

DIO1520

0.7 Ω , Ultra-Low On-Resistance Dual, SPDT Analog Switch

Features

- Switch type: SPDT (2X)
- Voltage operation: 1.65 V to 5.85 V
- Ultra-low on resistance: 0.7 Ω at 3 V
- -3 dB bandwidth: 300 MHz
- High off-isolation: -95 dB at 1 kHz
- Low crosstalk: -95 dB at 1 kHz
- Excellent on resistance matching: 0.02 Ω
- Low total harmonic distortion (THD): 0.024% at $V_{SW} = 2 V_{PP}$, $R_L = 32 \Omega$
- All switch I/O ports are high impedance with no leakage current, when $V_{CC} = 0 V$
- Break-before-make switching
- Green packaged: QFN1.4*1.8-10
- ± 8 kV HBM ESD

Descriptions

The DIO1520 is a dual Single-Pole, Double-Throw (SPDT) analog switch. The DIO1520 operates from a single 1.65 V to 5.85 V supply and features an ultra-low on resistance of 0.7 Ω at a 3 V supply and $T_A = 25^\circ\text{C}$. This device is fabricated with sub-micron CMOS technology to achieve fast switching speed and is designed for break-before-make operation.

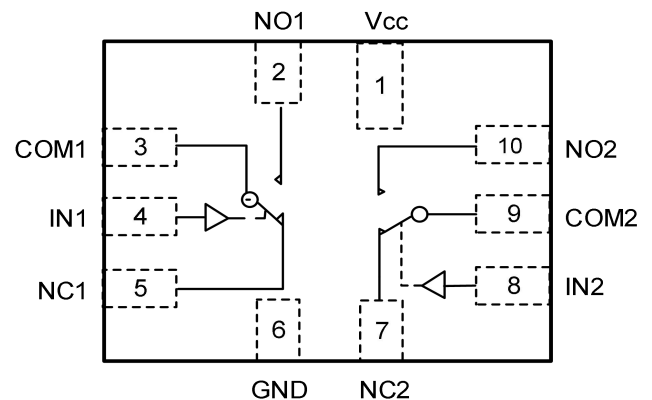
The DIO1520 guarantees 0.02 Ω on-resistance matching between switches, on-resistance flatness over the signal range, high off-isolation and low crosstalk, which ensures excellent linearity and low distortion when switching audio signals. The DIO1520 consists of two normally open and two normally close switches.

The DIO1520 provides the Green package with 10-lead QFN.

Applications

- Cell-phone/PDA
- MP3/MP4/PMP
- Portable instrumentation
- Battery powered communications
- Computer peripherals

Block Diagram



Ordering Information

Ordering Part No.	Top Marking	MSL	RoHS	T_A	Package	
DIO1520LP10	YW5Z	1	Green	-40 to 85°C	QFN1.4*1.8-10	Tape & Reel, 3000



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Pin Assignment

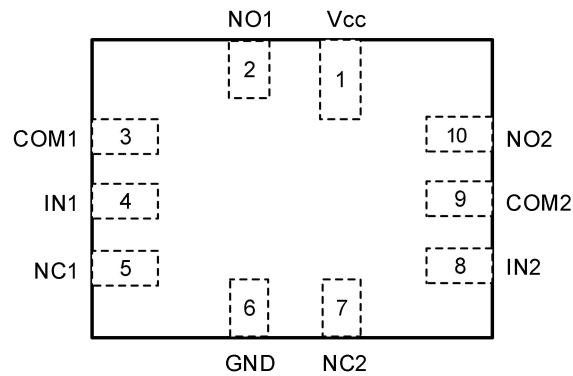


Figure 1. QFN1.4*1.8-10 (Top view)

Pin Descriptions

Pin Name	Description
V _{CC}	Power supply
GND	Ground
IN1, IN2	Digital control pin to connect the COM terminal to the NO or NC terminals
COM1, COM2	Common terminal
NO1, NO2	Normally-open terminal
NC1, NC2	Normally-closed terminal

Truth Table

IN1, IN2	NO	NC
L	OFF	ON
H	ON	OFF



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Absolute Maximum Ratings

Stresses beyond those listed under the Absolute Maximum Rating table may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other condition 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. DIOO does not recommend exceeding them or designing to absolute maximum ratings.

