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The Future of Analog IC Technology®

MP2735/MP2736

Low-Voltage 0.45Ω Dual SPDT Analog Switches

GENERAL DESCRIPTION

The MP2735/MP2736 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 MP2735/MP2736 are ideal for portable and battery power applications.

The MP2735/MP2736 have an operation range from 1.65V to 5.5V single supply. The MP2735 has two separate control pins and two separate SPDT switches. The MP2736 includes an \overline{EN} pin. All switches are at high impedance mode when the \overline{EN} is high.

The MP2735/MP2736 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 MP2735/MP2736 are offered in a QFN10 package.

FEATURES

- 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)
- 1.4mm x 1.8mm QFN10 Package
- ESD Human-Body Model $\pm 4000V$

APPLICATIONS

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

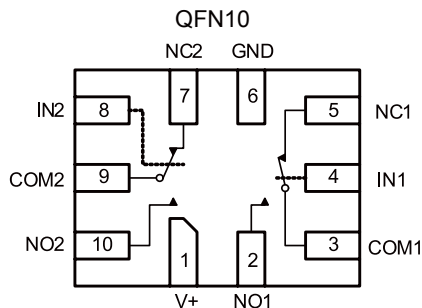
TRUTH TABLE

	IN1/2	\overline{EN}	NC1/2	NO1/2
MP2735	0	-	ON	OFF
	1	-	OFF	ON
MP2736	0	1	OFF	OFF
	1	1	OFF	OFF
	0	0	ON	OFF
	1	0	OFF	ON

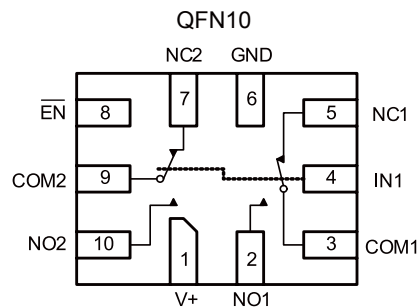
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FUNCTIONAL BLOCK DIAGRAM PIN CONFIGURATION

MP2735DQG



MP2736DQG

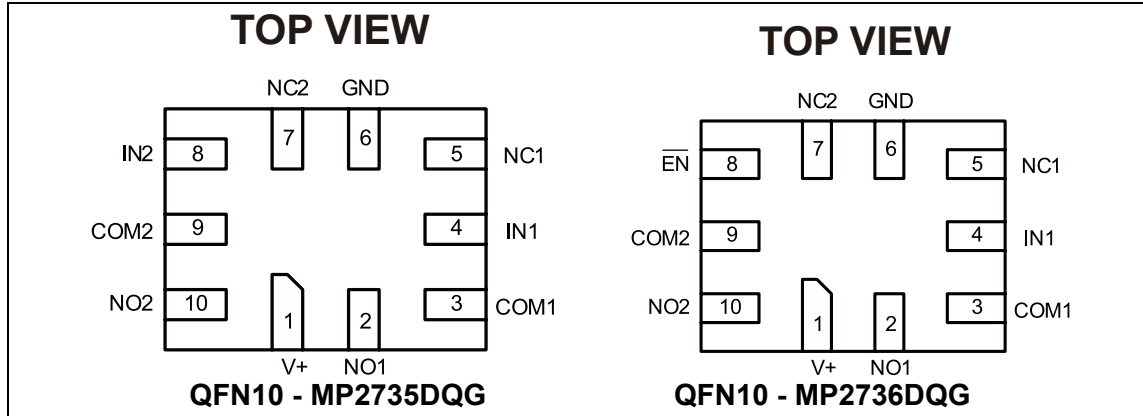


ORDERING INFORMATION

Part Number*	Package	Top Marking	Free Air Temperature (T _A)
MP2735DQG	QFN10 (1.4mm x1.8mm)	$\overline{2T}$	-40°C to +85°C
MP2736DQG		\overline{AM}	

* For Tape & Reel, add suffix -Z (e.g. MP2735DQG-Z).
 For RoHS compliant packaging, add suffix -LF (e.g. MP2735DQG-LF-Z)

PACKAGE REFERENCE



ABSOLUTE MAXIMUM RATINGS

V+ Supply Voltage-0.3V to +6V
 IN/COM/NC/NO Voltage ⁽¹⁾ ... -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 ⁽²⁾ ⁽³⁾) 208mW

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+=3V, ±10%, V_{IN}=0.4 or 1.65V, unless otherwise noted.

