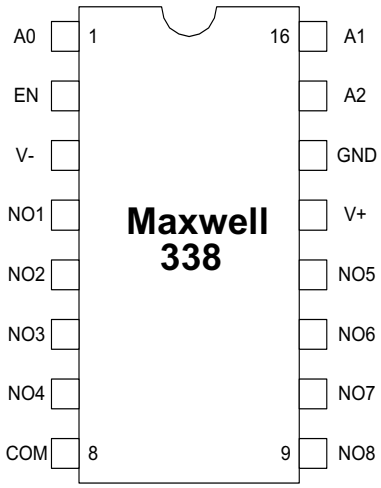
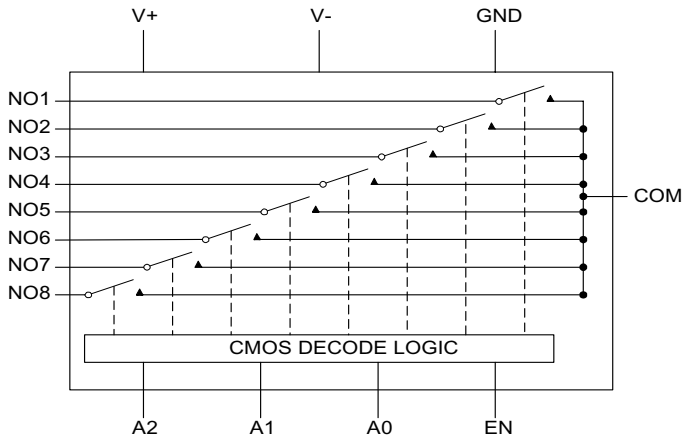
338

8-CHANNEL MULTIPLEXER





FEATURES:

- RAD-PAK® Technology hardened against natural space radiation
- Total dose hardness >100 Krads (Si), dependent upon orbit
- Package:
  -16 Pin RAID-PAK® flat pack
- On-resistance, <400 Ohms max
- Transition time, <500ns
- On-resistance match, <10 Ohms
- NO-Off leakage current, <20pA at 25°C
- 1.5pC charge injection
- Single-supply operation (4.5V to 30V) bipolar-supply operation (±4.5V to ±20V)
- Plug-in upgrade for industry-standard DG508A/DG509A
- Rail-to-rail signal handling
- TTL/CMOS-logic compatible

DESCRIPTION:

Maxwell Technologies' 338 monolithic, CMOS analog multiplexer features the 338 is designed to connect one of eight inputs to a common output by control of a 3-bit binary address, and may be used as either a mux or a demux. On-resistance is 400 ohms max, and the it conducts current equally well in both directions. These muxes feature extremely low off leakages (less than 20pA at 25°C), and extremely low on-channel leakages (less than 50pA at 25°C). The new design offers guaranteed low charge injection (1.5pC typ) and electrostatic discharge (ESD) protection greater than 2000V, per method 3015.7. The 338 operates from a single 4.5V to 30V supply or from dual supplies of ±4.5V to ±20V. All control inputs (whether address or enable) are TTL compatible (0.8V to 2.4V) over the full specified temperature range and over the ±4.5V to ±18V supply range. Capable of surviving space environments, the 338 is ideal for satellite, spacecraft, and space probe missions. The patented radiation-hardened RAD-PAK® technology incorporates radiation shielding in the microcircuit package. It eliminates box shielding while providing required lifetime in orbit. This product is available up to Class S packaging and screening.

