



16-Ch/Dual 8-Ch High-Performance CMOS Analog Multiplexers

DESCRIPTION

The DG406B is a 16-channel single-ended analog multiplexer designed to connect one of sixteen inputs to a common output as determined by a 4-bit binary address. The DG407B selects one of eight differential inputs to a common differential output. Break-before-make switching action protects against momentary shorting of inputs.

An on channel conducts current equally well in both directions. In the off state each channel blocks voltages up to the power supply rails. An enable (EN) function allows the user to reset the multiplexer/demultiplexer to all switches off for stacking several devices. All control inputs, address (A_x) and enable (EN) are TTL compatible over the full specified operating temperature range.

Applications for the DG406B, DG407B include high speed data acquisition, audio signal switching and routing, ATE systems, and avionics. High performance and low power dissipation make them ideal for battery operated and remote instrumentation applications.

Designed in the 44 V silicon-gate CMOS process, the absolute maximum voltage rating is extended to 44 V, allowing operation with ± 20 V supplies. Additionally single (12 V) supply operation is allowed. An epitaxial layer prevents latchup.

FEATURES

- Low on-resistance - R_{DS(on)}: 45 Ω
- Low charge injection - Q: 11 pC
- Fast transition time - t_{TRANS}: 115 ns
- Low power: 0.2 mW
- Single supply capability
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912



Note

* This datasheet provides information about parts that are RoHS-compliant and/or parts that are non-RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information/tables in this datasheet for details.

BENEFITS

- Higher accuracy
- Reduced glitching
- Improved data throughput
- Reduced power consumption
- Increased ruggedness
- Wide supply ranges: ± 5 V to ± 20 V

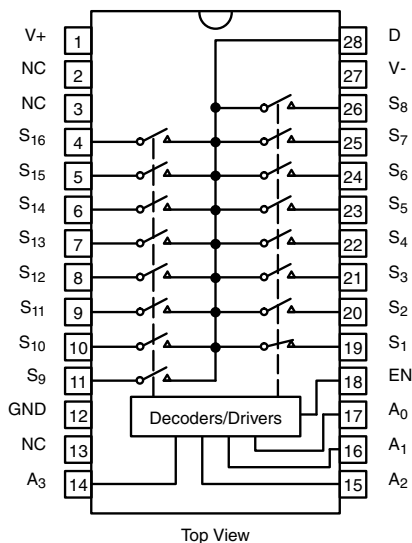
APPLICATIONS

- Data acquisition systems
- Audio signal routing
- Medical instrumentation
- ATE systems
- Battery powered systems
- High-rel systems
- Single supply systems

FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION

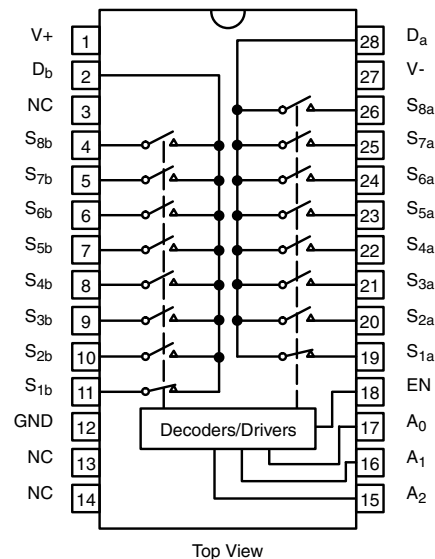
DG406B

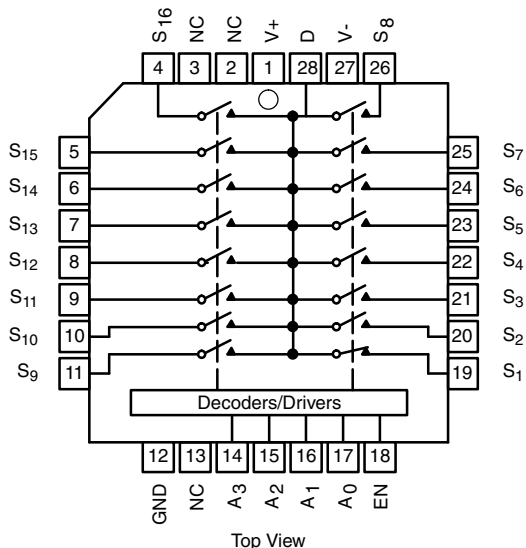
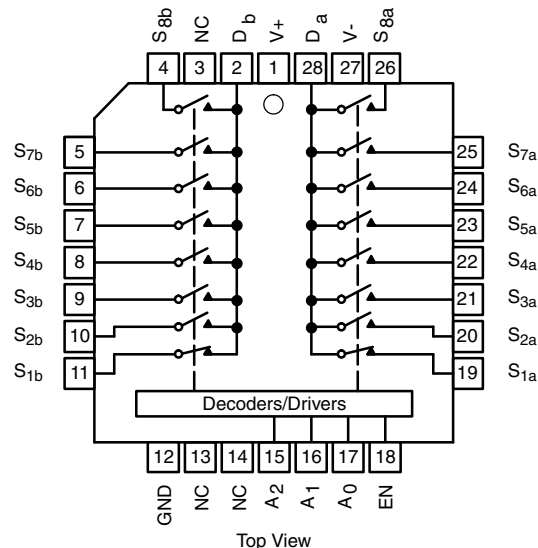
Dual-In-Line and SOIC Wide-Body