Parameter	Symbol	Condition	Min	Typ	Max	Units	
Analog Switch							
Analog Signal Range	V _{analog}	r _{DS(on)} , T _A = -40°C to +85°C	0		V+	V	
On-Resistance	r _{DS(on)}	V+=2.7V, I _{NO/NC} =100mA, V _{COM} =0.5V	T _A = +25°C	0.28	0.45	Ω	
		V+=2.7V, I _{NO/NC} =100mA, V _{COM} =1.5V					
		V+=2.7V, I _{NO/NC} =100mA, V _{COM} =0.5V	T _A = -40°C to +85°C	0.30			
		V+=2.7V, I _{NO/NC} =100mA, V _{COM} =1.5V					
		V+=5.5V, I _{NO/NC} =100mA, V _{COM} =0.9V	T _A = +25°C	0.20	0.30		
		V+=5.5V, I _{NO/NC} =100mA, V _{COM} =2.5V		0.18			
		V+=5.5V, I _{NO/NC} =100mA, V _{COM} =0.9V	T _A = -40°C to +85°C	0.25			
		V+=5.5V, I _{NO/NC} =100mA, V _{COM} =2.5V					
r _{ON} Match	Δr _{on}	V+=2.7V, I _{NO/NC} =100mA, V _{COM} =0.5V/1.5V	T _A = +25°C	0.01	0.02		
		V+=5.5V, I _{NO/NC} =100mA, V _{COM} =0.9V/2.5V					
r _{ON} Flatness	r _{ON} Flatness	V+=2.7V, I _{NO/NC} =100mA, V _{COM} =0.5V/1.5V					
Switch Off Leakage Current	I _{NO/NC(off)}	V+=5.5V, V _{NO/NC} =0.3V/4.0V, V _{COM} =4.0V/0.3V	T _A = +25°C	-40		40	nA
			T _A = -40°C to +85°C	-100		100	
	T _A = +25°C		-40		40		
	T _A = -40°C to +85°C		-100		100		
Channel-On Leakage Current	I _{COM(on)}	V+=5.5V, V _{NO/NC} =V _{COM} =4.0V/0.3V	T _A = +25°C	-40		40	
			T _A = -40°C to +85°C	-150		150	
Digital Control							
Input High Voltage	V _{INH}		T _A = -40°C to +85°C	1.65		V	
Input Low Voltage	V _{INL}						0.4
Input Capacitance	C _{IN}				6		pF
Input Current	I _{INL} or I _{INH}			V _{IN} =0 or V+	-1		1

ELECTRICAL CHARACTERISTICS (continued)
V+=3V, ±10%, V_{IN}=0.4 or 1.65V, unless otherwise noted.

Parameter	Symbol	Condition	Min	Typ	Max	Units		
Dynamic Characteristics								
Break-Before-Make Time	t _{BBM}	V+=3.6V, V _{NO} /V _{NC} =1.5V, R _L =50Ω, C _L =35pF	T _A = +25°C		10		ns	
Turn-On Time	t _{ON}				24	36		
Turn-Off Time	t _{OFF}		T _A = -40°C to +85°C			40		
			T _A = +25°C		20	30		
Enable Turn-On Time MP2736 ($\overline{\text{EN}}$)	t _{ON(EN)}		T _A = -40°C to +85°C			35		
			T _A = +25°C		24	36		
Enable Turn-Off Time MP2736 ($\overline{\text{EN}}$)	t _{OFF(EN)}		T _A = -40°C to +85°C			40		
			T _A = +25°C		20	30		
Off-Isolation ⁽⁴⁾	OIRR	R _L =50Ω, C _L =5pF, f=100kHz			-70		dB	
Crosstalk ⁽⁴⁾	XTALK					-70		dB
3dB Bandwidth				R _L =50Ω, C _L =5pF			50	
NO, NC Off Capacitance ⁽⁴⁾	C _{NO(off)}	V _{IN} =0V, or V+, f=1MHz	T _A = +25°C		55		pF	
	C _{NC(off)}				55			
Channel On Capacitance ⁽⁴⁾	C _{NO(on)}					130		
	C _{NC(on)}					130		
Power Supply								
Power Supply Range	V+			1.65		5.5	V	
Power Supply Current	I+	V _{IN} =0 or V+	T _A = -40°C to +85°C	-1		1	μA	