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TABLE 1. ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN	MAX	UNITS
Voltage Referenced to V- V+ GND	--	 -0.3 -0.3	 44 25	V
Digital Inputs, NO, COM	--	V- -2	V+ +2	V
Continuous Current (any terminal)	--	--	30	mA
Peak Current, NO or COM (pulsed at 1ms, 10% duty cycle max)	--	--	100	mA
Operating Temperature Ranges	--	-55	125	°C
Storage Temperature Range	--	-65	150	°C
Lead Temperature (soldering, 10sec)	--	--	300	°C

TABLE 2. 338RP ELECTRICAL CHARACTERISTICS - SINGLE SUPPLY

(V+ = +12V, V- = 0V, V_{AH} = 2.4V, V_{AL} = 0.8V, T_A = T_{MIN} TO T_{MAX}, UNLESS OTHERWISE SPECIFIED)

PARAMETER	SYMBOL	CONDITIONS	SUBGROUPS	MIN	TYP [1]	MAX	UNITS
SWITCH							
Analog Signal Range	V_{NO}, V_{COM}		1, 2, 3	0	--	12	V
On-Resistance	R_{ON}	I_{NO} = 0.2mA V_{COM} = 3V or 10V T_A = 25 °C		--	460	650	Ω
DYNAMIC							
Transition Time	t_{TRANS}	V_{NO1} = 8V V_{NO8} = 0V V_{IN} = 2.4V T_A = 25 °C	9	--	210	500	ns
Enable Turn-On Time	$t_{ON(EN)}$	V_{INH} = 2.4V V_{INL} = 0V V_{NO1} = 5V T_A = 25 °C	9	--	280	500	ns
Enable Turn-Off Time	$t_{OFF(EN)}$	V_{INH} = 2.4V V_{INL} = 0V V_{NO1} = 5V T_A = 25 °C	9	--	110	500	ns
Charge Injection[2]	Q	CL = 100pF V_{NO} = 0V R_S = 0 Ohms TA = 25C		--	1.8	5	pC

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

2. Guaranteed by Design

TABLE 3. ELECTRICAL CHARACTERISTICS - DUAL SUPPLIES

(V+ = 15V, V- = -15V, GND = 0V, V_{AH} = 2.4V, V_{AL} = 0.8V, T_A = T_{MIN} TO T_{MAX}, UNLESS OTHERWISE SPECIFIED)

PARAMETER	SYMBOL	CONDITIONS		SUBGROUPS	MIN	TYP [1]	MAX	UNITS
SWITCH								
Analog Signal Range	V_{NO}, V_{COM}			1, 2, 3	-15	--	15	V
On-Resistance	R_{ON}	I_{NO} = -0.2mA V_{COM} = 10V	T_A = 25 °C		--	220	400	Ω
			T_A = T_{MIN} to T_{MAX}		--	--	500	
On-Resistance Matching Between Channels [2,3]	D R_{ON}	I_{NO} = -0.2mA V_{COM} = 10V	T_A = 25 °C		--	4	10	Ω
			T_A = T_{MIN} to T_{MAX} [3]		--	--	15	
NO-Off Leakage Current [4].	$I_{NO(OFF)}$	V_{COM} = 10V V_{NO} = 10V V_{EN} = 0V	T_A = 25 °C	1	-0.02	0.001	0.02	nA
			T_A = T_{MIN} to T_{MAX}	2, 3	-20	--	20	
COM-Off Leakage Current [4]	$I_{COM(OFF)}$	V_{COM} = 10V V_{NO} = 10V V_{EN} = 0V	T_A = 25 °C	1	-0.05	0.05	0.05	nA
			T_A = T_{MIN} to T_{MAX}	2, 3	-40	--	40	
COM-On Leakage Current [4]	$I_{COM(ON)}$	V_{COM} = 10V V_{NO} = 10V sequence each switch on	T_A = 25 °C	1	-0.05	0.06	0.05	nA
			T_A = T_{MIN} to T_{MAX}	2, 3	-40	--	40	
INPUT								
Input Current with Input Voltage High	I_{AH}	V_A = 2.4V or 15V		1, 2, 3	-1.0	0.001	1.0	uA
Input Current with Input Voltage Low	I_{AL}	V_{EN} = 0V or 2.4V, V_A = 0V		1, 2, 3	-1.0	--	1.0	uA
SUPPLY								
Power-Supply Range	--	--	--	1, 2, 3	4.5	--	20	V
Positive Supply Current	I+	V_{EN} = V_A = 0V V_{EN} = 2.4V $V_{A(ALL)}$ = 2.4V	T_A = 25 °C	1	--	--	100	uA
			T_A = T_{MIN} to T_{MAX}	2, 3	--	--	150	
			T_A = 25 °C	1	--	290	500	
			T_A = T_{MIN} to T_{MAX}	2, 3	--	--	600	
Negative Supply Current	I-	V_{EN} = 0V or 2.4V $V_{A(ALL)}$ = 0V or 2.4V or 5V	T_A = 25 °C	1	-1	--	1	uA
			T_A = T_{MIN} to T_{MAX}	2, 3	-10	--	10	

