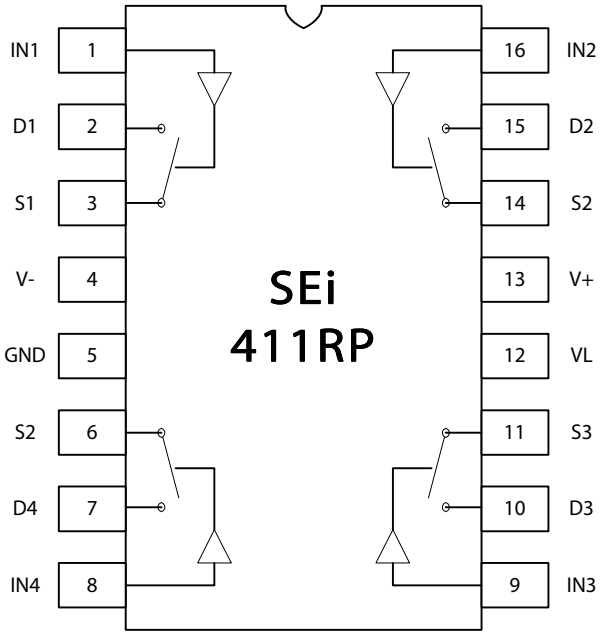
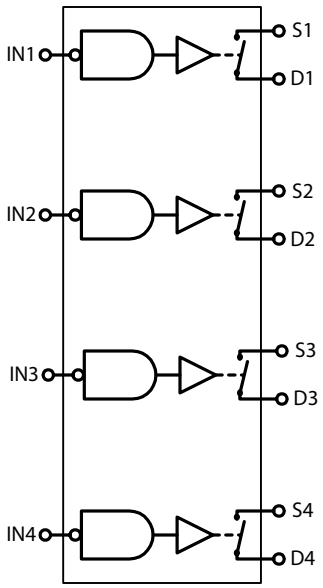
411RP





Four SPST Switches per Package

LOGIC	SWITCH
0	ON
1	OFF

Logic "0" ≤ 0.8V
Logic "0" ≥ 2.4V

FEATURES:

- Quad SPST CMOS Analog Switch
- 44-V Supply Max Rating
- RAD-PAK® radiation hardened against natural space radiation
- Total Dose Hardness: consult factory for TID
- Package : 16 pin RAD-PAK® Flat Package
- ± 15-V Analog Signal Range
- Trench Isolation Gurads Against Latch-Up
- Break Before Make Switching
- Low On-Resistance R_{ON}<45Ω
- Fast Switching t_{ON}<175ns
- Dual Supply t_{OFF}<145ns
- Ultra Low Power-P_D: 0.35mW
- TTL, CMOS Compatible
- Single Supply Capability

DESCRIPTION:

Space Electronics' 411RP (RP for RAD-PAK®) monolithic quad analog switches are designed to provide high speed, low error switching of precision analog signals. Combining low power (0.35 mW) with high speed (t_{ON}: 175 ns), the 411RP is ideally suited for space applications. The 411RP achieves high-voltage ratings and superior switching performance by employing a high voltage silicon gate process technology. An epitaxial layer prevents latch-up. Each switch conducts equally well in both directions when on, and blocks input voltages up to the supply levels when off. All switches exhibit break before make switching action for use in multiplexer application. The 411RP responds to opposite control logic as shown in the Truth Table. The patented radiation hardened RAD-PAK® technology incorporates radiation shielding in the microcircuit package. It provides a 100krad (Si) Total Dose survivability, based on GEO type orbit (actual TID tolerance is dependent upon orbit and mission duration). It eliminates box shielding while providing lifetime in orbit. This product is available in class B and S packaging and screening.

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TABLE 1. 411RP DUAL SUPPLY ELECTRICAL CHARACTERISTICS

(V_{DD} = +15V±10%, V_L = +5V±10%, GND = 0V, TA = -55 TO +125°C UNLESS OTHERWISE SPECIFIED.)