Symbol	Parameter	Min	Max	Unit
V_{CC}	Supply voltage	-0.3	6	V
V_{CNTRL}	DC input voltage	-0.3	6	V
V_{SW}	DC input I/O voltage	$V_{CC} - 7$	6	V
I_{IK}	DC input diode current	-50		mA
I_{OUT}	DC output current		500	mA
T_{STG}	Storage temperature	-65	150	$^{\circ}\text{C}$
ESD	HBM, JEDEC: JESD22-A114		± 8000	V

Recommend Operating Conditions

Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications.

Symbol	Parameter	Min	Max	Unit
V_{CC}	Supply voltage	1.65	5.85	V
V_{CNTRL}	Control input voltage (IN1/IN2)	0	V_{CC}	V
V_{SW}	Switch I/O voltage	$V_{CC} - 5.85$	V_{CC}	V
T_A	Operating temperature	-40	85	$^{\circ}\text{C}$



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Electrical Characteristics

All typical value are at $V_{CC} = 3.6 \text{ V}$, $T_A = 25^\circ\text{C}$ unless otherwise specified.

Symbol	Parameter	Conditions	V _{CC}	Temp.	Min	Typ	Max	Unit
Power requirements								
V _{CC}	Power supply range			-40 to 85°C	1.65		5.85	V
I _{CC}	Quiescent supply current	V _{CC} = 1.65 V to 5.85 V	4.2 V	25°C		25	50	nA
I _{CCT}	Increase in I _{CC} per input	Input at 2.6 V	4.2 V	-40 to 85°C			2.5	μA
		Input at 1.8 V					6.5	
Analog switch characteristics								
R _{ON}	On-resistance	V _{NO} , V _{NC} , or V _{COM} = 1 V, I _{COM} = -100 mA	3 V	25°C		0.7		Ω
				-40 to 85°C	0.6		0.9	Ω
ΔR _{ON}	On-resistance match between channels	V _{NO} , V _{NC} or V _{COM} = 1 V, I _{COM} = -100 mA	3 V	25°C		0.02	0.1	Ω
				-40 to 85°C			0.1	Ω
R _{FLAT (ON)}	On-resistance flatness	V _{NO} , V _{NC} or V _{COM} = 1 V, 2 V I _{COM} = -100 mA	3 V	25°C		0.05	0.1	Ω
				-40 to 85°C			0.1	Ω
I _{NC (OFF)} , I _{NO (OFF)}	Source OFF leakage current	V _{NO} , V _{NC} = 3.3 V, 0.3 V V _{COM} = 0.3 V/3.3 V	4.2 V	-40 to 85°C			50	nA
I _{NC (ON)} , I _{NO (ON)} I _{COM (ON)}	Channel ON leakage current	V _{NO} , V _{NC} = 3.3 V, 0.3 V or floating V _{COM} = 0.3 V/3.3 V	4.2 V	-40 to 85°C			50	nA
I _{OFF}	Power OFF current	V _{CC} = 0 V, V _{SW} = -3.7 V ~ 5.85 V					30	nA
Digital inputs								
V _{INH}	Input high voltage		5.5 V	-40 to 85°C	1.75			V
			4.2 V		1.65			
			2.7 V		1.3			
			1.8 V		1.2			
V _{INL}	Input low voltage		5.5 V	-40 to 85°C			0.9	V
			4.2 V				0.8	
			2.7 V				0.6	
			1.8 V				0.5	
Dynamic characteristics								
t _{ON}	Turn-on time	V _{IN} = 2.1 V to 0 V, R _L = 50 Ω, C _L = 35 pF, V _{NO1} or V _{NO2} or V _{NC2} = 2.1 V				1.6		μs



