0.8Ω, Low-Voltage, Single-Supply SPDT Analog Switch in SC70

ABSOLUTE MAXIMUM RATINGS

Voltages Referenced to GND
V+, IN ....-0.3V to +4V
COM, NC, NO (Note 1).............................-0.3V to (V+ + 0.3V)
Continuous Current NO, NC to COM.............................±150mA
Peak Current NO, NC to COM
 (pulsed at 1ms, 10% duty cycle max)........................ ±300mA
Continuous Power Dissipation

6-Pin SC70 (derate 3.1mW/°C above +70°C)...............247mW
6-Pin µDFN-6 (derate 2.1mW/°C above +70°C) 167mW
Operating Temperature Range
 MAX4714EXT ....-40°C to +85°C
Junction Temperature ....+150°C
Storage Temperature Range ....-65°C to +150°C
Lead Temperature (soldering, 10s) .... +300°C

Note 1: Signals on NC, NO, and COM exceeding V+ or GND are clamped by internal diodes.

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.

ELECTRICAL CHARACTERISTICS—Single +3V Supply

(V+ = +2.7V to +3.6V, V_{IH} = +1.4V, V_{IL} = +0.5V, T_A = T_{MIN} to T_{MAX}, unless otherwise noted. Typical values are at V+ = +3.0V and T_A = +25°C.) (Notes 2, 3)

PARAMETER	SYMBOL	CONDITIONS	T_A	MIN	TYP	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	V_{COM}, V_{NO}, V_{NC}			0		V+	V
On-Resistance (Note 4)	R_{ON}	V+ = 2.7V, I_{COM} = 100mA, V_{NO} or V_{NC} = 1.5V	+25°C		0.6	0.8	Ω
			T_{MIN} to T_{MAX}			0.9	
On-Resistance Match Between Channels (Note 5)	ΔR_{ON}	V+ = 2.7V, I_{COM} = 100mA, V_{NO} or V_{NC} = 1.5V	+25°C		0.03	0.06	Ω
			T_{MIN} to T_{MAX}			0.08	
On-Resistance Flatness (Note 6)	$R_{FLAT(ON)}$	V+ = 2.7V, I_{COM} = 100mA, V_{NO} or V_{NC} = 0.6V, 1.5V, 2.1V	+25°C		0.1	0.18	Ω
			T_{MIN} to T_{MAX}			0.2	
NO or NC Off-Leakage Current	$I_{NO(OFF)}$, $I_{NC(OFF)}$	V+ = 3.3V, V_{COM} = 0.3V, 3V, V_{NO} or V_{NC} = 3V, 0.3V	+25°C	-1		+1	nA
			T_{MIN} to T_{MAX}	-5		+5	
COM On-Leakage Current	$I_{COM(ON)}$	V+ = 3.3V, V_{COM} = 0.3V, 3V, V_{NO} or V_{NC} = 0.3V, 3V or floating	+25°C	-2		+2	nA
			T_{MIN} to T_{MAX}	-10		+10	
DYNAMIC							
Turn-On Time	t_{ON}	V_{NO} or V_{NC} = 1.5V, R_L = 50Ω, C_L = 35pF, Figure 1	+25°C		13	18	ns
			T_{MIN} to T_{MAX}			20	
Turn-Off Time	t_{OFF}	V_{NO} or V_{NC} = 1.5V, R_L = 50Ω, C_L = 35pF, Figure 1	+25°C		6	12	ns
			T_{MIN} to T_{MAX}			15	
Break-Before-Make Delay (Note 7)	t_{BBM}	V_{NO} or V_{NC} = 1.5V, R_L = 50Ω, C_L = 35pF, Figure 2	+25°C	1	9		ns
			T_{MIN} to T_{MAX}	1			
Charge Injection	Q	V_{GEN}, R_{GEN}, C_L = 1.0nF, Figure 3	+25°C		22		pC
Off-Isolation (Note 8)	V_{ISO}	f = 1MHz, V_{COM} = 1V_{RMS}, R_L = 50Ω, C_L = 5pF, Figure 4	+25°C		-54		dB
Crosstalk (Note 9)		f = 1MHz, V_{COM} = 1V_{RMS}, R_L = 50Ω, C_L = 5pF, Figure 4	+25°C		-54		dB
Total Harmonic Distortion	THD	f = 20Hz to 20kHz, V_{COM} = 2V_{P-P}, R_L = 32Ω	+25°C		0.01		%