PARAMETER	TEST CONDITIONS	+25°C	-55°C TO + 125°C	UNITS
ANALOG SWITCH			V_{DD} to V_{SS}	V
Analog Signal Range[1]	V_D=±8.5 V, I_S=-10mA	25		Ω typ
RON	V_{DD}=+13.5V, V_{SS}=-13.5V	35	45	Ω max
LEAKAGE CURRENTS	V_{DD} = +16.5 V, V_{SS} = -16.5V			
Source OFF Leakage I_S (OFF)	V_D = + 15.5V, V_S = 15.5V	±0.1		nA typ
	Test Circuit 2		±20	nA max
Drain OFF Leakage I_D (OFF)	V_D= ±15.5 V, V_S=±15.5V;	±0.1		nA typ
	Test Circuit 2		±20	na max
Channel ON Leakage I_D, I_S (ON)	V_D= V_S=±15.5V	±0.1		nA typ
	Test Circuit 3		±40	nA max
DIGITAL INPUTS				
Input High Voltage, V_{INH}			2.4	V min
Input Low Voltage, V_{INL}			0.8	V max
Input Current	V_{IN} = V_{INL} or V_{INH}	0.005		mA typ
I_{IL} or I_{IH}			±0.5	mA max
DYNAMIC CHARACTERISTICS				
t_{ON}	R_L= 300Ω, C_L= 35pF	110		ns typ
	V_S=±10V;Test Circuit 4		175	ns max
t_{OFF}	R_L= 300Ω, C_L= 35pF	100		ns typ
	V_S=±10V; Test Circuit 4		145	ns max
Charge Injection[1]	V_S=0 V,R_S=0Ω,C_L=10 nF; Test Circuit 6	5		pC typ
OFF Isolation	R_L=50Ω,C_L=5 pF, f=1MHz; Test Circuit 7	68		dB typ
		85		
CS (OFF)	f=1MHz	9		
CD (OFF)		9		pF typ
CD, CS (ON)		35		
POWER REQUIREMENTS	V_{DD}= +16.5 V, V_{SS}=-16.5V			
I+	Digital Inputs= 0 V or 5V	0.0001		uA typ
		1	5	uA max
I-		0.0001		uA typ
		1	5	uA max
I_L		0.0001		uA typ
		1	5	uA max

1. Guaranteed by design.

TABLE 2. 411RP SINGLE SUPPLY ELECTRICAL CHARACTERISTICS

(V_{DD} = +15V±10%, V_L = +5V±10%, GND = 0V, TA = -55 TO +125°C UNLESS OTHERWISE SPECIFIED.)

PARAMETER	TEST CONDITIONS	+25°C	-55°C TO 125°C	UNITS
ANALOG SIGNAL RANGE[1]	3.0 - 8.0V		0V to V_{DD}	V
R_{ON}	0<V_D=8.5V, I_S=-10 mA;	40		Ω typ
	V_{DD}=+10.8V	80	100	Ω max
LEAKAGE CURRENTS	V_{DD}=+13.2V			
Source OFF Leakage I_S (OFF)	V_D=12.2/1V,V_S=1/12.2V	±0.1		nA typ
	Test Circuit 2		±20	nA max
Drain OFF Leakage I_D (OFF)	V_D=12.2/1V,V_S=1/12.2	±0.1		nA typ
	Test Circuit 2		±20	nAmax
Channel ON Leakage I_D, I_S (ON)	V_D=V_S=+12.2V/+1V;	±0.1		nA typ
	Test Circuit 3		±40	nAmax
DIGITAL INPUTS				
Input High Voltage, V_{INH}			2.4	V min
Input Low Voltage, V_{INL}			0.8	V max
Input Current				
I_{INL} or I_{INH}	V_{IN}= V_{INL} or V_{INH}	0.0005		mA typ
			±0.5	mA max
DYNAMIC CHARACTERISTICS				
Ton	R_L= 300Ω, C_L=35 pF;	175		ns typ
	V_S= +8V;Test Circuit 4		250	ns max
Toff	R_L=300Ω,C_L=35pF	95		ns typ
	V_S=+8V; Test Circuit 4		125	ns max
Charge Injection[1]	V_S=0V,R_S=0Ω,C_L=10 nf; Test Circuit 6	25		pC typ
POWER REQUIREMENTS	V_{DD}=+13.2V, Digital Inputs = 0V or 5V			
I+		0.0001		mA typ
		1	5	mA max
I_L		0.0001		mA typ
	V_L = +5.25V	1	5	mA max