DG407B

Dual-In-Line and SOIC Wide-Body



FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION
DG406B
PLCC and LCC

DG407B
PLCC and LCC


TRUTH TABLE (DG406B)					
A ₃	A ₂	A ₁	A ₀	EN	ON SWITCH
X	X	X	X	0	None
0	0	0	0	1	1
0	0	0	1	1	2
0	0	1	0	1	3
0	0	1	1	1	4
0	1	0	0	1	5
0	1	0	1	1	6
0	1	1	0	1	7
0	1	1	1	1	8
1	0	0	0	1	9
1	0	0	1	1	10
1	0	1	0	1	11
1	0	1	1	1	12
1	1	0	0	1	13
1	1	0	1	1	14
1	1	1	0	1	15
1	1	1	1	1	16

TRUTH TABLE (DG407B)				
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

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 (DG406B)		
TEMP. RANGE	PACKAGE	PART NUMBER
-40 °C to 85 °C	28-Pin Plastic DIP	DG406BDJ, DG406BDJ-E3
	28-Pin PLCC	DG406BDN, DG406BDN-T1-E3
	28-Pin Widebody SOIC	DG406BDW, DG406BDW-E3, DG406BDW-T1-E3

ORDERING INFORMATION (DG407B)		
TEMP. RANGE	PACKAGE	PART NUMBER
-40 °C to 85 °C	28-Pin Plastic DIP	DG407BDJ, DG407BDJ-E3
	28-Pin PLCC	DG407BDN, DG407BDN-T1-E3
	28-Pin Widebody SOIC	DG407BDW, DG407BDW-E3, DG407BDW-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- ^g	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		-65 to 150	°C
Power Dissipation (Package) ^b	28-Pin Plastic DIP ^c	625	mW
	28-Pin Plastic PLCC ^c	450	mW
	28-Pin Widebody SOIC ^f	450	mW

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 soldered or welded to PC board.
- c. Derate 8.3 mW/°C above 75 °C.
- d. Derate 16 mW/°C above 75 °C.
- e. Derate 18 mW/°C above 75 °C.
- f. Derate 6 mW/°C above 75 °C.
- g. Also applies when V- = GND.

SPECIFICATIONS							
PARAMETER	SYMBOL	TEST CONDITIONS UNLESS OTHERWISE SPECIFIED	TEMP. ^b	TYP. ^c	D SUFFIX -40 °C to 85 °C		UNIT
					MIN. ^d	MAX. ^d	
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 sequence each switch on	Room	45	-	60	Ω
			Full	45	-	74	
R _{DS(on)} Matching Between Channels ^g	ΔR _{DS(on)}	V _D = ± 10 V	Room	5	-	-	%
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	
Drain Off Leakage Current	DG406B	V _D = ± 10 V, V _S = ± 10 V, V _{EN} = 0 V	Room	-	-1	1	
			Full	-	-40	40	
	Room		-	-1	1		
	Full		-	-20	20		
Drain On Leakage Current	DG406B	V _S = V _D = ± 10 V sequence each switch on	Room	-	-1	1	
			Full	-	-40	40	
	Room		-	-1	1		
	Full		-	-20	20		
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	-	-1	1	μA
Logic Low Input Current	I _{AL}	V _{EN} = 0 V, 2.4 V, V _A = 0 V	Full	-	-1	1	
Logic Input Capacitance	C _{in}	f = 1 MHz	Room	6	-	-	pF



SPECIFICATIONS								
PARAMETER	SYMBOL	TEST CONDITIONS UNLESS OTHERWISE SPECIFIED	TEMP. ^b	TYP. ^c	D SUFFIX -40 °C to 85 °C		UNIT	
					MIN. ^d	MAX. ^d		
Dynamic Characteristics								
Transition Time	t _{TRANS}	see figure 2	Room	115	-	148	ns	
			Full	-	-	161		
Break-Before-Make Interval	t _{OPEN}	see figure 4	Room	39	10	-		
			Full	-	21	-		
Enable Turn-On Time	t _{ON(EN)}	see figure 3	Room	75	-	107		
			Full	-	-	123		
Enable Turn-Off Time	t _{OFF(EN)}		Room	50	-	88		
			Full	-	-	94		
Charge Injection	Q	C _L = 1 nF, V _S = 0 V R _S = 0 Ω	Room	11	-	-	pC	
Off Isolation ^h	OIRR	V _{EN} = 0 V, R _L = 50 Ω, f = 1 MHz	Room	-86	-	-	dB	
Source Off Capacitance	C _{S(off)}	V _{EN} = 0 V, V _S = 0 V, f = 1 MHz	Room	6	-	-	pF	
Drain Off Capacitance		V _{EN} = 0 V, V _D = 0 V, f = 1 MHz	Room	108	-	-		
	DG407B		C _{D(off)}	Room	54	-		-
Drain On Capacitance	DG406B		C _{D(on)}	Room	114	-		-
	DG407B		C _{D(on)}	Room	57	-		-
Power Supplies								
Positive Supply Current	I ₊	V _{EN} = V _A = 0 V or 5 V	Room	23	-	30	μA	
			Full	-	-	75		
Negative Supply Current	I ₋		Room	-0.02	-1	-		
			Full	-	-10	-		
Positive Supply Current	I ₊	V _{EN} = 2.4 V, V _A = 0 V	Room	28	-	500		
			Full	-	-	700		
Negative Supply Current	I ₋		Room	-0.01	-20	-		
			Full	-	-20	-		

Notes

- a. Guaranteed by ± 15 V leakage test, not production tested.
- 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.