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ELECTRICAL CHARACTERISTICS—Single +3V Supply (continued)

(V+ = +2.7V to +3.6V, V_{IH} = +1.4V, V_{IL} = +0.5V, T_A = T_{MIN} to T_{MAX}, unless otherwise noted. Typical values are at V+ = +3.0V and T_A = +25°C.) (Notes 2, 3)

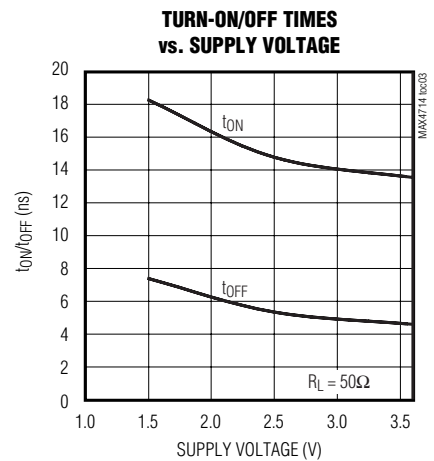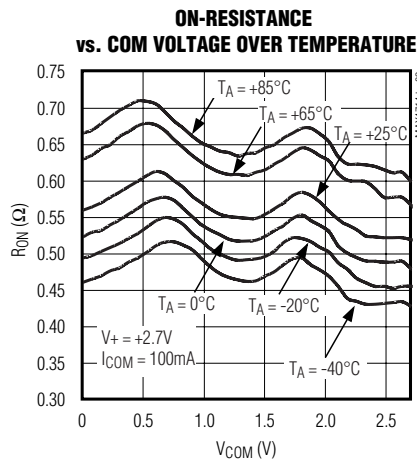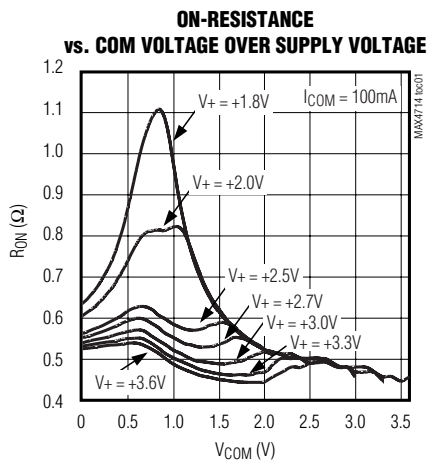| PARAMETER	SYMBOL	CONDITIONS	T_A	MIN	TYP	MAX	UNITS
NC or NO Off-Capacitance	$C_{NO(OFF)}$, $C_{NC(OFF)}$	f = 1MHz, Figure 5	+25°C		30		pF
COM On-Capacitance	$C_{COM(ON)}$	f = 1MHz, Figure 5	+25°C		65		pF
LOGIC INPUT							
Input Voltage Low	V_{IL}					0.5	V
Input Voltage High	V_{IH}			1.4			V
Input Leakage Current	I_{IN}	V_{IN} = 0V or V+		-1		+1	µA
SUPPLY							
Power-Supply Range	V+			1.6		3.6	V
Positive Supply Current	I+	V+ = +3.6V, V_{IN} = 0V or V+	+25°C		0.04	0.2	µA
			T_{MIN} to T_{MAX}			2	

ELECTRICAL CHARACTERISTICS—Single +1.8V Supply

(V+ = +1.8V, V_{IH} = +1V, V_{IL} = +0.4V, T_A = T_{MIN} to T_{MAX}, unless otherwise noted. Typical values are at T_A = +25°C.) (Notes 2, 3)

