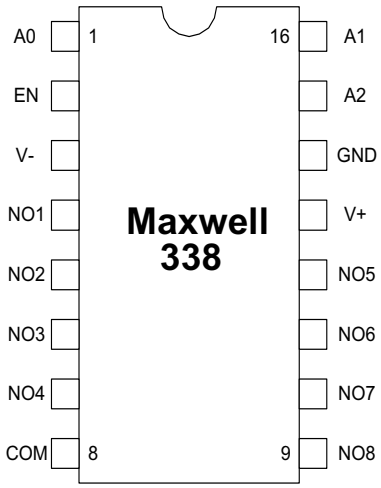
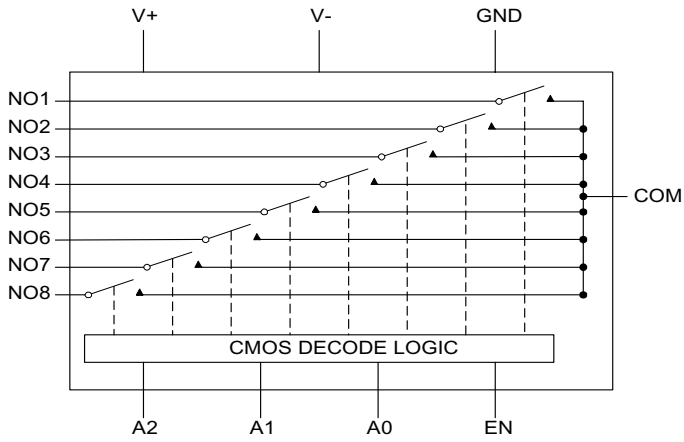
338

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

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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	

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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.

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

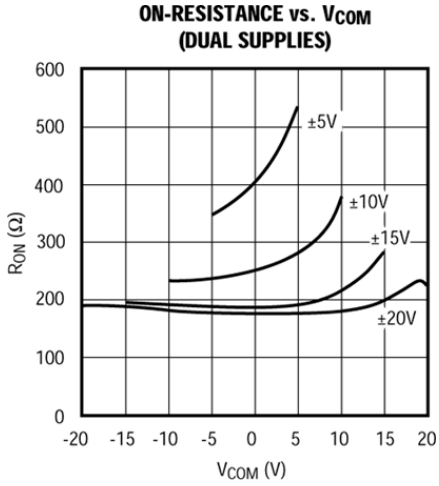
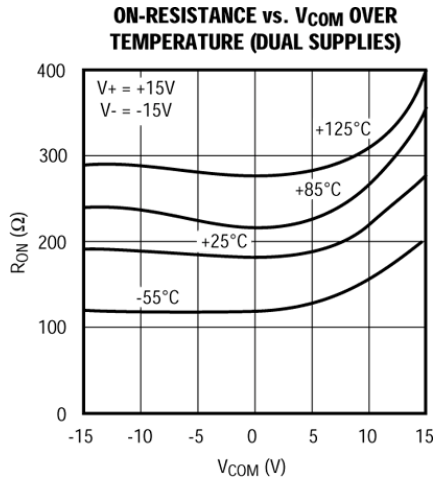


FIGURE 2. ON-RESISTANCE VS. VCOM OVER TEMPERATURE (DUAL SUPPLY)



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

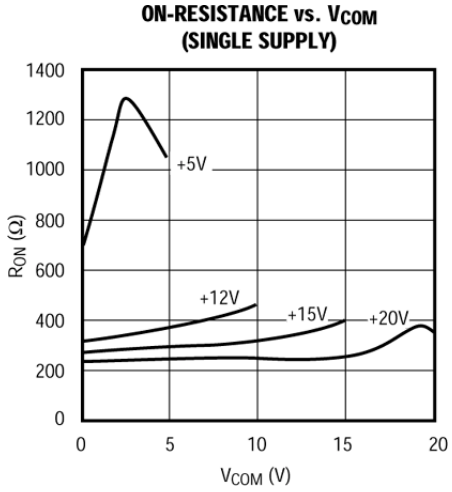


FIGURE 4. ON-RESISTANCE VS. V_{COM} OVER TEMPERATURE (SINGLE SUPPLY)

