



2.5 Ω, High Bandwidth, Dual SPDT Analog Switch

DESCRIPTION

The DG2517E is low-voltage dual single-pole / double-throw monolithic CMOS analog switches. Designed to operate from 1.8 V to 5.5 V power supply, the DG2517E achieves a bandwidth of 221 MHz while providing low on-resistance (2.5 Ω), excellent on-resistance matching (0.3 Ω) and flatness (1 Ω) over the entire signal range.

The DG2517E offers the advantage of high linearity that reduces signal distortion, making ideal for audio, video, and USB signal routing applications.

Built on Vishay Siliconix’s proprietary sub-micron high-density process, the DG2517E brings low power consumption at the same time as reduces PCB spacing with the MSOP10 and DFN10 packages.

As a committed partner to the community and the environment, Vishay Siliconix manufactures this product with the lead (Pb)-free device terminations. The DFN package has a nickel-palladium-gold device termination and is represented by the lead (Pb)-free “-GE4” suffix. The MSOP package uses 100 % matte Tin device termination and is represented by the lead (Pb)- free “-GE3” suffix. Both the matte Tin and nickel-palladium-gold device terminations meet all JEDEC® standards for reflow and MSL ratings.

FEATURES

- 1.8 V to 5.5 V single supply operation
- Low R_{ON}: 2.5 Ω at 4.5 V
- 221 MHz, -3 dB bandwidth
- Low off-isolation, -58 dB at 1 MHz
- +1.6 V logic compatible
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS COMPLIANT

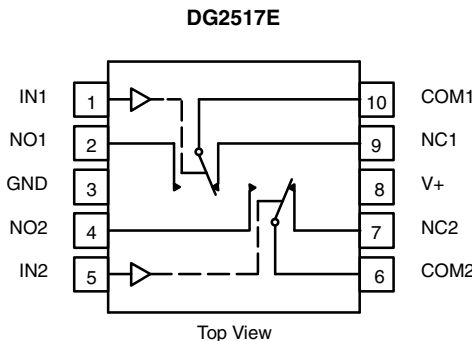
BENEFITS

- High linearity
- Low power consumption
- High bandwidth
- Full rail signal swing range

APPLICATIONS

- USB / UART signal switching
- Audio / video switching
- Cellular phone
- Media players
- Modems
- Hard drives
- PCMCIA

FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION



TRUTH TABLE		
LOGIC	NC1 AND NC2	NO1 AND NO2
0	ON	OFF
1	OFF	ON

ORDERING INFORMATION		
TEMP. RANGE	PACKAGE	PART NUMBER
-40 °C to 85 °C	MSOP-10	DG2517EDQ-T1-GE3
	DFN-10	DG2517EDN-T1-GE4

ABSOLUTE MAXIMUM RATINGS		
PARAMETER	LIMIT	UNIT
Reference to GND		
V+	-0.3 to +6	V
IN, COM, NC, NO ^a	-0.3 to (V+ + 0.3)	
Continuous current (any terminal)	± 50	mA
Peak current (pulsed at 1 ms, 10 % duty cycle)	± 200	
Storage temperature (D suffix)	-65 to +150	°C
Power dissipation (packages) ^b	MSOP-10 ^c	320
	DFN-10 ^d	1191
ESD / HBM	EIA / JESD22-A114-A	7.5k
ESD / CDM	EIA / JESD22-C101-A	1.5k
Latch up	JESD78	300

Notes

- Signals on NC, NO, or COM or IN exceeding V+ will be clamped by internal diodes. Limit forward diode current to maximum current ratings
- All leads welded or soldered to PC board
- Derate 4 mW/°C above 70 °C
- Derate 14.9 mW/°C above 70 °C