PARAMETER	SYMBOL	CONDITIONS	T_A	MIN	TYP	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	V_{COM}, V_{NO}, V_{NC}			0		V+	V
On-Resistance	R_{ON}	I_{COM} = 10mA, V_{NO} or V_{NC} = +0.9V	+25°C		1.2	2.5	Ω
			T_{MIN} to T_{MAX}			5	
NO or NC Off-Leakage Current	$I_{NO(OFF)}$, $I_{NC(OFF)}$	V_{COM} = 0.3V, 1.5V, V_{NO} or V_{NC} = 1.5V, 0.3V	+25°C	-1	0.01	+1	nA
			T_{MIN} to T_{MAX}	-5		+5	
COM On-Leakage Current	$I_{COM(ON)}$	V_{COM} = 0.3V, 1.5V, V_{NO} or V_{NC} = 0.3V, 1.5V or floating	+25°C	-2		+2	nA
			T_{MIN} to T_{MAX}	-10		+10	
DYNAMIC							
Turn-On Time	t_{ON}	V_{NO} or V_{NC} = 1.5V, R_L = 50Ω, C_L = 35pF, Figure 1	+25°C		18	25	ns
			T_{MIN} to T_{MAX}			30	
Turn-Off Time	t_{OFF}	V_{NO} or V_{NC} = 1.5V, R_L = 50Ω, C_L = 35pF, Figure 1	+25°C		9	15	ns
			T_{MIN} to T_{MAX}			18	
Break-Before-Make Delay (Note 7)	t_{BBM}	V_{NO} or V_{NC} = 1.5V, R_L = 50Ω, C_L = 35pF, Figure 2	+25°C	2			ns
			T_{MIN} to T_{MAX}	2			
Charge Injection	Q	V_{GEN} = 0V, R_{GEN} = 0, C_L = 1nF, Figure 3	+25°C		12		pC

0.8Ω, Low-Voltage, Single-Supply SPDT Analog Switch in SC70

ELECTRICAL CHARACTERISTICS—Single +1.8V Supply (continued)

(V+ = +1.8V, V_{IH} = +1V, V_{IL} = +0.4V, T_A = T_{MIN} to T_{MAX}, unless otherwise noted. Typical values are at T_A = +25°C.) (Notes 2, 3)

PARAMETER	SYMBOL	CONDITIONS	T_A	MIN	TYP	MAX	UNITS
LOGIC INPUT							
Input Voltage Low	V_{IL}					0.4	V
Input Voltage High	V_{IH}			1			V
Input Leakage Current	I_{IN}	V_{IN} = 0V or V+				1	µA
SUPPLY							
Positive Supply Current	I+	V_{IN} = 0V or V+	+25°C		0.04	0.2	µA
			T_{MIN} to T_{MAX}			2	

Note 2: The algebraic convention, where the most negative value is a minimum and the most positive value is a maximum, is used in this data sheet.

Note 3: Parts are 100% tested at +25°C. Limits across the full temperature range are guaranteed by design and correlation.

Note 4: Guaranteed by design for µDFN package.

Note 5: ΔR_{ON} = $R_{ON(MAX)}$ - $R_{ON(MIN)}$.

Note 6: Flatness is defined as the difference between the maximum and minimum values of on-resistance as measured over the specified analog signal range.

Note 7: Guaranteed by design.

Note 8: Off-Isolation = $20\log_{10}$ [V_{COM} / (V_{NC} or V_{NO})], V_{COM} = output, V_{NC} or V_{NO} = input to off switch.

Note 9: Between the two switches.

_____*Typical Operating Characteristics*
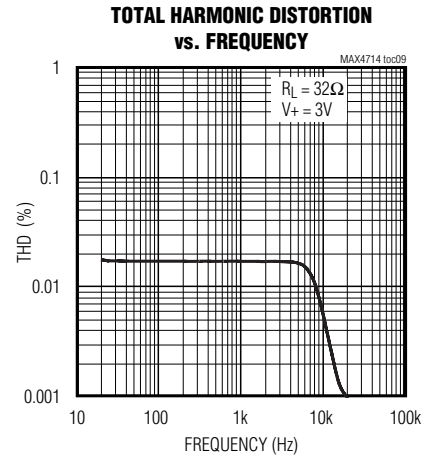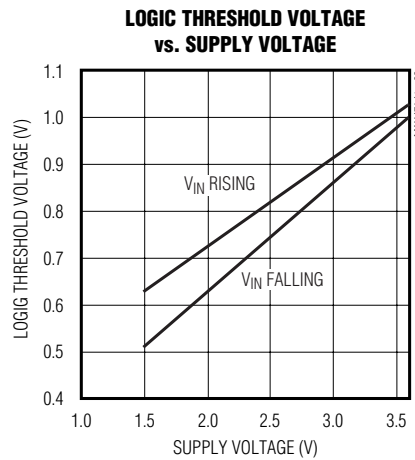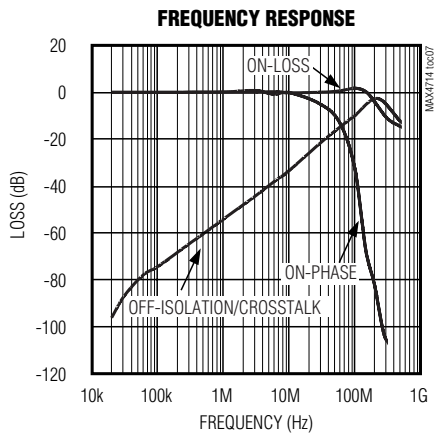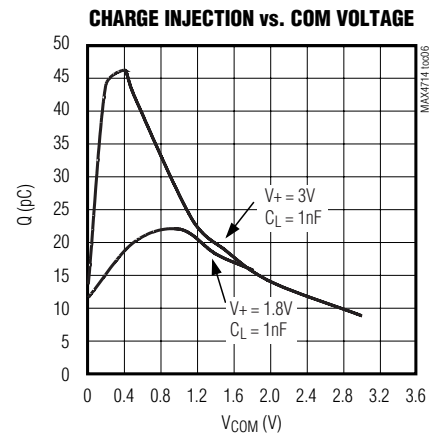
(T_A = +25°C, unless otherwise noted.)

