

## GENERAL DESCRIPTION

The MPQ2735 are low voltage, low on-resistance, dual single-pole, double-throw (SPDT) monolithic CMOS analog switches designed for high performance switching of analog signals. Combining low-power, high speed, low on-resistance, and small package size, the MPQ2735 are ideal for portable and battery power applications.

The MPQ2735 have an operation range from 1.65V to 5.5V single supply. The MPQ2735 has two separate control pins and two separate SPDT switches.

The MPQ2735 are guaranteed 1.65V logic compatible for  $V+ < 3.3V$ , allowing the easy interface with low voltage DSP or MCU control logic and ideal for one cell Li-ion battery direct power.

The switch conducts signals within power rails equally well in both directions when on, and blocks up to the power supply level when off. Break-before-make is guaranteed.

The MPQ2735 are offered in a QFN10 package.

## FEATURES

- Guaranteed Industrial/Automotive Temperature
- Low Voltage Operation (1.65V to 5.5V)
- Low On-Resistance -  $R_{ON}$ : 0.45Ω at 2.7V
- Fast Switching:  $T_{ON}$  = 29ns at 2.7V
- $T_{OFF}$  = 23ns at 2.7V
- Latch-Up Current >300mA (JESD78)
- 2mm x 2mm QFN10 Package
- ESD Human-Body Model ±4000V
- Available in AEC-Q100 Grade 1

## APPLICATIONS

- Cellular Phones
- Speaker Headset Switching
- Audio and Video Signal Routing
- PCMCIA Cards
- Battery Powered Systems
- Portable Media Player
- Handheld Test Instruments

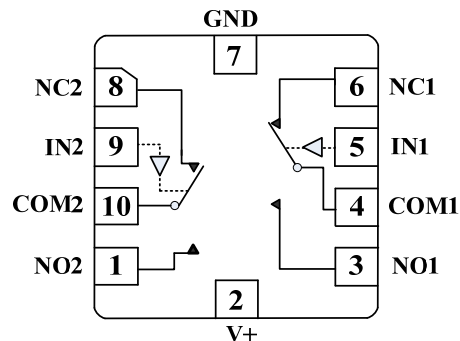
## TRUTH TABLE

	IN1/2	NC1/2	NO1/2
MPQ2735	0	ON	OFF
	1	OFF	ON

All MPS parts are lead-free, halogen-free, and adhere to the RoHS directive. For MPS green status, please visit the MPS website under Quality Assurance.

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## FUNCTIONAL BLOCK DIAGRAM PIN CONFIGURATION

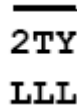


### ORDERING INFORMATION

Part Number*	Package	Top Marking
MPQ2735GG	QFN-10 (2mmx2mm)	See Below
MPQ2735GG-AEC1	QFN-10 (2mmx2mm)	See Below

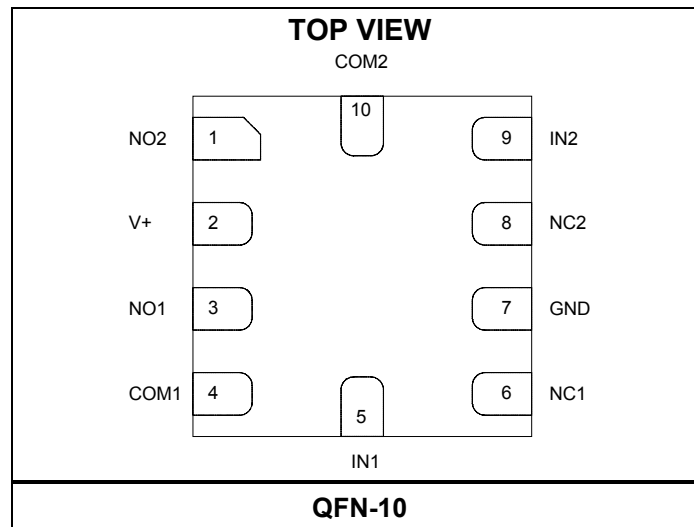
\* For Tape & Reel, add suffix -Z (e.g. MPQ2735GG-Z);

### TOP MARKING

  
**2TY**  
**LLL**

2T: product code of MPQ2735GG&MPQ2735GG-AEC1;  
 Y: year code;  
 LLL: lot number;