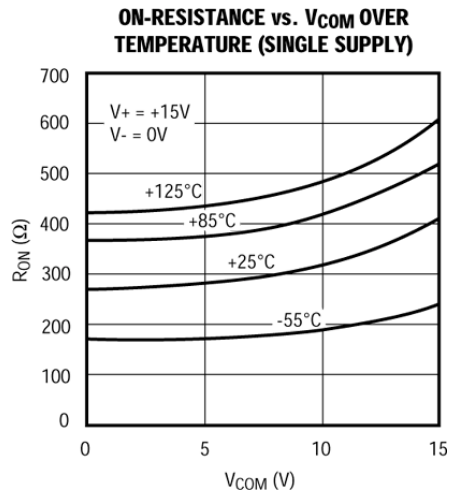
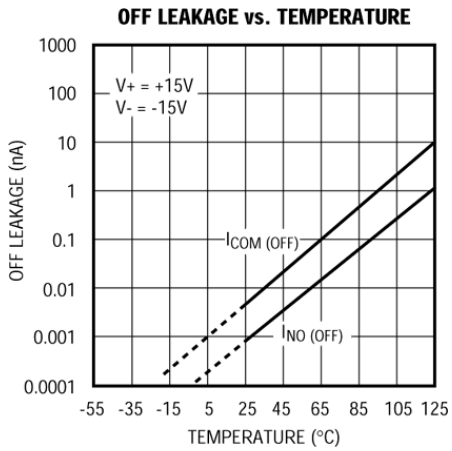


FIGURE 5. OFF LEAKAGE VS. TEMPERATURE



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FIGURE 6. ON LEAKAGE VS. TEMPERATURE

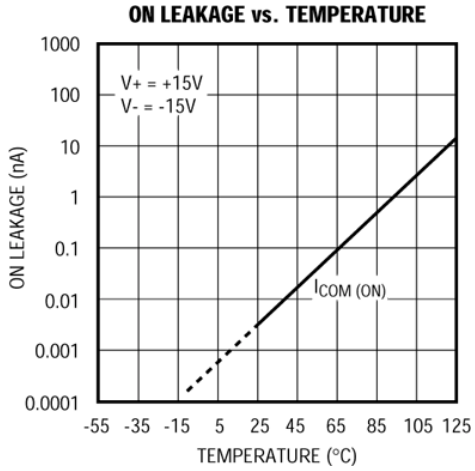


FIGURE 7. CHARGE INJECTION VS. V_{COM}

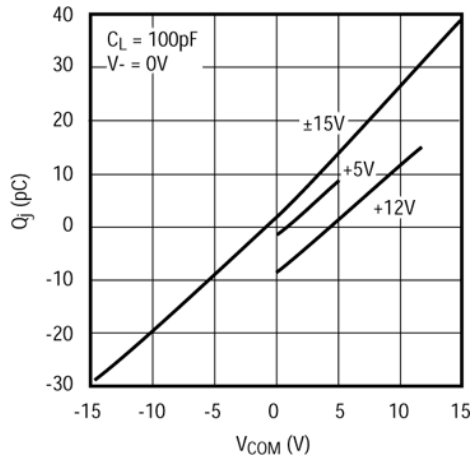
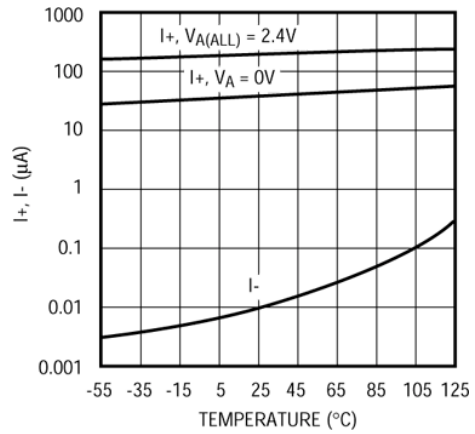