ON-RESISTANCE vs. COM VOLTAGE OVER SUPPLY VOLTAGE

ON-RESISTANCE vs. COM VOLTAGE OVER TEMPERATURE

TURN-ON/OFF TIMES vs. SUPPLY VOLTAGE

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Typical Operating Characteristics (continued)

(T_A = +25°C, unless otherwise noted.)

TURN-ON/OFF TIMES vs. TEMPERATURE

ON/OFF-LEAKAGE CURRENT vs. TEMPERATURE

CHARGE INJECTION vs. COM VOLTAGE

FREQUENCY RESPONSE

LOGIC THRESHOLD VOLTAGE vs. SUPPLY VOLTAGE

TOTAL HARMONIC DISTORTION vs. FREQUENCY
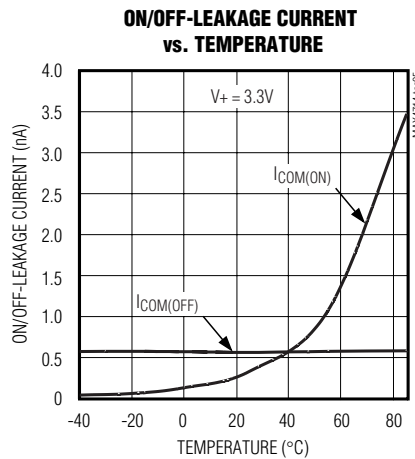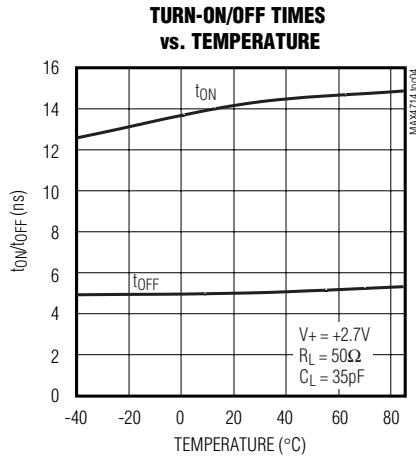
Pin Description

PIN	NAME	FUNCTION
1	IN	Digital Control Input
2	V+	Positive Supply Voltage Input
3	GND	Ground
4	NC	Analog Switch—Normally Closed
5	COM	Analog Switch—Common
6	NO	Analog Switch—Normally Open

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0.8Ω, Low-Voltage, Single-Supply SPDT Analog Switch in SC70

_____Detailed Description

The MAX4714 is a low-on-resistance (R_{ON}), low-voltage, single-pole/double-throw (SPDT) analog switch that operates from a +1.6V to +3.6V supply. The MAX4714 has break-before-make switching. This device also has fast switching speeds (t_{ON} = 18ns, max, t_{OFF} = 12ns, max).

When powered from a +3V supply, the 0.8Ω (max) R_{ON} allows high continuous currents to be switched in a variety of applications.

_____Applications Information

Logic Inputs
The MAX4714 logic input can be driven up to +3.6V regardless of the supply voltage. For example, with a

+3.3V supply, IN may be driven low to GND and high to +3.6V. Driving IN rail-to-rail minimizes power consumption.

Analog Signal Levels
Analog signals that range over the entire supply voltage (V+ to GND) can be passed with very little change in on-resistance (see _Typical Operating Characteristics_). The switches are bidirectional, so the NO, NC, and COM pins can be used as either inputs or outputs.