TABLE 3. ELECTRICAL CHARACTERISTICS - DUAL SUPPLIES

(V+ = 15V, V- = -15V, GND = 0V, V_{AH} = 2.4V, V_{AL} = 0.8V, T_A = T_{MIN} TO T_{MAX}, UNLESS OTHERWISE SPECIFIED)

PARAMETER	SYMBOL	CONDITIONS		SUBGROUPS	MIN	TYP [1]	MAX	UNITS
DYNAMIC								
Transition Time	t_{TRANS}	Figure 2.	T_A = 25 °C	9	--	200	500	ns
Break-Before-Make Interval	t_{OPEN}	Figure 4.	T_A = 25 °C	9	10	140	--	ns
Enable Turn-On Time	$t_{ON(EN)}$	Figure 3.	T_A = 25 °C	9	--	160	500	ns
			T_A = T_{MIN} to T_{MAX}	10, 11	--	--	750	
Enable Turn-Off Time	$t_{OFF(EN)}$	Figure 3.	T_A = 25 °C	9	--	100	500	ns
			T_A = T_{MIN} to T_{MAX}	10, 11	--	--	750	
Off Isolation [5,6]	V_{ISO}	V_{EN} = 0V, R_L = 1KW, T_A = +25 °C f = 100kHz		4	--	-75	--	dB
Crosstalk Between Channels	V_{CT}	V_{EN} = 2.4V, f = 100kHz, T_A = +25 °C V_{GEN} = 1Vp-p, R_L = 1kW		4	--	-92	--	dB
Logic Input Capacitance	C_{IN}	f = 1MHz, T_A = +25 °C			--	2	--	pF
NO-Off Capacitance	$C_{NO(OFF)}$	f = 1MHz, V_{EN} = V_{NO} = 0V T_A = +25 °C, Figure 8.			--	3	--	pF
COM-Off Capacitance	$C_{COM(OFF)}$	f = 1MHz, V_{EN} = 0.8V T_A = +25 °C, V_{COM} = 0V, Figure 8.			--	11	--	pF
COM-On Capacitance	$C_{COM(ON)}$	f = 1MHz, V_{EN} = 2.4V, T_A = +25 °C V_{COM} = 0V, Figure 8			--	16	--	pF

1. The algebraic convention where the most negative value is a minimum and the most positive value a maximum is used in this data sheet.
2. Characterized and not 100% tested.
3. DR_{ON} = $R_{ON(MAX)}$ - $R_{ON(MIN)}$.
4. Leakage parameters are 100% tested at the maximum rated hot temperature and guaranteed at 25 °C.
5. Guaranteed by design.
6. Worst-case isolation is on channel 4 because of its proximity to the drain pin. Isolation = 20logV_{COM}/V_{NO}, where V_{COM} = output and V_{NO} = input to off switch.