### PACKAGE REFERENCE



## ABSOLUTE MAXIMUM RATINGS

V+ Supply Voltage .....-0.3V to +6V  
IN/COM/NC/NO Voltage <sup>(1)</sup> ... -0.3V to V+ + 0.3V  
Current  
(Any terminal except NO, NC or COM) .....  
..... 30mA  
Continuous Current (NO, NC or COM) .....  
..... ±250mA  
Peak Current  
(Pulsed at 1ms, 10% duty cycle) ..... ±500mA  
Storage Temperature..... -65°C to +150°C  
Power Dissipation (QFN10 <sup>(2)</sup> <sup>(3)</sup>) ..... 208mW

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**Notes:**

- 1) Signals on NC, or COM or IN exceeding V+ will be clamped by internal diodes. Limit forward diode current to maximum current ratings.
- 2) Derate 4.0mW/°C above 70°C.
- 3) All leads welded or soldered to PC Board.

## ELECTRICAL CHARACTERISTICS

V<sub>+</sub>=3V, ±10%, V<sub>IN</sub>=0.4 or 1.65V, T<sub>J</sub> = -40°C to +125°C, unless otherwise noted. Typical values are at T<sub>J</sub> = 25°C.

Parameter	Symbol	Condition	Min	Typ	Max	Units
<b>Analog Switch</b>						
Analog Signal Range	V <sub>analog</sub>	r <sub>DS(on)</sub> , T <sub>A</sub> = -40°C to +125°C	0		V+	V
On-Resistance	r <sub>DS(on)</sub>	V <sub>+</sub> =2.7V, I <sub>NO/NC</sub> =100mA, V <sub>COM</sub> =0.5V	T <sub>A</sub> = +25°C	0.28	0.45	Ω
		V <sub>+</sub> =2.7V, I <sub>NO/NC</sub> =100mA, V <sub>COM</sub> =1.5V				
		V <sub>+</sub> =2.7V, I <sub>NO/NC</sub> =100mA, V <sub>COM</sub> =0.5V	T <sub>A</sub> = -40°C to +125°C	0.30		
		V <sub>+</sub> =2.7V, I <sub>NO/NC</sub> =100mA, V <sub>COM</sub> =1.5V				
		V <sub>+</sub> =5.5V, I <sub>NO/NC</sub> =100mA, V <sub>COM</sub> =0.9V	T <sub>A</sub> = +25°C	0.20	0.30	
		V <sub>+</sub> =5.5V, I <sub>NO/NC</sub> =100mA, V <sub>COM</sub> =2.5V				
		V <sub>+</sub> =5.5V, I <sub>NO/NC</sub> =100mA, V <sub>COM</sub> =0.9V	T <sub>A</sub> = -40°C to +125°C	0.25		
V <sub>+</sub> =5.5V, I <sub>NO/NC</sub> =100mA, V <sub>COM</sub> =2.5V						
r <sub>ON</sub> Match	Δr <sub>on</sub>	V <sub>+</sub> =2.7V, I <sub>NO/NC</sub> =100mA, V <sub>COM</sub> =0.5V/1.5V	T <sub>A</sub> = +25°C	0.01	0.02	
		V <sub>+</sub> =5.5V, I <sub>NO/NC</sub> =100mA, V <sub>COM</sub> =0.9V/2.5V				
r <sub>ON</sub> Flatness	r <sub>ON</sub> Flatness	V <sub>+</sub> =2.7V, I <sub>NO/NC</sub> =100mA, V <sub>COM</sub> =0.5V/1.5V			0.15	
Switch Off Leakage Current	I <sub>NO/NC(off)</sub>	V <sub>+</sub> =5.5V, V <sub>NO/NC</sub> =0.3V/4.0V, V <sub>COM</sub> =4.0V/0.3V	T <sub>A</sub> = +25°C	-40	40	nA
			T <sub>A</sub> = -40°C to +125°C	-1000	1000	
	T <sub>A</sub> = +25°C		-40	40		
	T <sub>A</sub> = -40°C to +125°C		-1000	1000		
	I <sub>COM(off)</sub>					
Channel-On Leakage Current	I <sub>COM(on)</sub>	V <sub>+</sub> =5.5V, V <sub>NO/NC</sub> =V <sub>COM</sub> =4.0V/0.3V	T <sub>A</sub> = +25°C	-40	40	
			T <sub>A</sub> = -40°C to +125°C	-1000	1000	
<b>Digital Control</b>						
Input High Voltage	V <sub>INH</sub>	T <sub>A</sub> = -40°C to +125°C	1.65			V
Input Low Voltage	V <sub>INL</sub>				0.4	
Input Capacitance	C <sub>IN</sub>		6			pF
Input Current	I <sub>INL</sub> or I <sub>INH</sub>		V <sub>IN</sub> =0	-1		1
		V <sub>IN</sub> = V+		5.5		