1. Guaranteed by design.

411RP TYPICAL PERFORMANCE CHARACTERISTICS

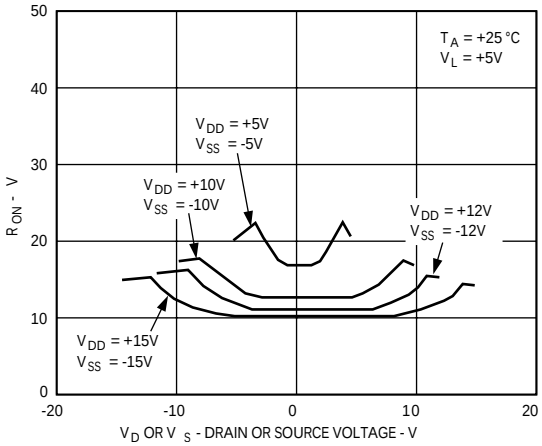


Figure 1. On Resistance as a Function of V_D (V_S) Dual Supplies

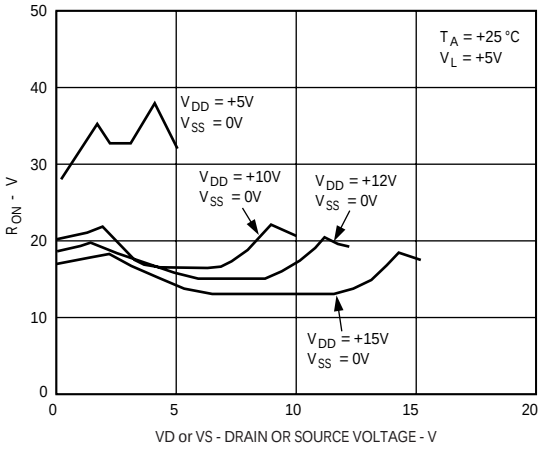


Figure 4. On Resistance as a Function of V_D (V_S) Single Supply

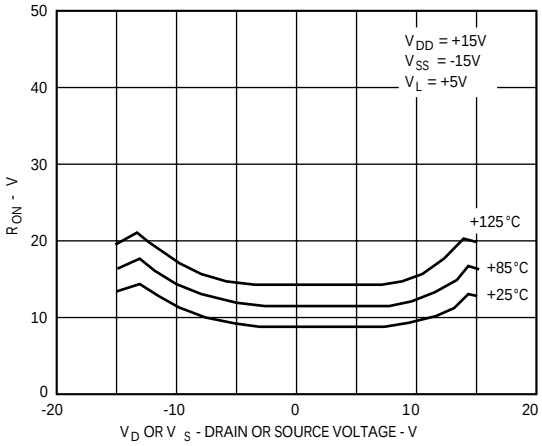


Figure 2. On Resistance as a Function of V_D (V_S) for Different Temperatures

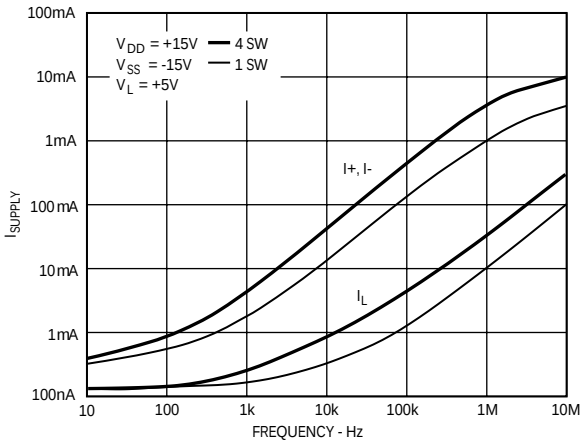