SPECIFICATIONS (V+ = 3 V)									
PARAMETER	SYMBOL	TEST CONDITIONS OTHERWISE UNLESS SPECIFIED V+ = 3 V, ± 10 %, VINL = 0.4 V, VINH = 1.5 V ^e	TEMP. ^a	LIMITS -40 °C to +85 °C			UNIT		
				MIN. ^c	TYP. ^b	MAX. ^c			
Analog Switch									
Analog signal range ^d	V _{ANALOG}		Full	0	-	V+	V		
Drain-source on-resistance	R _{DS(on)}	V+ = 1.8 V, V _{NC/NO} = 0.4 V / V+, I _{NC/NO} = 8 mA	Room	-	7	11	Ω		
			Full	-	-	13			
		V+ = 2.7 V, V _{COM} = 0.8 V / 1.8 V, I _{COM} = 10 mA	Room	-	4.6	5.5			
			Full	-	-	6.5			
On-resistance matching	ΔR _{DS(on)}	V+ = 2.7 V, V _{COM} = 0.8 V / 1.4 V / 1.8 V, I _{COM} = 10 mA	Room	-	0.02	0.3			
On-resistance flatness ^{d, f}	R _{flat(on)}		Full	-	-	0.6			
			Room	-	0.62	1			
			Full	-	-	1.5			
Off leakage current ^g	I _{NC/NO(off)}	V+ = 3.6 V, V _{NC/NO} = 1 V / 3.2 V, V _{COM} = 3.2 V / 1 V	Room	-1	0.01	1	nA		
Channel-on leakage current ^g	I _{COM(on)}	V+ = 3.6 V, V _{COM} = V _{NC/NO} = 1 V / 3.2 V	Full	-5	-	5			
			Room	-1	0.01	1			
			Full	-5	-	5			
Digital Control									
Input current ^d	I _{INL} or I _{INH}		Full	-1	-	1	μA		
Input high voltage ^d	V _{INH}		Full	1.5	-	-	V		
Input low voltage ^d	V _{INL}		Full	-	-	0.4			
Digital input capacitance ^d	C _{IN}		Room	-	3	-	pF		
Dynamic Characteristics									
Turn-on time	t _{ON}	V _{NC/NO} = 3 V, C _L = 35 pF, R _L = 300 Ω	Room	-	19	45	ns		
			Full	-	-	50			
Turn-off time	t _{OFF}		Room	-	9	35			
			Full	-	-	45			
Break-before-make time ^d	t _{BBM}		Room	4	11	-			
			Full	3	-	-			
Charge injection ^d	Q _{INJ}		C _L = 1 nF, V _{gen} = 1.5 V, R _{gen} = 0 Ω	Room	-	-9	-	pC	
Bandwidth ^d	BW		C _L = 5 pF (set up capacitance)	Room	-	226	-	MHz	
Off-isolation ^d	OIRR		R _L = 50 Ω, C _L = 5 pF	f = 1 MHz	Room	-	-55	-	dB
				f = 10 MHz	Room	-	-42	-	
Channel-to-channel crosstalk ^d	X _{TALK}	R _L = 50 Ω, C _L = 5 pF	f = 1 MHz	Room	-	-61	-		
			f = 10 MHz	Room	-	-44	-		
NO, NC off capacitance ^d	C _{NO(off)}	V+ = 2.7 V, f = 1 MHz	Room	-	7	-	pF		
	C _{NC(off)}		Room	-	7	-			
Channel-on capacitance ^d	C _{NO(on)}		Room	-	23	-			
	C _{NC(on)}		Room	-	23	-			
Power Supply									
Power supply range	V+				2.7	-	3.3	V	
Power supply current ^d	I+		V+ = 2.7 V, V _{IN} = 0 V or 2.7 V	Full	-	-	1	μA	

Notes

- a. Room = 25 °C, Full = as determined by the operating suffix
- b. Typical values are for design aid only, not guaranteed nor subject to production testing
- c. The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this datasheet
- d. Guarantee by design, not subjected to production test
- e. V_{IN} = V+ voltage to perform proper function
- f. Crosstalk measured between channels
- g. Guarantee by 5 V testing