**ELECTRICAL CHARACTERISTICS** (continued)

V+=3V, ±10%, V<sub>IN</sub>=0.4 or 1.65V, T<sub>J</sub> = -40°C to +125°C, unless otherwise noted. Typical values are at T<sub>J</sub> = 25°C.

Parameter	Symbol	Condition	Min	Typ	Max	Units		
<b>Dynamic Characteristics</b>								
Break-Before-Make Time <sup>(4)</sup>	t <sub>BBM</sub>	V+=3.6V, V <sub>NO</sub> /V <sub>NC</sub> =1.5V, R <sub>L</sub> =50Ω, C <sub>L</sub> =35pF	T <sub>A</sub> = +25°C	10		ns		
Turn-On Time <sup>(4)</sup>	t <sub>ON</sub>				24			
Turn-Off Time <sup>(4)</sup>	t <sub>OFF</sub>		T <sub>A</sub> = -40°C to +125°C		40			
			T <sub>A</sub> = +25°C		20			
		T <sub>A</sub> = -40°C to +125°C		35				
Off-Isolation <sup>(4)</sup>	OIRR	R <sub>L</sub> =50Ω, C <sub>L</sub> =5pF, f=100kHz		-70		dB		
Crosstalk <sup>(4)</sup>	XTALK			-70		dB		
3dB Bandwidth <sup>(4)</sup>				R <sub>L</sub> =50Ω, C <sub>L</sub> =5pF		50		MHz
NO, NC Off Capacitance <sup>(4)</sup>	C <sub>NO(off)</sub>	V <sub>IN</sub> =0V, or V+, f=1MHz	T <sub>A</sub> = +25°C	55		pF		
	C <sub>NC(off)</sub>			55				
Channel On Capacitance <sup>(4)</sup>	C <sub>NO(on)</sub>						130	
	C <sub>NC(on)</sub>						130	
<b>Power Supply</b>								
Power Supply Range	V+			1.65		5.5	V	
Power Supply Current	I+	V <sub>IN</sub> =0 or V+	T <sub>A</sub> = 25°C	-1		1	μA	