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t_{OFF}	Turn-off time	$V_{IN} = 2.1\text{ V to }0\text{ V}$, $R_L = 50\ \Omega$, $C_L = 35\text{ pF}$, V_{NO1} or V_{NO2} or $V_{NC2} = 2.1\text{ V}$				100		ns
t_D	Break-before-make time delay	$V_{IN} = 2.1\text{ V to }0\text{ V}$, $R_L = 50\ \Omega$, $C_L = 35\text{ pF}$, V_{NO1} or V_{NO2} or $V_{NC2} =$ 2.1 V				1.3		μs
BW	-3 dB bandwidth	$R_L = 50\ \Omega$, $C_L = 0\text{ pF}$				300		MHz
O_{ISO}	Off-isolation	$f = 1\text{ kHz}$, $R_L = 32\ \Omega$, $V_{SW} = 4\text{ V}_{PP}$				-95		dB
		$f = 10\text{ kHz}$, $R_L = 32\ \Omega$, $V_{SW} = 4\text{ V}_{PP}$				-80		dB
X_{TALK}	Channel-to-channel crosstalk	$f = 1\text{ kHz}$, $R_L = 32\ \Omega$				-95		dB
		$f = 10\text{ kHz}$, $R_L = 32\ \Omega$				-85		dB
THD	Total harmonic distortion	$f = 20\text{ Hz to }20\text{ kHz}$, $R_L = 32\ \Omega$, $V_{SW} = 2\text{ V}_{PP}$	4.5			0.024		%
		$f = 20\text{ Hz to }20\text{ kHz}$, $R_L = 32\ \Omega$, $V_{SW} = 4\text{ V}_{PP}$	3.5			0.050		
		$f = 20\text{ Hz to }20\text{ kHz}$, $R_L = 32\ \Omega$, $V_{SW} = 6\text{ V}_{PP}$	2.5			0.170		

Note:

(1) Specifications subject to change without notice.