SPECIFICATIONS FOR SINGLE SUPPLY									
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	-	0	12	V	
Drain-Source On-Resistance	R _{DS(on)}	V _D = 3 V, I _S = -1 mA sequence each switch on		Room	78	-	100	Ω	
R _{DS(on)} Matching Between Channels ^g	ΔR _{DS(on)}			Room	5	-	-	%	
Source Off Leakage Current ^a	I _{S(off)}	V _D = 10 V or 0.5 V, V _S = 0.5 V or 10 V, V _{EN} = 0 V		Room	-	-0.5	0.5	nA	
Drain Off Leakage Current	DG406B		I _{D(off)}		Room	-	-1		1
	DG407B				Room	-	-1		1
Drain On Leakage Current	DG406B		I _{D(on)}		Room	-	-1		1
	DG407B			Room	-	-1	1		
Dynamic Characteristics									
Transition Time	t _{TRANS}	V _{S1} = 8 V, V _{S8} = 0 V, V _{IN} = 2.4 V		Room	130	-	163	ns	
Enable Turn-On Time	t _{ON(EN)}	V _{INH} = 2.4 V, V _{INL} = 0 V, V _{IN} = 5 V		Room	93	-	125		
Enable Turn-Off Time	t _{OFF(EN)}			Room	63	-	94		
Charge Injection	Q	C _L = 1 nF, V _S = 6 V R _S = 0 Ω		Room	9	-	-	pC	
Power Supplies									
Positive Supply Current	I+	V _{EN} = 0 V or 5 V V _A = 0 V or 5 V		Room	13	-	30	μA	
				Full	-	-	75		
Positive Supply Current	I+			Room	-0.01	-20	-		
				Full	-	-20	-		

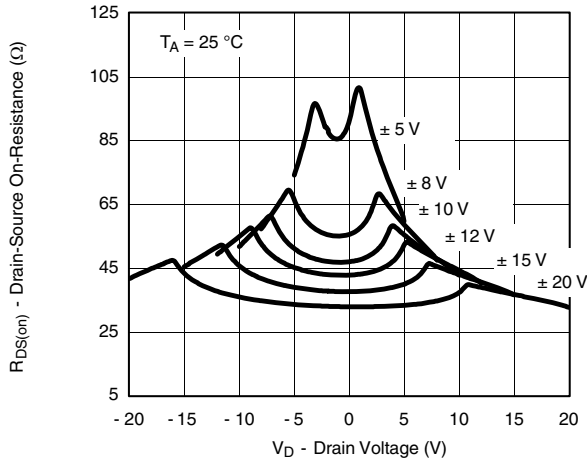
Notes

- a. Guaranteed by ± 15 V leakage test, not production tested.
- 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.

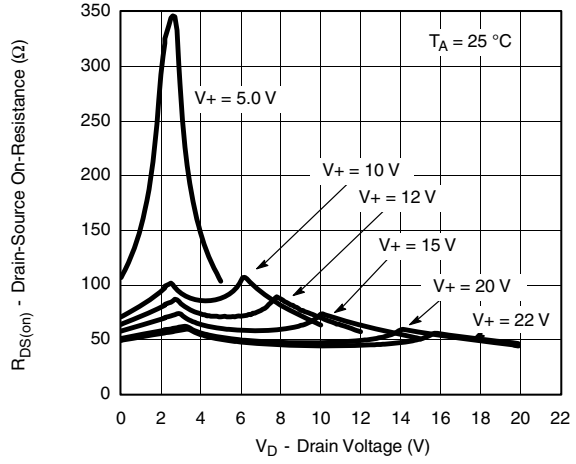
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



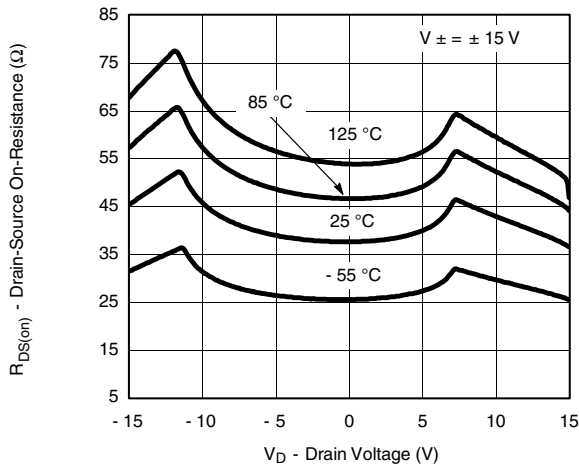
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