**Note:**

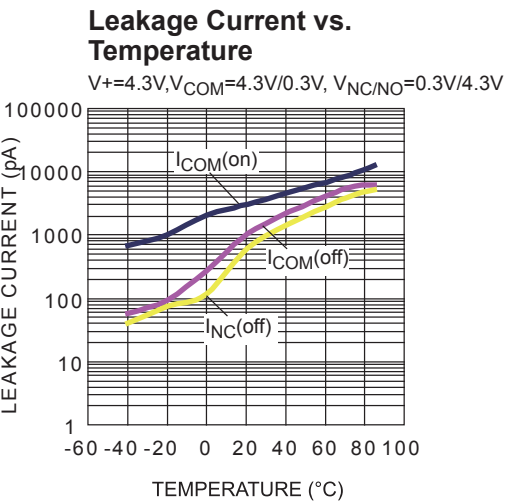
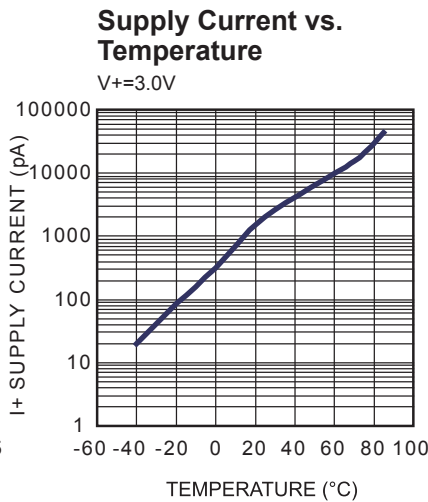
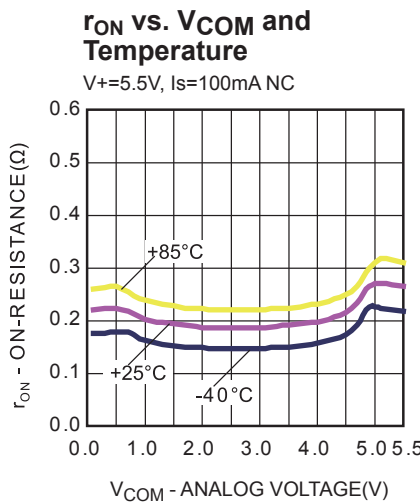
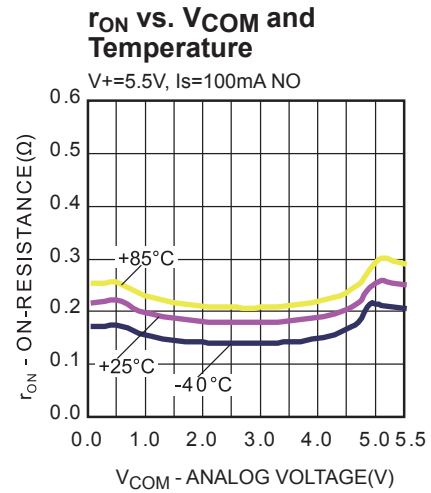
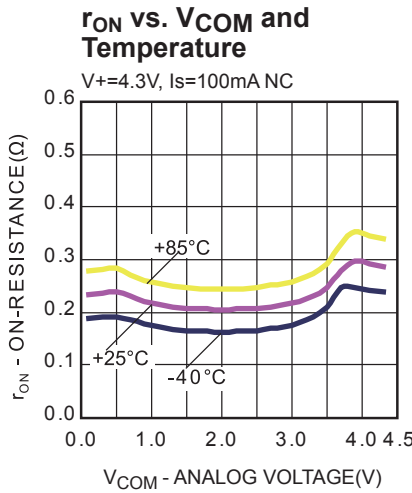
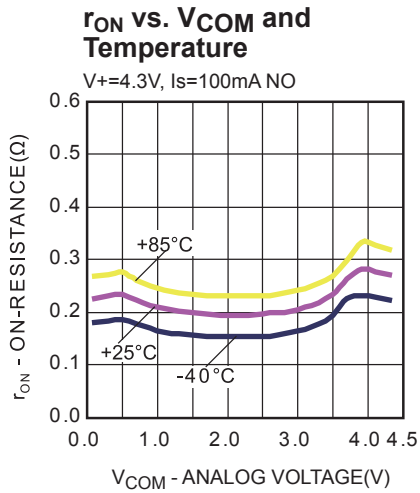
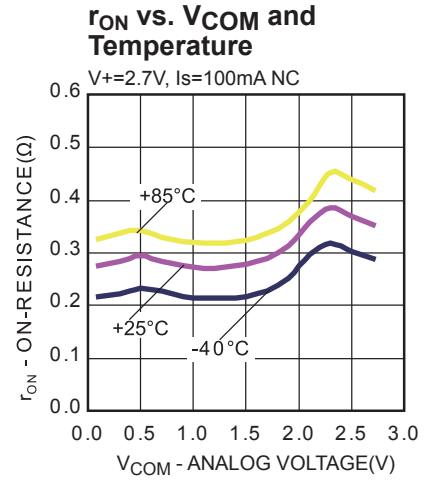
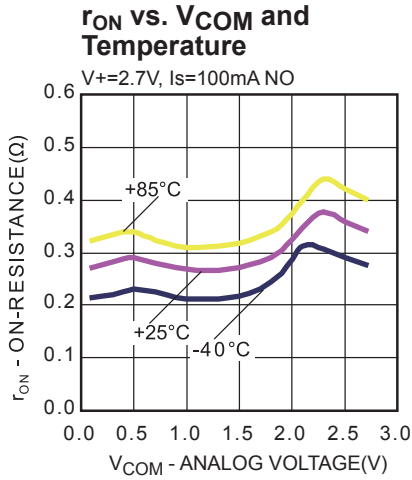
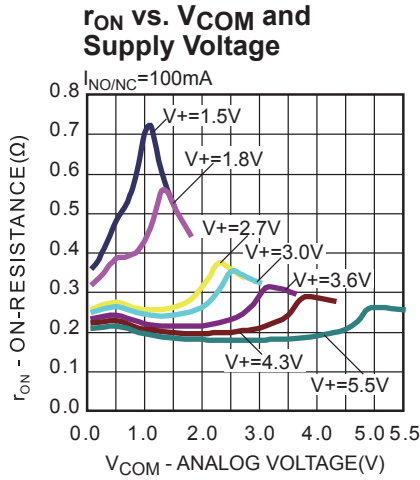
- 4) Guarantee by design, not subjected to production test.