Test Diagrams

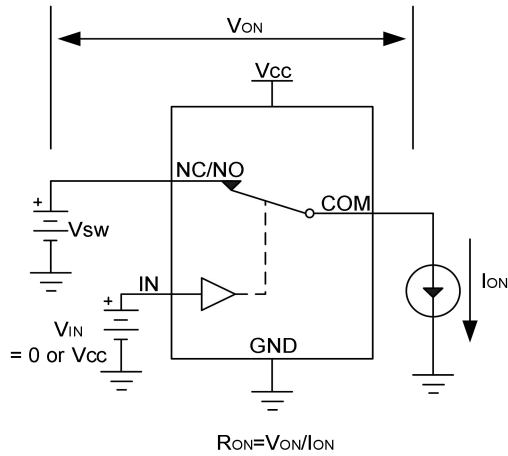


Figure 2. Switch on resistor

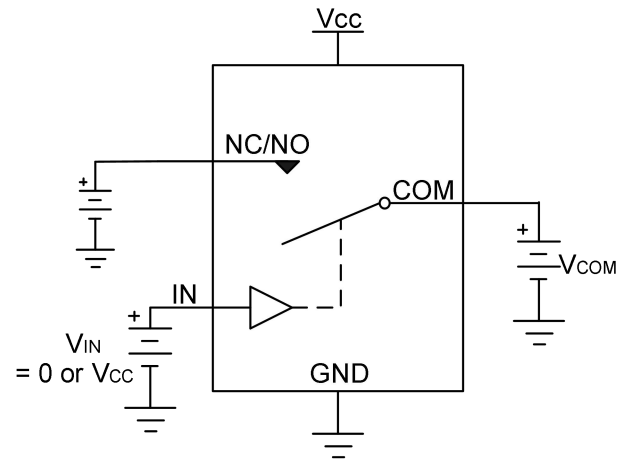


Figure 3. Switch off leakage

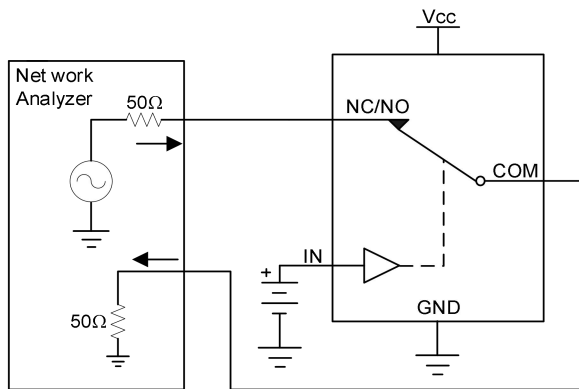


Figure 4. Bandwidth

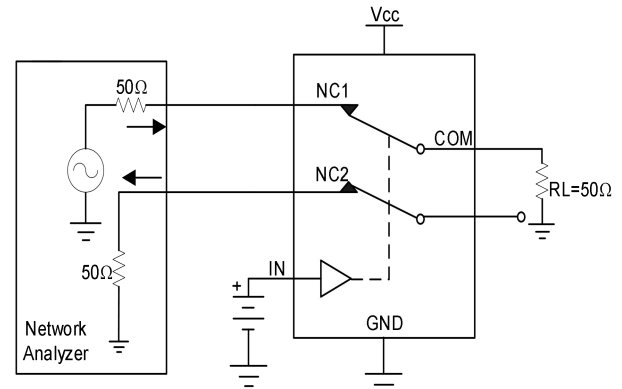


Figure 5. Channel-to-channel crosstalk

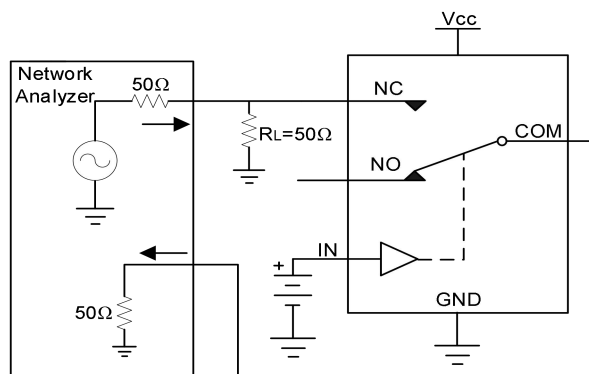