FIGURE 8. SUPPLY CURRENT VS. TEMPERATURE



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FIGURE 9. TRANSITION TIME VS. POWER SUPPLIES

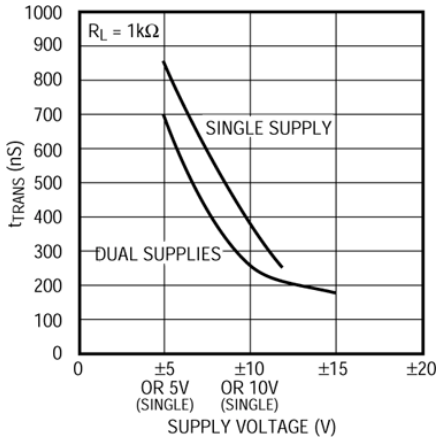


FIGURE 10. OVER VOLTAGE PROTECTION
USING EXTERNAL BLOCKING DIODES

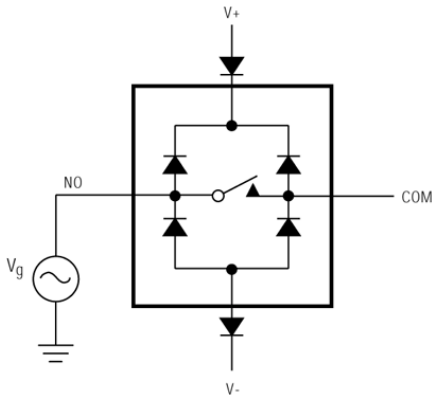
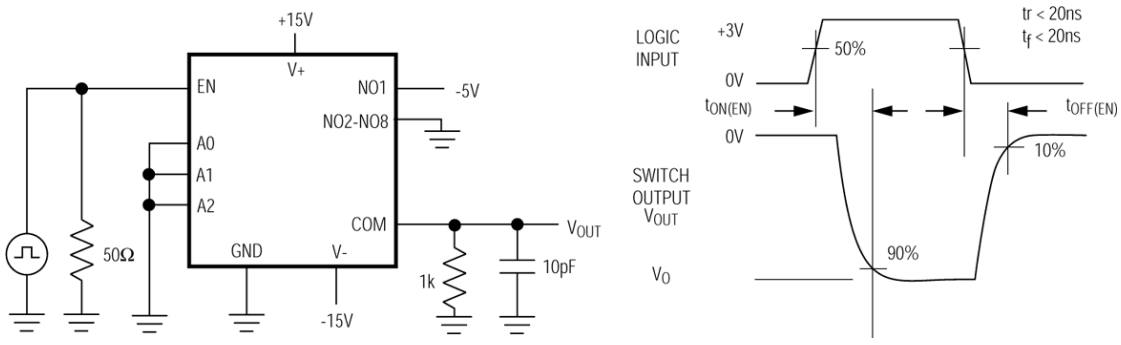


