0.45 Ω, Low Voltage Dual SPDT Analog Switch with Negative Swing Audio Capability

DESCRIPTION

The DG2750 is a dual SPDT low on-resistance switch designed to from a single 1.6 V to 5.5 V power supply. It is a bi-directional switch, and is capable of switching negative swing audio without the need for a coupling capacitor. With a single power supply, the audio signal can swing over the range from ((V+) - 5) to V+.

Guaranteed to operate with 1.4 V logic when V+ is in the range of 2.7 V to 5.5 V, the DG2750 will allow an easy interface with low voltage DSP or ASIC control logic.

The DG2750 is built on sub micron CMOS low voltage process technology, has very low quiescent current, and provides greater than 600 mA latch-up protection, as tested per JESD78.

The DG2750 is assembled in compact mQFN10, 1.4 mm x 1.8 mm x 0.55 mm and ultra thin UTMQFN of 0.35 mm thickness.

As a committed partner to the community and the environment, Vishay Siliconix manufactures this product with lead (Pb)-free device termination. The miniQFN-10 package has a nickel-palladium-gold device termination and is represented by the lead (Pb)-free "-E4" 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 DG2750 is fully RoHS-complaint and halogen-free.

FEATURES

- 1.6 V to 5.5 V single power rail operation
- Capable to switch negative swing audio without DC blocking capacitor
- Low signal distortion: THD+N < -98 dB
- Low on-resistance
- 1.4 V high logic
- Latch-up current > 600 mA (JESD78)
- ESD (HBM): 8 kV
- Reduced power consumption
- Reduce board space
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS
COMPLIANT

Pb
Pb-free

APPLICATIONS

- Cellular phones
- Portable media players
- Computer and game machine
- Handheld healthcare and instruments

FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION

miniQFN-10L

Top View

Device Marking: Ux for DG2750
x = Date/Lot Traceability Code
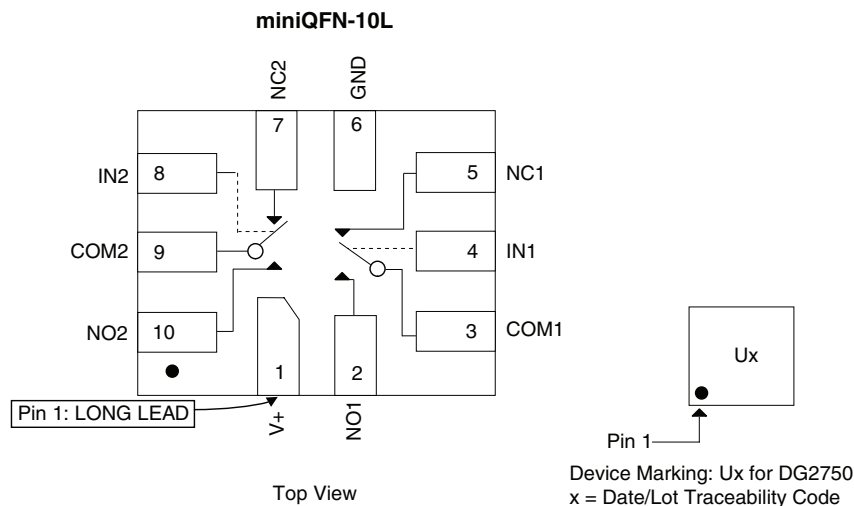
ORDERING INFORMATION

PART NUMBER	TEMPERATURE RANGE	PACKAGE	SIZE
DG2750DN-T1-E4	-40 °C to +85 °C	miniQFN-10	1.4 mm x 1.8 mm x 0.55 mm
DG2750DN1-T1-GE4		UTMQFN-10	1.4 mm x 1.8 mm x 0.35 mm

TRUTH TABLE, DG2750

IN1 (PIN 4)	IN2 (PIN 8)	FUNCTION
0	X	COM1 = NC1
1	X	COM1 = NO1
X	0	COM2 = NC2
X	1	COM2 = NO2

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise noted)

PARAMETER		LIMIT	UNIT
Reference to GND	V+, IN	-0.3 to +6	V
	COM, NO, NC [a]	(V+) -5.5 or -2.5 whichever higher, (V+ + 0.3)	
Current (Any Terminal except COM, NO, NC, IN)		30	mA
Continuous Current (COM, NO, NC, IN)		± 250	
Peak Current (Pulsed at 1 ms, 10 % Duty Cycle)		± 500	
Storage Temperature (D Suffix)		-65 to +150	°C
Power Dissipation (Packages) [b]	miniQFN-10 [c]	208	mW
ESD (Human Body Model) I/O to GND		8	kV
Latch-up (per JESD78)		600	mA