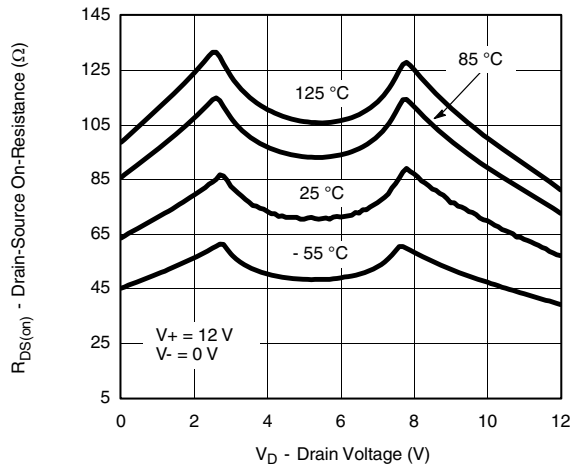
On-Resistance vs. V_D and Dual Supply Voltage



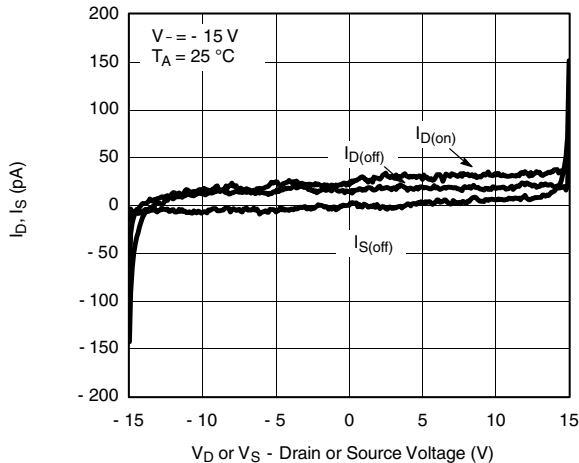
On-Resistance vs. V_D and Unipolar Supply Voltage



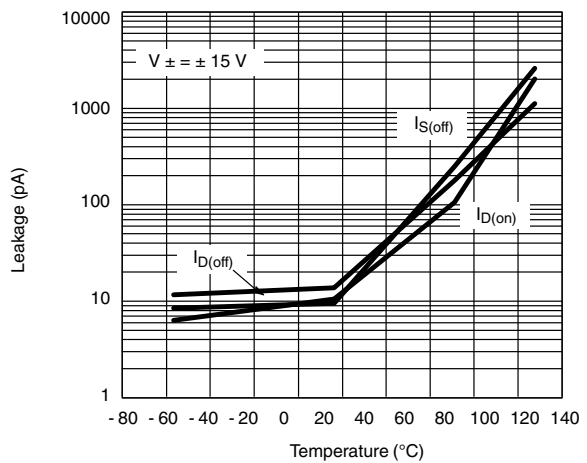
On-Resistance vs. V_D and Temperature



On-Resistance vs. V_D and Temperature



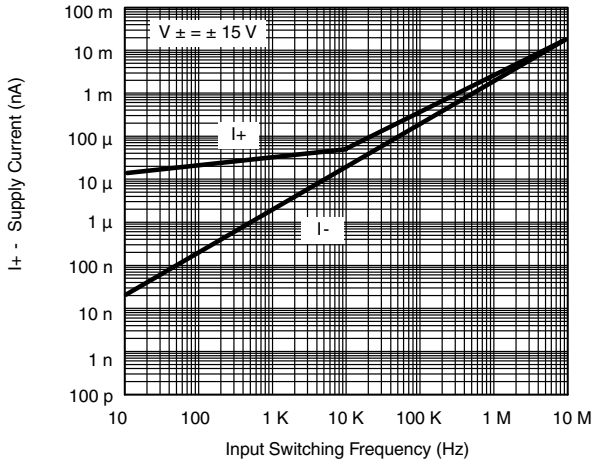
Leakage vs. Analog Voltage



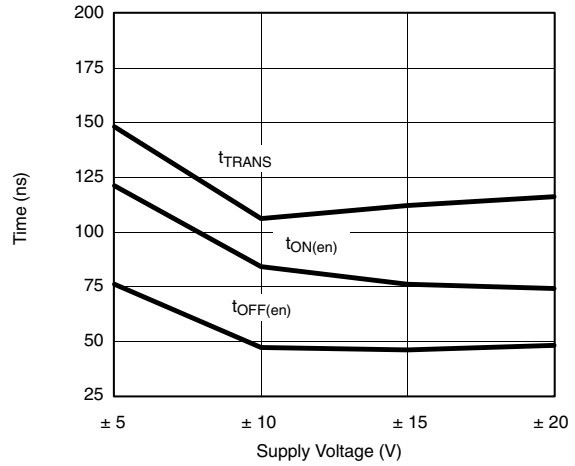
Leakage vs. Current



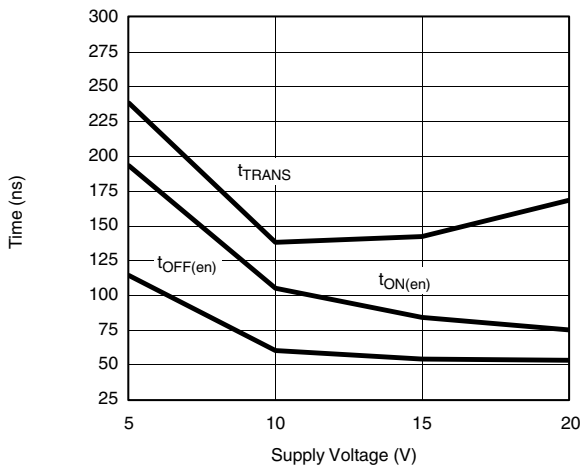
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