FIGURE 11. ENABLE SWITCHING TIME



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FIGURE 12. TRANSISTION TIME

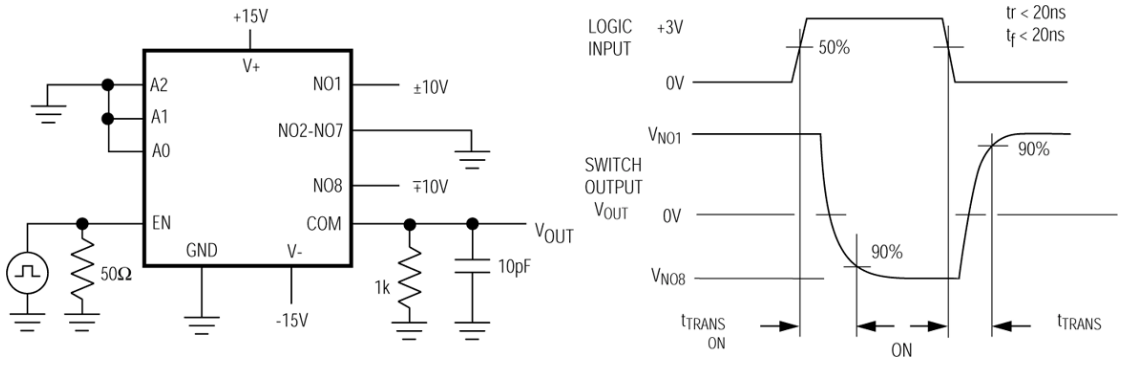


FIGURE 13. BREAK-BEFORE-MAKE INTERVAL

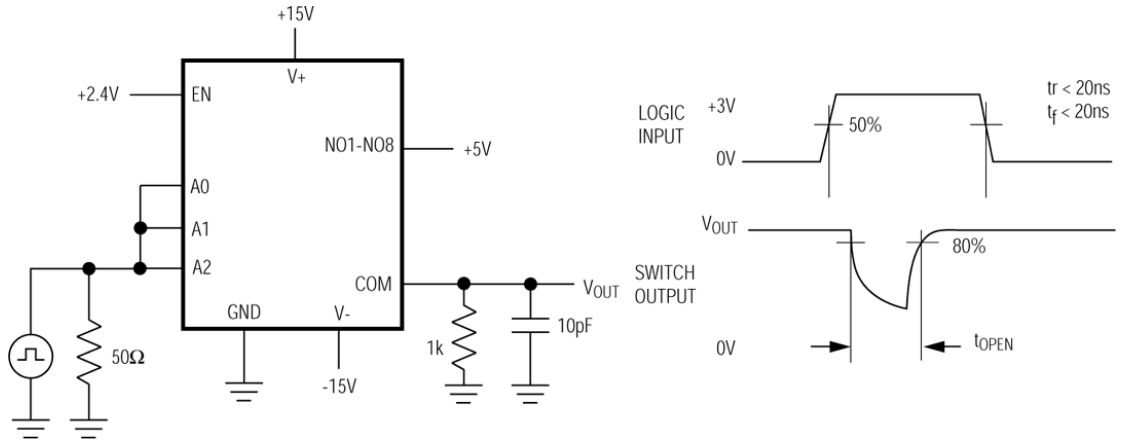
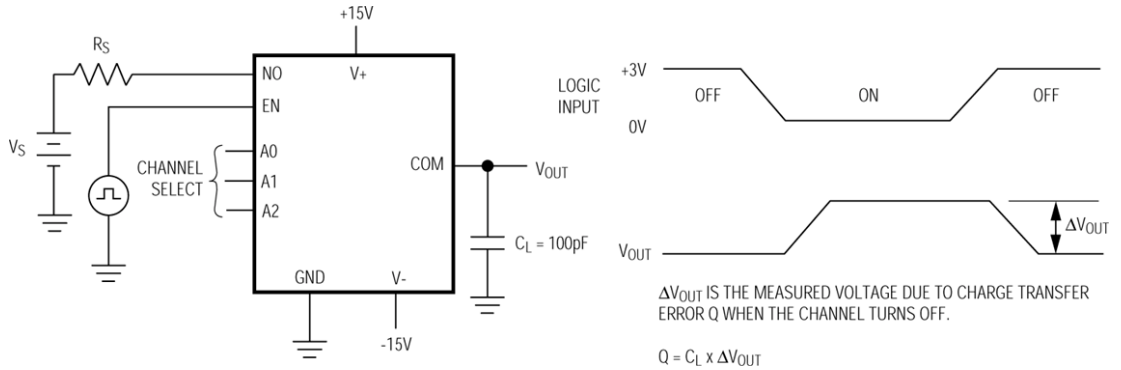