## PIN FUNCTIONS

Pin #	Name	Description
1	NO2	Normally open I/O port of switch2
2	V+	Supply Voltage
3	NO1	Normally open I/O port of switch1
4	COM1	Common I/O port for NC and NO channels of switch1
5	IN1	Channel select signal for switch1. IN1 high, NO1 channel is selected.
6	NC1	Normally closed I/O port of switch1
7	GND	Ground
8	NC2	Normally closed I/O port of switch2
9	IN2	Channel select signal for switch2. IN2 high, NO2 channel is selected.
10	COM2	Common I/O port for NC and NO channels of switch2

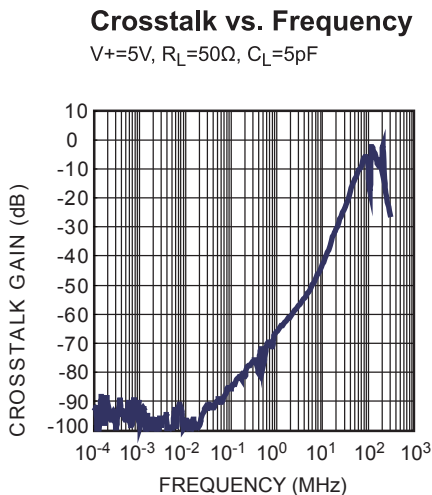
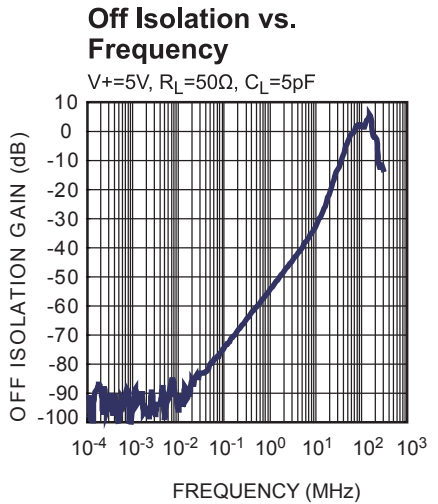
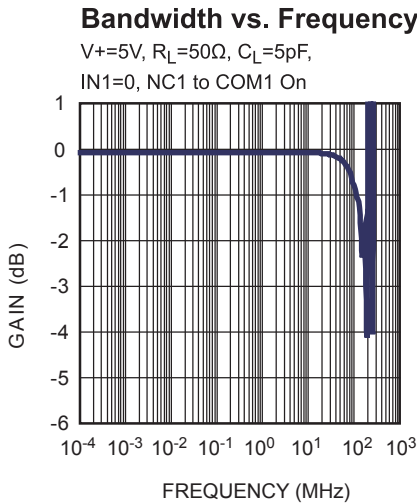
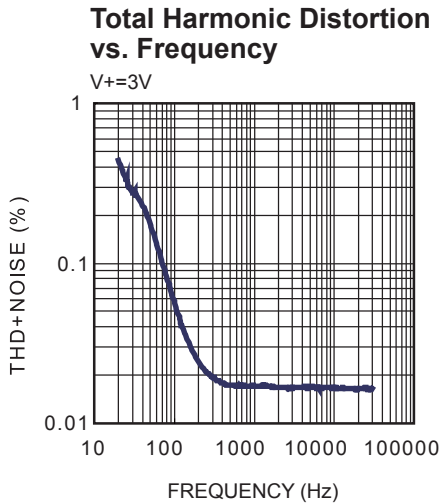
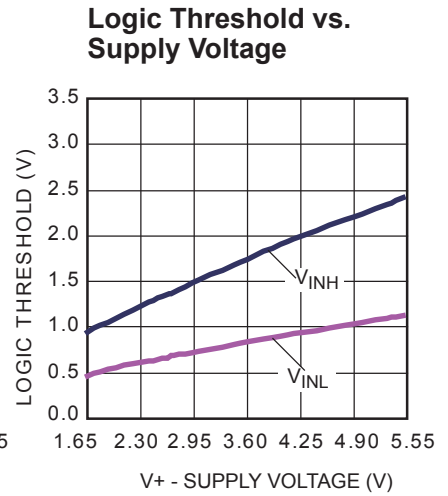
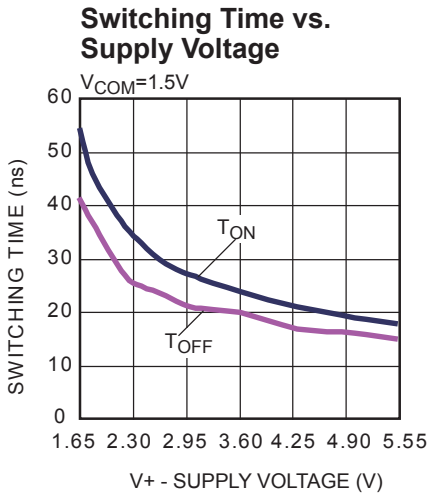
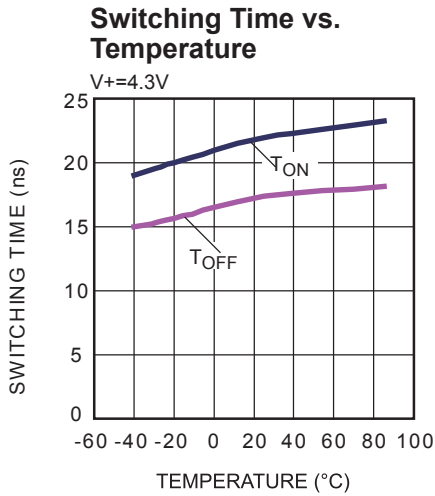
## TYPICAL PERFORMANCE CHARACTERISTICS