_____Chip Information

TRANSISTOR COUNT: 135

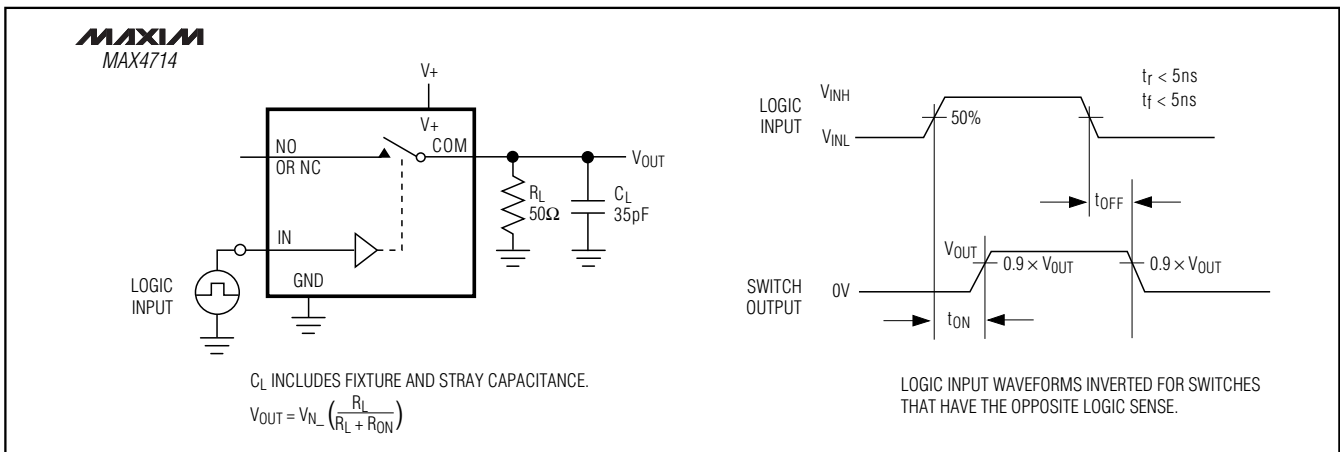PROCESS: CMOS

_____Test Circuits/Timing Diagrams
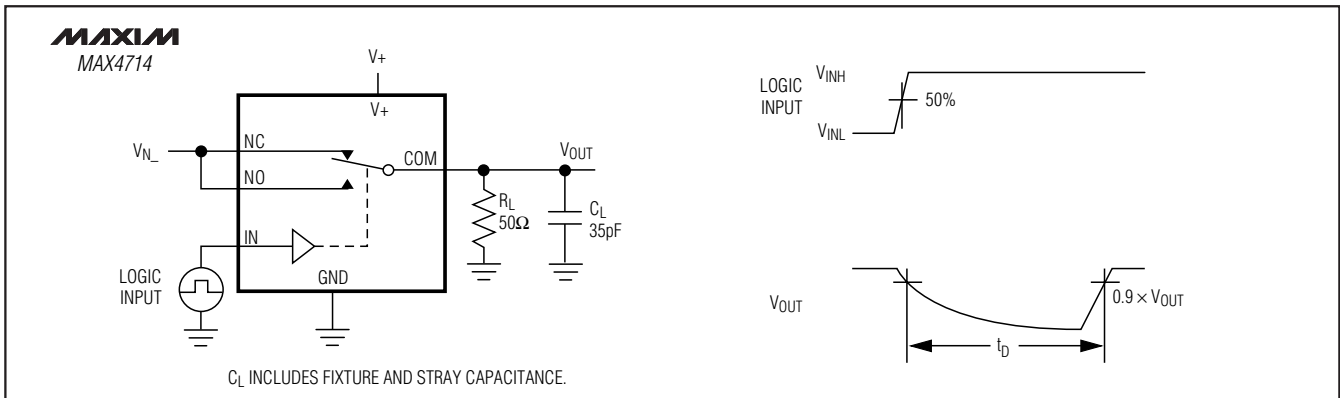

Figure 1. Switching Time

Figure 2. Break-Before-Make Interval

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MAX4714

Test Circuits/Timing Diagrams (continued)
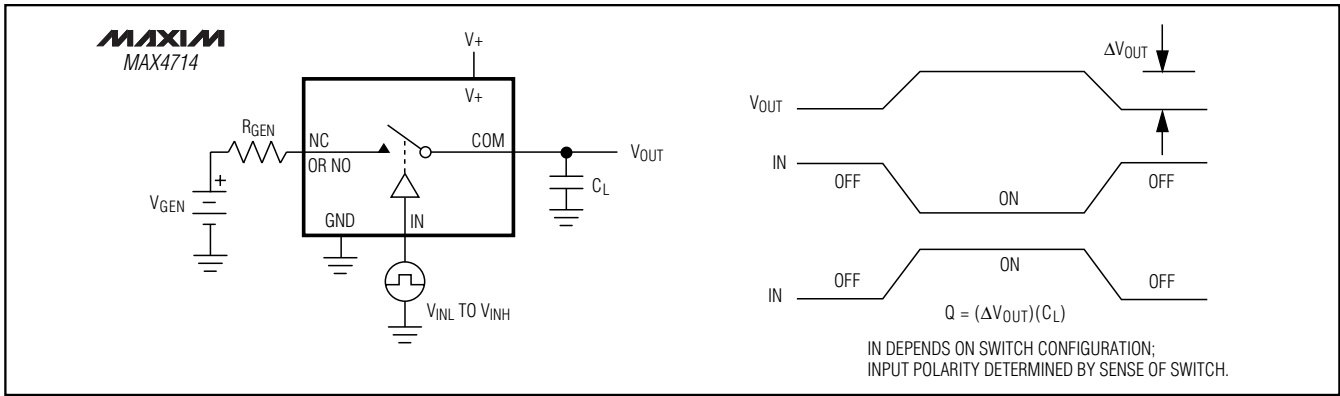
Figure 3. Charge Injection

$$\text{OFF-ISOLATION} = 20\log \frac{V_{OUT}}{V_{IN}}$$

