

700 MHz, -3 dB Bandwidth; Single SPDT Analog Switch

DESCRIPTION

DG3257 is a low R_{ON} , high bandwidth analog switch configured in single SPDT. It achieves $5\ \Omega$ switch on resistance, greater than 700 MHz -3 dB bandwidth with 5 pF load, and a channel to channel crosstalk at -32 dB and isolation at -33 dB. Fabricated with high density sub micro CMOS process, the DG3257 provides low parasitic capacitance, handles bidirectional signal flow with minimized phase distortion. Guaranteed 1.4 V logic high threshold makes it possible to interface directly with low voltage MCUs.

The DG3257 is designed for a wide range of operating voltages from 1.65 V to 5.5 V that can be driven directly from one cell Li-ion battery. On-chip protection circuit protects against fault events when V_+ goes zero. Latch up current is 300 mA, as per JESD78, and its ESD tolerance exceeds 6 kV.

Packaged in ultra small μ DFN6L (1 mm x 1 mm), it is ideal for portable high speed mix signal switching application.

As a committed partner to the community and the environment, Vishay Siliconix manufactures this product with lead (Pb)-free device termination.

The μ DFN6L package has a nickel-palladium-gold device termination and is represented by the lead (Pb)-free “-GE4” suffix to the ordering part number. The nickel-palladium-gold device terminations meet all JEDEC® standards for reflow and MSL rating. As a further sign of Vishay Siliconix’s commitment, the DG3257 is fully RoHS-compliant.

FEATURES

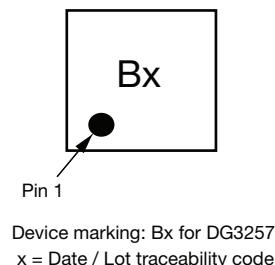
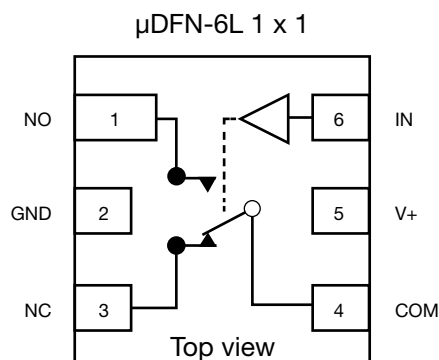
- 1.65 V to 5.5 V single supply operation
- Low resistance: $5\ \Omega$ /typ. at 4.2 V
- Switch ON capacitance: 9 pF typical
- -3 dB bandwidth: 700 MHz
- Power down protection
- Signal swing over V_+ capable (when signal swing over V_+ , signal pin current: typically $(V_S - 0.6\text{ V})/120\ \Omega$)
- Control logic S pin voltage can go beyond V_+
- Break before make switching
- Latch up current: 300 mA (JESD78)
- ESD / HBM: 6 kV,
- ESD / CDM: 1 kV
- TTL/CMOS compatible
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912


RoHS
COMPLIANT

APPLICATIONS

- Smart phones
- Tablet, e-readers
- Camera, audio devices
- Computer and peripherals
- Data storage
- IoT
- Wearable
- Portable healthcare

FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION



ORDERING INFORMATION

TEMP. RANGE	PACKAGE	PART NUMBER
-40 °C to +85 °C	μ DFN-6L	DG3257DN-T1-GE4

**TRUTH TABLE**

IN	NC	NO
0	ON	OFF
1	OFF	ON

PIN DESCRIPTION

PIN NAME	DESCRIPTION
IN	Logic select Input
V+	Power pin
GND	Power ground pin
NC	Normal close data port
NO	Normal open data port
COM	Common data port

ABSOLUTE MAXIMUM RATINGS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

PARAMETER	CONDITIONS	LIMITS	UNIT
V+, S	Reference to GND	-0.3 to +6	V
COM, NO, NC	Reference to GND	-0.3 to +6	
Maximum continuous switch current		± 50	mA
Maximum pulse switch current	Pulsed at 1 ms, 10 % duty cycle	± 100	
Thermal resistance		407	°C/W
ESD / HBM	EIA / JESD22-A114-A	6000	V
ESD / CDM	EIA / JESD22-C101A	1000	
Temperature			
Operating temperature		-40 to +85	°C
Max. operating junction temperature		150	
Operating junction temperature		125	
Storage temperature		-65 to +150	

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.