Note:

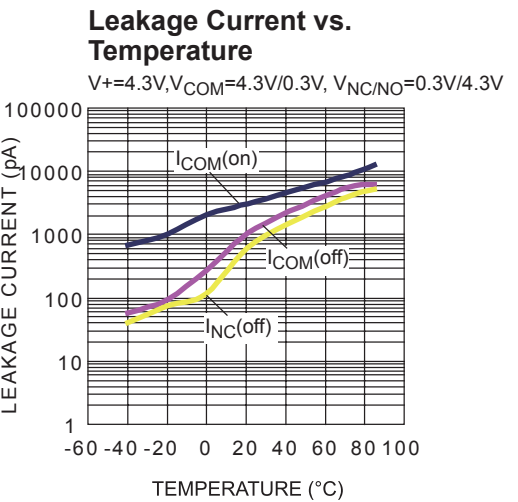
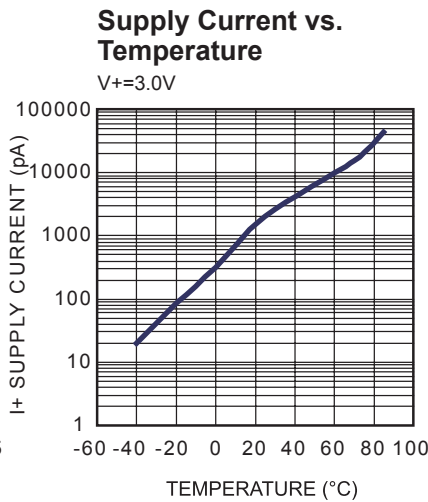
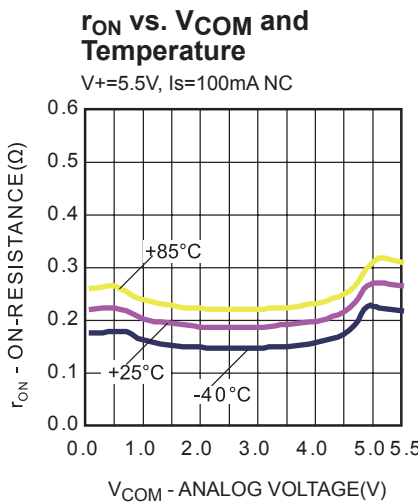
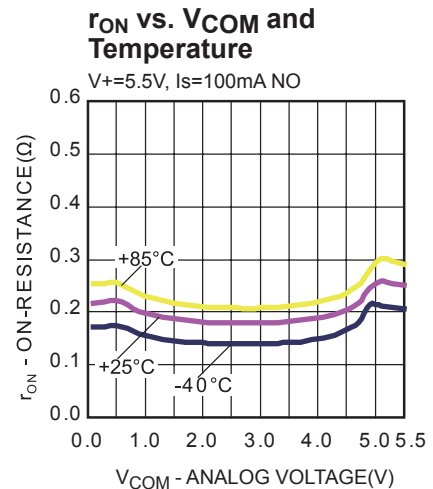
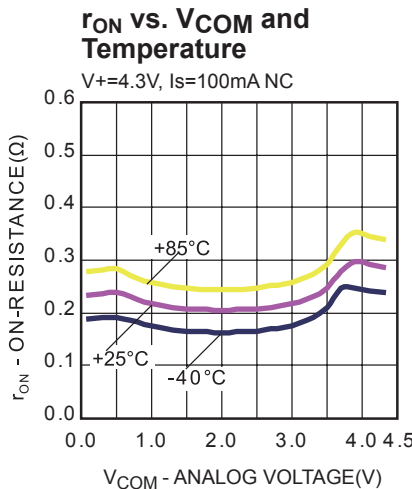