FIGURE 1. ON-RESISTANCE VS. V_{COM} (DUAL SUPPLIES)

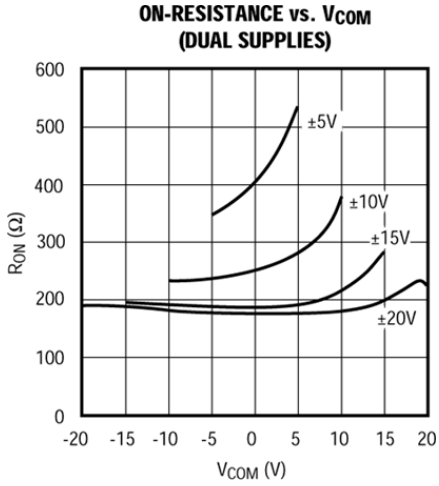


FIGURE 2. ON-RESISTANCE VS. VCOM OVER TEMPERATURE (DUAL SUPPLY)

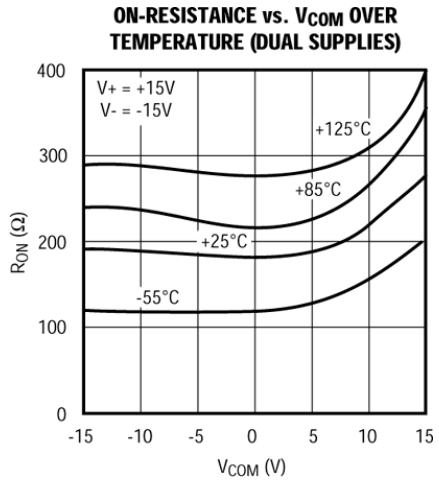


FIGURE 3. ON-RESISTANCE VS. V_{COM} OVER TEMPERATURE (SINGLE SUPPLY)

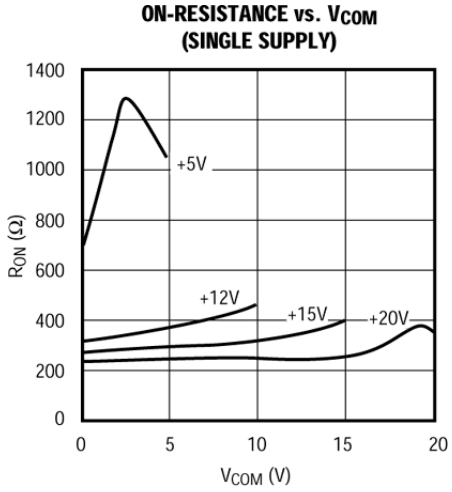


FIGURE 4. ON-RESISTANCE VS. V_{COM} OVER TEMPERATURE (SINGLE SUPPLY)