Notes

a. Signals on COM, NO, NC, exceeding V+ will be clamped by internal diodes. Limit forward diode current to maximum current ratings

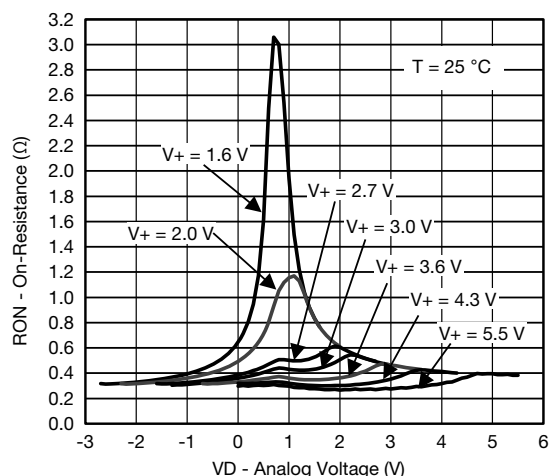b. All leads welded or soldered to PC board

c. Derate 2.6 mW/°C above 70 °C

SPECIFICATIONS (V+ = 2.7 V, ± 10 %)

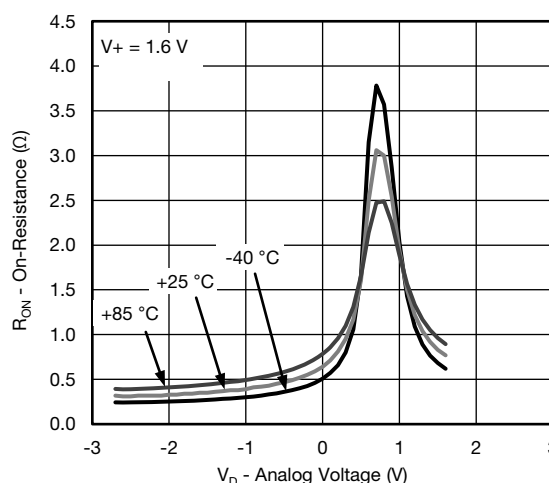| PARAMETER	SYMBOL	TEST CONDITIONS OTHERWISE UNLESS SPECIFIED	TEMP. [a]	LIMITS -40 °C to +85 °C			UNIT
				MIN.[b]	TYP. [c]	MAX. [b]	
Analog Switch							
Analog Signal Range [d]	V$_{ANALOG}$		Full	-2.5	-	V+	V
On-Resistance	R$_{DS(on)}$	V+ = 2.7 V, V$_S$ = ((V+) -4.5 V, -1 V, 0 V, 1 V, 2 V, V+), I$_S$ = 100 mA	Room	-	0.45	1	Ω
			Full	-	-	1.3	
On-Resistance Match	ΔR$_{ON}$		Room	-	0.1	-	
On-Resistance Flatness	R$_{ON}$ Flatness		Room	-	0.3	-	
Switch Off Leakage Current	I$_{NO/NC(off)}$	V+ = 2.7 V, V$_{NC/NO}$ = -2.5 V or 2.5 V, V$_{COM}$ = 2.5 V or -2.5 V	Room	-	50	-	nA
	I$_{COM(off)}$		Full	-250	-	250	
Channel On Leakage Current	I$_{COM(on)}$		Room	-	50	-	
			Full	-250	-	250	
Digital Control							
Input Voltage High	V$_{INH}$	V+ = 2.7 V to 4.3 V	Full	1.4	-	-	V
Input Voltage Low	V$_{INL}$		Full	-	-	0.6	
Input Capacitance	C$_{IN}$		Room	-	6.5	-	pF
Input Current	I$_{INL}$ or I$_{INH}$	V$_{IN}$ = 0 or V+	Full	-1	-	1	µA

SPECIFICATIONS (V+ = 2.7 V, ± 10 %)