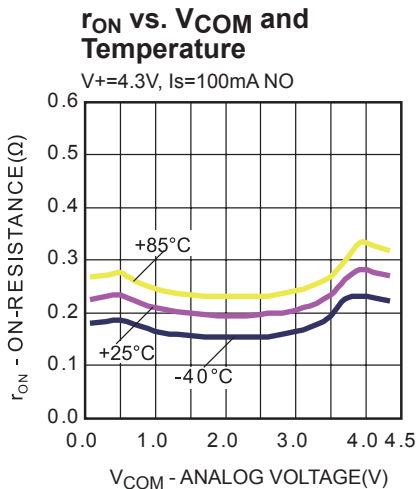
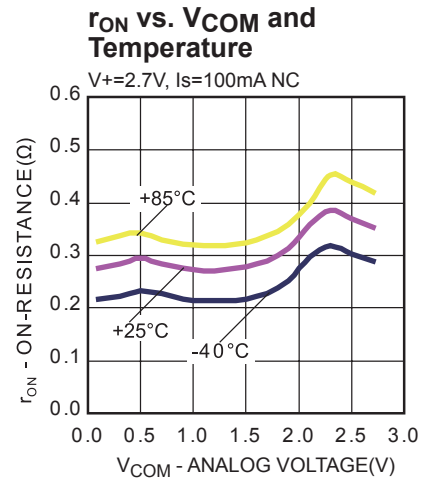
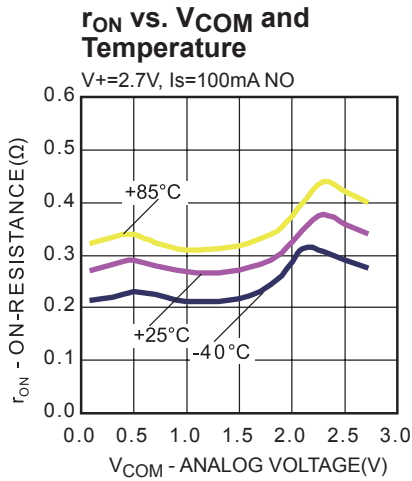
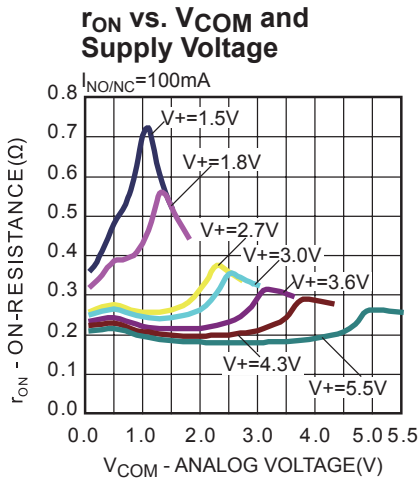
- 4) Guarantee by design, not subjected to production test.