SPECIFICATIONS

PARAMETER	SYMBOL	TEST CONDITIONS $V_+ = 3\text{ V}$, $V_{\text{INH}} = 1.3\text{ V}$, $V_{\text{INL}} = 0.5\text{ V}$ OTHERWISE UNLESS SPECIFIED	+25 $^{\circ}\text{C}$	-40 $^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$	TYP. ^a / MAX.	UNIT
Analog Switch						
Analog signal range	V_{ANALOG}		0 to 5.5			V
Drain-source on-resistance	$R_{\text{DS(on)}}$	$V_+ = 1.8\text{ V}$, $V_{\text{NC/NO}} = 0\text{ V to } V_+$, $I_{\text{S}\pm} = 8\text{ mA}$	28	-	Typ.	Ω
			47	54	Max.	
		$V_+ = 3\text{ V}$, $V_{\text{NC/NO}} = 0.4\text{ V}$, $I_{\text{S}\pm} = 8\text{ mA}$	7	-	Typ.	
			8	9	Max.	
		$V_+ = 3.6\text{ V}$, $V_{\text{NC/NO}} = 0.4\text{ V}$, $I_{\text{S}\pm} = 8\text{ mA}$	6	-	Typ.	
			7	8	Max.	
		$V_+ = 4.2\text{ V}$, $V_{\text{NC/NO}} = 0.4\text{ V}$, $I_{\text{S}\pm} = 8\text{ mA}$	5	-	Typ.	
			6	7	Max.	
		$V_+ = 5\text{ V}$, $V_{\text{NC/NO}} = 0.4\text{ V}$, $I_{\text{S}\pm} = 8\text{ mA}$	5	-	Typ.	
			5.5	6	Max.	
On-resistance flatness	$R_{\text{flat(on)}}$	$V_+ = 3\text{ V}$, $V_{\text{NC/NO}} = 0\text{ V}$, 1 V , $I_{\text{S}\pm} = 8\text{ mA}$	2	-	Typ.	Ω
			3	6	Max.	
On-resistance matching	$\Delta R_{\text{DS(on)}}$	$V_+ = 2.7\text{ V to } 5.5\text{ V}$, $V_{\text{S}} = 0\text{ V to } V_+$, $I_{\text{S}\pm} = 8\text{ mA}$	0.4	-	Typ.	
			0.6	0.8	Max.	
Switch off leakage current	$I_{\text{S}}/I_{\text{d(off)}}$	$V_+ = 5.5\text{ V}$, $V_{\text{COM}} = 1\text{ V / } 4.5\text{ V}$, $V_{\text{NC/NO}} = 4.5\text{ V / } 1\text{ V}$	± 0.2	-	Typ.	nA
			-	± 20	Max.	
Channel on leakage current	$I_{\text{d(on)}}$	$V_+ = 5.5\text{ V}$, $V_{\text{COM}} = 1\text{ V / } 4.5\text{ V}$, $V_{\text{NC/NO}} = \text{open}$	± 0.2	-	Typ.	
			-	± 20	Max.	
Power down leakage	$I_{\text{COM(PD)}}$	$V_+ = 0\text{ V}$, $V_{\text{COM}} = 4.5\text{ V}$	1	-	Max.	μA