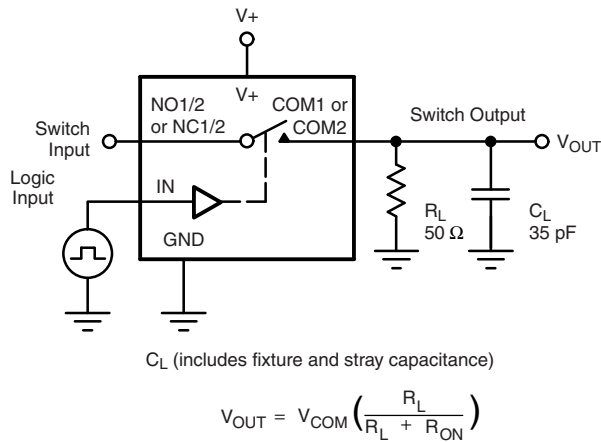| PARAMETER	SYMBOL	TEST CONDITIONS OTHERWISE UNLESS SPECIFIED	TEMP. [a]	LIMITS -40 °C to +85 °C			UNIT
				MIN.[b]	TYP. [c]	MAX. [b]	
Dynamic Characteristics							
Break-Before-Make Time [e, d]	t_{BBM}	V+ = 3 V, V_S = 1.5 V, R_L = 50 Ω, C_L = 35 pF	Room	800	1160	-	ns
			Full	1000	-	-	
Enable Turn-On Time [e, d]	$t_{ON(EN)}$		Room	-	1200	2100	
			Full	-	-	2500	
Enable Turn-Off Time [e, d]	$t_{OFF(EN)}$		Room	-	33	130	
			Full	-	-	150	
Charge Injection [d]	Q_{INJ}	C_L = 1 nF, R_{GEN} = 0 Ω, V_{GEN} = 0 V	Room	-	4	-	pC
Total Harmonic Distortion Plus Noise [d]	THD+N	f = 20 Hz to 20 kHz, V_{COM} = 0.5 V_{P-P}, R_S = R_L = 600 Ω; DC bias = 0 V		-	< -98	-	dB
Off-Isolation [d]	OIRR	V+ = 3 V, R_L = 50 Ω, C_L = 5 pF, f = 300 kHz		-	-54	-	dB
Crosstalk [d, f]	X_{TALK}			-	-60	-	
Bandwidth [d]	BW	V+ = 3 V, R_L = 50 Ω, -3 dB		-	49	-	MHz
Channel-Off Capacitance [d]	$C_{NC/NO(off)}$	V+ = 3 V, f = 1 MHz		-	36	-	pF
Channel-On Capacitance [d]	$C_{COM/NC/NO(on)}$			-	106	-	
Power Supply							
Power Supply Range	V+			1.6	-	5.5	V
Power Supply Current	I+	V_{IN} = 0 V, or V+	Full	-	-	2	µA

Notes

a. Room = 25 °C, Full = as determined by the operating 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. Guarantee by design, not subjected to production test
e. V_{IN} = V+ voltage to perform proper function
f. Crosstalk measured between channels

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)