FIGURE 14. CHARGE INJECTION



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FIGURE 15. OFF ISOLATION

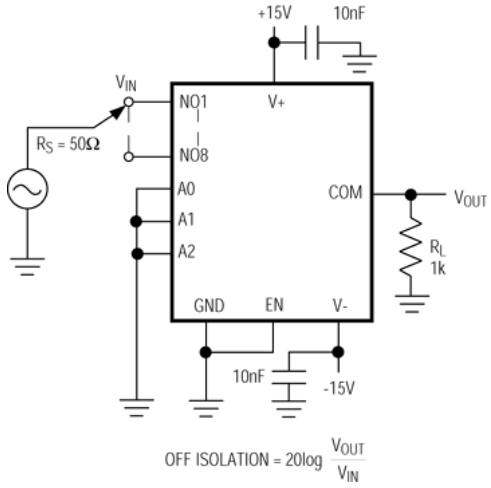


FIGURE 16. CROSSTALK

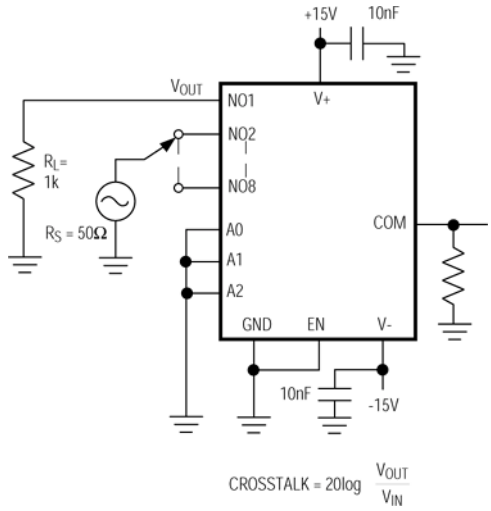
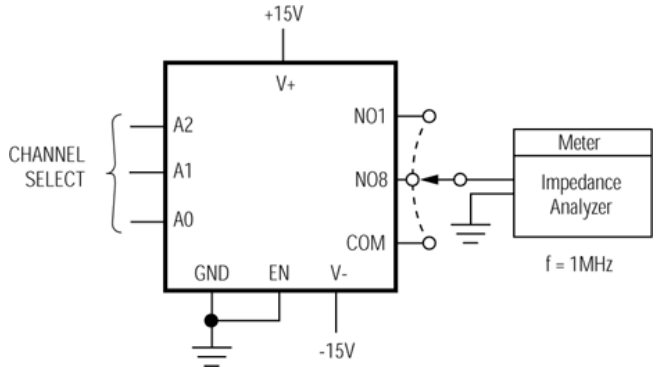


FIGURE 17. NO/COM CAPACITANCE



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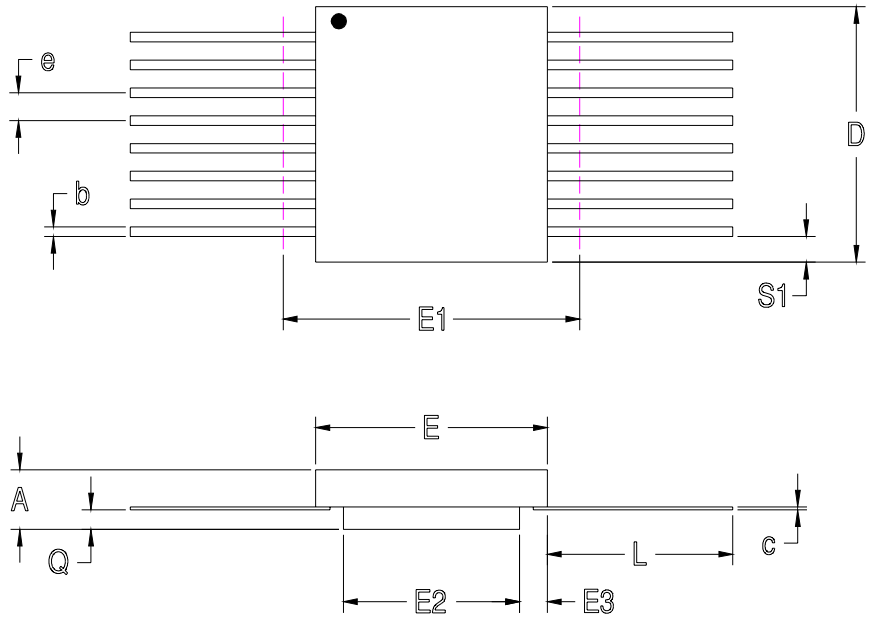
FIGURE 18.[1]TRUTH TABLE