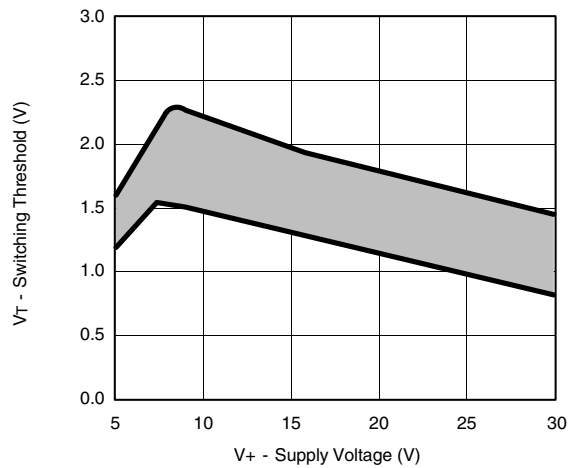
Supply Current vs. Input Switching Frequency



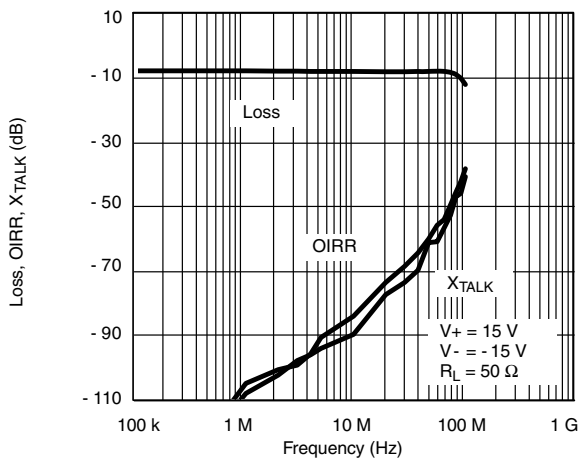
Switching Time vs. Bipolar Supplies



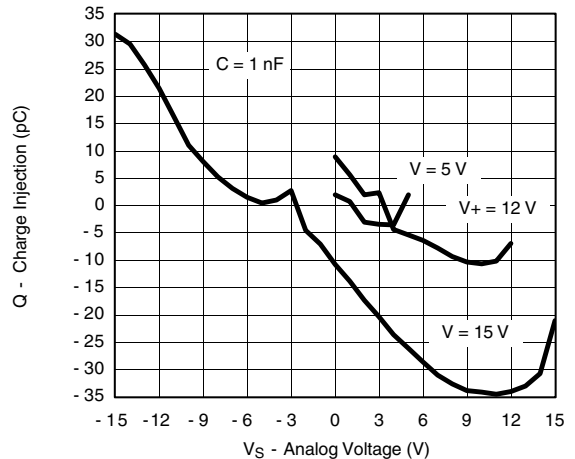
Switching Time vs. Single Supplies



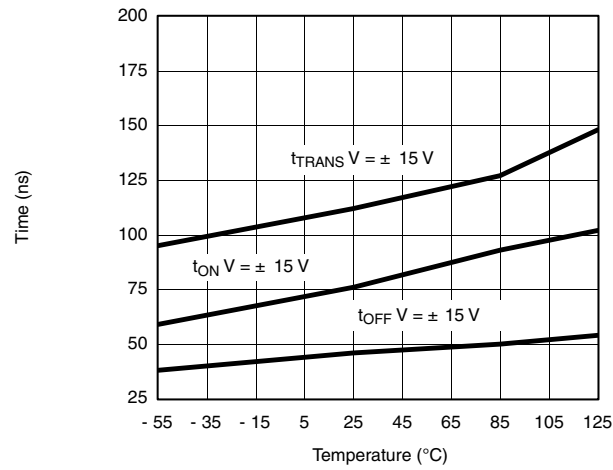
Switching Threshold vs. Supply Voltage



Insertion Loss, Off-Isolation Crosstalk vs. Frequency



Charge Injection vs. Analog Voltage

TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)