PIN FUNCTIONS

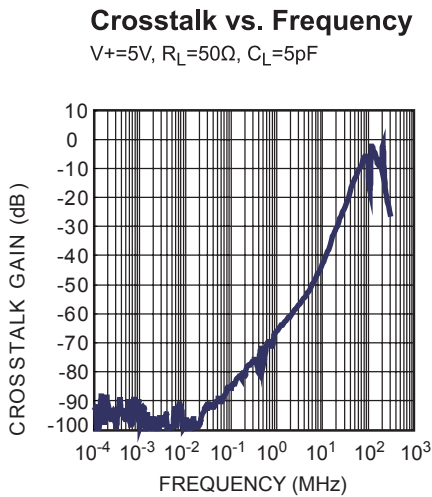
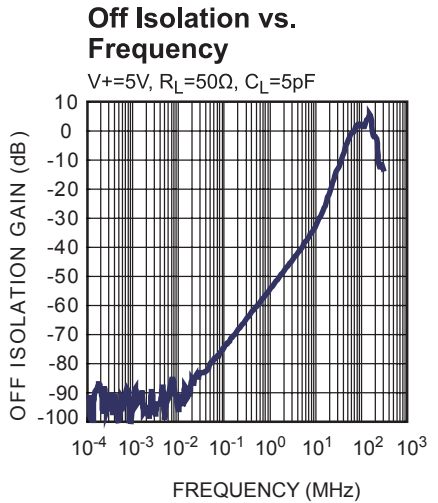
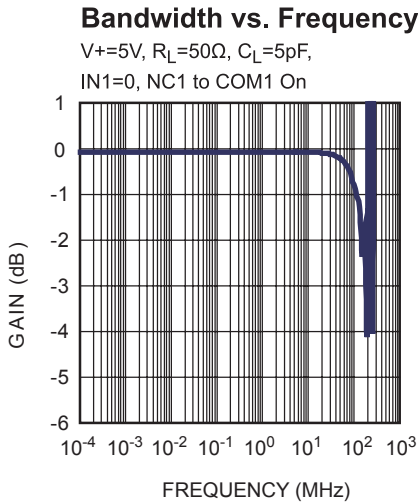
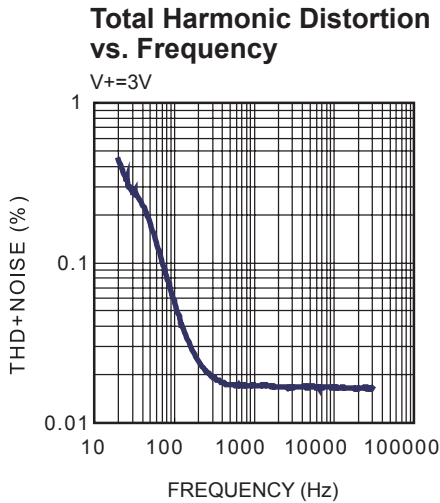
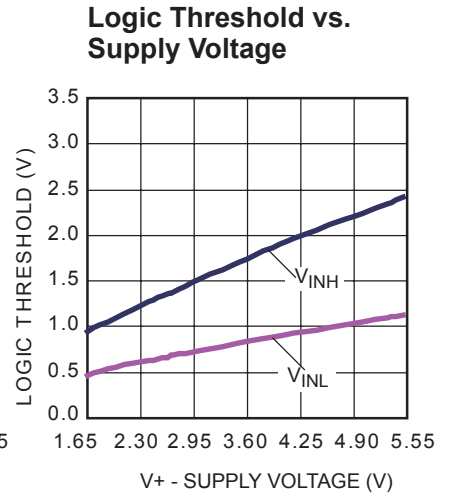
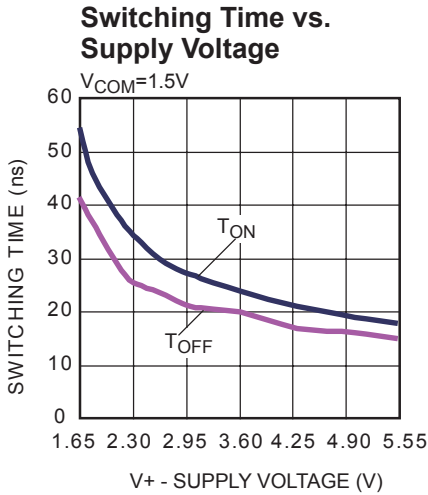
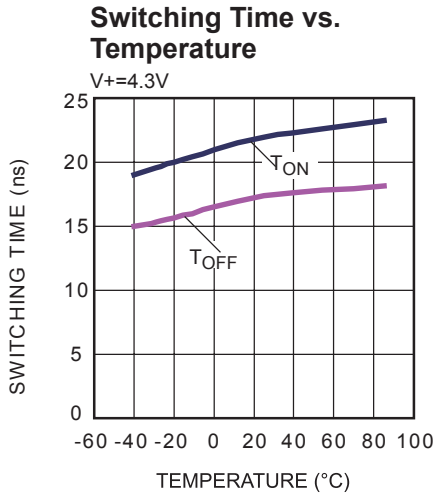
(MP2735DQG) Pin #	(MP2736DQG) Pin #	Name	Description
1	1	V+	Supply Voltage
2	2	NO1	Normally open I/O port of switch1
3	3	COM1	Common I/O port for NC and NO channels of switch1
4	4	IN1	Channel select signal for switch1. IN1 high, NO1 channel is selected. Otherwise, NC1 channel is selected in default. For MP2736, IN1 controls both switch1 and switch2
5	5	NC1	Normally closed I/O port of switch1
6	6	GND	Ground
7	7	NC2	Normally closed I/O port of switch2
8		IN2	Channel select signal for switch2. IN2 high, NO2 channel is selected. Otherwise, NC2 channel is selected in default
	8	$\overline{\text{EN}}$	Enable for two channels, active low
9	9	COM2	Common I/O port for NC and NO channels of switch2
10	10	NO2	Normally open I/O port of switch2