$$\text{ON-LOSS} = 20\log \frac{V_{OUT}}{V_{IN}}$$

$$\text{CROSSTALK} = 20\log \frac{V_{OUT}}{V_{IN}}$$

MEASUREMENTS ARE STANDARDIZED AGAINST SHORTS AT IC TERMINALS.
OFF-ISOLATION IS MEASURED BETWEEN COM_ AND "OFF" NO_ OR NC_ TERMINAL ON EACH SWITCH.
ON-LOSS IS MEASURED BETWEEN COM_ AND "ON" NO_ OR NC_TERMINAL ON EACH SWITCH.
CROSSTALK IS MEASURED FROM ONE CHANNEL TO ALL OTHER CHANNELS.
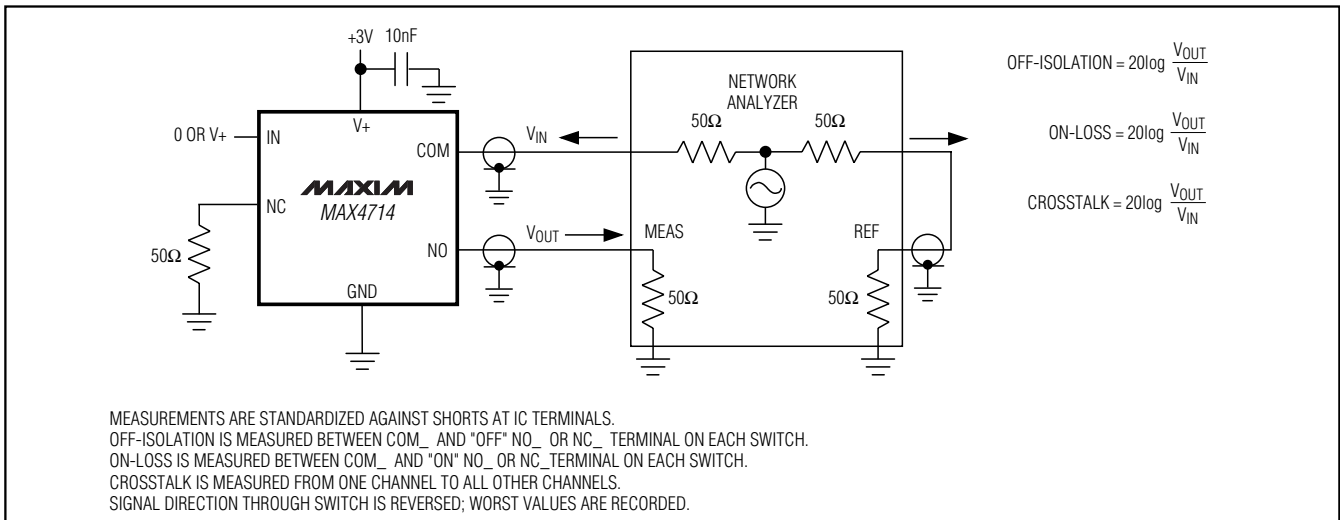SIGNAL DIRECTION THROUGH SWITCH IS REVERSED; WORST VALUES ARE RECORDED.