T<sub>A</sub> = +25°C, unless otherwise noted.



**TYPICAL PERFORMANCE CHARACTERISTICS (continued)**

T<sub>A</sub> = +25°C, unless otherwise noted.





## TEST CIRCUITS

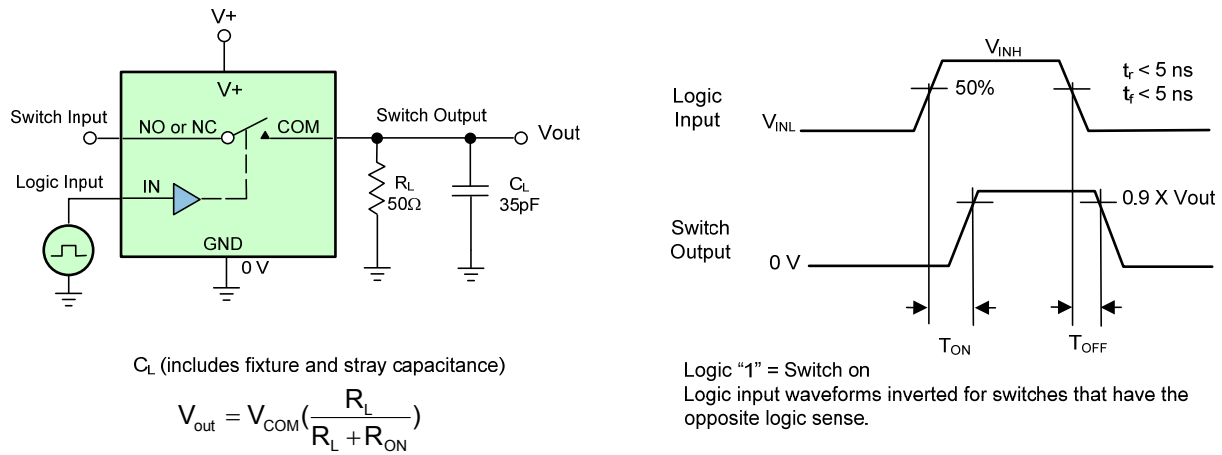