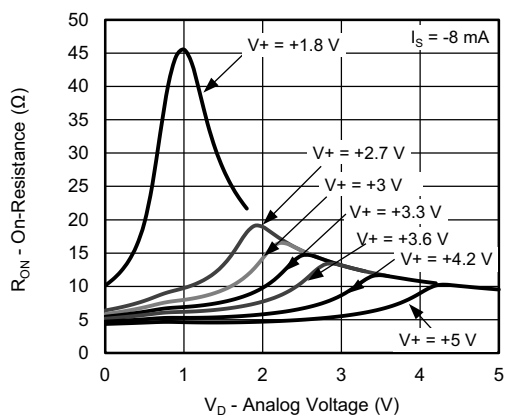
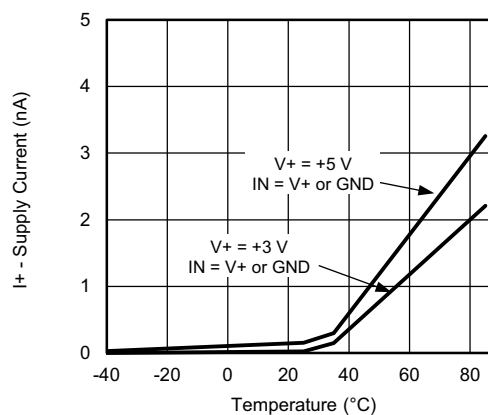
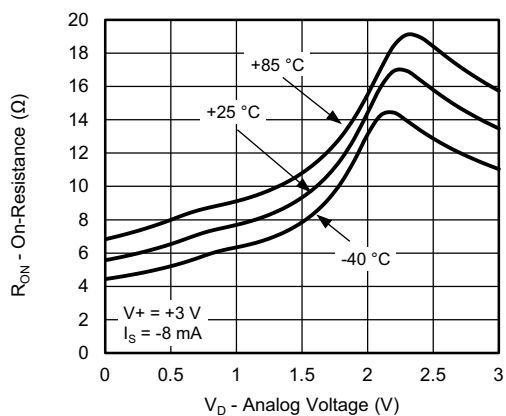
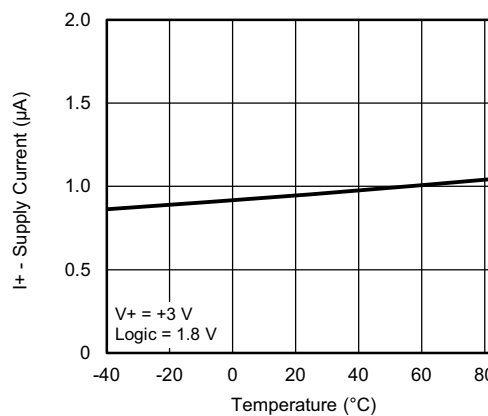
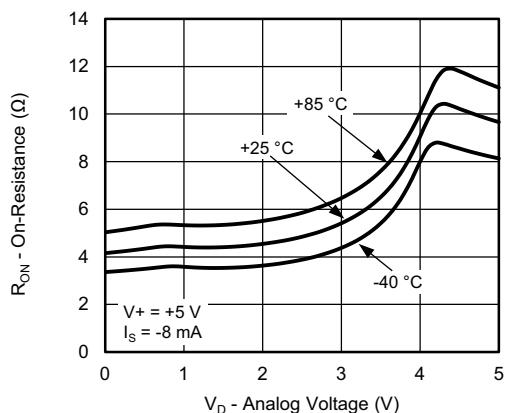
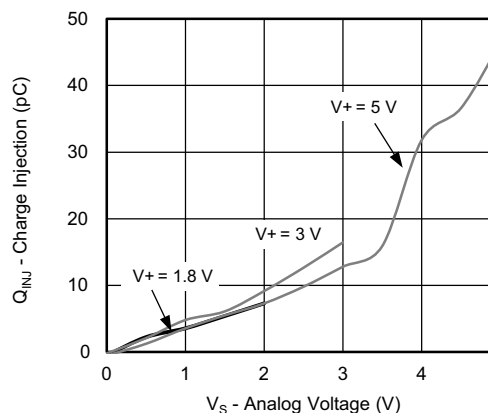