Figure 4. On-Loss, Off-Isolation, and Crosstalk
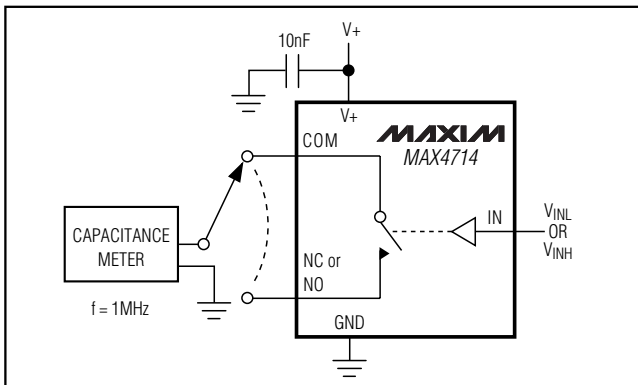
Figure 5. Channel Off/On-Capacitance

Package Information

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information go to **www.maxim-ic.com/packages**.)

SC70, 6L.EPS
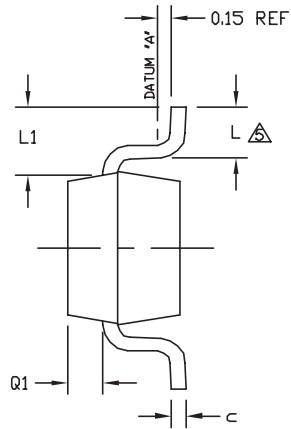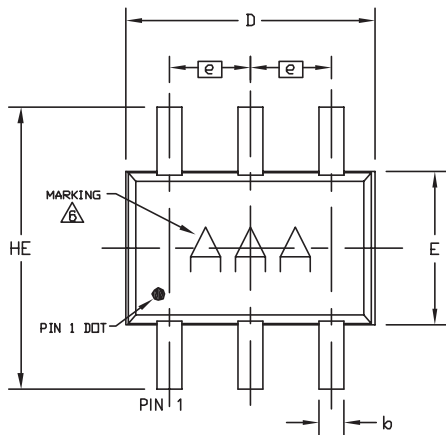
COMMON DIMENSIONS		
SYMBOL	MIN	MAX
A	0.80	1.10
A1	0.00	0.10
A2	0.80	1.00
b	0.15	0.30
c	0.10	0.18
D	1.80	2.20
e	0.65 BSC.	
E	1.15	1.35
HE	1.80	2.40
L	0.10	0.41
L1	0.425 TYP.	
Q1	0.10	0.40
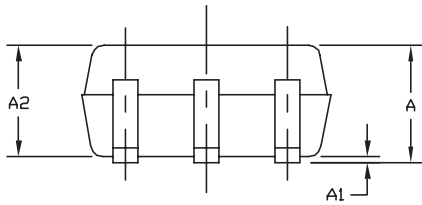
NOTE:
1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSIONS ARE INCLUSIVE OF PLATING.
3. DIMENSIONS ARE EXCLUSIVE OF MOLD FLASH & METAL BURR.
4. COPLANARITY 4 MILS. MAX.
5. FOOT LENGTH MEASURED AT INTERCEPT POINT BETWEEN DATUM "A" AND LEAD SURFACE.
6. MARKING IS FOR PACKAGE ORIENTATION REFERENCE ONLY.
7. LEAD CENTERLINES TO BE AT TRUE POSITION AS DEFINED BY BASIC DIMENSION "e", ±0.05.

DALLAS SEMICONDUCTOR **MAXIM**

TITLE			
PACKAGE OUTLINE, 6L SC70			
APPROVAL	DOCUMENT CONTROL NO. 21-0077	REV. C	1/1

−DRAWING NOT TO SCALE−

MAXIM

MAX4714

Package Information (continued)

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information go to **www.maxim-ic.com/packages**.)

6L UDFN.EPS

SYMBOL	COMMON DIMENSIONS		
	MIN.	NOM.	MAX.
A	0.64	0.72	0.80
A1	--	0.20	--
D	1.45	1.50	1.55
E	0.95	1.00	1.05
L	0.30	0.35	0.40
L1	--	--	0.08
L2	--	--	0.05
b	0.17	0.20	0.23
e	0.50 BSC.		