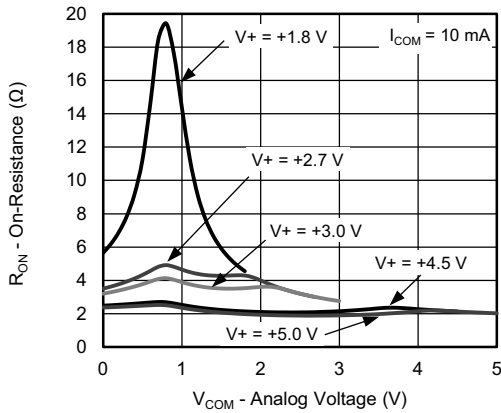
SPECIFICATIONS (V+ = 5 V)								
PARAMETER	SYMBOL	TEST CONDITIONS OTHERWISE UNLESS SPECIFIED V+ = 5 V, ± 10 %, VINL = 0.5 V, VINH = 2 V ^e	TEMP. ^a	LIMITS -40 °C to +85 °C			UNIT	
				MIN. ^c	TYP. ^b	MAX. ^c		
Analog Switch								
Analog signal ranged	V _{ANALOG}		Full	0	-	V+	V	
Drain-source on-resistance	R _{DS(on)}	V+ = 4.5 V, V _{COM} = 0.8 V / 3.5 V; I _{COM} = 10 mA	Room	-	2.5	3.1	Ω	
			Full	-	-	4		
On-resistance matching	ΔR _{DS(on)}	V+ = 4.5 V, V _{COM} = 0.8 V / 2.5 V / 3.5 V, I _{COM} = 10 mA	Room	-	0.01	0.4	Ω	
			Full	-	-	0.6		
On-resistance flatness ^{d, f}	R _{flat(on)}		Room	-	0.61	1	Ω	
			Full	-	-	1.5		
Off leakage current ^g	I _{NC/NO(off)}	V+ = 5.5 V, V _{NC/NO} = 1 V / 4.5 V, V _{COM} = 4.5 V / 1 V	Room	-2	0.15	2	nA	
			Full	-10	-	10		
Channel-on leakage current ^g	I _{COM(on)}	V+ = 5.5 V, V _{COM} = V _{NC/NO} = 1 V / 4.5 V	Room	-2	0.20	2	nA	
			Full	-10	-	10		
Power down leakage ^d	I _{PD}	V+ = 0 V, V _{COM} = 5.5 V, NC/NO open	Full	-	0.01	5	μA	
		V+ = 0 V, V _{NC/NO} = 5.5 V, COM, open	Full	-	0.01	3	mA	
Digital Control								
Input current ^d	I _{INL} or I _{INH}		Full	-1	-	1	μA	
Input high voltage ^d	V _{INH}		Full	2	-	-	V	
Input low voltage ^d	V _{INL}		Full	-	-	0.5	V	
Digital input capacitance ^d	C _{IN}		Room	-	3	-	pF	
Dynamic Characteristics								
Turn-on time	t _{ON}		Room	-	13	40	ns	
			Full	-	-	43		
Turn-off time	t _{OFF}	V _{NC/NO} = 3 V, C _L = 35 pF, R _L = 300 Ω	Room	-	7	33	ns	
			Full	-	-	35		
Break-before-make time ^d	t _{BBM}		Room	3	6	-	ns	
			Full	2	-	-		
Propagation delay ^d	tpd	V+ = 5 V, no R _L	Room	-	380	-	ps	
Charge injection ^d	Q _{INJ}	C _L = 1 nF, V _{gen} = 2.5 V, R _{gen} = 0 Ω	Room	-	-19.4	-	pC	
Bandwidth ^d	BW	C _L = 5 pF (set up capacitance)	Room	-	221	-	MHz	
Off-isolation ^d	OIRR	R _L = 50 Ω, C _L = 5 pF	f = 1 MHz	Room	-	-58	-	dB
			f = 10 MHz	Room	-	-43	-	
Channel-to-channel crosstalk ^d	X _{TALK}	R _L = 50 Ω, C _L = 5 pF	f = 1 MHz	Room	-	-62	-	dB
			f = 10 MHz	Room	-	-47	-	
NO, NC off capacitance ^d	C _{NO(off)}	V+ = 5 V, f = 1 MHz	Room	-	7	-	pF	
	C _{NC(off)}		Room	-	7	-		
Channel-on capacitance ^d	C _{NO(on)}		Room	-	23	-		
	C _{NC(on)}		Room	-	23	-		
Power Supply								
Power supply range	V+			4.5	-	5.5	V	
Power supply current ^d	I+	V+ = 5.5 V, V _{IN} = 0 or 5.5 V	Full	-	-	1	μA	