On-Resistance vs. V_D and Single Supply Voltage

On-Resistance vs. Analog Voltage and Temperature

For technical questions, contact: analogswitchtechsupport@vishay.com

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TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)
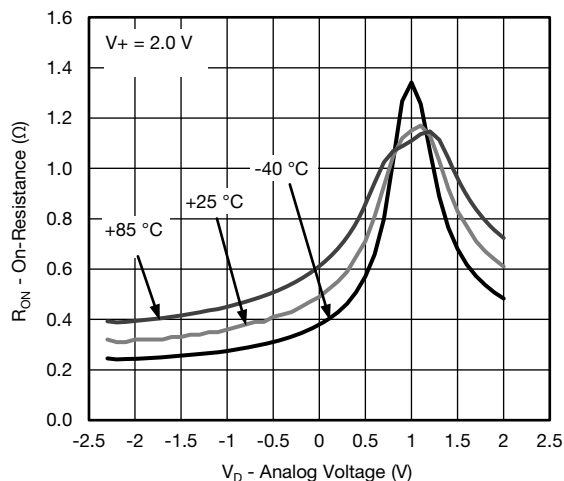
On-Resistance vs. Analog Voltage and Temperature
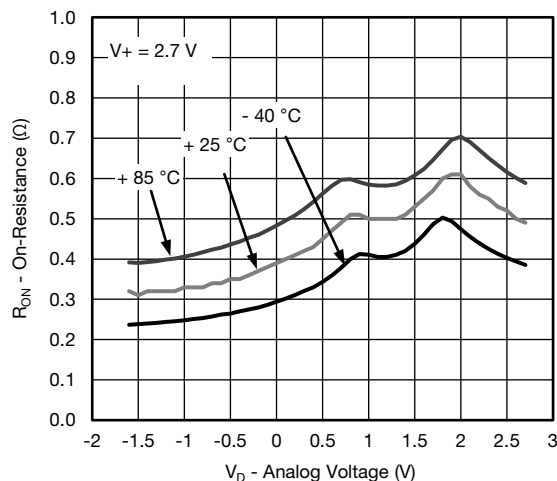
On-Resistance vs. Analog Voltage and Temperature
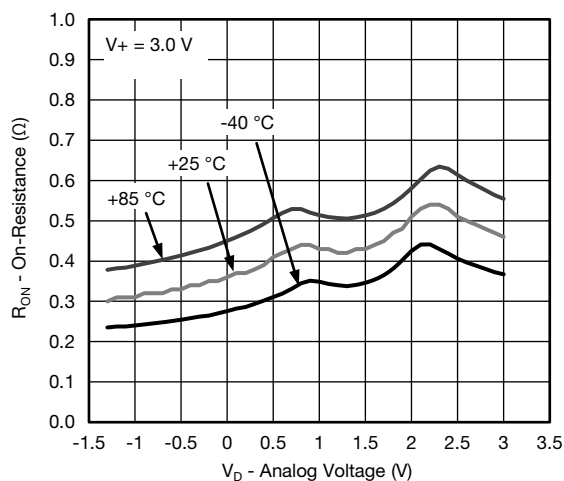
On-Resistance vs. Analog Voltage and Temperature
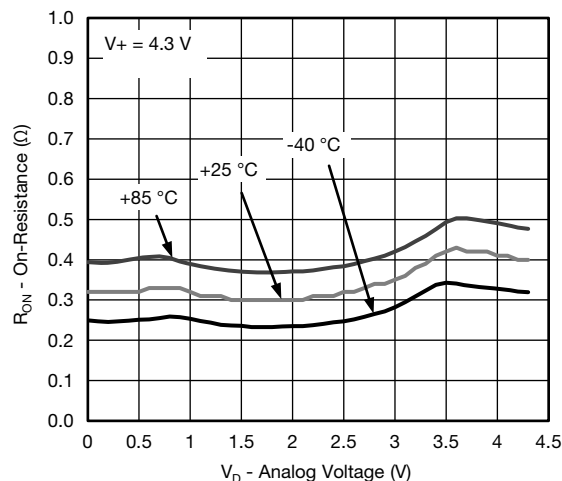
On-Resistance vs. Analog Voltage and Temperature
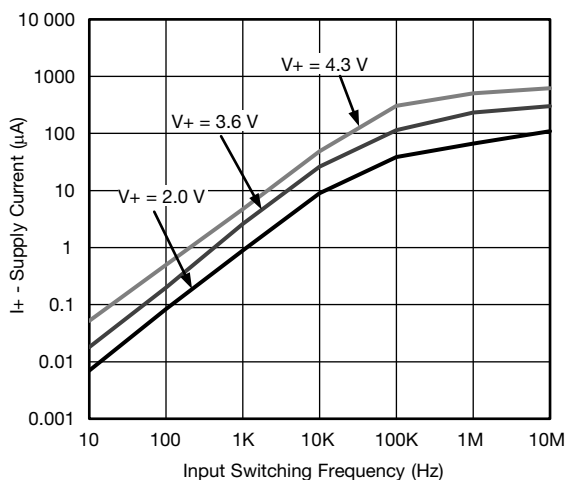
Supply Current vs. Input Switching Frequency
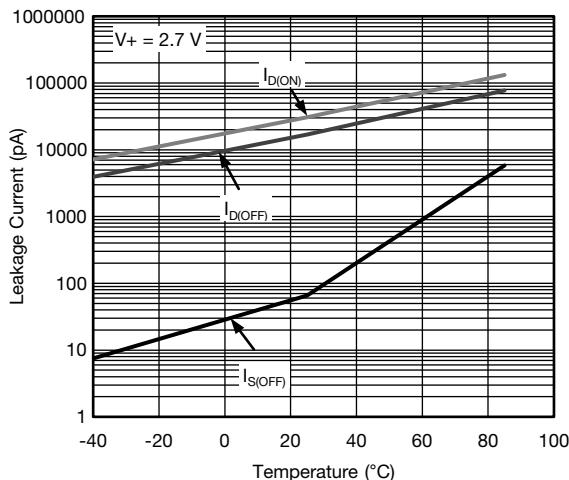
Leakage Current vs. Temperature