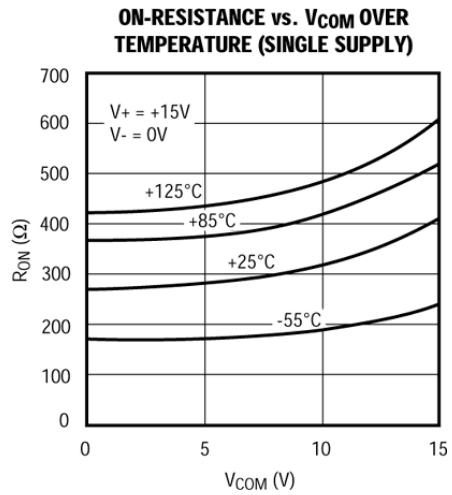


FIGURE 5. OFF LEAKAGE VS. TEMPERATURE

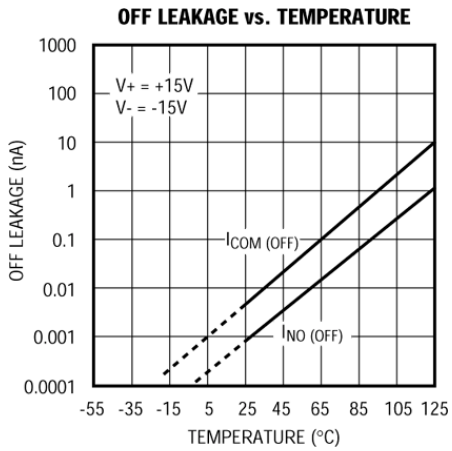


FIGURE 6. ON LEAKAGE VS. TEMPERATURE

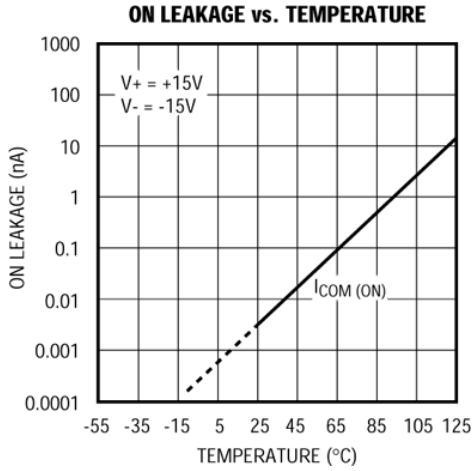


FIGURE 7. CHARGE INJECTION VS. V_{COM}

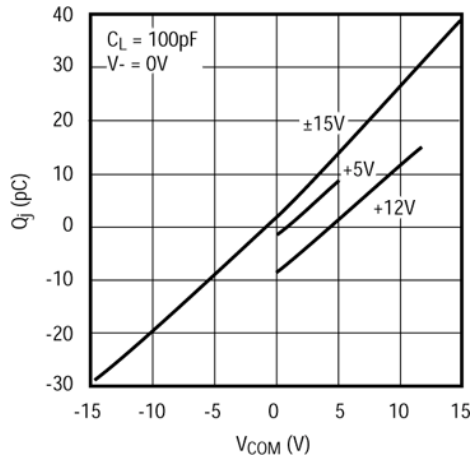


FIGURE 8. SUPPLY CURRENT VS. TEMPERATURE

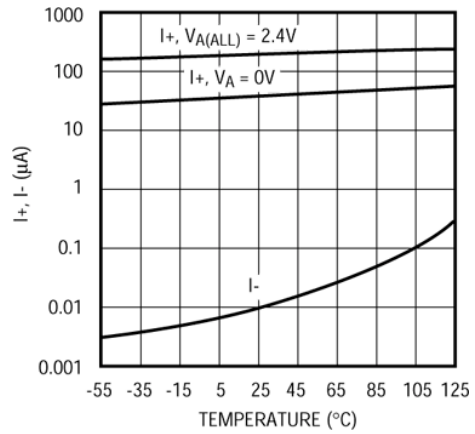


FIGURE 9. TRANSITION TIME VS. POWER SUPPLIES

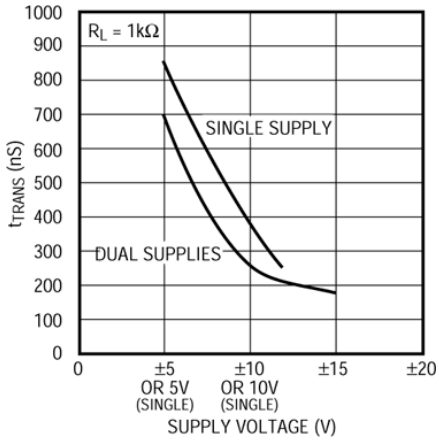


FIGURE 10. OVER VOLTAGE PROTECTION
USING EXTERNAL BLOCKING DIODES

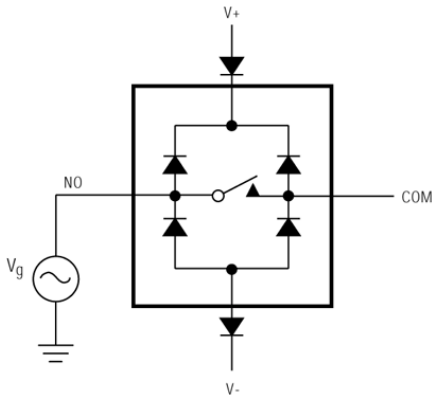