Notes

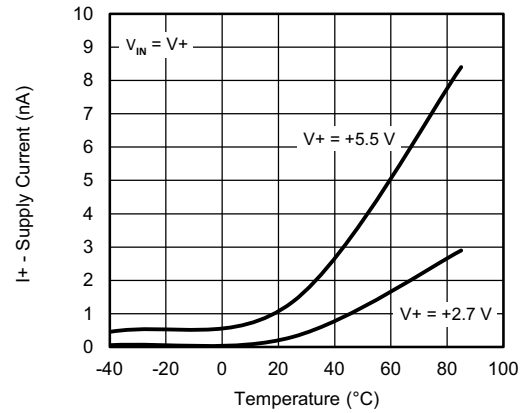
- a. Room = 25 °C, Full = as determined by the operating suffix
- b. Typical values are for design aid only, not guaranteed nor subject to production testing
- c. The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this datasheet
- d. Guarantee by design, not subjected to production test
- e. V_{IN} = input voltage to perform proper function
- f. Difference of min and max values
- g. Guaranteed by 5 V testing.

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.

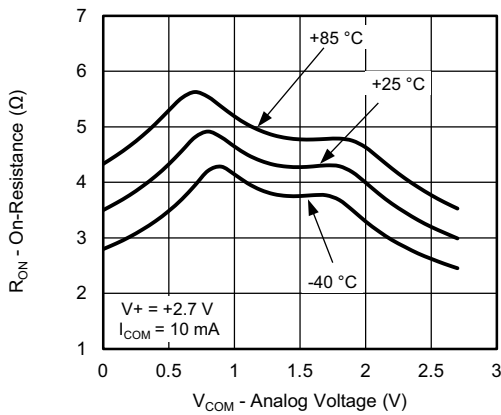
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