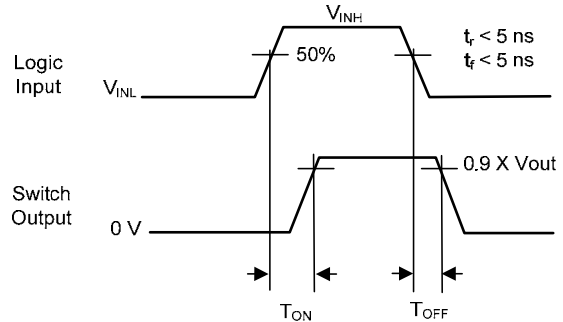
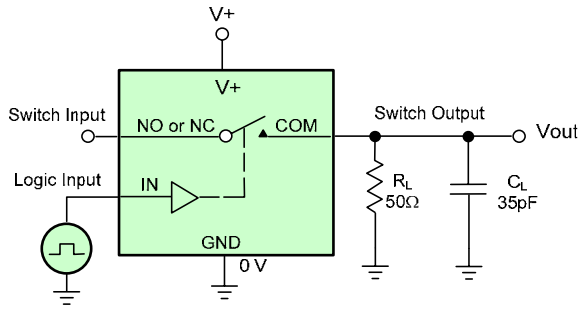
TYPICAL PERFORMANCE CHARACTERISTICS

$T_A = +25^\circ\text{C}$, unless otherwise noted.



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

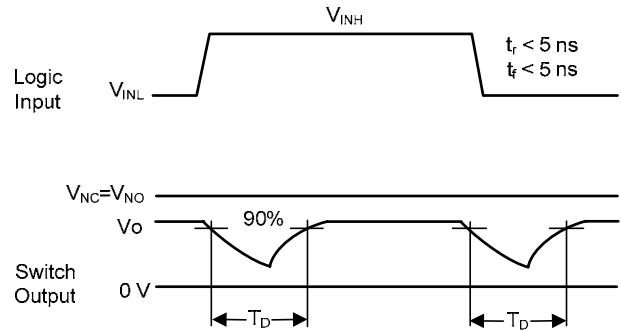
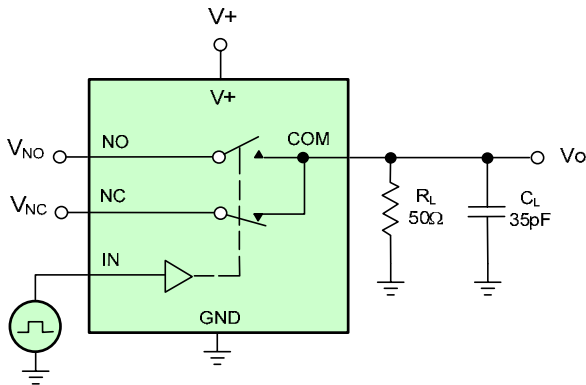
 T_A = +25°C, unless otherwise noted.


TEST CIRCUITS


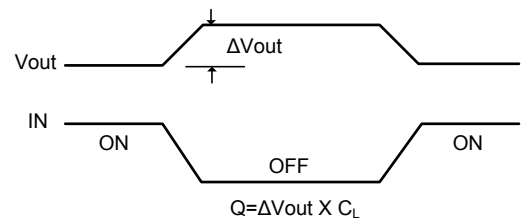
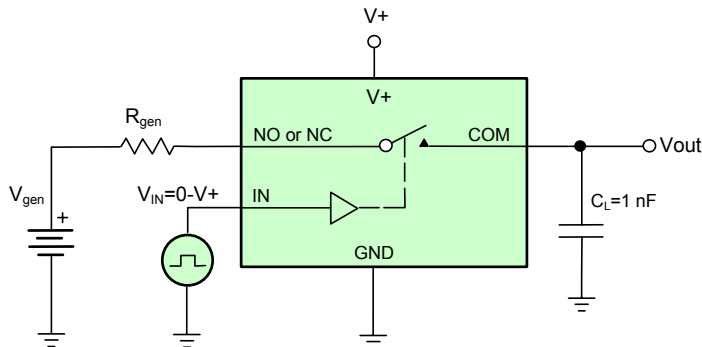
C_L (includes fixture and stray capacitance)