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TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)
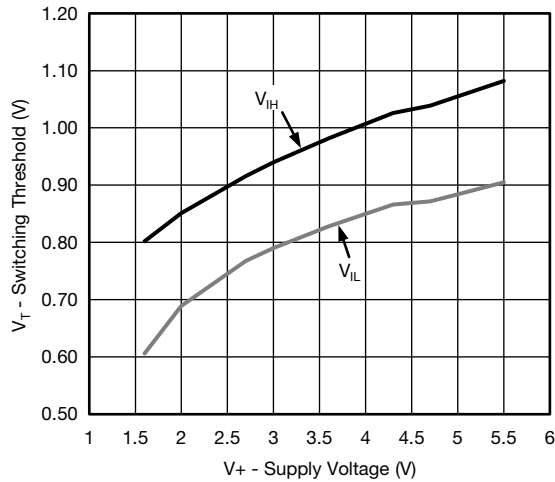
Switching Threshold vs. Supply Voltage
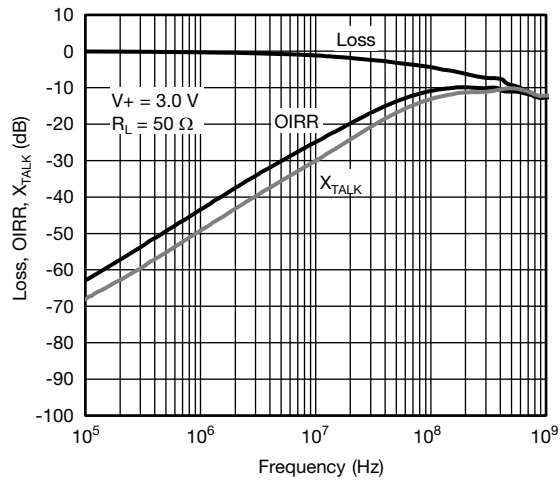
Insertion Loss, Off-Isolation, Crosstalk vs. Frequency

TEST CIRCUITS

C_L (includes fixture and stray capacitance)

$$V_{OUT} = V_{COM} \left(\frac{R_L}{R_L + R_{ON}} \right)$$
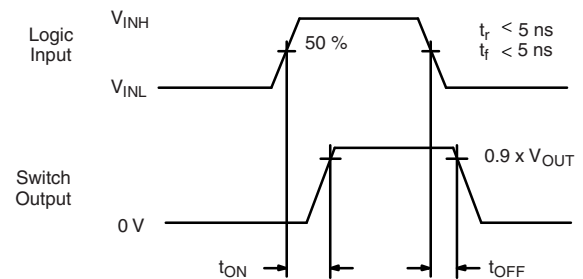
Logic "1" = Switch on
Logic input waveforms inverted for switches that have
the opposite logic sense.

Fig. 1 - Switching Time

C_L (includes fixture and stray capacitance)
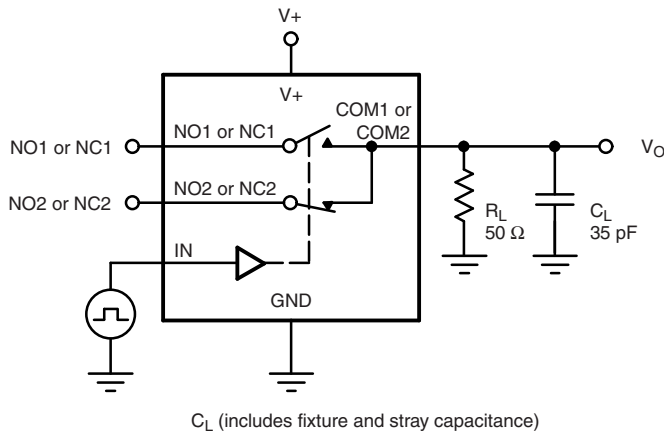
Fig. 2 - Break-Before-Make Interval
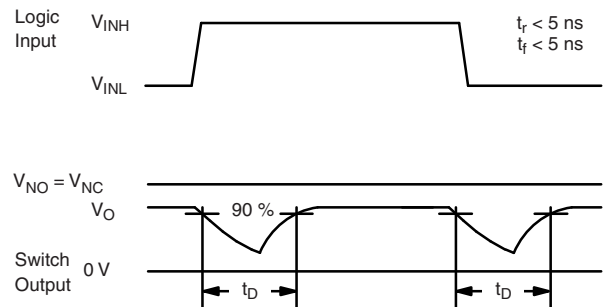
TEST CIRCUITS
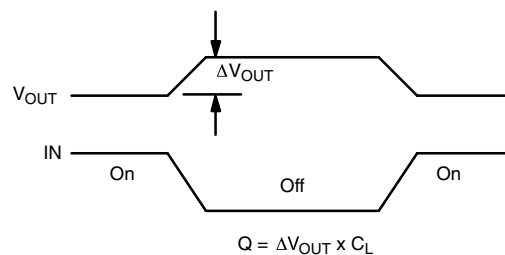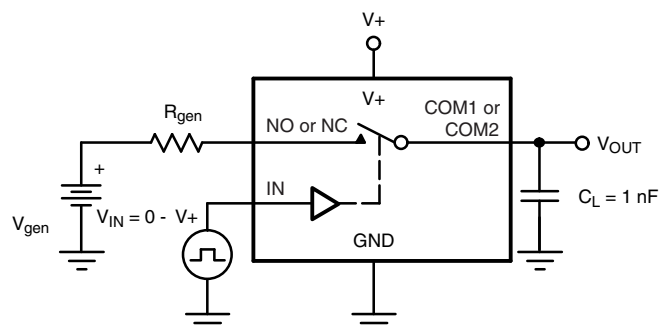
IN depends on switch configuration: input polarity determined by sense of switch.

