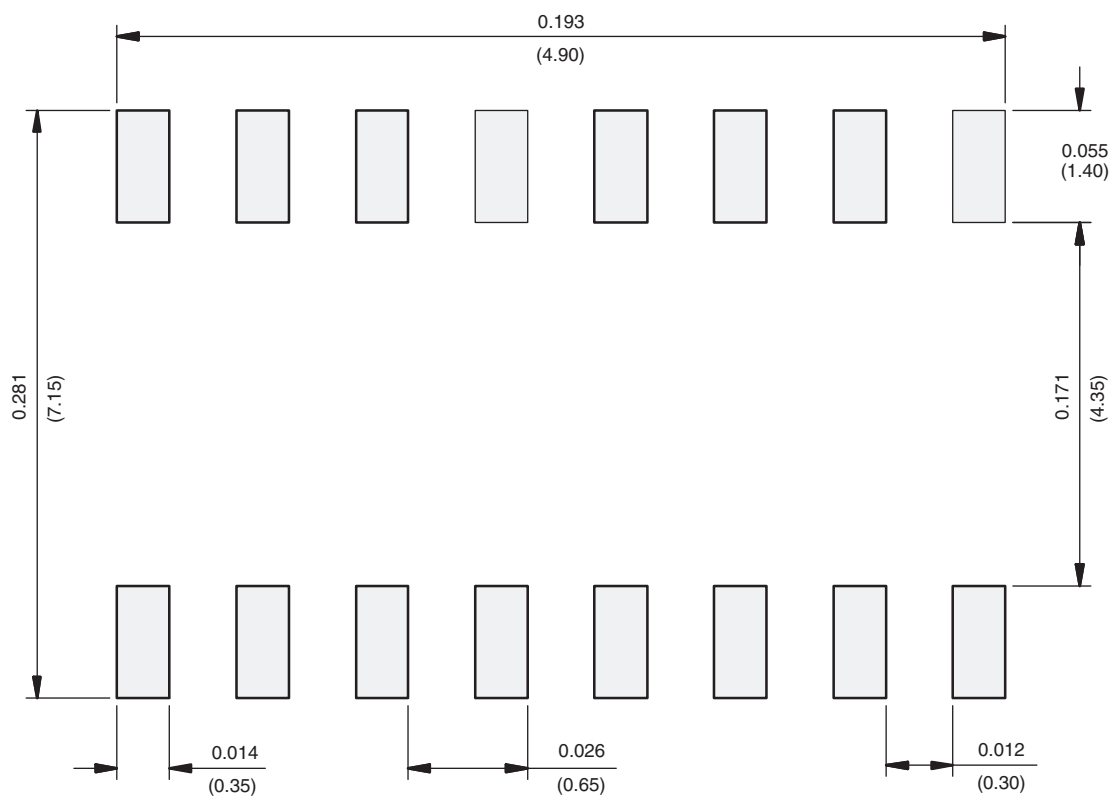
ECN: S-03946—Rev. D, 09-Jul-01
DWG: 5482

TSSOP: 16-LEAD



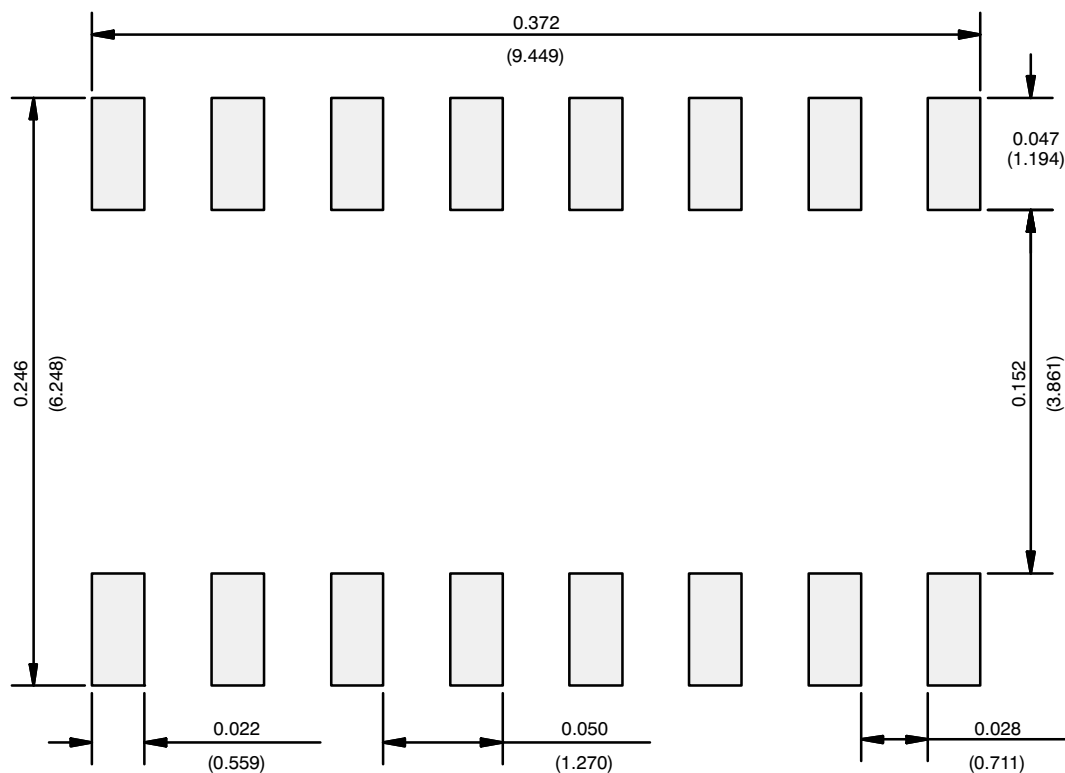
Symbols	DIMENSIONS IN MILLIMETERS		
	Min	Nom	Max
A	-	1.10	1.20
A1	0.05	0.10	0.15
A2	-	1.00	1.05
B	0.22	0.28	0.38
C	-	0.127	-
D	4.90	5.00	5.10
E	6.10	6.40	6.70
E1	4.30	4.40	4.50
e	-	0.65	-
L	0.50	0.60	0.70
L1	0.90	1.00	1.10
y	-	-	0.10
θ1	0°	3°	6°
ECN: S-61920-Rev. D, 23-Oct-06			
DWG: 5624			

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)

[Return to Index](#)



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