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

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

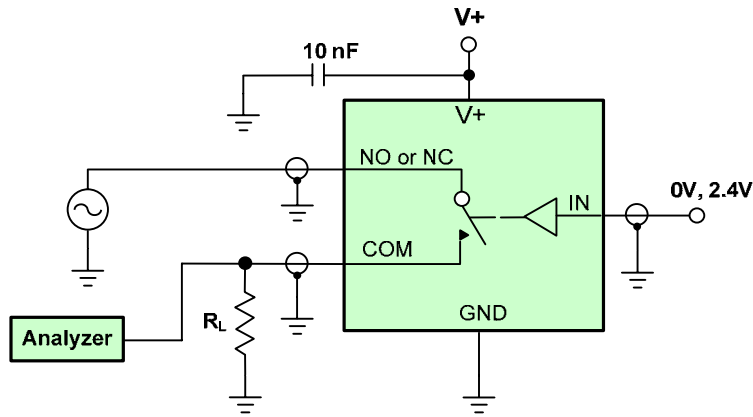
Figure 1 — Switching Time


C_L (includes fixture and stray capacitance)

Figure 2 — Break-Before-Make Interval


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

Figure 3 — Charge Injection



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

Figure 4 — Off-Isolation

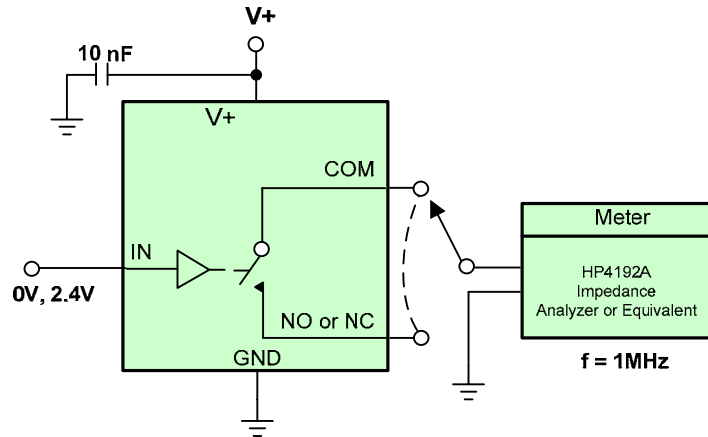
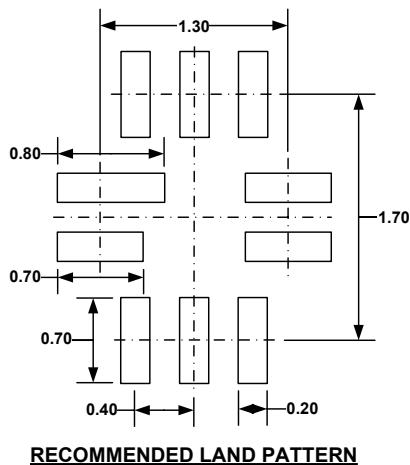
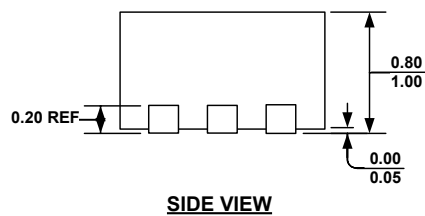
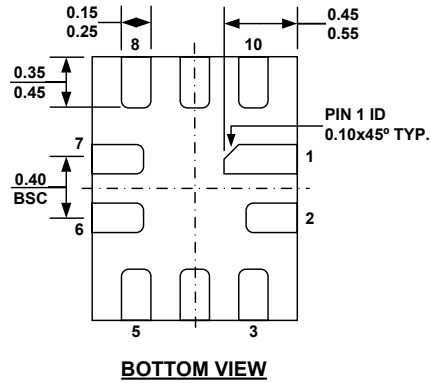
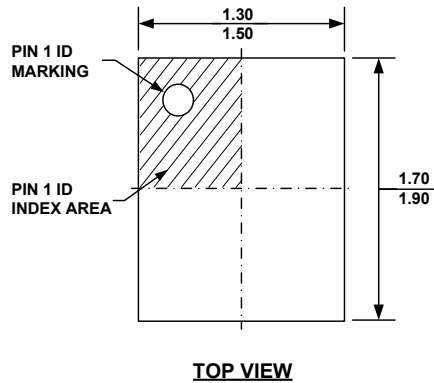


Figure 5 — Channel Off/On Capacitance

PACKAGE INFORMATION

PACKAGE OUTLINE DRAWING FOR 10L FCQFN (1.4x1.8mm) MF-PO-D-0084 revision 0.0



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.
- 5) DRAWING IS NOT TO SCALE.

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