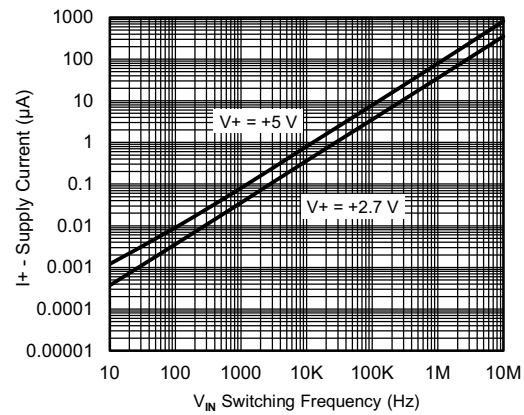
RON vs. VCOM and Single Supply Voltage



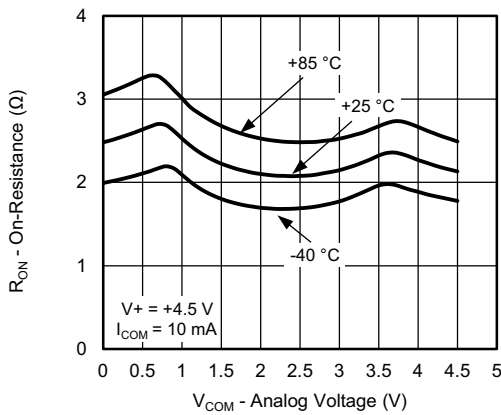
Supply Current vs. Temperature



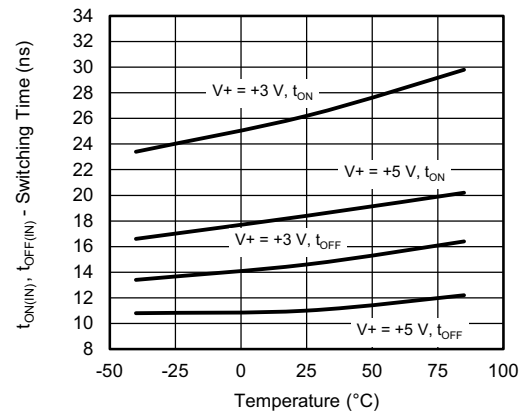
RON vs. Analog Voltage and Temperature



Positive Supply Current vs. Switching Frequency

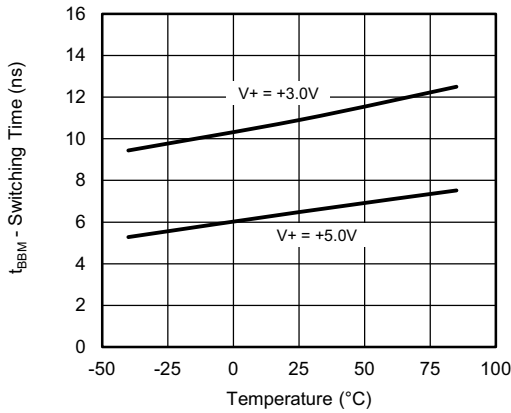


RON vs. Analog Voltage and Temperature

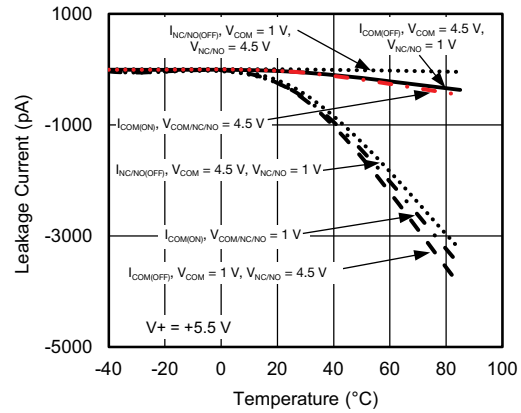


Switching Time vs. Temperature

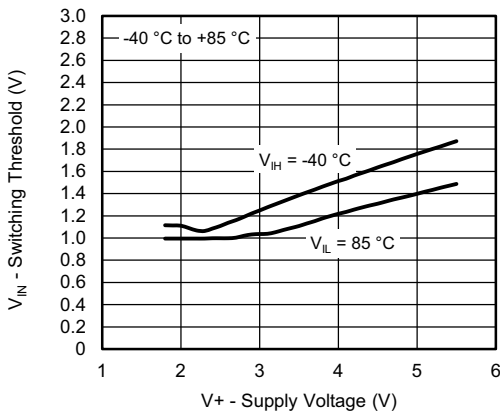
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