$$Q = \Delta V_{OUT} \times C_L$$

Fig. 3 - Charge Injection

$$\text{Off Isolation} = 20 \log \frac{\text{COM1 or COM2}}{\text{NC or NO}}$$
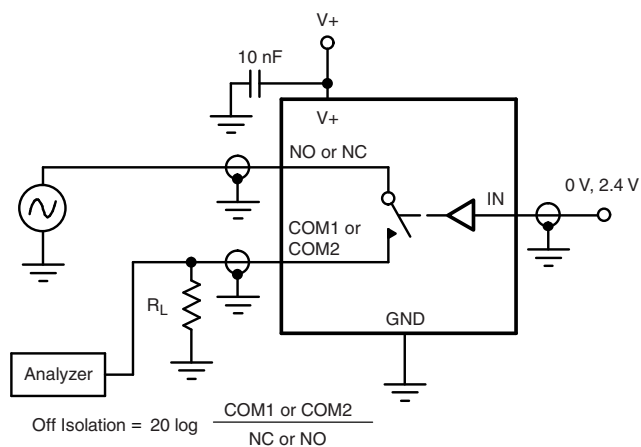
Fig. 4 - Off-Isolation
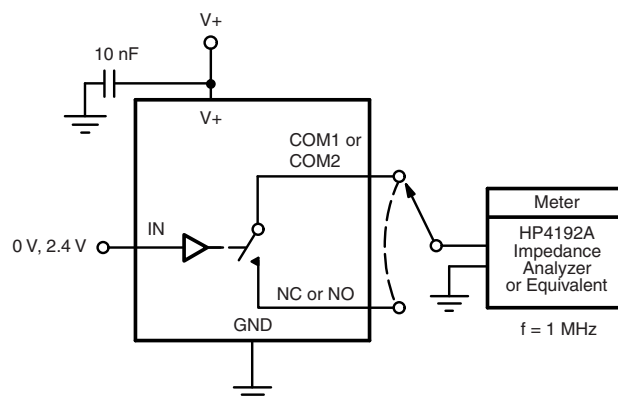
Fig. 5 - Channel Off/On Capacitance

PRODUCT SUMMARY

|	
Part number	DG2750
Status code	2
Configuration	SPDT x 2
Single supply min. (V)	1.6
Single supply max. (V)	5.5
Dual supply min. (V)	-
Dual supply max. (V)	-
On-resistance (Ω)	0.45
Charge injection (pC)	4
Source on capacitance (pF)	106
Source off capacitance (pF)	36
Leakage switch on typ. (nA)	50
Leakage switch off max. (nA)	250
-3 dB bandwidth (MHz)	49
Package	miniQFN-10
Functional circuit / applications	Audio, multi purpose, portable
Interface	Binary
Single supply operation	Yes
Dual supply operation	-
Turn on time max. (ns)	2100
Crosstalk and off isolation	-60