FIGURE 11. ENABLE SWITCHING TIME

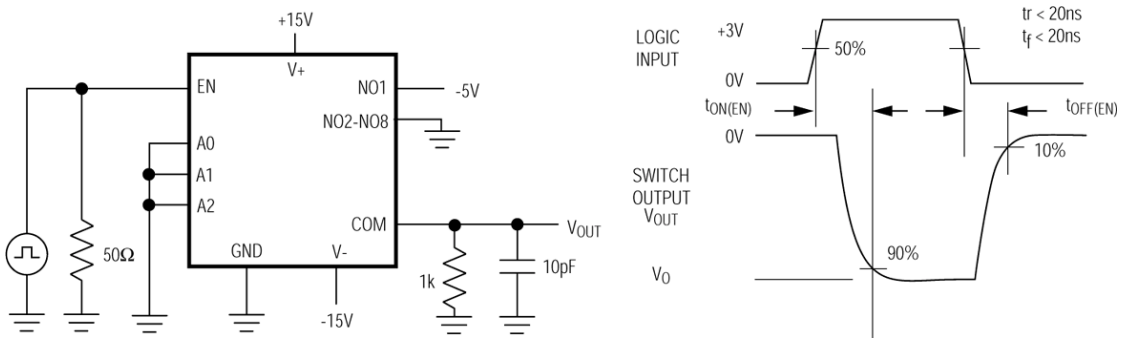


FIGURE 12. TRANSISTION TIME

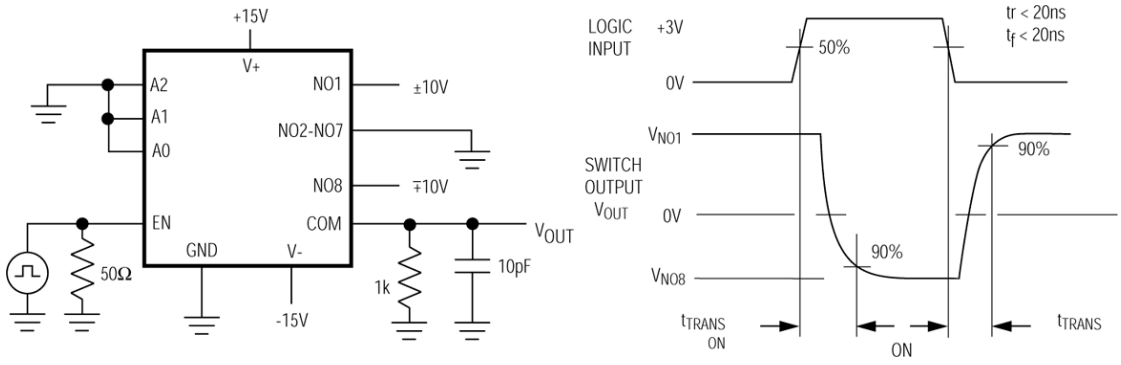


FIGURE 13. BREAK-BEFORE-MAKE INTERVAL

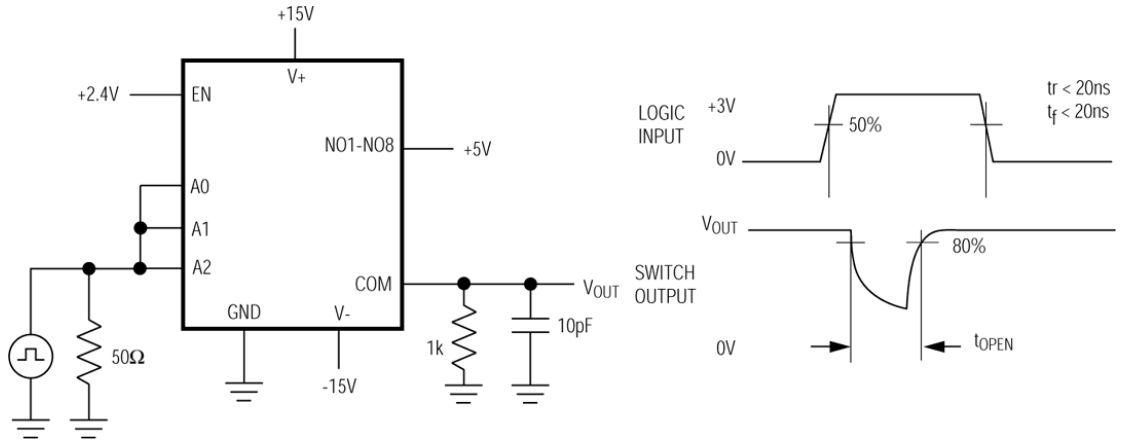


FIGURE 14. CHARGE INJECTION

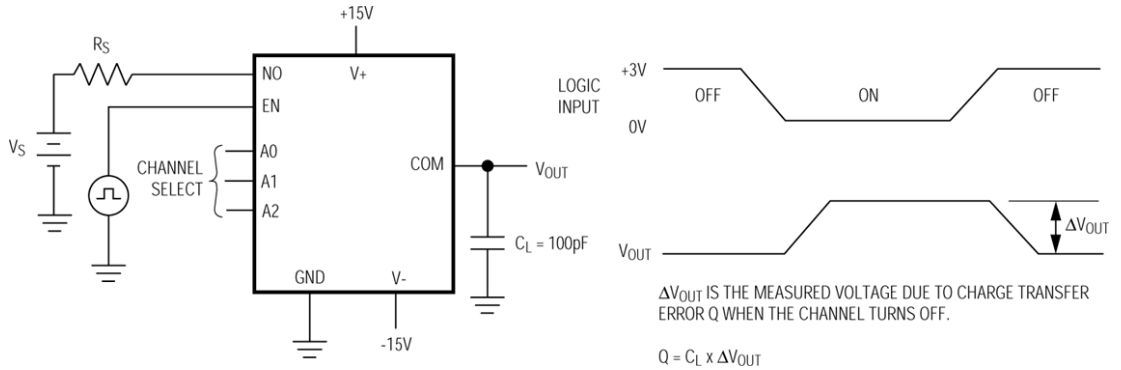


FIGURE 15. OFF ISOLATION

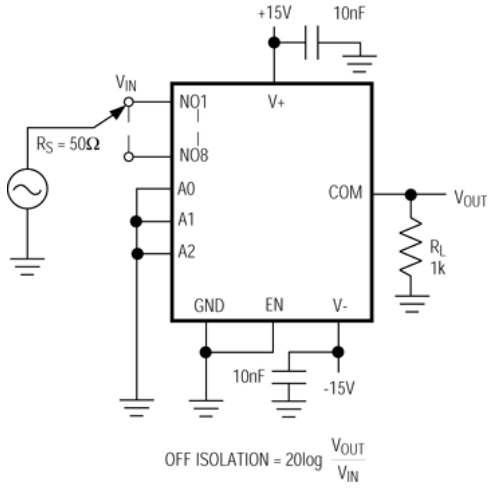


FIGURE 16. CROSSTALK

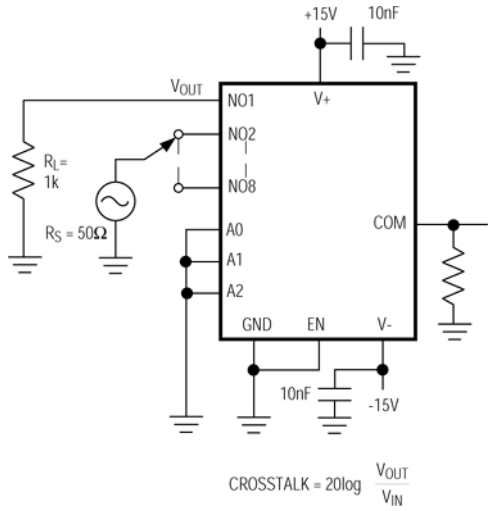


FIGURE 17. NO/COM CAPACITANCE

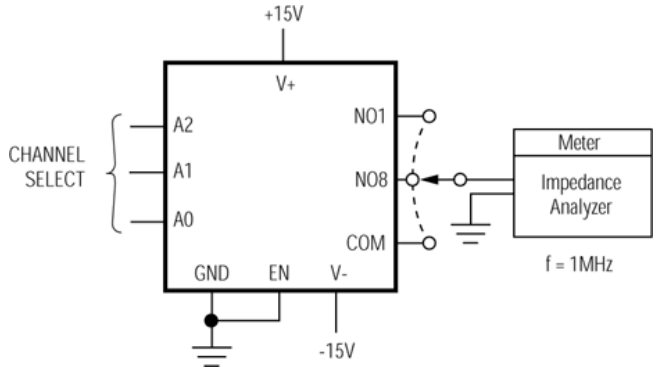
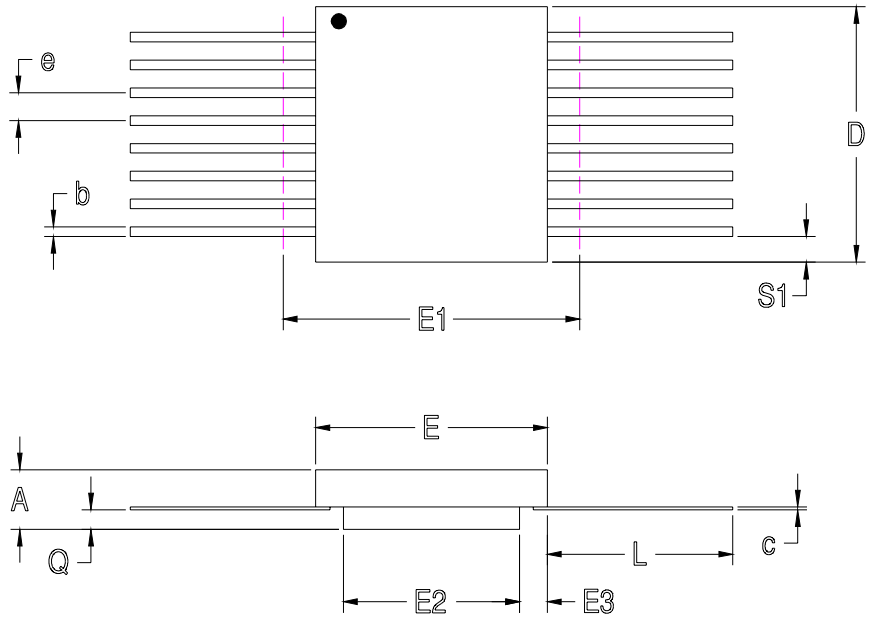