Switching Time vs. Temperature

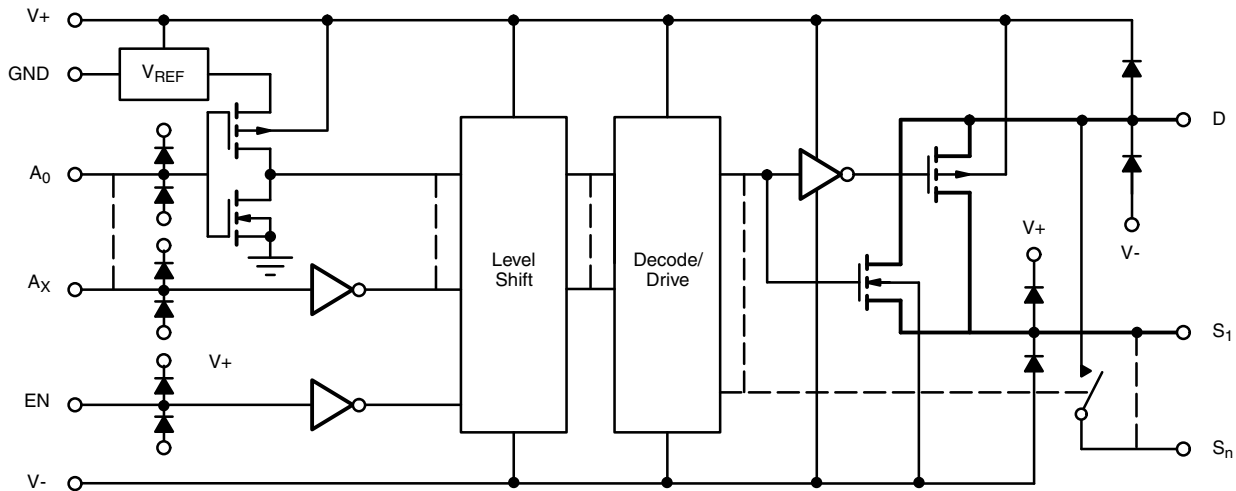
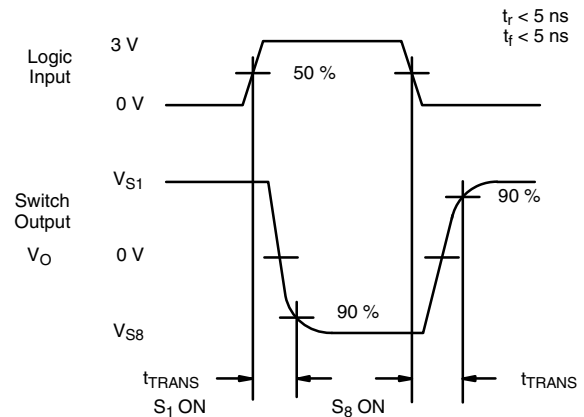
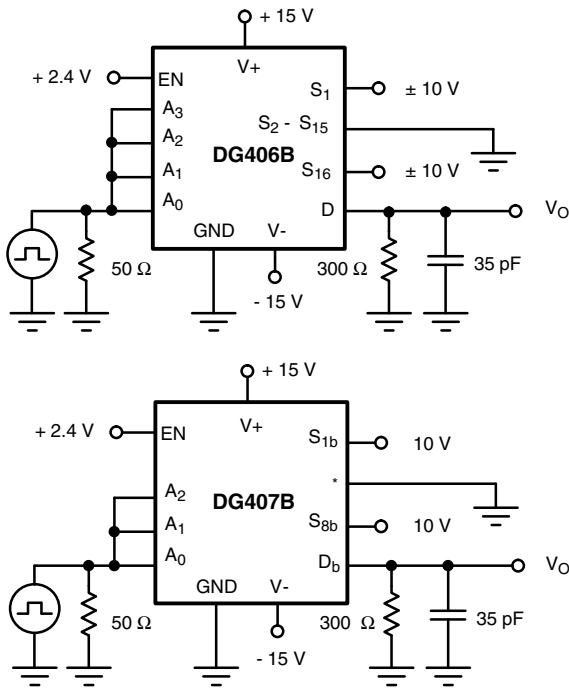
SCHEMATIC DIAGRAM (Typical Channel)


Fig. 1

TEST CIRCUITS



* = S_{1a} - S_{8a}, S_{2b} - S_{7b}, D_a

Fig. 2 - Transition Time

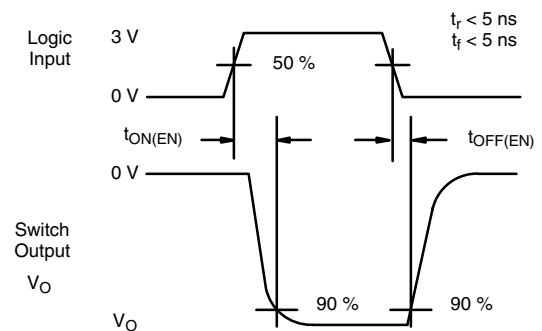
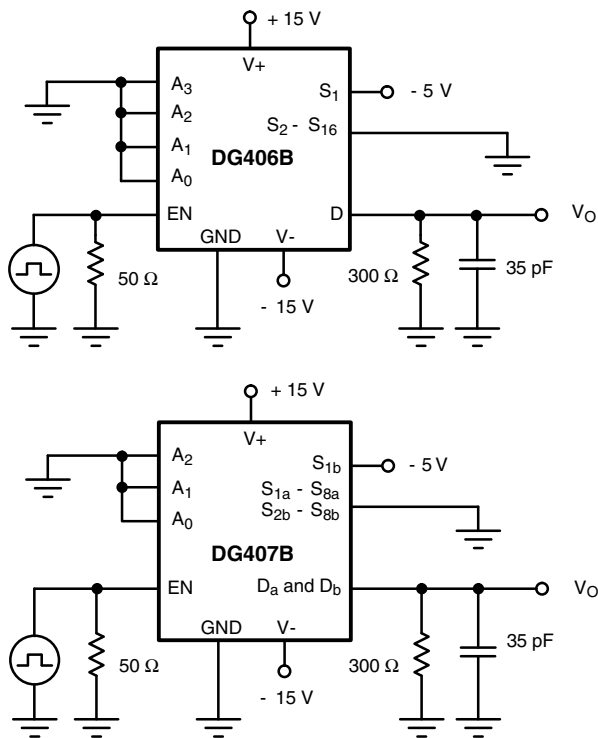