For technical questions, contact: analogswitchtechsupport@vishay.com

MINI QFN-10L CASE OUTLINE
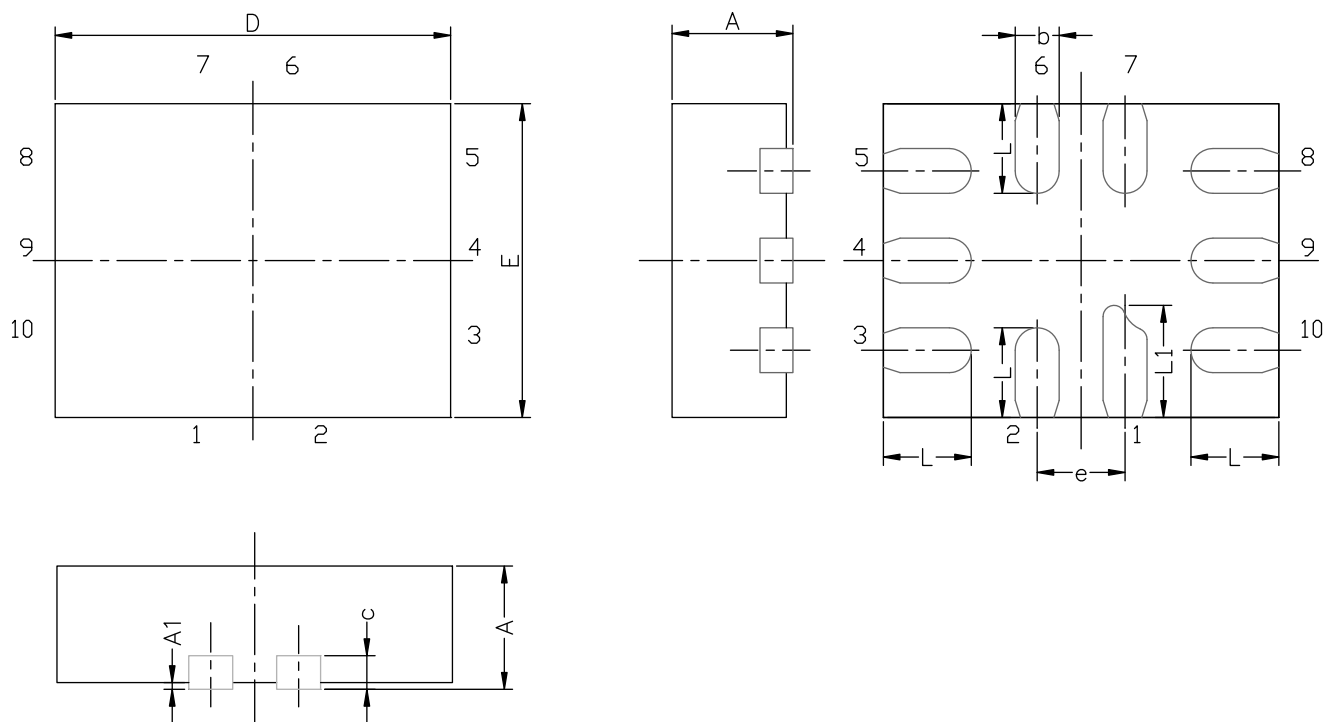
DIM	MILLIMETERS			INCHES		
	MIN.	NAM.	MAX.	MIN.	NAM.	MAX.
A	0.45	0.55	0.60	0.0177	0.0217	0.0236
A1	0.00	-	0.05	0.000	-	0.002
b	0.15	0.20	0.25	0.006	0.008	0.010
c	0.150 or 0.127 REF [1]			0.006 or 0.005 REF [1]		
D	1.70	1.80	1.90	0.067	0.071	0.075
E	1.30	1.40	1.50	0.051	0.055	0.059
e	0.40 BSC			0.016 BSC		
L	0.35	0.40	0.45	0.014	0.016	0.018
L1	0.45	0.50	0.55	0.0177	0.0197	0.0217

Note

[1] The dimension depends on the leadframe that assembly house used.