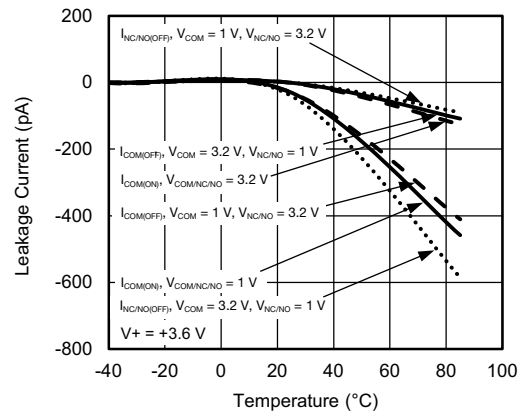
Switching Time vs. Temperature



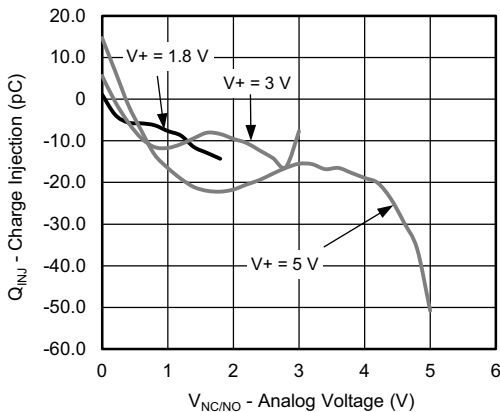
Leakage Current vs. Temperature



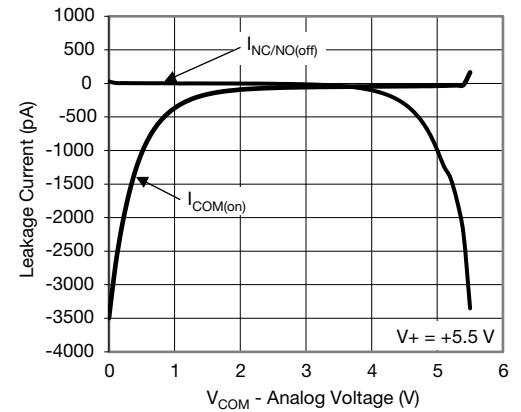
Switching Threshold vs. Supply Voltage



Leakage Current vs. Temperature

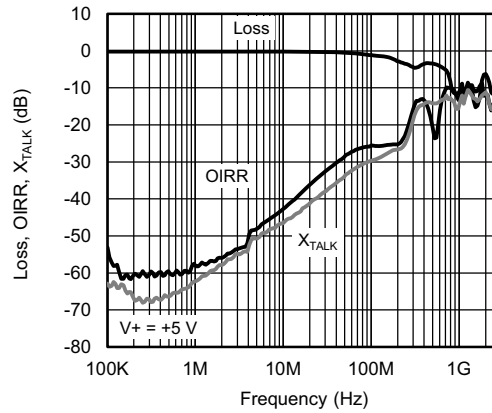


Charge Injection vs. Source Voltage



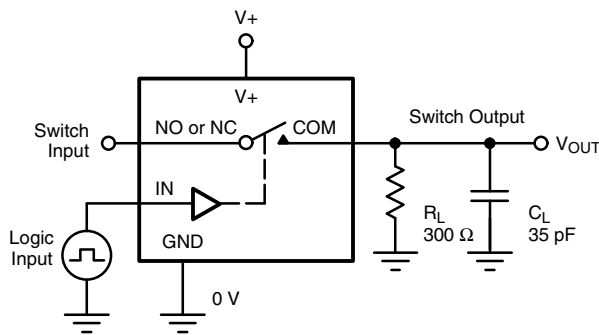
Leakage Current vs. Analog Voltage

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



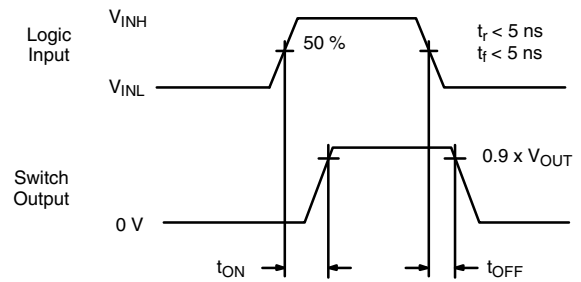
Loss, OIRR, X_{TALK} vs. Frequency

TEST CIRCUITS



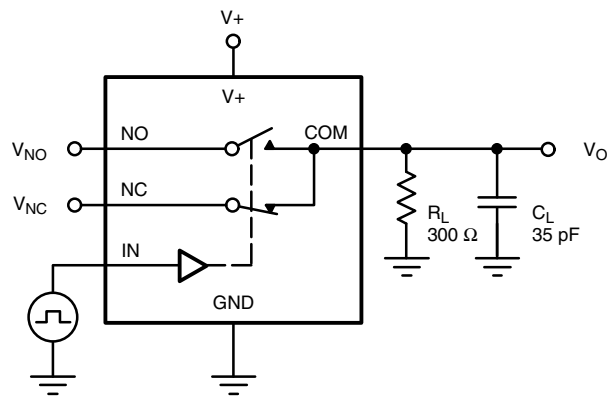
C_L (includes fixture and stray capacitance)

$$V_{OUT} = V_{COM} \left(\frac{R_L}{R_L + R_{ON}} \right)$$



Logic "1" = Switch On
Logic input waveforms inverted for switches that have the opposite logic sense.

Fig. 1 - Switching Time



C_L (includes fixture and stray capacitance)

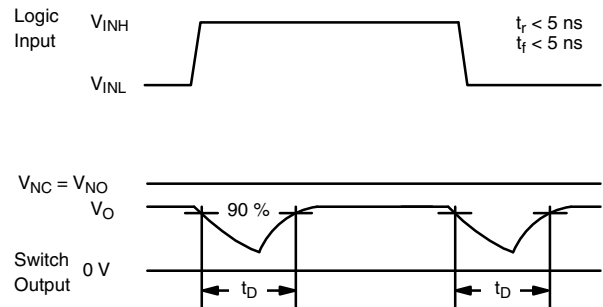
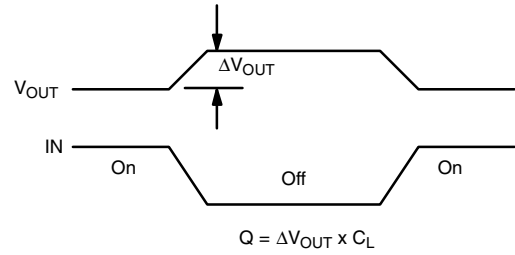
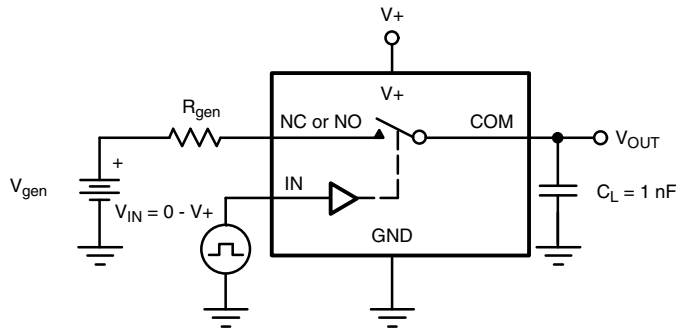