Figure 6. Off-isolation

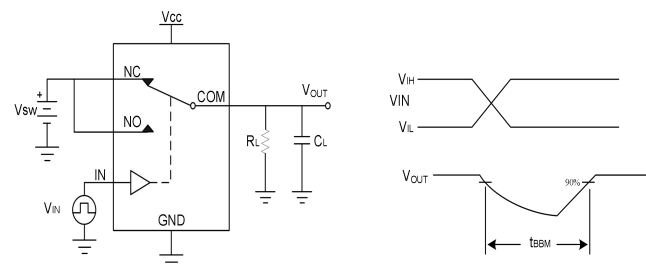


Figure 7. Break-before-make

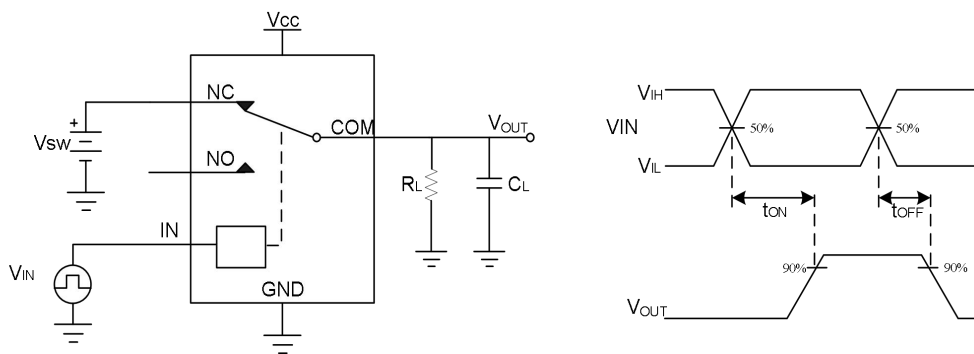


Figure 8. Turn-on/Turn-off

Typical Performance Characteristics

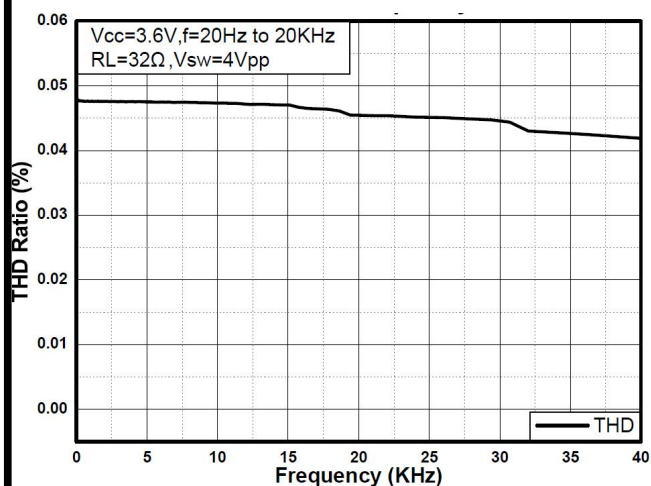


Figure 9. THD vs. Frequency (4 Vpp)

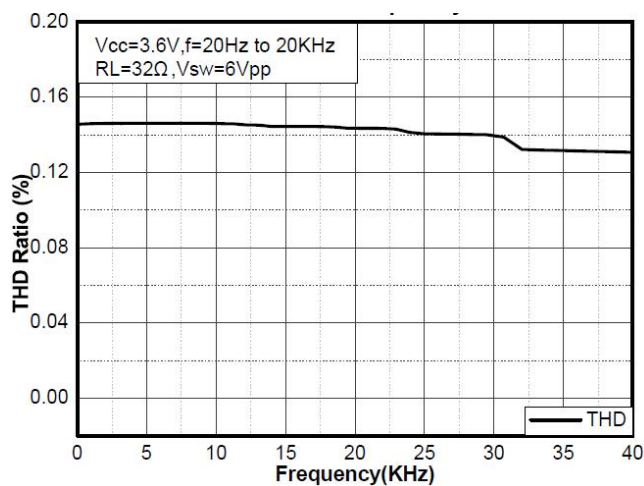


Figure 10. THD vs. Frequency (6 Vpp)