ECN T16-0163-Rev. B, 16-May-16
DWG: 5957

Ultra Thin MiniQFN-10L-T0.35 Case Outline

Top view

Side view

Bottom view

Front view
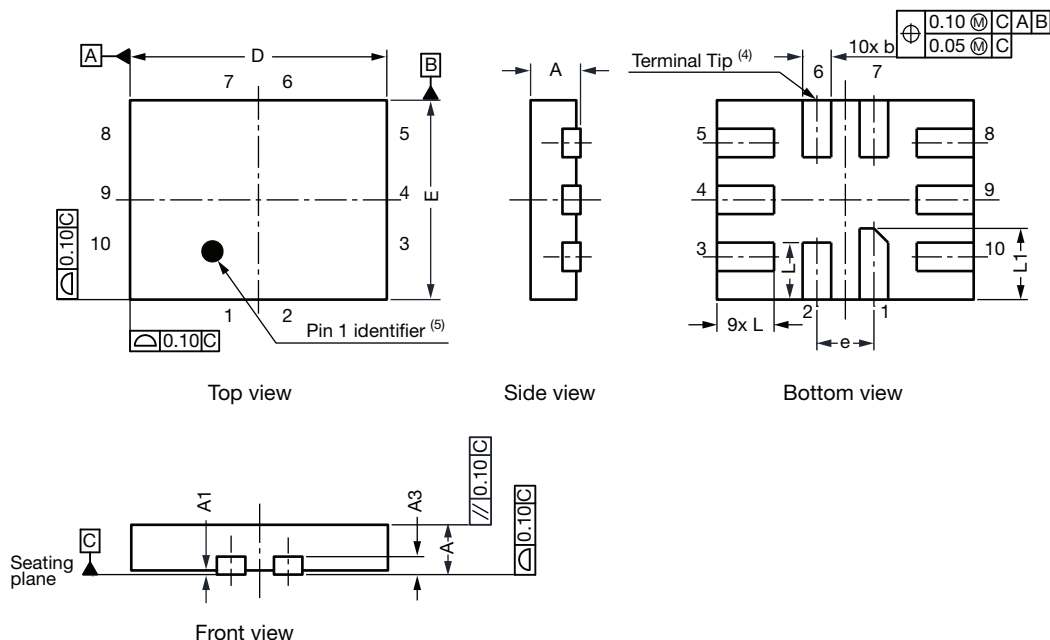
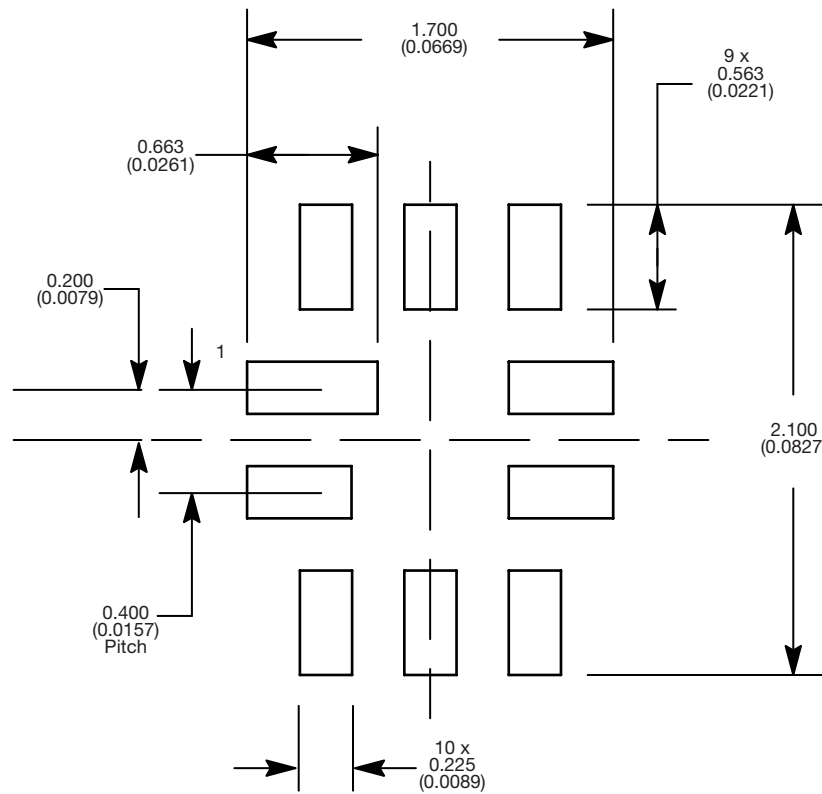| DIM.	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.30	0.35	0.40	0.012	0.014	0.016
A1	0.00	0.02	0.05	0.0000	0.0008	0.0020
A3	0.127 REF			0.005 REF		
b	0.15	0.20	0.25	0.006	0.008	0.010
D	1.80 BSC			0.071 BSC		
e	0.40 BSC			0.016 BSC		
E	1.40 BSC			0.055 BSC		
L	0.35	0.40	0.45	0.014	0.016	0.018
L1	0.45	0.50	0.55	0.018	0.020	0.022
N [3]	10			10		
Nd [3]	2			2		
Ne [3]	3			3		
ECN: T15-0603-Rev. A, 12-Oct-15 DWG: 6045						

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 is the number of terminals in X-direction, and
Ne is the number of terminals in Y-direction.
[4] Dimension 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 indentation mark or other feature of package body.
[6] Package warpage max. 0.05 mm.

RECOMMENDED MINIMUM PADS FOR MINI QFN 10L

1.700
(0.0669)

9 x
0.563
(0.0221)

0.663
(0.0261)

0.200
(0.0079)

1

2.100
(0.0827)

0.400
(0.0157)
Pitch

10 x
0.225
(0.0089)

Mounting Footprint
Dimensions in mm (inch)

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