Fig. 3 - Enable Switching Time

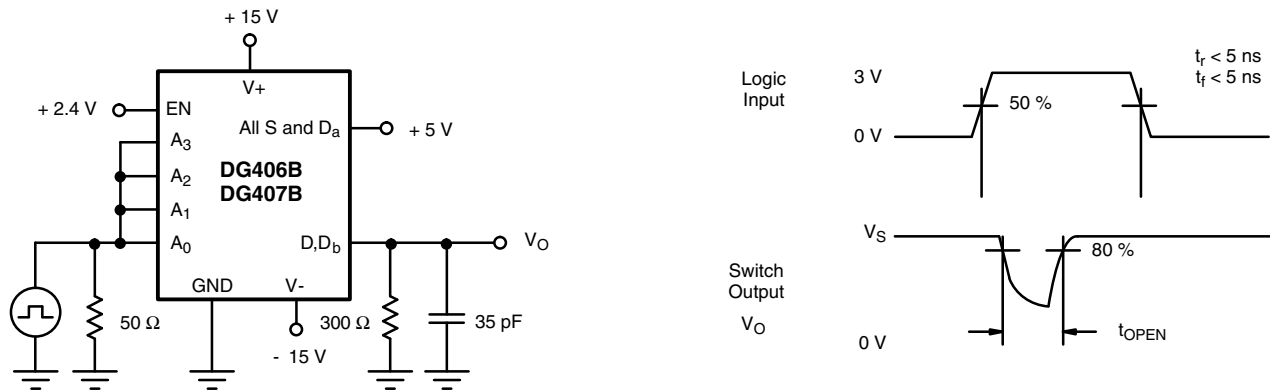
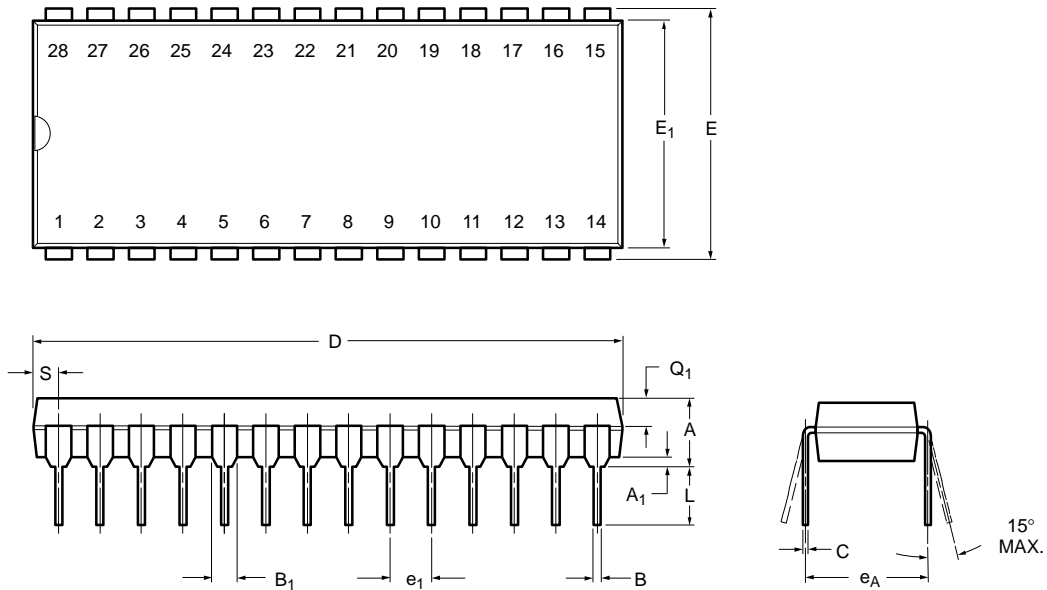
TEST CIRCUITS


Fig. 4 - Break-Before-Make Interval

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?72552.

PDIP: 28-LEAD

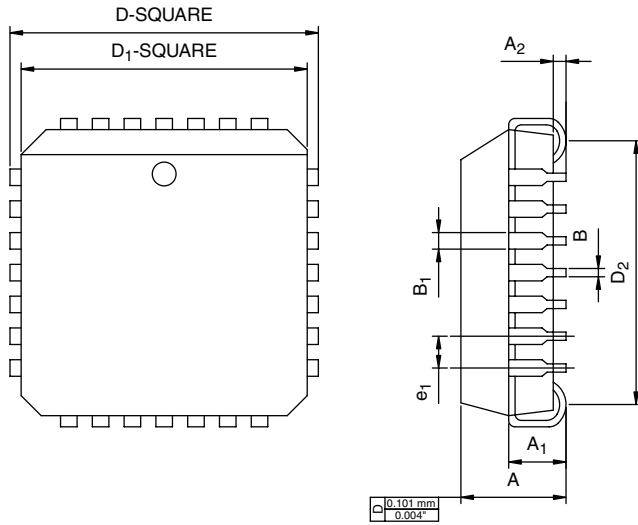


Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	2.29	5.08	0.090	0.200
A₁	0.39	1.77	0.015	0.070
B	0.38	0.56	0.015	0.022
B₁	0.89	1.65	0.035	0.065
C	0.204	0.30	0.008	0.012
D	35.10	39.70	1.380	1.565
E	15.24	15.88	0.600	0.625
E₁	13.21	14.73	0.520	0.580
e₁	2.29	2.79	0.090	0.110
e_A	14.99	15.49	0.590	0.610
L	2.60	5.08	0.100	0.200
Q₁	0.95	2.345	0.0375	0.0925
S	0.995	2.665	0.0375	0.105