FIGURE 18.[1]TRUTH TABLE

A2	A1	A0	EN	ON SWITCH
X	X	X	0	None
0	0	0	1	1
0	0	1	1	2
0	1	0	1	3
0	1	1	1	4
1	0	0	1	5
1	0	1	1	6
1	1	0	1	7
1	1	1	1	8

1. Logic “0” $V_{AL} \leq 0.8V$, Logic “1” $V_{AH} \geq 2.4V$.

16 PIN RAD-PAK® FLAT PACKAGE DIAGRAM



16 PIN RAD-PAK® FLAT PACKAGE

SYMBOL	DIMENSION		
	MIN	NOM	MAX
A	0.117	0.130	0.143
b	0.015	0.017	0.019
c	0.004	0.005	0.007
D	0.406	0.415	0.440
E	0.275	0.280	0.285
E1	--	--	0.500
E2	0.150	0.156	0.162
E3	0.030	0.062	--
e	0.050 BSC		
L	0.325	0.335	0.345
Q	0.020	0.033	0.045
S1	0.005	0.024	--
N	16		

F16-01
Note: All dimensions in inches

Important Notice:

These data sheets are created using the chip manufacturers published specifications. Maxwell Technologies verifies functionality by testing key parameters either by 100% testing, sample testing or characterization.

The specifications presented within these data sheets represent the latest and most accurate information available to date. However, these specifications are subject to change without notice and Maxwell Technologies assumes no responsibility for the use of this information.

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