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” $V_{AH} \geq 2.4V$.

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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

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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.

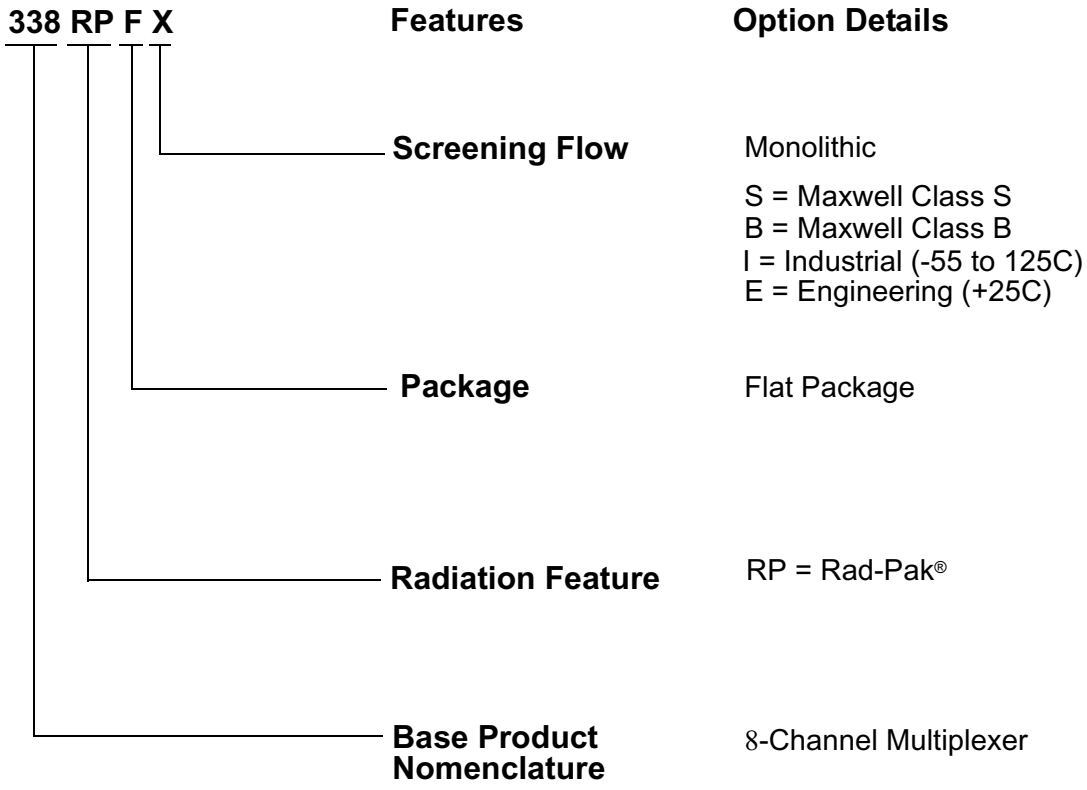
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