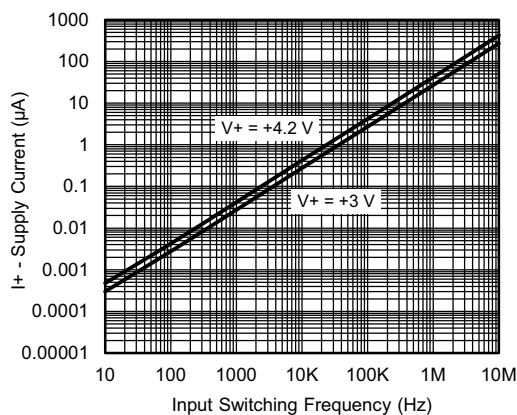
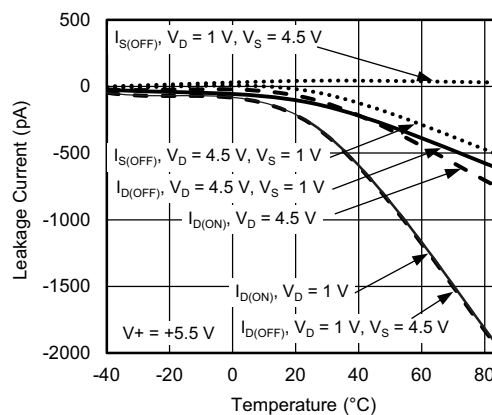
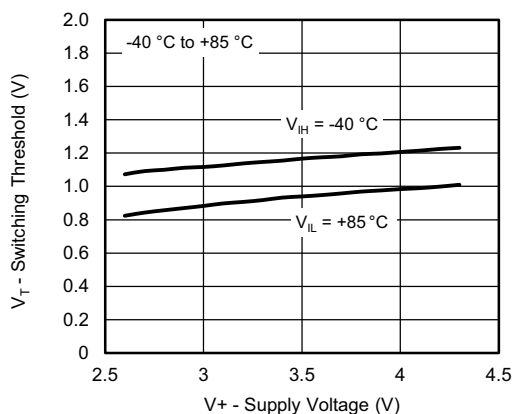
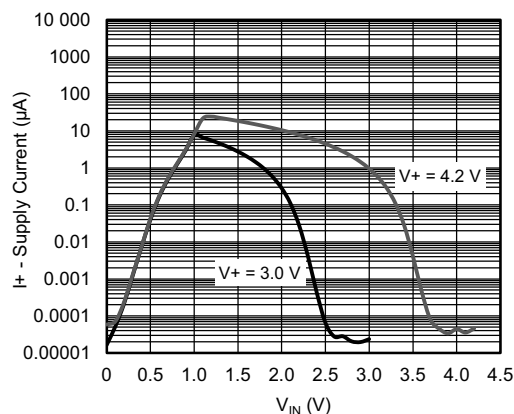
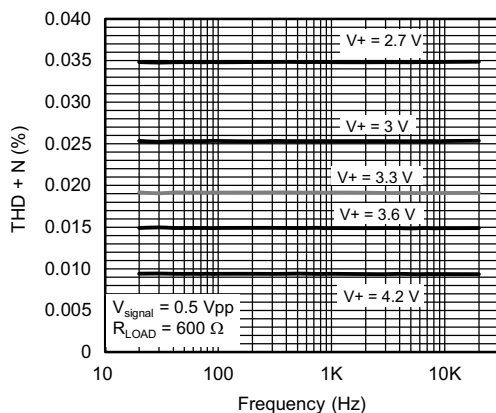
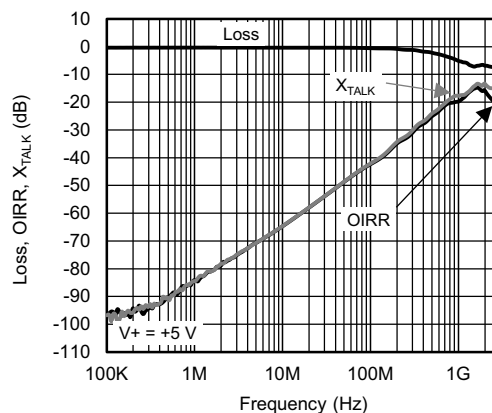
SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS V+ = 3 V, VINH = 1.3 V, VINL = 0.5 V OTHERWISE UNLESS SPECIFIED	+25 °C	-40 °C to +85 °C	TYP. ^a / MAX.	UNIT
Digital Control						
Input voltage high	VINH	V+ = 3 V	-	1.2	Min.	V
		V+ = 5 V	-	1.4	Min.	
Input voltage low	VINL	V+ = 3 V	-	0.45	Max.	
		V+ = 5 V	-	0.5	Max.	
Input leakage	IIN	V+ = 0 V, 5.5 V, VIN = VGND or V+	0.001	-	Typ.	μA
			-	0.23	Max.	
Digital input capacitance	CIN		5.6	-	Typ.	pF
Dynamic Characteristics						
Break-before-make-time	tOPEN	VNO = VNC = 1.5 V; RL = 300 Ω, CL = 35 pF	6	-	Typ.	ns
			-	2	Min.	
Turn-on time	tON	VNC = VNO = V+; RL = 50 Ω, CL = 35 pF	17	-	Typ.	
			40	50	Max.	
Turn-off time	tOFF		9	-	Typ.	
			35	45	Max.	
Propagation delay ^b	tPD		100	-	Typ.	ps
Charge injection ^b	QINJ	CL = 1 nF, RGEN = 0 Ω, VCOM = 1.5 V	4	-	Typ.	pC
Off-isolation ^b	OIRR	RL = 50 Ω, CL = 5 pF, f = 240 MHz	-33	-	Typ.	dB
Crosstalk ^b	XTALK		-32	-	Typ.	
Insertion loss ^b		RL = 50 Ω, CL = 5 pF, f = 1 MHz	-0.62	-	Typ.	
Total harmonic distortion + Noise ^b	THD + N	RL = 600 Ω, VPP = 0.5 Vp-p, f = 20 Hz to 20 kHz	0.025	-	Typ.	%
Bandwidth, -3 dB ^b	BW	RL = 50 Ω, CL = 5 pF	714	-	Typ.	MHz
Source off capacitance ^b	CS (off)	f = 240 MHz	3	-	Typ.	pF
Drain on capacitance ^b	CD(on)		9	-	Typ.	
Power Requirements						
Power supply range		GND = 0 V	+1.65 / +5.5 min. / max.			V
Power supply current	I+	Digital Inputs 0 V or V+, V+ = 2.7 V to 5.5 V	0.001	-	Typ.	μA
			-	0.4	Max.	
		Digital inputs 1.8 V, V+ = 3 V	1	-	Typ.	
			-	1.5	Max.	