ECN: S-03946—Rev. F, 09-Jul-01
DWG: 5488



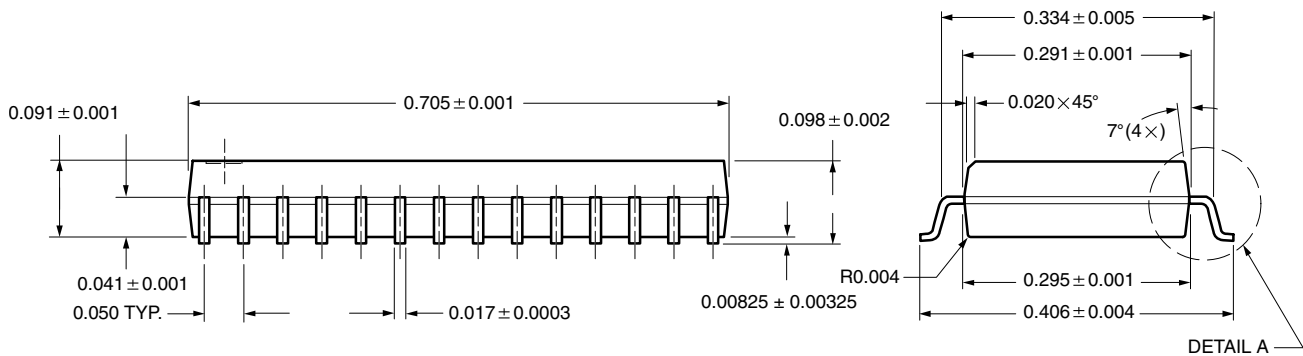
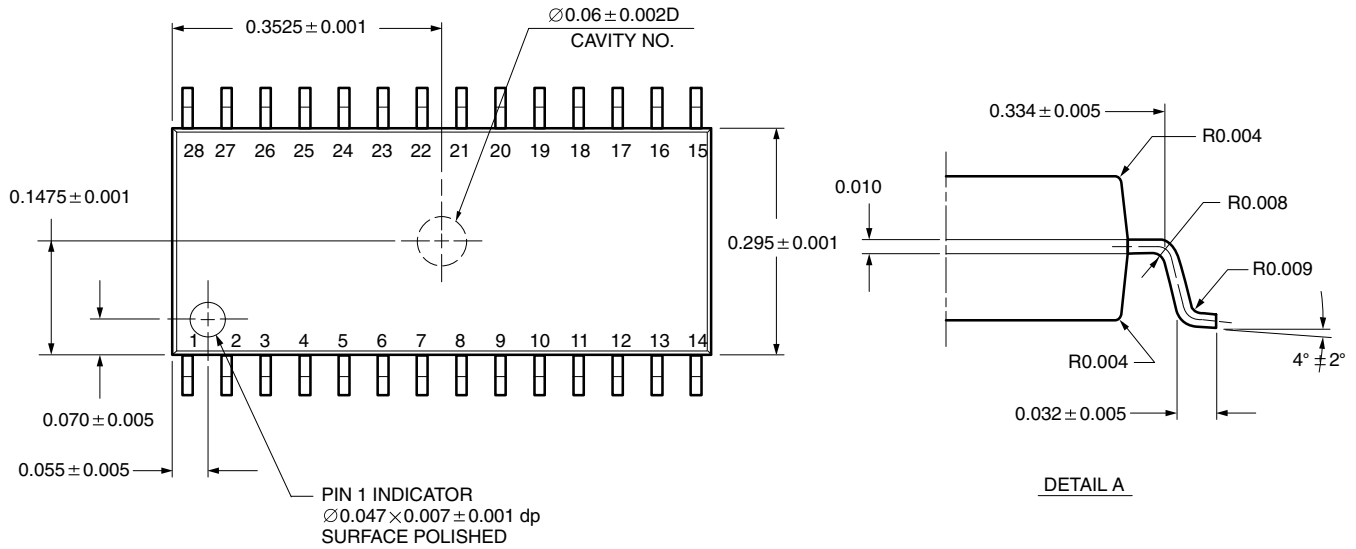
PLCC: 28-LEAD



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.20	4.57	0.165	0.180
A ₁	2.29	3.04	0.090	0.120
A ₂	0.51	-	0.020	-
B	0.331	0.553	0.013	0.021
B ₁	0.661	0.812	0.026	0.032
D	12.32	12.57	0.485	0.495
D ₁	11.430	11.582	0.450	0.456
D ₂	9.91	10.92	0.390	0.430
e ₁	1.27 BSC		0.050 BSC	
ECN: T09-0766-Rev. D, 28-Sep-09 DWG: 5491				



SOIC (WIDE-BODY): 28-LEADS



All Dimensions In Inches

ECN: E11-2209-Rev. D, 01-Aug-11
DWG: 5850



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.

Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

 [View DG407BDJ-E3 on WIN SOURCE](#)

 [Vishay Information](#)

Optimize Your Supply Chain with WIN SOURCE Solutions

-  Global Sourcing Solution
-  Obsolete Management
-  Cost Control Management
-  Shortage Management
-  Alternative Solution
-  Excess Inventory Management