Fig. 2 - Break-Before-Make Interval

TEST CIRCUITS



IN depends on switch configuration: input polarity determined by sense of switch.

Fig. 3 - Charge Injection

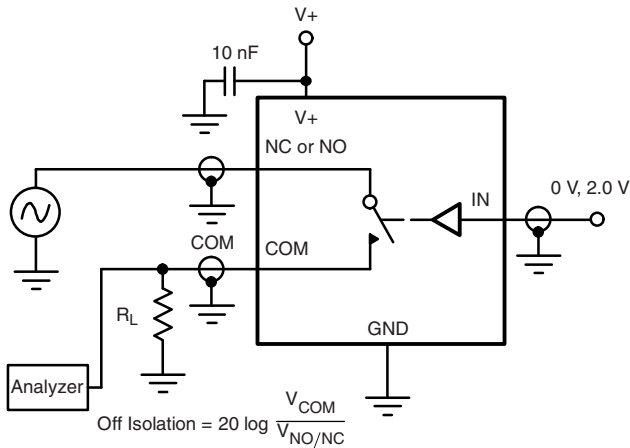


Fig. 4 - Off-Isolation

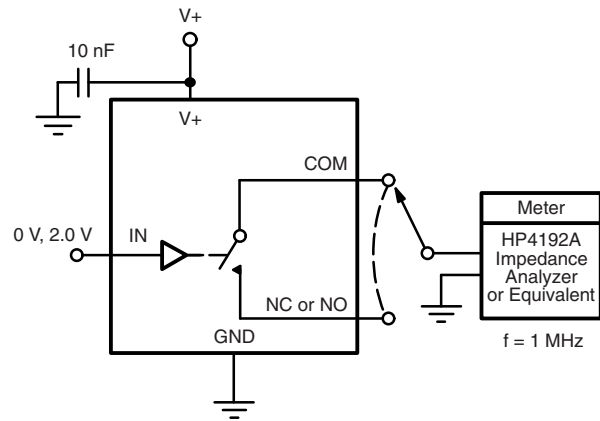


Fig. 5 - Channel Off/On Capacitance

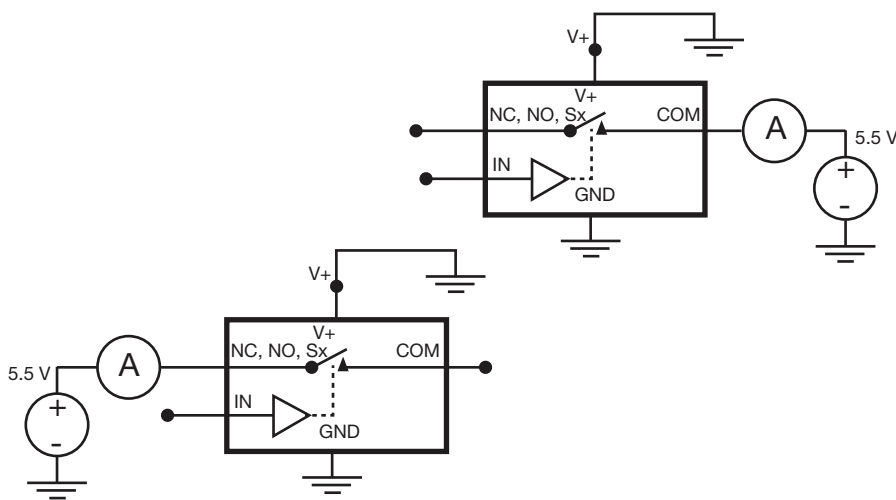


Fig. 6 - Source / Drain Power Down Leakage

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?74518.