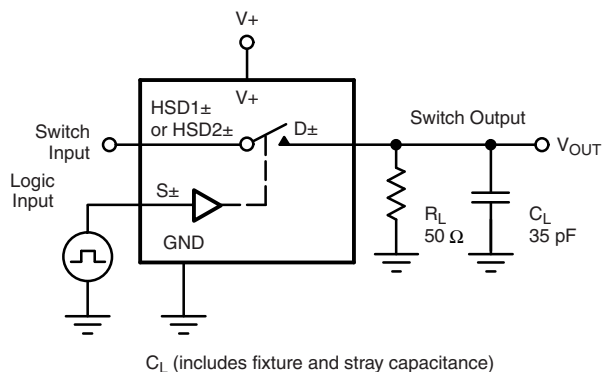
Notes

a. Typical values are for design aid only, not guaranteed nor subject to production testing.

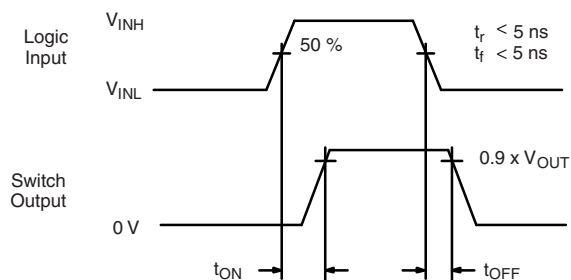
b. Guarantee by design, not subjected to production test.