Figure 5. Supply Current vs. Input Switching Frequency

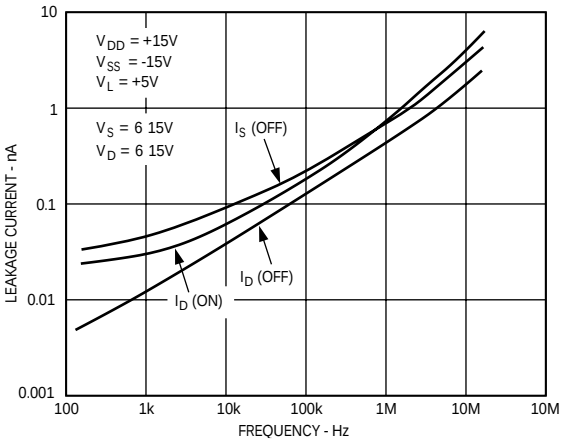


Figure 3. Leakage Currents as a Function of Temperature

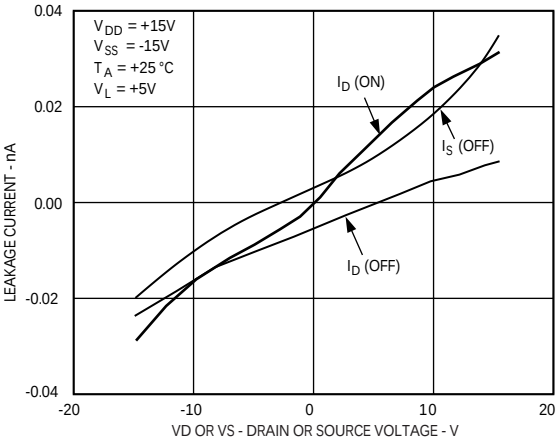


Figure 6. Leakage Currents as Function of V_D (V_S)

411RP TYPICAL PERFORMANCE CHARACTERISTICS

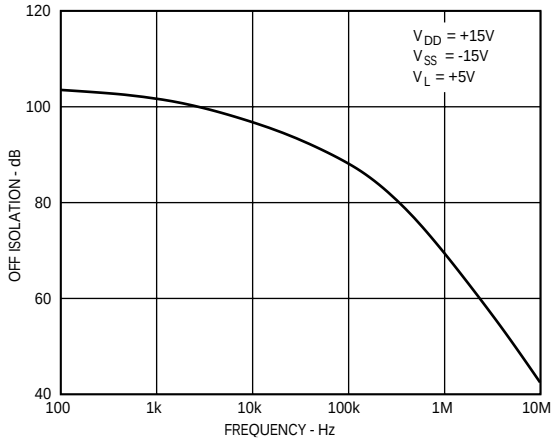


Figure 7. Off Isolation vs. Frequency

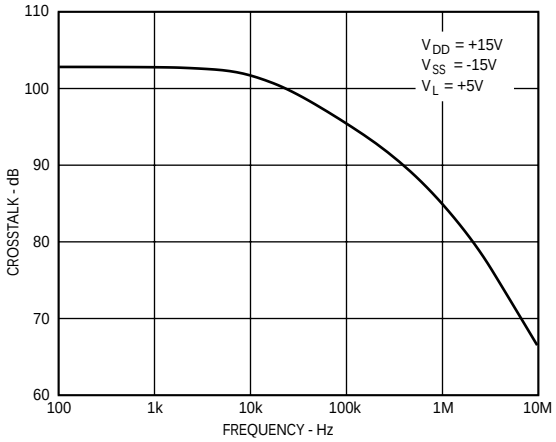
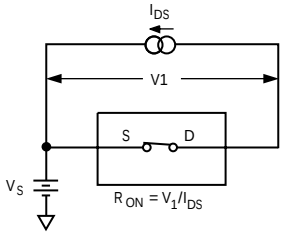
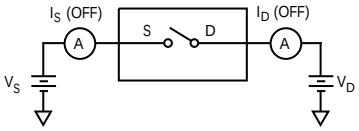