Figure 1 — Switching Time

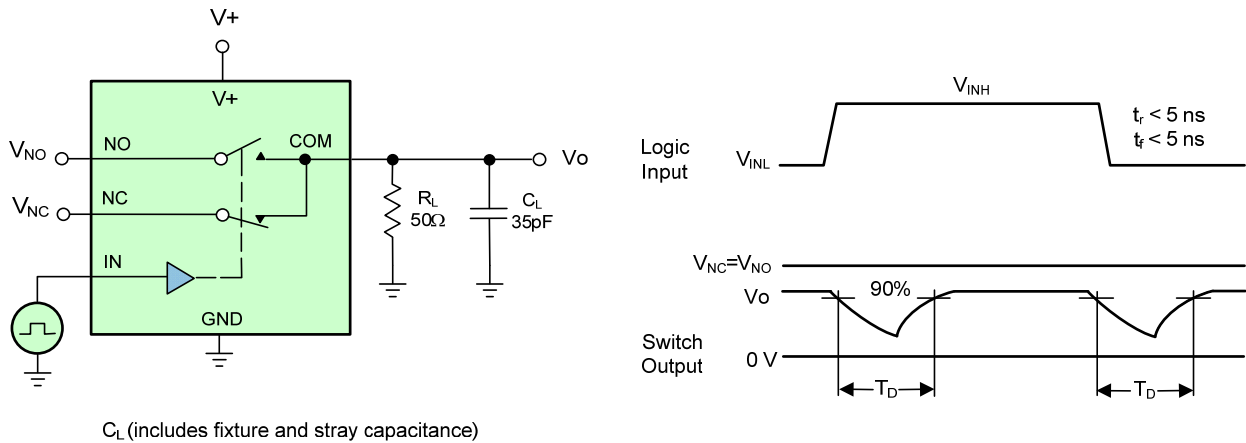


Figure 2 — Break-Before-Make Interval

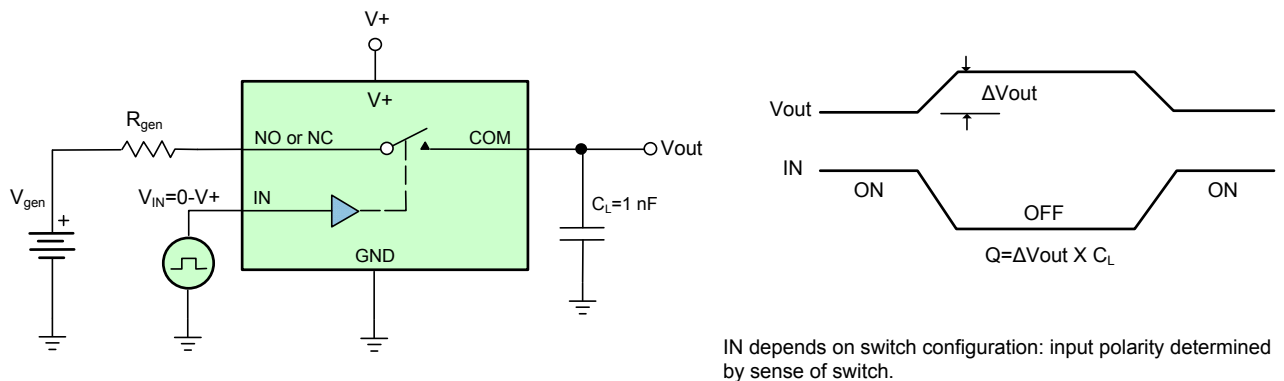
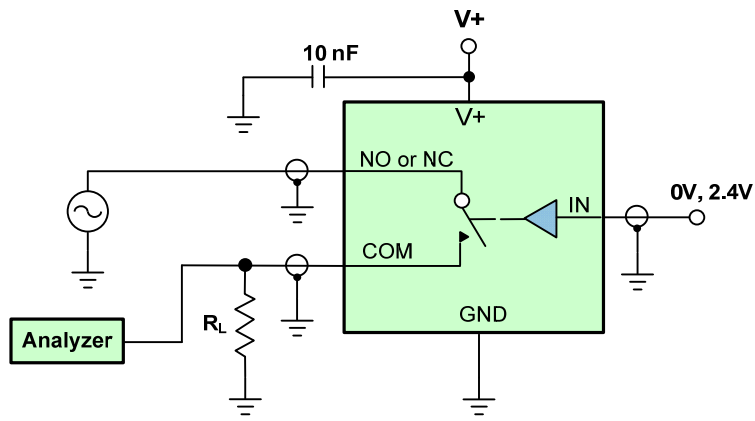
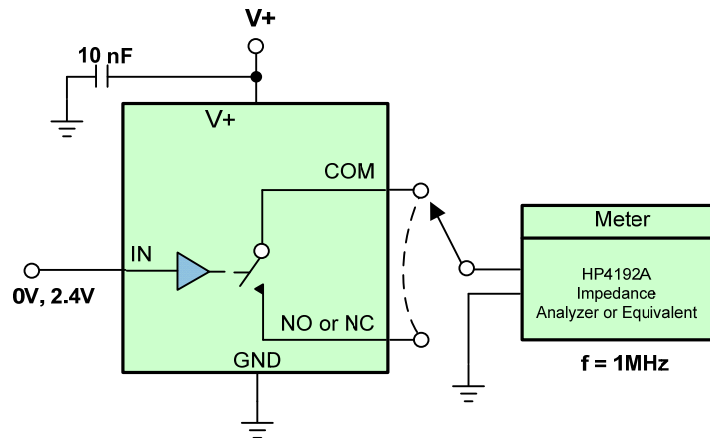