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

 R_{ON} vs. V_D and Single Supply Voltage

Supply Current vs. Temperature

 R_{ON} vs. Analog Voltage and Temperature

Supply Current vs. Temperature

 R_{ON} vs. Analog Voltage and Temperature

Charge Injection vs. Analog Voltage

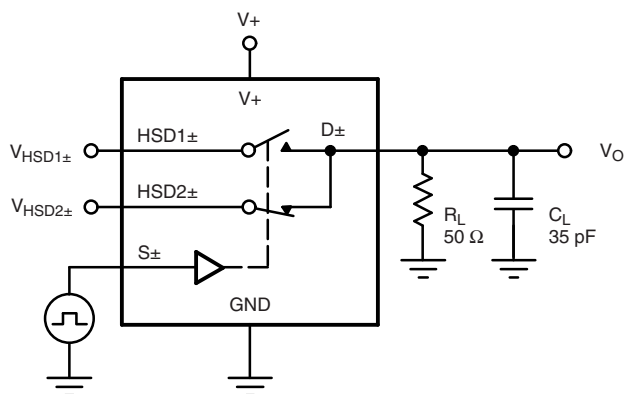
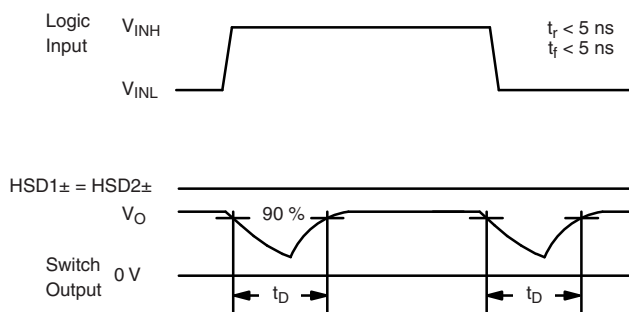
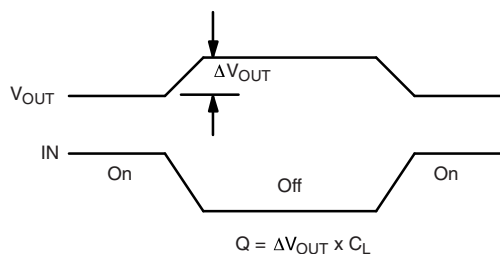
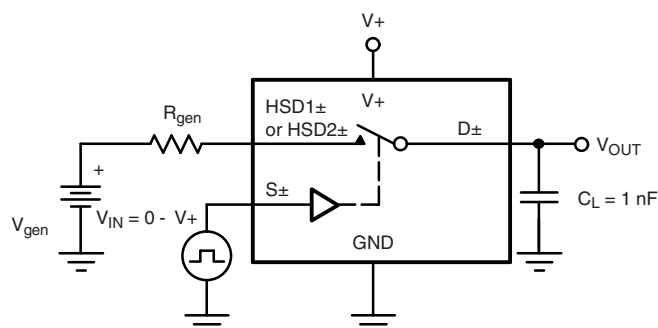
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

Supply Current vs. Input Switching Frequency

Leakage Current vs. Temperature

Switching Threshold vs. Supply Voltage

Supply Current vs. V_{IN}

THD + N vs. Frequency

 X_{TALK} , $V_+ = 5\text{ V}$

TEST CIRCUITS

 C_L (includes fixture and stray capacitance)