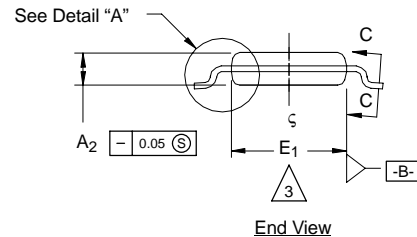
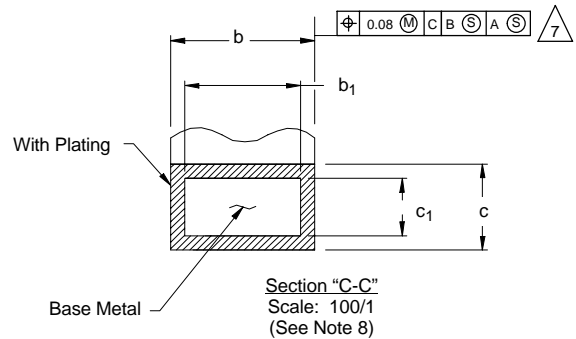


MSOP: 10-LEADS

JEDEC Part Number: MO-187, (Variation AA and BA)



Detail "B"
(Scale: 30/1)
Dambar Protrusion



NOTES:

- Die thickness allowable is 0.203 ± 0.0127.
- Dimensioning and tolerances per ANSI.Y14.5M-1994.
- Dimensions "D" and "E₁" do not include mold flash or protrusions, and are measured at Datum plane [-H-], mold flash or protrusions shall not exceed 0.15 mm per side.
- Dimension is the length of terminal for soldering to a substrate.
- Terminal positions are shown for reference only.
- Formed leads shall be planar with respect to one another within 0.10 mm at seating plane.
- The lead width dimension does not include Dambar protrusion. Allowable Dambar protrusion shall be 0.08 mm total in excess of the lead width dimension at maximum material condition. Dambar cannot be located on the lower radius or the lead foot. Minimum space between protrusions and an adjacent lead to be 0.14 mm. See detail "B" and Section "C-C".
- Section "C-C" to be determined at 0.10 mm to 0.25 mm from the lead tip.
- Controlling dimension: millimeters.
- This part is compliant with JEDEC registration MO-187, variation AA and BA.
- Datums [-A-] and [-B-] to be determined Datum plane [-H-].
- Exposed pad area in bottom side is the same as teh leadframe pad size.

N = 10L

Dim	MILLIMETERS			Note
	Min	Nom	Max	
A	-	-	1.10	
A ₁	0.05	0.10	0.15	
A ₂	0.75	0.85	0.95	
b	0.17	-	0.27	8
b ₁	0.17	0.20	0.23	8
c	0.13	-	0.23	
c ₁	0.13	0.15	0.18	
D	3.00 BSC			3
E	4.90 BSC			
E ₁	2.90	3.00	3.10	3
e	0.50 BSC			
e ₁	2.00 BSC			
L	0.40	0.55	0.70	4
N	10			5
α	0°	4°	6°	
ECN: T-02080—Rev. C, 15-Jul-02 DWG: 5867				

DFN-10 LEAD (3 X 3)



NOTES:

- All dimensions are in millimeters and inches.
- N is the total number of terminals.
- (3) Dimension b applies to metallized terminal and is measured between 0.15 and 0.30 mm from terminal tip.
- (4) Coplanarity applies to the exposed heat sink slug as well as the terminal.
- (5) The pin #1 identifier may be either a mold or marked feature, it must be located within the zone indicated.

Dim	MILLIMETERS			INCHES		
	Min	Nom	Max	Min	Nom	Max
A	0.80	0.90	1.00	0.031	0.035	0.039
A1	0.00	0.02	0.05	0.000	0.001	0.002
A3	0.20 BSC			0.008 BSC		
b	0.18	0.23	0.30	0.007	0.009	0.012
D	3.00 BSC			0.118 BSC		
D2	2.20	2.38	2.48	0.087	0.094	0.098
E	3.00 BSC			0.118 BSC		
E2	1.49	1.64	1.74	0.059	0.065	0.069
e	0.50 BSC			0.020 BSC		
L	0.30	0.40	0.50	0.012	0.016	0.020

*Use millimeters as the primary measurement.

ECN: S-42134—Rev. A, 29-Nov-04
DWG: 5943



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.