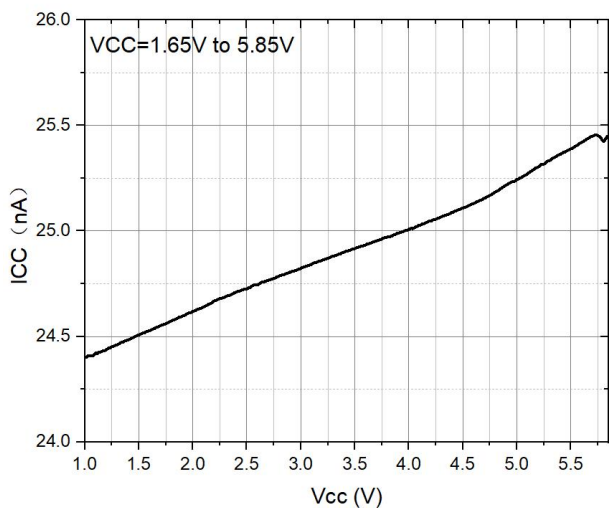


Figure 11. Quiescent current vs. Input voltage

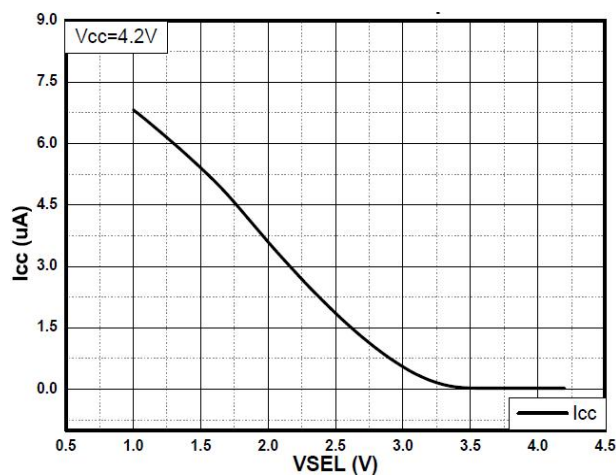


Figure 12. Increase in ICC per input

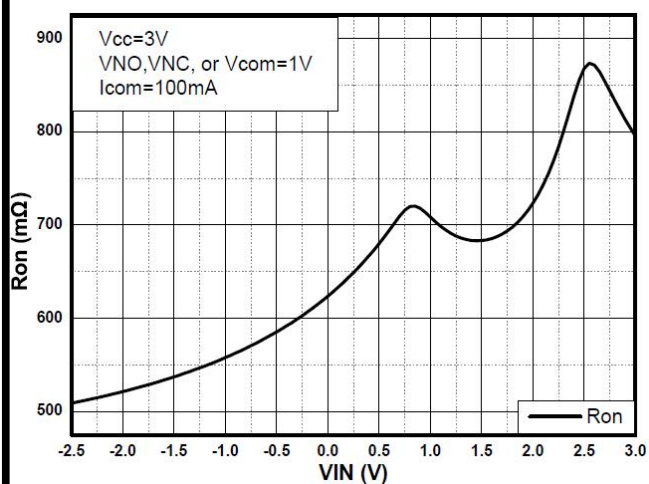


Figure 13. R_{ON} vs. Input voltage

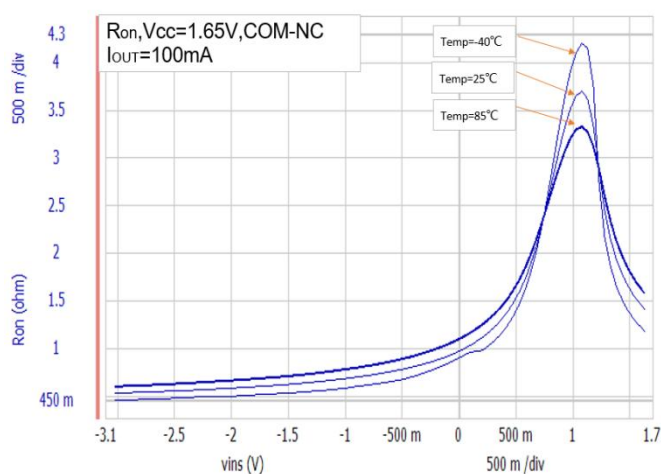


Figure 14. R_{ON} vs. Temperature

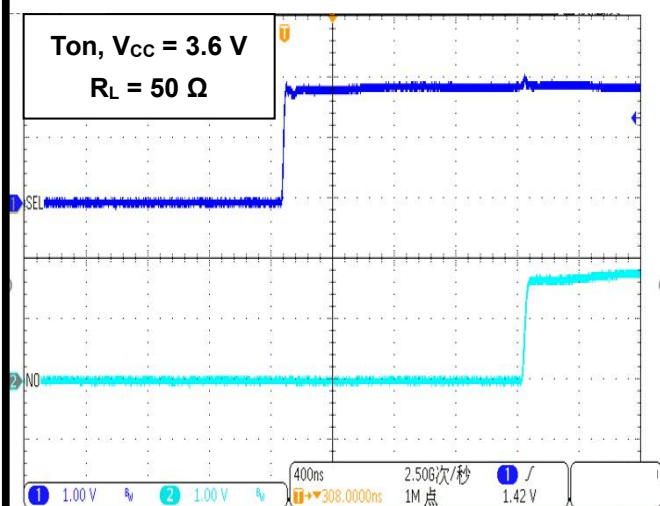


Figure 15. Turn-on time

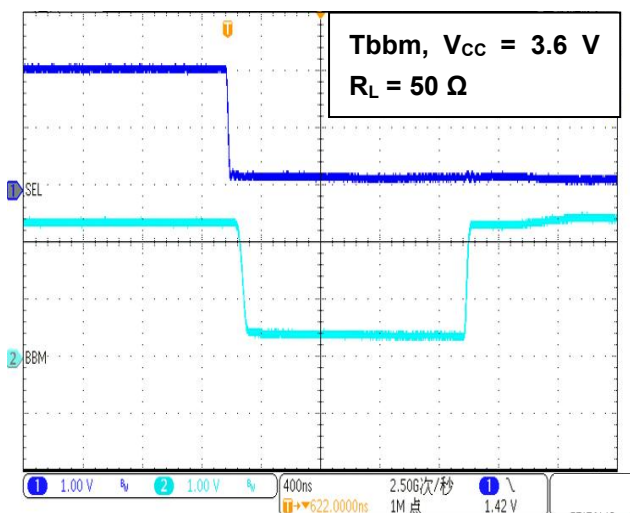
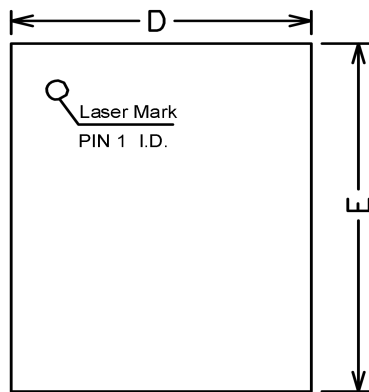
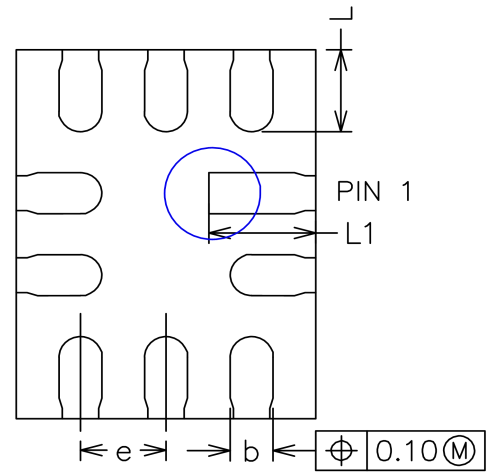


Figure 16. Break-before-make time

Physical Dimensions: QFN1.4*1.8-10



Top View

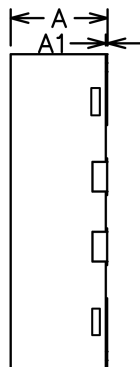
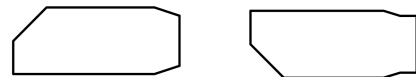


Bottom View



Side View

Two options



Side View

Common Dimensions (Units of measure = Millimeter)			
Symbol	Min	Nom	Max
A	0.50	0.55	0.60
A1	0.00	0.02	0.05
b	0.15	0.20	0.25
D	1.30	1.40	1.50
E	1.70	1.80	1.90
e	0.30	0.40	0.50
L	0.35	0.40	0.45
L1	0.45	0.50	0.55



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CONTACT US

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