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

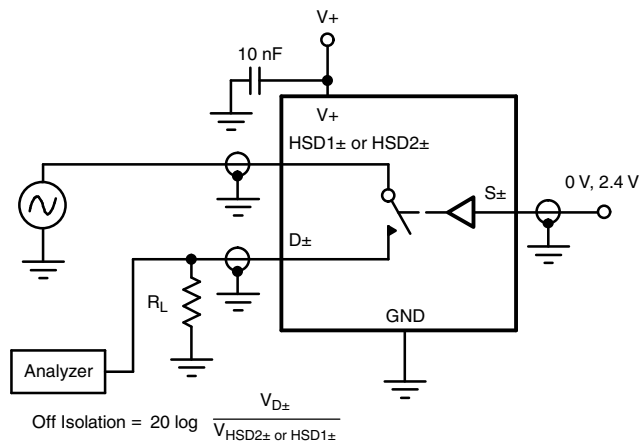
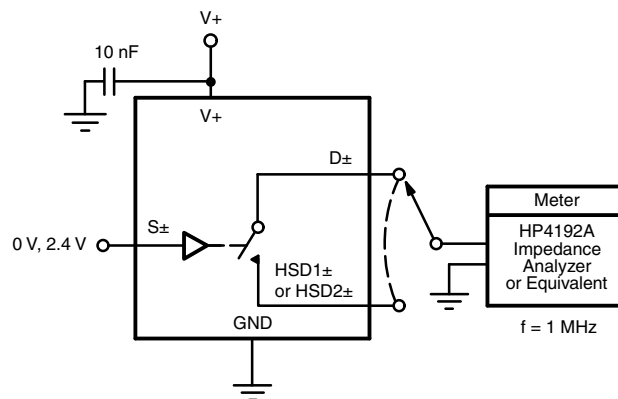


Logic "1" = Switch on
Logic input waveforms inverted for switches that have the opposite logic sense.

Fig. 1 - Switching Time

 C_L (includes fixture and stray capacitance)