NOTES:
1. DIMENSIONS ARE IN MILLIMETERS.
2. MARKING IS FOR PACKAGE ORIENTATION REFERENCE ONLY.
3. LEAD CENTERLINES TO BE AT TRUE POSITION AS DEFINED BY BASIC DIMENSION "e", ±0.05.
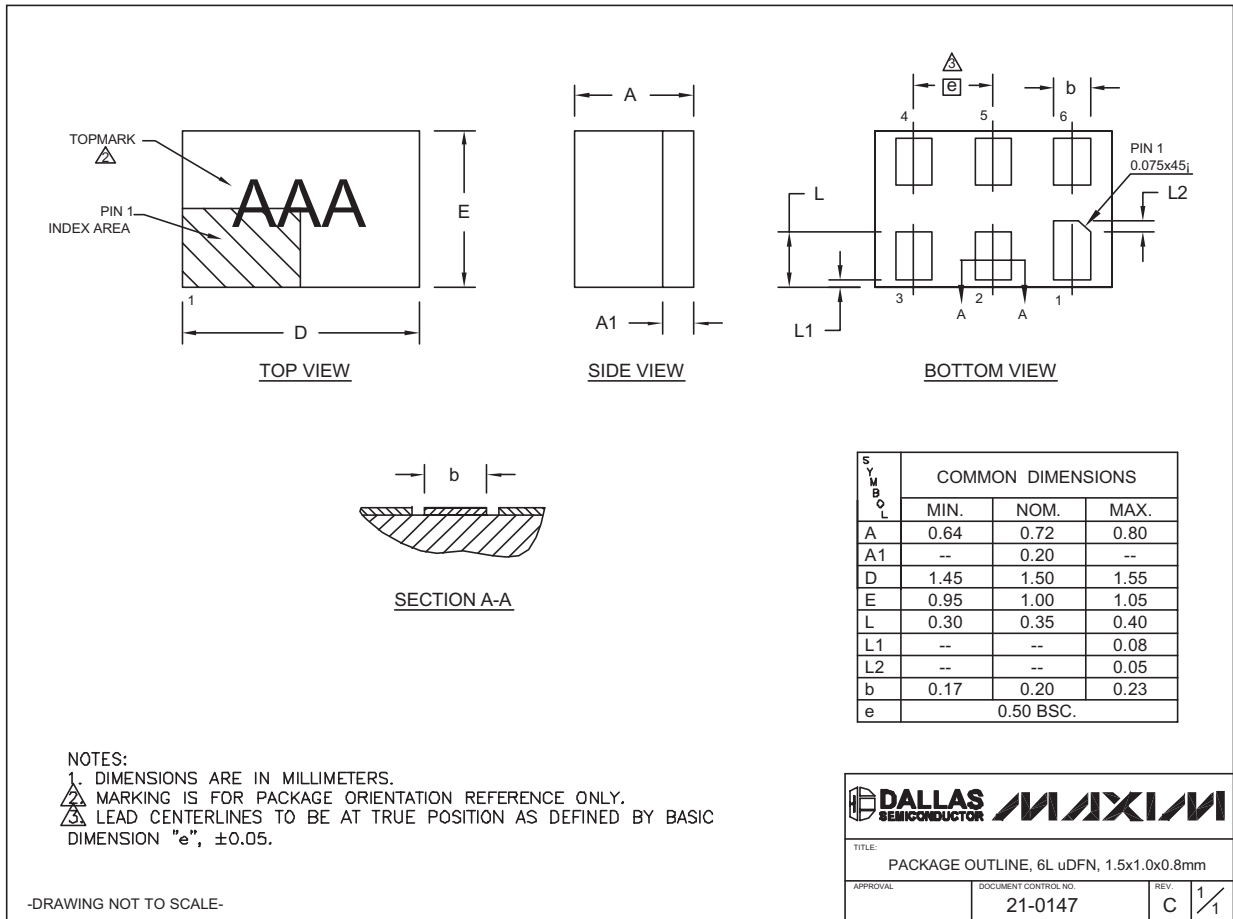
-DRAWING NOT TO SCALE-

DALLAS SEMICONDUCTOR **MAXIM**

TITLE:
PACKAGE OUTLINE, 6L uDFN, 1.5x1.0x0.8mm

APPROVAL	DOCUMENT CONTROL NO.	REV.	
	21-0147	C	1/1

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