Figure 3 — Charge Injection



$$\text{Off Isolation} = 20 \log \frac{V_{\text{COM}}}{V_{\text{NO/NC}}}$$

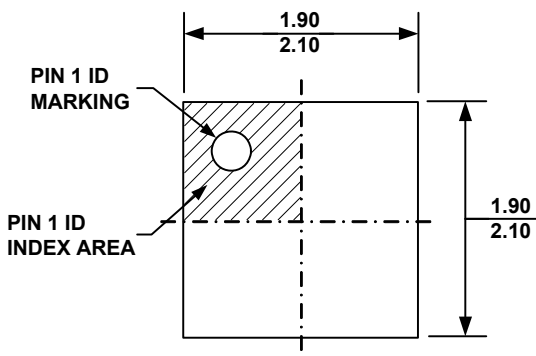
**Figure 4 — Off-Isolation**



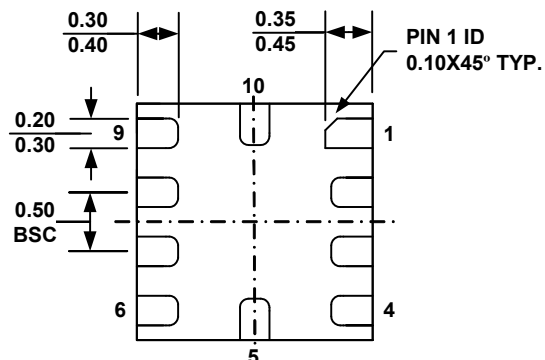
**Figure 5 — Channel Off/On Capacitance**

## PACKAGE INFORMATION

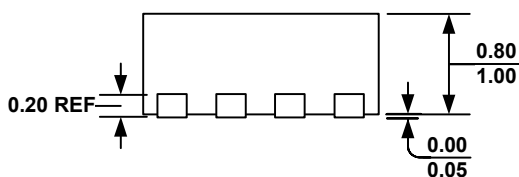
QFN-10 (2mmX2mm)



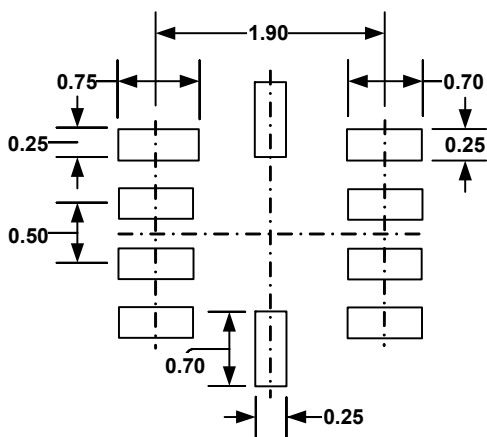
**TOP VIEW**



**BOTTOM VIEW**



**SIDE VIEW**



**RECOMMENDED LAND PATTERN**

### NOTE:

- 1) ALL DIMENSIONS ARE IN MILLIMETERS.
- 2) EXPOSED PADDLE SIZE DOES NOT INCLUDE MOLD FLASH.
- 3) LEAD COPLANARITY SHALL BE 0.10 MILLIMETER MAX.
- 4) JEDEC REFERENCE IS MO-220, VARIATION VCCD.
- 5) DRAWING IS NOT TO SCALE.

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