Figure 8. Crosstalk vs. Frequency

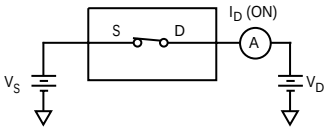
411RP TEST CIRCUITS



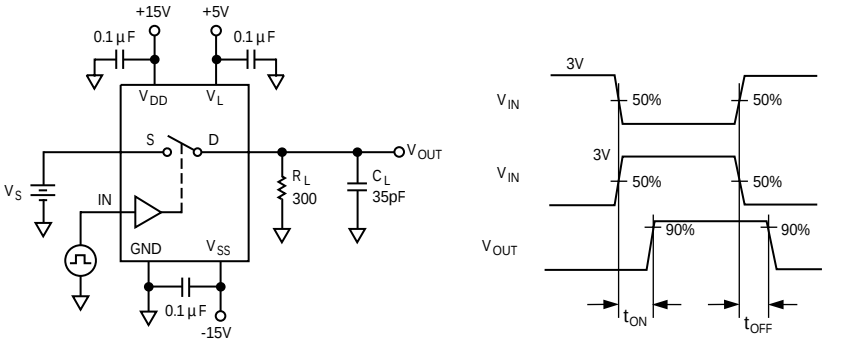
Test Circuit 1. On Resistance



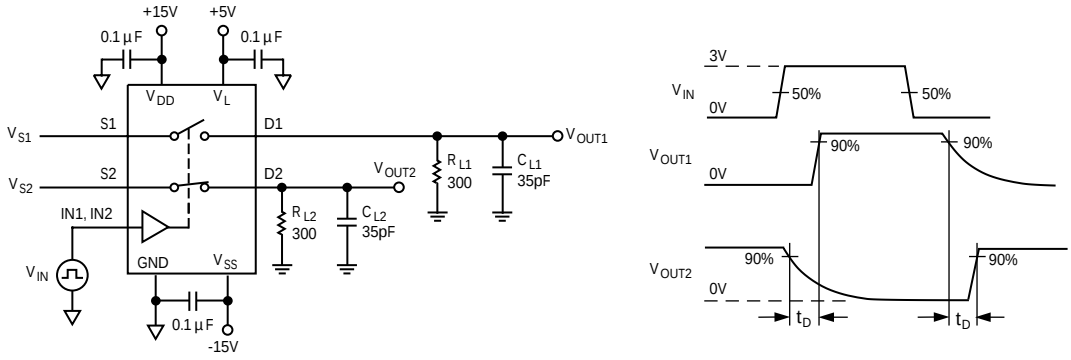
Test Circuit 2. Off Leakage



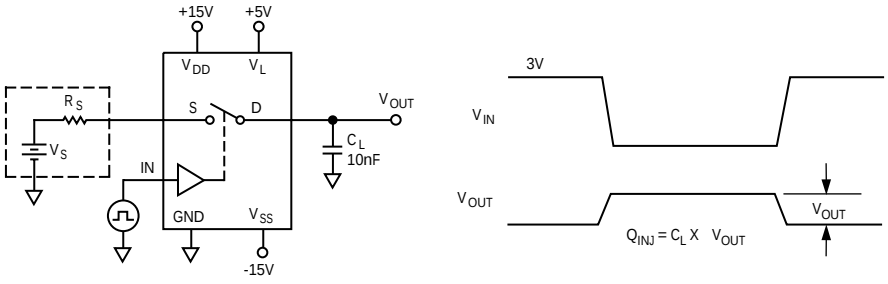
Test Circuit 3. On Leakage



Test Circuit 4. Switching Times

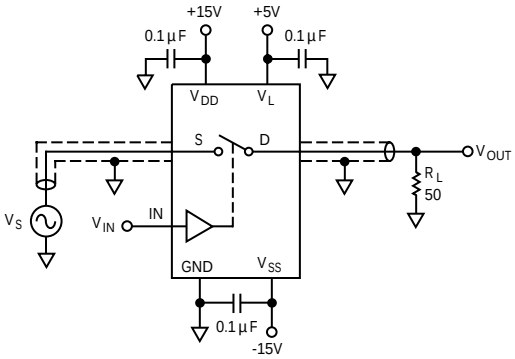


Test Circuit 5. Break-Before-Make Time Delay

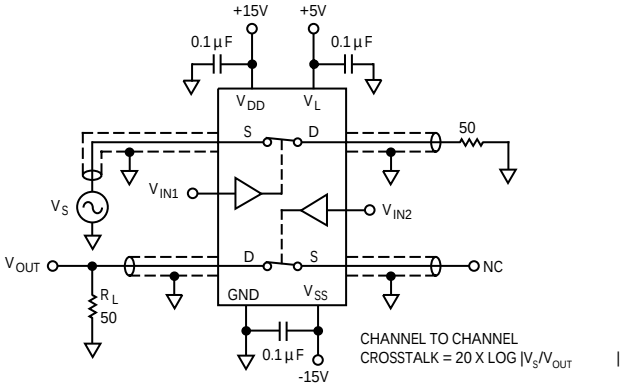


Test Circuit 6. Charge Injection

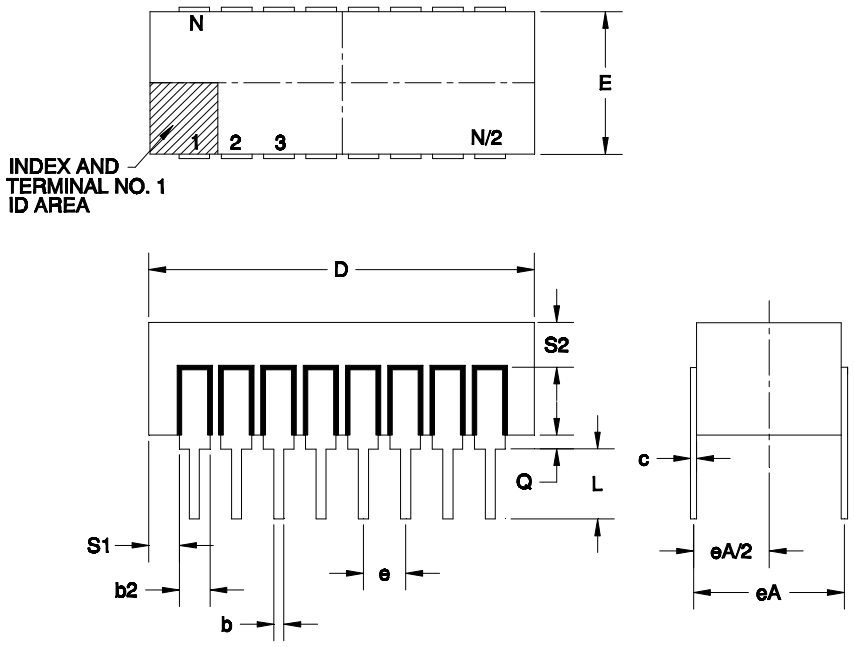
411RP TEST CIRCUITS



Test Circuit 7. Off Isolation



Test Circuit 8. Channel-to-Channel Crosstalk

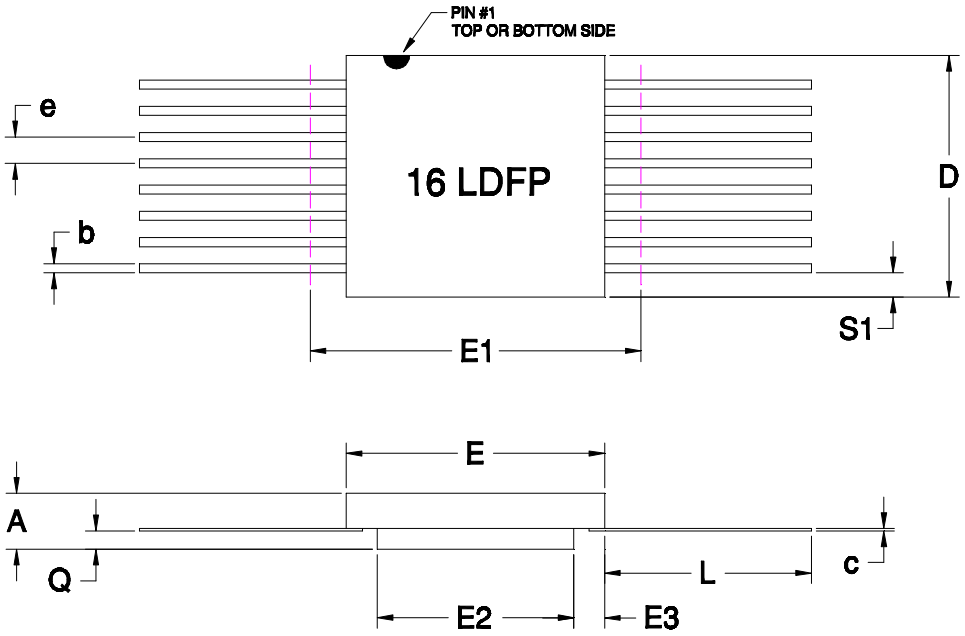


16-PIN RAD-PAK® DUAL IN-LINE PACKAGE

SYMBOL	DIMENSION		
	MIN	NOM	MAX
A	--	0.157	0.200
b	0.014	0.018	0.026
b2	0.045	0.047	0.065
c	0.008	0.010	0.018
D	--	0.800	0.840
E	0.220	0.295	0.310
eA	0.300 BSC		
eA/2	0.150 BSC		
e	0.100 BSC		
L	0.135	0.145	0.155
Q	0.000	0.002	0.060
S1	0.005	0.027	--
S2	0.005	--	--
N	16		

D16-01

Note: All dimensions in inches.



16-PIN RAD-PAK® FLAT PACKAGE

SYMBOL	DIMENSION		
	MIN	NOM	MAX
A	0.117	0.130	0.143
b	0.015	0.017	0.022
c	0.004	0.005	0.009
D	--	0.415	0.440
E	0.245	0.280	0.285
E1	--	--	0.315
E2	0.130	0.156	--
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. Space Electronics 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 Space Electronics assumes no responsibility for the use of this information.

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