Fig. 2 - Break-Before-Make Interval


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

Fig. 3 - Charge Injection

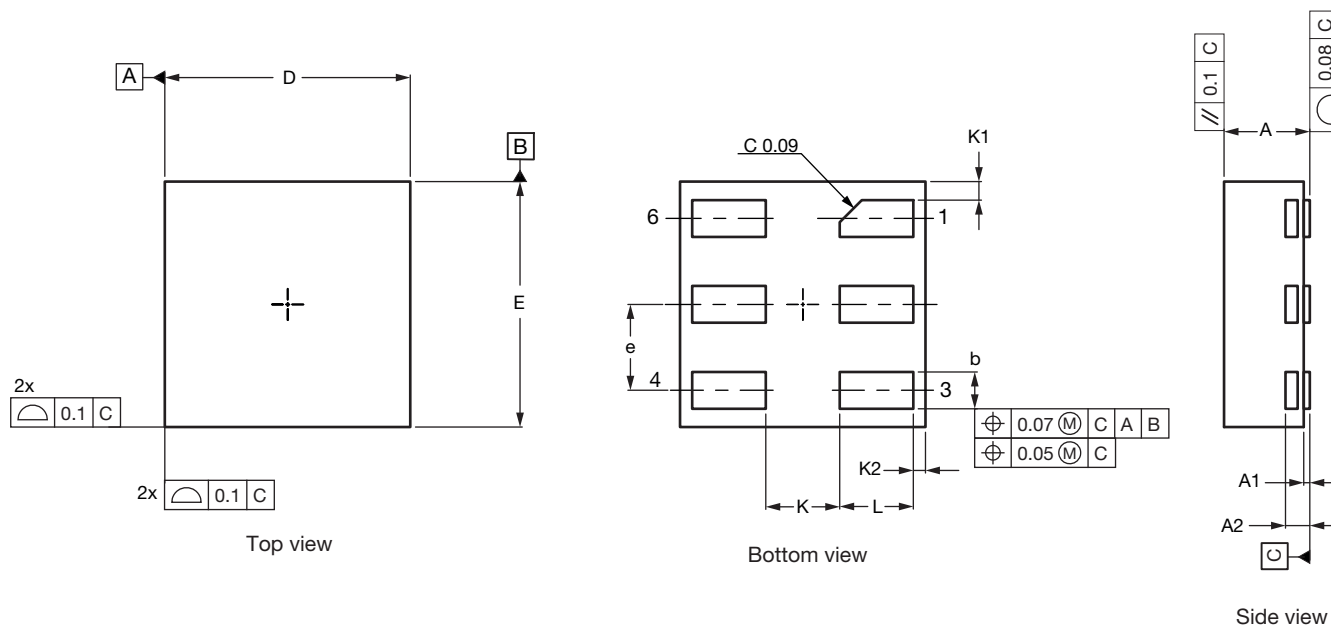
TEST CIRCUITS

Fig. 4 - Off-Isolation

Fig. 5 - Channel Off / On Capacitance



PRODUCT SUMMARY	
Part number	DG3257
Status code	2
Configuration	SPDT x 1
Single supply min. (V)	1.65
Single supply max. (V)	5.5
Dual supply min. (V)	-
Dual supply max. (V)	-
On-resistance (Ω)	5
Charge injection (pC)	4
Source on capacitance (pF)	9
Source off capacitance (pF)	3
Leakage switch on typ. (nA)	20
Leakage switch off max. (nA)	20
-3 dB bandwidth (MHz)	714
Package	μ DFN-6
Functional circuit / applications	Multi purpose, instrumentation, medical and healthcare, portable
Interface	Binary
Single supply operation	Yes
Dual supply operation	-
Turn on time max. (ns)	50
Crosstalk and off isolation	-32

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μDFN-6L 1 mm x 1 mm Case Outline



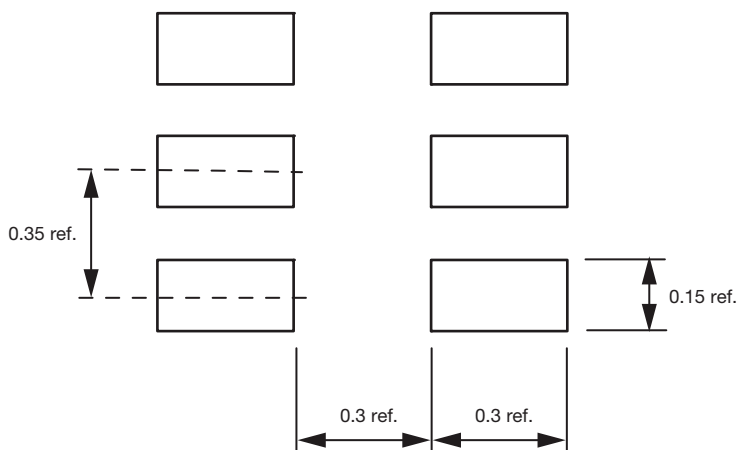
DIM.	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.32	0.35	0.38	0.013	0.014	0.015
A1	0.00	-	0.05	0.000	-	0.002
A2	0.10 Ref.			0.004 Ref.		
b	0.12	0.15	0.18	0.005	0.006	0.007
D	0.95	1.00	1.05	0.037	0.039	0.041
E	0.95	1.00	1.05	0.037	0.039	0.041
e	0.35 BSC			0.014 BSC		
K	0.30 Ref.			0.012 Ref.		
K1	0.075 Ref.			0.003 Ref.		
K2	0.05 Ref.			0.002 Ref.		
L	0.27	0.30	0.33	0.011	0.012	0.013

ECN: E23-0309-Rev. B, 28-Aug-2023
DWG: 6053

Notes

- Use millimeters as the primary measurement
- Dimensioning and tolerances conform to ASME Y14.5M-1994
- N is the number of terminals
- Nd and Ne is the number of terminals in each D and E site respectively
- Dimensions b applies to plated terminal and is measured between 0.15 mm and 0.30 mm from terminal tip
- The pin 1 identifier must be existed on the top surface of the package by using indentation mark or other feature of package body
- Package warpage max. 0.05 mm

Recommended Minimum PADs for μ DFN 6L



Mounting Footprint
Dimensions in mm



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